APPENDIX F

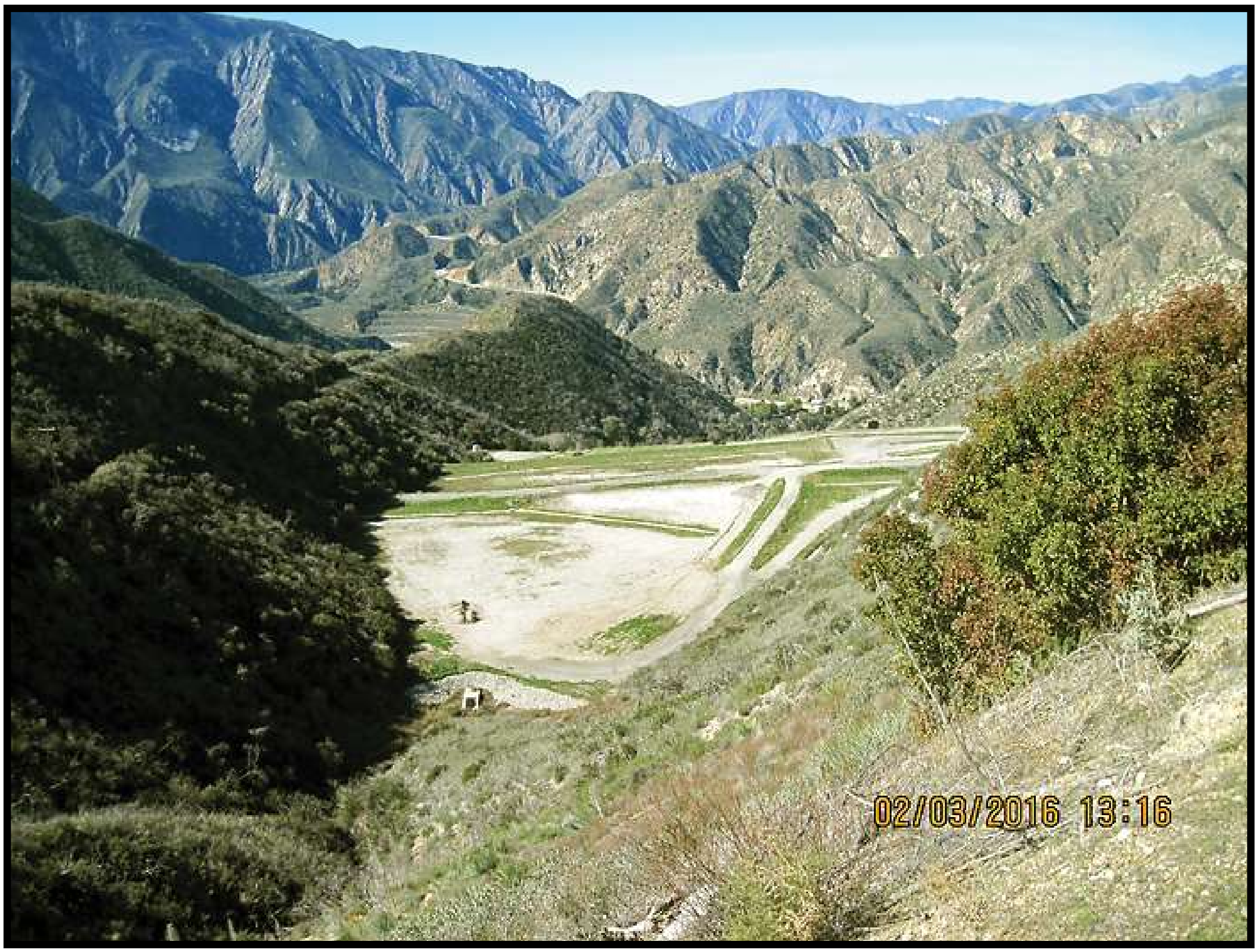
GEOTECHNICAL INVESTIGATION
MAPLE CANYON SEDIMENT PLACEMENT SITE

BIG TUJUNGA RESERVOIR SEDIMENT REMOVAL PROJECT

GEOTECHNICAL INVESTIGATION

MAPLE CANYON SEDIMENT PLACEMENT SITE

BIG TUJUNGA RESERVOIR
SEDIMENT REMOVAL PROJECT



COUNTY OF LOS ANGELES
PUBLIC WORKS
Public Service That Works

GEOTECHNICAL INVESTIGATIONS

GEOTECHNICAL AND MATERIALS

ENGINEERING DIVISION

January 31, 2018

TO: Christopher Stone
Stormwater Engineering Division

Attention Alex Ho

FROM: Greg Kelley Greg Kelley
Geotechnical and Materials Engineering Division

GEOTECHNICAL INVESTIGATION
MAPLE CANYON SEDIMENT PLACEMENT SITE
BIG TUJUNGA RESERVOIR SEDIMENT REMOVAL PROJECT
PROJECT ID WRDD000028 (PROJECT NO. HF00710003)

In accordance with your request dated August 23, 2012, we conducted a geotechnical investigation for the subject project. The conclusions and recommendations from the investigation are included in the attached report.

If you have any questions regarding this matter, please contact Karen Mendez at Extension 7896.

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GEOTECHNICAL INVESTIGATION
MAPLE CANYON SEDIMENT PLACE SITE
BIG TUJUNGA RESERVOIR
SEDIMENT REMOVAL PROJECT

ANGELES NATIONAL FOREST
UNINCORPORATED LOS ANGELES COUNTY

Prepared for

County of Los Angeles
Department of Public Works
Stormwater Engineering Division

Prepared by

County of Los Angeles
Department of Public Works
Geotechnical and Materials Engineering Division

January 31, 2018

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INTRODUCTION

This report documents a geotechnical investigation performed at the Maple Sediment Placement Site (SPS) located within the Angeles National Forest approximately 10 miles east-northeast of the unincorporated community of Sunland (Figure 1). It was approved as a 68-acre SPS by the United States Forest Service (USFS), effective July 1, 1981, following completion of an Environmental Assessment. The total fill capacity of Maple Canyon SPS is approximately 12 million cubic yards (mcy) and it was initially designed to be filled in five phases over 50 years and remain in operation until 2031. The currently proposed grading will be Phase 3.

Sediment removed from Big Tujunga Reservoir will be mechanically compacted to modern standards and hauled to the site with trucks, which were mechanically compacted to modern standards. Survey Division sounded the reservoir in 2011 and determined that approximately 2 mcy of sediment had accumulated. An additional 2.4 mcy is anticipated to accumulate in the reservoir owing to the 2009 Station Fire that burned 87 percent of the reservoir's watershed tributary. Thus, approximately 4.4 mcy of sediment will be placed at the Maple SPS over its construction span of 4 years.

Cleanout activities at Big Tujunga Reservoir are required to provide sufficient capability to protect downstream lives and property from the recurring threat of floods. These cleanouts restore reservoir capacity which provides greater flood control and water conservation capabilities.

SCOPE OF WORK

The scope of work for this investigation included the following:

1) Review of topographic, geologic, and hydrogeologic data pertinent to the site, as well as analysis of oblique and stereoscopic aerial photographs (see References).

2) Geotechnical observations at the site.

3) Completing six hollow-stem auger borings to depths of 26 to 45 feet below ground surface (bgs). Boring logs are presented in Appendix A and boring locations are shown on Plate 1.

4) Completing 22 backhoe trenches to a maximum depth of 10 feet. Trench logs are presented in Appendix B and trench locations are shown on Plate 1.

5) Lithologic logging of the borings and trenches by the visual-manual method.

6) Sampling of the borings at 5-foot intervals and geotechnical laboratory testing of select soil samples to determine shear strength and other index properties. A summary of the laboratory test results is presented in Appendix C.

7) Preparing this report describing the investigation and presenting our professional opinions, conclusions, and recommendations.

SITE DESCRIPTION

Maple Canyon has a length of approximately 1 mile and descends from 4,000 feet above sea level (asl) to 2,050 feet asl in Big Tujunga Canyon in the western San Gabriel Mountains. Big Tujunga Canyon Road crosses the canyon at 2,200 feet asl. The overall slope gradient is 20˚ (37 percent slope) and varies from 11˚ (20 percent slope) in the area of the SPS to 40˚ (84 percent slope) above Angeles Forest Highway. Side slopes vary from about 2:1 (26˚) to near vertical. The upper canyon is split into two drainages that are west and southwest draining; the main canyon drains to the west-northwest. The entrance to Maple Canyon SPS is directly across from the entrance to Big Tujunga Dam.

The existing fill varies in elevation from 2,350 asl at the toe, 600 feet east of Big Tujunga Canyon Road, to a working pad at 2,800 asl. The pad supports drainage structures and varies in elevation from the front at 2,800 feet asl to the back at 2,843 feet asl. Three debris basins are located at the upper eastern edge of the fill where the basins intercept overland flow from the three major drainages and direct the flow through buried drains to the toe. A paved, 20-foot-wide road winds up the fill with five switchbacks. Interspersed with the road are 20 drainage benches. Between benches, slopes are 2:1 (H:V); the fill has an overall gradient of 3.8:1 (14.5˚). Relief between the top of the fill and Angeles Forest Highway varies from 338 feet to 469 feet.

PROPOSED ENGINEERED FILL

The proposed engineered fill in the SPS is approximately 380 feet high with slope gradients of 2:1 (H:V) and an overall gradient of 3:1. Terrace drains will be 15 feet wide and spaced vertically every 25 feet. A 20-foot-wide access road that winds up the slope face will be extended to the top of the fill. Eventually the top of the SPS slope will approximate the elevation of Angeles Forest Highway and the Clear Creek Truck Trail, as shown on Plate 2.

SITE HISTORY

This narrative is based on review of oblique and stereoscopic aerial photographs maintained in our files (Langsner, 1956, Robinson, 1977, 1991) and materials provided by Stormwater Engineering Division. This narrative is provided because spill fill from three phases of road construction will be encountered during clean out and fill placement in upper Maple Canyon SPS. Lower Maple Canyon was filled during the first reservoir sediment removal project in 1968-1970. The first road into the area was the Edison Pole Road (currently Forest Service Road 3N27 north of Big Tujunga Canyon Road). This road was built in the 1920s to construct and maintain the power line across the San Gabriel Mountains (Langsner, 1956). It ran up Arroyo Seco, turned west on the south side of Josephine Peak, then turned northward into upper Maple Canyon. It then crossed Big Tujunga Canyon ¾-mile above the reservoir and approximately 1.3 miles northeast of the dam. By 1938, an access road to the dam had been graded from the Edison Pole Road through Maple Canyon and to the top of the left abutment. This access road is known as the Clear Creek Truck Trail (CCTT) (Figure 2 and Plate 1). Angeles Forest Highway (AFH) was under construction and the only section in the vicinity of the dam not completed in June 1938 was in upper Maple Canyon. AFH followed the Edison Pole Road in the vicinity of the dam, but in Maple Canyon the Edison Pole Road was higher on the slope. The power line crosses the upper part of Maple SPS and the northern end of the reservoir. Spill fill (road construction debris) from the Edison Pole Road, AFH, and CCTT was deposited in the upper slopes of Maple Canyon and will be encountered during grading of the SPS.

The first major road into this part of the San Gabriel Mountains was Angeles Crest Highway (State Route 2) initiated in 1929 and completed in 1956. Road construction reached Red Box, 7 miles southeast of the dam, by 1934. Angeles Forest Highway was constructed westward from Angeles Crest Highway at Clear Creek Station. Big Tujunga Canyon Road (BTCR) (Forest Service Road 3N53) was constructed down the canyon from AFH. By February 1954 the road had reached Maple Canyon where the entrance to the Dam site and Maple Canyon SPS occur. The bridge just south of Big Tujunga Reservoir was built in 1958.

Big Tujunga Dam, a concrete, variable-radius arch dam, was built from February 1930 through July 1931. Access to the dam site was provided by a dirt road following Big Tujunga Canyon Creek with up to 22 stream crossings. The road transitioned to a trail just north of the dam site. Cranes were built on both abutments and a concrete plant was constructed where the plunge pool is today. A foot bridge across the canyon provided access to the abutments. An estimated 50-foot thick layer of alluvium was removed to expose the underlying granitic rock for the dam foundation. The crest of the dam was large enough to drive vehicles across once access was provided around 1938. The dam tenders' houses were constructed on the alluvial fan downstream of the right abutment.

Some 450 homes site existed in the canyon below the dam, but most of these were destroyed by the February-March 1938 flood which crested the dam's spillway. The flow rate was estimated at 50,000 cubic feet per second. Eventually, a high road (BTCR) was built above stream grade. The U.S. Army Corp of Engineers built Hansen Dam downstream to protect the San Fernando Valley from a future 1938-magnitude flood event.

The first clean out of sediment behind the dam started in 1968. Sediments were sluiced through the dam and carried over the dam's right abutment on a conveyor belt system. Access to the reservoir was provided by driving the dam crest and following an unpaved dirt road northeastward across Manzanita Flats. The current north access road was constructed with bull dozers from the dam crest downward to the stream bed from late August through October 1968. As shown on Figure 2, sediments were placed as fill within the canyon downstream of the dam, first in the upper debris disposal area (Fill Area No. 1) followed by the lower debris disposal area (Fill Area No. 2).

The fill areas were constructed on stream sediment within the floodplain and bedrock ridges that caused the creek to meander were excavated. This altered the flow path of the creek by straightening it. The two cuts, northern and southern, are shown on Figure 2 and were completed by January 1970. Fill was moved on the conveyor belt system from the reservoir directly into trucks and then end-dumped at the disposal sites. Eventually four conveyor belts were used. Fill placement at the top of Fill Area No. 2 was achieved by trucking up an access road just north of the current bridge within Breakneck Canyon (see Figure 2). Filling of Maple Canyon, below the current BTCR, started in late 1968 as a part of Fill Area No. 1. The lower fill face of both fill areas along the creek were armored with rip-rap grouted in place. The two fill areas were apparently completed by late 1970. Fill Areas Nos. 1 and 2 have been referred to as the Upper and Lower Debris Disposal Areas and are currently referred to as the Big Tujunga Upper and Lower SPSs, respectively.

During reservoir clean out, the January-February 1969 flood occurred filling the reservoir at the dam with sediment to about ¾-full, destroying the conveyor systems, and significantly increasing the amount of sediment that needed to be removed to restore reservoir storage volume. Large gullies were eroded into the fills. Spillway flow occurred during this storm.

Sediments from the second and third clean outs of the reservoir were placed at the Maple Canyon Debris Disposal Area, currently known as the Maple Canyon Sediment Placement Site (Figure 2). The access road into the reservoir on the left abutment was constructed at about the same time as the two cleanouts to truck sediment from the reservoir to Maple Canyon SPS.

Phase 1 grading of 2.2 mcy of sediment (3,169,610 tons) was officially completed on February 22, 1983, over an area of approximately 14 acres. Phase 2 grading of 1.49 mcy was completed in 1994 and covered an additional 8 acres of the SPS. Fill was placed without removing colluvium and residual soil. Testing of relative compaction and moisture content of the fill was not accomplished. Corrugated steel pipe (CSP) was buried within the fill to direct surface water on and uphill of the fill to the toe of the fill and into Maple Canyon Creek. The debris basin adjacent the east side of BTCR directed water through the Fill Area No. 2 and thus to Big Tujunga Canyon Creek.

