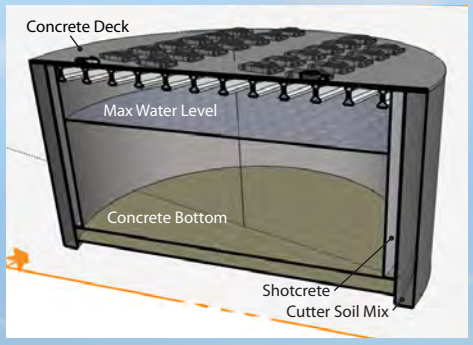
CITY OF PACIFICA

Wet Weather Equalization Basin Site Feasibility Evaluation

FINAL REPORT



Prepared By

RMC
Water and Environment

August 2015

Wet Weather Equalization Basin Site Feasibility Evaluation

Final Report

Prepared by:

RMC
Water and Environment

August 2015

Table of Contents

List of Tables

List of Figures

Attachments

List of Abbreviations

gpd	gallons per day
gpm	gallons per minute
mgd	million gallons per day
City	City of Pacifica
CSM	cutter soil mixing
HDD	horizontal directional drilling
MG	million gallons
Master Plan	City of Pacifica Collection System Master Plan (2011)
PTGAB	pilot tube guided auger boring
RWQCB	Regional Water Quality Control Board
SSO	sanitary sewer overflow

Chapter 1 Summary of Findings

This report presents the results and recommendations of a site feasibility evaluation for a wet weather equalization storage basin for the City of Pacifica (City). The report was prepared by RMC Water and Environment (RMC) under a contract amendment to the City's *Collection System Master Plan* completed in October 2011. The equalization basin is a key element of the program recommended in the *Master Plan* to eliminate storm-related sanitary sewer overflows (SSOs) in the City's wastewater collection system and reduce peak wet weather flows to the City's Calera Creek Water Recycling Plant. Based on the *Master Plan* findings, a 2.1 million gallon wet weather equalization basin located in the vicinity of the Linda Mar Pump Station was identified as the most viable alternative (in addition to other recommended sewer improvements) for meeting regulatory requirements for eliminating capacity-related SSOs.

Based on preliminary analyses, four potential sites, shown in Figure 1-1, were identified for detailed feasibility analyses. Variations in the siting of the basin on a given parcel, or in the routing of associated pipelines, resulted in six potential alternatives at these sites:

- Site 1 (formerly known as Site A): The park-and-ride parking lot near Linda Mar Blvd.
  - Site 1A on the west end of the parcel
- Site 2 (formerly known as Site B): Skate Park Parking Lot
  - Site 2A with associated pipelines parallel to Highway 1
  - Site 2B with associated pipelines that avoid Highway 1
- Site 3 (formerly known as Site C): The Crespi Parking Lot
  - Site 3A with associated pipelines parallel to Highway 1
  - Site 3B with associated pipelines that avoid Highway 1
- Site 4 (formerly known as Site D): The Linda Mar Pump Station parking lot.

Figure 1-1: Evaluated Site Locations Overview

Source: City of Pacifica

The matrix shown below in Table 1-1 quantifies how well each site meets the evaluation criteria used in the analysis and comparison of alternatives. (The evaluation criteria are described below and in Section 6 of this report.)

Table 1-1: Site Scoring Matrix

			Site Alternatives					
Criteria	**Weighting Factor**	**Relative Importance**	**1A**	**2A**	**2B**	**3A**	**3B**	**4**
Long-term Impact to Residents and Local Amenities	4	12%	-1	0	0	1	1	1
Construction Impact to Residents and Local Amenities	4	12%	1	-1	-1	0	-1	0
Willing Landowner	4	12%	1	2	2	1	1	2
Vulnerability to Sea Level Rise and Flooding	4	12%	0	0	0	1	2	-2
Cost	4	12%	2	1	1	0	-1	-1
Schedule*	4	12%	1	0	1	0	1	-2
Compatibility with Existing and Planned Landuse	1	3%	-1	1	1	1	1	2
Impact on City Revenue	2	6%	-1	0	0	1	1	0
Permitting	3	9%	1	-2	1	-2	0	-2
Exposure to Salt and Sand Impacts	1	3%	2	2	2	1	1	-1
Geotechnical Considerations	2	6%	2	2	2	2	2	1
Sum of Weighting Factors	*33*	100%						
Constructible			Yes	Yes	Yes	Yes	Yes	Yes
Score			22	9	22	14	20	-11
Tier			1	2	1	2	1	2

* Schedule ratings based on input provided by City staff and included in Attachment D.

As can be seen in Table 1-1, the following alternatives are top ranked and should be considered the best alternatives from which the City Council can make a final recommendation:

- **Site Alternative 1A (Linda Mar Blvd. Park & Ride Lot)** – This alternative would have the minimum amount of associated pipeline work and would avoid Caltrans and Coastal Commission permitting requirements. Because the site is owned by Caltrans, it would involve purchasing the western end of the parcel; they are willing to subdivide the parcel and sell only this portion. The schedule and timeline for acquisition is considered to be on the order of 18 months at this time. This site is located next to an existing gas station that does not have double containment for its storage tanks. Based on environmental borings and analysis, Site 1A appears to have very low levels of hydrocarbon contamination in the groundwater that would be expected due to the proximity to the gas station. There are also concentrations of metals found in the groundwater sample that are above environmental screening levels. The groundwater would need to be treated to address the fuel contamination and metal concentrations prior to discharge. The soil samples indicate that the hydrocarbon and metals concentrations are below the total threshold concentration limit and can therefore be disposed of at a local Class 3 landfill. The equalization basin would be approximately 81 feet in inner diameter, 70 feet deep and would be within 20 feet of neighboring residential property lines.

  Estimated capital cost: $13.0 million.

- **Site Alternative 2B (Skate Park Parking Lot)** – This site is owned by the City and therefore would not require land purchase. Associated pipelines would be constructed through residential streets, but would avoid paralleling Highway 1. Caltrans and Coastal Commission permitting would not be needed for this alternative. It is assumed that the same groundwater treatment

needed for Site Alternative 1A would be needed for Site Alternative 2B. The equalization basin would be approximately 95 feet in inner diameter, 55 feet deep and would be within 45 feet of neighboring residential property lines. This site alternative has the lowest schedule risk because it avoids the need to purchase the parcel, and avoids the need for Caltrans and Coastal Commission permitting.

Estimated capital cost: $15.4 million.

- **Site Alternative 3B (Crespi Parking Lot)** – This site would be furthest from neighboring residential property lines (approximately 350 to 400 feet), and therefore may raise less concerns with local residents. This site is owned by Caltrans and would require land purchase from Caltrans. Because of its close proximity to Highway 1, Coastal Commission permitting would probably be required. Although the expected permit requirements would be readily met by the envisioned basin, obtaining this permit could add 6 to 12 months to the project schedule. This alternative would route associated pipelines through residential streets, which would therefore avoid Highway 1 and the need for Caltrans permitting. It is assumed that the same groundwater treatment needed for Site Alternative 1A would be needed for Site Alternative 3B. The equalization basin would be approximately 100 feet in inner diameter and 51 feet deep and would be 350 to 400 feet to the nearest residential property line.

  Estimated capital cost: $18.3 million.

The other site alternatives scored lower than the above alternatives due to need for Coastal Commission permitting of the basin or influent pipeline, Caltrans permitting of pipelines parallel to, and crossing, Highway 1, vulnerability to flooding and sea level rise, or an estimated project schedule that does not meet the required regulatory timeframe.

In assessing the various alternatives, the following criteria were found to be the most important and therefore were given the heaviest weightings in Table 1-1 Site Scoring Matrix:

- Long-term Impact to Residents and Local Amenities – This criterion focuses on the potential impacts, or perception of those impacts, to those residents, businesses, and facilities that are located near the site. Odor and noise nuisances near the basin should be minimal, in light of the design provisions (odor control, quiet submersible pumps, etc.), however, maximized separation of the facilities from neighboring land uses will lessen these concerns.

- Construction Impact to Residents and Local Amenities - All of the evaluated sites are within parking lots of amenities that are used by various sectors of the public. This criterion considers the inconvenience to citizens whose use of those amenities would be impacted by construction and loss of parking during construction. Also, although the construction methods considered in this report would not structurally impact nearby residences, there remains a risk that unsubstantiated claims could be made at sites that are in close proximity to structures and amenities.

- Willing Landowner – It is preferable to locate the basin on a parcel either owned by the City or with a landowner willing to sell. Without a landowner willing to sell the basin parcel to the City, the difficulty of obtaining the parcel could be a fatal flaw of the site.

- Vulnerability to Sea Level Rise and Flooding – Sea level is anticipated to increase on the order of two feet over the lifetime of the equalization basin. Protecting the capital investment made in the basin is a primary concern. Site 4 (at Linda Mar Pump Station) is the only site of the four located on the ocean-side of Highway 1. It is assumed that inland locations would provide more protection from sea level rise and erosion than would be afforded by a site closer to the ocean. For this reason, sites east of Highway 1 are preferred.

  The City also prefers to have use of the facility during flood events to help reduce the potential for sewer surcharging and contamination. Sites that are less prone to flooding or could accommodate a design to remove the basin from a floodplain are preferable to those sites that are more likely to flood.

- Cost – The equalization basin and associated facilities are significant capital investments for the City. Therefore, lower cost alternatives are preferred, assuming benefits, impacts and risks are equal among the alternatives.

- Schedule – The Regional Water Quality Control Board (RWQCB) has imposed a Cease and Desist Order with a deadline of December 31, 2018 to implement measures to eliminate capacity related SSOs. Site alternatives where construction is scheduled to finish ahead of that deadline are considered to be more viable than site alternatives that would not meet the deadline.

- Permitting – Alternatives that require Caltrans and/or Coastal Commission permitting would result in longer project schedules. The probable permit requirements could be readily met by the envisioned basin, but the time and effort to obtain these permits could add 6 to 12 months to the project schedule.

Other criteria used in the analyses included compatibility with existing and planned land use, impact on City revenue, exposure to salt and sand impacts, and geotechnical considerations.

All of the alternatives are constructible and were developed with the guidance of geotechnical and structural engineers, as well as civil and hydraulic engineers. Three geotechnical borings were drilled on, or in the vicinity of the sites, two to a depth of approximately 75 feet and one to a depth of approximately 100 feet. These borings provide an indication of soil characteristics and stratigraphy that would be encountered during construction and which would have to be accommodated in design. The target depths for the borings were based on the approximate basin depths and assumed basin diameters at the given sites. The results of these borings indicate that soil conditions should be able to support the proposed basins at the sites listed above.

A summary comparison of the site alternatives discussed above are presented in Table 1-2 Site Evaluation Summary.

Table 1-2: Site Evaluation Summary

Item	Site 1A	Site 2A	Site 2B	Site 3A	Site 3B	Site 4
Location	Linda Mar Blvd. Park and Ride Lot – West end of parcel	Skate Park Parking Lot with pipelines crossing and parallel to Hwy 1	Skate Park Parking Lot with pipeline alignments that avoid Hwy 1	Crespi Parking Lot with pipelines crossing and parallel to Hwy 1	Crespi Parking Lot with Alternate Pipeline Alignment	Linda Mar Pump Station Parking Lot
Principal Advantage(s)	• Inland of Highway 1 so basin is protected from sea level rise and outside of the Coastal Commission review zone. • Relatively far from the shoreline so facilities are less exposed to ocean impacts such as salt and sand. • Relatively close to the diversion point and very close to the discharge point, reducing pipeline installation cost and impacts. • New pipelines would not need to cross Highway 1. • Least impact to existing use of all of the sites during construction due to total area available for parking and bus operation	• Inland of Highway 1 so basin is protected from sea level rise and outside of the Coastal Commission review zone. • Relatively far from the shoreline so facilities are less exposed to ocean impacts such as salt and sand.	• Inland of Highway 1, so basin is protected from sea level rise and outside of the Coastal Commission review zone. • Relatively far from the shoreline so facilities are less exposed to ocean impacts such as salt and sand. • Relatively far from privately owned structures and residences reducing the chance of negative perception and claims. • New pipelines would not need to cross Highway 1.	• Inland of Highway 1, so basin is protected from sea level rise and outside of the Coastal Commission review zone. • Relatively far from the shoreline so facilities are less exposed to ocean impacts such as salt and sand. • Relatively far from privately owned structures and residences reducing the chance of negative perception and claims. • Potentially improved revenue generation due to avoided lease cost.	• Inland of Highway 1 so basin is protected from sea level rise and outside of the Coastal Commission review zone. • Relatively far from the shoreline so facilities are less exposed to ocean impacts such as salt and sand. • Relatively far from privately owned structures and residences reducing the chance of negative perception and claims. • Potentially improved revenue generation due to avoided lease cost. • New pipelines would not need to cross Highway 1.	• Locates basin on same site as Linda Mar Pump Station. • Relatively far from privately owned structures and residences reducing the chance of negative perception and claims. • Relatively close to diversion point, reducing pipeline installation costs and impacts.
Principal Disadvantage(s)	• Smaller site which may increase cost due to inconvenience to contractor. • Close to privately owned structures and residences increasing the chance of negative perception and claims. • General plan designation as mixed use and potential loss of revenue due to limited future site use.	• Smaller site which may increase cost due to inconvenience to contractor. • Close to privately owned structures and residences increasing the chance of negative perception and claims. • Relatively far from the diversion point, increasing pipeline installation costs and impacts. • Loss of free Community Center parking during construction.	• Smaller site which may increase cost due to inconvenience to contractor. • Relatively far from the diversion point, increasing pipeline installation costs and impacts. • Loss of free Community Center parking during construction.	• Relatively far from the diversion point, increasing pipeline installation costs and impacts. • Most impact to existing use of all of the sites during construction because of the multiple amenities that are associated with this parking lot and the relatively high usage.	• Relatively far from the diversion point, increasing pipeline installation costs and impacts. • Most impact to existing use of all of the sites during construction because of the multiple amenities that are associated with this parking lot and the relatively high usage.	• West of Highway 1, exposing basin to the effects of sea level rise and putting the basin within the Coastal Commission review zone. Sea level rise and coastal erosion could lead to early replacement of basin. • Flood protection for this site may introduce additional project scrutiny from the Coastal Commission. • Closest site to shoreline so facilities are the most exposed to ocean impacts such as salt and sand.
Site Ownership	Caltrans	City	City	Caltrans	Caltrans	City
Owner Willing to Sell?	• Willing to subdivide parcel and sell west end to City.	• Not applicable as this property is City-owned.	• Not applicable as this property is City-owned.	• Yes, conditional on determination of stewardship of gifts and historic markers.	• Yes, conditional on determination of stewardship of gifts and historic markers.	• Not applicable as this property is City-owned.
Permitting	• Avoids Caltrans and Coastal Commission permitting	• Permit from Caltrans required for Highway 1 crossing. • Coordination and possible permit from the Coastal Commission for diversion pipeline.	• Avoids Caltrans and Coastal Commission permitting	• Permit from Caltrans required for Highway 1 crossing. • Coordination and possible permit from the Coastal Commission for diversion pipeline and due to visibility of site from Highway 1.	• Could require Coastal Commission permitting because site is readily visible from Highway 1.	• Basin would require review and likely permitting from the Coastal Commission for basin, pipelines, and associated facilities.

Item	Site 1A	Site 2A	Site 2B	Site 3A	Site 3B	Site 4
Construction Completion Date[a]	• Construction estimated to be complete on 6/30/2018 • 6 months prior to regulatory requirement	• Construction estimated to be complete on 12/31/2018 • 0 months prior to regulatory requirement	• Construction estimated to be complete on 6/30/2018 • 6 months prior to regulatory requirement	• Construction estimated to be complete on 12/31/2018 • 0 months prior to regulatory requirement	• Construction estimated to be complete on 6/30/2018 • 6 months prior to regulatory requirement	• Construction estimated to be complete on 6/30/2019 • 6 months after regulatory requirement
Other Considerations	• This site is relatively close to existing and past gas stations, increasing the risk for soil contamination. • This site has a joint use as a bus station that may need to be relocated during construction based on final siting. • Unknown timeframe for acquisition.	• This site would require construction under and next to a natural area. This could lead to additional environmental precautions. • Basin requires more than one day to empty due to current sewer capacity restrictions.	• This site would require construction next to a natural area. This could lead to additional environmental precautions. • Basin requires more than one day to empty due to current sewer capacity restrictions.	• This site would require construction next to a natural area. This could lead to additional environmental precautions. • Basin requires more than one day to empty due to current sewer capacity restrictions. • Unknown timeframe for acquisition.	• This site would require construction next to a natural area. This could lead to additional environmental precautions. • Basin requires more than one day to empty due to current sewer capacity restrictions. • Unknown timeframe for acquisition.	• This site may require additional geotechnical work to prepare the ground for construction. • Basin requires more than one day to empty due to current sewer capacity restrictions.
Basin Dimensions (internal)	81 ft diam x 70 ft depth	95 ft diam x 55 ft depth	95 ft diam x 55 ft depth	100 ft diam x 52 ft depth	100 ft diam x 51 ft depth	100 ft diam x 51 ft depth
Basin Cost	$3.4M	$3.7M	$3.7M	$3.8M	$3.8M	$3.8M
Associated Improvements Cost	$2.1M	$4.0M	$4.0M	$4.0M	$4.2M	$2.0M
Professional Services and Contractor Costs	$2.9M	$4.0M	$4.0M	$4.0M	$4.1M	$3.1M
Contingency	$2.1M	$2.9M	$2.9M	$3.0M	$3.0M	$2.2M
Land and Replacement Costs	$1.8M	$0	$0	$2.2M	$2.2M	$6.0M[b]
Estimated Total Project Cost, in 2013$[c, d]	**$12.3M**	**$14.5M**	**$14.6M**	**$16.9M**	**$17.3M**	**$17.1M**
Estimated Total Project Cost in 2016$[e]	**$13.0M**	**$15.3M**	**$15.4M**	**$17.9M**	**$18.3M**	**$18.1M**

Footnotes:

[a] See Attachment D for additional detail regarding project schedule input provided by City Staff.

[b] Cost reflects estimated abandonment and replacement cost due to sea level rise at this location.

[c] Estimated total project cost may not reflect sum of above components due to rounding errors.

[d] Costs reflect the same unit costs as originally estimated in 2013 for previous draft versions of this report.

[e] Costs in 2016 $ reflect inflation escalation to a presumed mid-point of construction of June 2016

Chapter 2 Introduction

The City of Pacifica prepared a *Collection System Master Plan* (RMC, October 2011) that described the development and use of a hydraulic model of the City's wastewater collection system to evaluate system capacity and identify deficiencies. The Master Plan also included evaluation of multiple alternatives to provide the capacity improvements needed. The Capital Improvement Plan associated with the City's preferred capacity assurance alternative included the following elements:

- Twelve sewer improvement projects totaling approximately 11,000 feet of new or upsized sewer pipelines;
- Increase in capacity of Linda Mar Pump Station by addition of a fourth pump; and
- Wet weather equalization basin.

The wet weather equalization basin would reduce the impacts of collection system inflow and infiltration on the Linda Mar Pump Station and force main, as well as at the Calera Creek Water Recycling Plant, preventing the need for extensive collection system rehabilitation or a more significant retrofit at or replacement of the pump station and force main and potential need to increase the peak hydraulic capacity of the plant. Based on the 10-year design storm established in the *Master Plan*, the basin capacity should be approximately 2.1 million gallons. In addition to the basin, supporting facilities and appurtenances include a gravity diversion pipeline to the basin, a pump station and force main from the tank back to the existing collection system, power generator, odor control, and basin wash down equipment.

The *Master Plan* identifies a location on Linda Mar Blvd. as the potential location for the proposed equalization basin. Rather than move immediately to design based on the *Master Plan*, the City chose to perform this evaluation in order to:

- Identify additional sites beyond the *Master Plan* site;
- Identify sites for consideration as the basis of design;
- Refine the cost estimate for the preferred basin; and
- Provide an increased level of confidence that construction of the basin at the preferred site is feasible.

This report summarizes the analysis performed to achieve the above goals and the results of that analysis. Additionally, this report provides a recommendation for potential preferred sites based on the information available at this time. Work performed for this report includes identification of alternative sites, a screening of those sites for further analysis, review of existing and development of new geotechnical information, analysis of hydraulic parameters, identification of feasible construction methods, development and application of evaluation criteria, and estimation of project costs. Selection of a single preferred site to move forward into the design will be decided by the City Council.

After introducing the sites to be evaluated, this report describes the recommended construction methods and project elements that should be included in the design. Based on those elements and methods, each site is evaluated with respect to several criteria. The results of those evaluations are then compiled to recommend sites for consideration for further evaluation and design.

Chapter 3 Potential Sites

The City and RMC identified the following nine potential site alternatives for the equalization basin:

- Site 1A: West End of Linda Mar Park-and-Ride
- Site 1B: East End of Linda Mar Park-and-Ride
- Site 2A: Skate Park Parking Lot (with pipelines that cross and parallel Highway 1)
- Site 2B: Skate Park Parking Lot (with pipelines that avoid Highway 1)
- Site 3A: Crespi Parking Lot (with pipelines that cross and parallel Highway 1)
- Site 3B: Crespi Parking Lot with (pipelines that avoid Highway 1)
- Site 3C: Crespi Parking Lot Open Space
- Site 4: Linda Mar Pump Station
- Site 5: Linda Mar Beach Parking Lot

These site alternatives were selected based on their public ownership (owned either by the City or Caltrans), proximity to the Linda Mar Pump Station, and their size being large enough to accommodate the basin. Figure 3-1 shows the locations of the basin sites associated with these nine site alternatives. Please note that during the course of this evaluation the sites were renamed as shown in Table 3-1 below. The body of this report uses the new site names whereas the attachments may use the earlier site names.

Table 3-1: Site Name Updates

New Site Name	Prior Site Name
Site 1	Site A
Site 2	Site B
Site 3	Site C
Site 4	Site D

A high level review of these nine site alternatives reveals that there are no readily apparent characteristics that would indicate a fatal flaw for the sites, with the exception of Site 1B. While this report was being written, Caltrans, the owner of this parcel, indicated that they were no longer willing to sell the eastern end of the parcel. In light of this recent development, Site 1B is no longer considered feasible and the analysis of this site is not presented in this report. Caltrans is willing to split the parcel and sell the western end; therefore Site 1A is considered viable and is discussed in this report.

To help differentiate the sites and to select a subset for further analysis, two non-physical characteristics, i.e. property ownership and Coastal Commission permitting, were identified as primary selection characteristics. Should Caltrans be unwilling to sell the property, or the Coastal Commission raise significant objections/conditions, the site could be fatally flawed.

As shown in Table 3-2, six of the original nine site alternatives were shortlisted for further analysis. Further discussions with Caltrans and the Coastal Commission regarding the sites are summarized and evaluated in Chapters 5 and 6.

Figure 3-1: Potential Site Location Overview

Source: City of Pacifica

Table 3-2: Preliminary Site Analysis Recommendations

Site Alternatives	Site Owner	Basin Within Coastal Commission Zone	Pipelines within Coastal Commission Zone	Shortlist for Further Analysis?
1A	Caltrans	No	No	Yes, Caltrans willing to sell western end of parcel
1B	Caltrans	No	No	No, Caltrans not willing to sell eastern end of parcel
2A	City	No	Yes	Yes
2B	City	No	No	Yes
3A	Caltrans	Probably yes, because readily visible from Highway 1	Yes	Yes
3B	Caltrans	Probably yes, because readily visible from Highway 1	No	Yes
3C	Caltrans	Probably, yes because readily visible from Highway 1 and would probably require extensive mitigation measures due to environmental concerns	Yes	No (Has no advantage over Site 3A and in a potentially sensitive environmental area)
4	City	Yes	Yes	Yes
5	City	Yes	Yes	No (Has no advantage over Site 4 and further from the Linda Mar Pump Station)

The six shortlisted site alternatives provide a selection of City and Caltrans properties within, and outside of, the Coastal Commission area of jurisdiction.

Chapter 4 Construction Methods

The following recommendations for construction methods reflect consideration of the proposed basin shapes, subsurface conditions, and construction feasibility. Subsurface conditions, including the results of several borings, are summarized in Attachment B and Attachment C (note that these attachments utilize an outdated naming convention for the basin sites). Details regarding basin size, pipeline sizes and lengths, and return pumping capacity are presented in Chapter 5. The construction methods and project elements described in this chapter apply to all sites.

4.1 Equalization Basin

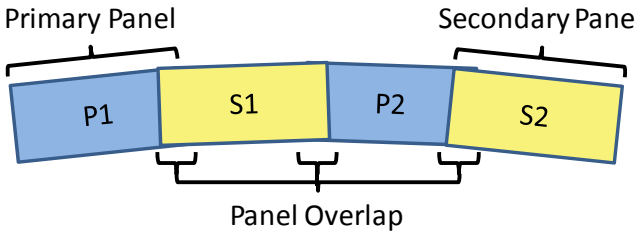
The primary construction method for the equalization basin recommended for all four of the sites is called the cutter soil mixing (CSM) method. This method of construction is advantageous for deep excavations in poor soils and in close proximity to other structures.

CSM involves creating a series of vertical interlocking, waterproof panels for the walls of the basin that do not require formwork or abandonment of non-structural elements, such as sheet piles. It provides a higher level of confidence in placement of the panels than other shaft or basin construction methods. This reduces risk of structural defects (and corresponding loss of hoop compression strength) or loss of seal between panels. Should the cutter start to drift as it is lowered, an operator can readjust the location and direction of the equipment. Given the volume of storage and structural depth needed for this project (on the order of 60-100 feet), the resultant basin structure needs to be circular in shape so that the walls can be designed as compression hoops.

CSM equipment consists of a dual-wheel cutting head attached to a Kelly bar drilling rig for placement and transportation. Figure 4-1 shows an example of cutting head and rig (photo from the equipment manufacturer Bauer). Water, and sometimes bentonite, is added as the cutting head is lowered into the ground to keep the soil fluidized. After reaching the design panel depth, cement grout is pumped to the cutting head and mixed with the soil as the equipment is removed. Panels are dug in alternating spaces, as shown in Figure 4-2. This creates a slurry-type wall which, when interlocked with adjoining panels, hardens to create a solid wall.

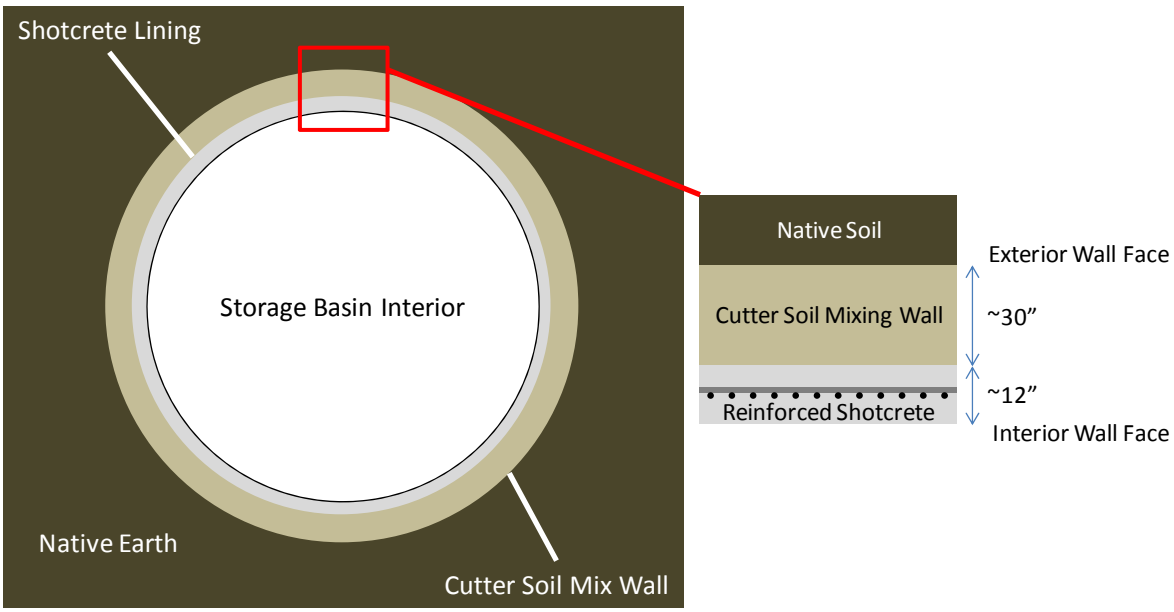
Figure 4-1: Cutter Soil Mixing Equipment

Figure 4-2: Plan View Excerpt of Cutter Soil Mixing Wall Panels



After completion of the circular basin wall, general excavation within the basin begins. After excavating the basin by approximately six to eight feet, welded steel rebar is dowelled into the slurry panels. Shotcrete is applied as the structural component of the basin and to create the interior of the basin wall. The shotcrete can be finished like normal concrete to create a smooth surface to facilitate washdown. Figure 4-3 shows the basin wall elements described in this section. After completion of the shotcrete wall and installation of hangers and anchors for other appurtenances, such as a walkway, valve and piping, or blowers, the excavation continues in stages of six to eight feet until the full depth of the basin is reached.

Figure 4-3: Plan View Section of Basin Wall Primary Components

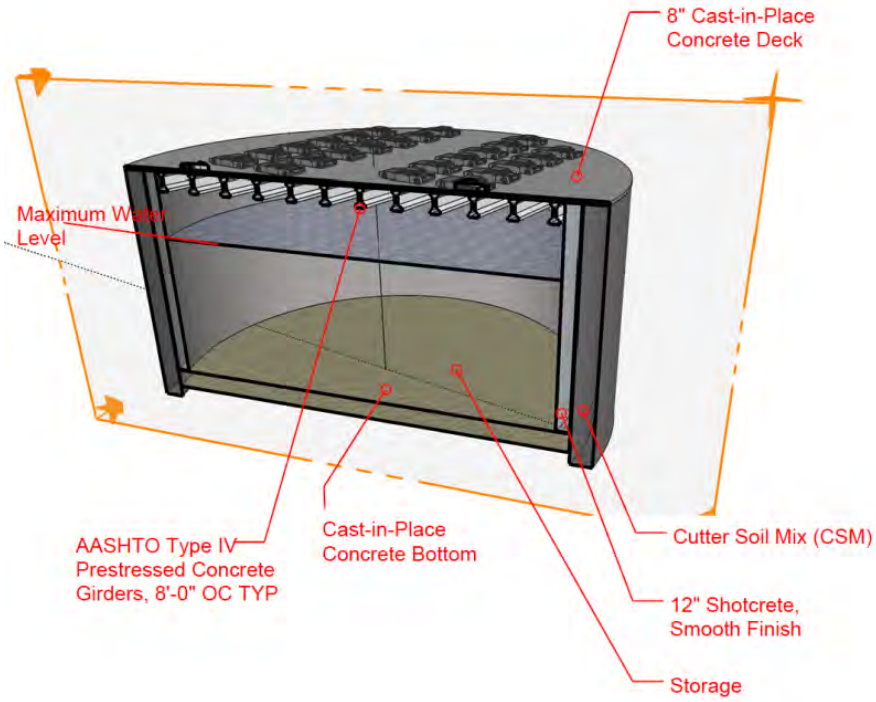


At the bottom of the basin, a concrete plug is poured monolithically to create the basin bottom and to create a counterweight to the hydrostatic uplift force that the basin will encounter. The concrete plug is held in place by keying it into the bottom of the shotcrete wall.

The land use at each of the four locations under consideration in this study is a parking lot. After the basin sides and bottom are compete, the existing parking lot can be restored by pouring a concrete deck over girders sized to support the existing and planned future traffic loads. Should other future uses be defined at the time of design, it would be possible to design the deck and girders to support higher loads.

Figure 4-4 consists of a graphic with the described basin elements.

Figure 4-4: Basin Section Showing Primary Elements



Secant pile construction was considered initially but is not recommended for basin construction. Secant piles are similar to the CSM panels except they are drilled, overlapping columns, usually with a steel rebar cage in every second pile. These are not recommended due to the higher risk of the piles being out of alignment at depth. Misaligned piles could create issues with:

- Maintaining the cylindrical shape critical for beneficial compression. Since the piles are the structural element in secant pile construction, misalignment rapidly reduces the benefits of the circular construction. The proposed method relies on the interior shotcrete as the structural element of the basin, allowing better control in maintaining the roundness of the basin.

- Creating a waterproof barrier. Water seepage between misaligned piles could be an issue, particularly at the bottom of the basin where the hydrostatic pressure is anticipated to be the greatest and the separation of the columns would be the most exaggerated. As described above, CSM allows greater control in placement and alignment of the panels.

4.2 Pipelines

Two pipelines will need to be installed for operation of the equalization basin, regardless of location, namely a gravity influent pipeline and a force main effluent pipeline. Subsurface conditions and groundwater level, particularly when the pipeline is close to the ocean, can drive selection of an installation method. Material choice for the pipelines is influenced by construction method, anticipated settling, pipe performance requirements, and cost.

The gravity flow influent line will be relatively deep since, for most alternatives, it diverts flow from the existing gravity collection system just upstream of the Linda Mar Pump Station, the hydraulic low point of the local system. In the case of Site Alternatives 1A, 2B, and 3B, the diversion can occur further upstream in the collection system.

Additional geotechnical and utility information will be developed in future phases of the project. This more detailed information will allow optimization of the pipeline installation methods, alignments, and costs. Based on currently available geotechnical information, it appears that the pipeline will start very close to the groundwater surface and layers of cohesionless sand. As the pipeline extends further away from the diversion point it will likely drop below the groundwater table and into cohesionless sand. Below is a brief summary of the various methods that were considered for these conditions.

- **Open Cut Installation**. It appears that this installation method would require significant dewatering and/or installation of sheet piles along both sides of the trench to prevent the trench from filling with water and collapsing on itself. This method is not anticipated to be used except for a short distance near the flow diversion points for Site Alternative 2A or Site Alternative 3A due to the depth of the pipelines and proximity to the ocean. This method is anticipated to be used at Site Alternative 1A, Site Alternative 2B, and Site Alternative 3B where the pipelines are relatively shallow and the pipeline alignments are further inland. This method is also anticipated to be used at Site Alternative 4, where the basin is located close enough to the pump station to make open cut work more cost efficient than tunneling methods. Selection of this installation method during the design phase will require confirmation of depth to groundwater and confirmation of soil conditions along the finalized pipeline plan and profile.

- **Pilot Tube Guided Auger Boring**. Pilot tube guided auger boring (PTGAB) relies on sight lines to confirm the line and grade of pipe segments between jacking and receiving pits. Since pipelines installed using PTGAB can have grades comparable to those installed by open cut methods, the pipes can be installed at a relatively flat grade compared to horizontal directional drilling. This method is has been applied on other projects where the hydrostatic groundwater levels are less than ten feet above the pipe. PTGAB is the basis of the pipe installation cost estimate elements for Site Alternatives 2A and 3Aof this study, but additional study during the design phase of the project will be necessary to confirm the applicability of this method.

- **Microtunneling**. Microtunneling is a trenchless method that is technically feasible based on the known geotechnical information. However, it is more expensive than other alternatives while having a similar minimal surface impact as PTGAB.

- **Horizontal Directional Drilling**. Horizontal directional drilling (HDD) has the smallest surface footprint compared to other pipeline installation alternatives described in this section since jacking and receiving pits are not needed. It is also relatively inexpensive for normal applications of the installation method. Gravity pipelines to basins are not the typical application of HDD however. Due to the need for steeper gradients on gravity lines (based on the methods guidance system), HDD would lead to deeper borings than other methods. Should it ever be necessary to expose the pipeline for maintenance or inspection, the deeper pipeline would make the excavation very expensive. The steep gradient and long distances (leading to large hydraulic head) also may lead to special construction requirements to control the bentonite used to lubricate the equipment and stabilize the boring. These and some other considerations, such as construction staging for pipeline lay length and bend radius, make other pipeline installation methods more attractive in this application than HDD.

The force main effluent pipeline will be shallower than the gravity pipeline. It is therefore assumed that an open cut method of installation would be feasible for the force main. The force main alignments shown in Chapter 5 do not cross Highway 1, which would have likely required a trenchless method.

4.3 Other Project Elements

Other project elements, as described below, will be constructed in, around, or near to the basin or pipelines.

- **Pumps**. It is assumed that the equalization basin will be emptied using submersible pumps. The pump will be located in a sump at the lowest point in the basin floor. Discharge piping, power cables, and instrumentation wiring will be mounted vertically to the side of the wall. A second pump will also be included for backup capacity. Pumps can be removed by portable hoist from the basin via a hatch at ground level.

- **Electrical Controls and Instrumentation**. Electrical controls will be located in a small building at ground level near the basin. Monitoring equipment, such as gas monitors, water level indicators, pump status, flow monitors, etc. will be located as appropriate. The data collection and logic center will also be located in the small structure. Operation of the basin system would occur within this structure.

- **Odor Control** – Odor control can be achieved through either a soil bed filter or a carbon scrubber. The soil bed filter consists of a perforated pipe network below a bed of organic material, often wood or bark chips. The carbon scrubber consists of an engineered system using cartridges of granular activated carbon or some other media. For purposes of this report, it is assumed that the soil bed filter will be used, primarily because it is more conservative from a project footprint perspective. For the volume associated with the empty basin, approximately 2,025 square feet (e.g. 45 feet x 45 feet) of bed surface area are required, whereas the carbon scrubber system is much more compact. (The selection of soil bed filter vs. carbon scrubber would be made in final design.)

- **Washdown System**. Tipping troughs are recommended for washdown of the basin walls and floor. The water dumped from the troughs will sluice waste into the sump. The troughs, tipping motors and actuators, and the water system to fill the troughs will be mounted on the walls of the basin.

- **Ventilation**. Build-up of explosive and corrosive gasses will need to be avoided. Also, ventilation will be required to allow maintenance and operations staff to access the basin interior. To achieve both of these objectives, ventilation will be provided by a fan with a duct to the bottom of the basin and an exhaust fan pulling air out of the basin and into the odor control system. The ventilation equipment will be mounted on the walls with access provided by a walkway. The mechanical equipment can be removed by portable hoist from the basin via a hatch at ground level.

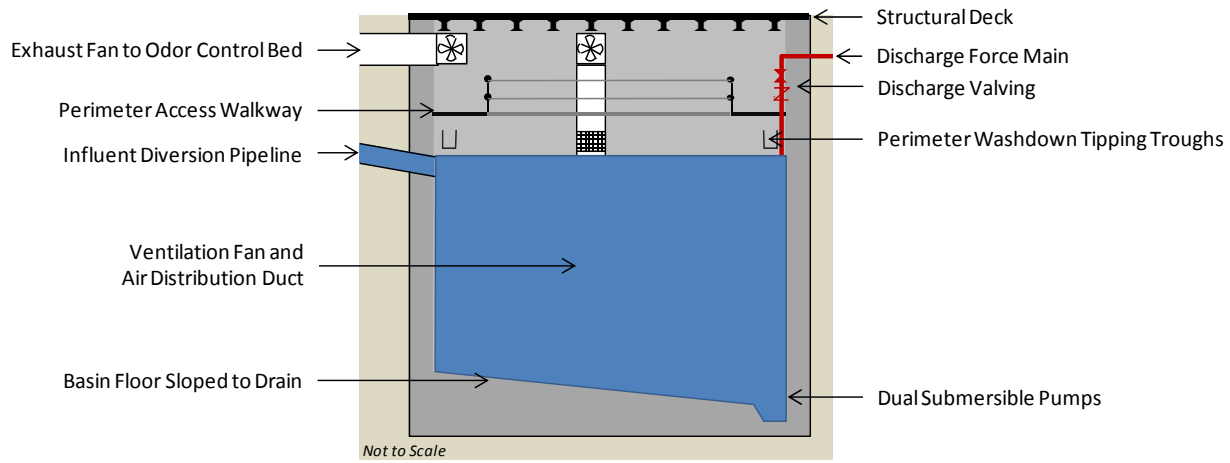
- **Valves and Piping**. Valves and piping will be located on the walls of the basin and accessible from the walkway wherever possible.

- **Walkway**. The walkway will be supported on the walls of the basin and designed to provide maintenance access to equipment and for visual inspection.

- **Diversion Manhole**. Diversion to the equalization basin will occur passively due to rising water surfaces as the existing collection system approaches its capacity. For this diversion to occur, a new manhole will be constructed at each diversion point that includes a weir overflow to the diversion pipeline.

Figure 4-5 shows schematically the interior features of the basin described above. A schematic of features exterior to the equalization basin is shown in Figure 5-1.

Figure 4-5: Interior Basin Components



4.4 Schedule

A precise schedule for construction will be developed during the design phase of the project, but it is expected that overall construction will take approximately sixteen months. Figure 4-6 shows an example of the construction sequencing that could be used.

Figure 4-6: Example Construction Sequence

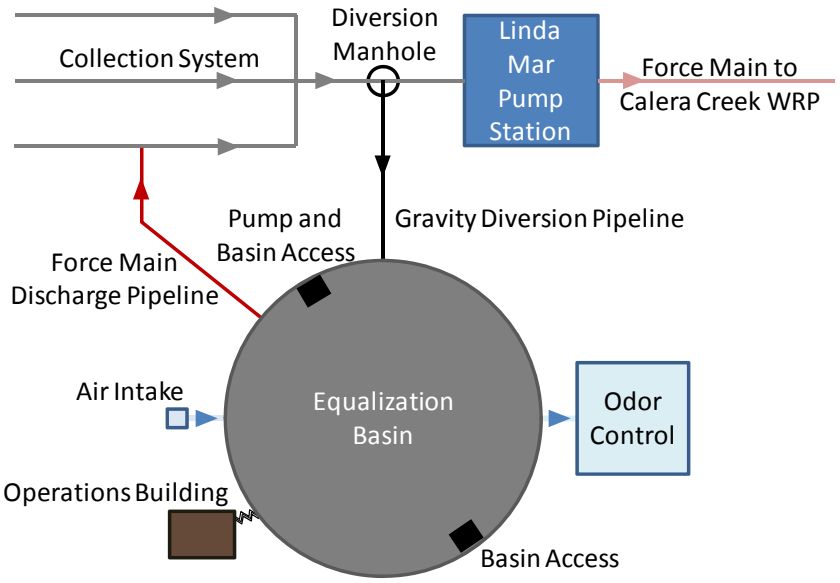
	Month															
Construction Element	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mobilization & Site Prep																
Cutter Soil Mix Wall																
Excavation, Rebar, and Shotcrete Placement																
Concrete Base																
Concrete Deck and Girders																
Diversion Pipeline																
Discharge Pipeline																
Electrical and Instrumentation																
Mechanical																
Testing and Startup																

Chapter 5 Site Alternative Analysis

Site Alternatives 1A, 2A, 2B, 3A, 3B, and 4 are evaluated in this chapter. All of these alternatives have the same hydraulic schematic, which is shown in Figure 5-1. As shown in that figure the hydraulic elements include:

- The diversion from the existing collection system upstream of the Linda Mar Pump Station;
- A gravity diversion pipeline between the diversion point and the equalization basin;
- An equalization basin site with the components exterior to the basin that were described in Chapter 4; and
- A force main leading back to an existing gravity sewer.

Figure 5-1: Schematic of Typical Equalization Basin Site and Pipelines



For each site, the following information is presented in the following sections:

- **Site Introduction** – This section includes a description of the basin location, pipeline alignments, estimated schedule for construction completion, and some site specific details such as relative location to the coastline and dimensions.
- **Size and Suitability** – This section includes discussion regarding the size of the site and its existing and planned land use. As shown in Figure 5-2, the basin depth is parabolically related to the diameter of the basin. It is preferable to find a balance between width and depth so as to reduce project footprint without making the basin unnecessarily deep. It is also preferable to locate the basin where it is compatible with existing and future land use. Impact to City revenue is assessed in this section.

- **Adjacent Land Uses** – The surroundings of the potential basin should also be considered when evaluating a basin site. It is preferable to locate the basin away from residences and private commercial areas due to both the perception of the project and the potential for nuisance claims. It is also preferable to locate the basin where there will be fewer construction impacts on the public.

- **Parcel Ownership** – As described in another chapter, it is critical that the basin be located on a parcel owned by an individual or organization willing to sell the necessary land to the City. This section includes some discussion about the current ownership status of the four sites.

- **Geotechnical Considerations** – A brief summary of the site specific information available for the basin site is presented in this section.

- **Pipeline Connections** – This section includes discussion about the relative complexity of the gravity and pressure pipelines that would be needed for operation of the basin at a given site, as well as a description of how flow would be returned to the sewer after a storage event.

- **Coastal Commission Jurisdiction** – The Coastal Commission permitting process has the potential to impede the project timeline and increase the cost of the project through permit requirements. Per Coastal Commission staff, the jurisdictional boundary of the Coastal Commission in this area is Highway 1. Therefore, work east of Highway 1 would be outside of the Coastal Commission zone. However, the Coastal Commission often exerts its jurisdiction east of the highway if the project is readily visible from the highway. Initial, informal discussions with the Coastal Commission staff have suggested that permitting requirements for the basin would be relatively minor should it be located west of Highway 1, however it can be a lengthy process to obtain this permit. Permit conditions may consist of restrictions on the operations building and construction best management practices. Without formal consultation, however, it is unclear what role the Coastal Commission would have in shaping the design of the basin, its construction, and its operation. We believe it is in the City's best interest to continue to endeavor to engage the Coastal Commission formally.

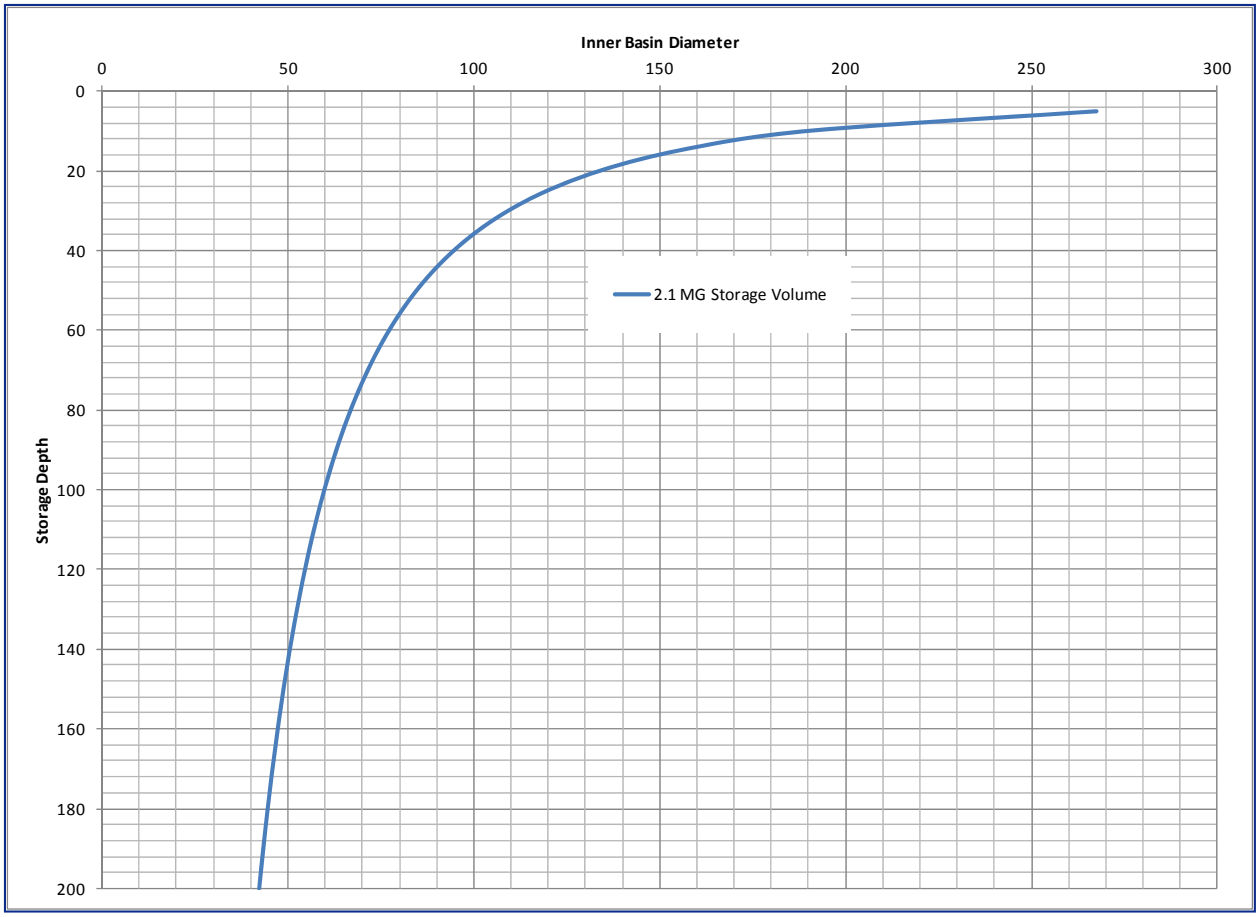
- **Ocean Impacts** – Proximity to the ocean impacts site selection in two ways. Most importantly, sea level rise will impact facilities not protected against coastal erosion. Latest projections for global sea level rise are on the order of two feet over the next fifty years (Advancing the Science of Climate Change, Board on Atmospheric Sciences and Climate, 2010, viewed at http://www.nap.edu/openbook.php?record_id=12782&page=244 on August 22, 2012). Note that local rise may be more or less than the global average. In addition to the increased mean sea level, additional wave action is associated with sea level rise. These factors could produce erosion that would threaten the structural stability of coastal infrastructure. While the foundation of the basin would be expected to be below the impacts of coastal erosion, the appurtenances such as the pipelines, operations building, and odor control facilities could be impacted. In order to provide protection to these facilities, it is assumed that locating the basin site east of Highway 1 will provide more protection to these facilities due to the additional space and civil infrastructure between the site and the coast.

  Closer proximity to the ocean also increases potential damages to the mechanical and electrical aspects of the equalization basin due to increased salt and sand. Although proper design can mitigate these impacts, salt and sand will lead to additional maintenance costs.

- **Flooding** – This section reviews the potential for flooding at the basin site as well as an initial assessment of the feasibility of reducing the potential for flooding of the equalization basin.

- **Estimated Project Costs** – This section consists primarily of a table summarizing the project cost estimate.

Figure 5-2: Diameter-Depth Relationship for Equalization Basin



5.1 Site Alternative 1A: Linda Mar Park-and-Ride

Site Introduction

Site Alternative 1A (formerly known as Site A1) is located in an asphalted parking lot on the east side of Highway 1. This site is relatively close to the Linda Mar Pump Station, with only Site 4 being closer. It is one of the furthest inland sites (along with Sites 2A and 2B) being considered in this chapter. In Table 5-1 below, the sizing parameters for this alternative are presented.

Table 5-1: Site Alternative 1A Infrastructure Dimensions and Rates

Parameter	Site Alternative 1A
Basin Inner Diameter	81 feet
Depth from Ground to: Maximum Water Surface Basin Floor	 15 feet 70 feet
Gravity Pipeline Length/Diameter	180 feet/24 inches 135 feet/18 inches
Force main Length/Diameter	100 feet (including vertical pump discharge)/12 inches
Basin Drainage Time/Flow Rate	24 hours/2.1 mgd

The basin drainage time assumes a discharge to the sewer in Linda Mar Blvd., where there is adequate capacity to accommodate a return flow rate of at least 2.1 mgd.

Construction is estimated to be complete by the end of June 2018. This is six months ahead of the RWQCB deadline.

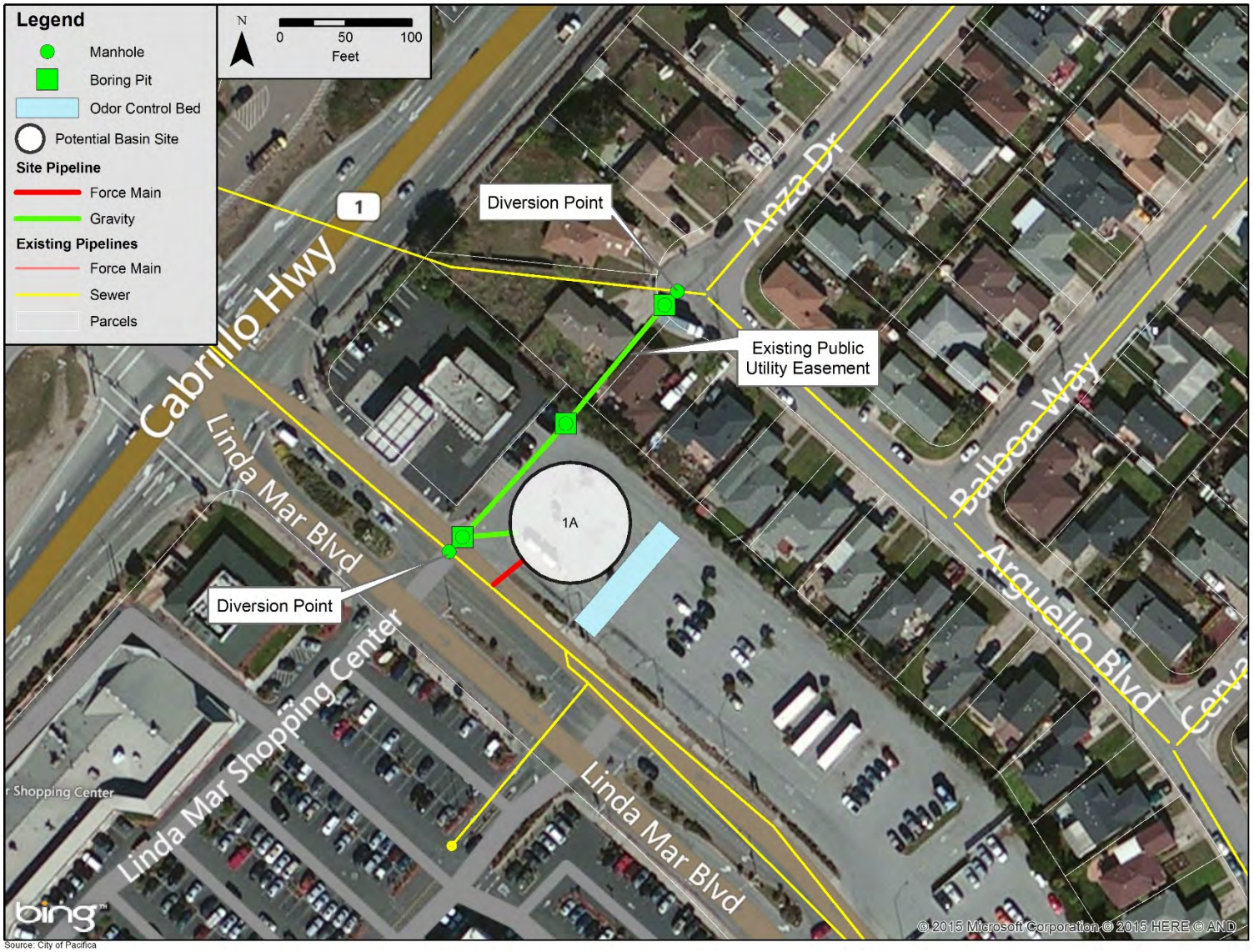
Size and Suitability

This site currently functions as a bus station and parking lot. These types of uses are compatible with the post project site condition so there does not appear to be a conflict with the current use. This parcel is zoned for multiple family residential and is identified as mixed use neighborhood in the latest projection of land use for the Pacifica General Plan Update (*General Plan Public Review Draft*).

City staff have indicated that this parcel, with its General Plan designation as mixed use, is considered to be a potential source of revenue to the City. The combination of the basin at the west end of the parcel and the Caltrans construction trailers, which Caltrans has indicated they plan to maintain at the east end of the parcel, makes it difficult to develop this parcel as envisioned in the General Plan. Loss of revenue generating space would need to be evaluated as part of the project cost but is beyond the scope of this evaluation.

The Site 1A basin shown in Figure 5-3 assumes an inner diameter of approximately 81 feet. This dimension leaves adequate room for construction and construction staging. Construction staging would take advantage of the site length, since the width of the parcel is relatively narrow. Attachment C of this report reviews basin siting considerations and evaluates various locations within this parcel. Attachment F includes a site plan and sections that updates one of the figures in the TM presented in Attachment C.

Figure 5-3: Potential Basin Location and Pipeline Alignment at Site Alternative 1A



Source: City of Pacifica

Adjacent Land Uses

The parcel is bounded by a gas station to the northwest, Linda Mar Blvd. to the southwest, residential structures to the northeast, and distantly to the southeast by De Solo Drive. Across Linda Mar Blvd. is a Safeway and shopping plaza. The proximity to the residences is the most critical aspect of the adjacent land uses. The basin would be approximately 20 feet from adjacent residential property lines, if located on the western end of the parcel. While construction methods can be implemented to reduce noise, dust, ground shaking, and other construction impacts, the potential risk of construction claims still exists. Considering public perception of wastewater projects and large construction in general, some opposition to locating an equalization basin close to the residences could be expected, particularly if another location further from residences is available. A public outreach meeting has already been held and the primary message from attendees supports this assumption. Public outreach and education would be an important component of a successful project at this location.

During the evaluation of Site Alternative 1A, concern was raised about potential ground contamination (soil or groundwater) from the adjacent gasoline station. (The gasoline station does not have double containment of its storage tanks.) To address these concerns, two environmental borings were conducted at the Site Alternative 1A site; one boring was at the proposed site of the equalization tank, and a second boring was close to the property boundary with the gasoline station property. Both borings were analyzed for hydrocarbon and metal contamination in the soil and the groundwater with the intent of estimating whether a pollution plume from the gasoline station was contaminating the site.

The analytical results of these borings are included in Attachment E. These results indicate that hydrocarbons and metals in the soil samples are below the Total Threshold Limit Concentrations set by CalEPA. Therefore, excavated soil from construction is not considered hazardous and would not require special handling or disposal. Excavation soil could be disposed of in municipal Class III landfills.

The analytical results for groundwater indicate that metals concentrations (in the groundwater) are not indicative of metals contamination from the adjacent gasoline station. The concentrations found are likely due to natural sources, or other hazardous sources not yet revealed. However, the concentrations found for arsenic, barium, beryllium, chromium, copper, nickel, vanadium, and zinc are above the Environmental Screening Level concentrations (ESLs) set by the State Water Resources Control Board. Therefore, treatment of water from dewatering would be needed to meet local discharge requirements. Treatment for these metals would probably include precipitation, coagulation, and filtration.

The analytical results indicate that the only hydrocarbons found in the groundwater are TPHD (diesel) and TBA, which would require activated carbon treatment of water from dewatering.

In summary, the environmental borings indicate that soils in this area of the site are not hazardous, but water from dewatering would need to be treated for diesel, TBA, and metals before discharge. The total treatment process would probably include precipitation, coagulation, filtration and activated carbon. The cost of providing this level of treatment has been included in the construction cost of Site Alternative 1A.

The eastern end of the parking lot is currently being used as a Caltrans field office. As mentioned previously, Caltrans intends to maintain this field office into the future.

Parcel Ownership

This parcel is currently owned by Caltrans. Caltrans is currently using this parcel as the site for their construction engineers' trailers for the Devils Slide Project and other local projects. Preliminary discussions and concept review with Caltrans representatives indicated that Caltrans was willing to sell the portion of the property not being used by the field offices to the City of Pacifica once departmental holds on the parcel are lifted.

The overall acquisition schedule for the parcel would be on the order of 18 months. Caltrans has indicated that they would grant access to the site during design once a purchase agreement in principal is in place. Should the acquisition process become prolonged, it could impact the ability of the City to meet its regulatory commitments regarding timing of the basin being available for operation.

It is unknown at this time what the contractual agreement between Caltrans and SamTrans is for use of the site as a bus station. It is assumed that the bus station would potentially need to be relocated during construction and perhaps permanently depending on final site configuration.

Geotechnical Considerations

The parcel is underlain by primarily marine terrace deposits with a cover layer of artificial fill. The fill composition and compaction is highly variable. The site has historically been a part of one or more coastal lagoons and/or sand dune deposits.

A geotechnical boring at this parcel was completed for this study. Table 5-2 summarizes the soil characteristics encountered by this boring.

Table 5-2: Site Alternative 1A Soil Condition Based on Geotechnical Boring

Depth	Encountered
0" – 4"	Asphaltic concrete pavement
4" – 4'	Fill consisting of medium to high plasticity sandy clay with gravel
4' – 14.5'	Lagoon deposits (medium stiff to 8.5'; very soft to 14.5')
14.5' – 19'	Stiff clay
19' – 64'	Interlayered deposits of: • Very stiff and medium dense to dense clay with varying amounts of sand and gravel • Dense silty and clayey sand with varying amounts of gravel • Hard sandy clay with gravel • Very dense clayey sand with gravel
64' – 79'	Very dense silty sand with gravel deposits
79' – 100'	Interlayered deposits of: • Hard clays with varying amounts of sand Very dense sand with gravel and varying amounts of clay and silt

Groundwater level was not available from the geotechnical boring due to the drilling method, but it was noted that the moist soils were encountered at about 10 feet depth. Monitoring by ADR Environmental Group of a nearby site indicates that groundwater levels are relatively shallow (1.8 to 7.86 feet deep). The environmental borings described above and in Attachment E suggest that groundwater is approximately

nineteen feet below ground surface. Groundwater levels are expected to vary seasonally and may also be influenced by tidal fluctuations.

