TETRA TECH

MEMO

To:	Kahana Solar LLC c/o Julia Mancinelli, Director - Environment, Innergex Renewable Energy, Inc. (Innergex)
Cc:	Jamie Horner, Senior Director – Storage and Innovation, Innergex
From:	Leslie McClain, Senior Project Manager, Tetra Tech
Date:	May 14, 2021
Subject:	Soil and Water Quality Concerns in Context to the Proposed Kahana Solar Project, Maui County, Hawaiʻi

Kahana Solar LLC (Kahana Solar) proposes to construct and operate the Kahana Solar Project (Project) on privately owned land near Napili-Honokōwai, on the island of Maui, Hawaiʻi. The Project will consist of a 20-megawatt (MW_{AC}[1]) solar photovoltaic system coupled with a 80-megawatt-hour battery energy storage system as well as ancillary support infrastructure. The Project will primarily be located on tax map key (TMK) 4-3-001:017, owned by Maui Land & Pineapple Company, approximately 1.2-miles mauka of the Kapalua Airport (Figure 1).

As the Project is located within the Maui County Agricultural District and is a solar energy facility greater than 15 acres, it is considered a special use per Maui County Code (MCC) §19.30A.060(A)(12). Therefore, the Applicant is seeking a County Special Use Permit (CUP), as provided in MCC §19.510.070, to construct and operate the proposed Project. The Project also requires a State Special Permit (SUP) as provided in Hawaiʻi Revised Statutes (HRS) Chapter 205. Early in the Project's community outreach process, Kahana Solar received comments from a few community stakeholders expressing concern that the Project may impact the underlying soils, the aquifer/groundwater, surface waters and nearshore waters due to leaching of toxic materials from the solar panels. The purpose of this memorandum is to address these concerns by discussing the Project's potential for polluting groundwater, surface, and nearshore waters during construction and operation of the Project. A detailed description of the Project infrastructure is provided below (Section 1), followed by a description of the Project Study Area including the watershed and aquifer it sits within (Section 2), and a discussion of potential impacts to soils, groundwater, surface waters, and nearshore waters from Project construction and operations (Section 3).

1.0 Project Description

Solar energy is the conversion of sunlight into usable energy forms. The sun's rays transmit light energy, in the form of photons, which can be converted to electricity using certain materials that naturally

[1] A 20-MW_{AC} project means the Project has a generation capacity of up to 20 megawatts of alternating current (AC) electricity at one moment in time.

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release electrons when exposed to light. These materials are contained within the photovoltaic (PV) solar panels. The solar PV system will consist of a series of PV panels mounted on a solar tracker racking system, as well as related electrical equipment. The PV system will be organized into several solar arrays sited within a 380-acre Project Area (Figure 1). The Project Study Area used for resource surveys (i.e. archaeological, biological, waters, etc.) encompasses approximately 412 acres. The Project Study Area includes the 380-acre Project Area referred to in this memorandum plus an additional 32 acres associated with the Project's main access road which would follow an existing agricultural road extending from the intersection of Honoapiʻilani Highway and Akahele Street, south of the Kapalua Airport, then mauka to the Project Area.

The Project Study Area is located on and surrounded by mostly vacant, fallow agricultural land, previously used for commercial pineapple and sugar cane cultivation. Pineapple operations ceased in 2009, and the land is currently undeveloped (Munekiyo Hiraga 2019; Pacific Legacy 2021). The former agricultural fields in the Project Area are separated into four areas by the gulches that run east-west through and/or adjacent to the Project Area. More information on the gulches is provided below in the *Project Area Description*. Each solar array area is surrounded by security fencing set back a minimum of 100 feet from the top of each gulch. Each solar array area is labeled on Figure 1 as follows (south to north): Area 1, Area 2, Area 3, Area 4. The total area within the four fenced areas is 220 acres. For purposes of evaluating impacts and demonstrating compliance with the applicable county and state review criteria, Tetra Tech has analyzed a proposed Project layout, as shown in Figure 1. However, the final design is anticipated to have a smaller footprint. Kahana Solar assumes the Project solar panels will cover a maximum of 65 acres, will be located within the four solar array areas identified in Figure 1, and will be sited no closer than 100 feet from the top of the gulches. The Project has been designed to limit the grading footprint and to minimize stormwater runoff. Low impact design (LID) techniques have been incorporated into the project in various ways to help keep the landscape minimally changed by the Project.

