PREPARED FOR:

THE RESERVE AT PACIFICA, LLC
231 W. FULTON STREET
GRAND RAPIDS, MICHIGAN 49503

PREPARED BY:

GEOCON CONSULTANTS, INC.
6671 BRISA STREET
LIVERMORE, CALIFORNIA 94550

GEOCON

GEOCON PROJECT NO. E8867-04-02 **JUNE 2016**

GEOCON
CONSULTANTS, INC.
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. E8867-04-02
June 27, 2016

The Preserve at Pacifica, LLC
231 W. Fulton Street
Grand Rapids, Michigan 49503

Attention: Mr. Paul C. Heule

Subject: ROCKAWAY QUARRY
PACIFICA, CALIFORNIA
GEOTECHNICAL FEASIBILITY STUDY FOR QUARRY DEVELOPMENT

Dear Mr. Heule:

In accordance with your authorization, we have prepared this report to present the results of our geotechnical feasibility study for the proposed development of Rockaway Quarry in Pacifica, California. Our feasibility study was performed to identify potential geotechnical constraints to the planned development, provide general recommendations to mitigate those constraints, and identify the need for future design-level geotechnical studies. The findings of this study indicate the site is suitable for development as planned provided the recommendations of this report are implemented during project planning and future design-level geotechnical investigations are performed for each individual project application within the overall development. Additional geotechnical studies will be required as design details emerge for the various areas of development.

If you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Sincerely,

GEOCON CONSULTANTS, INC.

Shane Rodacker, PE, GE
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
SHANE A. RODACKER
No. 2915
GEOTECHNICAL
STATE OF CALIFORNIA

(3) Addressee
(1/e-mail) Zentner & Zentner
Attention: Mr. John Zentner
(1/e-mail) SWA Architects
Attention: Ms. Ashley Langworthy

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GEOTECHNICAL FEASIBILITY STUDY

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical feasibility study for the planned development of Rockaway Quarry in Pacifica, California (see Vicinity Map, Figure 1). Our feasibility study was performed to identify potential geotechnical constraints to the planned development, provide general recommendations to mitigate those constraints, and outline the need for future design-level geotechnical investigations, based on the soil and geologic conditions encountered during our study.

The scope of this investigation included a review of readily-available geologic information and the geotechnical reports provided by the project team, field exploration, laboratory testing, engineering analysis and the preparation of this report. Our field exploration was performed from August 24 through August 26, 2015 during a geotechnical investigation associated with the quarry reclamation plan at that time. Our field exploration included the excavation of 21 exploratory test pits to maximum depths of approximately 21 feet at the site. The locations of our test pits are depicted on the Geologic Map, Figure 2. A detailed discussion of our field investigation and test pit logs are presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to evaluate pertinent physical properties. Appendix B presents the laboratory test results in tabular and graphic format.

The development concept plan and tentative map that were the basis for this study are presented as Figure 3 and in Appendix C, respectively. Geologic cross-sections that are based on civil cross-sections within the previous reclamation grading plan are presented as Figures 4 through 7. Selected grading concepts were updated after the reclamation grading plan; the cross-sections presented as Figures 4 through 7 are included to present baseline geologic information only.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions. References reviewed to prepare this report are provided in the *List of References* section.

If project details vary significantly from those described herein, Geocon should be contacted to determine the necessity for review and possible revision of this report.

2. BACKGROUND AND SITE DESCRIPTION

The project site is comprised of approximately 86 acres located north of Rockaway Beach and west of the Pacific Coast Highway (California SR 1) in Pacifica. The site is divided into two parcels that are separated by Calera Creek. The Eastern Parcel is approximately 39 acres of relatively level terrain that slopes gradually to the southwest and is bordered by the City of Pacifica Wastewater Treatment Plant to the north and the Rockaway Beach district of Pacifica to the south. West of Calera Creek is the approximately 47-acre Western Parcel that includes the formerly-mined hillside that was the source of aggregate (limestone) for the Rockaway Quarry. Historic mining operations at the quarry have resulted in various areas of undocumented fill and over-steepened cut slopes in the Western Parcel. It should be noted that, subsequent to the cessation of mining activity in the late 1980s, the City of Pacifica relocated Calera Creek approximately 300+ feet westward to its current location.

Various areas of the site have historically carried common names in prior reclamation plans and associated geotechnical studies. These areas are distinguishable on our Geologic Map (Figure 2) and include the following:

Quarry Pit

This area is the southeast-facing bowl to the west of Calera Creek and is essentially the remnant bottom of the former quarry. The Quarry Pit has two tiers – a western tier with surface elevations on the order of 40 to 50 feet MSL and a lower eastern tier with surface elevations on the order of 32 to 38 feet MSL.

Quarry Face

This south-facing cut slope was created by limestone mining operations in the quarry and extends from the Quarry Pit approximately 200 feet upslope to the Hilltop area.

East Flank

This southeast-facing slope area is located between Calera Creek and the Hilltop area.

Hilltop

The Hilltop is a relatively flat area atop the Quarry Face and East Flank areas. The Hilltop is characterized by three notable promontories that remain from past quarry operations. Ground surface elevations in this area range from approximately 240 feet to 280 feet MSL.

Southern Bluff

The Southern Bluff is a prominent northwest-southeast trending ridgeline that separates the Quarry Pit from the Pacific Ocean. The Southern Bluff ridgeline is up to approximately 70 feet above the adjacent Quarry Pit. The Southern Bluff transitions (slopes downward) to the Quarry Pit and Calera Creek at its southeastern end and ties into the Quarry Face at its northwestern end.

Eastern Parcel

The 39-acre Eastern Parcel is generally located east and south of Calera Creek, and bound by SR 1 and the Rockaway Beach district of Pacifica on its southeastern and southern sides, respectively. The Eastern Parcel is relatively flat with ground surface elevations of approximately 65 feet MSL at the northeastern margin to approximately 20 feet MSL at the extreme southwestern corner.

3. GEOLOGIC SETTING AND FAULTING

3.1 Regional Geology

Pacifica is located within the Coast Ranges Geomorphic Province of California, on the west side of the San Francisco peninsula. The Coast Ranges are a series of northwest trending mountains and valleys that extend along much of California's coast and inland to the Central Valley and Klamath Mountains. Topography is controlled by the predominant geological structural trends within the Coast Range that generally consist of northwest trending synclines, anticlines and faulted blocks. The dominant structure is a result of both active northwest trending strike-slip faulting, associated with the San Andreas Fault system, and east-west compression within the province.

The San Andreas Fault (SAF) is a major right-lateral strike-slip fault that extends from the Gulf of California in Mexico to Cape Mendocino in northern California. The SAF forms a portion of the boundary between two tectonic plates on the surface of the earth. To the west of the SAF is the Pacific Plate, which moves north relative to the North American Plate, located east of the fault. In the San Francisco Bay Area, movement across this plate boundary is concentrated on the SAF and also distributed, to a lesser extent, across a number of other faults including the Hayward, Calaveras and Rodgers Creek faults, among others. Together, these faults are referred to as the SAF system.

Basement rock west of the SAF is generally granitic, while to the east it consists of a chaotic mixture of highly deformed marine sedimentary, submarine volcanic and metamorphic rocks of the Franciscan Complex. Both are typically Jurassic to Cretaceous in age (205 to 65 million years old). Overlying the basement rocks are Cretaceous (about 140 to 65 million years old) marine, as well as Tertiary (about 65 to 1.6 million years old) marine and non-marine sedimentary rocks with some continental volcanic rock. These Cretaceous and Tertiary rocks have typically been extensively folded and faulted largely as a result of movement along the SAF system, which has been ongoing for about the last 25 million years, and regional compression during the last about 4 million years. The inland valleys, as well as the structural depression within which San Francisco Bay is located, are filled with unconsolidated to semi-consolidated deposits of Quaternary age (about the last 1.6 million years). Continental deposits (alluvium) consist of unconsolidated to semi-consolidated sand, silt, clay and gravel, while the bay deposits typically consist of soft organic-rich silt and clay (bay mud) or sand.

Based on geologic mapping by the United States Geological Survey (USGS), the site is generally mapped as limestone and greenstone of the Franciscan Complex to the west of Calera Creek with Quaternary age alluvium and terrace deposits to the east of the creek. The mapping (published in 1994) depicts areas of fill in the East Flank area and along the present alignment of Calera Creek, which was realigned subsequent to the USGS mapping.

3.2 Faulting and Seismicity

Geologists and seismologists recognize the San Francisco Bay Area as one of the most active seismic regions in the United States. The significant earthquakes that occur in the Bay Area are associated with crustal movements along well-defined active fault zones that generally trend in a northwesterly direction.

The site and the entire San Francisco Bay Area are seismically dominated by the presence of the active San Andreas Fault System. In the theory of plate tectonics, the San Andreas Fault System is a transform fault that forms the boundary between the northward moving Pacific Plate (west of the fault) and the southward moving North American Plate (east of the fault). In the Bay Area, the movement is distributed across a complex system of strike-slip, right lateral parallel and subparallel faults, which include the San Andreas, Hayward and Calaveras faults, among others.

To determine the distance to known active faults within 100 miles of the site, we used the computer program *EQFAULT* (Version 3, Blake, 2000). Site latitude is 37.6137° north; site longitude is -122.4932° west. Known active faults with 30 miles of the site are summarized in Table 3.2.

TABLE 3.2
REGIONAL FAULT SUMMARY

Fault Name	Distance to Site (miles)	Maximum Earthquake Magnitude, M_w
San Andreas (Peninsula)	2.4	7.1
San Andreas (1906)	2.4	7.9
San Gregorio	2.6	7.3
San Andreas (North Coast)	15.0	7.6
Monte Vista – Shannon	18.0	6.8
Hayward (Total Length)	21.0	7.1
Hayward (North)	21.0	6.9
Hayward (South)	21.5	6.9
Point Reyes	29.5	6.8
Calaveras (North of Calaveras Reservoir)	30.0	6.8

The San Andreas Fault and numerous other faults in the Bay Area (San Gregorio, Hayward, etc.) are sources of potential ground motion. However, earthquakes that might occur on other faults within northern California are also potential generators of significant ground motion at the site.

3.3 Surface Fault Rupture

The site is not within a currently established State of California Earthquake Fault Zone for surface fault rupture hazards. In addition, web-based mapping by the USGS indicates that no Quaternary age faults are present at the site. No active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site is considered low. By definition, an active fault is one with surface displacement within the last 11,000 years. A potentially-active fault has demonstrated evidence of surface displacement with the past 1.6 million years. Faults that have not moved in the last 1.6 million years are typically considered inactive.

3.4 Liquefaction

The site is not located within a State of California Seismic Hazard Zone for liquefaction. Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary loss of shear strength due to pore pressure buildup under the cyclic shear stresses associated with intense earthquakes. Primary factors that trigger liquefaction are: moderate to strong ground shaking (seismic source), relatively clean, loose granular soils (primarily poorly graded sands and silty sands), and saturated soil conditions (shallow groundwater). Due to the increasing overburden pressure with depth, liquefaction of granular soils is generally limited to the upper 50 feet of a soil profile.

Web-based mapping by the USGS indicates the majority of the Eastern Parcel possesses a “high” susceptibility to liquefaction. Design-level geotechnical investigations for any developments or

improvements in the Eastern Parcel should include an evaluation of liquefaction in accordance with industry standard of practice.

3.5 Landslides

Our field exploration identified landslides at the site. As shown on the Geologic Map (Figure 2) and landslides are present to the north of the East Flank area and may continue offsite onto the properties to the north and east. In addition, landslide deposits were observed below dumped fill materials in our Test Pit TP15. The landslide deposits observed in TP15 are likely associated with the eroded scarp immediately west of the mapped limits of dumped fill materials. Where not removed by cuts to attain design grades, landslide deposits will require remedial grading in the form of removal and recompaction. Additional discussion on landslide deposits is provided below in Section 4. Mass grading operations for the private road to access the hotel bungalows in the Hilltop area will likely require remedial grading to mitigate the potential effects of existing landslide deposits.

3.6 Tsunamis and Seiches

Based on mapping by the California Emergency Management Agency, the southwestern portion of the Eastern Parcel would be inundated by run-up during an extreme tsunami. The potential for inundation should be considered in project planning and design.

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Flooding from a seismically-induced seiche is considered unlikely.

3.7 Seacliff Retreat

A prior reclamation plan (Malcolm Carpenter Associates, 1996) indicated the local bluffs that overlook the Pacific Ocean are highly stable cliffs with erosion rates less than ½ foot per year. We have reviewed selected aerial photographs and observed the cliffs during our field exploration. We generally concur with the previously reported erosion rates and further opine that erosion rates in slopes or bluffs comprised of limestone will very likely be less than ½ foot per year.

It should be noted that a relatively shallow mantle of dumped fills is present on the outside (ocean side) face of the Southern Bluff. These materials are significantly more susceptible to erosion and show evidence of sloughing. However, the sloughing and erosion of these dumped fills appears to be of little consequence due to their shallow thickness and the absence of improvements that would derive support in the dumped fill materials.

4. SITE GEOLOGY AND GROUNDWATER CONDITIONS

4.1 Fill (Qf)

Fill material is present throughout the Quarry Pit and Eastern Parcel. These fill materials in the Quarry Pit and Eastern Parcel appear to have been placed and graded, but documentation of fill placement, quality, or compaction was not available during this investigation. Dumped Fill, unconsolidated material associated

with the former quarry operations, has been dumped or pushed down existing slopes in the East Flank and Southern Bluff areas, and is discussed separately in Section 4.2.

Fill in the Quarry Pit is on the order of 20+ feet thick over limestone bedrock and consists of loose to medium dense silty sandy gravel, clayey gravel, and gravel with sand, cobbles, boulders up to approximately 2 feet maximum dimension, and asphalt fragments. In the eastern tier of the Quarry Pit, fill is on the order of 11 feet thick.

