GENERATION EARTH

Water Pollution Prevention

Toolkit

COUNTY OF LOS ANGELES CALIFORNIA

Clean LA
LOS ANGELES COUNTY

2025

Generation Earth Program

Generation Earth is a Los Angeles County Public Works environmental education program. Our goal is to educate and encourage youth in Los Angeles County to be an active part of the solution to environmental concerns in their community. We offer do-it-yourself environmental projects that help youth make a positive difference in their schools, at home and in the world. Our programs are built to support the needs of teachers, students and schools.

Water Pollution Prevention Toolkit

This toolkit is designed to assist teachers and students in exploring water pollution and conservation potential on a typical school campus or in the community. This exploration will help your students determine what area of water pollution prevention and conservation they are interested in and then choose from a variety of Project Guides to help conserve water, increase stormwater infiltration or reduce pollution on campus.

The Hydrologic Cycle

The hydrologic cycle begins when rainwater starts to fall and percolates down into the soil and rocks. The soil and rock act as natural filters cleaning the water that collects in aquifers (underground layers of rock that store percolated water). This underground water is called ground water and supplies water to wells and natural springs that we can tap into for consumption. When it rains, water that did not percolate into the ground travels over land as stormwater runoff, flowing downhill and collecting in streams and rivers which then outlet into lakes and oceans. Evaporation occurs when the sun heats surface water such as in the lakes, rivers and oceans creating and drawing tiny water vapors into the atmosphere to form rain clouds, thus completing the hydrologic cycle.

The Urban Environment

As communities grow, more land is developed creating miles of impervious surfaces (hardscape such as streets and parking lots where water cannot percolate), buildings and houses. Since rain water cannot percolate into the ground,there is more runoff at the surface level which increases the risk of a flood. To prevent floods, engineers created a flood control system. The flood control system consists of catch basins, large underground pipes and open channels designed to quickly convey runoff straight to lakes or the ocean. However, it interrupts the natural hydrologic cycle by reducing the opportunity for percolation. Without this natural system of percolation and filtration, runoff reaches the lakes and the ocean directly carrying pollutants along the way.

The School Campus

The school campus may generate polluted runoff that ends up in the ocean. The land area of the school directs water from rain, sprinklers, faucets and garden hoses from the campus and into the storm drain system. As the runoff makes its way to a storm drain, trash and other pollutants are picked up and carried into the storm drain system negatively impacting the environment beyond the campus. Students, teachers, administrators, and maintenance staff are responsible for what flows off the campus, into the storm drains and to the ocean.

Stormwater as a Resource

Now more than ever conserving water and preventing stormwater runoff is important. Taking steps to reduce potable water use – indoor and outdoor – and percolating stormwater runoff into the ground and not into streets helps to increase local water supply, decrease the need for imported water and reduce stormwater pollution. In support, Los Angeles County made history in November 2018, when voters approved Measure W to revamp our outdated stormwater system. As a result, the Safe, Clean Water Program was created to fund projects to capture, clean and reuse stormwater by expanding parks and other open space opportunities to capture and infiltrate stormwater.

The Toolkit Steps!

1. Check This Out
To get started, students explore the subject of water pollution and conservation by working in teams to learn a specific topic related to water and share what they have learned through the creation of an infographic that they share with the class.

2. Water Audit
The next step is to explore water on campus. Using a map of the site, students indicate where there are specific water-related elements on campus. They continue the process by showing the direction the water takes and identifying areas of concern.

3. Get More Information (High School option)
The water audit is just part of the water picture at a site. Students explore further by conducting interviews with key site stakeholders.

4. Choose a Project Guide
Using the waste audit, site map and more, students answer questions to determine which water pollution prevention or water conservation project is most appropriate and interests them the most. A variety of Project Guides are suggested.

5. Let's Get Started
Once students have determined what Project Guides interest them, follow the guidelines to get started, including how to set up a classroom visit and more!

6. Resources
References and Next Generation Science Standard Skills are included.

Check this Out

To get started, students explore the subject of water by working in teams to learn a specific topic related to water pollution prevention and conservation and share what they have learned through the creation of an infographic that they share with the class.

Procedure

1. Divide students into five working groups. Groups should be as close to equal in size as possible.
2. Pass out a different topic sheet to each group.
3. Each group has 15 minutes to:
   - Learn and discuss the topic.
   - Use poster paper and markers to create an infographic answering the questions listed on the topic sheet.
4. Each group shares and explains their infographic with the whole group.
5. As a class, discuss the need for water pollution prevention and conservation, at home and in the community.