Pipeline Connections

For the gravity influent line to avoid crossing Highway 1, two diversion points are recommended. The primary diversion would occur from the trunk sewer in Linda Mar Blvd. However, in order to passively activate this diversion, the hydraulic grade line in the system would need to be raised to a point where the sewer in Arguello Blvd. would be significantly surcharged (to about ½ foot from the ground). Therefore a second diversion from Arguelo Blvd., as shown in Figure 5-3, is proposed. This diversion would require constructing a pipeline through an existing utility easement from Arguello Blvd. to the northwest corner of the parking lot and then along the perimeter of the parcel to the basin location. For both diversions, new manholes would be constructed on the existing sewers. Alternatives to the diversion strategy described above include:

- Diversion of flow on the west side of Highway 1, closer to the pump station. This diversion strategy would require a pipeline crossing Highway 1 to get to the basin site and all associated permits and requirements to do so.

- Diversion of flow from Linda Mar Blvd. downstream of the junction of the two Linda Mar Blvd. sewers. This diversion strategy would include an automated valve remotely controlled based on Linda Mar Pump Station wet well level. Assuming the same diversion point, using the valve would allow diversions at lower hydraulic grade than the passive weir system assumed in other scenarios. This ability reduces sewer surcharging in the Arguello Blvd. sewer compared to a passive overflow.

The discharge force main would connect the submersible pump within the basin to the gravity sewer in Linda Mar Blvd. It is assumed at this time that an additional penetration could be made in an existing manhole to create this connection. This will need to be confirmed during design.

Coastal Commission Jurisdiction

Site Alternative 1A and associated pipelines are located east of Highway 1 and would not be visible from Highway 1. Therefore, they would be considered beyond the jurisdiction of the Coastal Commission and will not need a Coastal Development Permit. However, some degree of Coastal Commission consultation will still be needed to obtain their concurrence that they do not have jurisdiction on this project. If the diversion site were to be located on the west side of Highway 1, however, this would require some coordination and potentially a permit from the Coastal Commission. Additional coordination with the Coastal Commission would be necessary to confirm permit requirements.

Ocean Impacts

As mentioned above, Site Alternative 1A is located east of Highway 1. It is therefore considered protected from the effects of sea level rise and is anticipated to have reduced maintenance requirements due to salt and sand compared to other sites.

Flooding

This site is within the 1% annual chance flood, more commonly known as the 100-year floodplain. Additionally, City staff have noted that flooding has occurred at this site in the past. To reduce the risk of flooding the basin with stormwater, it would be necessary to raise the basin access points, create a berm around the completely buried basin, or include some other flood protection measure. The flood depth varies based on basin location within the parcel and design flood event. There are no apparent fatal flaws to protecting the basin from flooding at this site. The cost estimate for this site does not reflect a detailed cost

associated with flood protection since there are multiple variables associated with providing this security but does include a placeholder of $100,000.

Estimated Project Costs

The estimated project costs for Site 1A are presented in Table 5-3. As can be seen in the table, the estimated cost for this site alternative is approximately $13.0M at the midpoint of construction (assumed to be June 2016).

Table 5-3: Total Project Costs for Site Alternative 1A

Basin & Site Summary

Tank Inner Diameter	81	Ft	Fill Depth	4	Ft
Cutter Soil Mix Wall Thickness	30	Inch	Bay Mud/Peat Depth	10	Ft
Shotcrete Wall Thickness	12	Inch	Native Soil Depth	61	Ft
Decking Thickness	8	Inch	Total Excavation Depth	75	Ft
Girder Depth	4.5	Ft			
Access Depth	7	Ft			
Tipping Bucket Depth	2	Ft			
Free Space Depth	1	Ft			
Storage Depth	55	Ft			
Foundation Thickness	5	Ft			
Cutter Soil Mix Cutoff Wall Depth	10	Ft			

Project Element	Category	Sub-Category	Quantity	Unit	Unit Cost	Extended Cost
Basin Structure						
	Basin Walls					
		Cutter Soil Mix Wall	22,034	SF	$ 20.00	$ 440,671
		Shotcrete (w/Fiber Reinforcement)	17,686	SF	$ 12.45	$ 220,186
		Welded Wire Mesh (6x6 - W4xW4)	177	CSF	$ 78.50	$ 13,883
		Smooth Finish	17,686	SF	$ 0.75	$ 13,264
	Concrete Base/Plug					
		Concrete/Rebar	1,002	CY	$ 195.00	$ 195,383
	Basin Cover					
		Decking (Concrete)	150	CY	$ 850.00	$ 127,650
		Decking (Rebar @ 205 lbs/CY concrete, FDOT)	30,786	LBS	$ 1.10	$ 33,865
		Precast/Prestressed I-Girders (AASHTO Type IV)	796	LF	$ 190.00	$ 151,240
	Excavation					
		General	15,063	CY	$ 70.00	$ 1,054,401
	Anchoring					
		Tiedown Soil Anchors (10' on center)	0	EA	$ 4,200.00	$ -
	Spoil Offhaul and Disposal:					
		Fill (Assumes Class III)	1,353	TON	$ 38.00	$ 51,401
		Bay Mud/Peat (Assumes Class II)	2,705	TON	$ 47.00	$ 127,149
		Native Soil (Assumes Class III)	20,684	TON	$ 38.00	$ 786,004
	Elevated Equipment/Access Deck					
		Steel for Concrete Perimeter Beams (2@12"x12")	10	CY	$ 259.00	$ 2,471
		Angle Support (4.5' @12' OC)	22	EA	$ 927.00	$ 20,394
		1.5" Alum. Grating	1,018	SF	$ 56.93	$ 57,948
		C10x4.25 (2)	484	LF	$ 163.58	$ 79,141
		Guardrail	226	LF	$ 106.95	$ 24,192
Subtotal						*$ 3,399,241*
Basin Appurtenances						
	Pumps		2	EA	$ 53,000.00	$ 106,000
	Controls		1	Allowance	$ 80,000.00	$ 80,000
	Standby Power		1	Allowance	$ 150,000.00	$ 150,000
	Foundation and Fencing		1	Allowance	$ 64,000.00	$ 64,000
	Washdown/10' of Header		26	EA	$ 11,000.00	$ 286,000
	Odor Control					
		Odor Control Bed (2,025 sf x 6 ft)	1	Allowance	$ 100,000.00	$ 100,000
		Ductwork and 2 Fans	1	Allowance	$ 100,000.00	$ 100,000
	Miscellaneous Piping		1	Allowance	$ 80,000.00	$ 80,000
Subtotal						*$ 966,000*

(Table 5-3 Continued)

Pipes					
	Diversion Manhole	2	EA	$ 10,000.00	$ 20,000
	Manholes	3	EA	$ 10,000.00	$ 30,000
	24" Diameter Gravity (Open Cut in Wet Sand)	180	LF	$ 480.00	$ 86,400
	18" Diameter Gravity (Open Cut in Wet Sand)	135	LF	$ 360.00	$ 48,600
	Interlocking Sheet Piles (8' deep)	5,040	SF	$ 12.00	$ 60,480
	12" Diameter Force Main (Open Cut)	30	LF	$ 240.00	$ 7,200
Subtotal					*$ 252,680*
Other					
	Dewatering (4 sump pumps and treatment)	1	Allowance	$ 10,000.00	$ 10,000
	Contaminated Groundwater Treatment	1	Allowance	$ 50,000.00	$ 50,000
	Paving (Basin Diameter + 20' buffer)	1,018	SY	$ 50.00	$ 50,894
	Paving (Force main trench)	10	SY	$ 50.00	$ 500
	Sidewalks	10	SF	$ 5.00	$ 50
	Traffic Control	1	Allowance	$ 53,000.00	$ 53,000
	Lot Improvements				
	Install Turf	1	TSF	$ 400.00	$ 400
	Shrubs (5' OC)	28	EA	$ 50.00	$ 1,400
	Flood Protection Measures	1	Allowance	$ 100,000.00	$ 100,000
	Utility Relocation	1	Allowance	$ 500,000.00	$ 500,000
	Park and Ride Relocation	1	Allowance	$ 100,000.00	$ 100,000
Subtotal					*$ 866,244*
Construction Subtotal					$ 5,484,165
Contractor Costs					
	Mobilization/Demobilization		% of Const. Subtotal	5%	$ 274,208
	Contractor Overhead and Profit		% of Const. Subtotal	15%	$ 822,625
	Change Order Allowance		% of Const. Subtotal	5%	$ 274,208
Subtotal					*$ 1,371,041*
Professional Services					
	Environmental Documentation/Permitting	1	Allowance	$ 350,000.00	$ 350,000
	Engineering		% of Const. Subtotal	10%	$ 548,416
	Legal		% of Const. Subtotal	2%	$ 109,683
	Construction Management		% of Const. Subtotal	10%	$ 548,416
Subtotal					*$ 1,556,516*
Design and Construction Contingency	Subtotal of Above				$ 8,411,722
			% of Project Subtotal	25%	$ 2,102,931
Subtotal					*$ 10,514,653*
Real Estate Costs					
	Property Acquisition	43,750	SF	$ 40.00	$ 1,750,000
	Property Sale	0	SF	$ (40.00)	$ -
Subtotal					$ 1,750,000
Total (10/2013 Dollars)	CCI = 9,689				$ 12,300,000
Total (6/2016 Dollars)	CCI = 10,238 (Projected)				**$ 13,000,000**

5.2 Site Alternatives 2A and 2B: Skate Park Parking Lot

Site Introduction

The Site Alternative 2A (formerly known as Site B) and Site Alternative 2B basins and potential pipeline alignments are shown in Figure 5-4. As can be seen, the basin is located near the Pacifica Skate Park and Community Center on the east side of Highway 1. Attachment F includes a figure that shows how the equalization basin could be integrated into this location. Site 2A and Site 2B are differentiated by their different influent gravity pipeline alignments. This basin site is one of the two furthest sites from the Linda Mar Pump Station. It is one of the furthest inland sites (along with Site 1A) being considered in this chapter. Table 5-4 summarizes some of the infrastructure characteristics proposed for this site. The sections below summarize some key physical parameters of Sites 2A and 2B.

Table 5-4: Site Alternatives 2A and 2B Infrastructure Dimensions and Rates

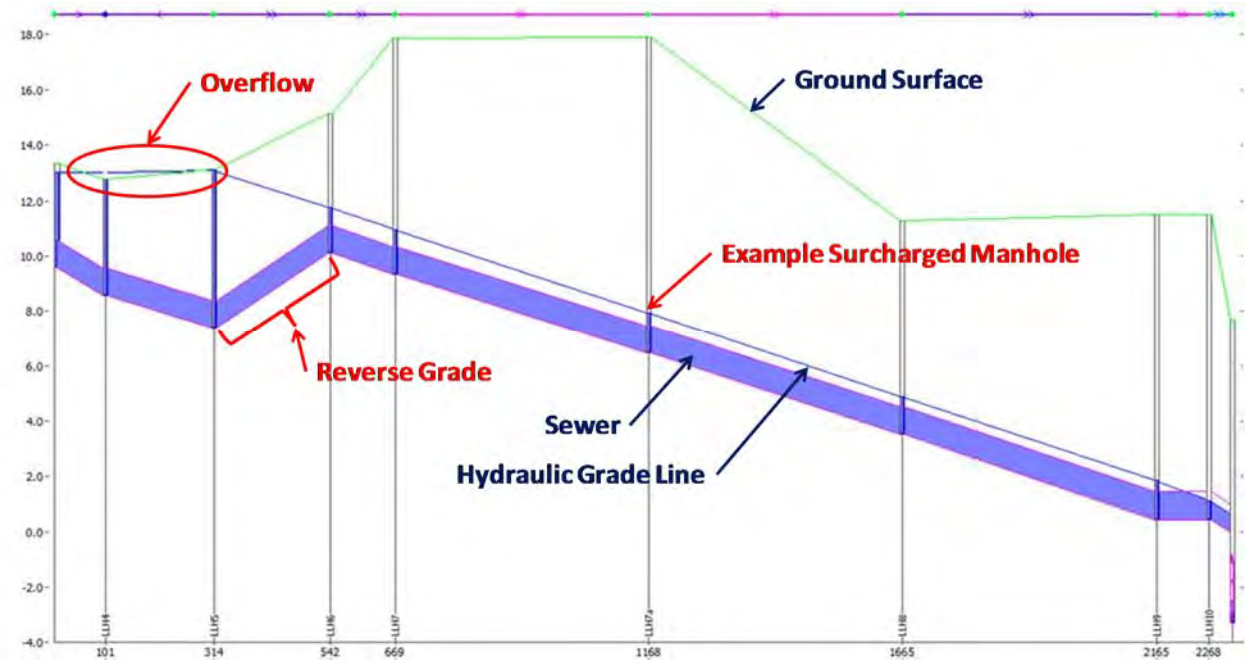
Parameter	Site 2A	Site 2B
Basin Inner Diameter	95 feet	95 feet
Depth from Ground to: Maximum Water Surface Basin Floor	 15 feet 55 feet	 15 feet 55 feet
Gravity Pipeline Length/Diameter	1,360 feet/24 inches	1,650 feet/24 inches
Force main Length/Diameter	530 feet (including vertical pump discharge)/12 inches	530 feet (including vertical pump discharge)/12 inches
Basin Drainage Time/Flow Rate	30 hours/1.7 mgd	30 hours/1.7 mgd

The basin drainage time assumes a discharge to the 12-inch sewer in Crespi Drive, which extends across Highway 1 and then parallels the shoreline to the Linda Mar Pump Station. Modeling indicates that there is approximately 1.7 mgd capacity available within the existing sewer without causing additional surcharging through much of the sewer. As shown in Figure 5-5, if 2.1 mgd were to be discharged to the sewer (to drain the basin within 24 hours), the sewer would be significantly surcharged along Crespi Drive, resulting in a potential overflow. This is largely due to one or both of the apparent reverse grades in the sewer. Addressing the hydraulic capacity limitation would be costly to correct as it likely involves pipe replacement for both the Crespi sewer and beachfront sewer between Crespi Dr. and the Linda Mar Pump Station. Thus, it would also be time consuming due to Coastal Commission and Caltrans permitting to increase the capacity of the Crespi Drive sewer to obtain more rapid drain times.

Figure 5-4: Potential Basin Location and Pipeline Alignments at Site Alternatives 2A and 2B

Source: City of Pacifica

Figure 5-5: Hydraulic Grade Line for Site Alternatives 2A and 2B: 2.1 mgd Discharge to LH5



Construction for Site Alternative 2A is estimated to be complete by the end of December 2018. This is at the RWQCB deadline. Construction for Site Alternative 2B is estimated to be complete by the end of June 2018. This is six months ahead of the RWQCB deadline. The longer project completion time for Site Alternative 2A is due to the increased time needed to secure Caltrans and Coastal Commission permits for this alternative's pipeline routes which cross and run adjacent to Highway 1.

Size and Suitability

This site is currently split between two uses. The western portion of the site is undeveloped, sandy open space. The eastern portion of the site is a parking lot for the Pacifica Community Center. These types of uses are compatible with the post project site condition so there does not appear to be any long-term conflict with the current uses. This parcel is zoned for controlled manufacturing and is identified as Public and Semi-public in the latest projection of land use for the Pacifica General Plan Update (*General Plan Public Review Draft*). Zoning changes may be needed to site the equalization basin on this parcel.

The parking lot would be closed during construction. Alternate parking would need to be identified to offset the loss of the free, publicly accessible parking during the construction period. The City does not believe that construction and operation of the basin for Site 2A or 2B would impact revenue.

The basin shown in Figure 5-4 assumes an inner diameter of approximately 95 feet. This should leave adequate room for construction at the surface. The parking lot not dedicated to the basin footprint could be used as a staging area for the contractor.

Adjacent Land Uses

This construction site is bounded by open space areas to the east and west, residential structures to the south, and the skate park and Community Center complex to the north. There is a large drainage/storm drain between the parking lot and the residences. The proximity to the residences is the most critical aspect of the adjacent land uses. The basin shown in Figure 5-4 is approximately 45 feet from the adjacent private property fence line. If the basin were to be moved farther north in the parking lot, the diameter of the basin

would be severely restricted (i.e. on the order of 60 feet, with a resulting interior depth of 120 feet). With the addition of retaining walls, as shown in Figure 5-6, the diameter could be increased to approximately 78 feet, with a resulting interior depth of 74 feet. Constructing the basin in this narrower part of the parking lot increases construction difficulty due to access restrictions and staging and sequencing challenges. Since the wider portion of the site, where the basin is located in Figure 5-4, is available, it is difficult to recommend locating the basin in the more constrained area.

Figure 5-6: Alternate Basin Location at Skate Park Parking Lot

While construction methods can be implemented to reduce noise, dust, ground shaking, and other construction impacts, the potential risk of construction claims still exists. Considering public perception of wastewater projects and large construction in general, some opposition to locating an equalization basin close to the residences could be expected, particularly if another site further from residences is available. A public outreach meeting has already been held and the primary message from attendees supports this assumption. Public outreach and education would be an important component of a successful project at this location.

Also of note are the adjacent natural areas (to the east and to the west of the skate park). The natural area to the west is far enough that environmental concerns can likely be mitigated through normal construction management practices. The natural area to the east is identified by the *Pacifica General Plan Public Review Draft* as the site of Linda Mar Shopping Center. Should the Shopping Center be developed prior to implementation of the basin project, the environmental sensitivity of the area would be diminished. At this

time though, it should be assumed that working close to these natural areas may require some additional precautions and biological surveys during the construction period.

Parcel Ownership

This site is owned by the City of Pacifica and therefore would avoid the cost of land purchase. The City has indicated a willingness to close this parking lot during construction.

Geotechnical Considerations

Site 2 is underlain by primarily marine terrace deposits with a cover layer of artificial fill. The fill composition and compaction is highly variable. The site has historically been a part of one or more coastal lagoons and/or sand dune deposits.

A geotechnical boring at Site 2 was completed for this study. Table 5-5 summarizes the soil encountered by this boring.

Table 5-5: Site 2 Soil Condition Based on Geotechnical Boring

Depth	Encountered
0" – 2"	Asphaltic concrete
2" – 5'	Fill consisting of clayey sand with gravel
5' – 8'	High plasticity clay (soft with peaty soil layers)
8' – 20'	High plasticity clay (very soft with peaty soil layers)
20' – 76.5'	Interlayered deposits of: • Stiff to hard lean clay with varying amounts of sand and gravel • Medium dense to very dense sand with varying amounts of gravel, silt, and clay • Dense to very dense gravels with varying amounts of sand, silt, and clay

Two reference borings were also available for the adjacent skate park. Findings from these borings supported the above layer descriptions with some variation as described in Attachment B.

Groundwater level was not available from the boring due to the drilling method, but it was noted that the moist soils were encountered at about 7 feet depth. Groundwater levels are expected to vary seasonally and may also be influenced by tidal fluctuations.

Pipeline Connections

Pipeline connections for Site 2A and 2B are relatively complex compared to Site 4 and roughly equivalent to Sites 3A and 3B. For Site 2A, the diversion manhole would be located adjacent to the Linda Mar Pump Station, and the diversion pipeline would need to cross several major storm drains and sewers near the diversion point. Crossing Highway 1 will require a permit from Caltrans and may require casing around the pipe. For Site 2B, two diversion points from the collection system are required to make this alternative hydraulically feasible. There are several locations where the diversion pipeline would likely cross existing pipelines though it is assumed that the diversion pipeline would be lower than those existing pipelines. There are fewer conflicts than the pipeline alignments shown for Sites 2A and 3A. There are no Caltrans permits required for Site 2B pipeline alignment.

Relocation of the conflicting pipelines, wet well work, or optimization of the diversion pipeline alignment should be investigated during detailed design to minimize the costs of pipeline costs. The diversion pipeline connection for Sites 2A and 2B requires more pipeline length than the diversion pipeline connections for Site Alternative 1A.

The discharge force main would connect the submersible pump within the basin to the gravity sewer in Crespi Drive. It is assumed at this time that an additional penetration could be made in an existing manhole to create this connection. This will need to be confirmed during design.

Coastal Commission Jurisdiction

The basin for Site Alternative 2A is located east of Highway 1 and is therefore considered to be removed from the Coastal Commission jurisdiction. For Site 2A, the diversion manhole and some pipeline work are west of Highway 1 however, and would require some coordination and potentially a permit from the Coastal Commission. Additional coordination with the Coastal Commission would be necessary to determine any permit requirements.

Alternative Site 2B and associated pipelines are located east of Highway 1 and would not be visible from Highway 1. Therefore, they would be considered beyond the jurisdiction of the Coastal Commission and will not need a Coastal Development Permit. However, some degree of Coastal Commission consultation will still be needed to obtain their concurrence that they do not have jurisdiction on this project.

Ocean Impacts

As mentioned above, Site Alternatives 2A and 2B are some of the farthest inland sites and are located east of Highway 1. They are therefore considered protected from the effects of sea level rise and are anticipated to have reduced maintenance requirements due to salt and sand compared to other sites.

The influent pipelines to Site Alternative 2B are more protected from ocean impacts than the influent pipelines to Site Alternative 2A due to their inland location.

Flooding

This site is within the 1% annual chance flood. Additionally, City staff have noted previous flooding at this site. To reduce the risk of flooding the basin with stormwater, it would be necessary to raise the basin access points, create a berm around the completely buried basin, or include some other flood protection measure. The flood depth varies based on the design flood event. There are no apparent fatal flaws to protecting the basin from flooding at this site. The cost estimate for this site does not reflect a detailed cost associated with flood protection since there are multiple variables associated with providing this security, but does include a placeholder of $100,000.

Estimated Project Costs

The estimated project costs for Site Alternative 2A are presented in Table 5-6 and the estimate project costs for Site Alternative 2B are presented in Table 5-7. As can be seen in the tables, the estimated cost for this project is approximately $15.3M (Site 2A) or $15.4M (Site 2B) at the midpoint of construction (assumed to be June 2016). These costs include an allowance for groundwater treatment for the metals found in the Site 1A environmental boring that were not likely to have been leaked from the neighboring gas station. While pipeline unit costs are cheaper for Site 2B than Site 2A, the savings are offset by the trench plates assumed at this time to be necessary during construction, longer gravity diversion length, as well as the road paving costs associated with the open trench method.

Table 5-6: Total Project Costs for Site Alternative 2A

Basin & Site Summary

Tank Inner Diameter	95	Ft	Fill Depth	5	Ft
Cutter Soil Mix Wall Thickness	30	Inch	Bay Mud/Peat Depth	15	Ft
Shotcrete Wall Thickness	12	Inch	Native Soil Depth	40	Ft
Decking Thickness	8	Inch	Total Excavation Depth	60	Ft
Girder Depth	4.5	Ft			
Access Depth	7	Ft			
Tipping Bucket Depth	2	Ft			
Free Space Depth	1	Ft			
Storage Depth	40	Ft			
Foundation Thickness	5	Ft			
Cutter Soil Mix Cutoff Wall Depth	10	Ft			

Project Element	Category	Sub-Category	Quantity	Unit	Unit Cost	Extended Cost
Basin Structure						
	Basin Walls					
		Cutter Soil Mix Wall	21,179	SF	$ 20.00	$ 423,581
		Shotcrete (w/Fiber Reinforcement)	16,266	SF	$ 12.45	$ 202,507
		Welded Wire Mesh (6x6 - W4xW4)	163	CSF	$ 78.50	$ 12,768
		Smooth Finish	16,266	SF	$ 0.75	$ 12,199
	Concrete Base/Plug					
		Concrete/Rebar	1,368	CY	$ 195.00	$ 266,854
	Basin Cover					
		Decking (Concrete)	202	CY	$ 850.00	$ 171,496
		Decking (Rebar @ 205 lbs/CY concrete, FDOT)	41,361	LBS	$ 1.10	$ 45,497
		Precast/Prestressed I-Girders (AASHTO Type IV)	796	LF	$ 190.00	$ 151,240
	Excavation					
		General	16,467	CY	$ 70.00	$ 1,152,719
	Anchoring					
		Tiedown Soil Anchors (10' on center)	0	EA	$ 4,200.00	$ -
	Spoil Offhaul and Disposal:					
		Fill (Assumes Class III)	2,309	TON	$ 38.00	$ 87,754
		Bay Mud/Peat (Assumes Class II)	5,542	TON	$ 47.00	$ 260,491
		Native Soil (Assumes Class III)	18,552	TON	$ 38.00	$ 704,957
	Elevated Equipment/Access Deck					
		Concrete Perimeter Beams (2@12"x12")	11	CY	$ 259.00	$ 2,893
		Angle Support (4.5' @12' OC)	25	EA	$ 927.00	$ 23,175
		1.5" Alum. Grating	1,194	SF	$ 56.93	$ 67,963
		C10x4.25 (2)	572	LF	$ 163.58	$ 93,530
		Guardrail	270	LF	$ 106.95	$ 28,895
Subtotal						*$ 3,708,521*
Basin Appurtenances						
	Pumps		2	EA	$ 53,000.00	$ 106,000
	Controls		1	Allowance	$ 80,000.00	$ 80,000
	Standby Power		1	Allowance	$ 150,000.00	$ 150,000
	Foundation and Fencing		1	Allowance	$ 64,000.00	$ 64,000
	Washdown/10' of Header		29	EA	$ 11,000.00	$ 319,000
	Odor Control					
		Odor Control Bed (2,025 sf x 6 ft)	1	Allowance	$ 100,000.00	$ 100,000
		Ductwork and 2 Fans	1	Allowance	$ 100,000.00	$ 100,000
	Miscellaneous Piping		1	Allowance	$ 80,000.00	$ 80,000
Subtotal						*$ 999,000*

(Table 5-6 Continued)

Pipes					
	Diversion Manhole	1	EA	$ 10,000.00	$ 10,000
	Manhole	4	EA	$ 10,000.00	$ 40,000
	24" Diameter Gravity (Pilot Guided Augur Boring)	1,360	LF	$ 900.00	$ 1,224,000
	Boring Pit	7	EA	$ 100,000.00	$ 700,000
	24" Diameter Gravity (Open Cut in Wet Sand)	40	LF	$ 480.00	$ 19,200
	Interlocking Sheet Piles (15' deep)	1,200	SF	$ 12.00	$ 14,400
	12" Diameter Force Main (Open Cut)	530	LF	$ 240.00	$ 127,200
Subtotal					*$ 2,134,800*
Other					
	Dewatering (4 sump pumps and treatment)	1	Allowance	$ 10,000.00	$ 10,000
	Contaminated Groundwater Treatment	1	Allowance	$ 50,000.00	$ 50,000
	Paving (Partial New Parking Lot (200'x90'))	2,000	SY	$ 50.00	$ 100,000
	Paving (Force main trench)	150	SY	$ 50.00	$ 7,500
	Sidewalks	160	SF	$ 5.00	$ 800
	Traffic Control	1	Allowance	$ 53,000.00	$ 53,000
	Lot Improvements				
	Install Turf	2	TSF	$ 400.00	$ 800
	Shrubs (5' OC)	70	EA	$ 50.00	$ 3,500
	Flood Protection Measures	1	Allowance	$ 100,000.00	$ 100,000
	Utility Relocation	1	Allowance	$ 500,000.00	$ 500,000
	Park and Ride Relocation	0	Allowance	$ 100,000.00	$ -
Subtotal					*$ 825,600*
Construction Subtotal					$ 7,667,921
Contractor Costs					
	Mobilization/Demobilization		% of Const. Subtotal	5%	$ 383,396
	Contractor Overhead and Profit		% of Const. Subtotal	15%	$ 1,150,188
	Change Order Allowance		% of Const. Subtotal	5%	$ 383,396
Subtotal					*$ 1,916,980*
Professional Services					
	Environmental Documentation/Permitting	1	Allowance	$ 350,000.00	$ 350,000
	Engineering		% of Const. Subtotal	10%	$ 766,792
	Legal		% of Const. Subtotal	2%	$ 153,358
	Construction Management		% of Const. Subtotal	10%	$ 766,792
Subtotal					*$ 2,036,943*
Design and Construction Contingency	Subtotal of Above				$ 11,621,844
			% of Project Subtotal	25%	$ 2,905,461
Subtotal					*$ 14,527,305*
Real Estate Costs					
	Property Acquisition	0	SF	$ 40.00	$ -
	Property Sale	0	SF	$ (40.00)	$ -
Subtotal					$ -
Total (10/2013 Dollars)	CCI = 9,689				$ 14,500,000
Total (6/2016 Dollars)	CCI = 10,238 (Projected)				**$ 15,300,000**
Note: Estimate does not include cost for land acquisition. It is assumed that this City-owned parcel is available for this project.					

Table 5-7: Total Project Costs for Site Alternative 2B

Basin & Site Summary

Tank Inner Diameter	95	Ft	Fill Depth	5	Ft
Cutter Soil Mix Wall Thickness	30	Inch	Bay Mud/Peat Depth	15	Ft
Shotcrete Wall Thickness	12	Inch	Native Soil Depth	40	Ft
Decking Thickness	8	Inch	Total Excavation Depth	60	Ft
Girder Depth	4.5	Ft			
Access Depth	7	Ft			
Tipping Bucket Depth	2	Ft			
Free Space Depth	1	Ft			
Storage Depth	40	Ft			
Foundation Thickness	5	Ft			
Cutter Soil Mix Cutoff Wall Depth	10	Ft			

Project Element	Category	Sub-Category	Quantity	Unit	Unit Cost	Extended Cost
Basin Structure						
	Basin Walls					
		Cutter Soil Mix Wall	21,179	SF	$ 20.00	$ 423,581
		Shotcrete (w/Fiber Reinforcement)	16,266	SF	$ 12.45	$ 202,507
		Welded Wire Mesh (6x6 - W4xW4)	163	CSF	$ 78.50	$ 12,768
		Smooth Finish	16,266	SF	$ 0.75	$ 12,199
	Concrete Base/Plug					
		Concrete/Rebar	1,368	CY	$ 195.00	$ 266,854
	Basin Cover					
		Decking (Concrete)	202	CY	$ 850.00	$ 171,496
		Decking (Rebar @ 205 lbs/CY concrete, FDOT)	41,361	LBS	$ 1.10	$ 45,497
		Precast/Prestressed I-Girders (AASHTO Type IV)	796	LF	$ 190.00	$ 151,240
	Excavation					
		General	16,467	CY	$ 70.00	$ 1,152,719
	Anchoring					
		Tiedown Soil Anchors (10' on center)	0	EA	$ 4,200.00	$ -
	Spoil Offhaul and Disposal:					
		Fill (Assumes Class III)	2,309	TON	$ 38.00	$ 87,754
		Bay Mud/Peat (Assumes Class II)	5,542	TON	$ 47.00	$ 260,491
		Native Soil (Assumes Class III)	18,552	TON	$ 38.00	$ 704,957
	Elevated Equipment/Access Deck					
		Concrete Perimeter Beams (2@12"x12")	11	CY	$ 259.00	$ 2,893
		Angle Support (4.5' @12' OC)	25	EA	$ 927.00	$ 23,175
		1.5" Alum. Grating	1,194	SF	$ 56.93	$ 67,963
		C10x4.25 (2)	572	LF	$ 163.58	$ 93,530
		Guardrail	270	LF	$ 106.95	$ 28,895
Subtotal						*$ 3,708,521*
Basin Appurtenances						
	Pumps		2	EA	$ 53,000.00	$ 106,000
	Controls		1	Allowance	$ 80,000.00	$ 80,000
	Standby Power		1	Allowance	$ 150,000.00	$ 150,000
	Foundation and Fencing		1	Allowance	$ 64,000.00	$ 64,000
	Washdown/10' of Header		29	EA	$ 11,000.00	$ 319,000
	Odor Control					
		Odor Control Bed (2,025 sf x 6 ft)	1	Allowance	$ 100,000.00	$ 100,000
		Ductwork and 2 Fans	1	Allowance	$ 100,000.00	$ 100,000
	Miscellaneous Piping		1	Allowance	$ 80,000.00	$ 80,000
Subtotal						*$ 999,000*

(Table 5-7 Continued)

Pipes					
	Diversion Manhole	2	EA	$ 10,000.00	$ 20,000
	Manhole	7	EA	$ 10,000.00	$ 70,000
	24" Diameter Gravity (Pilot Guided Augur Boring)	150	LF	$ 900.00	$ 135,000
	Boring Pit	2	EA	$ 100,000.00	$ 200,000
	24" Diameter Gravity (Open Cut)	1,540	LF	$ 480.00	$ 739,200
	Interlocking Sheet Piles (12' deep)	36,960	SF	$ 12.00	$ 443,520
	12" Diameter Force Main (Open Cut)	530	LF	$ 240.00	$ 127,200
Subtotal					*$ 1,734,920*
Other					
	Dewatering (4 sump pumps and treatment)	1	Allowance	$ 10,000.00	$ 10,000
	Contaminated Groundwater Treatment	1	Allowance	$ 50,000.00	$ 50,000
	Paving (Partial New Parking Lot (200'x90'))	2,000	SY	$ 50.00	$ 100,000
	Paving (Force main trench)	150	SY	$ 50.00	$ 7,500
	Paving (Street)	8,889	SY	$ 50.00	$ 444,444
	Sidewalks	160	SF	$ 5.00	$ 800
	Traffic Control	1	Allowance	$ 53,000.00	$ 53,000
	Lot Improvements				
	Install Turf	2	TSF	$ 400.00	$ 800
	Shrubs (5' OC)	70	EA	$ 50.00	$ 3,500
	Flood Protection Measures	1	Allowance	$ 100,000.00	$ 100,000
	Utility Relocation	1	Allowance	$ 500,000.00	$ 500,000
	Park and Ride Relocation	0	Allowance	$ 100,000.00	$ -
Subtotal					*$ 1,270,044*
Construction Subtotal					$ 7,712,485
Contractor Costs					
	Mobilization/Demobilization		% of Const. Subtotal	5%	$ 385,624
	Contractor Overhead and Profit		% of Const. Subtotal	15%	$ 1,156,873
	Change Order Allowance		% of Const. Subtotal	5%	$ 385,624
Subtotal					*$ 1,928,121*
Professional Services					
	Environmental Documentation/Permitting	1	Allowance	$ 350,000.00	$ 350,000
	Engineering		% of Const. Subtotal	10%	$ 771,249
	Legal		% of Const. Subtotal	2%	$ 154,250
	Construction Management		% of Const. Subtotal	10%	$ 771,249
Subtotal					*$ 2,046,747*
Design and Construction Contingency	Subtotal of Above				$ 11,687,353
			% of Project Subtotal	25%	$ 2,921,838
Subtotal					*$ 14,609,192*
Real Estate Costs					
	Property Acquisition	0	SF	$ 40.00	$ -
	Property Sale	0	SF	$ (40.00)	$ -
Subtotal					$ -
Total (10/2013 Dollars)	CCI = 9,689				$ 14,600,000
Total (6/2016 Dollars)	CCI = 10,238 (Projected)				**$ 15,400,000**
Note: Estimate does not include cost for land acquisition. It is assumed that this City-owned parcel is available for this project.					

5.3 Site Alternatives 3A and 3B: Crespi Parking Lot

Site Introduction

The Site Alternative 3A (formerly known as Site C1) and Site Alternative 3B basin and potential pipeline alignments are shown in Figure 5-7. As can be seen, the site is located near the Pacifica Skate Park and Community Center on the east side of Highway 1. Attachment F includes a figure that shows how the equalization basin could be integrated into this location. Site 3A and Site 3B are differentiated by their different influent gravity pipeline alignments. This basin site is the farthest site from the Linda Mar Pump Station by approximately 100 feet. It is the second closest site to the ocean being considered in this chapter. Table 5-8 summarizes some of the infrastructure characteristics proposed for this site. The sections below summarize some key physical parameters of Sites 3A and 3B.

Table 5-8: Site Alternatives 3A and 3B Infrastructure Dimensions and Rates

Parameter	Site 3A	Site 3B
Basin Inner Diameter	100 feet	100 feet
Depth from Ground to: Maximum Water Surface Basin Floor	 16 feet 52 feet	 15 feet 51 feet
Gravity Pipeline Length/Diameter	1,500 feet/24 inches	2,025 feet/24 inches
Force main Length/Diameter	290 feet (including vertical pump discharge)/12 inches	290 feet (including vertical pump discharge)/12 inches
Basin Drainage Time/Flow Rate	30 hours/1.7 mgd	30 hours/1.7 mgd

The pipeline alignment for Site Alternative 3B is evaluated using a 0.003 slope whereas the values in Table 3-9 for Site 3A reflect a 0.005 slope, resulting in different basin depths.

As with Site Alternatives 2A and 2B, the use of Site 3A or 3B would assume a discharge to the sewer in Crespi Drive. The use of Site 3A or 3B would therefore have the same implications regarding the Crespi Drive and beachfront sewers as described for Sites 2A and 2B.

Figure 5-7: Potential Basin Location and Pipeline Alignments at Site Alternatives 3A and 3B

Source: City of Pacifica

Construction for Site Alternative 3A is estimated to be complete by the end of December 2018. This is at the RWQCB deadline. Construction for Site Alternative 3B is estimated to be complete by the end of June 2018. This is six months ahead of the RWQCB deadline. The longer project completion time for Site Alternative 3A is due to the increased time needed to secure Caltrans and Coastal Commission permits for this alternative's pipeline routes which cross and run adjacent to Highway 1.

Size and Suitability

This site currently functions as a parking lot. These types of uses are compatible with the post project site condition so there does not appear to be any long-term conflict with the current use. This parcel is zoned for controlled manufacturing, however, and is identified as Visitor Service Commercial in the latest projection of land use for the Pacifica General Plan Update (*General Plan Public Review Draft*). While the basin is compatible with surface parking lot use, zoning changes may be needed to site the equalization basin on this parcel.

The City currently charges a parking fee for use of the parking lot, which generates revenue for the City. In addition, acquiring the parking lot area for the basin would mean that the City would no longer pay a lease fee to Caltrans and therefore obtain greater net revenue from parking. In these ways, City staff would consider selection of this site as favorable from a revenue generation perspective.

The basin shown in Figure 5-7 assumes an inner diameter of approximately 100 feet. The parking lot has adequate room for construction and staging. To accommodate construction, however, the parking spaces would not be available for the duration of construction.

Adjacent Land Uses

This parcel is bounded by a bike path and Highway 1 to the northwest, by an open space area to the southwest, by the Pacifica Community Center to the southeast, and Crespi Drive to the northeast. The adjacent land uses are relatively favorable for construction and long-term operation compared to Site Alternatives 1A, 2A, and 2B due to the separation from permanently occupied structures. The closest residences and commercial structures are approximately 350 to 400 feet from the basin site. This distance would help to reduce perception of construction and long-term impacts to residents and privately owned structures. However, since the basin and facilities would be adjacent to the open space area, some additional precautions and biological surveys may be required during the construction period.

A significant portion of the parking lot at Site C1 would serve as the construction area. It is unknown at this time whether the remaining portion of the parking lot would need to be closed to reduce public risk and construction interference. This parking lot is heavily used, as it serves the skate park and the community center and also acts as overflow parking for beach access. Reduced parking space availability may be a short-term impact of the project during construction.

Parcel Ownership

The Sites 3A and 3B parcel is currently owned by Caltrans and leased by the City. Preliminary discussions and concept review with Caltrans representatives indicates that Caltrans is willing to sell the property to the City of Pacifica once departmental holds on the parcel are lifted. Caltrans staff review indicates that there are plaques within this parcel commemorating the site of the "Portola Expedition Camp" and the "Site of the Discovery of San Francisco Bay". There is also a statue on the site that was a gift from Catalonia, Spain to commemorate the explorer Don Gaspar de Portola. Caltrans staff have indicated that prior to removing the departmental hold, a more thorough survey of the parcel boundary must be completed as well as establishment of the ability of the State to transfer ownership and maintenance responsibilities of the plaques and statue to the City. If the plaques and statue are not able to be transferred to the City, the State would require an easement for continued maintenance of the plaques and statue. The overall acquisition schedule for the parcel is unknown at this time. Should the acquisition process become prolonged, it could

impact the ability of the City to meet its regulatory commitments regarding timing of the basin being available for operation.

It is unknown at this time whether Caltrans would bundle the sale of the parking lot with the open space area to the south of the parking lot. As shown in Figure 5-7, there is no parcel boundary between Highway 1 and the potential basin site to evaluate the size of the parcel. For planning purposes, however, the parking lot area and the open space area are estimated to be approximately the same size, and the total area is approximately 1.5 acres.

Geotechnical Considerations

Sites 3A and 3B are underlain by primarily marine terrace deposits with a cover layer of artificial fill. The fill composition and compaction is highly variable. The site has historically been a part of one or more coastal lagoons and/or sand dune deposits.

A geotechnical boring at Site 3 was not completed for this study but subsurface conditions are anticipated to be similar to Site 2 due to their proximity to one another.

Pipeline Connections

The pipeline alignments for Sites 3A and 3B would have similar attributes as described for Sites 2A and 2B, respectively, with regard to pipeline connections, given that the two basin sites have similar hydraulic and geographic locations. For Site 3A it would not be necessary to go under the open space area, which would be required for Site 2A. Site 3B requires some additional pipeline relative to Site 2B, routed between the skate park and the community center and below an existing play structure, to connect to the basin.

Coastal Commission Jurisdiction

The basin for Site Alternatives 3A and 3B are located east of Highway 1 and therefore may be considered removed from Coastal Commission jurisdiction. However, because this site is readily viewable from Highway 1, the Coastal Commission will probably try to exert jurisdiction from this perspective and could require a Coastal Development Permit. The design of the basin would allow the City to meet all probable conditions of the permit without major modification. The most significant impact to the project due to Coastal Commission permitting would be time and effort consulting with them.

For Site Alternative 3A, the diversion manhole and some pipeline work are west of Highway 1 and would require some coordination and potentially a permit from the Coastal Commission. Additional coordination with the Coastal Commission would be necessary to determine any permit requirements. The pipelines associated with Site 3B are located east of Highway 1 would are not expected to have the same permit requirements.

Ocean Impacts

As mentioned above, Site Alternatives 3A and 3B are located east of Highway 1. They are therefore considered protected from the effects of sea level rise and are anticipated to have reduced maintenance requirements due to salt and sand compared to Site 4. The influent pipelines to Site 3B are more protected from ocean impacts than the influent pipelines to Site 3A due to their inland location.

Flooding

This site is only partially within the 1% annual chance flood. City staff have not noted any previous flooding at this site. Less significant measures, compared to other sites, would likely be needed to reduce the risk of flooding the basin with stormwater. There are no apparent fatal flaws to protecting the basin from flooding at this site. The cost estimate for this site does not reflect a detailed cost associated with flood protection since there are multiple variables associated with providing this security but does include a placeholder of $20,000.

Estimated Project Costs

The estimated project costs for Site Alternative 3A are presented in Table 5-9 and the estimate project costs for Site 3B are presented in Table 5-10. As can be seen in the tables, the estimated cost for this project is approximately $17.9M (Site 3A) or $18.3M (Site 3B) at the midpoint of construction (assumed to be June 2016). These costs include an allowance for groundwater treatment for the metals found in the Site 1A environmental boring that were not likely to have been leaked from the neighboring gas station. While pipeline unit costs are cheaper for Site 3B than Site 3A, the savings are offset by the trench plates assumed at this time to be necessary during construction, the longer overall length of the gravity diversion, as well as the road paving costs associated with the open trench method.

Table 5-9: Total Project Costs for Site Alternative 3A

Basin & Site Summary

Tank Inner Diameter	100	Ft	Fill Depth	5	Ft
Cutter Soil Mix Wall Thickness	30	Inch	Bay Mud/Peat Depth	15	Ft
Shotcrete Wall Thickness	12	Inch	Native Soil Depth	36	Ft
Decking Thickness	8	Inch	Total Excavation Depth	56	Ft
Girder Depth	4.5	Ft			
Access Depth	7	Ft			
Tipping Bucket Depth	2	Ft			
Free Space Depth	1	Ft			
Storage Depth	36	Ft			
Foundation Thickness	5	Ft			
Cutter Soil Mix Cutoff Wall Depth	10	Ft			

Project Element	Category	Sub-Category	Quantity	Unit	Unit Cost	Extended Cost
Basin Structure						
	Basin Walls					
		Cutter Soil Mix Wall	20,989	SF	$ 20.00	$ 419,780
		Shotcrete (w/Fiber Reinforcement)	15,865	SF	$ 12.45	$ 197,520
		Welded Wire Mesh (6x6 - W4xW4)	159	CSF	$ 78.50	$ 12,454
		Smooth Finish	15,865	SF	$ 0.75	$ 11,899
	Concrete Base/Plug					
		Concrete/Rebar	1,513	CY	$ 195.00	$ 295,074
	Basin Cover					
		Decking (Concrete)	222	CY	$ 850.00	$ 188,721
		Decking (Rebar @ 205 lbs/CY concrete, FDOT)	45,515	LBS	$ 1.10	$ 50,067
		Precast/Prestressed I-Girders (AASHTO Type IV)	796	LF	$ 190.00	$ 151,240
	Excavation					
		General	16,998	CY	$ 70.00	$ 1,189,880
	Anchoring					
		Tiedown Soil Anchors (10' on center)	0	EA	$ 4,200.00	$ -
	Spoil Offhaul and Disposal:					
		Fill (Assumes Class III)	2,554	TON	$ 38.00	$ 97,034
		Bay Mud/Peat (Assumes Class II)	6,128	TON	$ 47.00	$ 288,038
		Native Soil (Assumes Class III)	18,471	TON	$ 38.00	$ 701,879
	Elevated Equipment/Access Deck					
		Concrete Perimeter Beams (2@12"x12")	12	CY	$ 259.00	$ 3,044
		Angle Support (4.5' @12' OC)	27	EA	$ 927.00	$ 25,029
		1.5" Alum. Grating	1,257	SF	$ 56.93	$ 71,540
		C10x4.25 (2)	603	LF	$ 163.58	$ 98,669
		Guardrail	286	LF	$ 106.95	$ 30,575
Subtotal						*$ 3,832,443*
Basin Appurtenances						
	Pumps		2	EA	$ 53,000.00	$ 106,000
	Controls		1	Allowance	$ 80,000.00	$ 80,000
	Standby Power		1	Allowance	$ 150,000.00	$ 150,000
	Foundation and Fencing		1	Allowance	$ 64,000.00	$ 64,000
	Washdown/10' of Header		31	EA	$ 11,000.00	$ 341,000
	Odor Control					
		Odor Control Bed (2,025 sf x 6 ft)	1	Allowance	$ 100,000.00	$ 100,000
		Ductwork and 2 Fans	1	Allowance	$ 100,000.00	$ 100,000
	Miscellaneous Piping		1	Allowance	$ 80,000.00	$ 80,000
Subtotal						*$ 1,021,000*

(Table 5-9 Continued)

Pipes					
	Diversion Manhole	1	EA	$ 10,000.00	$ 10,000
	Manhole	4	EA	$ 10,000.00	$ 40,000
	24" Diameter Gravity (Pilot Guided Augur Boring)	1,460	LF	$ 900.00	$ 1,314,000
	Boring Pit	7	EA	$ 100,000.00	$ 700,000
	24" Diameter Gravity (Open Cut in Wet Sand)	40	LF	$ 480.00	$ 19,200
	Interlocking Sheet Piles (15' deep)	1,200	SF	$ 12.00	$ 14,400
	12" Diameter Force Main (Open Cut)	240	LF	$ 240.00	$ 57,600
Subtotal					*$ 2,155,200*
Other					
	Dewatering (4 sump pumps and treatment)	1	Allowance	$ 10,000.00	$ 10,000
	Contaminated Groundwater Treatment	1	Allowance	$ 50,000.00	$ 50,000
	Paving (Partial New Parking Lot (200'x140'))	3,111	SY	$ 50.00	$ 155,556
	Paving (Force main trench)	53	SY	$ 50.00	$ 2,667
	Sidewalks	0	SF	$ 5.00	$ -
	Traffic Control	1	Allowance	$ 53,000.00	$ 53,000
	Lot Improvements				
	Install Turf	1	TSF	$ 400.00	$ 400
	Shrubs (10' OC)	10	EA	$ 50.00	$ 500
	Flood Protection Measures	1	Allowance	$ 20,000.00	$ 20,000
	Utility Relocation	1	Allowance	$ 500,000.00	$ 500,000
	Park and Ride Relocation	0	Allowance	$ 100,000.00	$ -
Subtotal					*$ 792,122*
Construction Subtotal					$ 7,800,765
Contractor Costs					
	Mobilization/Demobilization		% of Const. Subtotal	5%	$ 390,038
	Contractor Overhead and Profit		% of Const. Subtotal	15%	$ 1,170,115
	Change Order Allowance		% of Const. Subtotal	5%	$ 390,038
Subtotal					*$ 1,950,191*
Professional Services					
	Environmental Documentation/Permitting	1	Allowance	$ 350,000.00	$ 350,000
	Engineering		% of Const. Subtotal	10%	$ 780,077
	Legal		% of Const. Subtotal	2%	$ 156,015
	Construction Management		% of Const. Subtotal	10%	$ 780,077
Subtotal					*$ 2,066,168*
Design and Construction Contingency	Subtotal of Above				$ 11,817,125
			% of Project Subtotal	25%	$ 2,954,281
Subtotal					*$ 14,771,406*
Real Estate Costs					
	Property Acquisition	53,800	SF	$ 40.00	$ 2,152,000
	Property Sale	0	SF	$ (40.00)	$ -
Subtotal					$ 2,152,000
Total (10/2013 Dollars)	CCI = 9,689				$ 16,900,000
Total (6/2016 Dollars)	CCI = 10,238 (Projected)				**$ 17,900,000**

Table 5-10: Total Project Costs for Site Alternative 3B

Basin & Site Summary

Tank Inner Diameter	100	Ft	Fill Depth	5	Ft
Cutter Soil Mix Wall Thickness	30	Inch	Bay Mud/Peat Depth	15	Ft
Shotcrete Wall Thickness	12	Inch	Native Soil Depth	36	Ft
Decking Thickness	8	Inch	Total Excavation Depth	56	Ft
Girder Depth	4.5	Ft			
Access Depth	7	Ft			
Tipping Bucket Depth	2	Ft			
Free Space Depth	1	Ft			
Storage Depth	36	Ft			
Foundation Thickness	5	Ft			
Cutter Soil Mix Cutoff Wall Depth	10	Ft			

Project Element	Category	Sub-Category	Quantity	Unit	Unit Cost	Extended Cost
Basin Structure						
	Basin Walls					
		Cutter Soil Mix Wall	20,989	SF	$ 20.00	$ 419,780
		Shotcrete (w/Fiber Reinforcement)	15,865	SF	$ 12.45	$ 197,520
		Welded Wire Mesh (6x6 - W4xW4)	159	CSF	$ 78.50	$ 12,454
		Smooth Finish	15,865	SF	$ 0.75	$ 11,899
	Concrete Base/Plug					
		Concrete/Rebar	1,513	CY	$ 195.00	$ 295,074
	Basin Cover					
		Decking (Concrete)	222	CY	$ 850.00	$ 188,721
		Decking (Rebar @ 205 lbs/CY concrete, FDOT)	45,515	LBS	$ 1.10	$ 50,067
		Precast/Prestressed I-Girders (AASHTO Type IV)	796	LF	$ 190.00	$ 151,240
	Excavation					
		General	16,998	CY	$ 70.00	$ 1,189,880
	Anchoring					
		Tiedown Soil Anchors (10' on center)	0	EA	$ 4,200.00	$ -
	Spoil Offhaul and Disposal:					
		Fill (Assumes Class III)	2,554	TON	$ 38.00	$ 97,034
		Bay Mud/Peat (Assumes Class II)	6,128	TON	$ 47.00	$ 288,038
		Native Soil (Assumes Class III)	18,471	TON	$ 38.00	$ 701,879
	Elevated Equipment/Access Deck					
		Concrete Perimeter Beams (2@12"x12")	12	CY	$ 259.00	$ 3,044
		Angle Support (4.5' @12' OC)	27	EA	$ 927.00	$ 25,029
		1.5" Alum. Grating	1,257	SF	$ 56.93	$ 71,540
		C10x4.25 (2)	603	LF	$ 163.58	$ 98,669
		Guardrail	286	LF	$ 106.95	$ 30,575
Subtotal						*$ 3,832,443*
Basin Appurtenances						
	Pumps		2	EA	$ 53,000.00	$ 106,000
	Controls		1	Allowance	$ 80,000.00	$ 80,000
	Standby Power		1	Allowance	$ 150,000.00	$ 150,000
	Foundation and Fencing		1	Allowance	$ 64,000.00	$ 64,000
	Washdown/10' of Header		31	EA	$ 11,000.00	$ 341,000
	Odor Control					
		Odor Control Bed (2,025 sf x 6 ft)	1	Allowance	$ 100,000.00	$ 100,000
		Ductwork and 2 Fans	1	Allowance	$ 100,000.00	$ 100,000
	Miscellaneous Piping		1	Allowance	$ 80,000.00	$ 80,000
Subtotal						*$ 1,021,000*

(Table 5-10 Continued)

Pipes					
	Diversion Manhole	2	EA	$ 10,000.00	$ 20,000
	Manhole	8	EA	$ 10,000.00	$ 80,000
	24" Diameter Gravity (Pilot Guided Augur Boring)	150	LF	$ 900.00	$ 135,000
	Boring Pit	2	EA	$ 100,000.00	$ 200,000
	24" Diameter Gravity (Open Cut)	1,875	LF	$ 480.00	$ 900,000
	Interlocking Sheet Piles (12' deep)	45,000	SF	$ 12.00	$ 540,000
	12" Diameter Force Main (Open Cut)	240	LF	$ 240.00	$ 57,600
Subtotal					*$ 1,932,600*
Other					
	Dewatering (4 sump pumps and treatment)	1	Allowance	$ 10,000.00	$ 10,000
	Contaminated Groundwater Treatment	1	Allowance	$ 50,000.00	$ 50,000
	Paving (Partial New Parking Lot (200'x140'))	3,111	SY	$ 50.00	$ 155,556
	Paving (Force main trench)	53	SY	$ 50.00	$ 2,667
	Paving (Street and Skate Park Lot))	8,978	SY	$ 50.00	$ 448,889
	Sidewalks	0	SF	$ 5.00	$ -
	Traffic Control	1	Allowance	$ 53,000.00	$ 53,000
	Lot Improvements				
	Install Turf	1	TSF	$ 400.00	$ 400
	Shrubs (10' OC)	10	EA	$ 50.00	$ 500
	Flood Protection Measures	1	Allowance	$ 20,000.00	$ 20,000
	Utility Relocation	1	Allowance	$ 500,000.00	$ 500,000
	Park and Ride Relocation	0	Allowance	$ 100,000.00	$ -
Subtotal					*$ 1,241,011*
Construction Subtotal					$ 8,027,054
Contractor Costs					
	Mobilization/Demobilization		% of Const. Subtotal	5%	$ 401,353
	Contractor Overhead and Profit		% of Const. Subtotal	15%	$ 1,204,058
	Change Order Allowance		% of Const. Subtotal	5%	$ 401,353
Subtotal					*$ 2,006,763*
Professional Services					
	Environmental Documentation/Permitting	1	Allowance	$ 350,000.00	$ 350,000
	Engineering		% of Const. Subtotal	10%	$ 802,705
	Legal		% of Const. Subtotal	2%	$ 160,541
	Construction Management		% of Const. Subtotal	10%	$ 802,705
Subtotal					*$ 2,115,952*
Design and Construction Contingency	Subtotal of Above				$ 12,149,769
			% of Project Subtotal	25%	$ 3,037,442
Subtotal					*$ 15,187,212*
Real Estate Costs					
	Property Acquisition	53,800	SF	$ 40.00	$ 2,152,000
	Property Sale	0	SF	$ (40.00)	$ -
Subtotal					$ 2,152,000
Total (10/2013 Dollars)	CCI = 9,689				$ 17,300,000
Total (6/2016 Dollars)	CCI = 10,238 (Projected)				**$ 18,300,000**

5.4 Site 4: Linda Mar Pump Station

Site Introduction

The Site Alternative 4 (formerly known as Site D) basin and potential pipeline alignment are shown in Figure 5-8. As can be seen, the site is located at the Linda Mar Pump Station. It is the closest site to the beach being considered in this chapter. Table 5-11 summarizes some of the infrastructure characteristics proposed for this site. The sections below summarize some key physical parameters of Site 4.

Table 5-11: Site Alternative 4 Infrastructure Dimensions and Rates

Parameter	Dimension
Basin Inner Diameter	100 feet
Depth from Ground to: Maximum Water Surface Basin Floor	 15 feet 51 feet
Gravity Pipeline Length/Diameter	200 feet/24 inches
Force main Length/Diameter	100 feet (including vertical pump discharge)/12 inches
Basin Drainage Time/Flow Rate	30 hours/1.7 mgd

The basin drainage time assumes a discharge to the existing 12-inch sewer within the Linda Mar Pump Station parcel. Modeling indicates that there is approximately 1.7 mgd capacity available within the existing sewer without causing surcharging and a backwater condition upstream. If 2.1 mgd were to be discharged to the sewer (to drain the basin within 24 hours) surcharge and backwater would be expected but overflows would not be expected. Further field surveys are recommended to confirm the actual capacity and horizontal alignment of the pipeline. Addressing the hydraulic capacity limitation is anticipated to be costly to correct as it likely involves additional pipe replacement for beachfront sewer between Crespi Dr. and the Linda Mar Pump Station. It would also require consultation with and potential permit requirements from the Coastal Commission to obtain more rapid drain times.

Figure 5-8: Potential Basin Location and Pipeline Alignment at Site Alternative 4

Source: City of Pacifica

Construction for Site Alternative 4 is estimated to be complete by the end of June 2019. This is six months after the RWQCB deadline.

Size and Suitability

This site currently functions as a parking lot providing access to the pump station and beach. This type of use is compatible with the post project site condition so there does not appear to be any long-term conflict with the current use. This parcel is zoned as a site for public facilities and is identified as beach/commuter parking in the latest projection of land use for the Pacifica General Plan Update (*General Plan Public Review Draft*). It appears therefore that there should not be any conflict with planned future uses either.

Some of the parking spaces may be eliminated due to surface features, but overall the City does not believe there would be revenue generation implications due to selection of this site as the preferred basin location.

The basin shown in Figure 5-8 assumes an inner diameter of approximately 100 feet. The parking lot has adequate room for construction and staging. It is unknown at this time whether additional parking would need to be made available since there appear to be numerous parking spaces available for beach access. This construction impact would be evaluated during the environmental documentation phase of the project to determine appropriate mitigation.

Adjacent Land Uses

Site Alternative 4 is bounded by the Linda Mar Pump Station to the southwest, the beach to the northwest, an adjacent parking lot to the northeast, and Highway 1 to the southeast. There is a Taco Bell restaurant approximately 50 feet to 100 feet from the basin site. However, there are no residences within about 160 feet. This makes the adjacent land uses relatively good compared to Site Alternatives 1A, 2A, and 2B but not as favorable as Sites 3A and 3B. It is anticipated that the entire pump station area would be closed to public access during construction to facilitate construction and reduce risk to the public.

A significant portion of the parking lot at Site 4 would serve as the construction area. It is unknown at this time whether the remaining portion of the parking lot would need to be closed to reduce public risk and construction interference. This parking lot is heavily used as it is parking for beach users. It is anticipated that parking lost during construction would likely be absorbed by other existing parking areas, decreasing the total number of parking spaces in the area.

Parcel Ownership

This site is owned by the City of Pacifica and therefore would avoid the cost of land purchase. The City is willing to allow siting of the basin on this parcel.

Geotechnical Considerations

Site Alternative 4 is underlain by primarily sand dune deposits with a cover layer of artificial fill. The sand dune deposits consist predominately of loose medium-to coarse-grained sand and may also include gravel and cobbles. The depth of the deposits are reported to be typically less than 19 feet. Site 4 was likely located on the sand dune that separated the coastal lagoon from the Pacific Ocean.

A geotechnical boring at Site Alternative 4 was completed for this study. Table 5-12 summarizes the soil encountered by this boring.

Based on the condition of the existing pavement by the pump station, it appears that about 2 inches of differential settlement has occurred at this site. The settlement could be the result of densification of the retaining wall backfill, fill induced consolidation of underlying clays, and/or peat decomposition. The composition of the fill and this differential settlement indicates that some additional stabilization of the surface soils in the area may be required for construction at this site to occur.

Table 5-12: Site Alternative 4 Soil Condition Based on Geotechnical Boring

Depth	Encountered
0" – 3"	Asphaltic concrete
3" – 7'	Fill consisting of clayey sand and graveland silty gravel with sand and cobbles. Fill was dry to moist and medium dense to dense
7' – 9'	Sandy clay
9' – 17'	Dense poorly-graded sand (i.e. old sand dune)
17' – 23'	Medium stiff peat with organic silt and clay
23' – 76.5'	Interlayered deposits of: • Medium stiff to stiff clays • Medium dense to dense clayey/silty sand with gravel

Groundwater level was not available from the boring due to the drilling method, but it was noted that the moist soils were encountered at about 8 feet depth. City staff reported that groundwater flowed through the pump station basement during a repair, indicating that the groundwater level is above the base of the pump station basement. Groundwater levels are expected to vary seasonally and may also be influenced by tidal fluctuations.