Based on our exploratory test pits in the area, fills in the Eastern Parcel are at least 6 feet thick and extend to depths of 15 feet or more in some locations. As encountered in our test pits, the fills were variable and consisted of silty sands and clays with variable amounts of gravel and clayey to gravelly sands. Various debris were observed in the fills and included wire, fabric, asphalt fragments, and concrete chunks up to approximately 2½ feet in maximum dimension.

Geotechnical documentation of prior grading activities was not provided. As such, fill materials at the site may contain constituents that differ from those described above and/or deleterious materials. Additional areas of fill may be present. Remedial grading of the fills will be required, particularly in areas to receive additional fills, structural loads or settlement-sensitive improvements; specific recommendations will be provide in future geotechnical investigations specific to planned development(s).

4.2 Dumped Fill (Qdf)

Dumped fill is considered herein to be material that was pushed or dumped down slopes at the site as waste material. Dumped fill is present as relatively thin cover (approximately 5 feet or less) over limestone bedrock along the top of the Southern Bluff and down much of the Southern Bluff's southwest (ocean-facing) slope, where it actively sloughs into the ocean. At the east end of the Quarry Face, dumped fill forms a ramp consisting of loose limestone gravel, cobbles, and boulders. Dumped fill on the East Flank consists variously of loose to medium dense silty sandy gravel, silty gravel, gravelly sand, and silty clay, with trace cobbles, boulders, and chunks of asphalt. Fill thicknesses in our test pits on the East Flank ranged from approximately 5 to 17 ½ feet. Where not removed by proposed cuts in the East Flank, the dumped fill will require remedial grading in the form of removal and recompaction.

4.3 Alluvium (Qa)

Alluvium was encountered below the fills that mantle the Eastern Parcel. As observed in our test pits, the alluvium consisted of silty to sandy lean to fat clays. Prior studies by others included soil borings that extended to maximum depths of approximately 40 feet and reported predominantly fine-grained soils (silts and clays) with some occurrences of dense to very dense sands and gravel. USGS mapping indicates the alluvial deposits are susceptible to liquefaction; the potential for liquefaction and resultant settlements should be evaluated in future geotechnical studies for developments and improvements in the Eastern Parcel.

4.4 Landslide Deposits (Qls)

Landslide deposits are present on the north-central boundary of the site and below some of the dumped fills in the East Flank. We observed two coalesced debris flow-type landslides along the north site

boundary (Test Pits TP17 and TP18). These landslide deposits are on the order of 6 to 8 feet thick and consist of silty clay overlying residual soil of generally similar composition.

We observed landslide deposits in the upper portion of the East Flank (Test Pit TP15) at a depth of approximately 5 to 9½ feet, underlying the dumped fill material and overlying residual soil. This landslide deposit consisted of brown sandy clay with gravel-sized clasts of brown siltstone. Test Pit TP15 was located approximately 50 feet downslope from an eroded and vegetated landslide scarp (see Geologic Map, Figure 2).

4.5 Franciscan Complex – Calera Limestone (fl)

Limestone at the site is identified in geologic references as the mid-Cretaceous age Calera Limestone. It is prominent south of the shear zone at the site, in the Quarry Face, the west end of the Quarry Pit, and the Southern Bluff, as a strong, light gray to dark gray layered rock with bedding on the order of 4 to 12 inches thick. The bedding orientation varies but generally dips to the north-northwest at inclinations of approximately 24 to 83 degrees below horizontal. It is intensely to moderately fractured but maintains relatively steep (even overhanging) slopes, owing to rough and calcite-cemented discontinuities. The existing approximately 1:1 (horizontal to vertical) limestone slopes in the Quarry Face and Southern Bluff appear to be performing well, exhibiting surficial raveling as would be anticipated, but not showing evidence of deep-seated instability.

In the central portion of the Quarry Pit (Test Pit TP11), limestone bedrock at the former quarry floor is present beneath approximately 20 to 21 feet or more of fill material, at an elevation of approximately 28 feet MSL. In the eastern tier of the Quarry Pit, we encountered limestone bedrock in Test Pit TP8 beneath approximately 11 feet of fill, at an approximate elevation of 22 feet MSL. Limestone blocks and fragments are also present within the shear zone along with other materials.

4.6 Franciscan Complex – Greenstone (fg)

Franciscan Complex greenstone in the region is described in published geologic references as altered mafic (dark) volcanic rock composed mostly of coarse pyroclastic deposits, but also some small intrusions (dikes) and flows. Geologic mapping by Kaldeveer and Associates (1983, included within the 1996 reclamation plan) depicts greenstone at the site within the limestone on the northeast side of the Southern Bluff, above the limestone in the western and upper portions of the Quarry Face, and extending northward from the shear zone. Our field observations of greenstone were generally consistent with Kaldeveer's 1983 map for the Southern Bluff and Quarry Face. We observed, however, that the slope and Hilltop area above the shear zone consist of brown, thinly to moderately-bedded siltstone with some interbedded chert. The siltstone in the Hilltop area is highly to moderately weathered and pervasively fractured, with varied bedding orientations. We interpret, based on observations elsewhere in the area (e.g. coastal bluffs near the northwest corner of the site) that greenstone in the region also includes some interbedded/associated sedimentary materials such as siltstone and sandstone. Therefore, the greenstone designation is retained for underlying geology of the northern portion of the site.

4.7 Shear Zone

A shear zone extends in an east-west trend across the site midway up the Quarry Face between approximate elevations of 170 and 200 feet MSL. The shear zone generally separates the Calera Limestone to the south and Franciscan greenstone and associated deposits to the north. The shear zone ranges from approximately 30 to 150 feet wide across the mid-slope bench and is approximately 400 feet wide at the west end where it meets the Pacific Ocean. The eastern visible extent of the shear zone is between the Quarry Face and East Flank, where bedrock disappears beneath dumped fill material. Materials within the shear zone include a disrupted mixture of limestone blocks and highly sheared shale and greenstone (mélange). Inactive faults bound the southern and northern edges of the shear zone at the interfaces with adjacent formational materials.

4.8 Groundwater

Groundwater was not encountered in any of our test pits to the maximum depth explored. Actual groundwater levels will fluctuate seasonally and with variations in rainfall, temperature and other factors and may be higher than observed during our study.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 General

5.1.1 Based on our understanding of the project and our review of background information, the development of Rockaway Quarry as presently proposed is feasible from a geotechnical standpoint. It is our opinion that neither soil nor geologic conditions were encountered during our prior investigation that would preclude the development as presently planned provided the recommendations presented herein are implemented.

5.1.2 Key geotechnical constraints to development of the quarry are the presence of undocumented fill materials and landslide deposits and the potential for surficial instabilities in new cut slopes within the shear zone materials and possibly the Franciscan Complex Greenstone. Remedial grading will be performed to mitigate these constraints where necessary. Major geotechnical constraints for the primary development areas are discussed in the following section.

5.1.3 Earthwork contractors should be aware that excavations in formational materials, especially limestone, will encounter difficult digging conditions and special excavation techniques may be required. An evaluation of rippability was beyond the scope of this study.

5.1.4 Rockaway Quarry is one of the oldest quarries in California and aggregate mining occurred over many decades with little or no available records. As such, unknown underground improvements and areas of undocumented fill (not discussed herein) may be present. If encountered, supplemental recommendations will be provided during reclamation grading operations. The artificial fills that are present at the site are undocumented and may contain constituents not reported herein.

5.1.5 Design-level geotechnical investigations should be performed for specific developments and improvements throughout the site, once design details emerge. Future geotechnical investigations may include additional subsurface exploration, laboratory testing and engineering analyses. The conclusions and recommendations presented herein may be modified based on the soil and geologic conditions encountered during future design-level studies.

5.1.6 Any changes to the development plan, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

5.2 Hotel & Conference Venue

5.2.1 The hotel & conference venue will straddle the inside the Southern Bluff and the southern margin of the Quarry Pit. Primary geotechnical constraints for this development area include the presence of hard formational materials that may present difficult digging conditions and require special excavation techniques. In addition, portions of the hotel/conference facility may be constructed atop the undocumented fills that were previously placed in the Quarry Pit. The undocumented fills in the Quarry Pit are unsuitable for the support of foundation loads. Deep foundations will likely be required to support the portion of hotel/conference facility that overlies the undocumented fills and mitigate the potential for differential settlements between

the portions of the facility founded in formational materials (limestone) and those founded in undocumented fill.

5.3 Hotel Bungalows

5.3.1 The hotel bungalows will be constructed in the Hilltop area that is underlain formational Franciscan Complex. While the formational materials will provide good foundation support characteristics for the relatively light bungalows, they may also present difficult digging conditions and require special excavation techniques in some areas. In addition, access to the bungalows will be provided via a private roadway (identified as Private Road #2 on the Tentative Map in Appendix C) that traverses the East Flank area. The East Flank area is mantled by Dumped Fill deposits that overlie formational Franciscan Complex and landslide deposits are also present in this area. As outlined in our prior geotechnical investigation for the quarry reclamation plan, grading for the private roadway will require significant amounts of remedial grading to mitigate the effects of undocumented fills, landslide deposits and potential surficial instabilities in cut slopes that expose Franciscan Complex. Details of the remedial grading will be provided during future design-level studies.

5.4 Quarry Village

5.4.1 The Quarry Village at the southwestern end of the East Parcel will include a variety of residential and commercial structures with associated site improvements (streets, utilities, etc.) Primary geotechnical constraints in this area include the presence of undocumented fills and the potential for liquefaction in the alluvial soils that underlie the fills. Site development will likely require remedial grading to mitigate the potential effects of the undocumented fills. Future design-level geotechnical studies should evaluate the potential for liquefaction in accordance with industry standards of practice. Liquefaction potential may warrant remedial grading and/or foundation design considerations to mitigate the effects of liquefaction-induced settlements.

5.5 Earthwork Grading Factors

5.5.1 Estimates of embankment shrink-swell factors are based on our experience with similar materials and information included in past studies by others at the site. It should be emphasized that variations in natural soil density, as well as in compacted fill, render estimated shrink-swell estimates to be very approximate. As an example, the contractor can compact fills to 90% relative compaction or higher. Thus, the contractor has a range of control over the fill volume. Considering the above discussion, the following earthwork factors may be used as a basis for estimating how much the on-site soils may shrink or swell when removed from their existing state and placed as compacted fill.

TABLE 5.5
EARTHWORK GRADING FACTORS

Geologic Unit	Approximate Shrink-Swell Factors
Fill	0 to 5 percent Shrinkage
Dumped Fill	5 to 15 Percent Shrinkage
Franciscan Greenstone	5 to 15 Percent Bulk
Calera Limestone	15 to 25 Percent Bulk

6. FURTHER GEOTECHNICAL SERVICES

6.1 Design-Level Geotechnical Investigations

6.1.1 As outlined herein, a design-level geotechnical investigation should be performed for each individual project within the overall quarry development. Additional field explorations will be likely be necessary, particularly for projects impacted by the presence of undocumented fill and potentially-liquefiable soils like those throughout the Eastern Parcel. This report only presents the results of a geotechnical feasibility study and should not be considered a design-level investigation.

6.2 Testing and Observation Services

6.2.1 The recommendations provided in this report are based on the assumption that we will continue as Geotechnical Engineer of Record throughout the construction phase. It is important to maintain continuity of geotechnical interpretation and confirm that field conditions encountered are similar to those anticipated during design. If we are not retained for these services, we cannot assume any responsibility for others interpretation of our recommendations, and therefore the future performance of the project.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Consultants, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the geotechnical scope of services provided by Geocon Consultants, Inc.

This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices used in the site area at this time. No warranty is provided, express or implied.