The 1983 storms again caused spillway flow and significant erosion of Fill Area No. 1 along the buried 84" CSP and access road. The Maple Canyon Relief Drain was constructed from a new desilting basin west of BTCR, down BTCR, and into the Clear Creek drainage just west of the bridge (Figure 2).

SUBSURFACE EXPLORATION

Exploration of the existing fill consisted of six borings drilled with a hollow stem CME-75 drill rig operated by the Department of Public Works Flood Maintenance Division (FMD), now Stormwater Maintenance Division. The borings were excavated to a maximum depth of 45 feet along the elevation where placement of the proposed fill is anticipated to begin. The borings were drilled to determine if previously placed unclassified fill soils are competent to support the proposed fill.

Exploration to determine the thickness of colluvium on the canyon slopes consisted of 22 backhoe trenches excavated on April 27 and May 31, 2016. A CAT 420F backhoe/front end loader operated by the Department of Public Works FMD was used for the exploration. An attempt to sample the colluvium with hand sampling equipment was unsuccessful, as the sample would not remain in the sampling tube.

Laboratory tests were performed on representative samples obtained during drilling. The approximate location of the borings and trenches are shown on Plate 1.

GEOLOGIC CONDITIONS

The San Gabriel Mountain Range, one of the prominent Transverse Ranges of southern California, is a high, rugged, lens-shaped mountainous area extending from the Newhall Pass eastward about 60 miles to Cajon Pass. Its maximum width of approximately 25 miles is in the central part of the range. The west-northwest draining Maple Canyon is located in the southwest San Gabriel Mountains.

Geologic Structure

The site is located on the Cretaceous-age (90± million years) Josephine quartz monzonite, north of the inactive Maple Canyon Fault and north branch of the San Gabriel Fault (Figure 3). The Maple Canyon Fault has been mapped on Plate 1 just north of the CCTT based on the presence of a transverse drainage on the south wall of the canyon. Thus, the fault and associated intense fracturing, may be encountered during Phase 3 grading and a part of the ultimate fill grading. The quartz monzonite is more weathered south of the fault and removals during benching may encounter highly weathered quartz monzonite.

The inactive north branch of the San Gabriel Fault will not be encountered during grading.

The main geologic structure in Maple Canyon is the fracturing of the bedrock. The rock is closely to moderately fractured, locally intensely fractured, with local and through-going fractures. While joint orientations in the field were taken when accessible (see Plate 1), a regional joint fabric was not discernible.

Bedrock (grd)

According to Dibblee 2002, this basement rock consists of leucocratic plutonic rocks that are nearly white, massive, medium-grained, and composed of quartz, sodic plagioclase, potassic feldspars, and minor biotite mica. This rock intrudes all other plutonic and metamorphic rock in the area.

Local geologic conditions are shown on the Geologic Map (see Plate 1). A rock slide has been mapped above Angeles Forest Highway. It is outside of the areas of proposed grading.

Surficial Materials

The surficial materials that will be encountered and require partial to total removal prior to placing fill (during grading) include thick brush, soil, alluvium, colluvium, and non-engineered spill fill and previously placed fill.

Brush

The southern canyon slope has extensive vegetation owed to its north-facing aspect that allows soil moisture to accumulate on its surface. The very thick brush, including trees, will be a significant construction concern since the vegetation will need to be removed within the limits of grading prior to fill placement. This vegetation will need to be removed offsite since its volume is more than can be accumulated under the 5 percent or less of organic debris specification for the quality of the fill. The rest of the site has vegetation, but not sufficiently thick to represent it as a separate unit on the geologic map.

Soil

Soil mantles the site as residual soil from weathering processes. It is thicker on the southern slope than elsewhere, but is unique except for the rock cliff faces. The material is usually black to brown, finer grain silt and sand, and loose. This material will need to be removed within the limits of grading prior to fill placement.

Alluvium (Qal)

Alluvium presently occurs in the debris basins on the east uphill side of the SPS. This material is grey, fine to coarse grain sand and gravel. This material will need to be removed within the limits of grading prior to fill placement.

Spill Fill (Afs)

There are three spill fills that will be encountered during grading and they are not differentiated on the map, except by location. The spill fill occurs as a result of road construction. Spill fill from the Edison Pole Road was deposited downslope at the head of the canyon. This material was pushed further down slope during construction of Angeles Forest Highway. The highway was constructed by blasting, jack hammering, and pushing the debris over the slopes. This material blankets areas at the head of the canyon and is very coarse and loose (see Plate 1) as it originates from essentially unweathered granitic rock. The spill fills from both roads are not differentiated on the geologic map.

The third spill fill was deposited non-slope from the CCTT. The downslope limit of this fill is estimated since it is obscured by the soil and brush on this slope. This material was not observed, but is considered finer grained than the other spill fills because it originates from the weathered rock south of the Maple Canyon Fault. Spill fills will need to be removed within the limits of grading prior to fill placement.

Non-Engineered Fill (Afn)

Non-engineered fill was placed at the SPS during Phase 1 and 2 grading. This is considered unclassified fill. It is our understanding that compaction and moisture content testing was not performed. Where drilled, the soils consist primarily of silty sands (SM) and poorly graded sands with silt and gravel (SP-SM) in medium dense to dense condition and extend to depths greater than 40 feet. The drilling did not differentiate the underlying colluvium from the non-engineered fill, nor was bedrock encountered.

The non-engineered fill on the fill pad (elevations ~2,800 to 2,850) will need to be over-excavated prior to engineered fill placement. See the Recommendations for the over-excavation requirement.

Colluvium (Col)

Two deposits of colluvium occur at the site. They are only differentiated by position; the thicker deposits are individually mapped, while the material on the slopes are not.

Colluvium occurs on the slopes as a thick residual soil that accumulates owed to weathering of the rock. On the slope faces this material is accumulating as modern deposits. The trench logs contained detailed descriptions where this material was encountered. It is a loose silt to boulder sized gravel. This material will need to be removed within the limits of grading prior to fill placement.

Very thick deposits occur in the upper canyons above the fill pad and below the non-engineered fill. Mapping of the deposits beneath the fill is based on aerial photographic analysis (see References). These deposits are Pleistocene in age (11,000 years to 1.6 million years) and are equivalent to the Older dissected gravel (Qog) mapped just north of Maple Canyon by Dibblee, 2002. This material filled the canyon and was then dissected by stream erosion (blue dashed lines on the Geologic Map).

In the upper canyons, this material is up to 30 feet thick and may have to be removed within the limits of grading prior to fill placement. Exploration and testing will be required of the colluvium to determine if it can be left in place during grading when access to the steep slopes can be provided. During trenching, an unsuccessful attempt was made to obtain a sample of the material.

Colluvium will need to be removed within the limits of grading prior to fill placement.

Subsurface Water

Natural seeps or springs were observed at the site in the north-facing slope south of the proposed SPS (see Plate 1); however, groundwater was not encountered in the exploratory borings or trenches. The broken crystalline granitic bedrock to the south of the proposed SPS is permeable enough to absorb rainwater. During and shortly after rainfall, water may infiltrate into the slope, percolate along the fractures and slowly flow as subsurface water into the fill and eventually to Big Tujunga Canyon Creek.

Seismic Ground Motion

Since strong ground motion from earthquakes is anticipated at the site within the lifespan of the proposed fill, it has been considered during analysis, and should be considered during design. In the event of a large earthquake on any of the nearby active faults, permanent ground deformation over a large area is likely to occur consisting of lateral and/or vertical movement. Potential constraints requiring mitigative design for the project resulting from permanent ground deformation have not been evaluated by the geotechnical engineer.

STABILITY ANALYSES

The existing non-engineered fill has an overall gradient of 3:1, local slopes were constructed at a gradient of 2:1 or less. Based on the County Grading Code, gross stability analysis is not required. The existing fill is considered statically and seismically stable, as is the proposed fill provided our recommendations are followed.

Surficial Stability

Based on occurrences at other SPS sites, localized surficial failures within the outer 4 feet of the proposed fill slope are likely to occur during and after major rain events; therefore, surficial stability analysis is not provided for this project. Soil materials from surficial failures may be collected onsite and reused as necessary.

CONCLUSIONS

The proposed project is feasible from a geotechnical standpoint.

The existing non-engineered fill is suitable for support of the proposed engineered fill.

The proposed fill slopes will have adequate gross stability factors of safety, provided our recommendations are implemented.

Surficial erosion and localized surficial failures may be anticipated following intensive rainfall. Based on the remote and isolated conditions of the site, surficial failures should not adversely affect any offsite properties.

RECOMMENDATIONS

Maximum gradient of the fill slope should be 2:1 (H:V).

Drainage benches should be at least 15 feet wide and constructed every 25 vertical feet or less. Drainage benches may be combined with the access road to achieve surface drainage.

It is recommended that surficial stability be mitigated with routine maintenance.

Preliminary and final design plans and specifications should be submitted to GMED for review and approval in order to verify that our recommendations have been incorporated into the plans.

A representative from GMED should be invited to the preconstruction meeting.

Geotechnical observations should be made by qualified personnel during construction to confirm anticipated conditions or to make appropriate recommendations where conditions deviate. If GMED is to provide construction observations, please contact us at (626) 458-4925, at least two (2) weeks prior to the start of work for foundation excavations and grading.

At the completion of grading construction, a final survey map, a fill compaction report, and an as-graded geological map shall be prepared based on information obtained during grading.

Benching

Prior to the placement of engineered fill, the canyon slopes shall be benched (excavated) to expose bedrock. Benches shall be approximately 4 feet high vertically and create a flat bench upon which the fill will be compacted. This operation is meant to remove unsuitable materials, including but not limited to, vegetation, alluvium, residual soil, colluvium, spill fill, non-engineered fill, and any other material not deemed suitable for support of engineered fill by the project geotechnical engineer.

Prior to Fill Placement

The existing non-engineered fill shall be over-excavated 3 feet below current grade, scarified to a depth of 1 foot, and recompacted to 90 percent relative compaction within 2 percent of optimum moisture. Compaction testing shall be completed prior to fill placement to verify compliance with the specification.

Sediments within the debris basins must be removed from rock prior to placement of engineered fill.

Fill Quality

The organic content of the fill must be less than 5 percent by volume and not contain concentrations of organics such as tree trunks. Organics may be removed during fill placement by on-site pickers and must be properly disposed of off-site.

The fill shall contain rocks no larger than 6 inches in diameter unless the rocks are wind rowed. Wind rowed rocks shall be placed in a shallow trench a minimum of one diameter apart, covered with dirt, and jetted with water to force fine grained material around each rock.

Sediments from the reservoir may have higher water content during weighing and transport than suitable for use in engineered fill. Wet soils must be dried out prior to placement or blended with dry soil to achieve the appropriate moisture content.

Fill Placement

Fill shall be constructed as an engineered fill. The fill should be placed in loose lifts not exceeding 8 inches in thickness, moisture conditioned as necessary, and mechanically compacted to 90 percent relative compaction within 2 percent of optimum moisture in accordance with ASTM D1557.

Construction of the Fill Slope Face

Two methods may be used to construct the fill slope face. The slope face may be overbuilt at least 2 horizontal feet from final grade and then trimmed back to a compacted core at grade. The fill may be placed at grade and mechanically compacted with a sheepsfoot roller on the back of a dozer at least every 4 vertical feet.

Whichever method is used, fill slope compaction testing will be conducted to determine compliance. The contractor will have to excavate and recompact all parts of the fill slope face that do not meet the compaction specifications.

Quality Control Observations and Testing

In-grading quality control observations must be made by California-licensed geologists and geotechnical engineers on a continuous to periodic basis as conditions warrant.

Field density tests must be made by a qualified soils technician under the direct supervision of a California-licensed geotechnical engineer. The testing may be completed using the Nuclear Test Methods, ASTM D2922-96 and D3017-88, provided a sand cone test is competed for every ten nuclear gage tests to verify compaction. The sand cone test must follow the ASTM D1556-96 method.

Sufficient density tests shall be taken and recorded per the following specification: at least one test for every 1,000 cubic yards of fill placed and at least one test every 2 feet of vertical fill placement.

Areas with failing density tests shall be reworked by the contractor and retested by the soils technician.

The soils technician will obtain representative samples of each different type of soil and send them to the lab for determination of a maximum per ASTM D1557. A list of the different maximums shall be maintained on-site by the soils technician.

Drainage

Adequate surface drainage should be provided for the proposed fill slope using terrace drains and associated down drains, as well as debris basins and buried drains.

Temporary drainage should be provided during construction. This includes providing adequate inlet structures prior to each rainy season during the lifetime of the project.

Corrosion Potential

During construction, corrosion testing should be performed on selected engineered fill samples. Provisions should be taken to protect concrete structures in contact with the engineered fill.

Construction Considerations

Contractor must identify and protect any structures that will be left in place from damage during grading activities.

A chipper may be used to reduce oversized organic material to chips.

LIMITATIONS

This report has been prepared for the exclusive use of Stormwater Engineering Division for the specific site discussed herein and should not be considered transferable to other sites or projects. In the event that any modification of the design, configuration, or use of the site is planned, the conclusions and recommendations contained in this report are no longer valid.

This study was conducted according to generally accepted geotechnical practice for projects of this magnitude. Our conclusions and recommendations are based on the data available and our interpretation of the data based on our experience and background. Hence, our conclusions and recommendations are professional opinions and are not meant to be a control of nature; therefore, no warranty is herein expressed or implied.

This report may not be duplicated without the consent of the Department of Public Works.

If you have any questions concerning this report, please contact Karen Mendez at (626) 458-7896.

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United States Geological Survey, 1959, Condor Peak Quadrangle, California. Scale 1:24,000.

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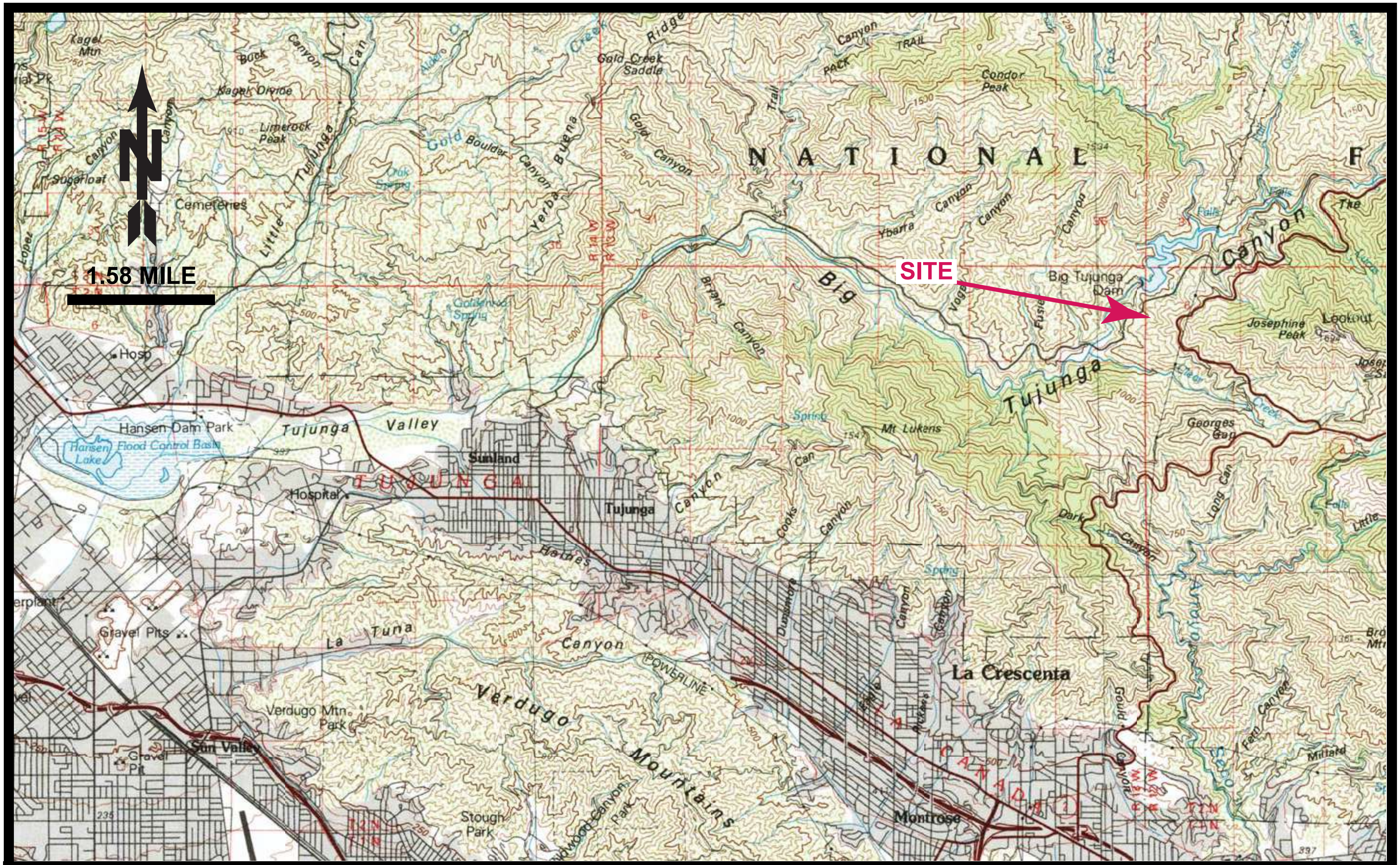
W.R. Wahler and Associates, August 1971, Design and Construction Recommendations for Big Tujunga Dam Debris Disposal Project.