Materials

- Topic Sheets (pages 4-8)
- Poster paper or dry erase board —one per group
- Markers—one set per group

High School Option

Guiding questions are provided for each Topic Sheet. These can be optional for use in creating the infographic.

Invite teams to explore their subject further by answering questions they may still have or that came up while sharing the infographics.

Moving Water

START HERE!

In thinking about Los Angeles County, it is hard to believe that there are seven major watersheds – five of which are located near metropolitan Los Angeles. These land areas collect and drain water runoff into a common body of water. For most of these watersheds that body of water is the Pacific Ocean. As water moves through the urban watershed, it picks up everything in its path!

Create an infographic that answers the following questions:

- What is a watershed?
- How does water move through a watershed?
- Why can this be an issue?
- What is something that can be done to support a healthy watershed?

- A watershed is the land area that "sheds" water to a drainage system or river. It helps supply us with water by feeding underground aquifers or channeling water into rivers and other waterways. Gravity moves water through the watershed from higher to lower areas. Every land is part of some watershed – including your campus and your neighborhood.
- A watershed functions best when the land area is more pervious allowing water to percolate into the aquifer. As rain falls onto land, it percolates through the soil and is filtered of pollutants before it reaches the water table below where it is stored. This underground layer is called an aquifer.
- A watershed's headwater begins at the mountains and foothills, flows across the valley floor and eventually into a body of water (lakes and ocean). In Los Angeles County, the Antelope Valley Watershed flows into dry lakes. Other watersheds such as the Santa Clara River, Los Angeles River, San Gabriel River, South Santa Monica Bay, North Santa Monica Bay and Dominguez Channel watersheds which flow into the Pacific Ocean.
- When the land becomes developed and less pervious, rainfall is not able to percolate into the ground, disrupting the natural infiltration of water by collecting debris along the way.
- Support a healthy watershed by placing mulch on bare ground to allow the water to be absorbed. Also, picking up litter is another important action to take.

Open the Flood Gates

START HERE!

Many of the waterways in Los Angeles County have been covered in concrete to provide for flood protection during major storm events. Now connected to city streets by gutters, catch basins and storm drains, this flood control system provides a quick and direct path for everything draining from our city straight to the ocean.

Create an infographic that answers the following questions:

- What is the typical climate of Los Angeles?
- Historically, why is that an issue?
- What is channelization and how does it affect water health?
- What is something that can be done to prevent water pollution?

- Los Angeles County has a Mediterranean climate, meaning that the climate is subject to cool wet winters and hot dry summers. When it does rain, most flooding in Southern California is the result of heavy precipitation over short periods of time and damage is often severe.[1]
- The flood event in 1938 saw over ten inches of rain over five days, leaving a third of Los Angeles flooded and causing 115 deaths. This, and floods earlier in 1914 and 1934 resulted in the decision to channelize the river.[2]
- Channelization is the process of engineering waterways to provide for flood control and improved drainage. The Los Angeles River channelization began in 1938 and when completed in 1960, formed a fifty-one mile engineered channel mostly lined with concrete.[3]
- Today, Los Angeles County Flood Control District encompasses more than 2,700 square miles within 6 major watersheds. It includes drainage infrastructure within 86 incorporated cities as well as the unincorporated County areas. This includes 14 major dams and reservoirs, 483 miles of open channel, 3,330 miles of underground storm drains and an estimated 82,000 catch basins.[4]
- These drainage systems were designed to move water swiftly and efficiently through the watershed. Unfortunately, it also carries debris and other pollutants that may affect water quality.
- Reducing pollutants or picking up trash are some of the ways to prevent pollutants from entering and flowing through the flood control channels and reaching the ocean.

Pollution Down the Drain

START HERE!

Street gutters are more important than you may realize. They drain water off the streets through catch basins and into storm drains. These catch basin openings lead to flood control channels that, in turn, carry the water directly to the waterbodies, such as creeks, rivers, lakes and ultimately the ocean. Water picks up debris as it travels through the streets and into the waterbodies.

Create an infographic that answers the following questions:

- What is stormwater?
- What is the difference between stormwater and wastewater?
- Why is stormwater an issue?
- How is motor oil a part of the issue?
- What is something that can be done to reduce the effect of urban runoff?

