County of Santa Cruz

PLANNING DEPARTMENT
701 OCEAN STREET, 4TH FLOOR, SANTA CRUZ, CA 95060
(831) 454-2580 FAX: (831) 454-2131
KATHLEEN MOLLOY PREVISICH, PLANNING DIRECTOR
www.sccoplanning.com

NOTICE OF INTENT TO ADOPT A MITIGATED NEGATIVE DECLARATION

NOTICE OF PUBLIC REVIEW AND COMMENT PERIOD

Pursuant to the California Environmental Quality Act, the following project has been reviewed by the County Environmental Coordinator to determine if it has a potential to create significant impacts to the environment and, if so, how such impacts could be solved. A Negative Declaration is prepared in cases where the project is determined not to have any significant environmental impacts. Either a Mitigated Negative Declaration or Environmental Impact Report (EIR) is prepared for projects that may result in a significant impact to the environment.

Public review periods are provided for these Environmental Determinations according to the requirements of the County Environmental Review Guidelines. The environmental document is available for review at the County Planning Department located at 701 Ocean Street, in Santa Cruz. You may also view the environmental document on the web at www.sccoplanning.com under the Planning Department menu. If you have questions or comments about this Notice of Intent, please contact Todd Sexauer of the Environmental Review staff at (831) 454-3511.

The County of Santa Cruz does not discriminate on the basis of disability, and no person shall, by reason of a disability, be denied the benefits of its services, programs or activities. If you require special assistance in order to review this information, please contact Bernice Shawver at (831) 454-3137 to make arrangements.

PROJECT: Rio Del Mar Storm Drain Improvements **APP #: 171057**

APN(S): No APN Specific (County Right of Way)

PROJECT DESCRIPTION: This is a proposal to install drainage improvements consisting of new and replacement underground storm drains, installation of new pump station and relocate stormwater outfall to new location within a portion of the county right of way on the ocean side of Beach Drive. Project intended to alleviate frequent flooding within the Rio Del Mar Flats and improve water quality.

PROJECT LOCATION: The proposed project is located in the Rio Del Mar Flats within the community of Aptos in the unincorporated Santa Cruz County. The County of Santa Cruz is bounded on the north by San Mateo County, on the south by Monterey and San Benito counties, on the east by Santa Clara County, and on the south and west by the Monterey Bay and the Pacific Ocean.

EXISTING ZONE DISTRICT: PR, C-1, RM-3
APPLICANT: Department of Public Works
OWNER: Department of Public Works
PROJECT PLANNER: Nathan Macbeth, (831) 454-3118
EMAIL: Nathan.Macbeth@santacruzcounty.us
ACTION: Negative Declaration with Mitigations
REVIEW PERIOD: October 2, 2017 through October 31, 2017

This project will be considered at a public hearing by the Zoning Administrator. The time, date and location have not been set. When scheduling does occur, these items will be included in all public hearing notices for the project.

COUNTY OF SANTA CRUZ

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MITIGATED NEGATIVE DECLARATION

Project: Rio Del Mar Storm Drain Improvements **APN(S): No APN Specific (County Right of Way)**

Project Description: This is a proposal to install drainage improvements consisting of new and replacement underground storm drains, installation of new pump station and relocate stormwater outfall to new location within a portion of the county right of way on the ocean side of Beach Drive. Project intended to alleviate frequent flooding within the Rio Del Mar Flats and improve water quality.

Project Location: The proposed project is located in the Rio Del Mar Flats within the community of Aptos in the unincorporated Santa Cruz County. The County of Santa Cruz is bounded on the north by San Mateo County, on the south by Monterey and San Benito counties, on the east by Santa Clara County, and on the south and west by the Monterey Bay and the Pacific Ocean.

Owner: County of Santa Cruz

Applicant: County of Santa Cruz

Staff Planner: Nathan Macbeth, (831) 454-3118

Email: Nathan.Macbeth@santacruzcounty.us

This project will be considered at a public hearing by the Zoning Administrator. The time, date and location have not been set. When scheduling does occur, these items will be included in all public hearing notices for the project.

California Environmental Quality Act Mitigated Negative Declaration Findings:

Find, that this Mitigated Negative Declaration reflects the decision-making body's independent judgment and analysis, and; that the decision-making body has reviewed and considered the information contained in this Mitigated Negative Declaration and the comments received during the public review period; and, that revisions in the project plans or proposals made by or agreed to by the project applicant would avoid the effects or mitigate the effects to a point where clearly no significant effects would occur; and, on the basis of the whole record before the decision-making body (including this Mitigated Negative Declaration) that there is no substantial evidence that the project as revised will have a significant effect on the environment. The expected environmental impacts of the project are documented in the attached Initial Study on file with the County of Santa Cruz Clerk of the Board located at 701 Ocean Street, 5th Floor, Santa Cruz, California.

Review Period Ends: October 31, 2017

Date:_____

_____
TODD SEXAUER, Environmental Coordinator
(831) 454-3511

County of Santa Cruz

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CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)
INITIAL STUDY/ENVIRONMENTAL CHECKLIST

Date: September 25, 2017 **Application Number:** 171057

Project Name: Rio Del Mar Storm Drain Improvements **Staff Planner:** Nathan MacBeth

I. OVERVIEW AND ENVIRONMENTAL DETERMINATION

APPLICANT: Department of Public Works **APN(s):** No APN Spec (County Right of Way)

OWNER: Department of Public Works **SUPERVISORAL DISTRICT:** 2nd

PROJECT LOCATION: The proposed project is located in the Rio Del Mar Flats within the community of Aptos in the unincorporated Santa Cruz County (FIGURE 1). Santa Cruz County is bounded on the north by San Mateo County, on the south by Monterey and San Benito counties, on the east by Santa Clara County, and on the south and west by the Monterey Bay and the Pacific Ocean.

SUMMARY PROJECT DESCRIPTION:

This is a proposal to install drainage improvements consisting of new and replacement underground storm drains, installation of new pump station and relocate stormwater outfall to new location within a portion of the county right of way on the ocean side of Beach Drive. Project intended to alleviate frequent flooding within the Rio Del Mar Flats and improve water quality.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED: *All of the following potential environmental impacts are evaluated in this Initial Study. Categories that are marked have been analyzed in greater detail based on project specific information.*

- ☒ Aesthetics and Visual Resources
- ☐ Agriculture and Forestry Resources
- ☒ Air Quality
- ☐ Biological Resources
- ☒ Cultural Resources
- ☒ Geology and Soils
- ☐ Greenhouse Gas Emissions
- ☐ Hazards and Hazardous Materials
- ☒ Hydrology/Water Supply/Water Quality
- ☐ Mineral Resources
- ☒ Noise
- ☐ Population and Housing
- ☐ Public Services
- ☐ Recreation
- ☐ Transportation/Traffic
- ☒ Utilities and Service Systems
- ☐ Tribal Cultural Resources
- ☐ Mandatory Findings of Significance

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED: *All of the following potential environmental impacts are evaluated in this Initial Study. Categories that are marked have been analyzed in greater detail based on project specific information.*

☐ Land Use and Planning

DISCRETIONARY APPROVAL(S) BEING CONSIDERED:

☐ General Plan Amendment	☒ Coastal Development Permit
☐ Land Division	☐ Grading Permit
☐ Rezoning	☐ Riparian Exception
☐ Development Permit	☐ LAFCO Annexation
☐ Sewer Connection Permit	☐ Other:

OTHER PUBLIC AGENCIES WHOSE APPROVAL IS REQUIRED (e.g., permits, financing approval, or participation agreement):

Permit Type/Action	Agency
Coastal Development Permit (Appealable)	California Coastal Commission

DETERMINATION:

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Todd Sexauer — 9-28-17

TODD SEXAUER, Environmental Coordinator — Date

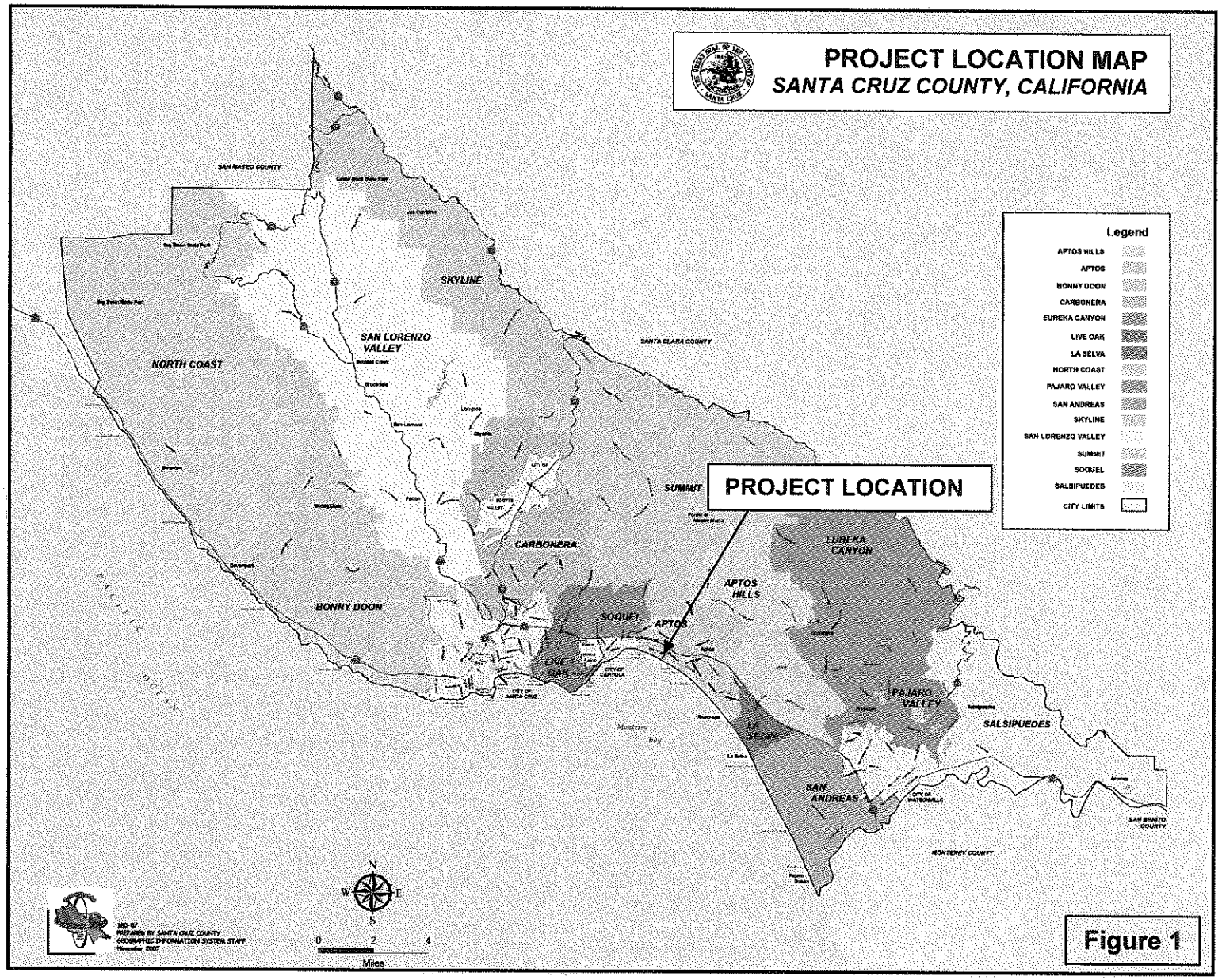
PROJECT LOCATION MAP
SANTA CRUZ COUNTY, CALIFORNIA
Legend
APTOS HILLS
APTOS
BONNY DOON
CARBONERA
EUREKA CANYON
LIVE OAK
LA SELVA
NORTH COAST
PAJARO VALLEY
SAN ANDREAS
SKYLINE
SAN LORENZO VALLEY
SUMMIT
SOQUEL
SALSIPUEDES
CITY LIMITS
PROJECT LOCATION
SKYLINE
SAN LORENZO VALLEY
NORTH COAST
SUMMIT
CARBONERA
EUREKA CANYON
APTOS HILLS
BONNY DOON
SOQUEL
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Figure 1

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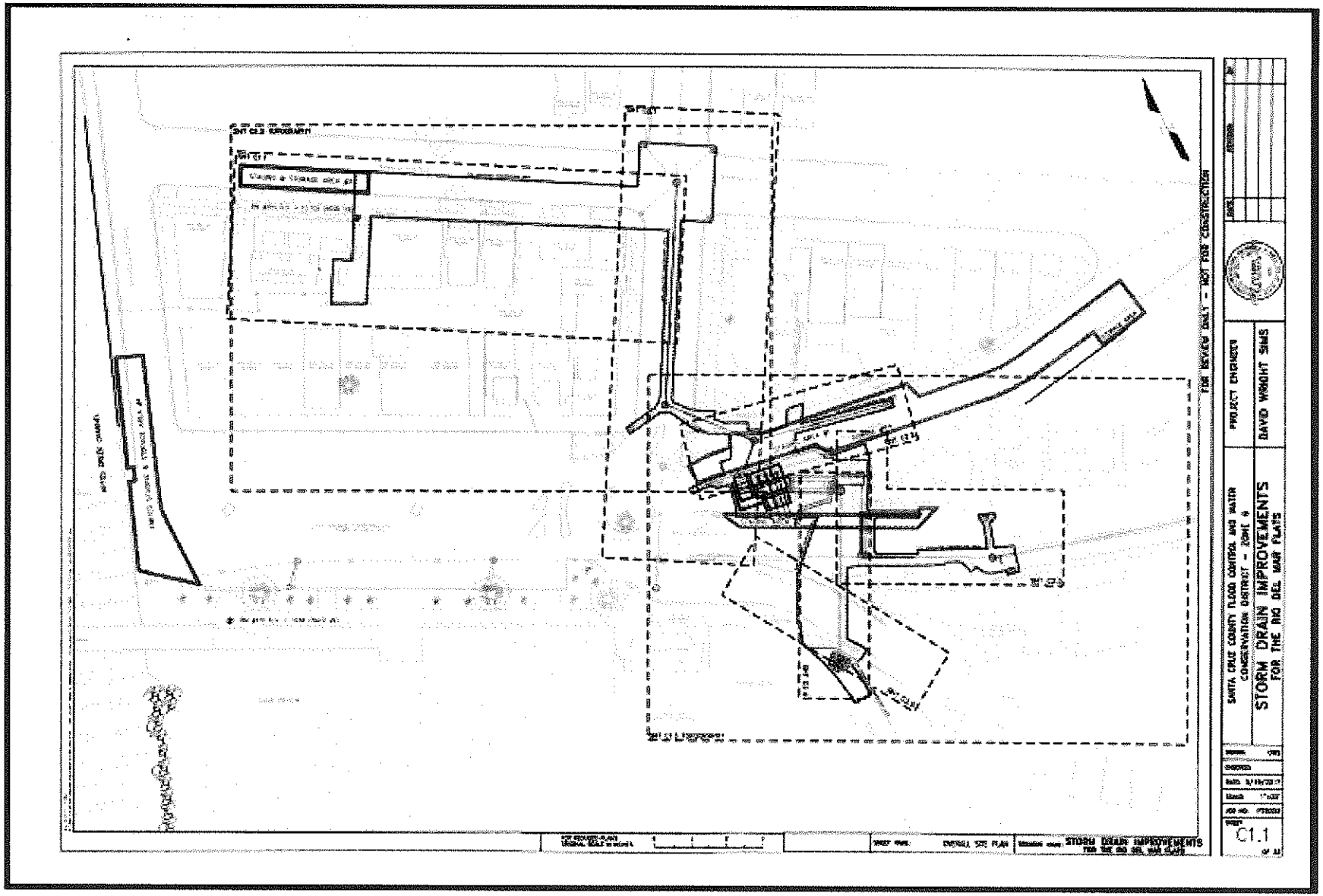

Project Site Plan **Figure 2**

RDM Storm Drain Improvements *Application Number:* 171057

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II. BACKGROUND INFORMATION

EXISTING SITE CONDITIONS:

Parcel Size (acres): County Right of way
Existing Land Use: Public Utilities
Vegetation: Non-native vegetation
Slope in area affected by project: ☒ 0 - 30% ☐ 31 – 100% ☐ N/A
Nearby Watercourse: Aptos Creek
Distance To: Approximately 450 feet

ENVIRONMENTAL RESOURCES AND CONSTRAINTS:

Water Supply Watershed:	Not Mapped	Fault Zone:	Not Mapped
Groundwater Recharge:	Not Mapped	Scenic Corridor:	Mapped Scenic
Timber or Mineral:	Not Mapped	Historic:	N/A
Agricultural Resource:	Not Mapped	Archaeology:	Not Mapped
Biologically Sensitive Habitat:		Noise Constraint:	N/A
Fire Hazard:	Not mapped	Electric Power Lines:	Overhead power
Floodplain:	Located within Flood Plain	Solar Access:	No change
Erosion:	Erosion control plan provided	Solar Orientation:	N/A
Landslide:	N/A	Hazardous Materials:	Not Listed
Liquefaction:	Very High Potential	Other:	N/A

SERVICES:

Fire Protection:	Aptos/LaSelva	Drainage District:	Zone 6
School District:	Pajaro Valley Unified	Project Access:	Public Right of Way
Sewage Disposal:	County Sanitation District	Water Supply:	Soquel Creek Water District

PLANNING POLICIES:

Zone District: PR, C-1, RM-3

Special Designation: Rio Del Mar Flats/Esplanade Special Community

General Plan: O-R, C-N, R-UH

Urban Services Line:	☒ Inside	☐ Outside
Coastal Zone:	☒ Inside	☐ Outside

ENVIRONMENTAL SETTING AND SURROUNDING LAND USES:

Natural Environment

Santa Cruz County is uniquely situated along the northern end of Monterey Bay approximately 55 miles south of the City of San Francisco along the Central Coast. The Pacific Ocean and Monterey Bay to the west and south, the mountains inland, and the prime agricultural lands along both the northern and southern coast of the county create limitations on the style and amount of building that can take place. Simultaneously, these natural features create an environment that attracts both visitors and new residents every year. The natural landscape provides the basic features that set Santa Cruz apart from the surrounding counties and require specific accommodations to ensure building is done in a safe, responsible and environmentally respectful manner.

The California Coastal Zone affects nearly one third of the land in the urbanized area of the unincorporated County with special restrictions, regulations, and processing procedures required for development within that area. Steep hillsides require extensive review and engineering to ensure that slopes remain stable, buildings are safe, and water quality is not impacted by increased erosion. The farmland in Santa Cruz County is among the best in the world, and the agriculture industry is a primary economic generator for the County. Preserving this industry in the face of population growth requires that soils best suited to commercial agriculture remain active in crop production rather than converting to other land uses.

PROJECT BACKGROUND:

Rio Del Mar Flats is an area developed with commercial, residential and recreational uses. This area is prone to flooding due to heavy rainfall, high tides and lack of sufficient drainage gradients in the existing stormwater system. The proposed stormwater improvements are based on a multi-year joint agency effort to address specific issues occurring in Rio Del Mar Flats. Since 2012, Department of Public works staff has held public meetings (Attachment 2), consulted with other regulatory agencies including County staff, State Parks, Coastal Commission staff, (FEMA) Federal Emergency Management Agency and Department of Fish and Wildlife in order to mitigate persistent flooding in the Rio Del Mar Flats. A FEMA grant was secured by the County of Santa a Cruz to assist with the costs associated with the construction of the project.

DETAILED PROJECT DESCRIPTION:

This is a proposal to install drainage improvements intended to alleviate seasonal flooding within the Rio Del Mar Flats, improve water quality, and maintain public and emergency vehicle access.

The project would consist of installation of new and replacement underground storm drains, through a combination of open trenching and directional drilling. Grading would include excavation of approximately 930 cubic yards of material for the installation of new pump station within a portion of the County right of way located between Rio Del Mar Boulevard and Venetian Road and installation of a new stormwater outfall located within a portion of the County right of way on the ocean side of Beach Drive.

The project would obtain primary and auxiliary power from an existing County Sanitation District Pump Station (Esplanade Pump Station). Installation of electric service would be underground and requiring trenching. The project would be designed to accommodate connection to a second backup generator located at the proposed pump facility located on Venetian Road adjacent to the main electric panel.

A traffic mitigation plan would be required for temporary road closures during construction. Construction is expected to occur over 2-5 months and be completed no later than December 2018.

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

III. ENVIRONMENTAL REVIEW CHECKLIST

A. AESTHETICS AND VISUAL RESOURCES

Would the project:

1. *Have a substantial adverse effect on a scenic vista?*	☐	☒	☐	☐

Discussion: Although portions of Rio Del Mar Flats are a designated scenic resource, the proposed development would not result in adverse impacts to scenic resources in that the project consists mainly of installation of underground utilities. The project would include construction of a stormwater pump, clarifying, and siltation vaults embedded in an existing vegetated hillside located between Rio Del Mar Boulevard and Venetian Road. The installation of the vaults would require excavation of approximately 930 cubic yards of material and construction of a series of stepped retaining walls with a maximum height of eight feet above existing grade as seen from Venetian Road.

Color and materials for the proposed roofing material for the electrical equipment and safety railing would be consistent with other improvements in the vicinity (Attachment 3). Mitigations requiring installation of aesthetic relief of the retaining walls visible from Venetian Road would ensure the proposal is consistent with development within an area mapped as a designated scenic resource.

Portions of the upper retaining walls and safety railing would be visible from Rio Del Mar Boulevard, however, the proposed vaults would not be visible from the beach, which is the primary public view shed.

The project includes construction of an outfall structure located on the beach. This structure would be located within an area that has been determined to be stable and not subject to wave inundation over the last 50 years. The proposed outfall would be constructed mostly below grade. Portions of the structure that are required to be placed above the sand would be surrounded with native vegetation (Attachment 4) to ensure both stability of the area and sand surrounding the proposed outfall, and ensure the project would be consistent with County General Plan policies, as specified in J-2, for preservation of scenic resources. Mitigation Measure GEO-1 would ensure restoration of the area surrounding the proposed outfall in the event the outfall becomes exposed.

Mitigation measures

In order to ensure consistency with County scenic resource protection the following Mitigation Measures would be required:

AES-1: Retaining walls that are visible from Venetian Road shall be finished with stamped concrete, stained with a natural color, required to install vegetation (e.g. planter boxes) sufficient enough to soften the face of the retaining wall or some

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

combination thereof. Alternatively, an artistic mural with content characteristic of the Rio Del Mar community may be installed on the face of the walls. Review of the proposed mitigation shall be subject to review by County Planning Department staff prior to installation.

2. *Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?* ☐ ☐ ☐ ☒

Discussion: See discussion under A-1 for potential impacts to scenic resources. The project site is not located along a County designated scenic road. No impact to scenic roads is anticipated.

3. *Substantially degrade the existing visual character or quality of the site and its surroundings?* ☐ ☐ ☒ ☐

Discussion: See discussion under A-1 and GEO-1. The existing visual setting consists of existing public roadways, a vegetated hillside at the location of the proposed pump station and water filtration and vegetated portion of the beach. The proposed project is designed and landscaped so as to fit into this setting. Implementation of Mitigation Measures AES-1 and GEO-1 would ensure that impacts to the visual character of the site and its surroundings would be less than significant.

4. *Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?* ☐ ☐ ☐ ☒

Discussion: The project does not include a source of light and would not affect either day or nighttime views in the area.

B. AGRICULTURE AND FORESTRY RESOURCES

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:

1. *Convert Prime Farmland, Unique Farmland, or Farmland of Statewide* ☐ ☐ ☐ ☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

Discussion: The project site does not contain any lands designated as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency. In addition, the project does not contain Farmland of Local Importance. Therefore, no Prime Farmland, Unique Farmland, Farmland of Statewide or Farmland of Local Importance would be converted to a non-agricultural use. No impact would occur from project implementation.

2. *Conflict with existing zoning for agricultural use, or a Williamson Act contract?* ☐ ☐ ☐ ☒

Discussion: The project site is located in an area containing a combination of Parks and Recreation (PR), Neighborhood Commercial (C-1) and Multi-family residential (3,000 square foot minimum parcel) zone districts. Neither of these zone districts are considered to be an agricultural zone. Additionally, the project site's land is not under a Williamson Act Contract. Therefore, the project does not conflict with existing zoning for agricultural use, or a Williamson Act Contract. No impact is anticipated.

3. *Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?* ☐ ☐ ☐ ☒

Discussion: The project is not located near land designated as Timber Resource. Therefore, the project would not affect the resource or access to harvest the resource in the future. The timber resource may only be harvested in accordance with California Department of Forestry timber harvest rules and regulations.

4. *Result in the loss of forest land or conversion of forest land to non-forest use?* ☐ ☐ ☐ ☒

Discussion: No forest land occurs on the project site or in the immediate vicinity. See discussion under B-3 above. No impact is anticipated.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
5. *Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?*	☐	☐	☐	☒

Discussion: The project site and surrounding area within a radius of approximately one half mile does not contain any lands designated as Prime Farmland, Unique Farmland, Farmland of Statewide Importance or Farmland of Local Importance as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency. Therefore, no Prime Farmland, Unique Farmland, Farmland of Statewide, or Farmland of Local Importance would be converted to a non-agricultural use. In addition, the project site contains no forest land, and no forest land occurs within one mile of the proposed project site. Therefore, no impacts are anticipated.

C. AIR QUALITY

The significance criteria established by the Monterey Bay Unified Air Pollution Control District (MBUAPCD) has been relied upon to make the following determinations. Would the project:

1. *Conflict with or obstruct implementation of the applicable air quality plan?*	☐	☐	☒	☐

Discussion: The project would not conflict with or obstruct any long-range air quality plans of the Monterey Bay Unified Air Pollution Control District (MBUAPCD). Because general construction activity related emissions (i.e., temporary sources) are accounted for in the emission inventories included in the plans, impacts to air quality plan objectives are less than significant. See C-2 below.

General estimated basin-wide construction-related emissions are included in the MBUAPCD emission inventory (which, in part, form the basis for the air quality plans cited below) and are not expected to prevent long-term attainment or maintenance of the ozone and particulate matter standards within the North Central Coast Air Basin (NCCAB). Therefore, temporary construction impacts related to air quality plans for these pollutants from the proposed project would be less than significant, and no mitigation would be required, since they are presently estimated and accounted for in the District's emission inventory, as described below. No stationary sources would be constructed that would be long-term permanent sources of emissions.

2. *Violate any air quality standard or contribute substantially to an existing or projected air quality violation?*	☐	☐	☒	☐

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

Discussion: Santa Cruz County is located within the North Central Coast Air Basin (NCCAB). The NCCAB does not meet state standards for ozone (reactive organic gases [ROGs] and nitrogen oxides [NOx]) and fine particulate matter (PM_{10}). Therefore, the regional pollutants of concern that would be emitted by the project are ozone precursors and PM_{10}.

Ozone is the main pollutant of concern for the NCCAB. The primary sources of ROG within the air basin are on- and off-road motor vehicles, petroleum production and marketing, solvent evaporation, and prescribed burning. The primary sources of NOx are on- and off-road motor vehicles, stationary source fuel combustion, and industrial processes. In 2010, daily emissions of ROGs were estimated at 63 tons per day. Of this, area-wide sources represented 49 percent, mobile sources represented 36 percent, and stationary sources represented 15 percent. Daily emissions of NOx were estimated at 54 tons per day with 69 percent from mobile sources, 22 percent from stationary sources, and 9 percent from area-wide sources. In addition, the region is "NOx sensitive," meaning that ozone formation due to local emissions is more limited by the availability of NOx as opposed to the availability of ROGs (MBUAPCD, 2013b).

PM_{10} is the other major pollutant of concern for the NCCAB. In the NCCAB, highest particulate levels and most frequent violations occur in the coastal corridor. In this area, fugitive dust from various geological and man-made sources combines to exceed the standard. Nearly three quarters of all NCCAB exceedances occur at these coastal sites where sea salt is often the main factor causing exceedance (MBUAPCD, 2005). In 2005 daily emissions of PM_{10} were estimated at 102 tons per day. Of this, entrained road dust represented 35 percent of all PM_{10} emission, windblown dust 20 percent, agricultural tilling operations 15 percent, waste burning 17 percent, construction 4 percent, and mobile sources, industrial processes, and other sources made up 9 percent (MBUAPCD, 2008).

Given the modest amount of new traffic that would be generated by the project there is no indication that new emissions of ROGs or NOx would exceed MBUAPCD thresholds for these pollutants; and therefore, there would not be a significant contribution to an existing air quality violation.

Project construction may result in a short term, localized decrease in air quality due to generation of PM_{10}. However, standard dust control best management practices, such as periodic watering, would be implemented during construction to avoid significant air quality impacts from the generation of PM_{10}.

Impacts

As required by the MBUAPCD, construction activities (e.g., excavation, grading, on-site vehicles) which directly generate 82 pounds per day or more of PM_{10} would have a

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

significant impact on local air quality when they are located nearby and upwind of sensitive receptors such as the community of Rio Del Mar (Table 1). Construction projects below the screening level thresholds shown in Table 1 are assumed to be below the 82 lb/day threshold of significance, while projects with activity levels higher than those thresholds may have a significant impact on air quality. The proposed project would require minimal grading. Although the project would produce PM_{10}, it would be far below the 82 pounds per day threshold. This would result in less than significant impacts on air quality from the generation of PM_{10}.

Construction projects using typical construction equipment such as dump trucks, scrapers, bulldozers, compactors and front-end loaders that temporarily emit precursors of ozone [i.e., volatile organic compounds (VOC) or oxides of nitrogen (NOx)], are accommodated in the emission inventories of state- and federally-required air plans and would not have a significant impact on the attainment and maintenance of ozone AAQS (MBUAPCD 2008).

Although not a mitigation measure per se (i.e., required by law), California ultralow sulfur diesel fuel with a maximum sulfur content of 15 ppm by weight will be used in all diesel-powered equipment, which minimizes sulfur dioxide and particulate matter.

The following Best Management Practices (BMPs) and Best Available Control Technology (BACT) will be implemented during all site excavation and grading.

BMPs and BACTs

The project impacts would be less than significant level with implementation of the required MBUAPCD emission control BMPs and BACTs, i.e., diesel engine and fugitive dust controls.

Contracted Diesel Control Measures: In addition to the use of Tiered engines and California ultralow sulfur diesel fuel, the following requirements will be incorporated into contract specifications:

- To minimize potential diesel odor impacts on nearby receptors (pursuant to MBUAPCD Rule 402, Nuisances), construction equipment will be properly tuned. A schedule of tune-ups will be developed and performed for all equipment operating within the project area. A written log of required tune-ups will be maintained and a copy of the log will be submitted to the County of Santa Cruz Department of Public Works (DPW) Planning Director for review every 2,000 service hours.
- Fixed temporary sources of air emissions (such as portable pumps, compressors, generators, etc.) will be electrically powered unless the contractor submits documentation and receives written approval from the County of Santa Cruz DPW that the use of such equipment is not practical, feasible, or available

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

(generally contingent upon power line proximity, capacity, and accessibility). California ultralow sulfur diesel fuel with maximum sulfur content of 15 ppm by weight (ppmw S), or an approved alternative fuel, will be used for on-site fixed equipment not using line power.

- To minimize diesel emission impacts, construction contracts will require off-road compression ignition equipment operators to reduce unnecessary idling with a 2-minute time limit, subject to monitoring and written documentation.
- On-road material hauling vehicles will shut off engines while queuing for loading and unloading for time periods longer than 2 minutes, subject to monitoring and written documentation.
- Off-road diesel equipment will be fitted with verified diesel emission control systems (e.g., diesel oxidation catalysts) to the extent reasonably and economically feasible.
- Utilize alternative fuel equipment (i.e., compressed or liquefied natural gas, biodiesel, electric) to the extent reasonably and economically feasible.

Feasibility will be determined consistent with Best Available Control Technology (BACT) general criteria: 1) achieved in practice; 2) contained in adopted control measures; 3) technologically feasible; and 4) cost-effective.

Diesel Particulate Matter Emissions Control Measures: In addition, the project will implement the following measures to reduce particulate matter emissions from diesel exhaust:

- Grid power will be used instead of diesel generators where it is feasible to connect to grid power (generally contingent upon power line proximity, capacity, and accessibility).
- The project specifications will include 13 CCR Sections 2480 and 2485, which limit the idling of all diesel-fueled commercial vehicles (weighing over 10,000 pounds, both California- or non-California-based trucks) to 30 seconds at a school or 5 minutes at any location. In addition, the use of diesel auxiliary power systems and main engines will be limited to 5 minutes when within 100 feet of homes or schools while the driver is resting.
- The project specifications will include 17 CCR Section 93115, Airborne Toxic Control Measure for Stationary Compression Ignition Engines, which specifies fuel and fuel additive requirements; emission standards for operation of any stationary, diesel-fueled, compression-ignition engines; and operation restrictions within 500 feet of school grounds when school is in session.
- A schedule of low-emissions tune-ups will be developed and such tune-ups will be performed on all equipment, particularly for haul and delivery trucks.

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

- Low-sulfur (≤ 15 ppmw S) fuels will be used in all stationary and mobile equipment.

Dust Control Measures: The following controls will be implemented at the construction and staging sites as applicable:

- Water all active construction areas at least twice daily as necessary and indicated by soil and air conditions.
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least 2 feet of freeboard.
- Pave, apply water three times daily, or apply (nontoxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
- All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, will be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover or vegetative ground cover.
- All on-site unpaved roads and off-site unpaved access roads will be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.
- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut & fill, and demolition activities will be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.
- When materials are transported off site, all material will be covered, or effectively wetted to limit visible dust emissions, and at least 6 inches of freeboard space from the top of the container will be maintained.
- All operations will limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. (The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden.)
- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles will be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/suppressant.
- Within urban areas, trackout will be immediately removed when it extends 50 or more feet from the site and at the end of each workday.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

- Any site with 150 or more vehicle trips per day will prevent carryout and trackout.
- Hydroseed or apply (nontoxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
- Enclose, cover, water twice daily, or apply (nontoxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 miles per hour.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways from sites with a slope greater than 1 percent.
- Replant vegetation in disturbed areas as quickly as possible.
- Install wheel washers for all exiting trucks, or wash off all trucks and equipment leaving the site.
- Install wind breaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 20 miles per hour.
- Limit the area subject to excavation, grading, and other construction activity at any one time.

Implementation of the above BMPs and BACT would ensure that emissions of diesel particulate matter (DPM) and fugitive dust from project excavation and grading would be consistent with the MBUAPCD emissions inventories. Impacts would be less than significant.

3. *Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?*	☐	☐	☒	☐

Discussion: Project construction would have a limited and temporary potential to contribute to existing violations of California air quality standards for ozone and PM_{10} primarily through diesel engine exhaust and fugitive dust. However, the Santa Cruz monitoring station has not had any recent violations of federal or state air quality standards mainly through dispersion of construction-related emission sources. BMPs and BACT described above under C-2 would ensure emissions remain below a level of significance. Therefore, the proposed project would not result in a cumulatively considerable net increase in criteria pollutants. The impact on ambient air quality would be less than significant.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
4. *Expose sensitive receptors to substantial pollutant concentrations?*	☐	☒	☐	☐

Discussion: Diesel exhaust contains substances (DPM, toxic air contaminants [TACs], mobile source air toxics [MSATs]) that are suspected carcinogens, along with pulmonary irritants and hazardous compounds, which may affect sensitive receptors such as young children, senior citizens, or those susceptible to respiratory disease. Where construction activity occurs in proximity to long-term sensitive receptors, a potential could exist for unhealthful exposure of those receptors to diesel exhaust, including residential receptors.

Impacts

The proposed project is located in the community of Rio Del Mar Flats and sensitive receptors would be as close as 30 feet from the project area. Since construction is anticipated to occur over a 20 week period, the sensitive receptors would be affected for a maximum of 20 weeks, which is less than .55 percent of the 70-year maximum exposed individual (MEI) criteria used for assessing public health risk due to emissions of certain air pollutants (MBUAPCD 2008).

Due to the intermittent and short-term temporary nature of construction activities (i.e., 20 weeks), emissions of DPM, TACs, or MSATs would not be sufficient to pose a significant risk to sensitive receptors from construction equipment operations during the course of the project with implementation of the following BMPs and BACT.

Implementation of the above BMPs and BACTs for control of diesel exhaust would be implemented. The project would not be expected to expose sensitive receptors to substantial pollutant concentrations. Impacts would be less than significant with the incorporation of mitigation.

5. *Create objectionable odors affecting a substantial number of people?*	☐	☐	☒	☐

Discussion: California ultralow sulfur diesel fuel with a maximum sulfur content of 15 ppm by weight would be used in all diesel-powered equipment, which minimizes emissions of sulfurous gases (sulfur dioxide, hydrogen sulfide, carbon disulfide, and carbonyl sulfide). Therefore, no objectionable odors are anticipated from construction activities associated with the proposed project, and no mitigation measures would be required. The proposed project would not create objectionable odors affecting a substantial number of people; therefore, impacts are expected to be less than significant.

D. BIOLOGICAL RESOURCES

Would the project:

1. *Have a substantial adverse effect, either directly or through habitat modifications,*	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife, or U.S. Fish and Wildlife Service?

Discussion: According to the California Natural Diversity Data Base (CNDDB), maintained by the California Department of Fish and Wildlife, Dudley's lousewort *(Pedicularis dudleyi)*, is mapped within the project area, however, lousewort thrives only among old-growth trees. The project site does not contain habitat which would provide the unique environment for Dudley's lousewort to thrive. No impact to the Dudley's lousewort is expected.

The CNDDB identifies Steelhead Trout *(Oncorhynchus mykiss irideus)* and Tidewater Gobey *(Eucyclogobius newberryi)* within Aptos Creek located adjacent to the project site. The project would not propose any disturbance to the stream channel. Consequently, no impact to these species is expected.

2.	*Have a substantial adverse effect on any riparian habitat or sensitive natural community identified in local or regional plans, policies, regulations (e.g., wetland, native grassland, special forests, intertidal zone, etc.) or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?*	☐	☐	☐	☒

Discussion: Though the project is adjacent to mapped and designated sensitive biotic communities (Aptos Creek) the project would not propose any disturbance in these mapped or designated areas. Consequently no impact to designated or mapped biotic habitat would occur.

