Appendix A-1

Legal Authority Certification

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December 6, 2013

Sam Unger, Executive Officer
California Regional Water Quality Control Board
Los Angeles Region
320 W. 4th Street, Suite 200
Los Angeles, California 90013-1105

Re: Statement of Legal Authority

Dear Mr. Unger:

This letter is provided to serve as the Statement of Legal Authority for the City of Baldwin Park (the "City") that must be submitted with its Annual Report pursuant to Part VI.A.2.b. of Order No. R4-2012-0175 for NPDES Permit No. CAS004001. As legal counsel for the City, it is my considered legal opinion that the City has all the necessary legal authority to implement and enforce the requirements contained in 40 CFR § 122.26(d)(2)(i)(A-F) and this Order during the reporting period of July 1, 2012 through June 30, 2013, to the extent permitted by State and Federal law, subject to the limitations on municipal action under the California and United States Constitutions.

Per the requirement in Part VI.A.2.b.i., here are citations to the Baldwin Park Municipal Code ("BPMC") for each of the following requirements found in Part VI.A.2.a:

i. Control the contribution of pollutants to its MS4 from storm water discharges associated with industrial and construction activity and control the quality of storm water discharged from industrial and construction sites. This requirement applies both to industrial and construction sites with coverage under an NPDES permit, as well as to those sites that do not have coverage under an NPDES permit.

BPMC Sections: 52.08 Control of pollutants from commercial facilities, 52.09 Control of pollutants from industrial activities, 52.10 Control of pollutants from other industrial facilities, 52.11 Control of pollutants from state permitted construction activities, and 52.12 Control of pollutants from other construction activities

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ii. *Prohibit all non-storm water discharges through the MS4 to receiving waters not otherwise authorized or conditionally exempt pursuant to Part III.A.*

BPMC Sections: 52.05 Illicit discharges, dumping and non-storm water discharges and 52.07 Reduction of pollutants in runoff

iii. *Prohibit and eliminate illicit discharges and illicit connections to the MS4.*

BPMC Sections: 52.05 Illicit discharges, dumping and non-storm water discharges and 52.06 Illicit connections

iv. *Control the discharge of spills, dumping, or disposal of materials other than storm water to its MS4.*

BPMC Section: 52.05 Illicit discharges, dumping and non-storm water discharges

v. *Require compliance with conditions in Permittee ordinances, permits, contracts or orders (i.e., hold dischargers to its MS4 accountable for their contributions of pollutants and flows);*

BPMC Sections: 52.02 Purpose and intent and 52.15 Inspections and enforcement

vi. *Utilize enforcement mechanisms to require compliance with applicable ordinances, permits, contracts, or orders.*

BPMC Sections: 52.15 Inspections and enforcement, 52.16 Notices of violation, 52.17 Nuisance, and 52.18 Remedies not exclusive

vii. *Control the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements among Co-permittees;*

BPMC Sections: 52.01 Definitions, 52.02 Purpose and intent, and 52.05 Illicit discharges, dumping and non-storm water discharges

viii. *Control of the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements with other owners of the MS4 such as the State of California Department of Transportation;*

BPMC Sections: 52.01 Definitions, 52.02 Purpose and intent, and 52.05 Illicit discharges, dumping and non-storm water discharges

ix. *Carry out all inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with applicable municipal ordinances,* *permits, contracts and orders, and with the provisions of this Order, including the prohibition of non-storm water discharges into the MS4 and receiving waters. This means the Permittee must have authority to enter, monitor, inspect, take measurements, review and copy records, and require regular reports from entities discharging into its MS4;*

BPMC Section: 52.15 Inspections and enforcement

x. Require the use of control measures to prevent or reduce the discharge of pollutants to achieve water quality standards/receiving water limitations;

BPMC Sections: 52.08 Control of pollutants from commercial facilities and 52.10 Control of pollutants from other industrial facilities

xi. Require that structural BMPs are properly operated and maintained;

BPMC Section: 52.13 Control of pollutants from new developments/redevelopments

xii. Require documentation on the operation and maintenance of structural BMPs and their effectiveness in reducing the discharge of pollutants to the MS4.

BPMC Section: 52.13 Control of pollutants from new developments/redevelopments

Per the requirement in Part VI.A.2.b.ii., the City's legal procedures available to mandate compliance with applicable municipal ordinances identified in the above section, and therefore with the conditions of the Order, can be found in BPMC Sections 52.15 Inspections and enforcement, 52.16 Notices of violation, 52.17 Nuisance, and 52.18 Remedies not exclusive. Here is the relevant text from those provisions:

52.15 Inspections and enforcement

[…]

(B) Enforcement.

(1) Any violation of this chapter is a misdemeanor and shall be punishable by either a fine of up to $1,000 or six months in the County Jail, or both.

(2) Any person who may otherwise be charged with a misdemeanor as a result of a violation of this chapter may be charged, at the discretion of the Prosecuting Attorney, with an infraction punishable by a fine of not more than $100 for the first violation, $200 for the second violation, and $250 for each additional violation thereafter.

(3) As a part of any sentence or other penalty imposed or the award of any damage, the Court may also order that restitution be paid to the city or any injured person, or, in the case of a violator who is a minor, by the minor's parent or lawfully designated guardian or custodian. Restitution may include the amount of any reward.

(4) Any person violating the provisions of this chapter shall reimburse the city for any and all costs incurred by the city in responding to, investigating, assessing, monitoring, treating, cleaning, removing, or remediating any illicit discharge or pollutant from the municipal storm drain system; rectifying any illicit connection; or remediating any violation of this chapter. Such costs to be paid to the city include all administrative expenses and all legal expenses, including costs and attorneys' fees, in obtaining compliance, and in litigation including all costs and attorneys' fees on any appeal. The costs to be recovered in this section shall be recoverable from any and all persons violating this chapter.

(5) In the event any violation of this chapter constitutes an imminent danger to public health, safety, or the environment, the Chief Executive Officer or Director, or any authorized agent thereof, may enter upon the premises from which the violation emanates, abate the violation and danger created to the public safety or the environment, and restore any premises affected by the alleged violation, without notice to or consent from the owner or occupant of the premises. An imminent danger shall include but is not limited to exigent circumstances created by the discharge of pollutants, where such discharge presents a significant and immediate threat to the public health or safety, or the environment.

(6) Any person acting in violation of this chapter may also be acting in violation of the Clean Water Act or the California Porter-Cologne Act (Cal. Water Code §§ 13000 et seq.) and the regulations thereunder, and other laws and regulations, and may be subject to damages, fines and penalties, including civil liability under such other laws. The City Attorney is authorized to file a citizen's suit pursuant to the Clean Water Act, seeking penalties, damages and orders compelling compliance and appropriate relief.

(7) The City Attorney is authorized to file in a court of competent jurisdiction a civil action seeking an injunction against any violation or threatened or continuing violation of this chapter. Any temporary, preliminary or permanent injunction issued pursuant hereto may include an order for reimbursement to the city for all costs incurred in enforcing this chapter, including costs of inspection, investigation, monitoring, treatment, abatement, removal or remediation undertaken by or at the expense of the city, and may include all legal expenses and fees and any of all costs incurred relating to the restoration or remediation of the environment.

(8) Each separate discharge in violation of this chapter and each day a violation of this chapter exists, without correction, shall constitute a new and separate violation punishable as a separate infraction, misdemeanor and/or civil violation.

52.16 Notices of violation

(A) Immediate notification. Any person who intentionally, negligently or otherwise violates any provision of this chapter resulting in a discharge of a pollutant or pollutants to the municipal storm drain system shall immediately notify the Director or his or her designee by telephone or in person, and shall identify at that time the location of the discharge, the date and time of the discharge, the type and concentration of the volume of pollutant discharged, as well as any collective action taken as a result of the illicit discharge. Written notification of such discharge information shall thereafter be provided to the Director or his or her designee within 48 hours of the discharge.

(B) Written report. All persons violating this chapter shall, within ten calendar days after any such discharge of a pollutant or pollutants, file with the Director a detailed written report describing the cause of the discharge, the date and time of the discharge, the type, concentration and volume of material discharged, the location of the discharge, any specific information necessary in connection with the location to fully explain the potential impacts from the discharge, and any corrective action or other measures taken in connection with the discharge, including any measures taken to prevent similar discharges in the future. Submission of this written report shall not be deemed to be a waiver or release of any person for liability, fines or other obligations imposed under this chapter, or otherwise in the city's code or under state or federal law.

52.17 Nuisance

(A) Notwithstanding any other provisions herein, violations of this chapter may further be deemed to be a public nuisance, which may be abated by administrative, civil, or criminal action in accordance with the terms and provisions of this code and state law.

[…]

52.18 Remedies not exclusive

Any remedies provided to the city in this chapter are not exclusive, and the city may utilize any and all other remedies as otherwise provided by law.

Thus, enforcement actions can be completed administratively or judicially if necessary.

Please contact the undersigned if you have any questions.

Sincerely,

ALESHIRE & WYNDER, LLP

Joseph W. Pannone
City Attorney for the City of Baldwin Park

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December 16, 2013

Mr. Samuel Unger, P.E., Executive Officer
California Regional Water Quality Control Board – Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013-2343

Attention: Mr. Ivar Ridgeway

Re: Certification By Legal Counsel For Los Angeles County Flood Control District's Annual Report

Dear Mr. Unger:

Pursuant to the requirements of Part VI(A)(2)(b) of Order No. R4-2012-0175 (the "Order"), the Office of the County Counsel of the County of Los Angeles makes the following certification in support of the Annual Report of the Los Angeles County Flood Control District ("LACFCD"):

<u>Certification Pursuant To Order Part VI(A)(2)(b)</u>

"*Each Permittee must submit a statement certified by its chief legal counsel that the Permittee has the legal authority within its jurisdiction to implement and enforce the requirements contained in 40 CFR §122.26(d)(2)(i)(A-F) and this Order.*"

LACFCD has the legal authority within its jurisdiction to implement and enforce each of the requirements contained in 40 CFR §122.26(d)(2)(i)(A-F) and the Order.

<u>Order Part VI(A)(2)(b)(i)</u>

"*Citation of applicable municipal ordinances or other appropriate legal authorities and their relationship to the requirements of 40 CFR §122.26(d)(2)(i)(A-F) and this Order*"

Citations Of Applicable Ordinances Or Other Legal Authorities

Although many portions of State law, the Charter of the County of Los Angeles, the Los Angeles County Code and LACFCD's Flood Control District Code ("Code") are potentially applicable to the implementation and enforcement of these requirements, the primary applicable laws and ordinances are as follows:

Los Angeles County Code, Title 12, Chapter 12.80 STORMWATER AND RUNOFF POLLUTION CONTROL, including:

§12.80.010 - §12.80.360 Definitions

§12.80.370 Short title.

§12.80.380 Purpose and intent.

§12.80.390 Applicability of this chapter.

§12.80.400 Standards, guidelines and criteria.

§12.80.410 Illicit discharges prohibited.

§12.80.420 Installation or use of illicit connections prohibited.

§12.80.430 Removal of illicit connection from the storm drain system.

§12.80.440 Littering and other discharge of polluting or damaging substances prohibited.

§12.80.450 Stormwater and runoff pollution mitigation for construction activity.

§12.80.460 Prohibited discharges from industrial or commercial activity.

§12.80.470 Industrial/commercial facility sources required to obtain a NPDES permit.

§12.80.480 Public facility sources required to obtain a NPDES permit.

§12.80.490 Notification of uncontrolled discharges required.

§12.80.500 Good housekeeping provisions.

§12.80.510 Best management practices for construction activity.

§12.80.520 Best management practices for industrial and commercial facilities.

§12.80.530 Installation of structural BMPs.

§12.80.540 BMPs to be consistent with environmental goals.

§12.80.550 Enforcement—Director's powers and duties.

§12.80.560 Identification for inspectors and maintenance personnel.

§12.80.570 Obstructing access to facilities prohibited.

§12.80.580 Inspection to ascertain compliance—Access required.

§12.80.590 Interference with inspector prohibited.

§12.80.600 Notice to correct violations—Director may take action.

§12.80.610 Violation a public nuisance.

§12.80.620 Nuisance abatement—Director to perform work when—Costs.

§12.80.630 Violation—Penalty.

§12.80.635 Administrative fines.

§12.80.640 Penalties not exclusive.

§12.80.650 Conflicts with other code sections.

§12.80.660 Severability.

§12.80.700 Purpose.

§12.80.710 Applicability.

§12.80.720 Registration required.

§12.80.730 Exempt facilities.

§12.80.740 Certificate of inspection—Issuance by the director.

§12.80.750 Certificate of inspection—Suspension or revocation.

§12.80.760 Certificate of inspection—Termination.

§12.80.770 Service fees.

§12.80.780 Fee schedule.

§12.80.790 Credit for overlapping inspection programs.

§12.80.800 Annual review of fees.

Los Angeles County Code, Title 12, Chapter 12.84 LOW IMPACT DEVELOPMENT STANDARDS, including:

§12.84.410 Purpose.

§12.84.420 Definitions.

§12.84.430 Applicability.

§12.84.440 Low Impact Development Standards.

§12.84.445 Hydromodification Control.

§12.84.450 LID Plan Review.

§12.84.460 Additional Requirements.

Los Angeles County Code, Title 22 PLANNING AND ZONING, Part 6 ENFORCEMENT PROCEDURES, including:

§22.60.330 General prohibitions.

§22.60.340 Violations.

§22.60.350 Public nuisance.

§22.60.360 Infractions.

§22.60.370 Injunction.

§22.60.380 Enforcement.

§22.60.390 Zoning enforcement order and noncompliance fee.

Los Angeles County Code, Title 26 BUILDING CODE, including:

§26.103 Violations And Penalties

§26.104 Organization And Enforcement

§26.105 Appeals Boards

§26.106 Permits

§26.107 Fees

§26.108 Inspections

LACFCD Code Chapter 21 - STORMWATER AND RUNOFF POLLUTION CONTROL including:

§21.01 Purpose and Intent

§21.03 Definitions

§21.05 Standards, Guidelines, and Criteria

§21.07 Prohibited Discharges

§21.09 Installation or Use of Illicit Connections Prohibited

§21.11 Littering Prohibited

§21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity

§21.15 Notification of Uncontrolled Discharges Required

§21.17 Requirement to Monitor and Analyze

§21.19 Conflicts With Other Code Sections

§21.21 Severability

§21.23 Violation a Public Nuisance

California Government Code §6502

California Government Code §23004

California Water Code §8100 *et. seq.*

Relationship Of Applicable Ordinances Or Other Legal Authorities To The Requirements of 40 CFR §122.26(d)(2)(i)(A-F) And The Order

Although, depending upon the particular issue, there may be multiple ways in which particular sections of the County of Los Angeles' ordinances, LACFCD's ordinances, and statutes relate to the requirements contained in 40 CFR §122.26(d)(2)(i)(A-F) and the Order, the table below indicates the basic relationship with Part VI(A)(2)(a) of the Order:

Order Part VI(A)(2)(a) Items	**Primary Applicable Ordinance/Statute**
i. Control the contribution of pollutants to its MS4 from storm water discharges associated with industrial and construction activity and control the quality of storm water discharged from industrial and construction sites. This requirement applies both to industrial and construction sites with coverage under an NPDES permit, as well as to those sites that do not have coverage under an NPDES permit.	Los Angeles County Code: §12.80.410 [illicit discharge prohibited]; §12.80.450 [construction] §12.80.460 [industrial and commercial] §12.80.470 and .480 [industrial and commercial NPDES requirements] §12.84.440 [LID standards] §12.84.445 [hydromodification control] §12.84.450 [LID Plan Review] §22.60.330 [general prohibitions] §22.60.340 [violations] §22.60.350 [public nuisance] §22.60.360 [infractions] §22.60.370 [injunction] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.103 [violations and penalties]

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§26.104 [enforcement] §26.106 [permits] §26.108 [inspections] LACFCD Code: §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze §21.23 Violation a Public Nuisance
ii. Prohibit all non-storm water discharges through the MS4 to receiving waters not otherwise authorized or conditionally exempt pursuant to Part III.A.	Los Angeles County Code: §12.80.410 [illicit discharge prohibited] LACFCD Code: §21.07 Prohibited Discharges
iii. Prohibit and eliminate illicit discharges and illicit connections to the MS4.	Los Angeles County Code: §12.80.410 [illicit discharge prohibited]; §12.80.420 [illicit connections prohibited] LACFCD Code: §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.23 Violation a Public Nuisance

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
iv. Control the discharge of spills, dumping, or disposal of materials other than storm water to its MS4.	Los Angeles County Code: §12.80.410 [illicit discharge prohibited]; §12.80.440 [littering and other polluting prohibited] LACFCD Code: §19.07 Interference With or Placing Obstructions, Refuse, Contaminating Substances, or Invasive Species in Facilities Prohibited §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze §21.23 Violation a Public Nuisance
v. Require compliance with conditions in Permittee ordinances, permits, contracts or orders (i.e., hold dischargers to its MS4 accountable for their contributions of pollutants and flows).	Los Angeles County Code: §12.80.490 [notification of uncontrolled discharge] §12.80.570 [obstructing access to facilities] §12.80.580 [compliance inspection] §12.80.610 [violation a nuisance] §12.620 [nuisance abatement] §12.80.635 [violation penalty]

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§12.80.640 [penalties not exclusive] §12.84.440 [LID standards] §12.84.445 [hydromodification control] §12.84.450 [LID Plan Review] §22.60.330 [general prohibitions] §22.60.340 [violations] §22.60.350 [public nuisance] §22.60.360 [infractions] §22.60.370 [injunction] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.103 [violations and penalties] §26.104 [enforcement] §26.106 [permits] §26.108 [inspections] LACFCD Code: §19.11 Violation a Public Nuisance §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§21.19 Conflicts With Other Code Sections §21.23 Violation a Public Nuisance
vi. Utilize enforcement mechanisms to require compliance with applicable ordinances, permits, contracts, or orders.	Same as item v., above
vii. Control the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements among Copermittees.	California Government Code §6502 California Government Code §23004
viii. Control of the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements with other owners of the MS4 such as the State of California Department of Transportation.	California Government Code §6502 California Government Code §23004
ix. Carry out all inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with applicable municipal ordinances, permits, contracts and orders, and with the provisions of this Order, including the prohibition of non-storm water discharges into the MS4 and receiving waters. This means the Permittee must have authority to enter, monitor, inspect, take measurements, review and copy records, and require regular reports from entities discharging into its MS4.	Los Angeles County Code: §12.80.490 [notification of uncontrolled discharge] §12.80.570 [obstructing access to facilities] §12.80.580 [compliance inspection] §12.80.610 [violation a nuisance] §12.80.620 [nuisance abatement] §12.80.635 [violation penalty] §12.80.640 [penalties not exclusive] §22.60.380 [enforcement.] §26.106 [permits] §26.108 [inspections]

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	LACFCD Code: §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze §21.23 Violation a Public Nuisance
x. Require the use of control measures to prevent or reduce the discharge of pollutants to achieve water quality standards/receiving water limitations.	Los Angeles County Code: §12.80.450 [construction mitigation] §12.80.500 [good housekeeping practices] §12.80.510 [construction BMPs] §12.80.520 [industrial/commercial BMPs] §12.84.440 [LID standards] §12.84.450 [LID Plan Review] §22.60.330 [general prohibitions] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.106 [permits] §26.108 [inspections] LACFCD Code: §21.05 Standards, Guidelines, and Criteria

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze §21.23 Violation a Public Nuisance
xi. Require that structural BMPs are properly operated and maintained.	Los Angeles County Code: §12.80.530 [installation of structural BMPs] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.106 [permits] §26.108 [inspections] LACFCD Code: §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§21.23 Violation a Public Nuisance
xii. Require documentation on the operation and maintenance of structural BMPs and their effectiveness in reducing the discharge of pollutants to the MS4.	Los Angeles County Code: §12.80.530 [installation of structural BMPs] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.106 [permits] §26.108 [inspections] LACFCD Code: §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze §21.23 Violation a Public Nuisance

<u>Order Part VI(A)(2)(b)(ii)</u>

"*Identification of the local administrative and legal procedures available to mandate compliance with applicable municipal ordinances identified in subsection (i) above and therefore with the conditions of this Order, and a statement as to whether enforcement actions can be completed administratively or whether they must be commenced and completed in the judicial system.*"

The local administrative and legal procedures available to mandate compliance with the above ordinances are specified in those ordinances, particularly in:

Los Angeles County Code:

§12.80.550 Enforcement—Director's powers and duties.

§12.80.600 Notice to correct violations—Director may take action.

§12.80.610 Violation a public nuisance.

§12.80.620 Nuisance abatement—Director to perform work when—Costs.

§12.80.630 Violation—Penalty.

§12.80.635 Administrative fines.

§12.80.640 Penalties not exclusive.

§12.84.450 LID Plan Review.

§12.84.460 Additional Requirements.

Title 26, §103 Violations And Penalties

Title 26, §104 Organization And Enforcement

Title 26, §105 Appeals Boards

Title 26, §106 Permits

§22.60.330 General prohibitions.

§22.60.340 Violations.

§22.60.350 Public nuisance.

§22.60.360 Infractions.

§22.60.370 Injunction.

§22.60.380 Enforcement.

§22.60.390 Zoning enforcement order and noncompliance fee.

LACFCD Code:

§21.05 Standards, Guidelines, and Criteria

§21.07 Prohibited Discharges

§21.09 Installation or Use of Illicit Connections Prohibited

§21.11 Littering Prohibited

§21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity

§21.15 Notification of Uncontrolled Discharges Required

§21.17 Requirement to Monitor and Analyze

§21.23 Violation a Public Nuisance

LACFCD attempts to first resolve each enforcement action administratively. However, the above cited ordinances also provide LACFCD with the authority to pursue such actions in the judicial system as necessary.

Very truly yours,

JOHN F. KRATTLI
County Counsel

By Judith Fries
JUDITH A. FRIES
Principal Deputy County Counsel
Public Works Division

JAF:jyj

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December 16, 2013

Mr. Samuel Unger, P.E., Executive Officer
California Regional Water Quality Control Board – Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013-2343

Attention: Mr. Ivar Ridgeway

Re: Certification By Legal Counsel For County of Los Angeles' Annual Report

Dear Mr. Unger:

Pursuant to the requirements of Part VI(A)(2)(b) of Order No. R4-2012-0175 (the "Order"), the Office of the County Counsel of the County of Los Angeles makes the following certification in support of the Annual Report of the County of Los Angeles ("County"):

Certification Pursuant To Order Part VI(A)(2)(b)

"*Each Permittee must submit a statement certified by its chief legal counsel that the Permittee has the legal authority within its jurisdiction to implement and enforce the requirements contained in 40 CFR §122.26(d)(2)(i)(A-F) and this Order.*"

The County has the legal authority within its jurisdiction to implement and enforce each of the requirements contained in 40 CFR §122.26(d)(2)(i)(A-F) and the Order.

Order Part VI(A)(2)(b)(i)

"*Citation of applicable municipal ordinances or other appropriate legal authorities and their relationship to the requirements of 40 CFR §122.26(d)(2)(i)(A-F) and this Order*"

Citations Of Applicable Ordinances Or Other Legal Authorities

Although many portions of State law, the Charter of the County of Los Angeles and the Los Angeles County Code are potentially applicable to the implementation and enforcement of these requirements, the primary applicable laws and ordinances are as follows:

Los Angeles County Code, Title 12, Chapter 12.80 STORMWATER AND RUNOFF POLLUTION CONTROL, including:

§12.80.010 - §12.80.360 Definitions

§12.80.370 Short title.

§12.80.380 Purpose and intent.

§12.80.390 Applicability of this chapter.

§12.80.400 Standards, guidelines and criteria.

§12.80.410 Illicit discharges prohibited.

§12.80.420 Installation or use of illicit connections prohibited.

§12.80.430 Removal of illicit connection from the storm drain system.

§12.80.440 Littering and other discharge of polluting or damaging substances prohibited.

§12.80.450 Stormwater and runoff pollution mitigation for construction activity.

§12.80.460 Prohibited discharges from industrial or commercial activity.

§12.80.470 Industrial/commercial facility sources required to obtain a NPDES permit.

§12.80.480 Public facility sources required to obtain a NPDES permit.

§12.80.490 Notification of uncontrolled discharges required.

§12.80.500 Good housekeeping provisions.

§12.80.510 Best management practices for construction activity.

§12.80.520 Best management practices for industrial and commercial facilities.

§12.80.530 Installation of structural BMPs.

§12.80.540 BMPs to be consistent with environmental goals.

§12.80.550 Enforcement—Director's powers and duties.

§12.80.560 Identification for inspectors and maintenance personnel.

§12.80.570 Obstructing access to facilities prohibited.

§12.80.580 Inspection to ascertain compliance—Access required.

§12.80.590 Interference with inspector prohibited.

§12.80.600 Notice to correct violations—Director may take action.

§12.80.610 Violation a public nuisance.

§12.80.620 Nuisance abatement—Director to perform work when—Costs.

§12.80.630 Violation—Penalty.

§12.80.635 Administrative fines.

§12.80.640 Penalties not exclusive.

§12.80.650 Conflicts with other code sections.

§12.80.660 Severability.

§12.80.700 Purpose.

§12.80.710 Applicability.

§12.80.720 Registration required.

§12.80.730 Exempt facilities.

§12.80.740 Certificate of inspection—Issuance by the director.

§12.80.750 Certificate of inspection—Suspension or revocation.

§12.80.760 Certificate of inspection—Termination.

§12.80.770 Service fees.

§12.80.780 Fee schedule.

§12.80.790 Credit for overlapping inspection programs.

§12.80.800 Annual review of fees.

Los Angeles County Code, Title 12, Chapter 12.84 LOW IMPACT DEVELOPMENT STANDARDS, including:

§12.84.410 Purpose.

§12.84.420 Definitions.

§12.84.430 Applicability.

§12.84.440 Low Impact Development Standards.

§12.84.445 Hydromodification Control.

§12.84.450 LID Plan Review.

§12.84.460 Additional Requirements.

Los Angeles County Code, Title 22 PLANNING AND ZONING, Part 6 ENFORCEMENT PROCEDURES, including:

§22.60.330 General prohibitions.

§22.60.340 Violations.

§22.60.350 Public nuisance.

§22.60.360 Infractions.

§22.60.370 Injunction.

§22.60.380 Enforcement.

§22.60.390 Zoning enforcement order and noncompliance fee.

Los Angeles County Code, Title 26 BUILDING CODE, including:

§26.103 Violations And Penalties

§26.104 Organization And Enforcement

§26.105 Appeals Boards

§26.106 Permits

§26.107 Fees

§26.108 Inspections

California Government Code §6502

California Government Code §23004

Relationship Of Applicable Ordinances Or Other Legal Authorities To The Requirements of 40 CFR §122.26(d)(2)(i)(A-F) And The Order

Although, depending upon the particular issue, there may be multiple ways in which particular sections of the County's ordinances and State law relate to the requirements contained in 40 CFR §122.26(d)(2)(i)(A-F) and the Order, the table below indicates the basic relationship with Part VI(A)(2)(a) of the Order:

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
i. Control the contribution of pollutants to its MS4 from storm water discharges associated with industrial and construction activity and control the quality of storm water discharged from industrial and construction sites. This requirement applies both to industrial and construction sites with coverage under an NPDES permit, as well as to those sites that do not have coverage under an NPDES permit.	§12.80.410 [illicit discharge prohibited]; §12.80.450 [construction] §12.80.460 [industrial and commercial] §12.80.470 and .480 [industrial and commercial NPDES requirements] §12.84.440 [LID standards] §12.84.445 [hydromodification control] §12.84.450 [LID Plan Review] §22.60.330 [general prohibitions]

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§22.60.340 [violations] §22.60.350 [public nuisance] §22.60.360 [infractions] §22.60.370 [injunction] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.103 [violations and penalties] §26.104 [enforcement] §26.106 [permits] §26.108 [inspections]
ii. Prohibit all non-storm water discharges through the MS4 to receiving waters not otherwise authorized or conditionally exempt pursuant to Part III.A.	§12.80.410 [illicit discharge prohibited]
iii. Prohibit and eliminate illicit discharges and illicit connections to the MS4.	§12.80.410 [illicit discharge prohibited]; §12.80.420 [illicit connections prohibited]
iv. Control the discharge of spills, dumping, or disposal of materials other than storm water to its MS4.	§12.80.410 [illicit discharge prohibited]; §12.80.440 [littering and other polluting prohibited]

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
v. Require compliance with conditions in Permittee ordinances, permits, contracts or orders (i.e., hold dischargers to its MS4 accountable for their contributions of pollutants and flows).	§12.80.490 [notification of uncontrolled discharge] §12.80.570 [obstructing access to facilities] §12.80.580 [compliance inspection] §12.80.610 [violation a nuisance] §12.620 [nuisance abatement] §12.80.635 [violation penalty] §12.80.640 [penalties not exclusive] §12.84.440 [LID standards] §12.84.445 [hydromodification control] §12.84.450 [LID Plan Review] §22.60.330 [general prohibitions] §22.60.340 [violations] §22.60.350 [public nuisance] §22.60.360 [infractions] §22.60.370 [injunction] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.103 [violations and penalties] §26.104 [enforcement] §26.106 [permits] §26.108 [inspections]
vi. Utilize enforcement mechanisms to require compliance with applicable ordinances, permits, contracts, or orders.	Same as item v., above

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
vii. Control the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements among Copermittees.	California Government Code §6502 and §23004
viii. Control of the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements with other owners of the MS4 such as the State of California Department of Transportation.	California Government Code §6502 and §23004
ix. Carry out all inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with applicable municipal ordinances, permits, contracts and orders, and with the provisions of this Order, including the prohibition of non-storm water discharges into the MS4 and receiving waters. This means the Permittee must have authority to enter, monitor, inspect, take measurements, review and copy records, and require regular reports from entities discharging into its MS4.	§12.80.490 [notification of uncontrolled discharge] §12.80.570 [obstructing access to facilities] §12.80.580 [compliance inspection] §12.80.610 [violation a nuisance] §12.80.620 [nuisance abatement] §12.80.635 [violation penalty] §12.80.640 [penalties not exclusive] §22.60.380 [enforcement.] §26.106 [permits] §26.108 [inspections]

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
x. Require the use of control measures to prevent or reduce the discharge of pollutants to achieve water quality standards/receiving water limitations.	§12.80.450 [construction mitigation] §12.80.500 [good housekeeping practices] §12.80.510 [construction BMPs] §12.80.520 [industrial/commercial BMPs] §12.84.440 [LID standards] §12.84.450 [LID Plan Review] §22.60.330 [general prohibitions] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.106 [permits] §26.108 [inspections]
xi. Require that structural BMPs are properly operated and maintained.	§12.80.530 [installation of structural BMPs] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.106 [permits] §26.108 [inspections]
xii. Require documentation on the operation and maintenance of structural BMPs and their effectiveness in reducing the discharge of pollutants to the MS4.	§12.80.530 [installation of structural BMPs] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.106 [permits] §26.108 [inspections]

Order Part VI(A)(2)(b)(ii)

"*Identification of the local administrative and legal procedures available to mandate compliance with applicable municipal ordinances identified in subsection (i) above and therefore with the conditions of this Order, and a statement as to whether enforcement actions can be completed administratively or whether they must be commenced and completed in the judicial system.*"

The local administrative and legal procedures available to mandate compliance with the above ordinances are specified in those ordinances, particularly in:

§12.80.550 Enforcement—Director's powers and duties.

§12.80.600 Notice to correct violations—Director may take action.

§12.80.610 Violation a public nuisance.

§12.80.620 Nuisance abatement—Director to perform work when—Costs.

§12.80.630 Violation—Penalty.

§12.80.635 Administrative fines.

§12.80.640 Penalties not exclusive.

§12.84.450 LID Plan Review.

§12.84.460 Additional Requirements.

Title 26, §103 Violations And Penalties

Title 26, §104 Organization And Enforcement

Title 26, §105 Appeals Boards

Title 26, §106 Permits

Title 22 PLANNING AND ZONING, Part 6 ENFORCEMENT PROCEDURES, including:

§22.60.330 General prohibitions.

§22.60.340 Violations.

§22.60.350 Public nuisance.

§22.60.360 Infractions.

§22.60.370 Injunction.

§22.60.380 Enforcement.

§22.60.390 Zoning enforcement order and noncompliance fee.

The County attempts to first resolve each enforcement action administratively. However, the above cited ordinances also provide the County with the authority to pursue such actions in the judicial system as necessary.

Very truly yours,

JOHN F. KRATTLI
County Counsel

By Judith A. Fries
JUDITH A. FRIES
Principal Deputy County Counsel
Public Works Division

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File No. 65002.00502

February 20, 2015

VIA U.S. MAIL

Sam Unger
Executive Officer
Los Angeles Regional Water Quality Control Board
320 West Fourth Street, Suite 200
Los Angeles, CA 90013

Re: Statement of Legal Authority in Compliance with Los Angeles Regional Water Quality Control Board Order No. R4-2012-0175

Dear Mr. Unger:

The City of Covina ("City") hereby submits this statement in its capacity as a Co-Permittee in accordance with Section VI.A.2 of Los Angeles Regional Water Quality Control Board Order No. R4-2012-0175, National Pollution Discharge Elimination System ("NPDES") Permit and Waste Discharge Requirements for the Municipal Separate Storm Sewer System ("MS4") Discharges Within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating From the City of Long Beach MS4 ("Permit").

STATEMENT OF LEGAL AUTHORITY

The undersigned attorney for the City does hereby state that the City has obtained adequate legal authority to comply with the legal requirements imposed on the City under the Permit, consistent with the requirements set forth in the regulations to the Clean Water Act, 40 CFR [Code of Federal Regulations] 122.26(d)(2)(i)(A-F), and to the extent permitted by State and Federal law and subject to the limitations on municipal action under the California and United States Constitutions. Subject to those limitations, this includes the authority to:

- Control the contribution of pollutants to the MS4 from storm water discharges associated with industrial and construction activity and control the quality of storm water discharged from industrial and construction sites. This requirement applies both to industrial and construction sites with coverage under an NPDES permit, as well as to those sites that do not have coverage under an NPDES permit. (Covina Municipal Code ("CMC"), §§ 8.50.050 [construction]; 8.50.060 [industrial].)

- Prohibit all non-storm water discharges through the MS4 to receiving waters not otherwise authorized or conditionally exempt pursuant to the Permit. (CMC, § 8.50.030.A [prohibition].)

- Prohibit and eliminate illicit discharges and illicit connections to the MS4. (CMC, § 8.50.030.B [prohibition and requirement to eliminate].)

- Control the discharge of spills, dumping, or disposal of materials other than storm water to its MS4. (CMC, §§ 8.50.040 [general prohibition]; 8.50.041 [prohibition on litter]; 8.50.042 [prohibition on landscape debris]; 8.50.061 [controls required].)

- Require compliance with conditions in City ordinances, permits, contracts or orders. (CMC, § 8.50.070, and chapters 1.20 and 1.28 [enforcement options].)

- Utilize enforcement mechanisms to require compliance with applicable ordinances, permits, contracts, or orders. (CMC, § 8.50.070, and chapters 1.20 and 1.28 [enforcement options].)

- Control the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements among Copermittees. (Gov. Code, §§ 37350, 37355 [authority to control city property by contract].)

- Control of the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements with other owners of the MS4 such as the State of California Department of Transportation. (Gov. Code, §§ 37350, 37355 [authority to control city property by contract].)

- Carry out all inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with applicable municipal ordinances, permits, contracts and orders, and with the provisions of the Permit. (CMC, §§ 1.08.010, 8.50.065 [authorizing City to enter, monitor, inspect, take measurements, review and copy records, and require regular reports].)

- Require the use of control measures to prevent or reduce the discharge of pollutants to achieve water quality standards/receiving water limitations. (CMC, § 8.50.061 [requiring control measures].)

- Require that structural BMPs are properly operated and maintained (CMC, § 8.50.061.L [requiring BMPs be properly operated and maintained].)

- Require documentation on the operation and maintenance of structural BMPs and their effectiveness in reducing the discharge of pollutants to the MS4. (CMC, § 8.50.061 [requiring operation and maintenance], 8.50.065 [requiring documentation].)

The administrative and legal procedures available to the City to mandate compliance with the applicable City ordinances identified above, together with a statement as to whether enforcement actions can be completed administratively or through the judicial system follows:

- Criminal Penalties. A violation of the City's ordinance constitutes a misdemeanor, enforceable through the judicial system. (CMC, §§ 1.20.020, 8.50.070.)

- Civil Actions. Injunctions and other civil actions may be completed through the judicial system. (CMC, § 8.40.040.)

- Administrative Enforcement Options. Public nuisance abatements, administrative citations, fines, and liens may be conducted administratively. (CMC, chapters 1.26 [administrative citation]; 1.28 [cost recovery, liens, special assessment], 8.40 [public nuisance] .)

CONCLUSION

Additionally, in 2015, the City will adopt a Low Impact Development ("LID") ordinance in compliance with the Permit, and the City's Enhanced Watershed Management Plan obligations. The City is currently developing the LID ordinance and anticipates adopting it by June 2015.

Thank you for your attention to this matter. Please do not hesitate to contact the undersigned if you have any questions or need any additional information.

Sincerely,

J. G. Andre Monette
for BEST BEST & KRIEGER LLP

burke
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December 1, 2014

SUBMITTED WITH ANNUAL REPORT

Mr. Samuel Unger, P.E., Executive Officer
California Regional Water Quality
Control Board – Los Angeles Region
320 West Fourth Street, Suite 200
Los Angeles, CA 90013

Attention Ms. Renee Purdy

Re: **Los Angeles County NPDES Permit No. CAS004001/Board Order No. R4-2012-0175: City of Industry's Annual Statement of Legal Authority (2013-2014)**

Dear Mr. Unger and Ms. Purdy:

This office serves as the City Attorney for the City of Industry. We are submitting this statement of legal authority pursuant to Part VI.A.2.b of Order No. R4-2012-0175 ("Order") and NPDES Permit No. CAS004001 ("NPDES Permit").

The City of Industry ("City") has the legal authority to implement and enforce the requirements contained in 40 CFR § 122.26(d)(2)(i)(A-F) and the Order during the reporting period of July 1, 2013 through June 30, 2014.

The City's legal authority to implement and enforce these requirements is derived from the provisions of Article XI of the California Constitution granting charter cities powers over municipal affairs, the City of Industry Charter, the City's general police powers under Article XI, Section 7 of the California Constitution, and more particularly, the provisions of the Industry Municipal Code, including Chapter 13.16 (Stormwater and Urban Runoff Pollution Control) and Chapter 13.17 (Standard Urban Stormwater Mitigation Plan Implementation).

The City's legal procedures available to mandate compliance with the provisions of Chapter 13.16 and 13.17 include Municipal Code sections 13.16.100 and 13.17.200, each of which deems a violation of Chapter 13.16 (including violations of the applicable provisions of the Order, the NPDES Permit and the Clean Water Act) and Chapter

LA #4829-4976-3616 v1

13.17, as applicable, to be a "nuisance" that can be abated and remedied administratively, or judicially, if necessary, in accordance with the enforcement procedures set forth in Industry Municipal Code Sections 13.16.090 and 13.17.200, as well as Municipal Code Chapter 1.08 (Code Violations, Penalties, Enforcement), Chapter 1.20 (Administrative Citations) and Chapter 1.30 (Public Nuisances).

Sincerely,

Donald M. Davis

DONALD M. DAVIS
DEPUTY CITY ATTORNEY

cc: Kevin Radecki, City Manager
John Ballas, City Engineer
Joshua Nelson, P.E., CNC Engineering, Inc.
James Cramsie, P.E., CNC Engineering, Inc.
Michele Vadon, City Attorney

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November 18, 2013

Sam Unger, P.E.
Executive Officer
California Regional Water Quality
Control Board -- Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013-1105

Re: Legal Authority

Dear Mr. Unger:

As the City Attorney for the City of Glendora, I am aware of the following legal authority requirements specified in *VI.A.2.b, of the MS4 Permit for Los Angeles County, (Order No. R4-2012-0175, NPDES Permit No. CAS004001*:

> *Each Permittee must submit a statement certified by its chief legal counsel that the Permittee has the legal authority within its jurisdiction to implement and enforce each of the requirements contained in 40 CFR § 122.26(d)(2)(i)(A-F) and this Order. Each Permittee shall submit this certification annually as part of its Annual Report beginning with the first Annual Report required under this Order. These statements must include:*
>
> i. *Citation of applicable municipal ordinances or other appropriate legal authorities and their relationship to the requirements of 40 CFR § 122.26(d)(2)(i)(A)-(F) and of this Order; and*
>
> ii. *Identification of the local administrative and legal procedures available to mandate compliance with applicable municipal ordinances identified in subsection (i) above and therefore with the conditions of this Order, and a statement as to whether enforcement actions can be completed administratively or whether they must be commenced and completed in the judicial system.*

The City has the legal authority to require compliance with the requirements associated with 40 CFR § 122.26(d)(2)(i)(A-F) and applicable provisions of the Order[1] per *Title 21,*

[1]Generally applies to the six core programs that make up the City's stormwater quality management program including program management, development planning, development construction, illicit connection and discharge detection and elimination, public agency, and industrial and commerical inspections. These programs are carried-over from the previous permit. They are to be revised permittees after the Regional Board has approved the watershed management

Zoning, 21.03.090 and Urban Runoff Pollution of the City of Glendora Municipal Code (adopted in 1995 and amended in 2000) and Chapter 9.36 of the City of Glendora Municipal Code entitled Abatement of Nuisances - Premises.

The City's municipal code provides for both administrative enforcement and legal enforcement should administrative enforcement fail. The administrative enforcement includes administrative citations, and public nuisance hearings. In addition the City can pursue criminal prosecution through the court. Generally a violation of the city's codes is punishable as a misdemeanor. In addition the City can pursue civil nuisance abatement actions, including but not limited to seeking injunctive relief in the civil courts.

Should you have any questions regarding this matter please feel free to call me.

Sincerely yours,

D. Wayne Leech

D. Wayne Leech
Attorney at Law

DWL/d

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program which is to be submitted by June 28, 2014.

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December 15, 2014

STATEMENT OF LEGAL AUTHORITY

This Statement of Legal Authority ("Statement") verifies that the City of La Puente ("City"), has established, maintains, and enforces legal authority to effectively implement all requirements of the California Regional Water Quality Control Board Los Angeles Region's Order No. R4-2012-0175 ("Order"), and the requirements set forth in 40 CFR § 122.26(d)(2)(i)(A-F) during the reporting period of July 1, 2013 through June 30, 2014.

As required in the Order, the City is responding to each of the items in Section VI.A.2 of the Order, including the provisions of 40 CFR 122.26(d)(2)(i)(A-F), as set forth below. Unless otherwise noted, all citations set forth herein are to the City's Municipal Code ("Code").

1. **Control the contribution of pollutants to its MS4 from storm water discharges associated with industrial and construction activity and control the quality of storm water discharged from industrial and construction sites. This requirement applies both to industrial and construction sites with coverage under an NPDES permit, as well as to those sites that do not have coverage under an NPDES permit.**

   Pursuant to Chapter 4.16 of the City's Code, industrial and construction sites are either required to maintain the appropriate NPDES permit, implement BMPs prescribed by the regional board or its executive officer, or comply with all requirements set forth in the Storm Water Management Quality Program.

   Municipal Code Section References: 4.16.080 Control of pollutants from industrial activities, 4.16.090 Control of pollutants from other industrial facilities, 4.16.100 Control of pollutants from state permitted construction activities, 4.16.110 Control of pollutants from other construction activities

2. **Prohibit all non-storm water discharges through the MS4 to receiving waters not otherwise authorized or conditionally exempt pursuant to Part III.A.**

   In accordance with the provisions of Section 4.16.040, illicit discharges are prohibited, and require payment for any remediation.

Municipal Code Section Reference: 4.16.040 Illicit discharges, dumping, and non-storm water discharges

3. **Prohibit and eliminate illicit discharges and illicit connections to the MS4.**

   Section 4.16.050 of the Code prohibits illicit connections, and requires the person who owns or operates an illicit connection to remove it or render it inoperable upon discovery.

   Municipal Code Section Reference: 4.16.050 Illicit connections

4. **Control the discharge of spills, dumping, or disposal of materials other than storm water to its MS4.**

   Under Section 4.16.040 of the Code, the City prohibits illicit discharges, and the dumping/disposal of pollutants and foreign objects.

   Municipal Code Section References: 4.16.040 Illicit discharges, dumping, and non-storm water discharges

5. **Require compliance with conditions in Permittee ordinances, permits, contracts or orders (i.e., hold dischargers to its MS4 accountable for their contributions of pollutants and flows);**

   Under its general police and zoning powers that are set forth by the California Constitution, the City is able to require compliance with the conditions set forth in its ordinances, permits, contracts and orders. Further, as set forth in the responses to Questions 1-4 above, the City's Code prohibits illicit discharges and dumping/disposal of pollutants and foreign objects, and contains enforcement provisions to address any violations.

   Municipal Code Section Reference: 4.16.040 Illicit discharges, dumping, and non-storm water discharges

   Additional Reference: Cal. Const. art. XI, §7

6. **Utilize enforcement mechanisms to require compliance with applicable ordinances, permits, contracts, or orders.**

   The City has the authority under the California Constitution and various State statutes to enforce its laws, rules and ordinances. Moreover, Chapters 4.16 and 3.20 of the City's Code contain specific enforcement provisions for violations of the stormwater and urban runoff pollution ordinance.

   Municipal Code Section References: 4.16.130 Enforcement, 3.20 Public Nuisances

   Additional Reference: Cal. Const. art. XI, §7

7. **Control the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements among Copermittees;**

   As a general law city, the City is invested with full power to do everything necessarily incident to a proper discharge of its public functions. This includes entering into agreements that serve a public purpose. Interagency agreements that work to control pollutants in the MS4 serve a public purpose, and are therefore within the City's contractual authority.

8. **Control of the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements with other owners of the MS4 such as the State of California Department of Transportation;**

As a general law city, the City is invested with full power to do everything necessarily incident to a proper discharge of its public functions. This includes entering into agreements that serve a public purpose. Interagency agreements that work to control pollutants in the MS4 serve a public purpose, and are therefore within the City's contractual authority.

9. **Carry out all inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with applicable municipal ordinances, permits, contracts and orders, and with the provisions of this Order, including the prohibition of non-storm water discharges into the MS4 and receiving waters. This means the Permittee must have authority to enter, monitor, inspect, take measurements, review and copy records, and require regular reports from entities discharging into its MS4;**

The City has the authority under the California Constitution and various State statutes to enforce its laws, rules and ordinances. This authority necessarily includes carrying out all inspections, surveillance and monitoring necessary to ensure compliance. Moreover, Chapters 4.16 and 3.20 of the City's Code contain specific enforcement provisions for violations of the stormwater and urban runoff pollution ordinance. Any enforcement action requires inspection, surveillance and monitoring.

Municipal Code Section References: 4.16.130 Enforcement, Chapter 3.20 Public Nuisances.

Additional Reference: Cal. Const. art. XI, §7

10. **Require the use of control measures to prevent or reduce the discharge of pollutants to achieve water quality standards/receiving water limitations;**

The discharge of pollutants is prevented/reduced by requiring commercial and industrial facilities and construction sites to implement BMPs, maintain General Industrial Activities Storm Water NPDES permits and General Construction Activity Storm Water NPDES permits.

Municipal Code Section: 4.16.070 Control of pollutants from commercial facilities; 4.16.080 Control of pollutants from industrial activities; 4.16.090 Control of pollutants from other industrial facilities; 4.16.100 Control of pollutants from state permitted construction activities; 4.16.110 Control of pollutants from other construction activities; and 4.16.120 Control of pollutants from new developments/redevelopment projects.

11. **Require that structural BMPs are properly operated and maintained; and**

Section 4.16.120 of the City's Code permits the City to require appropriate BMPs to be installed during construction, so they may be operated and maintained once the project is completed.

Municipal Code Section: 4.16.120 Control of pollutants from new developments/ redevelopment projects.

12. **Require documentation on the operation and maintenance of structural BMPs and their effectiveness in reducing the discharge of pollutants to the MS4.**

    Projects are conditioned to provide a Standard Urban Stormwater Mitigation Plan where structural BMPs and ongoing maintenance is required as a component.

    Municipal Code Section: 4.16.120 Control of pollutants from new developments/ redevelopment projects.

Identification of the local administrative and legal procedures available to mandate compliance with applicable municipal ordinances identified in subsection (i) above and therefore with the conditions of this Order, and a statement as to whether enforcement actions can be completed administratively or whether they must be commenced and completed in the judicial system.

The City has authority under the California Constitution and various State statutes to enact and enforce ordinances, and the City's Code contains provisions that apply specifically to stormwater and urban runoff. These ordinances contain specific enforcement provisions and/or are enforceable under general provisions of the City's Code. Enforcement may occur through misdemeanor prosecution, suspension or revocation of permits, and through administrative penalties. (*See* §§4.16.130(f)(3), 4.16.130(a)(4), and 4.16.130(e) of the City's Municipal Code.) Pursuant to Section 4.16.130(a) of the City's Code, the City may declare any violation of the City's Stormwater and Urban Runoff Pollution Prevention ordinances a public nuisance, and the City may then file a civil or criminal action to abate or enjoin the nuisance. Further, in accordance with the provisions set forth in Section 4.16.130(e), the City may enforce any violation of the Chapter 4.16 of the City's Code through a civil action. The City may also issue cease and desist orders, and revoke permits via administrative processes, pursuant to Section 4.16.130(f). In addition to the remedies and enforcement tools available in Chapter 4.16, the City may also use the public nuisance provisions set forth in Chapter 3.20, as well as any of the permit revocation provisions set forth in any applicable land use entitlement.

This completes the Statement as required by the Order. Should you have any questions, please do not hesitate to contact my office.

Very truly yours,

James M. Casso

James M. Casso
City Attorney

J & M
JONES & MAYER

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Mervin D. Feinstein

July 7, 2015

Sam Unger, Executive Officer
California Regional Water Quality Control Board
Los Angeles Region
320 W. 4th Street, Suite 200
Los Angeles, California 90013-1105

Re: Statement of Legal Authority – City of West Covina

Dear Mr. Unger:

This letter is provided to serve as the Statement of Legal Authority for the City of West Covina (the "City") that must be submitted with its Annual Report pursuant to Part VI.A.2.b. of Order No. R4-2012-0175 for NPDES Permit No. CAS004001. As legal counsel for the City, it is my considered legal opinion that the City has all the necessary legal authority to implement and enforce the requirements contained in 40 CFR § 122.26(d)(2)(i)(A-F) and this Order during the reporting period of July 1, 2015 through June 30, 2016, to the extent permitted by State and Federal law, subject to the limitations on municipal action under the California and United States Constitutions.

Per the requirement in Part VI.A.2.b.i., here are citations to the West Covina Municipal Code ("WCMC") for each of the following requirements found in Part VI.A.2.a:

i. *Control the contribution of pollutants to its MS4 from storm water discharges associated with industrial and construction activity and control the quality of storm water discharged from industrial and construction sites. This requirement applies both to industrial and construction sites with coverage under an NPDES permit, as well as to those sites that do not have coverage under an NPDES permit.*

WCMC Sections: 9-10 Erosion Control, 9-26, et seq. Storm Water and Urban Runoff Pollution Control, 9-28 Illicit discharges, dumping, and non-stormwater discharges, 9-31 Control of pollutants from commercial facilities, 9-32 Control of pollutants from industrial activities, 9-33 Control of pollutants from other industrial facilities, 9-34 Control of pollutants from state permitted construction activities, and 9-35 Control of pollutants from other construction activities

ii. *Prohibit all non-storm water discharges through the MS4 to receiving waters not otherwise authorized or conditionally exempt pursuant to Part III.A.*

WCMC Sections: 9-28 Illicit discharges, dumping and non-storm water discharges and 9-30 Reduction of pollutants in runoff

iii. *Prohibit and eliminate illicit discharges and illicit connections to the MS4.*

WCMC Sections: 9-28 Illicit discharges, dumping and non-storm water discharges and 9-29 Illicit connections

iv. *Control the discharge of spills, dumping, or disposal of materials other than storm water to its MS4.*

WCMC Section: 9-28 Illicit discharges, dumping and non-storm water discharges

v. *Require compliance with conditions in Permittee ordinances, permits, contracts or orders (i.e., hold dischargers to its MS4 accountable for their contributions of pollutants and flows);*

WCMC Sections: 9-26 Purpose and intent, 9-37 Enforcement – Authority, 9-38 Enforcement – Right of Entry, 9-39 Enforcement – Violation and Penalties

vi. *Utilize enforcement mechanisms to require compliance with applicable ordinances, permits, contracts, or orders.*

WCMC Sections: 9-37 Enforcement - Authority, 9-38 Enforcement – Right of Entry, 9-39 Enforcement – Violation and Penalties

vii. *Control the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements among Co-permittees;*

WCMC Sections: 9-26 Purpose and intent, 9-27 Definitions, and 9-28 Illicit discharges, dumping and non-storm water discharges

viii. *Control of the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements with other owners of the MS4 such as the State of California Department of Transportation;*

WCMC Sections: 9-26 Purpose and intent, 9-27 Definitions, and 9-28 Illicit discharges, dumping and non-storm water discharges

ix. *Carry out all inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with applicable municipal ordinances, permits, contracts and orders, and with the provisions of this Order, including the prohibition of non-storm water discharges into the MS4 and receiving waters. This means the Permittee must have authority to enter, monitor, inspect, take measurements, review and copy records, and require regular reports from entities discharging into its MS4;*

WCMC Section: 9-37 Enforcement - Authority, 9-38 Enforcement – Right of Entry, 9-39 Enforcement – Violation and Penalties

x. *Require the use of control measures to prevent or reduce the discharge of pollutants to achieve water quality standards/receiving water limitations;*

WCMC Sections: 9-10 Erosion Control, 9-26, et seq. Storm Water and Urban Runoff Pollution Control, 9-28 Illicit discharges, dumping, and non-stormwater discharges, 9-31 Control of pollutants from commercial facilities, 9-32 Control of pollutants from industrial activities, 9-33 Control of pollutants from other industrial facilities, 9-34 Control of pollutants from state permitted construction activities, and 9-35 Control of pollutants from other construction activities

xi. *Require that structural BMPs are properly operated and maintained;*

WCMC Section: 9-36 Control of pollutants from new developments/redevelopments

xii. *Require documentation on the operation and maintenance of structural BMPs and their effectiveness in reducing the discharge of pollutants to the MS4.*

WCMC Section: 9-36 Control of pollutants from new developments/redevelopments

Per the requirement in Part VI.A.2.b.ii., the City's legal procedures available to mandate compliance with applicable municipal ordinances identified in the above section, and therefore with the conditions of the Order, can be found in WCMC Sections 9-37 Enforcement - Authority, 9-38 Enforcement – Right of Entry, 9-39 Enforcement – Violation and Penalties

Here is the relevant text from those provisions:

- **Sec. 9-37. - Enforcement—Authority.**

(a) The director of public works, and duly authorized representatives thereof, are hereby authorized and directed to enforce all provisions of this chapter.
(b) Nothing in this chapter precludes a local authority from using regular full-time employees to enforce this article. This authority shall be in addition to the authority granted to police and community enhancement officers.

- **Sec. 9-38. - Enforcement—Right of entry.**

Whenever authorized enforcement officer has reasonable cause to believe that there exists in any building or upon any premises any condition which constitutes a violation of the provision of this chapter, the officer may enter such building or premises at any reasonable time to inspect the same or perform any duty imposed upon the officer by this chapter, provided that:
(1) If such building or premises be occupied, he or she shall first present proper credentials and request entry.
(2) If such building or premises be unoccupied, he or she shall first make a reasonable effort to locate the owner or occupant of the building or premises and request entry. In the event that request for entry is refused, the officer is hereby empowered to seek assistance from any court of competent jurisdiction in obtaining such entry.

- **Sec. 9-39. - Enforcement—Violations and penalties.**

(a) Any violation of this article and any violation of a written condition of approval issued by the director, and any violation of any provision of any NPDES permit is a misdemeanor and shall be punishable by either a fine of up to one thousand dollars ($1,000.00) or six (6) months in the county jail, or both.
(b) Any person who may otherwise be charged with a misdemeanor as a result of a violation of this article may be charged, at the discretion of the prosecuting attorney, with an infraction punishable by a fine of not more than one hundred dollars ($100.00) for the first violation, two hundred dollars ($200.00) for the second violation, and two hundred fifty dollars ($250.00) for each additional violation thereafter.
(c) Violations of this article may further be deemed to be a public nuisance which may be abated by administrative or civil or criminal action in accordance with the terms and provisions of this Code and state law.
(d) The city attorney is authorized to file in a court of competent jurisdiction a civil action seeking an injunction against any violation or threatened or continuing violation of this article. Any temporary, preliminary or permanent injunction issued pursuant hereto may include an order for reimbursement to the city for all costs incurred in enforcing this article, including costs of inspection, investigation, monitoring, treatment, abatement, removal or remediation undertaken by or at the expense of the city, and may include all legal expenses and fees and any and all costs incurred relating to the restoration or remediation of the environment.

(e) Any person acting in violation of this article may also be acting in violation of the Clean Water Act or the California Porter-Cologne Act (California Water Code Section 13000 et seq.) and the regulations thereunder, and other laws and regulations, and may be subject to damages, fines and penalties, including civil liability under such other laws. The city attorney is authorized to file a citizen's suit pursuant to the Clean Water Act, seeking penalties, damages and orders compelling compliance and appropriate relief.
(f) Each separate discharge or other act which is in violation of this article and each day a violation of this article exists, without correction, shall constitute a new and separate violation punishable as a separate infraction, misdemeanor and/or civil violation.
(g) The city may utilize any and all other remedies as otherwise provided by law.
(h) Civil penalties: Any person who violates any provision of this article or any written condition of approval issued by the director or any state or federal law or any provision of any NPDES permit may be civilly liable to the city in the sum of not less than one hundred dollars ($100.00) but not to exceed one thousand dollars ($1,000.00) per day for each day in which such violation occurs or continues. The city may petition the municipal or superior court to impose, assess, and recover such sums. The civil penalty provided in this subsection excludes inspection, abatement, and other costs; is cumulative and not exclusive; and shall be in addition to all other remedies available to the city under federal, state, or local laws and ordinances. Funds collected pursuant to this subsection shall be paid to the city's sewer and storm drain utility enterprise fund account.
(i) Administrative penalties: Where the director finds that any person has violated any provision of this article or any written condition of approval issued by the director or any state or federal law or any provision of any NPDES permit, he or she may assess an administrative penalty in a sum not to exceed one thousand dollars ($1,000.00) per day for each day in which such violation occurs or continues. The administrative penalty provided in this subsection shall be pursuant to administrative procedures; excludes inspection, abatement, and other costs; is cumulative and not exclusive; and shall be in addition to all other remedies available to the city under federal, state, or local laws and ordinances. Funds collected pursuant to this subsection shall be paid to the city's sewer and storm drain utility enterprise fund account.
(j) As a part of any sentence or other penalty imposed or the award of any damage, the court may also order that restitution be paid to the city or any injured person, or, in the case of a violator who is a minor, by the minor's parent or lawfully designated guardian or custodian. Restitution may include the amount of any reward.
(k) Any person violating the provisions of this article shall reimburse the city for any and all costs incurred by the city in responding to, investigating, assessing, monitoring, treating, cleaning, removing, or remediating any illicit discharge or pollutant from the MS4; rectifying any illicit connection; or remediating any violation of this article. Such costs to be paid to the city include all administrative expenses and all legal expenses, including costs and attorneys' fees, in obtaining compliance, and in litigation including all costs and attorneys' fees on any appeal. The costs to be recovered in this section shall be recoverable from any and all persons violating this article.

(l) All costs and fees incurred by the city as a result of any violation of this article which constitute a nuisance, including all administrative fees and expenses and legal fees and expenses, shall become a lien against the subject premises from which the nuisance emanated and a personal obligation against the owner, in accordance with Government Code Sections 38773.1 and 38773.5. The owner of record of the premises subject to any lien shall receive notice of the lien prior to recording, as required by Government Code Section 38773.1. The city attorney is authorized to collect nuisance abatement costs or enforce a nuisance lien in an action brought for money judgment, or by delivery to the county assessor of a special assessment against the premises in accordance with the conditions and requirements of Government Code Section 38773.5.

Thus, enforcement actions can be completed administratively or judicially if necessary. Please contact the undersigned if you have any questions.

Very truly yours,

Kimberly Hall Barlow

Kimberly Hall Barlow
West Covina City Attorney

KHB:wag
cc: Chino Consunji

Appendix A-2

Documentation of Stakeholder Outreach

Water Quality Improvement Plans for the San Gabriel River and Rio Hondo Watersheds

Stakeholder Meeting

Come and participate in:

- Discussions on goals and strategies
- Multi-benefit projects to enhance water supply and achieve water quality goals
- Questions and answers with agency representatives

WHEN March 9, 2015 | 9:00 a.m. to 11:00 a.m.

WHERE Los Angeles County Arboretum and Botanic Garden, Palm Room
301 North Baldwin Avenue, Arcadia, CA 91007

MORE INFO Linda Lee Miller | Phone (626) 458-7148 | llee@dpw.lacounty.gov

Without proper measures, urban runoff within a watershed often picks up pollutants as it flows through our cities and into storm drains, then rivers, and eventually the ocean. Water quality improvement plans are essential in restoring the health of our waterways. We invite you to discuss our draft plans that are underway for the San Gabriel River and Rio Hondo Watersheds.

WATER QUALITY IMPROVEMENT PLANS FOR SAN GABRIEL RIVER AND RIO HONDO WATERSHEDS STAKEHOLDER MEETING

Los Angeles County Arboretum and Botanic Garden, Ayres Hall

301 North Baldwin Avenue, Arcadia, CA 91007

March 9, 2015, 9:00 am to 11:00 am

Agenda

1. Sign-In at Welcome Station
2. Welcome
3. Introduction Remarks
4. Meeting Format
5. Presentation on Water Quality Improvement Plans
   - Upper San Gabriel River Watershed Group (USGR)
   - Rio Hondo/San Gabriel River Water Quality Group (RH/SGR)
6. Poster Stations
   - Overview of Watershed Management Groups
   - USGR Pollutant Reduction Strategies
   - USGR Regional Projects
   - RH/SGR Project Screening
   - RH/SGR Regional Projects
   - RH/SGR Green Streets
7. Group Discussion
8. Next Steps and Wrap Up
9. Poster Stations to Remain Open for More Q/A

San Gabriel River and Rio Hondo Watersheds Stakeholder Meeting

March 9, 2015

Sign-In Sheet

Name	Organization	Telephone	Email
JAMES CRAMSIE	INDUSTRY	(949) 863-0580	jcramsie@cc-eng.com
Chris Lopez	Regional Water Board	(213) 576-6674	chris.lopez@waterboards.ca.gov
JOHN DiMARIO	LA PUENTE	(626) 855-1517	Jdimario@lapuente.org
Sarah Le	NTD TV	323-456-6448	sarah.le@ntdtv.com
Mary Jane Macy	Arboretum	626-825-8053	mjmflicker@gmail.com
David Randall	"	213 675-7500	RandallDav@gmail.com
PAT HOLLAND	"	626 355 6329	PATHOLLAND@AOL.com
Gretchen Anderson	"	626-765-9275	gretchen-a@charter.net
Thomas Lee	"	626-286-9107	thomaskyuholee@gmail.com
Margaret Page	Los Voluntarios	626 3588854	dennis.n.page@verizon.net
Ron Kaelble			
Irma Kaelble	"	626-286-5574	
ANGELA GEORGE	LACDPW	626-458-4300	ageorge@dpw.lacounty.gov
Phylyp Bardwell	Rep Napolitano	626-350-0150	phylyp.bardwell@mail.house.gov
15 Marie Geng		626 374-8910	mariaelenageng@icloud.com

San Gabriel River and Rio Hondo Watersheds Stakeholder Meeting

March 9, 2015

Sign-In Sheet

Name	Organization	Telephone	Email
Vanessa Hevener	Arcadia	626-305-5327	vhevener@ci.arcadia.ca.us
Jason Pereira	CWE	714-526-7500	jpereira@cwecorp.com
MITCHELL H. BISHOP	ARBORETUM	626-821-3235	MITCHELL.BISHOP@ARBORETUM.ORG
Kenneth D. Hill	ARBORETUM	626-797-2089	kenhill8@gmail.com
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Sharon Gallant	MONROVIA	(626)932-5553	SGALLANT@CI.MONROVIA.CA.US
Jean Prinz	Arboretum	(626) 287-2981	jaygee@pacbell.net
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Rayma Harrison	Arboretum	626-287-9284	
Charles Seitz	Arboretum	626-272-5463	Charles.C.Seitz@gmail.com
DAN FOLIANT	ARBORETUM	818 248-0817	DANFORDF@EARTHLINK.NET
Marilyn Keiper	Volunteer	6528 Vista	San Gabriel 91775
Tom Tait	Arcadia		
ED SUHER	CASC ENG. FOR CITY OF INDUSTRY	310/291-1150	e_suher@CASCINC.COM
SONDRA HAUGE	League of Women Voters	626 286-0007	SLHAUGE4803@GMAIL.COM
Marcia Hale	UCLA	928-301-1642	mhale@ioes.ucla.edu
Ann CROISSANT	SGMRC	626-335-1771	glcroissant@cpp.edu
Thomas Mann	WRD	562-275-4235	tmann@wrd.org
NANCY YOSHIHARA	ARBORETUM	626 821 4447	nancy.yoshihara@arboretum.org
RICARDO MORENO	SCE	626-940-6128	ricardo.moreno@sce.com
Elizabeth Debreu	Arboretum	626-696-3106	ebdebreu@me.com
Vivian Castro	COVINA	626.384.5480	vcastro@covinaca.gov
George Brumder	Arboretum	626.795.0315	brumder@earthlink.net
Aaron Chiang	LACDPW	626-458-7115	achiang@dpw.lacounty.gov
Genevieve Osmena	LACDPW	626-458-3978	gosmena@dpw.lacounty.gov
Linda Lee Miller			
Jolene Guerrero			
Alexandra Biering			
Victor Harris	Present		
Bronwyn Kelly			
Paul Alva			
Terry Young	N/A		

San Gabriel River and Rio Hondo Watersheds Stakeholder Meeting

March 9, 2015

Sign-In Sheet

Name	Organization	Telephone	Email
RAFAEL CASILLAS	DUARTE	626 357 7931	rcasillas@accessduarte
Gregg Begell	DPW	626-300-8298	gbegell@dpw.lacounty.gov
JEREY BURKE	GLENDALE	626-914-8246	JBURKE@ CI.GLENDORA.CA.US
ALEX FORAN	ARBORETUM	626-281-3245	—
Alex Tachiki	Duarte	626-357-7931	atachiki@accessduarte.com
Ivar K Ridgeway	Regional Water Board	213-620-2150	
Catherine Heinlein	APU - Azusa	626-945-5609	cheinlein@apu.edu
JOEL FALLON	KCBS - KCAL	818-655-2299	JRFALLON@CBS.COM
THOMAS R CONROW	ARBO	626 524 1076	CONROW@EARTHLINK.NET
MARY CONROW	"	"	"
[illegible]		(626)285-9067	San Marino
Robert Tager	Arboretum	626-399-8110	rmtager[illegible]@gmail.com
Emily Rosedale-Kousoulis	Arboretum		emily_rosedale@yahoo.com
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Norma Scranton	Arboretum	626 793 7881	NormaScranton@sbcglobal
Michelle Keith	Bradbury	626 358 5218	mkeith@cityofbradbury
Shannon Bishop	LACSD	562-908-4288 x2443	sbishop@lacsd.org
Jill Vig	Arboretum	626 797 6330	jillevig@gmail.com
Sheryl Carlsen	Arboretum	626-356-0681	scarlsen23@gmail.com
Karen Brunner	Arboretum	(626) 355-4501	
Chris Cox	Arcadia	626 445-6412	gloriachriscox@aol.com

San Gabriel River and Rio Hondo Watersheds Stakeholder Meeting

March 9, 2015

Sign-In Sheet

Name	Organization	Telephone	Email
KATHY BOLSTER	LA ARBORETUM	626-355-2160	KATHYMBOLSTER@YAHOO.com
Katie Hamel	CWE	714)526-7500 x205	khamel@cwecorp.com
GLORIA COX	L.A Arboretum VOLS	626 445-6412	gloria.chris.cox.@aol.com.
STEPHANIE BOWER	ASLA	818 469-0587	Steph@transcapedesigns.com
Gilbert Resendez	Monrovia Nursery	626-893-2280	gresendez@monrovia.com
LEE SHIMMIN	LOS VOLUNTARIOS ARBORETUM	626 446 8641	LESHIMMIN@YAHOO.COM
Phillip Flores	CITY OF AZUSA	(626) 523-3023	PFLORES@CI.azusa.ca.us
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SANDY SNIDER	LA ARBORETUM	626/358-4601	SSNIDER626@Charter.net
Nicole Pun	Sing tao LA	10183894 2	nicolepun@singtaola.com
MARGARET CAMPBELL		626-442-6316	mhcampbell@sbcglobal.net
FRAN DELACH	SGVCOG	626-457-1800	fdelach@SGVCOG.org

San Gabriel River and Rio Hondo Watersheds Stakeholder Meeting

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March 9, 2015

Sign-In Sheet

Name	Organization	Telephone	Email
Shaké Mamigonian	Arboretum- Los Vols Volunteers	626-797-5932	shake.mamigonian@gmail.com
Pat Wilmott	Los Vols	626 289 1113	BRITBIE505@AOL.Com
STELLA MACDONALD	Los Vos	626-579-7449	GEOSTEL79@GMAIL.COM
GEORGE MACDONALD	Los Vos	" " "	" " "
Tai White	Los Vos	626-359-1906	taimuh@juno.com
Margaux Viera	Arboretum	626399-9621	gauxviera@gmail.com

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San Gabriel River and Rio Hondo Watersheds Stakeholder Meeting

March 9, 2015

Sign-In Sheet

Name	Organization	Telephone	Email
Marsha Perez	Los Vols	626 3580313	MARSHAAPEREZ@GMAIL.COM
Jeanne Kinkopf	Los Vols	626 335-2262	J.Jkinkopf@gmail.com
Bob + Joyce Travis	Los Vols	626-574-0665	travisinarc@yahoo.com
Pam Warner	Arb trustee	626.683.4906	pbwarner2@gmail
Margaret Fullinwider	Los Vols	626-355-3647	mfullinw@hotmail.com
ISELA VAZQUEZ	NLMUD	562.843.3070	IVAZQUEZ@NLMUD.ORG
Vickere Murphy	Senator Liu	818.409.0400	vickere.murphy@sen.ca.gov

Enhanced Watershed Management Program Development

Stakeholder Meeting

Clean Rivers and Waterways.

We all want it.

What can we do about it?

The cities in the San Gabriel River and Rio Hondo Watersheds are collaborating to create long-term water quality improvement plans.

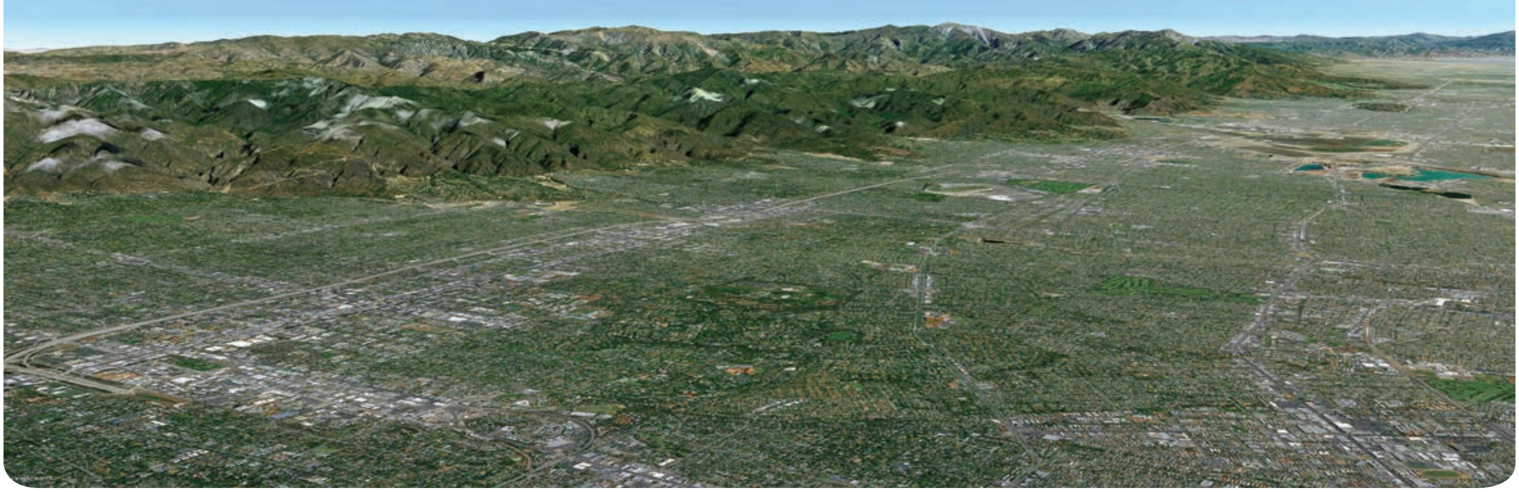
WHEN May 5, 2014 | 1:30 p.m. to 3:30 p.m.

WHERE Los Angeles County Department of Public Works
900 S Fremont Avenue, Alhambra, CA 91803 | Conference Rooms A & B

MORE INFO Linda Lee Miller | Phone (626) 458-7148 | llee@dpw.lacounty.gov

We are interested in hearing about your project ideas, community needs, and possible opportunities to work with others in achieving water quality goals. The 2-hour session includes a general overview, poster sessions and a discussion. Results from the meeting will help us explore and understand the needs and resources of the watershed. We look forward to your participation.

Arcadia
Azusa
Baldwin Park
Bradbury
Covina
Duarte
Glendora
Industry
La Puente
Monrovia
Sierra Madre
County of Los Angeles
Los Angeles County Flood Control District



San Gabriel River and Rio Hondo Watersheds Stakeholder Meeting Agenda

Los Angeles County Department of Public Works, Conference Rooms A & B
May 5th, 2014, 1:30 pm to 3:30 pm

1. Sign-In at Welcome Station
2. Welcome
3. Introduction Remarks
4. Agenda/Ground Rules
5. Presentation on EWMP Development
6. Poster Stations
    - Upper San Gabriel River EWMP Group
    - Rio Hondo/San Gabriel River Water Quality Group
    - Small-Scale Distributed Best Management Practices
    - Large-Scale Regional Projects
7. Group Discussion
8. Next Steps and Wrap Up
9. Poster Station to Remain Open for More Q&A

San Gabriel River and Rio Hondo Watersheds Stakeholder Meeting

May 5, 2014

Sign-In Sheet

Initial	Name	Organization	Telephone	Email
JH	Javier Hernandez	Bike San Gabriel	626-536-1044	javier@bikesgv.org
BW	Blake Whittington	Council for Watershed Health	626 797 9991	blake@watershedhealth.org
PS	Peter Shellenbarger	Heal the Bay		
	Mark Kenyon / Simran Sikand	North East Trees	323-441-8634 x24	simran@northeasttrees.org
NG	Noah Garrison	NRDC		ngarrison@nrdc.org
	Charlotte Pienkos	The Nature Conservancy		
RT	Reymundo Trejo	Upper San Gabriel Valley MWD		reymundo@USGVMWD.org
[illegible]	Robert Romanek	Watershed Conservation Authority		
DE	Debbie Enos	Watershed Conservation Authority	626 815-1019	denos@wca.ca.gov
	Brad Jensen	San Gabriel Valley Economic Partnership		
	Kelly Middleton, Public Information Officer MARK HALL	San Gabriel Valley Mosquito & Vector Control District (Greater Los Angeles County Vector Control District)	562-944-9656	mhall@glacvcd.org
AY	Armando Yanez	Assembly Member Roger Hernandez, District 48	(626) 960-4457	armando.yanez@asm.ca.gov
Ivar K. Ridgeway	Ivar Ridgeway	Los Angeles Regional Water Quality Control Board		
TM	Thomas Martin	Water Replinishment District of Southern California	562 275 4235	
DL	David Lopez	Baldwin Park	(626) 960-4011 x458	dlopez@baldwinpark.com
VC	Vivian Castro	Covina	(626)384-5480	vcastro@covinaca.gov
	Jerry Burke	Glendora	(626) 914-8246	jburke@ci.glendora.ca.us
	James Cramsie	Industry	(714) 863-0588	jcramsie@cc-eng.com
	John DiMario	La Puente	(626) 855-1517	jdimario@lapuente.org
JG	Jolene Guerrero	LACDPW/LACFCD	(626) 458-4364	jguerrer@dpw.lacounty.gov
[illegible]	Linda Lee Miller	LACDPW/LACFCD	(626) 458-7148	llee@dpw.lacounty.gov
VH	Victor Harris	MWH	(626) 568-6024	victor.harris@mwhglobal.com
[illegible]	Bronwyn Kelly	MWH	(626) 568-6691	bronwyn.kelly@mwhglobal.com
TH	Tony Hancock	MWH	(858) 751-1204	tony.hancock@mwhglobal.com
VH	Vanessa Hevener	Arcadia	(626) 359-7028	vhevener@ci.arcadia.ca.us
DB	Daniel Bobadilla	Azusa	(626) 812-5264	dbobadilla@ci.azusa.ca.us
[illegible]	Michelle Keith	Bradbury	(626) 358-3218 x300	MKeith@CityofBradbury.org

Initial	Name	Organization	Telephone	Email
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RC	Rafael Casillas	Duarte	(626) 357-7931	rcasillas@accessduarte.com
JC	James Carlson	Sierra Madre	(626) 355-7135 x803	JCarlson@cityofsierramadre.com
GO	Genevieve Osmena	LACDPW/LACFCD	(626) 458-3978	gosmena@dpw.lacounty.gov
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KH	Katie Harrel	CWE	(714)526-7500 x205	kharrel@cwecorp.com
	Elroy Kiepke	Willdan	562-908-6278	ekiepke@willdan.com
ES	Ed Suher	CASC FOR CITY OF INDUSTRY	310-291-1150	
VLB	JERRY [illegible]	GLENDORA	626 914-8249	
	ANGELA GEORGE	LA COUNTY		
KH	Kalieh Honish	Covina	6/384-5220	PW@covinaca.gov
H.R.	Humberto Rios	LA COUNTY	(626)458-4368	hrios@dpw.lacounty.gov
AT	Alex Tachiki	Duarte	626-357-7931	ATACHIKI@ACCESSDUARTE.COM
DR	Dana Robertson	LA County	626 458-5911	drobertson@dpw.lacounty
MG	Mark Grey	BIASC/CICWQ		mgrey@biasc.org
RG	Robert Gomez	LACFCD	626 458-4344	rgomez@dpw.lacounty.gov
	Peter Shellenbarger	Heal the Bay		

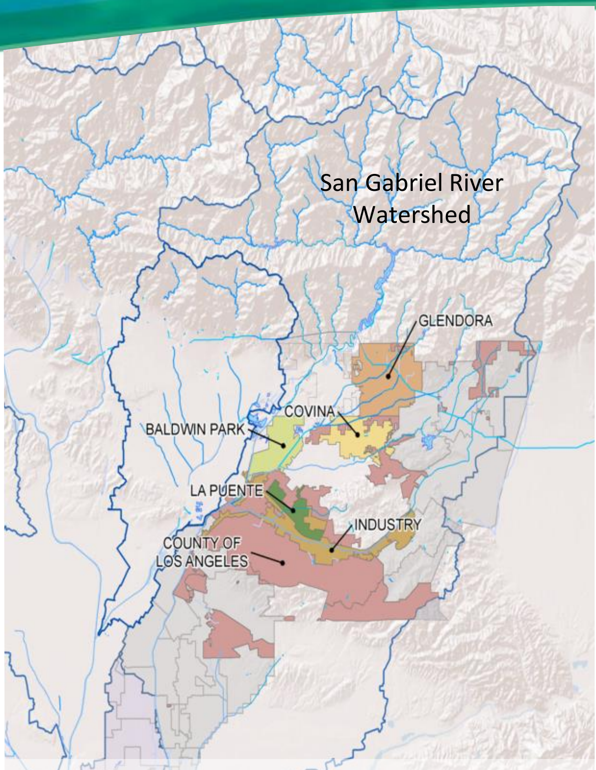
March 9, 2015 Stakeholder Meeting


March 9, 2015 Poster Station Breakout Session


May 5, 2014 Stakeholder Meeting

May 5, 2014 Poster Station Breakout Session

WATERSHED MANAGEMENT in the SAN GABRIEL RIVER WATERSHED



Upper San Gabriel River Enhanced Watershed Management Group

Help us improve water quality in the San Gabriel River Watershed! We are interested in hearing about your project ideas, community needs, and possible opportunities to work with others in achieving water quality goals.

What is a stormwater permit?

Stormwater runoff travels over our cities and enters the storm drain system. In order for cities to operate their storm drains, they must obtain a stormwater permit. In 2012, a new permit was adopted by the Regional Board. The permit is intended to provide multiple benefits, consisting of, but not limited to:

- Protect water quality in our rivers, streams, lakes, reservoirs, and the ocean
- Protect human and wildlife health
- Provide opportunities to capture and use the stormwater runoff to recharge our groundwater basins
- Provide multiple benefits including habitat improvement, aesthetic value, and recreation areas.

Who is affected by it?

The permit affects the entire County of Los Angeles including the cities, businesses, and the public. In short, we are all responsible for doing our part to maintain water quality in our region.

What is an Enhanced Watershed Management Program (EWMP)?

The County and cities are currently developing an EWMP to address the requirements of the permit. The EWMP will identify potential project locations, Best Management Practices (BMPs), and a comprehensive monitoring program. The EWMP will adapt to new data and information over time. Once implemented, the EWMP will serve as a road map to improve water quality in the watershed.

When will the EWMP be completed?

The EWMP is currently being drafted and anticipated to be completed by June 2015. The Program will provide a thorough foundation for new stormwater management practices.

Why is this important?

The EWMP is a large, coordinated effort and requires the support of many organizations and individuals, including you, in order to be a success. If developed and implemented correctly, the program can help restore the health of our waters and provide sustainability for years to come. We welcome you to participate in the protection of our valuable water resources.

How can you help?

We want to hear from you! We would greatly appreciate feedback from you, including:

- Help on identifying locations for projects that capture/treat stormwater runoff
- Ideas on how to reduce urban runoff
- Providing feedback on stormwater management projects
- Assisting us in identifying stakeholders as potential teaming partners
- Ideas on funding sources and partnership opportunities

Please see attached form to submit project information. Email completed form and any questions to:

LINDA LEE MILLER, P.E.,
County of Los Angeles Department of Public Works, Watershed Management Division
(626) 458-7148 | LLEE@dpw.lacounty.gov

Appendix A-3

Los Angeles County Flood Control District (LACFCD) Background Information

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT (LACFCD) BACKGROUND INFORMATION

In 1915, the Los Angeles County Flood Control Act established the LACFCD and empowered it to manage flood risk and conserve stormwater for groundwater recharge. In coordination with the United States Army Corps of Engineers, the LACFCD developed and constructed a comprehensive system that provides for the regulation and control of flood waters through the use of reservoirs and flood channels. The system also controls debris, collects surface stormwater from streets, and replenishes groundwater with stormwater and imported and recycled waters. The LACFCD covers the 2,753 square-mile portion of Los Angeles County south of the east-west projection of Avenue S, excluding Catalina Island. It is a special district governed by the County of Los Angeles Board of Supervisors, and its functions are carried out by the Los Angeles County Department of Public Works. The LACFCD service area is shown in **Figure A-1.**

Unlike cities and counties, the LACFCD does not own or operate any municipal sanitary sewer systems, public streets, roads, or highways. The LACFCD operates and maintains storm drains and other appurtenant drainage infrastructure within its service area. The LACFCD has no planning, zoning, development permitting, or other land use authority within its service area. The permittees that have such land use authority are responsible under the MS4 Permit for inspecting and controlling pollutants from industrial and commercial facilities, development projects, and development construction sites. (Permit, Part II.E, p. 17.)

The MS4 Permit language clarifies the unique role of the LACFCD in stormwater management programs: "[g]iven the LACFCD's limited land use authority, it is appropriate for the LACFCD to have a separate and uniquely-tailored stormwater management program. Accordingly, the stormwater management program minimum control measures imposed on the LACFCD in Part VI.D of this Order differ in some ways from the minimum control measures imposed on other permittees. Namely, aside from its own properties and facilities, the LACFCD is not subject to the Industrial/Commercial Facilities Program, the Planning and Land Development Program, and the Development Construction Program. However, as a discharger of storm and non-stormwater, the LACFCD remains subject to the Public Information and Participation Program [(PIPP)] and the Illicit Connections and Illicit Discharges Elimination Program. Further, as the owner and operator of certain properties, facilities and infrastructure, the LACFCD remains subject to requirements of a Public Agency Activities Program." (Permit, Part II.F**,** p. 18.)

Consistent with the role and responsibilities of the LACFCD under the Permit, the EWMPs and CIMPs reflect the opportunities that are available for the LACFCD to collaborate with permittees having land use authority over the subject watershed area. In some instances, the opportunities are minimal; however, the LACFCD remains responsible for compliance with certain aspects of the MS4 permit as discussed above.

In some instances, in recognition of the increased efficiency of implementing certain programs regionally, the LACFCD has committed to responsibilities above and beyond its obligations under the 2012 Permit. For example, although under the 2012 Permit the PIPP is a responsibility of each permittee, the LACFCD is committed to implementing certain regional elements of the PIPP on behalf of all permittees at no cost to the permittees. These regional elements include:

- Maintaining a countywide hotline (888-CLEAN-LA) and website (www.888cleanla.com) for public reporting and general stormwater management information at an estimated annual cost of $250,000. Each permittee can utilize this hotline and website for public reporting within its jurisdiction.
- Broadcasting public service announcements and conducting regional advertising campaigns at an estimated annual cost of $750,000.

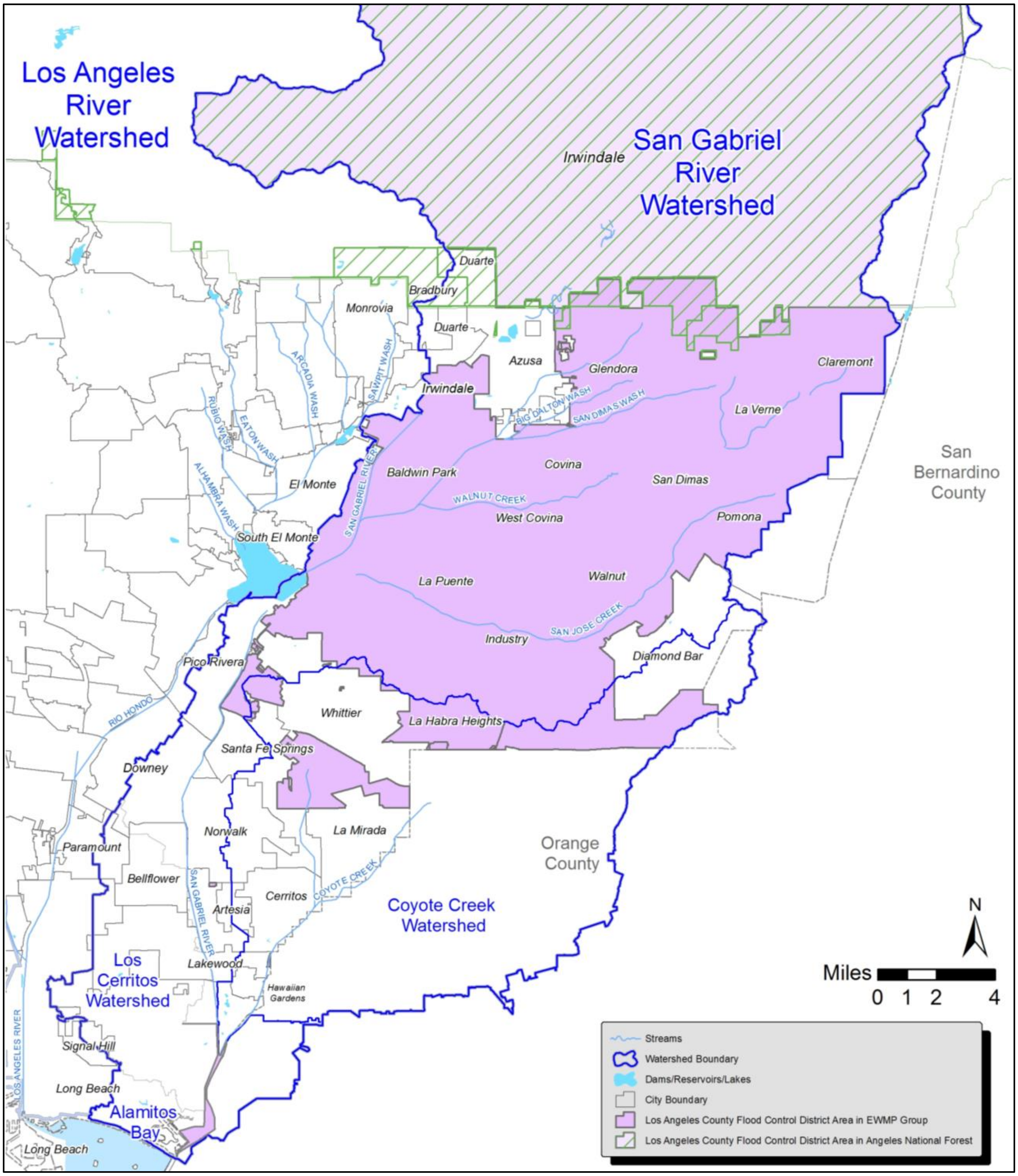
- Facilitating the dissemination of public education and activity specific-stormwater pollution prevention materials at an estimated annual cost of $100,000.
- Maintaining a stormwater website at an estimated annual cost of $10,000.

The LACFCD will implement these elements on behalf of all permittees starting July 2015 and through the Permit term. With the LACFCD handling these elements regionally, permittees can better focus on implementing local or watershed-specific programs, including student education and community events, to fully satisfy the PIPP requirements of the 2012 Permit.

Similarly, although water quality monitoring is a responsibility of each permittee under the 2012 Permit, the LACFCD is committed to implement certain regional elements of the monitoring program. Specifically, the LACFCD will continue to conduct monitoring at the seven existing mass emissions stations required under the previous Permit. The LACFCD will also participate in the Southern California Stormwater Monitoring Coalition's Regional Bioassessment Program on behalf of all permittees. By taking on these additional responsibilities, the LACFCD wishes to increase the efficiency and effectiveness of these programs.

Figure A-1
Los Angeles County Flood Control District Service Area

Figure A-2
Los Angeles County Flood Control District Area in USGR EWMP Group



Appendix B-1

Conceptual Designs of Example Regional EWMP Projects

TECHNICAL MEMORANDUM

To:	Upper San Gabriel River EWMP Group	**Date:**	February 2, 2015
From:	The MWH Team	**Reference:**	USGR EWMP
Subject:	Task 8.4 – Project Schedules and Cost Estimates Technical Memorandum		

1 INTRODUCTION

The Upper San Gabriel River (USGR) Enhanced Watershed Management Program (EWMP) will include regional EWMP projects that retain and infiltrate or beneficially reuse all stormwater runoff from the 85th-percentile, 24-hour storm event for the drainage area tributary to the project. These projects will enhance flood control, improve downstream water quality, promote water conservation efforts and improve local aesthetics. Through an extensive screening process and coordination with the USGR EWMP Group (Group), ten (10) proposed regional EWMP project sites were selected for conceptual design for inclusion in the EWMP plan. Best Management Practice (BMP) types have been selected and sized for each of the ten (10) sites. Based on the conceptual designs, preliminary cost estimates and a conceptual project schedule were developed. Through the analysis of alternatives, the optimization and milestone sequencing of the RAA maximizes the effectiveness of capital improvement spending to address human health and water quality related challenges and non-compliance. This technical memorandum (TM) presents the conceptual designs of the ten regional EWMP projects and the associated preliminary cost estimates and the estimated project schedule.

2 REGIONAL EWMP PROJECTS

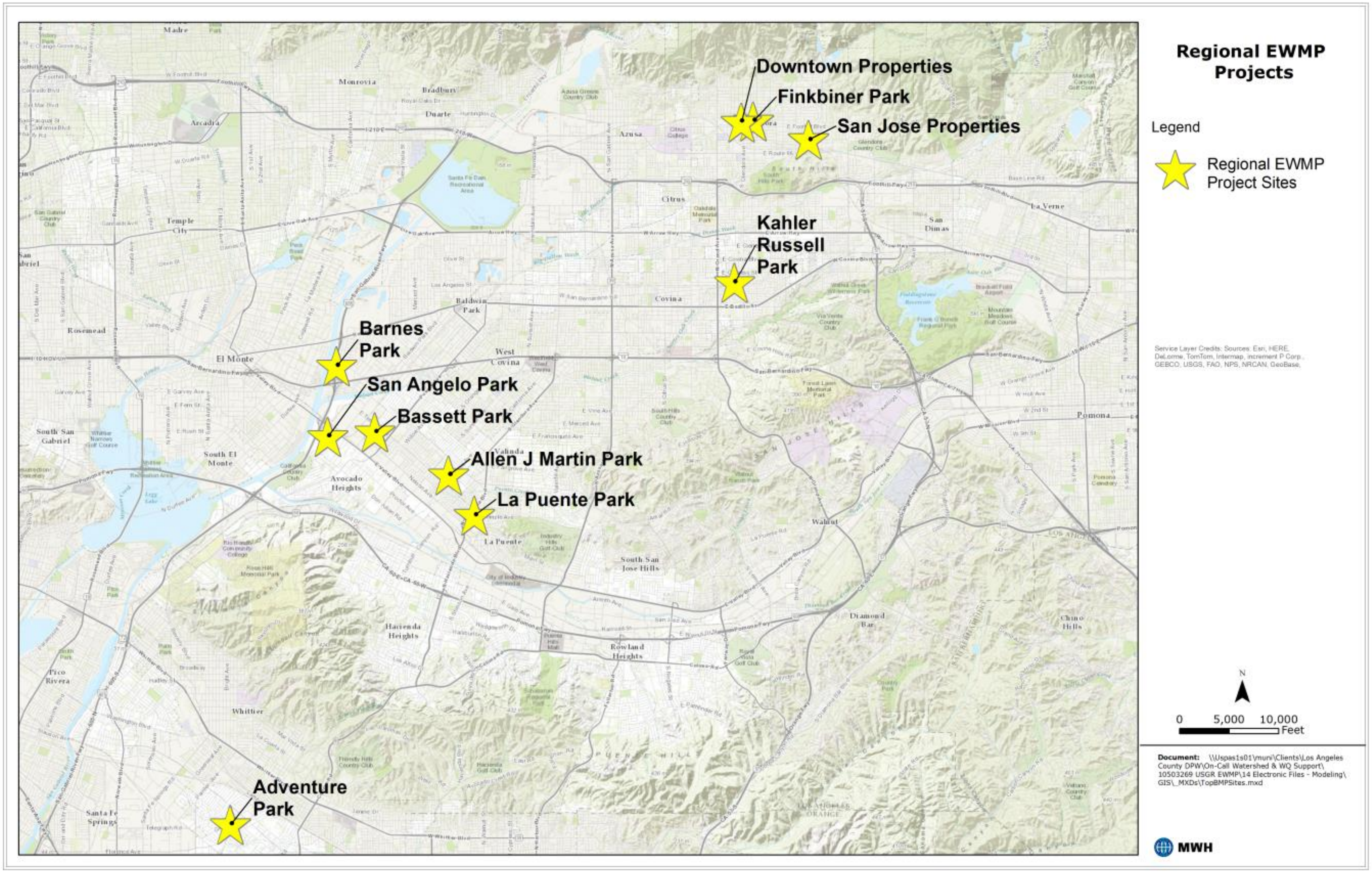
As summarized in the *Proposed Regional EWMP Projects Technical Memorandum* (MWH, 2014c), regional EWMP project locations were selected, as provided in **Table 1** and depicted in **Figure 1**. In coordination with the Group, a preliminary layout was developed for each of the projects.

Table 1

Regional EWMP Project Sites

Regional EWMP Project Site	Address
Adventure Park (aka Gunn Ave. Park)	10130 S. Gunn Avenue, Whittier, CA 90605
Barnes Park	3251 Patritti Avenue, Baldwin Park, CA 91706
San Angelo Park and Vacant Lot	245 San Angelo Avenue, Bassett, CA 91746
Bassett Park	510 Vineland Avenue, La Puente, CA 91746
Allen J Martin Park	14830 East Giordano Street, La Puente, CA 91744
La Puente Park	15538-15598 E Temple Ave, La Puente, CA 91744
Kahler Russell Park	735 North Glendora Avenue, Covina, CA 91724
Downtown Properties (Glendora)	Foothill Blvd. and Glendora Ave., Glendora, CA 91741
San Jose Properties (Glendora) – Alternative	Burnaby Dr, Lawford St., Glendora, CA 91741
Finkbiner Park - Alternative	160 N. Wabash Ave, Glendora, CA 91741

Figure 1
Regional EWMP Project Sites



2.1 Project Design Criteria

A conceptual level design was developed for each of the regional EWMP projects that include the selection of BMP type, preliminary sizing, configuration, and diversion pipeline alignment. Based on discussions with the Group and industry standards, the criteria and assumptions presented provided the basis for the conceptual designs. During the actual design and implementation phase of the projects, these assumptions should be reevaluated.

- Per Los Angeles' MS4 Permit requirements, all projects were sized to retain and infiltrate the 85th-percentile, 24-hour storm event for the drainage area tributary to the project (Regional Board, 2012).
- Where feasible, BMPs were configured within the site's open areas to avoid removal of trees and existing facilities.
- Based on discussion with the Group, the following BMP types were selected:
  - Surface Infiltration
    - La Puente Park
    - San Jose Properties (Glendora) - Alternative
  - Subsurface Infiltration
    - Adventure Park (aka Gunn Ave. Park)
    - Barnes Park
    - San Angelo Park and Vacant Lot
    - Bassett Park
    - Allen J Martin Park
    - Kahler Russell Park
    - Downtown Properties (Glendora)
    - Finkbiner Park - Alternative
- Surface infiltration facilities were sized to infiltrate the 85th-percentile, 24-hour storm volume within 72 hours. Based on discussions and recommendations with the Greater Los Angeles County Vector Control District, the 72-hour drawdown time was selected for vector control, safety, and maintenance of park functionality.
- For the purposes of cost estimating, 96-inch perforated aluminized steel type II corrugated metal pipe (CMP) was selected for subsurface infiltration BMPs.
- Diversion pipelines were selected to pull from nearby, upstream existing storm drains to deliver the 85th-percentile, 24-hour storm volume to the site by gravity.
- For the purposes of cost estimating, diversion pipelines were assumed to be constructed of reinforced concrete pipe (RCP).
- The preliminary alignments of diversion pipelines were selected to utilize streets and avoid crossing major obstacles (e.g. open channels, railways, highways).
- A diversion structure would be constructed at the point of diversion to deliver the 85th-percentile, 24-hour storm volume to the site and allow higher flows to bypass into the existing storm drain.
- Pretreatment consists of CDS® Hydrodynamic Separation systems (Contech, 2015).

2.2 Project Components

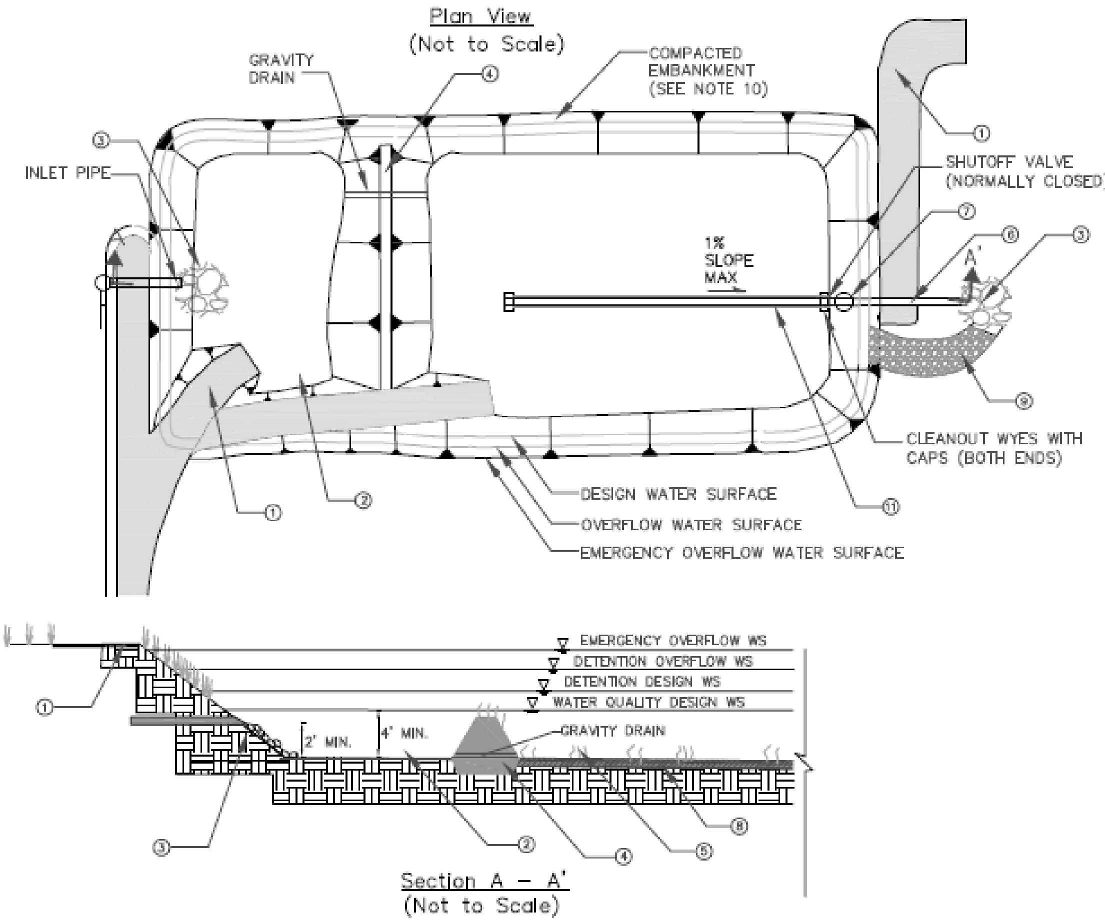
The regional EWMP projects consist of either surface or subsurface infiltration basins. Each of the projects will include a diversion pipeline to deliver water to the site from existing storm drains. Additionally, each site will include educational components and low impact development (LID) components to provide multi-benefit features to the projects. The educational and LID components will be developed in the EWMP Plan and are not included in this TM. Major components of the projects are discussed in further detail below and based on information summarized in the *Summary of Existing and Potential Control Measures Technical Memorandum* (MWH, 2013).

2.2.1 Surface Infiltration Basins

Surface infiltration basins will consist of retention basins designed to allow for infiltration of stormwater into the subsurface. The major construction components of surface infiltration basins include excavation, earthwork, inlets/outlets, energy dissipation (e.g. riprap), and landscaping. Surface infiltration basins are sized to provide a 72-hour drawdown time based on the underlying soils infiltration capability. Drawdown time governs the maximum depth of the basin and, therefore, the footprint of the basin. An example schematic of an infiltration basin is shown in **Figure 2** (LACDPW, 2009).

Figure 2

Example Infiltration Basin Schematic



NOTES:

1. MAINTENANCE RAMP SHOULD BE PAVED. SLOPE SHOULD NOT EXCEED 12%. MAINTENANCE RAMP SHOULD PROVIDE ACCESS TO BOTH THE FIRST CELL AND MAIN BASIN.
2. UPSTREAM PRETREATMENT SHALL BE PROVIDED. SEDIMENT FOREBAY WITH VOLUME EQUAL TO 25% OF TOTAL INFILTRATION BASIN VOLUME MAY BE USED IN LIEU OF UPSTREAM PRETREATMENT. DEPTH SHALL BE 4' MIN TO 8' MAX PLUS AN ADDITIONAL 1 FOOT MIN SEDIMENT STORAGE DEPTH.
3. RIP RAP APRON OR OTHER ENERGY DISSIPATION.
4. EXTEND EARTHEN BERM ACROSS ENTIRE WIDTH OF THE INFILTRATION BASIN.
5. INFILTRATION BASIN BOTTOM AND SIDE SLOPES SHALL BE PLANTED WITH DROUGHT TOLERANT VEGETATION. DEEP ROOTED VEGETATION PREFERRED FOR BASIN BOTTOM. NO TOPSOIL SHALL BE ADDED TO INFILTRATION BASIN BED.
6. SIZE OUTLET PIPE TO PASS CAPITAL DESIGN PEAK FLOW FOR ON–LINE INFILTRATION BASINS AND WATER QUALITY PEAK FLOW FOR OFF–LINE INFILTRATION BASINS.
7. WATER QUALITY OUTLET STRUCTURE. SEE FIGURE 7–2 AND FIGURE 7–3 FOR DETAILS.
8. OVER EXCAVATE BASIN BOTTOM 1 FOOT. RE–PLACE EXCAVATED MATERIAL UNIFORMLY WITHOUT COMPACTION. AMENDING EXCAVATED MATERIAL WITH 2" – 4" OF COARSE SAND IS RECOMMENDED FOR SOILS WITH BORDER LINE INFILTRATION CAPACITY.
9. INSTALL EMERGENCY OVERFLOW SPILLWAY AS NEEDED. SEE FIGURE 2–4 FOR DETAILS
10. EMBANKMENT SIDE SLOPES SHALL BE NO STEEPER THAN 3H:1V BOTH OUTSIDE AND INSIDE.
11. INSTALL OPTIONAL 6" MINIMUM DIAMETER PERFORATED PIPE UNDERDRAIN. INSTALL AT 0.5% MINIMUM SLOPE.

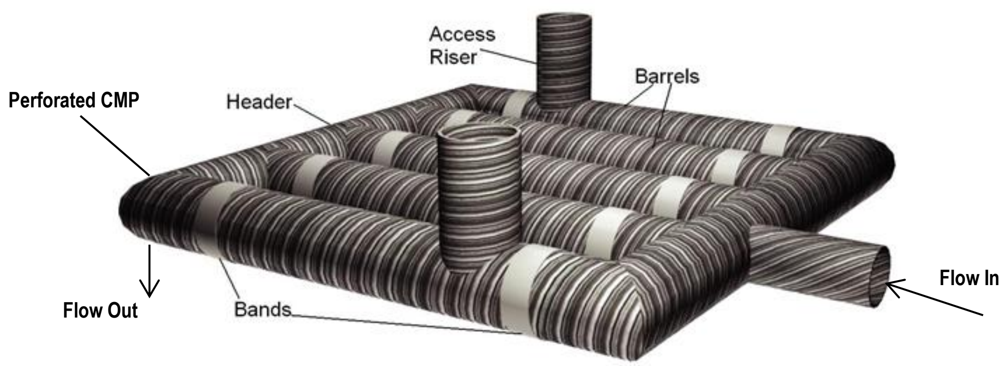
2.2.2 Subsurface Infiltration Basins

Subsurface infiltration basins consist of underground storage systems designed to infiltrate stormwater into subgrade soils. Subsurface infiltration basins require structures to be placed underneath the site and backfilled to the existing site grade. Such structures are available in a variety of sizes and material types, including plastic, concrete, and metal. For the purposes of cost estimating, 96-inch CMP was assumed as the subsurface infiltration structure material type. Based on discussions with the manufacturer, the subsurface infiltration basin can be configured in a variety of shapes to match site requirements. A diversion pipeline would be connected to CMP headers to distribute water through the subsurface infiltration basin. Access risers will be provided for operations and maintenance. Design considerations include vector control, such as sealed lids to restrict insect access. An example concept of subsurface infiltration using CMP is depicted in **Figure 3** (Contech, 2015).

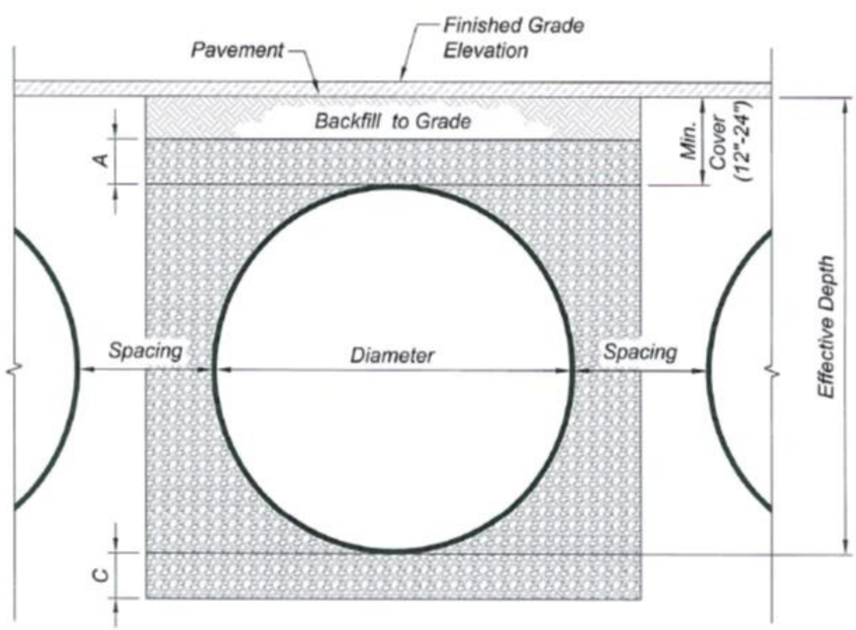
Figure 3

Conceptual Subsurface Infiltration Using CMP (modified from Contech, 2015)

Plan View



Section View

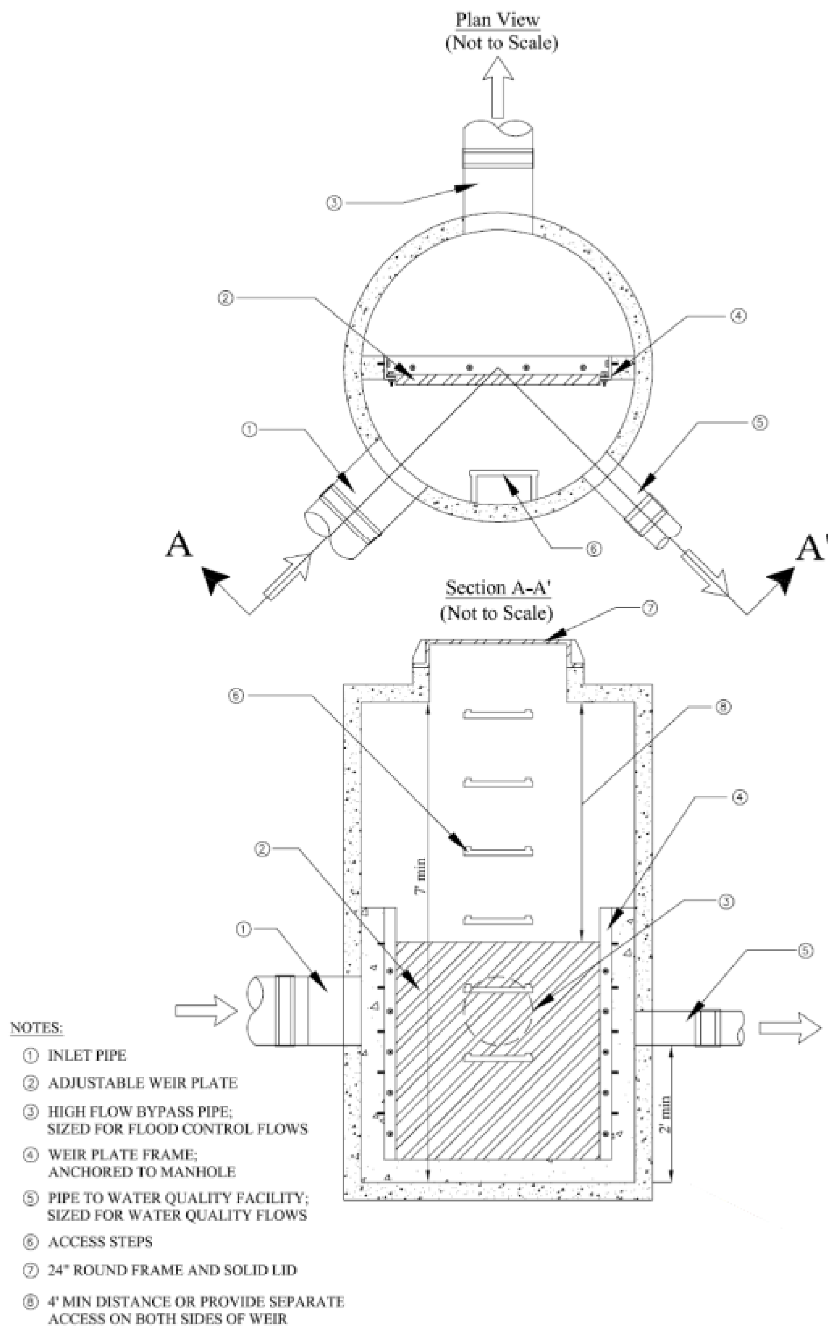


2.2.3 Diversion Structure and Pipeline

To deliver water to the sites, diversion structures and pipelines will be constructed to connect existing storm drains to the BMP. Diversion structures are designed to convey the required water quality flow to the BMP and allow excess flows to bypass through the existing storm drain. Diversion structures may be constructed in a manhole or subsurface tank and include hydraulic controls (e.g. weirs) and/or mechanical controls (e.g. valves, rubber dams). For the purposes of cost estimating, it was assumed that diversion pipelines would be constructed of RCP. Adequate hydraulic head is required to deliver water to the BMP by gravity. A hydraulic analysis must be conducted to confirm hydraulic limitations of the diversion structure and pipeline during the full-scale design phase. An example diversion structure is shown in **Figure 4** (LACDPW, 2009).

Figure 4

Example Diversion Structure Drawing

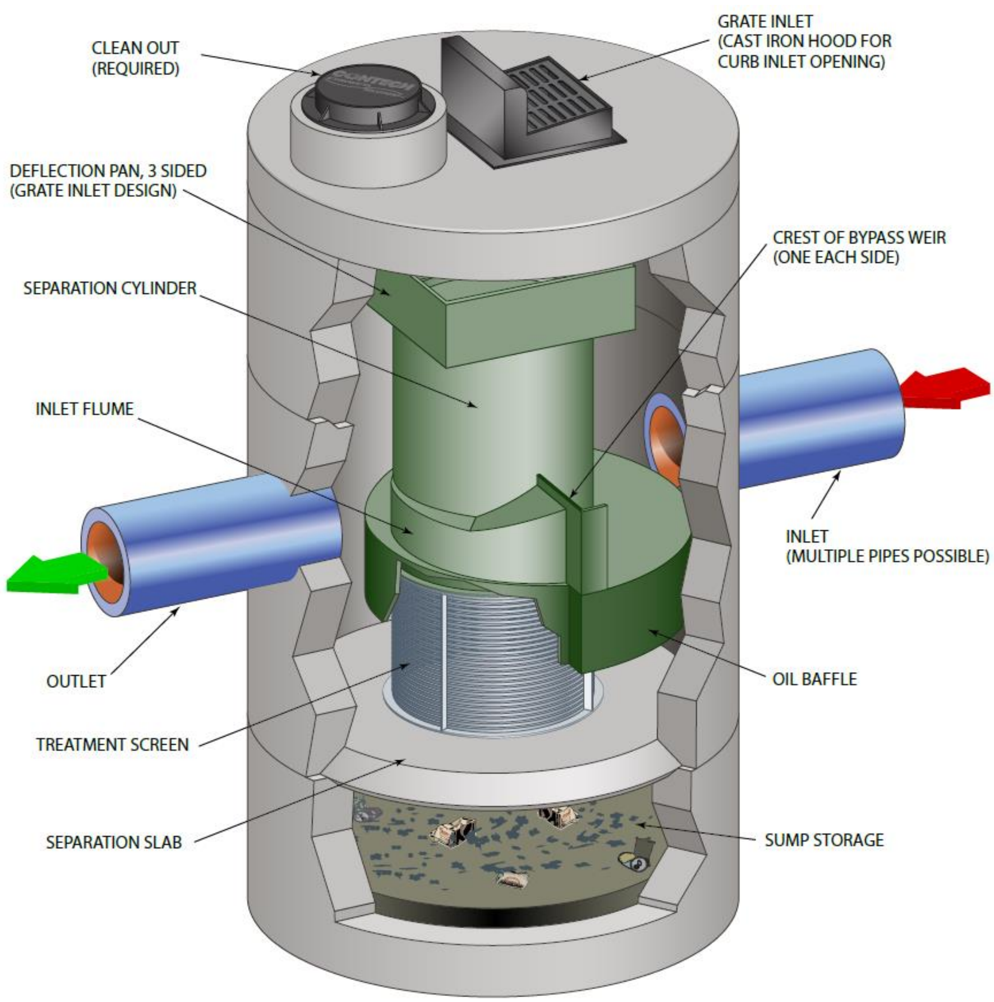


2.2.4 Pretreatment Facilities

Pretreatment of storm water runoff is an important component of both surface and subsurface infiltration facilities. Removal of sediment, trash and debris will greatly reduce maintenance required for the infiltration facilities and increase the useful life of the BMP. There are a variety of technologies available for treating runoff, including hydrodynamic separators, mechanical filters, and biofilters. For the purposes of these conceptual designs, a hydrodynamic separator (swirl chamber type system) has been assumed to remove sediment and debris prior to entering the infiltration facility. As depicted in **Figure 5**, Continuous deflection separators¨ (CDS) units are pre-cast units placed downstream of drain inlets to capture sediment and debris, and can be manufactured in a variety of configurations. These underground units create a vortex of water that allows water to escape through the screen, while contaminants are deflected into the sump, and later removed. The CDS units are intended to screen litter, fine sand, and larger particles that can have other pollutants adsorbed to them. They can act as a first screen influence for trash and debris, vegetative material, oil and grease, and heavy metals. Multiple units in parallel may be required for high flows.

Figure 5

Example CDS Pretreatment Unit (Contech, 2015)



2.3 Project Sizing and Configuration

Calculations were performed to determine the approximate size required to capture the 85^{th}-percentile, 24-hour storm volume for each of the sites. A layout was developed for each of the projects to site the BMP footprint and diversion pipeline on an aerial photograph of the site.

The 85^{th}-percentile, 24-hour storm volume was determined using the SUSTAIN model, as summarized in the *Evaluation of Effectiveness of Candidate Regional BMP to Support Project Selection Technical Memorandum* (MWH, 2014a). Infiltration rates for each site were determined by using GIS soils data and infiltration curves from the County of Los Angeles, Department of Public Works *Hydrology Manual* (LACDPW, 2006 and County of Los Angeles, 2014). Additional data will be gathered during geotechnical sampling of the sites. **Table 2** presents the capture volumes and infiltration rates used to size the BMPs for each site.

Infiltration rates in **Table 2** were utilized for general sizing purposes. Because infiltration tests were not conducted, the infiltration rates will not change. Observations from geotechnical testing were in general conformity with these results. Validation of infiltration rates will be required for full design. As discussed in **Section 2.1**, surface infiltration basins were sized to provide a 72-hour drawdown time, based on the infiltration rate of the underlying soil. Surface infiltration basins require side slopes to meet the geotechnical requirements of the site. As a result, the required BMP footprint was increased by 20 percent to calculate the design BMP footprint to account for basin geometry. The sizing of surface infiltration basins is shown in **Table 3**.

Sizing of subsurface infiltration basins was calculated using Contech's CMP Detention System – Rectangular DYODS™ tool (Contech, 2015). **Table 4** presents the values used as inputs to the tool. The sizing of subsurface infiltration basins is shown in **Table 5**.

A preliminary layout was developed for each project to configure the BMP and diversion pipeline on an aerial photograph of the site. The preliminary layouts for each site are presented in **Figure 6** through **Figure 15**.

Table 2

Conceptual Design Inputs

Site Name (Owner)	Total Site Size (acre)	Jurisdictions in Contributing Drainage Area (acres)	85th Percentile Storm Volume (acre-feet)	Infiltration Rate (inches per hour)	Estimated Diversion Pipe Diameter (inches)
Finkbiner Park (Glendora) - Alternative	9.1	Glendora (261 ac)	6.0	0.63	18
La Puente Park (La Puente)	22.0	La Puente (28.6 ac)*	1.3*	0.27	8
Allen J Martin Park (County)	6.8	County (340.6 ac), La Puente (82 ac)*	16.8*	0.36	24
Bassett Park (County)	9.8	County (41.6 ac), Industry (26.1 ac)*	13.8*	0.81	24
Kahler Russell Park (Covina)	17.0	County (462.6 ac), Covina (424.9 ac), Glendora (152.4 ac)*	36.6*	0.63	36
San Angelo Park (County)	9.5	Industry (156.7 ac)	10.9	0.36	24
Barnes Park (Baldwin Park)	6.6	Baldwin Park (384.2 ac)*	22.3*	0.63	32
Adventure Park (County)	14.6	County (1,530 ac)*	7.8*	0.63	18
Downtown Properties (Glendora)	1.1	Glendora (180.7 ac)*	4.1*	0.63	12
San Jose Properties (Glendora) - Alternative	5.2	Glendora (173.3 ac)*	4.0*	0.63	12

* Volumes not determined from SUSTAIN. 85th percentile, 24-hour storm volume was determined by applying the runoff volume per acre drainage area (acre-feet per acre) of the nearest modeled site to the contributing drainage area of the site.

Table 3

Surface Infiltration Basin Sizing

Site Name	Infiltration Rate (inches per hour)	Drawdown Time (hours)	Maximum BMP Depth (feet)	Required BMP Footprint (acre)	Design BMP Footprint (acre)	Approximate Excavation Volume (cubic yards)
La Puente Park	0.27	72	1.6	0.8	1.0	2,585
San Jose Properties - Alternative	0.63	72	3.8	1.1	1.3	7,699

Table 4

Assumed Inputs for Subsurface Infiltration Basin Sizing Tool[1]

Input	Value
Limiting Width (ft)	Based on site dimensions
Invert Depth Below Asphalt (ft)	13.5
Solid or Perforated Pipe	Perforated
Shape or Diameter (in)	96
Number of Headers	2
Spacing between Barrels (ft)	3
Stone Width around Perimeter of System (ft)	2
Depth A: Porous Stone Above Pipe (in)	6
Depth C: Porous Stone Below Pipe (in)	6
Stone Porosity (0-40%)	40%

Notes:
1. Developed for input to Contech's CMP Detention System – Rectangular DYODS™ tool (Contech, 2015).

Table 5
Subsurface Infiltration Basin Sizing[1]

Site Name	Revised 85th Percentile Storm Volume (ac-ft)	Revised 85th Percentile Storm Volume (cf)	Limiting Width[2] (ft)	Pipe Storage (cf)	Porous Stone Storage (cf)	Total Storage Provided (cf)	Total Storage Provided (ac-ft)	Number of Barrels	Length Per Barrel (ft)	Length Per Header (ft)	Rectangular Footprint Width (ft)	Rectangular Footprint Length (ft)	Design BMP Footprint (Acre)	Total CMP Footage (ft)	Approx. Total Pieces	Approx. Truckloads	Total Excavation (yd^3)	Porous Stone Backfill (yd^3)	Backfill to Grade (yd^3)
Finkbiner Park - Alternative	6.0	260,924	200	189,702	73,130	262,832	6.0	18	188	195	199	208	1.0	3,774	162	81	20,696	6,771	6,899
Allen J Martin Park	16.8	732,154	350	531,055	204,955	736,010	16.9	31	319	338	342	339	2.7	10,565	464	232	57,696	18,977	19,323
Bassett Park	13.8	599,880	300	435,349	168,083	603,433	13.9	27	299	294	298	319	2.2	8,661	377	189	47,531	15,563	15,844
Kahler Russell Park	36.6	1,593,654	500	1,153,291	445,768	1,599,060	36.7	45	488	492	496	508	5.8	22,944	987	494	125,984	41,275	41,995
San Angelo Park	10.9	473,062	300	344,419	132,578	476,997	11.0	27	232	294	298	252	1.7	6,852	296	148	37,548	12,276	12,516
Barnes Park	22.3	971,019	400	703,616	271,654	975,270	22.4	36	367	393	397	387	3.5	13,998	610	305	76,820	25,153	25,607
Adventure Park	7.8	337,894	200	244,893	94,754	339,648	7.8	18	249	195	199	269	1.2	4,872	216	108	26,766	8,774	8,922
Downtown Properties	4.1	180,640	200	131,796	50,443	182,239	4.2	18	124	195	199	144	0.7	2,622	126	63	14,328	4,671	4,776

Notes:
1. Developed using Contech's CMP Detention System – Rectangular DYODS™ tool (Contech, 2015). Additional information on the tool is available at http://www.conteches.com/products/stormwater-management/detention-and-infiltration/cmp-detention-and-infiltration.aspx#2004317-technical-info.
2. Based on preliminary layouts of regional EWMP projects.

Figure 6

Finkbiner Park – Alternative – Preliminary Layout

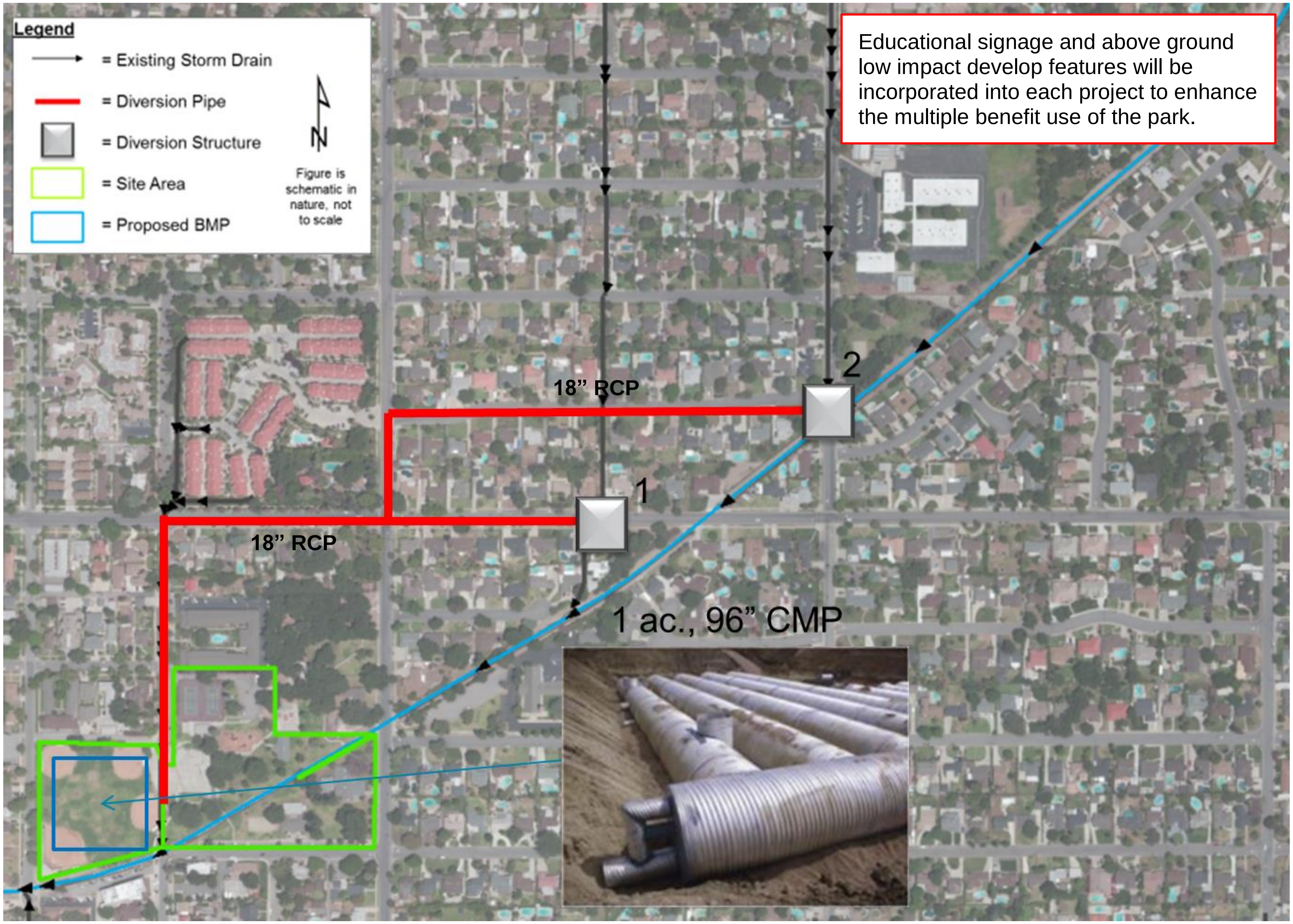


Figure 7

La Puente Park – Preliminary Layout

Figure 8

Allen J. Martin Park – Preliminary Layout

Figure 9

Bassett Park – Preliminary Layout

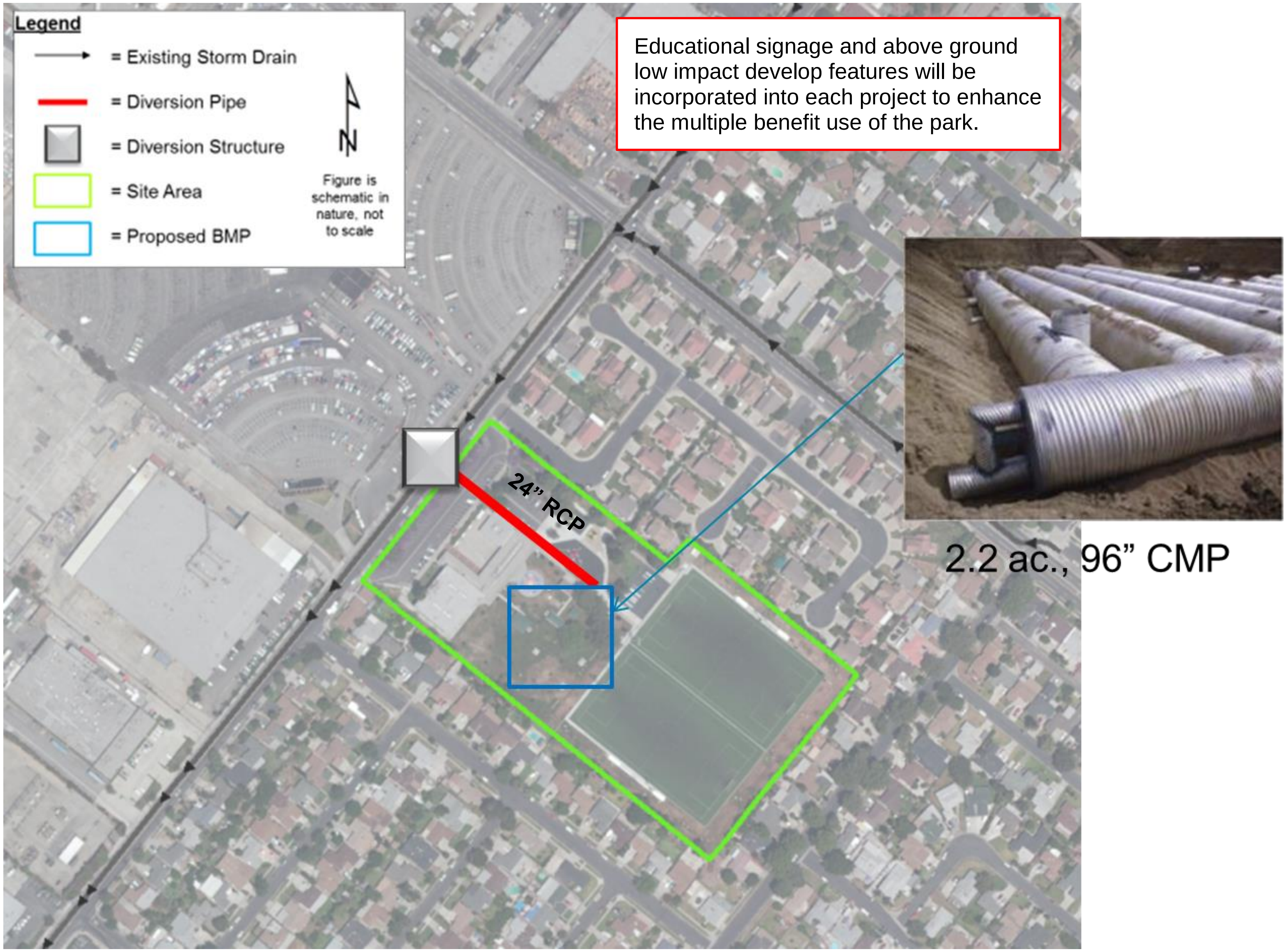


Figure 10

Kahler Russell Park – Preliminary Layout

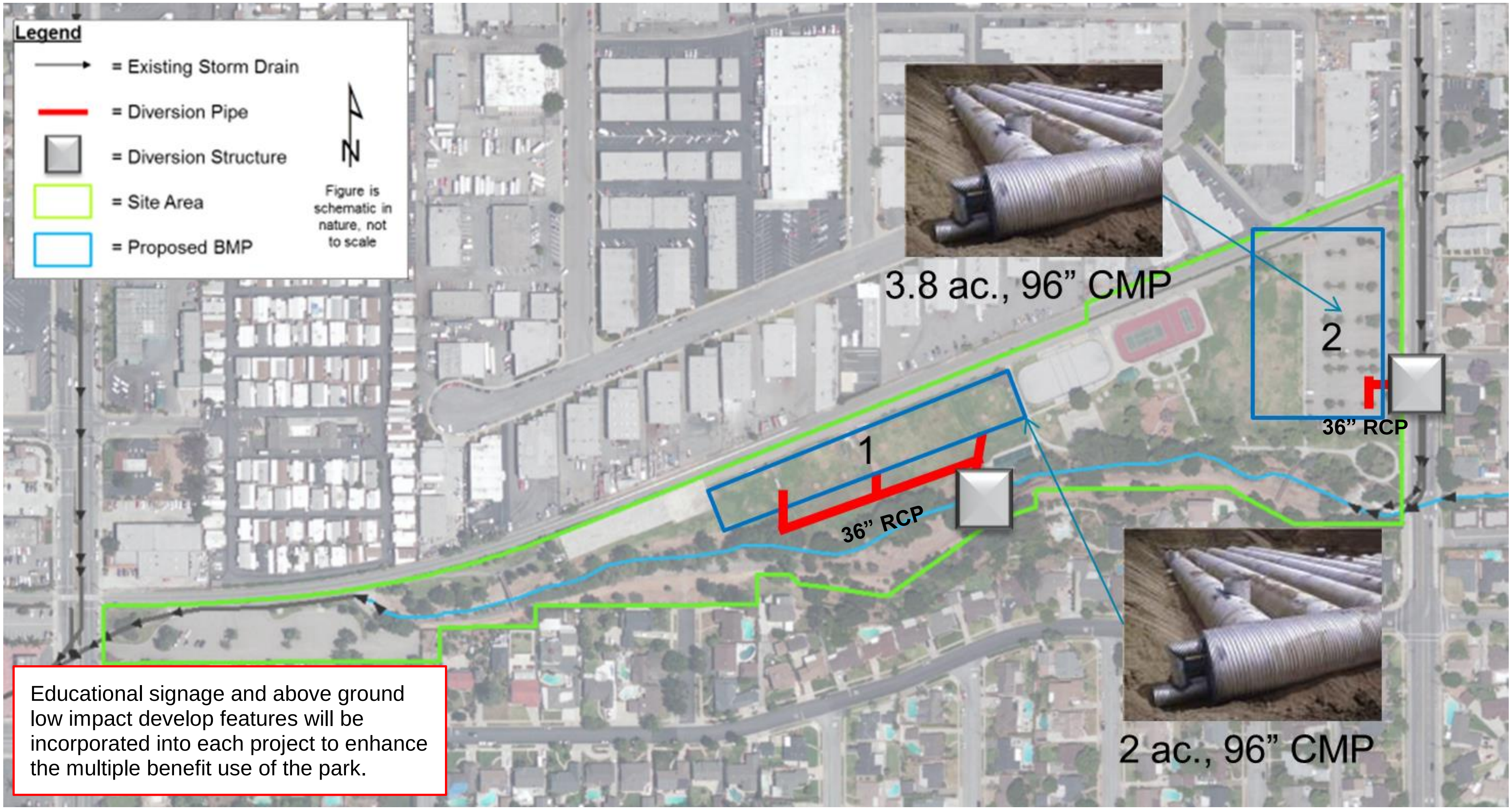


Figure 11

San Angelo Park and Vacant Lot – Preliminary Layout

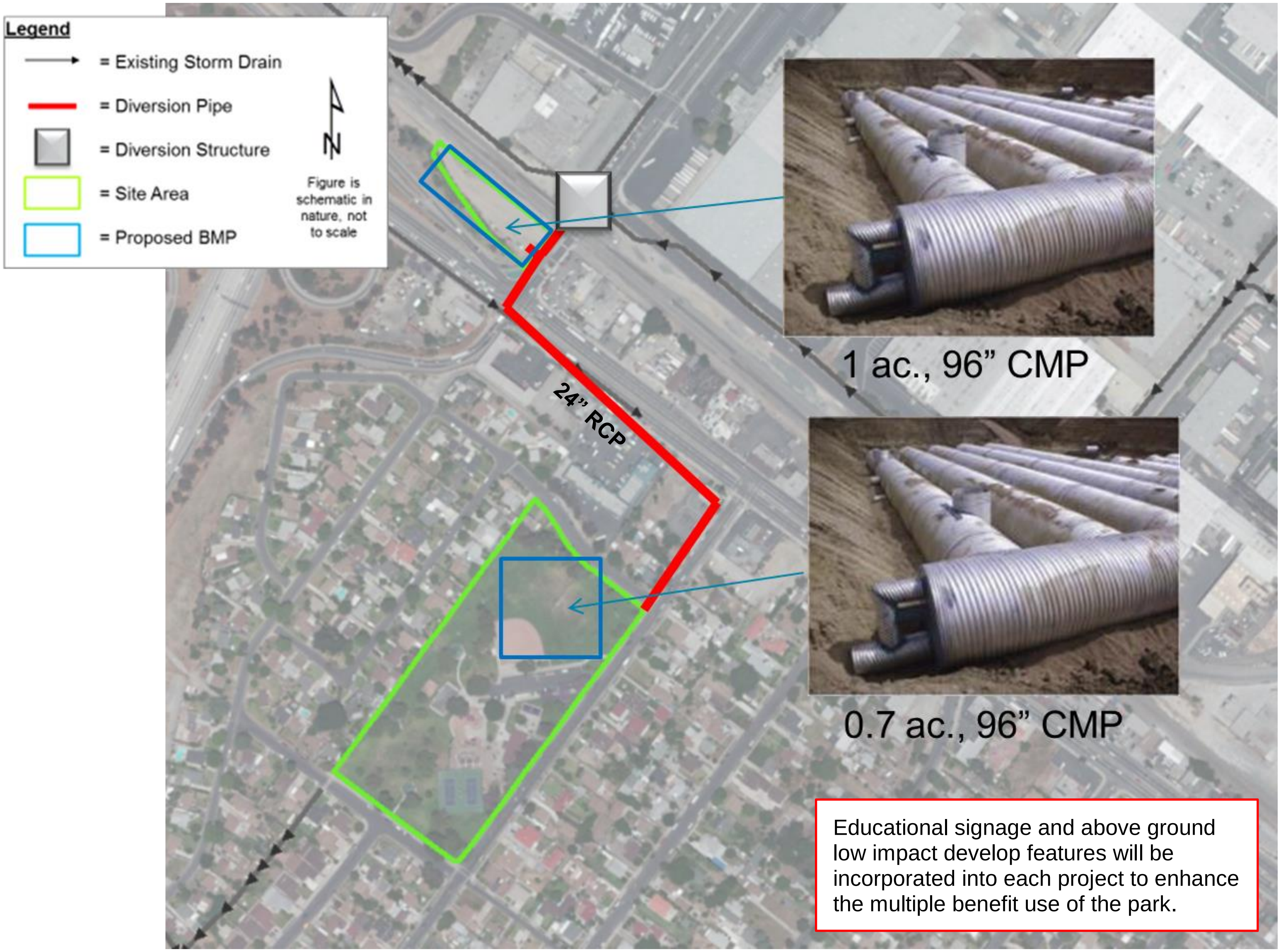


Figure 12

Barnes Park – Preliminary Layout

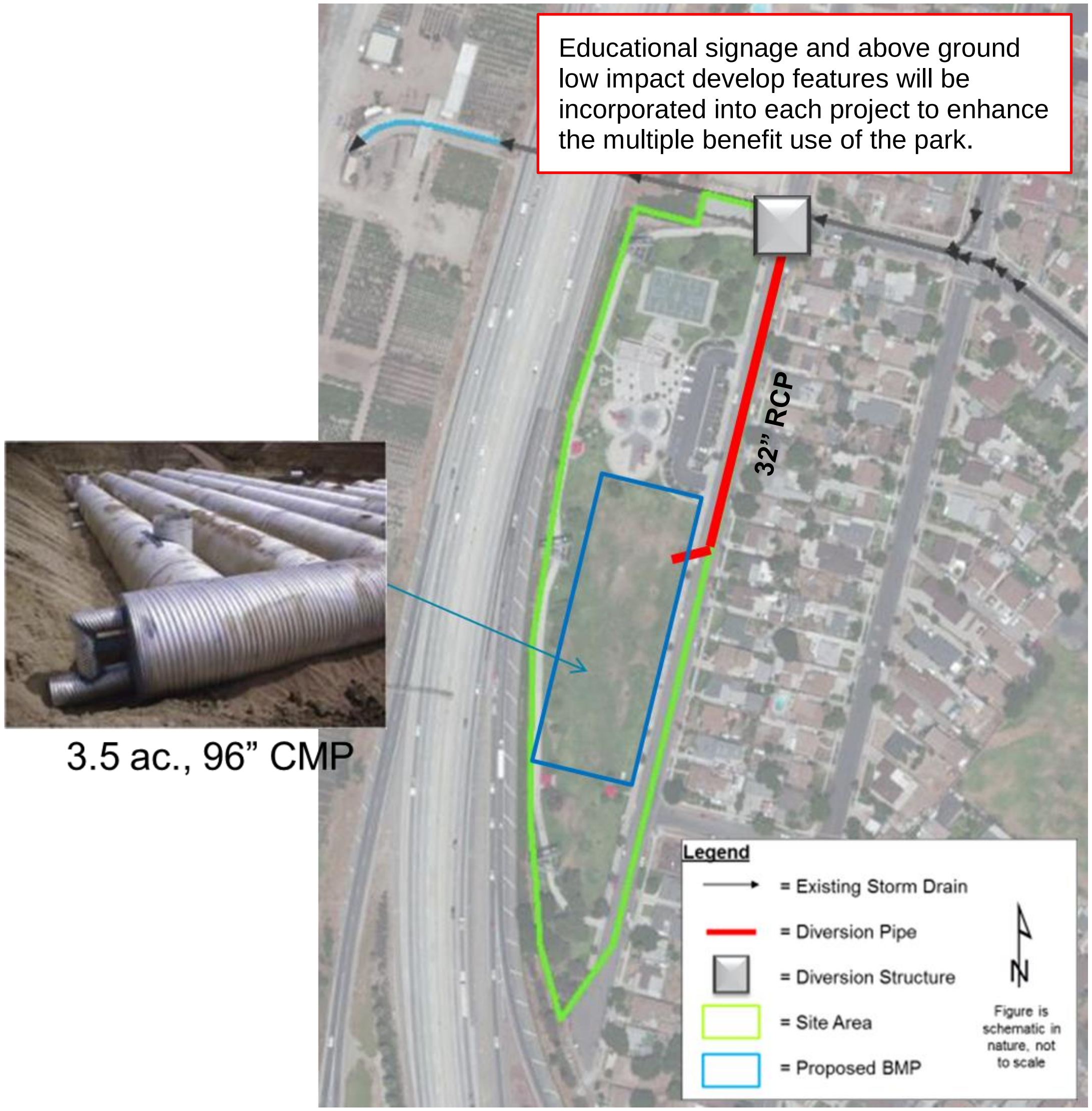


Figure 13

Adventure Park – Preliminary Layout

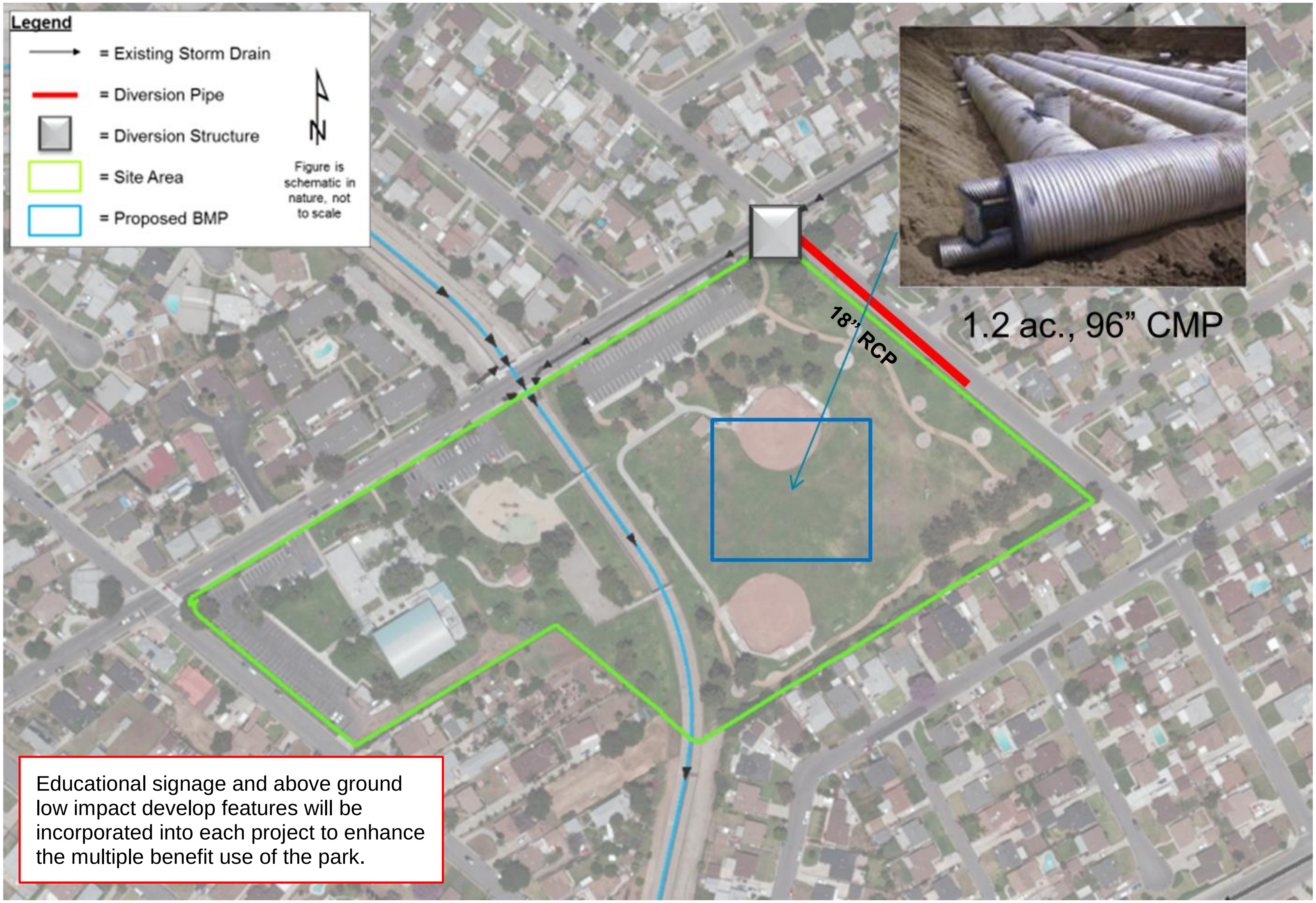


Figure 14

Downtown Properties (Glendora) – Preliminary Layout

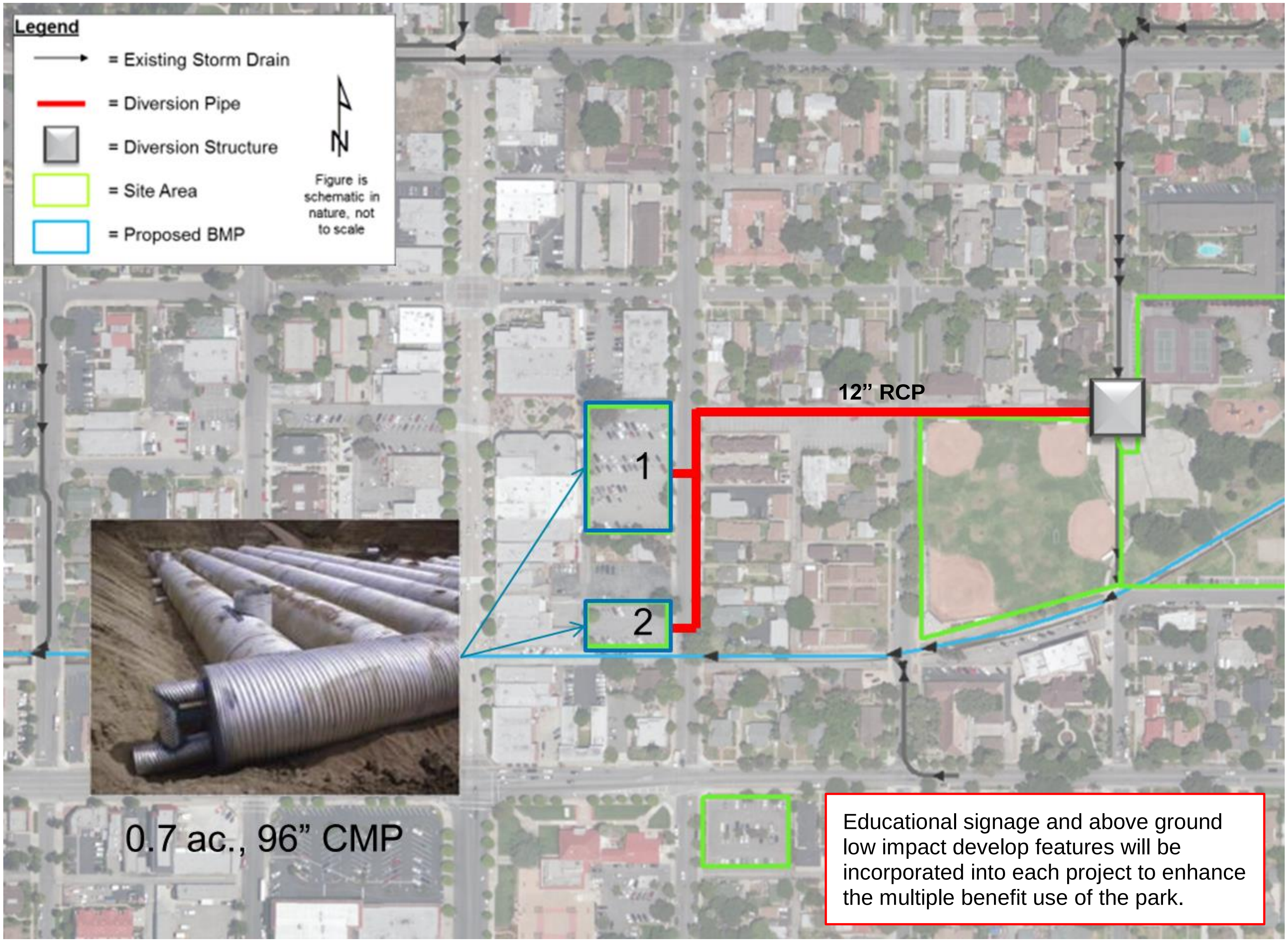
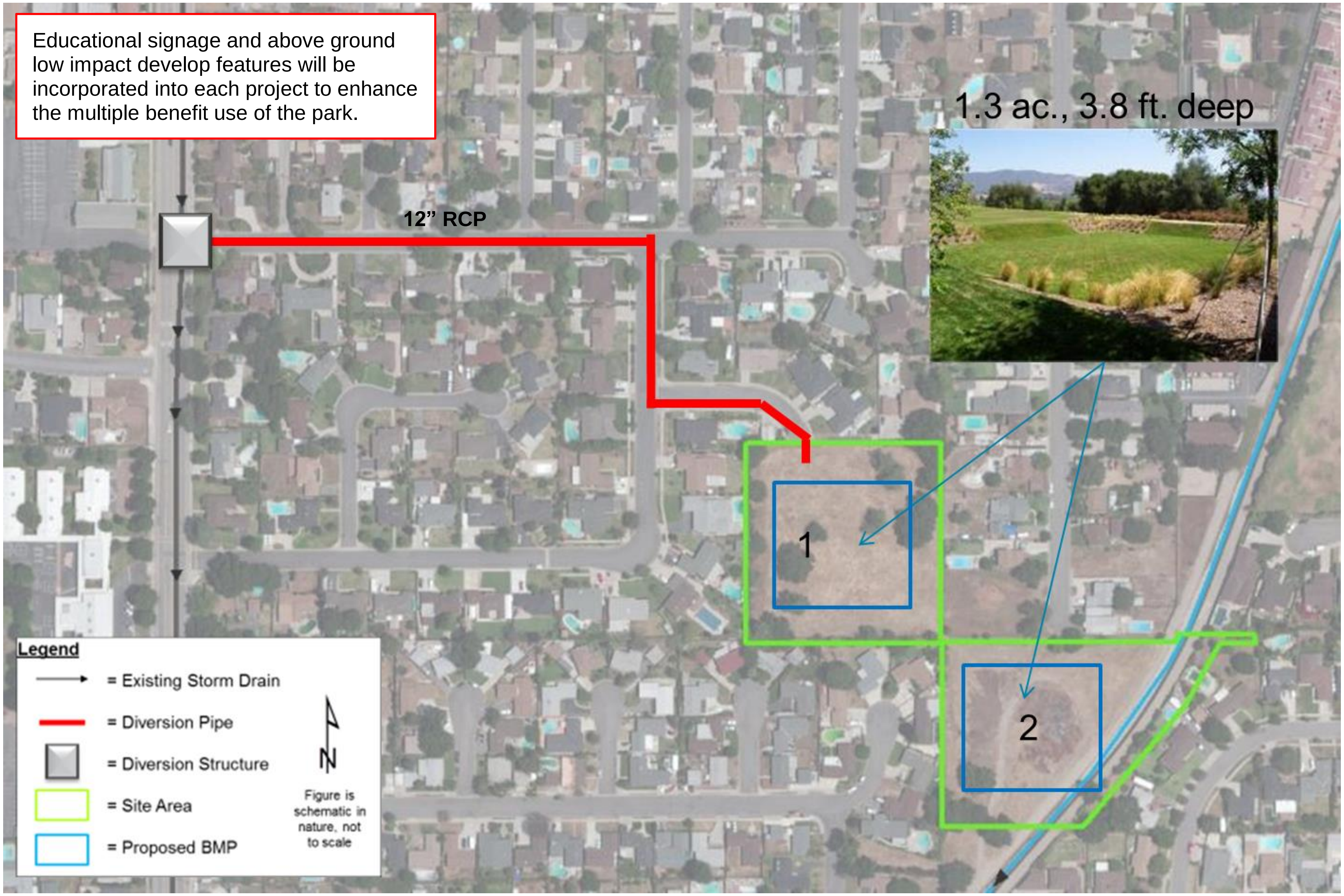


Figure 15

San Jose Properties (Glendora) – Alternative – Preliminary Layout



3 COST ESTIMATES

The order-of-magnitude estimates presented in this TM are consistent with Class 5 estimates per Association for the Advancement of Cost Engineering International (AACEI) guidelines (AACEI, 2011). Engineering, design, permitting, and support services are based on percentage of the order-of-magnitude construction cost estimate. The AACEI describes a Class 5 in the following manner:

> *Class 5 estimates are generally prepared based on very limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 2% to 10% complete. They are often prepared for strategic planning purposes market studies assessment of viability project location studies and long range capital planning. Virtually all Class 5 estimates use stochastic estimating methods such as cost curves capacity factors and other parametric techniques. Expected accuracy ranges are from –20% to –50% on the low side and +30% to 100% on the high side, depending on technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances. As little as 1 hour or less to perhaps more than 200 hours may be spent preparing the estimate based on the project and estimating methodology*

3.1 Basis of Cost

Based on the conceptual sizing and layout presented in previous sections, order-of-magnitude cost estimates were developed for each project using the unit costs of similar stormwater BMPs described in the *Multi-Pollutant TMDL Implementation Plan for the Unincorporated County Area of Los Angeles River Watershed* (LACDPW, 2010). Unit costs were verified and modified based on recent construction experience for similar projects. Unit costs from the report were escalated from the report's 2009 estimates to 2015 values using the Engineering News-Record (ENR) Building and Construction Cost Index (ENR, 2015). **Table 6** presents the unit costs for the major construction components of the conceptual designs.

Table 6

Conceptual Design Major Components Unit Costs

Construction Component	Unit Cost
Mobilization[1]	10% of construction total
Site Preparation[1]	$6,000 per acre
Excavation and Removal	$30.00 per cubic yard
Asphalt/Base Removal	$9.60 per cubic yard
Reinforced Concrete Pipe[1]	$16.00 per diameter (inch) per length (foot)
Gravel Sub-base	$63.00 per cubic yard
Backfill Material[1]	$20.00 per cubic yard
Landscaping[1]	$5.00 - $25.00 per square foot
96-inch Corrugated Metal Pipe[2]	$111,000 per acre-foot
Planning/Project Management[1]	20% of total construction costs
Design and Permitting (Centralized)[1]	15% of total construction costs
Contingency for Planning Estimate (Centralized)	25% of total construction costs

Notes:
1. Unit costs have been modified from TMDL Implementation Plan based on recent construction experience for similar projects.
2. Material costs for the 96-inch CMP used in subsurface infiltration basins were provided by Contech Engineering Solutions. Costs include CDS pretreatment.

3.2 Assumptions for Cost Estimates

Several assumptions were made to develop the order-of-magnitude cost estimates. As planning-level estimates, the costs presented in this TM are based on the conceptual understanding of the projects to date and are subject to change pending the development and design of the projects. Several assumptions were included in the *Multi-Pollutant TMDL Implementation Plan for the Unincorporated County Area of Los Angeles River Watershed* (LACDPW, 2010). The assumptions used in the development of the referenced report apply to the cost estimates developed in this TM. These assumptions have been modified based on the specific aspects of the regional EWMP projects and are presented below for reference.

3.2.1 Planning/Project Management

Additional administrative costs will be required to administer, manage, and coordinate the project's implementation and are included with the planning costs. Administrative costs can vary widely with the complexity of the project, but for purposes of comparison, a value of 20 percent of the capital costs is assumed for planning.

3.2.2 Design/Permitting

Meeting regulatory requirements and obtaining environmental permits will be required for construction implementation. The applicability of many regulations for a specific project depends on its site or design characteristics.

Designing structural BMPs requires collecting data, analyzing it, and preparing documents that can be used for constructing a project. Data collection will include geotechnical investigations, field investigation of existing utilities (potholing), and a topographic survey for mapping. The design deliverables are project plans and specifications that can be bid by a contractor for construction. Engineering costs can vary widely depending on the complexity of the project. For the purposes of the cost estimates, a fixed rate of 15 percent was applied to the centralized BMP construction costs to estimate the design /permitting cost.

3.2.3 Construction

Construction costs are based on the BMPs major components. Assumptions used in estimating costs are provided below.

- Mobilization: Mobilization costs are highly variable depending on the magnitude of the project. A mobilization factor of 10 percent was included.
- Site Preparation: Site preparation includes various tasks associated with preparing site for construction, such as security and setback controls, removal and storage or existing items, and preparation of construction staging areas.
- Excavation and removal: Excavation and removal costs include the cost of excavating the volume of soil required to provide the required storage, hauling the removed dirt off-site, and disposal at an appropriate facility. The estimate is based on previous concept-level Los Angeles Department of Public Works and North Carolina State University estimates (LACDPW, 2010).
- Asphalt/Base Removal: Costs are included for areas that can be implemented as a retrofit. The estimate is based on data from R.S. Means (LACDPW, 2010).
- Reinforced Concrete Pipe: Costs were derived from R.S. Means and are included to estimate the costs for constructing a storm drain extension of or to bypass an existing storm drain system.
- Gravel Sub-base: A gravel sub-base consisting of a washed No. 57 stone typically used as a base for roads and any construction. The estimate is based on quotes from vendors for No. 57 stone and R.S. Means (LACDPW, 2010).
- Landscaping: One of the benefits of distributed BMPs is that they can be integrated into the site plan and often incorporated into the landscaping. Landscaping costs were estimated using data from North Carolina State University (LACDPW, 2010). It is generally suggested to use native landscaping for any BMP because native landscaping is more adapted to the natural conditions

increasing the survivability, although in many cases, landscaping will consist of grass or ball fields to achieve multiple objectives of the project.

- Contingency: Because some of the project components have not been fully defined at this preliminary stage, a contingency factor of 25 percent has been applied to the construction costs to estimate the total construction costs and capture expected but as yet unidentified additional costs. The costs could arise from site-specific field conditions such as those associated with utility relocations, dewatering, and erosion and sedimentation control. At this stage of project development, the contingency also includes an allowance for such items as field facilities and construction scheduling, which might be required but are not specifically itemized.

3.3 Cost Estimates for Regional EWMP Projects

The total project costs for the regional EWMP projects are summarized in **Table 7.** A detailed breakdown of the order-of-magnitude cost estimate for each project is presented in **Table 8** through **Table 17**. It is important to note that these costs only consist of the initial capital costs to construct the projects and do not include costs associated with long-term operation and maintenance.

Table 7

Summary of Regional EWMP Project Cost Estimates

Site Name	Total Project Cost
Finkbiner Park - Alternative	$5,515,000
La Puente Park	$699,000
Allen J Martin Park	$11,038,000
Bassett Park	$8,622,000
Kahler Russell Park	$22,686,000
San Angelo Park	$7,730,000
Barnes Park	$14,061,000
Adventure Park	$4,881,000
Downtown Properties (Glendora)	$2,705,000
San Jose Properties (Glendora) - Alternative	$1,375,000
Total Cost of Regional EWMP Projects	**$79,312,000**

Table 8

Finkbiner Park – Alternative – Preliminary Cost Estimate

Site Name				
Finkbiner Park				
BMP Type				
Subsurface				
Project Component	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$689,000
Design/Permitting	% of Total Construction Cost	15%	--	$517,000
Planning & Design Total				**$1,206,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	20,700	$621,000
Asphalt/Base Removal	$/yd^3	$9.60	1,400	$13,000
Site Preparation	$/acre	$6,000.00	1.0	$6,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	66,100	$1,058,000
Gravel Sub-base	$/yd^3	$63.00	6,800	$428,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	41,400	$207,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	6,900	$138,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	6.0	$663,000
Construction Subtotal				**$3,134,000**
Mobilization	% of Construction Total	10%	--	$313,000
Construction Total				**$3,447,000**
Project Subtotal				**$4,653,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$862,000
Project Total				**$5,515,000**

Table 9

La Puente Park – Preliminary Cost Estimate

Site Name				
La Puente Park				
BMP Type				
Surface				
Project Component	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$87,000
Design/Permitting	% of Total Construction Cost	15%	--	$66,000
Planning & Design Total				**$153,000**
Construction				
Excavation and Removal	$/yd³	$30.00	2,600	$78,000
Asphalt/Base Removal	$/yd³	$9.60	300	$3,000
Site Preparation	$/acre	$6,000.00	1.0	$6,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	5,900	$94,000
Gravel Sub-base	$/yd³	$63.00	--	--
Landscaping (includes mulch/sod and vegetation)	$/ft²	$5.00	43,100	$216,000
Native/Complex Landscaping	$/ft²	$25.00	--	--
Backfill	$/yd³	$20.00	--	--
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	--	--
Construction Subtotal				**$397,000**
Mobilization	% of Construction Total	10%	--	$40,000
Construction Total				**$437,000**
Project Subtotal				**$590,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$109,000
Project Total				**$699,000**

Table 10

Allen J Martin Park – Preliminary Cost Estimate

Site Name
Allen J Martin Park
BMP Type
Subsurface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$1,380,000
Design/Permitting	% of Total Construction Cost	15%	--	$1,035,000
Planning & Design Total				**$2,415,000**
Construction				
Excavation and Removal	$/yd³	$30.00	57,700	$1,731,000
Asphalt/Base Removal	$/yd³	$9.60	500	$5,000
Site Preparation	$/acre	$6,000.00	2.7	$16,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	31,100	$498,000
Gravel Sub-base	$/yd³	$63.00	19,000	$1,197,000
Landscaping (includes mulch/sod and vegetation)	$/ft²	$5.00	116,000	$580,000
Native/Complex Landscaping	$/ft²	$25.00	--	--
Backfill	$/yd³	$20.00	19,400	$388,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	16.8	$1,856,000
Construction Subtotal				**$6,271,000**
Mobilization	% of Construction Total	10%	--	$627,000
Construction Total				**$6,898,000**
Project Subtotal				**$9,313,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$1,725,000
Project Total				**$11,038,000**

Table 11

Bassett Park – Preliminary Cost Estimate

Site Name				
Bassett Park				
BMP Type				
Subsurface				
Project Component	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$1,078,000
Design/Permitting	% of Total Construction Cost	15%	--	$808,000
Planning & Design Total				**$1,886,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	47,600	$1,428,000
Asphalt/Base Removal	$/yd^3	$9.60	200	$2,000
Site Preparation	$/acre	$6,000.00	2.2	$13,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	9,600	$154,000
Gravel Sub-base	$/yd^3	$63.00	15,600	$983,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	95,100	$476,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	15,900	$318,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	13.8	$1,525,000
Construction Subtotal				**$4,899,000**
Mobilization	% of Construction Total	10%	--	$490,000
Construction Total				**$5,389,000**
Project Subtotal				**$7,275,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$1,347,000
Project Total				**$8,622,000**

Table 12

Kahler Russell Park – Preliminary Cost Estimate

Site Name				
Kahler Russell Park				
BMP Type				
Subsurface				
Project Component	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$2,836,000
Design/Permitting	% of Total Construction Cost	15%	--	$2,127,000
Planning & Design Total				**$4,963,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	126,000	$3,780,000
Asphalt/Base Removal	$/yd^3	$9.60	300	$3,000
Site Preparation	$/acre	$6,000.00	5.8	$35,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	20,300	$325,000
Gravel Sub-base	$/yd^3	$63.00	41,300	$2,602,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	252,000	$1,260,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	42,000	$840,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	36.6	$4,044,000
Construction Subtotal				**$12,889,000**
Mobilization	% of Construction Total	10%	--	$1,289,000
Construction Total				**$14,178,000**
Project Subtotal				**$19,141,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$3,545,000
Project Total				**$22,686,000**

Table 13

San Angelo Park – Preliminary Cost Estimate

Site Name
San Angelo Park
BMP Type
Subsurface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$966,000
Design/Permitting	% of Total Construction Cost	15%	--	$725,000
Planning & Design Total				**$1,691,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	37,600	$1,128,000
Asphalt/Base Removal	$/yd^3	$9.60	700	$7,000
Site Preparation	$/acre	$6,000.00	1.7	$10,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	40,000	$640,000
Gravel Sub-base	$/yd^3	$63.00	12,300	$775,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	75,100	$376,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	12,600	$252,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	10.9	$1,204,000
Construction Subtotal				**$4,392,000**
Mobilization	% of Construction Total	10%	--	$439,000
Construction Total				**$4,831,000**
Project Subtotal				**$6,522,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$1,208,000
Project Total				**$7,730,000**

Table 14

Barnes Park – Preliminary Cost Estimate

Site Name Barnes Park **BMP Type** Subsurface				
Project Component	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$1,758,000
Design/Permitting	% of Total Construction Cost	15%	--	$1,318,000
Planning & Design Total				**$3,076,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	76,900	$2,307,000
Asphalt/Base Removal	$/yd^3	$9.60	300	$3,000
Site Preparation	$/acre	$6,000.00	3.5	$21,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	20,200	$323,000
Gravel Sub-base	$/yd^3	$63.00	25,200	$1,588,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	153,700	$769,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	25,700	$514,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	22.3	$2,464,000
Construction Subtotal				**$7,989,000**
Mobilization	% of Construction Total	10%	--	$799,000
Construction Total				**$8,788,000**
Project Subtotal				**$11,864,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$2,197,000
Project Total				**$14,061,000**

Table 15

Adventure Park – Preliminary Cost Estimate

Site Name Adventure Park **BMP Type** Subsurface				
Project Component	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$610,000
Design/Permitting	% of Total Construction Cost	15%	--	$458,000
Planning & Design Total				**$1,068,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	26,800	$804,000
Asphalt/Base Removal	$/yd^3	$9.60	200	$2,000
Site Preparation	$/acre	$6,000.00	1.2	$7,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	6,000	$96,000
Gravel Sub-base	$/yd^3	$63.00	8,800	$554,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	53,600	$268,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	9,000	$180,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	7.8	$862,000
Construction Subtotal				**$2,773,000**
Mobilization	% of Construction Total	10%	--	$277,000
Construction Total				**$3,050,000**
Project Subtotal				**$4,118,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$763,000
Project Total				**$4,881,000**

Table 16

Downtown Properties (Glendora) – Preliminary Cost Estimate

Site Name
Downtown Properties (Glendora)
BMP Type
Subsurface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$338,000
Design/Permitting	% of Total Construction Cost	15%	--	$254,000
Planning & Design Total				**$592,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	14,400	$432,000
Asphalt/Base Removal	$/yd^3	$9.60	1,600	$15,000
Site Preparation	$/acre	$6,000.00	0.7	$4,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	15,000	$240,000
Gravel Sub-base	$/yd^3	$63.00	4,700	$296,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	--	--
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	4,800	$96,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	4.1	$453,000
Construction Subtotal				**$1,536,000**
Mobilization	% of Construction Total	10%	--	$154,000
Construction Total				**$1,690,000**
Project Subtotal				**$2,282,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$423,000
Project Total				**$2,705,000**

Table 17

San Jose Properties (Glendora) – Alternative – Preliminary Cost Estimate

Site Name
San Jose Properties (Glendora)
BMP Type
Surface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$172,000
Design/Permitting	% of Total Construction Cost	15%	--	$129,000
Planning & Design Total				**$301,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	7,700.0	$231,000
Asphalt/Base Removal	$/yd^3	$9.60	600.0	$6,000
Site Preparation	$/acre	$6,000.00	1.3	$8,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	16,300.0	$261,000
Gravel Sub-base	$/yd^3	$63.00	--	--
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	55,000.0	$275,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	--	--
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	--	--
Construction Subtotal				**$781,000**
Mobilization	% of Construction Total	10%	--	$78,000
Construction Total				**$859,000**
Project Subtotal				**$1,160,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$215,000
Project Total				**$1,375,000**

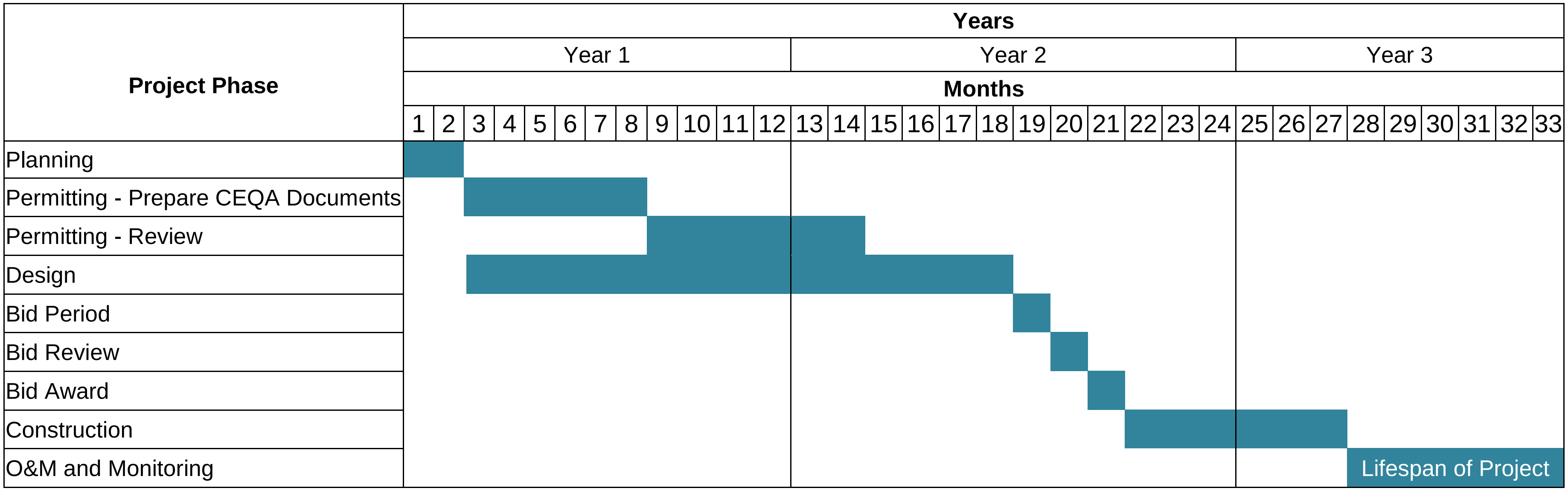
4 PROJECT SCHEDULE

An estimated project schedule has been developed as a representative schedule for implementation of all of the regional EWMP projects. This schedule is applicable to all of the projects because of the similarities between projects. The estimated schedule includes phases for planning, design, permits, construction, O&M, and post-construction monitoring. Durations are assigned to each phase on the basis of an understanding of the activities required for each. The conceptual project schedule is presented in **Figure 16**. The conceptual project schedule is based on the following assumptions from the *Multi-Pollutant TMDL Implementation Plan for the Unincorporated County Area of Los Angeles River Watershed* (LACDPW, 2010):

- Planning—The planning phase requires further development of the project concept resulting in a preliminary design. If project approval is recommended during the planning phase, the agency would move forward with the design.
- Permits—On the basis of an assessment of the permits and regulatory compliance measures that might be necessary for the project, the schedule includes six months for preparing environmental documents and the minimum 6-month review time anticipated for application approval.
- Design/Bid/Award—The schedule for the design phase begins with preliminary design to further develop the project concepts and establish the basis for design. A geotechnical investigation and report and utility research would occur toward the beginning of the design phase. During the design phase, the County’s hydraulic/hydrology group would be involved for the proposed modifications to its storm drain facilities. Having final design documents allows the project to be competitively bid. The schedule assumes a 30-calendar-day bid period, followed by another 30 days for bid review, selection, and contract award.
- Construction—The construction phase duration is based on a generalized breakdown of the activities required for its completion. Construction starts with the contractor’s mobilization, including vendor and subcontractor procurement, materials submittals, permit acquisitions, and temporary facilities. Because all the centralized structural BMPs involve some form of basin construction, a relatively substantial amount of time has been allocated for excavation and surface preparation. Large basins have a longer duration for those activities than small basins, and vice versa. Projects with significant appurtenances, such as longer lengths of pipe, flow control structures, or pumping facilities, also have extended durations.
- O&M—It is assumed that maintenance is required throughout the project life of 20 years.
- Monitoring and Reporting — Monitoring and reporting for regional EWMP projects will be conducted per MS4 Permit requirements.

Figure 16

Conceptual Project Schedule



5 CONSIDERATIONS FOR PROJECT IMPLEMENTATION

This TM presents the ten (10) regional EWMP projects as conceptual designs for the EWMP Plan. If projects progress to implementation, additional information and studies would be required to support a full scale design. Considerations for the full scale design of the regional EWMP projects include:

- Operation, maintenance, and monitoring planning and access
- Verification of existing flow patterns in site's contributing drainage area
- Confirmation of infiltration rates
- Structural calculations of subsurface infiltration basin material strength
- Detailed geotechnical study
- Design of diversion structure
- Final sizing and alignment of diversion pipeline based on hydraulic analysis
- Evaluation of pretreatment requirements
- Determination of environmental impact and associated CEQA documentation
- Additional Permitting
- Energy dissipation requirements
- Stakeholder input
- Identification of existing utilities
- Landscaping considerations
- Improvements to park facilities
- Vector control requirements

6 REFERENCES

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APPENDIX B-2: STRUCTURAL BMP FACT SHEETS

BMP Fact Sheets were developed for each subcategory of structural BMPs. Each BMP Fact Sheet further details BMP functions, design variations, and typical design components. A relative performance gauge is used to display the BMP performance functions for each subcategory.

B-2.1 BMP FACT SHEETS FOR REGIONAL BMPS

Regional BMPs are constructed structural practices intended to treat runoff from a contributing area of multiple parcels (generally on the order of 10s or 100s of acres or larger). Regional practices include infiltration facilities that promote groundwater recharge and detention facilities that encourage settling and control of the peak of the rain event. Infiltration and detention regional BMPs can be either constructed as open-surface basins or subsurface galleries. Regional practices also include constructed wetlands, which use engineered wetland environments to encourage constituent removal, and treatment facilities, which use conventional wastewater treatment processes to target constituents of concern or divert flows to sanitary sewer.

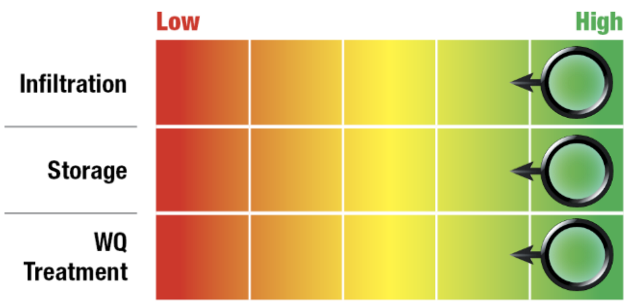
B-2.1.1 Infiltration Facilities (Regional BMP)

Infiltration facilities are designed to decrease runoff volume through groundwater recharge and improve water quality through filtration and sorption. Facilities can incorporate engineered medias to improve percolation into native soils. Infiltration facilities can be open-surface basins or subsurface galleries.


Surface Infiltration Basin


Subsurface Infiltration Gallery

BMP Performance Functions



Design Variations

Several design variations include:

- ***Surface Infiltration Basins:*** depressions designed to infiltrate stormwater into the subgrade soils. Facilities can be vegetated to encourage evapotranspiration and aesthetics. Also known as spreading grounds.
- ***Subsurface Infiltration Galleries:*** underground storage systems designed to infiltrate stormwater into subgrade soils. Subsurface systems are used when limited area is available for BMP implementation.

Typical Design Components

Figure B-2-1 presents a typical design and highlights potential design variations:

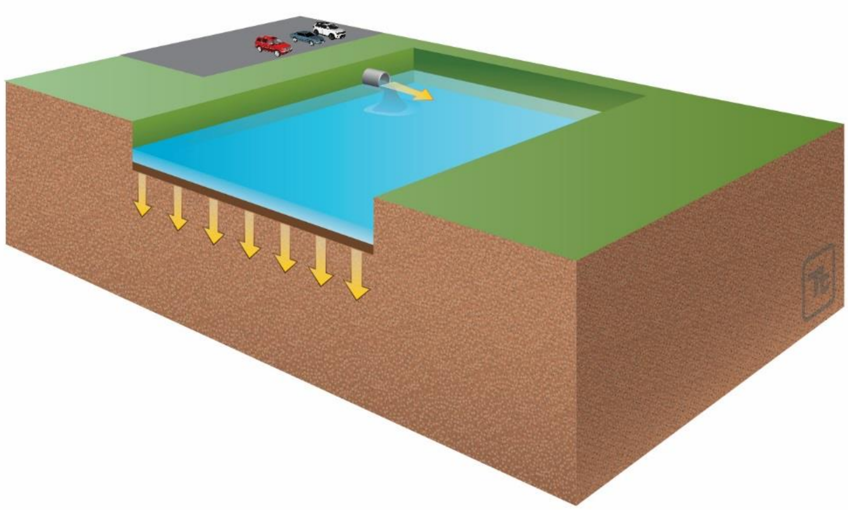
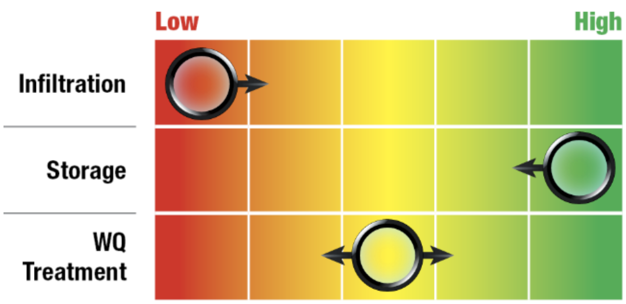


Figure B-2-1. Typical regional infiltration facility schematic (arrows indicate water pathways).

B-2.1.2 Detention Facilities (Regional BMP)

Detention facilities are designed to detain runoff and improve water quality through constituent settling. Facilities encourage settling by decreasing runoff flow rates and allowing ponding to occur. Detention facilities can be open-surface practices or subsurface galleries and can be dry during non-rainy seasons or wet year-round.

BMP Performance Functions



Design Variations

Several design variations include:

- ***Surface Detention Basins:*** basins designed to detain stormwater runoff for a specified time to allow sedimentation of particle-bound constituents. Surface systems can have permanent pools or fully drain between storms.
- ***Subsurface Detention Galleries:*** underground storage systems designed to detain stormwater. Subsurface systems are used when limited area is available for BMP implementation.

Typical Design Components

Figure B-2-2 presents a typical design and highlights potential design variations:

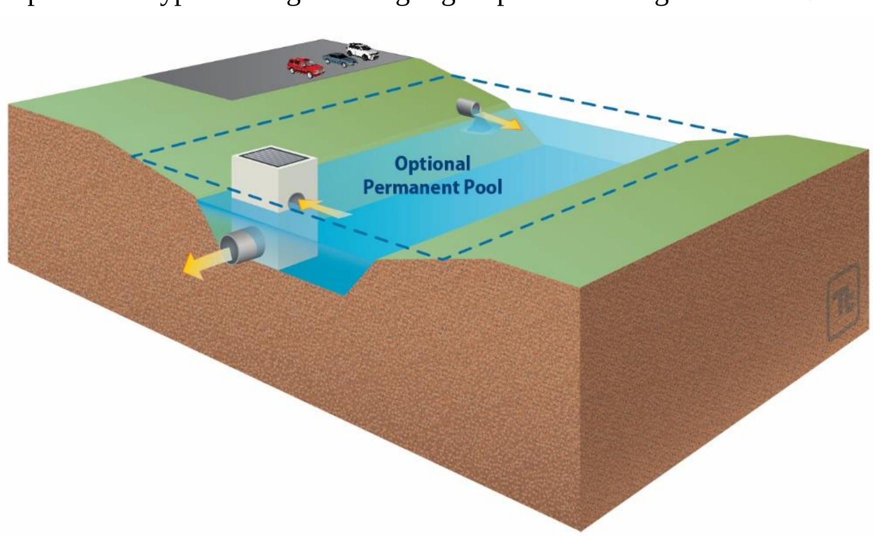
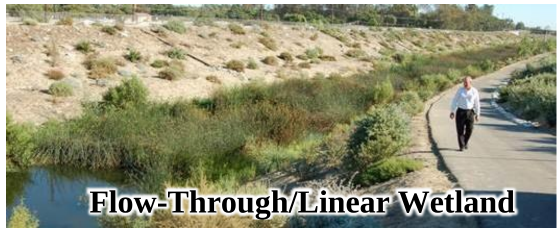


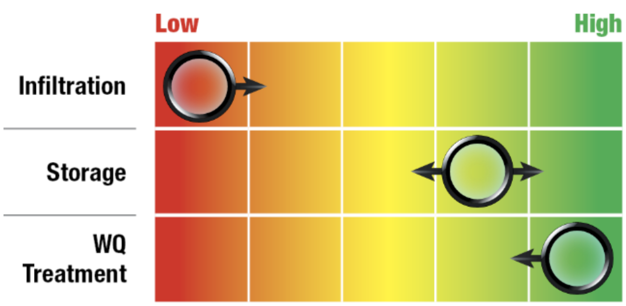
Figure B-2-2. Typical regional detention facility schematic (arrows indicate water pathways).

B-2.1.3 Constructed Wetlands (Regional BMP)

Constructed wetlands are engineered, shallow-marsh systems designed to control and treat stormwater runoff. Particle-bound constituents are removed through settling, and other constituents are removed through biogeochemical activity. Constructed wetlands must always maintain a baseflow into the system, which can come from an intersected groundwater or an associated low-flow diversion utilizing dry-weather flows.



BMP Performance Functions



Design Variations

Several design variations include:

- ***Wetland Basins:*** basins with shallow permanent pools and a temporary shallow ponding zone. An outlet control structure typically regulates dewatering of the temporary storage volume.
- ***Flow-through/Linear Wetlands:*** wetlands that provide treatment as water passes through a long flow path. These wetlands are typically constructed parallel to existing channels such that water can be easily diverted.

Typical Design Components

Figure B-2-3 presents a typical design and highlights potential design variations:

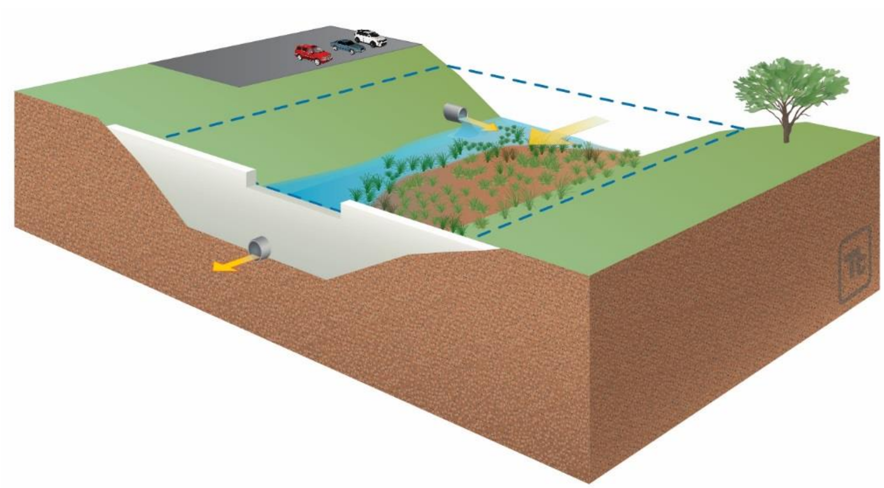


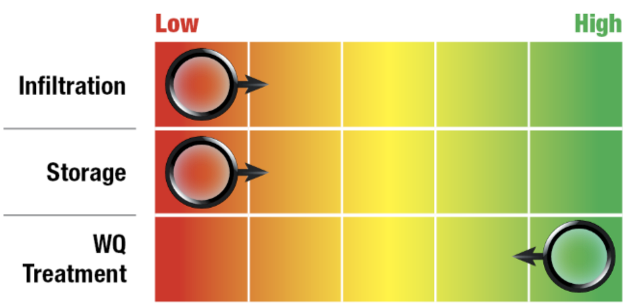
Figure B-2-3. Typical regional constructed wetland schematic (arrows indicate water pathways).

B-2.1.4 Treatment Facilities (Regional BMP)

Other regional water quality technology falls into the *treatment facilities* subcategory. These systems typically divert flow from engineered channels to a treatment facility. Water is treated using physical, chemical, biological or radiological processes and is then returned to the original channel, directed to beneficial uses or discharged to the treatment plant outfall.

(source: City of Santa Monica)

BMP Performance Functions



Design Variations

Treatment facilities design variations include:

- ***Low Flow Diversion:*** a design flow rate (typically dry weather flow) is diverted from the storm drain to a sanitary sewer for treatment.
- ***Treatment and Return:*** water is pumped or conveyed by gravity from a channel to a small-scale wastewater treatment facility where it is treated and discharged back into the original channel. Sometimes a portion of treated water can be diverted for beneficial uses.

Typical Design Components

Figure 0-4 presents a typical design and highlights potential design variations:

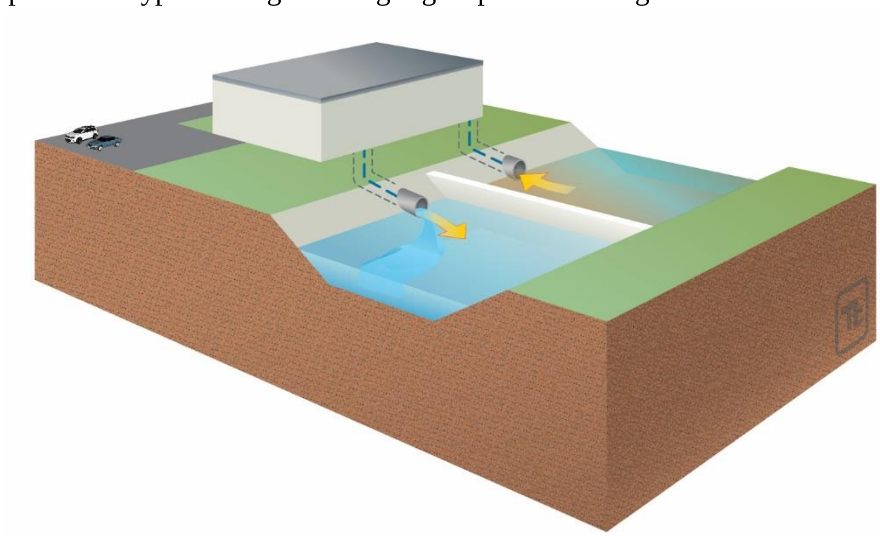


Figure 0-4. Typical regional treatment facility schematic (arrows indicate water pathways).

B-2.2 BMP FACT SHEETS FOR DISTRIBUTED BMPS

Distributed BMPs are constructed structural practices intended to treat runoff relatively close to the source and typically implemented at a single- or few-parcel level (normally less than one acre). As described in the following BMP Fact Sheets, distributed BMPs include the following subcategories:

- Site-scale detention facilities
- Green infrastructure
- Flow-through treatment BMPs
- Source control structural BMPs

The Permit specifies that EWMPs should "incorporate effective technologies, approaches and practices, including green infrastructure." Therefore, green infrastructure has been added as a major subcategory of distributed BMPs. The primary goal of distributed green infrastructure BMPs is to intercept and treat runoff near its source using resilient natural systems. As opposed to traditional gray infrastructure, green infrastructure relies on contact between runoff and direct precipitation, soils, and vegetation to accomplish volume and constituent reduction. Green infrastructure has been to shown to cost-effectively reduce the impacts of wet-weather flows while also reducing BMP maintenance requirements (Kloss et al. 2006). In addition, green infrastructure can provide multiple benefits to the surrounding community, including increasing property values, landscape value and sense of well-being, increased safety, and reducing crime rate (Ward et al. 2008; Shultz and Schmitz 2008; Wolf 2008; Northeastern Illinois Planning Commission 2004; Hastie 2003; Kuo 2003; Kuo et al. 2001a; Kuo et al. 2001b; Wolf 1998) as well as the reduction in reliance of imported water, a key issue in Southern California.

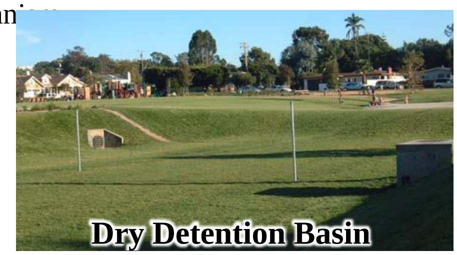
Structural BMPs incorporated into the green infrastructure subcategory include the following:

- Bioretention and biofiltration
- Permeable pavement
- Green streets
- Bioswales
- Infiltration BMPs
- Rainfall harvest (green roofs, cisterns and rain barrels)

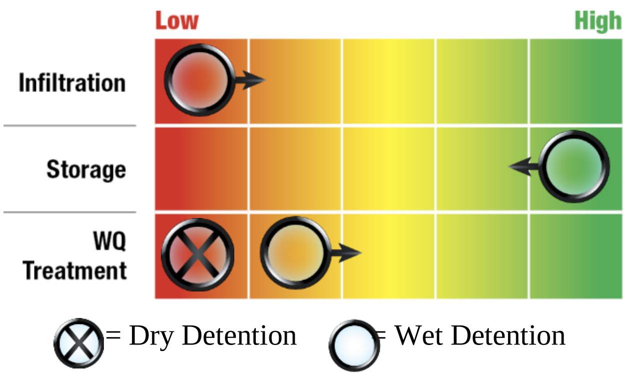
These subcategories are described in the BMP Fact Sheets below.

B-2.2.1 Site-Scale Detention (Distributed BMP)

Site-scale detention facilities are designed to detain runoff from an individual parcel and improve water quality through constituent settling. Site-scale detention facilities can reduce peak flows and improve water quality by storing water in a basin before slowly draining the water through an orifice to the downstream waterway. Settling of sediment and sediment-bound constituents is the primary constituent removal mechanism.



BMP Performance Functions



Design Variations

Several design variations include:

- ***Dry Detention Basins:*** Runoff ponds on the basin surface and fully drains between storm events. The drawdown orifice is located at the bottom of the basin.
- ***Wet Detention Pond:*** Runoff is captured in a temporary storage zone above a permanent pool. The drawdown orifice sets the depth of the permanent pool.
- ***Detention Chambers:*** Subsurface chambers or vaults designed to detain captured runoff.

Typical Design Components

Figure B-2-5 presents a typical design and highlights potential design variations:

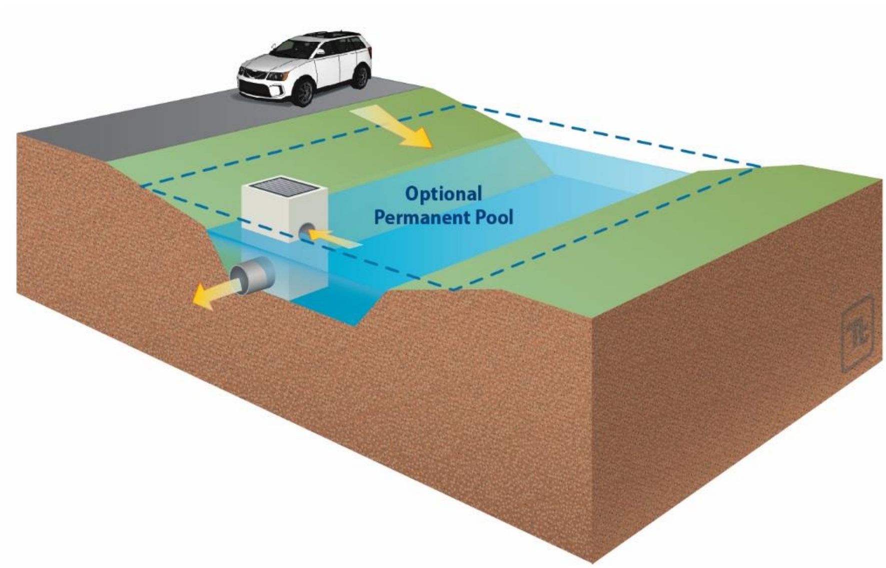
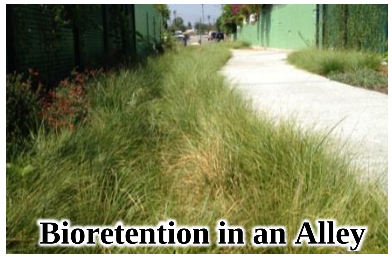


Figure B-2-5. Typical distributed site-scale detention schematic (arrows indicate water pathways).

B-2.2.2 Bioretention and Biofiltration (Green Infrastructure BMP)

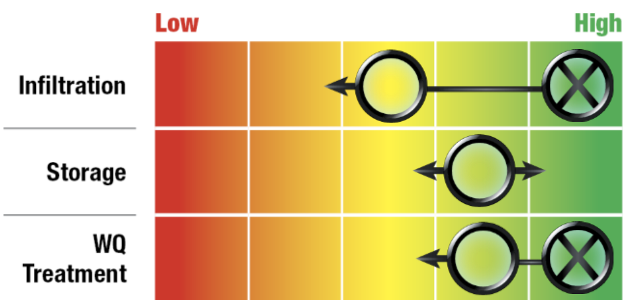
Bioretention and biofiltration are vegetated BMPs designed to capture and filter stormwater runoff through a soil layer. Following filtration, treated runoff infiltrates underlying soils (bioretention), or, if the subgrade has poor permeability, exits through an underdrain to the downstream conveyance network (biofiltration). Vegetation can enhance biological treatment processes.


Residential Bioretention


Bioretention in an Alley


Parking Lot Biofiltration

BMP Performance Functions



= Bioretention = Biofiltration (unlined)

Design Variations

Several design variations include:

- ***Bioretention:*** shallow, depressed, vegetated basins with permeable soil media. Runoff temporarily ponds on the surface before filtering through the soil. Bioretention does not include underdrains.
- ***Biofiltration:*** bioretention areas with underdrains. Infiltration is considered incidental, although substantial infiltration can occur in some unlined systems.

Typical Design Components

Figure B-2-6 presents a typical design and highlights potential design variations:

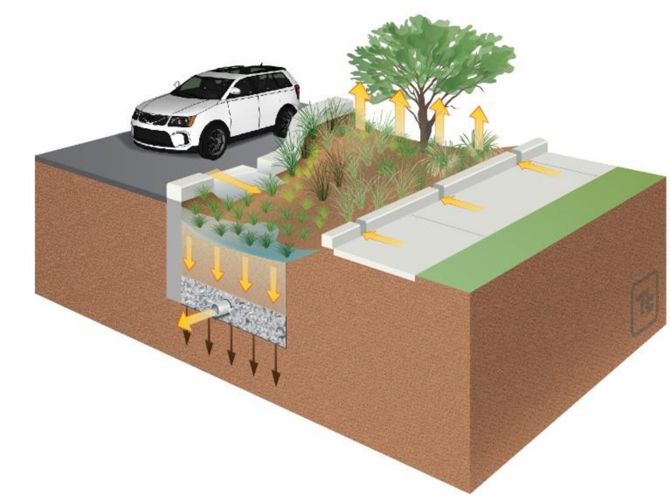
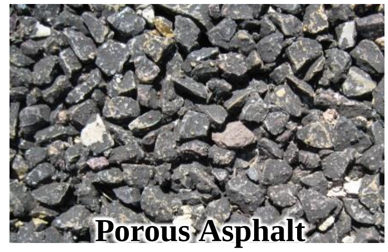


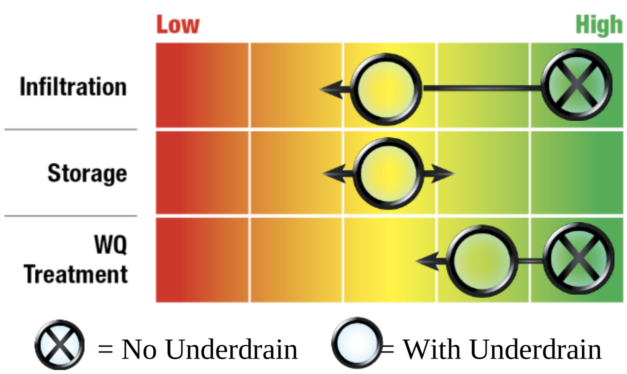
Figure B-2-6. Typical distributed bioretention and biofiltration schematic showing underdrain option (arrows indicate water pathways).

B-2.2.3 Permeable Pavement (Green Infrastructure BMP)

Permeable pavement is a stable load-bearing surface that allows for stormwater infiltration. Beneath the permeable surface is a crushed-rock reservoir that provides structural support while allowing runoff to percolate to the underlying soils. Permeable pavement can be fully infiltrating or can have an underdrain like bioretention and biofiltration practices.



BMP Performance Functions



Design Variations

Several design variations include:

- ***Pervious Concrete:*** fines are excluded from typical concrete aggregate to create permeable void space within the section.
- ***Porous Asphalt:*** fines are excluded from typical hot-mix asphalt to create pores within the section.
- ***Permeable Interlocking Concrete Pavers:*** Pavers that allow infiltration of rainwater through joints between the blocks

Typical Design Components

Figure B-2-7 presents a typical design and highlights potential design variations:

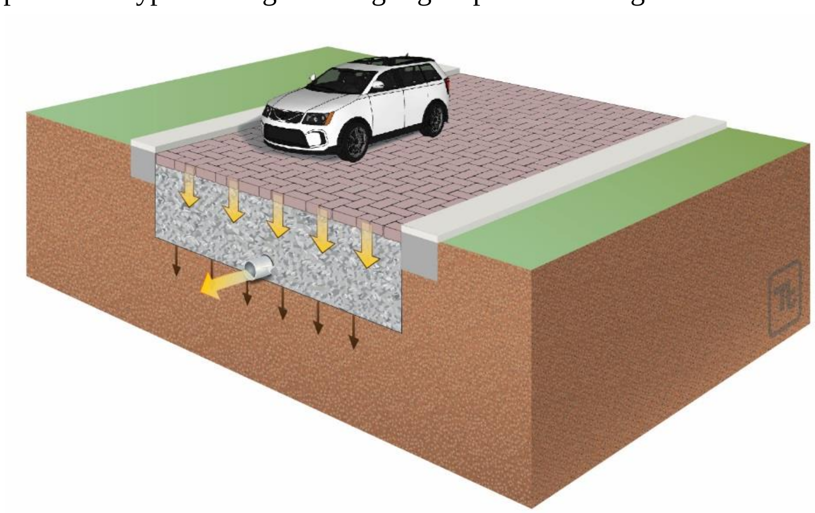
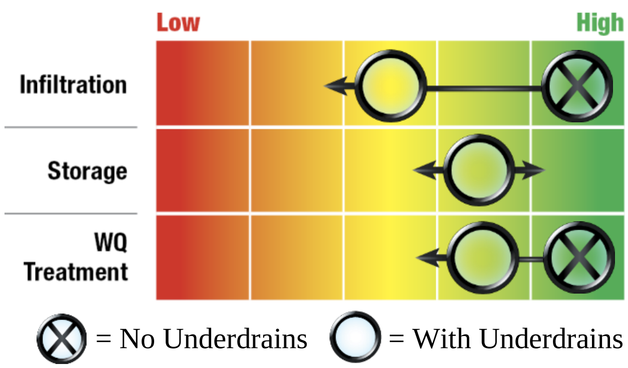


Figure B-2-7. Typical distributed permeable pavement schematic showing underdrain option (arrows indicate water pathways).

B-2.2.4 Green Streets (Green Infrastructure BMP)

Green streets are systems of multiple BMPs arranged in a linear fashion within the street right-of-way (as opposed to a parcel-based implementation). Green streets are designed to reduce runoff and improve water quality for the runoff from the roadway and adjacent parcels. Bioretention, biofiltration, and permeable pavement BMPs are commonly used in conjunction and can be hydraulically connected using subsurface stone reservoirs.

BMP Performance Functions



Design Variations

Green streets can feature several design variations. Some common features include:

- ***Linear Bioretention/Biofiltration:*** BMPs can be incorporated as linear systems between the road and parcel to intercept runoff from both roadways and properties.
- ***Curb Extensions:*** bioretention/biofiltration BMPs "bumpouts" can intercept gutter flow.
- ***Permeable Parking Lanes:*** street parking can be designed with permeable pavement to intercept roadway runoff.

Typical Design Components

Figure B-2-8 presents a typical design and highlights potential design variations:

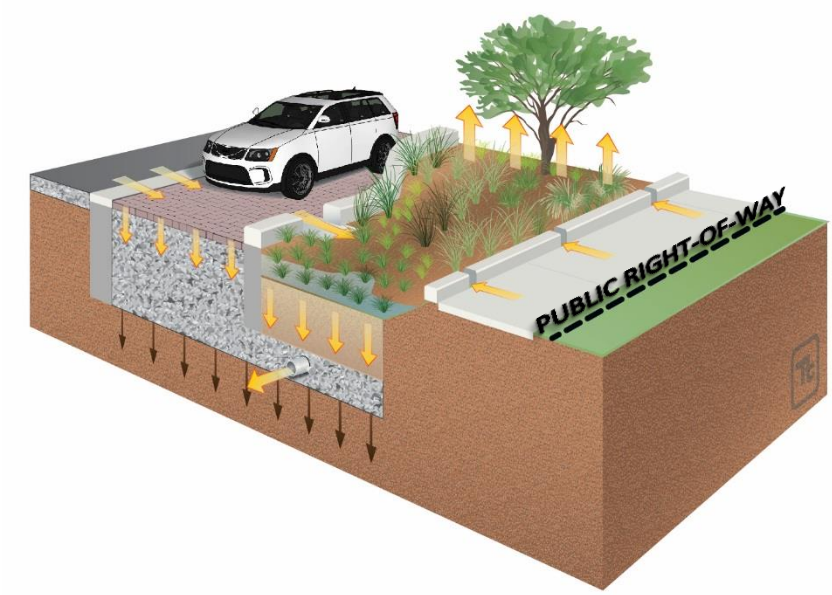


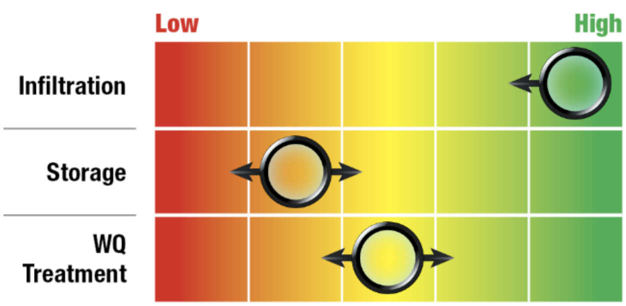
Figure B-2-8. Typical distributed green street schematic (arrows indicate water pathways).

B-2.2.5 Infiltration BMPs (Green Infrastructure BMP)

Infiltration BMPs capture and infiltrate runoff into underlying soils. Runoff is typically stored in subsurface trenches or pits filled with engineered soil media, gravel, or concrete chambers. Some infiltration BMPs that inject water into subsurface reservoirs are considered Class V injection wells and must be registered as such. Infiltration BMPs are unvegetated (see Bioretention for vegetated practices).

Source: www.peerlessconcrete.com

BMP Performance Functions



Design Variations

Several design variations include:

- ***Infiltration Trench:*** a media-filled trench that captures runoff in the pore space of gravel or soil prior to infiltration.
- ***Dry/Wet Well:*** a gravel-surrounded vault with perforated walls that receives runoff from a pipe and allows direct infiltration into the ground.
- ***Rock Well:*** a gravel-filled pit that receives runoff from a pipe. This BMP is essentially a dry well without a concrete vault.

Typical Design Components

Figure B-2-9 below presents a typical design and highlights potential design variations:

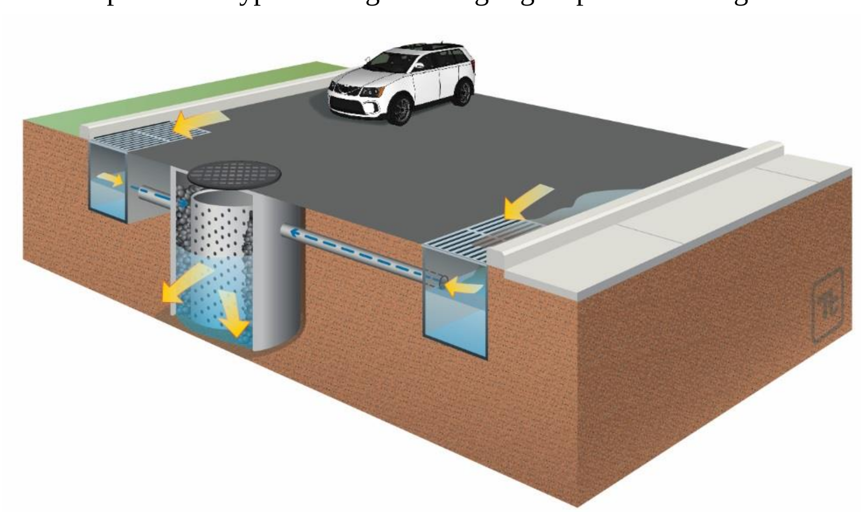
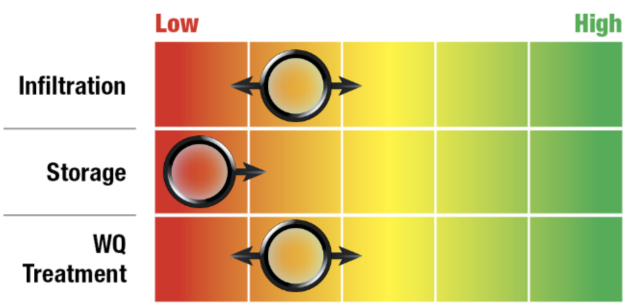


Figure B-2-9. Typical distributed infiltration BMP schematic showing perforated concrete dry well variation (arrows indicate water pathways; for infiltration trenches, see Figure B-2-6 and omit vegetation).

B-2.2.6 Bioswales (Green Infrastructure BMP)

Bioswales are practices that convey uniform sheet flow through vegetated, shallow depressions to remove sediment-associated constituents by settling and straining. Infiltration and filtration through soil media are not key components of bioswales; rather, bioswales are typically implemented to act as pretreatment and used to transport runoff to an associated structural BMP.

BMP Performance Functions



Design Variations

Several design variations include:

- ***Vegetated Swale:*** linear, vegetated channels used to convey concentrated flow from the contributing area to a structural BMP. Check dams can be added in areas of steep slopes or to further decrease the flow rates and spread the runoff over a larger area.
- ***Vegetative Filter Strip:*** broad-sloped, vegetated areas used to convey sheet flow from the contributing area to a structural BMP or other conveyance channel.

Typical Design Components

Figure B-2-10 presents a typical design and highlights potential design variations:

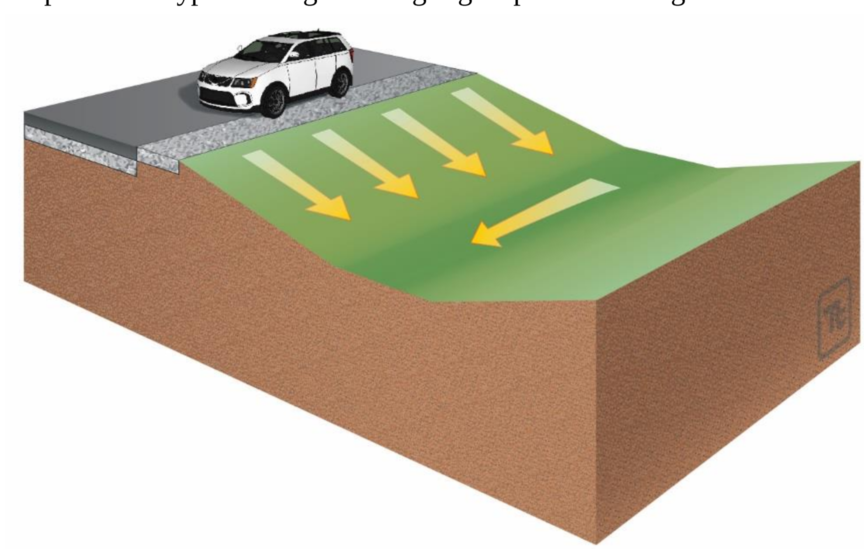
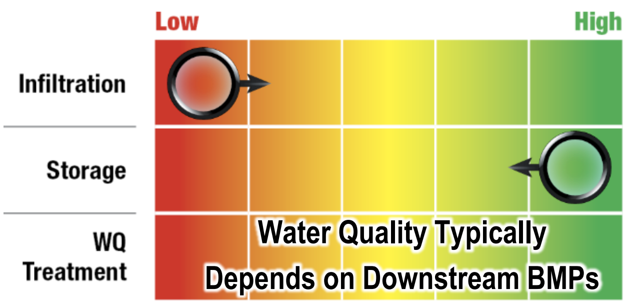


Figure B-2-10. Typical distributed bioswale schematic (arrows indicate water pathways).

B-2.2.7 Rainfall Harvest (Green Infrastructure BMP)

The primary goal for rainfall harvest is improving water quality by intercepting rooftop runoff and lowering the overall impervious impact of a developed site. Runoff can be reduced through interception and evapotranspiration on green roofs or used for alternative uses with a cistern or rain barrel.