0 1

Scale in Miles

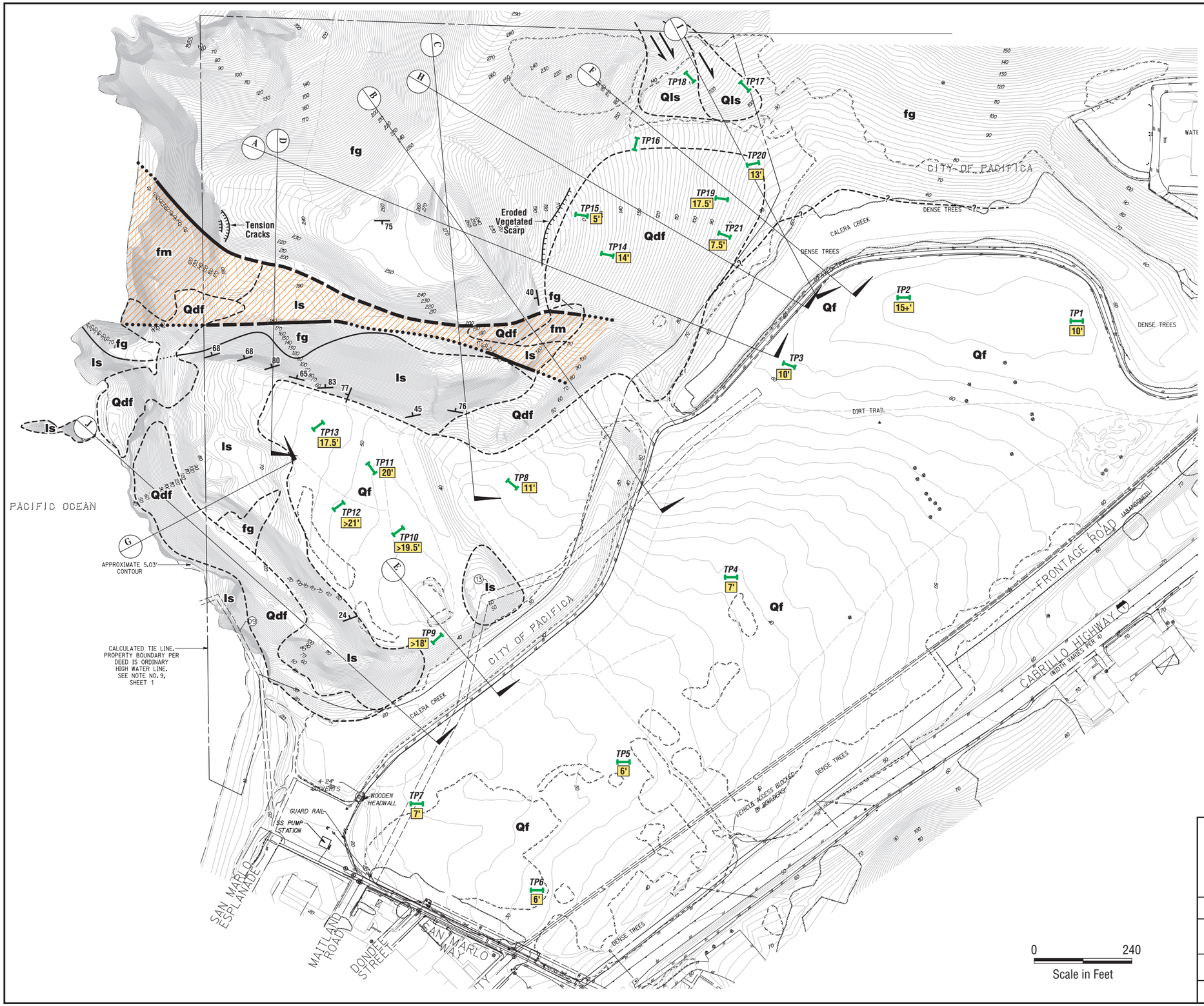
GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

Rockaway Quarry

Pacifica,
California

VICINITY MAP

E8867-04-02	June 2016	Figure 1



LEGEND:

- I — Approximate Location of Civil/Geologic Cross-Section
- TP1 — Approximate Test Pit Location
- 10' — Approximate Depth of Fill
- Geologic Contact (dashed where approximate; dotted where covered)
- Fault
- Shear Zone
- Landslide
- 75 — Strike and Dip of Bedding
- **Qf** Fill
- **Qdf** Dumped Fill
- **Qls** Landslide Deposit

Franciscan Complex

- **fm** melange: highly sheared mixture of shale, greenstone and limestone
- **fg** greenstone: altered mafic volcanic with associated siltstone
- **ls** Calera Limestone: light to dark gray, moderately bedded

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GEOLOGIC MAP

E8867-04-02	June 2016	Figure 2

Reference: SWA Architects, April 2016

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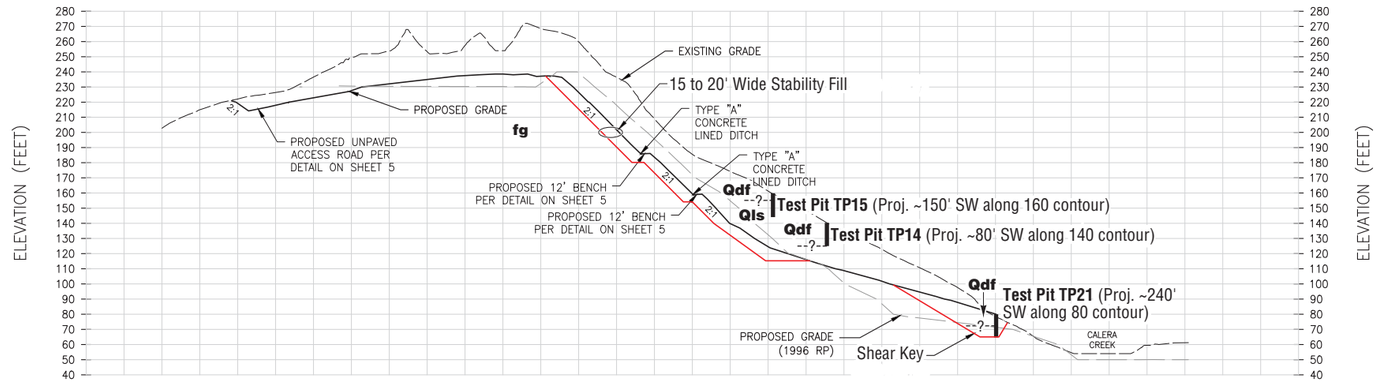
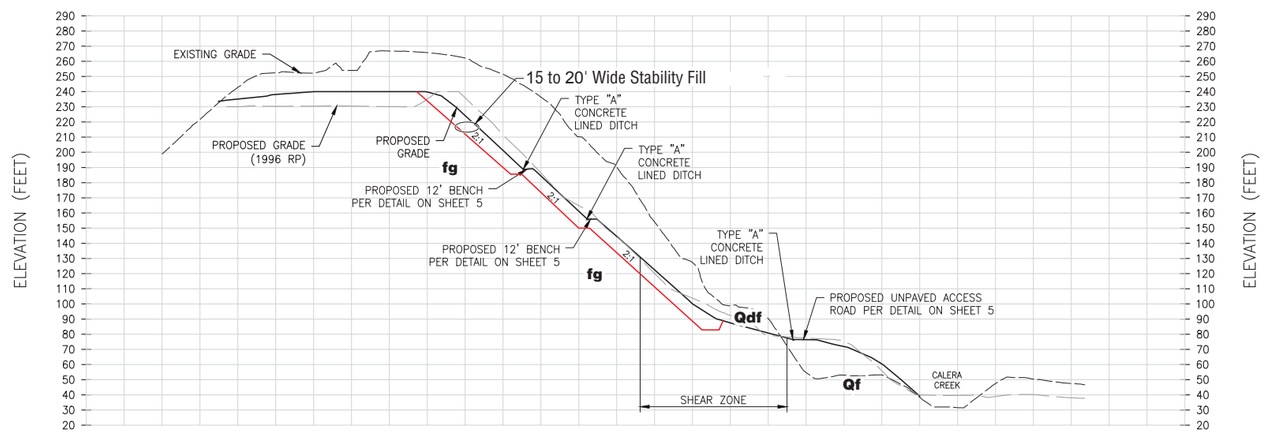
Conceptual Redevelopment Plan

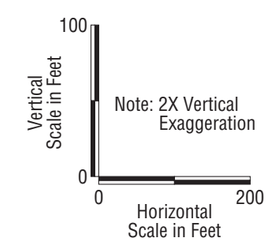
E8867-04-02	June 2016	Figure 3



A SECTION A



B SECTION B



LEGEND:

- Approximate Test Pit Location (projected where noted)
- --?-- Geologic Contact (queried where uncertain)
- Estimated Limit of Remedial Grading

Qf Fill
Qdf Dumped Fill
Qls Landslide Deposit

Franciscan Complex
fm melange
fg greenstone
ls Calera Limestone

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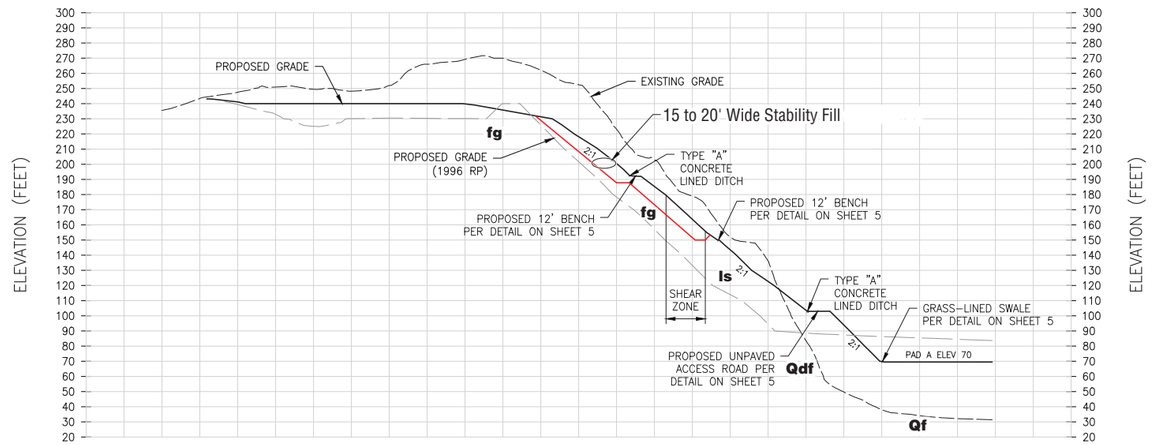
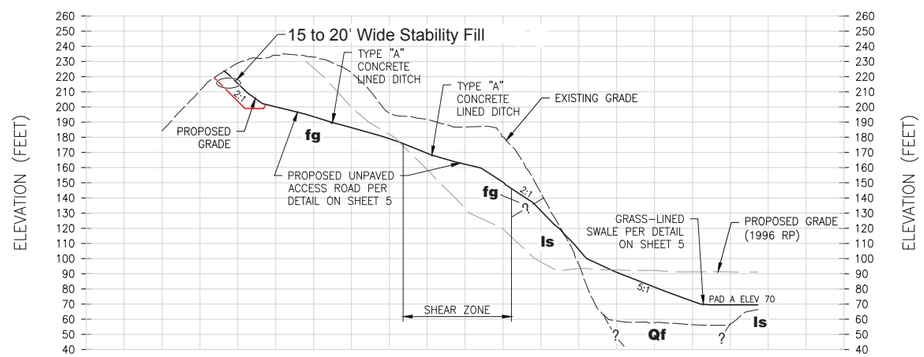
GEOLOGIC CROSS-SECTIONS A AND B

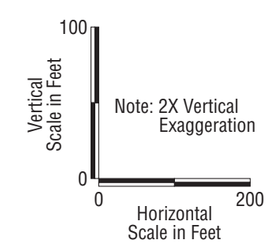
E8867-04-02	June 2016	Figure 4



C SECTION C



D SECTION D



LEGEND:

- Approximate Test Pit Location (projected where noted)
- --?-- Geologic Contact (queried where uncertain)
- Estimated Limit of Remedial Grading

Qf Fill
Qdf Dumped Fill
Qls Landslide Deposit

Franciscan Complex
fm melange
fg greenstone
ls Calera Limestone

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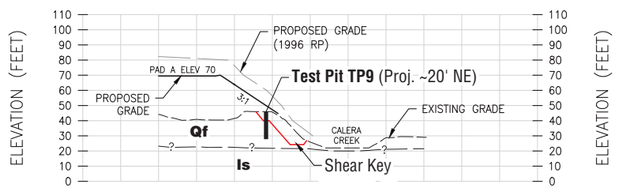
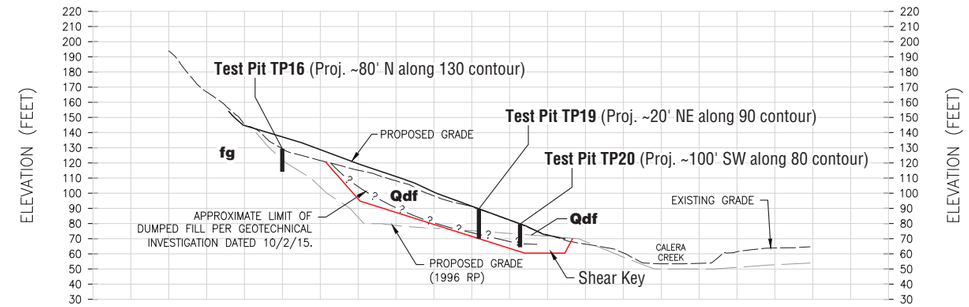
GEOLOGIC CROSS-SECTIONS C AND D

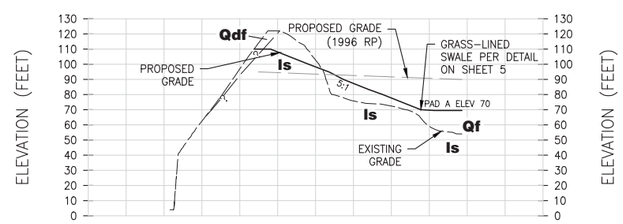
E8867-04-02	June 2016	Figure 5



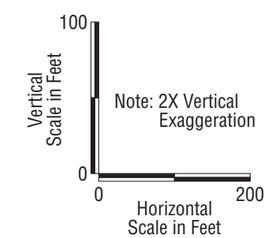
E SECTION E



F SECTION F



G SECTION G



LEGEND:

- Approximate Test Pit Location (projected where noted)
- --?-- Geologic Contact (queried where uncertain)
- Estimated Limit of Remedial Grading