3.	*Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?*	☐	☐	☐	☒

Discussion: There are no mapped or designated federally protected wetlands on or adjacent to the project site. Therefore, no impacts would occur from project implementation. Aptos Creek is currently 450 feet away from the location of the proposed outfall. No impact would occur in that the project proposes a stormwater treatment

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

screening and filtration which is intended to improve stormwater quality.

4.	*Interfere substantially with the movement of any native resident or migratory fish or wildlife species or migratory wildlife corridors, or impede the use of native wildlife nursery sites?*	☐	☐	☐	☒

Discussion: The proposed project does not involve any activities that would interfere with the movements or migrations of fish or wildlife, or impede use of a known wildlife nursery site.

5.	*Conflict with any local policies or ordinances protecting biological resources (such as the Sensitive Habitat Ordinance, Riparian and Wetland Protection Ordinance, and the Significant Tree Protection Ordinance)?*	☐	☐	☐	☒

Discussion: The project would not conflict with any local policies or ordinances.

6.	*Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?*	☐	☐	☐	☒

Discussion: The proposed project would not conflict with the provisions of any adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. Additionally, the project would incorporate revegetation and monitoring of the areas surrounding the proposed outfall as well as the proposed pump/water treatment infrastructure. Therefore, no impact would occur.

7.	*Produce nighttime lighting that would substantially illuminate wildlife habitats?*	☐	☐	☐	☒

Discussion: All construction would be completed during daylight hours. No nighttime lighting impacts from project implementation would occur.

E. CULTURAL RESOURCES

Would the project:

1.	*Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5?*	☐	☐	☐	☒

Discussion: The project site consists of County right of way and does not contain any

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

existing structure. Further, the project site does not contain a designation as a historic resource on any federal, state or local inventory. As a result, no impacts to historical resources would occur from project implementation.

2.	*Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5?*	☐	☐	☒	☐

Discussion: The location of the proposed pump station is mapped as having potential archeological resources. Boring logs provided by the project Geotechnical Engineer contained in Attachment 5 indicate the proposed pump station would be located in area containing artificial fill. Therefore, archaeological resources are not expected to occur within the project area.

Pursuant to County Code Section 16.40.040, if at any time in the preparation for or process of excavating or otherwise disturbing the ground, any human remains of any age, or any artifact or other evidence of a Native American cultural site which reasonably appears to exceed 100 years of age are discovered, the responsible persons shall immediately cease and desist from all further site excavation and comply with the notification procedures given in County Code Chapter 16.40.040. Impacts are expected to be less than significant.

3.	*Disturb any human remains, including those interred outside of dedicated cemeteries?*	☐	☐	☒	☐

Discussion: See discussion under E-2. Impacts are expected to be less than significant. However, pursuant to Section 16.40.040 of the Santa Cruz County Code, if at any time during site preparation, excavation, or other ground disturbance associated with this project, human remains are discovered, the responsible persons shall immediately cease and desist from all further site excavation and notify the sheriff-coroner and the Planning Director. If the coroner determines that the remains are not of recent origin, a full archeological report shall be prepared and representatives of the local Native California Indian group shall be contacted. Disturbance shall not resume until the significance of the archeological resource is determined and appropriate mitigations to preserve the resource on the site are established.

4.	*Would the project cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074?*	☐	☐	☒	☐

Discussion: See discussion under E-2. Impacts would be less than significant.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
5. *Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?*	☐	☐	☐	☒

Discussion: No unique paleontological resources or unique geologic features are known to occur in the vicinity of the proposed project. No impacts are anticipated.

F. GEOLOGY AND SOILS

Would the project:

1. *Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:*				
A. *Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.*	☐	☐	☒	☐
B. *Strong seismic ground shaking?*	☐	☐	☒	☐
C. *Seismic-related ground failure, including liquefaction?*	☐	☐	☒	☐
D. *Landslides?*	☐	☐	☒	☐

Discussion (A through D): All of Santa Cruz County is subject to some hazard from earthquakes. However, the project site is not located within or adjacent to a county or state mapped fault zone. A geotechnical investigation for the proposed project was performed by Cotton, Shires, and Associates, Inc. dated May 16, 2017 (Attachment 5). This report was reviewed and accepted by the County of Santa Cruz on June 23, 2017 (Attachment 6).

The report concluded that no active faults have been recognized in the project area and potential for surface faulting and ground rupture is low. The project has been designed to address a high probability for seismic ground shaking associated with large earthquakes. The location of the proposed pump station was found to have a low probability for liquefaction and lateral spreading due to relatively shallow and competent Purisima Formation however the location of the proposed outfall would be located in an area containing loose alluvial

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

sand materials with a high potential for liquefaction. Similarly, the storm drain pipes and manholes in the streets are currently and would remain within a soil type with a high potential for liquefaction as well. There is no indication that landsliding is a significant hazard at this site.

The project has been designed to incorporate recommendations of the Geotechnical Engineer to ensure potential impacts resulting from seismic shaking and liquefaction would be less than significant.

2. *Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?*	☐	☐	☒	☐

Discussion: See discussion under F-1. The report cited above concluded that there is a potential risk from seismic shaking and liquefaction. The recommendations contained in the geotechnical report include foundations design to mitigate potential differential foundation movement for the proposed pump station and underground discharge structure. Recommendations have been provided for site grading including dewatering for excavations below the water table and the use of temporary shoring during excavation and installation of new pipelines. Implementation of these recommendations would reduce potential hazards to a less than significant level.

3. *Develop land with a slope exceeding 30%?*	☐	☐	☒	☐

Discussion: The project would include grading of an existing vegetated hillside in excess of 30% slope for the installation of a stormwater pump facility. Implementation of the recommendations of the project Geotechnical Engineer contained in Attachment 5 would ensure impacts related to potential slope instability would be less than significant.

4. *Result in substantial soil erosion or the loss of topsoil?*	☐	☐	☒	☐

Discussion: Some potential for erosion exists during the construction phase of the project; however, this potential would be minimal with the implementation of the recommendations from the Geotechnical Engineer requiring temporary shoring of all grading activities. Additionally, standard erosion controls are a required condition of the project. Prior to approval of a grading or building permit, the project must have an approved Erosion Control Plan (*Section 16.22.060 of the County Code*), which would specify detailed erosion and sedimentation control measures. The plan would include

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

provisions for disturbed areas to be planted with ground cover and to be maintained to minimize surface erosion.

Mitigation Measures

GEO-1 The project would be conditioned to require replenishment of sand around the proposed outfall located on the beach in the event of scour from storm events or increased stormwater discharge. Implementation of this mitigation would ensure potential impacts from soil erosion or loss of topsoil would be considered less than significant.

5.	*Be located on expansive soil, as defined in Section 1802.3.2 of the California Building Code (2007), creating substantial risks to life or property?*	☐	☐	☐	☒

Discussion: The geotechnical report for the project did not identify any elevated risk associated with expansive soils. Therefore, no impact is anticipated.

6.	*Have soils incapable of adequately supporting the use of septic tanks, leach fields, or alternative waste water disposal systems where sewers are not available for the disposal of waste water?*	☐	☐	☐	☒

Discussion: No septic systems are proposed and the project would not connect to the Santa Cruz County Sanitation District. No impact would occur.

7.	*Result in coastal cliff erosion?*	☐	☐	☐	☒

Discussion: The proposed project is not located in the vicinity of a coastal cliff or bluff; and therefore, would not contribute to coastal cliff erosion. No impact is anticipated.

G. GREENHOUSE GAS EMISSIONS

Would the project:

1.	*Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?*	☐	☐	☒	☐

Discussion: The proposed project, like all development, would be responsible for an incremental increase in greenhouse gas emissions by usage of fossil fuels during the site grading and construction. Santa Cruz County has recently adopted a Climate Action Strategy (CAS) intended to establish specific emission reduction goals and necessary actions to reduce greenhouse gas levels to pre-1990 levels as required under AB 32 legislation. The strategy intends to reduce greenhouse gas emissions and energy consumption by

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

implementing measures such as reducing vehicle miles traveled through the County and regional long range planning efforts and increasing energy efficiency in new and existing buildings and facilities. All project construction equipment would be required to comply with the Regional Air Quality Control Board emissions requirements for construction equipment. As a result, impacts associated with the temporary increase in greenhouse gas emissions are expected to be less than significant.

2. *Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?*	☐	☐	☐	☒

Discussion: See the discussion under G-1 above. No significant impacts are anticipated.

H. HAZARDS AND HAZARDOUS MATERIALS

Would the project:

1. *Create a significant hazard to the public or the environment as a result of the routine transport, use or disposal of hazardous materials?*	☐	☐	☒	☐

Discussion: The proposed project would not create a significant hazard to the public or the environment. While one of the objectives of the proposed project is to extract contaminants including heavy metals and other contaminants from storm water runoff in order to improve overall water quality, the project would not require routine transport or disposal of hazardous materials. During construction, fuel would be used at the project site. In addition, fueling may occur within the limits of the primary staging areas proposed to be located on Venetian Road. Best management practices would be used to ensure that no impacts would occur. Impacts are expected to be less than significant.

2. *Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?*	☐	☐	☒	☐

Discussion: Please see discussion under H-1 above. Project impacts would be considered less than significant.

3. *Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?*	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

Discussion: The Aptos Junior High School is located 1001 Huntington Drive, approximately 1.3 miles to the north east of the project site. Although fueling of equipment is likely to occur within the staging area, best management practices would be implemented. No impacts are anticipated.

4. *Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?*	☐	☐	☒	☐

Discussion: The majority of the project site is not included on the September 15, 2017 list of hazardous sites in Santa Cruz County compiled pursuant to Government Code Section 65962.5. The project would obtain primary and auxiliary power from the County of Santa Cruz Sanitation District Esplanade pump station which is listed on the list of hazardous sites as having diesel and hydrocarbon contaminants in the soil. In order to obtain power from the pump station, trenching would be required within the Marina Drive right of way. Less than significant impacts are anticipated from project implementation.

5. *For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?*	☐	☐	☐	☒

Discussion: The proposed project is not located within two miles of a public airport or public use airport. No impact is anticipated.

6. *For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?*	☐	☐	☐	☒

Discussion: The proposed project is not located in the vicinity of a private airstrip.

7. *Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?*	☐	☐	☐	☒

Discussion: The proposed project would not conflict with implementation of the County of Santa Cruz Local Hazard Mitigation Plan 2015-2020 (County of Santa Cruz, 2020). Therefore, no impacts to an adopted emergency response plan or evacuation plan would

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

occur from project implementation.

8. *Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?*	☐	☐	☒	☐

Discussion: The proposed project is not located in a Fire Hazard Area. However, the project design incorporates all applicable fire safety code requirements and includes fire protection devices as required by the local fire agency. Impacts would be less than significant.

I. HYDROLOGY, WATER SUPPLY, AND WATER QUALITY

Would the project:

1. *Violate any water quality standards or waste discharge requirements?*	☐	☐	☒	☐

Discussion: The project would not discharge runoff either directly or indirectly into a public or private water supply. As indicated in the evaluation of potential project alternatives (Attachment 7), the project would include a screening and filtration system designed to reduce the amount of suspended particulates and heavy metals in stormwater entering the system before being discharged onto the beach where it would be further filtered by perking into the sand. Implementation of the project would result in an improvement to existing conditions in which stormwater is not filtered and discharged directly into Aptos Creek. Potential siltation from the proposed project would be addressed through implementation of erosion control best management practices (BMPs). No water quality standards or waste discharge requirements would be violated. Impacts would be less than significant.

2. *Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?*	☐	☐	☐	☒

Discussion: The project is located within the Soquel Creek Water District service area however the project would not require connection to a public water supply. The project is not located in a mapped groundwater recharge area. No adverse impact would occur to

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

groundwater recharge with project implementation.

3.	*Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?*	☐	☐	☐	☒

Discussion: The proposed project is located approximately 450 feet from Aptos Creek and would result in a reduction of existing stormwater runoff entering the creek however, the project would result in redirecting runoff to the beach to alleviate potential flooding in Rio Del Mar Flats. The project would not result in a substantial alteration to the drainage pattern in the area as all drainage would continue to flow into the Monterey Bay. Department of Public Works Drainage Section staff has designed the proposed drainage system. No impact would occur from project implementation.

4.	*Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding, on- or off-site?*	☐	☐	☒	☐

Discussion: The proposed project is located within 450 feet of Aptos Creek; however, the project would not alter the existing overall drainage pattern of the site as indicated in Attachment 7. Department of Public Works Drainage staff has designed a drainage plan to comply with County design standards. Impacts from project construction would be less than significant.

5.	*Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems, or provide substantial additional sources of polluted runoff?*	☐	☐	☒	☐

Discussion: Department of Public Works Drainage staff has designed the proposed project to achieve a 10-year storm system capacity. The project would meet or exceed County design standards and the project would not result in increased stormwater runoff. Refer to response I-1 for discussion of urban contaminants and/or other polluting runoff. Impacts would be considered less than significant.

6.	*Otherwise substantially degrade water quality?*	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

Discussion: The project proposes installation of siltation screening and clarification vaults in order to minimize the effects of urban pollutants. As indicated in Attachment 7, the project would redirect the majority of existing stormwater runoff from an existing outfall in Aptos Creek to the proposed location on the beach. Consequently, the project would result in a reduction to the amount of urban pollutants entering the creek and Monterey Bay. The proposed improvements to water quality would improve existing conditions which allow urban pollution to flow to the creek. No impact would occur as a result of implementation of the project as the project would result in improved water quality.

7.	*Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?*	☐	☐	☐	☒

Discussion: According to the Federal Emergency Management Agency (FEMA) National Flood Insurance Rate Map, dated May 16, 2012, portions of the proposed development lie within a 100-year flood hazard area. The project is intended to alleviate potential for seasonal flooding within Rio Del Mar Flats and protect existing residential and commercial development in the vicinity of the project. The project would not include construction of additional housing within the flood plain. No impact would occur as a result from project implementation.

8.	*Place within a 100-year flood hazard area structures which would impede or redirect flood flows?*	☐	☐	☐	☒

Discussion: According to the Federal Emergency Management Agency (FEMA) National Flood Insurance Rate Map, dated May 16, 2012, A letter dated May 22, 2017 from David W. Sims (Attachment 8) indicated the project would be located on the fringes of Zone AE and Zone VE on FEMA Flood insurance rate maps dated 5/16/12

The small amounts of back fill associated with project grading would be placed outside and above the mapped Zone AE however, the majority of the grading associated with the project (approximately 925 cubic yards) would be off hauled to an approved County dump site. The project, as designed, would not increase the base flood elevation of Aptos Creek and would not redirect coastal flood waters or result in an increase in potential for flood damage to nearby structures. No impact would occur.

9.	*Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a*	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

result of the failure of a levee or dam?

Discussion: The proposed project is intended to reduce risk of loss, injury or death involving flooding. The project is located within Rio Del Mar Flats which is an area that is prone to seasonal flooding. The project is intended to pump flood waters through a filtration system and discharge the stormwater at a location on the beach. Portions of the project site lie within a 100-year flood hazard area; however, the project is designed to collect and filter stormwater runoff to proposed outfall within a historically stable location on the seaward side of Beach Drive. The proposed project would not impede flood flows though or redirect flood flows. No impact would occur.

10.	*Inundation by seiche, tsunami, or mudflow?*	☐	☐	☐	☒

Discussion: There are two primary types of tsunami vulnerability in Santa Cruz County. The first is a teletsunami or distant source tsunami from elsewhere in the Pacific Ocean. This type of tsunami is capable of causing significant destruction in Santa Cruz County. However, this type of tsunami would usually allow time for the Tsunami Warning System for the Pacific Ocean to warn threatened coastal areas in time for evacuation (County of Santa Cruz 2010).

The more vulnerable risk to the County of Santa Cruz is a tsunami generated as the result of an earthquake along one of the many earthquake faults in the region. Even a moderate earthquake could cause a local source tsunami from submarine landsliding in Monterey Bay. A local source tsunami generated by an earthquake on any of the faults affecting Santa Cruz County would arrive just minutes after the initial shock. The lack of warning time from such a nearby event would result in higher causalities than if it were a distant tsunami (County of Santa Cruz 2010).

The project site is located within the tsunami inundation zone however the project would not result in a greater threat to the effects of a tsunami. In addition, no impact from a seiche or mudflow is anticipated. No impact would occur.

J. LAND USE AND PLANNING

Would the project:

1.	*Physically divide an established community?*	☐	☐	☐	☒

Discussion: The proposed project does not include any element that would physically divide an established community. No impact would occur.

2.	*Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but*	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Discussion: The proposed project does not conflict with any regulations or policies adopted for the purpose of avoiding or mitigating an environmental effect. General Plan Policy 5.10.7 (Visual Resources) states: *Prohibit the placement of new permanent structures which would be visible from the public beach, except where allowed on existing parcels of record, or for shoreline protection and for public access.*

While GP policy 5.10.7 is intended to apply to residential development, implementation of the proposed revegetation plan would ensure the proposed outfall would not be visible from the public beach. Additionally, the project is intended to improve and maintain existing public and emergency vehicle access by reducing potential for seasonal flooding in the project vicinity.

The project site is located in an area designated as a Primary Public Shoreline Access in Chapter 7 of the County General Plan. The project site consist of existing basic improvements and law enforcement necessary to accommodate the increase in visitors associated with State and regional publicity. Improvements to public access are subject to General Plan Policy 7.6.2 (Trail Easements). The location of the proposed development would not restrict existing public access and the proposed outfall is located within an existing public right of way intended for public access. The project would not conflict with existing or future plans to improve public access at the project location. The scope of the proposed development does not trigger the need for further trails easements or necessitate further improvements or expansion of existing or new public access or trails.

The proposed project has been designed to ensure consistency with the Rio Del Mar Flats/Esplanade Area Special Community in terms of landscaping paving, circulation, and implementation of flood control. No impacts are anticipated.

3.	*Conflict with any applicable habitat conservation plan or natural community conservation plan?*	☐	☐	☐	☒

Discussion: The proposed project would not conflict with any applicable habitat conservation plan or natural community conservation plan. No impact would occur.

K. MINERAL RESOURCES

Would the project:

1.	*Result in the loss of availability of a known mineral resource that would be of value to*	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

the region and the residents of the state?

Discussion: The site does not contain any known mineral resources that would be of value to the region and the residents of the state. Therefore, no impact is anticipated from project implementation.

2. *Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?*	☐	☐	☐	☒

Discussion: The project site is zoned (PR) Parks Recreation and Open Space, (C-1) Neighborhood Commercial, (RM-3) Multi-family Residential (minimum parcels size 3,000 square feet), which are not considered to be an Extractive Use Zone (M-3) nor does it have a Land Use Designation with a Quarry Designation Overlay (Q) (County of Santa Cruz 1994). Therefore, no potentially significant loss of availability of a known mineral resource of locally important mineral resource recovery (extraction) site delineated on a local general plan, specific plan or other land use plan would occur as a result of this project.

L. NOISE

Would the project result in:

1. *Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?*	☐	☒	☐	☐

Discussion:

County of Santa Cruz General Plan

The Santa Cruz County General Plan (County of Santa Cruz 1994) contains the following table, which specifies the maximum allowable noise exposure for stationary noise sources (Table 2). The County of Santa Cruz has not adopted noise thresholds for construction noise.

The following applicable noise related policy is found in the Public Safety and Noise Element of the Santa Cruz County General Plan (Santa Cruz County 1994).

- Policy 6.9.7 Construction Noise. Require mitigation of construction noise as a condition of future project approvals.

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

Table 2: Maximum Allowable Noise Exposure for Stationary Noise Sources[1]

	Daytime[5] (7:00 am to 10:00 pm)	Nighttime[2, 5] (10:00 pm to 7:00 am)
Hourly Leq average hourly noise level, dB[3]	50	45
Maximum Level, dB[3]	70	65
Maximum Level, dB – Impulsive Noise[4]	65	60

Notes:
1 As determined at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards may be applied to the receptor side of noise barriers or other property line noise mitigation measures.
2 Applies only where the receiving land use operates or is occupied during nighttime hours
3 Sound level measurements shall be made with "slow" meter response.
4 Sound level measurements shall be made with "fast" meter response
5 Allowable levels shall be raised to the ambient noise levels where the ambient levels exceed the allowable levels. Allowable levels shall be reduced to 5 dB if the ambient hourly Leq is at least 10 dB lower than the allowable level.
Source: County of Santa Cruz 1994

There are no County of Santa Cruz ordinances that specifically regulate construction noise levels. However, Section 8.30.010 (Curfew—Offensive noise) of the Santa Cruz County Code contains the following language regarding noise impacts:

(A) No persons shall, between the hours of ten p.m. and eight a.m., make, cause, suffer, or permit to be made any offensive noise:

1. Which is made within one hundred feet of any building or place regularly used for sleeping purposes; or

2. Which disturbs any person of ordinary sensitivities within his or her place of residence

(B) Offensive noise" means any noise which is loud, boisterous, irritating, penetrating, or unusual, or that is unreasonably distracting in any other manner such that it is likely to disturb people of ordinary sensitivities in the vicinity of such noise, and includes, but is not limited to, noise made by an individual alone or by a group of people engaged in any business, activity, meeting, gathering, game, dance, or amusement, or by any appliance, contrivance, device, tool, structure, construction, vehicle, ride, machine, implement, instrument or vehicle.

Any new or additional noise ordinance provisions of the County Code that are not currently in effect, but that are in effect at the time of discretionary review or building permit application, shall be applied to the project as appropriate.

Sensitive Receptors

Some land uses are generally regarded as being more sensitive to noise than others due to the type of population groups or activities involved. Sensitive population groups generally include children and the elderly. Noise sensitive land uses typically include all residential uses (single- and multi-family, mobile homes, dormitories, and similar uses), hospitals, nursing homes, schools, and parks.

Table 3: Typical Noise Levels for Common Construction Equipment (at 50 feet)

Equipment	L_{max} (dBA)
Air Compressor	81
Backhoe	80
Cement Mixer Truck	85
Cement Pump Truck	82
Chain Saw	85
Compactor	82
Crane	83
Concrete Saw	90
Dozer	85
Excavator	85
Dump Truck	84
Flat Bed Truck	84
Front End Loader	80
Fork Lift	75
Generator	81
Grader	85
Hoe-rams	90
jackhammers	88
Paver	85
Pick-up Truck	55
Pneumatic Tools	85
Rollers	74
Tree Chipper	87

Source: Federal Transit Authority, 2006.

The use of construction equipment to accomplish the proposed project would result in noise in the project area, i.e., construction zone. Table 3 shows typical noise levels for common construction equipment. The sources of noise that are normally measured at 50 feet, are used to determine the noise levels at nearby sensitive receptors by attenuating 6 dB for each doubling of distance for point sources of noise such as operating construction equipment. Noise levels at the nearest sensitive receptors for each site were analyzed on a worst-case basis, using the equipment with the highest noise level expected to be used.

The nearest sensitive receptors are located approximately 30 feet to the south of the construction area.

Impacts

Although construction activities would likely occur during daytime hours, noise may be audible to nearby residents and Pixie's Deli which provides outdoor seating for customers. However, periods of noise exposure would be temporary. Noise from construction activity may vary substantially on a day-to-day basis.

Potential Temporary Construction Noise Impacts

Construction activity would be expected to use equipment listed in Table 3. Based on the activities proposed for the proposed project, the equipment with the loudest operating noise level that would be used often during activity would be a concrete saw or excavator, which would produce noise levels of 85-90 dBA at a distance of 50 feet. The nearest sensitive receptor is located approximately 30 feet from the construction site. At that distance, the decibel level would produce noise levels of 89-94 dBA. However, these impacts would also be temporary.

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

The County of Santa Cruz has not adopted significance thresholds for construction noise. However, Policy 6.9.7 of the General Plan requires mitigation of construction noise as a condition of future project approvals.

The following mitigation measures will be required to assist in the reduction of temporary construction noise impacts. With the implementation of those measures, no adverse noise impacts are expected occur during construction activities.

Mitigation Measures

NOI-1 Limit construction activity to between the hours of 7:00 a.m. to 6:00 p.m. Monday through Friday. Prohibit construction activity on weekends and Holidays.

NOI-2 Limit use of construction equipment which would produce noise levels in excess of 75 dBA outside the hours of 9:00 a.m. to 5:00 p.m.

NOI-3 Require that all construction and maintenance equipment powered by gasoline or diesel engines have sound-control devices that are at least as effective as those originally provided by the manufacturer and that all equipment be operated and maintained to minimize noise generation.

NOI-4 Prohibit gasoline or diesel engines from having unmuffled exhaust.

NOI-5 Use noise-reducing enclosures around stationary noise-generating equipment capable of 6 dB attenuation. Installation of noise reducing enclosures along Venetian Road between the primary staging area and Pixie's Deli. Enclosures shall not impede pedestrian access.

2. *Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?*	☐	☐	☒	☐

Discussion: The use of construction equipment would potentially generate vibration in the project area. The nearest residential property is located at approximately 30 feet to the south of the project site on Rio Del Mar Boulevard. Due to this distance, none of the area residences would experience significant groundborne vibration or groundborne noise levels during construction activities associated with the proposed project. Impacts would be less than significant.

3. *A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?*	☐	☐	☐	☒

Discussion: As indicated in discussion under L-1 and L-2 above, the project would result in temporary impacts related to construction noise. However, the proposed project would not result in a permanent increase in the ambient noise level. The project proposes

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

installation of submersible pumps and motors located in an underground concrete vault. Each pump would be submersed in water which would substantially muffle and effectively mitigate their noise. No impacts are expected related to permanent increase in ambient noise associated with the project.

4. *A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?*	☐	☒	☐	☐

Discussion: See discussion under L-1 above. Noise generated during project construction would increase the ambient noise levels in adjacent areas. Construction would be temporary; however, and given the limited duration of this impact it is considered to be less than significant with the incorporation of mitigation measures.

5. *For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?*	☐	☐	☐	☒

Discussion: The proposed project is not within two miles of a public airport. Therefore, the proposed project would not expose people residing or working in the project area. No impact is anticipated.

6. *For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?*	☐	☐	☐	☒

Discussion: The proposed project is not within two miles of a private airstrip. Therefore, the proposed project would not expose people residing or working in the project area. No impact is anticipated.

M. POPULATION AND HOUSING

Would the project:

1. *Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?*	☐	☐	☐	☒

Discussion: The proposed project would not induce substantial population growth in an area because the project does not propose any physical or regulatory change that would

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

remove a restriction to or encourage population growth in an area including, but limited to the following: new or extended infrastructure or public facilities; new commercial or industrial facilities; large-scale residential development; accelerated conversion of homes to commercial or multi-family use; or regulatory changes including General Plan amendments, specific plan amendments, zone reclassifications, sewer or water annexations; or LAFCO annexation actions. No impact would occur.

2.	*Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?*	☐	☐	☐	☒

Discussion: The proposed project would not displace any existing housing. No impact would occur.

3.	*Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?*	☐	☐	☐	☒

Discussion: The proposed project would not displace a substantial number of people since the project is intended to reduce potential for flooding in the Rio Del Mar Flats and improve water quality. No impact would occur.

N. PUBLIC SERVICES

Would the project:

1.	*Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:*				
	a. *Fire protection?*	☐	☐	☒	☐
	b. *Police protection?*	☐	☐	☒	☐
	c. *Schools?*	☐	☐	☒	☐
	d. *Parks?*	☐	☐	☒	☐
	e. *Other public facilities; including the maintenance of roads?*	☐	☐	☒	☐

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

Discussion (a through e): While the project represents an incremental contribution to the need for services, the increase would be minimal. Moreover, the project meets all of the standards and requirements identified by the local fire agency or California Department of Forestry, as applicable, and school, park, and transportation fees to be paid by the applicant would be used to offset the incremental increase in demand for school and recreational facilities and public roads. Impacts would be considered less than significant.

O. RECREATION

Would the project:

1.	*Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?*	☐	☐	☐	☒

Discussion: The proposed project would not increase the use of existing neighborhood and regional parks or other recreational facilities. No impact would occur.

2.	*Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?*	☐	☐	☐	☒

Discussion: The proposed project does not propose the expansion or construction of additional recreational facilities. Further, the design and location of the proposed stormwater pump station and outfall would not require the construction of recreational facilities. No impact would occur.

P. TRANSPORTATION/TRAFFIC

Would the project:

1.	*Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?*	☐	☐	☒	☐

Discussion: It is expected that the project would result in temporary road closures and

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

restrictions to circulation within the Rio Del Mar Flats during construction of the proposed project. The excavation and off haul of approximately 930 cubic yards of material would likely result in approximately 100 truck trips during construction of the primary pump station on Venetian Road. The project would be conditioned to require submittal of a traffic management plan for review and approval by the Department of Public Works prior to commencement of construction. While the project would result in the temporary loss of on street parking along portions of Venetian Road, sufficient parking would remain be available within the Esplanade for businesses within Rio Del Mar. The project would be conditioned to ensure pedestrian access to businesses within the Rio Del Mar Flats be maintained throughout the construction phase, particularly Pixie's Deli. The project would not result in an increase in traffic; therefore, impacts would be less than significant.

2. *Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?* ☐ ☐ ☐ ☒

Discussion: In 2000, at the request of the Santa Cruz County Regional Transportation Commission (SCCRTC), the County of Santa Cruz and other local jurisdictions exercised the option to be exempt from preparation and implementation of a Congestion Management Plan (CMP) per Assembly Bill 2419. As a result, the County of Santa Cruz no longer has a Congestion Management Agency or CMP. The CMP statutes were initially established to create a tool for managing and reducing congestion; however, revisions to those statutes progressively eroded the effectiveness of the CMP. There is also duplication between the CMP and other transportation documents such as the Regional Transportation Plan (RTP) and the Regional Transportation Improvement Program (RTIP). In addition, the goals of the CMP may be carried out through the Regional Transportation Improvement Program and the Regional Transportation Plan. Any functions of the CMP which are useful, desirable and do not already exist in other documents may be incorporated into those documents.

The proposed project would not conflict with either the goals and/or policies of the RTP or with monitoring the delivery of state and federally-funded projects outlined in the RTIP. No impact would occur.

3. *Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?* ☐ ☐ ☐ ☒

Discussion: No change in air traffic patterns would result from project implementation.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

Therefore, no impact is anticipated.

4.	*Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?*	☐	☐	☐	☒

Discussion: The proposed project consists of construction of storm drain improvements and stormwater filtration located within the county right of way. Though temporary impacts to project area roadways during construction would occur, roadways within the project area would be restored to preconstruction condition. The location of the stormwater filtration vaults would be sufficiently set back from intersections and driveways to ensure clear sight distance and safety for motorists, bicycles and/or pedestrians. No increase in hazards would occur from project design or from incompatible uses. No impact would occur from project implementation.

5.	*Result in inadequate emergency access?*	☐	☐	☒	☐

Discussion: Temporary lane closures would be required for periods of time during project construction. A traffic control plan would be prepared. However, the proposed project would not restrict emergency access for police, fire, or other emergency vehicles. Impacts would be less than significant from project implementation.

6.	*Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?*	☐	☐	☐	☒

Discussion: The proposed project design would comply with current road requirements to prevent potential hazards to motorists, bicyclists, and/or pedestrians. No impact would occur.

Q. TRIBAL CULTURAL RESOURCES

1. *Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:*

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
A. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources Code section 5020.1(k), or	☐	☐	☐	☒
B. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	☒

Discussion: The project proposes to construct storm drain improvements consisting of replacement of existing storm drains, construction of a new pump station and water filtration system and relocation of an existing stormwater outfall. Section 21080.3.1(b) of the California Public Resources Code (AB 52) requires a lead agency formally notify a California Native American tribe that is traditionally and culturally affiliated within the geographic area of the discretionary project when formally requested. As of this writing, no California Native American tribes traditionally and culturally affiliated with the Santa Cruz County region have formally requested a consultation with the County of Santa Cruz (as Lead Agency under CEQA) regarding Tribal Cultural Resources. As a result, no Tribal Cultural Resources are known to occur in or near the project area. Therefore, no impact to the significance of a Tribal Cultural Resource is anticipated from project implementation.

R. UTILITIES AND SERVICE SYSTEMS

Would the project:

1. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒

Discussion: The proposed project would not generate wastewater. No impacts would occur.

2. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

Discussion: No waste water would be generated by the proposed project however, the proposed stormwater improvements incorporate filtration and screening infrastructure in order to improve water quality. The project would redirect stormwater runoff to a location on the beach where it is filtered further by leaching into the sand. The relocation of an existing outfall in Aptos Creek to the proposed location on the beach would result in improved water quality within Aptos Creek. No impacts are expected to occur.

3.	*Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?*	☐	☐	☐	☒

Discussion: The project would not generate increased runoff. The proposed storm drain improvements are intended to redirect existing stormwater runoff in order to alleviate periodic seasonal flooding within the Rio Del Mar Flats due to heavy rainfall, high tides and lack of sufficient drainage gradients. The project includes new and expanded drainage facilities in order to achieve a 10-year capacity within the existing storm management system. No impact would occur.

4.	*Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?*	☐	☐	☐	☒

Discussion: The proposed project would only use small amounts of water during construction for dust control, concrete work and establishment of revegetation and landscaping. No water use would be required during the operational phase of the project. No impacts are expected to occur from project implementation.

5.	*Result in determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?*	☐	☐	☐	☒

Discussion: The proposed project would only use small amounts of water during construction for dust control and concrete work. No wastewater would be generated. No water use would be required during the operational phase of the project. No impacts are expected to occur from project implementation.

6.	*Be served by a landfill with sufficient permitted capacity to accommodate the*	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

project's solid waste disposal needs?

Discussion: The proposed would not generate solid waste during the operational phase of the project. However, construction debris would be generated during demolition and construction, much of which would be recycled. No impact is anticipated.

7. *Comply with federal, state, and local statutes and regulations related to solid waste?*	☐	☐	☐	☒

Discussion: The project would comply with all federal, state, and local statutes and regulations related to solid waste disposal. No impact would occur.

S. MANDATORY FINDINGS OF SIGNIFICANCE

1. *Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?*	☐	☐	☐	☒

Discussion: The potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory were considered in the response to each question in Section III (A through Q) of this Initial Study. Resources have been evaluated and determined to not to have potential significant impacts by the project, particularly Dudley's lousewort, Steelhead Trout, and Tidewater Gobey. As a result of this evaluation, there is no substantial evidence of potential adverse impacts requiring mitigation. Therefore, this project has been determined not to meet this Mandatory Finding of Significance.

2. *Does the project have impacts that are individually limited, but cumulatively considerable? ("cumulatively considerable" means that the incremental effects of a project are considerable when*	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Discussion: In addition to project specific impacts, this evaluation considered the projects potential for incremental effects that are cumulatively considerable. As a result of this evaluation, there is no substantial evidence that there are cumulative effects associated with this project. Therefore, this project has been determined not to meet this Mandatory Finding of Significance.

3. *Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?*	☐	☐	☐	☒

Discussion: In the evaluation of environmental impacts in this Initial Study, the potential for adverse direct or indirect impacts to human beings were considered in the response to specific questions in Section III (A through Q). As a result of this evaluation, there is no substantial evidence that there are adverse effects to human beings associated with this project. Therefore, this project has been determined not to meet this Mandatory Finding of Significance.

IV. REFERENCES USED IN THE COMPLETION OF THIS INITIAL STUDY

California Department of Conservation. 1980

Farmland Mapping and Monitoring Program Soil Candidate Listing for Prime Farmland and Farmland of Statewide Importance Santa Cruz County U.S. Department of Agriculture, Natural Resources Conservation Service, soil surveys for Santa Cruz County, California, August 1980.

County of Santa Cruz, 2013

County of Santa Cruz Climate Action Strategy. Approved by the Board of Supervisors on February 26, 2013.

County of Santa Cruz, 2015

County of Santa Cruz Local Hazard Mitigation Plan 2015-2020. Prepared by the County of Santa Cruz Office of Emergency Services.

County of Santa Cruz, 1994

1994 General Plan and Local Coastal Program for the County of Santa Cruz, California. Adopted by the Board of Supervisors on May 24, 1994, and certified by the California Coastal Commission on December 15, 1994.

MBUAPCD, 2008

Monterey Bay Unified Air Pollution Control District (MBUAPCD), CEQA Air Quality Guidelines. Prepared by the MBUAPCD, Adopted October 1995, Revised: February 1997, August 1998, December 1999, September 2000, September 2002, June 2004 and February 2008.

MBUAPCD, 2013a

Monterey Bay Unified Air Pollution Control District, NCCAB (NCCAB) Area Designations and Attainment Status – January 2013. Available online at http://www.mbuapcd.org/mbuapcd/pdf/Planning/Attainment_Status_January_2013_2.pdf

MBUAPCD, 2013b

Triennial Plan Revision 2009-2011. Monterey Bay Air Pollution Control District. Adopted April 17, 2013.