Pipeline Connections

Pipeline connections for Site Alternative 4 are relatively less complex compared to Site Alternatives 2A, 2B, 3A, and 3B. The diversion manhole would be similar to the diversion manhole of Site Alternatives 2A and 3A, and the diversion pipeline would need to cross several major storm drains and sewers near the diversion point. Relocation of the conflicting pipelines or wetwell work to avoid pipelines are options, but a lower cost option may be for the diversion pipeline to parallel the storm and sewer pipelines at a steep grade for a short distance and then make the turn towards the basin sites. The diversion pipeline connection for Site Alternative 4 does not however need to cross Highway 1, thus avoiding a Caltrans permit and casing.

The discharge force main would connect the submersible pump within the basin to the gravity sewer on-site just upstream of the Linda Mar Pump Station. It is assumed at this time that an additional penetration could be made in an existing manhole to create this connection. This will need to be confirmed during design.

Coastal Commission Jurisdiction

Although Site 4 is owned by the City, a significant consideration for selection of this site is the oversight that the Coastal Commission has west of Highway 1. Preliminary discussions with Coastal Commission staff have indicated that should a permit be required, there would be some permit conditions related to placement and appearance of the controls building as well as construction BMPs. Coastal commission staff have also suggested that this project may qualify for a waiver. However, the time needed to obtain a waiver can be significant and could significantly impact the project schedule. As no formal consultation has been performed, however, it is unknown what specific permit conditions would be required.

Ocean Impacts

Site Alternative 4 is located west of Highway 1. It is therefore considered exposed to the effects of sea level rise and is anticipated to have relatively more maintenance requirements due to salt and sand than the other three sites. It is also much more likely that the City would need to replace this facility in the future

due to coastal erosion. The present worth cost of replacement at an alternative site in the future is estimated to be approximately $6M.

Flooding

This site is within the 1% annual chance flood with additional wave hazards. Additionally, City staff have noted previous flooding at this site. To reduce the risk of flooding the basin with stormwater, it would be necessary to raise the access points, create a berm around the completely buried basin, or include some other flood protection measure. The flood depth varies based on the design flood event. It should be noted that raising the basin or creating some type of flood barrier around the basin could make obtaining a Coastal Commission permit more difficult. Whether these flood protection measures would be a fatal flaw from the perspective of the Coastal Commission or what mitigation measures would be required from the Coastal Commission are unknown. The cost estimate for this site does not reflect a detailed cost associated with flood protection since there are multiple variables associated with providing this security but does include a placeholder of $100,000. The permitting allowance is also raised to reflect the additional permitting complexity.

Estimated Project Costs

The estimated project costs for Site Alternative 4 are presented in Table 5-13. As can be seen in the table, the estimated cost for this project is approximately $18.1M at the midpoint of construction (assumed to be June 2016). These costs include an allowance for groundwater treatment for the metals found in the Site 1A environmental boring that were not likely to have been leaked from the neighboring gas station.

Table 5-13: Total Project Costs for Site Alternative 4

Basin & Site Summary

Tank Inner Diameter	100	Ft	Fill Depth	7	Ft
Cutter Soil Mix Wall Thickness	30	Inch	Bay Mud/Peat Depth	10	Ft
Shotcrete Wall Thickness	12	Inch	Native Soil Depth	39	Ft
Decking Thickness	8	Inch	Total Excavation Depth	56	Ft
Girder Depth	4.5	Ft			
Access Depth	7	Ft			
Tipping Bucket Depth	2	Ft			
Free Space Depth	1	Ft			
Storage Depth	36	Ft			
Foundation Thickness	5	Ft			
Cutter Soil Mix Cutoff Wall Depth	10	Ft			

Project Element	Category	Sub-Category	Quantity	Unit	Unit Cost	Extended Cost
Basin Structure						
	Basin Walls					
		Cutter Soil Mix Wall	20,989	SF	$ 20.00	$ 419,780
		Shotcrete (w/Fiber Reinforcement)	15,865	SF	$ 12.45	$ 197,520
		Welded Wire Mesh (6x6 - W4xW4)	159	CSF	$ 78.50	$ 12,454
		Smooth Finish	15,865	SF	$ 0.75	$ 11,899
	Concrete Base/Plug					
		Concrete/Rebar	1,513	CY	$ 195.00	$ 295,074
	Basin Cover					
		Decking (Concrete)	222	CY	$ 850.00	$ 188,721
		Decking (Rebar @ 205 lbs/CY concrete, FDOT)	45,515	LBS	$ 1.10	$ 50,067
		Precast/Prestressed I-Girders (AASHTO Type IV)	796	LF	$ 190.00	$ 151,240
	Excavation					
		General	16,998	CY	$ 70.00	$ 1,189,880
	Anchoring					
		Tiedown Soil Anchors (10' on center)	0	EA	$ 4,200.00	$ -
	Spoil Offhaul and Disposal:					
		Fill (Assumes Class III)	3,575	TON	$ 38.00	$ 135,848
		Bay Mud/Peat (Assumes Class II)	4,086	TON	$ 47.00	$ 192,025
		Native Soil (Assumes Class III)	20,003	TON	$ 38.00	$ 760,100
	Elevated Equipment/Access Deck					
		Concrete Perimeter Beams (2@12"x12")	12	CY	$ 259.00	$ 3,044
		Angle Support (4.5' @12' OC)	27	EA	$ 927.00	$ 25,029
		1.5" Alum. Grating (	1,257	SF	$ 56.93	$ 71,540
		C10x4.25 (2)	603	LF	$ 163.58	$ 98,669
		Guardrail	286	LF	$ 106.95	$ 30,575
Subtotal						*$ 3,833,464*
Basin Appurtenances						
	Pumps		2	EA	$ 53,000.00	$ 106,000
	Controls		1	Allowance	$ 80,000.00	$ 80,000
	Standby Power		1	Allowance	$ 150,000.00	$ 150,000
	Foundation and Fencing		1	Allowance	$ 64,000.00	$ 64,000
	Washdown/10' of Header		31	EA	$ 11,000.00	$ 341,000
	Odor Control					
		Odor Control Bed (2,025 sf x 6 ft)	1	Allowance	$ 100,000.00	$ 100,000
		Ductwork and 2 Fans	1	Allowance	$ 100,000.00	$ 100,000
	Miscellaneous Piping		1	Allowance	$ 80,000.00	$ 80,000
Subtotal						*$ 1,021,000*

(Table 5-13 Continued)

Pipes					
	Diversion Manhole	1	EA	$ 10,000.00	$ 10,000
	Manhole	1	EA	$ 10,000.00	$ 10,000
	24" Diameter Gravity (Pilot Guided Augur Boring)	0	LF	$ 900.00	$ -
	Boring Pit	0	EA	$ 100,000.00	$ -
	24" Diameter Gravity (Open Cut in Wet Sand)	200	LF	$ 480.00	$ 96,000
	Interlocking Sheet Piles (15' deep)	6,000	SF	$ 12.00	$ 72,000
	12" Diameter Force Main (Open Cut)	60	LF	$ 240.00	$ 14,400
Subtotal					*$ 202,400*
Other					
	Dewatering (4 sump pumps and treatment)	1	Allowance	$ 10,000.00	$ 10,000
	Contaminated Groundwater Treatment	1	Allowance	$ 50,000.00	$ 50,000
	Paving (Basin Diameter + 20' buffer)	1,408	SY	$ 50.00	$ 70,376
	Paving (Force main trench)	20	SY	$ 50.00	$ 1,000
	Sidewalks	0	SF	$ 5.00	$ -
	Traffic Control	0	Allowance	$ 53,000.00	$ -
	Lot Improvements				
	Install Turf	1	TSF	$ 400.00	$ 400
	Shrubs (5' OC)	40	EA	$ 50.00	$ 2,000
	Flood Protection Measures	1	Allowance	$ 100,000.00	$ 100,000
	Utility Relocation	1	Allowance	$ 500,000.00	$ 500,000
	Park and Ride Relocation	0	Allowance	$ 100,000.00	$ -
	Land Acquisition	0	Allowance	$ -	$ -
Subtotal					*$ 733,776*
Construction Subtotal					$ 5,790,640
Contractor Costs					
	Mobilization/Demobilization		% of Const. Subtotal	5%	$ 289,532
	Contractor Overhead and Profit		% of Const. Subtotal	15%	$ 868,596
	Change Order Allowance		% of Const. Subtotal	5%	$ 289,532
Subtotal					*$ 1,447,660*
Professional Services					
	Environmental Documentation/Permitting	1	Allowance	$ 400,000.00	$ 400,000
	Engineering		% of Const. Subtotal	10%	$ 579,064
	Legal		% of Const. Subtotal	2%	$ 115,813
	Construction Management		% of Const. Subtotal	10%	$ 579,064
Subtotal					*$ 1,673,941*
Design and Construction Contingency	Subtotal of Above				$ 8,912,241
			% of Project Subtotal	25%	$ 2,228,060
Subtotal					*$ 11,140,302*
Real Estate Costs					
	Property Acquisition	0	SF	$ 40.00	$ -
	Property Sale	0	SF	$ (40.00)	$ -
Subtotal					$ -
Sea Level Rise					
	Present Worth Cost of Replacement at Alternate Site*	1	Allowance	$ 5,960,000.00	$ 5,960,000
Total (10/2013 Dollars)	CCI = 9,689				$ 17,100,000
Total (6/2016 Dollars)	CCI = 10,238 (Projected)				**$ 18,100,000**

* Replacement cost may vary depending on time of replacement, inflation, and interest rates.

Chapter 6 Findings and Recommendations

6.1 Site Findings

A summary of each site, highlighting the most significant advantages and disadvantages, and information discussed in the previous chapters is provided in Table 6-1.

Table 6-1: Summary of Findings and Costs for Shortlisted Site Alternatives

Item	Site 1A	Site 2A	Site 2B	Site 3A	Site 3B	Site 4
Location	Linda Mar Blvd. Park and Ride Lot – West end of parcel	Skate Park Parking Lot with pipelines crossing and parallel to Hwy 1	Skate Park Parking Lot with pipeline alignments that avoid Hwy 1	Crespi Parking Lot with pipelines crossing and parallel to Hwy 1	Crespi Parking Lot with Alternate Pipeline Alignment	Linda Mar Pump Station Parking Lot
Principal Advantage(s)	• Inland of Highway 1 so basin is protected from sea level rise and outside of the Coastal Commission review zone. • Relatively far from the shoreline so facilities are less exposed to ocean impacts such as salt and sand. • Relatively close to the diversion point and very close to the discharge point, reducing pipeline installation cost and impacts. • New pipelines would not need to cross Highway 1. • Least impact to existing use of all of the sites during construction due to total area available for parking and bus operation	• Inland of Highway 1 so basin is protected from sea level rise and outside of the Coastal Commission review zone. • Relatively far from the shoreline so facilities are less exposed to ocean impacts such as salt and sand.	• Inland of Highway 1, so basin is protected from sea level rise and outside of the Coastal Commission review zone. • Relatively far from the shoreline so facilities are less exposed to ocean impacts such as salt and sand. • Relatively far from privately owned structures and residences reducing the chance of negative perception and claims. • New pipelines would not need to cross Highway 1.	• Inland of Highway 1, so basin is protected from sea level rise and outside of the Coastal Commission review zone. • Relatively far from the shoreline so facilities are less exposed to ocean impacts such as salt and sand. • Relatively far from privately owned structures and residences reducing the chance of negative perception and claims. • Potentially improved revenue generation due to avoided lease cost.	• Inland of Highway 1 so basin is protected from sea level rise and outside of the Coastal Commission review zone. • Relatively far from the shoreline so facilities are less exposed to ocean impacts such as salt and sand. • Relatively far from privately owned structures and residences reducing the chance of negative perception and claims. • Potentially improved revenue generation due to avoided lease cost. • New pipelines would not need to cross Highway 1.	• Locates basin on same site as Linda Mar Pump Station. • Relatively far from privately owned structures and residences reducing the chance of negative perception and claims. • Relatively close to diversion point, reducing pipeline installation costs and impacts.
Principal Disadvantage(s)	• Smaller site which may increase cost due to inconvenience to contractor. • Close to privately owned structures and residences increasing the chance of negative perception and claims. • General plan designation as mixed use and potential loss of revenue due to limited future site use.	• Smaller site which may increase cost due to inconvenience to contractor. • Close to privately owned structures and residences increasing the chance of negative perception and claims. • Relatively far from the diversion point, increasing pipeline installation costs and impacts. • Loss of free Community Center parking during construction.	• Smaller site which may increase cost due to inconvenience to contractor. • Relatively far from the diversion point, increasing pipeline installation costs and impacts. • Loss of free Community Center parking during construction.	• Relatively far from the diversion point, increasing pipeline installation costs and impacts. • Most impact to existing use of all of the sites during construction because of the multiple amenities that are associated with this parking lot and the relatively high usage.	• Relatively far from the diversion point, increasing pipeline installation costs and impacts. • Most impact to existing use of all of the sites during construction because of the multiple amenities that are associated with this parking lot and the relatively high usage.	• West of Highway 1, exposing basin to the effects of sea level rise and putting the basin within the Coastal Commission review zone. Sea level rise and coastal erosion could lead to early replacement of basin. • Flood protection for this site may introduce additional project scrutiny from the Coastal Commission. • Closest site to shoreline so facilities are the most exposed to ocean impacts such as salt and sand.
Site Ownership	Caltrans	City	City	Caltrans	Caltrans	City
Owner Willing to Sell?	• Willing to subdivide parcel and sell west end to City.	• Not applicable as this property is City-owned.	• Not applicable as this property is City-owned.	• Yes, conditional on determination of stewardship of gifts and historic markers.	• Yes, conditional on determination of stewardship of gifts and historic markers.	• Not applicable as this property is City-owned.
Permitting	• Avoids Caltrans and Coastal Commission permitting	• Permit from Caltrans required for Highway 1 crossing. • Coordination and possible permit from the Coastal Commission for diversion pipeline.	• Avoids Caltrans and Coastal Commission permitting	• Permit from Caltrans required for Highway 1 crossing. • Coordination and possible permit from the Coastal Commission for diversion pipeline and due to visibility of site from Highway 1.	• Could require Coastal Commission permitting because site is readily visible from Highway 1.	• Basin would require review and likely permitting from the Coastal Commission for basin, pipelines, and associated facilities.

Item	Site 1A	Site 2A	Site 2B	Site 3A	Site 3B	Site 4
Construction Completion Date[a]	• Construction estimated to be complete on 6/30/2018 • 6 months prior to regulatory requirement	• Construction estimated to be complete on 12/31/2018 • 0 months prior to regulatory requirement	• Construction estimated to be complete on 6/30/2018 • 6 months prior to regulatory requirement	• Construction estimated to be complete on 12/31/2018 • 0 months prior to regulatory requirement	• Construction estimated to be complete on 6/30/2018 • 6 months prior to regulatory requirement	• Construction estimated to be complete on 6/30/2019 • 6 months after regulatory requirement
Other Considerations	• This site is relatively close to existing and past gas stations, increasing the risk for soil contamination. • This site has a joint use as a bus station that may need to be relocated during construction based on final siting. • Unknown timeframe for acquisition.	• This site would require construction under and next to a natural area. This could lead to additional environmental precautions. • Basin requires more than one day to empty due to current sewer capacity restrictions.	• This site would require construction next to a natural area. This could lead to additional environmental precautions. • Basin requires more than one day to empty due to current sewer capacity restrictions.	• This site would require construction next to a natural area. This could lead to additional environmental precautions. • Basin requires more than one day to empty due to current sewer capacity restrictions. • Unknown timeframe for acquisition.	• This site would require construction next to a natural area. This could lead to additional environmental precautions. • Basin requires more than one day to empty due to current sewer capacity restrictions. • Unknown timeframe for acquisition.	• This site may require additional geotechnical work to prepare the ground for construction. • Basin requires more than one day to empty due to current sewer capacity restrictions.
Basin Dimensions (internal)	81 ft diam x 70 ft depth	95 ft diam x 55 ft depth	95 ft diam x 55 ft depth	100 ft diam x 52 ft depth	100 ft diam x 51 ft depth	100 ft diam x 51 ft depth
Basin Cost	$3.4M	$3.7M	$3.7M	$3.8M	$3.8M	$3.8M
Associated Improvements Cost	$2.1M	$4.0M	$4.0M	$4.0M	$4.2M	$2.0M
Professional Services and Contractor Costs	$2.9M	$4.0M	$4.0M	$4.0M	$4.1M	$3.1M
Contingency	$2.1M	$2.9M	$2.9M	$3.0M	$3.0M	$2.2M
Land and Replacement Costs	$1.8M	$0	$0	$2.2M	$2.2M	$6.0M[b]
Estimated Total Project Cost, in 2013$[c, d]	**$12.3M**	**$14.5M**	**$14.6M**	**$16.9M**	**$17.3M**	**$17.1M**
Estimated Total Project Cost in 2016$[e]	**$13.0M**	**$15.3M**	**$15.4M**	**$17.9M**	**$18.3M**	**$18.1M**

Footnotes:

[a] See Attachment D for additional detail regarding City staff project schedule input.

[b] Cost reflects estimated abandonment and replacement cost due to sea level rise at this location.

[c] Estimated total project cost may not reflect sum of above components due to rounding errors.

[d] Costs reflect the same unit costs as originally estimated in 2013 for previous draft versions of this report.

[e] Costs in 2016 $ reflect inflation escalation to a presumed mid-point of construction of June 2016

6.2 Evaluation and Comparison of Site Alternatives

The shortlisted site alternatives were evaluated and compared using the following criteria in Table 6-2. Also listed in that table are the scores used to quantify how well (or poorly) a given alternative met a given criterion. The criteria scoring ranged from -2 if the impact was strongly negative, to +2 if it was strongly positive.

Table 6-2: Description of Criteria and Scores Used in Comparison Matrix

Criteria	Description	Additional Notes
Long-term Impact to Residents and Local Amenities	Potential impacts, or perception of those impacts, to nearby residents, businesses, and facilities. Such concerns could include odor, noise, and visual impacts.	This criterion is particularly sensitive to adjacent residences and businesses. Considered to be a primary factor.
Construction Impact to Residents and Local Amenities	Impacts related to noise, vibration, dust, and loss of parking during construction.	This criterion is sensitive to nearby residences and businesses as well as the "day use" parking public. Considered to be a primary factor.
Willing Landowner	Willingness of landowner to sell the site to the City	Lack of willing owner is considered a fatal flaw.
Vulnerability to Sea Level Rise and Flooding	Vulnerability of the site to flooding or wave erosion due to sea level rise and/or location within 100 yr flood plain. Cost or difficulty of addressing flooding also considered.	Considered to be a primary factor.
Cost	Total project capital cost is included (construction, design, admin, etc)	Considered to be a primary factor.
Schedule	Amount of schedule float between estimated construction completion and regulatory completion requirement.	Considered to be a primary factor. Project schedule estimates provided in consultation with City staff.
Compatibility with Existing and Planned Land Use	How well a site alternative fits with the existing land use and zoning.	All of the alternative sites would allow resumption of parking lot function, but may require zoning modifications
Impact on City Revenue	Considers income disruption from paid parking areas impacted by construction or siting of basin and cessation of lease costs to other land owners	An issue for Site Alternatives 1A, 3A, and 3B
Permitting	Ability of alternative to avoid or minimize the need for Caltrans and/or Coastal Commission consultation and permitting	Considered a primary factor due to potential impact on project schedule.

Criteria	Description	Additional Notes
Exposure to Salt and Sand Impacts	Site Alternatives closest to the ocean are prone to greater maintenance costs due to salt corrosion and sand impacts	
Geotechnical and Soil Contamination Considerations	Impact of site variations on the cost or difficulty of construction	Soil borings were taken at 3 of the four parcels under consideration.
Constructible	Pass/Fail test for the project alternative	

Scores	Description	Additional Notes
2	Direct feedback that is positive; Strong indication that criteria and project are a good fit	
1	Positive indication or anticipated positive response; Likely a good fit between the criteria and project	
0	Neutral or unknown	
-1	Negative indication or anticipated negative response; Likely to be a poor fit between the criteria and project	
-2	Direct feedback that is negative; Strong indication that criteria and project are not a good fit	
Yes	Constructible	Applies to Constructible criteria
No	Not Constructible - Fatal Flaw	Applies to Constructible criteria

The matrix shown below in Table 6-3 quantifies how well each site alternative meets the evaluation criteria used in this analysis.

Table 6-3: Site Priority Decision Matrix

			Site Alternatives					
Criteria	Weighting Factor	Relative Importance	1A	2A	2B	3A	3B	4
Long-term Impact to Residents and Local Amenities	4	12%	-1	0	0	1	1	1
Construction Impact to Residents and Local Amenities	4	12%	1	-1	-1	0	-1	0
Willing Landowner	4	12%	1	2	2	1	1	2
Vulnerability to Sea Level Rise and Flooding	4	12%	0	0	0	1	2	-2
Cost	4	12%	2	1	1	0	-1	-1
Schedule*	4	12%	1	0	1	0	1	-2
Compatibility with Existing and Planned Landuse	1	3%	-1	1	1	1	1	2
Impact on City Revenue	2	6%	-1	0	0	1	1	0
Permitting	3	9%	1	-2	1	-2	0	-2
Exposure to Salt and Sand Impacts	1	3%	2	2	2	1	1	-1
Geotechnical Considerations	2	6%	2	2	2	2	2	1
Sum of Weighting Factors	*33*	100%						
Constructible			Yes	Yes	Yes	Yes	Yes	Yes
Score			22	9	22	14	20	-11
Tier			1	2	1	2	1	2

* Schedule ratings based on input provided by City staff and included in Attachment D.

6.3 Recommended Site Alternatives

As can be seen in Table 6-3, the following alternatives are top ranked, can be constructed prior to the RWQCB deadline of 31 December 2018, and should be considered the best alternatives from which the City Council can make a final recommendation:

- **Site Alternative 1A (Linda Mar Blvd. Park & Ride Lot)** – This alternative would have the minimum amount of associated pipeline work and would avoid Caltrans and Coastal Commission permitting requirements. Because the site is owned by Caltrans, it would involve purchasing the western end of the parcel; they are willing to subdivide the parcel and sell only this portion. The schedule and timeline for acquisition is considered to be on the order of 18 months at this time. This site is located next to an existing gas station that does not have double containment for its storage tanks. Based on environmental borings and analysis, Site 1A appears to have very low levels of hydrocarbon contamination in the groundwater that would be expected due to the proximity to the gas station. There are also concentrations of metals found in the groundwater sample that are above environmental screening levels. Water from dewatering would need to be treated to address the fuel contamination and metal concentrations prior to discharge. The soil samples indicate that the hydrocarbon and metals concentrations are below the total threshold concentration limit and can therefore be disposed of at a local Class 3 landfill. The equalization basin would be approximately 81 feet in inner diameter, 70 feet deep and would be within 20 feet of neighboring residential property lines.

  Estimated capital cost: $13.0 million.

- **Site Alternative 2B (Skate Park Parking Lot)** – This site is owned by the City and therefore would not require land purchase. Associated pipelines would be constructed through residential streets, but would avoid paralleling Highway 1. Caltrans and Coastal Commission permitting would not be needed for this alternative. It is assumed that the same groundwater treatment

needed for Site Alternative 1A would be needed for Site Alternative 2B. The equalization basin would be approximately 95 feet in inner diameter, 55 feet deep and would be within 45 feet of neighboring residential property lines. This site alternative has the lowest schedule risk because it avoids the need to purchase the parcel, and avoids the need for Caltrans and Coastal Commission permitting.

Estimated capital cost: $15.4 million.

- **Site Alternative 3B (Crespi Parking Lot)** – This site would be furthest from neighboring residential property lines (approximately 350 to 400 feet), and therefore may be raise less concerns with local residents. This site is owned by Caltrans and would require land purchase from Caltrans. Because of its close proximity to Highway 1, Coastal Commission permitting would probably be required. Although the expected permit requirements would be readily met by the envisioned basin, obtaining this permit could add 6 to 12 months to the project schedule. This alternative would route associated pipelines through residential streets, which would therefore avoid Highway 1 and the need for Caltrans permitting. It is assumed that the same groundwater treatment needed for Site Alternative 1A would be needed for Site Alternative 2B. The equalization basin would be approximately 100 feet in inner diameter and 51 feet deep.

  Estimated capital cost: $18.3 million.

The other site alternatives scored lower than the above alternatives due to need for Coastal Commission permitting of the basin or influent pipeline, Caltrans permitting of pipelines parallel to, and crossing, Highway 1, vulnerability to flooding and sea level rise, or an estimated project schedule that does not meet the required regulatory timeframe.

Attachment A - Preliminary Geotechnical Report

City of Pacific
Wet Weather Basin Project
Pacifica, California

Geotechnical Engineering Siting Study

December 27, 2012

Prepared for:

RMC Water and Environment

and

Prepared by:

JACOBS ASSOCIATES
Engineers/Consultants

Jacobs Associates
484 North Wiget Lane
Walnut Creek, CA 94598

Distribution

To: Tim Harrison, PE
RMC Water and Environment
701 Ocean Street, Room 410
Santa Cruz, CA 95060

From: Robert Kahl, PE, GE
Jacobs Associates

Prepared By: Robert Kahl, PE, GE and
Mark Pinske, ET
Jacobs Associates

Table of Contents

List of Figures

List of Appendices

1 Introduction

This report presents the results of a geotechnical engineering siting study for the City of Pacifica's (City) planned Wet Weather Basin. The City is currently planning for 2.1-MG underground basin to be located Linda Mar area in the southern portion of the City (see Figure 1).

Project details stated herein, such as potential wet weather basin sites (herein referred to as basin sites) and rough basin dimensions were provided by RMC Water and Environment (2012).

1.1 Project Description

The City and RMC are currently considering the following six basin sites:

- Caltrans Parking Lot (Site A)
- Skate Park Parking Lot (Site B)
- Community Center Site (Site C1)
- Vacant Caltrans Parcel (Site C2)
- Linda Mar Pump Station Parking Lot (Site D)
- City Beach Parking Lot (Site E)

The locations of the basin sites are shown on Figure 2. The basin locations and sizes shown on Figure 2 are representative only and are based on a conceptual drawing by RMC for City review. The diameters of the potential basins will be partially based on the site constraints and could range from 75 feet to 150 feet. Inside basin depths for a 2.1 MG basin could range from approximately 63.5 feet (for a 75-foot-inside-diameter basin) to 16 feet (for a 150-foot-inside-diameter basin).

1.2 Purpose and Scope of Work

The purpose of this geotechnical engineering siting study is to evaluate the six basin sites from a geologic and geotechnical perspective (i.e., excavation retention systems, dewatering, ground improvement requirements, foundation type, constructability, and long-term performance issues)

This report presents a summary of geologic and geotechnical conditions and construction constraints along with geologic and geotechnical impacts on project design, construction and long-term performance for each of the six basin sites. The scope of work for the project was defined in Exhibit A of the Subconsultant Agreement for Services between RMC Water and Environment and Jacob Engineers dated April 12, 2012 and Amendment No. 1 to the Subconsultant Agreement dated October 3, 2012.

2 Method of Evaluation

The geotechnical engineering evaluation of the six potential basin sites included:

- Geologic, seismic, historic development and geotechnical research;

- Site reconnaissance of each site; and
- Preliminary subsurface investigation.

2.1 Research

The site history for the basin sites was researched by:

- Review of historic topographic maps by United State Geologic Survey (USGS).
- Examination of historic aerial photographs on file at Photoscience in Emeryville, California.

The geologic and seismic setting of the basin sites was evaluated by review of published maps and reports by U.S. Geologic Survey (USGS), California Geologic Survey (CGS), and CGS's predecessor agency, California Department of Mines and Geology CDMC) including:

- Geology maps and reports
- Fault and fault rupture maps
- Liquefaction maps

The subsurface conditions at each of the basin sites was researched by review of published soil maps by the USGS, reference geotechnical reports, and geotechnical data from Geotracker site.

Historical aerial photographs were also examined for evidence of manmade alterations at, and adjacent to, the basin sites and for general geologic conditions (i.e., geomorphology).

2.2 Reconnaissance

In conjunction with our review of historic topographic maps, published geologic and geotechnical reports and examination of historic aerial photographs, we conducted a site reconnaissance of each of the potential basin sites to check site-specific surface conditions.

2.3 Preliminary Geotechnical Test Borings and Laboratory Testing

Two geotechnical test borings (i.e., Borings 1and 2) were drilled and logged to depths of approximately 76.5 feet at basin sites B and D to investigate the subsurface conditions in the area of the basin sites. The borings were drilled on September 18 and 19, 2012. The mapped locations of Borings 1 and 2 are shown on Figure B-1 in Appendix B and Figure D-1 in Appendix D. Logs of Borings 1 and 2 are provided in Figures B-3 and D-3 in Appendices B and D, respectively.

Boring 1 and Boring 2 were drilled with a Failing 1500 drill rig using a 5-inch tri-cone drill bit and rotary wash drilling methods. For the test borings, relatively undisturbed soil samples were obtained by driving a 2.5-inch inside diameter (ID), 3.0-inch outside diameter (OD), Modified California Sampler (MCS) containing brass liners into the bottom of the boring at the depth indicated on the log. Disturbed soil samples were obtained by driving a 1.4-inch ID, 2.0-inch OD Standard Penetration Test (SPT) sampler

into the bottom of the boring. A 140-pound hammer falling 30 inches per blow was used to drive MCS and SPT samplers.

The number of blows required to drive the samplers the last 12 inches of an 18-inch drive are recorded on the boring logs as penetration resistance (blows/foot). The penetration resistance values (blows/foot) recorded for SPT sampler drives on the boring logs are actual American Society for Testing and Materials (ASTM) D1586 N-values. The penetration resistance values recorded on boring logs for all MCS sampler drives are field blow counts for the sampler used and are not SPT N-values. Equivalent SPT N-values for the MCS sampler will be lower. Soil samples retrieved from the test borings were examined for classification, logged, and sealed to preserve their natural moisture content for laboratory testing. Classification systems used to log soil samples are provided in Appendix A. Descriptions of soils provided on the boring logs are based on observations during drilling and sampling and on the results of laboratory tests.

At the end of drilling each test boring, the depth to the groundwater level in the test boring was measured and logged and the test boring was backfilled with cement grout. Groundwater levels noted on the boring logs (at the time of drilling) do not represent static equilibrium groundwater levels. The static equilibrium groundwater levels may be higher or lower than the groundwater level measured in the boring at the end of drilling.

Moisture content, unit weight, Atterberg limits (i.e., liquid limit and plasticity index), grain size analysis, and direct shear tests were performed on soil samples retrieved from the test borings to evaluate their physical characteristics and engineering properties. The results of these tests are included on the Boring Logs 1 and 2 presented on Figure B-3 in Appendix B and Figure D-3 in Appendix D, respectively.

3 General Findings

This section presents the general findings of our research of the potential basin sites.

3.1 Geology

Basin sites A, B, C1 and C2 are located at the mouth of the San Pedro Valley on the southeast side of Pacific Coast Highway. Basin sites A, B and C1 are located in Artificial Fill underlain as Marine Terrace Deposits (Figure 3). Figure 3 shows basin site C1 to be underlain by Marine Terrace Deposits; however, in recent years the site has been filled-in. Figure 3 shows that basin site C2 has not been filled in and is underlain by Marine Terrace Deposits. The Artificial Fill composition and compaction is reported to be highly variable.

Basin sites D and E are located along the Linda Mar Beach on the northwest side of the Pacific Coast Highway. Basin sites D is located in fill-in area underlain by Sand Dune deposits and basin site E is underlain by sand dune deposits (Figure 3). The Sand Dune deposits consist predominately of loose medium- to coarse-grained sand and may also include gravel and cobbles. The depth of Sand Dune deposits are reported to be typically less than 6 meters (i.e., 19 feet).

Prior to infilling and draining of the San Pedro Valley (early1990's), historic topographic mapping (see Figure 4) show the basin sites were located in coastal lagoons and sand dune deposits. These coastal lagoons would fill up with valley runoff until high surf breached the coastal sand dunes and drained the lagoon (or portions of the lagoon). The former coastal lagoon, Lake Mathilde, appears to have been filled in early 1900's. Historic aerial photos (see Figure 5) show that basin sites A, B, C1 and C2 were in what appears to be undeveloped land of the former Lake Mathilde and basin sites D and E were located in sand dune area.

From an overall geotechnical perspective, most of the basin sites are similar (i.e., located at the mouth of the San Perdro Valley near the Pacific Ocean and within and/or adjacent to a filled in Lake Mathilde). Basin site C2 has had little to no infilling and appears to be a remnant of the Lake Mathilde.

U.S. Soil/National Resources (2010), maps the near surface soil as Orthents and Urban Land; however does not provide properties for these soil types (see Figure 6).

3.2 Seismic Setting and Hazards and Flooding Hazards

3.2.1 Seismic Setting

The location of active faults (an active fault is one with known evidence of surface displacement within the last 11,000 years) and other significant seismogenic sources relative to the basin sites are illustrated on Figure 7. No active faults cross the basin sites (Hart and Bryant, 1997). The nearest active faults to the basin sites are the San Gregorio Fault and San Andreas Fault. The San Gregorio Fault is approximately 2.5 to 3.0 km (1.5 to 2 miles) southwest of the basin sites. The San Andreas Fault is approximately 5 to 5.5 kilometers (3 to 3.5 miles) northeast of the basin sites.

The basin sites will be subject to strong ground shaking during future displacement from these faults and other seismogenic sources in Northern California. The Working Group on California Earthquake Probabilities (WGCEP, 2003 and 2007) estimates there is a 6% probability of one or more large (>6.7 magnitude) earthquakes on the San Gregorio Fault, a 21% probability of one or more large (>6.7 magnitude) earthquakes on the San Andreas Fault, and an aggregate 63% probability of one or more large (>6.7 magnitude) earthquakes on any fault in the San Francisco Bay Area in the next 30 years.

3.2.2 Seismic Shaking

The estimated peak ground acceleration during maximum magnitude (characteristic) earthquakes, having a 10% probability of exceedance in 50 years (i.e., a seismic recurrence interval of one event in 475 years), is on the order of 0.66g in the area of the basin sites (Figure 8).

The actual ground surface acceleration that will occur at any of the basin sites during an earthquake will be a function of earthquake magnitude, epicenter distance, mode and direction of seismic wave propagation (directivity), soil amplification or attenuation, and near source factors.

For the estimated peak firm rock accelerations, it is anticipated that the basin sites will experience a Modified Mercalli Intensity shaking severity level on the order of X (see Figure 9).

3.2.3 Liquefaction and Lateral Spreading

Liquefaction is a phenomenon in which soils lose internal strength and become fluid as a result of increased pore water pressure generated by cyclic loading. This behavior has historically been induced by strong ground shaking during earthquakes. Soils which have historically liquefied have typically been saturated silts and sands of low to medium density which are relatively free of clay. An ABAG (2011) map (Figure 10) which shows liquefaction potential as mapped by William Lettis & Associates and Knudsen and others (2000) and Witter and others (2006). The liquefaction map indicates that basin sites A, C2 and D are located in areas of very high liquefaction susceptibility and basin sites B, C1, and E are located in area of moderate liquefaction susceptibility.

During liquefaction, the ground may also undergo large permanent displacements that can damage underground utilities and well-built surface structures. The type of displacement of major concern associated with liquefaction is lateral spreading because it involves large scale lateral displacement of large blocks of ground down gentle slopes towards Pacific Ocean.

3.2.4 Flooding

Mapping of flood areas by FEM Q3 (2003) and DFIRM (2009) as presented on an ABAG (2011) map (see Figure 11) indicates that of the all the sites A, B, and C are located within of the Zone A 100 year flood zone and site D and E are located at or within the area of wave action.

3.3 General Basin Site History

Prior to the 1870, all the basin sites were located within or immediately adjacent to a coastal lagoon (see 1869 topographic map on Figure 4). In 1896, the coastal lagoon had shrunk in size and was called Lake Mathilde (see topographic maps on Figure 4).

A railroad was constructed by the early 1900's along the mouth of the San Pedro Valley adjacent to the present Linda Mar beach front on the ocean side of the basin sites D and E (see early 1900's panoramic photo on Figure 5). The railroad track was in place in 1915 (see topographic map on Figure 4).

Lake Mathilde was filled in between 1900 and 1915 (see topographic maps on Figure 4). Pacific Coast Highway constructed prior to 1939 (see topographic map on Figure 4). Remains of the railroad embankment are visible in 1946 and 1969 air photo photos (see photographs on Figure 5). By 1969, residential and commercial developments covered the San Pedro Valley.

Site Specific histories at basin sites A, B, C1, C2, D and E is presented in Section 4

4 Basin Site-Specific Findings

All of the basin sites are near the mouth of the San Pedro Valley. Each of the six basin sites has unique specific surface and subsurface conditions that will impact design, construction and long-term performance (e.g., site history, past and present use, old and new generations of fill, proximity to existing structures and pipelines, and proximity to Pacific Ocean).

The following sections summarize the specific findings of our research, historic air photo examination, and site reconnaissance for each of the basin sites.

4.1 Site A (Caltrans Parking Lot)

Site A, the Caltrans Parking Lot site, is located on the northeast side of Linda Mar Boulevard near the intersection of Linda Mar Boulevard and the Pacific Coast Highway (see Figure A-1 in Appendix A). A site reconnaissance was made by Jacobs Associates on May 10, 2012.

Site A is bordered by Linda Mar Boulevard to the southwest, Valero Gas Station to the northwest, residential development to the northeast, and parking to the southeast. Selected photographs taken at Site A are presented on Figure A-2.

4.1.1 Site A: Existing Site Improvements

Site A improvements consist primarily of an asphaltic concrete paved parking lot. Surface improvements include lighting, bus stop awnings, and trees. Underground improvements (see Figure 2) include:

- A large-diameter underground storm drain runs along the northwest property line (i.e., adjacent to single-family residential properties, see Figure 2).
- A small-diameter storm drain is located along the northwest side of the Site A (i.e., crosses the parking lot, see Figure 2).
- Underground sewer lines are located within adjacent Linda Mar Boulevard (see Figure 2).

The parking lot and improvements showed no obvious signs of the distress.

4.1.2 Site A: Adjacent Structure Foundations

Single-family residential structures border the northeast side of Site A. The residential structures are primarily one-story wood-framed stucco-sided single family residences. The residential structures appear to be founded on shallow perimeter foundations and isolated interior footing.

A Valero Gas Station is located northwest of Site A. The Valero Gas Station structures are most likely supported on at-grade slab-on-grade foundations. The gas pump awning columns are most likely supported on concrete reinforced pier which extend roughly 5 to 10 feet below grade.

4.1.3 Site A: Subsurface Soil and Groundwater Conditions

The project area was historically located within or adjacent to a coastal lagoon (see Figure 3 and 4) which was filled in in the early 1900's.

Denny's restaurant, located at the southwest corner of Linda Mar Boulevard and Pacific Coast Highway, was at former Lion Oil Gas Station and a Geotraker site (i.e., State Water Board Leak Underground Storage Tank site). Well monitoring by ADR Environmental Group (ADR) indicates the groundwater levels were approximately 1.8 to 7.86 feet deep on February 28, 2005. ADR suspected that groundwater levels are influenced by Pacific Ocean tidal fluctuations.

No site specific subsurface soil information was available at Site A.

4.2 Site B (Skate Park Parking Lot)

Site B is located on the south end of the Skate Park Parking Lot. Access to the Site B is via the Community Center's southeast driveway (see Figure B-1 in Appendix B). A site reconnaissance was made by Jacobs Associates on May 10, 2012.

Site B is bordered by a Skate Park to north, a vacant Caltrans parcel to northwest, single family residences to southwest and undeveloped land to southeast. Selected photographs taken at Site B are presented on Figure B-2.

4.2.1 Site B: Existing Site Conditions

Site B is partially covered with asphaltic concrete paving. Surface improvements at Site B include lighting, and a storm drain inlet. Underground improvements at Site B include a small diameter storm drain line which connects storm drain inlet. The parking lot and improvements showed no obvious signs of distress.

In addition, a set of large underground storm drains parallel to the property line between Site B and the residential development to the southeast (see Figure 2).

4.2.2 Site B: Adjacent Structure Foundations

Adjacent structures include single family residences and the Skate Park structure. The single family residences are most likely founded on shallow perimeter foundations and isolated interior footings. The Skate Park is a massive concrete structure with swimming pool-like features which extends below adjacent grade. The Skate Park was constructed in 2005. We observed no obvious cracks in the concrete or structure settlement. It is not known to us at this time if the Skate Park structure is supported on a shallow (i.e., mat foundations) or deep foundations system (i.e., piles or drilled piers).

4.2.3 Site B: Subsurface Soil and Groundwater Conditions

Project Boring 1 was drilled near the southwest corner of the Skate Park parking lot. A log of Boring 1 is presented on Figure B-3 in Appendix B). In addition, two borings were drilled by John C. Hom & Associates, on November 11, 2002, at the Skate Park site. These reference borings (herein referred to as Reference Boring RB-1 and RB-2) are presented on Figures B-4 and B-5 in Appendix B.

The pavement encountered in Boring 1 consisted of approximately 2 inches of asphaltic concrete. Below the asphaltic concrete, fill consisting of clayey sand with gravel extend to a depth of about 5 feet.

Below the fill, high plasticity clays were encountered to a depth of 20 feet. The clays were soft from depths of about 5 to 8 feet and very soft from depths of about 8 to 20 feet. Peaty soil layers were encountered within the soft/very soft clay.

From 20 feet to 76.5 feet, Boring 1 encountered interlayered deposits of:

- stiff to hard lean clay with varying amounts of sand and gravel,
- medium dense to very dense sand with varying amounts of gravel, silt and clay, and
- dense to very dense gravels with varying amount of sand, silt and clay.

Groundwater levels could not be measured within Boring 1 due to rotary wash drilling methods. Wet soils samples were encountered at a depth of 7 feet. Groundwater levels at the site are expected to vary seasonally and may also be influenced Pacific Ocean by tidal fluctuations.

Reference Boring RB-1 encountered very loose to very stiff fill in the upper five to six feet. Below the fill, layers of soft clay and very loose sand were encountered to depths of 12. Below 12 feet and 16 feet, loose sand interlayered with peat (marsh deposits) was encountered. Below 16 feet and 20 feet, medium stiff peat and stiff sandy clays were encountered.

Reference Boring RB-2 encountered loose fill in the upper 4½ feet. Below the fill, medium stiff sandy clay interlayered with medium stiff clayey and peaty clay were encountered to a depth of 21 feet.

4.3 Site C1 and C2 (Community Center Parking Lot and Vacant Caltrans Parcel)

Site C1 is located at the Community Center Parking Lot. Site C1 is bounded by the Community Center, the Skate Park, Site C2, and the Pacific Coast Highway (see Figure C-1 in Appendix C).

Site C2 is an undeveloped area bordered by Pacific Coast Highway to the northwest, a single family residential development to the southwest, the Community Center parking lot the northeast, and the Skate Park to the east (see Figure C-2 in Appendix C).

A site reconnaissance of Sites C1 and C2 was made by Jacobs Associates on May 10, 2012. Selected photographs taken at Site C2 are presented on Figure C-2. No photographs were taken of Site C1.

4.3.1 Site C1 and C2: General Site Conditions

The parking lot pavement at Site C1 is asphaltic concrete. The parking lot has curbs and planters, lighting, and a raised monument. The parking lot and improvements show no obvious signs of the distress.

Site C2 is undeveloped land and possibly a remnant of the former Lake Mathilde (see geology and topographic map on Figures 3 and 4). The site appears to be a potential wildlife habitat.
Existing underground improvements include a set of large storm drains which parallel to the property line between Site C2 and the single family residential development to the southeast (see Figure 2).

4.3.2 Site C1 and C-2: Adjacent Structure Foundations and Ground Settlement

Structures adjacent to Site C1 include the Skate Park structure and Community Center building. The Skate Park is a massive concrete structure with swimming pool-like structures which extend below adjacent grade. The Skate Park was constructed in 2005. We observed no obvious cracks or structure settlement at the Community Center building or the Skate Park structure. It is not known to us at this time if the Skate Park structure is supported on a shallow (i.e., mat foundations) or deep foundations system (i.e., piles or drilled piers). The Community Center building is a large above grade structure and is most likely supported on a deep foundation system (e.g., drilled piers, piles).

4.3.3 Site C1 and C2: Subsurface Soil and Groundwater Conditions

The subsurface soil conditions at Site C1 and Site C2 are anticipated to be similar to Boring 1 at the Skate Park parking lot and Reference Borings RB-1 and RB-2 drilled at the Skate Park (see Boring 1 and References Borings RB-1 and RB-2 on Figure B-2, B-3, and B-4 in Appendix B, respectively).

Raising Site C2 with fill could result in consolidation settlement of the soft/peaty clays which underlie the upper about 10 to feet of the site. The fill-induced settlement could potentially extend beyond Site C2 and result in foundation settlement and damage to adjacent structures (e.g., nearby single-family residential structures.

4.4 Site D (Linda Mar PS Parking Lot)

Site D is located at the Linda Mar Pump Station Parking Lot. Site D is bounded by the Linda Mar Pump Station to the southwest, the Pacific Coast Highway to the southeast, the Taco Bell parking lot to the northeast, and Linda Mar beach to the northwest (see Figure D-1 in Appendix D).

A site reconnaissance of Site D was made by Jacobs Associates on May 10, 2012. Selected photographs taken at Site D presented on Figure D-2.

4.4.1 Site D: General Site Conditions

The parking lot pavement at Site D consists of asphaltic concrete. Existing underground improvements include a storm drains along the southeast and southwest sides the basin and a force main sewer and gravity sewer along the northwest side (see Figure 2).

4.4.2 Site D: Structure Foundations and Ground Settlement

The Linda Mar Pump Station extends below grade. The foundation depth and type of the pump station is not known to us at this time. The Taco Bell structure to the north of the Basin D is supported on wood piles.
The asphaltic concrete pavement adjacent to the pump station has settled differential approximately 2 inches (see Figure D-2 in Appendix D). Differential settlement could be the result of densification of basement retaining wall backfill, fill-induced consolidation settlement of underlying clays, and/or peat decomposition.

4.4.3 Site D: Subsurface Soil and Groundwater Conditions

Project Boring 2 was drilled near the southeast corner of the pump station parking lot (see Figure D-1). The log of Boring 2 is presented on Figure D-3 in Appendix D.

The pavement encountered in Boring 2 consisted of approximately 3 inches of asphaltic concrete. Below the asphaltic concrete, fill consisting of clayey sand and gravel and silty gravel with sand and cobbles extended to a depth of 7 feet. The fill was dry to moist and medium dense to dense.

Below the fill, a thin layer of sandy clay was encountered between 7 and about 9 feet. Below 9 feet, medium dense to dense poorly-graded sand (i.e., old sand dune deposits) was encountered to a depth of 17 feet. Between 17 and 23 feet, a medium stiff layer of peat with organic silt and clay was encountered.

Between 23 feet and about 76.5 feet, layers of medium stiff to stiff clays, medium dense to dense clayey/silty sand with gravel were encountered.

Groundwater levels could not be measured within Boring 2 due to rotary wash drilling methods. Wet soils samples were encountered at a depth of about 8 feet. Groundwater levels are expected to vary seasonally and may also be influenced Pacific Ocean by tidal fluctuations. Doug Trade with the City of Pacifica reported that groundwater flowed through the pump station basement slab during a repair which indicates that the groundwater level at Site D is above the base of the pump station basement.

4.5 Site E (City Beach Parking Lot)

Site E is located at the northeast end of the city beach parking lot (see Figure E-1 in Appendix D). Site E is bounded by a public restroom/storm drain pump station structure and Linda Mar beach to the northwest, sand dunes to the northeast, and landscaping and Pacific Coast Highway to the southeast.

A site reconnaissance of Site E was made by Jacobs Associates on May 10, 2012. Selected photographs taken at Site E presented on Figure E-2.

4.5.1 Site E: General Site Conditions

The parking lot at Site E consist of an asphaltic concrete. Existing underground improvements include a storm drains along the northwest and southwest sides of the Site E and a force main and sewer line along the northwest side of Site E (see Figure 2).

4.5.2 Site E: Structure Foundations and Ground Settlement

The restroom/storm drain pump station structure extends below grade. The foundation depth and type is not known to us at this time.

4.5.3 Site E: Subsurface Soil and Groundwater Conditions

Sand dune deposits (see Figure 3) most likely underlie the exiting pavement section. The subsurface conditions at Site E are anticipated to be similar to that encountered in Boring 2 at the Linda Mar Pump Station (see Figure D-3 in Appendix D), with the exception of possibly less fill.

5 Siting Evaluation

Based on findings from our geologic and site research, historic air photo examination, and site reconnaissance, we evaluated the six potential basin sites with respect to geologic hazards and geological/geotechnical impacts on design, construction and long-term performance.

5.1 Geologic Hazards

Although no active faults are mapped as crossing any of the basin sites, all of the basin sites are subject to strong levels of seismic shaking from nearby faults.

For determining CBC 2010 seismic design parameters, Site B is Site Class E and Site D is Site Class D, based on Boring 1 and Boring 2 soil profile. Based on a similar geologic setting as Site B; Sites A, C1, and C2 are most likely Site Class E. Based on similar geologic setting as Site D; Site E is most likely Site Class D.

A site-specific subsurface investigation to determine the thickness, plasticity index, moisture content, and undrained shear strength is required to determine the Site Class for Basin Sites A, C1, C2, and E.

5.1.1 Liquefaction and Densification

Sites A, C2 and D are located in mapped areas of very high liquefaction susceptibility and Sites B, C1, and E are locate in mapped areas of moderate susceptibility (see Figure 10).

Project borings 1 and 2 did not encounter potentially liquefiable sands at Site B and D, respectively. However, Reference Borings RB-1 and RB-2 at the Skate Park encountered potential liquefiable wet, very loose to loose layers of sands to depths of 14 feet.

Liquefaction at the sites could result in ground surface settlement; however, the basin bottoms will extend below the liquefiable soils and the basin structure will therefore not be adversely impacted by liquefaction and densification. Localized liquefaction and densification of very loose to medium dense sands could impact influent and effluent pipelines connected to the basin and at-grade improvements.

Additional subsurface investigations are required to confirm potential for liquefaction at the chosen site.

5.1.2 Lateral Spreading

The risk of liquefaction at the basin sites is very high to moderate (Section 5.1.1 above), however, the potential for lateral spreading impacting the basins is low. Liquefaction induced lateral spreading into Pacific Ocean could impact influent and effluent pipelines connected to the basin and at-grade improvements.

5.1.3 Flooding

The FEMA Flood map (see Figure 11) indicates that all the sites are within a 100-year flood zone and the near Basin Sites B and E, flooding with velocity hazard (i.e., wave action) could occur. Design of basin and basin improvement will need to address potential flooding.

5.2 Consolidation Settlement

It is anticipated that the basin bottoms will be underlain by stiff to very stiff and medium dense to dense soils and will not be susceptible to consolidation settlement.

Site C2 is lower in elevation than the other basin sites and appears be located within a remnant of a former lake (Lake Mathilde). Raising the elevation of the Site C2 by placement of fill could result in consolidation settlement and/or densification of underlying soft/loose soils. The consolidation settlement and densification could impact adjacent residences and nearby improvements (i.e., buried pipelines).

5.3 Tank Excavations

Project borings 1 and 2 were drilled to depths of 76.5 feet. No bedrock was encountered within the project borings. With the exception of potential for large debris within the fill (which may require removal prior to installing shoring), the soils encountered in the project borings are excavatible with conventional equipment.

Water-tight shoring for basin excavations will be necessary at all of the sites. Fills and native sand and gravels will likely produce copious groundwater inflow. Dewatering will be difficult and will produce area-wide subsidence from consolidation soft soils layers. Therefore, water-tight shoring will be

preferable. Excavations in fill and native soil will be done in the wet (i.e.,"underwater" excavation) and will include a tremie-poured concrete floor plug. Water-tight shoring, such as sheetpiles, slurry diaphragm walls, secant pile walls or sunken caissons can be installed ahead of the excavation in a manner in which groundwater inflow can be controlled.

The scope of work for this basin siting study did not include an assessment of soil and groundwater contamination at the sites. However, our site reconnaissance and site research did suggest that excavations at Basin Site A could encounter contaminated soil and groundwater associated with nearby gas stations (see Figure A-1 in Appendix A).

5.4 Preliminary Tank Design Data

5.4.1 Tank Foundation

Mat foundations can be used to support at all potential basin sites.

5.4.2 Downdrag Forces

Basin sites raised with fill (e.g., Basin Site C2) will induce consolidation settlement of soft clay. Consolidation, if not completed prior to construction of the basin, will result in downdrag forces (i.e., negative friction) along sides of the buried basin. The rate of consolidations is dependent on the thickness of the compressible soils. Given the thickness of the underlying soft soils encountered in Project Boring 1 and 2, it is anticipated that consolidation settlement will occur within one to two months after fill placement. If construction of the basin does not occur prior to completion of consolidation settlement a preliminary downdrag load of 500 pounds per foot for existing fill and soft clay is recommended.

5.4.3 Hydrostatic Uplift Forces

The basins will need to resist hydrostatic uplift forces (i.e., buoyancy from groundwater). Concrete plugs, hold-down anchors drilled and grouted into the underlying soil, concrete collars and/or deep foundation lips can potential be used to resist hydrostatic uplift pressures

5.4.4 Corrosion

The basins are underlain by fill and alluvial soils containing clay soil are typically moderately to highly corrosive to uncoated steel (e.g., pipe piles) and reinforced concrete. Corrosion testing of soils should done to evaluate corrosion potential at the chosen basin site

5.4.5 Construction Impacts

Many of the basin sites are located near or adjacent to existing structures and improvements (i.e., residential housing, commercial and industrial structures, roads, underground utilities) which will have a significant impact on construction and construction costs (i.e., will require special shoring, ground improvement, temporary support, or a combination thereof). We have identified the sites which

potentially will have significant, moderate, or minimal impact on adjacent structures and therefore require protection of adjacent structures in Table 1.

We also looked at the space available at each of the sites (for the basin structure and the construction equipment and laydown area) with respect to site constraints (e.g., property lines, existing improvements). A summary of our conclusions regarding available construction space is provided on Table 1.

Other miscellaneous construction considerations we identified are summarized on Table 1.

Table 1. Construction Impacts

Basin Site	CONSTRUCTION IMPACTS		
	Potential Impact to Adjacent Structures	**Available Construction Space**	**Miscellaneous**
A	Moderate	Construction space is tight and will require a small diameter deep basin.	Close proximity to single family residences and potential for claims from adjacent homeowners. Shoring design needs to protect adjacent residences and underground utilities.
B	Moderate	Construction space is tight and will require a small diameter deep basin.	Close proximity to single family residences and potential for claims from adjacent homeowners. Shoring design need to minimize excavation shoring deflection to prevent damage to Skate Park structure (especially if Skate Park structure is not supported on piles) and adjacent underground utilities. Safety issue with skate park patrons.
C1	Minimal	Construction space is adequate.	Safety issue with skate park and community center patrons.
C2	Moderate to Significant	Construction space is adequate. Removal of vegetation and raising grade required	Potential for claims from adjacent homeowners due to consolidation settlement caused by fill placement at site to raise the grade. Shoring design needs to minimize excavation shoring deflection to prevent damage to adjacent structures and underground utilities. Possible wildlife habitat site.

Table 1. Construction Impacts (cont'd)

Basin Site	CONSTRUCTION IMPACTS (cont'd)		
	Adjacent Structure Impact	Available Construction Space	Miscellaneous
D	Moderate	Construction space is adequate with the exception of the northwest side adjacent to the Taco Bell parking lot.	Shoring design needs to minimize excavation shoring deflection to prevent damage to adjacent structures and underground utilities (including pump station and Taco Bell parking lot).
E	Moderate	Construction space is tight and will require a small diameter deep basin.	Shoring design needs to minimize excavation shoring deflection to prevent damage to adjacent structures and underground utilities Safety could be an issue at busy beach parking lot.

6 Preliminary Conclusions

Based upon the findings of this Geotechnical Engineering Siting Study and considering the principal geotechnical impacts on design, construction and long-term performance (e.g., soil stability/shoring systems, groundwater, impacts on, and protection of, adjacent structures, ground improvement requirements, foundations, differential settlement, buried structures, potential site contamination, and available construction space), it is our opinion that underground basin can be constructed on any of the potential sites (i.e., no fatal flaws); however basin construction at some sites is more preferable and less risky than at other sites.

6.1 Basin Sites

Site C1 (i.e., Community Center Parking Lot) is the most preferable and least risky basin site primarily for the following reasons:

- Site C1 can be sited to minimize the impact on adjacent structures.
- Site C1 has a minimal amount of adjacent subsurface utilities.
- Site C1 can accommodate a larger basin diameter than Sites A, B, and E. This result in a shallower and less expensive basin.

Site A (i.e., Caltrans Parking Lot), Site B (i.e., Skate Park Parking Lot), Site D (i.e., Linda Mar Pump Station), and Site E (i.e., City Beach Parking Lots), are next preferable basin sites primarily for the following reasons:

- Sites A, B, and E can accommodate a basin with a smaller diameter. A smaller diameter basin will require deeper and more expensive shoring system.

- Site D can accommodate a larger basin than Sites A, B, and E, however, Site D is bordered by critical underground piping on three sides which will require a shoring system which allows minimal deflection.
- Site A, B, and E will require extensive monitoring of adjacent improvements.
- Site D is close to existing and former gas stations and could have soil and groundwater contamination issues.

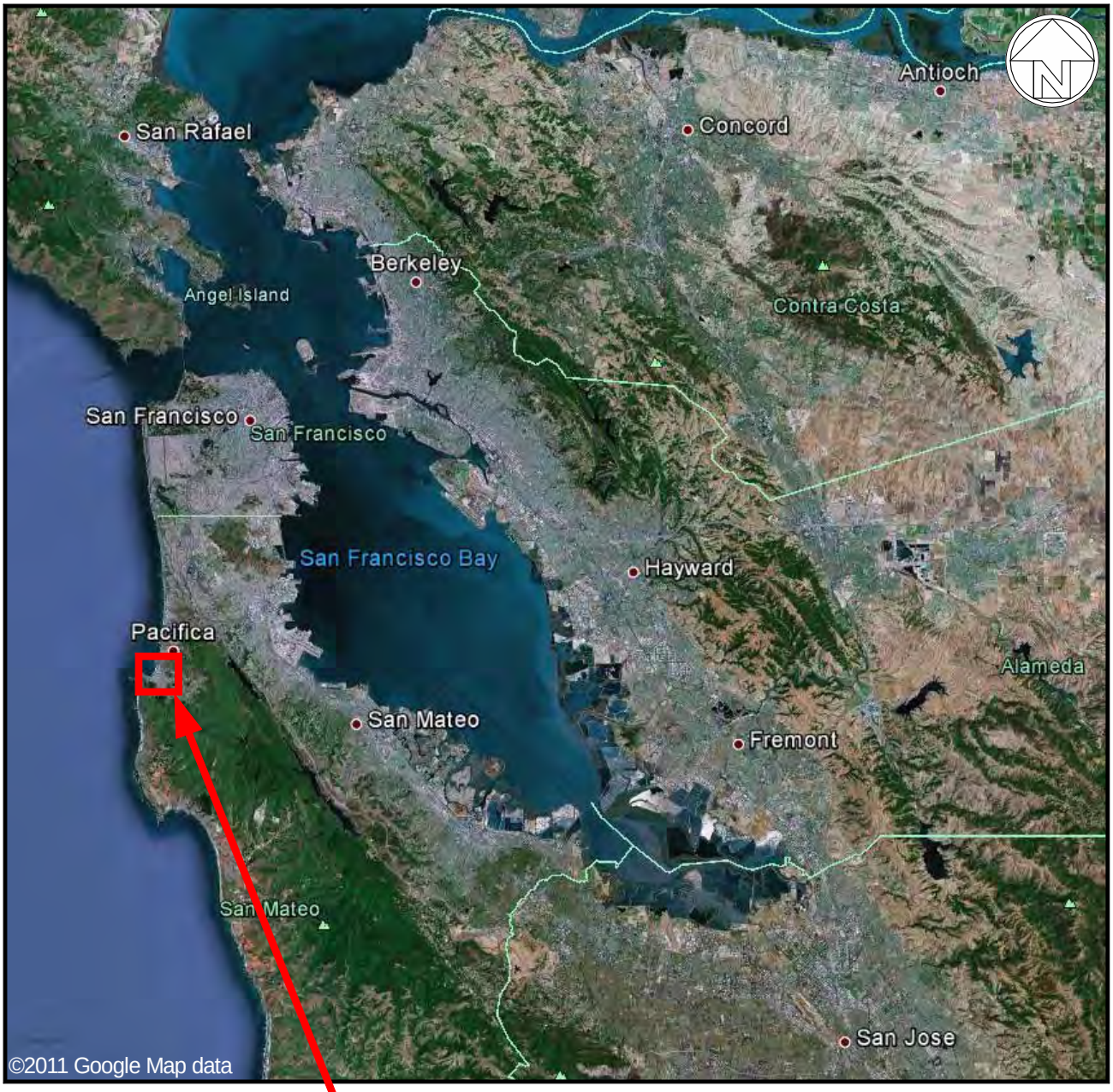
Site C2 (i.e., Vacant Caltrans Parcel) is the least preferable basin site primarily for the following reasons:

- Site C2 will require fill to raise grade which could result in consolidation settlement of adjacent single family residences and underground storm drains.