- In urban environments, rain falls onto impervious surfaces and runs across the pavement, through gutters, enters the catch basins and into the storm drains.
- Storm drains help prevent urban flooding by moving large volumes of stormwater to flood control channels and into the ocean. Urban runoff from sources of water, such as over watering of lawn, is carried directly to the ocean.
- Unlike wastewater, which is from toilets, sinks and showers and is carried out by underground sewer pipes that go directly to a wastewater treatment plant, stormwater is not treated before being sent out to the ocean.
- Urban runoff is a significant source of ocean pollution. Litter, pet waste, cigarette butts, fast food packaging, plastic shopping bags, plastic water bottles, leaking motor oil – anything on the ground – can end up washed into gutters and carried to the ocean.
- One gallon of used motor oil, poured into the gutter or dripping from a car, can contaminate up to one million gallons of ocean water. Over 115 million gallons of motor oil are sold in California each year; and only about half of it is recycled with the other half ending up in the waste stream, polluting our waterways and ocean or burning off, causing air pollution.[5]
- Eliminating the use of harmful pesticides and fertilizers on plants that will be washed into the street, recycling used motor oil and picking up trash are just some of the ways to prevent polluted urban runoff from reaching the ocean.

The Source of the Issue

START HERE!

Not all pollution is the same! Different types of pollution are regulated by the Environmental Protection Agency in different ways through the Clean Water Act. Identifying the type of pollutants and their source help government agencies address the pollutants' impacts on our environment.

Create an infographic that answers the following questions:

- How is water pollution categorized?
- What is nonpoint source pollution?
- What is TMDL?
- What is something that can be done to prevent nonpoint source pollution?

- Water pollution is categorized by where it originates or its "source." It is either "point source" or "nonpoint source".
- Point source pollution is discharged from a single, identifiable source such as pipes, factories or ships.
- Nonpoint source pollution is caused by rainfall moving over the ground as runoff picking up pollutants and depositing them into rivers or other bodies of water.[6] Pollutants can include fertilizers, insecticides, car oil, pet waste, bacteria and trash.
- When these pollutants enter bodies of water such as our lakes and ocean, whether it is point or nonpoint, it becomes a huge water quality issue. As a result, the State of California established TMDLs (Total Maximum Daily Loads) which are scientifically established maximum amounts of a particular pollutant that a specific body of water can receive and still meet water quality standards. For example, the Los Angeles River can only have a certain amount of metals in it and still meet the TMDL.
- Eliminating the use of harmful pesticides and fertilizers on plants that may be washed into the street, recycling used motor oil and picking up trash are just some of the ways to prevent these pollutants from entering waterways.

Every Drop Counts

START HERE!

The average person in California uses 120 gallons of water per day. Up to 70 percent of that water is used outdoors for watering plants and lawns. Los Angeles County residents can make a huge difference by reducing water usage and ensuring that every drop counts!

Create an infographic that answers the following questions:

- Historically, where did most of the water for Los Angeles come from?
- Where does it come from now?
- How does weather impact imported water?
- What can be done locally to conserve water and reduce the need for imported water?

- The El Pueblo de Los Angeles was founded in 1781. During this time the Pueblo relied almost exclusively on the Los Angeles River for its water. In the early years, water from the river was channeled through a distribution system of dams, water wheels and ditches.[7]
- Local water supply such as groundwater was not enough to satisfy the demand of the growing population, creating a need to import water from other sources. In 1913, the City of Los Angeles completed construction of the first Los Angeles Aqueduct.[8] The Aqueduct diverted water from the Owens River that runs along the base of the eastern Sierra Nevada Mountains. Other sources include waters from the Colorado River and the Sacramento-San Joaquin River Delta (California Aqueduct/State Water Project).
- Relying on imported water can be an issue when the weather can be unpredictable. The amount of rainfall received during the winter season determines the amount of snowpack in the Sierra Nevada Mountains, the water levels in California's reservoirs and ultimately the supply of our underground aquifers.
- Conserve water by capturing rainwater in rain barrels that can provide water for gardens or replacing high-water use plants with climate-appropriate and native plants.
- Slowing down rainwater and allowing it to infiltrate into the ground, such as through planting trees, installing rain gardens and mulching helps to replenish local groundwater supplies and decrease the need for imported water.

WATER AUDIT

Once students have explored the subject of water pollution prevention and conservation, it is time to assess what is happening on their campus. Conducting a water audit of their site will help determine the most appropriate water related project.

Using a map of the site, students indicate where there are specific water-related elements on campus. They continue the process by showing the direction water takes and identify any areas of concern.