The panels will be arranged in north-south oriented rows within four solar array areas. The PV panels will rotate their orientation throughout the day to track the sun, facing east in the morning, facing straight up at solar noon, and facing west in the afternoon. The spacing between the solar trackers will be approximately 21 feet and the entire area below and around the solar panels will be revegetated after construction to reduce dust and sediment and erosion issues. The majority of the Project Study Area, including the area beneath the solar panels, will require minor grading such that the existing drainage patterns will not be significantly altered. In general, grading will be focused around the access roads, equipment pads, and substation.

Electricity produced by the Project's solar panels will be fed into a power conversion system (PCS) via underground DC electric collector lines.[2] The Project will include up to 10 PCSs distributed throughout the solar array areas. Each PCS includes three or four Photovoltaic Coupled Energy Storage System (PV-

[2] In areas where the desired depth cannot be achieved (due to basalt rock or other prohibitive subsurface conditions), the collector lines may be housed in cable trays in accordance with the applicable National Electric Code provisions.

Coupled ESS) Units and a step-up transformer. The PV-Coupled ESS Units combine a lithium-ion battery system, inverter, and controller that can either a) store DC electricity for future use, or b) convert DC electricity to alternating current (AC) electricity and send the AC electricity to the step-up transformer, as required based on grid demand. The step-up transformer increases the AC voltage from the PV-Coupled ESS units to 34.5 kilovolts (kV), where it will then be conveyed via AC underground[3] medium voltage collector lines and combiner boxes to the Project's collector substation. The collector substation will include a main power transformer which will further increase the electrical voltage to 69-kV in order to match the voltage of the Maui Electric electrical grid. A new switchyard will be constructed adjacent to the Project collector substation as part of the interconnection facilities. A 69-kV overhead transmission line will connect the electricity produced by the Project to the existing Maui Electric 69-kV overhead transmission line located less than 400 feet west of the switchyard (Figure 1).

The Project will not require extremely hazardous materials as defined by 40 CFR §355 – List of Extremely Hazardous Substances and Their Threshold Planning Quantities; no such substances will be produced, used, stored, transported, or disposed of as part of Project construction, operations and maintenance, or decommissioning phases. However, as the community has expressed concerns regarding potential leaching of toxic materials from the solar panel and other Project infrastructure, the following subsections provide more detail regarding the material components that make up the various Project infrastructure and its potential for introducing toxic substances into the soils, groundwater, and surface waters.

Solar Panel Construction/Design

The solar panels proposed at the Project are made up of crystalline silicon PV cells. These are the most common solar cells used in commercially available solar panels (USDOE 2021). The crystalline silicon cells are insulated and protected from the elements on both sides by sheets of polymers and glass. The glass is tempered and covered with a protective plastic layer that gives the glass added strength and ensure that if the glass were to crack or break it would stay intact (similar to how a car windshield cracks but stays intact). Thus, damaged panels generally do not break into pieces but remain together in one piece (NC Clean Energy Technology Center 2017). The panels are held together in an aluminum frame. On the back of the panel, a junction box contains copper wiring and electrical connections manufactured in a similar manner to other commercial electronic products.

PV modules are designed for a long service life, generally 30-35 years, and typically come with a 25-year warranty. For a panel to comply with its warranty, its internal components must be sealed from any moisture to prevent corrosion that would reduce the panel's output below power warranty levels. The output of the solar panels are remotely monitored with periodic visual inspections. If a panel's output or efficiency drops, or in the unlikely event that a panel breaks, it would be removed from the PV array and recycled.

[3] In areas where the desired depth cannot be achieved (due to basalt rock or other prohibitive subsurface conditions), the collector lines may be housed in cable trays in accordance with the applicable National Electric Code provisions.