BMP Performance Functions



Design Variations

Several design variations include:

- ***Green Roof:*** engineered, vegetated roof structures intended to intercept rainfall in a growing medium. Rooftop detention can be incorporated if structures allow.
- ***Cisterns and Rain Barrels:*** storage tanks used to intercept and store rooftop runoff. Captured runoff can be reused to offset non-potable water uses such as irrigation and toilet flushing. Alternatively, stored water can be slowly released to a pervious surface.

Typical Design Components

Figure B-2-11 presents a typical design and highlights potential design variations:

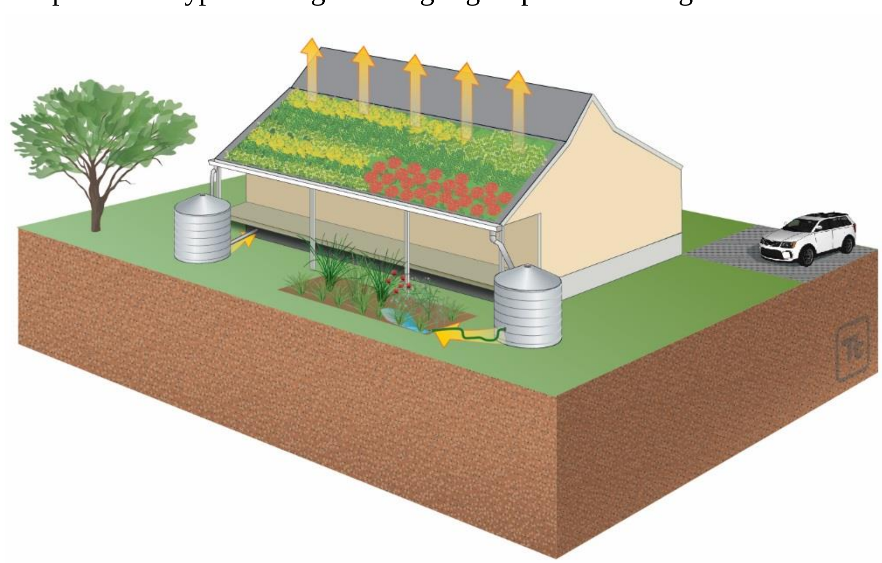


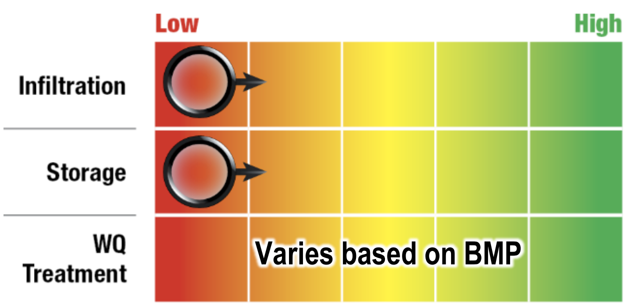
Figure B-2-11. Typical distributed rainfall harvest schematic (arrows indicate water pathways).

B-2.2.8 Flow-Through Treatment BMP (Distributed BMP)

Manufactured flow-through devices are commercial products that aim to provide stormwater treatment using patented, innovative technologies. Typical types of manufactured devices for stormwater management include cartridge filters, media filters, and high-flow biotreatment devices.

(photo source: Jonathan Page, NCSU-

BMP Performance Functions



Design Variations

Several design variations include:

- ***Media/Cartridge Filters:*** proprietary filtration devices used to remove constituents.
- ***High-Flow Biotreatment Device:*** modular, vault-type practices containing high-flow media. Typically incorporate vegetation.

Typical Design Components

Figure B-2-12 presents a typical design and highlights potential design variations:

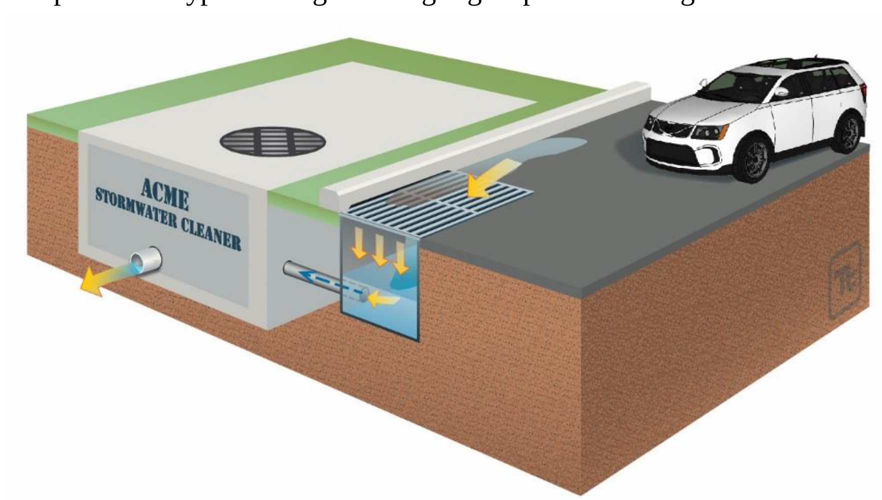
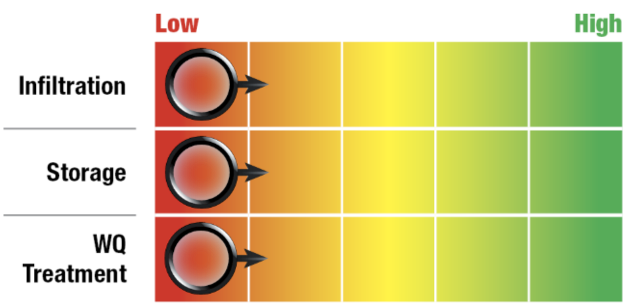


Figure B-2-12. Typical distributed flow-through treatment BMP schematic (arrows indicate water pathways).

B-2.2.9 Source Control Structural BMPs (Distributed BMP)

Source control structural BMPs are commercial products designed to treat runoff in highly urbanized environments. Mechanical separation, or more complex physicochemical processes, provides separation of gross solids and other constituents. Many models feature media or materials designed to sequester hydrocarbons and other constituents.

BMP Performance Functions



Design Variations

Several design variations include:

- ***Hydrodynamic Separators:*** mechanical devices that use screens, baffles, and/or vertical flow to separate sediment and gross solids.
- ***Catch Basin Inserts:*** inserts that use nets, screens, fabric, and/or filtration media to gross solids, fine sediments, oils, and/or grease from runoff entering a catch basin.

Typical Design Components

Figure B-2-13 presents a typical design and highlights potential design variations:

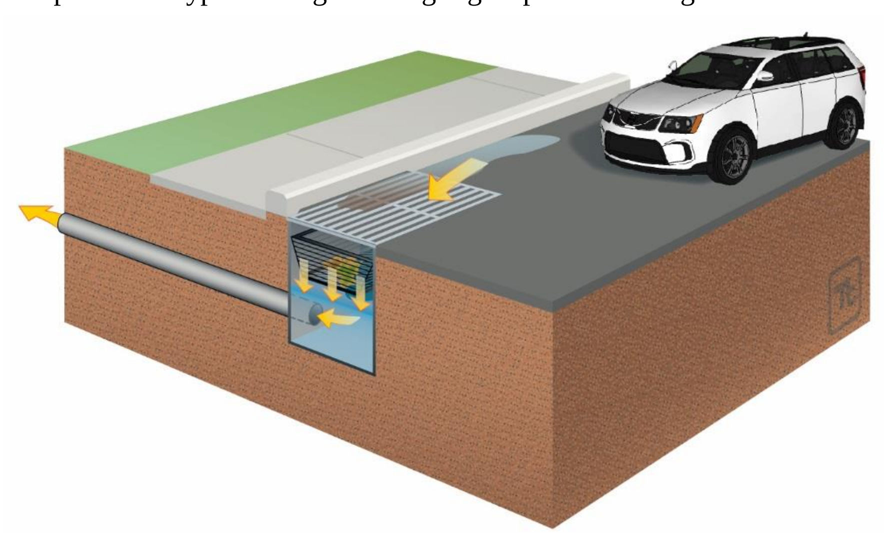


Figure B-2-13. Typical distributed source control structural BMP (arrows indicate water pathways).

Appendix B-3

Geotechnical Report for Example Regional EWMP Projects

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants

GEOTECHNICAL SERVICES
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NOS. T10503269-102669-OM AND T10507113-102944-OM

PREPARED FOR:

MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order Nos. T10503269-102669-OM and T10507113-102944-OM

Dear Ms. Kelly:

In accordance with your authorization and task orders dated January 21 and 27, 2015, we have performed geotechnical services for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. Our services included the preparation of geotechnical reports for each of the 10 sites under consideration for the project. Our reports for each site are attached herewith. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

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CAT/WRM/GTF/gg

Attachments:
Attachment 1 – Geotechnical Report for Adventure Park
Attachment 2 – Geotechnical Report for Allen J. Martin Park
Attachment 3 – Geotechnical Report for Bassett Park
Attachment 4 – Geotechnical Report for San Angelo Park
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Distribution: (1) Addressee (via e-mail)

ATTACHMENT 1

GEOTECHNICAL REPORT FOR ADVENTURE PARK

Geotechnical and Environmental Sciences Consultants

GEOTECHNICAL SERVICES
ADVENTURE PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NO. T10503269-102669-OM

PREPARED FOR:

MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
Adventure Park
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order No. T10503269-102669-OM

Dear Ms. Kelly:

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Adventure Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. This report presents geotechnical data obtained by Ninyo & Moore relative to the proposed project. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

William Morrison, PE, GE
Senior Engineer

Gregory T. Farrand, PG, CEG
Principal Geologist

CAT/WRM/GTF/KHM/gg

Distribution: (1) Addressee (via e-mail)

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Appendices

1. INTRODUCTION

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Adventure Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California (Figure 1). This report presents a compilation of geotechnical data obtained from the project along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project. We understand that the information contained herein will be included in the environmental report.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and subsurface exploration with regard to the proposed project. Specifically, we performed the following tasks:

- Review of readily available background materials, including State of California Seismic Hazards Zones map, State of California Earthquake Fault Zone map (Alquist-Priolo Special Studies Zones map), other published geologic maps and literature, in-house information, stereoscopic aerial photographs, and plans provided by the client.
- Performance of a site reconnaissance to observe the existing conditions at the site and to mark the proposed boring location for utility clearance. Mark-out of potential existing underground utilities was conducted through Underground Service Alert (USA).
- Performing a subsurface exploration consisting of drilling, logging and sampling of one exploratory soil boring at the site. The boring was advanced to a depth of approximately 46.5 feet using a truck-mounted drill rig equipped with hollow stem augers.
- Performing geotechnical laboratory testing on soil samples collected during our subsurface exploration. The testing included an evaluation of moisture content, in-situ moisture and dry density, grain-size analysis (sieve and 200 wash), Atterberg Limits, direct shear, and soil corrosivity.
- Compiling the data obtained from our background research, subsurface exploration, and laboratory testing.
- Preparing this report that presents geotechnical data obtained from our background review, site reconnaissance, and subsurface exploration at the project site, along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project.

3. PROJECT AND SITE DESCRIPTION

The purpose of the project is to assist MWH Americas (MWH) and the Los Angeles County Department of Public Works (LADPW) in developing an Enhanced Watershed Management Program (EWMP) for the Upper San Gabriel River Watershed. Our services are intended to help support feasibility analyses being conducted by MWH and LADPW for Better Management Practices (BMPs) at specific locations as part of the EWMP. We understand that the BMPs will help to reduce the impact of storm water and non-storm water discharges on the area (MWH, 2014).

Ten separate sites located within the San Gabriel Valley in Los Angeles County, California have been selected for feasibility analyses for the project. This report addresses the Adventure County Park site which is located at 10130 S. Gunn Avenue in the city of Whittier (Figures 1 and 2). Adventure Park is maintained by the County of Los Angeles. Geotechnical evaluations for the other nine sites are addressed in reports that are being issued under separate covers (Ninyo & Moore, 2015a through 2015i).

Adventure County Park is developed with improvements that include restroom and recreation center buildings, basketball courts, baseball/softball fields, asphalt concrete (AC) paved parking lots, paved and unpaved walkways, playground equipment, light poles, landscaping consisting of trees, shrubs, and grass areas, and other associated appurtenances. The site for the proposed improvements is located in a grass area to the east of the recreation center building. The site coordinates are approximately 33.9420°N latitude and -118.0363°W longitude. Elevations across the project site range from approximately 140 feet at the northern and eastern portions of the park, to 150 feet above mean sea level (MSL) at the southwestern portion of the park.

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our field exploration at the Adventure Park site included a geologic reconnaissance that was conducted on February 19, 2015 and subsurface exploration that was conducted on March 10, 2015. The subsurface exploration consisted of drilling one 8-inch diameter hollow stem auger boring (B-1) to a depth of approximately 46.5 feet below ground surface (bgs). The boring was logged by a geologist from our firm. Representative disturbed and undisturbed soil samples were obtained at selected depths from the boring for laboratory testing. The approximate location of the boring is presented on Figure 2. The boring log is presented in Appendix A.

Laboratory testing of selected soil samples obtained from our exploratory boring included in-situ dry density and moisture content, gradation, Atterberg limits, direct shear, and soil corrosivity. The results of the in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests described above are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, and groundwater conditions at the Adventure Park site are provided in the following sections.

5.1. Regional and Geologic Setting

The subject site is located within the northeastern portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Norris and Webb, 1990). The geomorphic province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and continues farther to the tip of Baja California. The Los Angeles Basin has been divided into four structural blocks which are generally bounded by prominent fault systems. The site is located within the Northeastern Block, which is bordered on the west and south by the Whittier-Elsinore fault and is bordered on the north by the San Gabriel Mountains and the Raymond Hill Fault. The Northeastern Block is a deep basin characterized by thick sequences of alluvium and sedimentary units overlying basement rocks, which are at depths of up to approximately 12,000 feet below the surface in the central part of the San Gabriel Valley.

5.2. Site Geology

Our review of the referenced geologic maps and literature indicates that the subject site is underlain by Holocene to Pleistocene alluvial gravel and sand (Dibblee, 2001). Geologic units encountered during our reconnaissance and subsurface exploration of the project site included relatively thin fill soils that mantle alluvium. Generalized descriptions of the units encountered are provided in the subsequent sections. Additional descriptions are provided on the boring logs in Appendix A. A geologic map of the region is presented on Figure 3.

5.2.1. Fill

Fill materials were encountered in our boring B-1 extending from the ground surface to a depth of approximately 1 foot below existing grade. As observed, the fill materials generally consisted of dark brown, moist, medium dense, silty sand. Scattered roots and grass were encountered in the fill materials.

5.2.2. Alluvium

Alluvium was encountered in our boring B-1 underlying the fill materials and was observed to extend to the total depth explored of approximately 46.5 feet below existing grade. As observed in our boring, the alluvial materials generally consisted of various shades of brown and gray, moist to wet, medium dense to very dense, well graded sands with silt, silty sands, clayey sands, and sandy silts. Interbeds of grayish-brown and reddish-brown, moist to wet, very stiff to hard, silty clay and clayey silt were also encountered in the alluvium. Scattered gravel was encountered at various depths in the alluvium.

5.3. Groundwater

Groundwater was encountered during our subsurface exploration in our boring B-1 at an approximate depth of 31 feet. Fluctuations in the groundwater level and perched conditions typically occur due to variations in precipitation, ground surface topography, subsurface stratification, irrigation, and other factors.

6. FAULTING AND SEISMICITY

Based on our review of published geologic maps and review of stereoscopic aerial photographs, no active fault traces are mapped as underlying the Adventure Park site. Therefore, the potential for surface fault rupture at the site is considered to be low. The project site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, Adventure Park is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed improvements. Figure 4 shows the approximate site location relative to the major faults in the region.

6.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated at 0.842g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based).

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.822g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.822g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.2. Surface Fault Rupture

The probability of damage due to surface ground rupture is relatively low due to the lack of known active faults crossing the project site. Surface ground cracking related to shaking from distant events is not considered a significant hazard, although it is a possibility.

6.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon in which loosely deposited, granular soils and some fine-grained soils located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration can result in a loss of grain-to-grain contact due to a rapid rise in pore water pressure causing the soil to behave as a fluid for a short period. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

According to the Seismic Hazard Zones Map for the Whittier Quadrangle, (CGS, 1999), the Adventure Park site is mapped as being in an area susceptible to liquefaction. During our subsurface exploration, groundwater was encountered at Adventure Park at a depth of 31 feet. Accordingly, it is our opinion that the soils underlying Adventure Park may be susceptible to liquefaction. If improvements are planned at Adventure Park, we recommend that a liquefaction evaluation be performed in accordance with California Geological Survey guidelines (CGS, 2008).

7. OTHER GEOTECHNICAL CONSIDERATIONS

7.1. Slope Stability

Our review of maps published by the California Geological Survey (CGS, 1999) indicate that the Adventure Park site is not situated in an area considered to be susceptible to seismic-induced landsliding. In addition, our observations indicate that the site is generally level to gently sloping. Consequently, landsliding or slope instability are not considered to be a constraint at the project site.

7.2. Corrosion

Laboratory testing was performed on representative samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with the California Test (CT) 643 and the sulfate and chloride tests were performed in accordance with CTs 417 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing performed on a sample obtained from the site indicated an electrical resistivity value of 950 ohm-cm, a soil pH value of 7.0, a chloride content of 155 ppm, and a sulfate content of 0.022 percent. According to Caltrans criteria and American Concrete Institute (ACI) 318 guidelines, a corrosive soil is defined as one with more than 500 ppm chlorides, more than 0.2 percent sulfates, a pH less than 5.5, or an electrical resistivity of less than 1,000 ohm-cm. Based on the Caltrans criteria and ACI guidelines, the upper soils encountered at the site are considered to be corrosive.

8. DISCUSSION AND FINDINGS

As discussed above, our geotechnical services were performed to assist MWH and LADPW evaluate the preliminary feasibility of an onsite storm water infiltration system at the Adventure Park site. Based on our communications with MWH, we understand that the preliminary criteria at the site is related to the presence of groundwater or dense materials providing refusal to drilling equipment within 100 feet of the ground surface. As such, our scope of services included the drilling of an exploratory boring that extended to a depth of 100 feet, to groundwater, or to refusal (whichever is shallower). We understand that BMPs being considered for the site are conceptual at this time. Based on the information obtained from our geotechnical evaluation, the following findings and conclusions have been made:

- The project site is underlain by relatively shallow fill (approximately 1 foot deep) overlying alluvial soils. The encountered portions of the fill were generally comprised of silty sands that contained scattered organic material, along with scattered amounts of gravel. The underlying alluvial soils were observed to consist of well graded sands with silt, silty sands, clayey sands, sandy silts, clayey silts, and silty clays.

- Groundwater was encountered in our exploratory boring at a depth of 31 feet. Per the request of MWH, this boring was terminated prior to reaching a depth of 100 feet.

- Based on our review of aerial photographs and published geologic maps, there are no known active faults or landslides underlying the project site.

- Our faulting and seismicity evaluation indicated that the site is subject to severe ground shaking due to a design seismic event.

- Review of geological literature indicates that the site is situated in an area that has been mapped as being susceptible to liquefaction. In addition, groundwater was encountered at the site at a depth of 31 feet. If this site is selected as part of the project, we recommend that a detailed liquefaction evaluation be performed in accordance with California Geological Survey guidelines (CGS, 2008).

- In-place infiltration testing was not performed as part of our geotechnical services. However, based on published correlations between a soil's grain size and its permeability (Shepherd, 1989), an estimated permeability on the order of 10^{-4} cm/sec within the sandy and silty soils can be utilized for preliminary evaluation purposes. Clayey soils encountered at the site can be expected to have significantly lower permeabilities. Actual design of storm water infiltration devices should be in accordance with the County of Los Angeles guidelines and should be based on field infiltration testing at the site.

- Recommendations provided in this report are preliminary in nature and are not intended to provide sufficient information to fully address potential geotechnical related issues. Prior to site development an additional geotechnical evaluation should be performed.

9. PRELIMINARY RECOMMENDATIONS

As noted above we understand that the Better Management Practices (BMPs) associated with the proposed Upper San Gabriel River EWMP Project are conceptual at this time. As such, details regarding the types and construction of the BMPs (if any) are not known at this time for the Adventure Park site. We recommend that the geotechnical information presented herein be utilized during the evaluation of the feasibility of the devices associated with the EWMP project at the site. The design of BMPs should be performed in accordance with County of Los Angeles guidelines.

The following sections of this report provide preliminary recommendations for earthwork and design of structure foundations for preliminary planning purposes. Once the type and general construction of the devices is better defined, Ninyo & Moore should review the devices' preliminary design. At that time, supplemental recommendations may be provided.

9.1. Site Preparation

Prior to earthwork, the project site should be cleared of existing structures, pavement, abandoned utilities (if present), and stripped of rubble, debris, vegetation, loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite.

9.2. Materials for Fill

On-site soils relatively free of organic material are suitable for reuse as fill. In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾-inch. Oversize materials should be separated from material to be used for fill and removed from the site. Although not anticipated, if encountered, high plasticity clays and silts should be disposed of off-site.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material should generally be granular soils with a very low to low expansion potential (i.e., an expansion index of 50 or less as evaluated by ASTM D 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

9.3. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified, moisture conditioned as needed to achieve moisture contents generally above the optimum moisture content, and then compacted to a relative compaction of 90 percent as evaluated in accordance with ASTM D 1557. The evaluation of compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when the project area is ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

9.4. Utility Trench Backfill

Based on our subsurface exploration, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the "Greenbook" (Standard Specifications for Public Works) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557. Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

9.5. Preliminary Foundation Recommendations

For preliminary design purposes, shallow, spread or continuous footings founded on compacted fill or alluvial soils can be considered suitable for support of structures. Shallow, spread or continuous footings bearing on compacted fill or alluvial soils may be designed assuming an allowable bearing capacity of 2,000 psf. This allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. Spread footings should be founded 18 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches and isolated footings should be 18 inches in width or more. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

For resistance of foundations to lateral loads, we recommend an allowable passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot be used. This value assumes that the ground is horizontal for a distance of 10 feet or more, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. If passive and frictional resistances are to be used in combination, we recommend that the passive value not exceed one-half of the total resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

9.6. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Laboratory testing indicated the sulfate content of the sample tested was less than 0.2 percent, which is considered negligible for sulfate attack based on ACI criteria (ACI, 2011). Although significant sulfate content was not indicated, due to the potential for variability of site fill soil, we recommend that Type II/V cement be used for concrete structures in contact with soil. The water-cement ratio of the concrete should be 0.45 or less and the slump should be 4 inches or less.

9.7. Plan Review and Construction Observation

The preliminary conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Because we understand that the design of the BMPs devices for the EWMP project is conceptual at this point, we recommend that Ninyo & Moore review the devices' preliminary design, once the type and general construction of the devices is better defined. At that time, supplemental recommendations may be provided.

Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations to evaluate the assumptions inherent in the design.

The preliminary recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the preliminary conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for feasibility and preliminary design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our preliminary conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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Ninyo & Moore, 2015d, Geotechnical Services, Barnes Park, Upper San Gabriel River EWMP, Los Angeles County, California, Task Order No. T10503269-102669-OM, Project No. 107900001: dated June 3.

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Ninyo & Moore, 2015h, Geotechnical Services, Finkbiner Park, Upper San Gabriel River EWMP, Los Angeles County, California, Task Order No. T10503269-102669-OM, Project No. 107900001: dated June 3.

Ninyo & Moore, 2015i, Geotechnical Services, La Puente Park, Upper San Gabriel River EWMP, Los Angeles County, California, Task Order No. T10503269-102669-OM, Project No. 107900001: dated June 3.

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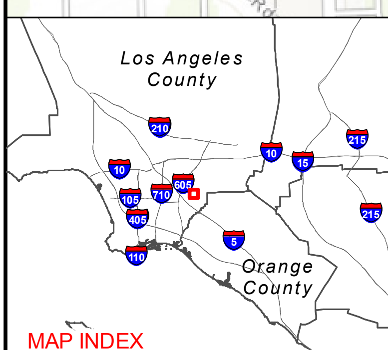
SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS.



MAP INDEX

Feet

0 750 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

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Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	1
107900001	6/15		

SOURCE: Aerial Imagery - ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP.

LEGEND

SITE BOUNDARY

B-1 TD=46.5' BORING
TD=TOTAL DEPTH IN FEET

N

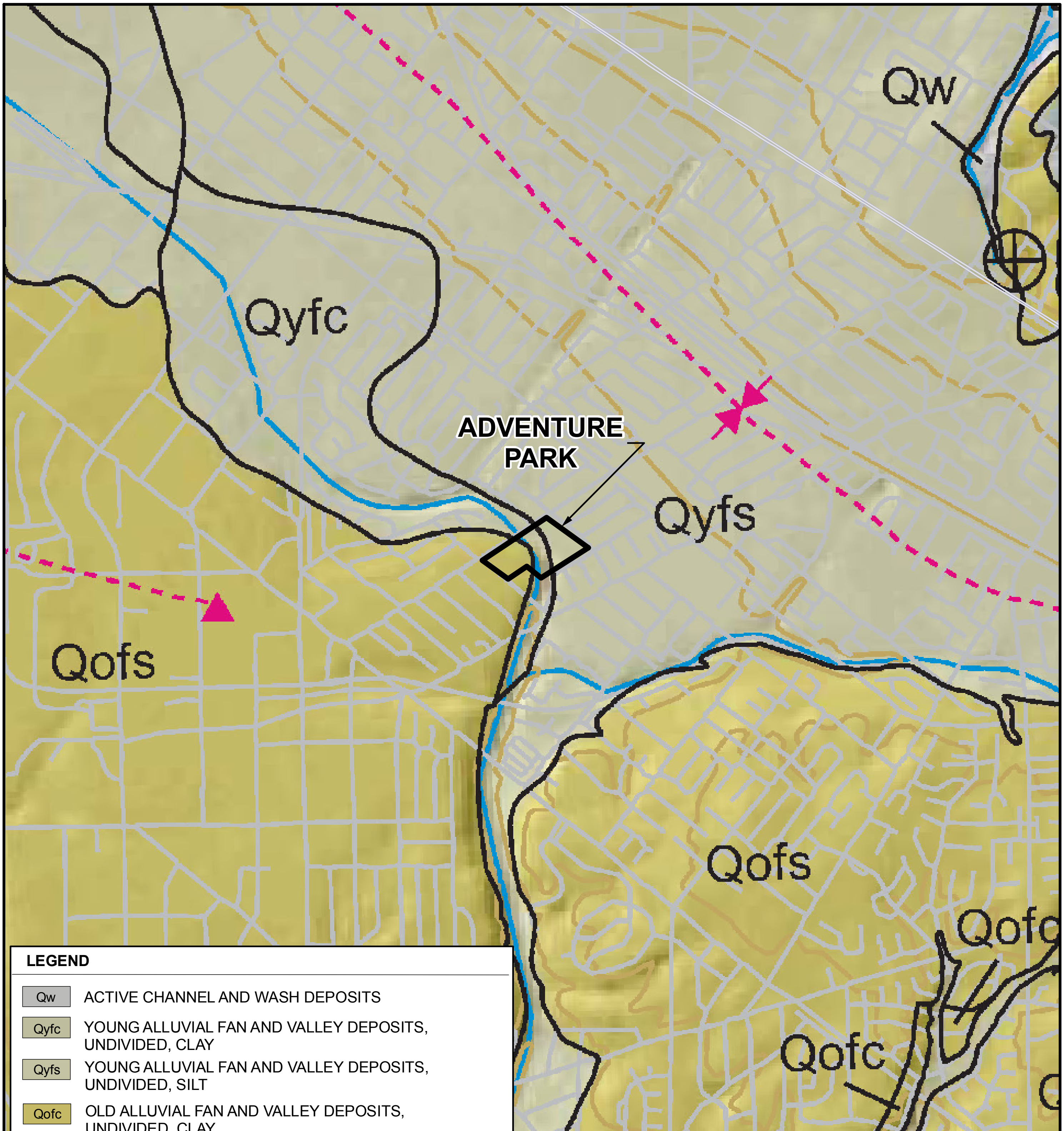
SCALE IN FEET

0 150 300 600

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		BORING LOCATION	FIGURE
PROJECT NO.	DATE	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	2
107900001	6/15		

2_107900001_BL_AP.mxd AOB



LEGEND

Qw	ACTIVE CHANNEL AND WASH DEPOSITS
Qyfc	YOUNG ALLUVIAL FAN AND VALLEY DEPOSITS, UNDIVIDED, CLAY
Qyfs	YOUNG ALLUVIAL FAN AND VALLEY DEPOSITS, UNDIVIDED, SILT
Qofc	OLD ALLUVIAL FAN AND VALLEY DEPOSITS, UNDIVIDED, CLAY
Qofs	OLD ALLUVIAL FAN AND VALLEY DEPOSITS, UNDIVIDED, SILT
	SYNCLINAL FOLD - SOLID WHERE WELL LOCATED; DASHED WHERE APPROXIMATELY LOCATED OR INFERRED; DOTTED WHERE CONCEALTED. PLUNGE DIRECTION INDICATED BY ARROWHEAD ON FOLD AXIS.

SOURCE: SAUCEDO, G.J., GREENE, H.G., KENNEDY, M.P., AND BEZORE, S.P., 2003, GEOLOGIC MAP OF THE LONG BEACH 30' X 60' QUADRANGLE, CALIFORNIA

N

Feet

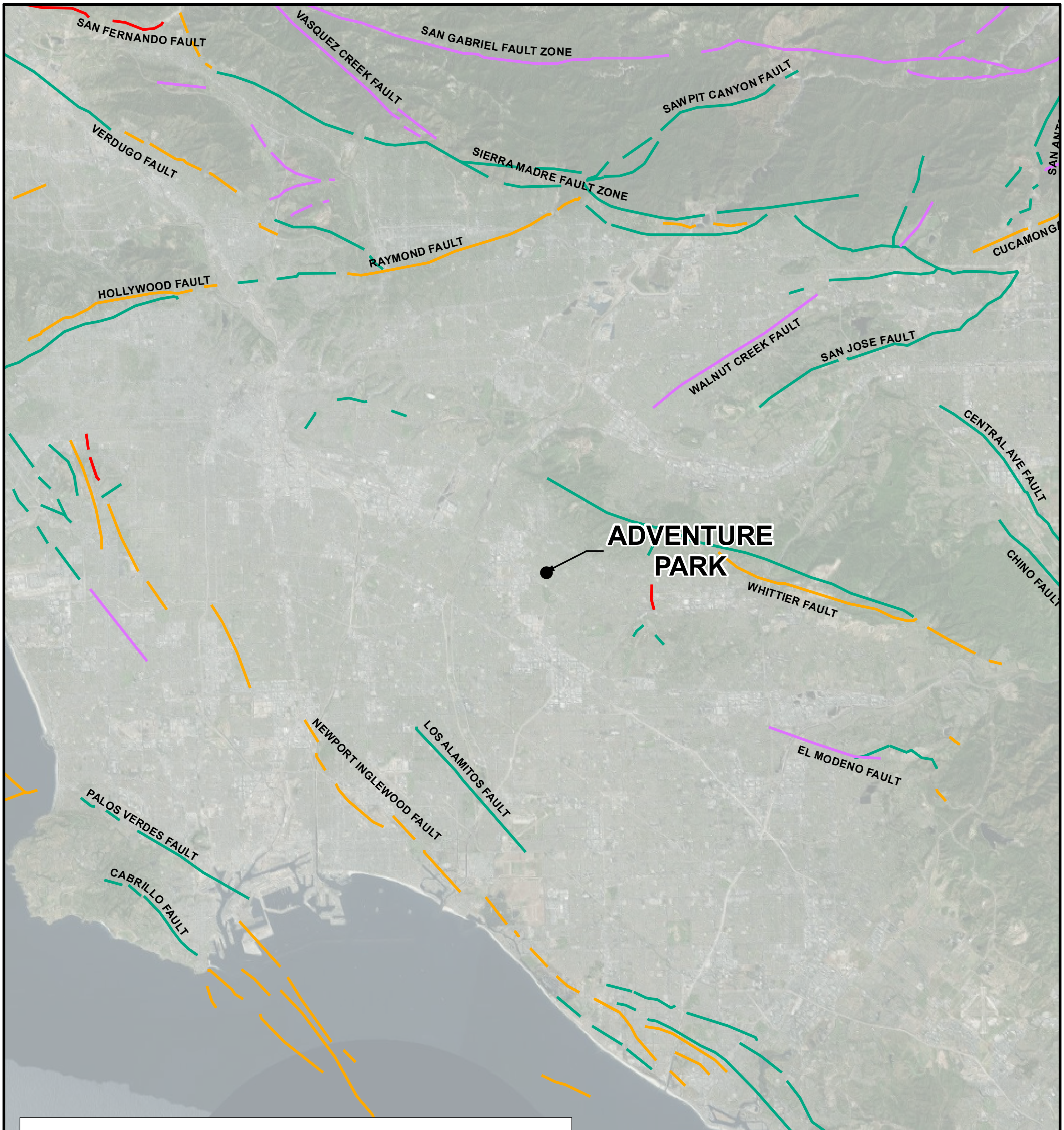
0 1,000 2,000 4,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore

PROJECT NO.	DATE	GEOLOGY	FIGURE
107900001	6/15	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	3

3_107900001_G_AP.mxd AOB



LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS

N

Miles

0 3 6 12

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

4_107900001_F_AP_93.mxd AOB

Ninyo & Moore

PROJECT NO.	DATE	FAULT LOCATIONS	FIGURE
107900001	6/15	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	4

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1⅜ inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change.
								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
15								
								The total depth line is a solid line that is drawn at the bottom of the boring.
20								

Ninyo & Moore

BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

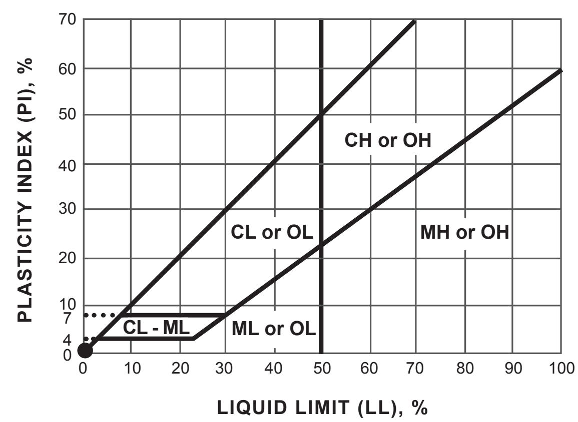
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS: GROUP SYMBOL	SECONDARY DIVISIONS: GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVEL more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SILT and CLAY liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

Ninyo & Moore

USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DATE DRILLED 3/10/15 BORING NO. B-1

GROUND ELEVATION 150' ± (MSL) SHEET 1 OF 2

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	FILL: Dark brown, moist, medium dense, silty fine to medium SAND; scattered roots and grass.
						SM	ALLUVIUM: Light brown, moist, medium dense, silty, fine to medium SAND.
						SC	Dark brown, moist, medium dense, clayey fine to medium SAND; scattered roots.
		28				ML	Dark yellowish brown, moist, medium dense, fine sandy SILT; trace clay.
							Trace medium sand; scattered caliche.
						CL-SC	Grayish brown, moist, very stiff, silty CLAY with pockets of light brown, moist, medium dense, clayey fine to coarse SAND with gravel.
10		15	19.2				
		20	10.5			ML	Dark yellowish brown, moist, medium dense, fine sandy SILT; trace medium and coarse sand; some grayish brown mottling.
20		35	1.7			SW-SM	Light brown, moist, dense to very dense, well graded SAND with silt; some fine gravel.
		75	2.2	120.7			Scattered gravel up 1-inch in diameter.
30		50	9.5				Scattered gravel up to 1-1/2-inch in diameter.
							Wet.
		23	15.8				Less gravel.
			16.3			ML	Dark reddish brown, wet, hard, clayey SILT; some fine sand; micaceous.
40							

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BORING LOG

ADVENTURE PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-1

DATE DRILLED 3/10/15 BORING NO. B-1

GROUND ELEVATION 150' ± (MSL) SHEET 2 OF 2

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		■	18	21.3			ML	ALLUVIUM: (Continued) Reddish brown and grayish brown (mottled), wet, very stiff, clayey SILT; some fine sand.
		■	26	32.8				Dense; silt with fine SAND; finely laminated; trace medium to coarse sand; no clay; gravel in shoe.
								Total Depth = 46.5 feet. Groundwater encountered at approximately 32 feet during drilling and measured at approximately 31 feet 30 minutes after drilling Backfilled shortly after drilling on 3/10/15. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
50								
60								
70								
80								

Ninyo & Moore

BORING LOG

ADVENTURE PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-2

APPENDIX B

LABORATORY TESTING

Classification
Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

Moisture Content
The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests
The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis
Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-4. These test results were utilized in evaluating the soil classifications in accordance with the USCS.

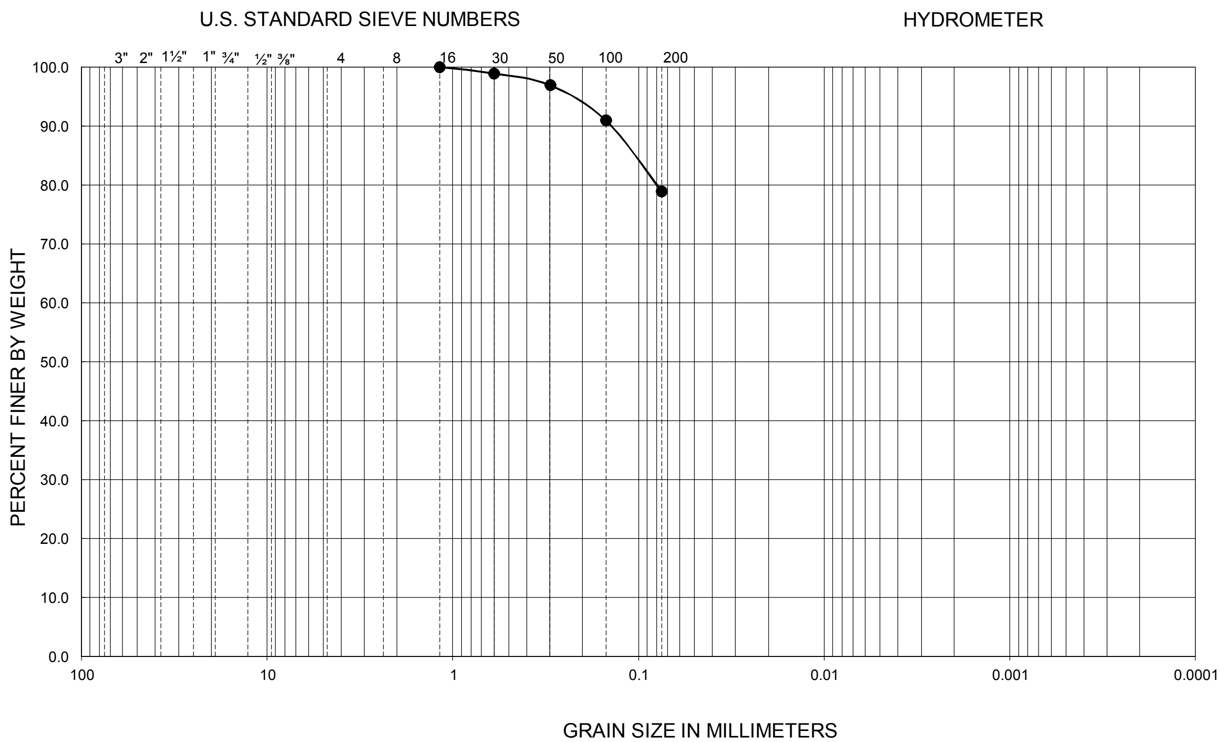
Atterberg Limits
Tests were performed on a selected representative fine-grained soil sample to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318. These test results were utilized to evaluate the soil classification in accordance with USCS. The test results and classification are shown on Figure B-5.

Direct Shear Tests
A direct shear test was performed on a relatively undisturbed sample in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-6.

Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-7.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



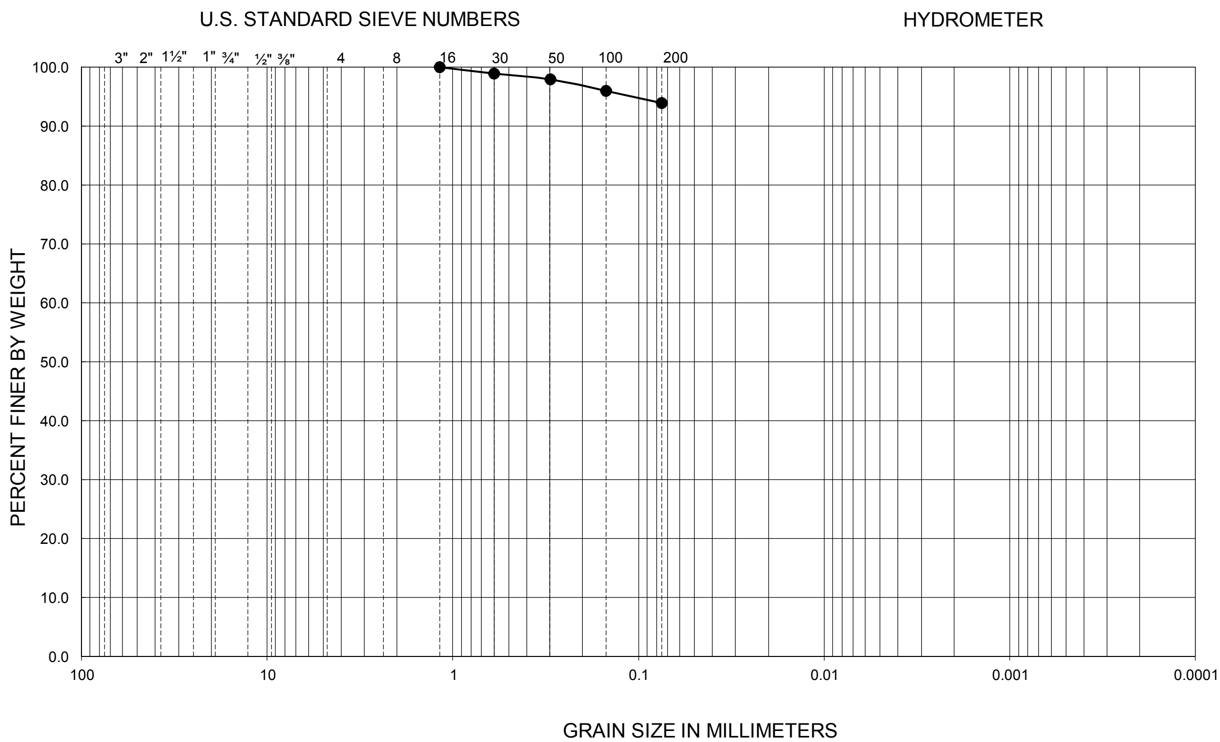
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-1	5.0-6.5	--	--	--	--	--	--	--	--	79	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-1
107900001	6/15		

107900001_SIEVE B-1 @ 5.0-6.5.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

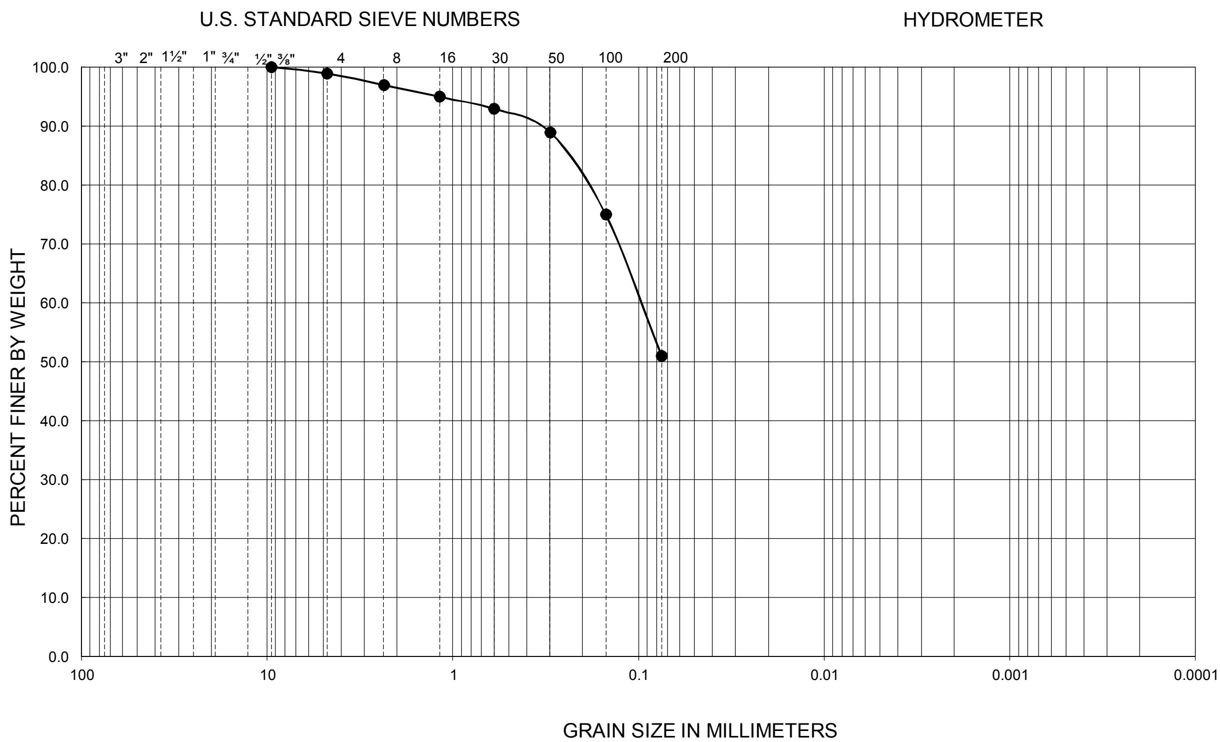


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-1	10.0-11.5	--	--	--	--	--	--	--	--	94	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-2
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

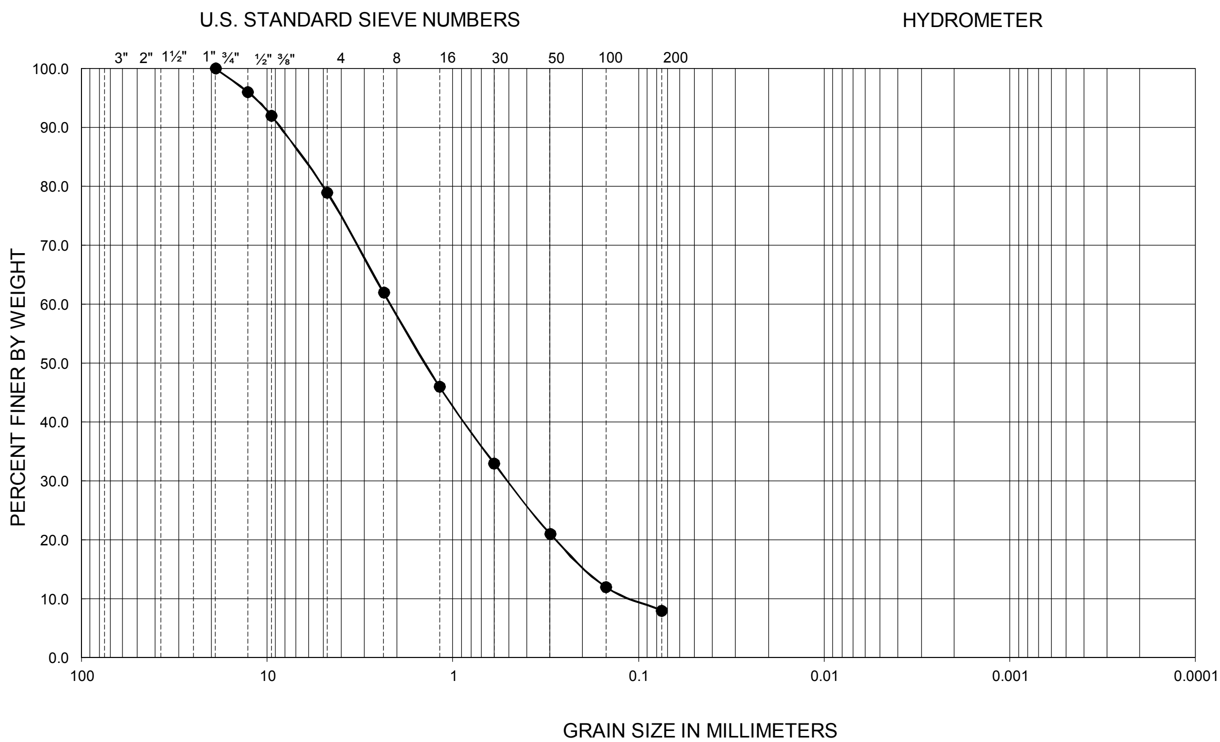


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-1	15.0-16.5	--	--	--	--	--	--	--	--	51	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-3
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



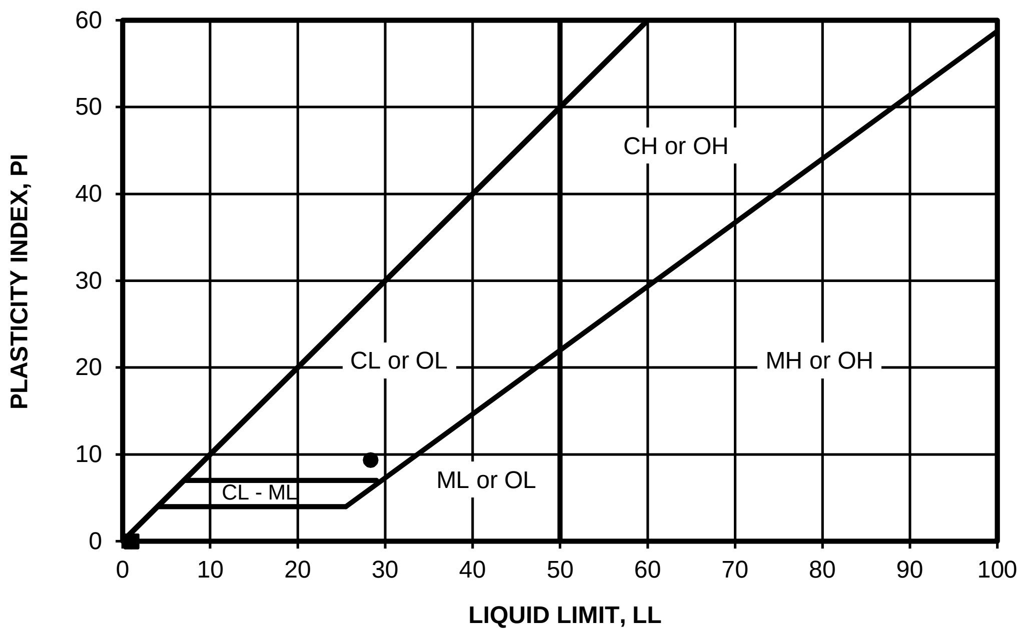
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-1	30.0-31.5	--	--	--	0.12	0.51	2.15	17.9	1.0	8	SW-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-4
107900001	6/15		

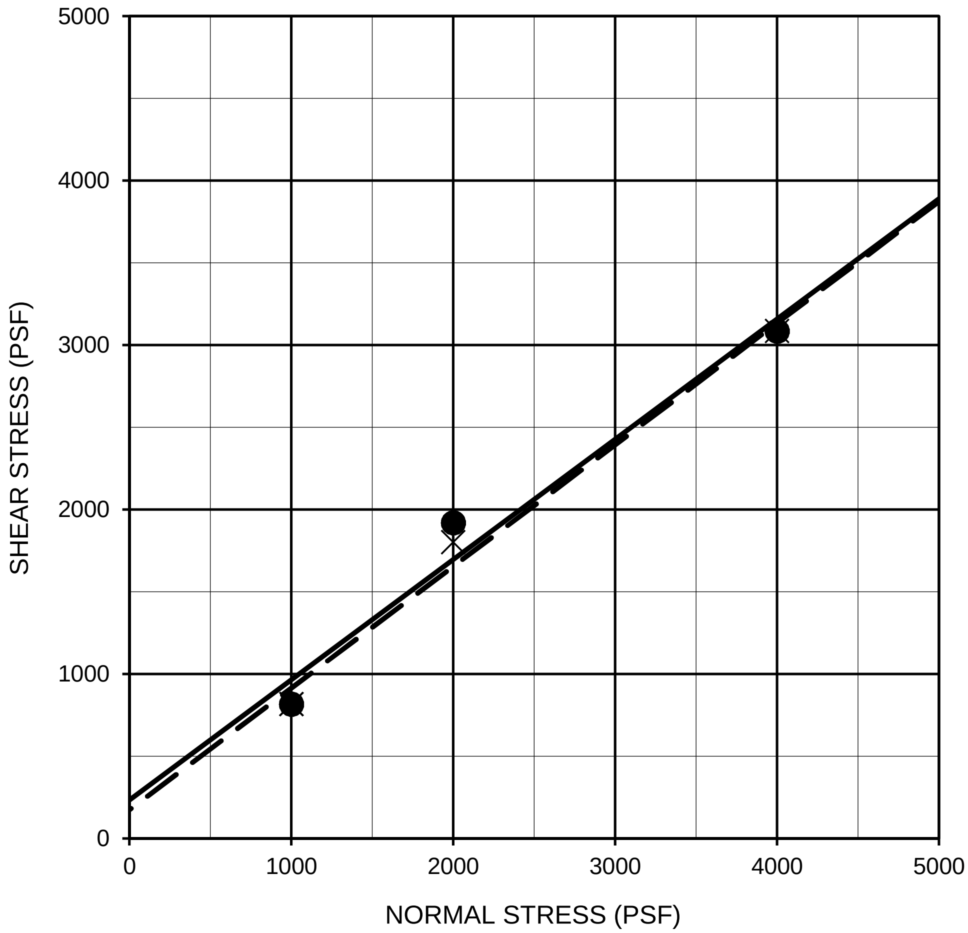
SYMBOL	LOCATION	DEPTH (FT)	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve)	USCS (Entire Sample)
●	B-1	10.0-11.5	28	19	9	CL	CL

NP - INDICATES NON-PLASTIC



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

Ninyo & Moore		ATTERBERG LIMITS TEST RESULTS	FIGURE
PROJECT NO.	DATE	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-5
107900001	6/15		



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SAND	—●—	B-1	25.0-26.5	Peak	230	36	SM
Silty SAND	- - X - -	B-1	25.0-26.5	Ultimate	170	36	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	DATE	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-6
107900001	6/15		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2] (ppm)	SULFATE CONTENT [2] (%)	CHLORIDE CONTENT [3] (ppm)
B-1	6.0-10.0	7.0	950	220	0.022	155

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore		CORROSIVITY TEST RESULTS	FIGURE
PROJECT NO.	DATE	ADVENTURE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-7
107900001	6/15		

ATTACHMENT 2

GEOTECHNICAL REPORT FOR ALLEN J. MARTIN PARK

GEOTECHNICAL SERVICES
ALLEN J. MARTIN PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NO. T10503269-102669-OM

PREPARED FOR:

MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
Allen J. Martin Park
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order No. T10503269-102669-OM

Dear Ms. Kelly:

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Allen J. Martin Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. This report presents geotechnical data obtained by Ninyo & Moore relative to the proposed project. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

William Morrison, PE, GE
Senior Engineer

Gregory T. Farrand, PG, CEG
Principal Geologist

CAT/WRM/GTF/gg

Distribution: (1) Addressee (via e-mail)

TABLE OF CONTENTS

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Figures

Appendices

1. INTRODUCTION

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Allen J. Martin Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California (Figure 1). This report presents a compilation of geotechnical data obtained from the project, along with a preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project. We understand that the information contained herein will be included in the environmental report.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and subsurface exploration with regard to the proposed project. Specifically, we performed the following tasks:

- Review of readily available background materials, including State of California Seismic Hazards Zones map, State of California Earthquake Fault Zone map (Alquist-Priolo Special Studies Zones map), other published geologic maps and literature, in-house information, stereoscopic aerial photographs, and plans provided by the client.
- Performance of a site reconnaissance to observe the existing conditions at the site and to mark the proposed boring location for utility clearance. Mark-out of potential existing underground utilities was conducted through Underground Service Alert (USA).
- Performing a subsurface exploration consisting of drilling, logging and sampling of one exploratory soil boring at the site. The boring was advanced to a depth of approximately 101 feet using a truck-mounted drill rig equipped with hollow stem augers.
- Performing geotechnical laboratory testing on soil samples collected during our subsurface exploration. The testing included an evaluation of moisture content, in-situ moisture and dry density, grain-size analysis (sieve and 200 wash), Atterberg Limits, direct shear, and soil corrosivity.
- Compiling the data obtained from our background research, subsurface exploration, and laboratory testing.
- Preparing this report that presents geotechnical data obtained from our background review, site reconnaissance, and subsurface exploration at the project site, along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project.

3. PROJECT AND SITE DESCRIPTION

The purpose of the project is to assist MWH Americas (MWH) and the Los Angeles County Department of Public Works (LADPW) in developing an Enhanced Watershed Management Program (EWMP) for the Upper San Gabriel River Watershed. Our services are intended to help support feasibility analyses being conducted by MWH and LADPW for Better Management Practices (BMPs) at specific locations as part of the EWMP. We understand that the BMPs will help to reduce the impact of storm water and non-storm water discharges on the area (MWH, 2014).

Ten separate sites located within the San Gabriel Valley in Los Angeles County, California have been selected for feasibility analyses for the project. This report addresses the Allen J. Martin County Park site, which is located at 14830 E. Giordano Street in the city of La Puente (Figures 1 and 2) and is maintained by the County of Los Angeles. Geotechnical evaluations for the other nine sites are addressed in reports that are being issued under separate covers (Ninyo & Moore, 2015a through 2015i).

The site is developed with improvements that include restroom and recreation center buildings, basketball courts, a baseball/softball field, asphalt concrete (AC) paved parking lots, paved and unpaved walkways, playground equipment, light poles, landscaping consisting of trees, shrubs, and grass areas, and other associated appurtenances. The site for the proposed improvements is located in a grass area to the northeast of the softball field. The site coordinates are approximately 34.0399°N latitude and -117.9616°W longitude. The elevation at the project site is approximately 315 feet above mean sea level (MSL).

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our field exploration at the Allen J. Martin Park site included a geologic reconnaissance that was conducted on February 19, 2015 and subsurface exploration that was conducted on March 11, 2015. The subsurface exploration consisted of drilling one 8-inch diameter hollow stem auger boring (B-2) to a depth of 100.8 feet below ground surface (bgs). The boring was logged by a geologist from our firm. Representative disturbed and undisturbed soil samples were obtained at selected depths from the boring for laboratory testing. The approximate location of the boring is presented on Figure 2. The boring log is presented in Appendix A.

Laboratory testing of selected soil samples obtained from our exploratory boring included in-situ dry density and moisture content, gradation, Atterberg limits, direct shear, and soil corrosivity. The results of the in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests described above are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, and groundwater conditions at the Allen J. Martin Park site are provided in the following sections.

5.1. Regional and Geologic Setting

The subject site is located within the northeastern portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Norris and Webb, 1990). The geomorphic province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and continues farther to the tip of Baja California. The Los Angeles Basin has been divided into four structural blocks which are generally bounded by prominent fault systems. The site is located within the Northeastern Block, which is bordered on the west and south by the Whittier-Elsinore fault and is bordered on the north by the San Gabriel Mountains and the Raymond Hill Fault. The Northeastern Block is a deep basin characterized by thick sequences of alluvium and sedimentary units overlying basement rocks, which are at depths of up to approximately 12,000 feet below the surface in the central part of the San Gabriel Valley.

5.2. Site Geology

Our review of the referenced geologic maps and literature indicates that the subject site is underlain by Holocene to Pleistocene alluvial gravel and sand (Dibblee and Ehrenspeck, 1999). Geologic units encountered during our reconnaissance and subsurface exploration of the project site included relatively thin fill soils that mantle alluvium. Generalized descriptions of the units encountered are provided in the subsequent sections. Additional descriptions are provided on the boring logs in Appendix A. A geologic map of the region is presented on Figure 3.

5.2.1. Fill

Fill materials were encountered in our boring B-2 extending from the ground surface to a depth of approximately 4 feet below existing grade. As observed, the fill materials generally consisted of dark brown, moist, medium dense, silty sand. Scattered roots and grass were encountered in the fill materials.

5.2.2. Alluvium

Alluvium was encountered in our boring B-2 underlying the fill materials and was observed to extend to the total depth explored of 100.8 feet below existing grade. As observed in our boring, the alluvial materials generally consisted of various shades of brown, moist, medium dense to very dense, silty sands and sandy silts. Interbeds of grayish-brown, moist, stiff to hard, silty clay and clayey silt were also encountered in the alluvium. Scattered gravel was encountered at various depths in the alluvium.

5.3. Groundwater

Groundwater was not encountered during our subsurface exploration in our boring B-2. Fluctuations in the groundwater level and perched conditions typically occur due to variations in precipitation, ground surface topography, subsurface stratification, irrigation, and other factors.

6. FAULTING AND SEISMICITY

Based on our review of published geologic maps and review of stereoscopic aerial photographs, no active fault traces are mapped as underlying the Allen J. Martin Park site. Therefore, the potential for surface fault rupture at the site is considered to be low. The project site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, Allen J. Martin Park is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed improvements. Figure 4 shows the approximate site location relative to the major faults in the region. The nearest known active fault is the San Jose fault, located approximately 5 miles east of the site.

6.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated at 0.852g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based).

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.763g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.763g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.2. Surface Fault Rupture

The probability of damage due to surface ground rupture is relatively low due to the lack of known active faults crossing the project site. Surface ground cracking related to shaking from distant events is not considered a significant hazard, although it is a possibility.

6.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon in which loosely deposited, granular soils and some fine-grained soils located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration can result in a loss of grain-to-grain contact due to a rapid rise in pore water pressure causing the soil to behave as a fluid for a short period. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

According to the Seismic Hazard Zones Map for the Baldwin Park Quadrangle, (CGS, 1999), the Allen J. Martin Park site is mapped as being in an area susceptible to liquefaction. While review of the Seismic Hazard Zone Report for the Baldwin Park quadrangle (CGS, 1998) indicates that the historic high groundwater is at a depth on the order of 13 feet, groundwater was not encountered at Allen J. Martin Park to the total depth explored of 100.8 feet during our subsurface exploration. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Allen J. Martin Park site.

7. OTHER GEOTECHNICAL CONSIDERATIONS

7.1. Slope Stability

Our review of maps published by the California Geological Survey (CGS, 1999) indicates that the Allen J. Martin Park site is not situated in an area considered to be susceptible to seismic-induced landsliding. In addition, our observations indicate that the site is generally level to gently sloping. Consequently, landsliding or slope instability are not considered to be a constraint at the project site.

7.2. Corrosion

Laboratory testing was performed on representative samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with the California Test (CT) 643 and the sulfate and chloride tests were performed in accordance with CTs 417 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing performed on a sample obtained from the site indicated an electrical resistivity value of 2,200 ohm-cm, a soil pH value of 7.6, a chloride content of 100 ppm, and a sulfate content of 0.006 percent. According to Caltrans criteria (2012) and American Concrete Institute (ACI) 318 guidelines, a corrosive soil is defined as one with more than 500 ppm chlorides, more than 0.2 percent sulfates, a pH less than 5.5, or an electrical resistivity of less than 1,000 ohm-cm. Based on the Caltrans criteria and ACI guidelines, the upper soils encountered at the site are not considered to be corrosive.

8. DISCUSSION AND FINDINGS

As discussed above, our geotechnical services were performed to assist MWH and LADPW as they evaluate the preliminary feasibility of an onsite storm water infiltration system at the Allen J. Martin Park site. Based on our communications with MWH, we understand that the preliminary criteria at the site is related to the presence of groundwater or dense materials providing refusal to drilling equipment within 100 feet of the ground surface. As such, our scope of services included the drilling of an exploratory boring that extended to a depth of 100 feet, to groundwater, or to refusal (whichever is shallower). We understand that BMPs being considered for the site are conceptual at this time. Based on the information obtained from our geotechnical evaluation, the following findings and conclusions have been made:

- The project site is underlain by relatively shallow fill (approximately 4 feet deep) overlying alluvial soils. The encountered portions of the fill were generally comprised of silty sands that contained scattered organic material, along with scattered amounts of gravel. The underlying alluvial soils were observed to consist of silty sands, clayey sands, sandy silts, clayey silts, and silty clays.

- Groundwater was not encountered in our exploratory boring to the total depth explored of 100.8 feet.

- Based on our review of aerial photographs and published geologic maps, there are no known active faults or landslides underlying the project site.

- Our faulting and seismicity evaluation indicated that the site is subject to severe ground shaking due to a design seismic event.

- Review of geological literature indicates that the site is situated in an area that has been mapped as being susceptible to liquefaction. However, groundwater was not encountered in our exploration at the site. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Allen J. Martin Park site. However, it may be prudent to perform a detailed liquefaction evaluation in accordance with California Geological Survey guidelines (CGS, 2008).

- In-place infiltration testing was not performed as part of our geotechnical services. However, based on published correlations between a soil's grain size and its permeability (Shepherd, 1989), an estimated permeability on the order of 10^{-4} cm/sec within the encountered sandy and silty soils can be utilized for preliminary evaluation purposes. Clayey soils encountered at the site can be expected to have significantly lower permeabilities. Actual design of storm water infiltration devices should be in accordance with the County of Los Angeles guidelines and should be based on field infiltration testing at the site.

- Recommendations provided in this report are preliminary in nature and are not intended to provide sufficient information to fully address potential geotechnical related issues prior to site development. An additional geotechnical evaluation should be performed.

9. PRELIMINARY RECOMMENDATIONS

As noted above we understand that the Better Management Practices (BMPs) associated with the proposed Upper San Gabriel River EWMP Project are conceptual at this time. As such, details regarding the types and construction of the BMPs (if any) are not known at this time for the Allen J. Martin Park site. We recommend that the geotechnical information presented herein be utilized during the evaluation of the feasibility of the devices associated with the EWMP project at the site. The design of BMPs should be performed in accordance with County of Los Angeles guidelines.

The following sections of this report provide preliminary recommendations for earthwork and design of structure foundations for preliminary planning purposes. Once the type and general construction of the devices is better defined, Ninyo & Moore should review the devices' preliminary design. At that time, supplemental recommendations may be provided.

9.1. Site Preparation

Prior to earthwork, the project site should be cleared of existing structures, pavement, abandoned utilities (if present), and stripped of rubble, debris, vegetation, loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite.

9.2. Materials for Fill

On-site soils relatively free of organic material are suitable for reuse as fill. In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾-inch. Oversize materials should be separated from material to be used for fill and removed from the site. Although not anticipated, if encountered, high plasticity clays and silts should be disposed of off-site.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material should generally be granular soils with a very low to low expansion potential (i.e., an expansion index of 50 or less as evaluated by ASTM D 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

9.3. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified, moisture conditioned as needed to achieve moisture contents generally above the optimum moisture content, and then compacted to a relative compaction of 90 percent as evaluated in accordance with ASTM D 1557. The evaluation of compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when the project area is ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

9.4. Utility Trench Backfill

Based on our subsurface exploration, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the "Greenbook" (Standard Specifications for Public Works Construction) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557. Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

9.5. Preliminary Foundation Recommendations

For preliminary design purposes, shallow, spread or continuous footings founded on compacted fill or alluvial soils can be considered suitable for support of structures. Shallow, spread or continuous footings bearing on compacted fill or alluvial soils may be designed assuming an allowable bearing capacity of 2,000 psf. This allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. Spread footings should be founded 18 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches and isolated footings should be 18 inches in width or more. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

For resistance of foundations to lateral loads, we recommend an allowable passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot be used. This value assumes that the ground is horizontal for a distance of 10 feet or more, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. If passive and frictional resistances are to be used in combination, we recommend that the passive value not exceed one-half of the total resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

9.6. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Laboratory testing indicated the sulfate content of the sample tested was less than 0.2 percent, which is considered negligible for sulfate attack based on ACI criteria (ACI, 2011). Although significant sulfate content was not indicated, we recommend that Type II/V cement be used for concrete structures in contact with soil, due to the potential for variability of site soil. The water-cement ratio of the concrete should be 0.45 or less and the slump should be 4 inches or less.

9.7. Plan Review and Construction Observation

The preliminary conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Because we understand that the design of the BMPs devices for the EWMP project is conceptual at this point, we recommend that Ninyo & Moore review the devices' preliminary design, once the type and general construction of the devices is better defined. At that time, supplemental recommendations may be provided.

Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations to evaluate the assumptions inherent in the design.

The preliminary recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the preliminary conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for feasibility and preliminary design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our preliminary conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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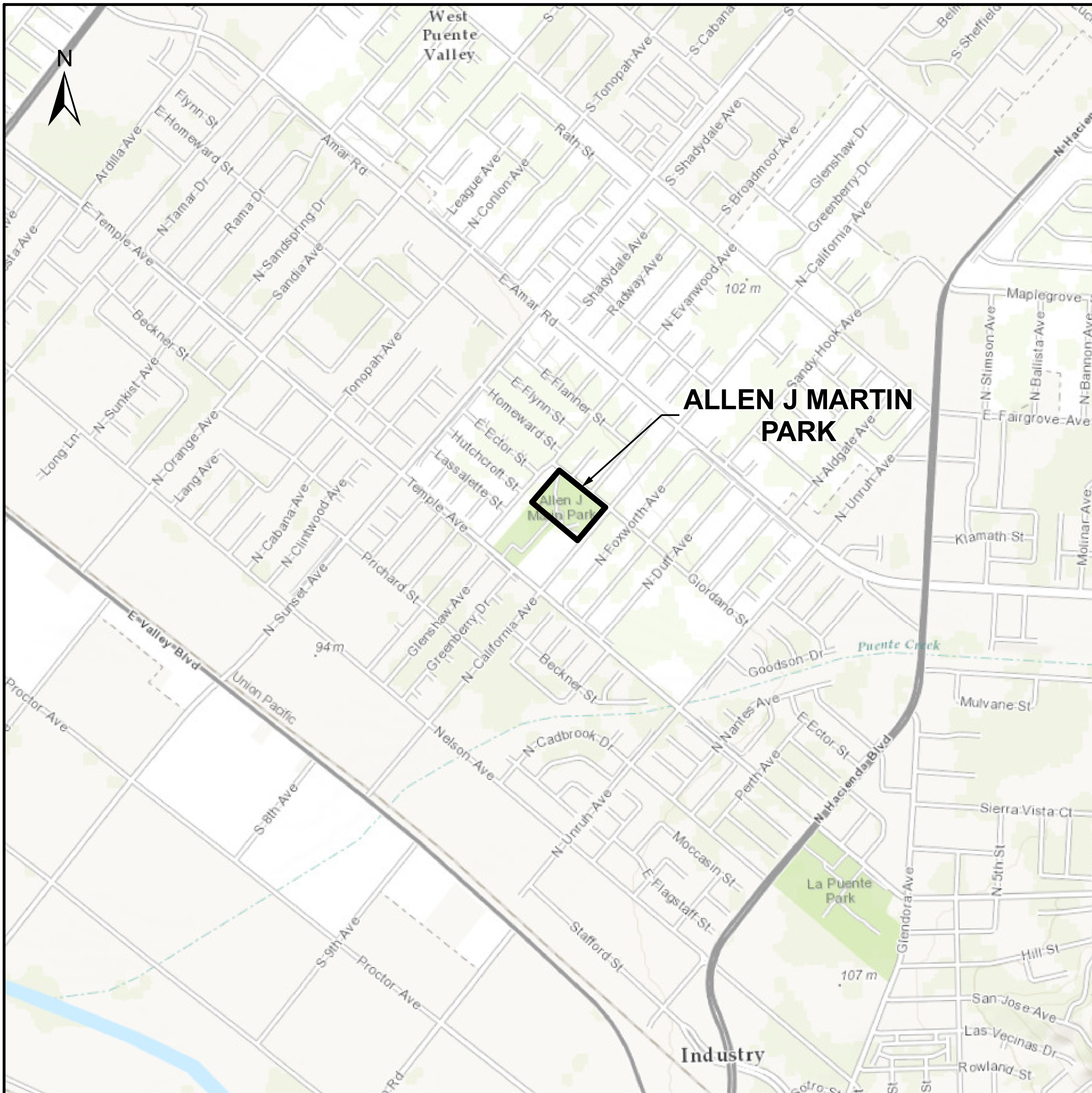
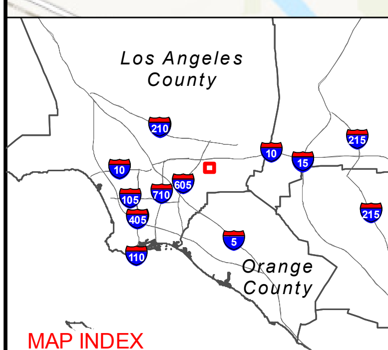


SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS.



Feet

0 750 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

1_107900001_SL_AM_93.mxd AOB

Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	ALLEN J. MARTIN PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	1
107900001	6/15		

SOURCE: Aerial Imagery - ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP.

LEGEND

SITE BOUNDARY

B-2 TD=100.8' BORING
TD=TOTAL DEPTH IN FEET

N

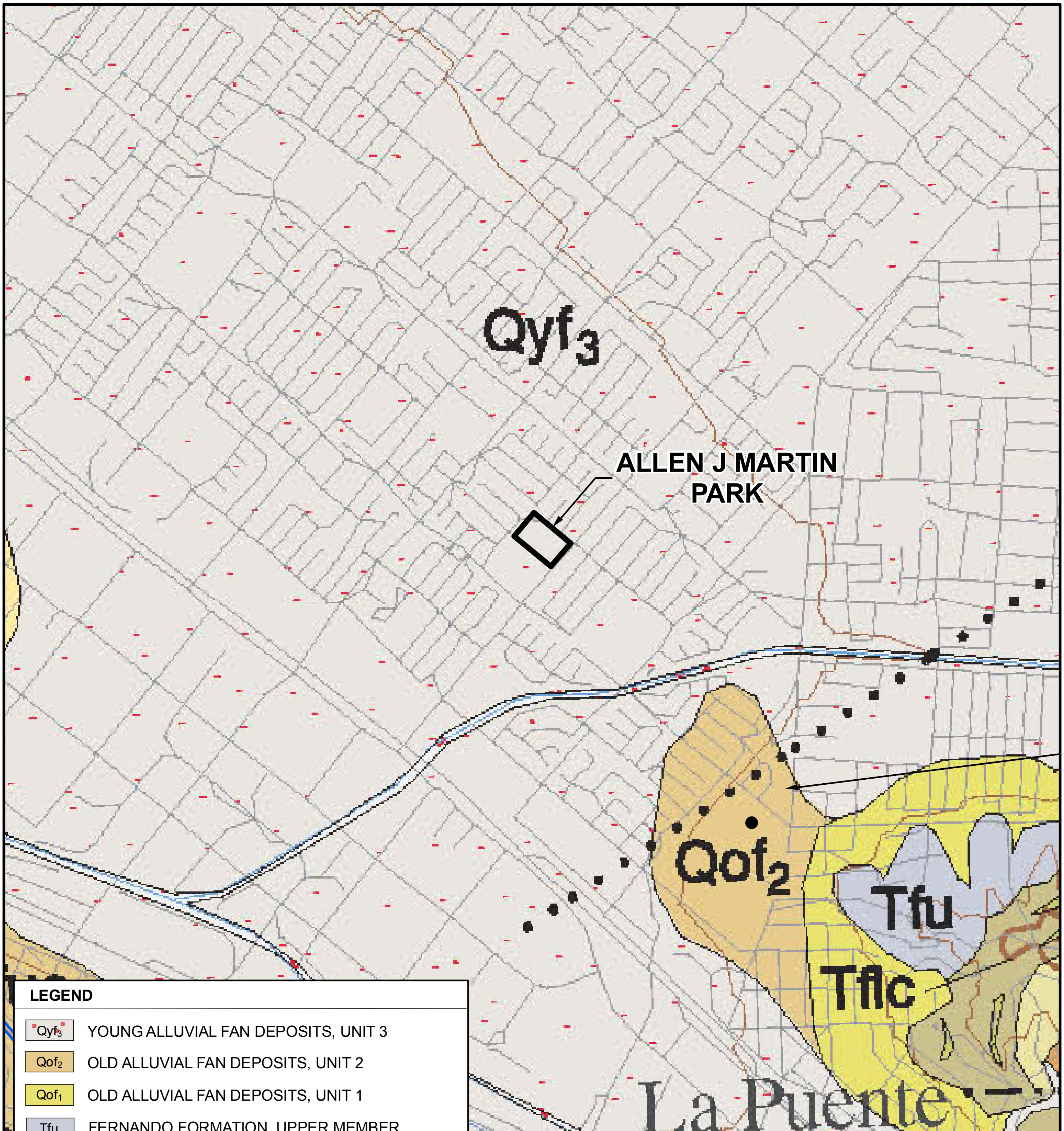
SCALE IN FEET

0 100 200 400

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		BORING LOCATION	FIGURE
PROJECT NO.	DATE	ALLEN J. MARTIN PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	2
107900001	6/15		

2_107900001_BL_AM_93.mxd AOB



LEGEND

Qyf3	YOUNG ALLUVIAL FAN DEPOSITS, UNIT 3
Qof2	OLD ALLUVIAL FAN DEPOSITS, UNIT 2
Qof1	OLD ALLUVIAL FAN DEPOSITS, UNIT 1
Tfu	FERNANDO FORMATION, UPPER MEMBER
Tflc	FERNANDO FORMATION, LOWER MEMBER, CONGLOMERATE
65 U D	FAULT - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATE, DOTTED WHERE CONCEALED. ARROW AND NUMBER INDICATE DIRECTION AND ANGLE OF DIP OF FAULT PLANE

SOURCE: MORTON, D.M., AND MILLER, F.K., 2006, GEOLOGIC MAP OF THE SAN BERNARDINO AND SANTA ANA 30' X 60' QUADRANGLE, CALIFORNIA

N

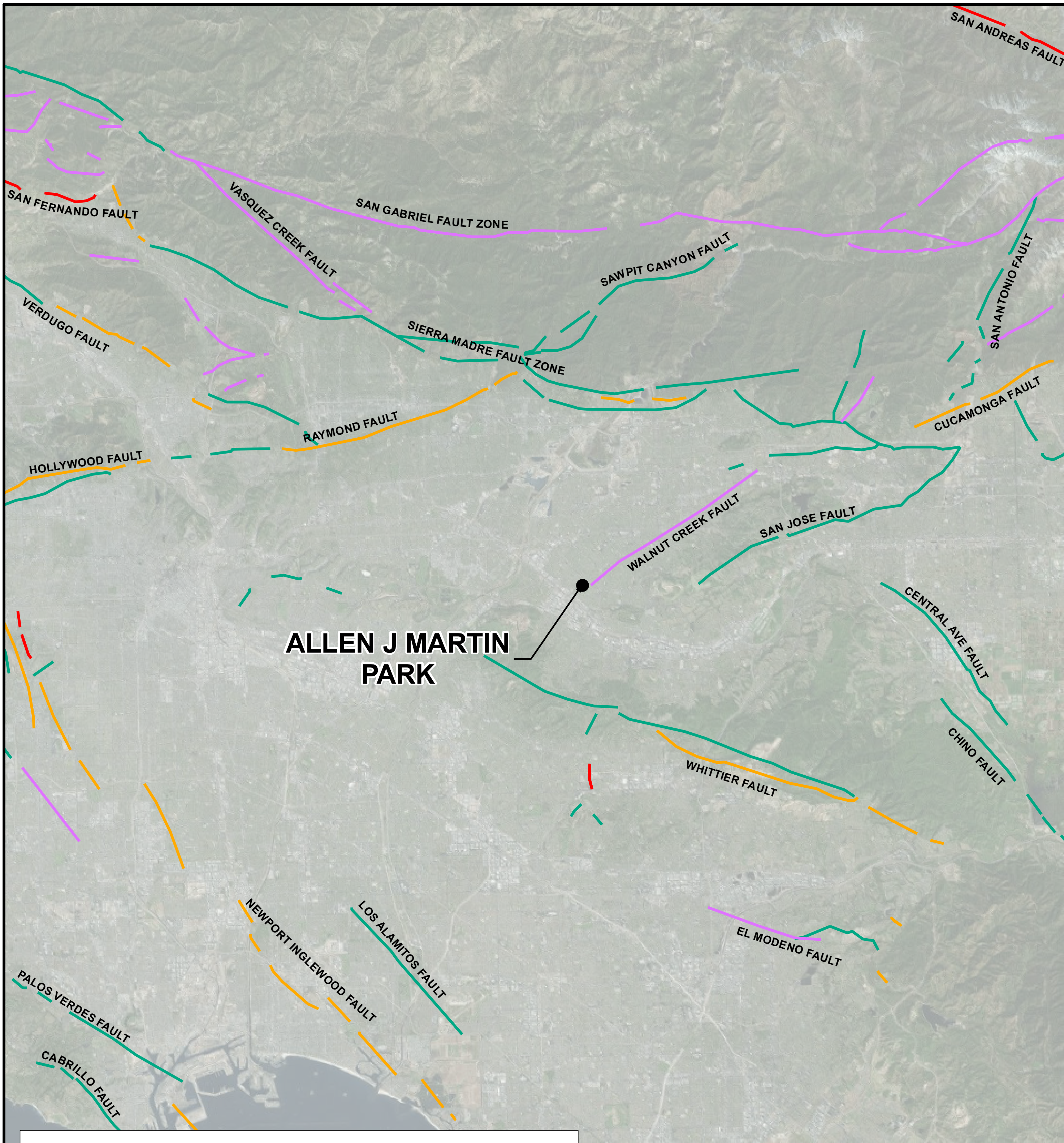
Feet

0 1,000 2,000 4,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		GEOLOGY	FIGURE
PROJECT NO.	DATE	ALLEN J. MARTIN PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	3
107900001	6/15		

13_107900001_G.mxd AOB



SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS

LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

N

Miles

0 3 6 12

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore

PROJECT NO.	DATE
107900001	6/15

FAULT LOCATIONS

ALLEN J. MARTIN PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

FIGURE

4

4_107900001_F_AM_93.mxd AOB

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1⅜ inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change.
15								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
								The total depth line is a solid line that is drawn at the bottom of the boring.
20								

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BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

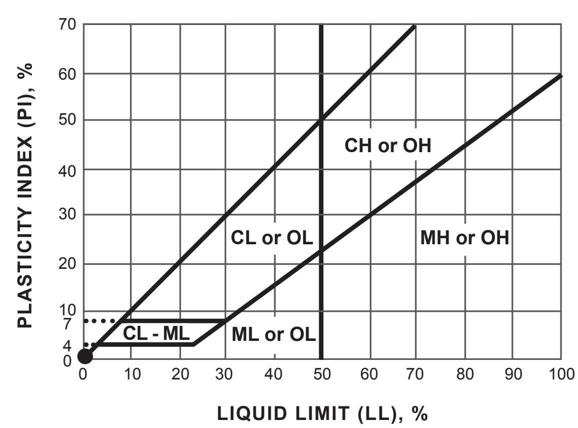
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS: GROUP SYMBOL	SECONDARY DIVISIONS: GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVEL more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SILT and CLAY liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

Ninyo & Moore

USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DATE DRILLED 3/11/15	BORING NO. B-2	
GROUND ELEVATION 315' ± (MSL)	SHEET 1 OF 3	
METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)		
DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer)	DROP 30"	
SAMPLED BY CAT	LOGGED BY CAT	REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	X						SM	FILL: Dark brown, moist, medium dense, silty fine to medium SAND; scattered roots and grass.
		X	29	9.5	110.1		SM	ALLUVIUM: Brown, moist, medium dense, silty fine SAND; trace caliche deposits; massive.
							ML	Brown, moist, medium dense, fine sandy SILT.
10		X	8	11.3				Scattered pinhole holds.
		X	16	10.9				Trace medium and coarse sand.
20		X	10	19.1				
		X	7	19.9				Dark brown; clayey; trace medium and coarse sand and gravel. Scattered black manganese deposits.
30		X	18	19.4	103.9			Finely laminated; no gravel.
		X	11	20.5				
							CL	Grades to grayish brown, moist, very stiff, silty CLAY; trace fine sand; some reddish brown mottling.
							SM	Grayish brown, moist, medium dense, silty fine SAND; some clay; some reddish brown mottling.
40								

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BORING LOG

ALLEN J. MARTIN PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-1

DATE DRILLED	3/11/15	BORING NO.	B-2
GROUND ELEVATION	315' ± (MSL)	SHEET	2 OF 3
METHOD OF DRILLING	8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)		
DRIVE WEIGHT	140 lbs. (Auto-Trip Hammer)	DROP	30"
SAMPLED BY	CAT	LOGGED BY	CAT
REVIEWED BY	GTF		

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		◣	12	20.6			SM	ALLUVIUM: (Continued) Grayish brown, moist, medium dense, silty fine SAND; some clay; some reddish brown mottling.
		◣	19	24.7			ML	Light grayish brown, moist, medium dense, fine sandy SILT; trace clay; some reddish brown staining.
50		◣	9	22.5			CL	Dark grayish brown and brown mottled, moist, stiff, silty CLAY; scattered pockets of fine gravel.
							SM	Light reddish brown, moist, very dense, silty fine SAND; scattered layers of coarse sand and fine gravel.
60		◣	53	6.1				
70		◣	50	9.6				Light yellowish brown; trace gravel up to 1-inch.
							ML	Brown and grayish brown, laminated, moist, very dense, fine sandy SILT.
80								

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BORING LOG

ALLEN J. MARTIN PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-2

DATE DRILLED 3/11/15 BORING NO. B-2

GROUND ELEVATION 315' ± (MSL) SHEET 3 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
80			25	23.8			ML	ALLUVIUM: (Continued) Light grayish brown, moist, hard, clayey SILT; scattered caliche deposits.
90			28	19.2				Fine sandy; trace clay; pockets of light gray material.
								@ 98': Gravel layer.
							SM	Light brown, moist, very dense, silty fine SAND with gravel.
100				3.9				Scattered gravel up to 1-inch in diameter.
								Total Depth = 100.8 feet. Groundwater not encountered during drilling. Backfilled shortly after drilling on 3/11/15. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
110								
120								

Ninyo & Moore

BORING LOG

ALLEN J. MARTIN PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-3

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

Moisture Content

The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis

Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-5. These test results were utilized in evaluating the soil classifications in accordance with USCS.

Atterberg Limits

Tests were performed on a selected representative fine-grained soil sample to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318. These test results were utilized to evaluate the soil classification in accordance with USCS. The test results and classification are shown on Figure B-6.

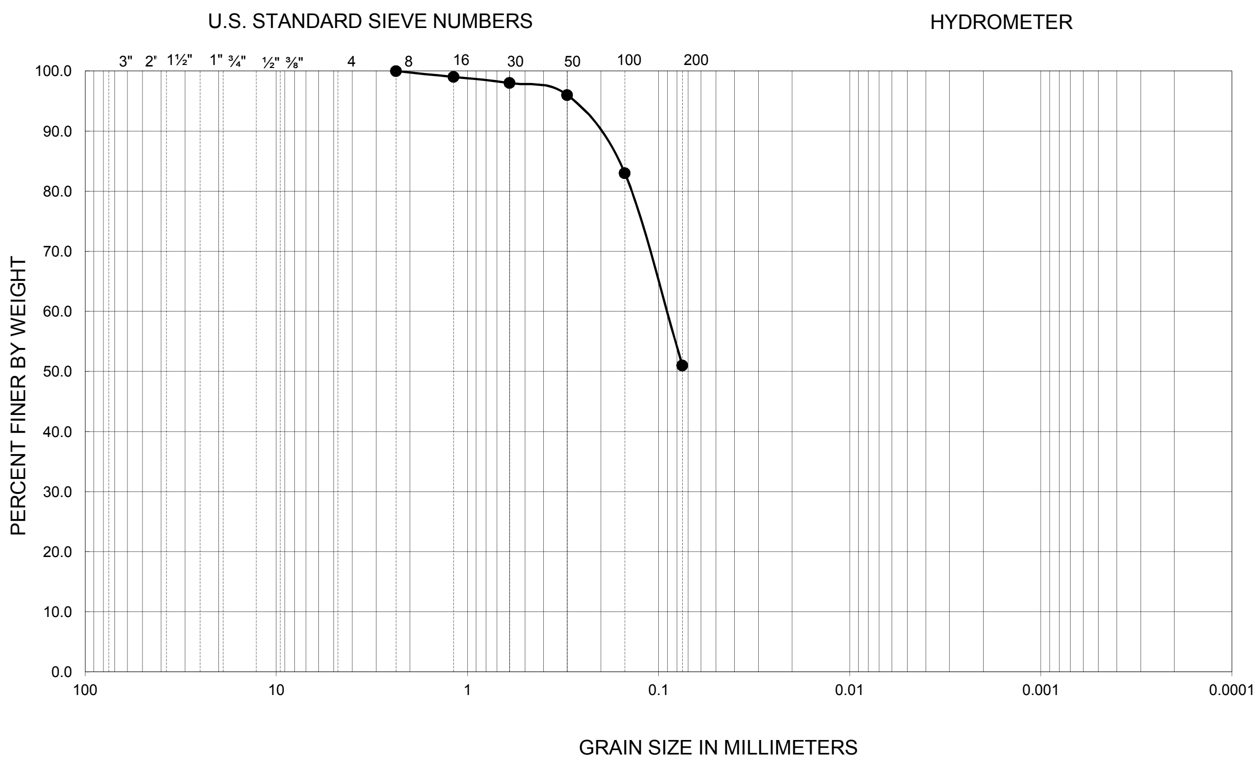
Direct Shear Tests

A direct shear test was performed on a relatively undisturbed sample in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-7.

Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-8.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-2	10.0-11.5	--	--	--	--	--	--	--	--	51	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

GRADATION TEST RESULTS

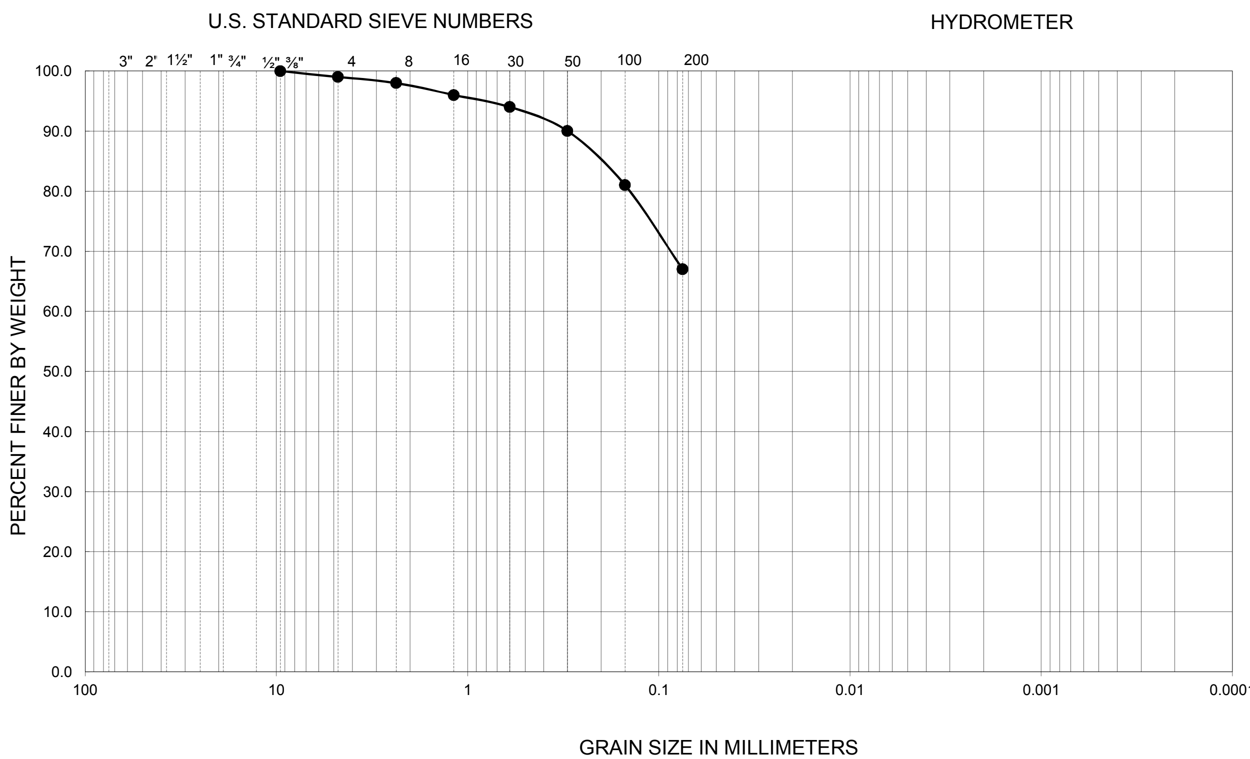
PROJECT NO.	DATE
107900001	6/15

ALLEN J. MARTIN PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

FIGURE

B-1

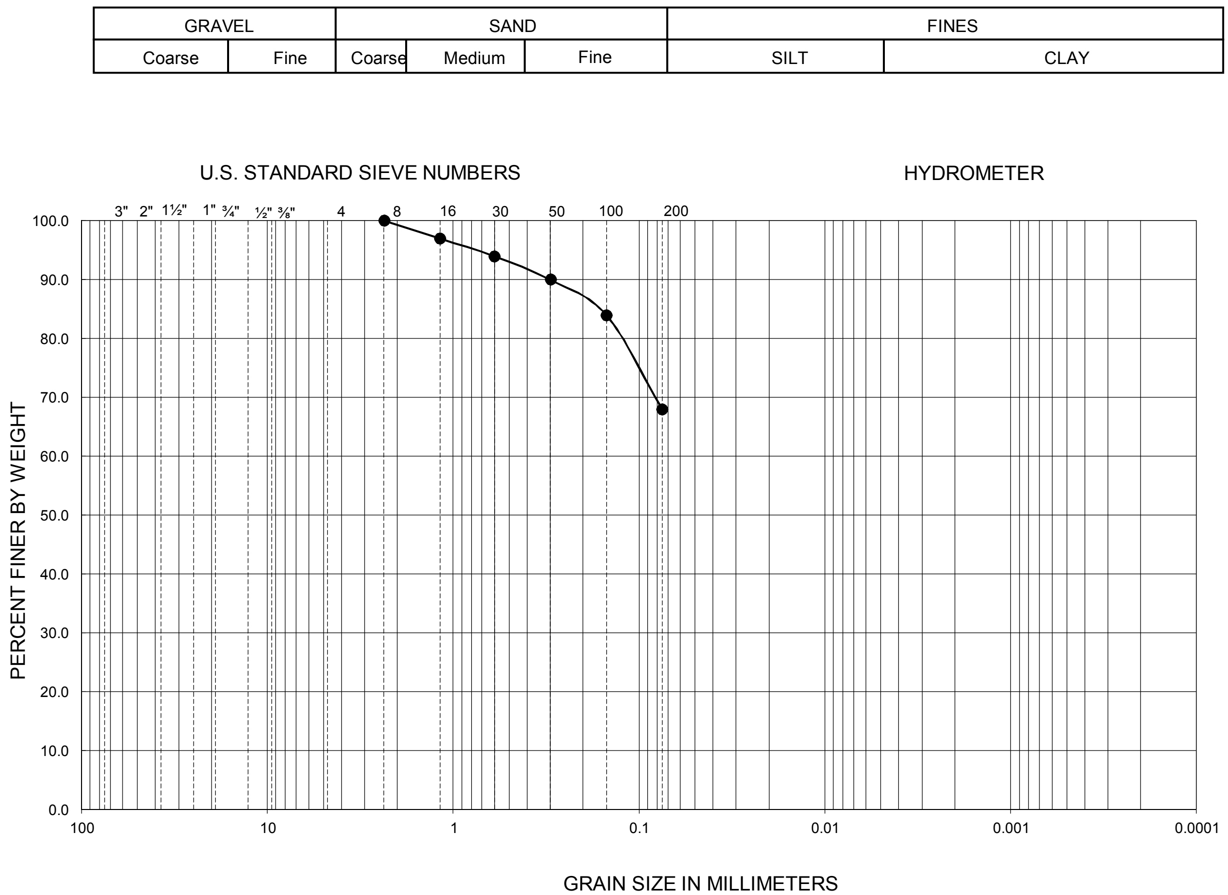
GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-2	25.0-26.5	--	--	--	--	--	--	--	--	67	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	ALLEN J. MARTIN PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-2
107900001	6/15		



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-2	35.0-36.5	--	--	--	--	--	--	--	--	68	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

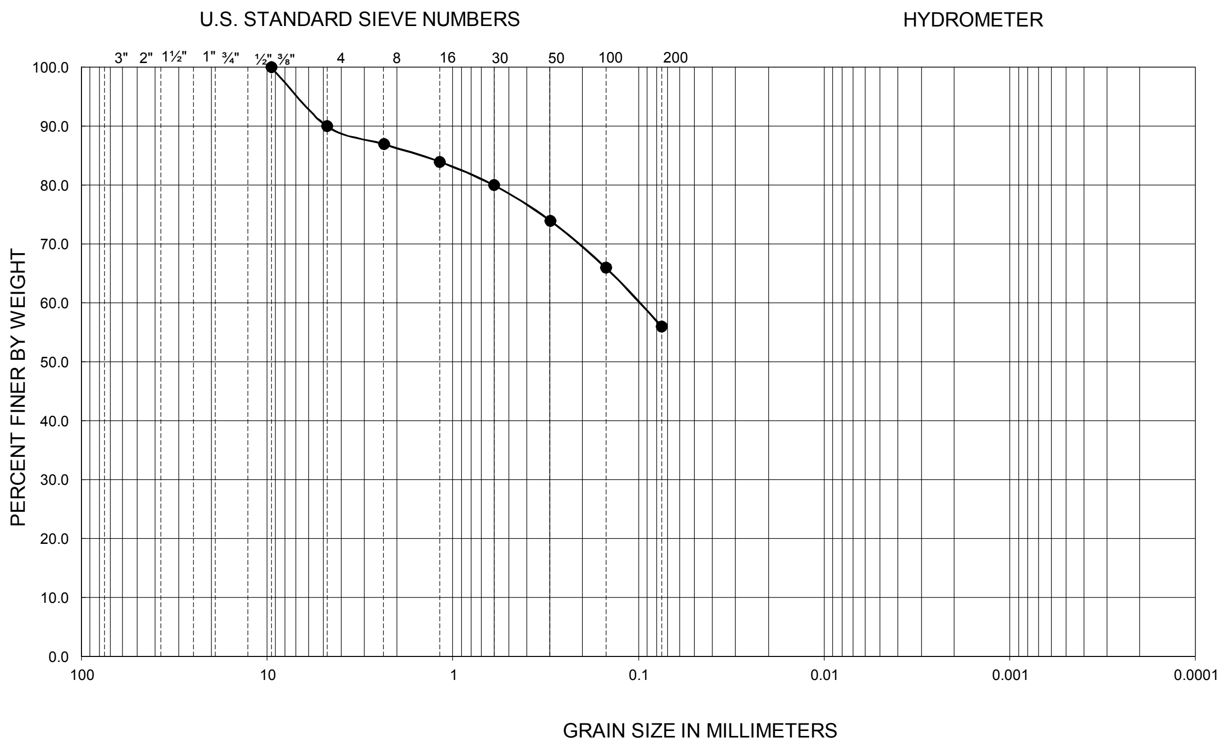
GRADATION TEST RESULTS

PROJECT NO.	DATE
107900001	6/15

ALLEN J. MARTIN PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

FIGURE
B-3

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-2	50.0-51.5	--	--	--	--	--	--	--	--	56	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

GRADATION TEST RESULTS

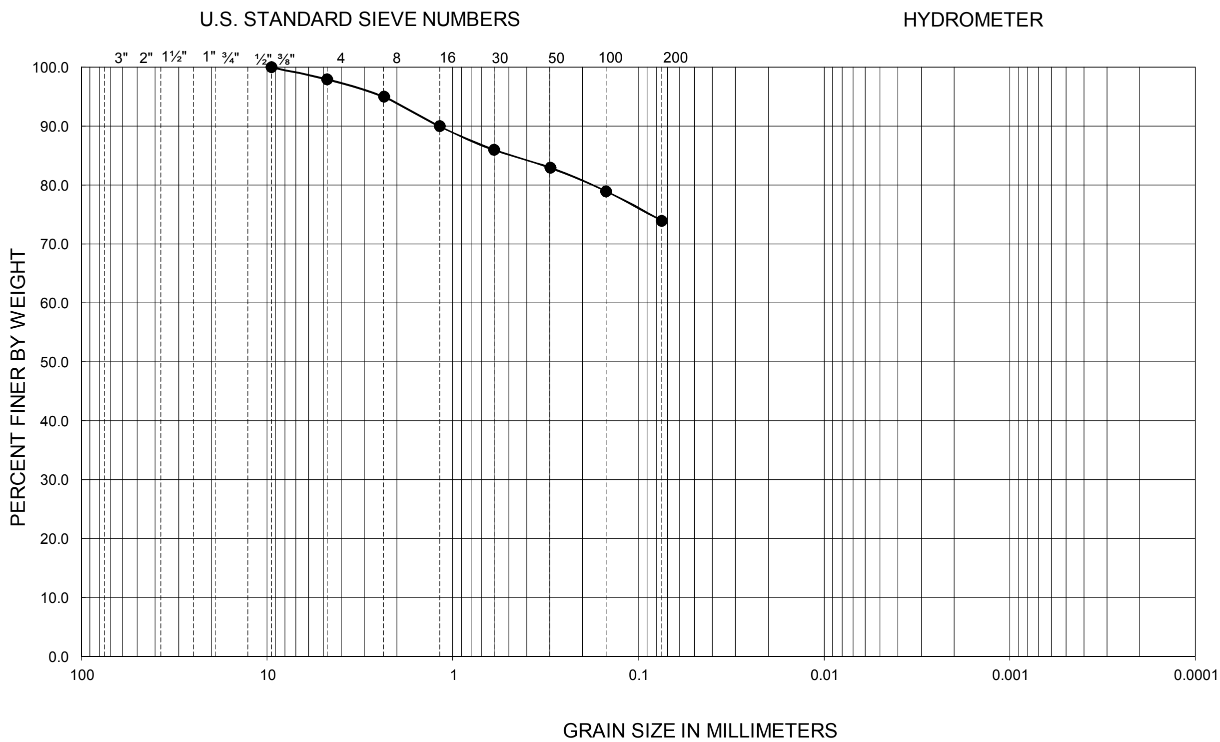
FIGURE

B-4

PROJECT NO.	DATE
107900001	6/15

ALLEN J. MARTIN PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



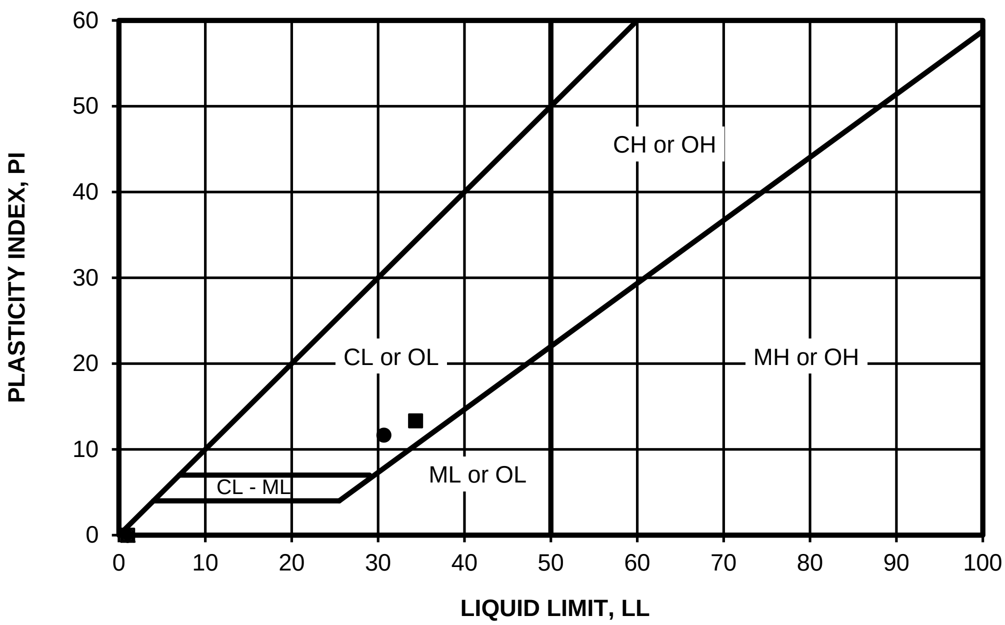
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-2	80.0-81.5	--	--	--	--	--	--	--	--	74	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	ALLEN J. MARTIN PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-5
107900001	6/15		

SYMBOL	LOCATION	DEPTH (FT)	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve)	USCS (Entire Sample)
●	B-2	35.0-36.5	31	19	12	CL	CL
■	B-2	50.0-51.5	34	21	13	CL	CL

NP - INDICATES NON-PLASTIC



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

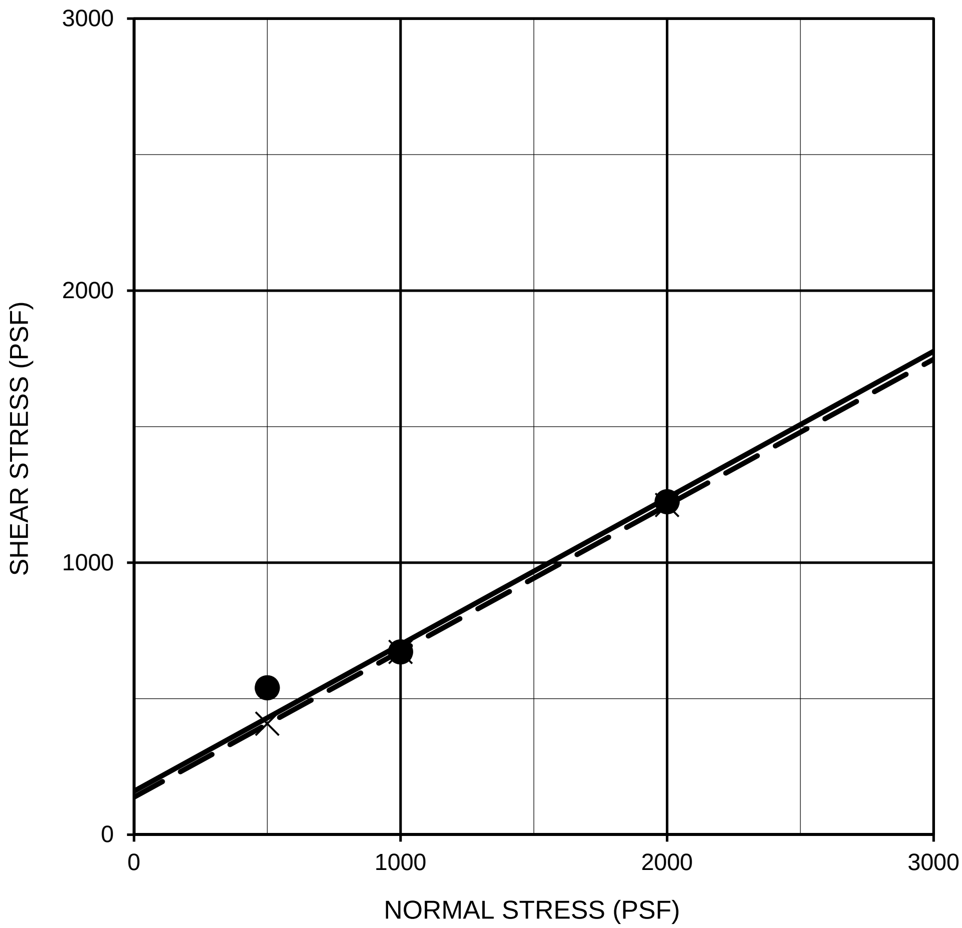
Ninyo & Moore

ATTERBERG LIMITS TEST RESULTS

PROJECT NO.	DATE
107900001	6/15

ALLEN J. MARTIN PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

FIGURE
B-6



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SAND	—●—	B-2	5.0-6.5	Peak	160	28	SM
Silty SAND	- - x - -	B-2	5.0-6.5	Ultimate	140	28	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore	DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO. / DATE	ALLEN J. MARTIN PARK	B-7
107900001 / 6/15	UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2] (ppm)	SULFATE CONTENT [2] (%)	CHLORIDE CONTENT [3] (ppm)
B-2	1.0-5.0	7.6	2,200	60	0.006	100

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore

CORROSIVITY TEST RESULTS

PROJECT NO.	DATE
107900001	6/15

ALLEN J. MARTIN PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

FIGURE

B-8

ATTACHMENT 3

GEOTECHNICAL REPORT FOR BASSETT PARK

GEOTECHNICAL SERVICES
BASSETT PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NO. T10503269-102669-OM

PREPARED FOR:
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:
Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
Bassett Park
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order No. T10503269-102669-OM

Dear Ms. Kelly:

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Bassett Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. This report presents geotechnical data obtained by Ninyo & Moore relative to the proposed project. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

William R. Morrison

REGISTERED PROFESSIONAL ENGINEER
WILLIAM R. MORRISON
No. 2468
Exp. 12/31/16
GEOTECHNICAL
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William Morrison, PE, GE
Senior Engineer

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STATE OF CALIFORNIA

CAT/WRM/GTF/KHM/gg

Distribution: (1) Addressee (via e-mail)

TABLE OF CONTENTS

Appendices

1. INTRODUCTION

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Bassett Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California (Figure 1). This report presents a compilation of geotechnical data obtained from the project along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project. We understand that the information contained herein will be included in the environmental report.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and subsurface exploration with regard to the proposed project. Specifically, we performed the following tasks:

- Review of readily available background materials, including State of California Seismic Hazards Zones map, State of California Earthquake Fault Zone map (Alquist-Priolo Special Studies Zones map), other published geologic maps and literature, in-house information, stereoscopic aerial photographs, and plans provided by the client.

- Performance of a site reconnaissance to observe the existing conditions at the site and to mark the proposed boring location for utility clearance. Mark-out of potential existing underground utilities was conducted through Underground Service Alert (USA).

- Performing a subsurface exploration consisting of drilling, logging and sampling of one exploratory soil boring at the site. The boring was advanced to a depth of approximately 101 feet using a truck-mounted drill rig equipped with hollow stem augers.

- Performing geotechnical laboratory testing on soil samples collected during our subsurface exploration. The testing included an evaluation of moisture content, in-situ moisture and dry density, grain-size analysis (sieve and 200 wash), direct shear, and soil corrosivity.

- Compiling the data obtained from our background research, subsurface exploration, and laboratory testing.

- Preparing this report that presents geotechnical data obtained from our background review, site reconnaissance, and subsurface exploration at the project site, along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project.

3. PROJECT AND SITE DESCRIPTION

The purpose of the project is to assist MWH Americas (MWH) and the Los Angeles County Department of Public Works (LADPW) in developing an Enhanced Watershed Management Program (EWMP) for the Upper San Gabriel River Watershed. Our services are intended to help support feasibility analyses being conducted by MWH and LADPW for Better Management Practices (BMPs) at specific locations as part of the EWMP. We understand that the BMPs will help to reduce the impact of storm water and non-storm water discharges on the area (MWH, 2014).

Ten separate sites located within the San Gabriel Valley in Los Angeles County, California have been selected for feasibility analyses for the project. This report addresses the Bassett County Park site, which is located at 510 N. Vineland Avenue in the city of La Puente (Figures 1 and 2). Bassett Park is maintained by the County of Los Angeles. Geotechnical evaluations for the other nine sites are addressed in reports that are being issued under separate covers (Ninyo & Moore, 2015a through 2015i).

Bassett County Park is developed with improvements that include restroom and recreation center buildings, soccer fields, asphalt concrete (AC) paved parking lots, paved and unpaved walkways, playground equipment, light poles, landscaping consisting of trees, shrubs, and grass areas, and other associated appurtenances. The site for the proposed improvements is located in a grass area in the central portion of the park to the south of the recreation center building. The site coordinates are approximately 34.0513°N latitude and -117.9877°W longitude. The elevation at the project site is approximately 300 feet above mean sea level (MSL).

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our field exploration at the Bassett Park site included a geologic reconnaissance that was conducted on February 19, 2015 and subsurface exploration that was conducted on March 12, 2015. The subsurface exploration consisted of drilling one 8-inch diameter hollow stem auger boring (B-3) to a depth of 100.8 feet below ground surface (bgs). The boring was logged by a geologist from our firm. Representative disturbed and undisturbed soil samples were obtained at selected depths from the boring for laboratory testing. The approximate location of the boring is presented on Figure 2. The boring log is presented in Appendix A.

Laboratory testing of selected soil samples obtained from our exploratory boring included in-situ dry density and moisture content, gradation, direct shear, and soil corrosivity. The results of the in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests described above are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, and groundwater conditions at the Bassett Park site are provided in the following sections.

5.1. Regional and Geologic Setting

The subject site is located within the northeastern portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Norris and Webb, 1990). The geomorphic province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and continues farther to the tip of Baja California. The Los Angeles Basin has been divided into four structural blocks which are generally bounded by prominent fault systems. The site is located within the Northeastern Block, which is bordered on the west and south by the Whittier-Elsinore fault and is bordered on the north by the San Gabriel Mountains and the Raymond Hill Fault. The Northeastern Block is a deep basin characterized by thick sequences of alluvium and sedimentary units overlying basement rocks, which are at depths of up to approximately 12,000 feet below the surface in the central part of the San Gabriel Valley.

5.2. Site Geology

Our review of the referenced geologic maps and literature indicates that the subject site is underlain by Holocene to Pleistocene alluvial gravel and sand (Dibblee and Ehrenspeck, 1999). Geologic units encountered during our reconnaissance and subsurface exploration of the project site included relatively thin fill soils that mantle alluvium. Generalized descriptions of the units encountered are provided in the subsequent sections. Additional descriptions are provided on the boring logs in Appendix A. A geologic map of the region is presented on Figure 3.

5.2.1. Fill

Fill materials were encountered in our boring B-3 extending from the ground surface to a depth of approximately 5 feet below existing grade. As observed, the fill materials generally consisted of dark brown, moist, medium dense, silty sand. Scattered roots and grass were encountered in the fill materials.

5.2.2. Alluvium

Alluvium was encountered in our boring B-3 underlying the fill materials and was observed to extend to the total depth explored of 100.8 feet below existing grade. As observed in our boring, the alluvial materials generally consisted of various shades of brown, moist, loose to very dense, well graded sands, poorly graded sands, and silty sands. Scattered gravel and gravel layers were encountered at various depths in the alluvium.

5.3. Groundwater

Groundwater was not encountered during our subsurface exploration in our boring B-3. Fluctuations in the groundwater level and perched conditions typically occur due to variations in precipitation, ground surface topography, subsurface stratification, irrigation, and other factors.

6. FAULTING AND SEISMICITY

Based on our review of published geologic maps and review of stereoscopic aerial photographs, no active fault traces are mapped as underlying the Bassett Park site. Therefore, the potential for surface fault rupture at the site is considered to be low. The project site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, Bassett Park is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed improvements. Figure 4 shows the approximate site location relative to the major faults in the region. The nearest known active fault is the Whittier segment of the Elsinore fault, located approximately 5 miles south of the site.

6.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated at 0.867g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based).

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.772g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.772g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.2. Surface Fault Rupture

The probability of damage due to surface ground rupture is relatively low due to the lack of known active faults crossing the project site. Surface ground cracking related to shaking from distant events is not considered a significant hazard, although it is a possibility.

6.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon in which loosely deposited, granular soils and some fine-grained soils located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration

can result in a loss of grain-to-grain contact due to a rapid rise in pore water pressure causing the soil to behave as a fluid for a short period. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

According to the Seismic Hazard Zones Map for the Baldwin Park Quadrangle, (CGS, 1999), the Bassett Park site is mapped as being in an area susceptible to liquefaction. While review of the Seismic Hazard Zone Report for the Baldwin Park Quadrangle (CGS, 1998) indicates that the historic high groundwater is at a depth of less than 10 feet, groundwater was not encountered at Bassett Park to the total depth explored of 100.8 feet during our subsurface exploration. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Bassett Park site.

7. OTHER GEOTECHNICAL CONSIDERATIONS

7.1. Slope Stability

Our review of maps published by the California Geological Survey (CGS, 1999) indicates that the Bassett Park site is not situated in an area considered to be susceptible to seismic-induced landsliding. In addition, our observations indicate that the site is generally level to gently sloping. Consequently, landsliding or slope instability are not considered to be a constraint at the project site.

7.2. Corrosion

Laboratory testing was performed on representative samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with the California Test (CT) 643 and the sulfate and chloride tests were performed in accordance with CTs 417 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing performed on a sample obtained from the site indicated an electrical resistivity value of 3,900 ohm-cm, a soil pH value of 8.4, a chloride content of 190 ppm, and a sulfate content of 0.010 percent. According to Caltrans criteria (2012) and American Concrete Institute (ACI) 318 guidelines, a corrosive soil is defined as one with more than 500 ppm chlorides, more than 0.2 percent sulfates, a pH less than 5.5, or an electrical resistivity of less than 1,000 ohm-cm. Based on the Caltrans criteria and ACI guidelines, the upper soils encountered at the site are not considered to be corrosive.

8. DISCUSSION AND FINDINGS

As discussed above, our geotechnical services were performed to assist MWH and LADPW evaluate the preliminary feasibility of an onsite storm water infiltration system at the Bassett Park site. Based on our communications with MWH, we understand that the preliminary criteria at the site is related to the presence of groundwater or dense materials providing refusal to drilling equipment within 100 feet of the ground surface. As such, our scope of services included the drilling of an exploratory boring that extended to a depth of 100 feet, to groundwater, or to refusal (whichever is shallower). We understand that BMPs being considered for the site are conceptual at this time. Based on the information obtained from our geotechnical evaluation, the following findings and conclusions have been made:

- The project site is underlain by relatively shallow fill (approximately 5 feet deep) overlying alluvial soils. The encountered portions of the fill were generally comprised of silty sands that contained scattered organic material, along with scattered amounts of gravel. The underlying alluvial soils were observed to consist of well graded sands, poorly graded sands, and silty sands.
- Groundwater was not encountered in our exploratory boring to the total depth explored of 100.8 feet.
- Based on our review of aerial photographs and published geologic maps, there are no known active faults or landslides underlying the project site.
- Our faulting and seismicity evaluation indicated that the site is subject to severe ground shaking due to a design seismic event.

- Review of geological literature indicates that the site is situated in an area that has been mapped as being susceptible to liquefaction. However, groundwater was not encountered in our exploration at the site. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Bassett Park site. However, it may be prudent to perform a detailed liquefaction evaluation in accordance with California Geological Survey guidelines (CGS, 2008).

- In-place infiltration testing was not performed as part of our geotechnical services. However, based on published correlations between a soil's grain size and its permeability (Shepherd, 1989), an estimated permeability on the order of 10^{-3} cm/sec within the encountered sandy soils can be utilized for preliminary evaluation purposes. Actual design of storm water infiltration devices should be in accordance with the County of Los Angeles guidelines and should be based on field infiltration testing at the site.

- Recommendations provided in this report are preliminary in nature and are not intended to provide sufficient information to fully address potential geotechnical related issues. Prior to site development an additional geotechnical evaluation should be performed.

9. PRELIMINARY RECOMMENDATIONS

As noted above we understand that the Better Management Practices (BMPs) associated with the proposed Upper San Gabriel River EWMP Project are conceptual at this time. As such, details regarding the types and construction of the BMPs (if any) are not known at this time for the Bassett Park site. We recommend that the geotechnical information presented herein be utilized during the evaluation of the feasibility of the devices associated with the EWMP project at the site. The design of BMPs should be performed in accordance with County of Los Angeles guidelines.

The following sections of this report provide preliminary recommendations for earthwork and design of structure foundations for preliminary planning purposes. Once the type and general construction of the devices is better defined, Ninyo & Moore should review the devices' preliminary design. At that time, supplemental recommendations may be provided.

9.1. Site Preparation

Prior to earthwork, the project site should be cleared of existing structures, pavement, abandoned utilities (if present), and stripped of rubble, debris, vegetation, loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite.

9.2. Materials for Fill

On-site soils relatively free of organic material are suitable for reuse as fill. In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾-inch. Oversize materials should be separated from material to be used for fill and removed from the site. Although not anticipated, if encountered, high plasticity clays and silts should be disposed of off-site.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material should generally be granular soils with a very low to low expansion potential (i.e., an expansion index of 50 or less as evaluated by ASTM D 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

9.3. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified, moisture conditioned as needed to achieve moisture contents generally above the optimum moisture content, and then compacted to a relative compaction of 90 percent as evaluated in accordance with ASTM D 1557. The evaluation of

compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when the project area is ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

9.4. Utility Trench Backfill

Based on our subsurface exploration, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the "Greenbook" (Standard Specifications for Public Works Construction) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557.

Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

9.5. Preliminary Foundation Recommendations

For preliminary design purposes, shallow, spread or continuous footings founded on compacted fill or alluvial soils can be considered suitable for support of structures. Shallow, spread or continuous footings bearing on compacted fill or alluvial soils may be designed assuming an allowable bearing capacity of 2,000 psf. This allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. Spread footings should be founded 18 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches and isolated footings should be 18 inches in width or more. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

For resistance of foundations to lateral loads, we recommend an allowable passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot be used. This value assumes that the ground is horizontal for a distance of 10 feet or more, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. If passive and frictional resistances are to be used in combination, we recommend that the passive value not exceed one-half of the total resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

9.6. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Laboratory testing indicated the sulfate content of the sample tested was less than 0.2 percent, which is considered negligible for sulfate attack based on ACI criteria (ACI, 2011). Although significant sulfate content was not indicated, we recommend that Type II/V cement be used for concrete structures in contact with soil, due to the potential for variability of site soil. The water-cement ratio of the concrete should be 0.45 or less and the slump should be 4 inches or less.

9.7. Plan Review and Construction Observation

The preliminary conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Because we understand that the design of the BMPs devices for the EWMP project is conceptual at this point, we recommend that Ninyo & Moore review the devices' preliminary design, once the type and general construction of the devices is better defined. At that time, supplemental recommendations may be provided.

Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations to evaluate the assumptions inherent in the design.

The preliminary recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the preliminary conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for feasibility and preliminary design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our preliminary conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to

government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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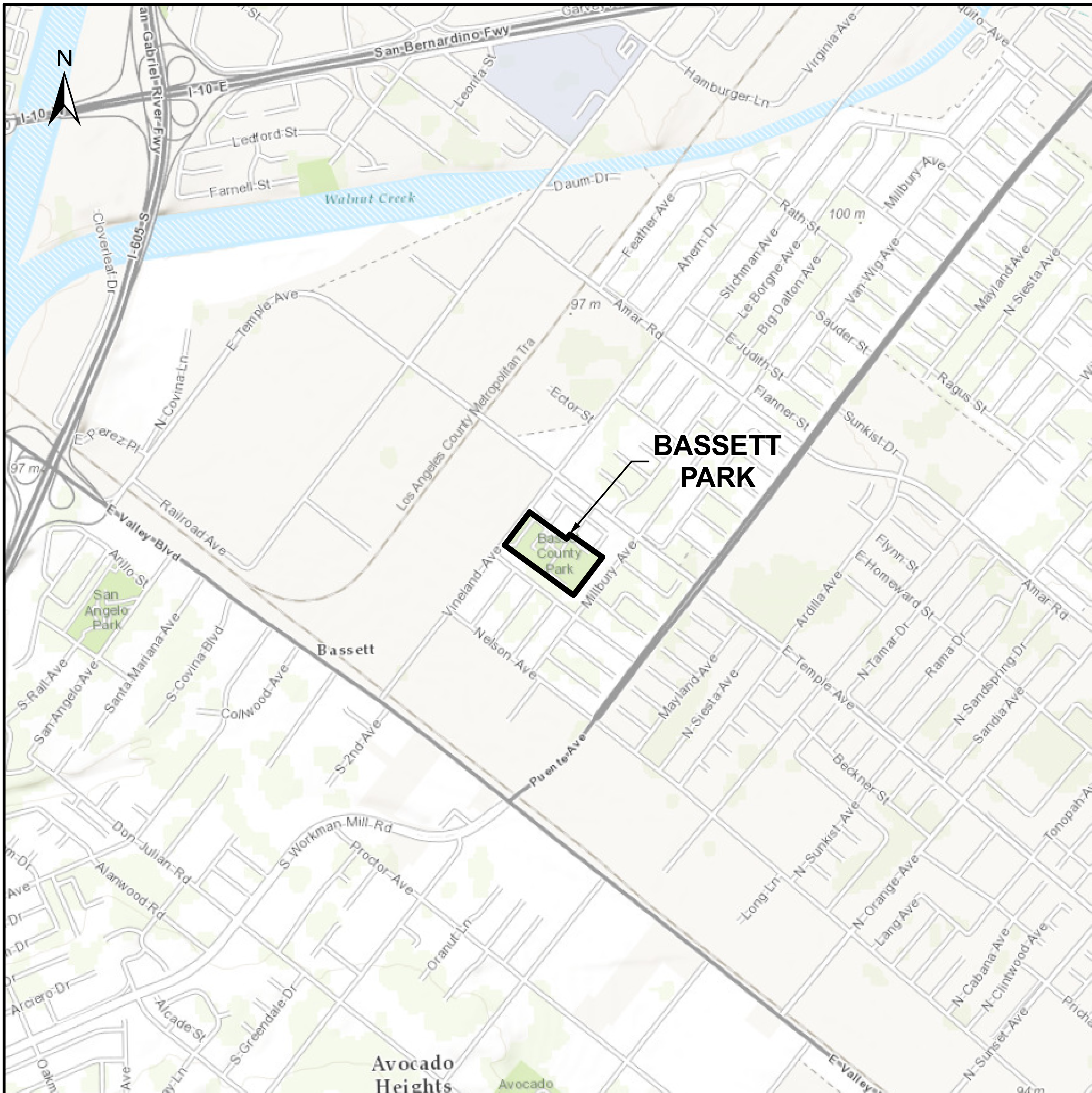
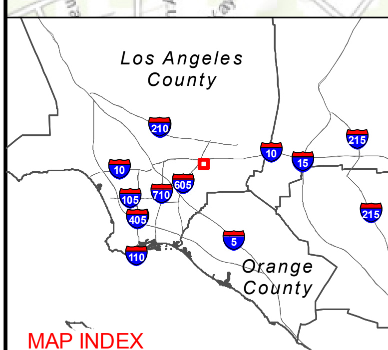


SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS.



Feet

0 750 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

1_107900001_SL_BAS_93.mxd AOB

Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	BASSETT PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	1
107900001	6/15		

SOURCE: Aerial Imagery - ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP.

LEGEND

SITE BOUNDARY

B-3 TD=100.8' BORING
TD=TOTAL DEPTH IN FEET

N

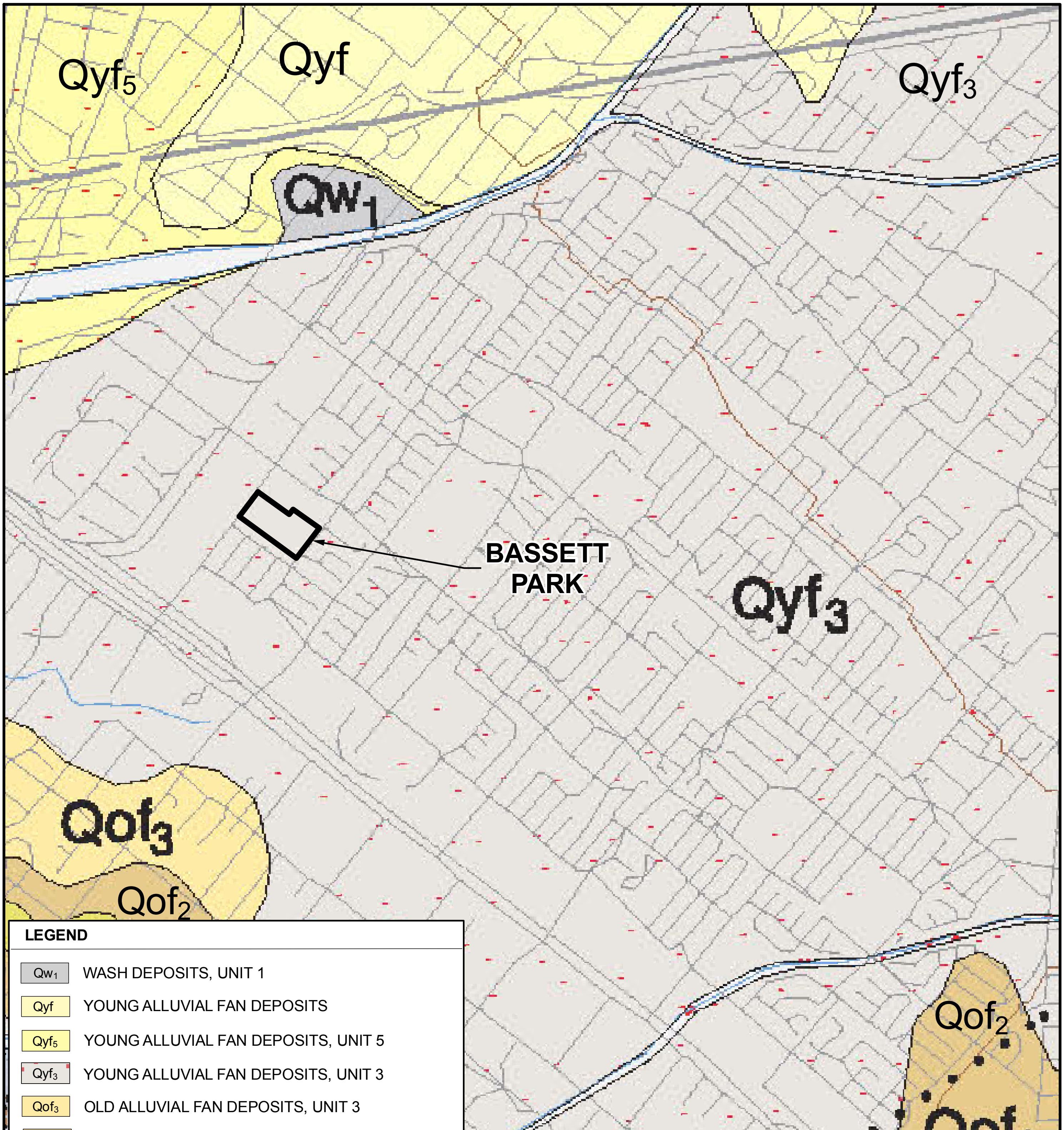
SCALE IN FEET

0 100 200 400

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

2_107900001_BL_BAS_93.mxd AOB

Ninyo & Moore		BORING LOCATION	FIGURE
PROJECT NO.	DATE	BASSETT PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	2
107900001	6/15		



LEGEND

Qw_1	WASH DEPOSITS, UNIT 1
Qyf	YOUNG ALLUVIAL FAN DEPOSITS
Qyf_5	YOUNG ALLUVIAL FAN DEPOSITS, UNIT 5
Qyf_3	YOUNG ALLUVIAL FAN DEPOSITS, UNIT 3
Qof_3	OLD ALLUVIAL FAN DEPOSITS, UNIT 3
Qof_2	OLD ALLUVIAL FAN DEPOSITS, UNIT 2

65 U D — FAULT - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATE, DOTTED WHERE CONCEALED. ARROW AND NUMBER INDICATE DIRECTION AND ANGLE OF DIP OF FAULT PLANE

SOURCE: MORTON, D.M., AND MILLER, F.K., 2006, GEOLOGIC MAP OF THE SAN BERNARDINO AND SANTA ANA 30' X 60' QUADRANGLE, CALIFORNIA

N

Feet

0 1,000 2,000 4,000

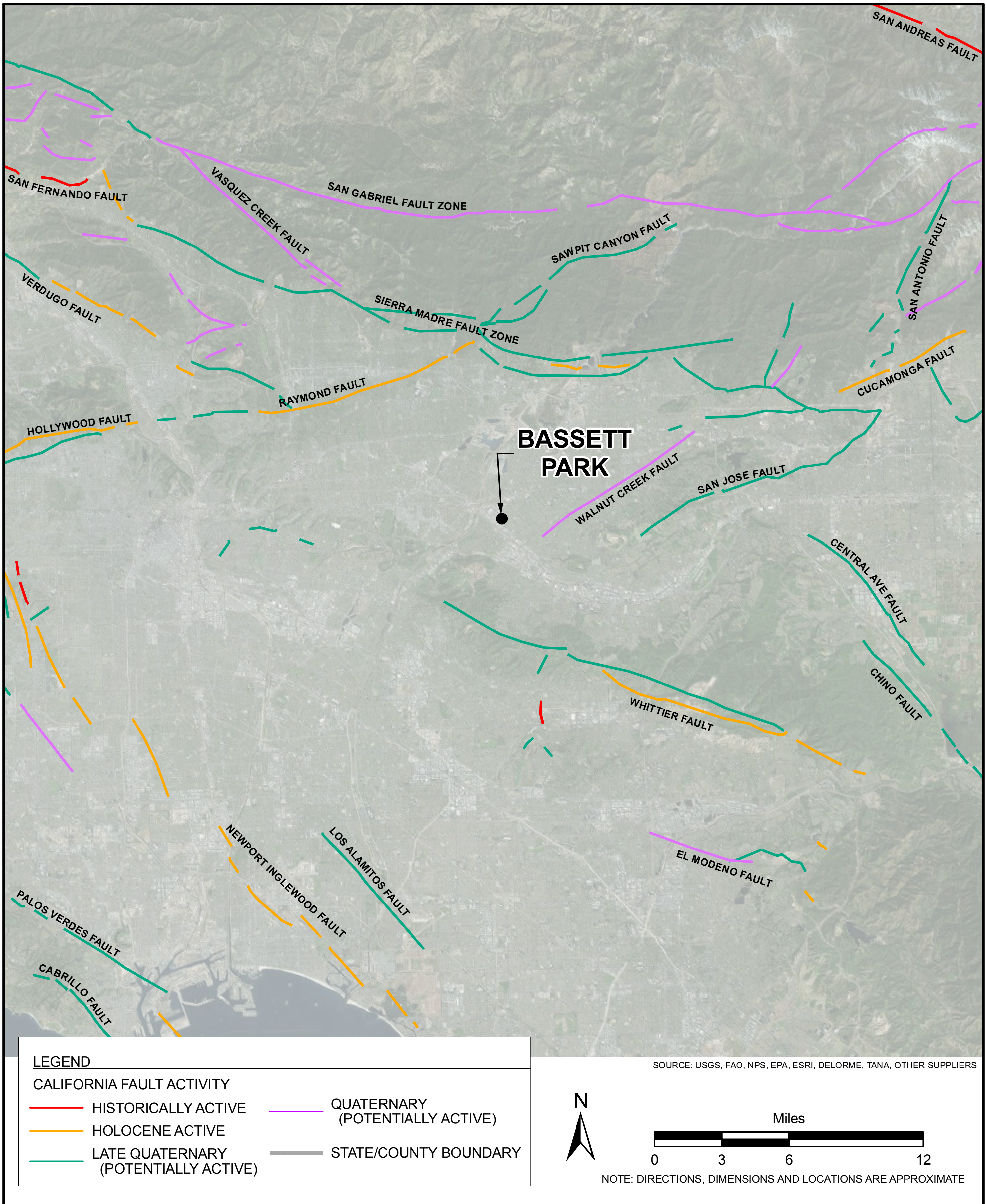
NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore

GEOLOGY		FIGURE
PROJECT NO.	DATE	
107900001	6/15	3

BASSETT PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

3_107900001_G_BAS_93.mxd AOB



Ninyo & Moore

PROJECT NO.	DATE
107900001	6/15

FAULT LOCATIONS

BASSETT PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

FIGURE 4

4_107900001_F_BAS_93.mxd AOB

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1⅜ inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change.
								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
15								
								The total depth line is a solid line that is drawn at the bottom of the boring.
20								

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BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

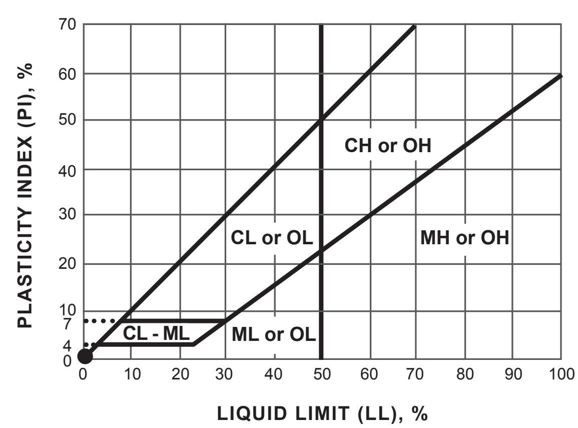
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS	
			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVEL more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SILT and CLAY liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DATE DRILLED 3/12/15 BORING NO. B-3

GROUND ELEVATION 300' ± (MSL) SHEET 1 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	FILL: Dark brown, moist, medium dense, silty fine SAND; scattered grass and roots.
			14	24.9	95.3		SM	ALLUVIUM: Brown, moist, loose to medium dense, silty fine SAND; few roothairs.
10			5	12.2				Loose.
			23	2.5				Light brown; dense; trace coarse sand and fine gravel. Gravel layer.
20			22	2.2	106.3			Brown; medium dense; silty fine sand.
			13	9.0				Some coarse sand to fine gravel in shoe.
30			15	11.7				Some faint reddish brown mottling; micaceous.
			18	11.4				Light grayish brown.
40								

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BORING LOG

BASSETT PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-1

DATE DRILLED	3/12/15	BORING NO.	B-3
GROUND ELEVATION	300' ± (MSL)	SHEET 2 OF 3	
METHOD OF DRILLING	8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)		
DRIVE WEIGHT	140 lbs. (Auto-Trip Hammer)	DROP	30"
SAMPLED BY	CAT	LOGGED BY CAT	REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		X	30	3.0			SW-SM	ALLUVIUM: (Continued) Light grayish brown, moist, dense, silty fine to coarse SAND; few fine gravel with scattered layers of grayish brown, moist, very stiff, SILT; finely laminated.
		X	48	2.9				Little cohesion; gravel up to 1/2-inch in diameter.
50		X	66	9.3	113.3			Scattered gravel up to 2 inches in diameter.
								Gravel layer.
60		X	61	3.0				Very dense; scattered gravel up to 1-inch in diameter.
								@ 65' to 68': Scattered gravel.
								Scattered layers of gravelly sand; scattered fine laminations.
70		X	66	3.8				
80								

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BORING LOG

BASSETT PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-2

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 3/12/15 BORING NO. B-3 / GROUND ELEVATION 300' ± (MSL) SHEET 3 OF 3 / METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden) / DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30" / SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF / DESCRIPTION/INTERPRETATION
80			50/5"	2.5			SP-SM	ALLUVIUM: (Continued) Light brown, moist, very dense, poorly graded SAND with silt; gravel up to 1/2-inch in diameter.
							SM	Mottled brown and reddish brown, moist, very dense, silty fine SAND; trace clay; scattered fine laminations.
90			45	9.5				
100			50/4"	2.9				Light grayish brown; silty fine to coarse sand; scattered gravel up to 1-inch in diameter (gravel in shoe).
								Total Depth = 100.8 feet. Groundwater not encountered during drilling. Backfilled shortly after drilling on 3/12/15. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
110								
120								

Ninyo & Moore

BORING LOG

BASSETT PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-3

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

Moisture Content

The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis

Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-3. These test results were utilized in evaluating the soil classifications in accordance with USCS.

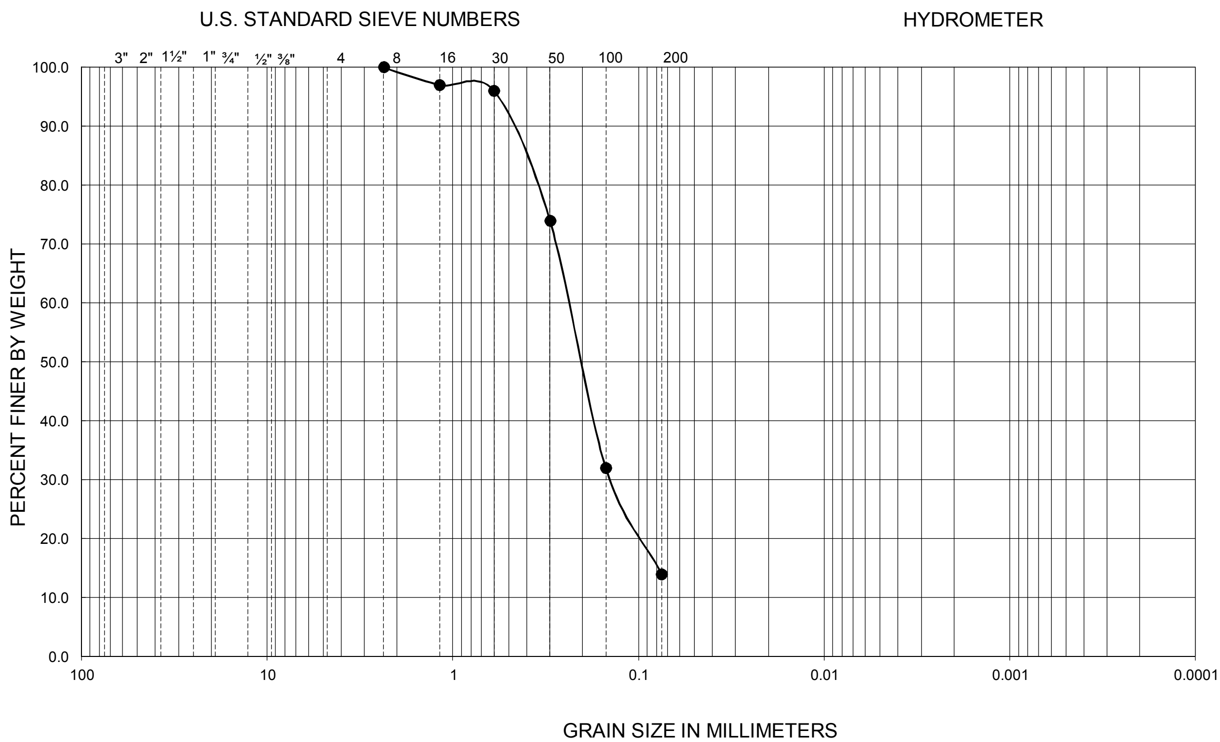
Direct Shear Tests

A direct shear test was performed on a relatively undisturbed sample in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-4.

Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-5.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

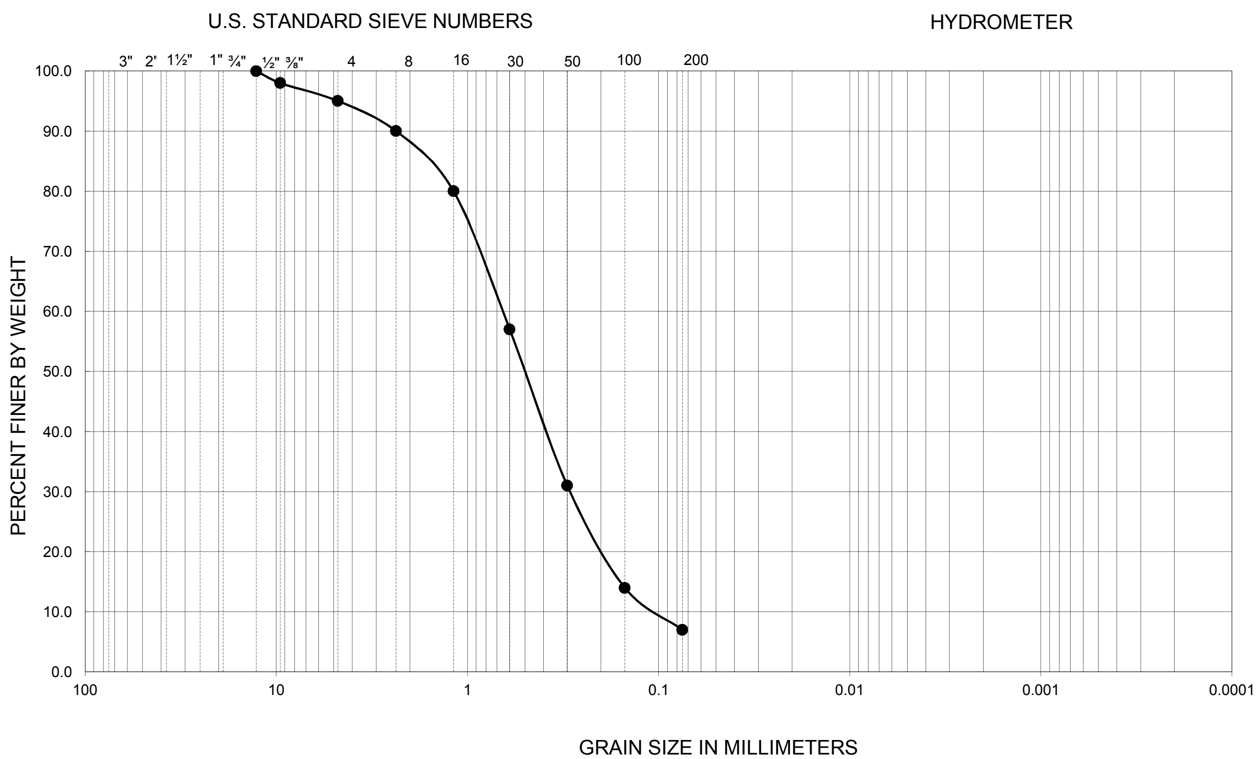


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-3	10.0-11.5	--	--	--	--	--	--	--	--	14	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	BASSETT PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-1
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

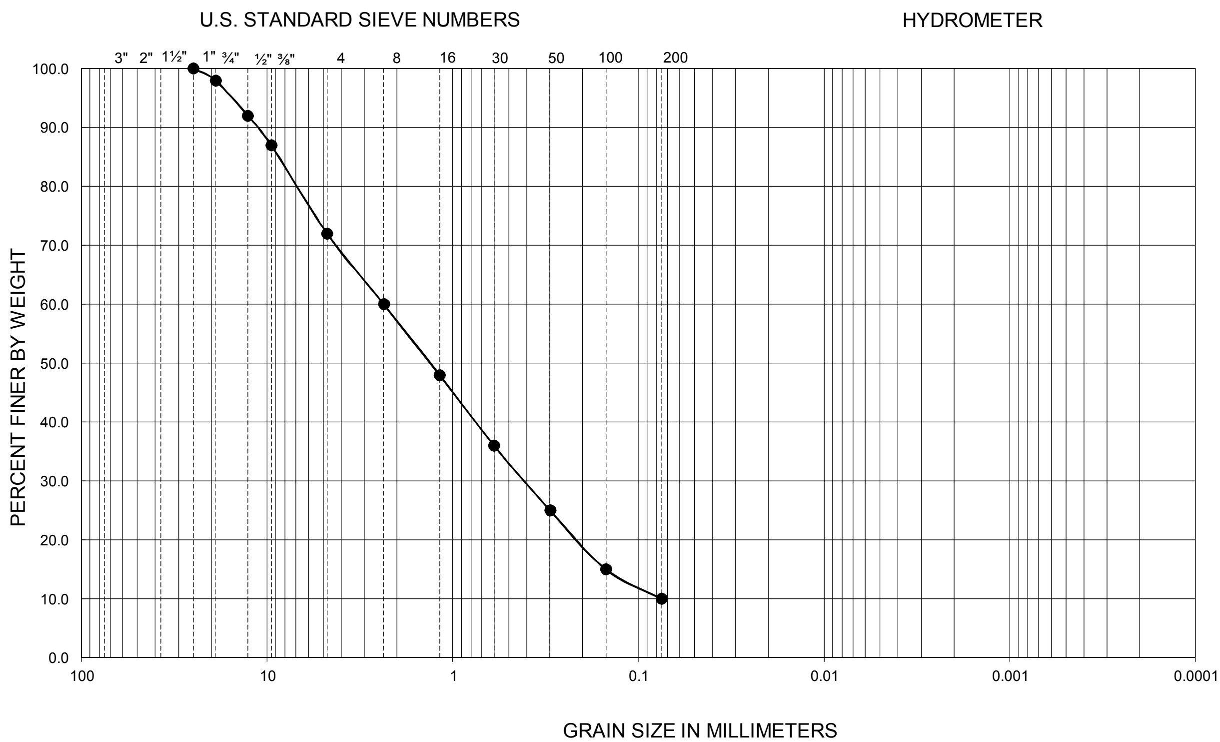


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-3	40.0-41.5	--	--	--	0.11	0.29	0.65	5.9	1.1	7	SW-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	BASSETT PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-2
107900001	6/15		

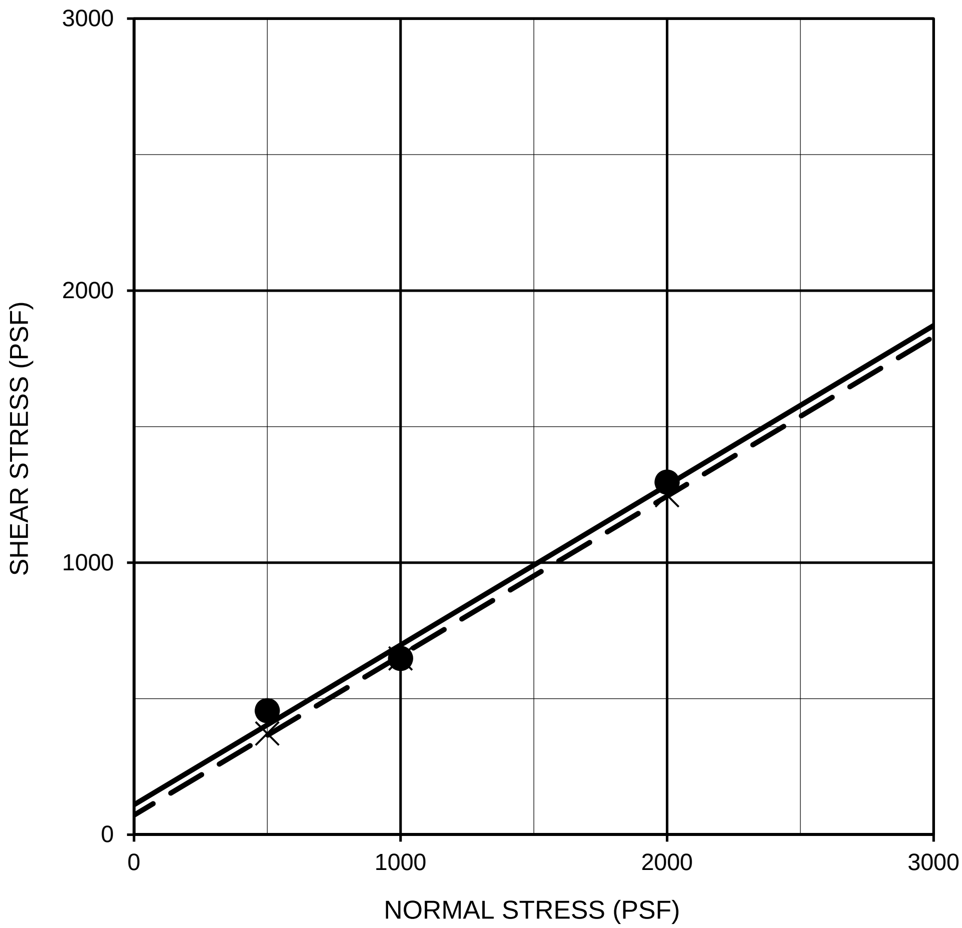
GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-3	80.0-80.9	--	--	--	0.75	0.42	2.36	3.1	0.1	10	SP-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	BASSETT PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-3
107900001	6/15		



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, φ (degrees)	Soil Type
Silty SAND	——●——	B-3	5.0-6.5	Peak	110	30	SM
Silty SAND	- - x - -	B-3	5.0-6.5	Ultimate	70	30	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore

DIRECT SHEAR TEST RESULTS

FIGURE

B-4

BASSETT PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

PROJECT NO.	DATE
107900001	6/15

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-3	0.5-3.0	8.4	3,900	100	0.010	190

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore

CORROSIVITY TEST RESULTS

PROJECT NO.	DATE
107900001	6/15

BASSETT PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

FIGURE
B-5

ATTACHMENT 4

GEOTECHNICAL REPORT FOR SAN ANGELO PARK

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants

GEOTECHNICAL SERVICES
SAN ANGELO PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NO. T10503269-102669-OM

PREPARED FOR:

MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
San Angelo Park
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order No. T10503269-102669-OM

Dear Ms. Kelly:

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at San Angelo Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. This report presents geotechnical data obtained by Ninyo & Moore relative to the proposed project. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

William R. Morrison

REGISTERED PROFESSIONAL ENGINEER
WILLIAM R. MORRISON
No. 2468
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CAT/WRM/GTF/KHM/gg

Distribution: (1) Addressee (via e-mail)

TABLE OF CONTENTS

Appendices

1. INTRODUCTION

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at San Angelo Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California (Figure 1). This report presents a compilation of geotechnical data obtained from the project along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project. We understand that the information contained herein will be included in the environmental report.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and subsurface exploration with regard to the proposed project. Specifically, we performed the following tasks:

- Review of readily available background materials, including State of California Seismic Hazards Zones map, State of California Earthquake Fault Zone map (Alquist-Priolo Special Studies Zones map), other published geologic maps and literature, in-house information, stereoscopic aerial photographs, and plans provided by the client.
- Performance of a site reconnaissance to observe the existing conditions at the site and to mark the proposed boring location for utility clearance. Mark-out of potential existing underground utilities was conducted through Underground Service Alert (USA).
- Performing a subsurface exploration consisting of drilling, logging and sampling of one exploratory soil boring at the site. The boring was advanced to a depth of approximately 101 feet using a truck-mounted drill rig equipped with hollow stem augers.
- Performing geotechnical laboratory testing on soil samples collected during our subsurface exploration. The testing included an evaluation of moisture content, in-situ moisture and dry density, grain-size analysis (sieve and 200 wash), direct shear, and soil corrosivity.
- Compiling the data obtained from our background research, subsurface exploration, and laboratory testing.
- Preparing this report that presents geotechnical data obtained from our background review, site reconnaissance, and subsurface exploration at the project site, along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project.

3. PROJECT AND SITE DESCRIPTION

The purpose of the project is to assist MWH Americas (MWH) and the Los Angeles County Department of Public Works (LADPW) in developing an Enhanced Watershed Management Program (EWMP) for the Upper San Gabriel River Watershed. Our services are intended to help support feasibility analyses being conducted by MWH and LADPW for Better Management Practices (BMPs) at specific locations as part of the EWMP. We understand that the BMPs will help to reduce the impact of storm water and non-storm water discharges on the area (MWH, 2014).

Ten separate sites located within the San Gabriel Valley in Los Angeles County, California have been selected for feasibility analyses for the project. This report addresses the San Angelo County Park site, which is located at 245 San Angelo Avenue in the city of Bassett (Figures 1 and 2). San Angelo Park is maintained by the County of Los Angeles. Geotechnical evaluations for the other nine sites are addressed in reports that are being issued under separate covers (Ninyo & Moore, 2015a through 2015i).

San Angelo County Park is developed with improvements that include restroom and recreation center buildings, tennis courts, softball/baseball fields, asphalt concrete (AC) paved parking lots, paved and unpaved walkways, playground equipment, light poles, landscaping consisting of trees, shrubs, and grass areas, and other associated appurtenances. The site for the proposed improvements is located in a grass area in the southwest portion of the park to the west of the tennis courts. The site coordinates are approximately 34.0497°N latitude and -118.0036°W longitude. The elevation at the project site is approximately 290 feet above mean sea level (MSL).

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our field exploration at the San Angelo Park site included a geologic reconnaissance that was conducted on February 19, 2015 and subsurface exploration that was conducted on March 16, 2015. The subsurface exploration consisted of drilling one 8-inch diameter hollow stem auger boring (B-4) to a depth of 101.4 feet below ground surface (bgs). The boring was logged by a geologist from our firm. Representative disturbed and undisturbed soil samples were obtained at selected depths from the boring for laboratory testing. The approximate location of the boring is presented on Figure 2. The boring log is presented in Appendix A.

Laboratory testing of selected soil samples obtained from our exploratory boring included in-situ dry density and moisture content, gradation, direct shear, and soil corrosivity. The results of the in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests described above are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, and groundwater conditions at the San Angelo Park site are provided in the following sections.

5.1. Regional and Geologic Setting

The subject site is located within the northeastern portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Norris and Webb, 1990). The geomorphic province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and continues farther to the tip of Baja California. The Los Angeles Basin has been divided into four structural blocks which are generally bounded by prominent fault systems. The site is located within the Northeastern Block, which is bordered on the west and south by the Whittier-Elsinore fault and is bordered on the north by the San Gabriel Mountains and the Raymond Hill Fault. The Northeastern Block is a deep basin characterized by thick sequences of alluvium and sedimentary units overlying basement rocks, which are at depths of up to approximately 12,000 feet below the surface in the central part of the San Gabriel Valley.

5.2. Site Geology

Our review of the referenced geologic maps and literature indicates that the subject site is underlain by Holocene to Pleistocene alluvial gravel and sand (Dibblee and Ehrenspeck, 1999). Geologic units encountered during our reconnaissance and subsurface exploration of the project site included relatively thin fill soils that mantle alluvium. Generalized descriptions of the units encountered are provided in the subsequent sections. Additional descriptions are provided on the boring logs in Appendix A. A geologic map of the region is presented on Figure 3.

5.2.1. Fill

Fill materials were encountered in our boring B-4 extending from the ground surface to a depth of approximately 3.5 feet below existing grade. As observed, the fill materials generally consisted of brown, moist, medium dense, silty sand. Scattered roots and grass were encountered in the fill materials.

5.2.2. Alluvium

Alluvium was encountered in our boring B-4 underlying the fill materials and was observed to extend to the total depth explored of 101.4 feet below existing grade. As observed in our boring, the alluvial materials generally consisted of various shades of brown, olive, and gray, moist to wet, medium dense to very dense, poorly graded sands, silty sands, silts, and sandy silts. Scattered gravel and gravel layers were encountered at various depths in the alluvium.

5.3. Groundwater

Groundwater was encountered during our subsurface exploration in our boring B-4 at an approximate depth of 97 feet. Fluctuations in the groundwater level and perched conditions typically occur due to variations in precipitation, ground surface topography, subsurface stratification, irrigation, and other factors.

6. FAULTING AND SEISMICITY

Based on our review of published geologic maps and review of stereoscopic aerial photographs, no active fault traces are mapped as underlying the San Angelo Park site. Therefore, the potential for surface fault rupture at the site is considered to be low. The project site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, San Angelo Park is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed improvements. Figure 4 shows the approximate site location relative to the major faults in the region. The nearest known active fault is the Whittier segment of the Elsinore fault, located approximately 4.5 miles south of the site.

6.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated at 0.884g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based).

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.792g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.792g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.2. Surface Fault Rupture

The probability of damage due to surface ground rupture is relatively low due to the lack of known active faults crossing the project site. Surface ground cracking related to shaking from distant events is not considered a significant hazard, although it is a possibility.

6.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon in which loosely deposited, granular soils and some fine-grained soils located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration can result in a loss of grain-to-grain contact due to a rapid rise in pore water pressure causing the soil to behave as a fluid for a short period. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

According to the Seismic Hazard Zones Map for the El Monte Quadrangle, (CDMG, 1999), the San Angelo Park site is mapped as being in an area susceptible to liquefaction. While review of the Seismic Hazard Zone Report for the El Monte Quadrangle (CGS, 1998) indicates that the historic high groundwater is at a depth of less than 10 feet, we encountered groundwater at San Angelo Park at an approximate depth of 97 feet during our subsurface exploration. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the San Angelo Park site.

7. OTHER GEOTECHNICAL CONSIDERATIONS

7.1. Slope Stability

Our review of maps published by the California Geological Survey (CGS, 1999) indicates that the San Angelo Park site is not situated in an area considered to be susceptible to seismic-induced landsliding. In addition, our observations indicate that the site is generally level to gently sloping. Consequently, landsliding or slope instability are not considered to be a constraint at the project site.

7.2. Corrosion

Laboratory testing was performed on representative samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with the California Test (CT) 643 and the sulfate and chloride tests were performed in accordance with CTs 417 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing performed on a sample obtained from the site indicated an electrical resistivity value of 2,500 ohm-cm, a soil pH value of 8.0, a chloride content of 400 ppm, and a sulfate content of 0.001 percent. According to Caltrans criteria (2012) and American Concrete Institute (ACI) 318 guidelines, a corrosive soil is defined as one with more than 500 ppm chlorides, more than 0.2 percent sulfates, a pH less than 5.5, or an electrical resistivity of less than 1,000 ohm-cm. Based on the Caltrans criteria and ACI guidelines, the upper soils encountered at the site are not considered to be corrosive.

8. DISCUSSION AND FINDINGS

As discussed above, our geotechnical services were performed to assist MWH and LADPW evaluate the preliminary feasibility of an onsite storm water infiltration system at the San Angelo Park site. Based on our communications with MWH, we understand that the preliminary criteria at the site is related to the presence of groundwater or dense materials providing refusal to drilling equipment within 100 feet of the ground surface. As such, our scope of services included the drilling of an exploratory boring that extended to a depth of 100 feet, to groundwater, or to refusal (whichever is shallower). We understand that BMPs being considered for the site are conceptual at this time. Based on the information obtained from our geotechnical evaluation, the following findings and conclusions have been made:

- The project site is underlain by relatively shallow fill (approximately 3.5 feet deep) overlying alluvial soils. The encountered portions of the fill were generally comprised of silty sands that contained scattered organic material, along with scattered amounts of gravel. The underlying alluvial soils were observed to consist of poorly graded sands, silty sands, silts, and sandy silts.

- Groundwater was encountered in our exploratory boring at an approximate depth of 97 feet.

- Based on our review of aerial photographs and published geologic maps, there are no known active faults or landslides underlying the project site.

- Our faulting and seismicity evaluation indicated that the site is subject to severe ground shaking due to a design seismic event.

- Review of geological literature indicates that the site is situated in an area that has been mapped as being susceptible to liquefaction. However, groundwater was encountered at an approximate depth of 97 feet. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the San Angelo Park site. However, it may be prudent to perform a detailed liquefaction evaluation in accordance with California Geological Survey guidelines (CGS, 2008).

- In-place infiltration testing was not performed as part of our geotechnical services. However, based on published correlations between a soil's grain size and its permeability (Shepherd, 1989), an estimated permeability on the order of 10^{-4} cm/sec within the encountered sandy and silty soils can be utilized for preliminary evaluation purposes. Actual design of storm water infiltration devices should be in accordance with the County of Los Angeles guidelines and should be based on field infiltration testing at the site.

- Recommendations provided in this report are preliminary in nature and are not intended to provide sufficient information to fully address potential geotechnical related issues. Prior to site development an additional geotechnical evaluation should be performed.

9. PRELIMINARY RECOMMENDATIONS

As noted above we understand that the Better Management Practices (BMPs) associated with the proposed Upper San Gabriel River EWMP Project are conceptual at this time. As such, details regarding the types and construction of the BMPs (if any) are not known at this time for the San Angelo Park site. We recommend that the geotechnical information presented herein be utilized during the evaluation of the feasibility of the devices associated with the EWMP project at the site. The design of BMPs should be performed in accordance with County of Los Angeles guidelines.

The following sections of this report provide preliminary recommendations for earthwork and design of structure foundations for preliminary planning purposes. Once the type and general construction of the devices is better defined, Ninyo & Moore should review the devices' preliminary design. At that time, supplemental recommendations may be provided.

9.1. Site Preparation

Prior to earthwork, the project site should be cleared of existing structures, pavement, abandoned utilities (if present), and stripped of rubble, debris, vegetation, loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite.

9.2. Materials for Fill

On-site soils relatively free of organic material are suitable for reuse as fill. In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾-inch. Oversize materials should be separated from material to be used for fill and removed from the site. Although not anticipated, if encountered, high plasticity clays and silts should be disposed of off-site.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material should generally be granular soils with a very low to low expansion potential (i.e., an expansion index of 50 or less as evaluated by ASTM D 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

9.3. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified, moisture conditioned as needed to achieve moisture contents generally above the optimum moisture content, and then compacted to a relative compaction of 90 percent as evaluated in accordance with ASTM D 1557. The evaluation of compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when the project area is ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

9.4. Utility Trench Backfill

Based on our subsurface exploration, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the "Greenbook" (Standard Specifications for Public Works Construction) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557. Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

9.5. Preliminary Foundation Recommendations

For preliminary design purposes, shallow, spread or continuous footings founded on compacted fill or alluvial soils can be considered suitable for support of structures. Shallow, spread or continuous footings bearing on compacted fill or alluvial soils may be designed assuming an allowable bearing capacity of 2,000 psf. This allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. Spread footings should be founded 18 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches and isolated footings should be 18 inches in width or more. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

For resistance of foundations to lateral loads, we recommend an allowable passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot be used. This value assumes that the ground is horizontal for a distance of 10 feet or more, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. If passive and frictional resistances are to be used in combination, we recommend that the passive value not exceed one-half of the total resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

9.6. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Laboratory testing indicated the sulfate content of the sample tested was less than 0.2 percent, which is considered negligible for sulfate attack based on ACI criteria (ACI, 2011). Although significant sulfate content was not indicated, we recommend that Type II/V cement be used for concrete structures in contact with soil, due to the potential for variability of site soil. The water-cement ratio of the concrete should be 0.45 or less and the slump should be 4 inches or less.

9.7. Plan Review and Construction Observation

The preliminary conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Because we understand that the design of the BMPs devices for the EWMP project is conceptual at this point, we recommend that Ninyo & Moore review the devices' preliminary design, once the type and general construction of the devices is better defined. At that time, supplemental recommendations may be provided.

Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations to evaluate the assumptions inherent in the design.

The preliminary recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the preliminary conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for feasibility and preliminary design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our preliminary conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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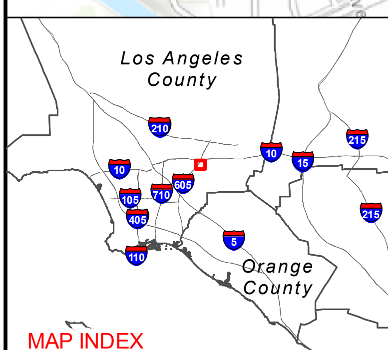


Feet

0 750 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

1_107900001_SL_SA_93.mxd AOB

Ninyo & Moore

PROJECT NO.	DATE	SITE LOCATION	FIGURE
107900001	6/15	SAN ANGELO PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	1

SOURCE: Aerial Imagery - ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP.

LEGEND

SITE BOUNDARY

B-4 TD=101.4' BORING
TD=TOTAL DEPTH IN FEET

N

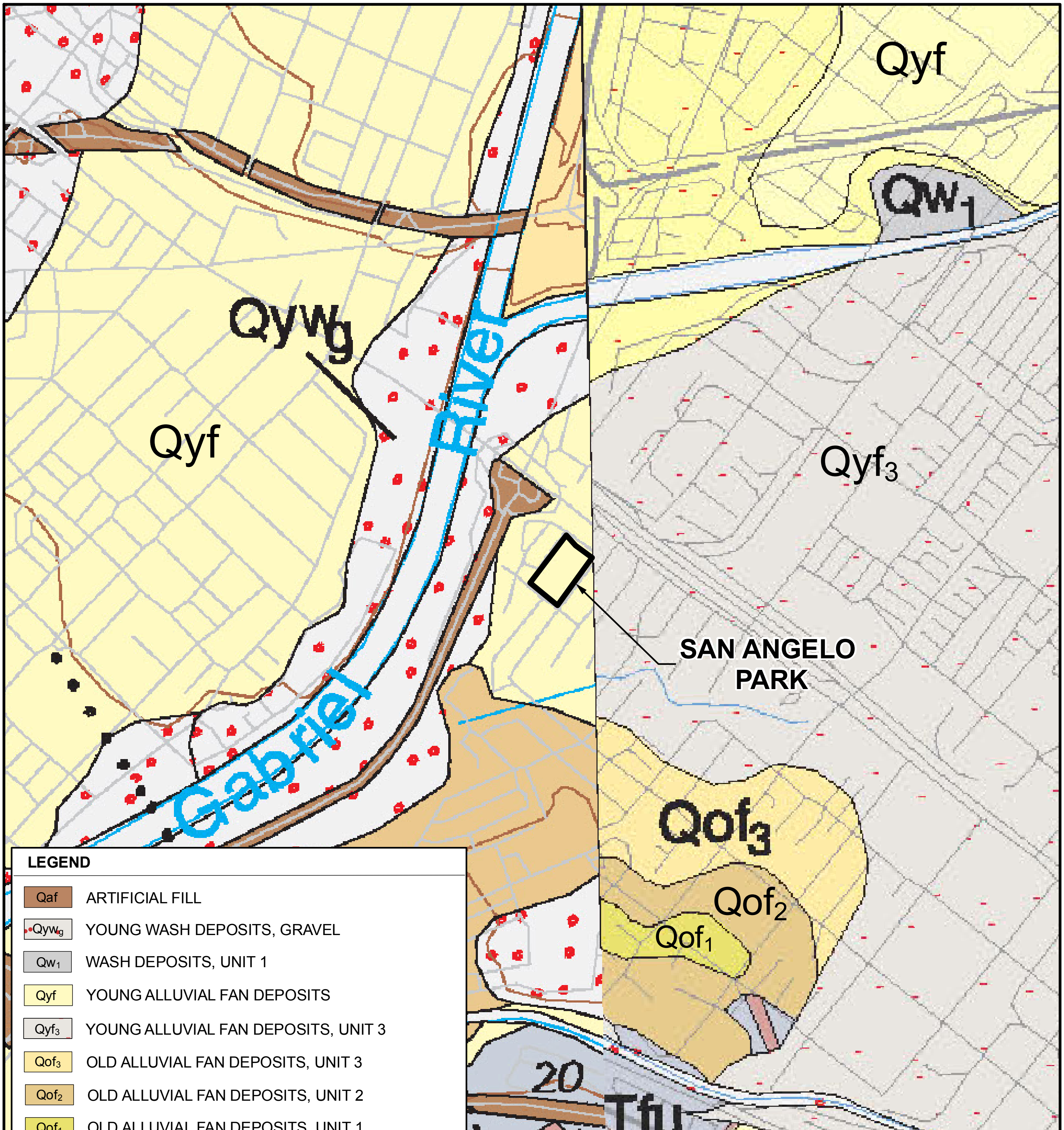
SCALE IN FEET

0 100 200 400

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

2_107900001_BL_SA_93.mxd AOB

Ninyo & Moore		BORING LOCATION	FIGURE
PROJECT NO.	DATE	SAN ANGELO PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	2
107900001	6/15		



LEGEND

Qaf	ARTIFICIAL FILL
Qyw_g	YOUNG WASH DEPOSITS, GRAVEL
Qw_1	WASH DEPOSITS, UNIT 1
Qyf	YOUNG ALLUVIAL FAN DEPOSITS
Qyf_3	YOUNG ALLUVIAL FAN DEPOSITS, UNIT 3
Qof_3	OLD ALLUVIAL FAN DEPOSITS, UNIT 3
Qof_2	OLD ALLUVIAL FAN DEPOSITS, UNIT 2
Qof_1	OLD ALLUVIAL FAN DEPOSITS, UNIT 1
Tfu	FERNANDO FORMATION, UPPER MEMBER
65 U D	FAULT - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATE, DOTTED WHERE CONCEALED. ARROW AND NUMBER INDICATE DIRECTION AND ANGLE OF DIP OF FAULT PLANE

N

SOURCE: MORTON, D.M., AND MILLER, F.K., 2006, GEOLOGIC MAP OF THE SAN BERNARDINO AND SANTA ANA 30' X 60' QUADRANGLE, CALIFORNIA
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Feet

0 1,000 2,000 4,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

3_107900001_G_SA_93.mxd AOB

Ninyo & Moore

PROJECT NO.	DATE	GEOLOGY	FIGURE
107900001	6/15	SAN ANGELO PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	3

LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS

N

Miles

0 3 6 12

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

4_107900001_F_SA_93.mxd AOB

Ninyo & Moore		FAULT LOCATIONS	FIGURE
PROJECT NO.	DATE	SAN ANGELO PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	4
107900001	6/15		

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples
Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples
Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler
Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1⅜ inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples
Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler
The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change.
15								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
20								The total depth line is a solid line that is drawn at the bottom of the boring.

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BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

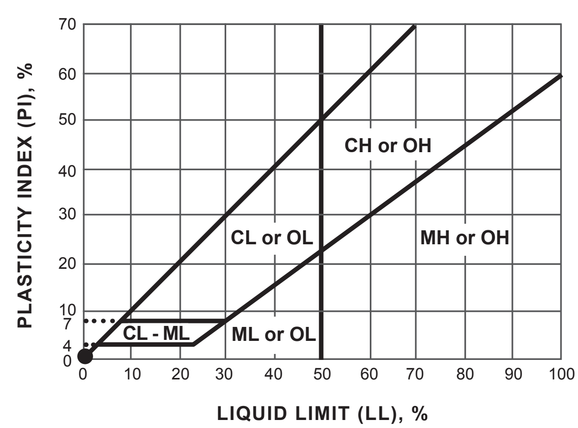
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS: GROUP SYMBOL	SECONDARY DIVISIONS: GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	**GRAVEL** more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	**SILT and CLAY** liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DATE DRILLED 3/16/15 BORING NO. B-4

GROUND ELEVATION 290' ± (MSL) SHEET 1 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	FILL: Brown, moist, medium dense, silty fine SAND; scattered grass and roots.
							ML	ALLUVIUM: Brown, moist, medium dense, fine sandy SILT; scattered roothairs.
			30	3.8	106.9		SM	Light brown, moist, medium dense, silty fine SAND; trace coarse sand.
10			10	18.0			ML	Brown, moist, medium dense, fine sandy SILT; scattered pinhole voids; trace coarse sand and fine gravel; resembles soil horizon.
			16	3.9				Light brown.
							SP-SM	Light brown, moist, medium dense, poorly graded SAND with silt.
20			15	4.2				Little cohesion.
			35	7.9	95.4			Trace clay. No clay.
30			18	3.3				Same as above.
			13	25.0			ML	Olive, moist, medium dense, SILT; scattered infilled root and burrow casts; reddish brown staining.
40								

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BORING LOG

SAN ANGELO PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-1

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
								DATE DRILLED 3/16/15 BORING NO. B-4
								GROUND ELEVATION 290' ± (MSL) SHEET 2 OF 3
								METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)
								DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"
								SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF
40			12	42.0			ML	ALLUVIUM: (Continued) Gray and dark gray, moist, medium dense, SILT; finely laminated; scattered layers of fine sandy silt; approximately 1/2-inch thick layer of black, carbon-organic material; scattered infilled root casts and burrows; slightly micaceous; scattered organics.
							SM	Light brown, moist, very dense, silty fine SAND; trace medium to coarse sand.
			65/10"	4.5				
50			28	3.1				Dense; fine to coarse sand; scattered gravel up to 1/2-inch in diameter.
								@ 56': Gravel layer.
60			65	2.3				Scattered gravel up to 1/2-inch in diameter.
70			41	3.2				Light grayish brown; scattered layers of gravel.
80								

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BORING LOG

SAN ANGELO PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-2

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
								DATE DRILLED 3/16/15 BORING NO. B-4
								GROUND ELEVATION 290' ± (MSL) SHEET 3 OF 3
								METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)
								DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"
								SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF
80			50/6"	1.6			SM	ALLUVIUM: (Continued) Light grayish brown, moist, very dense, silty fine to coarse SAND; scattered gravel up to 1-inch in diameter.
90			65/11"	15.9				More gravel.
								Groundwater encountered; wet.
100			73/11"	14.1				Brown; wet; gravel up to 1/2-inch in diameter.
								Total Depth = 101.4 feet. Groundwater encountered at approximately 97 feet during drilling; measured at approximately 97 feet approximately 30 minutes after drilling. Backfilled shortly after drilling on 3/16/15.
								Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.
								The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
110								
120								

Ninyo & Moore

BORING LOG

SAN ANGELO PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-3

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

Moisture Content

The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis

Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-5. These test results were utilized in evaluating the soil classifications in accordance with USCS.

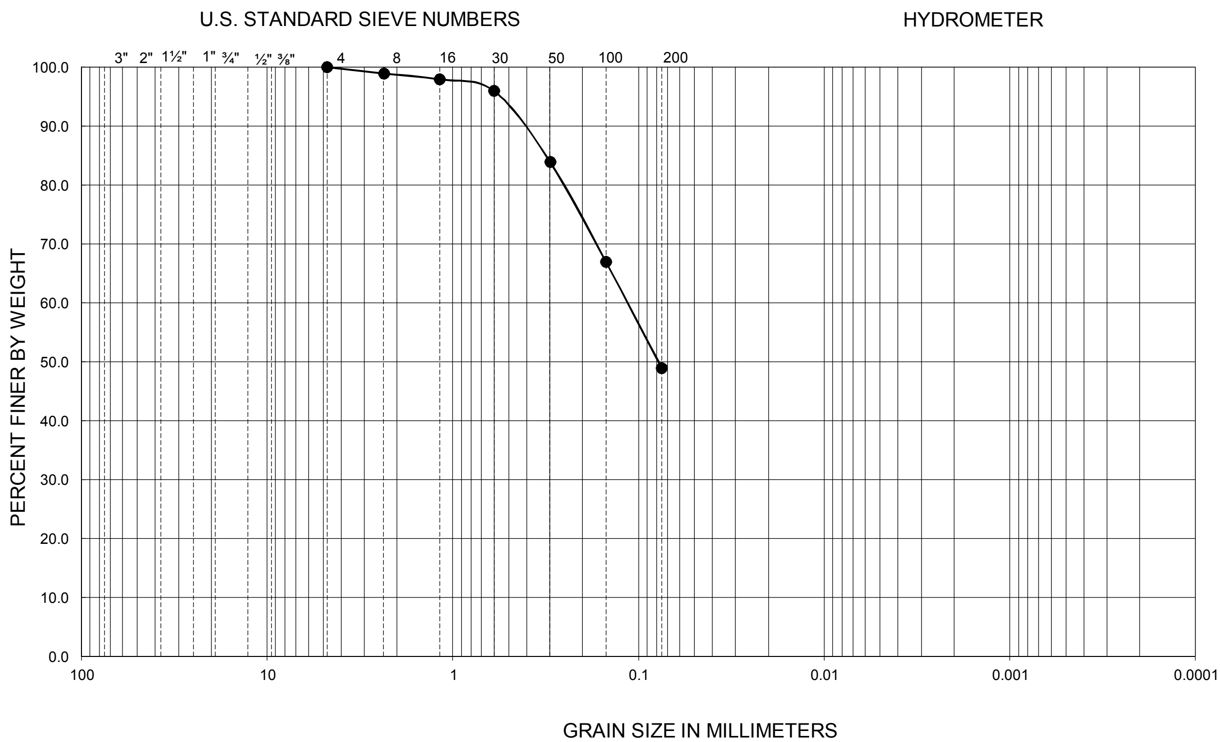
Direct Shear Tests

A direct shear test was performed on a relatively undisturbed sample in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-6.

Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-7.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



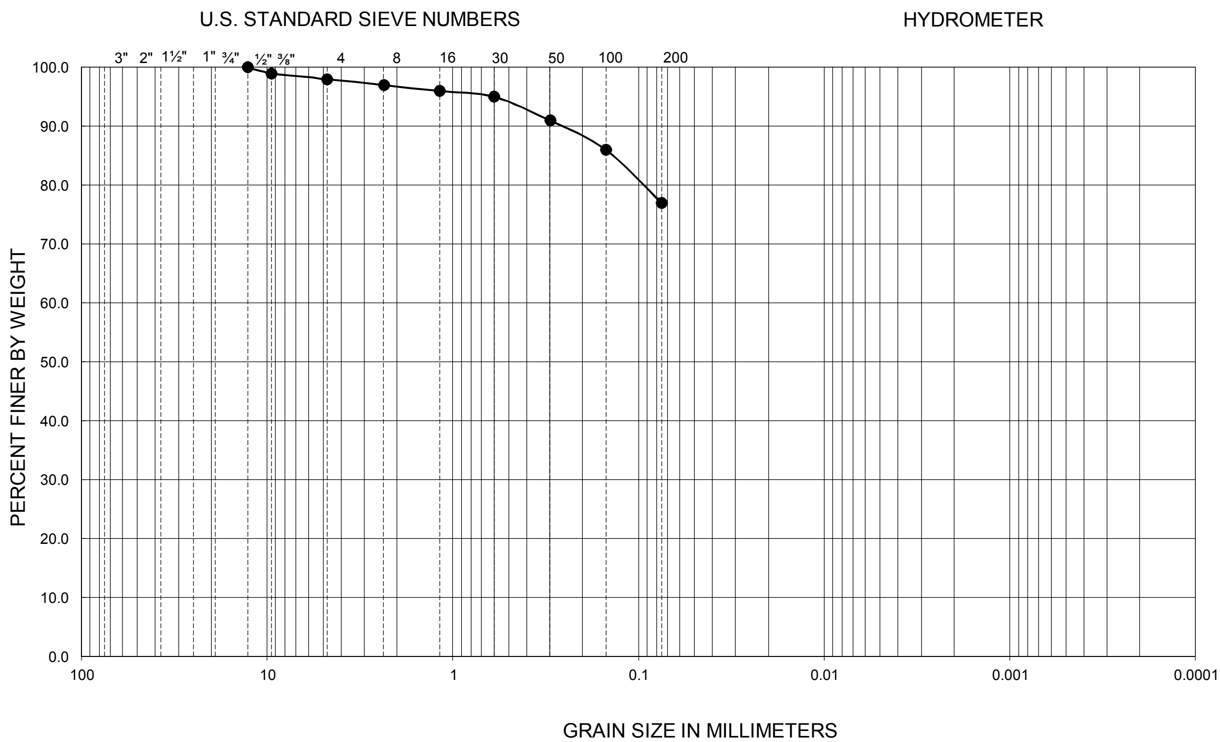
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-4	5.0-8.0	--	--	--	--	--	--	--	--	49	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	SAN ANGELO PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-1
107900001	6/15		

107900001_SIEVE B-4 @ 5.0-8.0.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



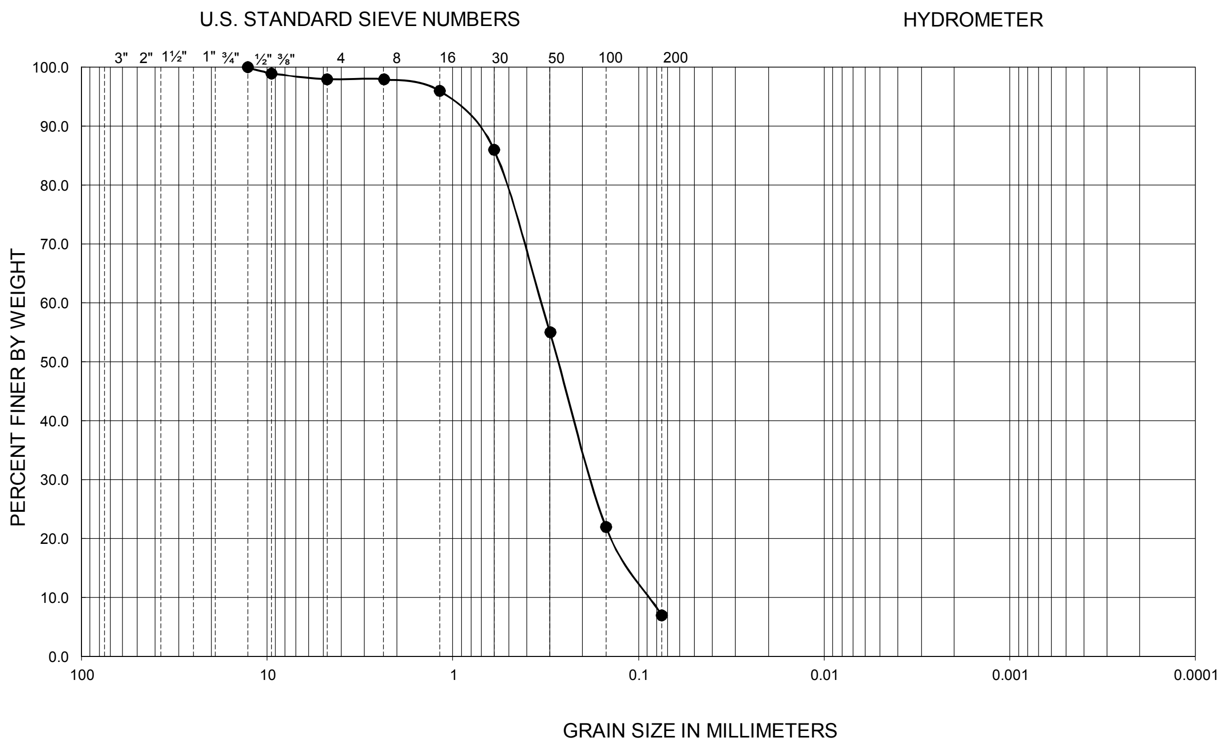
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-4	10.0-11.5	--	--	--	--	--	--	--	--	77	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	SAN ANGELO PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-2
107900001	6/15		

107900001_SIEVE B-4 @ 10.0-11.5.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

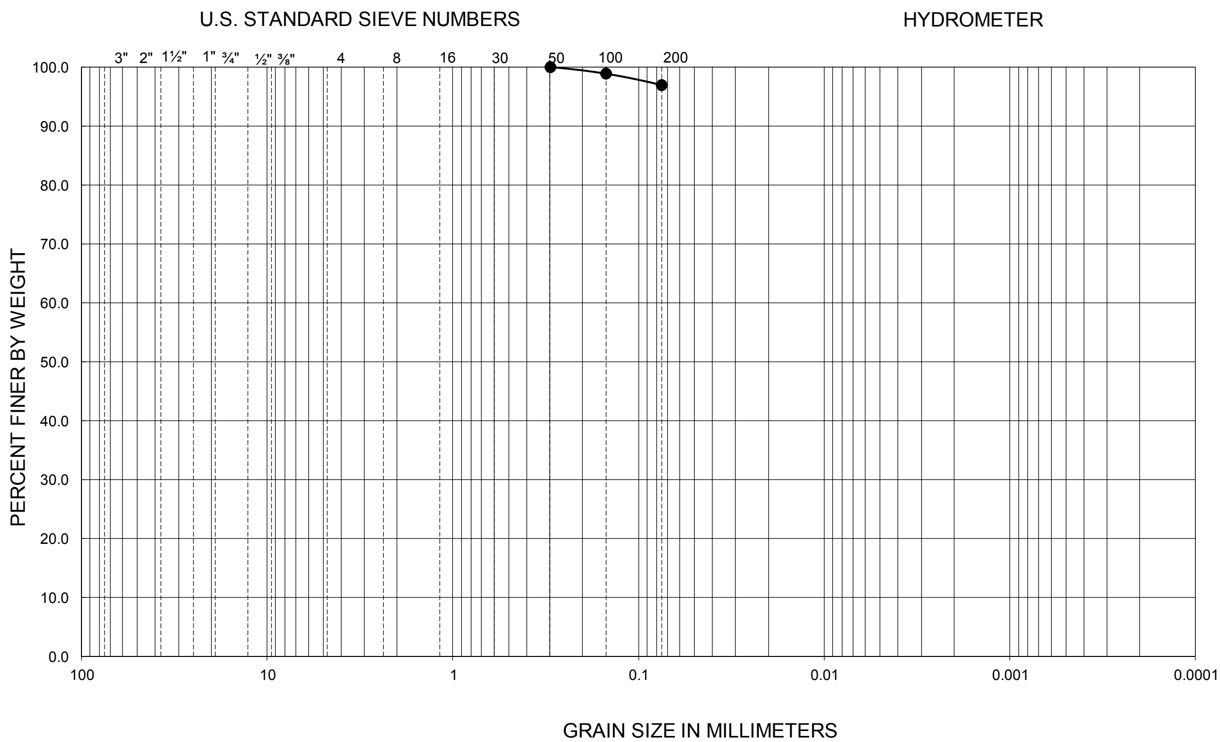


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-4	20.0-21.5	--	--	--	0.09	0.18	0.34	3.8	1.1	7	SP-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	SAN ANGELO PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-3
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

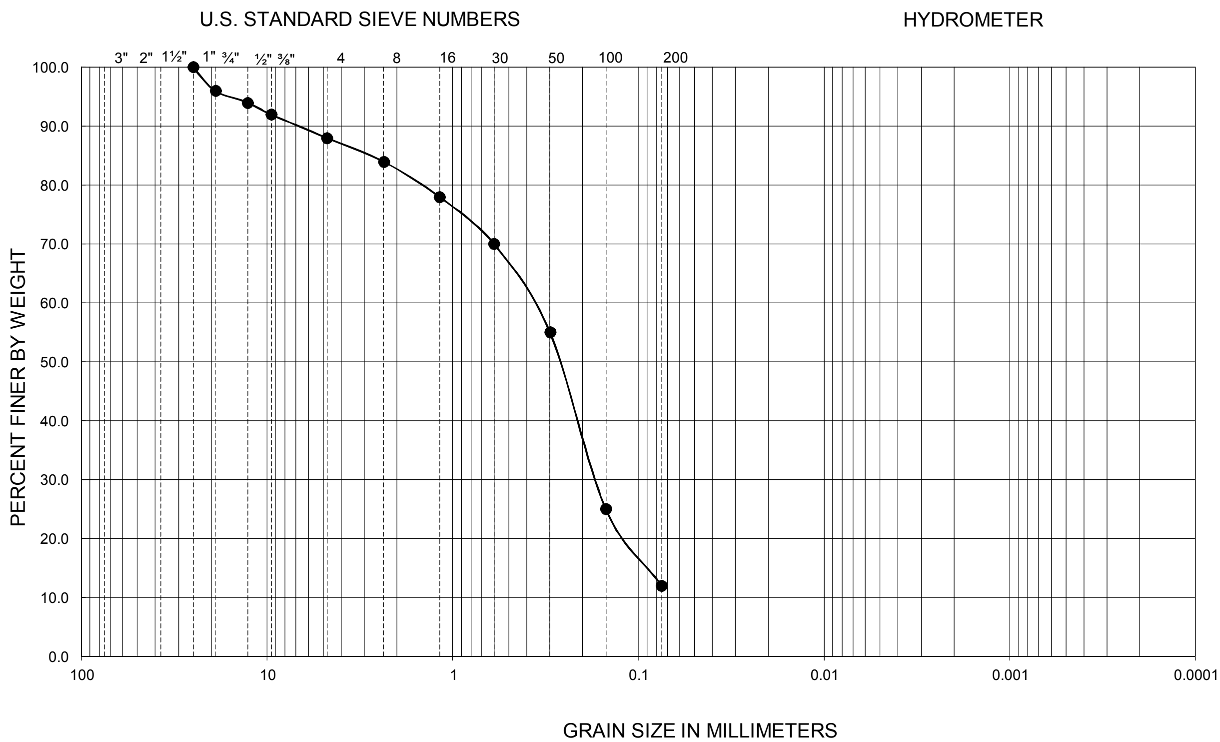


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-4	40.0-41.5	--	--	--	--	--	--	--	--	97	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	SAN ANGELO PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-4
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-4	50.0-51.5	--	--	--	--	--	--	--	--	12	SM

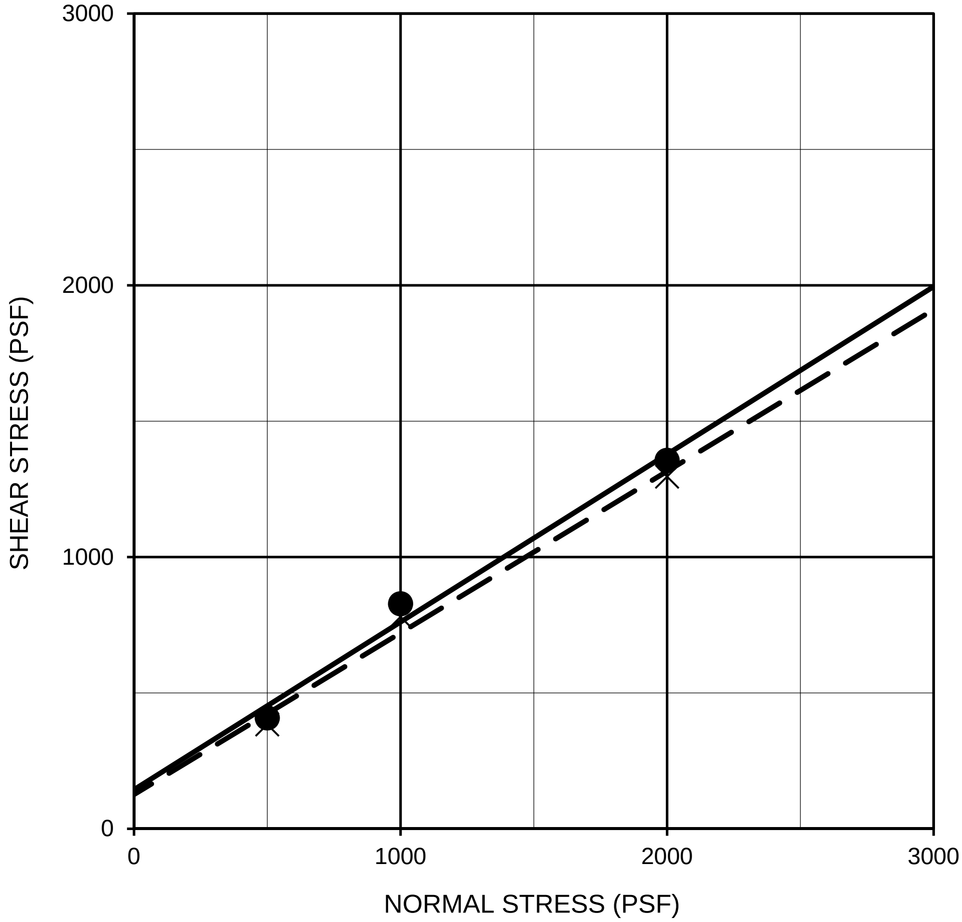
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

GRADATION TEST RESULTS

PROJECT NO.	DATE	SAN ANGELO PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	FIGURE
107900001	6/15		**B-5**

107900001_SIEVE B-4 @ 50.0-51.5.xls



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SAND	—●—	B-4	5.0-6.5	Peak	140	32	SM
Silty SAND	- - x - -	B-4	5.0-6.5	Ultimate	130	31	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	DATE	SAN ANGELO PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-6
107900001	6/15		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2] (ppm)	SULFATE CONTENT [2] (%)	CHLORIDE CONTENT [3] (ppm)
B-4	0.0-3.0	8.0	2,500	10	0.001	400

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore

CORROSIVITY TEST RESULTS

PROJECT NO.	DATE
107900001	6/15

SAN ANGELO PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

FIGURE
B-7

ATTACHMENT 5

GEOTECHNICAL REPORT FOR BARNES PARK

GEOTECHNICAL SERVICES
BARNES PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NO. T10503269-102669-OM

PREPARED FOR:

MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
Barnes Park
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order No. T10503269-102669-OM

Dear Ms. Kelly:

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Barnes Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. This report presents geotechnical data obtained by Ninyo & Moore relative to the proposed project. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

William R. Morrison

REGISTERED PROFESSIONAL ENGINEER
WILLIAM R. MORRISON
No. 2468
Exp. 12/31/16
GEOTECHNICAL
STATE OF CALIFORNIA

William Morrison, PE, GE
Senior Engineer

Gregory T. Farrand, PG, CEG
Principal Geologist

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CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

CAT/WRM/GTF/KHM/gg

Distribution: (1) Addressee (via e-mail)

TABLE OF CONTENTS

Figures

1. INTRODUCTION

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Barnes Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California (Figure 1). This report presents a compilation of geotechnical data obtained from the project along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project. We understand that the information contained herein will be included in the environmental report.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and subsurface exploration with regard to the proposed project. Specifically, we performed the following tasks:

- Review of readily available background materials, including State of California Seismic Hazards Zones map, State of California Earthquake Fault Zone map (Alquist-Priolo Special Studies Zones map), other published geologic maps and literature, in-house information, stereoscopic aerial photographs, and plans provided by the client.
- Performance of a site reconnaissance to observe the existing conditions at the site and to mark the proposed boring location for utility clearance. Mark-out of potential existing underground utilities was conducted through Underground Service Alert (USA).
- Performing a subsurface exploration consisting of drilling, logging and sampling of one exploratory soil boring at the site. The boring was advanced to a depth of approximately 101 feet using a truck-mounted drill rig equipped with hollow stem augers.
- Performing geotechnical laboratory testing on soil samples collected during our subsurface exploration. The testing included an evaluation of moisture content, in-situ moisture and dry density, grain-size analysis (sieve and 200 wash), direct shear, and soil corrosivity.
- Compiling the data obtained from our background research, subsurface exploration, and laboratory testing.
- Preparing this report that presents geotechnical data obtained from our background review, site reconnaissance, and subsurface exploration at the project site, along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project.

3. PROJECT AND SITE DESCRIPTION

The purpose of the project is to assist MWH Americas (MWH) and the Los Angeles County Department of Public Works (LADPW) in developing an Enhanced Watershed Management Program (EWMP) for the Upper San Gabriel River Watershed. Our services are intended to help support feasibility analyses being conducted by MWH and LADPW for Better Management Practices (BMPs) at specific locations as part of the EWMP. We understand that the BMPs will help to reduce the impact of storm water and non-storm water discharges on the area (MWH, 2014).

Ten separate sites located within the San Gabriel Valley in Los Angeles County, California have been selected for feasibility analyses for the project. This report addresses the Barnes County Park site, which is located at 3251 Patritti Avenue in the city of Baldwin Park (Figures 1 and 2). Barnes Park is maintained by the County of Los Angeles. Geotechnical evaluations for the other nine sites are addressed in reports that are being issued under separate covers (Ninyo & Moore, 2015a through 2015i).

Barnes County Park is developed with improvements that include restroom and recreation center buildings, basketball courts, asphalt concrete (AC) paved parking lots, paved walkways, playground equipment, light poles, landscaping consisting of trees, shrubs, and grass areas, and other associated appurtenances. The site for the proposed improvements is located in a grass area in the southern portion of the park. The site coordinates are approximately 34.0688°N latitude and -117.9996°W longitude. The elevation at the project site is approximately 300 feet above mean sea level (MSL).

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our field exploration at the Barnes Park site included a geologic reconnaissance that was conducted on February 19, 2015 and subsurface exploration that was conducted on March 18, 2015. The subsurface exploration consisted of drilling one 8-inch diameter hollow stem auger boring (B-5) to a depth of 100.5 feet below ground surface (bgs). The boring was logged by a geologist from our firm. Representative disturbed and undisturbed soil samples were obtained at selected depths from the boring for laboratory testing. The approximate location of the boring is presented on Figure 2. The boring log is presented in Appendix A.

Laboratory testing of selected soil samples obtained from our exploratory boring included in-situ dry density and moisture content, gradation, direct shear, and soil corrosivity. The results of the in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests described above are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, and groundwater conditions at the Barnes Park site are provided in the following sections.

5.1. Regional and Geologic Setting

The subject site is located within the northeastern portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Norris and Webb, 1990). The geomorphic province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and continues farther to the tip of Baja California. The Los Angeles Basin has been divided into four structural blocks which are generally bounded by prominent fault systems. The site is located within the Northeastern Block, which is bordered on the west and south by the Whittier-Elsinore fault and is bordered on the north by the San Gabriel Mountains and the Raymond Hill Fault. The Northeastern Block is a deep basin characterized by thick sequences of alluvium and sedimentary units overlying basement rocks, which are at depths of up to approximately 12,000 feet below the surface in the central part of the San Gabriel Valley.

5.2. Site Geology

Our review of the referenced geologic maps and literature indicates that the subject site is underlain by Holocene to Pleistocene alluvial gravel and sand (Dibblee and Ehrenspeck, 1999). Geologic units encountered during our reconnaissance and subsurface exploration of the project site included relatively thin fill soils that mantle alluvium. Generalized descriptions of the units encountered are provided in the subsequent sections. Additional descriptions are provided on the boring logs in Appendix A. A geologic map of the region is presented on Figure 3.

5.2.1. Fill

Fill materials were encountered in our boring B-5 extending from the ground surface to a depth of approximately 2 feet below existing grade. As observed, the fill materials generally consisted of dark brown, moist, medium dense, silty sand. Scattered roots and grass were encountered in the fill materials.

5.2.2. Alluvium

Alluvium was encountered in our boring B-5 underlying the fill materials and was observed to extend to the total depth explored of 100.5 feet below existing grade. As observed in our boring, the alluvial materials generally consisted of various shades of brown, moist to wet, medium dense to very dense, well graded sands, poorly graded sands, and silty sands. Interbeds of brown, moist to wet, stiff sandy silt were also encountered in the alluvium. Scattered gravel was encountered at various depths in the alluvium.

5.3. Groundwater

Groundwater was not encountered during our subsurface exploration in our boring B-5. Fluctuations in the groundwater level and perched conditions typically occur due to variations in precipitation, ground surface topography, subsurface stratification, irrigation, and other factors.

6. FAULTING AND SEISMICITY

Based on our review of published geologic maps and review of stereoscopic aerial photographs, no active fault traces are mapped as underlying the Barnes Park site. Therefore, the potential for surface fault rupture at the site is considered to be low. The project site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, Barnes Park is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed improvements. Figure 4 shows the approximate site location relative to the major faults in the region. The nearest known active fault is the Raymond fault, located approximately 6 miles northwest of the site.

6.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated at 0.890g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based).

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.791g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.791g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.2. Surface Fault Rupture

The probability of damage due to surface ground rupture is relatively low due to the lack of known active faults crossing the project site. Surface ground cracking related to shaking from distant events is not considered a significant hazard, although it is a possibility.

6.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon in which loosely deposited, granular soils and some fine-grained soils located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration

can result in a loss of grain-to-grain contact due to a rapid rise in pore water pressure causing the soil to behave as a fluid for a short period. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

According to the Seismic Hazard Zones Map for the Baldwin Park Quadrangle, (CGS, 1999), the Barnes Park site is mapped as being in an area susceptible to liquefaction. While review of the Seismic Hazard Zone Report for the Baldwin Park Quadrangle (CGS, 1998) indicates that the historic high groundwater is at a depth on the order of 10 feet, groundwater was not encountered at Barnes Park to the total depth explored of 100.5 feet during our subsurface exploration. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Barnes Park site.

7. OTHER GEOTECHNICAL CONSIDERATIONS

7.1. Slope Stability

Our review of maps published by the California Geological Survey (CGS, 1999) indicate that the Barnes Park site is not situated in an area considered to be susceptible to seismic-induced landsliding. In addition, our observations indicate that the site is generally level to gently sloping. Consequently, landsliding or slope instability are not considered to be a constraint at the project site.

7.2. Corrosion

Laboratory testing was performed on representative samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with the California Test (CT) 643 and the sulfate and chloride tests were performed in accordance with CTs 417 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing performed on a sample obtained from the site indicated an electrical resistivity value of 6,000 ohm-cm, a soil pH value of 7.7, a chloride content of 170 ppm, and a sulfate content of 0.014 percent. According to Caltrans criteria (2012) and American Concrete Institute (ACI) 318 guidelines, a corrosive soil is defined as one with more than 500 ppm chlorides, more than 0.2 percent sulfates, a pH less than 5.5, or an electrical resistivity of less than 1,000 ohm-cm. Based on the Caltrans criteria and ACI guidelines, the upper soils encountered at the site are not considered to be corrosive.

8. DISCUSSION AND FINDINGS

As discussed above, our geotechnical services were performed to assist MWH and LADPW evaluate the preliminary feasibility of an onsite storm water infiltration system at the Barnes Park site. Based on our communications with MWH, we understand that the preliminary criteria at the site is related to the presence of groundwater or dense materials providing refusal to drilling equipment within 100 feet of the ground surface. As such, our scope of services included the drilling of an exploratory boring that extended to a depth of 100 feet, to groundwater, or to refusal (whichever is shallower). We understand that BMPs being considered for the site are conceptual at this time. Based on the information obtained from our geotechnical evaluation, the following findings and conclusions have been made:

- The project site is underlain by relatively shallow fill (approximately 2 feet deep) overlying alluvial soils. The encountered portions of the fill were generally comprised of silty sands that contained scattered organic material, along with scattered amounts of gravel. The underlying alluvial soils were observed to consist of well graded sands, poorly graded sands, silty sands, and sandy silts.

- Groundwater was not encountered in our exploratory boring to the total depth explored of 100.5 feet.

- Based on our review of aerial photographs and published geologic maps, there are no known active faults or landslides underlying the project site.

- Our faulting and seismicity evaluation indicated that the site is subject to severe ground shaking due to a design seismic event.

- Review of geological literature indicates that the site is situated in an area that has been mapped as being susceptible to liquefaction. However, groundwater was not encountered in our exploration at the site. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Barnes Park site. However, it may be prudent to perform a detailed liquefaction evaluation in accordance with California Geological Survey guidelines (CGS, 2008).

- In-place infiltration testing was not performed as part of our geotechnical services. However, based on published correlations between a soil's grain size and its permeability (Shepherd, 1989), an estimated permeability on the order of 10^{-3} cm/sec within the encountered sandy soils can be utilized for preliminary evaluation purposes. Actual design of storm water infiltration devices should be in accordance with the County of Los Angeles guidelines and should be based on field infiltration testing at the site.

- Recommendations provided in this report are preliminary in nature and are not intended to provide sufficient information to fully address potential geotechnical related issues. Prior to site development an additional geotechnical evaluation should be performed.

9. PRELIMINARY RECOMMENDATIONS

As noted above we understand that the Better Management Practices (BMPs) associated with the proposed Upper San Gabriel River EWMP Project are conceptual at this time. As such, details regarding the types and construction of the BMPs (if any) are not known at this time for the Barnes Park site. We recommend that the geotechnical information presented herein be utilized during the evaluation of the feasibility of the devices associated with the EWMP project at the site. The design of BMPs should be performed in accordance with County of Los Angeles guidelines.

The following sections of this report provide preliminary recommendations for earthwork and design of structure foundations for preliminary planning purposes. Once the type and general construction of the devices is better defined, Ninyo & Moore should review the devices' preliminary design. At that time, supplemental recommendations may be provided.

9.1. Site Preparation

Prior to earthwork, the project site should be cleared of existing structures, pavement, abandoned utilities (if present), and stripped of rubble, debris, vegetation, loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite.

9.2. Materials for Fill

On-site soils relatively free of organic material are suitable for reuse as fill. In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾-inch. Oversize materials should be separated from material to be used for fill and removed from the site. Although not anticipated, if encountered, high plasticity clays and silts should be disposed of off-site.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material should generally be granular soils with a very low to low expansion potential (i.e., an expansion index of 50 or less as evaluated by ASTM D 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

9.3. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified, moisture conditioned as needed to achieve moisture contents generally above the optimum moisture content, and then compacted to a relative compaction of 90 percent as evaluated in accordance with ASTM D 1557. The evaluation of

compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when the project area is ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

9.4. Utility Trench Backfill

Based on our subsurface exploration, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the “Greenbook” (Standard Specifications for Public Works Construction) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557.

Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

9.5. Preliminary Foundation Recommendations

For preliminary design purposes, shallow, spread or continuous footings founded on compacted fill or alluvial soils can be considered suitable for support of structures. Shallow, spread or continuous footings bearing on compacted fill or alluvial soils may be designed assuming an allowable bearing capacity of 2,000 psf. This allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. Spread footings should be founded 18 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches and isolated footings should be 18 inches in width or more. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

For resistance of foundations to lateral loads, we recommend an allowable passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot be used. This value assumes that the ground is horizontal for a distance of 10 feet or more, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. If passive and frictional resistances are to be used in combination, we recommend that the passive value not exceed one-half of the total resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

9.6. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Laboratory testing indicated the sulfate content of the sample tested was less than 0.2 percent, which is considered negligible for sulfate attack based on ACI criteria (ACI, 2011). Although significant sulfate content was not indicated, we recommend that Type II/V cement be used for concrete structures in contact with soil, due to the potential for variability of site soil. The water-cement ratio of the concrete should be 0.45 or less and the slump should be 4 inches or less.

9.7. Plan Review and Construction Observation

The preliminary conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Because we understand that the design of the BMPs devices for the EWMP project is conceptual at this point, we recommend that Ninyo & Moore review the devices' preliminary design, once the type and general construction of the devices is better defined. At that time, supplemental recommendations may be provided.

Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations to evaluate the assumptions inherent in the design.

The preliminary recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the preliminary conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for feasibility and preliminary design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our preliminary conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to

government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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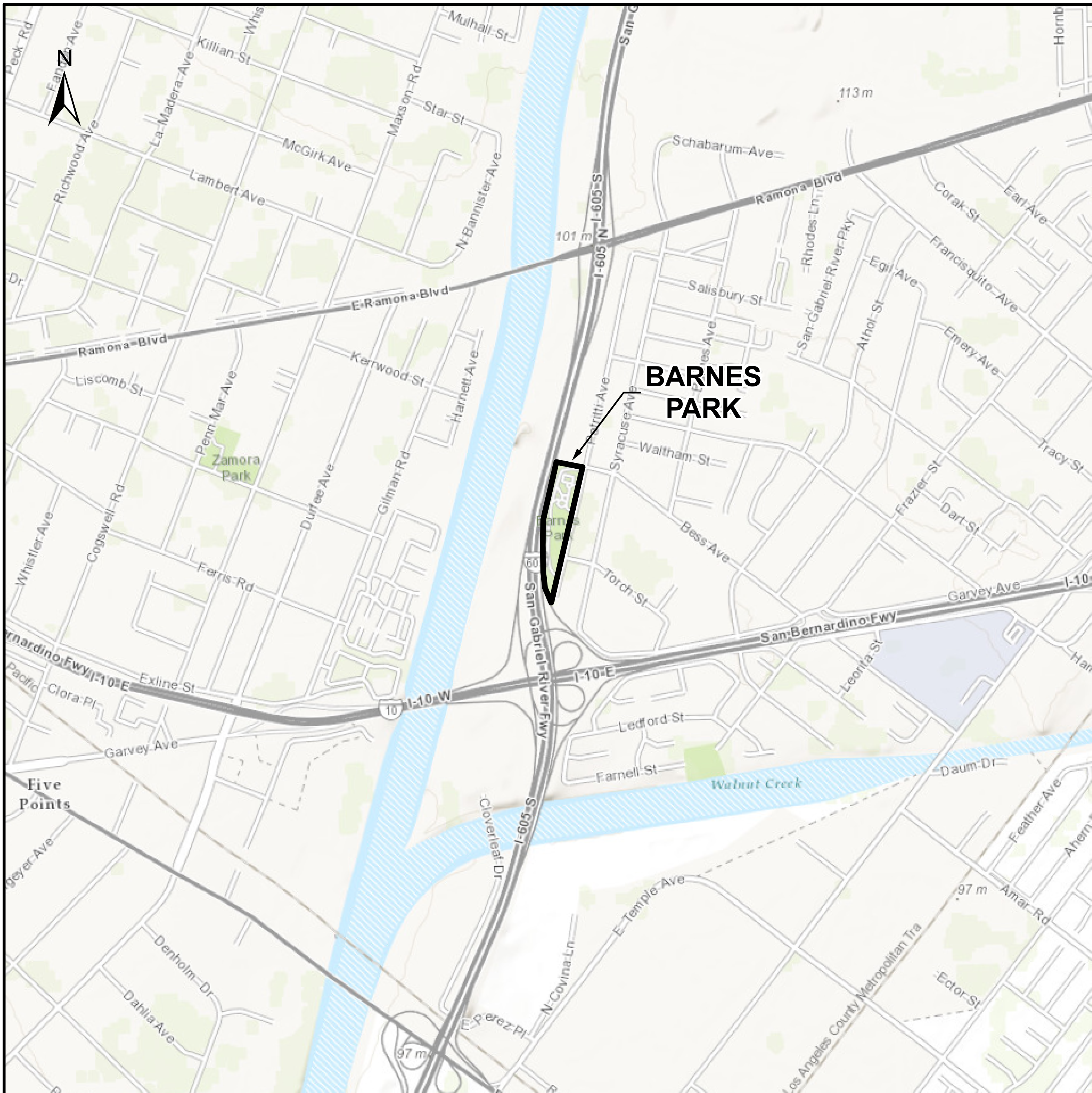
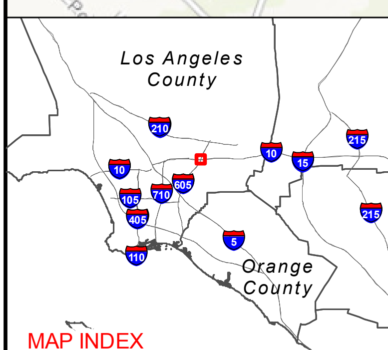


SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS.