Procedure

1. Plan to work in groups when mapping and auditing the site.
2. Create a map using one of the following:
   - An existing map and remove any unnecessary information.
   - Online map of the site
   - Hand-made map using a large sheet of paper.
3. Make sure each group has a map, Water Audit Guidelines, and specific colored pencils or markers.
4. Have students follow the instructions to locate specific water-related elements and mark them on the map. Then, continue the process by using arrows to show the direction water takes and identify any areas of concern.
5. Familiarize students with the areas they are observing and demonstrate how to gather the data.
6. In the classroom, instruct groups to report findings.
7. Create a combined map of all findings representing the site as a whole.

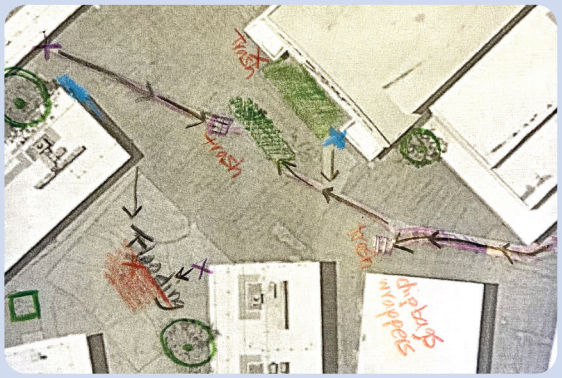
Materials

- Water Audit Guidelines (page 10)
- Colored Pencils/Markers (red, blue, green, purple, black) - one per group
- Maps of the site

Helpful Hints

Break the site maps into different parts of the campus for each group.

If possible, plan to conduct the audit during a rainy day, to see where water travels or suggest using buckets of water to see and understand the flow of water across the site.



Water Audit Guidelines

Walk around the entire assigned area.

Look for:

- Trees and places where water can get into the ground (grass, bare dirt, garden, etc.)
  - — **Use GREEN to show these places on your map**
  - — **Use**  **to show existing trees on your map**
  - — **Use**  **to show empty tree wells on your map**
- Sources of water (faucets, sprinklers, hoses, etc.)
  - — **Use BLUE to show these places on your map** →

- Places where water travels (gutters, down spout, drain, etc.)
  - — **Use PURPLE to show these places on your map** →

- Trash and other things that could be harmful to water (food, trash, oil, etc.)
  - — **Use a RED X to show these items on your map**

Indicate:

- The direction water would travel. Use arrows to show the direction. Remember, water flows from high to low points.
- Where water pools or floods during a rainstorm.
- Where you found a lot of trash and other areas of concern.
- What type of trash was found and a possible source for where it came from.

GET MORE INFORMATION

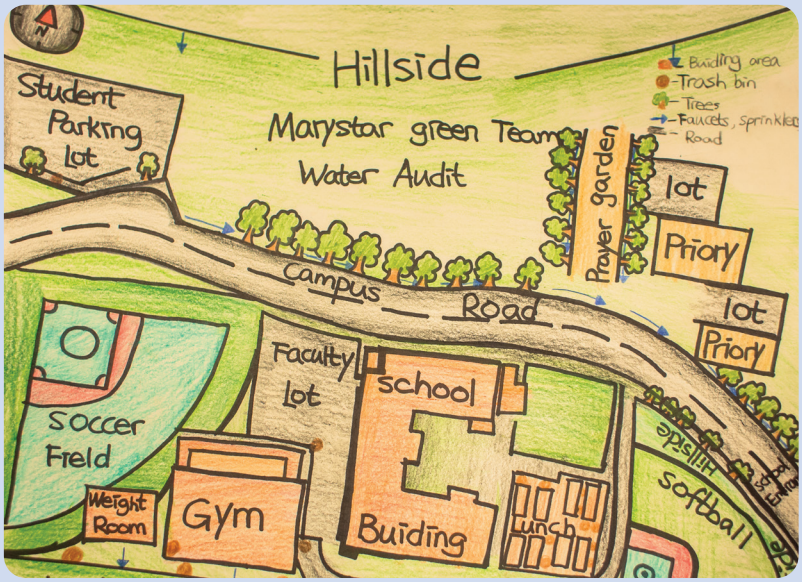
The water audit is the first step to gathering information. It is important to find out more by interviewing key site stakeholders. Stakeholders are people who may affect or be affected by a water pollution prevention or conservation program.

Materials

- Suggested interview questions for each group (page 12)
- Pencil/pen

Procedure

1. Depending on your campus, determine which stakeholders to interview:
   - Principal
   - On-site Maintenance/Plant Manager
2. Create questions to ask each stakeholder. See page 12 for samples.
3. Divide students into groups to set up and conduct interviews.
4. Have groups share what they learned.