Solar Panel Materials

Well over 80% (by weight) of the content of a PV panel is the tempered glass front and the aluminum frame, both of which are common building materials. Most of the remaining portion are common plastics. The active, electricity generating and conducting components of the system makeup less than 5% of the weight of most panels and include the silicon photovoltaic cells, the small electrical leads connecting them together, and the wires coming out of the back of the panel (NC Clean Energy Technology Center 2017). The PV cell itself is nearly 100% silicon and silicon is the second most common element in the Earth's crust. The silicon for PV cells is obtained by high-temperature processing of quartz sand (SiO2) that removes its oxygen molecules (NC Clean Energy Technology Center 2017). The refined silicon is converted to a PV cell by adding extremely small amounts of boron and phosphorus, both of which are common and of very low toxicity (NC Clean Energy Technology Center 2017). There are other minor components of the PV cell that are generally benign materials. The glass frit and solder (both components of the PV cell that is encapsulated in the glass panel) may contain trace amount of metals that can have some toxicity but testing to simulate the potential for leaching from broken panels did not find a potential toxicity threat from these trace elements (NC Clean Energy Technology Center 2017).

The other components of the solar modules include the mounting structure, commonly referred to as “racking”. The racking includes vertical post made out of galvanized steel and other above-ground racking components made of either galvanized steel or aluminum, which are both extremely common and benign building materials.

PCS Materials

As stated earlier, the electricity produced by the Project’s solar panels will be fed into a power conversion system (PCS) via underground DC electric collector lines. Each PCS includes three or four PV-Coupled ESS Units and a step-up transformer. The PV-Coupled ESS Units combine a lithium-ion battery system, inverter, and controller. Each PV-Coupled ESS unit will have a weather-proof steel enclosure that protect the working components from the elements. The units will be mounted on concrete pads or beam foundations. Each PCS unit will include and incorporate multiple layers of protection to avoid failures and risks of fire.

The step-up transformer increases the AC voltage from the PV-Coupled ESS units to 34.5 kilovolts (kV), where it will then be conveyed via collector lines to the Project’s collector substation. Transformers will use oil-based products for insulation and cooling. Although transformer oil is typically mineral oil or seed oil that is considered nontoxic and a non-hazardous substance, secondary containment measures will be put in place to ensure the potential for oil-related spills is minimal and if one occurred it would be contained.

Substation and Switchyard

The Project collector substation and the switchyard will include equipment such as free-standing steel switch-rack structures, a main power transformer, breakers, utility poles, and associated electrical lines. This infrastructure will be separately fenced for electrical safety and will include concrete foundations and secondary containment measures will be put in place to ensure the potential for oil-related spills (from transformer oil) is minimal and if one occurred it would be contained. An emergency management system (EMS) will be installed to allow all operations to be supervised and all system functions to be protected in response to real-time dispatch signals from Maui Electric, as well as report production data, energy forecasts, and other system health data.

Construction and Operational Considerations

During the construction phase of the Project, some hazardous fuels (e.g., gasoline and diesel fuel) and lubricants, will be onsite. However, only a limited amount of these materials will be onsite and implementation of best management practices (BMPs) (e.g. proper storage procedures with secondary containment, routine inspection of vehicles for leaks, fueling vehicles and equipment offsite or within designated areas with secondary containment, etc.) will ensure there will be minimal or no significant effect on surface, underground and marine water resources and neighboring properties and surrounding flora and fauna. A spill prevention plan will be developed prior to construction that describes measures that will be taken to avoid and minimize potential impacts associated with refueling, handling and storage of hazardous materials. Development and execution of the spill prevention plan will reduce potential impacts to a less than significant level.

No chemicals are expected to be used for ongoing maintenance of the solar panels. Solar arrays will be cleaned with a mild, biodegradable detergent, if or when necessary. Other more innovative water-less and dry brushing techniques will be explored as an option.

Vegetation will be managed during operations to ensure vegetation does not overgrow the photovoltaic panels, preventing solar radiation from reaching them, and to reduce fire risk. Vegetation control will employ BMPs and techniques that are most appropriate for the local environment (i.e. mowing and/or grazing) thus reducing the need to use chemical herbicides. In rare circumstances where it is necessary to use herbicides, an effort will be made to minimize use and only apply bio-degradable, EPA-registered, organic solutions that are non-toxic to wildlife. Sustainable, long-term management practices and the promotion of healthy biodiversity within local ecosystems is a priority. Any herbicides used for vegetation management on the site will be selected and used in a manner that fully complies with all applicable laws and regulations.