Stereoscopic Aerial Photographs

Year	Source	Flight	Frames
1928	Fairchild	C300	F-279, F-280, F248, F249
6/15/1938	USDA	AXJ-52	55-56
2/3/1954	USDA	AXJ-15K	127-128
1973	U2	73-036	133-135
2/23/1970	American Aerial	70125	1-3
8/29/1980	American Aerial	80203	1-5
5/5/2010	RBF	10-1393	1-1 to 1-5, 2-1 to 2-3

FIGURES



GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

Location Map

Maple Canyon Sediment Placement Site

Digitized by R. Larson

5/5/16

Figure 1

GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

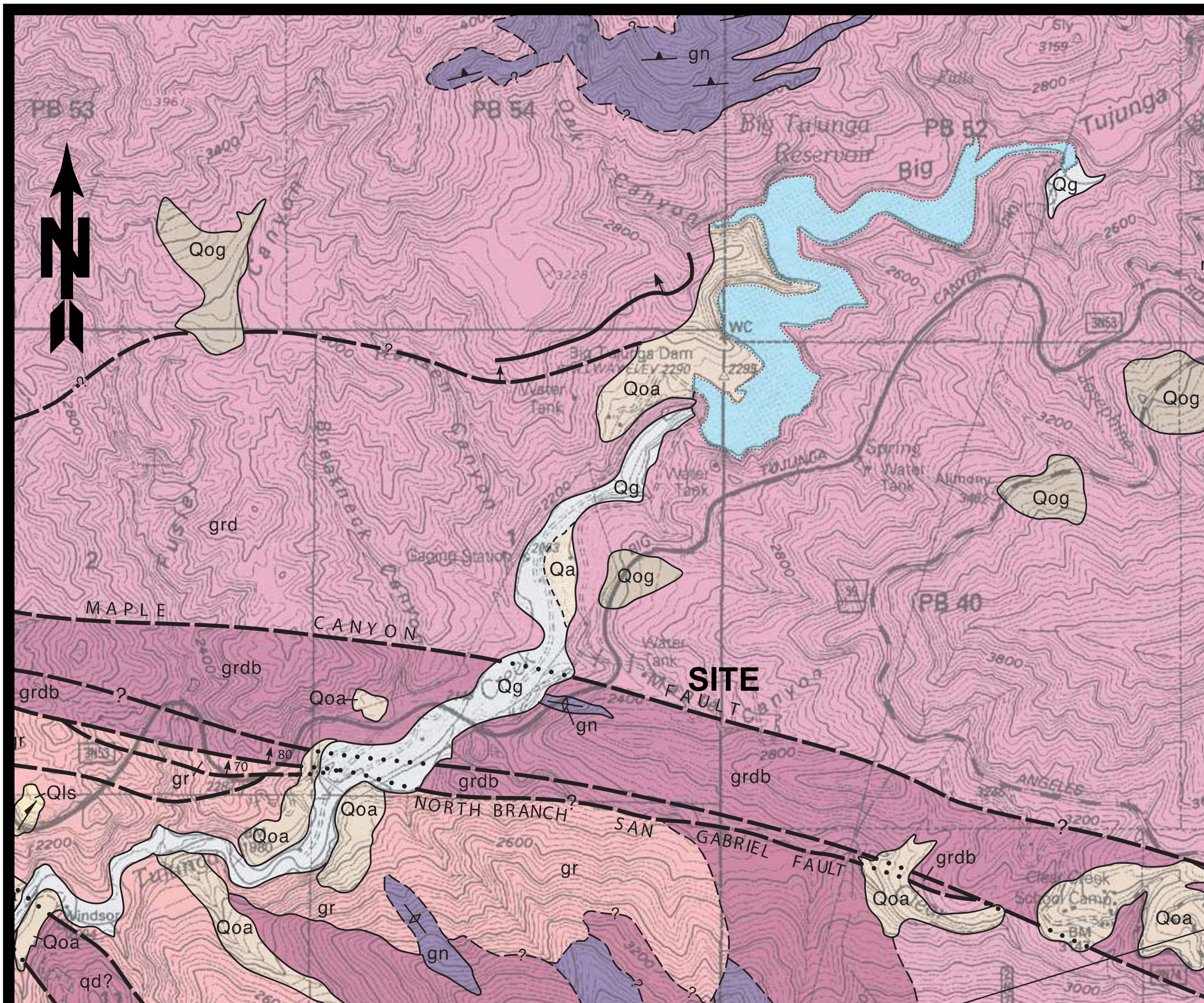
Regional Vicinity Photo

Maple Canyon Sediment Placement Site

Digitized by **R. Larson**

5/5/16

Figure 2



Legend

Surficial sediments
Qa - stream alluvium
Qg - stream gravel
Qls - landslide
Qoa - older dissected alluvium
Qog - older dissected gravel

Basement rock
gr - quartz monzonite
grd - Josephine quartz monzonite
grdb - Josephine quartz monzonite, weathered
gn - gneiss

Scale: 1 inch = 2000 ft.

Dibblee, T.W. Jr. and Carter, B., 2002, Geologic Map of the Condor Peak Quadrangle, Los Angeles, California

GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

Regional Geologic Map

Maple Canyon Sediment Placement Site

Digitized by R. Larson

5/5/16

Figure 3

APPENDIX A

BORING LOGS

Project: Big Tujunga Dam and Reservoir Sediment Removal	SUMMARY LOG OF BORING AND SAMPLING
Project Location: Maple SPS	Los Angeles County Department of Public Works
PCA: HF00710003 — Monitoring Well Installed: Yes / (No)	Geotechnical and Materials Engineering Division

Boring No.: B-1A	Date(s) Drilled: 1/24/12	Logged by: O. Cruz	Boring Diameter 6.5 in.	Ground Elevation N/A ft.	Page 1 of 2
Station No./ Boring Location: Plate 1		Drilled by: FMD	Hammer Weight 140 lbs.	Total Depth 31 ft.	Depth to Invert N/A ft.
Long/ Lat: N/A		Drilling Method/ Equipment: Hollow Stem	Drop Height 30 in.	Depth to Groundwater N/A ft.	Depth to Bedrock N/A ft.

DEPTH (FEET)	FIELD DATA: Sample No.	Drive/Bulk	Blow Count (per 6 in.)	Comments/ Interpretations/ Attitudes/ PID - PPM	Graphic Log / Lithology	DESCRIPTION AND/OR LITHOLOGIC DESCRIPTION	USCS	In-situ γ_d (pcf)	In-situ MC (%)	Sieve % Passing No. 4	Sieve % Passing No. 200	Type of Tests
0						SILTY SAND medium dense, medium brown, dry, some gravel 1.5" to 3"	SM					
5	1R	Drive	4 10 14			@5': thin sandy layer with few gravel, light brown		111.2	9.9			
	2B	Bulk				@7': black, trace of organic odor						
10	3R	Drive	12 18 25			Poorly-graded SAND with SILT and GRAVEL dense, medium brown to grey, fine gravel	SP-SM					
15	4R	Drive	11 15 25			@15': moist, coarse gravel, trace of organics, granitic fragments						
	5B	Bulk										
20	6R	Drive	13 19 30									
25	7R	Drive	20 50/2"			@25': very dense, decrease in silt content, moist, gray to dark brown, increase in coarse gravel, granitic fragments						

LEGEND

California Ring (2.5 in. OD) Sample
California Ring (3 in. OD) Sample
SPT (2 in. OD) Sample
Bulk Sample
Depth to invert
Seepage Encountered During Drilling
Groundwater Encountered During Drilling
Distinct Contact
Gradational or Uncertain Contact
γ_d - Dry Density
MC - Moisture Content

Types of Tests

AT - Atterberg Limits	HY - Hydrometer
CO - Consolidation	MD - Maximum Density
CR - Corrosion	SA - Sieve Analysis
DS - Direct Shear	SE - Sand Equivalence
EI - Expansion Index	TR - Triaxial

Note: This log contains observations and interpretations that are valid only for the specific date and location of the boring. Subsurface conditions vary between borings and with time. Material descriptions are derived using visual classification methods and may vary from descriptions/classifications based on laboratory testing.

Project: Big Tujunga Dam and Reservoir Sediment Removal	SUMMARY LOG OF BORING AND SAMPLING
Project Location: Maple SPS	Los Angeles County Department of Public Works
PCA: HF00710003 — Monitoring Well Installed: Yes / No	Geotechnical and Materials Engineering Division

Boring No.: B-1A	Date(s) Drilled: 1/24/12	Logged by: O. Cruz	Boring Diameter 6.5 in.	Ground Elevation N/A ft.	Page 2 of 2
Station No./ Boring Location: Plate 1		Drilled by: FMD	Hammer Weight 140 lbs.	Total Depth 31.5 ft.	Depth to Invert N/A ft.
Long/ Lat: N/A		Drilling Method/ Equipment: Hollow Stem	Drop Height 30 in.	Depth to Groundwater N/A ft.	Depth to Bedrock N/A ft.

DEPTH (FEET)	FIELD DATA: Sample No.	Drive	Bulk	Blow Count (per 6 in.)	Comments/ Interpretations/ Attitudes/ PID - PPM	Graphic Log / Lithology	DESCRIPTION AND/OR LITHOLOGIC DESCRIPTION	LABORATORY TESTING: USCS	In-situ γ_d (pcf)	MC (%)	Sieve % Passing No. 4	No. 200	Type of Tests
30	8R			22 45 35/1″									
							TD= 31.5′						
35													
40													
45													
50													
55													

LEGEND

California Ring (2.5 in. OD) Sample
California Ring (3 in. OD) Sample
SPT (2 in. OD) Sample
Bulk Sample
Depth to invert
Seepage Encountered During Drilling
Groundwater Encountered During Drilling
Distinct Contact
Gradational or Uncertain Contact
γ_d - Dry Density
MC - Moisture Content

Types of Tests

AT - Atterberg Limits
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Project: Big Tujunga Dam and Reservoir Sediment Removal
Project Location: Maple SPS
PCA: HF00710003
Monitoring Well Installed: Yes / No

SUMMARY LOG OF BORING AND SAMPLING
Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division

Boring No.: B-2A	Date(s) Drilled: 1/24/12	Logged by: O. Cruz	Boring Diameter 6.5 in.	Ground Elevation N/A ft.	Page 1 of 2
Station No./ Boring Location: Plate 1		Drilled by: FMD	Hammer Weight 140 lbs.	Total Depth 31.5 ft.	Depth to Invert N/A ft.
Long/ Lat: N/A		Drilling Method/ Equipment: Hollow Stem	Drop Height 30 in.	Depth to Groundwater N/A ft.	Depth to Bedrock N/A ft.

DEPTH (FEET)	Sample No.	Drive / Bulk	Blow Count (per 6 in.)	Comments/ Interpretations/ Attitudes/ PID - PPM	DESCRIPTION AND/OR LITHOLOGIC DESCRIPTION	USCS	γ_d (pcf)	MC (%)	No. 4	No. 200	Type of Tests
0				surface soils were wet (rained previous weekend)	SILTY SAND medium dense, dark brown, moist	SM					
	1R	Drive	10 17 22								
5	3B	Bulk			@4.5′: granite fragment 2.5″ diameter						
	2R	Drive	8 10 14		@6′: increase in sand content @7′: black, trace of organic material, decrease in moisture						
	4R	Drive	12 16 20								
10	5R	Drive	11 17 21		@10′: trace of granite, a few fine gravel						
15		Drive	21 25/0″	2.5″ rock plugged tip							
	6R	Drive	15 23 31		Poorly graded SAND with GRAVEL dense, grey, moist, coarse sand, fine gravel	SP					
	7B	Bulk									
20	8R	Drive	13 27 31		Poorly-graded SAND with SILT & GRAVEL very dense, increase in gravel content, some silt	SP-SM					
25	9R	Drive	20 20 25		@25′: rock fragments approximately 1″ wide, wet, grey-brown						

LEGEND

California Ring (2.5 in. OD) Sample
California Ring (3 in. OD) Sample
SPT (2 in. OD) Sample
Bulk Sample
Depth to invert
Seepage Encountered During Drilling
Groundwater Encountered During Drilling
Distinct Contact
Gradational or Uncertain Contact
γ_d - Dry Density
MC - Moisture Content

Types of Tests
AT - Atterberg Limits
CO - Consolidation
CR - Corrosion
DS - Direct Shear
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Note: This log contains observations and interpretations that are valid only for the specific date and location of the boring. Subsurface conditions vary between borings and with time. Material descriptions are derived using visual classification methods and may vary from descriptions/classifications based on laboratory testing.

Project: Big Tujunga Dam and Reservoir Sediment Removal	SUMMARY LOG OF BORING AND SAMPLING
Project Location: Maple SPS	Los Angeles County Department of Public Works
PCA: HF00710003 — Monitoring Well Installed: Yes / No	Geotechnical and Materials Engineering Division

Boring No.: B-2A	Date(s) Drilled: 1/24/12	Logged by: O. Cruz	Boring Diameter: 6.5 in.	Ground Elevation: N/A ft.	Page 2 of 2
Station No./ Boring Location: Plate 1		Drilled by: FMD	Hammer Weight: 140 lbs.	Total Depth: 31.5 ft.	Depth to Invert: N/A ft.
Long/ Lat: N/A		Drilling Method/ Equipment: Hollow Stem	Drop Height: 30 in.	Depth to Groundwater: N/A ft.	Depth to Bedrock: N/A ft.