Attachment 1

Mitigation Monitoring and Reporting Program

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County of Santa Cruz

PLANNING DEPARTMENT
701 OCEAN STREET, 4TH FLOOR, SANTA CRUZ, CA 95060
(831) 454-2580 FAX: (831) 454-2131 TDD: (831) 454-2123
KATHLEEN MOLLOY PREVISICH, PLANNING DIRECTOR

MITIGATION MONITORING AND REPORTING PROGRAM
for
Rio Del Mar Storm Drain Improvements Project
Application No. 171057, September 25, 2017

No.	Environmental Impact	Mitigation Measures	Responsibility for Compliance	Method of Compliance	Timing of Compliance
Aesthetics and Visual Resources					
AES-1	*Have a substantial adverse effect on a scenic vista?*	Retaining walls that are visible from Venetian Road shall be finished with stamped concrete, stained with a natural color, required to install vegetation (e.g. planter boxes) sufficient enough to soften the face of the retaining wall or some combination thereof. Alternatively, an artistic mural with content characteristic of the Rio Del Mar community may be installed on the face of the walls. Review of the proposed mitigation shall be subject to review by County Planning Department staff prior to installation.	Department of Public Works	Compliance monitored by the County Planning Department and Department of Public Works	To be implemented prior to, during, and following project construction
Noise					
NOI-1	*Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?*	Limit construction activity to between the hours of 7:00 a.m. to 6:00 p.m. Monday through Friday. Prohibit construction activity on weekends and Holidays.	Department of Public Works	Compliance monitored by the County Planning Department and Department of Public Works	To be implemented prior to and during project construction
NOI-2		Limit use of construction equipment which would produce noise levels in excess of 75 dBA outside the hours of 9:00 a.m. to 5:00 p.m.	Department of Public Works	Compliance monitored by the County Planning Department and Department of Public Works	To be implemented prior to and during project construction
NOI-3		Require that all construction and maintenance equipment powered by gasoline or diesel engines have sound-control devices that are at least as effective as those originally provided by the manufacturer and that all equipment be operated and maintained to minimize noise generation.	Department of Public Works	Compliance monitored by the County Planning Department and Department of Public Works	To be implemented prior to and during project construction
NOI-4		Prohibit gasoline or diesel engines from having unmuffled exhaust.	Department of Public Works	Compliance monitored by the County Planning Department and Department of Public Works	To be implemented prior to and during project construction
NOI-5		Use noise-reducing enclosures around stationary noise-generating	Department of	Compliance	To be implemented

No.	Environmental Impact	Mitigation Measures	Responsibility for Compliance	Method of Compliance	Timing of Compliance
		equipment capable of 6 dB attenuation. Installation of noise reducing enclosures along Venetian Road between the primary staging area and Pixie's Deli. Enclosures shall not impede pedestrian access.	Public Works	monitored by the County Planning Department and Department of Public Works	prior to and during project construction
N/A	*A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?*	See mitigation measures NOI-1 through NOI-5. Impacts would be less than significant with implementation of mitigation.	Department of Public Works	Compliance monitored by the County Planning Department and Department of Public Works	To be implemented prior to and during project construction

Thank you!

COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS

Agenda

Brief storm recovery update
Rio Del Mar "Flats" project update

Who am I?
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Santa Cruz County

2016 – 2017 STORM DAMAGE

- 200 locations
- $93 Million in damage
- Federal declaration for January and February Storms
- Most rain in recorded history
- Years to recovery...

2017 Storm Damage

State Park Drive (Seacliff)

Valencia Road (Trout Creek)

2017 Storm Damage

2017 Storm Damage

Trout Gulch Road

2017 Storm Damage

Questions?

COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS

Rio Del Mar "Flats"
Storm Water Drainage Improvement

THE PROJECT

COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS

Purpose

Isolate and deliver neighborhood storm water to a new outfall structure on Rio Del Mar State Beach.

Project is not intended to:

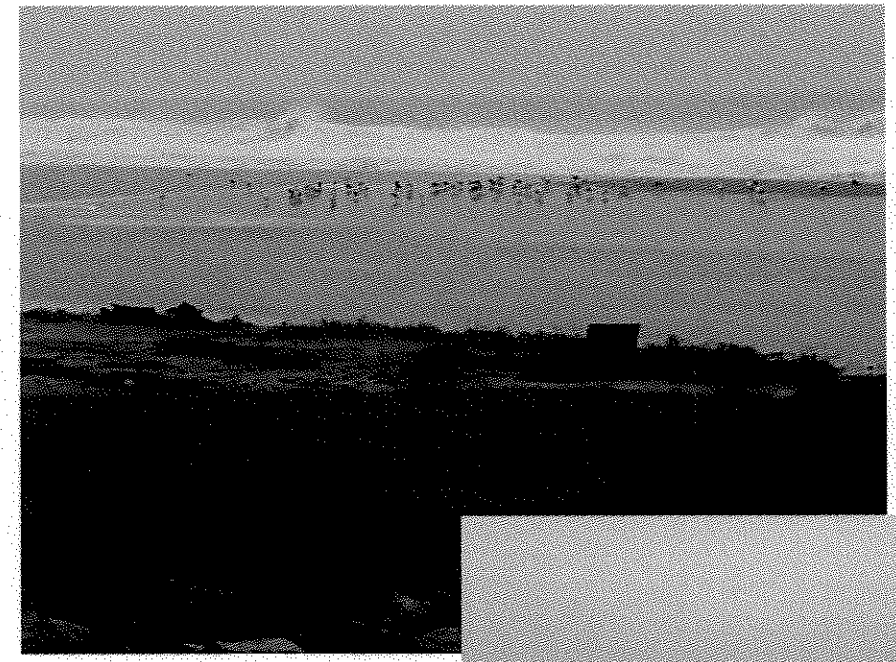
Change FEMA flood maps

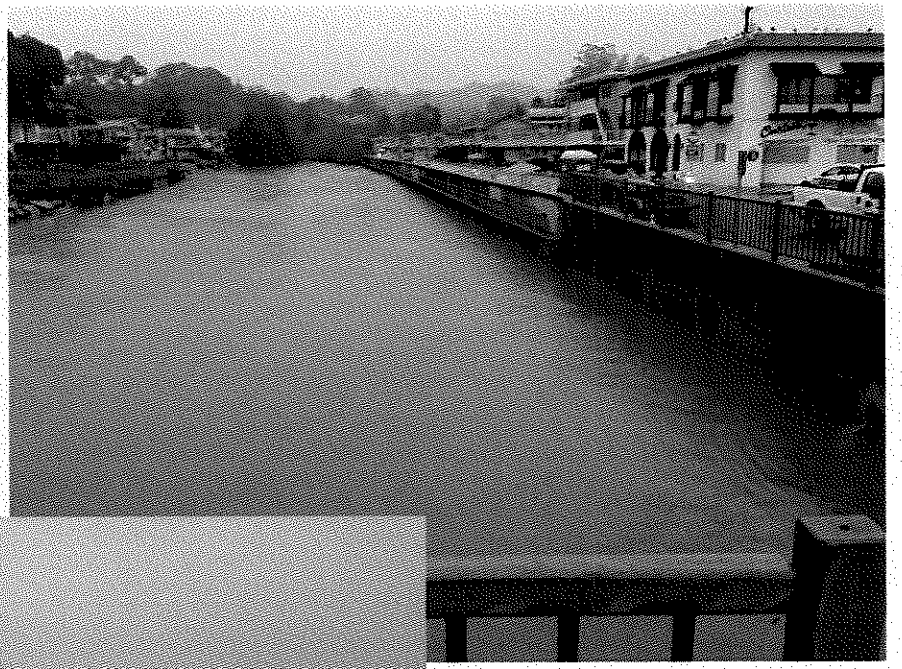
Address Aptos Creek flooding

Sea level rise or tidal flooding

WHY DO WE NEED THE PROJECT?

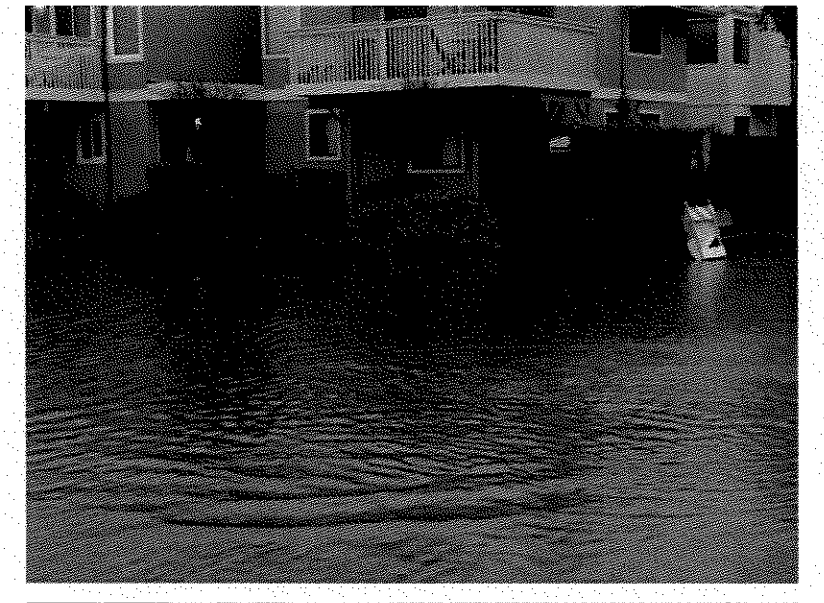
COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS

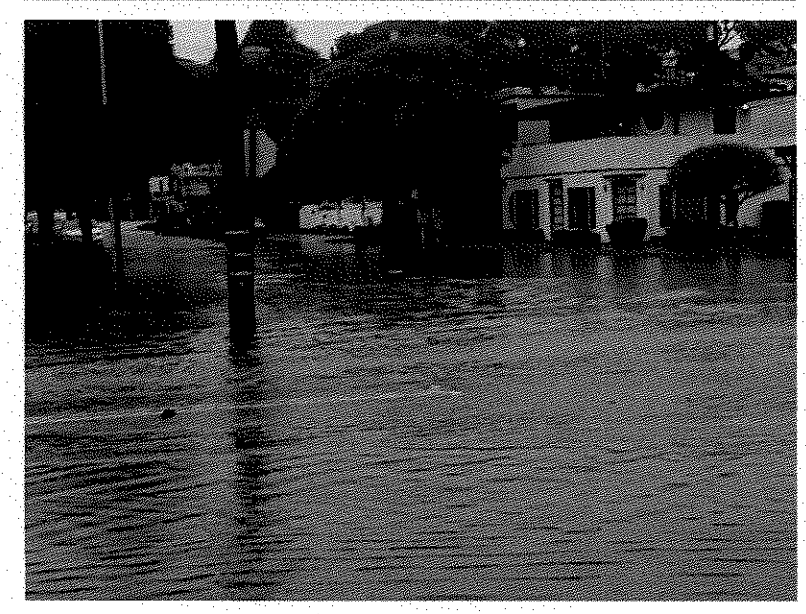




WHY DO WE NEED THE PROJECT?

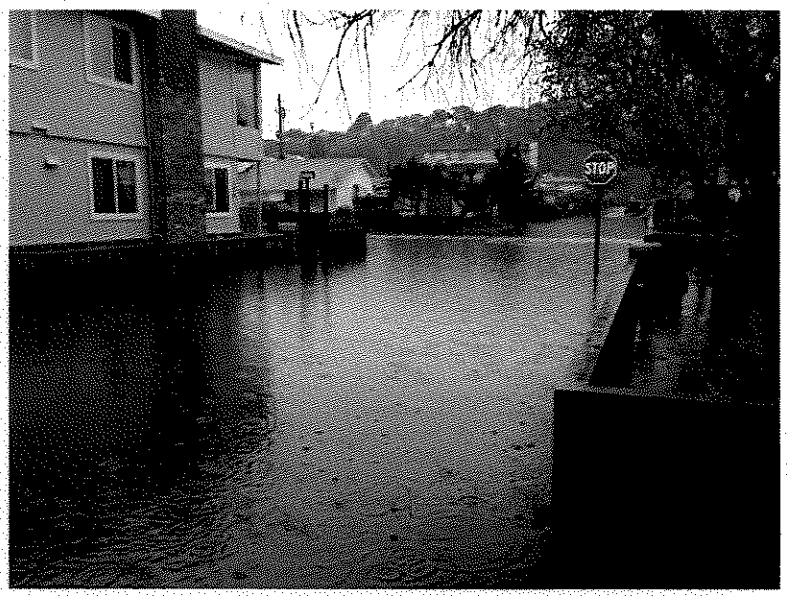
COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS





WHY DO WE NEED THE PROJECT?

COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS



WHY DO WE NEED THE PROJECT?

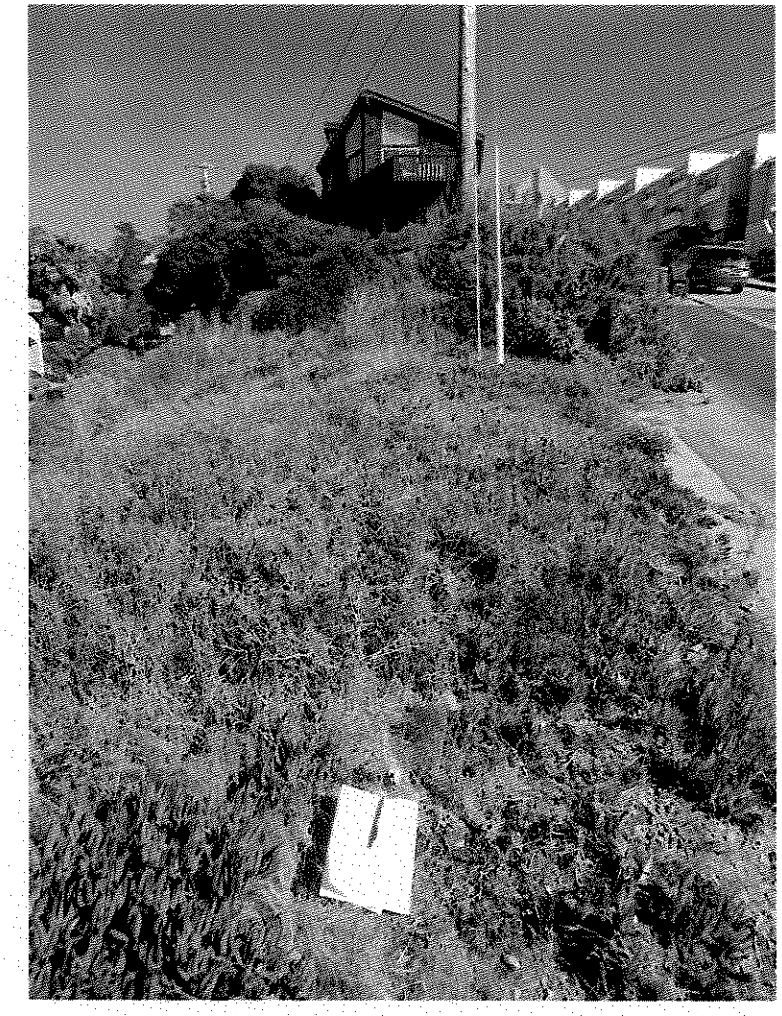
COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS

THE PROJECT?

COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS

STORM WATER PUMP STATION

COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS



- In the gore between Venetian Rd. and Rio Del Mar Blvd.
- Structure mostly below ground
- Area selected for high ground

OUTFALL STRUCTURE

COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS

- In the ice plant area
- 15 – foot diameter, underground structure
- Not visible
- Outside normal flooded areas

PROJECT INITIATION - 2014

COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS

FUNDING

FEMA Grant	$950k
Local Match	$320k
Total Project	**$1.27M**

PROJECT STATUS

COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS

Coastal and Environmental Permit
October 2017

Plans, Specifications, and Estimate
December 2017

Project Advertisement for Bids
February 2018

Anticipated Project Completion
August 2018

QUESTIONS?

COUNTY OF SANTA CRUZ
DEPARTMENT OF
Public WORKS

Who am I?
Colt Esenwein, P.E.
Assistant Director of Special Services
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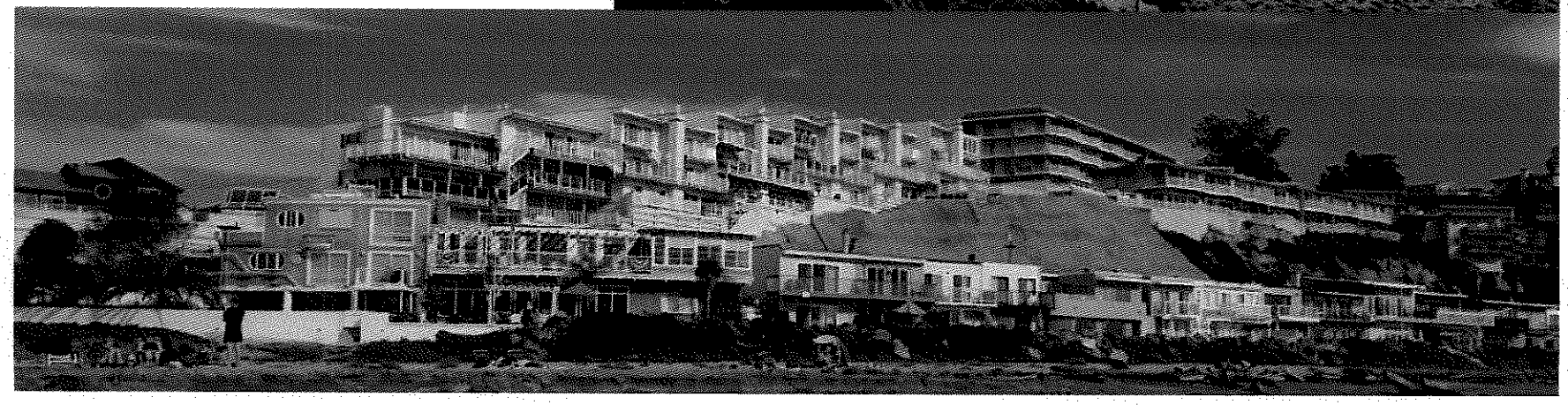
colt.esenwein@santacruzcounty.us
(831)454-2595



David Sims

From: Colt Esenwein
Sent: Wednesday, April 19, 2017 7:23 PM
To: Rachel Fatoohi; David Sims; Ashleigh Trujillo
Subject: RDMIA meeting
Attachments: image1.JPG; ATT00001.txt; image2.JPG; ATT00002.txt

All good comments, group thankful for project, no opposition to plan.

RDMIA SEMI ANNUAL MEETING APRIL 19, 2017 SIGN IN SHEET

	NAME	MEMBER YES	MEMBER NO
1	Dan Rothenbush	X	
2	Fay Levinson / Joe Vela	x	
3	Terry & Alice Cannella	X	
4	Bill + Susie Riley	X	
5	Joyce Hopkins	X	
6	Peggy Eklund	X	
7	[illegible]		
8	MICHEAL SAINT		X
9	Barry Scott		
10	LAUREL GRANLUND	✓	
11	Jan Granlund	✓	
12	JIM PUNCHES	✓	
13	Shannon Emily Kinnecut		✓
14	LISA VIEIRA	X	
15	Greg Horne	✓	
16	Nan & Tom McConnell	—	
17	Ann Berry-Kline	X	
18	PETER & DONNA TOWNSEND	X	
19	BILL HARE	X	
20	BETSY HARE	X	
21	THOMAS PISTOLE	X	
22	Rob Gaskill	X	
23	Dondi Gaskill	X	
24	Don Schemel + Sue		X
25	Mark Nance	X	

	NAME	YES	NO
26	Cherie Weeland	X	
27	Jessica Santillano		X
28	Sara Clarenbach	X	
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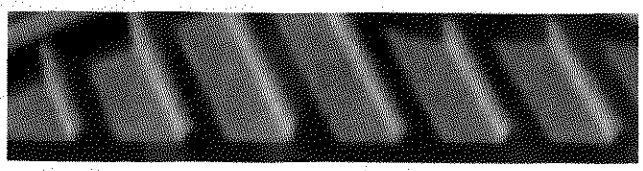
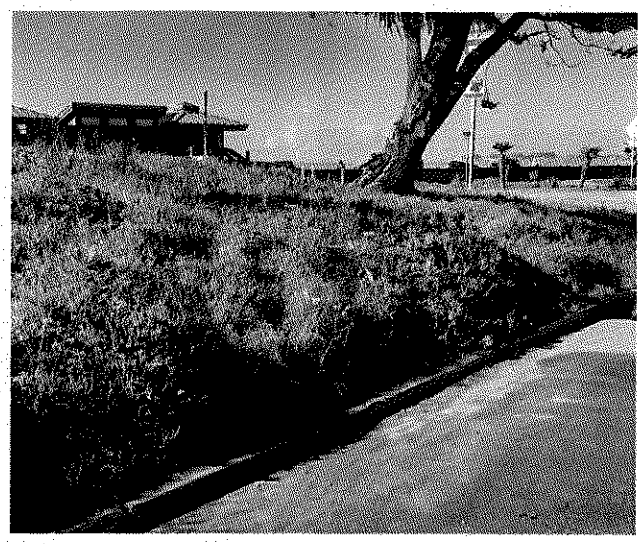
RIO DEL MAR FLATS PUMP STATION
COLOR/MATERIALS/PLANTING SHEET

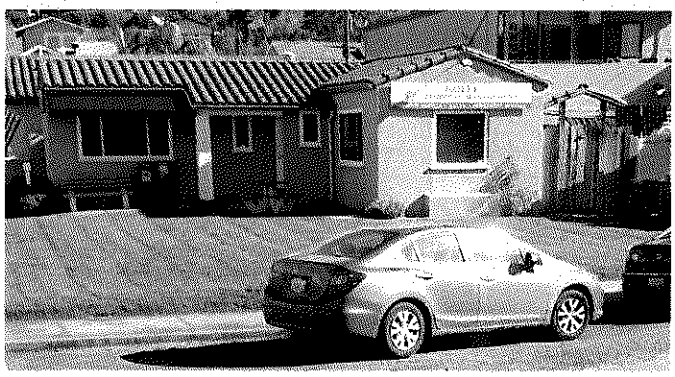
Roof Overhang For Electric Control Panel



Reddish Metal Roof
(May not be exactly as shown above; color to match surrounding restroom and property management office roofs shown below)

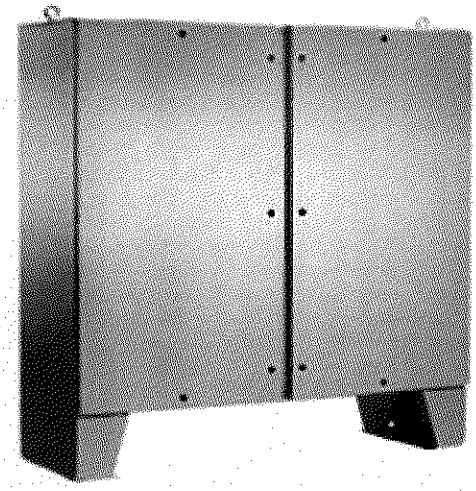


Rio Del Mar Beach Restroom

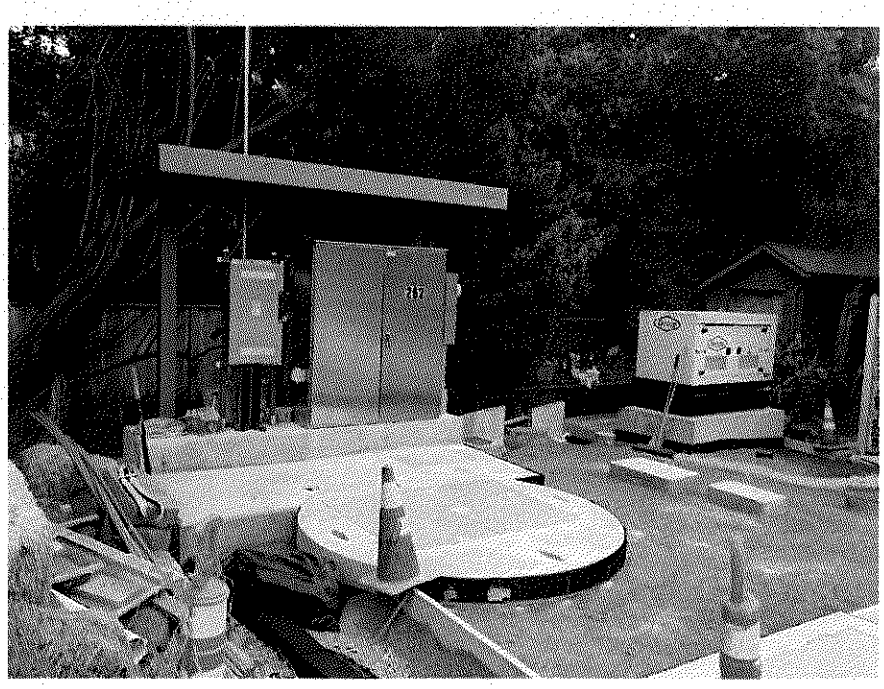


Baily Property Management

Electronic Control Panel Stainless Steel Enclosure



72"x64"x18" Stainless Steel Enclosure
(Exact model may vary slightly)

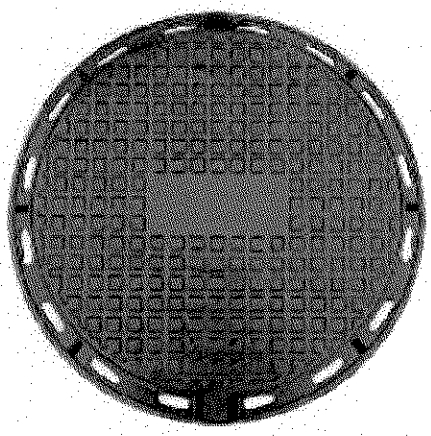


Similar Panel/Enclosure at 15th Street in Santa Cruz

Concrete Retaining Walls

Smooth Finish Concrete Retaining Walls to Match Existing Nearby Stairs

Manhole



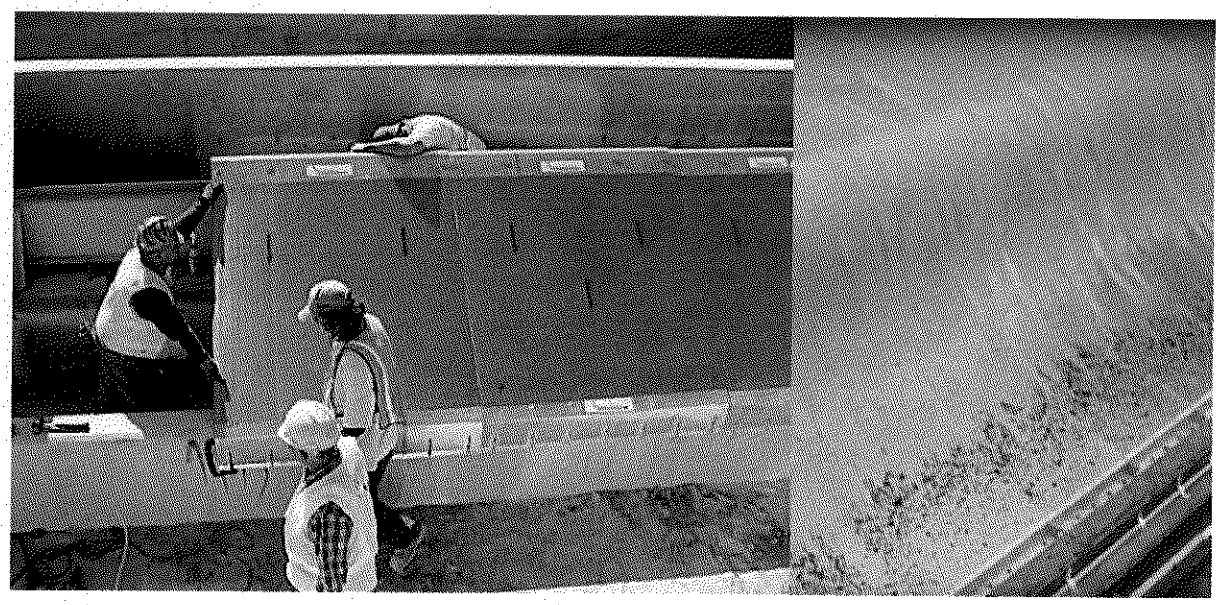
Cast Iron Manhole Cover for Storm Drain Outfall (to be marked "STORM DRAIN")

Railing

Galvanized Steel Railing on Upper Level of the Vaults
(Similar in character to the railing along Aptos Creek)

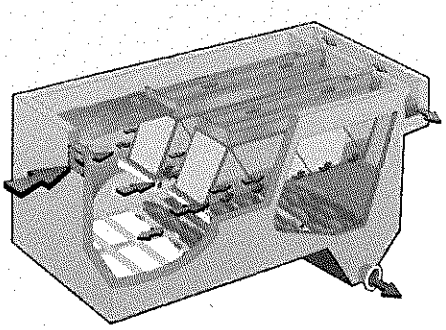
Coanda Screen:

Photos below show a series of Coanda trash and debris screens being installed, and under flow conditions. The model on the left is most similar to that specified for the project, with a flat 45 degree tilted surface. The screens are entirely made from stainless steel and will not rust. They are bolted to the top edge of concrete stem walls to provide support, with a water vault under the screen that then pipes the water further through the system. To protect the screen from possible vandalism, the screen surface will be shielded by an offset panel (red colored per other submitted samples), tilted at 45 degrees such that it will appear as a simulated roof. This also has the advantage of hiding any debris deposits adhering to the screen surface. The retaining wall directly below the lip of the Coanda screen makes up the interior of the service bay and this view will be partly obscured from the Venetian street and sidewalks by preserving a portion of the vegetated slope between the service bay and Venetian Road.



Inclined Plate-Pack Settler Module:

Photos below show the visible top surface of a representative sediment settler vault at larger installations than that proposed for this project. Only one plate-pack unit, inserted into a 30 ft. by 11 ft. vault space, is proposed for this project. The plate-pack settler module is made of stainless steel and does not rust. In operation there is a shallow pool of water a few inches deep covering the walkable surface (for maintenance) of the plate pack with flow troughs on either side. Deep portions of the vault are not accessible, except by maintenance personnel when cleaning. Off-season and long periods between storms, the vault is to be drained. The top surface would not be visible from the Venetian street surface, or sidewalks, as the elevation is above eye height. Vaults elevated above surrounding grade will receive perimeter railing (per other submitted samples) that will deterr trespass. There are no adjacent sidewalks on Rio del Mar Blvd to provide a view, or promote access either, and maturing shrubs reaching 4 to 5 feet height will further obscure this viewpoint.



PLANTING

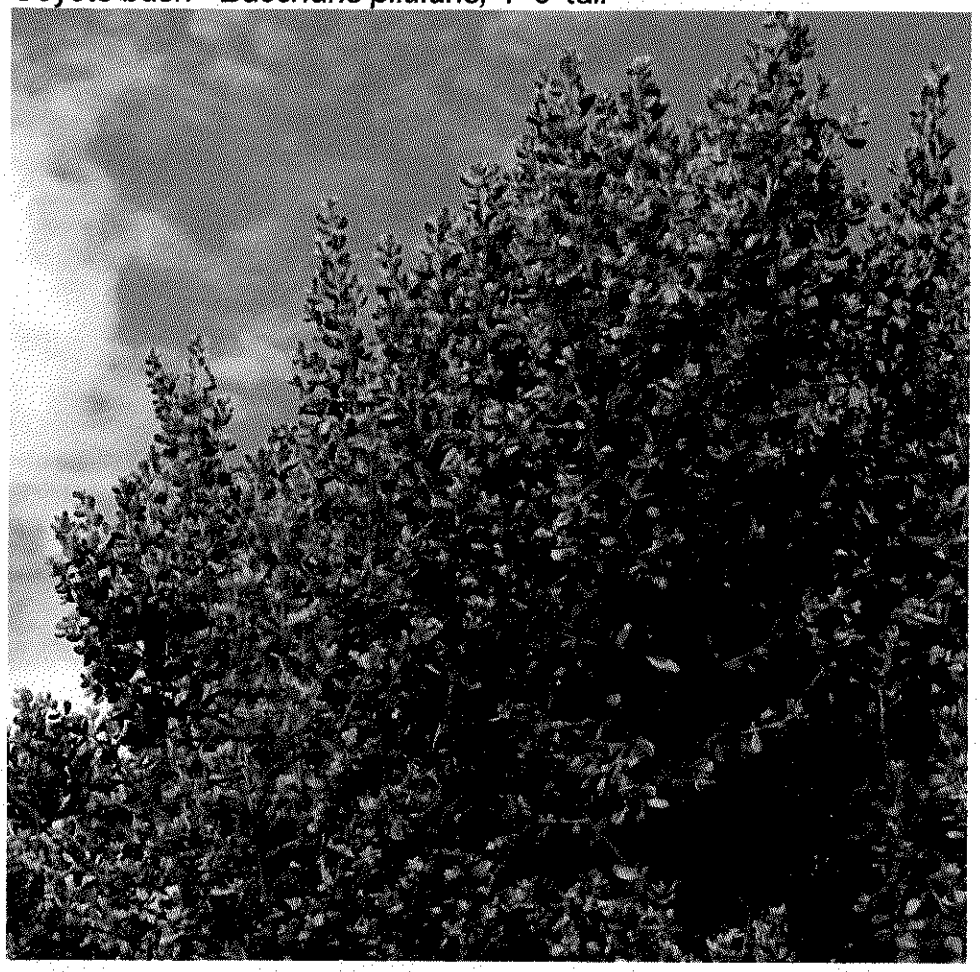
The following plants are coastal native species that will be considered for use on the Rio Del Mar Storm Drain Improvement Project. The planting will serve as screening and erosion control.

Plants for Placement at the Pumping Station Area
Coastal native species – Shrubs use for screening, erosion control, drought tolerant
Contractor will be allowed to choose approximately four from the eleven choices below, dependent on availability.

Ceanothus *"Dark Star"*, 4'-6' tall (additional taller varieties)

Rhus integrifolia, 4'-5' tall

Coyote bush - *Baccharis pilularis, 4'-6' tall*



Arctostaphylos *andersonii*, 6' – 8' tall (additional taller varieties)

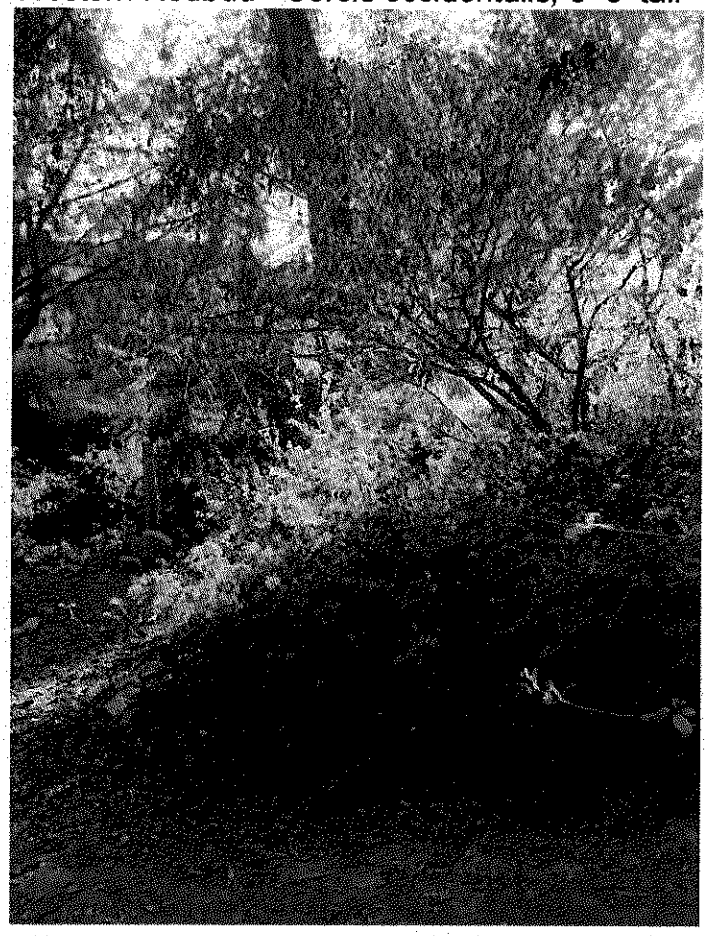
Arctostaphylos *andersonii*

Coffeeberry –*Rhamnus californica , 4-6" tall*

Flannel Bush – Fremontodendron californicum *'California Glory'*, 6'-10' tall

Rock Rose – Cistus 'Santa Cruz', 3'-5'

Western Redbud - *Cercis occidentalis*, 3'-5' tall



Purple Sage - Salvia leucophylla, 3'-5' tall

California bush anemone - Carpenteria californica 'Elizabeth', 3'-5'

Spice Bush - Calycanthus occidentalis, 6'-8'

Plants for Placement at the Beach Outfall Area

Coastal native species - use for ground cover, erosion control, drought tolerant. Contractor will be allowed to choose four from the nine choices below, dependent on availability.

Ceanothus g. horizontalis (Carmel Creeper or Anchor Bay), 1'-2' tall

Deergrass - Muhlenbergia rigens , 2'-3' tall

Sea Thrift – Armeria Maritima, 6"- 1'

Coyote bush - *Baccharis pilularis 'Twin Peaks' , 2'-3' tall*

Arctostaphylos 'Emerald Carpet' , 1' – 2' tall
(or *Arctostaphylos hookeri* - Monterey Carpet)

Coffeeberry –*Rhamnus californica 'Seaview' , 2' tall*

Seaside Daisy - *Erigeron glaucus* 'Cape Sebastian' – 1'-2' tall
(or *Erigeron* x 'Wayne Roderick')

Sand Strawberry - *Fragaria chiloensis , 6"-1' tall*

California Aster - Aster chilensis (dwarf varity) – 1' tall

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

May 16, 2017
E5696

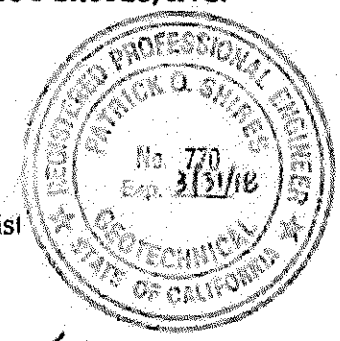
David W. Sims, P.E.
Civil Engineer
Stormwater Management Section
Department of Public Works
County of Santa Cruz

SUBJECT: **Geotechnical Investigation**
RE: Rio Del Mar Flats Pump Station
Aptos, Santa Cruz County

Dear Mr. Sims:

Cotton, Shires and Associates, Inc. (CSA) is pleased to provide you with this report summarizing the results of our geotechnical investigation of the Rio Del Mar Flats area being considered for a pump station, in Aptos, Santa Cruz County, California. We understand that Rio Del Mar Flats area floods consistently during heavy rainfall events, particularly during high tide. In this report, we provide a geotechnical characterization of the area, analyses, and geotechnical recommendations for mitigating the flood hazard with the proposed pump station. We trust that this provides you with the information that you need at this time. If you have any questions regarding this report, or need additional information, please feel free to call.

Very truly yours,
COTTON, SHIRES AND ASSOCIATES, INC.