2.0 Project Study Area Description

The climate in the Project Study Area ranges from arid and very dry near the western edges to seasonally mesic in the upper elevations (Price et al. 2012). According to the Online Rainfall Atlas of Hawaiʻi (Giambelluca et al. 2013), the Kapalua Airport receives a mean annual rainfall of approximately 29.3 inches and the upper elevations of the Project Study Area receive 72.1 inches. Rainfall is typically highest in December/January and lowest in June through September (Giambelluca et al. 2013).

In general, the Project Study Area's terrain slopes northwest toward the Pacific Ocean and is bisected by several gulches. The elevation of the Project Study Area ranges from approximately 80 feet above mean sea level (amsl) in the western portion near Akahele Street to approximately 1,360 feet amsl near the eastern boundary. The fallow agricultural fields where the solar arrays will be sited have an average slope of 10% facing northwest. The slopes within the four gulches in and near the Project Study Area are over 15% and, in some places, reach close to 50% slope.

The gulches that run east-west through the Project Study Area separate the agricultural fields into four areas. Kahana Stream flows north of the Project Study Area, Pulepule Gulch flows between Areas 3 and 4, Kahanaiki Gulch flows between Areas 2 and 3, an unnamed gulch flows between Areas 1 and 2, and Māhinahina Gulch flows to the south of Area 1 (Figure 1). None of these gulches are associated with perennial streams and are likely ephemeral under the Navigable Waters Protection Rule (NWPR) because they only have surface flow in direct response to rainfall. Additional details can be found in the Project's Waters of the U.S. determination and delineation report (Tetra Tech, 2021a). The solar panels will be setback by a minimum of 100 feet from the top of the gulches.

A general biological survey was conducted by Tetra Tech and LeGrande Biological Surveys Inc. on June 16-20, 2020 and July 2-3, 2020. Biologists conducted a pedestrian survey and recorded all plant species, dominant vegetation types, and any listed or rare plant species within the Project Study Area. During the survey, biologists examined areas more likely to support native plants (e.g., rocky outcrops, gulches, and shady areas) more intensely. The biologists also documented all bird species seen or heard while walking or driving within the Project Study Area and conducted two-minute point count surveys to document listed waterbirds that could occur within or near the Project Study Area. Habitat of listed animals, if observed, was also documented. Additional details regarding survey methodology can be found in the Project's Biological Resources Survey Report (Tetra Tech 2021b).

The biological surveys found no listed plant species in the Project Study Area and found low concentrations of native plants mostly in the gulches and along the upper elevations of the Project Study Area. The fallow, overgrown pineapple fields are dominated by non-native plant species. Biological surveys documented 141 plant species within the Project Study Area: 18 of the observed plant species are native to the Hawaiian Islands, and the remaining 123 plant species are non-native to the Hawaiian Islands. Nineteen bird species were recorded within the Project Study Area, most of which are non-native to the Hawaiian Islands, and are species commonly found in rural or agricultural areas. Three native (endemic) birds were detected in the Project Study Area: the ʻapapane (*Himatione sanguinea*), Hawaiʻi ʻamakihi (*Chlorodrepanis virens*), and aeʻo or Hawaiian stilt (*Himantopus mexicanus knudseni*). Hawaiʻi ʻamakihi and ʻapapane were heard along the forested edges of Kahanaiki Gulch and Māhinahina Stream on the eastern edge of the Project Study Area. Additionally, the threatened Hawaiian goose or nēnē (*Branta sandwichensis*) was recorded in the immediate vicinity of the Project Study Area. Additional details regarding survey results can be found in the Project's Biological Resources Survey Report (Tetra Tech 2021b).