DEPTH (FEET)	FIELD DATA: Sample No.	Drive	Bulk	Blow Count (per 6 in.)	Comments/ Interpretations/ Attitudes/ PID - PPM	Graphic Log / Lithology	DESCRIPTION AND/OR LITHOLOGIC DESCRIPTION	LABORATORY TESTING: USCS	In-situ γ_d (pcf)	In-situ MC (%)	Sieve % Passing No. 4	Sieve % Passing No. 200	Type of Tests
30	10R			14 28 42									
							TD= 31.5′						
35													
40													
45													
50													
55													

LEGEND

California Ring (2.5 in. OD) Sample
California Ring (3 in. OD) Sample
SPT (2 in. OD) Sample
Bulk Sample
Depth to invert
Seepage Encountered During Drilling
Groundwater Encountered During Drilling
Distinct Contact
Gradational or Uncertain Contact
γ_d - Dry Density
MC - Moisture Content

Types of Tests

AT - Atterberg Limits
CO - Consolidation
CR - Corrosion
DS - Direct Shear
EI - Expansion Index
HY - Hydrometer
MD - Maximum Density
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TR - Triaxial

Note: This log contains observations and interpretations that are valid only for the specific date and location of the boring. Subsurface conditions vary between borings and with time. Material descriptions are derived using visual classification methods and may vary from descriptions/classifications based on laboratory testing.

Project: Big Tujunga Dam and Reservoir Sediment Removal	**SUMMARY LOG OF BORING AND SAMPLING**
Project Location: Maple SPS	Los Angeles County Department of Public Works
PCA: HF00710003 — Monitoring Well Installed: Yes / No (circled: No)	Geotechnical and Materials Engineering Division

Boring No.: B-3A — Date(s) Drilled: 1/25/12	Logged by: O. Cruz	Boring Diameter: 6.5 in.	Ground Elevation: N/A ft.	Page 1 of 1
Station No./Boring Location: Plate 1	Drilled by: FMD	Hammer Weight: 140 lbs.	Total Depth: 26.5 ft.	Depth to Invert: N/A ft.
Long/Lat: N/A	Drilling Method/Equipment: Hollow Stem	Drop Height: 30 in.	Depth to Groundwater: N/A ft.	Depth to Bedrock: N/A ft.

DEPTH (FEET)	FIELD DATA: Sample No.	Drive / Bulk	Blow Count (per 6 in.)	Comments/Interpretations/Attitudes/PID - PPM	Graphic Log / Lithology	DESCRIPTION AND/OR LITHOLOGIC DESCRIPTION	USCS	γ_d (pcf)	MC (%)	Sieve % Passing No. 4	Sieve % Passing No. 200	Type of Tests
0						SILTY SAND medium dense, medium brown, dry	SM					
5	1R	Drive	6 10 12			@5': cobble, hard drilling moist, little gravel, black (trace organic) medium dense						
	2B	Bulk										
10	3R	Drive	11 25 25			@10'dense		117.1	9.6			DS
						@14': increase in gravel content, up to 4" wide native soils, dark brown						
15		Drive	5 12 19	no recovery								
20	4R	Drive	20 23 25			Poorly-graded SAND with SILT & GRAVEL dense, light brown, dry, broken up sands, some gravel, little silt	SP-SM					
	6B	Bulk										
25	5R	Drive	16 28 34			@25': weathered bedrock, light brown, dry, granite conglomerate fragments TD= 26.5'		127.0	5.1			DS

LEGEND

California Ring (2.5 in. OD) Sample
California Ring (3 in. OD) Sample
SPT (2 in. OD) Sample
Bulk Sample
Depth to invert
Seepage Encountered During Drilling
Groundwater Encountered During Drilling
Distinct Contact
Gradational or Uncertain Contact
γ_d - Dry Density
MC - Moisture Content

Types of Tests

AT - Atterberg Limits
CO - Consolidation
CR - Corrosion
DS - Direct Shear
EI - Expansion Index
HY - Hydrometer
MD - Maximum Density
SA - Sieve Analysis
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Project: Big Tujunga Dam and Reservoir Sediment Removal Project Location: Maple SPS PCA: HF00710003	Monitoring Well Installed: Yes / No	**SUMMARY LOG OF BORING AND SAMPLING** Los Angeles County Department of Public Works Geotechnical and Materials Engineering Division

Boring No.: B-4A	Date(s) Drilled: 1/25/12	Logged by: O. Cruz	Boring Diameter 6.5 in.	Ground Elevation N/A ft.	Page 1 of 2
Station No./ Boring Location: Plate 1		Drilled by: FMD	Hammer Weight 140 lbs.	Total Depth 41.5 ft.	Depth to Invert N/A ft.
Long/ Lat: N/A		Drilling Method/ Equipment: Hollow Stem	Drop Height 30 in.	Depth to Groundwater N/A ft.	Depth to Bedrock N/A ft.

DEPTH (FEET)	FIELD DATA: Sample No.	FIELD DATA: Drive/Bulk	FIELD DATA: Blow Count (per 6 in.)	Comments/ Interpretations/ Attitudes/ PID - PPM	DESCRIPTION AND/OR LITHOLOGIC DESCRIPTION	USCS	In-situ γ_d (pcf)	In-situ MC (%)	Sieve % Passing No. 4	Sieve % Passing No. 200	Type of Tests
0				rained previous weekend	SILTY SAND medium dense, medium brown, dry	SM					
					@2.5': black (trace organics), moist						
	1R	Drive	8 14 15				120.1	7.5			
5	2R	Drive	10 16 15				96.9	46.4	27	9	SA MD
	4B	Bulk									
	3R	Drive	5 9 10				107.3	11.5			DS
10	5R	Drive	4 4 4		@10': loose lense						
15	6R	Drive	8 16 20		Poorly graded SAND with SILT and GRAVEL dense, dark grey to medium brown, coarse sand and gravel	SP-SM					
	7B	Bulk									
20	8R	Drive	21 35 45		@20': very dense						
25	9R	Drive	6 23 33		@20': increase in gravel content, dense						
	10B	Bulk									

LEGEND

California Ring (2.5 in. OD) Sample
California Ring (3 in. OD) Sample
SPT (2 in. OD) Sample
Bulk Sample
Depth to invert
Seepage Encountered During Drilling
Groundwater Encountered During Drilling
Distinct Contact
Gradational or Uncertain Contact
γ_d - Dry Density
MC - Moisture Content

Types of Tests

AT - Atterberg Limits
CO - Consolidation
CR - Corrosion
DS - Direct Shear
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Project: Big Tujunga Dam and Reservoir Sediment Removal	SUMMARY LOG OF BORING AND SAMPLING
Project Location: Maple SPS	Los Angeles County Department of Public Works
PCA: HF00710003 — Monitoring Well Installed: Yes / (No)	Geotechnical and Materials Engineering Division

Boring No.: B-4A	Date(s) Drilled: 1/25/12	Logged by: O. Cruz	Boring Diameter 6.5 in.	Ground Elevation N/A ft.	Page 2 of 2
Station No./ Boring Location: Plate 1		Drilled by: FMD	Hammer Weight 140 lbs.	Total Depth 41.5 ft.	Depth to Invert N/A ft.
Long/ Lat: N/A		Drilling Method/ Equipment: Hollow Stem	Drop Height 30 in.	Depth to Groundwater N/A ft.	Depth to Bedrock N/A ft.

DEPTH (FEET)	FIELD DATA: Sample No.	Drive	Bulk	Blow Count (per 6 in.)	Comments/ Interpretations/ Attitudes/ PID - PPM	Graphic Log / Lithology	DESCRIPTION AND/OR LITHOLOGIC DESCRIPTION	LABORATORY TESTING: USCS	In-situ γ_d (pcf)	MC (%)	Sieve % Passing No. 4	No. 200	Type of Tests
30	10R			16 25 35			@30': moist, fine gravel						
35													
40	11R			14 41 51			@40': very dense						
							TD=41.5'						
45													
50													
55													

LEGEND

California Ring (2.5 in. OD) Sample
California Ring (3 in. OD) Sample
SPT (2 in. OD) Sample
Bulk Sample
Depth to invert
Seepage Encountered During Drilling
Groundwater Encountered During Drilling
Distinct Contact
Gradational or Uncertain Contact
γ_d - Dry Density
MC - Moisture Content

Types of Tests

AT - Atterberg Limits
CO - Consolidation
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Project: Big Tujunga Dam and Reservoir Sediment Removal Project Location: Maple SPS PCA: HF00710003 Monitoring Well Installed: Yes / No	**SUMMARY LOG OF BORING AND SAMPLING** Los Angeles County Department of Public Works Geotechnical and Materials Engineering Division

Boring No.: B-5A	Date(s) Drilled: 1/26/12	Logged by: O. Cruz	Boring Diameter 6.5 in.	Ground Elevation N/A ft.	Page 1 of 2
Station No./ Boring Location: Plate 1		Drilled by: FMD	Hammer Weight 140 lbs.	Total Depth 45 ft.	Depth to Invert N/A ft.
Long/ Lat: N/A		Drilling Method/ Equipment: Hollow Stem	Drop Height 30 in.	Depth to Groundwater N/A ft.	Depth to Bedrock N/A ft.

DEPTH (FEET)	FIELD DATA: Sample No.	Drive / Bulk	Blow Count (per 6 in.)	Comments/ Interpretations/ Attitudes/ PID - PPM	Graphic Log / Lithology	DESCRIPTION AND/OR LITHOLOGIC DESCRIPTION	LABORATORY TESTING: USCS	In-situ γ_d (pcf)	In-situ MC (%)	Sieve % Passing No. 4	Sieve % Passing No. 200	Type of Tests
0						SILTY SAND medium dense, medium brown, moist	SM					
	2B	Bulk										
5	1R	Drive	9 26 31			Poorly graded SAND with SILT and GRAVEL dense, dark grey to dark brown, moist	SP-SM					
						@9': medium dense, light grey, increase in fine gravel content, coarse-grained sand						
10	3R	Drive	12 16 17					114.1	3.7			
15	4R	Drive	10 13 20									
20	5R	Drive	11 24 26			@20': dense						
25												

LEGEND

California Ring (2.5 in. OD) Sample
California Ring (3 in. OD) Sample
SPT (2 in. OD) Sample
Bulk Sample
Depth to invert
Seepage Encountered During Drilling
Groundwater Encountered During Drilling
Distinct Contact
Gradational or Uncertain Contact
γ_d - Dry Density
MC - Moisture Content

Types of Tests

AT - Atterberg Limits
CO - Consolidation
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Project: Big Tujunga Dam and Reservoir Sediment Removal
Project Location: Maple SPS
PCA: HF00710003

Monitoring Well Installed: Yes / No

SUMMARY LOG OF BORING AND SAMPLING

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division

Boring No.: B-5A	Date(s) Drilled: 1/26/12	Logged by: O. Cruz	Boring Diameter 6.5 in.	Ground Elevation N/A ft.	
Station No./ Boring Location: Plate 1		Drilled by: FMD	Hammer Weight 140 lbs.	Total Depth 45 ft.	Depth to Invert N/A ft.
Long/ Lat: N/A		Drilling Method/ Equipment: Hollow Stem	Drop Height 30 in.	Depth to Groundwater N/A ft.	Depth to Bedrock N/A ft.

DEPTH (FEET)	FIELD DATA: Sample No.	Drive	Bulk	Blow Count (per 6 in.)	Comments/ Interpretations/ Attitudes/ PID - PPM	Graphic Log / Lithology	DESCRIPTION AND/OR LITHOLOGIC DESCRIPTION	LABORATORY TESTING: USCS	In-situ γ_d (pcf)	MC (%)	Sieve % Passing No. 4	No. 200	Type of Tests
30	6R			10 21 30									
35							@35′: hard drilling						
40							@40′: very hard drilling, medium grey, powder-like						
	7B			35/6″	no recovery								
45							TD= 45′						
50													
55													

LEGEND

California Ring (2.5 in. OD) Sample
California Ring (3 in. OD) Sample
SPT (2 in. OD) Sample
Bulk Sample
Depth to invert
Seepage Encountered During Drilling
Groundwater Encountered During Drilling
Distinct Contact
Gradational or Uncertain Contact
γ_d - Dry Density
MC - Moisture Content

Types of Tests

AT - Atterberg Limits
CO - Consolidation
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EI - Expansion Index
HY - Hydrometer
MD - Maximum Density
SA - Sieve Analysis
SE - Sand Equivalence
TR - Triaxial

Project: Big Tujunga Dam and Reservoir Sediment Removal Project Location: Maple SPS PCA: HF00710003 Monitoring Well Installed: Yes / No	**SUMMARY LOG OF BORING AND SAMPLING** Los Angeles County Department of Public Works Geotechnical and Materials Engineering Division

Boring No.: B-6A	Date(s) Drilled: 1/26/12	Logged by: O. Cruz	Boring Diameter 6.5 in.	Ground Elevation N/A ft.	Page 1 of 1
Station No./ Boring Location: Plate 1		Drilled by: FMD	Hammer Weight 140 lbs.	Total Depth 26 ft.	Depth to Invert N/A ft.
Long/ Lat: N/A		Drilling Method/ Equipment: Hollow Stem	Drop Height 30 in.	Depth to Groundwater N/A ft.	Depth to Bedrock N/A ft.

DEPTH (FEET)	Sample No.	Drive / Bulk	Blow Count (per 6 in.)	Comments/ Interpretations/ Attitudes/ PID - PPM	Graphic Log / Lithology	DESCRIPTION AND/OR LITHOLOGIC DESCRIPTION	USCS	γ_d (pcf)	MC (%)	Sieve % Passing No. 4	Sieve % Passing No. 200	Type of Tests
0						SILTY SAND medium dense, medium brown, moist	SM					
5	1R	Drive	20 39 44			@5': very dense, dry, trace gravel						
	2B	Bulk										
10	3R	Drive	17 25 28			@10': black (trace organics), dense						
						@12': dark grey- dark brown, moist						
						Poorly graded SAND with SILT medium dense, dark brown to black, moist	SP-SM					
	5B	Bulk								97.7	50.0	SA MD DS
15	4R	Drive	6 11 15					115.0	13.1			
20	5R	Drive	20 38 50/4"			@20': trace gravel						
						@23': hard drilling						
25	6R	Drive	28 45 25/1"			@25': gravel approximately 2.5" wide						
						TD=26'						

LEGEND

- California Ring (2.5 in. OD) Sample
- California Ring (3 in. OD) Sample
- SPT (2 in. OD) Sample
- Bulk Sample
- Depth to invert
- Seepage Encountered During Drilling
- Groundwater Encountered During Drilling
- Distinct Contact
- Gradational or Uncertain Contact
- γ_d - Dry Density
- MC - Moisture Content