Qf Fill
Qdf Dumped Fill
Qls Landslide Deposit

Franciscan Complex
fm melange
fg greenstone
ls Calera Limestone

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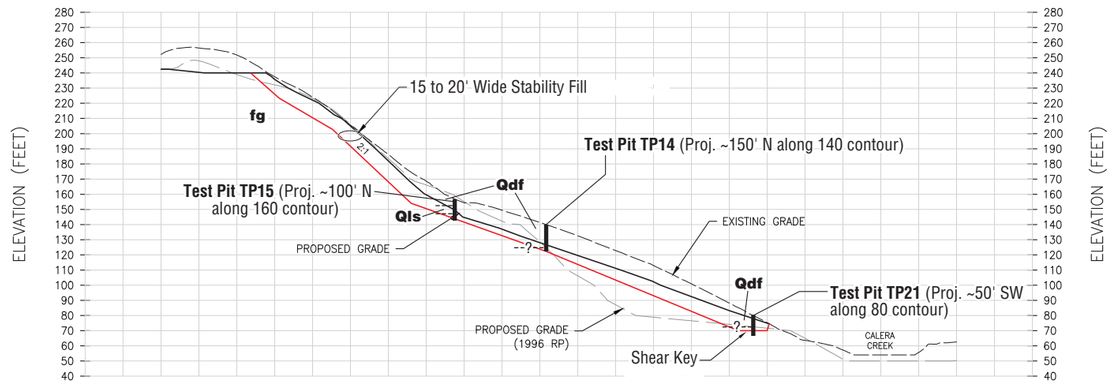
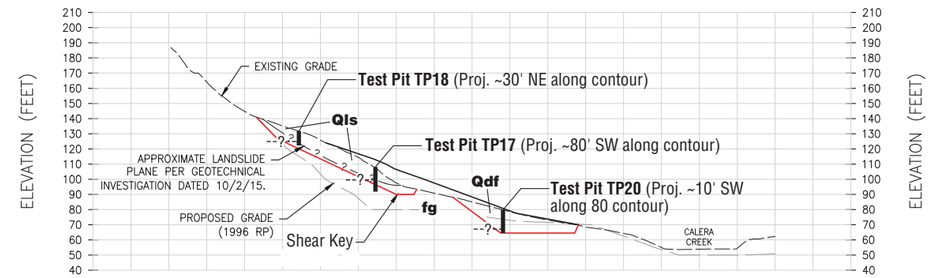
GEOLOGIC CROSS-SECTIONS E, F, AND G

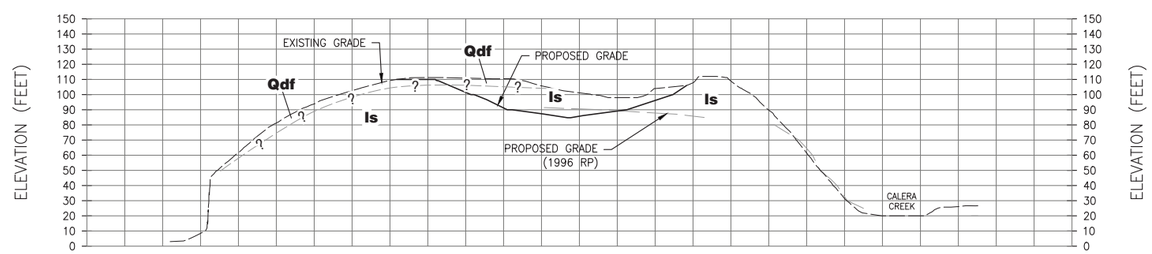
E8867-04-02	June 2016	Figure 6



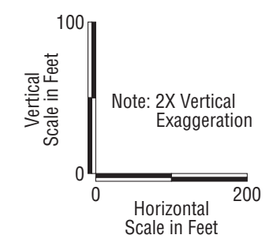
H SECTION H



I SECTION I



J SECTION J



LEGEND:

- Approximate Test Pit Location (projected where noted)
- --?-- Geologic Contact (queried where uncertain)
- Estimated Limit of Remedial Grading

Qf Fill
Qdf Dumped Fill
Qls Landslide Deposit

Franciscan Complex
fm melange
fg greenstone
ls Calera Limestone

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GEOLOGIC CROSS-SECTIONS H, I, AND J

E8867-04-02	June 2016	Figure 7

APPENDIX A

APPENDIX A
FIELD EXPLORATION

Fieldwork for our prior investigation included a site visit, subsurface exploration, and soil sampling. The locations of the exploratory borings are shown on the Geologic Map, Figure 2. Logs of our exploratory test pits are presented in figures following the text in this appendix. Explorations were located in the field using a measuring tape and existing reference points or hand-held GPS equipment. Therefore, actual test pit locations may deviate slightly.

Our subsurface exploration was performed on August 24 through 26, 2015 and included the excavation of exploratory test pits at selected locations throughout the site. Test pits were excavated at 21 locations with a track-mounted Caterpillar 321D excavator equipped with a 36-inch bucket; representative bulk soil samples were obtained for further examination and laboratory testing. Test pit depths ranged from 7 to 21 feet below the existing ground surface. Upon completion, the test pits were backfilled with tamped lifts of excavation spoils.

Subsurface conditions encountered in the exploratory borings were visually examined, classified and logged in general accordance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D2488). This system uses the Unified Soil Classification System (USCS) for soil designations. The logs depict soil and geologic conditions encountered and depths at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, drill rig penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the field logs were revised based on subsequent laboratory testing.

UNIFIED SOIL CLASSIFICATION

MAJOR DIVISIONS				TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO.4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC	CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO.4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS WITH OR WITHOUT GRAVEL
			SC	CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL	ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 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 OR CLAYS OF MEDIUM TO HIGH PLASTICITY
	HIGHLY ORGANIC SOILS		PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

BORING/TRENCH LOG LEGEND

- No Recovery
- Shelby Tube Sample
- Bulk Sample
- SPT Sample
- Modified California Sample
- Groundwater Level (At Completion)
- Groundwater Level (Seepage)

PENETRATION RESISTANCE

SAND AND GRAVEL			SILT AND CLAY			
RELATIVE DENSITY	BLOWS PER FOOT (SPT)*	BLOWS PER FOOT (MOD-CAL)*	CONSISTENCY	BLOWS PER FOOT (SPT)*	BLOWS PER FOOT (MOD-CAL)*	COMPRESSIVE STRENGTH (tsf)
VERY LOOSE	0 - 4	0 - 6	VERY SOFT	0 - 2	0 - 3	0 - 0.25
LOOSE	5 - 10	7 - 16	SOFT	3 - 4	4 - 6	0.25 - 0.50
MEDIUM DENSE	11 - 30	17 - 48	MEDIUM STIFF	5 - 8	7 - 13	0.50 - 1.0
DENSE	31 - 50	49 - 79	STIFF	9 - 15	14 - 24	1.0 - 2.0
VERY DENSE	OVER 50	OVER 79	VERY STIFF	16 - 30	25 - 48	2.0 - 4.0
			HARD	OVER 30	OVER 48	OVER 4.0

*NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE LAST 12 INCHES OF AN 18-INCH DRIVE

MOISTURE DESCRIPTIONS

FIELD TEST	APPROX. DEGREE OF SATURATION, S (%)	DESCRIPTION
NO INDICATION OF MOISTURE; DRY TO THE TOUCH	S<25	DRY
SLIGHT INDICATION OF MOISTURE	25≤S<50	DAMP
INDICATION OF MOISTURE; NO VISIBLE WATER	50≤S<75	MOIST
MINOR VISIBLE FREE WATER	75≤S<100	WET
VISIBLE FREE WATER	100	SATURATED

QUANTITY DESCRIPTIONS

APPROX. ESTIMATED PERCENT	DESCRIPTION
<5%	TRACE
5 - 10%	FEW
11 - 25%	LITTLE
26 - 50%	SOME
>50%	MOSTLY

GRAVEL/COBBLE/BOULDER DESCRIPTIONS

CRITERIA	DESCRIPTION
PASS THROUGH A 3-INCH SIEVE AND BE RETAINED ON A NO. 4 SIEVE (#4 TO 3")	GRAVEL
PASS A 12-INCH SQUARE OPENING AND BE RETAINED ON A 3-INCH SIEVE (3"-12")	COBBLE
WILL NOT PASS A 12-INCH SQUARE OPENING (>12")	BOULDER

BEDDING SPACING DESCRIPTIONS

THICKNESS/SPACING	DESCRIPTOR
GREATER THAN 10 FEET	MASSIVE
3 TO 10 FEET	VERY THICKLY BEDDED
1 TO 3 FEET	THICKLY BEDDED
3 5/8-INCH TO 1 FOOT	MODERATELY BEDDED
1 1/4-INCH TO 3 5/8-INCH	THINLY BEDDED
3/8-INCH TO 1 1/4-INCH	VERY THINLY BEDDED
LESS THAN 3/8-INCH	LAMINATED

STRUCTURE DESCRIPTIONS

CRITERIA	DESCRIPTION
ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS AT LEAST 1/2-INCH THICK	STRATIFIED
ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS LESS THAN 1/2-INCH THICK	LAMINATED
BREAKS ALONG DEFINITE PLANES OF FRACTURE WITH LITTLE RESISTANCE TO FRACTURING	FISSURED
FRACTURE PLANES APPEAR POLISHED OR GLOSSY, SOMETIMES STRIATED	SLICKENSIDED
COHESIVE SOIL THAT CAN BE BROKEN DOWN INTO SMALLER ANGULAR LUMPS WHICH RESIST FURTHER BREAKDOWN	BLOCKY
INCLUSION OF SMALL POCKETS OF DIFFERENT SOIL, SUCH AS SMALL LENSES OF SAND SCATTERED THROUGH A MASS OF CLAY	LENSED
SAME COLOR AND MATERIAL THROUGHOUT	HOMOGENOUS

CEMENTATION/INDURATION DESCRIPTIONS

FIELD TEST	DESCRIPTION
CRUMBLES OR BREAKS WITH HANDLING OR LITTLE FINGER PRESSURE	WEAKLY CEMENTED/INDURATED
CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE	MODERATELY CEMENTED/INDURATED
WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE	STRONGLY CEMENTED/INDURATED

IGNEOUS/METAMORPHIC ROCK STRENGTH DESCRIPTIONS

FIELD TEST	DESCRIPTION
MATERIAL CRUMBLES WITH BARE HAND	WEAK
MATERIAL CRUMBLES UNDER BLOWS FROM GEOLOGY HAMMER	MODERATELY WEAK
1/8-INCH INDENTATIONS WITH SHARP END FROM GEOLOGY HAMMER	MODERATELY STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH **ONE** BLOW FROM GEOLOGY HAMMER	STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH **COUPLE** BLOWS FROM GEOLOGY HAMMER	VERY STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH **MANY** BLOWS FROM GEOLOGY HAMMER	EXTREMELY STRONG

IGNEOUS/METAMORPHIC ROCK WEATHERING DESCRIPTIONS

DEGREE OF DECOMPOSITION	FIELD RECOGNITION	ENGINEERING PROPERTIES
SOIL	DISCOLORED, CHANGED TO SOIL, FABRIC DESTROYED	EASY TO DIG
COMPLETELY WEATHERED	DISCOLORED, CHANGED TO SOIL, FABRIC MAINLY PRESERVED	EXCAVATED BY HAND OR RIPPING (Saprolite)
HIGHLY WEATHERED	DISCOLORED, HIGHLY FRACTURED, FABRIC ALTERED AROUND FRACTURES	EXCAVATED BY HAND OR RIPPING, WITH SLIGHT DIFFICULTY
MODERATELY WEATHERED	DISCOLORED, FRACTURES, INTACT ROCK-NOTICEABLY WEAKER THAN FRESH ROCK	EXCAVATED WITH DIFFICULTY WITHOUT EXPLOSIVES
SLIGHTLY WEATHERED	MAY BE DISCOLORED, SOME FRACTURES, INTACT ROCK-NOT NOTICEABLY WEAKER THAN FRESH ROCK	REQUIRES EXPLOSIVES FOR EXCAVATION, WITH PERMEABLE JOINTS AND FRACTURES
FRESH	NO DISCOLORATION, OR LOSS OF STRENGTH	REQUIRES EXPLOSIVES

IGNEOUS/METAMORPHIC ROCK JOINT/FRACTURE DESCRIPTIONS

FIELD TEST	DESCRIPTION
NO OBSERVED FRACTURES	UNFRACTURED/UNJOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 1 TO 3 FOOT INTERVALS	SLIGHTLY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 4-INCH TO 1 FOOT INTERVALS	MODERATELY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 1-INCH TO 4-INCH INTERVALS WITH SCATTERED FRAGMENTED INTERVALS	INTENSELY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT LESS THAN 1-INCH INTERVALS; MOSTLY RECOVERED AS CHIPS AND FRAGMENTS	VERY INTENSELY FRACTURED/JOINTED

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Pacifica, California

KEY TO LOGS

E8867-04-02	October 2015	Figure A1

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP1

ELEV. (MSL.) _____ DATE COMPLETED **8/24/2015**

ENG./GEO. **SR** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	FILL Medium-stiff to stiff, dry to humid, light-brown, (f) Sandy SILT with artificial 3 inch minus gravels, trace clay			
1	TP1-1-3							
2								
3								
4								
5					-old cable wire, north end of trench -medium-stiff			
6								
7								
8	TP1-8			CL	Soft, moist, medium to dark-brown CLAY			
9								
10	TP1-10			CH	ALLUVIUM Soft to medium-stiff, black fat CLAY with trace (f) SAND and thread-sized rootlets			
11								
12					END OF TEST PIT AT 12 FEET NO FREE WATER ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A2, Log of Test Pit TP1, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP2

ELEV. (MSL.) _____ DATE COMPLETED **8/24/2015**

ENG./GEO. **SR** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	FILL Medium-stiff to stiff, dry to humid, light-brown, (f) Sandy SILT with 1 inch rock in upper 3 feet			
1								
2								
3								
4								
5	TP2-5			CL	Medium-stiff, moist, medium-brown and orange, CLAY with angular gravel; moderate plasticity			
6								
7								
8					-asphalt layer in the trench wall			
9								
10	TP2-10				-stiff, moist, dark-gray, sandy to gravelly			
11								
12					-varicolored sand-clay-gravel mixtures			
13								
14								
15					-asphalt and concrete chunks			

END OF TEST PIT AT 15 FEET
NO FREE WATER ENCOUNTERED
BACKFILLED IN LIFTS WITH TAMPED SPOILS

Figure A3, Log of Test Pit TP2, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP3