The Project Study Area is within the Honokōwai and Kahana watersheds (CWRM 2008; Group 70 and SRGII 2016). These watersheds are included in the Atlas of Hawaiian Watersheds (Parham et al. 2008). Mahinahina Gulch, Area 1, the unnamed gulch, and Area 2 are all located in the Honokōwai watershed. Kahanaiki Gulch, Area 3, Pulepule Gulch, Area 4, and Kahana Stream are all located within the Kahana watershed. The Project's main access road from Akahele Street to the Project solar array areas is located in the Honokōwai watershed. See Figure 2.

The Project is located within the Lahaina Aquifer Sector, which is further delineated into six hydrologically connected ground-water hydrologic units for management purposes by the State of Hawaiʻi Commission on Water Resource Management (CWRM)[4]. The majority of the Project is located within the Honokōwai Hydrologic Unit but a portion of Area 4 is located in a different system – the Honolua Hydrologic Unit (CWRM 2018, see Figure 3). In Hawaii, the major ground water systems are either freshwater-lens or dike-impounded systems. A freshwater-lens system is found in dike-free volcanic rocks[5] and includes a lens-shaped freshwater body that forms because of the density difference between freshwater and the underlying saltwater (Gingerich and Engott 2012). An intermediate transition zone of brackish water (which can be quite thick) underlays the freshwater-lens before the underlying saltwater (Figure 4). Freshwater-lens systems are recharged by direct infiltration of precipitation and irrigation water, and by inflow from upgradient ground-water systems (USGS 2000). Freshwater flow is predominantly horizontal in the dike-free volcanic rocks. Fresh groundwater moves mainly from inland recharge areas to coastal discharge areas, where springs and seeps exist above and below sea level. Water moving westward from the center of West Maui Volcano flows radially to discharge areas along the coast (Gingerich and Engott 2012).

The most important source of fresh groundwater in the Lahaina area is the freshwater lens in dike-free volcanic rocks. The dike-impounded systems are found near the caldera and rift zones of the volcanoes, where low permeability dikes have intruded other rocks (Gingerich and Engott 2012). These dikes can impound water to altitudes as great as 3,000 feet above mean sea level (amsl) in the West Maui Volcano interior (Gingerich and Engott 2012). In contrast, the water table in the dike-free volcanic rocks/fresh-water lens is as high as a few feet above sea level. The water table under the Project Study Area is estimated to be about 4 to 6 feet amsl based on available well data from CWRM (HGGRC 2012). There are four existing wells within the Project Area, a deep monitoring well at the Maui County Department of Water Supply water treatment plant located just south of Māhinahina Gulch, and four wells located on the parcels just south of Māhinahina Gulch. As most of these wells are located at 600 to 1,000 feet amsl, the water table below the Project Area is estimated to be anywhere from 600 to 1,000 feet below the ground.

3.0 Potential Impacts to Soils, Ground Water, Surface Waters and Nearshore Waters

The concern for Project related impacts to soils, groundwater, surface waters, and nearshore waters are primarily associated with the introduction of hazardous materials to the Project Area and the potential

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[4]Ground-water hydrologic units have been established by the CWRM to provide a consistent basis for managing ground water resources. The units are primarily determined by subsurface conditions (CWRM 2018).
[5] Dikes are thin, near-vertical sheets of massive, low-permeability rock that intrude existing rocks, commonly permeable lava flows. Dikes can extend vertically and laterally for long distances and impede the flow of ground water (USGS 2000).

for erosion and sediment runoff during Project construction and operation. The following sections discuss these potential impacts in more detail.

Hazardous Materials

The Project's construction and operation is anticipated to have no significant effect on soils, groundwater, surface waters, and nearshore waters due to Project related hazardous materials. As noted in Section 1.0 above, the Project will not require extremely hazardous materials as defined by 40 CFR §355 – List of Extremely Hazardous Substances and Their Threshold Planning Quantities. Solar panels are mostly composed of benign materials such as glass, aluminum, plastic and steel and the small amounts of toxic materials present in the panels are sealed within the glass panels. Concern that hazardous materials may leach from damaged panels will be mitigated by the Project's operational monitoring program. This program will monitor each panel's power output/efficiency and will detect panel malfunctions in real time, allowing the operations team to promptly remove damaged panels from the site, thus avoiding the introduction of trace amounts of hazardous materials to the Project Area.