Types of Tests

AT - Atterberg Limits	HY - Hydrometer
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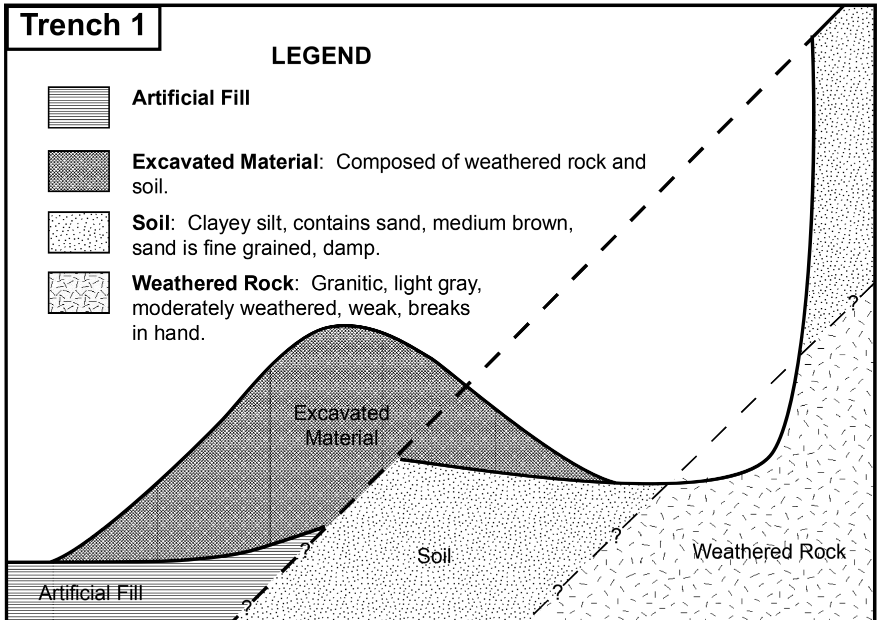
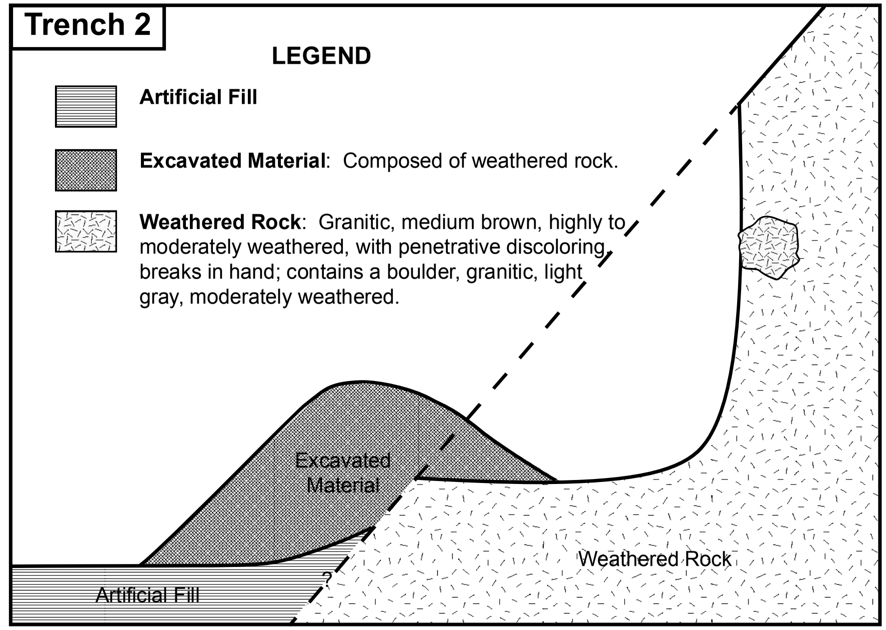
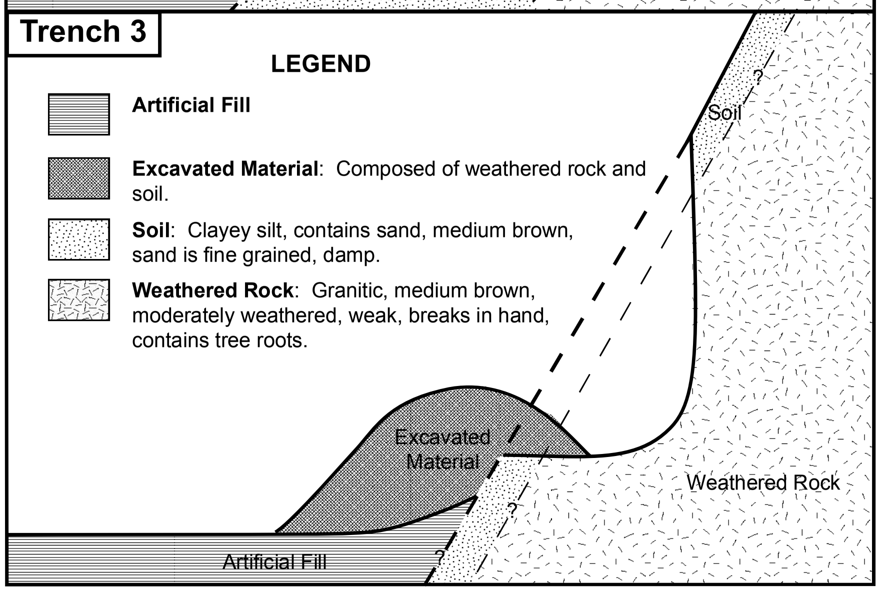
APPENDIX B

TRENCH LOGS







GRAPHIC SCALE

1 inch = 2 feet

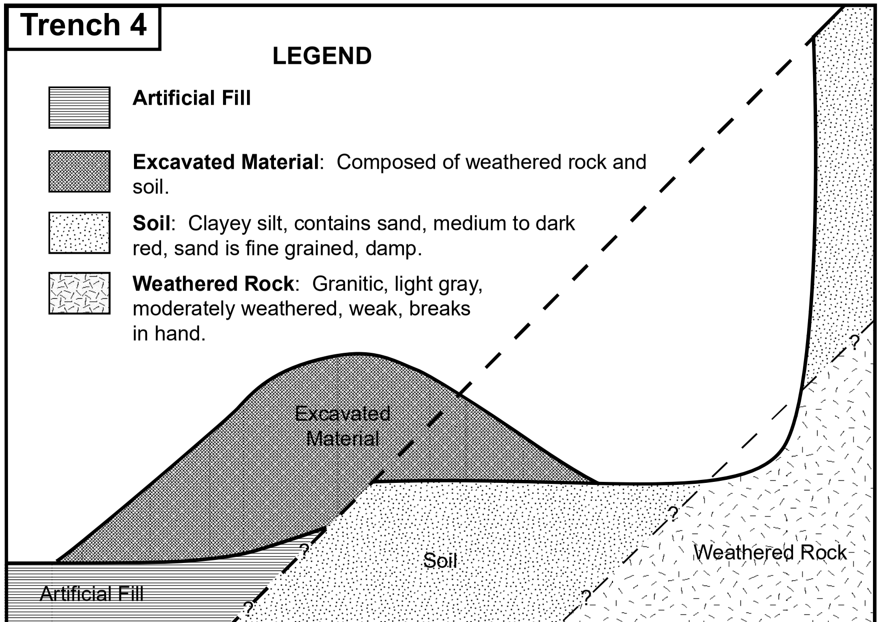
Horiztonal = Vertical

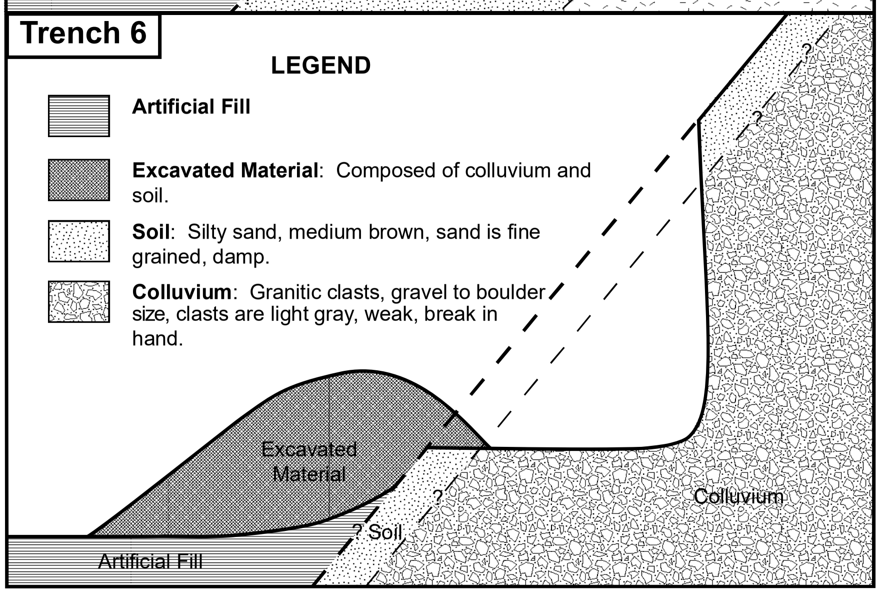
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

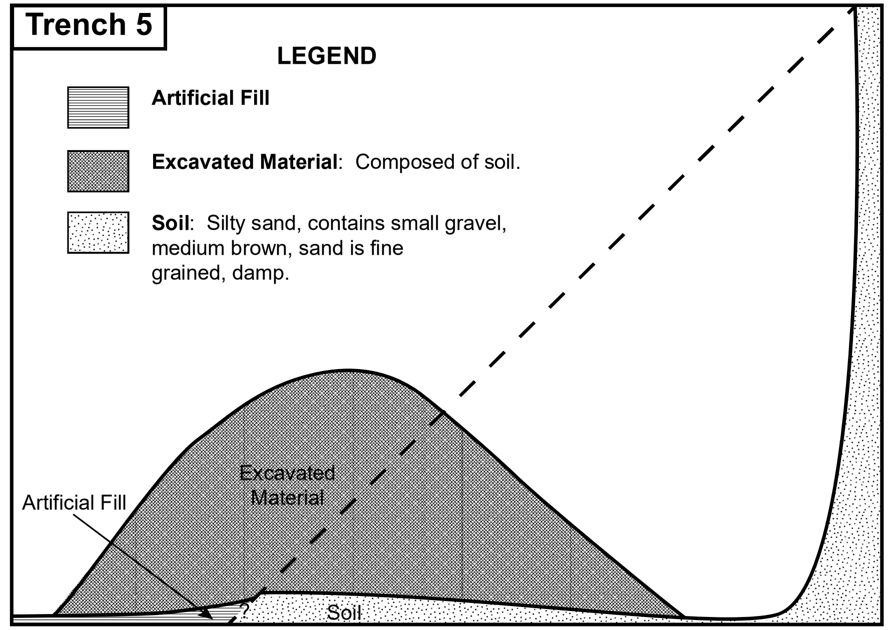
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

TRENCH LOGS 1,2, & 3
Big Tujunga Reservoir Sediment Removal Project
Tujunga, CA

Date: Sept 2016	Drafted by: RLM/RAL	Scale: 1" = 2'	FIGURE 1







GRAPHIC SCALE

1 inch = 2 feet

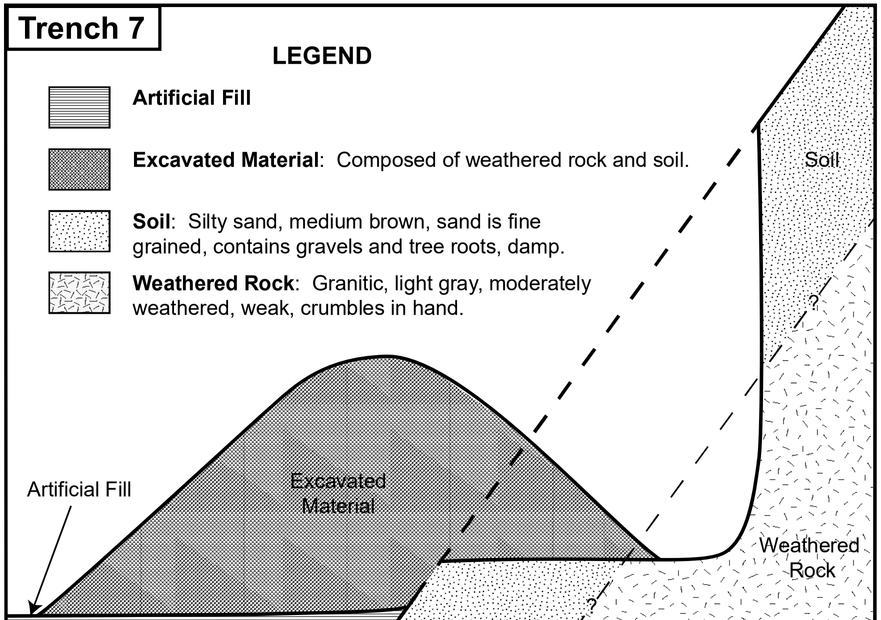
Horiztonal = Vertical

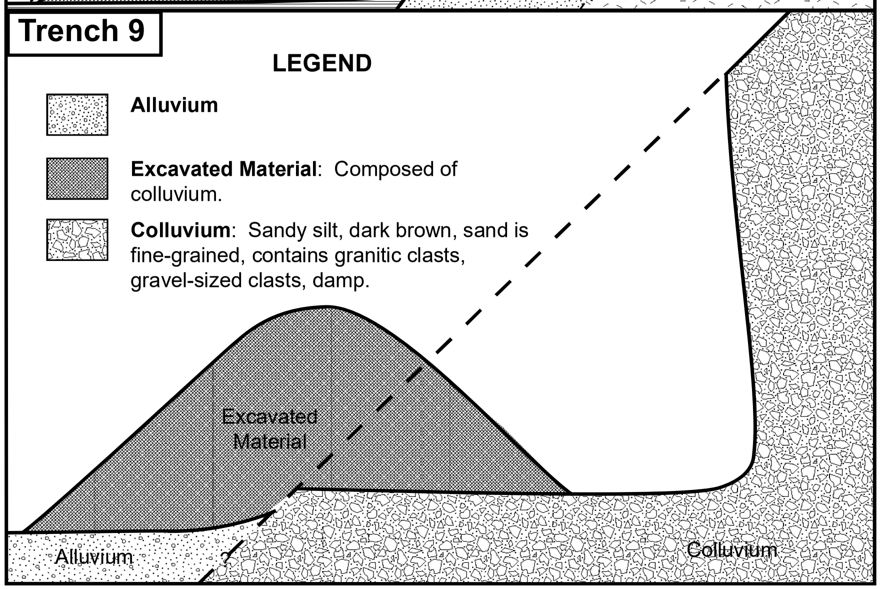
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

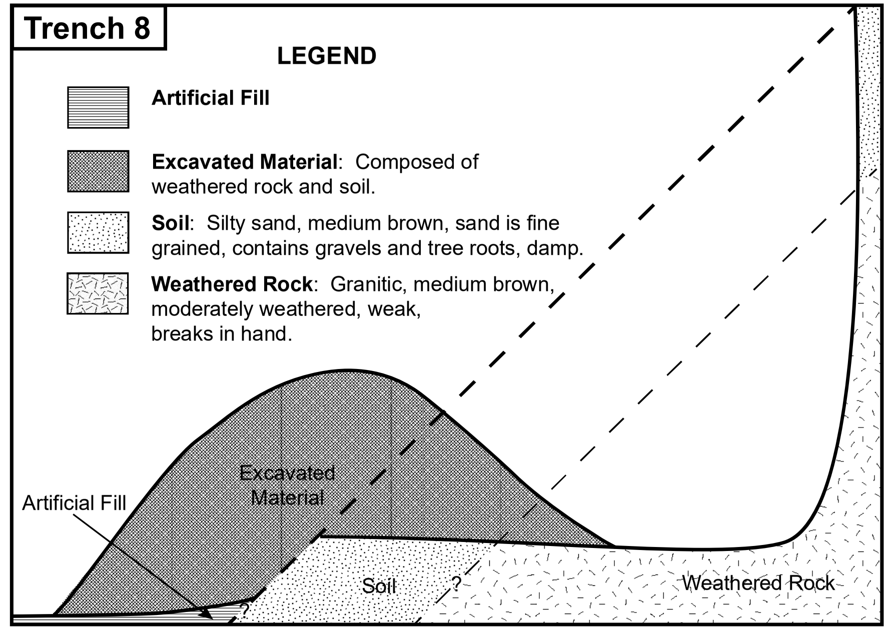
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