Feet

0 750 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

1_107900001_SL_BAR_93.mxd AOB

Ninyo & Moore

SITE LOCATION

PROJECT NO.	DATE	BARNES PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	FIGURE 1
107900001	6/15		

SOURCE: Aerial Imagery - ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP.

LEGEND

SITE BOUNDARY

B-5 TD=101' BORING
TD=TOTAL DEPTH IN FEET

N

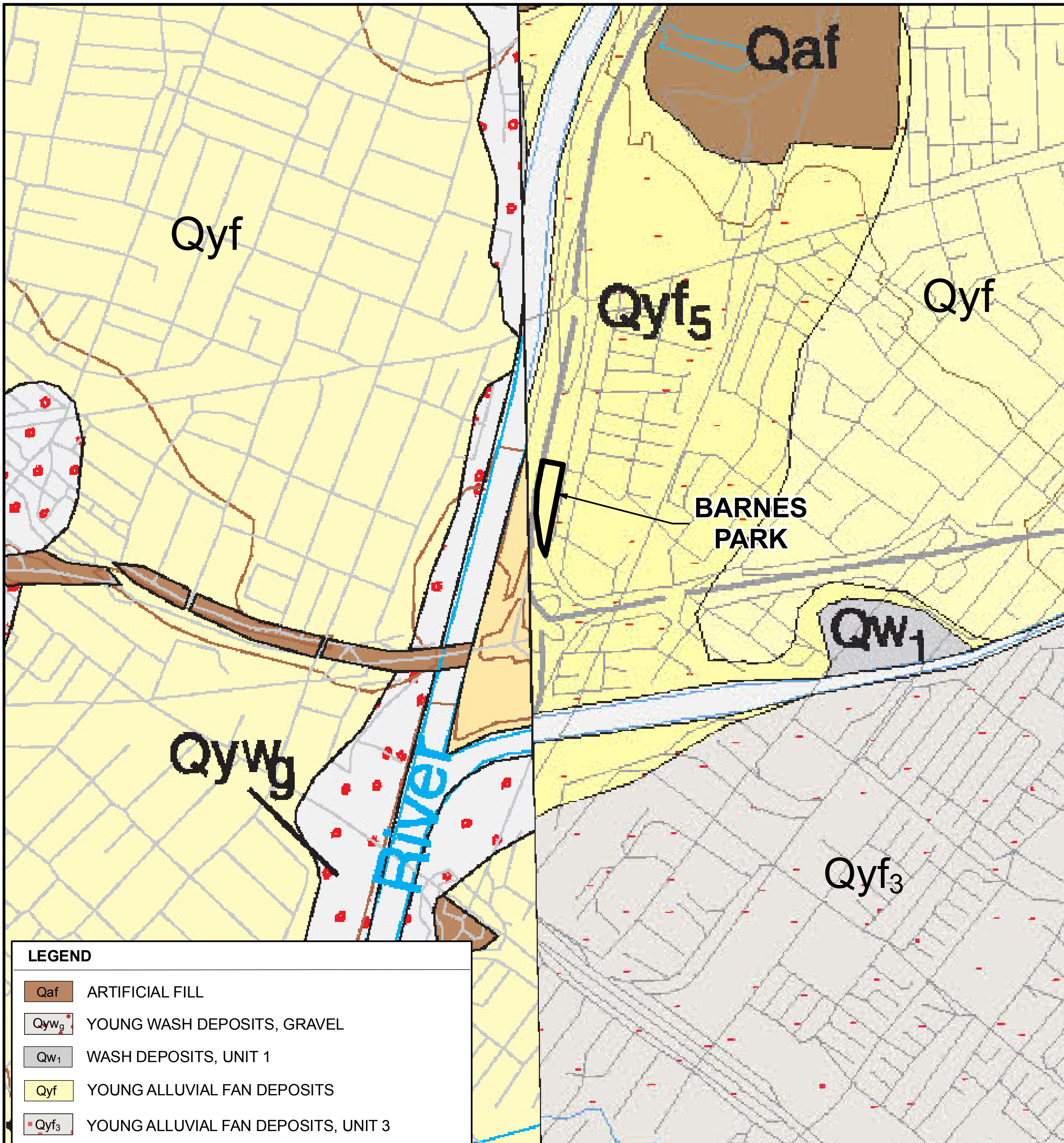
SCALE IN FEET

0 100 200 400

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		BORING LOCATION	FIGURE
PROJECT NO.	DATE	BARNES PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	2
107900001	6/15		

2_107900001_BL_BAR_93.mxd AOB



LEGEND

Qaf	ARTIFICIAL FILL
Qyw_g	YOUNG WASH DEPOSITS, GRAVEL
Qw_1	WASH DEPOSITS, UNIT 1
Qyf	YOUNG ALLUVIAL FAN DEPOSITS
Qyf_3	YOUNG ALLUVIAL FAN DEPOSITS, UNIT 3
Qyf_5	YOUNG ALLUVIAL FAN DEPOSITS, UNIT 5

65 U D FAULT - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATE, DOTTED WHERE CONCEALED. ARROW AND NUMBER INDICATE DIRECTION AND ANGLE OF DIP OF FAULT PLANE

N

SOURCE: MORTON, D.M., AND MILLER, F.K., 2006, GEOLOGIC MAP OF THE SAN BERNARDINO AND SANTA ANA 30' X 60' QUADRANGLE, CALIFORNIA
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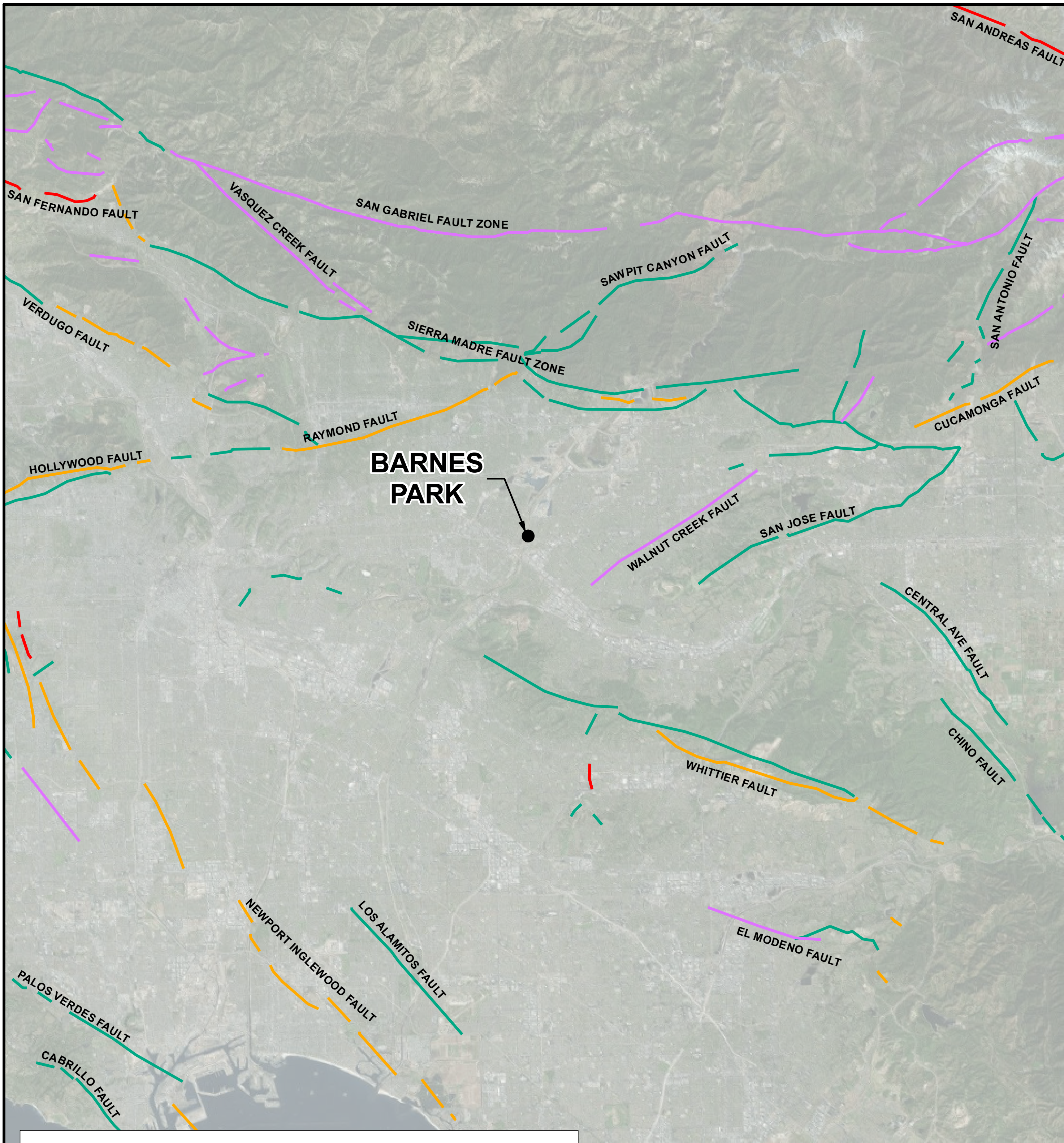
Feet

0 1,000 2,000 4,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

3_107900001_G_SA_93.mxd AOB

Ninyo & Moore		GEOLOGY	FIGURE
PROJECT NO.	DATE	BARNES PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	3
107900001	6/15		



LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS

N

Miles

0 3 6 12

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore

FAULT LOCATIONS

PROJECT NO.	DATE
107900001	6/15

BARNES PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

FIGURE 4

4_107900001_F_BAR_93.mxd AOB

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1⅜ inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	<u>MAJOR MATERIAL TYPE (SOIL)</u>: Solid line denotes unit change.
							CL	Dashed line denotes material change.
								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
15								
								The total depth line is a solid line that is drawn at the bottom of the boring.
20								

Ninyo & Moore

BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

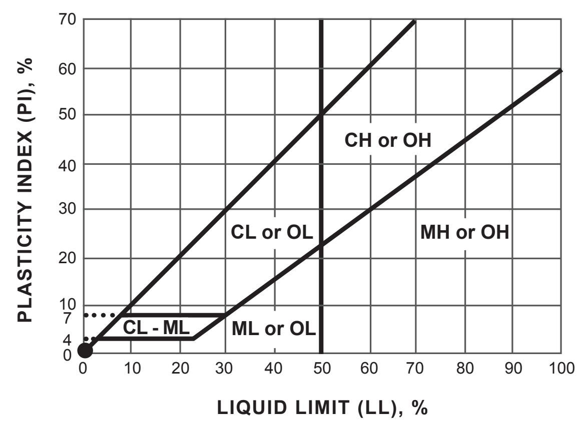
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS: GROUP SYMBOL	SECONDARY DIVISIONS: GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	**GRAVEL** more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	**SILT and CLAY** liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

Ninyo & Moore

USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DATE DRILLED	3/18/15
BORING NO.	B-5
GROUND ELEVATION	300' ± (MSL)
SHEET	1 OF 3
METHOD OF DRILLING	8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)
DRIVE WEIGHT	140 lbs. (Auto-Trip Hammer)
DROP	30"
SAMPLED BY	CAT
LOGGED BY	CAT
REVIEWED BY	GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	FILL: Dark brown, moist, medium dense, silty fine to medium SAND; scattered grass and roots.
							SW-SM	ALLUVIUM: Light grayish brown, moist, medium dense, well graded SAND with silt; gravel up to 1/2-inch. Gravelly from approximately 4 to 9 feet.
			14	4.7				Little cohesion.
10			44	2.6	117.9			Gravel up to 1-inch.
							SM	Light grayish brown, moist, loose to medium dense, silty SAND.
			7	16.0			ML	Brown, moist to wet, stiff, fine sandy SILT.
20			22	4.7			SW-SM	Light grayish brown, moist, medium dense, well graded SAND with silt; trace gravel up to 1-inch.
			28	4.2				Graded bedding- grades from silty fine sand to silty fine to coarse sand; fining upward.
								@ 28': Gravel extending to 29 feet.
30			50	3.4				
			77/11"	3.8	117.6			Very dense; graded bedding-fining upward.
40								

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BORING LOG

BARNES PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-1

DATE DRILLED 3/18/15	BORING NO. B-5		
GROUND ELEVATION 300' ± (MSL)	SHEET 2 OF 3		
METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)			
DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer)	DROP 30"		
SAMPLED BY CAT	LOGGED BY CAT	REVIEWED BY GTF	

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		X	40	5.7			SM	ALLUVIUM: (Continued) Light grayish brown, moist, very dense, silty fine to coarse SAND; scattered gravel up to 1 inch; graded bedding- fining upward.
		X	73	2.5				Massive.
50		X	47	2.9				Graded bedding- fining upward; scattered gravel up to 1/2-inch.
							SP-SM	Light grayish brown, moist, very dense, poorly graded SAND with silt.
60		X	62	2.7				Brown and grayish brown; medium dense. @ 62': Gravel layer; difficult drilling.
70		X	73	2.2				Gravel up to 1-inch; trace clay. Yellowish brown. Gravelly; difficult drilling.
80								

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BORING LOG

BARNES PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-2

DATE DRILLED 3/18/15 BORING NO. B-5

GROUND ELEVATION 300' ± (MSL) SHEET 3 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
80			50/6"	2.8			SM	ALLUVIUM: (Continued) Brown and grayish brown, moist, very dense, silty fine to coarse SAND; scattered gravel up to 1-inch.
90			72	3.2				Brown; gravel up to 1/2-inch.
100			50/6"	12.6				Moist to wet; fine sandy SILT; some reddish brown mottling; micaceous.
								Total Depth = 100.5 feet. Groundwater not encountered during drilling. Backfilled shortly after drilling on 3/18/15. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
110								
120								

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BORING LOG

BARNES PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-3

APPENDIX B

LABORATORY TESTING

Classification
Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

Moisture Content
The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

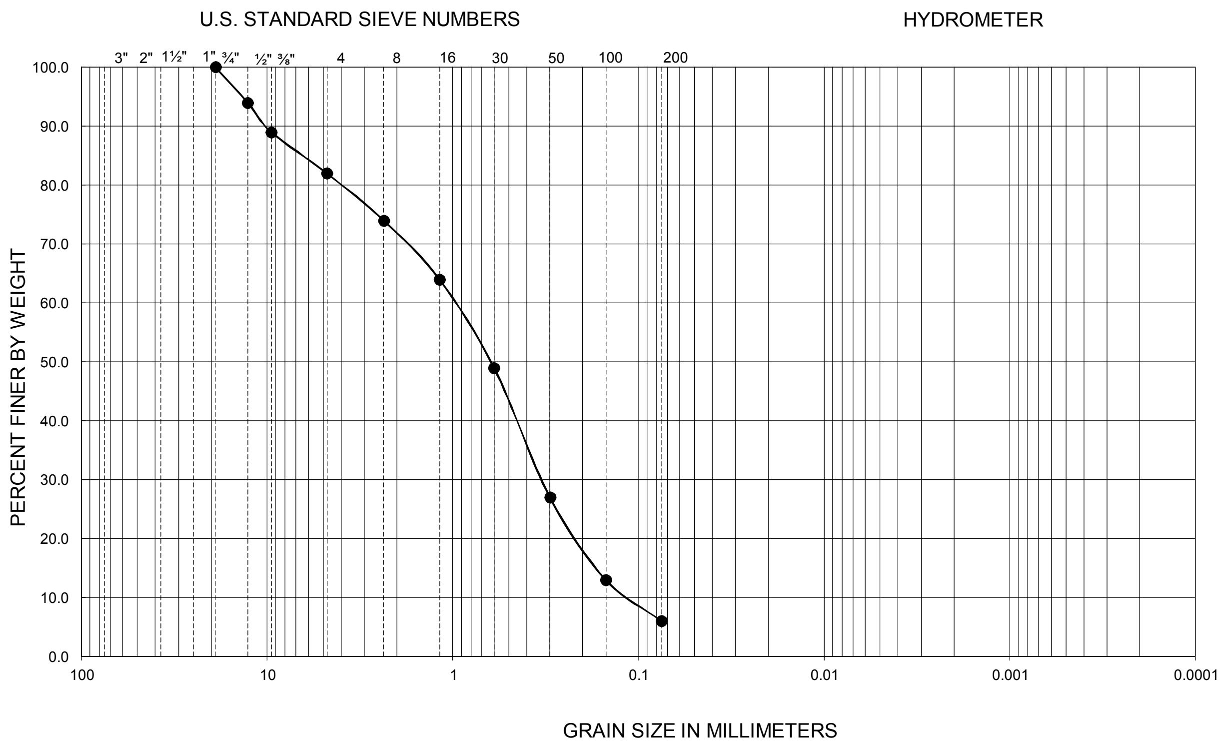
In-Place Moisture and Density Tests
The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis
Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-4. These test results were utilized in evaluating the soil classifications in accordance with USCS.

Direct Shear Tests
A direct shear test was performed on a relatively undisturbed sample in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-5.

Soil Corrosivity Tests
Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-6.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

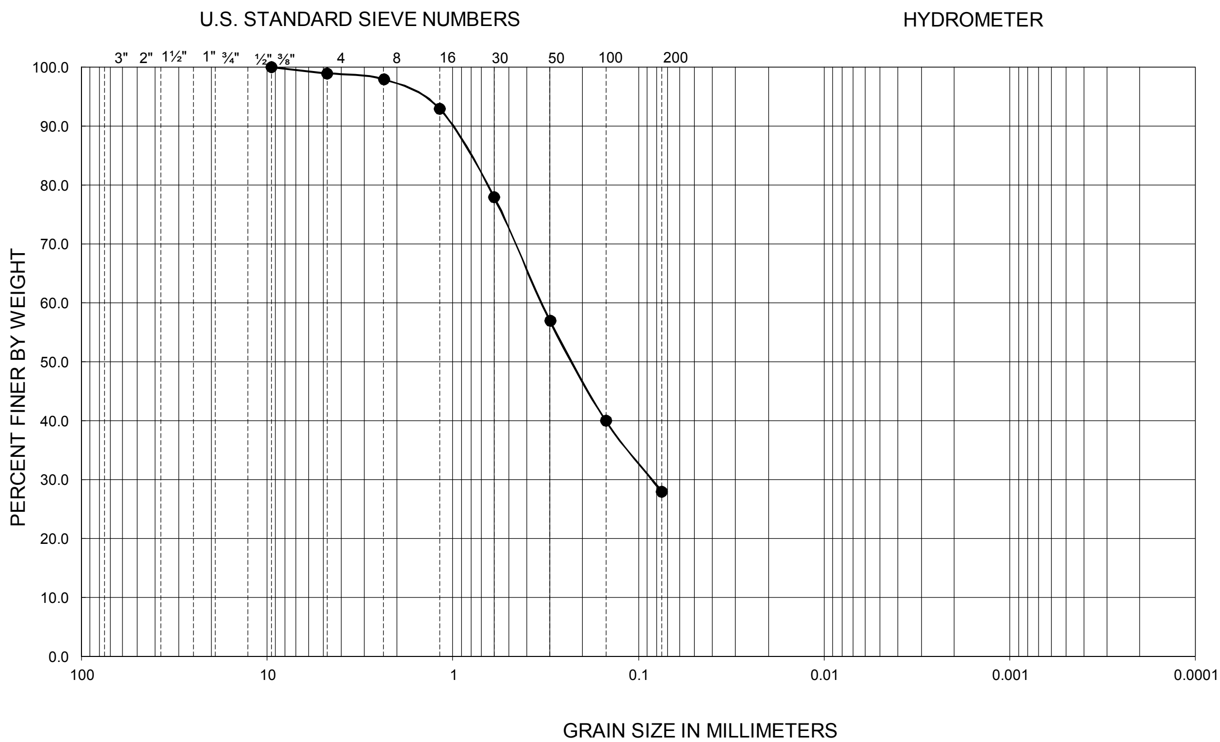


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-5	5.0-6.5	--	--	--	0.13	0.34	0.95	7.6	1.0	6	SW-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	BARNES PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-1
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-5	15.0-16.5	--	--	--	--	--	--	--	--	28	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

GRADATION TEST RESULTS

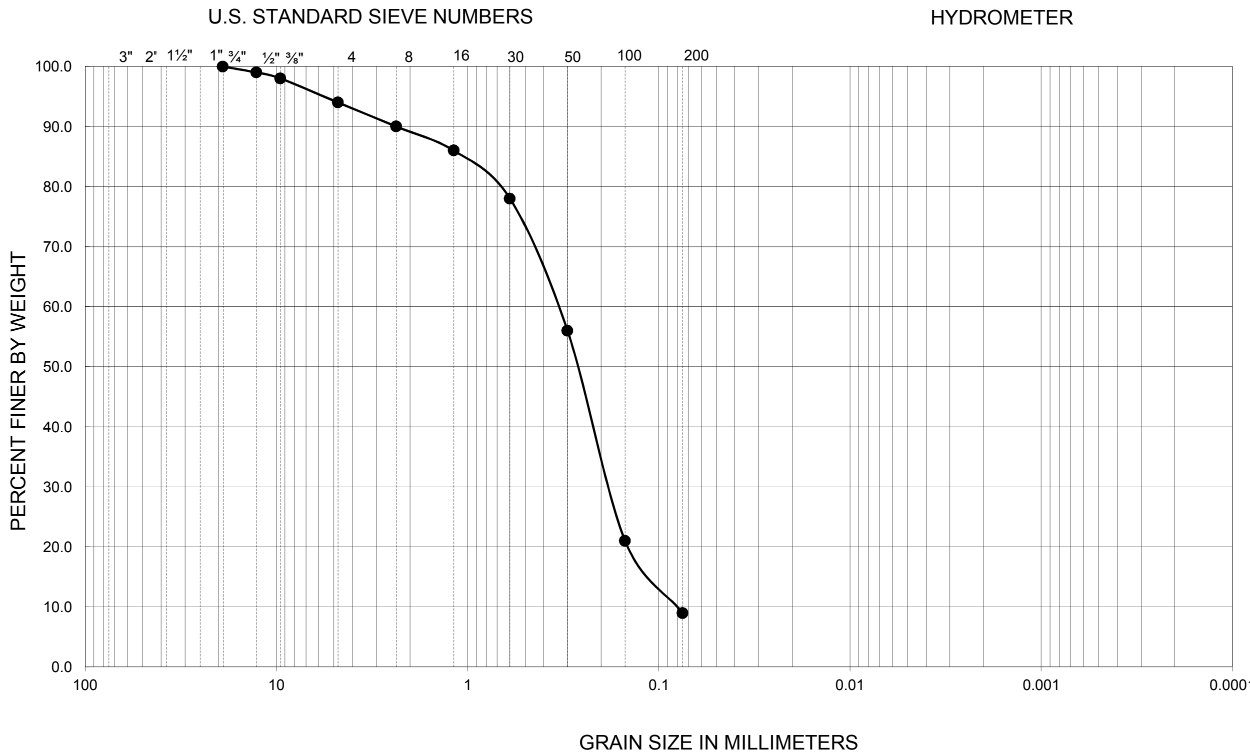
FIGURE **B-2**

PROJECT NO.	DATE
107900001	6/15

BARNES PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

107900001_SIEVE B-5 @ 15.0-16.5.xls

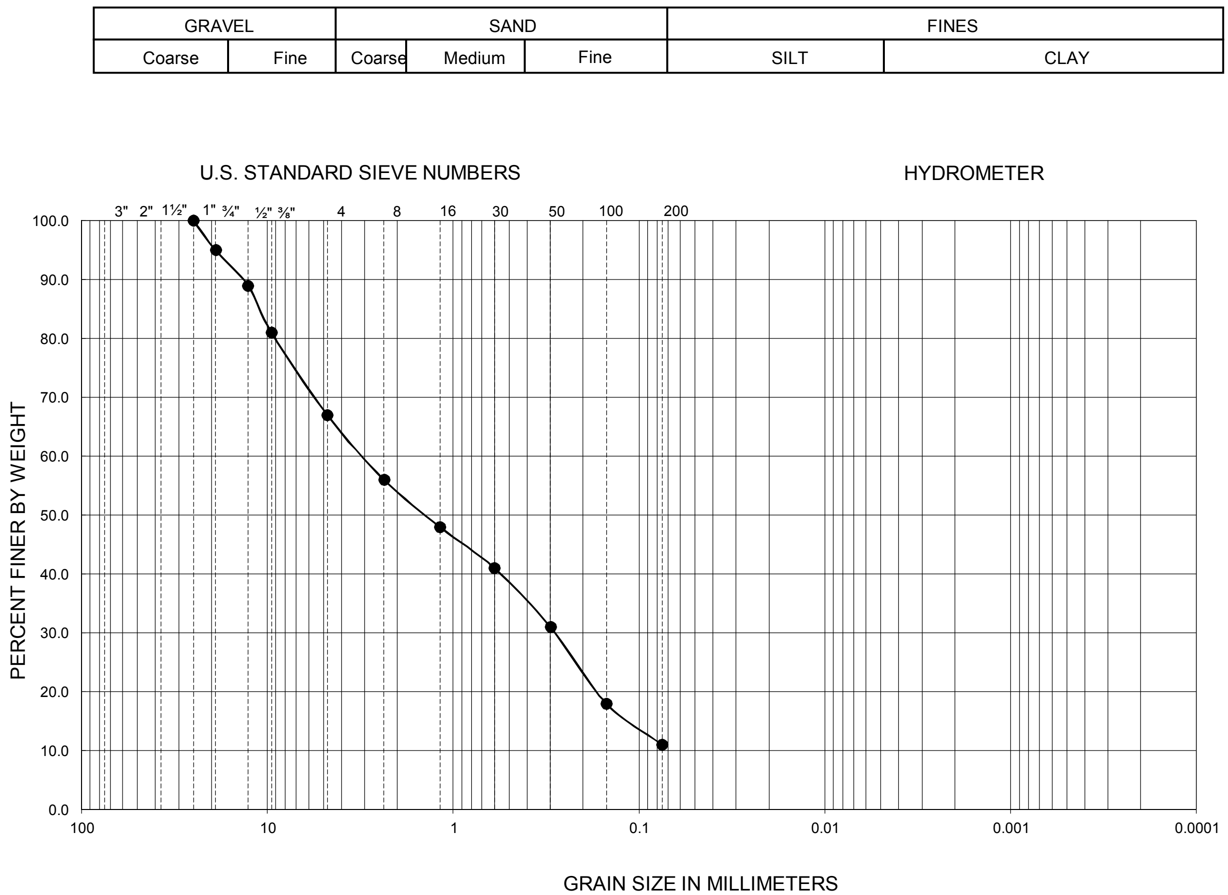
GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-5	25.0-26.5	--	--	--	0.08	0.18	0.33	4.2	1.2	9	SW-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	BARNES PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-3
107900001	6/15		



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-5	60.0-61.5	--	--	--	--	--	--	--	--	11	SP-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

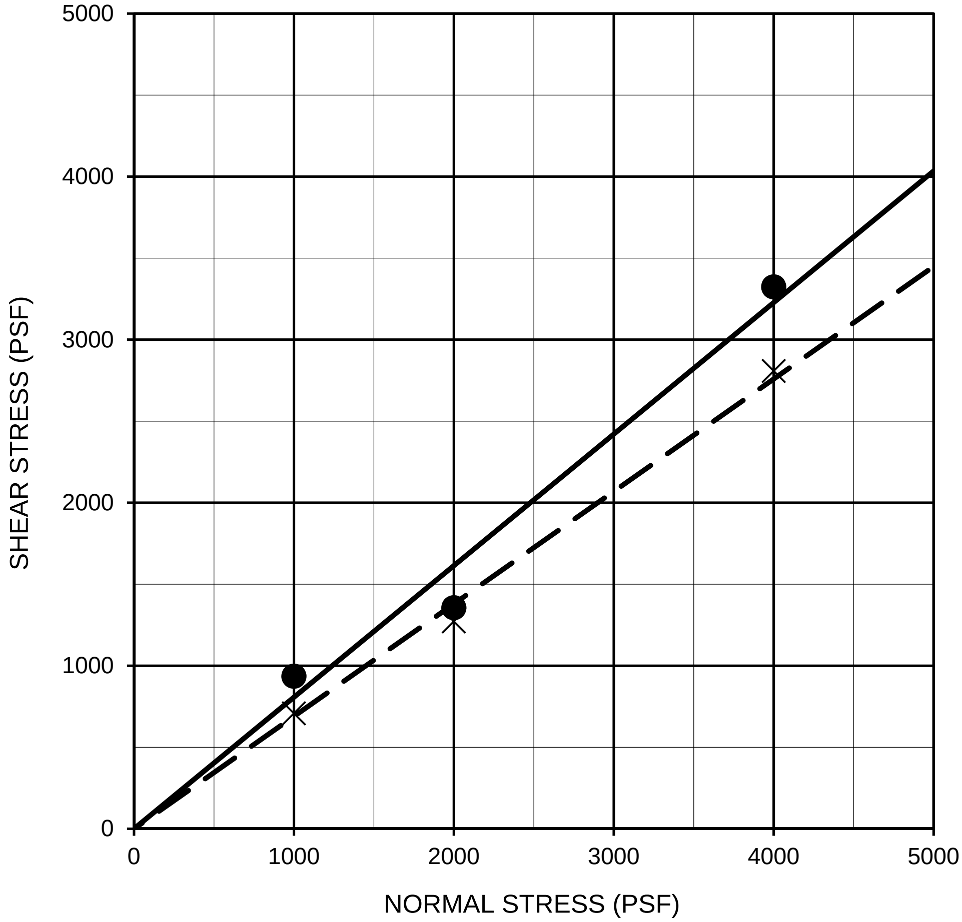
Ninyo & Moore

GRADATION TEST RESULTS

PROJECT NO.	DATE
107900001	6/15

BARNES PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

FIGURE
B-4



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SAND	—●—	B-5	10.0-11.5	Peak	0	39	SM
Silty SAND	- - x - -	B-5	10.0-11.5	Ultimate	0	35	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore	DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO. / DATE	BARNES PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-5
107900001 / 5/15		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-5	0.0-5.0	7.7	6,000	140	0.014	170

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore		CORROSIVITY TEST RESULTS	FIGURE
PROJECT NO.	DATE	BARNES PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-6
107900001	6/15		

ATTACHMENT 6

GEOTECHNICAL REPORT FOR KAHLER RUSSELL PARK

GEOTECHNICAL SERVICES
KAHLER RUSSELL PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NO. T10503269-102669-OM

PREPARED FOR:

MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
Kahler Russell Park
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order No. T10503269-102669-OM

Dear Ms. Kelly:

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Kahler Russell Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. This report presents geotechnical data obtained by Ninyo & Moore relative to the proposed project. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

REGISTERED PROFESSIONAL ENGINEER
WILLIAM R. MORRISON
No. 2468
Exp. 12/31/16
GEOTECHNICAL
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William Morrison, PE, GE
Senior Engineer

Gregory T. Farrand, PG, CEG
Principal Geologist

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CAT/WRM/GTF/KHM/gg

Distribution: (1) Addressee (via e-mail)

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Figures

1. INTRODUCTION

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Kahler Russell Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California (Figure 1). This report presents a compilation of geotechnical data obtained from the project along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project. We understand that the information contained herein will be included in the environmental report.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and subsurface exploration with regard to the proposed project. Specifically, we performed the following tasks:

- Review of readily available background materials, including State of California Seismic Hazards Zones map, State of California Earthquake Fault Zone map (Alquist-Priolo Special Studies Zones map), other published geologic maps and literature, in-house information, stereoscopic aerial photographs, and plans provided by the client.
- Performance of a site reconnaissance to observe the existing conditions at the site and to mark the proposed boring location for utility clearance. Mark-out of potential existing underground utilities was conducted through Underground Service Alert (USA).
- Performing a subsurface exploration consisting of drilling, logging and sampling of one exploratory soil boring at the site. The boring was advanced to a depth of 100.5 feet using a truck-mounted drill rig equipped with hollow stem augers.
- Performing geotechnical laboratory testing on soil samples collected during our subsurface exploration. The testing included an evaluation of moisture content, in-situ moisture and dry density, grain-size analysis (sieve and 200 wash), direct shear, and soil corrosivity.
- Compiling the data obtained from our background research, subsurface exploration, and laboratory testing.
- Preparing this report that presents geotechnical data obtained from our background review, site reconnaissance, and subsurface exploration at the project site, along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project.

3. PROJECT AND SITE DESCRIPTION

The purpose of the project is to assist MWH Americas (MWH) and the Los Angeles County Department of Public Works (LADPW) in developing an Enhanced Watershed Management Program (EWMP) for the Upper San Gabriel River Watershed. Our services are intended to help support feasibility analyses being conducted by MWH and LADPW for Better Management Practices (BMPs) at specific locations as part of the EWMP. We understand that the BMPs will help to reduce the impact of storm water and non-storm water discharges on the area (MWH, 2014).

Ten separate sites located within the San Gabriel Valley in Los Angeles County, California have been selected for feasibility analyses for the project. This report addresses the Kahler Russell County Park site, which is located at 735 North Glendora Avenue in the city of Covina (Figures 1 and 2). Kahler Russell Park is maintained by the County of Los Angeles. Geotechnical evaluations for the other nine sites are addressed in reports that are being issued under separate covers (Ninyo & Moore, 2015a through 2015i).

Kahler Russell County Park is developed with improvements that include restroom and recreation center buildings, softball/baseball fields, tennis and basketball courts, a roller hockey rink, asphalt concrete (AC) paved parking lots, paved and unpaved walkways, playground equipment, light poles, landscaping consisting of trees, shrubs, and grass areas, and other associated appurtenances. The site for the proposed improvements is located in a grass area in the northeast portion of the park between the tennis courts and the parking lot. The site coordinates are approximately 34.0938°N latitude and -117.8650°W longitude. Elevations at the project site range from approximately 620 feet above mean sea level (MSL) at the west end of the park to roughly 660 feet MSL at the east end of the park.

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our field exploration at the Kahler Russell Park site included a geologic reconnaissance that was conducted on February 19, 2015 and subsurface exploration that was conducted on March 3, 2015. The subsurface exploration consisted of drilling one 8-inch diameter hollow stem auger boring (B-6) to a depth of 100.5 feet below ground surface (bgs). The boring was logged by a geologist from our firm. Representative disturbed and undisturbed soil samples were obtained at selected depths from the boring for laboratory testing. The approximate location of the boring is presented on Figure 2. The boring log is presented in Appendix A.

Laboratory testing of selected soil samples obtained from our exploratory boring included in-situ dry density and moisture content, gradation, direct shear, and soil corrosivity. The results of the in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests described above are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, and groundwater conditions at the Kahler Russell Park site are provided in the following sections.

5.1. Regional and Geologic Setting

The subject site is located within the northeastern portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Norris and Webb, 1990). The geomorphic province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and continues farther to the tip of Baja California. The Los Angeles Basin has been divided into four structural blocks which are generally bounded by prominent fault systems. The site is located within the Northeastern Block, which is bordered on the west and south by the Whittier-Elsinore fault and is bordered on the north by the San Gabriel Mountains and the Raymond Hill Fault. The Northeastern Block is a deep basin characterized by thick sequences of alluvium and sedimentary units overlying basement rocks, which are at depths of up to approximately 12,000 feet below the surface in the central part of the San Gabriel Valley.

5.2. Site Geology

Our review of the referenced geologic maps and literature indicates that the subject site is underlain by Holocene to Pleistocene alluvial gravel and sand (Dibblee and Minch, 2002).

Geologic units encountered during our reconnaissance and subsurface exploration of the project site included relatively thin fill soils that mantle alluvium. Generalized descriptions of the units encountered are provided in the subsequent sections. Additional descriptions are provided on the boring logs in Appendix A. A geologic map of the region is presented on Figure 3.

5.2.1. Fill

Fill materials were encountered in our boring B-6 extending from the ground surface to a depth of approximately 3.5 feet below existing grade. As observed, the fill materials generally consisted of dark brown, moist, medium dense, silty sand. Scattered gravel was encountered in the fill materials.

5.2.2. Alluvium

Alluvium was encountered in our boring B-6 underlying the fill materials and was observed to extend to the total depth explored of approximately 100.5 feet below existing grade. As observed in our boring, the alluvial materials generally consisted of various shades of brown, moist, loose to very dense, silty sands and sandy silts. Scattered gravel was encountered at various depths in the alluvium.

5.3. Groundwater

Groundwater was not encountered during our subsurface exploration in our boring B-6. Fluctuations in the groundwater level and perched conditions typically occur due to variations in precipitation, ground surface topography, subsurface stratification, irrigation, and other factors.

6. FAULTING AND SEISMICITY

Based on our review of published geologic maps and review of stereoscopic aerial photographs, no active fault traces are mapped as underlying the Kahler Russell Park site. Therefore, the potential for surface fault rupture at the site is considered to be low. The project site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, Kahler Russell Park is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed improvements. Figure 4 shows the approximate site location relative to the major faults in the region. The nearest known active fault is the San Jose fault, located approximately 3 miles southeast of the site.

6.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated at 0.888g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based).

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.778g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.778g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.2. Surface Fault Rupture

The probability of damage due to surface ground rupture is relatively low due to the lack of known active faults crossing the project site. Surface ground cracking related to shaking from distant events is not considered a significant hazard, although it is a possibility.

6.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon in which loosely deposited, granular soils and some fine-grained soils located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration can result in a loss of grain-to-grain contact due to a rapid rise in pore water pressure causing the soil to behave as a fluid for a short period. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

According to the Seismic Hazard Zones Map for the San Dimas Quadrangle, (CGS, 1999), the Kahler Russell Park site is not mapped as being in an area susceptible to liquefaction. During our subsurface exploration, groundwater was not encountered at Kahler Russell Park to the total depth explored of 100.5 feet. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Kahler Russell Park site.

7. OTHER GEOTECHNICAL CONSIDERATIONS

7.1. Slope Stability

Our review of maps published by the California Geological Survey (CGS, 1999) indicate that the Kahler Russell Park site is not situated in an area considered to be susceptible to seismic-induced landsliding. In addition, our observations indicate that the site is generally level to gently sloping. Consequently, landsliding or slope instability are not considered to be a constraint at the project site.

7.2. Corrosion

Laboratory testing was performed on representative samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with the California Test (CT) 643 and the sulfate and chloride tests were performed in accordance with CTs 417 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing performed on a sample obtained from the site indicated an electrical resistivity value of 2,900 ohm-cm, a soil pH value of 7.6, a chloride content of 490 ppm, and a sulfate content of 0.009 percent. According to Caltrans criteria and American Concrete Institute (ACI) 318 guidelines, a corrosive soil is defined as one with more than 500 ppm chlorides, more than 0.2 percent sulfates, a pH less than 5.5, or an electrical resistivity of less than 1,000 ohm-cm. While the upper soils encountered at the site are not considered to be corrosive (based on Caltrans criteria (2012) and ACI guidelines), the chloride content measured in the soil is high enough that it would be prudent to consider this site to be corrosive.

8. DISCUSSION AND FINDINGS

As discussed above, our geotechnical services were performed to assist MWH and LADPW evaluate the preliminary feasibility of an onsite storm water infiltration system at the Kahler Russell Park site. Based on our communications with MWH, we understand that the preliminary criteria at the site is related to the presence of groundwater or dense materials providing refusal to drilling equipment within 100 feet of the ground surface. As such, our scope of services included the drilling of an exploratory boring that extended to a depth of 100 feet, to groundwater, or to refusal (whichever is shallower). We understand that BMPs being considered for the site are conceptual at this time. Based on the information obtained from our geotechnical evaluation, the following findings and conclusions have been made:

- The project site is underlain by relatively shallow fill (approximately 3.5 feet deep) overlying alluvial soils. The encountered portions of the fill were generally comprised of silty sands that contained scattered amounts of gravel. The underlying alluvial soils were observed to consist of silty sands and sandy silts.

- Groundwater was not encountered in our exploratory boring to the total depth explored of 100.5 feet.

- Based on our review of aerial photographs and published geologic maps, there are no known active faults or landslides underlying the project site.

- Our faulting and seismicity evaluation indicated that the site is subject to severe ground shaking due to a design seismic event.

- Review of geological literature indicates that the site is not situated in an area that has been mapped as being susceptible to liquefaction. Additionally, groundwater was not encountered in our exploration at the site. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Kahler Russell Park site.

- In-place infiltration testing was not performed as part of our geotechnical services. However, based on published correlations between a soil's grain size and its permeability (Shepherd, 1989), an estimated permeability on the order of 10^{-3} cm/sec within the encountered sandy and silty soils can be utilized for preliminary evaluation purposes. Actual design of storm water infiltration devices should be in accordance with the County of Los Angeles guidelines and should be based on field infiltration testing at the site.

- Recommendations provided in this report are preliminary in nature and are not intended to provide sufficient information to fully address potential geotechnical related issues. Prior to site development an additional geotechnical evaluation should be performed.

9. PRELIMINARY RECOMMENDATIONS

As noted above we understand that the Better Management Practices (BMPs) associated with the proposed Upper San Gabriel River EWMP Project are conceptual at this time. As such, details regarding the types and construction of the BMPs (if any) are not known at this time for the Kahler Russell Park site. We recommend that the geotechnical information presented herein be utilized during the evaluation of the feasibility of the devices associated with the EWMP project at the site. The design of BMPs should be performed in accordance with County of Los Angeles guidelines.

The following sections of this report provide preliminary recommendations for earthwork and design of structure foundations for preliminary planning purposes. Once the type and general construction of the devices is better defined, Ninyo & Moore should review the devices' preliminary design. At that time, supplemental recommendations may be provided.

9.1. Site Preparation

Prior to earthwork, the project site should be cleared of existing structures, pavement, abandoned utilities (if present), and stripped of rubble, debris, vegetation, loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite.

9.2. Materials for Fill

On-site soils relatively free of organic material are suitable for reuse as fill. In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾-inch. Oversize materials should be separated from material to be used for fill and removed from the site. Although not anticipated, if encountered, high plasticity clays and silts should be disposed of off-site.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material should generally be granular soils with a very low to low expansion potential (i.e., an expansion index of 50 or less as evaluated by ASTM D 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

9.3. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified, moisture conditioned as needed to achieve moisture contents generally above the optimum moisture content, and then compacted to a relative compaction of 90 percent as evaluated in accordance with ASTM D 1557. The evaluation of

compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when the project area is ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

9.4. Utility Trench Backfill

Based on our subsurface exploration, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the “Greenbook” (Standard Specifications for Public Works Construction) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557.

Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

9.5. Preliminary Foundation Recommendations

For preliminary design purposes, shallow, spread or continuous footings founded on compacted fill or alluvial soils can be considered suitable for support of structures. Shallow, spread or continuous footings bearing on compacted fill or alluvial soils may be designed assuming an allowable bearing capacity of 2,000 psf. This allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. Spread footings should be founded 18 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches and isolated footings should be 18 inches in width or more. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

For resistance of foundations to lateral loads, we recommend an allowable passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot be used. This value assumes that the ground is horizontal for a distance of 10 feet or more, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. If passive and frictional resistances are to be used in combination, we recommend that the passive value not exceed one-half of the total resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

9.6. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Laboratory testing indicated the sulfate content of the sample tested was less than 0.2 percent, which is considered negligible for sulfate attack based on ACI criteria (ACI, 2011). Although significant sulfate content was not indicated, we recommend that Type II/V cement be used for concrete structures in contact with soil, due to the potential for variability of site soil. The water-cement ratio of the concrete should be 0.45 or less and the slump should be 4 inches or less.

9.7. Plan Review and Construction Observation

The preliminary conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Because we understand that the design of the BMPs devices for the EWMP project is conceptual at this point, we recommend that Ninyo & Moore review the devices' preliminary design, once the type and general construction of the devices is better defined. At that time, supplemental recommendations may be provided.

Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations to evaluate the assumptions inherent in the design.

The preliminary recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the preliminary conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for feasibility and preliminary design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our preliminary conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to

government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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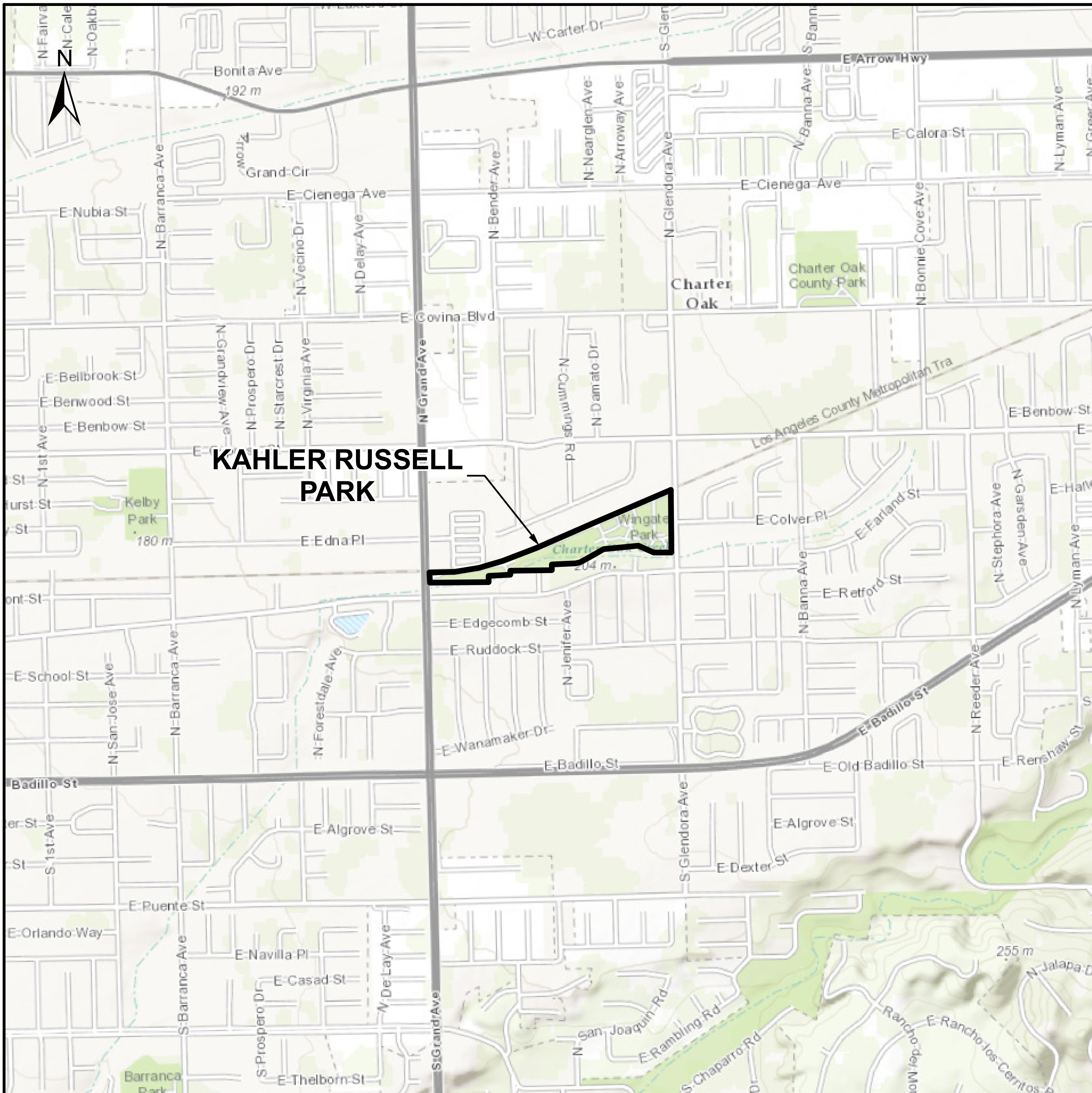
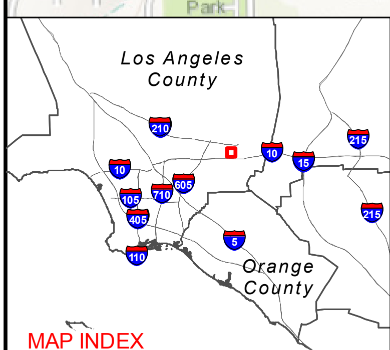


SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS.



Feet

0 750 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

1_107900001_SL_KR_93.mxd AOB

Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	KAHLER RUSSELL PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	1
107900001	6/15		

SOURCE: Aerial Imagery - ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP.

LEGEND

SITE BOUNDARY

B-6 TD=100.5' BORING
TD=TOTAL DEPTH IN FEET

N

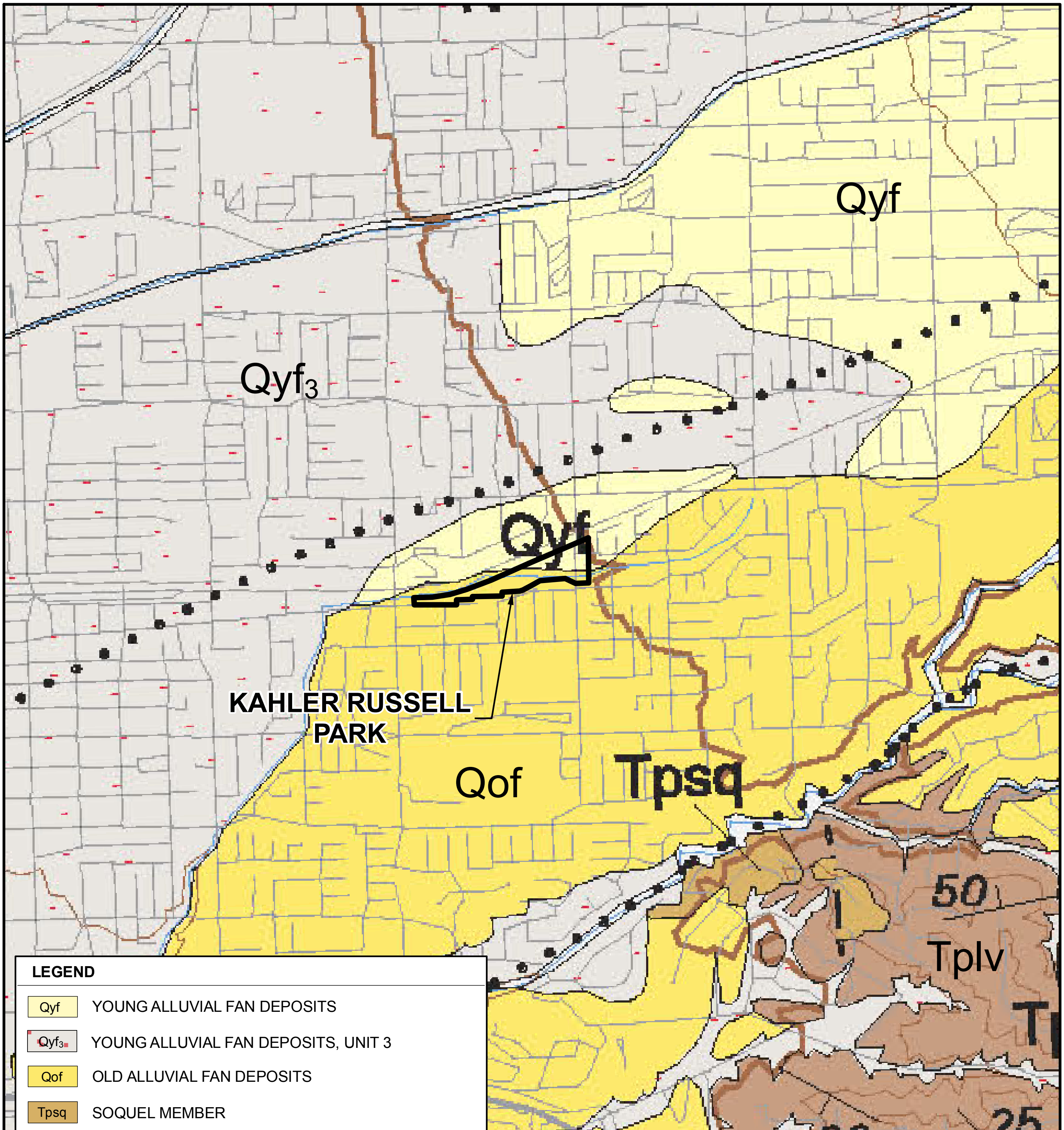
SCALE IN FEET

0 200 400 800

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

2_107900001_BL_KR_93.mxd AOB

Ninyo & Moore		BORING LOCATION	FIGURE
PROJECT NO.	DATE	KAHLER RUSSELL PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	2
107900001	6/15		



LEGEND

Qyf	YOUNG ALLUVIAL FAN DEPOSITS
Qyf_3	YOUNG ALLUVIAL FAN DEPOSITS, UNIT 3
Qof	OLD ALLUVIAL FAN DEPOSITS
Tpsq	SOQUEL MEMBER
Tplv	LA VIDA MEMBER

65 U D .... FAULT - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATE, DOTTED WHERE CONCEALED. ARROW AND NUMBER INDICATE DIRECTION AND ANGLE OF DIP OF FAULT PLANE

SOURCE: MORTON, D.M., AND MILLER, F.K., 2006, GEOLOGIC MAP OF THE SAN BERNARDINO AND SANTA ANA 30' X 60' QUADRANGLE, CALIFORNIA

N

Feet

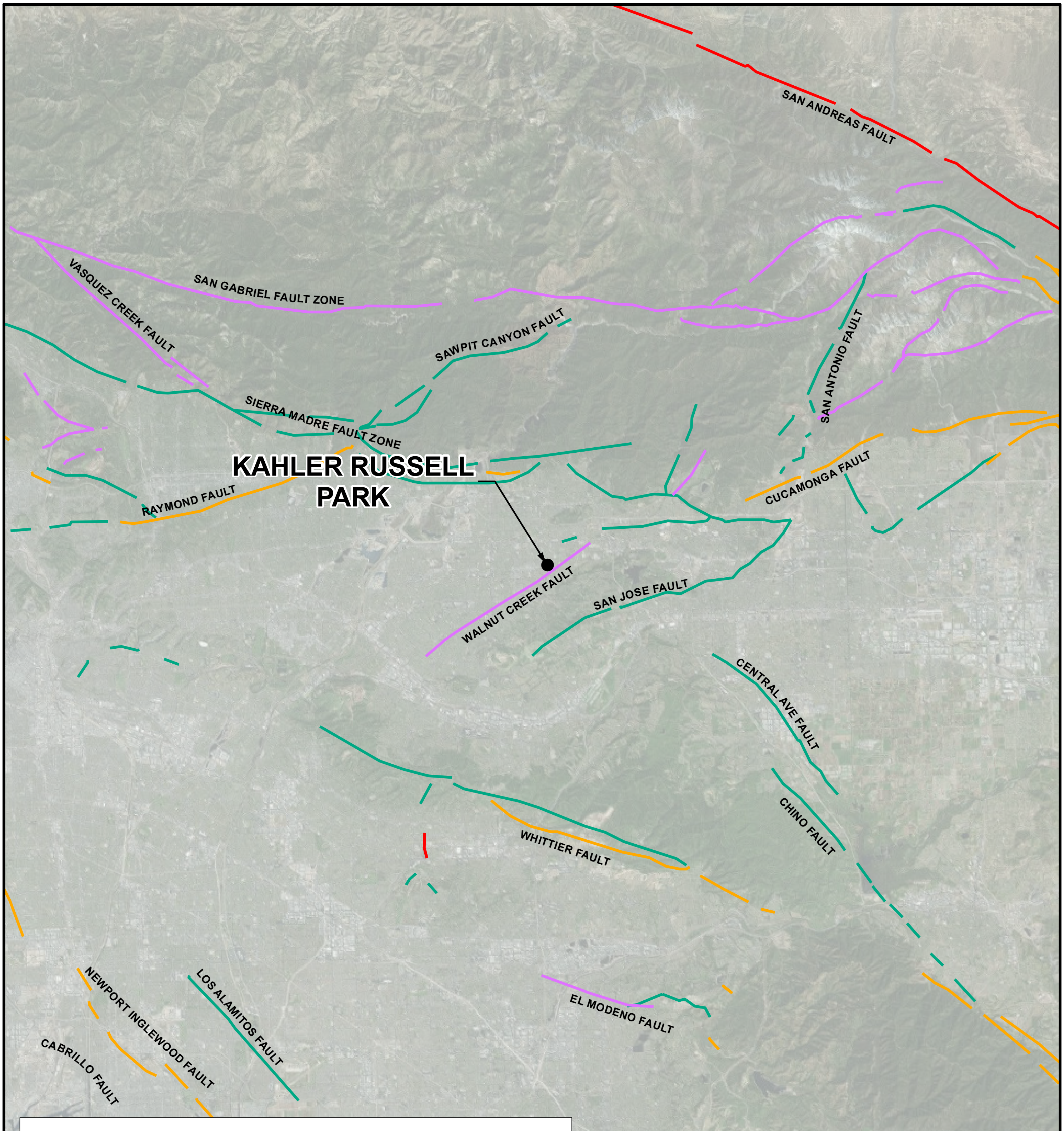
0 1,000 2,000 4,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore

PROJECT NO.	DATE	GEOLOGY	FIGURE
107900001	6/15	KAHLER RUSSELL PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	3

3_107900001_G_KR_93.mxd AOB



LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS

N

Miles

0 3 6 12

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

4_107900001_F_KR_93.mxd AOB

Ninyo & Moore	FAULT LOCATIONS	FIGURE
PROJECT NO. 107900001	DATE 6/15	KAHLER RUSSELL PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	4

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1⅜ inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change.
15								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
								The total depth line is a solid line that is drawn at the bottom of the boring.
20								

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BORING LOG		
Explanation of Boring Log Symbols		
PROJECT NO.	DATE	FIGURE

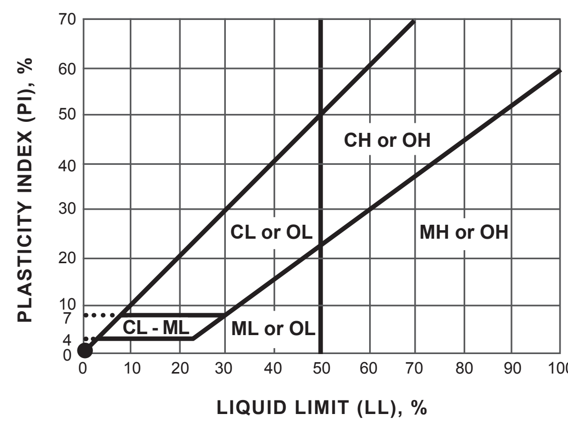
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS: GROUP SYMBOL	SECONDARY DIVISIONS: GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	**GRAVEL** more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	**SILT and CLAY** liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DATE DRILLED 3/3/15 BORING NO. B-6

GROUND ELEVATION 650' ± (MSL) SHEET 1 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	FILL: Dark brown, moist, medium dense, silty fine to coarse SAND; scattered gravel up to 1 inch in diameter.
							SM	ALLUVIUM: Brown, moist, loose, silty fine to coarse SAND; trace fine gravel (less than 1/2 inch in diameter); micaceous.
			14	2.8	109.7			
								Dense.
10			27	3.6				Scattered gravel up to 1 inch in diameter; scattered fragments of decomposed granitic rock up to 1 inch in diameter.
			10	9.8				Medium dense; silty fine sand; few laminations visible; highly micaceous.
20			39	4.0				Very dense; silty fine to coarse SAND; scattered gravel up to 1 inch in diameter.
							ML	Brown, moist, medium dense, fine sandy SILT; micaceous.
30			18	14.5				
40								

Ninyo & Moore

BORING LOG

KAHLER RUSSELL PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-1

DATE DRILLED 3/3/15	BORING NO. B-6	
GROUND ELEVATION 650' ± (MSL)	SHEET 2 OF 3	
METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)		
DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer)	DROP 30"	
SAMPLED BY CAT	LOGGED BY CAT	REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		X	28	16.3	110.2		ML	ALLUVIUM: (Continued) Reddish brown, moist, medium dense, fine to coarse sandy SILT; micaceous; few gravel up to 1/2 inch in diameter; trace clay.
							SM	Yellowish brown, moist, medium dense, silty fine to coarse SAND; micaceous.
50		X	87/10"	2.0				Light grayish brown; scattered gravel up to 1 inch in diameter.
60		X	26	12.1			ML	Reddish brown, moist, medium dense, fine sandy SILT.
							SM	Brown, moist, medium dense, silty fine SAND.
							ML	Reddish brown, moist, medium dense, fine sandy SILT.
							SM	Reddish brown, moist, very dense, silty fine to medium SAND; trace clay.
70		X	37	9.6				
80								

Ninyo & Moore

BORING LOG

KAHLER RUSSELL PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-2

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
80		◢	22	17.2			ML	ALLUVIUM: (Continued) Reddish brown, moist, dense, fine to medium sandy SILT; trace clay; trace gravel up to 1/2-inch in diameter.
								Harder drilling.
90		◢	31	13.1				Micaceous.
100		◢	50/6	2.6				Light brown; medium dense; silty fine to coarse sand with gravel.
								Total Depth = 100.5 feet. Groundwater not encountered during drilling. Backfilled shortly after drilling on 3/3/15. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
110								
120								

DATE DRILLED 3/3/15 BORING NO. B-6

GROUND ELEVATION 650' ± (MSL) SHEET 3 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

Ninyo & Moore

BORING LOG

KAHLER RUSSELL PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-3

APPENDIX B

LABORATORY TESTING

Classification
Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

Moisture Content
The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

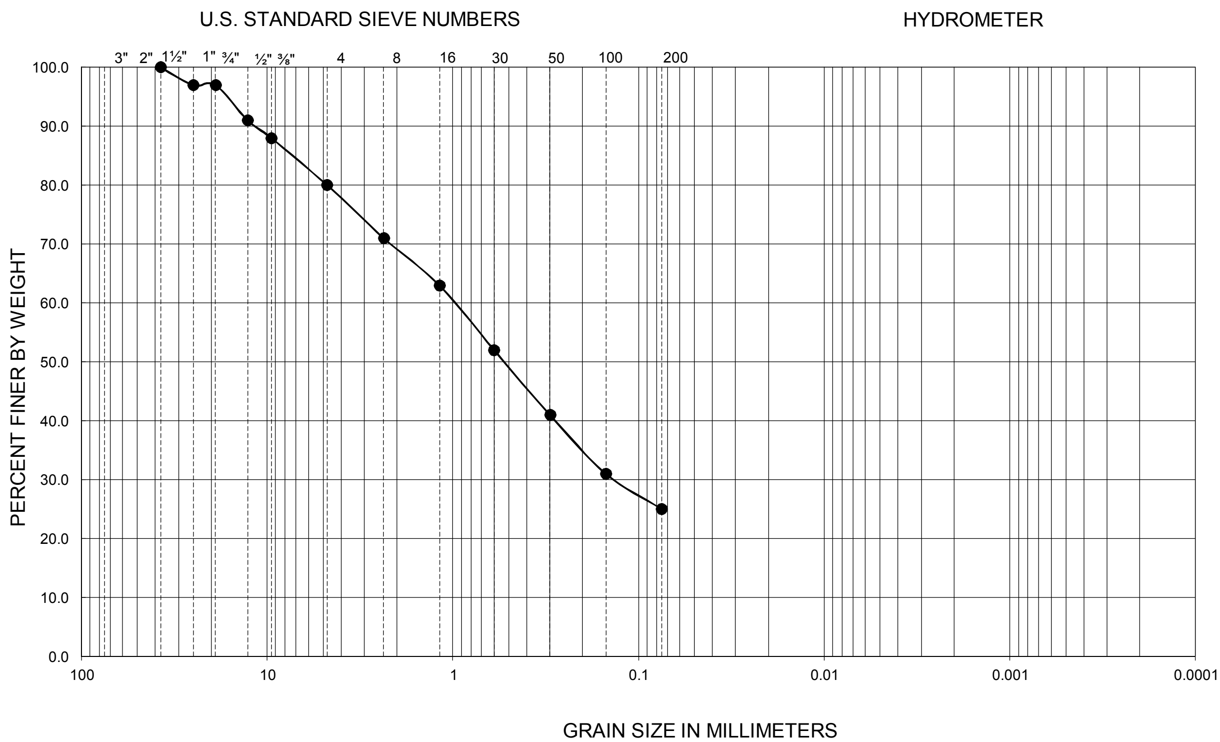
In-Place Moisture and Density Tests
The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis
Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-5. These test results were utilized in evaluating the soil classifications in accordance with USCS.

Direct Shear Tests
A direct shear test was performed on a relatively undisturbed sample in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-6.

Soil Corrosivity Tests
Soil pH, and resistivity tests were performed on a representative sample in general accordance with California Test (CT) 643. The soluble sulfate and chloride content of selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-7.

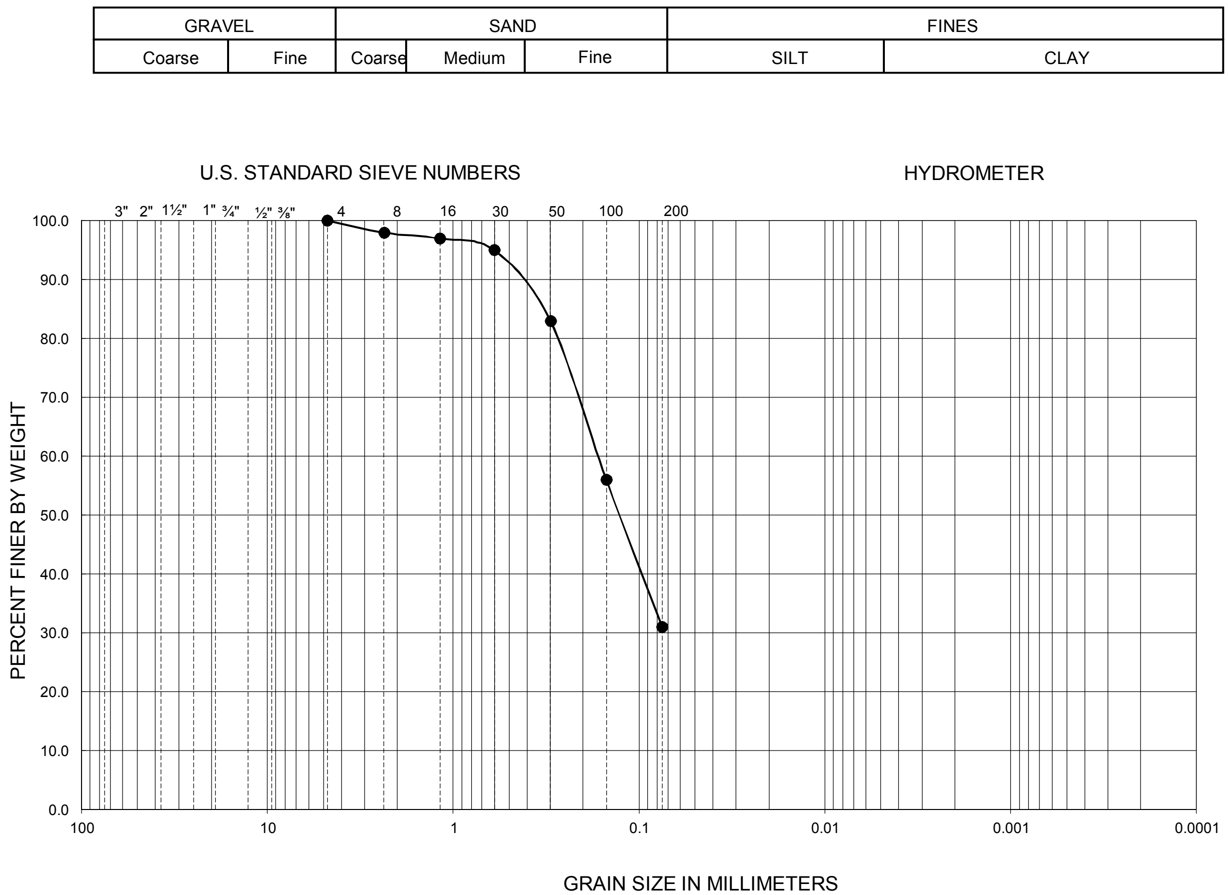
GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-6	10.0-11.5	--	--	--	--	--	--	--	--	25	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	KAHLER RUSSELL PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-1
107900001	6/15		

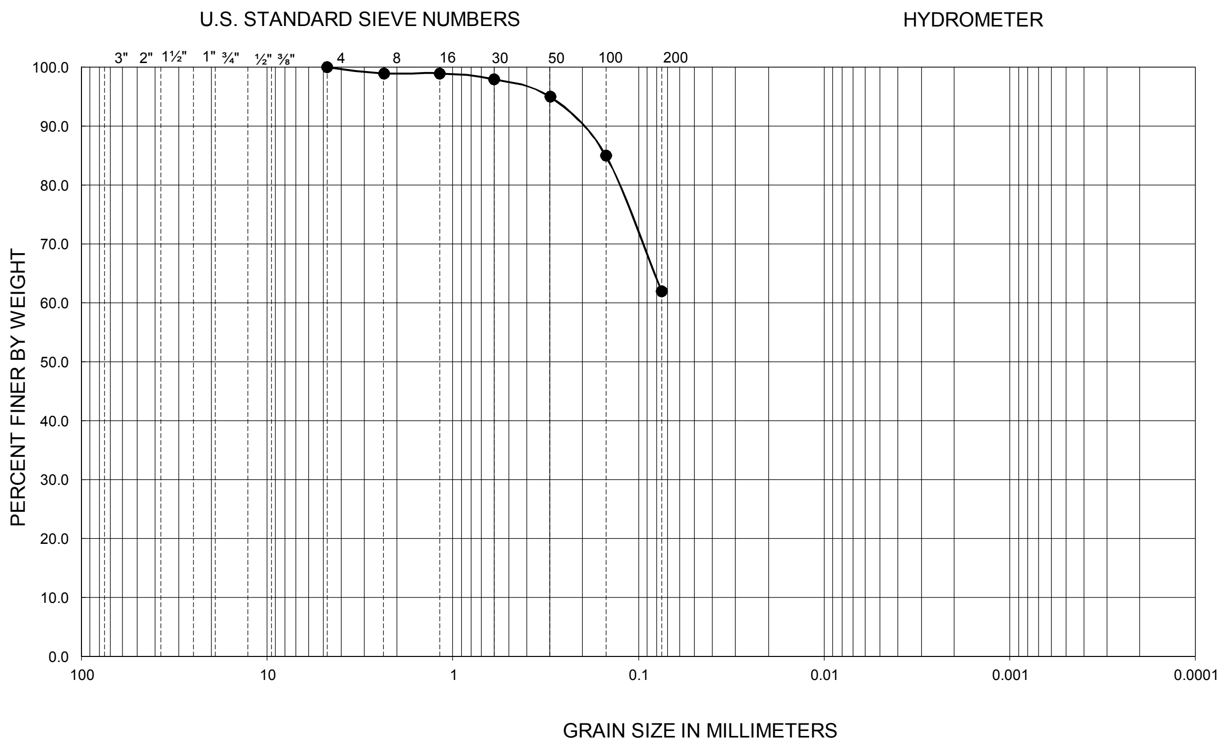


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-6	15.0-16.5	--	--	--	--	--	--	--	--	31	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore	GRADATION TEST RESULTS		FIGURE
PROJECT NO.	DATE	KAHLER RUSSELL PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-2
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-6	30.0-31.5	--	--	--	--	--	--	--	--	62	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

GRADATION TEST RESULTS

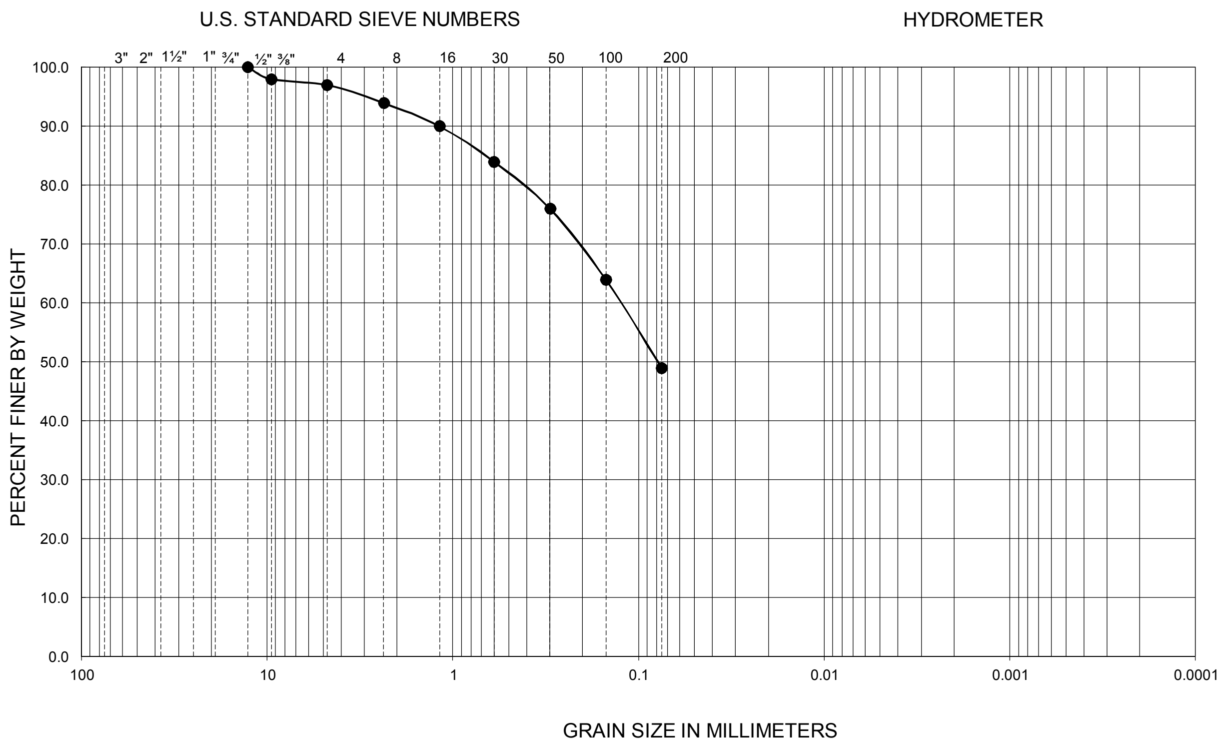
FIGURE

B-3

PROJECT NO.	DATE
107900001	6/15

KAHLER RUSSELL PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

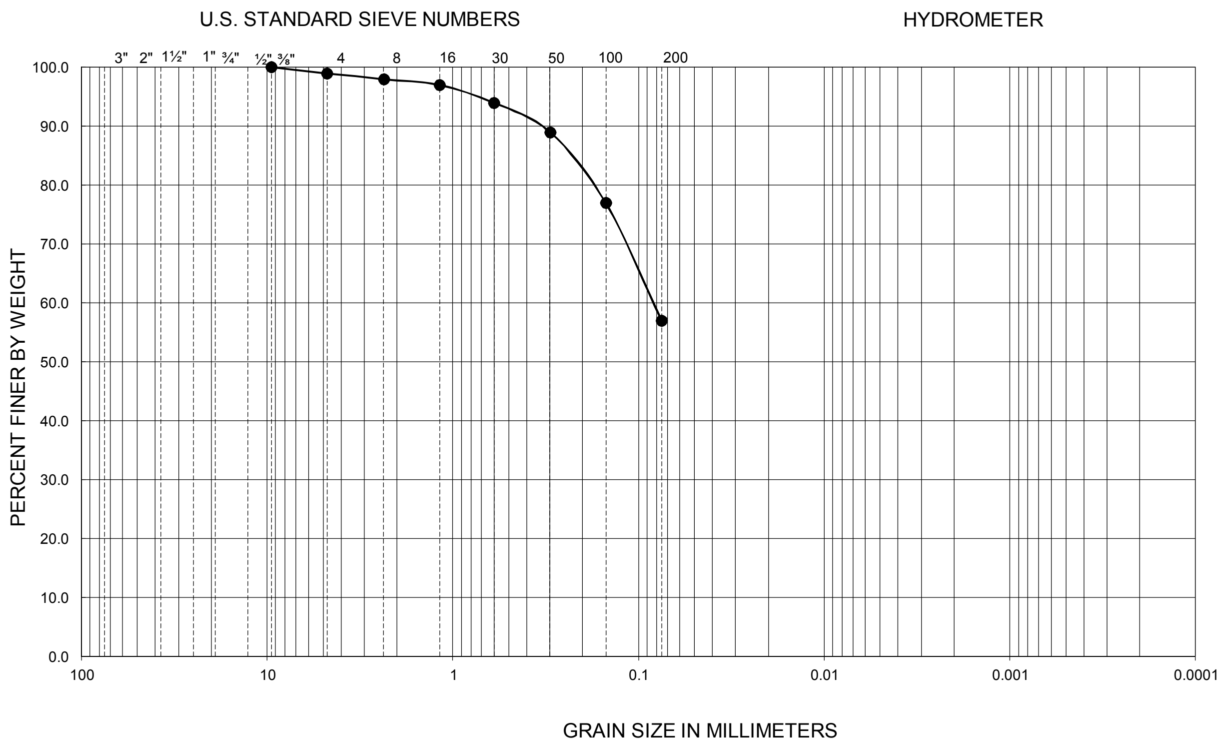


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-6	40.0-41.5	--	--	--	--	--	--	--	--	49	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	KAHLER RUSSELL PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-4
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

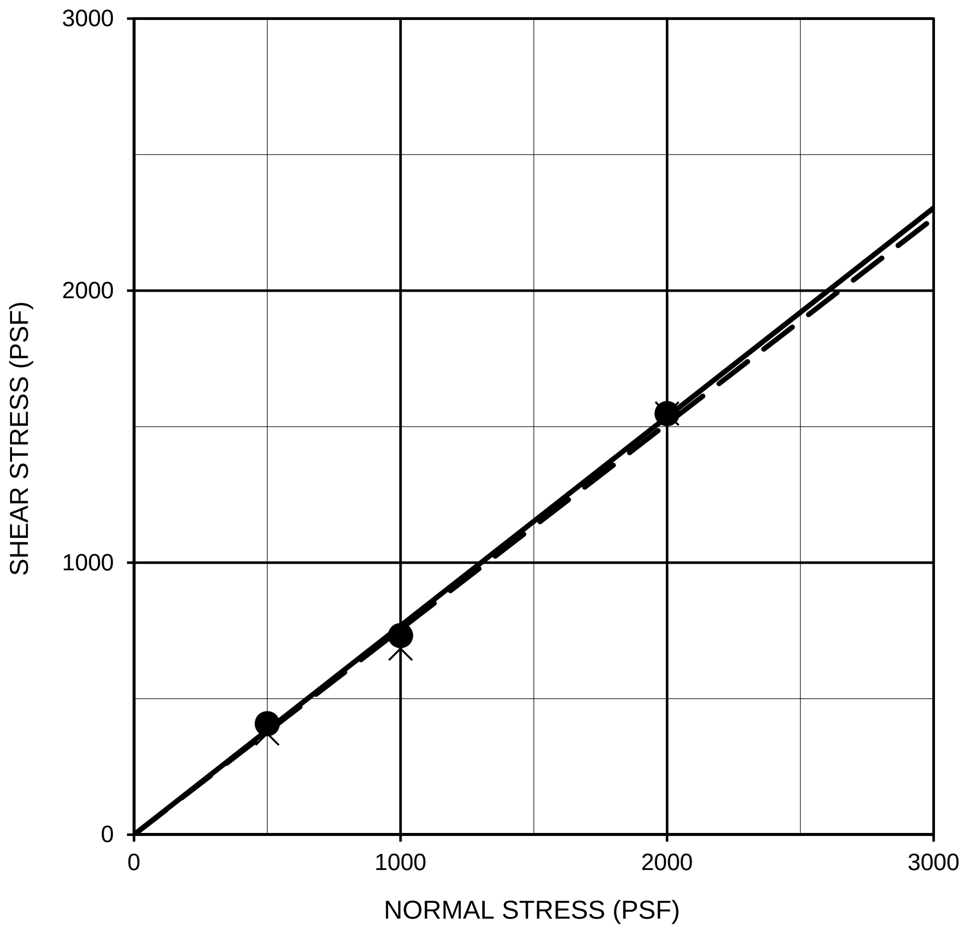


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-6	80.0-81.5	--	--	--	--	--	--	--	--	57	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	KAHLER RUSSELL PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-5
107900001	6/15		

107900001_SIEVE B-6 @ 80.0-81.5.xls



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SAND	—●—	B-6	5.0-6.5	Peak	0	38	SM
Silty SAND	- - x - -	B-6	5.0-6.5	Ultimate	0	38	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	DATE	KAHLER RUSSELL PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-6
107900001	6/15		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-6	5.0-8.0	7.6	2,900	90	0.009	490

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore

CORROSIVITY TEST RESULTS

FIGURE **B-7**

PROJECT NO.	DATE
107900001	6/15

KAHLER RUSSELL PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

ATTACHMENT 7

GEOTECHNICAL REPORT FOR DOWNTOWN PROPERTIES (GLENDORA)

GEOTECHNICAL SERVICES
DOWNTOWN PROPERTIES (GLENDORA)
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NO. T10507113-102944-OM

PREPARED FOR:

MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
Downtown Properties (Glendora)
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order No. T10507113-102944-OM

Dear Ms. Kelly:

In accordance with your authorization and task order dated January 27, 2015, we have performed geotechnical services at the Downtown Properties (Glendora) site for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. This report presents geotechnical data obtained by Ninyo & Moore relative to the proposed project. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

William R. Morrison

REGISTERED PROFESSIONAL ENGINEER
WILLIAM R. MORRISON
No. 2468
Exp. 12/31/16
GEOTECHNICAL
STATE OF CALIFORNIA

William Morrison, PE, GE
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ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

CAT/WRM/GTF/gg

Distribution: (1) Addressee (via e-mail)

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Figures

Appendices

1. INTRODUCTION

In accordance with your authorization and task order dated January 27, 2015, we have performed geotechnical services at the Downtown Properties (Glendora) site for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California (Figure 1). This report presents a compilation of geotechnical data obtained from the project, along with a preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project. We understand that the information contained herein will be included in the environmental report.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and subsurface exploration with regard to the proposed project. Specifically, we performed the following tasks:

- Review of readily available background materials, including State of California Seismic Hazards Zones map, State of California Earthquake Fault Zone map (Alquist-Priolo Special Studies Zones map), other published geologic maps and literature, in-house information, stereoscopic aerial photographs, and plans provided by the client.
- Performance of a site reconnaissance to observe the existing conditions at the site and to mark the proposed boring location for utility clearance. Mark-out of potential existing underground utilities was conducted through Underground Service Alert (USA).
- Performing a subsurface exploration consisting of drilling, logging and sampling of one exploratory soil boring at the site. The boring was advanced to a depth of 101.5 feet using a truck-mounted drill rig equipped with hollow stem augers.
- Performing geotechnical laboratory testing on soil samples collected during our subsurface exploration. The testing included an evaluation of moisture content, in-situ moisture and dry density, grain-size analysis (sieve and 200 wash), direct shear, and soil corrosivity.
- Compiling the data obtained from our background research, subsurface exploration, and laboratory testing.
- Preparing this report that presents geotechnical data obtained from our background review, site reconnaissance, and subsurface exploration at the project site, along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project.

3. PROJECT AND SITE DESCRIPTION

The purpose of the project is to assist MWH Americas (MWH) and the Los Angeles County Department of Public Works (LADPW) in developing an Enhanced Watershed Management Program (EWMP) for the Upper San Gabriel River Watershed. Our services are intended to help support feasibility analyses being conducted by MWH and LADPW for Better Management Practices (BMPs) at specific locations as part of the EWMP. We understand that the BMPs will help to reduce the impact of storm water and non-storm water discharges on the area (MWH, 2014).

Ten separate sites located within the San Gabriel Valley in Los Angeles County, California have been selected for feasibility analyses for the project. This report addresses the Downtown Properties (Glendora) site, which is located on N. Vista Bonita Avenue north of East Foothill Boulevard in the city of Glendora (Figures 1 and 2) and is utilized by the City of Glendora as a public parking lot. Geotechnical evaluations for the other nine sites are addressed in reports that are being issued under separate covers (Ninyo & Moore, 2015a through 2015i).

The site is currently developed with improvements that include an asphalt concrete (AC) paved parking lot, planter walls and landscaping consisting of trees and shrubs. We understand that the proposed improvements are planned near the center of the parking lot. The site coordinates are approximately 34.1368°N latitude and -117.8645°W longitude. The elevation at the project site is approximately 780 feet above mean sea level (MSL).

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our field exploration at the Downtown Properties (Glendora) site included a geologic reconnaissance that was conducted on February 19, 2015 and subsurface exploration that was conducted on March 5, 2015. The subsurface exploration consisted of drilling one 8-inch diameter hollow stem auger boring (B-7) to a depth of 101.5 feet below ground surface (bgs). The boring was logged by a geologist from our firm. Representative disturbed and undisturbed soil samples were obtained at selected depths from the boring for laboratory testing. The approximate location of the boring is presented on Figure 2. The boring log is presented in Appendix A.

Laboratory testing of selected soil samples obtained from our exploratory boring included in-situ dry density and moisture content, gradation, direct shear, and soil corrosivity. The results of the in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests described above are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, and groundwater conditions at the Downtown Properties (Glendora) site are provided in the following sections.

5.1. Regional and Geologic Setting

The subject site is located within the northeastern portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Norris and Webb, 1990). The geomorphic province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and continues farther to the tip of Baja California. The Los Angeles Basin has been divided into four structural blocks which are generally bounded by prominent fault systems. The site is located within the Northeastern Block, which is bordered on the west and south by the Whittier-Elsinore fault and is bordered on the north by the San Gabriel Mountains and the Raymond Hill Fault. The Northeastern Block is a deep basin characterized by thick sequences of alluvium and sedimentary units overlying basement rocks, which are at depths of up to approximately 12,000 feet below the surface in the central part of the San Gabriel Valley.

5.2. Site Geology

Our review of the referenced geologic maps and literature indicates that the subject site is underlain by Holocene to Pleistocene alluvial gravel and sand (Dibblee and Minch, 2002). Geologic units encountered during our reconnaissance and subsurface exploration of the project site included relatively thin fill soils that mantle alluvium. Generalized descriptions of the units encountered are provided in the subsequent sections. Additional descriptions are provided on the boring logs in Appendix A. A geologic map of the region is presented on Figure 3.

5.2.1. Fill

Fill materials were encountered in our boring B-7 underlying the AC pavement section to a depth of approximately 7 feet below existing grade. As observed, the fill materials generally consisted of brown, dry, medium dense, silty sand. Scattered gravel, concrete fragments, and roots were encountered in the fill materials.

5.2.2. Alluvium

Alluvium was encountered in our boring B-7 underlying the fill materials and was observed to extend to the total depth explored of 101.5 feet below existing grade. As observed in our boring, the alluvial materials generally consisted of various shades of brown and gray, dry to moist, medium dense to very dense, silty sands and clayey sands. Scattered gravel was encountered at various depths in the alluvium.

5.3. Groundwater

Groundwater was not encountered during our subsurface exploration in our boring B-7. Fluctuations in the groundwater level and perched conditions typically occur due to variations in precipitation, ground surface topography, subsurface stratification, irrigation, and other factors.

6. FAULTING AND SEISMICITY

Based on our review of published geologic maps and review of stereoscopic aerial photographs, no active fault traces are mapped as underlying the Downtown Properties (Glendora) site. Therefore, the potential for surface fault rupture at the site is considered to be low. The project site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, Downtown Properties (Glendora) is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed improvements. Figure 4 shows the approximate site location relative to the major faults in the region. The nearest known active fault is the Sierra Madre fault, located approximately 1 mile northwest of the site.

6.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated at 0.955g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based).

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.855g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.855g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.2. Surface Fault Rupture

The probability of damage due to surface ground rupture is relatively low due to the lack of known active faults crossing the project site. Surface ground cracking related to shaking from distant events is not considered a significant hazard, although it is a possibility.

6.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon in which loosely deposited, granular soils and some fine-grained soils located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration

can result in a loss of grain-to-grain contact due to a rapid rise in pore water pressure causing the soil to behave as a fluid for a short period. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

According to the Seismic Hazard Zones Map for the Glendora Quadrangle, (CGS, 1999), the Downtown Properties (Glendora) site is not mapped as being in an area susceptible to liquefaction. During our subsurface exploration, groundwater was not encountered at Downtown Properties (Glendora) to the total depth explored of 101.5 feet. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Downtown Properties (Glendora) site.

7. OTHER GEOTECHNICAL CONSIDERATIONS

7.1. Slope Stability

Our review of maps published by the California Geological Survey (CGS, 1999) indicates that the Downtown Properties (Glendora) site is not situated in an area considered to be susceptible to seismic-induced landsliding. In addition, our observations indicate that the site is generally level to gently sloping. Consequently, landsliding or slope instability are not considered to be a constraint at the project site.

7.2. Corrosion

Laboratory testing was performed on representative samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with the California Test (CT) 643 and the sulfate and chloride tests were performed in accordance with CTs 417 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing performed on a sample obtained from the site indicated an electrical resistivity value of 1,600 ohm-cm, a soil pH value of 7.0, a chloride content of 340 ppm, and a sulfate content of 0.138 percent. According to Caltrans criteria (2012) and American Concrete Institute (ACI) 318 guidelines, a corrosive soil is defined as one with more than 500 ppm chlorides, more than 0.2 percent sulfates, a pH less than 5.5, or an electrical resistivity of less than 1,000 ohm-cm. Based on the Caltrans criteria and ACI guidelines, the upper soils encountered at the site are not considered to be corrosive.

8. DISCUSSION AND FINDINGS

As discussed above, our geotechnical services were performed to assist MWH and LADPW as they evaluate the preliminary feasibility of an onsite storm water infiltration system at the Downtown Properties (Glendora) site. Based on our communications with MWH, we understand that the preliminary criteria at the site is related to the presence of groundwater or dense materials providing refusal to drilling equipment within 100 feet of the ground surface. As such, our scope of services included the drilling of an exploratory boring that extended to a depth of 100 feet, to groundwater, or to refusal (whichever is shallower). We understand that BMPs being considered for the site are conceptual at this time. Based on the information obtained from our geotechnical evaluation, the following findings and conclusions have been made:

- The project site is underlain by relatively shallow fill (approximately 7 feet deep) overlying alluvial soils. The encountered portions of the fill were generally comprised of silty sands. The underlying alluvial soils were observed to consist of silty sands and clayey sands.
- Groundwater was not encountered in our exploratory boring to the total depth explored of 101.5 feet.
- Based on our review of aerial photographs and published geologic maps, there are no known active faults or landslides underlying the project site.
- Our faulting and seismicity evaluation indicated that the site is subject to severe ground shaking due to a design seismic event.

- Review of geological literature indicates that the site is not situated in an area that has been mapped as being susceptible to liquefaction. Additionally, groundwater was not encountered in our exploration at the site. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Downtown Properties (Glendora) site.

- In-place infiltration testing was not performed as part of our geotechnical services. However, based on published correlations between a soil's grain size and its permeability (Shepherd, 1989), an estimated permeability on the order of 10^{-2} cm/sec within the encountered sandy soils can be utilized for preliminary evaluation purposes. Clayey soils encountered at the site can be expected can be expected to have significantly lower permeabilities. Actual design of storm water infiltration devices should be in accordance with the County of Los Angeles guidelines and should be based on field infiltration testing at the site.

- Recommendations provided in this report are preliminary in nature and are not intended to provide sufficient information to fully address potential geotechnical related issues prior to site development. An additional geotechnical evaluation should be performed.

9. PRELIMINARY RECOMMENDATIONS

As noted above we understand that the Better Management Practices (BMPs) associated with the proposed Upper San Gabriel River EWMP Project are conceptual at this time. As such, details regarding the types and construction of the BMPs (if any) are not known at this time for the Downtown Properties (Glendora) site. We recommend that the geotechnical information presented herein be utilized during the evaluation of the feasibility of the devices associated with the EWMP project at the site. The design of BMPs should be performed in accordance with County of Los Angeles guidelines.

The following sections of this report provide preliminary recommendations for earthwork and design of structure foundations for preliminary planning purposes. Once the type and general construction of the devices is better defined, Ninyo & Moore should review the devices' preliminary design. At that time, supplemental recommendations may be provided.

9.1. Site Preparation

Prior to earthwork, the project site should be cleared of existing structures, pavement, abandoned utilities (if present), and stripped of rubble, debris, vegetation, loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite.

9.2. Materials for Fill

On-site soils relatively free of organic material are suitable for reuse as fill. In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾-inch. Oversize materials should be separated from material to be used for fill and removed from the site. Although not anticipated, if encountered, high plasticity clays and silts should be disposed of off-site.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material should generally be granular soils with a very low to low expansion potential (i.e., an expansion index of 50 or less as evaluated by ASTM D 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

9.3. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified, moisture conditioned as needed to achieve moisture contents generally above the optimum moisture content, and then compacted to a relative compaction of 90 percent as evaluated in accordance with ASTM D 1557. The evaluation of

compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when the project area is ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

9.4. Utility Trench Backfill

Based on our subsurface exploration, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the “Greenbook” (Standard Specifications for Public Works Construction) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557.

Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

9.5. Preliminary Foundation Recommendations

For preliminary design purposes, shallow, spread or continuous footings founded on compacted fill or alluvial soils can be considered suitable for support of structures. Shallow, spread or continuous footings bearing on compacted fill or alluvial soils may be designed assuming an allowable bearing capacity of 2,000 psf. This allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. Spread footings should be founded 18 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches and isolated footings should be 18 inches in width or more. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

For resistance of foundations to lateral loads, we recommend an allowable passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot be used. This value assumes that the ground is horizontal for a distance of 10 feet or more, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. If passive and frictional resistances are to be used in combination, we recommend that the passive value not exceed one-half of the total resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

9.6. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Laboratory testing indicated the sulfate content of the sample tested was less than 0.2 percent, which is considered negligible for sulfate attack based on ACI criteria (ACI, 2011). Although significant sulfate content was not indicated, we recommend that Type II/V cement be used for concrete structures in contact with soil, due to the potential for variability of site soil. The water-cement ratio of the concrete should be 0.45 or less and the slump should be 4 inches or less.

9.7. Plan Review and Construction Observation

The preliminary conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Because we understand that the design of the BMPs devices for the EWMP project is conceptual at this point, we recommend that Ninyo & Moore review the devices' preliminary design, once the type and general construction of the devices is better defined. At that time, supplemental recommendations may be provided.

Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations to evaluate the assumptions inherent in the design.

The preliminary recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the preliminary conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for feasibility and preliminary design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our preliminary conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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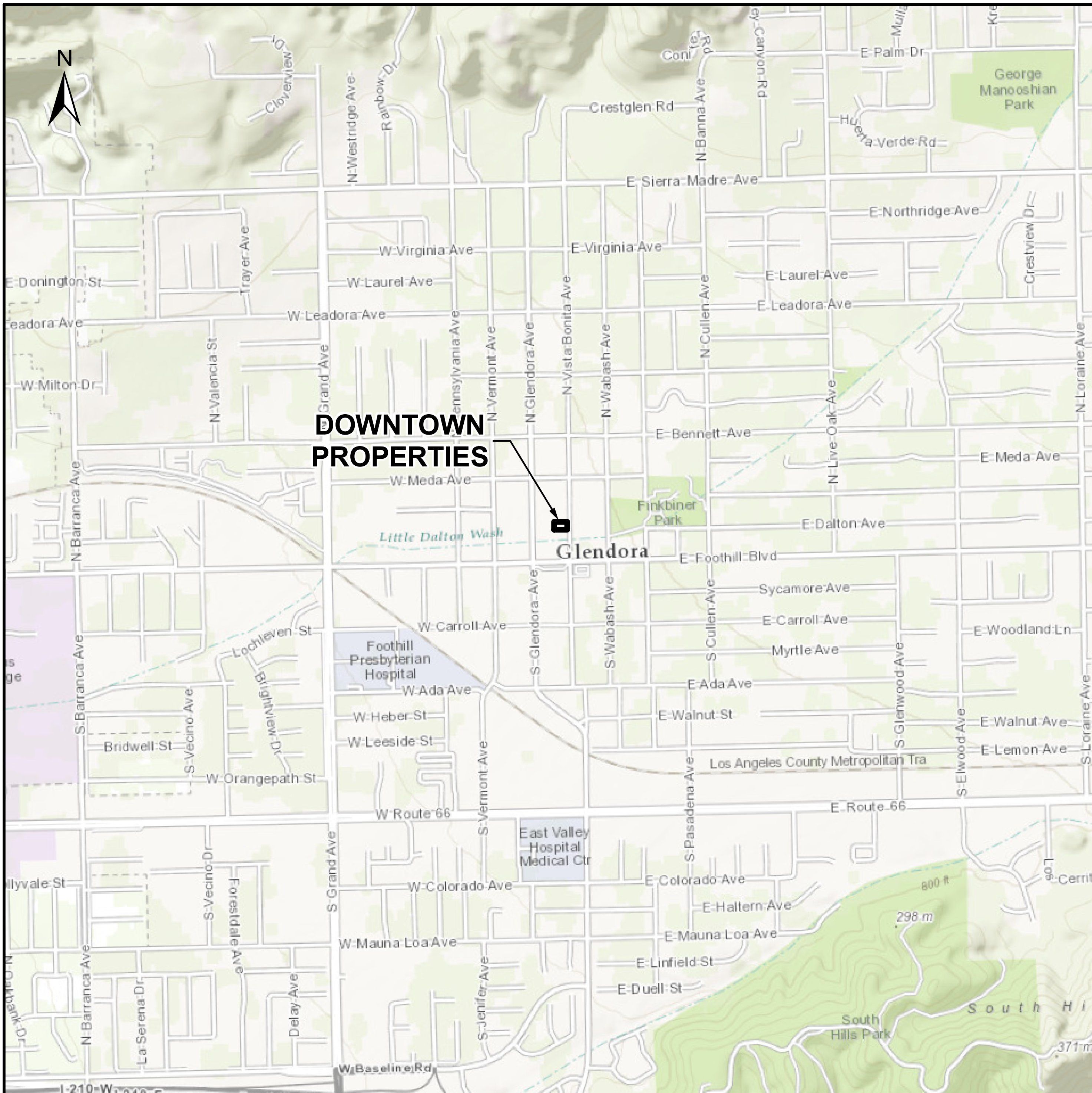
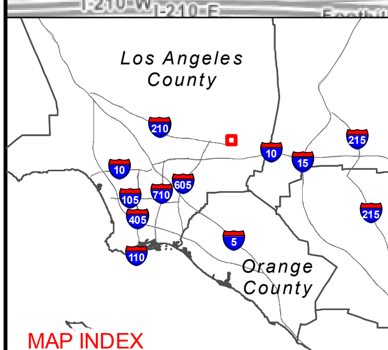


SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS.



Feet

0 750 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

1_107900001_SL_DT_93.mxd AOB

Ninyo & Moore

SITE LOCATION

PROJECT NO.	DATE	DOWNTOWN PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	FIGURE
107900001	6/15		1

SOURCE: Aerial Imagery - ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP.

LEGEND

SITE BOUNDARY

B-7 TD=101.5' BORING
TD=TOTAL DEPTH IN FEET

N

SCALE IN FEET

0 50 100 200

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		BORING LOCATION	FIGURE
PROJECT NO.	DATE	DOWNTOWN PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	2
107900001	6/15		

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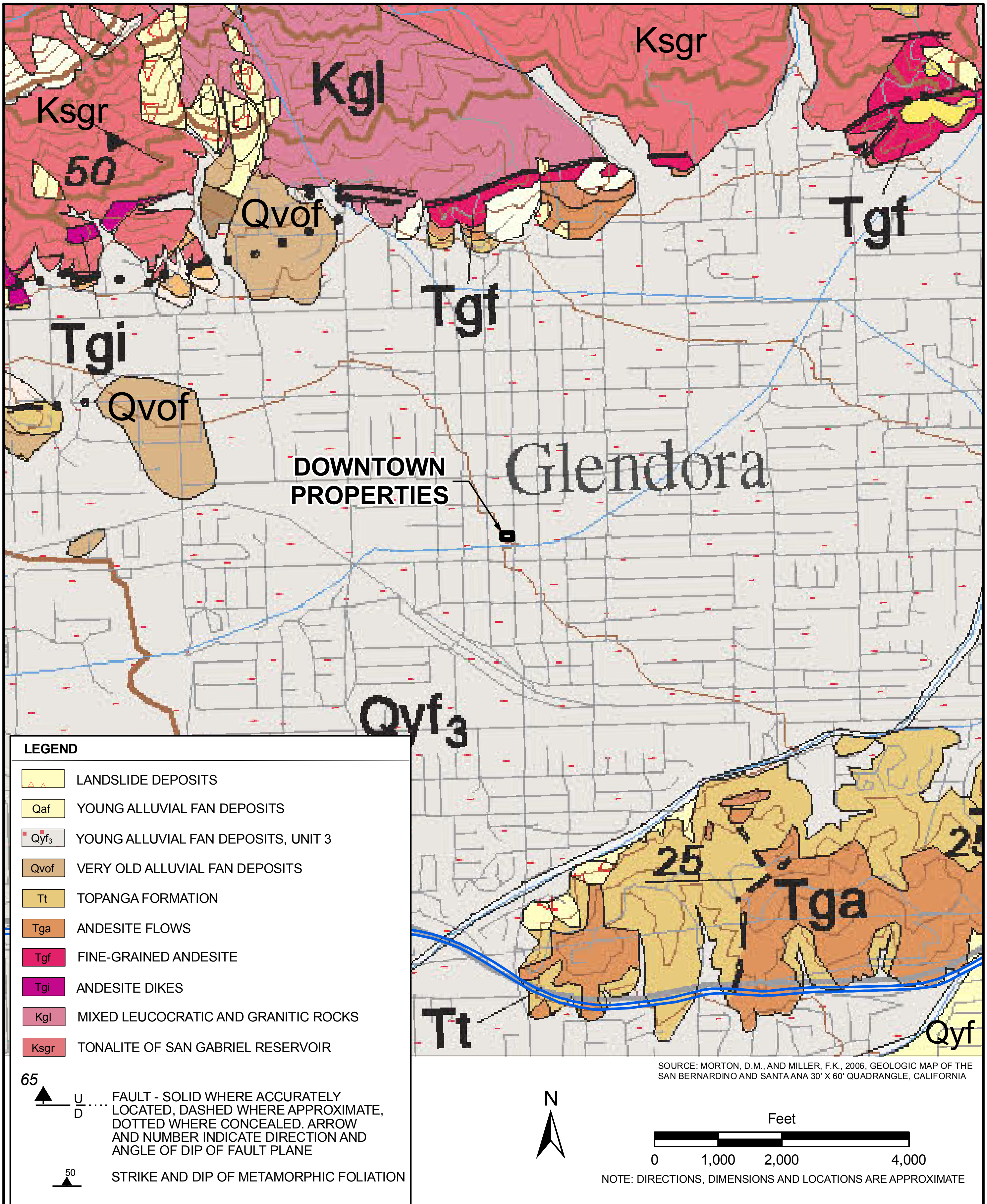

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GEOLOGY

FIGURE 3

PROJECT NO.	DATE
107900001	6/15

DOWNTOWN PROPERTIES (GLENDORA)
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

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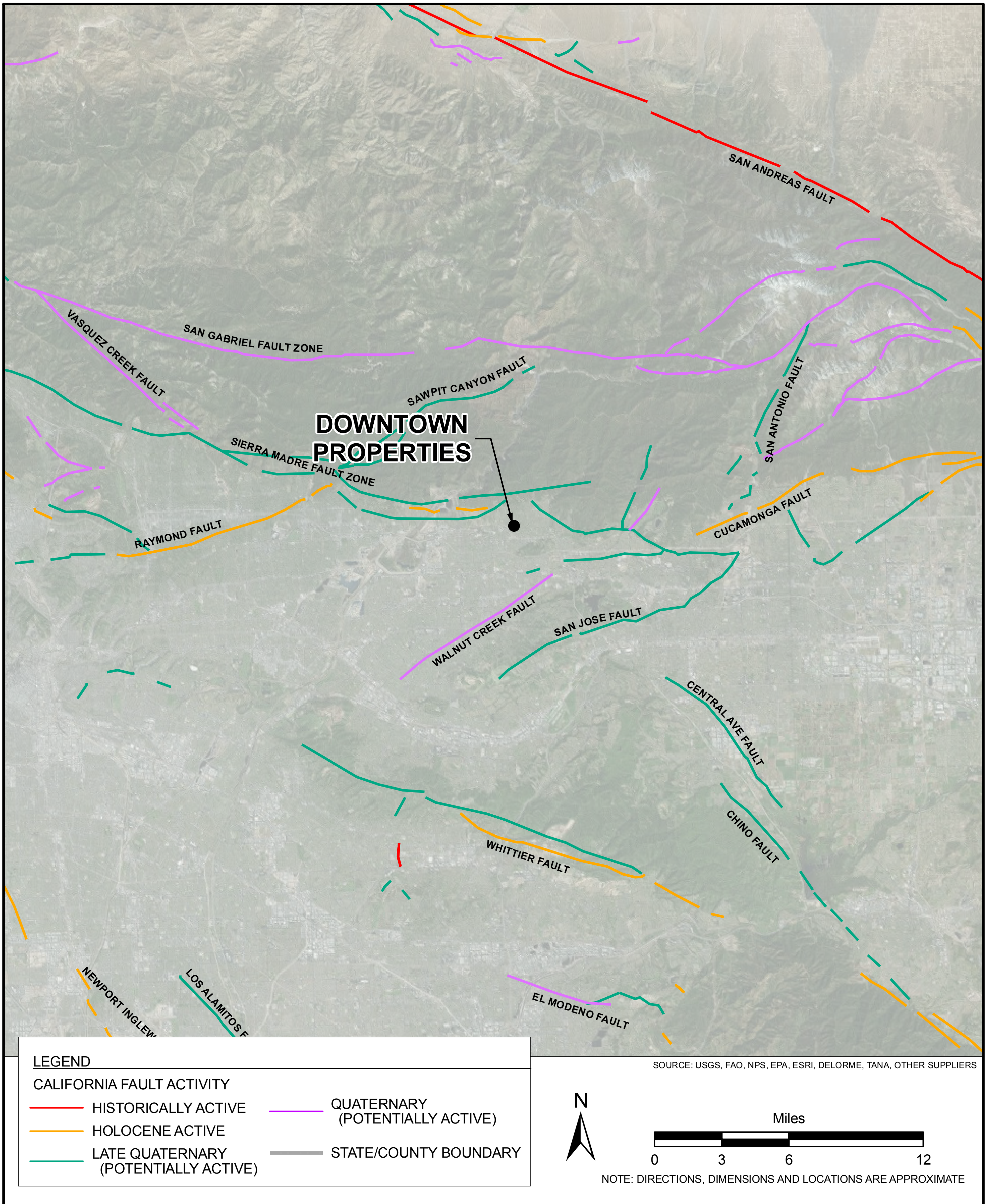

LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

4_107900001_F_DT_93.mxd AOB

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FAULT LOCATIONS

PROJECT NO.	DATE		FIGURE
107900001	6/15	DOWNTOWN PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	4

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1⅜ inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change.
15								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
20								The total depth line is a solid line that is drawn at the bottom of the boring.

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BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

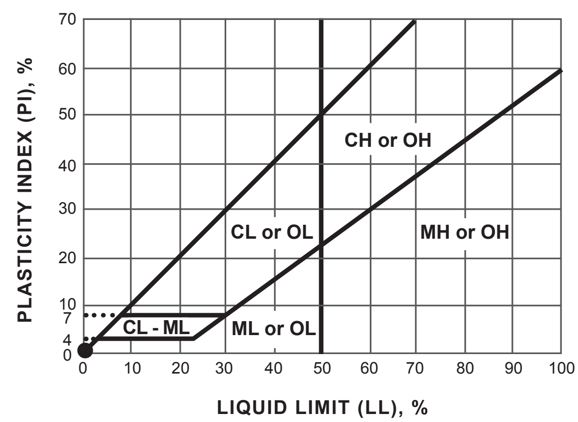
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS: GROUP SYMBOL	SECONDARY DIVISIONS: GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVEL more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SILT and CLAY liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DATE DRILLED 3/5/15 BORING NO. B-7

GROUND ELEVATION 780' ± (MSL) SHEET 1 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								ASPHALT CONCRETE: Approximately 2 inches thick.
								BASE: Approximately 3 inches thick.
							SM	FILL: Brown, dry, medium dense, silty fine SAND; scattered gravel and concrete fragments up to 6 inches in diameter; scattered roots.
			26	4.3	111.9			
							SM	ALLUVIUM: Brown, dry, medium dense to dense, silty fine SAND with gravel up to 1 inch in diameter.
10			24	1.5				
			48	1.5				Brownish gray.
20			17	5.1				Brown; medium dense; trace coarse sand; scattered gravel up to 1 inch in diameter.
			53	1.9				Scattered gravel layers approximately 2 inches thick.
								Gravel layer at 27 feet.
30			43	2.7				
								Gravel layer at 32.5 feet.
			50/6"	2.2				Grayish brown; moist.
40								

DATE DRILLED 3/5/15 BORING NO. B-7

GROUND ELEVATION 780' ± (MSL) SHEET 2 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		■	50/4"	2.0			SM	ALLUVIUM: (Continued) Grayish brown, moist, medium dense, silty fine to coarse SAND; scattered gravel up to 1 inch in diameter.
		■	47	4.2				Light grayish brown; some reddish brown staining.
50		■	50/6"	3.2				
60								Grayish brown.
70		■	50/6"	3.0				
		■	25	9.8			SC	Dark brown, moist, dense, clayey fine to medium SAND; trace coarse sand.
							SM	Grayish brown, moist, very dense, silty fine to coarse SAND with gravel.
80								

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BORING LOG

DOWNTOWN PROPERTIES (GLENDORA) - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-2

DATE DRILLED 3/5/15 BORING NO. B-7

GROUND ELEVATION 780' ± (MSL) SHEET 3 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
80		◣	62	3.1			SM	ALLUVIUM: (Continued) Grayish brown, moist, very dense, silty fine to coarse SAND; scattered gravel up to 1 inch in diameter.
90		◣	50/4"	3.5				Silty fine sand; trace coarse sand; scattered fragments of decomposed granitic rock.
100		◣	35	13.0				Dark brown; dense; silty fine sand; trace medium sand; highly micaceous.
								Total Depth = 101.5 feet. Groundwater not encountered during drilling. Backfilled and patched with concrete shortly after drilling on 3/5/15. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
110								
120								

Ninyo & Moore

BORING LOG

DOWNTOWN PROPERTIES (GLENDORA) - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-3

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

Moisture Content

The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis

Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-4. These test results were utilized in evaluating the soil classifications in accordance with USCS.

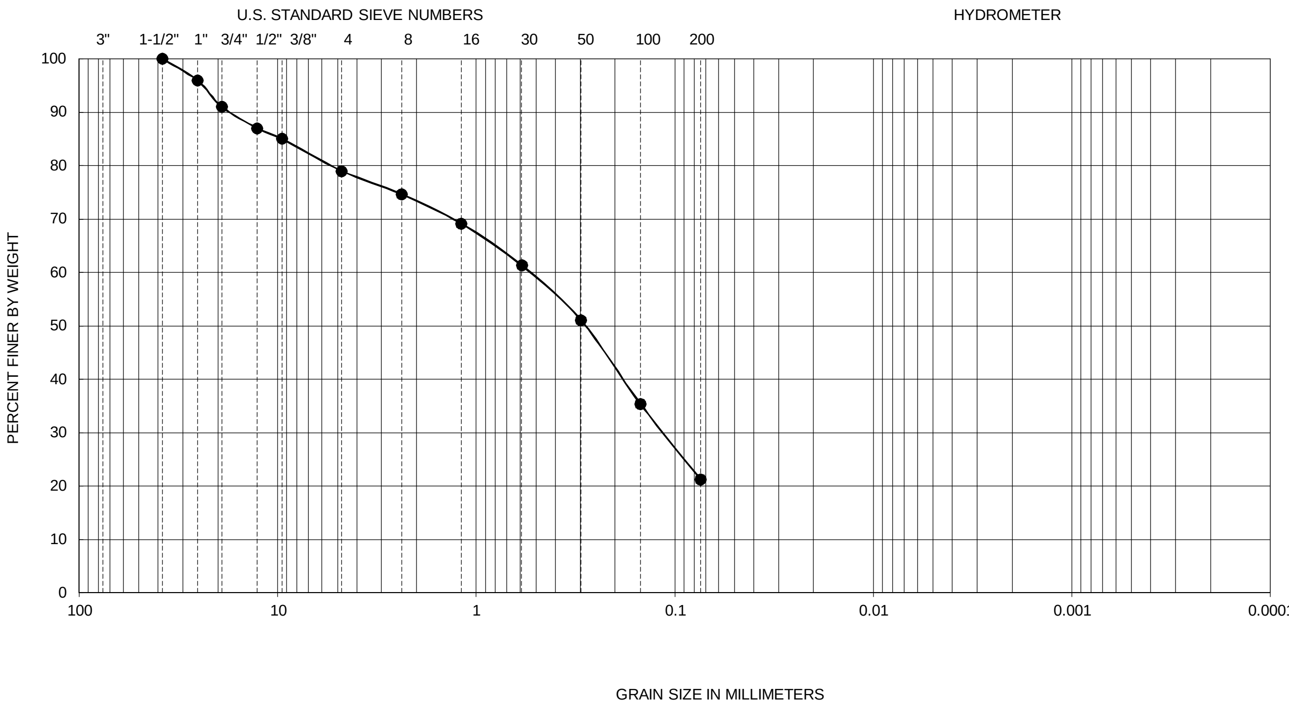
Direct Shear Tests

A direct shear test was performed on a relatively undisturbed sample in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-5.

Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-6.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay

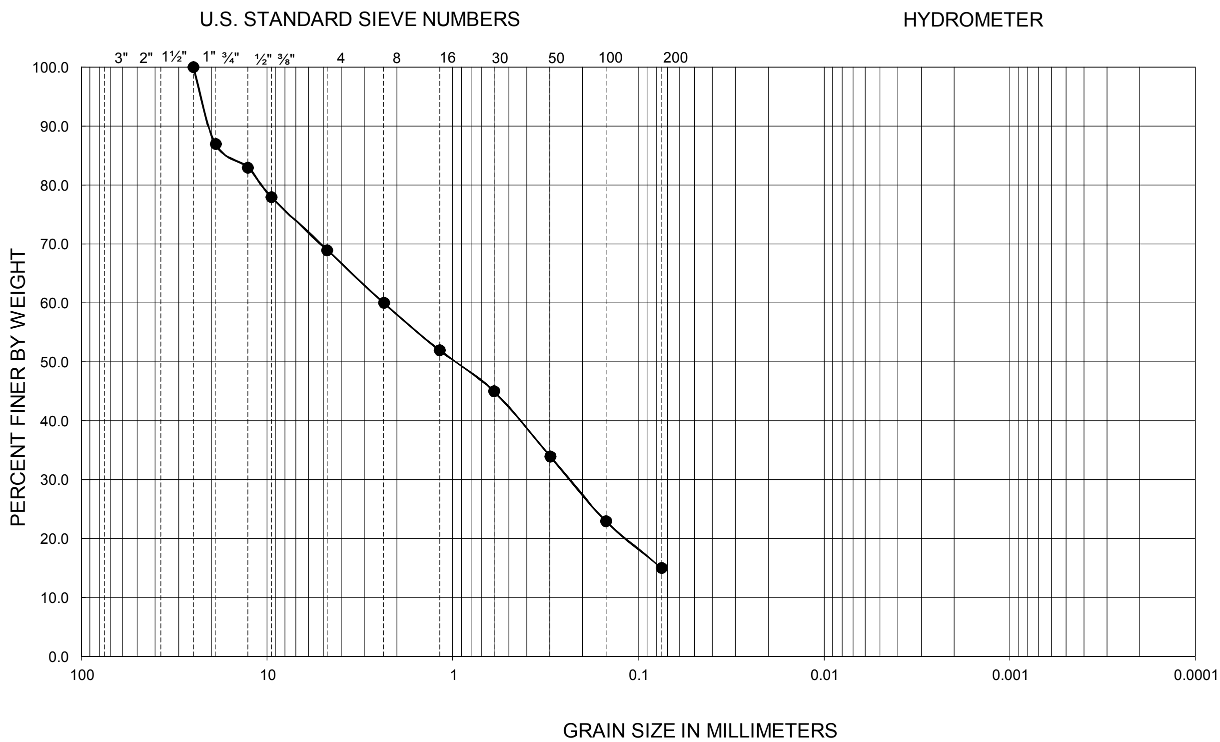


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-7	0.5-5.0	--	--	--	--	--	--	--	--	21	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	DOWNTOWN PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-1
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

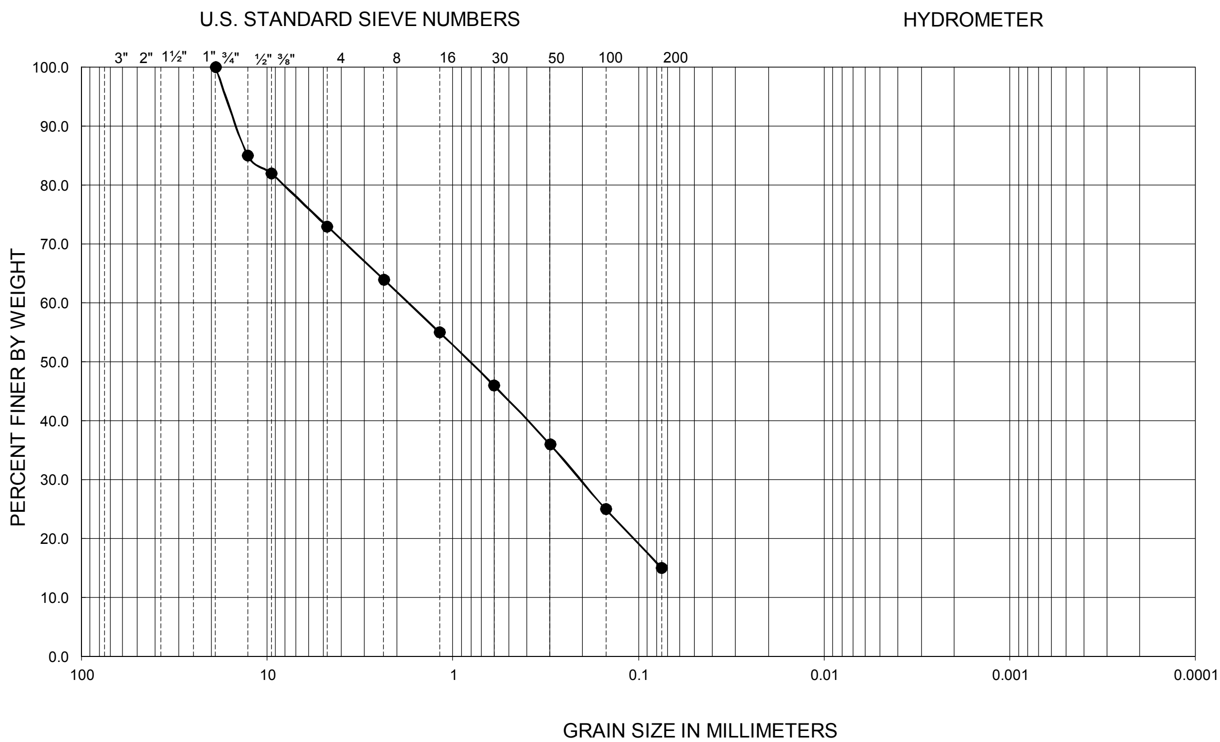


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-7	15.0-16.5	--	--	--	--	--	--	--	--	15	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	DOWNTOWN PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-2
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

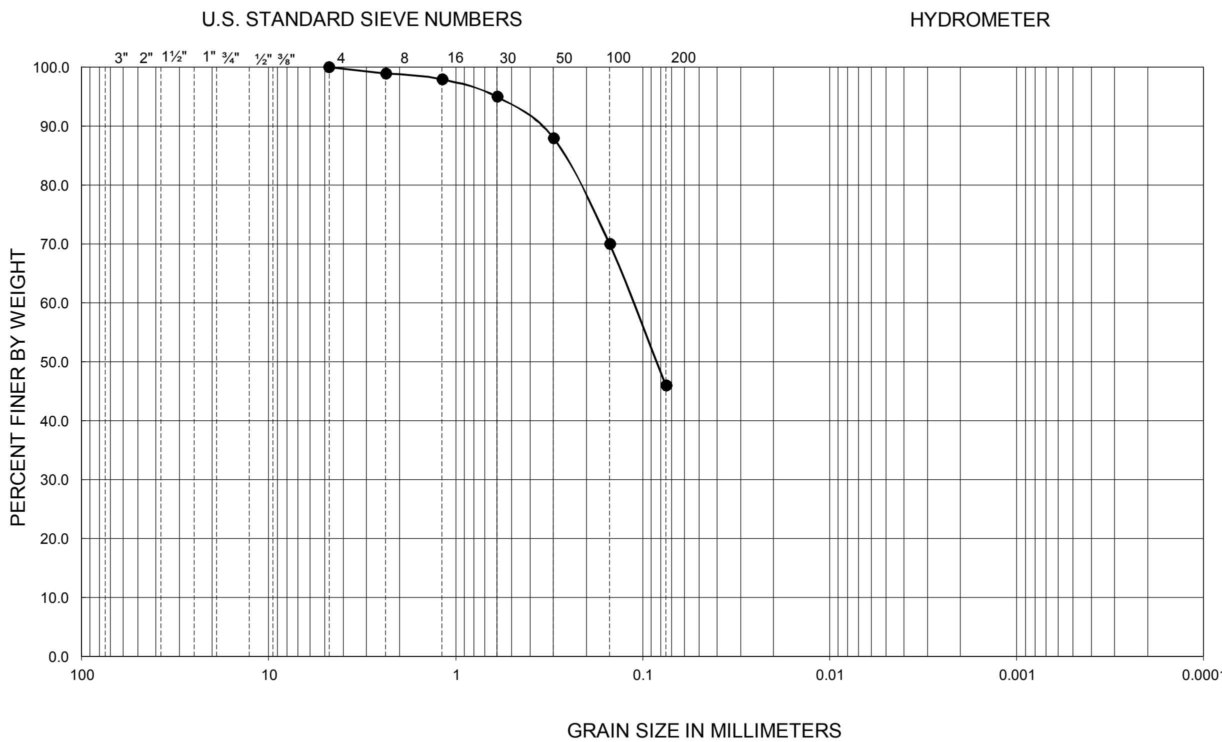


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-7	70.0-70.5	--	--	--	--	--	--	--	--	15	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	DOWNTOWN PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-3
107900001	6/15		

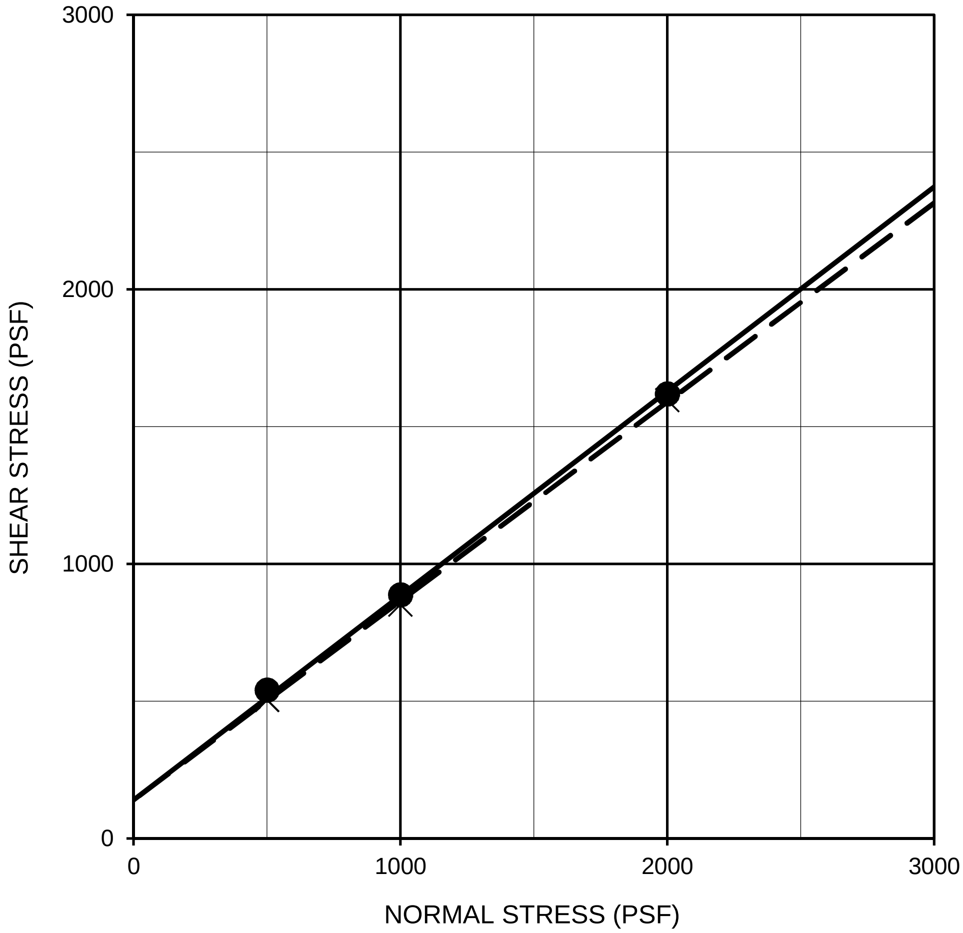
GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-7	100.0-101.5	--	--	--	--	--	--	--	--	46	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	DOWNTOWN PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-4
107900001	6/15		



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SAND	—●—	B-7	5.0-6.5	Peak	140	37	SM
Silty SAND	- - X - -	B-7	5.0-6.5	Ultimate	140	36	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore

PROJECT NO.	DATE
107900001	6/15

DIRECT SHEAR TEST RESULTS

DOWNTOWN PROPERTIES (GLENDORA)
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

FIGURE
B-5

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-7	0.5-5.0	7.0	1,600	1380	0.138	340

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore

CORROSIVITY TEST RESULTS

PROJECT NO.	DATE
107900001	6/15

DOWNTOWN PROPERTIES (GLENDORA)
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

FIGURE

B-6

ATTACHMENT 8

GEOTECHNICAL REPORT FOR SAN JOSE PROPERTIES (GLENDORA)

GEOTECHNICAL SERVICES
SAN JOSE PROPERTIES (GLENDORA)
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NO. T10507113-102944-OM

PREPARED FOR:
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:
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Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
San Jose Properties (Glendora)
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order No. T10507113-102944-OM

Dear Ms. Kelly:

In accordance with your authorization and task order dated January 27, 2015, we have performed geotechnical services at the San Jose Properties (Glendora) site for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. This report presents geotechnical data obtained by Ninyo & Moore relative to the proposed project. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

REGISTERED PROFESSIONAL ENGINEER
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Distribution: (1) Addressee (via e-mail)

TABLE OF CONTENTS

Appendices

1. INTRODUCTION

In accordance with your authorization and task order dated January 27, 2015, we have performed geotechnical services at the San Jose Properties (Glendora) site for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California (Figure 1). This report presents a compilation of geotechnical data obtained from the project, along with a preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project. We understand that the information contained herein will be included in the environmental report.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and subsurface exploration with regard to the proposed project. Specifically, we performed the following tasks:

- Review of readily available background materials, including State of California Seismic Hazards Zones map, State of California Earthquake Fault Zone map (Alquist-Priolo Special Studies Zones map), other published geologic maps and literature, in-house information, stereoscopic aerial photographs, and plans provided by the client.
- Performance of a site reconnaissance to observe the existing conditions at the site and to mark the proposed boring location for utility clearance. Mark-out of potential existing underground utilities was conducted through Underground Service Alert (USA).
- Performing a subsurface exploration consisting of drilling, logging and sampling of one exploratory soil boring at the site. The boring was advanced to a depth of 100.5 feet using a truck-mounted drill rig equipped with hollow stem augers.
- Performing geotechnical laboratory testing on soil samples collected during our subsurface exploration. The testing included an evaluation of moisture content, in-situ moisture and dry density, grain-size analysis (sieve and 200 wash), direct shear, and soil corrosivity.
- Compiling the data obtained from our background research, subsurface exploration, and laboratory testing.
- Preparing this report that presents geotechnical data obtained from our background review, site reconnaissance, and subsurface exploration at the project site, along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project.

3. PROJECT AND SITE DESCRIPTION

The purpose of the project is to assist MWH Americas (MWH) and the Los Angeles County Department of Public Works (LADPW) in developing an Enhanced Watershed Management Program (EWMP) for the Upper San Gabriel River Watershed. Our services are intended to help support feasibility analyses being conducted by MWH and LADPW for Better Management Practices (BMPs) at specific locations as part of the EWMP. We understand that the BMPs will help to reduce the impact of storm water and non-storm water discharges on the area (MWH, 2014).

Ten separate sites located within the San Gabriel Valley in Los Angeles County, California have been selected for feasibility analyses for the project. This report addresses the San Jose Properties (Glendora) site, which is located at the east end of Woodland Lane in the city of Glendora (Figures 1 and 2) and is maintained by the City of Glendora. Geotechnical evaluations for the other nine sites are addressed in reports that are being issued under separate covers (Ninyo & Moore, 2015a through 2015i).

The site is presently undeveloped, with oak trees and stockpiles of soil present on the site. We understand that the proposed improvements are proposed for the southeasterly of the two lots. The site coordinates are approximately 34.1319°N latitude and -117.8419°W longitude. The elevation at the project site is approximately 840 feet above mean sea level (MSL).

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our field exploration at the San Jose Properties (Glendora) site included a geologic reconnaissance that was conducted on February 19, 2015 and subsurface exploration that was conducted on March 4, 2015. The subsurface exploration consisted of drilling one 8-inch diameter hollow stem auger boring (B-8) to a depth of 100.5 feet below ground surface (bgs). The boring was logged by a geologist from our firm. Representative disturbed and undisturbed soil samples were obtained at selected depths from the boring for laboratory testing. The approximate location of the boring is presented on Figure 2. The boring log is presented in Appendix A.

Laboratory testing of selected soil samples obtained from our exploratory boring included in-situ dry density and moisture content, gradation, direct shear, and soil corrosivity. The results of the in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests described above are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, and groundwater conditions at the San Jose Properties (Glendora) site are provided in the following sections.

5.1. Regional and Geologic Setting

The subject site is located within the northeastern portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Norris and Webb, 1990). The geomorphic province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and continues farther to the tip of Baja California. The Los Angeles Basin has been divided into four structural blocks which are generally bounded by prominent fault systems. The site is located within the Northeastern Block, which is bordered on the west and south by the Whittier-Elsinore fault and is bordered on the north by the San Gabriel Mountains and the Raymond Hill Fault. The Northeastern Block is a deep basin characterized by thick sequences of alluvium and sedimentary units overlying basement rocks, which are at depths of up to approximately 12,000 feet below the surface in the central part of the San Gabriel Valley.

5.2. Site Geology

Our review of the referenced geologic maps and literature indicates that the subject site is underlain by Holocene to Pleistocene alluvial gravel and sand (Dibblee and Minch, 2002). Geologic units encountered during our reconnaissance and subsurface exploration of the project site included relatively thin fill soils that mantle alluvium. Generalized descriptions of the units encountered are provided in the subsequent sections. Additional descriptions are provided on the boring logs in Appendix A. A geologic map of the region is presented on Figure 3.

5.2.1. Fill

Fill materials were encountered in our boring B-8 from the ground surface to a depth of approximately 3 feet below existing grade. As observed, the fill materials generally consisted of dark brown, moist, medium dense, silty sand. Scattered gravel and cobbles were encountered in the fill materials.

5.2.2. Alluvium

Alluvium was encountered in our boring B-8 underlying the fill materials and was observed to extend to the total depth explored of 100.5 feet below existing grade. As observed in our boring, the alluvial materials generally consisted of various shades of brown, moist, medium dense to very dense, poorly graded sands and silty sands. Scattered gravel was encountered at various depths in the alluvium.

5.3. Groundwater

Groundwater was not encountered during our subsurface exploration in our boring B-8. Fluctuations in the groundwater level and perched conditions typically occur due to variations in precipitation, ground surface topography, subsurface stratification, irrigation, and other factors.

6. FAULTING AND SEISMICITY

Based on our review of published geologic maps and review of stereoscopic aerial photographs, no active fault traces are mapped as underlying the San Jose Properties (Glendora) site. Therefore, the potential for surface fault rupture at the site is considered to be low. The project site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, San Jose Properties (Glendora) is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed improvements. Figure 4 shows the approximate site location relative to the major faults in the region. The nearest known active fault is the Sierra Madre fault, located approximately 1 mile northwest of the site.

6.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated at 0.964g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based).

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.858g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.858g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.2. Surface Fault Rupture

The probability of damage due to surface ground rupture is relatively low due to the lack of known active faults crossing the project site. Surface ground cracking related to shaking from distant events is not considered a significant hazard, although it is a possibility.

6.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon in which loosely deposited, granular soils and some fine-grained soils located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration

can result in a loss of grain-to-grain contact due to a rapid rise in pore water pressure causing the soil to behave as a fluid for a short period. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

According to the Seismic Hazard Zones Map for the Glendora Quadrangle, (CGS, 1999), the San Jose Properties (Glendora) site is not mapped as being in an area susceptible to liquefaction. During our subsurface exploration, groundwater was not encountered at San Jose Properties (Glendora) to the total depth explored of 100.5 feet. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the San Jose Properties (Glendora) site.

7. OTHER GEOTECHNICAL CONSIDERATIONS

7.1. Slope Stability

Our review of maps published by the California Geological Survey (CGS, 1999) indicates that the San Jose Properties (Glendora) site is not situated in an area considered to be susceptible to seismic-induced landsliding. In addition, our observations indicate that the site is generally level to gently sloping. Consequently, landsliding or slope instability are not considered to be a constraint at the project site.

7.2. Corrosion

Laboratory testing was performed on representative samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with the California Test (CT) 643 and the sulfate and chloride tests were performed in accordance with CTs 417 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing performed on a sample obtained from the site indicated an electrical resistivity value of 3,700 ohm-cm, a soil pH value of 7.9, a chloride content of 90 ppm, and a sulfate content of 0.001 percent. According to Caltrans criteria (2012) and American Concrete Institute (ACI) 318 guidelines, a corrosive soil is defined as one with more than 500 ppm chlorides, more than 0.2 percent sulfates, a pH less than 5.5, or an electrical resistivity of less than 1,000 ohm-cm. Based on the Caltrans criteria and ACI guidelines, the upper soils encountered at the site are not considered to be corrosive.

8. DISCUSSION AND FINDINGS

As discussed above, our geotechnical services were performed to assist MWH and LADPW as they evaluate the preliminary feasibility of an onsite storm water infiltration system at the San Jose Properties (Glendora) site. Based on our communications with MWH, we understand that the preliminary criteria at the site is related to the presence of groundwater or dense materials providing refusal to drilling equipment within 100 feet of the ground surface. As such, our scope of services included the drilling of an exploratory boring that extended to a depth of 100 feet, to groundwater, or to refusal (whichever is shallower). We understand that BMPs being considered for the site are conceptual at this time. Based on the information obtained from our geotechnical evaluation, the following findings and conclusions have been made:

- The project site is underlain by relatively shallow fill (approximately 3 feet deep) overlying alluvial soils. The encountered portions of the fill were generally comprised of silty sands. The underlying alluvial soils were observed to consist of poorly graded sands and silty sands.
- Groundwater was not encountered in our exploratory boring to the total depth explored of 100.5 feet.
- Based on our review of aerial photographs and published geologic maps, there are no known active faults or landslides underlying the project site.
- Our faulting and seismicity evaluation indicated that the site is subject to severe ground shaking due to a design seismic event.

- Review of geological literature indicates that the site is not situated in an area that has been mapped as being susceptible to liquefaction. Additionally, groundwater was not encountered in our exploration at the site. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the San Jose Properties (Glendora) site.

- In-place infiltration testing was not performed as part of our geotechnical services. However, based on published correlations between a soil's grain size and its permeability (Shepherd, 1989), an estimated permeability on the order of 10^{-2} cm/sec within the encountered sandy soils can be utilized for preliminary evaluation purposes. Actual design of storm water infiltration devices should be in accordance with the County of Los Angeles guidelines and should be based on field infiltration testing at the site.

- Recommendations provided in this report are preliminary in nature and are not intended to provide sufficient information to fully address potential geotechnical related issues prior to site development. An additional geotechnical evaluation should be performed.

9. PRELIMINARY RECOMMENDATIONS

As noted above we understand that the Better Management Practices (BMPs) associated with the proposed Upper San Gabriel River EWMP Project are conceptual at this time. As such, details regarding the types and construction of the BMPs (if any) are not known at this time for the San Jose Properties (Glendora) site. We recommend that the geotechnical information presented herein be utilized during the evaluation of the feasibility of the devices associated with the EWMP project at the site. The design of BMPs should be performed in accordance with County of Los Angeles guidelines.

The following sections of this report provide preliminary recommendations for earthwork and design of structure foundations for preliminary planning purposes. Once the type and general construction of the devices is better defined, Ninyo & Moore should review the devices' preliminary design. At that time, supplemental recommendations may be provided.

9.1. Site Preparation

Prior to earthwork, the project site should be cleared of existing structures, pavement, abandoned utilities (if present), and stripped of rubble, debris, vegetation, loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite.

9.2. Materials for Fill

On-site soils relatively free of organic material are suitable for reuse as fill. In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾-inch. Oversize materials should be separated from material to be used for fill and removed from the site. Although not anticipated, if encountered, high plasticity clays and silts should be disposed of off-site.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material should generally be granular soils with a very low to low expansion potential (i.e., an expansion index of 50 or less as evaluated by ASTM D 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

9.3. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified, moisture conditioned as needed to achieve moisture contents generally above the optimum moisture content, and then compacted to a relative compaction of 90 percent as evaluated in accordance with ASTM D 1557. The evaluation of compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when the project area is ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

9.4. Utility Trench Backfill

Based on our subsurface exploration, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the "Greenbook" (Standard Specifications for Public Works Construction) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557. Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

9.5. Preliminary Foundation Recommendations

For preliminary design purposes, shallow, spread or continuous footings founded on compacted fill or alluvial soils can be considered suitable for support of structures. Shallow, spread or continuous footings bearing on compacted fill or alluvial soils may be designed assuming an allowable bearing capacity of 2,000 psf. This allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. Spread footings should be founded 18 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches and isolated footings should be 18 inches in width or more. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

For resistance of foundations to lateral loads, we recommend an allowable passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot be used. This value assumes that the ground is horizontal for a distance of 10 feet or more, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. If passive and frictional resistances are to be used in combination, we recommend that the passive value not exceed one-half of the total resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

9.6. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Laboratory testing indicated the sulfate content of the sample tested was less than 0.2 percent, which is considered negligible for sulfate attack based on ACI criteria (ACI, 2011). Although significant sulfate content was not indicated, we recommend that Type II/V cement be used for concrete structures in contact with soil, due to the potential for variability of site soil. The water-cement ratio of the concrete should be 0.45 or less and the slump should be 4 inches or less.

9.7. Plan Review and Construction Observation

The preliminary conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Because we understand that the design of the BMPs devices for the EWMP project is conceptual at this point, we recommend that Ninyo & Moore review the devices' preliminary design, once the type and general construction of the devices is better defined. At that time, supplemental recommendations may be provided.

Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations to evaluate the assumptions inherent in the design.

The preliminary recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the preliminary conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for feasibility and preliminary design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our preliminary conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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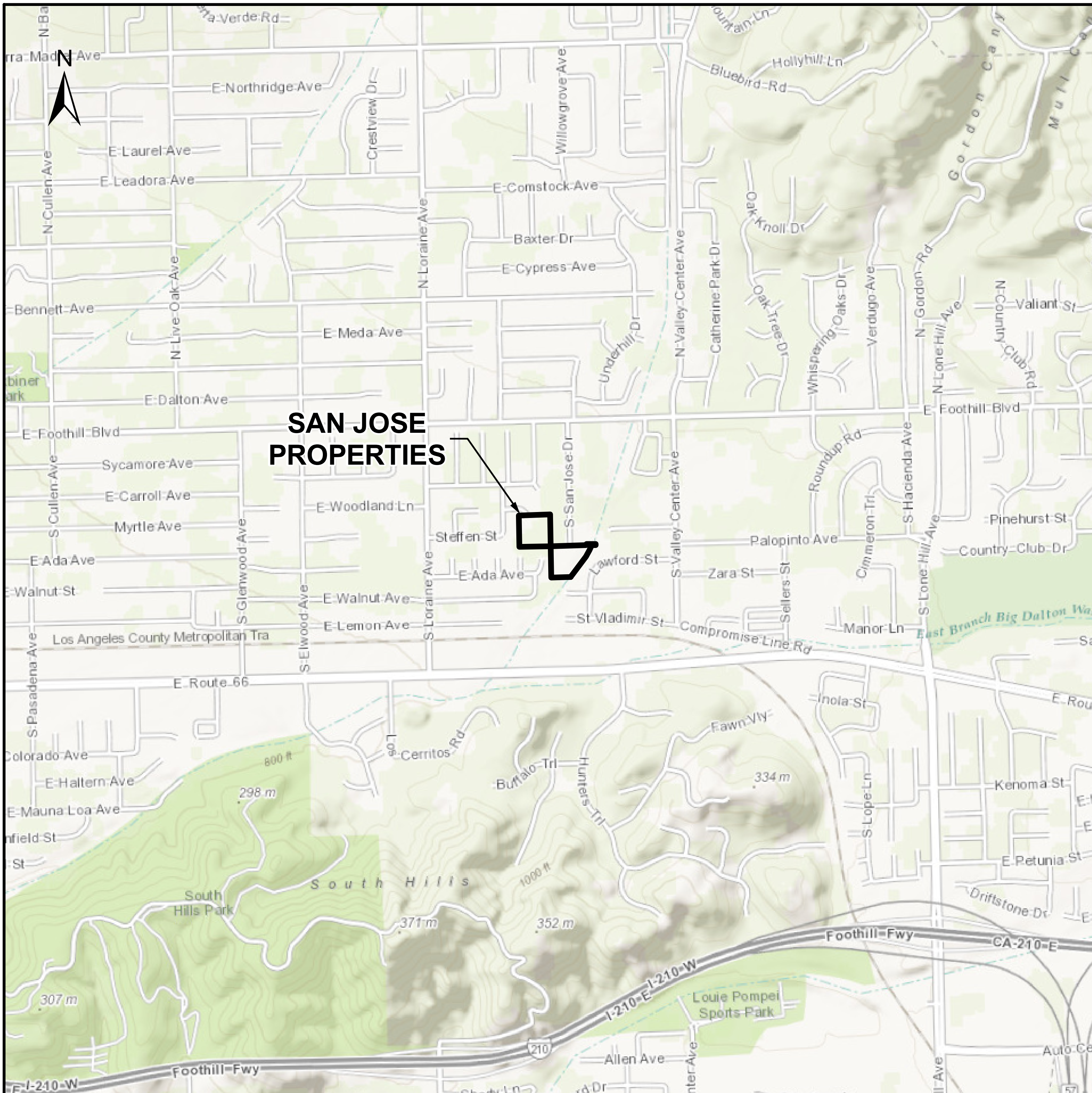
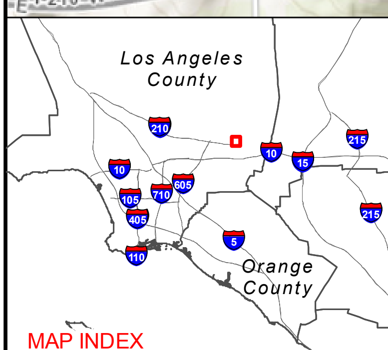


SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS.



MAP INDEX

Feet

0 750 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	SAN JOSE PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	1
107900001	6/15		

1_107900001_SL_SJ_93.mxd AOB

SOURCE: Aerial Imagery - ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP.

LEGEND

SITE BOUNDARY

B-8 TD=100.5' BORING
TD=TOTAL DEPTH IN FEET

N

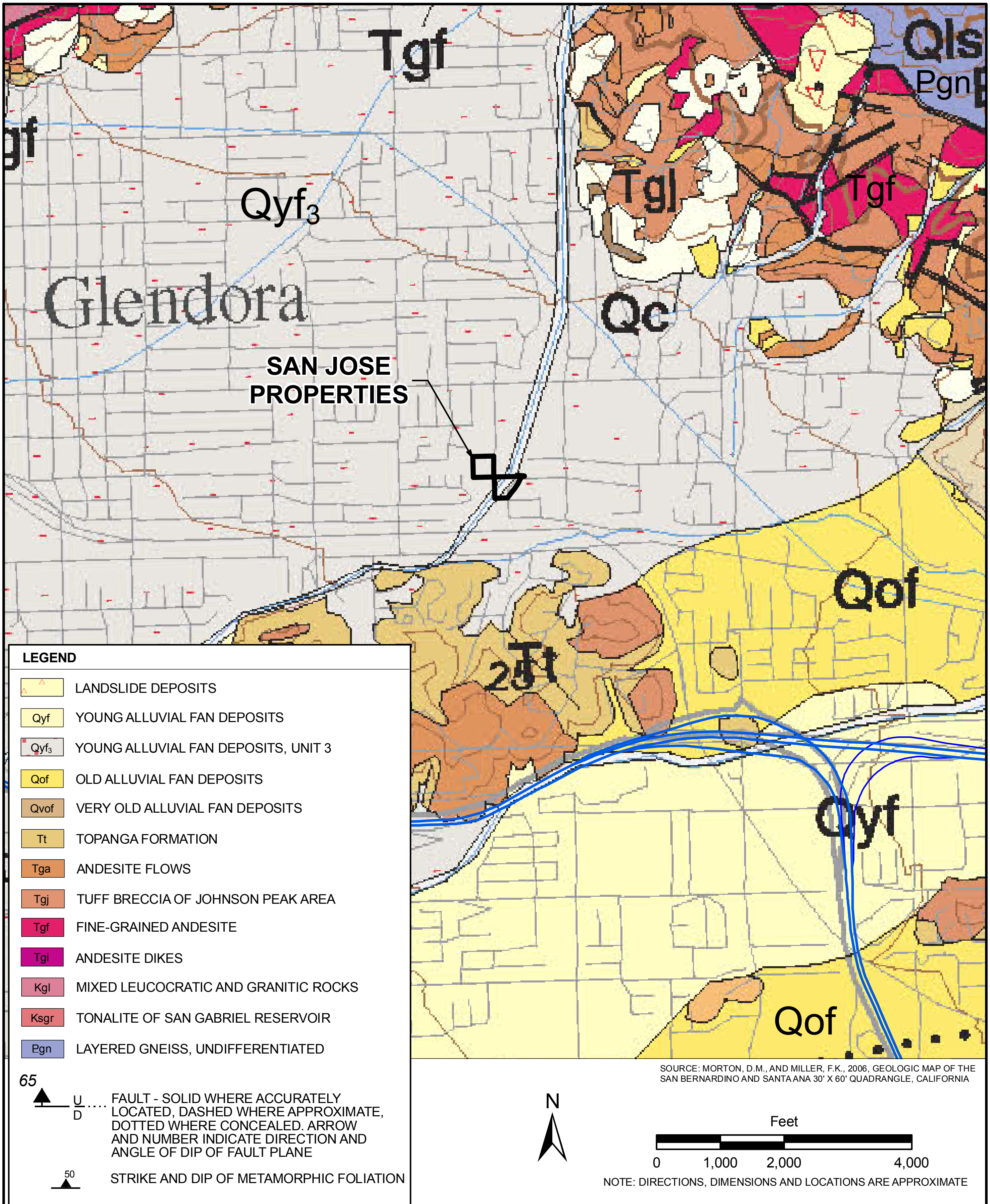
SCALE IN FEET

0 100 200 400

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

2_107900001_BL_SJ_93.mxd AOB

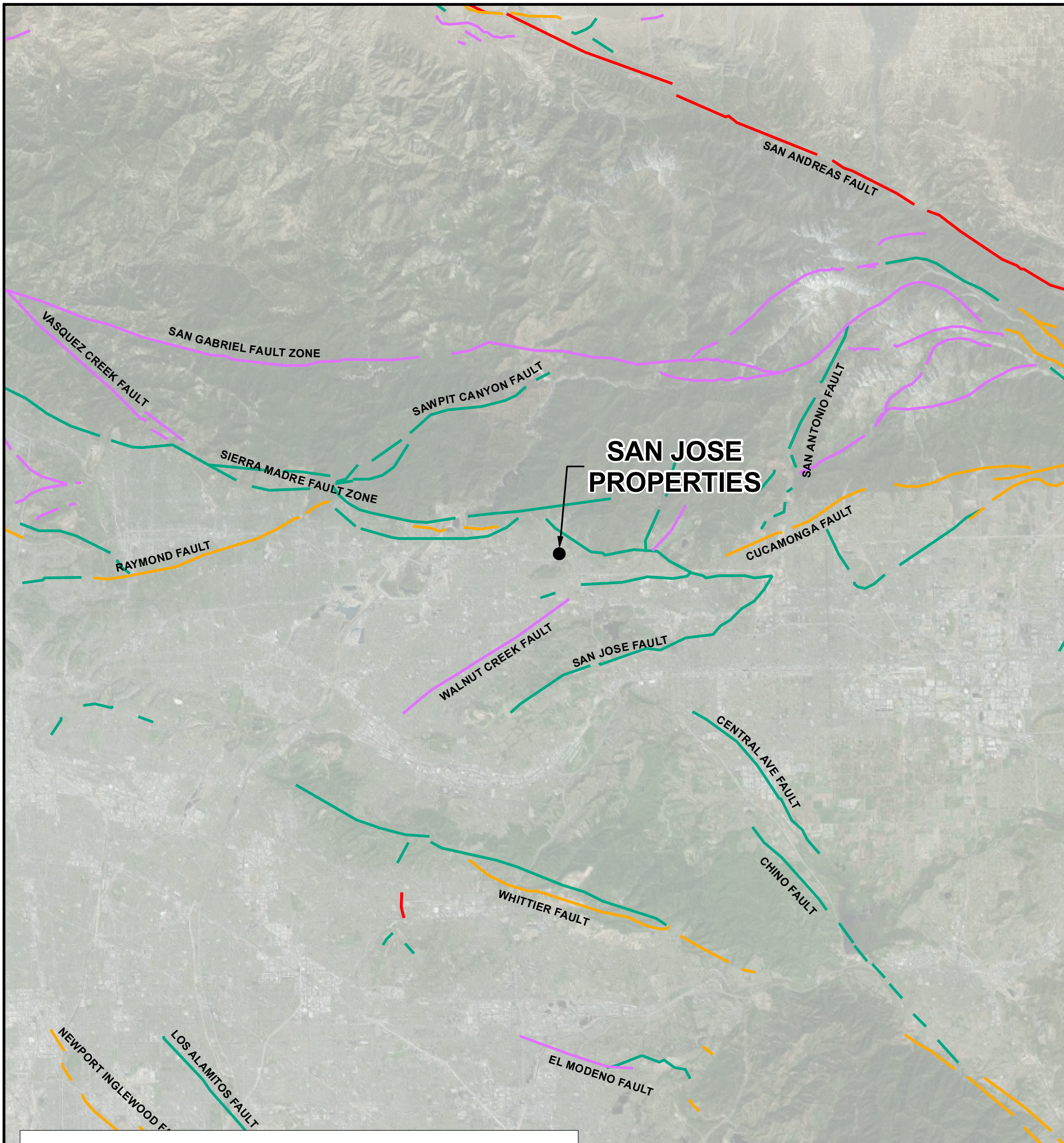
Ninyo & Moore		BORING LOCATION	FIGURE
PROJECT NO.	DATE	SAN JOSE PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	2
107900001	6/15		



Ninyo & Moore

PROJECT NO.	DATE	GEOLOGY	FIGURE
107900001	6/15	SAN JOSE PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	3

3_107900001_G_SJ_93.mxd AOB



SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS

LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

N

Miles

0 3 6 12

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		FAULT LOCATIONS	FIGURE
PROJECT NO.	DATE	SAN JOSE PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	4
107900001	6/15		

4_107900001_F_SJ_93.mxd AOB

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1⅜ inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change.
								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
15								
								The total depth line is a solid line that is drawn at the bottom of the boring.
20								

Ninyo & Moore

BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

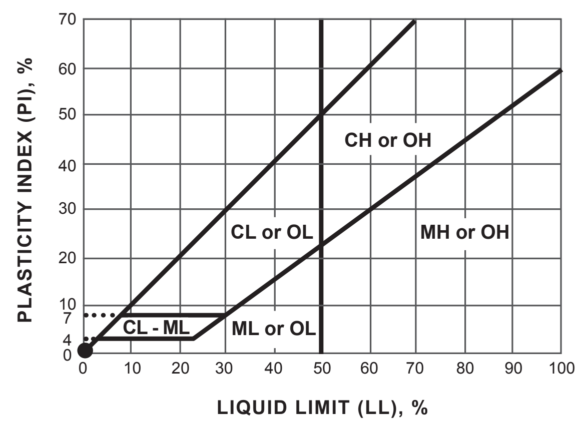
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS: GROUP SYMBOL	SECONDARY DIVISIONS: GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVEL more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SILT and CLAY liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	FILL: Dark brown, moist, medium dense, silty fine to coarse SAND; scattered gravel and cobbles up to 6 inches in diameter.
							SP-SM	ALLUVIUM: Brown, moist, medium dense, poorly graded SAND with silt and gravel up to 2 inches in diameter.
			38	2.7				
							SM	Brown to reddish brown, moist, medium dense, silty fine SAND; scattered gravel layers 1 to 2 inches thick; micaceous; some gravel-sized clasts of decomposed granitic rock.
10			8	9.2				
			29	3.7	103.8			Dark yellowish brown; trace coarse sand; slightly micaceous.
20			60	2.4				Medium dense to dense; silty fine to coarse sand; scattered gravel layers; some gravel-sized clasts of decomposed granitic rock.
			25	7.8	106.8			Scattered faint laminations visible.
30			32	4.4				Brown to reddish brown.
40								

DATE DRILLED 3/4/15 BORING NO. B-8

GROUND ELEVATION 815' ± (MSL) SHEET 1 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

Ninyo & Moore

BORING LOG

SAN JOSE PROPERTIES (GLENDORA) - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-1

DATE DRILLED 3/4/15 BORING NO. B-8

GROUND ELEVATION 815' ± (MSL) SHEET 2 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		■	19	12.8			SM	ALLUVIUM: (Continued) Brown to reddish brown, moist, medium dense, silty fine to medium SAND; scattered gravel layers.
50		■	52	5.4				Dark yellowish brown; dense to very dense; silty fine to coarse SAND.
60		■	57	4.9				Scattered layers of gravel approximately 1 to 3 inches thick (gravel is decomposed granitic rock).
70		■	55	8.0				
								Water added to borehole.
80								

Ninyo & Moore

BORING LOG

SAN JOSE PROPERTIES (GLENDORA) - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-2

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
80		■	61	4.2			SM	ALLUVIUM: (Continued) Dark yellowish brown, moist, dense to very dense, silty fine to coarse SAND; scattered gravel layers (gravel is white, weathered quartz).
90		■	50/3"	3.7				Grayish brown; very dense; scattered gravel layers (gravel is dark gray, weathered gabbro).
100		■	50/6"	3.4				Brown; very dense; scattered gravel layers.
								Total Depth = 100.5 feet. Groundwater not encountered during drilling. Backfilled shortly after drilling on 3/4/15.
								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
								The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
110								
120								

DATE DRILLED 3/4/15 BORING NO. B-8

GROUND ELEVATION 815' ± (MSL) SHEET 3 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

Moisture Content

The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis

Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-4. These test results were utilized in evaluating the soil classifications in accordance with USCS.

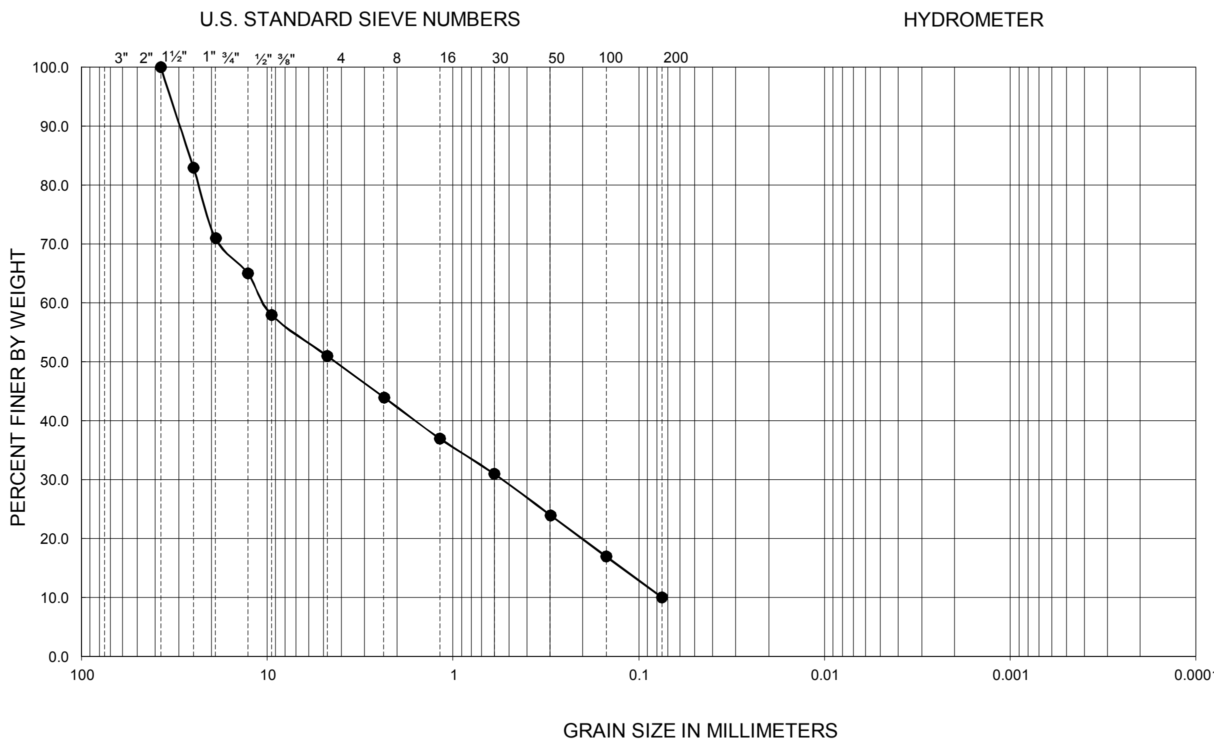
Direct Shear Tests

A direct shear test was performed on a relatively undisturbed sample in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-5.

Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-6.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



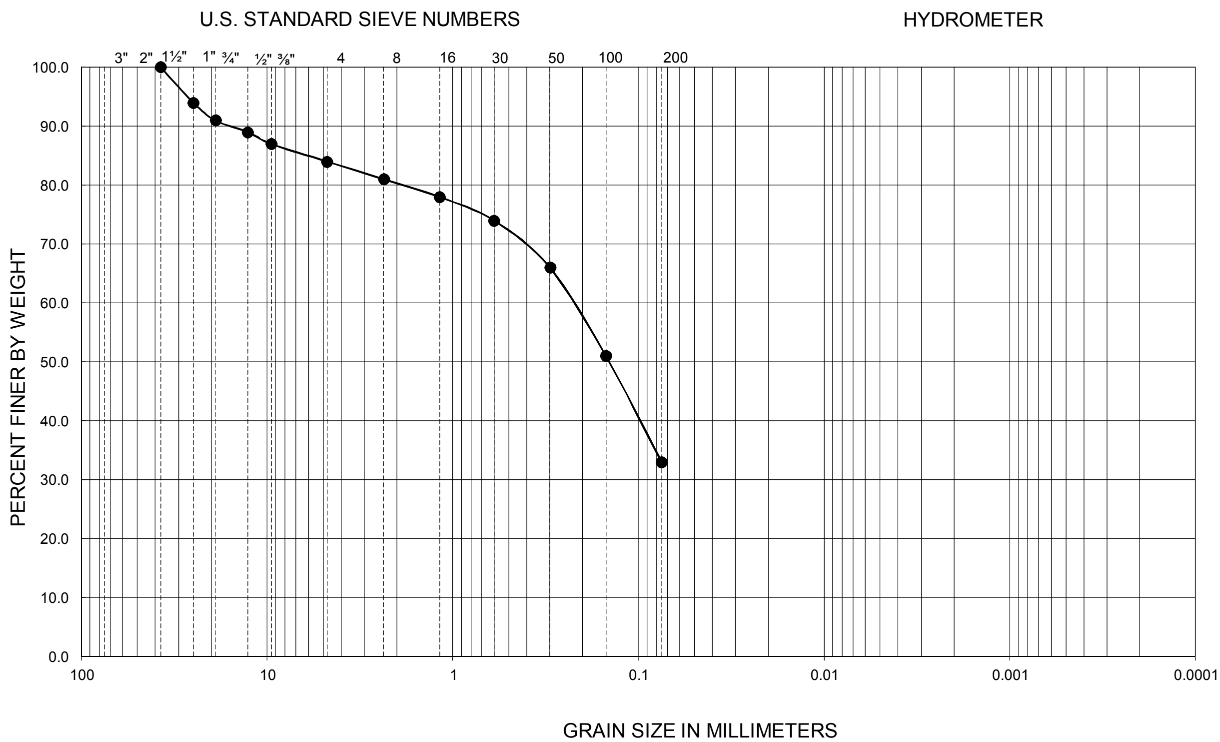
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-8	5.0-6.5	--	--	--	0.08	0.54	10.80	144.0	0.4	10	GP-GM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	SAN JOSE PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-1
107900001	6/15		

107900001_SIEVE B-8 @ 5.0-6.5.xls

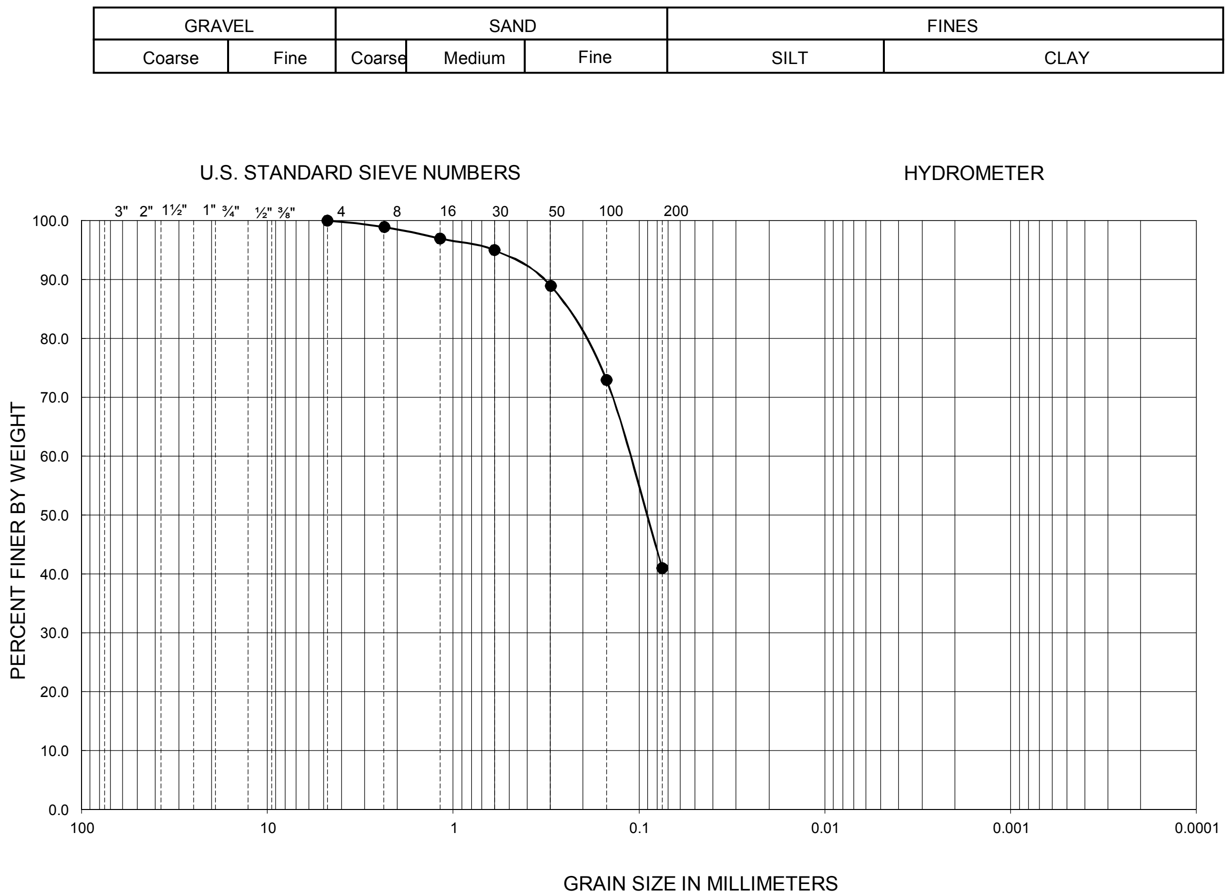
GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-8	10.0-11.5	--	--	--	--	--	--	--	--	33	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	SAN JOSE PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-2
107900001	6/15		

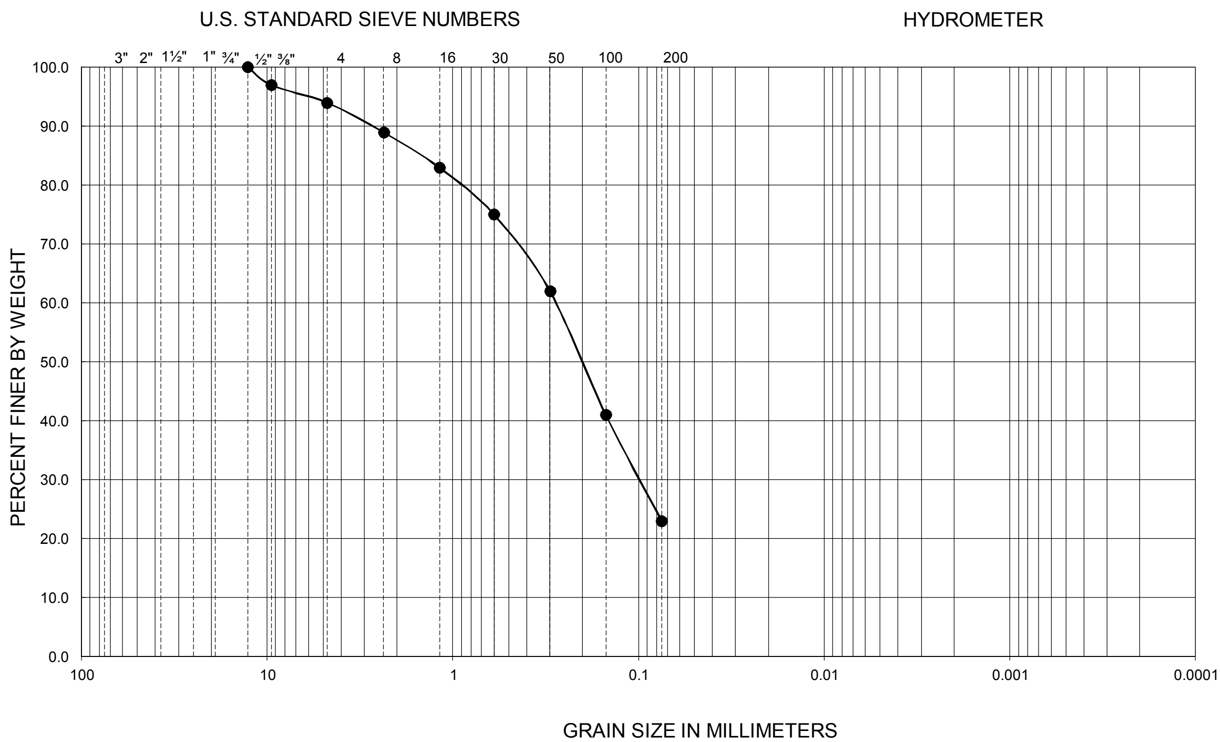


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-8	25.0-26.5	--	--	--	--	--	--	--	--	41	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore	GRADATION TEST RESULTS	FIGURE
PROJECT NO. / DATE	SAN JOSE PROPERTIES (GLENDORA)	B-3
107900001 / 6/15	UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

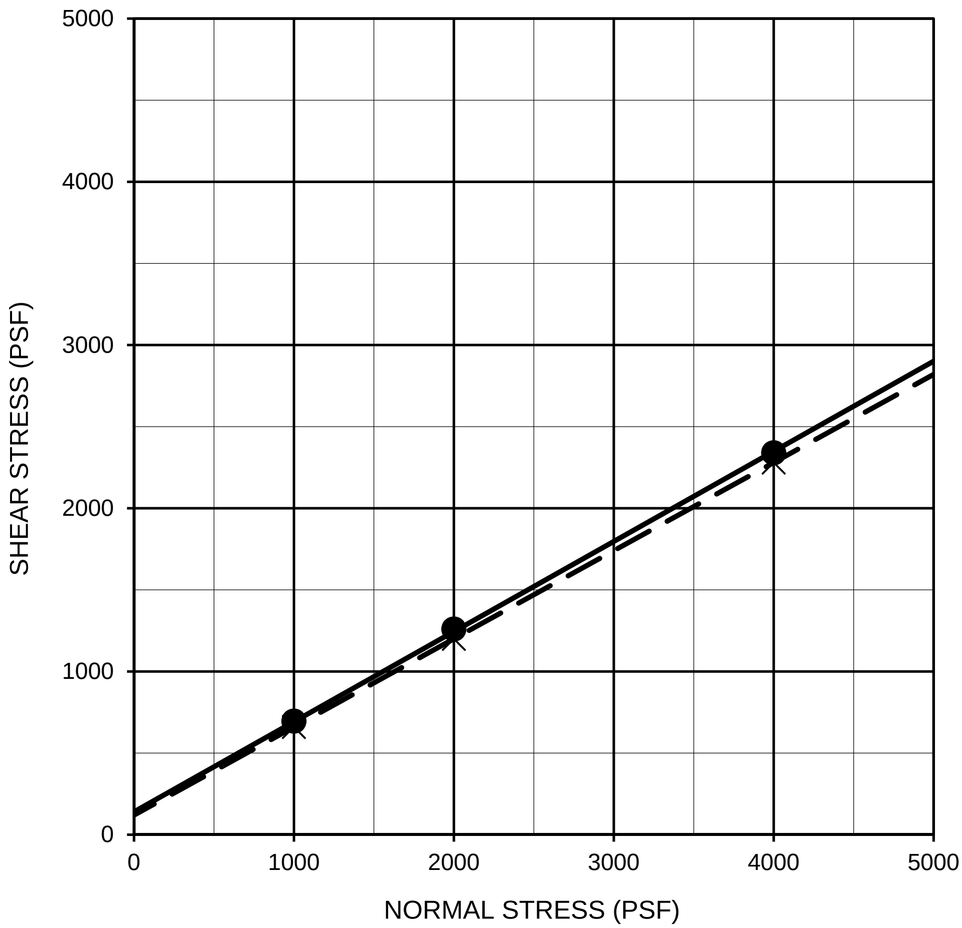


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-8	50.0-51.5	--	--	--	--	--	--	--	--	23	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	SAN JOSE PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-4
107900001	6/15		

107900001_SIEVE B-8 @ 50.0-51.5.xls



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SAND	—●—	B-8	15.0-16.5	Peak	140	29	SM
Silty SAND	- - x - -	B-8	15.0-16.5	Ultimate	120	28	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore	DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO. / DATE	SAN JOSE PROPERTIES (GLENDORA) UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-5
107900001 / 6/15		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-8	5.0-10.0	7.9	3,700	10	0.001	90

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore

CORROSIVITY TEST RESULTS

PROJECT NO.	DATE
107900001	6/15

SAN JOSE PROPERTIES (GLENDORA)
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

FIGURE
B-6

ATTACHMENT 9

GEOTECHNICAL REPORT FOR FINKBINER PARK

GEOTECHNICAL SERVICES
FINKBINER PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NO. T10503269-102669-OM

PREPARED FOR:

MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
Finkbiner Park
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order No. T10503269-102669-OM

Dear Ms. Kelly:

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Finkbiner Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. This report presents geotechnical data obtained by Ninyo & Moore relative to the proposed project. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

REGISTERED PROFESSIONAL ENGINEER
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Distribution: (1) Addressee (via e-mail)

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Appendices

1. INTRODUCTION

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at Finkbiner Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California (Figure 1). This report presents a compilation of geotechnical data obtained from the project along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project. We understand that the information contained herein will be included in the environmental report.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and subsurface exploration with regard to the proposed project. Specifically, we performed the following tasks:

- Review of readily available background materials, including State of California Seismic Hazards Zones map, State of California Earthquake Fault Zone map (Alquist-Priolo Special Studies Zones map), other published geologic maps and literature, in-house information, stereoscopic aerial photographs, and plans provided by the client.

- Performance of a site reconnaissance to observe the existing conditions at the site and to mark the proposed boring location for utility clearance. Mark-out of potential existing underground utilities was conducted through Underground Service Alert (USA).

- Performing a subsurface exploration consisting of drilling, logging and sampling of one exploratory soil boring at the site. The boring was advanced to a depth of 101.5 feet using a truck-mounted drill rig equipped with hollow stem augers.

- Performing geotechnical laboratory testing on soil samples collected during our subsurface exploration. The testing included an evaluation of moisture content, in-situ moisture and dry density, grain-size analysis (sieve and 200 wash), direct shear, and soil corrosivity.

- Compiling the data obtained from our background research, subsurface exploration, and laboratory testing.

- Preparing this report that presents geotechnical data obtained from our background review, site reconnaissance, and subsurface exploration at the project site, along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project.

3. PROJECT AND SITE DESCRIPTION

The purpose of the project is to assist MWH Americas (MWH) and the Los Angeles County Department of Public Works (LADPW) in developing an Enhanced Watershed Management Program (EWMP) for the Upper San Gabriel River Watershed. Our services are intended to help support feasibility analyses being conducted by MWH and LADPW for Better Management Practices (BMPs) at specific locations as part of the EWMP. We understand that the BMPs will help to reduce the impact of storm water and non-storm water discharges on the area (MWH, 2014).

Ten separate sites located within the San Gabriel Valley in Los Angeles County, California have been selected for feasibility analyses for the project. This report addresses the Finkbiner County Park site, which is located at 160 N. Wabash Avenue in the city of Glendora (Figures 1 and 2). Finkbiner Park is maintained by the County of Los Angeles. Geotechnical evaluations for the other nine sites are addressed in reports that are being issued under separate covers (Ninyo & Moore, 2015a through 2015i).

Finkbiner County Park is developed with improvements that include restroom and recreation center buildings, softball/baseball fields, tennis and basketball courts, a skate park, asphalt concrete (AC) paved parking lots, paved walkways, playground equipment, light poles, landscaping consisting of trees, shrubs, and grass areas, and other associated appurtenances. The site for the proposed improvements is located in an AC paved parking lot in the northern portion of the park. The site coordinates are approximately 34.1382°N latitude and -117.8607°W longitude. The elevation at the project site is approximately 800 feet above mean sea level (MSL).

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our field exploration at the Finkbiner Park site included a geologic reconnaissance that was conducted on February 19, 2015 and subsurface exploration that was conducted on March 9, 2015. The subsurface exploration consisted of drilling one 8-inch diameter hollow stem auger boring (B-9) to a depth of 101.5 feet below ground surface (bgs). The boring was logged by a geologist from our firm. Representative disturbed and undisturbed soil samples were obtained at selected depths from the boring for laboratory testing. The approximate location of the boring is presented on Figure 2. The boring log is presented in Appendix A.

Laboratory testing of selected soil samples obtained from our exploratory boring included in-situ dry density and moisture content, gradation, direct shear, and soil corrosivity. The results of the in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests described above are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, and groundwater conditions at the Finkbiner Park site are provided in the following sections.

5.1. Regional and Geologic Setting

The subject site is located within the northeastern portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Norris and Webb, 1990). The geomorphic province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and continues farther to the tip of Baja California. The Los Angeles Basin has been divided into four structural blocks which are generally bounded by prominent fault systems. The site is located within the Northeastern Block, which is bordered on the west and south by the Whittier-Elsinore fault and is bordered on the north by the San Gabriel Mountains and the Raymond Hill Fault. The Northeastern Block is a deep basin characterized by thick sequences of alluvium and sedimentary units overlying basement rocks, which are at depths of up to approximately 12,000 feet below the surface in the central part of the San Gabriel Valley.

5.2. Site Geology

Our review of the referenced geologic maps and literature indicates that the subject site is underlain by Holocene to Pleistocene alluvial gravel and sand (Dibblee and Minch, 2002). Geologic units encountered during our reconnaissance and subsurface exploration of the project site included relatively thin fill soils that mantle alluvium. Generalized descriptions of the units encountered are provided in the subsequent sections. Additional descriptions are provided on the boring logs in Appendix A. A geologic map of the region is presented on Figure 3.

5.2.1. Fill

Fill materials were encountered in our boring B-9 underlying the AC pavement to a depth of approximately 3.5 feet below existing grade. As observed, the fill materials generally consisted of grayish brown, moist, medium dense, silty sand.

5.2.2. Alluvium

Alluvium was encountered in our boring B-9 underlying the fill materials and was observed to extend to the total depth explored of approximately 101.5 feet below existing grade. As observed in our boring, the alluvial materials generally consisted of various shades of brown, moist, medium dense to very dense, well graded sands, poorly graded sands, silty sands, and sandy silts. Scattered gravel was encountered at various depths in the alluvium.

5.3. Groundwater

Groundwater was not encountered during our subsurface exploration in our boring B-9. Fluctuations in the groundwater level and perched conditions typically occur due to variations in precipitation, ground surface topography, subsurface stratification, irrigation, and other factors.

6. FAULTING AND SEISMICITY

Based on our review of published geologic maps and review of stereoscopic aerial photographs, no active fault traces are mapped as underlying the Finkbiner Park site. Therefore, the potential for surface fault rupture at the site is considered to be low. The project site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, Finkbiner Park is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed improvements. Figure 4 shows the approximate site location relative to the major faults in the region. The nearest known active fault is the Sierra Madre fault, located approximately 1 mile northwest of the site.

6.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated at 0.957g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based).

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.856g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.856g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.2. Surface Fault Rupture

The probability of damage due to surface ground rupture is relatively low due to the lack of known active faults crossing the project site. Surface ground cracking related to shaking from distant events is not considered a significant hazard, although it is a possibility.

6.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon in which loosely deposited, granular soils and some fine-grained soils located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration

can result in a loss of grain-to-grain contact due to a rapid rise in pore water pressure causing the soil to behave as a fluid for a short period. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

According to the Seismic Hazard Zones Map for the Glendora Quadrangle, (CGS, 1999), the Finkbiner Park site is not mapped as being in an area susceptible to liquefaction. During our subsurface exploration, groundwater was not encountered at Finkbiner Park to the total depth explored of 101.5 feet. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Finkbiner Park site.

7. OTHER GEOTECHNICAL CONSIDERATIONS

7.1. Slope Stability

Our review of maps published by the California Geological Survey (CGS, 1999) indicates that the Finkbiner Park site is not situated in an area considered to be susceptible to seismic-induced landsliding. In addition, our observations indicate that the site is generally level to gently sloping. Consequently, landsliding or slope instability are not considered to be a constraint at the project site.

7.2. Corrosion

Laboratory testing was performed on representative samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with the California Test (CT) 643 and the sulfate and chloride tests were performed in accordance with CTs 417 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing performed on a sample obtained from the site indicated an electrical resistivity value of 2,500 ohm-cm, a soil pH value of 7.5, a chloride content of 630 ppm, and a sulfate content of 0.002 percent. According to Caltrans criteria and American Concrete Institute (ACI) 318 guidelines, a corrosive soil is defined as one with more than 500 ppm chlorides, more than 0.2 percent sulfates, a pH less than 5.5, or an electrical resistivity of less than 1,000 ohm-cm. Based on the Caltrans criteria and ACI guidelines, the upper soils encountered at the site are considered to be corrosive, due to the relatively high chloride content.

8. DISCUSSION AND FINDINGS

As discussed above, our geotechnical services were performed to assist MWH and LADPW evaluate the preliminary feasibility of an onsite storm water infiltration system at the Finkbiner Park site. Based on our communications with MWH, we understand that the preliminary criteria at the site is related to the presence of groundwater or dense materials providing refusal to drilling equipment within 100 feet of the ground surface. As such, our scope of services included the drilling of an exploratory boring that extended to a depth of 100 feet, to groundwater, or to refusal (whichever is shallower). We understand that BMPs being considered for the site are conceptual at this time. Based on the information obtained from our geotechnical evaluation, the following findings and conclusions have been made:

- The project site is underlain by relatively shallow fill (approximately 3.5 feet deep) overlying alluvial soils. The encountered portions of the fill were generally comprised of silty sands. The underlying alluvial soils were observed to consist of well graded sands, poorly graded sands, silty sands, and sandy silts.

- Groundwater was not encountered in our exploratory boring to the total depth explored of 101.5 feet.

- Based on our review of aerial photographs and published geologic maps, there are no known active faults or landslides underlying the project site.

- Our faulting and seismicity evaluation indicated that the site is subject to severe ground shaking due to a design seismic event.

- Review of geological literature indicates that the site is not situated in an area that has been mapped as being susceptible to liquefaction. Additionally, groundwater was not encountered in our exploration at the site. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the Finkbiner Park site.

- In-place infiltration testing was not performed as part of our geotechnical services. However, based on published correlations between a soil's grain size and its permeability (Shepherd, 1989), an estimated permeability on the order of 10^{-3} cm/sec within the encountered sandy and silty soils can be utilized for preliminary evaluation purposes. Actual design of storm water infiltration devices should be in accordance with the County of Los Angeles guidelines and should be based on field infiltration testing at the site.

- Recommendations provided in this report are preliminary in nature and are not intended to provide sufficient information to fully address potential geotechnical related issues. Prior to site development an additional geotechnical evaluation should be performed.

9. PRELIMINARY RECOMMENDATIONS

As noted above we understand that the Better Management Practices (BMPs) associated with the proposed Upper San Gabriel River EWMP Project are conceptual at this time. As such, details regarding the types and construction of the BMPs (if any) are not known at this time for the Finkbiner Park site. We recommend that the geotechnical information presented herein be utilized during the evaluation of the feasibility of the devices associated with the EWMP project at the site. The design of BMPs should be performed in accordance with County of Los Angeles guidelines.

The following sections of this report provide preliminary recommendations for earthwork and design of structure foundations for preliminary planning purposes. Once the type and general construction of the devices is better defined, Ninyo & Moore should review the devices' preliminary design. At that time, supplemental recommendations may be provided.

9.1. Site Preparation

Prior to earthwork, the project site should be cleared of existing structures, pavement, abandoned utilities (if present), and stripped of rubble, debris, vegetation, loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite.

9.2. Materials for Fill

On-site soils relatively free of organic material are suitable for reuse as fill. In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾-inch. Oversize materials should be separated from material to be used for fill and removed from the site. Although not anticipated, if encountered, high plasticity clays and silts should be disposed of off-site.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material should generally be granular soils with a very low to low expansion potential (i.e., an expansion index of 50 or less as evaluated by ASTM D 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

9.3. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified, moisture conditioned as needed to achieve moisture contents generally above the optimum moisture content, and then compacted to a relative compaction of 90 percent as evaluated in accordance with ASTM D 1557. The evaluation of compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when the project area is ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

9.4. Utility Trench Backfill

Based on our subsurface exploration, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the "Greenbook" (Standard Specifications for Public Works Construction) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557. Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

9.5. Preliminary Foundation Recommendations

For preliminary design purposes, shallow, spread or continuous footings founded on compacted fill or alluvial soils can be considered suitable for support of structures. Shallow, spread or continuous footings bearing on compacted fill or alluvial soils may be designed assuming an allowable bearing capacity of 2,000 psf. This allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. Spread footings should be founded 18 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches and isolated footings should be 18 inches in width or more. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

For resistance of foundations to lateral loads, we recommend an allowable passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot be used. This value assumes that the ground is horizontal for a distance of 10 feet or more, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. If passive and frictional resistances are to be used in combination, we recommend that the passive value not exceed one-half of the total resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

9.6. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Laboratory testing indicated the sulfate content of the sample tested was less than 0.2 percent, which is considered negligible for sulfate attack based on ACI criteria (ACI, 2011). Although significant sulfate content was not indicated, we recommend that Type II/V cement be used for concrete structures in contact with soil, due to the potential for variability of site soil. The water-cement ratio of the concrete should be 0.45 or less and the slump should be 4 inches or less.

9.7. Plan Review and Construction Observation

The preliminary conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Because we understand that the design of the BMPs devices for the EWMP project is conceptual at this point, we recommend that Ninyo & Moore review the devices' preliminary design, once the type and general construction of the devices is better defined. At that time, supplemental recommendations may be provided.

Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations to evaluate the assumptions inherent in the design.

The preliminary recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the preliminary conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for feasibility and preliminary design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our preliminary conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to

government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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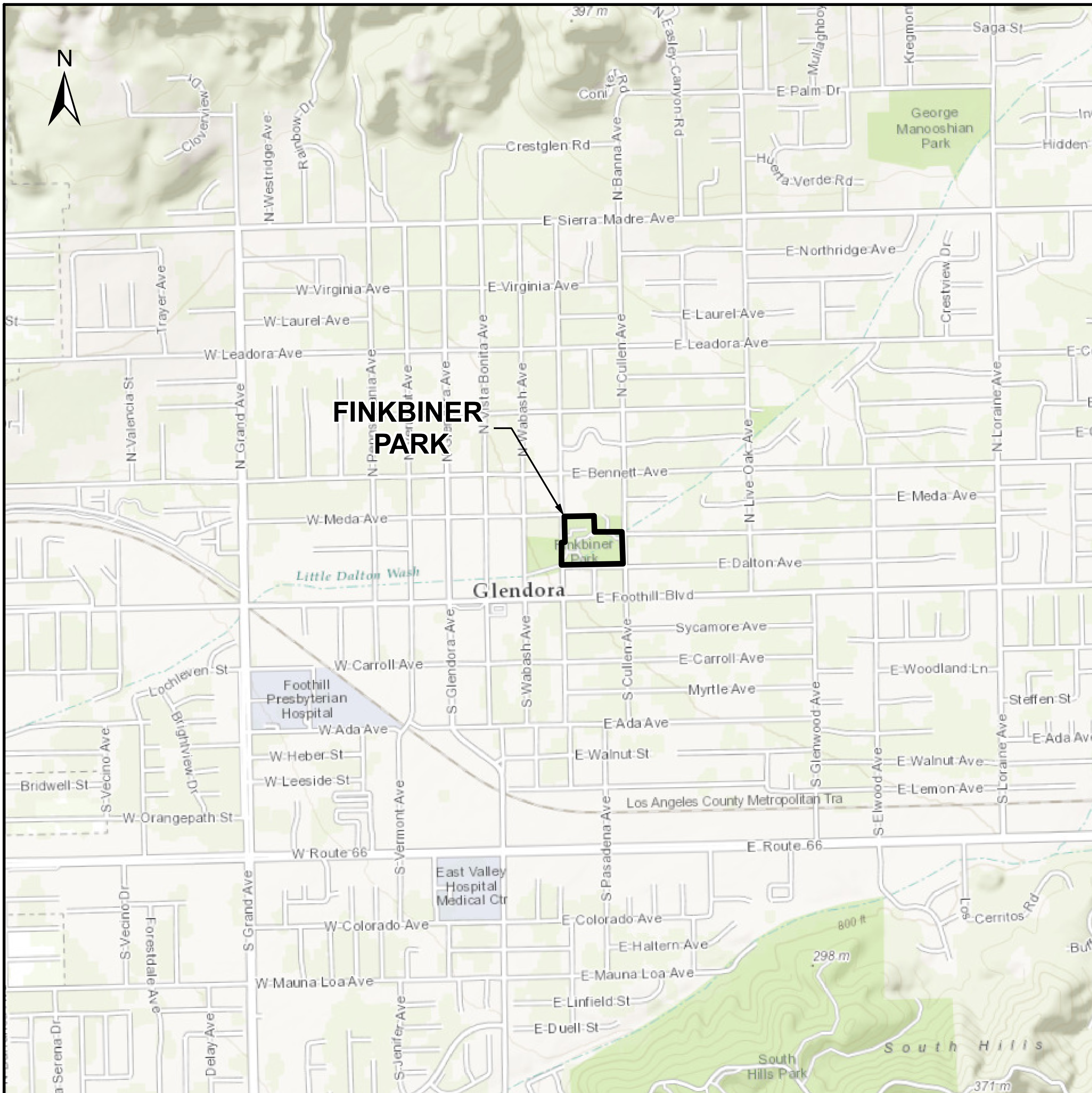
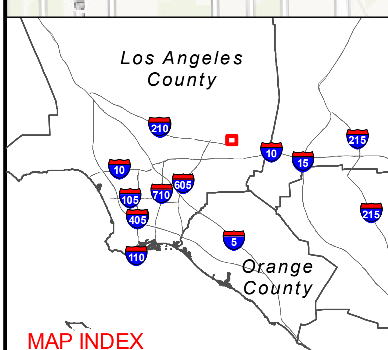


SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS.



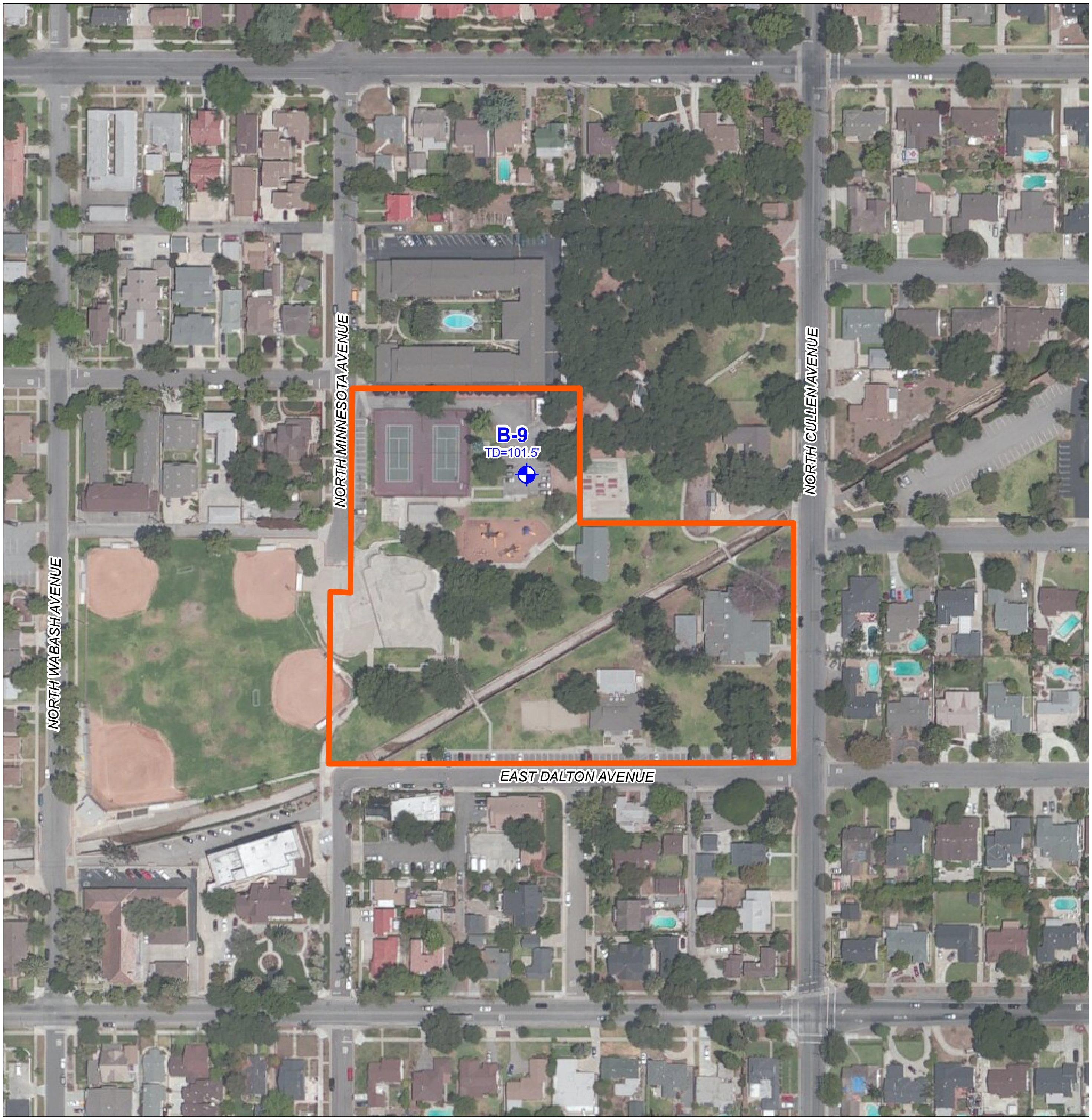
Feet

0 750 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	FINKBINER PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	1
107900001	6/15		

1_107900001_SL_F_93.mxd AOB



SOURCE: Aerial Imagery - ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP.

LEGEND

SITE BOUNDARY

B-9 TD=101.5' BORING
TD=TOTAL DEPTH IN FEET

N

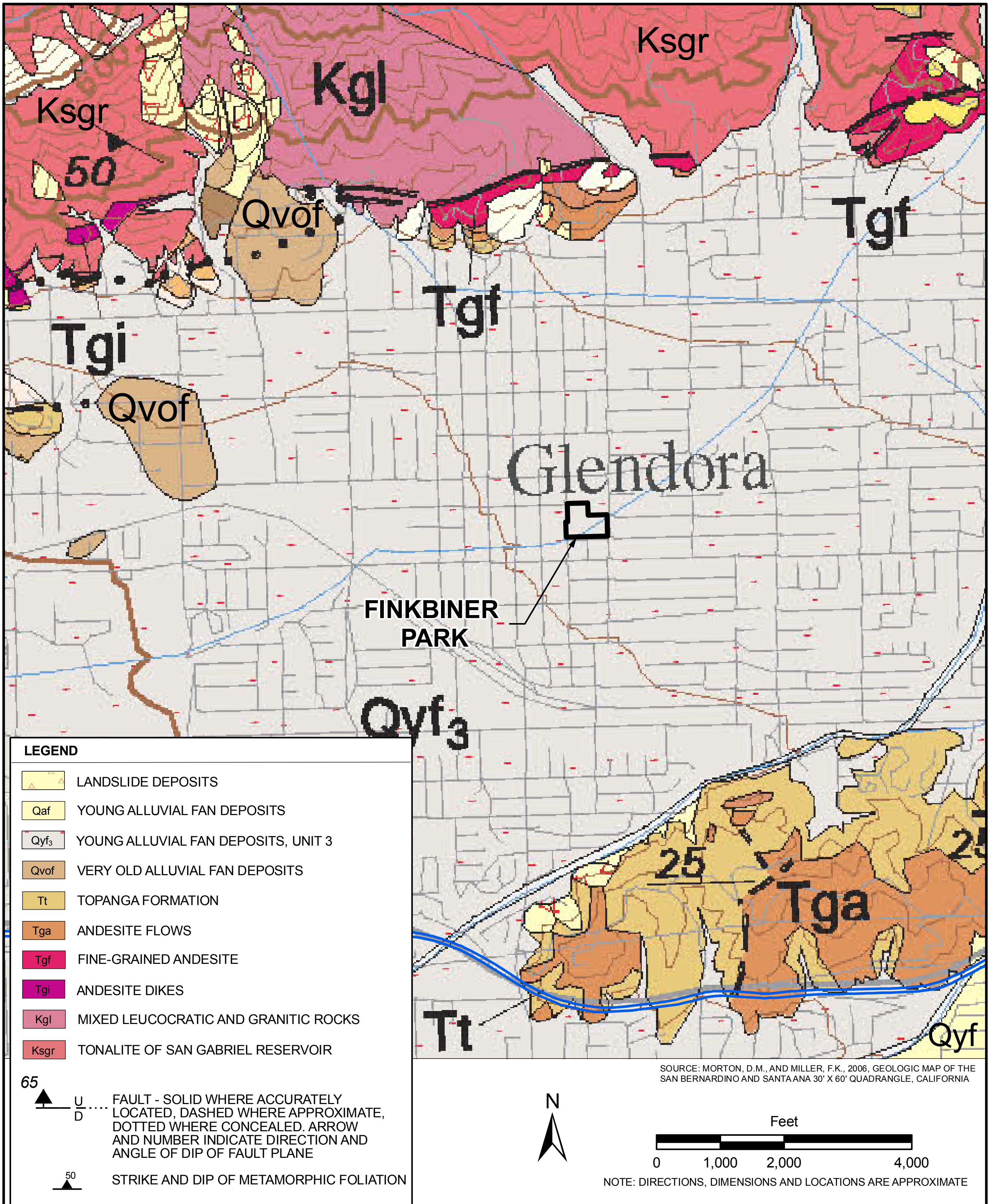
SCALE IN FEET

0 100 200 400

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

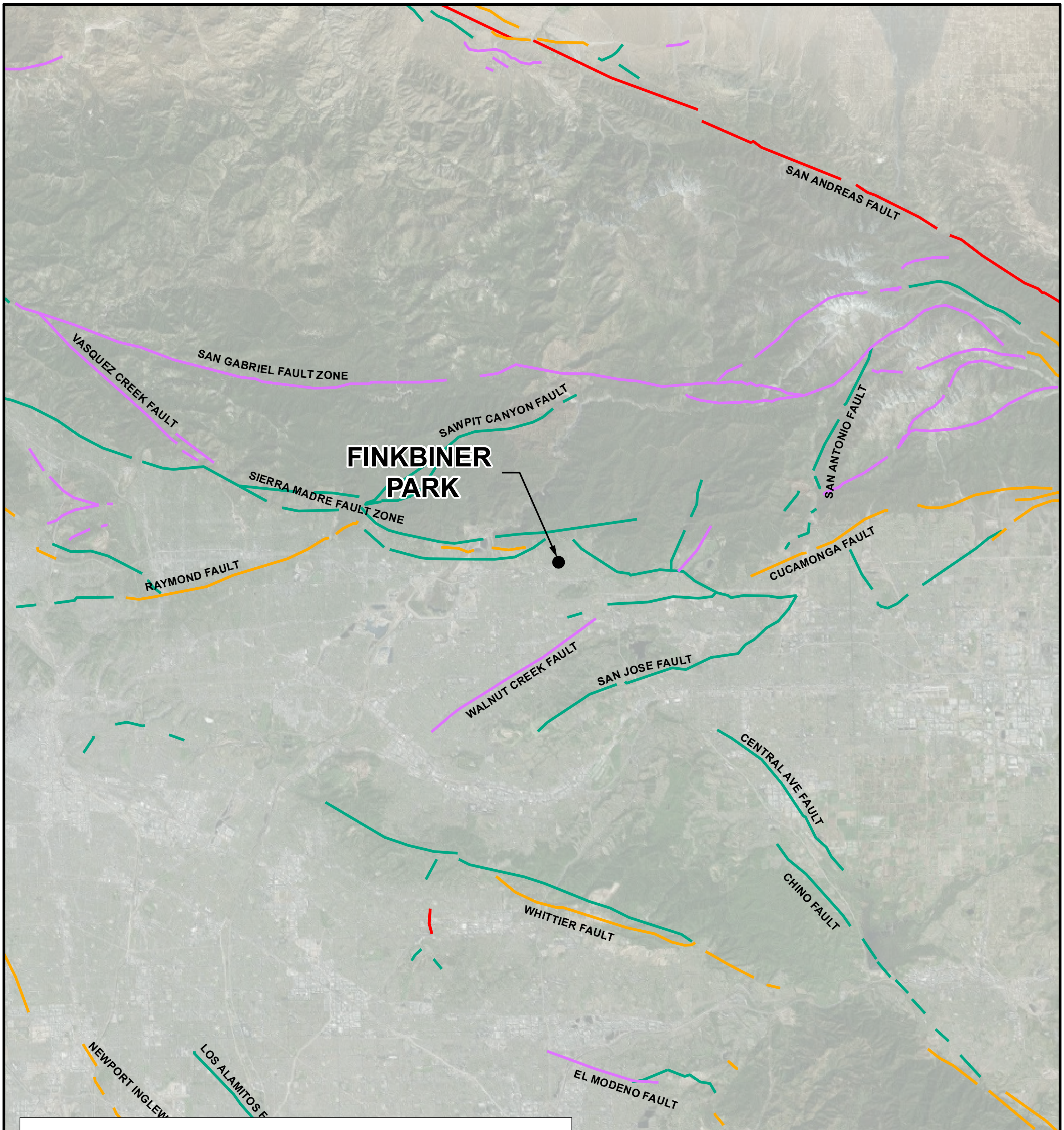
2_107900001_BL_F_93.mxd AOB

Ninyo & Moore		BORING LOCATION	FIGURE
PROJECT NO.	DATE	FINKBINER PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	2
107900001	6/15		



Ninyo & Moore	GEOLOGY	FIGURE
PROJECT NO. 107900001	DATE 6/15	FINKBINER PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	3

3_107900001_G_F_93.mxd AOB



SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS

LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

N

Miles

0 3 6 12

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

4_107900001_F_F_93.mxd AOB

Ninyo & Moore

FAULT LOCATIONS

PROJECT NO.	DATE		FIGURE
107900001	6/15	FINKBINER PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	4

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples
Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples
Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler
Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1⅜ inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples
Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler
The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change.
								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
15								
								The total depth line is a solid line that is drawn at the bottom of the boring.
20								

Ninyo & Moore

BORING LOG		
Explanation of Boring Log Symbols		
PROJECT NO.	DATE	FIGURE

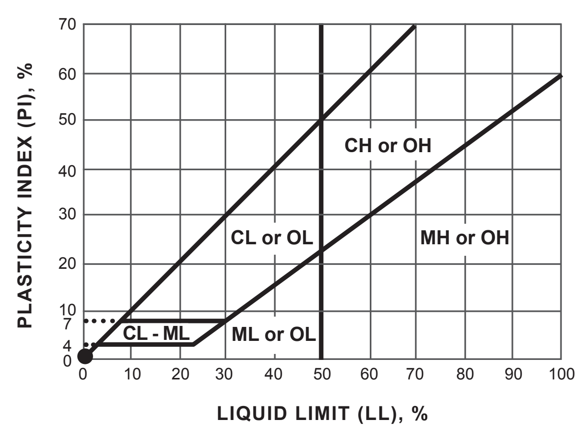
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS: GROUP SYMBOL	SECONDARY DIVISIONS: GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	**GRAVEL** more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	**SILT and CLAY** liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

Ninyo & Moore

USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 3/09/15 BORING NO. B-9 GROUND ELEVATION 800' ± (MSL) SHEET 1 OF 3 METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden) DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30" SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF DESCRIPTION/INTERPRETATION
0								ASPHALT CONCRETE: Approximately 3 to 4 inches thick; no base.
							SM	FILL: Grayish brown, moist, medium dense, silty fine to coarse SAND.
							SP-SM	ALLUVIUM: Brown, moist, medium dense, poorly graded SAND with silt; scattered.
			16	3.7				
10			39					More gravel; some caliche.
			53	1.6				Scattered layers of gravel.
20			34	2.7				Medium dense to dense.
			38					
30			53					
			50/6"	3.0				Gravel bed.
							ML	Reddish brown, moist, medium dense, fine sandy SILT; trace clay; trace coarse sand and fine gravel.
40								

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BORING LOG

FINKBINER PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	3/15	A-1

DATE DRILLED	3/09/15	BORING NO.	B-9
GROUND ELEVATION	800' ± (MSL)	SHEET	2 OF 3
METHOD OF DRILLING	8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)		
DRIVE WEIGHT	140 lbs. (Auto-Trip Hammer)	DROP	30"
SAMPLED BY	CAT	LOGGED BY	CAT
REVIEWED BY	GTF		

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		◣	18	16.6			ML	ALLUVIUM: (Continued) Reddish brown, moist, medium dense, fine sandy SILT; scattered medium and coarse sand and fine gravel; trace clay.
								Gravel layer.
							SM	Grayish brown, moist, medium dense to dense, silty fine to medium SAND; scattered layers of gravel.
50		◣	54	3.9				
60		◣	45	5.2				Brown, moist, medium dense, silty fine to medium SAND.
							SW	Grayish brown, moist, medium dense, silty fine to coarse SAND with gravel.
							SM	Dark brown, moist, medium dense to dense, silty fine SAND; micaceous.
70		◣	23					Grayish brown; fine to coarse sand; scattered gravel.
80								

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BORING LOG

FINKBINER PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	3/15	A-2

DATE DRILLED 3/09/15 BORING NO. B-9

GROUND ELEVATION 800' ± (MSL) SHEET 3 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
80		▼	86				SM	ALLUVIUM: (Continued) Brown and gray, moist, dense to very dense, silty fine to coarse SAND; scattered gravel and fragments of decomposed granitic rock. Difficult drilling; water added.
								Gravel layer.
90		▼	73					Scattered fine gravel.
								Reddish brown; silty fine sand; micaceous.
100		▼	24					Dense; scattered gravel layers.
								Total Depth = 101.5 feet. Groundwater not encountered during drilling. Backfilled shortly after drilling on 3/09/15. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
110								
120								

Ninyo & Moore

BORING LOG

FINKBINER PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	3/15	A-3

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

Moisture Content

The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis

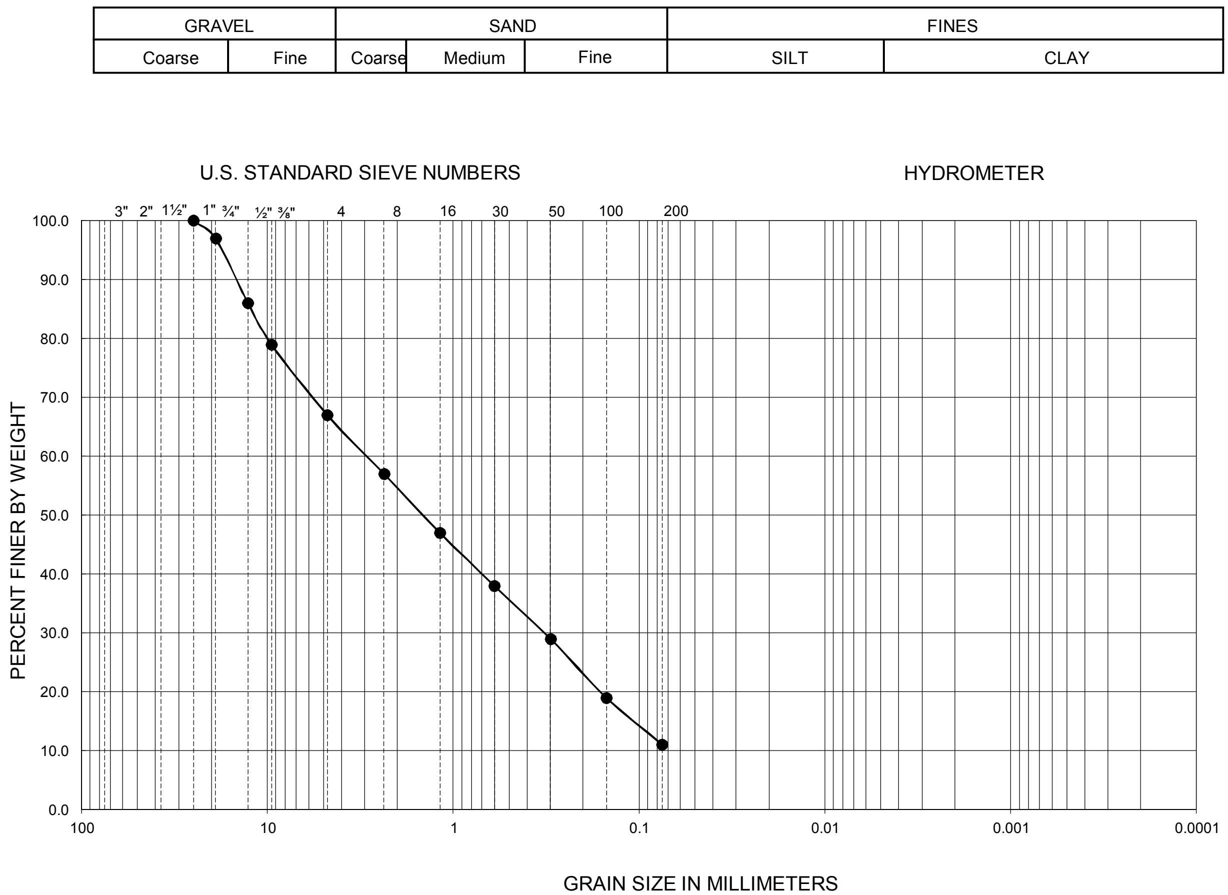
Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-4. These test results were utilized in evaluating the soil classifications in accordance with USCS.

Direct Shear Tests

A direct shear test was performed on a relatively undisturbed sample in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-5.

Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-6.