John M. Wallace
Principal Engineering Geologist
CEG 1923

Patrick O. Shires
Senior Principal Geotechnical Engineer
GE 770

JMW:POS:st

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www.cottonshires.com

GEOTECHNICAL INVESTIGATION

Rio Del Mar Flats Pump Station
Aptos, California

For:
David W. Sims, P.E.
Civil Engineer
Stormwater Management Section
Department of Public Works
County of Santa Cruz

by
COTTON, SHIRES AND ASSOCIATES, INC.
330 Village Lane
Los Gatos, California 95030

May 2017

GEOTECHNICAL INVESTIGATION
Rio Del Mar Flats Pump Station
Aptos, California

Table of Contents

TECHNICAL REPORT

GEOTECHNICAL INVESTIGATION
Rio Del Mar Flats Pump Station
Aptos, California

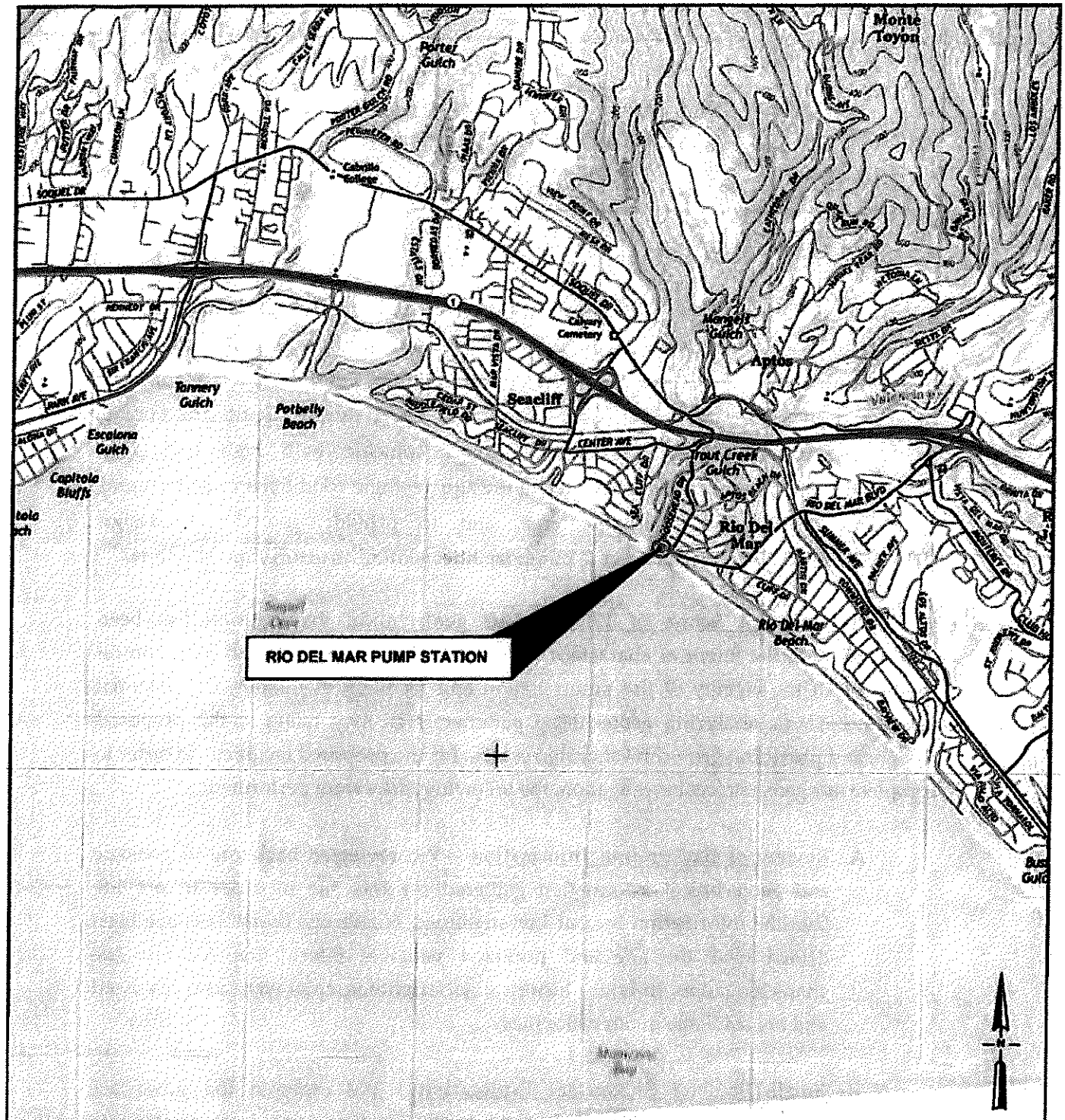
1.0 INTRODUCTION

In this report, Cotton, Shires and Associates, Inc. (CSA) is pleased to summarize the results of our Geotechnical Investigation for the proposed pump station at the Rio Del Mar Flats in Aptos, Santa Cruz County, California (Figure 1, Site Location Map). We understand that this area experiences frequent flooding during significant rainfall events, particularly when these rainfall events coincide with high tide. This investigation was performed to characterize the site geologic conditions in and around the pump facility and discharge area, and to provide geotechnical design recommendations for constructing the pump facilities, outfall structure, and conduits.

1.1 Purpose and Scope of Work - Our geotechnical investigation has been performed with the intent of characterizing the current site geologic and geotechnical conditions in the vicinity of the pump station and facilities, evaluating the potential geologic hazards, analyzing geotechnical parameters as they relate to the proposed design, and providing geotechnical design criteria for the proposed facilities. In order to complete our geotechnical investigation, the following tasks were performed:

A. **Review of Background Information** – We reviewed background geologic and geotechnical information gathered for this site in order to provide baseline information for our investigation. Numerous boreholes have been drilled near the site and provided valuable information for our site characterization. In-house historical aerial photographs were also reviewed and are available in our office files.

B. **Small-Diameter Subsurface Exploration** – We explored the subsurface conditions of the proposed pump facility and associated structures with seven (7) small-diameter boreholes in roughly the locations identified in the RFP. These borings were logged by our geologists/geotechnical engineers to aid in our interpretation of the subsurface conditions. Borehole logs are



COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

SITE LOCATION MAP
RIO DEL MAR PUMP STATION
APTOS, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
KW	1" = 1/2 mile	E5696
APPROVED BY	DATE	FIGURE NO.
JW	MARCH 2017	1

presented in Appendix A. Selected samples were collected to determine geotechnical properties and corrosion potential of the underlying materials.

C. **Instrumentation/Percolation Testing** – Open standpipe piezometers were installed into 2 exploratory boreholes, one at the future pump station, and the other at the outfall structure, for the purpose of monitoring groundwater levels. The piezometers were fitted with a flush-mounted well covers. We also performed percolation tests in one borehole to evaluate the infiltration capacity of the earth materials at the location of the stormwater underground discharge structure.

D. **Geologic/Geotechnical Map** – We utilized the existing topographic base map provided by the County (in CAD format) to portray the borehole locations, existing cultural features and utilities, and geologic materials (i.e., artificial fill, alluvium, bedrock).

E. **Engineering Geologic Cross Sections** – Selected engineering geologic cross sections were generated to portray the site surface topography and subsurface geologic conditions in relation to existing and proposed structures.

F. **Laboratory Testing** - Representative samples from the field exploration program were tested to provide a basis for foundation and retaining wall design, and for liquefaction evaluations. Laboratory testing of soil and bedrock materials included the following tests: moisture-density tests, sieve analysis, Caltrans corrosion suite of tests (i.e., minimum resistivity, pH, chloride and sulfate), and groundwater salinity.

G. **Liquefaction Evaluation and Geotechnical Analyses and Preparation of Geotechnical Design Criteria** – Using the data acquired from the tasks above, the liquefaction potential of the site was evaluated and anticipated seismically induced settlements estimated. Geotechnical data was analyzed in order to provide foundation, retaining wall, shoring and drainage design criteria.

H. Monitoring – We monitored the two newly installed piezometers and the existing piezometer in the parking lot. Data loggers were installed in these boreholes to gather continuous water level data at 15 minute intervals.

I. Reporting – This technical report with pertinent illustrations summarizes the results of our geotechnical investigation. The report contains an assessment of the observed site conditions, and provides geotechnical engineering conclusions and recommendations for use in designing and implementing the storm water pump station and associated structures.

1.2 Discussion – We understand that the County is proposing to construct a stormwater pump facility in the Rio Del Mar Flats area to mitigate persistent flooding due to heavy rainfall, high tides, and lack of sufficient drainage gradients in the existing stormwater system. The proposed pump station would be located across from the Pixie Deli on the south side of Venetian Road, and would draw water from the flood-prone areas to the pump station via new drain pipes, and would also utilize some of the existing storm drain pipes. The pump station would then convey the storm water under Rio Del Mar Boulevard and under Beach Drive to the beach via a new storm drain pipe that would discharge into an underground discharge structure. The proposed underground structure would discharge minor flows vertically to the beach sand to promote infiltration, but would discharge primary flows through a surface portal to allow large storm flows to discharge overland to the beach when inflows exceed the infiltration capacity of the sand.

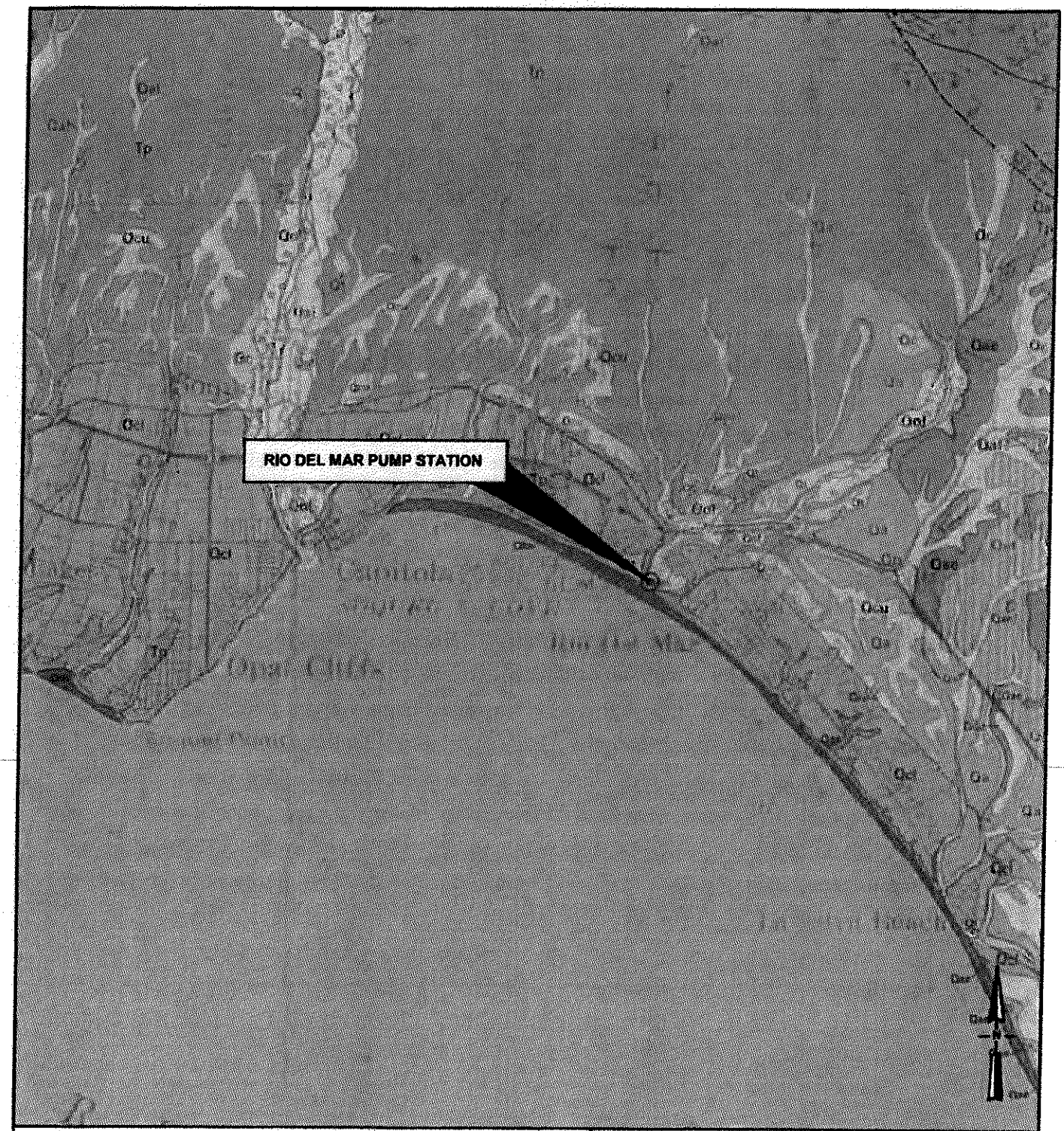
2.0 PHYSICAL SETTING

The project site is influenced by a number of physical parameters, including topography, geologic setting and seismicity. The following is a brief description of the engineering geologic and geotechnical engineering site constraints related to these parameters.

2.1 **Topography** - The project site is characterized, in general, by relatively level alluvial floodplain topography associated with Aptos Creek. Elevations range from approximately El. 10 feet along Venetian Drive near the proposed pump station, El. 15 feet to 25 feet along Rio Del Mar Blvd heading eastward up the hill, and El. 14 feet along the back beach area in the vicinity of the proposed outfall structure. All elevations are in reference to the NGVD 29 datum.

2.2 **Geologic Setting** – The project site is located within the Coast Range Geomorphic Province. Uplift of the Coast Ranges within the last 2 to 3 million years has resulted in dissection of the mountain range, alluvial deposition within the San Francisco Bay structural trough, and subsidence of the alluvial sediments. This area is characterized by rugged hills with moderate relief, steep valleys, and locally steep hillsides abutting drainages. The project site, prior to residential development, was a back beach estuary where Aptos Creek incised through Purisima Formation bedrock and developed a relatively wide alluvial floodplain. According to published geologic maps (Brabb, 1989), the pump site is underlain by sedimentary bedrock materials of the Purisima Formation (Figure 2, Regional Geologic Map). The level areas of the Rio Del Mar Flats are older alluvial deposits associated with ancestral Aptos Creek. The proposed outfall structure is to be located underground, within beach sand along the back beach. Grading associated with residential development of the area included grading portions of the seacliff to allow Rio Del Mar Blvd to extend down onto the Rio Del Mar Flats area.

2.3 **Seismic Setting** - The project site is situated in a very seismically active area. Historically, this area has been subjected to violent ground shaking from major earthquakes and the site will continue to experience very strong ground shaking in the future. Figure 3 illustrates the significant active faults located closest to the site, including the San Andreas fault zone (located 7.0 miles toward the northeast), the San



Geologic Units

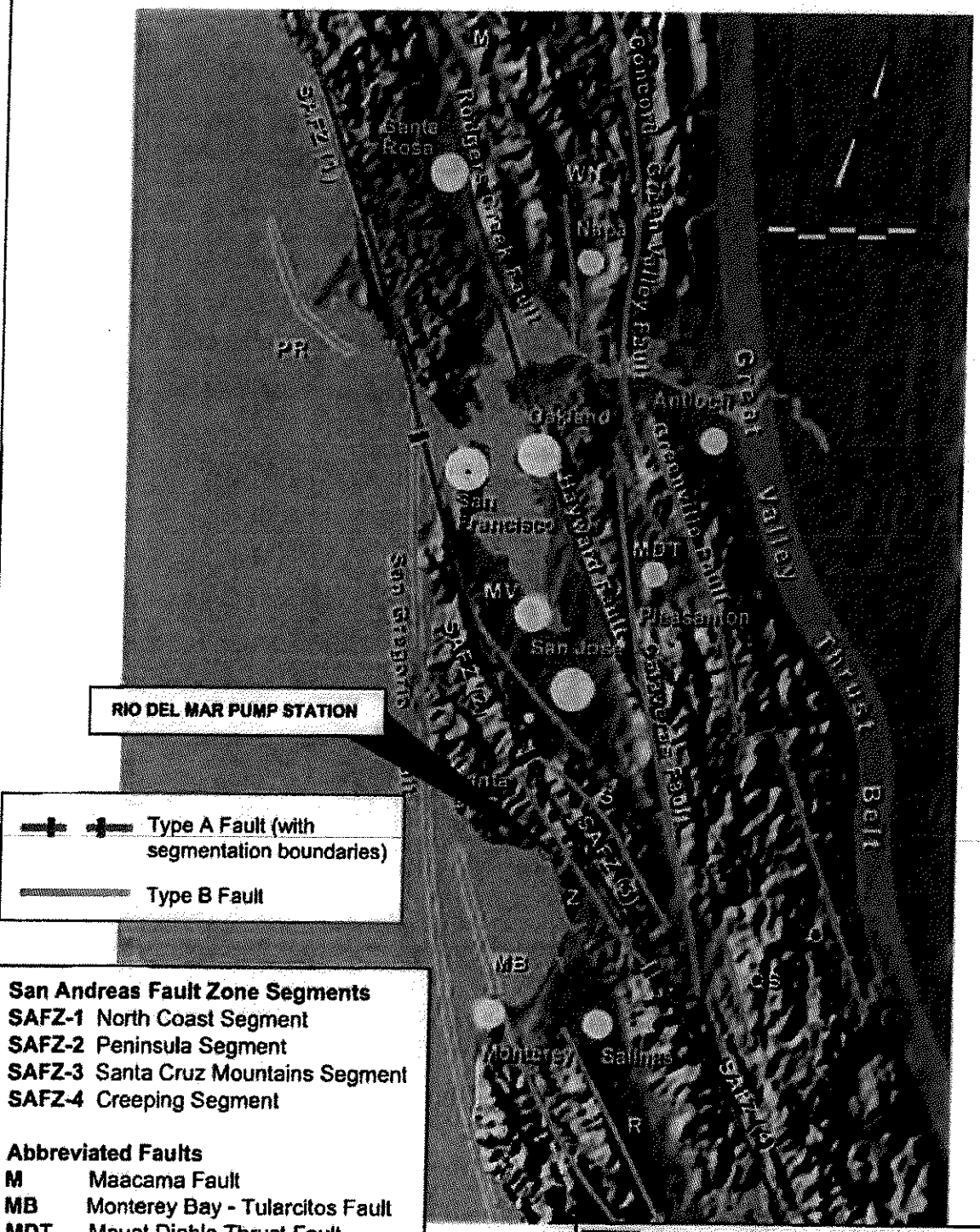
Qc	Colluvium (Holocene)	Qcu	Coastal terrace deposits
Qal	Alluvial deposits, undifferentiated	Qcl	Lowest emergent coastal terrace
Qof	Older flood-plain deposits	Qa	Aromas Sand
Qb	Basin deposits	Qae	Eolian lithofacies
Qbs	Beach sand (Holocene)	Tp	Purisma Formation
Qt	Terrace deposits		

Source: Geologic Map of Santa Cruz County, California (1989) compiled by Earl E. Brabb.

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

REGIONAL GEOLOGIC MAP
RIO DEL MAR PUMP STATION
APTOS, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
KW	1" = 5 miles	E5696
APPROVED BY	DATE	FIGURE NO.
JW	MARCH 2017	2



COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

San Francisco Bay Area Fault Map
RIO DEL MAR PUMP STATION
APTOS, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
KW	1"=25 miles	E5696
APPROVED BY	DATE	FIGURE NO.
JW	MARCH 2017	3

Gregorio fault (located 16.0 miles to the southwest), the Zayante/Vergeles fault (located 4.0 miles toward the northeast), and the Monterey Bay/Tularcitos fault (11.0 miles to the south). The site is not located within a State (California Geological Survey) Mapped Earthquake-Induced Landslide Hazard Zone.

TABLE 1 – Nearby Faults

Fault Source	Distance (mi.)	Moment Magnitude[1]	Peak Horizontal Accelerations (g)[2]
San Andreas 1906	7.0	7.9	0.47
Zayante/ Vergeles	4.0	6.8	0.46
San Andreas Santa Cruz Mtns	7.0	7.0	0.36
San Gregorio	16.0	7.0	
Monterey Bay/ Tularcitos	11.0	7.1	0.29

[1]Based on "Probabilistic Seismic Hazard Assessment for The State of California" by CDMG, DMG Open-File Report 96-08. Magnitude based on Maximum Credible Earthquake as suggested by CDMG.

[2]Based on attenuation relationships developed by Campbell, 1994, (unconstrained, average horizontal component, mean); as determined using the computer program EQFAULT by Blake, 1989, and updated 1997.

2.3.1 **Probabilistic Analysis** - We performed a peak ground acceleration analysis of the site employing the U.S.G.S. Seismic Design Tool, with the 2010 ASCE 7 (with March 2013 errata) Design Code. The results of our analysis indicate an appropriate Maximum Considered Earthquake Geometric Mean (MCEG) Peak Ground Acceleration (PGA_M) of 0.47g.

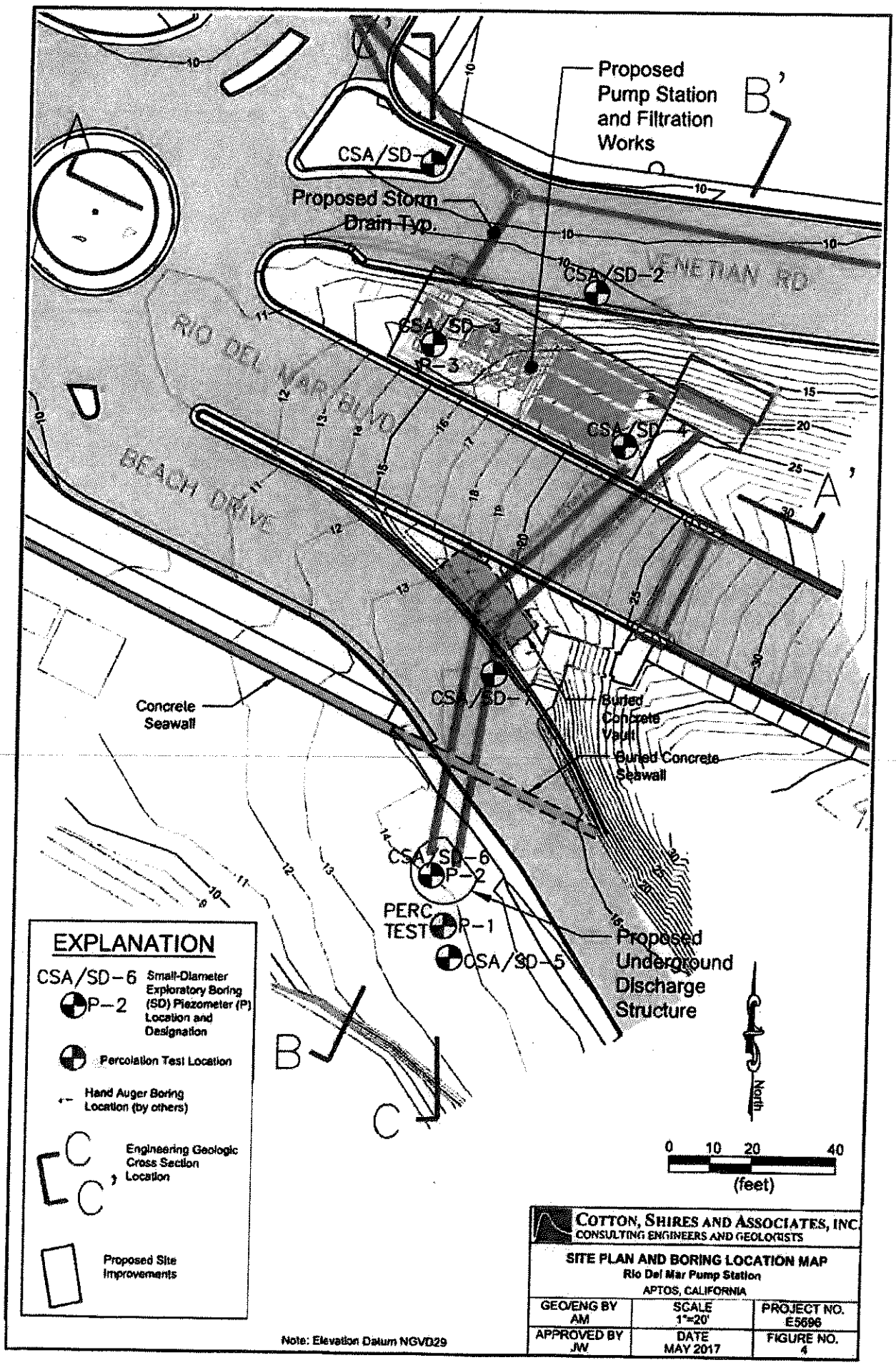
Taking into account the faults described above, the 2013 California Building Code (CBC), the ASCE 7-10 code coefficients presented in Section 6.8 of this report, the strong-motion records from the 1989 Loma Prieta Earthquake where the closest recording instrument to the site was located at the Capitola Fire Station and experienced a maximum horizontal ground acceleration of 0.54g, and the results of the peak ground acceleration analysis, it is our opinion that the proposed development at this site could experience a peak horizontal ground acceleration (PGA_M) as high as **0.54g**.

2.4 **Laboratory Testing** - We performed laboratory tests on representative undisturbed samples obtained from our exploratory borings. These tests included in-situ unit weight, natural moisture content, grain size analysis, corrosion testing, chemical analysis of groundwater, and sieve wash analysis, (see Appendix C, Laboratory Testing Results). We also performed in situ percolation tests on the site soils in the vicinity of the underground discharge structure. Some of the lab test results are also noted on the exploratory boring logs.

3.0 SITE CONDITIONS

3.1 Surface Conditions at the Pump Site – The proposed pump station is to be located between Venetian Road and Rio Del Mar Blvd along a relatively steep (up to 30-degree inclination), north-facing slope (Figure 4, Site Plan and Boring Location Map). The north-facing slope appears to have been a natural cut bank for an ancestral meander bend of Aptos Creek. At the top of this slope is Rio Del Mar Blvd. which appears to have been graded in the early 1900s to achieve a uniform drivable surface down to the Rio Del Mar Flats area. Some artificial fill was placed to help maintain grade for Rio Del Mar Blvd near the base of the hill.

3.2 Surface Conditions at the Underground Discharge (Outfall) Structure – The underground discharge structure is located along the south side of Beach Drive atop the elevated back beach, near elevation 14 feet (NGVD 29). The proposed outfall area will be placed approximately 40 feet back from the top of the elevated back beach slope face. This location is typically above inundation from high tides and large storm surges as it is set back in a protected alcove between the State Park bathroom facility and the residential structures along Beach Drive, and contains a thick growth of ground vegetation that has been in place for at least 25 years. However, Aptos Creek occasionally flows eastward, parallel with the shoreline for hundreds of feet due to shoaling in front of the mouth of the creek. Occasionally these parallel flows encroach upon the back beach area and the adjacent residential yards of Beach Drive, most of which have rip rap protecting the face of the back beach. In 2012, a persistent episode of flow in this orientation created scour and erosion along the face of the elevated back beach area, and exposed portions of the rip rap protecting the rear yards. The creek alignment at this time was at least 80 feet from the proposed location of the discharge facility, but could indirectly impact the proposed discharge facility in the unlikely event the alignment of the creek extends much further north than in 2012. Following breeching of the sandbar, Aptos Creek resumed flow seaward, and coastal processes (wind and short-period waves) restored the scoured beach within a period of several years. While reportedly not documented historically, the outfall structure location may potentially be impacted by infrequent storm surges during the lifetime of the structure, and thus, should be designed to account for scour, undermining, and impact from logs being carried by extreme storm surges.


Proposed Pump Station and Filtration Works
B'
A
CSA/SD-1
Proposed Storm Drain Typ.
CSA/SD-2
VENETIAN RD.
CSA/SD-3
P-3
RIO DEL MAR BLVD.
D
CSA/SD-4
A'
BEACH DRIVE
Concrete Seawall
CSA/SD-7
Buried Concrete Vault
Buried Concrete Seawall
CSA/SD-6
P-2
PERC TEST
P-1
CSA/SD-5
Proposed Underground Discharge Structure
B
C
North
0 10 20 40
(feet)
EXPLANATION
CSA/SD-6 Small-Diameter Exploratory Boring
P-2 (SD) Piezometer (P) Location and Designation
Percolation Test Location
Hand Auger Boring Location (by others)
C C' Engineering Geologic Cross Section Location
Proposed Site Improvements
Note: Elevation Datum NGVD29
COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS
SITE PLAN AND BORING LOCATION MAP
Rio Del Mar Pump Station
APTOS, CALIFORNIA
GEO/ENG BY AM
SCALE 1"=20'
PROJECT NO. E5696
APPROVED BY JW
DATE MAY 2017
FIGURE NO. 4

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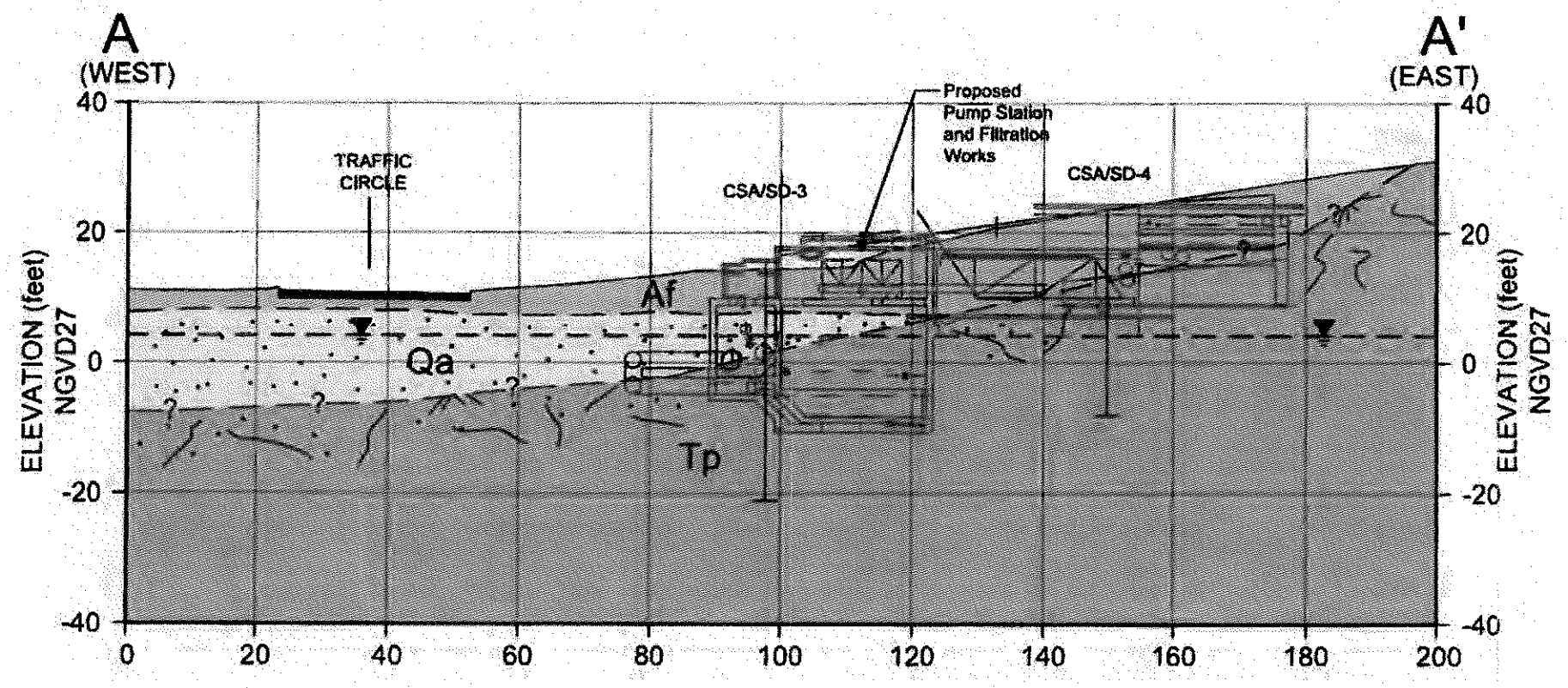

EXPLANATION

EARTH MATERIALS

- Af — Artificial Fill
- Qa — Alluvium
- Tp — Purisima Formation

SYMBOLS

- Approximate Ground Water Surface
- CSA/SD-4 — Small-Diameter Exploratory Boring Location

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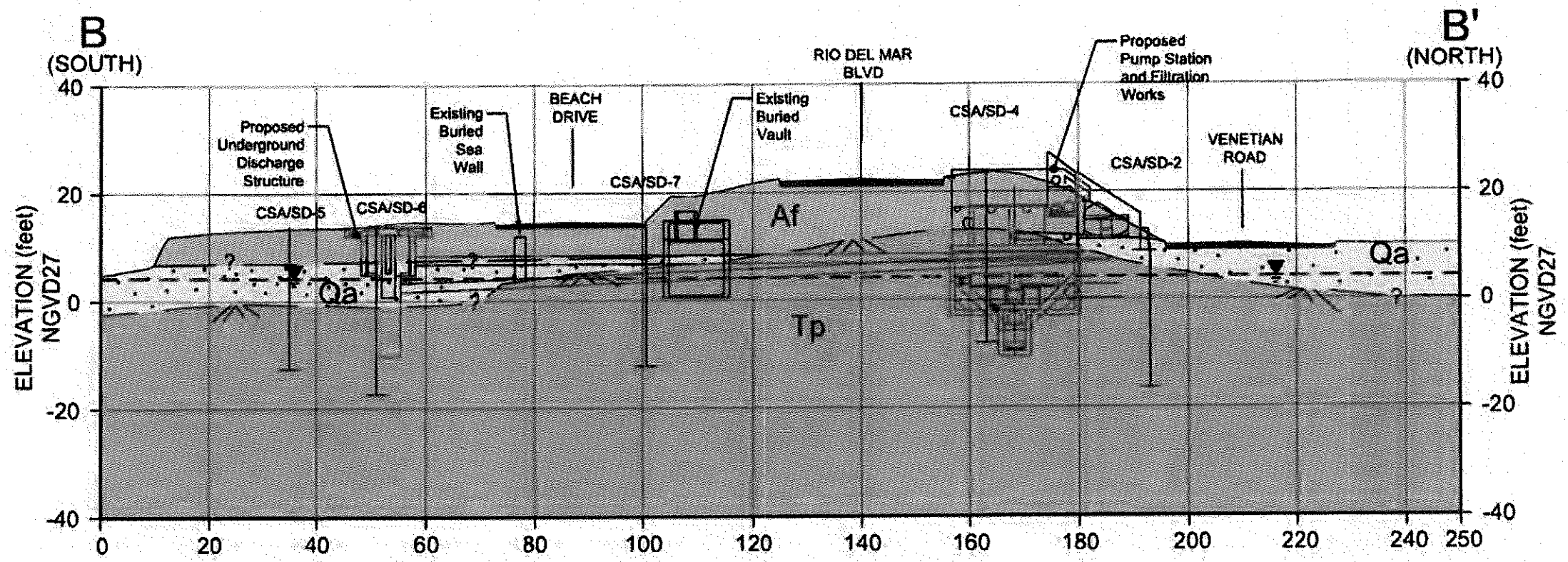
ENGINEERING GEOLOGIC CROSS SECTION A-A'
Rio Del Mar Pump Station
APTOS, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
AM	1"=20'	E5696
APPROVED BY	DATE	FIGURE NO.
JW	MAY 2017	5



EXPLANATION

EARTH MATERIALS

- Af — Artificial Fill
- Qa — Alluvium
- Tp — Purisima Formation

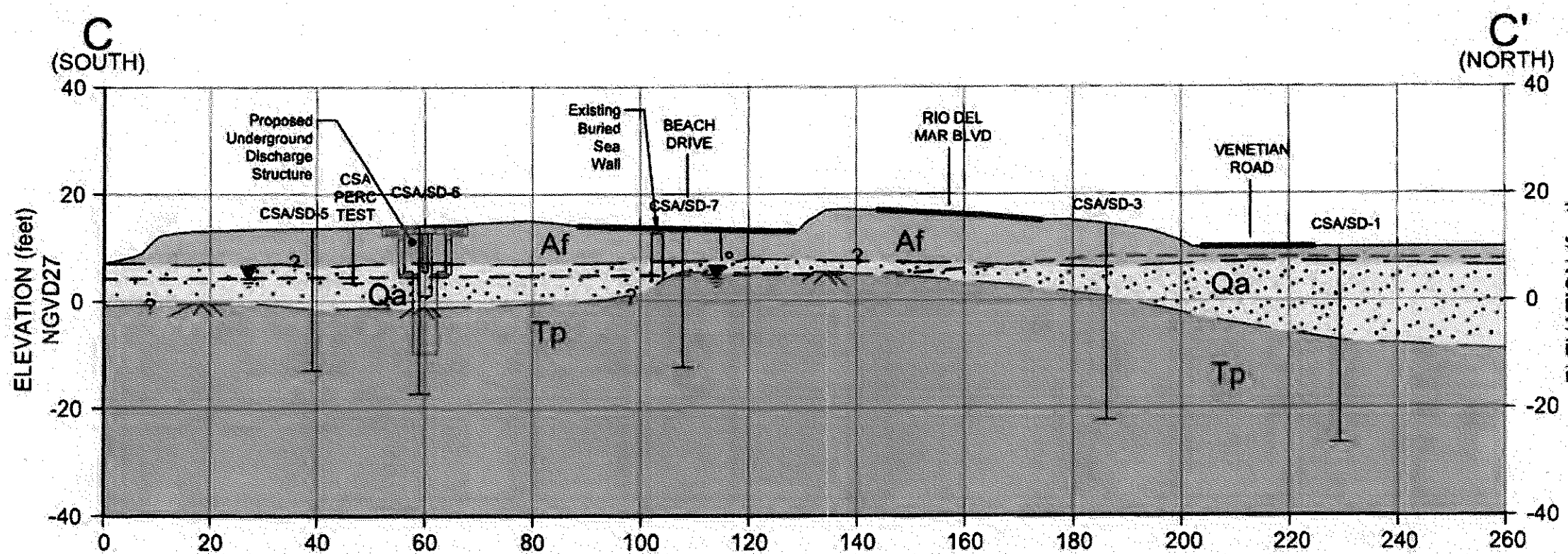
SYMBOLS

- Approximate Ground Water Surface
- CSA/SD-7 — Small-Diameter Exploratory Boring Location

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

ENGINEERING GEOLOGIC CROSS SECTION B-B'
Rio Del Mar Pump Station
APTOS, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
AM	1"=20'	E5696
APPROVED BY	DATE	FIGURE NO.
JW	MAY 2017	6



EXPLANATION

EARTH MATERIALS

- Af — Artificial Fill
- Qa — Alluvium
- Tp — Purisima Formation

SYMBOLS

- Approximate Ground Water Surface
- CSA/SD-7 — Small-Diameter Exploratory Boring Location

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CONSULTING ENGINEERS AND GEOLOGISTS

ENGINEERING GEOLOGIC CROSS SECTION C-C'
Rio Del Mar Pump Station
APTOS, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
AM	1"=20'	E5696
APPROVED BY	DATE	FIGURE NO.
JW	MAY 2017	7

3.3 **Subsurface Conditions** – We explored the subsurface conditions in the vicinity of the pump station and outfall facility by excavating seven small-diameter boreholes (CSA/SD-1 through CSA/SD-7) to depths ranging from 26.5 to 36.5 feet below the ground surface. All boreholes were drilled using a track-mounted drill rig provided by Britton Drilling. The results of the exploratory excavations are described below, and boring locations are shown on Figure 4, and on Figures 5, 6, and 7, Engineering Geologic Cross Sections A-A', B-B', and C-C':

CSA/SD-1: This small-diameter borehole was excavated in the landscaped triangle on Venetian Drive near the traffic circle at an elevation of 10 feet. In this borehole, we encountered approximately 2.75 feet of clayey sand artificial fill overlying 15 feet of alluvium, which overlies competent Purisima Formation bedrock to the explored depth of 36.5 feet. The alluvium consisted of interbedded sand and clay that was loose/soft with blow counts ranging from 5 to 9. These materials were underlain by competent bedrock materials of the Purisima Formation consisting of weathered sandstone with traces of gravel. Very high blow counts were encountered in these materials. Groundwater was encountered 8 feet below the ground surface, which corresponded to an elevation of +2.0'.