6.2 Site-Specific Geotechnical Investigations

Site-specific geotechnical and environmental design investigation will be required at the selected basin site. The investigations will likely include: deep borings (similar to those drilled at Site B and Site D), cone penetration tests, multi-stage piezometers, groundwater monitoring/sampling wells, test pits in fill and physical and chemical testing of disturbed and "undisturbed" soil and groundwater samples.

Figures



JACOBS ASSOCIATES
Engineers/Consultants

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Vicinity Map

Figure
1

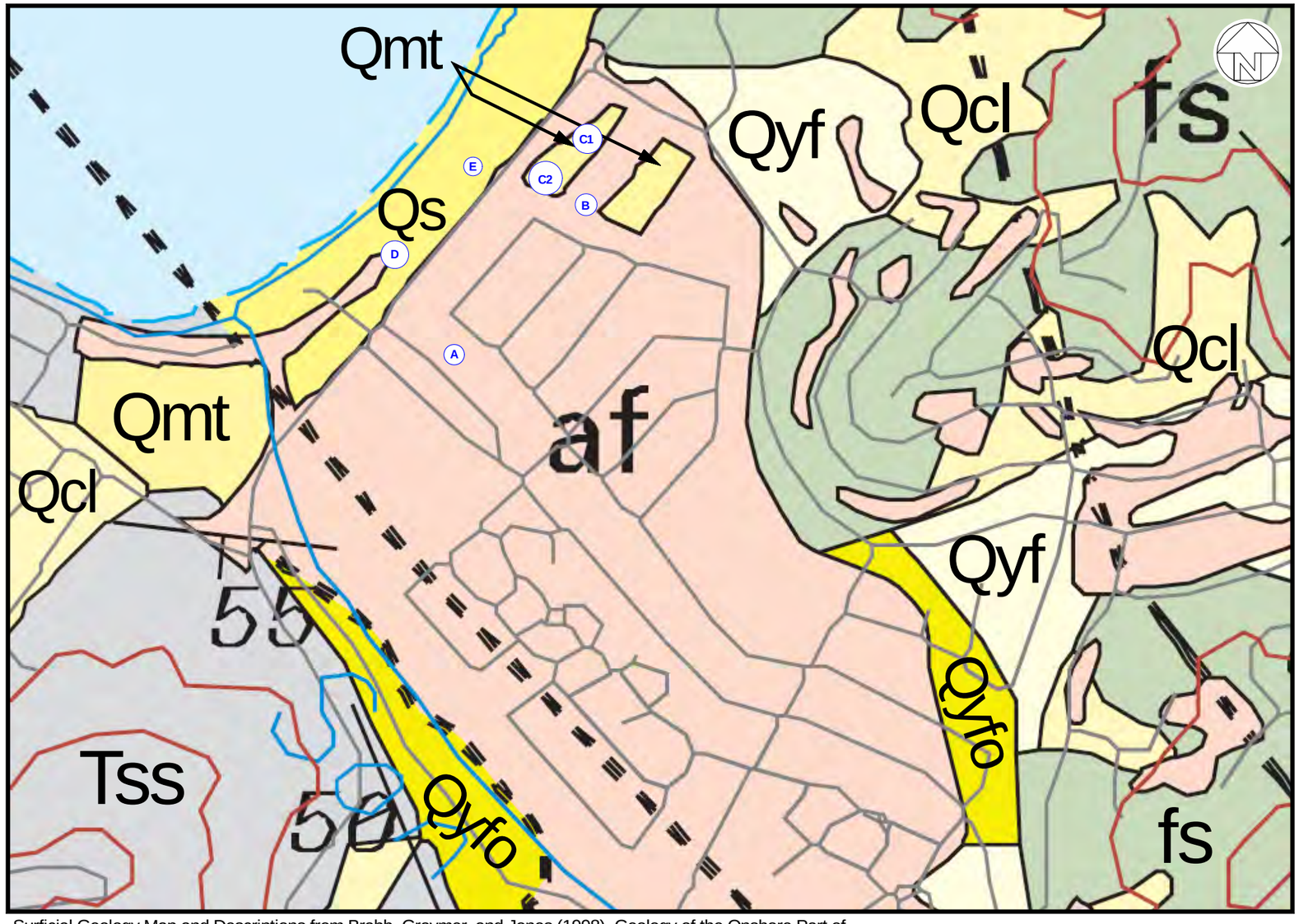
File No. 4497.0 | December 2012

Figure 1, Alternative Site Study (RMC, 2012)

NOTES:

Basin locations and sizes intended to be presentative only. Furture refinement of size, location, and shape will occur later in the site feasibility evaluation. The location and type of pipelines have not been verfied and intended in this analysis to be a representative only.

JACOBS ASSOCIATES Engineers/Consultants		**RMC Water and Environment** City of Pacifica Wet Weather Basin Project Pacifica, California **Potential Basin Sites**	Figure **2**
File No. 4497.0	December 2012		



Surficial Geology Map and Descriptions from Brabb, Graymer, and Jones (1998), Geology of the Onshore Part of San Mateo County, California; U.S.G.S OFR 98-137.

Approximate Locations of Potential Basin Sites:

- (A) - Caltrans Parking Lot
- (B) - Skate Park Parking Lot
- (C1) - Community Center Parking Lot
- (C2) - Vacant Caltrans Parcel
- (D) - Linda Mar Pump Station Parking Lot
- (E) - City Beach Parking Lot

LEGEND:

af — **Artificial Fill (Historic)**
- Loose to very well consolidated gravel, sand, silt, clay, rock fragments, organic matter, and man-made debris in various combinations. Thickness is variable and may exceed 30 m in some places. Some is compacted and quite firm, but fill made before 1965 is usually not compacted and consists simply of dumped materials.

Qyf — **Younger (Inner) Alluvial Fan Deposits (Holocene)**
- Unconsolidated fine- to coarse-grained sand, silt, and gravel, coarser grained at heads of fans and in narrow canyons.

Qyfo — **Younger (Outer) Alluvial Fan Deposits (Holocene)**
- Unconsolidated fine sand, silt, and clayey silt.

Qcl — **Colluvium (Holocene)**
- Loose to firm, friable, unsorted sand, silt, clay, gravel, rock debris, and organic material in varying proportions.

Qmt — **Marine Terrace Deposits (Pleistocene)**
- Poorly consolidated and poorly indurated well- to poorly-sorted sand and gravel. Thickness variable but probably less than 30 m.

Qs — **Sand Dune and Beach Deposits (Holocene)**
- Predominantly loose, medium- to coarse-grained, well-sorted sand but also included pebbles, cobbles, and silt. Thickness less than 6 m in most places, but in other places may exceed 30 m.

fs — **Sandstone**
- Greenish-gray to buff, fine- to coarse-grained sandstone (graywacke), with interbedded siltstone and shale. Siltstone and shale interbeds constitute less than 20 percent of unit, but in places form sequences as much as several tens of meters thick. In many places, shearing has obscured bedding relations; rock in which shale has been sheared to gouge constitutes about 10 percent of unit. Gouge is concentrated in zones that are commonly less than 30 m wide but in places may be as much as 150 m wide. Total thickness of unit is unknown but is probably at least many hundreds of meters.

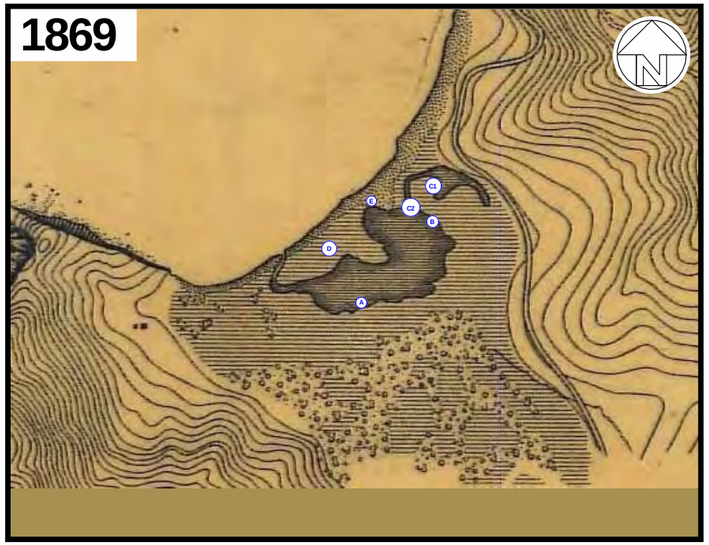
Tss — **Unnamed Sandstone, Shale, and Conglomerate (Paleocene)**
- Rhythmically alternating beds of sandstone and shale, with a discontinuous boulder and cobble conglomerate near middle of section and some pebble conglomerate beds near base of section on Montara Mountain. Sandstone is gary to buff, fine- to coarse-grained, and arkosic; the shale is dark gray to brown; conglomerate contains angular boulders of granite rock as long as 2 m and smaller boulders, cobbles, and rounded pebbles of hornblede gneiss, muscovite gneiss and schist, Franciscan chert, quartzite, limestone, sandstone, and shale.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

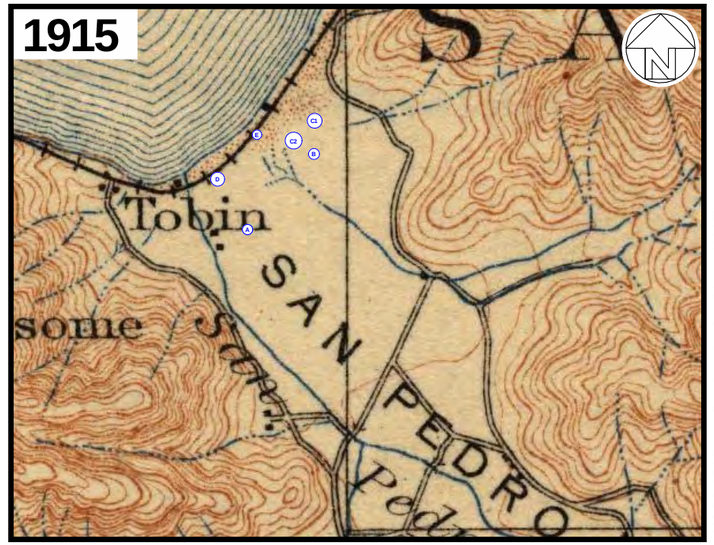
RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Geologic Map

Figure **3**

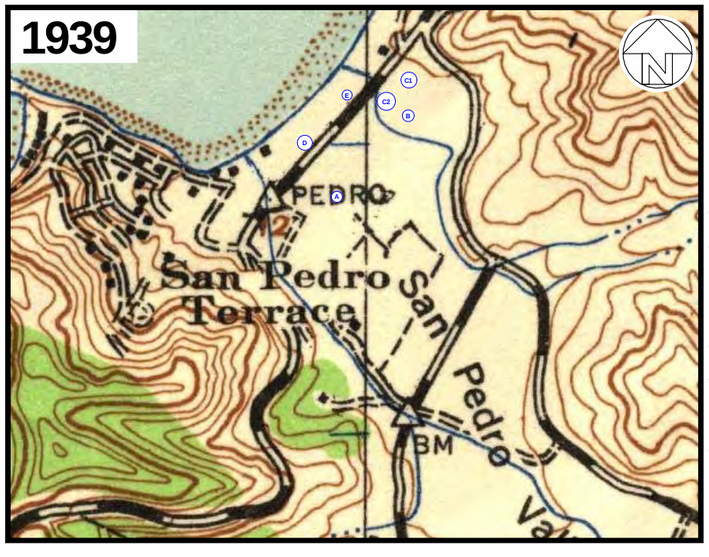


NOAA Office of Coast Survey, San Francisco Peninsula (1869)

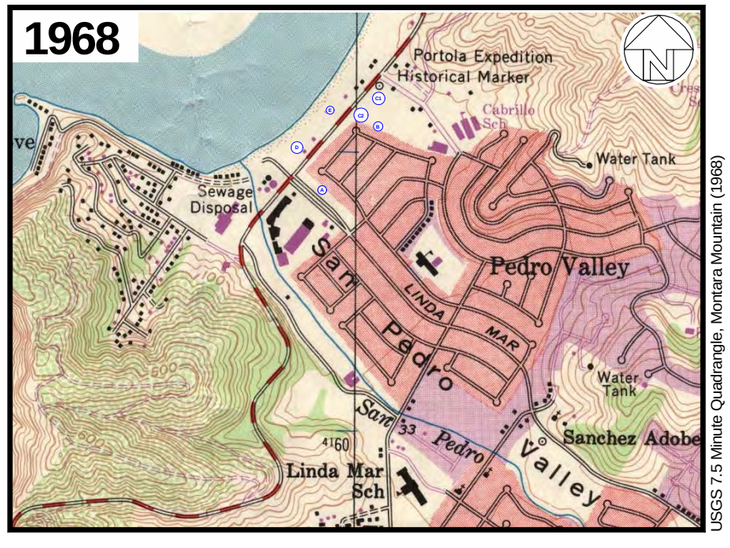
USGS 15 Minute Quadrangle, San Mateo (1896)



USGS 15 Minute Quadrangle, San Mateo (1915)



USGS 15 Minute Quadrangle, San Mateo (1939)



USGS 7.5 Minute Quadrangle, Montara Mountain (1968)

Approximate Locations of Potential Basin Sites:

- (A) - Caltrans Parking Lot
- (B) - Skate Park Parking Lot
- (C1) - Community Center Parking Lot
- (C2) - Vacant Caltrans Parcel
- (D) - Linda Mar Pump Station Parking Lot
- (E) - City Beach Parking Lot

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Historic Topographic Maps

Figure
4

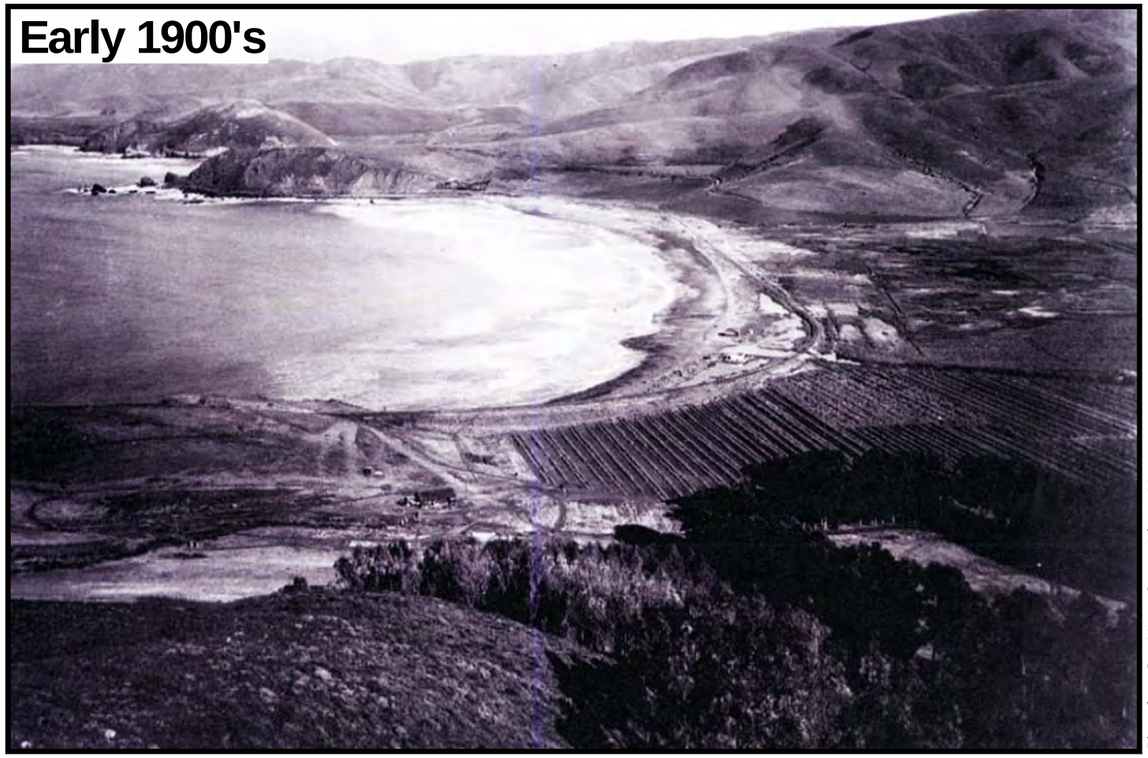


Photo from San Mateo County History Museum

Aerial photo courtesy of Pacific Aerial Survey, flown 1946

Aerial photo courtesy of Pacific Aerial Survey, flown 1969

○ - Approximate Locations of Potential Basin Sites

A - Caltrans Parking Lot

B - Skate Park Parking Lot

C1 - Community Center Parking Lot

C2 - Vacant Caltrans Parcel

D - Linda Mar PS Parking Lot

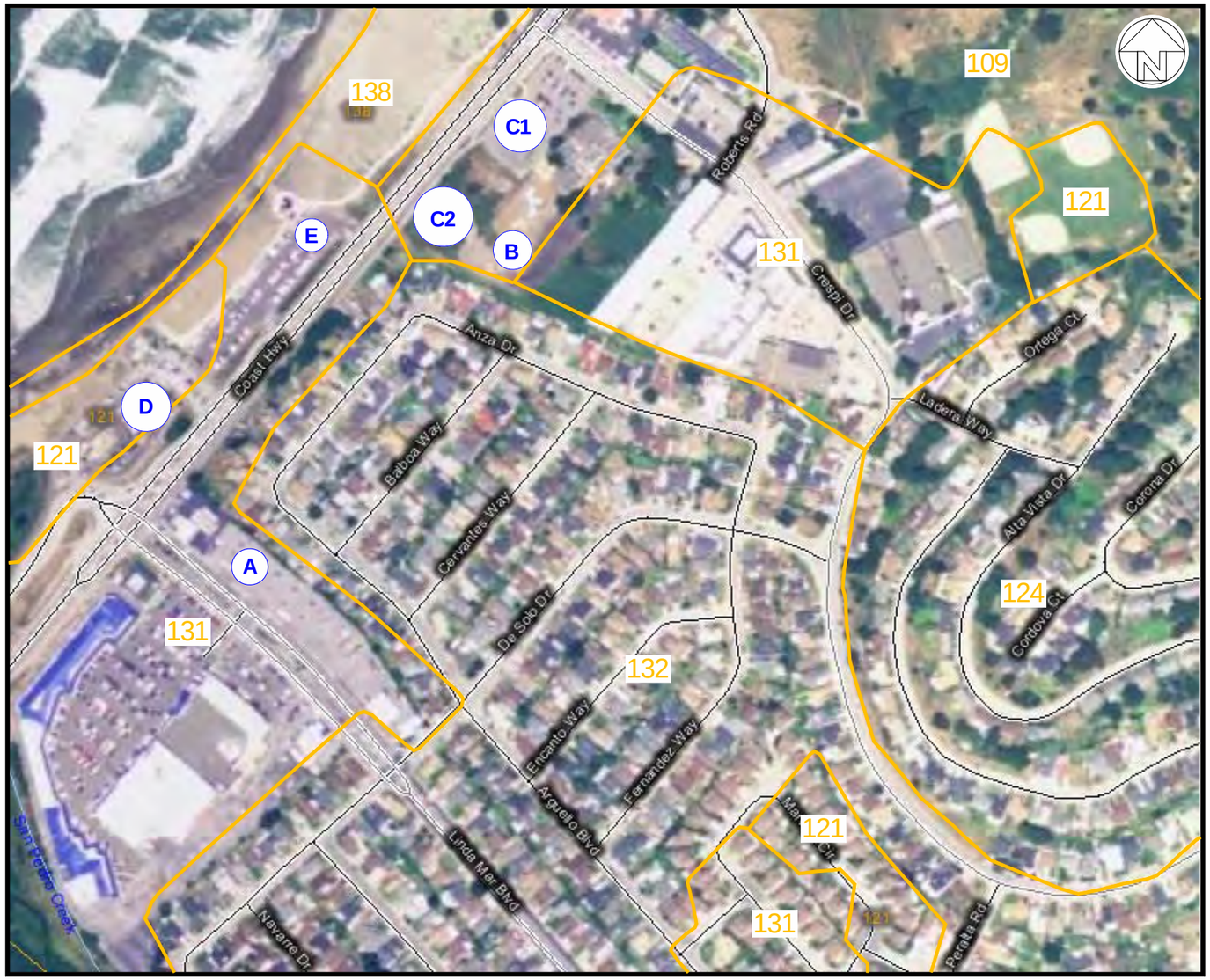
E - City Beach Parking Lot

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Aerial Photos

Figure
5



Soil Map and Descriptions from U.S. Soil/Natural Resources Conservation Service (Kashiwagi, J.H., 1991 & NRCS 2010).

- Approximate Location of Potential Basin Sites

A - Caltrans Parking Lot
B - Skate Park Parking Lot
C1 - Community Center Parking Lot
C2 - Vacant Caltrans Parcel
D - Linda Mar PS Parking Lot
E - City Beach Parking Lot

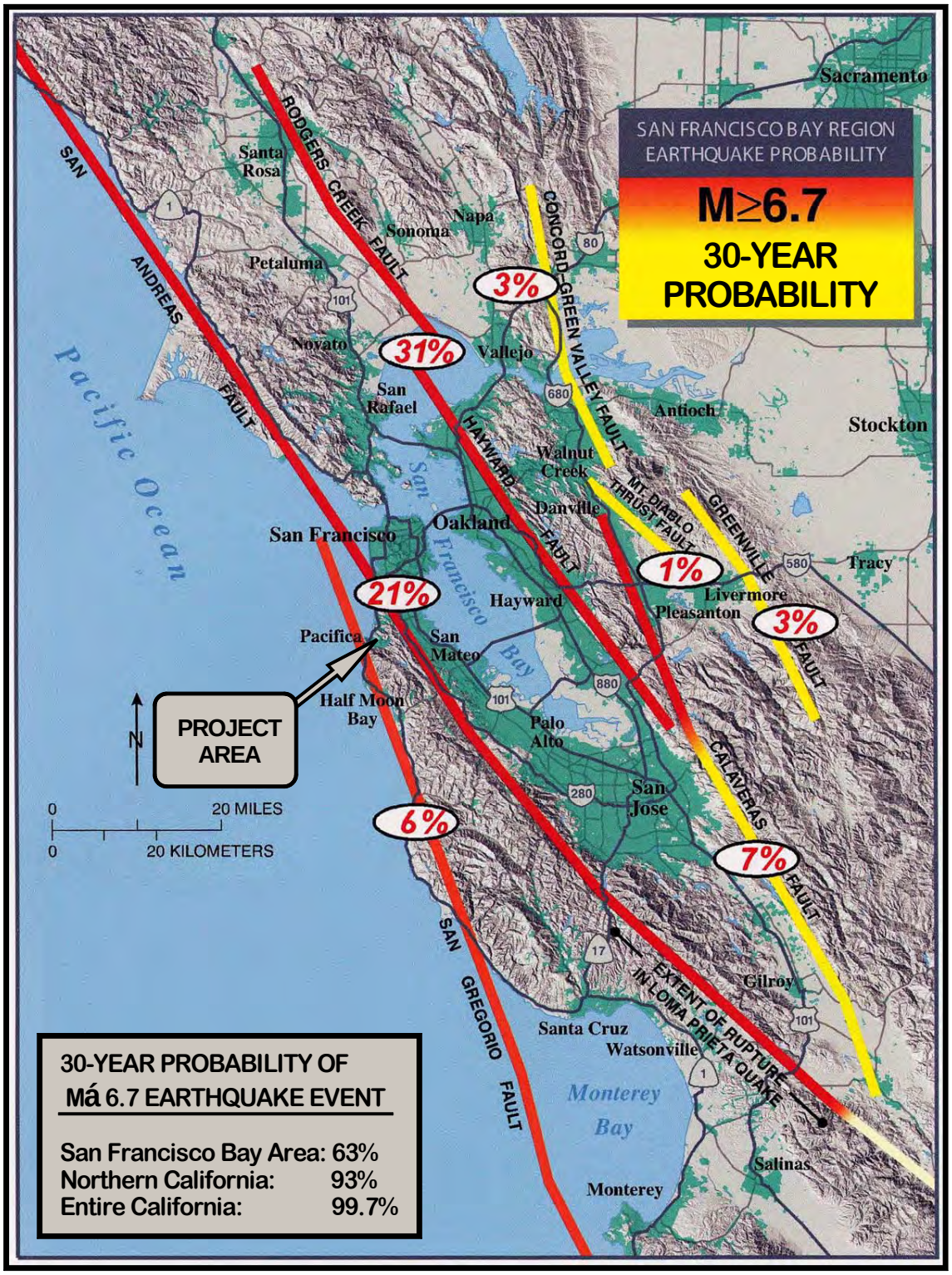
Mapped Soil		Below Ground Depth (in)	USCS Group Symbol	% Passing Sieve:		Atterberg Limits		Depth to Bedrock (in)	High Water Table (ft)	Risk of Corrosion	
Id.	Name			No. 4	No. 200	Liquid Limit	Plasticity Index			Uncoated Steel	Concrete
109	Candlestick	0-20	SM, ML, CL, SC	80-100	35-60	20-40	NP-20	20	>6.0	Moderate	Moderate
	Barnabe	0-8	GC-GM, GM	45-55	15-30	20-35	NP-10	8	>6.0	Moderate	Moderate
121/124	Orthents	0-60	No properties listed for Orthents and Urban Land (Kashiwagi, 1991)								
131/132	Urban Land	0-6									
138	Beaches										

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Soil Map

Figure
6



Map from WGCEP (2003 and 2007)

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California

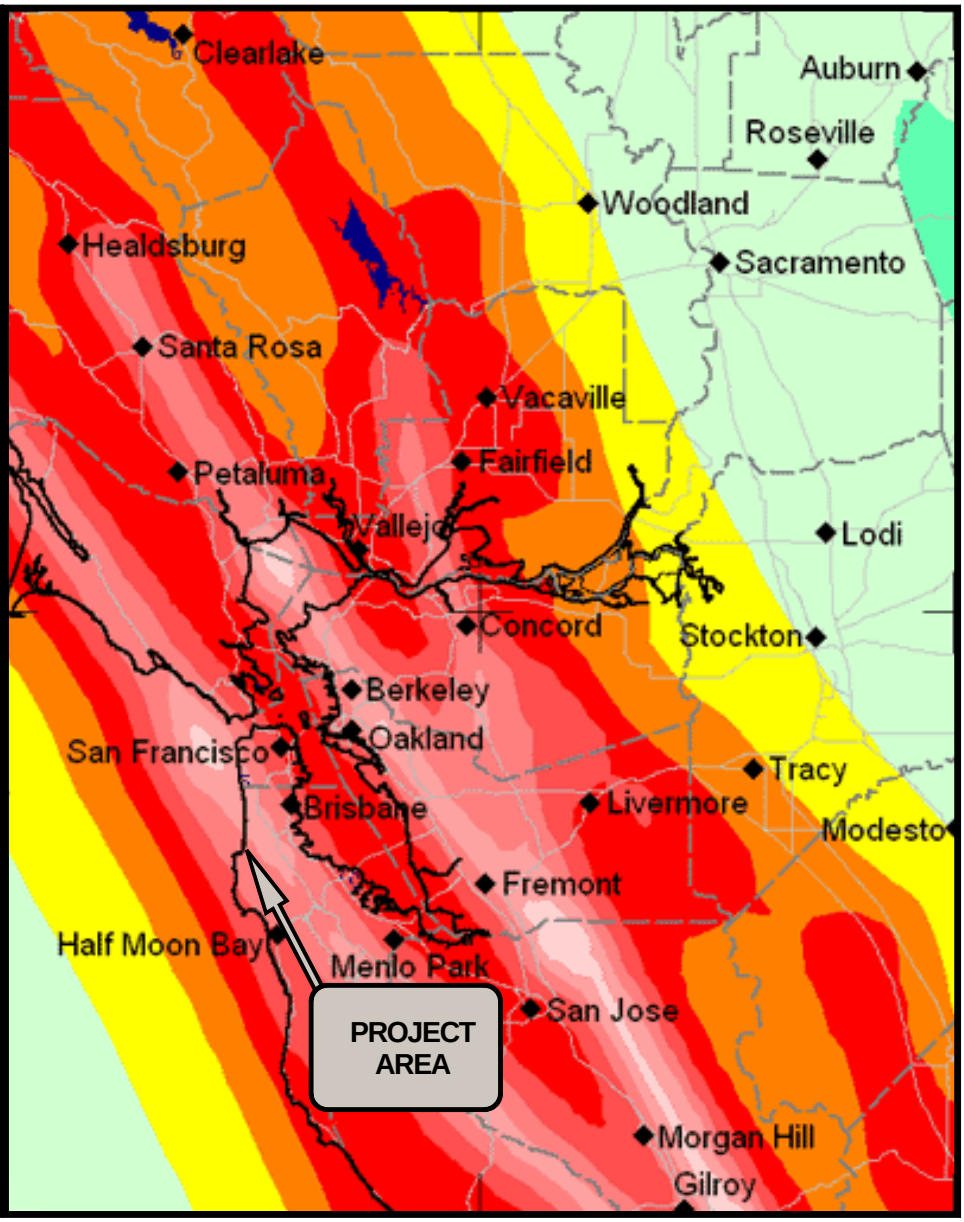
Bay Area Fault Map

Figure
7

Peak Ground Acceleration Shaking with 10% probability exceedance in 50 years (firm rock condition)

- <10% g
- 10-20%g
- 20-30%g
- 30-40%g
- 40-50%g
- 50-60%g
- 60-70%g
- 70-80%g
- >80%g

("g" is gravity)



Modified from USGS/CGS 2002 Probabilistic Seismic Hazards Assessment Model (Cao and others 2003).

Latitude/Longitude	N 37.596°/W 122.90°
Peak Ground Acceleration:	0.66g

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Seismic Shaking Map

Figure
8

AVERAGE PEAK VELOCITY (CENTIMETERS PER SECOND)	MODIFIED MERCALLI INTENSITY VALUE AND DESCRIPTION	AVERAGE PEAK ACCELERATION ("g" is gravity - 9.80 meters per second squared)
	I. Not felt except by a very few under especially favorable circumstances.	
	II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.	
	III. Felt quite noticeable indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing vehicles may rock slightly. Vibration like passing of a truck. Duration estimated.	
1-2	IV. During the day felt indoors by many, outdoors by few. At night some awakened. Rattling of dishes, windows, and doors; walls make creaking sounds. Hanging objects swing. Sensation like a heavy truck passing. Standing vehicles rocked noticeably.	0.015g-.02g
2-5	V. Felt by nearly everyone, many awakened. Some dishes, windows and so on broken; cracked plaster in a few places; unstable objects overturned. Disturbances of trees, poles and other tall objects sometimes noticeable. Pendulum clocks may stop. Buildings trembled throughout.	0.03g-0.04g
5-8	VI. Felt by all, many frightened and run outdoors. Some moderately heavy furniture moved; a few instances of fallen plaster and damaged chimneys. Trees, bushes, shaken slightly to moderately. Damage slight in poorly constructed buildings. Broken dishes, glassware and some windows. Moved furnishings and overturned furniture.	0.06g-0.07g
8-12	VII. Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; chimneys cracked to considerable extent. Noticed by persons driving vehicles. Waves on ponds, lakes, running water. Broke numerous windows, heavy furniture overturned. Dislodged bricks and stones.	0.10g-0.15g
20-30	VIII. Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving vehicles disturbed.	0.25g-0.30g
45-55	IX. Damage considerable in specially designed structures; well-designed frame structures thrown out-of-plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken. Reservoirs threatened.	0.50g-0.55g
More than 60	X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Railroad rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed, slopped over banks. Reservoirs greatly damaged. Open cracks in cement pavements and asphalt road surfaces.	More than 0.60g
	XI. Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly. Dams, dikes, embankments severly damaged. Destroyed large well-built bridges.	
	XII. Damage total. Practically all works of construction damaged greatly or destroyed. Landslides, falls of rock, slumping of river banks extensive. Fault slips in firm rock, with notable horizontal vertical off-set displacements. Water channels, surface and underground disturbed and modified greatly. Waves seen on ground surfaces.	

REFERENCE ; Compiled from "Earthquakes & Volcanoes," Volume 21, Number 1, 1989, and "Earthquakes A Primer," Bruce A. Bolt, W.H. Freeman and Company, San Francisco, Copyright 1993.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Modified Mercalli Scale

Figure
9

Liquefaction Susceptibility Map

Susceptibility Level

- Very High
- High
- Moderate
- Low
- Very Low
- Major Roads
- Local Roads

Scale: 1 inch = 0.55 miles

This map is intended for planning use only and is not intended to be site-specific. Rather, it depicts the general hazard level of a neighborhood and the relative hazard levels from community to community. Hazard levels are less likely to be accurate if your neighborhood is on or near the border between two zones. This information is not a substitute for a site-specific investigation by a licensed professional.

This map is available at http://quake.abag.ca.gov

Sources:
This map is based on work by William Lettis & Associates, Inc. and USGS.
USGS Open-File Report 00-444, Knudsen & others, 2000 and
USGS Open-File Report 2006-1037, Witter & others, 2006

For more information visit:
http://pubs.usgs.gov/of/2000/of00-444/
http://pubs.usgs.gov/of/2006/1037/

ABAG Geographic Information Systems

Liquefaction Map from ABAG, 2012.

○ - Approximate Locations of Potential Basin Sites

A - Caltrans Parking Lot
B - Skate Park Parking Lot
C1 - Community Center Parking Lot
C2 - Vacant Caltrans Parcel
D - Linda Mar PS Parking Lot
E - City Beach Parking Lot

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
USGS Liquefaction Susceptibility Map

Figure
10

FEMA Flood Hazard Areas

Flood Hazard Areas

- Zone V- (100 yr. Flood Zone)
- Zone A- (100 yr. Flood Zone)
- Zone X500- (500 yr. Flood Zone or other concerns)
- Urbanized Area

Shaded to show topographical relief

Detailed FEMA Explanation

Flood Zone	Description
Zone V	This code identifies an area inundated by 1% annual chance flooding with velocity hazard (wave action).
Zone A	This code identifies an area inundated by 1% annual chance flooding.
Zone X500	This code identifies an area inundated by 0.2% annual chance flooding; an area inundated by 1% annual chance flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 1% annual chance flooding.

Scale: 1 inch = 0.55 miles

Sources:
Flood Zones - FEMA Q3 (2003) and DFIRM (2009)
Base Data - TeleAtlas (2008)
The product has been designed to support planning activities.
A more detailed version of this map is available at http://quake.abag.ca.gov

ABAG Geographic Information Systems

Flood Map from ABAG, 2012.

- Approximate Locations of Potential Basin Sites

A - Caltrans Parking Lot
B - Skate Park Parking Lot
C1 - Community Center Parking Lot
C2 - Vacant Caltrans Parcel
D - Linda Mar PS Parking Lot
E - City Beach Parking Lot

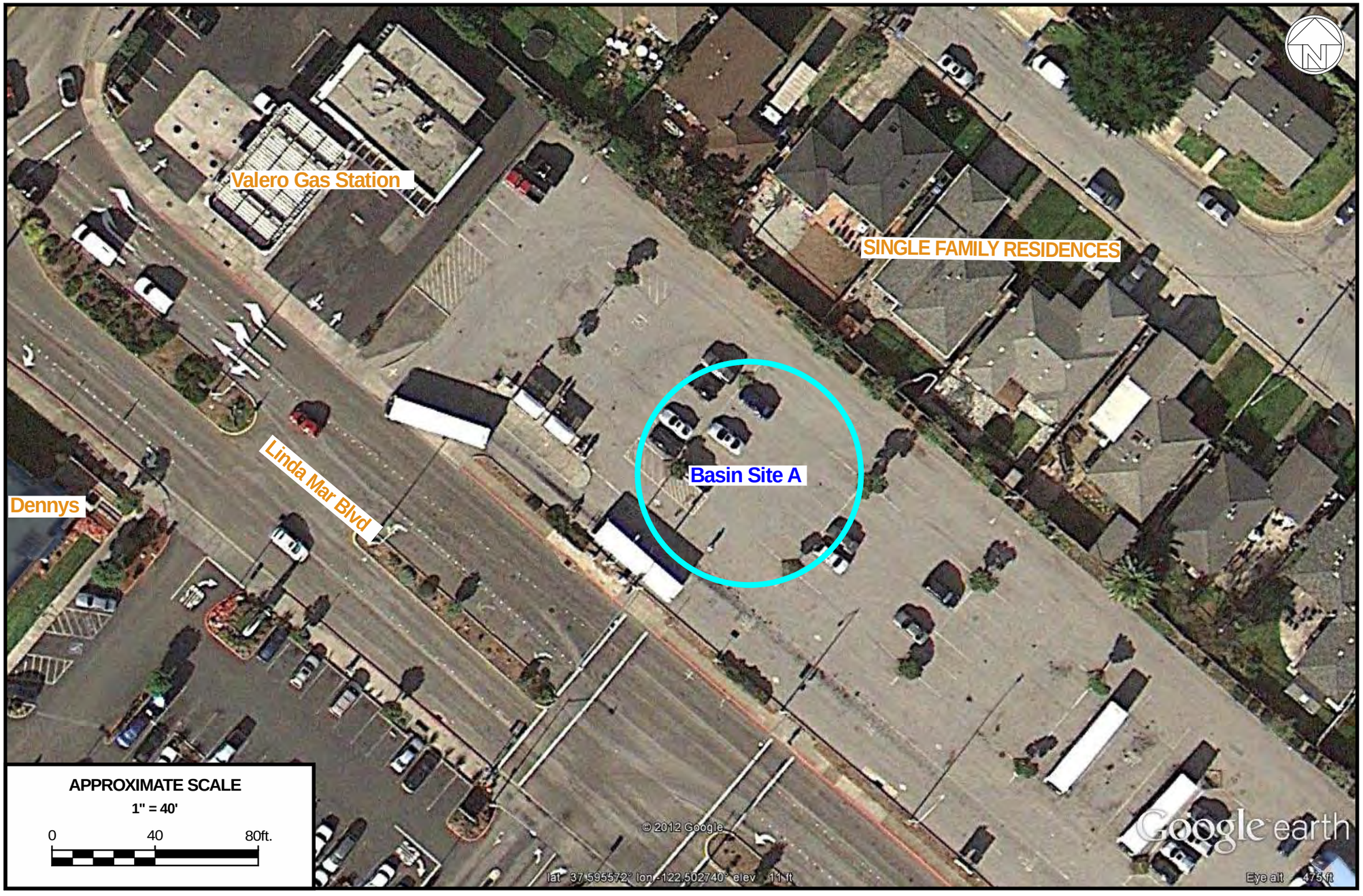
JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
FEMA Flood Map

Figure
11

Appendix A



NOTES:

Basin location and size are preliminary and taken from Figure 1, Alternative Site Study (RMC, 2012).

JACOBS ASSOCIATES
Engineers/Consultants

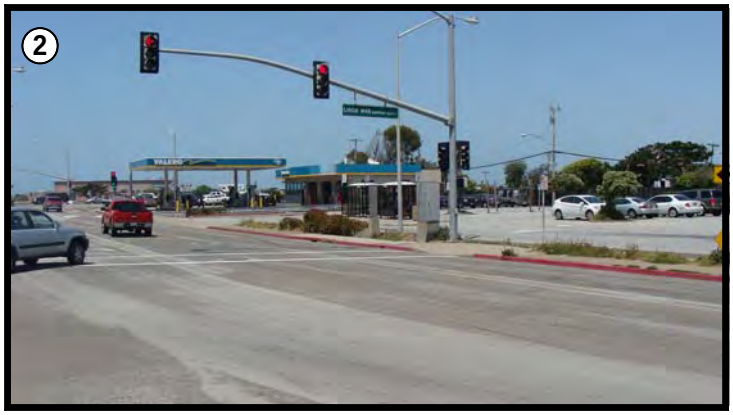
File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California

Site A - Caltrans Parking Lot

Figure
A-1

1 **Northwestly view of Site A. Site is near a Valero gas station. Geotracker site (i.e., environmental site) is located across the street at from gas station (now Denny's).**



2 Northerly view from Linda Mar Boulevard of Site A.

3 **View of typical residential house located northwest of the project site. Recently painted with possible patched cracks along base of house.**

Photographs taken on May 10, 2012.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California

Site A Photos - Caltans Parking Lot

Figure

A-2

Appendix B

APPROXIMATE SCALE

1" = 40'

0 40 80ft.

Community Center

Vacant Caltrans Parcel (Site C2)

Skate Park

RB-1

RB-2

Reference boring locations at Skate Park not know at this time.

Basin Site B

Boring 1

Undeveloped Land

Adjacent Single Family Residences

© 2012 Google

Google earth

Imagery Date: 10/31/2011 lat 37.597951° lon -122.500103° elev 11 ft Eye alt 468 ft

LEGEND:

Boring 1 - Project boring (see Log on Figure B-3 in Appendix B)

RB-1 - Reference Borings (see logs on Figures B-4 and B-5 in Appendix B).

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Site B - Skate Parking Lot

Figure
B-1

1 Westerly view of Site B. Parking lot in the area of the Site B does not appear to get heavy use. Single family residential borders the southwest side of the Skate Park lot.

2 Northwestery view of Site B. Site B will be located partially in the parking lot and in the undeveloped land adjacent to the Skate Park.

3 Westerly view of Skate Park. The Skate Park is a concrete structure which appears to be founded on a shallow foundation. No the concrete has no cracks. The Skate Park was dedicated in December of 2004.

Photographs taken on May 10, 2012.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California

Site B Photos - Skate Park Lot

Figure
B-2

LOG OF BORING 1 ①

LOCATION: see Figure B-1

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	③GROUNDWATER	DESCRIPTION ②	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
					Parking lot: 2 inches asphalt concrete										
					CLAYEY SAND WITH GRAVEL (SC) - yellowish brown - fine to coarse sand, fine gravel - dry										
	1	☒			**SANDY CLAY (CL)** - dark gray - fine sand - dry/moist	27		43	23						
5	2	■	4		**FAT CLAY WITH SAND (CH)** - dark grayish blue - fine sand - soft - moist	26	95						0.74		
10	3	◢	0		**FAT CLAY (CH) - BAY MUD** - very dark gray/black - trace to few organics, peaty - trace coarse sand @ 17½' - very soft - wet	72		99	67						
15	4	▯	pushed		CONSOLIDATION TEST SAMPLE B-2-4 C_C = 0.43 P_C = 1.40 ksf	71	59								
20	5	■	13		**LEAN CLAY (CL)** - light grayish blue with light brown mottling - few fine sand, little silt - stiff - moist	23	104						2.34		
25	6	◢	42		**SILTY SAND WITH GRAVEL (SM) and SILTY GRAVEL WITH SAND (GM)** - light reddish/yellowish brown - fine to coarse sand - little angular gravel/rock (up to 1.5") - dense - dry	10									
					BORING CONTINUED AT 28 FEET ON FIGURE B-4 (2 OF 3)										

NOTES
① Drilled 09/17/12 with a Failing 1500 drill rig using a 5-inch tri-cone bit and mud rotary with a 30" drop by 140 lb. automatic sampling hammer.
② See report text and figures B-3 and B-5 through B-9 for definitions, lab test results, and additional soil descriptions.
③ Free groundwater level obscured during drilling due to water-added drilling method. Static equilibrium groundwater depth is unknown.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Log of Boring 1 - Skate Park Lot

Figure
B-3
(1 of 3)

LOG OF BORING 1 (Continued) ①

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER	DESCRIPTION	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
					BORING CONTINUED FROM 28 FEET ON FIGURE B-4 (1 OF 3)										
30	7		33		**SILTY/CLAYEY SAND WITH GRAVEL (SC/SM)** - reddish/orangish brown - fine to coarse sand, mostly fine angular gravel/rock - dense - dry	12				38	47	15			
35	8		38			12				23	62	15			
40	9		19		**LEAN CLAY (CL)** - grayish blue with yellow brown striations until 41' - few fine sand, trace fine angular gravel/rock until 41' - stiff - moist - grades clayier with depth	21	110	37	20				5.30		
45	10		66		**CLAYEY/SILTY SAND WITH GRAVEL (SC/SM)** - grayish blue and reddish/yellowish brown - mostly fine sand, fine gravel - dense, cemented - moist/dry	14	123			18	47	35			
50	11		28		**FAT CLAY (CH)** - grayish blue and orangish brown - few sand, few silt - very stiff - moist	29	98	56	34				4.19		
					BORING CONTINUED AT 53 FEET ON FIGURE B-3 (3 OF 3)										

FINES 6% Silt 9% Clay

FINES 5% Silt 10% Clay

FINES 16% Silt 19% Clay

NOTES

① See Notes on Figure B-3, 1 of 3.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Log of Boring 1 - Skate Park Lot

Figure
B-3
(2 of 3)

LOG OF BORING 1 (Continued) ①

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER	DESCRIPTION	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
					BORING CONTINUED FROM 53 FEET ON FIGURE B-4 (2 OF 3)										
55	12		22		**LEAN CLAY WITH SAND (CL)** - light gray and orangish brown - fine sand, few silt - very stiff - moist										
60	13		75		**LEAN CLAY WITH SAND (CL)** - grayish blue and reddish brown - fine sand, few to little silt - hard - moist/dry	14	122						9.04		
65	14		26		**LEAN CLAY (CL)** - reddish/orangish brown and grayish/yellowish brown - trace fine sand - very stiff - moist	25									
					SILTY SAND (SM) - orangish/reddish brown - fine sand - medium dense - moist					0	46	54			
70	15		28		**SANDY LEAN CLAY (CL)** - bluish gray and reddish/yellowish brown - fine sand, few silt - moist - very stiff	26	100			0	38	62		97	39°
75	16		22		**SILTY SAND (SM) and SANDY LEAN CLAY (CL)** - reddish brown and yellowish/grayish brown - mostly fine sand - medium dense and very stiff - moist	27									
					BOTTOM OF BORING AT 76 ½ FEET										
80															

FINES
30% Silt
24% Clay

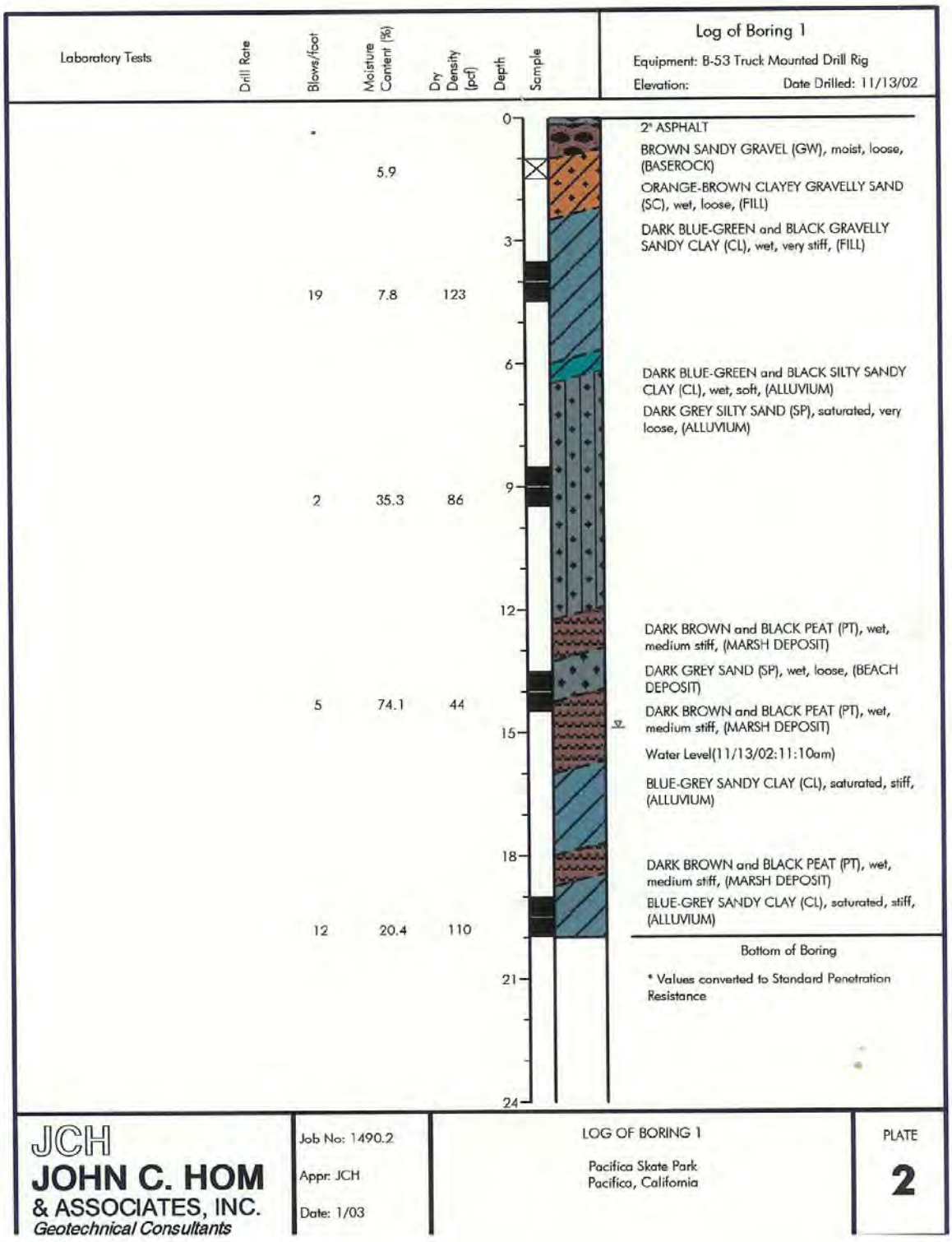
NOTES
① See Notes on Figure B-3, 1 of 3.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Log of Boring 1 - Skate Park Lot

Figure
B-3
(3 of 3)



Jacobs Associates remarks:

1. Reference: Log of Boring 1 from John C. Hom & Associates (2003)

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

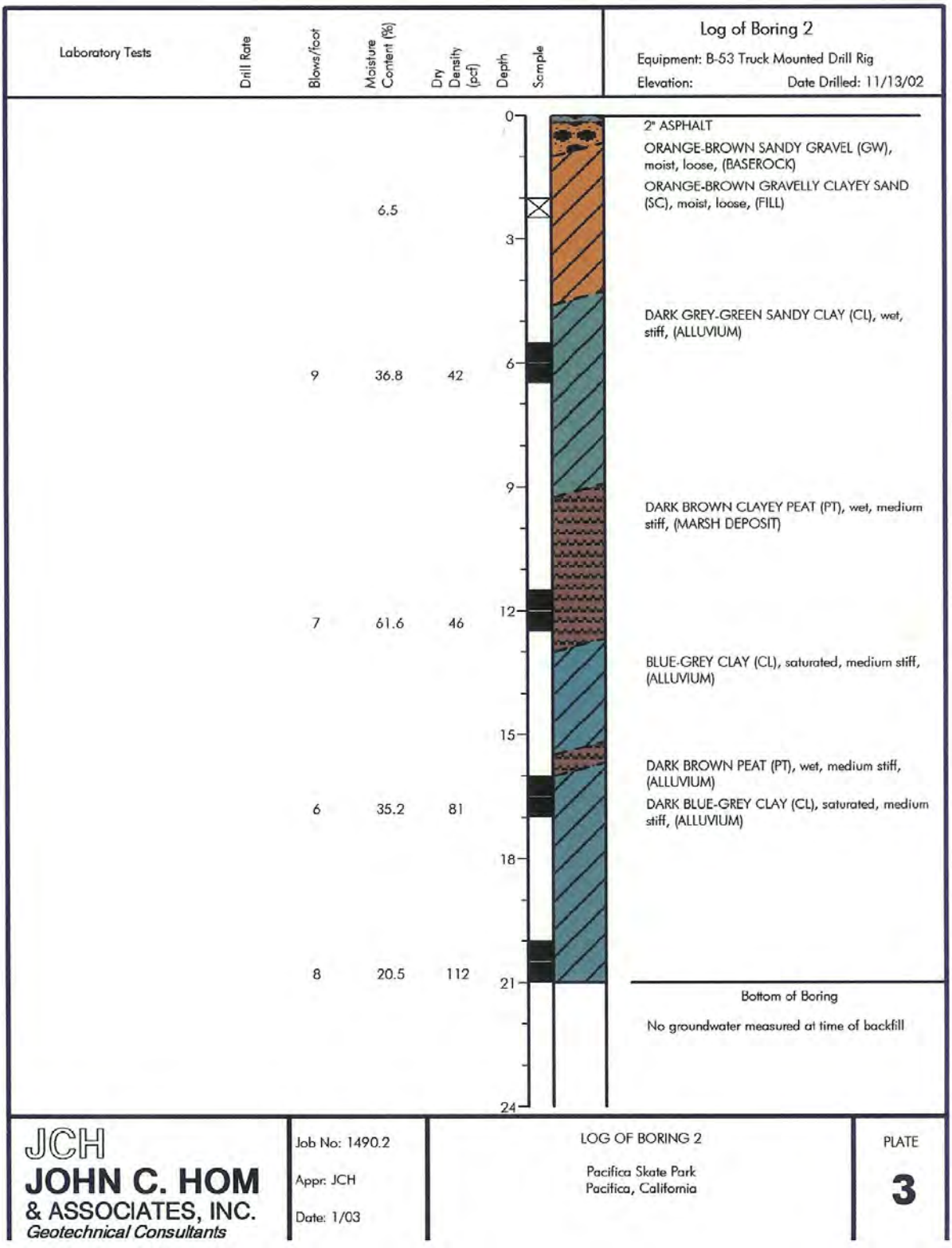
RMC Water and Environment

City of Pacifica
Wet Weather Basin Project
Pacifica, California

Site B - Reference Boring RB-1

Figure

B-4



Jacobs Associates remarks:

1. Reference: Log of Boring 2 from John C. Hom & Associates (2003)

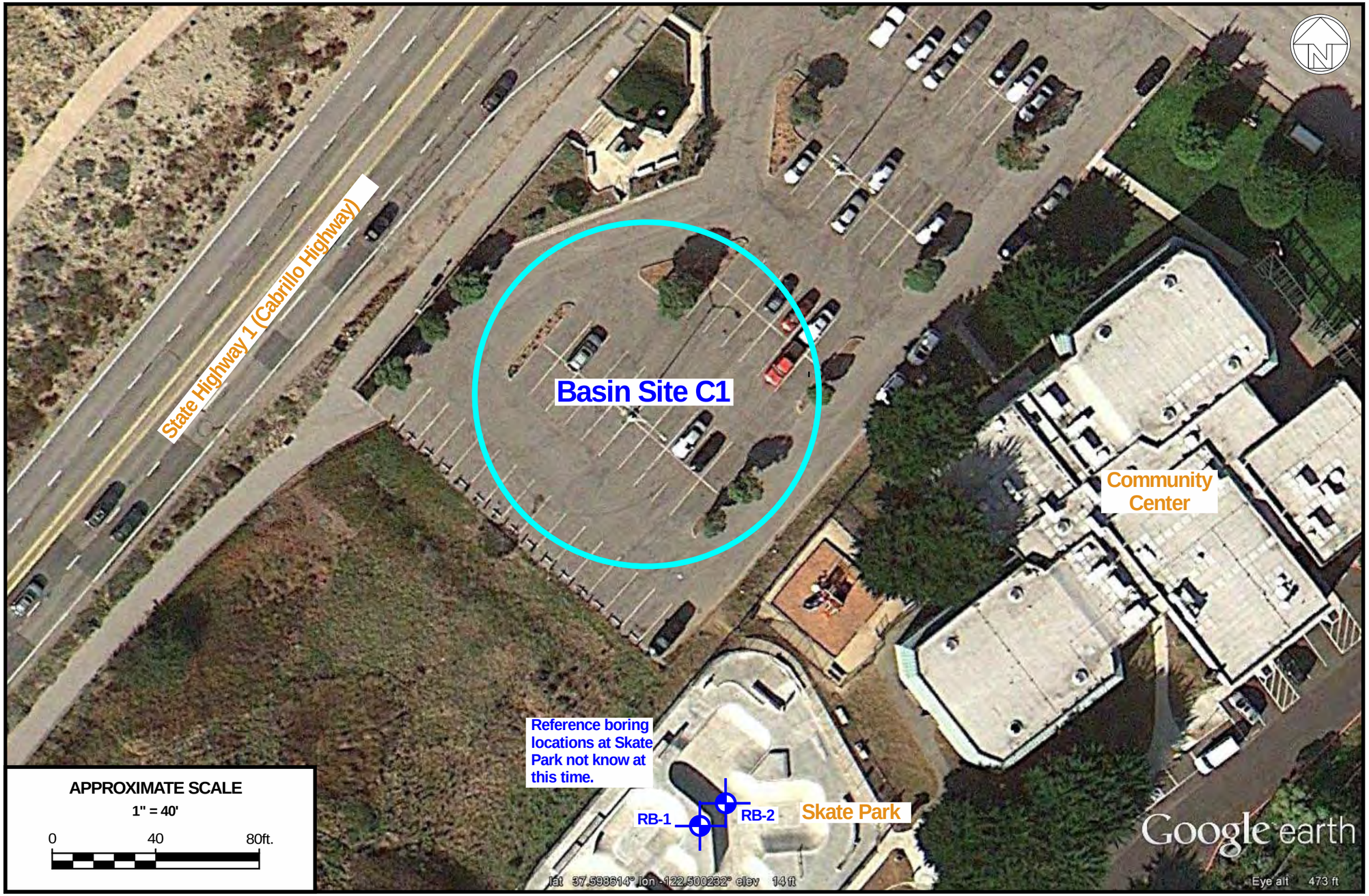
JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Site B - Reference Boring RB-2

Figure
B-5

Appendix C



APPROXIMATE SCALE

1" = 40'

0 40 80ft.

LEGEND:

RB-1 - Reference Borings (see logs on Figures B-4 and B-5 in Appendix B).

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Site C1 - Community Center Lot

Figure
C-1

APPROXIMATE SCALE

1" = 40'

0 40 80ft.

LEGEND:

Boring 1 - Project boring (see Log on Figure B-3 in Appendix B)

RB-1 - Reference Borings (see logs on Figures B-4 and B-5 in Appendix B).

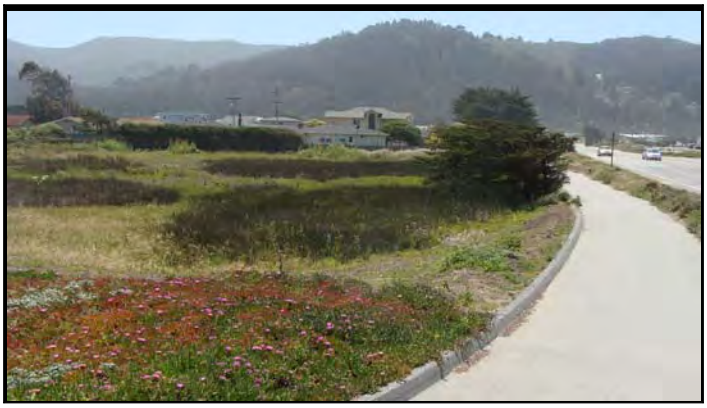
JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Site C2 - Vacant Caltrans Parcel

Figure C-2

① Southwestly view of eastern portion of Site C2. Site C2 is bounded by single family residential developement. Site C2 is approxiately 2 to 3 feet lower in elevation than surrounding developed land.



② Southwesterly view of western portion of Site C2. Site is bounded by sidewalk and Highway 1.