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-9	15.0-16.5	--	--	--	--	--	--	--	--	11	SP-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

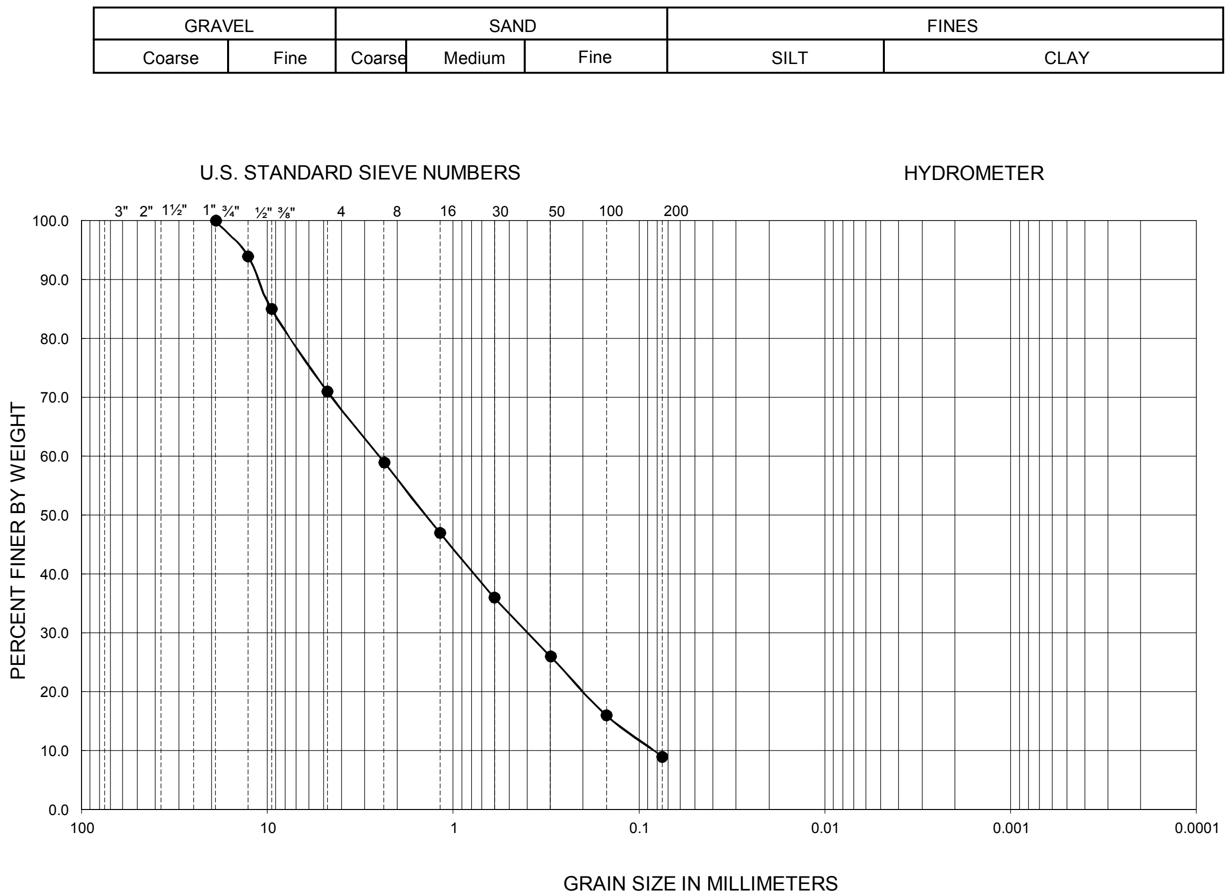
GRADATION TEST RESULTS

PROJECT NO.	DATE
107900001	6/15

FINKBINER PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

FIGURE

B-1



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-9	25.0-26.5	--	--	--	0.08	0.40	2.50	31.3	0.8	9	SP-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

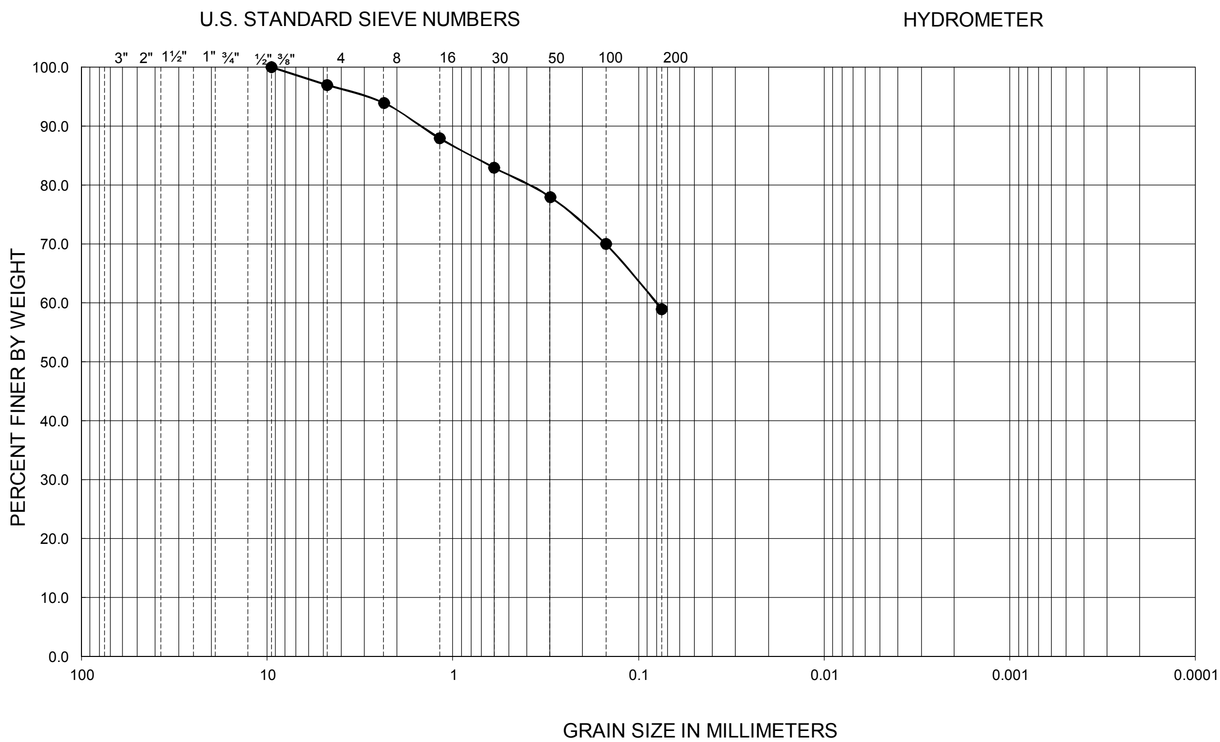
GRADATION TEST RESULTS

FIGURE **B-2**

PROJECT NO.	DATE
107900001	6/15

FINKBINER PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-9	40.0-41.5	--	--	--	--	--	--	--	--	59	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

GRADATION TEST RESULTS

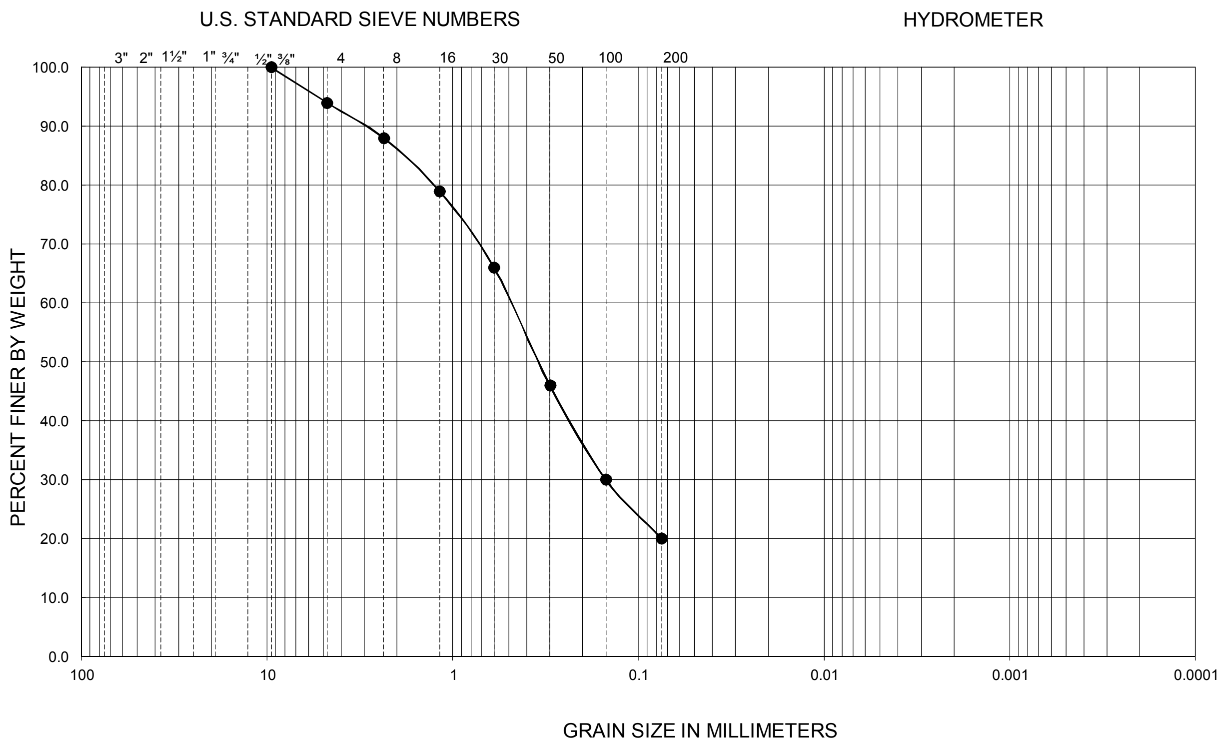
FIGURE

B-3

PROJECT NO.	DATE
107900001	6/15

FINKBINER PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

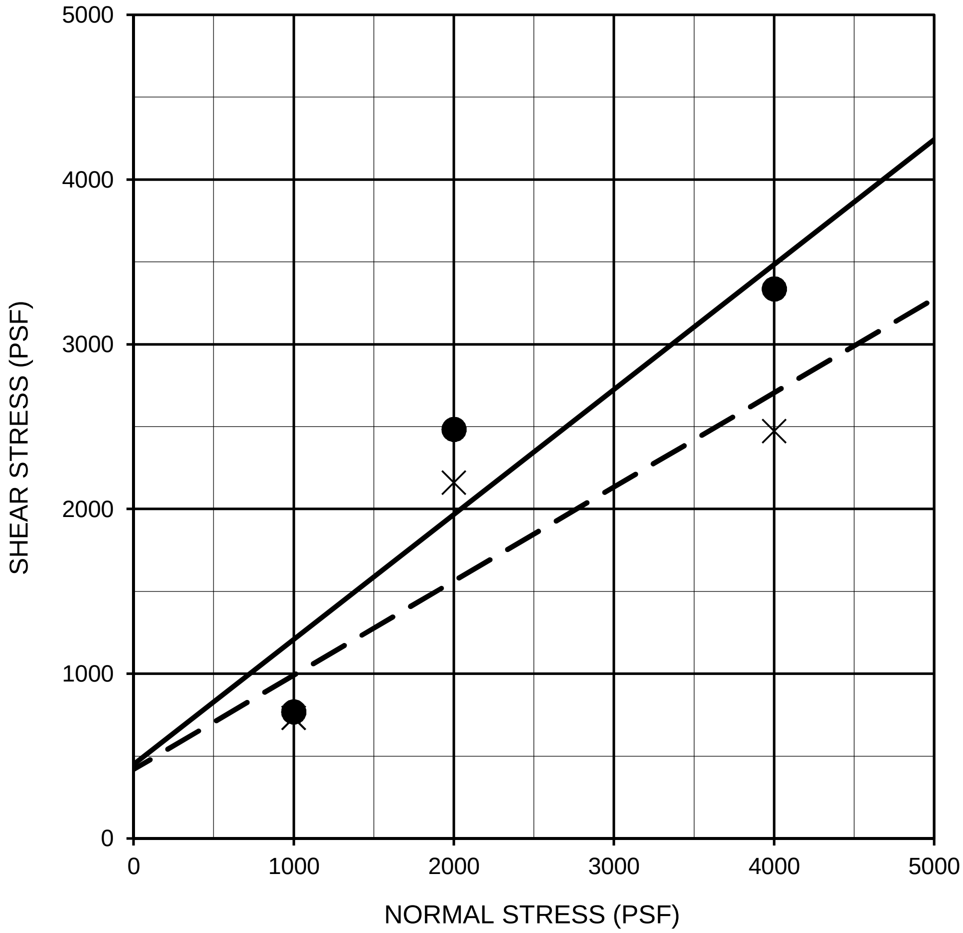


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-9	60.0-61.5	--	--	--	--	--	--	--	--	20	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	FINKBINER PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-4
107900001	6/15		

107900001_SIEVE B-9 @ 60.0-61.5.xls



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SAND	—●—	B-9	10.0-11.5	Peak	450	37	SM
Silty SAND	- - x - -	B-9	10.0-11.5	Ultimate	420	30	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore

PROJECT NO.	DATE	DIRECT SHEAR TEST RESULTS	FIGURE
107900001	6/15	FINKBINER PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-5

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-9	0.3-4.0	7.5	2,500	20	0.002	630

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore		CORROSIVITY TEST RESULTS	FIGURE
PROJECT NO.	DATE	FINKBINER PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	B-6
107900001	6/15		

ATTACHMENT 10

GEOTECHNICAL REPORT FOR LA PUENTE PARK

GEOTECHNICAL SERVICES
LA PUENTE PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA
TASK ORDER NO. T10503269-102669-OM

PREPARED FOR:

MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

PREPARED BY:

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

June 3, 2015
Project No. 107900001

Ninyo & Moore

Geotechnical and Environmental Sciences Consultants

June 3, 2015
Project No. 107900001

Ms. Bronwyn Kelly
MWH Americas
300 North Lake Avenue, Suite 400
Pasadena, California 91101

Subject: Geotechnical Services
La Puente Park
Upper San Gabriel River EWMP
Los Angeles County, California
Task Order No. T10503269-102669-OM

Dear Ms. Kelly:

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at La Puente Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California. This report presents geotechnical data obtained by Ninyo & Moore relative to the proposed project. We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

REGISTERED PROFESSIONAL ENGINEER
WILLIAM R. MORRISON
No. 2468
Exp. 12/31/16
GEOTECHNICAL
STATE OF CALIFORNIA

William Morrison, PE, GE
Senior Engineer

Gregory T. Farrand, PG, CEG
Principal Geologist

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CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

CAT/WRM/GTF/KHM/gg

Distribution: (1) Addressee (via e-mail)

TABLE OF CONTENTS

1. INTRODUCTION

In accordance with your authorization and task order dated January 21, 2015, we have performed geotechnical services at La Puente Park for the Upper San Gabriel River Enhanced Watershed Management Program (EWMP) project in Los Angeles County, California (Figure 1). This report presents a compilation of geotechnical data obtained from the project, along with a preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project. We understand that the information contained herein will be included in the environmental report.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and subsurface exploration with regard to the proposed project. Specifically, we performed the following tasks:

- Review of readily available background materials, including State of California Seismic Hazards Zones map, State of California Earthquake Fault Zone map (Alquist-Priolo Special Studies Zones map), other published geologic maps and literature, in-house information, stereoscopic aerial photographs, and plans provided by the client.
- Performance of a site reconnaissance to observe the existing conditions at the site and to mark the proposed boring location for utility clearance. Mark-out of potential existing underground utilities was conducted through Underground Service Alert (USA).
- Performing a subsurface exploration consisting of drilling, logging and sampling of one exploratory soil boring at the site. The boring was advanced to a depth of 101.5 feet using a truck-mounted drill rig equipped with hollow stem augers.
- Performing geotechnical laboratory testing on soil samples collected during our subsurface exploration. The testing included an evaluation of moisture content, in-situ moisture and dry density, grain-size analysis (sieve and 200 wash), Atterberg Limits, direct shear, and soil corrosivity.
- Compiling the data obtained from our background research, subsurface exploration, and laboratory testing.
- Preparing this report that presents geotechnical data obtained from our background review, site reconnaissance, and subsurface exploration at the project site, along with preliminary evaluation of potential geotechnical factors that could affect the conceptual design of the project.

3. PROJECT AND SITE DESCRIPTION

The purpose of the project is to assist MWH Americas (MWH) and the Los Angeles County Department of Public Works (LADPW) in developing an Enhanced Watershed Management Program (EWMP) for the Upper San Gabriel River Watershed. Our services are intended to help support feasibility analyses being conducted by MWH and LADPW for Better Management Practices (BMPs) at specific locations as part of the EWMP. We understand that the BMPs will help to reduce the impact of storm water and non-storm water discharges on the area (MWH, 2014).

Ten separate sites located within the San Gabriel Valley in Los Angeles County, California have been selected for feasibility analyses for the project. This report addresses the La Puente County Park site, which is located at 501 N. Glendora Avenue in the city of La Puente (Figures 1 and 2) and is maintained by the County of Los Angeles. Geotechnical evaluations for the other nine sites are addressed in reports that are being issued under separate covers (Ninyo & Moore, 2015a through 2015i).

The site is developed with improvements that include restroom and recreation center buildings, softball/baseball fields, basketball courts, asphalt concrete (AC) paved parking lots, paved walkways, playground equipment, light poles, landscaping consisting of trees, shrubs, and grass areas, and other associated appurtenances. The site for the proposed improvements is located in a grass area in the central portion of the park to the south of the softball fields. The site coordinates are approximately 34.0281°N latitude and -117.9535°W longitude. The elevation at the project site is approximately 340 feet above mean sea level (MSL).

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our field exploration at the La Puente Park site included a geologic reconnaissance that was conducted on February 19, 2015 and subsurface exploration that was conducted on March 17, 2015. The subsurface exploration consisted of drilling one 8-inch diameter hollow stem auger boring (B-10) to a depth of 101.5 feet below ground surface (bgs). The boring was logged by a geologist from our firm. Representative disturbed and undisturbed soil samples were obtained at selected depths from the boring for laboratory testing. The approximate location of the boring is presented on Figure 2. The boring log is presented in Appendix A.

Laboratory testing of selected soil samples obtained from our exploratory boring included in-situ dry density and moisture content, gradation, Atterberg Limits, direct shear, and soil corrosivity. The results of the in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests described above are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, and groundwater conditions at the La Puente Park site are provided in the following sections.

5.1. Regional and Geologic Setting

The subject site is located within the northeastern portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Norris and Webb, 1990). The geomorphic province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and continues farther to the tip of Baja California. The Los Angeles Basin has been divided into four structural blocks which are generally bounded by prominent fault systems. The site is located within the Northeastern Block, which is bordered on the west and south by the Whittier-Elsinore fault and is bordered on the north by the San Gabriel Mountains and the Raymond Hill Fault. The Northeastern Block is a deep basin characterized by thick sequences of alluvium and sedimentary units overlying basement rocks, which are at depths of up to approximately 12,000 feet below the surface in the central part of the San Gabriel Valley.

5.2. Site Geology

Our review of the referenced geologic maps and literature indicates that the subject site is underlain by Holocene to Pleistocene alluvial gravel and sand (Dibblee and Ehrenspeck, 1999). Geologic units encountered during our reconnaissance and subsurface exploration of the project site included relatively thin fill soils that mantle alluvium. Generalized descriptions of the units encountered are provided in the subsequent sections. Additional descriptions are provided on the boring logs in Appendix A. A geologic map of the region is presented on Figure 3.

5.2.1. Fill

Fill materials were encountered in our boring B-10 extending from the ground surface to a depth of approximately 3 feet below existing grade. As observed, the fill materials generally consisted of brown, dry, medium dense, sandy silt. Scattered roots and grass were encountered in the fill materials. AC fragments were also encountered in the fill materials.

5.2.2. Alluvium

Alluvium was encountered in our boring B-10 underlying the fill materials and was observed to extend to the total depth explored of approximately 101.5 feet below existing grade. As observed in our boring, the alluvial materials generally consisted of various shades of brown, moist to wet, medium dense to very dense, silty sands, clayey sands, and sandy silts. Interbeds of grayish-brown and reddish-brown, moist to wet, stiff to hard, silty clay, sandy clay, and clayey silt were also encountered in the alluvium. Scattered gravel and gravel layers were encountered at various depths in the alluvium.

5.3. Groundwater

Groundwater was not encountered during our subsurface exploration in our boring B-10. Fluctuations in the groundwater level and perched conditions typically occur due to variations in precipitation, ground surface topography, subsurface stratification, irrigation, and other factors.

6. FAULTING AND SEISMICITY

Based on our review of published geologic maps and review of stereoscopic aerial photographs, no active fault traces are mapped as underlying the La Puente Park site. Therefore, the potential for surface fault rupture at the site is considered to be low. The project site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, La Puente Park is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed improvements. Figure 4 shows the approximate site location relative to the major faults in the region. The nearest known active fault is the San Jose fault, located approximately 4 miles east of the site.

6.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated at 0.856g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based).

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.776g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.776g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.2. Surface Fault Rupture

The probability of damage due to surface ground rupture is relatively low due to the lack of known active faults crossing the project site. Surface ground cracking related to shaking from distant events is not considered a significant hazard, although it is a possibility.

6.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon in which loosely deposited, granular soils and some fine-grained soils located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration can result in a loss of grain-to-grain contact due to a rapid rise in pore water pressure causing the soil to behave as a fluid for a short period. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

According to the Seismic Hazard Zones Map for the Baldwin Park Quadrangle, (CGS, 1999), the La Puente Park site is not mapped as being in an area susceptible to liquefaction. During our subsurface exploration, groundwater was not encountered at La Puente Park to the total depth explored of 101.5 feet. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the La Puente Park site.

7. OTHER GEOTECHNICAL CONSIDERATIONS

7.1. Slope Stability

Our review of maps published by the California Geological Survey (CGS, 1999) indicates that the La Puente Park site is not situated in an area considered to be susceptible to seismic-induced landsliding. In addition, our observations indicate that the site is generally level to gently sloping. Consequently, landsliding or slope instability are not considered to be a constraint at the project site.

7.2. Corrosion

Laboratory testing was performed on representative samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with the California Test (CT) 643 and the sulfate and chloride tests were performed in accordance with CTs 417 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing performed on a sample obtained from the site indicated an electrical resistivity value of 640 ohm-cm, a soil pH value of 7.0, a chloride content of 490 ppm, and a sulfate content of 0.010 percent. According to Caltrans criteria (2012) and American Concrete Institute (ACI) 318 guidelines, a corrosive soil is defined as one with more than 500 ppm chlorides, more than 0.2 percent sulfates, a pH less than 5.5, or an electrical resistivity of less than 1,000 ohm-cm. Based on the Caltrans criteria and ACI guidelines, the upper soils encountered at the site are considered to be corrosive.

8. DISCUSSION AND FINDINGS

As discussed above, our geotechnical services were performed to assist MWH and LADPW as they evaluate the preliminary feasibility of an onsite storm water infiltration system at the La Puente Park site. Based on our communications with MWH, we understand that the preliminary criteria at the site is related to the presence of groundwater or dense materials providing refusal to drilling equipment within 100 feet of the ground surface. As such, our scope of services included the drilling of an exploratory boring that extended to a depth of 100 feet, to groundwater, or to refusal (whichever is shallower). We understand that BMPs being considered for the site are conceptual at this time. Based on the information obtained from our geotechnical evaluation, the following findings and conclusions have been made:

- The project site is underlain by relatively shallow fill (approximately 3 feet deep) overlying alluvial soils. The encountered portions of the fill were generally comprised of sandy silt that contained scattered organic material, along with scattered AC fragments. The underlying alluvial soils were observed to consist of silty sands, clayey, sandy silts, sandy clays, silty clays, and clayey silts.

- Groundwater was not encountered in our exploratory boring to the total depth explored of 101.5 feet.

- Based on our review of aerial photographs and published geologic maps, there are no known active faults or landslides underlying the project site.

- Our faulting and seismicity evaluation indicated that the site is subject to severe ground shaking due to a design seismic event.

- Review of geological literature indicates that the site is not situated in an area that has been mapped as being susceptible to liquefaction. Additionally, groundwater was not encountered in our exploration at the site. Based on the observed absence of a shallow groundwater table, we consider the potential for seismic-induced liquefaction to be low at the La Puente Park site.

- In-place infiltration testing was not performed as part of our geotechnical services. However, based on published correlations between a soil's grain size and its permeability (Shepherd, 1989), an estimated permeability on the order of 10^{-4} cm/sec within the encountered sandy and silty soils can be utilized for preliminary evaluation purposes. Clayey soils encountered at the site can be expected can be expected to have significantly lower permeabilities. Actual design of storm water infiltration devices should be in accordance with the County of Los Angeles guidelines and should be based on field infiltration testing at the site.

- Recommendations provided in this report are preliminary in nature and are not intended to provide sufficient information to fully address potential geotechnical related issues prior to site development. An additional geotechnical evaluation should be performed.

9. PRELIMINARY RECOMMENDATIONS

As noted above we understand that the Better Management Practices (BMPs) associated with the proposed Upper San Gabriel River EWMP Project are conceptual at this time. As such, details regarding the types and construction of the BMPs (if any) are not known at this time for the La Puente Park site. We recommend that the geotechnical information presented herein be utilized during the evaluation of the feasibility of the devices associated with the EWMP project at the site. The design of BMPs should be performed in accordance with County of Los Angeles guidelines.

The following sections of this report provide preliminary recommendations for earthwork and design of structure foundations for preliminary planning purposes. Once the type and general construction of the devices is better defined, Ninyo & Moore should review the devices' preliminary design. At that time, supplemental recommendations may be provided.

9.1. Site Preparation

Prior to earthwork, the project site should be cleared of existing structures, pavement, abandoned utilities (if present), and stripped of rubble, debris, vegetation, loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite.

9.2. Materials for Fill

On-site soils relatively free of organic material are suitable for reuse as fill. In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾-inch. Oversize materials should be separated from material to be used for fill and removed from the site. Although not anticipated, if encountered, high plasticity clays and silts should be disposed of off-site.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material should generally be granular soils with a very low to low expansion potential (i.e., an expansion index of 50 or less as evaluated by ASTM D 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

9.3. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified, moisture conditioned as needed to achieve moisture contents generally above the optimum moisture content, and then compacted to a relative compaction of 90 percent as evaluated in accordance with ASTM D 1557. The evaluation of

compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when the project area is ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

9.4. Utility Trench Backfill

Based on our subsurface exploration, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the “Greenbook” (Standard Specifications for Public Works Construction) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557.

Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

9.5. Preliminary Foundation Recommendations

For preliminary design purposes, shallow, spread or continuous footings founded on compacted fill or alluvial soils can be considered suitable for support of structures. Shallow, spread or continuous footings bearing on compacted fill or alluvial soils may be designed assuming an allowable bearing capacity of 2,000 psf. This allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. Spread footings should be founded 18 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches and isolated footings should be 18 inches in width or more. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

For resistance of foundations to lateral loads, we recommend an allowable passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot be used. This value assumes that the ground is horizontal for a distance of 10 feet or more, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. If passive and frictional resistances are to be used in combination, we recommend that the passive value not exceed one-half of the total resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

9.6. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Laboratory testing indicated the sulfate content of the sample tested was less than 0.2 percent, which is considered negligible for sulfate attack based on ACI criteria (ACI, 2011). Although significant sulfate content was not indicated, we recommend that Type II/V cement be used for concrete structures in contact with soil, due to the potential for variability of site soil. The water-cement ratio of the concrete should be 0.45 or less and the slump should be 4 inches or less.

9.7. Plan Review and Construction Observation

The preliminary conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Because we understand that the design of the BMPs devices for the EWMP project is conceptual at this point, we recommend that Ninyo & Moore review the devices' preliminary design, once the type and general construction of the devices is better defined. At that time, supplemental recommendations may be provided.

Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations to evaluate the assumptions inherent in the design.

The preliminary recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the preliminary conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for feasibility and preliminary design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our preliminary conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to

government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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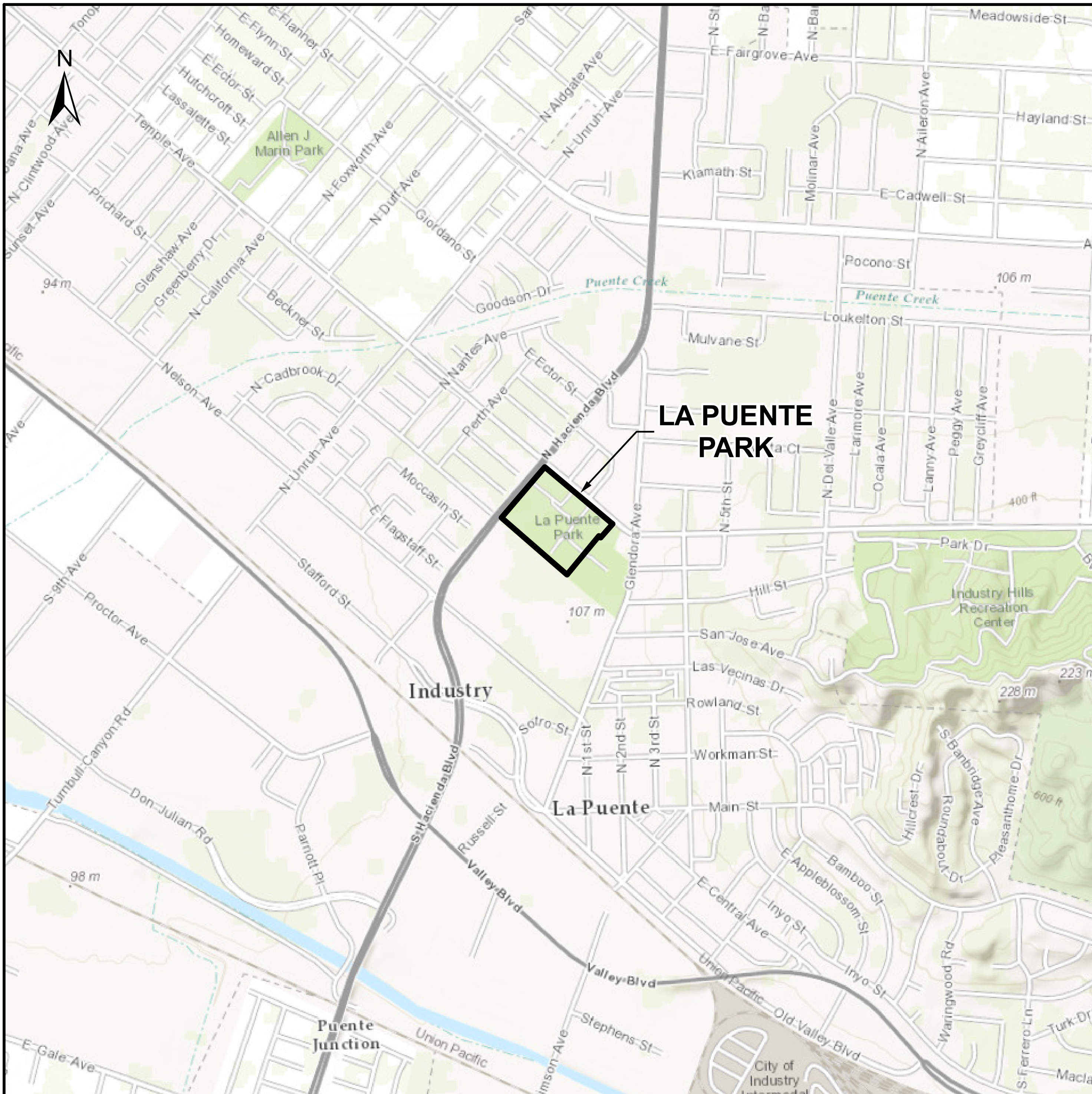
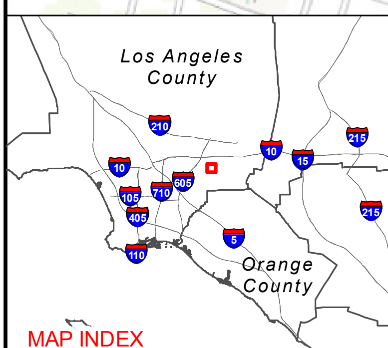


SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS.



Feet

0 750 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

1_107900001_SL_LP_93.mxd AOB

Ninyo & Moore	SITE LOCATION	FIGURE
PROJECT NO. 107900001	DATE 6/15	LA PUENTE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	1

SOURCE: Aerial Imagery - ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP.

LEGEND

SITE BOUNDARY

B-10 TD=101.5' BORING
TD=TOTAL DEPTH IN FEET

N

SCALE IN FEET

0 150 300 600

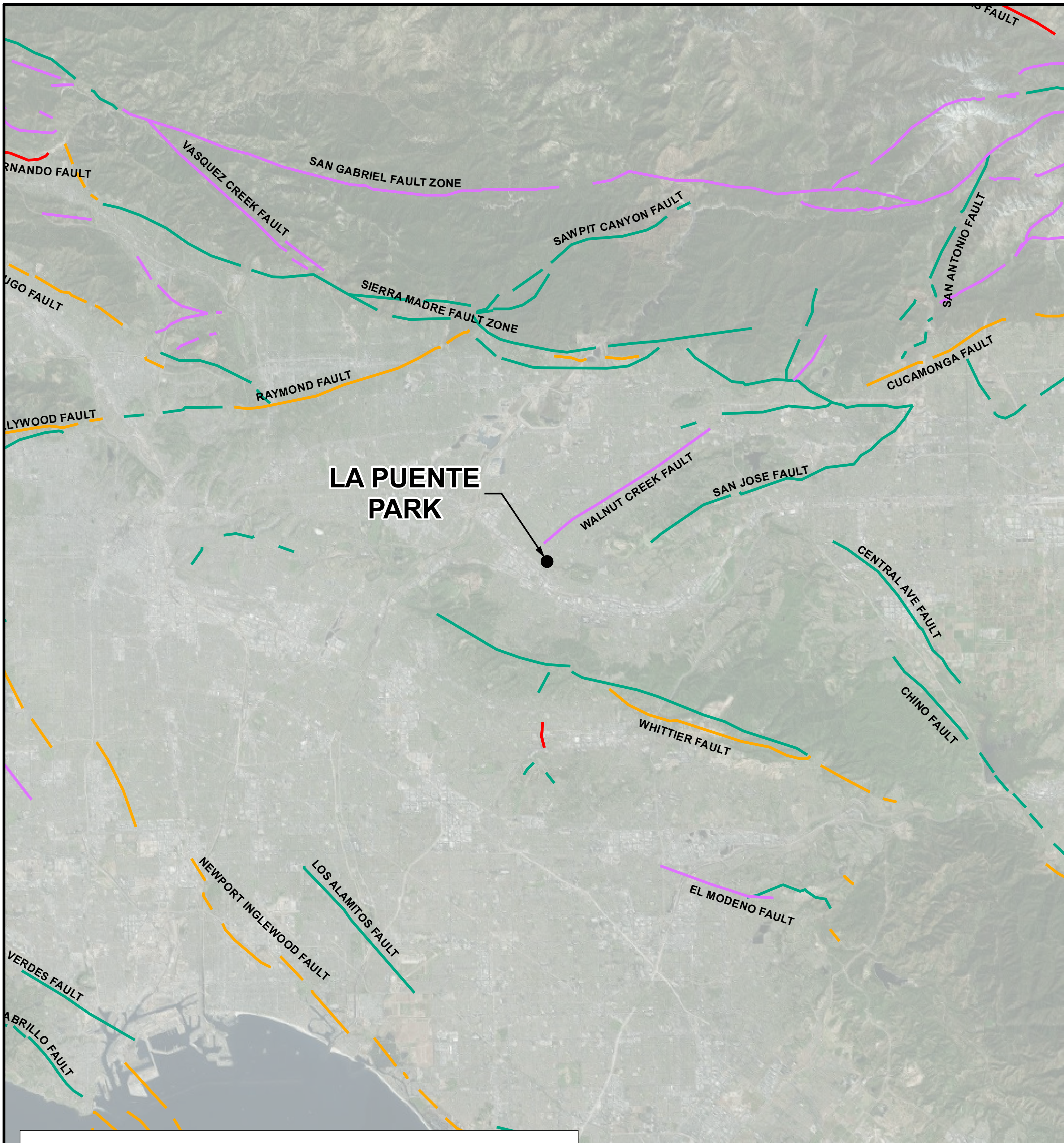
NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

2_107900001_BL_LP_93.mxd AOB

Ninyo & Moore		BORING LOCATION	FIGURE
PROJECT NO.	DATE	LA PUENTE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	2
107900001	6/15		

3_107900001_G_LP_93.mxd AOB

Ninyo & Moore		GEOLOGY	FIGURE
PROJECT NO.	DATE	LA PUENTE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	3
107900001	6/15		



SOURCE: USGS, FAO, NPS, EPA, ESRI, DELORME, TANA, OTHER SUPPLIERS

LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

N

Miles

0 3 6 12

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		FAULT LOCATIONS	FIGURE
PROJECT NO.	DATE	LA PUENTE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	4
107900001	6/15		

4_107900001_F_LP_93.mxd AOB

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1⅜ inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change.
15								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
20								The total depth line is a solid line that is drawn at the bottom of the boring.

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BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

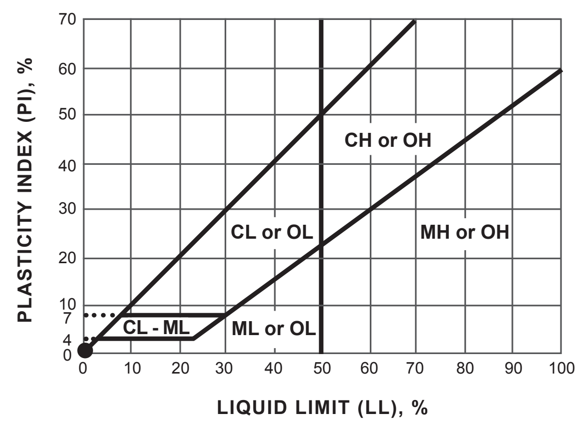
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS: GROUP SYMBOL	SECONDARY DIVISIONS: GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVEL more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SILT and CLAY liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD: SPT (blows/foot)	SPOOLING CABLE OR CATHEAD: MODIFIED SPLIT BARREL (blows/foot)	AUTOMATIC TRIP HAMMER: SPT (blows/foot)	AUTOMATIC TRIP HAMMER: MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ML	FILL: Brown, dry, medium dense, fine to medium sandy SILT; scattered roots and grass; trace fragments of asphalt.
							SM	ALLUVIUM: Light reddish brown, moist, dense, silty fine SAND; trace clay; trace medium sand; scattered pinhole voids.
			26	16.2				
10			45	10.7	121.4			Trace coarse sand and gravel up to 1-inch in diameter.
			35	5.6				Fine to coarse sand.
							SC	Brown, moist, dense, clayey fine to coarse SAND with gravel up to 1-inch in diameter.
20			24	10.8				
							ML	Reddish brown, moist, hard, clayey SILT; trace fine sand; scattered fine laminations.
							CL	Brown, moist, stiff, silty CLAY; some fine to medium sand; scattered black manganese deposits; slightly micaceous.
			9	21.1				
30			30	17.0	108.8			Mottled reddish brown and light brown; trace fine gravel.
							SC	Brown, moist, dense, clayey fine to SAND.
			21	16.6				
							CL	Brown, moist, hard, silty CLAY with fine to coarse sand and fine gravel.
40								

DATE DRILLED 3/17/15 BORING NO. B-10

GROUND ELEVATION 320' ± (MSL) SHEET 1 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

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BORING LOG

LA PUENTE PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-1

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40			13	16.0			ML	ALLUVIUM: (Continued) Reddish brown, moist, medium dense, fine sandy SILT; scattered black manganese deposits; resembles soil profile.
			16	24.3				
							SM	Brown, moist, dense, silty fine SAND; some yellowish brown mottling; micaceous.
50			50	15.1	111.6			
							CL	Mottled brown and grayish brown, moist, stiff, silty CLAY.
60			11	25.2				Trace fine sand.
							SM	Light grayish brown, moist, very dense, silty fine SAND; trace gravel up to 1/2-inch in diameter.
70			57	6.2				
							CL	Mottled brown and light grayish brown, moist, hard, fine sandy CLAY.
80								

DATE DRILLED 3/17/15 BORING NO. B-10

GROUND ELEVATION 320' ± (MSL) SHEET 2 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

Ninyo & Moore

BORING LOG

LA PUENTE PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-2

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
80		▼	28	16.5			CL	ALLUVIUM: (Continued) Mottled brown and light grayish brown, moist, hard, fine sandy CLAY.
							SC	Brown and light grayish brown, wet, dense, clayey fine to medium SAND; scattered clay up to 1/2-inch in diameter.
							ML	Mottled brown and light grayish brown, wet, hard, clayey SILT; scattered pockets of fine sand.
90		▼	22	18.0				
100		▼	33	17.7			CL	Brown, wet, hard, silty CLAY; scattered grayish and reddish brown mottling.
								Total Depth = 101.5 feet. Groundwater not encountered during drilling. Backfilled shortly after drilling on 3/17/15. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
110								
120								

DATE DRILLED 3/17/15 BORING NO. B-10

GROUND ELEVATION 320' ± (MSL) SHEET 3 OF 3

METHOD OF DRILLING 8" Diameter Hollow-Stem Auger (CME 75) (Geoboden)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY GTF

Ninyo & Moore

BORING LOG

LA PUENTE PARK - UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	A-3

APPENDIX B

LABORATORY TESTING

Classification
Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

Moisture Content
The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests
The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

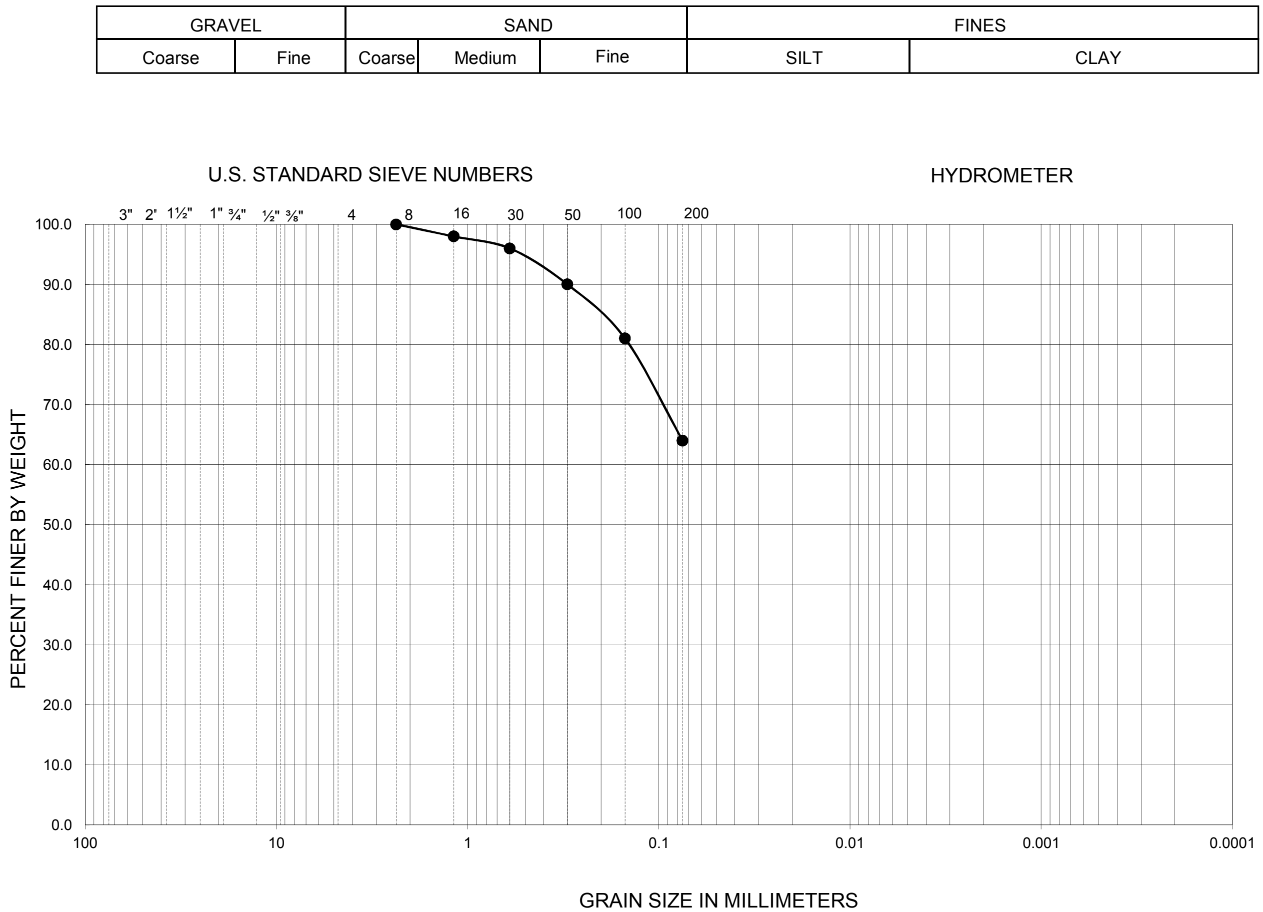
Gradation Analysis
Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-6. These test results were utilized in evaluating the soil classifications in accordance with USCS.

Atterberg Limits
Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318. These test results were utilized to evaluate the soil classification in accordance with USCS. The test results and classifications are shown on Figure B-7.

Direct Shear Tests
A direct shear test was performed on a relatively undisturbed sample in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-8.

Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-9.



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-10	0.0-3.0	--	--	--	--	--	--	--	--	64	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

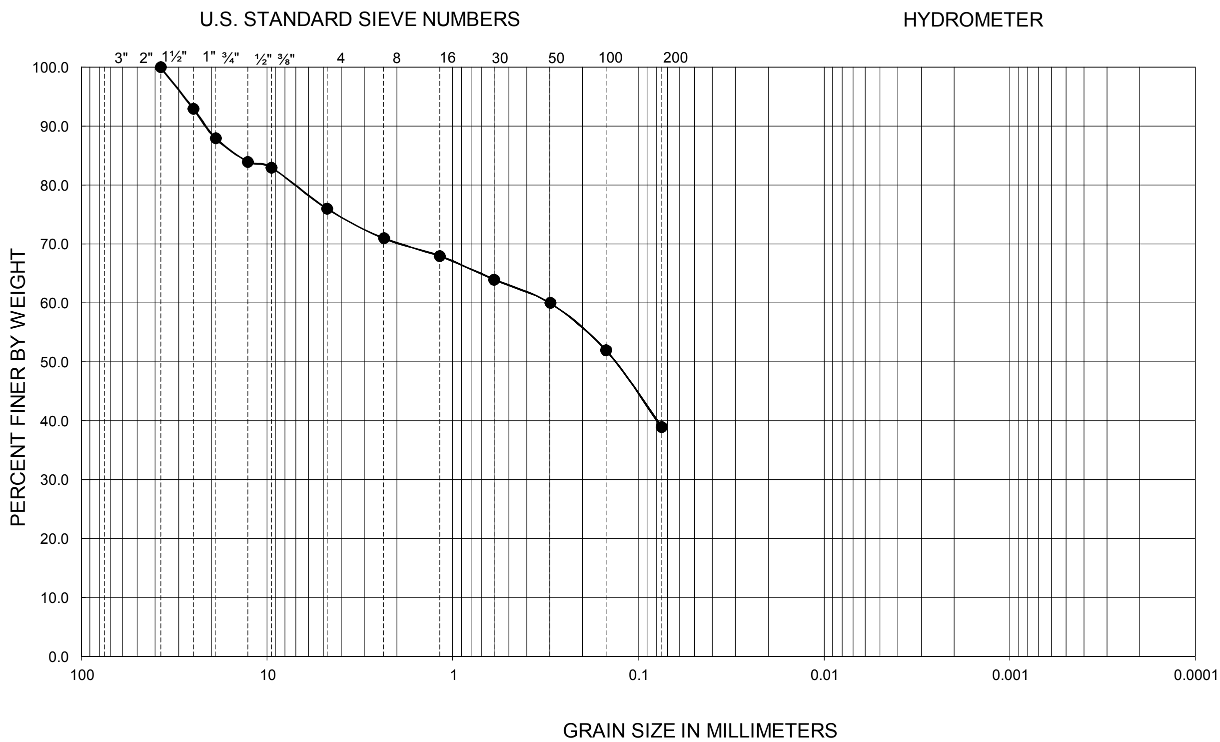
GRADATION TEST RESULTS

FIGURE **B-1**

PROJECT NO.	DATE
107900001	6/15

LA PUENTE PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

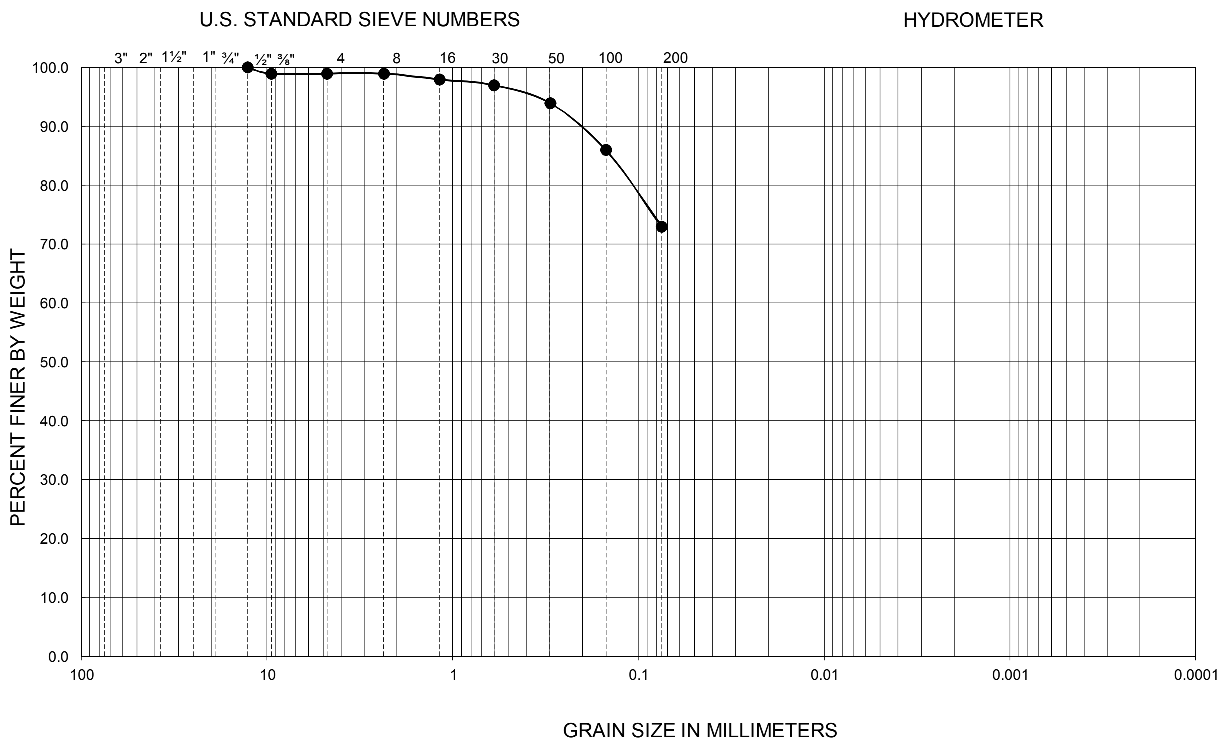


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-10	20.0-21.5	--	--	--	--	--	--	--	--	39	SC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA PUENTE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-2
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

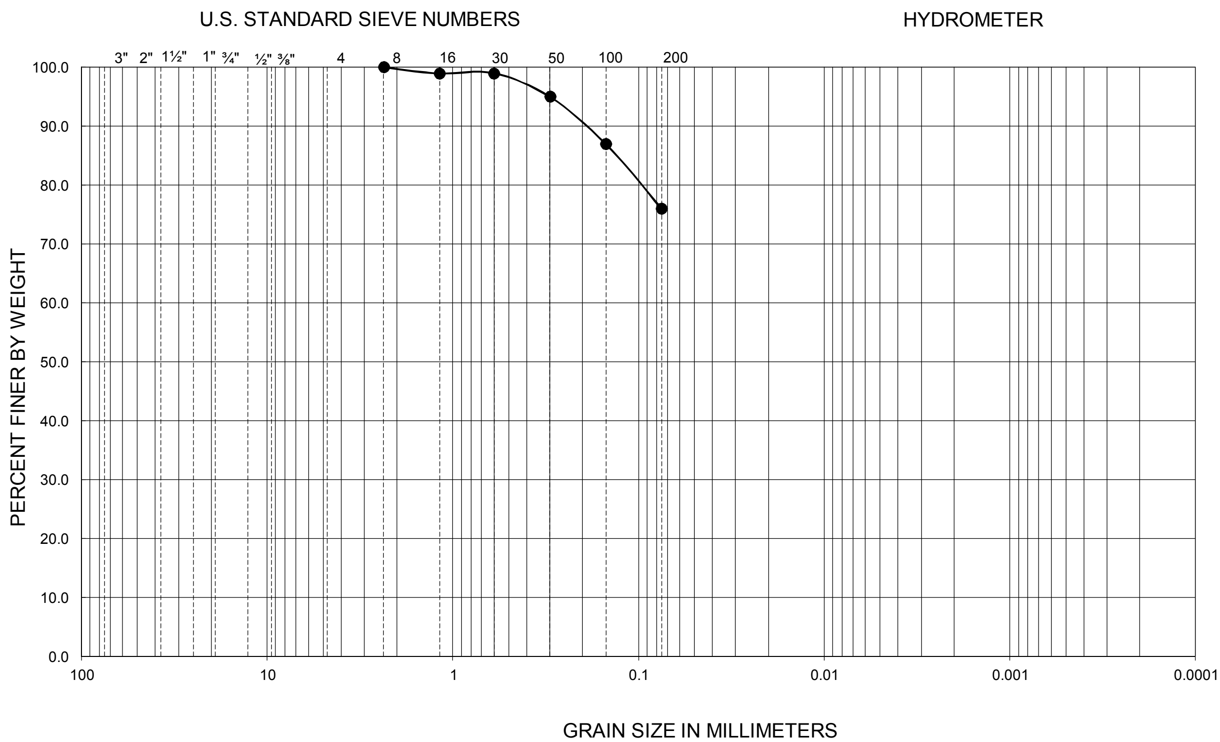


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-10	25.0-26.5	--	--	--	--	--	--	--	--	73	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA PUENTE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-3
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-10	40.0-41.5	--	--	--	--	--	--	--	--	76	ML

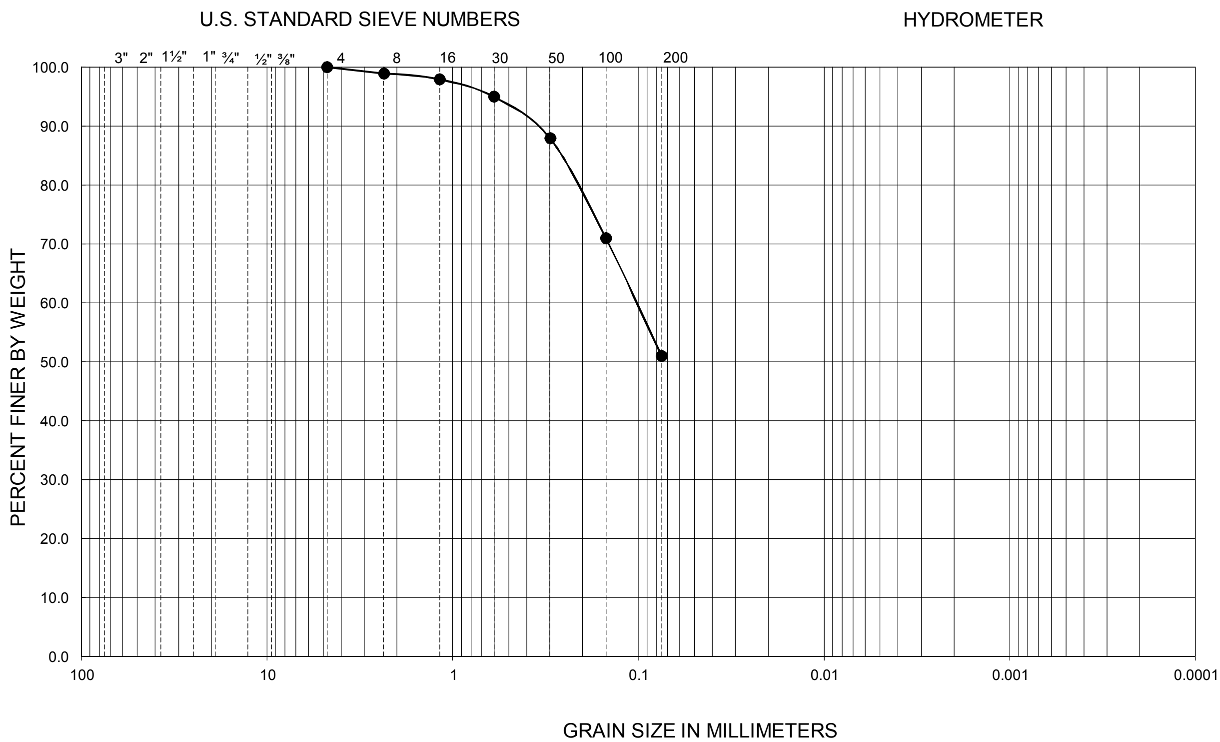
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore

GRADATION TEST RESULTS

PROJECT NO.	DATE	LA PUENTE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	FIGURE B-4
107900001	6/15		

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



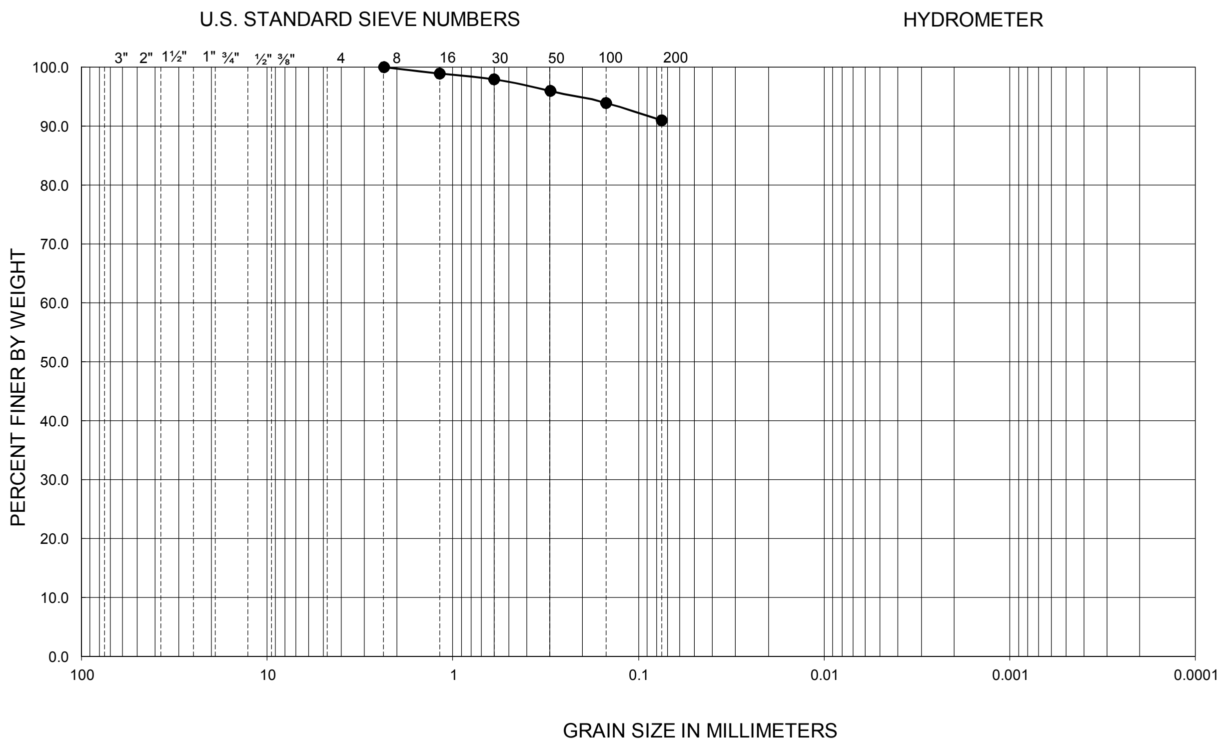
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-10	45.0-46.5	--	--	--	--	--	--	--	--	51	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA PUENTE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-5
107900001	6/15		

107900001_SIEVE B-10 @ 45.0-46.5.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-10	60.0-61.5	--	--	--	--	--	--	--	--	91	CL

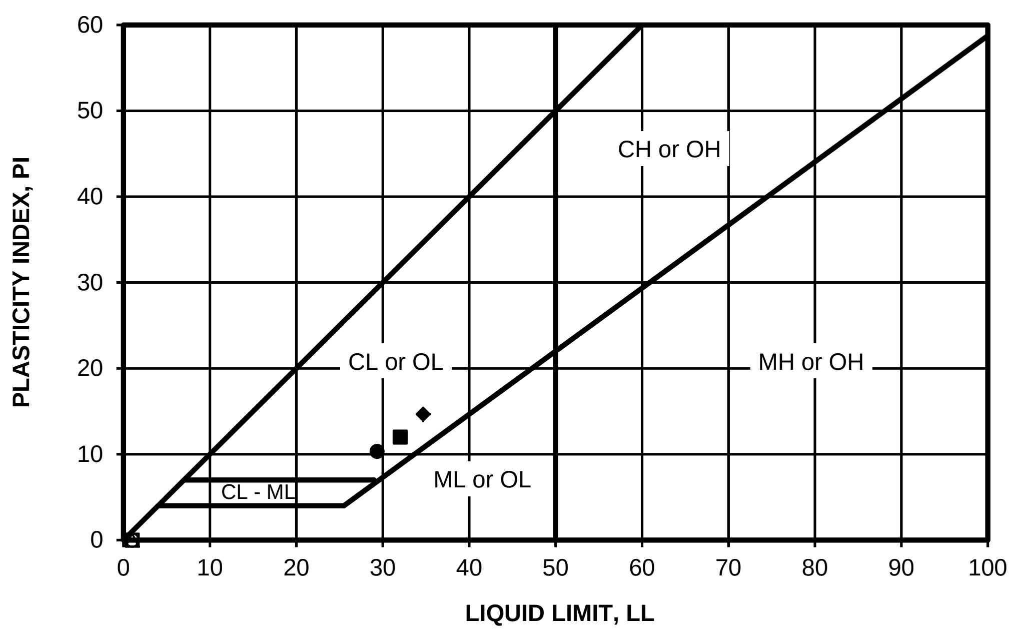
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA PUENTE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGELES COUNTY, CALIFORNIA	B-6
107900001	6/15		

107900001_SIEVE B-10 @ 60.0-61.5.xls

SYMBOL	LOCATION	DEPTH (FT)	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve)	USCS (Entire Sample)
●	B-10	20.0-21.5	29	19	10	CL	CL
■	B-10	25.0-26.5	32	20	12	CL	CL
◆	B-10	60.0-61.5	35	20	15	CL	CL

NP - INDICATES NON-PLASTIC



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

Ninyo & Moore

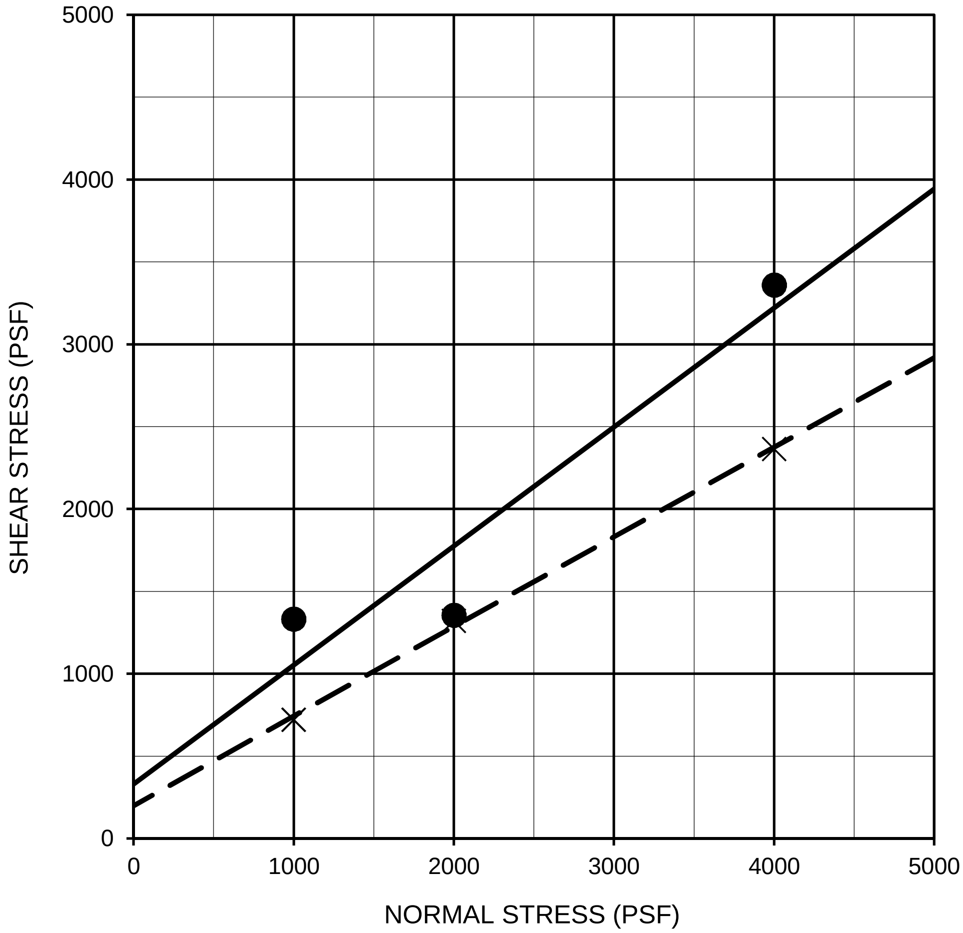
ATTERBERG LIMITS TEST RESULTS

FIGURE

B-7

PROJECT NO.	DATE
107900001	6/15

LA PUENTE PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGLES COUNTY, CALIFORNIA



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SAND	—●—	B-10	10.0-11.5	Peak	330	36	SM
Silty SAND	- - x - -	B-10	10.0-11.5	Ultimate	200	29	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

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DIRECT SHEAR TEST RESULTS

LA PUENTE PARK
UPPER SAN GABRIEL RIVER EWMP
LOS ANGELES COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107900001	6/15	B-8

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-10	0.0-3.0	7.0	640	100	0.010	490

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

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CORROSIVITY TEST RESULTS

PROJECT NO.	DATE	LA PUENTE PARK UPPER SAN GABRIEL RIVER EWMP LOS ANGLES COUNTY, CALIFORNIA	FIGURE
107900001	6/15		B-9

Appendix B-4

Initial Environmental Studies for Example Regional EWMP Projects

Upper San Gabriel River Enhanced Watershed Management Program
Regional Project Environmental Study Checklist

Site ID: CS12	**Date: 1/12/2015**
Site Name: Adventure Park	**Personnel: Andrew Payne**

Site Address/Location: 10130 South Gunn Avenue, Whittier, CA 90605

General Notes:

- Park includes a gymnasium, baseball/softball fields, basketball courts, children's play area/playground, children's day care, community/recreation center fitness areas, walking path, open grass and picnic areas.

- Overall the open areas near the baseball/softball field areas area in northeastern portion of the park are most feasible area to sample soil and/or design BMP. An alternate soil sampling is located south of the gymnasium. A driveway near the southern end of the parking lot and gymnasium can be utilized for access. The park is located within a residential neighborhood of Whittier.

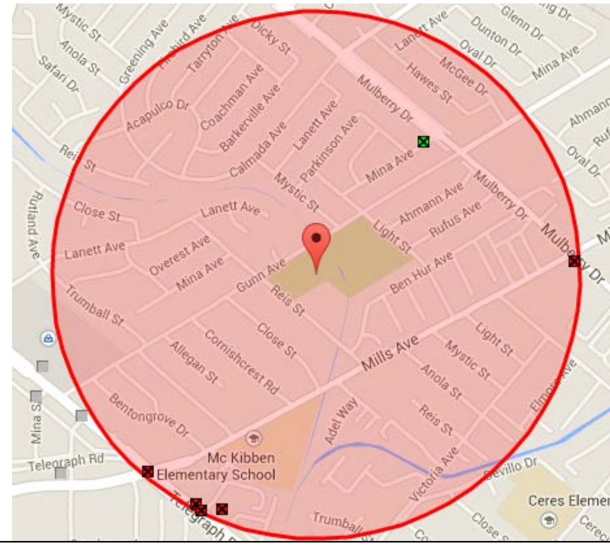
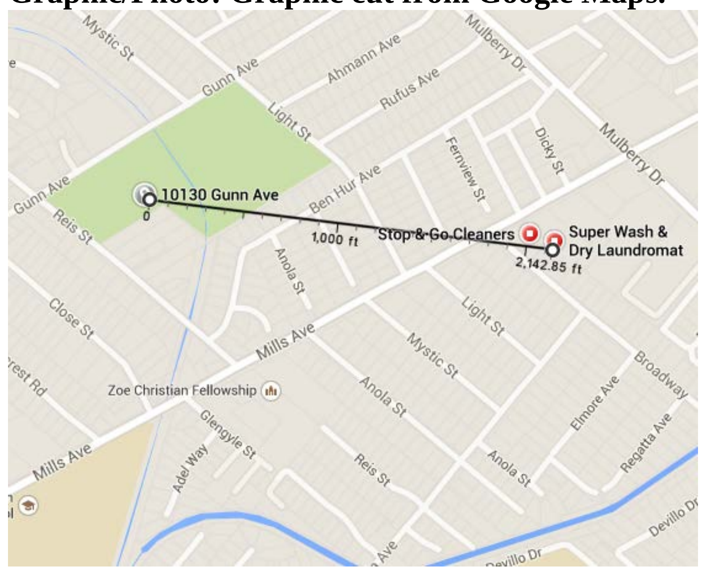
Environmental Factor – AESTHETICS		
Finding: Open areas near baseball/softball field is recommended area.	**Potential Impact: Low to moderate impact to open grass area.**	**Graphic/Photo: View looking south at baseball/softball fields.** 
Finding: Road located behind gymnasium to access alternate soil sampling location.	**Potential Impact: Low to impact to grass.**	**Graphic/Photo: View looking SE at area near alternate soil sampling location.** 

Environmental Factor – AGRICULTURAL/FOREST RESOURCES		
Finding: No observed Ag/Forest resources at park during visit.	**Potential Impact: Unknown/None**	**Graphic/Photo: None.**
Environmental Factor – AIR QUALITY/GHG EMISSIONS		

Finding: Park is located in residential neighborhood.	**Potential Impact: Low to moderate – residences in close proximity to the site and park boundary.**	**Graphic/Photo: View looking SW; residence to south of park and near alternate soil sample location (background right).** 
Environmental Factor – BIOLOGICAL RESOURCES		

Finding: Trees along park boundary and near sampling location and the alternate soil sampling location.	**Potential Impact: Low.** **Drill rig and/or construction can be positioned to minimize impact.**	**Graphic/Photo: View looking SE at trees near gymnasium and access road.** 
Finding: No nesting birds were observed upon visit.	**Potential Impact: Low.** **Drill rig and/or construction can be positioned to minimize impact.**	**Graphic/Photo: None.**

Environmental Factor – CULTURAL RESOURCES		
Finding: Nothing observed during site visit.	**Potential Impact: Unknown.**	**Graphic/Photo: None.**
Environmental Factor – GEOLOGY/SOILS/HAZARDOUS MATERIALS		

Finding: No apparent issues during initial site visit. Seven former cleanup sites are located within ½ mile of the park (Geotracker).	**Potential Impact: Low to moderate.**	**Graphic/Photo: Graphic cut from SWRCB Geotracker website.** 
Finding: No apparent issues during initial site visit. Two dry cleaners located within ½ mile of the park to the east (Google). Two others dry cleaners, not shown are located within one mile to the NE and SSW.	**Potential Impact: Low.**	**Graphic/Photo: Graphic cut from Google Maps.** 

Finding: The Whittier section of the Elsinore Fault and the Whittier Fault (Elsinore/Whittier Fault) a part of the San Andreas Fault System and are mapped in Whittier approximately three miles north of the park. The Elsinore Whittier Fault is reported to have been active in the last 15,000 years. However, the Whittier Narrows Earthquake in 1987 was epicentered on a previously unidentified portion of a thrust fault beneath the uplifted Puente Hills and Elysian Park-Montebello Hills (Southern California Earthquake Data Center Caltech website).	**Potential Impact: Low to moderate during earthquake.**	**Graphic/Photo: Interactive Fault Map (USGS).**  **- Dotted black and green lines are inferred faults.**
Environmental Factor – HYDROLOGY/WATER QUALITY		

Finding: See previous section notes regarding location of cleanup sites and dry cleaners in proximity of park.	**Potential Impact: Low to moderate impact to GW via cleanup sites or dry cleaner.**	**Graphic/Photo: See above in previous section.**
Finding: A rectangular concrete lined wash is located in the park. The wash drains north to south and separates the gymnasium building area from the open softball/baseball field area.	**Potential Impact: Low.**	**Graphic/Photo: View looking NE at wash (foreground) and Softball/baseball fields (background).** 

Environmental Factor – LAND USE/PLANNING		
Finding: The location is an active baseball/softball field and open grass area with trees, walking path and fitness areas. Soil testing and/or construction should not impact use but schedule of park services should be determined.	**Potential Impact: Low to moderate.**	**Graphic/Photo: See above photo.**

Environmental Factor – NOISE

Finding: Drill rig noise may impact residents located in close proximity to park in all directions.	**Potential Impact: Moderate.**	**Graphic/Photo: None.**
Environmental Factor – PUBLIC SERVICES/RECREATION		
Finding: park uses include general recreation, basketball, and soccer.	**Potential Impact: Low impact sports/recreations that may be played in open area.**	**Graphic/Photo: None**

Environmental Factor – TRANSPORTATION/TRAFFIC		
Finding: Park is located within a residential neighborhood near a light industrial and commercial area of Whittier. Traffic is low in neighborhood but can be high in Whittier.	**Potential Impact: Low to moderate.**	**Graphic/Photo: None.**
Environmental Factor – UTILITIES/SERVICE SYSTEMS		

Finding: Dalton Wash and surrounding storm drains.	**Potential Impact: Low potential.**	**Graphic/Photo: View looking south at wash and Gunn Avenue bridge crossing.** 
Finding: Below and above ground electrical, water, sewer or fiber optic lines.	**Potential Impact: Moderate. Close proximity to residents, the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks.**	**Graphic/Photo: View SE at parking lighting, baseball/softball field and power lines in neighborhood adjacent to park.** 

Upper San Gabriel River Enhanced Watershed Management Program
Regional Project Environmental Study Checklist

Site ID: 45	**Date: 1/12/2015**
Site Name: Allen J Martin Park	**Personnel: Andrew Payne**

Site Address/Location: 14830 Giordano Street, La Puente, CA 91744

General Notes:

- Park includes a baseball field, basketball court, fitness areas, splash pad water park area, playground, picnic areas, and recreation offices with day care services.

- Overall the baseball field area is most feasible location to sample soil and/or design BMP. Park is rectangular in shape and surface flow should drain in a south and southwesterly direction. Surrounding storm drains observed during site visit within surrounding neighborhood. Residential in all directions and an elementary school (Temple Academy) is located to the southwest and shares that boundary with the park.

Environmental Factor – AESTHETICS		
Finding: Open area inside fence baseball field is most feasible location. Access to the site through outfield gate in fence.	**Potential Impact: Moderate impact to grass field and ballpark schedule.**	**Graphic/Photo: View looking west at the sample location.** 
Environmental Factor – AGRICULTURAL/FOREST RESOURCES		

Finding: None observed during site visit.	**Potential Impact: Unknown/none.**	**Graphic/Photo: None.**
Environmental Factor – AIR QUALITY/GHG EMISSIONS		
Finding: Houses located north, west and east of park.	**Potential Impact: Low to moderate impact - residents are in close proximity to the site and park.**	**Graphic/Photo: View looking SW down N. California Ave. – houses on left, east of park.** 

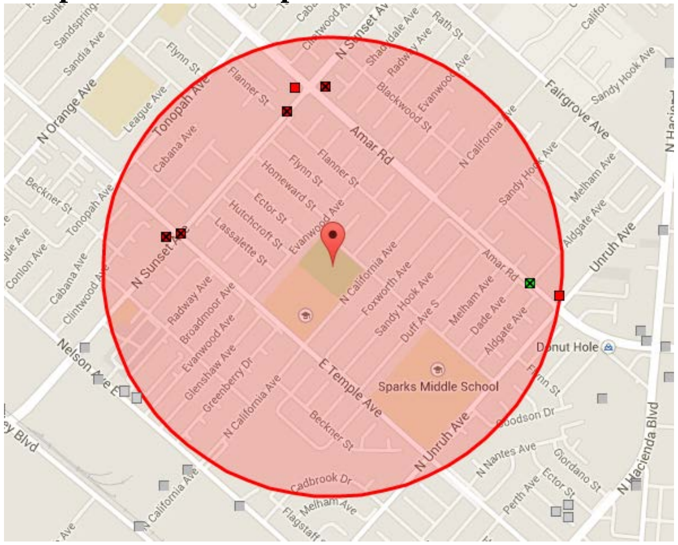
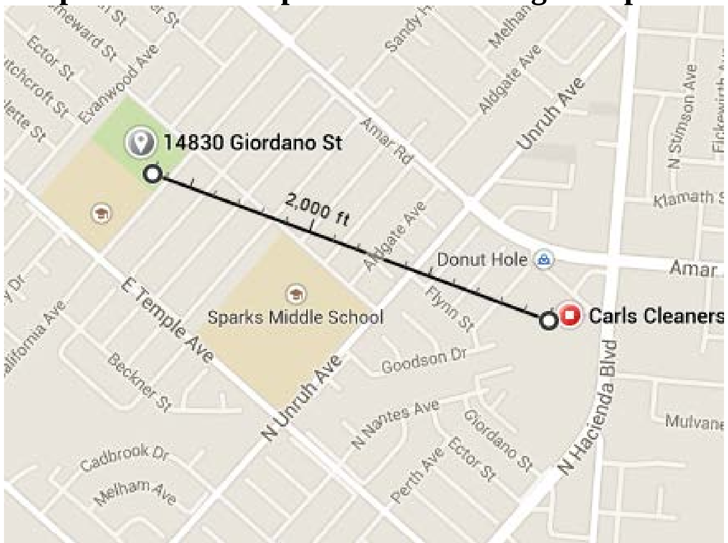
Finding: Residents located north, west and east of park.	**Potential Impact: Low to moderate impact - residents at apartments are in close proximity to the site and park boundary.**	**Graphic/Photo: View looking north across at houses along Wabash Ave.** 
Finding: Temple Academy Elementary School.	**Potential Impact: Low to moderate impact – Temple Academy is to SW and is in close proximity to site and park boundary.**	**Graphic/Photo: View of SW along California Ave towards Temple Academy.** 

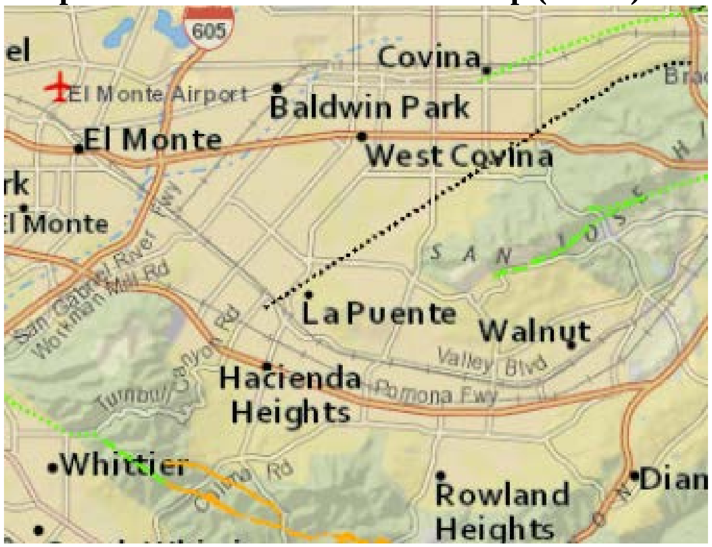
Environmental Factor – BIOLOGICAL RESOURCES

Finding: No trees are located on baseball fields. Some trees are located around baseball field and along California Ave to the east and are not in close proximity to the site. Drill rig/construction will be in open area.	**Potential Impact: No to low.**	**Graphic/Photo: View SW along California Ave at trees east of site.** 
Finding: No trees are located on baseball fields. Some trees are located around baseball field and along California Ave to the east and are not in close proximity to the site. Drill rig/construction will be in open area.	**Potential Impact: No to low.**	**Graphic/Photo: View NW along Giordano St at trees north of the site.** 

Finding: No trees are located on softball fields. Trees are located to south and east of softball fields and are not in close proximity to the site. Drill rig will be in open area.	**Potential Impact: No to low.**	**Graphic/Photo: View looking west at trees west of the site.** 
Environmental Factor – CULTURAL RESOURCES		
Finding: Nothing observed during site visit.	**Potential Impact: Unknown.**	**Graphic/Photo: None.**

Environmental Factor – GEOLOGY/SOILS/HAZARDOUS MATERIALS

Finding: No apparent issues during initial site visit. Seven cleanup sites, five of which are now closed, one is eligible for closure and one undergoing site cleanup are located within ½ mile of the park. the two open cleanup cases are a Former Target Service Station (down gradient from park) and CKS Investments Inc. (up gradient from park).	**Potential Impact: Moderate.**	**Graphic/Photo: Graphic cut from SWRCB Geotracker website.** 
Finding: No apparent issues during initial site visit. Closest dry cleaner is located approximately 3,400 feet to the ESE of the park.	**Potential Impact: Low.** **Groundwater flow is reported to be N to NW in the area (Geotracker).**	**Graphic/Photo: Graphic cut from Google Maps.** 

Finding: The Walnut Creek Fault is mapped as inferred into La Puente, but no extensive information is reported. The Sierra Madre Fault zone is north of La Puente – last proximal earthquake near Sierra Madre was not actually Sierra Madre Fault, but occurred in 1991 (Southern California Earthquake Data Center Caltech website). Liquefaction found as factor during preliminary information gathering/tech memo.	**Potential Impact: Low to moderate during earthquake.**	**Graphic/Photo: Interactive Fault Map (USGS).**  - **Dotted black line is Walnut Creek Fault and Sierra Madre Fault zone is north of La Puente.**

Environmental Factor – HYDROLOGY/WATER QUALITY

Finding: Observed three groundwater monitoring wells and one remediation or groundwater extraction well located north of the park's parking lot along Giordano Street.	**Potential Impact: Moderate to high impact to GW – unknown contaminants.**	**Graphic/Photo: View looing NW along Giordano St at wells in street north of park.** 
Environmental Factor – LAND USE/PLANNING		
Finding: Baseball field located in the area. Will need to contact park to understand schedule and use.	**Potential Impact: Schedule impacts to baseball or softball games.**	**Graphic/Photo: View of recreation office and reference to youth sports available at park.** 

Finding: Other park uses include general recreation, basketball, fitness, playground, and splash pad youth water park area.	**Potential Impact: Low impact to schedule or traffic, sample location is east of this area.**	**Graphic/Photo: View of entrance to park, fitness areas playground, recreation office and basketball courts (left).** 

Environmental Factor – NOISE

Finding: Drill rig noise may impact residents and elementary school located in close proximity to park; houses/residences (all directions) and Temple Academy (SW).	**Potential Impact: Moderate.**	**Graphic/Photo: See previous photos.**

Finding: Drill rig noise may impact day care center located at recreation offices at park.	**Potential Impact: Moderate.**	**Graphic/Photo: View of recreation office ads posted on baseball field fence.** 

Environmental Factor – PUBLIC SERVICES/RECREATION

Finding: Park includes general recreation, basketball, fitness, playground, and splash pad youth water park area. Day care services provided at park recreation offices.	**Potential Impact: Low direct impact to most; work in the area near open fields may have low to moderate impact baseball field use.**	**Graphic/Photo: View of Splash Pad located on west side of park.**

		
Environmental Factor – TRANSPORTATION/TRAFFIC		
Finding: Park is located within a residential area and traffic is low	**Potential Impact: Low to no.**	**Graphic/Photo: None.**
Environmental Factor – UTILITIES/SERVICE SYSTEMS		

Finding: Below and above ground electrical, water, sewer or fiber optic lines may be present in neighborhood and park.	**Potential Impact: Low to moderate. Close proximity to residents, the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks.**	**Graphic/Photo: See above photo.**

Upper San Gabriel River Enhanced Watershed Management Program
Regional Project Environmental Study Checklist

Site ID: CS11	**Date: 1/6/2015**
Site Name: Barnes Park	**Personnel: Andrew Payne**

Site Address/Location: 3251 Patritti Avenue, Baldwin Park, CA 91706

General Notes:

- Park includes basketball courts, open grass areas, children's play area/playground, community/recreation center fitness areas, splash pad, and picnic areas.

- Overall the open field grass in the southern portion of the park is most feasible area to sample soil and/or design BMP. There is a driveway near the southern end of the park to allow for drive in access. The park is located within a residential neighborhood in Baldwin Park. Residential areas are located to north and east. The Interstate 605 freeway is along the west boundary and the interchange to the Interstate 10 freeway is to the south.

Environmental Factor – AESTHETICS		
Finding: Open area in southern portion of park is good potential for BMP implementation.	**Potential Impact: Low to moderate impact to grass field, schedule for sports played at park in grass area.**	**Graphic/Photo: View looking south at grass area.** 
Finding: Driveway access to grass area.	**Potential Impact: Low to moderate impact to grass field.**	**Graphic/Photo: View looking north at park.** 

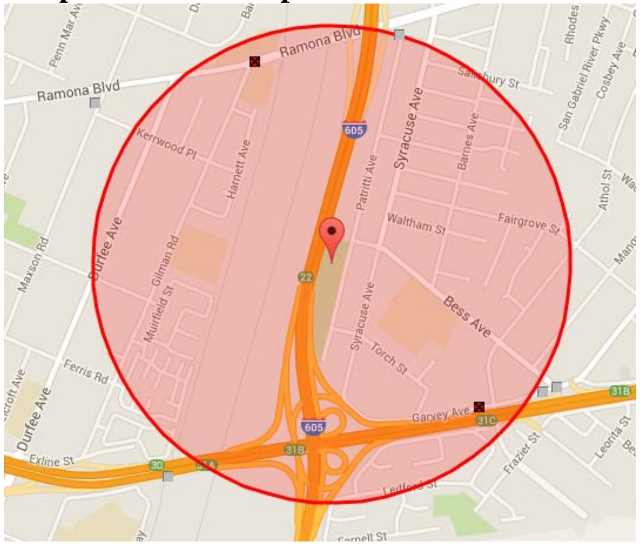
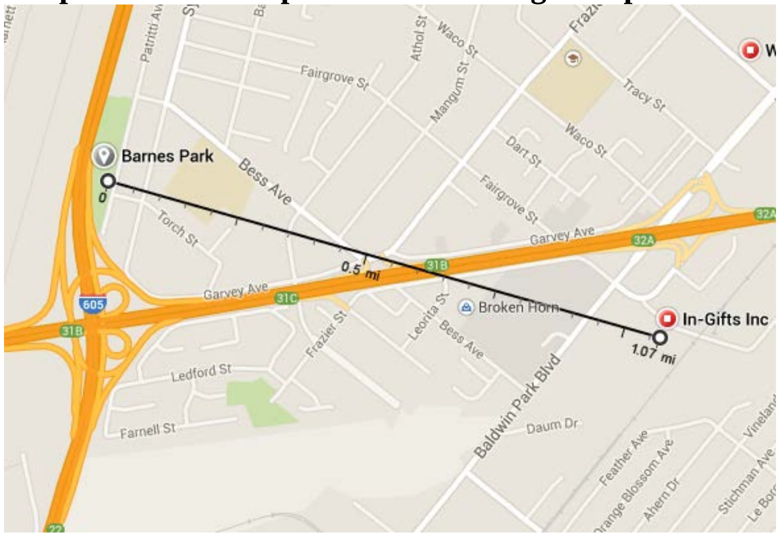
Environmental Factor – AGRICULTURAL/FOREST RESOURCES		
Finding: No observed Ag/Forest resources at park during visit.	**Potential Impact: Unknown/None**	**Graphic/Photo: None.**
Environmental Factor – AIR QUALITY/GHG EMISSIONS		

Finding: Residential neighborhood located north and east of park.	Potential Impact: Low to moderate – residences in close proximity to area and park boundary.	Graphic/Photo: View looking north at park with neighborhood across Patritti Ave to east (on right). 

Environmental Factor – BIOLOGICAL RESOURCES

Finding: Trees are located grass area.	**Potential Impact: Low.** **Drill rig and/or construction can be positioned to minimize impact.**	**Graphic/Photo: View looking SW at trees around grass area.** 
Finding: Trees are located south of grass area.	**Potential Impact: Low.** **Drill rig and/or construction can be positioned to minimize impact.**	**Graphic/Photo: View looking S/SE at driveway access and at trees south of the area.** 

Finding: No nesting birds were observed upon visit.	**Potential Impact: Low.** **Drill rig and/or construction can be positioned to minimize impact.**	**Graphic/Photo: None.**
Environmental Factor – CULTURAL RESOURCES		
Finding: Nothing observed during site visit.	**Potential Impact: Unknown.**	**Graphic/Photo: None.**

Environmental Factor – GEOLOGY/SOILS/HAZARDOUS MATERIALS		
Finding: No apparent issues during initial site visit. Two former cleanup sites are located within ½ mile of the park. One DTSC cleanup site is located ½ mile north of park (Geotracker).	**Potential Impact: Low to moderate.**	**Graphic/Photo: Graphic cut from SWRCB Geotracker website.** 
Finding: No apparent issues during initial site visit. Closest dry cleaner is over a mile; GW direction in this area is variable in area is variable SE to NE (Geotracker).	**Potential Impact: Low.**	**Graphic/Photo: Graphic cut from Google Maps.** 

Finding: The Walnut Creek Fault and Indian Hill Fault are mapped as inferred south and east of Baldwin Park respectively, but no extensive information is reported. The Sierra Madre Fault zone is north of Baldwin Park – last proximal earthquake near Sierra Madre was not actually Sierra Madre Fault, but occurred in 1991 (Southern California Earthquake Data Center Caltech website). Liquefaction found as factor during preliminary information gathering/tech memo.	Potential Impact: Low to moderate during earthquake.	Graphic/Photo: Interactive Fault Map (USGS).  - Dotted black and green lines are inferred faults.
Environmental Factor – HYDROLOGY/WATER QUALITY		

Finding: See sections above regarding cleanup sites.	**Potential Impact: Low to moderate impact to GW via cleanup sites.**	**Graphic/Photo: See above in previous section.**
Finding: Linear concrete lined drainage along west side of park that drains to box culvert to south of park.	**Potential Impact: None.**	**Graphic/Photo: Box culvert.** 

Finding: Storm/sewer pump located along sidewalk adjacent to park property. Pump reportedly elevates water to properly drain into box culvert storm drain system to south.	**Potential Impact: None.**	**Graphic/Photo: Pump Vault.** 
Environmental Factor – LAND USE/PLANNING		

Finding: Soil testing and/or construction should not impact use but schedule of park services should be determined.	**Potential Impact: Low to moderate impact potential to field usage.**	**Graphic/Photo: View north of open area.** 
Environmental Factor – NOISE		
Finding: Drill rig noise may impact residents located in close proximity to park in all directions.	**Potential Impact: Moderate.**	**Graphic/Photo: None.**
Environmental Factor – PUBLIC SERVICES/RECREATION		

Finding: Park uses include general recreation, basketball, and soccer.	**Potential Impact: Low impact sports/recreations that may be played in open area.**	**Graphic/Photo: None**
Environmental Factor – TRANSPORTATION/TRAFFIC		
Finding: Park is located within a residential area and traffic is low.	**Potential Impact: Low to no.**	**Graphic/Photo: None.**

Environmental Factor – UTILITIES/SERVICE SYSTEMS		
Finding: Storm/sewer pump located along sidewalk adjacent to park property. Pump reportedly elevates water to properly drain into box culvert storm drain system to south.	**Potential Impact: Low potential.**	**Graphic/Photo: View east along drainage and walking path.** 
Finding: Below and above ground electrical, water, sewer or fiber optic lines. Additionally, open field area lights and advertisements near/on park property.	**Potential Impact: Low to moderate. Close proximity to residents, the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks.**	**Graphic/Photo: View west at advertisement billboard sign.** 

Upper San Gabriel River Enhanced Watershed Management Program
Regional Project Environmental Study Checklist

Site ID: 136	**Date: 1/7/2015**
Site Name: Bassett Park	**Personnel: Andrew Payne**

Site Address/Location: 510 Vineland Avenue La Puente, CA 91746

General Notes:

- Park includes a gymnasium, a synthetic grass soccer field, basketball courts, children's play area/playground, skate park, community/recreation center fitness areas, open grass and picnic areas.

- Overall the open area east of the gymnasium in the southern portion of the park is most feasible area to sample soil and/or design BMP. A driveway near the southern end of the parking lot and gymnasium can be utilized to access the area. The park is located within a light industrial, commercial and residential neighborhood in Baldwin Park. Residential areas are located to north, south and east.

Environmental Factor – AESTHETICS		
Finding: Open area in southern portion of park is good potential for implementation.	**Potential Impact: Low to moderate impact to open grass area.**	**Graphic/Photo: View looking east at grass area.** 

Finding: Driveway access to grass area.	**Potential Impact: Low to moderate impact to grass field.**	**Graphic/Photo: View looking east at access to the area.** 

Environmental Factor – AGRICULTURAL/FOREST RESOURCES

Finding: No observed Ag/Forest resources at park during visit.	**Potential Impact: Unknown/None**	**Graphic/Photo: None.**

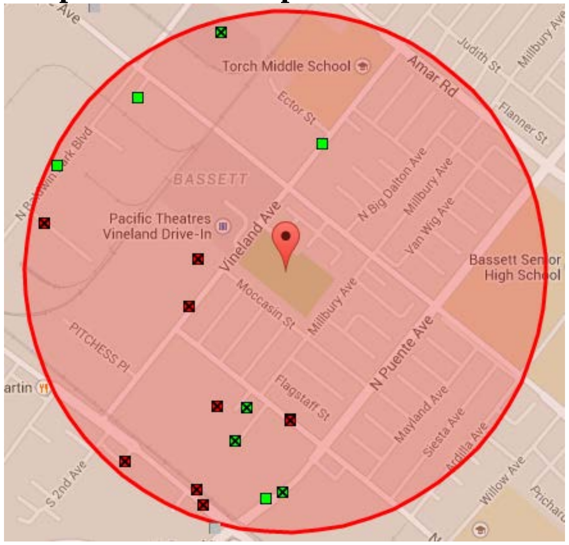
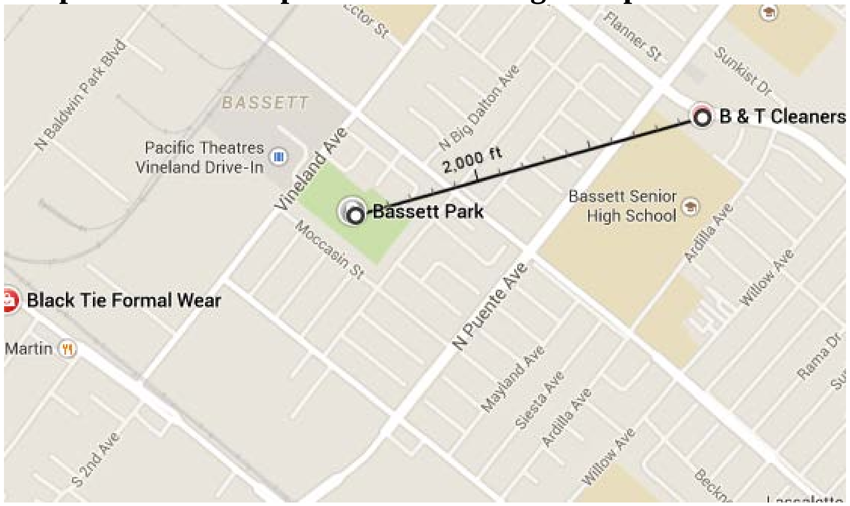
Environmental Factor – AIR QUALITY/GHG EMISSIONS

Finding: Residential neighborhood located north, south and east of park.	Potential Impact: Low to moderate – residences in close proximity to the area and park boundary.	Graphic/Photo: View looking east near the area, residence to south (on right). 

Environmental Factor – BIOLOGICAL RESOURCES

Finding: Trees are located grass area.	**Potential Impact: Low.** **Drill rig and/or construction can be positioned to minimize impact.**	**Graphic/Photo: View looking west at trees south of access area.** 
Finding: No nesting birds were observed upon visit.	**Potential Impact: Low.** **Drill rig and/or construction can be positioned to minimize impact.**	**Graphic/Photo: None.**

Environmental Factor – CULTURAL RESOURCES		
Finding: Nothing observed during site visit.	**Potential Impact: unknown.**	**Graphic/Photo: none.**
Environmental Factor – GEOLOGY/SOILS/HAZARDOUS MATERIALS		

Finding: No apparent issues during initial site visit. Four open case cleanup sites and 13 former cleanup sites are located within ½ mile of the park (Geotracker).	**Potential Impact: Low to moderate.**	**Graphic/Photo: Graphic cut from SWRCB Geotracker website.** 
Finding: No apparent issues during initial site visit. Two dry cleaners located within one mile (Google).	**Potential Impact: Low.**	**Graphic/Photo: Graphic cut from Google Maps.** 

Finding: The Walnut Creek Fault is mapped as inferred into La Puente, but no extensive information is reported. The Sierra Madre Fault zone is north of La Puente – last proximal earthquake near Sierra Madre was not actually Sierra Madre Fault, but occurred in 1991 (Southern California Earthquake Data Center Caltech website). Liquefaction found as factor during preliminary information gathering/tech memo.	**Potential Impact: Low to moderate during earthquake.**	**Graphic/Photo: Interactive Fault Map (USGS).**  - **Dotted black and green lines are inferred faults.**

Environmental Factor – HYDROLOGY/WATER QUALITY

Finding: See previous section notes regarding location of cleanup sites and dry cleaners in proximity of park.	**Potential Impact: Low to moderate impact to GW via cleanup sites or dry cleaner.**	**Graphic/Photo: See above in previous section.**
Finding: Sand bags along southern portion of park near the area. Low spot or ponding area during rain.	**Potential Impact: Low.**	**Graphic/Photo: View east with sand bags along boundary of park and neighboring house.** 

Environmental Factor – LAND USE/PLANNING		
Finding: The area is an open grass area with trees, picnic tables and park lighting. Soil testing and/or construction should not impact use but schedule of park services should be determined.	**Potential Impact: Low to moderate.**	**Graphic/Photo: View east of the area.** 
Environmental Factor – NOISE		

Finding: Drill rig noise may impact residents located in close proximity to park in all directions.	**Potential Impact: Moderate.**	**Graphic/Photo: None.**
Environmental Factor – PUBLIC SERVICES/RECREATION		
Finding: park uses include general recreation, basketball, and soccer.	**Potential Impact: Low impact sports/recreations that may be played in open area.**	**Graphic/Photo: None**

Environmental Factor – TRANSPORTATION/TRAFFIC		
Finding: Park is located within a light industrial, commercial and residential area and traffic is moderate to heavy at times.	**Potential Impact: Low to moderate.**	**Graphic/Photo: None.**
Environmental Factor – UTILITIES/SERVICE SYSTEMS		

Finding: Storm drain located in low spot near the area. Irrigation and other utility boxes located near the area.	**Potential Impact: Low to moderate potential.**	**Graphic/Photo: See photo below.**
Finding: Below and above ground electrical, water, sewer or fiber optic lines. Additionally, open field area lights and advertisements near/on park property.	**Potential Impact: Moderate. Close proximity to residents, the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks.**	**Graphic/Photo: View east at area.** 

Upper San Gabriel River Enhanced Watershed Management Program
Regional Project Environmental Study Checklist

Site ID: 11	**Date: 12/19/2014**
Site Name: Finkbiner Park	**Personnel: Andrew Payne**

Site Address/Location: 160 N. Wabash Ave., Glendora, CA

General Notes:

- Park includes two tennis courts with night lighting, three lighted softball diamonds, picnic tables, barbecues, a playground, checkout stand, basketball court, scout hut, youth center, legion building, volleyball courts, horseshoe pits, fitness area and skate park.

- Overall the softball diamond grass area is most feasible area to sample soil and/or design BMP. Park is irregular shaped and surface flow should drain in a south and southwesterly direction. Dalton Wash and surrounding storm drains observed during site visit. Dalton Wash is approximately 15 feet deep rectangular shaped concrete lined wash trending NE to SW through the park. Dalton Wash drains to the SW. Residential in all directions and light commercial to south.

Environmental Factor – AESTHETICS		
Finding: Open ball field areas with access along south and east ends and some fencing along north, south and west sides.	**Potential Impact: Moderate impact to grass field, ballpark schedule and potentially to fences.**	**Graphic/Photo: View looking NW at area for sampling.** 

Finding: Open ball field areas with access along south and east ends and some fencing along north, south and west sides.	**Potential Impact: Moderate impact to grass field, ballpark schedule and potentially to fences.**	**Graphic/Photo: View looking SE at the area.** 

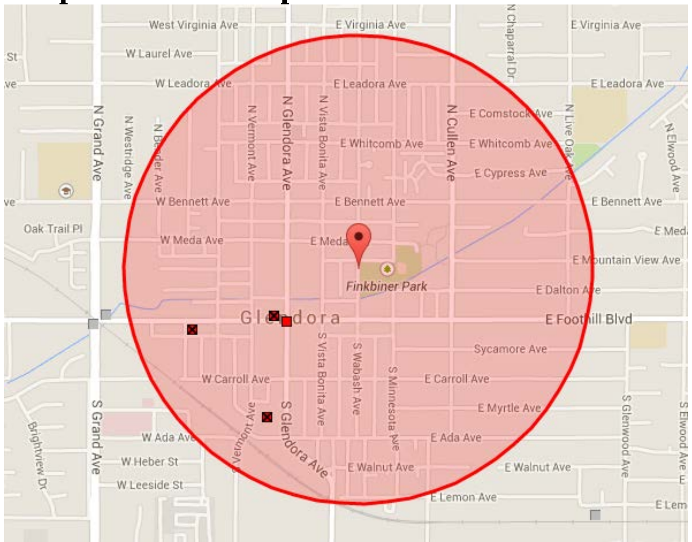
Environmental Factor – AGRICULTURAL/FOREST RESOURCES

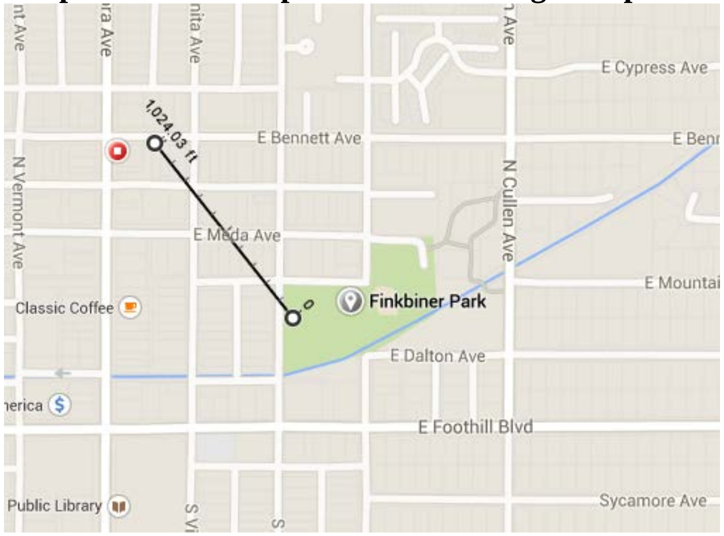
Finding: US Forest Service Department of Agriculture Offices; Glendora Ranger Station. Offices are located south of the park on the corner of Wabash and Foothill.	**Potential Impact: Unknown/None.**	**Graphic/Photo: View of Ranger Station.** 
Environmental Factor – AIR QUALITY/GHG EMISSIONS		
Finding: Apartments located north of softball fields across alley/access way from park.	**Potential Impact: Low to moderate impact - residents at apartments are in close proximity to the area and park boundary.**	**Graphic/Photo: View north - apartments in background.** 

Finding: Houses located west of softball fields across Wabash Ave from park.	**Potential Impact: Low to moderate impact - residents at apartments are in close proximity to the area and park boundary.**	**Graphic/Photo: View looking west across at houses along Wabash Ave.** 
Finding: Senior citizen care center – La Fetra Center.	**Potential Impact: Low to moderate impact - workers and senior citizens receiving care are in close proximity to AOI and park boundary.**	**Graphic/Photo: View of La Fetra Center.** 

Environmental Factor – BIOLOGICAL RESOURCES		
Finding: No trees are located on softball fields. Some trees are located along Wabash Ave to west and are not in close proximity to the area. Drill rig will be in open area.	**Potential Impact: No to low.**	**Graphic/Photo: View NW at sampling area.** 

Finding: No trees are located on softball fields. Some trees are located to north of softball fields and are not in close proximity to the area. Drill rig will be in open area.	**Potential Impact: No to low.**	**Graphic/Photo: View north at sampling area.** 
Finding: No trees are located on softball fields. Trees are located to south and east of softball fields and are not in close proximity to the area. Drill rig will be in open area.	**Potential Impact: No to low.**	**Graphic/Photo: View looking east at south and east sides of softball fields.** 
Environmental Factor – CULTURAL RESOURCES		

Finding: Nothing observed during site visit. However, City of Glendora Library and Cultural center is approx. ¾ mile WSW of park.	**Potential Impact: Unknown.**	**Graphic/Photo: None.**
Environmental Factor – GEOLOGY/SOILS/HAZARDOUS MATERIALS		
Finding: No apparent issues during initial site visit. Four cleanup sites, three of which are now closed, are located within ½ mile of the park. The one open cleanup case is the Glendora Police Station and appears to be down gradient.	**Potential Impact: Low.**	**Graphic/Photo: Graphic cut from SWRCB Geotracker website.** 

Finding: No apparent issues during initial site visit. Closest dry cleaner (Boy's Cleaners) is located approximately 1,000 feet to the NW of the park.	**Potential Impact: Low to moderate.**	**Graphic/Photo: Graphic cut from Google Maps.** 
Finding: park near Sierra Madre Fault zone – last proximal earthquake near Sierra Madre was not actually Sierra Madre Fault, but occurred in 1991 (Southern California Earthquake Data Center Caltech website).	**Potential Impact: Moderate during earthquake.**	**Graphic/Photo: Interactive Fault Map (USGS).**  - **Dashed green near Glendora is Sierra Madre Fault zone.**

Environmental Factor – HYDROLOGY/WATER QUALITY		
Finding: Notes regarding location of cleanup sites and dry cleaners in proximity of park.	**Potential Impact: low to moderate impact to GW via gas station or dry cleaner.**	**Graphic/Photo: See above in previous section.**
Finding: Dalton Wash runs NE to SW through park; concrete lined wash draining to SW.	**Potential Impact: Low impact.** **Drill rig can be positioned far away enough from wash to minimize impact.**	**Graphic/Photo: View west at Dalton Wash located south of softball fields.** 

Environmental Factor – LAND USE/PLANNING

<table>
<tr>
<td>Finding: Softball and local youth soccer games located in area of interest. Will need to contact park to understand schedule.</td>
<td>Potential Impact: Schedule impacts.</td>
<td>Graphic/Photo: View of softball fields and soccer goal.


</td>
</tr>
<tr>
<td>Finding: Other park uses include general recreation, skate park, and youth center.</td>
<td>Potential Impact: Low impact to schedule or traffic.</td>
<td>Graphic/Photo: Park Map.

</td>
</tr>
</table>

Environmental Factor – NOISE		
Finding: Drill rig noise may impact residents located in close proximity to park in all directions; La Fetra center (south), youth center (east), American legion (east), and US Agriculture/forest ranger offices (south).	**Potential Impact: Moderate.**	**Graphic/Photo: None.**

Environmental Factor – PUBLIC SERVICES/RECREATION		
Finding: Youth center, La Fetra Center, youth sports, park rec areas (basketball, softball, tennis, playground, skate park), American Legion.	**Potential Impact: Low direct impact to most; work in the area near open fields may have low to moderate impact on soccer and softball.**	**Graphic/Photo: None**

Environmental Factor – TRANSPORTATION/TRAFFIC		
Finding: Park is located within a residential area and traffic is low.	**Potential Impact: No to low.**	**Graphic/Photo: None.**
Environmental Factor – UTILITIES/SERVICE SYSTEMS		

Finding: Dalton Wash and surrounding storm drains.	**Potential Impact: Low potential. (Storm drains, Dalton Wash in photo)**	**Graphic/Photo: View NE of softball fields/park from Wabash.** 
Finding: Below and above ground electrical.	**Potential Impact: Low to moderate; Dig alert to be notified prior to any subsurface investigation.**	**Graphic/Photo: See above photo.**

Finding: Unknown water, sewer or fiber optic lines may be present in neighborhood and park.	**Potential Impact: Low to moderate. Close proximity to residents, the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks.**	**Graphic/Photo: None.**

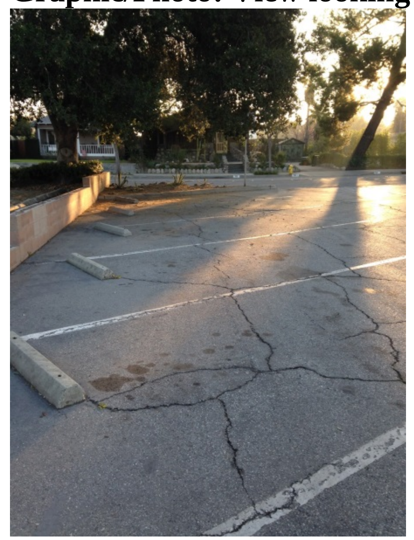
Upper San Gabriel River Enhanced Watershed Management Program
Regional Project Environmental Study Checklist

Site ID: N/A	**Date: 1/30/2015**
Site Name: Glendora Downtown Property	**Personnel: Andrew Payne**

Site Address/Location: 100-200 N. Vista Bonita Avenue, (Glendora Ave and Foothill Blvd.), Glendora, CA

General Notes:

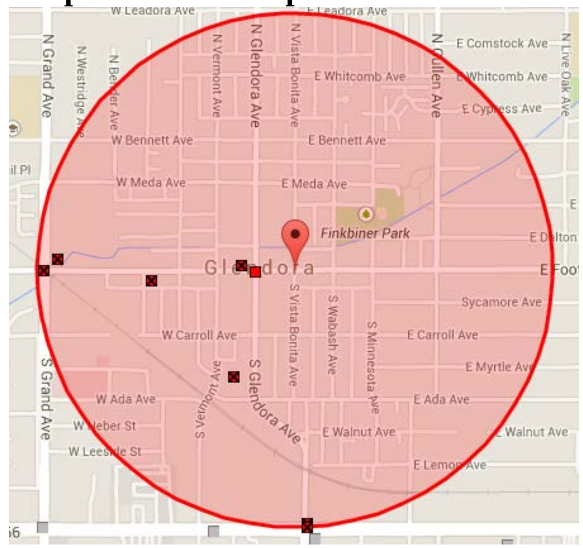
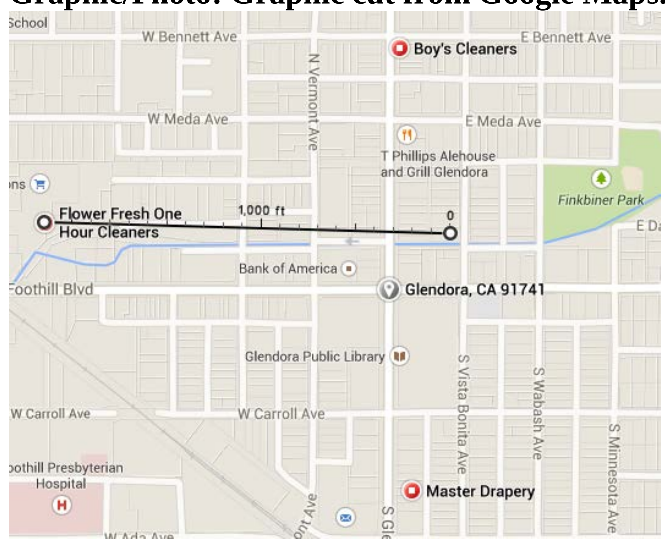
- Overall the north parking stalls in the southern portion of the City of Glendora parking lot at the Downtown Properties is the area to sample soil and/or design BMP. Parking lot is located approximately one block north of the City of Glendora City Hall in a commercial and residential area of Glendora.

Environmental Factor – AESTHETICS		
Finding: Location is asphalt parking lot.	**Potential Impact: Low impact to asphalt parking lot.**	**Graphic/Photo: View looking NW at Area of sampling area.** 
Environmental Factor – AGRICULTURAL/FOREST RESOURCES		

Finding: US Forest Service Department of Agriculture Offices two locks east on Foothill Blvd.; Glendora Ranger Station. Offices are located on the corner of Wabash and Foothill.	**Potential Impact: Unknown/None.**	**Graphic/Photo: View of Ranger Station.** 
Environmental Factor – AIR QUALITY/GHG EMISSIONS		
Finding: Residents and local businesses located near the area on Vista Bonita Ave and Glendora Ave.	**Potential Impact: Low to moderate impact - residents at businesses are near the area.**	**Graphic/Photo: View west at businesses adjacent to parking lot.** 

Environmental Factor – BIOLOGICAL RESOURCES		
Finding: Some trees are located near area.	**Potential Impact: Low.** **Drill rig can be positioned to minimize impacts.**	**Graphic/Photo: See above photo.**

Environmental Factor – CULTURAL RESOURCES		
Finding: Nothing observed during site visit. However, City of Glendora Library and Cultural center is approx. ½ to ¾ mile south of area.	**Potential Impact: Unknown.**	**Graphic/Photo: None.**

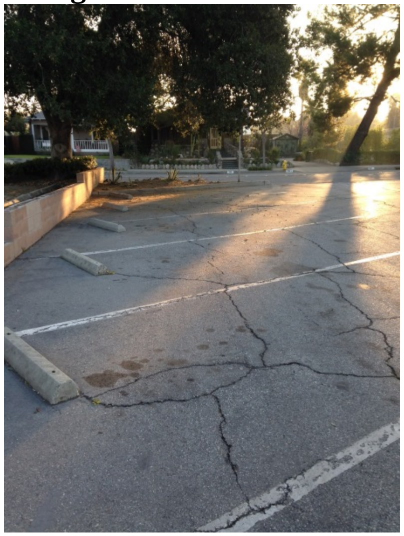
Environmental Factor – GEOLOGY/SOILS/HAZARDOUS MATERIALS		
Finding: No apparent issues during initial site visit. Seven closed cleanup sites and one open case cleanup site are located within ½ mile of the park. The one open cleanup case is the Glendora Police Station and appears to be down gradient.	**Potential Impact: Low.**	**Graphic/Photo: Graphic cut from SWRCB Geotracker website.** 
Finding: No apparent issues during initial site visit. Three dry cleaners are located approximately ½ mile from the site.	**Potential Impact: Low to moderate.**	**Graphic/Photo: Graphic cut from Google Maps.** 

<table>
<tr>
<td>Finding: park near Sierra Madre Fault zone – last proximal earthquake near Sierra Madre was not actually Sierra Madre Fault, but occurred in 1991 (Southern California Earthquake Data Center Caltech website).</td>
<td>Potential Impact: Moderate during earthquake.</td>
<td>Graphic/Photo: Interactive Fault Map (USGS).

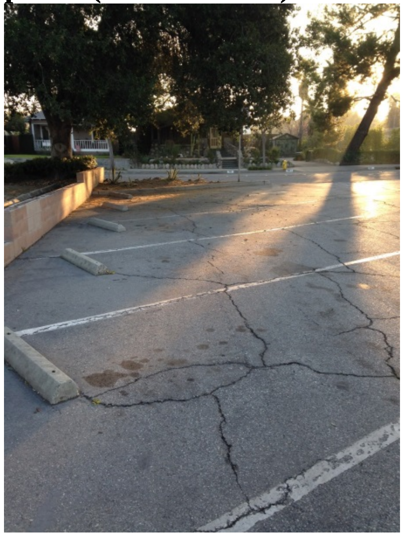

- Dashed green near Glendora is Sierra Madre Fault zone.
-</td>
</tr>
<tr>
<td colspan="3">Environmental Factor – HYDROLOGY/WATER QUALITY</td>
</tr>
</table>

Finding: Notes regarding location of cleanup sites and dry cleaners in proximity of park.	**Potential Impact: Low to moderate impact to GW via gas station or dry cleaner.**	**Graphic/Photo: See above in previous section.**
Finding: Dalton Wash runs east to west just south of the area; underground concrete lined drainage.	**Potential Impact: Low to moderate impact.** **Drill rig can be positioned far away enough from wash to minimize impact.**	**Graphic/Photo: None.**

Environmental Factor – LAND USE/PLANNING		
Finding: Location is active parking lot for area businesses; city use.	**Potential Impact: Low.**	**Graphic/Photo: View west at parking area and businesses in background.** 

Environmental Factor – NOISE		
Finding: Drill rig noise may impact residents or businesses located in near the area.	**Potential Impact: Low to moderate.**	**Graphic/Photo: View east at parking lot and residence in background.** 

Environmental Factor – PUBLIC SERVICES/RECREATION		
Finding: Public parking lot.	**Potential Impact: Low to moderate impact to parking users and business traffic.**	**Graphic/Photo: See above photos.**
Environmental Factor – TRANSPORTATION/TRAFFIC		

Finding: Public parking lot; area is reportedly low traffic area but can be moderate at times.	**Potential Impact: Low to moderate impact to parking users and business traffic.**	**Graphic/Photo: See above photos.**
Environmental Factor – UTILITIES/SERVICE SYSTEMS		
Finding: Dalton Wash and surrounding storm drains.	**Potential Impact: Low potential. (Storm drains, Dalton Wash in photo).** **Drill rig can be positioned to minimize impacts.**	**Graphic/Photo: View east; storm drain in background right of photo (Dalton Wash).** 

Finding: Above and below electrical lines, and any other utility lines including water, sewer or fiber optic lines that may be present near the area.	**Potential Impact: Low to moderate. Close proximity to residents and businesses, the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks.**	**Graphic/Photo: View west at businesses and parking lot lighting.** 

Upper San Gabriel River Enhanced Watershed Management Program
Regional Project Environmental Study Checklist

Site ID: N/A	**Date: 1/30/2015**
Site Name: San Jose Properties	**Personnel: Andrew Payne**

Site Address/Location: Located at the south end of San Jose Ave, between Burnaby Dr and Lawford St., Glendora, CA

General Notes:

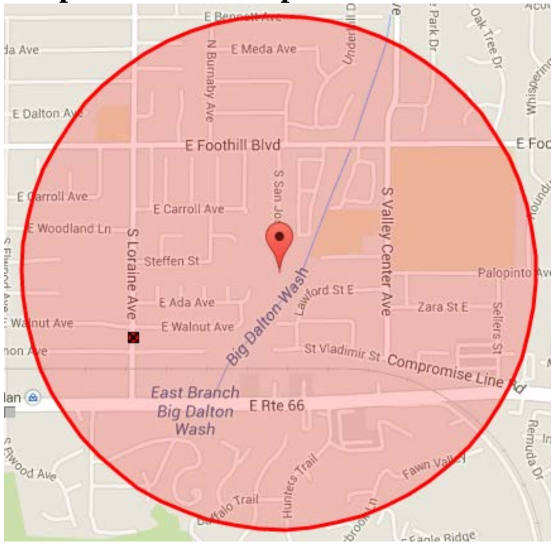
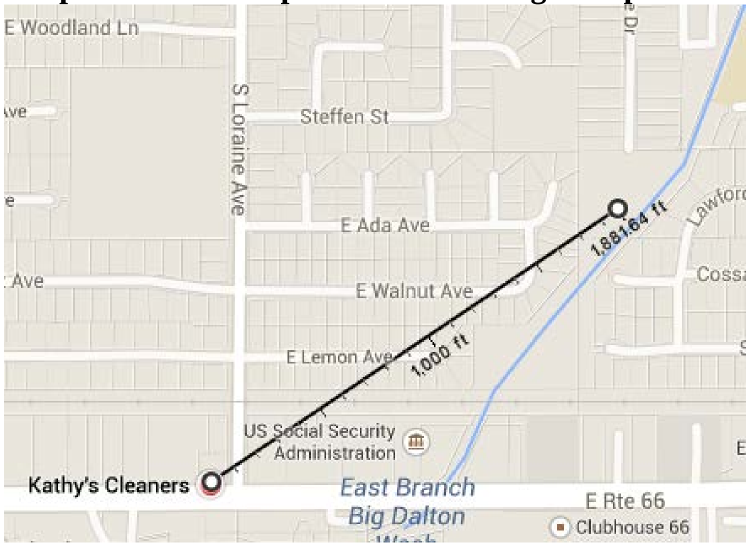
- Overall the property is open and flat open grass area with some oak trees. The area to sample soil and/or design BMP is located west of a Los Angeles County Flood Control District (LACFCD) Big Dalton Wash and north of the City of Glendora Maintenance yard. Open area is located within a residential neighborhood.

Environmental Factor – AESTHETICS		
Finding: AOI is open grass area with some oak trees. Property is used by City of Glendora for some mulch and soil stockpiling.	**Potential Impact: Low impact to oak trees.**	**Graphic/Photo: View looking north at the sampling area.** 
Environmental Factor – AGRICULTURAL/FOREST RESOURCES		

Finding: US Forest Service Department of Agriculture Offices on Foothill Blvd.; Glendora Ranger Station. Offices are located on the corner of Wabash and Foothill.	**Potential Impact: Unknown/None.**	**Graphic/Photo: View of Ranger Station.** 
Environmental Factor – AIR QUALITY/GHG EMISSIONS		
Finding: Residents and City of Glendora yard located near AOI.	**Potential Impact: Low impact – residents and workers located near property.** **Drill rig can be positioned to minimize impacts.**	**Graphic/Photo: View north and Big Dalton Wash; residents east, west and north of property.** 

Environmental Factor – BIOLOGICAL RESOURCES		
Finding: Some oak trees are located near the sample area.	**Potential Impact: Low.** **Drill rig can be positioned to minimize impacts.**	**Graphic/Photo: See above photos.**

Environmental Factor – CULTURAL RESOURCES		
Finding: Nothing observed during site visit. However, City of Glendora Library and Cultural center is located in downtown Glendora approximately 1.5 miles west.	**Potential Impact: Unknown.**	**Graphic/Photo: None.**

Environmental Factor – GEOLOGY/SOILS/HAZARDOUS MATERIALS		
Finding: No apparent issues during initial site visit. One closed cleanup site is located at the City of Glendora Maintenance yard.	**Potential Impact: Low; area up gradient of City of Glendora yard.**	**Graphic/Photo: Graphic cut from SWRCB Geotracker website.** 
Finding: No apparent issues during initial site visit. One dry cleaner located within ½ mile.	**Potential Impact: Low.**	**Graphic/Photo: Graphic cut from Google Maps.** 

Finding: park near Sierra Madre Fault zone – last proximal earthquake near Sierra Madre was not actually Sierra Madre Fault, but occurred in 1991 (Southern California Earthquake Data Center Caltech website).	Potential Impact: Moderate during earthquake.	Graphic/Photo: Interactive Fault Map (USGS).  - Dashed green near Glendora is Sierra Madre Fault zone. -

Environmental Factor – HYDROLOGY/WATER QUALITY

Finding: Notes regarding location of cleanup sites and dry cleaners in proximity of park.	**Potential Impact: Low to moderate impact to GW via gas station or dry cleaner.**	**Graphic/Photo: See above in previous section.**
Finding: Big Dalton Wash runs north to south just west of the area; concrete lined drainage.	**Potential Impact: Low to moderate impact.** **Drill rig can be positioned far away enough from wash to minimize impact.**	**Graphic/Photo: None.**

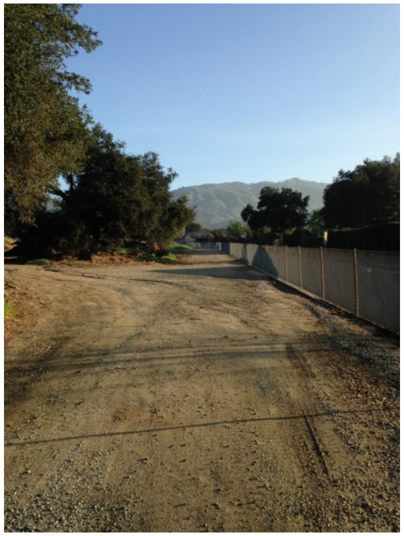
Environmental Factor – LAND USE/PLANNING		
Finding: Area is open area and utilized for soil and mulch stockpiling.	**Potential Impact: None.**	**Graphic/Photo: View north at the area.** 

Environmental Factor – NOISE		
Finding: Drill rig noise may impact residents near area.	**Potential Impact: Low.**	**Graphic/Photo: None.**

Environmental Factor – PUBLIC SERVICES/RECREATION		
Finding: Property is an open grass lot that is used by City of Glendora and LAFCD only.	**Potential Impact: Low impact to City of Glendora operations.**	**Graphic/Photo: None.**
Environmental Factor – TRANSPORTATION/TRAFFIC		

Finding: Property is an open grass lot that is used by City of Glendora and LACFCD only.	**Potential Impact: Low impact to City of Glendora and LACFCD operations.**	**Graphic/Photo: None.**

Environmental Factor – UTILITIES/SERVICE SYSTEMS

Finding: Big Dalton Wash located to the east of the AOI.	**Potential Impact: Low potential.** **Drill rig can be positioned to minimize impacts.**	**Graphic/Photo: View north and Big Dalton Wash.** 

Finding: Above and below electrical lines, and any other utility lines including water, sewer or fiber optic lines that may be present.	**Potential Impact: Low to moderate. Close proximity to residents, the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks.**	**Graphic/Photo: None.**

Upper San Gabriel River Enhanced Watershed Management Program
Regional Project Environmental Study Checklist

Site ID: 147	**Date: 12/19/2014**
Site Name: Kahler Russell Park	**Personnel: Andrew Payne**

Site Address/Location: 735 North Glendora Avenue, Covina, CA 91724

General Notes:

- Park includes basketball & tennis courts, sports fields (baseball diamonds and football upright), a playground, hiking trail & roller hockey rink.

- Overall the open field grass area is most feasible area to sample soil and/or design BMP. An asphalted access/maintenance road along the north boundary of the park will allow for access into area via a locked gate near the east parking lot. A tree lined natural and engineered drainage runs from the east to west along the south side of the park. The park includes a concrete lined drainage inlet (east side of park at Glendora Ave), vegetated/semi-natural drainage, erosional BMPs and concrete box culvert outlet (west side of park at Grand Ave). A walking trail follows drainage along south side of park. Residential to south, east and trailer park (Mobil Aire) to NW, commercial to the west, industrial/commercial to the north.

Environmental Factor – AESTHETICS

Finding	Potential Impact	Graphic/Photo
Finding: Grass area is open at west end with some fencing adjacent to access road along north side.	**Potential Impact: Impact to grass field, ballpark schedule and potentially to fences.**	**Graphic/Photo: View looking west at sample area at grass field areas.** 
Finding: Open grass area on east side park.	**Potential Impact: Impact to grass field.**	**Graphic/Photo: View looking north near east parking lot.** 

Environmental Factor – AGRICULTURAL/FOREST RESOURCES		
Finding: No observed Ag/Forest resources at park during visit.	**Potential Impact: Unknown/None.**	**Graphic/Photo: None.**
Environmental Factor – AIR QUALITY/GHG EMISSIONS		

Finding: Residential neighborhood located south of park.	**Potential Impact: Low to moderate – residences in close proximity and park boundary.**	**Graphic/Photo: View looking SW at neighborhood south of park.** 
Finding: Residential neighborhood NW of park.	**Potential Impact: Low to moderate – residences in close proximity to park boundary.**	**Graphic/Photo: View of residences NW of park.** 

Finding: Residential neighborhood east of park.	**Potential Impact: Low – residences not in close proximity to AOI or park boundary.**	**Graphic/Photo: View of residences east of park.** 

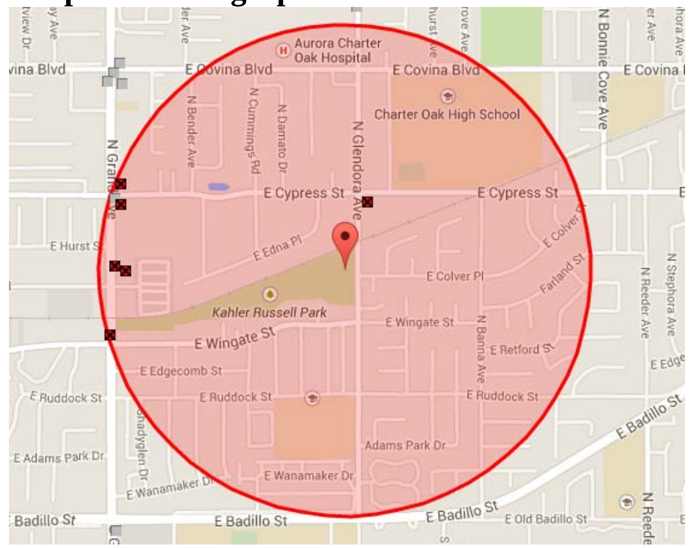
Environmental Factor – BIOLOGICAL RESOURCES

Finding: Trees are located near eastern open area. However drill rig and/or construction can be positioned to minimize impact.	**Potential Impact: Low.**	**Graphic/Photo: View W/NW at eastern open area.** 
Finding: Trees are located near ball fields. However drill rig and/or construction can be positioned to minimize impact.	**Potential Impact: Low.**	**Graphic/Photo: View SE at western open area/ball fields.** 

Finding: Trees are located near the area.	**Potential Impact: No to low.** **Drill rig can be positioned to minimize impacts.**	**Graphic/Photo: View looking SW.** 

Environmental Factor – CULTURAL RESOURCES

Finding: Nothing observed during site visit.	**Potential Impact: Unknown.**	**Graphic/Photo: None.**

Environmental Factor – GEOLOGY/SOILS/HAZARDOUS MATERIALS		
Finding: No apparent issues during initial site visit. Six former LUST sites now closed are located within ½ mile of the park. One located less than 1,000 feet up gradient of park.	**Potential Impact: Low to moderate.**	**Graphic/Photo: graphic cut from SWRCB Geotracker website.** 
Finding: No apparent issues during initial site visit. Two dry cleaners located within ½ mile of the park.	**Potential Impact: Low to moderate.**	**Graphic/Photo: Graphic cut from Google Maps.** 

Finding: Indian Hill Fault is mapped in Covina, but no extensive information is reported. The Sierra Madre Fault zone is north of Covina – last proximal earthquake near Sierra Madre was not actually Sierra Madre Fault, but occurred in 1991 (Southern California Earthquake Data Center Caltech website).	**Potential Impact: Moderate during earthquake.**	**Graphic/Photo: Interactive Fault Map (USGS).**  - **Dotted green line is Indian Hill fault and Sierra Madre Fault zone is north of Covina.**

Environmental Factor – HYDROLOGY/WATER QUALITY

Finding: Notes regarding location of gas stations and dry cleaners in proximity of park.	**Potential Impact: Low to moderate impact to GW via gas station or dry cleaner.**	**Graphic/Photo: See above in previous section.**
Finding: Vegetated drainage that leads to other waters; San Gabriel River.	**Potential Impact: Low impact.** **Drill rig can be positioned far away enough from wash to not impact or have potential to impact.**	**Graphic/Photo: View NW across drainage at open area ball fields.** 

Environmental Factor – LAND USE/PLANNING		
Finding: Walking path is located along south boundary of park. Soil testing and/or construction should not impact path.	**Potential Impact: No to low impact potential to walking path.**	**Graphic/Photo: View west of walking trail.** 
Finding: Park uses include general recreation, roller hockey, basketball, baseball and football fields, and play ground.	**Potential Impact: Low impact to soccer, football, baseball or softball that may be played in the ball fields open area AOI.**	**Graphic/Photo: View west at AOI and open grass areas.** 

Environmental Factor – NOISE		
Finding: Drill rig noise may impact residents located in close proximity to park in NW, South and East directions.	**Potential Impact: Moderate.**	**Graphic/Photo: None.**
Environmental Factor – PUBLIC SERVICES/RECREATION		

Finding: Park uses include general recreation, soccer, roller hockey, basketball, baseball and football fields, and play ground.	**Potential Impact: Low impact to soccer, football, baseball or softball that may be played in the ball fields open area.**	**Graphic/Photo: None.**
Environmental Factor – TRANSPORTATION/TRAFFIC		
Finding: Park is located within a light industrial, commercial, residential area and traffic is low to moderate.	**Potential Impact: Low.**	**Graphic/Photo: None.**

Environmental Factor – UTILITIES/SERVICE SYSTEMS		
Finding: Vegetated drainage.	**Potential Impact: Low potential. (storm drains, and drainage in photo)**	**Graphic/Photo: View east along drainage and walking path.** 
Finding: Below and above ground electrical.	**Potential Impact: Low to moderate; Dig alert to be notified prior to any subsurface investigation.**	**Graphic/Photo: See above photo.**

Finding: Unknown water, sewer or fiber optic lines.	**Potential Impact: Low to moderate. Close proximity to residents, the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks.**	**Graphic/Photo: None.**
Finding: Railroad located along north Boundary of park. Metrolink train observed during visit.	**Potential Impact: Unknown impact. Close proximity to railroad the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks. Easements should be verified.**	**Graphic/Photo:** **View of Metrolink train in background.** 

Upper San Gabriel River Enhanced Watershed Management Program
Regional Project Environmental Study Checklist

Site ID: 41	**Date: 1/12/2015**
Site Name: La Puente Park	**Personnel: Andrew Payne**

Site Address/Location: 501 Glendora Avenue La Puente, CA 91744

General Notes:

- Park includes a gymnasium, baseball/softball fields, basketball courts, handball courts, children’s play area/playground, children’s day care, community/recreation center fitness areas, open grass and picnic areas. A La Puente City maintenance yard is located on park property. La Puente High School is located along the southern boundary of the park property. St Joseph’s elementary school is located at the corner of Temple Avenue and Glendora Avenue along the northeast boundary of the park and main parking lot.

- Overall the large open area northwest of the main parking lot is most feasible area to sample soil and/or design BMP. This area can be accessed via an asphalt access road that is shared with La Puente City maintenance yard. The park is located within a commercial and residential area of La Puente.

Environmental Factor – AESTHETICS		
Finding: Open area in central and east portion of park.	**Potential Impact: Low to moderate impact to open grass area.**	**Graphic/Photo: View looking east; elementary school in background.** 

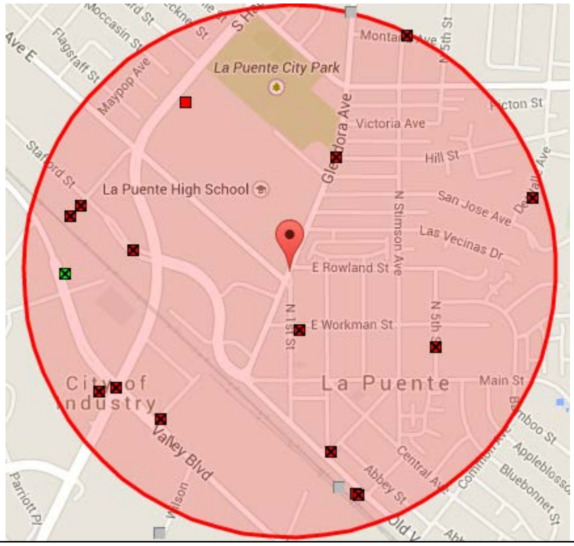
Finding: Asphalt road can be utilized to access.	**Potential Impact: Low to moderate impact to grass.**	**Graphic/Photo: View looking SE and access road.** 
Environmental Factor – AGRICULTURAL/FOREST RESOURCES		
Finding: No observed Ag/Forest resources at park during visit.	**Potential Impact: Unknown/None**	**Graphic/Photo: None.**
Environmental Factor – AIR QUALITY/GHG EMISSIONS		

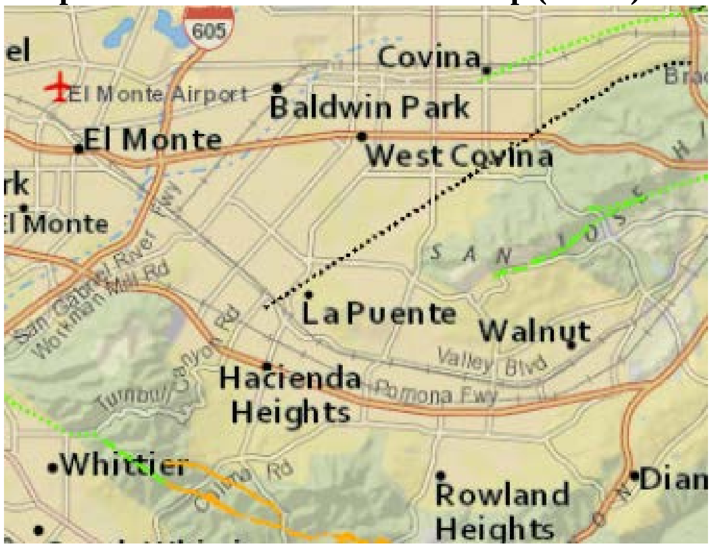
Finding: Park is located in near schools and residential neighborhood.	**Potential Impact: Low to moderate – residences and schools near park boundary.**	**Graphic/Photo: View looking east; schools and residences near park.** 
Environmental Factor – BIOLOGICAL RESOURCES		

Finding: Trees near area.	**Potential Impact: Low.** **Drill rig and/or construction can be positioned to minimize impact.**	**Graphic/Photo: View looking south/SW at trees.** 
Finding: No nesting birds were observed upon visit.	**Potential Impact: Low.** **Drill rig and/or construction can be positioned to minimize impact.**	**Graphic/Photo: None.**

Environmental Factor – CULTURAL RESOURCES		
Finding: Nothing observed during site visit.	**Potential Impact: Unknown.**	**Graphic/Photo: None.**

Environmental Factor – GEOLOGY/SOILS/HAZARDOUS MATERIALS

Finding: No apparent issues during initial site visit. Sixteen former cleanup sites and two open cleanup sites are located within ½ mile of the park (Geotracker).	**Potential Impact: Low to moderate.**	**Graphic/Photo: Graphic cut from SWRCB Geotracker website.** 
Finding: No apparent issues during initial site visit. One dry cleaner located approximately ¾ mile north of the park.	**Potential Impact: Low to moderate.**	**Graphic/Photo: Graphic cut from Google Maps.** 

Finding: The Walnut Creek Fault is mapped as inferred into La Puente, but no extensive information is reported. The Sierra Madre Fault zone is north of La Puente – last proximal earthquake near Sierra Madre was not actually Sierra Madre Fault, but occurred in 1991 (Southern California Earthquake Data Center Caltech website). Liquefaction found as factor during preliminary information gathering/tech memo.	Potential Impact: Low to moderate during earthquake.	Graphic/Photo: Interactive Fault Map (USGS).  - Dotted black and green lines are inferred faults.

Environmental Factor – HYDROLOGY/WATER QUALITY

Finding: See previous section notes regarding location of cleanup sites and dry cleaner in proximity of park.	**Potential Impact: Low to moderate impact to GW via cleanup sites or dry cleaner.**	**Graphic/Photo: See above in previous section.**
Environmental Factor – LAND USE/PLANNING		
Finding: The area is an active open grass field near picnic and playground areas. Soil testing and/or construction should not impact use but schedule of park services should be determined.	**Potential Impact: Low to moderate.**	**Graphic/Photo: View SE; picnic areas and playground in background.** 

Environmental Factor – NOISE		
Finding: Drill rig noise may impact schools or residents located near park.	**Potential Impact: Moderate.**	**Graphic/Photo: View looking east; schools and residences near park.** 
Environmental Factor – PUBLIC SERVICES/RECREATION		

Finding: Park uses include general recreation, baseball/softball, basketball, football, and soccer.	**Potential Impact: Low impact sports/recreations that may be played in open area.**	**Graphic/Photo: None.**
Environmental Factor – TRANSPORTATION/TRAFFIC		
Finding: Park is located within a residential and commercial area of La Puente. Traffic is low to moderate.	**Potential Impact: Low to moderate.**	**Graphic/Photo: None.**

Environmental Factor – UTILITIES/SERVICE SYSTEMS		
Finding: Utilities on park property; storm drains.	**Potential Impact: Low potential.**	**Graphic/Photo: View looking north/NW at storm drain manhole just west of the area.** 
Finding: Below and above ground electrical, water, sewer or fiber optic lines.	**Potential Impact: low to moderate. Close proximity to residents, the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks.**	**Graphic/Photo: View east at lighting and above ground power lines.** 

Upper San Gabriel River Enhanced Watershed Management Program
Regional Project Environmental Study Checklist

Site ID: 160	**Date: 1/7/2015**
Site Name: Sand Angelo Park	**Personnel: Andrew Payne**

Site Address/Location: 245 San Angelo, La Puente, CA 91746

General Notes:

- Park includes basketball & tennis courts, baseball diamond, children's play area/playground, community room (under construction during visit), computer center, fitness areas, picnic areas, and splash pad.

- Overall the open field grass area near the baseball diamonds is most feasible area to sample soil and/or design BMP. The baseball diamond area is not fenced in and will allow for access into area via a parking lot or north east end of park near maintenance building. The park is located within a residential neighborhood in a predominately commercial and industrial area of La Puente. Residential areas are located to south, west and east. Commercial and light industrial areas are located to the north (NE). Railroad tracks run parallel to Valley Boulevard located less than 1,000 feet to the NE of park.

<table>
<tr><th colspan="3">Environmental Factor – AESTHETICS</th></tr>
<tr><td>Finding: Open area in northern portion of park near baseball field is good potential area.</td><td>Potential Impact: Low to moderate impact to grass field, ballpark schedule and other sports played at park in grass area.</td><td>Graphic/Photo: View looking south at baseball field.
</td></tr>
<tr><td>Finding: Smaller open grass area on south/SW side of park.</td><td>Potential Impact: Low impact to grass field.</td><td>Graphic/Photo: View looking NE at smaller potential.
</td></tr>
</table>

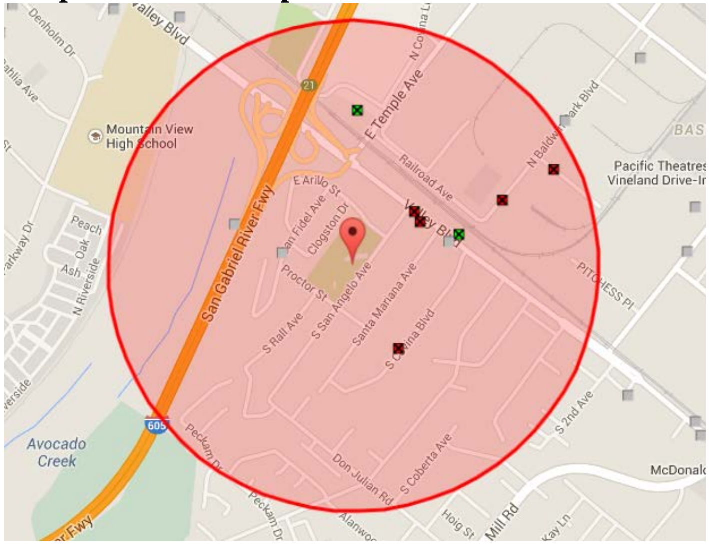
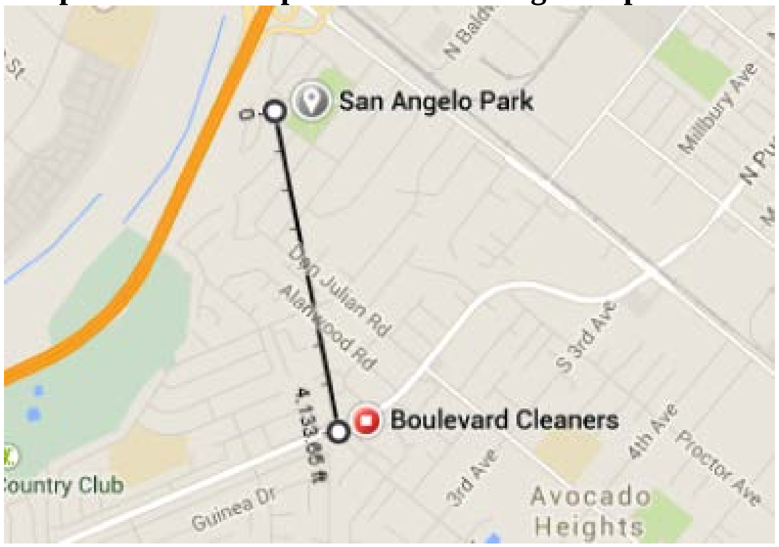
Environmental Factor – AGRICULTURAL/FOREST RESOURCES		
Finding: No observed Ag/Forest resources at park during visit.	**Potential Impact: Unknown/None.**	**Graphic/Photo: None.**
Environmental Factor – AIR QUALITY/GHG EMISSIONS		

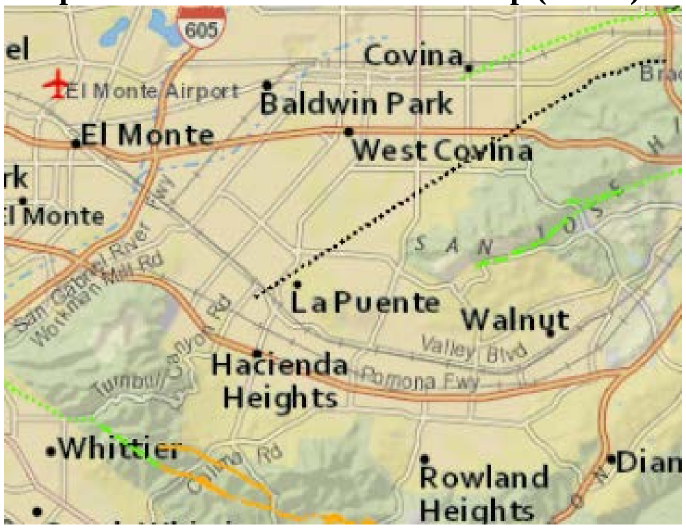
Finding: Residential neighborhood located south, east and west of park.	**Potential Impact: Low to moderate – residences in close proximity to area and park boundary.**	**Graphic/Photo: View looking west at neighborhood sharing wall with park to W/NW.** 
Finding: Residential neighborhood east/SE of park.	**Potential Impact: Low impact - near area and park boundary.**	**Graphic/Photo: View looking SE at residences across San Angelo Avenue.** 

Finding: Residential neighborhood SW and NW of park.	**Potential Impact: Low to moderate – residences in close proximity to park boundary.**	**Graphic/Photo: View looking NW at residences SW and NW of park.** 
Environmental Factor – BIOLOGICAL RESOURCES		

Finding: Trees are located around ball field. However drill rig and/or construction can be positioned to minimize impact.	**Potential Impact: Low.**	**Graphic/Photo: View looking NE at trees around ball field.** 
Finding: Trees are located around smaller area. However drill rig and/or construction can be positioned to minimize impact.	**Potential Impact: Low to moderate.**	**Graphic/Photo: View looking NE at smaller area.** 

Finding: No nesting birds were observed upon visit. However drill rig and/or construction can be positioned to minimize impact.	**Potential Impact: Low.**	**Graphic/Photo: None.**
Environmental Factor – CULTURAL RESOURCES		
Finding: Nothing observed during site visit.	**Potential Impact: Unknown.**	**Graphic/Photo: None.**

Environmental Factor – GEOLOGY/SOILS/HAZARDOUS MATERIALS		
Finding: No apparent issues during initial site visit. Seven former cleanup sites are located within ½ mile of the park. One closed site located less than 1,500 feet up gradient of park. One DTSC cleanup site located ½ mile north of park.	**Potential Impact: Low to moderate.**	**Graphic/Photo: Graphic cut from SWRCB Geotracker website.** 
Finding: No apparent issues during initial site visit. Closest dry cleaner (Boulevard Cleaners) is located less than 1 mile to the SSE and up gradient of the park; GW direction in area is reported as NW (Geotracker).	**Potential Impact: Low to moderate.**	**Graphic/Photo: Graphic cut from Google Maps.** 

<table>
<tr>
<td>Finding: The Walnut Creek Fault is mapped as inferred into La Puente, but no extensive information is reported. The Sierra Madre Fault zone is north of La Puente – last proximal earthquake near Sierra Madre was not actually Sierra Madre Fault, but occurred in 1991 (Southern California Earthquake Data Center Caltech website).
Liquefaction found as factor during preliminary information gathering/tech memo.</td>
<td>Potential Impact: Low to moderate during earthquake.</td>
<td>Graphic/Photo: Interactive Fault Map (USGS).


- Dotted black line is Walnut Creek Fault and Sierra Madre Fault zone is north of La Puente.</td>
</tr>
<tr>
<td colspan="3">Environmental Factor – HYDROLOGY/WATER QUALITY</td>
</tr>
<tr>
<td>Finding: Notes regarding location of gas stations and dry cleaners in proximity of park.</td>
<td>Potential Impact: Low to moderate impact to GW via gas station or dry cleaner.</td>
<td>Graphic/Photo: see above in previous section.</td>
</tr>
</table>

Finding: Area around park has storm drains and no other drainage or wash proximal to park.	**Potential Impact: None.**	**Graphic/Photo: None.**
Environmental Factor – LAND USE/PLANNING		
Finding: Ball field is most feasible location. Soil testing and/or construction should not impact use but schedule of park services should be determined.	**Potential Impact: Low to moderate impact potential to ball field usage.**	**Graphic/Photo: View east of ball field.** 

Finding: Park uses include general recreation, basketball, baseball/softball, tennis, and play ground.	**Potential Impact: Low impact to park uses in smaller area.**	**Graphic/Photo: View looking east at park playground and other amenities from the smaller area.** 
Environmental Factor – NOISE		

Finding: Drill rig noise may impact residents located in close proximity to park in all directions.	**Potential Impact: Moderate.**	**Graphic/Photo: None.**
Environmental Factor – PUBLIC SERVICES/RECREATION		
Finding: Park uses include general recreation, baseball/softball, basketball, potentially soccer, tennis, and play ground.	**Potential Impact: Low impact sports/recreations that may be played in the ball field or smaller area.**	**Graphic/Photo: None**

Environmental Factor – TRANSPORTATION/TRAFFIC		
Finding: Park is located within a residential area and traffic is low.	**Potential Impact: Low to no.**	**Graphic/Photo: None.**
Environmental Factor – UTILITIES/SERVICE SYSTEMS		

Finding: Transformer located near maintenance house in northern corner of park.	**Potential Impact: Low potential.**	**Graphic/Photo: View east along drainage and walking path.** 
Finding: Below and above ground electrical, water, sewer or fiber optic lines.	**Potential Impact: Low to moderate. Close proximity to residents, the potential for below ground utilities is expected. Dig alert and subsurface planning will be utilized in pre-subsurface tasks.**	**Graphic/Photo: See above photo.**

Appendix C-1

Model Calibration and Parameters

Table C-1-1. Regional Board model parameter ranges

Parameter Description	Units	Range Of Initial Values	USGR Model Values
Hydrology Parameters			
• Interception storage capacity	in.	0.01-0.40	0.05-0.2
• Manning's n for overland flow	--	0.01-0.15	0.1-0.2
• Upper zone nominal soil moisture storage	in.	0.05-2.0	0.5
• Fraction of GW inflow to deep recharge	--	0.0-0.50	0.0
• Fraction of remaining ET from baseflow	--	0.0-0.20	0.0
• Fraction of remaining ET from active GW	--	0.0-0.20	0.0
• Lower zone nominal soil moisture storage	in.	2.0-15.0	7.0
• Interflow inflow parameter	--	1.0-10.0	1.0
• Interflow recession parameter	--	0.3-0.85	0.6-0.7
• Lower zone ET parameter	--	0.1-0.9	0.25-0.6
Water Quality Parameters			
• Initial storage of water quality constituent on land surface	lbs	0.0-0.0005	0.0
• Wash-off potency factor for sediment associated constituent	lbs/ton	0.0-10.0	0.03-2.57
• Scour potency factor for sediment associated constituent	lbs/ton	NA	0.03-2.57
• Accumulation rate of water quality constituent of land surface	lbs/ac/day	0.0-0.0005	n/a
• Maximum storage of water quality constituent on land surface	lbs/ac/day	0.0-0.0005	n/a
• Rate of surface runoff that removes 90% of stored mass	in/hr.	0.0-0.5	n/a
• General first order in-stream loss rate of constituent	1/day	0.2-0.2	0.1-0.2
Sediment Parameters			
• Coefficient in the soil detachment equation	--	0.05-0.75	0.1-0.35
• Exponent in the soil detachment equation	--	1.0-3.0	1.81
• Coefficient in the sediment wash-off equation	--	0.1-10.0	0.35-0.85
• Exponent in the sediment wash-off equation	--	1.0-3.0	2.0
• Coefficient in the sediment scour equation	--	0.0-10.0	0.0
• Exponent in the sediment scour equation	--	1.0-5.0	2.0
• Solids accumulation rate on the land surface	lbs/ac/day	0.0-30.0	0.003
• Fraction of solids removed from land surface per day	--	0.01-1.0	0.025

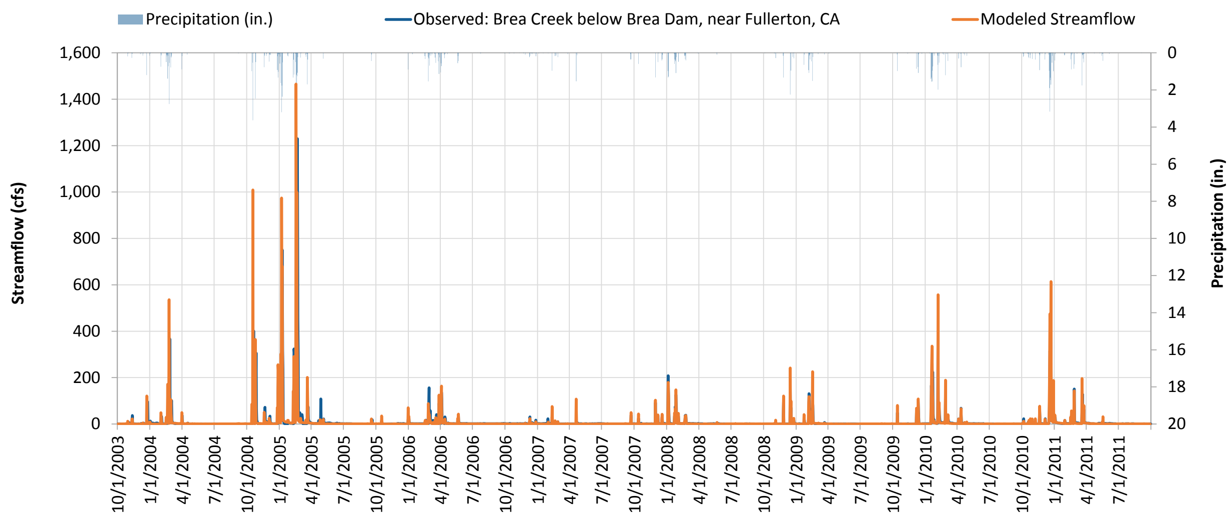


Figure C-1-1. Daily flow at Brea Creek below Brea Dam, near Fullerton, CA (Station ID: 11088500).

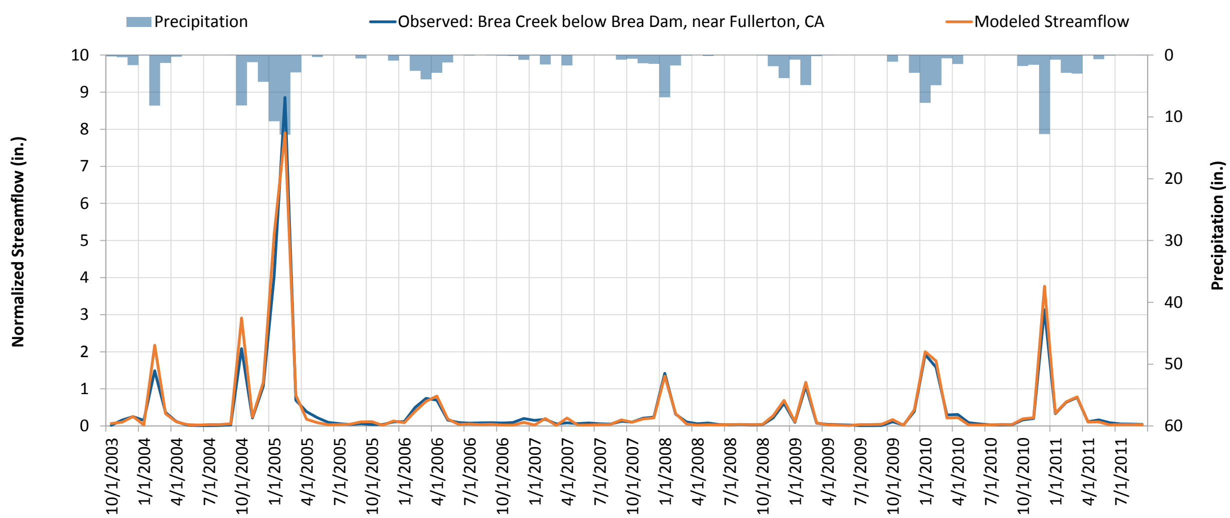


Figure C-1-2. Monthly flow at Brea Creek below Brea Dam, near Fullerton, CA (Station ID: 11088500).

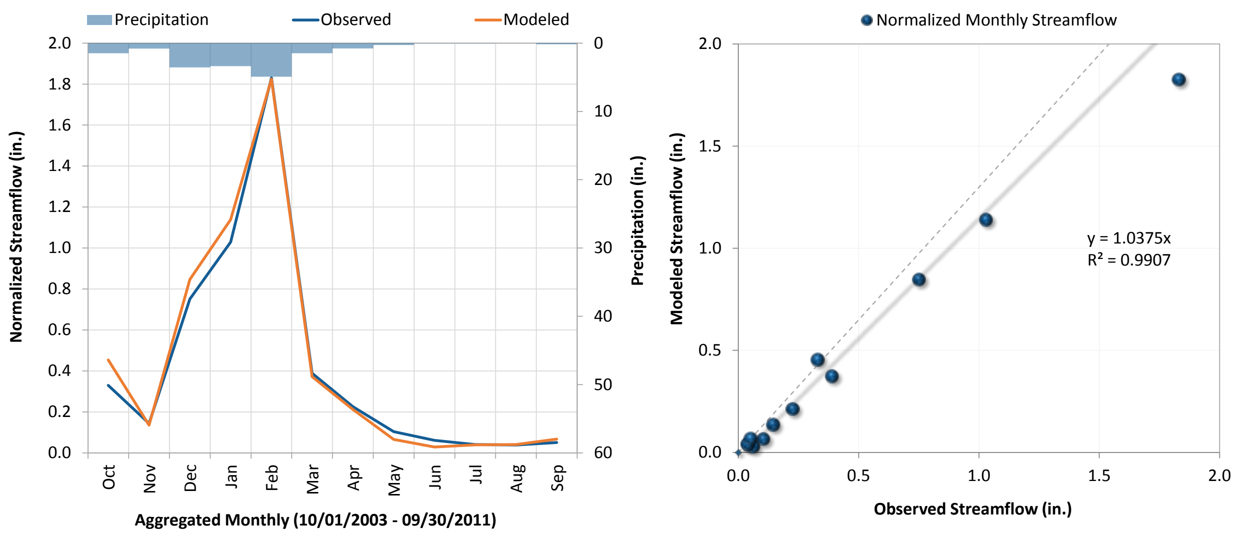


Figure C-1-3. Average monthly flow at Brea Creek below Brea Dam, near Fullerton, CA (Station ID: 11088500).

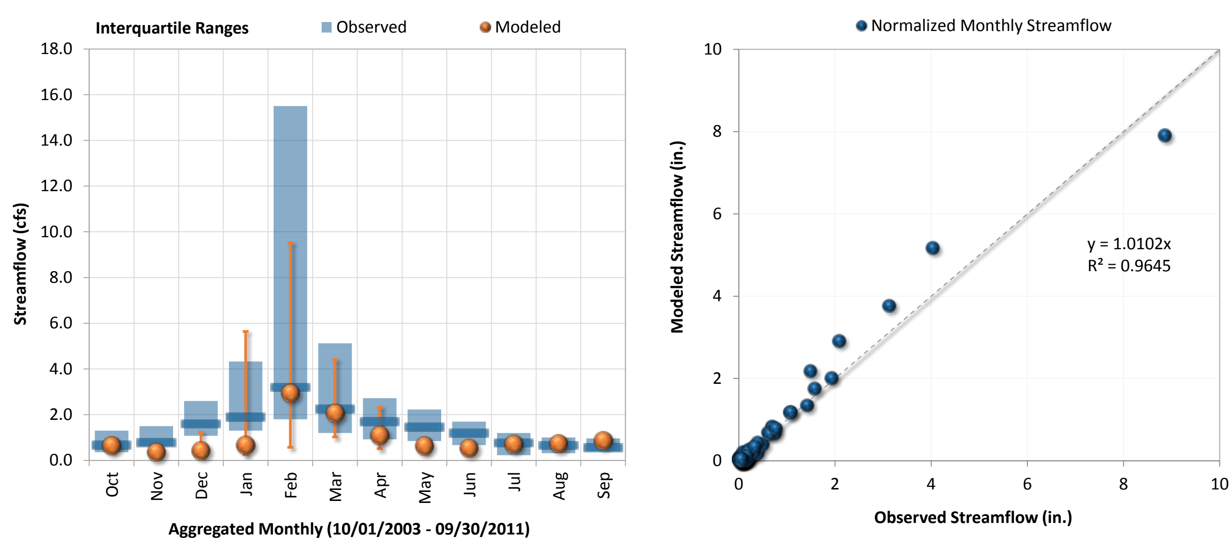


Figure C-1-4. Monthly flow interquartiles at Brea Creek below Brea Dam, near Fullerton, CA (Station ID: 11088500).

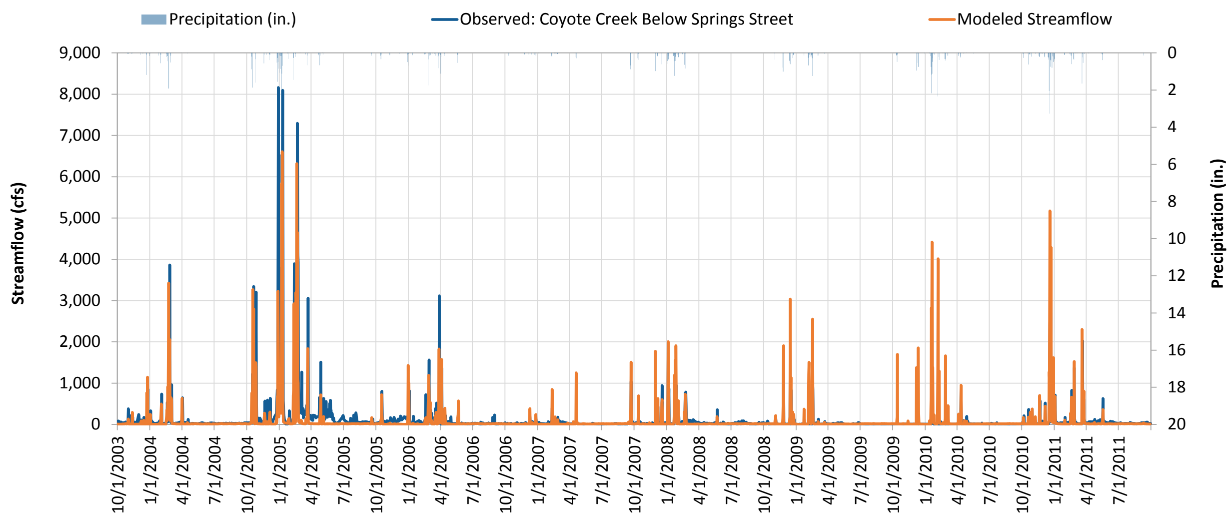


Figure C-1-5. Daily flow at Coyote Creek Below Springs Street (Station ID: F354).

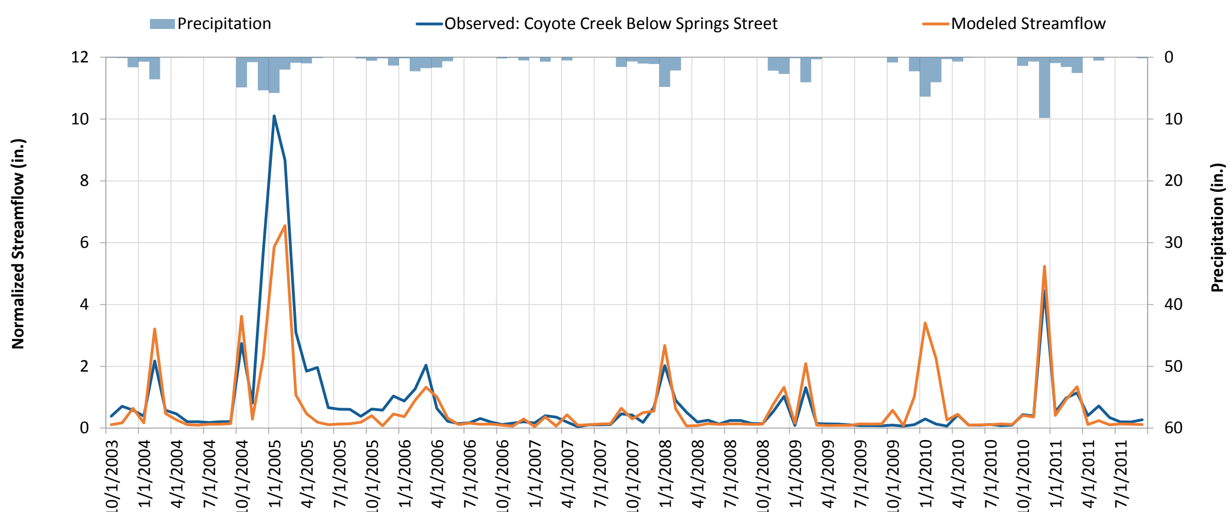


Figure C-1-6. Monthly flow at Coyote Creek Below Springs Street (Station ID: F354).

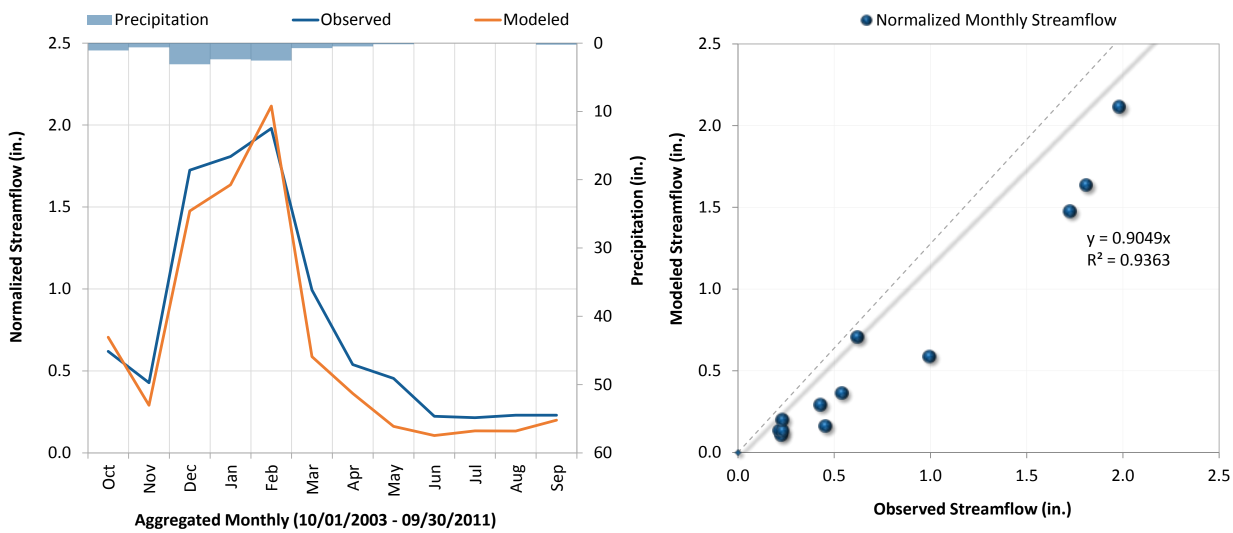


Figure C-1-7. Average monthly flow at Coyote Creek Below Springs Street (Station ID: F354).

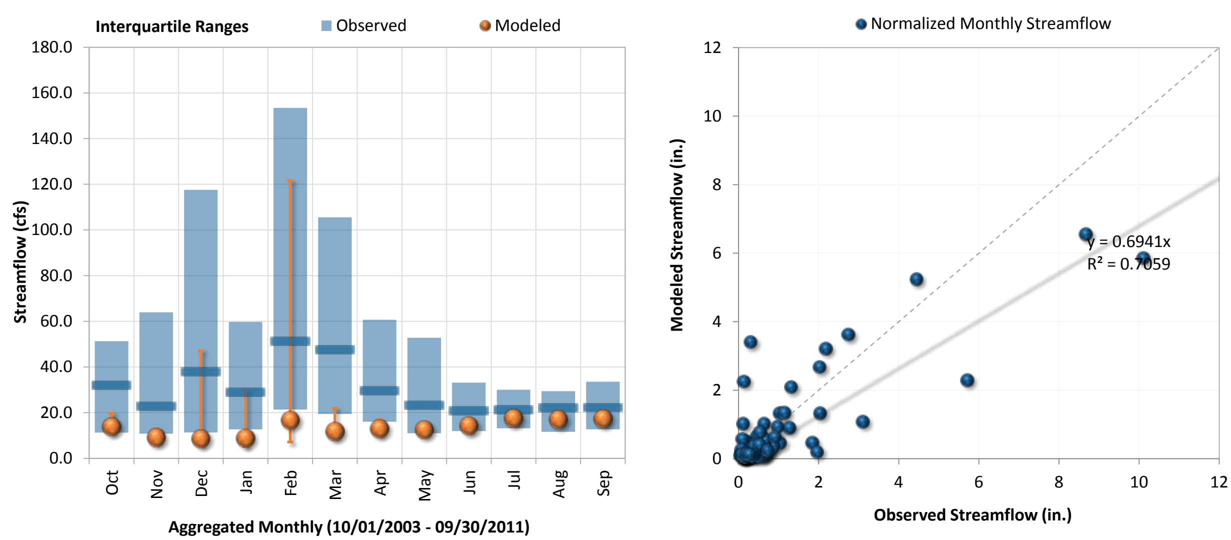


Figure C-1-8. Monthly flow interquartiles at Coyote Creek Below Springs Street (Station ID: F354).

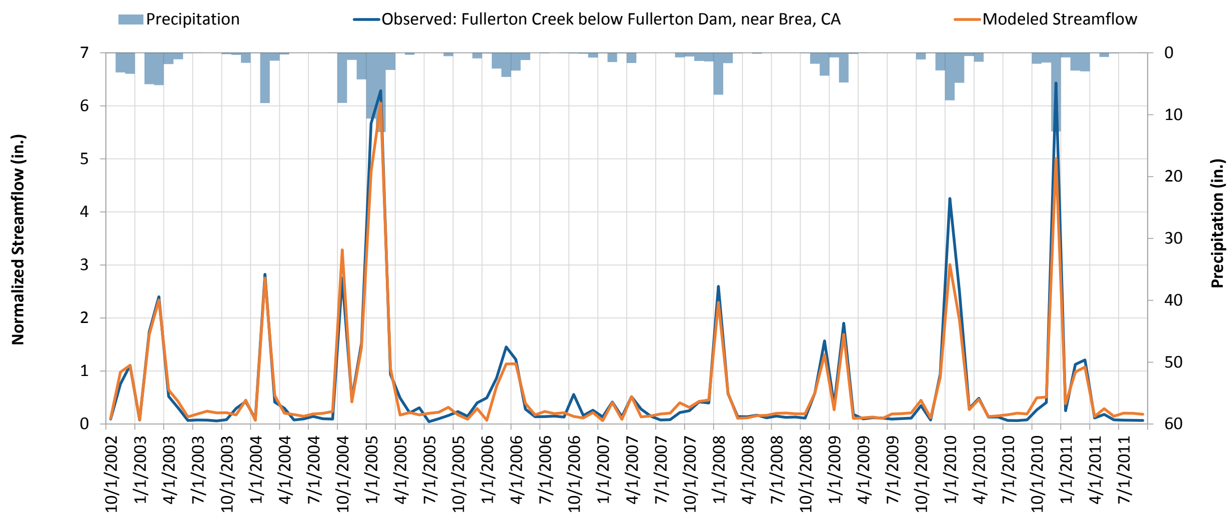


Figure C-1- 9. Monthly flow at Fullerton Creek below Fullerton Dam, near Brea, CA (Station ID: 11089500).

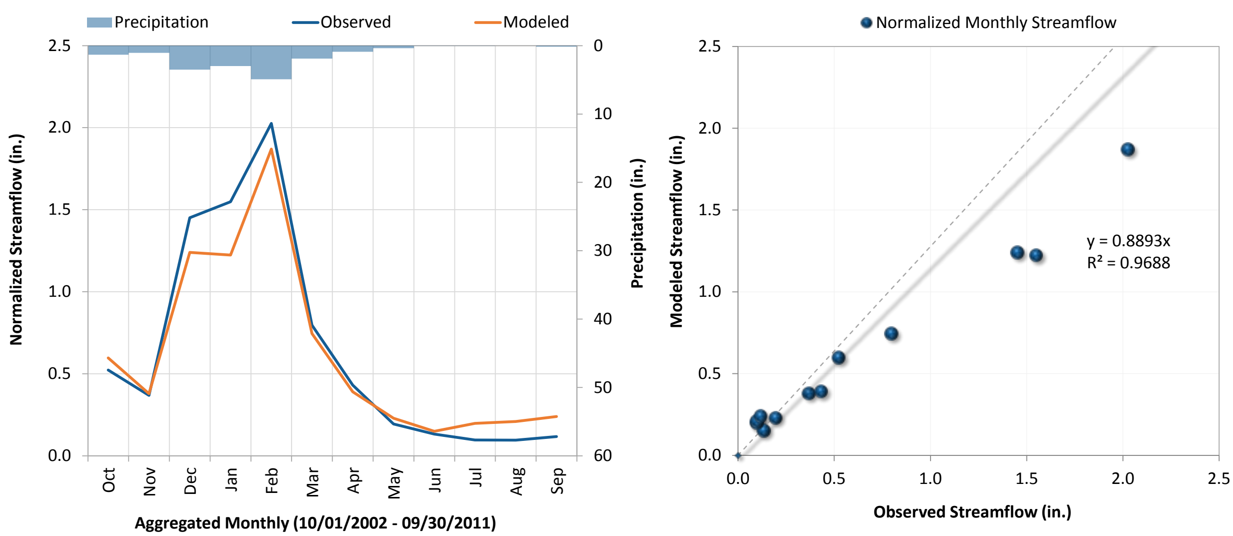


Figure C-1- 10. Average monthly flow at Fullerton Creek below Fullerton Dam, near Brea, CA (Station ID: 11089500).

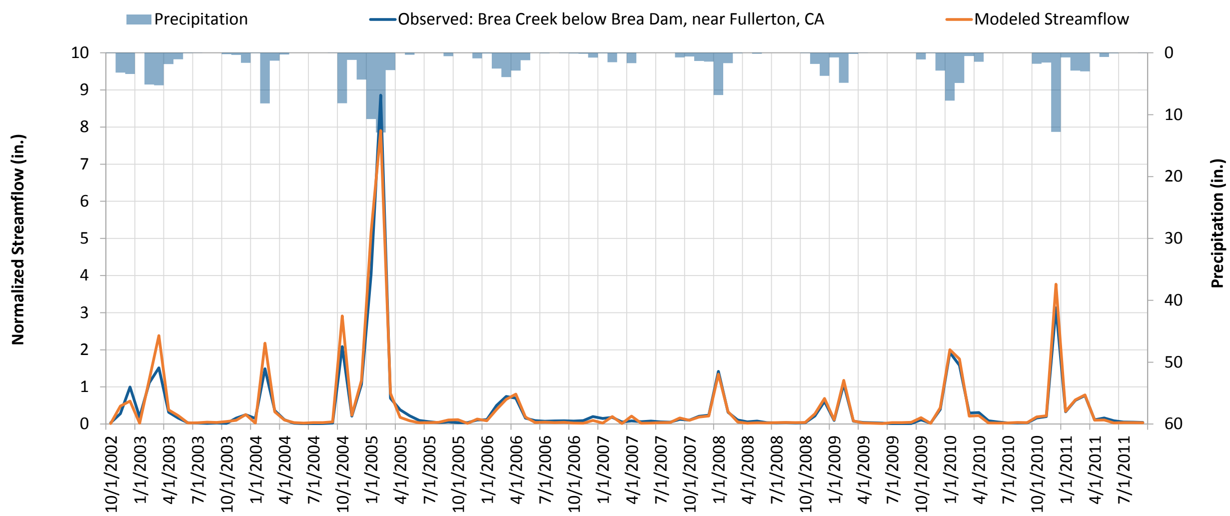
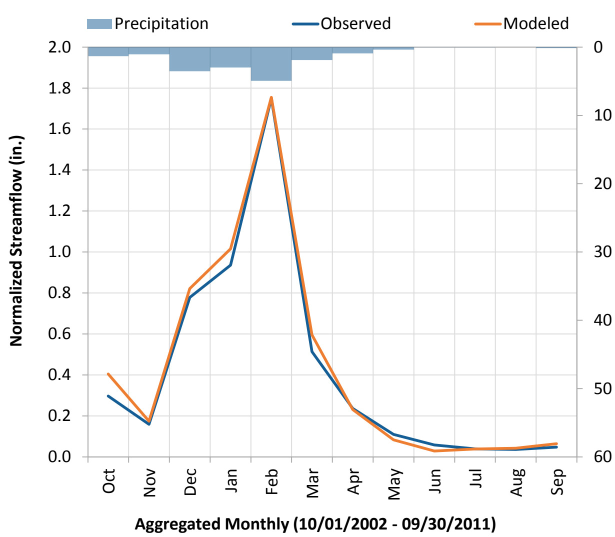


Figure C-1- 11. Monthly flow at Brea Creek below Brea Dam, near Fullerton, CA (Station ID: 11088500).



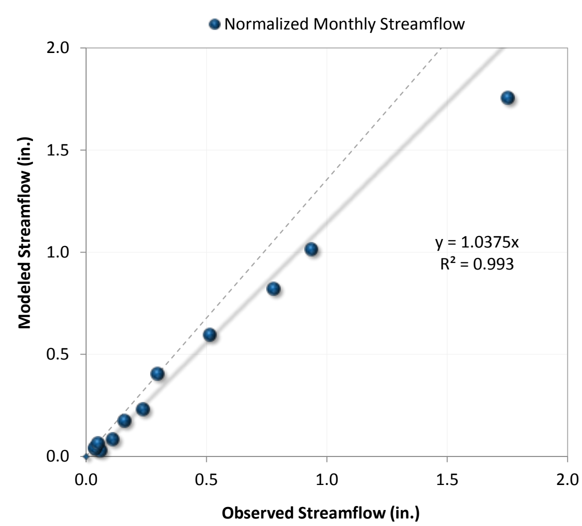


Figure C-1- 12. Average monthly flow at Brea Creek below Brea Dam, near Fullerton, CA (Station ID: 11088500).

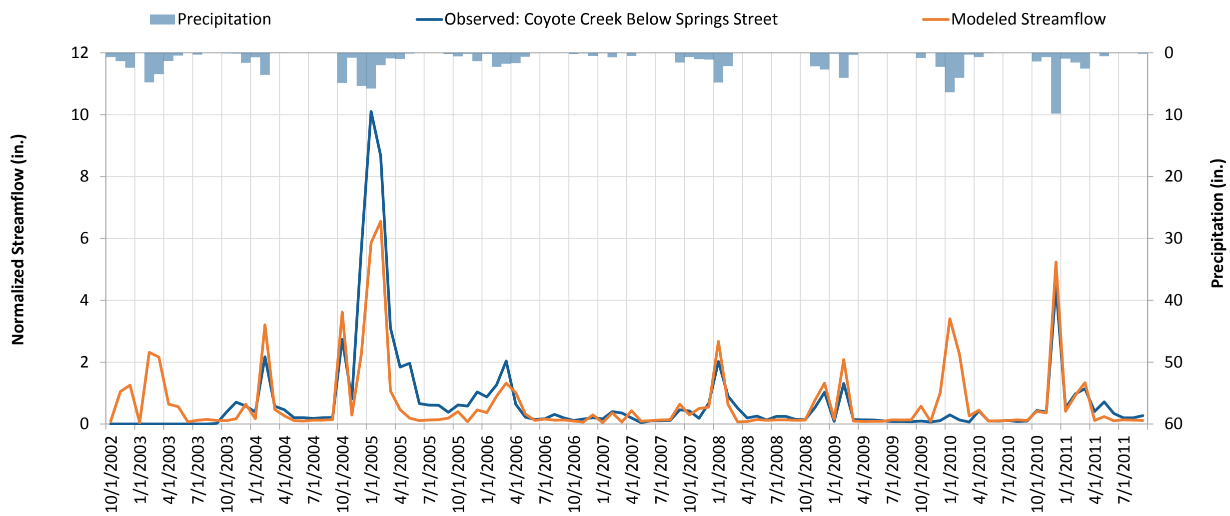


Figure C-1- 13. Monthly flow at Coyote Creek Below Springs Street (Station ID: F354).

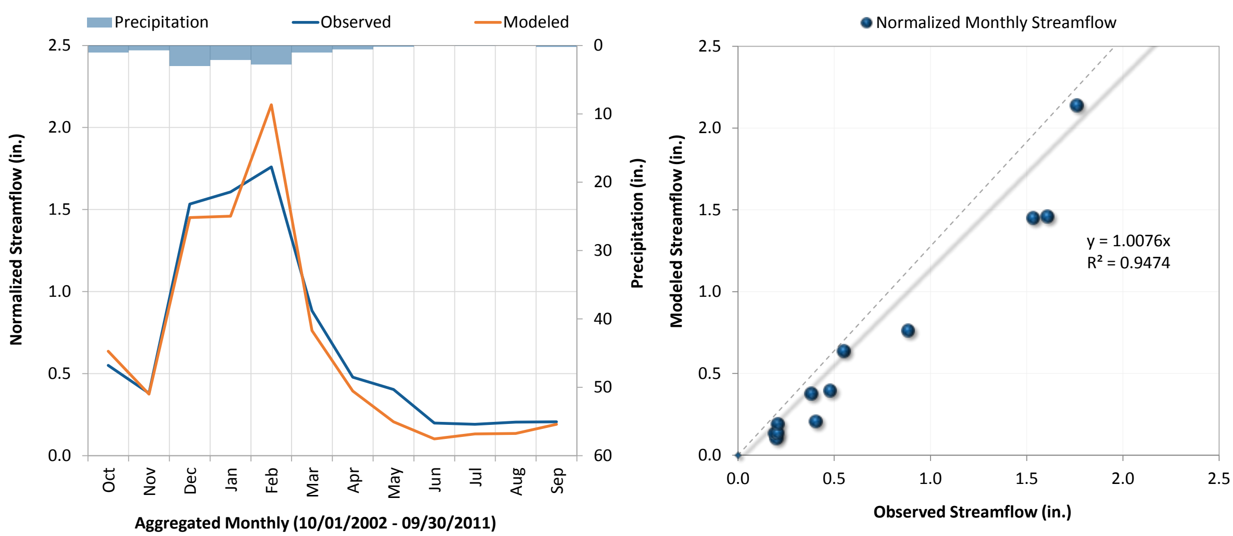


Figure C-1- 14. Average monthly flow at Coyote Creek Below Springs Street (Station ID: F354).

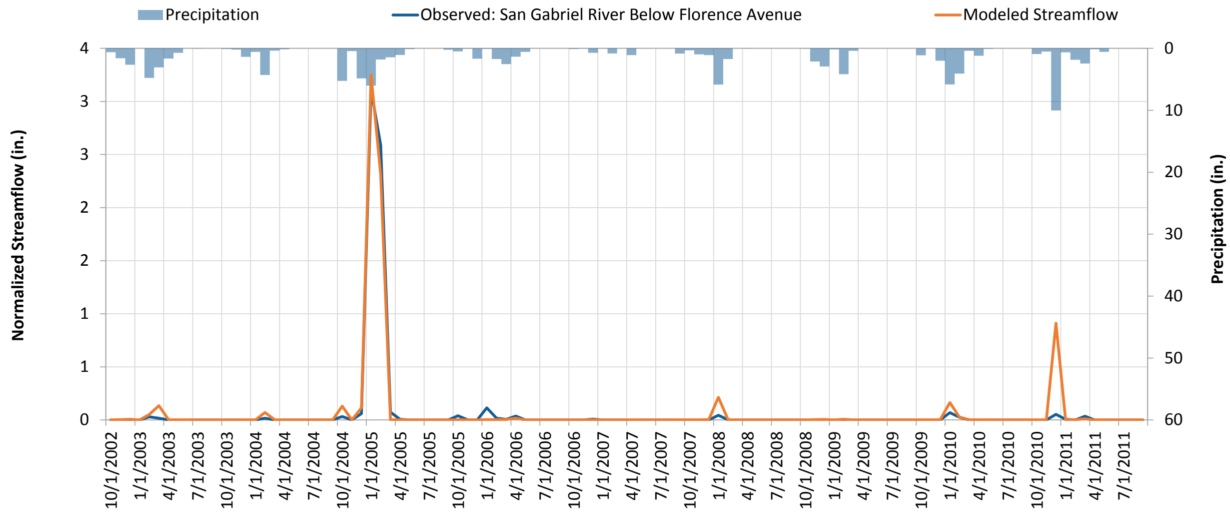


Figure C-1- 15. Monthly flow at San Gabriel River Below Florence Avenue (Station ID: F262C).

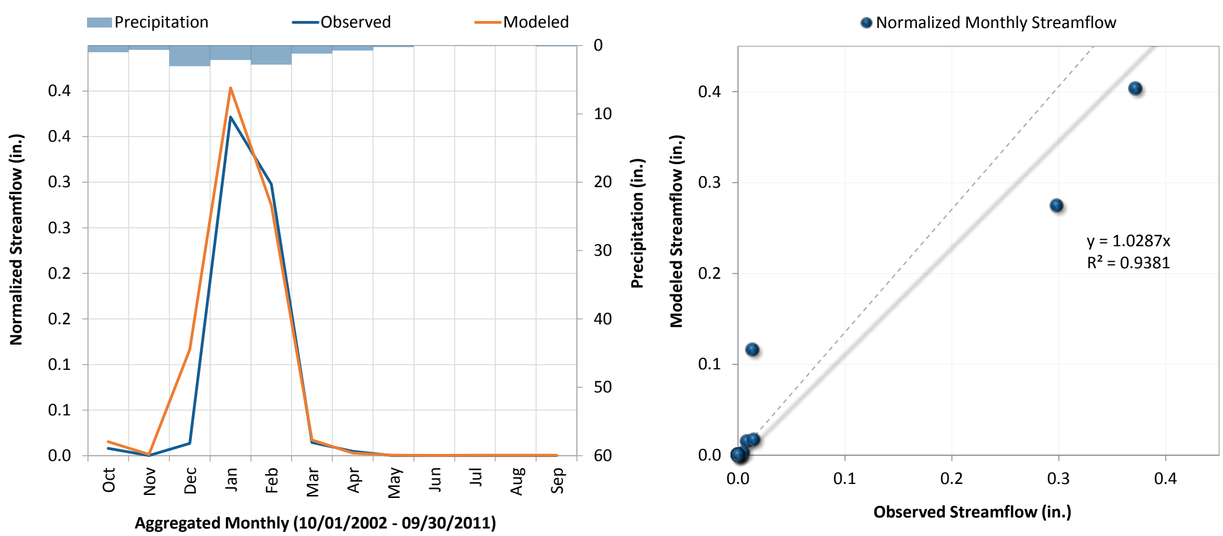


Figure C-1- 16. Average monthly flow at San Gabriel River Below Florence Avenue (Station ID: F262C).

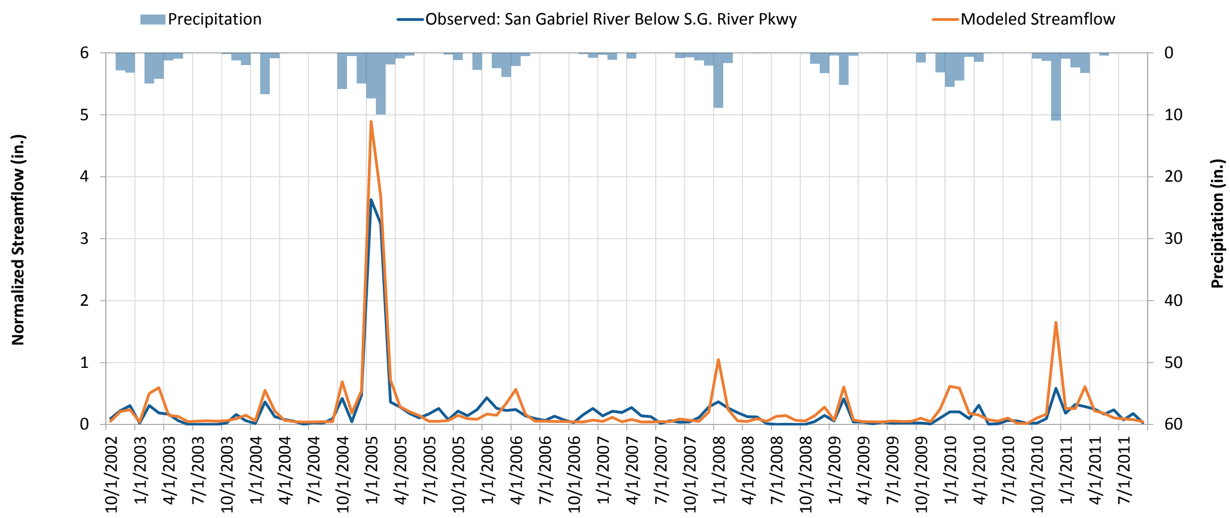


Figure C-1- 17. Monthly flow at San Gabriel River Below S.G. River Pkwy (Station ID: F263C).

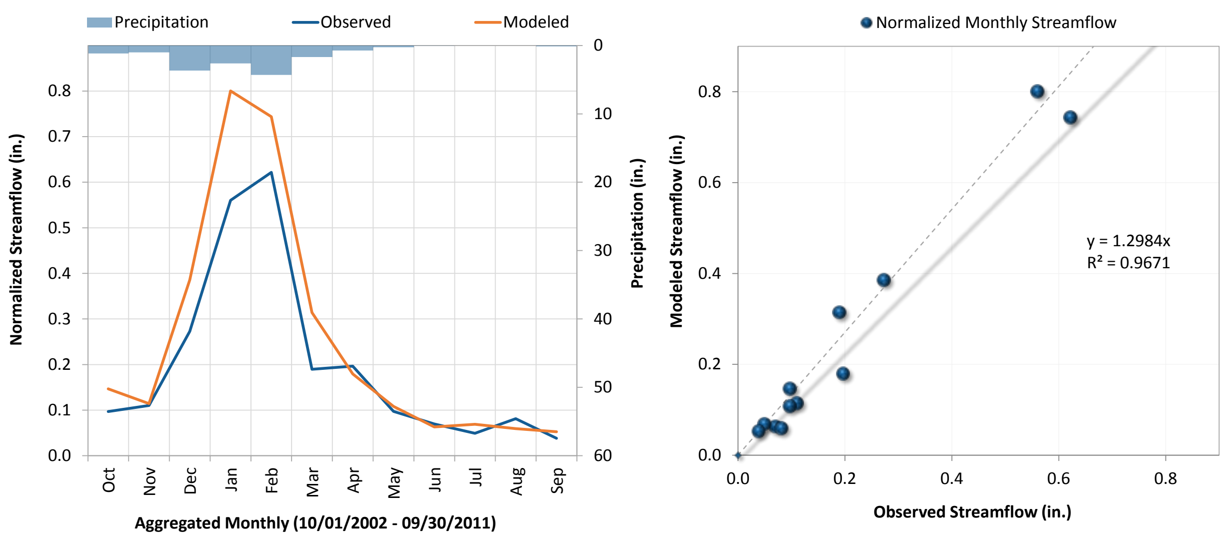


Figure C-1- 18. Average monthly flow at San Gabriel River Below S.G. River Pkwy (Station ID: F263C).

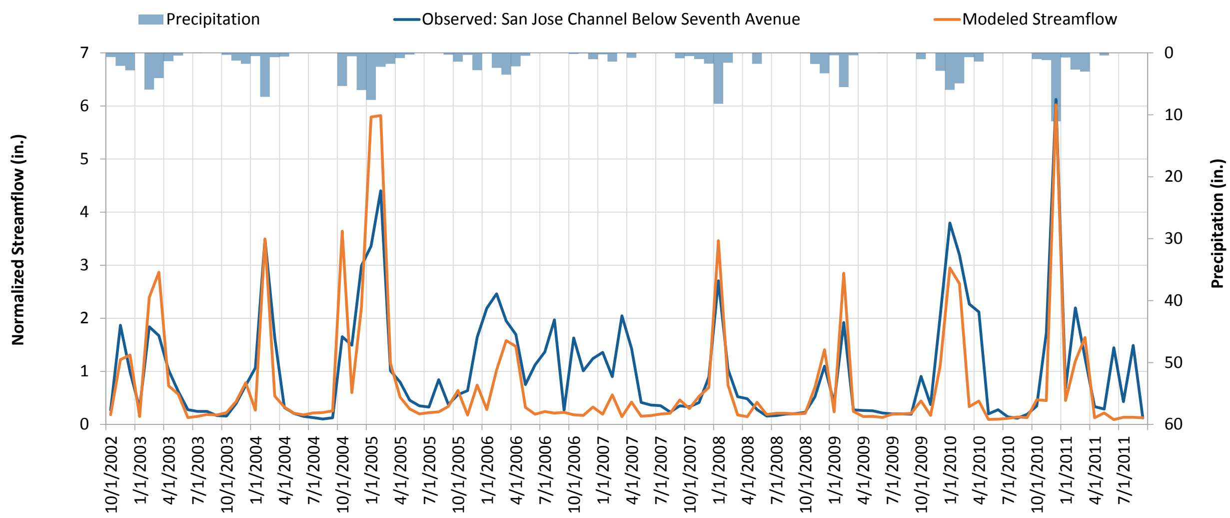
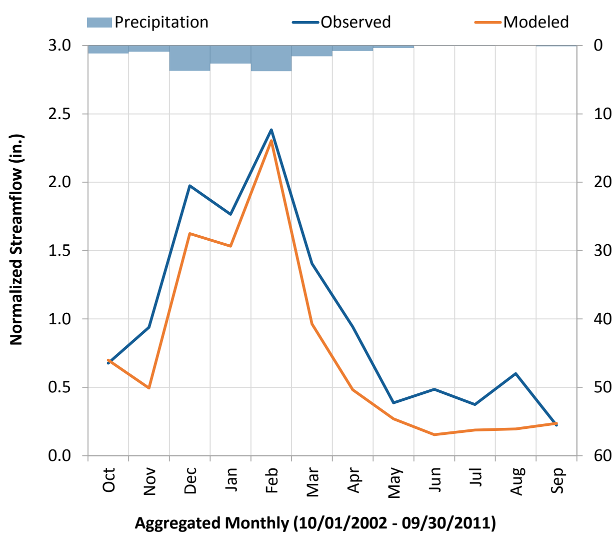


Figure C-1- 19. Monthly flow at San Jose Channel Below Seventh Avenue (Station ID: F312B).



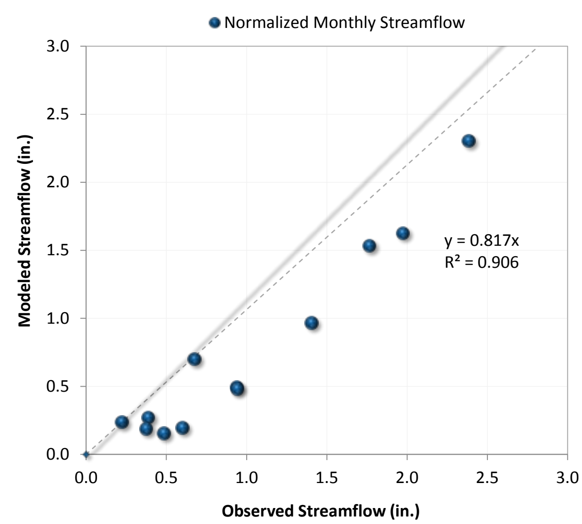


Figure C-1- 20. Average monthly flow at San Jose Channel Below Seventh Avenue (Station ID: F312B).

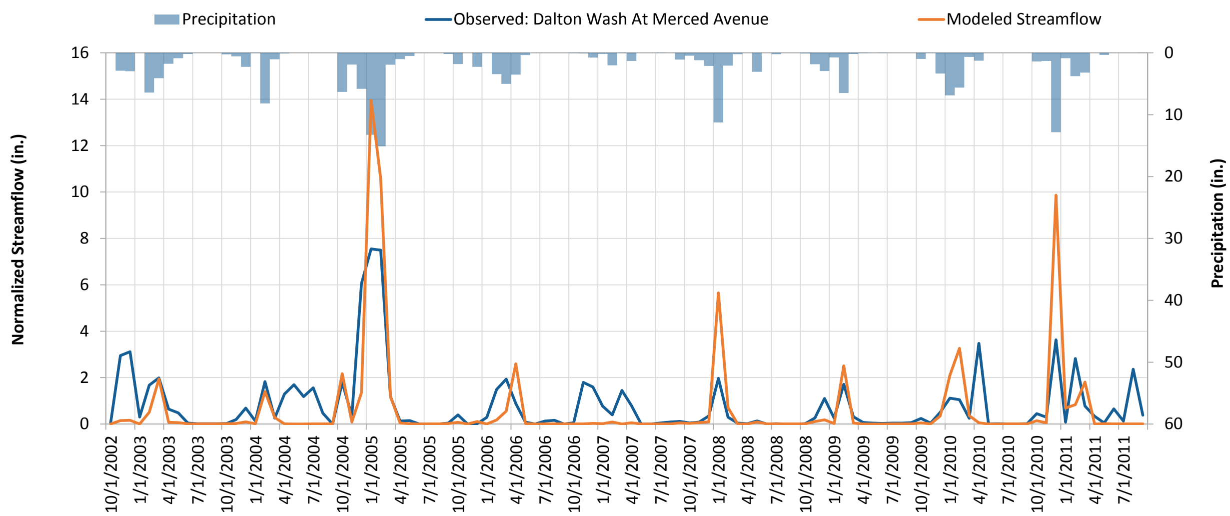


Figure C-1- 21. Monthly flow at Dalton Wash At Merced Avenue (Station ID: F274B).

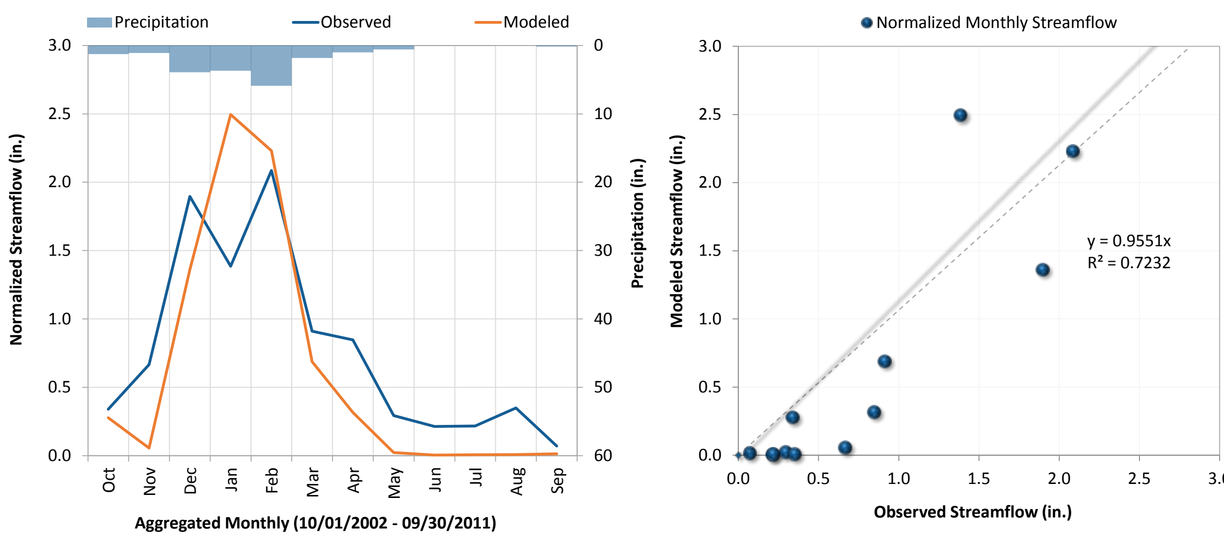


Figure C-1- 22. Average monthly flow at Dalton Wash At Merced Avenue (Station ID: F274B).