TRENCH LOGS 4,5, & 6
Big Tujunga Reservoir Sediment Removal Project
Tujunga, CA

Date: Sept 2016	Drafted by: RLM/RAL	Scale: 1" = 2'	FIGURE 2







GRAPHIC SCALE

1 inch = 2 feet
Horiztonal = Vertical

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

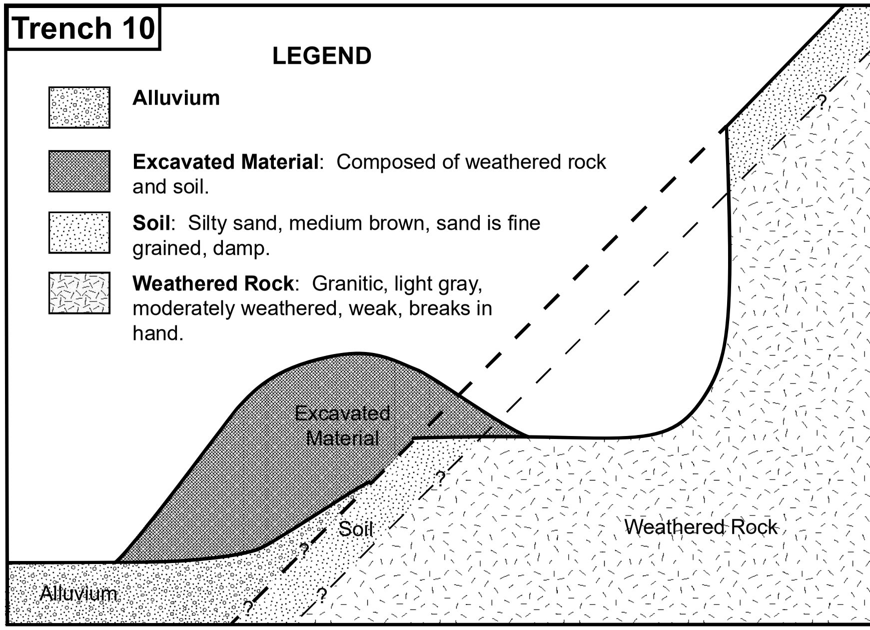
TRENCH LOGS 7, 8, & 9
Big Tujunga Reservoir Sediment Removal Project
Tujunga, CA

Date: Sept 2016	Drafted by: RLM/RAL	Scale: 1" = 2'	FIGURE 3

Trench 10

LEGEND

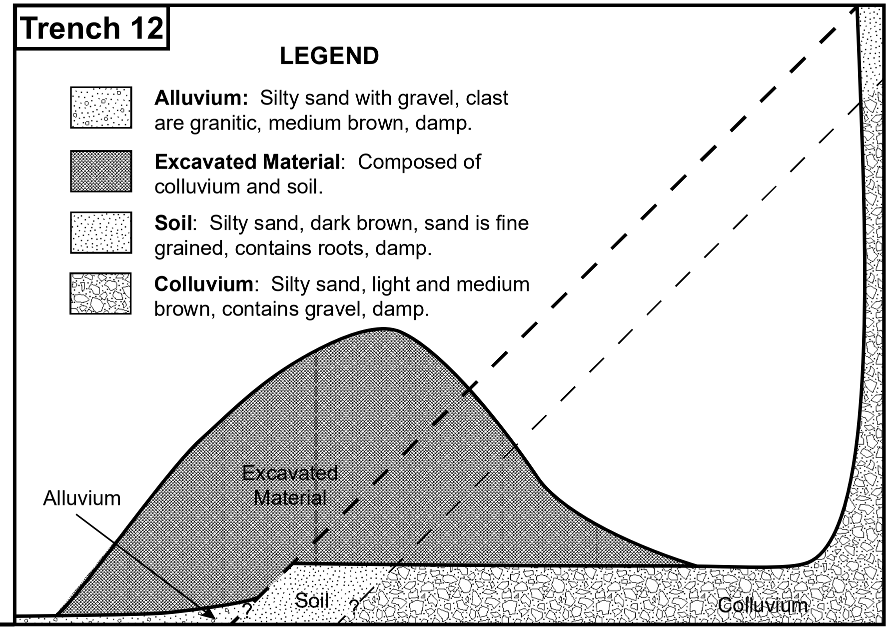
- **Alluvium**
- **Excavated Material**: Composed of weathered rock and soil.
- **Soil**: Silty sand, medium brown, sand is fine grained, damp.
- **Weathered Rock**: Granitic, light gray, moderately weathered, weak, breaks in hand.



Trench 12

LEGEND

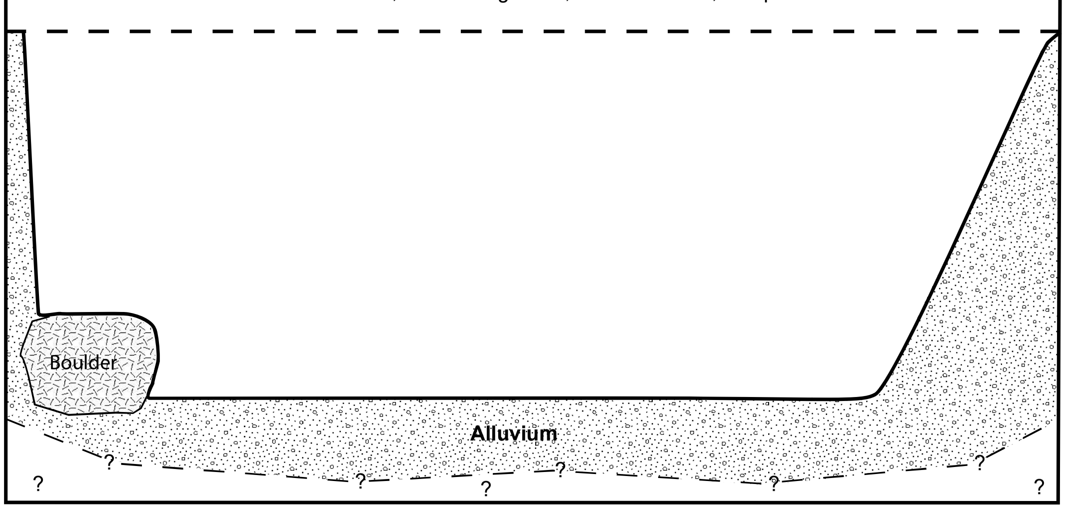
- **Alluvium:** Silty sand with gravel, clast are granitic, medium brown, damp.
- **Excavated Material**: Composed of colluvium and soil.
- **Soil**: Silty sand, dark brown, sand is fine grained, contains roots, damp.
- **Colluvium**: Silty sand, light and medium brown, contains gravel, damp.



Trench 11

LEGEND

- **Alluvium**: Silty sand with gravel, contains some cobbles and one boulder, clasts are granitic, medium brown, damp.



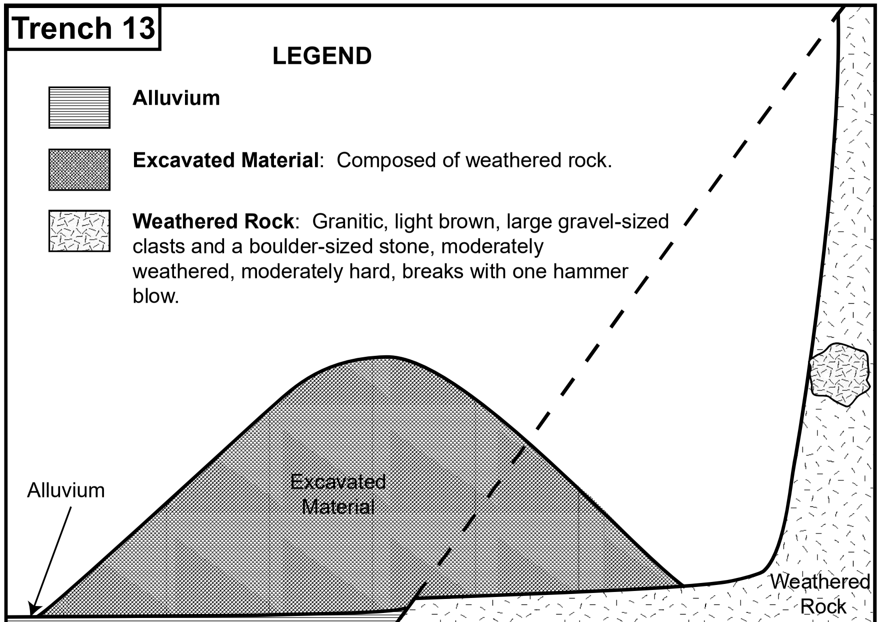
GRAPHIC SCALE

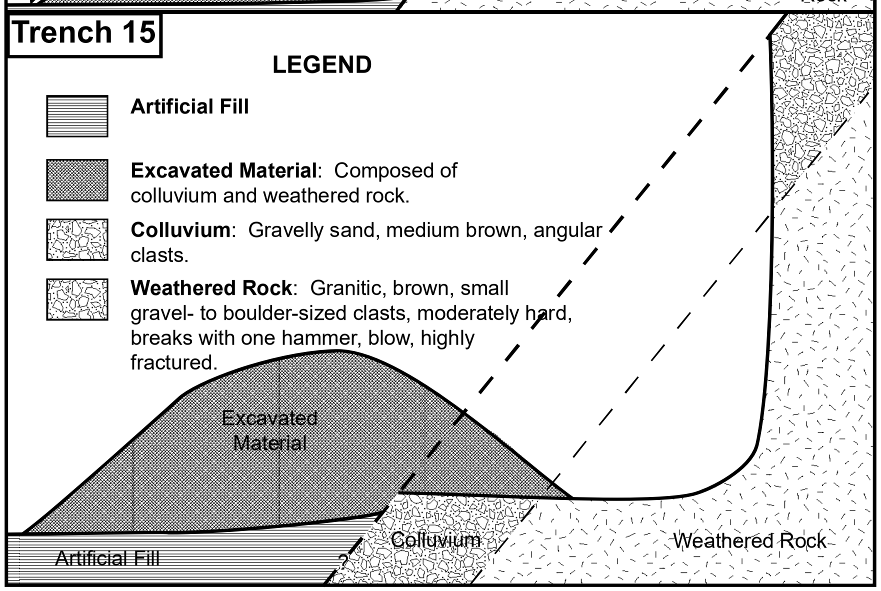
1 inch = 2 feet
Horiztonal = Vertical

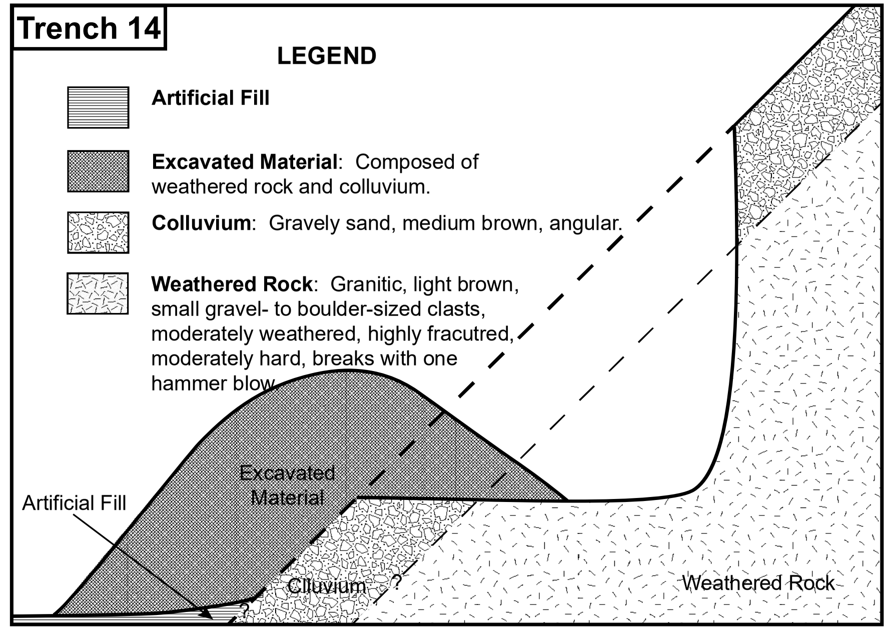
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

TRENCH LOGS 10,11, & 12
Big Tujunga Reservoir Sediment Removal Project
Tujunga, CA

Date: Sept 2016	Drafted by: RLM/RAL	Scale: 1" = 2'	FIGURE 4







GRAPHIC SCALE

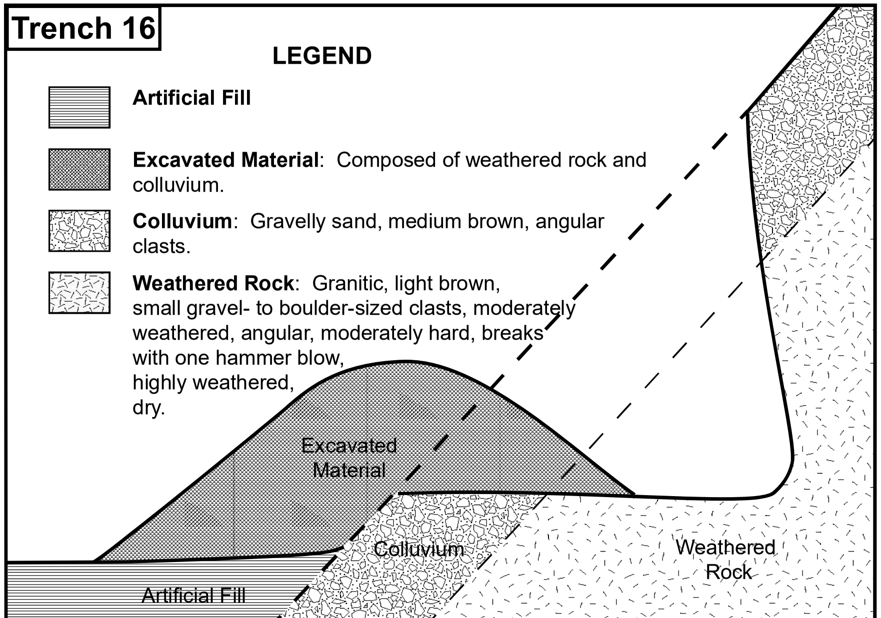
1 inch = 2 feet
Horiztonal = Vertical

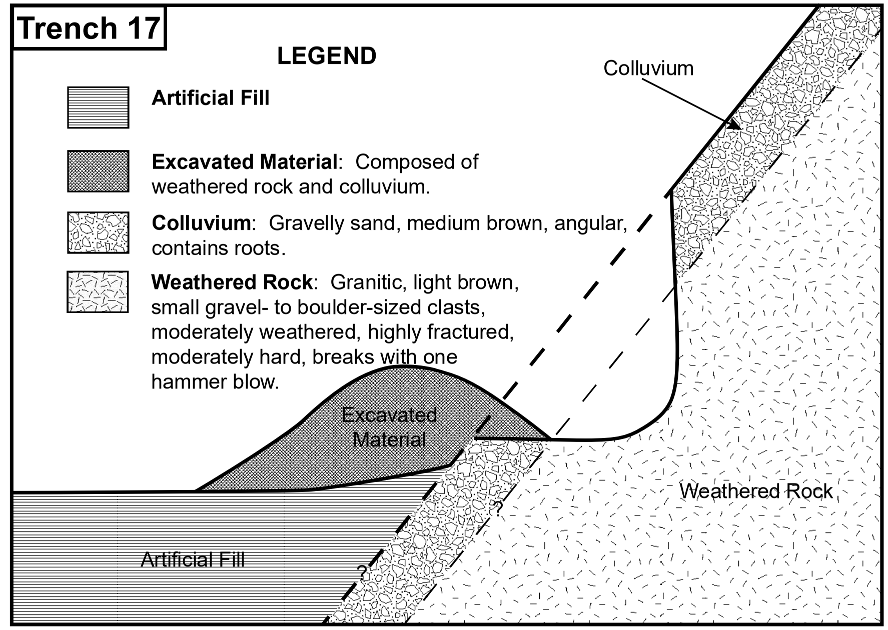
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