CSA/SD-2: This small-diameter borehole was excavated in Venetian Drive, on the south side of the road near where the proposed pump station would be located, with a top elevation of roughly 10 feet. In this borehole, we encountered approximately 0.75 feet of artificial fill composed of the roadway surface and base rock, overlying 4.5 feet of alluvium, which overlies competent Purisima Formation bedrock to the explored depth of 26.5 feet. The alluvium consisted of sand that was loose with blow count 7. These materials were underlain by competent bedrock materials of the Purisima Formation consisting of weathered sandstone with traces of gravel. Very high blow counts (generally in excess of 50 blows per foot) were encountered in these materials. Groundwater was encountered 9 feet below the ground surface, which corresponded to an elevation of +1.0'.

CSA/SD-3: This small-diameter borehole was excavated in the landscaped area between Venetian Drive and Rio Del Mar Blvd., at an elevation of approximately 15.5 feet near where the proposed pump station would be located. In this borehole, we encountered approximately 8 feet of artificial fill consisting of layered sand and silt,

overlying 15 feet of alluvium. which overlies competent Purisima Formation bedrock to the explored depth of 36.5 feet. The alluvium consisted of loose sand with blow counts ranging from 3 to 11. These materials were underlain by competent bedrock materials of the Purisima Formation consisting of weathered sandstone with traces of gravel to the explored depth of 36.5 feet. Very high blow counts (in excess of 50 blows per foot) were encountered in these materials. Groundwater was encountered 11 feet below the ground surface, which corresponded to an elevation of +3.4 feet. A 2-inch diameter open standpipe piezometer was installed to a depth of 31.5 feet.

CSA/SD-4: This small-diameter borehole was excavated in the landscaped area between Venetian Drive and Rio Del Mar Blvd., at an elevation of approximately 23.5 feet, upslope of where the proposed pump station would be located, near the inclined plate-pack settler. In this borehole, we encountered approximately 11 feet of artificial fill consisting of medium dense sand, overlying competent Purisima Formation bedrock to the explored depth of 31.5 feet. The Purisima Formation consisted of weathered sandstone with traces of gravel with very high blow counts (generally in excess of 50 blows per foot). Groundwater was encountered 20 feet below the ground surface, which corresponded to an elevation of +3.5 feet.

CSA/SD-5: This small-diameter borehole was excavated along the elevated back beach south of Beach Drive in the vicinity of the proposed underground discharge structure at an elevation of 13.9 feet. In this borehole, we encountered 15 feet of alluvium, consisting of loose beach sand with blow counts ranging from 4 to 8. Competent Purisima Formation bedrock was encountered below the sand to the explored depth of 26.5 feet. Very high blow counts (generally in excess of 50 blows per foot) were encountered in these materials. Groundwater was encountered 9.5 feet below the ground surface, which corresponded to an elevation of +4.4 feet.

CSA/SD-6: This small-diameter borehole was also excavated along the elevated back beach south of Beach Drive in the vicinity of the proposed underground discharge structure at an elevation of 14.2'. In this borehole, we encountered 15.5 feet of alluvium, consisting of loose beach sand with blow counts ranging from 3 to 5. Competent Purisima Formation bedrock was encountered below the sand to the explored depth of 31.5 feet. Very high blow counts (generally in excess of 50 blows per foot) were encountered in these materials. Groundwater was encountered 10 feet below the

ground surface, which corresponded to an elevation of +4.2'. A 2-inch diameter open standpipe piezometer was installed to a depth of 30 feet.

CSA/SD-7: This small-diameter borehole was excavated in Beach Drive near the foot of the stairway descending from Rio Del Mar Blvd. to Beach Drive, and has a top elevation of 14.3 feet. In this borehole, we encountered approximately 6.6 feet of artificial fill consisting of sand and silty sand overlying 2 feet of alluvium, which overlies competent Purisima Formation bedrock to the explored depth of 26.5 feet. The fill and alluvium loose with blow counts ranging from 5 to 6. These materials were underlain by competent bedrock materials of the Purisima Formation consisting of weathered sandstone with traces of gravel. Very high blow counts (generally in excess of 50 blows per foot) were encountered in these materials. Groundwater was encountered 13 feet below the ground surface, which corresponded to an elevation of +1.3 feet.

3.4 **Ground Water** – Groundwater was encountered in each of the seven boreholes, ranging in elevations from +1.0 to +4.4 (NGVD 29). The elevations recorded at the time of drilling did not show a direct correlation with tidal fluctuations, and groundwater was encountered in both the alluvium and the Purisima Formation. These elevations do not represent a stabilized elevation in all of the boreholes, and the elevation noted on the boring logs was where the groundwater was first noticed. The piezometer readings in Boreholes CSA/SD-3 and CSA/SD-6 represent stabilized groundwater levels, and graphs of these are presented in Figure 8. Data loggers installed on these two piezometers, and a third data logger installed on a pre-existing piezometer in front of the Café Rio restaurant, collected automated readings every 15 minutes. Small- and large-scale tidal fluctuations can be seen in the data, but the highest and most rapid fluctuations in groundwater levels occur immediately following heavy rainfall. It should be noted that Aptos Creek was flowing freely to the sea at the time of our drilling; however, groundwater conditions during construction could be higher when sand bars close off the mouth of Aptos Creek or shortly after heavy rainfall.

Laboratory testing was performed on water samples taken from borings CSA/SD-3 and CSA/SD-6 and showed only slightly elevated levels of salinity (i.e., brackish water). Moderate rainfall amounts had been received in the Aptos area prior to commencement of drilling on November 30, with accumulated rainfall of approximately 12 inches received from October 15 to November 28, with 0.8 inches of rain on November 26/27.

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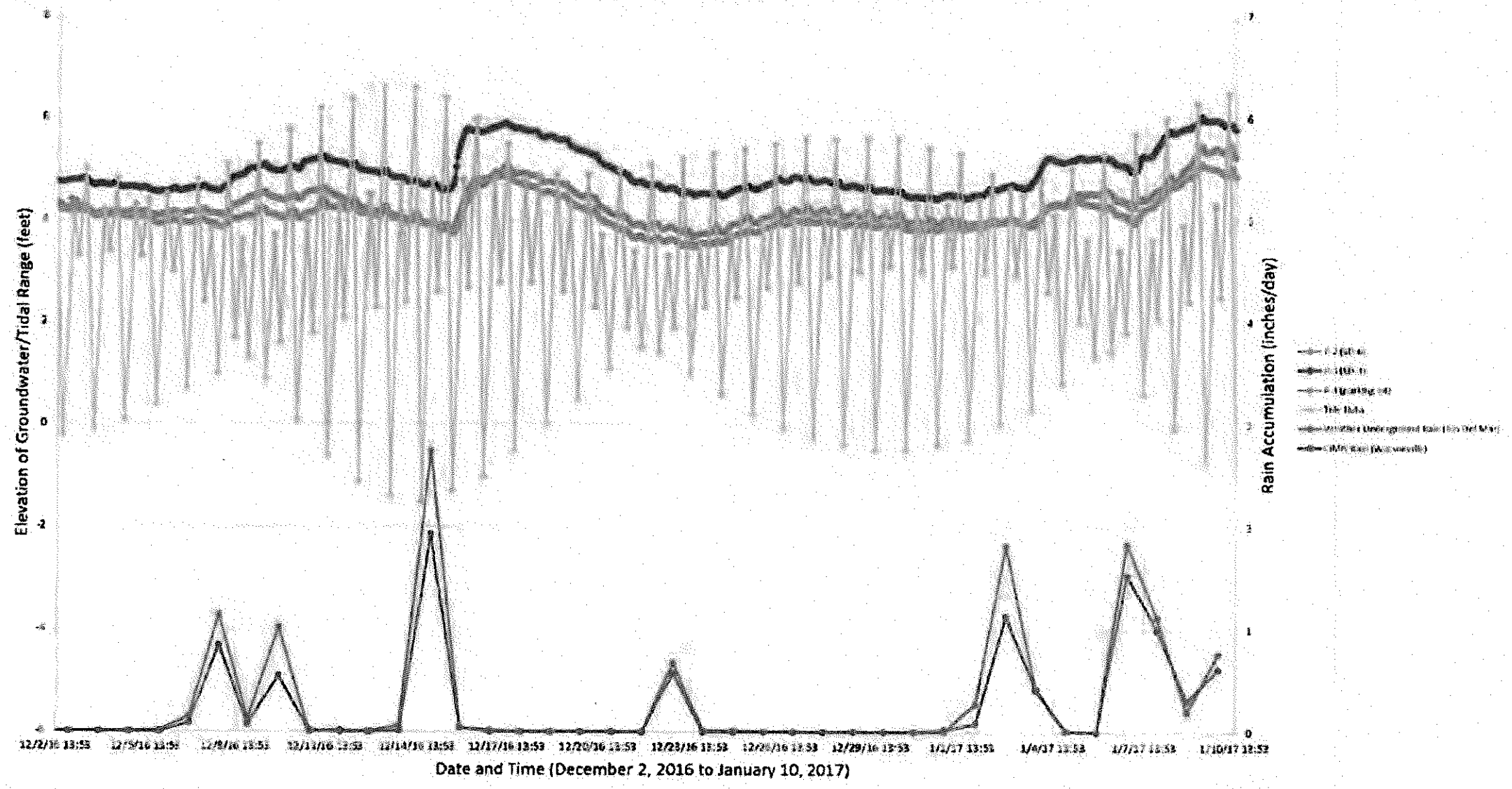
Rio Del Mar Pump Station Piezometer Data with Rain Fall and Tidal Range
December 2, 2016 to January 10, 2017



COTTON, SHIRES AND ASSOCIATES, INC. CONSULTING ENGINEERS AND GEOLOGISTS		
Piezometer Data with Rain Fall and Tidal Range **RIO DEL MAR PUMP STATION** APTOS, CALIFORNIA		
GEO/ENG BY KW	SCALE NTS	PROJECT NO. E5696
APPROVED BY JW	DATE MARCH 2017	FIGURE NO. 8

4.0 POTENTIAL GEOTECHNICAL HAZARDS

In the following sections, we list identified potential geotechnical hazards at the proposed Rio Del Mar Pump Station site along with the corresponding degrees of estimated potential risk, and we provide recommendations for possible mitigation measures.

4.1 **Seismic Hazards** - Seismic ground shaking associated with a large earthquake on the San Andreas Fault or one of the closer faults is considered to be a **high** potential hazard in the project area. Peak ground accelerations of up to **0.54g** should be anticipated at the site (see report Section 2.3).

No active faults have been recognized on, or mapped through, the subject property. Thus, the potential for surface faulting and ground rupture from faulting at the subject site is considered to be **low**. The Zayante-Vergeles Fault is the closest mapped active fault to the site, located approximately 4.0 miles to the northeast.

Seismically-induced ground failure mechanisms include: landsliding, liquefaction, lateral spreading, lurching, and differential compaction. The potential for strong ground shaking to trigger a landslide at the Rio Del Mar Pump Station site that could impact the proposed pump station structure is considered to be **low** due to the low relief and relatively shallow and competent Purisima Formation bedrock that the structure will be embedded into. Topography at the filtration basin site is relatively gentle and therefor the potential for seismically induced landsliding at that site is considered to be **low**.

Due to the relatively shallow and competent Purisima Formation bedrock that the pump station structure will be embedded into, the potential for liquefaction and/or cyclic mobility and lateral spreading is considered to be **low** for the pump station site. However, we did identify loose alluvial sand materials in the borings for the underground discharge structure that are considered to have **high** potential for liquefaction. Similarly, storm drain pipes and manholes in the streets are in alluvial areas characterized by loose sands that are considered to have **high** potential for liquefaction. In the following table, we present a summary of the results of our liquefaction analysis:

Table 2 – Liquefaction Analysis

Boring No.	Depth (ft)	Structure Impacted	N_{ave}	Volumetric Strain (%)	Settlement (in)
CSA/ SD-1	2.75 – 17.5	Pipelines, etc. in Aptos Beach Drive and Venetian Road	6	4.5	8.0
CSA/ SD-2	2.75 – 4.5	Pipelines, etc. in Venetian Road	7	4.5	2.0
CSA/ SD-3	8.0 – 13.5	Pump Station*	7	4.5	3.0
CSA/ SD-4	0.0 – 11.0	Coanda Screen, Inclined Plate Settler	16.5	0.0	0.0
CSA/ SD-5	10.0 – 15.0	Underground Discharge Structure	5.0	5.0	3.0
CSA/ SD-6	10.0 – 15.5	Underground Discharge Structure	3.8	5.0	3.3
CSA/ SD-7	2.75 – 8.5	Pipelines in Beach Drive	5.3	5.0	3.5

* Since the Pump Station will be founded below a depth of 13.5 feet, this settlement should not impact the structure itself.

Based on our liquefaction induced settlement calculations summarized in the above table, we anticipate total settlements to be negligible for the pump station. However, the pipelines beneath the streets and the underground discharge structure can be expected to have moderate to high settlements in a liquefaction event without mitigation measures being incorporated (see Recommendations Section of report). There is a high potential that the alluvial sand materials encountered at the underground discharge structure site could lurch, settle (compact differentially) and behave differently under seismically-induced ground shaking, resulting in differential movement and possible distress to a structure supported in these materials. Consequently, we are

recommending that the underground discharge structure be pier-supported within competent bedrock materials, which would reduce the liquefaction risks to low levels.

There is a low potential that the Purisima Formation bedrock materials encountered at the pump station site could lurch, settle (compact differentially) and behave differently under seismically-induced ground shaking.

4.2 Settlement Behavior - For our settlement analysis, we assumed that the pump station structure would be supported either on a typical shallow footing/mat/slab type foundation bearing in either undisturbed Purisima Formation bedrock using a maximum allowable bearing pressure of 5,000 psf for the dead plus long term live load, or on piers embedded a minimum of 8 feet into Purisima Formation bedrock materials deriving support using an adhesion of 750 psf and uplift resistance of 250 psf in bedrock only. Based on these assumptions, we estimate that total static settlement for the pump station structure should be less than 1 inch, and differential settlements should be less than 1/2 inch over 40 feet. We assumed the underground discharge structure would be pier-supported, with a minimum embedment of 8 feet into Purisima Formation bedrock materials deriving support using an adhesion of 750 psf and uplift resistance of 250 psf in bedrock only. Based on these assumptions, we estimate that total static settlement for the underground discharge structure should be less than 1 inch, and differential settlements should be less than 1/2 inch over 25 feet.

4.3 Soil Corrosion Screening - We are not experts on corrosion of steel and sulfate attack on concrete, but we did have laboratory tests on the soils at this site performed to provide screening information for corrosion and sulfate attack. The soil resistivity test results appear to show moderate to high corrosion potential for uncoated steel (USDA NSSH Part 618 [Subpart B]), likely due to the marine environment. Our laboratory test results should be utilized by your design engineers in determining the appropriate design to resist corrosion potential for the particular components being designed. With corrosion resistant materials incorporated into the design, corrosion hazards can be reduced to acceptable low levels.

4.4 Coastal Processes; Wave Run-up, Wave Impact, and Beach Erosion - As discussed in Section 3.2, the underground discharge structure is located along the south side of Beach Drive atop the elevated back beach, near elevation 14 feet (NGVD 29),

Historical aerial photographs reveal that this location experiences very infrequent wave run-up, as the vegetated back beach can be seen in aerial photographs extending back into the late 1980s and early 1990s. It appears that the 1982 storm surge reached this area as the vegetated back beach is much larger in the pre-1982 aerial photographs (California Coastal Records Project, Adelman); however, damage to the area was nowhere near as severe as other locations along this stretch of beach. This area can be expected to be impacted by very infrequent (25- to 50-year events) wave run-up that will likely carry large logs transported downstream by Aptos Creek. The underground location of the discharge facility may preclude impact from most of these run-up events, as scour at the discharge site is expected to be infrequent and shallow.

It should be noted that the existing storm drain outfall is located within Aptos Creek, where repeated storm damage and frequent flooding have occurred. The proposed location of the discharge facility tucked between the State Park bathroom and residential structures is a far superior location, and should provide long-term performance benefits over the existing location. Considering the pier-supported structural design elements, with scour and impact-resistant designs, the risk of significant damage to the discharge facility can be reduced to acceptable levels. It should also be noted that the discharge facility will be adjacent to the Esplanade retaining wall, which has been in existence since the late 1920s without significant damage.

4.5 Project Hazards – The proposed project construction could adversely impact adjacent structures if proper construction methods are not incorporated. A qualified contractor must be selected, and with proper shoring, vibration monitoring, and construction observation, the risks posed by the construction activities (i.e., settlement, trench collapse, and excessive vibrations) can be reduced to acceptable level.

5.0 RECOMMENDATIONS

5.1 **Foundation Design Considerations** - The principal factors affecting foundation type selection are potentially liquefiable earth materials encountered at depth. We have provided recommendations for foundations designed to mitigate potential differential foundation movement caused by liquefaction induced settlement and uplift due to hydrostatic forces in the following section of this report.

5.2 **Foundation Type and Design Criteria**

5.2.1 **Pump Station, Coanda Screen Vault, Inclined Plate Settler Vault and Retaining Walls - Footing/Mat/Slab Foundations** - The proposed new pump station, Coanda screen vault, inclined plate settler vault structures and retaining walls supporting them may be supported by footing/mat/slab foundations embedded in bedrock. The footing/mat/slab foundations for these structures (where founded in bedrock) should be designed for an allowable bearing capacity of 5,000 pounds per square foot (psf) for dead-plus-live loads that may be increased by one third for transient loads, including wind or seismic forces. Resistance to lateral loads should be computed using a concrete/soil base friction coefficient of 0.37, and 450 pcf equivalent fluid passive resistance below an embedment depth of 1 foot and where there is at least 8 horizontal feet of earth material cover. The footing/structure should be designed to resist hydrostatic uplift forces by assuming that flood conditions are present and groundwater levels are at the ground surface, or slightly higher surrounding the structure. For uplift design, a soil/concrete friction factor of 0.3 may be used for the side-wall portions of the structures embedded in bedrock.

If these structures or retaining walls are not founded in bedrock, then the underlying liquefiable soil materials should either be over-excavated into bedrock and replaced with Caltrans Class 2 Aggregate Base material compacted to minimum 95% relative compaction (ASTM D-1557-12) or the structures/walls should be founded on piers per the recommendations given in Section 5.2.2 below.

5.2.2 **Underground Discharge Structure – Pier-Supported Foundation** - The proposed new underground discharge structure should be supported by pier(s) embedded into bedrock. The pier(s) should be embedded a minimum of 8 feet into the Purisima Formation bedrock and designed using an allowable adhesion in bedrock of

750 pounds per square foot (psf) for dead-plus-live loads that may be increased by one third for transient loads, including wind or seismic forces. Resistance to lateral loads (earth and seismic design pressures) should be computed using a 450 pcf equivalent fluid passive resistance acting over 3 pier diameters in bedrock. The structure should be designed to resist hydrostatic uplift forces by assuming that flood conditions are present and groundwater levels are at the ground surface surrounding the structure. Uplift resistance of 250 psf adhesion should be used for the portion of the pier(s) embedded in bedrock. The structure should be designed to be free-standing in the event that heavy storm surges scour the beach sand from below the structure.

We understand that an observation deck has been postulated within the County right-of-way at the discharge location as part of a walkway improvement project. Space limitations may necessitate that the deck be located above the discharge facility. Rather than utilize the discharge structure for support, or attempt to drill piers around the discharge structure at a latter time and risk damaging the facility, we would recommend installing perimeter stand-alone pier supports as part of the discharge construction. If the supports are not utilized for the deck, These piers could help reduce long-term maintenance costs associated with the discharge facility by acting as a trash rack should scour and debris attempt to block the discharge outlet, whether the deck is constructed or not.

When the inflow capacity of the pumping system exceeds the infiltration capacity, the system is designed with an overflow discharge at the top of the underground discharge structure. A storm drain channel should be designed to carry storm water to a designated area away from the basin, and away from the adjacent residences to reduce the potential for erosion and scour. Periodic maintenance of this channel should be anticipated due to fluctuating sand elevations and storm surge scour.

5.2.3 Lateral Earth and Seismic Pressures – The proposed pump station, Coanda screen vault, inclined plate settler vault structures, retaining walls and underground discharge structure will be subjected to lateral earth pressures that are variable depending on the material types that they are embedded into and groundwater levels associated with those material types. Where the earth materials are artificial fill or alluvial sands, buried walls should be designed to accommodate at rest pressures of 60 pcf equivalent fluid pressure above and 91 pcf equivalent fluid pressure where below

the water table, or possible flood event water tables. Resistance to lateral loads in fill or alluvial sands should be computed using a 150 pcf equivalent fluid passive resistance. Where the earth materials are Purisima Formation bedrock, buried walls below the groundwater table (or flood event groundwater levels) should be designed to accommodate at rest pressures of 83 pcf equivalent fluid. Resistance to lateral loads in bedrock should be computed using a 450 pcf equivalent fluid passive resistance. If the structures are to be designed for lateral seismic pressures during the design earthquake, then an additional 14 pcf equivalent fluid pressure should be applied to the buried structures.

5.2.4 **Pipelines** - Proposed new pipelines will be subjected to liquefaction induced settlements and since they will be tied into a pump station that is founded on bedrock, differential settlement between the pipeline and pump station is likely during an earthquake. The risk would be if an earthquake occurred during heavy rainfall, in which case stormwater flow through the pipeline, particularly in the pressurized lines leading to the outfall structure, could be interrupted, resulting in localized piping, settlement, and possible sinkholes. If this risk is unacceptable, then flexible connections should be considered between the pipelines and the pump station and outfall structure. Micropiles or helical anchors closely spaced beneath the pipelines could also be considered (spacing should be based upon maximum clear support span of proposed pipes). Pipelines and joints with higher ductility should be less prone to disruption during seismic shaking and differential settlement and pipeline and connection designs to accommodate 50% of the predicted liquefaction settlements provided in Table 2 above may be considered as reasonable designs for service level events.

5.2.5 **Temporary Shoring** – Temporary shoring should be anticipated for pipeline, pump, and outfall structures. The contractor is responsible for on-site safety, and all shoring should comply with CAL-OSHA excavation and grading codes, and the contractor shall have a *'competent person'* (as defined by CAL-OSHA) on site each day, and throughout the day, to monitor the site soil, groundwater and shoring systems, as conditions may change. Additionally, the project specifications should require the contractor to repair all damages to adjacent structures, roads and utilities resulting from the project construction.

We anticipate that the pipeline and outfall structures will be excavated in CAL-OSHA 'Type C Soils', and the pump station and other major vaults partially in 'Type B soils'; however, the lower portion of this structure will be below the groundwater table and thus should be considered a 'Type C soil'. The temporary shoring should be designed to protect personnel, existing adjacent structures, and utilities. It should be designed to prevent settlement, heave and lateral movement into the excavation, and should be designed to minimize vibrations and withstand anticipated surcharge loads from vehicular traffic.

Pipelines – Pipeline excavations will be subject to running sands, and sand boils in the bottom of the excavations. We recommend a positive shoring system be considered, such as sheetpiles, that actively support the site soils over a passive support shoring system (such as shields or box shores). We do not recommend the use of aluminum hydraulic shores for these types of materials due to shallow groundwater, running sands, and the lag time between excavation and shoring placement. The potential for running sands could result in significant lateral movement and associated settlement into the excavation, prior to being able to secure a box or other braced shoring system or other passive type shoring system. Driven, interconnected sheetpiles should be designed, constructed and installed by the contractor, but should follow the 'Lateral Earth Pressure' recommendations of Section 5.2.3. External dewatering using well-points may be necessary if the sheetpile wall cannot be tightly interconnected. If possible, it is recommended that prior to excavation for the proposed structures, the County work with the controlling permitting agencies to assure that Aptos Creek is flowing freely to the ocean, and is not blocked by a sand bar, which could elevate groundwater significantly. It may be prudent for the County to have the selected contractor perform a test excavation in an area not close to sensitive structures to assure that their temporary shoring methodology is successfully. The contractor should have registered civil engineers experienced with temporary shoring in liquefiable materials submit shoring plans clearly outlining their methodology prior to construction.

The County should consider documenting site distress surrounding the construction alignment prior to construction, and install vibration monitoring equipment if vibratory hammers are utilized for sheetpile installation, or if other vibratory equipment will be utilized.

Pump Station and Associated Facilities (Coanda screen vault, inclined settler vault structures and retaining walls supporting them) – The pump station and associated facilities will be excavated into bedrock materials of the Purisima Formation. These bedrock materials are considered to be friable to low hardness (rock terminology) but moderately strong. These materials could ravel or spall when excavated beneath the groundwater table. Additionally, the proximity of the pump station excavation to Rio Del Mar Blvd could potentially destabilize the roadway, and subject the excavation to vibrations from vehicle traffic. Consequently, robust shoring will likely be necessary along the northern side of Rio Del Mar Blvd., possibly necessitating deep pier and lagging shoring, possibly with tiebacks. It would be acceptable to abandon lagging in place with the caveat that some maintenance might be expected in the future if lagging materials decompose over time. It would also be acceptable to design steel reinforced shotcrete walls (possibly with temporary tiebacks) that could also serve as, or be incorporated into, permanent walls. Tiebacks could either be removed or be abandoned in place.

Underground Discharge (Outfall) Structure – The excavation for the underground discharge structure will be partially within unconsolidated sand. The base of the structure will be near the groundwater level. Pier drilling for support of this structure will necessitate casing be utilized to maintain the integrity of the borehole. We recommend that the County and contractor consider utilizing a robust (such as 1/2-inch thick uncoated steel for sacrificial corrosion design or ¼-inch thick for galvanized, or HDPE) casing that can be left in place to act as a guard against impact from logs during extreme storm events. Frictional resistance values have been provided should this design element be utilized.

We recommend that shoring be utilized as necessary for the outfall structure to help prevent sidewall collapse, running sands, and sand boils. With the cylindrical vault, it may be possible to avoid using sheetpile shoring and instead utilize cylindrical casing.

5.2.6 **Dewatering** – Temporary dewatering should be anticipated for excavations that extend below the water table. The sandy materials encountered in our borings are anticipated to have high hydraulic conductivities and be capable of caving/running if not adequately dewatered during or prior to excavation. The

contractor is responsible for dewatering in accordance with local, State and Federal regulations and permitting restrictions. Additionally, the project specifications should require the contractor to repair all damages to adjacent structures, roads and utilities resulting from dewatering. For excavations, either pumping from wells or well points may be needed or in some situations, sumps with pumps may be sufficient. A review of dewatering methods successfully utilized for other projects conducted in the area is encouraged prior to bidding the project.

5.3 Site Grading - Based on our field investigation, grading excavations should be within the capabilities of moderate excavation equipment (i.e., backhoes and excavators). Dewatering should be anticipated where depths greater than 4 feet below the ground surface (or higher depending on the season) are needed for project components (see Dewatering Section 5.2.6 above).

5.3.1 Site Preparation - All loose material, vegetation, existing concrete foundations, asphaltic concrete, debris, and other deleterious material should be stripped and removed from the areas to be occupied by the new structures. This material should be disposed of in a suitable location off-site.

The site should be excavated as necessary for planned grades. In areas to receive fill, the exposed surface should be scarified to at least an 8-inch depth, moisture conditioned to at least 2% over optimum moisture content and compacted to at least 90 percent relative compaction based on ASTM D-1557-12.

If over-excavation and replacement with aggregate base material is chosen over pier foundations, then the unconsolidated soil materials over bedrock should be excavated for planned subgrades. The exposed surface should be scarified to at least an 8-inch depth, moisture conditioned to at least 2% over optimum moisture content and compacted to at least 95 percent relative compaction based on ASTM D-1557-12.

Where structures are to bear directly on Purisima Formation bedrock, excavations into bedrock should be cleaned of all loose debris and concrete may be poured directly on the cleaned bedrock surface.

5.3.2. Compacted Fill – Excavated on-site material can be used for structural fill provided it is free of organic material and other debris and rocks greater than 4 inches in maximum dimension. Imported fill should be free of organic material; it should contain no material larger than 4 inches; it should have a plasticity index (PI) of less than 16; it should be free of hazardous contamination (per State of California requirements); and it should be free of Asphaltic Concrete grindings. The fill should be placed in horizontal lifts not exceeding 8 inches in loose thickness, moisture conditioned to at least optimum moisture content, and compacted to at least 95 percent relative compaction beneath structures and 18 inches below the aggregate base rock for pavements, and 90 percent relative compaction elsewhere, all based on ASTM D-1557-12.

Fill around the underground discharge structure (beach outfall) and its immediately adjacent discharge pipe should be sand having a hydraulic conductivity similar to or greater than the materials that were removed (high permeability sands) in order to promote infiltration of discharged water. Jetting of these materials may be an acceptable method of placement in this area.

5.3.3 Utility Trench Backfill - Planned pipelines appear to be 10 to 13 feet deep and up to 17.5 feet deep for the discharge pipe to the beach outfall, and as such will be near or below the groundwater level. Consequently, if trenchless installation is not utilized, dewatering and shoring will likely be necessary. Utility trenches may be backfilled with approved, on-site soil or imported material meeting the recommendations for compacted fill given above. Bedding materials for pipes should be graded and placed in accordance with the pipe manufacturer's recommendations. The backfill should be compacted to at least 90 percent relative compaction, consistent with ASTM D-1557-12. In paved areas, the upper 18 inches of trench backfill should be compacted to at least 95 percent relative compaction, consistent with ASTM D-1557-12. Equipment and methods should be used that are suitable for work in confined areas without damaging trench walls or conduits. Due to the potential for elevated moisture conditions within the trench, pumping ground, the location of the pipelines within heavy automobile traffic areas, and the potential for vibrations to liquefy site soils, consideration should be given to backfilling trenches with Control Density Fill (i.e., Control Low Strength Material – CLSM).

5.3.4 Cut Slope Design - Any new permanent cut slopes should not exceed an inclination of 2:1 (H:V). During the dry season, temporary cut slopes of 1:1 (H:V) in Purisima bedrock should generally be satisfactory for construction purposes, provided that they are inspected and approved by our field representative at the time of construction and monitored daily during construction. However, this temporary cutslope is only applicable if structures, roadways or utilities are not close by. Temporary slopes in alluvial soils and fill materials should be sloped in accordance with OSHA approved shoring and sloping guidelines based upon the nature of the excavated soils, but should not exceed 1.5:1 (H:V). Excavation methods, shoring, bracing and safety of excavations are the responsibility of the contractor. All excavations should comply with applicable local, State and Federal safety regulations.

Care should be taken to ensure that the existing structures are not undermined during temporary construction excavations. If the bottoms of proposed new footings are deep enough to intersect a 45-degree line extending down from the bottom of the existing footing, the existing footings should be underpinned prior to excavation of adjacent trenches for new footing construction. Excavations adjacent to existing footings should not be left open for protracted periods of time and all due haste should be exercised to excavate, place, and pour concrete for the new footings.

5.3.5 Fill Slope Design - All permanent fill slopes constructed with on-site excavated earth materials should have a maximum inclination of 2:1 (H:V).

5.3.6 Keyway Design – While not anticipated for this project, large fills placed on slopes steeper than 6:1 should have a keyway at the toe no less than 12 feet wide and be continuously benched at least 1 foot into the undisturbed dense material. For smaller fills, such as those anticipated on this project for the pump station and associated facilities retaining walls, keyways will not be necessary. The resulting subgrade for all fills should be inspected by our representative for firmness prior to placement of any new fill materials.

5.4 Surface Drainage - We recommend that all surface drainage be permanently diverted away from the planned structures at a minimum 2% grade into an appropriate catch basin/storm drain system, or natural swale.

5.5 **Seismic Design** - A peak ground acceleration of 0.54g should be anticipated for design purposes at the site. Based on our geotechnical investigation, the site location, our interpretation of the 2013 CBC documents related to Earthquake Loads and using the USGS U.S. Seismic Design Maps tool, we are providing the following parameter recommendations from the corresponding figures and tables:

Table 3 – Seismic Design Parameters

Parameter	Value
Site Classification	E
Mapped Spectral Acc. 0.2 Sec. (g)	$S_S = 1.501$
Mapped Spectral Acc. 1 Sec. (g)	$S_1 = 0.633$
Fa – Site Coefficient	0.9
Fv – Site Coefficient	2.4
$S_{MS} = FaS_S$	1.351
$S_{M1} = FvS_1$	1.518
$S_{DS}=2/3\ S_{MS}$	0.9
$S_{D1}=2/3\ S_{M1}$	1.012

5.6 **Pavement Design** - The asphaltic concrete pavement recommendations provided below are based on Procedure 608 of the Caltrans Highway Design Manual, estimated traffic indices for various pavement-loading conditions, and on a design R-value of 5. The design R-value was chosen based on conservatism and if lesser pavement sections are desired, then we recommend R-value testing be performed on representative samples of subgrade materials.

Table 4 - Asphalt Concrete Pavement Recommendations

(Design R-value = 5)

Design Traffic Index (TI)	Asphaltic Concrete Thickness (inches)	Class 2 Aggregate Base* Thickness (inches)	Total Pavement Section Thickness

			(inches)
4.0	2.5	8.0	10.5
4.5	2.5	10.0	12.5
5.0	3.0	10.0	13.0
5.5	3.0	12.0	15.0
6.0	3.5	13.0	16.5

*Caltrans Class 2 aggregate base; minimum R-value of 78

To improve pavement life and reduce the potential for pavement distress through construction, we recommend that the full design asphaltic concrete section be constructed prior to construction traffic loading. Alternatively, a higher traffic index may be chosen for areas where construction traffic will use pavements.

5.7 Portland Cement Concrete Flatwork Design – Exterior concrete flatwork subject to pedestrian and/or occasional light pick up loading should be at least 4 inches thick and supported on at least 18 inches of non-expansive fill overlying subgrade prepared in accordance with the Site Grading recommendations of this report. Flatwork that will be subject to heavier or frequent vehicular loading should be designed in accordance with the recommendations in the "Portland Cement Concrete Pavement Design" section below. To help reduce the potential for uncontrolled shrinkage cracking, adequate expansion and control joints should be included. Consideration should be given to limiting the control joint spacing to a maximum of about 2 feet in each direction for each inch of concrete thickness. Flatwork should be isolated from adjacent foundations or retaining walls except where limited sections of structural slabs are included to span between supports and at the transitions between at-grade and on-structure flatwork where structural design for this is incorporated.

The top 18 inches of soil below exterior concrete slabs-on-grade should have an expansion index of 50 or less or Plasticity Index < 16. Exterior slabs should have a minimum thickness of 4-inches and be reinforced with at least No. 3 bars at 18-inches on center each way. Slabs should be provided with weakened plane joints. Joints should be placed in accordance with the American Concrete Institute (ACI) guidelines. Proper

control joints should be provided to reduce the potential for damage resulting from shrinkage. Subgrade materials should not be allowed to desiccate between grading and the construction of the concrete slabs. The slab subgrade should be thoroughly and uniformly moistened prior to placing concrete.

All dedicated exterior flatwork should conform to standards provided by the governing agency including section composition, supporting material thickness and any requirements for reinforcing steel. Concrete mix proportions and construction techniques, including the addition of water and improper curing, can adversely affect the finished quality of the concrete and result in cracking and spalling of the slab. We recommend that all placement and curing be performed in accordance with procedures outlined by the American Concrete Institute and/or Portland Cement Association. Special consideration should be given to concrete placed and cured during hot or cold weather conditions.

5.8 **Portland Cement Concrete Pavement Design** – Portland cement concrete (PCC) pavement subject to heavy vehicle loads should have a minimum concrete compressive strength of at least 3,500 psi, supporting the PCC on at least 6 inches of Class 2 aggregate base compacted to minimum 95% relative compaction as recommended in the Site Grading section of this report, and laterally restraining the PCC with curbs or concrete shoulders. Vacuum truck loading pads should consist of at least 8 inches thickness of PCC underlain by at least 6 inches of Class 2 aggregate base and reinforced with a minimum of No. 4 bars at 16 inches on centers both ways or greater reinforcement as required by the project civil or structural engineer. The top 18 inches of soil below the aggregate base rock should have an expansion index of 50 or less or Plasticity Index < 16. All placement and curing should be performed in accordance with procedures outlined by the American Concrete Institute and/or Portland Cement Association.