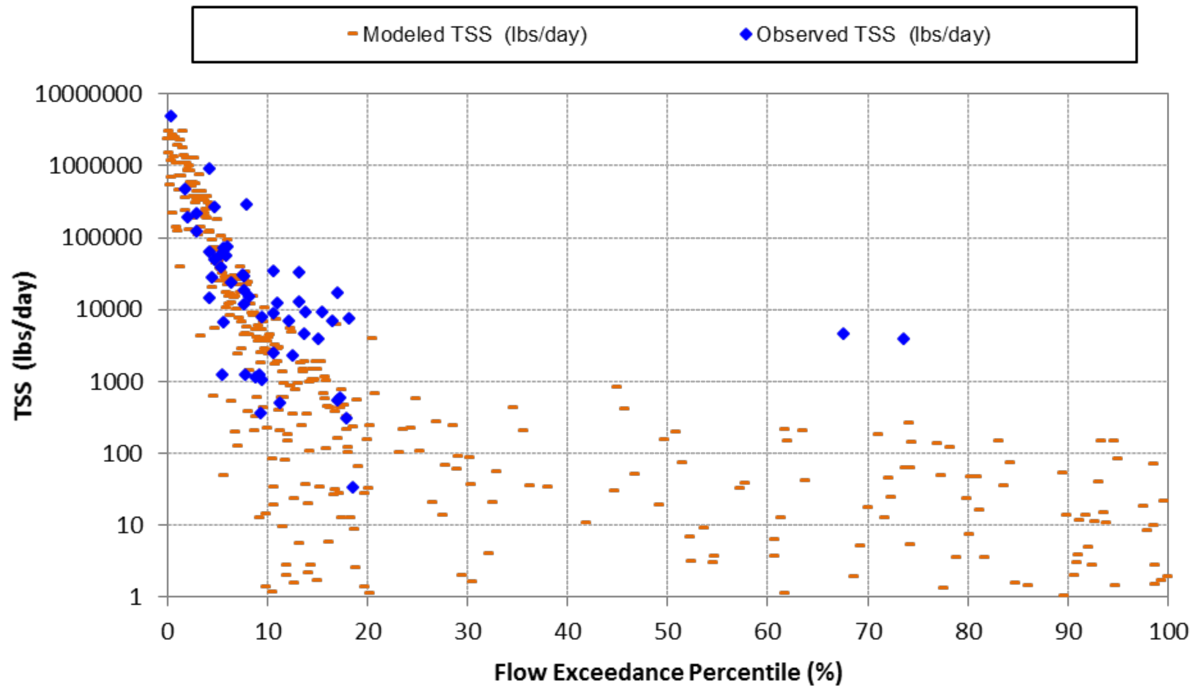


Figure C-1-23. Simulated vs. observed load duration plots for Total Sediment (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

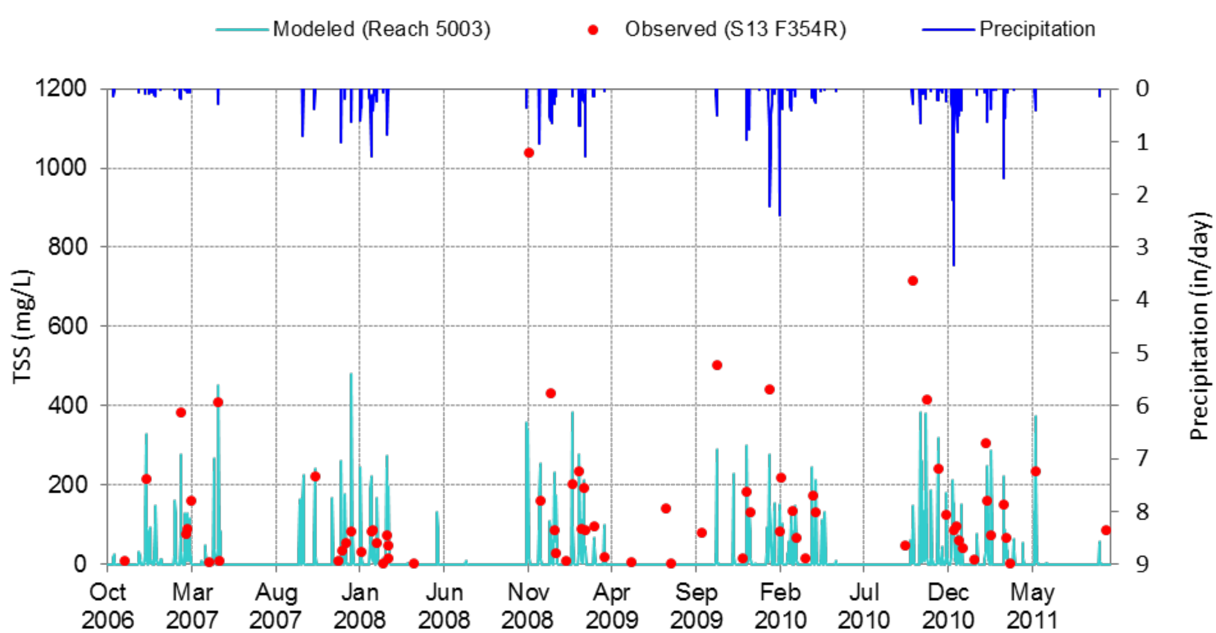


Figure C-1-24. Simulated vs. observed timeseries plots for Total Sediment (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

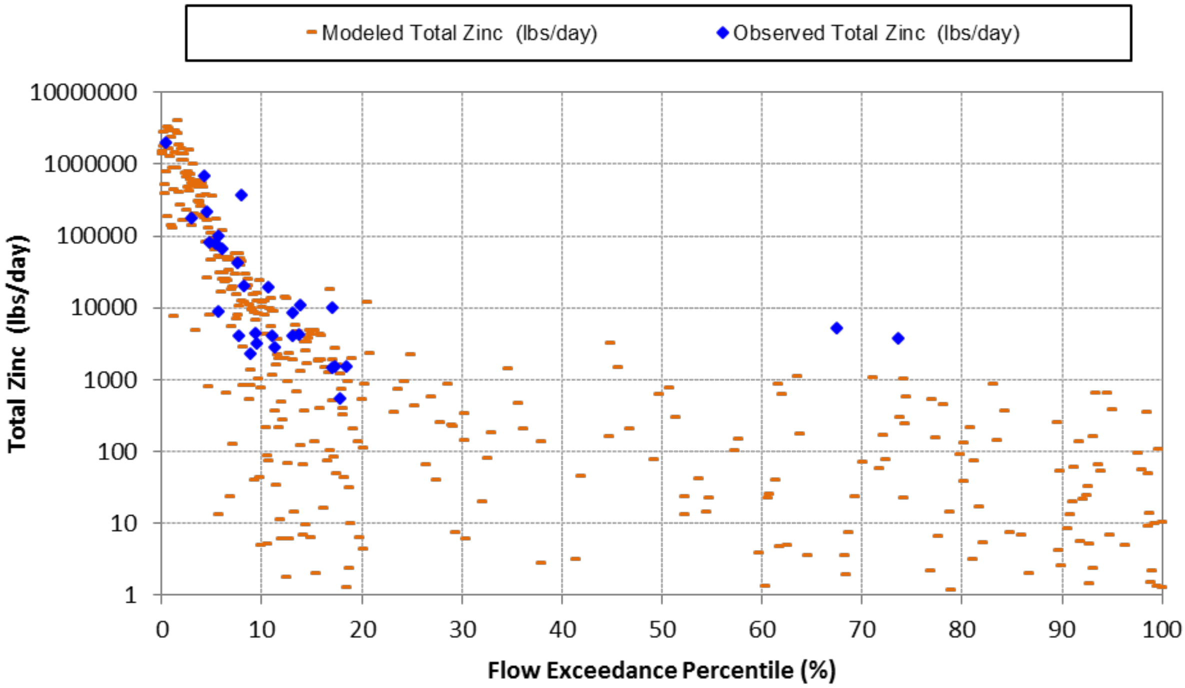


Figure C-1-25. Simulated vs. observed load duration plots for Total Zinc (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

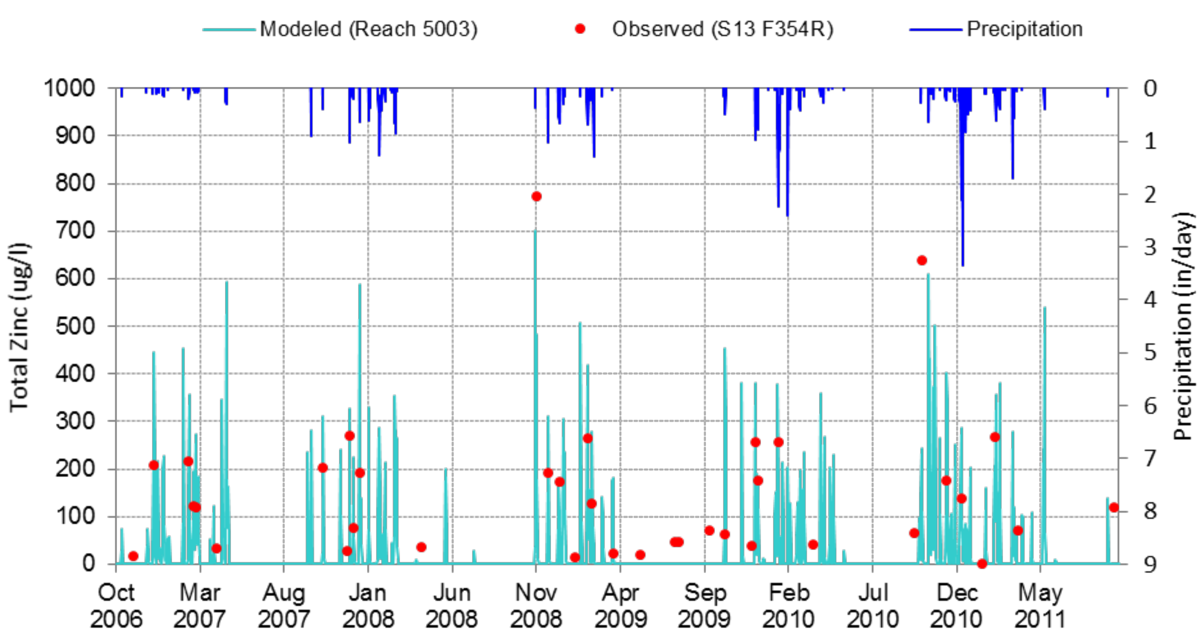


Figure C-1-26. Simulated vs. observed timeseries plots for Total Zinc (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

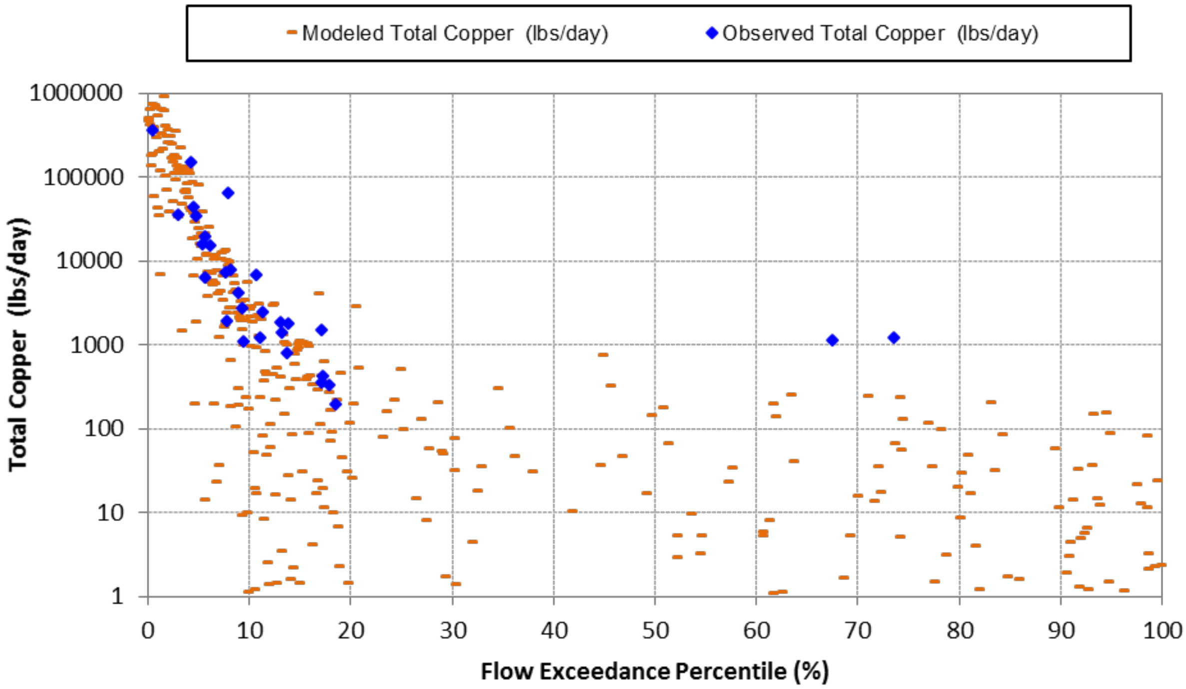


Figure C-1-27. Simulated vs. observed load duration plots for Total Copper (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

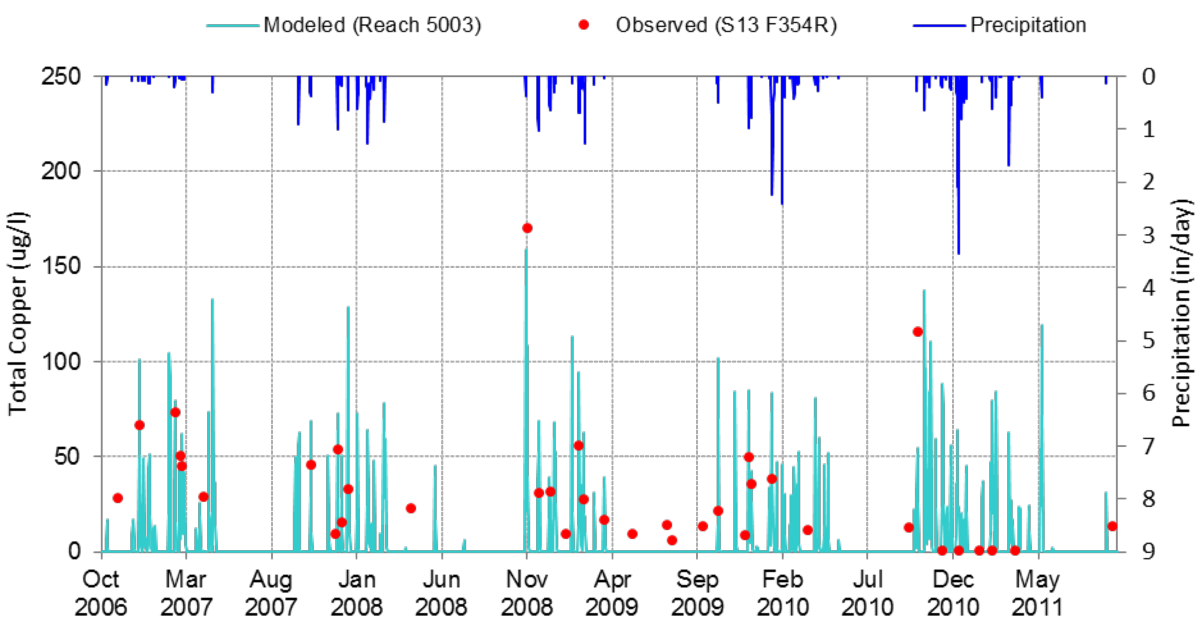


Figure C-1-28. Simulated vs. observed timeseries plots for Total Copper (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

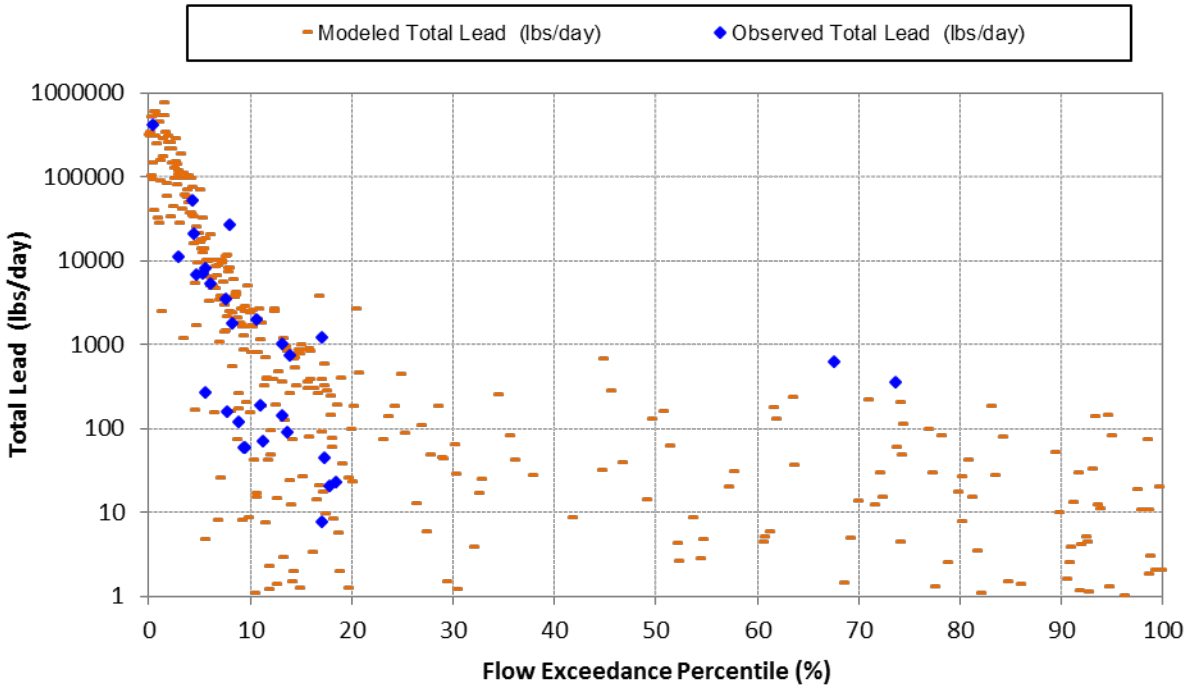


Figure C-1-29 Simulated vs. observed load duration plots for Total Lead (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

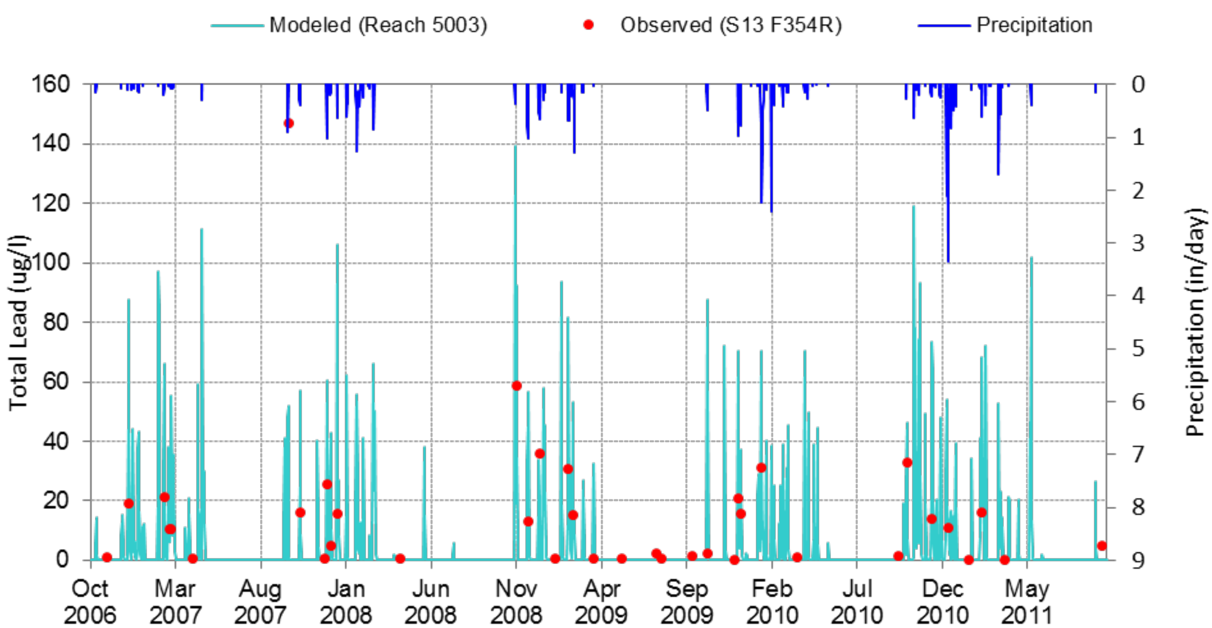


Figure C-1-30. Simulated vs. observed timeseries plots for Total Lead (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

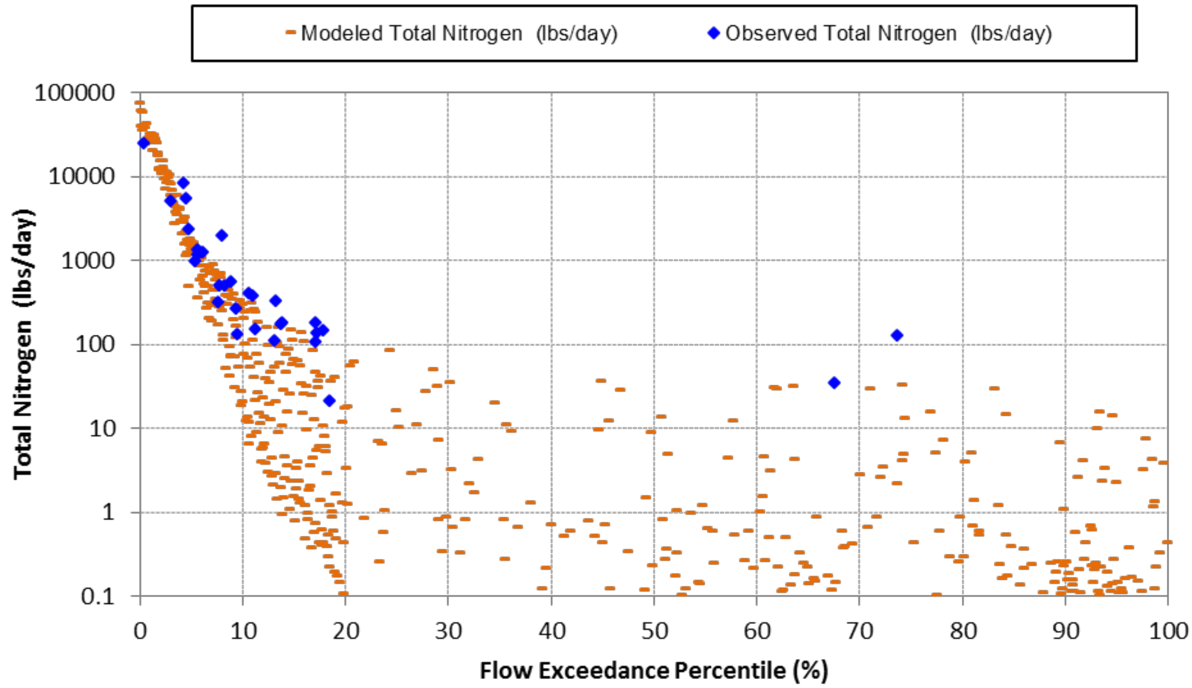


Figure C-1-31. Simulated vs. observed load duration plots for Total Nitrogen (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

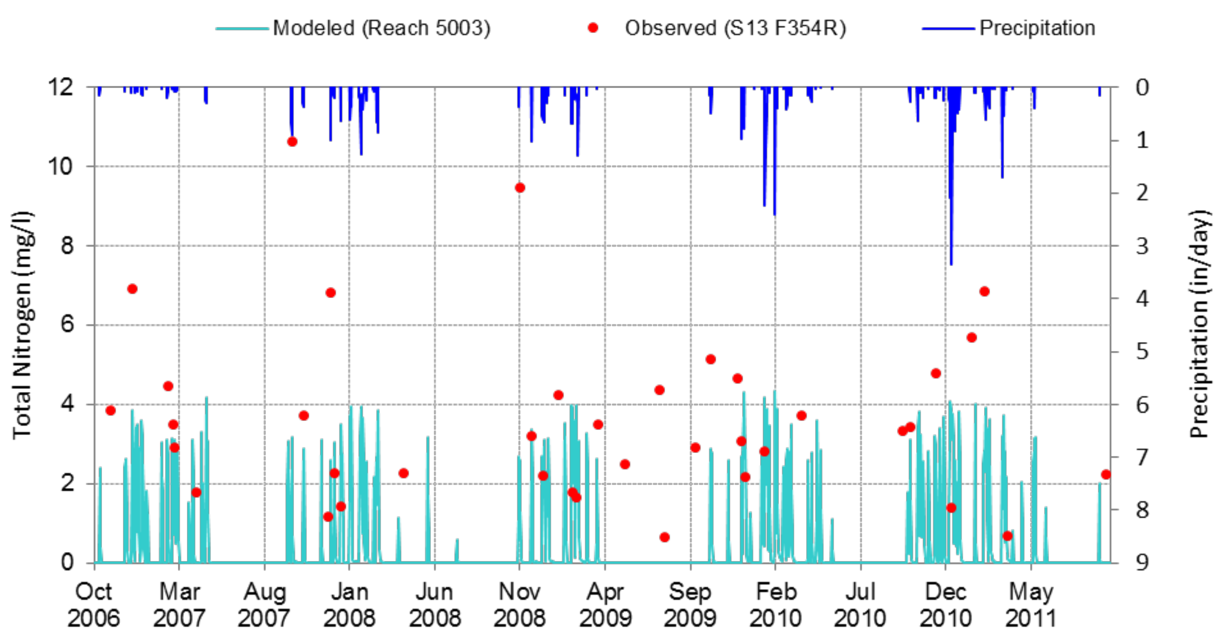


Figure C-1-32. Simulated vs. observed timeseries plots for Total Nitrogen (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

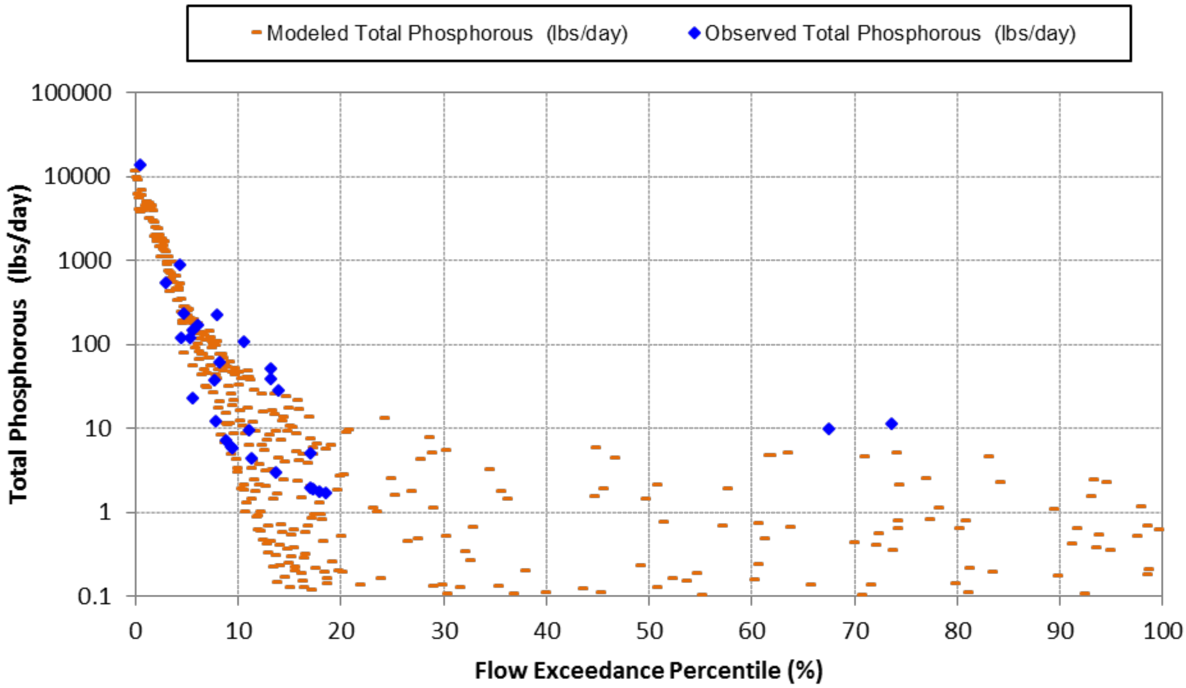


Figure C-1-33 Simulated vs. observed load duration plots for Total Phosphorous (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

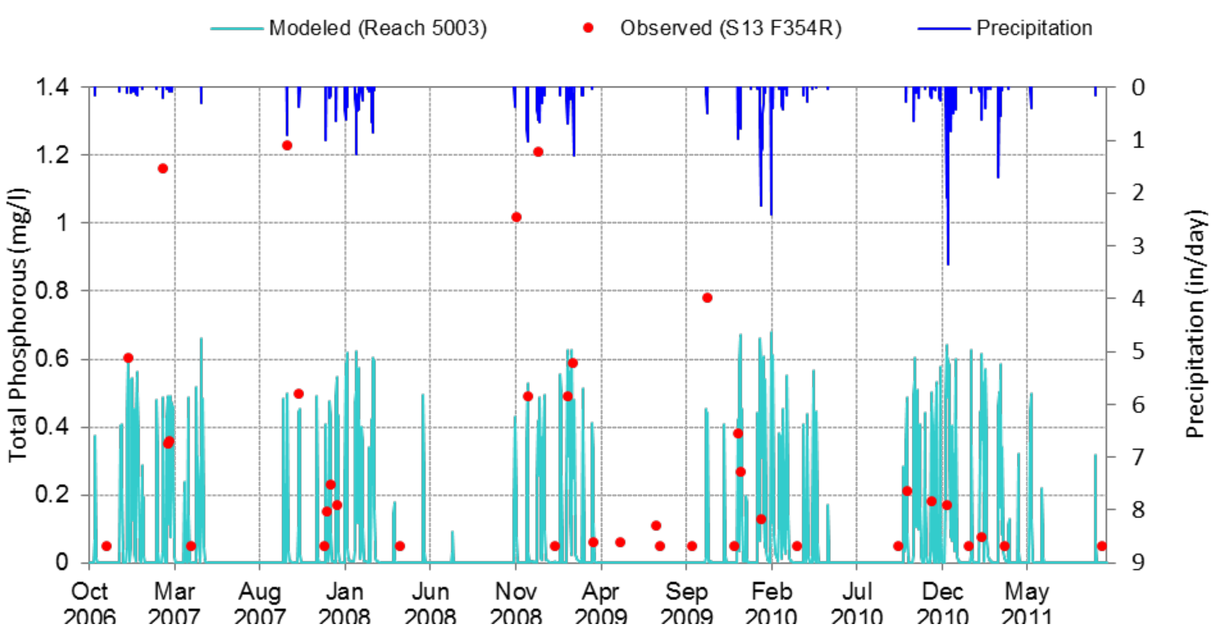


Figure C-1-34. Simulated vs. observed timeseries plots for Total Lead (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

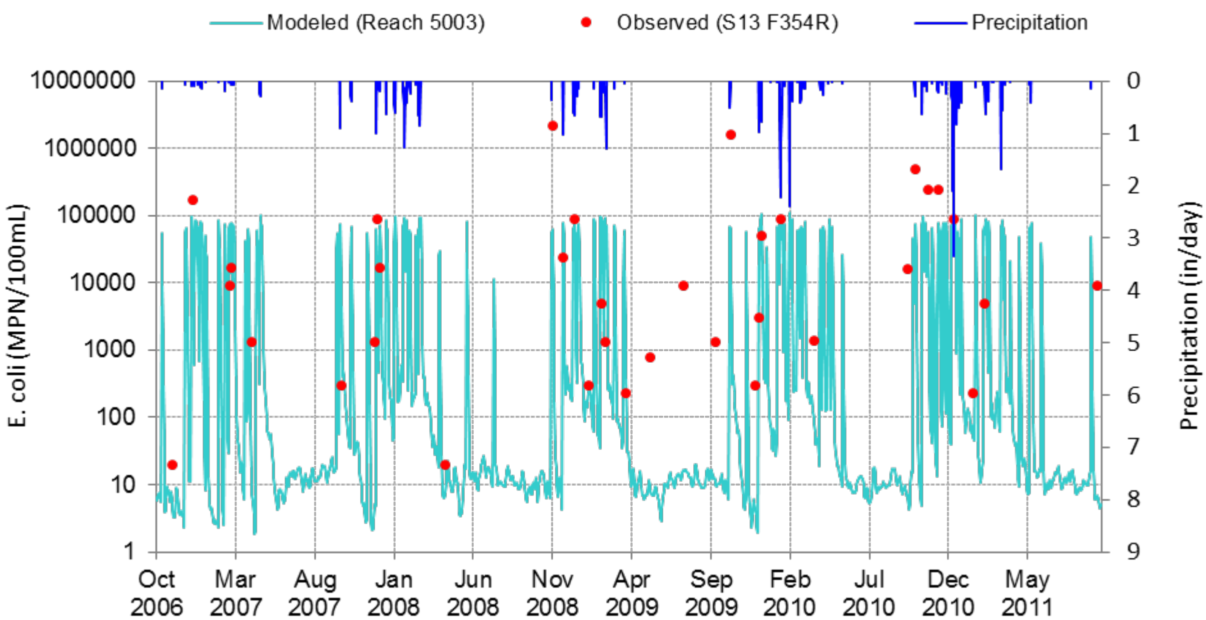


Figure C-1-35. Simulated vs. observed timeseries plots for *E. coli* (10/1/2006 through 9/30/2011) at Coyote Creek Mass Emission Station (S13).

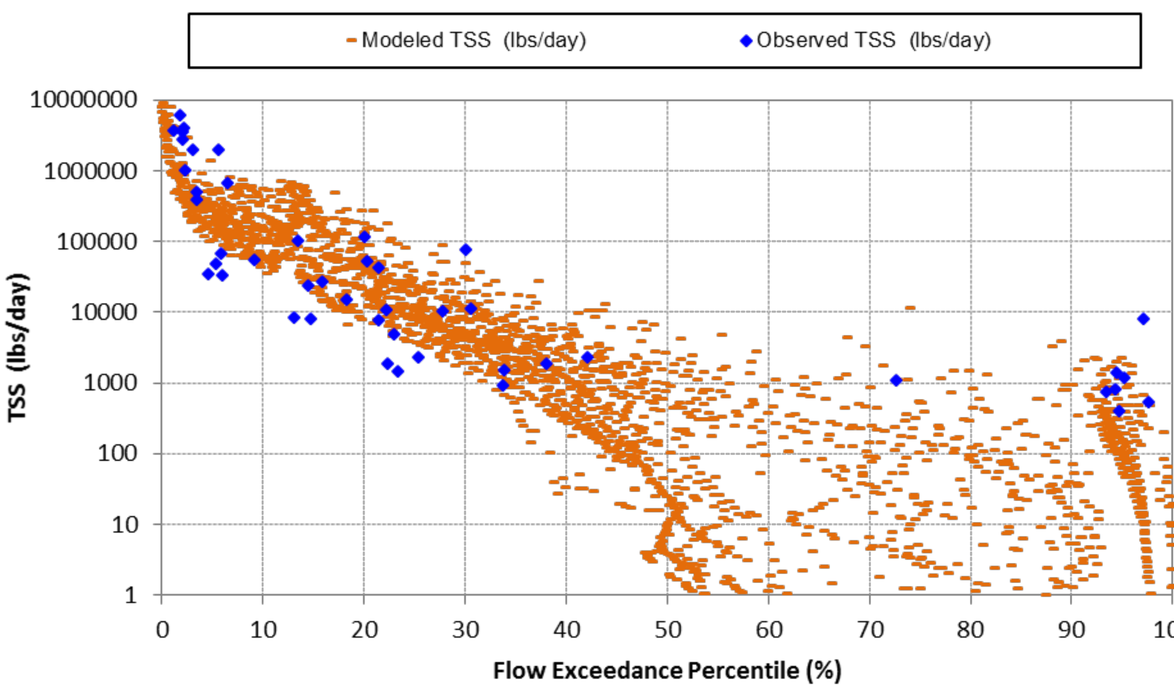


Figure C-1-36. Simulated vs. observed load duration plots for Total Sediment (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

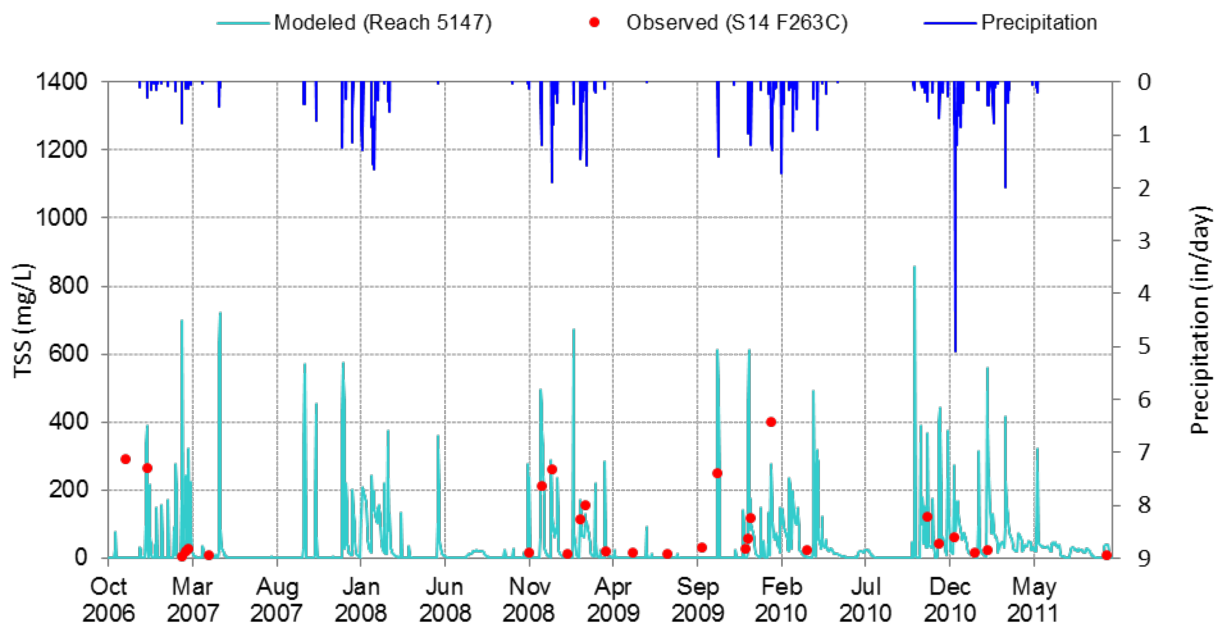


Figure C-1-37. Simulated vs. observed timeseries plots for Total Sediment (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

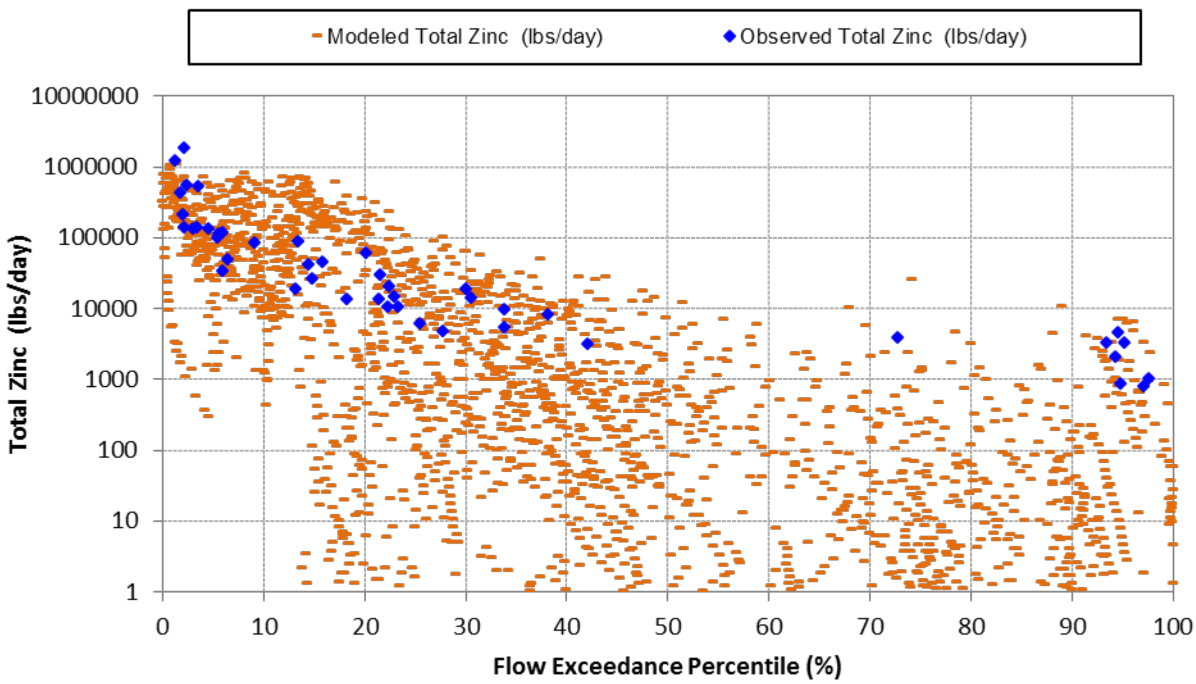


Figure C-1-38. Simulated vs. observed load duration plots for Total Zinc (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

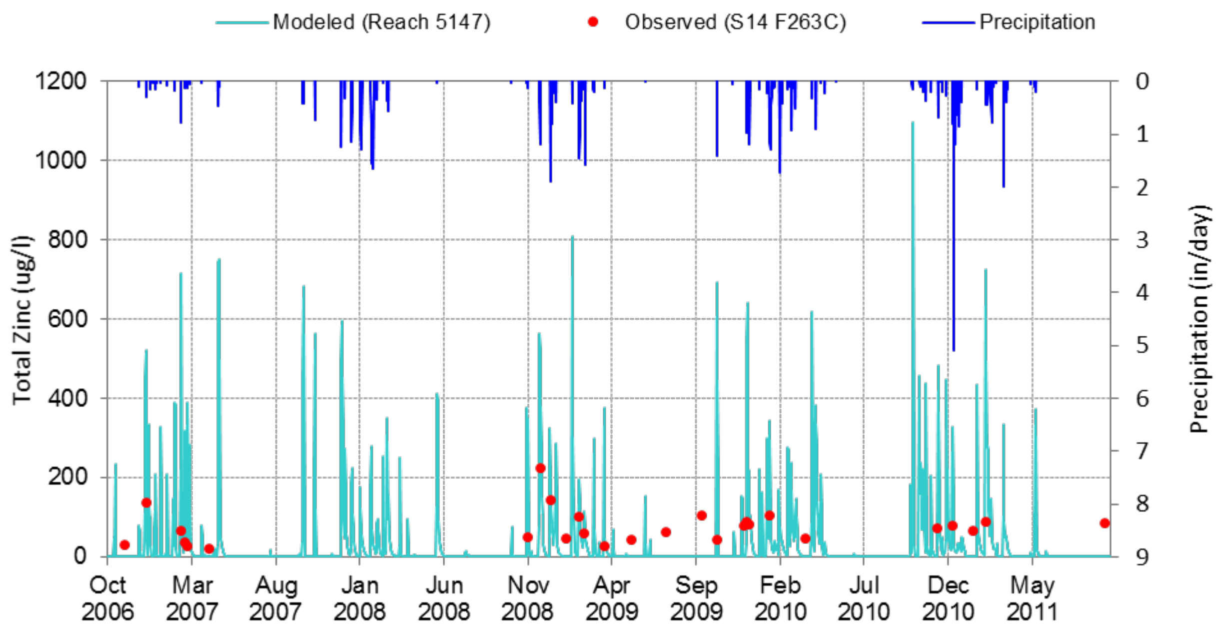


Figure C-1-39. Simulated vs. observed timeseries plots for Total Zinc (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

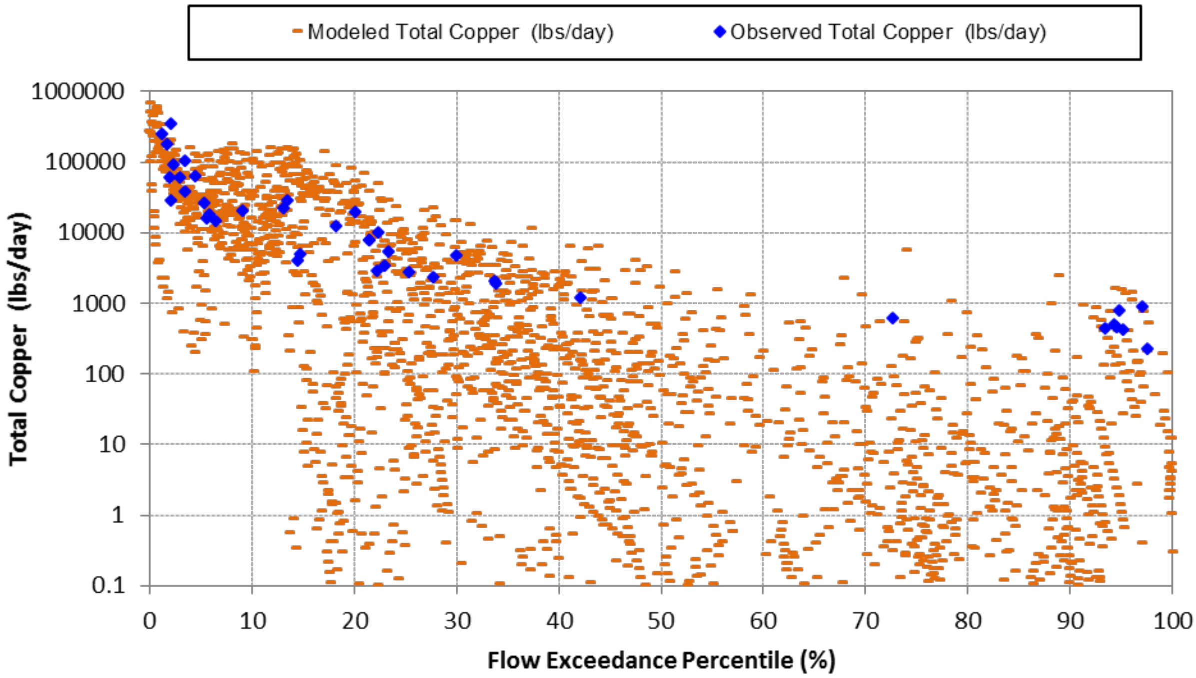


Figure C-1-40. Simulated vs. observed load duration plots for Total Copper (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

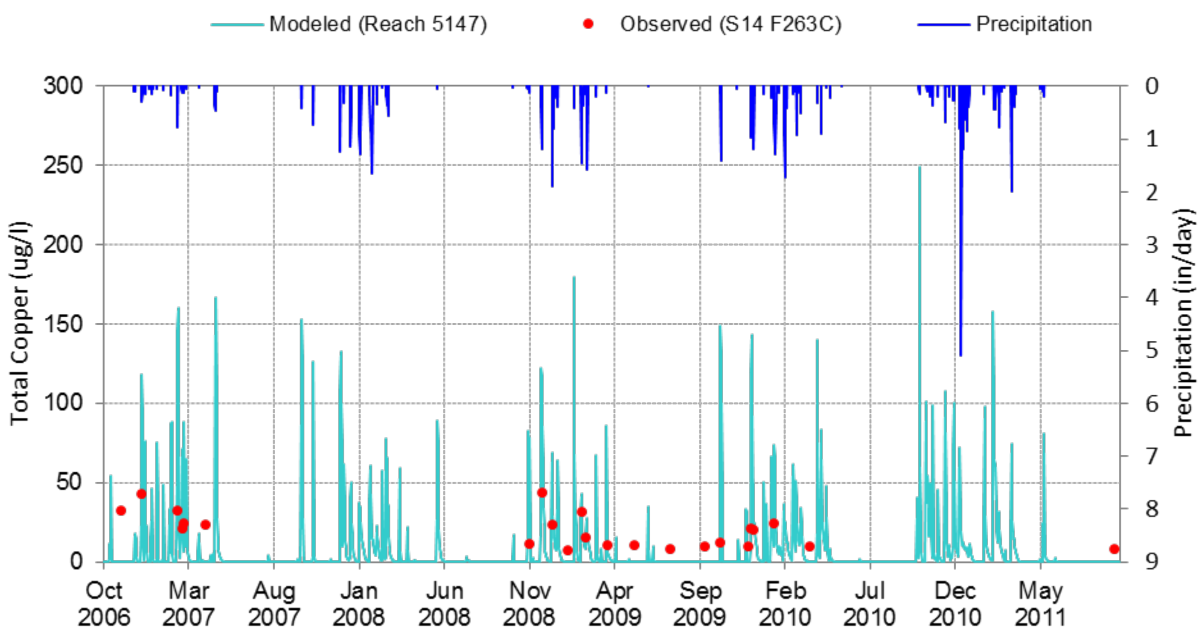


Figure C-1-41. Simulated vs. observed timeseries plots for Total Copper (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

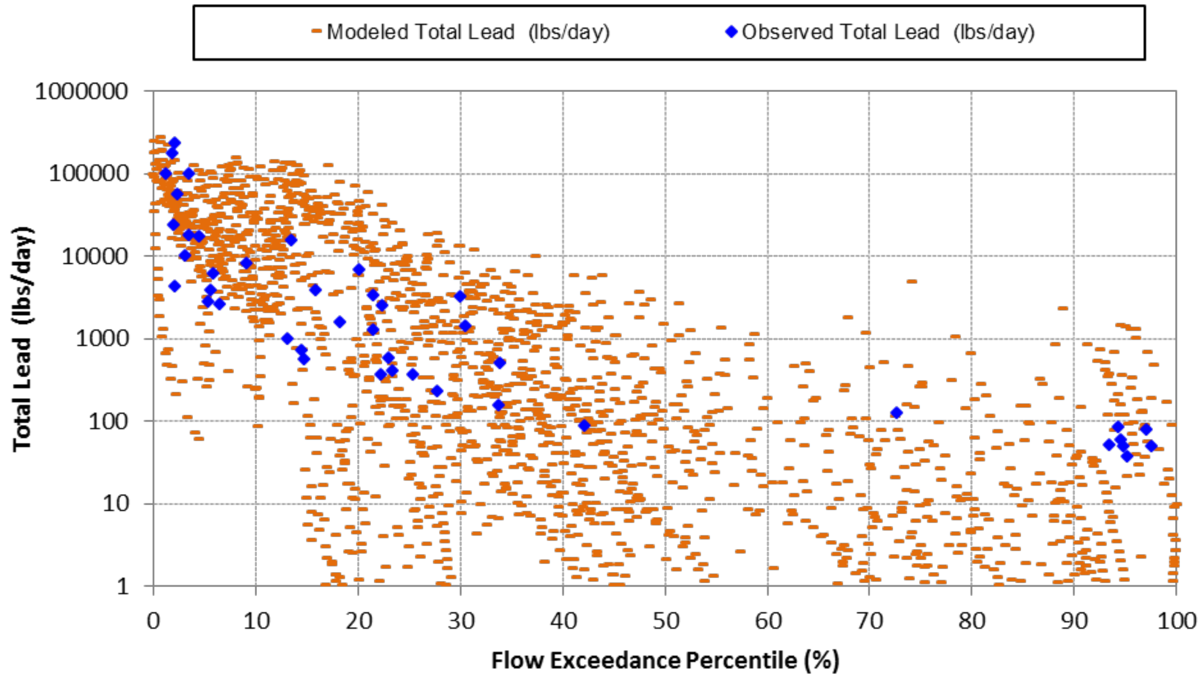


Figure C-1-42 Simulated vs. observed load duration plots for Total Lead (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

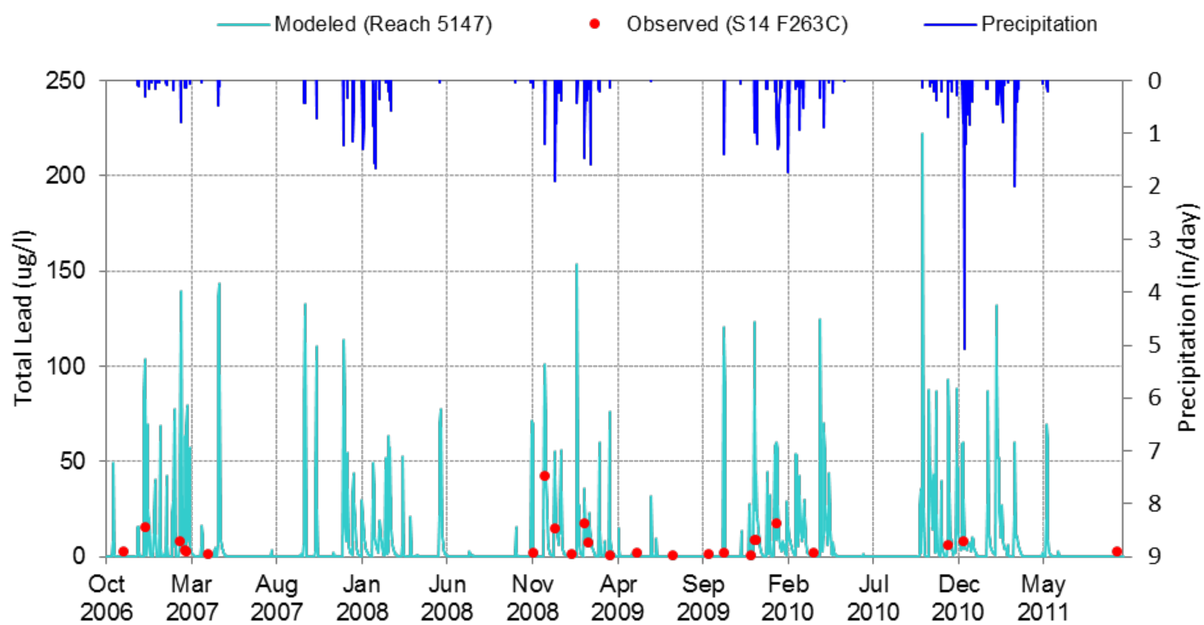


Figure C-1-43. Simulated vs. observed timeseries plots for Total Lead (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

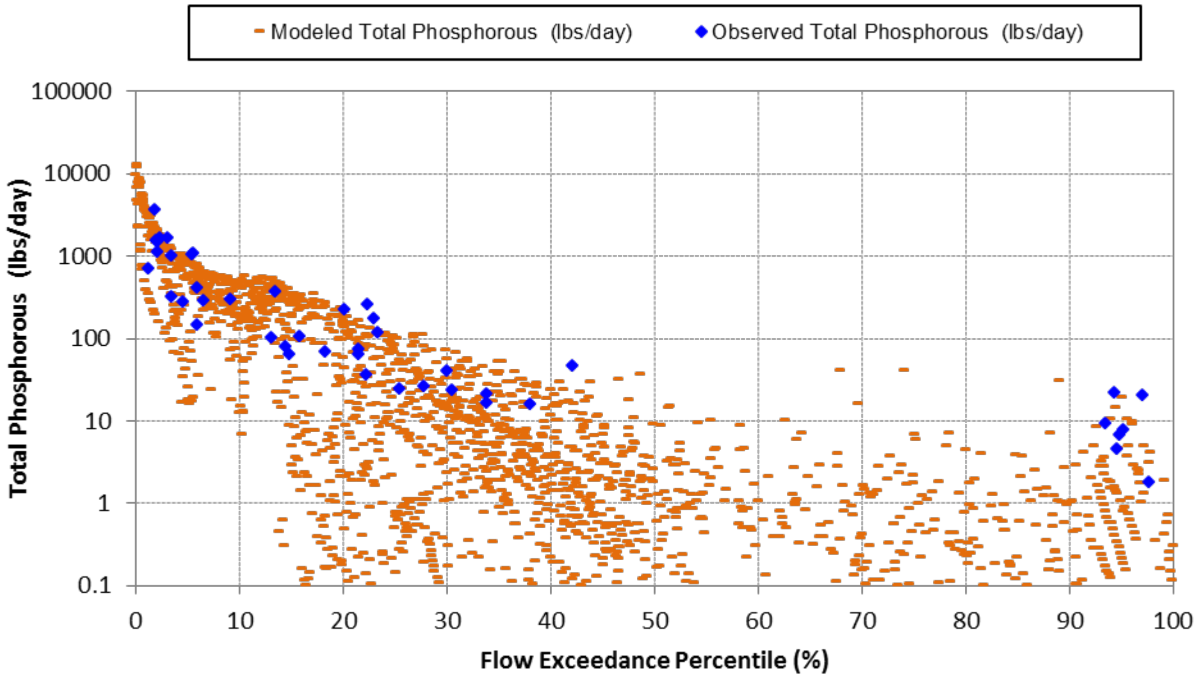


Figure C-1-44 Simulated vs. observed load duration plots for Total Phosphorous (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

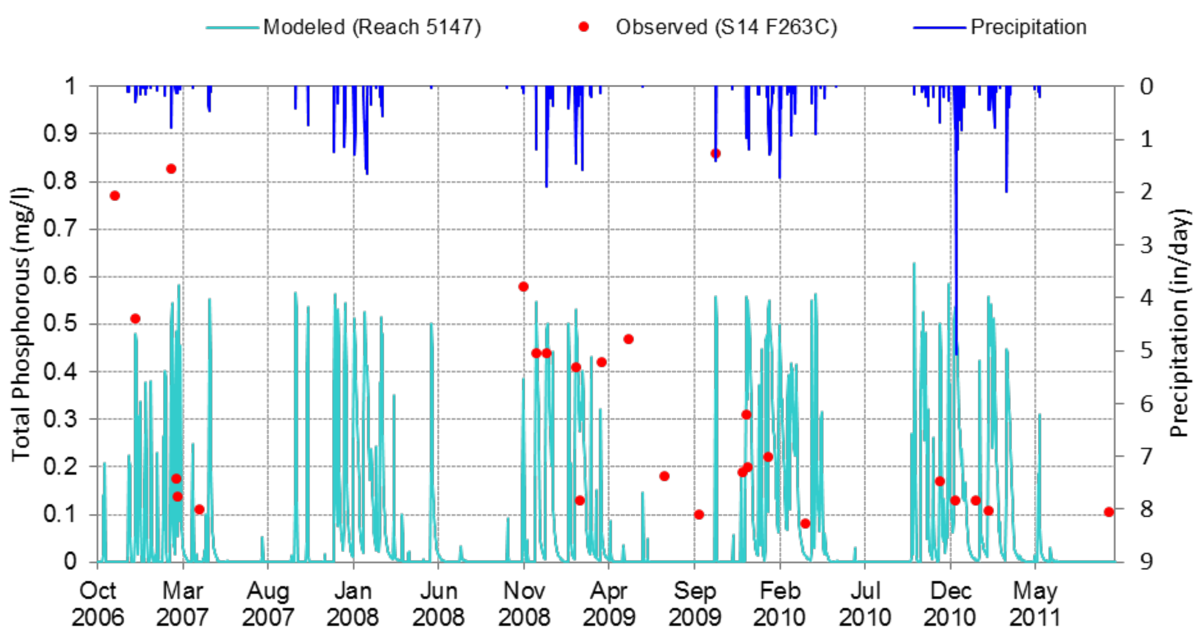


Figure C-1-45. Simulated vs. observed timeseries plots for Total Phosphorous (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

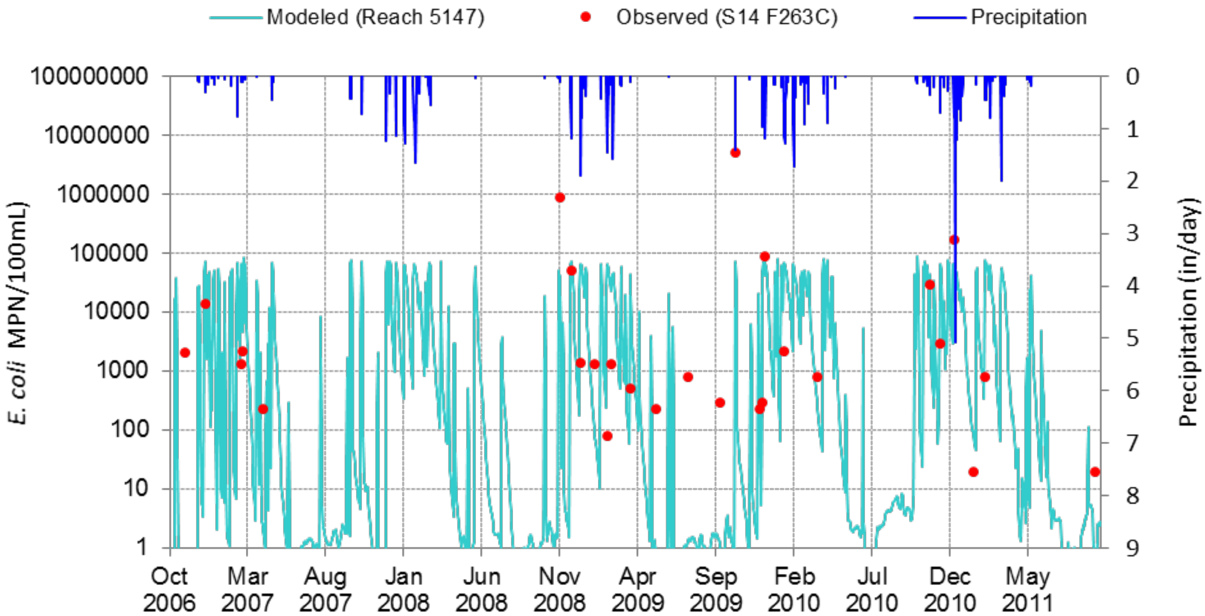


Figure C-1-46. Simulated vs. observed timeseries plots for *E. coli* (10/1/2006 through 9/30/2011) at San Gabriel River Mass Emission Station (S14).

Appendix C-2

Dry Weather RAA and Non-Stormwater Analysis

APPENDIX C-2:
Nonstormwater Analysis and Dry Weather RAA

This appendix presents the simulation of non-stormwater and dry weather reasonable assurance analysis (RAA) for the Upper San Gabriel River EWMP.

1 Introduction

The MS4 Permit effectively prohibits discharges of non-stormwater[1] (dry weather runoff) and states that EWMPs shall "ensure that discharges…do not include non-stormwater discharges that are effectively prohibited." In addition, the MS4 Permit includes dry weather water quality based effluent limitations (WQBELs) for some of the applicable total maximum daily loads (TMDLs) including the San Gabriel River Metals TMDL. However, it is important that dry and wet weather conditions not be evaluated in separate silos – the EWMP includes a large network of wet weather BMPs that will eliminate a majority of non-stormwater discharges. As presented herein, the non-stormwater simulation quantifies the reduction of wet weather BMPs on non-stormwater discharges, and the remaining amount to be addressed will be achieved by non-stormwater abatement programs including source investigation/elimination and regional water use reduction efforts.
The non-stormwater analysis and dry weather RAA are presented as follows:

- Methodology and validation for non-stormwater simulation (Section 2)
- Results of non-stormwater simulation (Section 3)
- Dry weather RAA (Section 3)

2 Non-stormwater Simulation Approach

The primary source of non-stormwater is outdoor water use. As such, the non-stormwater analysis is based on a simulation of non-stormwater whose *source* is outdoor water use[2] in each of the subwatersheds within the EWMP area and whose *sink* is evapotranspiration and incidental infiltration. The modeling approach used for the non-stormwater analysis is distinctly different from the wet weather RAA – with the wet weather RAA being process-based (build-up wash off) and the dry weather RAA being a steady-state simulation based on empirical water use data from southern California. The non-stormwater analysis and wet weather RAA are linked by estimating the effectiveness of wet weather control measures on non-stormwater flows. The methodology and validation are presented in the subsections below.

[1] Non-stormwater does not include all dry weather runoff. For example, permitted dry weather discharges (e.g., dewatering) and groundwater baseflow are exempted/allowed by the Permit.
[2] Non-stormwater volumes are not necessarily equal to dry weather runoff volumes in the EWMP area. Non-stormwater is the portion of dry weather runoff that is effectively prohibited by the Permit. Dry weather runoff would also include groundwater that is discharged through the MS4 system (if any), which is allowed by the Permit. By focusing on the non-stormwater portion of dry weather runoff, the non-stormwater analysis and dry weather RAA are focused on the portion of dry weather runoff that is required to be controlled by MS4s.

2.1 METHODOLOGY

The methodology for the non-stormwater analysis is presented in the following subsections.

2.1.1 Non-stormwater Production Rates

The volumes of non-stormwater generated in the EWMP area were estimated by combining per capita outdoor water use rates with population estimates. For each subwatershed in the EWMP area, the daily generation of non-stormwater was the product of [1] the population in the subwatershed and [2] the estimated per capita water use. The basic parameters are the following:

- U.S. census population at the subwatershed level, and
- A steady-state per capita outdoor water use rate derived from a literature review

Outdoor water use was characterized through a literature review compiling typical per capita outdoor water use in Southern California. Twenty-five (25) estimates of outdoor water use were compiled[3] as shown in **Figure 2-1**. A 50th percentile (median) outdoor water use value of 68 gallons per capita per day (gpcd) was selected as the representative outdoor water use condition.

Population estimates were then calculated using United States Census Bureau 2010 population and housing unit counts by block (US Census Bureau 2010). The population density data were spatially matched with the USGR EWMP subwatersheds (see **Figure 2-2**) and the total estimated population was then tabulated for each modeled area. The estimated population within each subwatershed was then proportionally distributed across the BMP drainage area. For outdoor water use estimates based on households, it was assumed that 2.97 persons are in each household (DeOreo et al., 2011). This per capita outdoor water use was used as a steady state input to the LSPC watershed model baseline to generate non-stormwater in the EWMP area.

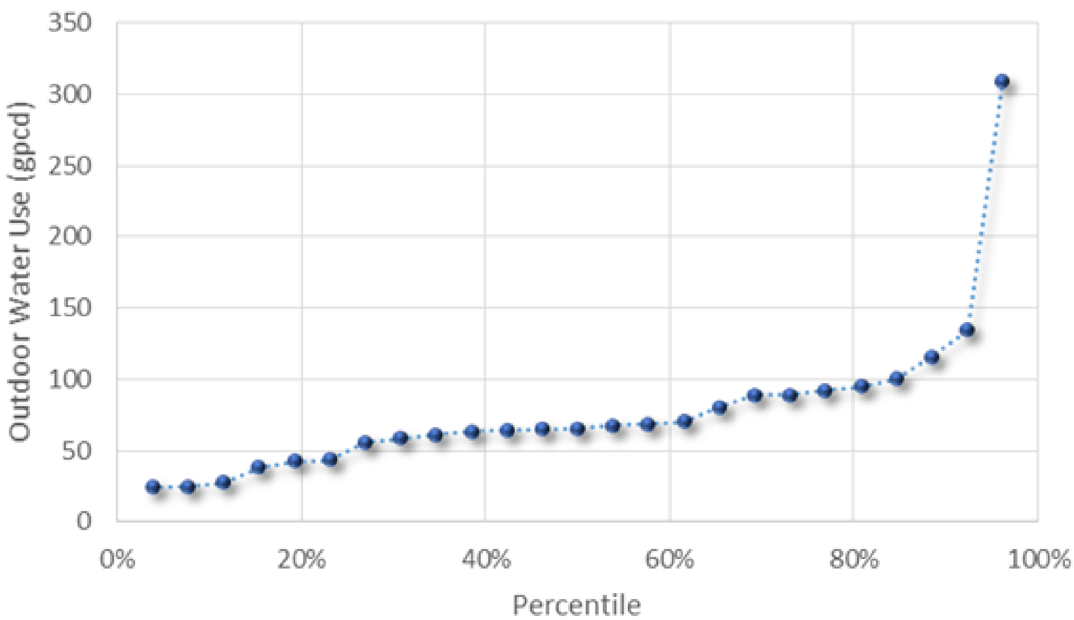


Figure 2-1. Distribution of Outdoor Water Use Estimates Compiled in Literature Review

[3] California Department of Water Resources, 2005, 2013; Christian-Smith et al., 2012; DeOreo et al., 2011; Gleick et al., 2003; LADPW 2010; Natural Resources Defense Council and Pacific Institute, 2014

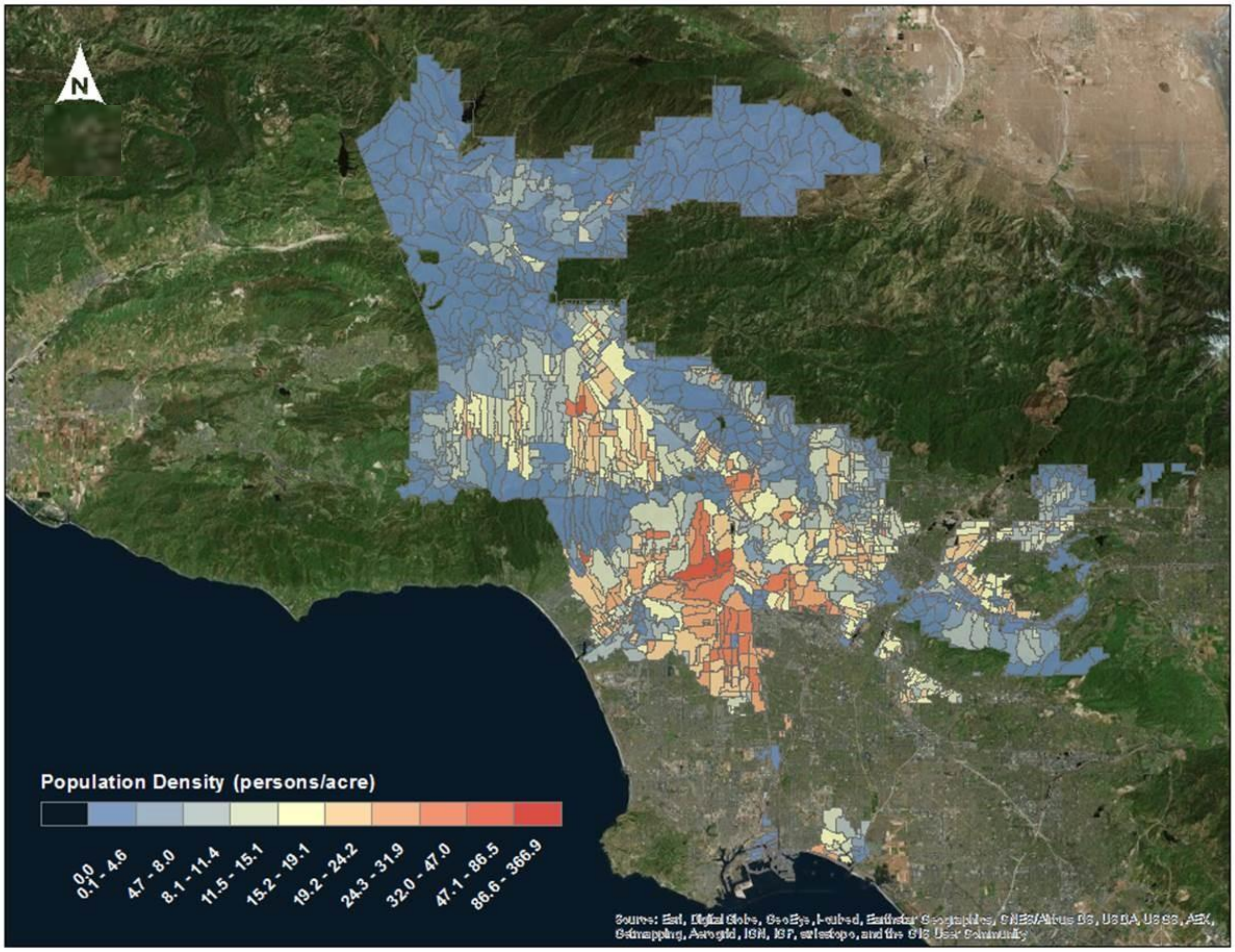


Figure 2-2. Population Estimates by Subwatershed in LA County

2.1.2 Antecedent Conditions

Although clearly defined definitions exist for wet periods, definitions for dry periods are less clearly defined. Wet-weather periods are either defined in terms of rainfall or instream flow. For bacteria, a wet day is one with a rainfall total greater than 0.1 inches plus the three subsequent days, while metals criteria define wet days as those with instream flow above the 90th percentile. As such, a dry weather critical condition was defined for the non-stormwater analysis, as described below.

Antecedent conditions for the USGR non-stormwater analysis was determined by counting the number of consecutive dry days by month, exactly as was done for the Gateway Watershed Management Programs (LSGWMP, 2015). **Figure 2-3** illustrates graphically the analysis to identify a representative dry period. Within the two selected years (Critical WY 2003 and Average WY 2008), the 45-day period between 8/17 and 9/30 was found to be the most representative of dry weather conditions because (1) no rainfall occurred at any of the gages throughout all three WMP areas, (2) it was during a time of the year that was historically shown to experience the least amount of spatially-weighted rainfall in a year, and (3) it was late in the summer following an extended period of no rainfall for both 2003 and 2008.

A 30-day period falling between 8/21 and 9/20 during the Average WY 2008 was used to generate the evapotranspiration boundary conditions for the USGR non-stormwater analysis. The daily average volume over the 30-day period is used as the basis for reporting.

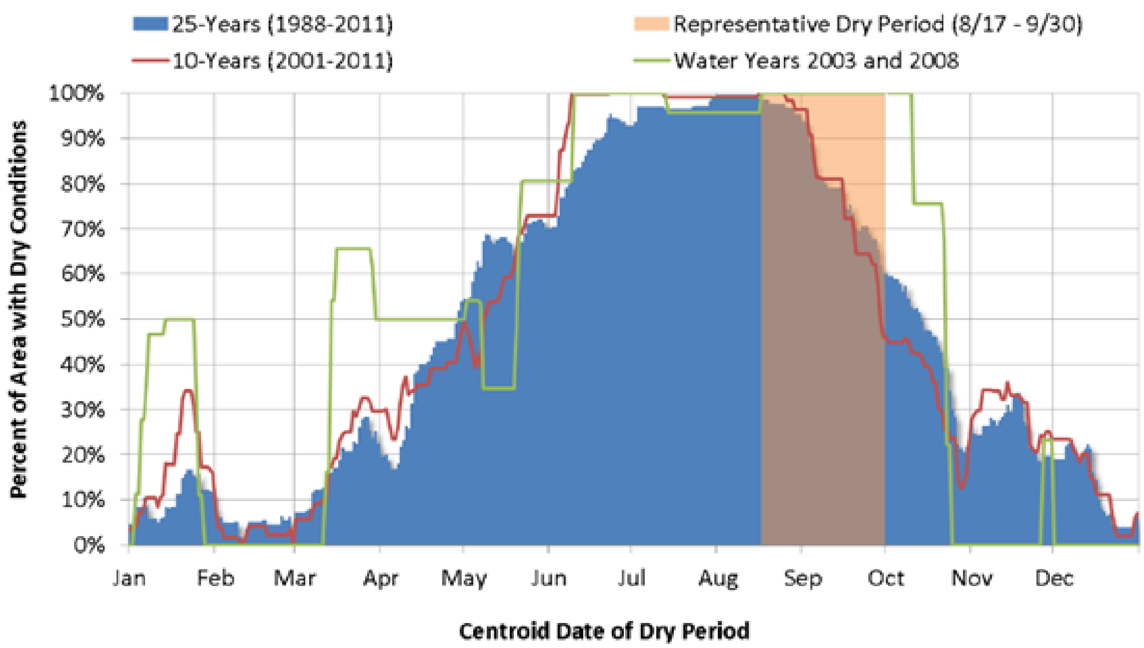


Figure 2-3. Summary of non-wet weather periods in the Lower San Gabriel River WMP (LSGRWG 2015).

2.1.3 Effect of Wet Weather Controls on Non-stormwater

The wet weather control measures in the EWMP (defined by the wet weather RAA) will provide significant benefits for eliminating non-stormwater. For USGR, the dry weather runoff timeseries was routed through the interim (10%, 35% and 65%) and final (100%) metals wet-weather BMP networks to quantify the incidental non-stormwater reduction. In addition, the additional bacteria BMPs to be implemented by 2040 are known to be able to achieve all non-stormwater runoff. The comparison of baseline to remaining non-stormwater volume is used to calculate the percent reduction in non-stormwater flows in the EWMP area at each milestone through structural BMPs alone. Remaining runoff volume, if any, is the amount to be addressed by non-stormwater abatement programs including source investigation/elimination and regional water use reduction efforts.

2.2 VALIDATION

Several studies in Southern California have produced a correlations between drainage area and dry weather flow for larger basins. A study by Ackerman and Stein (2005) was used to support the validation effort. The study included selection of four urbanized sites in Los Angeles County which had a historic flow record. The two largest basins included in the study were Ballona Creek and Coyote Creek. To allow anthropogenic dry weather flows to be isolated, each location was selected based on specific characteristics including heavily urbanized landscapes, concrete lined channels (to focus on areas with minimal groundwater baseflow), and lack of significant point source discharges. The study estimated dry weather runoff to be about 180 cubic meters per day per square kilometer of drainage area for large basins in Southern California (Ackerman and Stein, 2005).

Multiplying the daily flow estimate from Ackerman and Stein (2005) by the total MS4 drainage area of the USGR EWMP results in an estimated flow of **39.9** acre-feet per day. Using the dry weather modeling methodology described above, the total dry weather runoff simulated for USGR is approximately **34.8** acre-feet per day, a ***difference of -13%***. As such, based on calculated percent difference, the non-stormwater analysis is validated to provide a reasonable estimate of non-stormwater generated in the EWMP area.

3 Results of Non-stormwater Simulation

The amount of non-stormwater to be addressed by the EWMP was determined by the non-stormwater simulation. For each jurisdiction in USGR EWMP Group, the baseline non-stormwater volumes were estimated along with the non-stormwater volume remaining *after* implementation of wet weather control measures that correspond to each of the EWMP milestones (2017, 2020, 2023, 2026 and 2040). The corresponding non-stormwater volume reductions are shown in **Figure 3-1**.

To consider the sensitivity of the analysis to the assumed outdoor water use, the simulation was also conducted using the 90th percentile water use estimate (109 gpcd), as shown in **Table 3-1**. The analysis of non-stormwater percent reduction was generally insensitive to a higher water use estimate, due to the fact that residual non-stormwater is due to areas where few control measures are implemented (rather than BMPs being “overtopped” by higher non-stormwater flow rates).

Table 3-1. Simulated Non-stormwater Reduction using 50th versus 90th Percentile Water Use Estimates

	Percent Reduction of Non-stormwater Volume with Final Metals BMPs Implemented (2026)	
Jurisdiction	**Median Outdoor Water Use Estimate (68 gpcd)**	**90th Percentile Outdoor Water Use Estimate (109 gpcd)**
Baldwin Park	73%	73%
Covina	68%	68%
Glendora	69%	69%
Industry	78%	78%
La Puente	82%	82%
Uninc. LA County	75%	75%

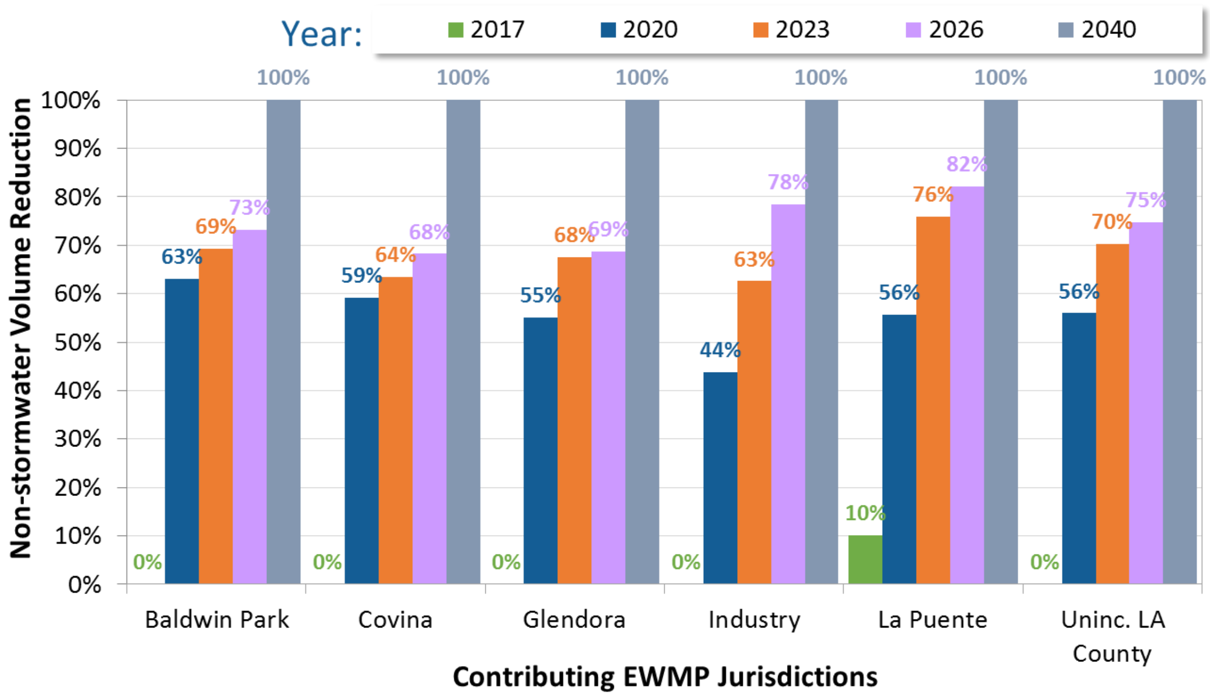


Figure 3-1. Schedule for <u>Non-stormwater Reductions</u> via Implementation of EWMP Structural BMPs

4 Dry Weather Reasonable Assurance Analysis

The schedules of non-stormwater reductions presented in Section 3 provide the foundation of the dry weather RAA. To provide reasonable assurance that dry weather receiving water limitations (RWLs) will be achieved, the non-stormwater volume reductions were assumed to correspond to pollutant load reductions[4]. Required reductions to achieve RWLs were estimated by analyzing receiving water monitoring data and comparing the 90^{th} percentile concentration to the corresponding water quality objective. For any required reduction, the year by which the reduction will be achieved can be estimated through the scheduled percent reduction of non-stormwater volumes, as shown in **Table 4-1**.

With the exception of *E. coli*, all of the pollutant subject to the dry weather RAA are being attained through existing minimum control measures (MCMs). In the case of *E. coli*, the required reduction during dry weather is quite high (85.1%), which justifies an extended compliance schedule. Structural control measures are expected to eliminate non-stormwater in the USGR EWMP area by 2040. As such, 2040 is the recommended compliance date for attainment of dry weather bacteria RWLs in USGR.

[4] The assumption that non-stormwater volume reduction corresponds to pollutant load reduction in the receiving water is supported by the following: [1] pollutant concentrations and flow rates during dry weather are generally uncorrelated meaning that a unit of volume reduction is expected to achieve the same unit in load reduction and [2] the pollutants that are targeted by the dry weather RAA are generally contributed by MS4 discharges and thus a reduction in non-stormwater volume will be directly linked to receiving water reductions.

Table 4-1. Dry Weather Required Reductions and Schedule for Achievement

		90th percentile receiving water concentration [1]		Water quality objective			
Pollutant	**A TMDL in Watershed Currently Applies?**	**Value**	**Number of samples in dataset**	**Concentration**	**Source**	**Required % Reduction**	**Schedule for Corresponding Reduction in Non-stormwater by Structural BMPs in EWMP**
Copper	Yes	10.75 ug/L	148	15.04 ug/L	CTR (chronic) [2]	0%	Currently attained by existing MCMs
Zinc	Yes	76.37 ug/L	142	192.5 ug/L	CTR (chronic) [2]	0%	Currently attained by existing MCMs
Selenium	Yes	2.74 ug/L	124	5.0 ug/L	CTR (chronic) [2]	0%	Currently attained by existing MCMs
Lead	No	2.53 ug/L	146	6.49 ug/L	CTR (chronic) [2]	0%	Currently attained by existing MCMs
Nickel	No	9.43 ug/L	92	83.7 ug/L	CTR (chronic) [2]	0%	Currently attained by existing MCMs
E. coli	No	849 MPN /100mL	101	126 MPN /100mL	Basin Plan geometric mean	85.1%	2040

1 – Based on receiving water data collected at mass emission stations in San Gabriel River (S13) and Coyote Creek (S14). Datasets were combined. Non-detects were handled using regression on order statistics.

2 – Hardness assumed to be 175 mg/L, as used in the SGR Metals TMDL.

5 Conclusions

The non-stormwater simulation has supported the dry weather RAA for USGR, which provides reasonable assurance of achievement of dry weather RWLs by certain milestones. Existing MCMs appear to be addressing metals RWLs, whose 90th percentile concentrations during dry weather are less than applicable WQOs. In the case of *E. coli*, the required reduction is greater than 85%, which will necessitate an extended compliance schedule. The recommended compliance schedule is 2040, which is when non-stormwater is expected to be eliminated in the EWMP area.

6 References

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APPENDIX C-3: CONTROL MEASURE OPPORTUNITY SUMMARY

This appendix summarizes the methods for identifying existing, planned, and potential control measure opportunities in the Upper San Gabriel River EWMP area. The identified control measures (herein called best management practices, or BMPs, interchangeably) served as the "pool" of opportunities considered in the RAA, and ultimately determined the suite of strategies prescribed in the EWMP.

Methods and results are presented per the following sections:

- **Section C-3.1 – Existing and Planned Control Measures:** summarizes the known existing and planned BMP opportunities in the USGR EWMP area.
- **Section C-3.2 – Potential Control Measure Opportunity assessment:** describes the methods for identifying new BMP opportunities for each category described in Section 4 of the EWMP.

C-3.1. Existing and Planned Control Measures

This section summarizes the methods for identifying existing and planned BMPs within each jurisdiction. Note that all BMPs constructed prior to September 2011 are implicitly included in the EWMP analysis through calibration of the WMMS, whereas BMPs constructed post-September 2011 were explicitly included in the RAA.

A BMP data request was distributed to the Group Members to identify existing and planned BMPs. The Cities of Covina, Glendora, and Industry, and Los Angeles County and Los Angeles County Flood Control District responded to the data request with summaries of existing and planned BMPs. In addition, a literature review was performed to identify further structural BMP projects that were not encompassed by the data request. The literature review included the following documents/sources:

- Integrated Regional Watershed Management Plan (IRWMP) documents,
- the Online Project Tracking and Integration System (OPTI) database, and
- the Notice of Intent (NOI).

Appendix C-6 lists the identified projects through data request. Note that the Duck Farm project was the only planned regional project considered in the RAA because identified flood control projects may not necessarily meet the water quality intent of the EWMP.

C-3.2. Potential Control Measure Opportunity Assessment

Additional control measures were identified to meet the numeric water quality objectives of the EWMP. This section discusses the methods employed to assess new control measure opportunities for each category discussed in Section 4 of the EWMP[1]. An analysis of soil infiltration rates was also performed to evaluate the prominence of systems where poor infiltration necessitates underdrains (e.g. biofiltration systems).

Parcel Screening Criteria

Not all parcels are suitable for control measures. Candidate parcels were screened based on land use, slope, ownership, soil contamination, and institutional preference for additional BMP opportunities. Data used for the desktop screening processes are listed in Table C-3-1.

[1] Note that for the purposes of the RAA, total drainage area must be conserved. In other words, overlapping drainage areas were consolidated to avoid double-counting the same treated drainage area. The reported opportunities in this section are therefore smaller than the actual available spatial opportunities in the EWMP area – this was reconciled in the RAA by incorporating routing between BMPs so that the cumulative upstream drainage area to each BMP is represented.

Table C-3-1. Data inventory for street screening

Data Set	Format	Description	Source
Parcels	GIS Shapefile	Outlines property boundaries, sizes, and ownership	Los Angeles County (LAC) Assessor
Roads	GIS Shapefile	Shows street centerline network & classification by Topologically Integrated Geographic Encoding and Reference (TIGER)	LAC GIS Portal
Land Use	GIS Shapefile	Subdivides the region into predefined land use categories with similar runoff properties. Each individual land use feature identifies the associated percent impervious coverage.	LAC WMMS Model
Subwatersheds	GIS Shapefile	Defines drainage areas to selected outlet points	LAC WMMS Model
Slopes	GIS Shapefile	Classifies regions by the slope category	LAC WMMS Model
Jurisdictions	GIS Shapefile	Establishes city and county boundaries	LAC GIS Portal
Soil Contamination Hazards	Table	Coordinates of active soil contamination and cleanup sites	State of California Water Resources Control Board GeoTracker

Public Parcel Screening (LID on Public Parcels)

Retrofitting public parcels with BMPs can be an efficient strategy for reducing stormwater runoff. This method allows municipalities the flexibility to prioritize and schedule stormwater projects to coincide with improvements that are already on the books (such as scheduled parking lot resurfacing, utility work, and public park improvements). Implementing LID on public parcels also allows municipalities the freedom to construct, inspect, and maintain BMPs without the need to purchase private property or to create stormwater easements.

Candidate public parcels in the EWMP area were first identified using their assessor's identification number. The list of public parcels underwent the screening procedure outlined in Section 3.2.1.1 of the EWMP, and were subjected to review by the Group Members. Resulting candidate parcels served as the basis for regional BMP opportunities, per the jurisdictional input provided in Section 3.5, and Tier 1 parcels were subjected to detailed site evaluations.

Public parcel candidates for LID retrofits were additionally screened for slopes greater than 10% because high slopes tend to preclude efficient LID BMP retrofits. Areas with high slope were clipped out of the candidate parcels, while low slope parcel areas were retained as potential opportunities.

Soil contamination can present a risk of mobilizing pollutants from public parcels into the groundwater. To avoid this potential problem, sites that were identified as having open contamination cases (per the State of California GeoTracker database) were eliminated as unsuitable BMP retrofit opportunities. Sites that have been remediated or have closed cases were still considered as opportunities to provide BMP retrofits.

The results of desktop screening for LID BMPs on public parcels is tabulated in Table C-3-2 and displayed in Figure C-3-1. Note that the RAA assumed LID BMPs could be implemented on the identified public parcels to treat the *direct* runoff from the parcel proper, whereas regional BMPs could be co-located on the same parcel to treat *offsite* runoff.

Table C-3-2. Screened public parcel retrofit opportunities[2]

Jurisdiction	Total Public Parcel Area Identified for LID Opportunity (acres)
Baldwin Park	258
Covina	332
Glendora	216
Industry	231
La Puente	83
Unincorporated LA County	1,150

[2] Reported areas represent total parcel areas – the actual *BMP footprints* to be implemented on the screened parcels was identified in the RAA based on the design assumptions detailed in Appendix C-4.

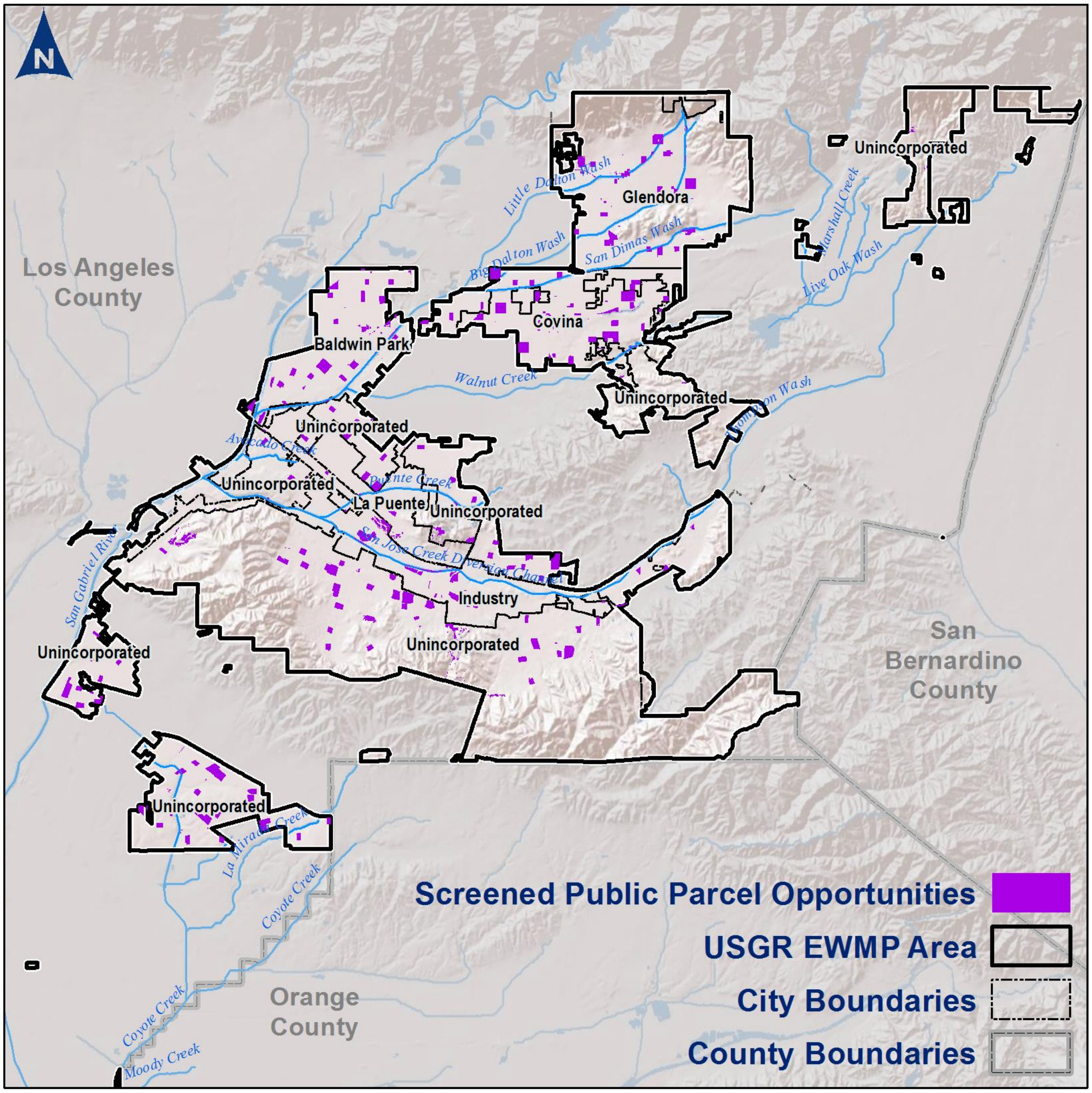

Figure C-3-1. Screened Opportunities for LID on Public Parcels.

Notes: Regional and LID BMPs can be co-located on the same parcel, although their respective drainage areas do not overlap (LID treats the parcel, while regional BMPs treat the upstream area).

Private Parcel Screening (Residential LID and Redevelopment)

Distributed LID on private parcels was applied based on the relevant land use areas. High-density residential land areas were considered for residential LID opportunities at a predicted rate of 1% per year (starting in 2017); in other words, the RAA assumed that 1% of residences would implement LID measures to treat their parcels each year.

To represent LID due to redevelopment in the EWMP area, all developed land uses were considered. The land area redeveloped (and treated) was approximated based on City of Los Angeles historical redevelopment rates (Table C-3-3; Los Angeles River Upper Reach 2 Watershed Management Area Cities, 2014).

LID on private parcels represented in the EWMP is tabulated in Table C-3-4 and shown visually in Figure C-3-2.

Table C-3-3. Redevelopment rates by land use over compliance period (2015-2026)[3]

Modeled Land Use	Redevelopment Rate (2015-2026)
High-Density Residential	1.98%
Low-Density Residential	1.98%
Multi-Family Residential	1.98%
Commercial	1.65%
Institutional	1.76%
Industrial	3.74%

Table C-3-4. Predicted areas treated by LID on private parcels

Jurisdiction	Total Acres Assumed Treated by Residential LID (2017-2026)	Total Acres Assumed Treated by LID due to Redevelopment (2015-2026)
Baldwin Park	152	71
Covina	150	64
Glendora	315	119
Industry	59	180
La Puente	119	48
Unincorporated LA County	1,022	457

[3] Redevelopment of transportation and road land uses was assumed to be managed by green streets and therefore not included in the parcel-scale analysis

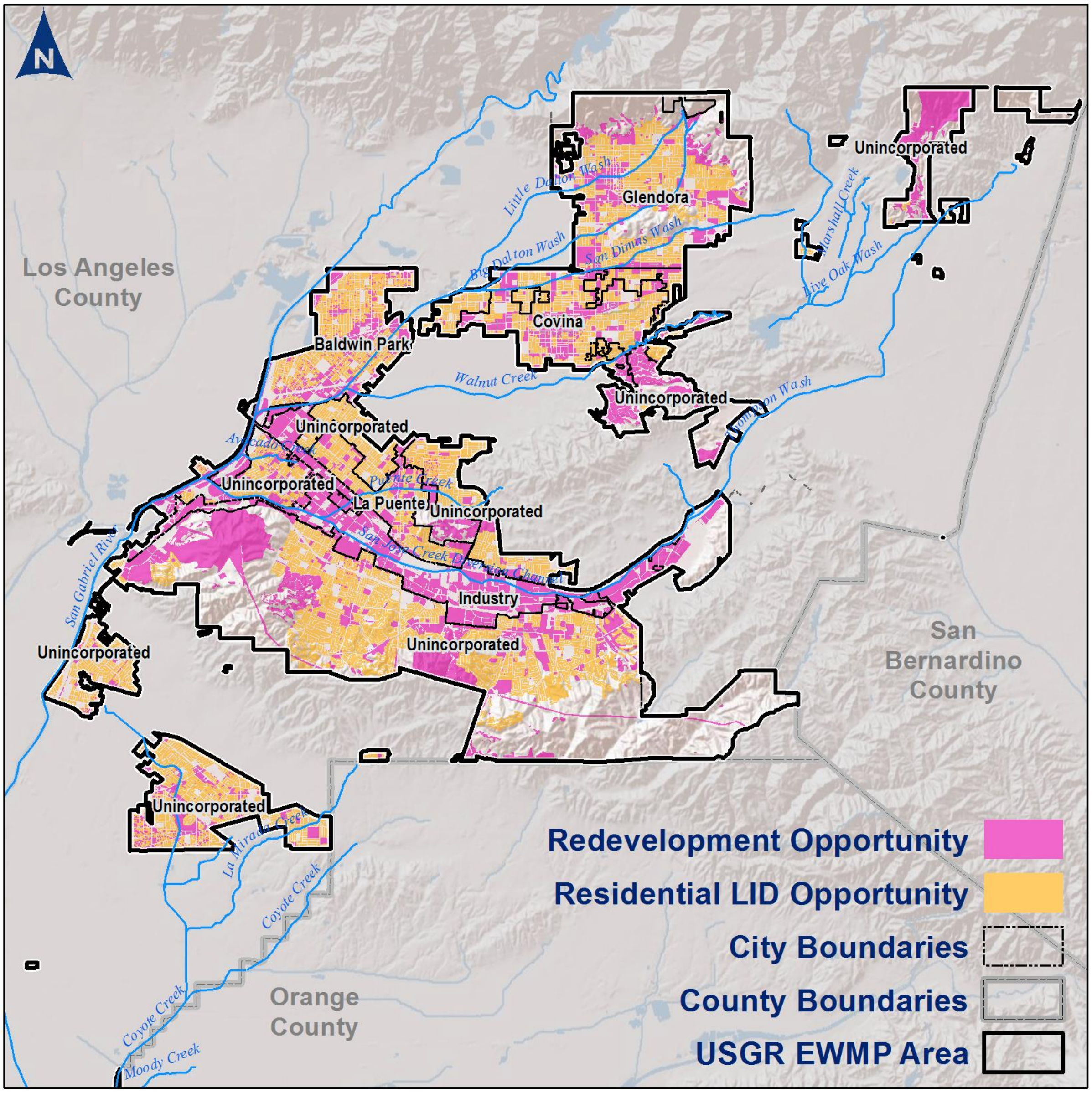

Figure C-3-2. LID on Private Parcels Represented in the EWMP.

Notes: Displayed opportunities are distributed proportionally by land use throughout the EWMP area at the rates specified in Table C-3-4.

Street Screening Criteria

Stormwater BMPs in the right-of-way are treatment systems arranged linearly within the street corridor and are designed to reduce runoff volumes and improve runoff water quality from the roadway and adjacent parcels. Implementing BMPs in the right-of-way provides an opportunity to meet water quality goals by locating BMPs in areas owned or controlled by a municipality to avoid the cost of land acquisition or establishing an easement. Implementing street retrofit opportunities allows for direct control of construction, maintenance, and monitoring activities by the responsible jurisdiction.

Not all roads are suited for right-of-way BMP retrofits; therefore, screening is required to eliminate roads where green street retrofits are impractical or infeasible due to physical constraints. While right-of-way BMP retrofits can be implemented in a variety of settings, the physical characteristics of the road itself such as the road type, local topography, and depth to groundwater can significantly influence the practicality of designing and constructing these features. A screening protocol was established to identify realistic opportunities for retrofits based on the best available GIS data, as listed in Table C-3-1, and supplemented with the Topologically Integrated Geographic Encoding and Reference (TIGER) Census roads data.
High traffic volumes, speed limits, and slopes impact the feasibility of green infrastructure implementation along street corridors. Road classification data contains information typically useful for determining if the street is subject to high traffic volumes and speeds, and Census TIGER road data provides the best available road classification information for the study area. Table C-3-5 shows the Master Address File (MAF)/TIGER Feature Classification Codes (MTFCC) deemed appropriate for street retrofit opportunities. Only roads with the MTFCCs listed in Table C-3-5 were considered for street retrofits in this screening analysis. All other roads were screened out.

Table C-3-5. Green Street BMP Assumed Suitable MTFCC

MTFCC	Description
S1400	Local neighborhood road, rural road, city street
S1730	Alley
S1780	Parking lot road

In addition to the screening of road types, opportunities were further screened to remove segments that have steep slopes. BMP implementation on streets with grades greater than 10 percent present engineering challenges that substantially reduce the cost effectiveness of the retrofit opportunity. From the available WMMS slope information, roads were considered as retrofit opportunities if the slope was less than 10 percent.

The results of the street screening are presented in Table C-3-6.

Table C-3-6. Screened potential green street opportunities

Jurisdiction	Approximate Miles of Screened Green Street Opportunity (miles of frontage length)[4]	Total Approximate Direct[5] Drainage Area to Screened Street Opportunities (acres)
Baldwin Park	195	2,839
Covina	215	3,097
Glendora	272	4,412
Industry	102	1,953
La Puente	119	1,744
Unincorporated LA County	1,032	16,438

[4] Note that this is total screened *frontage* length (not *road* length or *BMP* length). The road length is approximately one half of the reported frontage, and the required green street BMP lengths were determined in the RAA based on the assumptions in Appendix C-4.

[5] Recall that upstream BMPs such as LID on parcels, and their associated drainage areas, are also ultimately routed to green streets.

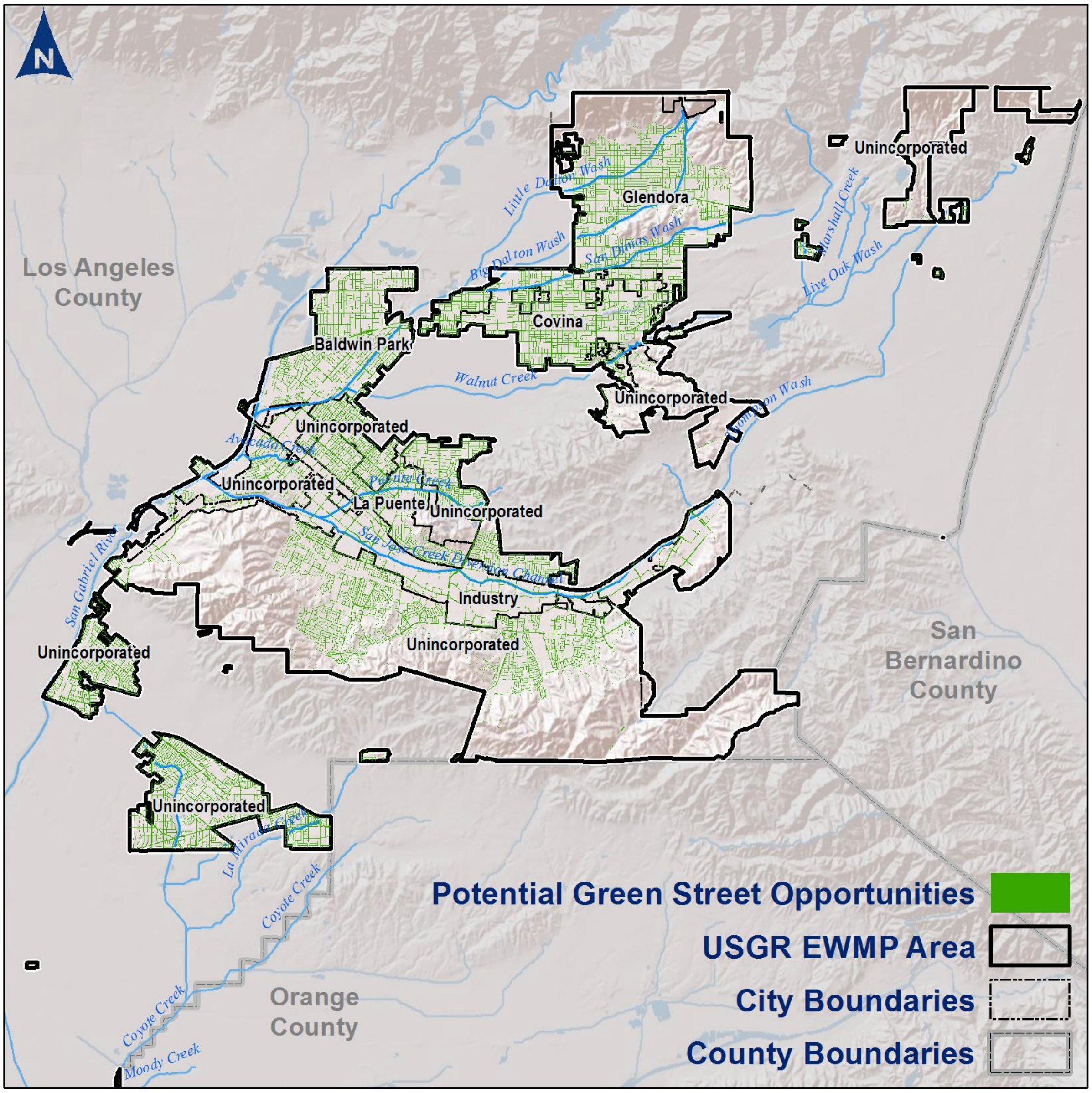

Figure C-3-3. Screened Potential Green Street Locations.

Soil Infiltration Rate Assessment

Soil infiltration rates are one of the key drivers of infiltration BMP performance, and determine whether an underdrain is necessary to facilitate drainage. This section describes the methodology used to estimate subwatershed-scale soil infiltration rates for BMP modeling.

The RAA model implicitly includes soil infiltration parameters that were arrived at through calibration efforts; however, to explicitly model control measures, infiltration rates were defined by subwatershed using available geospatial data. Soil data coverage provided through the LACDPW Hydrology Manual categorized soil unit areas into soil types. Runoff coefficient curves reported in the Hydrology Manual were developed by LACDPW for each soil type using double ring infiltrometer tests performed on areas of homogeneous runoff characteristics (LACDPW 2006). LADPW employed a sprinkling-type infiltrometer to perform the tests in each homogeneous area.

Runoff coefficient curves represent the response of the runoff coefficient (defined as the ratio of runoff to rainfall from a land area) to varying rainfall intensities. Each curve displays an inflection point representing the rainfall intensity at which substantial runoff initiates. According to LADPW (2006), each curve was assigned a minimum runoff coefficient of 0.1, "indicating that there is some runoff even at the smallest rainfall intensities." The infiltration rate for each soil curve can therefore calculated as the difference between the rainfall intensity at the point of inflection and the minimum runoff rate, as demonstrated conceptually in Figure C-3-4.

The inflection point, and subsequently calculated infiltration rate, for each unique soil type in the EWMP area were identified using the runoff coefficient curves in Appendix C of the *Hydrology Manual* (LADPW 2006). Subwatershed areas were then intersected with the soil type coverage to calculate an area-weighted infiltration rate. Attachment C shows the distribution of the infiltration rates.

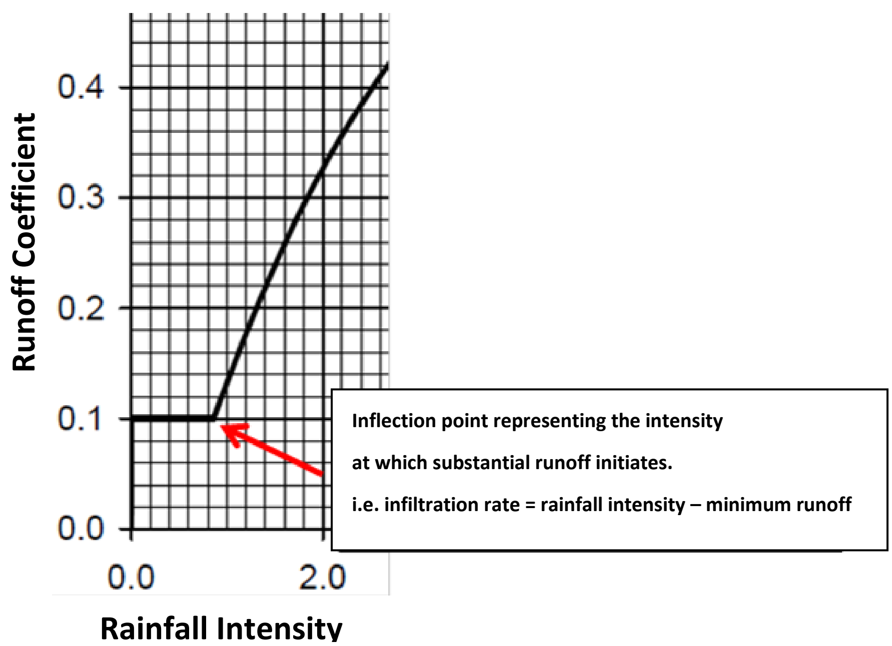

Figure C-3-4. Example Determination of Runoff Coefficient Inflection Point for an Arbitrary Soil Type in Appendix C of LACDPW (2006).

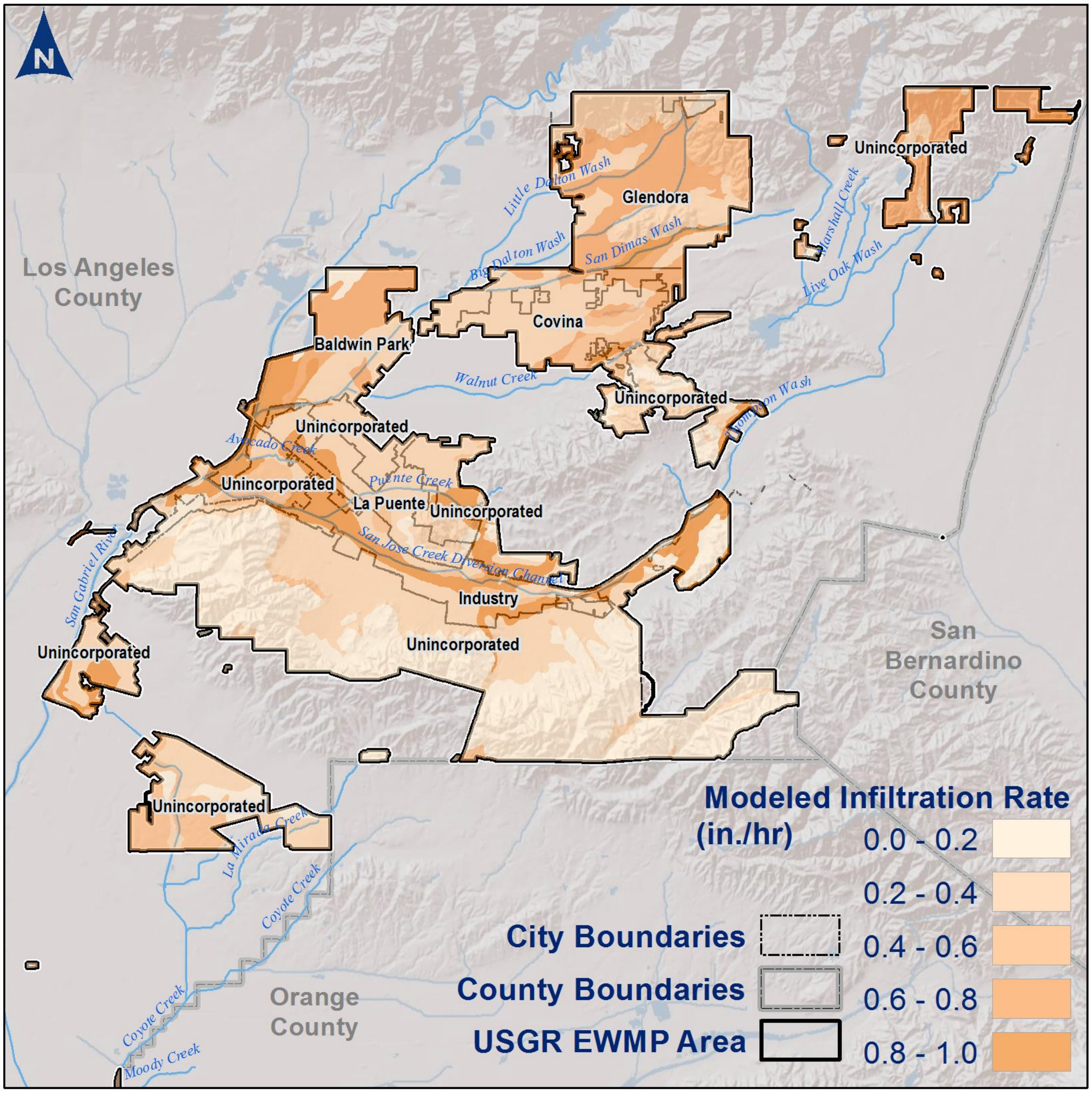

Figure C-3-5. Map Showing Modeled Soil Infiltration Rates Throughout the Upper San Gabriel River EWMP Area.

Appendix H of the Permit mandates underdrains (biofiltration systems) when subsoil infiltration rates are below 0.3 in/hr. Figure C-3-10 shows areas where green infrastructure and LID BMPs will likely require underdrains.

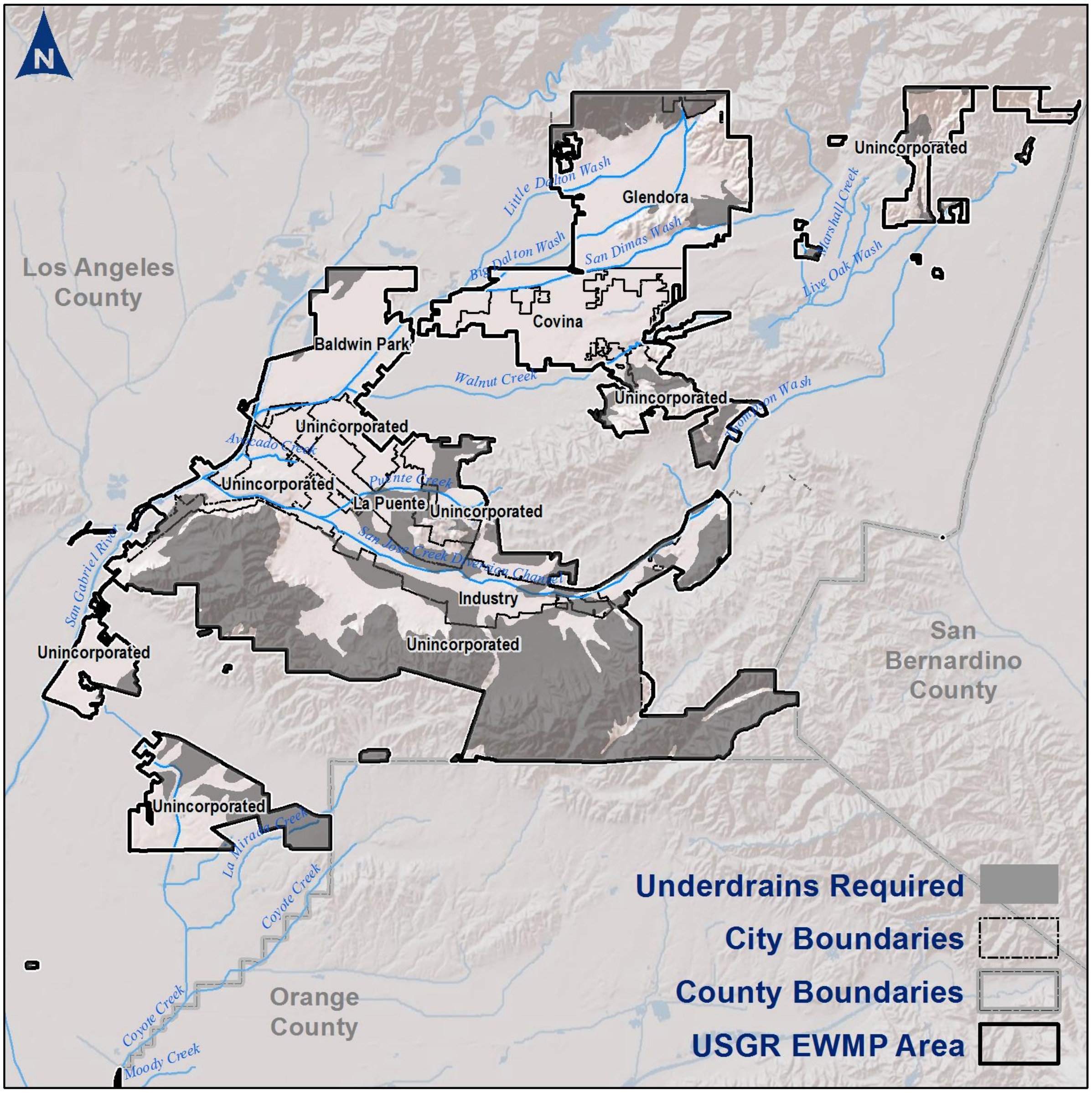

Figure C-3-6. Areas where underdrains will likely be required (e.g. where subsoil infiltration rates are estimated less than 0.3 in/hr)

Appendix C-4

BMP Modeling Details

APPENDIX C-4: BMP DESIGN AND MODELING DETAILS

This appendix presents details on BMP design assumptions. These assumptions were generated using best available data to represent the opportunities and limitations in the EWMP area. For the EWMP to meet its full potential as a planning document, it is essential that the control measure assumptions provide a definitive link between the RAA and actual implementation efforts that are aligned with Group Member preferences. Group Members were therefore surveyed and the resulting preferences used to inform the RAA are listed in Table C-4-1.

Note that hydrologic response units (HRU) are analogous with land uses for many purposes. Discrete land uses are routed to different types of BMPs. For example, residential HRUs/land uses are routed to residential LID. The allocations and available BMP opportunities vary by jurisdiction and watershed. Runoff from non-EWMP and non-MS4 permittees – including non-traditional Phase 2 MS4 areas, parcels with industrial stormwater permits, and the extent of the Caltrans right-of-way– was not routed to BMPs.

Recall that cost functions are presented in Section 7 of the EWMP.

Table C-4-1. Jurisdictional BMP Preferences

Jurisdiction	Institutional	LID Ordinance	Residential LID	LID on Municipal Parcels	Permeable Pavement	Tier 1 and 2 Regional	Tier 3 Regional (Regional/LID on Schools)
Baldwin Park	5%	Yes	Yes	Yes	Yes	Yes	Yes
Covina	10%	Yes	Yes	Yes	Yes	Yes	Yes
Industry	10%	Yes	Yes	Yes	Yes	Yes	Yes
Glendora	10%	Yes	Yes	Yes	Yes	Yes	No
La Puente	5%	Yes	Yes	Yes	No	Yes	No
Unincorporated LA County	10%	Yes	Yes	Yes	Yes	Yes	Yes

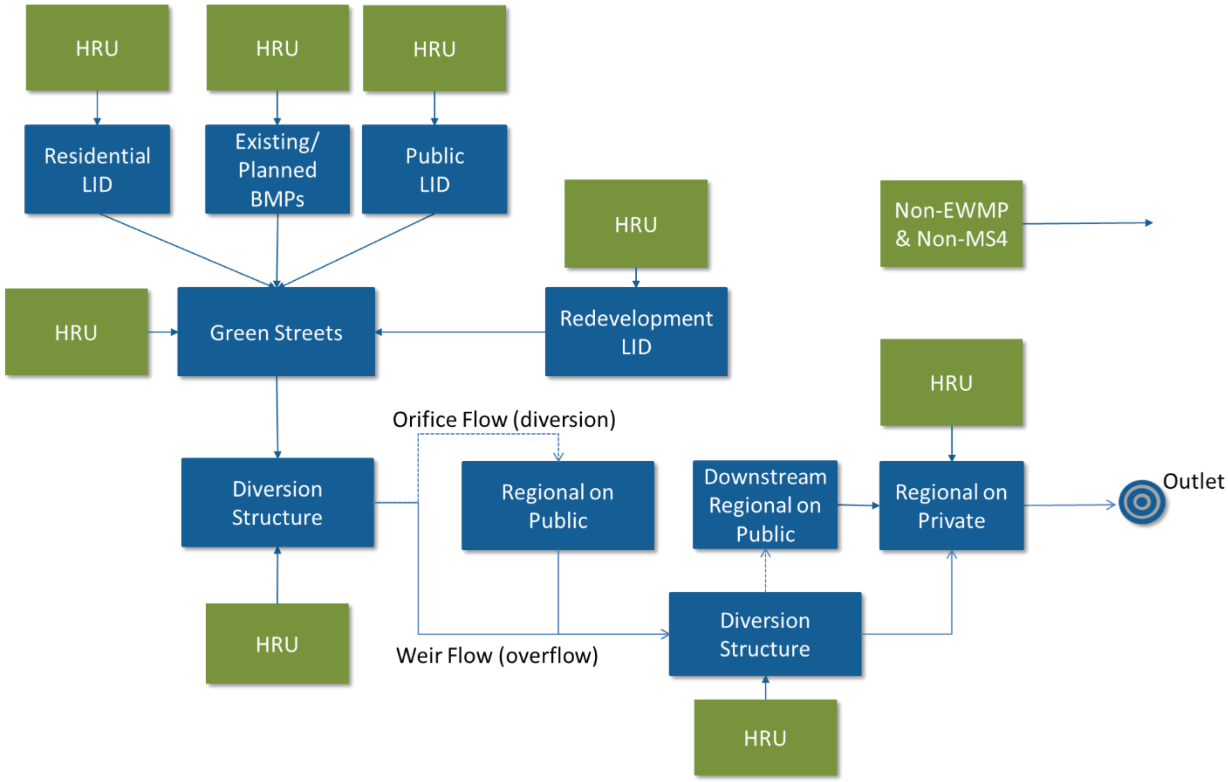

Figure C-4-1. Conceptual schematic illustrating BMP routing for the RAA

C-4.1 INSTITUTIONAL BMPS

The load reduction resulting from institutional BMPs varied by EWMP Group member per Table C-4-1, and this reduction was assumed implicitly, e.g.., no modeling was performed (see Section 3.3 of the EWMP for details).

C-4.2 EXISTING/PLANNED DISTRIBUTED BMPS, LID ON PUBLIC PARCELS, REDEVELOPMENT

Table C-4-2 provides the modeled sizing criteria for existing/planned distributed BMPs, LID on public parcels, and redevelopment LID. The public parcels considered for LID included screened parcels owned by the EWMP Group members; schools and parcels owned by other entities were also considered if directed by EWMP Group members.

Table C-4-2. Existing/Planned Infiltration/Filtration BMP design criteria

Parameter		Value	Units
Surface	Design Drainage Area	*Sized to capture 85th percentile volume*	
	BMP Footprint		
	Ponding Depth	9	*in.*
Soil	Depth	2	*ft.*
	Media Porosity	0.35	*n/a*
	Media Infiltration Rate	2	*in/hr*
Underdrain	Use underdrain if underlying soils are less than	0.3	*in/hr*
	Depth	1.5	*ft.*
	Media Porosity	0.4	*n/a*
	Subsoil Infiltration Rate	*Match underlying soils*	
Pollutant Removal Performance	*See Section C-4.8*		
Cost	*Use bioretention cost functions*		

C-4.3 EXISTING/PLANNED REGIONAL BMPS

The assumptions for modeling the Duck Farm facility are listed below in Table C-4-3 (per *San Gabriel River Corridor Master Plan*, 2006).

Table C-4-3. Duck Farm regional BMP (stormwater wetland) design criteria

Parameter		Value	Units	Notes
Surface	Design Drainage Area	*Avocado Creek Drainage Area*		
	BMP Footprint	15.0	*ac (fixed)*	*Given in concept plan*
	Temporary Ponding Depth	12	*in.*	*Assumed*
	Weir Length	100	*ft*	*Assumed*
	Assumed Orifice Cross-Sectional Area	0.8	*sf*	*To dewater temporary ponding in 3-5 days*
	Assumed Orifice Height	0	*ft*	*Assumed*
Diversion Type	Pumped	22	*cfs*	*Assumed optimum diversion rate of 0.07 cfs per contributing acreage*
Pollutant Removal Performance	*See Section C-4.8*			
Cost	*No cost – planned project*			

C-4.4 REGIONAL BMPS ON PUBLIC PARCELS

The assumptions for modeling the regional facilities are listed below in Table C-4-4. Public parcels considered for regional BMPs included screened parcels owned by the EWMP Group members (see Section 3.2.1 of the EWMP); schools and parcels owned by other entities were also considered if directed by EWMP Group members. Assumptions governing Tier 1 facilities were specified on a site-by-site basis. A total of 21 Tier 1 facilities were included in the RAA per EWMP Group member input.

Table C-4-4. Regional facility on public parcels design criteria

Parameter		Value	Units	Notes
Surface	Design Drainage Area	*Specified explicitly for each BMP*		
	BMP Footprint			
	Ponding Depth	3	*ft*	*Assumed*
	Weir Length	25	*% of width*	*Assumed to allow free overflow*
Diversion Type	*Assumed pumped if major storm drain greater than 100 ft from BMP. Used optimum diversion rate of 0.07 cfs per contributing acreage*			
Pollutant Removal Performance	*See Section C-4.8*			
Cost	*Use regional project cost functions*			

C-4.5 GREEN STREETS

Green street design criteria are provided in Table C-4-5 below. Permeable pavement was considered in the RAA to simulate "additional storage", which would be in the form of permeable pavements, suspended pavements, or other subsurface storage. Certain high-efficiency BMPs (green street opportunities undersized relative to their contributing drainage area) are inherently acknowledged in the subwatershed-scale model inputs, but such opportunities must be identified with street-scale analyses.

Table C-4-5. Green Street BMP design criteria

<table>
<tr><th colspan="2">Parameter</th><th>Value</th><th>Units</th></tr>
<tr><td colspan="4">Bioretention Assumptions</td></tr>
<tr><td rowspan="3">Surface</td><td>Design Drainage Area</td><td colspan="2" rowspan="2">Specified for each subwatershed, jurisdiction, and land use combination based on available opportunities</td></tr>
<tr><td>BMP Footprint</td></tr>
<tr><td>Ponding Depth</td><td>7</td><td>in.</td></tr>
<tr><td rowspan="3">Soil</td><td>Depth</td><td>2</td><td>ft.</td></tr>
<tr><td>Media Porosity</td><td>0.35</td><td>n/a</td></tr>
<tr><td>Media Infiltration Rate</td><td>2</td><td>in/hr</td></tr>
<tr><td rowspan="4">Underdrain</td><td>Use underdrain if underlying soils are less than</td><td>0.3</td><td>In/hr</td></tr>
<tr><td>Depth</td><td>1.5</td><td>ft.</td></tr>
<tr><td>Media Porosity</td><td>0.4</td><td>n/a</td></tr>
<tr><td>Subsoil infiltration Rate</td><td colspan="2">Match underlying soils</td></tr>
<tr><td>Pollutant Removal Performance</td><td colspan="3">See Section C-4.8</td></tr>
<tr><td>Cost</td><td colspan="3">Use bioretention cost functions</td></tr>
<tr><td colspan="4">Permeable Pavement Assumptions</td></tr>
<tr><td rowspan="3">Surface</td><td>Design Drainage Area</td><td colspan="2" rowspan="2">Specified for each subwatershed, jurisdiction, and land use combination based on available opportunities</td></tr>
<tr><td>BMP Footprint</td></tr>
<tr><td>Ponding Depth</td><td>0.12</td><td>in.</td></tr>
<tr><td rowspan="3">Aggregate</td><td>Depth</td><td>2</td><td>ft.</td></tr>
<tr><td>Media Porosity</td><td>0.4</td><td>n/a</td></tr>
<tr><td>Media Infiltration Rate</td><td>2</td><td>in/hr</td></tr>
<tr><td rowspan="4">Underdrain</td><td>Use underdrain if underlying soils are less than</td><td>0.3</td><td>In/hr</td></tr>
<tr><td>Depth</td><td>1.5</td><td>ft.</td></tr>
<tr><td>Media Porosity</td><td>0.4</td><td>n/a</td></tr>
<tr><td>Subsoil Infiltration Rate</td><td colspan="2">Match underlying soils</td></tr>
<tr><td>Pollutant Removal Performance</td><td colspan="3">See Section C-4.8</td></tr>
<tr><td>Cost</td><td colspan="3">Use permeable pavement cost functions</td></tr>
</table>

C-4.6 LID ON PRIVATE RESIDENTIAL PARCELS

Model inputs assumed that 1% of homeowners per year (starting in 2017) would participate in residential LID programs. Assumptions for LID on private residential parcels are presented in Table C-4-6.

Table C-4-6. Residential LID design criteria

Parameter		Value	Units
Surface	Design Drainage Area	*1% of high-density residential land use per year, starting in 2017*	
	BMP Footprint	*4*	*% of drainage area (e.g. footprint as percentage of each retrofitted parcel)*
	Ponding Depth	9	*in.*
Soil	Depth	2	*ft.*
	Media Porosity	0.35	*n/a*
	Media Infiltration Rate	*Match underlying soils*	
Pollutant Removal Performance	*See Section C-4.8*		
Cost	*Use LID on Residential cost functions*		

C-4.7 REGIONAL PROJECTS ON ACQUIRED PRIVATE PARCELS

Remaining untreated areas and effluent from upstream BMPs are assumed to drain to private parcels that have the potential to provide regional BMP opportunities. For the purposes of the RAA, these BMP opportunities are assumed to be infiltration basins. Table C-4-7 provides a summary of the design criteria for these BMPs.

Table C-4-7. Design criteria for regional BMPs on private parcels

Parameter		Value	Units
Infiltration Basin			
Surface	Design Drainage Area	*All areas not routed to upstream BMPs*	
	Maximum BMP Footprint	5	*% of directly contributing drainage area*
	Ponding Depth	36	*in.*
	Orifice	*No Orifice – Assume fully infiltrating.*	
Diversion Type	*Assume 100% routed to facility*		
Pollutant Removal Performance	*See Section C-4.8*		
Cost	*Use Regional Project on Private Parcel cost functions*		

C-4.8 BMP PERFORMANCE ANALYSIS

This section presents the results of a statistical analysis of available BMP performance data relevant to Southern California. The goal was to review and summarize data regarding performance of BMPs for reducing priority constituents from stormwater and non-stormwater flows. The scope of work specified the analysis to be based on data provided by the Group Members, specific to southern California, and analyzed in consideration of applicable MS4 Permit limitations. No BMP performance data were provided by the Group Members, and thus external data were compiled as described below. The compiled dataset is extensive and appendices are presented through web links (to avoid complications with printing).

The following sections provide an overview of the data sources, description of statistical methods, and summary of the results of the statistical analysis.

C-4.8.1 Data Sources for BMP Performance Data

Data for the BMP performance analysis were derived from the International BMP Database (IBD), the most extensive effort to collect and distribute BMP performance data in the United States (US). The IBD is sponsored by the US Environmental Protection Agency (USEPA), Water Environment Research Foundation (WERF), the American Society of Civil Engineers (ASCE)/Environmental and Water Resources Institute (EWRI), the American Public Works Association (APWA), and the Federal Highway Administration (FHWA). The stated purpose of the project is “to provide scientifically sound information to improve the design, selection and performance of BMPs.”

Current (November 2013) available sites with monitoring data in Southern California are displayed in Figure C-4-2 to provide an applicable data set for the Upper San Gabriel River EWMP area. There are 44 sites that have data within the mapped area with monitoring data from a total of 58 BMPs. Many of the BMPs, particularly bioswales, are owned and operated by CalTrans and therefore implemented on roadways, maintenance stations, and park and ride facilities throughout Southern California.

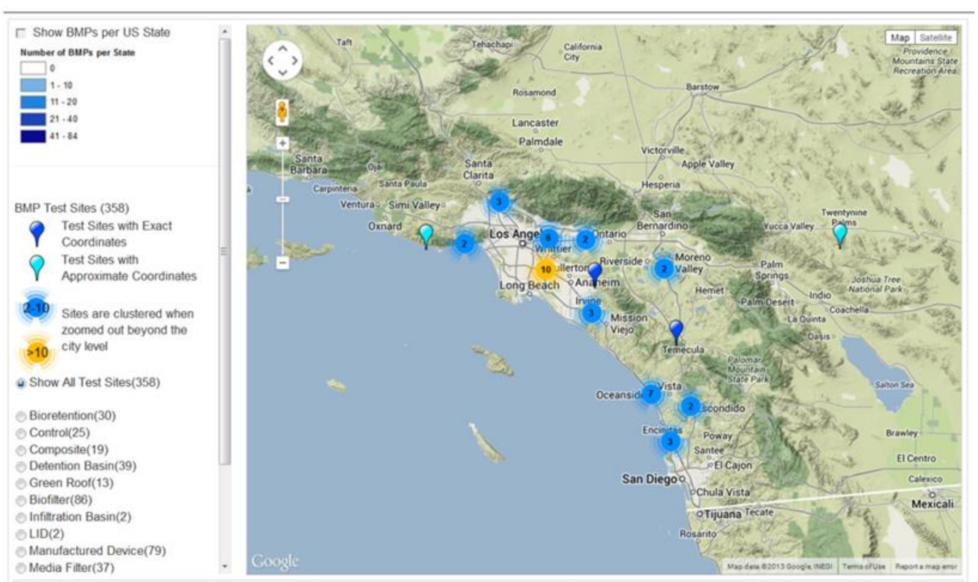

Figure C-4-2. Southern California BMPs from the International BMP Database (www.bmpdatabase.org)

C-4.8.2 Description of Analyzed Data

Analysis of BMP data in the IBD collected from Southern California provides a cross-section of structural BMP results and constituents. An overview of the data characteristics consist of:

- **BMP types:** five of the BMP subcategories were represented in the IBD for the Southern California region, including:
    - Constructed wetlands
    - Site-scale detention
    - Bioswales
    - Flow through Treatment BMPs
    - Catch basin inserts
- **Constituents:** the IBD contains sample data for hundreds of constituents ranging from metals to pesticides. This analysis herein emphasized a subset of constituents referred to herein as "common constituents of concern", and consists of:
    - Total suspended solids (TSS)
    - Fecal coliform
    - Total copper
    - Total lead, and
    - Total zinc

  The database was then screened for additional constituents with sufficient data to perform analysis and results. Based on this screening, an additional 18 constituents were identified, for a total of 23 constituents. To assist with organization and presentation of the results, each of the 23 constituents were categorized into four groups:
    - Metals
    - Bacteria
    - Solids, and
    - Nutrients.
- **Land use:** a majority of the BMPs identified in the IBD are primarily for transportation related sites. Other major land use categories such as residential, commercial, and industrial are not heavily represented in the analysis herein. However, the effluent concentrations and performance metrics are still generally considered applicable to non-transportation land uses. Many bioswales were included in the analysis, which allowed for grouping of bioswales into three categories: "all", "Caltrans", and "Non-Caltrans."
- **Monitoring methods:** the majority of the data from the IBD are based on flow-weighted composite (FWC) samples which is the general preferred practice. FWC samples provide a better measurement of the total load from a storm event and most accurately portrays the removal efficiency of BMPs. These types of samples can be used to generate representative event mean concentrations (EMCs) that can be used to calibrate water quality models. The analysis herein emphasizes reduction in concentrations of constituents. Flow reduction is heavily site- and storm-specific (depended on rainfall intensity, soil types, antecedent conditions, etc.) and can be predicted through other means (e.g., modeling).

C-4.8.3 Statistical Analysis

The statistical analysis herein is primarily based on three metrics:

- Tabular summary statistics of inflow and outflow from BMPs (mean, median, percentiles, etc.)
- Graphical presentation of the inflow and outflow using box plots
- Tabular presentation of constituent reductions and tests for statistical significance of differences between inflow and outflow

It is acknowledged that "percent reduction" is a BMP performance metric that deserves caveats (see the article "Voodoo Hydrology" in the July 2006 article of Stormwater Magazine[1]). Percent reduction is a readily-understandable BMP performance metric, and it also convenient for reporting a compact form (as shown in Table C-4-8). However, BMP performance is ultimately characterized by both the reduction of pollutants from inflow to outflow and the concentration of constituents in the outflow. For this analysis, percent reduction is presented as a simple metric to compare different BMPs across different storm and land use conditions. In addition, inflow and outflow datasets were analyzed separately, in order to characterize the quality of BMP outfalls and allow for future comparison to Permit limitations.

The approach to handling non-detects can greatly affect estimated summary statistics. For the BMP performance analysis, statistical analyses of measured concentrations were based on regression-on-order statistics (ROS). The primary advantage/purpose of the ROS approach is to account for sample limits of detection (SLODs) in samples that were non-detect (referred to as "censored"). An Excel add-in developed by the California Department of Transportation (CalTrans) was used to generate ROS, for which the primary references for the statistical procedures are Shumway and Azari (2000) and Helsel (1990).

C-4.8.4 Results

The results of the statistical analysis produced thousands of measures that can be used to evaluate BMPs. These results will support the RAA assumptions regarding effluent concentrations from some BMPs. The results are presented in formats that are designed to allow readers to focus on both absolute (inflow and outflow concentrations) and relative performance of BMPs (percent reductions) for individual constituents and groups of constituents. As mentioned previously, extensive appendices were generated and are available for web download. The results of the analysis are presented as follows:

- **Percent removal:** the results in Table C-4-8 provide mean and median removal percentages for the BMPs and for each of the 23 Constituents of Concern (COCs) analyzed. The table can be used to evaluate relative performance across constituent and BMP categories.
- **Inflow and outflow concentrations for common COCs:** shown in Table C-4-9 thru Table C-4-13 are comparisons of standard statistics for the five available BMP categories across each of the common COCs. The corresponding box plots in Figure C-4-4 thru Figure C-4-7 graphically represent the range of inflow versus outflow performance for the BMP categories.
- **Detailed summary statistics for of inflow and outflow concentrations for all constituents:** standard statistics, including significance testing for inflow and outflow concentrations, for the 23 COCs are included in **Section C-4.8.6**.
- **Detailed performance statistics for all BMPs and all constituents:** extensive summary statistics and box plots of BMP performance across the BMP categories are included in **Section C-4.8.6**.

Box plots are a graphical representation of numerical data through their quartiles. The presented box plots include whiskers that span from the 10th to 90th percentiles and display outliers, defined as values that are more than 1.5 times the inner quartile range beyond the median. These outliers are ***included*** in all the generated summary statistics. This approach is consistent with technical memorandums on the IBD website. The following Figure C-4-3 is graphical representation of box plots for reference.

[1] http://www.stormh2o.com/SW/Editorial/Voodoo_Hydrology_37.aspx

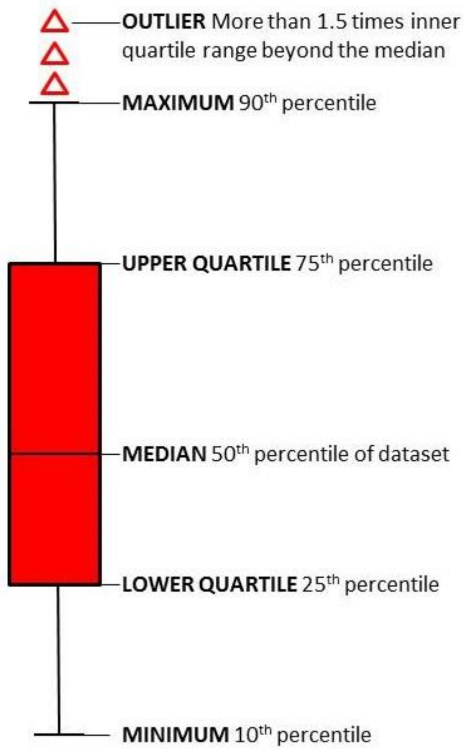

Figure C-4-3. Box plot component legend

Table C-4-8. Mean and Median Percent Removal from Inflow to Outfall for All Constituents and BMP Categories

Constituent Group	Constituent	BioSwale (All)		BioSwale (Caltrans)		BioSwale (Non-Caltrans)		Constructed Wetland		Flow Through Treatment BMP		Site Scale Detention	
		% Change, Mean	% Change, Median	% Change, Mean	% Change, Median	% Change, Mean	% Change, Median	% Change, Mean	% Change, Median	% Change, Mean	% Change, Median	% Change, Mean	% Change, Median
Metals	Total Arsenic	-51.14%	-21.85%	21.19%	29.33%	**-70.90%**	-44.19%	**-64.23%**	-65.00%	-11.57%	-18.52%	-19.56%	-24.00%
	Total Cadmium	**-51.15%**	-58.47%	-15.99%	-49.52%	**-68.14%**	-66.32%	**-74.50%**	-62.40%	1.22%	-48.00%	**-53.72%**	-49.44%
	Total Chromium	-24.85%	-42.03%	-21.11%	-28.38%	-27.37%	-61.06%	**-81.54%**	-88.30%	**-35.10%**	-37.04%	-60.67%	-50.00%
	Total Copper	**-69.02%**	-68.29%	**-59.24%**	-60.98%	**-70.39%**	-60.32%	-98.02%	-85.81%	-55.03%	-38.89%	**-51.83%**	-48.04%
	Total Iron	-57.30%	-61.20%	-48.56%	-47.57%	---	---	---	---	---	---	---	---
	Total Lead	**-75.46%**	-77.05%	**-69.92%**	-75.02%	**-76.11%**	-67.68%	-98.11%	-97.41%	**-63.71%**	-76.15%	**-66.23%**	-59.26%
	Total Nickel	**-59.02%**	-64.38%	-41.24%	-46.58%	**-69.50%**	-72.97%	-48.11%	-36.78%	-21.04%	-28.57%	-62.53%	-45.21%
	Total Zinc	**-74.08%**	-75.66%	**-71.53%**	-76.14%	**-71.42%**	-68.65%	**-84.48%**	-85.56%	**-62.40%**	-74.89%	**-68.98%**	-64.64%
Bacteria	Fecal Coliform	-13.70%	-82.00%	---	---	-13.70%	-82.00%	-94.54%	-92.69%	-26.36%	-91.43%	99.1%	41.7%
	Total Coliform	---	---	---	---	---	---	-0.18%	-62.97%	**-99.91%**	-99.90%	---	---
Solids	Total Suspended Solids	**-50.46%**	-59.21%	-24.21%	-51.28%	-61.37%	**-58.33%**	**-94.55%**	-95.22%	**-65.0%**	-82.28%	**-62.82%**	-62.00%
	Total Dissolved Solids	-3.72%	7.32%	17.58%	12.36%	-17.36%	-2.50%	**+1169%**	1739%	12.12%	16.67%	-0.29%	0.00%
	Turbidity	**-62.65%**	-50.67%	**-62.65%**	-50.67%	---	---	---	---	---	---	---	---
Nutrients	Kjeldahl nitrogen (TKN)	-18.52%	-15.00%	29.02%	16.67%	**-31.74%**	-25.24%	-22.91%	8.33%	-24.22%	-30.97%	-14.86%	-20.21%
	Nitrogen, ammonia as N	15.93%	-25.50%	40.91%	-9.04%	---	---	-61.86%	-57.14%	28.35%	50.00%	---	---
	Nitrogen, Nitrate (NO3) as N	-12.14%	-21.25%	13.77%	-1.31%	-22.54%	-23.29%	-66.90%	-87.87%	24.13%	41.41%	-13.89%	-10.59%
	Nitrogen, Nitrite (NO2) as N	89.01%	31.91%	89.01%	31.91%	---	---	**-100%**	-100%	---	---	---	---
	Nitrogen, unionized ammonia (NH3) as N	---	---	---	---	---	---	---	---	**-56.11%**	-62.50%	---	---
	Organic carbon, Dissolved	-10.96%	7.50%	17.74%	34.02%	-28.27%	-14.14%	-32.54%	-40.91%	-1.43%	-7.14%	6.92%	9.09%
	Organic carbon, Total	-13.17%	0.00%	15.30%	18.18%	-29.70%	-5.56%	-23.90%	-6.67%	-4.78%	-12.79%	0.68%	6.06%
	Phosphorus as P, Dissolved	+263%	+250%	---	---	+263.42%	+250.00%	+186.92%	90.18%	-7.14%	-11.11%	-3.15%	22.22%
	Phosphorus as P, Total	+125%	+100%	+219%	+269%	92.89%	68.18%	-19.33%	-14.29%	**-34.10%**	-25.00%	**-35.61%**	-19.44%
	Phosphorus, orthophosphate as P	+369%	+553%	+531%	+795%	59.09%	31.91%	---	---	---	---	---	---

Note 1: Orange values indicate statistically different inflow and outflow concentrations based on 95% confidence intervals.

Note 2: If insufficient data were available to calculate the % removal, then --- is shown. **Note 3:** Catch basin inserts are not shown because effluent data were insufficient.

Table C-4-9. Inflow/Outflow Summary Statistics for TSS (mg/l)

BMP Category	Number of BMP Sampling Locations		Number of Samples Analyzed		25th Percentile		Median (50th Percentile)		75th Percentile	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Site Scale Detention	5	5	76	69	75	23	100	38	169	59
Bioswales	31	31	159	103	45.0	18.0	76.0	31.0	130	54
Catch Basin Inserts	0	6	---	88	---	20	---	37.5	---	71
Flow Through Treatment BMPs	13	13	230	218	8.875	2.875	39.5	7.00	89.25	22.25
Constructed Wetlands	1	1	13	14	140	3.50	230	11.0	255	13.5

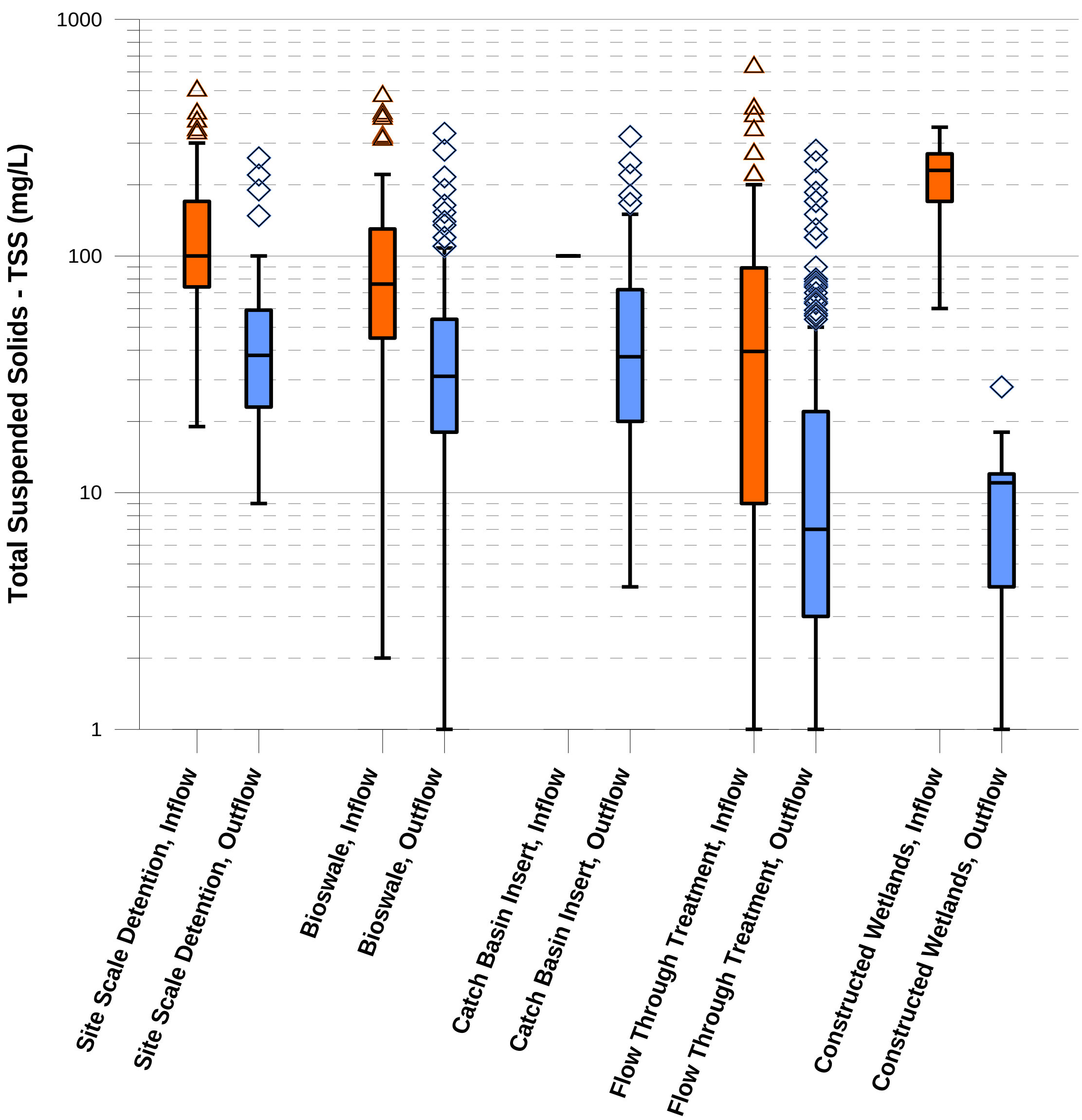

Figure C-4-4 Box Plots of Inflow/Outflow TSS Concentrations in Southern California

BMP Category	Number of BMP Sampling Locations		Number of Samples Analyzed		25th Percentile		Median (50th Percentile)		75th Percentile	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Site Scale Detention	9	9	34	30	300	475	600	850	1700	3075
Bioswales	8	8	33	19	500	130	5000	900	16500	5000
Catch Basin Inserts	0	6	---	---	---	---	---	---	---	---
Flow Through Treatment BMPs	11	11	172	152	300	7.47	900	77.1	3000	797
Constructed Wetlands	2	2	13	14	230	20.0	1300	95.0	3800	255

Table C-4-10. Inflow/Outflow Summary Statistics for Fecal Coliform (#/100mL)

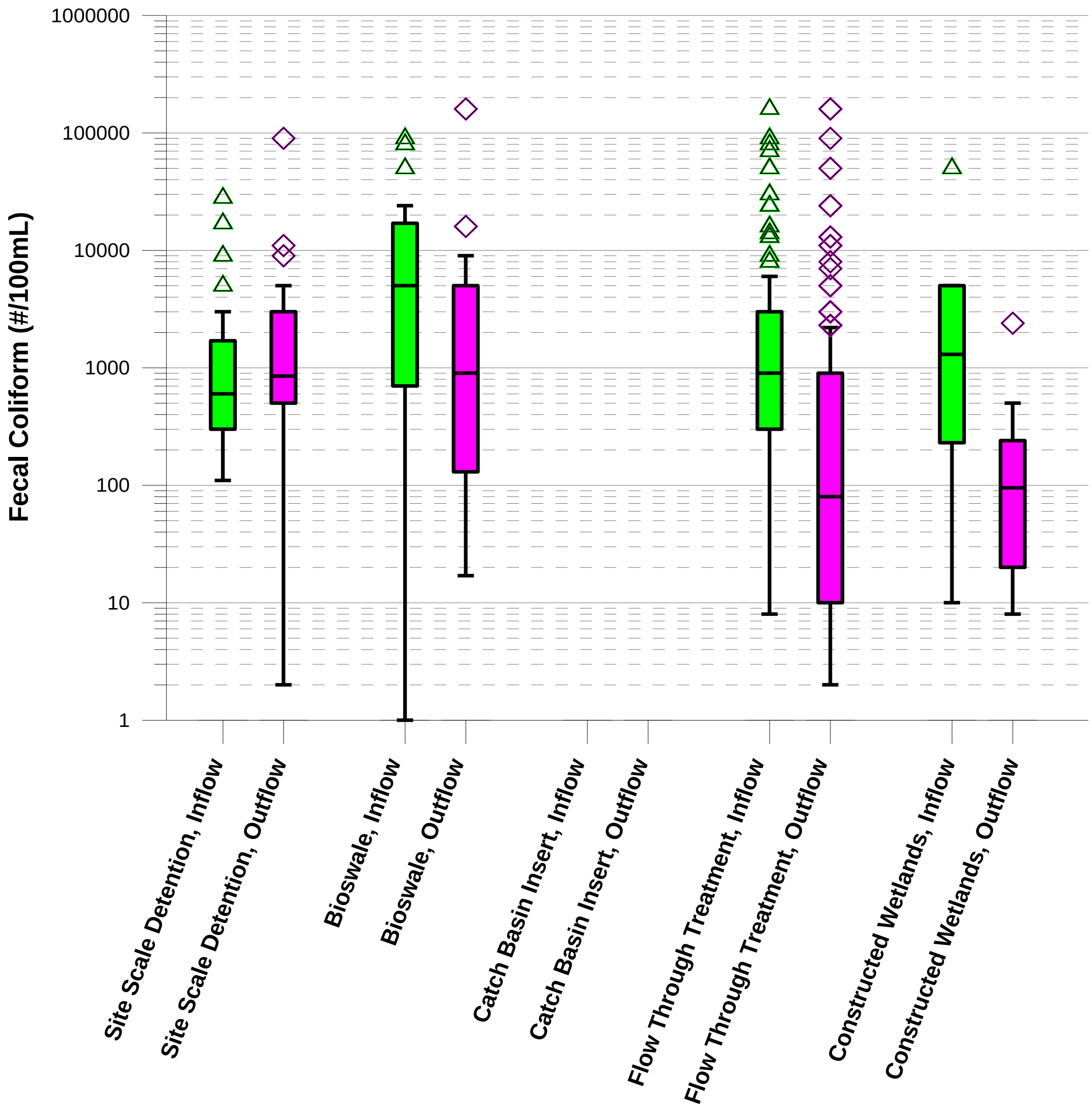

Figure C-4-5 Box Plots of Inflow/Outflow Fecal Coliform Concentrations in Southern California

BMP Category	Number of BMP Sampling Locations		Number of Samples Analyzed		25th Percentile		Median (50th Percentile)		75th Percentile	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Site Scale Detention	5	5	76	68	26.25	15.00	39.45	20.50	63.75	28.00
Bioswales	31	31	150	100	22.00	8.23	41.00	13.00	70.50	19.90
Catch Basin Inserts	0	6	---	88	---	5.95	---	13	---	22
Flow Through Treatment BMPs	11	11	150	146	11.98	6.20	18.00	11.00	33.00	21.25
Constructed Wetlands	2	2	21	22	11.15	5.55	62.00	8.80	110.00	14.75

Table C-4-11. Inflow/Outflow Summary Statistics for Copper (µg/l)

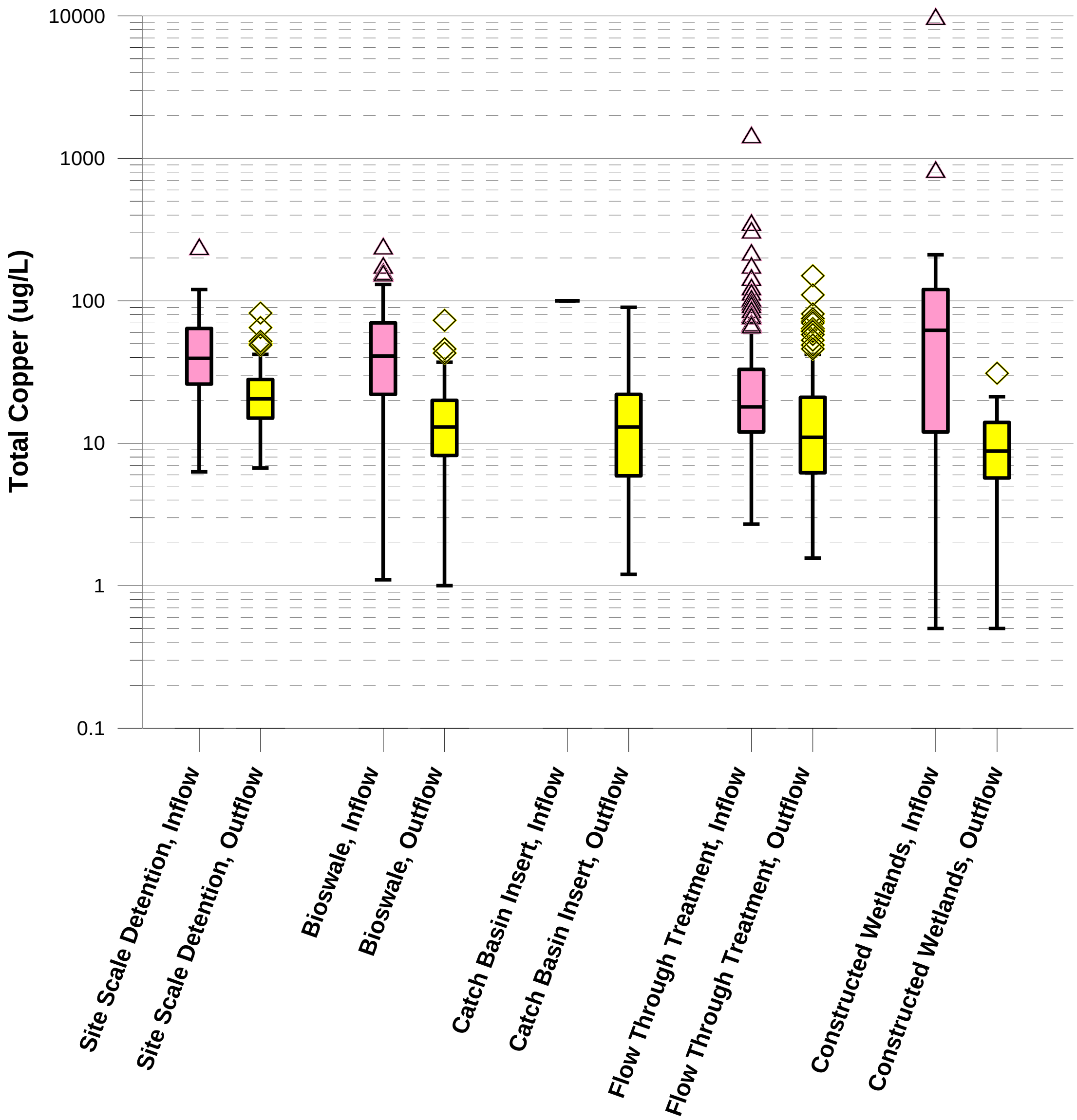

Figure C-4-5 Box Plots of Inflow/Outflow Copper Concentrations in Southern California

BMP Category	Number of BMP Sampling Locations		Number of Samples Analyzed		25th Percentile		Median (50th Percentile)		75th Percentile	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Site Scale Detention	5	5	76	69	34.40	13.00	54.00	22.00	108.25	36.50
Bioswales	31	31	150	100	13.92	3.53	32.89	7.55	77.75	21.50
Catch Basin Inserts	0	6	---	88	---	2.3	---	6	---	12.45
Flow Through Treatment BMPs	11	11	149	146	6.50	1.00	13.00	3.10	25.50	7.10
Constructed Wetlands	2	2	21	22	3.32	2.70	170.00	4.40	315.00	8.32

Table C-4-12. Inflow/Outflow Summary Statistics for Lead (µg/l)

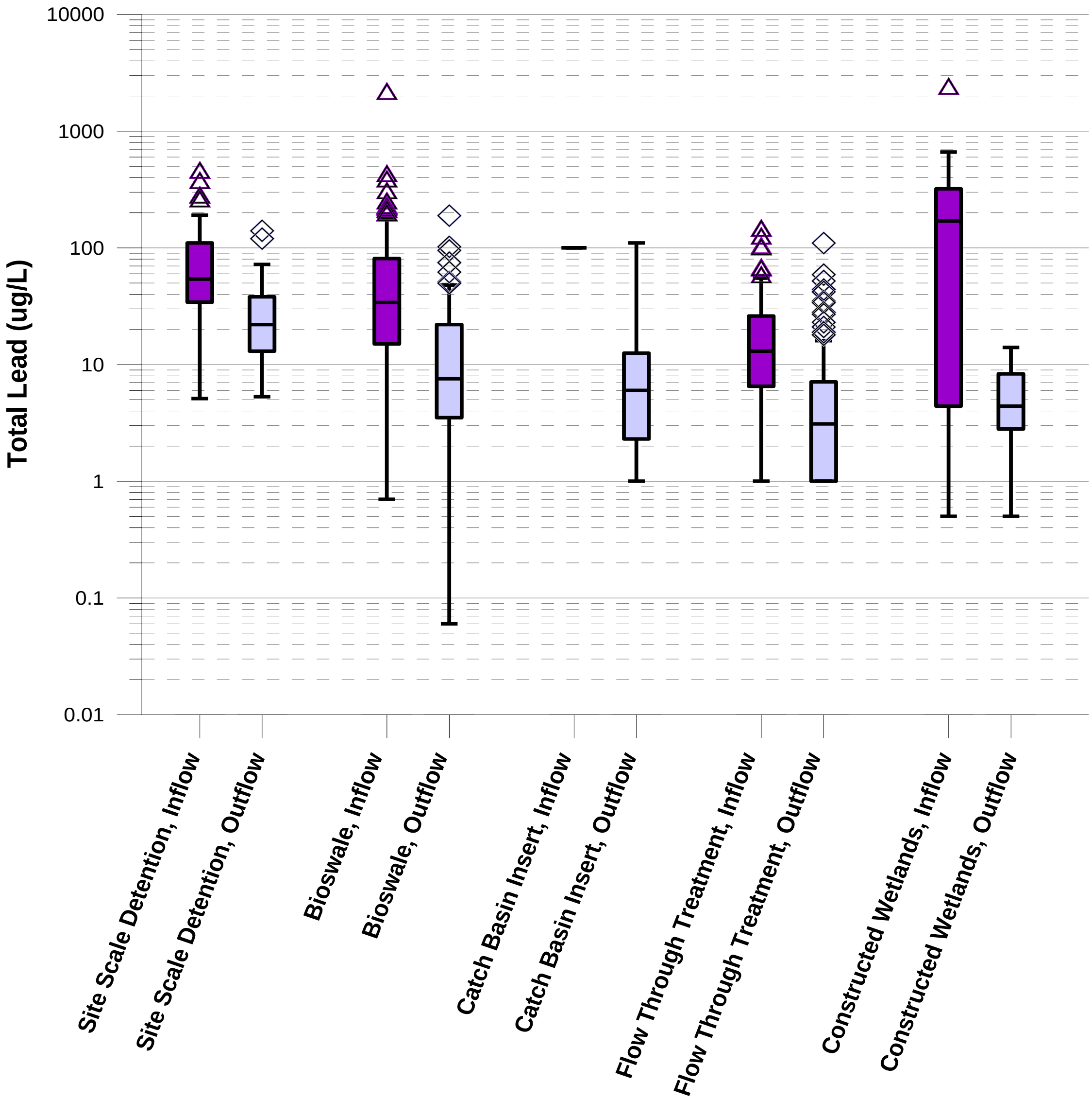

Figure C-4-6 Box Plots of Inflow/Outflow Lead Concentrations in Southern California

Table C-4-13. Inflow/Outflow Summary Statistics for Zinc (µg/l)

BMP Category	Number of BMP Sampling Locations		Number of Samples Analyzed		25th Percentile		Median (50th Percentile)		75th Percentile	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Site Scale Detention	5	5	76	68	152.75	68.25	280.00	99.00	504.75	150.00
Bioswales	31	31	150	100	110	29.5	228	55.5	360	82.5
Catch Basin Inserts	0	6	---	88	---	50.5	---	107	---	220
Flow Through Treatment BMPs	11	11	150	146	110	23.00	221	55.5	400	131
Constructed Wetlands	2	2	21	22	109.00	28.53	270.00	39.00	450.00	84.35

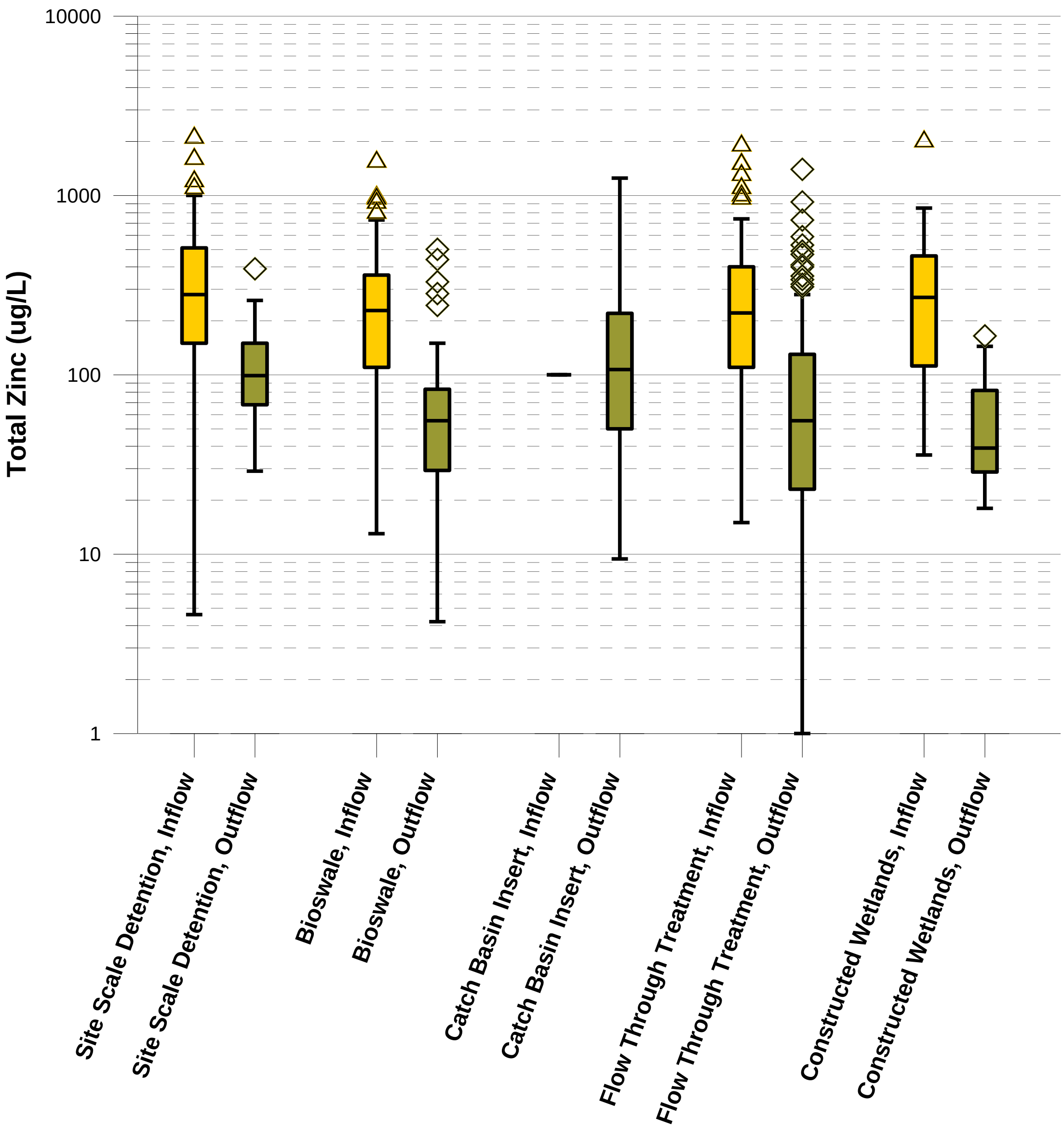

Figure C-4-7 Box Plots of Inflow/Outflow Lead Concentrations in Southern California

C-4.8.5 Discussion and Observations regarding BMP Performance

The statistical analysis presented herein has many applications, including supporting the RAA for the EWMP. As future applications are undertaken, the results can be analyzed in more detail. For this Work Plan, several general observations are highlighted, as follows:

- **Comparison of outflow quality among BMPs:** the constructed wetland (n = 2) and flow through treatment BMPs (n = 31) generally exhibited the highest quality effluent. Reductions of TSS were generally higher compared to other BMPs and concentrations of TSS in outflows were generally lower (see Table C-4-9 and Figure C-4-4). Elevated performance is also apparent for other constituents. The constructed wetlands exhibited exceptional reductions (>84%) of total copper, lead, and zinc. Constituents were likely reduced in the constructed wetlands by means of sedimentation, chemical and biological conversions, and uptake. The flow through treatment BMPs in the dataset were mostly Caltrans BMPs including media filters and proprietary cartridge filters with a range of sand/peat and sand/gravel mixes.

- **BMP performance for individual constituents:** among the constituents analyzed, the percent removals were often the highest for total metals, especially lead and zinc (Table C-4-8). The poorest performance was often for nutrients, with phosphorous concentrations increasing in some cases (likely due to leaching). For bacteria, only the constructed wetlands and flow through treatment BMPs were able to generate outflows with median fecal coliform concentrations less than 235 MPN per 100mL (which is an applicable Permit limitation if fecal coliform is assumed equivalent to *E. coli*) (see Table C-4-10 and Figure C-4-5).

Application of the data herein for the RAA effort: in general, the majority of pollutant removal associated with potential stormwater BMPs in the RAA will be due to volume reduction (infiltration). SUSTAIN, which will be used for the RAA, is process-based and thus is able to estimate volume reduction and the proportion of inflow that is infiltrated, treated, and overflowed. Because the model is dynamic, these proportions change from storm to storm (i.e., overflows are less frequent during small storms than large storms). SUSTAIN also simulated first order decay of pollutants per the parameters listed in the *Guidelines for Conducting Reasonable Assurance Analysis in a Watershed Management Program, Including an Enhanced Watershed Management Program* (Nguyen et al., 2014).

For the subset of BMPs with a treatment component, some assumptions were needed regarding the quality of treated and discharged outflow (e.g., biofiltration BMPs, which have an underdrain). The analysis herein support those assumptions. It is noted that SUSTAIN does not provide a mechanism to apply effluent concentrations, so the median concentration reduction rates reported in Table C-4-8 were applied to underdrain effluent (acknowledging the limitations of this metric discussed in C-4.8.3).

C-4.8.6 Detailed Results

A detailed summary of BMP influent and effluent statistics for all 23 analyzed constituents, as well as detailed performance metrics for all BMP categories can be provided upon request.

C-4.9 REFERENCES

IBD (International BMP Database). July 2012. Constituent Catergory Summary Statistical Addendum: TSS, Bacteria, Nutrients, and Metals. http://www.bmpdatabase.org/index.htm Accessed November 18, 2013

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Appendix C-5

Green Infrastructure Results Summary

APPENDIX C-5: GREEN INFRASTRUCTURE RESULTS SYNTHESIS

This appendix discusses the RAA results relevant to green infrastructure, which comprises a substantial portion of the prescribed control measure capacity (and cost) in the EWMP.

Table C-5-1, Figure C-5-1, and Figure C-5-2 present the green street retrofit rates per jurisdiction and Subwatershed that are prescribed by the EWMP, as informed by the RAA. Table C-5-2 lists the specific streets that passed desktop screening for green street opportunities.

Table C-5-1. Green Street Retrofit Rates (Green Street Intensity) by Jurisdiction

Jurisdiction	Total Considered Frontage Length (miles)	Total Approximate Miles of Green Street BMPs[1]	Approximate Jurisdiction-Wide Frontage Retrofit Rate
Baldwin Park	195	35	18%
Covina	215	30	14%
Industry	272	65	24%
Glendora	102	17	17%
La Puente	119	26	22%
Unincorporated LA County	1,032	176	17%

[1] Tabulated values are based on BMP lengths (not retrofitted street lengths) and assume all capacity installed as bioretention per the assumptions in Appendix W

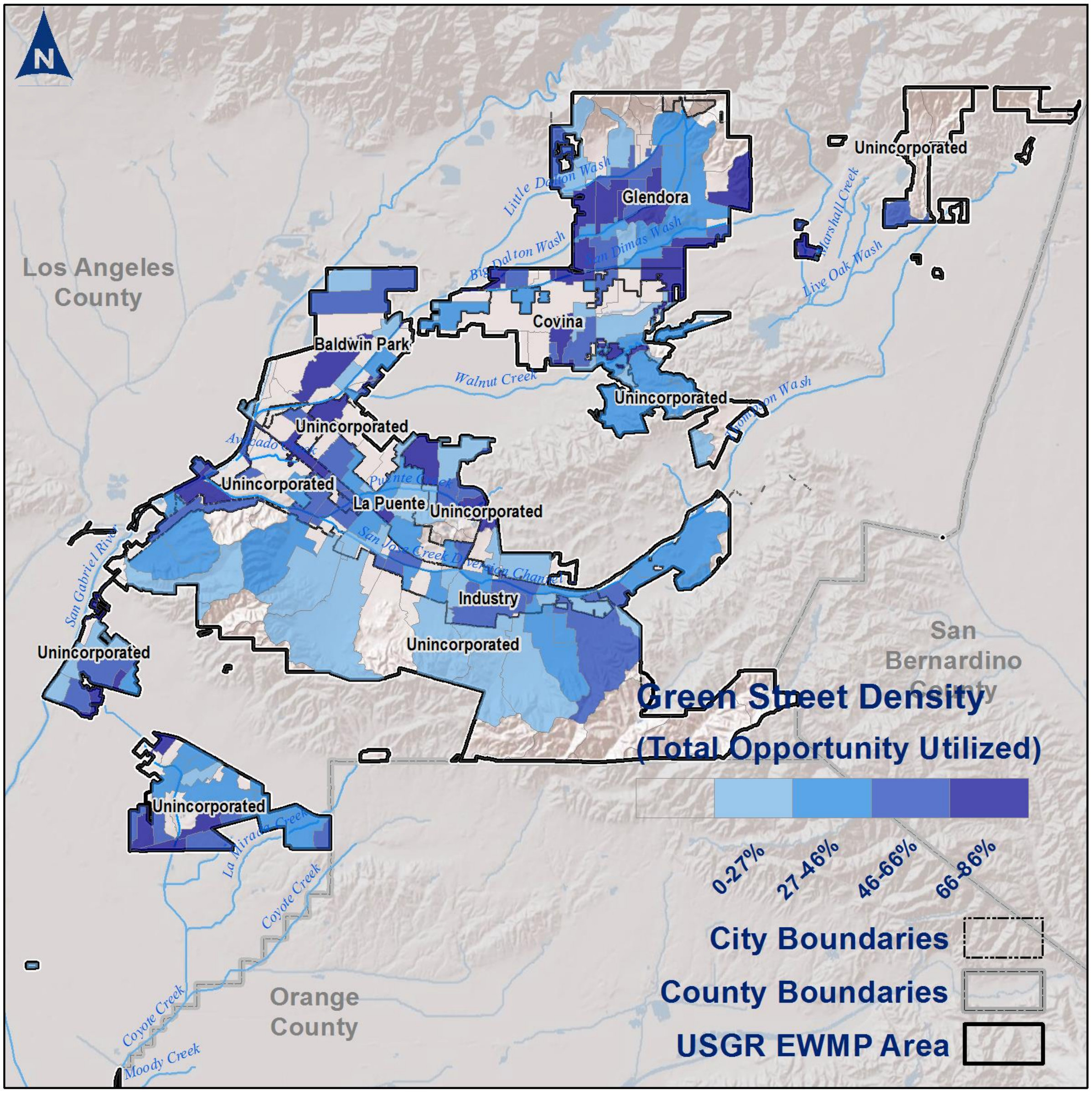

Figure C-5-1. Model Output Green Street Utilization (Density) Per Subwatershed

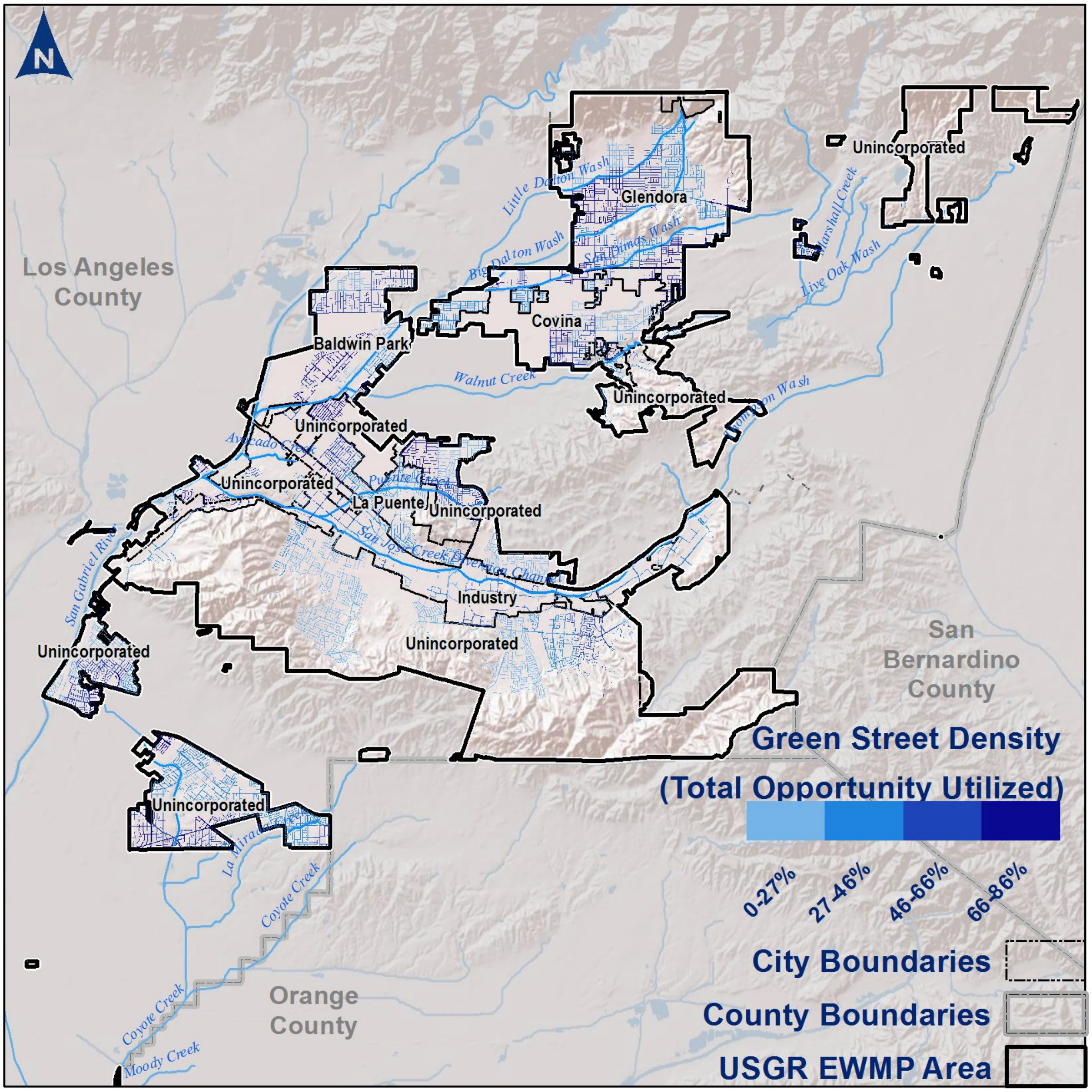

Figure C-5-2. Model Output Green Street Utilization (Density) Displayed Relative to Screened Street Opportunities

Table C-5-2. Tabulation of Green Street Opportunities (screened for slopes and functional class)

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Balwin Park	75228		462
Balwin Park	75228	N Puente Ave	422
Balwin Park	75230	Cloverleaf Dr	386
Balwin Park	75232	Ramona Blvd	3
Balwin Park	75232	Ramona Pkwy	21
Balwin Park	75237	Ramona Blvd	371
Balwin Park	75240		4938
Balwin Park	75240	Alderson Ave	660
Balwin Park	75240	Anada St	175
Balwin Park	75240	Anniston Ave	1254
Balwin Park	75240	Baca Ct	108
Balwin Park	75240	Baldwin Park Blvd	2677
Balwin Park	75240	Belgate St	1570
Balwin Park	75240	Bellbrook St	1163
Balwin Park	75240	Benbow St	2339
Balwin Park	75240	Benham Ave	764
Balwin Park	75240	Benwood St	588
Balwin Park	75240	Bleecker	422
Balwin Park	75240	Bleecker St	361
Balwin Park	75240	Bleeker St	2588
Balwin Park	75240	Bogart Ave	2869
Balwin Park	75240	Borel St	1026
Balwin Park	75240	Bresee Ave	2646
Balwin Park	75240	Brookport St	608
Balwin Park	75240	Brooks Dr	768
Balwin Park	75240	California Ave	1304
Balwin Park	75240	Calmview Ave	1613
Balwin Park	75240	Cavell Pl	350
Balwin Park	75240	Cavette Pl	1130
Balwin Park	75240	Center St	2453
Balwin Park	75240	Chilcot St	606
Balwin Park	75240	Cragmont	33
Balwin Park	75240	Cragmount St	33
Balwin Park	75240	Cutler Ave	1941
Balwin Park	75240	Demblon St	2052
Balwin Park	75240	Devanah St	228
Balwin Park	75240	Downing Ave	1679
Balwin Park	75240	Dunia St	2007
Balwin Park	75240	E Baldwin Ave	1315
Balwin Park	75240	E Joanbridge St	1665
Balwin Park	75240	Edra Ave	1448
Balwin Park	75240	Elizabeth St	815
Balwin Park	75240	Elton St	2321
Balwin Park	75240	Estella St	1545
Balwin Park	75240	Filhurst Ave	52
Balwin Park	75240	Fortin St	1272
Balwin Park	75240	Gates St	49
Balwin Park	75240	Gayhurst Ave	1514
Balwin Park	75240	Grace Ave	504
Balwin Park	75240	Hallwood Dr	857
Balwin Park	75240	Harlan Ave	1462
Balwin Park	75240	Heintz St	1298
Balwin Park	75240	Hornbrook Ave	1541

[2] Some screened street opportunities are unnamed because no identifying information was available in the US Census Tiger/LINE source data.

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Balwin Park	75240	Jerry Ave	1761
Balwin Park	75240	Joanbridge St	1704
Balwin Park	75240	Kenmore Ave	1338
Balwin Park	75240	la Rica Ave	2172
Balwin Park	75240	la Sena Ave	1942
Balwin Park	75240	Landis Ave	2654
Balwin Park	75240	Lante St	2323
Balwin Park	75240	Larry Ave	846
Balwin Park	75240	Laurens Ave	473
Balwin Park	75240	Littlejohn St	2434
Balwin Park	75240	Los Angeles St	9319
Balwin Park	75240	Maine Ave	5254
Balwin Park	75240	Marion Ave	1368
Balwin Park	75240	Masline Ct	126
Balwin Park	75240	Masline St	823
Balwin Park	75240	Maupin Ave	286
Balwin Park	75240	Merced Ave	2617
Balwin Park	75240	Monterey Ave	1164
Balwin Park	75240	Norco Ave	428
Balwin Park	75240	Nubia St	3959
Balwin Park	75240	Ohio St	3269
Balwin Park	75240	Olive St	3104
Balwin Park	75240	Ott Pl	54
Balwin Park	75240	Park Ave	513
Balwin Park	75240	Park Centre St	31
Balwin Park	75240	Phelan Ave	2413
Balwin Park	75240	Plascencia Ct	463
Balwin Park	75240	Rockenbach St	3727
Balwin Park	75240	Sandstone St	487
Balwin Park	75240	School St	46
Balwin Park	75240	Scott Pl	810
Balwin Park	75240	Spring St	447
Balwin Park	75240	Stancroft Ave	620
Balwin Park	75240	Stewart Ave	2656
Balwin Park	75240	Via el Camino	37
Balwin Park	75240	Walnut St	2625
Balwin Park	75241		3926
Balwin Park	75241	Anada St	1618
Balwin Park	75241	Baldwin Park Blvd	2619
Balwin Park	75241	Basinview Ave	834
Balwin Park	75241	Benham Ave	1831
Balwin Park	75241	Bresee Ave	1233
Balwin Park	75241	Calais St	1307
Balwin Park	75241	Center St	89
Balwin Park	75241	Chilcot St	1199
Balwin Park	75241	Clearcrest Dr	1228
Balwin Park	75241	Commerce Cir	33
Balwin Park	75241	Commerce Dr	2491
Balwin Park	75241	Cragmont St	903
Balwin Park	75241	Cutler Ave	1362
Balwin Park	75241	Edra Ave	9
Balwin Park	75241	Gates St	775
Balwin Park	75241	Jerry Ave	1203
Balwin Park	75241	Joanbridge St	1983
Balwin Park	75241	la Rica Ave	2087
Balwin Park	75241	Landis Ave	2160
Balwin Park	75241	Larry Ave	816
Balwin Park	75241	Masline St	1788
Balwin Park	75241	Merced Ave	1250
Balwin Park	75241	Nubia St	3629
Balwin Park	75241	Olive St	3872
Balwin Park	75241	Rivergrade Rd	1435
Balwin Park	75241	Sandstone St	808
Balwin Park	75241	School St	796
Balwin Park	75241	Stewart Ave	2650

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Balwin Park	75241	Walnut St	63
Balwin Park	75241	Wimmer Ave	1654
Balwin Park	75243	Rivergrade Rd	35
Balwin Park	75244		829
Balwin Park	75244	Commerce Dr	123
Balwin Park	75244	Live Oak Ave	760
Balwin Park	75244	Rivergrade Rd	17
Balwin Park	75360		576
Balwin Park	75360	Amar Rd	980
Balwin Park	75360	Cloverleaf Dr	29
Balwin Park	75360	Dalewood St	474
Balwin Park	75360	Farnell St	1602
Balwin Park	75360	Frazier St	1034
Balwin Park	75360	Garvey Ave	44
Balwin Park	75360	Hensel St	739
Balwin Park	75360	Ledford St	2038
Balwin Park	75360	Marlinda Ave	32
Balwin Park	75360	Matlock Ave	415
Balwin Park	75360	Nolina Ave	586
Balwin Park	75360	Patritti Ave	995
Balwin Park	75360	Piniero Pl	401
Balwin Park	75360	Syracuse Ave	1652
Balwin Park	75360	Torch St	1242
Balwin Park	75360	Valens St	278
Balwin Park	75360	Via Van Cleave	168
Balwin Park	75360	Westcott Ave	903
Balwin Park	75361		4937
Balwin Park	75361	Athol St	6590
Balwin Park	75361	Aukland St	669
Balwin Park	75361	Barnes Ave	3318
Balwin Park	75361	Bess Ave	2166
Balwin Park	75361	Blenheim St	898
Balwin Park	75361	Cedar Cir	135
Balwin Park	75361	Chelsfield St	1267
Balwin Park	75361	Cleo St	1237
Balwin Park	75361	Corak St	1964
Balwin Park	75361	Cosbey Ave	3435
Balwin Park	75361	Cosbey St	525
Balwin Park	75361	Durbin St	36
Balwin Park	75361	Duthie St	408
Balwin Park	75361	Earl Ave	1125
Balwin Park	75361	Egil Ave	759
Balwin Park	75361	Emery Ave	446
Balwin Park	75361	Fairgrove St	2963
Balwin Park	75361	Finchley St	1615
Balwin Park	75361	Francisquito Ave	1688
Balwin Park	75361	Frazier St	1057
Balwin Park	75361	Mangum St	3662
Balwin Park	75361	Nolina St	4
Balwin Park	75361	Parkview Dr	59
Balwin Park	75361	Parkwood Pl	40
Balwin Park	75361	Patritti Ave	1311
Balwin Park	75361	Ramona Blvd	4572
Balwin Park	75361	Ramona Pkwy	594
Balwin Park	75361	Rhodes Ln	598
Balwin Park	75361	Royston St	975
Balwin Park	75361	Saint James Pl	496
Balwin Park	75361	Salisbury St	1455
Balwin Park	75361	San Gabriel River Pkwy	1597
Balwin Park	75361	Schabarum Ave	43
Balwin Park	75361	Summer Ln	36
Balwin Park	75361	Syracuse Ave	2695
Balwin Park	75361	Torrey Cir	134
Balwin Park	75361	Waco St	2216
Balwin Park	75361	Waltham St	1152

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Balwin Park	75361	Wescott Cir	98
Balwin Park	75361	Westcott Ave	1526
Balwin Park	75362		90
Balwin Park	75364		5521
Balwin Park	75364	Adoue Pl	323
Balwin Park	75364	Athol St	770
Balwin Park	75364	Baldwin Park Blvd	16105
Balwin Park	75364	Bess Ave	1589
Balwin Park	75364	Bresee Ave	1614
Balwin Park	75364	Corak St	836
Balwin Park	75364	Dalewood St	373
Balwin Park	75364	Dart St	747
Balwin Park	75364	Doublegrove St	565
Balwin Park	75364	Durness St	359
Balwin Park	75364	E Tracy St	282
Balwin Park	75364	Earl Ave	1305
Balwin Park	75364	Emery Ave	447
Balwin Park	75364	Fairgrove St	1207
Balwin Park	75364	Finchley St	363
Balwin Park	75364	Foster Ave	4242
Balwin Park	75364	Francisquito Ave	3030
Balwin Park	75364	Frazier St	6598
Balwin Park	75364	Garvey Ave	355
Balwin Park	75364	Grace Ave	1433
Balwin Park	75364	Hammond St	508
Balwin Park	75364	Havenbrook St	509
Balwin Park	75364	Idaho Ave	480
Balwin Park	75364	Idaho St	1298
Balwin Park	75364	Illinois St	1323
Balwin Park	75364	Judith St	1514
Balwin Park	75364	Kenmore Ave	2304
Balwin Park	75364	la Rica Ave	717
Balwin Park	75364	Leorita St	813
Balwin Park	75364	Loma Ln	1182
Balwin Park	75364	Macdevitt St	387
Balwin Park	75364	Maine Ave	7194
Balwin Park	75364	Merced Ave	2796
Balwin Park	75364	Monterey Ave	2640
Balwin Park	75364	Nolina St	588
Balwin Park	75364	Pacific Ave	649
Balwin Park	75364	Paddy Ln	4778
Balwin Park	75364	Rall Ave	273
Balwin Park	75364	Ramona Blvd	3471
Balwin Park	75364	Remey Ave	552
Balwin Park	75364	Rexwood Ave	1924
Balwin Park	75364	Robinette Ave	1341
Balwin Park	75364	Rockway Dr	892
Balwin Park	75364	Shaver St	372
Balwin Park	75364	Sparland St	415
Balwin Park	75364	St James Cir	35
Balwin Park	75364	Sterling Way	664
Balwin Park	75364	Stewart Ave	84
Balwin Park	75364	Susquehana Cir	129
Balwin Park	75364	Susquehanna Ave	669
Balwin Park	75364	Torrey Cir	1031
Balwin Park	75364	Torrey St	510
Balwin Park	75364	Tracy St	2125
Balwin Park	75364	Via Rancho	317
Balwin Park	75364	Via Venado St	144
Balwin Park	75364	Waco St	1597
Balwin Park	75365		5020
Balwin Park	75365	Alta Lake Ave	359
Balwin Park	75365	Baldwin Park Blvd	2511
Balwin Park	75365	Ballentine Pl	1020
Balwin Park	75365	Bellgreen St	1027

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Balwin Park	75365	Benham Ave	1491
Balwin Park	75365	Bogart Ave	1130
Balwin Park	75365	Bresee Ave	2585
Balwin Park	75365	Center St	3290
Balwin Park	75365	Cesar Chavez Dr	275
Balwin Park	75365	Clark St	4464
Balwin Park	75365	Crickett Ln	303
Balwin Park	75365	Cutler Ave	2272
Balwin Park	75365	Downing Ave	91
Balwin Park	75365	Elwyn Dr	1369
Balwin Park	75365	Filhurst Ave	3163
Balwin Park	75365	Foster Ave	9
Balwin Park	75365	Fountain Ct	36
Balwin Park	75365	Fountain Villas Ct	232
Balwin Park	75365	Grace Ave	1038
Balwin Park	75365	Harlan Ave	3794
Balwin Park	75365	Hornbrook Ave	2987
Balwin Park	75365	Jerry Ave	2406
Balwin Park	75365	Kenmore Ave	1057
Balwin Park	75365	la Rica Ave	3146
Balwin Park	75365	Landis Ave	262
Balwin Park	75365	Laurens Ave	502
Balwin Park	75365	Lubican St	1829
Balwin Park	75365	Maine Ave	2265
Balwin Park	75365	Maupin Ave	1268
Balwin Park	75365	Merced Ave	3190
Balwin Park	75365	Monterey Ave	1530
Balwin Park	75365	Morgan St	1252
Balwin Park	75365	Pacific Ave	122
Balwin Park	75365	Palm Ave	5124
Balwin Park	75365	Palmrose St	746
Balwin Park	75365	Park Shadow Ct	75
Balwin Park	75365	Ramona Blvd	5305
Balwin Park	75365	Ramona Pkwy	9902
Balwin Park	75365	Shadylawn Pl	699
Balwin Park	75365	Stewart Ave	3982
Balwin Park	75365	Valle Vista Ave	1230
Balwin Park	75365	Walnut St	3143
Balwin Park	75366		818
Balwin Park	75366	Baldwin Park Blvd	857
Balwin Park	75366	Bess Ave	9
Balwin Park	75366	Dalewood St	847
Balwin Park	75366	Hamburger Ln	800
Balwin Park	75366	Maine Ave	919
Balwin Park	75366	Vineland Ave	1295
Balwin Park	75366	Virginia Ave	1320
Balwin Park	75366	Whitesell St	484
Balwin Park	75367		1161
Balwin Park	75367	Big Dalton Ave	561
Balwin Park	75367	Dundry Ave	41
Balwin Park	75367	Francisquito Ave	1423
Balwin Park	75367	N Puente Ave	38
Balwin Park	75367	Puente Ave	890
Balwin Park	75367	Via Rosa	32
Balwin Park	75368		373
Balwin Park	75368	Corak St	379
Balwin Park	75368	Dalewood St	143
Balwin Park	75368	Durness St	852
Balwin Park	75368	Feather Ave	1417
Balwin Park	75368	Foster Ave	851
Balwin Park	75368	Francisquito Ave	842
Balwin Park	75368	Garvey Ave	826
Balwin Park	75368	Kenmore Cir	151
Balwin Park	75368	Rexwood Ave	864
Balwin Park	75368	Rockway Dr	894

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Balwin Park	75368	Stichman Ave	1040
Balwin Park	75368	Vineland Ave	2932
Balwin Park	75369		119
Balwin Park	75369	Big Dalton Ave	139
Balwin Park	75369	Garden View Ln	373
Balwin Park	75369	Halinor Ave	471
Balwin Park	75369	Puente Ave	117
Balwin Park	75369	Robbie Ct	194
Balwin Park	75369	S Halinor Ave	115
Balwin Park	75369	S Siesta Ave	68
Balwin Park	75369	Siesta Ave	383
Balwin Park	75369	Valona Dr	471
Balwin Park	75369	Walnut Creek Pkwy	902
Balwin Park	75370		63
Balwin Park	75370	Chetney Dr	42
Balwin Park	75370	Howellhurst Dr	622
Balwin Park	75370	la Sena Ave	21
Balwin Park	75370	Navilla Pl	61
Balwin Park	75370	Root St	189
Balwin Park	75370	Swanee Ln	286
Balwin Park	75370	W Puente Ave	182
Balwin Park	75370	Willow Ave	1262
Balwin Park	75372		1482
Balwin Park	75372	Calino Ave	72
Balwin Park	75372	Dalewood St	78
Balwin Park	75372	Garden View Ln	74
Balwin Park	75372	Garvey Ave	112
Balwin Park	75372	Halinor Ave	300
Balwin Park	75372	Puente Ave	2109
Balwin Park	75372	S Halinor Ave	26
Balwin Park	75372	W Garvey Ave S	935
Balwin Park	75372	Walnut Creek Pkwy	49
Balwin Park	75373		58
Balwin Park	75373	Big Dalton Ave	711
Balwin Park	75373	Corak St	192
Balwin Park	75373	Dalewood St	360
Balwin Park	75373	Dundry Ave	24
Balwin Park	75422		175
Balwin Park	75422	Big Dalton Ave	1683
Balwin Park	75422	Central Ave	104
Balwin Park	75422	Dundry Ave	126
Balwin Park	75422	E Badillo St	448
Balwin Park	75422	Jeanette Ln	904
Balwin Park	75422	Merced Ave	175
Balwin Park	75422	Pacific Ave	174
Balwin Park	75422	Puente Ave	30
Balwin Park	75423		814
Balwin Park	75423	Adams Dr	392
Balwin Park	75423	E Badillo St	1146
Balwin Park	75423	Kenoak Dr	996
Balwin Park	75423	Sharons Way	209
Balwin Park	75423	W Badillo St	76
Balwin Park	75423	W Kenoak Dr	37
Balwin Park	75423	Willow Ave	632
Balwin Park	75424		1970
Balwin Park	75424	Alderson Ave	836
Balwin Park	75424	Auction Ave	34
Balwin Park	75424	Central Ave	1301
Balwin Park	75424	Chevalier Ave	847
Balwin Park	75424	Clark St	23
Balwin Park	75424	de la Gair Ct	340
Balwin Park	75424	Downing Ave	1563
Balwin Park	75424	E Badillo St	2167
Balwin Park	75424	Elstead St	181
Balwin Park	75424	Elton St	85

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Balwin Park	75424	Jeremie St	849
Balwin Park	75424	Lozaro Dr	250
Balwin Park	75424	Maine Ave	366
Balwin Park	75424	Pacheco Dr	230
Balwin Park	75424	Pacific Ave	128
Balwin Park	75424	Park Pl	616
Balwin Park	75424	Puente Ave	33
Balwin Park	75424	Ramona Blvd	2137
Balwin Park	75424	Stichman Ave	1299
Balwin Park	75424	Vineland Ave	2220
Balwin Park	75424	Virginia Ave	1017
Balwin Park	75425		1874
Balwin Park	75425	Alvine Ln	159
Balwin Park	75425	Ardilla Ave	883
Balwin Park	75425	Badillo Cir	187
Balwin Park	75425	Big Dalton Ave	2510
Balwin Park	75425	Central Ave	1307
Balwin Park	75425	Chetney Dr	1094
Balwin Park	75425	Chevalier Ave	567
Balwin Park	75425	Cleary Dr	765
Balwin Park	75425	Dexter St	425
Balwin Park	75425	Dundry Ave	476
Balwin Park	75425	E Badillo St	1384
Balwin Park	75425	Halinor Ave	189
Balwin Park	75425	Halinor Ln	189
Balwin Park	75425	Howellhurst Dr	833
Balwin Park	75425	Jeremie St	891
Balwin Park	75425	Mayland Ave	941
Balwin Park	75425	Millbury Ave	683
Balwin Park	75425	N Morris Ave	3
Balwin Park	75425	Navilla Pl	608
Balwin Park	75425	Pacific Ave	199
Balwin Park	75425	Puente Ave	3175
Balwin Park	75425	Root St	1329
Balwin Park	75425	Swanee Ln	395
Balwin Park	75425	W Badillo St	80
Balwin Park	75425	W Puente Ave	68
Balwin Park	75425	Willow Ave	8
Balwin Park	75426		66
Balwin Park	75426	Ahern Dr	3122
Balwin Park	75426	Bresee Ave	98
Balwin Park	75426	Bresee Pl	98
Balwin Park	75426	Cedarwood Ave	475
Balwin Park	75426	Channing St	460
Balwin Park	75426	Cloverside St	800
Balwin Park	75426	Clydewood St	323
Balwin Park	75426	Cutler Ave	100
Balwin Park	75426	Downing Ave	239
Balwin Park	75426	Feather Ave	1559
Balwin Park	75426	Havenbrook St	477
Balwin Park	75426	Holly Ave	858
Balwin Park	75426	Macdevitt St	568
Balwin Park	75426	Merced Ave	1283
Balwin Park	75426	Mossberg Ave	437
Balwin Park	75426	Pacific Ave	1284
Balwin Park	75426	Stichman Ave	3280
Balwin Park	75426	Vineland Ave	3440
Balwin Park	75427		1453
Balwin Park	75427	Ardilla Ave	678
Balwin Park	75427	Big Dalton	28
Balwin Park	75427	Big Dalton Ave	3410
Balwin Park	75427	Bresee	128
Balwin Park	75427	Bresee Ave	309
Balwin Park	75427	Bresee Pl	579
Balwin Park	75427	Channing Ave	37

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Balwin Park	75427	Channing St	1074
Balwin Park	75427	Clydewood St	1265
Balwin Park	75427	Dundry Ave	9
Balwin Park	75427	Dutch Ln	955
Balwin Park	75427	Garvey Ave	140
Balwin Park	75427	Havenbrook St	219
Balwin Park	75427	la Vista Ave	449
Balwin Park	75427	Macdevitt St	948
Balwin Park	75427	Mayland Ave	432
Balwin Park	75427	Merced Ave	1312
Balwin Park	75427	Millbury Ave	3576
Balwin Park	75427	N Ardilla Ave	889
Balwin Park	75427	N Puente Ave	700
Balwin Park	75427	Pacific Ave	2063
Balwin Park	75427	Puente Ave	3664
Balwin Park	75427	Sierra Way	1259
Balwin Park	75427	Stockdale St	1287
Balwin Park	75427	Telluride Dr	705
Balwin Park	75427	Van Wig Ave	2079
Balwin Park	75427	W Cedarwood St	36
Balwin Park	75427	W Clydewood Ave	1
Balwin Park	75427	W Dutch Ln	122
Balwin Park	75427	W Havenbrook St	41
Balwin Park	75427	W Macdevitt St	948
Balwin Park	75427	W Sherway St	2
Balwin Park	75428		137
Balwin Park	75428	Puente Ave	641
Balwin Park	75428	Ramona Blvd	132
Balwin Park	75428	W San Bernardino Rd	1465
Balwin Park	75530	Olive St	21
Covina	205379		763
Covina	205379	Iris Ave S	263
Covina	205379	N Lark Ellen Ave	51
Covina	205379	S Eileen Ave	198
Covina	205379	S Homerest Ave	106
Covina	205379	S Hyacinth Ave	193
Covina	205379	S Lark Ellen Ave	556
Covina	205379	S Leaf Ave	492
Covina	205379	S Waterbury Ave	405
Covina	205379	W Badillo St	2239
Covina	205379	W Grovecenter St	2544
Covina	205381		271
Covina	205381	E Badillo St	1201
Covina	205381	E Eckerman Ave	3
Covina	205381	E Puente Ave	6
Covina	205381	E Rowland Ave	9
Covina	205381	E Workman Ave	2
Covina	205381	Eastbury Ave	1303
Covina	205381	N Armel Dr	23
Covina	205381	N Heathdale Ave	19
Covina	205381	N Phillips Ave	21
Covina	205381	S Armel Dr	3938
Covina	205381	S Eastbury Ave	1303
Covina	205381	S Heathdale Ave	2600
Covina	205381	S Houser Dr	1297
Covina	205381	W Badillo St	1293
Covina	205381	W Greendale St	291
Covina	205381	W Marbury St	482
Covina	205381	W Puente Ave	1298
Covina	205381	W Rowland St	2529
Covina	205381	W Thelborn St	458
Covina	205381	W Verness St	419
Covina	205381	W Workman Ave	1281
Covina	205383	E Workman Ave	11
Covina	205385		6106

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205385	Aldenville St	843
Covina	205385	Casad St	456
Covina	205385	E Idahome St	38
Covina	205385	E Mardina St	11
Covina	205385	E Workman Ave	89
Covina	205385	Hepner Ave	504
Covina	205385	Hollenbeck Ave	599
Covina	205385	Oak Tree Ct	49
Covina	205385	S 3rd Ave	1275
Covina	205385	S 4th Ave	1299
Covina	205385	S 5th Ave	807
Covina	205385	S Albertson Ave	2711
Covina	205385	S Aldenville Ave	2656
Covina	205385	S Calvados Ave	1831
Covina	205385	S Cedar Dr	1271
Covina	205385	S Edenfield Ave	1111
Covina	205385	S Fenimore Ave	2558
Covina	205385	S Fircraft Ave	668
Covina	205385	S Hepner Ave	1344
Covina	205385	S Hollenbeck Ave	3939
Covina	205385	S Midsite Ave	981
Covina	205385	S Third Ave	391
Covina	205385	Swanee Ln	202
Covina	205385	W Arbor Ct	30
Covina	205385	W Badillo St	17
Covina	205385	W Casad St	761
Covina	205385	W Center St	2618
Covina	205385	W Dexter St	2378
Covina	205385	W Idahome St	559
Covina	205385	W Puente Ave	1139
Covina	205385	W Puente St	1417
Covina	205385	W Rowland St	5353
Covina	205385	W Shamwood St	558
Covina	205385	W Swanee Ln	202
Covina	205385	W Workman Ave	1960
Covina	205386		5310
Covina	205386	Alisal St	268
Covina	205386	Baranca Ave	1985
Covina	205386	Briargate Ln	543
Covina	205386	Camellia Dr	1042
Covina	205386	Dexter St	461
Covina	205386	E Adams Park Dr	1135
Covina	205386	E Algrove St	2517
Covina	205386	E Alisal St	749
Covina	205386	E Badillo St	2305
Covina	205386	E Casad Ave	1016
Covina	205386	E Dexter St	850
Covina	205386	E Eastland Ctr Dr	70
Covina	205386	E Grovecenter St	480
Covina	205386	E Italia St	297
Covina	205386	E Level St	359
Covina	205386	E Loma Vista St	36
Covina	205386	E Navilla Pl	2779
Covina	205386	E Paseo St	242
Covina	205386	E Puente Ave	51
Covina	205386	E Puente St	4162
Covina	205386	E Ramona St	426
Covina	205386	E Rossellen Pl	247
Covina	205386	E Rowland St	3939
Covina	205386	E Ruddock St	940
Covina	205386	E Shoppers Ln	950
Covina	205386	E Swanee Ln	786
Covina	205386	E Thelborn St	1345
Covina	205386	E Workman Ave	3735
Covina	205386	E Workman Ln	1643

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205386	E Workman St	2983
Covina	205386	Forestdale Ave	1509
Covina	205386	la Serena Dr	533
Covina	205386	Linda Terrace Dr	323
Covina	205386	Lowell St	425
Covina	205386	Monte Vista Ave	1305
Covina	205386	N Barranca St	1174
Covina	205386	N Brightview Dr	470
Covina	205386	N Citrus Ave	86
Covina	205386	N de Lay Ave	1442
Covina	205386	N Forestdale Ave	1196
Covina	205386	N Grand Ave	704
Covina	205386	N Grandview Ave	32
Covina	205386	N Linda Terrace Dr	516
Covina	205386	Oaktree Dr	104
Covina	205386	Orangewood Dr	1364
Covina	205386	Orlando Way	73
Covina	205386	Padua Dr	201
Covina	205386	Peachtree Ln	323
Covina	205386	Prospero Dr	228
Covina	205386	Ramona St	426
Covina	205386	S 1st Ave	600
Covina	205386	S 2nd Ave	301
Covina	205386	S Baranca Ave	2504
Covina	205386	S Brightview Dr	431
Covina	205386	S Citrus Ave	4011
Covina	205386	S de Lay Ave	838
Covina	205386	S Forestdale Ave	1509
Covina	205386	S Grand Ave	31
Covina	205386	S Grandview Ave	570
Covina	205386	S Kendall Way	733
Covina	205386	S Newton St	444
Covina	205386	S Palmetto Ave	3
Covina	205386	S Prospero Dr	1007
Covina	205386	S San Antonio Dr	474
Covina	205386	S San Jose Ave	1355
Covina	205386	S San Jose Dr	1355
Covina	205386	S Stewart Dr	790
Covina	205386	S Vecino Dr	954
Covina	205386	Stewart Dr	790
Covina	205386	W Puente St	64
Covina	205386	W Rowland St	149
Covina	205386	Workman Ave	685
Covina	205387		14484
Covina	205387	Adams Park Dr	1006
Covina	205387	Badillo St	2465
Covina	205387	Bender Ave	903
Covina	205387	Brookport St	562
Covina	205387	Calmgrove Ave	693
Covina	205387	Charter Dr	1081
Covina	205387	Danehurst Ave	728
Covina	205387	Darfield Ave	1076
Covina	205387	E Adams Park Dr	590
Covina	205387	E Badillo St	9964
Covina	205387	E Bellbrook St	591
Covina	205387	E Benwood St	12
Covina	205387	E Cypress St	502
Covina	205387	E Dexter St	28
Covina	205387	E Edgecomb St	4295
Covina	205387	E Farland St	494
Covina	205387	E Grovecenter St	849
Covina	205387	E Haller St	774
Covina	205387	E Lomira Dr	293
Covina	205387	E Old Badillo St	2148
Covina	205387	E Palm Dr	1441

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205387	E Puente St	345
Covina	205387	E Retford St	346
Covina	205387	E Ruddock St	7469
Covina	205387	E Wanamaker Dr	1136
Covina	205387	E Wanmaker Dr	2363
Covina	205387	E Wingate St	692
Covina	205387	Edgecomb St	357
Covina	205387	Farland St	93
Covina	205387	Glendora Ave	722
Covina	205387	Glenoak Ave	143
Covina	205387	Greenpark Ave	123
Covina	205387	Greer Ave	144
Covina	205387	Henton Ave	513
Covina	205387	Ivescrest Ave	558
Covina	205387	Kinsella Ave	193
Covina	205387	Lomira St	186
Covina	205387	Lyman St	1565
Covina	205387	Mangrove Ave	1358
Covina	205387	N Banna Ave	1897
Covina	205387	N Bender Ave	903
Covina	205387	N Calmgrove Ave	693
Covina	205387	N Danehurst Ave	728
Covina	205387	N Darfield Ave	1476
Covina	205387	N Dodsworth Ave	855
Covina	205387	N Garsden Ave	1175
Covina	205387	N Glendora Ave	2078
Covina	205387	N Grand Ave	3637
Covina	205387	N Henton Ave	217
Covina	205387	N Ivescrest Ave	558
Covina	205387	N Jenifer Ave	28
Covina	205387	N Jennifer Ave	602
Covina	205387	N Lyman Ave	1565
Covina	205387	N Mangrove Ave	1358
Covina	205387	N Nearglen Ave	1213
Covina	205387	N Reeder Ave	2021
Covina	205387	N Retford Knoll	264
Covina	205387	N Shadyglen Dr	1005
Covina	205387	N Starglen Dr	311
Covina	205387	N Stephora Ave	1330
Covina	205387	N Sunflower Ave	766
Covina	205387	N Westridge Ave	1496
Covina	205387	N Wilson	214
Covina	205387	Nearglen Ave	710
Covina	205387	Retford St	1448
Covina	205387	Rimhurst Ave	1313
Covina	205387	S Ashton Dr	332
Covina	205387	S Farber Ave	42
Covina	205387	S Grand Ave	1912
Covina	205387	S Starglen Dr	232
Covina	205387	S Treanor Ave	3
Covina	205387	S Wilson Ave	315
Covina	205387	Sachs Pl	281
Covina	205387	Shadyglen Dr	1005
Covina	205387	Starglen Dr	311
Covina	205387	Stephora Ave	108
Covina	205387	W Cypress St	502
Covina	205387	Wanmaker Dr	3498
Covina	205387	Westridge Ave	1496
Covina	205387	Wilbur Ave	286
Covina	205388		10554
Covina	205388	Algrove St	523
Covina	205388	Baranca Ave	140
Covina	205388	College Way	367
Covina	205388	E Algrove St	523
Covina	205388	E Alisal St	225

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205388	E Badillo St	2620
Covina	205388	E Center St	1545
Covina	205388	E College St	2134
Covina	205388	E Dexter St	2360
Covina	205388	E Front St	813
Covina	205388	E Grovecenter St	523
Covina	205388	E Italia St	2654
Covina	205388	E Loma Vista St	897
Covina	205388	E Navilla Pl	1085
Covina	205388	E Puente St	1317
Covina	205388	E Rowland St	764
Covina	205388	E San Bernardino Rd	2665
Covina	205388	E School St	2655
Covina	205388	E Workman Ave	308
Covina	205388	Grovecenter St	523
Covina	205388	Howard Ave	284
Covina	205388	N 1st Ave	1778
Covina	205388	N 2nd Ave	1780
Covina	205388	N Barranca St	36
Covina	205388	N Citrus Ave	1724
Covina	205388	N Curtis Ave	283
Covina	205388	Oakbank Ave	531
Covina	205388	Orange Cir	173
Covina	205388	Orlando Way	1257
Covina	205388	Park Ave	283
Covina	205388	S 1st Ave	1931
Covina	205388	S 2nd Ave	3643
Covina	205388	S Baranca Ave	176
Covina	205388	S Citrus Ave	1295
Covina	205388	S Eremland Dr	1389
Covina	205388	S Orange Cir	173
Covina	205388	S Palmetto Ave	513
Covina	205388	S San Antonio Dr	192
Covina	205388	S San Jose Ave	1261
Covina	205388	S San Jose Dr	1261
Covina	205388	San Jose Ave	2047
Covina	205388	School St	2655
Covina	205388	Traymore Ave	246
Covina	205388	W Badillo St	38
Covina	205388	W Center St	58
Covina	205388	W College St	36
Covina	205388	W Cottage Dr	38
Covina	205388	W Dexter St	46
Covina	205388	W Geneva Pl	31
Covina	205388	W Orange St	36
Covina	205388	W San Bernardino Rd	35
Covina	205389		1152
Covina	205389	Brookport St	68
Covina	205389	Calmgrove Ave	23
Covina	205389	Cummings Rd	602
Covina	205389	Daneburst Ave	165
Covina	205389	Danehurst Ave	19
Covina	205389	Darfield Ave	538
Covina	205389	E Brookport St	68
Covina	205389	E Cienega Ave	698
Covina	205389	E Colver Pl	2742
Covina	205389	E Covina Blvd	705
Covina	205389	E Cypress Cir	91
Covina	205389	E Cypress St	2019
Covina	205389	E Edna Pl	1887
Covina	205389	E Groverdale St	462
Covina	205389	E Haller St	271
Covina	205389	E San Bernardino Rd	52
Covina	205389	E Tudor St	257
Covina	205389	E Wingate St	3767

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205389	Farland St	2489
Covina	205389	Greenpark Ave	607
Covina	205389	Henton Ave	495
Covina	205389	Ivescrest Ave	703
Covina	205389	Kinsella Ave	264
Covina	205389	Lyman St	6
Covina	205389	Mangrove Ave	193
Covina	205389	N Banna Ave	1471
Covina	205389	N Calmgrove Ave	23
Covina	205389	N Danehurst Ave	184
Covina	205389	N Darfield Ave	1623
Covina	205389	N Dodsworth Ave	416
Covina	205389	N Garsden Ave	424
Covina	205389	N Glendora Ave	3851
Covina	205389	N Grand Ave	439
Covina	205389	N Henton Ave	206
Covina	205389	N Ivescrest Ave	1288
Covina	205389	N Jennifer Ave	27
Covina	205389	N Kidder Ave	983
Covina	205389	N Langham Ave	869
Covina	205389	N Lyman Ave	6
Covina	205389	N Mangrove Ave	193
Covina	205389	N Nearglen Ave	38
Covina	205389	N Reeder Ave	752
Covina	205389	N Rimhurst Ave	815
Covina	205389	N Stephora Ave	232
Covina	205389	N Westridge Ave	34
Covina	205389	Nearglen Ave	38
Covina	205389	Rimhurst Ave	238
Covina	205389	Sachs Pl	335
Covina	205389	Westridge Ave	34
Covina	205390		1525
Covina	205390	Barston Ave	1029
Covina	205390	Bonnie Cove Ave	389
Covina	205390	Brookport St	647
Covina	205390	E Bellbrook St	0
Covina	205390	E Benbow St	959
Covina	205390	E Benwood St	803
Covina	205390	E Brookport St	1437
Covina	205390	E Cienega Ave	36
Covina	205390	E Covina Blvd	1614
Covina	205390	E Cypress St	2577
Covina	205390	E Venton St	792
Covina	205390	Grammont Ave	849
Covina	205390	Greenhaven St	260
Covina	205390	Greenpark Ave	302
Covina	205390	Greer Ave	1108
Covina	205390	Heritage Way	2
Covina	205390	Lyman St	887
Covina	205390	N Barston Ave	247
Covina	205390	N Bonnie Cove Ave	389
Covina	205390	N Charter Dr	903
Covina	205390	N Garsden Ave	1819
Covina	205390	N Greenpark Ave	565
Covina	205390	N Lyman Ave	1739
Covina	205390	N Reeder Ave	1811
Covina	205390	N Stephora Ave	1069
Covina	205390	N Sunflower Ave	930
Covina	205390	Tudor St	296
Covina	205391		3159
Covina	205391	Baranca Ave	4547
Covina	205391	Commercial Ave	263
Covina	205391	E Algrove St	336
Covina	205391	E Alisal St	197
Covina	205391	E Badillo St	380

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205391	E Chester Rd	662
Covina	205391	E Cypress St	763
Covina	205391	E Dexter St	331
Covina	205391	E Edna Pl	2596
Covina	205391	E Front St	12
Covina	205391	E Hurst St	853
Covina	205391	E Italia St	181
Covina	205391	E Kenoak Dr	214
Covina	205391	E Ruddock St	539
Covina	205391	E Rue Royale St	468
Covina	205391	E San Bernardino Rd	2658
Covina	205391	E School St	15
Covina	205391	N Grandview Ave	1382
Covina	205391	N Linda Terrace Dr	68
Covina	205391	N Prospero Dr	1079
Covina	205391	N Vecino Dr	1631
Covina	205391	S Baranca Ave	1260
Covina	205391	School St	15
Covina	205392		667
Covina	205392	Bender Ave	545
Covina	205392	Calora St	147
Covina	205392	Cummings Rd	1415
Covina	205392	E Benbow St	323
Covina	205392	E Brookport St	574
Covina	205392	E Calora St	26
Covina	205392	E Cienega Ave	730
Covina	205392	E Covina Blvd	1623
Covina	205392	E Cypress St	2034
Covina	205392	E Edna Pl	388
Covina	205392	E Hurst St	59
Covina	205392	N Bender Ave	1309
Covina	205392	N Calmgrove Ave	954
Covina	205392	N Damato Dr	1146
Covina	205392	N Dodsworth Ave	1583
Covina	205392	N Grand Ave	6484
Covina	205393		720
Covina	205393	Center Court Dr	211
Covina	205393	E Covina Hills Rd	112
Covina	205393	E Garvey Ave	201
Covina	205393	E Garvey St	523
Covina	205393	E Holt Ave	1324
Covina	205393	E Via Verde St	275
Covina	205393	N Garvey Ave	475
Covina	205393	Oaktree Dr	319
Covina	205393	Park View Dr	378
Covina	205393	S Oak Tree Dr	1201
Covina	205393	S Oaktree Dr	133
Covina	205393	S Village Oaks Dr	320
Covina	205393	Via Verde St	275
Covina	205393	Workman Ave	14
Covina	205394		885
Covina	205394	Banna Ave	245
Covina	205394	Bender Ave	33
Covina	205394	Calmgrove Ave	27
Covina	205394	Center Court Dr	1062
Covina	205394	Dawn Ridge Way	742
Covina	205394	E Algrove St	920
Covina	205394	E Covina Hills Rd	1860
Covina	205394	E Deepview Dr	236
Covina	205394	E Dexter St	1578
Covina	205394	E Grovecenter St	77
Covina	205394	E Navilla Pl	2113
Covina	205394	E Puente St	2264
Covina	205394	E Ranchcreek Rd	1744
Covina	205394	E Rowland St	29

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205394	E Walnut Creek Rd	327
Covina	205394	Evergreen Cir	59
Covina	205394	Glendora Ave	599
Covina	205394	Heffner Hill Rd	810
Covina	205394	Knollcrest Dr	543
Covina	205394	Level St	926
Covina	205394	Meadowwood Dr	1032
Covina	205394	Midhurst Dr	252
Covina	205394	N Forest Hills Dr	327
Covina	205394	N Grand Ave	734
Covina	205394	N Ranchcreek Rd	126
Covina	205394	N Reeder Ave	218
Covina	205394	N Westridge Ave	34
Covina	205394	Navilla Pl	31
Covina	205394	Oak Canyon Rd	662
Covina	205394	Rancho el Fuerte	458
Covina	205394	Rancho el Fuerte Dr	458
Covina	205394	Rancho Sinaloa Dr	406
Covina	205394	S Ashton Dr	657
Covina	205394	S Chaparro Rd	1796
Covina	205394	S Corrida Dr	1072
Covina	205394	S Farber Ave	606
Covina	205394	S Grand Ave	2019
Covina	205394	S Heffner Hill Rd	245
Covina	205394	S Midhurst Dr	252
Covina	205394	S Oak Park Rd	674
Covina	205394	S Shadyglen Dr	264
Covina	205394	S Starglen Dr	518
Covina	205394	S Village Oaks Dr	522
Covina	205394	S Wilson Ave	396
Covina	205394	San Joaquin Rd	242
Covina	205394	Shadyglen Dr	30
Covina	205394	Shouse Ave	590
Covina	205394	Wilbur Ave	411
Covina	205394	Workman Ave	50
Covina	205395		40
Covina	205395	Adams Park Dr	567
Covina	205395	Barston Ave	331
Covina	205395	E Adams Park Dr	567
Covina	205395	E Edgecomb St	646
Covina	205395	E Lomira Dr	46
Covina	205395	E Old Badillo St	51
Covina	205395	E Palm Dr	462
Covina	205395	E Puente St	378
Covina	205395	E Rancho Culebra Dr	505
Covina	205395	E Rancho Grande Dr	135
Covina	205395	E Renshaw St	641
Covina	205395	Garsden Ave	1322
Covina	205395	Greer Ave	776
Covina	205395	Lomira St	5
Covina	205395	Lyman St	277
Covina	205395	N Garsden Ave	106
Covina	205395	N Lyman Ave	236
Covina	205395	N Lyman St	41
Covina	205395	N Rancho la Merced Dr	79
Covina	205395	N Reeder Ave	1266
Covina	205395	N Stephora Ave	308
Covina	205395	Palm Dr	95
Covina	205395	Paseo Valle Vis	24
Covina	205395	Puente St	45
Covina	205395	Rancho Corto Dr	128
Covina	205395	Rancho Culebra Dr	692
Covina	205395	Rancho del Sol Dr	174
Covina	205395	Rancho Los Nogales Dr	60
Covina	205395	Rancho Simi Dr	31

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205395	S Rancho Alegre Dr	81
Covina	205395	S Rancho Lindo Dr	260
Covina	205395	Stephora Ave	41
Covina	205395	Wanamaker Dr	609
Covina	205423		13034
Covina	205423	4th Ave	1653
Covina	205423	Baranca Ave	2100
Covina	205423	Bellbrook St	2080
Covina	205423	Benbow St	579
Covina	205423	Benwood St	303
Covina	205423	Bridger St	172
Covina	205423	Brookport St	159
Covina	205423	Calera Ave	213
Covina	205423	Coolfield Dr	702
Covina	205423	Curtis Ave	210
Covina	205423	Cutter Way	1199
Covina	205423	Dover Rd	835
Covina	205423	E Badillo St	1315
Covina	205423	E Bellbrook St	2080
Covina	205423	E Benbow St	3846
Covina	205423	E Benwood St	2934
Covina	205423	E Bickley Dr	384
Covina	205423	E Brookport St	1362
Covina	205423	E Cienega Ave	66
Covina	205423	E Covina Blvd	7027
Covina	205423	E Cypress St	8711
Covina	205423	E Edna Pl	1714
Covina	205423	E Front St	1827
Covina	205423	E Greenhaven St	1886
Covina	205423	E Groverdale St	1183
Covina	205423	E Hurst St	1564
Covina	205423	E Kelby St	1421
Covina	205423	E Section Center St	49
Covina	205423	E Tudor St	3147
Covina	205423	Eva D Edwards	199
Covina	205423	Fenimore Ave	504
Covina	205423	Fredkin Dr	736
Covina	205423	Front St	221
Covina	205423	Glentana St	571
Covina	205423	Golden Grove Way	434
Covina	205423	Homerest Ave	1284
Covina	205423	Howard Ave	129
Covina	205423	Janalinda Ave	339
Covina	205423	Kemp Pl	383
Covina	205423	Kingside Dr	580
Covina	205423	Larkin Ave	68
Covina	205423	Leaf Ave	1262
Covina	205423	Marilyn Way	793
Covina	205423	Mc Gill St	63
Covina	205423	N 1st Ave	2109
Covina	205423	N 2nd Ave	621
Covina	205423	N 3rd Ave	1857
Covina	205423	N 4th Ave	2796
Covina	205423	N 5th Ave	1866
Covina	205423	N Albertson Ave	34
Covina	205423	N Aldenville Ave	30
Covina	205423	N Armel Dr	2802
Covina	205423	N Calera Ave	359
Covina	205423	N Calvados Ave	1713
Covina	205423	N Cedar Dr	2396
Covina	205423	N Citrus Ave	3991
Covina	205423	N Conwell Ave	19
Covina	205423	N Curtis Ave	72
Covina	205423	N Delay Ave	53
Covina	205423	N Edenfield Ave	1722