ELEV. (MSL.) _____ DATE COMPLETED **8/24/2015**

ENG./GEO. **SR** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	FILL Medium dense, dry to humid, varicolored, Clayey Gravelly SAND with concrete chunks in upper 3 feet			
1								
2								
3	TP3-3-4							
4								
5					-stiff, moist, more clayey			
6								
7								
8								
9								
10				CL	ALLUVIUM Soft to medium-stiff, brown (f) Sandy CLAY with trace organics			
11	TP3-11							
12								
13					-with lenses of (f) medium-gray sand below 13 feet			
14	TP3-14				-TP3-14 sample is sand only			
15					END OF TEST PIT AT 15 FEET NO FREE WATER ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A4, Log of Test Pit TP3, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP4

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	FILL Estimated loose, dry, brown, Silty SAND with fine gravel			
1								
2					- becomes damp, trace clay			
3					- wire in fill			
4	TP4-4			CL-ML	- concrete slab chunk, approximately 30", filter fabric, asphalt			
5				SM	Moist, brown, Silty CLAY, trace sand, no roots			
6					Damp, dark grey-brown, damp, Silty SAND, fine to coarse angular sand, trace fine gravel, trace clay (resembles asphalt, but no odor and friables)			
7	TP4-7			CL-ML	ALLUVIUM/RESIDUAL SOIL Moist, drak grey-brown, Silty CLAY, few red-brown root traces, trace fine to medium-grained sand			
8								

TEST PIT TERMINATED AT 8 FEET
GROUNDWATER NOT ENCOUNTERED
BACKFILLED IN LIFTS WITH TAMPED SPOILS

Figure A5, Log of Test Pit TP4, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP5

ELEV. (MSL.) _____ DATE COMPLETED **8/24/2015**

ENG./GEO. **SR** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	FILL Stiff to hard, dry, light-brown, Sandy SILT with (f) angular gravel			
1								
2	TP5-2							
3								
4								
5								
6	TP5-6			CL	ALLUVIUM Medium-stiff, moist, black CLAY with roots of approximately 1 inch and seams/mottles of dark red clay -pinholing throughout			
7					END OF TEST PIT AT 7 FEET NO FREE WATER ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A6, Log of Test Pit TP5, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP6

ELEV. (MSL.) _____ DATE COMPLETED **8/24/2015**

ENG./GEO. **SR** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	FILL Stiff, humid, reddish-brown gravelly CLAY -dark gray at 1 foot -frequent occurences of asphalt in upper 5 to 6 feet			
1								
2								
3								
4								
5								
6	TP6-6			SC	ALLUVIUM Medium dense, humid to moist, dark-gray to black, Clayey Sand			
7	TP6-7-8				-moist, orange-brown mottles, with (f) angular gravels			
8								
9								
10					END OF TEST PIT AT 10 FEET NO FREE WATER ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A7, Log of Test Pit TP6, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP7

ELEV. (MSL.) _____ DATE COMPLETED **8/24/2015**

ENG./GEO. **SR** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	FILL Stiff to hard, dry to humid, light to medium-brown, Sandy SILT with clay			
1								
2								
3					-more clayey			
4	TP7-4							
5								
6					-approximately 1 foot thick zone of 3 inch minus angular gravel			
7	TP7-7			CL	ALLUVIUM Medium-stiff, moist, black (f) Sandy CLAY			
8								
					END OF TEST PIT AT 8½ FEET NO FREE WATER ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A8, Log of Test Pit TP7, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP8

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	FILL Dry to damp, brown, Silty GRAVEL with sand, trace clay, few cobble (24" max), average gravel approximately 2"			
1								
2								
3								
4								
5					- caving from 5' to 8'			
6	TP8-6							
7	TP8-7-11				- becomes moist, dark brown-grey			
8								
9								
10					- becomes dark brown			
11					- refusal on limestone bedrock			

TEST PIT TERMINATED AT 11 FEET
GROUNDWATER NOT ENCOUNTERED
BACKFILLED IN LIFTS WITH TAMPED SPOILS

Figure A9, Log of Test Pit TP8, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP9

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TP9-0			GM	FILL Estimated medium dense, dry, brown, Silty Sandy GRAVEL, fine to coarse sand, fine to coarse sub-angular gravel, trace cobble (10")			
1								
2								
3					- becomes damp below 3'			
4								
5	TP9-5-11							
6								
7								
8								
9								
10								
11								
12	TP9-12			GC	Moist, dark brown-grey, Clayey GRAVEL			
13								
14								
15								
16								
17								
18					- limit of reach at 18'			

TEST PIT TERMINATED AT 18 FEET
GROUNDWATER NOT ENCOUNTERED
BACKFILLED IN LIFTS WITH TAMPED SPOILS

Figure A10, Log of Test Pit TP9, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP10

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	FILL Estimated loose to medium dense, dry to damp, green-brown, Silty Sandy GRAVEL, fine to coarse sand, fine to coarse gravel, trace cobbles (8")			
1								
2	TP10-2							
3				GM/GC	Moist, multicolor: brown, gray, green, Silty to Clayey GRAVEL			
4								
5								
6								
7								
8					- trace asphalt pieces			
9								
10								
11								
12					- trace wet soil at 12'			
13								
14	TP10-14							
15								
16								
17					- becomes very moist to wet			
18								
19					- limit of reach			

TEST PIT TERMINATED AT 19½ FEET
GROUNDWATER NOT ENCOUNTERED
BACKFILLED IN LIFTS WITH TAMPED SPOILS

Figure A11, Log of Test Pit TP10, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP11

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	FILL Estimated medium dense, dry, green-brown, brown, red-brown, Silty Sandy GRAVEL, trace cobble (10"), trace asphalt (6"), trace to little clay			
1								
2								
3					- becomes damp 3' to 7'			
4	TP11-4-18							
5								
6								
7								
8					- becomes moist to very moist			
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20					Hard, limestone cobbles and bedrock			
21					TEST PIT TERMINATED AT 21 FEET GROUNDWATER NOT ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A12, Log of Test Pit TP11, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP12

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	FILL Estimated loose to medium dense, dry to damp, multicolored, Silty Sandy GRAVEL, fine to coarse-grained sand, fine to coarse sub-angular to angular gravel (average medium gravel), trace cobble "greenstone" (metavolcanic) (13" max), trace asphalt			
1								
2								
3	TP12-3							
4								
5								
6								
7								
8	TP12-8							
9								
10								
11								
12								
13								
14	TP12-14							
15								
16								
17					- increasing proportion limestone and metavolcanic gravel and cobbles (24" max)			
18								
19								
20								
21					TEST PIT TERMINATED AT 21 FEET GROUNDWATER NOT ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A13, Log of Test Pit TP12, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP13

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	FILL Estimated loose, dry, brown/green-brown/red-brown, Silty Sandy GRAVEL, trace cobble (10" max), trace asphalt chunks (12")			
1								
2								
3					- becomes estimated medium dense, damp			
4								
5								
6								
7								
8								
9								
10								
11								
12				GP	Estimated loose, GRAVEL with sand, trace silt, brown angular limestone, caving, increasing coarse gravel and cobble			
13								
14								
15								
16								
17								
					TEST PIT TERMINATED AT 17½ FEET GROUNDWATER NOT ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A14, Log of Test Pit TP13, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP14

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TP14-0-14			GM	FILL Estimated loose to medium dense, dry to damp, brown, Silty Sandy GRAVEL/Gravelly SAND, fine to coarse-grained sand, fine to coarse gravel, trace to little cobble and boulders (24" max)			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14				CL-ML	RESIDUAL SOIL Moist, dark brown, Silty CLAY, trace sand and fine gravel -grades to dark grey-brown clay at 16'			
15	TP14-15							
16	TP14-16				Dark gray-brown CLAY, yellowish at 17'			
17					TEST PIT TERMINATED AT 17 FEET GROUNDWATER NOT ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A15, Log of Test Pit TP14, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP15

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM-SM	FILL Dry to damp, brown, Silty Sandy GRAVEL, trace cobble and boulders (36") to Silty Gravelly SAND, trace to little clay, clasts of limestone			
1								
2								
3								
4								
5	TP15-5-9			CL	LANDSLIDE/DEBRIS FLOW Damp to mosit, brown, Sandy CLAY with gravel (brown siltstone)			
6								
7								
8								
9								
10	TP15-10			CL-ML	RESIDUAL SOIL Moist, dark gray, Silty CLAY - becomes yellow			
11								
12								
13								
14	TP15-14							
					TEST PIT TERMINATED AT 14 FEET GROUNDWATER NOT ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A16, Log of Test Pit TP15, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP16

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TP16-0-3			CL-ML	RESIDUAL SOIL Gray-brown, Clayey SILT/Silty CLAY, trace fine roots, trace porosity, trace sand, trace gravel/cobbles in first 12"			
1								
2								
3								
4	TP16-4							
5					- grades to moist, yellow, silty clay			
6								
7	TP16-7							
8								
9								
10	TP16-10-12							
11					- becomes completely weathered claystone, excavates as: estimated stiff, very moist, multicolor: yellow and pale yellow-brown, silty clay, fine blocky soil structure			
12								
13								
14	TP16-14				TEST PIT TERMINATED AT 14 FEET GROUNDWATER NOT ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A17, Log of Test Pit TP16, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP17

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL-ML	DEBRIS FLOW/SLIDE DEBRIS Dry, dark gray, Silty CLAY, trace fine roots			
1								
2					- becomes moist, yellow			
3					- increasing moisture from 3' to 8'			
4					- wet zone at 8' (2-3" thick)			
5								
6								
7								
8				CL-ML	RESIDUAL SOIL Silty CLAY, trace black mottling, trace medium-grained sand			
9	TP17-8.5							
10					- moist from 10' to 17'			
11					- becomes completely weathered claystone, excavates as: estimated stiff, very moist, multicolor: yellow and pale yellow-brown, silty clay, fine blocky soil structure			
12								
13								
14								
15								
16	TP17-16							
17	TP17-17.5							
					TEST PIT TERMINATED AT 17½ FEET GROUNDWATER NOT ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A18, Log of Test Pit TP17, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP18

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL-ML	LANDSLIDE DEBRIS Dry to damp, dark brown-gray, Silty CLAY, trace roots			
1								
2					- becomes moist, yellow			
3								
4	TP18-4							
5								
6	TP18-6			CL-ML	RESIDUAL SOIL Moist, yellow and yellow-brown, Silty CLAY - slide plane at 6' (1" thick moist yellow CLAY)			
7								
8	TP18-8							
9					TEST PIT TERMINATED AT 9 FEET GROUNDWATER NOT ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A19, Log of Test Pit TP18, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP19

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	FILL Dry to damp, brown and dark brown, Silty GRAVEL, with cobble and boulders (30" max), trace clay			
1								
2								
3								
4								
5								
6								
7				CL-ML	Mixed, moist, dark brown and yellow, Silty CLAY			
8								
9								
10								
11	TP19-11			CL	Moist, multicolor: black and green, CLAY			
12								
13								
14	TP19-14			GP	Estimated loose, damp, gray, Sandy GRAVEL, 1/2" crushed baserock (man-made), caving			
15								
16								
17	TP19-17.5			CL-ML	RESIDUAL SOIL Moist, multicolor: brown, dark gray, yellow, Silty CLAY			
18	TP19-18			CL	Dark gray and dark brown, CLAY with sand, and fine sub-round gravel -limit of reach			
19								

TEST PIT TERMINATED AT 19½ FEET
GROUNDWATER NOT ENCOUNTERED
BACKFILLED IN LIFTS WITH TAMPED SPOILS

Figure A20, Log of Test Pit TP19, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP20

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	FILL Dry, brown, Silty GRAVEL, trace cobble and boulder (30" max), trace clay			
1								
2				CL-ML	Damp to moist dark gray-brown and yellow-brown, Silty CLAY			
3								
4	TP20-4							
5								
6								
7				CL-ML	Dark gray, Silty CLAY, trace chunks asphalt, lens of asphalt (18" max, 4-5" wide)			
8								
9								
10								
11								
12					- becomes yellow and dark gray			
13				CL-ML	RESIDUAL SOIL Dark gray to dark gray-brown, Silty CLAY, trace sand and sub-round gravel -grades to yellow			
14								
15	TP20-15-16							
16					TEST PIT TERMINATED AT 16 FEET GROUNDWATER NOT ENCOUNTERED BACKFILLED IN LIFTS WITH TAMPED SPOILS			

Figure A21, Log of Test Pit TP20, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E8867-04-02** PROJECT NAME: **Rockaway Quarry**

TEST PIT TP21

ELEV. (MSL.) _____ DATE COMPLETED **8/25/2015**

ENG./GEO. **JP** OPERATOR **Geocon**

EQUIPMENT **CAT 321D w/ 36" bucket** HAMMER TYPE _____

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (TONS/SQFT)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TP21-0-6			GM	FILL Estimated loose, dry to damp, brown to dark brown, Silty Sandy GRAVEL, with trace to little cobble			
1								
2								
3								
4								
5								
6	TP21-6			CL	Yellow to yellow-brown, Silty CLAY irregular abrupt boundary with vegetation imprints			
7								
8	TP21-8			ML	RESIDUAL SOIL Dark brown, Clayey SILT, fine, pale yellow roots at boundary			
9								
10				CL	Moist, yellow, Silty CLAY			
11								
12	TP21-12							