Sample Questions

School Principal

- Has there previously been a water pollution prevention or conservation program on campus?
  - — If yes, what were the successes and failures?
  - — If no, what kind of water conservation program would you like to see on campus?
- What kind of water pollution prevention program would you like on campus?
- Would you consider launching or improving a campus water pollution prevention or conservation program?

Facilities/Plant Manager

- Is there a need for any waste/pollution management or awareness on campus?
  - — If yes, where and what type of waste/pollution do you see the most of?
- Are there areas on campus that flood when there is water/rain runoff?
  - — If yes, do you have any suggested solutions?
- Are there any drains that are continually clogged?
  - — If yes, where and what are they clogged with?
- Are there any empty tree wells?
  - — If yes, is there irrigation?
- Do you use mulch around trees and plants?
- Are there any planters or gardens that can be converted to native plants to reduce the use of water?

CHOOSE A PROJECT

Using the water audit and any additional information about water on campus, determine with the group what they would like to achieve at their site by asking specific questions that lead to project suggestions.

Procedure

1. Lead a discussion about what was learned about water on campus.
2. Inform the class that they can help prevent water pollution, conserve water and raise awareness on their campus through a variety of project guides and other resources. They are:
   - Campus/Community Cleanup Event
   - Water Pollution Prevention Campaign
   - Storm Drain Stenciling
   - Installing Native Plants
   - Installing a Rain Garden
   - Installing a Rain Barrel
   - Planting/Caring for Trees
   - Mulching or Composting
   - Beach/River Clean-up
3. Use the Project Selection sheets to answer specific questions.
4. Once complete, work with the students to go through all the answers and options to determine which Project Guide to use or learn more about.

Materials

- Project Selection sheets (pages 14-15)

Helpful Hint

Review the different Project Guides ahead of time.

Project Selection

Step 1

Using the completed map:

- Look at the areas indicated by **GREEN**

  — Could these areas use mulch to help slow the flow of water and allow it to seep into the ground? **No** ☐ **Yes** ☐ Talk to your GE Coordinator for mulching options

  — Are there areas that could use native and/or climate-appropriate plants to help conserve the amount of water used to irrigate them? **No** ☐ **Yes** ☐ Use the Native Plant Project Guide for planting options

- Look at the trees on your campus

  — Are there young trees that need care or empty tree wells that need trees? **No** ☐ **Yes** ☐ Use the Planting Trees or Caring for Trees Project Guides for guidelines

- Look at sources of water indicated by **BLUE**

  — Are there areas where water can be redirected from drains and hard surfaces? **No** ☐ **Yes** ☐ Use the Rain Garden Project Guide for guidelines

- Look at places indicated by **PURPLE**

  — Are there drains and/or gutters filled with trash or other substances? **No** ☐ **Yes** ☐ Use the Campus/ Community Cleanup Event Guide for guidelines

  — Do any of these drains lead to the storm drain system? If so, could they be stenciled (labeled) to raise awareness? **No** ☐ **Yes** ☐ Go to the Resource Section for stenciling

- Look at places indicated by **RED X**

  — Is there a lot of trash that could be reduced through a clean-up event? **No** ☐ **Yes** ☐ Use the Campus/ Community Cleanup Event Guide for guidelines

  — Is there a specific type of trash that has a clear source? **No** ☐ **Yes** ☐ Talk to your GE Coordinator for options, depending on the source

Step 2

Using the completed interview questionnaire:

— Is there need for any waste or pollution management or awareness on campus?

No ☐ **Yes** ☐ Use the Campus/ Community Cleanup Event Guide or the Education Campaign Project Guide

— Are there areas on campus that flood or pool water that could be redirected into a rain garden or other permeable area?

No ☐ **Yes** ☐ Use the Rain Garden Project Guide for guidelines

Step 3

Consider the impact in the community or at the beach/river:

— Does the class have the ability to go on a field trip?

No ☐ **Yes** ☐ Go to the Resource Section for beach and river clean up resources

— Does the class have the ability to create and provide a community tour of water issues in the neighborhood?

No ☐ **Yes** ☐ Use the Water Education Guide for ideas

LET'S GET STARTED

A variety of Project Guides are available to help prevent water pollution, conserve water and raise awareness on their campus. Once the group has chosen a specific Project Guide, it is time to get started on a service learning project.