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205423	N Elspeth Way	2781
Covina	205423	N Enid Ave	280
Covina	205423	N Fairvale Ave	1124
Covina	205423	N Fairvalley Ave	1038
Covina	205423	N Fenimore Ave	1647
Covina	205423	N Fircroft Ave	51
Covina	205423	N Grandview Ave	1344
Covina	205423	N Heathdale Ave	1868
Covina	205423	N Hollenbeck Ave	2002
Covina	205423	N Homerest Ave	692
Covina	205423	N Houser Dr	1851
Covina	205423	N Howard Ave	634
Covina	205423	N Janalinda Ave	339
Covina	205423	N la Breda	519
Covina	205423	N Lark Ellen Ave	1005
Covina	205423	N Larkin Dr	1633
Covina	205423	N Park Ave	1767
Covina	205423	N Prospero Dr	1639
Covina	205423	N Rimsdale Ave	1620
Covina	205423	N Traymore Ave	363
Covina	205423	N Vecino Dr	23
Covina	205423	N Viceroy Ave	1859
Covina	205423	N Vincent Ave	2013
Covina	205423	N Vogue Ave	488
Covina	205423	N Waterbury Ave	562
Covina	205423	Palland Ln	182
Covina	205423	Park Ave	183
Covina	205423	Queenside Dr	654
Covina	205423	Ramona Blvd	758
Covina	205423	Reed St	1949
Covina	205423	Rimsdale Ave	403
Covina	205423	S 3rd Ave	45
Covina	205423	S 4th Ave	23
Covina	205423	S 5th Ave	21
Covina	205423	S Third Ave	45
Covina	205423	Starcrest Dr	1665
Covina	205423	Traymore Ave	481
Covina	205423	Valencia Pl	2207
Covina	205423	Virginia Ave	1349
Covina	205423	Vogue Ave	488
Covina	205423	W Adams Park Dr	1223
Covina	205423	W Badillo St	6087
Covina	205423	W Bellbrook St	200
Covina	205423	W Benbow St	754
Covina	205423	W Benwood St	1055
Covina	205423	W Bobbie St	276
Covina	205423	W Bridger St	1227
Covina	205423	W Chester Rd	1006
Covina	205423	W Clovermead St	127
Covina	205423	W College St	1279
Covina	205423	W Cottage Dr	627
Covina	205423	W Covina Blvd	2351
Covina	205423	W Cypress St	1665
Covina	205423	W Edna Pl	4236
Covina	205423	W Front St	2629
Covina	205423	W Geneva Pl	647
Covina	205423	W Glentana St	1215
Covina	205423	W Golden Grove Way	390
Covina	205423	W Griswold Rd	999
Covina	205423	W Hampton Ct	342
Covina	205423	W Industrial Park St	1256
Covina	205423	W Kenoak Dr	914
Covina	205423	W Orange St	630
Covina	205423	W Palm Ave	531
Covina	205423	W Palm Dr	1026

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205423	W Pershing Ct	369
Covina	205423	W San Bernadino Rd	2693
Covina	205423	W San Bernardino Rd	7692
Covina	205423	W Tudor St	1247
Covina	205423	Zinfadel Dr	32
Covina	205454	Conwell Ave	57
Covina	205455		26
Covina	205455	Conwell Ave	927
Covina	205455	Devanah St	243
Covina	205455	Groverdale St	262
Covina	205455	Larkin Dr	284
Covina	205455	N Armel Dr	2080
Covina	205455	N Eastbury Ave	1519
Covina	205455	N Heathdale Ave	2021
Covina	205455	N O'Malley Ave	1495
Covina	205455	N O Malley Ave	1495
Covina	205455	W Alcross St	729
Covina	205455	W Gragmont St	245
Covina	205455	W Grondahl St	1414
Covina	205455	W Groverdale St	1114
Covina	205455	W Nubia St	369
Covina	205456	N Albertson Ave	812
Covina	205456	N Fircroft Ave	930
Covina	205456	N Glenfinnan Ave	570
Covina	205456	N Hollenbeck Ave	1996
Covina	205456	N Midsite Ave	554
Covina	205456	W Alcross St	388
Covina	205456	W Grondahl St	51
Covina	205456	W Nubia St	1228
Covina	205457		126
Covina	205457	Albertson Ave	424
Covina	205457	Fircroft Ave	458
Covina	205457	Grondahl St	150
Covina	205457	Groverdale St	249
Covina	205457	N Albertson Ave	424
Covina	205457	N Aldenville Ave	1796
Covina	205457	N Calvados Ave	346
Covina	205457	N Citrus Ave	49
Covina	205457	N Edenfield Ave	597
Covina	205457	N Fenimore Ave	1831
Covina	205457	N Fircroft Ave	458
Covina	205457	N Hollenbeck Ave	100
Covina	205457	N Viceroy Ave	372
Covina	205457	W Alcross St	591
Covina	205457	W Bygrove St	564
Covina	205457	W Devanah St	1128
Covina	205457	W Gragmont St	565
Covina	205457	W Grondahl St	1438
Covina	205457	W Nubia St	14
Covina	205458		255
Covina	205458	N Citrus Ave	1432
Covina	205458	W Devanah St	56
Covina	205459		661
Covina	205459	Arrow Grand Cir	2702
Covina	205459	Baranca Ave	1455
Covina	205459	Calvin St	249
Covina	205459	E Cienega Ave	2562
Covina	205459	E Groverdale St	680
Covina	205459	E Nubia St	1765
Covina	205459	E Stephanie Dr	569
Covina	205459	Grandview Ave	36
Covina	205459	N Calera Ave	1172
Covina	205459	N Delay Ave	44
Covina	205459	N Fairvale Ave	52
Covina	205459	N Fairvalley Ave	878

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Covina	205459	N Ranger Dr	300
Covina	205459	N Traymore Ave	588
Covina	205459	Ranger Dr	410
Covina	205459	Starcrest Dr	208
Covina	205459	Stephanie Dr	569
Covina	205459	W Arrow Hwy	1517
Covina	205461	E Arrow Hwy	996
Covina	205461	N Grand Ave	191
Covina	205461	S Grand Ave	82
Covina	205461	W Arrow Hwy	49
Covina	205469		48
Covina	205469	Masline St	1640
Covina	205469	N Rimsdale Ave	732
Covina	205469	W Greenhaven St	1329
Covina	205469	W Grondahl St	1647
Glendora	305390		1350
Glendora	305390	Barston Pl	270
Glendora	305390	Bentley Pl	211
Glendora	305390	Bruning Ave	355
Glendora	305390	Burnaby Dr	258
Glendora	305390	Candish Ave	974
Glendora	305390	Claraday St	2153
Glendora	305390	E Claraday St	2648
Glendora	305390	E Heather St	865
Glendora	305390	E Ivy St	527
Glendora	305390	E Jedburgh St	1869
Glendora	305390	E Juanita Ave	2479
Glendora	305390	E Newburgh St	1071
Glendora	305390	E Plymouth Ct	405
Glendora	305390	E Plymouth St	887
Glendora	305390	E Renwick Rd	1756
Glendora	305390	Glenview Ln	5
Glendora	305390	Grammont Pl	262
Glendora	305390	Greer Ave	707
Glendora	305390	Heather St	269
Glendora	305390	Ivy St	1122
Glendora	305390	Jedburgh St	1869
Glendora	305390	N Valley Center Ave	1018
Glendora	305390	Payson St	531
Glendora	305390	Plymouth St	2633
Glendora	305390	Renwick Rd	1326
Glendora	305390	S Bradford Dr	405
Glendora	305390	S Burnaby Dr	1802
Glendora	305390	S Candish Ave	178
Glendora	305390	S Chelsea Pl	276
Glendora	305390	S Sunflower Ave	2444
Glendora	305390	S Treanor Ave	1464
Glendora	305390	S Willow Ave	1014
Glendora	305390	S Yucca Pl	201
Glendora	305390	Suffolk Pl	209
Glendora	305390	W Juanita Ave	16
Glendora	305396	E Claraday St	37
Glendora	305396	Glenview Ln	35
Glendora	305396	Goldrush Dr	24
Glendora	305396	N Valley Center Ave	1200
Glendora	305438	E Hollyvale St	13
Glendora	305438	S Barranca Ave	578
Glendora	305439	E Alosta Ave	44
Glendora	305439	S Barranca Ave	26
Glendora	305439	Stadium Way	42
Glendora	305439	State Rte 66	44
Glendora	305440		109
Glendora	305440	Calera Ave	233
Glendora	305440	Campus Dr	18
Glendora	305440	Donington St	142

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305440	E Foothill Blvd	8
Glendora	305440	E Leadora Ave	154
Glendora	305440	E Leandora Ave	172
Glendora	305440	E Sierra Madre Ave	301
Glendora	305440	Foxglove Ct	437
Glendora	305440	N Baldy Vista Ave	528
Glendora	305440	N Barranca Ave	1725
Glendora	305440	N Citrus Ave	234
Glendora	305440	N Oak Dr	333
Glendora	305440	N Yucca Ridge Rd	173
Glendora	305440	W Bennett Ave	50
Glendora	305440	W Danton Dr	71
Glendora	305440	W Donington St	1401
Glendora	305440	W Foothill Blvd	118
Glendora	305440	W Leadora Ave	1450
Glendora	305440	W Milton Dr	357
Glendora	305440	W Sierra Madre Ave	26
Glendora	305441		258
Glendora	305441	Amber Oaks Ln	35
Glendora	305441	Ambleside Way	37
Glendora	305441	Autumn Oaks Ln	34
Glendora	305441	Buckeke Pl	21
Glendora	305441	Devon Ct	41
Glendora	305441	N Calera Ave	369
Glendora	305441	N Galanto Ave	609
Glendora	305441	N Lowell Ave	593
Glendora	305441	N Marcile Ave	441
Glendora	305441	N Oakbank Dr	487
Glendora	305441	N Valencia St	682
Glendora	305441	N Vecino Ave	248
Glendora	305441	N Wildwood Ave	550
Glendora	305441	Newhill St	976
Glendora	305441	Ranger Dr	300
Glendora	305441	S Barranca Ave	2206
Glendora	305441	S California Ave	650
Glendora	305441	S Marcile Ave	653
Glendora	305441	S Valencia St	667
Glendora	305441	S Wildwood Ave	649
Glendora	305441	W Bennett Ave	318
Glendora	305441	W Carroll Ave	1303
Glendora	305441	W Dalton Ave	893
Glendora	305441	W Foothill Blvd	3814
Glendora	305441	W Invergarry St	452
Glendora	305442		223
Glendora	305442	Buckeke Pl	60
Glendora	305442	Donington St	308
Glendora	305442	E la Fetra Dr	47
Glendora	305442	N Marcile Ave	282
Glendora	305442	N Valencia St	1204
Glendora	305442	N Wildwood Ave	989
Glendora	305442	Trayer Ave	598
Glendora	305442	W Bennett Ave	2234
Glendora	305442	W Foothill Blvd	1069
Glendora	305442	W la Crosse St	117
Glendora	305442	W la Fetra Dr	47
Glendora	305442	W Leadora Ave	918
Glendora	305442	W Milton Dr	288
Glendora	305442	W Sierra Madre Ave	418
Glendora	305443	Forestdale Ave	28
Glendora	305443	S Grand Ave	15
Glendora	305444		894
Glendora	305444	Bubbling Well Dr	1124
Glendora	305444	Cloverview Dr	138
Glendora	305444	Donington St	660
Glendora	305444	Fernpark Dr	738

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305444	N Bender Ave	1299
Glendora	305444	N Grand Ave	8271
Glendora	305444	N Leose Ln	96
Glendora	305444	N Pennsylvania Ave	269
Glendora	305444	N Trayer Ave	1151
Glendora	305444	N Valencia Ave	459
Glendora	305444	N Valencia St	75
Glendora	305444	N Vecino Ave	411
Glendora	305444	N Washington Ave	1118
Glendora	305444	N Westridge Ave	2077
Glendora	305444	Parkbrook Dr	309
Glendora	305444	Pennsylvania Ln	126
Glendora	305444	Rainbow Dr	1034
Glendora	305444	Richardson Ln	518
Glendora	305444	W Bennett Ave	1359
Glendora	305444	W Comstock Ave	916
Glendora	305444	W la Crosse St	686
Glendora	305444	W Laurel Ave	1355
Glendora	305444	W Leadora Ave	2855
Glendora	305444	W Meda Ave	1296
Glendora	305444	W Mountain View Ave	604
Glendora	305444	W Northridge Ave	1336
Glendora	305444	W Sierra Madre Ave	2607
Glendora	305444	W Virgina Ave	1
Glendora	305444	W Whitcomb Ave	910
Glendora	305444	Washington Ave	66
Glendora	305444	West Virginia Ave	1354
Glendora	305445		4474
Glendora	305445	Dyer Ln	186
Glendora	305445	E Bennett Ave	3530
Glendora	305445	E Bougainvillea Ln	33
Glendora	305445	E Buckboard Ln	630
Glendora	305445	E Comstock Ave	1894
Glendora	305445	E Cypress Ave	2393
Glendora	305445	E Dalton Ave	3318
Glendora	305445	E Foothill Blvd	3859
Glendora	305445	E Laurel Ave	938
Glendora	305445	E Leadora Ave	2633
Glendora	305445	E Meda Ave	3126
Glendora	305445	E Mountain View Ave	2637
Glendora	305445	E Northridge Ave	574
Glendora	305445	E Oakwood Ave	731
Glendora	305445	E Sierra Madre Ave	196
Glendora	305445	E Virginia Ave	1380
Glendora	305445	E Whitcomb Ave	1987
Glendora	305445	Hawk Ln	162
Glendora	305445	Lesterwest Way	464
Glendora	305445	N Buckboard Ln	630
Glendora	305445	N Crestview Dr	1142
Glendora	305445	N Cullen Ave	2567
Glendora	305445	N Elwood Ave	1672
Glendora	305445	N Glendora Ave	1317
Glendora	305445	N Glenwood Ave	1135
Glendora	305445	N Live Oak Ave	1681
Glendora	305445	N Minnesota Ave	746
Glendora	305445	N Pasadena Ave	327
Glendora	305445	N Pennsylvania Ave	243
Glendora	305445	N Ranch Ln	1038
Glendora	305445	N Vermont Ave	470
Glendora	305445	N Vista Bonita Ave	1308
Glendora	305445	N Wabash Ave	1306
Glendora	305445	S Cullen Ave	78
Glendora	305445	S Glendora Ave	88
Glendora	305445	S Glenwood Ave	30
Glendora	305445	S Minnesota Ave	70

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305445	S Pennsylvania Ave	669
Glendora	305445	S Vermont Ave	343
Glendora	305445	S Vista Bonita Ave	86
Glendora	305445	S Wabash Ave	78
Glendora	305445	S Washington Ave	629
Glendora	305445	W Bennett Ave	6
Glendora	305445	W Carroll Ave	1016
Glendora	305445	W Foothill Blvd	1960
Glendora	305445	W Meda Ave	395
Glendora	305446		1010
Glendora	305446	Boulder Springs Dr	358
Glendora	305446	Canyon Springs Ln	186
Glendora	305446	Colby Trail Mtwy	71
Glendora	305446	Coronet St	486
Glendora	305446	Dalton Springs Ln	68
Glendora	305446	E Becklee Rd	581
Glendora	305446	E Northridge Ave	27
Glendora	305446	E Palm Dr	2447
Glendora	305446	E Sierra Madre Ave	2697
Glendora	305446	Englewild Dr	840
Glendora	305446	Fawn Springs Ln	1110
Glendora	305446	Flamingo St	1207
Glendora	305446	Fountain Springs Ln	1944
Glendora	305446	Hidden Springs Ln	1754
Glendora	305446	Indian Springs Dr	1984
Glendora	305446	Kregmont Dr	1143
Glendora	305446	N Loraine Ave	2238
Glendora	305446	Pebble Sprgs Ln	687
Glendora	305446	Quail Springs Path	523
Glendora	305446	Rose Dr	241
Glendora	305446	Saga St	1933
Glendora	305446	Willow Springs Ln	248
Glendora	305446	Willowgrove Ave	46
Glendora	305447		15254
Glendora	305447	Conifer Rd	92
Glendora	305447	Crestglen Rd	479
Glendora	305447	E Bennett Ave	1740
Glendora	305447	E Bougainvillea Ln	27
Glendora	305447	E Laurel Ave	657
Glendora	305447	E Leadora Ave	1907
Glendora	305447	E Northridge Ave	41
Glendora	305447	E Palm Dr	14
Glendora	305447	E Sierra Madre Ave	1426
Glendora	305447	E Virginia Ave	1860
Glendora	305447	E Whitcomb Ave	1833
Glendora	305447	N Banna Ave	784
Glendora	305447	N Brown Sage Dr	827
Glendora	305447	N Cullen Ave	1273
Glendora	305447	N Glendora Ave	3393
Glendora	305447	N Leose Ln	149
Glendora	305447	N Minnesota Ave	2619
Glendora	305447	N Pasadena Ave	1120
Glendora	305447	N Pennsylvania Ave	3490
Glendora	305447	N Vermont Ave	3282
Glendora	305447	N Vista Bonita Ave	3456
Glendora	305447	N Wabash Ave	2658
Glendora	305447	W Bennett Ave	841
Glendora	305447	W Laurel Ave	3
Glendora	305447	W Leadora Ave	782
Glendora	305447	W Meda Ave	447
Glendora	305447	W Mountain View Ave	441
Glendora	305447	W Sierra Madre Ave	767
Glendora	305447	W Virgina Ave	192
Glendora	305447	W Whitcomb Ave	775
Glendora	305447	West Virginia Ave	782

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305448		32
Glendora	305448	Crestglen Rd	350
Glendora	305448	E Calabria Dr	411
Glendora	305448	E Comstock Ave	90
Glendora	305448	E Cypress Ave	89
Glendora	305448	E Laurel Ave	590
Glendora	305448	E Leadora Ave	636
Glendora	305448	E Northridge Ave	1348
Glendora	305448	E Sierra Madre Ave	1504
Glendora	305448	E Virginia Ave	589
Glendora	305448	E Whitcomb Ave	89
Glendora	305448	Entrada Way	444
Glendora	305448	Huerta Verde Rd	1191
Glendora	305448	N Live Oak Ave	3522
Glendora	305448	N Verano Dr	409
Glendora	305448	Orangecrest Ave	328
Glendora	305448	Prima Vera Rd	925
Glendora	305448	Sunny Grove Ln	51
Glendora	305448	Via Estrellita Ave	163
Glendora	305448	Viaestrelitiam	32
Glendora	305449		293
Glendora	305449	Cavan Ln	217
Glendora	305449	E Northridge Ave	781
Glendora	305449	E Palm Dr	912
Glendora	305449	E Sierra Madre Ave	409
Glendora	305449	E Virginia Ave	333
Glendora	305449	Entrada Way	1532
Glendora	305449	Huerta Verde Rd	226
Glendora	305449	Kilnaleck Ln	208
Glendora	305449	Mullaghboy Dr	1133
Glendora	305449	N Englewild Dr	440
Glendora	305449	Rose Dr	100
Glendora	305449	Sheelin Ln	235
Glendora	305451		36
Glendora	305451	E Bennett Ave	302
Glendora	305451	E Comstock Ave	613
Glendora	305451	E Cypress Ave	615
Glendora	305451	E Laurel Ave	611
Glendora	305451	E Leadora Ave	612
Glendora	305451	E Northridge Ave	615
Glendora	305451	E Palm Dr	414
Glendora	305451	E Sierra Madre Ave	239
Glendora	305451	E Virginia Ave	399
Glendora	305451	E Whitcomb Ave	613
Glendora	305451	Easley Canyon Rd	31
Glendora	305451	Green Oak Ln	265
Glendora	305451	N Chaparral Dr	969
Glendora	305451	N Easley Canyon Rd	1229
Glendora	305451	N Live Oak Ave	377
Glendora	305451	Oak Canyon Ln	360
Glendora	305451	Oak Grove Dr	706
Glendora	305458	S Barranca Avenue Glendora	253
Glendora	305458	W Arrow Hwy	166
Glendora	305459		31
Glendora	305459	W Bonita Ave	54
Glendora	305460		306
Glendora	305460	Briargate Ln	170
Glendora	305460	Dale Rd	731
Glendora	305460	Delay Ave	765
Glendora	305460	Dike St	86
Glendora	305460	Gaillard St	164
Glendora	305460	Ghent St	770
Glendora	305460	la Serena Dr	36
Glendora	305460	Millburgh Ave	542
Glendora	305460	S Burton Rd	406

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305460	S Prospero Dr	1441
Glendora	305460	S Soderberg Ave	878
Glendora	305460	S Vecino Ave	1748
Glendora	305460	W Bonita Ave	1104
Glendora	305460	W Carter Dr	708
Glendora	305460	W Dike St	27
Glendora	305460	W Gaillard St	8
Glendora	305460	W Gladstone St	1823
Glendora	305460	W Laxford St	1195
Glendora	305460	W Woodcroft Ave	528
Glendora	305461		688
Glendora	305461	Charvers Ave	84
Glendora	305461	Delay Ave	299
Glendora	305461	Fleetwood Pl	607
Glendora	305461	Gaillard St	443
Glendora	305461	Ghent St	244
Glendora	305461	Pennsylvania Ave	749
Glendora	305461	Rosalynn Dr	20
Glendora	305461	S Bender Ave	2068
Glendora	305461	S Calmgrove Ave	417
Glendora	305461	S Danehurst Ave	549
Glendora	305461	S Dodsworth Ave	375
Glendora	305461	S Farber Ave	1151
Glendora	305461	S Glendora Ave	563
Glendora	305461	S Grand Ave	7816
Glendora	305461	S Jenifer Ave	1137
Glendora	305461	S Nearglen Ave	1202
Glendora	305461	S Reynolds Way	842
Glendora	305461	S Westridge Ave	721
Glendora	305461	Santa Fe Ave	926
Glendora	305461	Shady Glen Dr	432
Glendora	305461	South	926
Glendora	305461	Vermont Ave	705
Glendora	305461	W Carter Dr	2505
Glendora	305461	W Dawson Ave	504
Glendora	305461	W Gaillard St	212
Glendora	305461	W Ghent St	228
Glendora	305461	W Gladstone St	3161
Glendora	305461	W Juanita Ave	2614
Glendora	305461	W Kirkwall Rd	1338
Glendora	305461	W Laxford St	936
Glendora	305461	W Newburgh St	1710
Glendora	305461	W Norgate St	1234
Glendora	305461	W Payson St	1294
Glendora	305461	W Renwick Rd	1335
Glendora	305461	Washington Ave	770
Glendora	305461	Westridge Ave	220
Glendora	305462		144
Glendora	305462	Camden St	106
Glendora	305462	E Camden St	1208
Glendora	305462	E Gladstone St	2302
Glendora	305462	E Juanita Ave	1561
Glendora	305462	E Kirkwall Rd	182
Glendora	305462	E Laxford St	82
Glendora	305462	E Newhaven Ln	337
Glendora	305462	E Norgate St	388
Glendora	305462	E Payson St	766
Glendora	305462	E Renwick Rd	564
Glendora	305462	Essex Ct	147
Glendora	305462	Essex St	837
Glendora	305462	Glendora Ava Access Rd	104
Glendora	305462	Greenfield Ct	267
Glendora	305462	Newhaven Ct	222
Glendora	305462	Renwick Rd	206
Glendora	305462	Rosalynn Dr	970

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305462	S Concord Ln	2135
Glendora	305462	S Glencroft Rd	1981
Glendora	305462	S Glendora Ave	3137
Glendora	305462	S Newhaven Ln	304
Glendora	305462	S Rimhurst Ave	1965
Glendora	305462	S Wabash Ave	781
Glendora	305462	S Wabash St	332
Glendora	305462	Temmera Ln	955
Glendora	305462	Trenton Ct	124
Glendora	305462	W Carter Dr	93
Glendora	305462	W Gladstone St	11
Glendora	305462	W Juanita Ave	10
Glendora	305462	W Payson St	13
Glendora	305463		328
Glendora	305463	Avon Pl	184
Glendora	305463	Bonnie Cove Ave	3676
Glendora	305463	Bradford Dr	529
Glendora	305463	Bradley Ct	404
Glendora	305463	Bramhall Ave	405
Glendora	305463	Bruning Ave	1342
Glendora	305463	Burnaby Dr	386
Glendora	305463	Camden St	38
Glendora	305463	Candish Ave	166
Glendora	305463	Canyon Meadows Ln	87
Glendora	305463	Claraday St	303
Glendora	305463	Crown St	1281
Glendora	305463	Deserta Dr	65
Glendora	305463	Dover St	481
Glendora	305463	E Allen Ave	1103
Glendora	305463	E Carter Dr	315
Glendora	305463	E Dover St	460
Glendora	305463	E Gladstone St	2554
Glendora	305463	E Hampton St	332
Glendora	305463	E Juanita Ave	3641
Glendora	305463	E Laxford St	388
Glendora	305463	E Newburgh St	480
Glendora	305463	E Payson St	980
Glendora	305463	E Renwick Rd	1492
Glendora	305463	E Woodcroft Ave	213
Glendora	305463	Essex St	1999
Glendora	305463	Ghent St	425
Glendora	305463	Greenfield Ct	410
Glendora	305463	Greer Ave	868
Glendora	305463	Hampton St	332
Glendora	305463	Heritage Pl	443
Glendora	305463	Hunters Trl	43
Glendora	305463	Indian Bend	16
Glendora	305463	Ivy St	327
Glendora	305463	Kirkwall Rd	765
Glendora	305463	Lisa Ellen St	167
Glendora	305463	Lyman Ave	989
Glendora	305463	Lyman St	254
Glendora	305463	Morpath Ln	159
Glendora	305463	N Valley Center Ave	279
Glendora	305463	Plymouth St	1050
Glendora	305463	Queen Anne Ct	110
Glendora	305463	S Banna Ave	1052
Glendora	305463	S Dover St	244
Glendora	305463	S Glendora Ave	9
Glendora	305463	S Pinkerton Rd	348
Glendora	305463	S Rimhurst Ave	672
Glendora	305463	S Stephora Ave	261
Glendora	305463	S Sunflower Ave	1022
Glendora	305463	Shady Ln	75
Glendora	305463	Stephora Ave	678

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305463	Suffolk Ave	381
Glendora	305463	Swain St	596
Glendora	305463	Wales Ave	610
Glendora	305463	Willow Ave	467
Glendora	305463	Windsor Pl	183
Glendora	305463	Woodcraft Ave	40
Glendora	305463	Woodcroft Ave	221
Glendora	305463	York Ave	736
Glendora	305464		1835
Glendora	305464	Bradford Dr	1574
Glendora	305464	Burnaby Dr	5
Glendora	305464	Candish Ave	14
Glendora	305464	Crown St	1080
Glendora	305464	Dover St	1263
Glendora	305464	E Gladstone St	2848
Glendora	305464	Essex St	1260
Glendora	305464	Glendora Marketplace Dr	86
Glendora	305464	N Balton Ave	35
Glendora	305464	N Lone Hill Ave	31
Glendora	305464	N Shellman Ave	34
Glendora	305464	N Valley Center Ave	1206
Glendora	305464	S Burnaby Dr	134
Glendora	305464	S Lone Hill Ave	1990
Glendora	305464	S Sunflower Ave	156
Glendora	305464	S Willow Ave	119
Glendora	305464	W Gladstone St	2673
Glendora	305464	Willow Ave	985
Glendora	305464	Yucca Pl	373
Glendora	305465		122
Glendora	305465	Auto Centre Dr	3206
Glendora	305465	Lindsay Way	217
Glendora	305465	N Amelia Ave	796
Glendora	305465	Nicole Ct	548
Glendora	305465	S Lone Hill Ave	1208
Glendora	305465	W Allen Ave	34
Glendora	305466	Amelia Ave	658
Glendora	305466	Bradish Ave	289
Glendora	305466	Chippendale Ave	370
Glendora	305466	Country Oak Dr	28
Glendora	305466	Country Oak Rd	28
Glendora	305466	E Baseline Rd	1326
Glendora	305466	Groveton Ave	349
Glendora	305466	Inverness Ave	354
Glendora	305466	N Amelia Ave	16
Glendora	305466	S Amelia Ave	420
Glendora	305466	S Lone Hill Ave	675
Glendora	305466	W Baseline Rd	29
Glendora	305471	E Gladstone St	5
Glendora	305471	Ghent St	35
Glendora	305471	S Barranca Ave	815
Glendora	305471	S Barranca Avenue Glendora	5
Glendora	305471	W Gladstone St	67
Glendora	305472		5517
Glendora	305472	Alford St	699
Glendora	305472	Briargate Ln	1008
Glendora	305472	Brightview Dr	2334
Glendora	305472	Calder Dr	442
Glendora	305472	Delay Ave	1269
Glendora	305472	Duell St	349
Glendora	305472	E Alosta Ave	1
Glendora	305472	E Duell St	3
Glendora	305472	E Mauna Loa Ave	655
Glendora	305472	Forestdale Ave	3963
Glendora	305472	Galatea St	750
Glendora	305472	Glenlyn Dr	344

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305472	Helensburg St	877
Glendora	305472	la Serena Dr	1047
Glendora	305472	Orangepath St	1857
Glendora	305472	S Barranca Ave	1481
Glendora	305472	S Brightview Dr	666
Glendora	305472	S Grand Ave	4087
Glendora	305472	S Prospero Dr	1263
Glendora	305472	S Vecino Ave	844
Glendora	305472	S Vecino Dr	1501
Glendora	305472	Stadium Way	3
Glendora	305472	Starcrest Dr	669
Glendora	305472	State Rte 66	5241
Glendora	305472	Vecino Dr	435
Glendora	305472	W Bagnall St	1797
Glendora	305472	W Baseline Rd	2394
Glendora	305472	W Bridwell St	1630
Glendora	305472	W Carroll Ave	25
Glendora	305472	W Dornie St	455
Glendora	305472	W Duell St	344
Glendora	305472	W Glen Lyn Dr	521
Glendora	305472	W Heber St	1898
Glendora	305472	W Hollyvale St	221
Glendora	305472	W Invergarry St	919
Glendora	305472	W Leeside St	512
Glendora	305472	W Lochleven St	1174
Glendora	305472	W Mauna Loa Ave	1903
Glendora	305473	Alford St	3
Glendora	305473	Galatea St	33
Glendora	305473	S Barranca Ave	148
Glendora	305474		184
Glendora	305474	Alford St	347
Glendora	305474	Armstead St	1866
Glendora	305474	Briargate Ln	203
Glendora	305474	Brightview Dr	485
Glendora	305474	Charvers Ave	701
Glendora	305474	Citrus Edge St	1131
Glendora	305474	Danehurst Ave	965
Glendora	305474	Delay Ave	565
Glendora	305474	Dike St	334
Glendora	305474	Farber Ave	291
Glendora	305474	Forestdale Ave	619
Glendora	305474	Galatea St	916
Glendora	305474	la Serena Dr	353
Glendora	305474	Ronwood St	846
Glendora	305474	S Bender Ave	1068
Glendora	305474	S Calmgrove Ave	392
Glendora	305474	S Glendora Ave	397
Glendora	305474	S Grand Ave	942
Glendora	305474	S Jenifer Ave	213
Glendora	305474	S Pennsylvania Ave	496
Glendora	305474	S Prospero Dr	546
Glendora	305474	S Soderberg Ave	216
Glendora	305474	S Washington Ave	490
Glendora	305474	S Westridge Ave	153
Glendora	305474	Shady Glen Dr	8
Glendora	305474	W Dawson Ave	1682
Glendora	305474	W Dawson Ct	808
Glendora	305474	W Dike St	981
Glendora	305474	W Gaillard St	722
Glendora	305474	W Tedrow Dr	260
Glendora	305475		419
Glendora	305475	Center Ave	582
Glendora	305475	E Ada Ave	2174
Glendora	305475	E Carroll Ave	1998
Glendora	305475	E Colorado Ave	1617

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305475	E Duell St	550
Glendora	305475	E Haltern Ave	1475
Glendora	305475	E Lemon Ave	2484
Glendora	305475	E Linfield St	1193
Glendora	305475	E Mauna Loa Ave	1519
Glendora	305475	E Myrtle Ave	2011
Glendora	305475	E Walnut Ave	2127
Glendora	305475	Lemar Park Dr	678
Glendora	305475	Marion Pl	364
Glendora	305475	S Cullen Ave	1503
Glendora	305475	S Minnesota Ave	1223
Glendora	305475	S Pasadena Ave	2350
Glendora	305475	S Pepper Ave	389
Glendora	305475	Scott Pl	357
Glendora	305475	State Rte 66	4482
Glendora	305475	Sycamore Ave	2024
Glendora	305475	Tate Ave	179
Glendora	305476		6806
Glendora	305476	Armstead St	51
Glendora	305476	Bryant Cir S	118
Glendora	305476	Citrus Edge St	618
Glendora	305476	Danehurst Ave	334
Glendora	305476	E Ada Ave	1637
Glendora	305476	E Carroll Ave	1804
Glendora	305476	E Myrtle Ave	609
Glendora	305476	Farber Ave	627
Glendora	305476	Heber St	1191
Glendora	305476	Orangepath St	37
Glendora	305476	Parker Dr	613
Glendora	305476	Primrose Pl	194
Glendora	305476	S Bender Ave	584
Glendora	305476	S Calmgrove Ave	408
Glendora	305476	S Dodsworth Ave	681
Glendora	305476	S Fuchsia Ave	815
Glendora	305476	S Glendora Ave	1868
Glendora	305476	S Grand Ave	6845
Glendora	305476	S Jenifer Ave	1694
Glendora	305476	S Minnesota Ave	1333
Glendora	305476	S Pasadena Ave	52
Glendora	305476	S Pennsylvania Ave	1675
Glendora	305476	S Santa Fe Ave	1307
Glendora	305476	S Vermont Ave	2845
Glendora	305476	S Vista Bonita Ave	1319
Glendora	305476	S Wabash Ave	1327
Glendora	305476	S Washington Ave	998
Glendora	305476	S Westridge Ave	586
Glendora	305476	State Rte 66	4777
Glendora	305476	Stiteswood Ave	381
Glendora	305476	Sycamore Ave	593
Glendora	305476	W Ada Ave	1727
Glendora	305476	W Baseline Rd	2656
Glendora	305476	W Carroll Ave	1035
Glendora	305476	W Colorado Ave	2578
Glendora	305476	W Duell St	455
Glendora	305476	W Glen Lyn Dr	297
Glendora	305476	W Haltern Ave	514
Glendora	305476	W Larkspur Ln	177
Glendora	305476	W Leeside St	1197
Glendora	305476	W Linfield St	379
Glendora	305476	W Mauna Loa Ave	2557
Glendora	305476	W Meacham St	230
Glendora	305476	W Petunia St	456
Glendora	305476	W Tedrow Dr	443
Glendora	305477		919
Glendora	305477	E Colorado Ave	934

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305477	E Duell St	584
Glendora	305477	E Haltern Ave	691
Glendora	305477	E Lemon Ave	272
Glendora	305477	E Linfield St	566
Glendora	305477	E Mauna Loa Ave	665
Glendora	305477	E Walnut Ave	883
Glendora	305477	Langham Ave	120
Glendora	305477	S Glendora Ave	3094
Glendora	305477	S Minnesota Ave	721
Glendora	305477	S Vista Bonita Ave	460
Glendora	305477	S Wabash Ave	1054
Glendora	305477	State Rte 66	2209
Glendora	305477	W Baseline Rd	72
Glendora	305477	W Colorado Ave	59
Glendora	305477	W Haltern Ave	55
Glendora	305477	W Mauna Loa Ave	54
Glendora	305478		275
Glendora	305478	Candlewicke Ct	161
Glendora	305478	E Mauna Loa Ave	103
Glendora	305478	E Paddington Rd	121
Glendora	305478	Los Cerritos Rd	20
Glendora	305478	S Elwood Ave	1038
Glendora	305478	State Rte 66	1736
Glendora	305478	Stonehedge Dr	454
Glendora	305479		155
Glendora	305479	Cedarwood Ave	519
Glendora	305479	E Ada Ave	1257
Glendora	305479	E Carroll Ave	1234
Glendora	305479	E Dalton Ave	828
Glendora	305479	E Foothill Blvd	1796
Glendora	305479	E Lemon Ave	1882
Glendora	305479	E Meda Ave	1170
Glendora	305479	E Mountain View Ave	1158
Glendora	305479	E Myrtle Ave	913
Glendora	305479	E Walnut Ave	1880
Glendora	305479	E Woodland Ln	1579
Glendora	305479	N Elwood Ave	636
Glendora	305479	Pinewood Pl	278
Glendora	305479	S Elwood Ave	2801
Glendora	305479	S Glenwood Ave	2151
Glendora	305479	S Loraine Ave	470
Glendora	305479	Sandalwood Pl	419
Glendora	305479	State Rte 66	2168
Glendora	305479	Sycamore Ave	20
Glendora	305480		1021
Glendora	305480	Akeley Dr	198
Glendora	305480	Baxter Dr	1574
Glendora	305480	E Ada Ave	1304
Glendora	305480	E Bennett Ave	2576
Glendora	305480	E Carroll Ave	1218
Glendora	305480	E Comstock Ave	1872
Glendora	305480	E Cypress Ave	1753
Glendora	305480	E Dalton Ave	1687
Glendora	305480	E Foothill Blvd	2273
Glendora	305480	E Leadora Ave	768
Glendora	305480	E Lemon Ave	871
Glendora	305480	E Meda Ave	130
Glendora	305480	E Mountain View Ave	1593
Glendora	305480	E Northridge Ave	967
Glendora	305480	E Walnut Ave	1450
Glendora	305480	E Whitcomb Ave	123
Glendora	305480	E Woodland Ln	441
Glendora	305480	Encanto Dr	387
Glendora	305480	Humphreys Way	835
Glendora	305480	la Flora Ln	489

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305480	Meda Ave	1600
Glendora	305480	N Akeley Dr	179
Glendora	305480	N Burnaby Ave	1707
Glendora	305480	N Loraine Ave	3349
Glendora	305480	N San Jose Dr	416
Glendora	305480	N Treanor Ave	542
Glendora	305480	N Worthy Dr	443
Glendora	305480	Pflueger Ave	588
Glendora	305480	S Akeley Dr	559
Glendora	305480	S Burnaby Dr	1287
Glendora	305480	S Loraine Ave	1957
Glendora	305480	S San Jose Dr	70
Glendora	305480	S Treanor Ave	844
Glendora	305480	S Worthy Dr	1235
Glendora	305480	State Rte 66	1204
Glendora	305480	Steffen St	798
Glendora	305480	Thornhurst Ave	557
Glendora	305480	Treanor Ave	844
Glendora	305480	Underhill Dr	2094
Glendora	305480	Underhill Ter	128
Glendora	305480	Willow Springs Ln	362
Glendora	305480	Willow Springs Park	584
Glendora	305480	Willowgrove Ave	1682
Glendora	305480	Worthy Dr	114
Glendora	305481		1197
Glendora	305481	Acorn Ln	901
Glendora	305481	Amelia Ave	1194
Glendora	305481	Beaverbrook Ln	511
Glendora	305481	Bradish Ave	688
Glendora	305481	Branch Oak Ct	221
Glendora	305481	Branch Oak Dr	465
Glendora	305481	Buffalo Trl	627
Glendora	305481	Caballo Ave	849
Glendora	305481	Canyon Meadows Ln	256
Glendora	305481	Compromise Line Rd	1519
Glendora	305481	Cordelia Ave	832
Glendora	305481	Danecroft Ave	528
Glendora	305481	Deerview St	319
Glendora	305481	Deserta Dr	594
Glendora	305481	Duell St	733
Glendora	305481	E Acera Ct	124
Glendora	305481	E Duell St	1384
Glendora	305481	E Foothill Blvd	1884
Glendora	305481	E Leaning Oak Ct	212
Glendora	305481	E Linfield St	2527
Glendora	305481	E Petunia St	2501
Glendora	305481	E Steffen St	2
Glendora	305481	E Zara St	1139
Glendora	305481	Elkhorn Ln	177
Glendora	305481	Fawn Valley	801
Glendora	305481	Glengrove Ave	1442
Glendora	305481	Gold Dust St	489
Glendora	305481	Groveton Ave	172
Glendora	305481	Heritage Oak Dr	678
Glendora	305481	High Country Dr	121
Glendora	305481	Highland Dr	161
Glendora	305481	Hunters Trl	1952
Glendora	305481	Inola St	1265
Glendora	305481	Inverness Ave	1124
Glendora	305481	Kenoma St	1780
Glendora	305481	Manor Ln	1426
Glendora	305481	N Hacienda Ave	828
Glendora	305481	N Valley Center Ave	1850
Glendora	305481	Oak Knoll Dr	26
Glendora	305481	Oaktree Cir	214

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305481	Oaktree Ct	519
Glendora	305481	Oaktree Dr	1904
Glendora	305481	Oaktree Ln	355
Glendora	305481	Oaktree Pl	187
Glendora	305481	Oaktree Ter	158
Glendora	305481	Palopinto Ave	2377
Glendora	305481	Partridge Ln	162
Glendora	305481	Poppy Ln	929
Glendora	305481	Puma Canyon Ln	673
Glendora	305481	Remuda Dr	1318
Glendora	305481	Rodeo Rd	1161
Glendora	305481	Roundup Rd	1839
Glendora	305481	S Cimmeron Trl	1060
Glendora	305481	S Gordon Ave	501
Glendora	305481	S Hacienda Ave	1326
Glendora	305481	S Lone Hill Ave	4414
Glendora	305481	S Lope Ln	2207
Glendora	305481	S Lupin Ln	237
Glendora	305481	S Prairie Pl	172
Glendora	305481	S Sage Pl	221
Glendora	305481	S Wagonwheel Rd	502
Glendora	305481	Saint Vladimir St	75
Glendora	305481	Sandstone Dr	31
Glendora	305481	Scottdale Ave	790
Glendora	305481	Sellers St	1104
Glendora	305481	Sierra Sky Dr	42
Glendora	305481	State Rte 66	6926
Glendora	305481	Tressy Ave	1521
Glendora	305481	Verdugo Ave	1557
Glendora	305481	W Duell St	391
Glendora	305481	Whispering Oaks Dr	1535
Glendora	305481	Wild Rose Ln	48
Glendora	305482		931
Glendora	305482	Amelia Ave	2434
Glendora	305482	Club Vista Dr	331
Glendora	305482	Country Club Dr	2388
Glendora	305482	Country Club Vista St	169
Glendora	305482	Crescent Glen Dr	469
Glendora	305482	E Curtis Ct	33
Glendora	305482	E Financial Way	490
Glendora	305482	E Foothill Blvd	2659
Glendora	305482	Edgemont Pl	557
Glendora	305482	Glengrove Ave	80
Glendora	305482	N Birchnell Ave	53
Glendora	305482	Oak Park Rd	162
Glendora	305482	State Rte 66	4887
Glendora	305482	Swiftwater Way	73
Glendora	305482	Valcourt Ln	423
Glendora	305482	Wild Rose Ln	53
Glendora	305482	Wildwood Mtwy	12
Glendora	305482	Woodglen Dr	48
Glendora	305483		419
Glendora	305483	Amelia Ave	1114
Glendora	305483	Big Fir Ln	544
Glendora	305483	Canterbury Ln	508
Glendora	305483	Club Vista Dr	3
Glendora	305483	Country Club Ct	59
Glendora	305483	Country Club Dr	2516
Glendora	305483	Cumberland Rd	1590
Glendora	305483	E Foothill Blvd	2472
Glendora	305483	E Redwood Dr	149
Glendora	305483	Exmoor Pl	208
Glendora	305483	Glengrove Ave	553
Glendora	305483	Grand Oaks Dr	50
Glendora	305483	Inverness Pl	583

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Glendora	305483	la Quinta Dr	354
Glendora	305483	Manor Ln	73
Glendora	305483	Morgan Ranch Dr	168
Glendora	305483	Morgan Ranch Rd	925
Glendora	305483	N Country Club Rd	673
Glendora	305483	N Greencroft Ave	314
Glendora	305483	N Lone Hill Ave	523
Glendora	305483	Oakhart Dr	495
Glendora	305483	Oakland Rd	312
Glendora	305483	Palomar Dr	208
Glendora	305483	Palopinto Ave	180
Glendora	305483	Pinehurst St	1143
Glendora	305483	Redwood Dr	411
Glendora	305483	S Country Club Rd	1650
Glendora	305483	S Lone Hill Ave	2574
Glendora	305483	S Oakhart Dr	51
Glendora	305483	Shenandoah Ln	137
Glendora	305483	Silver Tree Rd	145
Glendora	305484		255
Glendora	305484	Acorn Ln	85
Glendora	305484	Meadow Brook Ln	252
Glendora	305484	Meadowbrook Ln	160
Glendora	305484	Morgan Ranch Rd	500
Glendora	305484	N Country Club Rd	549
Glendora	305484	N Greencroft Ave	299
Glendora	305484	N Hacienda Ave	710
Glendora	305484	N Lone Hill Ave	546
Glendora	305484	Oakland Rd	218
Glendora	305484	Silver Tree Rd	71
Glendora	305484	Valiant St	1320
Glendora	305485		147
Glendora	305485	Boulder Springs Dr	335
Glendora	305485	Canyon Springs Ln	246
Glendora	305485	Catherine Park Dr	2454
Glendora	305485	Dalton Springs Ln	1083
Glendora	305485	E Comstock Ave	848
Glendora	305485	E Cossacks Pl	1098
Glendora	305485	E Foothill Blvd	1050
Glendora	305485	E Laurel Ave	194
Glendora	305485	E Lawford St	1374
Glendora	305485	E Leadora Ave	701
Glendora	305485	E Northridge Ave	151
Glendora	305485	E Palm Dr	666
Glendora	305485	E Sierra Madre Ave	708
Glendora	305485	E Steffen St	380
Glendora	305485	E Virginia Ave	193
Glendora	305485	Elmgrove Dr	967
Glendora	305485	Fawn Springs Ln	22
Glendora	305485	Fern Dell Pl	514
Glendora	305485	Forest Oaks Dr	314
Glendora	305485	Fountain Springs Ln	1296
Glendora	305485	Glendora Mountain Rd	4604
Glendora	305485	N Valley Center Ave	3555
Glendora	305485	Oak Forest Cir	45
Glendora	305485	Oak Knoll Dr	150
Glendora	305485	Palopinto Ave	0
Glendora	305485	Pebble Sprgs Ln	414
Glendora	305485	S San Jose Dr	1252
Glendora	305485	Saint Vladimir St	1123
Glendora	305485	State Rte 66	528
Glendora	305485	Thornhurst Ave	687
Glendora	305485	Underhill Dr	101
Glendora	305485	Windingway Ln	0
Glendora	305489	Big Dalton Canyon Rd	238
Industry	365150		237

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Industry	365150	Capitol Ave	694
Industry	365150	Rose Hills Rd	217
Industry	365150	San Gabriel River Pkwy	86
Industry	365151		374
Industry	365151	Baybar Rd	75
Industry	365151	Capitol Ave	29
Industry	365151	Mission Mill Rd	263
Industry	365151	Peck Rd	807
Industry	365151	Pellissier Pl	1982
Industry	365151	Red Hat Ln	293
Industry	365151	Workman Mill Rd	406
Industry	365152		4212
Industry	365152	Crossroads Pkwy N	1715
Industry	365152	Crossroads Pkwy S	2077
Industry	365152	Fry's Pkwy	30
Industry	365152	Workman Mill Rd	621
Industry	365154	Kella Ave	487
Industry	365154	Peck Rd	112
Industry	365154	Rooks Rd	100
Industry	365156	Pellissier Pl	164
Industry	365158		35
Industry	365158	6th Ave	3628
Industry	365158	7th Ave	145
Industry	365158	Bonelli St	2092
Industry	365158	Clark Ave	23
Industry	365158	Coralridge Pl	1
Industry	365158	Don Julian Rd	1880
Industry	365158	Lomitas Ave	0
Industry	365158	Orange Ave	601
Industry	365158	Proctor Ave	2094
Industry	365158	Wildwood Way	14
Industry	365159		1
Industry	365159	7th Ave	2353
Industry	365159	Don Julian Rd	1153
Industry	365159	E Nelson Ave	626
Industry	365159	N Sunset Ave	873
Industry	365159	Proctor Ave	54
Industry	365160	7th Ave	925
Industry	365160	Bonelli St	57
Industry	365161		168
Industry	365161	9th Ave	1171
Industry	365161	Cadbrook Dr	3
Industry	365161	Don Julian Rd	2464
Industry	365161	E Nelson Ave	1097
Industry	365161	N California Ave	811
Industry	365161	N Unruh Ave	33
Industry	365161	Perth Ave	1
Industry	365161	Proctor Ave	1372
Industry	365161	Turnbull Canyon Rd	2112
Industry	365163		25
Industry	365164		150
Industry	365164	del Valle Ave	2
Industry	365164	E Temple Ave	35
Industry	365164	Hill St	234
Industry	365164	Kaplan Ave	636
Industry	365164	Loukelton St	310
Industry	365164	Mentz St	1
Industry	365164	Temple Ave	1954
Industry	365167		54
Industry	365167	Glenloch Ave	7
Industry	365167	Glenlock Ave	7
Industry	365167	N Azusa Ave	2117
Industry	365169		48
Industry	365169	9th Ave	128
Industry	365169	Turnbull Canyon Rd	83

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Industry	365170		1357
Industry	365170	Don Julian Rd	2163
Industry	365170	E Nelson Ave	2426
Industry	365170	el Encanto Rd	644
Industry	365170	Hudson Ave	902
Industry	365170	Maypop Ave	7
Industry	365170	N Hacienda Blvd	13
Industry	365170	N Unruh Ave	741
Industry	365170	Newquist Ave	340
Industry	365170	Parriot Pl	515
Industry	365170	Proctor Ave	2518
Industry	365170	S Hacienda Blvd	2519
Industry	365170	Stafford St	4139
Industry	365170	Turnbull Canyon Rd	463
Industry	365170	Valley Blvd	1856
Industry	365171	Marwood St	20
Industry	365171	Turnbull Canyon Rd	218
Industry	365172		227
Industry	365172	Clark Ave	14
Industry	365172	Don Julian Rd	4145
Industry	365172	E Parriot Pl	318
Industry	365172	E Workman St	4
Industry	365172	Glendora Ave	891
Industry	365172	Parriot Pl	1205
Industry	365172	Rausch Rd	227
Industry	365172	Russell St	680
Industry	365172	S Hacienda Blvd	4914
Industry	365172	Salt Lake Ave	3010
Industry	365172	Sotro St	710
Industry	365172	Stafford St	2281
Industry	365172	Turnbull Canyon Rd	644
Industry	365172	Valley Blvd	1790
Industry	365172	Wilson	293
Industry	365173		0
Industry	365173	Parriot Pl	85
Industry	365174	E Gale Ave	498
Industry	365174	Falstone Ave	2
Industry	365174	Gale Ave	498
Industry	365174	Phoenix Dr	781
Industry	365174	Robin Way	249
Industry	365175		127
Industry	365175	E Gale Ave	5
Industry	365175	Gale Ave	5
Industry	365175	Phoenix Dr	16
Industry	365175	Robin Way	21
Industry	365175	S Stimson Ave	1158
Industry	365175	Ward Way	9
Industry	365176		30
Industry	365176	E Nelson Ave	43
Industry	365176	S Stimson Ave	1382
Industry	365176	Stafford St	1
Industry	365176	Stephens St	6
Industry	365176	Valley Blvd	1849
Industry	365177	S Stimson Ave	355
Industry	365177	Stephens St	1065
Industry	365179	Bixby Dr	751
Industry	365179	Chestnut St	120
Industry	365179	Darius Ct	219
Industry	365179	E Gale Ave	1255
Industry	365179	E Johnson Dr	434
Industry	365179	Gale Ave	1255
Industry	365179	Johnson Dr	983
Industry	365180		74
Industry	365180	Bixby Dr	1050
Industry	365180	Chestnut St	1547

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Industry	365180	E Gale Ave	2121
Industry	365180	E Johnson Dr	1130
Industry	365180	Gale Ave	2121
Industry	365180	John Reed Ct	2129
Industry	365180	Marion Ct	220
Industry	365182	Anaheim and Puente Rd	71
Industry	365182	Arenth Ave	33
Industry	365183		38
Industry	365183	Chestnut St	1254
Industry	365183	E Gale Ave	2453
Industry	365183	Evergreen Pl	1237
Industry	365183	Gale Ave	2453
Industry	365183	Green Dr	2174
Industry	365183	Kearn Creek Ct	628
Industry	365183	S Azusa Ave	1138
Industry	365184		3265
Industry	365184	Anaheim and Puente Rd	915
Industry	365184	Arenth Ave	143
Industry	365184	Chestnut St	2054
Industry	365184	Railroad St	59
Industry	365184	S Azusa Ave	2314
Industry	365184	Virgil Waters Way	721
Industry	365185		4022
Industry	365185	Arenth Ave	1
Industry	365185	Azusa Way	1786
Industry	365185	Gemini St	5
Industry	365185	Hurley St	167
Industry	365185	Main St	253
Industry	365185	N Azusa Ave	9
Industry	365185	Renault St	26
Industry	365185	S Azusa Ave	2898
Industry	365186		60
Industry	365186	E Gale Ave	2189
Industry	365186	Gale Ave	2189
Industry	365186	Railroad St	2240
Industry	365186	S Azusa Ave	1653
Industry	365186	S Hatcher Ave	6
Industry	365186	Wallace Ave	496
Industry	365187		680
Industry	365187	Ajax Ave	1009
Industry	365187	Arenth Ave	3334
Industry	365187	Chestnut St	463
Industry	365187	Hambledon Ave	478
Industry	365187	Phillips Dr	271
Industry	365187	Radecki Ct	632
Industry	365187	Rowland St	910
Industry	365187	S Hambledon Ave	193
Industry	365187	S Hatcher Ave	38
Industry	365189		469
Industry	365189	Ajax Ave	10
Industry	365189	Ajax Cir	76
Industry	365189	Albatross Rd	1819
Industry	365189	Almahurst St	974
Industry	365189	Canada Ct	700
Industry	365189	Castleton St	2281
Industry	365189	Colima Rd	5808
Industry	365189	E Gale Ave	370
Industry	365189	Fullerton Rd	1459
Industry	365189	Gale Ave	4594
Industry	365189	Hanover Rd	1306
Industry	365189	Keystone St	894
Industry	365189	Radecki Ct	73
Industry	365189	Railroad St	816
Industry	365189	Rowland St	4584
Industry	365189	S Hatcher Ave	2034

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Industry	365189	S Jellick Ave	769
Industry	365189	S Lawson St	1516
Industry	365189	Samuelson St	752
Industry	365189	San Jose Ave	1310
Industry	365189	Stoner Creek Rd	935
Industry	365189	Walnut Hall Rd	1075
Industry	365191		1261
Industry	365191	Ajax Ave	194
Industry	365191	Arenth Ave	5447
Industry	365191	Cortney Ct	557
Industry	365191	Epperson Dr	1264
Industry	365191	Rowland St	222
Industry	365191	S Lawson St	1272
Industry	365191	San Jose Ave	624
Industry	365192	Giano Ave	525
Industry	365194	Coiner Ct	420
Industry	365194	Gale Ave	871
Industry	365194	San Jose Ave	356
Industry	365195	Arenth Ave	3408
Industry	365195	Epperson Dr	683
Industry	365195	S Nogales St	583
Industry	365195	S Sentous St	154
Industry	365196	Charlie Rd	451
Industry	365196	San Jose Ave	2089
Industry	365197		1815
Industry	365197	Centre Dr	457
Industry	365197	E Walnut Dr N	1420
Industry	365197	Fairway Dr	1008
Industry	365197	Quiroz Ct	547
Industry	365197	S Nogales St	737
Industry	365197	S Otterbein Ave	29
Industry	365197	S Sentous St	204
Industry	365197	San Jose Ave	1636
Industry	365197	Walnut Dr	87
Industry	365197	Wright Way	157
Industry	365198		49
Industry	365198	Business Pkwy	3312
Industry	365198	Cam de Teodoro	101
Industry	365198	Fairway Dr	920
Industry	365198	San Jose Ave	7
Industry	365198	Tucker Ln	552
Industry	365199	Cam de Teodoro	198
Industry	365199	Fairway Dr	4
Industry	365203		2162
Industry	365203	Business Pkwy	2125
Industry	365203	Currier Rd	60
Industry	365203	Lemon Ave	1074
Industry	365204	N Grand Ave	30
Industry	365204	Old Brea Canyon Rd	108
Industry	365205		2729
Industry	365205	Baker Pkwy	5580
Industry	365205	Brea Canyon Rd	3464
Industry	365205	Cheryl Ln	2472
Industry	365205	Currier Rd	1886
Industry	365205	Garcia Ln	793
Industry	365205	Grand Crossings Pkwy	1488
Industry	365205	Lemon Ave	1117
Industry	365205	N Grand Ave	3822
Industry	365205	Old Ranch Rd	1510
Industry	365205	Pso Sonrisa	2
Industry	365205	Reyes Dr	761
Industry	365205	S Brent Cir	93
Industry	365205	S Mayo Ave	1539
Industry	365205	Spanish Ln	588
Industry	365205	Valley Blvd	494

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Industry	365205	Waddingham Way	824
Industry	365207		499
Industry	365207	Benton Ct	31
Industry	365207	Ferrero Pkwy	30
Industry	365207	Grand Ave	178
Industry	365207	N Grand Ave	310
Industry	365207	Valley Blvd	691
Industry	365208	Faure Ave	250
Industry	365208	Valley Blvd	102
Industry	365211	Garcia Ln	258
Industry	365211	Machlin Ct	261
Industry	365227		1575
Industry	365227	Austen Way	4
Industry	365227	E Nelson Ave	1672
Industry	365227	Ector St	29
Industry	365227	Mayland Ave	6
Industry	365227	Moccasin St	3
Industry	365227	N Mason Way	595
Industry	365227	N Puente Ave	1028
Industry	365227	Pitches Pl	30
Industry	365227	Siesta Ave	11
Industry	365227	Stichman Ave	4
Industry	365227	Vineland Ave	3221
Industry	365227	Workman Mill Rd	257
Industry	365228		41
Industry	365228	Cabana Ave	3
Industry	365228	Clintwood Ave	2
Industry	365228	Conlon Ave	2
Industry	365228	E Nelson Ave	2818
Industry	365228	League Ave	0
Industry	365228	Long Ln	676
Industry	365228	N Willow Ave	789
Industry	365228	Orange Ave	338
Industry	365228	Sandia Ave	4
Industry	365228	Sunkist Ave	9
Industry	365228	Tonopah Ave	4
Industry	365228	Willow Ave	4
Industry	365229		57
Industry	365229	Valley Blvd	593
Industry	365230		168
Industry	365230	E Nelson Ave	847
Industry	365230	E Temple Ave	2597
Industry	365230	N Baldwin Park Blvd	2697
Industry	365230	N Covina Ln	10
Industry	365230	Perez Pl	689
Industry	365230	Railroad Ave	17
Industry	365231	Clora Pl	399
Industry	365231	Durfee Ave	391
Industry	365231	Gilman Rd	214
Industry	365362	Amar Rd	1434
Industry	365362	Canal Pl	292
Industry	365362	Daum Dr	496
Industry	365362	N Baldwin Park Blvd	471
Industry	365362	Vineland Ave	62
Industry	365363		33
Industry	365363	E Temple Ave	2061
Industry	365363	Louden Ln	660
Industry	365363	N Baldwin Park Blvd	1815
Industry	365366	Daum Dr	323
La Puente	425159		1196
La Puente	425159	Amar Rd	658
La Puente	425159	Beckner St	431
La Puente	425159	Broadmoor Ave	843
La Puente	425159	Cabana Ave	882
La Puente	425159	Clintwood Ave	1321

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
La Puente	425159	Culp St	100
La Puente	425159	E Nelson Ave	1598
La Puente	425159	E Temple Ave	2657
La Puente	425159	Ector St	305
La Puente	425159	Evanwood Ave	1982
La Puente	425159	Flagstaff St	30
La Puente	425159	Flanner St	1476
La Puente	425159	Glenshaw Dr	1754
La Puente	425159	Greenberry Dr	1812
La Puente	425159	Hartsville St	445
La Puente	425159	Hutchcroft St	304
La Puente	425159	Las Vecinas Dr	122
La Puente	425159	Lassalette St	827
La Puente	425159	League Ave	30
La Puente	425159	Moccasin St	176
La Puente	425159	N Sunset Ave	2328
La Puente	425159	Prichard St	2288
La Puente	425159	Radway Ave	848
La Puente	425159	Shadydale Ave	1080
La Puente	425159	Tonopah Ave	639
La Puente	425161		899
La Puente	425161	Aldgate Ave	649
La Puente	425161	Amar Rd	2424
La Puente	425161	Beckner St	1175
La Puente	425161	Cadbrook Dr	1701
La Puente	425161	E Cadwell St	524
La Puente	425161	E Nelson Ave	1778
La Puente	425161	E Temple Ave	2239
La Puente	425161	Ector St	1076
La Puente	425161	Elliot Ave	819
La Puente	425161	Flagstaff St	1880
La Puente	425161	Flynn St	820
La Puente	425161	Gaylawn Ct	285
La Puente	425161	Giordano St	1187
La Puente	425161	Goodson Dr	1281
La Puente	425161	Hartsville St	1173
La Puente	425161	Hayland St	35
La Puente	425161	Homeward St	466
La Puente	425161	Hutchcroft St	725
La Puente	425161	Ivanell Ave	1697
La Puente	425161	Las Vecinas Dr	627
La Puente	425161	Lassalette St	1248
La Puente	425161	Maypop Ave	61
La Puente	425161	Melham Ave	1146
La Puente	425161	Moccasin St	1552
La Puente	425161	N California Ave	856
La Puente	425161	N Eldon Ave	1334
La Puente	425161	N Hacienda Blvd	940
La Puente	425161	N Nantes Ave	3142
La Puente	425161	N Unruh Ave	2454
La Puente	425161	Orrington Ave	625
La Puente	425161	Perth Ave	1928
La Puente	425161	Prichard St	1875
La Puente	425161	Temple Ave	196
La Puente	425161	Unruh Ave	1829
La Puente	425162		101
La Puente	425162	Aldgate Ave	202
La Puente	425162	Amar Rd	154
La Puente	425162	Beckner St	1865
La Puente	425162	California Ave	487
La Puente	425162	Duff Ave	772
La Puente	425162	E Temple Ave	1880
La Puente	425162	Foxworth Ave	771
La Puente	425162	Maplegrove St	198
La Puente	425162	Melham Ave	384

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
La Puente	425162	N California Ave	966
La Puente	425162	Prichard St	566
La Puente	425162	Saint Malo Ave	419
La Puente	425162	Sandy Hook Ave	910
La Puente	425162	W Francisquito Ave	801
La Puente	425163		3554
La Puente	425163	Aileron Ave	255
La Puente	425163	Amar Rd	5645
La Puente	425163	Ballista Ave	155
La Puente	425163	del Valle Ave	1591
La Puente	425163	E Blackwood St	833
La Puente	425163	E Cadwell St	1858
La Puente	425163	Elliot Ave	47
La Puente	425163	Fairgrove Ave	1857
La Puente	425163	Fickewirth Ave	1627
La Puente	425163	Gilwood Ave	744
La Puente	425163	Hayland St	1247
La Puente	425163	Klamath St	1143
La Puente	425163	Larimore Ave	0
La Puente	425163	Maplegrove St	156
La Puente	425163	Molinar Ave	1636
La Puente	425163	N Ballista Ave	473
La Puente	425163	N Hacienda Blvd	3835
La Puente	425163	N Larimore Ave	985
La Puente	425163	N Stimson Ave	1304
La Puente	425163	Rygate Ave	328
La Puente	425163	Unruh Ave	21
La Puente	425164		4475
La Puente	425164	Aileron Ave	2396
La Puente	425164	Bromar St	151
La Puente	425164	Cambay St	1156
La Puente	425164	del Valle Ave	3154
La Puente	425164	E Montana Ave	935
La Puente	425164	E Temple Ave	3345
La Puente	425164	E Victoria Ave	954
La Puente	425164	Ector St	30
La Puente	425164	Fickewirth Ave	559
La Puente	425164	Gaylawn Ct	488
La Puente	425164	Gilwood Ave	1012
La Puente	425164	Glendora Ave	2717
La Puente	425164	Greycliff Ave	2029
La Puente	425164	Hill St	1076
La Puente	425164	Hudson Ave	663
La Puente	425164	Lanny Ave	2245
La Puente	425164	Lawnwood St	1315
La Puente	425164	Loukelton St	3708
La Puente	425164	Mentz St	2134
La Puente	425164	Molinar Ave	665
La Puente	425164	Mulvane St	779
La Puente	425164	N 5th St	1278
La Puente	425164	N Ballista Ave	732
La Puente	425164	N Hacienda Blvd	4561
La Puente	425164	N Larimore Ave	2018
La Puente	425164	N Stimson Ave	1823
La Puente	425164	Ocala Ave	2021
La Puente	425164	Peggy Ave	2081
La Puente	425164	Picton St	633
La Puente	425164	Pocono St	770
La Puente	425164	San Jose Ave	273
La Puente	425164	Santo Oro Ave	999
La Puente	425164	Sierra Vista Ct	2710
La Puente	425164	Temple Ave	101
La Puente	425164	Wake Ct	119
La Puente	425170	Flagstaff St	862
La Puente	425170	Las Vecinas Dr	376

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
La Puente	425170	Maypop Ave	717
La Puente	425170	Moccasin St	2
La Puente	425170	N Hacienda Blvd	2098
La Puente	425172	E Workman St	2
La Puente	425172	Glendora Ave	48
La Puente	425176		3352
La Puente	425176	Abbey St	2016
La Puente	425176	Albert St	591
La Puente	425176	Appleblossom St	1824
La Puente	425176	Baja Ave	156
La Puente	425176	Bamboo St	3194
La Puente	425176	Banbridge Dr	283
La Puente	425176	Banyan Ln	47
La Puente	425176	Bluebonnet St	2060
La Puente	425176	Buckeye St	20
La Puente	425176	Central Ave	2732
La Puente	425176	Cimarron St	56
La Puente	425176	Common St	1420
La Puente	425176	Dalesford Dr	2
La Puente	425176	Dial Ave	176
La Puente	425176	E Nelson Ave	482
La Puente	425176	E Rowland St	982
La Puente	425176	E Workman St	2243
La Puente	425176	Glendora Ave	1375
La Puente	425176	Greenbriar Ln	23
La Puente	425176	Hill St	434
La Puente	425176	Hillcrest Dr	531
La Puente	425176	Hofgaarden St	11
La Puente	425176	Inyo St	1838
La Puente	425176	Jasmine Ln	34
La Puente	425176	Lance Ct	139
La Puente	425176	Las Vecinas Dr	257
La Puente	425176	Main St	3037
La Puente	425176	N 1st St	1104
La Puente	425176	N 2nd St	981
La Puente	425176	N 3rd St	981
La Puente	425176	N 5th St	1099
La Puente	425176	N Stimson Ave	1450
La Puente	425176	Old Valley Blvd	1430
La Puente	425176	S 1st St	431
La Puente	425176	S 2nd St	777
La Puente	425176	S 4th St	683
La Puente	425176	S Stimson Ave	1065
La Puente	425176	San Jose Ave	743
La Puente	425176	Shay Ave	568
La Puente	425176	Stafford St	35
La Puente	425176	Tanglewood St	61
La Puente	425176	Valley Blvd	1215
La Puente	425176	Workman St	347
La Puente	425177		0
La Puente	425177	Hofgaarden St	533
La Puente	425177	Old Valley Blvd	1203
La Puente	425177	Valley Blvd	872
La Puente	425178		3655
La Puente	425178	Ansted Dr	113
La Puente	425178	Banbridge Ave	1866
La Puente	425178	Dalesford Dr	1014
La Puente	425178	Ellora St	160
La Puente	425178	Ferncreek Dr	393
La Puente	425178	Ferrero Ln	1938
La Puente	425178	Fife Ave	153
La Puente	425178	Hurley St	1294
La Puente	425178	Inyo St	3091
La Puente	425178	Maclaren St	1460
La Puente	425178	Main St	2580

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
La Puente	425178	Nathene Dr	292
La Puente	425178	Northam St	508
La Puente	425178	Park Rock Dr	132
La Puente	425178	Park Rock Rd	846
La Puente	425178	Pleasanthome Dr	391
La Puente	425178	Rorimer St	1586
La Puente	425178	Roundabout Dr	1015
La Puente	425178	Roxham Ave	343
La Puente	425178	Salais St	629
La Puente	425178	Severing Dr	36
La Puente	425178	Sprong Ln	65
La Puente	425178	Turk Dr	1875
La Puente	425178	Valley Blvd	1378
La Puente	425178	Waringwood Rd	1566
La Puente	425178	Wegman Dr	2280
La Puente	425181	Ferrero Ln	32
La Puente	425181	Valley Blvd	1330
La Puente	425182		1654
La Puente	425182	Azalea Ct	31
La Puente	425182	Chatterton Ave	1788
La Puente	425182	Dora Guzman Ave	1524
La Puente	425182	Harmsworth Ave	670
La Puente	425182	Hurley St	191
La Puente	425182	Inyo St	1511
La Puente	425182	Laura Ave	430
La Puente	425182	Maclaren St	52
La Puente	425182	Main St	1572
La Puente	425182	Marston Ave	760
La Puente	425182	Northam St	766
La Puente	425182	Radstock Ave	837
La Puente	425182	Rorimer St	403
La Puente	425182	Salais St	374
La Puente	425182	Severing Dr	117
La Puente	425182	Turk Dr	14
La Puente	425182	Valley Blvd	134
La Puente	425182	Villa Park St	592
La Puente	425182	Wickford Ave	1840
La Puente	425185		3443
La Puente	425185	Azalea Ct	412
La Puente	425185	Azusa Way	35
La Puente	425185	Hurley St	980
La Puente	425185	Leverett Ave	924
La Puente	425185	Main St	1467
La Puente	425185	S Azusa Ave	1593
La Puente	425185	Villa Park St	388
La Puente	425227		1378
La Puente	425227	Ardilla Ave	3859
La Puente	425227	Beckner St	1051
La Puente	425227	E Las Vecinas Dr	677
La Puente	425227	E Temple Ave	1651
La Puente	425227	Flagstaff St	592
La Puente	425227	Flynn St	944
La Puente	425227	Giordano St	520
La Puente	425227	Hartsville St	485
La Puente	425227	Homeward St	638
La Puente	425227	Marland St	543
La Puente	425227	Mayland Ave	1828
La Puente	425227	Moccasin St	709
La Puente	425227	N Puente Ave	3576
La Puente	425227	Nevers St	590
La Puente	425227	Prichard St	935
La Puente	425227	Siesta Ave	2127
La Puente	425227	Willow Ave	124
La Puente	425228		3363
La Puente	425228	Amar Rd	2879

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
La Puente	425228	Ardilla Ave	308
La Puente	425228	Beckner St	3454
La Puente	425228	Cabana Ave	1732
La Puente	425228	Clintwood Ave	1499
La Puente	425228	Conlon Ave	768
La Puente	425228	Culp St	11
La Puente	425228	E Las Vecinas Dr	281
La Puente	425228	E Nelson Ave	767
La Puente	425228	E Temple Ave	2886
La Puente	425228	Flagstaff St	286
La Puente	425228	Flynn St	702
La Puente	425228	Giordano St	38
La Puente	425228	Hartsville St	24
La Puente	425228	Homeward St	2879
La Puente	425228	Lang Ave	1084
La Puente	425228	Lassalette St	720
La Puente	425228	League Ave	2313
La Puente	425228	Marland St	292
La Puente	425228	Meeker Ave	2554
La Puente	425228	Moccasin St	968
La Puente	425228	N Puente Ave	113
La Puente	425228	Orange Ave	4313
La Puente	425228	Prichard St	1211
La Puente	425228	Rama Dr	2433
La Puente	425228	Sandia Ave	3666
La Puente	425228	Sandsprings Dr	2567
La Puente	425228	Sunkist Ave	4093
La Puente	425228	Sunkist Dr	324
La Puente	425228	Tamar Dr	3319
La Puente	425228	Tonopah Ave	3117
La Puente	425228	Willow Ave	4641
La Puente	425362		91
La Puente	425362	Amar Rd	1011
La Puente	425362	N Puente Ave	1288
La Puente	425362	Sauder St	28
La Puente	425362	Sunkist Dr	765
Unincorporated	835016	Emerald Cir	5
Unincorporated	835016	Fontainbleau Ave	115
Unincorporated	835016	Garnet Ave	111
Unincorporated	835016	Jade Ave	159
Unincorporated	835016	Opal Ave	134
Unincorporated	835016	Pearl Cir	211
Unincorporated	835045		282
Unincorporated	835045	Amber Valley Dr	236
Unincorporated	835045	Candlelight Dr	773
Unincorporated	835045	Fireside Dr	559
Unincorporated	835045	Grayling Ave	1309
Unincorporated	835045	Helmcrest Dr	52
Unincorporated	835045	Lambert Rd	2185
Unincorporated	835045	Landmark Dr	477
Unincorporated	835045	Larrylyn Dr	1489
Unincorporated	835045	Larrylynn Dr	312
Unincorporated	835045	Maybrook Ave	1779
Unincorporated	835045	Placid Dr	458
Unincorporated	835045	Pounds Ave	1270
Unincorporated	835045	Red Coach Ln	1582
Unincorporated	835045	Richvale Dr	156
Unincorporated	835045	Silver Grove Dr	763
Unincorporated	835045	Sugargrove Dr	573
Unincorporated	835045	Tigrina Ave	2073
Unincorporated	835045	Woodbrier Dr	1319
Unincorporated	835046		609
Unincorporated	835046	Agave Ave	864
Unincorporated	835046	Antoinette Dr	465
Unincorporated	835046	Ashby Ct	68

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835046	Avocado Crest Rd	84
Unincorporated	835046	Casa del Rey Dr	425
Unincorporated	835046	Citrus St	469
Unincorporated	835046	Cornwall Ct	9
Unincorporated	835046	Cromwell Way	20
Unincorporated	835046	Dartmouth Ln	97
Unincorporated	835046	Devonshire Way	61
Unincorporated	835046	Eseverri Ln	1531
Unincorporated	835046	Hacienda Blvd	576
Unincorporated	835046	Hacienda Rd	576
Unincorporated	835046	Harbor Blvd	39
Unincorporated	835046	Hertford Pl	19
Unincorporated	835046	Janine Dr	985
Unincorporated	835046	Madelena Dr	1659
Unincorporated	835046	Marianita Dr	172
Unincorporated	835046	Mondo Dr	165
Unincorporated	835046	Norwich Pl	355
Unincorporated	835046	Nottingham Ln	35
Unincorporated	835046	Papyrus Dr	241
Unincorporated	835046	Passiflora Dr	280
Unincorporated	835046	Pine Edge Dr	945
Unincorporated	835046	Stonegate Ln	274
Unincorporated	835046	Sunbird Ave	387
Unincorporated	835046	Vantage Pointe Dr	316
Unincorporated	835046	Villa Rita Dr	1255
Unincorporated	835046	Wales Ct	19
Unincorporated	835046	Wellington Ln	80
Unincorporated	835056		1747
Unincorporated	835056	Jalee Ct	29
Unincorporated	835056	S Hillrise Dr	23
Unincorporated	835057	Brea Canyon Cut Off Rd	99
Unincorporated	835057	Crestline Dr	37
Unincorporated	835057	E Crestline Dr	99
Unincorporated	835057	Edgemont Pl	41
Unincorporated	835057	Pathfinder Rd	59
Unincorporated	835057	Portside Dr	64
Unincorporated	835063		1691
Unincorporated	835063	Clearglen Ave	450
Unincorporated	835063	Elmrock Ave	255
Unincorporated	835063	Granada Ave	2
Unincorporated	835063	Hartdale Ave	378
Unincorporated	835063	Hillgate Dr	7
Unincorporated	835063	Kibbee Ave	417
Unincorporated	835063	la Cima Dr	641
Unincorporated	835063	la Serna Dr	644
Unincorporated	835063	Landmark Dr	20
Unincorporated	835063	Lemon Dr	1098
Unincorporated	835063	Marlinton Dr	856
Unincorporated	835063	Mayes Dr	711
Unincorporated	835063	Penford Dr	652
Unincorporated	835063	Richvale Dr	2880
Unincorporated	835063	Santa Gertrudes Ave	1856
Unincorporated	835063	Scott Ave	766
Unincorporated	835063	Sharon Hill Dr	1097
Unincorporated	835063	Stamy Rd	259
Unincorporated	835063	Tidwell Ave	876
Unincorporated	835064		3370
Unincorporated	835064	1st Ave	4223
Unincorporated	835064	Amber Valley Dr	4312
Unincorporated	835064	Andiron Dr	456
Unincorporated	835064	Bogardus Ave	156
Unincorporated	835064	Breezewood Dr	2045
Unincorporated	835064	Candlelight Dr	1540
Unincorporated	835064	Celestine Dr	470
Unincorporated	835064	Clearglen Ave	1532

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835064	Creswick Dr	489
Unincorporated	835064	Cullman Ave	1721
Unincorporated	835064	Edgeworth Ave	908
Unincorporated	835064	Elm Hill Dr	432
Unincorporated	835064	Elmrock Ave	1049
Unincorporated	835064	Falconhill Dr	1162
Unincorporated	835064	Fireside Dr	1137
Unincorporated	835064	First Ave	2270
Unincorporated	835064	Golden Lantern Ln	1036
Unincorporated	835064	Grovedale Dr	3471
Unincorporated	835064	Groveland Ave	3119
Unincorporated	835064	Groveside Ave	2051
Unincorporated	835064	Helmcrest Dr	568
Unincorporated	835064	Hillgate Dr	1123
Unincorporated	835064	Kentucky Ave	282
Unincorporated	835064	Lambert Rd	4439
Unincorporated	835064	Landmark Dr	2503
Unincorporated	835064	Lemon Dr	166
Unincorporated	835064	Lone Ridge Pl	165
Unincorporated	835064	Marlinton Dr	4150
Unincorporated	835064	Maybrook Ave	557
Unincorporated	835064	Meadow Green Rd	312
Unincorporated	835064	Mollyknoll Ave	690
Unincorporated	835064	Ocean Ave	1850
Unincorporated	835064	Placid Dr	2024
Unincorporated	835064	Pounds Ave	807
Unincorporated	835064	Red Coach Ln	1748
Unincorporated	835064	Richvale Dr	2788
Unincorporated	835064	Santa Gertrudes Ave	326
Unincorporated	835064	Sharon Hill Dr	1074
Unincorporated	835064	Silver Grove Dr	2852
Unincorporated	835064	Starwood Dr	345
Unincorporated	835064	Sugargrove Dr	958
Unincorporated	835064	Tidwell Ave	556
Unincorporated	835064	Tigrina Ave	987
Unincorporated	835064	Whitespring Dr	1238
Unincorporated	835064	Woodbrier Dr	434
Unincorporated	835065		61
Unincorporated	835065	Avocado Crest Rd	522
Unincorporated	835065	Hacienda Blvd	934
Unincorporated	835065	Hacienda Rd	934
Unincorporated	835065	Janine Dr	0
Unincorporated	835065	Madelena Dr	13
Unincorporated	835069		2329
Unincorporated	835069	Anabel Ave	498
Unincorporated	835069	Anola St	972
Unincorporated	835069	Archway Dr	1319
Unincorporated	835069	Armsdale Ave	1140
Unincorporated	835069	Arroyo Dr	1593
Unincorporated	835069	Bonavista Ln	1045
Unincorporated	835069	Burgess Ave	2215
Unincorporated	835069	Chere Dr	2223
Unincorporated	835069	Colima Rd	1716
Unincorporated	835069	Corley Dr	1873
Unincorporated	835069	E Busby Dr	2329
Unincorporated	835069	E Keese Dr	919
Unincorporated	835069	E Tedford Dr	2558
Unincorporated	835069	Eagan Dr	872
Unincorporated	835069	Edderton Ave	2546
Unincorporated	835069	Felt Dr	209
Unincorporated	835069	Foxcroft Dr	772
Unincorporated	835069	Henshaw Ave	454
Unincorporated	835069	Hillwood Dr	398
Unincorporated	835069	Keese Dr	1646
Unincorporated	835069	Kelford St	306

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835069	Kessock Ave	1015
Unincorporated	835069	la Mirada Blvd	1568
Unincorporated	835069	Leffingwell Rd	2247
Unincorporated	835069	Lucinda Dr	725
Unincorporated	835069	Miller Rd	1691
Unincorporated	835069	Mohall Ln	499
Unincorporated	835069	Moline Dr	822
Unincorporated	835069	Mystic St	18
Unincorporated	835069	Parise Dr	208
Unincorporated	835069	Placid Dr	1650
Unincorporated	835069	Raritan Dr	809
Unincorporated	835069	S Parise Dr	928
Unincorporated	835069	S Sunnybrook Ln	433
Unincorporated	835069	Saranac Dr	908
Unincorporated	835069	Saranac Pl	155
Unincorporated	835069	Springview Dr	1294
Unincorporated	835069	Tana Ave	420
Unincorporated	835069	Tanfield Dr	369
Unincorporated	835069	Tedford Dr	1008
Unincorporated	835069	Telegraph Rd	313
Unincorporated	835069	Thrace Dr	1098
Unincorporated	835069	Vaga Ave	329
Unincorporated	835069	Vaga Dr	329
Unincorporated	835069	Valley View Ave	3734
Unincorporated	835069	Wicker Dr	209
Unincorporated	835070		169
Unincorporated	835070	Anola St	1281
Unincorporated	835070	Bluefield Ave	1074
Unincorporated	835070	Cerecita Dr	990
Unincorporated	835070	Gladhill Rd	245
Unincorporated	835070	Hornell St	1122
Unincorporated	835070	Kibbee Ave	137
Unincorporated	835070	la Cima Dr	303
Unincorporated	835070	la Mirada Blvd	542
Unincorporated	835070	la Serna Dr	423
Unincorporated	835070	Leffingwell Rd	6664
Unincorporated	835070	Mayes Dr	382
Unincorporated	835070	Mystic St	629
Unincorporated	835070	Nashville Ave	694
Unincorporated	835070	Saranac Dr	2571
Unincorporated	835070	Scott Ave	1211
Unincorporated	835070	Stamy Rd	415
Unincorporated	835070	Tropico Ave	136
Unincorporated	835070	Weeks Dr	589
Unincorporated	835070	Wilmaglen Dr	1052
Unincorporated	835070	Woodcrest Dr	1785
Unincorporated	835071		1480
Unincorporated	835071	Beaty Ave	909
Unincorporated	835071	Fidel Ave	172
Unincorporated	835071	Laurel Ave	489
Unincorporated	835071	Meyer Rd	1490
Unincorporated	835071	Nita Ct	163
Unincorporated	835071	Painter Ave	3072
Unincorporated	835071	Rainier Ave	1050
Unincorporated	835071	Shoemaker Ave	4521
Unincorporated	835071	Sunnyside Pl	2
Unincorporated	835071	Sunshine Ave	740
Unincorporated	835071	Virginia Ave	199
Unincorporated	835072		2101
Unincorporated	835072	Beaty Ave	1761
Unincorporated	835072	Carmenita Rd	6773
Unincorporated	835072	Fidel Ave	3417
Unincorporated	835072	Hurchel Ct	23
Unincorporated	835072	Laurel Ave	4300
Unincorporated	835072	Leffingwell Rd	1235

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835072	Louis Ave	2822
Unincorporated	835072	Meyer Rd	2586
Unincorporated	835072	Michelle Cir	253
Unincorporated	835072	Painter Ave	1028
Unincorporated	835072	S Louis Ave	2822
Unincorporated	835072	Splendora Ave	689
Unincorporated	835072	Sunshine Ave	2214
Unincorporated	835072	Virginia Ave	236
Unincorporated	835073		197
Unincorporated	835073	Calusa Ave	445
Unincorporated	835073	Carmenita Rd	986
Unincorporated	835073	Duffield Ave	142
Unincorporated	835073	E Busby Dr	913
Unincorporated	835073	Fidel Ave	52
Unincorporated	835073	Hastings Dr	19
Unincorporated	835073	Inez St	13
Unincorporated	835073	Kayreid Dr	1024
Unincorporated	835073	Leffingwell Rd	4362
Unincorporated	835073	Leland Ave	756
Unincorporated	835073	Loma Dr	1316
Unincorporated	835073	Louis Ave	10
Unincorporated	835073	Meyer Rd	2786
Unincorporated	835073	Placid Dr	2861
Unincorporated	835073	Ramsey Dr	638
Unincorporated	835073	S Alclad Ave	243
Unincorporated	835073	S Louis Ave	10
Unincorporated	835073	S Newgate Ave	293
Unincorporated	835073	S Telechron Ave	429
Unincorporated	835073	Saranac Dr	1999
Unincorporated	835073	Woodridge Ave	763
Unincorporated	835074		910
Unincorporated	835074	Allegan St	1016
Unincorporated	835074	Armsdale Ave	5
Unincorporated	835074	Burgess Ave	126
Unincorporated	835074	Chadsey Dr	1743
Unincorporated	835074	Close St	547
Unincorporated	835074	Colima Rd	3131
Unincorporated	835074	Corley Dr	1798
Unincorporated	835074	Cornishcrest Rd	1484
Unincorporated	835074	Coteau Dr	2052
Unincorporated	835074	Double Eagle Dr	43
Unincorporated	835074	Eagan Dr	44
Unincorporated	835074	Kane Ave	566
Unincorporated	835074	Leffingwell Rd	9431
Unincorporated	835074	Loma Dr	750
Unincorporated	835074	Miller Rd	25
Unincorporated	835074	Natalie Dr	1357
Unincorporated	835074	Obert Ave	364
Unincorporated	835074	Poulter Dr	694
Unincorporated	835074	Reis St	669
Unincorporated	835074	Syracuse Dr	1040
Unincorporated	835074	Syracuse St	1040
Unincorporated	835074	Telegraph Rd	4306
Unincorporated	835074	Theis Ave	509
Unincorporated	835074	Trumball St	14
Unincorporated	835074	Valley View Ave	3471
Unincorporated	835075		1132
Unincorporated	835075	Alclad Ave	39
Unincorporated	835075	Beaty Ave	400
Unincorporated	835075	Carmenita Rd	3770
Unincorporated	835075	E Haley Ave	793
Unincorporated	835075	Fendale St	268
Unincorporated	835075	Hastings Dr	818
Unincorporated	835075	Hermes St	334
Unincorporated	835075	Inez St	3656

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835075	Lakeland Rd	1620
Unincorporated	835075	Leffingwell Rd	3155
Unincorporated	835075	Leland Ave	4914
Unincorporated	835075	Lukay St	1376
Unincorporated	835075	Meyer Rd	6798
Unincorporated	835075	Mina Ave	2044
Unincorporated	835075	Mitony Ave	1618
Unincorporated	835075	Sunshine Ave	1174
Unincorporated	835075	Utica St	657
Unincorporated	835075	Virginia Ave	1341
Unincorporated	835076		537
Unincorporated	835076	Abisko Dr	420
Unincorporated	835076	Alclad Ave	1462
Unincorporated	835076	Bentongrove Dr	650
Unincorporated	835076	Biella Way	641
Unincorporated	835076	Breckenridge Dr	1358
Unincorporated	835076	Ceres Ave	474
Unincorporated	835076	Cornishcrest Rd	2
Unincorporated	835076	Honeysuckle Ln	1597
Unincorporated	835076	la Vina Ln	64
Unincorporated	835076	Lakeland Rd	530
Unincorporated	835076	Lausanne Ct	179
Unincorporated	835076	Leffingwell Rd	67
Unincorporated	835076	Marquardt Ave	226
Unincorporated	835076	Newgate Ave	1397
Unincorporated	835076	Ramsey Dr	308
Unincorporated	835076	Rancho Ln	16
Unincorporated	835076	S Bramblebush Ave	203
Unincorporated	835076	S Homage Ave	358
Unincorporated	835076	Starlight Ave	1847
Unincorporated	835076	Sundance Ave	630
Unincorporated	835076	Sunnybrook Ln	1947
Unincorporated	835076	Syracuse Dr	272
Unincorporated	835076	Syracuse St	272
Unincorporated	835076	Telechron Ave	1373
Unincorporated	835076	Telegraph Rd	8056
Unincorporated	835076	Trumball St	784
Unincorporated	835076	Valley View Ave	536
Unincorporated	835076	Viburnum Dr	1052
Unincorporated	835076	Victoria Ave	1453
Unincorporated	835077		71
Unincorporated	835077	Alclad Ave	2104
Unincorporated	835077	Crewe St	1215
Unincorporated	835077	Faraday Ave	282
Unincorporated	835077	Fendale St	511
Unincorporated	835077	Hastings Dr	539
Unincorporated	835077	Hermes St	442
Unincorporated	835077	Leffingwell Rd	61
Unincorporated	835077	Lukay St	811
Unincorporated	835077	Marquardt Ave	1495
Unincorporated	835077	Newgate Ave	2238
Unincorporated	835077	Ramsey Dr	1702
Unincorporated	835077	Telechron Ave	2749
Unincorporated	835077	Utica St	1394
Unincorporated	835078		1419
Unincorporated	835078	Adel Way	496
Unincorporated	835078	Adger Dr	662
Unincorporated	835078	Allegan St	1259
Unincorporated	835078	Anola St	2388
Unincorporated	835078	Archway Dr	1453
Unincorporated	835078	Arroyo Dr	1841
Unincorporated	835078	Belcourt Dr	368
Unincorporated	835078	Bentongrove Dr	32
Unincorporated	835078	Bonavista Ln	1989
Unincorporated	835078	Bramblebush Ave	224

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835078	Broadway	3099
Unincorporated	835078	Canelo Rd	1390
Unincorporated	835078	Cantrell Ave	631
Unincorporated	835078	Cerecita Dr	1553
Unincorporated	835078	Ceres Ave	3200
Unincorporated	835078	Chadsey Dr	1529
Unincorporated	835078	Close St	1163
Unincorporated	835078	Colima Rd	7145
Unincorporated	835078	Corley Dr	1819
Unincorporated	835078	Cornishcrest Rd	1889
Unincorporated	835078	Danbrook Dr	1765
Unincorporated	835078	Devillo Dr	2039
Unincorporated	835078	Dicky St	484
Unincorporated	835078	Dunton Dr	1639
Unincorporated	835078	Eagan Dr	1271
Unincorporated	835078	Elmore Ave	180
Unincorporated	835078	Fernview St	1529
Unincorporated	835078	Gerber Ave	389
Unincorporated	835078	Glengyle St	684
Unincorporated	835078	Glenn Dr	961
Unincorporated	835078	Goodhue St	2661
Unincorporated	835078	Hawes St	1602
Unincorporated	835078	Homage Ave	1738
Unincorporated	835078	Hornell St	1193
Unincorporated	835078	Kane Ave	1500
Unincorporated	835078	la Mirada Blvd	5967
Unincorporated	835078	Lanning Dr	239
Unincorporated	835078	Lashburn St	1329
Unincorporated	835078	Light St	38
Unincorporated	835078	Lindhall Way	276
Unincorporated	835078	McGee Dr	557
Unincorporated	835078	Meta Dr	340
Unincorporated	835078	Midcrest Dr	353
Unincorporated	835078	Mohall Ln	607
Unincorporated	835078	Mulberry Dr	9207
Unincorporated	835078	Mystic St	1337
Unincorporated	835078	Nanry St	829
Unincorporated	835078	Nashville Ave	342
Unincorporated	835078	Parise Dr	2924
Unincorporated	835078	Pso Villa Capri	32
Unincorporated	835078	Reis St	1787
Unincorporated	835078	Rimgate Dr	1221
Unincorporated	835078	Ruoff Ave	1097
Unincorporated	835078	Salida Ave	359
Unincorporated	835078	Stamy Rd	30
Unincorporated	835078	Sunnybrook Ln	842
Unincorporated	835078	Terryknoll Dr	1099
Unincorporated	835078	Theis Ave	1006
Unincorporated	835078	Trumball St	1882
Unincorporated	835078	Valley View Ave	3275
Unincorporated	835078	Valleyview Ave	46
Unincorporated	835078	Victoria Ave	2252
Unincorporated	835078	Wedgeport Ave	390
Unincorporated	835079		187
Unincorporated	835079	Bluefield Ave	962
Unincorporated	835079	Cole Rd	1019
Unincorporated	835079	Danbrook Dr	41
Unincorporated	835079	Dunton Dr	943
Unincorporated	835079	Greenbush Ave	593
Unincorporated	835079	Hester Ave	996
Unincorporated	835079	Lindhall Way	632
Unincorporated	835079	S Cole Rd	31
Unincorporated	835079	Stamy Rd	320
Unincorporated	835079	Tolman Dr	374
Unincorporated	835080		1117

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835080	Anola St	7
Unincorporated	835080	Cole Rd	340
Unincorporated	835080	Fernview St	1659
Unincorporated	835080	Garydale Dr	947
Unincorporated	835080	Gladhill Rd	1382
Unincorporated	835080	Glenbrier Ave	208
Unincorporated	835080	Goodhue St	1705
Unincorporated	835080	Homeland Ave	775
Unincorporated	835080	Hornell St	609
Unincorporated	835080	Jenkins Dr	1666
Unincorporated	835080	Kentucky Ave	739
Unincorporated	835080	Kibbee Ave	825
Unincorporated	835080	la Cima Dr	1010
Unincorporated	835080	la Serna Dr	814
Unincorporated	835080	Lashburn St	168
Unincorporated	835080	Leffingwell Rd	2648
Unincorporated	835080	Lindhall Way	31
Unincorporated	835080	Midcrest Dr	1963
Unincorporated	835080	Milvern Dr	1224
Unincorporated	835080	Mollyknoll Ave	1445
Unincorporated	835080	Mulberry Dr	756
Unincorporated	835080	Mystic St	496
Unincorporated	835080	Norcrest Dr	592
Unincorporated	835080	Richvale Dr	309
Unincorporated	835080	Santa Gertrudes Ave	1000
Unincorporated	835080	Saranac Dr	23
Unincorporated	835080	Scott Ave	2061
Unincorporated	835080	Sharon Hill Dr	628
Unincorporated	835080	Stamy Rd	2303
Unincorporated	835080	Tidwell Ave	279
Unincorporated	835080	Tropico Ave	725
Unincorporated	835080	Wilmaglen Dr	763
Unincorporated	835080	Woodcrest Dr	19
Unincorporated	835081		3491
Unincorporated	835081	Colima Rd	1518
Unincorporated	835081	Corley Dr	43
Unincorporated	835081	Dalmatian Ave	1078
Unincorporated	835081	Danbrook Dr	1234
Unincorporated	835081	Dunton Dr	1427
Unincorporated	835081	Eagan Dr	66
Unincorporated	835081	la Mirada Blvd	2705
Unincorporated	835081	Lanning Dr	904
Unincorporated	835081	Memphis Ave	1194
Unincorporated	835081	Nashville Ave	1671
Unincorporated	835081	Valleyview Ave	70
Unincorporated	835082		25
Unincorporated	835082	Bonavista Ln	143
Unincorporated	835082	Broadway	14
Unincorporated	835082	Ceres Ave	444
Unincorporated	835082	Danbrook Dr	207
Unincorporated	835082	Hawes St	1126
Unincorporated	835082	Homage Ave	110
Unincorporated	835082	Lanning Dr	526
Unincorporated	835082	McGee Dr	78
Unincorporated	835082	Mulberry Dr	640
Unincorporated	835082	Rimgate Dr	17
Unincorporated	835082	Ruoff Ave	406
Unincorporated	835083	Canal Point Rd	53
Unincorporated	835083	Colima Rd	145
Unincorporated	835083	Hermitage Dr	67
Unincorporated	835084		2866
Unincorporated	835084	Alclad Ave	141
Unincorporated	835084	Allegan St	816
Unincorporated	835084	Anola St	343
Unincorporated	835084	Ben Hur Ave	266

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835084	Bentongrove Dr	1422
Unincorporated	835084	Calmada Ave	1400
Unincorporated	835084	Carmenita Rd	1503
Unincorporated	835084	Close St	1427
Unincorporated	835084	Cornishcrest Rd	1988
Unincorporated	835084	Dicky St	568
Unincorporated	835084	Florence Ave	2938
Unincorporated	835084	Gunn Ave	4309
Unincorporated	835084	Inez St	2253
Unincorporated	835084	Joyglen Dr	691
Unincorporated	835084	Lanett Ave	2731
Unincorporated	835084	Leland Ave	1188
Unincorporated	835084	Light St	677
Unincorporated	835084	Mills Ave	2614
Unincorporated	835084	Mina Ave	2245
Unincorporated	835084	Mina St	753
Unincorporated	835084	Mulberry Dr	1218
Unincorporated	835084	Mystic St	1099
Unincorporated	835084	Overest Ave	1417
Unincorporated	835084	Parkinson Ave	1116
Unincorporated	835084	Reis St	1937
Unincorporated	835084	Sundance Ave	1578
Unincorporated	835084	Telegraph Rd	4120
Unincorporated	835084	Trumball St	2000
Unincorporated	835085		1142
Unincorporated	835085	Adel Way	52
Unincorporated	835085	Allerton St	468
Unincorporated	835085	Anola St	1502
Unincorporated	835085	Ben Hur Ave	923
Unincorporated	835085	Broadway	1360
Unincorporated	835085	Cerecita Dr	251
Unincorporated	835085	Dicky St	860
Unincorporated	835085	Elmore Ave	362
Unincorporated	835085	Fernview St	468
Unincorporated	835085	Glengyle St	391
Unincorporated	835085	Hawes St	1247
Unincorporated	835085	Lanning Dr	694
Unincorporated	835085	Light St	1339
Unincorporated	835085	Mills Ave	2681
Unincorporated	835085	Mulberry Dr	3787
Unincorporated	835085	Mystic St	1384
Unincorporated	835085	Regatta Ave	879
Unincorporated	835085	Reis St	866
Unincorporated	835085	Ruoff Ave	681
Unincorporated	835085	Terryknoll Dr	901
Unincorporated	835085	Victoria Ave	1479
Unincorporated	835086		153
Unincorporated	835086	Ahmann Ave	2215
Unincorporated	835086	Allerton St	16
Unincorporated	835086	Armley Aly	1525
Unincorporated	835086	Armley Ave	3643
Unincorporated	835086	Ben Hur Ave	2501
Unincorporated	835086	Dunton Dr	29
Unincorporated	835086	Fernview St	18
Unincorporated	835086	Glenn Dr	293
Unincorporated	835086	Gunn Ave	2083
Unincorporated	835086	Hawes St	947
Unincorporated	835086	Lanning Dr	1492
Unincorporated	835086	Light St	868
Unincorporated	835086	McGee Dr	310
Unincorporated	835086	Mills Ave	2516
Unincorporated	835086	Mina Ave	754
Unincorporated	835086	Mulberry Dr	4574
Unincorporated	835086	Oval Dr	1610
Unincorporated	835086	Rufus Ave	2837

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835087		545
Unincorporated	835087	Barkerville Ave	1177
Unincorporated	835087	Calmada Ave	1887
Unincorporated	835087	Coachman Ave	1383
Unincorporated	835087	Dunton Dr	1101
Unincorporated	835087	Glenn Dr	1346
Unincorporated	835087	Hawes St	1399
Unincorporated	835087	Lanett Ave	753
Unincorporated	835087	Lanning Dr	1854
Unincorporated	835087	McGee Dr	987
Unincorporated	835087	Mina Ave	68
Unincorporated	835087	Mulberry Dr	3608
Unincorporated	835087	Oval Dr	1018
Unincorporated	835089		1141
Unincorporated	835089	Allegan St	157
Unincorporated	835089	Amsdell Ave	869
Unincorporated	835089	Ann St	6
Unincorporated	835089	Anola St	1920
Unincorporated	835089	Barton Rd	1105
Unincorporated	835089	Bluford Ave	669
Unincorporated	835089	Bright Ave	428
Unincorporated	835089	Caffel Way	560
Unincorporated	835089	Carmenita Rd	2992
Unincorporated	835089	Close St	2084
Unincorporated	835089	Cornishcrest Rd	1005
Unincorporated	835089	du Page Ave	228
Unincorporated	835089	Dupage Ave	1071
Unincorporated	835089	Firebird Ave	459
Unincorporated	835089	Greening Ave	40
Unincorporated	835089	Greenleaf Ave	1919
Unincorporated	835089	Guilford Ave	375
Unincorporated	835089	Hawkstone Ave	617
Unincorporated	835089	Jody Ave	110
Unincorporated	835089	Lanett Ave	1364
Unincorporated	835089	Laurel Ave	836
Unincorporated	835089	Los Nietos Rd	693
Unincorporated	835089	Painter Ave	802
Unincorporated	835089	Parkinson Ave	691
Unincorporated	835089	Racimo Dr	1431
Unincorporated	835089	Reis St	2256
Unincorporated	835089	Rutland Ave	855
Unincorporated	835089	Safari Dr	1171
Unincorporated	835089	Scribner Ave	712
Unincorporated	835089	Trumball St	1271
Unincorporated	835089	Walburg St	269
Unincorporated	835089	Walthall Ave	644
Unincorporated	835090		1412
Unincorporated	835090	Acapulco Dr	1493
Unincorporated	835090	Allerton St	759
Unincorporated	835090	Anola St	8
Unincorporated	835090	Barkerville Ave	1415
Unincorporated	835090	Calmada Ave	608
Unincorporated	835090	Coachman Ave	907
Unincorporated	835090	Dicky St	802
Unincorporated	835090	Firebird Ave	2950
Unincorporated	835090	Greening Ave	1000
Unincorporated	835090	Lanning Dr	1145
Unincorporated	835090	Laurel Ave	1189
Unincorporated	835090	Maryknoll Ave	2799
Unincorporated	835090	Mulberry Dr	1966
Unincorporated	835090	Reis St	707
Unincorporated	835090	Tarryton Ave	2669
Unincorporated	835092		2574
Unincorporated	835092	Amsdell Ave	2152
Unincorporated	835092	Anola St	104

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835092	Badminton Ave	2263
Unincorporated	835092	Carmenita Rd	1051
Unincorporated	835092	Dicky St	270
Unincorporated	835092	Firebird Ave	9
Unincorporated	835092	Greening Ave	1419
Unincorporated	835092	Guilford Ave	1377
Unincorporated	835092	Lanning Dr	278
Unincorporated	835092	McGee Dr	134
Unincorporated	835092	Mulberry Dr	4539
Unincorporated	835092	Mystic St	1340
Unincorporated	835092	Painter Ave	5040
Unincorporated	835092	Rutland Ave	954
Unincorporated	835092	Safari Dr	114
Unincorporated	835092	Walburg St	27
Unincorporated	835093		4422
Unincorporated	835093	Aeolian St	1259
Unincorporated	835093	Broadway	895
Unincorporated	835093	Burke St	1407
Unincorporated	835093	Chatfield Ave	437
Unincorporated	835093	Disney Ave	665
Unincorporated	835093	Greyford St	21
Unincorporated	835093	Halray Ave	900
Unincorporated	835093	Kengard Ave	1073
Unincorporated	835093	Lambert Rd	133
Unincorporated	835093	Lins Ave	118
Unincorporated	835093	Lochinvar St	666
Unincorporated	835093	Lynalan Ave	1442
Unincorporated	835093	Mines Blvd	933
Unincorporated	835093	Nan St	528
Unincorporated	835093	Norwalk Blvd	3860
Unincorporated	835093	Orange St	275
Unincorporated	835093	Pacific Electric Railway	49
Unincorporated	835093	Perkins Ave	839
Unincorporated	835093	Ridgeview Ln	100
Unincorporated	835093	Rivera Rd	671
Unincorporated	835093	Skabo Ave	770
Unincorporated	835093	Slauson Ave	1106
Unincorporated	835093	Sorensen Ave	1088
Unincorporated	835093	Thornlake Ave	218
Unincorporated	835093	Verbeck St	390
Unincorporated	835093	Waddell St	792
Unincorporated	835093	Wakeman St	1227
Unincorporated	835093	Walnut St	701
Unincorporated	835093	Westman Ave	1309
Unincorporated	835094		15668
Unincorporated	835094	Aldrich St	2222
Unincorporated	835094	Allerton St	1571
Unincorporated	835094	Balfour St	2005
Unincorporated	835094	Bexley Dr	1503
Unincorporated	835094	Blanding St	218
Unincorporated	835094	Boer Ave	2143
Unincorporated	835094	Bradhurst St	1753
Unincorporated	835094	Broadway	5023
Unincorporated	835094	Cedarcliff Ave	1852
Unincorporated	835094	Choisser St	1289
Unincorporated	835094	Clive Ave	883
Unincorporated	835094	Coolhurst Dr	2361
Unincorporated	835094	Cully Ave	2213
Unincorporated	835094	Dicky St	3553
Unincorporated	835094	Duchess Dr	4657
Unincorporated	835094	Eddystone St	311
Unincorporated	835094	Flory St	1264
Unincorporated	835094	Gerda Ct	186
Unincorporated	835094	Glengarry Ave	4130
Unincorporated	835094	Gretna Ave	5284

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835094	Greyford St	344
Unincorporated	835094	Halray Ave	1035
Unincorporated	835094	Havenwood Dr	1999
Unincorporated	835094	Keith Dr	1651
Unincorporated	835094	Kengard Ave	1021
Unincorporated	835094	Loch Lomand Dr	350
Unincorporated	835094	Loch Lomond Dr	1519
Unincorporated	835094	Lynalan Ave	2163
Unincorporated	835094	Mines Blvd	4212
Unincorporated	835094	Norwalk Blvd	2844
Unincorporated	835094	Pacific Electric Railway	23
Unincorporated	835094	Reichling Ln	1576
Unincorporated	835094	Ridgeview Ln	56
Unincorporated	835094	Rincon Dr	800
Unincorporated	835094	Rose Hedge Dr	3212
Unincorporated	835094	Saragosa St	2419
Unincorporated	835094	See Dr	22
Unincorporated	835094	Shubin Ln	59
Unincorporated	835094	Sorensen Ave	756
Unincorporated	835094	Thornlake Ave	1479
Unincorporated	835094	Townley Dr	161
Unincorporated	835094	Vanport Ave	4410
Unincorporated	835094	Vicki Dr	2049
Unincorporated	835094	Washington Blvd	653
Unincorporated	835094	Western Ave	565
Unincorporated	835094	Westman Ave	1596
Unincorporated	835094	Winchell St	1933
Unincorporated	835095		2191
Unincorporated	835095	Appledale Ave	1439
Unincorporated	835095	Balfour St	481
Unincorporated	835095	Barnum Dr	129
Unincorporated	835095	Bexley Dr	603
Unincorporated	835095	Blackford Ave	665
Unincorporated	835095	Blanding	267
Unincorporated	835095	Blanding St	1079
Unincorporated	835095	Bluecrest Ln	20
Unincorporated	835095	Calobar Ave	1460
Unincorporated	835095	Crowndale Ave	1096
Unincorporated	835095	Eddystone St	866
Unincorporated	835095	Grady Ave	630
Unincorporated	835095	Greyford St	1895
Unincorporated	835095	Havenwood Dr	2
Unincorporated	835095	Lambert Rd	1014
Unincorporated	835095	Loch Lomand Dr	0
Unincorporated	835095	Ramey Rd	293
Unincorporated	835095	Reichling Ln	1052
Unincorporated	835095	Rivera Rd	3
Unincorporated	835095	Rose Hedge Dr	1785
Unincorporated	835095	S Balfour St	265
Unincorporated	835095	Sorensen Ave	2400
Unincorporated	835095	Townley Dr	619
Unincorporated	835095	Washington Blvd	1538
Unincorporated	835095	Wellsford Ave	2055
Unincorporated	835095	Wexford Ave	1254
Unincorporated	835101	Skyline Dr	27
Unincorporated	835101	Turnbull Canyon Rd	32
Unincorporated	835109	167th St	146
Unincorporated	835109	Alora Ave	638
Unincorporated	835109	Eric Ave	640
Unincorporated	835109	Graystone Ave	639
Unincorporated	835109	Harvest Ave	335
Unincorporated	835109	Mapes Ave	592
Unincorporated	835132		1386
Unincorporated	835132	Ben Avon St	431
Unincorporated	835132	Bradwell Ave	1386

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835132	Cascade Cir	31
Unincorporated	835132	Danby Ave	154
Unincorporated	835132	Donnybrook Cir	259
Unincorporated	835132	Flamingo Cir	373
Unincorporated	835132	Lindenvale Rd	939
Unincorporated	835132	Lochinvar St	131
Unincorporated	835132	Oberon St	345
Unincorporated	835132	Pioneer Blvd	5272
Unincorporated	835132	Poinciana St	352
Unincorporated	835132	Sal Ave	202
Unincorporated	835132	Shadyside Ave	2895
Unincorporated	835132	Slauson Ave	2715
Unincorporated	835132	Summerfield Ave	2666
Unincorporated	835132	Vanessa Cir	101
Unincorporated	835132	Waddell St	623
Unincorporated	835132	Wheelock Cir	203
Unincorporated	835132	Woodhue St	912
Unincorporated	835133		2072
Unincorporated	835133	Abbotsford Rd	689
Unincorporated	835133	Aeolian St	2483
Unincorporated	835133	Alburtis Ave	1811
Unincorporated	835133	Ben Avon St	1190
Unincorporated	835133	Boer Ave	1263
Unincorporated	835133	Danby Ave	1071
Unincorporated	835133	Decosta Ave	1488
Unincorporated	835133	Duchess Dr	1003
Unincorporated	835133	Flallon Ave	1890
Unincorporated	835133	Godoy St	644
Unincorporated	835133	Millergrove Dr	3340
Unincorporated	835133	Milna Ave	892
Unincorporated	835133	Morrill Ave	1772
Unincorporated	835133	Orange St	355
Unincorporated	835133	Rexall Ave	337
Unincorporated	835133	Rivera Rd	2208
Unincorporated	835133	Sanger Ave	1206
Unincorporated	835133	Short St	226
Unincorporated	835133	Slauson Ave	6201
Unincorporated	835133	Vanport Ave	1860
Unincorporated	835133	Vicki Dr	2939
Unincorporated	835133	Waddell St	1011
Unincorporated	835133	Walnut St	1599
Unincorporated	835133	Washington Blvd	656
Unincorporated	835133	Wheelock St	695
Unincorporated	835137		3799
Unincorporated	835137	Allerton St	412
Unincorporated	835137	Balfour St	35
Unincorporated	835137	Bartley Ave	124
Unincorporated	835137	Bradwell Ave	1203
Unincorporated	835137	Choisser St	618
Unincorporated	835137	Coolhurst Dr	451
Unincorporated	835137	Danby Ave	1657
Unincorporated	835137	Dunlap Crossing Rd	75
Unincorporated	835137	Greyford St	333
Unincorporated	835137	Millergrove Dr	18
Unincorporated	835137	Milna Ave	1016
Unincorporated	835137	Morrill Ave	437
Unincorporated	835137	Norwalk Blvd	1290
Unincorporated	835137	Pioneer Blvd	1525
Unincorporated	835137	Rockne Ave	821
Unincorporated	835137	Saragosa St	362
Unincorporated	835137	Vicki Dr	37
Unincorporated	835137	Washington Blvd	1859
Unincorporated	835138		8228
Unincorporated	835138	Aldrich St	578
Unincorporated	835138	Bexley Dr	2344

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835138	Boer Ave	857
Unincorporated	835138	Broadway	1115
Unincorporated	835138	Dorland Pl	216
Unincorporated	835138	Duchess Dr	1574
Unincorporated	835138	Dunlap Crossing Rd	512
Unincorporated	835138	Glencannon Dr	936
Unincorporated	835138	Glengarry Ave	1793
Unincorporated	835138	Gretna Ave	169
Unincorporated	835138	Hadley St	3331
Unincorporated	835138	Havenwood Pl	80
Unincorporated	835138	Holbrook St	1392
Unincorporated	835138	Keith Dr	1836
Unincorporated	835138	Loch Avon Dr	3427
Unincorporated	835138	Loch Lomond Dr	6
Unincorporated	835138	Loch Lomond Pl	114
Unincorporated	835138	McNees Ave	1047
Unincorporated	835138	Mines Blvd	212
Unincorporated	835138	Morrill Ave	1543
Unincorporated	835138	Norwalk Blvd	2122
Unincorporated	835138	Pleasant Way	1265
Unincorporated	835138	Prather Ave	375
Unincorporated	835138	Redman Ave	1110
Unincorporated	835138	Reichling Ln	1863
Unincorporated	835138	Rincon Dr	2930
Unincorporated	835138	Rockne Ave	1811
Unincorporated	835138	Rose Hedge Dr	638
Unincorporated	835138	See Dr	2609
Unincorporated	835138	Townley Dr	1656
Unincorporated	835138	Vanport Ave	168
Unincorporated	835138	Western Ave	266
Unincorporated	835140		1941
Unincorporated	835140	Aldrich St	511
Unincorporated	835140	Bexley Dr	432
Unincorporated	835140	Bradhurst St	505
Unincorporated	835140	Danby Ave	1803
Unincorporated	835140	Dunlap Crossing Rd	571
Unincorporated	835140	Holbrook St	413
Unincorporated	835140	Loch Avon Dr	553
Unincorporated	835140	Loch Lomond Dr	601
Unincorporated	835140	Milna Ave	375
Unincorporated	835140	Pioneer Blvd	2527
Unincorporated	835140	Reichling Ln	442
Unincorporated	835140	Rose Hedge Dr	748
Unincorporated	835140	Townley Dr	701
Unincorporated	835142	Bernardino Ave	13
Unincorporated	835142	Dorland St	129
Unincorporated	835142	Eduardo Ave	76
Unincorporated	835142	Esperanza Ave	819
Unincorporated	835142	Floral Dr	197
Unincorporated	835142	Holbrook St	33
Unincorporated	835142	Juarez Ave	815
Unincorporated	835142	Lockheed Ave	1218
Unincorporated	835142	Milna Ave	232
Unincorporated	835142	Nobles Ave	345
Unincorporated	835142	Obregon St	371
Unincorporated	835142	Orange Dr	254
Unincorporated	835142	Orchard Ave	242
Unincorporated	835142	Pioneer Blvd	724
Unincorporated	835146		229
Unincorporated	835146	Adele Ave	420
Unincorporated	835146	Ben Alder Ave	209
Unincorporated	835146	Bernardino Ave	384
Unincorporated	835146	Danby Ave	196
Unincorporated	835146	Floral Dr	982
Unincorporated	835146	Lundene Dr	1639

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835146	Marbrink Ct	225
Unincorporated	835146	Obregon St	253
Unincorporated	835146	Orange Dr	537
Unincorporated	835146	Pioneer Blvd	1709
Unincorporated	835146	Strong Ave	1492
Unincorporated	835147		218
Unincorporated	835147	Abbeywood Ave	1985
Unincorporated	835147	Avoncroft St	1109
Unincorporated	835147	Balmoral St	1102
Unincorporated	835147	Croton Ave	1820
Unincorporated	835147	Domo St	237
Unincorporated	835147	Elford Dr	835
Unincorporated	835147	Giles Pl	141
Unincorporated	835147	Lampson St	1151
Unincorporated	835147	Mears Pl	145
Unincorporated	835147	Noyes St	931
Unincorporated	835147	Pioneer Blvd	715
Unincorporated	835147	Rideau St	1127
Unincorporated	835147	Springland Dr	535
Unincorporated	835147	Yoder Ave	257
Unincorporated	835148		2410
Unincorporated	835148	Pioneer Blvd	482
Unincorporated	835148	Ridgegate Dr	61
Unincorporated	835148	Spy Glass Hill Rd	31
Unincorporated	835148	Strong Ave	63
Unincorporated	835148	Sycamore Canyon Rd	36
Unincorporated	835148	Workman Mill Rd	1759
Unincorporated	835150		5465
Unincorporated	835150	Canyon Meadows Dr	515
Unincorporated	835150	Cliota St	1566
Unincorporated	835150	E Mission Mill Rd	2678
Unincorporated	835150	Eadhill Pl	49
Unincorporated	835150	Kimbark Ave	1013
Unincorporated	835150	Lucayan Dr	151
Unincorporated	835150	Mountain Shadows Dr	5
Unincorporated	835150	Overcrest Dr	992
Unincorporated	835150	Rancho Verde Dr	26
Unincorporated	835150	Ridgegate Dr	149
Unincorporated	835150	Rimview Dr	283
Unincorporated	835150	Rose Hills Rd	977
Unincorporated	835150	Spy Glass Hill Rd	449
Unincorporated	835150	Starca Ave	574
Unincorporated	835150	Woodmar Dr	128
Unincorporated	835150	Workman Mill Rd	4503
Unincorporated	835151		2661
Unincorporated	835151	Peck Rd	885
Unincorporated	835151	Workman Mill Rd	5267
Unincorporated	835154		1466
Unincorporated	835154	Coast Dr	325
Unincorporated	835154	Kathleen St	447
Unincorporated	835154	Kella Ave	162
Unincorporated	835154	Pacific Park Dr	924
Unincorporated	835154	Peck Rd	1018
Unincorporated	835154	Rooks Rd	755
Unincorporated	835155		73
Unincorporated	835155	Bryce Rd	666
Unincorporated	835155	Bunker Ave	644
Unincorporated	835155	Burkett Rd	1603
Unincorporated	835155	Fruitvale Ave	1321
Unincorporated	835155	Herb St	1052
Unincorporated	835155	Rush St	1295
Unincorporated	835155	Thienes Ave	327
Unincorporated	835156		1873
Unincorporated	835156	Cam del Oro	345
Unincorporated	835156	Cam del Rey	202

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835156	Cam del Rio	176
Unincorporated	835156	Cambray Dr	973
Unincorporated	835156	Crossroads Pkwy N	424
Unincorporated	835156	Dela St	196
Unincorporated	835156	Enna St	117
Unincorporated	835156	Equestrian Ln	336
Unincorporated	835156	Famosa St	256
Unincorporated	835156	Gala St	194
Unincorporated	835156	Holford St	200
Unincorporated	835156	Kathleen St	267
Unincorporated	835156	Kaydel Rd	1506
Unincorporated	835156	Kella Ave	1044
Unincorporated	835156	Mardel Ave	860
Unincorporated	835156	Parkway Dr	1941
Unincorporated	835156	Pearson Ave	1169
Unincorporated	835156	Peck Rd	569
Unincorporated	835156	Pellissier Pl	42
Unincorporated	835156	Pellissier Rd	1265
Unincorporated	835156	Pso Verde	458
Unincorporated	835156	Rush St	742
Unincorporated	835156	S Via Bandera	76
Unincorporated	835156	Thienes Ave	347
Unincorporated	835156	Thoroughbred Way	701
Unincorporated	835156	Via del Sol Ave	189
Unincorporated	835156	Via Sur Ave	18
Unincorporated	835156	Whittier Woods Cir	755
Unincorporated	835156	Whittier Woods Dr	544
Unincorporated	835156	Workman Mill Rd	2423
Unincorporated	835157		745
Unincorporated	835157	4th Ave	815
Unincorporated	835157	Ankerton St	2937
Unincorporated	835157	Arciero Dr	1297
Unincorporated	835157	Bark Dr	202
Unincorporated	835157	Belgreen Dr	195
Unincorporated	835157	Bonwick Dr	294
Unincorporated	835157	Bunbury Dr	3759
Unincorporated	835157	Channelwood Dr	706
Unincorporated	835157	Coleford Ave	576
Unincorporated	835157	Cow Creek Ct	294
Unincorporated	835157	Creedmore Dr	254
Unincorporated	835157	Delamare Dr	804
Unincorporated	835157	Dovey Ave	1315
Unincorporated	835157	Duryea Ave	154
Unincorporated	835157	Eaglemont Dr	357
Unincorporated	835157	el Capitan Ct	245
Unincorporated	835157	Elsah Ave	854
Unincorporated	835157	Fairplain Ave	820
Unincorporated	835157	Fontenoy Ave	1021
Unincorporated	835157	Garin Ave	356
Unincorporated	835157	Gemwood Dr	1540
Unincorporated	835157	Goodhart Ave	460
Unincorporated	835157	Grossmont Dr	2644
Unincorporated	835157	Guinea Dr	2529
Unincorporated	835157	Hansford Ave	718
Unincorporated	835157	Honan Ave	155
Unincorporated	835157	Lacewood Dr	1457
Unincorporated	835157	Larkport Ave	64
Unincorporated	835157	Laurie Ln	117
Unincorporated	835157	Lonestar St	269
Unincorporated	835157	Loumont St	3864
Unincorporated	835157	Newmarket St	437
Unincorporated	835157	Oakman Dr	1625
Unincorporated	835157	Pamela Kay Ln	606
Unincorporated	835157	Porto Rico Dr	609
Unincorporated	835157	Redlen Ave	1427

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835157	Rolling Greens Way	592
Unincorporated	835157	Rosella St	633
Unincorporated	835157	S Belgreen Dr	1374
Unincorporated	835157	S Coleford Ave	1023
Unincorporated	835157	S Siesta Ave	182
Unincorporated	835157	Sand Spoiling Ave	431
Unincorporated	835157	Trailside Dr	975
Unincorporated	835157	Valaressa Ln	383
Unincorporated	835157	Workman Mill Rd	10437
Unincorporated	835157	Yvette Dr	415
Unincorporated	835158		759
Unincorporated	835158	4th Ave	1864
Unincorporated	835158	5th Ave	4654
Unincorporated	835158	6th Ave	503
Unincorporated	835158	Beech Hill Ave	688
Unincorporated	835158	Clark Ave	900
Unincorporated	835158	Coralridge Pl	534
Unincorporated	835158	Don Julian Rd	1289
Unincorporated	835158	Folkstone Ave	4
Unincorporated	835158	Lomitas Ave	2706
Unincorporated	835158	Proctor Ave	1721
Unincorporated	835158	Redburn Ave	664
Unincorporated	835158	Rosella St	46
Unincorporated	835158	S 6th Ave	4
Unincorporated	835158	S Siesta Ave	626
Unincorporated	835158	Trailside Dr	86
Unincorporated	835158	Wildwood Way	47
Unincorporated	835159		2703
Unincorporated	835159	7th Ave	1319
Unincorporated	835159	Amar Rd	2864
Unincorporated	835159	Broadmoor Ave	2261
Unincorporated	835159	Cabana Ave	1535
Unincorporated	835159	Clintwood Ave	1776
Unincorporated	835159	Conlon Ave	1270
Unincorporated	835159	Dancer St	594
Unincorporated	835159	E Blackwood St	2260
Unincorporated	835159	E Giordano St	782
Unincorporated	835159	E Temple Ave	200
Unincorporated	835159	Ector St	1033
Unincorporated	835159	Evanwood Ave	4108
Unincorporated	835159	Fairgrove Ave	155
Unincorporated	835159	Flanner St	1589
Unincorporated	835159	Flynn St	1073
Unincorporated	835159	Glenshaw Dr	1512
Unincorporated	835159	Greenberry Dr	1749
Unincorporated	835159	Homeward St	1073
Unincorporated	835159	Hutchcroft St	1031
Unincorporated	835159	Janetdale St	18
Unincorporated	835159	Lassalette St	1031
Unincorporated	835159	League Ave	1274
Unincorporated	835159	Marengo Ct	1
Unincorporated	835159	N California Ave	2337
Unincorporated	835159	N Sunset Ave	3609
Unincorporated	835159	Proctor Ave	1243
Unincorporated	835159	Radway Ave	2246
Unincorporated	835159	Ragus Ave	1255
Unincorporated	835159	Ragus St	204
Unincorporated	835159	Rath St	2066
Unincorporated	835159	S Broadmoor Ave	5
Unincorporated	835159	S Cabana Ave	1
Unincorporated	835159	S Radway Ave	4
Unincorporated	835159	S Shadydale Ave	2
Unincorporated	835159	S Tonopah Ave	1
Unincorporated	835159	Sauder St	444
Unincorporated	835159	Shadydale Ave	2270

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835159	Shaver St	460
Unincorporated	835159	Tonopah Ave	1781
Unincorporated	835159	W Fairgrove Ave	1726
Unincorporated	835160		937
Unincorporated	835160	7th Ave	1380
Unincorporated	835160	Ameluxen Ave	3603
Unincorporated	835160	Ansford St	707
Unincorporated	835160	Autumn Moon Dr	488
Unincorporated	835160	Beech Hill Ave	2402
Unincorporated	835160	Binney St	760
Unincorporated	835160	Cabinda Dr	1014
Unincorporated	835160	Clark Ave	909
Unincorporated	835160	Coble Ave	24
Unincorporated	835160	Crystal Lantern Dr	497
Unincorporated	835160	Denley St	552
Unincorporated	835160	E Gale Ave	496
Unincorporated	835160	Eadbrook Dr	814
Unincorporated	835160	Fairbury St	857
Unincorporated	835160	Finegrove Ave	700
Unincorporated	835160	Folger St	166
Unincorporated	835160	Folkstone Ave	3268
Unincorporated	835160	Frankton Ave	822
Unincorporated	835160	Gale Ave	1105
Unincorporated	835160	Gembrook Ave	503
Unincorporated	835160	Hedgepath Ave	346
Unincorporated	835160	Janette St	282
Unincorporated	835160	Langhill Dr	1026
Unincorporated	835160	Latchford Ave	421
Unincorporated	835160	Los Robles Ave	1097
Unincorporated	835160	Marwood St	1169
Unincorporated	835160	Novak St	966
Unincorporated	835160	Old Canyon Dr	1597
Unincorporated	835160	Orange Grove Ave	1345
Unincorporated	835160	Palm Ave	3391
Unincorporated	835160	Pomona Fwy Rmp	3
Unincorporated	835160	Riderwood Ave	1042
Unincorporated	835160	Ridley Ave	654
Unincorporated	835160	Running Springs Rd	585
Unincorporated	835160	S 6th Ave	77
Unincorporated	835160	S 7th Ave	2126
Unincorporated	835160	Shadybend Dr	550
Unincorporated	835160	Silver Maple Dr	34
Unincorporated	835160	Spring Water St	513
Unincorporated	835160	Walbrook Dr	774
Unincorporated	835160	Wedgeworth Dr	205
Unincorporated	835161		25
Unincorporated	835161	8th Ave	1356
Unincorporated	835161	9th Ave	1325
Unincorporated	835161	E Giordano St	73
Unincorporated	835161	Fairgrove Ave	7
Unincorporated	835161	Flynn St	4
Unincorporated	835161	Goodson Dr	2
Unincorporated	835161	N Unruh Ave	1606
Unincorporated	835161	Proctor Ave	1549
Unincorporated	835161	Turnbull Canyon Rd	527
Unincorporated	835162		1039
Unincorporated	835162	Aldgate Ave	2705
Unincorporated	835162	Amar Rd	3091
Unincorporated	835162	Barrydale St	416
Unincorporated	835162	California Ave	1538
Unincorporated	835162	Dancer St	589
Unincorporated	835162	Delvale St	279
Unincorporated	835162	Duff Ave	2908
Unincorporated	835162	E Blackwood St	863
Unincorporated	835162	E Giordano St	1833

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835162	E Hayland St	860
Unincorporated	835162	E Temple Ave	236
Unincorporated	835162	Egan Ave	685
Unincorporated	835162	Evanwood Ave	1630
Unincorporated	835162	Fairgrove Ave	2567
Unincorporated	835162	Flanner St	200
Unincorporated	835162	Flynn St	198
Unincorporated	835162	Foxworth Ave	2969
Unincorporated	835162	Glenshaw Dr	1617
Unincorporated	835162	Greenberry Dr	2500
Unincorporated	835162	Homeward St	207
Unincorporated	835162	Janetdale St	654
Unincorporated	835162	Joycedale St	678
Unincorporated	835162	Maplegrove St	28
Unincorporated	835162	Melham Ave	1986
Unincorporated	835162	N California Ave	1777
Unincorporated	835162	N Dade Ave	1053
Unincorporated	835162	Ragus Ave	1279
Unincorporated	835162	Sandy Hook Ave	4803
Unincorporated	835162	Sauder St	211
Unincorporated	835162	St Malo Ave	654
Unincorporated	835162	Temple Ave	275
Unincorporated	835162	W Fairgrove Ave	121
Unincorporated	835162	W Francisquito Ave	29
Unincorporated	835163		1710
Unincorporated	835163	Aileron Ave	3702
Unincorporated	835163	Alwood St	3895
Unincorporated	835163	Amar Rd	1876
Unincorporated	835163	Ballista Ave	895
Unincorporated	835163	Bannon Ave	1302
Unincorporated	835163	Blackwood St	1149
Unincorporated	835163	Briarbank St	818
Unincorporated	835163	Cobre Ct	219
Unincorporated	835163	del Valle Ave	942
Unincorporated	835163	Doublegrove St	2015
Unincorporated	835163	Dubesor St	2525
Unincorporated	835163	E Cadwell St	1870
Unincorporated	835163	Fairgrove Ave	2274
Unincorporated	835163	Fellowship St	3955
Unincorporated	835163	Fickewirth Ave	14
Unincorporated	835163	Francisquito Ave	2226
Unincorporated	835163	Greycliff Ave	1825
Unincorporated	835163	Griffith Ave	1907
Unincorporated	835163	Harvestmoon St	2167
Unincorporated	835163	Hayland St	1358
Unincorporated	835163	Larimore Ave	1299
Unincorporated	835163	Maplegrove St	4244
Unincorporated	835163	Meadowside St	1599
Unincorporated	835163	Mullender Ave	1684
Unincorporated	835163	N Hacienda Blvd	2559
Unincorporated	835163	N Stimson Ave	2460
Unincorporated	835163	S Glendora Ave	661
Unincorporated	835163	S Silver Birch Pl	1
Unincorporated	835163	W Francisquito Ave	24
Unincorporated	835164		2260
Unincorporated	835164	Amar Rd	6
Unincorporated	835164	Arvid St	1446
Unincorporated	835164	Brigita Ave	781
Unincorporated	835164	Dixford Ln	247
Unincorporated	835164	E Amar Rd	2432
Unincorporated	835164	E Blackwood St	102
Unincorporated	835164	E Burtree St	72
Unincorporated	835164	E Cadwell St	1822
Unincorporated	835164	Echelon Ave	971
Unincorporated	835164	Elsberry Ave	1610

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835164	Elster Ave	120
Unincorporated	835164	Fairgrove Ave	46
Unincorporated	835164	Frandale Ave	2033
Unincorporated	835164	Garda Ave	116
Unincorporated	835164	Glenhope Dr	2171
Unincorporated	835164	Hartview Ave	1033
Unincorporated	835164	Hayland St	36
Unincorporated	835164	Helmsdale Ave	2972
Unincorporated	835164	Ingram St	191
Unincorporated	835164	Kaplan Ave	12
Unincorporated	835164	Kelwood St	573
Unincorporated	835164	Klamath St	150
Unincorporated	835164	Lacon Ave	462
Unincorporated	835164	Lawnwood St	1299
Unincorporated	835164	Lidford Ave	2618
Unincorporated	835164	Loukelton St	483
Unincorporated	835164	Montbrook Ave	122
Unincorporated	835164	Montbrook St	2514
Unincorporated	835164	Mulvane St	571
Unincorporated	835164	N Brigita Ave	515
Unincorporated	835164	N Indian Summer Ave	692
Unincorporated	835164	N Ruthcrest Ave	2293
Unincorporated	835164	Pocono St	2173
Unincorporated	835164	Prior Ave	1588
Unincorporated	835164	Ranlett Ave	2096
Unincorporated	835164	Temple Ave	343
Unincorporated	835164	Valinda Ave	392
Unincorporated	835164	Wing Ln	1351
Unincorporated	835165		408
Unincorporated	835165	Algonquin Dr	352
Unincorporated	835165	Alwood St	54
Unincorporated	835165	Avington Ave	780
Unincorporated	835165	Benwick St	812
Unincorporated	835165	Blackwood St	11
Unincorporated	835165	Blue Lagoon St	948
Unincorporated	835165	Cherry Blossom Way	24
Unincorporated	835165	Cloverglen Dr	2423
Unincorporated	835165	Dalark St	1055
Unincorporated	835165	Dawley Ave	1321
Unincorporated	835165	Doublegrove St	5173
Unincorporated	835165	Dubesor St	3497
Unincorporated	835165	E Alwood St	3113
Unincorporated	835165	E Blackwood St	1161
Unincorporated	835165	E Burtree St	415
Unincorporated	835165	E Cadwell St	539
Unincorporated	835165	E Crocus Dr	202
Unincorporated	835165	E Florence Ave	29
Unincorporated	835165	E Francisquito Ave	2485
Unincorporated	835165	E Holton St	438
Unincorporated	835165	E Mc Wood St	680
Unincorporated	835165	E Meadowside St	1152
Unincorporated	835165	Echelon Ave	2773
Unincorporated	835165	Elsberry Ave	14
Unincorporated	835165	Fairgrove Ave	2247
Unincorporated	835165	Fellowship St	2544
Unincorporated	835165	Francisquito Ave	2468
Unincorporated	835165	Garrett Ct	258
Unincorporated	835165	Gretta Ave	601
Unincorporated	835165	Hartview Ave	1973
Unincorporated	835165	Harvestmoon St	1952
Unincorporated	835165	Hayland St	1692
Unincorporated	835165	Holton St	2552
Unincorporated	835165	Hyacinth	96
Unincorporated	835165	Klamath St	940
Unincorporated	835165	Lear Ct	240

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835165	Maplegrove St	3158
Unincorporated	835165	Meadowside St	25
Unincorporated	835165	N Cedon Dr	143
Unincorporated	835165	N Indian Summer Ave	2716
Unincorporated	835165	N Lark Ellen Ave	717
Unincorporated	835165	Pass and Covina Rd	2288
Unincorporated	835165	S Avington Ave	286
Unincorporated	835165	S Frandale Ave	1
Unincorporated	835165	S Gaybar Ave	176
Unincorporated	835165	S Hyacinth Ave	96
Unincorporated	835165	S Lark Ellen Ave	1738
Unincorporated	835165	S Neff Ave	175
Unincorporated	835165	S Valinda Ave	28
Unincorporated	835165	Shale Ave	193
Unincorporated	835165	Thicket Dr	99
Unincorporated	835165	Valinda Ave	2590
Unincorporated	835165	Vanderwell Ave	1453
Unincorporated	835165	Walnut Ave	2102
Unincorporated	835165	Water Body	202
Unincorporated	835165	Wren Ave	199
Unincorporated	835166	Amar Rd	910
Unincorporated	835166	Ashcomb Dr	8
Unincorporated	835166	Dawley Ave	35
Unincorporated	835166	Dore St	34
Unincorporated	835166	Doublegrove St	901
Unincorporated	835166	Dubesor St	557
Unincorporated	835166	E Amar Rd	1049
Unincorporated	835166	E Burtree St	44
Unincorporated	835166	Elsberry Ave	519
Unincorporated	835166	Galecrest Ave	638
Unincorporated	835166	Grand View Ln	1124
Unincorporated	835166	Graybar Ave	284
Unincorporated	835166	Gretta Ave	280
Unincorporated	835166	Gumbiner St	345
Unincorporated	835166	Kelwood St	352
Unincorporated	835166	Lawnwood St	2559
Unincorporated	835166	Loukelton St	1688
Unincorporated	835166	Montbrook St	218
Unincorporated	835166	Mulvane St	2413
Unincorporated	835166	N Olive Grove Ln	41
Unincorporated	835166	Pocono St	2810
Unincorporated	835166	Rimgrove Dr	25
Unincorporated	835166	S Hyacinth Ave	25
Unincorporated	835166	S Lark Ellen Ave	344
Unincorporated	835166	Season Ave	195
Unincorporated	835166	Valinda Ave	3857
Unincorporated	835166	Vanderwell Ave	1663
Unincorporated	835166	Witzman Dr	161
Unincorporated	835167		270
Unincorporated	835167	Abell Ct	386
Unincorporated	835167	Ashcomb Dr	1883
Unincorporated	835167	Bandon Ave	485
Unincorporated	835167	Baskin Ave	527
Unincorporated	835167	Broadvale Dr	1044
Unincorporated	835167	Cadrow Ave	436
Unincorporated	835167	Damrel Dr	253
Unincorporated	835167	Dunsview Ave	894
Unincorporated	835167	Engle Pl	158
Unincorporated	835167	Galecrest Ave	256
Unincorporated	835167	Glengray St	1025
Unincorporated	835167	Glenhope Dr	3164
Unincorporated	835167	Glenloch Ave	49
Unincorporated	835167	Glenlock Ave	49
Unincorporated	835167	Grand View Ln	165
Unincorporated	835167	Grandview Ln	256

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835167	Gumbiner St	880
Unincorporated	835167	Ironton Dr	237
Unincorporated	835167	Lanham Dr	214
Unincorporated	835167	Larham Dr	147
Unincorporated	835167	Lawnwood St	1
Unincorporated	835167	Mangate Ave	1045
Unincorporated	835167	Millstone Dr	616
Unincorporated	835167	Mulvane St	172
Unincorporated	835167	N Azusa Ave	1041
Unincorporated	835167	Raminda Ave	744
Unincorporated	835167	Rimgrove Dr	2335
Unincorporated	835167	Roxdale Ave	805
Unincorporated	835167	Roxley Dr	356
Unincorporated	835167	S Azusa Ave	1278
Unincorporated	835167	Sam Gerry Dr	3554
Unincorporated	835167	Temple Ave	3495
Unincorporated	835167	Valinda Ave	955
Unincorporated	835167	Vanderwell Ave	549
Unincorporated	835167	Wing Ln	3378
Unincorporated	835167	Witzman Dr	1388
Unincorporated	835169		1135
Unincorporated	835169	9th Ave	2080
Unincorporated	835169	Ansford St	1366
Unincorporated	835169	Binney St	641
Unincorporated	835169	Clark Ave	2146
Unincorporated	835169	Doverfield Ave	1249
Unincorporated	835169	E Gale Ave	1966
Unincorporated	835169	E Poplar Ave	40
Unincorporated	835169	Fairbury St	751
Unincorporated	835169	Finegrove Ave	1163
Unincorporated	835169	Folger St	553
Unincorporated	835169	Gale Ave	3122
Unincorporated	835169	Hedgepath Ave	1166
Unincorporated	835169	Kinbrae Ave	1391
Unincorporated	835169	Latchford Ave	1257
Unincorporated	835169	Marwood St	259
Unincorporated	835169	Novak St	544
Unincorporated	835169	Riderwood Ave	15
Unincorporated	835169	Ridley Ave	811
Unincorporated	835169	S Jarrow Ave	1572
Unincorporated	835169	Walbrook Dr	1565
Unincorporated	835171		2213
Unincorporated	835171	9th Ave	607
Unincorporated	835171	Adalia Ave	615
Unincorporated	835171	Adna Ave	471
Unincorporated	835171	Athel Dr	135
Unincorporated	835171	Avocado Ter	723
Unincorporated	835171	Bernard Ct	44
Unincorporated	835171	Binney St	1616
Unincorporated	835171	Blazing Star Dr	2175
Unincorporated	835171	Bycroft St	244
Unincorporated	835171	Calkin St	518
Unincorporated	835171	Clark Ave	1326
Unincorporated	835171	Cll Corta	109
Unincorporated	835171	Cll de la Fuente	232
Unincorporated	835171	Cll Despensero	297
Unincorporated	835171	Cll Redonda	170
Unincorporated	835171	Coble Ave	1237
Unincorporated	835171	Copper Lantern Dr	1279
Unincorporated	835171	Country Knoll Pl	213
Unincorporated	835171	Darley Ave	913
Unincorporated	835171	Deborah Kay Ln	22
Unincorporated	835171	Deerhaven Dr	1777
Unincorporated	835171	Denley St	748
Unincorporated	835171	Doverfield Ave	725

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835171	Drumhill Dr	596
Unincorporated	835171	Drybrook Dr	183
Unincorporated	835171	E Gale Ave	2423
Unincorporated	835171	E Los Altos Dr	303
Unincorporated	835171	E Los Robles Ave	1654
Unincorporated	835171	E Manzanita Dr	1156
Unincorporated	835171	E Oak Canyon Dr	719
Unincorporated	835171	E Poplar Ave	1348
Unincorporated	835171	Edgeridge Dr	244
Unincorporated	835171	el Venado Dr	21
Unincorporated	835171	Elkhill Dr	141
Unincorporated	835171	Finegrove Ave	1022
Unincorporated	835171	Folger St	971
Unincorporated	835171	Gale Ave	2423
Unincorporated	835171	Gatlin Ave	1236
Unincorporated	835171	Golden View Dr	27
Unincorporated	835171	Hedgepath Ave	998
Unincorporated	835171	Hollis St	268
Unincorporated	835171	Horticultural Dr	23
Unincorporated	835171	Janlu Ave	992
Unincorporated	835171	Kamas Ave	202
Unincorporated	835171	Kinbrae Ave	521
Unincorporated	835171	la Mesita Dr	1060
Unincorporated	835171	Las Lomitas Dr	1465
Unincorporated	835171	Las Tunas Dr	662
Unincorporated	835171	Latchford Ave	921
Unincorporated	835171	Los Robles Ave	3988
Unincorporated	835171	Lujon St	1154
Unincorporated	835171	Marwood St	1378
Unincorporated	835171	Mockingbird Hill Dr	75
Unincorporated	835171	Mountain Spring St	1437
Unincorporated	835171	New Vista Pl	673
Unincorporated	835171	Orange Grove Ave	2422
Unincorporated	835171	Palm Ave	729
Unincorporated	835171	Riderwood Ave	1111
Unincorporated	835171	Ridley Ave	2857
Unincorporated	835171	Ringer Pl	106
Unincorporated	835171	Rochlen St	213
Unincorporated	835171	Rockfold Dr	163
Unincorporated	835171	Rockhill Dr	213
Unincorporated	835171	S 7th Ave	2715
Unincorporated	835171	S 9th Ave	2302
Unincorporated	835171	S Eldon Ave	502
Unincorporated	835171	S Nantes Ave	1106
Unincorporated	835171	S Vallecito Dr	2719
Unincorporated	835171	Samar Ave	234
Unincorporated	835171	Shadybend Dr	557
Unincorporated	835171	Shefford St	378
Unincorporated	835171	Silver Lantern Dr	777
Unincorporated	835171	Silver Maple Dr	0
Unincorporated	835171	Skyline Dr	12
Unincorporated	835171	Sonnet Pl	164
Unincorporated	835171	Stovall Ave	1226
Unincorporated	835171	Terry Lynn Ln	142
Unincorporated	835171	Turnbull Canyon Rd	8010
Unincorporated	835171	Valencia Ave	2510
Unincorporated	835171	Via Cielo	13
Unincorporated	835171	Walbrook Dr	1366
Unincorporated	835171	Wedgeworth Dr	1211
Unincorporated	835172		32
Unincorporated	835172	Angelcrest Dr	376
Unincorporated	835172	Clark Ave	34
Unincorporated	835172	E Gale Ave	898
Unincorporated	835172	Gale Ave	898
Unincorporated	835172	Rochlen St	45

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835172	Turnbull Canyon Rd	170
Unincorporated	835173		4354
Unincorporated	835173	Acuna Dr	54
Unincorporated	835173	Adelhart St	1130
Unincorporated	835173	Adelita Dr	2513
Unincorporated	835173	Agosta Dr	649
Unincorporated	835173	Albeno St	42
Unincorporated	835173	Allenton Ave	492
Unincorporated	835173	Annellen St	366
Unincorporated	835173	Antisana Pl	184
Unincorporated	835173	Aptos Ave	71
Unincorporated	835173	Atglen St	429
Unincorporated	835173	Atitlan Dr	656
Unincorporated	835173	Avalo Dr	993
Unincorporated	835173	Azaria Ave	822
Unincorporated	835173	Barata St	301
Unincorporated	835173	Barletta Dr	1033
Unincorporated	835173	Belle River Dr	428
Unincorporated	835173	Binney St	929
Unincorporated	835173	Budleigh Dr	846
Unincorporated	835173	Buttram St	798
Unincorporated	835173	Cam del Sur	141
Unincorporated	835173	Cam del Tomasini	52
Unincorporated	835173	Camino Ave	813
Unincorporated	835173	Canal Point Rd	68
Unincorporated	835173	Caracol Dr	622
Unincorporated	835173	Cardillo Ave	1512
Unincorporated	835173	Cargreen Ave	132
Unincorporated	835173	Caricia Dr	1903
Unincorporated	835173	Cold Plains Dr	1437
Unincorporated	835173	Colima Rd	6957
Unincorporated	835173	Cristalino St	1919
Unincorporated	835173	Dahl Dr	31
Unincorporated	835173	Daykin St	290
Unincorporated	835173	Daytona Ave	1284
Unincorporated	835173	Deanne Dr	323
Unincorporated	835173	Deborah Kay Ln	61
Unincorporated	835173	Decima Dr	729
Unincorporated	835173	del Prado Dr	4984
Unincorporated	835173	del Vista Dr	29
Unincorporated	835173	Denley St	633
Unincorporated	835173	Deolinda Dr	365
Unincorporated	835173	Dodrill Dr	639
Unincorporated	835173	Dolonita Ave	75
Unincorporated	835173	Dryden Pl	206
Unincorporated	835173	Dunswell Ave	1021
Unincorporated	835173	E Clarkgrove St	653
Unincorporated	835173	E Gale Ave	1936
Unincorporated	835173	E Kennard St	736
Unincorporated	835173	E la Belle St	481
Unincorporated	835173	E la Moine St	1473
Unincorporated	835173	E Los Altos Dr	7599
Unincorporated	835173	E Los Robles Ave	903
Unincorporated	835173	E Newton St	2958
Unincorporated	835173	E Sigman St	442
Unincorporated	835173	E Tetley St	3386
Unincorporated	835173	el Baile Pl	578
Unincorporated	835173	el Gavilan Dr	46
Unincorporated	835173	el Selinda Dr	1738
Unincorporated	835173	el Tesoro Ct	213
Unincorporated	835173	el Volcan Pl	101
Unincorporated	835173	Facilidad St	2015
Unincorporated	835173	Falstone Ave	1411
Unincorporated	835173	Farmstead Ave	1282
Unincorporated	835173	Fragancia Ave	1927

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835173	Frame Ave	280
Unincorporated	835173	Gale Ave	1936
Unincorporated	835173	Galemont Ave	2526
Unincorporated	835173	Garo St	809
Unincorporated	835173	Glenmark Dr	556
Unincorporated	835173	Glennhill Dr	40
Unincorporated	835173	Glenstone Ave	1360
Unincorporated	835173	Gun Tree Dr	495
Unincorporated	835173	Gypsy Dr	9
Unincorporated	835173	Halliburton Rd	855
Unincorporated	835173	Heatherfield Dr	39
Unincorporated	835173	Hollis St	1305
Unincorporated	835173	Humford Ave	957
Unincorporated	835173	Joan Dr	1813
Unincorporated	835173	Jurado Ave	2533
Unincorporated	835173	Kennard St	1634
Unincorporated	835173	Koury Dr	140
Unincorporated	835173	la Barra Pl	129
Unincorporated	835173	la Belle St	2273
Unincorporated	835173	la Bonita Dr	390
Unincorporated	835173	la Donna Way	41
Unincorporated	835173	la Floresta Dr	967
Unincorporated	835173	la Moine St	164
Unincorporated	835173	la Monde St	771
Unincorporated	835173	la Plata Ave	2556
Unincorporated	835173	la Ronda Cir	276
Unincorporated	835173	la Subida Dr	5448
Unincorporated	835173	Lado de Loma Dr	25
Unincorporated	835173	Ladysmith St	1166
Unincorporated	835173	Lancewood Ave	2333
Unincorporated	835173	Larchwood Ave	3342
Unincorporated	835173	Las Lomitas Dr	1678
Unincorporated	835173	Las Marias Ave	111
Unincorporated	835173	Leander Dr	1228
Unincorporated	835173	Leticia Dr	3261
Unincorporated	835173	Lonecrest Dr	1287
Unincorporated	835173	Los Bentos Dr	326
Unincorporated	835173	Los Molinos St	1460
Unincorporated	835173	Lotus Dr	204
Unincorporated	835173	Lujon St	2519
Unincorporated	835173	Lynbrook Ave	790
Unincorporated	835173	Malton Pl	196
Unincorporated	835173	Managua Pl	97
Unincorporated	835173	Maracaibo Pl	528
Unincorporated	835173	Marwood St	375
Unincorporated	835173	Metropol Dr	142
Unincorporated	835173	Mockingbird Hill Dr	30
Unincorporated	835173	Montellano Ave	1759
Unincorporated	835173	Montera Dr	1296
Unincorporated	835173	Montesano Ave	216
Unincorporated	835173	Newbolt Cir	20
Unincorporated	835173	Newhampton St	1224
Unincorporated	835173	Novak St	377
Unincorporated	835173	Oboe Cir	111
Unincorporated	835173	Olympus Ave	2344
Unincorporated	835173	Orinoco Pl	170
Unincorporated	835173	Padova Dr	583
Unincorporated	835173	Parkland Dr	822
Unincorporated	835173	Pietro Dr	801
Unincorporated	835173	Pintura Dr	3837
Unincorporated	835173	Pontenova Ave	1492
Unincorporated	835173	Ragley St	427
Unincorporated	835173	Regalado St	3931
Unincorporated	835173	Relch-Ling St	98
Unincorporated	835173	Richdale Ave	2218

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835173	Richview Dr	1041
Unincorporated	835173	Rio Claro Dr	974
Unincorporated	835173	Robruce Ln	149
Unincorporated	835173	Rochlen St	27
Unincorporated	835173	Rojas St	1473
Unincorporated	835173	Rumson St	726
Unincorporated	835173	S Angelcrest Dr	2666
Unincorporated	835173	S Dunswell Ave	1822
Unincorporated	835173	S Farmstead Ave	2703
Unincorporated	835173	S Galemont Ave	3084
Unincorporated	835173	S Hacienda Blvd	19005
Unincorporated	835173	S Kwis Ave	5705
Unincorporated	835173	S Las Marias Ave	2145
Unincorporated	835173	S Vallecito Dr	3114
Unincorporated	835173	S Viewfield Ave	40
Unincorporated	835173	Senadale St	265
Unincorporated	835173	Shadybend Dr	28
Unincorporated	835173	Shefford St	953
Unincorporated	835173	Sigman St	67
Unincorporated	835173	Sillman St	503
Unincorporated	835173	Sweet Pl	482
Unincorporated	835173	Taloga St	1034
Unincorporated	835173	Teresina Dr	805
Unincorporated	835173	Terry Lynn Ln	105
Unincorporated	835173	Thaxton Ave	356
Unincorporated	835173	Three Palms Dr	2650
Unincorporated	835173	Turnbull Canyon Rd	101
Unincorporated	835173	Valdemar Dr	654
Unincorporated	835173	Valle Contento Dr	280
Unincorporated	835173	Via Verita Ave	1631
Unincorporated	835173	Villa Grande Rd	22
Unincorporated	835173	Walbrook Dr	482
Unincorporated	835173	Waseca St	181
Unincorporated	835173	Wedgeworth Dr	495
Unincorporated	835173	Weeping Willow Ln	148
Unincorporated	835173	White Cloud Dr	1770
Unincorporated	835173	Wickshire Ave	1978
Unincorporated	835173	Windrush Dr	1051
Unincorporated	835173	Woodcreek Cir	290
Unincorporated	835173	Yojoa Pl	480
Unincorporated	835174		1041
Unincorporated	835174	Anders Ave	654
Unincorporated	835174	Binney St	800
Unincorporated	835174	Denley St	378
Unincorporated	835174	E Clarkgrove St	650
Unincorporated	835174	E Gale Ave	1728
Unincorporated	835174	Falstone Ave	1829
Unincorporated	835174	Folger St	415
Unincorporated	835174	Gale Ave	1728
Unincorporated	835174	Garo St	825
Unincorporated	835174	Gayland Ave	1278
Unincorporated	835174	Lancewood Ave	1337
Unincorporated	835174	Marchmont Ave	1278
Unincorporated	835174	Marwood St	408
Unincorporated	835174	Novak St	369
Unincorporated	835174	Olympus Ave	1496
Unincorporated	835174	Pontenova Ave	3523
Unincorporated	835174	S Hacienda Blvd	4347
Unincorporated	835174	S Olympus Ave	1187
Unincorporated	835174	Shadybend Dr	1368
Unincorporated	835174	Sigman St	749
Unincorporated	835174	Three Palms Dr	719
Unincorporated	835174	Three Palms St	483
Unincorporated	835174	Walbrook Dr	872
Unincorporated	835175		2652

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835175	Abascal Dr	102
Unincorporated	835175	Abuela Pl	12
Unincorporated	835175	Allenton Ave	1564
Unincorporated	835175	Amber Tree Ln	236
Unincorporated	835175	Amelgado Dr	1323
Unincorporated	835175	Apple Creek Ln	1
Unincorporated	835175	Armington Ave	1781
Unincorporated	835175	Atglen St	382
Unincorporated	835175	Atitlan Dr	225
Unincorporated	835175	Atlantida Dr	1232
Unincorporated	835175	Balassi Rd	247
Unincorporated	835175	Barford Ave	2681
Unincorporated	835175	Binney St	2500
Unincorporated	835175	Bolar Ave	142
Unincorporated	835175	Bork Ave	234
Unincorporated	835175	Bycroft St	212
Unincorporated	835175	Canarias Dr	33
Unincorporated	835175	Canelones Dr	2510
Unincorporated	835175	Carrara Dr	451
Unincorporated	835175	Ceciana Dr	94
Unincorporated	835175	Cedarlane Dr	1129
Unincorporated	835175	Charlemont Ave	4445
Unincorporated	835175	Chella Dr	229
Unincorporated	835175	Cherry Gate Way	48
Unincorporated	835175	Circle Hill Ln	271
Unincorporated	835175	Clementina Dr	662
Unincorporated	835175	Colima Rd	8283
Unincorporated	835175	Collegio Dr	198
Unincorporated	835175	Corina Ct	156
Unincorporated	835175	Country Canyon Rd	2102
Unincorporated	835175	Country Cyn Rd	242
Unincorporated	835175	Craighton Ave	1069
Unincorporated	835175	Cranberry Ln	38
Unincorporated	835175	Dahl Dr	117
Unincorporated	835175	Dawn Haven Rd	807
Unincorporated	835175	Deer Trail Dr	31
Unincorporated	835175	Deerpeak Dr	451
Unincorporated	835175	Delmesa Ave	658
Unincorporated	835175	Denley St	2208
Unincorporated	835175	Duranzo Dr	1716
Unincorporated	835175	E Gale Ave	2535
Unincorporated	835175	E Los Altos Dr	703
Unincorporated	835175	Eastleigh Ave	1619
Unincorporated	835175	Echo Hill Ln	78
Unincorporated	835175	Elderway Dr	967
Unincorporated	835175	Eli Pl	208
Unincorporated	835175	Elm Haven Dr	170
Unincorporated	835175	Ember Glen Rd	151
Unincorporated	835175	Fabueno Dr	154
Unincorporated	835175	Fallen Oak Rd	489
Unincorporated	835175	Fidelidad Dr	775
Unincorporated	835175	Fieldgate Ave	3253
Unincorporated	835175	Flamstead Dr	2296
Unincorporated	835175	Flower Creek Ln	415
Unincorporated	835175	Folger St	1437
Unincorporated	835175	Fontezuela Dr	1350
Unincorporated	835175	Gale Ave	2535
Unincorporated	835175	Garo St	3191
Unincorporated	835175	Garona Dr	188
Unincorporated	835175	Genola Dr	527
Unincorporated	835175	Glenelder Ave	2438
Unincorporated	835175	Gotera Dr	53
Unincorporated	835175	Green Spring Ln	62
Unincorporated	835175	Gregorio Dr	484
Unincorporated	835175	Halliburton Rd	7955

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835175	Harp Dr	212
Unincorporated	835175	Hinnen Ave	2417
Unincorporated	835175	Hollis St	474
Unincorporated	835175	Ilopango Dr	354
Unincorporated	835175	Kellerton Dr	1416
Unincorporated	835175	Kennard St	521
Unincorporated	835175	Kiska Ave	1579
Unincorporated	835175	la Cana Dr	1158
Unincorporated	835175	la Monde St	2787
Unincorporated	835175	la Ronda Cir	15
Unincorporated	835175	Ladysmith St	927
Unincorporated	835175	Lazy Brook Ln	51
Unincorporated	835175	Leopold Ave	1463
Unincorporated	835175	Lujon St	75
Unincorporated	835175	Lyndhurst Ave	1218
Unincorporated	835175	Manco Dr	43
Unincorporated	835175	Marvene Dr	839
Unincorporated	835175	Matchleaf Ave	1983
Unincorporated	835175	Maywind Way	742
Unincorporated	835175	Mesa Robles Dr	1390
Unincorporated	835175	Montera Dr	68
Unincorporated	835175	Oakrow Dr	641
Unincorporated	835175	Old Copper Ln	396
Unincorporated	835175	Oldridge Dr	712
Unincorporated	835175	Pando Dr	171
Unincorporated	835175	Paso Verde Dr	1309
Unincorporated	835175	Piermont Dr	261
Unincorporated	835175	Placentia Dr	209
Unincorporated	835175	Pso de Rocha	360
Unincorporated	835175	Punta del Este Dr	2890
Unincorporated	835175	Quince Cir	111
Unincorporated	835175	Rada Rd	991
Unincorporated	835175	Ranmore Dr	555
Unincorporated	835175	Rio Branca Dr	146
Unincorporated	835175	Rio Lempa Dr	138
Unincorporated	835175	Rochlen St	671
Unincorporated	835175	Ruiz Pl	116
Unincorporated	835175	Rustic Gate Way	141
Unincorporated	835175	S Stimson Ave	8858
Unincorporated	835175	Salazar Dr	465
Unincorporated	835175	Salto Dr	180
Unincorporated	835175	Santa Bianca Dr	1641
Unincorporated	835175	Sarandi Grande Dr	95
Unincorporated	835175	Sarani Grande Dr	2035
Unincorporated	835175	Sea Spring Dr	189
Unincorporated	835175	Shadybend Dr	1582
Unincorporated	835175	Sierra Park Way	41
Unincorporated	835175	Sierra Ridge Way	26
Unincorporated	835175	Sigman St	2720
Unincorporated	835175	Sisal Pl	169
Unincorporated	835175	Sleepy Spring Way	57
Unincorporated	835175	Soriano Dr	2239
Unincorporated	835175	Stimson Ave	1474
Unincorporated	835175	Stitzel Dr	1300
Unincorporated	835175	Sunny View Ter	71
Unincorporated	835175	Sweet Pl	35
Unincorporated	835175	Three Palms Dr	329
Unincorporated	835175	Three Palms St	329
Unincorporated	835175	Ticatica Dr	668
Unincorporated	835175	Vascones Dr	494
Unincorporated	835175	Villa Alta Pl	438
Unincorporated	835175	Villa Flores Dr	981
Unincorporated	835175	Wain Pl	17
Unincorporated	835175	Ward Way	7
Unincorporated	835175	Wedgeworth Dr	3577

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835175	Whitehead Ln	98
Unincorporated	835179		308
Unincorporated	835179	Bork Ave	914
Unincorporated	835179	Carriage Pl	63
Unincorporated	835179	Clayhill Ave	955
Unincorporated	835179	Colima Rd	1315
Unincorporated	835179	Countrywood Ave	1874
Unincorporated	835179	Dore Dr	286
Unincorporated	835179	Elm Haven Dr	1247
Unincorporated	835179	Ember Glen Rd	1607
Unincorporated	835179	Fallen Oak Rd	19
Unincorporated	835179	Fern Haven Dr	761
Unincorporated	835179	Fern Haven Rd	761
Unincorporated	835179	Flower Glen Dr	1020
Unincorporated	835179	Halliburton Rd	1646
Unincorporated	835179	Nace Pl	141
Unincorporated	835179	Naco Pl	143
Unincorporated	835179	Old Forest Rd	1350
Unincorporated	835179	Rada Rd	7
Unincorporated	835179	Wedgeworth Dr	2253
Unincorporated	835183		708
Unincorporated	835183	Aleppo Pl	37
Unincorporated	835183	Birch Log Way	370
Unincorporated	835183	Bracewood Dr	61
Unincorporated	835183	Bretonwood Ln	6
Unincorporated	835183	Bruck Cir	208
Unincorporated	835183	Candela Dr	46
Unincorporated	835183	Cap Ct	12
Unincorporated	835183	Carriage Pl	12
Unincorporated	835183	Cedarmont Dr	535
Unincorporated	835183	Cherry Gate Way	187
Unincorporated	835183	Clear River Ln	155
Unincorporated	835183	Colima Rd	7068
Unincorporated	835183	Copper Hill Rd	180
Unincorporated	835183	Countrypark Ln	340
Unincorporated	835183	Countrywood Ave	2096
Unincorporated	835183	Dawn Haven Rd	4
Unincorporated	835183	Deer Trail Dr	385
Unincorporated	835183	E Orlon Dr	101
Unincorporated	835183	Eagle Park Rd	1477
Unincorporated	835183	Elberglen Dr	354
Unincorporated	835183	Elklane Dr	277
Unincorporated	835183	Fallen Dr	25
Unincorporated	835183	Flower Vale Ln	344
Unincorporated	835183	Forest Glen Dr	956
Unincorporated	835183	Gaypark Way	310
Unincorporated	835183	Glenfold Dr	104
Unincorporated	835183	Golden Rose Ave	806
Unincorporated	835183	Green Coach Rd	354
Unincorporated	835183	Heather Hill Rd	1755
Unincorporated	835183	Highwood Rd	96
Unincorporated	835183	Ivy Hill Rd	267
Unincorporated	835183	Jeslew Ct	301
Unincorporated	835183	Kings View Dr	17
Unincorporated	835183	Kirk View Dr	420
Unincorporated	835183	Langspur Dr	132
Unincorporated	835183	Lark Tree Way	1304
Unincorporated	835183	Manor Gate Rd	1977
Unincorporated	835183	Meadow Glen Way	443
Unincorporated	835183	Moonview Dr	9
Unincorporated	835183	Mountain Brook Dr	441
Unincorporated	835183	Nadula Dr	127
Unincorporated	835183	New Pine Dr	225
Unincorporated	835183	Orchard Hill Ln	1752
Unincorporated	835183	Pamela Ct	42

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835183	Park Lawn Rd	1664
Unincorporated	835183	Pepper Brook Way	3119
Unincorporated	835183	Radcourt Dr	68
Unincorporated	835183	Regan Ct	7
Unincorporated	835183	Ridge Park Dr	1911
Unincorporated	835183	Rocky Knoll Rd	36
Unincorporated	835183	Royal View Rd	384
Unincorporated	835183	S Azusa Ave	3515
Unincorporated	835183	Saleroso Dr	67
Unincorporated	835183	Shady Meadow Dr	1105
Unincorporated	835183	Summer Lawn Way	1067
Unincorporated	835183	Tombur Dr	38
Unincorporated	835183	Tomich Rd	335
Unincorporated	835183	Turnpost Ln	1358
Unincorporated	835183	Waverly Glen Way	299
Unincorporated	835183	Wedgeworth Dr	3745
Unincorporated	835183	Woodmont Pl	359
Unincorporated	835185		677
Unincorporated	835185	Boulay St	1149
Unincorporated	835185	Calcutta St	1057
Unincorporated	835185	Gemini St	1766
Unincorporated	835185	Glenloch Ave	406
Unincorporated	835185	Glenlock Ave	406
Unincorporated	835185	Glenthorne St	1005
Unincorporated	835185	Hemphill St	757
Unincorporated	835185	Lew Ave	202
Unincorporated	835185	Main St	2
Unincorporated	835185	N Sandalwood Ave	1239
Unincorporated	835185	N Winton Ave	1336
Unincorporated	835185	Northam St	1796
Unincorporated	835185	Renault St	1564
Unincorporated	835185	S Azusa Ave	1774
Unincorporated	835185	S Backton Ave	829
Unincorporated	835185	S Hambledon Ave	1637
Unincorporated	835185	S Sandalwood Ave	2340
Unincorporated	835185	S Winton Ave	2170
Unincorporated	835185	Salais St	2036
Unincorporated	835185	Sandalwood Ave	131
Unincorporated	835185	Tadmore St	1321
Unincorporated	835185	Trier Ave	2
Unincorporated	835185	Vanguard Ave	1434
Unincorporated	835185	Villa Corta St	581
Unincorporated	835185	Villa Park St	1143
Unincorporated	835185	Wintonwood Ln	141
Unincorporated	835185	Zenith Ave	1080
Unincorporated	835186		246
Unincorporated	835186	Colima Rd	740
Unincorporated	835186	Pepper Brook Way	43
Unincorporated	835186	S Azusa Ave	1491
Unincorporated	835187		5
Unincorporated	835187	Hurley St	163
Unincorporated	835187	Maclaren St	611
Unincorporated	835187	S Hambledon Ave	156
Unincorporated	835188		226
Unincorporated	835188	Alderton Ave	2472
Unincorporated	835188	Backton Ave	1663
Unincorporated	835188	Bainford Ave	1891
Unincorporated	835188	Boulay St	121
Unincorporated	835188	Calcutta St	657
Unincorporated	835188	Doverdale Ave	1375
Unincorporated	835188	Gemini St	1168
Unincorporated	835188	Glenthorne St	701
Unincorporated	835188	Hemphill St	548
Unincorporated	835188	Hurley St	1639
Unincorporated	835188	Jeannie Dr	99

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835188	la Puente Rd	533
Unincorporated	835188	Maclaren St	73
Unincorporated	835188	N Hambledon Ave	1379
Unincorporated	835188	N Shipman Ave	1585
Unincorporated	835188	Northam St	438
Unincorporated	835188	Redbud Pl	183
Unincorporated	835188	Renault St	1237
Unincorporated	835188	Richford Ave	1456
Unincorporated	835188	S Backton Ave	838
Unincorporated	835188	S Hambledon Ave	1067
Unincorporated	835188	S Shipman Ave	1260
Unincorporated	835188	Shipman Ave	1671
Unincorporated	835188	Trier Ave	866
Unincorporated	835188	Vanguard Ave	24
Unincorporated	835188	Villa Corta St	653
Unincorporated	835188	Wellford Dr	749
Unincorporated	835189		4708
Unincorporated	835189	Abeja Dr	177
Unincorporated	835189	Agostino Dr	102
Unincorporated	835189	Aguiro St	470
Unincorporated	835189	Albatross Rd	47
Unincorporated	835189	Almena Ave	817
Unincorporated	835189	Amargoso Dr	20
Unincorporated	835189	Atina Dr	1185
Unincorporated	835189	Ave del Canada	436
Unincorporated	835189	Barefoot Ln	536
Unincorporated	835189	Barroso St	115
Unincorporated	835189	Bramble Ct	104
Unincorporated	835189	Cam Bello	827
Unincorporated	835189	Castleford Pl	57
Unincorporated	835189	Cll Barcelona	1455
Unincorporated	835189	Cll Belleza	82
Unincorporated	835189	Cll Bogota	138
Unincorporated	835189	Cll la Paz	12
Unincorporated	835189	Cll Madrid	714
Unincorporated	835189	Cocklebur Pl	280
Unincorporated	835189	Colima Rd	5692
Unincorporated	835189	Companario Dr	1250
Unincorporated	835189	Contador Dr	138
Unincorporated	835189	Contra Costa Dr	151
Unincorporated	835189	Cordoza Ave	983
Unincorporated	835189	Cornwall Ct	4
Unincorporated	835189	Cottontail Pl	28
Unincorporated	835189	Cowbell Ct	51
Unincorporated	835189	Crimsoncrest Dr	387
Unincorporated	835189	Crosshaven Dr	1219
Unincorporated	835189	Cuatro Dr	1330
Unincorporated	835189	Deepgrove Ave	407
Unincorporated	835189	Desidia St	417
Unincorporated	835189	Destoya Ave	711
Unincorporated	835189	Donosa Dr	950
Unincorporated	835189	Dublin Way	46
Unincorporated	835189	E Via Amorosa	431
Unincorporated	835189	Escalada Ave	495
Unincorporated	835189	Espito St	838
Unincorporated	835189	Fainridge Pl	89
Unincorporated	835189	Fullerton Rd	6362
Unincorporated	835189	Galatina St	1464
Unincorporated	835189	Gallineta St	1293
Unincorporated	835189	Gloriosa Ave	559
Unincorporated	835189	Gnu Cir	54
Unincorporated	835189	Gooseberry Dr	363
Unincorporated	835189	Graystone Way	74
Unincorporated	835189	Harbor Blvd	173
Unincorporated	835189	Hayridge Ct	58

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835189	Hertford Pl	2
Unincorporated	835189	Larkvane Rd	157
Unincorporated	835189	Liliana Ct	78
Unincorporated	835189	Los Palacios Dr	1944
Unincorporated	835189	Madona St	367
Unincorporated	835189	Manzanillo Dr	238
Unincorporated	835189	Marengo Dr	3
Unincorporated	835189	Matador Dr	259
Unincorporated	835189	Maystone Pl	207
Unincorporated	835189	Mescal St	1866
Unincorporated	835189	Mondino Dr	154
Unincorporated	835189	Nearbank Dr	174
Unincorporated	835189	Paquita Dr	85
Unincorporated	835189	Pathfinder Rd	819
Unincorporated	835189	Pavas Ct	406
Unincorporated	835189	Pocatello Ave	1464
Unincorporated	835189	Pso Azul	17
Unincorporated	835189	Quail Cove Ave	2
Unincorporated	835189	Rio Bonito Dr	61
Unincorporated	835189	Rio Seco Dr	371
Unincorporated	835189	S Larkvane Rd	1289
Unincorporated	835189	Saleroso Dr	388
Unincorporated	835189	Samara Dr	312
Unincorporated	835189	Senteno St	50
Unincorporated	835189	Silverbank Pl	282
Unincorporated	835189	Sordello St	380
Unincorporated	835189	Sunrise Dr	650
Unincorporated	835189	Tambor Ct	646
Unincorporated	835189	Tiburon Ct	204
Unincorporated	835189	Tomas Ct	128
Unincorporated	835189	Tuliptree	56
Unincorporated	835189	Valcarlos Ave	1544
Unincorporated	835189	Valenza Ave	632
Unincorporated	835189	Vantage Pointe Dr	369
Unincorporated	835189	Via Amorosa	156
Unincorporated	835189	Via Calma	919
Unincorporated	835189	Via Dicha	89
Unincorporated	835189	Via Entrada	215
Unincorporated	835189	Via San Jose	2
Unincorporated	835189	Wales Ct	91
Unincorporated	835189	Whippoorwill Dr	393
Unincorporated	835189	Winrow Ct	37
Unincorporated	835189	Yorkshire Way	306
Unincorporated	835190		7791
Unincorporated	835190	Abano Ave	212
Unincorporated	835190	Abeto Ave	672
Unincorporated	835190	Ablano Ave	574
Unincorporated	835190	Abonado Pl	175
Unincorporated	835190	Adivino St	589
Unincorporated	835190	Aguiro St	4331
Unincorporated	835190	Alberca Dr	174
Unincorporated	835190	Alderbury Dr	1464
Unincorporated	835190	Amberly Pl	55
Unincorporated	835190	Andrada Dr	579
Unincorporated	835190	Arba St	293
Unincorporated	835190	Aviston Pl	126
Unincorporated	835190	Barroso St	2919
Unincorporated	835190	Batson Ave	7928
Unincorporated	835190	Bellorita St	2130
Unincorporated	835190	Blakeman Ave	1994
Unincorporated	835190	Blandford Dr	2902
Unincorporated	835190	Buttonwood Ln	1098
Unincorporated	835190	Cam Bello	1071
Unincorporated	835190	Cam Viejo	1008
Unincorporated	835190	Camarina Dr	740

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835190	Canela Pl	102
Unincorporated	835190	Cantaria Ave	2556
Unincorporated	835190	Cardona Dr	117
Unincorporated	835190	Cedarbreak Ave	340
Unincorporated	835190	Cedric Pl	78
Unincorporated	835190	Chandu Pl	50
Unincorporated	835190	Colima Rd	3127
Unincorporated	835190	Colinton Dr	317
Unincorporated	835190	Companario Dr	482
Unincorporated	835190	Dancy St	780
Unincorporated	835190	del Bonita St	1798
Unincorporated	835190	Desidia St	823
Unincorporated	835190	Dione Way	139
Unincorporated	835190	Doubletree Ln	1192
Unincorporated	835190	Dragonera Dr	665
Unincorporated	835190	Duenas Dr	160
Unincorporated	835190	E Cam Bello	376
Unincorporated	835190	Elmhurst St	135
Unincorporated	835190	Farjardo St	1770
Unincorporated	835190	Felicia Ave	645
Unincorporated	835190	Fidalgo St	1361
Unincorporated	835190	Fieldbrook St	2235
Unincorporated	835190	Fullerton Rd	2439
Unincorporated	835190	Galatina St	1104
Unincorporated	835190	Gallineta St	1053
Unincorporated	835190	Gallio Ave	1802
Unincorporated	835190	Handah Ct	218
Unincorporated	835190	Hespero St	239
Unincorporated	835190	Honore St	272
Unincorporated	835190	Jellick Ave	3287
Unincorporated	835190	Kara Pl	252
Unincorporated	835190	Kinnow Pl	106
Unincorporated	835190	Klum Pl	207
Unincorporated	835190	la Cortita St	582
Unincorporated	835190	la Cuerva Dr	147
Unincorporated	835190	la Cueva Dr	323
Unincorporated	835190	la Guardia St	2676
Unincorporated	835190	Lincroft St	1702
Unincorporated	835190	Los Berros Dr	63
Unincorporated	835190	Los Machos Dr	259
Unincorporated	835190	Los Padres Dr	5429
Unincorporated	835190	Los Palacios Dr	526
Unincorporated	835190	Madona St	398
Unincorporated	835190	Marcola Dr	167
Unincorporated	835190	Marimba St	2246
Unincorporated	835190	Mescal St	4225
Unincorporated	835190	Mescalero St	1325
Unincorporated	835190	Native Ave	33
Unincorporated	835190	Nogales St	31
Unincorporated	835190	Norsewood Dr	1602
Unincorporated	835190	Oral St	271
Unincorporated	835190	Pathfinder Rd	3634
Unincorporated	835190	Penn St	238
Unincorporated	835190	Philbrook St	984
Unincorporated	835190	Plano Dr	479
Unincorporated	835190	Rainer Ave	462
Unincorporated	835190	Recinto Ave	1579
Unincorporated	835190	Rio Seco Dr	46
Unincorporated	835190	Rocky Ct	197
Unincorporated	835190	S Cam Bello	483
Unincorporated	835190	S Cam Viejo	1008
Unincorporated	835190	S Jellick Ave	1827
Unincorporated	835190	Sandraglen Dr	27
Unincorporated	835190	Santa Ysabela Dr	1212
Unincorporated	835190	Santar St	679

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835190	Seadler Dr	633
Unincorporated	835190	Senteno St	1105
Unincorporated	835190	Sierra Leone Ave	5590
Unincorporated	835190	Sordello St	892
Unincorporated	835190	Subido St	407
Unincorporated	835190	Tortosa Ave	1513
Unincorporated	835190	Vantage Pointe Dr	41
Unincorporated	835190	Vidora Dr	923
Unincorporated	835190	Villa Clara St	2386
Unincorporated	835190	Vivero Dr	736
Unincorporated	835190	Wellesley Dr	11
Unincorporated	835192		118
Unincorporated	835192	Abery Ave	1667
Unincorporated	835192	Altario St	3754
Unincorporated	835192	Balham Ave	1842
Unincorporated	835192	Barca Ave	114
Unincorporated	835192	Colston Ave	1609
Unincorporated	835192	Damasco St	456
Unincorporated	835192	Deepmead Ave	1035
Unincorporated	835192	Don Baptista Ave	126
Unincorporated	835192	Donna Antonia Ave	143
Unincorporated	835192	Elizondo St	545
Unincorporated	835192	Eulita Ave	348
Unincorporated	835192	Faxina Ave	1639
Unincorporated	835192	Galleano St	2068
Unincorporated	835192	Gendel Dr	1251
Unincorporated	835192	Giano Ave	1102
Unincorporated	835192	Hallrich St	637
Unincorporated	835192	Hurley St	846
Unincorporated	835192	Jeannie Dr	968
Unincorporated	835192	Jellick Ave	1819
Unincorporated	835192	la Puente Rd	1204
Unincorporated	835192	la Seda Rd	2509
Unincorporated	835192	Lanaca St	2171
Unincorporated	835192	Lochmere Ave	1466
Unincorporated	835192	Maclaren St	830
Unincorporated	835192	Mancero Ave	106
Unincorporated	835192	Northam St	1502
Unincorporated	835192	Pacato Rd	60
Unincorporated	835192	Palamos Ave	674
Unincorporated	835192	Renault St	4525
Unincorporated	835192	Richburn Ave	1948
Unincorporated	835192	Rorimer St	2737
Unincorporated	835192	Trafalgar Ave	1043
Unincorporated	835192	Ventena Ave	134
Unincorporated	835192	Vidalia Ave	1122
Unincorporated	835192	Villa Park St	3710
Unincorporated	835192	Whiteford Ave	1188
Unincorporated	835192	Yorbita Rd	1097
Unincorporated	835193		1527
Unincorporated	835193	Abelian Ave	761
Unincorporated	835193	Almanor St	252
Unincorporated	835193	Bench St	487
Unincorporated	835193	Boyer Ln	162
Unincorporated	835193	Cottonwood Cir	34
Unincorporated	835193	Damasco St	832
Unincorporated	835193	E Campton St	465
Unincorporated	835193	E Elberland St	1309
Unincorporated	835193	E Hollingworth St	1799
Unincorporated	835193	E Valley View St	274
Unincorporated	835193	Elizondo St	776
Unincorporated	835193	Eulita Ave	269
Unincorporated	835193	Faxina Ave	582
Unincorporated	835193	Fenmead St	177
Unincorporated	835193	Frankfurt Ave	2078

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835193	Gendel Dr	474
Unincorporated	835193	Grassmere Ave	384
Unincorporated	835193	Highcastle St	585
Unincorporated	835193	la Puente Rd	1693
Unincorporated	835193	N Addleman Ave	736
Unincorporated	835193	N Capron Ave	642
Unincorporated	835193	N Darney Ave	534
Unincorporated	835193	Northam St	2233
Unincorporated	835193	S Darney Ave	534
Unincorporated	835193	S Ellesford Ave	4
Unincorporated	835193	S Hackley Ave	10
Unincorporated	835193	S Nogales St	953
Unincorporated	835193	S Sentous Ave	80
Unincorporated	835193	Trish Way	28
Unincorporated	835193	Valleyview Ave	318
Unincorporated	835193	Woodside Park Dr	28
Unincorporated	835194		4591
Unincorporated	835194	Abert St	123
Unincorporated	835194	Adney St	360
Unincorporated	835194	Afelio Dr	181
Unincorporated	835194	Aguiro St	979
Unincorporated	835194	Ajanta Ave	602
Unincorporated	835194	Alcona St	742
Unincorporated	835194	Alexdale Ln	783
Unincorporated	835194	Allwood Ct	78
Unincorporated	835194	Andrada Dr	558
Unincorporated	835194	Bachelin St	359
Unincorporated	835194	Baelen St	508
Unincorporated	835194	Balan Rd	589
Unincorporated	835194	Barroso St	832
Unincorporated	835194	Betley St	252
Unincorporated	835194	Bolanos Ave	3739
Unincorporated	835194	Bold St	482
Unincorporated	835194	Camwood Ave	528
Unincorporated	835194	Cancela Pl	77
Unincorporated	835194	Cardona St	319
Unincorporated	835194	Carreta Dr	270
Unincorporated	835194	Carvin Ave	261
Unincorporated	835194	Colima Rd	2622
Unincorporated	835194	Dairen St	646
Unincorporated	835194	Daisetta St	469
Unincorporated	835194	Dakin St	146
Unincorporated	835194	Desire Ave	53
Unincorporated	835194	E Labin Ct	430
Unincorporated	835194	Eadbury Ave	939
Unincorporated	835194	Edmore Ave	961
Unincorporated	835194	Electra Ave	629
Unincorporated	835194	Fadden St	374
Unincorporated	835194	Felch Ave	364
Unincorporated	835194	Galatina St	707
Unincorporated	835194	Gale Ave	406
Unincorporated	835194	Greenbay Dr	751
Unincorporated	835194	Greencastle Ave	2556
Unincorporated	835194	Greengate Dr	319
Unincorporated	835194	Greenport Ave	1609
Unincorporated	835194	Heatherton Ave	1351
Unincorporated	835194	Hillman Ln	355
Unincorporated	835194	Honore St	894
Unincorporated	835194	Ivory	91
Unincorporated	835194	Killian Ave	1058
Unincorporated	835194	Kim Ct	173
Unincorporated	835194	la Guardia St	2059
Unincorporated	835194	Labin Ct	456
Unincorporated	835194	Larne St	348
Unincorporated	835194	Lerona Ave	2027

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835194	Leslie Ln	277
Unincorporated	835194	Mandy St	158
Unincorporated	835194	Nogales St	186
Unincorporated	835194	Nowell Ave	2137
Unincorporated	835194	Nunez Dr	157
Unincorporated	835194	Oak View Ln	58
Unincorporated	835194	Orbit Ct	161
Unincorporated	835194	Otterbein Ave	2858
Unincorporated	835194	Paso Real Ave	4867
Unincorporated	835194	Pathfinder Rd	1401
Unincorporated	835194	Pilario St	486
Unincorporated	835194	Radby St	774
Unincorporated	835194	Raleo Ave	1154
Unincorporated	835194	Remo Ave	364
Unincorporated	835194	Ridgeview Ave	28
Unincorporated	835194	Rio Seco Dr	1023
Unincorporated	835194	Routh Dr	3
Unincorporated	835194	S Nogales St	5834
Unincorporated	835194	Songbird Ln	141
Unincorporated	835194	Springport Dr	1371
Unincorporated	835194	Trot Ave	389
Unincorporated	835194	Valencia St	2904
Unincorporated	835194	Villa Clara St	446
Unincorporated	835194	Well St	460
Unincorporated	835194	Windrose Dr	358
Unincorporated	835195	E Valley View St	341
Unincorporated	835195	N Darney Ave	220
Unincorporated	835195	S Darney Ave	220
Unincorporated	835195	Valleyview Ave	401
Unincorporated	835196		1016
Unincorporated	835196	Abdera St	521
Unincorporated	835196	Abelian Ave	335
Unincorporated	835196	Addis St	44
Unincorporated	835196	Ajanta Ave	262
Unincorporated	835196	Aldora Dr	648
Unincorporated	835196	Andrada Dr	480
Unincorporated	835196	Banida Ave	1058
Unincorporated	835196	Breckelle St	41
Unincorporated	835196	Camerons St	365
Unincorporated	835196	Carreta Dr	546
Unincorporated	835196	Carvin Ave	189
Unincorporated	835196	Colima Rd	2585
Unincorporated	835196	Companario Dr	492
Unincorporated	835196	Cone St	161
Unincorporated	835196	Custoza Ave	1944
Unincorporated	835196	Daisetta St	719
Unincorporated	835196	Electra Ave	240
Unincorporated	835196	Ellesford Ave	134
Unincorporated	835196	Gale Ave	728
Unincorporated	835196	Greyhall St	253
Unincorporated	835196	Jodi St	370
Unincorporated	835196	Labin Ct	1
Unincorporated	835196	Montell Ct	99
Unincorporated	835196	Otterbein Ave	3276
Unincorporated	835196	Pilario St	860
Unincorporated	835196	Raleo Ave	549
Unincorporated	835196	S Nogales St	276
Unincorporated	835196	S Otterbein Ave	2284
Unincorporated	835196	Tranbarger St	448
Unincorporated	835196	Valencia St	686
Unincorporated	835197		3884
Unincorporated	835197	Abert St	452
Unincorporated	835197	Addis St	1096
Unincorporated	835197	Andrada Dr	312
Unincorporated	835197	Annadel Ave	3163

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835197	Arcdale Ave	2166
Unincorporated	835197	Baelen St	800
Unincorporated	835197	Balan Rd	1876
Unincorporated	835197	Banida Ave	1932
Unincorporated	835197	Bellavista Dr	34
Unincorporated	835197	Bluehaven Dr	2359
Unincorporated	835197	Bluffwood St	1506
Unincorporated	835197	Bomar Ct	216
Unincorporated	835197	Brea Canyon Cut-Off Ct	21
Unincorporated	835197	Brea Canyon Cut Off Rd	1789
Unincorporated	835197	Brea Canyon Cutoff Rd	2414
Unincorporated	835197	Brisa Ln	60
Unincorporated	835197	Calmette Ave	1133
Unincorporated	835197	Camwood Ave	1096
Unincorporated	835197	Carly Ct	489
Unincorporated	835197	Carreta Dr	459
Unincorporated	835197	Carvin Ave	972
Unincorporated	835197	Castlebar Dr	332
Unincorporated	835197	Castlepeak St	880
Unincorporated	835197	Centre Dr	16
Unincorporated	835197	Clay Ct	19
Unincorporated	835197	Colima Rd	5534
Unincorporated	835197	Cone St	5
Unincorporated	835197	Coraview Ln	32
Unincorporated	835197	Corrinne Ln	84
Unincorporated	835197	Cronin Dr	1403
Unincorporated	835197	Dacian Dr	312
Unincorporated	835197	Dairen St	261
Unincorporated	835197	Debann Pl	143
Unincorporated	835197	Delamere Dr	1132
Unincorporated	835197	Donway Dr	231
Unincorporated	835197	E Castlebar Dr	332
Unincorporated	835197	E Crestline Dr	21
Unincorporated	835197	E Walnut Dr	838
Unincorporated	835197	E Walnut Dr N	2436
Unincorporated	835197	E Waterfall Way	27
Unincorporated	835197	Eadbury Ave	373
Unincorporated	835197	Edmore Ave	1035
Unincorporated	835197	Electra Ave	892
Unincorporated	835197	Emerald Meadow Dr	915
Unincorporated	835197	Esquiline Ave	549
Unincorporated	835197	Evening Breeze Dr	76
Unincorporated	835197	Fadden St	249
Unincorporated	835197	Fairway Dr	1925
Unincorporated	835197	Flintwood Dr	92
Unincorporated	835197	Gale Ave	399
Unincorporated	835197	Galeview Dr	525
Unincorporated	835197	Gene Ct	203
Unincorporated	835197	Gravina St	708
Unincorporated	835197	Greenwillow Ln	98
Unincorporated	835197	Greyhall St	413
Unincorporated	835197	Hallgreen Dr	701
Unincorporated	835197	Heathridge Cir	155
Unincorporated	835197	Hollandale Ave	1008
Unincorporated	835197	Huntcliff Ln	16
Unincorporated	835197	Iluso Ave	82
Unincorporated	835197	Joel Dr	317
Unincorporated	835197	Julie Dr	139
Unincorporated	835197	Katrine Cir	153
Unincorporated	835197	Kingsmill Ave	1370
Unincorporated	835197	la Guardia St	37
Unincorporated	835197	Lake Canyon Dr	796
Unincorporated	835197	Larmor Ave	536
Unincorporated	835197	Leanne Ter	37
Unincorporated	835197	Lindengrove Ave	1528

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835197	Mairemont Dr	65
Unincorporated	835197	Markstay St	1204
Unincorporated	835197	Mary Ann Ln	26
Unincorporated	835197	Missionary Ridge Rd	32
Unincorporated	835197	Nacora St	1166
Unincorporated	835197	Nausika Ave	1195
Unincorporated	835197	Newbridge Cir	129
Unincorporated	835197	Newgarden St	888
Unincorporated	835197	Oakburn Dr	900
Unincorporated	835197	Pathfinder Rd	382
Unincorporated	835197	Pepperdale Dr	3049
Unincorporated	835197	Pilario St	852
Unincorporated	835197	Portside Dr	26
Unincorporated	835197	Prosa Ct	124
Unincorporated	835197	Quicksilver Ln	678
Unincorporated	835197	Raskin Dr	489
Unincorporated	835197	Reedview Dr	575
Unincorporated	835197	Rhapsody Rd	109
Unincorporated	835197	Robert Rd	228
Unincorporated	835197	Rogan Ct	355
Unincorporated	835197	Rudy St	65
Unincorporated	835197	Ruth Ct	4
Unincorporated	835197	S Cronin Dr	34
Unincorporated	835197	S Hillrise Dr	37
Unincorporated	835197	S Nogales St	740
Unincorporated	835197	S Otterbein Ave	1182
Unincorporated	835197	S Pepperdale Dr	27
Unincorporated	835197	San Jose Ave	3721
Unincorporated	835197	Sand Spring Dr	1167
Unincorporated	835197	Searls Dr	2124
Unincorporated	835197	Sekio Ave	982
Unincorporated	835197	Shelyn Dr	694
Unincorporated	835197	Sirius Dr	138
Unincorporated	835197	Springport Dr	1094
Unincorporated	835197	Starshine Rd	7
Unincorporated	835197	Tarta Ct	20
Unincorporated	835197	Temre Ln	226
Unincorporated	835197	Thelma Ln	111
Unincorporated	835197	Tranbarger St	1057
Unincorporated	835197	Walnut Dr	3991
Unincorporated	835197	Walnut Leaf Dr	725
Unincorporated	835197	Windrose Dr	223
Unincorporated	835197	Wineglow Cir	129
Unincorporated	835197	Wright Way	14
Unincorporated	835197	Ybarra Dr	1920
Unincorporated	835198		30
Unincorporated	835198	Chapel Hill Dr	454
Unincorporated	835198	Colima Rd	1153
Unincorporated	835198	Fairway Dr	61
Unincorporated	835198	Iluso Ave	71
Unincorporated	835198	Leanne Ter	413
Unincorporated	835198	Moscada Ave	194
Unincorporated	835198	Padrino Ave	364
Unincorporated	835198	Prosa Ct	9
Unincorporated	835198	Tam O Shanter Dr	218
Unincorporated	835198	Tierra Cima	301
Unincorporated	835198	Tierra Luna	300
Unincorporated	835198	Tierra Siesta	110
Unincorporated	835198	Walnut Dr	325
Unincorporated	835198	Walnut Leaf Dr	567
Unincorporated	835198	Wyn Ter	721
Unincorporated	835199		23
Unincorporated	835199	Castlehill St	16
Unincorporated	835200		29
Unincorporated	835201	Lemon Ave	25

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835202	Cam de Gloria	8
Unincorporated	835202	Cam de Teodoro	8
Unincorporated	835205		129
Unincorporated	835205	Brea Canyon Rd	1220
Unincorporated	835205	Commerce Pointe Dr	1314
Unincorporated	835205	Currier Rd	1084
Unincorporated	835205	Lemon Ave	27
Unincorporated	835205	Old Ranch Rd	89
Unincorporated	835205	Pso Sonrisa	22
Unincorporated	835205	Pso Tesoro	29
Unincorporated	835205	Somerset Dr	15
Unincorporated	835205	Spr Trail Ave	34
Unincorporated	835205	Valley Blvd	5115
Unincorporated	835207		33
Unincorporated	835207	N Grand Ave	199
Unincorporated	835207	Spr Trail Ave	7
Unincorporated	835207	Valley Blvd	1556
Unincorporated	835207	W Temple Ave	2590
Unincorporated	835208	Faure Ave	6
Unincorporated	835208	Valley Blvd	1538
Unincorporated	835208	W Temple Ave	1529
Unincorporated	835222	Butte St	27
Unincorporated	835222	Fox Park Dr	571
Unincorporated	835222	Foxpark Dr	571
Unincorporated	835222	Lynoak Dr	376
Unincorporated	835222	N Towne Ave	629
Unincorporated	835222	N Woodbend Ave	540
Unincorporated	835222	Silverdale Dr	448
Unincorporated	835222	Towne Ave	629
Unincorporated	835222	W Richbrook Dr	791
Unincorporated	835222	Woodbend Dr	540
Unincorporated	835224	Grand Ave	4
Unincorporated	835224	Live Oak Dr	121
Unincorporated	835224	Mount Baldy Rd	98
Unincorporated	835224	N Mountain Ave	47
Unincorporated	835224	Olive Hill Dr	170
Unincorporated	835224	Olive Knoll Pl	10
Unincorporated	835224	Rhodelia Ave	28
Unincorporated	835224	Via Padova	1265
Unincorporated	835224	Webb Canyon Rd	462
Unincorporated	835225	Calspar St	541
Unincorporated	835225	Catania Pl	125
Unincorporated	835225	N Mountain Ave	1283
Unincorporated	835225	Rhodelia Ave	943
Unincorporated	835225	Rockmont Ave	1549
Unincorporated	835225	Sage St	119
Unincorporated	835225	Silver Tree St	664
Unincorporated	835225	Towne Ave	220
Unincorporated	835225	W Sage St	543
Unincorporated	835226		85
Unincorporated	835226	Basetdale Ave	1588
Unincorporated	835226	Eaglemount Dr	216
Unincorporated	835226	Oakman Dr	273
Unincorporated	835226	S Belgreen Dr	1773
Unincorporated	835226	S Caraway Dr	2010
Unincorporated	835226	S Cunningham Dr	1670
Unincorporated	835226	Vinemead Dr	1111
Unincorporated	835227		8837
Unincorporated	835227	3rd Ave	1235
Unincorporated	835227	4th Ave	1363
Unincorporated	835227	Alanwood Rd	2769
Unincorporated	835227	Arciero	483
Unincorporated	835227	Arciero Dr	274
Unincorporated	835227	Arlista St	463
Unincorporated	835227	Austen Way	33

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835227	Basetdale Ave	2759
Unincorporated	835227	Beckner St	663
Unincorporated	835227	Benbrook Dr	245
Unincorporated	835227	Bielec Ln	4
Unincorporated	835227	Bravo St	28
Unincorporated	835227	Cll Verde	145
Unincorporated	835227	Clogston Dr	1000
Unincorporated	835227	Cobb Ct	41
Unincorporated	835227	Coberta Ave	81
Unincorporated	835227	Deepriver Dr	647
Unincorporated	835227	Don Julian Rd	3793
Unincorporated	835227	Dovey Ave	190
Unincorporated	835227	E Arillo St	285
Unincorporated	835227	E Nelson Ave	1020
Unincorporated	835227	E Senora St	584
Unincorporated	835227	E Temple Ave	2787
Unincorporated	835227	Eckford St	457
Unincorporated	835227	Ector St	766
Unincorporated	835227	Flagstaff St	696
Unincorporated	835227	Flynn St	470
Unincorporated	835227	Giordano St	1275
Unincorporated	835227	Greendale Dr	2348
Unincorporated	835227	Gyna Ln	607
Unincorporated	835227	Hartsville St	811
Unincorporated	835227	Hilbert Ave	219
Unincorporated	835227	Hoig St	1210
Unincorporated	835227	Homeward St	990
Unincorporated	835227	Hutchcroft St	926
Unincorporated	835227	Karns Ave	737
Unincorporated	835227	Las Vecinas Dr	707
Unincorporated	835227	Lassalette St	868
Unincorporated	835227	Le Borgne Ave	1371
Unincorporated	835227	Levelwood St	430
Unincorporated	835227	Lomitas Ave	2519
Unincorporated	835227	Mackenzie Ct	365
Unincorporated	835227	Merville Dr	628
Unincorporated	835227	Millbury Ave	3575
Unincorporated	835227	Moccasin St	1916
Unincorporated	835227	N Big Dalton Ave	2475
Unincorporated	835227	N Mason Way	3
Unincorporated	835227	N Stichman Ave	668
Unincorporated	835227	Obar Dr	445
Unincorporated	835227	Orange Blossom Ave	2639
Unincorporated	835227	Oranut Ln	61
Unincorporated	835227	Pamela Kay Ln	1813
Unincorporated	835227	Peckam Dr	2815
Unincorporated	835227	Pencin Dr	320
Unincorporated	835227	Prichard St	696
Unincorporated	835227	Proctor Ave	3746
Unincorporated	835227	Ramada Ave	485
Unincorporated	835227	S 2nd Ave	736
Unincorporated	835227	S 3rd Ave	2181
Unincorporated	835227	S Basetdale Ave	1398
Unincorporated	835227	S Bassetdale Ave	616
Unincorporated	835227	S Belgreen Dr	465
Unincorporated	835227	S Coberta Ave	761
Unincorporated	835227	S Collwood Ave	1436
Unincorporated	835227	S Covina Blvd	1697
Unincorporated	835227	S Cunningham Dr	67
Unincorporated	835227	S Rall Ave	1931
Unincorporated	835227	S San Angelo Ave	2277
Unincorporated	835227	S San Fidel Ave	1668
Unincorporated	835227	S Siesta Ave	723
Unincorporated	835227	San Angelo Ave	1398
Unincorporated	835227	Santa Mariana Ave	2744

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835227	Spanish Oak Ln	30
Unincorporated	835227	Stichman Ave	763
Unincorporated	835227	Valley Blvd	2800
Unincorporated	835227	Van Wig Ave	1791
Unincorporated	835227	Vineland Ave	883
Unincorporated	835227	Vinemead Dr	324
Unincorporated	835227	Workman Mill Rd	5622
Unincorporated	835228		696
Unincorporated	835228	Amar Rd	221
Unincorporated	835228	Ardilla Ave	3015
Unincorporated	835228	Barrydale St	3302
Unincorporated	835228	Bromley Ave	1356
Unincorporated	835228	Cagliero St	267
Unincorporated	835228	Dancer St	1073
Unincorporated	835228	Dillerdale St	1281
Unincorporated	835228	Donaldale St	1981
Unincorporated	835228	E Blackwood St	966
Unincorporated	835228	E Hayland St	629
Unincorporated	835228	Edanruth Ave	2218
Unincorporated	835228	Fairgrove Ave	2997
Unincorporated	835228	Janetdale St	863
Unincorporated	835228	Joycedale St	1006
Unincorporated	835228	Lang Ave	862
Unincorporated	835228	Mayland Ave	2789
Unincorporated	835228	Meeker Ave	1812
Unincorporated	835228	N Orange Ave	325
Unincorporated	835228	N Puente Ave	1714
Unincorporated	835228	N Siesta Ave	2663
Unincorporated	835228	Nolandale St	998
Unincorporated	835228	Orange Ave	1625
Unincorporated	835228	Ragus Ave	430
Unincorporated	835228	Ragus St	2304
Unincorporated	835228	Rama Dr	1135
Unincorporated	835228	Rath St	1229
Unincorporated	835228	S Conlon Ave	1
Unincorporated	835228	S Lang Ave	1
Unincorporated	835228	S Orange Ave	326
Unincorporated	835228	S Sunset Ave	1
Unincorporated	835228	S Willow Ave	516
Unincorporated	835228	Sandia Ave	1995
Unincorporated	835228	Sandsprings Dr	1736
Unincorporated	835228	Sauder St	206
Unincorporated	835228	Shaver St	1198
Unincorporated	835228	Snowdale St	1055
Unincorporated	835228	Sunkist Ave	2994
Unincorporated	835228	Tamar Dr	529
Unincorporated	835228	W Fairgrove Ave	1135
Unincorporated	835228	Willow Ave	3124
Unincorporated	835229	Valley Blvd	62
Unincorporated	835360	Amar Rd	0
Unincorporated	835362		4307
Unincorporated	835362	Amar Rd	2180
Unincorporated	835362	Barrydale St	1576
Unincorporated	835362	Bess St	368
Unincorporated	835362	Cagliero St	1880
Unincorporated	835362	Dancer St	498
Unincorporated	835362	Daum Dr	17
Unincorporated	835362	Dillerdale St	463
Unincorporated	835362	Donaldale St	472
Unincorporated	835362	Fairgrove Ave	908
Unincorporated	835362	Flanner St	721
Unincorporated	835362	Janetdale St	466
Unincorporated	835362	Joycedale St	477
Unincorporated	835362	Judith St	1818
Unincorporated	835362	Le Borgne Ave	3233

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835362	Millbury Ave	3974
Unincorporated	835362	N Ahern Dr	2212
Unincorporated	835362	N Baldwin Park Blvd	70
Unincorporated	835362	N Big Dalton Ave	2636
Unincorporated	835362	N Feather Ave	2166
Unincorporated	835362	N Puente Ave	1126
Unincorporated	835362	N Stichman Ave	3123
Unincorporated	835362	Nolandale St	469
Unincorporated	835362	Orange Blossom Ave	1551
Unincorporated	835362	Ragus St	512
Unincorporated	835362	Rath St	2217
Unincorporated	835362	Sauder St	843
Unincorporated	835362	Shaver St	403
Unincorporated	835362	Snowdale St	212
Unincorporated	835362	Van Wig Ave	4183
Unincorporated	835362	Vineland Ave	2895
Unincorporated	835362	Whitesell St	588
Unincorporated	835366	Baldwin Park Blvd	71
Unincorporated	835366	Daum Dr	11
Unincorporated	835366	N Baldwin Park Blvd	228
Unincorporated	835366	Vineland Ave	334
Unincorporated	835367		47
Unincorporated	835367	Big Dalton Ave	30
Unincorporated	835367	Francisquito Ave	1115
Unincorporated	835367	N Orange Ave	19
Unincorporated	835367	N Willow Ave	2
Unincorporated	835367	S Orange Ave	22
Unincorporated	835367	S Willow Ave	28
Unincorporated	835367	Van Wig Ave	36
Unincorporated	835367	W Francisquito Ave	481
Unincorporated	835367	Willow Ave	26
Unincorporated	835371		455
Unincorporated	835371	E Badillo St	2341
Unincorporated	835371	E Grovecenter St	948
Unincorporated	835371	N Conlon Ave	360
Unincorporated	835371	N Frijo Ave	451
Unincorporated	835371	N Lang Ave	455
Unincorporated	835371	N Orange Ave	662
Unincorporated	835371	Nora Ave	39
Unincorporated	835371	W Badillo St	2
Unincorporated	835371	W Grovecenter St	2
Unincorporated	835376		436
Unincorporated	835376	E Badillo St	4438
Unincorporated	835376	E Elgenia St	2120
Unincorporated	835376	E Grovecenter St	830
Unincorporated	835376	Ellen Dr	53
Unincorporated	835376	Morada Ave	47
Unincorporated	835376	N Broadmoor Ave	415
Unincorporated	835376	N Greenberry Ave	403
Unincorporated	835376	N Hartley Ave	443
Unincorporated	835376	N Irwindale Ave	682
Unincorporated	835376	N Morada Ave	396
Unincorporated	835376	N Shadydale Ave	340
Unincorporated	835376	N Sunset Ave	51
Unincorporated	835376	N Walnuthaven Dr	407
Unincorporated	835376	W Badillo St	273
Unincorporated	835376	Walnuthaven Dr	55
Unincorporated	835376	Woodgrove Ave	56
Unincorporated	835384		383
Unincorporated	835384	E Cameron Ave	228
Unincorporated	835386		440
Unincorporated	835386	E Casad Ave	427
Unincorporated	835386	E Navilla Pl	412
Unincorporated	835386	E Puente Ave	137
Unincorporated	835386	E Puente St	1123

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835386	E Rowland St	1090
Unincorporated	835386	E Swanee Ln	443
Unincorporated	835386	E Thelborn St	616
Unincorporated	835386	Level St	420
Unincorporated	835386	N de Lay Ave	1527
Unincorporated	835386	N Grand Ave	44
Unincorporated	835386	S de Lay Ave	128
Unincorporated	835386	S Oak Tree Dr	53
Unincorporated	835387		1018
Unincorporated	835387	Bellbrook St	235
Unincorporated	835387	E Badillo St	1900
Unincorporated	835387	E Benbow St	592
Unincorporated	835387	E Benwood St	216
Unincorporated	835387	E Brookport St	553
Unincorporated	835387	E Cypress St	1495
Unincorporated	835387	E Dexter St	886
Unincorporated	835387	E Ruddock St	412
Unincorporated	835387	Glen Arden Ave	1559
Unincorporated	835387	Lyman St	154
Unincorporated	835387	N Asherton Ave	1210
Unincorporated	835387	N Castleview Ave	395
Unincorporated	835387	N Lyman Ave	154
Unincorporated	835387	N Sunflower Ave	1157
Unincorporated	835387	W Badillo St	746
Unincorporated	835387	W Cypress St	1082
Unincorporated	835389		1551
Unincorporated	835389	A St	31
Unincorporated	835389	Bonnie Cove Ave	2084
Unincorporated	835389	C St	44
Unincorporated	835389	Calora St	844
Unincorporated	835389	D St	50
Unincorporated	835389	Darfield Ave	213
Unincorporated	835389	E Calora St	1426
Unincorporated	835389	E Cienega Ave	1982
Unincorporated	835389	E Covina Blvd	1974
Unincorporated	835389	E Nubia St	228
Unincorporated	835389	E St	47
Unincorporated	835389	E Stephanie Dr	1291
Unincorporated	835389	E Venton St	385
Unincorporated	835389	F St	45
Unincorporated	835389	Fletcher Park Way	144
Unincorporated	835389	Heritage Way	1
Unincorporated	835389	N Banna Ave	1236
Unincorporated	835389	N Bonnie Cove Ave	849
Unincorporated	835389	N Darfield Ave	566
Unincorporated	835389	N Glendora Ave	1157
Unincorporated	835389	N Henton Ave	544
Unincorporated	835389	N Ivescrest Ave	428
Unincorporated	835389	N Kidder Ave	437
Unincorporated	835389	N Kinsella Ave	534
Unincorporated	835389	N Langham Ave	697
Unincorporated	835389	N Mangrove Ave	2083
Unincorporated	835389	N Rimhurst Ave	1477
Unincorporated	835389	New Castle Ln	34
Unincorporated	835389	Stephanie Dr	6
Unincorporated	835389	Tudor St	631
Unincorporated	835390		6394
Unincorporated	835390	Bonnie Cove Ave	1127
Unincorporated	835390	Calora St	2625
Unincorporated	835390	Candish Ave	45
Unincorporated	835390	Castleview Ave	847
Unincorporated	835390	E Arrow Hwy	5239
Unincorporated	835390	E Cienega Ave	4364
Unincorporated	835390	E Cloverton St	418
Unincorporated	835390	E Covina Blvd	2321

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835390	E Cypress St	8
Unincorporated	835390	E Nubia St	1492
Unincorporated	835390	Ford Way	24
Unincorporated	835390	Garsden Ave	848
Unincorporated	835390	Glen Arden Ave	1007
Unincorporated	835390	Greenhaven St	665
Unincorporated	835390	Greenpark Ave	422
Unincorporated	835390	Greer Ave	1225
Unincorporated	835390	Heritage Way	68
Unincorporated	835390	Lyman Ave	1301
Unincorporated	835390	N Asherton Ave	327
Unincorporated	835390	N Bonnie Cove Ave	1127
Unincorporated	835390	N Burnaby Dr	1418
Unincorporated	835390	N Glen Arden Ave	285
Unincorporated	835390	N Reeder Ave	462
Unincorporated	835390	N Stephora Ave	414
Unincorporated	835390	N Sunflower Ave	1936
Unincorporated	835390	N Treanor Ave	898
Unincorporated	835390	S Sunflower Ave	74
Unincorporated	835390	Stephanie Dr	1955
Unincorporated	835390	Stephora Ave	152
Unincorporated	835390	Strawberry Ln	98
Unincorporated	835390	Tudor St	2025
Unincorporated	835390	Venton St	401
Unincorporated	835390	W Covina Blvd	1953
Unincorporated	835390	Willow Ave	672
Unincorporated	835391	E Hurst St	1017
Unincorporated	835391	N Brightview Dr	446
Unincorporated	835391	N Delay Ave	498
Unincorporated	835391	N Glenvina Ave	437
Unincorporated	835391	N Linda Ter Dr	442
Unincorporated	835392		1758
Unincorporated	835392	A St	9
Unincorporated	835392	Arroway Ave	1047
Unincorporated	835392	Bender Ave	1322
Unincorporated	835392	C St	11
Unincorporated	835392	Calora St	27
Unincorporated	835392	D St	11
Unincorporated	835392	Dodsworth Ave	357
Unincorporated	835392	E Bellbrook St	160
Unincorporated	835392	E Benwood St	175
Unincorporated	835392	E Brookport St	164
Unincorporated	835392	E Calora St	601
Unincorporated	835392	E Cienega Ave	1951
Unincorporated	835392	E Covina Blvd	1064
Unincorporated	835392	E Cypress St	635
Unincorporated	835392	E Greenhaven St	28
Unincorporated	835392	E Groverdale St	35
Unincorporated	835392	E Hurst St	81
Unincorporated	835392	E St	9
Unincorporated	835392	E Tudor St	24
Unincorporated	835392	F St	7
Unincorporated	835392	Greenhaven St	404
Unincorporated	835392	Groverdale St	1172
Unincorporated	835392	Jenifer Ave	1026
Unincorporated	835392	N Bender Ave	25
Unincorporated	835392	N Farber Ave	360
Unincorporated	835392	N Grand Ave	2829
Unincorporated	835392	N Linda Lou Ave	46
Unincorporated	835392	N Westridge Ave	872
Unincorporated	835392	Nearglen Ave	1582
Unincorporated	835392	Stephanie Dr	358
Unincorporated	835392	Tudor St	403
Unincorporated	835393		1019
Unincorporated	835393	Allman Pl	380

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835393	Cameron Ave	873
Unincorporated	835393	E Acridge Dr	87
Unincorporated	835393	E Cameron Ave	227
Unincorporated	835393	E Cortez St	44
Unincorporated	835393	E Covina Hills Rd	2568
Unincorporated	835393	E Dameral Dr	72
Unincorporated	835393	E Golden Bough Dr	886
Unincorporated	835393	E Holt Ave	280
Unincorporated	835393	E Limecrest Dr	251
Unincorporated	835393	E Lorencita Dr	1186
Unincorporated	835393	E Rancho Los Cerritos Rd	988
Unincorporated	835393	E Rancho San Jose Dr	1531
Unincorporated	835393	E Sunset Hill Dr	81
Unincorporated	835393	E Via Verde St	228
Unincorporated	835393	Hillside Dr	1
Unincorporated	835393	Jalapa Dr	19
Unincorporated	835393	Los Lomitas Way	32
Unincorporated	835393	N Cameron Ave	412
Unincorporated	835393	N Grand Ave	4526
Unincorporated	835393	N Monte Verde Dr	336
Unincorporated	835393	N Palomino Dr	7
Unincorporated	835393	N Rancho el Encino Dr	208
Unincorporated	835393	N Rancho la Carlota Rd	1213
Unincorporated	835393	N Theodora Dr	27
Unincorporated	835393	Rancho del Monico Rd	1009
Unincorporated	835393	Rancho Rio Bonita Rd	1218
Unincorporated	835393	Rancho Santoro Dr	223
Unincorporated	835393	S Buenos Aires Dr	81
Unincorporated	835393	S Grand Ave	905
Unincorporated	835393	S Monte Verde Dr	87
Unincorporated	835393	S Monte Verde St	324
Unincorporated	835393	Via Caballos St	34
Unincorporated	835394		25
Unincorporated	835394	Bender Ave	530
Unincorporated	835394	Calmgrove Ave	473
Unincorporated	835394	Danehurst Ave	371
Unincorporated	835394	Deepview Ln	522
Unincorporated	835394	E Covina Hills Rd	1092
Unincorporated	835394	E Navilla Pl	1230
Unincorporated	835394	E Rambling Rd	1991
Unincorporated	835394	E Rowland St	31
Unincorporated	835394	Gila Dr	144
Unincorporated	835394	N Grand Ave	608
Unincorporated	835394	N Linton Dr	256
Unincorporated	835394	N Madill Ave	292
Unincorporated	835394	N Muse Dr	147
Unincorporated	835394	N San Joaquin Rd	1852
Unincorporated	835394	N Westridge Ave	531
Unincorporated	835394	Navilla Pl	138
Unincorporated	835394	Nearglen Ave	365
Unincorporated	835394	Rancho del Monico Rd	270
Unincorporated	835394	Rancho la Floresta Rd	155
Unincorporated	835394	Rancho Rio Bonita Rd	359
Unincorporated	835394	S Grand Ave	720
Unincorporated	835394	S Rancho del Monico Rd	187
Unincorporated	835394	San Joaquin Rd	22
Unincorporated	835394	Shadyglen Dr	517
Unincorporated	835394	Shouse Ave	305
Unincorporated	835394	Solano Pl	238
Unincorporated	835394	Squire Dr	794
Unincorporated	835395		296
Unincorporated	835395	Adams Park Dr	27
Unincorporated	835395	Boxelder Ln	85
Unincorporated	835395	Covina Hills Rd	381
Unincorporated	835395	E Adams Park Dr	27