Photographs taken on May 10, 2012.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

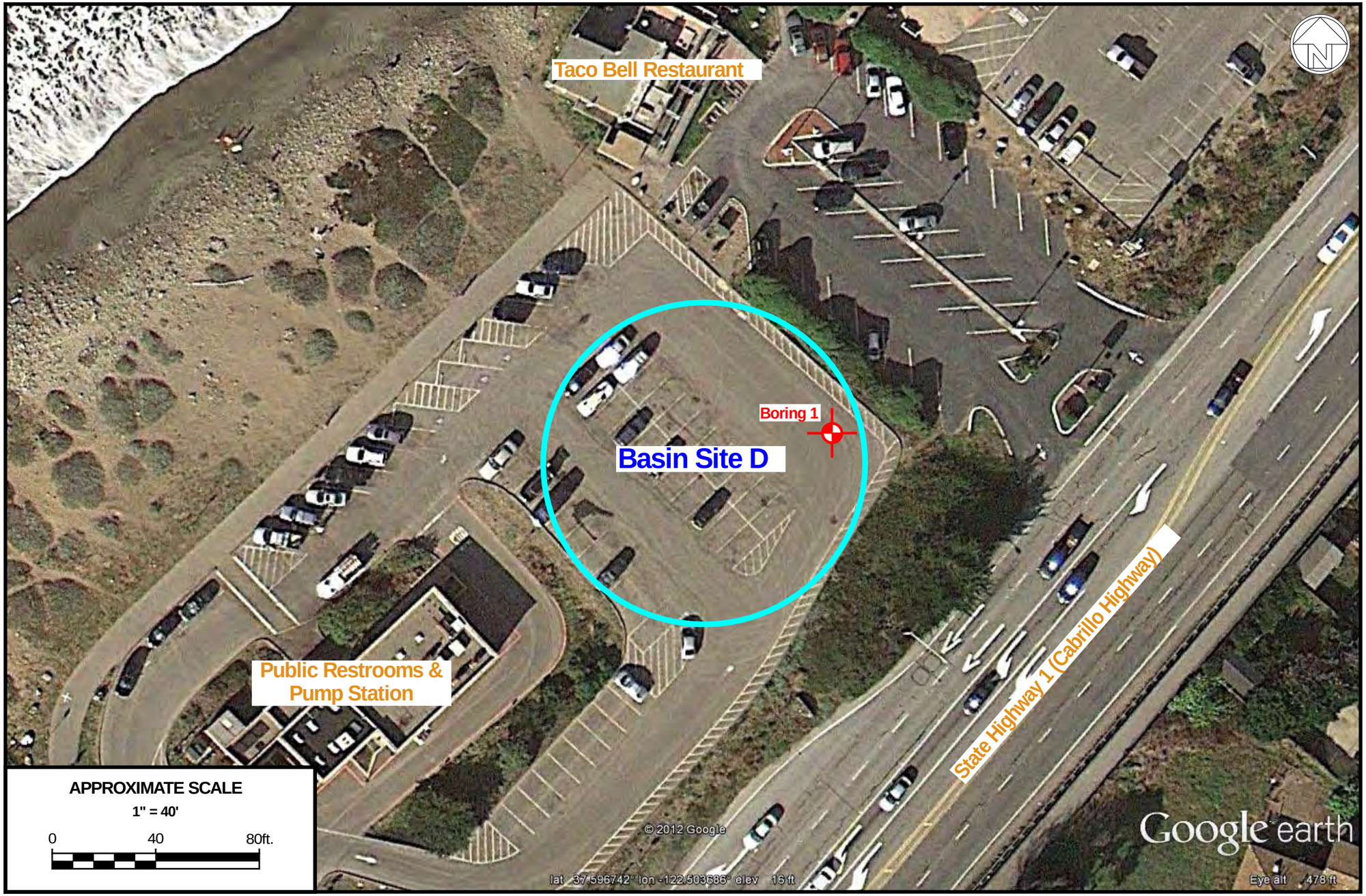
RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California

Site C2 Photos - Vacant Caltrans Parcel

Figure

C-3

Appendix D



Boring 2
- Project test boring (see log on Figure D-4)

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California
Site D - Linda Mar PS Lot

Figure
D-1

1 Northeasterly view of parking lot on west side of Site D. Site D is covered with aphaltic contrete.

2 View of approximately two inches of settlement between parking lot surface and pump station structure.

3 View of Taco Bell resturant located to the north of the Pump Station.

4 View the wood pile foundations used to support the adjacent Taco Bell building.

Photographs taken on May 10, 2012.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California

Site D Photos - Linda Mar PS Lot

Figure
D-2

LOG OF BORING 2 ①

LOCATION: Site D - Linda Mar Pump Station Parking Lot (see Figure D-1)

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	③GROUNDWATER	DESCRIPTION ②	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
					Parking lot: 3 inches asphalt concrete										
					CLAYEY SAND WITH GRAVEL (SC) - FILL - dark reddish brown - fine to coarse sand - fine to coarse angular gravel/crushed rock - organics (wood) @ 1-2' - dry										
5	1				**SILTY GRAVEL WITH SAND (GM) - Fill**										
	2		42		- brown and light green/white - fine to coarse sand, fine to coarse angular gravel/rock - medium dense - dry/moist - cobbles @ 5'	10				45	34	21			
					SANDY LEAN CLAY (CL) - very dark gray - fine sand - moist to wet										
10	3		29		**POORLY-GRADED SAND (SP)** - dark bluish gray - fine sand, trace fines - medium dense to dense - wet	20	115			0	97	3			
15	4		40												
					PEAT (PT) WITH ORGANIC SILT/CLAY (OL/OH) - dark brown - mostly organics (wood and grass) - little black organic clay (OH) - strong sulfurous odor - medium stiff - wet Sample 5: 45.3% Organic Matter										
20	5		10			217	22								
					FAT CLAY (CH) - BAY MUD - dark grayish blue - trace silt - wet - stiffer @ 27 ½' CONSOLIDATION TEST, SAMPLE B-1-6: C_C = 0.32, P_C = 2.30 ksf										
25	6		pushed			42	79						1.12		
					BORING CONTINUED AT 28 FEET ON FIGURE D-4 (2 OF 3)										

NOTES
① Drilled 09/18/12 with a Failing 1500 drill rig using a 5-inch tri-cone bit and mud rotary with a 30" drop by 140 lb. automatic sampling hammer.
② Free groundwater level obscured during drilling due to water-added drilling method. Static equilibrium groundwater depth is unknown.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
Log of Boring 2 - Linda Mar PS Lot

Figure **D-3** (1 of 3)

LOG OF BORING 2 (Continued) ①

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER	DESCRIPTION	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
					BORING CONTINUED FROM 28 FEET ON FIGURE D-3 (1 OF 3)										
30	7		17		**LEAN CLAY (CL)** - grayish green/blue with orangish brown mottling - trace to few coarse sand - stiff - wet	23	107	41	24				1.29		
35	8		13		**CLAYEY/SILTY SAND WITH GRAVEL (SC/SM)** - olive brown/bluish green/orangish brown - fine to coarse sand, fine gravel - medium dense - wet	15				27	48	25			
40					**CLAYEY/SILTY SAND (SC/SM)** - grayish blue - fine sand, few gravel - medium dense - wet										
	9		19		**LEAN CLAY WITH SAND (CL)** - grayish blue and orangish brown - fine to coarse sand - stiff - wet	28 25	99 101						1.24		
45	10		25		**CLAYEY/SILTY SAND WITH GRAVEL (SC/SM)** - grayish blue/orangish brown and reddish brown - fine to coarse sand, fine angular gravel - medium dense - wet	16				22	58	20			
50	11		62		**CLAYEY/SILTY SAND WITH GRAVEL (SC/SM)** - orangish brown - fine to coarse sand, fine to coarse angular/sharp gravel/rock - very dense - wet - white/opaque rock fragments in shoe of sampler	10				37	49	14			
					BORING CONTINUED AT 53 FEET ON FIGURE D-3 (3 OF 3)										

CONSOLIDATION TEST
SAMPLE B-1-9
C_C = 0.14
P_C = 3.80 ksf

FINES
17% Silt
8% Clay

FINES
12% Silt
8% Clay

FINES
8% Silt
6% Clay

NOTES
① See Notes on Figure D-3, 1 of 3.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
Log of Boring 2 - Linda Mar PS Lot

Figure
D-3
(2 of 3)

LOG OF BORING 2 (Continued) ①

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER	DESCRIPTION	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
					BORING CONTINUED FROM 53 FEET ON FIGURE D-3 (2 OF 3)										
55	12		28		**LEAN CLAY (CL)** - bluish gray and light orangish brown - few coarse sand (dark reddish brown) - very stiff - moist	21	108	41	23				2.32		
60	13		26		**CLAYEY/SILTY SAND WITH GRAVEL (SC/SM)** - bluish gray and orangish brown - fine to coarse sand, fine angular gravel - medium dense - moist	15				-	-	33			
65	14		35		**LEAN CLAY (CL)** - bluish gray and reddish brown - few sand - few coarse gravel @ 65½' - very stiff - moist	23	103						3.69		
70	15		22		**CLAYEY/SILTY SAND (SC/SM)** - dark grayish blue - fine to medium/coarse sand - medium dense to dense - moist to wet - clayey sand with trace black organic woody material (70 to 71 feet)	24				0	70	30			
75	16		33		- thin layer of bluish gray CL with sand @ 75' - thin layer of dark brown CL/ML @ 76'										
80					**BOTTOM OF BORING AT 76 ½ FEET**										

NOTES ① See Notes on Figure D-3, 1 of 3.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
Log of Boring 2 - Linda Mar PS Lot

Figure
D-3
(3 of 3)

Appendix E

APPROXIMATE SCALE

1" = 40'

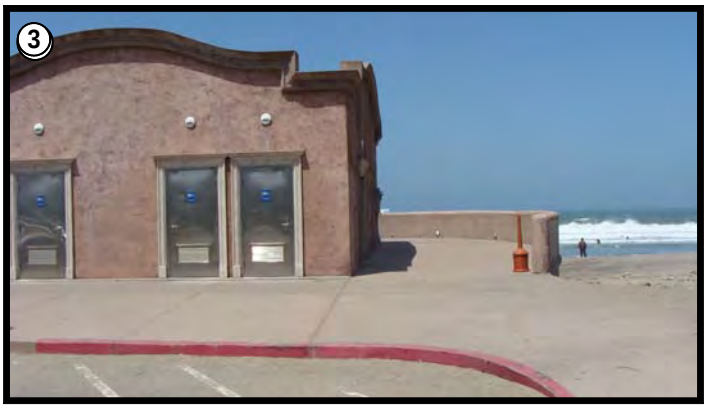
0 40 80ft.

JACOBS ASSOCIATES Engineers/Consultants		**RMC Water and Environment** City of Pacifica Wet Weather Basin Project Pacifica, California **Site E - City Beach Parking Lot**	**Figure** **E-1**
File No. 4497.0	December 2012		

1 Southerly view of Basin Site E. Site E is located in a aphaltic concrete parking lot with concrete curbs along the northwest side (i.e., the beach side) and the northeast side.

Highway 1 parallels the southeast sideof the site and is separated from the parking lot by a landscaped area.

2 Westerly view of the parking lot and bathroom/ pump station structure.



3 View of beach front bathroom/pump station structure.

4 **View of northern entrance to City Beach parking lot.**

Photographs taken on May 10, 2012.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | December 2012

RMC Water and Environment
City of Pacifica
Wet Weather Basin Project
Pacifica, California

Site E Photos - City Beach Parking Lot

Figure

E-2

Attachment B - Geotechnical Memorandum for Site A

JACOBS ASSOCIATES
Engineers/Consultants

Geotechnical Memorandum

May 17, 2013

Mr. Tim Harrison
RMC Water and Environment
2011 N. Main Street, Suite 400
Walnut Creek, CA 94596

Subject: Preliminary Test Boring at Basin Site A
Pacifica Wet Weather Equalization Basin Study

Dear Mr. Harrison:

Jacobs Associates is pleased to submit this Geotechnical Memorandum presenting the findings of preliminary test boring B-3 drilled at Basin Site A (i.e., Caltans Parking Lot), located on the northeast of Linda Mar Boulevard northwest of De Soto Drive (see Figure 1).

Jacobs Associates previously drilled preliminary test boring Borings B-1 and B-2 at the Skate Park Lot (Basin Site B) and at the Linda Mar Pump Station (Basin Site D). The logs of test Borings B-1 and B-2 are included in Geotechnical Engineering Siting Study (Jacobs Associates, 2012).

GEOTECHNICAL FIELD INVESTIGATION AND LAB TESTING

Preliminary Project Test Boring B-3

Preliminary project test Boring B-3 was drilled and logged on April 16, 2013. Boring log legends and the Boring B-3 log are provided in Appendices A and B, respectively. Boring B-3 was drilled with a B-57 truck-mounted drill rig. Rotary wash methods and a 5-inch-diameter tri-cone drill bit were to drill to a depth of 100.5 feet.

Relatively undisturbed samples were obtained by driving a 2.5-inch inside diameter (ID), 3-inch outside diameter (OD), Modified California Sampler (MCS) containing brass liners in to the bottom of the boring at the depth indicated on the log. Disturbed soil samples were obtained by driving a 1.4-inch ID, 2.0-inch OD Standard Penetration Test (SPT) sampler into the bottom of the boring at the depth indicated on the log. An automatic 140-pound hammer falling 30 inches per blows was used to drive MCS and SPT samplers.

The number of blows required to drive the samplers the last 12 inches of an 18-inch drive are recorded on the boring logs as penetration resistance (blows/foot). MCS penetration resistance values are field blow counts that were not reduced to equivalent SPT N-values. Soil samples retrieved from the test borings were examined for classification per ASTM D2488, logged, and sealed to preserve their natural moisture content for laboratory testing.

Classifications systems used to log soil samples are provided in Appendix A. Descriptions of soils provided on the boring logs in Appendix B and are based on observations during drilling and sampling and on the results of laboratory tests.

The test boring was backfilled with grout in accordance with County permit requirements. No obvious contaminated soil and/or contaminated groundwater were noted during drilling. Drilling spoils were placed in 55 gallon drums and disposed by the Pitcher Drilling at a landfill site. Testing of drummed soil may be done by the landfill site. Any environment testing of the drilling spoils by land fill site will be provided to RMC.

Laboratory Testing

Moisture content, unit weight, Atterberg limits (i.e., liquid limit and plasticity index), grain size analysis, and unconfined compression tests were performed on samples retrieved from the test boring to evaluate their physical characteristics and engineering properties. The results of these tests are included on the boring log in Appendix B and in figures in Appendix C.

GENERAL SUBSURFACE SOIL CONDITIONS

Fill (Approximately 0 to 4 feet)

Basin Site A is covered with approximately 4-inch thick layer of asphaltic concrete pavement. Underlying the pavement to a depth of about 4 feet, fill consisting of medium to high plasticity sandy clay with gravel was encountered.

Lagoon Deposits (Approximately 4 to 14.5 feet)

Below the fill, medium stiff Lagoon Deposits were encountered a depth of about 8.5 feet. Below the medium stiff Lagoon Deposits, a layer of very soft Lagoon Deposits were encountered to a depth of about 14.5 feet.

Stiff Clay Deposit (Approximately 14.5 to 19 feet)

Below the very soft Lagoon Deposit, a relatively thin layer of stiff clay was encountered.

Very Stiff and Medium Dense/Dense Deposits (Approximately 19 to 64 feet)

Below the stiff clay deposits, very stiff and medium dense to dense deposits consisting of interlayered clays with varying amounts of sand and gravel and dense silty and clayey sand with varying amounts of gravel to depths of about 64 feet. SPT blow counts generally ranged from 17 blows/foot (based on corrected MCS blow count) to 29 blows/foot.

Layers of hard sandy clay with gravel and very dense clayey sand with gravel having a blow count of 61 blows/per foot were encountered between depths of about 37 and 45 feet.

Very Dense Deposits (64 feet to 79 feet)

Between a depth of about 64 feet and 79 feet, very dense silty sand with gravel deposits were encountered. SPT blow counts ranged from 60 to 67 blows per foot.

Hard and Very Dense Deposits (79 feet to 100 feet)

Below a depth of about 79 feet, hard clays with vary amounts of sand and very dense sand with gravel and varying amounts of clay and silt were encountered. SPT blow counts ranged from 60 blows per foot to 50 blow/3 inches. Note that 50 blows/3 inches was recorded at a depth of 100 feet.

GROUNDWATER CONDITIONS

Groundwater was obscured during drilling due to water-added drilling method. Sampling encountered wet soils at a depth of 10 feet.

CLOSE

We appreciate the opportunity to provide RMC Water and Environment and the City of Pacifica with this geotechnical memorandum presenting the findings of preliminary test boring B-3 drilled at Basin Site A for City's Equalization Basin Preliminary Site Assessment project. If you have any questions regarding this memorandum, please call.

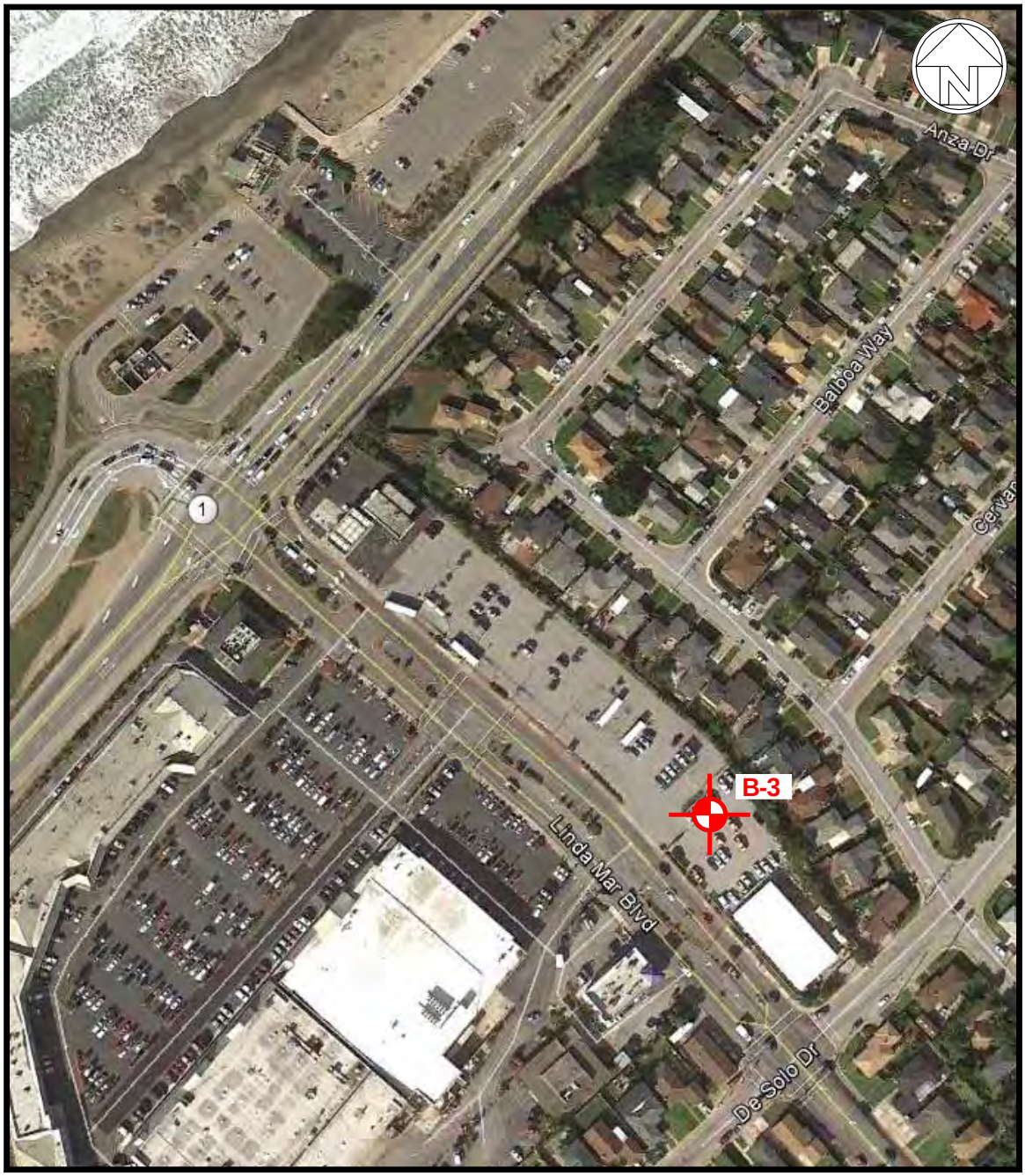
Sincerely yours,

JACOBS ASSOCIATES

Robert Kahl, PE, GE
Senior Associate

Attachments: Appendix A through Appendix C

Reference: 4497.0



- Boring Location

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | May 2013

County of San Mateo
City of Pacifica
Wet Weather Basin Project
Pacifica, California

Boring Location Map

Figure
1

Appendix A

KEY TO BORING LOGS

Shelby tube sample

Grab sample

1.4" I.D./2" O.D. Standard Penetration Test (ASTM D1586) sampler (SPT)

2.5" I.D./3" O.D. Modified California sampler (MCS) with brass liners

NSR No sample recovery

RELATIVE DENSITY		CONSISTENCY		
SANDS AND GRAVELS	SPT, N	SILTS AND CLAYS	SPT, N	UNCONFINED COMPRESSIVE STRENGTH, tsf
VERY LOOSE	0-4	VERY SOFT	0-2	0-0.25
LOOSE	4-10	SOFT	2-4	0.25-0.50
MEDIUM DENSE	10-30	MEDIUM STIFF	4-8	0.50-1.00
DENSE	30-50	STIFF	8-15	1.00-2.00
VERY DENSE	50+	VERY STIFF	15-30	2.00-4.00
		HARD	30+	>4.00

Reference: Terzaghi, K. and Peck, R., SOIL MECHANICS IN ENGINEERING PRACTICE, 2nd ed., John Wiley and Sons, New York, 1967. Page 341 Table 45.1 and page 347 Table 45.2.

MOISTURE CONDITION

DESCRIPTION	CRITERIA
DRY	Absence of moisture, dusty, dry to the touch
MOIST	Damp but no visible water
WET	Visible free water, usually soil is below water table

Reference: ASTM D2488, Table 3 - Criteria for Describing Moisture Condition

CONSTITUENT DESCRIPTIONS

DESCRIPTION	CRITERIA
TRACE	less than 5%
FEW	5% to 10%
LITTLE	15% to 25%
SOME	30% to 45%
MOSTLY	50% to 100%

Reference: ASTM D2488, Note 15

NOTES:

1. Lines separating strata in the logs represent approximate boundaries only and are dashed where strata change depth is less certain and queried where strata change depth is not known. Actual strata change may be gradual. No warranty is provided as to the continuity of strata between borings. Logs represent the subsurface section observed at the boring location on the date of drilling only.
2. Penetration resistance (blows/ft.) are the last 12" of an 18" drive using a 140-pound hammer falling 30 inches per blow (Failing 1500 drill rig) unless noted otherwise. The penetration resistance values noted on the logs are actual blows per foot of penetration for the respective sampler type (i.e., MCS sampler penetration resistance has not been reduced to an equivalent SPT "N" value).
3. Where noted on the boring logs, slough is defined as material from the bore hole walls which collapses or flows into and partially fills the bore hole on removal of the hollow stem auger plug or solid stem augers. The presence of slough within the bore hole can render drive sampling impossible (samplers fill entirely with slough) and invalidate the blow count.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | May 2013

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
Boring Log Legend

Figure
A-1
(1 of 2)

UNIFIED SOIL CLASSIFICATION SYSTEM

CRITERIA FOR ASSIGNING GROUP SYMBOLS AND GROUP NAMES [A]				GROUP SYMBOL	GROUP NAME [B]
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve	**GRAVELS** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels** < 5% fines [C]	$Cu \geq 4$ and $1 < Cc < 3$ [E]	**GW**	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]	**GP**	Poorly graded gravel [F]
		Gravels with Fines > 12% fines [C]	Fines classify as ML or MH	**GM**	Silty gravel [F,G,H]
			Fines classify as CL or CH	**GC**	Clayey gravel [F,G,H]
	SANDS 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands** < 5% fines [D]	$Cu \geq 6$ and $1 < Cc < 3$ [E]	**SW**	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]	**SP**	Poorly graded sand [I]
		Sands with Fines > 12% fines [D]	Fines classify as ML or MH	**SM**	Silty sand [G,H,I]
			Fines classify as CL or CH	**SC**	Clayey sand [G,H,I]
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	**SILTS AND CLAYS** Liquid limit < 50	**Inorganic**	PI > 7 plots on or above "A" line [J]	**CL**	Lean clay [K,L,M]
			PI < 4 plots below "A" line [J]	**ML**	Silt [K,L,M]
		Organic	Liquid limit-oven dried / Liquid limit-not dried < 0.75	**OL**	Organic Clay [K,L,M,N] / Organic Silt [K,L,M,O]
	SILTS AND CLAYS Liquid limit > 50	**Inorganic**	PI plots on or above "A" line	**CH**	Fat clay [K,L,M]
			PI plots below "A" line	**MH**	Elastic silt [K,L,M]
		Organic	Liquid limit-oven dried / Liquid limit-not dried < 0.75	**OH**	Organic Clay [K,L,M,P] / Organic Silt [K,L,M,Q]
HIGHLY ORGANIC SOILS		**Primarily organic matter, dark color and organic odor**		**PT**	Peat

NOTES:

A Based on the material passing the 3-in. (75mm) sieve.

B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

C Gravels with 5% to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

D Sands with 5% to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

E $Cu = \frac{D_{60}}{D_{10}}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

F If soil contains $\geq$ 15% sand, add "with sand" to group name.

G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

H If fines are organic, add "with organic fines" to group name.

I If soil contains $\geq$ 15% gravel, add "with gravel" to group name.

J If Atterberg limits plot in hatched area, soil is a CL-ML (silty clay).

K If soil contains 15% to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

L If soil contains $\geq$ 30% plus No.200, predominantly sand, add "sandy" to group name.

M If soil contains $\geq$ 30% plus No.200, predominantly gravel, add "gravelly" to group name.

N PI $\geq$ 4 and plots on or above "A" line.

O PI < 4 or plots below "A" line.

P PI plots on or above "A" line.

Q PI plots below "A" line.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | May 2013

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
Boring Log Legend

Figure
A-1
(2 of 2)

Appendix B

LOG OF BORING B-3 ①

LOCATION: See Figure 1

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	③GROUNDWATER	DESCRIPTION ②	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
					Parking lot: 6 inches asphalt concrete										
					SANDY LEAN/FAT CLAY WITH GRAVEL (CL/CH) - FILL - very dark gray - fine to coarse sand, rounded gravel - dry to moist at 3' - clayey sand (SC) with coarse gravel from 3½-4' (gravels up to 4")										
5	1		9		**LEAN TO FAT CLAY (CL/CH) - BAY MUD** - dark bluish grey - trace sand - trace organics - medium stiff - moist	39	80								
10	2		2		**LEAN CLAY (CL) - BAY MUD** - very dark bluish grey - trace organics - very soft - wet	35	88	38	20				0.26		
15	3		19		**LEAN/FAT CLAY (CL/CH)** - very dark olive brown - few sand, few silt - stiff - moist	23	100						3.35		
20	4		36		**SILTY SAND WITH GRAVEL (SM)** - dark gray with varicolored brown/red/blue - mostly fine to coarse sand with fine gravel and few coarse gravel - pockets of clay/silt - medium dense - moist/wet	14	120			21	61	18			
25	5		26		**SANDY LEAN CLAY (CL)** - dark bluish gray and yellowish, reddish brown - fine to coarse sand, fine gravel - very stiff - moist	19	113						3.14		
					BORING CONTINUED AT 28 FEET ON FIGURE B-1 (1 OF 4)										

FINES
12% Silt
6% Clay

NOTES
① Drilled 04/16/13 with a Failing 1500 drill rig using a 4-inch drag bit and mud rotary with a 30" drop by 140 lb. automatic sampling hammer.
② See report Appendices A and C for definitions, lab test results, and additional soil descriptions.
③ Free groundwater level obscured during drilling due to water-added drilling method. Static equilibrium groundwater depth is unknown.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | May 2013

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
Log of Boring B-3

Figure
B-1
(1 of 4)

LOG OF BORING B-3 (Continued) ①

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER	DESCRIPTION	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
					BORING CONTINUED FROM 28 FEET ON FIGURE B-1 (1 OF 4)										
30	6		21		**CLAYEY SAND FEW GRAVEL (CL)** - dark greenish, bluish grey - fine to coarse sand, trace fine to few angular gravel - stiff/very stiff - moist/wet - sandier with depth	23	104			5	50	45			
35	7		29		**CLAYEY SAND (SC)** - brownish/yellow/red - fine to coarse sand, trace fine gravel - little fines - medium dense - wet										
40	8		61		**SANDY LEAN CLAY WITH GRAVEL (CL) and CLAYEY SAND WITH GRAVEL (SC)** - dark brown with yellow and red - fine to coarse sand, mostly fine angular gravel - hard/very dense - moist					57	34	9			
45	9		19		**LEAN CLAY WITH SAND (CL)** - olive brown and reddish brown - fine to coarse sand - very stiff - moist - less sand with depth trace black organics										
50	10		35		**LEAN CLAY (CL)** - dark bluish gray - trace gravel and sand - trace organics - very stiff - moist	21	107	45	24				4.19		
					BORING CONTINUED AT 53 FEET ON FIGURE B-1 (3 OF 4)										

FINES
30% Silt
15% Clay

NOTES
① See Notes on Figure B-1, 1 of 4.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | MAY 2013

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
Log of Boring B-3

Figure
B-1
(2 of 4)

LOG OF BORING B-3 (Continued) ①

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER	DESCRIPTION	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
					BORING CONTINUED FROM 53 FEET ON FIGURE B-1 (2 OF 4)										
55	11		36		**LEAN/FAT CLAY (CL/CH)** - dark bluish gray - trace organics - very stiff - moist	14	110								
60	12		40		**FAT CLAY WITH SAND (CH)** - olive brown/gray/blue - very fine sand/silt, trace mica flakes - very stiff - moist	28	99	54	28				6.02		
65	13		67		**SILTY SAND WITH GRAVEL (SC)** - dark greenish/bluish gray - fine to coarse sand, fine angular gravel - trace mica flakes - very dense - wet	14				38	47	15			
70	14		60			15									
75	15		65			28				20	61	19			
					BORING CONTINUED AT 78 FEET ON FIGURE B-3 (4 OF 4)										

FINES: 10% Silt, 5% Clay

FINES: 13% Silt, 6% Clay

NOTES

① See Notes on Figure B-1, 1 of 4.

JACOBS ASSOCIATES
Engineers/Consultants

File No. 4497.0 | May 2013

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
Log of Boring B-3

Figure **B-1** (3 of 4)

LOG OF BORING B-3 (Continued) ①

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER	DESCRIPTION	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
					BORING CONTINUED FROM 78 FEET ON FIGURE B-1 (3 OF 4)										
80	16		79/11½"		**LEAN CLAY/SILT WITH SAND (CL/ML)** - dark yellowish brown and bluish gray - very fine sand, trace mica flakes - hard - moist/dry	20	112						7.07		
					SANDY LEAN CLAY WITH GRAVEL (CL) - yellow/brown/red/green - fine to coarse sand, mostly fine angular gravel (rock-like) - hard - moist/dry										
85	17		59		**SILTY SAND (SM)** - dark bluish gray - mostly fine sand, trace organics at 86½' - thin later of well-graded sand with clay (SW-SC) at 86' - dense - moist/wet					-	73	27			
90	18		77		**LEAN CLAY WITH SAND (CL)** - very dark bluish gray - fine sand, few to little silt - hard - moist	19	113	32	15				9.23		
95	19		64		**SILTY/CLAYEY SAND WITH GRAVEL (SC)** - bluish gray/brown/yellow - fine to coarse sand, mostly fine angular gravel - very dense - wet										
100	20		50/3"		**CLAYEY TO SILTY SAND WITH GRAVEL (SC/SM)** - dark grey with yellow/reddish brown - fine to coarse sand with fine to coarse angular gravel - very dense - wet	19	113			26	58	16			
					BOTTOM OF BORING AT 100 ¾ FEET										

FINES: 21% Silt, 6% Clay

FINES: 10% Silt, 6% Clay

NOTES

① See Notes on Figure B-1, 1 of 4.

JACOBS ASSOCIATES
Engineers/Consultants

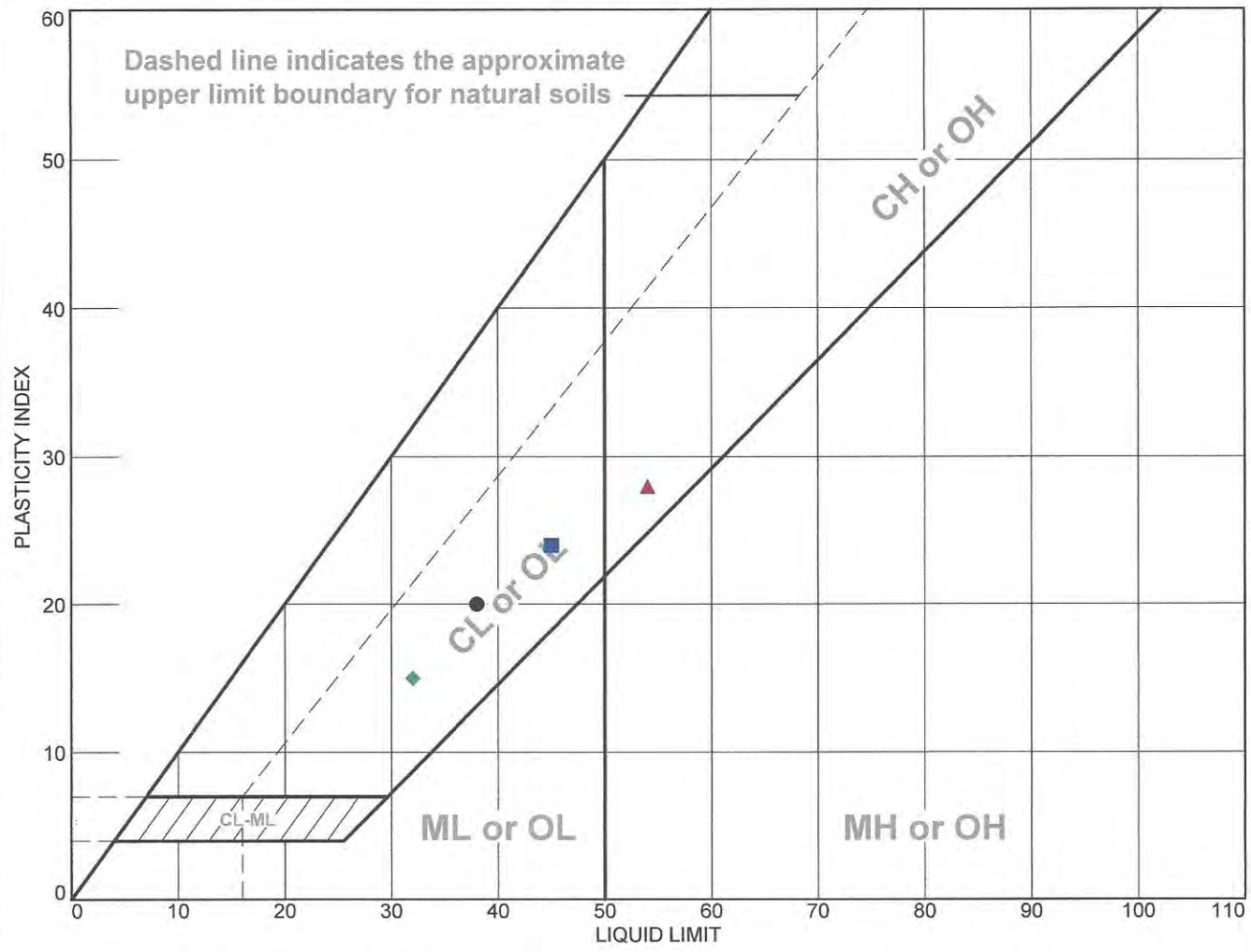
File No. 4497.0 | May 2013

RMC Water and Environment
City of Pacifica
Wet Weather Equalization Basin Project
Pacifica, California
Log of Boring B-3

Figure
B-1
(4 of 4)

Appendix C

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Soft,dark grey sandy LEAN CLAY(CL).	38	18	20			CL
■	Very dark grey LEAN CLAY.	45	21	24			CL
▲	Very stiff, Olive grey FAT CLAY(CH) with sand.	54	26	28			CH
◆	Dark grey sandy LEAN CLAY.	32	17	15			CL

Project No. 4497.0 **Client:** Jacobs Associates

Project: Pacifica Wet Weather Basin

●	**Source of Sample:** B-3	**Depth:** 11-11.5'	**Sample Number:** B3-2A
■	**Source of Sample:** B-3	**Depth:** 50.5-51'	**Sample Number:** B3-10B
▲	**Source of Sample:** B-3	**Depth:** 61-61.5'	**Sample Number:** B3-12A
◆	**Source of Sample:** B-3	**Depth:** 91-91.5	**Sample Number:** B3-18A

Remarks:

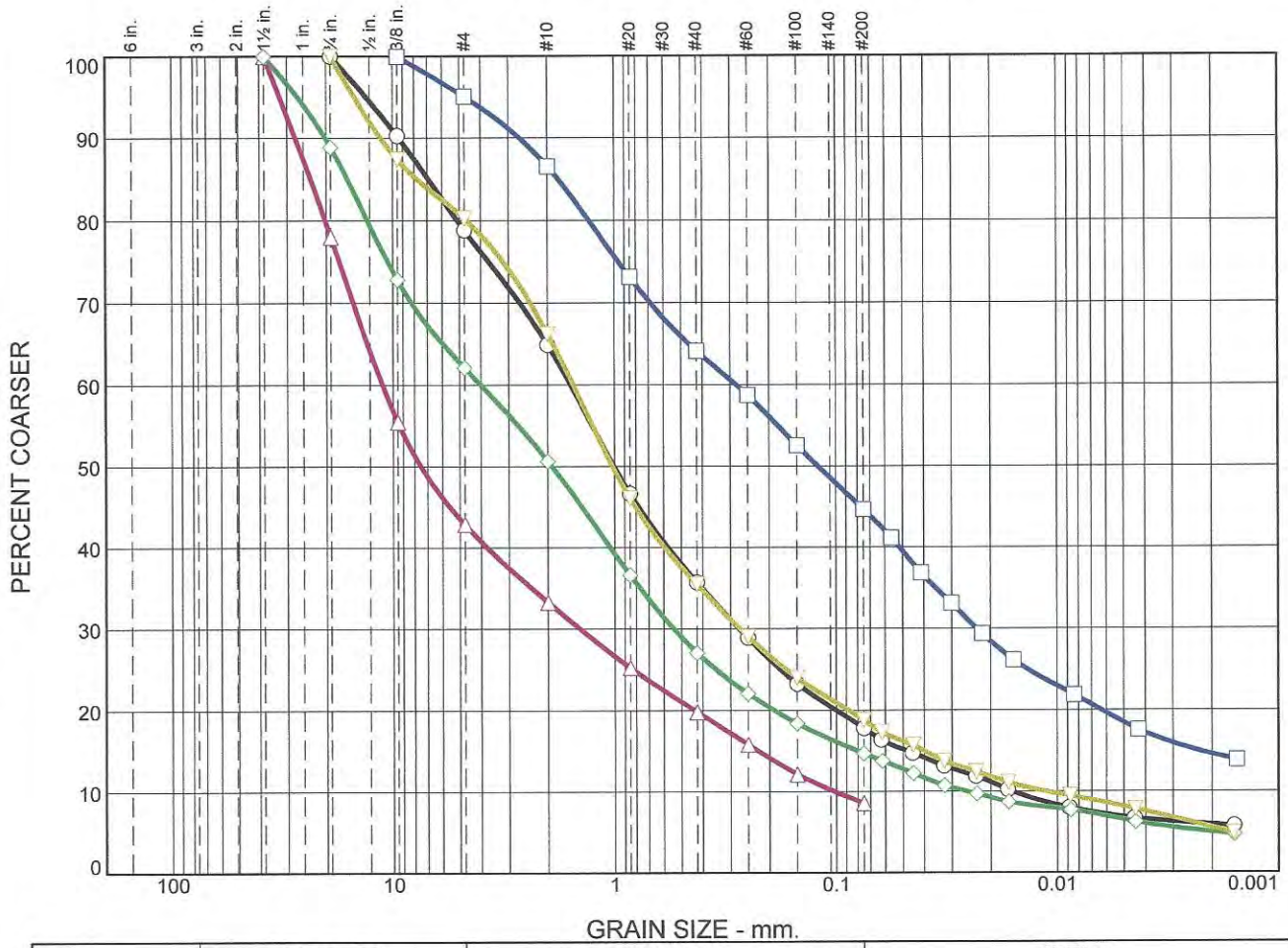
Soil Mechanics Lab

Oakland, California

Plate C-1

Tested By: _____

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	21.2	13.9	29.2	17.9	11.9	5.9
□	0.0	0.0	4.9	8.5	22.4	19.5	30.1	14.6
△	0.0	22.0	35.1	9.6	13.5	11.2	8.6	
◇	0.0	11.1	26.8	11.4	23.6	12.4	9.7	5.0
▽	0.0	0.0	19.7	14.0	30.8	16.7	13.3	5.5

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-3	B3-4A	21-21.5'	Dark grey silty fine to coarse SAND with fine gravel.	SM
□	B-3	B3-6A	31-31.5'	Dark bluish grey clayey SAND.	SC
△	B-3	B3-8	40-41.5	Dark brn.silty f-c GRAVEL with fine to coarse sand.	GP-GM
◇	B-3	B3-13	65-66.5'	Dark grey silty fine to coarse SAND with fine gravel.	SM
▽	B-3	B3-15	75-76.5'	Dark grey silty fine to coarse SAND with fine gravel.	SM

Soil Mechanics Lab

Oakland, California

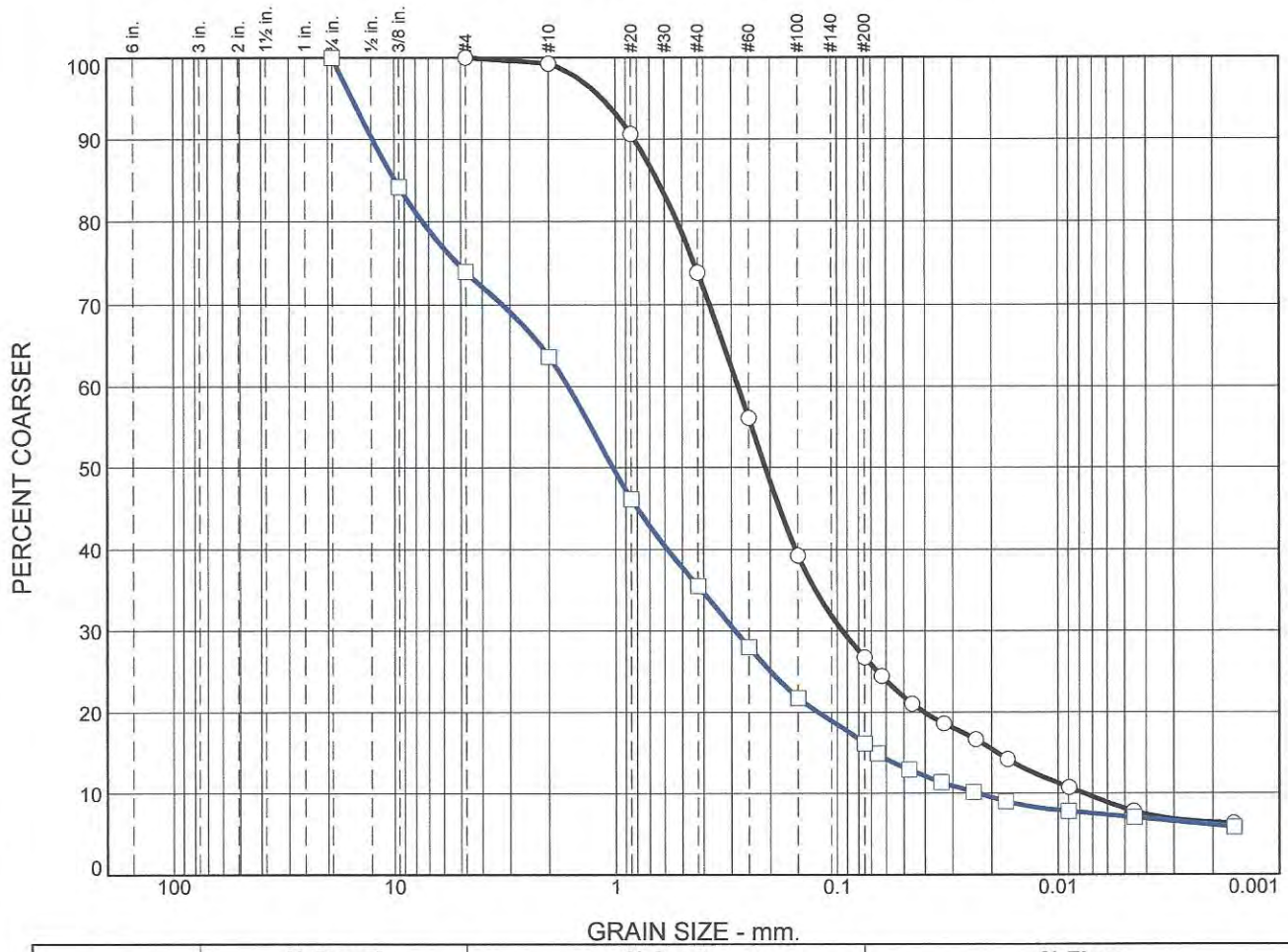
Client: Jacobs Associates

Project: Pacifica Wet Weather Basin

Project No.: 4497.0 **Plate** C-2(1of2)

Tested By: _____

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.7	25.4	47.1	20.4	6.4
□	0.0	0.0	26.0	10.3	28.2	19.3	10.1	6.1

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-3	B3-17A & B	85.5-86.5'	Dark grey silty fine & coarse SAND.	SM
□	B-3	B3-20	100-100.75	Dark grey silty fine to coarse SAND with fine gravel.	SM

Soil Mechanics Lab

Oakland, California

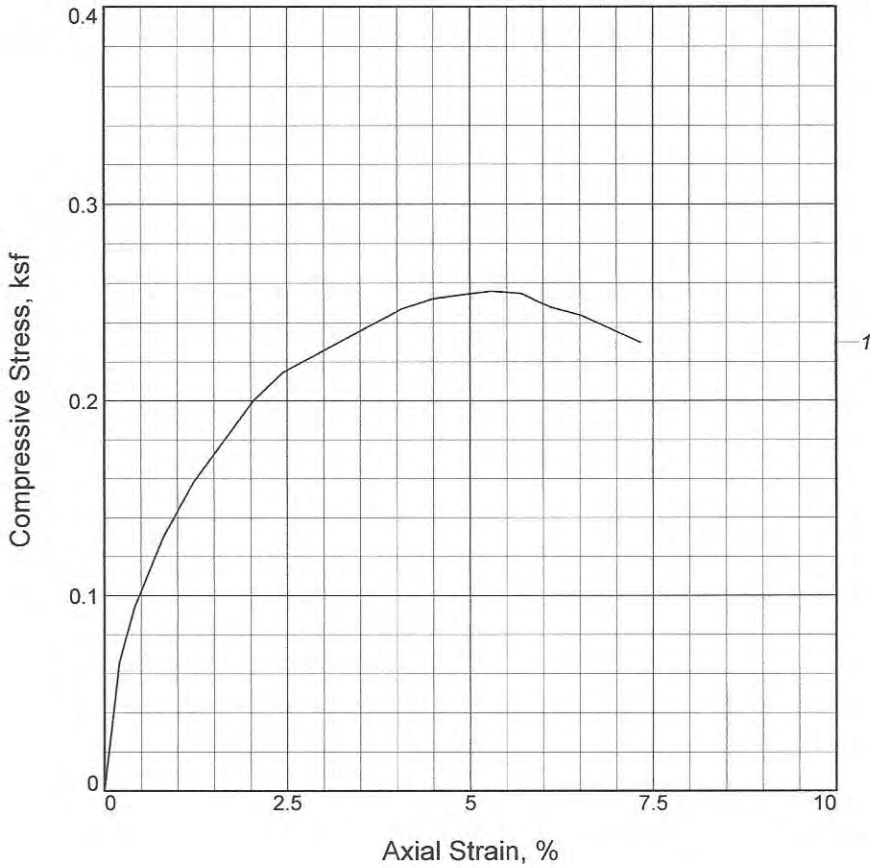
Client: Jacobs Associates

Project: Pacifica Wet Weather Basin

Project No.: 4497.0 **Plate** C-2(2of2)

Tested By: _____

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	0.256			
Undrained shear strength, ksf	0.128			
Failure strain, %	5.3			
Strain rate, in./min.	0.08			
Water content, %	35.1			
Wet density, pcf	118.7			
Dry density, pcf	87.8			
Saturation, %	103.1			
Void ratio	0.9190			
Specimen diameter, in.	2.42			
Specimen height, in.	4.91			
Height/diameter ratio	2.03			

Description: Soft,dark grey sandy LEAN CLAY(CL).

LL = 38	**PL =** 18	**PI =** 20	**Assumed GS=** 2.70	**Type:** Mod.Cal.

Project No.: 4497.0
Date Sampled:
Remarks:

Plate C-3(1OF4)

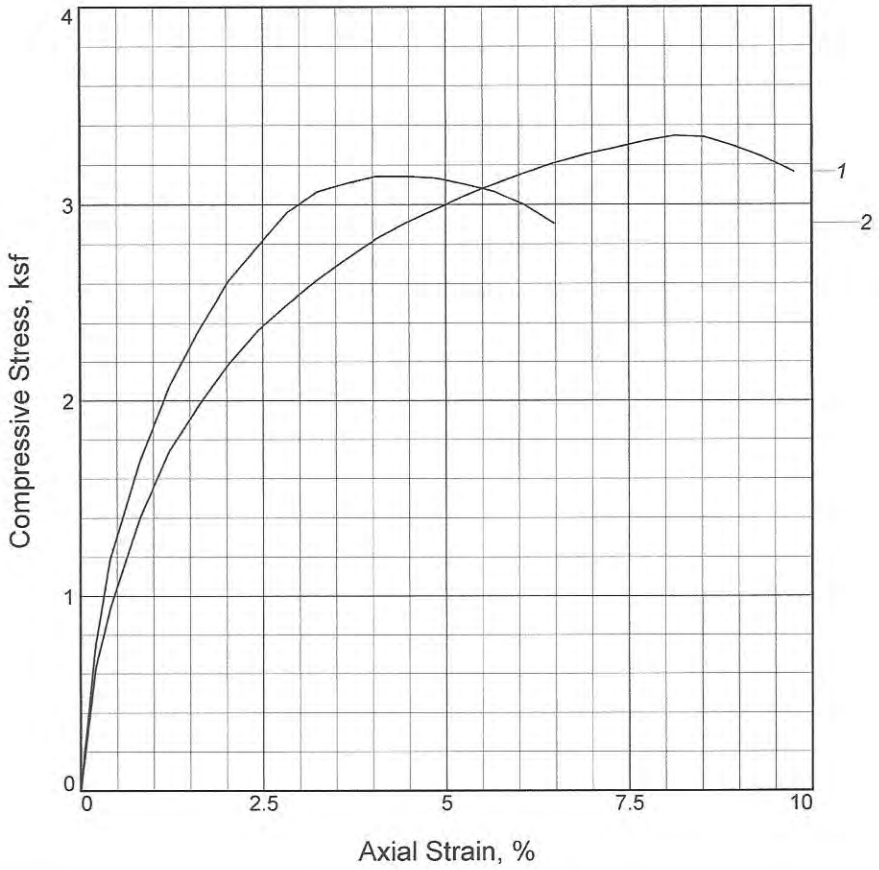
Client: Jacobs Associates

Project: Pacifica Wet Weather Basin

Source of Sample: B-3 **Depth:** 11-11.5'
Sample Number: B3-2A

UNCONFINED COMPRESSION TEST
Soil Mechanics Lab
Oakland, California

UNCONFINED COMPRESSION TEST



Sample No.	1	2		
Unconfined strength, ksf	3.347	3.144		
Undrained shear strength, ksf	1.674	1.572		
Failure strain, %	8.1	4.0		
Strain rate, in./min.	0.08	0.08		
Water content, %	22.9	19.2		
Wet density, pcf	123.2	134.8		
Dry density, pcf	100.2	113.2		
Saturation, %	90.7	105.7		
Void ratio	0.6818	0.4894		
Specimen diameter, in.	2.42	2.42		
Specimen height, in.	4.92	4.94		
Height/diameter ratio	2.04	2.04		

Description: See remarks

LL =	**PL =**	**PI =**	**Assumed GS=** 2.70	**Type:** Mod.Cal.

Project No.: 4497.0

Date Sampled:

Remarks:
#1/3A @ 16-16.5':Stiff,very dk. grey sandy LEAN CLAY(CL).
#2/5A @ 26-26.5':Very stiff,dk. grey sandy CLAY(CL).

Plate C-3(2of4)

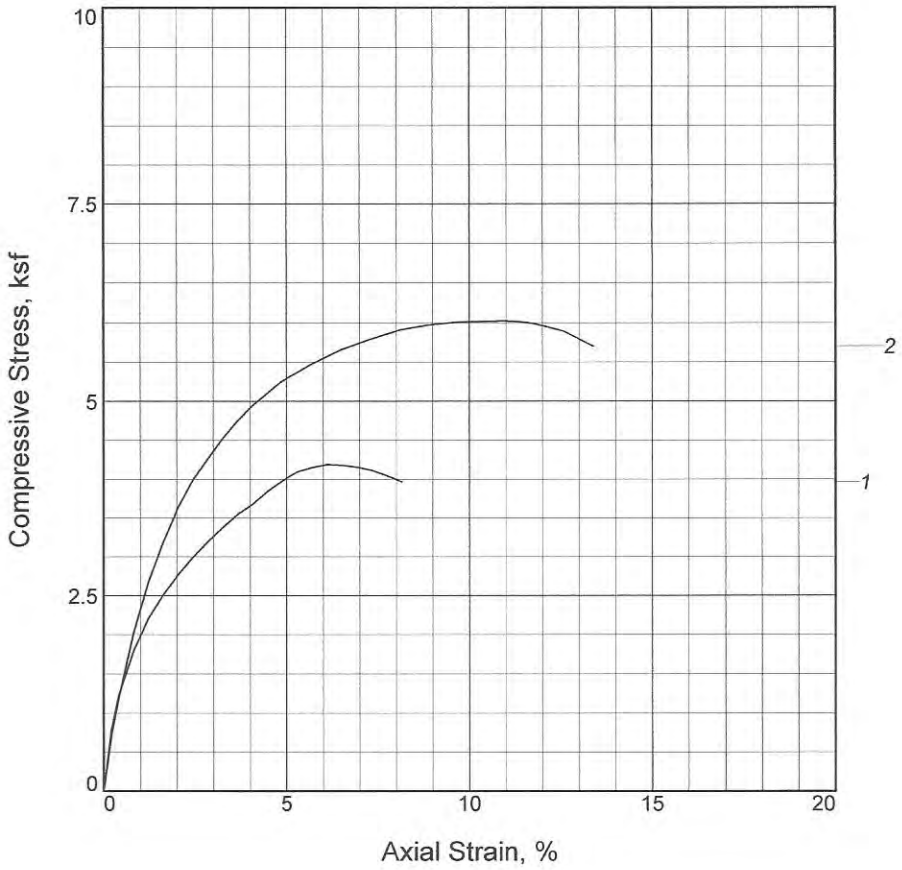
Client: Jacobs Associates

Project: Pacifica Wet Weather Basin

Source of Sample: B-3

UNCONFINED COMPRESSION TEST
Soil Mechanics Lab
Oakland, California

UNCONFINED COMPRESSION TEST



Sample No.	1	2		
Unconfined strength, ksf	4.188	6.022		
Undrained shear strength, ksf	2.094	3.011		
Failure strain, %	6.1	11.0		
Strain rate, in./min.	0.08	0.08		
Water content, %	22.1	27.6		
Wet density, pcf	130.7	126.5		
Dry density, pcf	107.0	99.2		
Saturation, %	103.9	106.4		
Void ratio	0.5746	0.6998		
Specimen diameter, in.	2.42	2.42		
Specimen height, in.	4.91	4.93		
Height/diameter ratio	2.03	2.04		

Description: See remarks

LL =	PL =	PI =	**Assumed GS=** 2.70	**Type:** Mod.Cal.

Project No.: 4497.0

Date Sampled:

Remarks:
#1/10B @ 50.5-51':V.stiff,v.dk. gr.LN. CLAY(CL).
#2/12A @ 61-61.5':V.stiff,olive gr.FAT CLAY(CH).

Plate C-3(3of4)

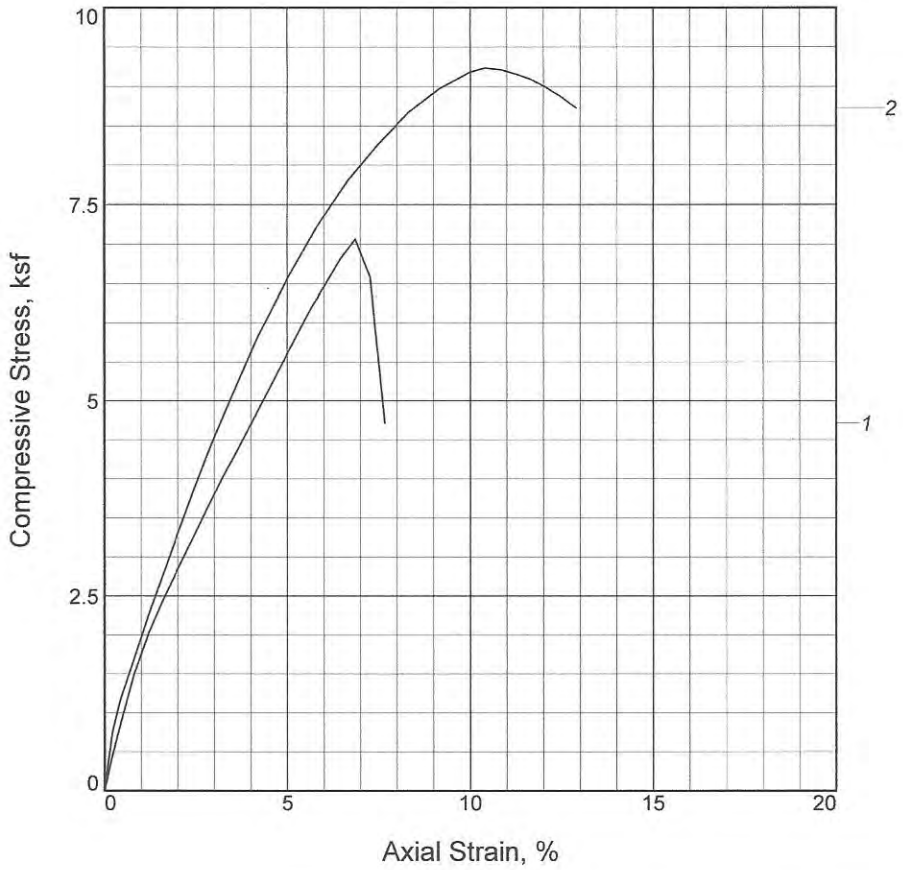
Client: Jacobs Associates

Project: Pacifica Wet Weather Basin

Source of Sample: B-3

UNCONFINED COMPRESSION TEST
Soil Mechanics Lab
Oakland, California

UNCONFINED COMPRESSION TEST



Sample No.	1	2		
Unconfined strength, ksf	7.066	9.232		
Undrained shear strength, ksf	3.533	4.616		
Failure strain, %	6.9	10.4		
Strain rate, in./min.	0.08	0.08		
Water content, %	19.5	18.5		
Wet density, pcf	134.1	134.3		
Dry density, pcf	112.2	113.4		
Saturation, %	104.9	102.4		
Void ratio	0.5019	0.4869		
Specimen diameter, in.	2.42	2.42		
Specimen height, in.	4.96	4.81		
Height/diameter ratio	2.05	1.99		

Description: See remarks.

LL =	**PL =**	**PI =**	**Assumed GS=** 2.70	**Type:** Mod.Cal.

Project No.: 4497.0

Date Sampled:

Remarks:
#1/16B @ 80.5-81':V.stiff,dk.gr. sandy CLAY(CL).
#2/18B @ 90.5-91':Hard,v.dk.gr.LEAN CLAY(CL).

Plate C-3(4of4)

Client: Jacobs Associates

Project: Pacifica Wet Weather Basin

Source of Sample: B-3

UNCONFINED COMPRESSION TEST
Soil Mechanics Lab
Oakland, California

Attachment C - Limited Site Plan for Site A

DRAFT Technical Memorandum

City of Pacifica – Wet Weather Equalization Basin Site Feasibility Evaluation

Subject: **Limited Site Plan For Site A**

Prepared For: Maria Aguilar

Prepared by: Tim Harrison

Reviewed by: Steve Clary, Gisa Ju

Date: October 11, 2013

Reference: 0297-001

1 Background and Purpose of Technical Memorandum

The 2011 Collection System Master Plan prepared by RMC for the City of Pacifica (City) recommends construction of a flow equalization facility in the vicinity of the Linda Mar Pump Station to address wet weather issues in the City's sanitary sewer system. RMC has performed a wet weather equalization basin site feasibility evaluation for the City. Based on that evaluation, the City has identified Site A as a potential implementation site. This technical memorandum (TM) refines the location of the basin and appurtenant facilities within Site A. This TM also presents three site plan alternatives that will be used for further discussion and evaluation by City staff and elected officials.

2 Summary of Findings

This TM analyzes three alternative locations for basin placement within Site A. Key conclusions include:

- Construction of the basin at the northern end, southern end, or middle of the parcel is considered technically feasible. Construction of the basin at the southern end of the parcel is limited to a smaller footprint and has a corresponding increase in required basin depth.
- By locating the basin at the northern end or southern end of the parcel, the facilities would have less impact on the commercial development potential of the site than a basin located in the middle of the parcel.
- Flood protection from a 1% chance flood event is possible. Raising only the entry points to the basin and critical equipment would maintain a level grade over more of the parcel than raising the entire basin. By limiting the raised portion of the basin, impacts on commercial development would be reduced while still providing the necessary flood protection.