Steps

1. **Get assigned a Generation Earth Program Coordinator.**
   Reach out to Generation Earth at info@generationearth.com expressing your interest in one of the project guides. The Generation Earth Outreach Coordinator will connect you to a Program Coordinator.

2. **Set up a classroom visit**.
   If interested, work with your Generation Earth Program Coordinator to set up a classroom visit. Classroom visits can be with the teacher and/or students.

3. **Download a Project Guide**.
   Project Guides can be downloaded directly from generationearth.com

Eco Clubs

- Have your teacher advisor follow the guidelines provided to register your Eco Club.
- Once you have completed a project, your Eco Club will receive an official certification and join a network of clubs with access to resources and continued support from Generation Earth.

RESOURCES

To Learn More About the County's Stormwater Programs

- dpw.lacounty.gov
- cleanla.lacounty.gov
- safecleanwaterla.org
- waterforla.lacounty.gov

Stormdrain Stenciling

For information on storm drain pollution or storm drain stenciling:

- healthebay.org
- waterforla.lacounty.gov
- dpw.lacounty.gov/LACFCD/web

Beach and River Cleanups

- **Los Angeles County Beaches: Heal the Bay**
  healthebay.org/take-part

  — **Nothin' But Sand Beach Clean Up**
  10am – Noon
  Various Beaches, see calendar

  — **Adopt a Beach**
  Support for large group beach cleanup (must commit to three cleanups within a year)
  Submit request online using form

  — **Coastal Cleanup Day**
  A Saturday in September
  Locations throughout County
  healthebay.org/events

- **Los Angeles River: Friends of the Los Angeles River**
  folar.org/cleanup

  — **La Gran Limpieza/ The Great LA River Cleanup**
  Two weekends during April
  Multiple locations down entire length of river

References

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5. www.cawrecycles.org/recycling-news/1500
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Next Generation Science Standards

Science And Engineering Practices

- **Asking Questions and Defining Problems**
  - — **Check This Out (Pg. 3)**
    Check This Out activity allows students to identify problems in their community and use valuable information to begin to design solutions.
  - — **Water Audit (Pg. 9)**
    By conducting a water audit, students are able to define the problems on their campus.
  - — **Get More Information (Pg. 11)**
    By conducting interviews with key site stakeholders, students are able to ask and refine questions that will help them define their goals.
  - — **Choose a Project (Pg. 13)**
    Students work as a group to ask specific questions intended to determine what they need to achieve success.
- **Developing and Using Models**
  - — **Check This Out (Pg. 3)**
    Check This Out activity allows students to develop infographics as tools for representing water pollution issues and their solutions.
  - — **Water Audit (Pg. 9)**
    By creating a map of the site, students are able to construct and use models as helpful tools for presenting their ideas and explanations, which will serve as diagrams in planning their investigations.

- **Planning and Carrying Out Investigations**
  - **Water Audit (Pg. 9)**
    In the process of creating a map of the site, students are able to investigate the layout of their landscape, systematically collecting data about the feasibility of their project by identifying the variables that may impact its success, as well as the parameters they have to work within.
  - **Project Selection (Pg. 14)**
    In order to determine which project would best serve the site, students carry out investigations by collecting data about their surroundings which will inform the decision of which project to carry out.

- **Analyzing and Interpreting Data**
  - **Choose a Project (Pg. 13)**
    In order to determine which project would best serve the site, students are able to analyze and interpret critical data collected about their site during their Water Audit by utilizing a range of tools and experiments to determine water flow patterns, relationships between drains and storm drain systems and the toxicity levels of fertilizers or other chemicals being used for maintenance.

- **Using Mathematics and Computational Thinking**
  - **Water Audit (Pg. 9)**
    By assessing the physical layout of their site, students are able to utilize mathematics and computational thinking by designing a map that shows the physical scale of and quantitative relationship between various components essential to their project's success.

- **Constructing Explanations and Designing Solutions**
  - **Choose A Project (Pg. 13)**
    Based on the phenomena they have observed and the data they have collected and analyzed, students are able to form explanations and conclusions about what project they should carry out and design a plan for how to engineer and implement the solutions to the problems that informed their project choice.

- **Engaging in Argument from Evidence**
  - **Toolkit Process (all pages)**
    Students are able to critically argue why they have designed their specific plan and defend its validity based on the evidence they have produced.

Cross Cutting Concepts

- Patterns
- Cause and Effect
- Scale, proportion and quantity
- Systems and system models
- Energy and matter
- Structure and function
- Stability and change

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