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835395	E Cloverland Dr	2124
Unincorporated	835395	E Covina Hills Rd	647
Unincorporated	835395	E Mesarica Rd	2167
Unincorporated	835395	E Renshaw St	236
Unincorporated	835395	E Rimpath Dr	809
Unincorporated	835395	E Via Verde St	452
Unincorporated	835395	Lyman St	307
Unincorporated	835395	Mesarica Rd	2167
Unincorporated	835395	N Briarpath Ave	619
Unincorporated	835395	N Lyman Ave	135
Unincorporated	835395	N Lyman St	172
Unincorporated	835395	N Sunflower Ave	261
Unincorporated	835395	N Woodhurst Dr	1086
Unincorporated	835395	Nottingham Ln	10
Unincorporated	835395	Pso Victoria	16
Unincorporated	835395	Scarborough Ln	25
Unincorporated	835395	Via Verde	14
Unincorporated	835396		117
Unincorporated	835396	E Arrow Hwy	33
Unincorporated	835396	E Badillo St	26
Unincorporated	835396	E Cienega Ave	35
Unincorporated	835396	E Covina Blvd	26
Unincorporated	835396	Greenhaven St	29
Unincorporated	835396	N Valley Center Ave	1368
Unincorporated	835396	S Valley Center Ave	3118
Unincorporated	835396	W Arrow Hwy	26
Unincorporated	835396	W Badillo St	65
Unincorporated	835396	W Cienega Ave	23
Unincorporated	835396	W Covina Blvd	56
Unincorporated	835396	W Tudor St	24
Unincorporated	835401		35
Unincorporated	835401	Stephens Ranch Rd	2353
Unincorporated	835405	Briney Point Rd	20
Unincorporated	835405	Broken Spur Rd	190
Unincorporated	835405	Glen Ivy St	579
Unincorporated	835405	Japonica Ave	81
Unincorporated	835405	Realitos Dr	728
Unincorporated	835405	Roughrider Rd	323
Unincorporated	835405	Smoketree Dr	1097
Unincorporated	835405	St Mark Ave	67
Unincorporated	835405	Summit Rd	899
Unincorporated	835405	Wagon Horse Ave	173
Unincorporated	835405	Williams Ave	932
Unincorporated	835406	Summit Rd	25
Unincorporated	835408		19
Unincorporated	835408	Live Oak Canyon Rd	95
Unincorporated	835408	Live Oak Dr	383
Unincorporated	835409		37
Unincorporated	835409	Glen Ivy St	68
Unincorporated	835409	Live Oak Canyon Rd	346
Unincorporated	835409	Live Oak Dr	7
Unincorporated	835409	Miller Ranch Rd	62
Unincorporated	835409	Summit Rd	618
Unincorporated	835409	Webb Canyon Rd	103
Unincorporated	835409	Williams Ave	54
Unincorporated	835410		101
Unincorporated	835410	Allen Ave	252
Unincorporated	835410	Bellgrove St	544
Unincorporated	835410	Cambert St	648
Unincorporated	835410	Carlet St	188
Unincorporated	835410	Damien Ave	1335
Unincorporated	835410	Donley St	194
Unincorporated	835410	E Allen Ave	19
Unincorporated	835410	E Gladstone St	2063
Unincorporated	835410	E Juanita Ave	239

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835410	Fernshaw Dr	905
Unincorporated	835410	Fordland Ave	1866
Unincorporated	835410	Forestdale St	15
Unincorporated	835410	Gaillard St	600
Unincorporated	835410	Ghent St	839
Unincorporated	835410	Glenlea St	1293
Unincorporated	835410	Herbine St	343
Unincorporated	835410	Lesmar Dr	490
Unincorporated	835410	Lyford Dr	1918
Unincorporated	835410	Payson St	212
Unincorporated	835410	Ramona Ave	1325
Unincorporated	835411	Forestdale St	434
Unincorporated	835411	Sedalia Ave	114
Unincorporated	835423		21778
Unincorporated	835423	Aspan Ave	1633
Unincorporated	835423	Ballentine Pl	1650
Unincorporated	835423	Bellechasse Ave	453
Unincorporated	835423	Bridger St	577
Unincorporated	835423	Brookport St	1473
Unincorporated	835423	Clovermead St	1638
Unincorporated	835423	Coney Ave	856
Unincorporated	835423	Conlon Ave	495
Unincorporated	835423	Coolfield Dr	777
Unincorporated	835423	Covina Blvd	66
Unincorporated	835423	Cypress St	291
Unincorporated	835423	David St	1
Unincorporated	835423	E Badillo St	1116
Unincorporated	835423	E Bellbrook St	1178
Unincorporated	835423	E Benbow St	3008
Unincorporated	835423	E Benwood St	1174
Unincorporated	835423	E Bridger St	129
Unincorporated	835423	E Clovermead St	1831
Unincorporated	835423	E Covina Blvd	3446
Unincorporated	835423	E Cypress St	6254
Unincorporated	835423	E Edna Pl	6625
Unincorporated	835423	E Greenhaven St	481
Unincorporated	835423	E Griswold Rd	243
Unincorporated	835423	E Groverdale St	475
Unincorporated	835423	E Queenside Dr	811
Unincorporated	835423	E San Bernardino Rd	649
Unincorporated	835423	E Tudor St	483
Unincorporated	835423	Edenfield Ave	313
Unincorporated	835423	Ellen Dr	1921
Unincorporated	835423	Foxdale Ave	1022
Unincorporated	835423	Fredkin Dr	317
Unincorporated	835423	Frijo Ave	486
Unincorporated	835423	Greenberry Ave	598
Unincorporated	835423	Irwindale Ave	1346
Unincorporated	835423	Kelby St	251
Unincorporated	835423	Kingside Dr	3626
Unincorporated	835423	Lang Ave	706
Unincorporated	835423	Larkin Dr	2436
Unincorporated	835423	McGill St	526
Unincorporated	835423	Morada Ave	2055
Unincorporated	835423	N Albertson Ave	328
Unincorporated	835423	N Aldenville Ave	367
Unincorporated	835423	N Armel Dr	195
Unincorporated	835423	N Brightview Dr	1191
Unincorporated	835423	N Broadmoor Ave	1810
Unincorporated	835423	N Calvados Ave	1291
Unincorporated	835423	N Carvol Dr	143
Unincorporated	835423	N Conwell Ave	2788
Unincorporated	835423	N Delay Ave	1252
Unincorporated	835423	N Duna Dr	116
Unincorporated	835423	N Duxford Ave	717

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835423	N Eastbury Ave	1058
Unincorporated	835423	N Edenfield Ave	507
Unincorporated	835423	N Elspeth Way	714
Unincorporated	835423	N Fenimore Ave	901
Unincorporated	835423	N Fircroft Ave	1580
Unincorporated	835423	N Glenfinnan Ave	1143
Unincorporated	835423	N Hartley Ave	1884
Unincorporated	835423	N Heathdale Ave	1353
Unincorporated	835423	N Hollenbeck Ave	2918
Unincorporated	835423	N Irwindale Ave	1063
Unincorporated	835423	N Lark Ellen Ave	1253
Unincorporated	835423	N Lark Ellen Ln	46
Unincorporated	835423	N Lyall Ave	145
Unincorporated	835423	N Midsite Ave	1549
Unincorporated	835423	N Orange Ave	280
Unincorporated	835423	N Rinard Ave	157
Unincorporated	835423	N Shadydale Ave	1216
Unincorporated	835423	N St Malo Ave	471
Unincorporated	835423	N Sunset Ave	449
Unincorporated	835423	N Trujillo Dr	523
Unincorporated	835423	N Vecino Dr	1373
Unincorporated	835423	N Vincent Ave	1713
Unincorporated	835423	N Vogue Ave	40
Unincorporated	835423	Nora Ave	1050
Unincorporated	835423	Queenside Dr	4591
Unincorporated	835423	Roxburgh Ave	1281
Unincorporated	835423	Shadydale Ave	348
Unincorporated	835423	St Malo Ave	308
Unincorporated	835423	Trujillo Dr	471
Unincorporated	835423	W Badillo St	2
Unincorporated	835423	W Clovermead St	131
Unincorporated	835423	W Covina Blvd	2556
Unincorporated	835423	W Edna Pl	11
Unincorporated	835423	W San Bernardino Rd	2625
Unincorporated	835423	W Village Ln	1
Unincorporated	835423	Walnuthaven Dr	984
Unincorporated	835423	Woodgrove Ave	1099
Unincorporated	835423	Yaleton Ave	973
Unincorporated	835428		725
Unincorporated	835428	Ballentine Pl	532
Unincorporated	835428	E Royal Estates Dr	56
Unincorporated	835428	E San Bernardino Rd	375
Unincorporated	835428	Foxdale Ave	16
Unincorporated	835428	Kingside Dr	55
Unincorporated	835428	Mc Gill St	489
Unincorporated	835428	N Irwindale Ave	544
Unincorporated	835428	Nora Ave	21
Unincorporated	835428	Queenside Dr	51
Unincorporated	835428	Ramona Blvd	1399
Unincorporated	835428	W San Bernardino Rd	1874
Unincorporated	835428	Yaleton Ave	638
Unincorporated	835432		4026
Unincorporated	835432	Coney Ave	1086
Unincorporated	835432	E Bellbrook St	4173
Unincorporated	835432	E Benbow St	3705
Unincorporated	835432	E Benwood St	3576
Unincorporated	835432	E Brookport St	2952
Unincorporated	835432	Ellen Dr	670
Unincorporated	835432	N Lark Ellen Ave	1290
Unincorporated	835432	N Trujillo Dr	867
Unincorporated	835432	N Vincent Ave	1268
Unincorporated	835432	N Vogue Ave	1137
Unincorporated	835432	Roxburgh Ave	1114
Unincorporated	835432	W Brookport St	470
Unincorporated	835438	S Barranca Ave	54

Group Member	Subwatershed	Street Name[2]	Centerline Length (feet)
Unincorporated	835453	N Vincent Ave	10
Unincorporated	835453	Vincent Ave	139
Unincorporated	835454	Lark Ellen Ave	269
Unincorporated	835454	N Lark Ellen Ave	48
Unincorporated	835458	S Barranca Avenue Glendora	0
Unincorporated	835458	W Arrow Hwy	40
Unincorporated	835459		504
Unincorporated	835459	N Brightview Dr	25
Unincorporated	835459	N Delay Ave	26
Unincorporated	835459	W Arrow Hwy	25
Unincorporated	835461		93
Unincorporated	835461	Arroway Ave	30
Unincorporated	835461	Arroway Ave Exd	91
Unincorporated	835461	B St	53
Unincorporated	835461	E Arrow Hwy	1651
Unincorporated	835461	Nearglen Ave	2
Unincorporated	835461	S Glendora Ave	36
Unincorporated	835463		2873
Unincorporated	835463	Bonnie Cove Ave	136
Unincorporated	835463	E Arrow Hwy	2644
Unincorporated	835463	N Banna Ave	47
Unincorporated	835463	N Glendora Ave	25
Unincorporated	835463	S Banna Ave	73
Unincorporated	835468	E Baseline Rd	1200
Unincorporated	835468	E Foothill Blvd	393
Unincorporated	835468	Lyford Dr	134
Unincorporated	835468	N San Dimas Canyon Rd	781
Unincorporated	835469	Lark Ellen Ave	45
Unincorporated	835489	Big Dalton Canyon Rd	6

Appendix C-6

Detailed Lists of Existing and Planned BMPs

APPENDIX C-6: DETAILED LIST OF EXISTING AND PLANNED CONTROL MEAUSURES

The lists below were prepared using the resources discussed in Appendix C-3, and organized as follows:

- **C-6-1: Detailed List of Existing Regional BMPs**
- **C-6-2: Detailed List of Planned Regional BMPs**
- **C-6-3: Detailed List of Existing Distributed BMPs**
- **C-6-4: Detailed List of Planned Distributed BMPs**

C-6-1: DETAILED LIST OF EXISTING REGIONAL BMPS IN UPPER SAN GABRIEL RIVER EWMP GROUP

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude and Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes	Information Needed to Evaluate Performance			
													Location Known?	Treatment Volume Known?	Footprint Known?	Drainage Area
R1	C	DR	Inf	StormTech MC3500 Chamber	34.079567, -117.890457	Infiltration of storm water. Removal of nutrients, pesticides, and sediment.		3			Semiannual inspections, at the beginning and end of the rainy season.		YES	NO	NO	NO
R2	C	DR	Inf	Storm Chamber	34.093338, -117.889832	Infiltration of stormwater, Removal of oil and grease, and sediment.	9/1/10	1	O	Optional outflow	Pre and post storm event, weekly during the rainy season, monthly during dry season.		YES	NO	NO	NO
R3	C	DR	Inf	StormTech DC-780 Chamber	34.103989, -117.903954	Infiltration of storm water. Removal of trash and debris, oil and grease, sediment, nutrients, metals, and pathogens.	4/16/10	1	B	Bypass to MS4	Bi-annually		YES	NO	NO	NO
R4	G	DR	Inf	Infiltration Facility	34.113922, -117.872668	Infiltration		Full Site	O	Outlets to the street.		Maxwell Plus Drainage System	YES	NO	NO	NO
R5	G	DR	Inf	Infiltration Basin	34.118555, -117.834909	Detention/ Infiltration		Full Site	O			Pompeii Park	YES	NO	NO	NO

Notes: C = Covina, G = Glendora, DR = Data Request; Inf = Infiltration, Unk = Unknown; E = Existing, P = Planned; B = Bypass, O = Overflow

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude and Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes	Information Needed to Evaluate Performance			
													Location Known?	Treatment Volume Known?	Footprint Known?	Drainage Area
R6	G	DR	Inf	Infiltration Basin	34.146981, -117.846631	Infiltration	NOC 1/10/12	1	O	12" PVC to Catch Basin on Sierra Madre	2 times/ year - April & October	Infiltration Basin at the Water Yard	YES	**NO**	**NO**	**NO**
R12	LA CF CD	IRW MP	Inf	Live Oak spreading ground improve-ements	34.12233, -117.74484	Infiltration	2/1/15					Added storage, efficient operations, and increased percolation rate.	YES	**NO**	**NO**	Yes

Notes: LACFCD = Los Angeles County Flood Control District; C = Covina, G = Glendora, DR = Data Request, Inf = Infiltration, Unk = Unknown, P = Planned; B = Bypass, O = Overflow, IRWMP = Integrated Regional Water Management Plan

C-6-2: DETAILED LIST OF PLANNED REGIONAL BMPS IN UPPER SAN GABRIEL RIVER EWMP GROUP

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude and Longitude)	Planned Completion	Comments and Notes	Information Needed to Evaluate Performance			
								Location Known?	Treatment Volume Known?	Footprint Known?	Drainage Area Known?
R7	LA CF CD	DR, IRWMP	Inf	Walnut Creek Spreading Basin Pump Station Project	34.074657, -117.874026	12/01/2016	Improvement of Walnut Spreading Basin will increase local groundwater supplies	YES	NO	NO	YES
R8	Un Inc	DR, WCA	WL	Projects being developed by the Watershed Conservation Authority (Duck Farm)	34.050093, -118.007176	--	--	YES	NO	YES	YES
R9	LA CF CD	IRWMP	Inf	Miller Pit Spreading Basins	34.12682, -117.94455	09/01/2017	The existing deep pits will be converted to spreading basins and an intake structure and pipeline will be constructed to divert storm water from the San Gabriel River. The pits will recharge water, while also serving as a sediment placement sites until enough material is imported to grade the pits into shallower spreading basins.	YES	NO	NO	NO
R10	LA CF CD	IRWMP	Inf	Olive Pit Water Conservation Park	34.09973, -117.94551	09/01/2025	The new spreading grounds will divert water from Big Dalton Wash for groundwater recharge. Recharging groundwater has multiple benefits including soil aquifer treatment that will remove contaminants such as metals and trash. Diverting the water from the channel also reduces the flood risk downstream of the facility. Also used as SPS for dams	YES	NO	NO	NO

Notes: LACFCD = Los Angeles County Flood Control District; Uninc = Unincorporated LA County; DR = Data Request; WCA = Watershed Conservation Authority website; Inf = Infiltration Facility; WL = Constructed Wetland, IRWMP = Integrated Regional Water Management Plan

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude and Longitude)	Planned Completion	Comments and Notes	Information Needed to Evaluate Performance			
								Location Known?	Treatment Volume Known?	Footprint Known?	Drainage Area Known?
R11	LA CF CD	IRWMP	Inf	Big Dalton spreading grounds improve-ments	34.15446, -117.83378	02/01/2018	Increased capacity and percolation rate of the spreading grounds	YES	NO	NO	NO
R13	LA CF CD	IRWMP	Inf	Santa Fe Dam Water Conservation Pool	34.11368, -117.9684	12/29/2016	Santa Fe Dam primarily serves and is located in a watershed that is almost fully developed and produces a tremendous amount of runoff. Peak flows pass through the dam and proceed downstream. The peak flows often exceed intake capacity at downstream spreading grounds long before the grounds reach capacity, so the flows must be bypassed and wasted to the ocean. The proposed project will create a year-round water conservation pool with a maximum storage elevation of 463 ft NGVD. The conservation pool will serve to store the peak flows. The dam can later be operated to send water to the downstream spreading grounds facilities as intake capacity allows. The project includes construction of a levee to elevation 466 ft. within Santa Fe Reservoir to protect the adjacent recreation facilities. Two-3 ft. diameter by 80 ft. length pipes will be constructed along with an additional 7 ft. diameter by 4790 ft. length pipe or a pump station in order to drain the adjacent recreation area.	YES	NO	NO	NO

Notes: LA = LA County and LOS ANGELES COUNTY FLOOD CONTROL DISTRICT; UnInc = Unincorporated LA County; DR = Data Request; WCA = Watershed Conservation Authority website; Inf = Infiltration Facility; WL = Constructed Wetland, IRWMP = Integrated Regional Water Management Plan

C-6-3: DETAILED LIST OF EXISTING DISTRIBUTED BMPS IN UPPER SAN GABRIEL RIVER EWMP GROUP

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude, Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes
D1	C	DR	D	Porous Landscape Detention Area	34.075802, -117.889626	Removal of petroleum hydrocarbons trash and debris	10/18/2011	N/A	O	No outlet	Once monthly	--
D2	C	DR	SC	Kristar FloGard Catch basin Insert	34.075802, -117.889626	Removal of petroleum hydrocarbons, trash and debris	10/18/2011	1	B	"Ultimate" bypass	Quarterly inspections	--
D3	C	DR	Inf	Infiltration trench	34.079567, -117.890457	Infiltration of storm water. Removal of nutrients, pesticides, and sediment	--	1	O	Infiltration trench overflow discharges to the MS4	Semiannual inspections, weekly removal of accumulated trash and debris	--
D4	C	DR	SC	FloGard Trash & Debris Guard	34.088408, -117.916971	Remove trash and debris	--	1	B	Catch basin outlet structure	Weekly	--
D5	C	DR	Bio	Modular Wetland System	34.088478, -117.889694	Infiltration of storm water. Removal of petroleum hydrocarbons, pesticides, nutrients, and pathogens	2/10/2011	1	B	Bypass to MS4	Annually	--
D6	C	DR	SC	Catch Basin Filter	34.089314, -117.915665	Prevent debris, sediment	--	1	N/A	Catch basin outlet structure	Once annually	--
D7	C	DR	Inf	Dry Well	34.090050, -117.892403	Infiltration of storm water. Removal of oils and vehicle fluids	--	2	N/A	No outlet, drywell	--	--
D8	C	DR	Inf	CUDO Stormwater infiltration system	34.090559, -117.892444	Infiltration of Storm water. Removal of petroleum hydrocarbons, pesticides, nutrients, and pathogens	2/10/2011	1	O	Infiltration and overflow pipe	Prior to and following the rainy season	--

Notes: C = Covina, G = Glendora, I = Industry; UnInc = Unincorporated LA County; DR = Data Request; D = Detention; SC = Catch Basin Insert; Inf = Infiltration BMP; GS = Green Street, Bio = Bioretention/Biofiltration; PP = Permeable Pavement; BS = Bioswale; RH = Rainfall Harvest; Unk = Unknown; Maint. Cov. = Maintenance Covenant; O = Overflow; B = Bypass

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude, Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes
D9	C	DR	SC	Kristar FloGard Catch basin Insert	34.093338, -117.889832	Removal of sediment, trash debris, oils and grease	9/1/2010	1	B	"Ultimate" Bypass	Pre and post storm event, weekly during the rainy season, monthly during dry season.	--
D10	C	DR	SC	Brooks Catch Basin	34.093338, -117.889832	Removal of trash, debris and sediment	9/1/2010	1	O	Overflow to MS4	Pre and post storm event, weekly during the rainy season, monthly during dry season.	--
D11	C	DR	SC	Catch Basin Insert	34.094983, -117.846413	Biotreatment	SUSMP Approved 2/26/2013	1	O	2 Kristar FloGard+Plus filter inserts (1 at the inlet and 1 at the outlet).	Regular sweeping and removal of debris - At least once a month. Catch basin filter insert inspections - At least once a month. Cleaning out the filter insert - At least 3 times a year.	--

Notes: C = Covina, G = Glendora, I = Industry; UnInc = Unincorporated LA County; DR = Data Request; D = Detention; SC = Source Control Structural BMP; FT = Flow-Through Treatment BMP; GS = Green Street, Bio = Bioretention/Biofiltration; PP = Permeable Pavement; BS = Bioswale; DW = Dry/Wet Well; RH = Rainfall Harvest; Unk = Unknown; E = Existing; Maint. Cov. = Maintenance Covenant; O = Overflow; B = Bypass

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude, Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes
D12	C	DR	BS	Vegetated Swale	34.094983, -117.846413	Biotreatment	SUSMP Approved 2/26/2013	1	O	100 foot long vegetated swale designed per LA County SUSMP Manual	Regular sweeping and removal of debris - At least once a month. Swale routine maintenance (remove sediment accumulations, remove trash and debris, clean and/or unclog all areas, establish vegetated areas, etc.) - Annually prior to wet season and after major storm events. Swale major maintenance (improve grade, fix underdrains, reseed, replant, etc.) - As needed semiannually at the beginning and end of wet season.	--
D13	C	DR	Bio	Rainstore Infiltration System	34.096188, -117.908226	Removal of trash, debris, metals, oil and grease	8/25/2010	1	O	Overflow to MS4	Pre and post storm event, weekly during the rainy season, monthly during dry season.	--

Notes: C = Covina, G = Glendora, I = Industry; UnInc = Unincorporated LA County; DR = Data Request; D = Detention; SC = Source Control Structural BMP; GS = Green Street, Bio = Bioretention/Biofiltration; PP = Permeable Pavement; BS = Bioswale; DW = Dry/Wet Well; RH = Rainfall Harvest; Unk = Unknown; E = Existing; Maint. Cov. = Maintenance Covenant; O = Overflow; B = Bypass

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude, Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes
D14	C	DR	SC	Bio-Clean Filter Insert	34.096188, -117.908226	Removal of trash, debris, metals, oil and grease	8/25/2010	1	O	Overflow to MS4	Pre and post storm event, weekly during the rainy season, monthly during dry season.	--
D15	C	DR	SC	Brooks Catch Basin	34.096188, -117.908226	Removal of trash, debris, metals, oil and grease	8/25/2010	1	O	Overflow to MS4	Pre and post storm event, weekly during the rainy season, monthly during dry season.	--
D16	C	DR	SC	Kristar FloGard Catch basin Insert	34.096592, -117.907309	Remove petroleum hydrocarbons	2/10/2011	1	B	Bypass weir frame assembly	Three cleanings annually	--
D17	C	DR	Bio	Modular Wetland System	34.096592, -117.907310	Infiltration of storm water. Removal of petroleum hydrocarbons, pesticides, nutrients, and pathogens	2/10/2011	1	B	Infiltration and High flow external bypass	Minimum ot twice annually	--
D18	C	DR	Inf	Infiltration trench	34.100376, -117.866776	Infiltration of storm water. Removal of trash and debris, oil and grease, sediment, nutrients, metals, and pathogens	9/30/2010	1	O	Overflow to MS4	Inspect prior to and after the rainy season. Inspect after significant rain events.	--
D19	C	DR	Inf	Infiltration basin	34.100376, -117.866776	Infiltration of storm water. Removal of trash and debris, oil and grease, sediment, nutrients, metals, and pathogens	9/30/2010	1	O	Overflow to MS4	Inspect prior to and after the rainy season. Inspect after significant rain events.	--
D20	C	DR	SC	FloGard Fossil Filters	34.100376, -117.866776	Removal of trash, debris, sediment, metals, oil and grease	9/30/2010	1	B	--	Prior to and during and following the rainy season	--

Notes: C = Covina, G = Glendora, I = Industry; UnInc = Unincorporated LA County; DR = Data Request; D = Detention; SC = Source Control Structural BMP; GS = Green Street, Bio = Bioretention/Biofiltration; PP = Permeable Pavement; BS = Bioswale; DW = Dry/Wet Well; RH = Rainfall Harvest; Unk = Unknown; E = Existing; Maint. Cov. = Maintenance Covenant; O = Overflow; B = Bypass

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude, Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes
D21	C	DR	Inf	Trench Drain	34.103989, -117.903954	Infiltration of storm water. Removal of trash and debris, oil and grease, sediment, nutrients, metals, and pathogens	4/16/2010	1	B	Bypass to MS4	Bi-annually	--
D22	C	DR	Inf	Infiltration basin	34.103989, -117.903954	Infiltration of storm water. Removal of trash and debris, oil and grease, sediment, nutrients, metals, and pathogens	4/16/2010	1	O	overflow to MS4	Bi-annually	--
D23	C	DR	SC	FloGard curb inlet filter	34.103989, -117.903954	Removal of trash, debris, sediment, metals, oil and grease	4/16/2010	1	O	Overflow to MS4	Annually	--
D24	G	DR	Inf	ChamberMaxx	34.106747, -117.86331	Retention	Maint. Cov. Signed 6/2/2010	2	O	4" PVC	Maintenance Covenant	ChamberMaxx by Contech Stormwater Solutions Inc.
D25	G	DR	SC	FloGard Filter Inserts	34.106747, -117.86331	Remove debris & silt	Maint. Cov. Signed 6/2/2010	5	O	4" PVC, 6" PVC & 8" PVC	Maintenance Covenant	FloGard Catch Basin Filter Insert
D26	G	DR	SC	Smart Sponge Plus	34.113922, -117.872668	Pre-filter	--	6	O	Outlets to the Maxwell Plus Drainage System	--	Smart Sponge Plus Ultra-Urban Filters
D27	G	DR	D	StormChamber	34.113935, -117.837633	Detention	--	2	O	Outlets to 66" County-Maintained SD	--	Contech StormChamber System
D28	G	DR	SC	Water Quality Inlets	34.113935, -117.837633	Pre-filter	--	2	O	Outlets to Storm Chamber System	--	StormScreen with StormGate Water Quality Inlets (2)
D29	G	DR	Bio	Detention Basin	34.116589, -117.826195	Infiltration	--	--	--	--	--	

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D30	G	DR	PP	Pervious Brick Pavers	34.12822, -117.857728	Infiltration	Maint. Cov. Signed 8/18/10	2	O	Parking Lot drains to grassy swale.	Maintenance Covenant	Parking lot drains to two areas where there is pervious bricks. This area overflows to two grassy swales. The grassy swales drain to a structure for treatment.
D31	G	DR	BS	Grassy Swale	34.12822, -117.857728	Pre-filter	Maint. Cov. Signed 8/18/10	2	O	Grassy swale drains to inlet structure.	Maintenance Covenant	
D32	G	DR	SC	SwaleGard Filter	34.12822, -117.857728	Pretreatment before it enters street	Maint. Cov. Signed 8/18/10	2	O	4" PVC to parkway drain to street.	Maintenance Covenant	
D33	G	DR	SC	FloGard Filter	34.129313, -117.844722	Pretreatment before it enters street	No Maint. Cov. 9/2005.	4	O	8" & 12" PVC to Parkway Drain	Drainage study, semiannually.	Four Inlets with FloGard Filters before leaving site.
D34	G	DR	SC	FloGard	34.129386, -117.84411	Pre-filter	2/1/2007	1	O	10" PVC to Parkway Drain	Maintenance Covenant	FloGard Catch Basin/Trench Basin Filter Inserts
D35	G	DR	SC	Catch Basin Insert	34.130023, -117.846355	Pre-filter	Installed 2/1/2013	3	O	18" RCP to channel.	2 times/year - April & October	FloGard Catch Basin Filter Insert
D36	G	DR	Inf	Infiltration Trench	34.132001, -117.819687	Infiltration	9/1/2010	Entire Lot	O	8" PVC out to Amelia Avenue	--	Maintenance Yard at Country Club
D37	G	DR	Bio	Grassy Swale	34.136671, -117.861188	Infiltration	NOC 6/20/13	1	B	Parkway Drain	--	La Fetra Centre Parking Lot drains to a grassy swale.
D38	G	DR	SC	CDS Unit	34.14803, -117.856317	Remove debris & silt	Maint. Cov. Signed 3/10/2005	1	O	24" RCP & APWA Parkway Drain	Maintenance Covenant	CDS Model PMSU20-20
D39	G	DR	SC	Catch Basin Insert	34.153678, -117.857334	Pre-filter	--	1	O	Outlets to the street.	--	Hillside site, infiltration was not an option. Treatment only.
D40	I	DR	SC	CDS Unit	33.991495, -117.920658	--	--	--	--	--	--	--
D41	I	DR	SC	CDS Unit	33.991713, -117.924376	--	--	--	--	--	--	--

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D42	I	DR	SC	CDS Unit	33.993244, -117.919008	--	--	--	--	--	--	--
D43	I	DR	SC	CDS Unit	33.9933, -117.919838	--	--	--	--	--	--	--
D44	I	DR	SC	CDS Unit	33.993731, -117.915256	--	--	--	--	--	--	--
D45	I	DR	SC	CDS Unit	33.994001, -117.92035	--	--	--	--	--	--	--
D46	I	DR	SC	CDS Unit	33.994548, -117.916065	--	--	--	--	--	--	--
D47	I	DR	SC	CDS Unit	33.994646, -117.898629	--	--	--	--	--	--	--
D48	I	DR	SC	CDS Unit	33.994863, -117.870137	--	--	--	--	--	--	--
D49	I	DR	SC	CDS Unit	33.995345, -117.872748	--	--	--	--	--	--	--
D50	I	DR	SC	CDS Unit	33.995752, -117.900137	--	--	--	--	--	--	--
D51	I	DR	SC	CDS Unit	33.996908, -117.918175	--	--	--	--	--	--	--
D52	I	DR	SC	CDS Unit	33.997029, -117.918906	--	--	--	--	--	--	--
D53	I	DR	SC	CDS Unit	33.997157, -117.906466	--	--	--	--	--	--	--
D54	I	DR	SC	CDS Unit	33.997232, -117.867499	--	--	--	--	--	--	--
D55	I	DR	SC	CDS Unit	33.997342, -117.868774	--	--	--	--	--	--	--
D56	I	DR	SC	CDS Unit	33.997354, -117.902132	--	--	--	--	--	--	--
D57	I	DR	SC	CDS Unit	33.998158, -117.921735	--	--	--	--	--	--	--
D58	I	DR	SC	CDS Unit	33.998946, -117.923654	--	--	--	--	--	--	--
D59	I	DR	SC	CDS Unit	33.999148, -117.895479	--	--	--	--	--	--	--
D60	I	DR	SC	CDS Unit	33.999982, -117.880678	--	--	--	--	--	--	--

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D61	I	DR	SC	CDS Unit	34.00019, -117.933856	--	--	--	--	--	--	--
D62	I	DR	SC	CDS Unit	34.00021, -117.938845	--	--	--	--	--	--	--
D63	I	DR	SC	CDS Unit	34.000354, -117.934752	--	--	--	--	--	--	--
D64	I	DR	SC	CDS Unit	34.000768, -117.935888	--	--	--	--	--	--	--
D65	I	DR	SC	CDS Unit	34.001148, -117.887376	--	--	--	--	--	--	--
D66	I	DR	SC	CDS Unit	34.002972, -117.867997	--	--	--	--	--	--	--
D67	I	DR	SC	CDS Unit	34.003181, -117.912471	--	--	--	--	--	--	--
D68	I	DR	SC	CDS Unit	34.003637, -117.8663	--	--	--	--	--	--	--
D69	I	DR	SC	CDS Unit	34.004193, -117.8649	--	--	--	--	--	--	--
D70	I	DR	SC	CDS Unit	34.004519, -117.907575	--	--	--	--	--	--	--
D71	I	DR	SC	CDS Unit	34.004647, -117.907229	--	--	--	--	--	--	--
D72	I	DR	SC	CDS Unit	34.004732, -117.912273	--	--	--	--	--	--	--
D73	I	DR	SC	CDS Unit	34.005731, -117.855215	--	--	--	--	--	--	--
D74	I	DR	SC	CDS Unit	34.008447, -117.851997	--	--	--	--	--	--	--
D75	I	DR	SC	CDS Unit	34.008661, -117.921121	--	--	--	--	--	--	--
D76	I	DR	SC	CDS Unit	34.009469, -117.857666	--	--	--	--	--	--	--
D77	I	DR	SC	CDS Unit	34.009551, -117.921144	--	--	--	--	--	--	--
D78	I	DR	SC	CDS Unit	34.01126, -117.851865	--	--	--	--	--	--	--
D79	I	DR	SC	CDS Unit	34.015078, -117.843725	--	--	--	--	--	--	--

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D80	I	DR	SC	CDS Unit	34.015146, -117.844916	--	--	--	--	--	--	--
D81	I	DR	SC	CDS Unit	34.016298, -117.845574	--	--	--	--	--	--	--
D82	I	DR	SC	CDS Unit	34.017047, -117.9617	--	--	--	--	--	--	--
D83	I	DR	SC	CDS Unit	34.017301, -117.963244	--	--	--	--	--	--	--
D84	I	DR	SC	CDS Unit	34.017457, -117.962079	--	--	--	--	--	--	--
D85	I	DR	SC	CDS Unit	34.017733, -117.836496	--	--	--	--	--	--	--
D86	I	DR	SC	CDS Unit	34.018541, -117.834289	--	--	--	--	--	--	--
D87	I	DR	SC	CDS Unit	34.018544, -117.837956	--	--	--	--	--	--	--
D88	I	DR	SC	CDS Unit	34.019959, -117.836626	--	--	--	--	--	--	--
D89	I	DR	SC	CDS Unit	34.022505, -117.967893	--	--	--	--	--	--	--
D90	I	DR	SC	CDS Unit	34.022621, -118.040984	--	--	--	--	--	--	--
D91	I	DR	SC	CDS Unit	34.023944, -117.967551	--	--	--	--	--	--	--
D92	I	DR	SC	CDS Unit	34.024896, -117.836725	--	--	--	--	--	--	--
D93	I	DR	SC	CDS Unit	34.026029, -117.830991	--	--	--	--	--	--	--
D94	I	DR	SC	CDS Unit	34.026054, -117.965164	--	--	--	--	--	--	--
D95	I	DR	SC	CDS Unit	34.026547, -117.959943	--	--	--	--	--	--	--
D96	I	DR	SC	CDS Unit	34.026873, -117.834421	--	--	--	--	--	--	--
D97	I	DR	SC	CDS Unit	34.028139, -117.987565	--	--	--	--	--	--	--
D98	I	DR	SC	CDS Unit	34.028221, -117.830292	--	--	--	--	--	--	--

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D99	I	DR	SC	CDS Unit	34.028268, -117.829133	--	--	--	--	--	--	--
D100	I	DR	SC	CDS Unit	34.028421, -117.827871	--	--	--	--	--	--	--
D101	I	DR	SC	CDS Unit	34.028475, -117.986762	--	--	--	--	--	--	--
D102	I	DR	SC	CDS Unit	34.028799, -118.016978	--	--	--	--	--	--	--
D103	I	DR	SC	CDS Unit	34.029221, -118.018475	--	--	--	--	--	--	--
D104	I	DR	SC	CDS Unit	34.03042, -117.984812	--	--	--	--	--	--	--
D105	I	DR	SC	CDS Unit	34.030716, -118.037049	--	--	--	--	--	--	--
D106	I	DR	SC	CDS Unit	34.031353, -118.029414	--	--	--	--	--	--	--
D107	I	DR	SC	CDS Unit	34.03145, -118.008891	--	--	--	--	--	--	--
D108	I	DR	SC	CDS Unit	34.031861, -118.028596	--	--	--	--	--	--	--
D109	I	DR	SC	CDS Unit	34.032228, -118.027779	--	--	--	--	--	--	--
D110	I	DR	SC	CDS Unit	34.032506, -118.037012	--	--	--	--	--	--	--
D111	I	DR	SC	CDS Unit	34.035653, -117.983282	--	--	--	--	--	--	--
D112	I	DR	SC	CDS Unit	34.035761, -117.970735	--	--	--	--	--	--	--
D113	I	DR	SC	CDS Unit	34.035963, -117.935828	--	--	--	--	--	--	--
D114	I	DR	SC	CDS Unit	34.036037, -117.973224	--	--	--	--	--	--	--
D115	I	DR	SC	CDS Unit	34.036493, -117.976129	--	--	--	--	--	--	--
D116	I	DR	SC	CDS Unit	34.036619, -117.976303	--	--	--	--	--	--	--
D117	I	DR	SC	CDS Unit	34.040154, -117.98144	--	--	--	--	--	--	--

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D118	I	DR	SC	CDS Unit	34.041178, -117.978071	--	--	--	--	--	--	--
D119	I	DR	SC	CDS Unit	34.041559, -117.978623	--	--	--	--	--	--	--
D120	I	DR	SC	CDS Unit	34.042648, -117.980045	--	--	--	--	--	--	--
D121	I	DR	SC	CDS Unit	34.044243, -117.993134	--	--	--	--	--	--	--
D122	I	DR	SC	CDS Unit	34.045993, -117.986605	--	--	--	--	--	--	--
D123	I	DR	SC	CDS Unit	34.046928, -117.991272	--	--	--	--	--	--	--
D124	I	DR	SC	CDS Unit	34.051857, -117.995578	--	--	--	--	--	--	--
D125	I	DR	SC	CDS Unit	34.052277, -117.994253	--	--	--	--	--	--	--
D126	I	DR	SC	CDS Unit	34.05602, -117.992649	--	--	--	--	--	--	--
D127	I	DR	SC	CDS Unit	34.05895, -117.985098	--	--	--	--	--	--	--
D128	I	DR	SC	CDS Unit	34.060203, -117.989129	--	--	--	--	--	--	--
D129	I	DR	SC	CDS Unit	34.061224, -117.990731	--	--	--	--	--	--	--
D130	Un Inc	DR	RH	Rain Barrel	33.9179, -118.027342	--	5/20/2011	--	--	--	--	--
D131	Un Inc	DR	Inf	Dry Well	33.9232, -118.054657	--	10/15/2010	--	--	--	--	--
D132	Un Inc	DR	Bio	Planter Box	33.9232, -118.054657	--	6/21/2012	--	--	--	--	--
D133	Un Inc	DR	Bio	Rain Garden	33.9233, -118.042791	--	10/13/2011	--	--	--	--	--
D134	Un Inc	DR	PP	Porous Pavement	33.9711, -118.061229	--	2/22/2012	--	--	--	--	--
D135	Un Inc	DR	PP	Porous Pavement	33.9789, -117.904154	--	6/6/2013	--	--	--	--	--
D136	Un Inc	DR	Bio	Rain Garden	33.9843, -118.068262	--	8/8/2013	--	--	--	--	--

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D137	Un Inc	DR	PP	Porous Pavement	33.996, -117.89257	--	8/2/2012	--	--	--	--	--
D138	Un Inc	DR	RH	Rain Barrel	34.0055, -117.982251	--	8/23/2010	--	--	--	--	--
D139	Un Inc	DR	RH	Rain Barrel	34.0127, -117.917844	--	7/19/2011	--	--	--	--	--
D140	Un Inc	DR	RH	Cistern	34.0375, -117.996587	--	11/27/2012	--	--	--	--	--
D141	Un Inc	DR	PP	Porous Pavement	34.0453, -117.930634	--	2/15/2012	--	--	--	--	--
D142	Un Inc	DR	RH	Rain Barrel	34.074, -117.851950	--	4/3/2012	--	--	--	--	--
D143	Un Inc	DR	Bio	Rain Garden	34.088, -117.936809	--	10/12/2012	--	--	--	--	--
D144	Un Inc	DR	RH	Rain Barrel	34.0992, -117.9199954	--	1/6/2012	--	--	--	--	--
D145	Un Inc	DR	SC	(2) FLOWGARD FB-24 CATCH BASIN FILTERS	33.935169, -118.012581	--	1/31/2007	--	--	--	--	7-ELEVEN STORE #33578
D146	Un Inc	DR	SC	ONE FLO-GARD TRENCH DRAIN FILTER MODEL FF-TD12 AND ONE FLO-GARD CATCH BASIN	33.935169, -118.011178	--	11/14/2006	--	--	--	--	7-ELEVEN STORE #33590

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D147	Un Inc	DR	SC	2'X2' CB LOCATED WEST SIDE OF THE PROPERTY WITH FLOGARD FILTER MODELFF24D	33.935207, -118.020486	--	10/18/2007	--	--	--	--	ATLANTIS EQUITIES LLC
D148	Un Inc	DR	SC	FLOGARD CATCH BASIN FILTER AND TRASH & DEBRIS GAURD	33.936616, -118.043246	--	12/5/2007	--	--	--	--	NEW ROMANOFFSKY CHURCH
D149	Un Inc	DR	SC	INSTALL (1)CATCH BASIN FILTER MODEL:FGP-42CI, CAPACITY 1.5CFS (1)T	33.942357, -118.028642	--	9/27/2010	--	--	--	--	6201 WHITTIER LLC
D150	Un Inc	DR	SC	(1) ABTECH CO1414H (1) ABTECH DI2020H	33.964786, -118.070177	--	7/29/2008	--	--	--	--	CVS PHARMACY
D151	Un Inc	DR	SC	THREE CATCH BASINS WITH FILTER INSERTS. FILTER MODEL FLO-GARD FF-24D	33.967881, -117.913570	--	11/3/2011	--	--	--	--	PRELAND LLC
D152	Un Inc	DR	SC	TRITON DROP INLET INSERT AND FILTERA UNITS	33.970659, -117.912364	--	9/13/2012	--	--	--	--	LA CO P&R PATHFINDER PARK

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D153	Un Inc	DR	SC	CDS UNIT (MODEL CDS3020) LOCATED NORTH SIDE OF PROPERTY.	33.980080, -118.062229	--	12/10/2008	--	--	--	--	CALIFORNIA YUAN YUNG RETREAT
D154	Un Inc	DR	SC	SWALE GARD GRASSY SWALE PREFILTER, ROOF DRAIN CATCH BASIN FOSSIL FILTER, PARK	33.985832, -118.068121	--	4/24/2008	--	--	--	--	LA CO SORENSEN LIBRARY
D155	Un Inc	DR	SC	FGP-24F, FG-TDG36	33.985925, -117.953820	--	7/12/2005	--	--	--	--	MY FRIENDS HOUSE CHURCH
D156	Un Inc	DR	SC	(2) FGP-16F FILTERS	33.987806, -117.893159	--	3/29/2007	--	--	--	--	PRUDENTIAL MULHEARN REALTY
D157	Un Inc	DR	SC	ONE TRENCH DRAIN FILTER AND TWO C.B. FILTER INSERTS.	33.987874, -117.896308	--	9/21/2010	--	--	--	--	COLIMA COMMERCIAL CENTER
D158	Un Inc	DR	SC	FD DOWNSPOUTS, FF-12D, FG-TDG36	33.988382, -117.905461	--	9/25/2006	--	--	--	--	PARLIN HSU
D159	Un Inc	DR	SC	FOUR CATCH BASIN FILTER INSERTS	33.989748, -117.870067	--	9/8/2008	--	--	--	--	WALGREENS

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ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude, Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes
D160	Un Inc	DR	SC	SEVEN STORMWATE R CATCHBASIN FILTERS AND AREAS OF POROUS PAVEMENT	33.990029, -117.889684	--	1/3/2011	--	--	--	--	FIRST CHINESE BAPTIST CHURCH
D161	Un Inc	DR	SC	1 FOSSIL FILTER, MODEL NO. FF-36D(2PC)	33.992033, -117.889761	--	8/6/2007	--	--	--	--	NEW WORLD RTC ILP
D162	Un Inc	DR	SC	(1)FLOGARD FGP-5.0CI, FLOW CAP.=2.00 CFS; (5)FLOGARD FGP-36F, FLOW CAP.=2,4 CFS	33.999127, -117.884724	--	2/9/2010	--	--	--	--	PEARL OF THE EAST
D163	Un Inc	DR	SC	ONE TRENCH DRAIN FOSSIL FILTER (FG-TDOF18)	34.007960, -117.964019	--	2/14/2011	--	--	--	--	CALIF PROFESSIONAL ENG INC
D164	Un Inc	DR	SC	FLO-GARD PLUS CATCH BASIN INSERT MODEL FGP-36F	34.008263, -117.903522	--	10/25/2006	--	--	--	--	VAGABOND INN-HACIENDA HEIGHTS
D165	Un Inc	DR	SC	FOSSIL FILTER FLOGUARD 24X24	34.008319, -117.851267	--	7/25/2012	--	--	--	--	CAPITAL-C INVESTMENTS LLC

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ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude, Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes
D166	Un Inc	DR	SC	ONE STORMWATE R FILTER FOR CATCH BASIN (FLOGARD FGP-36F)	34.011918, -117.966642	--	1/12/2009	--	--	--	--	LAYTON CROSS
D167	Un Inc	DR	SC	2 FLOGARD TRASH & DEBRIS GAURDS W/ FILTER POUCHES. TREATMENT DEVICESLOC ATED AT T	34.032535, -118.037573	--	8/22/2007	--	--	--	--	MCDONALD'S RESTAURANT #01779
D168	Un Inc	DR	SC	STORM WATER FILTERS: CATCH BASIN FILTERS IN 4 LOCATIONS.	34.033405, -117.994003	--	1/2/2008	--	--	--	--	CHARLES DUNN EQUITIES I LLC
D169	Un Inc	DR	Un k		34.035340, -117.980266	--	3/19/2008	--	--	--	--	APOSTOLIC CHRISTIAN CHURCH
D170	Un Inc	DR	SC	(1) HYDRO CARTRIDGE MODEL NO. 4170-M (1) BIO-CLEA	34.035538, -117.991897	--	4/24/2008	--	--	--	--	SOXNET INC
D171	Un Inc	DR	SC	32 CATCH BASIN FOSSIL FILTERS, ONE TRENCH DRAIN FILTER, ONE CDS UNITAND 3 STORMW	34.035549, -117.980062	--	1/5/2011	--	--	--	--	LA CO COMMUNITY DEVELOP COMMSN

Notes: C = Covina, G = Glendora, I = Industry; UnInc = Unincorporated LA County; DR = Data Request; D = Detention; SC = Source Control Structural BMP; GS = Green Street, Bio = Bioretention/Biofiltration; PP = Permeable Pavement; BS = Bioswale; Inf = Infiltration BMP; RH = Rainfall Harvest; Unk = Unknown; E = Existing; Maint. Cov. = Maintenance Covenant; O = Overflow; B = Bypass

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude, Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes
D172	Un Inc	DR	SC	(1) HYDRO-CARTRIDGE FILTER MODEL NO. 4170-M	34.040341, -117.962016	--	9/26/2011	--	--	--	--	JESCO LIGHTING GROUP
D173	Un Inc	DR	SC	THREE CATCH BASIN INSERTS-BUILT WITH "EQUIVALENT " MODEL INSTEAD OF FGP-18.	34.040951, -117.998177	--	8/22/2007	--	--	--	--	LA CO P&R ALLEN J MARTIN PARK
D174	Un Inc	DR	SC	FOSSIL FILTER FF-18D	34.041477, -117.984408	--	1/4/2007	--	--	--	--	JACK-IN-THE-BOX #05337
D175	Un Inc	DR	SC	(1)FF-24D, (1) FG-TDOF3-2, (1) FG-DS8	34.044825, -117.925723	--	8/1/2006	--	--	--	--	ATHENS DISPOSAL CO
D176	Un Inc	DR	SC	(1) FLOGARD FOSSIL FILTER (FG-M2424) WITH 0.3 CFS TREATMENT CAPACITY	34.055138, -117.985570	--	9/14/2009	--	--	--	--	VALINDA PLAZA
D177	Un Inc	DR	SC	(1)FGP-21F (1) FD-TDG56 FOSSIL FILTERS	34.089829, -117.934017	--	7/22/2008	--	--	--	--	PEI SHEN ZHU
D178	Un Inc	DR	SC	FGP-12F, FGP-18F, FGP-24F	34.095781, -117.871853	--	7/3/2007	--	--	--	--	COVINA PETROLEUM INC

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ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude, Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes
D179	Un Inc	DR	SC	(5)FGP-12F, CAP.=0.4CFS/ EACH; (1)FGP-18F, CAP.=0.7CFS; (1)FF-TD10, CAP.=0.3CFS;	33.922745, -118.029163	--	2/9/2010	--	--	--	--	MATT BEGIN
D180	C	DR	D	Detention system	UNKNOWN	Storage unit discharge to Modular wetland	2/10/2011	1	B	Bypass to MS4	--	--
D181	C	DR	SC	Kristar FloGard catch basins and inserts	UNKNOWN	Remove petroleum hydrocarbons	6/30/2008	--	--	--	--	--
D182	G	DR	SC	FloGard Filter Inserts	Glendora Downtown (UNKNOWN)	Remove debris & silt	Installed 2/1/2013	7	O	18" RCP	2 times/year - April & October	FloGard Catch Basin Filter Insert
D183	G	DR	PP	Pervious Gutter	Various Locations (UNKNOWN)	Infiltration	NOC 4/5/13	6	B	--	2 times/year - April & October	Pervious gutter installed at six locations in the City
D184	Un Inc	NOI	GS	Avocado Heights Multi Use Trail	34.033879, -117.987537	Infiltration, impervious area reduction	9/26/2014	-	-	-	-	Roadway widths reduced by 4 feet, trail constructed of DG, infiltration swale installed at downslope end

Notes: C = Covina, G = Glendora, I = Industry; UnInc = Unincorporated LA County; DR = Data Request; D = Detention; SC = Source Control Structural BMP; GS = Green Street, Bio = Bioretention/Biofiltration; PP = Permeable Pavement; BS = Bioswale; Inf = Infiltration BMP; RH = Rainfall Harvest; Unk = Unknown; E = Existing; Maint. Cov. = Maintenance Covenant; O = Overflow; B = Bypass

C-6-4: DETAILED LIST OF PLANNED DISTRIBUTED BMPS IN UPPER SAN GABRIEL RIVER EWMP GROUP

ID	Jurisdiction	Data Source	BMP Subcategory	BMP Name	Location (Latitude and Longitude)	Purpose of BMP (treatment objectives)	Date Facility Placed in Service	Number of Inflow Points	Bypass or Overflow	Description, Types, and Designs of Outlets	Maintenance Type and Frequency	Comments and Notes
D185	C	DR	GS	Shoppers Lane Streetscape and Parking Lot Improvements	34.079062, -117.8901	--	--	--	--	--	--	13 bioretention planters, bioswales, and a small permeable pavement section
D186	C	DR	GS	Green Street Improvement Plans	34.08389, -117.890092	--	--	--	--	--	--	Biofiltration curb extensions, permeable sidewalks, landscaped median, Filterra boxes
D187	G	DR	Bio	Infiltration Islands	34.116589, -117.826195	Infiltration	--	--	--	--	--	--

Notes: C = Covina, G = Glendora, UnInc = Unincorporated LA County; DR = Data Request; GS = Green Street, Bio = Bioretention/Biofiltration; P = Planned

Appendix C-7

Cost Optimization Curves

APPENDIX C-7: BMP Cost Optimization Curves

This appendix presents BMP cost optimization curves for each watershed and jurisdiction, as follows:

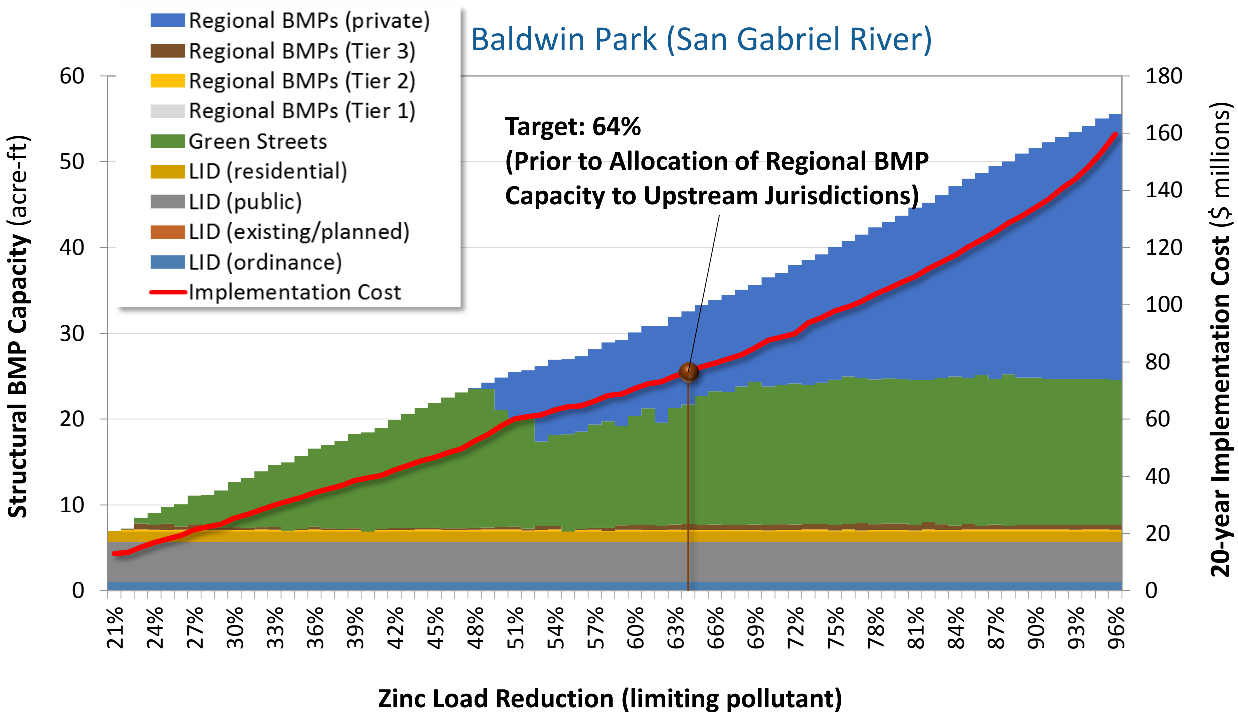

Figure C-7-1. BMP capacities: Baldwin Park (San Gabriel River).

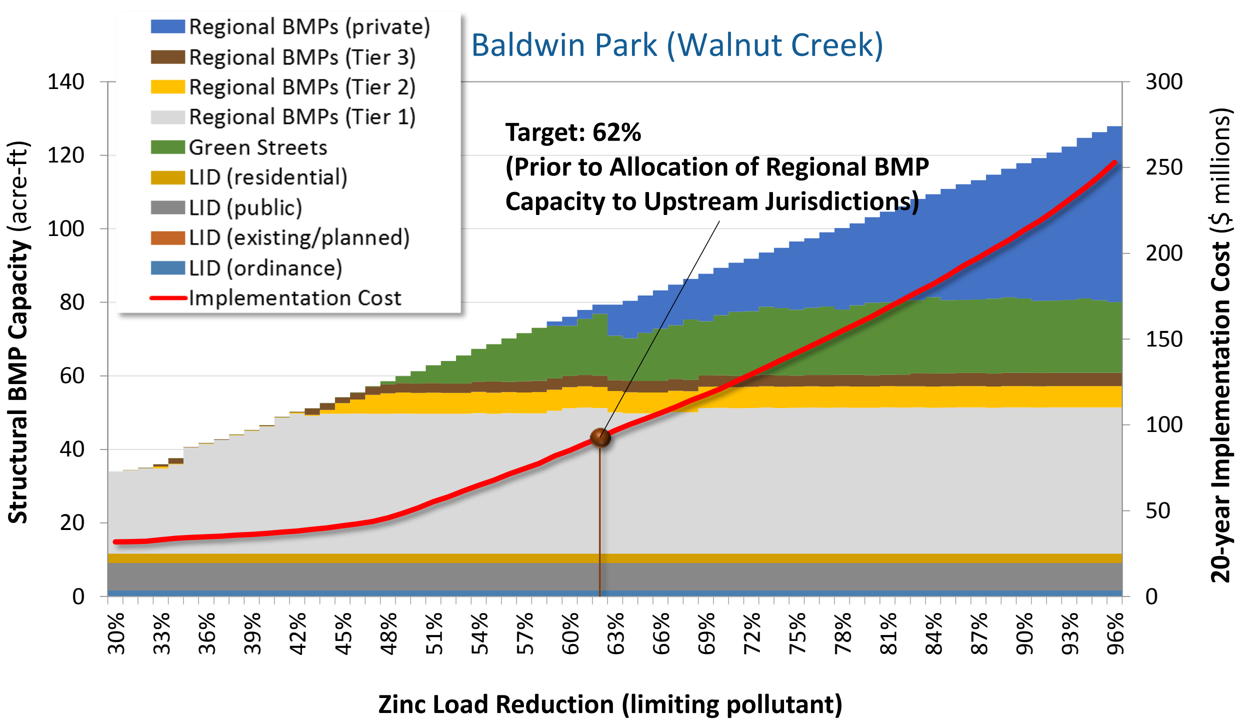

Figure C-7-2. BMP capacities: Baldwin Park (Walnut Creek).

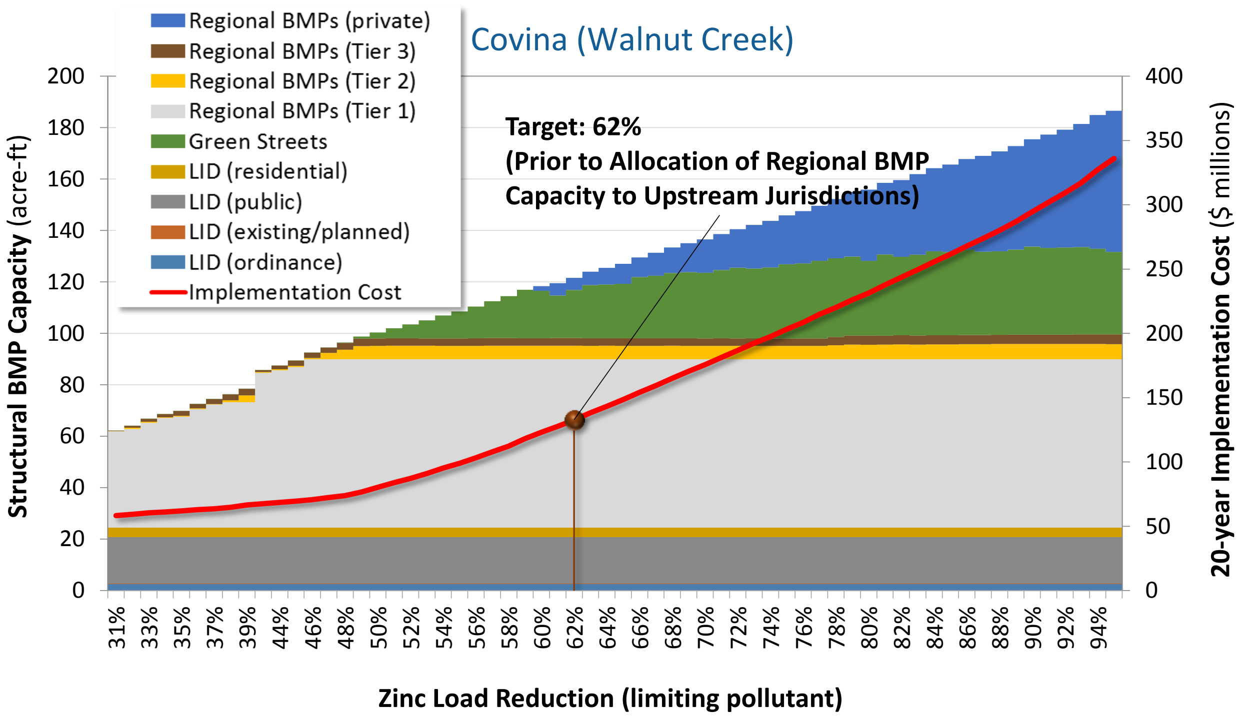

Figure C-7-3. BMP capacities: Covina (Walnut Creek).

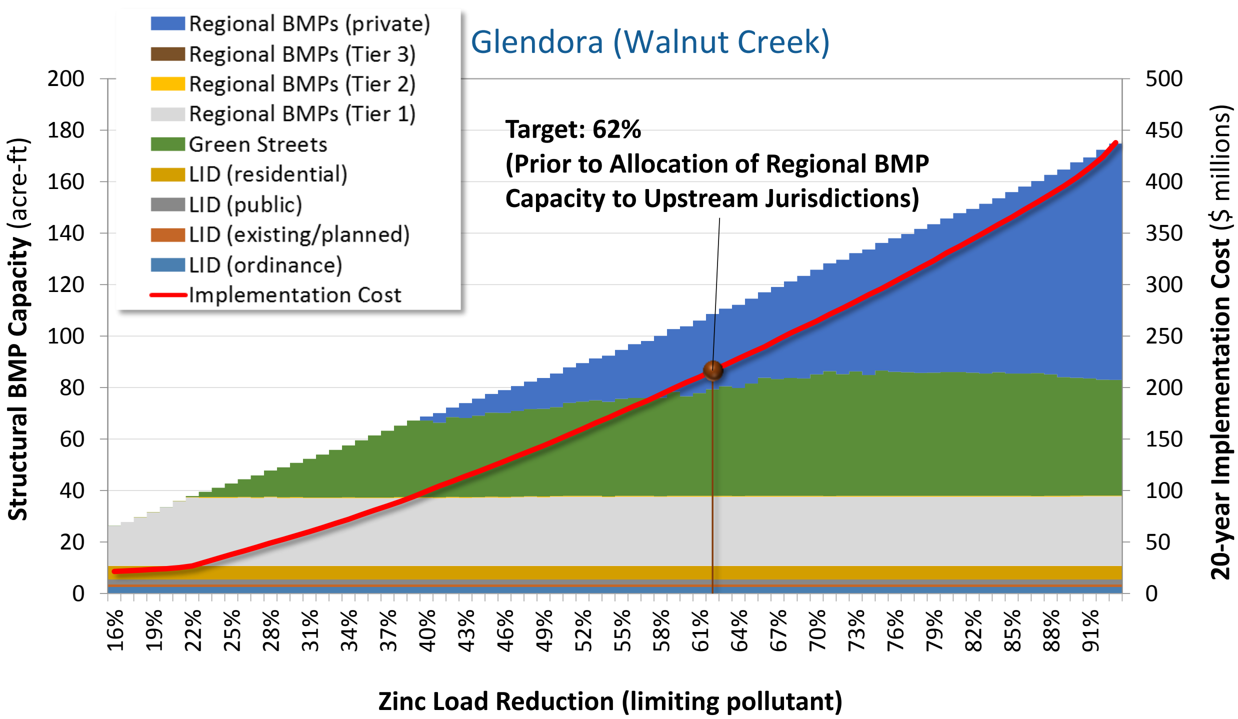

Figure C-7-4. BMP capacities: Glendora (Walnut Creek).

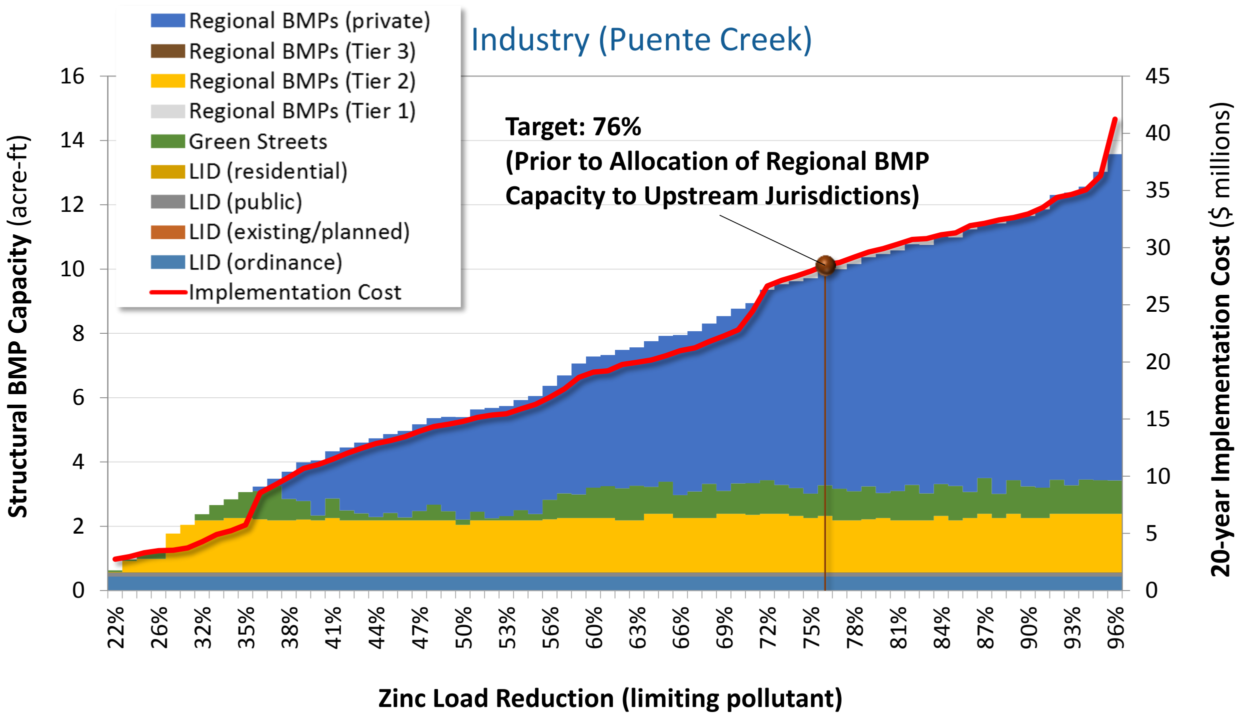

Figure C-7-5. BMP capacities: Industry (Puente Creek).

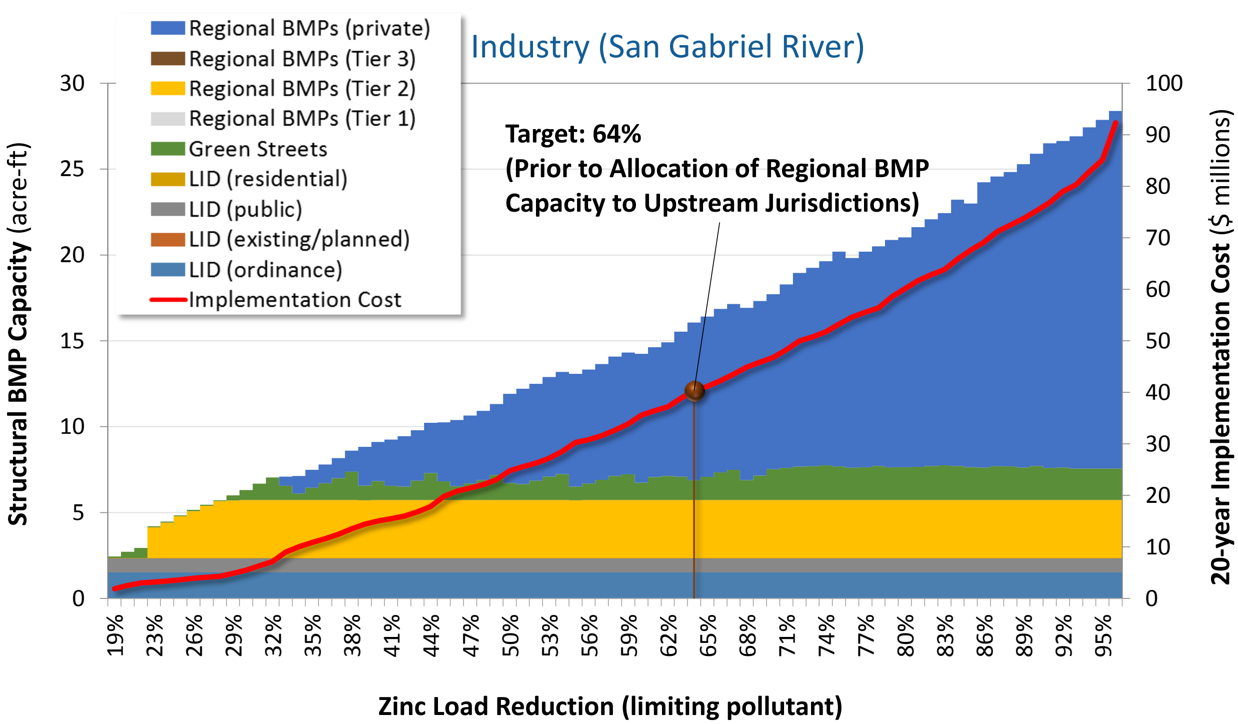

Figure C-7-6. BMP capacities: Industry (San Gabriel River).

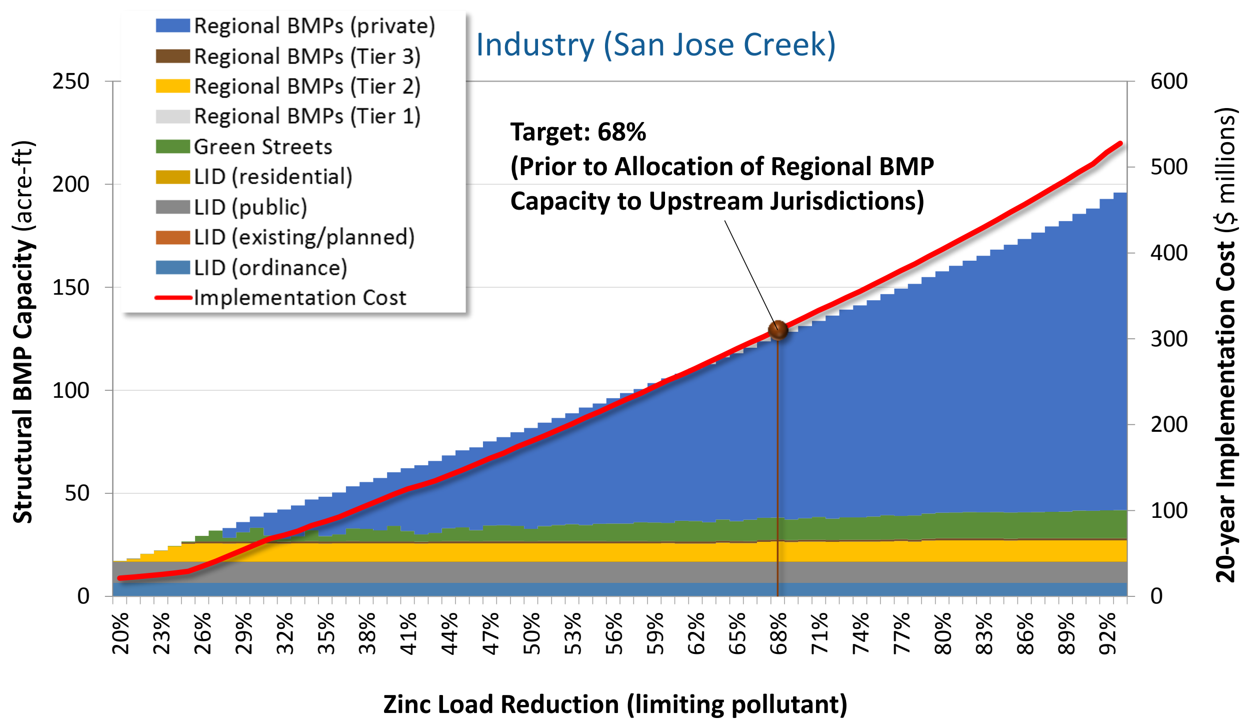

Figure C-7-7. BMP capacities: Industry (San Jose Creek).

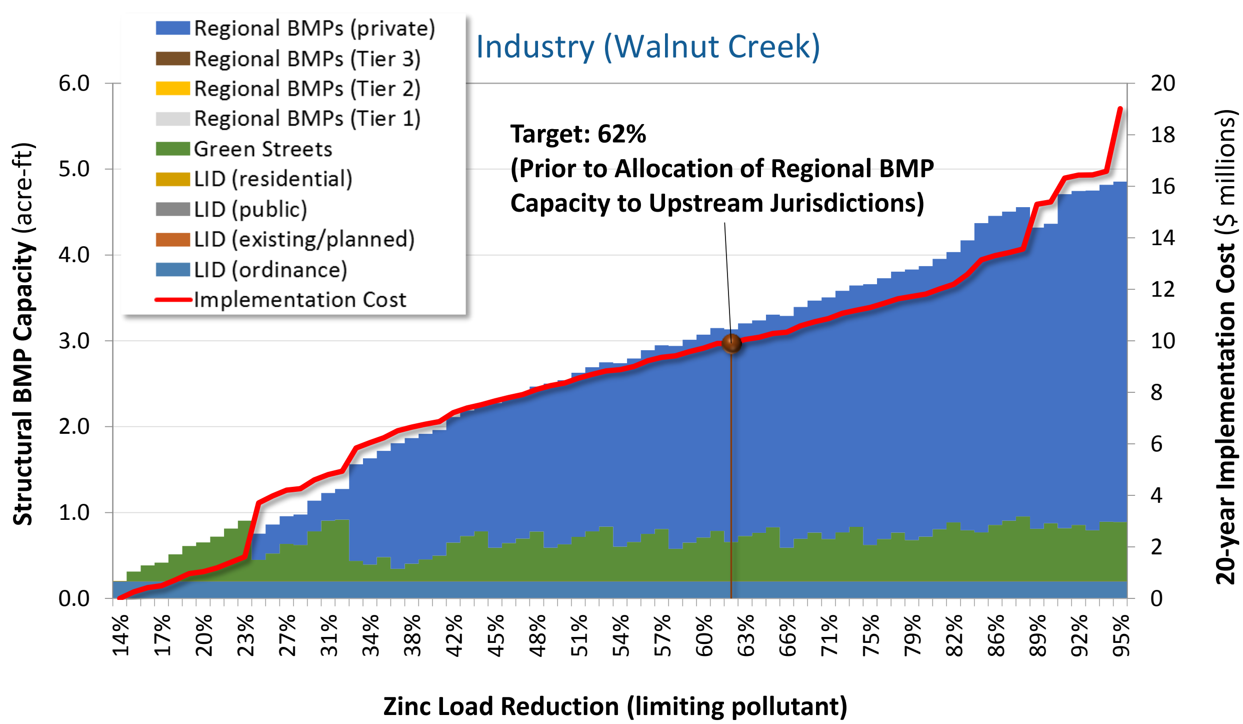

Figure C-7-8. BMP capacities: Industry (Walnut Creek).

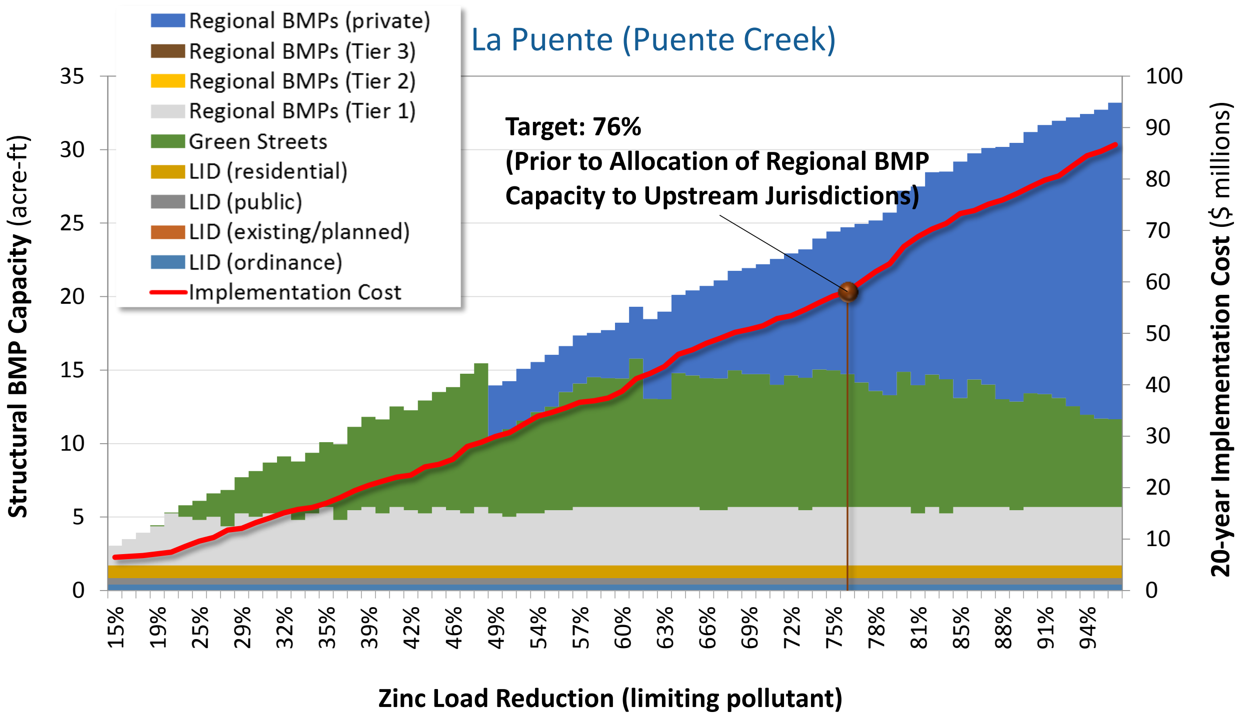

Figure C-7-9. BMP capacities: La Puente (Puente Creek).

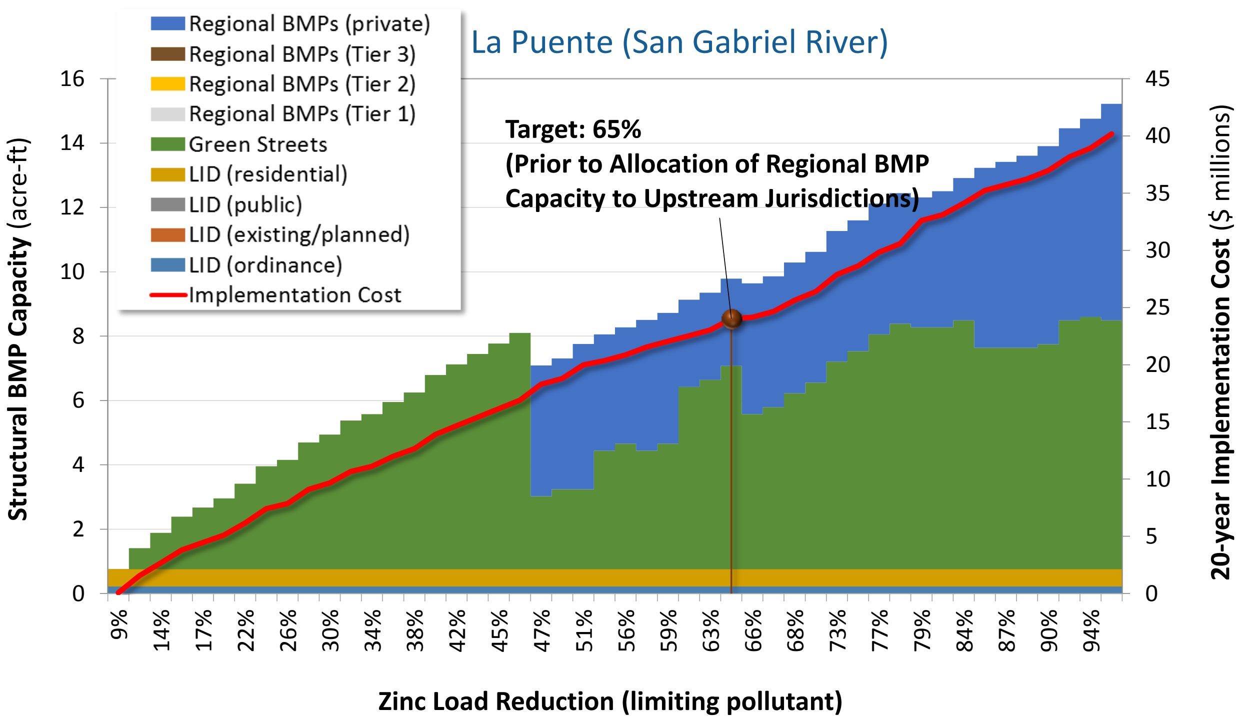

Figure C-7-10. BMP capacities: La Puente (San Gabriel River).

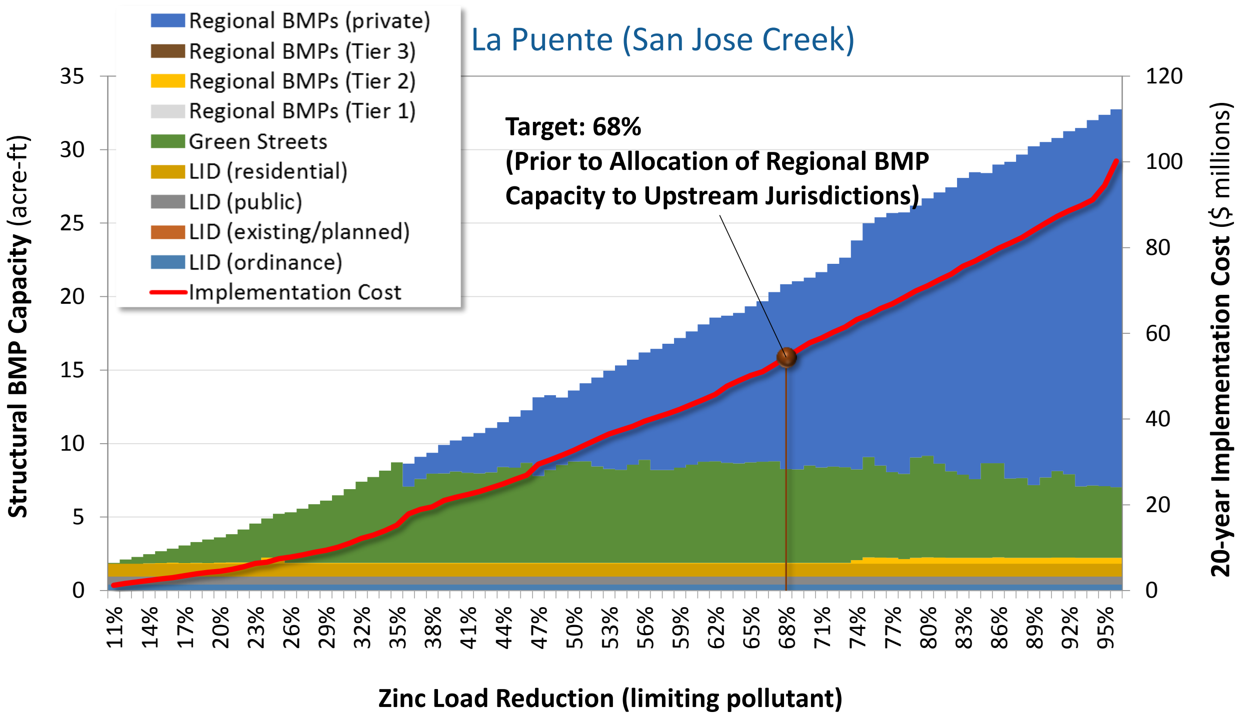

Figure C-7-11. BMP capacities: La Puente (San Jose Creek).

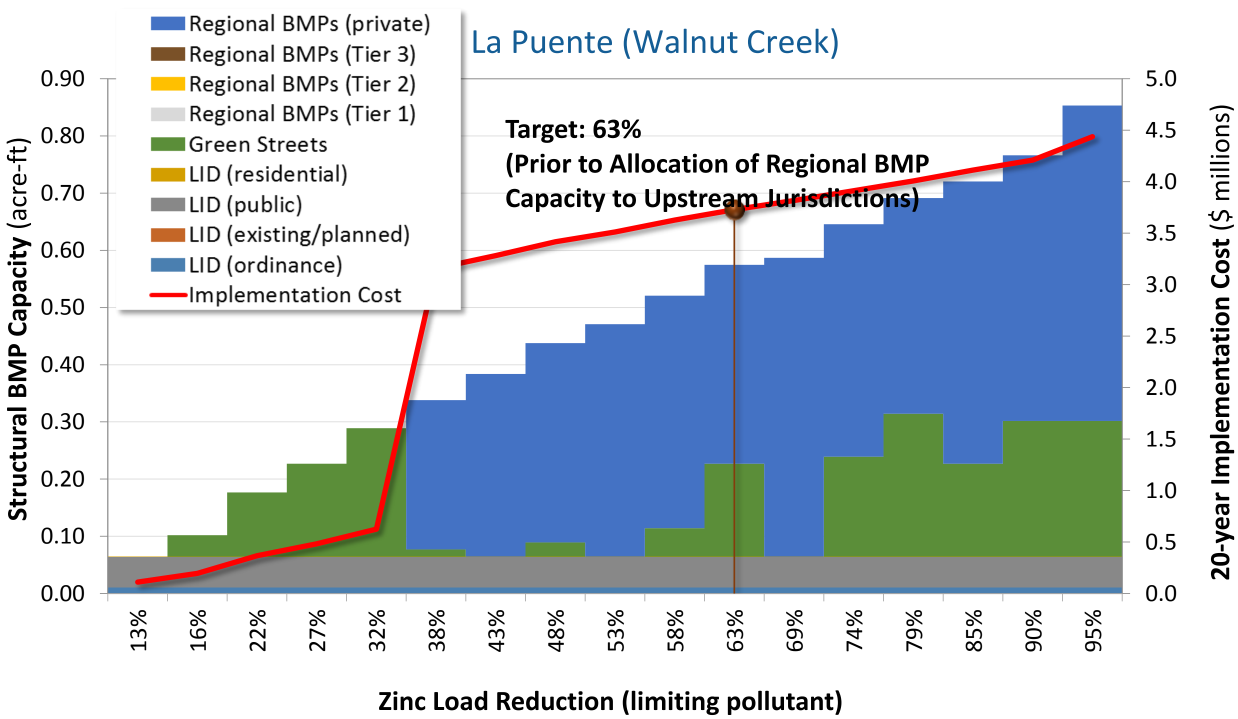

Figure C-7-12. BMP capacities: La Puente (Walnut Creek).

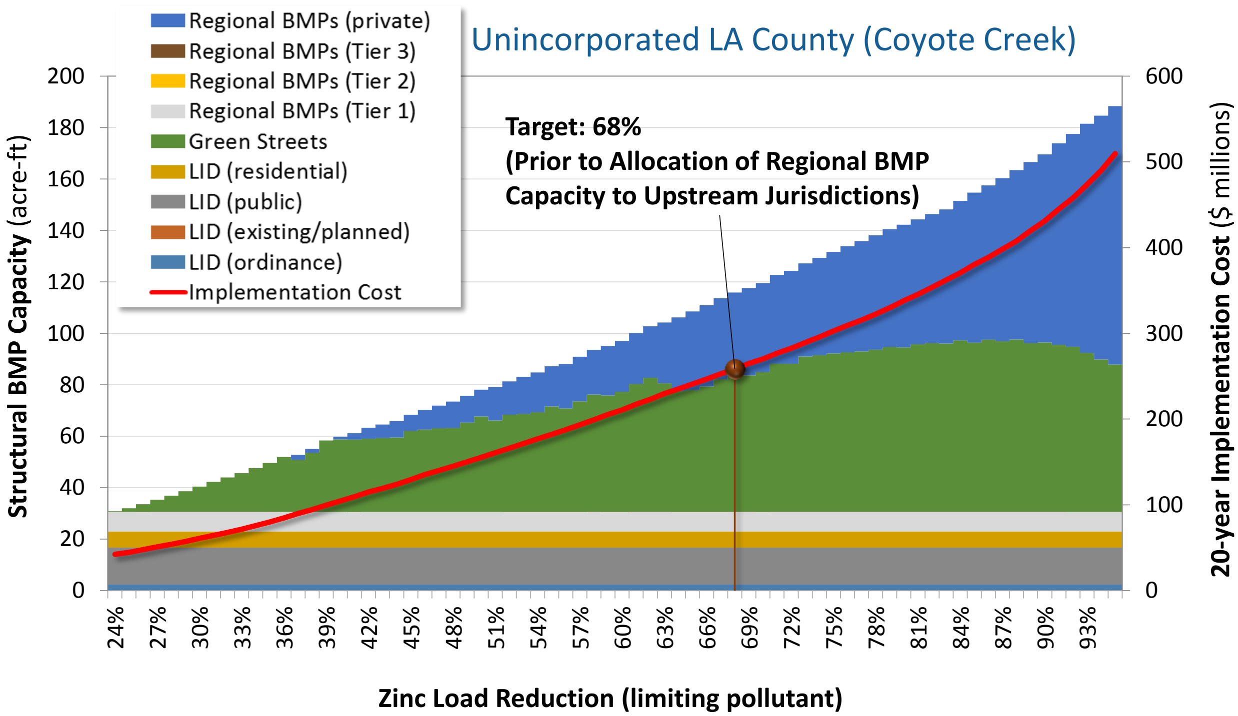

Figure C-7-13. BMP capacities: Unincorporated LA County (Coyote Creek).

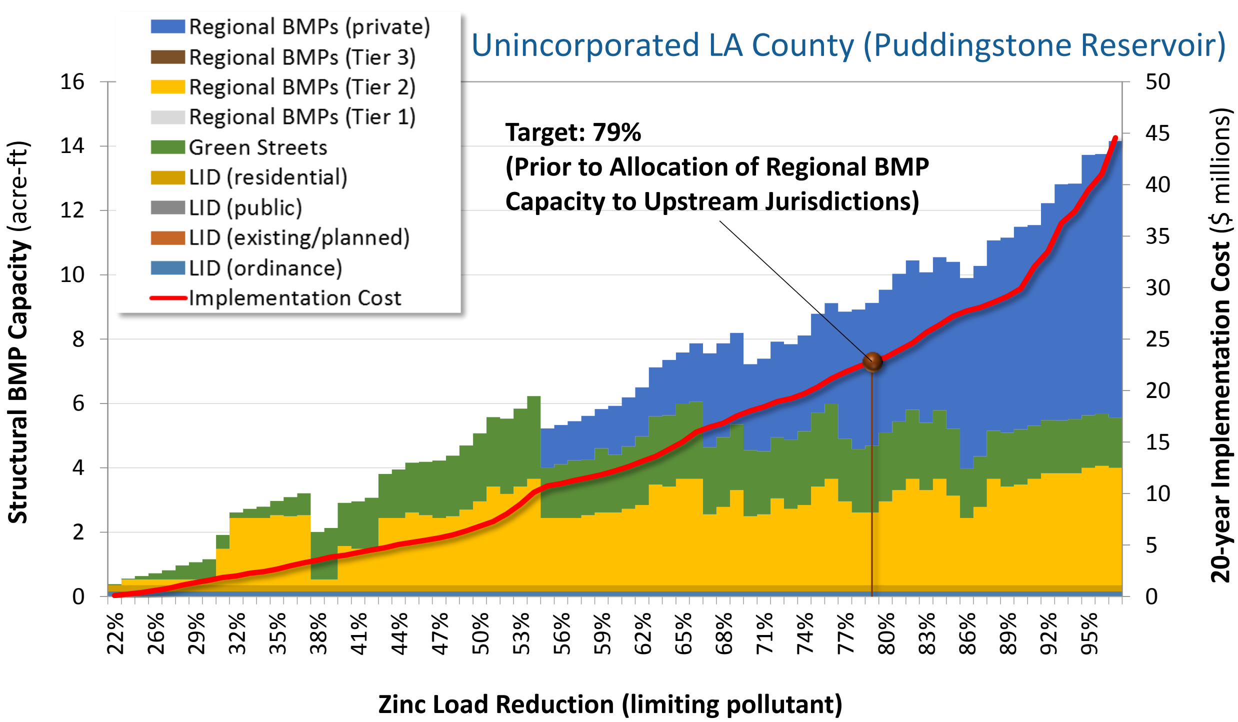

Figure C-7-14. BMP capacities: Unincorporated LA County (Puddingstone Reservoir).

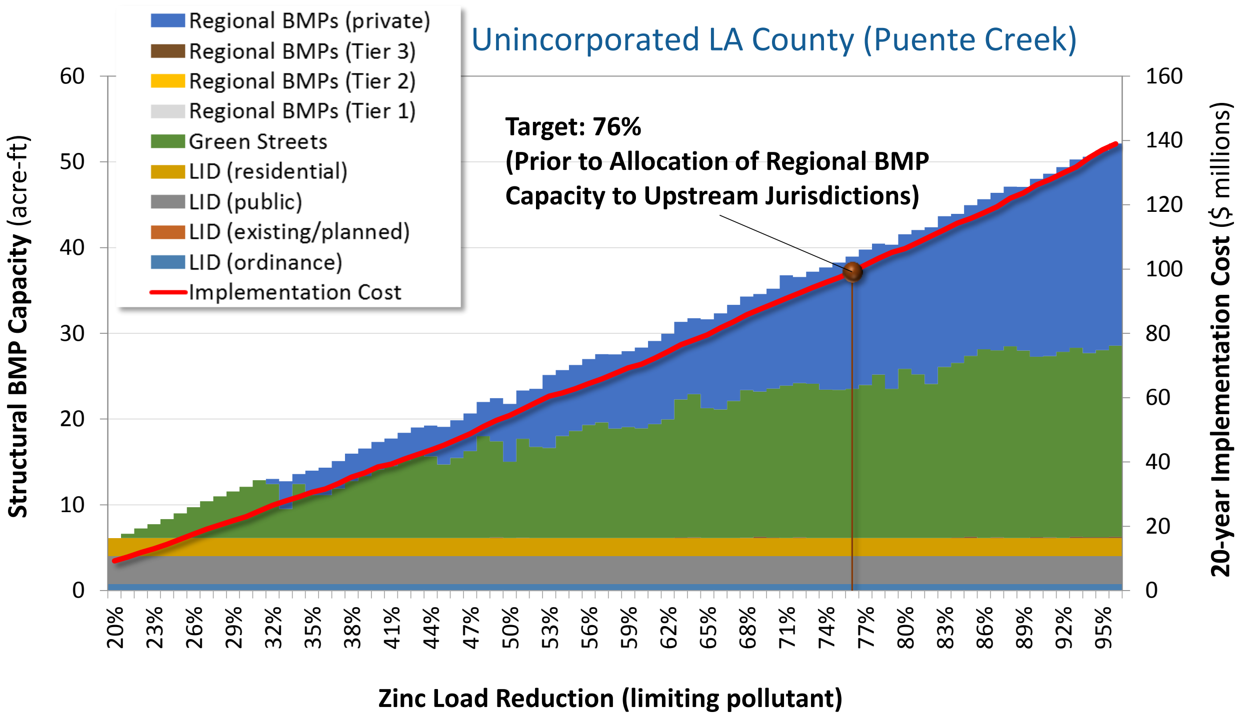

Figure C-7-15. BMP capacities: Unincorporated LA County (Puente Creek).

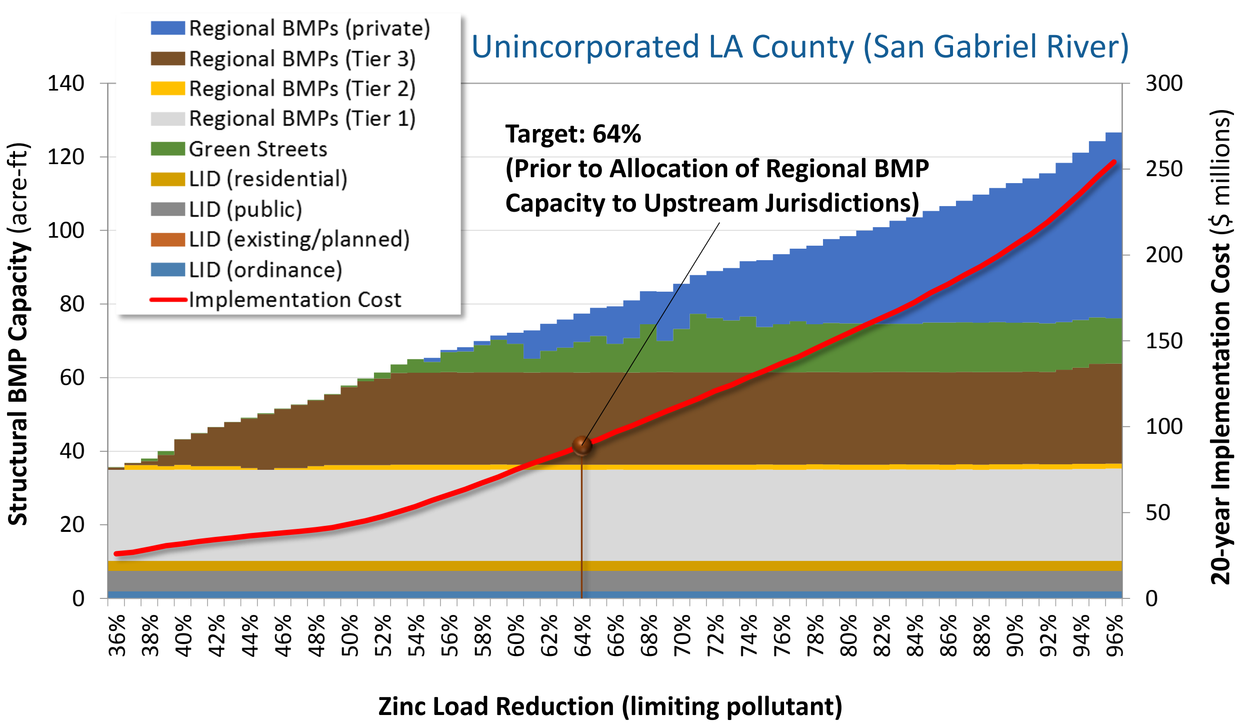

Figure C-7-16. BMP capacities: Unincorporated LA County (San Gabriel River).

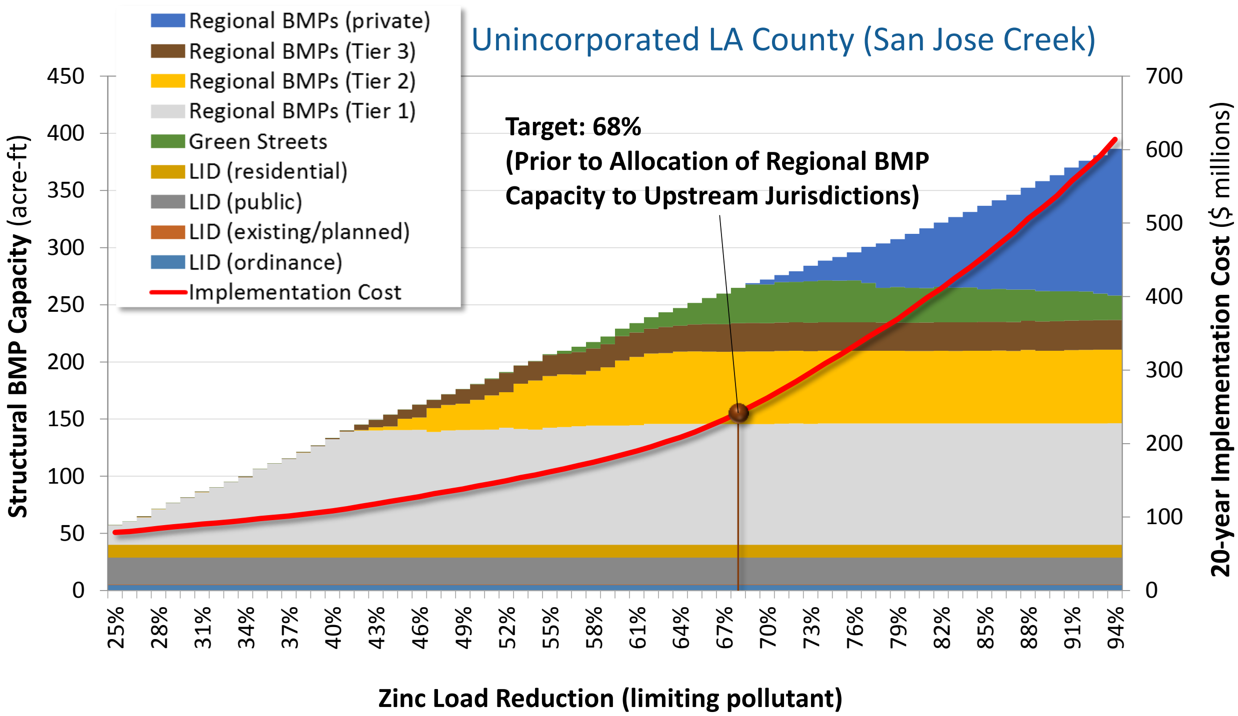

Figure C-7-17. BMP capacities: Unincorporated LA County (San Jose Creek).

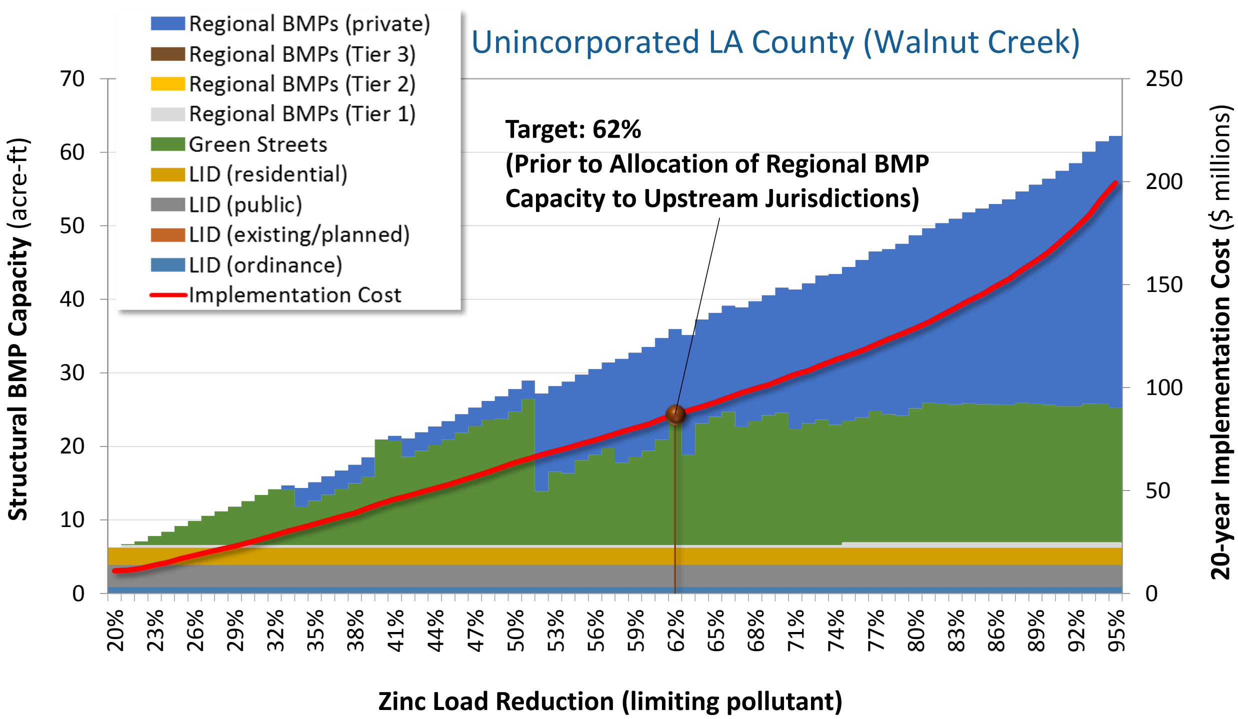

Figure C-7-18. BMP capacities: Unincorporated LA County (Walnut Creek).

Appendix C-8

List of Screened Public Parcels

SITE INFORMATION										INITIAL SCREENING CRITERIA						
										Major Site Constraint				Other Site Criteria		
Site ID	Name	Jurisdiction	Ownership	Nearby Storm Drains	Land Use Category	Tier	Area (acres)	Distance to Conveyance (feet)	Assessor's Identification Number (AIN)	Ground Surface Slope Greater Than 20%	Depth to Groundwater Less Than 20 Feet Below Ground Surface	Significant Ecological Area	Overlying Bedrock	Overlying Methane Producing Landfill	Overlying VOC/Nitrate Plume	High Liquefaction Potential
11	Finkbiner Park	Glendora	GLENDORA CITY	MTD 1129, Little Dalton Wash		1	6.1	0	8638009906	NO	NO	NO	NO	NO	YES	NO
45	Allen J Martin Park	County	LA COUNTY	BI 1220, BI 1114-Unit 1		1	6.8	1,852	8212011902	NO	NO	NO	NO	NO	NO	YES
54	Fairgrove Academy	La Puente	HACIENDA LA PUENTE UNIFIED SCHOOL DIST	BI 0448 Unit 1 Line A, BI 0301, Puente Creek	Public Elementary Schools	1	16.6	1,689	8252013900	NO	NO	NO	NO	NO	NO	YES
57	Dawson Avenue Park	Glendora	GLENDORA CITY	Big Dalton Wash		1	5.4	208	8641002273, 8641002904	NO	NO	NO	NO	NO	NO	NO
66	Charter Oak Park	County	LA COUNTY	Cienega Drain, BI 1218 - Line B	Regional Parks & Gardens	1	11.8	2,331	8403013900	NO	NO	NO	NO	NO	YES	NO
71	Hollenbeck Park	Covina	COVINA CITY	BI 2701-Line H		1	9.5	39	8407001905	NO	NO	NO	NO	NO	YES	NO
136	Bassett Park	County	LA COUNTY	Bassett Park Drain	Regional Parks & Gardens	1	9.8	3,465	8562010901	NO	NO	NO	NO	NO	NO	YES
138	Carolyn Rosas Park	County	LA COUNTY	PD 0356, PD 1335	Regional Parks & Gardens	1	6.5	7,614	8253014900	NO	NO	NO	NO	NO	NO	NO
140	Covina Park	Covina	COVINA CITY PARK	BI 0423 Unit 1	Regional Parks & Gardens	1	10.9	4,105	8431026001, 8431026900, 8431026901	NO	NO	NO	NO	NO	YES	NO
147	Kahler Russell Park	Covina	COVINA CITY	MTD 191	Regional Parks & Gardens	1	17.0	4,247	8428015902, 8428015903, 8428023901	NO	NO	NO	NO	NO	YES	NO
150	Los Robles County Park	County	LA COUNTY	Ninth Avenue Drain, BI 1221	Regional Parks & Gardens	1	5.0	5,335	8211003901	NO	NO	NO	NO	NO	NO	NO
152	Manzanita Park	County	LA COUNTY	PD 0096BI 1272 - Line B	Regional Parks & Gardens	1	12.1	5,609	8215012900	NO	NO	NO	NO	NO	NO	YES
157	Pepperbrook Park	County	LA COUNTY	PD 1457, PD 1210, PD 1154	Regional Parks & Gardens	1	5.1	5,523	8207014900	NO	NO	NO	NO	NO	NO	NO
160	San Angelo Park	County	LA COUNTY	PD 0163	Regional Parks & Gardens	1	8.7	1,695	8110012903, 8110012904, 8110012905	NO	NO	NO	NO	NO	YES	YES
162	Stimson Park (Steinmetz Park)	County	LA COUNTY	BI 0527 - Line B	Regional Parks & Gardens	1	11.5	3,793	8244005915	NO	NO	NO	NO	NO	NO	YES
170	Gladstone Park	Glendora	LA CO FLOOD CONTROL DIST	Big Dalton Wash	Regional Parks & Gardens	1	9.3	0	8653002902, 8653002905, 8653002906	NO	NO	NO	NO	NO	YES	NO
345	Glenoaks Golf Course	Glendora	GLENDORA CITY	Big Dalton Wash	Golf Courses	1	19.2	829	8641007900, 8641007901, 8641007902, 8641007903, 8641007904, 8641007905, 8641007906, 8641007907, 8641007908, 8641007909, 8641007910, 8641007911, 8641007912, 8641007913, 8641007917, 8641007918, 8641007919, 8641007920, 8641007921	NO	NO	NO	NO	NO	NO	NO
CS1	Old Bassett Unified School District Site	County	BASSETT UNIFIED SCHOOL DIST	Francisquito Drain	Public Schools	1	8.7	108	8558023905, 8558023910	NO	NO	NO	NO	NO	YES	YES
CS10	Walnut Creek Nature Park	Baldwin Park	BALDWIN PARK CITY	Walnut Creek Channel	Regional Parks & Gardens	1	4.6	231	8564014907, 8564014908, 8564016909, 8564016912, 8564016913	NO	NO	NO	NO	NO	YES	YES
CS11	Barnes Park	Baldwin Park	BALDWIN PARK CITY	BI 9705	Regional Parks & Gardens	1	6.6	751	8550001904, 8550001906	NO	NO	NO	NO	NO	YES	YES
CS8	Morgan Park	Baldwin Park	BALDWIN PARK CITY	MTD 0037	Regional Parks & Gardens	1	10.0	2,528	8544021900, 8544021901, 8544021902, 8544021903, 8544021904, 8544021905, 8544021907, 8544021908, 8544021909, 8544021910, 8544021911, 8544022902	NO	NO	NO	NO	NO	YES	NO
WC1	Cortez Park	West Covina	City of West Covina	Charlinda Drain, South Hills Drain	Regional Parks & Gardens	1	16.5	0	8479022901, 8479022900, 8479022904	NO	NO	NO	NO	NO	NO	NO
41	La Puente Park	La Puente	LA PUENTE CITY	PRDD 0291, BI 4801-Line B		1*	15.2	1,639	8214025900	NO	NO	NO	NO	NO	NO	NO
CS12	Adventure Park	County	LA COUNTY	BI 0693, BI 0015	Regional Parks & Gardens	1*	14.6	16,357	8156001910, 8156001911	NO	NO	NO	YES	NO	NO	YES
51	Rimgrove Park	County	LA COUNTY	Puente Creek		2	6.0	503	8248015901	NO	NO	NO	NO	NO	NO	NO
144	Gloria Heer Park	County	LA COUNTY	PD 1570	Regional Parks & Gardens	2	10.4	8,681	8265019900	NO	NO	NO	YES	NO	NO	NO
148	Kelby Park	Covina	COVINA CITY	BI 0423 Unit 1 Line A, San Dimas Wash	Regional Parks & Gardens	2	5.9	3,269	8430015900, 8430035900	NO	NO	NO	NO	NO	YES	NO
159	Rowland Heights Park	County	LA COUNTY	PD 1301, PD 1047, PD 1139	Regional Parks & Gardens	2	10.2	3,470	8762004902	NO	NO	NO	YES	NO	NO	NO

Notes: *La Puente Park and Adventure Park have not been modeled in SUSTAIN. These sites were upgraded to Tier 1 based on institutional knowledge provided by the USGR Group; Site list TBD based on Adaptive Management

SITE INFORMATION										INITIAL SCREENING CRITERIA						
										Major Site Constraint				Other Site Criteria		
Site ID	Name	Jurisdiction	Ownership	Nearby Storm Drains	Land Use Category	Tier	Area (acres)	Distance to Conveyance (feet)	Assessor's Identification Number (AIN)	Ground Surface Slope Greater Than 20%	Depth to Groundwater Less Than 20 Feet Below Ground Surface	Significant Ecological Area	Overlying Bedrock	Overlying Methane Producing Landfill	Overlying VOC/Nitrate Plume	High Liquefaction Potential
CS7	Hilda L. Solis Park	Baldwin Park	BALDWIN PARK CITY	Big Dalton Wash	Regional Parks & Gardens	2	3.8	8	8554005900	NO	NO	NO	NO	NO	YES	NO
46	Avocado Heights Park	County	LA COUNTY			2	7.8	2,297	8206014904	NO	NO	NO	NO	NO	NO	YES
107	Buildings and Parking Lot Near Channel	Baldwin Park	LA COUNTY	Walnut Creek		2	5.6	286	8564004902, 8564004903	NO	NO	NO	NO	NO	YES	YES
120	Truck Loading/Parking	Baldwin Park	LA COUNTY			2	10.2	327	8564004901	NO	NO	NO	NO	NO	YES	YES
132	Glendora Civic Center	Glendora	GLENDORA CITY		City Halls	2	4.3	279	8638027908	NO	NO	NO	NO	NO	YES	NO
141	Edna Park	Covina	COVINA CITY	BI 0423	Regional Parks & Gardens	2	1.6	3,186	8431012900, 8431012901	NO	NO	NO	NO	NO	YES	NO
155	Ole Hammer Park	Glendora	GLENDORA CITY	BI 3701 - Line E	Regional Parks & Gardens	2	1.5	19	8648018908	NO	NO	NO	NO	NO	YES	NO
156	Parque Xalapa	Covina	COVINA CITY		Regional Parks & Gardens	2	2	1,956	8447031901	NO	NO	NO	NO	NO	NO	YES
167	Willow Springs Park	Glendora	GLENDORA CITY	BI 3701 - Line C	Regional Parks & Gardens	2	1.2	1,550	8656005910	NO	NO	NO	NO	NO	NO	NO
169	Civic Center Park	Covina			Regional Parks & Gardens	2	1.4	4,323	8430026900	NO	NO	NO	NO	NO	YES	NO
171	Hollenbeck Park (FCD Parcel)	Covina	COVINA CITY		Regional Parks & Gardens	2	9.8	19	8407001909	NO	NO	NO	NO	NO	YES	NO
174	Sunshine Park	County	LA COUNTY	PI 0189-Giano Channel	Regional Parks & Gardens	2	7	2,067	8727014902, 8727014903, 8727014904, 8727014905, 8727014906, 8727014907, 8727014908, 8727014909, 8727014910, 8727014911, 8727014912, 8727014913	NO	NO	NO	NO	NO	NO	YES
347	Baldwin Park City Hall	Baldwin Park	BALDWIN PARK CITY		City Halls	2	3.4	1,543	8554001900, 8554001910	NO	NO	NO	NO	NO	YES	NO
366	Industry City Hall	Industry	INDUSTRY CITY		City Halls	2	2.3	3,102	8208025910	NO	NO	NO	NO	NO	NO	YES
379	Avenue Park	County	LA COUNTY		Regional Parks & Gardens	2	5	2,025	8206003900, 8206003901, 8206004900	NO	NO	NO	NO	NO	NO	NO
473	Covina CIty Hall	Covina	COVINA CITY		City Halls	2	1	5,076	8445001913	NO	NO	NO	NO	NO	YES	NO
CS9	Shyer Park	County	BALDWIN PARK CITY		Regional Parks & Gardens	2	1.3	42	8558022801, 8560028801, 8560028904	NO	NO	NO	NO	NO	YES	YES
134	Amelia Mayberry Park	County	LA COUNTY	BI 7350-U2	Regional Parks & Gardens	2	14.4	14,428	8026005900	NO	NO	NO	YES	NO	NO	NO
137	Bill Blevins Park	County	LA COUNTY PARK		Regional Parks & Gardens	2	5.3	9,297	8269040900, 8269040901	YES	NO	NO	YES	NO	NO	NO
139	Countrywood Park	County	LA COUNTY		Regional Parks & Gardens	2	6.2	6,563	8295021900, 8295021901	YES	NO	NO	NO	NO	NO	NO
151	Louie Pompei Memorial Sports Park	Glendora	GLENDORA CITY		Regional Parks & Gardens	2	20.8	0	8642017901, 8642018900, 8642018907, 8642018908	YES	NO	NO	NO	NO	NO	YES
153	McNees Park	County	LA COUNTY	BI 0008- U8 Line A	Regional Parks & Gardens	2	0.6	6,599	8171028900	NO	NO	NO	YES	NO	NO	NO
161	Sorensen Park	County		BI 0530 - Line B	Regional Parks & Gardens	2	11.4	4,685	8171015901	NO	NO	NO	YES	NO	NO	YES
164	Thomas S Burton Park	County	LA COUNTY		Regional Parks & Gardens	2	11.8	6,700	8205007900	YES	NO	NO	YES	NO	NO	NO
173	Pathfinder Community Regional Park	County	LA COUNTY		Regional Parks & Gardens	2	29	12,276	8269003901, 8269003902	YES	NO	NO	YES	NO	NO	NO
378	Trailview Park	County	LA COUNTY		Regional Parks & Gardens	2	50.6	10,641	8265028900	YES	NO	NO	YES	NO	NO	NO
441	Peter F Schabarum	County	LA COUNTY		Regional Parks & Gardens	2	575.2	5,697	8265002904, 8265002906, 8265002908, 8265003904, 8295019900, 8295019901, 8295019903	YES	NO	YES	YES	NO	NO	NO

SITE INFORMATION										INITIAL SCREENING CRITERIA						
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Site ID	Name	Jurisdiction	Ownership	Nearby Storm Drains	Land Use Category	Tier	Area (acres)	Distance to Conveyance (feet)	Assessor's Identification Number (AIN)	Ground Surface Slope Greater Than 20%	Depth to Groundwater Less Than 20 Feet Below Ground Surface	Significant Ecological Area	Overlying Bedrock	Overlying Methane Producing Landfill	Overlying VOC/Nitrate Plume	High Liquefaction Potential
	Regional County Park															
465	South Hills Park	Glendora	GLENDORA CITY		Regional Parks & Gardens	2	269.2	0	8644010056, 8644010902, 8644013905, 8644013906, 8644013907, 8644014271, 8644014273, 8644014901, 8644014902, 8644014904, 8644014905, 8644014907, 8644014909, 8644014910, 8644014911, 8644015911, 8644015914, 8644015915, 8644027270, 8644027901, 8644027902	YES	NO	NO	YES	NO	NO	NO
WC2	Cameron Park	West Covina	City of West Covina		Regional Parks & Gardens	2	6.4	1,296	8486008903	NO	NO	NO	NO	NO	NO	NO
WC3	Lot near channel	West Covina	City of West Covina			2	0.8	570	8724013901, 8724013900	NO	NO	NO	NO	NO	NO	YES
WC4	Parking Lot	West Covina	City of West Covina			2	8.3	0	8468016904	NO	NO	NO	NO	NO	YES	NO
WC5	Orangewood Park	West Covina	City of West Covina		Regional Parks & Gardens	2	8.0	0	8468017903	NO	NO	NO	NO	NO	YES	NO
WC6	Walmerado Park	West Covina	City of West Covina		Regional Parks & Gardens	2	5.6	4,882	8488017902	NO	NO	NO	NO	NO	YES	NO
CS13	COVINA-VALLEY UNIFIED SCHOOL DISTRICT SPORTS COMPLEX	Covina	Covina Valley Unified School District		Public Schools	3	11.2	5,280	8444021903, 8444021904	NO	NO	NO	NO	NO	NO	NO
78	Badillo Elementary School	Covina	COVINA CITY		Public Elementary Schools	3	8.7	977	8426012902	NO	NO	NO	NO	NO	NO	NO
80	Twin Lakes Elementary School	Baldwin Park	LA COUNTY			3	57.7	0	8550001907	NO	NO	NO	NO	NO	YES	YES
88	Barranca Park, Barranca Elementary School	Covina			Regional Parks & Gardens, Public Elementary Schools	3	13.8	1,601	8451008900	NO	NO	NO	NO	NO	NO	NO
92	Site at top of Baldwin Park	Baldwin Park	LA CO FLOOD CONTROL DIST			3	10	0	8535011901	NO	NO	NO	NO	NO	NO	NO
98	Jones (Charles D) Middle School	Baldwin Park	BALDWIN PARK CITY		Public Middle Schools	3	15.8	669	8555012902	NO	NO	NO	NO	NO	YES	YES
367	La Puente City Hall	La Puente	LA PUENTE CITY	BI 4801 - La Puente, Line A	City Halls	3	1.8	2,638	8246016903	NO	NO	NO	NO	NO	NO	YES
380	San Jose Creek Overlook	County			Regional Parks & Gardens	3	3	92	8120019905	NO	NO	NO	NO	NO	NO	YES
CS4	LADWP Utility Electric Corridor	Baldwin Park	LA CITY DEPT OF WATER AND POWER		Other	3	15.8	378	8550003270, 8550003271, 8550003273, 8551011270, 8551011271, 8556009272, 8564002270, 8564019272	NO	NO	NO	NO	NO	YES	YES
23	Rorimer (Remote) Elementary School	County	ROWLAND UNIFIED SCHOOL DIST		Public Elementary Schools	3	9.2	1,428	8726001900	NO	NO	NO	NO	NO	NO	YES
25	High Voltage Electrical Easement near San Angelo Park	County	WATERSHED CONSERVATIONAUTHORITY			3	7.2	430	8110029907	NO	NO	NO	NO	NO	YES	YES
27	Andrews (Wallen) Elementary School	County	WHITTIER CITY SCHOOL DIST			3	9.3	1,636	8115010900	NO	NO	NO	NO	NO	NO	NO
31	Valinda Elementary School	County	ROWLAND UNIFIED SCHOOL DIST			3	8.6	1,594	8742010901	NO	NO	NO	NO	NO	NO	NO
33	Wing Lane Elementary	County	ROWLAND UNIFIED SCHOOL DIST		Public Elementary Schools	3	10	36	8745014900	NO	NO	NO	NO	NO	NO	YES

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	School															
34	Ron Hockwalt High School (RHHS)	Industry	WALNUT VALLEY UNIFIED SCHOOLDIST		Public High Schools	3	6.6	527	8760023909	NO	NO	NO	NO	NO	NO	YES
43	Temple Academy Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	9.4	1,415	8212011901	NO	NO	NO	NO	NO	YES	YES
44	Sparks Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	22.7	63	8212020901	NO	NO	NO	NO	NO	NO	YES
48	Glenelder Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	10	1,594	8242004900	NO	NO	NO	NO	NO	YES	YES
49	Commercial Buildings	Industry	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST	Pontenova Drain, BI 0442 Line B		3	7.9	833	8245004906	NO	NO	NO	NO	NO	YES	YES
50	Grandview Elementary School	County	ROWLAND UNIFIED SCHOOL DIST			3	17.3	440	8248015900	NO	NO	NO	NO	NO	NO	YES
61	Western Christian High School	County	CHARTER OAK UNIFIED SCHOOL DIST			3	5.3	2,127	8428016907	NO	NO	NO	NO	NO	YES	NO
65	Fairvalley High (Continuation) School	Covina	COVINA VALLEY UNIFIED SCHOOLDIST		Public High Schools	3	10.1	38	8406001902	NO	NO	NO	NO	NO	YES	NO
67	Charter Oak Park (COUSD Parcel)	County	CHARTER OAK UNIFIED SCHOOL DIST		Lot owned by Charter Oak Unified School District	3	14	1,959	8403013901	NO	NO	NO	NO	NO	YES	NO
70	Ben Lomond Elementary School	County	COVINA VALLEY UNIFIED SCHOOLDIST		Public Elementary Schools	3	9.1	1,428	8405008900	NO	NO	NO	NO	NO	YES	NO
72	Valencia Elementary School	Covina	COVINA VALLEY UNIFIED SCHOOLDIST		Public Elementary Schools	3	9.6	298	8408021900	NO	NO	NO	NO	NO	YES	NO
73	Gladstone High School	Covina	AZUSA UNIFIED SCHOOL DIST			3	37.9	30	8409019906	NO	NO	NO	NO	NO	YES	NO
74	Northview High School	Covina	COVINA VALLEY UNIFIED SCHOOLDIST			3	17.8	1,533	8420013901	NO	NO	NO	NO	NO	YES	NO
75	Cypress Ball Park and Elementary School	County	COVINA VALLEY UNIFIED SCHOOLDIST		Regional Parks & Gardens, Public Elementary Schools	3	15.7	681	8421015900	NO	NO	NO	NO	NO	YES	NO
76	Northview High School	Covina	COVINA VALLEY UNIFIED SCHOOLDIST			3	19.3	1,473	8420013902	NO	NO	NO	NO	NO	YES	NO
77	Lark Ellen Elementary School	County	COVINA VALLEY UNIFIED SCHOOLDIST			3	6.6	1,409	8419031905	NO	NO	NO	NO	NO	YES	NO
79	Vacant Lot near SGR	County	WATERSHED CONSERVATIONAUTHORITY	PD 1620		3	6.2	946	8110001901	NO	NO	NO	NO	NO	YES	YES
81	Manzanita Elementary School	County	COVINA VALLEY UNIFIED SCHOOLDIST		Public Elementary Schools	3	9.7	1,409	8435016901	NO	NO	NO	NO	NO	NO	NO
83	Partially Vacant Lot near Irwindale Shopping Center	County	COVINA VALLEY UNIFIED SCHOOLDIST			3	9.6	2,053	8435006900	NO	NO	NO	NO	NO	YES	NO
84	Central	Baldwin	BALDWIN PARK UNIFIED		Public Elementary	3	9.6	215	8438004900	NO	NO	NO	NO	NO	YES	NO

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	Elementary School	Park	SCHOOL DIST		Schools											
86	Sierra Vista Middle School	Covina	COVINA VALLEY UNIFIED SCHOOLDIST		Public Middle Schools	3	13.5	2,587	8446007903	NO	NO	NO	NO	NO	YES	NO
91	Partially Vacant Lot near California Elementary	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST			3	9.1	2,605	8472022901	NO	NO	NO	NO	NO	NO	YES
95	Sierra Vista High School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public High Schools	3	41.8	2,928	8552011902	NO	NO	NO	NO	NO	YES	YES
97	Vineland Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST			3	14.7	534	8554018900	NO	NO	NO	NO	NO	YES	NO
99	Foster Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Elementary Schools	3	9	527	8555017900	NO	NO	NO	NO	NO	YES	YES
100	Torch Middle School	Industry	BASSETT UNIFIED SCHOOL DIST		Public Middle Schools	3	21	1,358	8561020900	NO	NO	NO	NO	NO	YES	YES
101	Elwin Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Elementary Schools	3	11.8	2,663	8556009900	NO	NO	NO	NO	NO	YES	YES
102	Van Wig (J E) Elementary School	County	BASSETT UNIFIED SCHOOL DIST		Public Elementary Schools	3	8.5	810	8560008900	NO	NO	NO	NO	NO	YES	YES
108	Madrid (Alfred S) Middle School	Industry	MOUNTAIN VIEW SCHOOL DIST			3	14.3	371	8565024902	NO	NO	NO	NO	NO	YES	YES
110	De Anza Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Elementary Schools	3	10.5	1,502	8550019901	NO	NO	NO	NO	NO	YES	YES
115	Olive Middle School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST			3	16.3	1,289	8535011904	NO	NO	NO	NO	NO	NO	NO
116	Nogales High School	County	ROWLAND UNIFIED SCHOOL DISTRICT			3	40.2	2,690	8725005906	NO	NO	NO	NO	NO	NO	YES
119	Vacant Lot near Channel	County	WATERSHED CONSERVATION AUTHORITY			3	6.6	319	8110029002, 8110029903	NO	NO	NO	NO	NO	YES	YES
122	Cedargrove Elementary School	County	CHARTER OAK UNIFIED SCHOOL DIST			3	17.7	1,559	8404010900	NO	NO	NO	NO	NO	YES	NO
194	Santana High (Continuation) School	County	ROWLAND UNIFIED SCHOOL DIST		Public High Schools	3	5	703	8760002900	NO	NO	NO	NO	NO	NO	NO
196	Unknown School	County	CHARTER OAK UNIFIED SCHOOL DIST		?	3	8.7	2,181	8403013901	NO	NO	NO	NO	NO	YES	NO
199	Edgewood Academy	County	BASSETT UNIFIED SCHOOL DIST		Public Elementary Schools	3	18.3	2,984	8465013900, 8465013901	NO	NO	NO	NO	NO	YES	YES
203	Alvarado Middle School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Middle Schools	3	22.3	5,325	8272001900	NO	NO	NO	NO	NO	NO	NO
204	Holland (Jerry D) Middle School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Middle Schools	3	12.5	4,318	8543015900	NO	NO	NO	NO	NO	YES	NO
205	Walnut Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Elementary Schools	3	9.5	1,630	8542001900	NO	NO	NO	NO	NO	NO	NO
208	Covina Elementary School	Covina	COVINA VALLEY UNIFIED SCHOOLDIST		Public Elementary Schools	3	15.3	4,597	8429017900, 8429018900	NO	NO	NO	NO	NO	YES	NO
210	Glen Oak Elementary	Covina	CHARTER OAK UNIFIED SCHOOL DIST		Public Elementary Schools	3	8.5	2,750	8402010939	NO	NO	NO	NO	NO	YES	NO

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	School															
211	Jellick Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	8.6	2,645	8761001900	NO	NO	NO	NO	NO	NO	NO
212	Bursch (Charles) Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Elementary Schools	3	8.7	4,392	8546025900	NO	NO	NO	NO	NO	YES	NO
214	Geddes (Ernest R) Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Elementary Schools	3	13.1	3,181	8415007900, 8415014902, 8415022900	NO	NO	NO	NO	NO	YES	NO
215	Baldwin Park High School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public High Schools	3	41.1	561	8438001904, 8459001900	NO	NO	NO	NO	NO	NO	NO
217	Covina High School	Covina	COVINA VALLEY UNIFIED SCHOOLDIST		Public High Schools	3	35.9	4,069	8443013900, 8443014900, 8443014901	NO	NO	NO	NO	NO	YES	NO
220	Tracy Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Elementary Schools	3	9.2	2,770	8551021906, 8551021909	NO	NO	NO	NO	NO	YES	YES
222	Kenmore Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Elementary Schools	3	6.7	3,877	8552012901	NO	NO	NO	NO	NO	YES	YES
223	La Seda Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	12	3,165	8727004900	NO	NO	NO	NO	NO	NO	YES
226	Heath (Margaret) Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Elementary Schools	3	6.7	3,676	8536025902	NO	NO	NO	NO	NO	NO	NO
227	Royal Oak Middle School	County	CHARTER OAK UNIFIED SCHOOL DIST		Public Middle Schools	3	42.5	1,421	8428016908, 8428016907	NO	NO	NO	NO	NO	YES	NO
228	Las Palmas Middle School	Covina	COVINA VALLEY UNIFIED SCHOOLDIST		Public Middle Schools	3	15.9	2,720	8434010901	NO	NO	NO	NO	NO	YES	NO
230	Pleasant View Elementary School	Baldwin Park	BALDWIN PARK UNIFIED SCHOOL DIST		Public Elementary Schools	3	9	3,910	8414018900	NO	NO	NO	NO	NO	YES	NO
233	Charter Oak High School	Covina	COVINA VALLEY UNIFIEDSCHOOL DIST		Public High Schools	3	45.3	3,012	8403005901	NO	NO	NO	NO	NO	YES	NO
241	Don Julian Elementary School	County	BASSETT UNIFIED SCHOOL DIST		Public Elementary Schools	3	10	3,042	8206005900	NO	NO	NO	NO	NO	NO	NO
257	Villacorta (Remote) Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	8.4	4,194	8728015900	NO	NO	NO	NO	NO	NO	NO
259	Meadow Green Elementary School	County	LOWELL JOINT SCHOOL DIST		Public Elementary Schools	3	10.1	4,813	8035007900	NO	NO	NO	NO	NO	NO	NO
263	Sunkist Elementary School	County	BASSETT UNIFIED SCHOOL DIST		Public Elementary Schools	3	9.9	2,562	8464032900	NO	NO	NO	NO	NO	NO	YES
264	Erwin (thomas M) Elementary School	County	BASSETT UNIFIED SCHOOL DIST		Public Elementary Schools	3	15.4	4,217	8465027900, 8465027901	NO	NO	NO	NO	NO	NO	YES
265	Rowland (Remote) Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	11.6	6,537	8270023902	NO	NO	NO	NO	NO	NO	NO
267	Nelson (Ada S) Elementary School	County	LOS NIETOS SCHOOL DIST		Public Elementary Schools	3	8.3	2,931	8178003900	NO	NO	NO	NO	NO	NO	YES

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270	Killian Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	9.2	6,514	8272020901, 8272020902	NO	NO	NO	NO	NO	NO	NO
273	Mill Elementary School	County	WHITTIER CITY SCHOOL DIST		Public Elementary Schools	3	7.5	3,729	8125027907	NO	NO	NO	NO	NO	NO	NO
274	Farjardo (Remote) Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	7.2	7,493	8253014901	NO	NO	NO	NO	NO	NO	NO
280	Baldwin Academy Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	10	4,761	8254008901, 8254008902	NO	NO	NO	NO	NO	YES	YES
281	California Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	9.3	3,402	8472018900	NO	NO	NO	NO	NO	NO	YES
285	Yorbita (Remote) Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	11.1	1,477	8727010900	NO	NO	NO	NO	NO	NO	YES
286	Wedgeworth Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	20	3,387	8209001901	NO	NO	NO	NO	NO	NO	NO
287	Wilson (Glen A) High School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public High Schools	3	38.3	3,038	8207004901	NO	NO	NO	NO	NO	NO	YES
288	Cedarlane Middle School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Middle Schools	3	21.3	3,248	8243036900	NO	NO	NO	NO	NO	NO	YES
289	Bixby Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	10.1	4,456	8207004900	NO	NO	NO	NO	NO	NO	NO
292	Los Molinos Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	10	12,196	8290016900	NO	NO	NO	NO	NO	NO	NO
293	Los Altos Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	8.8	10,411	8222022901	NO	NO	NO	NO	NO	NO	NO
294	Newton Middle School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Middle Schools	3	14.8	7,391	8215022900, 8215022901	NO	NO	NO	NO	NO	NO	NO
297	Los Robles Academy Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	9.4	5,426	8211003902	NO	NO	NO	NO	NO	NO	NO
298	Los Altos High School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public High Schools	3	37.8	3,885	8215001900	NO	NO	NO	NO	NO	NO	YES
300	Shadybend Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	8.3	2,969	8218013901, 8218014907	NO	NO	NO	NO	NO	NO	YES
301	Palm Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	11.6	4,155	8220009900	NO	NO	NO	NO	NO	NO	NO
339	Tri-Community Adult School	Covina	COVINA VALLEY UNIFIED SCHOOLDIST		Public Adult Schools	3	0.8	5,011	8444010900	NO	NO	NO	NO	NO	YES	NO
47	Truck Loading Dock	County	U S POSTAL SERVICE			3	24.9	619	8218009901	NO	NO	NO	NO	NO	YES	YES
172	Los Altos Park	County	SOUTH WHITTIER SCHOOL DIST	BI 0531 - U2 Line B	Regional Parks & Gardens	3	2.4	15,211	8031012903	NO	NO	NO	YES	NO	NO	NO
175	Pico Rivera Municipal Golf Course	County			Golf Courses	3	2.9	752	8119010905, 8119010906	NO	YES	NO	NO	NO	NO	YES
184	Rio Hondo	County	RIO HONDO COMMUNITY		Colleges &	3	138.5	3,827	8125026800, 8125026802, 8125026902, 8125026903	YES	NO	YES	YES	YES	NO	NO

SITE INFORMATION										INITIAL SCREENING CRITERIA						
										Major Site Constraint				Other Site Criteria		
Site ID	Name	Jurisdiction	Ownership	Nearby Storm Drains	Land Use Category	Tier	Area (acres)	Distance to Conveyance (feet)	Assessor's Identification Number (AIN)	Ground Surface Slope Greater Than 20%	Depth to Groundwater Less Than 20 Feet Below Ground Surface	Significant Ecological Area	Overlying Bedrock	Overlying Methane Producing Landfill	Overlying VOC/Nitrate Plume	High Liquefaction Potential
	Community College		COLLEGE DIST		Universities											
198	El Camino High (Continuation) School	County	NORWALK LA MIRADA UNIFIED SCHOOLDIST		Public High Schools	3	11.4	11,649	8032014900	NO	NO	NO	YES	NO	NO	NO
224	Ybarra Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	10.1	2,785	8762018902, 8762018903	NO	NO	NO	YES	NO	NO	YES
225	Sonrise Christian	Covina	CHARTER OAK UNIFIED SCHOOL DIST		Private and Charter Schools	3	13.1	2,823	8428013901	NO	NO	NO	NO	NO	YES	NO
231	Sonrise Christian	Covina	CHARTER OAK UNIFIED SCHOOL DIST		Private and Charter Schools	3	8.5	3,964	8427003901	NO	NO	NO	NO	NO	YES	NO
238	Rowland High School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public High Schools	3	36.9	5,830	8276009900	NO	NO	NO	YES	NO	NO	NO
239	Mulberry Elementary School	County			Public Elementary Schools	3	8.8	17,854	8159005901	NO	NO	NO	YES	NO	NO	YES
240	Pioneer High School	County	WHITTIER UNION HIGH SCHOOL DIST		Public High Schools	3	35	1,532	8177019902, 8177019904, 8177019905	NO	NO	NO	YES	NO	NO	YES
244	Aeolian Elementary School	County	LOS NIETOS SCHOOL DIST		Public Elementary Schools	3	11.8	5,510	8169008900, 8169008901, 8169008902, 8169020030, 8169020031, 8169020032, 8169020033, 8169020034, 8169020901, 8169020902, 8169020903, 8169020904	NO	NO	NO	YES	NO	NO	YES
246	La Colima Elementary School	County	EAST WHITTIER CITY SCHOOL DIST		Public Elementary Schools	3	9.6	13,988	8227004900	NO	NO	NO	YES	NO	NO	NO
247	Loma Vista Elementary School	County	SOUTH WHITTIER SCHOOL DIST		Public Elementary Schools	3	9.4	17,339	8028005900	NO	NO	NO	YES	NO	NO	NO
248	West Whittier Elementary School	County	WHITTIER CITY SCHOOL DIST		Public Elementary Schools	3	6.2	1,630	8174021900	NO	NO	NO	YES	NO	NO	YES
249	Northam (Remote) Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	9.8	2,530	8728010900, 8728010901	NO	NO	NO	YES	NO	NO	NO
250	Los Altos/Monte Vista Elementary School	County	SOUTH WHITTIER SCHOOL DIST		Public Elementary Schools	3	14.5	15,211	8031012903, 8031012904, 8031013900	NO	NO	NO	YES	NO	NO	YES
251	Telechron Elementary School	County	SOUTH WHITTIER SCHOOL DIST		Public Elementary Schools	3	6.6	17,951	8030008901, 8030008902	NO	NO	NO	YES	NO	NO	NO
252	Phelan Elementary School	County	WHITTIER CITY SCHOOL DIST		Public Elementary Schools	3	8.7	1,988	8176028900	NO	NO	NO	YES	NO	NO	YES
254	Sorensen (Christian) Elementary School	County	WHITTIER CITY SCHOOL DIST		Public Elementary Schools	3	6.9	5,416	8171015900	NO	NO	NO	YES	NO	NO	YES
255	Blandford Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	9.5	9,983	8258009900	NO	NO	NO	YES	NO	NO	NO
256	Los Nietos Middle School	County	LOS NIETOS SCHOOL DIST		Public Middle Schools	3	13.5	3,373	8178023900, 8178025901, 8178025902	NO	NO	NO	YES	NO	NO	YES
260	Whittier Christian School	County	LOWELL JOINT SCHOOL DIST		Private and Charter Schools	3	9.4	3,756	8036009900	NO	NO	NO	YES	NO	NO	NO
261	Granada Middle	County	EAST WHITTIER CITY SCHOOL		Public Middle	3	29.5	8,548	8040012900	NO	NO	NO	YES	NO	NO	NO

SITE INFORMATION										INITIAL SCREENING CRITERIA						
										Major Site Constraint				Other Site Criteria		
Site ID	Name	Jurisdiction	Ownership	Nearby Storm Drains	Land Use Category	Tier	Area (acres)	Distance to Conveyance (feet)	Assessor's Identification Number (AIN)	Ground Surface Slope Greater Than 20%	Depth to Groundwater Less Than 20 Feet Below Ground Surface	Significant Ecological Area	Overlying Bedrock	Overlying Methane Producing Landfill	Overlying VOC/Nitrate Plume	High Liquefaction Potential
	School		DIST		Schools											
262	Edwards (Katherine) Middle School	County	WHITTIER CITY SCHOOL DIST		Public Middle Schools	3	19.6	1,950	8174032901	NO	NO	NO	YES	NO	NO	YES
266	Ceres Elementary School	County	EAST WHITTIER CITY SCHOOL DIST		Public Elementary Schools	3	10.5	17,524	8155008900, 8155008901	NO	NO	NO	YES	NO	NO	NO
268	Shelyn Elementary School	County	ROWLAND UNIFIED SCHOOL DISTRICT		Public Elementary Schools	3	8.2	6,154	8276002906	NO	NO	NO	YES	NO	NO	NO
272	Washington Elementary School	County	WHITTIER CITY SCHOOL DIST		Public Elementary Schools	3	7.8	4,477	8173022900	NO	NO	NO	YES	NO	NO	YES
275	California High School	County	WHITTIER UNION HIGH SCHOOL DIST		Public High Schools	3	55.2	16,437	8151027905	NO	NO	NO	YES	NO	NO	YES
276	Rancho-Starbuck Middle School	County	LOWELL JOINT SCHOOL DIST		Public Middle Schools	3	22.5	2,073	8036023900	NO	NO	NO	YES	NO	NO	NO
290	Mesa Robles Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	22.7	7,216	8205014900	NO	NO	NO	YES	NO	NO	NO
291	Grazide Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	10	10,265	8204022900	YES	NO	NO	YES	NO	NO	NO
296	Orange Grove Middle School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Middle Schools	3	17.1	5,741	8211013900	NO	NO	NO	NO	YES	NO	NO
299	Kwis Elementary School	County	HACIENDA LA PUENTE UNIFIEDSCHOOL DIST		Public Elementary Schools	3	14.3	6,222	8215012901	NO	NO	NO	YES	NO	NO	YES
309	Hillview Middle School	County	EAST WHITTIER CITY SCHOOL DIST		Public Middle Schools	3	18.3	11,773	8228022900, 8228022901	NO	NO	NO	YES	NO	NO	NO
343	Whittier Narrows Equestrian Center	County	U S GOVT		Regional Parks & Gardens	3	27	298	8125012910, 8125062003, 8125062904	NO	YES	YES	NO	NO	NO	YES
346	Industry Hills Golf Club	Industry	INDUSTRY CITY		Golf Courses	3	421.2	1,063	8247013904, 8247014900, 8262001010, 8262001011, 8262001900, 8262001902, 8262011011, 8262011930, 8262011931, 8262012028, 8262012270, 8262012271, 8262012272, 8262012273, 8262012274, 8262012275, 8262012276, 8262015900, 8262015902, 8262015904, 8262015905	YES	NO	NO	YES	YES	NO	YES
373	San Jose Creek Water Reclamation Plant West	County	CO SANITATION DIST NO 18		Utilities	3	16.4	153	8115001904, 8115001906	NO	YES	NO	NO	NO	NO	YES
377	California Polytechnic University Pomona	County	STATE OF CALIF		Colleges & Universities	3	545	33	8710002902, 8710002903, 8710003907, 8710003916	YES	NO	YES	YES	YES	NO	YES
448	Streamland Park	County	U S GOVT		Regional Parks & Gardens	3	1.9	2,663	8119010905, 8119010906	NO	YES	NO	NO	NO	NO	YES
451	Orchard Dale Elementary School	County	EAST WHITTIER CITY SCHOOL DIST		Public Elementary Schools	3	12.9	12,383	8226020905	NO	NO	NO	YES	NO	NO	YES
453	Carmela Elementary School	County	SOUTH WHITTIER SCHOOL DIST		Public Elementary Schools	3	2.7	15,215	8026006900	NO	NO	NO	YES	NO	NO	NO
454	Lake Marie Elementary School	County	SOUTH WHITTIER SCHOOL DIST		Public Elementary Schools	3	22.7	12,187	8167029907, 8167029908	NO	NO	NO	YES	NO	NO	NO

SITE INFORMATION										INITIAL SCREENING CRITERIA						
										Major Site Constraint				Other Site Criteria		
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446	California Country Club[1]	Industry			Golf Courses	4	14.1	617	8115002006	NO	YES	NO	NO	NO	NO	YES
35	Homestead Museum	Industry	Urban Development Agency	San Jose Creek	Historic Site	3	6.2	373	8208027906	NO	NO	NO	NO	NO	YES	YES
62	Homestead Museum	Industry	Urban Development Agency	San Jose Creek	Historic Site	3	5.8	298	8208027912	NO	NO	NO	NO	NO	YES	YES
63	Homestead Museum (Buildings)	Industry	Urban Development Agency	San Jose Creek	Historic Site	3	9.1	835	8208027906, 8208027911	NO	NO	NO	NO	NO	YES	YES
282	Workman (William) High School	Industry	Hacienda La Puente Unified	Puente Creek and City drains	Public High Schools	2	30.9	184	8250001912	NO	NO	NO	NO	NO	NO	YES
283	Sierra Vista Middle School[1]	La Puente			Public Middle Schools	3	13.2	649	8251013904, 8251010900	NO	NO	NO	NO	NO	NO	YES
53	Sierra Vista Middle School[1]	La Puente			Public Middle Schools	3	7.8	649	8251010900	NO	NO	NO	NO	NO	NO	YES
55	Sierra Vista Middle School[1]	La Puente			Public Middle Schools	3	5.4	1,250	8251013904	NO	NO	NO	NO	NO	NO	YES
269	Bassett Senior High School[1]	La Puente			Public High Schools	3	36.7	3,403	8201010900	NO	NO	NO	NO	NO	NO	YES
52	Del Valle Elementary School[1]	La Puente			Public Elementary Schools	3	11.4	325	8251003900	NO	NO	NO	NO	NO	NO	YES
WC7	California Elementary [1]	West Covina	West Covina Unified School District			3										
WC8	Cameron Elementary[1]	West Covina	West Covina Unified School District			3										
WC9	Merced Elementary[1]	West Covina	West Covina Unified School District			3										
WC10	Merlinda Elementary[1]	West Covina	West Covina Unified School District			3										
WC11	Monte Vista Elementary[1]	West Covina	West Covina Unified School District			3										
WC12	Orangewood Elementary[1]	West Covina	West Covina Unified School District			3										
WC13	Vine Elementary[1]	West Covina	West Covina Unified School District			3										
WC14	Wescove Elementary[1]	West Covina	West Covina Unified School District			3										
WC15	Edgewood Middle School[1]	West Covina	West Covina Unified School District			3										
WC16	Hollencrest Middle School[1]	West Covina	West Covina Unified School District			3										
WC17	Walnut Grove Intermediate[1]	West Covina	West Covina Unified School District			3										
WC18	Coronado High School[1]	West Covina	West Covina Unified School District			3										
WC19	Edgewood High School[1]	West Covina	West Covina Unified School District			3										
WC20	West Covina High School[1]	West Covina	West Covina Unified School District			3										
WC21	Rio Verde Academy[1]	West Covina	West Covina Unified School District			3										
WC22	San Jose Charter[1]	West Covina	West Covina Unified School District			3										

SITE INFORMATION										INITIAL SCREENING CRITERIA						
										Major Site Constraint				Other Site Criteria		
Site ID	Name	Jurisdiction	Ownership	Nearby Storm Drains	Land Use Category	Tier	Area (acres)	Distance to Conveyance (feet)	Assessor's Identification Number (AIN)	Ground Surface Slope Greater Than 20%	Depth to Groundwater Less Than 20 Feet Below Ground Surface	Significant Ecological Area	Overlying Bedrock	Overlying Methane Producing Landfill	Overlying VOC/Nitrate Plume	High Liquefaction Potential
WC23	Willowood Pre-School[1]	West Covina	West Covina Unified School District			3										
WC24	Mesa Elementary[1]	West Covina	Covina Unified School District			3										
WC25	Grovecenter Elementary[1]	West Covina	Covina Unified School District			3										
WC26	Rowland Avenue Elementary[1]	West Covina	Covina Unified School District			3										
WC27	Workman Avenue[1]	West Covina	Covina Unified School District			3										
WC28	Traweek[1]	West Covina	Covina Unified School District			3										
WC29	South Hills High[1]	West Covina	Covina Unified School District			3										
WC30	Children's Center[1]	West Covina	Covina Unified School District			3										
WC31	Hollingworth Elementary[1]	West Covina	Rowland Unified School District			3										
WC32	Telesis Academy of Science & Math[1]	West Covina	Rowland Unified School District			3										
WC33	Giano Intermediate[1]	West Covina	Rowland Unified School District			3										
WC34	Tri-Community Pioneer Center[1]	West Covina	Covina Unified School District			3										

[1] Site was added to the preliminary site list during a revision subsequent to the site selection screening.

Appendix C-9:
Additional RAA Information

Contents

Figures

Tables

1 INTRODUCTION

As a component of the Regional Board's review of the EWMP, additional information from the Reasonable Assurance Analysis (RAA) was requested regarding baseline calculations and predicted BMP performance. In response, this appendix contains additional information and RAA outputs, as follows:

- Section 2: Additional outputs regarding baseline condition and critical condition calculations
- Section 3: Additional outputs regarding predicted end-of-pipe best management practice (BMP) performance
- Section 4: Additional outputs through a regional validation example demonstrating attainment of instream receiving water limits (RWLs) by BMPs

2 BASELINE CONDITION: ADDITIONAL OUTPUTS

Comment #2 of the Regional Board's Enclosure 2, *Summary of Comments and Necessary Revisions for the RAA* (RAA Comment Enclosure), requested a comparison be provided for the exceedance volume (EV) by subbasin the 90th percentile of pollutant (zinc) load to account for conditions in which flow may be high but concentration may not exceed the RWL. Figure 2-1 presents a comparison of the total zinc load for three 24-hour 90th percentile critical conditions:

1. 90th percentile 24-hour Exceedance Volume
2. 90th percentile modeled daily flow times 90th percentile modeled concentration, and
3. 90th percentile modeled daily load.

The results show that zinc loading during the Exceedance Volume critical condition (#1, above) is higher than the other 90th percentile metrics (#2 and #3) and thus it is a conservative critical condition that is consistent with RAA Guidelines.

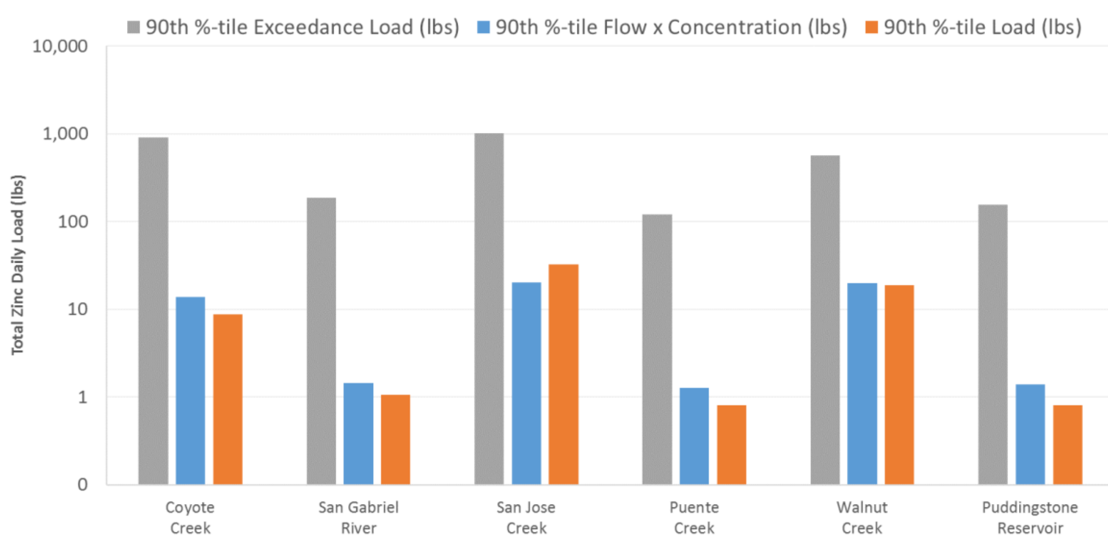


Figure 2-1. Demonstration of exceedance volume approach comparing the 90th percentile condition zinc loads by assessment area.

3 BMP PERFORMANCE: ADDITIONAL OUTPUTS

Regional Board Comment #3 of the RAA Comment Enclosure requested model results be presented for both the baseline condition and the post-EMP (managed) scenario with the proposed BMPs. The model results are summarized below by assessment area, as follows:

- Runoff and pollutant load under the baseline and BMP scenarios for the 90th percentile total zinc critical condition (Table 3-1)
- Runoff under baseline and BMP scenarios for the 90th percentile, 11th or 16th wettest day bacteria critical condition (Table 3-2)

Table 3-1. Baseline and BMP Scenario for Runoff and Pollutant Loads during Zinc Critical Condition

Assessment Area	Scenario	Runoff Volume (ac-ft)	*E. coli* (MPN)	Total Copper (lbs)	Total Lead (lbs)	Total Zinc (lbs)	% Total Zinc Reduction
Coyote Creek	Baseline	262.9	1.7E+14	53.7	49.5	238.9	67%
	with BMPs	126.4	5.6E+13	17.7	16.4	77.8	
San Gabriel River	Baseline	340.6	2.5E+14	63.3	51.1	297.5	64%
	with BMPs	152.6	8.7E+13	23.2	19.1	107.3	
San Jose Creek	Baseline	879.3	8.7E+14	183.6	154.6	838.2	67%
	with BMPs	380.6	2.8E+14	59.3	49.0	274.8	
Puente Creek	Baseline	141.9	1.5E+14	33.4	29.9	148.4	76%
	with BMPs	46.6	3.1E+13	7.8	6.9	35.4	
Walnut Creek	Baseline	794.6	9.3E+14	182.0	164.9	796.4	62%
	with BMPs	367.6	3.3E+14	69.9	64.3	303.9	
Puddingstone Reservoir	Baseline	23.5	1.7E+13	2.3	1.4	8.1	78%
	with BMPs	10.3	6.0E+12	0.6	0.4	1.8	

Table 3-2. Baseline Runoff and BMP Retention for Assessment Areas during Bacteria Critical Condition

Assessment Area	Baseline Runoff during 90th percentile, 11th day after HFS (acre-feet)	Runoff with BMPs during 90th percentile, 11th day after HFS (acre-feet)
Coyote Creek	72.6	0.0
San Gabriel River	105.2	0.0
San Jose Creek	258.4	0.0
Puente Creek [1]	48.7	0.0
Walnut Creek	279.9	0.0
Puddingstone Reservoir	4.9	0.0

1. Bacteria critical condition for Puente Creek, which is not subject to high flow suspension, is the 90th percentile, 16th wettest day as discussed in **Table 4-3** of the USGR EWMP.

4 REGIONAL VALIDATION EXAMPLE

Comment #5 of the RAA Comment Enclosure requested a proof/validation/demonstration that managing metals using the recommended EWMP BMPs results in instream attainment of RWLs. It is important to note that volume-and-load-reduction targets are determined at the *beginning* of the Reasonable Assurance Analysis (RAA) process (and through the limiting pollutant analysis), and thus the extra step at the end of the RAA process to show validation results is optional. However, it is understood that a clear validation may be useful for engaging the public and Regional Board during future discussion.

The RAA for the USGR EWMP employs a two-tiered optimization approach that manages stormwater runoff from EWMP areas according to critical conditions for associated water bodies (or assessment areas). For metals, the management target becomes the load reduction that achieves receiving water limitations (RWLs) during the critical storm that produces the 90th percentile Exceedance Volume. The following EWMPs used this two-tiered optimization approach for selecting Best Management Practices (BMPs) for their implementation plans:

- Upper Santa Clara River (USCR),
- Upper Los Angeles River (ULAR),
- Ballona Creek (BC),
- Upper San Gabriel River (USGR),
- Malibu Creek (MC), and
- Carson and Lawndale portions of the Dominguez Channel (DC) EWMP

In order to support future public discussions, this section provides an example regional validation for a representative example waterbody within Los Angeles County: Puente Creek, a tributary to San Jose Creek in the San Gabriel River Watershed. This regional validation example is attached to each of the six "selected EWMPs" listed above, and this sections presents several comparisons between the Puente Creek watershed and the selected EWMPs, based on averaged conditions *across all six* of those EWMP areas. The selected EWMP areas summarized in Table 4-1 represent the land use distribution within the 6 EWMP groups mapped in Figure 4-1. The areas in Table 4-1 represent the total MS4 areas for which the two-tiered optimization approach was used. Average rainfall within the selected EWMP areas was calculated by area-weighting 25 years of hourly rainfall from 111 unique rainfall gages from over 1,442 WMMS subwatersheds. Average rainfall for Puente Creek was calculated by area-weighting 25 years of rainfall from 2 rainfall gages over eight WMMS subwatersheds. Area-normalized rainfall depths were then plotted and compared (Figure 4-2 and Figure 4-3).

Puente Creek was selected for this demonstration because:

- Puente Creek has high required zinc reductions, providing a conservative demonstration of modeled BMP performance.
- Puente Creek is a watershed where 100% of the watershed area is contained within the EWMP boundary (Figure 4-1).

The land use distribution is Puente Creek is generally more urbanized than the land use distribution in the other selected EWMP areas mentioned above (see

- Table 4-1). Compared to the average distribution in the selected EWMP areas, the Puente Creek watershed has more urban area (93% vs. 55%). The distribution of Commercial, Institutional, Industrial, and Roads is similar; however, Puente Creek has nearly twice as much residential area (expressed as pervious and impervious residential land cover).
- Average rainfall in Puente Creek is very similar to average rainfall throughout the selected EWMP areas. Figure 4-2 shows annual average rainfall distribution for 25 years in Puente

Creek watershed vs. selected EWMP areas. Figure 4-3 also confirms that seasonal variability in Puente follows the average seasonal trend in the selected EWMP areas. The percent difference in annual average and median rainfall in Puente Creek vs. selected EWMP areas over 25 years of record is only -1.4% and -3.8%, respectively.

- The RAA for Puente Creek recommended a mix of LID, Green Streets, and Regional BMPs, which collectively treat 78% of the EWMP area.

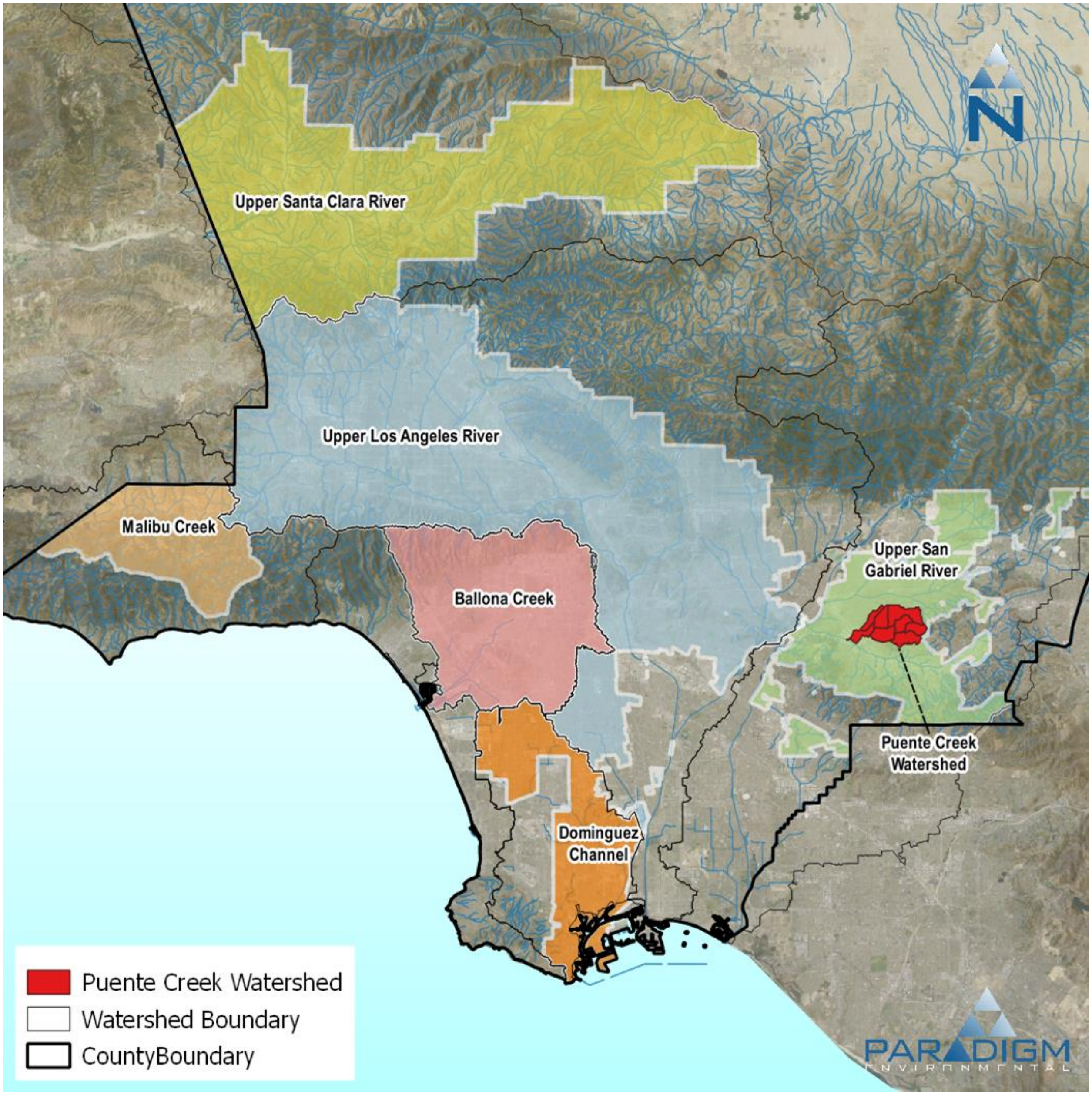


Figure 4-1. Location of Puente Creek watershed within the context of selected Los Angeles County EWMPs.

Table 4-1. Comparison of land use distribution in the Puente Creek EWMP area vs. selected EWMP areas

Land Use		Land Use Distribution[1] by Drainage Area			
		Selected EWMP Areas[2]		Puente Creek Watershed	
		Acres	Percent	Acres	Percent
Impervious	Residential	81,701	10%	1,044	19%
	Commercial	26,250	3%	226	4%
	Institutional	16,163	2%	231	4%
	Industrial	31,467	4%	277	5%
	Roads	60,793	7%	467	9%
Urban Pervious		236,137	29%	2,762	51%
Non-Urban Pervious		363,182	45%	398	7%
Total		**815,692**	**100%**	**5,405**	**100%**

1: Color gradient shows relative land use distribution from least (white) to greatest (red)
2: Selected EWMP areas include: USCR, USGR, ULAR, BC, Malibu, and portions of DC

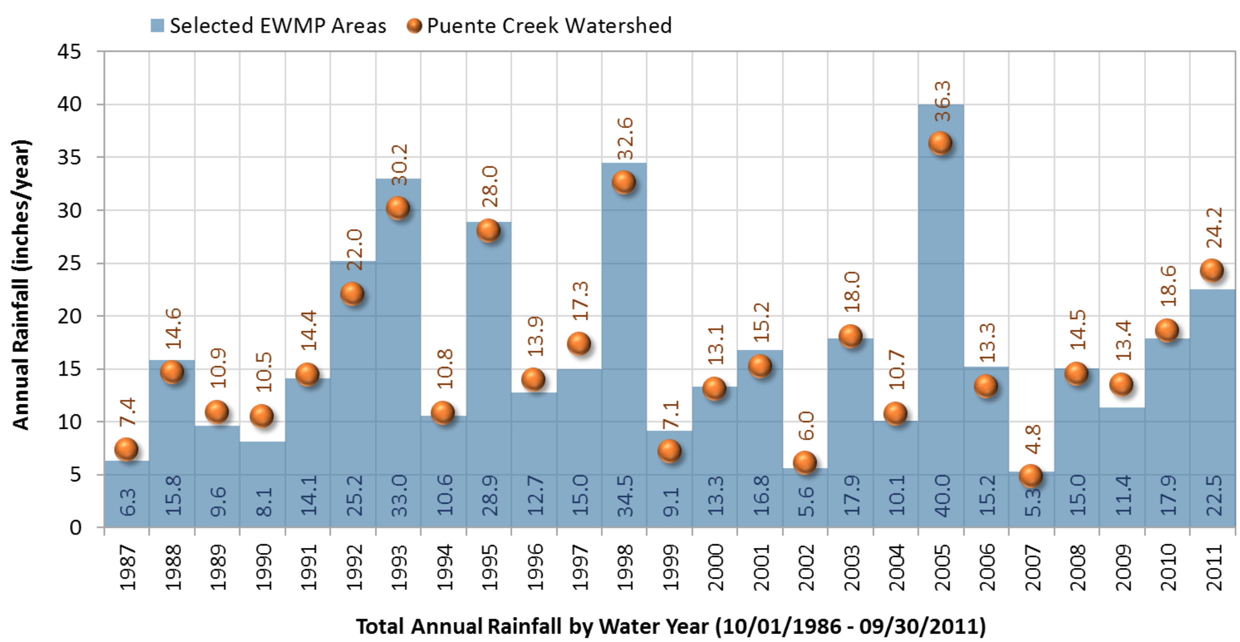


Figure 4-2. Annual rainfall distribution (25 years) in Puente Creek watershed vs. selected EWMP areas.

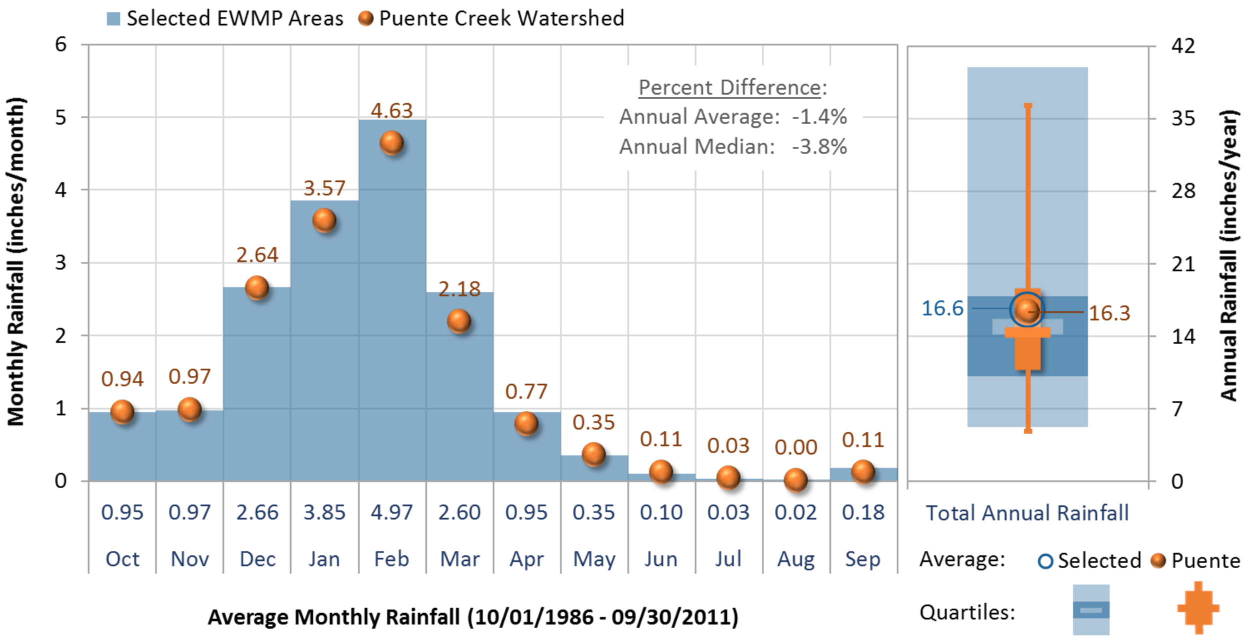


Figure 4-3. Monthly and annual rainfall variability in Puente Creek watershed vs. selected EWMP areas.

4.1 Validation Methodology

RAAs for the selected EWMPs were built on the two primary models within the Watershed Management Modeling System (WMMS) – the Loading Simulation Program in C++ (LSPC), which is used for watershed runoff and streamflow routing, and the System for Urban Stormwater Treatment and Analysis INtegration (SUSTAIN), which is used for BMP selection and placement optimization modeling. As shown in Figure 4-4, to conduct the RAA and complete the validation, the modeling workflow includes (1) simulating watershed rainfall-runoff and pollutant loading; (2) predicting performance of BMPs with fixed assumptions and cost-optimize the cumulative network of BMPs given available BMP opportunities; and (3) validating the selected BMP network to provide reasonable assurance of attainment of RWLs.

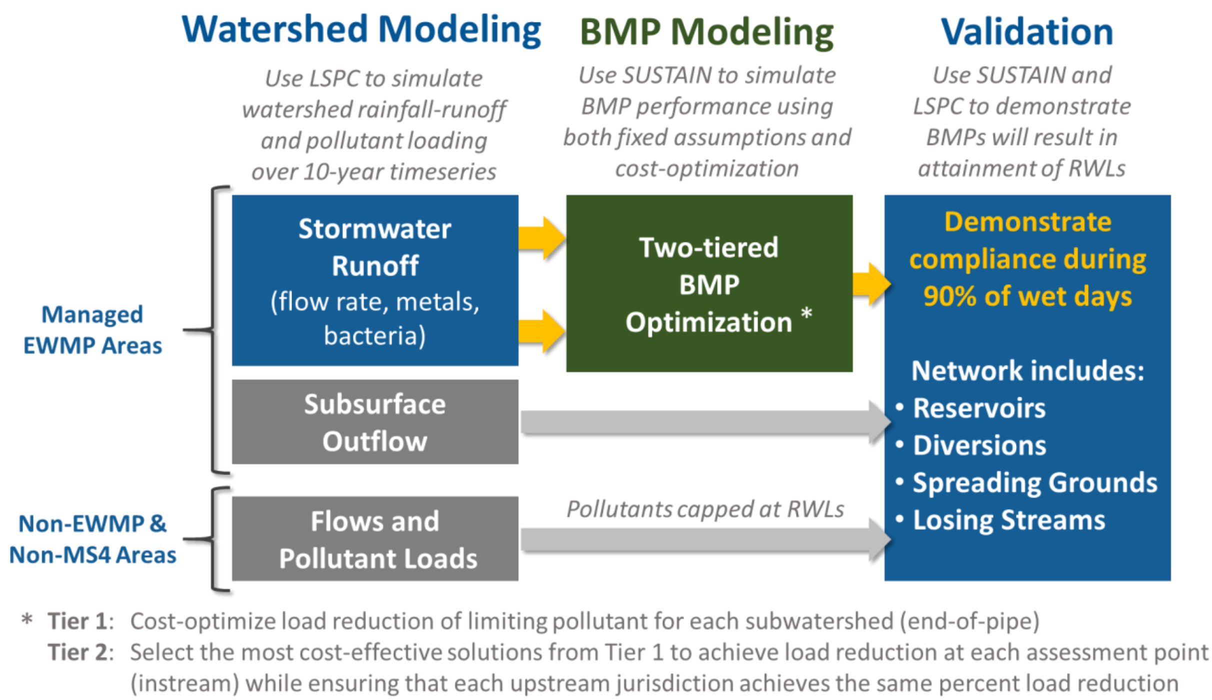


Figure 4-4. Components of the RAA Modeling Process.

4.2 Watershed Model Configuration

The watershed model simulates stormwater runoff and routing/transport for flow and pollutant loads. Subwatershed outflow includes surface and subsurface contributions. Stormwater BMPs manage the surface runoff portion of subwatershed outflow. As described in the RAA sections of the EWMPs, results from 10-years of continuous simulation were used to identify the limiting pollutant's critical condition (i.e. 90^{th} percentile zinc Exceedance Volume) and the required load reduction associated with that critical condition. Although critical conditions are determined instream, associated runoff and loadings originate from multiple subwatersheds and jurisdictions.

An important aspect of the RAA is that load reductions within an assessment area are equitably distributed among jurisdictions contributing to the exceedance. For this reason, the original WMMS subwatersheds were further subdivided into jurisdictions. As described in the RAA sections of the selected EWMPs, all jurisdictions draining to a given assessment point were held to the same percent reduction. Figure 4-5 shows the original WMMS and updated RAA subwatershed routing networks for Puente Creek for the four contributing jurisdictions. The zinc critical condition in Puente Creek required a 76% instream load reduction—for equitability, all jurisdictions are required to each achieve a 76% load reduction collectively within their respective areas that drain to Puente Creek.

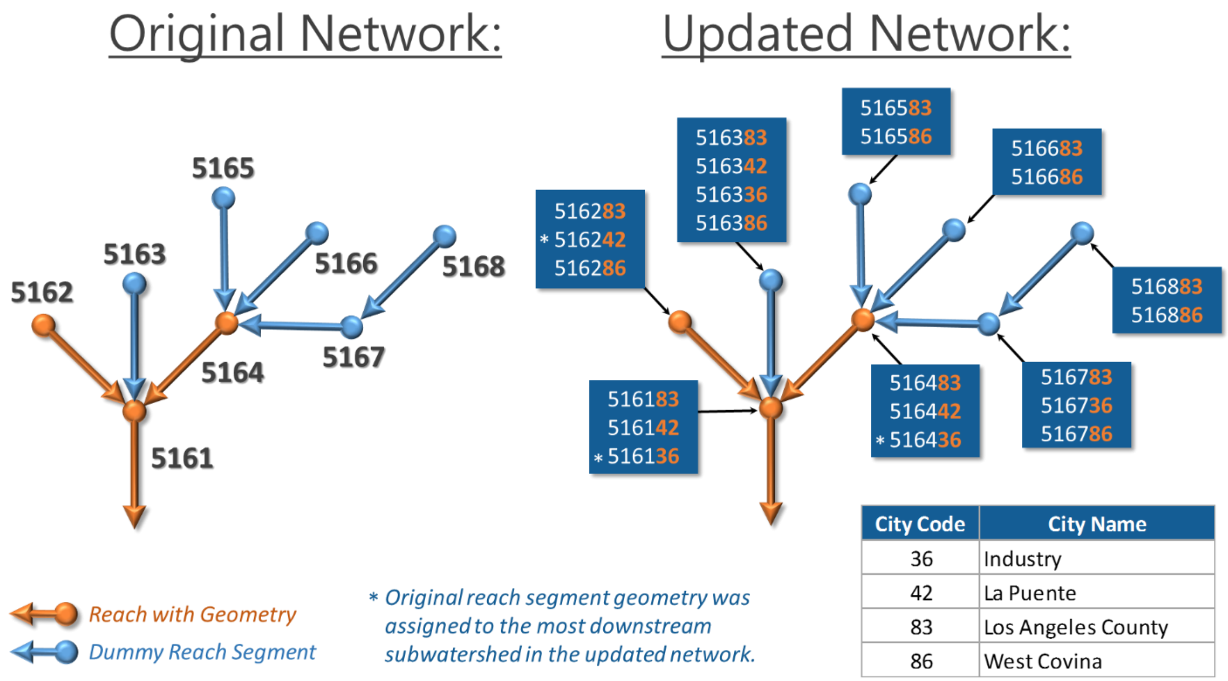


Figure 4-5. Original WMMS vs. RAA subwatershed modeling network for Puente Creek with contributing jurisdictions.

As previously shown in Figure 4-4, individual subwatershed contributions are separated into surface runoff and baseflow. Surface runoff from EWMP areas within Puente Creek were exported from the watershed model and used as boundary conditions for BMP modeling. Validation is performed by replacing baseline runoff in the watershed model with BMP effluent from the EWMP implementation plan. Subsurface flows and any other contributions from non-EWMP areas were also identified in the baseline model for accounting purposes. Non-EWMP areas were not managed by EWMP BMPs but it is important to account for impact of non-EWMP areas on the validation, as further described in Section 0.

4.3 BMP Model Configuration

SUTAIN was used to identify the most cost-effective combination of management practices in each subwatershed that collectively achieved a 76% zinc load reduction in each jurisdiction. Figure 4-6 shows the most cost-effective distribution BMP capacity by BMP type (LID, green streets, and regional BMPs). Table 4-2 summarizes the detailed recipes for compliance for the four jurisdictions within the Puente Creek assessment area. For this exercise, the validation is focused on zinc RWL attainment and thus the BMPs associated with the 2026 metals attainment milestone were included in the model to validate RWL attainment for metals.

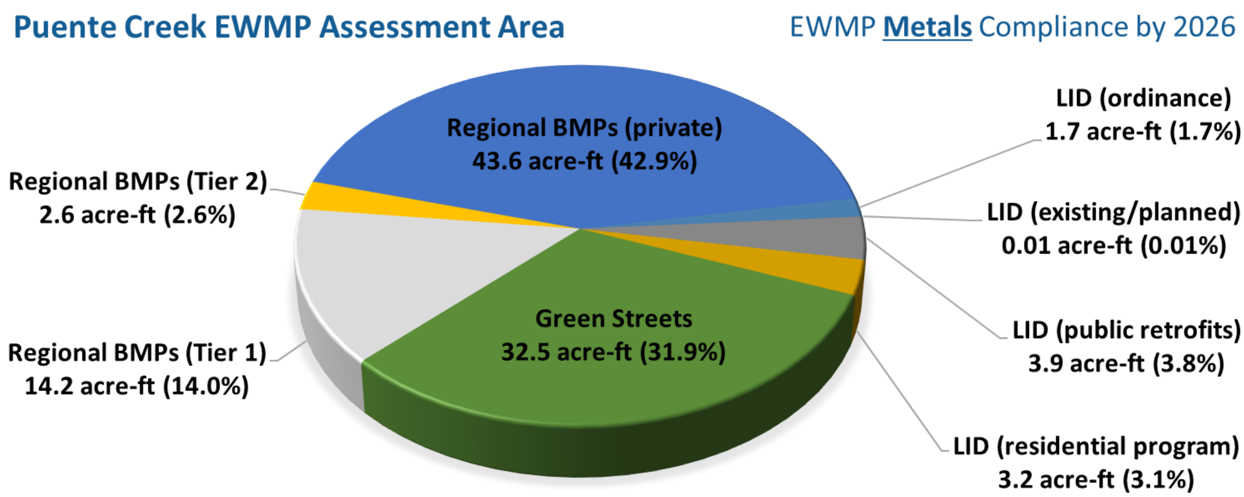


Figure 4-6. BMP capacities for metals compliance in the Puente Creek watershed.

Table 4-2. Detailed recipe for Metals TMDL compliance by jurisdiction for the Puente Creek Watershed

		EWMP Implementation Plan Component	Optimized Capacity by Jurisdiction (acre-ft)			
			Industry	La Puente	Los Angeles County	West Covina
For Metals Attainment by 2026		24-hour Volume Managed	14.28	28.71	48.58	21.14
	LID	Ordinance	0.43	0.42	0.77	0.09
		Planned LID	---	---	0.01	---
		Public LID	0.14	0.42	3.27	0.05
		Residential LID	0.01	0.86	2.07	0.23
		Green Streets	0.98	9.00	17.62	4.85
	Regional	Tier 1 (public, owned)	---	10.92	3.31	---
		Tier 2 (public, owned)	0.81	0.03	---	1.78
		Tier 2 (public, non-owned)	---	---	0.00	---
		Private	6.82	10.52	15.42	10.8
		Total BMP Capacity	**9.19**	**32.18**	**42.48**	**17.8**

4.4 Routing Configuration between Watershed and BMP Models for Validation Example

The validation process involved deconstructing and reconstructing the watershed model within the Puente Creek assessment area. A step-by-step sequence of tests were performed to systematically layer the components, verifying for expected outcomes from test cases at each step in the process. The steps include:

1. **Establish baseline (original subwatershed network)**: run the baseline watershed model (with the original 8-subwatershed network), which serves as the primary reference point for validation.
2. **Confirm baseline (updated subwatershed network)**: run the updated baseline watershed (with the updated jurisdiction-based network with 22 subwatersheds) and verify that flow and water quality matches results from Step 1.
    a. **Establish EWMP baseline**: separate runoff into EWMP and non-MS4 timeseries. Non-MS4 areas are assumed to be managed by other means to achieve RWL. For the validation run, doing that ensures that non-EWMP areas do not contribute to exceedance at the assessment point. Thus, the concentrations of zinc from non-MS4 areas are "capped" at the RWL to prevent the non-MS4 areas from causing or contributing to RWL exceedances.
3. **Confirm optimized BMP solution**: combine baseline LSPC and SUSTAIN BMP model runs
    a. Route 10 years of baseline continuous simulation runoff from LSPC through the selected EWMP BMPs to generate timeseries of treated runoff.
    b. Replace baseline timeseries in the watershed with treated BMP effluent from SUSTAIN. That is, the timeseries of concentration and flow rate in the effluent from the selected BMP solution for each assessment area was inserted back into the watershed model (LSPC) and routed through the reach network.
    c. Run the updated watershed model to generate 10-years of runoff and instream pollutant concentrations at the outlet of Puente Creek with BMPs implemented.
4. **Process Validate Output**: sort and plot 10-years of zinc *wet-weather* concentrations for each of the three model runs listed below.
    a. Baseline model for Puente Creek (output from Step 1 or 2 above)
    b. EWMP baseline model with non-MS4 area capped at RWL (output from Step 3 above)
    c. BMP solution model run (output from Step 4 above)
5. **Validate Results**: Plot the three percentile plots from Step 4 on a graph, along with the RWL. Demonstrate that the BMP solution model run achieves RWL at the 90th percentile threshold for the modeled 10-year period. Attaining the RWL in the EWMP baseline model with non-MS4 areas capped at the RWL represents validation of the RAA approach.

4.5 Results and Conclusions

Per Step #4 and #5 of the validation process described above, the 10-year record was analyzed to validate that RWLs were attained on 90% of wet weather days. Figure 4-7 presents baseline timeseries vs. EWMP-implemented time series for flow and zinc concentration in Puente Creek.

The successful validation outcome (for Puente Creek) is shown in Figure 4-8. The 90th percentile wet weather concentration of total zinc at the mouth of Puente Creek is compared to the RWL. Three different conditions are shown in Figure 4-8, as follows:

1. Baseline/existing condition ("Baseline", blue line)
2. Baseline condition, except with zinc concentrations capped at RWLs for runoff from non-MS4 and non-EWMP areas ("Baseline for EWMP MS4s", green line)
3. Condition after BMPs specified by the RAA are implemented ("EWMP implemented", orange line).

Validation is demonstrated by the outcome that the 90th percentile concentration at the mouth of Puente Creek is less than the zinc RWL. This validation is representative of each of the selected EWMPs including USGR.

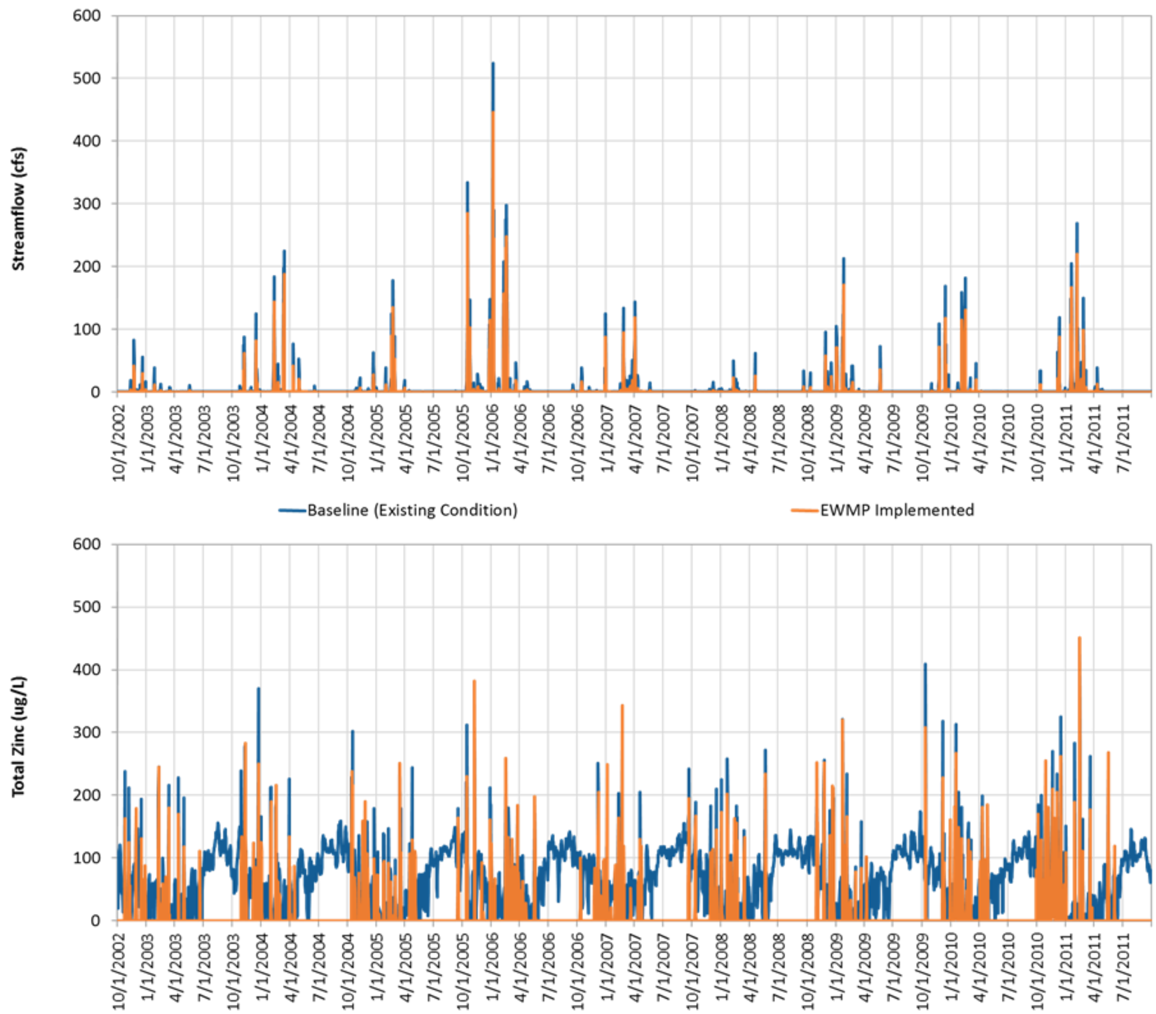


Figure 4-7. Instream validation 10-years timeseries plot demonstrating attainment of RWLs (Puente Creek).

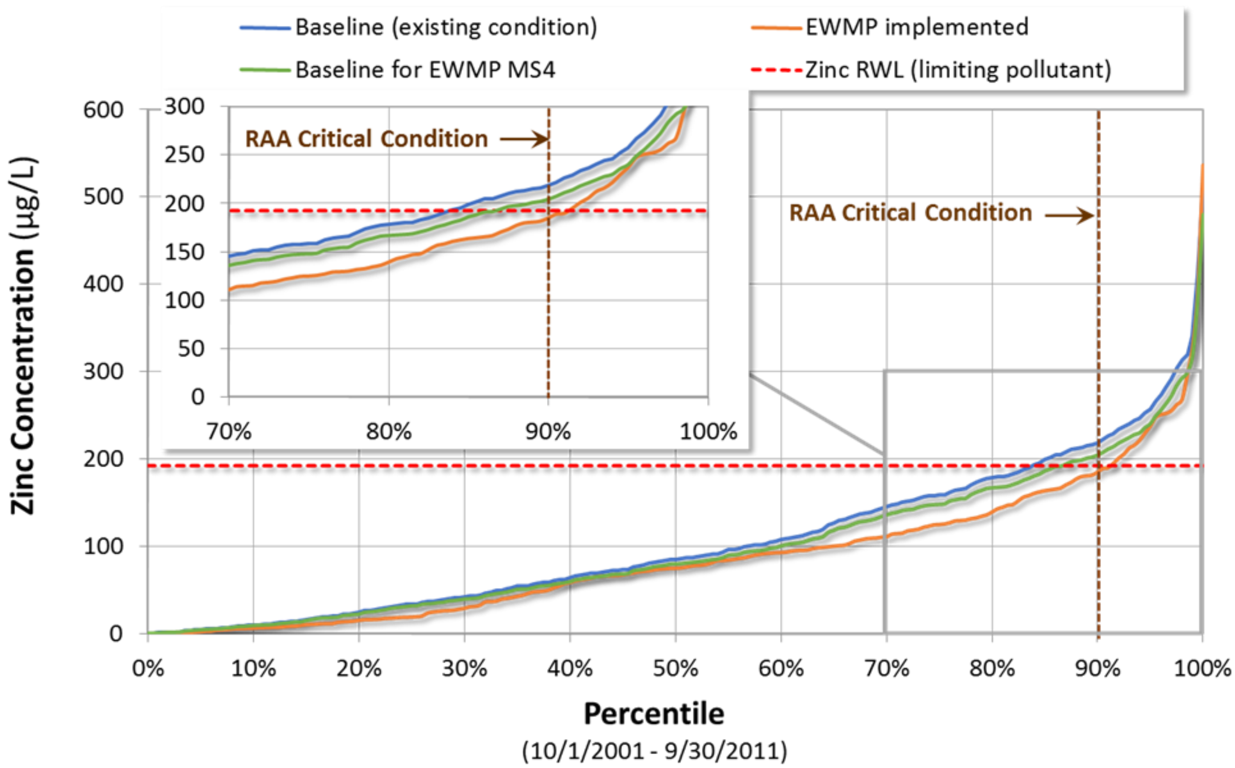


Figure 4-8. Instream validation plot demonstrating attainment of RWLs (Puente Creek).

Appendix D-1

Detailed Recipe for Final EWMP Compliance

APPENDIX D-1: DETAILED RAA OUTPUT AND EWMP IMPLEMENTATION PLAN FOR FINAL COMPLIANCE

For summaries of the BMP capacities and performance goals by jurisdiction and receiving water, please see Appendix D-3. This appendix presents the detailed RAA output and EWMP implementation plan including Compliance Targets. A series of tables are presented below, organized first by jurisdiction and then by watershed. Detailed subwatershed index maps are presented in Appendix D-2. The detailed tables are as follows:

The following color-gradients and symbol legend applies to all tables in Appendix D-1:

RED = Subwatersheds with highest required % load reductions
BLUE = Subwatersheds with highest BMP capacities within a BMP category
--- = BMP opportunity was either not available or not selected for the subwatershed
(a value of 0.00 means that BMP capacity is non-zero but less than 0.004).