In general, the concern for PV panel toxicity is related to the disposal of panels in landfills. Many PV panels can be reused even after their useful life at a utility scale solar facility is done. And for panels that are no longer usable (i.e. damaged) they are usually recycled. However, in a scenario where the panels are disposed of in a landfill, most research concludes that crystalline silicon panels, such as the ones proposed at Kahana, are considered non-hazardous and have no risk of leaching hazardous substances in the landfill (NC Clean Energy 2017). Thus, PV modules do not pose a hazardous materials risk to the environment during their service lifetime and do not pose a material threat to public health and safety.

Other potential sources of hazardous materials at the Project include oil-based products used in transformers at the PCS units and the substation. As these oils are typically mineral or seed oil based, they are considered non-hazardous. Furthermore, secondary containment measures will be put in place to ensure the potential for oil-related spills is minimal and if one occurred it would be contained. A limited amount of hazardous fuels (e.g., gasoline and diesel fuel) and lubricants will be onsite during construction. However, potential impacts to soils, groundwater, and surface waters would be mitigated through the implementation of BMPs ensuring there will be minimal or no significant effect on surface, underground and marine water resources and neighboring properties and surrounding flora and fauna. No chemicals are expected to be used for ongoing maintenance of the solar panels and use of herbicides to control vegetation is not anticipated but if it were required it would be used sparingly and only bio-degradable, EPA-registered, organic solutions would be used that are non-toxic to wildlife.

Due to the limited presence of hazardous materials in the Project components and construction equipment, and due to the proposed containment and mitigation measures, the Project is anticipated to have minimal or no significant effect on soils, ground water, surface waters, and near shore waters due to presence of hazardous materials.

Erosion and Sediment Runoff

Project infrastructure will be sited to generally avoid surface water features within the Project Study Area to the maximum extent practicable. However, access road crossings and/or collector line crossings over the unnamed gulch, Kahanaiki Gulch, and Pulepule Gulch will be needed to allow for Project access. The crossings will be designed to utilize existing crossings to the extent practicable and to have as small of a footprint as possible and will be designed to sufficiently convey flows during and following rain events.

In addition to the typical stormwater management BMPs, Project design minimizes stormwater runoff through the following LID techniques:

- limit the amount of impervious surfaces to reduce runoff,
- minimize the amount of grading to promote sheet flow,
- plant ground cover on the majority of the site to provide both runoff reduction and treatment, and
- incorporate water bars/rolling dips into the design and have vetiver grass located at the outlets of the water bars/rolling dips to promote BMPs.

Unlike urban land uses such as buildings and parking lots, the amount of pervious surface area associated with a utility scale solar project is expected to be minimal. The solar panels are mounted on piles that have a very small footprint. Following Maui County's guidance on siting solar arrays to minimize stormwater runoff, the solar panels will be adequately spaced and vegetation maintained below and around the panels to allow for rainwater dripping off the panels to be absorbed by the ground or dispersed as sheet flow. Some pervious areas will be added to the Project Area such as the substation and PCS units. However, the Project design includes sediment basins provided at critical locations on site to ensure any potential for sediment erosion will be captured and treated during construction. Once construction is complete and permanent vegetation is established within the site, the sediment basins will be converted to detention basins. These detention basins will continue to provide stormwater runoff control by means of a discharge culvert and riprap outlet. The volume of water within the detention basins will be controlled to reduce future erosion downslope. Where needed, swales will be used to help route stormwater into the basins.

New access roads will be designed with best management practices to control erosion and runoff. These same BMPs will be implemented on existing agricultural roads within the Project Area that Kahana Solar plans to use/maintain. Graded roads will be crowned or cross sloped to facilitate runoff. Some roads may require installation of ditches to carry runoff to improved outlets (e.g. energy dissipators [riprap outlets] or detention basins).