TEST PIT TERMINATED AT 12½ FEET
GROUNDWATER NOT ENCOUNTERED
BACKFILLED IN LIFTS WITH TAMPED SPOILS

Figure A22, Log of Test Pit TP21, page 1 of 1

GEOCON TEST PIT LOG E8867-04-02 ROCKAWAY QUARRY TEST PIT 8.25.2015.GPJ 10/21/15

GEOCON

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

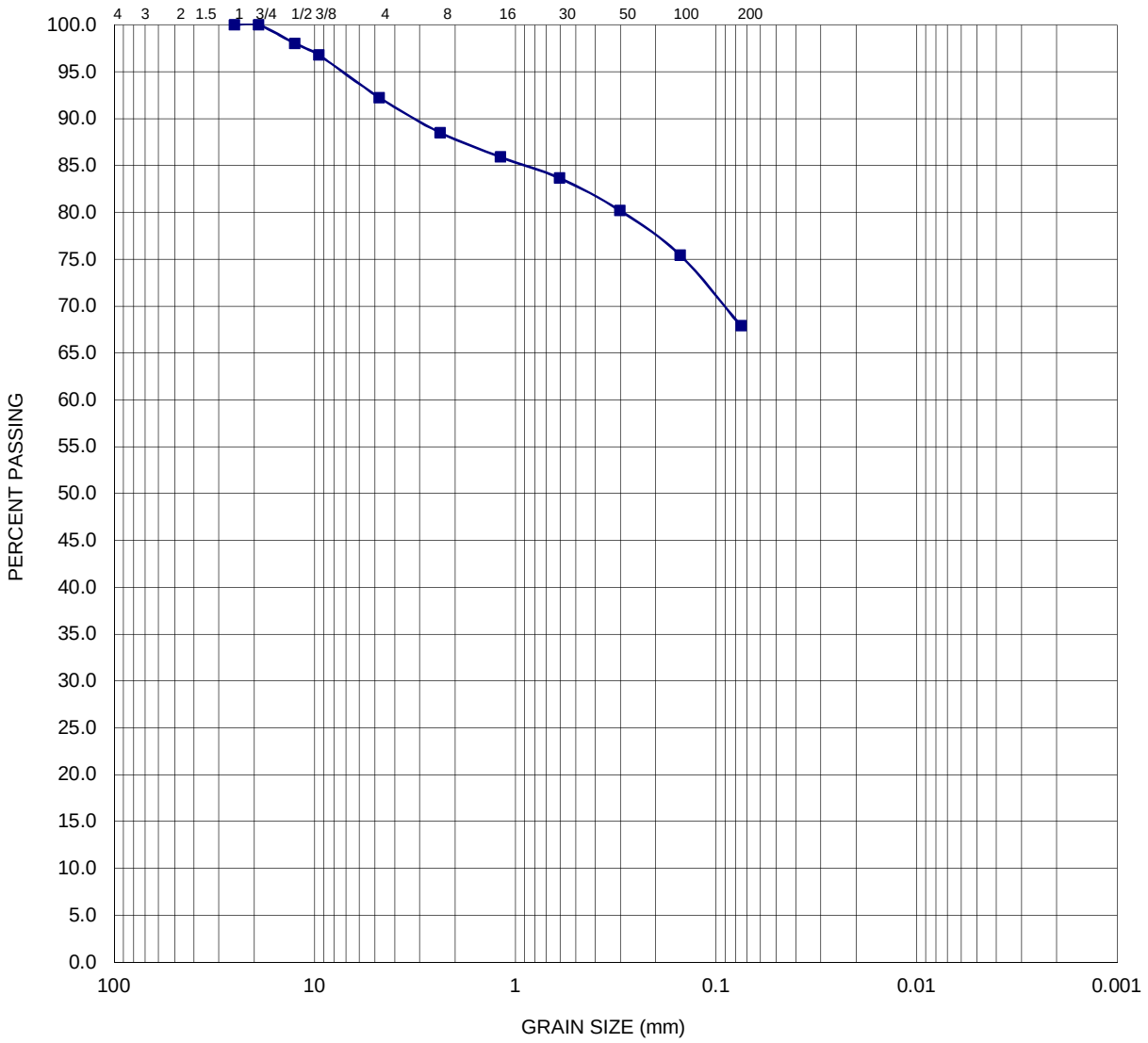
APPENDIX B

APPENDIX B
LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM), Caltrans, or other suggested procedures. Selected samples were tested for Atterberg Limits and grain size distribution. The results of the laboratory tests are summarized in tabular format below and the following figures.

TABLE B-I
SUMMARY OF LABORATORY ATTERBERG LIMITS TEST RESULTS
ASTM D 4318

Sample No.	Liquid Limit	Plastic Limit	Plasticity Index
TP1-8	24	16	8
TP2-5	45	23	22
TP7-4	22	15	7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Pit: TP1

Depth To Sample: 1 - 3'

Sieve Date: 9/30/2015

Tested and Computed by: PG/JBM

Test Data

Sieve Number	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	100	100	97.999	96.8	92.2	88.5	85.9	83.6	80.2	75.4	67.9

Geocon Consultants, Inc.
6671 Brisa Street
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Telephone: (925) 371-5900
Fax: (925) 371-5915

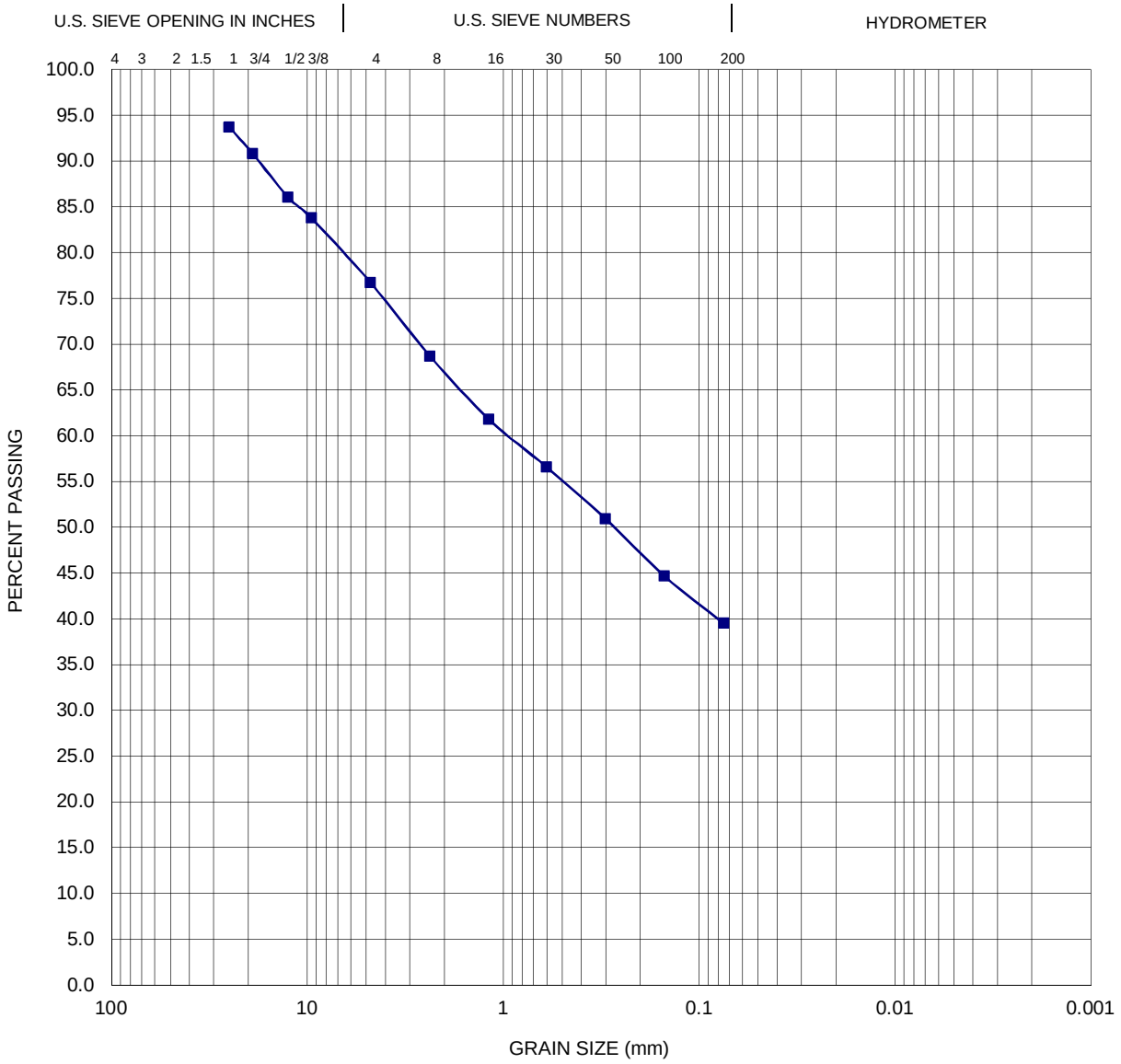
Particle Size Analysis - ASTM D422

Project: Rockaway Quarry

Location: Pacifica, California

Project No.: E8867-04-02

Figure B1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Pit: TP3

Depth To Sample: 3 - 4"

Sieve Date: 9/30/2015

Tested and Computed by: PG/JBM

Test Data

Sieve Number	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	95.194	93.717	90.812	86.002	83.8	76.7	68.7	61.8	56.6	50.9	44.6	39.5

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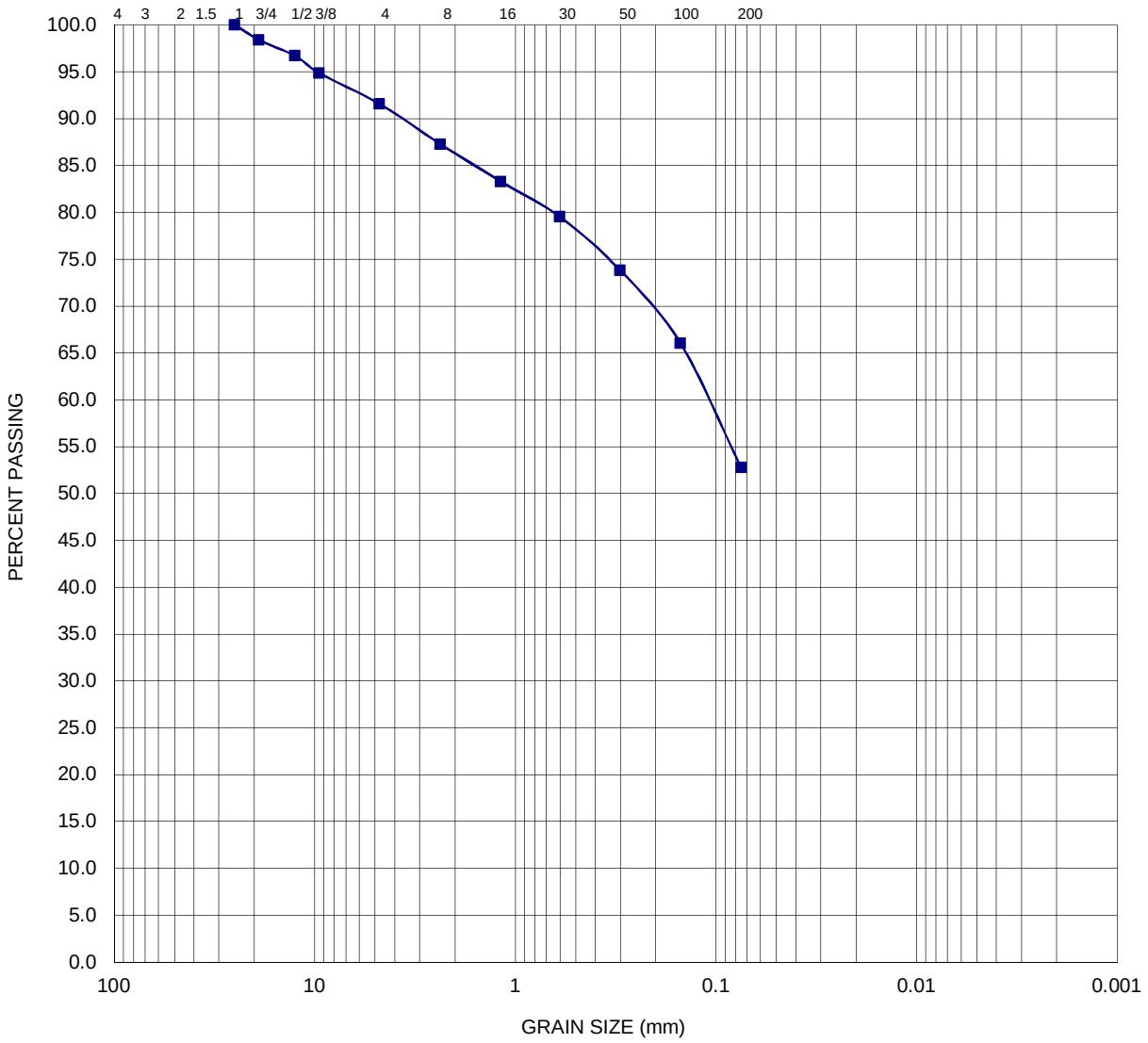
Particle Size Analysis - ASTM D422

Project: Rockaway Quarry

Location: Pacifica, California

Project No.: E8867-04-02

Figure B2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Pit: TP5

Sieve Date: 9/28/2015

Depth To Sample: 2'

Tested and Computed by: PG/JBM

Test Data

Sieve Number	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	100	98.403	96.684	94.9	91.6	87.3	83.3	79.5	73.8	66.0	52.8