3 Parcel Description

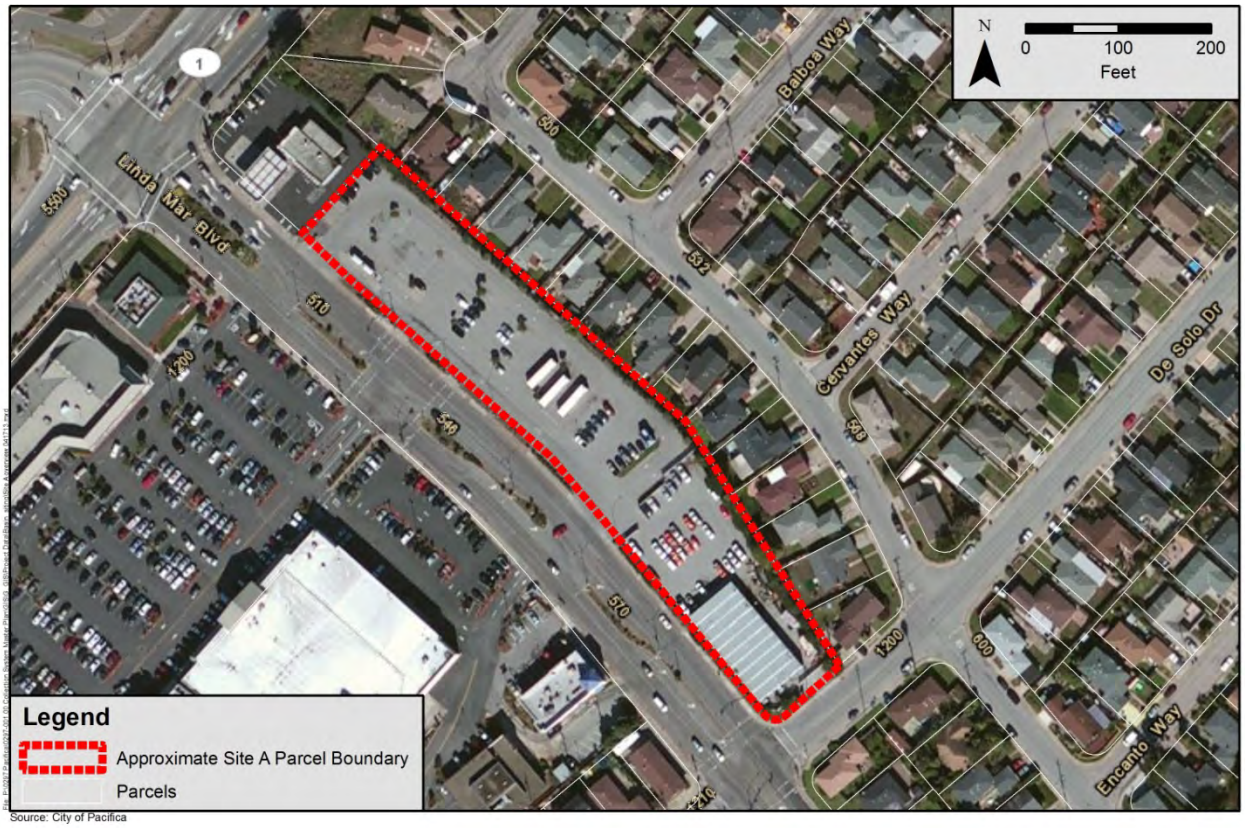
Site A, shown in Figure 1, is one of the City's potential sites for the equalization basin.

Site A is currently owned by Caltrans. As State property, there is no official parcel boundary on the southwest side along Linda Mar Blvd. Should parcel acquisition move forward, Caltrans will establish all of the boundaries through their mapping and legal description generation. It is assumed however that the parcel boundary would be similar to State Parcel 024609-01-01, as shown in Appendix 1.

As can be seen in Figure 1, Site A is bounded on the southwest and southeast by Linda Mar Blvd. and De Solo Dr. There is a gas station to the northwest. The northeast boundary is bordered by a fence and tree line which separates Site A from numerous residential properties. Site A currently has multiple uses. The southeast portion is used by Caltrans to support construction of the Devils Slide tunnels. The remaining portion of Site A is used by SamTrans, as allowed by Caltrans, as a bus station with associated parking. It

appears that SamTrans uses a portion of Site A as a turnaround and staging area for out-of-service buses. The proposed General Plan update also identifies Site A as mixed use. This means that any infrastructure placed on the site (e.g. the basin and appurtenances) would need to accommodate City revenue generating uses, such as retail, hotel, and residential development.

Figure 1: Site A Parcel Overview



4 Criteria for Evaluation of Alternative Locations within Site A

In addition to the 2.1 million gallon equalization basin, there are several other facilities that will need to be located in close proximity to the basin. These include a soil bed odor filter, an operations shed to house pump controls and a generator, and influent and effluent pipelines. Due to the large size of Site A however, the basin and appurtenant facilities will not require the entire available area. The City therefore has the ability to select a location for the project facilities within Site A. While certain criteria were used to prioritize Site A from the other potential general construction sites, new criteria that are more applicable to local siting are used to refine where within Site A the equalization basin should be located. Those criteria include:

- **Construction Area** – Construction of the basin will require approximately a 10-foot wide perimeter around the limit of the basin structure and a separate 50-foot by 50-foot area next to the basin for the crane and spoil stock piling. Some additional space requirements are anticipated for the soil bed filter and operations shed. Pipeline construction area requirements are dependent on the installation method and materials but are not anticipated to impact location preference. The preferred location should have adequate room for construction. It is possible to better meet this criteria by reducing the diameter of the equalization basin, but that would be to the detriment of the location's ability to fulfill the basin depth criteria described below.

- **Basin Depth** – A shallow basin is preferred to a deep basin, as there are advantages to operation and maintenance of the facility as well as potential cost implications. Since there is a required storage volume, depth of the basin is reduced by increasing the diameter of the basin. As implied above, this criteria is inversely correlated to the Construction Area criteria above: with a shallower basin the area available for construction and staging is reduced.
- **Impacts to Other Parcel Uses** – As described above, there are multiple existing uses for Site A. While Caltrans will have vacated their construction support area by the time of construction, it is City's intent to allow SamTrans to continue to utilize the Site A property for continued operations at least through the current lease. The preferred location should have reduced impacts, compared to other locations, to SamTrans operations during and after construction. The preferred location should also allow for future development of the parcel that is consistent with the proposed General Plan land use.

Minimizing impacts to residences was initially considered as a criteria, but due to the row of houses along the northeast side of the parcel, there was no differentiation between the alternative locations within the site. Construction methods have been identified that will minimize the impacts to residents during construction, and measures will be included in the project design to reduce long-term impacts such as potential short-term odors. Final design will also seek to reduce visual and other impacts to local residents.

5 Evaluation of Alternative Locations within Site A

Three locations within Site A have been identified and evaluated against the criteria outlined in Section 4. Site A-1 is the furthest north of the three evaluated locations and the closest to the gas station. Site A-2 is the furthest south of the three evaluated locations and the farthest from the gas station. Site A-3 is located between sites A-1 and A-2 where the parcel starts to narrow. Layout concepts for purposes of examining available area and impacts associated with sites A-1, A-2, and A-3 are provided in Figures 2, 3, and 4, respectively. These figures were developed for comparison purposes only and are not intended to represent actual site layouts. As such, basin diameters are maximized while maintaining the construction area minimum requirements, and simplified layouts of the major features and space constraints are presented.

Figure 2: Site A-1 Layout for Comparison

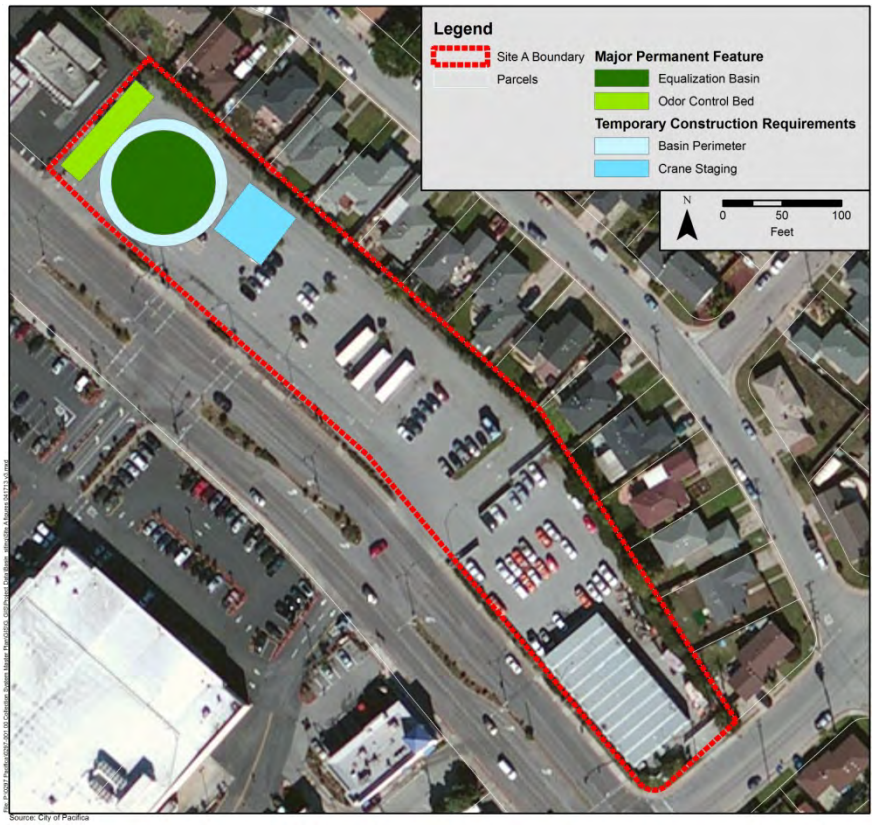


Figure 3: Site A-2 Layout for Comparison

Figure 4: Site A-3 Layout for Comparison

Based on the information shown in Figure 2, Site A-1 compares to the three evaluation criteria as follows:

- Construction Area - This location could provide adequate construction and staging room.
- Basin Depth - The diameter of the basin shown is 88 feet. The associated inner diameter, which is more relevant to storage, is assumed to be 81 feet. The active storage depth at this site would be about 55 feet and the vertical drop from ground surface to top of the basin foundation would be about 70 feet. This depth is well within the standard application of the assumed cutter soil mix construction method.
- Impacts to Other Parcel Uses – Locating the basin at Site A-1 would require an adjustment to the bus stop configuration and routing within the parcel. These changes appear to be possible, particularly with the additional space afforded by the vacated Caltrans construction offices. Pipeline construction impacts would be less than at the other two evaluated locations due to proximity to the diversion points. Construction would require approximately half of the currently used area (not including the Caltrans construction area). The site could be arranged to accommodate some types of future development. It is located on the northern end of the parcel, leaving a large consolidated area for future development of commercial structures.

Based on the information shown in Figure 3, Site A-2 compares to the three evaluation criteria as follows:

- Construction Area - This location could provide adequate construction and staging room.
- Basin Depth - The diameter of the basin shown is 78 feet. The associated inner diameter, which is more relevant to storage, is assumed to be 71 feet. The active storage depth at this site would be about 72 feet and the vertical drop from ground surface to top of the basin foundation would be about 87 feet. This depth is within the standard application of the assumed cutter soil mix construction methodology.

- Impacts to Other Parcel Uses – Locating the basin at Site A-2 would likely not require SamTrans to alter the bus stop or adjust the routing within the parcel except for short periods of time for construction of the influent pipelines. Construction and all facilities (other than pipelines) could likely be limited to the area currently reserved for the Caltrans Devils Slide Project parking and construction trailers. The site could be arranged to accommodate some types of future development. It is located on the southern end of the parcel, leaving a large consolidated area for future development of commercial structures

Based on the information shown in Figure 4, Site A-3 compares to the three evaluation criteria as follows:

- Construction Area - This location could provide adequate construction and staging room.
- Basin Depth - The diameter of the basin shown is 98 feet. The associated inner diameter, which is more relevant to storage, is assumed to be 91 feet. The active storage depth at this site would be about 44 feet and the vertical drop from ground surface to top of the basin foundation would be about 59 feet. This depth is well within the standard application of the assumed cutter soil mix construction method.
- Impacts to Other Parcel Uses – Locating the basin at Site A-3 would require adjustment to the bus stop configuration and routing within the parcel. Pipeline construction impacts to SamTrans would be similar to those at Site A-2. The majority of the basin construction could be limited to the area currently reserved for the Caltrans Devils Slide Project parking and construction trailers. A new curb cut to Linda Mar Blvd. would be needed to allow access to the parcel from the street without impacting the construction area. The site could be arranged to accommodate some types of future development. However, the basin would be in the middle of the parcel, which would place the facilities in the middle of future development of the site. Although parking spaces could be placed on the roof of the basin, construction of commercial structures would not be practical on the basin roof. Therefore, the basin would limit the development potential of the site to a greater degree than the other two alternatives discussed herein.

Table 1 summarizes a comparison of the three sites using the three criteria as the basis for that comparison.

Table 1: Comparison Matrix of Three Locations

	Site A-1	Site A-2	Site A-3
Construction Area	Adequate construction area is available.	Adequate construction area is available.	Adequate construction area is available.
Basin Depth	Basin at this site would likely be deeper than at Site A-3 but shallower than at Site A-2.	Basin at this site would likely be the deepest of the three evaluated locations.	Basin at this site would likely be the shallowest of the three evaluated locations.
Impacts to Other Parcel Uses	This location would incur mitigable impacts on existing parcel uses. Would allow the southern 75% of parcel to be available for future commercial structures.	This location would incur the least impact on existing parcel uses. Would allow the northern 75% of parcel to be available for future commercial structures.	This location would incur mitigable impacts on existing parcel uses. Would bisect the parcel, leaving two smaller areas for future commercial structures.

Based on this evaluation, the City would prefer either Site A-1 or Site A-2 over Site A-3. All of these sites are technically feasible but locating the basin at Site A-3 would reduce the likelihood of selling for redevelopment the remaining portions of the parcel that would be left on either side of the basin. Not developing the parcel is not consistent with the City General Plan and significantly increases the relative cost of the project due to the net increase in land acquisition costs.

6 Preliminary Site Layout

To better understand how the project at any of these sites might be implemented, a set of preliminary layout and section drawings have been developed and are included in Appendix 2 of this TM. These drawings demonstrate how some additional criteria and conditions could be achieved. Those criteria and conditions include:

- Flood proofing – As a wet weather facility, the equalization basin will be most useful to the City during and after large storm events when flooding may occur. Should the basin fill with flood water, the capacity that was intended for high flows in the sanitary sewer system would not be available. It is therefore necessary to protect the basin from flooding due to surface water. Three flood protection methods were considered for this site:
  - Floodwalls/Levees – Building floodwalls around the equalization basin facilities is a feasible method that would provide flood protection. Doing so, however, would potentially hinder future use of the parcel or disconnect one portion of the parcel from another. Ramps would likely be used to provide access over the floodwalls, increasing their overall footprint. Floodwalls or levees would likely be harder to integrate into the future uses of the parcel.
  - Basin Sealing – This method would involve utilizing waterproof seals at all basin openings as well as the odor control, generator, and control facilities. While possible to implement, this method would require additional maintenance compared to the other two flood protection methods and is not considered to be as reliable. When implementing flood protection measures at the Linda Mar Pump Station, the City elected to build walls and levees rather than rely on waterproof seals.

- Elevated Ground Surface – Elevating the basin facilities is a feasible method that would provide flood protection. Depending on the ultimate land use, ramps or a continuous slope across the parcel could provide connectivity between the elevated portion and the existing grade. Elevating the ground surface at the access points to the basin reduces the need for soil offhaul during excavation of the basin. This flood protection method is the basis of the site layouts presented in Attachment 2.

FEMA's Flood Insurance Rate Map (FIRM) (Map number 06081C0107E, effective date is October 16, 2012) identifies Site A as within Zone AH. Zone AH is FEMA's designation for "Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet." (www.fema.gov). The FIRM indicates that the mapped water surface elevation is 14 feet. For comparison, the ground elevation at the basin locations varies between approximately 10 feet and 12.5 feet (elevation information taken from a subset of the USGS National Elevation Dataset, vertical datum NAVD88 with units converted from meters to feet). The submergence over these facilities during a 1% flow event could therefore be expected to be on the order of 1.5 to 4 feet. For purposes of this TM, it is assumed that the ground elevation for the entry points and sensitive equipment for the equalization basin facilities would be raised to 14.5 feet, negating the impacts of the flood waters during a 1% event. The perimeter of the elevated area could be graded to allow appropriate access for the elevated area.

- Vehicle access – The drawing set in Appendix 2 shows how vehicle access from the street could be maintained as well as potential bus stop location within the parcel to maintain the bus station functionality.

- Operations and maintenance access – After construction and start-up of the facility, access to the surface and sub-surface facilities will be critical to operation and maintenance of the equalization basin. The drawing set shows how vehicle and personnel access could be incorporated into the future project.

- Other uses – The drawings included in Appendix 2 show a raised area to remove the entry points and sensitive equipment from the 1% flood event. These raised areas have a limited footprint and are oriented to allow for future uses of the Site A parcel. It is assumed that the non-raised equalization basin area could be used for parking depending on site layout. It would be possible to increase the load capacity of the basin roof at the design phase should the City wish to consider construction of structures or other heavier uses over the basin.

The odor control bed can be planted to act as a lightly vegetated buffer between the Site A parcel and Linda Mar Blvd.

7 Next Steps

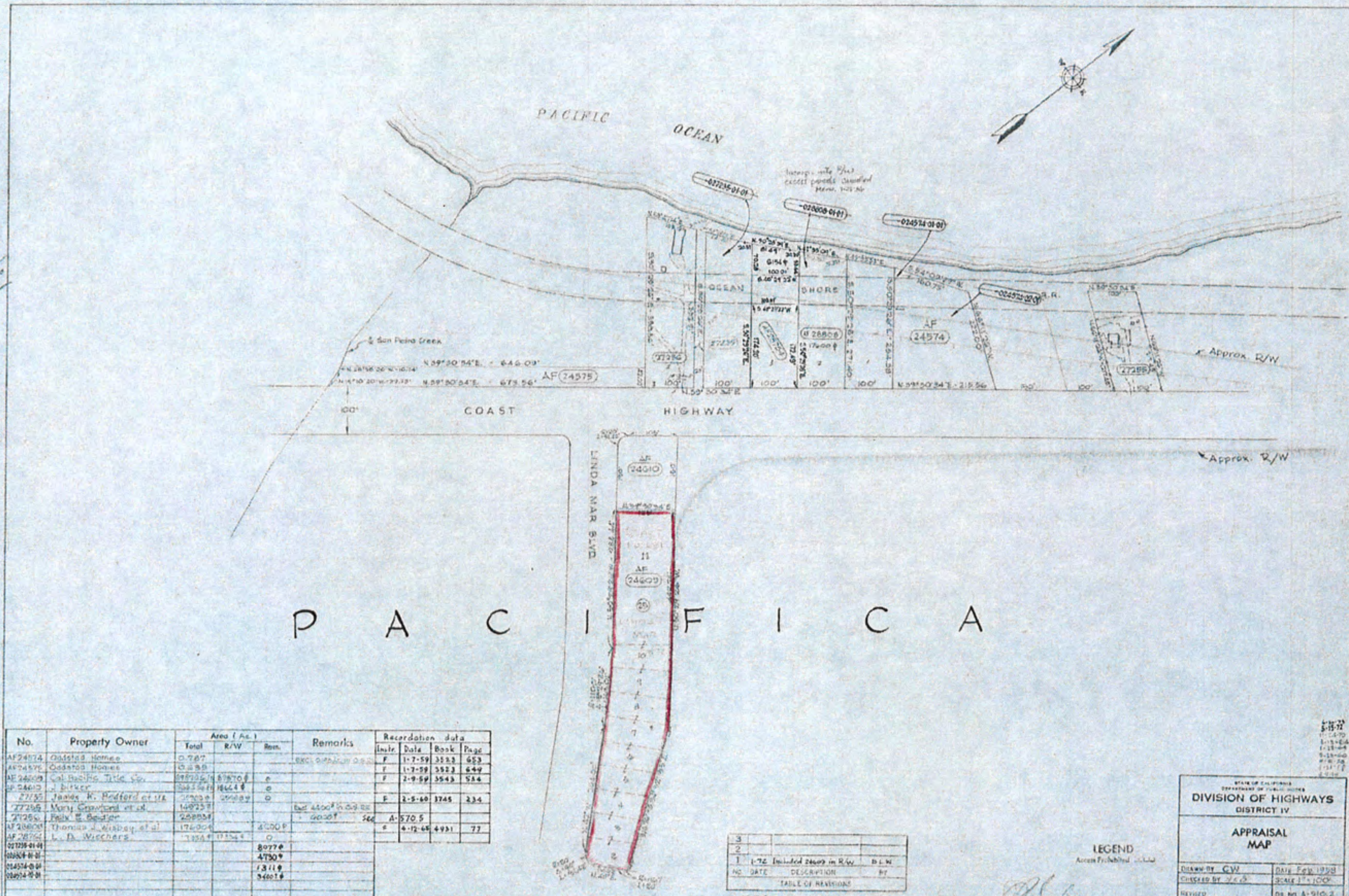
This TM has identified two preferred locations within Site A for the wet weather equalization basin and demonstrated how multiple criteria can be satisfied through site layout. Due to the subterrainean nature of most of the equalization basin facilities, the existing uses of the Site A parcel could continue and many future uses of the parcel could be accommodated, especially with advance knowledge of loading design criteria and future site layout plans.

The information presented in this TM can be combined with the site assessments presented in the Wet Weather Site Feasibility Evaluation Report to make a more informed decision regarding the preferred equalization basin site. Based on the overall assessment of the sites and input from the public, the City

will make a selection of the preferred equalization basin site. Should one of the Site A locations presented in this TM be preferred, the drawings included in Appendix 2 can be used as a tool to further the discussion regarding layout options and potentially serve as a partial basis of design.

Appendix 1 - State Parcel 024609-01-01

Figure provided by Caltrans on 4/10/13



No.	Property Owner	Area (Ac.) Total	R/W	Rem.	Remarks	Recordation data Instr.	Date	Book	Page
AF 24574	Oddstad Homes	0.787			EXC.	F	1-7-59	3523	653
AF 24575	Oddstad Homes	0.288				F	1-7-59	3523	649
AF 24609	Cal-Pacific Title Co.	87870 S.F.	87870 #	0		F	2-9-59	3543	534
SF 24610	J. Bitker	18664 S.F.	18664 #	0					
27755	James K. Bedford et ux	25089 #	25089 #	0		F	2-5-60	3745	234
27288	Mary Crawford et al	148257			Exc. 4400# in 09.DE				
27256	Felix E. Beuter	268554			+ 6000# see	A-570.5			
AF 28808	Thomas J. Wisbey et al	176004		4000 #		F	4-12-65	4931	77
AF 28762	L. D. Wiechers	17354 #	17354 #	0					
027235-01-01				8077 #					
020008-01-01				4730 #					
024574-01-01				13119 #					
024574-02-01				34601 #					

3			
2			
1	1-72	Included 24609 in R/W	D.L.W.
NO.	DATE	DESCRIPTION	BY

TABLE OF REVISIONS

CAUTION: CHECK WITH TRACING TO SEE IF YOU HAVE LATEST REVISION

LEGEND
Access Prohibited

Approved: [signature]
District Engineer

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
DISTRICT IV

APPRAISAL MAP

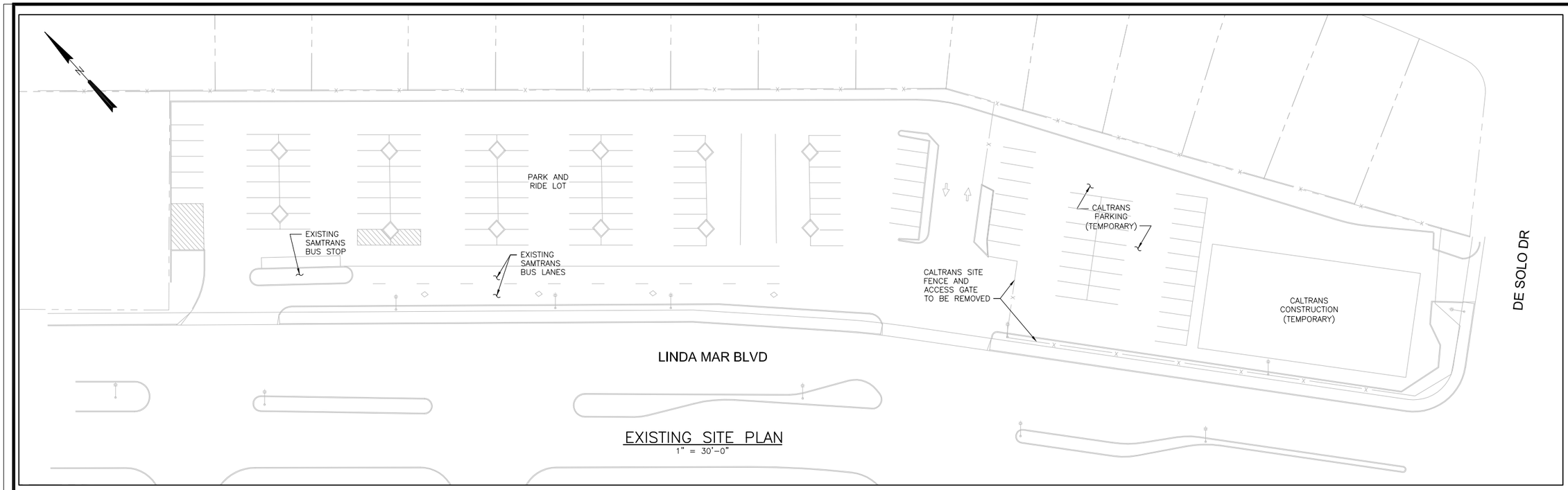
Drawn by CW — Date Feb 1958
Checked by — Scale 1" = 100'
Revised — Dr. No. A-910.2

FILE	CO.	RTE.	P.M.	NO.
	SM	1	41.0	MM6

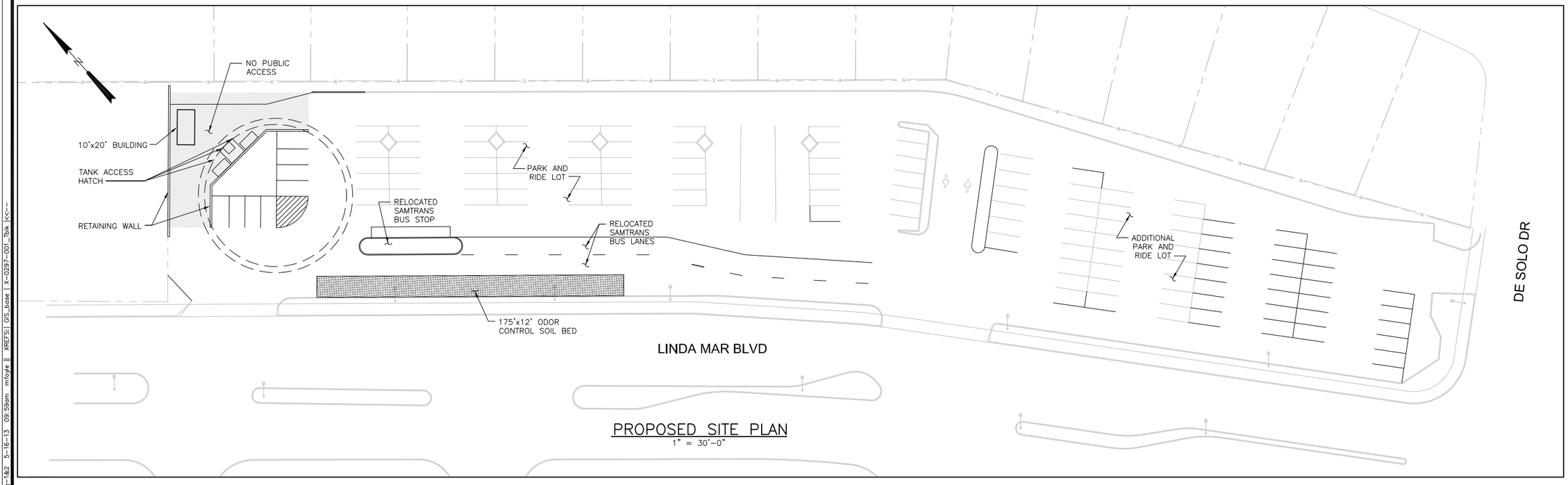
A510003

120722
J.E.G. A-510.3 K-5103 A-570

Appendix 2 – Preliminary Site Layouts and Sections



EXISTING SITE PLAN
1" = 30'-0"



PROPOSED SITE PLAN
1" = 30'-0"

FILENAME: 0297-001-Fig-1&2 5-16-13 09:59am mfoyle || XREFs: | GIS_base | X-0297-001_Tblk |<<--

Last Saved By: mfoyle 5-16-13 09:59am

0" 1"
VERIFY SCALES
BAR IS ONE INCH
LONG ON FULL
SIZE DRAWING.
IF NOT ONE INCH
LONG ON THIS
DRAWING, ADJUST
SCALES ACCORDINGLY

RMC
Water and Environment

REV	DATE	BY	APVD	DESCRIPTION
1				
2				
3				
4				
5				

DESIGNED
DRAWN
CHECKED

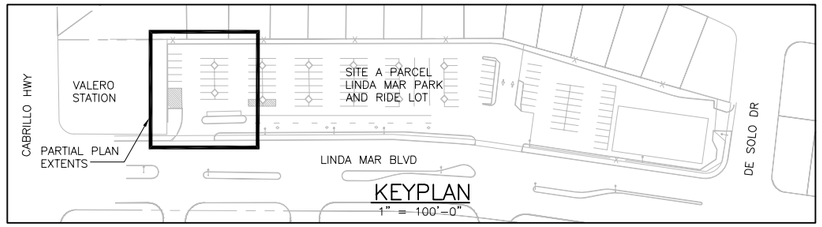
SUBMITTED: _____ RMC PROJ ENGR C____
APPROVED: _____ RMC ENGR C____

WET WEATHER EQUALIZATION BASIN SITE FEASIBILITY EVAL.

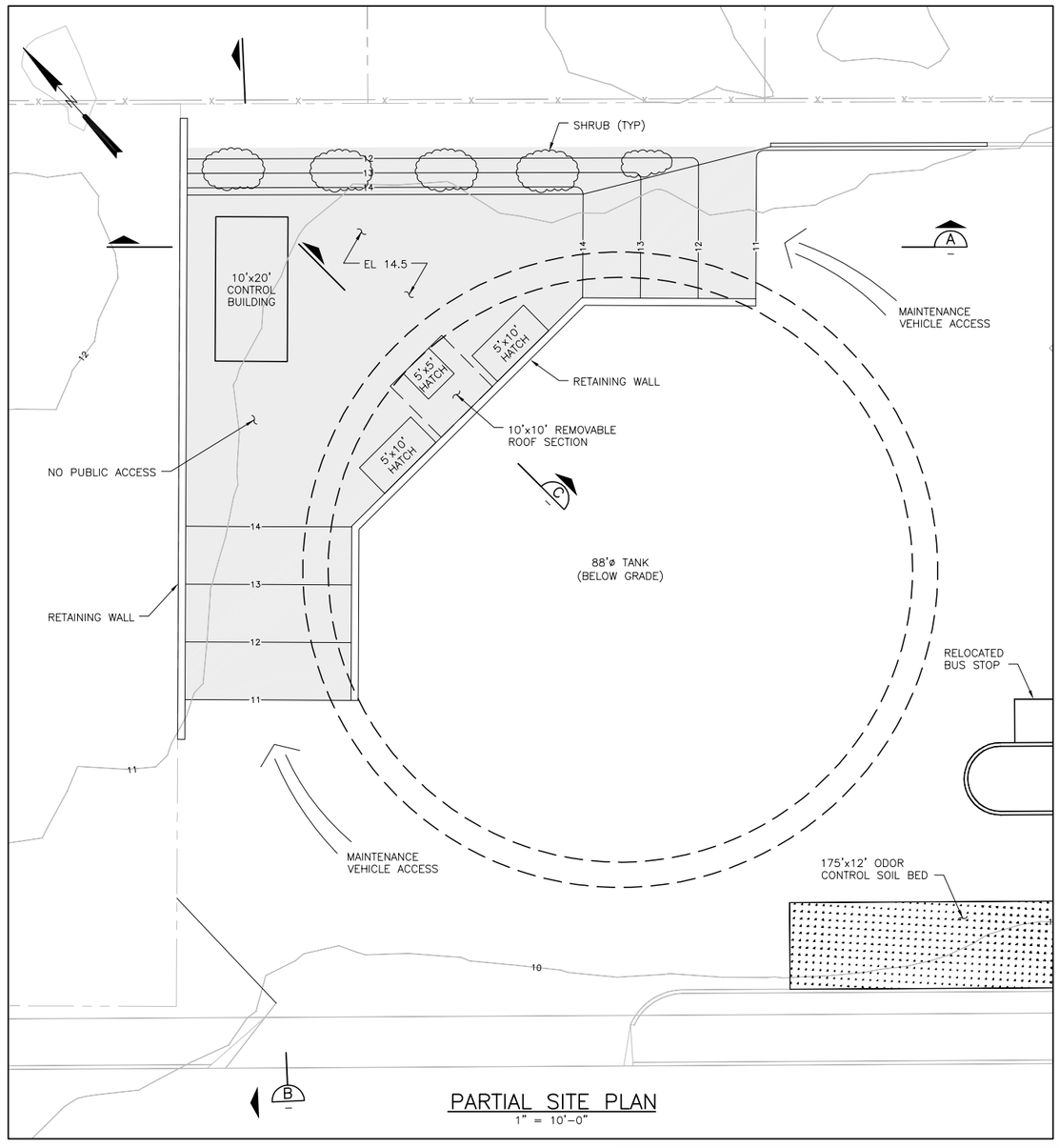
SITE A-1
CONCEPTUAL SITE PLAN

Fig 1

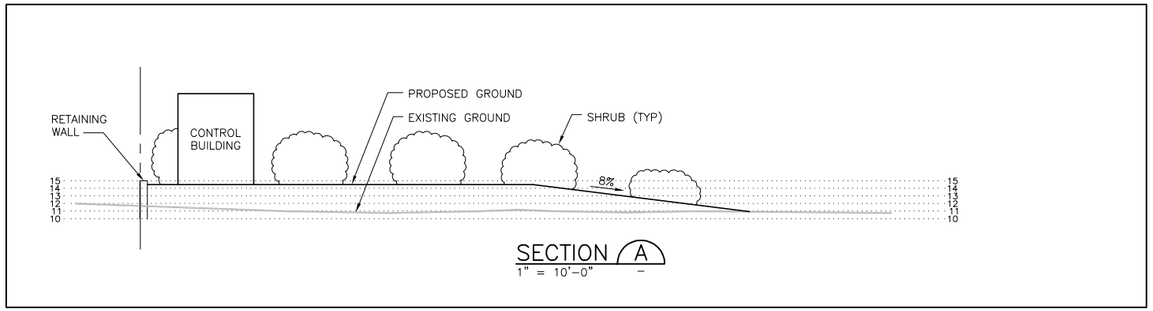
DWG NO	
SHEET NO	OF
PROJ NO	0297-001
DATE	MAY 2013



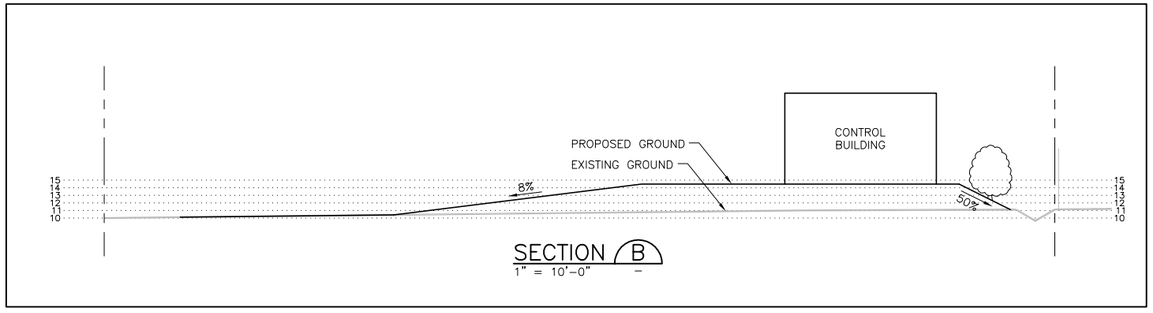
KEYPLAN
1" = 100'-0"



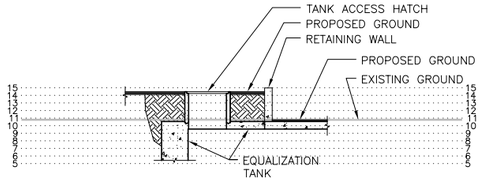
PARTIAL SITE PLAN
1" = 10'-0"



SECTION A
1" = 10'-0"



SECTION B
1" = 10'-0"



SECTION C
1" = 10'-0"

0" 1"
VERIFY SCALES
BAR IS ONE INCH LONG ON FULL SIZE DRAWING. IF NOT ONE INCH LONG ON THIS DRAWING, ADJUST SCALES ACCORDINGLY

RMC Water and Environment

REV	DATE	BY	APVD	DESCRIPTION

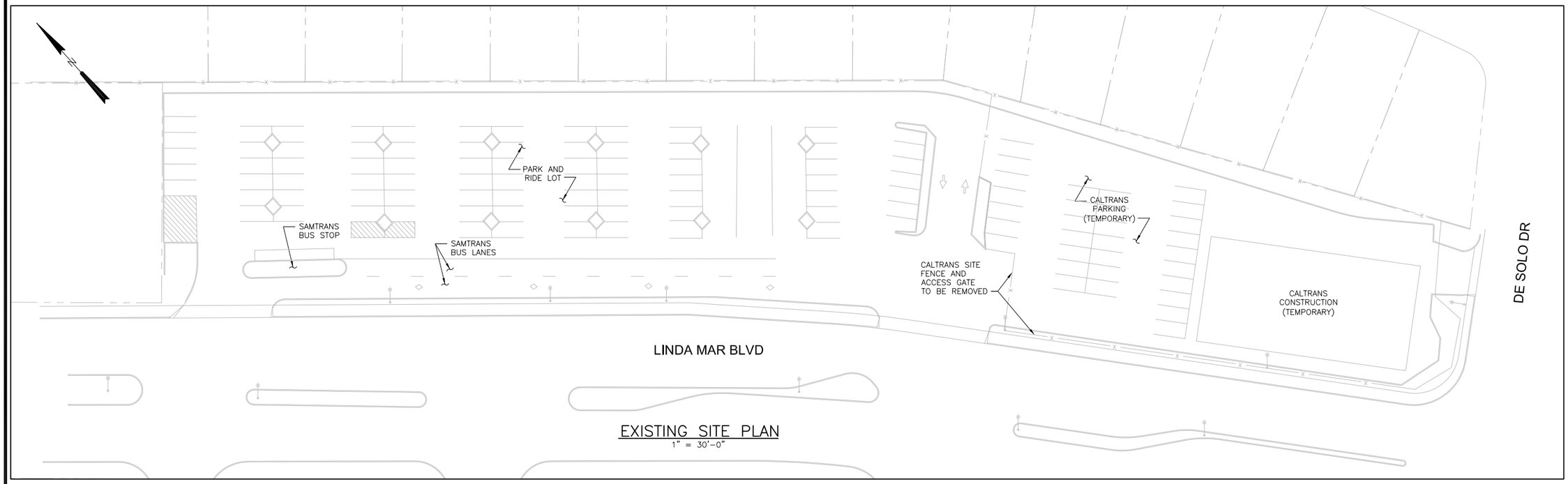
DESIGNED
DRAWN
CHECKED

SUBMITTED: _____ RMC PROJ ENGR C____
APPROVED: _____ RMC ENGR C____

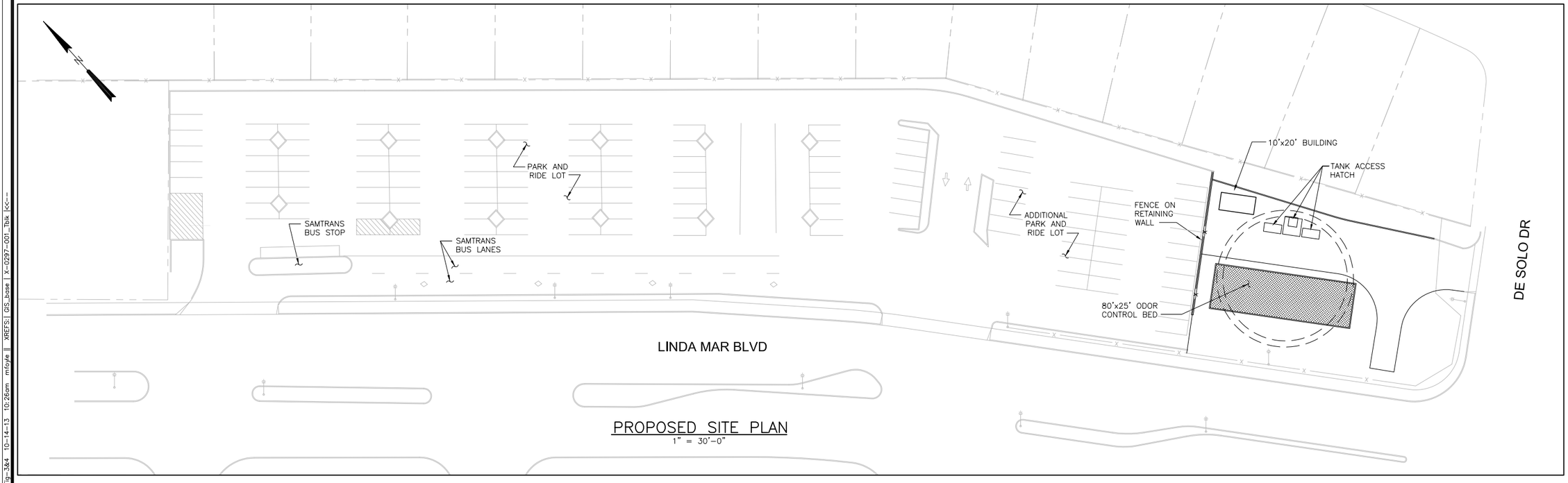
WET WEATHER EQUALIZATION BASIN SITE FEASIBILITY EVAL.

SITE A-1 EQUALIZATION BASIN PLAN AND SECTIONS

DWG NO	Fig 2
SHEET NO	OF
PROJ NO	0297-001
DATE	MAY 2013



EXISTING SITE PLAN
1" = 30'-0"



PROPOSED SITE PLAN
1" = 30'-0"

0" 1"
VERIFY SCALES
BAR IS ONE INCH LONG ON FULL SIZE DRAWING. IF NOT ONE INCH LONG ON THIS DRAWING, ADJUST SCALES ACCORDINGLY

RMC Water and Environment

REV	DATE	BY	APVD	DESCRIPTION

DESIGNED
DRAWN
CHECKED

SUBMITTED: RMC PROJ ENGR C
APPROVED: RMC ENGR C

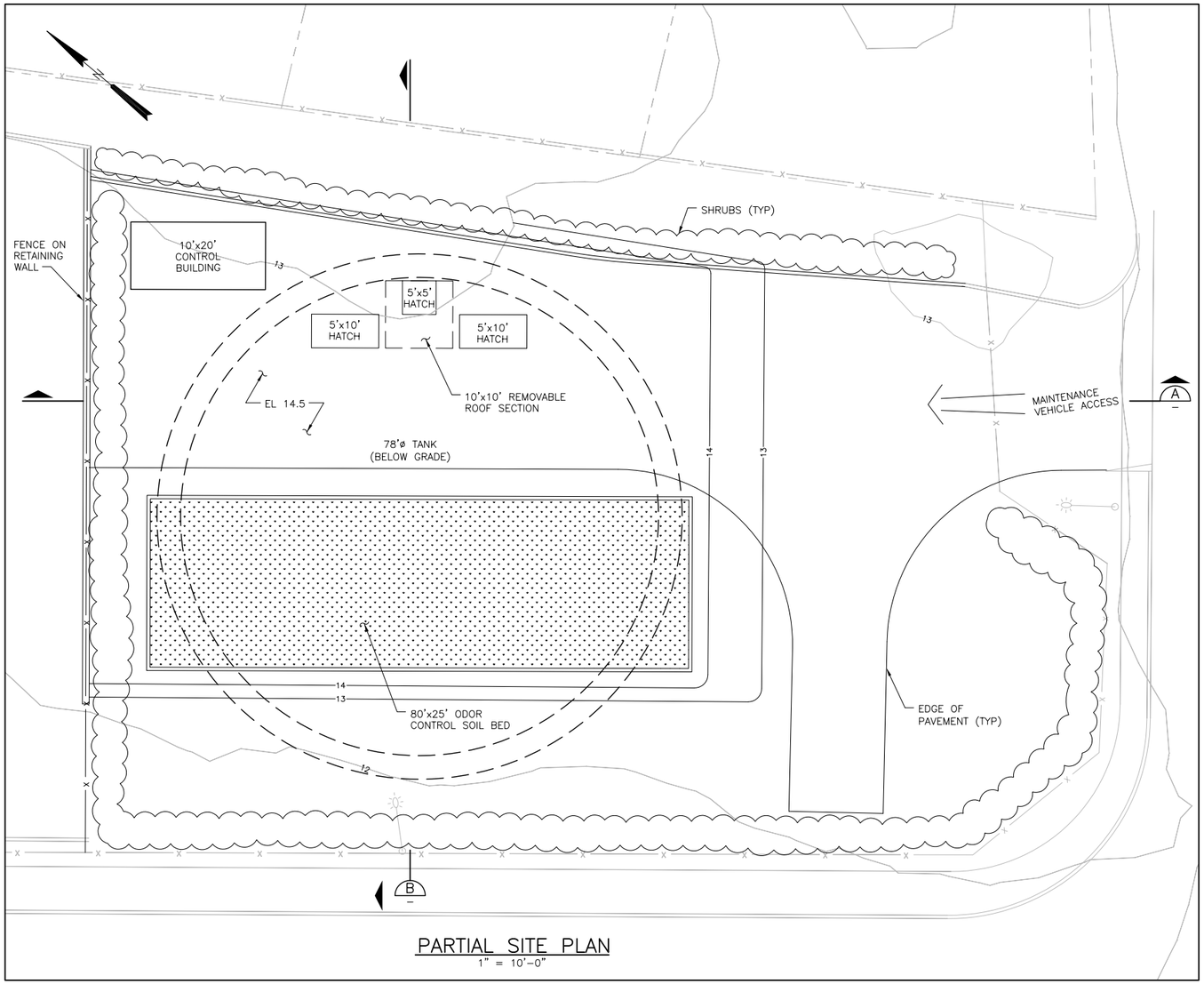
WET WEATHER EQUALIZATION BASIN SITE FEASIBILITY EVAL.

SITE A-2
CONCEPTUAL SITE PLAN

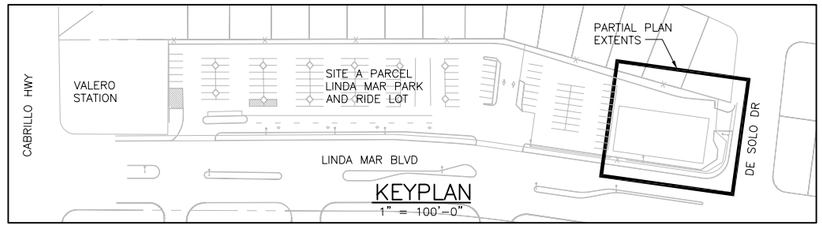
DWG NO	Fig 3
SHEET NO	OF
PROJ NO	0297-001
DATE	MAY 2013

FILENAME: 0297-001-Fig-3&4 10-14-13 10:26am mfoyle || XREFS: | GIS_base | X-0297-001_Talk |<<--

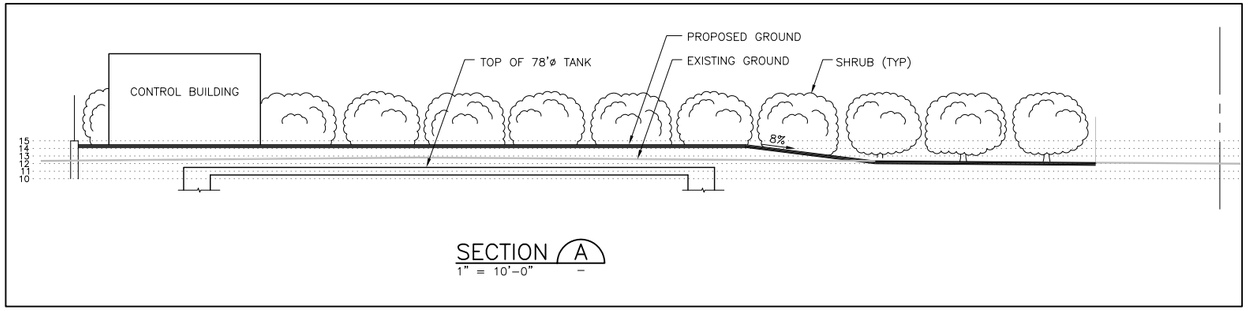
Last Saved By: mfoyle 8-01-13 03:30pm



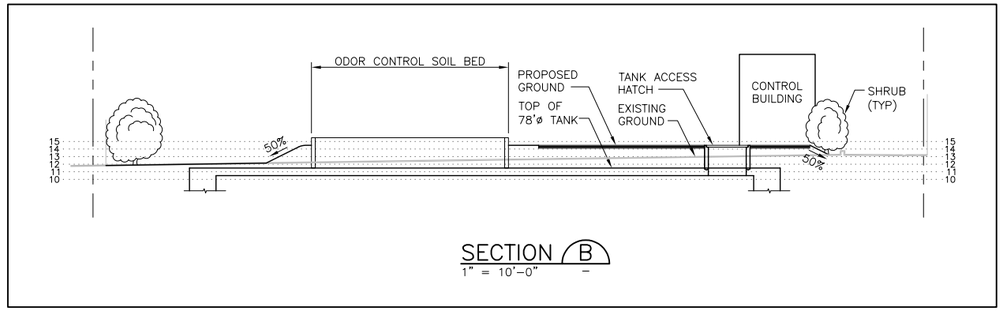
PARTIAL SITE PLAN
1" = 10'-0"



KEYPLAN
1" = 100'-0"



SECTION A
1" = 10'-0"



SECTION B
1" = 10'-0"

0" 1" — VERIFY SCALES — BAR IS ONE INCH LONG ON FULL SIZE DRAWING. IF NOT ONE INCH LONG ON THIS DRAWING, ADJUST SCALES ACCORDINGLY

RMC Water and Environment

REV	DATE	BY	APVD	DESCRIPTION

DESIGNED
DRAWN
CHECKED

SUBMITTED: _____ RMC PROJ ENGR C____
APPROVED: _____ RMC ENGR C____

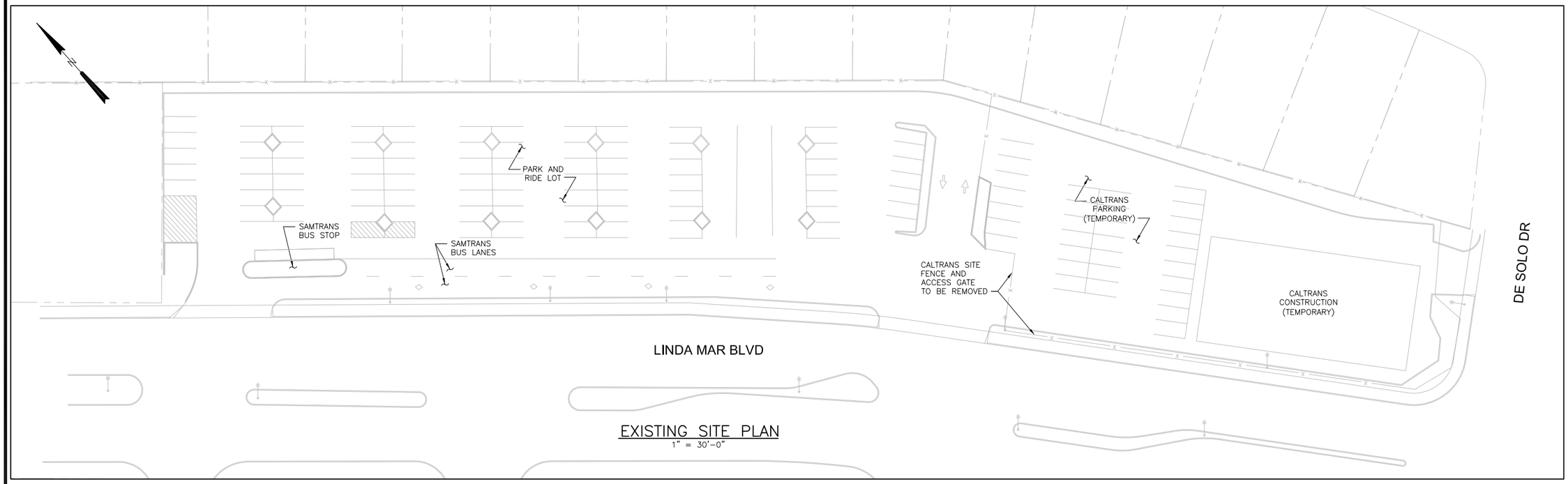
WET WEATHER EQUALIZATION BASIN SITE FEASIBILITY EVAL.

SITE A-2 EQUALIZATION BASIN PLAN AND SECTIONS

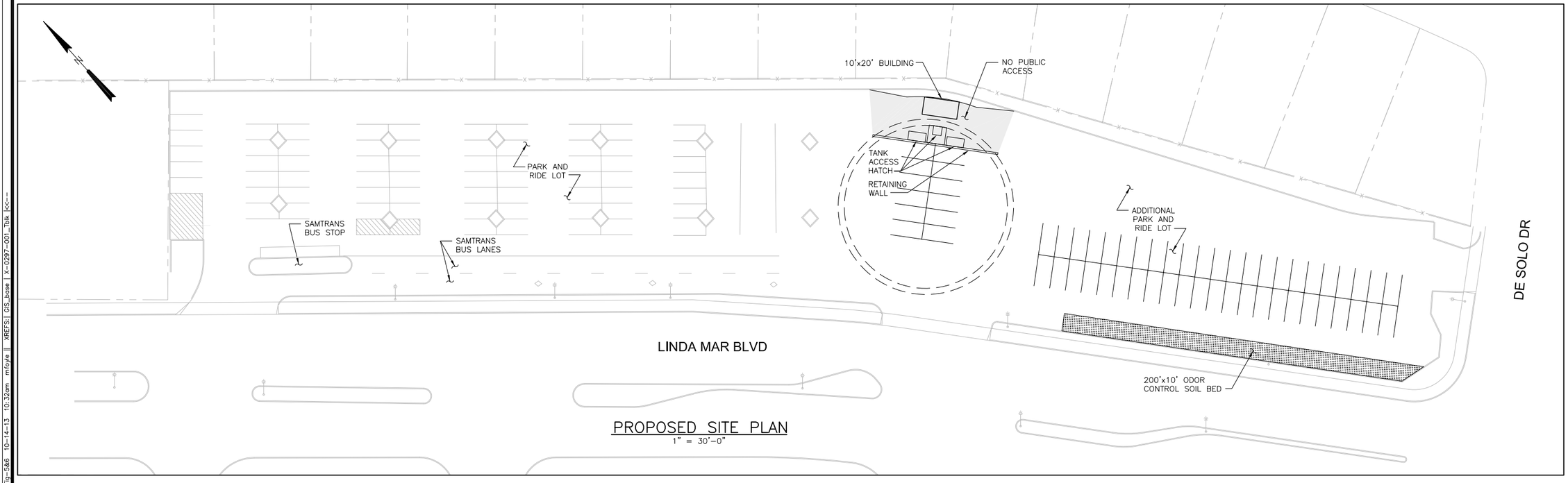
DWG NO	Fig 4
SHEET NO	OF
PROJ NO	0297-001
DATE	MAY 2013

FILENAME: 0297-001-Fig-3&4 10-14-13 10:30am mfoyle || XREFS: | GIS_base | X-0297-001_Thik |<<--

Last Saved By: mfoyle 8-01-13 03:30pm



EXISTING SITE PLAN
1" = 30'-0"



PROPOSED SITE PLAN
1" = 30'-0"

0" 1"
VERIFY SCALES
BAR IS ONE INCH
LONG ON FULL
SIZE DRAWING.
IF NOT ONE INCH
LONG ON THIS
DRAWING, ADJUST
SCALES ACCORDINGLY

RMC
Water and Environment

REV	DATE	BY	APVD	DESCRIPTION

DESIGNED
DRAWN
CHECKED

SUBMITTED: RMC PROJ ENGR C
APPROVED: RMC ENGR C

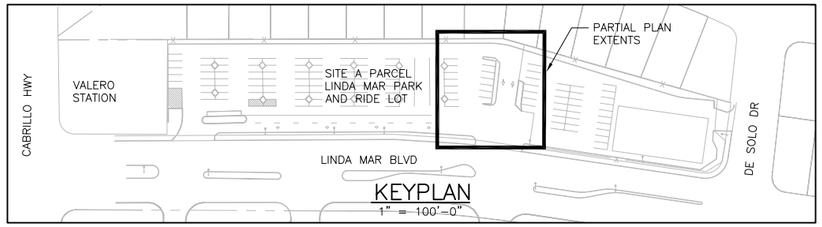
WET WEATHER EQUALIZATION BASIN SITE FEASIBILITY EVAL.