Adequate expansion and control joints should be included. Consideration should be given limiting the control joint spacing to a maximum of about 2 feet in each direction for each inch of concrete thickness. Joints should be placed in accordance with the American Concrete Institute (ACI) guidelines. Proper control joints should be provided to reduce the potential for damage resulting from shrinkage. Subgrade materials should not be allowed to desiccate between grading and the construction of the concrete pavement. The PCC pavement subgrade should be thoroughly and uniformly moistened prior to placing concrete. PCC pavement should be isolated from adjacent

structures except where structural slabs are necessary to span between supports and at the transitions between at-grade and on-structure pavement where structural design for this is incorporated.

5.9 **Technical Review** - This report, and any supplemental recommendations, should be reviewed by the contractor as part of the bid process. It is strongly recommended that no construction be started nor grading undertaken until the final drawings, specifications, and calculations have been reviewed and approved in writing by a representative of **Cotton, Shires and Associates, Inc.**

5.10 **Earthwork Construction Observation and Testing** - All excavations including pier drilling should be observed by a representative of **Cotton, Shires and Associates, Inc.** prior to filling or pouring of concrete foundations. Any grading should also be observed and tested as appropriate to assure adequate stripping and compaction. Our office should be contacted with a minimum of 48 hours advance notice of construction activities requiring inspection and/or testing services and a minimum of 72 hours advance notice and provision of representative laboratory compaction curve samples for testing of fill.

6.0 INVESTIGATION LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted engineering geology and geotechnical engineering principles and practices. No warranty, expressed or implied, or merchantability of fitness, is made or intended in connection with our work, by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings.

Any recommendations and/or design criteria presented in this report are contingent upon our firm being retained to review the final drawings and specifications, to be consulted when any questions arise with regard to the recommendations contained herein, and to provide testing and inspection services for earthwork and construction operations. Unanticipated soil and geologic conditions are commonly encountered during construction which cannot be fully determined from existing exposures or by limited subsurface investigation. Such conditions may require additional expenditures during construction to obtain a properly constructed project. Some contingency fund is recommended to accommodate these possible extra costs.

This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are called to the attention of the project architect and/or engineer and incorporated into the plans. Furthermore, it is also the responsibility of the owner, or of his representative, to ensure that the contractor and subcontractors carry out such recommendations in the field.

7.0 REFERENCES

7.1 Documents/Maps

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7.2 Aerial Photographs

Year	Flight	Line	Vendor
7-21-1952	GS-WL	13-41	USGS
1957	22830	2-89	Teledyne
10-14-1975	SCZCO	1-81, 82	Towill
11-12-1975	AV-1215	12-41, 42	Pacific Aerial
1-8-1982	Aptos 957	1, 3	Pacific Aerial

California Coastal Records Project, Oblique and vertical aerial photographs 1972 through 2015

APPENDIX A

BORING LOGS

APPENDIX A

Field Exploration:

Subsurface exploration consisted of drilling seven small-diameter boreholes at the locations shown on our Site Plan and Boring Location Map (Figure 4) on November 30, December 1, and December 2, 2016. Britton Drilling used their track-mounted drill rig to drill seven, 7-inch diameter hollow-stem auger holes to depths ranging from 26.5 to 36.5 feet. Relatively undisturbed samples were collected by driving a Modified California sampler using a 140 pound hammer. Samples were logged in the field by a CSA engineering geologist.

Standpipe piezometers were installed in boreholes CSA/SD-3 and CSA/SD-6 for the purpose of monitoring groundwater levels. CSA/SD-3 is located in the vicinity of the proposed pump station and the 2-inch pipe was installed to a depth of 31.5 feet, with the upper 11.5 feet of the pipe solid, the remaining perforated. CSA/SD-6 is located in the vicinity of the proposed underground discharge structure to a depth of 30 feet, with the upper 10 of the pipe solid and the lower 20 perforated. These piezometers were fitted with automated data-loggers that recorded groundwater levels at 15 minutes intervals. Water level data have been depicted in relation to tidal fluctuations and rainfall on Figure 8.

We surveyed the tops of our boreholes with a Leica TCRA 1202 reflectorless total station survey instrument. Boring locations are shown on Figure 4, Site Plan and Boring Location Map, which was modified from the topographic survey map provided to us from the County of Santa Cruz Department of Public Works.

Percolation testing was performed in the vicinity of the proposed underground discharge (beach outfall) structure, and is described in Appendix B.

COTTON, SHIRES AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

Project: Rio Del Mar Pump Station — Boring: CSA/SD-1

Location: Island on Venetian Rd @ Traffic Circle — Project No.: E5696

Drilling Contractor/Rig: Britton / Track Rig CME — Date of Drilling: 11/30/16

Ground Surface Elev.: 10.07' — Logged By: AM — Hole Diameter: 7" Ø Hollow Stem

Surface: Soil Landscaped Area — Weather: Clear/Mild

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight(pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
										START DRILLING 8:35
2		SC	**FILL 0'-2.75'** 0.0'-2.75' Clayey Sand; dusky brown, loose, moist	T-1 T-2	102 106	5.0 20.9	5 6 7	MC		
		SP	**ALLUVIUM 2.75'-17.5'**				(9)			
4		CH	2.75'-3.75' Sand; yellow brown, loose, moist	B-1			3 3 2	SPT		
		SP					(5)			8:40
		CH	3.75'-4.25' Clay; dusky brown, soft, moist	B-2			2 3 2	SPT		
6		SP	4.25'-5.25' Sand; yellow brown, loose moist				(5)			8:47
8			5.25'-5.75' Clay; dusky brown, soft, moist	B-3			1 2 3	SPT		GW Elev @ 8:47= +2.0' Tide @8:47= +5.2'
			5.75'-17.5' Sand; medium to dark gray with minor yellow brown sand grains, loose, moist to wet, medium to coarse grained				(5)			8:53 13.2%-#200
10				B-4			1 3 4	SPT		
12			water on sampler @ 8'				(7)			9:04
14										
16				B-5			3 4 4	SPT		5.2%-#200
							(8)			9:15
18			**PURISIMA FORMATION** **BEDROCK 17.5'-BOH**							@ 17.5' Driller reports stiffer drilling
20			17.5'-25.5' Sandstone; dark greenish brown, weakly cemented, described as soil: very dense to hard, moist to wet, fine grained sand, trace gravels	B-6			12 24 39	SPT		
							(63)			9:28
22							24 50/4" 34/4"	MC		
24										9:41
			25.5'-26.0' lens of sandy gravel; sub rounded gravels up to 0.3", gravels are sandstone, chert and granitics	T-3			25 50/3" 34/3"	MC		
26										9:59
			26.0'-BOH Sandstone; dark greenish brown, weakly cemented, described as a soil: very dense to hard, moist to wet, fine grained sand, trace gravels							
28										

Project Rio Del Mar Pump / E5696 Date 11/30/16 Boring CSA/SD-1

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight(pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
32			Sandstone continued as above	B-7			16 29 56 (85)	SPT		
			@31.5' Gravel Lens: 6 inches thick							10:30
34										
36			@35.0' Gravel lens: 4 inches thick	B-8			20 37 50/4" (87/10")	SPT		
			TD = 36.5' Water at 8' during drilling							END DRILLING 10:52
38										
40										
42										
44										
46										
48										
50										
52										
54										
56										
58										
60										
62										

Sheet 2 of 2

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CONSULTING ENGINEERS AND GEOLOGISTS

COTTON, SHIRES AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

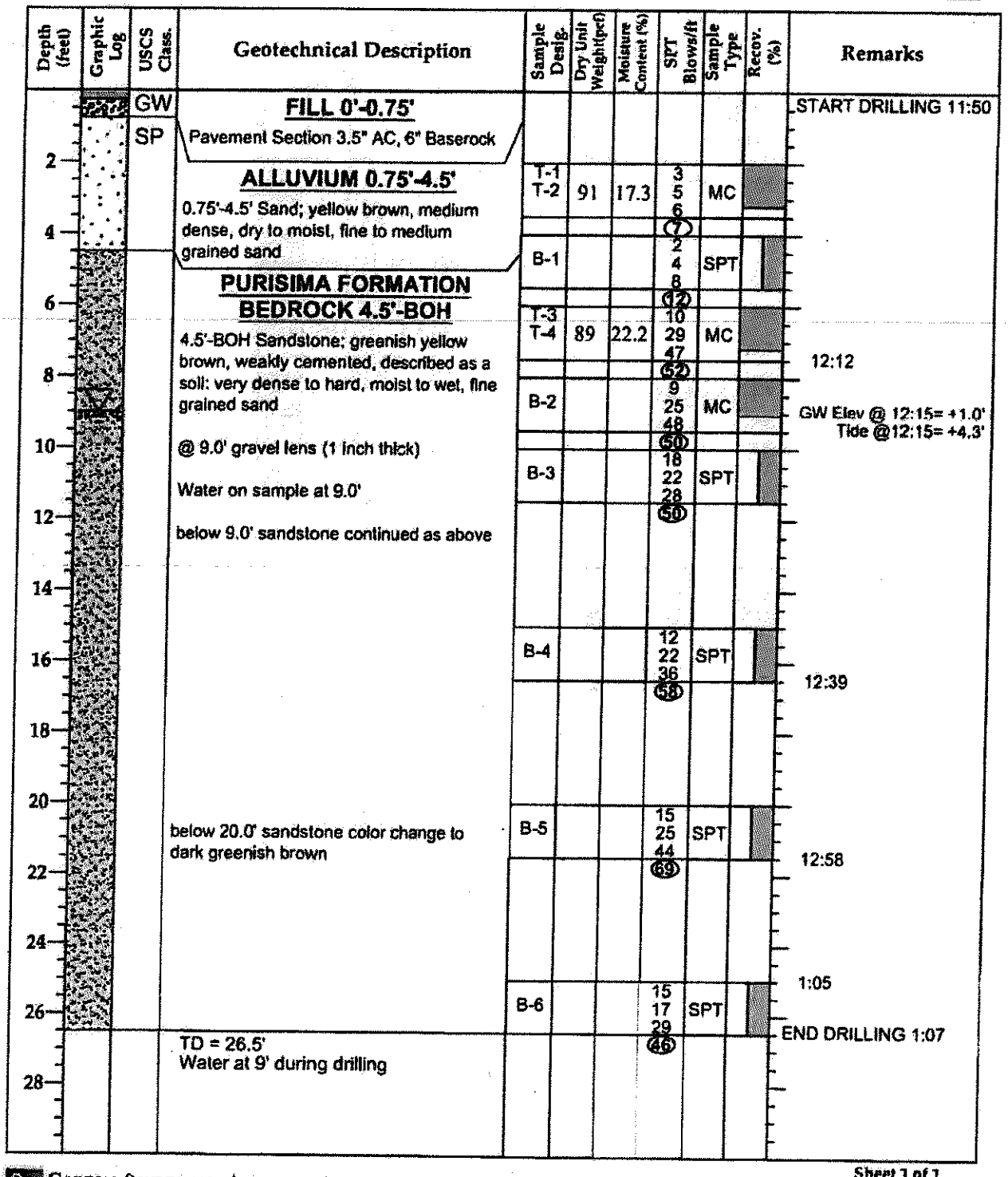
Project: Rio Del Mar Pump Station — Boring: CSA/SD-2

Location: South Side of Venetian Rd @ Pixie Deli — Project No.: E5696

Drilling Contractor/Rig: Britton / Track Rig CME — Date of Drilling: 11/30/16

Ground Surface Elev.: 10.17' — Logged By: AM — Hole Diameter: 7" Ø Hollow Stem

Surface: Paved Roadway — Weather: Clear/Mild



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Sheet 1 of 1

COTTON, SHIRES AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

Project: Rio Del Mar Pump Station — Boring: CSA/SD-3

Location: Slope between Venetian and Rio Del Mar — Project No.: E5696

Drilling Contractor/Rig: Britton / Track Rig CME — Date of Drilling: 11/30/16

Ground Surface Elev.: 15.4' — Logged By: AM — Hole Diameter: 7" Ø Hollow Stem

Surface: Soil — Weather: Clear/Mild

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight(pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
										START DRILLING 2:02
2		SM	**FILL 0'-8.0'** 0.0'-8.0' Silty Sand; yellow brown sand with layers of dusky brown clayey silt; very dense, dry, trace sub rounded gravels up to 0.5 inch	T-1 T-2	99.1	9.1	6 10 12 (15)	MC		LL = 21, PI = 0 2:07
4				T-3 T-4	102	7.0	7 13 14 (18)	MC		
6				T-5 T-6	101	6.5	4 13 15 (19)	MC		2:17
8		SP	**ALLUVIUM 8.0'-13.5'** 8.0'-13.5' Sand; buff to yellowish brown, loose, dry, fine to medium grained sand @ 11.0' sampler is wet below 11.0' sand is wet	T-7 T-8	97	3.5	4 8 8 (11)	MC		2:25 Sieve 97.9% sand, 2.1% fines GW Elev @ 2:30= +3.4' Tide @2:30= +1.3'
10				B-1			2 2 1 (3)	SPT		
12										
14			**PURISIMA FORMATION BEDROCK 13.5'-BOH** 13.5'-30.5 Sandstone; greenish yellow brown, weakly cemented, described as a soil: very dense to hard, moist to wet, fine grained sand							@ 13.5' Driller reports stiffer drilling
16				B-2			12 20 34 (54)	SPT		2:39
18										
20				T-9 T-10	99	25.8	16 32 50/4" (56/10")	MC		2:50
22										
24										
26				B-3			11 20 31 (51)	SPT		3:08
28										

Project Rio Del Mar Pump / E5696 Date 11/30/16 Boring CSA/SD-3

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight(pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
			@ 30' lens of coarse sand and gravel, 6 inches thick	B-4			17 30 46 (76)	SPT		
32			30.5'-BOH Sandstone; dark gray, described as a soil; hard, moist, fine grained sand							
34										
36				B-5			8 23 47 (70)	SPT		END DRILLING 3:37
38			TD = 36.5' Water at 11' during drilling 2 inch Ø standpipe piezometer installed to a depth of 31.5': 20 feet slotted pipe 11.5 feet solid pipe 21 feet of coarse aquarium sand 2 feet of bentonite chips 8.5 feet of cement grout							
40										
42										
44										
46										
48										
50										
52										
54										
56										
58										
60										
62										

COTTON, SHIRES AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

Project: Rio Del Mar Pump Station — Boring: CSA/SD-4

Location: Slope between Venetian and Rio Del Mar East of SD-3 — Project No.: E5696

Drilling Contractor/Rig: Britton / Track Rig CME — Date of Drilling: 12/1/16

Ground Surface Elev.: 23.5' — Logged By: AM — Hole Diameter: 7" Ø Hollow Stem

Surface: Soil — Weather: Clear/Mild

Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight(pcf)	Moisture Content (%)	SPT Blows/ft.	Sample Type	Recov. (%)	Remarks
0	SP	**FILL 0'-11.0'**							START DRILLING 10:04
		0.0'-11.0' Sand; yellow brown, medium dense, moist, fine grained sand	T-1 T-2	90	10.1	8 9 11 (14)	MC		
			B-1			6 6 5 (11)	SPT		Sieve 94.6% sand, 5.4% fines
			B-2			6 10 11 (21)	SPT		10:18-10:30 fill water tank
			B-3			5 9 11 (20)	SPT		Sieve 0.9% gravel 90.9% sand, 8.2% fines
			B-4			9 18 24 (42)	SPT		10:36 10:42
		PURISIMA FORMATION BEDROCK 11.0'-BOH							
		11.0'-BOH Sandstone; yellow brown minor greenish tint, weakly cemented, described as a soil; very dense to hard, moist, fine grained sand	T-3 T-4	91	11.1	14 32 48 (54)	MC		11:02
		below 16' color dark yellowish brown	T-5 T-6	97	21.8	14 30 50/5" (54/11")	MC		11:06
		@20' sampler wet	B-5			14 24 31 (55)	SPT		GW Elev @ 11:20= +3.5' Tide @11:20= +5.2' 11:22
			B-6			13 24 31 (42)	SPT		11:32

Project Rio Del Mar Pump / E5696 Date 11/30/16 Boring CSA/SD-4

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight(pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
				B-7			14 26 46	SPT		END DRILLING 11:45
32			TD = 31.5' Water at 20' during drilling				(72)			
34										
36										
38										
40										
42										
44										
46										
48										
50										
52										
54										
56										
58										
60										
62										

COTTON, SHIRES AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

Project: Rio Del Mar Pump Station — Boring: CSA/SD-5

Location: Back Beach — Project No.: E5696

Drilling Contractor/Rig: Britton / Track Rig CME — Date of Drilling: 12/1/16

Ground Surface Elev.: 13.9' — Logged By: AM — Hole Diameter: 7" Ø Hollow Stem

Surface: Beach Sand and Ice Plant — Weather: Clear/Mild

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight(pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
		SP	**FILL 0.0'-7.0'** 0.0'-7.0' Sand; yellowish brown, loose, moist, fine to medium grained sand							START DRILLING 1:05
2				T-1 T-2	100	3.1	8 3 3 (4)	MC		1:08
4				B-1			2 2 2 (4)	SPT		2.6%-#200 1:12
6				B-2			3 3 5 (8)	SPT		
8		SP	**ALLUVIUM 7.0'-15.0'** 7.0'-10.0' Sand; yellowish brown, loose, moist, fine to medium grained sand	B-3			3 3 2 (5)	SPT		0.8%-#200 1:28
10		SP	Water on Sampler at 9.5' 10.0'-15.0' Sand; dark yellowish brown to gray; loose, wet, medium to coarse grained sand	B-4			1 2 2 (4)	SPT		GW Elev @ 1:30= +4.4' Tide @1:30= +3.2' 1:32 3.0%-#200
12										
14										
16			**PURISIMA FORMATION** **BEDROCK 15.0'-BOH** 15.0'-BOH Sandstone; greenish yellow brown, weakly cemented, described as a soil; very dense to hard, moist, fine grained sand	B-5			12 17 28 (45)	SPT		1:51
18										
20				B-6			15 28 50/5" (78/11")	SPT		
22										
24										
26				B-7			15 27 44 (71)	SPT		END DRILLING 2:23
28			TD = 26.5' Water at 9.5' during drilling							

Sheet 1 of 1

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

COTTON, SHIRES AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

Project: Rio Del Mar Pump Station — Boring: CSA/SD-6

Location: Back Beach — Project No.: E5696

Drilling Contractor/Rig: Britton / Track Rig CME — Date of Drilling: 12/1/16

Ground Surface Elev.: 14.2' — Logged By: AM — Hole Diameter: 9.5" Ø Hollow Stem

Surface: Beach Sand and Ice Plant — Weather: Clear/Mild

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight(pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
		SP	**FILL 0.0'-7.0'** 0.0'-7.0' Sand; yellowish brown, loose, moist, fine to medium grained sand							START DRILLING 3:25
2				T-1 T-2	103	4.8	4 3 4 (5)	MC		
4										3:29
				B-1			1 2 1 (3)	SPT		
6										3:32
				B-2			1 2 2 (4)	SPT		
8		SP	**ALLUVIUM 7.0'-15.5'** 7.0'-15.0' Sand; yellowish brown, loose, moist, fine to medium grained sand							3:37
				B-3			1 2 2 (4)	SPT		
10			@ 9.5'-9.75' choppy drilling Water on Sampler at 10.0'							3:46 GW Elev @ 3:45= +4.2' Tide @ 3:45= +0.7'
				B-4			1 1 2 (3)	SPT		
12										3:51
14			15.0'-15.5' Sand; light gray, loose, wet, medium to coarse grained sand							
		SP	**PURISIMA FORMATION BEDROCK 15.5'-BOH** 15.5'-BOH' Sandstone; greenish yellow brown, weakly cemented, described as a soil; very dense to hard, moist, fine grained sand, trace sub-rounded gravels up to 0.25 inch	B-5 B-6			3 11 18 (29)	SPT		
16										
18										
20				T-3 T-4			16 39 50/5" (61/11")	MC		
22										4:12
24										
26				B-7 B-8			15 28 32 (60)	SPT		
			25.6'-26.5' lens of coarse sand and gravel below 26.5' Sandstone continued as above							4:29
28										

Project Rio Del Mar Pump / E5696 Date 12/1/16 Boring CSA/SD-6

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight(pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
			Sandstone continued as above	B-9			10 26 40	SPT		END DRILLING 4:50
32			TD = 31.5' Water at 10' during drilling				66			
34			2 inch Ø standpipe piezometer installed to a depth of 30':							
36			20 feet slotted pipe 10 feet solid pipe							
38			21 feet of coarse aquarium sand 2 feet of bentonite chips 7 feet of cement grout							
40										
42										
44										
46										
48										
50										
52										
54										
56										
58										
60										
62										

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

COTTON, SHIRES AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

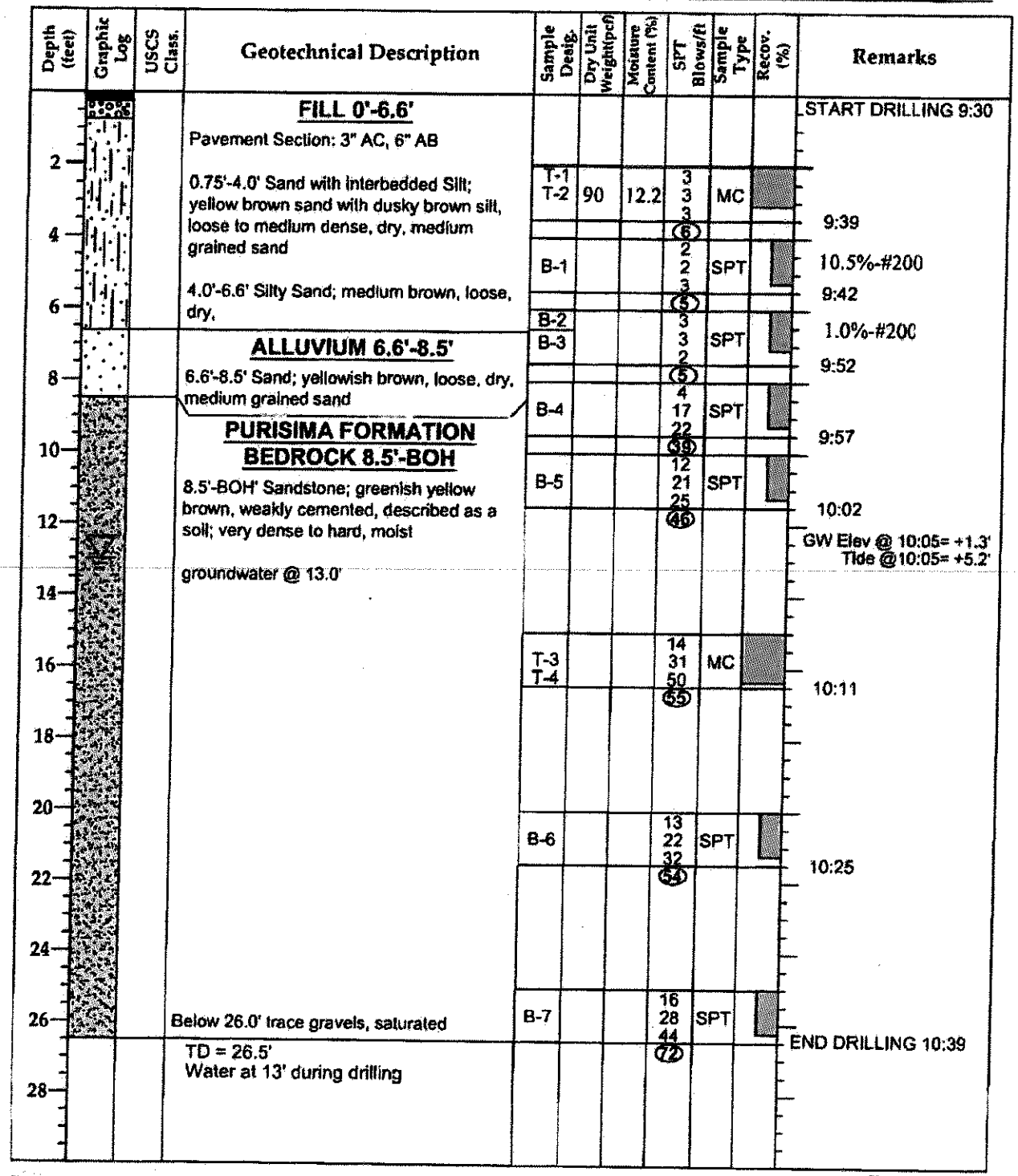
Project: Rio Del Mar Pump Station — Boring: CSA/SD-7

Location: Westbound Lane of Beach Drive @ Crosswalk — Project No.: E5696

Drilling Contractor/Rig: Britton / Track Rig CME — Date of Drilling: 12/2/16

Ground Surface Elev.: 14.3' — Logged By: AM — Hole Diameter: 7" Ø Hollow Stem

Surface: Asphalt Road — Weather: Clear/Mild



Sheet 1 of 1

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

APPENDIX B

PERCOLATION TESTING

APPENDIX B

Percolation Testing

Percolation testing of the in situ soil at the base of the proposed underground discharge (beach outfall) structure was performed on December 2, 2016. The purpose of this testing was to determine percolation rates of the soil at this location to assist in design of the proposed underground discharge structure. The soil encountered at this location consisted of clean, medium grained sand. It is our understanding based on drawings provided to us by Santa Cruz County that the base of the underground discharge structure will be at elevation 4.25 feet. Our intent was to test the in situ soil near this elevation.

Test Hole Preparation - On December 1, 2016 a 7-inch diameter hollow stem auger was used to drill a 10 foot deep hole to elevation 4.3 feet. Based on our experience drilling borings in the vicinity of the underground discharge structure we did not think that the percolation test boring would remain open without casing. A 2.75-inch outside diameter, 2.35-inch inside diameter, solid ABS casing was installed through the center of the hollow stem auger to the bottom of the boring. The depth to the bottom of the casing was tagged and sounded to confirm that the casing was in contact with firm, in-place materials and that no slough had entered the casing during installation. After confirming that the casing was free of debris and in contact with native materials the hollow stem auger was pulled from the boring. Once the auger was removed from the boring the depth of the boring (outside of the casing) was measured and it was found to have caved in to a depth of 5 feet. The depth of the center of the casing was once again tagged to confirm that the casing remained in contact with native materials and that no slough had entered the casing. Bentonite chips were installed around the outside of the casing, in the annulus of the boring, to a depth of 2.5 feet. On December 1, 2016 clean water was repeatedly added to the casing to pre-soak the surrounding materials. Solid casing, rather than perforated casing, was used to facilitate testing of the in-place native materials. Our intent was to assure that we were testing the in-place native material rather than loose slough that collapsed around the casing when the augers were removed from the hole.

Test Procedure – On December 2, 2016 percolation rates were determined in a series of 4 tests. Because the percolation rate of the native materials was extremely high, it was not feasible to use a manual water level indicator and take readings at the standard 10-minute intervals. A Solinst Levelogger® was installed at the base of the percolation test casing and was programmed to record head of water in feet at one second intervals.

Four tests were performed using different volumes of water for each test (2, 3, 4, and 5 gallons). Note that the theoretical volume of the casing (10.2 feet in length) is 2.3 gallons. The data collected was then graphed and converted into minutes per inch (MPI). Because of the rapid percolation rate, the height of the column of water (head) had a significant impact on the percolation rate. Because of this impact, we have subdivided our results and reported average MPI at each one-foot increment of head.

APPENDIX C

LABORATORY TEST RESULTS

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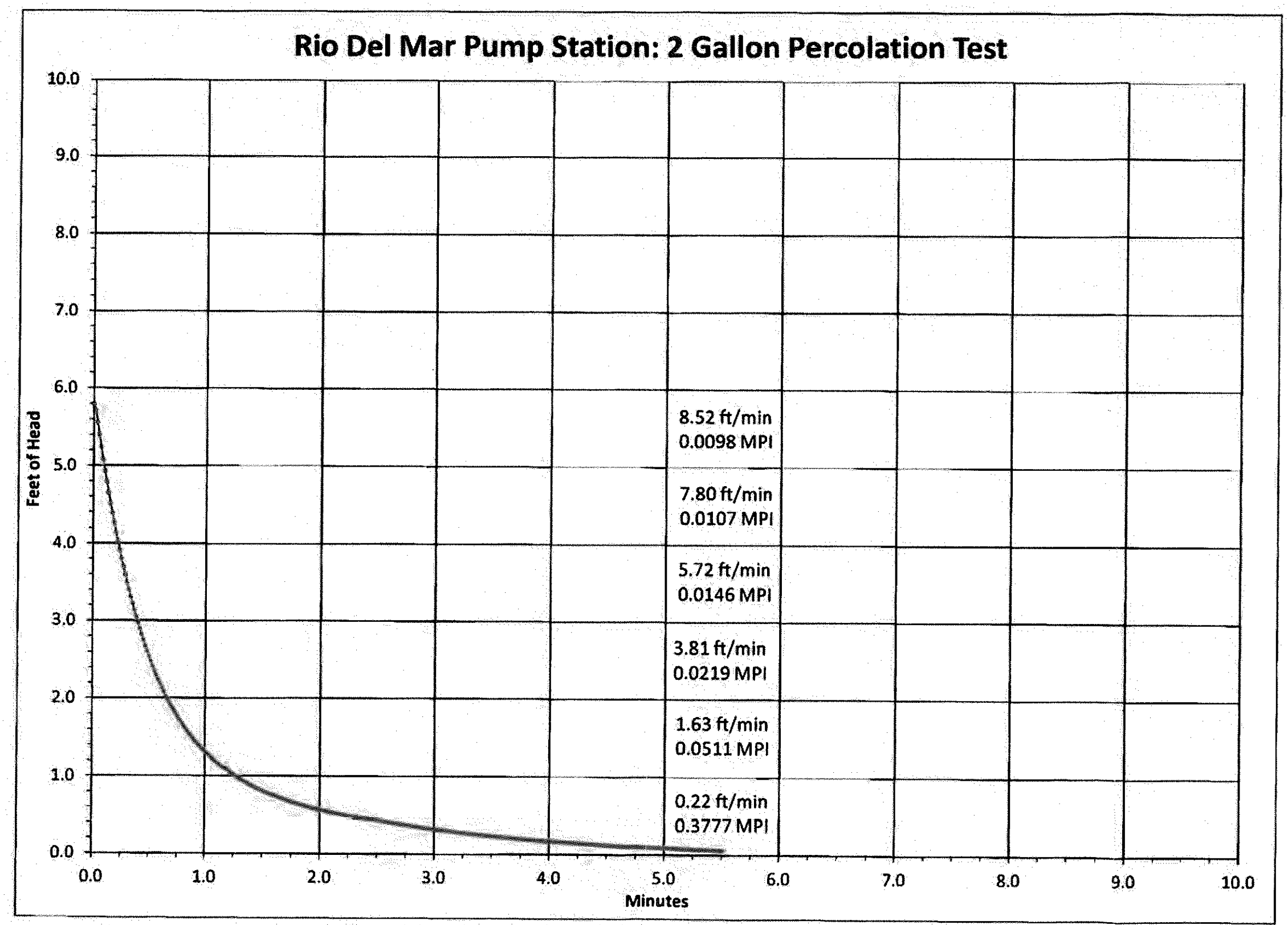
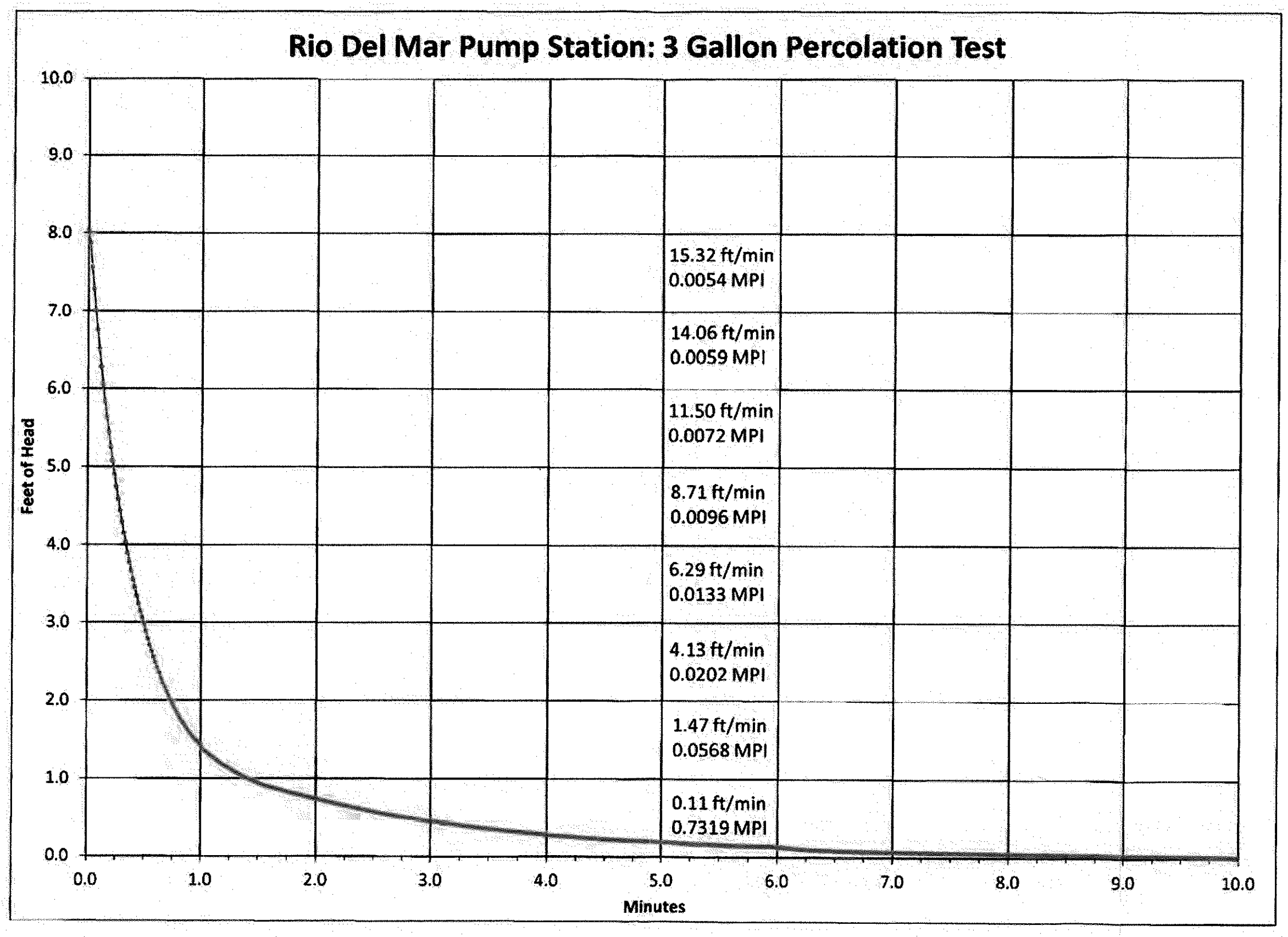
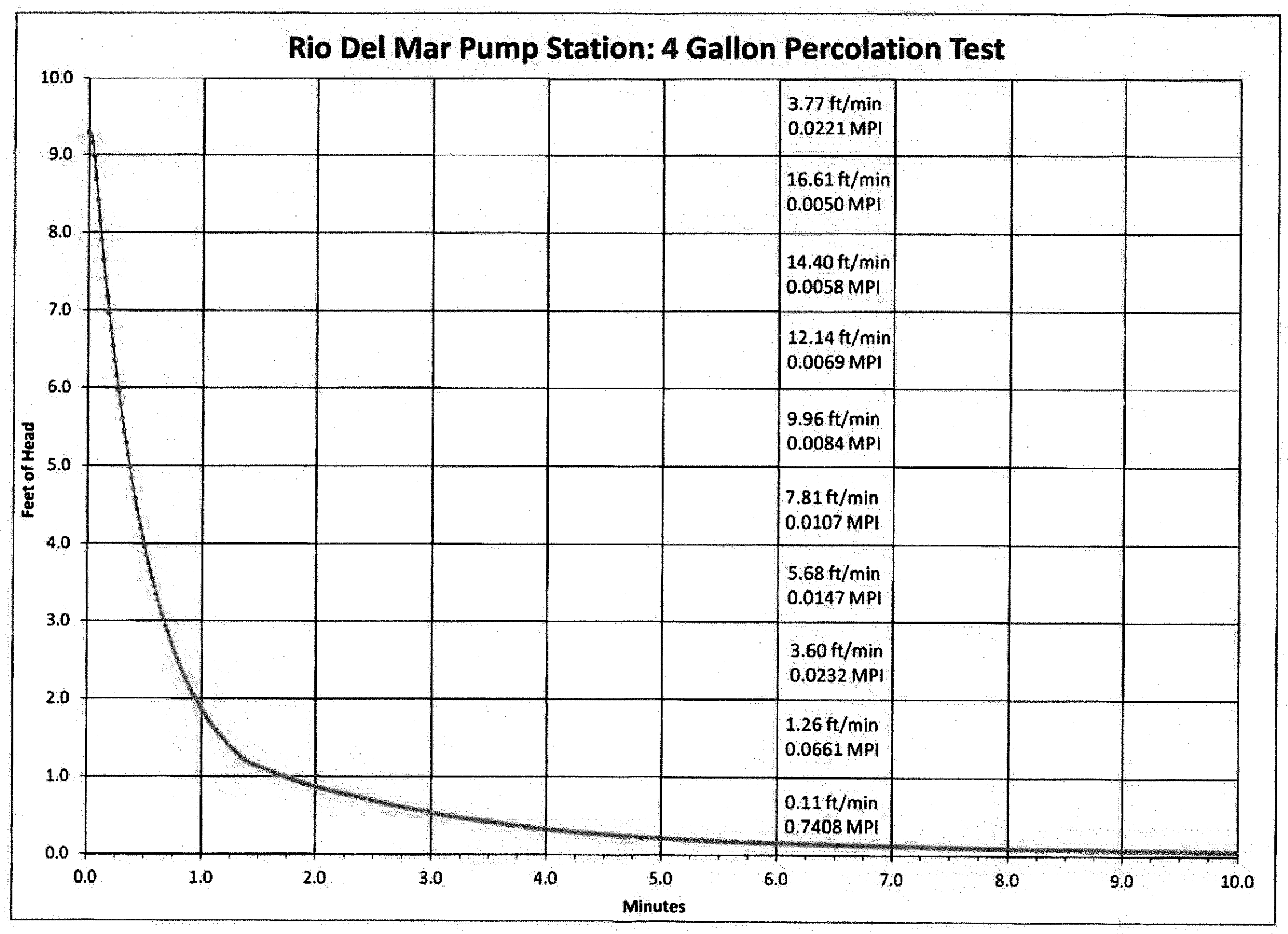
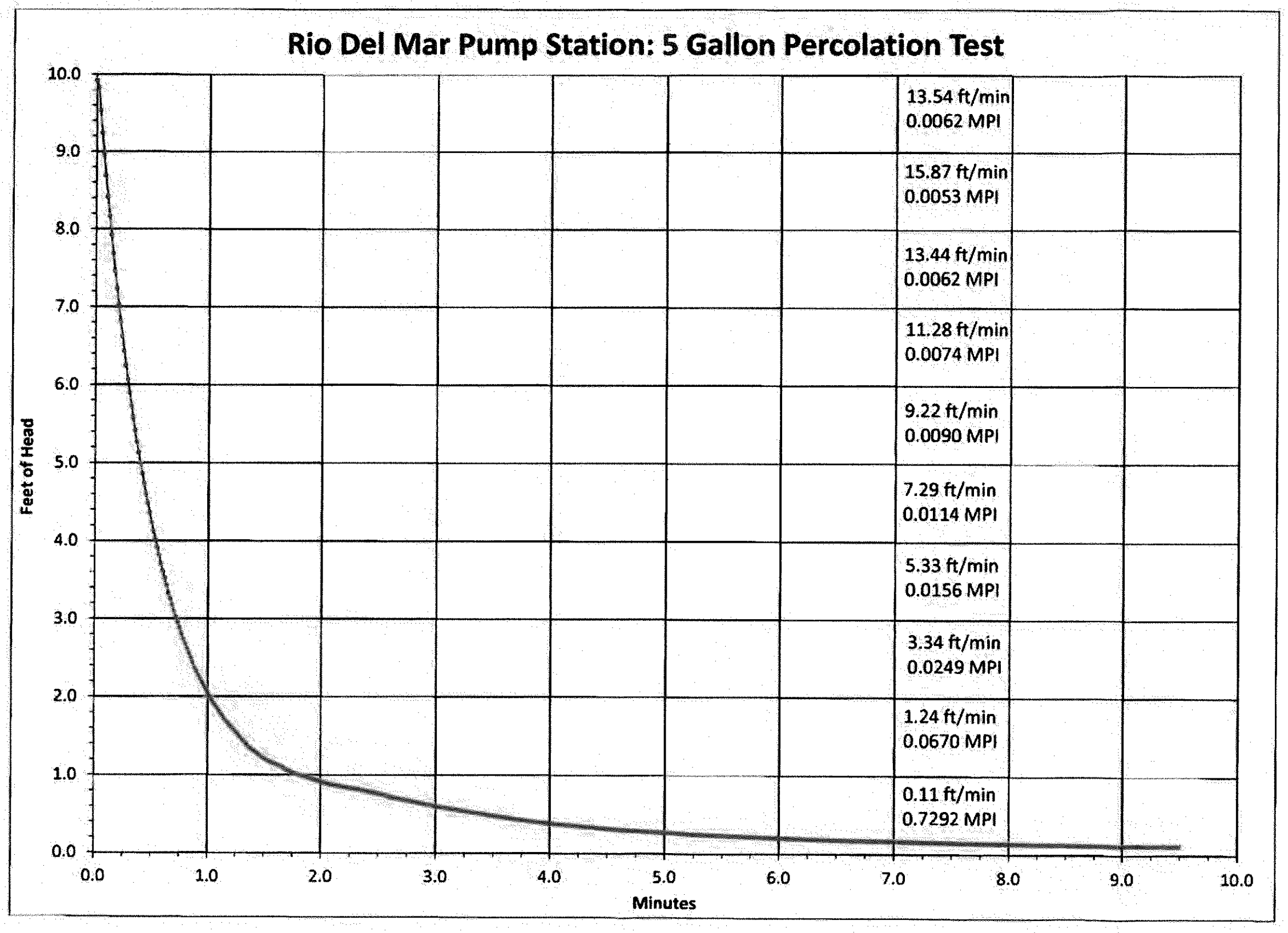