Kahana Solar has been consulting with Ridge to Reef, Coral Reef Alliance, and the West Maui Soil and Conservation District to learn about their ongoing efforts to restore the natural functions of the two watersheds the Project is located within and to reduce sediment runoff during storm events. The Wahikuli-Honokōwai Watershed Management Plan (SRGII 2012) and the Kahana, Honokahua, and Honolua Watershed Management Plan (Group 70 and SRGII 2016) both identify dirt roads in fallow agricultural areas that are highly eroded and in disrepair as significant sources of sediment runoff. Based on the Project layout and equipment selection, Kahana Solar will be improving some existing agricultural access roads located within the Project footprint and therefore will be assisting with removal of some of these non-point sediment sources. For example, Kahana Solar proposes to access the solar array areas by using and improving an existing access road that extends from the intersection of Honoapiʻilani Highway and Akahele Street, south of the Kapalua Airport, then mauka to the Project's solar site. This access road is identified by the Wahikuli-Honokōwai Watershed Management Plan (SRGII 2012) as a priority road needing remediation. Kahana Solar will implement, where applicable and required, the Watershed Plan's recommended practices for controlling erosion and runoff such as improving the road surface, road drainage, and constructing sediment retention basins as needed, along this road.

Based on the design and BMP discussed above, the Project's construction and operation is anticipated to have minimal or no significant effect on soils, groundwater, surface waters, and nearshore waters due to erosion and sediment runoff.

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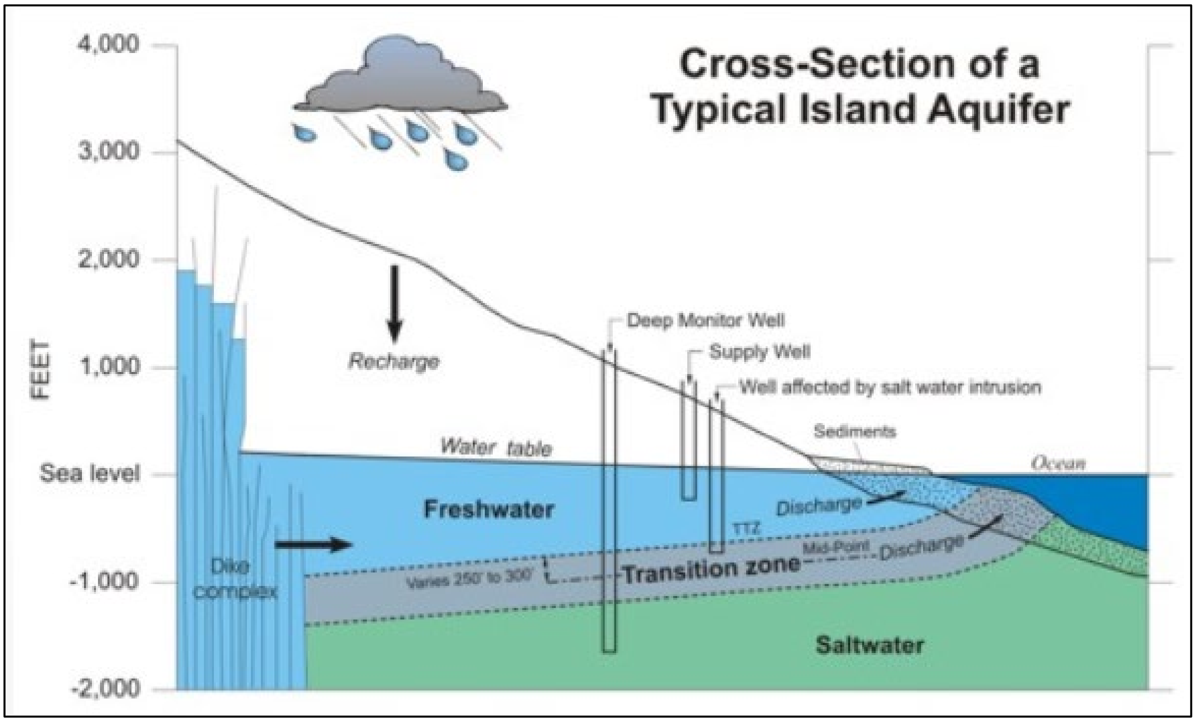
Figure 4. Cross Section of Typical Island Aquifer



Source: Gingerich and Engott 2012