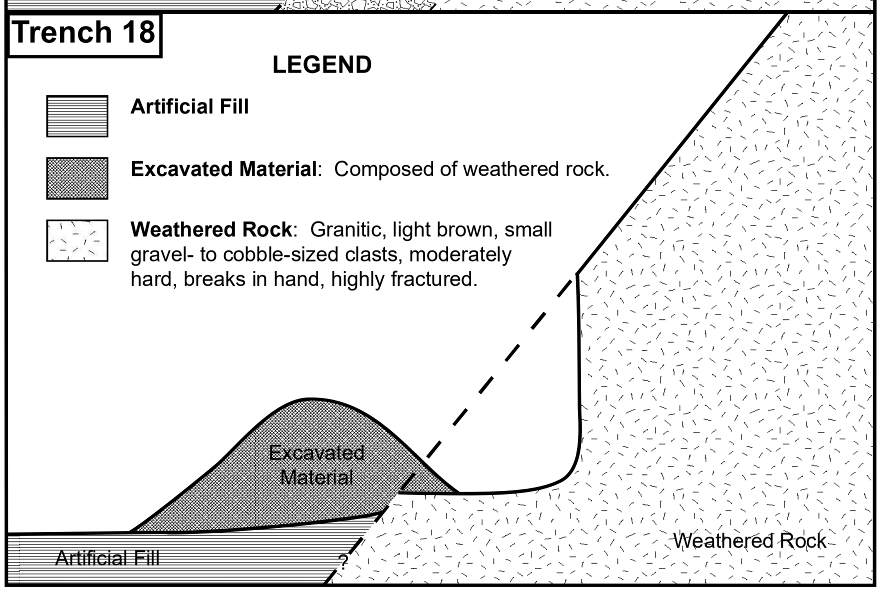
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

TRENCH LOGS 13,14, & 15
Big Tujunga Reservoir Sediment Removal Project
Tujunga, CA

Date: Sept 2016	Drafted by: RLM/RAL	Scale: 1" = 2'	FIGURE 5



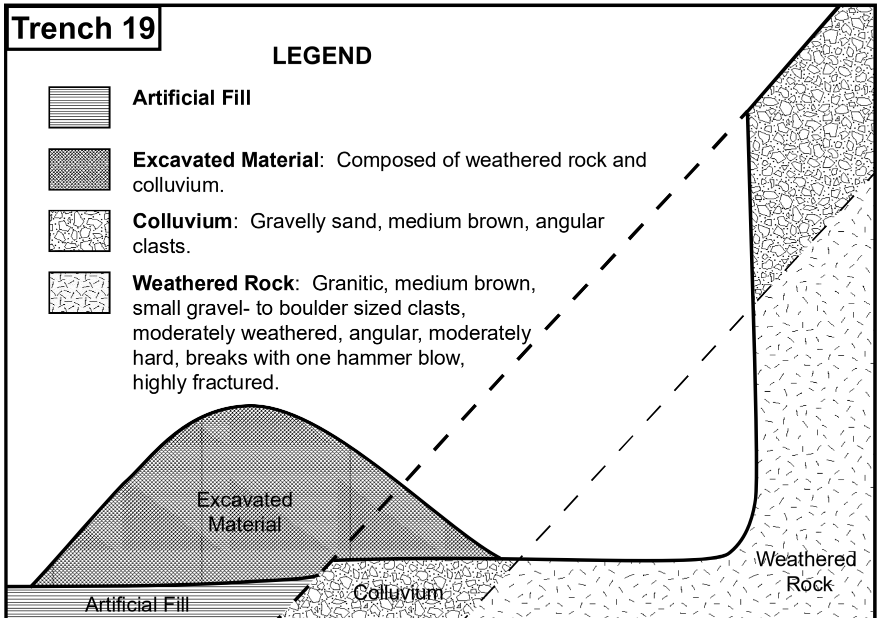


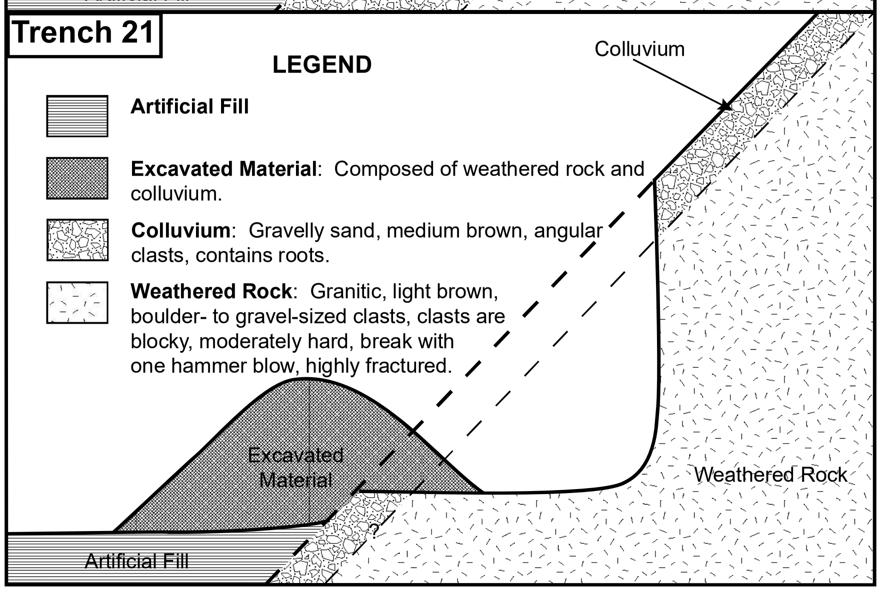


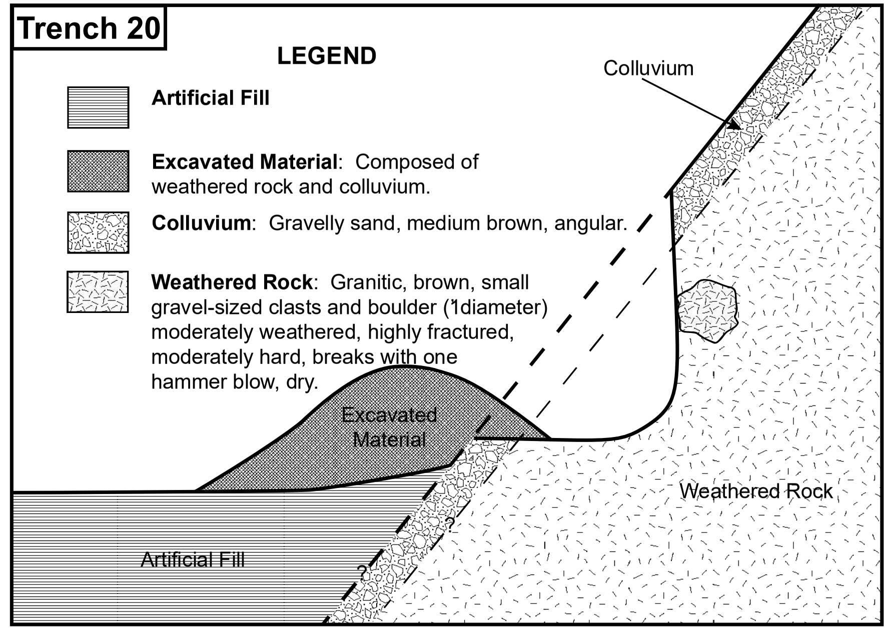
GRAPHIC SCALE

1 inch = 2 feet
Horiztonal = Vertical

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS			
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION			
TRENCH LOGS 16,17, & 18 Big Tujunga Reservoir Sediment Removal Project Tujunga, CA			
Date: Sept 2016	Drafted by: RLM/RAL	Scale: 1" = 2'	FIGURE 6





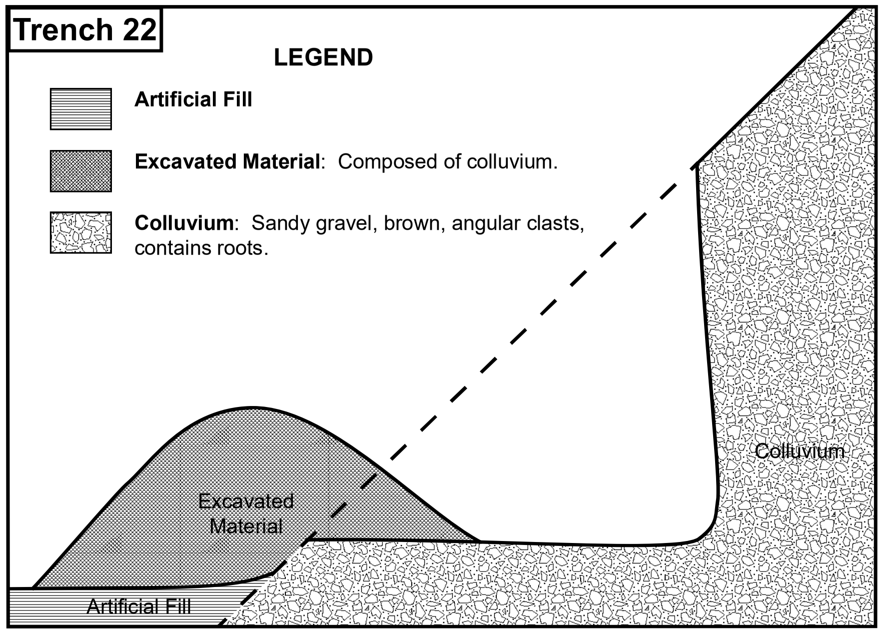


GRAPHIC SCALE
1 inch = 2 feet
Horiztonal = Vertical

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

TRENCH LOGS 19, 20, & 21
Big Tujunga Reservoir Sediment Removal Project
Tujunga, CA

Date: Sept 2016	Drafted by: RLM/RAL	Scale: 1" = 2'	FIGURE 7



GRAPHIC SCALE

1 inch = 2 feet
Horiztonal = Vertical

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

TRENCH LOG 22
Big Tujunga Reservoir Sediment Removal Project
Tujunga, CA

Date: Sept 2016	Drafted by: RLM/RAL	Scale: 1" = 2'	FIGURE 8

APPENDIX C

GEOTECHNICAL LABORATORY RESULTS

SUMMARY OF LABORATORY TEST RESULTS

Geotechnical Laboratory

PROJECT NAME: Big Tujunga Reservoir Cleanout
TECHNICIAN: JA-HA-EH
PCA: HF00710003

ENGINEER: Olga Cruz
DATE: 4/16/2012

BORING/ SAMPLE	DEPTH	UNIFIED SOIL CLASSIFICATION					MOISTURE AND DRY DENSITY				DIRECT SHEAR				CHEMICAL				Permeability
			ATTERBERG LIMITS																
B - S	(ft)	Class.	LL	PI	#4 % Pass	#200 % Pass	γ_{field} pcf	m.c.$_{field}$ %	γ_{bulk} pcf	m.c.$_{optimum}$ %	$\Phi_{ultimate}$ Degree	$c_{ultimate}$ psf	$\Phi_{maximum}$ Degree	$c_{maximum}$ psf	pH	Min. Resistivity (K ohm-cm)	Cl (ppm)	SO_4 (ppm)	(ft/day)
1A-1R	5						111.2	9.9											
1A-2B	7-9																		
3A-3R	10						117.1	9.6			36	0	44	0					
3A-5R	25						127.0	5.1			48	0	49	0					
4A-1R	2.5						120.1	7.5											
4A-4B	4-7	SC	27	9	96.9	46.4			132.8	9.2									
4A-3R	7.5						107.3	11.5			33	0	33	0					
5A-3R	10						114.1	3.7											
6A-5B	12-15	ML	20	3	97.7	50.0			131.0	9.8	36	0	44	0					
6A-4R	15						115.0	13.1											
B2-6R	17'	Top rings					125.7	6.0											
B2-6R	17'	Bott.rings					126.2	3.5											
B3-2B	5-8								128.0	10.5									

SUMMARY OF LABORATORY TEST RESULTS

Geotechnical Laboratory

PROJECT NAME: Maple SPS at Big Tujunga Dam
TECHNICIAN: TA, MG, EH
PCA: HF00710003

ENGINEER: O. Cruz, R. Larson
DATE: 6/6/2016
PAGE: 1 **OF** 1

Updated 6/30/2016

BORING /SAMPLE	DEPTH (inch)	UNIFIED SOIL CLASSIFICATION					* MOISTURE AND DRY DENSITY				^ DIRECT SHEAR				CHEMICAL				Expansion Index (EI / Potential)
		Class.	ATTERBERG LIMITS		#4	#200	γ_{field}	m.c.$_{field}$	$\gamma_{max.}$	m.c.$_{optimum}$	Φ_{ult}	c_{ult}	$\Phi_{maxi.}$	$c_{maxi.}$	pH	Min. Resistivity	Cl	SO_4	
B - S			LL	PI	% Pass	% Pass	pcf	%	pcf	%	Degree	psf	Degree	psf		(K ohm-cm)	(ppm)	(ppm)	
Sampel 1	0-12	GP			20.8	2.7													
(Test Pit)																			
Sampe 2	0-32	SM			70.5	16.2													
(Sample Site)																			
Hand Samples																			
Set #1	0-6	SM			70.4	18.0	97.5	2.3			36	0	45 <	0					
Set #2	6-11	† SM			73.9	13.2	111.6	8.8			35	159	35	224					

† Close to SW-SM please review extended distribution graph

* Sampled ring density may not reflect in-situ conditions; due to the dryness of the area water was added during sampling for better sample retention within the hand sampler.