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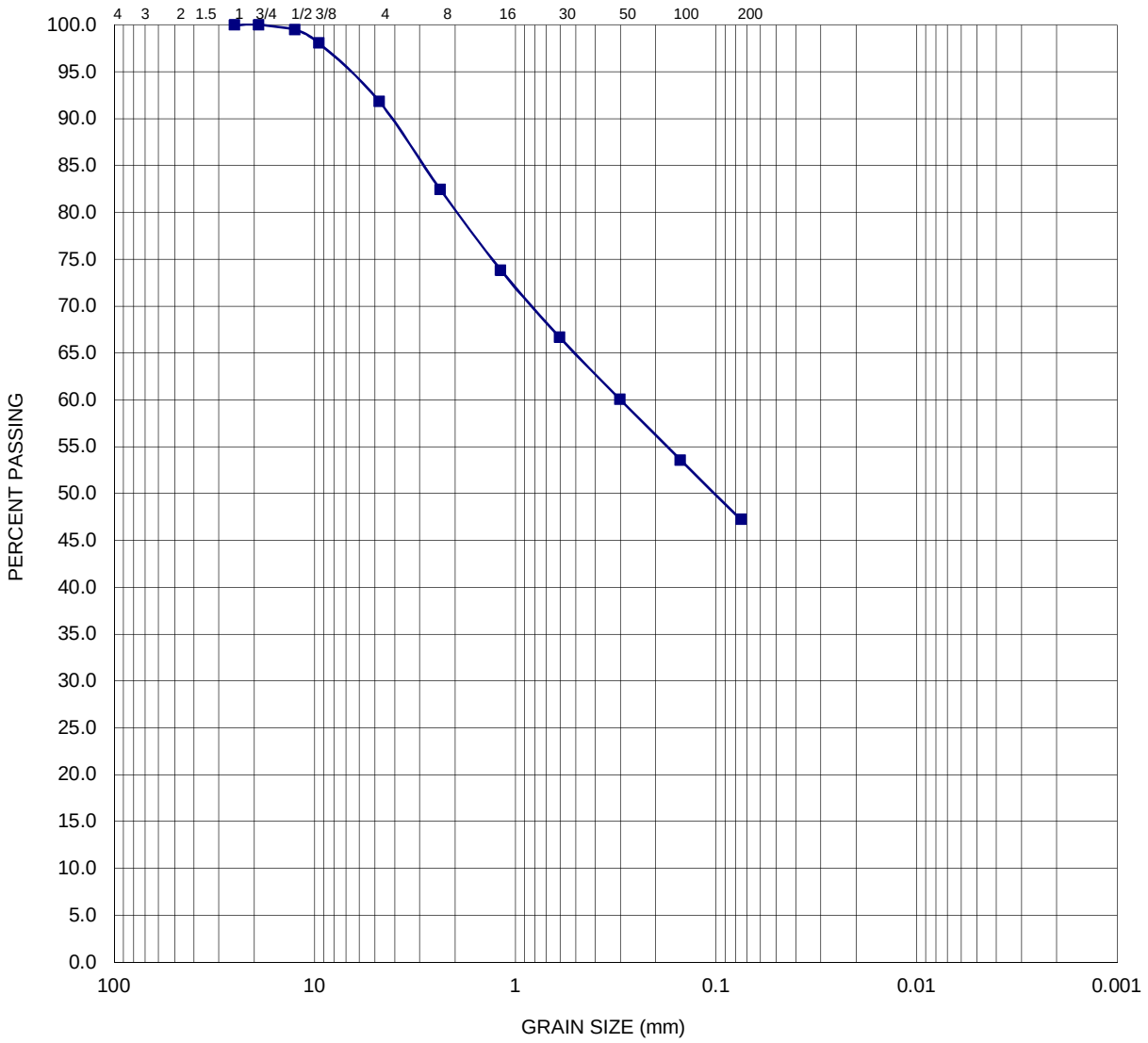
Particle Size Analysis - ASTM D422

Project: Rockaway Quarry

Location: Pacifica, California

Project No.: E8867-04-02

Figure B3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Pit: TP6

Depth To Sample: 7 - 8'

Sieve Date: 9/28/2015

Tested and Computed by: PG/JBM

Test Data

Sieve Number	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	100	100	99.46	98.0	91.8	82.4	73.8	66.6	60.0	53.5	47.2

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Particle Size Analysis - ASTM D422

Project: Rockaway Quarry

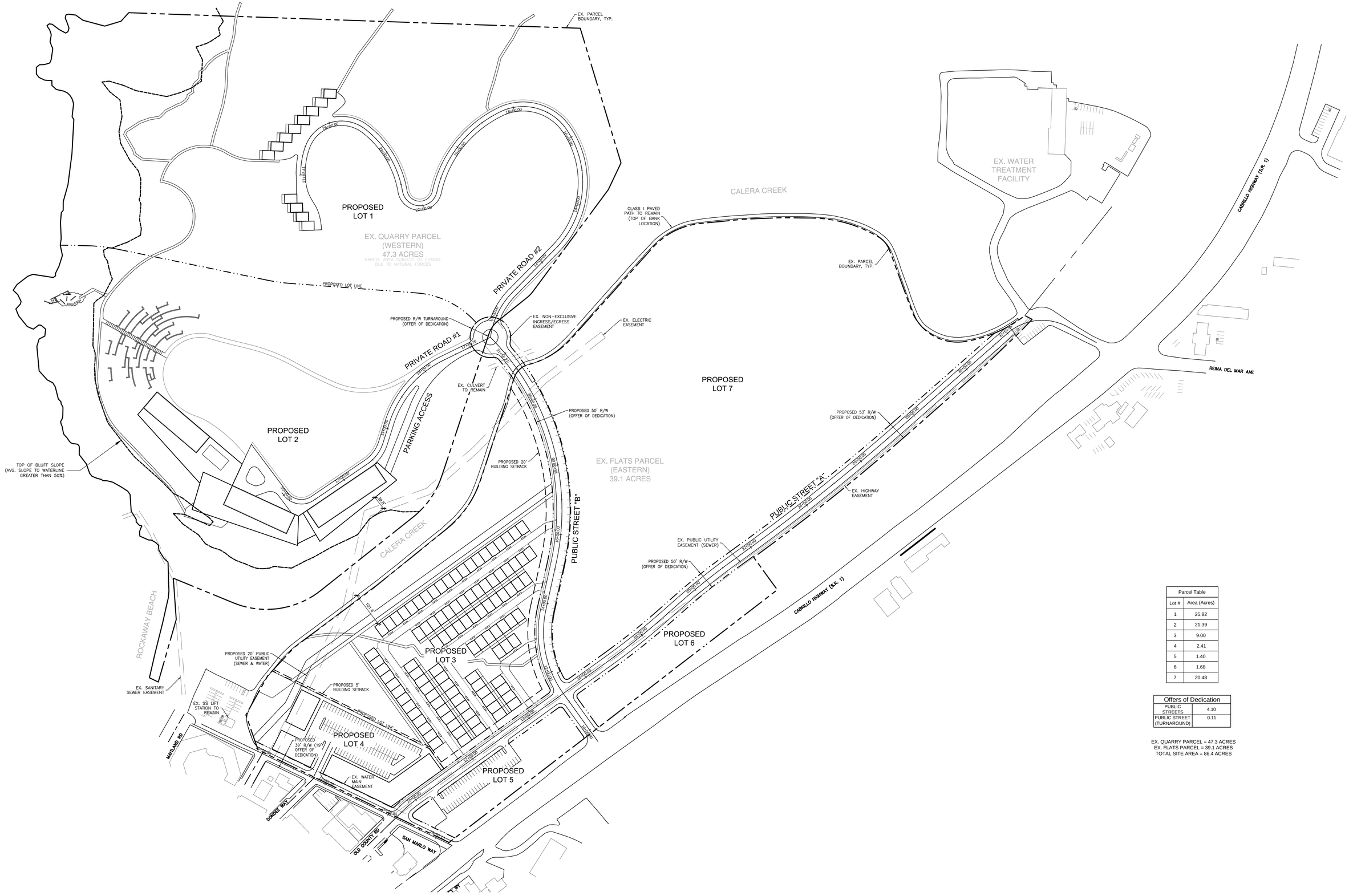
Location: Pacifica, California

Project No.: E8867-04-02

Figure B4

APPENDIX C

APPENDIX C
TENTATIVE MAP



Parcel Table	
Lot #	Area (Acres)
1	25.82
2	21.39
3	9.00
4	2.41
5	1.40
6	1.68
7	20.48

Offers of Dedication	
PUBLIC STREETS	4.10
PUBLIC STREET (TURNAROUND)	0.11

EX. QUARRY PARCEL = 47.3 ACRES
EX. FLATS PARCEL = 39.1 ACRES
TOTAL SITE AREA = 86.4 ACRES

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VESTING TENTATIVE MAP

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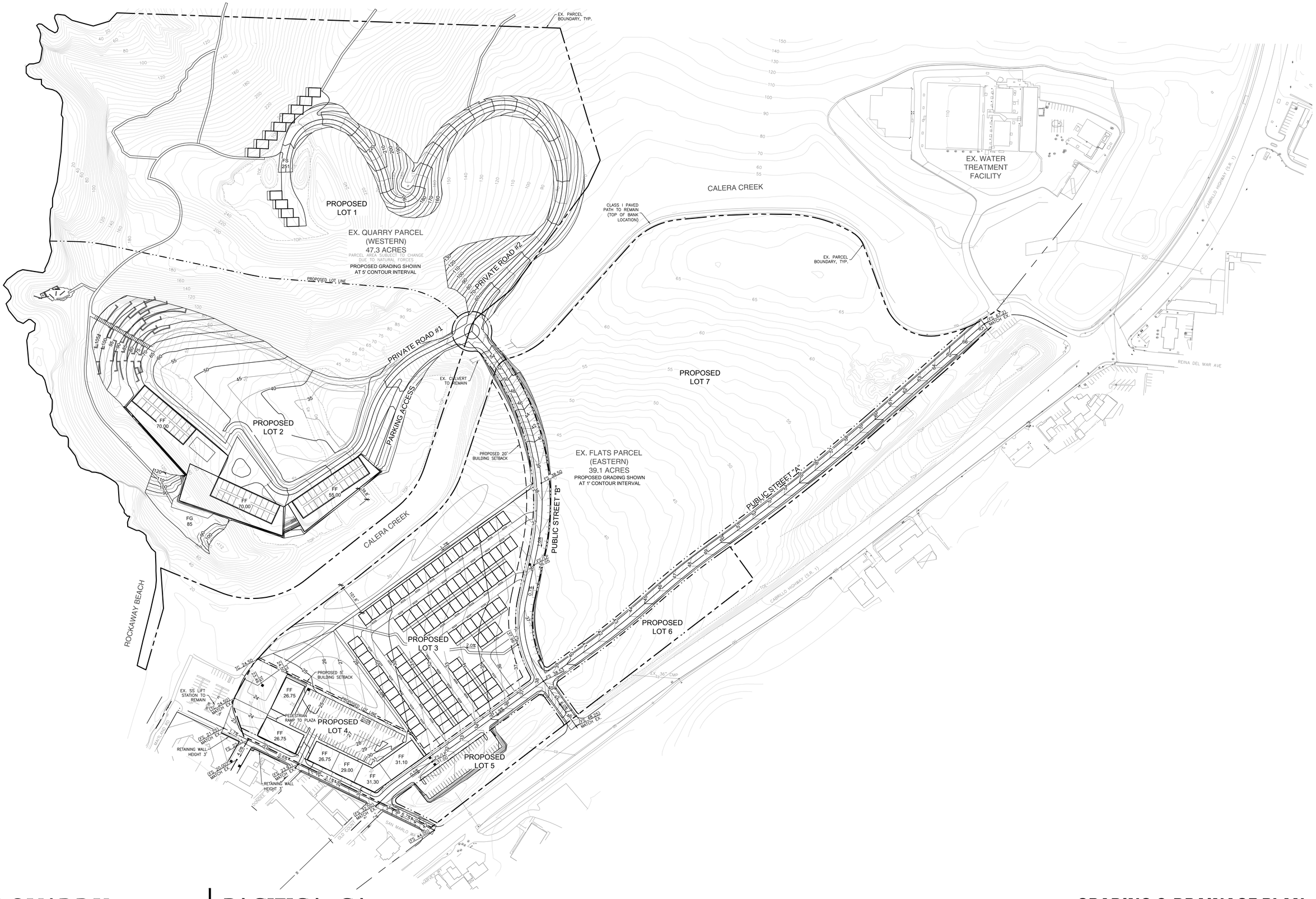

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GRADING & DRAINAGE PLAN

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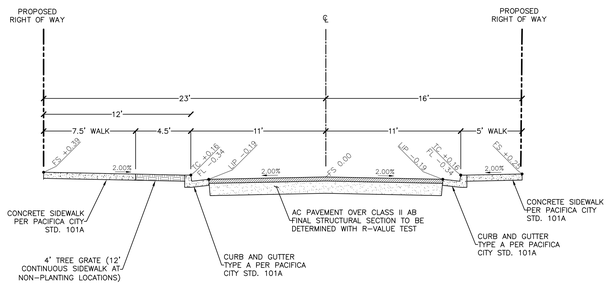
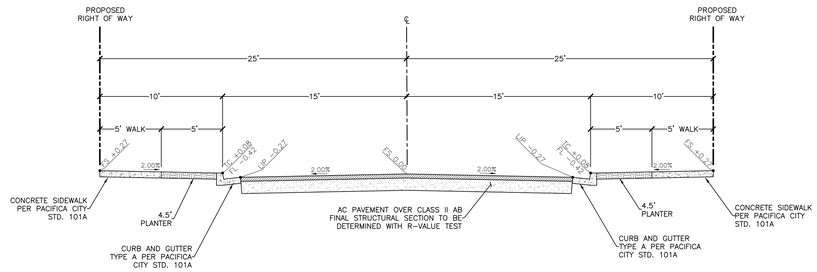