SITE A-3
CONCEPTUAL SITE PLAN

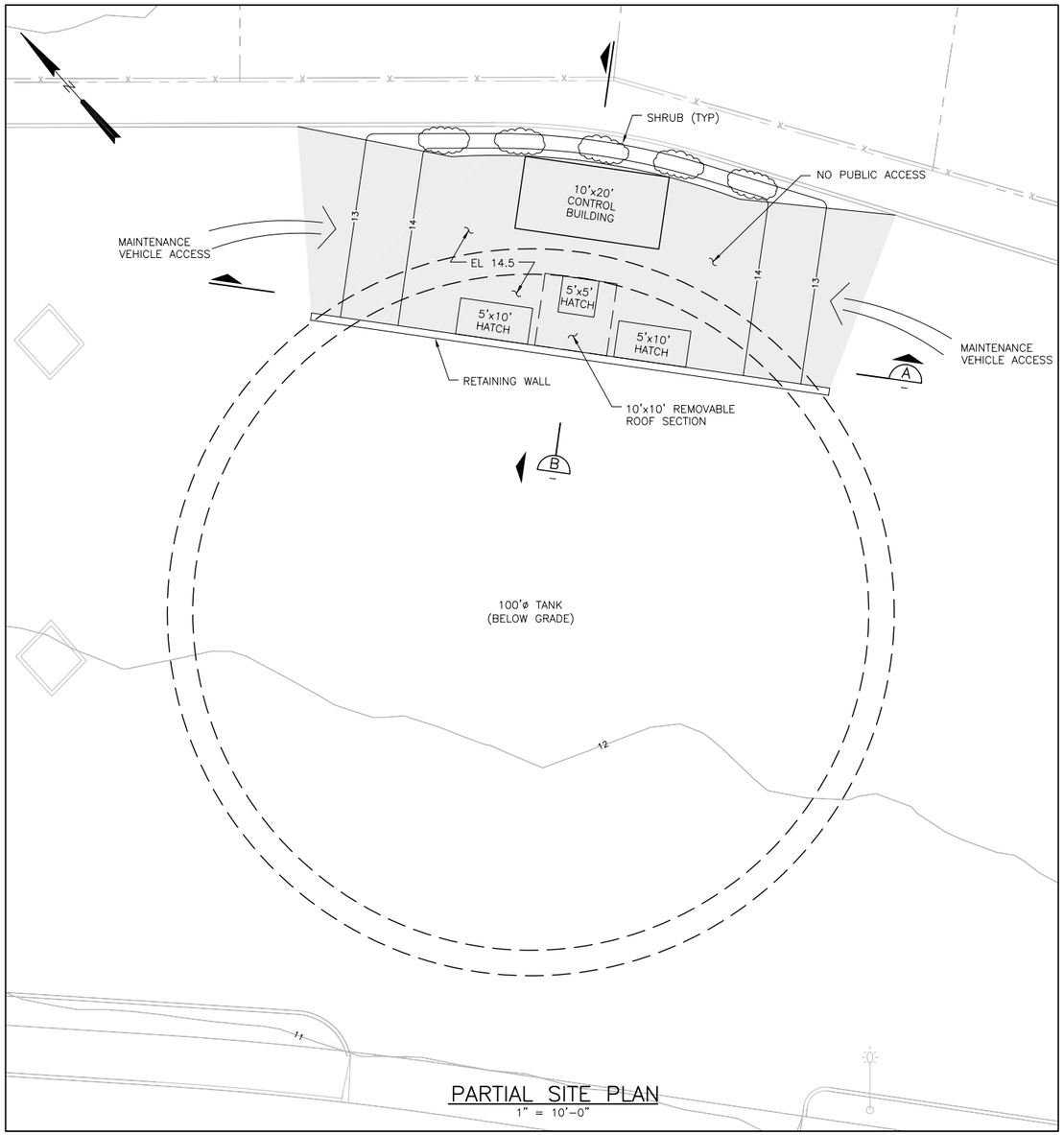
DWG NO	Fig 5
SHEET NO	OF
PROJ NO	0297-001
DATE	MAY 2013

FILENAME: 0297-001-Fig-5&6 10-14-13 10:32am mfoyle || XREFS: | GIS_base | X-0297-001_Talk |<<--

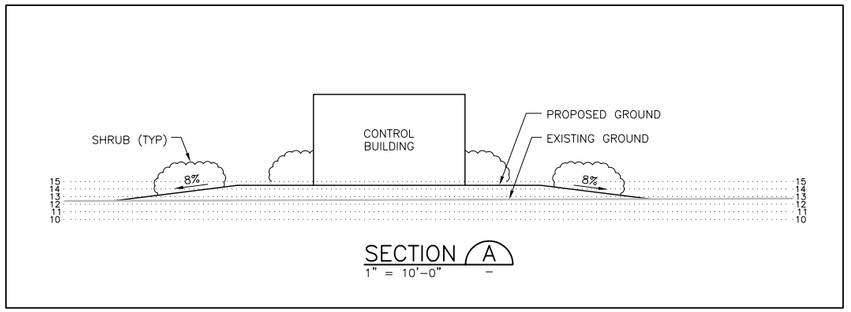
Last Saved By: mfoyle 5-16-13 12:06pm



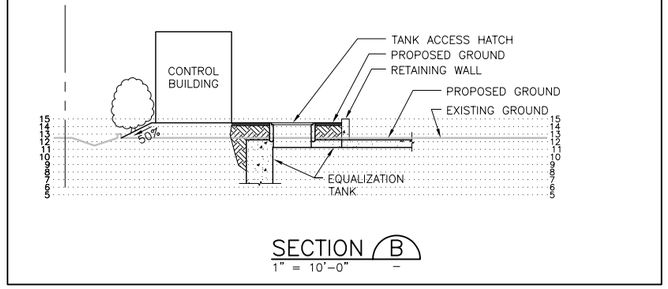
KEYPLAN
1" = 100'-0"



PARTIAL SITE PLAN
1" = 10'-0"



SECTION A
1" = 10'-0"



SECTION B
1" = 10'-0"

FILENAME: 0297-001-Fig-5&6 10-14-13 10:31am mfoyle || XREFS:| GIS_base | X-0297-001_Tblk |<<--

Last Saved By: mfoyle 5-16-13 12:06pm

0" — 1" — VERIFY SCALES — BAR IS ONE INCH LONG ON FULL SIZE DRAWING. IF NOT ONE INCH LONG ON THIS DRAWING, ADJUST SCALES ACCORDINGLY

RMC Water and Environment

REV	DATE	BY	APVD	DESCRIPTION
1				
2				
3				
4				
5				

DESIGNED
DRAWN
CHECKED

SUBMITTED: _____ RMC PROJ ENGR C____
APPROVED: _____ RMC ENGR C____

CITY OF PACIFICA

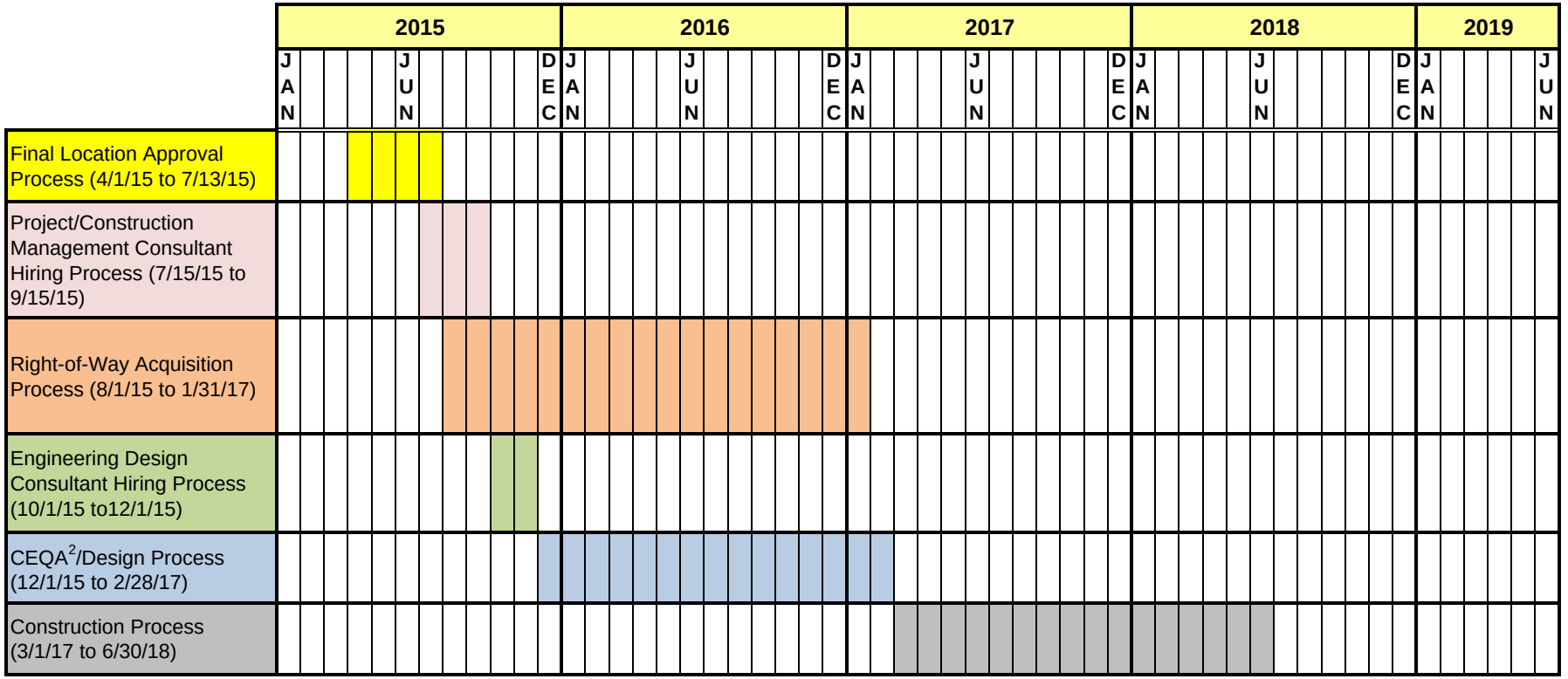
WET WEATHER EQUALIZATION BASIN SITE FEASIBILITY EVAL.

SITE A-3
EQUALIZATION BASIN
PLAN AND SECTIONS

DWG NO	Fig 6
SHEET NO	OF
PROJ NO	0297-001
DATE	MAY 2013

Attachment D - City Staff Schedule Estimates

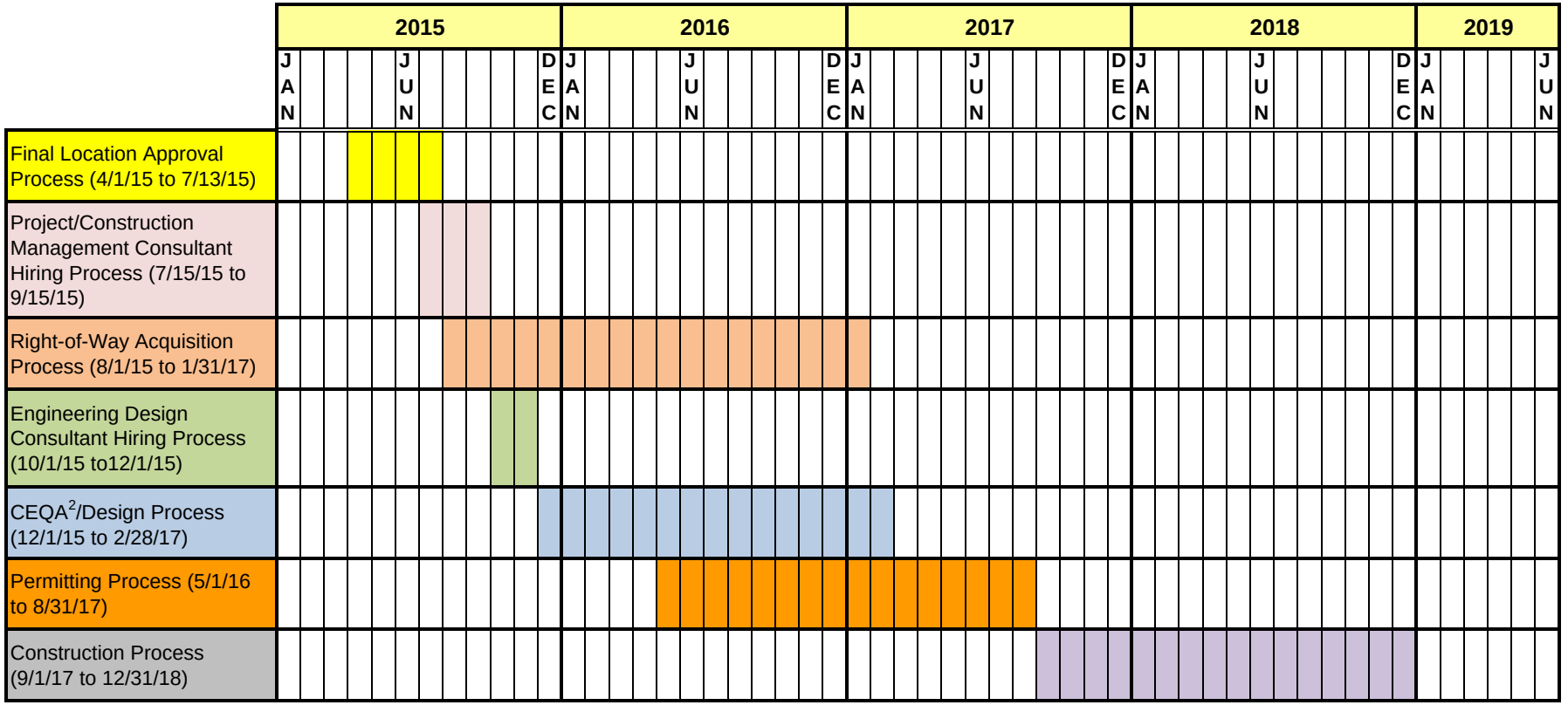
PACIFICA WET WEATHER EQUALIZATION BASIN TIMELINE TO CONSTRUCTION COMPLETION
SITE ALTERNATIVE 1A



NOTES: 1. DATES ARE ONLY ESTIMATE ESPECIALLY FOR CEQA/DESIGN PROCESS AND CONSTRUCTION PROCESS

2. CEQA - CALIFORNIA ENVIRONMENTAL QUALITY ACT

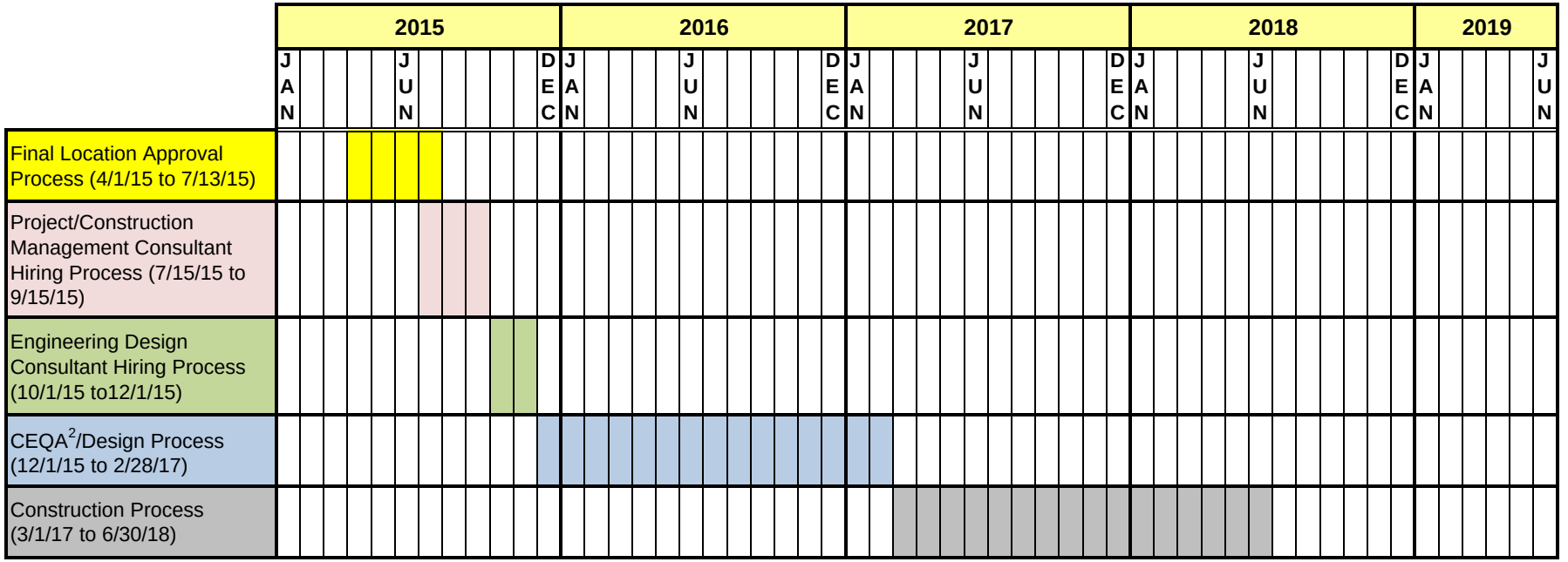
PACIFICA WET WEATHER EQUALIZATION BASIN TIMELINE TO CONSTRUCTION COMPLETION
SITE ALTERNATIVES 2A AND 3A



NOTES: 1. DATES ARE ONLY ESTIMATE ESPECIALLY FOR CEQA/DESIGN PROCESS AND CONSTRUCTION PROCESS

2. CEQA - CALIFORNIA ENVIRONMENTAL QUALITY ACT

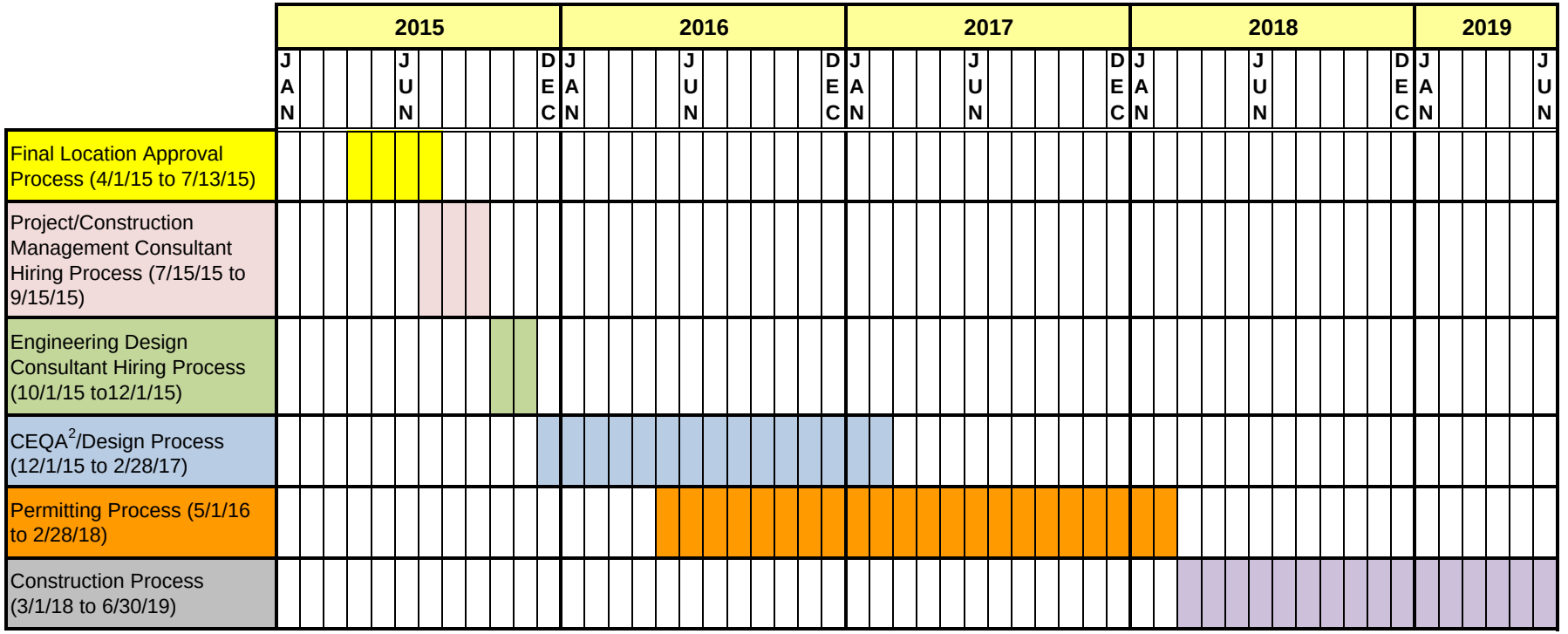
PACIFICA WET WEATHER EQUALIZATION BASIN TIMELINE TO CONSTRUCTION COMPLETION
SITE ALTERNATIVES 2B AND 3B



NOTES: 1. DATES ARE ONLY ESTIMATE ESPECIALLY FOR CEQA/DESIGN PROCESS AND CONSTRUCTION PROCESS

2. CEQA - CALIFORNIA ENVIRONMENTAL QUALITY ACT

PACIFICA WET WEATHER EQUALIZATION BASIN TIMELINE TO CONSTRUCTION COMPLETION
SITE ALTERNATIVE 4



NOTES: 1. DATES ARE ONLY ESTIMATE ESPECIALLY FOR CEQA/DESIGN PROCESS AND CONSTRUCTION PROCESS

2. CEQA - CALIFORNIA ENVIRONMENTAL QUALITY ACT

Attachment E - Site 1A Environmental Boring Test Results

BONKOWSKI & ASSOCIATES, INC.
GEOTECHNICAL SERVICES AND HAZARDOUS MATERIALS MANAGEMENT

July 1, 2015

RMC Water and Environment
Mr. Stephen Clary, Principal
2175 N. California Blvd., Suite 315
Walnut Creek, CA 94596

Environmental Site Assessment, Pacifica Sewer Basin Project, Site 1A

The following letter report summarizes the results of Bonkowski & Associates, Inc. (BAI) environmental assessment of shallow soils and groundwater at the CalTrans Park and Ride located at 507 Linda Mar Boulevard, in Pacifica, California. The purpose of the work was to explore shallow soils and groundwater in the vicinity of the City of Pacifica Sewer Basin Project Site 1A to identify petroleum fuel hydrocarbons. A Phase II Soil and Groundwater Investigation of the adjacent gas station located at 505 Linda Mar Boulevard identified low concentrations of fuel hydrocarbons and metals in the underlying shallow soil and groundwater (Stantec boring logs and laboratory test data, 2015).

To complete this task, two GeoProbe borings (GP-1 and GP-2) were advanced by Woodward Drilling at the locations shown on Figure 1. GP-1 was advanced along the west side of the property in close proximity to the gas station described above. GP-2 was advanced into the near center of the planned sewer basin. Both GP-1 and GP-2 were advanced to total depths of 20 feet. A BAI field geologist (1) collected soil samples from depths of 16 or 20 feet in each boring for chemical testing, (2) measured the volatile organic vapor content of the samples using a Mini-RAE 3000 PID, (3) collected a grab groundwater sample from a depth of 19 feet in GP-2 for chemical testing, and (4) and prepared a log for each boring using the Unified Soils Classification System.

The soils encountered consisted primarily of gravelly silt, clayey silt, clayey sand, clayey silty sand and fat clay. The top of the shallowmost groundwater was encountered at a depth of 19 feet in GP-2. Groundwater was not encountered in GP-1. The borings logs are presented in Appendix A. The organic vapor concentrations ranged from 0.2 to 0.5 ppm (PID units). The highest PID concentrations were noted in GP-2, at depths of 7 and 10 feet. The VOC PID measurements are tabulated on the logs. Both borings were backfilled in accordance with County well sealing standards.

The soil and groundwater samples collected from GP-1 and GP-2 were analyzed by McCampbell Analytical for TPHG and TPHD by EPA Method 8015; BTEX, MTBE, TBA, TAME, ETBE and DIPE by EPA Method 8260 and CAM 17 Metals by E200.8. The analytical results are summarized in Tables 1 thru 4. The McCampbell Analytical reports are included in Appendix B. The grab groundwater sample collected from GP-2 contained 210 μg/l of TPHD and 2.5 μg/l of TBA. No other hydrocarbon compounds were reported.

The field investigation was limited to exploration of shallow soils and groundwater for evidence of hydrocarbon contamination from the adjacent gasoline station. The possible presence or absence of any other type of contamination at the Site is not addressed in this work, nor is the extent of this contamination. The boring logs indicate the soil conditions encountered at the time and locations the borings were made, and may not represent conditions at other times and locations.

BONKOWSKI & ASSOCIATES, INC.

REGISTERED GEOLOGIST
CYNTHIA A. DITTMAR
No. 7213
Exp. 7/16
STATE OF CALIFORNIA

Cynthia A. Dittmar, PG 7213 EIT
Project Manager

Michael S. Bonkowski, PG CEG 1329 L.HG
Manager, Environmental and Engineering Services

ATTACHMENTS:

Table 1 – Groundwater Chemical Test Results (EPA 8015, 8021 and 8260)
Table 2 – Groundwater Chemical Test Results (CAM 17 Metals)
Table 3 – Soil Chemical Test Results (EPA 8015, 8021 and 8260)
Table 4 – Soil Chemical Test Results (CAM 17 Metals)

Figure 1 – Soil Boring Locations, 507 Linda Mar Boulevard, Pacifica, California

Appendix A – Logs of Borings GP-1 and GP-2. Explanation of Terms Used for Soil Description and Legend of Boring Log Symbols.

Appendix B – McCampbell Analytical Soil and Groundwater Analyses. Chain-of-Custody Forms.

BONKOWSKI & ASSOCIATES, INC.

TABLES

Table 1. Groundwater Chemical Test Results (EPA 8015, 8021 and 8260)
Pacifica Sewer Basin Project, Site 1A, Pacifica, California

Sample No.	Sample Depth (feet)	TPHG (µg/l)	TPHD (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethyl-benzene (µg/l)	Total Xylenes (µg/l)	MTBE (µg/l)	DIPE (µg/l)	ETBE (µg/l)	TAME (µg/l)	TBA (µg/l)	Date Sampled
GP-2[1]	19	<50	210*†	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	6/19/2015

[1] TPHD samples analyzed with a silica gel cleanup
* Diesel range compounds are significant; no recognizable pattern
† Oil range compounds are significant

Table 2. Groundwater Chemical Test Results (CAM 17 Metals)
Pacifica Sewer Basin Project, Site 1A, Pacifica, California

Sample No.	Sample Depth (feet)	Antimony (µg/l)	Arsenic (µg/l)	Barium (µg/l)	Beryllium (µg/l)	Cadmium (µg/l)	Chromium (µg/l)	Cobalt (µg/l)	Copper (µg/l)	Lead (µg/l)	Mercury (µg/l)	Molybdenum (µg/l)	Nickel (µg/l)	Selenium (µg/l)	Silver (µg/l)	Thallium (µg/l)	Vanadium (µg/l)	Zinc (µg/l)	Date Sampled
GP-2	19	< 5.0	20	3,400	9.6	<2.5	430	160	270	110	0.61	<5.0	620	<5.0	<1.9	<5.0	440	720	6/19/2015

Table 3. Soil Chemical Test Results (EPA 8015, 8021 and 8260)
Pacifica Sewer Basin Project, Site 1A, Pacifica, California

Sample No.	Sample Depth (feet)	TPHG (mg/kg)	TPHD (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)	MTBE (mg/kg)	DIPE (mg/kg)	ETBE (mg/kg)	TAME (mg/kg)	TBA (mg/kg)	Date Sampled
GP-1	16	<1.0	<1.0	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	6/19/2015
GP-2	20	<1.0	<1.0	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	6/19/2015

Table 4. Soil Chemical Test Results (CAM 17 Metals)
Pacifica Sewer Basin Project, Site 1A, Pacifica, California

Sample No.	Sample Depth (feet)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	Date Sampled
GP-1	16	<0.50	2.2	160	<0.50	<0.25	58	8.0	17	6.2	<0.050	0.83	33	<0.50	<0.50	<0.50	39	43	6/19/2015
GP-2	20	0.53	5.3	260	0.95	<0.25	85	10	46	14	0.10	1.9	72	1.3	<0.50	<0.50	62	110	6/19/2015

BONKOWSKI & ASSOCIATES, INC.

FIGURES

Approximate Scale (feet):

0 50 100

LEGEND

GP-1 Soil Sample

N

Project No. E215383	Sewer Basin Project, Site 1A Pacifica, California	SOIL SAMPLE LOCATIONS	Figure 1
Bonkowski & Associates, Inc.			

BONKOWSKI & ASSOCIATES, INC.

APPENDIX A

BORING LOGS

Bonkowski & Associates, Inc.

PROJECT NAME RMC -Pacifica **FILE NO.** E215383

BORING LOCATION 507 Linda Mar Blvd., Pacifica		**BORING NUMBER** GP-1	
DRILLING AGENCY Woodward Drilling	**DRILLER** David V.	**DATE STARTED / DATE FINISHED** 6/19/15	
DRILLING EQUIPMENT Truck-mounted GeoProbe		**TOTAL DEPTH** 20'	**SAMPLER** Continuous Core
DRILLING METHOD Direct Push	**CORE DIAMETER** 1.5"	**NO. OF SAMPLES** **DIST.**	**UNDIST.** 5
TYPE OF SEAL **NO. 1** Neat Cement	**FROM** 0 **TO** 20 **FT.**	**WATER LEVEL** **FIRST** NE	**COMPL.** **24 HRS.**
NO. 2	**FROM** **TO** **FT.**	**LOGGED BY:** CA Dittmar	**CHECKED BY:** MB

Depth (feet)	Samples	Blows	MATERIAL DESCRIPTION		USCS	Lithology
			9" AC FILL - CLAYEY SILT, w/ gravel, 10YR 3/2, very dark gray brown, damp/dry, no odor		ML	
			GRAVELLY SILT, GLEY 1-2.5/10, green black, damp, no odor	0.4 ppm	ML	
5			FAT CLAY, GLEY 1-2.5/N, black, moist/wet, no odor		CH	
				0.4 ppm		
			CLAYEY SILT, GLEY 1-2.5/N, black, moist/wet, no odor		ML	
10				0.4 ppm		
			AA, more silt, wet, no odor		ML	
				0.2 ppm		
15			AA		ML	
				0.4 ppm		
20						
25						
30						
35						

Bonkowski & Associates, Inc.

PROJECT NAME RMC -Pacifica **FILE NO.** E215383

BORING LOCATION 507 Linda Mar Blvd., Pacifica		**BORING NUMBER** GP-2	
DRILLING AGENCY Woodward Drilling	**DRILLER** David V.	**DATE STARTED / DATE FINISHED** 6/19/15	
DRILLING EQUIPMENT Truck-mounted GeoProbe		**TOTAL DEPTH** 20'	**SAMPLER** Continuous Core
DRILLING METHOD Direct Push	**CORE DIAMETER** 1.5"	**NO. OF SAMPLES** **DIST.**	**UNDIST.** 5
TYPE OF SEAL **NO. 1** Neat Cement	**FROM** 0 **TO** 20 **FT.**	**WATER LEVEL** **FIRST** 19 feet	**COMPL.** **24 HRS.**
NO. 2	**FROM** **TO** **FT.**	**LOGGED BY:** CA Dittmar	**CHECKED BY:** MB

Depth (feet)	Samples	Blows	MATERIAL DESCRIPTION		USCS	Lithology
			8" AC			
			FILL - CLAYEY SILT, w/ gravel, 10YR 3/2, very dark gray brown, moist, no odor		ML	
			CLAYEY SILT, GLEY 1-2.5/10, green black, moist, no odor	0.4 ppm	ML	
			AA, with gravel to 3/4", moist, no odor			
5			CLAYEY SILTY COARSE SAND, GLEY 1-2.5/10, green black, wet, no odor		SM	
			FAT CLAY with roots, GLEY 2-2.5/5GB, green black, wet, no odor	0.5 ppm	CH	
			CLAYEY SAND, GLEY 2-2.5/5GB, green black, wet, no odor		SC	
10			FAT CLAY with roots, GLEY 2-2.5/5GB, green black, wet, no odor		CH	
			CLAYEY SAND, GLEY 2-2.5/5GB, green black, wet, no odor	0.5 ppm	SC	
			FAT CLAY with grasses, GLEY 2-2.5/5PB, blue black, wet, no odor	0.4 ppm	CH	
15						
				0.2 ppm ▼		
20						
25						
30						
35						

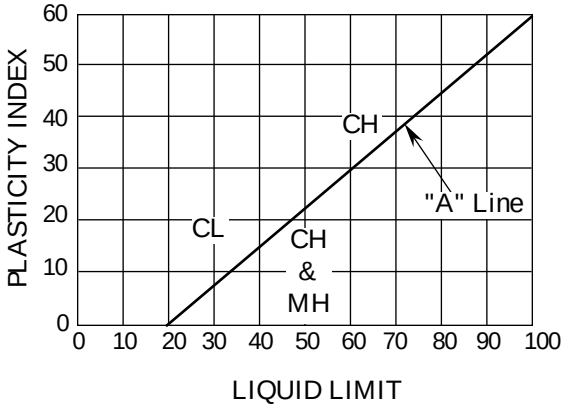
SAMPLE CLASSIFICATION CHART

UNIFIED SOIL CLASSIFICATION				
MAJOR DIVISIONS		SYMBOLS	GRAPHIC COLUMN	TYPICAL NAMES
COARSE GRAINED SOILS (More than 1/2 of soil > no. 200 sieve size)	GRAVELS (More than 1/2 of coarse fraction > no. 4 sieve size)	GW		Well-graded gravels and gravel-sand mixtures, little or no fines
		GP		Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM		Silty gravels, gravel-sand-silt mixtures
		GC		Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction < no. 4 sieve size)	SW		Well-graded sands or gravelly sands, little or no fines
		SP		Poorly-graded sands or gravelly sands, little or no fines
		SM		Silty sands, sand-silt mixtures
		SC		Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (More than 1/2 of soil < no. 200 sieve size)	SILTS & CLAYS LL < 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL		Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL > 50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays
		OH		Organic clays of medium to high plasticity, fat clays
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils

CLASSIFICATION MODIFIERS	
TRACE	0 - 10 %
LITTLE	10 - 20 %
SOME	20 - 35 %
AND	35 - 50 %
± MODIFIERS	

GRAIN SIZE CLASSIFICATION		
CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Grain Size	Sieve Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.76
coarse (c)	3" to 3/4"	76.2 to 19.1
fine (f)	3/4" to No. 4	19.1 to 4.76
SAND	No. 4 to No. 200	4.76 to 0.074
coarse (c)	No. 4 to No. 10	4.76 to 2.00
medium (m)	No. 10 to No. 40	2.00 to 0.420
fine (f)	No. 40 to No. 200	0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

PLASTICITY CHART



SAMPLE CLASSIFICATION CHART

Moisture Content		
DRY	-	Little/ No Perceptible Moisture
DAMP	-	Some Perceptible Moisture, Not Compactible
MOIST	-	Compactible
WET	-	Above Compaction Range
SATURATED	-	Pores, Voids Filled With Water
▼	-	Water Table (at Time Of Drilling)

SORTING ($S_o = P_{75}/P_{25}$)	
	S_o
EXTREMELY WELL	1.0 - 1.1
VERY WELL	1.1 - 1.2
WELL	1.2 - 1.4
MODERATELY	1.4 - 2.0
POORLY	2.0 - 2.7
VERY POORLY	2.7 - 5.0

SOIL CONSISTENCY

SAND OR GRAVEL	BLOWS/FT	SILT OR CLAY	BLOWS/FT	THUMB PENETRATION
Very Loose	< 5	Very Soft	< 3	Very easily - inches
Loose	5 - 15	Soft	3 - 5	Easily - inches
Medium Dense	16 - 40	Medium (firm)	6 - 10	Moderate Effort - inches
Dense	41 - 65	Stiff	11 - 20	Indented easily
Very Dense	> 65	Very Stiff	21 - 40	Indented by nail
		Hard	>40	Difficult by nail

SOIL BORING AND WELL CONSTRUCTION LEGEND

▌ Laboratory Sample

▼ Water Level Observed in Boring

▽ Static Water Level Measured in Well

Note: Blow Count (Blows/Ft) Represent the Number of Blows of a 140 - Pound Hammer Falling 30 Inches per Blow Required to Drive a Sampler Through The Last 12 Inches of an 18-inch Penetration.

Note: The Line Separating Strata on the Logs Represents Approximate Boundaries Only. The Actual Transition may be Gradual. No Warranty is Provided as to the Continuity of Soil Strata Between Borings. Logs Represent the Soil Section Observed at the Boring Location on the Date of Drilling Only.

Blank Casing

Screened Casing

Cement Grout

Bentonite

Sand Pack

BONKOWSKI & ASSOCIATES, INC.

APPENDIX B

CHEMICAL LABORATORY REPORTS

McCampbell Analytical, Inc.
"When Quality Counts"

Analytical Report

WorkOrder: 1506873 **Amended:** 06/26/2015

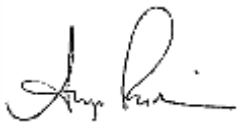
Report Created for: Bonkowski & Associates

6400 Hollis Street, Suite 4
Emeryville, CA 94608

Project Contact: Cynthia Dittmar
Project P.O.: E215382-01
Project Name: #E215382; RMC Pacifica

Project Received: 06/19/2015

Analytical Report reviewed & approved for release on 06/26/2015 by:



Angela Rydelius,
Laboratory Manager

McCampbell Analytical, Inc.
"When Quality Counts"
1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Glossary of Terms & Qualifier Definitions

Client: Bonkowski & Associates
Project: #E215382; RMC Pacifica
WorkOrder: 1506873

Glossary Abbreviation

95% Interval	95% Confident Interval
DF	Dilution Factor
DI WET	(DISTLC) Waste Extraction Test using DI water
DISS	Dissolved (direct analysis of 0.45 µm filtered and acidified water sample)
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
N/A	Not Applicable
ND	Not detected at or above the indicated MDL or RL
NR	Data Not Reported due to matrix interference or insufficient sample amount.
PF	Prep Factor
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
SPLP	Synthetic Precipitation Leachate Procedure
TCLP	Toxicity Characteristic Leachate Procedure
TEQ	Toxicity Equivalents
WET (STLC)	Waste Extraction Test (Soluble Threshold Limit Concentration)

Analytical Qualifiers

a1	sample diluted due to matrix interference
e2	diesel range compounds are significant; no recognizable pattern
e7	oil range compounds are significant

Quality Control Qualifiers

F1	MS/MSD recovery and/or RPD was out of acceptance criteria; LCS validated the prep batch.
F2	LCS recovery for this compound is outside of acceptance limits.

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Project:	#E215382; RMC Pacifica	**Extraction Method:**	SW5030B
Date Received:	6/19/15 18:16	**Analytical Method:**	SW8260B
Date Prepared:	6/19/15	**Unit:**	mg/kg

Oxygenated Volatile Organics & BTEX by P&T and GC/MS

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
S-215383-GP1-20	1506873-001A	Soil	06/19/2015	GC16	106566

Analytes	Result	RL	DF	Date Analyzed
tert-Amyl methyl ether (TAME)	ND	0.0050	1	06/25/2015 01:10
Benzene	ND	0.0050	1	06/25/2015 01:10
t-Butyl alcohol (TBA)	ND	0.050	1	06/25/2015 01:10
Diisopropyl ether (DIPE)	ND	0.0050	1	06/25/2015 01:10
Ethylbenzene	ND	0.0050	1	06/25/2015 01:10
Ethyl tert-butyl ether (ETBE)	ND	0.0050	1	06/25/2015 01:10
Methyl-t-butyl ether (MTBE)	ND	0.0050	1	06/25/2015 01:10
Toluene	ND	0.0050	1	06/25/2015 01:10
Xylenes, Total	ND	0.0050	1	06/25/2015 01:10

Surrogates	REC (%)	Limits	
Dibromofluoromethane	98	70-130	06/25/2015 01:10
Toluene-d8	90	70-130	06/25/2015 01:10
Benzene-d6	81	60-140	06/25/2015 01:10
Ethylbenzene-d10	84	60-140	06/25/2015 01:10

Analyst(s): KF

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
S-215383-GP2-16	1506873-002A	Soil	06/19/2015	GC10	106605

Analytes	Result	RL	DF	Date Analyzed
tert-Amyl methyl ether (TAME)	ND	0.0050	1	06/22/2015 16:07
Benzene	ND	0.0050	1	06/22/2015 16:07
t-Butyl alcohol (TBA)	ND	0.050	1	06/22/2015 16:07
Diisopropyl ether (DIPE)	ND	0.0050	1	06/22/2015 16:07
Ethylbenzene	ND	0.0050	1	06/22/2015 16:07
Ethyl tert-butyl ether (ETBE)	ND	0.0050	1	06/22/2015 16:07
Methyl-t-butyl ether (MTBE)	ND	0.0050	1	06/22/2015 16:07
Toluene	ND	0.0050	1	06/22/2015 16:07
Xylenes, Total	ND	0.0050	1	06/22/2015 16:07

Surrogates	REC (%)	Limits	
Dibromofluoromethane	81	70-130	06/22/2015 16:07
Toluene-d8	88	70-130	06/22/2015 16:07
Benzene-d6	82	60-140	06/22/2015 16:07
Ethylbenzene-d10	90	60-140	06/22/2015 16:07

Analyst(s): AK

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Project:	#E215382; RMC Pacifica	**Extraction Method:**	SW5030B
Date Received:	6/19/15 18:16	**Analytical Method:**	SW8260B
Date Prepared:	6/23/15	**Unit:**	µg/L

Oxygenated Volatile Organics & BTEX by P&T and GC/MS

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
W-215383-GP2-	1506873-003C	Water	06/19/2015 12:15	GC28	106744

Analytes	Result	RL	DF	Date Analyzed
tert-Amyl methyl ether (TAME)	ND	0.50	1	06/23/2015 23:45
Benzene	ND	0.50	1	06/23/2015 23:45
t-Butyl alcohol (TBA)	**2.5**	2.0	1	06/23/2015 23:45
Diisopropyl ether (DIPE)	ND	0.50	1	06/23/2015 23:45
Ethylbenzene	ND	0.50	1	06/23/2015 23:45
Ethyl tert-butyl ether (ETBE)	ND	0.50	1	06/23/2015 23:45
Methyl-t-butyl ether (MTBE)	ND	0.50	1	06/23/2015 23:45
Toluene	ND	0.50	1	06/23/2015 23:45
Xylenes, Total	ND	0.50	1	06/23/2015 23:45
Surrogates	**REC (%)**	**Limits**		
Dibromofluoromethane	105	70-130		06/23/2015 23:45
Toluene-d8	106	70-130		06/23/2015 23:45

Analyst(s): KBO

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Project:	#E215382; RMC Pacifica	**Extraction Method:**	SW3050B
Date Received:	6/19/15 18:16	**Analytical Method:**	SW6020
Date Prepared:	6/19/15	**Unit:**	mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
S-215383-GP1-20	**1506873-001A**	**Soil**	**06/19/2015**	**ICP-MS1**	**106604**

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	0.50	1	06/22/2015 20:35
Arsenic	**2.2**	0.50	1	06/22/2015 20:35
Barium	**160**	5.0	1	06/22/2015 20:35
Beryllium	ND	0.50	1	06/22/2015 20:35
Cadmium	ND	0.25	1	06/22/2015 20:35
Chromium	**58**	0.50	1	06/22/2015 20:35
Cobalt	**8.0**	0.50	1	06/22/2015 20:35
Copper	**17**	0.50	1	06/22/2015 20:35
Lead	**6.2**	0.50	1	06/22/2015 20:35
Mercury	ND	0.050	1	06/22/2015 20:35
Molybdenum	**0.83**	0.50	1	06/22/2015 20:35
Nickel	**33**	0.50	1	06/22/2015 20:35
Selenium	ND	0.50	1	06/22/2015 20:35
Silver	ND	0.50	1	06/22/2015 20:35
Thallium	ND	0.50	1	06/22/2015 20:35
Vanadium	**39**	0.50	1	06/22/2015 20:35
Zinc	**43**	5.0	1	06/22/2015 20:35

Surrogates	REC (%)	Limits	
Terbium	86	70-130	06/22/2015 20:35

Analyst(s): DB

(Cont.)

CDPH ELAP 1644 ♦ NELAP 4033ORELAP

Angela Rydelius, Lab Manager

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Project:	#E215382; RMC Pacifica	**Extraction Method:**	SW3050B
Date Received:	6/19/15 18:16	**Analytical Method:**	SW6020
Date Prepared:	6/19/15	**Unit:**	mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
S-215383-GP2-16	**1506873-002A**	**Soil**	**06/19/2015**	**ICP-MS1**	**106604**

Analytes	Result	RL	DF	Date Analyzed
Antimony	**0.53**	0.50	1	06/22/2015 22:02
Arsenic	**5.3**	0.50	1	06/22/2015 22:02
Barium	**260**	5.0	1	06/22/2015 22:02
Beryllium	**0.95**	0.50	1	06/22/2015 22:02
Cadmium	ND	0.25	1	06/22/2015 22:02
Chromium	**85**	0.50	1	06/22/2015 22:02
Cobalt	**10**	0.50	1	06/22/2015 22:02
Copper	**46**	0.50	1	06/22/2015 22:02
Lead	**14**	0.50	1	06/22/2015 22:02
Mercury	**0.10**	0.050	1	06/22/2015 22:02
Molybdenum	**1.9**	0.50	1	06/22/2015 22:02
Nickel	**72**	0.50	1	06/22/2015 22:02
Selenium	**1.3**	0.50	1	06/22/2015 22:02
Silver	ND	0.50	1	06/22/2015 22:02
Thallium	ND	0.50	1	06/22/2015 22:02
Vanadium	**62**	0.50	1	06/22/2015 22:02
Zinc	**110**	5.0	1	06/22/2015 22:02

Surrogates	REC (%)	Limits	
Terbium	120	70-130	06/22/2015 22:02

Analyst(s): DB

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Project:	#E215382; RMC Pacifica	**Extraction Method:**	E200.8
Date Received:	6/19/15 18:16	**Analytical Method:**	E200.8
Date Prepared:	6/19/15	**Unit:**	µg/L

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
W-215383-GP2-	1506873-003B	Water	06/19/2015 12:15	ICP-MS1	106569

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	5.0	10	06/22/2015 16:42
Arsenic	**20**	5.0	10	06/22/2015 16:42
Barium	**3400**	50	10	06/22/2015 16:42
Beryllium	**9.6**	5.0	10	06/22/2015 16:42
Cadmium	ND	2.5	10	06/22/2015 16:42
Chromium	**430**	5.0	10	06/22/2015 16:42
Cobalt	**160**	5.0	10	06/22/2015 16:42
Copper	**270**	20	10	06/22/2015 16:42
Lead	**110**	5.0	10	06/22/2015 16:42
Mercury	**0.61**	0.25	10	06/22/2015 16:42
Molybdenum	ND	5.0	10	06/22/2015 16:42
Nickel	**620**	5.0	10	06/22/2015 16:42
Selenium	ND	5.0	10	06/22/2015 16:42
Silver	ND	1.9	10	06/22/2015 16:42
Thallium	ND	5.0	10	06/22/2015 16:42
Vanadium	**440**	5.0	10	06/22/2015 16:42
Zinc	**720**	150	10	06/22/2015 16:42

Surrogates	REC (%)	Limits	
Terbium	105	70-130	06/22/2015 16:42

Analyst(s): DVH Analytical Comments: a1

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Project:	#E215382; RMC Pacifica	**Extraction Method:**	SW5030B
Date Received:	6/19/15 18:16	**Analytical Method:**	SW8021B/8015Bm
Date Prepared:	6/19/15	**Unit:**	mg/Kg

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
S-215383-GP1-20	1506873-001A	Soil	06/19/2015	GC19	106575

Analytes	Result	RL	DF	Date Analyzed
TPH(g)	ND	1.0	1	06/24/2015 00:18
MTBE	---	0.050	1	06/24/2015 00:18
Benzene	---	0.0050	1	06/24/2015 00:18
Toluene	---	0.0050	1	06/24/2015 00:18
Ethylbenzene	---	0.0050	1	06/24/2015 00:18
Xylenes	---	0.0050	1	06/24/2015 00:18

Surrogates	REC (%)	Limits	
2-Fluorotoluene	97	70-130	06/24/2015 00:18

Analyst(s): IA

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
S-215383-GP2-16	1506873-002A	Soil	06/19/2015	GC19	106575

Analytes	Result	RL	DF	Date Analyzed
TPH(g)	ND	1.0	1	06/24/2015 01:18
MTBE	---	0.050	1	06/24/2015 01:18
Benzene	---	0.0050	1	06/24/2015 01:18
Toluene	---	0.0050	1	06/24/2015 01:18
Ethylbenzene	---	0.0050	1	06/24/2015 01:18
Xylenes	---	0.0050	1	06/24/2015 01:18

Surrogates	REC (%)	Limits	
2-Fluorotoluene	91	70-130	06/24/2015 01:18

Analyst(s): IA

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Project:	#E215382; RMC Pacifica	**Extraction Method:**	SW5030B
Date Received:	6/19/15 18:16	**Analytical Method:**	SW8021B/8015Bm
Date Prepared:	6/26/15	**Unit:**	µg/L

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
W-215383-GP2-	1506873-003A	Water	06/19/2015 12:15	GC19	106823

Analytes	Result	RL	DF	Date Analyzed
TPH(g)	ND	50	1	06/26/2015 13:45
MTBE	---	5.0	1	06/26/2015 13:45
Benzene	---	0.50	1	06/26/2015 13:45
Toluene	---	0.50	1	06/26/2015 13:45
Ethylbenzene	---	0.50	1	06/26/2015 13:45
Xylenes	---	0.50	1	06/26/2015 13:45
Surrogates	**REC (%)**	**Limits**		
aaa-TFT	87	70-130		06/26/2015 13:45

Analyst(s): IA

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Project:	#E215382; RMC Pacifica	**Extraction Method:**	SW3550B
Date Received:	6/19/15 18:16	**Analytical Method:**	SW8015B
Date Prepared:	6/19/15	**Unit:**	mg/Kg

Total Extractable Petroleum Hydrocarbons w/out SG Clean-Up

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
S-215383-GP1-20	**1506873-001A**	**Soil**	**06/19/2015**	**GC6A**	**106581**

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	ND	1.0	1	06/21/2015 16:14

Surrogates	REC (%)	Limits	
C9	103	70-130	06/21/2015 16:14

Analyst(s): TK

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
S-215383-GP2-16	**1506873-002A**	**Soil**	**06/19/2015**	**GC6A**	**106581**

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	ND	1.0	1	06/21/2015 13:51

Surrogates	REC (%)	Limits	
C9	102	70-130	06/21/2015 13:51

Analyst(s): TK

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Project:	#E215382; RMC Pacifica	**Extraction Method:**	SW3510C
Date Received:	6/19/15 18:16	**Analytical Method:**	SW8015B
Date Prepared:	6/19/15	**Unit:**	µg/L

Total Extractable Petroleum Hydrocarbons w/out SG Clean-Up

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
W-215383-GP2-	**1506873-003A**	**Water**	**06/19/2015 12:15**	**GC6B**	**106598**

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	**260**	50	1	06/20/2015 15:16
Surrogates	**REC (%)**	**Limits**		
C9	92	70-130		06/20/2015 15:16

Analyst(s): TK Analytical Comments: e7,e2

McCampbell Analytical, Inc.
"When Quality Counts"
1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106566
Date Analyzed:	6/19/15	**Extraction Method:**	SW5030B
Instrument:	GC16	**Analytical Method:**	SW8260B
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106566 1506831-004AMS/MSD

QC Summary Report for SW8260B

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Acetone	ND	-	0.10	-	-	-	-
tert-Amyl methyl ether (TAME)	ND	0.0585	0.0050	0.050	-	117, F2	53-116
Benzene	ND	0.0561	0.0050	0.050	-	112	63-137
Bromobenzene	ND	-	0.0050	-	-	-	-
Bromochloromethane	ND	-	0.0050	-	-	-	-
Bromodichloromethane	ND	-	0.0050	-	-	-	-
Bromoform	ND	-	0.0050	-	-	-	-
Bromomethane	ND	-	0.0050	-	-	-	-
2-Butanone (MEK)	ND	-	0.020	-	-	-	-
t-Butyl alcohol (TBA)	ND	0.259	0.050	0.20	-	130	41-135
n-Butyl benzene	ND	-	0.0050	-	-	-	-
sec-Butyl benzene	ND	-	0.0050	-	-	-	-
tert-Butyl benzene	ND	-	0.0050	-	-	-	-
Carbon Disulfide	ND	-	0.0050	-	-	-	-
Carbon Tetrachloride	ND	-	0.0050	-	-	-	-
Chlorobenzene	ND	-	0.0050	-	-	-	-
Chloroethane	ND	-	0.0050	-	-	-	-
Chloroform	ND	-	0.0050	-	-	-	-
Chloromethane	ND	-	0.0050	-	-	-	-
2-Chlorotoluene	ND	-	0.0050	-	-	-	-
4-Chlorotoluene	ND	-	0.0050	-	-	-	-
Dibromochloromethane	ND	-	0.0050	-	-	-	-
1,2-Dibromo-3-chloropropane	ND	-	0.0040	-	-	-	-
1,2-Dibromoethane (EDB)	ND	-	0.0040	-	-	-	-
Dibromomethane	ND	-	0.0050	-	-	-	-
1,2-Dichlorobenzene	ND	-	0.0050	-	-	-	-
1,3-Dichlorobenzene	ND	-	0.0050	-	-	-	-
1,4-Dichlorobenzene	ND	-	0.0050	-	-	-	-
Dichlorodifluoromethane	ND	-	0.0050	-	-	-	-
1,1-Dichloroethane	ND	-	0.0050	-	-	-	-
1,2-Dichloroethane (1,2-DCA)	ND	-	0.0040	-	-	-	-
1,1-Dichloroethene	ND	-	0.0050	-	-	-	-
cis-1,2-Dichloroethene	ND	-	0.0050	-	-	-	-
trans-1,2-Dichloroethene	ND	-	0.0050	-	-	-	-
1,2-Dichloropropane	ND	-	0.0050	-	-	-	-
1,3-Dichloropropane	ND	-	0.0050	-	-	-	-
2,2-Dichloropropane	ND	-	0.0050	-	-	-	-
1,1-Dichloropropene	ND	-	0.0050	-	-	-	-
cis-1,3-Dichloropropene	ND	-	0.0050	-	-	-	-
trans-1,3-Dichloropropene	ND	-	0.0050	-	-	-	-

(Cont.)

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106566
Date Analyzed:	6/19/15	**Extraction Method:**	SW5030B
Instrument:	GC16	**Analytical Method:**	SW8260B
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106566 1506831-004AMS/MSD

QC Summary Report for SW8260B

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Diisopropyl ether (DIPE)	ND	0.0528	0.0050	0.050	-	105	52-129
Ethylbenzene	ND	-	0.0050	-	-	-	-
Ethyl tert-butyl ether (ETBE)	ND	0.0563	0.0050	0.050	-	113	53-125
Freon 113	ND	-	0.0050	-	-	-	-
Hexachlorobutadiene	ND	-	0.0050	-	-	-	-
Hexachloroethane	ND	-	0.0050	-	-	-	-
2-Hexanone	ND	-	0.0050	-	-	-	-
Isopropylbenzene	ND	-	0.0050	-	-	-	-
4-Isopropyl toluene	ND	-	0.0050	-	-	-	-
Methyl-t-butyl ether (MTBE)	ND	0.0579	0.0050	0.050	-	116	58-122
Methylene chloride	ND	-	0.0050	-	-	-	-
4-Methyl-2-pentanone (MIBK)	ND	-	0.0050	-	-	-	-
Naphthalene	ND	-	0.0050	-	-	-	-
n-Propyl benzene	ND	-	0.0050	-	-	-	-
Styrene	ND	-	0.0050	-	-	-	-
1,1,1,2-Tetrachloroethane	ND	-	0.0050	-	-	-	-
1,1,2,2-Tetrachloroethane	ND	-	0.0050	-	-	-	-
Tetrachloroethene	ND	-	0.0050	-	-	-	-
Toluene	ND	0.0519	0.0050	0.050	-	104	76-130
1,2,3-Trichlorobenzene	ND	-	0.0050	-	-	-	-
1,2,4-Trichlorobenzene	ND	-	0.0050	-	-	-	-
1,1,1-Trichloroethane	ND	-	0.0050	-	-	-	-
1,1,2-Trichloroethane	ND	-	0.0050	-	-	-	-
Trichloroethene	ND	-	0.0050	-	-	-	-
Trichlorofluoromethane	ND	-	0.0050	-	-	-	-
1,2,3-Trichloropropane	ND	-	0.0050	-	-	-	-
1,2,4-Trimethylbenzene	ND	-	0.0050	-	-	-	-
1,3,5-Trimethylbenzene	ND	-	0.0050	-	-	-	-
Vinyl Chloride	ND	-	0.0050	-	-	-	-
Xylenes, Total	ND	-	0.0050	-	-	-	-
Surrogate Recovery							
Dibromofluoromethane	0.128	0.130		0.12	102	104	70-130
Toluene-d8	0.122	0.118		0.12	98	94	70-130
4-BFB	0.0107	-		0.0125	86	-	-
Benzene-d6	0.103	0.108		0.10	103	108	60-140
Ethylbenzene-d10	0.104	0.112		0.10	104	112	60-140
1,2-DCB-d4	0.0965	-		0.1	96	-	-

(Cont.)

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106566
Date Analyzed:	6/19/15	**Extraction Method:**	SW5030B
Instrument:	GC16	**Analytical Method:**	SW8260B
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106566 1506831-004AMS/MSD

QC Summary Report for SW8260B

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
tert-Amyl methyl ether (TAME)	0.0454	0.0451	0.050	ND	91	90	70-130	0.705	20
Benzene	0.0459	0.0436	0.050	ND	92	87	70-130	5.11	20
t-Butyl alcohol (TBA)	0.182	0.186	0.20	ND	91	93	70-130	1.95	20
Diisopropyl ether (DIPE)	0.0415	0.0418	0.050	ND	83	84	70-130	0.732	20
Ethyl tert-butyl ether (ETBE)	0.0447	0.0450	0.050	ND	89	90	70-130	0.501	20
Methyl-t-butyl ether (MTBE)	0.0448	0.0445	0.050	ND	90	89	70-130	0.640	20
Toluene	0.0427	0.0412	0.050	ND	85	82	70-130	3.59	20
Surrogate Recovery									
Dibromofluoromethane	0.126	0.128	0.12		101	102	70-130	1.18	20
Toluene-d8	0.114	0.115	0.12		91	92	70-130	1.30	20
Benzene-d6	0.0903	0.0862	0.10		90	86	60-140	4.58	20
Ethylbenzene-d10	0.0927	0.0902	0.10		93	90	60-140	2.73	20

(Cont.)

McCampbell Analytical, Inc.
"When Quality Counts"
1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106605
Date Analyzed:	6/20/15	**Extraction Method:**	SW5030B
Instrument:	GC16	**Analytical Method:**	SW8260B
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106605 1506873-002AMS/MSD

QC Summary Report for SW8260B

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Acetone	ND	-	0.10	-	-	-	-
tert-Amyl methyl ether (TAME)	ND	0.0470	0.0050	0.050	-	94	53-116
Benzene	ND	0.0453	0.0050	0.050	-	91	63-137
Bromobenzene	ND	-	0.0050	-	-	-	-
Bromochloromethane	ND	-	0.0050	-	-	-	-
Bromodichloromethane	ND	-	0.0050	-	-	-	-
Bromoform	ND	-	0.0050	-	-	-	-
Bromomethane	ND	-	0.0050	-	-	-	-
2-Butanone (MEK)	ND	-	0.020	-	-	-	-
t-Butyl alcohol (TBA)	ND	0.210	0.050	0.20	-	105	41-135
n-Butyl benzene	ND	-	0.0050	-	-	-	-
sec-Butyl benzene	ND	-	0.0050	-	-	-	-
tert-Butyl benzene	ND	-	0.0050	-	-	-	-
Carbon Disulfide	ND	-	0.0050	-	-	-	-
Carbon Tetrachloride	ND	-	0.0050	-	-	-	-
Chlorobenzene	ND	-	0.0050	-	-	-	-
Chloroethane	ND	-	0.0050	-	-	-	-
Chloroform	ND	-	0.0050	-	-	-	-
Chloromethane	ND	-	0.0050	-	-	-	-
2-Chlorotoluene	ND	-	0.0050	-	-	-	-
4-Chlorotoluene	ND	-	0.0050	-	-	-	-
Dibromochloromethane	ND	-	0.0050	-	-	-	-
1,2-Dibromo-3-chloropropane	ND	-	0.0040	-	-	-	-
1,2-Dibromoethane (EDB)	ND	-	0.0040	-	-	-	-
Dibromomethane	ND	-	0.0050	-	-	-	-
1,2-Dichlorobenzene	ND	-	0.0050	-	-	-	-
1,3-Dichlorobenzene	ND	-	0.0050	-	-	-	-
1,4-Dichlorobenzene	ND	-	0.0050	-	-	-	-
Dichlorodifluoromethane	ND	-	0.0050	-	-	-	-
1,1-Dichloroethane	ND	-	0.0050	-	-	-	-
1,2-Dichloroethane (1,2-DCA)	ND	-	0.0040	-	-	-	-
1,1-Dichloroethene	ND	-	0.0050	-	-	-	-
cis-1,2-Dichloroethene	ND	-	0.0050	-	-	-	-
trans-1,2-Dichloroethene	ND	-	0.0050	-	-	-	-
1,2-Dichloropropane	ND	-	0.0050	-	-	-	-
1,3-Dichloropropane	ND	-	0.0050	-	-	-	-
2,2-Dichloropropane	ND	-	0.0050	-	-	-	-
1,1-Dichloropropene	ND	-	0.0050	-	-	-	-
cis-1,3-Dichloropropene	ND	-	0.0050	-	-	-	-
trans-1,3-Dichloropropene	ND	-	0.0050	-	-	-	-

(Cont.)

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106605
Date Analyzed:	6/20/15	**Extraction Method:**	SW5030B
Instrument:	GC16	**Analytical Method:**	SW8260B
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106605 1506873-002AMS/MSD

QC Summary Report for SW8260B

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Diisopropyl ether (DIPE)	ND	0.0425	0.0050	0.050	-	85	52-129
Ethylbenzene	ND	-	0.0050	-	-	-	-
Ethyl tert-butyl ether (ETBE)	ND	0.0456	0.0050	0.050	-	91	53-125
Freon 113	ND	-	0.0050	-	-	-	-
Hexachlorobutadiene	ND	-	0.0050	-	-	-	-
Hexachloroethane	ND	-	0.0050	-	-	-	-
2-Hexanone	ND	-	0.0050	-	-	-	-
Isopropylbenzene	ND	-	0.0050	-	-	-	-
4-Isopropyl toluene	ND	-	0.0050	-	-	-	-
Methyl-t-butyl ether (MTBE)	ND	0.0469	0.0050	0.050	-	94	58-122
Methylene chloride	ND	-	0.0050	-	-	-	-
4-Methyl-2-pentanone (MIBK)	ND	-	0.0050	-	-	-	-
Naphthalene	ND	-	0.0050	-	-	-	-
n-Propyl benzene	ND	-	0.0050	-	-	-	-
Styrene	ND	-	0.0050	-	-	-	-
1,1,1,2-Tetrachloroethane	ND	-	0.0050	-	-	-	-
1,1,2,2-Tetrachloroethane	ND	-	0.0050	-	-	-	-
Tetrachloroethene	ND	-	0.0050	-	-	-	-
Toluene	ND	0.0424	0.0050	0.050	-	85	76-130
1,2,3-Trichlorobenzene	ND	-	0.0050	-	-	-	-
1,2,4-Trichlorobenzene	ND	-	0.0050	-	-	-	-
1,1,1-Trichloroethane	ND	-	0.0050	-	-	-	-
1,1,2-Trichloroethane	ND	-	0.0050	-	-	-	-
Trichloroethene	ND	-	0.0050	-	-	-	-
Trichlorofluoromethane	ND	-	0.0050	-	-	-	-
1,2,3-Trichloropropane	ND	-	0.0050	-	-	-	-
1,2,4-Trimethylbenzene	ND	-	0.0050	-	-	-	-
1,3,5-Trimethylbenzene	ND	-	0.0050	-	-	-	-
Vinyl Chloride	ND	-	0.0050	-	-	-	-
Xylenes, Total	ND	-	0.0050	-	-	-	-
Surrogate Recovery							
Dibromofluoromethane	0.124	0.126		0.12	99	101	70-130
Toluene-d8	0.117	0.113		0.12	94	90	70-130
4-BFB	0.0116	-		0.0125	93	-	-
Benzene-d6	0.0959	0.0904		0.10	96	90	60-140
Ethylbenzene-d10	0.104	0.105		0.10	104	105	60-140
1,2-DCB-d4	0.102	-		0.1	102	-	-

(Cont.)