^ Three residual passes were performed on each data point

Geotechnical and Materials Engineering Division
Los Angeles County Department of Public Works

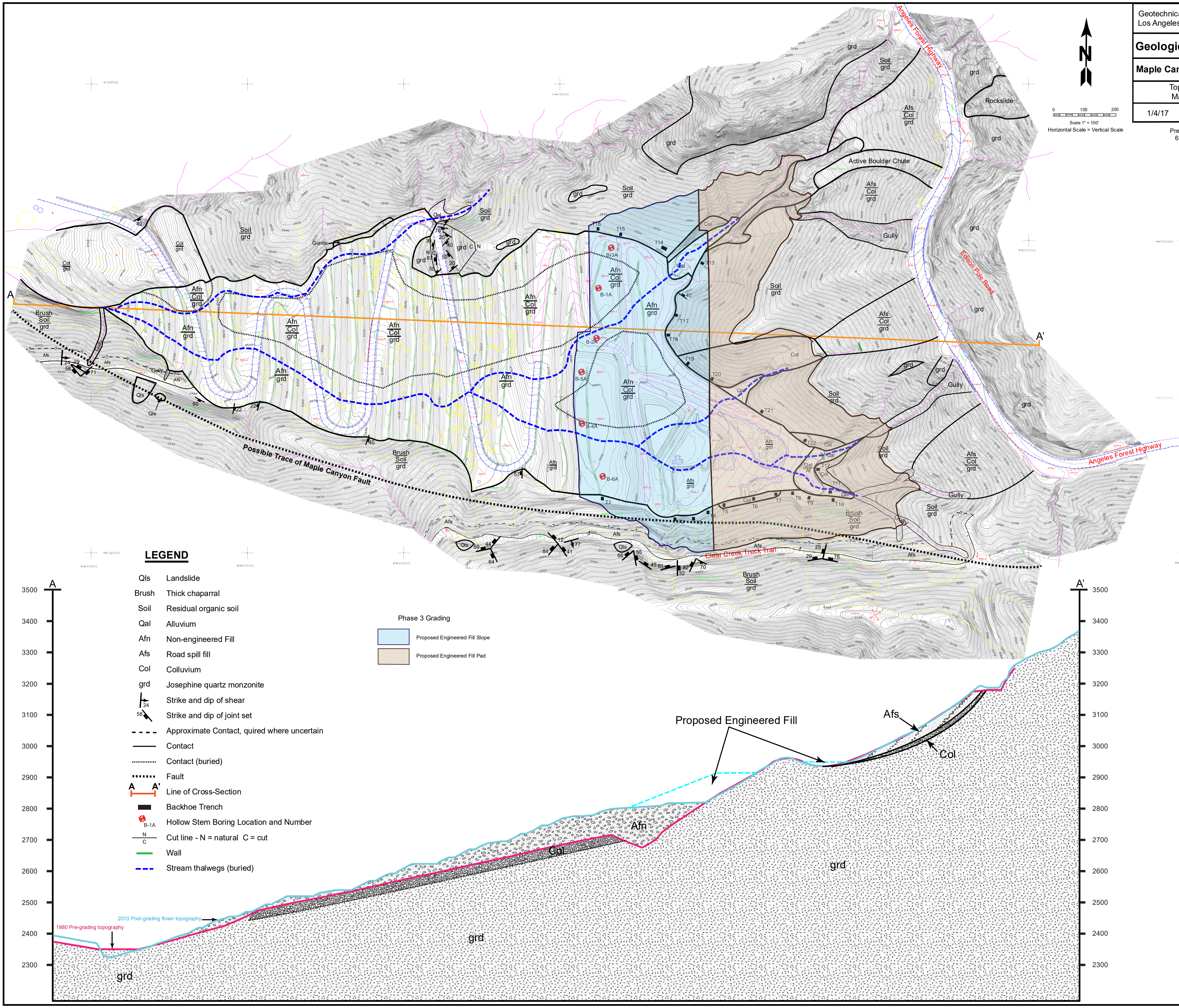
Geologic Map and Cross Section

Maple Canyon Sediment Placement Site

Topography flown May 5, 2010
Map created August 26, 2010

1/4/17	drawn by Robert A. Larson	PLATE 1

Pre-grading topography from Survey Maps 63-T128 and 63-T129 dated 8/29/1980



Geotechnical and Materials Engineering Division
Los Angeles County Department of Public Works
PHASE 3 GRADING PLAN
PLATE 2

℄ MAIN ACCESS ROAD ALIGNMENT DATA

Element	Northing	Easting	Bearing	Delta	Radius	Arc Length	Tangent Length	BC STA	EC STA	PI Northing	PI Easting
100+00.00	1,925,694.49	6,506,081.42	S15°04'07"E	-	-	-	-	-	-	-	-
105+56.92	1,925,156.73	6,506,226.20		-	-	-	-	-	-	-	-
Δ6	-	-	-	180°00'00"	45.00	141.37	-	105+56.92	106+98.29	-	-
106+98.29	1,925,180.12	6,506,313.11	N15°04'07"W	-	-	-	-	-	-	-	-
107+67.94	1,925,247.38	6,506,295.00		-	-	-	-	-	-	-	-
Δ7	-	-	-	25°13'43"	152.23	67.03	34.07	107+67.94	108+34.97	1,925,280.64	6,506,287.61
108+34.97	1,925,313.87	6,506,295.10	N12°42'16"E	-	-	-	-	-	-	-	-
113+50.84	1,925,817.11	6,506,408.55		-	-	-	-	-	-	-	-
113+50.84	1,925,817.11	6,506,408.55	N11°11'41"E	-	-	-	-	-	-	-	-
115+63.51	1,926,025.73	6,506,449.84		-	-	-	-	-	-	-	-

℄ DRI ACCESS ROAD ALIGNMENT DATA

Element	Northing	Easting	Bearing	Delta	Radius	Arc Length	Tangent Length	BC STA	EC STA	PI Northing	PI Easting
400+00.00	1,926,025.73	6,506,449.84	N11°11'41"E	-	-	-	-	-	-	-	-
400+18.88	1,926,044.25	6,506,453.51		-	-	-	-	-	-	-	-
Δ5	-	-	-	78°17'16"	45.00	61.49	36.63	400+18.88	400+80.37	1,926,080.18	6,506,460.62
400+80.37	1,926,080.52	6,506,497.24	N89°28'57"E	-	-	-	-	-	-	-	-
401+85.58	1,926,081.47	6,506,602.45		-	-	-	-	-	-	-	-
Δ6	-	-	-	64°27'04"	20.00	22.50	12.61	401+85.58	402+08.08	1,926,081.58	6,506,615.06
402+08.08	1,926,093.00	6,506,620.39	N25°01'54"E	-	-	-	-	-	-	-	-
402+24.75	1,926,108.11	6,506,627.45		-	-	-	-	-	-	-	-

℄ DRI ACCESS ROAD ALIGNMENT DATA

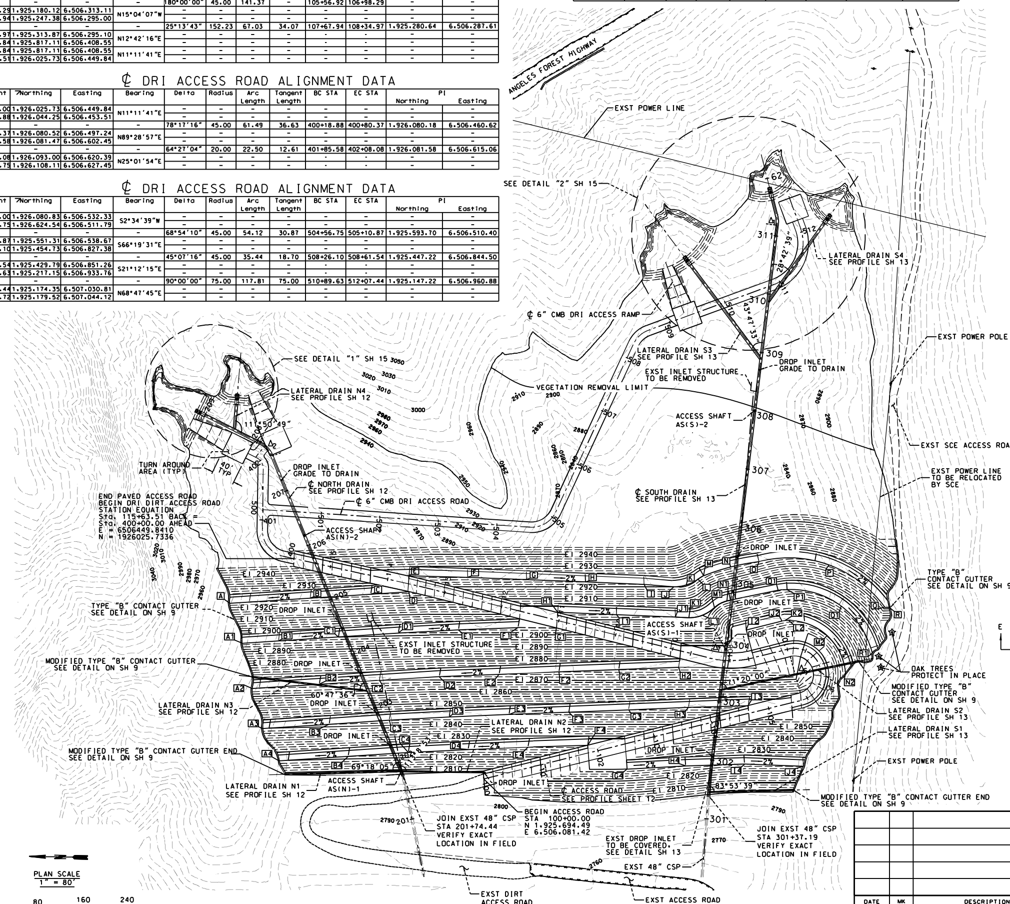
Element	Northing	Easting	Bearing	Delta	Radius	Arc Length	Tangent Length	BC STA	EC STA	PI Northing	PI Easting
500+00.00	1,926,080.83	6,506,532.33	S2°34'39"W	-	-	-	-	-	-	-	-
504+56.75	1,926,624.54	6,506,511.79		-	-	-	-	-	-	-	-
Δ7	-	-	-	68°54'10"	45.00	54.12	30.87	504+56.75	505+10.87	1,925,593.70	6,506,510.40
505+10.87	1,925,551.31	6,506,538.67	S66°19'31"E	-	-	-	-	-	-	-	-
508+26.10	1,925,454.73	6,506,827.38		-	-	-	-	-	-	-	-
Δ8	-	-	-	45°07'16"	45.00	35.44	18.70	508+26.10	508+61.54	1,925,447.22	6,506,844.50
508+61.54	1,925,429.79	6,506,851.26	S21°12'15"E	-	-	-	-	-	-	-	-
510+89.63	1,925,217.15	6,506,933.76		-	-	-	-	-	-	-	-
Δ9	-	-	-	90°00'00"	75.00	117.81	75.00	510+89.63	512+07.44	1,925,147.22	6,506,960.88
512+07.44	1,925,174.35	6,507,030.81	N68°47'45"E	-	-	-	-	-	-	-	-
512+21.72	1,925,179.52	6,507,044.12		-	-	-	-	-	-	-	-

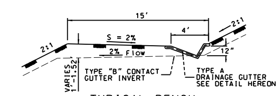
℄ CONSTRUCTION CURVE DATA NORTH AND SOUTH DRAINS

Element	Delta	Radius	Arc Length	Tangent Length	BC STA	EC STA	PI Northing	PI Easting
Δ1	21°09'26"	45.00	16.62'	8.40'	311+18.23	311+34.85	1,925,213.24	6,507,043.12
Δ2	40°57'35"	45.00	32.17'	16.81'	207+63.73	207+95.90	1,926,073.43	6,506,638.93

BENCH GRADING COORDINATE TABLE

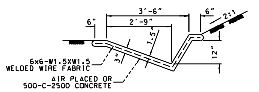
POINT	NORTHING	EASTING
A	1,926,133.94	6,506,371.49
B	1,925,997.07	6,506,383.23
C	1,925,893.69	6,506,392.09
D	1,925,828.97	6,506,397.64
E	1,925,831.19	6,506,424.59
F	1,925,728.97	6,506,424.20
G	1,925,628.70	6,506,422.27
H	1,926,133.49	6,506,420.34
I	1,925,428.16	6,506,448.41
J	1,925,377.24	6,506,415.30
K	1,925,356.03	6,506,418.96
L	1,925,336.94	6,506,428.91
M	1,925,327.04	6,506,435.14
N	1,925,280.88	6,506,451.08
O	1,925,233.11	6,506,461.22
P	1,925,114.04	6,506,457.98
Q	1,925,017.57	6,506,388.12
R	1,925,010.13	6,506,388.39
A1	1,926,111.36	6,506,303.81
B1	1,926,049.61	6,506,383.23
C1	1,925,893.69	6,506,392.09
D1	1,925,845.23	6,506,326.76
E1	1,925,743.23	6,506,334.19
F1	1,925,641.41	6,506,340.29
G1	1,925,575.93	6,506,340.85
H1	1,925,574.41	6,506,367.79
I1	1,925,474.05	6,506,365.85
J1	1,925,373.69	6,506,363.92
K1	1,925,327.55	6,506,367.78
L1	1,925,307.92	6,506,380.83
M1	1,925,297.98	6,506,388.30
N1	1,925,286.38	6,506,393.08
O1	1,925,199.53	6,506,412.92
P1	1,925,184.29	6,506,414.39
Q1	1,925,091.57	6,506,388.34
R1	1,925,036.92	6,506,309.09
A2	1,926,092.37	6,506,226.97
B2	1,925,978.22	6,506,236.81
C2	1,925,876.02	6,506,245.62
D2	1,925,773.90	6,506,253.94
E2	1,925,672.09	6,506,260.04
F2	1,925,570.27	6,506,266.14
G2	1,925,468.45	6,506,272.24
H2	1,925,366.64	6,506,278.35
I2	1,925,252.47	6,506,344.37
J2	1,925,192.02	6,506,360.64
K2	1,925,186.30	6,506,361.79
L2	1,925,180.48	6,506,362.19
M2	1,925,186.30	6,506,361.79
N2	1,925,186.30	6,506,361.79
A3	1,925,186.30	6,506,361.79
B3	1,925,186.30	6,506,361.79
C3	1,925,186.30	6,506,361.79
D3	1,925,186.30	6,506,361.79
E3	1,925,186.30	6,506,361.79
F3	1,925,186.30	6,506,361.79
G3	1,925,186.30	6,506,361.79
H3	1,925,186.30	6,506,361.79
I3	1,925,186.30	6,506,361.79
A4	1,925,186.30	6,506,361.79
B4	1,925,186.30	6,506,361.79
C4	1,925,186.30	6,506,361.79
D4	1,925,186.30	6,506,361.79
E4	1,925,186.30	6,506,361.79
F4	1,925,186.30	6,506,361.79
G4	1,925,186.30	6,506,361.79
H4	1,925,186.30	6,506,361.79
I4	1,925,186.30	6,506,361.79
J4	1,925,186.30	6,506,361.79





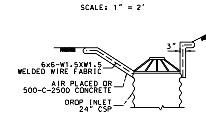
TYPICAL BENCH

SCALE: 1" = 5'



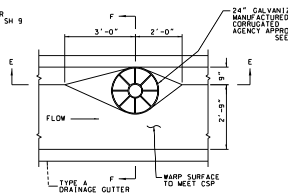
TYPICAL TYPE A DRAINAGE GUTTER

SCALE: 1" = 2'



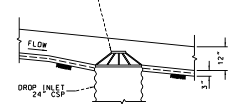
SECTION F-F

SCALE: 1" = 2'



MODIFIED TYPE A DRAINAGE GUTTER AT DROP INLET

SCALE: 1" = 2'



SECTION E-E

SCALE: 1" = 2'

DATE	MK	DESCRIPTION

REVISIONS

REGISTERED PROFESSIONAL ENGINEER JAYKUMAR VARMA No. 79078 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

BIG TUJUNGA DAM AND RESERVOIR

MAPLE CANYON SEDIMENT PLACEMENT SITE

FILL PLAN, SECTIONS AND DETAILS

WRD000028	JOB HF00710003	DWG 63-D192.10	SHEET 10 OF 24

DRAFTER	DESIGNER	CHECKER	CADD PROJECT FILE NAME	REVIEWED	DATE
S. EK	M. SHAMIM	M. SHAMIM	WRD000028 Maple SPS.dgn	BY	