Table 1. Baldwin Park, San Gabriel River: RAA Output and EWMP Implementation Plan for Final Compliance

	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		**EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT** (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
Subwatershed ID	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
522807	0.01	0.11	6%	0.008	---	---	0.000	---	0.00	---	---	---	**0.01**	0.11	**0.12**
523007	3.69	0.02	95%	0.039	---	0.902	---	---	---	0.01	---	---	**0.95**	0.02	**0.97**
523107	0.06	0.18	9%	0.033	---	---	---	---	---	---	---	---	**0.03**	0.18	**0.22**
523207	0.09	0.29	8%	0.047	---	0.006	0.000	---	---	---	---	---	**0.05**	0.29	**0.35**
523407	0.07	0.23	9%	0.041	---	---	0.000	---	---	---	---	---	**0.04**	0.23	**0.27**
523607	0.05	0.15	9%	0.026	---	---	0.000	---	---	---	---	---	**0.03**	0.15	**0.17**
523707	0.09	0.29	8%	0.049	---	---	0.000	---	---	---	---	---	**0.05**	0.29	**0.34**
523907	---	0.00	5%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
524007	41.15	---	85%	0.546	---	2.298	0.949	11.98	10.25	---	0.42	11.27	**37.71**	---	**37.71**
524107	6.03	0.71	31%	0.246	---	1.378	0.292	1.51	---	---	0.34	---	**3.76**	0.71	**4.47**
524307	0.01	0.13	8%	0.022	---	---	---	---	---	---	---	---	**0.02**	0.13	**0.16**
524407	0.00	0.04	6%	0.002	---	---	---	---	---	---	0.00	---	**0.00**	0.04	**0.04**
Total	**51.26**	**2.16**	**64%**	**1.06**	**0.00**	**4.58**	**1.24**	**13.49**	**10.25**	**0.01**	**0.75**	**11.27**	**42.66**	**2.16**	**44.82**

Table 2. Baldwin Park, Walnut Creek: RAA Output and EWMP Implementation Plan for Final Compliance

	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
Subwatershed ID	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
536007	14.55	0.71	83%	0.121	---	0.264	0.116	0.11	2.31	---	---	---	**2.92**	0.71	**3.63**
536107	12.20	0.24	71%	0.169	---	0.926	0.473	5.04	3.04	---	0.00	---	**9.65**	0.24	**9.90**
536207	1.17	---	100%	0.010	---	0.009	0.004	---	0.96	---	---	---	**0.98**	---	**0.98**
536407	18.07	0.88	47%	0.346	---	2.972	0.555	6.72	7.27	---	0.60	---	**18.46**	0.88	**19.34**
536507	31.62	---	96%	0.233	---	0.886	0.552	---	7.28	---	0.21	2.45	**11.62**	---	**11.62**
536607	0.72	0.05	26%	0.196	---	0.002	0.008	0.40	6.40	---	---	---	**7.01**	0.05	**7.06**
536707	0.34	0.03	21%	0.023	---	---	0.006	0.27	0.28	---	---	---	**0.58**	0.03	**0.61**
536807	6.29	0.14	81%	0.053	---	1.198	0.072	0.30	---	---	0.05	---	**1.67**	0.14	**1.81**
536907	0.38	0.16	27%	0.017	---	---	0.033	0.27	0.00	---	---	---	**0.32**	0.16	**0.48**
537007	0.02	0.10	8%	0.007	---	---	0.015	---	---	---	0.00	---	**0.02**	0.10	**0.12**
537207	0.32	0.18	21%	0.013	---	---	0.004	0.23	---	---	---	---	**0.24**	0.18	**0.42**
537307	0.04	0.28	7%	0.025	---	---	0.010	---	---	---	---	---	**0.03**	0.28	**0.31**
542207	0.24	0.41	11%	0.059	---	0.027	0.049	0.04	---	---	---	---	**0.18**	0.41	**0.59**
542307	0.47	0.01	70%	0.006	---	0.001	0.027	0.40	---	---	0.08	---	**0.51**	0.01	**0.52**
542407	7.34	0.06	74%	0.139	---	0.637	0.078	0.43	---	2.98	0.01	---	**4.27**	0.06	**4.33**
542507	5.34	1.08	47%	0.087	---	0.487	0.129	---	---	---	0.05	---	**0.75**	1.08	**1.83**
542607	3.13	0.08	55%	0.054	---	0.062	0.140	1.93	---	2.80	---	---	**4.98**	0.08	**5.06**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
542707	1.50	0.84	21%	0.073	---	0.008	0.218	1.02	---	---	---	---	**1.32**	0.84	**2.16**
542807	0.15	0.02	38%	0.007	---	0.007	0.004	0.12	---	---	---	---	**0.13**	0.02	**0.15**
553007	0.00	0.00	12%	0.000	---	---	0.001	---	---	---	0.00	---	**0.00**	0.00	**0.01**
Total	**103.91**	**5.28**	**62%**	**1.64**	**0.00**	**7.49**	**2.49**	**17.28**	**27.54**	**5.78**	**1.00**	**2.45**	**65.67**	**5.28**	**70.96**

Table 3. Covina, Walnut Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
537920	0.07	0.18	13%	0.012	---	---	0.054	---	---	---	---	---	**0.07**	0.18	**0.25**
538120	2.71	0.47	46%	0.040	---	1.740	0.110	---	---	---	0.04	---	**1.94**	0.47	**2.40**
538320	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
538520	2.35	1.46	27%	0.119	---	0.168	0.256	0.09	---	---	0.24	---	**0.87**	1.46	**2.33**
538620	14.24	---	86%	0.175	0.038	1.049	0.347	4.55	---	---	0.01	4.78	**10.94**	---	**10.94**
538720	16.95	0.11	77%	0.205	---	3.833	0.475	4.53	---	1.09	---	---	**10.13**	0.11	**10.25**
538820	10.44	0.34	72%	0.144	---	0.610	0.114	4.96	---	1.96	0.54	---	**8.33**	0.34	**8.67**
538920	16.42	0.16	93%	0.170	---	2.977	0.235	---	10.57	---	0.00	---	**13.96**	0.16	**14.12**
539020	0.31	1.05	14%	0.068	---	---	0.168	---	11.04	---	---	---	**11.28**	1.05	**12.33**
539120	2.88	0.69	35%	0.136	---	0.604	0.033	0.56	---	0.12	0.44	---	**1.89**	0.69	**2.58**
539220	0.31	1.19	13%	0.108	---	0.067	0.094	---	---	0.01	---	---	**0.28**	1.19	**1.46**
539320	1.54	0.21	42%	0.037	---	0.014	0.018	0.17	---	0.03	---	---	**0.27**	0.21	**0.48**
539420	2.25	0.79	35%	0.090	---	0.114	0.190	1.35	---	---	---	---	**1.74**	0.79	**2.53**
539520	0.13	0.28	14%	0.020	---	0.016	0.088	---	---	0.00	---	---	**0.12**	0.28	**0.40**
542320	45.79	1.21	82%	0.735	0.338	3.694	1.040	---	27.90	0.14	3.53	---	**37.37**	1.21	**38.58**
543220	0.00	0.00	21%	0.000	---	---	0.001	0.00	---	---	0.00	---	**0.00**	0.00	**0.00**
545420	0.05	0.08	12%	0.020	---	---	0.024	---	---	---	0.01	---	**0.06**	0.08	**0.14**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
545520	2.48	0.21	40%	0.082	---	0.492	0.102	0.98	---	---	---	---	**1.66**	0.21	**1.87**
545620	1.95	---	99%	0.017	---	0.051	0.046	---	0.40	---	---	---	**0.51**	---	**0.51**
545720	0.18	0.37	14%	0.032	---	0.020	0.105	---	0.48	---	0.00	---	**0.64**	0.37	**1.02**
545820	0.02	0.05	12%	0.017	---	---	---	---	---	---	0.03	---	**0.05**	0.05	**0.10**
545920	3.87	0.48	45%	0.149	---	0.589	0.087	1.45	---	0.01	0.02	---	**2.31**	0.48	**2.79**
546020	0.00	0.00	16%	0.001	---	---	---	0.00	---	---	---	---	**0.00**	0.00	**0.00**
546120	0.03	0.02	15%	0.004	---	---	---	0.02	---	---	---	---	**0.02**	0.02	**0.04**
546920	3.08	0.10	51%	0.071	---	1.944	0.049	0.66	---	---	---	---	**2.72**	0.10	**2.82**
Total	**128.05**	**9.45**	**62%**	**2.45**	**0.38**	**17.98**	**3.64**	**19.31**	**50.40**	**3.36**	**4.86**	**4.78**	**107.16**	**9.45**	**116.61**

Table 4. Glendora, Walnut Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
539030	4.56	0.47	55%	0.098	---	0.000	0.242	3.28	3.85	---	---	---	**7.48**	0.47	**7.95**
539630	---	0.01	5%	---	---	---	---	---	---	---	---	---	**0.00**	0.01	**0.01**
543830	---	0.00	5%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
543930	0.01	0.00	51%	0.000	---	---	---	0.01	---	---	---	---	**0.01**	0.00	**0.01**
544030	0.89	0.08	52%	0.014	---	---	0.027	0.45	---	---	---	---	**0.49**	0.08	**0.58**
544130	2.95	0.05	50%	0.056	---	0.004	0.120	1.87	---	---	---	---	**2.05**	0.05	**2.10**
544230	2.11	0.26	29%	0.101	---	0.046	0.072	0.33	---	---	---	---	**0.55**	0.26	**0.81**
544330	0.03	0.05	9%	0.019	---	---	0.004	---	---	---	---	---	**0.02**	0.05	**0.08**
544430	0.42	0.67	9%	0.108	---	---	0.267	---	---	---	---	---	**0.37**	0.67	**1.05**
544530	15.89	---	96%	0.150	---	0.370	0.397	5.13	0.18	---	---	3.60	**9.83**	---	**9.83**
544630	0.90	0.32	18%	0.091	---	0.388	0.149	0.03	---	---	---	---	**0.65**	0.32	**0.97**
544730	2.36	0.45	28%	0.074	---	0.016	0.190	1.76	---	---	---	---	**2.04**	0.45	**2.48**
544830	1.00	0.08	46%	0.022	---	0.014	0.064	---	0.05	---	---	---	**0.15**	0.08	**0.23**
544930	0.10	0.13	9%	0.025	---	0.003	0.064	---	---	---	---	---	**0.09**	0.13	**0.22**
545030	0.00	0.01	8%	0.006	---	---	---	---	---	---	---	---	**0.01**	0.01	**0.01**
545130	0.08	0.11	9%	0.018	---	---	0.062	---	9.99	0.09	---	---	**10.16**	0.11	**10.26**
545230	0.00	0.01	8%	0.006	---	---	---	---	---	---	---	---	**0.01**	0.01	**0.01**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
545830	0.04	0.00	26%	0.002	---	---	---	0.03	---	---	---	---	**0.03**	0.00	**0.03**
545930	0.14	0.02	27%	0.006	---	---	---	0.09	---	---	---	---	**0.10**	0.02	**0.12**
546030	2.22	0.28	38%	0.077	---	0.001	0.088	1.49	---	---	---	---	**1.66**	0.28	**1.94**
546130	8.65	0.11	79%	0.114	---	0.014	0.253	2.29	4.56	---	---	---	**7.24**	0.11	**7.35**
546230	0.73	0.34	16%	0.057	---	---	0.204	0.37	---	---	---	---	**0.64**	0.34	**0.98**
546330	13.75	0.22	83%	0.183	0.067	0.465	0.307	1.65	3.74	0.14	---	---	**6.54**	0.22	**6.77**
546430	4.94	---	89%	0.096	0.492	0.034	0.070	1.29	1.54	0.06	---	2.18	**5.76**	---	**5.76**
546530	3.04	---	95%	0.043	0.264	---	---	0.16	---	0.00	---	1.84	**2.31**	---	**2.31**
546630	0.05	0.25	8%	0.010	---	0.000	0.039	---	---	---	---	---	**0.05**	0.25	**0.30**
547130	---	0.00	5%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
547230	10.37	---	85%	0.124	0.004	---	0.283	3.73	---	---	---	4.07	**8.21**	---	**8.21**
547330	---	---	---	---	---	---	---	---	---	---	---	---	**0.00**	---	**0.00**
547430	4.99	0.09	76%	0.057	---	0.051	0.179	0.54	2.12	---	---	---	**2.94**	0.09	**3.03**
547530	10.99	---	95%	0.115	---	---	0.239	2.33	---	---	---	5.34	**8.02**	---	**8.02**
547630	16.75	---	90%	0.198	---	0.313	0.259	4.81	---	---	---	6.78	**12.36**	---	**12.36**
547730	1.77	0.03	50%	0.037	0.020	---	0.055	1.20	0.69	---	---	---	**2.01**	0.03	**2.04**
547830	0.38	0.07	32%	0.016	---	---	0.022	0.33	---	---	---	---	**0.37**	0.07	**0.44**
547930	6.80	---	90%	0.088	0.141	---	0.205	2.31	---	---	---	2.13	**4.87**	---	**4.87**

	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
Subwatershed ID	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
548030	10.08	---	95%	0.097	---	0.038	0.391	0.93	4.04	---	---	3.14	**8.63**	---	**8.63**
548130	4.53	2.58	33%	0.207	---	0.043	0.449	3.14	---	---	---	---	**3.84**	2.58	**6.42**
548230	1.00	0.49	39%	0.036	---	---	0.045	0.84	---	---	---	---	**0.92**	0.49	**1.41**
548330	0.30	0.82	10%	0.044	---	0.000	0.197	---	---	---	---	---	**0.24**	0.82	**1.06**
548430	0.07	0.32	9%	0.024	---	---	0.043	---	---	---	---	---	**0.07**	0.32	**0.39**
548530	2.61	0.68	32%	0.113	---	0.197	0.177	1.57	---	---	---	---	**2.06**	0.68	**2.74**
548630	0.00	0.04	8%	0.005	---	---	---	---	---	---	---	---	**0.00**	0.04	**0.04**
548730	0.03	0.23	8%	0.030	---	---	---	---	---	---	---	---	**0.03**	0.23	**0.26**
548830	---	0.00	5%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
548930	0.00	0.01	6%	0.000	---	---	---	---	---	---	---	---	**0.00**	0.01	**0.01**
Total	**135.54**	**9.30**	**62%**	**2.57**	**0.99**	**2.00**	**5.16**	**41.95**	**30.76**	**0.29**	**0.00**	**29.08**	**112.80**	**9.30**	**122.10**

Table 5. Industry, Puente Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
516136	7.39	---	66%	0.318	---	0.115	---	0.71	---	0.38	---	3.40	**4.92**	---	**4.92**
516336	0.04	0.01	58%	0.001	---	---	---	0.06	---	---	---	---	**0.06**	0.01	**0.07**
516436	4.28	---	85%	0.101	---	0.001	0.006	0.22	---	0.15	---	3.43	**3.90**	---	**3.90**
516736	2.57	0.02	96%	0.009	---	0.024	---	---	---	0.28	---	---	**0.31**	0.02	**0.33**
Total	**14.28**	**0.03**	**76%**	**0.43**	**0.00**	**0.14**	**0.01**	**0.98**	**0.00**	**0.81**	**0.00**	**6.82**	**9.19**	**0.03**	**9.22**

Table 6. Industry, San Gabriel River: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026												For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs							
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)		Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
514836	0.00	0.01	12%	0.001	---	---	---	---	---	---	---	---	**0.00**		0.01	**0.01**
514936	0.00	0.00	13%	0.000	---	---	---	---	---	---	---	---	**0.00**		0.00	**0.00**
515036	0.12	0.59	14%	0.114	---	---	---	---	---	---	0.00	---	**0.12**		0.59	**0.71**
515136	4.86	0.51	62%	0.262	---	---	---	0.27	---	1.54	1.05	---	**3.11**		0.51	**3.62**
515236	0.19	0.17	21%	0.056	---	---	0.000	0.09	---	0.33	2.50	---	**2.98**		0.17	**3.14**
515436	1.28	---	90%	0.018	---	---	0.000	0.05	---	---	---	1.10	**1.17**		---	**1.17**
515636	0.01	0.01	35%	0.018	---	---	0.000	---	---	0.00	0.24	---	**0.26**		0.01	**0.27**
522636	4.02	---	86%	0.116	---	---	0.002	---	---	---	---	2.40	**2.52**		---	**2.52**
522736	5.32	---	95%	0.346	---	0.002	0.000	0.62	2.01	---	---	2.93	**5.91**		---	**5.91**
522836	0.95	0.03	46%	0.091	---	0.216	---	0.26	---	---	---	---	**0.57**		0.03	**0.60**
522936	4.38	---	90%	0.130	---	---	---	0.02	---	---	---	2.65	**2.81**		---	**2.81**
523036	0.37	0.91	17%	0.340	---	---	---	---	20.99	0.06	---	---	**21.39**		0.91	**22.30**
523136	1.81	0.11	64%	0.036	---	0.603	---	0.04	---	---	---	---	**0.68**		0.11	**0.79**
523236	0.00	0.00	13%	0.001	---	---	---	---	---	---	---	---	**0.00**		0.00	**0.01**
Total	**23.32**	**2.34**	**64%**	**1.53**	**0.00**	**0.82**	**0.00**	**1.34**	**23.01**	**1.93**	**3.79**	**9.08**	**41.51**		**2.34**	**43.85**

Table 7. Industry, San Jose Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
515736	0.02	0.11	12%	0.009	---	---	0.000	---	---	0.00	---	---	**0.01**	0.11	**0.12**
515836	14.48	---	90%	0.560	---	0.028	0.000	0.93	---	0.14	---	8.66	**10.32**	---	**10.32**
515936	1.41	0.87	25%	0.190	---	---	---	0.66	---	---	---	---	**0.85**	0.87	**1.72**
516036	0.10	0.04	41%	0.004	---	---	---	0.07	---	---	---	---	**0.08**	0.04	**0.12**
516936	0.24	1.08	14%	0.187	---	---	---	---	---	---	---	---	**0.19**	1.08	**1.27**
517036	13.10	---	91%	0.295	---	2.132	0.003	1.28	---	0.24	---	6.11	**10.06**	---	**10.06**
517136	0.07	0.48	12%	0.058	---	---	0.000	---	---	---	---	---	**0.06**	0.48	**0.54**
517236	19.32	---	96%	0.432	---	1.812	0.001	0.82	---	0.71	---	8.31	**12.08**	---	**12.08**
517336	0.07	0.28	14%	0.047	---	---	0.006	---	---	---	---	---	**0.05**	0.28	**0.33**
517436	0.32	0.31	20%	0.053	---	---	0.003	0.17	---	---	0.01	---	**0.23**	0.31	**0.54**
517536	0.39	0.43	20%	0.092	---	---	---	0.22	---	---	0.01	---	**0.31**	0.43	**0.75**
517636	0.14	1.10	13%	0.123	---	0.010	0.000	---	---	0.01	---	---	**0.14**	1.10	**1.24**
517736	6.43	---	90%	0.100	---	0.062	---	0.17	---	---	---	4.93	**5.26**	---	**5.26**
517836	1.75	0.02	96%	0.002	---	0.004	0.001	---	---	0.16	---	---	**0.17**	0.02	**0.19**
517936	1.34	0.48	30%	0.131	---	0.658	---	0.28	---	---	---	---	**1.07**	0.48	**1.54**
518036	1.75	0.92	25%	0.234	---	0.342	---	0.76	---	---	---	---	**1.34**	0.92	**2.26**
518136	0.42	0.80	16%	0.019	---	0.382	---	---	---	---	---	---	**0.40**	0.80	**1.21**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026												For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs							
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)		Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
518236	0.12	0.21	15%	0.020	---	0.089	0.000	---	---	0.15	---	---	**0.26**		0.21	**0.47**
518336	8.62	---	91%	0.228	---	0.256	---	0.74	---	0.01	---	5.78	**7.01**		---	**7.01**
518436	0.54	0.14	30%	0.100	---	0.116	---	0.18	---	0.02	---	---	**0.42**		0.14	**0.56**
518536	0.54	0.19	35%	0.066	---	0.289	0.000	0.19	---	0.19	---	---	**0.74**		0.19	**0.93**
518636	11.05	0.03	96%	0.260	---	2.042	---	0.17	---	4.63	0.03	---	**7.13**		0.03	**7.16**
518736	0.57	1.41	15%	0.214	---	---	0.000	0.22	---	0.03	---	---	**0.47**		1.41	**1.88**
518836	0.02	0.06	13%	0.015	---	---	---	---	---	---	---	---	**0.01**		0.06	**0.07**
518936	41.60	---	90%	0.851	---	1.084	0.001	1.32	---	2.02	0.02	23.08	**28.36**		---	**28.36**
519036	0.00	0.06	11%	0.004	---	---	---	---	---	---	---	---	**0.00**		0.06	**0.06**
519136	1.69	1.04	21%	0.380	---	---	---	0.95	---	---	---	---	**1.33**		1.04	**2.36**
519236	0.12	0.06	31%	0.006	---	---	---	0.08	---	---	---	---	**0.09**		0.06	**0.15**
519336	---	0.01	10%	---	---	---	---	---	---	---	---	---	**0.00**		0.01	**0.01**
519436	0.23	0.51	15%	0.078	---	---	---	0.07	---	---	0.00	---	**0.15**		0.51	**0.67**
519536	7.85	---	90%	0.191	---	---	---	0.49	---	---	---	6.01	**6.69**		---	**6.69**
519636	0.53	0.52	20%	0.107	---	---	---	0.26	---	---	---	---	**0.37**		0.52	**0.89**
519736	0.46	0.41	17%	0.296	---	0.111	---	0.02	---	---	1.87	---	**2.30**		0.41	**2.71**
519836	0.69	0.60	16%	0.252	---	0.051	---	0.29	---	---	---	---	**0.60**		0.60	**1.19**
519936	0.05	0.11	13%	0.016	---	0.027	---	---	---	---	---	---	**0.04**		0.11	**0.16**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
520036	0.01	0.05	11%	0.006	---	---	---	---	---	---	---	---	**0.01**	0.05	**0.06**
520236	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
520336	6.23	---	85%	0.197	---	---	0.000	0.30	---	---	---	5.16	**5.66**	---	**5.66**
520436	0.00	0.01	11%	0.000	---	---	0.001	---	---	---	---	---	**0.00**	0.01	**0.01**
520536	23.52	---	90%	0.652	---	0.837	0.001	1.07	---	---	---	16.42	**18.98**	---	**18.98**
520736	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
520836	0.00	0.00	11%	0.000	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
521136	2.99	---	96%	0.075	---	---	---	---	---	---	---	2.18	**2.25**	---	**2.25**
521236	0.00	0.01	12%	0.001	---	---	---	---	---	---	---	---	**0.00**	0.01	**0.01**
521336	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
Total	**168.80**	**12.36**	**68%**	**6.55**	**0.00**	**10.33**	**0.02**	**11.72**	**0.00**	**8.31**	**1.93**	**86.64**	**125.50**	**12.36**	**137.86**

Table 8. Industry, Walnut Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
536036	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
536236	0.05	0.17	15%	0.045	---	---	0.002	---	0.72	---	---	---	**0.76**	0.17	**0.94**
536336	3.97	---	71%	0.151	---	---	---	0.46	---	---	---	2.48	**3.08**	---	**3.08**
536636	0.00	0.01	16%	0.004	---	---	---	---	0.14	---	---	---	**0.14**	0.01	**0.15**
Total	**4.02**	**0.19**	**63%**	**0.20**	**0.00**	**0.00**	**0.00**	**0.46**	**0.85**	**0.00**	**0.00**	**2.48**	**3.99**	**0.19**	**4.17**

Table 9. La Puente, Puente Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
516142	11.66	---	95%	0.119	---	0.048	0.298	2.95	---	0.03	---	6.47	**9.92**	---	**9.92**
516242	5.28	---	95%	0.077	---	0.061	0.049	0.27	9.51	---	---	4.05	**14.03**	---	**14.03**
516342	6.51	0.21	82%	0.076	---	---	0.126	2.67	0.05	---	---	---	**2.93**	0.21	**3.14**
516442	5.26	0.23	49%	0.151	---	0.312	0.386	3.10	1.36	---	---	---	**5.30**	0.23	**5.53**
Total	**28.71**	**0.45**	**76%**	**0.42**	**0.00**	**0.42**	**0.86**	**9.00**	**10.92**	**0.03**	**0.00**	**10.52**	**32.18**	**0.45**	**32.62**

Table 10. La Puente, San Gabriel River: RAA Output and EWMP Implementation Plan for Final Compliance

	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
Subwatershed ID	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
522742	1.17	0.39	17%	0.075	---	---	0.140	0.65	---	---	---	---	**0.87**	0.39	**1.26**
522842	11.92	---	85%	0.148	---	---	0.390	5.67	---	---	---	2.71	**8.92**	---	**8.92**
Total	**13.09**	**0.39**	**66%**	**0.22**	**0.00**	**0.00**	**0.53**	**6.32**	**0.00**	**0.00**	**0.00**	**2.71**	**9.79**	**0.39**	**10.17**

Table 11. La Puente, San Jose Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
515942	7.03	---	95%	0.073	---	---	0.175	1.76	0.96	---	---	3.80	**6.77**	---	**6.77**
517042	0.76	0.36	26%	0.041	---	0.124	0.022	0.46	---	---	---	---	**0.64**	0.36	**1.01**
517242	---	0.00	5%	---	---	---	---	---	---	0.00	---	---	**0.00**	0.00	**0.00**
517642	3.14	0.38	49%	0.130	---	0.381	0.260	2.91	---	0.69	---	---	**4.36**	0.38	**4.75**
517742	0.11	0.10	38%	0.017	---	---	---	0.16	---	---	---	---	**0.18**	0.10	**0.28**
517842	6.68	---	90%	0.068	---	---	0.303	---	---	---	---	5.64	**6.01**	---	**6.01**
518142	0.00	0.00	56%	---	---	---	---	0.01	---	---	---	---	**0.01**	0.00	**0.01**
518242	3.34	---	95%	0.041	---	0.042	0.097	0.30	---	0.12	---	2.75	**3.35**	---	**3.35**
518542	0.63	0.19	47%	0.039	---	---	0.013	0.96	---	0.14	---	---	**1.15**	0.19	**1.33**
Total	**21.68**	**1.03**	**68%**	**0.41**	**0.00**	**0.55**	**0.87**	**6.55**	**0.96**	**0.94**	**0.00**	**12.19**	**22.48**	**1.03**	**23.51**

Table 12. La Puente, Walnut Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
536242	0.70	---	63%	0.011	---	0.054	0.000	0.16	0.42	---	---	0.35	**0.99**	---	**0.99**
Total	**0.70**	**0.00**	**63%**	**0.01**	**0.00**	**0.05**	**0.00**	**0.16**	**0.42**	**0.00**	**0.00**	**0.35**	**0.99**	**0.00**	**0.99**

Table 13. Uninc. LA County, Coyote Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
501683	0.05	0.25	13%	0.032	---	---	0.018	---	---	---	---	---	**0.05**	0.25	**0.30**
504583	1.77	0.17	56%	0.063	---	0.339	0.135	1.83	---	---	---	---	**2.36**	0.17	**2.53**
504683	0.27	1.29	13%	0.106	---	---	0.243	---	---	0.00	0.00	---	**0.35**	1.29	**1.64**
505183	0.07	0.65	13%	0.098	---	---	---	---	---	---	---	---	**0.10**	0.65	**0.75**
505283	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
505383	---	0.03	12%	0.001	---	---	---	---	---	---	---	---	**0.00**	0.03	**0.03**
505483	0.00	0.00	11%	0.000	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
505683	0.04	0.16	13%	0.012	---	---	0.029	---	---	---	---	---	**0.04**	0.16	**0.20**
505783	0.03	0.07	13%	0.009	---	---	0.035	---	---	---	0.02	---	**0.06**	0.07	**0.14**
506383	1.30	0.14	60%	0.035	---	0.588	0.107	1.07	---	---	---	---	**1.80**	0.14	**1.94**
506483	5.02	0.43	61%	0.141	---	0.448	0.458	5.36	---	---	---	---	**6.41**	0.43	**6.84**
506583	0.00	0.00	40%	---	---	---	---	0.01	---	---	---	---	**0.01**	0.00	**0.01**
506983	11.95	---	91%	0.143	0.005	0.980	0.401	4.06	---	---	---	4.04	**9.63**	---	**9.63**
507083	2.50	0.13	70%	0.042	---	0.917	0.148	2.24	---	---	---	---	**3.35**	0.13	**3.48**
507183	1.81	0.13	51%	0.034	0.006	0.087	0.058	0.82	---	---	---	---	**1.00**	0.13	**1.13**
507283	6.07	---	90%	0.078	---	0.149	0.158	1.65	---	---	0.01	2.70	**4.75**	---	**4.75**
507383	4.85	---	91%	0.071	---	0.110	0.124	1.25	---	---	---	2.51	**4.07**	---	**4.07**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
507483	9.11	---	95%	0.089	---	2.103	0.141	2.71	---	---	---	2.10	**7.14**	---	**7.14**
507583	6.28	---	90%	0.080	0.005	0.471	0.209	2.63	---	---	---	1.65	**5.05**	---	**5.05**
507683	3.61	0.35	46%	0.090	---	0.599	0.172	2.01	---	---	---	---	**2.87**	0.35	**3.22**
507783	1.50	0.10	46%	0.031	---	---	0.125	1.08	---	---	---	---	**1.23**	0.10	**1.33**
507883	27.65	---	95%	0.266	---	2.267	0.840	6.14	---	---	---	14.21	**23.72**	---	**23.72**
507983	0.45	0.07	55%	0.015	---	0.104	0.050	0.45	---	---	---	---	**0.62**	0.07	**0.69**
508083	1.42	0.25	50%	0.066	---	0.001	0.194	1.95	---	---	---	---	**2.21**	0.25	**2.46**
508183	0.10	0.36	13%	0.021	---	---	0.087	---	---	---	---	---	**0.11**	0.36	**0.47**
508283	1.60	0.17	57%	0.031	---	1.174	0.023	---	---	---	---	---	**1.23**	0.17	**1.40**
508383	0.02	0.14	13%	0.007	---	---	0.023	---	---	---	0.01	---	**0.04**	0.14	**0.19**
508483	9.43	1.03	67%	0.131	---	0.167	0.315	---	7.80	---	---	---	**8.41**	1.03	**9.44**
508583	2.96	0.79	45%	0.081	---	1.363	0.125	1.39	---	---	---	---	**2.96**	0.79	**3.75**
508683	2.29	0.14	73%	0.050	---	0.446	0.164	2.15	---	---	---	---	**2.81**	0.14	**2.95**
508783	1.32	0.08	71%	0.035	---	0.027	0.156	1.58	---	---	---	---	**1.80**	0.08	**1.88**
508883	0.00	0.00	87%	0.000	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
508983	0.33	1.51	14%	0.082	---	---	0.237	---	---	---	---	---	**0.32**	1.51	**1.83**
509083	0.21	0.77	14%	0.039	---	---	0.175	---	---	---	---	---	**0.21**	0.77	**0.98**
509283	1.83	0.13	46%	0.040	---	---	0.112	1.51	---	---	---	---	**1.67**	0.13	**1.80**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
509383	4.88	0.53	66%	0.087	0.053	0.751	0.141	2.41	---	---	---	---	**3.44**	0.53	**3.98**
509483	17.69	---	91%	0.223	---	1.191	0.667	6.97	---	---	---	4.31	**13.36**	---	**13.36**
509583	1.86	0.19	71%	0.046	---	---	0.170	2.28	---	---	---	---	**2.49**	0.19	**2.69**
510083	0.00	0.00	14%	0.000	---	---	0.001	---	---	---	---	---	**0.00**	0.00	**0.00**
510183	0.00	0.05	12%	0.005	---	---	0.000	---	---	---	0.01	---	**0.01**	0.05	**0.07**
510983	0.06	0.12	25%	0.007	---	---	0.024	0.06	---	---	---	---	**0.09**	0.12	**0.22**
Total	**130.35**	**10.27**	**68%**	**2.39**	**0.07**	**14.28**	**6.07**	**53.60**	**7.80**	**0.00**	**0.05**	**31.52**	**115.78**	**10.27**	**126.05**

Table 14. Uninc. LA County, Puddingstone Reservoir: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026												For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs							
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)		Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
540183	4.18	0.04	78%	0.034	---	0.008	0.001	---	---	2.26	---	---	**2.30**		0.04	**2.34**
540583	2.46	---	90%	0.021	---	---	0.033	0.23	---	---	---	1.52	**1.81**		---	**1.81**
540683	0.01	0.03	20%	0.002	---	---	0.002	0.00	---	---	---	---	**0.01**		0.03	**0.04**
540883	0.02	0.02	16%	0.005	---	---	0.001	0.01	---	---	---	---	**0.02**		0.02	**0.04**
540983	3.70	---	100%	0.047	---	---	0.001	---	---	---	---	2.92	**2.96**		---	**2.96**
541083	2.22	0.12	66%	0.036	---	---	0.151	1.70	---	---	---	---	**1.89**		0.12	**2.00**
541183	0.06	0.01	46%	0.003	---	---	0.008	0.08	---	---	---	---	**0.09**		0.01	**0.10**
Total	**12.64**	**0.21**	**79%**	**0.15**	**0.00**	**0.01**	**0.20**	**2.03**	**0.00**	**2.26**	**0.00**	**4.44**	**9.08**		**0.21**	**9.29**

Table 15. Uninc. LA County, Puente Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
516183	0.98	0.64	25%	0.106	---	0.154	0.001	0.43	---	---	---	---	**0.69**	0.64	**1.33**
516283	3.06	1.62	33%	0.113	---	1.539	0.308	---	0.55	---	---	---	**2.51**	1.62	**4.13**
516383	11.76	---	90%	0.142	---	0.491	0.451	4.26	2.77	---	---	5.03	**13.15**	---	**13.15**
516483	7.32	---	91%	0.088	---	0.831	0.324	2.98	---	---	---	1.18	**5.41**	---	**5.41**
516583	13.15	---	95%	0.140	0.008	0.109	0.574	4.72	---	---	---	6.00	**11.56**	---	**11.56**
516683	2.93	0.11	71%	0.037	---	0.011	0.160	2.01	---	---	0.00	---	**2.22**	0.11	**2.33**
516783	9.39	---	90%	0.140	---	0.131	0.254	3.22	---	---	0.00	3.21	**6.95**	---	**6.95**
Total	**48.58**	**2.37**	**76%**	**0.77**	**0.01**	**3.27**	**2.07**	**17.62**	**3.31**	**0.00**	**0.00**	**15.42**	**42.48**	**2.37**	**44.85**

Table 16. Uninc. LA County, San Gabriel River: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026												For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs							
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
513283	2.78	0.47	52%	0.034	---	0.972	0.125	0.12	---	---	0.11	---	**1.37**	0.47	**1.83**
513383	7.31	0.24	71%	0.078	---	1.932	0.242	3.24	---	---	0.01	---	**5.50**	0.24	**5.73**
513583	0.00	0.02	13%	0.002	---	---	---	---	---	---	---	---	**0.00**	0.02	**0.02**
513783	0.17	1.05	13%	0.055	---	---	0.099	---	---	---	0.05	---	**0.20**	1.05	**1.25**
513883	6.44	0.37	56%	0.101	0.010	0.316	0.286	1.81	---	1.38	0.16	---	**4.06**	0.37	**4.43**
514083	0.12	0.35	15%	0.020	---	---	0.084	---	---	---	0.16	---	**0.27**	0.35	**0.61**
514283	0.51	0.16	40%	0.016	---	---	0.045	0.33	---	---	0.06	---	**0.44**	0.16	**0.60**
514383	0.03	0.18	12%	0.017	---	---	0.000	---	---	---	---	---	**0.02**	0.18	**0.20**
514683	0.08	0.28	15%	0.013	---	---	0.057	---	---	---	---	---	**0.07**	0.28	**0.35**
514783	0.17	0.62	14%	0.048	---	---	0.112	---	---	---	---	---	**0.16**	0.62	**0.78**
514883	0.07	0.48	16%	0.027	---	---	0.056	0.03	---	---	0.03	---	**0.14**	0.48	**0.62**
515083	2.53	0.64	46%	0.055	---	0.014	0.151	0.34	---	---	1.10	---	**1.66**	0.64	**2.30**
515183	27.63	0.44	91%	0.110	---	0.378	---	0.29	---	1.10	6.78	---	**8.65**	0.44	**9.09**
515283	0.10	0.00	87%	0.164	---	0.002	0.001	---	---	0.41	11.85	---	**12.42**	0.00	**12.43**
515383	0.13	0.96	13%	0.126	---	---	---	---	---	---	---	---	**0.13**	0.96	**1.09**
515483	0.29	0.77	15%	0.093	---	---	0.007	0.11	---	---	---	---	**0.21**	0.77	**0.98**
515583	0.76	0.23	41%	0.020	---	---	0.043	0.51	---	---	---	---	**0.58**	0.23	**0.81**

	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026												For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs							
Subwatershed ID	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
515683	11.54	---	90%	0.282	---	---	0.114	1.22	---	---	0.74	6.54	**8.90**	---	**8.90**
522683	1.36	0.59	37%	0.076	---	---	0.072	0.74	---	---	---	---	**0.88**	0.59	**1.47**
522783	29.72	---	94%	0.320	0.003	0.275	0.746	---	1.80	0.00	---	1.12	**4.26**	---	**4.26**
522883	3.37	2.09	30%	0.144	---	1.713	0.422	---	0.00	---	---	---	**2.28**	2.09	**4.37**
522983	1.65	0.01	91%	---	---	---	---	---	---	---	---	---	**0.00**	0.01	**0.01**
523083	0.13	0.25	16%	0.084	---	---	---	---	---	0.19	---	---	**0.27**	0.25	**0.52**
Total	**96.89**	**10.19**	**64%**	**1.89**	**0.01**	**5.60**	**2.66**	**8.73**	**1.80**	**3.08**	**21.06**	**7.66**	**52.48**	**10.19**	**62.67**

Table 17. Uninc. LA County, San Jose Creek: RAA Output and EWMP Implementation Plan for Final Compliance

	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
Subwatershed ID	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
515783	0.85	3.37	14%	0.267	---	0.006	0.418	---	---	0.00	0.06	---	**0.75**	3.37	**4.12**
515883	6.10	1.17	48%	0.216	---	0.464	0.088	1.02	---	0.27	---	---	**2.06**	1.17	**3.23**
515983	10.38	0.47	82%	0.110	---	0.523	0.339	---	5.67	---	---	---	**6.65**	0.47	**7.11**
516083	4.89	1.13	48%	0.203	---	0.531	0.387	2.52	---	---	1.25	---	**4.89**	1.13	**6.03**
516983	0.25	1.06	13%	0.065	---	---	0.148	---	---	---	---	---	**0.21**	1.06	**1.27**
517083	---	---	---	---	---	---	---	---	---	---	---	---	**0.00**	---	**0.00**
517183	21.70	0.23	87%	0.240	---	2.852	0.525	2.31	10.77	---	2.23	---	**18.93**	0.23	**19.17**
517283	0.01	0.08	12%	0.003	---	---	0.010	---	---	---	---	---	**0.01**	0.08	**0.09**
517383	63.82	0.56	91%	0.605	---	2.966	1.922	4.06	42.62	---	3.78	---	**55.95**	0.56	**56.51**
517483	10.58	0.91	68%	0.066	---	0.085	0.186	---	---	---	0.23	---	**0.56**	0.91	**1.48**
517583	28.51	1.11	72%	0.414	---	2.797	1.465	0.00	6.27	16.86	4.57	---	**32.37**	1.11	**33.48**
517983	6.26	0.06	92%	0.027	---	2.464	0.088	---	---	---	0.03	---	**2.61**	0.06	**2.67**
518083	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
518383	20.93	0.41	81%	0.193	---	0.425	0.564	0.96	2.34	12.93	2.27	---	**19.69**	0.41	**20.10**
518583	5.03	0.18	65%	0.067	0.004	0.494	0.271	2.84	---	---	---	---	**3.67**	0.18	**3.85**
518683	0.01	0.01	16%	---	---	---	---	0.01	---	0.12	0.01	---	**0.13**	0.01	**0.15**
518783	0.23	0.09	30%	0.019	---	---	0.006	0.11	---	---	---	---	**0.13**	0.09	**0.23**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
518883	1.36	0.60	32%	0.074	---	0.429	0.198	---	---	---	---	---	**0.70**	0.60	**1.30**
518983	25.42	0.80	82%	0.302	0.026	0.158	0.964	0.60	---	20.29	0.97	---	**23.31**	0.80	**24.11**
519083	35.57	0.41	81%	0.394	0.004	1.413	1.098	2.37	26.72	0.01	0.77	---	**32.79**	0.41	**33.20**
519183	0.02	0.01	21%	0.002	---	---	0.006	0.00	---	---	---	---	**0.01**	0.01	**0.03**
519283	11.47	0.41	63%	0.234	---	1.748	0.453	0.37	---	5.31	---	---	**8.12**	0.41	**8.53**
519383	2.45	0.45	45%	0.046	---	1.946	0.150	---	---	---	---	---	**2.14**	0.45	**2.59**
519483	17.74	0.61	63%	0.332	0.144	3.746	0.634	4.66	---	4.00	2.68	---	**16.19**	0.61	**16.80**
519583	0.09	0.03	30%	0.006	---	---	0.006	0.05	---	---	---	---	**0.06**	0.03	**0.10**
519683	1.54	0.91	40%	0.099	0.172	0.017	0.128	1.70	---	---	0.01	---	**2.13**	0.91	**3.04**
519783	19.53	0.74	57%	0.464	---	0.522	0.969	5.21	---	4.76	5.12	---	**17.05**	0.74	**17.79**
519883	0.13	0.20	15%	0.037	---	---	0.096	0.04	---	---	---	---	**0.18**	0.20	**0.38**
519983	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
520083	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
520183	0.00	0.00	12%	0.000	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
520283	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
520583	0.11	0.40	12%	0.099	---	---	---	---	---	---	---	---	**0.10**	0.40	**0.50**
520783	0.11	0.07	35%	0.023	---	---	---	0.16	---	---	---	---	**0.18**	0.07	**0.26**
520883	0.18	0.15	20%	0.147	---	---	---	0.02	---	---	---	---	**0.16**	0.15	**0.32**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026										For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
520983	0.01	0.01	29%	0.001	---	---	0.006	---	---	---	---	---	**0.01**	0.01	**0.02**
522183	0.02	0.10	11%	0.013	---	---	0.002	---	---	---	---	---	**0.01**	0.10	**0.11**
522283	0.04	0.00	15%	0.007	---	---	0.030	---	---	---	---	---	**0.04**	0.00	**0.04**
522383	0.00	0.00	17%	0.000	---	---	0.001	---	---	---	---	---	**0.00**	0.00	**0.00**
522483	0.05	0.13	13%	0.014	---	---	0.024	---	---	---	---	---	**0.04**	0.13	**0.17**
522583	0.04	0.09	13%	0.006	---	---	0.024	---	---	---	---	---	**0.03**	0.09	**0.12**
Total	**295.43**	**16.97**	**68%**	**4.79**	**0.35**	**23.59**	**11.21**	**29.01**	**94.39**	**64.56**	**23.99**	**0.00**	**251.89**	**16.97**	**268.86**

Table 18. Uninc. LA County, Walnut Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026												For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs							
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
536083	0.14	0.68	13%	0.089	---	---	0.000	---	0.00	---	---	---	**0.09**	0.68	**0.76**
536283	6.84	0.24	68%	0.082	---	0.434	0.364	4.96	0.34	---	---	---	**6.18**	0.24	**6.42**
536383	0.03	0.16	13%	0.021	---	---	---	---	---	---	---	---	**0.02**	0.16	**0.18**
536483	---	---	---	---	---	---	---	---	0.00	---	---	---	**0.00**	---	**0.00**
536683	0.01	0.05	14%	0.012	---	---	0.000	---	0.44	---	---	---	**0.45**	0.05	**0.50**
536783	0.02	0.01	35%	---	---	---	---	0.02	0.01	---	---	---	**0.03**	0.01	**0.03**
537183	0.03	0.09	13%	0.005	---	---	0.025	---	---	---	---	---	**0.03**	0.09	**0.12**
537683	0.07	0.19	14%	0.013	---	---	0.058	---	---	---	---	---	**0.07**	0.19	**0.26**
538483	0.00	0.01	10%	0.000	---	---	0.000	---	---	---	---	---	**0.00**	0.01	**0.01**
538683	0.27	0.03	26%	0.011	---	---	0.050	0.15	---	---	---	---	**0.21**	0.03	**0.24**
538783	1.11	0.13	52%	0.025	---	---	0.073	0.84	0.01	1.58	---	---	**2.52**	0.13	**2.65**
538983	3.92	0.38	64%	0.055	---	1.112	0.142	---	0.33	---	---	---	**1.64**	0.38	**2.02**
539083	8.43	---	91%	0.108	---	---	0.238	3.52	11.27	---	---	2.51	**17.65**	---	**17.65**
539183	0.03	0.07	15%	0.006	---	---	0.027	---	---	0.00	---	---	**0.04**	0.07	**0.11**
539283	1.67	0.44	40%	0.057	---	---	0.133	1.27	---	0.00	---	---	**1.46**	0.44	**1.90**
539383	0.24	0.24	26%	0.025	0.001	0.000	0.012	0.30	---	0.34	---	---	**0.67**	0.24	**0.92**
539483	1.96	0.06	65%	0.030	---	---	0.129	1.43	---	---	---	---	**1.59**	0.06	**1.65**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
539583	0.63	0.19	41%	0.018	---	0.102	0.022	0.43	---	---	---	---	**0.57**	0.19	**0.77**
539683	---	0.03	10%	---	---	---	0.000	---	---	---	---	---	**0.00**	0.03	**0.03**
539783	0.02	0.27	12%	0.027	---	---	---	---	---	---	---	---	**0.03**	0.27	**0.30**
539883	0.12	0.00	62%	0.002	---	---	0.007	0.09	---	---	---	---	**0.09**	0.00	**0.10**
541283	---	0.00	11%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
541683	---	---	---	---	---	---	---	---	---	---	---	---	**0.00**	---	**0.00**
542383	19.32	---	86%	0.225	0.004	1.297	0.809	4.54	---	0.00	0.17	9.12	**16.17**	---	**16.17**
542883	0.08	0.06	15%	0.013	---	---	0.054	0.01	---	---	---	---	**0.08**	0.06	**0.14**
543283	0.28	0.23	14%	0.047	0.003	---	0.207	---	---	---	---	---	**0.26**	0.23	**0.49**
543883	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
544083	0.00	0.00	17%	---	---	---	0.000	---	---	---	---	---	**0.00**	0.00	**0.00**
544683	---	---	---	---	---	---	---	---	---	---	---	---	**0.00**	---	**0.00**
544983	---	---	---	---	---	---	---	---	---	---	---	---	**0.00**	---	**0.00**
545083	---	---	---	---	---	---	---	---	---	---	---	---	**0.00**	---	**0.00**
545383	0.03	0.02	15%	0.007	---	---	0.022	0.00	---	---	---	---	**0.03**	0.02	**0.05**
545483	0.01	0.01	13%	0.003	---	---	0.005	---	---	---	0.00	---	**0.01**	0.01	**0.02**
545883	0.00	0.00	15%	---	---	---	---	0.00	---	---	---	---	**0.00**	0.00	**0.00**
545983	0.00	0.01	11%	0.000	---	---	0.000	---	---	0.00	---	---	**0.00**	0.01	**0.01**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026										For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
546083	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
546183	0.18	0.02	46%	0.004	---	---	0.003	0.12	---	---	---	---	**0.13**	0.02	**0.15**
546383	0.19	0.01	56%	0.001	---	---	0.001	0.13	---	---	---	---	**0.13**	0.01	**0.15**
546883	0.15	0.06	50%	0.004	---	---	0.007	0.10	---	---	---	---	**0.11**	0.06	**0.17**
546983	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
547283	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
548483	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
548583	---	0.01	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.01	**0.01**
548683	---	0.01	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.01	**0.01**
548783	---	0.02	10%	0.000	---	---	---	---	---	---	---	---	**0.00**	0.02	**0.02**
548883	---	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
548983	---	0.00	10%	0.000	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
570183	---	0.00	---	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
Total	**45.80**	**3.73**	**62%**	**0.89**	**0.01**	**2.94**	**2.39**	**17.91**	**12.40**	**1.92**	**0.17**	**11.63**	**50.27**	**3.73**	**54.00**

Appendix D-2

Subwatershed Index Maps with Control Measure Capacity

APPENDIX D-2: Subwatershed Index Maps with Control Measure Capacity

This appendix presents the index maps that relate the subwatersheds and jurisdictions to the EWMP quantities specified in Appendix D-1. The maps are presented as follows:

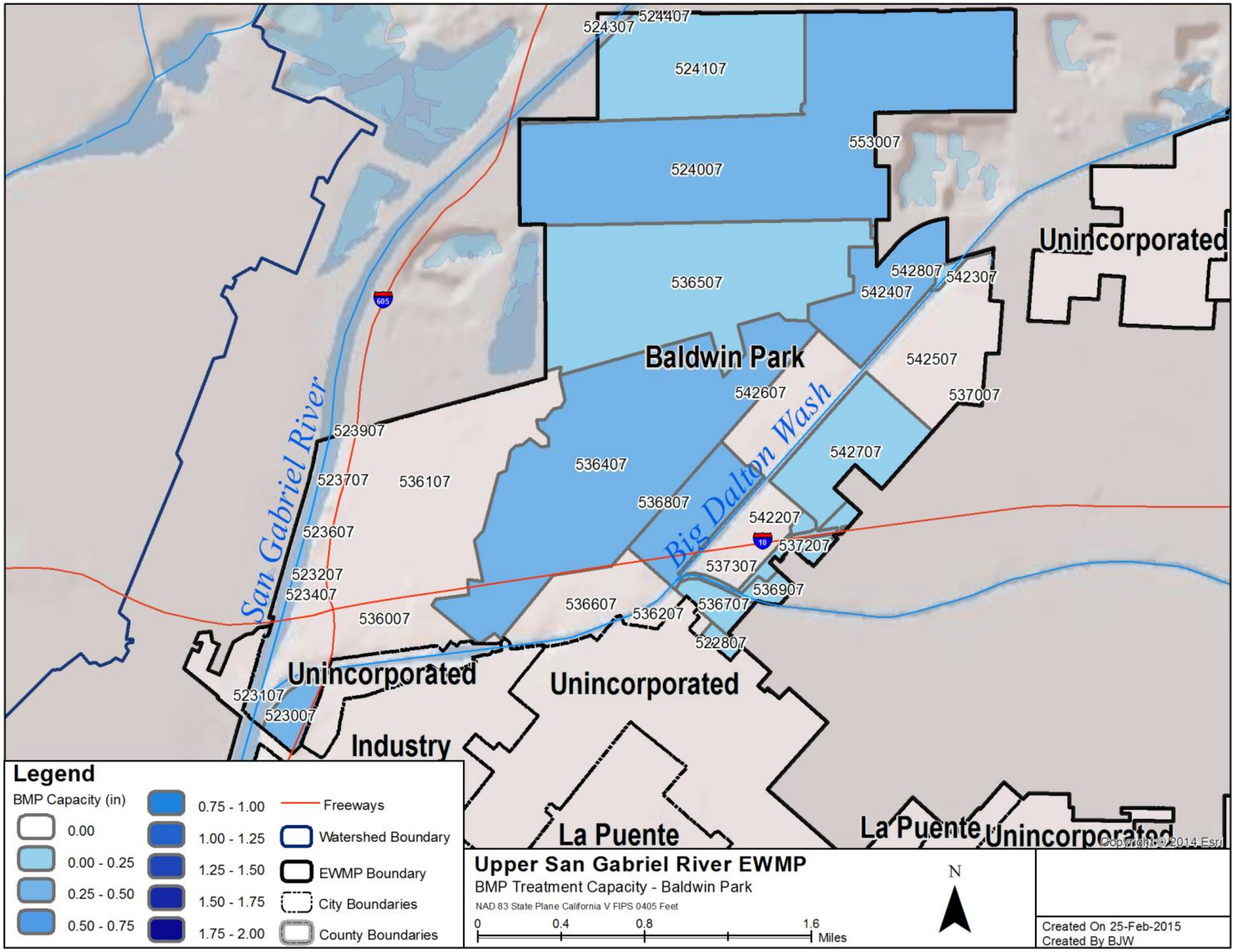


Figure D-2-1. Baldwin Park Index Map

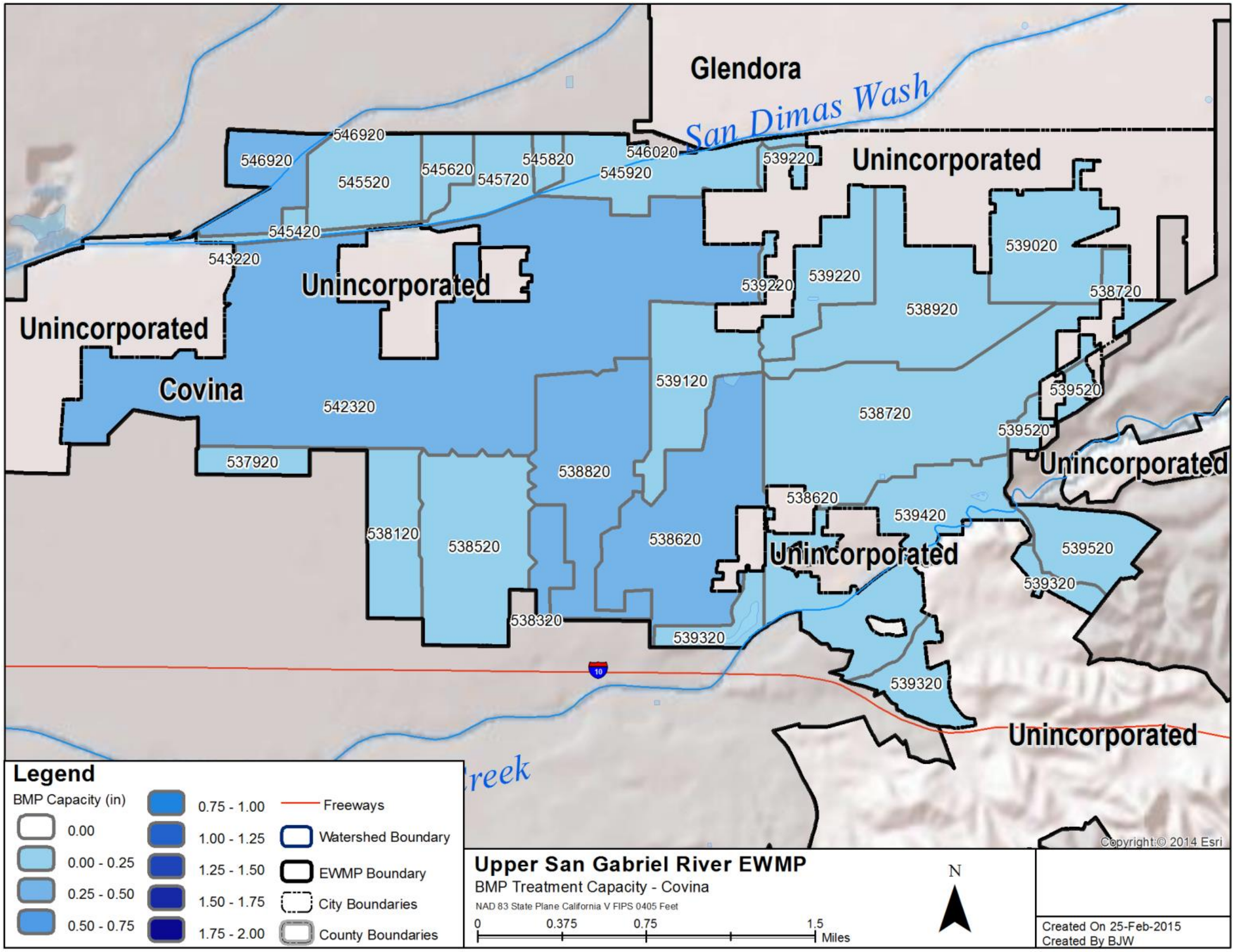


Figure D-2-2. Covina Index Map

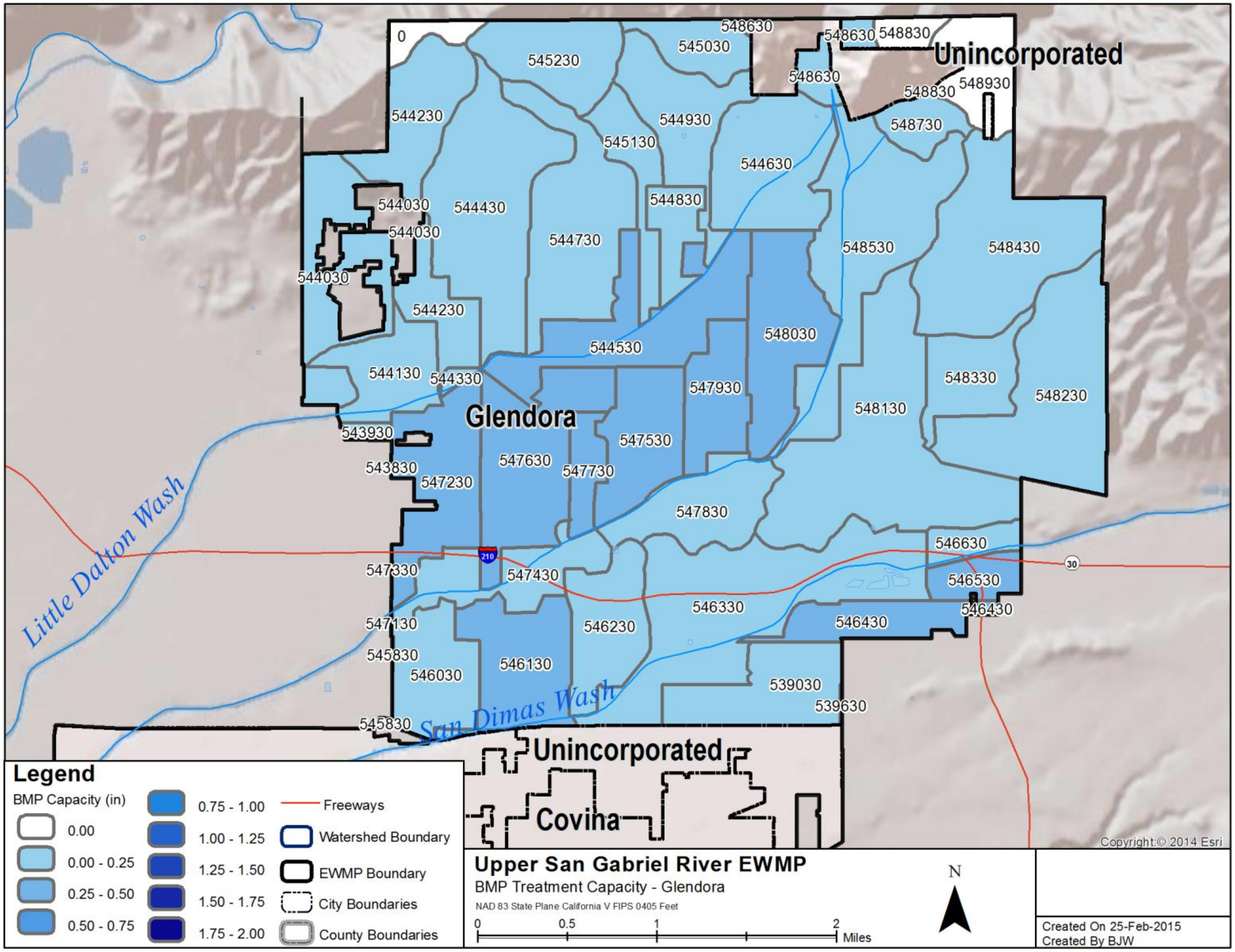


Figure D-2-3. Glendora Index Map

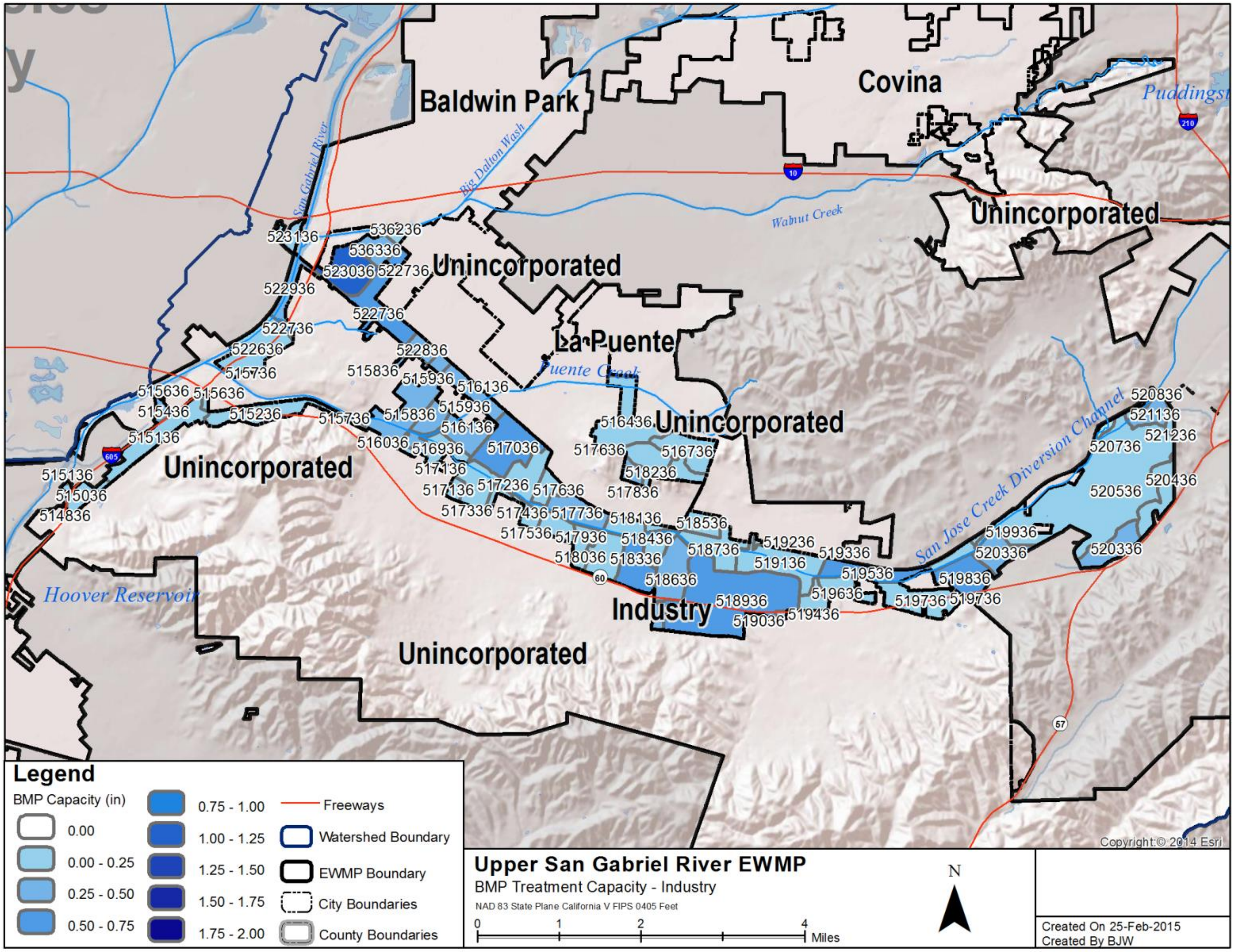


Figure D-2-4. Industry Index Map

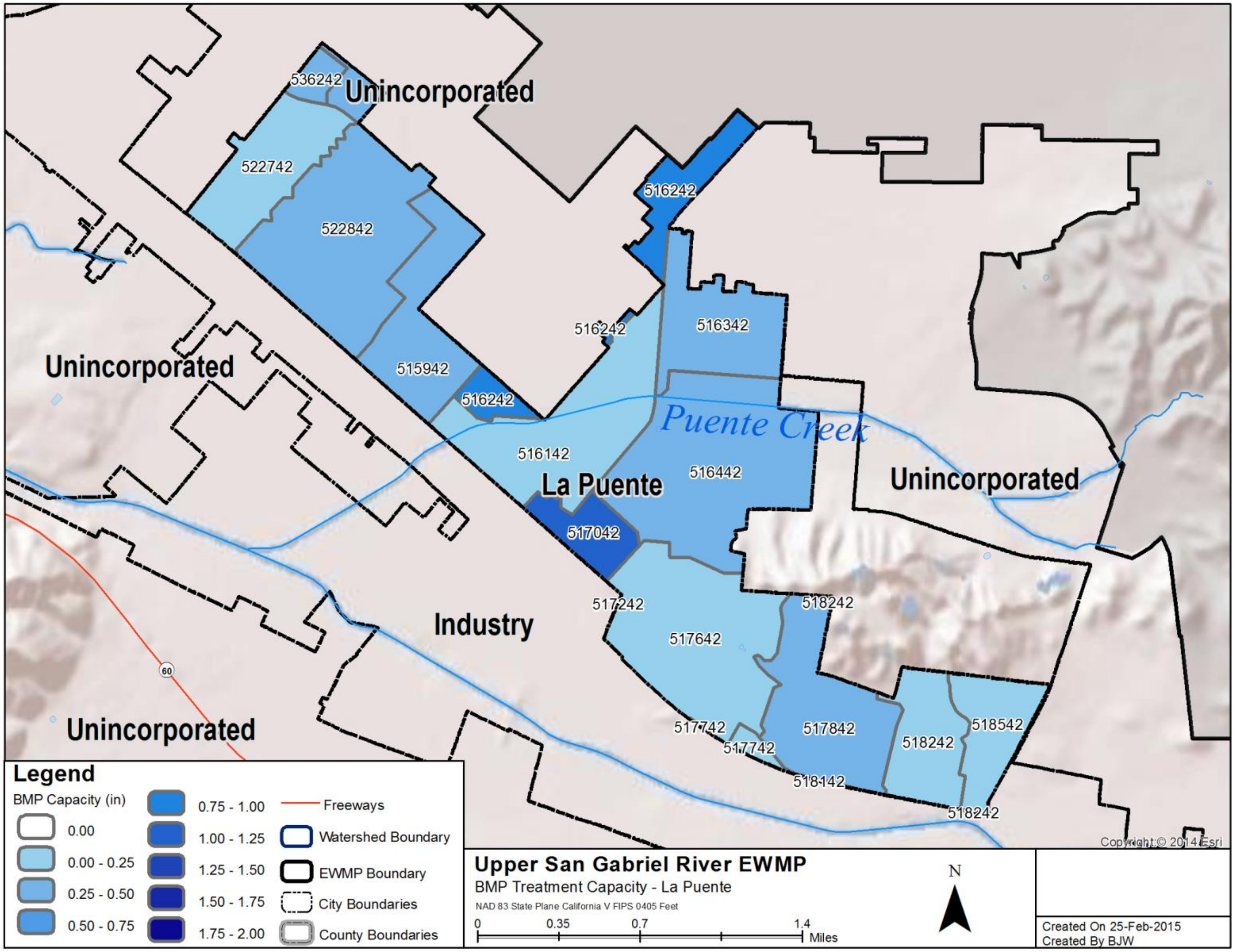


Figure D-2-5. La Puente Index Map

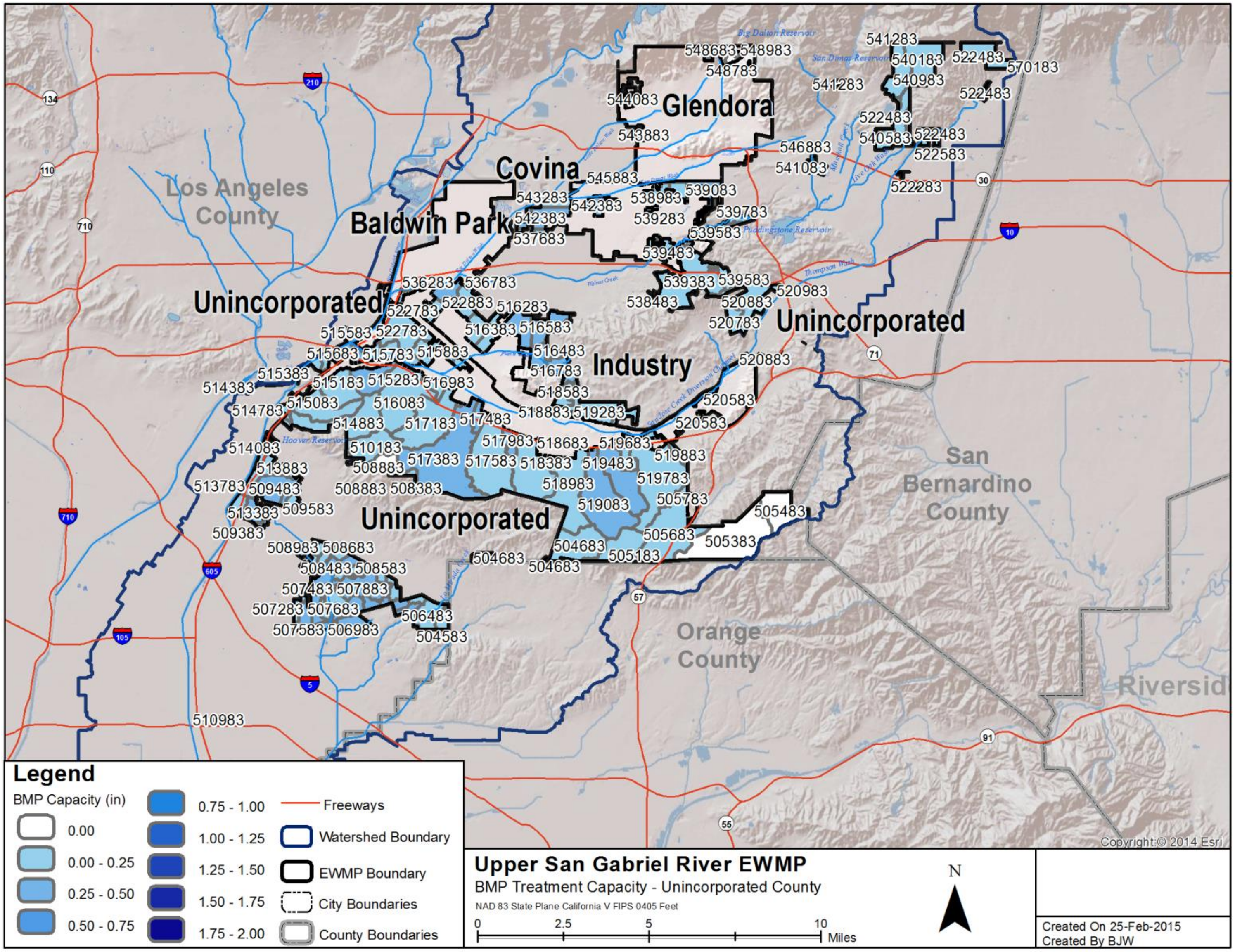


Figure D-2-6. Unincorporated LA County Index Map

Appendix D-3

Milestone Scheduling of EWMP Control Measures

APPENDIX D-3: Compliance Targets and Implementation Plan for EWMP Milestones

These tables present the Compliance Targets and EWMP Implementation Plan for each EWMP milestone including TMDL milestones for SGR Bacteria TMDL and Puddingstone Reservoir.

The following color-gradients and symbol legend applies to all tables in Appendix D-3:

RED = Milestones with highest required % load reductions
BLUE = Milestones with highest BMP capacities within a BMP category
--- = BMP opportunity was either not available or not selected for the milestone
(a value of 0.00 means that BMP capacity is non-zero but less than 0.004).

Table D-3-1. Baldwin Park: Targets and EWMP Implementation Plan for Interim and Final Compliance

Assessment Area	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)									
			Low-Impact Development				Streets	Regional BMPs				
	EWMP Milestone	24-hour Volume Managed (acre-ft)	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Regional BMPs (Tier 1)	Regional BMPs (Tier 2)	Regional BMPs (Tier 3)	Regional BMPs (Private)	Cumulative BMP Capacity (acre-ft)
San Gabriel River	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	16.2	0.36	---	1.27	0.40	3.17	3.38	0.00	---	---	**8.59**
	65% Milestone (2023)	36.7	0.73	---	3.06	0.87	9.00	10.25	0.01	0.30	2.82	**27.03**
	Final Metals (2026)	51.6	1.06	---	4.58	1.24	13.49	10.25	0.01	0.75	11.27	**42.66**
	Final Bacteria (2036)	53.7	1.06	---	4.58	1.24	13.49	10.25	0.01	0.75	13.43	**44.82**
Walnut Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	30.7	0.35	---	0.93	0.56	1.92	2.72	---	---	---	**6.48**
	65% Milestone (2023)	65.5	0.61	---	2.46	0.97	5.41	15.40	0.60	---	---	**25.45**
	Final Metals (2026)	105.1	1.64	---	7.49	2.49	17.28	27.54	5.78	1.00	2.45	**65.67**
	Final Bacteria (2036)	110.3	1.64	---	7.49	2.49	17.28	27.54	5.78	1.00	7.74	**70.96**
Total	**---**	**164.08**	**2.70**	**0.00**	**12.07**	**3.74**	**30.78**	**37.79**	**5.79**	**1.75**	**21.17**	**115.77**

Table D-3-2. Covina: Targets and EWMP Implementation Plan for Interim and Final Compliance

Assessment Area	COMPLIANCE TARGET: BMP PERFORMANCE GOAL — EWMP Milestone	COMPLIANCE TARGET: BMP PERFORMANCE GOAL — 24-hour Volume Managed (acre-ft)	EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet) — Low-Impact Development: Ordinance	Low-Impact Development: Planned LID	Low-Impact Development: Public LID	Low-Impact Development: Residential LID	Streets: Green Streets	Regional BMPs: Regional BMPs (Tier 1)	Regional BMPs: Regional BMPs (Tier 2)	Regional BMPs: Regional BMPs (Tier 3)	Regional BMPs: Regional BMPs (Private)	Cumulative BMP Capacity (acre-ft)
Walnut Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	36.5	0.57	0.38	2.41	0.84	2.15	9.34	---	---	---	**15.67**
	65% Milestone (2023)	80.7	0.91	0.38	5.17	1.35	6.29	26.25	0.65	---	---	**41.00**
	Final Metals (2026)	130.2	2.45	0.38	17.98	3.64	19.31	50.40	3.36	4.86	4.78	**107.16**
	Final Bacteria (2036)	139.6	2.45	0.38	17.98	3.64	19.31	50.40	3.36	4.86	14.24	**116.61**
Total	**---**	**139.64**	**2.45**	**0.38**	**17.98**	**3.64**	**19.31**	**50.40**	**3.36**	**4.86**	**14.24**	**116.61**

Table D-3-3. Glendora: Targets and EWMP Implementation Plan for Interim and Final Compliance

Assessment Area	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)									
			Low-Impact Development				Streets	Regional BMPs				
	EWMP Milestone	24-hour Volume Managed (acre-ft)	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Regional BMPs (Tier 1)	Regional BMPs (Tier 2)	Regional BMPs (Tier 3)	Regional BMPs (Private)	Cumulative BMP Capacity (acre-ft)
Walnut Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	43.9	0.65	0.99	0.38	1.33	6.50	4.85	---	---	---	**14.69**
	65% Milestone (2023)	93.6	1.69	0.99	1.24	3.38	25.61	30.76	0.22	---	---	**63.89**
	Final Metals (2026)	140.2	2.57	0.99	2.00	5.16	41.95	30.76	0.29	---	29.08	**112.80**
	Final Bacteria (2036)	149.5	2.57	0.99	2.00	5.16	41.95	30.76	0.29	---	38.37	**122.10**
Total	**---**	**149.45**	**2.57**	**0.99**	**2.00**	**5.16**	**41.95**	**30.76**	**0.29**	**0.00**	**38.37**	**122.10**

Table D-3-4. Industry: Targets and EWMP Implementation Plan for Interim and Final Compliance

Assessment Area	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)									
			Low-Impact Development				Streets	Regional BMPs				
	EWMP Milestone	24-hour Volume Managed (acre-ft)	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Regional BMPs (Tier 1)	Regional BMPs (Tier 2)	Regional BMPs (Tier 3)	Regional BMPs (Private)	Cumulative BMP Capacity (acre-ft)
Puente Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	4.2	0.13	---	0.03	0.00	0.22	---	0.06	---	---	**0.44**
	65% Milestone (2023)	9.3	0.30	---	0.09	0.00	0.66	---	0.65	---	1.71	**3.40**
	Final Metals (2026)	14.5	0.43	---	0.14	0.01	0.98	---	0.81	---	6.82	**9.19**
	Final Bacteria (2036)	14.6	0.43	---	0.14	0.01	0.98	---	0.81	---	6.86	**9.22**
San Gabriel River	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	5.4	0.52	---	0.18	0.00	0.33	7.59	0.31	---	---	**8.94**
	65% Milestone (2023)	15.6	1.14	---	0.55	0.00	0.92	23.01	1.86	1.73	2.27	**31.48**
	Final Metals (2026)	24.1	1.53	---	0.82	0.00	1.34	23.01	1.93	3.79	9.08	**41.51**
	Final Bacteria (2036)	26.4	1.53	---	0.82	0.00	1.34	23.01	1.93	3.79	11.42	**43.85**
San Jose Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	31.9	2.04	---	2.50	0.01	2.69	---	0.14	---	---	**7.38**
	65% Milestone (2023)	116.2	4.89	---	7.26	0.01	8.33	---	8.02	0.79	27.43	**56.73**
	Final Metals (2026)	177.9	6.55	---	10.33	0.02	11.72	---	8.31	1.93	86.64	**125.50**
	Final Bacteria (2036)	190.3	6.55	---	10.33	0.02	11.72	---	8.31	1.93	99.00	**137.86**
Walnut Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	0.9	0.12	---	---	0.00	0.25	0.85	---	---	---	**1.23**
	65% Milestone (2023)	2.7	0.16	---	---	0.00	0.36	0.85	---	---	1.24	**2.61**
	Final Metals (2026)	4.0	0.20	---	---	0.00	0.46	0.85	---	---	2.48	**3.99**
	Final Bacteria (2036)	4.2	0.20	---	---	0.00	0.46	0.85	---	---	2.66	**4.17**
Total	**---**	**235.48**	**8.71**	**0.00**	**11.29**	**0.03**	**14.50**	**23.86**	**11.04**	**5.73**	**119.94**	**195.10**

Table D-3-5. La Puente: Targets and EWMP Implementation Plan for Interim and Final Compliance

Assessment Area	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)									
			Low-Impact Development				Streets	Regional BMPs				
	EWMP Milestone	24-hour Volume Managed (acre-ft)	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Regional BMPs (Tier 1)	Regional BMPs (Tier 2)	Regional BMPs (Tier 3)	Regional BMPs (Private)	Cumulative BMP Capacity (acre-ft)
Puente Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	10.1	0.11	---	0.08	0.22	1.64	0.47	---	---	---	**2.52**
	65% Milestone (2023)	20.2	0.29	---	0.27	0.60	5.97	10.92	0.03	---	1.62	**19.69**
	Final Metals (2026)	30.0	0.42	---	0.42	0.86	9.00	10.92	0.03	---	10.52	**32.18**
	Final Bacteria (2036)	30.4	0.42	---	0.42	0.86	9.00	10.92	0.03	---	10.97	**32.62**
San Gabriel River	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	5.2	0.08	---	---	0.20	2.03	---	---	---	---	**2.31**
	65% Milestone (2023)	10.6	0.18	---	---	0.42	4.92	---	---	---	1.36	**6.87**
	Final Metals (2026)	13.2	0.22	---	---	0.53	6.32	---	---	---	2.71	**9.79**
	Final Bacteria (2036)	13.5	0.22	---	---	0.53	6.32	---	---	---	3.10	**10.17**
San Jose Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	6.2	0.14	---	0.16	0.32	1.78	0.32	0.14	---	---	**2.86**
	65% Milestone (2023)	13.8	0.30	---	0.41	0.64	4.80	0.96	0.92	---	3.05	**11.07**
	Final Metals (2026)	22.8	0.41	---	0.55	0.87	6.55	0.96	0.94	---	12.19	**22.48**
	Final Bacteria (2036)	23.8	0.41	---	0.55	0.87	6.55	0.96	0.94	---	13.22	**23.51**
Walnut Creek	10% Milestone (2017)	0.1	0.00	---	0.01	0.00	0.02	---	---	---	---	**0.03**
	35% Milestone (2020)	0.2	0.01	---	0.03	0.00	0.09	0.42	---	---	---	**0.54**
	65% Milestone (2023)	0.5	0.01	---	0.04	0.00	0.13	0.42	---	---	0.17	**0.77**
	Final Metals (2026)	0.7	0.01	---	0.05	0.00	0.16	0.42	---	---	0.35	**0.99**
	Final Bacteria (2036)	0.7	0.01	---	0.05	0.00	0.16	0.42	---	---	0.35	**0.99**
Total	**---**	**68.51**	**1.07**	**0.00**	**1.02**	**2.26**	**22.03**	**12.30**	**0.98**	**0.00**	**27.64**	**67.29**

Table D-3-6. Uninc. LA County: Targets and EWMP Implementation Plan for Interim and Final Compliance

Assessment Area	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)									
			Low-Impact Development				Streets	Regional BMPs				
	EWMP Milestone	24-hour Volume Managed (acre-ft)	Ordinance	Planned LID	Public LID	Residential LID	Green Streets, All Components	Regional BMPs (Tier 1)	Regional BMPs (Tier 2)	Regional BMPs (Tier 3)	Regional BMPs (Private)	Cumulative BMP Capacity (acre-ft)
Coyote Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	28.5	0.59	0.07	2.01	1.50	8.33	2.57	---	---	---	**15.06**
	65% Milestone (2023)	85.8	1.61	0.07	8.96	4.10	34.14	7.80	0.00	0.02	2.09	**58.77**
	Final Metals (2026)	136.4	2.39	0.07	14.28	6.07	53.60	7.80	0.00	0.05	31.52	**115.78**
	Final Bacteria (2036)	146.7	2.39	0.07	14.28	6.07	53.60	7.80	0.00	0.05	41.79	**126.05**
Puddingstone Reservoir	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	4.5	0.05	---	0.00	0.06	0.45	---	0.45	---	---	**1.02**
	65% Milestone (2023)	8.5	0.10	---	0.01	0.13	1.33	---	1.81	---	0.73	**4.10**
	Final Metals (2026)	13.2	0.15	---	0.01	0.20	2.03	---	2.26	---	4.44	**9.08**
	Final Bacteria (2036)	13.4	0.15	---	0.01	0.20	2.03	---	2.26	---	4.65	**9.29**
Puente Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	13.1	0.22	0.01	0.67	0.58	3.44	0.18	---	---	---	**5.09**
	65% Milestone (2023)	35.7	0.57	0.01	2.46	1.53	12.35	3.31	---	0.00	4.15	**24.38**
	Final Metals (2026)	50.7	0.77	0.01	3.27	2.07	17.62	3.31	---	0.00	15.42	**42.48**
	Final Bacteria (2036)	53.1	0.77	0.01	3.27	2.07	17.62	3.31	---	0.00	17.80	**44.85**
San Gabriel River	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
	35% Milestone (2020)	29.0	0.46	0.01	0.65	0.63	0.97	0.59	---	---	---	**3.32**
	65% Milestone (2023)	62.9	0.86	0.01	2.28	1.26	3.21	1.80	1.11	0.82	---	**11.34**
	Final Metals (2026)	99.3	1.89	0.01	5.60	2.66	8.73	1.80	3.08	21.06	7.66	**52.48**

Assessment Area	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)									
			Low-Impact Development				Streets	Regional BMPs				
	EWMP Milestone	24-hour Volume Managed (acre-ft)	Ordinance	Planned LID	Public LID	Residential LID	Green Streets, All Components	Regional BMPs (Tier 1)	Regional BMPs (Tier 2)	Regional BMPs (Tier 3)	Regional BMPs (Private)	Cumulative BMP Capacity (acre-ft)
	Final Bacteria (2036)	109.5	1.89	0.01	5.60	2.66	8.73	1.80	3.08	21.06	17.85	**62.67**
San Jose Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
San Jose Creek	35% Milestone (2020)	36.5	0.97	0.35	2.63	2.26	3.22	---	---	---	---	**9.44**
San Jose Creek	65% Milestone (2023)	171.7	1.76	0.35	6.92	4.11	9.00	59.18	8.45	---	---	**89.77**
San Jose Creek	Final Metals (2026)	297.7	4.79	0.35	23.59	11.21	29.01	94.39	64.56	23.99	---	**251.89**
San Jose Creek	Final Bacteria (2036)	314.7	4.79	0.35	23.59	11.21	29.01	94.39	64.56	23.99	16.97	**268.86**
Walnut Creek	10% Milestone (2017)	---	---	---	---	---	---	---	---	---	---	**0.00**
Walnut Creek	35% Milestone (2020)	9.8	0.20	0.01	0.45	0.50	1.99	0.11	---	---	---	**3.26**
Walnut Creek	65% Milestone (2023)	31.2	0.61	0.01	1.96	1.64	11.42	12.40	1.16	0.07	2.28	**31.53**
Walnut Creek	Final Metals (2026)	47.2	0.89	0.01	2.94	2.39	17.91	12.40	1.92	0.17	11.63	**50.27**
Walnut Creek	Final Bacteria (2036)	51.0	0.89	0.01	2.94	2.39	17.91	12.40	1.92	0.17	15.36	**54.00**
Total	**---**	**688.27**	**10.87**	**0.45**	**49.69**	**24.60**	**128.90**	**119.69**	**71.82**	**45.28**	**114.43**	**565.72**

Appendix E

EWMP Addendum for City of West Covina

1 Introduction

This appendix presents an addendum to incorporate the City of West Covina into the Upper San Gabriel River (USGR) Enhanced Watershed Management Program (EWMP). The draft USGR EWMP submitted on June 25, 2015 included West Covina as a participating agency, along with the County of Los Angeles, Los Angeles County Flood Control District (LACFCD), and the Cities of Baldwin Park, Covina, Glendora, Industry, and La Puente. This addendum provides the analyses needed to fully incorporate West Covina into the USGR EWMP and presents the EWMP Implementation Plan for West Covina.

This addendum provides West Covina-specific analyses needed to incorporate West Covina into the USGR EWMP. The reader is referred to the USGR EWMP for details on methodology and analyses that apply to the entire USGR EWMP Group. To support review of this document, the format and organization of this addendum follows the USGR EWMP. When a cross-reference within this addendum refers to a section of the main body of the USGR EWMP, the reference includes “of the USGR EWMP”. Otherwise, the cross-reference is referring a section within this addendum.

Descriptions of jurisdictional area, land use, and geology are described for West Covina in **Section 1.2** of the USGR EWMP.

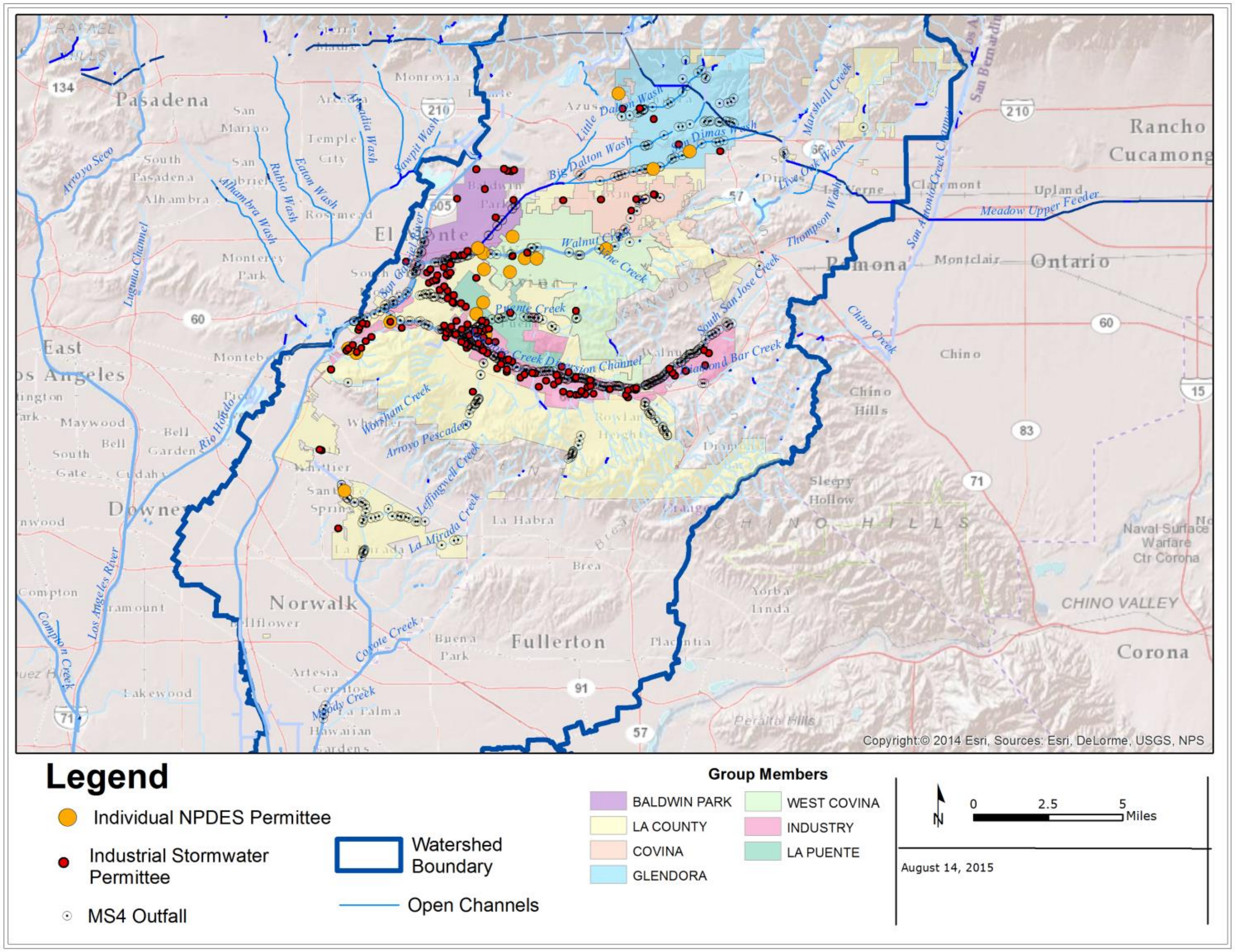
2 Identification of Water Quality Priorities

West Covina is located within the Upper San Gabriel River Watershed Management Area, which was analyzed in Section 2, Identification of Water Quality Priorities of the USGR EWMP. Receiving waters applicable to West Covina include: Big Dalton Wash, Walnut Creek, and Puente Creek. Each of the applicable water bodies was fully evaluated in the USGR EWMP. The inclusion of West Covina does not necessitate any additional TMDLs, and thus the existing compliance dates do not require modification. Furthermore, the addition of West Covina does not introduce a change to the USGR Water Quality Priorities or compliance dates.

2.1 INITIAL SOURCE ASSESSMENT

An initial source assessment was conducted for the USGR EWMP, as described in **Section 2.6** of the USGR EWMP. The initial source assessment has been updated to include NPDES-permitted dischargers within the City of West Covina, as shown in **Figure E- 1**.

Figure E- 1
Updated Map of NPDES-permitted Dischargers within the USGR EWMP Area



3 Watershed Control Measures

The Permit requires the identification of Watershed Control Measures, which are strategies, institutional measures, and BMPs[1] that will be implemented through the EWMP individually or collectively at a watershed-scale to address Water Quality Priorities. **Section 3** of the USGR EWMP describes the categories of BMPs used to develop the USGR EWMP (and simulated by the RAA), summarizes existing and planned structural BMPs, and describes the institutional control measures that will be implemented including customization of MCMs.

West Covina evaluated the menu of control measures used for development of the USGR EWMP and determined which of the institutional and structural control measures are best suited for its stormwater program. The menu of institutional, LID, green street, and regional project control measures selected by West Covina is summarized in **Table E-1**. Additional information regarding the selected control measures are provided in the following subsections, organized by control measure type.

Potential regional project sites are subdivided into three separate "tiers". Tier 1 consists of regional EWMP projects for which a conceptual design has been completed and included in the EWMP. Tier 2 projects are other regional projects located on identified city-owned property, while Tier 3 projects are located on schools or non-City owned public parcels.

Table E-1
Summary of Control Measures Selected by West Covina for EWMP Development

Control Measure Type	Control Measure Subcategory for EWMP / RAA	Incorporation Approach for EWMP for West Covina
Institutional	Enhanced institutional	5% baseline for 2012 Permit MCMs, plus additional 5% reduction due to catch basin inserts
LID	LID due to Ordinance	Yes, incorporate based on projected growth rates
	Residential LID incentive program	Yes, incorporate program starting in 2017
	LID Retrofits on municipal parcels	Yes, incorporate for identified parcel opportunities
Green streets	Green streets with permeable pavement	Yes, incorporate suitable streets as opportunities
Regional projects	Tier 1 projects (City-owned, subject to concept design)	Yes, incorporate Cortez Park
	Tier 2 projects (City-owned, based on initial design assumptions)	Yes, incorporate identified Tier 2 parcels as opportunities
	Tier 3 projects (located on non-City owned parcels such as schools)	Yes

[1] In this EWMP, the terms "control measures" and "best management practices (BMPs)" are used interchangeably.

3.1 REGIONAL PROJECTS IN WEST COVINA

The screening process described in **Section 3.2.1** of the USGR EWMP was used to identify potential suitable parcels for regional projects in West Covina. The screening layers used to identify potential regional projects are depicted in **Figure E-3** though **Figure E-11**. Based on this analysis, a potential Tier 1 regional project, Cortez Park, was identified along with 5 additional potential Tier 2 regional projects. **Figure E-2** shows the identified parcels and potential drainage areas that could be intercepted by regional projects located on those parcels.

Figure E-2
Regional BMP Opportunities Identified in West Covina

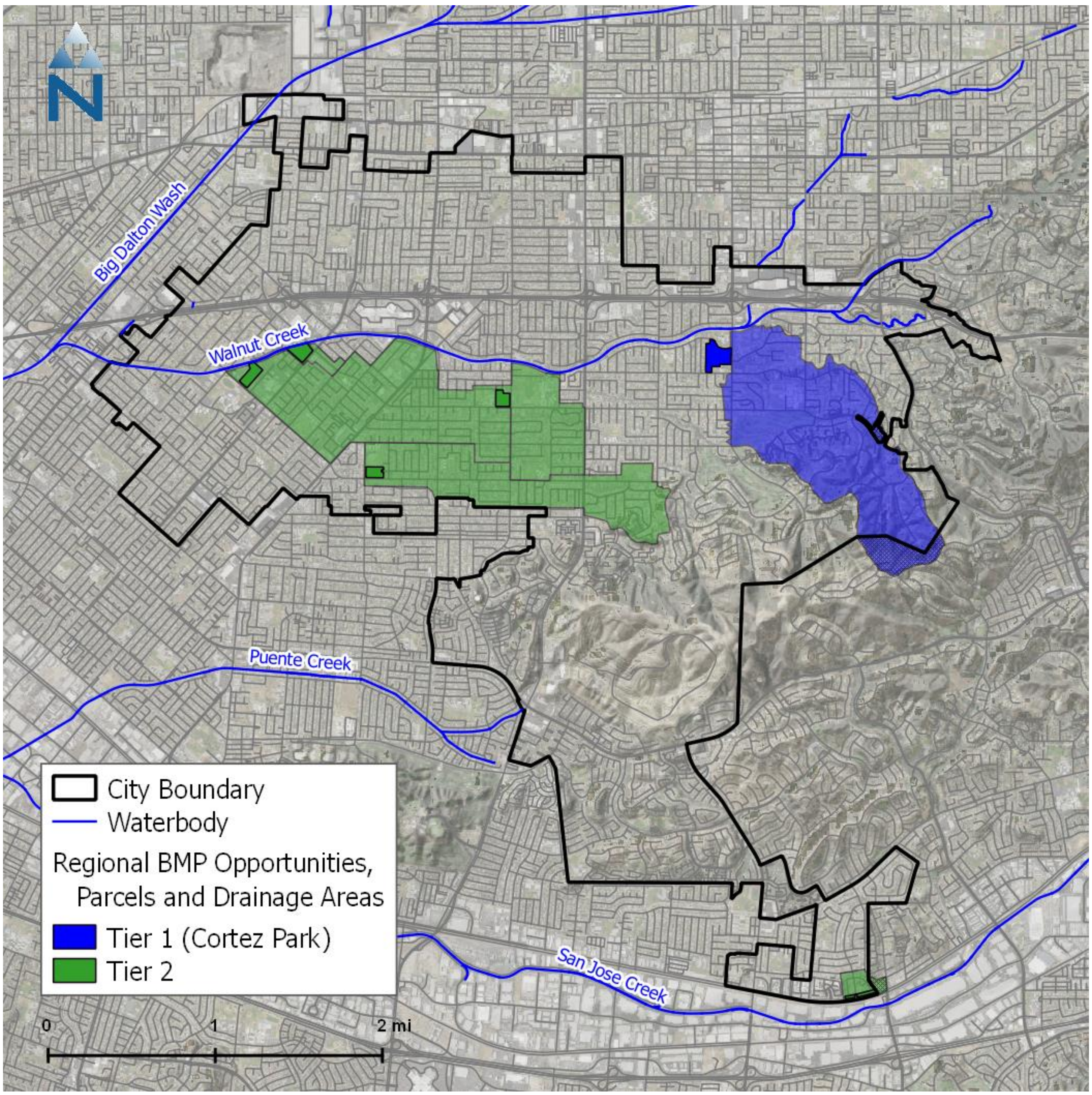


Figure E-3
Bedrock

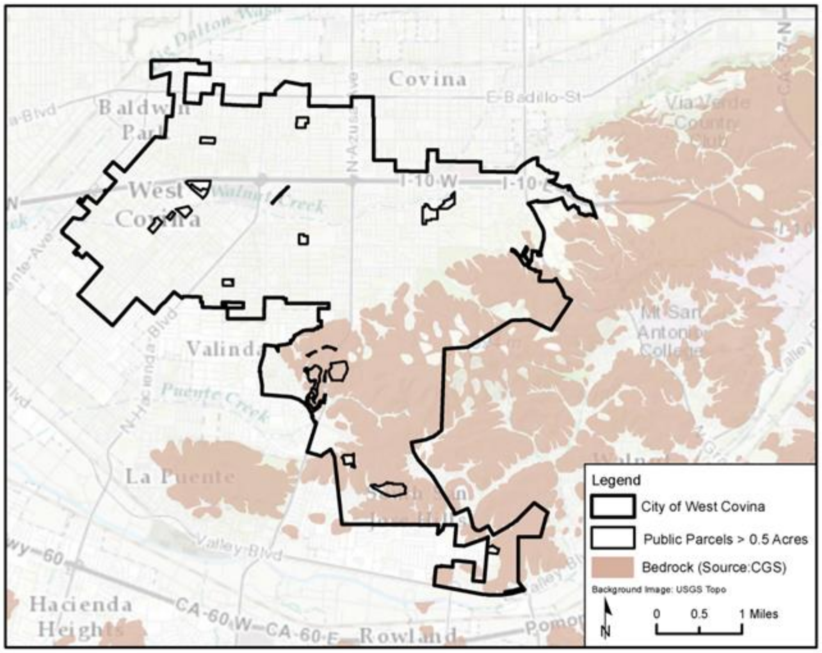


Figure E-4
Methane-Producing Landfills

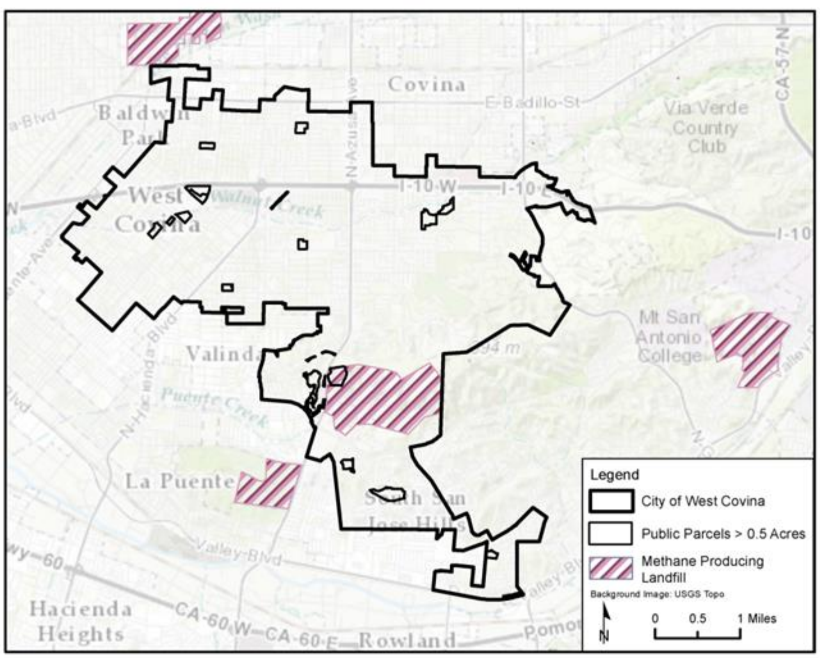


Figure E-5
Significant Ecological Areas (SEAs)

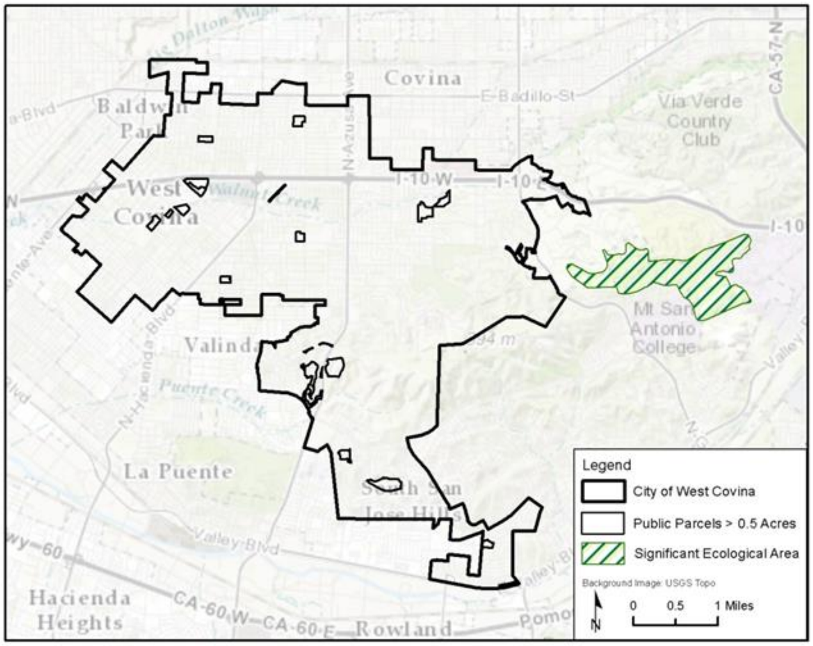


Figure E-6
Depth to Groundwater (<20 ft. BGS)

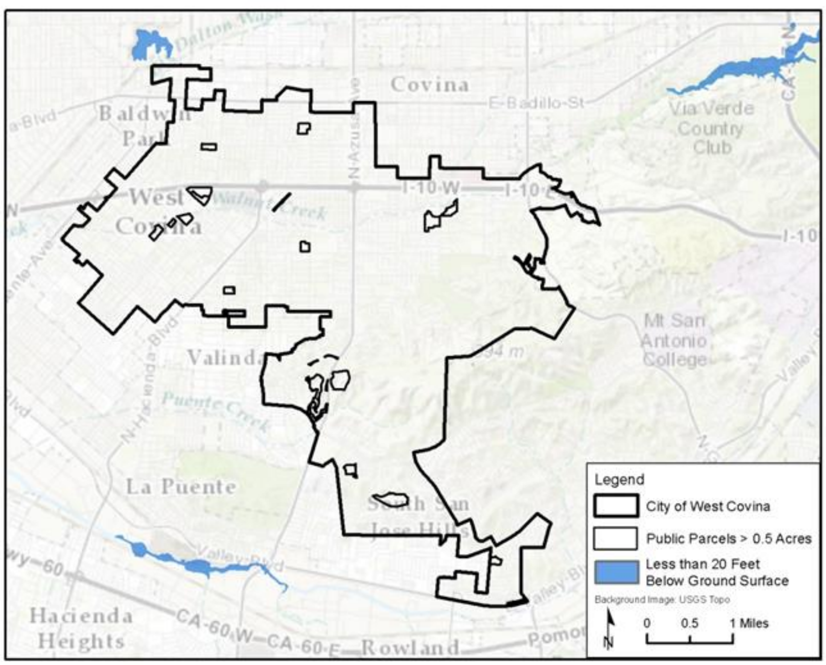


Figure E-7
Ground Surface Slope

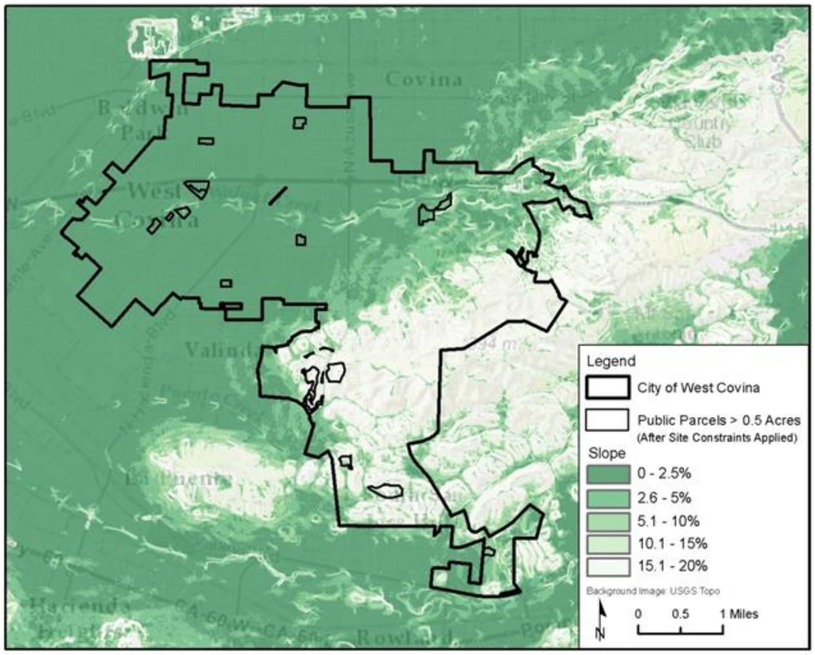


Figure E-8
RAA Subwatersheds and Flow Direction

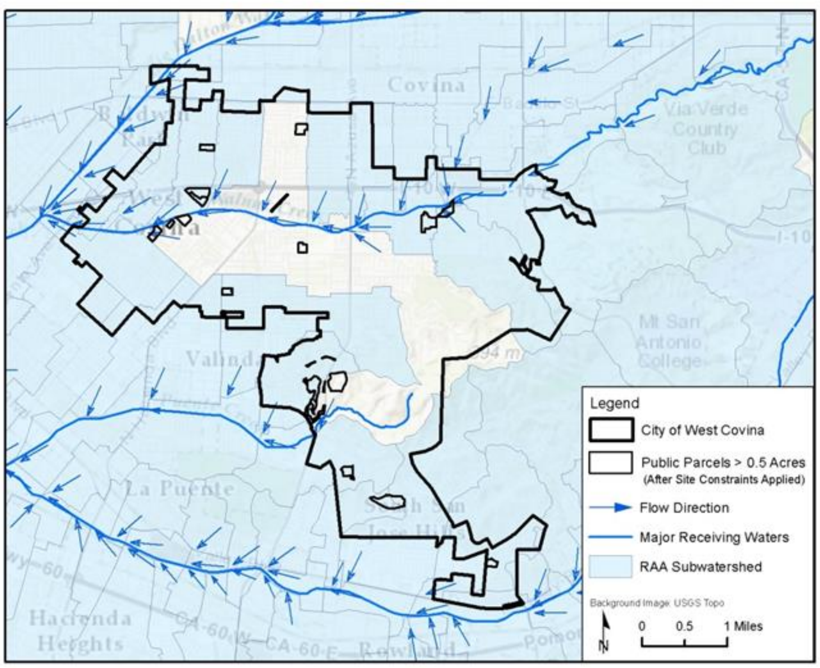


Figure E-9
Soil Infiltration Rates

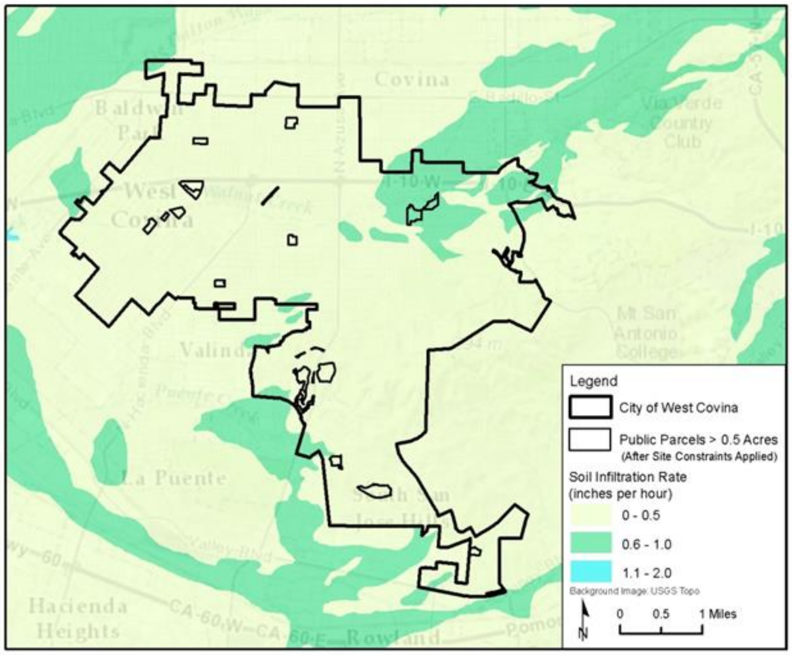


Figure E-10
Groundwater Contamination

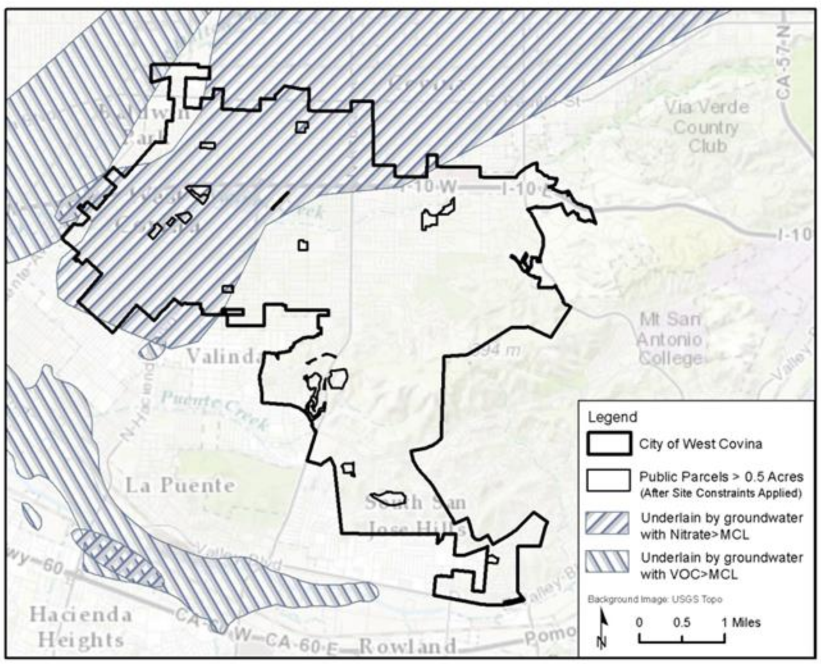
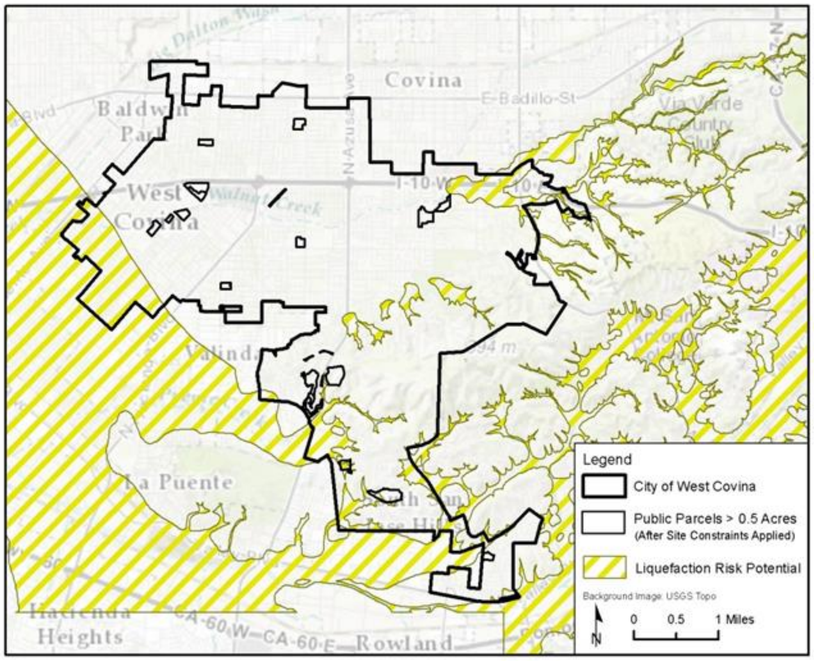


Figure E-11
High Liquefaction Potential



3.1.1 Signature (Tier 1) Regional EWMP Project

As described in **Section 3.2.1.2** of the EWMP, the signature regional EWMP projects retain and infiltrate or beneficially reuse stormwater runoff from the 85th-percentile, 24-hour storm event for the drainage area tributary to the project. Through an initial screening process and coordination with West Covina, Cortez Park was selected for conceptual design and inclusion in the EWMP. West Covina will complete the planning, permitting and designing of Cortez Park by December 2023 and complete construction by December 2024.

Cortez Park is located at 2441 E Cortez St in West Covina, northwest of the intersection of East Cortez Street and South Citrus Street. The conceptual design includes diversion from the adjacent storm sewer along South Citrus Street flowing westward into Cortez Park. Stormwater would be routed into a series of perforated 96-inch corrugated metal pipe (CMP) segments which would store significant volumes of water underground and allow for percolation over time. The CMP would be installed underground over an area of approximately 4.5 acres, after which park facilities (ball fields, walkways and trees) could be re-installed, providing both stormwater quality and recreational benefits.

Criteria consistent with the EWMP and **Appendix B1** were used to develop a conceptual design for a regional EWMP project on Cortez Park. The inputs used to develop the conceptual design of Cortez Park are summarized in **Table E-2**. Preliminary sizing calculations are provided in **Table E-3**. The preliminary layout for Cortez Park is shown in **Figure E-12**. **Table E-4** presents the preliminary cost estimate for Cortez Park. West Covina will complete the planning, permitting and designing of Cortez Park by December 2023.

Table E-2
Conceptual Design Inputs - Cortez Park

Site Name (Owner)	Total Site Size (acre)	Jurisdictions in Contributing Drainage Area (acres)	85th Percentile Storm Volume (acre-feet)	Infiltration Rate (inches per hour)**	Estimated Diversion Pipe Diameter (inches)
Cortez Park (West Covina)	16.5	West Covina (745 ac), Walnut (51 ac)	28.3*	0.54 - 0.63	60

* Volumes not determined from SUSTAIN. The 85th percentile, 24-hour storm volume was determined by applying the runoff volume per acre drainage area (acre-feet per acre) of the nearest modeled site to the contributing drainage area of the site.
** Infiltration rates for each site were determined by using GIS soils data and infiltration curves from the County of Los Angeles, Department of Public Works Hydrology Manual (LACDPW, 2006 and County of Los Angeles, 2014). Additional data will be gathered during geotechnical sampling of the sites.

Table E-3
Subsurface Infiltration Basin Sizing[1]

Site Name	Cortez Park
85th Percentile Storm Volume (ac-ft)	28.3
85th Percentile Storm Volume (cf)	1,230,853
Limiting Width[2] (ft)	200
Pipe Storage (cf)	886,382
Porous Stone Storage (cf)	346,087
Total Storage Provided (cf)	1,232,468
Total Storage Provided (ac-ft)	28.3
Number of Barrels	18
Length Per Barrel (ft)	958
Length Per Header (ft)	195
Rectangular Footprint Width (ft)	199
Rectangular Footprint Length (ft)	978
Design BMP Footprint (Acre)	4.5
Total CMP Footage (ft)	17,634
Approx. Total Pieces	738
Approx. Truckloads	369
Total Excavation (yd^3)	97,311
Porous Stone Backfill (yd^3)	32,045
Backfill to Grade (yd^3)	32,437

Notes:
1. Developed using Contech's CMP Detention System – Rectangular DYODS™ tool (Contech, 2015). Additional information on the tool is available at http://www.conteches.com/products/stormwater-management/detention-and-infiltration/cmp-detention-and-infiltration.aspx#2004317-technical-info.
2. Based on preliminary layouts of the Cortez Park EWMP project.

Figure E-12
Cortez Park – Preliminary Layout

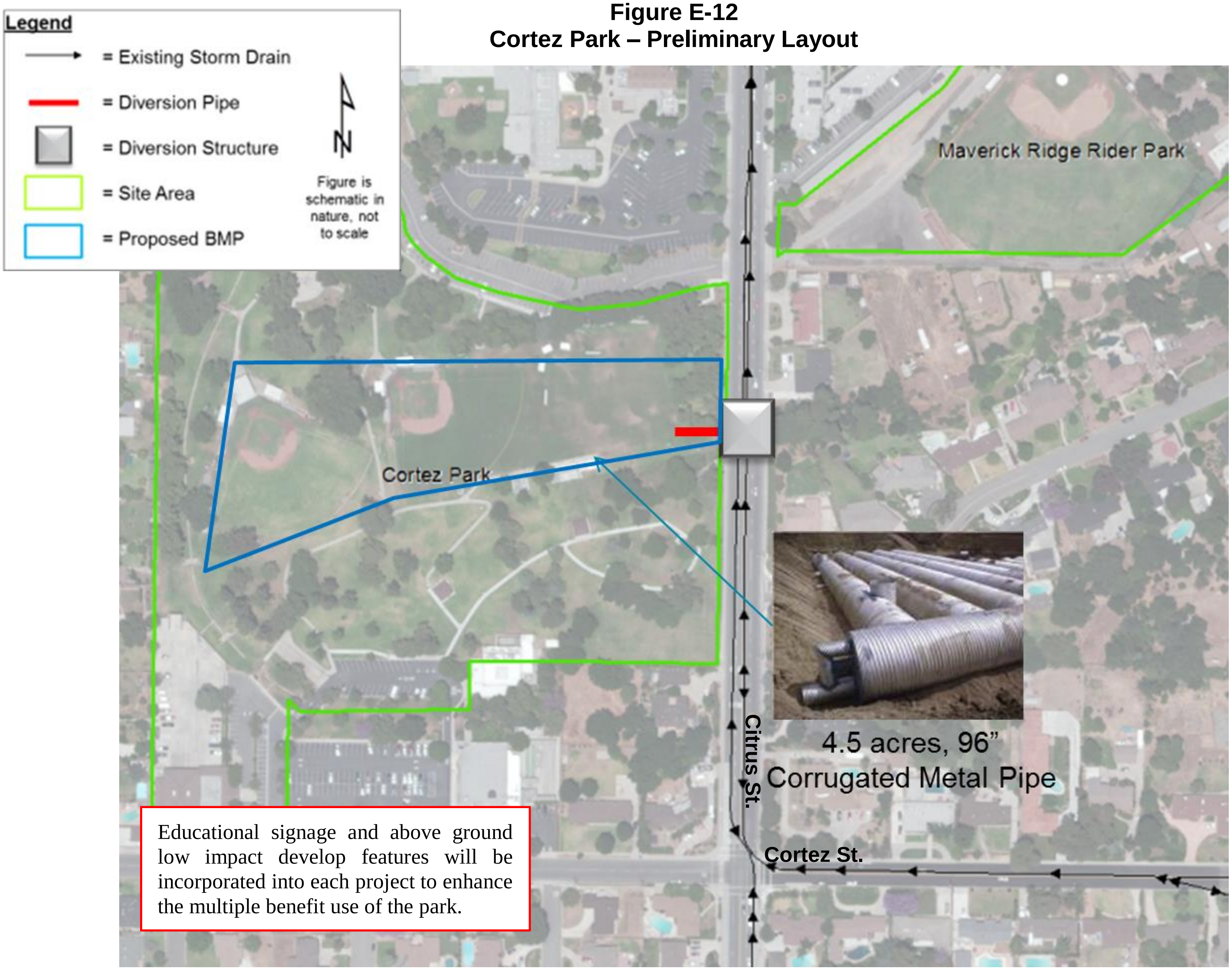


Table E-4
Cortez Park – Preliminary Cost Estimate

Site Name
Cortez Park
BMP Type
Subsurface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$2,352,000
Design/Permitting	% of Total Construction Cost	15%	--	$1,764,000
Planning & Design Total				**$4,116,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	97,400	$2,922,000
Asphalt/Base Removal	$/yd^3	$9.60	400	$4,000
Site Preparation	$/acre	$6,000.00	4.5	$27,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	60,000	$960,000
Gravel Sub-base	$/yd^3	$63.00	32,100	$2,023,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	194,700	$974,000
Native/Complex Landscaping	$/ft^2	$25.00	-	$0
Backfill	$/yd^3	$20.00	32,500	$650,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	28.3	$3,127,000
Construction Subtotal				**$10,687,000**
Mobilization	% of Construction Total	10%	--	$1,069,000
Construction Total				**$11,756,000**
Project Subtotal				**$15,872,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$3,968,000
Project Total				**$19,840,000**

3.1.2 Tier-2 Regional Projects

In addition to the signature Tier 1 project at Cortez Park, potential Tier 2 regional projects were identified using a detailed spatial analysis as described in **Section 3** of the EWMP, beginning with an initial screening based on potential constraints, and culminating with an identification of publically owned parcels potentially suitable for regional projects. **Table E-5** summarizes the Tier-2 Regional BMP opportunities identified through the screening process and incorporated into the RAA model for West Covina. **Figure E-2** shows the extent of contributing drainage areas to each of the potential Tier-2 regional projects, as well as the signature project in Cortez Park. These regional projects were not subject to concept design, however their capacity and footprint were optimized during RAA modeling as described in **Section 4**. During EWMP implementation, the design details for Tier 2 regional projects will be further refined.

Table E-5
Summary of Tier-2 Regional BMPs for West Covina

Description	**Address**	**Approximate Location (Lat/Long)**	**Approximate Available Footprint** (acres)	**Potential Upstream Area to be Intercepted** (acres)
Cameron Park	1305 E Cameron Ave	34.06, -117.92	6.4	228.4
Lot near channel	3100 - 3298 Lanesboro Dr.	34.00, -117.87	0.8	24.8
Parking Lot	811 S. Sunset Ave	34.07, -117.94	8.3	23.3
Orangewood Park	1615 W Merced Ave	34.06, -117.95	8.0	611.2
Walmerado Park	625 E Merced Ave	34.05, -117.93	5.6	423.8

3.1.3 Regional Projects on Private Parcels

In some cases, the required pollutant reductions to achieve RWLs may be greater than can be achieved with identified opportunities for LID, green streets and regional projects on City-owned parcels. To provide reasonable assurance of pollutant reduction, another category of regional BMP – regional projects on private parcels – are included in the RAA and EWMP Implementation Plan. Because specific opportunities for land acquisition and/or public-private partnerships cannot be confirmed during the timeframe of the EWMP development, the RAA modeling described in **Section 4** of the USGR EWMP reports a conceptual volume of infiltration basins required in each subwatershed to achieve the required pollutant reductions. Modeling assumptions for additional regional control measures on private parcels will follow the assumptions presented for subsurface infiltration basins, as discussed in **Section 4.**

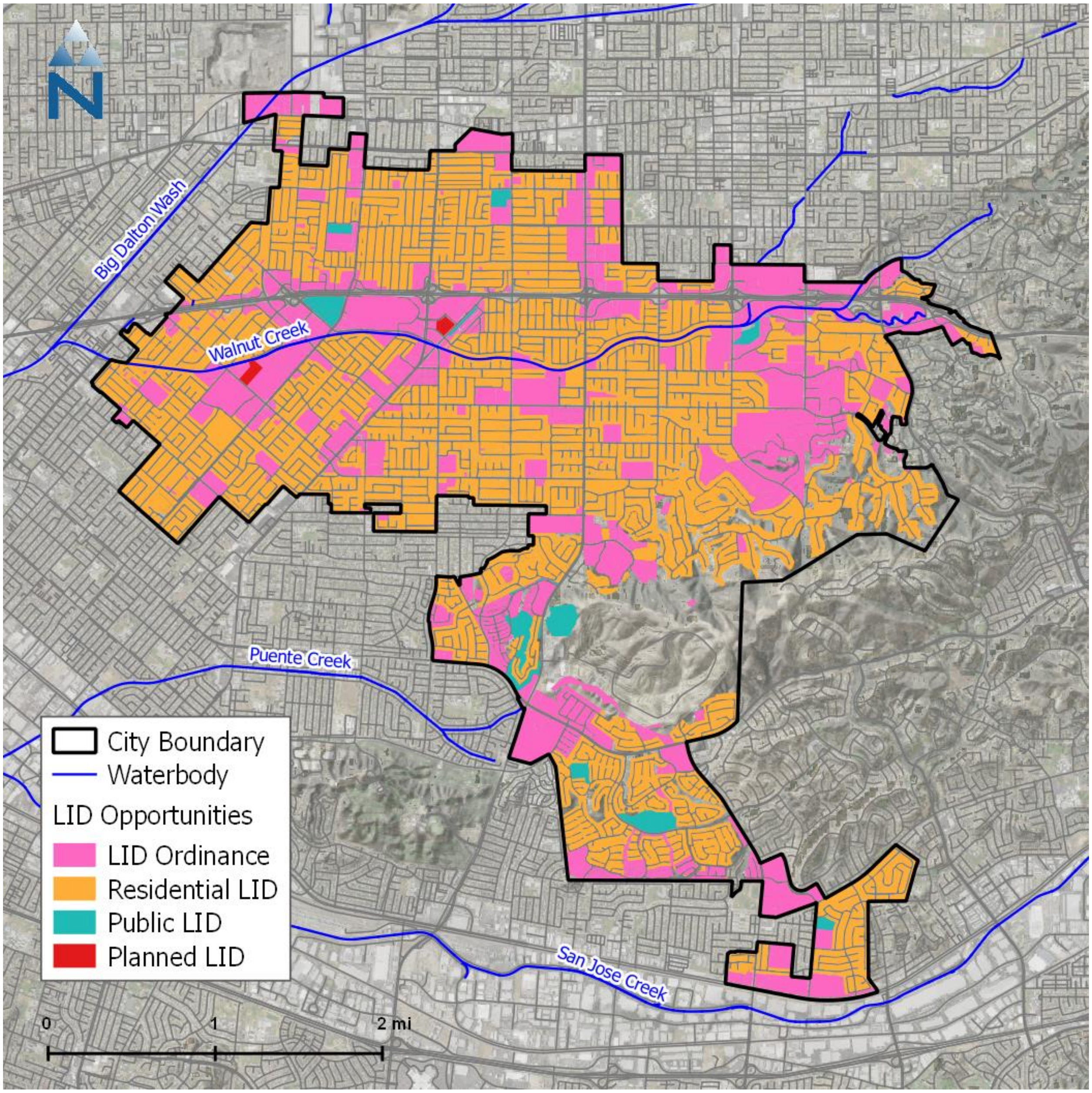
3.2 LID PROGRAMS

The approach/assumptions for representing LID BMPs for West Covina RAA is consistent with those described in **Section 4.3** of the USGR EWMP. **Figure E-13** shows the extent of LID opportunities throughtout West Covina while the following summarizes key details about each of the LID program components:

- Existing and Planned BMPs – Accounts for current or recently completed projects (since 2011). Two existing/planned projects were incorporated for West Covina. These include projects at Orangewood Park and the private development "The Colony at The Lakes West Covina" located at 301 South Glendora Avenue.
- LID Ordinance (New/Redevelopment) – Required mitigation of newly developed or redeveloped sites which is 100% funded by the developer. Redevelopment is based on growth rates reported by the Los Angeles Bureau of Sanitation. These sites are designed to retain the 85th percentile storm.
- Residential LID – Treats runoff at the residential parcel scale through a series of voluntary and incentive based programs. This program assumes implementation of 1% per year on high-density, single family residential parcels and is designed to retain the 85th percentile storm. The program would start enrolling parcels in 2017.
- LID on Public Parcels (Retrofits) – Retrofit opportunities on public parcels with a unique opportunity for public outreach and education. These sites are designed to retain the 85th percentile storm.

Note that **Figure E-13** shows the assumed LID BMP *opportunities*; the actual capacity of LID control measures *to be implemented* for West Covina's EWMP Implementation Plan (per the RAA) is presented in **Section 5**.

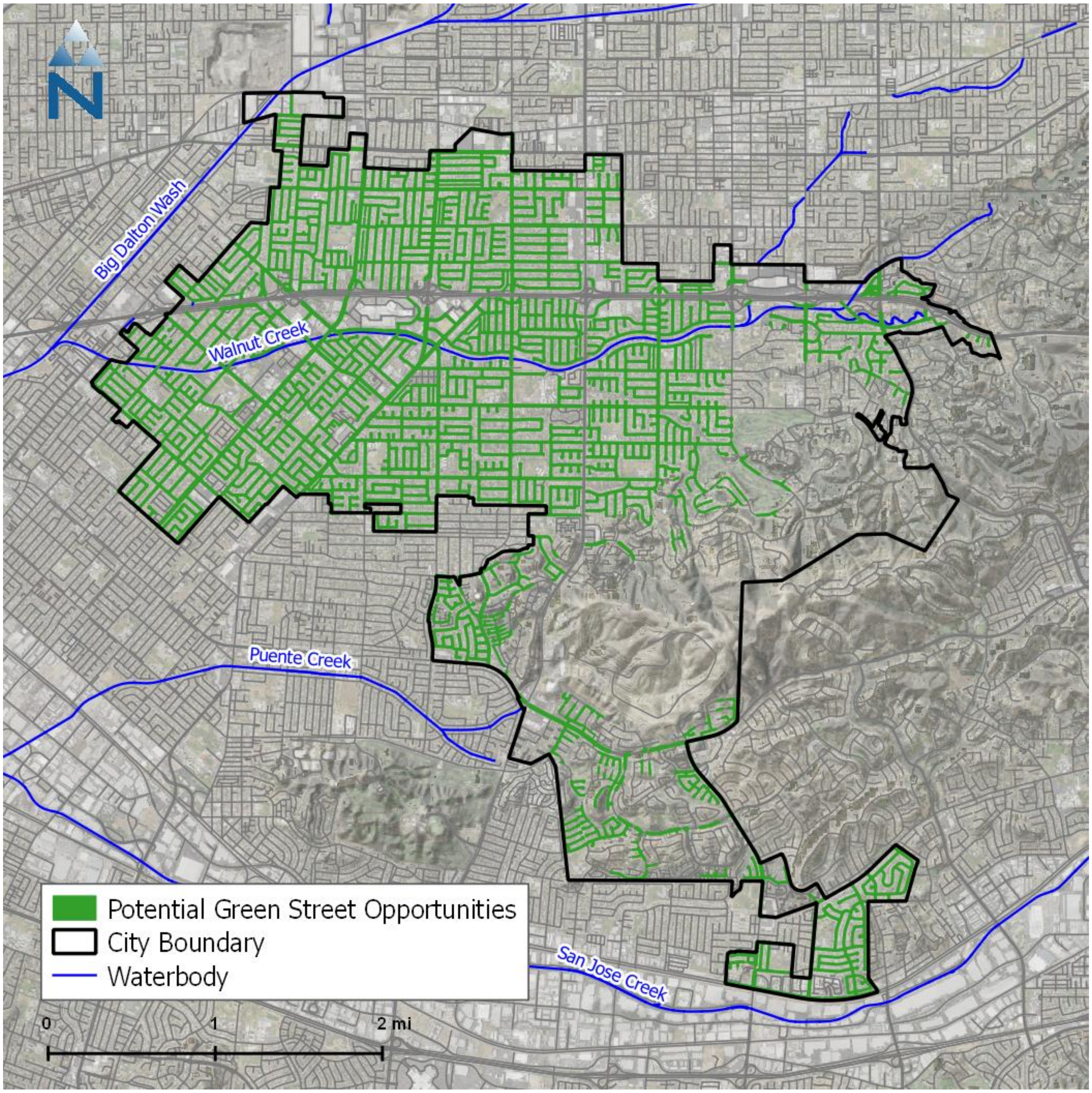
Figure E-13
Opportunities for LID Identified in West Covina



3.3 GREEN STREETS PROGRAM

In implementing the green streets program, West Covina will consider incorporating green streets concepts into the street and sewer CIP. As part of the fiscal years 2015-2020 CIP, the City is programming over $8.5 million in storm drain and NPDES improvements at various locations in the City. The methods for screening potential street opportunities is described in **Appendix C** of the USGR EWMP. When applied to West Covina, the screening procedure identified over 300 linear miles of potential frontage length for green streets, as shown in **Figure E-14**. Note that **Figure E-14** shows the green street BMP *opportunities*; the capacity of green street control measures *to be implemented* for West Covina's EWMP Implementation Plan (per the RAA) is presented in **Section 5**. In implementing the green street program, West Covina will consider incorporating green streets concepts into street and sewer CIP. As part of the fiscal years 2015-2020 CIP, City is programming over $8.5 million in storm drain and NPDES improvements at various locations in the City.

Figure E-14
Opportunities for Green Streets based on Suitable Street Screening



3.4 INSTITUTIONAL BMPS

Institutional BMPs are a fundamental component of West Covina's stormwater program, including the minimum control measures (MCMs) required by the Permit. For development of this EWMP, West Covina has elected to not customize the baseline MCMs in the 2012 Permit. Consistent with Section 3.3 of the USGR EWMP, the RAA for West Covina assumes that implementation of the MCMs in the 2012 Permit will represent a 5% increase in pollutant reduction when compared to the MCMs under the previous Permit. In addition, West Covina will be implementing additional institutional control measures to achieve an additional 5% reduction, for a total of 10% reduction due to institutional control measures, including expedited installation of full capture systems in catch basins in high trash generation areas (Priority A and B catch basins) by December 2016 and the remainder by June 2018.

4 Reasonable Assurance Analysis

A key element of the EWMP is the RAA, which is prescribed by the Permit as a process to demonstrate "that the activities and control measures…will achieve applicable WQBELs and/or RWLs with compliance deadlines during the Permit term" (Permit section C.5.b.iv.(5), page 63 – RWQCB, 2012). While the Permit prescribes the RAA as a quantitative demonstration that control measures will be effective, the RAA also promotes a modeling process to support the EWMP Group with selection of control measures. In particular, the RAA was used to evaluate the many different scenarios/combinations of institutional, distributed and regional control measures (described in **Section 3**) that could potentially be used by West Covina to comply with the RWLs and WQBELs of the Permit, and was then used to select the control measures specified in the EWMP Implementation Plan for West Covina (described in **Section 5**).

The RAA for West Covina followed an identical process as the USGR EWMP, as described in **Section 4** of the USGR EWMP. In 2014, the Regional Board issued RAA Guidelines (RWQCB, 2014), which outline expectations for developing RAAs, and those guidelines were followed closely during development of this RAA. This section presents some of the key metrics associated with the RAA, including required pollutant reductions for the receiving waters West Covina discharges into. In general, however, details of the RAA are not repeated here. Instead, the reader should refer to **Section 4** of the USGR EWMP.

This section highlights key metrics associated with the RAA using an outline that reflects **Section 4** of the USGR EWMP, as follows:

- Overview of modeling approach and modeling domain (**4.1**)
- Baseline critical conditions and required pollutant reductions (**4.2**)
- Representation of control measures in RAA (**4.3**)
- Approach for selecting control measures for the EWMP Implementation Plan (**4.4**)

4.1 OVERVIEW OF RAA MODELING APPROACH

The Watershed Management Modeling System (WMMS) is the modeling system used to conduct the RAA for the USGR EWMP. WMMS is specified in the Permit as an approved tool to conduct the RAA. The WMMS includes a comprehensive watershed model of the entire Los Angeles County area that represents the unique hydrology and hydraulics features and characterizes pollutant loading and downstream transport for all of the key TMDL constituents (Tetra Tech 2010a, 2010b). See **Section 4.1** of the USGR EWMP for additional details on the RAA modeling approach.

With West Covina incorporated into the EWMP Group, the USGR EWMP area encompasses 297 subwatersheds within the WMMS model (**Figure E-15**). **Figure E-16** zooms into the 39 subwatersheds and four receiving waters/assessment areas encompassed within the West Covina jurisdictional boundary – Walnut Creek, San Gabriel River, San Jose Creek, Puente Creek (a tributary to San Jose Creek).

Figure E-15
USGR EWMP Group Area and 297 Subwatersheds Represented by WMMS

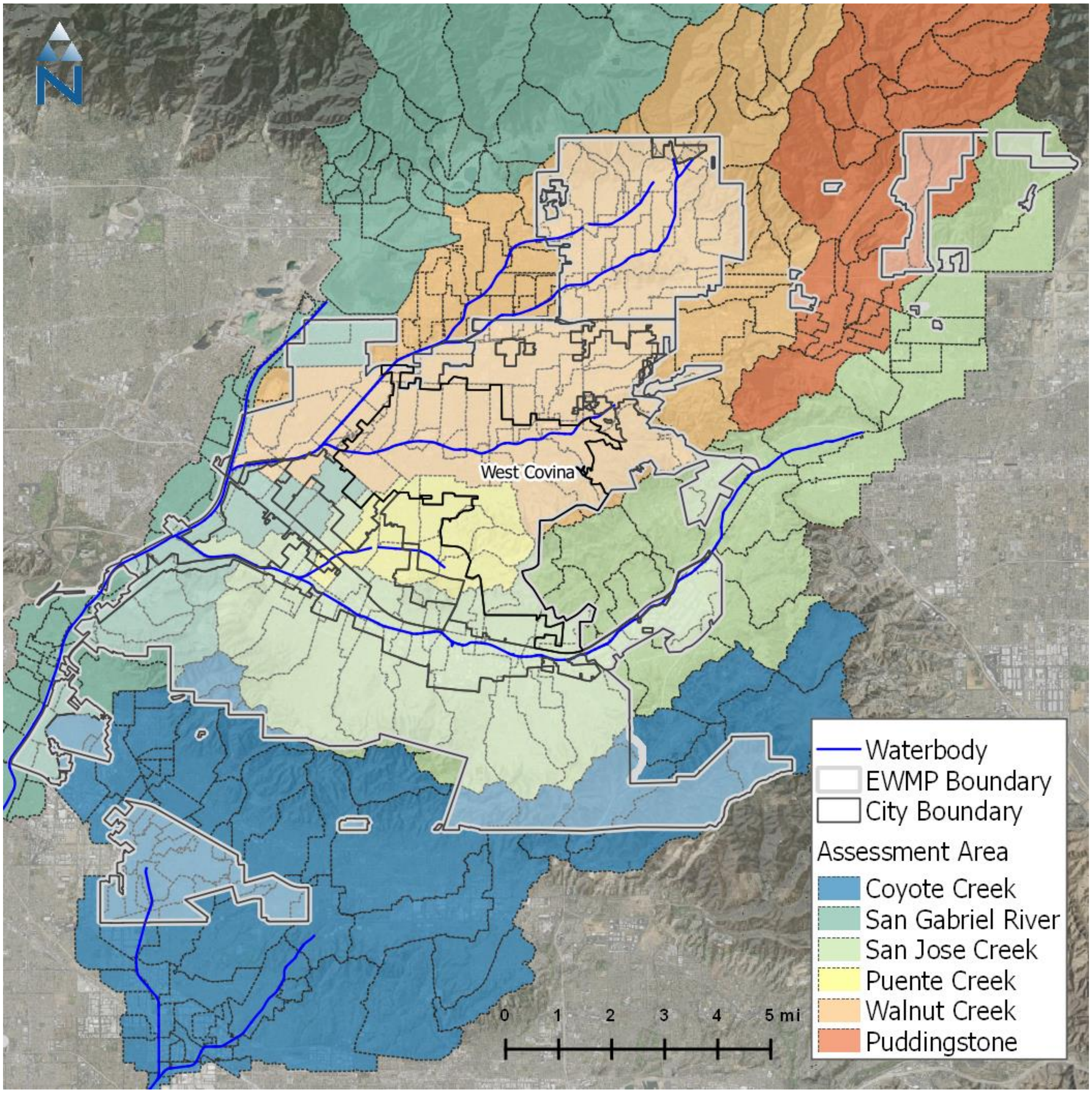
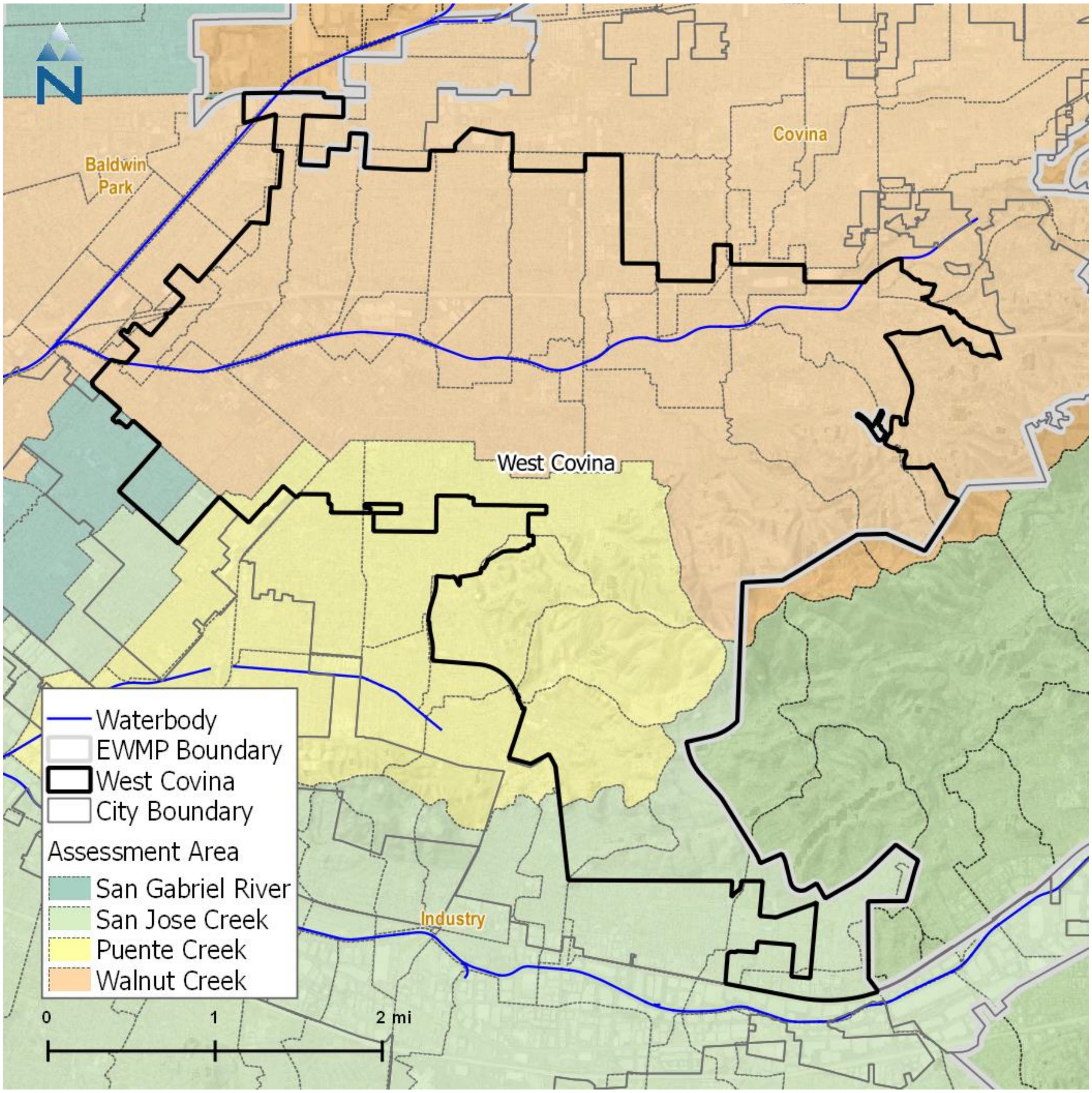


Figure E-16
West Covina EWMP Boundary, Assessment Areas, and Subwatersheds



4.2 BASELINE CRITICAL CONDITIONS AND REQUIRED POLLUTANT REDUCTIONS

Water quality targets and required reduction goals are associated with each receiving water/assessment area in the USGR EWMP. All jurisdictions contributing runoff to a given waterbody are held to the same required percent load reduction. As shown in **Figure E-16**, West Covina contributes runoff to four USGR waterbodies including Puente Creek, San Gabriel River, San Jose Creek, and Walnut Creek. **Table E-6** shows required pollutant reductions for interim and final compliance for each of the four assessment areas for West Covina. See **Section 4.2** of the USGR EWMP for the model calibration results, the approach to calculate interim and final targets based on the water quality priority pollutants, and the determination of the limiting pollutants. In short, the RAA analyzes 90th percentile 24-hour periods in terms of the exceeding load of the two key limiting pollutants – zinc and bacteria – and the EWMP is designed to achieve the required pollutant reductions under those critical conditions. **Figure E-17** presents the volume of runoff contributing to zinc exceedances during each rolling 24-hour period of the 10-year simulation when water quality targets were exceeded, referred to as the "Exceedance Volume", for the West Covina portion of the USGR EWMP; **Figure E-18** similarly presents the volume of runoff contributing to bacteria exceedances.

Table E-6
Required Pollutant Reductions for Interim and Final Compliance for West Covina Assessment Areas

Condition and Pollutant Addressed	Reduction Metric	RAA Assessment Area			
		San Gabriel River	Walnut Creek	San Jose Creek	Puente Creek
Final Compliance with Metals and Other Water Quality Priorities (except *E. coli*)	Required Load Reduction [1]	64%	62%	67%	76%
Interim Compliance with Metals and Other Water Quality Priorities (except *E. coli*)	Loading during average/interim condition (pounds) [2]	124	427	434	53
	Loading during 90th percentile/final condition (pounds) [3]	293	918	1,500	158
	Ratio used to gradually phase from interim to final required reduction	0.42	0.47	0.29	0.34
Final Compliance with *E. coli*	Runoff volume to be retained	Runoff from critical bacteria storm is retained prior to discharge to receiving water (excluding open space subwatersheds)			

1 – Based on control of zinc during storm that generates the 90th percentile zinc Exceedance Volume
2 – Loading of zinc at mouth of watershed from storm that generates the average zinc Exceedance Volume
3 – Loading of zinc at mouth of watershed from storm that generates the 90th percentile zinc Exceedance Volume

Figure E-17
Runoff Contributing to Zinc Exceedances during Critical Storm Conditions

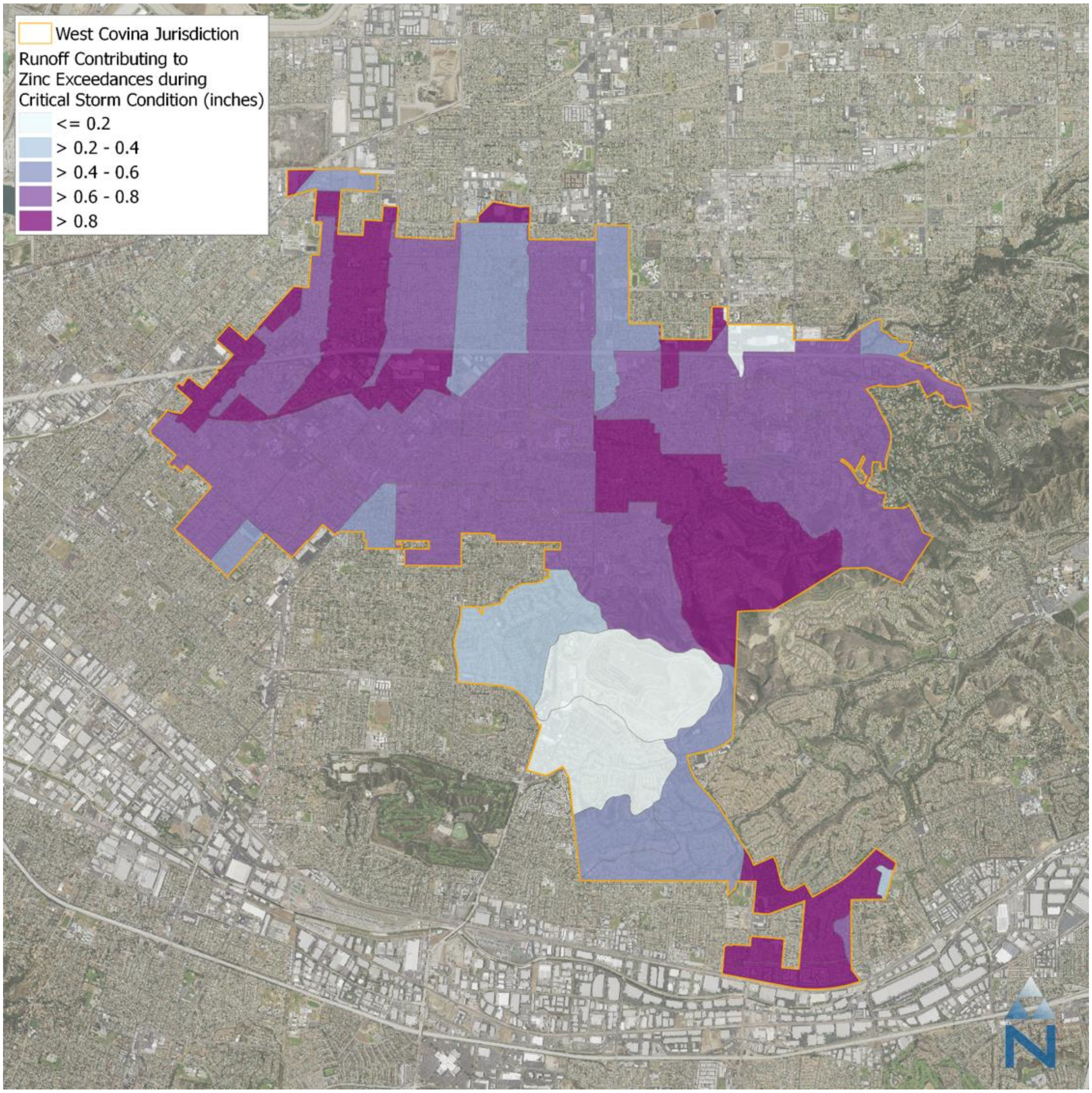
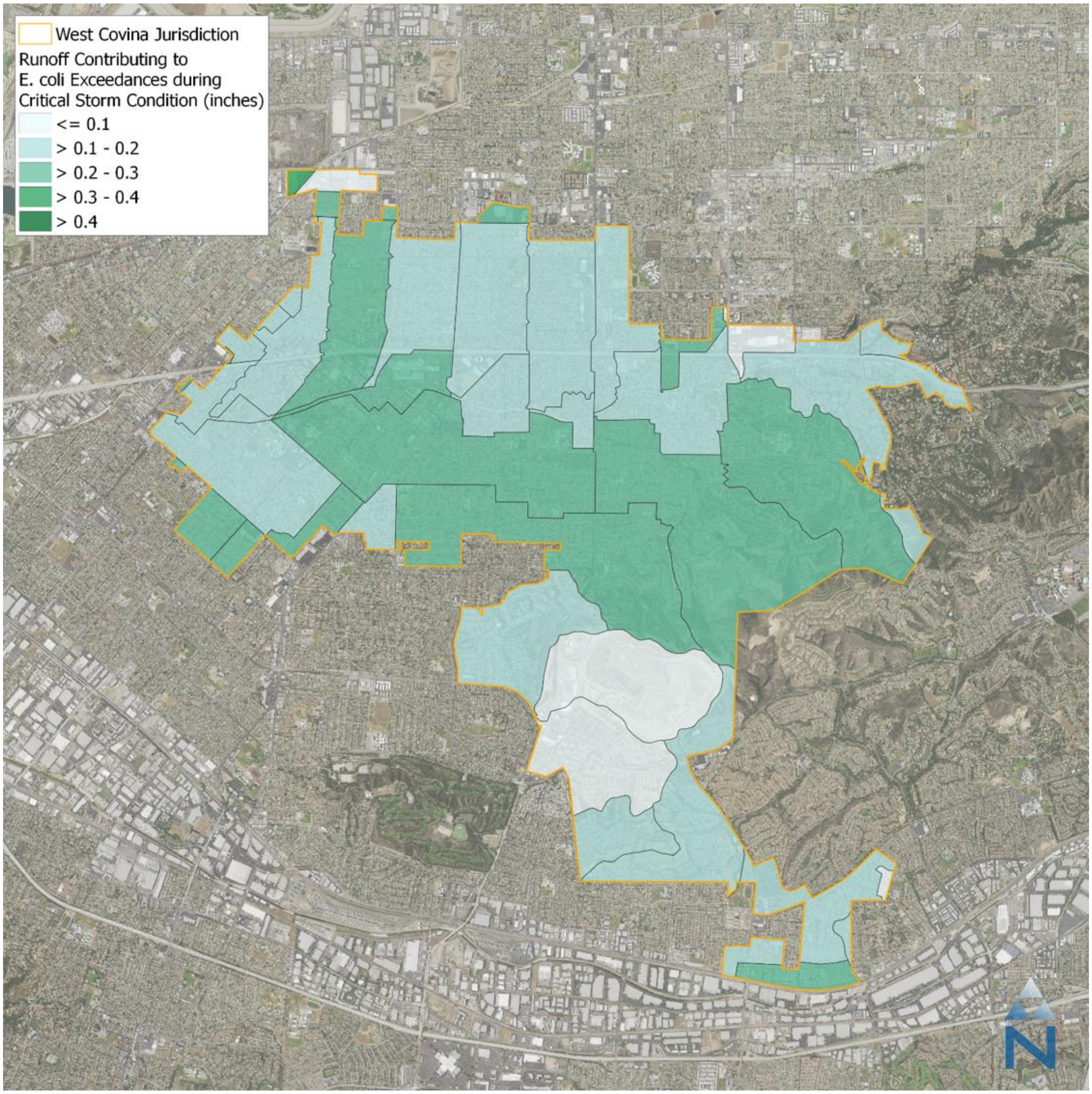


Figure E-18
Runoff Contributing to Bacteria Exceedances during Critical Storm Conditions



4.3 REPRESENTATION OF EWMP CONTROL MEASURES

An overview of menu of control measures selected by West Covina for inclusion in the EWMP and the analysis/screening of potential BMP opportunities in the city was presented in **Section 3**. The representation of control measures in the model is an important element of the RAA, as it provides the link between future watershed activities, model-predicted water quality improvement, and, ultimately, compliance. The BMP programs to be implemented by West Covina and the corresponding RAA assumptions for BMP design parameters are presented in Table 4-7 of the USGR EWMP. See **Section 4.3** of the USGR EWMP for additional details on the representation of EWMP control measures.

4.4 SELECTION OF CONTROL MEASURES FOR POLLUTANT REDUCTION PLAN

The RAA process is an important tool for assisting EWMP agencies with selection of control measures for EWMP implementation (known as the EWMP Implementation Plan). A major challenge associated with stormwater planning is the multitude of potential types and locations of control measures and the varying performance and cost of each scenario. The process for selecting the control measures for the EWMP Implementation Plan in West Covina, which used an identical process as the USGR EWMP, is presented in this subsection.

4.4.1 Selection of Control Measures for Final Wet Weather Compliance

The SUSTAIN model within WMMS provides a powerful tool for considering millions of scenarios of control measures and recommending a solution based on cost-effectiveness. The RAA process for West Covina first determines the control measures to achieve zinc RWLs under critical conditions and then determines the additional capacity (if any) to retain the critical bacteria storm. The optimization modeling is conducted stepwise to determine the control measures for final compliance that are selected for the EWMP Implementation Plan, as follows:

1. **Determine the cost-effective BMP solutions <u>for each subwatershed</u> in the EWMP area:** an example set of "BMP solutions" is shown in **Section 4.4.1** of the USGR EWMP, which shows thousands of scenarios considered for an individual subwatershed in the EWMP area. The scenarios are based on the available opportunity (e.g., the available footprints for regional BMPs and length of right-of-way for green streets) and predicted performance for controlling zinc if BMPs were implemented at those opportunities with varying sizes. The most cost-effective BMP solutions for each of the 39 subwatersheds in West Covina provide the basis for cost optimization.
2. **Determine the cost-effective scenarios <u>for each assessment area in West Covina</u>:** by rolling up the BMP solutions at the subwatershed level, the most cost-effective scenarios for achieving the zinc reduction targets for each assessment area can be determined. These "cost optimization curves", as presented in **Figure E-19**, highlight the cost-optimized solution among the universe of defined opportunities (from **Section 3**) for each assessment area in West Covina. The optimized point on each curve includes a "recipe for compliance" for all the subwatersheds within that assessment area
3. **Extract the cost-effective scenarios <u>for the required reduction</u>:** the required zinc reductions specified in **Table E-6** determine the specific scenario that is selected from the cost optimization curves. West Covina assessment areas were held to the same percent reduction as other jurisdictions contributing to the same waterbodies. The selected scenarios become the EWMP Implementation Plan. The extracted control measures comprise a detailed recipe for compliance with RWLs for metals and other Water Quality Priorities for each subwatershed in the jurisdictional area.
4. **Route the critical bacteria storm through the control measures in the extracted scenario:** the effectiveness of the selected control measures for retaining the critical bacteria storm is evaluated. The additional capacity (if any) to retain the critical bacteria storm is determined for each subwatershed.

Figure E-20 illustrates the process for extracting from the cost optimization curve the control measures to achieve both the zinc RWLs and bacteria WQBELs. The resulting EWMP Implementation Plan for final compliance is presented in **Section 5**.

Figure E-19
Cost Optimization Curves for West Covina Assessment Areas

This graph shows the set of optimized BMP solutions for the four assessment areas in West Covina. Each optimization curve represents over 1 million BMP scenarios that were evaluated for cost-effectiveness. The required reduction varies by assessment area; the curves vary with BMP opportunity.

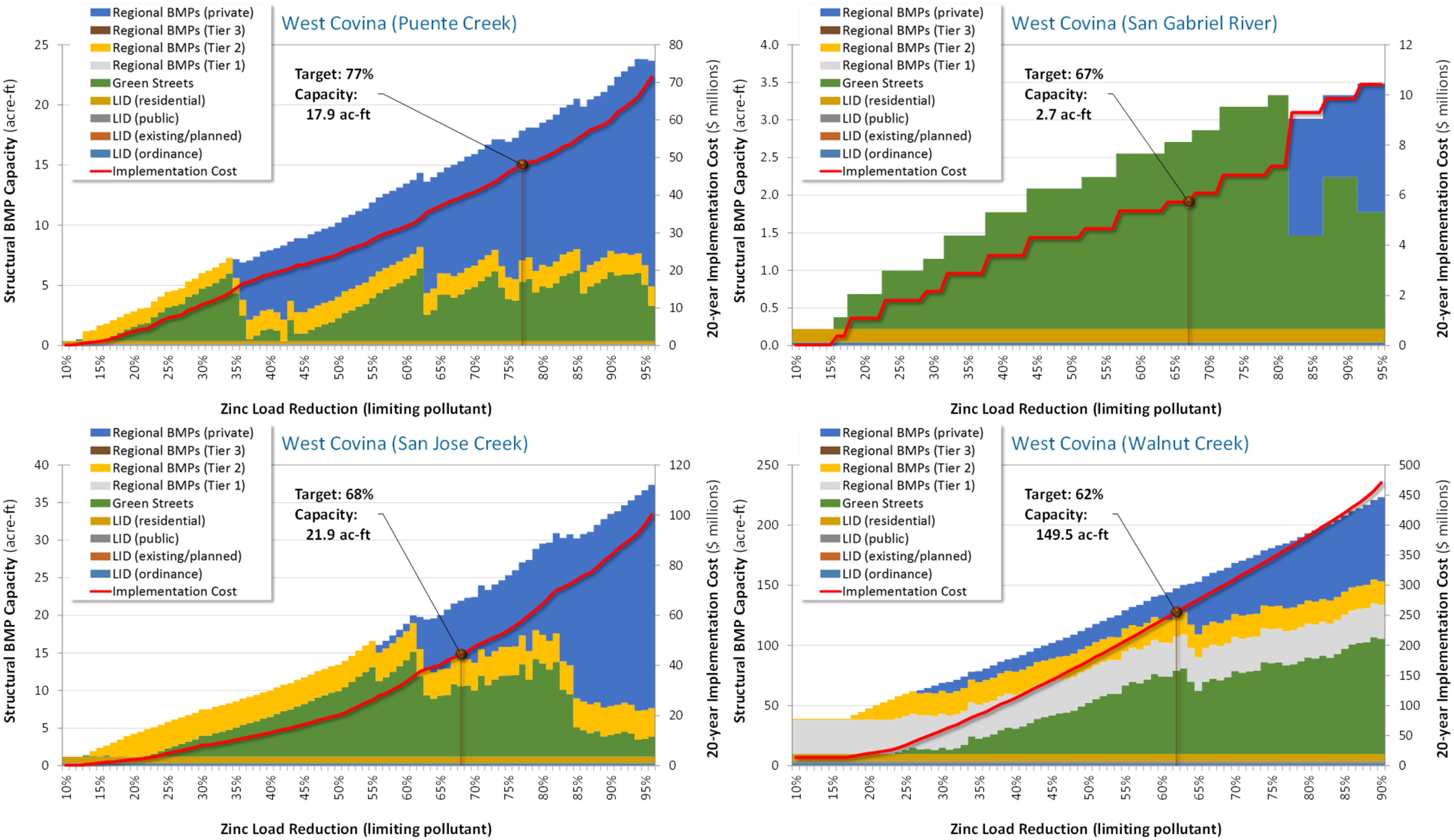
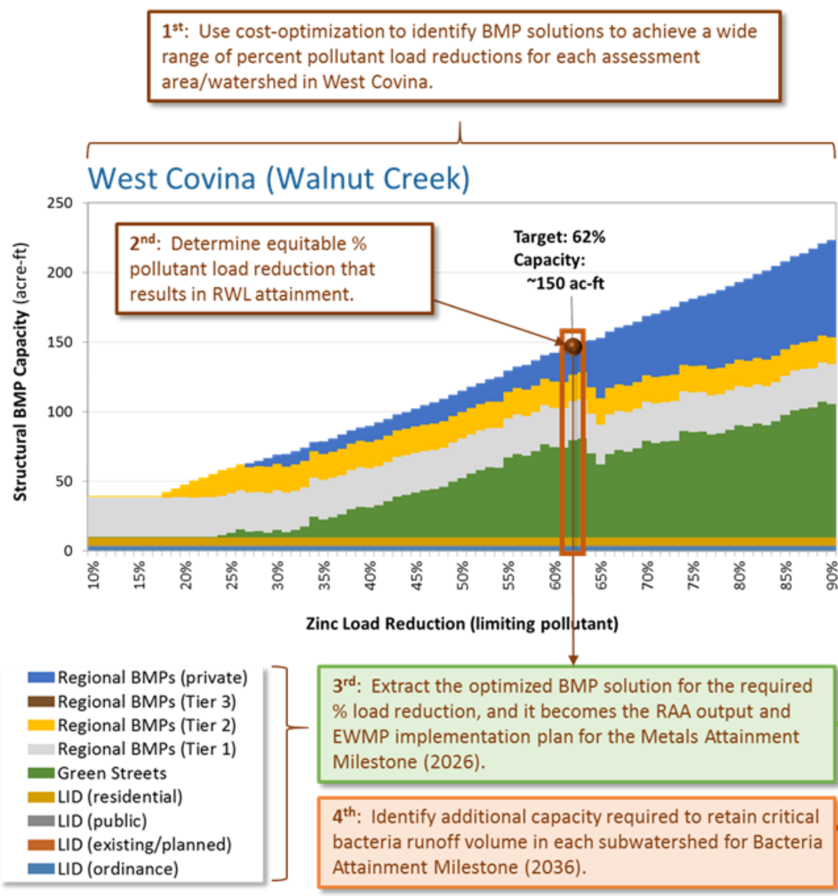


Figure E-20
Illustration of how the EWMP Implementation Plan is Extracted from a Cost Optimization Curve

This illustration uses the West Covina portion of the Walnut Creek watershed as an example. Four steps are shown for RAA development: developing cost-optimized BMP solutions for a wide range of % load reductions (1st, uppermost text box), determining the equitable % load reduction needed to attain RWLs for the corresponding receiving water (2nd, middle text box), extracting the BMP solution for metals attainment (3rd, bottom text box), and identifying additional capacity for bacteria attainment (4th, bottom text box). The EWMP Implementation Plan for the other three assessment areas are presented in **Section 5**. Note that while each assessment area/watershed achieves the required % reduction in aggregate, subwatersheds *within* a jurisdiction have variable reductions based on optimization (which is why some subwatersheds have high % reductions [red shaded rows in table] and others have low % reductions).



Subwatershed ID	TARGET: BMP PERFORMANCE GOAL — For Metals by 2026: 24-hour Volume Managed (acre-ft)	TARGET — For Bacteria by 2036: Additional 24-hour Volume Managed (acre-ft)	EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet) — For Metals Attainment by 2026: % Load Reduction Critical Condition	Low-Impact Development: Ordinance	Low-Impact Development: Planned LID	Low-Impact Development: Public LID	Low-Impact Development: Residential LID	Streets: Green Streets	Regional BMPs: Tier 1 (public, owned)	Regional BMPs: Tier 2 (public, owned)	Regional BMPs: Tier 2 (public, non-owned)	Regional BMPs: Private	Total BMP Capacity (acre-ft)	For Bacteria Attainment by 2036: Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
536786	11.62	0.49	70%	0.165	---	---	0.346	9.63	---	---	---	---	10.15	0.49	10.63
536986	0.23	0.58	13%	0.042	---	---	0.147	---	---	---	---	---	0.19	0.58	0.77
537086	9.11	0.28	79%	0.108	---	---	0.389	7.71	---	---	---	---	8.21	0.28	8.49
537186	15.84	---	91%	0.179	---	0.968	0.343	9.20	---	---	---	2.83	13.52	---	13.52
537286	0.17	0.01	71%	0.002	---	---	0.006	0.12	---	---	---	---	0.13	0.01	0.13
537486	33.01	---	90%	0.416	0.016	---	0.735	---	---	18.97	---	6.46	26.60	---	26.60
537586	7.53	---	90%	0.100	---	---	0.076	2.97	---	---	---	3.03	6.17	---	6.17
537686	8.33	0.31	68%	0.114	---	---	0.384	6.75	---	---	---	---	7.24	0.31	7.55
537786	10.72	0.32	79%	0.120	0.236	0.003	0.454	8.85	---	---	---	---	9.66	0.32	9.99
537886	4.96	0.18	68%	0.071	---	0.157	0.221	3.86	---	---	---	---	4.31	0.18	4.50
537986	14.42	---	90%	0.164	---	---	0.543	8.53	---	---	---	2.98	12.22	---	12.22
538086	0.16	0.37	14%	0.030	---	---	0.102	---	---	---	---	---	0.13	0.37	0.50
538186	1.47	0.11	55%	0.016	---	---	0.072	1.18	---	---	---	---	1.27	0.11	1.38
538286	1.38	8.67	12%	0.287	---	---	1.125	---	---	---	---	---	1.41	8.67	10.08
538386	12.92	---	90%	0.154	---	---	0.466	6.72	---	---	---	2.76	10.10	---	10.10
538486	12.14	2.64	47%	---	---	0.045	---	---	28.30	---	---	---	28.34	2.64	30.98
538586	2.05	0.08	73%	0.031	---	---	0.049	1.43	---	---	---	---	1.51	0.08	1.59
538686	0.00	0.00	10%	---	---	---	---	---	---	---	---	---	0.00	0.00	0.00
539386	8.75	1.12	52%	0.160	---	---	0.339	6.96	---	---	---	---	7.46	1.12	8.58
539486	0.71	0.13	56%	0.008	---	---	0.035	0.55	---	---	---	---	0.59	0.13	0.71
542386	0.07	0.55	12%	0.044	---	---	0.029	---	---	---	---	---	0.07	0.55	0.62
542486	0.03	0.18	12%	0.025	---	---	---	---	---	---	---	---	0.03	0.18	0.21
542586	0.05	0.10	14%	0.008	---	---	0.032	---	---	---	---	---	0.04	0.10	0.14
542786	0.11	0.31	13%	0.021	---	---	0.092	---	---	---	---	---	0.11	0.31	0.42
542886	0.10	0.05	15%	0.035	---	---	---	0.05	---	---	---	---	0.08	0.05	0.13
Total	**155.88**	**16.46**	**62%**	**2.30**	**0.25**	**1.17**	**5.98**	**74.50**	**28.30**	**18.97**	**0.00**	**18.07**	**149.54**	**16.46**	**166.01**

RED = Subwatersheds with highest required % load reductions
BLUE = Subwatersheds with highest BMP capacities within a BMP category

4.4.2 Selection of Control Measures for Interim Wet Weather Compliance

With the EWMP Implementation Plan for final compliance determined, the remaining step for the wet weather RAA is scheduling of control measures *over time* to achieve interim milestones. Following a consistent approach as the USGR EWMP, the following wet weather milestones were utilized for development of the West Covina EWMP Implementation Plan, primarily based on the milestones of the SGR Metals TMDL:

- Achieve 10% of the reduction for zinc[2] (2017)
- Achieve 35% of the reduction for zinc (2020)
- Achieve 65% of the reduction for zinc (2023)
- Final compliance with zinc RWLs (2026)
- Final compliance with bacteria WQBELs (2036)

As permitted by Regional Board Guidelines (RWQCB, 2014), the applicable critical condition for the RAA/EWMP gradually phases from *average* conditions for interim milestones to *90th percentile* conditions for final compliance. See **Section 4.4.2** of the USGR EWMP for additional details on the approach to select control measures to achieve interim and final compliance requirements.

[2] While these milestones are expressed as reduction in zinc, because zinc is a limiting pollutant (see **Section 4.2.4**), achievement of zinc RWLs by these dates assures even greater reduction in other Water Quality Priority pollutants.

5 EWMP Implementation Plan

The EWMP Implementation Plan is the "recipe for compliance" for West Covina to address Water Quality Priorities and comply with the provisions of the MS4 Permit. Through the RAA, a series of quantitative analyses were used to identify the capacities of LID, green streets and regional BMPs that comprise the EWMP Implementation Plan and assure those control measures will address the Water Quality Priorities within the specified compliance schedules. The EWMP Implementation Plan includes individual recipes for each watershed/assessment area within West Covina – San Gabriel River (mainstem), San Jose Creek, Puente Creek and Walnut Creek (see **Figure E-16** for a map of these assessment areas). Implementation of the EWMP Implementation Plan will provide a BMP-based compliance pathway for West Covina to achieve the MS4 Permit requirements. This section describes the EWMP Implementation Plan for West Covina and the pace of its implementation to achieve applicable milestones, through the following subsections:

- Elements of the EWMP Implementation Plan (**5.1**)
- Stormwater control measures to be implemented by 2036 for final compliance (**5.2**)
- Scheduling of stormwater control measures to achieve TMDL and EWMP milestones (**5.3**)
- Non-stormwater control measures (**5.4**)

The approach and descriptive language used within this section for West Covina are identical to **Section 5** of the USGR EWMP.

5.1 ELEMENTS OF THE EWMP IMPLEMENTATION PLAN

The EWMP Implementation Plan for West Covina is expressed in terms of [1] the volumes[3] of stormwater and non-stormwater to be managed by West Covina to address Water Quality Priorities and [2] the control measures that will be implemented to achieve those volume reductions. The two primary elements of the EWMP Implementation Plan are as follows:

- **Compliance Targets**: for MS4 compliance determination purposes, the ultimate metric for EWMP implementation is the volume of stormwater managed by implemented control measures. The stormwater volume to be managed[4] by West Covina is considered a measurable goal that could be used to assess BMP-based compliance. To support future compliance determination and adaptive management, the volume of stormwater is reported along with the capacities of control measures to be implemented by West Covina in the EWMP Implementation Plan.

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[3] Volume is used rather than pollutant loading because volume reduction is more readily tracked and reported by MS4 agencies. As described in **Section 4.2.3**, the volume reductions are actually a *water quality* improvement metric based on required pollutant reductions.

[4] The volume is determined by reporting the amount of water that would be retained (infiltrated) by BMPs over the course of a 24-hour period under the critical 90th percentile storm condition. Additional volume would be *treated* by these BMPs, but that additional treatment is *implici*t to the reported Compliance Targets.

[19] While the EWMP Implementation Plan reports the *total* BMP capacity to be implemented, that capacity is not a compliance target because some BMP capacities are sized to reflect a BMP program rather than sized to achieve the required reduction. For example, the BMPs implemented by the LID ordinance and the residential LID program were sized to retain the 85th percentile, 24-hour storm but that volume may be larger than is needed to achieve zinc RWLs. If those BMPs were replaced by a different type of BMP (e.g., regional BMP), the total BMP capacity may be smaller but just as effective.

- **EWMP Implementation Plan**: the network of control measures that has reasonable assurance of achieving the Compliance Targets is referred to as the EWMP Implementation Plan. The identified BMPs (and BMP preferences) will likely evolve over the course of adaptive management in response to "lessons learned". As such, it is anticipated the BMP capacities within the various subcategories will be reported to the Regional Board but *not* tracked explicitly by the Regional Board for compliance determination. As BMPs are substituted over the course of EWMP implementation (e.g., replace green street capacity in a subwatershed with additional regional BMP capacity), West Covina will show equivalency for achieving the corresponding Compliance Target.

5.2 STORMWATER CONTROL MEASURES TO BE IMPLEMENTED BY 2036 FOR FINAL COMPLIANCE

The EWMP will guide stormwater management in West Covina for the coming decades, and the control measures to be implemented have the potential to transform communities including widespread green infrastructure. The EWMP Implementation Plan identifies the location and type of control measures to be implemented by West Covina for final compliance by 2036 to address all Water Quality Priorities including the limiting pollutants zinc and *E. coli*. The EWMP Implementation Plan for final compliance is presented as the following components:

- **Summary of total capacity of control measures to be implemented by West Covina <u>across the entire EWMP area</u>:** bar graphs are used to summarize the control measure capacities that comprise the EWMP Implementation Plan. Shown in **Figure E-21** are the bar graphs that detail the various sub-categories of control measures to be implemented by West Covina, and across the entire EWMP area. **Table E-7** summarizes BMP capacity by type in West Covina.
- **Summary of total capacity of control measures to be implemented by West Covina <u>in each assessment area</u>:** the control measures to be implemented within each watershed/assessment area are shown in **Figure E-22** as bar charts of BMP capacity and in **Figure E-23** as pie graphs showing relative capacity by BMP type.
- **Detailed recipe for compliance including volumes of stormwater to be managed by West Covina and control measure capacities:** the EWMP Implementation Plan is detailed for each subwatershed in the EWMP area (generally 1 to 2 square mile drainages). Shown in **Figure E-24** is a map of the "density" of control measure capacities to be implemented to address metals and other Water Quality Priorities (through controlling zinc) and **Figure E-25** shows the additional capacity to address *E. coli*. The maps are shown as detailed tables as **Table E-8** through **Table E-11** which present for each assessment area the volumes of stormwater to be managed in each subwatershed (Compliance Targets) and the control measures to achieve those volume reductions (EWMP Implementation Plan). Separate Compliance Targets and EWMP Implementation Plans are provided for Metals and Other Water Quality Priorities and *E. coli*. For reference, the additional control measure capacity to address *E. coli*, beyond those needed for zinc is presented in **Figure E-26**.

The network of control measures in the EWMP Implementation Plan is extensive and its implementation would represent a sea change in how stormwater will be managed in West Covina. The next subsection describes the timeline/sequencing for implementing the EWMP Implementation Plan. The costs and financial strategy for the EWMP are presented in **Section 7**.

Figure E-21
USGR EWMP Implementation Plan for Final Compliance by 2036 including West Covina

The two panels show the total structural BMP capacity required for each USGR EWMP jurisdiction including West Covina, to attain RWLs. The top panel groups the BMP types into LID, green streets and regional BMPs, while the bottom panel provides more resolution for the BMP subcategories.

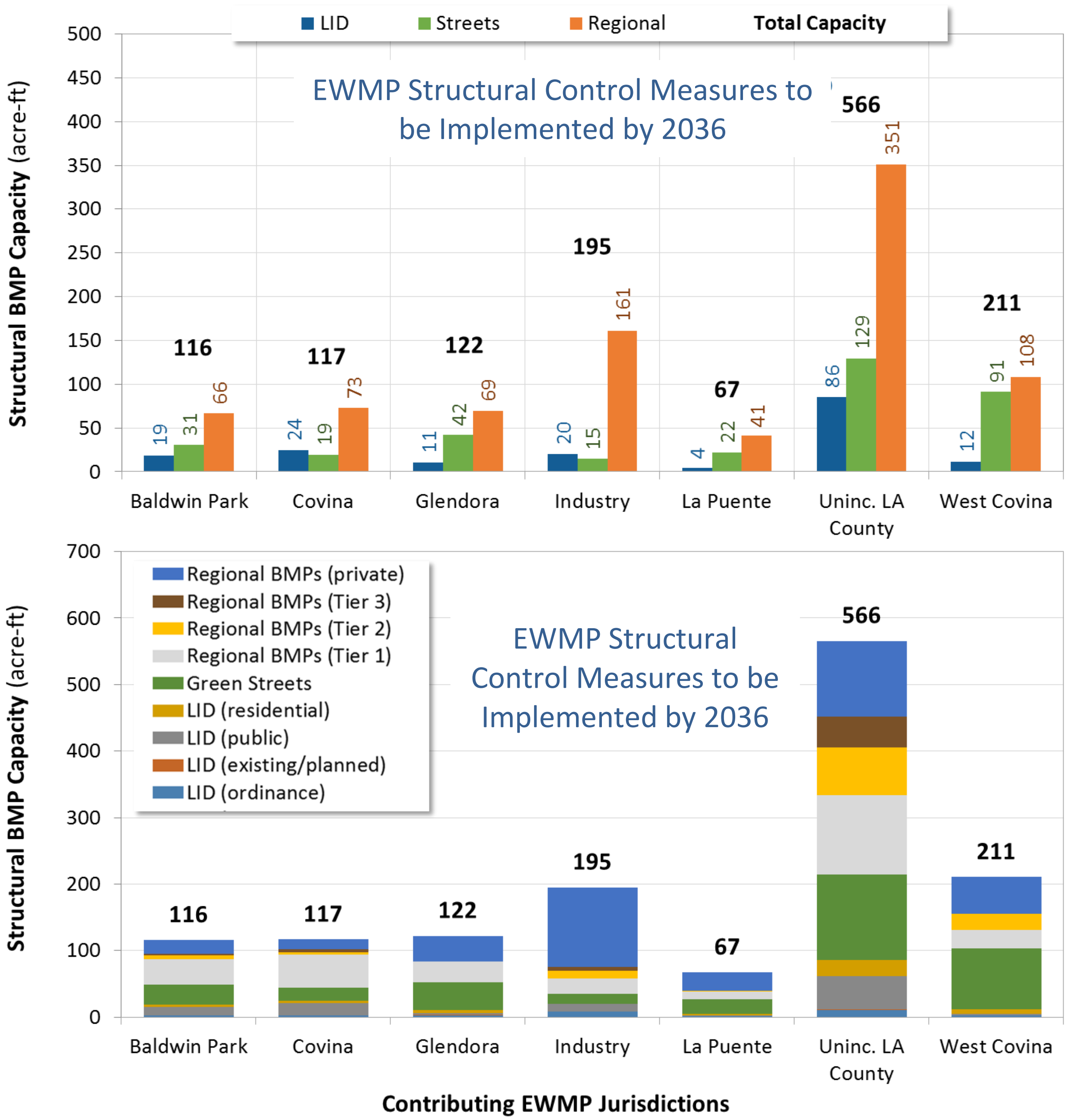


Table E-7
Summary of BMP Capacity by BMP Type

Jurisdiction/ Goal		Low-Impact Development				Green Streets	Regional BMPs				Total
		Ordin-ance	Plan-ned LID	Resi-dential LID	Public LID		Tier 1	Tier 2	Tier 3	Private	
West Covina	2017 -10%	0	0	0.02	0	0	0	0	0	0	**0.02**
	2020 - 35%	0.67	0.25	1.78	0.16	11.08	9.34	17.64	0	0	**40.92**
	2023 - 65%	1.76	0.25	4.59	0.69	51.57	28.30	19.06	0	5.86	**112.08**
	2026 - Final Metals	2.77	0.25	7.23	1.25	91.21	28.30	24.25	0	36.71	**191.97**
	2032 - Final Bacteria	2.77	0.25	7.23	1.25	91.21	28.30	24.25	0	55.2	**210.46**

Figure E-22
EWMP Implementation Plan for West Covina for Each Watershed / Assessment Area

This figure shows control measure capacities for the final 2036 EWMP milestone for West Covina, organized by watershed/assessment area.

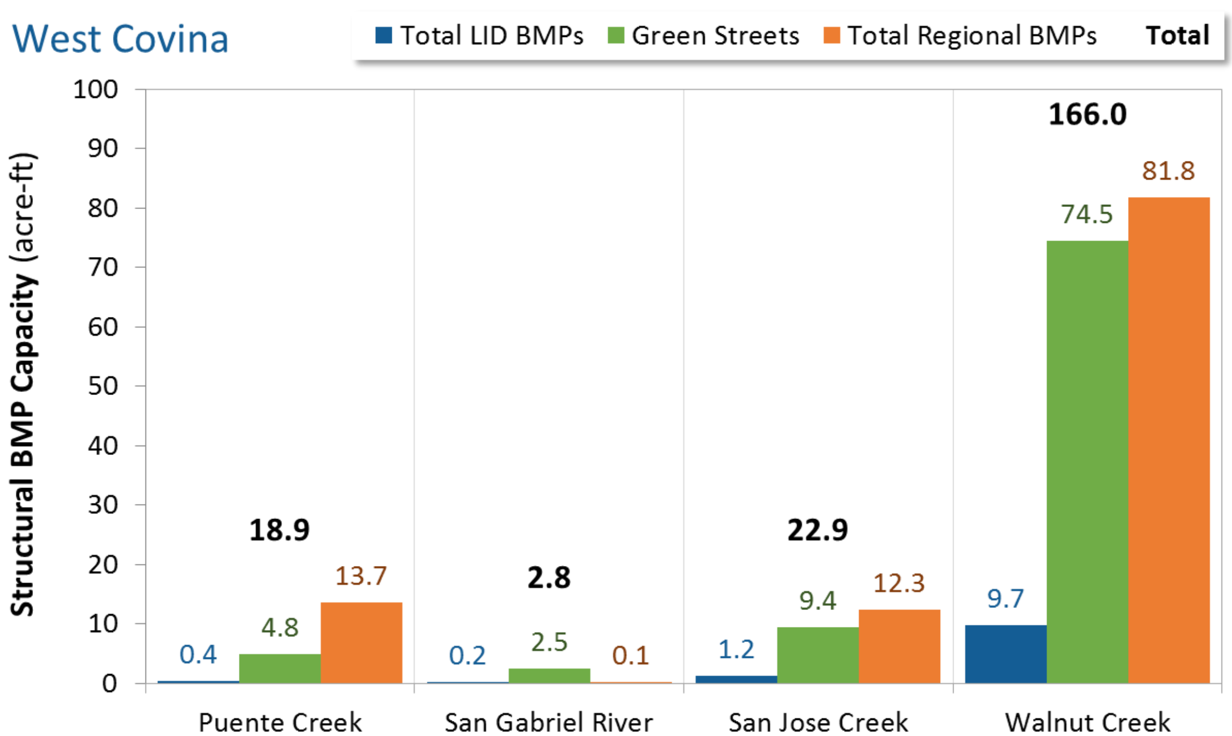


Figure E-23
BMP Distribution in West Covina's EWMP Implementation Plan by Watershed / Assessment Area

This figure shows control measure capacity distribution for the final 2036 EWMP milestone, organized by watershed / assessment area.

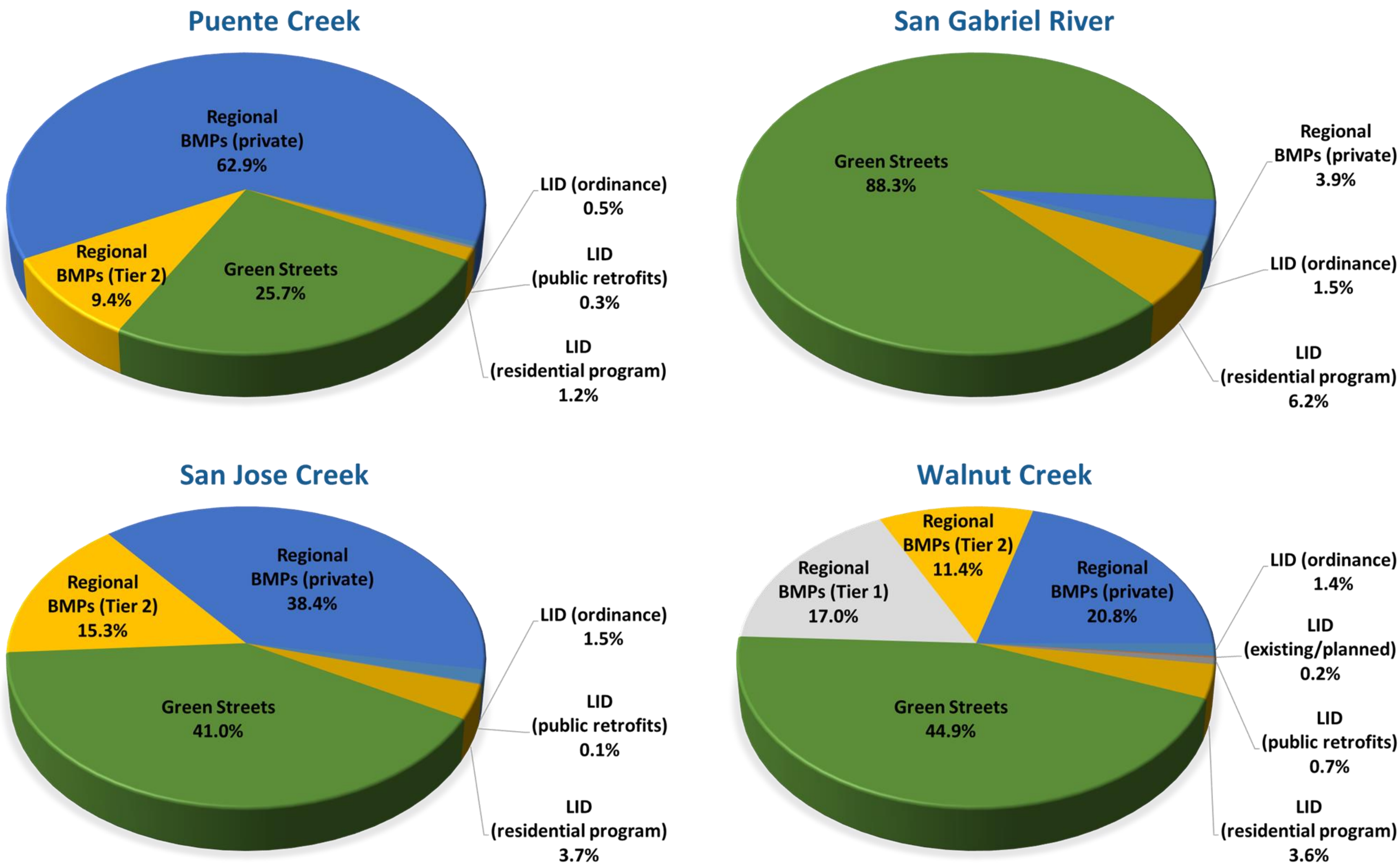


Figure E-24
West Covina EWMP Implementation Plan by Subwatershed for Metals and Other Water Quality Priorities (except *E. coli*)

This map presents West Covina's EWMP Implementation Plan for Metals and Other Water Quality Priorities as control measure "density" by subwatershed. The BMP density is higher in some areas [dark blue] because either [1] relatively high load reductions are required or [2] BMPs in those areas were relatively cost-effective (e.g., due to high soil infiltration rates). The BMP capacities are normalized by area (i.e., the BMP capacity for each subwatershed [in units of acre-feet] was divided by the subwatershed area [in units of acres] to express the BMP capacity in units of depth [inches]). This map presents the total BMP capacity for metals attainment summarized in **Table E-8** through **Table E-11**. Note that while each jurisdiction within an assessment area/watershed is held to an equivalent % reduction (as the other jurisdictions), subwatersheds within an assessment area may have variable reductions based on optimization (another reason why some subwatersheds are dark blue while others are light blue).

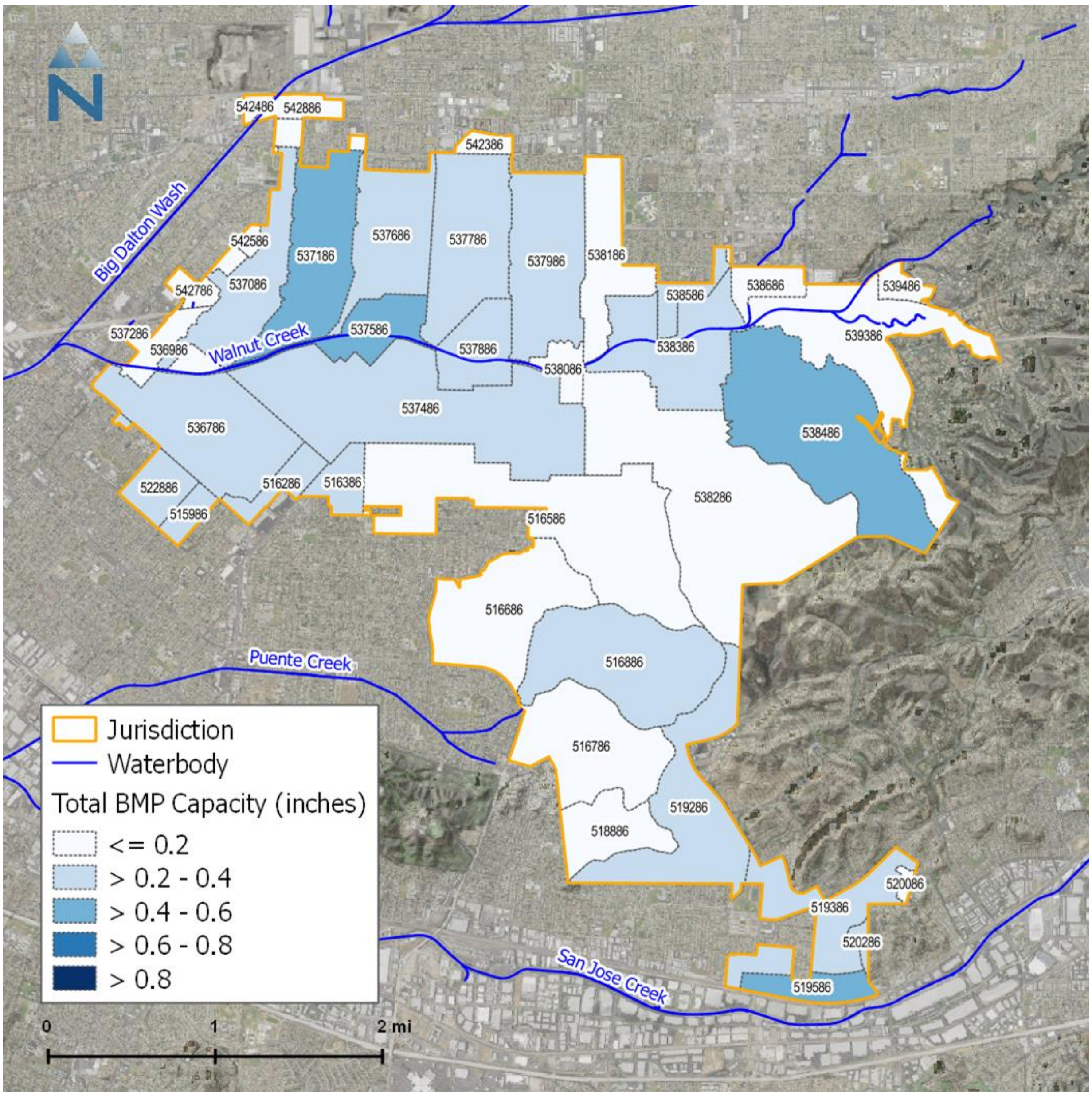


Figure E-25
Additional Control Measures in EWMP Implementation Plan to Address *E. coli*

This map uses the same approach as **Table E-11** to presents the additional capacity in the EWMP Implementation Plan to address E. coli (beyond the control measures to be implemented to address Metals and Other Water Quality Priorities). Note the BMP capacities are much less than in **Table E-11** because the control measures for Metals and Other Water Quality Priorities retain much of the critical bacteria storm. Some subwatersheds are not shaded because zero additional capacity is required. These additional capacities are detailed in **Table E-8** through **Table E-11**.

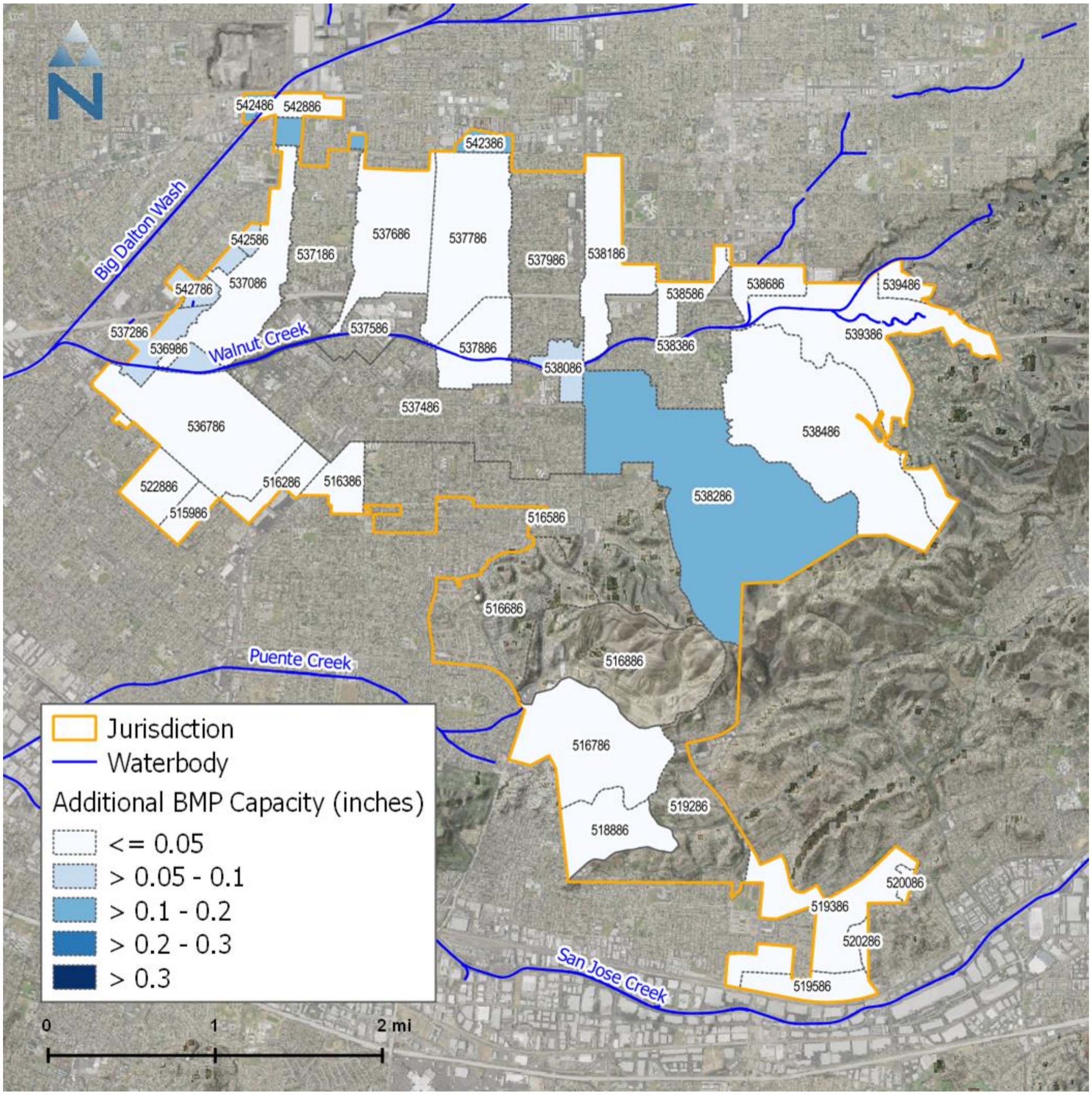


Figure E-26
Additional Control Measures in EWMP Implementation Plan to Address *E. coli*

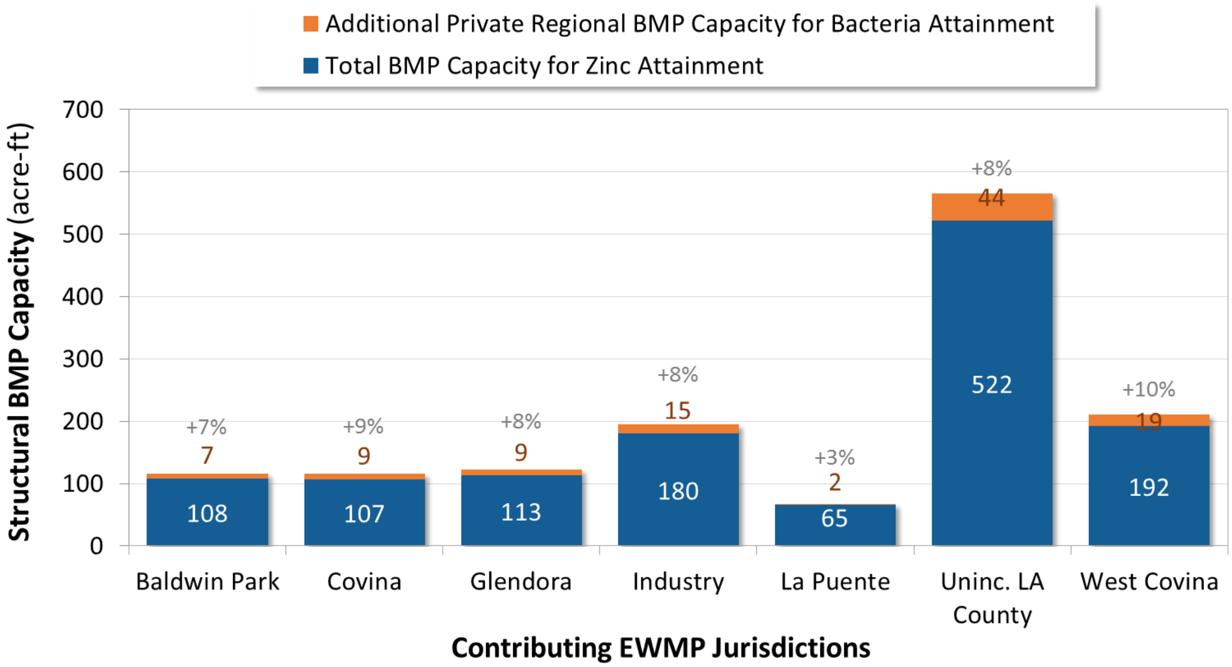


Table E-8
West Covina, Puente Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026												For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs							
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
516286	2.45	0.09	71%	0.029	---	---	0.130	1.96	---	---	---	---	**2.12**	0.09	**2.21**
516386	1.90	0.06	77%	0.021	---	---	0.089	1.59	---	---	---	---	**1.70**	0.06	**1.76**
516586	9.83	---	91%	0.030	---	---	---	---	---	1.78	---	6.15	**7.96**	---	**7.96**
516686	4.87	---	92%	0.002	---	0.000	---	0.94	---	---	---	3.11	**4.05**	---	**4.05**
516786	0.28	0.93	16%	0.006	---	0.050	0.015	0.36	---	---	---	---	**0.43**	0.93	**1.36**
516886	1.81	---	84%	0.000	---	0.000	---	---	---	---	---	1.54	**1.54**	---	**1.54**
Total	**21.14**	**1.08**	**77%**	**0.09**	**0.00**	**0.05**	**0.23**	**4.85**	**0.00**	**1.78**	**0.00**	**10.80**	**17.80**	**1.08**	**18.88**

RED = Subwatersheds with highest required % load reductions
BLUE = Subwatersheds with highest BMP capacities within a BMP category
--- = BMP opportunity was either not available or not selected for the subwatershed (a value of 0.00 means that BMP capacity is non-zero but less than 0.004).

Table E-9
West Covina, San Gabriel River: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
522886	3.15	0.11	66%	0.044	---	---	0.176	2.49	---	---	---	---	**2.71**	0.11	**2.82**
Total	**3.15**	**0.11**	**66%**	**0.04**	**0.00**	**0.00**	**0.18**	**2.49**	**0.00**	**0.00**	**0.00**	**0.00**	**2.71**	**0.11**	**2.82**

RED = Subwatersheds with highest required % load reductions
BLUE = Subwatersheds with highest BMP capacities within a BMP category
--- = BMP opportunity was either not available or not selected for the subwatershed (a value of 0.00 means that BMP capacity is non-zero but less than 0.004).

Table E-10
West Covina, San Jose Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
515986	1.17	0.08	65%	0.012	---	---	0.055	0.94	---	---	---	---	**1.01**	0.08	**1.09**
518886	0.83	0.33	49%	0.029	---	0.001	0.134	1.19	---	---	---	---	**1.36**	0.33	**1.69**
519286	9.18	---	81%	0.069	---	0.024	0.270	0.50	---	---	---	7.84	**8.70**	---	**8.70**
519386	4.61	0.38	61%	0.164	---	0.004	0.306	6.33	---	---	---	---	**6.81**	0.38	**7.18**
519586	4.04	0.15	70%	0.056	---	---	0.048	---	---	3.50	---	---	**3.61**	0.15	**3.76**
520086	0.02	0.01	50%	0.000	---	---	0.001	0.04	---	---	---	---	**0.04**	0.01	**0.04**
520286	0.22	0.01	70%	0.007	---	---	0.031	0.37	---	---	---	---	**0.41**	0.01	**0.41**
Total	**20.07**	**0.95**	**67%**	**0.34**	**0.00**	**0.03**	**0.84**	**9.37**	**0.00**	**3.50**	**0.00**	**7.84**	**21.93**	**0.95**	**22.88**

RED = Subwatersheds with highest required % load reductions
BLUE = Subwatersheds with highest BMP capacities within a BMP category
--- = BMP opportunity was either not available or not selected for the subwatershed
(a value of 0.00 means that BMP capacity is non-zero but less than 0.004).

Table E-11
West Covina, Walnut Creek: RAA Output and EWMP Implementation Plan for Final Compliance

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026												For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs							
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)		Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
536786	11.62	0.49	70%	0.165	---	---	0.346	9.63	---	---	---	---	**10.15**		0.49	**10.63**
536986	0.23	0.58	13%	0.042	---	---	0.147	---	---	---	---	---	**0.19**		0.58	**0.77**
537086	9.11	0.28	79%	0.108	---	---	0.389	7.71	---	---	---	---	**8.21**		0.28	**8.49**
537186	15.84	---	91%	0.179	---	0.968	0.343	9.20	---	---	---	2.83	**13.52**		---	**13.52**
537286	0.17	0.01	71%	0.002	---	---	0.006	0.12	---	---	---	---	**0.13**		0.01	**0.13**
537486	33.01	---	90%	0.416	0.016	---	0.735	---	---	18.97	---	6.46	**26.60**		---	**26.60**
537586	7.53	---	90%	0.100	---	---	0.076	2.97	---	---	---	3.03	**6.17**		---	**6.17**
537686	8.33	0.31	68%	0.114	---	---	0.384	6.75	---	---	---	---	**7.24**		0.31	**7.55**
537786	10.72	0.32	79%	0.120	0.236	0.003	0.454	8.85	---	---	---	---	**9.66**		0.32	**9.99**
537886	4.96	0.18	68%	0.071	---	0.157	0.221	3.86	---	---	---	---	**4.31**		0.18	**4.50**
537986	14.42	---	90%	0.164	---	---	0.543	8.53	---	---	---	2.98	**12.22**		---	**12.22**
538086	0.16	0.37	14%	0.030	---	---	0.102	---	---	---	---	---	**0.13**		0.37	**0.50**
538186	1.47	0.11	55%	0.016	---	---	0.072	1.18	---	---	---	---	**1.27**		0.11	**1.38**
538286	1.38	8.67	12%	0.287	---	---	1.125	---	---	---	---	---	**1.41**		8.67	**10.08**
538386	12.92	---	90%	0.154	---	---	0.466	6.72	---	---	---	2.76	**10.10**		---	**10.10**
538486	12.14	2.64	47%	---	---	0.045	---	---	28.30	---	---	---	**28.34**		2.64	**30.98**

Subwatershed ID	COMPLIANCE TARGET: BMP PERFORMANCE GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)													
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026												For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs							
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cumulative BMP Capacity for both Metals and Bacteria (acre-ft)
538586	2.05	0.08	73%	0.031	---	---	0.049	1.43	---	---	---	---	**1.51**	0.08	**1.59**
538686	0.00	0.00	10%	---	---	---	---	---	---	---	---	---	**0.00**	0.00	**0.00**
539386	8.75	1.12	52%	0.160	---	---	0.339	6.96	---	---	---	---	**7.46**	1.12	**8.58**
539486	0.71	0.13	56%	0.008	---	---	0.035	0.55	---	---	---	---	**0.59**	0.13	**0.71**
542386	0.07	0.55	12%	0.044	---	---	0.029	---	---	---	---	---	**0.07**	0.55	**0.62**
542486	0.03	0.18	12%	0.025	---	---	---	---	---	---	---	---	**0.03**	0.18	**0.21**
542586	0.05	0.10	14%	0.008	---	---	0.032	---	---	---	---	---	**0.04**	0.10	**0.14**
542786	0.11	0.31	13%	0.021	---	---	0.092	---	---	---	---	---	**0.11**	0.31	**0.42**
542886	0.10	0.05	15%	0.035	---	---	---	0.05	---	---	---	---	**0.08**	0.05	**0.13**
Total	**155.88**	**16.46**	**62%**	**2.30**	**0.25**	**1.17**	**5.98**	**74.50**	**28.30**	**18.97**	**0.00**	**18.07**	**149.54**	**16.46**	**166.01**

RED = Subwatersheds with highest required % load reductions
BLUE = Subwatersheds with highest BMP capacities within a BMP category
--- = BMP opportunity was either not available or not selected for the subwatershed (a value of 0.00 means that BMP capacity is non-zero but less than 0.004).

5.3 SCHEDULING OF STORMWATER CONTROL MEASURES TO ACHIEVE EWMP AND TMDL MILESTONES

Scheduling of control measure implementation for the EWMP Implementation Plan is primarily based on the milestones of the SGR Metals TMDL, and an additional implementation period to address SGR-wide *E. coli* impairments by 2036, as follows:

- Achieve 10% of the reduction for zinc (2017)
- Achieve 35% of the reduction for zinc (2020)
- Achieve 65% of the reduction for zinc (2023)
- Final compliance with zinc RWLs (2026)
- Final compliance with bacteria WQBELs (2036)

The scheduling of the EWMP Implementation Plan is presented as the following components:

- **Summary of control measure capacities to be implemented by West Covina by assessment area/watershed:** the LID, green streets and regional BMP capacities that will be implemented over time to achieve milestones are shown in **Figure E-27**. Separate panels are shown for each assessment area/watershed – San Gabriel River (mainstem), San Jose Creek, Puente Creek and Walnut Creek.
- **Detailed scheduling for West Covina including volumes of stormwater to be managed and control measure capacities:** detailed tables that present the scheduling by assessment area including volumes of stormwater (Compliance Targets) to be managed are presented in **Table E-12**. West Covina has a standalone recipe for each assessment area/watershed.

The pace of implementation for the EWMP Implementation Plan is rapid due to the milestones of the SGR Metals TMDL. The pace of implementation is directly proportional to required internal and financial resources, and the additional required resource to implement the EWMP will be significant. The costs and financial strategy for the EWMP are presented in **Section 7** of the USGR EWMP.

Figure E-27
Scheduling of EWMP Implementation Plan for West Covina to Achieve EWMP / TMDL Milestones

This panel presents the LID, green streets and regional BMP capacities to be implemented by West Covina in each assessment area. The bold number is the total capacity for the milestone. Note the y-axis scales differ among panels, with a majority of BMP capacity being implemented in Walnut Creek.

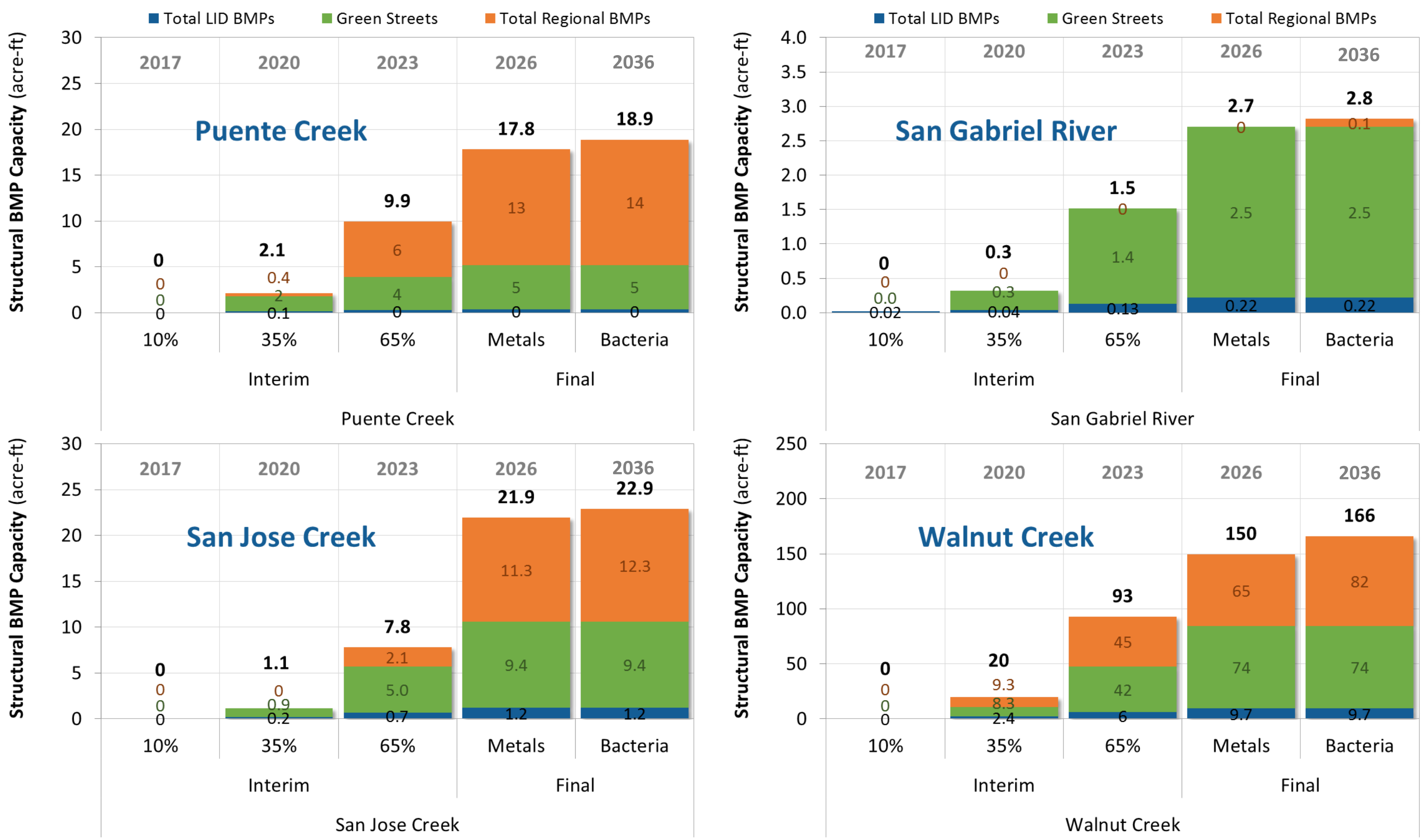


Table E-12
West Covina: RAA Output and EWMP for Interim and Final Compliance

Assessment Area	COMPLIANCE TARGET: BMP GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)									
	EWMP Milestone	24-hour Volume Managed (acre-ft)	Low-Impact Development				Streets	Regional BMPs				Total BMP Capacity (acre-ft)
			Ordinance	Planned LID	Public LID	Residential LID	Green Streets, All Components	Regional BMPs (Tier 1)	Regional BMPs (Tier 2)	Regional BMPs (Tier 3)	Regional BMPs (Private)	
Puente Creek	10% Milestone (2017)	0.0	---	---	---	---	---	---	---	---	---	**0.00**
Puente Creek	35% Milestone (2020)	2.5	0.04	---	0.02	0.09	1.62	---	0.36	---	---	**2.12**
Puente Creek	65% Milestone (2023)	12.1	0.07	---	0.03	0.19	3.63	---	1.78	---	4.24	**9.93**
Puente Creek	Final Metals (2026)	21.1	0.09	---	0.05	0.23	4.85	---	1.78	---	10.80	**17.80**
Puente Creek	Final Bacteria (2036)	22.2	0.09	---	0.05	0.23	4.85	---	1.78	---	11.88	**18.88**
San Gabriel River	10% Milestone (2017)	0.0	0.00	---	---	0.02	---	---	---	---	---	**0.02**
San Gabriel River	35% Milestone (2020)	0.4	0.01	---	---	0.04	0.28	---	---	---	---	**0.32**
San Gabriel River	65% Milestone (2023)	1.9	0.03	---	---	0.11	1.38	---	---	---	---	**1.51**
San Gabriel River	Final Metals (2026)	3.2	0.04	---	---	0.18	2.49	---	---	---	---	**2.71**
San Gabriel River	Final Bacteria (2036)	3.3	0.04	---	---	0.18	2.49	---	---	---	0.11	**2.82**
San Jose Creek	10% Milestone (2017)	0.0	---	---	---	---	---	---	---	---	---	**0.00**
San Jose Creek	35% Milestone (2020)	0.8	0.07	---	0.00	0.16	0.90	---	---	---	---	**1.12**
San Jose Creek	65% Milestone (2023)	6.5	0.19	---	0.01	0.47	5.01	---	2.10	---	---	**7.78**
San Jose Creek	Final Metals (2026)	20.1	0.34	---	0.03	0.84	9.37	---	3.50	---	7.84	**21.93**
San Jose Creek	Final Bacteria (2036)	21.0	0.34	---	0.03	0.84	9.37	---	3.50	---	8.79	**22.88**
Walnut Creek	10% Milestone (2017)	0.0	---	---	---	---	---	---	---	---	---	**0.00**
Walnut Creek	35% Milestone (2020)	25.4	0.55	0.25	0.14	1.42	8.28	9.34	---	---	---	**19.97**
Walnut Creek	65% Milestone (2023)	91.2	1.47	0.25	0.65	3.82	41.55	28.30	15.18	---	1.62	**92.83**
Walnut Creek	Final Metals (2026)	155.9	2.30	0.25	1.17	5.98	74.50	28.30	18.97	---	18.07	**149.54**
Walnut Creek	Final Bacteria (2036)	172.3	2.30	0.25	1.17	5.98	74.50	28.30	18.97	---	34.53	**166.01**

Assessment Area	COMPLIANCE TARGET: BMP GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)									
			Low-Impact Development				Streets	Regional BMPs				
	EWMP Milestone	24-hour Volume Managed (acre-ft)	Ordinance	Planned LID	Public LID	Residential LID	Green Streets, All Components	Regional BMPs (Tier 1)	Regional BMPs (Tier 2)	Regional BMPs (Tier 3)	Regional BMPs (Private)	Total BMP Capacity (acre-ft)
Total	**---**	**218.86**	**2.77**	**0.25**	**1.25**	**7.24**	**91.21**	**28.30**	**24.25**	**0.00**	**55.31**	**210.58**

5.4 NON-STORMWATER CONTROL MEASURES

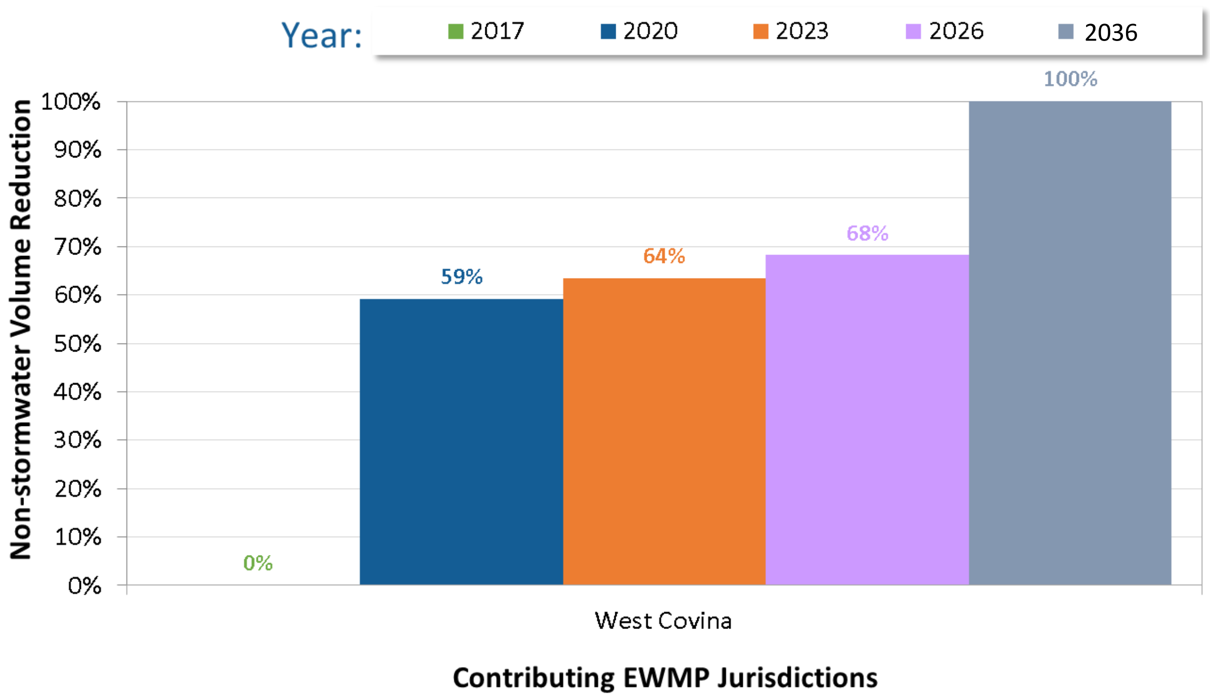
The MS4 permit effectively prohibits non-stormwater discharges and the SGR Metals TMDL includes milestones for attainment of dry weather RWLs. The EWMP Implementation Plan has assurance of eliminating non-stormwater discharges through implementation of the network of wet weather control measures. As shown in **Figure E-28** the EWMP Implementation Plan achieves 100% elimination of non-stormwater flows from West Covina by 2036. The dry weather milestones of the SGR Metals TMDL have assurance of being addressed for the following reasons:

1. During dry weather, exceedances of metals RWLs are rare. As such, existing MCMs and control measures have reasonable assurance of attaining metals RWLs.
2. By 2020, which is the 70% reduction milestone of the Metals TMDL, 59% of non-stormwater flows will be completely eliminated.
3. By 2023, which the final compliance date for the Metals TMDL, approximately 64% of non-stormwater flows will be eliminated in USGR, which is sufficient for TMDL attainment.
4. By 2026, the final dry weather compliance date in the draft SGR Bacteria TMDL, 68% of non-stormwater flows will be eliminated in USGR, which is likely sufficient for TMDL attainment.
5. The non-stormwater screening, investigation and abatement programs being conducted under the CIMP for West Covina will increase the rate of eliminating non-stormwater flows beyond the reductions provided by the control measures of the EWMP Implementation Plan. In other words, the non-stormwater abatement programs provide a "margin of safety" for the assurance demonstrated in **Figure E-28**.
6. An additional margin of safety is provided by the assumed outdoor water use in the dry weather RAA. The non-stormwater volumes in the non-stormwater analysis were based on existing median outdoor water use rates. Most water supply agencies have initiatives to significantly reduce outdoor water use in the coming years and thus the rate of elimination of non-stormwater flows should be more rapid than shown in **Figure E-28**.

Overall, the EWMP Implementation Plan and related non-stormwater reduction programs are expected to effectively eliminate non-stormwater flows in West Covina.

Figure E-28
Schedule for Eliminating Non-Stormwater Discharges in West Covina

The figure shows the effect of the EWMP Implementation Plan on non-stormwater discharges in West Covina. The top panel shows the schedule for volume reductions in non-stormwater discharges, while the bottom panel shows the non-stormwater volumes remaining. Over time, the wet weather control measures will eliminate non-stormwater discharges. The reductions to be achieved by the dry weather compliance dates from the SGR Metals TMDL are sufficient to achieve the milestones.



6 Assessment and Adaptive Management Framework

The assessment and adaptive management framework for West Covina is identical to the framework provided in **Section 6** of the EWMP.

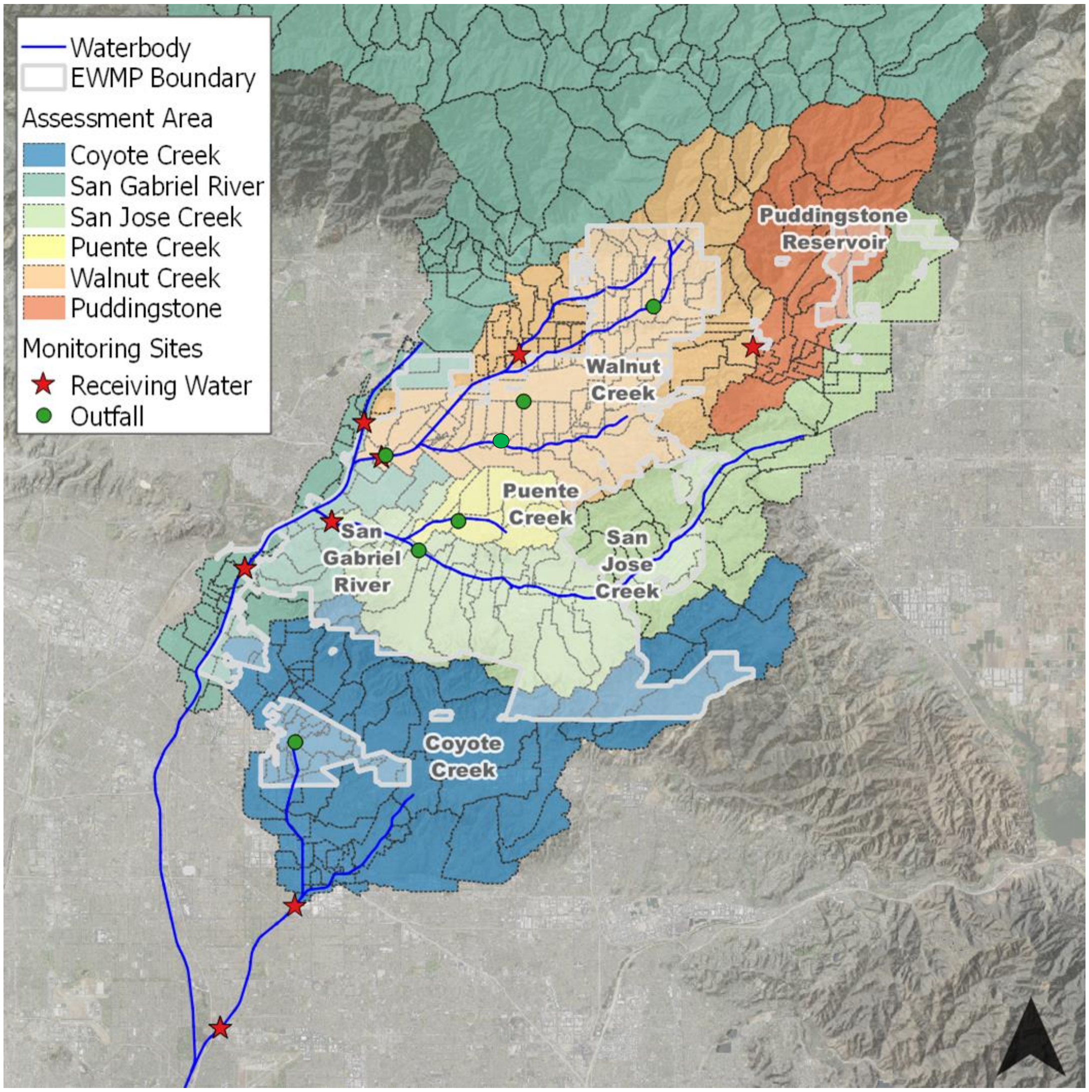
6.1 REPORTING

Annual reporting for West Covina will be performed in accordance with the procedures described in **Section 6.2** of the EWMP. **Figure E-29** shows the updated CIMP monitoring locations. A stormwater outfall monitoring site has been added for West Covina, located at the coordinates shown in **Table E- 13**.

Table E- 13
Stormwater Outfall Monitoring Site for West Covina

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Walnut Creek Wash	West Covina	BI 589B	120 inches	SW Outfall	34.067749	-117.927379

Figure E-29
CIMP Monitoring Locations



7 EWMP Implementation Costs and Financial Strategy

Preliminary implementation costs for West Covina were developed using the methodology and assumptions described in **Section 7** of the USGR EWMP. The costs provided here are considered to be planning level and can be refined as EWMP implementations progresses with the use of actual BMP implementation costs.

7.1 ESTIMATED EWMP PROGRAM COSTS

The basis of EWMP program costs were developed for the USGR EWMP Group and described in **Section 7.1** of the EWMP. **Table E-14** summarizes the total implementation costs for West Covina. **Figure E-30** and **Table E-15** show a detailed cost breakdown for West Covina over the timeframe of EWMP implementation.

Table E-14
EWMP Implementation Cost Summary for West Covina

Jurisdiction	Total BMP Capacity (acre-feet)	Total Capital Costs	Total O&M Costs	Total Cost of Implementation
West Covina	211	$ 187,386,000	$ 150,182,000	$ 337,567,000

Figure E-30
EWMP Implementation Cost Breakdown for West Covina

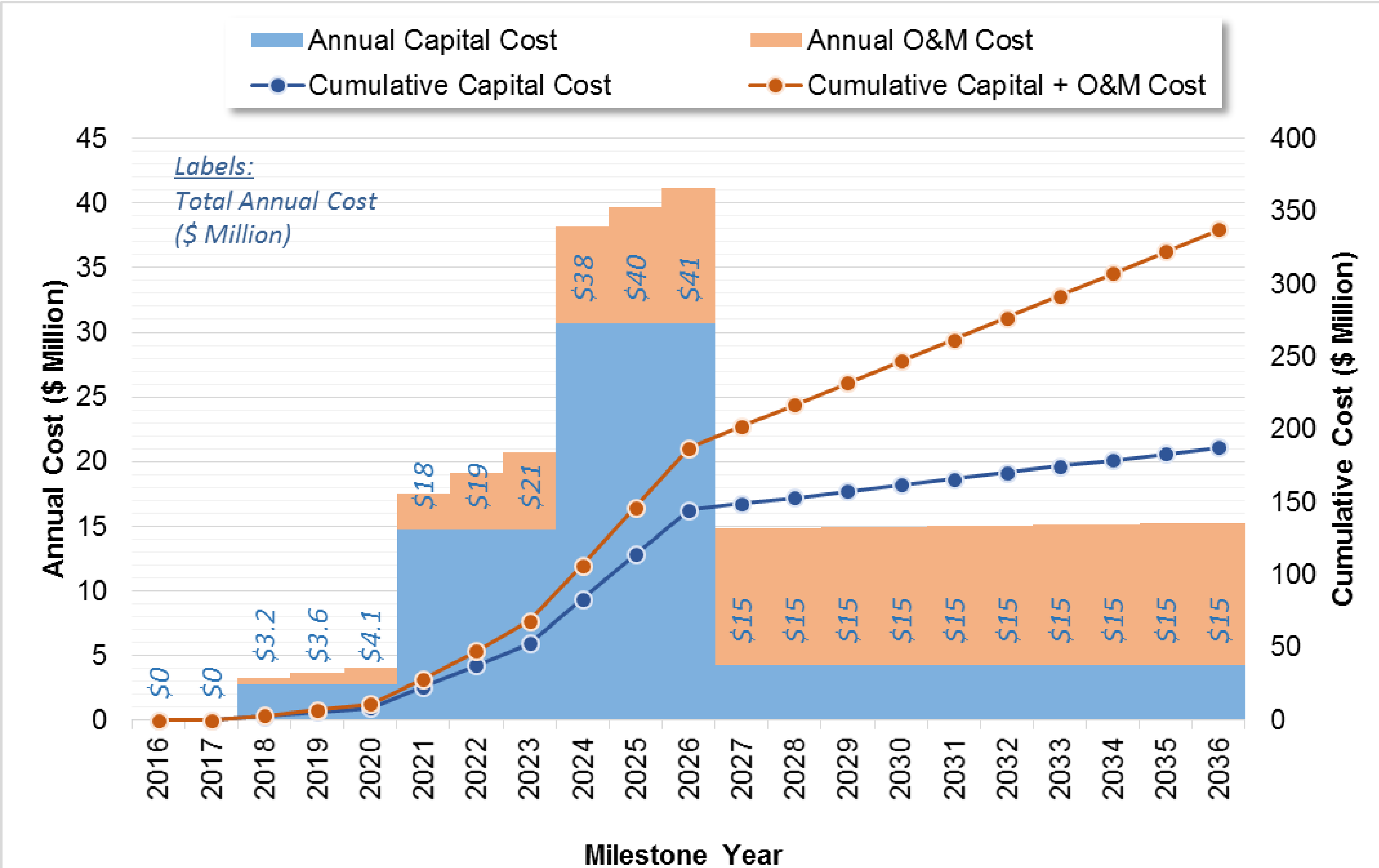


Table E-15
EWMP Implementation Cost for West Covina

Jurisdiction	Cumulative Total Capacity	Annual Capital Costs	Annual O&M	Total Annual Costs
West Covina				
2016	0.01	$ 1,000	$ -	$ 1,000
2017	0.02	$ 1,000	$ -	$ 1,000
2018	7.6	$ 2,807,000	$ 418,000	$ 3,225,000
2019	15.3	$ 2,807,000	$ 837,000	$ 3,644,000
2020	22.9	$ 2,807,000	$ 1,255,000	$ 4,062,000
2021	52	$ 14,701,000	$ 2,837,000	$ 17,538,000
2022	81.2	$ 14,701,000	$ 4,418,000	$ 19,119,000
2023	110.3	$ 14,701,000	$ 6,000,000	$ 20,701,000
2024	136.6	$ 30,670,000	$ 7,488,000	$ 38,158,000
2025	162.9	$ 30,670,000	$ 8,976,000	$ 39,646,000
2026	189.2	$ 30,670,000	$ 10,464,000	$ 41,134,000
2027	191.3	$ 4,285,000	$ 10,516,000	$ 14,801,000
2028	193.5	$ 4,285,000	$ 10,568,000	$ 14,853,000
2029	195.6	$ 4,285,000	$ 10,619,000	$ 14,904,000
2030	197.8	$ 4,285,000	$ 10,671,000	$ 14,956,000
2031	199.9	$ 4,285,000	$ 10,723,000	$ 15,008,000
2032	202	$ 4,285,000	$ 10,775,000	$ 15,060,000
2033	204.2	$ 4,285,000	$ 10,827,000	$ 15,112,000
2034	206.3	$ 4,285,000	$ 10,878,000	$ 15,163,000
2035	208.5	$ 4,285,000	$ 10,930,000	$ 15,215,000
2036	210.6	$ 4,285,000	$ 10,982,000	$ 15,267,000
			Total	**$ 337,567,000**

7.2 FUNDING SOURCES

Similar to the other Group members, West Covina has sufficient funds to achieve the activities proposed within this current MS4 Permit cycle, namely, implementing enhanced MCMs and regional project and green streets planning and design through December 2017. West Covina utilizes an existing fund of $382,000 from the General Fund and funds from the Landscape Maintenance Districts.

7.3 NEXT STEPS

West Covina will begin utilizing existing funds to implement the EWMP as well as pursue additional funding in accordance with the below priorities.

GROUP MEMBER	FUNDING PRIORITIES	INTEGRATION WITH EXISTING INFRASTRUCTURE IMPROVEMENT PLANS
West Covina	1. Apply for grants 2. Seek allocation in the General Fund 3. Investigate bond and loan opportunities 4. Investigate adopting an NPDES inspection fee 5. Continued participation in stormwater funding advocacy efforts led by the League of California Cities and California Contract Cities	• Development of a stormwater capital improvement plan for existing public facilities by December 2018 • Development of a plan to complement the EWMP and Green Street Policy by December 2018