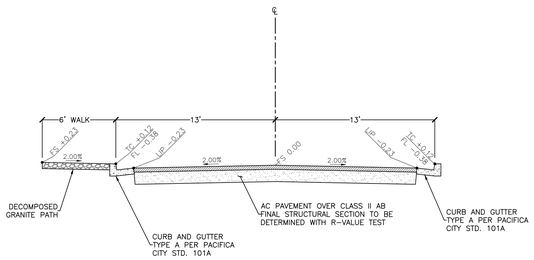
TYPICAL STREET SECTION: SAN MARLO WAY

STATION 10+00.00 TO STATION 13+85.27



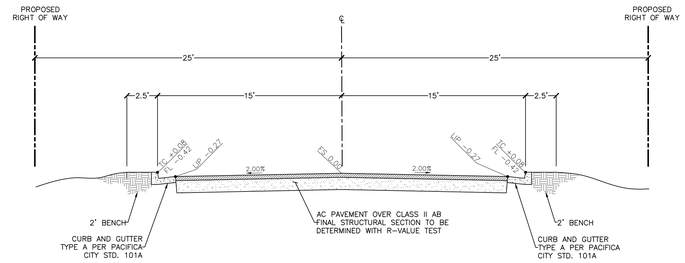
TYPICAL STREET SECTION: PUBLIC STREETS A+B

STREET A: STATION 10+00.00 TO STATION 14+85.70
STREET B: STATION 20+47.01 TO STATION 21+56.27



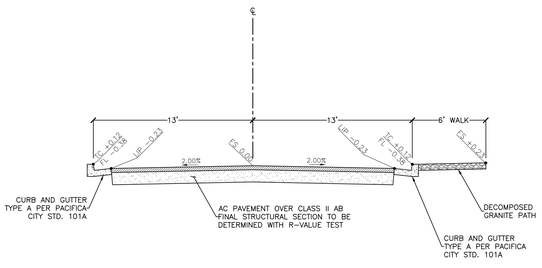
TYPICAL STREET SECTION: PRIVATE ROAD #1

STATION 10+00.00 TO STATION 17+45.76



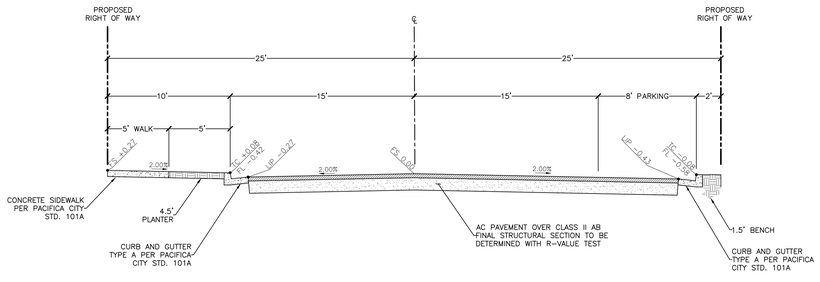
TYPICAL STREET SECTION: PUBLIC STREETS A+B

STREET A: STATION 15+54.78 TO STATION 31+55.55
STREET B: STATION 10+00.00 TO STATION 10+94.35



TYPICAL STREET SECTION: PRIVATE ROAD #2

STATION 10+00.00 TO STATION 27+82.41



TYPICAL STREET SECTION: PUBLIC STREET B

STATION 11+88.62 TO STATION 20+47.01

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TYPICAL STREET SECTIONS

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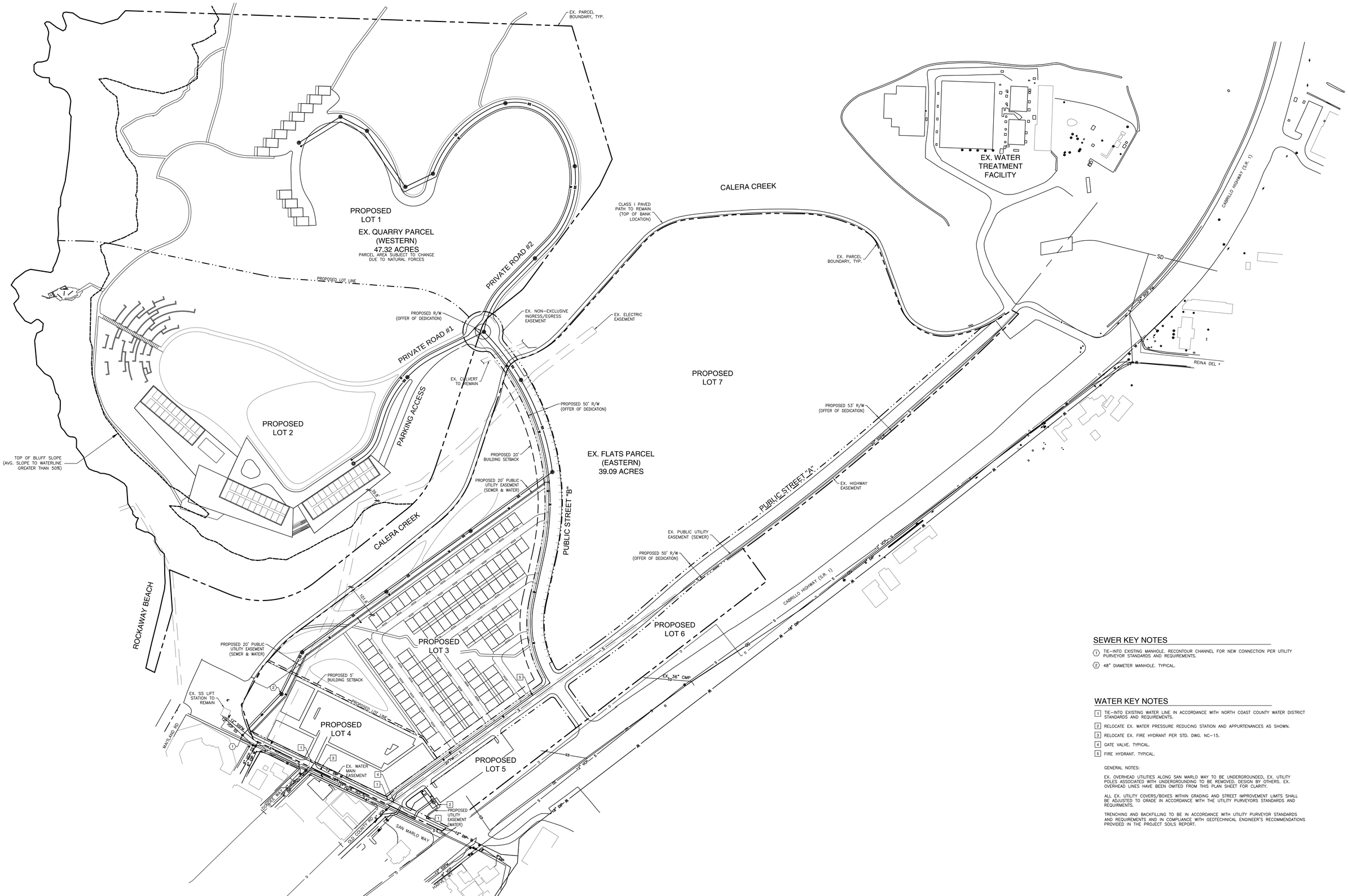

SEWER KEY NOTES

1. TIE-INTO EXISTING MANHOLE. RECONTOUR CHANNEL FOR NEW CONNECTION PER UTILITY PURVEYOR STANDARDS AND REQUIREMENTS.
2. 48" DIAMETER MANHOLE. TYPICAL.

WATER KEY NOTES

1. TIE-INTO EXISTING WATER LINE IN ACCORDANCE WITH NORTH COAST COUNTY WATER DISTRICT STANDARDS AND REQUIREMENTS.
2. RELOCATE EX. WATER PRESSURE REDUCING STATION AND APPURTENANCES AS SHOWN.
3. RELOCATE EX. FIRE HYDRANT PER STD. DWG. NC-15.
4. GATE VALVE. TYPICAL.
5. FIRE HYDRANT. TYPICAL.

GENERAL NOTES:

EX. OVERHEAD UTILITIES ALONG SAN MARLO WAY TO BE UNDERGROUNDED, EX. UTILITY POLES ASSOCIATED WITH UNDERGROUNDING TO BE REMOVED. DESIGN BY OTHERS. EX. OVERHEAD LINES HAVE BEEN OMITED FROM THIS PLAN SHEET FOR CLARITY.

ALL EX. UTILITY COVERS/BOXES WITHIN GRADING AND STREET IMPROVEMENT LIMITS SHALL BE ADJUSTED TO GRADE IN ACCORDANCE WITH THE UTILITY PURVEYORS STANDARDS AND REQUIRMENTS.

TRENCHING AND BACKFILLING TO BE IN ACCORDANCE WITH UTILITY PURVEYOR STANDARDS AND REQUIREMENTS AND IN COMPLIANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATIONS PROVIDED IN THE PROJECT SOILS REPORT.

THE QUARRY | PACIFICA, CA

UTILITY PLAN

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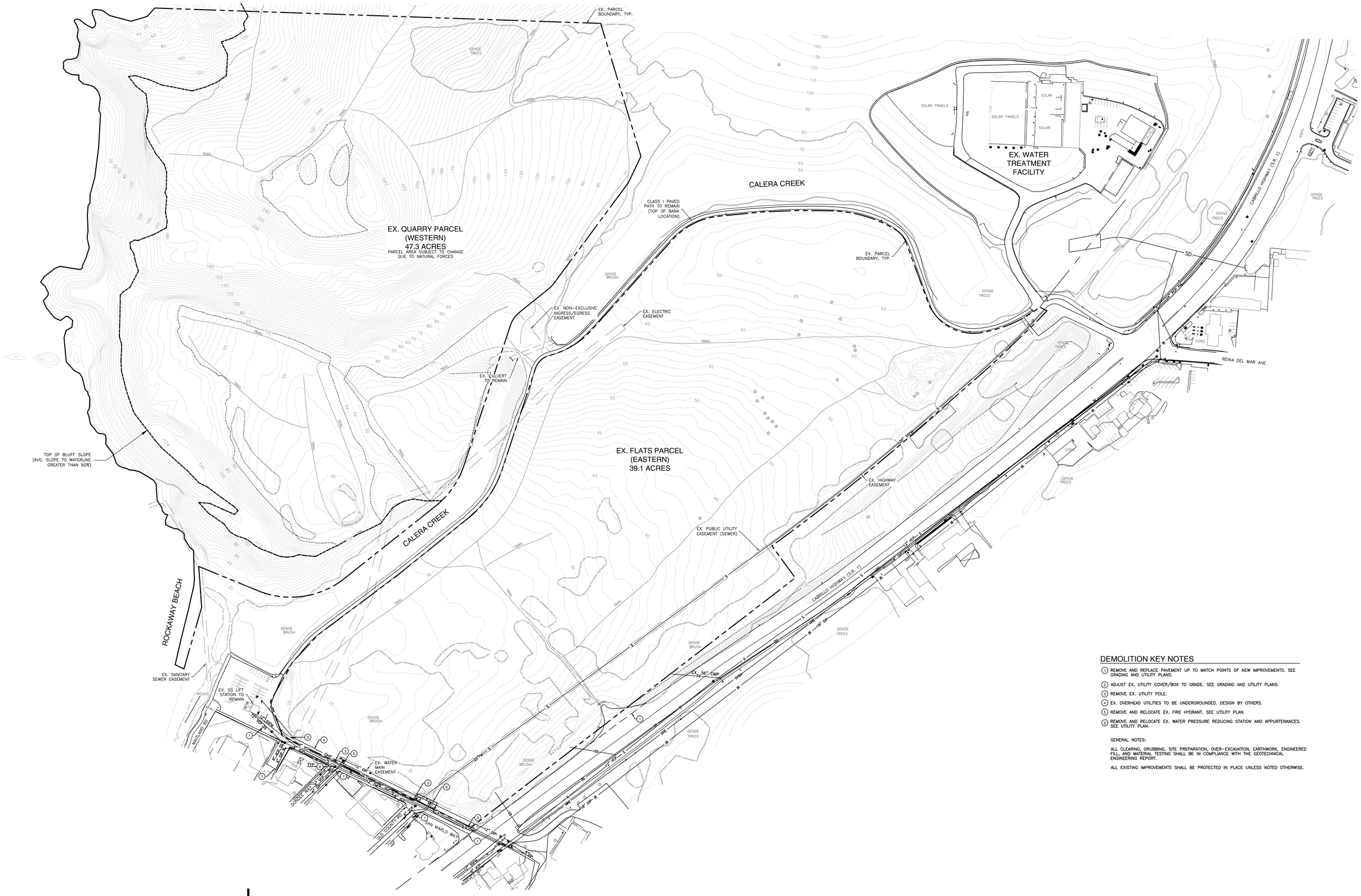

DEMOLITION KEY NOTES

1. REMOVE AND REPLACE PAVEMENT UP TO MATCH POINTS OF NEW IMPROVEMENTS. SEE GRADING AND UTILITY PLANS.
2. ADJUST EX. UTILITY COVER/BOX TO GRADE. SEE GRADING AND UTILITY PLANS.
3. REMOVE EX. UTILITY POLE.
4. EX. OVERHEAD UTILITIES TO BE UNDERGROUNDED. DESIGN BY OTHERS.
5. REMOVE AND RELOCATE EX. FIRE HYDRANT. SEE UTILITY PLAN.
6. REMOVE AND RELOCATE EX. WATER PRESSURE REDUCING STATION AND APPURTENANCES. SEE UTILITY PLAN.

GENERAL NOTES:

ALL CLEARING, GRUBBING, SITE PREPARATION, OVER-EXCAVATION, EARTHWORK, ENGINEERED FILL, AND MATERIAL TESTING SHALL BE IN COMPLIANCE WITH THE GEOTECHNICAL ENGINEERING REPORT.

ALL EXISTING IMPROVEMENTS SHALL BE PROTECTED IN PLACE UNLESS NOTED OTHERWISE.

THE QUARRY | PACIFICA, CA

TOPOGRAPHY AND DEMOLITION PLAN

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