Rio Del Mar Pump Station: 2 Gallon Percolation Test
Feet of Head
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Minutes
8.52 ft/min
0.0098 MPI
7.80 ft/min
0.0107 MPI
5.72 ft/min
0.0146 MPI
3.81 ft/min
0.0219 MPI
1.63 ft/min
0.0511 MPI
0.22 ft/min
0.3777 MPI


Rio Del Mar Pump Station: 3 Gallon Percolation Test
Feet of Head
Minutes
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
15.32 ft/min
0.0054 MPI
14.06 ft/min
0.0059 MPI
11.50 ft/min
0.0072 MPI
8.71 ft/min
0.0096 MPI
6.29 ft/min
0.0133 MPI
4.13 ft/min
0.0202 MPI
1.47 ft/min
0.0568 MPI
0.11 ft/min
0.7319 MPI


Rio Del Mar Pump Station: 4 Gallon Percolation Test
Feet of Head
Minutes
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
3.77 ft/min
0.0221 MPI
16.61 ft/min
0.0050 MPI
14.40 ft/min
0.0058 MPI
12.14 ft/min
0.0069 MPI
9.96 ft/min
0.0084 MPI
7.81 ft/min
0.0107 MPI
5.68 ft/min
0.0147 MPI
3.60 ft/min
0.0232 MPI
1.26 ft/min
0.0661 MPI
0.11 ft/min
0.7408 MPI


Rio Del Mar Pump Station: 5 Gallon Percolation Test
Feet of Head
Minutes
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
13.54 ft/min
0.0062 MPI
15.87 ft/min
0.0053 MPI
13.44 ft/min
0.0062 MPI
11.28 ft/min
0.0074 MPI
9.22 ft/min
0.0090 MPI
7.29 ft/min
0.0114 MPI
5.33 ft/min
0.0156 MPI
3.34 ft/min
0.0249 MPI
1.24 ft/min
0.0670 MPI
0.11 ft/min
0.7292 MPI

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PERRY LABORATORY
HORTICULTURAL ADVISING AND TESTING

424 AIRPORT BOULEVARD
WATSONVILLE, CA 95076
Telephone 831/722-7606
Fax 831/722-5053

Kacie Wellington
330 Village Lane
Los Gatos, CA 95030

January 12, 2017

CHEMICAL WATER ANALYSES

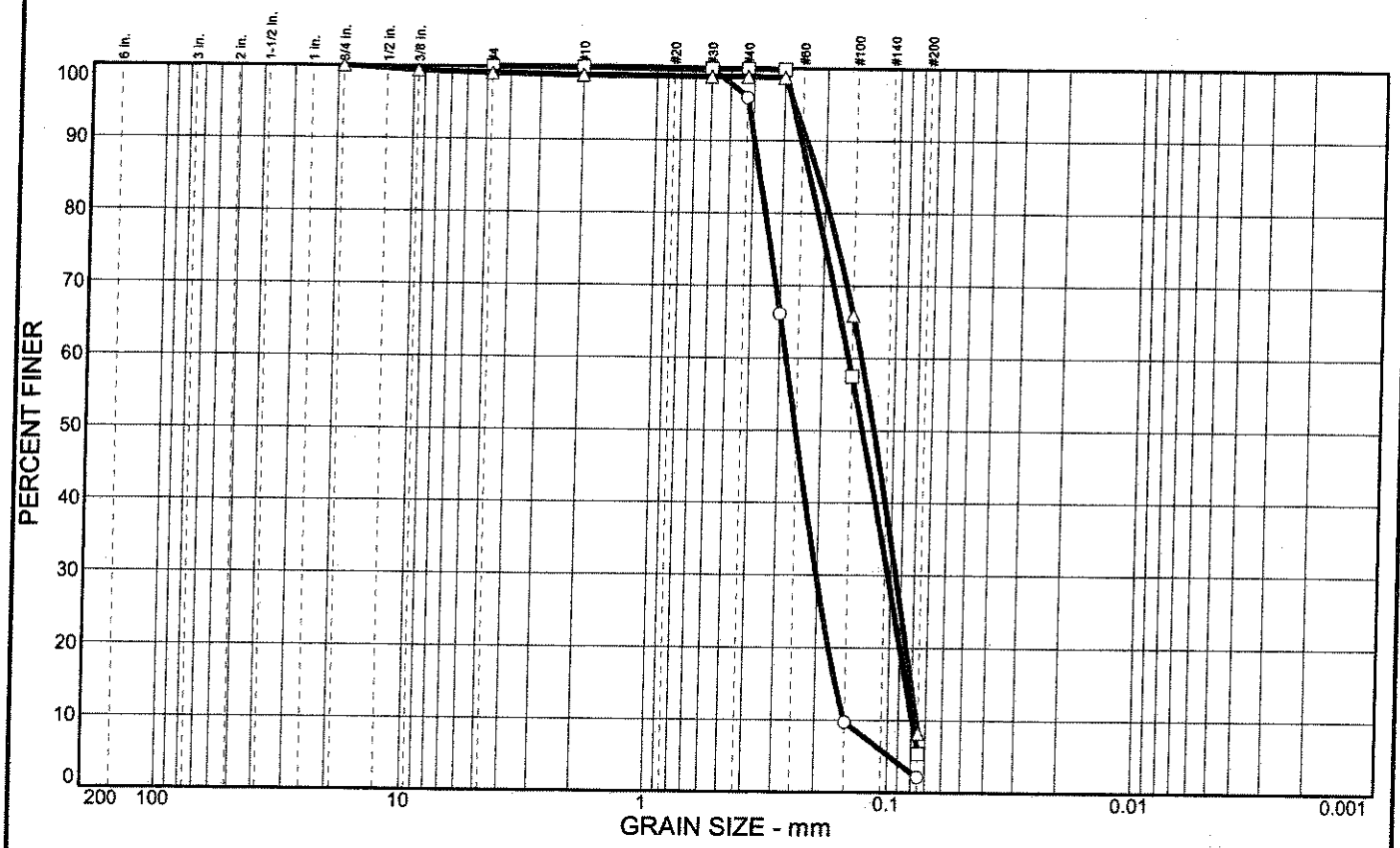
Chemical analyses on samples received: January 10, 2017

Sample Identification:	Guideline Values For Irrigation Water	CSA/SD-1 (P-1) High Tide	CSA/SD-1 (P-1) Low Tide
CONSTITUENTS			
pH	6.0-7.8	7.05	6.98
Electrical Conductivity (dS/M)	<0.75	1.95	2.15
Calcium, Ca (meq/l)	<5.0	1.61	1.82
Magnesium, Mg (meq/l)	<2.0	1.88	2.00
Potassium, K (meq/l)	<0.1	0.42	0.41
Sodium, Na (meq/l)	<3.00	20.61	19.80
Chloride, Cl (meq/l)	<3.00	12.40	13.70
Carbonate, CO_3 (meq/l)	<0.01	0.00	0.00
Bicarbonate, HCO_3 (meq/l)	<1.50	6.00	5.85
Sulfate, SO_4-S (meq/l)	<5.20	2.00	2.17
Nitrate, NO_3 (meq/l)	<0.73	0.07	0.07
Boron, B (ppm)	<0.50	0.32	0.23
Total Dissolved Solids, TDS (ppm)	<480	1248	1376
SAR adj.	<6.0	15.60	14.33
Iron, Fe (ppm)	<0.20	0.28	0.24
Manganese, Mn (ppm)	<0.10	0.30	0.48
Zinc, Zn (ppm)	<0.10	0.01	0.01
Copper, Cu (ppm)	<0.10	0.01	0.01
Nitrate Nitrogen, NO_3-N (ppm)	<10.0	1	1

Respectfully submitted,

Clifford B. Low M.S.

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			97.9	2.1					
□			94.6	5.4					
△		0.9	90.9	8.2					

SIEVE inches size	PERCENT FINER ○	□	△
3/4"			100.0
3/8"			99.4
	GRAIN SIZE		
D_{60}	0.281	0.156	0.138
D_{30}	0.202	0.103	0.0953
D_{10}	0.151	0.0795	0.0765
	COEFFICIENTS		
C_c	0.96	0.85	0.86
C_u	1.86	1.96	1.80

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	100.0	99.1
#10	100.0	100.0	98.9
#30	99.7	99.9	98.8
#40	95.9	99.9	98.8
#50	66.1	99.8	98.7
#100	9.7	57.5	65.9
#200	2.1	5.4	8.2

SOIL DESCRIPTION

○ Olive Gray Poorly Graded SAND

□ Olive Brown Poorly Graded SAND w/ Clay

△ Olive Brown Poorly Graded SAND w/ Clay

REMARKS:

○

□

△

○ Source: SD-3 Sample No.: B-1 Elev./Depth: 10.0'

□ Source: SD-4 Sample No.: B-1 Elev./Depth: 4.0'

△ Source: SD-4 Sample No.: B-3 Elev./Depth: 8.0'

COOPER TESTING LABORATORY

Client: Cotton, Shires & Associates

Project: Rio Del Mar Pump Sta - E5696

Project No.: 026-623

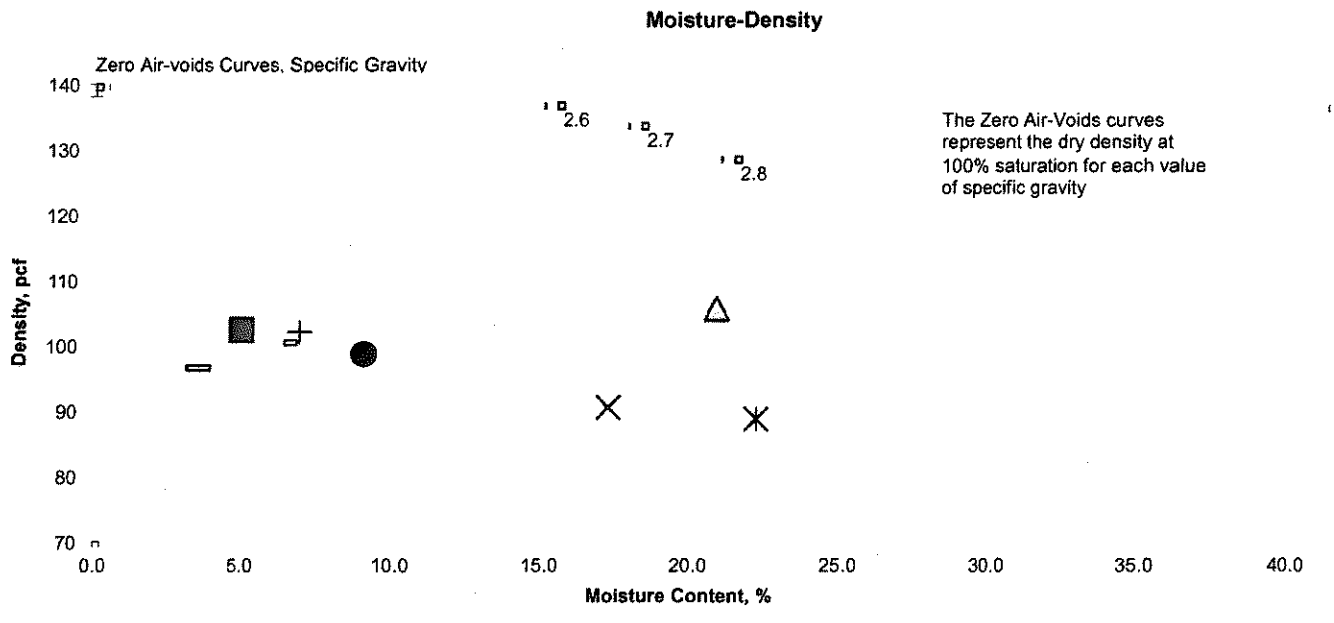
Figure

Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

CTL Job No:	026-263a	**Project No.**	E5696	**By:**	RU
Client:	Cotton, Shires & Associates	**Date:**	12/22/16		
Project Name:	Rio Del mar Pump Sta	**Remarks:**			

Boring:	SD-1	SD-1	SD-2	SD-2	SD-3	SD-3	SD-3
Sample:	T-2	T-2	T-2	T-4	T-2	T-4	T-6
Depth, ft:	2.5	2.5	2.5	6.5	2.5	4.5	6.5
Visual Description:	Dark Olive Brown Sandy CLAY	Olive Gray SAND w/ Silt	Olive Brown Silty SAND	Olive Brown Clayey SAND	Dark Olive Brown Clayey SAND	Dark Olive Brown Clayey SAND	Dark Olive Brown Clayey SAND
Actual G_s							
Assumed G_s	2.70	2.70	2.70	2.70	2.70	2.70	2.70
Moisture, %	5.0	20.9	17.3	22.2	9.1	7.0	6.5
Wet Unit wt, pcf	107.5	127.7	106.1	108.4	107.6	109.1	107.0
Dry Unit wt, pcf	102.4	105.6	90.5	88.7	98.7	102.0	100.5
Dry Bulk Dens.pb, (g/cc)	1.64	1.69	1.45	1.42	1.58	1.63	1.61
Saturation, %	20.9	94.4	54.0	66.5	34.5	28.8	25.7
Total Porosity, %	39.3	37.4	46.4	47.4	41.5	39.5	40.4
Volumetric Water Cont.,Θw,%	8.2	35.3	25.1	31.6	14.3	11.4	10.4
Volumetric Air Cont., Θa,%	31.1	2.1	21.3	15.9	27.2	28.1	30.0
Void Ratio	0.65	0.60	0.86	0.90	0.71	0.65	0.68
Series	1	2	3	4	5	6	7

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturatio void ratio should be considered approximate.

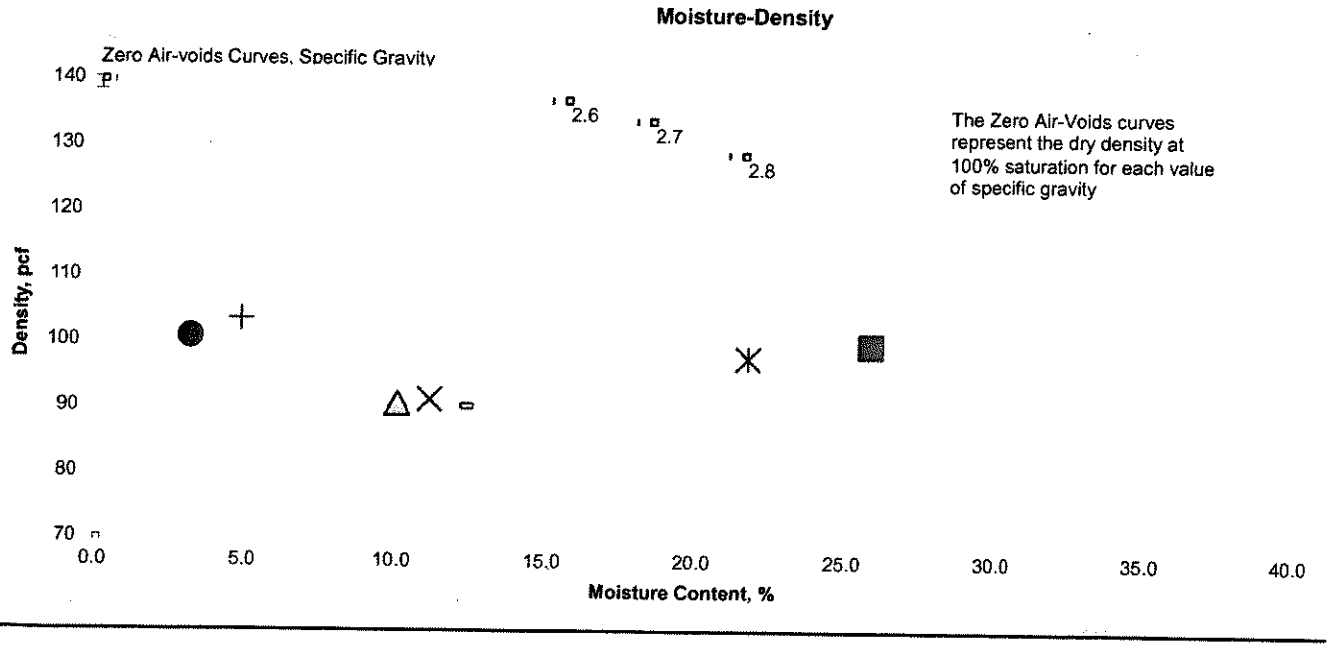


Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

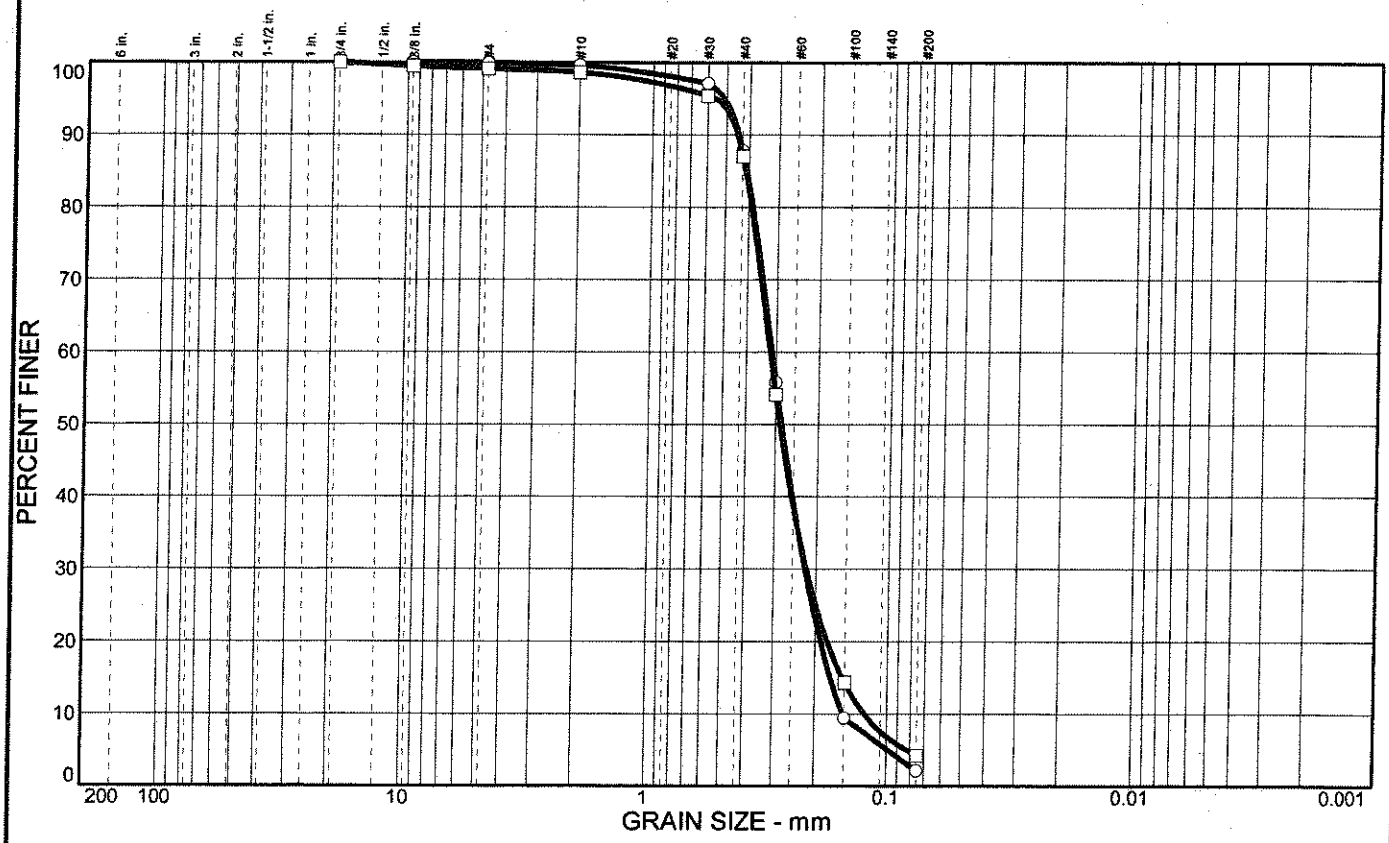
CTL Job No:	026-263b	**Project No.**	E5696	**By:**	RU
Client:	Cotton, Shires & Associates	**Date:**	12/22/16		
Project Name:	Rio Del mar Pump Sta	**Remarks:**			

Boring:	SD-3	SD-4	SD-4	SD-4	SD-5	SD-6	SD-7
Sample:	T-10	T-2	T-4	T-6	T-2	T-2	T-2
Depth, ft:	20.5	2.5	13.5	16.0	2.5	3.0	2.5
Visual Description:	Dark Olive Gray Clayey SAND	Olive Brown Silty SAND	Olive Brown Silty SAND	Olive Brown Clayey SAND	Olive Gray SAND w/ Silt	Olive Gray SAND w/ Silt	Olive Gray SAND w/ Silt
Actual G_s							
Assumed G_s	2.70	2.70	2.70	2.70	2.70	2.70	2.70
Moisture, %	25.8	10.1	11.1	21.8	3.1	4.8	12.2
Wet Unit wt, pcf	125.1	99.4	101.0	118.5	103.6	108.1	101.0
Dry Unit wt, pcf	99.4	90.3	90.9	97.3	100.4	103.2	90.0
Dry Bulk Dens.pb, (g/cc)	1.59	1.45	1.46	1.56	1.61	1.65	1.44
Saturation, %	100.0	31.3	35.1	80.2	12.4	20.5	37.6
Total Porosity, %	41.1	46.5	46.1	42.3	40.5	38.8	46.7
Volumetric Water Cont.,θw,%	41.1	14.6	16.2	33.9	5.0	8.0	17.6
Volumetric Air Cont., θa,%	0.0	31.9	29.9	8.4	35.4	30.9	29.1
Void Ratio	0.70	0.87	0.86	0.73	0.68	0.64	0.87
Series	1	2	3	4	5	6	7

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturatio void ratio should be considered approximate.



Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		0.1	97.8	2.1					
□		0.9	94.9	4.2					

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □
3/4"		100.0
3/8"	100.0	99.5
GRAIN SIZE		
D_{60}	0.313	0.318
D_{30}	0.222	0.219
D_{10}	0.153	0.124
COEFFICIENTS		
C_c	1.03	1.22
C_u	2.05	2.56

SIEVE number size	PERCENT FINER ○	PERCENT FINER □
#4	99.9	99.1
#10	99.6	98.6
#30	97.1	95.4
#40	87.8	87.0
#50	55.8	54.1
#100	9.4	14.3
#200	2.1	4.2

SOIL DESCRIPTION

○ Olive Brown Poorly Graded SAND

□ Dark Olive Brown Poorly Graded SAND

REMARKS:

○

□

○ Source: SD-6 Sample No.: B-2 Elev./Depth: 6.0'

□ Source: SD-6 Sample No.: B-4 Elev./Depth: 10.0'

COOPER TESTING LABORATORY

Client: Cotton, Shires & Associates

Project: Rio Del Mar Pump Sta - E5696

Project No.: 026-623 Figure

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Corrosivity Test Summary

CTL # 026-623 **Date:** 12/23/16 **Tested By:** PJ **Checked:** PJ
Client: Cotton, Shires & Associates **Project:** Rio Del Mar Pump Sta **Proj. No:** E5696
Remarks:

Sample Location or ID			Resistivity @ 15.5 °C (Ohm-cm)			Chloride	Sulfate		pH	ORP	Moisture	Soil Visual Description
Boring	Sample, No.	Depth, ft.	As Rec.	Minimum	Saturated	mg/kg	mg/kg	%		(Redox)	At Test	
						Dry Wt.	Dry Wt.	Dry Wt.		mv	%	
			ASTM G57	Cal 643	ASTM G57	Cal 422-mod.	Cal 417-mod.	Cal 417-mod.	Cal 643	SM 2580B	ASTM D2216	
SD-1	B-1 & B-2	4.0-6.0	-	2085	-	31	185	0.0185	8.0	-	17.0	Gray Silty SAND
SD-3	B-2 & T-9	15-20	-	1233	-	242	36	0.0036	8.4	-	29.8	Grayish Brown Silty SAND
SD-6	B-1 & B-3	6.0 & 8.0	-	12584	-	15	5	0.0005	8.5	-	6.6	Grayish Brown Silty SAND
						Text						

#200 Sieve Wash Analysis
ASTM D 1140

Job No.:	026-623	**Project No.:**	E5696	**Run By:**	MD
Client:	Cotton, Shires & Assoc.	**Date:**	12/23/16	**Checked By:**	DC
Project:	Rio Del Mar Pump Sta.				

Boring:	SD-1	SD-1	SD-5	SD-5	SD-5	SD-7	SD-7	
Sample:	B-3	B-5	B-1	B-3	B-4	B-1	B-3	
Depth, ft.:	8.0	15.0	4.0	8.0	10.0	4.0	6.6	
Soil Type:	Dark Gray Silty SAND	Dark Gray SAND w/ Silt	Olive Gray SAND	Olive Gray SAND	Dark Olive Gray SAND	Olive Brown SAND w/ Silt	Olive Brown SAND	
Wt of Dish & Dry Soil, gm	546.2	515.1	704.3	676.1	774.0	603.4	621.7	
Weight of Dish, gm	175.0	175.4	309.9	305.5	336.6	247.8	310.6	
Weight of Dry Soil, gm	371.2	339.7	394.4	370.6	437.4	355.6	311.1	
Wt. Ret. on #4 Sieve, gm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Wt. Ret. on #200 Sieve, gm	322.2	322.1	384.2	367.7	424.2	318.4	307.9	
% Gravel	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	
% Sand	**86.8**	**94.8**	**97.4**	**99.2**	**97.0**	**89.5**	**99.0**	
% Silt & Clay	**13.2**	**5.2**	**2.6**	**0.8**	**3.0**	**10.5**	**1.0**	

Remarks: As an added benefit to our clients, the gravel fraction may be included in this report. Whether or not it is included is dependent upon both the technician's time available and if there is a significant enough amount of gravel. The gravel is always included in the percent retained on the #200 sieve but may not be weighed separately to determine the percentage, especially if there is only a trace amount, (5% or less).

COUNTY OF SANTA CRUZ

PLANNING DEPARTMENT
701 OCEAN STREET, 4TH FLOOR, SANTA CRUZ, CA 95060
(831) 454-2580 FAX: (831) 454-2131 TDD: (831) 454-2123
KATHLEEN MOLLOY PREVISICH, PLANNING DIRECTOR

23 June 2017

County of Santa Cruz
Department of Public Works – Stormwater Management Section
Attention: David Sims, Civil Engineer
701 Ocean Street, 4th Floor
Santa Cruz, CA 95060

Subject: Review of the Geotechnical Investigation for the Rio Del Mar Flats Pump Station dated 16 May 2017 by Cotton Shires and Associates, Inc – Project No. E5696

Project Site: Intersections of Aptos Beach Drive, Venetian Road, Rio Del Mar Blvd, and Beach Drive in Rio Del Mar
Proposed Outfall on State Beach adjacent APN 043-072-01 (202 Beach Drive)
CDP Application No. 171057

Dear Applicant:

The purpose of this letter is to inform you that the Planning Department *has accepted* the subject report. The following items shall be required:

1. The project shall comply with the National Flood Insurance Program and the County Building Code;

2. All project design and construction shall comply with the recommendations of the report;

3. Final plans shall reference the soils report by title, author, and date. Final plans should include a statement that the project shall conform to the report's recommendations; and

4. After plans are prepared that are acceptable to all reviewing agencies, please submit a completed Soils (Geotechnical) Engineer Plan Review Form to Environmental Planning. The author of the soils report shall sign and stamp the completed form. Please note that the plan review form must reference the final plan set by last revision date.

Any updates to report recommendations necessary to address conflicts between the report and plans must be provided via a separate addendum to the soils report.

Electronic copies of all forms required to be completed by the Geotechnical Engineer may be found on our website: www.sccoplanning.com, under "Environmental", "Geology & Soils", and "Assistance & Forms".

After building permit issuance the soils engineer *must remain involved with the project* during construction. Please review the Notice to Permits Holders (attached).

Our acceptance of the report is limited to its technical content. Other project issues such as zoning, fire safety, septic or sewer approval, etc. may require resolution by other agencies.

Please note that this determination may be appealed within 14 calendar days of the date of service. Additional information regarding the appeals process may be found online at: http://www.sccoplanning.com/html/devrev/plnappeal_bldg.htm

If we can be of any further assistance, please contact the undersigned at (831) 454-3168 or rick.parks@santacruzcounty.us

Sincerely,

Rick Parks, GE 2603
Civil Engineer – Environmental Planning

Cc: Environmental Planning, Attn: Nathan MacBeth
Cotton Shires and Associates, Inc, Attn: Patrick Shires, GE

Attachments: Notice to Permit Holders

NOTICE TO PERMIT HOLDERS WHEN A SOILS REPORT HAS BEEN PREPARED, REVIEWED AND ACCEPTED FOR THE PROJECT

After issuance of the building permit, the County requires your soils engineer to be involved during construction. Several letters or reports are required to be submitted to the County at various times during construction. They are as follows:

1. **When a project has engineered fills and / or grading**, a letter from your soils engineer must be submitted to the Environmental Planning section of the Planning Department prior to foundations being excavated. This letter must state that the grading has been completed in conformance with the recommendations of the soils report. Compaction reports or a summary thereof must be submitted.

2. **Prior to placing concrete for foundations**, a letter from the soils engineer must be submitted to the building inspector and to Environmental Planning stating that the soils engineer has observed the foundation excavation and that it meets the recommendations of the soils report.

3. **At the completion of construction,** a *Soils (Geotechnical) Engineer Final Inspection Form* from your soils engineer is required to be submitted to Environmental Planning that includes copies of all observations and the tests the soils engineer has made during construction and is stamped and signed, certifying that the project was constructed in conformance with the recommendations of the soils report.

   If the *Final Inspection Form* identifies any portions of the project that were not observed by the soils engineer, you may be required to perform destructive testing in order for your permit to obtain a final inspection. The soils engineer then must complete and initial an *Exceptions Addendum Form* that certifies that the features not observed will not pose a life safety risk to occupants.

A) Preferred Project – Pump Station with New Outfall

The preferred project eliminates local rainfall-induced flooding throughout most of the Rio Del Mar Flats up through the County established 10-year storm standard provided elsewhere in the County. This is achieved at a formally determined cost/benefit ratio that is less costly than other feasible alternatives. The improvements are accomplished by excluding some of the runoff from high ground areas from accumulating in the low lying areas through provision of a new gravity-powered pipe system along Rio del Mar Blvd. that can build elevation pressure and discharge flows to a new location on the beach sands. Also, the existing pipe system serving the low lying Rio Flats areas is rerouted to a new pump station that will discharge to the same beach sand area. This rerouting of a portion of the existing pipe system resolves current hydraulic connectivity problems with the backwatered Aptos Creek, and bypasses flows around pipes and catch basins nearest the beach wave intrusion areas within the Esplanade parking lot that are prone to plugging. The elimination of connectivity to backwater conditions, isolation from inlet and pipe plugging, and provision of pumps, improves removal of runoff accumulations and reduces water quality pollution by altering the physical extents and time periods of ponding throughout many blocks of the neighborhood.

Proposed drainage pipe systems will collect and reroute rainfall surface drainages such that they do not collect and pond in low lying developed areas, but are instead discharged to the beach area outside of the developed lowlands where the water will in light and moderate storm conditions infiltrate into the beach sands within the interior and near proximity of the underground vault, or under larger storm conditions surface flow onto the sands reaching the storm wave zone, which under such large storm conditions is temporarily closer to the discharge point and where wave action is actively redistributing the beach sands with each wave occurrence. See project plans for the proposed outfall location, and Figures 1, 2, & 3 included herein for photographic evidence of the long-term stability of the proposed outfall location.

Figure 1: June 1928 photo, taken during a mid-point in extended sub-division construction, indicates that the chosen point for the proposed out-fall location has, comparative to the performance history of the actually developed creek outfall location, become a stabilized area. This is in evidence by the quickly established vegetated tops of sand dunes seen on the back-beach once Aptos Creek flows were channelized away. Approval and filing of Sub-division #5 was made in June 1926, so the realignment of Aptos Creek had not occurred for longer than two seasons.

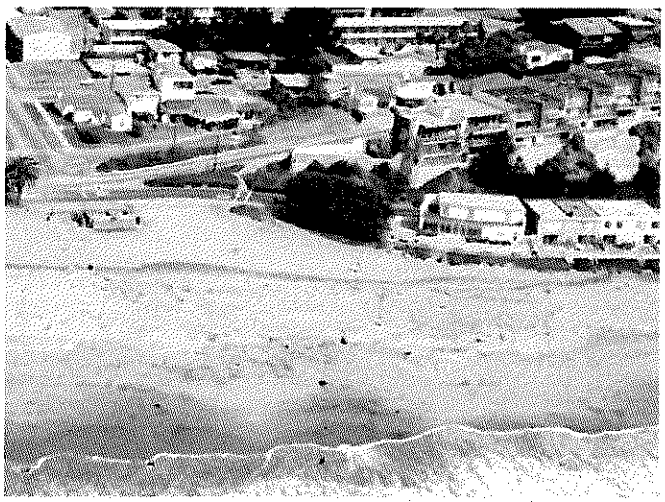


Figure 2: This 1979 photo shows that back-beach vegetation in the form of both iceplant and large established trees easily persist and are out of reach of most wave run-up events, around the location of the proposed new outfall structure. Salt water would kill the vegetation if it was present with any frequency. The trees have been removed to build a home, but the iceplant has persisted for decades and is still present today. The mid-beach shows scour lines from temporary Aptos Creek flows. The State Parks restroom was rebuilt in the 2000's, but was never destroyed during its entire service life of many decades. State Park's had the confidence to build a new restroom in exactly the same location.