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106605
Date Analyzed:	6/20/15	**Extraction Method:**	SW5030B
Instrument:	GC16	**Analytical Method:**	SW8260B
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106605 1506873-002AMS/MSD

QC Summary Report for SW8260B

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
tert-Amyl methyl ether (TAME)	0.0325	0.0317	0.050	ND	65,F1	63,F1	70-130	2.36	20
Benzene	0.0371	0.0362	0.050	ND	74	72	70-130	2.38	20
t-Butyl alcohol (TBA)	0.132	0.121	0.20	ND	66,F1	60,F1	70-130	8.78	20
Diisopropyl ether (DIPE)	0.0367	0.0359	0.050	ND	73	72	70-130	2.20	20
Ethyl tert-butyl ether (ETBE)	0.0353	0.0345	0.050	ND	71	69,F1	70-130	2.35	20
Methyl-t-butyl ether (MTBE)	0.0340	0.0330	0.050	ND	68,F1	66,F1	70-130	3.01	20
Toluene	0.0378	0.0374	0.050	ND	76	75	70-130	1.31	20
Surrogate Recovery									
Dibromofluoromethane	0.104	0.105	0.12		83	84	70-130	0.629	20
Toluene-d8	0.110	0.110	0.12		88	88	70-130	0	20
Benzene-d6	0.0832	0.0816	0.10		83	82	60-140	2.03	20
Ethylbenzene-d10	0.0957	0.0919	0.10		96	92	60-140	3.98	20

McCampbell Analytical, Inc.
"When Quality Counts"
1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/23/15	**BatchID:**	106744
Date Analyzed:	6/23/15	**Extraction Method:**	SW5030B
Instrument:	GC28	**Analytical Method:**	SW8260B
Matrix:	Water	**Unit:**	µg/L
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106744 1506844-004BMS/MSD

QC Summary Report for SW8260B

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Acetone	ND	-	10	-	-	-	-
tert-Amyl methyl ether (TAME)	ND	9.19	0.50	10	-	92	54-140
Benzene	ND	9.88	0.50	10	-	99	47-158
Bromobenzene	ND	-	0.50	-	-	-	-
Bromochloromethane	ND	-	0.50	-	-	-	-
Bromodichloromethane	ND	-	0.50	-	-	-	-
Bromoform	ND	-	0.50	-	-	-	-
Bromomethane	ND	-	0.50	-	-	-	-
2-Butanone (MEK)	ND	-	2.0	-	-	-	-
t-Butyl alcohol (TBA)	ND	29.8	2.0	40	-	74	42-140
n-Butyl benzene	ND	-	0.50	-	-	-	-
sec-Butyl benzene	ND	-	0.50	-	-	-	-
tert-Butyl benzene	ND	-	0.50	-	-	-	-
Carbon Disulfide	ND	-	0.50	-	-	-	-
Carbon Tetrachloride	ND	-	0.50	-	-	-	-
Chlorobenzene	ND	-	0.50	-	-	-	-
Chloroethane	ND	-	0.50	-	-	-	-
Chloroform	ND	-	0.50	-	-	-	-
Chloromethane	ND	-	0.50	-	-	-	-
2-Chlorotoluene	ND	-	0.50	-	-	-	-
4-Chlorotoluene	ND	-	0.50	-	-	-	-
Dibromochloromethane	ND	-	0.50	-	-	-	-
1,2-Dibromo-3-chloropropane	ND	-	0.20	-	-	-	-
1,2-Dibromoethane (EDB)	ND	-	0.50	-	-	-	-
Dibromomethane	ND	-	0.50	-	-	-	-
1,2-Dichlorobenzene	ND	-	0.50	-	-	-	-
1,3-Dichlorobenzene	ND	-	0.50	-	-	-	-
1,4-Dichlorobenzene	ND	-	0.50	-	-	-	-
Dichlorodifluoromethane	ND	-	0.50	-	-	-	-
1,1-Dichloroethane	ND	-	0.50	-	-	-	-
1,2-Dichloroethane (1,2-DCA)	ND	-	0.50	-	-	-	-
1,1-Dichloroethene	ND	-	0.50	-	-	-	-
cis-1,2-Dichloroethene	ND	-	0.50	-	-	-	-
trans-1,2-Dichloroethene	ND	-	0.50	-	-	-	-
1,2-Dichloropropane	ND	-	0.50	-	-	-	-
1,3-Dichloropropane	ND	-	0.50	-	-	-	-
2,2-Dichloropropane	ND	-	0.50	-	-	-	-
1,1-Dichloropropene	ND	-	0.50	-	-	-	-
cis-1,3-Dichloropropene	ND	-	0.50	-	-	-	-
trans-1,3-Dichloropropene	ND	-	0.50	-	-	-	-

(Cont.)

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/23/15	**BatchID:**	106744
Date Analyzed:	6/23/15	**Extraction Method:**	SW5030B
Instrument:	GC28	**Analytical Method:**	SW8260B
Matrix:	Water	**Unit:**	µg/L
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106744 1506844-004BMS/MSD

QC Summary Report for SW8260B

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Diisopropyl ether (DIPE)	ND	9.86	0.50	10	-	99	57-136
Ethylbenzene	ND	-	0.50	-	-	-	-
Ethyl tert-butyl ether (ETBE)	ND	8.95	0.50	10	-	90	55-137
Freon 113	ND	-	0.50	-	-	-	-
Hexachlorobutadiene	ND	-	0.50	-	-	-	-
Hexachloroethane	ND	-	0.50	-	-	-	-
2-Hexanone	ND	-	0.50	-	-	-	-
Isopropylbenzene	ND	-	0.50	-	-	-	-
4-Isopropyl toluene	ND	-	0.50	-	-	-	-
Methyl-t-butyl ether (MTBE)	ND	8.75	0.50	10	-	87	53-139
Methylene chloride	ND	-	0.50	-	-	-	-
4-Methyl-2-pentanone (MIBK)	ND	-	0.50	-	-	-	-
Naphthalene	ND	-	0.50	-	-	-	-
n-Propyl benzene	ND	-	0.50	-	-	-	-
Styrene	ND	-	0.50	-	-	-	-
1,1,1,2-Tetrachloroethane	ND	-	0.50	-	-	-	-
1,1,2,2-Tetrachloroethane	ND	-	0.50	-	-	-	-
Tetrachloroethene	ND	-	0.50	-	-	-	-
Toluene	ND	9.88	0.50	10	-	99	52-137
1,2,3-Trichlorobenzene	ND	-	0.50	-	-	-	-
1,2,4-Trichlorobenzene	ND	-	0.50	-	-	-	-
1,1,1-Trichloroethane	ND	-	0.50	-	-	-	-
1,1,2-Trichloroethane	ND	-	0.50	-	-	-	-
Trichloroethene	ND	-	0.50	-	-	-	-
Trichlorofluoromethane	ND	-	0.50	-	-	-	-
1,2,3-Trichloropropane	ND	-	0.50	-	-	-	-
1,2,4-Trimethylbenzene	ND	-	0.50	-	-	-	-
1,3,5-Trimethylbenzene	ND	-	0.50	-	-	-	-
Vinyl Chloride	ND	-	0.50	-	-	-	-
Xylenes, Total	ND	-	0.50	-	-	-	-
Surrogate Recovery							
Dibromofluoromethane	25.9	26.0		25	104	104	70-130
Toluene-d8	27.4	27.5		25	110	110	70-130
4-BFB	2.56	-		2.5	102	-	-

(Cont.)

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/23/15	**BatchID:**	106744
Date Analyzed:	6/23/15	**Extraction Method:**	SW5030B
Instrument:	GC28	**Analytical Method:**	SW8260B
Matrix:	Water	**Unit:**	µg/L
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106744 1506844-004BMS/MSD

QC Summary Report for SW8260B

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
tert-Amyl methyl ether (TAME)	10.2	10.1	10	ND	102	101	69-139	1.39	20
Benzene	10.1	9.77	10	ND	101	98	69-141	3.28	20
t-Butyl alcohol (TBA)	38.9	39.2	40	ND	97	98	41-152	0.633	20
Diisopropyl ether (DIPE)	10.2	10.1	10	ND	102	101	72-140	1.69	20
Ethyl tert-butyl ether (ETBE)	9.66	9.46	10	ND	97	95	71-140	2.08	20
Methyl-t-butyl ether (MTBE)	10.0	9.92	10	ND	100	99	73-139	1.19	20
Toluene	9.60	9.27	10	ND	96	93	71-128	3.44	20
Surrogate Recovery									
Dibromofluoromethane	26.3	26.4	25		105	106	70-130	0.578	20
Toluene-d8	27.0	26.6	25		108	107	70-130	1.57	20

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106604
Date Analyzed:	6/22/15	**Extraction Method:**	SW3050B
Instrument:	ICP-MS1	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106604 1506873-001AMS/MSD

QC Summary Report for Metals

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Antimony	ND	53.9	0.50	50	-	108	75-125
Arsenic	ND	51.4	0.50	50	-	103	75-125
Barium	ND	524	5.0	500	-	105	75-125
Beryllium	ND	54.0	0.50	50	-	108	75-125
Cadmium	ND	52.6	0.25	50	-	105	75-125
Chromium	ND	52.0	0.50	50	-	104	75-125
Cobalt	ND	51.8	0.50	50	-	103	75-125
Copper	ND	53.5	0.50	50	-	107	75-125
Lead	ND	53.5	0.50	50	-	107	75-125
Mercury	ND	1.18	0.050	1.25	-	95	75-125
Molybdenum	ND	51.6	0.50	50	-	103	75-125
Nickel	ND	53.0	0.50	50	-	106	75-125
Selenium	ND	53.7	0.50	50	-	107	75-125
Silver	ND	52.6	0.50	50	-	105	75-125
Thallium	ND	48.4	0.50	50	-	97	75-125
Vanadium	ND	52.2	0.50	50	-	104	75-125
Zinc	ND	543	5.0	500	-	109	75-125
Surrogate Recovery							
Terbium	515	542		500	103	108	70-130

(Cont.)

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106604
Date Analyzed:	6/22/15	**Extraction Method:**	SW3050B
Instrument:	ICP-MS1	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106604 1506873-001AMS/MSD

QC Summary Report for Metals

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Antimony	46.5	43.2	50	ND	93	86	75-125	7.40	20
Arsenic	47.5	42.7	50	2.159	91	81	75-125	10.5	20
Barium	728	630	500	158.3	114	94	75-125	14.5	20
Beryllium	40.7	39.5	50	ND	80	78	75-125	2.97	20
Cadmium	47.0	43.9	50	ND	94	87	75-125	6.83	20
Chromium	120	100	50	58.31	123	84	75-125	17.6	20
Cobalt	50.1	46.1	50	7.971	84	76	75-125	8.48	20
Copper	71.1	60.1	50	17.07	108	86	75-125	16.8	20
Lead	56.7	51.2	50	6.225	101	90	75-125	10.2	20
Mercury	1.16	1.09	1.25	ND	90	84	75-125	6.50	20
Molybdenum	46.5	42.7	50	0.8290	91	84	75-125	8.55	20
Nickel	92.8	77.0	50	33.35	119	87	75-125	18.7	20
Selenium	49.2	44.2	50	ND	98	88	75-125	10.7	20
Silver	47.4	44.0	50	ND	95	88	75-125	7.24	20
Thallium	44.0	41.2	50	ND	88	82	75-125	6.59	20
Vanadium	100	83.0	50	38.56	124	89	75-125	18.9	20
Zinc	545	483	500	42.81	100	88	75-125	12.0	20
Surrogate Recovery									
Terbium	464	428	500		93	86	70-130	8.11	20

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106569
Date Analyzed:	6/22/15	**Extraction Method:**	E200.8
Instrument:	ICP-MS2	**Analytical Method:**	E200.8
Matrix:	Water	**Unit:**	µg/L
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106569 1506846-001GMS/MSD

QC Summary Report for Metals

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Antimony	ND	50.7	0.50	50	-	101	85-115
Arsenic	ND	50.0	0.50	50	-	100	85-115
Barium	ND	520	5.0	500	-	104	85-115
Beryllium	ND	51.0	0.50	50	-	102	85-115
Cadmium	ND	50.5	0.25	50	-	101	85-115
Chromium	ND	50.4	0.50	50	-	101	85-115
Cobalt	ND	50.9	0.50	50	-	102	85-115
Copper	ND	51.6	2.0	50	-	103	85-115
Lead	ND	50.7	0.50	50	-	101	85-115
Mercury	ND	1.28	0.025	1.25	-	103	85-115
Molybdenum	ND	49.8	0.50	50	-	99	85-115
Nickel	ND	51.1	0.50	50	-	102	85-115
Selenium	ND	51.4	0.50	50	-	103	85-115
Silver	ND	50.2	0.19	50	-	100	85-115
Thallium	ND	47.0	0.50	50	-	94	85-115
Vanadium	ND	50.4	0.50	50	-	101	85-115
Zinc	ND	516	15	500	-	103	85-115
Surrogate Recovery							
Terbium	776	781		750	104	104	70-130

(Cont.)

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106569
Date Analyzed:	6/22/15	**Extraction Method:**	E200.8
Instrument:	ICP-MS2	**Analytical Method:**	E200.8
Matrix:	Water	**Unit:**	µg/L
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106569 1506846-001GMS/MSD

QC Summary Report for Metals

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Antimony	48.7	50.4	50	ND<5.0	97	101	70-130	3.43	20
Arsenic	49.4	52.4	50	ND<5.0	99	105	70-130	5.89	20
Barium	557	569	500	72.28	97	99	70-130	2.11	20
Beryllium	48.8	50.8	50	ND<5.0	98	102	70-130	3.89	20
Cadmium	49.0	50.9	50	ND<2.5	98	102	70-130	3.82	20
Chromium	46.6	48.8	50	ND<5.0	93	98	70-130	4.57	20
Cobalt	49.2	50.6	50	ND<5.0	95	98	70-130	2.83	20
Copper	60.3	62.6	50	ND<20	87	92	70-130	3.73	20
Lead	50.0	51.4	50	ND<5.0	100	103	70-130	2.76	20
Mercury	1.18	1.29	1.25	ND<0.25	78	86	70-130	8.25	20
Molybdenum	49.5	50.7	50	ND<5.0	94	96	70-130	2.40	20
Nickel	54.4	56.1	50	7.691	93	97	70-130	3.17	20
Selenium	47.2	52.9	50	ND<5.0	94	106	70-130	11.5	20
Silver	49.0	50.4	50	ND<1.9	98	101	70-130	2.72	20
Thallium	45.5	47.1	50	ND<5.0	91	94	70-130	3.43	20
Vanadium	47.0	49.8	50	ND<5.0	94	100	70-130	5.86	20
Zinc	450	474	500	ND<150	90	95	70-130	5.20	20
Surrogate Recovery									
Terbium	794	811	750		106	108	70-130	2.13	20

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106575
Date Analyzed:	6/22/15	**Extraction Method:**	SW5030B
Instrument:	GC19	**Analytical Method:**	SW8021B/8015Bm
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106575 1506845-041AMS/MSD

QC Summary Report for SW8021B/8015Bm

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TPH(btex)	ND	0.529	0.40	0.60	-	88	70-130
MTBE	ND	0.0842	0.050	0.10	-	84	70-130
Benzene	ND	0.107	0.0050	0.10	-	107	70-130
Toluene	ND	0.109	0.0050	0.10	-	109	70-130
Ethylbenzene	ND	0.112	0.0050	0.10	-	112	70-130
Xylenes	ND	0.359	0.0050	0.30	-	120	70-130
Surrogate Recovery							
2-Fluorotoluene	0.126	0.115		0.10	127	115	70-130

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
TPH(btex)	NR	NR		15	NR	NR	-	NR	
MTBE	NR	NR		ND<0.25	NR	NR	-	NR	
Benzene	NR	NR		0.073	NR	NR	-	NR	
Toluene	NR	NR		0.72	NR	NR	-	NR	
Ethylbenzene	NR	NR		0.25	NR	NR	-	NR	
Xylenes	NR	NR		0.69	NR	NR	-	NR	
Surrogate Recovery									
2-Fluorotoluene	NR	NR			NR	NR	-	NR	

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/25/15	**BatchID:**	106823
Date Analyzed:	6/25/15	**Extraction Method:**	SW5030B
Instrument:	GC19	**Analytical Method:**	SW8021B/8015Bm
Matrix:	Water	**Unit:**	µg/L
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106823

QC Summary Report for SW8021B/8015Bm

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TPH(btex)	ND	54.8	40	60	-	91	70-130
MTBE	ND	11.1	5.0	10	-	111	70-130
Benzene	ND	11.0	0.50	10	-	110	70-130
Toluene	ND	11.2	0.50	10	-	111	70-130
Ethylbenzene	ND	11.6	0.50	10	-	116	70-130
Xylenes	ND	37.3	0.50	30	-	124	70-130
Surrogate Recovery							
aaa-TFT	8.91	8.97		10	89	90	70-130

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106581
Date Analyzed:	6/19/15	**Extraction Method:**	SW3550B
Instrument:	GC11A, GC6A	**Analytical Method:**	SW8015B
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106581 1506849-010AMS/MSD

QC Report for SW8015B w/out SG Clean-Up

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TPH-Diesel (C10-C23)	ND	46.6	1.0	40	-	117	70-130
TPH-Motor Oil (C18-C36)	ND	-	5.0	-	-	-	-
Surrogate Recovery							
C9	26.3	27.2		25	105	109	70-130

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
TPH-Diesel (C10-C23)	38.3	41.5	40	ND	96	104	70-130	8.05	30
Surrogate Recovery									
C9	26.2	26.2	25		105	105	70-130	0	30

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/19/15	**BatchID:**	106598
Date Analyzed:	6/19/15 - 6/23/15	**Extraction Method:**	SW3510C
Instrument:	GC2A, GC2B	**Analytical Method:**	SW8015B
Matrix:	Water	**Unit:**	µg/L
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106598

QC Report for SW8015B w/out SG Clean-Up

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TPH-Diesel (C10-C23)	ND	1060	50	1000	-	106	61-157
TPH-Motor Oil (C18-C36)	ND	-	250	-	-	-	-
Surrogate Recovery							
C9	564	602		625	90	96	70-134

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1506873 **ClientCode: BONK**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ EQuIS ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
Cynthia Dittmar
Bonkowski & Associates
6400 Hollis Street, Suite 4
Emeryville, CA 94608
(510) 450-0770 FAX: (925) 284-3552

Email: cindy@bonkowski.com
cc/3rd Party:
PO: E215382-01
ProjectNo: #E215382; RMC Pacifica

Bill to:
Accounts Payable
Bonkowski & Associates
6400 Hollis Street, Suite 4
Emeryville, CA 94608
accounting@bonkowski.com

Requested TAT: **5 days**

Date Received: **06/19/2015**
Date Printed: **06/26/2015**

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below)											
					1	2	3	4	5	6	7	8	9	10	11	12
1506873-001	S-215383-GP1-20	Soil	6/19/2015	☐	A		A		A		A					
1506873-002	S-215383-GP2-16	Soil	6/19/2015	☐	A		A		A		A					
1506873-003	W-215383-GP2-	Water	6/19/2015 12:15	☐		C		B		A		A				

Test Legend:

1	8260B_5OXYBTEX_S	2	8260B_5OXYBTEX_W	3	CAM17MS_S	4	CAM17MS_W	5	G-MBTEX_S
6	G-MBTEX_W	7	TPH(D)_S	8	TPH(D)_W	9		10	
11		12							

The following SampIDs: 001A, 002A, 003A contain testgroup.

Prepared by: Erika Santos

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

WORK ORDER SUMMARY

Client Name: BONKOWSKI & ASSOCIATES
Project: #E215382; RMC Pacifica
Comments:

QC Level: LEVEL 2
Client Contact: Cynthia Dittmar
Contact's Email: cindy@bonkowski.com

Work Order: 1506873
Date Received: 6/19/2015

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Lab ID	Client ID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	De-chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1506873-001A	S-215383-GP1-20	Soil	Multi-Range TPH(g,d,mo)	1	Acetate Liner	☐	6/19/2015	5 days		☐	
			SW6020 (CAM 17)			☐		5 days		☐	
			SW8260B (5 OXYS & BTEX)			☐		5 days		☐	
1506873-002A	S-215383-GP2-16	Soil	Multi-Range TPH(g,d,mo)	1	Acetate Liner	☐	6/19/2015	5 days		☐	
			SW6020 (CAM 17)			☐		5 days		☐	
			SW8260B (5 OXYS & BTEX)			☐		5 days		☐	
1506873-003A	W-215383-GP2-	Water	Multi-Range TPH(g,d,mo)	2	2 VOAs w/HCL + 2-aVOAs (multi-range)	☐	6/19/2015 12:15	5 days	Present	☐	
1506873-003B	W-215383-GP2-	Water	E200.8 (CAM 17)	1	250mL HDPE w/ HNO3	☐	6/19/2015 12:15	5 days	Present	☐	
1506873-003C	W-215383-GP2-	Water	SW8260B (5 OXYS & BTEX)	2	VOA w/ HCl	☐	6/19/2015 12:15	5 days	Present	☐	

NOTES: - STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.

1504873

McCampbell Analytical, Inc.

1534 Willow Pass Rd. / Pittsburg, CA 94565-1701
www.mccampbell.com / main@mccampbell.com
Telephone: (877) 252-9262 / Fax: (925) 252-9269

CHAIN OF CUSTODY RECORD

TURN AROUND TIME: RUSH ☐ 1 DAY ☐ 2 DAY ☐ 3 DAY ☐ 5 DAY ☒

GeoTracker EDF ☐ PDF ☐ EDD ☐ Write On (DW) ☐ EQuIS ☐ 10 DAY ☐

Effluent Sample Requiring "J" flag ☐ UST Clean Up Fund Project ☐; Claim #_____

Report To: Cindy Dittmar **Bill To:** Faith Fisher

Company: Bonkowski & Associates, Inc., 6400 Hollis Street, Ste 4, Emeryville 94608

Tele: (510) 450-0770 x 13 **E-Mail:** Cindy@Bonkowski.com; msb@bonkowski.com

Project #: E215382 **Project Name:** RMC Pacifica

Project Location: Pacifica, CA **Purchase Order#** E215382-01

Sampler Signature:

SAMPLE ID	Location/ Field Point Name	SAMPLING Date	SAMPLING Time	# Containers	MATRIX: Ground Water	Waste Water	Drinking Water	Sea Water	Soil	Air	Sludge	Other	METHOD PRESERVED: HCL	HNO_3	Other
S-215383-GP1-20	GP-1	6-19-15	—	1					x						
~~S-215383-GP1-~~	~~GP-1~~			1					x						
S-215383-GP2-16	GP-2			1					x						
~~S-215383-GP2-~~	~~GP-2~~			1					x						
~~W-215383-GP1-~~	~~GP-1~~			5	x								X	X	X
W-215383-GP2-	GP-2		12:15	5	x								X	X	X

SAMPLE ID	BTEX & TPH as Gas (8021/ 8015) MTBE	TPH as Diesel (8015) #TPHGT	Total Petroleum Oil & Grease (1664 / 5520 E/B&F)	Total Petroleum Hydrocarbons (418.1)	EPA 505/ 608 / 8081 (Cl Pesticides)	EPA 608 / 8082 PCB's ; Aroclors / Congeners	EPA 507 / 8141 (NP Pesticides)	EPA 515 / 8151 (Acidic Cl Herbicides)	EPA 524.2 / 624 / 8260 (VOCs)	EPA 525.2 / 625 / 8270 (SVOCs)	EPA 8270 SIM / 8310 (PAHs / PNAs)	CAM 17 Metals (200.8 / 6020)***	LUFT 5 Metals (200.8 / 6020)***	Metals (200.8 / 6020)***	Lab to Filter sample for Dissolved metals analysis	BTEX & 5 oxys 8260
S-215383-GP1-20		X										X				X
~~S-215383-GP1-~~																
S-215383-GP2-16		X										X				X
~~S-215383-GP2-~~																
~~W-215383-GP1-~~																
W-215383-GP2-		X										X				X

**MAI clients MUST disclose any dangerous chemicals known to be present in their submitted samples in concentrations that may cause immediate harm or serious future health endangerment as a result of brief, gloved, open air, sample handling by MAI staff. Non-disclosure incurs an immediate $250 surcharge and the client is subject to full legal liability for harm suffered. Thank you for your understanding and for allowing us to work safely.

*** If metals are requested for water samples and the water type is not specified on the chain of custody, then MAI will default to metals by E200.8.

Relinquished By:	Date:	Time:	Received By:
	6/19/15	18:40	
Relinquished By:	Date:	Time:	Received By:
	6-19-15	1605	Erika Y Santos
Relinquished By:	Date:	Time:	Received By:

ICE/t° 5.0 COMMENTS:

GOOD CONDITION_____

HEAD SPACE ABSENT_____

DECHLORINATED IN LAB_____

APPROPRIATE CONTAINERS_____

PRESERVED IN LAB_____

VOAS O&G METALS OTHER HAZARDOUS:

PRESERVATION_____ pH<2_____

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Sample Receipt Checklist

Client Name: **Bonkowski & Associates**
Date and Time Received: **6/19/2015 6:16:45 PM**

Project Name: **#E215382; RMC Pacifica**
LogIn Reviewed by: Erika Santos

WorkOrder №: **1506873** Matrix: Soil/Water
Carrier: Bernie Cummins (MAI Courier)

Chain of Custody (COC) Information

Chain of custody present?	Yes	☑	No	☐
Chain of custody signed when relinquished and received?	Yes	☑	No	☐
Chain of custody agrees with sample labels?	Yes	☑	No	☐
Sample IDs noted by Client on COC?	Yes	☑	No	☐
Date and Time of collection noted by Client on COC?	Yes	☑	No	☐
Sampler's name noted on COC?	Yes	☑	No	☐

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes	☐	No	☐	NA ☑
Shipping container/cooler in good condition?	Yes	☑	No	☐	
Samples in proper containers/bottles?	Yes	☑	No	☐	
Sample containers intact?	Yes	☑	No	☐	
Sufficient sample volume for indicated test?	Yes	☑	No	☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes	☑	No	☐	
Sample/Temp Blank temperature	Temp: 5.6°C				NA ☐
Water - VOA vials have zero headspace / no bubbles?	Yes	☑	No	☐	NA ☐
Sample labels checked for correct preservation?	Yes	☑	No	☐	
pH acceptable upon receipt (Metal: <2; 522: <4; 218.7: >8)?	Yes	☑	No	☐	NA ☐
Samples Received on Ice?	Yes	☑	No	☐	
	(Ice Type: WET ICE)				

UCMR3 Samples:

Total Chlorine tested and acceptable upon receipt for EPA 522?	Yes	☐	No	☐	NA ☑
Free Chlorine tested and acceptable upon receipt for EPA 218.7, 300.1, 537, 539?	Yes	☐	No	☐	NA ☑

** NOTE: If the "No" box is checked, see comments below.*

Comments:

McCampbell Analytical, Inc.
"When Quality Counts"

Analytical Report

WorkOrder: 1506873 A

Report Created for: Bonkowski & Associates

6400 Hollis Street, Suite 4
Emeryville, CA 94608

Project Contact: Cynthia Dittmar
Project P.O.: E215382-01
Project Name: #E215382; RMC Pacifica

Project Received: 06/19/2015

Analytical Report reviewed & approved for release on 06/29/2015 by:

Angela Rydelius,
Laboratory Manager

1534 Willow Pass Rd. Pittsburg, CA 94565 ♦ TEL: (877) 252-9262 ♦ FAX: (925) 252-9269 ♦ www.mccampbell.com
NELAP: 4033ORELAP ♦ ELAP: 1644 ♦ ISO/IEC: 17025:2005 ♦ WSDE: C972-11 ♦ ADEC: UST-098 ♦ UCMR3

McCampbell Analytical, Inc.
"When Quality Counts"
1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Glossary of Terms & Qualifier Definitions

Client: Bonkowski & Associates
Project: #E215382; RMC Pacifica
WorkOrder: 1506873

Glossary Abbreviation

95% Interval	95% Confident Interval
DF	Dilution Factor
DI WET	(DISTLC) Waste Extraction Test using DI water
DISS	Dissolved (direct analysis of 0.45 µm filtered and acidified water sample)
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
N/A	Not Applicable
ND	Not detected at or above the indicated MDL or RL
NR	Data Not Reported due to matrix interference or insufficient sample amount.
PF	Prep Factor
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
SPLP	Synthetic Precipitation Leachate Procedure
TCLP	Toxicity Characteristic Leachate Procedure
TEQ	Toxicity Equivalents
WET (STLC)	Waste Extraction Test (Soluble Threshold Limit Concentration)

Analytical Qualifiers

a1	sample diluted due to matrix interference
e2	diesel range compounds are significant; no recognizable pattern
e7	oil range compounds are significant

Quality Control Qualifiers

F1	MS/MSD recovery and/or RPD was out of acceptance criteria; LCS validated the prep batch.
F2	LCS recovery for this compound is outside of acceptance limits.

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Project:	#E215382; RMC Pacifica	**Extraction Method:**	SW3510C/3630C
Date Received:	6/19/15 18:16	**Analytical Method:**	SW8015B
Date Prepared:	6/19/15	**Unit:**	µg/L

Total Extractable Petroleum Hydrocarbons with Silica Gel Clean-Up

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
W-215383-GP2-	1506873-003A	Water	06/19/2015 12:15	GC2A	106935

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	**210**	100	2	06/29/2015 10:47

Surrogates	REC (%)	Limits	
C9	89	70-130	06/29/2015 10:47

Analyst(s): TK

Analytical Comments: e7,e2

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	Bonkowski & Associates	**WorkOrder:**	1506873
Date Prepared:	6/29/15	**BatchID:**	106935
Date Analyzed:	6/29/15	**Extraction Method:**	SW3510C/3630C
Instrument:	GC2B	**Analytical Method:**	SW8015B
Matrix:	Water	**Unit:**	µg/L
Project:	#E215382; RMC Pacifica	**Sample ID:**	MB/LCS-106935

QC Report for SW8015B w/SG Clean-Up

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TPH-Diesel (C10-C23)	ND	896	50	1000	-	90	59-151
TPH-Motor Oil (C18-C36)	ND	-	250	-	-	-	-
Surrogate Recovery							
C9	460	574		625	74	92	77-130

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1506873 A **ClientCode: BONK**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
Cynthia Dittmar
Bonkowski & Associates
6400 Hollis Street, Suite 4
Emeryville, CA 94608
(510) 450-0770 FAX: (925) 284-3552

Email: cindy@bonkowski.com
cc/3rd Party:
PO: E215382-01
ProjectNo: #E215382; RMC Pacifica

Bill to:
Accounts Payable
Bonkowski & Associates
6400 Hollis Street, Suite 4
Emeryville, CA 94608
accounting@bonkowski.com

Requested TAT: 5 days
Date Received: **06/19/2015**
Date Add-On: **06/29/2015**
Date Printed: **06/29/2015**

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below)											
					1	2	3	4	5	6	7	8	9	10	11	12
1506873-003	W-215383-GP2-	Water	6/19/2015 12:15	☐	A											

Test Legend:

1	TPH(D)WSG_W	2		3		4		5	
6		7		8		9		10	
11		12							

Prepared by: Erika Santos

Add-On Prepared By: Maria Venegas

Comments: TPH(D) w/SG added 6/29/15 Rush TAT.

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

WORK ORDER SUMMARY

Client Name: BONKOWSKI & ASSOCIATES
Project: #E215382; RMC Pacifica
Comments: TPH(D) w/SG added 6/29/15 Rush TAT.

QC Level: LEVEL 2
Client Contact: Cynthia Dittmar
Contact's Email: cindy@bonkowski.com

Work Order: 1506873
Date Received: 6/19/2015
Date Add-On: 6/29/2015

Lab ID	Client ID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1506873-003A	W-215383-GP2-	Water	SW8015B (Diesel w/ S.G. Clean-Up)	2	2 VOAs w/HCL + 2-aVOAs (multi-range)	6/19/2015 12:15	1 day	Present	☐	

NOTES: - STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.

150687 3

McCampbell Analytical, Inc.

1534 Willow Pass Rd. / Pittsburg, CA 94565-1701
www.mccampbell.com / main@mccampbell.com
Telephone: (877) 252-9262 / Fax: (925) 252-9269

CHAIN OF CUSTODY RECORD

TURN AROUND TIME: RUSH ☐ 1 DAY ☐ 2 DAY ☐ 3 DAY ☐ 5 DAY ☒

GeoTracker EDF ☐ PDF ☐ EDD ☐ Write On (DW) ☐ EQuIS ☐ 10 DAY ☐

Effluent Sample Requiring "J" flag ☐ UST Clean Up Fund Project ☐; Claim #_____

Report To: Cindy Dittmar **Bill To:** Faith Fisher

Company: Bonkowski & Associates, Inc., 6400 Hollis Street, Ste 4, Emeryville 94608

Tele: (510) 450-0770 x 13 **E-Mail:** Cindy@Bonkowski.com; msb@bonkowski.com

Project #: E215382 **Project Name:** RMC Pacifica

Project Location: Pacifica, CA **Purchase Order#** E215382-01

Sampler Signature: [signature]

SAMPLE ID	Location/ Field Point Name	SAMPLING Date	SAMPLING Time	# Containers	MATRIX: Ground Water	Waste Water	Drinking Water	Sea Water	Soil	Air	Sludge	Other	METHOD PRESERVED: HCL	HNO_3	Other
S-215383-GP1-20	GP-1	6-19-15	—	1					X						
~~S-215383-GP1-~~	~~GP-1~~			~~1~~					~~X~~						
S-215383-GP2-16	GP-2			1					X						
~~S-215383-GP2-~~	~~GP-2~~			~~1~~					~~X~~						
~~W-215383-GP1-~~	~~GP-1~~			~~5~~	X								X	X	X
W-215383-GP2-	GP-2		12:15	5	X								X	X	X

SAMPLE ID	BTEX & TPH as Gas (8021/ 8015) MTBE	TPH as Diesel (8015) #TPHG	Total Petroleum Oil & Grease (1664 / 5520 E/B&F)	Total Petroleum Hydrocarbons (418.1)	EPA 505/ 608 / 8081 (Cl Pesticides)	EPA 608 / 8082 PCB's ; Aroclors / Congeners	EPA 507 / 8141 (NP Pesticides)	EPA 515 / 8151 (Acidic Cl Herbicides)	EPA 524.2 / 624 / 8260 (VOCs)	EPA 525.2 / 625 / 8270 (SVOCs)	EPA 8270 SIM / 8310 (PAHs / PNAs)	CAM 17 Metals (200.8 / 6020)***	LUFT 5 Metals (200.8 / 6020)***	Metals (200.8 / 6020)***	Lab to Filter sample for Dissolved metals analysis	BTEX 8260
S-215383-GP1-20		X										X				X
~~S-215383-GP1-~~																
S-215383-GP2-16		X										X				X
~~S-215383-GP2-~~																
~~W-215383-GP1-~~																
W-215383-GP2-		X										X				X

SGC added to Diesel 5/29/15 SPD

**MAI clients MUST disclose any dangerous chemicals known to be present in their submitted samples in concentrations that may cause immediate harm or serious future health endangerment as a result of brief, gloved, open air, sample handling by MAI staff. Non-disclosure incurs an immediate $250 surcharge and the client is subject to full legal liability for harm suffered. Thank you for your understanding and for allowing us to work safely.

*** If metals are requested for water samples and the water type is not specified on the chain of custody, then MAI will default to metals by E200.8.

Relinquished By:	Date:	Time:	Received By:
[signature]	6/19/15	14:40	[signature]
[signature]	6-19-15	1605	[signature]

ICE/t° 5.0

COMMENTS:

GOOD CONDITION_____

HEAD SPACE ABSENT_____

DECHLORINATED IN LAB_____

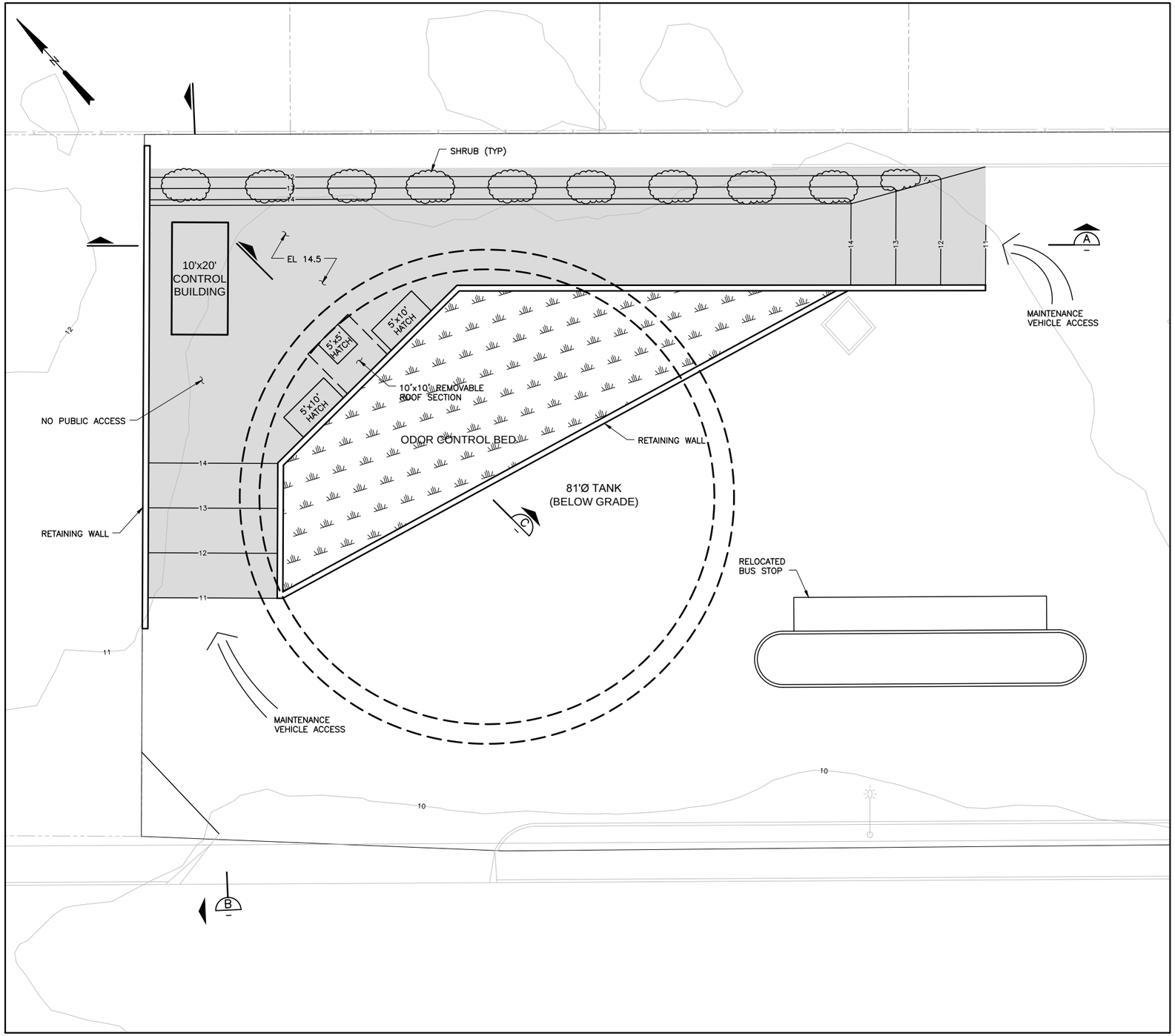
APPROPRIATE CONTAINERS_____

PRESERVED IN LAB_____

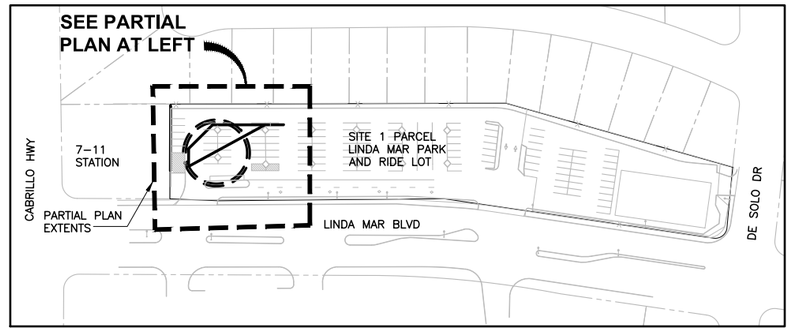
VOAS O&G METALS OTHER HAZARDOUS:

PRESERVATION_____ pH<2_____

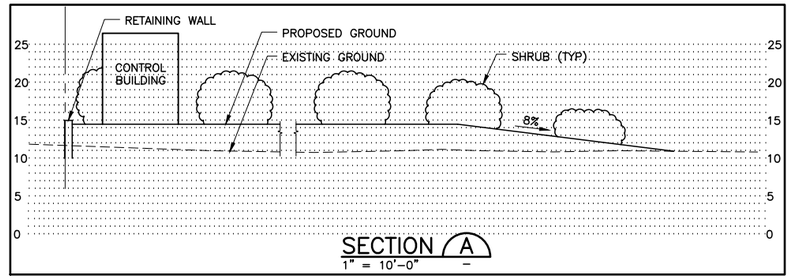
Attachment F - Surface Layout Figures for Site 1A, Site 2B, and Site 3B



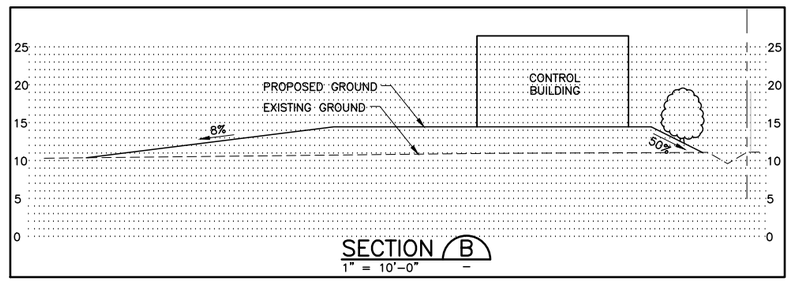
PARTIAL SITE PLAN
1" = 10'-0"



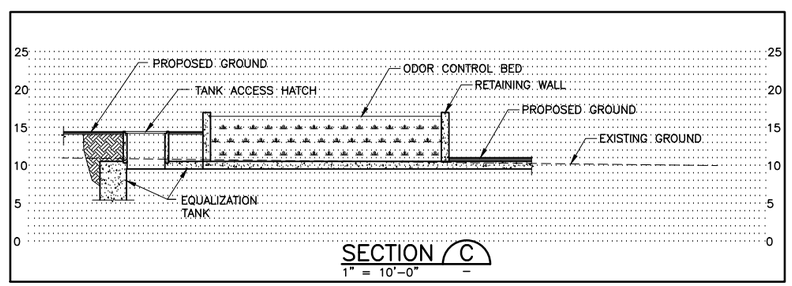
KEYPLAN
1" = 100'-0"



SECTION A
1" = 10'-0"



SECTION B
1" = 10'-0"



SECTION C
1" = 10'-0"

0" 1" — VERIFY SCALES — BAR IS ONE INCH LONG ON FULL SIZE DRAWING. IF NOT ONE INCH LONG ON THIS DRAWING, ADJUST SCALES ACCORDINGLY

RMC Water and Environment

REV	DATE	BY	APVD	DESCRIPTION

DESIGNED
DRAWN
CHECKED

SUBMITTED: _____ RMC PROJ ENGR C_____
APPROVED: _____ RMC ENGR C_____

CITY OF PACIFICA INCORPORATED • NOV 22 1957

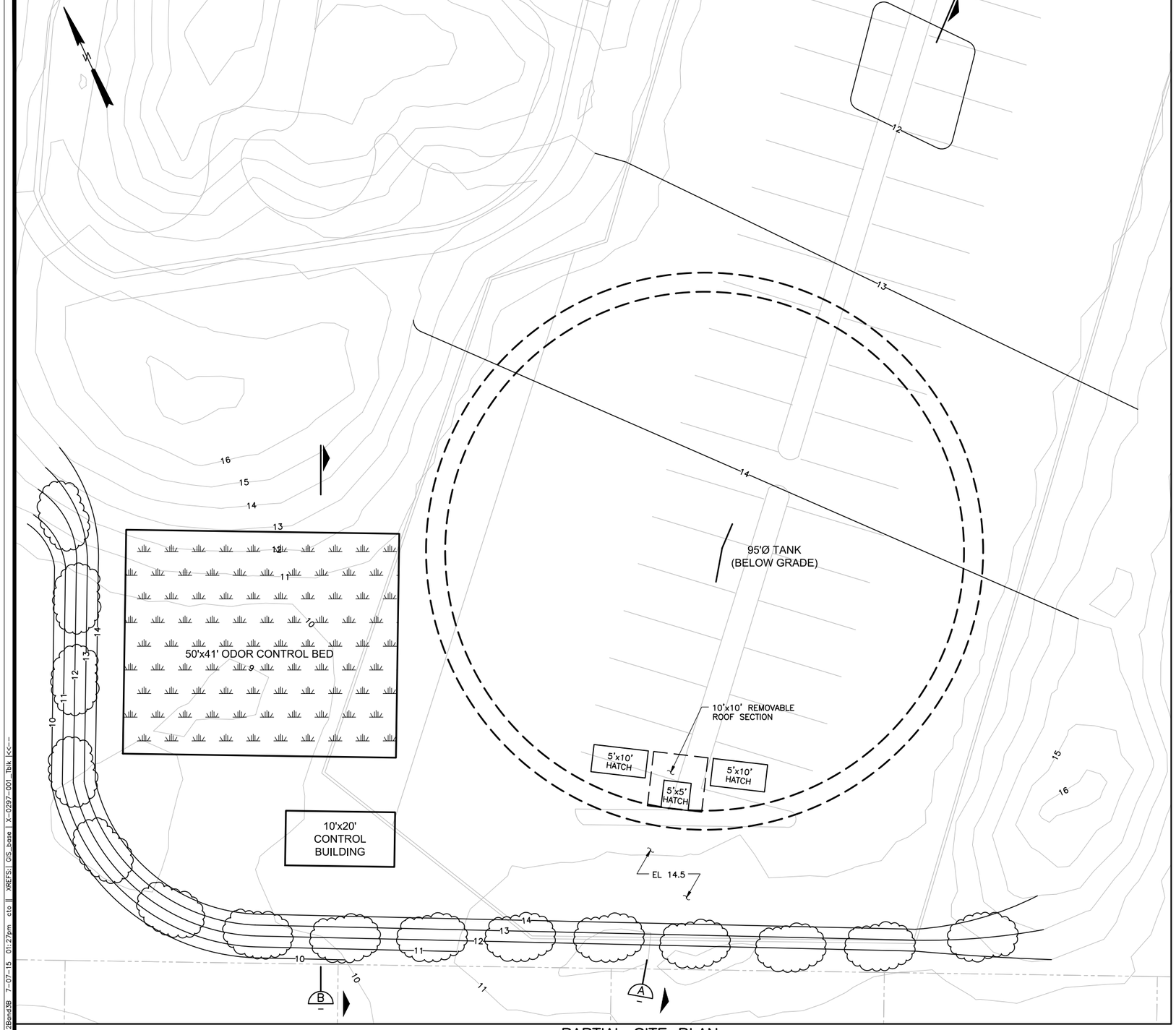
WET WEATHER EQUALIZATION BASIN SITE FEASIBILITY EVAL.

SITE 1A EQUALIZATION BASIN PLAN AND SECTIONS

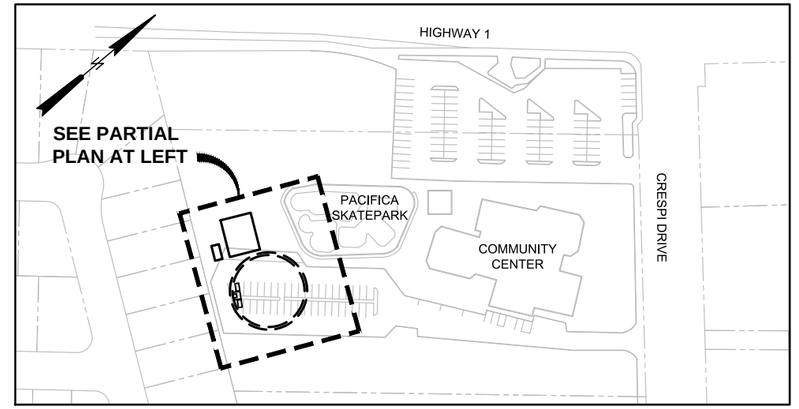
DWG NO	
SHEET NO	OF
PROJ NO	0297-001
DATE	July 2015

FILENAME: 0297-001-Fig-2Bond3B 7-07-15 01:29pm cto || XREFS|| GIS_base | X-0297-001_Tblk |<<--

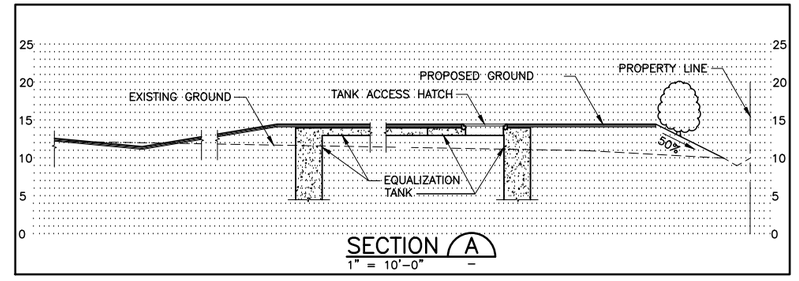
Last Saved By: cto 7-07-15 12:21pm



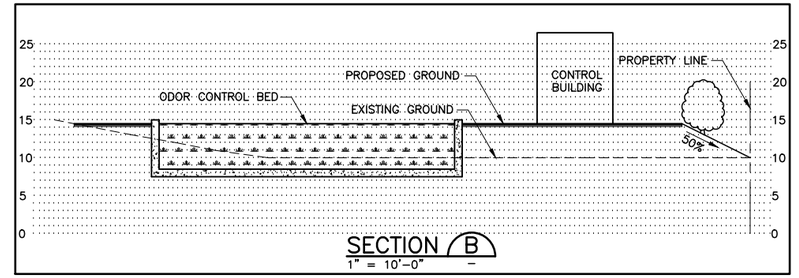
PARTIAL SITE PLAN
1" = 10'-0"



KEYPLAN
1" = 100'-0"



SECTION A
1" = 10'-0"



SECTION B
1" = 10'-0"

FILENAME: 0297-001-Fig-2Bond3B 7-07-15 01:27pm cto || XREFS:| GIS_base | X-0297-001_Tblk |<<--

Last Saved By: cto 7-07-15 12:21pm

0" 1"
VERIFY SCALES
BAR IS ONE INCH
LONG ON FULL
SIZE DRAWING.
IF NOT ONE INCH
LONG ON THIS
DRAWING, ADJUST
SCALES ACCORDINGLY

RMC
Water and Environment

REV	DATE	BY	APVD	DESCRIPTION

DESIGNED
DRAWN
CHECKED

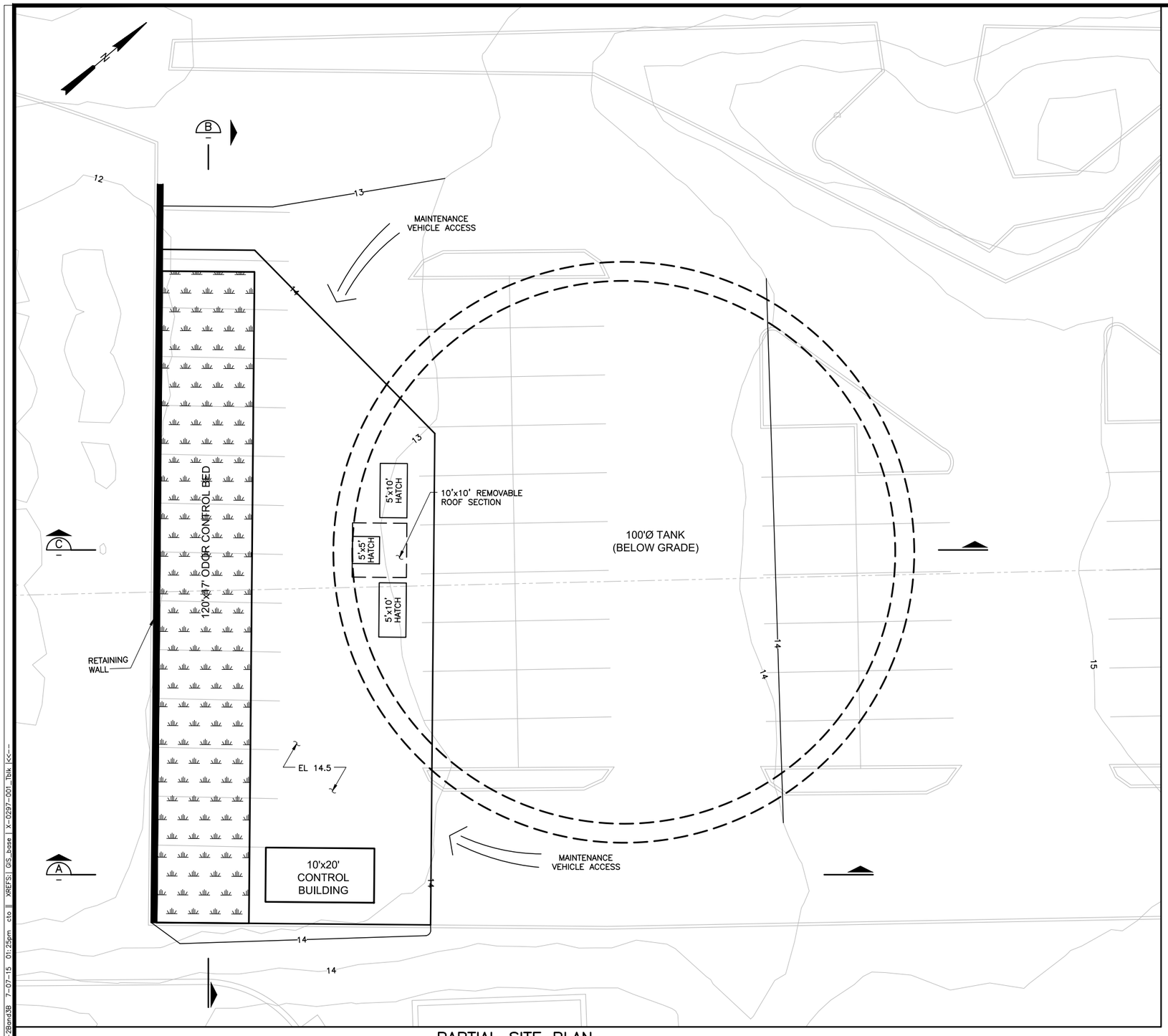
SUBMITTED: RMC PROJ ENGR C
APPROVED: RMC ENGR C

CITY OF PACIFICA
INCORPORATED • NOV 22 1957

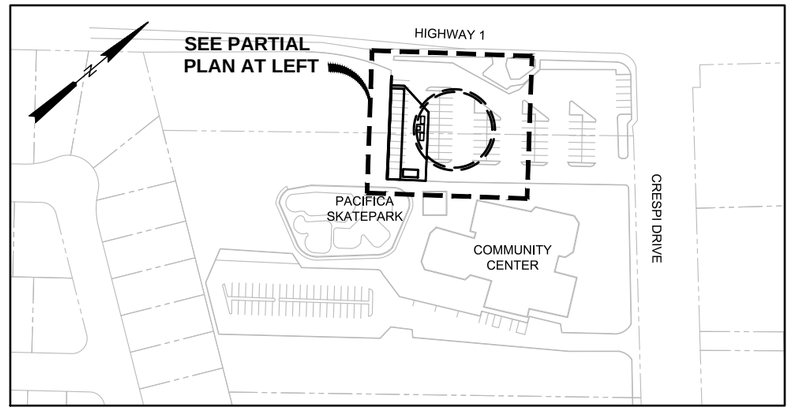
WET WEATHER EQUALIZATION BASIN SITE FEASIBILITY EVAL.

SITE 2B
EQUALIZATION BASIN
PLAN AND SECTIONS

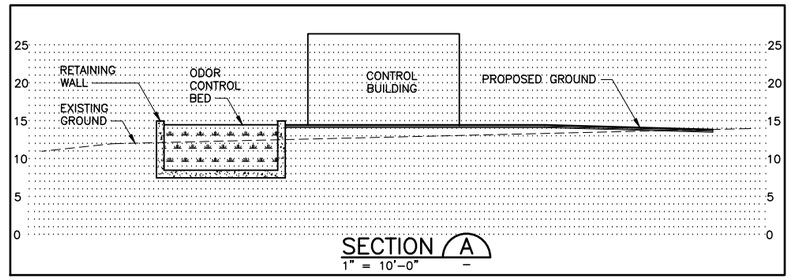
DWG NO	
SHEET NO	OF
PROJ NO	0297-001
DATE	July 2015



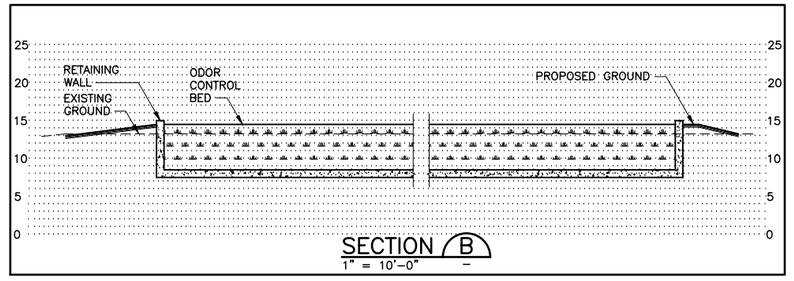
PARTIAL SITE PLAN
1" = 10'–0"



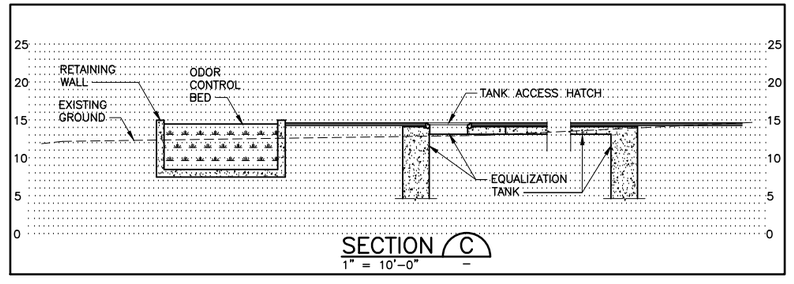
KEYPLAN
1" = 100'–0"



SECTION A
1" = 10'–0"



SECTION B
1" = 10'–0"



SECTION C
1" = 10'–0"

0" 1" — VERIFY SCALES — BAR IS ONE INCH LONG ON FULL SIZE DRAWING. IF NOT ONE INCH LONG ON THIS DRAWING, ADJUST SCALES ACCORDINGLY

RMC Water and Environment

REV	DATE	BY	APVD	DESCRIPTION

DESIGNED
DRAWN
CHECKED

SUBMITTED: _____ RMC PROJ ENGR C____
APPROVED: _____ RMC ENGR C____

CITY OF PACIFICA — INCORPORATED • NOV 22, 1957

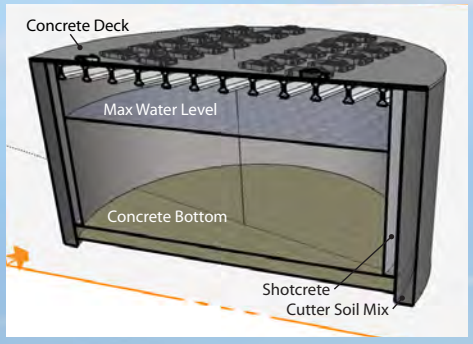
WET WEATHER EQUALIZATION BASIN SITE FEASIBILITY EVAL.

SITE 3B EQUALIZATION BASIN PLAN AND SECTIONS

DWG NO	
SHEET NO	OF
PROJ NO	0297-001
DATE	July 2015

FILENAME: 0297-001-Fig-2Band3B 7-07-15 01:25pm cto | XREFS: | GIS_base | X-0297-001_Tblk |<<--

Last Saved By: cto 7-07-15 12:21pm


Concrete Deck
Max Water Level
Concrete Bottom
Shotcrete
Cutter Soil Mix