Figure 3: This 1986 aerial shows a record of the greatest degree of beach erosion known to be photographed for the location. Virtually the entire length of beach has been significantly, but temporarily, eroded and is strewn with debris. The elevated area of the proposed outfall location is seen, between the State Park's restroom building and the stand of trees (not yet occupied by a future home), to be unaffected by either debris or erosion.

No construction disturbance of Aptos Creek channel, or the highly variable meander segment across the beach frontage, is planned under this preferred project alternative. The only modifications are changes to rainfall runoff discharge points and quantities received at these different points. The new discharge structure is positioned on an existing lot of record (1928, Subdivision #8), entirely within existing County accepted right-of-way, on well vegetated beach sands, at elevation well above ordinary high tide level. The new pipe discharge point is more than 200 feet away from both ordinary ocean high tide line, and from the fixed locations of Aptos Creek channel. The discharge point is at times within 200 feet of the terminal end of Aptos Creek channel as it meanders across different positions along the beach frontage. This meandering path is highly variable, sometimes running north, south, or straight out to sea. Left alone it most often runs southwards. During storm conditions all of this nearby topography is overwhelmed by surf conditions reshaping the beach sands, and no specific topography persists for the meander channel.

Aptos Creek at Rio Del Mar Beach is permanently posted due to routinely high bacteria levels. Based on past and current testing, the source of the majority of these bacteria is from birds and other wildlife, but human sourced bacteria and other urban pollutants are also present. The surrounding urban neighborhood presently discharges runoff to Aptos Creek, contributing much of the urban pollutants. The preferred project will substantially reduce the polluted discharge (consistent with Section 30231 of Coastal Act) directed to Aptos Creek coming from the Rio Del Mar neighborhood, which will make a significant incremental improvement to the overall conditions of the larger watershed, much of which is otherwise protected and natural (Nisene-Marks). Additionally, the opportunity for pollutants to come into contact with water will be significantly

reduced by elimination of the street, yard and building flooding that now occurs frequently during common rain events.

Within Aptos Creek channel there exists Federally Threatened - Steelhead and Federally Endangered - Tidewater Goby. These fish are among the most important of valuable natural coastal resources that need better protections to survive. The new preferred outfall location, through avoidance, improves water quality within the sensitive habitat of Aptos Creek where these threatened and endangered fish species reside and become periodically confined. While there is no riparian habitat within many hundreds of feet, the walled and confined Aptos Creek channel does serve at times as a lagoon. The creek mouth is often impounded by barrier sands, such that the water exchange rate is very slow, and the water body (lagoon) is under these conditions much more sensitive to pollutant loads, heating, and depletion of biological oxygen that could harm fish health and survival. Removal of runoff routed from urban street pavements to this near-static water body improves all these issues. None of the other alternative projects (or variations) will provide this improvement or benefits to this valued coastal resource.

This preferred project is also a best solution for the community because it significantly improves the conditions for safe public access and transit over an extensive area, and because it avoids damage to the largest number of structures and affected streets at low cost. It also improves emergency response access to the neighborhood and beach area, a critical function during storm conditions. It is done with monetary resources provided by the local county government, special drainage district, and federal grant funding, rather than residents having to continue to bear losses and/or seek individual alternative remedies.

The Coastal Commission has authority to permit the new drainage outfall, which was known in advance. As a result, the local Coastal Commission staff, Tamara Doan, has already been presented with an overview of the project (5/24/12) some years ago, and gave her verbal support for the establishment of this outfall on the beach, in part because of the communicated water quality benefits the project would have in avoiding contamination in Aptos Creek, and because the outfall design was agreed to be mostly hidden and discharged to underground beach sand receiving extensive pre-filtration prior to routing to the outfall location, and additional filtration within the beach sands. Additionally, Susan Craig designated Tamara Doan to officially be a representative in her place during attendance for a late-stage, multi-agency meeting, finally resulting in the project securing grant funding. Prior Coastal Commission input and official guidance was very relevant to the development of the preferred project as it is being proposed.

This issue of water quality and its harmful impacts to Aptos Creek is substantially resolved by only the preferred project, because it discharges into elevated sands that provide substantial filtration and bio-degradation of pollutants. Discharge flows will most often join into the high underground water table that then drains laterally into the ocean. Typically, the chosen site provides hundreds of feet of sand to filter and biologically remediate pollutants. The mechanism of sand filtering the runoff discharge has been investigated previously by Geosyntec consultants for a project in Hermosa Beach, and Tamara Doan of the Coastal Commission strongly encouraged (but did not require) some form of emulation. The preferred project provides this emulation in a manner that is reflective of site constraints.

There have been some questions expressed by State Park's staff via permit reviewers about occasional ponded water on the mid-beach as an existing undesired nuisance, and concern for further aggravation. Firstly, this existing 'ponding' is not a perched or isolated occurrence of water that can be removed; it is the appearance of the water table itself above the ground surface any time sand scour from wave action or creek flow is

sufficiently deep to expose the water table. Secondly, if State Park's managers wish the water table to not appear above sand grade, then they could choose to re-establish some variable form of mechanical sand grading operation, so as to re-bury the water table while avoiding any sensitive areas nearest the ever-shifting creek mouth. Regardless of the beach management chosen (or not performed) by the State, the preferred project discharge point will not perch, or aggravate the depth of any water appearing on the mid-beach, as any contribution is rapidly leveled to that of the surrounding, interconnected water table. The water table influenced by Aptos Creek has substantially more than a thousand feet of exposure to sea level through highly pervious sands. What fluctuation occurs is governed by tides, slight mounding from the entirety of Aptos Creek's flows, and regionally occurring rainfall. Refer to the piezometer data in Fig. 8, on page 24, of the geotechnical investigation.

All these reasons, and historic photographic evidence indicates this project alternative (A), establishing a new outfall location, is superior to the alternative projects evaluated below. The preferred project is also favored because it is ultimately the most protective of coastal resources.

B) Variation Project – Pump St on with Existing Outfall

The variation of using the existing outfall for the pump station project has been previously considered and was discarded for multiple reasons under the project engineer's assessment. In general, the concept is technically and hydraulically feasible and could achieve some, but not all, of the goals of the preferred project. The assessment included several consultations with Coastal Commission staff (Tamara Doan) who agreed with the inferiority of the variation, and County notes from this April 11, 2013 meeting with the Coastal Commission conclude with *"avoid the creek"*.

Extensive history of damages at the Aptos Creek outfall: A series of photos that follow, illustrate the extensive damages that have occurred immediately at the drainage outfall location. They are listed in brief:

1) Early to mid-1930's Stop-log dam across river mouth collapses in a "sea-storm".

2) 1955 Large rainfall flows in Aptos Creek collapse the channel wall. Wall replaced years later – likely in 1981.

3) 1982 Large rainfall flows damage the replaced channel wall, undermining and removing extensive backfill.

4) 1982 Large rainfall flows severely damage the brand new State Park footbridge (built 1981), and reportedly it was replaced shortly thereafter (1983).

5) 2001 to present. Smaller rain & sea storm events continue to progress structural damage to the channel wall.

This frequency of extensive damage indicates that most all past design and construction efforts repeatedly could not endure the very dynamic ocean and creek hydraulic conditions at this specific location, despite designs that were quite massive, and costly. This frequency suggests that storm events approximating a 25 to 50-year return frequency can fully destroy normal constructions, and that smaller events exact a progressive toll of accumulating damage. This is not a reasonable risk for structural improvements desired to have a service life of 75 to 100 years.

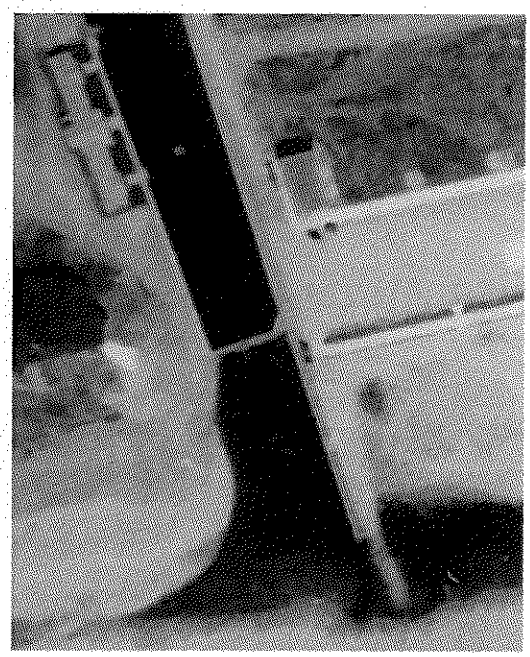
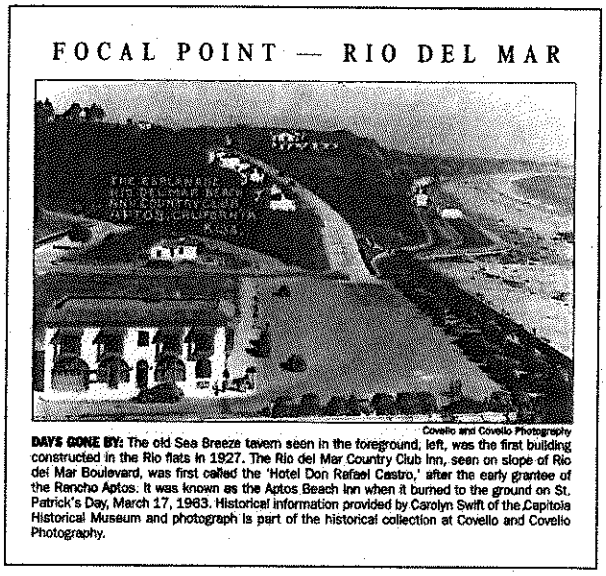


Figure 4: This 1928 photo shows the recently built and intact stop-log dam across Aptos Creek, exactly at the position of the present-day pipe outfall. Within a few years the dam collapsed.



FOCAL POINT — RIO DEL MAR

Covello and Covello Photography

DAYS GONE BY: The old Sea Breeze tavern seen in the foreground, left, was the first building constructed in the Rio flats in 1927. The Rio del Mar Country Club Inn, seen on slope of Rio del Mar Boulevard, was first called the 'Hotel Don Rafael Castro,' after the early grantee of the Rancho Aptos. It was known as the Aptos Beach Inn when it burned to the ground on St. Patrick's Day, March 17, 1963. Historical information provided by Carolyn Swift of the Capitola Historical Museum and photograph is part of the historical collection at Covello and Covello Photography.

Figure 5: The unbroken channel wall can be seen in the foreground of the above photo.

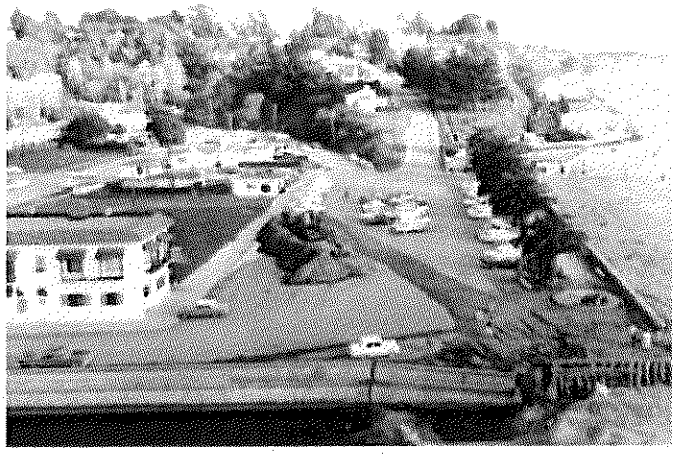
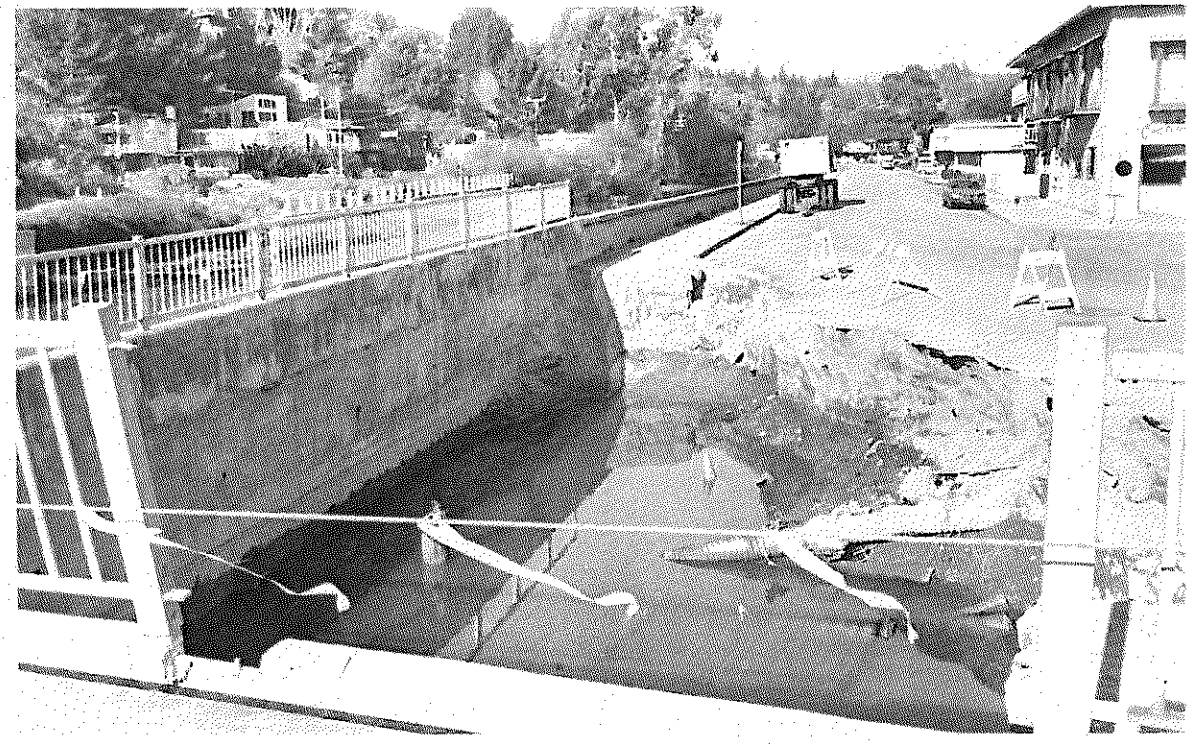


Figure 6: The broken channel wall was likely triggered by scour from the 1955 extreme storm event. Photo is circa 1960, due to obvious on-going sewer line & vault construction.

Figure 7: Typed caption documents repetitive storm damages over the decades, all occurring at the same location; to the channel dam, the channel wall, and the State Park's footbridge.



When the rains stopped, there was a gaping hole in the Rio del Mar Esplanade where Aptos Creek runs into Monterey Bay.

Figure 8: The extreme 1982 storm event scoured below the channel wall base, causing extensive parking lot backfill to be lost from under the wall to Aptos Creek's flows. The wall rests on deeper piles, but in present–day the wall is progressively tilting, settling, cracking, and off-set from its original alignment.

Figure 9: The present-day offset (~2") and tilt in the channel wall immediately adjacent to the State Park's footbridge and existing outfall pipes indicates progression of structural deterioration since the State Park footbridge was built/rebuilt in 1981/1983. Less apparent in the photo angle is evidence of settling offset.

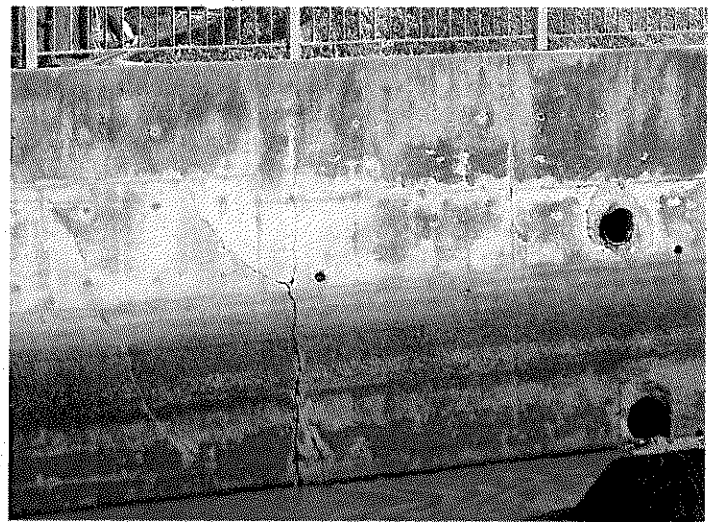


Figure 10: Present-day, several large, open cracks indicate the channel wall is bulging towards, and sinking into, the creek channel in excess of the offset amounts shown in the prior figure. The pair of existing outfall pipes is visible at right.

Figure 11: Present-day, multiple sinkholes indicate recurring loss of backfill from behind the cracked channel wall at the same location as much more extensive backfill loss during the 1982 storm. The drainage grate and curb at left edge of photo marks the existing outfallposition.

Water quality issues and protection of coastal resources: The Aptos Creek outfall variation will not improve nearly as substantially the environmental and health conditions in Aptos Creek and of waters flowing across the public beach. This variation will not reduce, at all, the discharge quantity directed to Aptos Creek coming from the Rio Del Mar neighborhood. Under the variation of creek outfall discharge, only gross trash would be removed from the discharge stream. The presence of particulate pollutants in the runoff sediments and other pollutants dissolved within the water would continue to be discharged directly into the Creek channel. The creek mouth is often impounded by barrier sands, such that the water exchange rate is very slow, and the water body is under these conditions much more sensitive to pollutant loads, heating, and depletion of biological oxygen that could harm fish health and survival. There is no feasible, complete means to remove these pollutants once entrained into the flow, so a strategy that removes the flows to a more acceptable location that

can receive remediation (as in the preferred project) is a more prudent course of action. The Federally Threatened - Steelhead and Federally Endangered - Tidewater Goby fish species in Aptos Creek, a valued coastal resource, will not under this outfall variation get the higher level of protections discussed under the preferred project. Human health conditions for users of the beach will not under this outfall variation get the higher level of protections discussed under the preferred project. No other direct discharge location to Aptos Creek would perform any better on the issue of water quality.

Grant and jurisdictional ownership and permitting issues: The federal grant received did not allow for this variation on the project to be pursued. To implement this variation of the project, the grant would need to be revised and re-evaluated. The jurisdictional property ownerships and associated permitting hurdles would likely be more difficult and extensive to acquire, raising far more problematic issues to resolve than does the preferred project. The County of Santa Cruz has only a pre-existing prescriptive right to discharge at this creek outfall location, set in place upon the original 1926 sub-division #5 creation. The County does not own the land parcel on which the pipe outfall or adjacent grated inlet is placed, nor does the County own, or have any responsibility for, the section of wall at the outfall location. This section of wall is entirely on State Park's property, and appears to have had contemporaneous construction with the State Park's footbridge, shown by style of design and construction, matching concrete form work and integral railings.

To obtain a more reliable outfall at Aptos Creek would require reconstruction of the structurally damaged channel wall, entailing extensive disturbance to Aptos Creek. Large scale shoring and dewatering, and partial diversion of the Creek's channel bed would probably be necessary. Water levels (including tides and swells) would be difficult to control, and there would be significant potential for construction material contamination during reconstruction of the wall. Adequate foundation geology is expected to be much deeper at this location. These conditions and disturbances would not represent better choices for coastal resource protection. Costs to implement these construction methods would also be very high, and are not available within the grant funds secured.

All the above reasons, performance history, and photographic evidence indicate this project variation (B), using the existing outfall location, is significantly inferior to the preferred project being proposed.

C) Alternate Project – Elevate Building Structures

Another means of avoiding some of the monetary flood damages would be a project to elevate the lowest lying building structures. Of the 43 structures physically surveyed for a grant application's formal benefit/cost analysis, 38 were determined to have flooding within the first floor elevations for a 10-year event. The other 5 structures would receive some damages below first floor levels, as would other structures not surveyed. It is likely that a flood elevation program would need to elevate in excess of 50 to 60 structures within the Rio Flats neighborhood to gain the fullest reduction in damages from a 10-year rainfall event. In actuality, other regulations would require elevation to 1 foot above the 100-year flood plain, meaning that many homes would need to be raised 5 to 6 feet higher than present elevation; an even more expensive proposition. A typical cost to elevate a medium size perimeter foundation residence is estimated to average $100,000. For 50 structures this would approximate a $5 million cost just to gain relief from rainfall ponding, which is not monetarily competitive with the preferred project. Additionally, such an elevation program would be only a partial solution to damages since the rainfall ponding problems would still continue to occur, creating pollution, damaging streets and utilities, and making neighborhood and beach access inconvenient and unsafe for residents, visitors and emergency responders. For these reasons this alternative is not preferred to address rainfall ponding and flooding in the Rio Flats neighborhood.

Elevating homes does elevate some pollutant sources found within first floor living quarters. Garage structures are unlikely to be elevated substantially because of small lot sizes and limitations in possible grade changes for driveway approaches. Thus this project alternative still allows extended time periods of ponding throughout the Rio Flats, flooding the street system, yards, and some garages, which doesn't alter the extents and opportunity time for pollutant sources to make contact and soak in the flood waters. Any such pollutant mixing would then be discharged to Aptos Creek. Elevating homes also does nothing to improve the safe transit of primary residential roads used for evacuation and emergency response, or to provide reasonable access for users of the beach.

The Rio Flats area is susceptible to "very high" liquefaction, so raising house foundations and creating taller structures could negatively affect structure response in the advent of a strong earthquake, requiring further structural improvements to the existing buildings beyond the foundation addition.

All these reasons indicate this project alternative (C) is inferior to the preferred project being proposed.

D) Alternate Project – Improve Gravity Piping (No Pump Station)

This alternative has been investigated multiple times by several different County staff over the years, and where it was possible to implement, this occurred in one project location along upper Moosehead Dr. In general, it is neither feasible for the low-lying streets of the Rio del Mar Flats, nor any of the elevated perimeter areas that drain into the Rio Flats, where such perimeter areas cannot be feasibly, or cost effectively, intercepted. The non-feasible drainage area is a large one, and unaddressed would by itself result in the type of flooding presently experienced.

Different hydraulic conditions, from heavy, elevated creek flow, to wave surge running up the creek channel, to elevated sand berms formed by ocean swells have been observed to back up the Aptos Creek waterline to an elevation sometimes in excess of 10 feet, which exceeds the drainage grate inlet elevations in the neighborhood that are all near 9.5 feet elevation. These hydraulic conditions occur fairly frequently (sometimes absent of any significant rainfall), creating negative gravity head situations and mild reverse flows through the existing pipe systems until the water surface elevations equalize on both ends of the system, at which point there is no flow at all in either direction. Any new outfall and pipes connected to Aptos Creek would suffer the same dysfunction, regardless of any relocation, any increase in pipe diameter, any improvement in pipe slope, and any improvement in pipe smoothness. Efficiency gains cannot be realized for systems with zero, or negative, hydraulic conditions.

Alternatively, a gravity pipe within the Rio Flats routed to an open discharge point on the beach some distance from the creek's influence, and terminating at a low elevation near the usual surf line would be less frequently affected by conditions and flows related to the creek, thus having a better range of performance. But such pipe would still be affected by ocean swell on a regular basis; to the extent that this swell equaled the elevation of the Rio Flats. Such system, if it could survive battering in the surf-zone, would at times become hydraulically dysfunctional as well, leading to backed up drainage and flooding. Any system without hydraulic driving energy simply does not run, so building such a system anew would prove fruitless.

Gravity piping systems are feasible for some significant portions of the upper bluff drainage areas surrounding the Rio Flats, and which naturally drain into the Flats, because of the availability of increased elevation and good feasibility of interception. Prior study identified two major areas where this was potentially feasible and already incorporated one of these two feasible locations into the preferred project; this is the proposed Rio del Mar Blvd. pipe and inlet system. This inclusion for the one area has helped reduce pumping costs, allowed smaller sized pumping structures, and lengthened the available response time if pumps were to temporarily go without power. The other potential gravity pipe drainage area (upper Aptos Beach Dr.), further inland and with a much greater distance to a feasible outfall location, was determined to not be cost effective to provide at this time, and so remains a portion of the pumped watershed.

All these reasons indicate this project alternative (D) is inferior to the preferred project being proposed. The positive aspects that exist have been incorporated into the preferred project.

E) No Project

Consequences of taking no action include continuation of frequent flooding of private and public roadways, residential yards and homes and commercial businesses. This flooding causes significant monetary damages and business losses to private owners, and impedes provision of normal County services such as public transport, roads, sewage, and emergency response. Currently, damages for rainstorms below a 10-year event approach $1.5 to $2 million per significant storm. In a 10-year period multiple damaging rainfall events occur, such that cumulative losses might easily exceed $10 million, per the formally conducted grant application benefit/cost analysis.

Doing nothing allows extended time periods of ponding throughout the Flats, which increases the extents and opportunity time for pollutant sources to make contact and soak in the flood waters. Any such pollution increases are then discharged to Aptos Creek where there is either a standing water pool due to the sand-enclosed mouth, or shallow surface flow across the public beach often waded across, or played in, by beach visitors. This water quality pollution harms wildlife and humans.

Doing nothing allows extended time periods of ponding throughout the Flats, which decreases the ability to make safe transit of primary residential roads used for home access, recreational access, evacuations and emergency response.

Doing nothing allows extended time periods of ponding throughout the Flats, which increases the life-threatening hazards if overhead electrical wires fall into the standing water during strong storm conditions.

Climate Change and Sea Level Rise (RM)

Global sea levels have risen approximately 7 to 8 inches in the 90 years since the Rio Del Mar Flats development was created. Recent research indicates that the rate of sea level rise is expected to continue to increase, with varying opinions on acceleration. The amount of sea level change that has already occurred in the past 90 years has had no impact on the Rio del Mar Flats community if considered in isolation, and cumulatively it is not one of the more significant contributors of current flood problems. Rather, it is the most minor of all identified flooding aggravations, and is expected to remain minor in influence for the service life of the preferred project, even if the amount of sea-level rise were to increase multiples to that of past experience, in similar time period.

As background, the problems in the Rio Del Mar Flats have existed since its first development in the late 1920s, principally because the area was once a wetland estuary, flat and low lying with poor land slope, and was not adequately raised in elevation upon initial development, leading to limited range for the original drainage system to accommodate changes over time. The original configuration has slowly become increasingly worse due to: progressive urbanized development with consequent runoff increases; California State Park's cumulative land acquisitions and land management changes; aging infrastructure; and least significantly, minor sea level rise.

The most recent significant change to causative flood problems occurred 12 or 13 years ago, with State Park's cessation of their breaching management of the Aptos Creek channel mouth, which used to be seasonally performed by bulldozer work and shaping a sand berm along the line of riprap and wooden piles on the south side of the Aptos channel mouth. Breaching, or lack there-of, can alter elevation of the Aptos Creek water level in excess of 8 feet (see photo below); a magnitude difference from past sea level rise. The preferred project is designed to be capable of completely mitigating the suddenly large hydraulic regime change caused by the imposed breaching management cessation, and consequently the project's installations also accommodate the smaller past and future sea level rises expected to occur within the approximate 75 to 100 year service life of

the project. The cessation of breaching has been observed to now regularly back up the Aptos Creek waterline, occasionally reaching to a maximum of approximately 10 feet elevation, exceeding drainage grate inlet elevations in the neighborhood that are near 9.5 feet elevation. In one year the Aptos channel never did breach until the following season.

The preferred project's new outfall location is designed to provide gravity head (starting at up to 17.5 ft. elevation) within the connected discharge pipe, functioning with a discharge tail-water level calculated at 15.0 feet elevation, and thus would remain properly operational for rainfall discharges well beyond all intended or evolving conditions. The provided operating range exceeds the topographic conditions existing along Aptos Creek's more inland banks, as well as the top of the brick seawall (~13.5 ft. elev.) dividing the parking lot from the beach. The fact is that the new outfall structure and the rest of the project components are designed to be advantageously positioned, protected, and hydraulically isolated, and simply cannot be exposed to sea-level rise before such rise would otherwise make the neighborhood unlivable. It should be kept in mind that the proposed project is intended to provide a solution to flooding caused only by locally occurring rainfall. The project has never been intended to address flooding from upper watershed flows into Aptos Creek in excess of the 10-year carrying capacity of the channel, nor does the project attempt to fully address ocean-based storms or sea level rise that would eventually also overtop the Aptos Creek channel banks. The project does consider, and accommodates in its hydraulic functioning and layout, the past and evolving non-storm hydraulic conditions that represent the continuous background operating and management conditions.

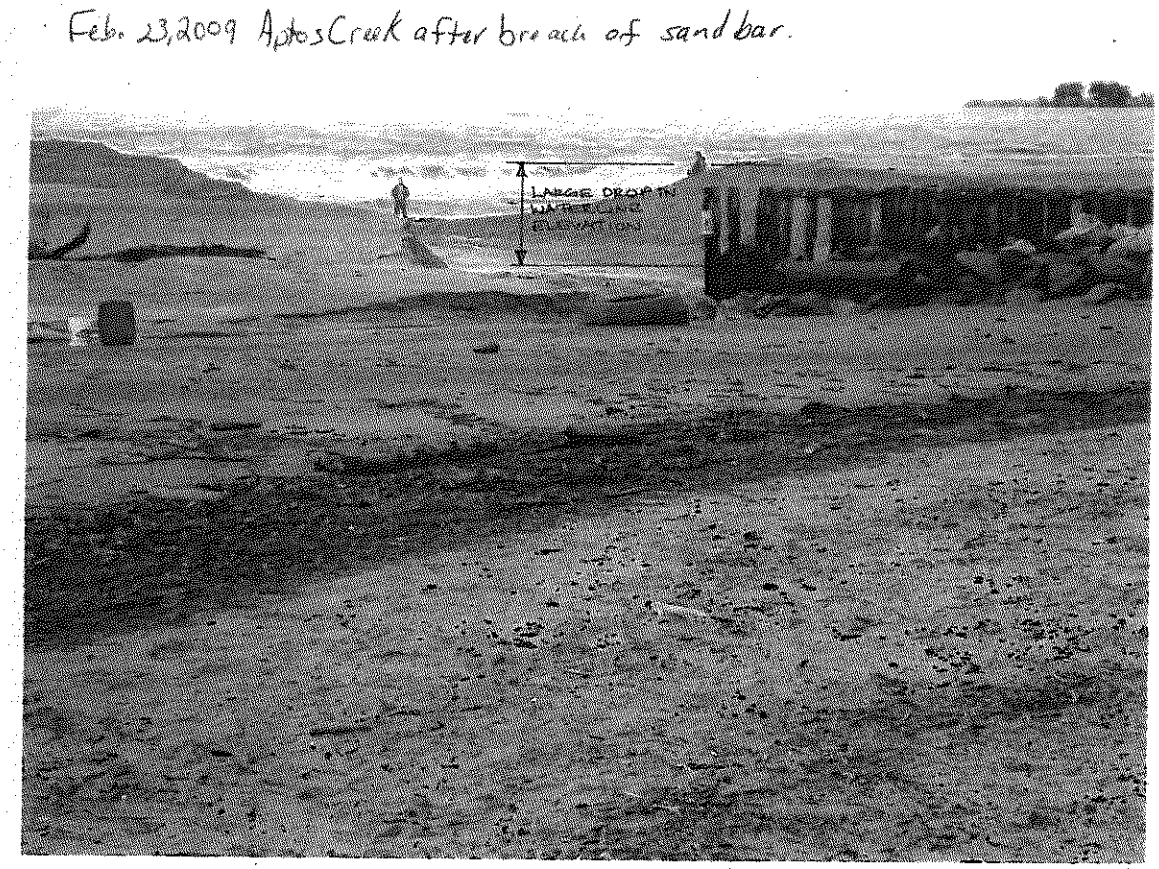


Figure 12: This photo shows the degree of elevational change that relates to sand blockage of the Aptos Creek mouth and the difference that can exist between non-breached and breached conditions. This elevation change is well in excess of 8 feet, and far exceeds past sea level changes, and reasonably anticipated future sea-level change within the preferred project's service life.

COUNTY OF SANTA CRUZ
DEPARTMENT OF PUBLIC WORKS
INTER-OFFICE CORRESPONDENCE

DATE: 5/22/2017

TO: Antonella Gentile

FROM: David W. Sims

SUBJECT: Application #171057 - Project impact to flood elevations

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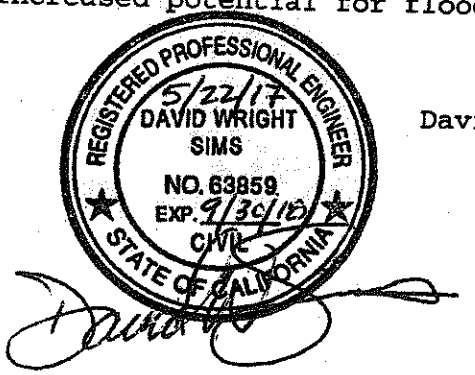
This letter is in reference to application #171057, Storm Drainage Improvements for the Rio del Mar Flats, which proposes to build a stormwater pumping station and appurtenant collection pipes, filtration vaults and discharge facilities related to the pump station, in an area of mapped FEMA flooding.

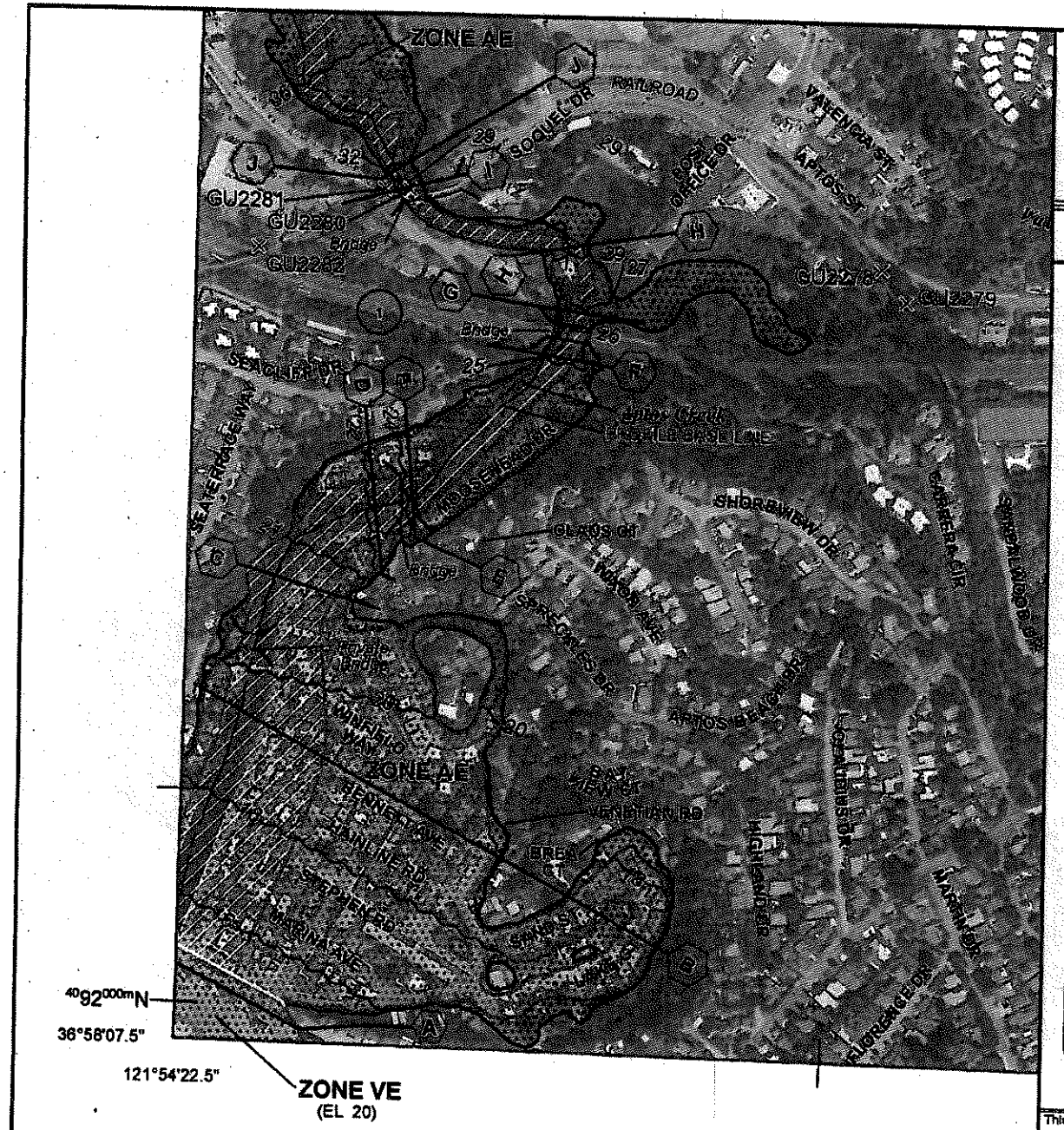
The project will be built near the mouth of Aptos Creek and the Pacific coast line, in an area mapped along the fringes of Zone AE and Zone VE on FEMA flood insurance rate map number 06087C0357E, panel 357, and last revised 5/16/2012.

The project has an estimated 930 CY of grading cut, and 5 CY of fill, with a resulting net export of 925 CY of soil off-site. The small amounts of fill soils are placed outside and above the mapped Zone AE floodplain boundary at elevations above 17.75 feet NAVD 88, as shown on FEMA map vertical datum, or the equivalent of 15.00 feet NGVD 29 as shown on project plans. Nearest the area of grading activity within Zone AE, the 1% chance flood elevation is approximately 2 feet lower than the stated fill soil elevation. Areas of cut will occur within Zone AE and below the 1% chance flood elevation, providing a very minor amount of improved storage within the floodplain.

The project, as designed, will not cause any increase to the base flood elevation of Aptos Creek, and will not redirect coastal flood waters, or result in an increased potential for flood damage to nearby structures.



David W. Sims, C.E., 63859



MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET

METER

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0357E

FIRM

FLOOD INSURANCE RATE MAP

SANTA CRUZ COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 357 OF 470

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SANTA CRUZ COUNTY	060363	0357	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06087C0357E

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency