ENGINEERING/OPERATIONAL COMMITTEE MEETING AGENDA
TRABUCO CANYON WATER DISTRICT
32003 DOVE CANYON DRIVE, TRABUCO CANYON, CA
VIDEO/AUDIO BROADCAST MEETING
MARCH 3, 2021 AT 7:00 AM

COMMITTEE MEMBERS
Edward Mandich, Committee Chair
Stephen Dopudja, Committee Member
Michael Safranski, Committee Member Alternate

DISTRICT STAFF
Fernando Paludi, General Manager
Michael Perea, District Secretary
Lorrie Lausten, District Engineer
Gary Kessler, Water System Superintendent
Jason Stroud, Maintenance Superintendent

AGENDA NOTE:
*Due to the spread of COVID-19 and as authorized by the Governor's Executive Order, Trabuco Canyon Water District will be holding this Engineering/Operational Committee Meeting by video broadcast (**Go To Meeting**), and will be available by either video conference or telephone audio as follows:*

***Video Conferencing:** You can join the meeting from your computer, tablet, or smartphone by clicking on the following link: https://zoom.us/j/97375627682*

Telephone Audio: *1 (669) 900-6833*
Access Code: 973-7562-7682

*Persons desiring to monitor the Committee meeting agenda items may download the agenda and documents on the internet at **www.tcwd.ca.gov**.*

*You may submit public comments by email to the Board at **mperea@tcwd.ca.gov**. In order to be part of the record, emailed comments on meeting agenda items must be received by the District, at the referenced e-mail address, not later than 7:00 a.m. (PDT) on the day of the meeting.*

CALL MEETING TO ORDER

VISITOR PARTICIPATION
*Members of the public wishing to address the Board regarding a particular item on the agenda are requested to submit public comments by email to the Board at **mperea@tcwd.ca.gov**. The Committee Chair will call on the visitor following the Committee's discussion about the matter. Committees do not constitute a quorum of the Board of Directors and Committee Members cannot make decisions on matters. The Committee makes recommendations only to the Board of Directors. Members of the public will be given the opportunity to speak to the Committee prior to making a recommendation on the matter. For persons desiring to make verbal comments and utilizing a translator to present their comments into English reasonable time accommodations, consistent with State law, shall be provided. Please limit comments to three minutes.*

ORAL COMMUNICATION
*Members of the public who wish to make comment on matters not appearing on the agenda are requested to submit oral communication by email to the Board at **mperea@tcwd.ca.gov**. Under the requirements of State Law, Directors cannot take action on items not identified on the agenda and will not make decisions on such matters. The Board President may direct District Staff to follow up on issues as may be deemed appropriate. For persons*

desiring to make verbal comments and utilizing a translator to present their comments into English reasonable time accommodations, consistent with State law, shall be provided. Please limit comments to three minutes.

COMMITTEE MEMBER COMMENTS

REPORT FROM THE GENERAL MANAGER

ADMINISTRATIVE MATTERS

PRESENTER(S): FERNANDO PALUDI, GENERAL MANAGER
MICHAEL PEREA, DISTRICT SECRETARY

ITEM 1: ENGINEERING/OPERATIONAL COMMITTEE MEETING RECAP

RECOMMENDED ACTION:
Approve the following Engineering/Operational Committee Meeting Recap(s) and recommend that the Board receive and file same (Consent Calendar).

1. *February 3, 2021*

ENGINEERING MATTERS

PRESENTER(S): FERNANDO PALUDI, GENERAL MANAGER
MICHAEL PEREA, ASSISTANT GENERAL MANAGER
LORRIE LAUSTEN, DISTRICT ENGINEER

ITEM 2: DISCUSSION AND POSSIBLE ACTION(S) RELATING TO TCWD'S DOMESTIC WATER STORAGE AND RESERVOIR SITING STUDY UPDATE

RECOMMENDED ACTION:
Committee to receive information at the time of the Committee Meeting.

ITEM 3: DISCUSSION AND POSSIBLE ACTION(S) CONCERNING PORTER PROPERTY RESERVOIR PLANNING LEVEL CONSTRUCTION COST ESTIMATE

RECOMMENDED ACTION:
Committee to receive information at the time of the Committee Meeting.

ITEM 4: DISCUSSION AND POSSIBLE ACTION(S) CONCERNING BELL CANYON SEWER LIFT STATION REHABILITATION PROJECT

RECOMMENDED ACTION:
Committee to receive information at the time of the Committee Meeting.

ITEM 5: OTHER ENGINEERING AND OPERATIONS PROJECT UPDATES

1. Saddle Crest Development
2. Saddleback Meadows Development
3. Joplin Property/SCADA Upgrade
4. Golf Club Sewer Lift Station
5. Other Projects

RECOMMENDED ACTION:
Committee to receive project status updates at time of the Committee Meeting.

OPERATIONAL MATTERS

PRESENTER(S): GARY KESSLER, WATER SYSTEM SUPERINTENDENT
MICHAEL PEREA, ASSISTANT GENERAL MANAGER
JASON STROUD, MAINTENANCE DEPARTMENT SUPERINTENDENT

ITEM 6: WATER SYSTEM UPDATES

RECOMMENDED ACTION:
Committee to receive system status updates. No action required.

ITEM 7: WASTEWATER SYSTEM UPDATES

RECOMMENDED ACTION:
Committee to receive system status updates. No action required.

ITEM 8: MAINTENANCE DEPARTMENT UPDATES

RECOMMENDED ACTION:
Committee to receive system status updates. No action required.

REGULATORY AND OTHER MATTERS

ITEM 9: OTHER MATTERS/REPORTS

RECOMMENDED ACTION:
Hear Other Matters/Reports that may have arisen after the posting of the agenda.

ADJOURNMENT

AVAILABILITY OF AGENDA MATERIALS
Agenda exhibits and other writings that are disclosable public records distributed to all or a majority of the members of the Trabuco Canyon Water District Board of Directors in connection with a matter subject to discussion or consideration at an open meeting of the Board of Directors are available for public inspection at the Trabuco Canyon Water District Administrative Facility, 32003 Dove Canyon Drive, Trabuco Canyon, California (District Administrative Facility) or will be posted online on the District's website located at www.tcwd.ca.gov. If such writings are distributed to members of the Board less than 72 hours prior to the meeting, they will be available online at www.tcwd.ca.gov at the same time as they are distributed to the Board Members, except that, if such

writings are distributed immediately prior to or during the meeting, they will be posted online on the District's website located at www.tcwd.ca.gov.

COMPLIANCE WITH THE REQUIREMENTS OF CALIFORNIA GOVERNMENT CODE SECTION 54954.2

In compliance with California law and the Americans with Disabilities Act, if you need special disability-related modifications or accommodations, including auxiliary aids or services in order to participate in the meeting, or if you need the agenda provided in an alternative format, please contact the District Secretary at (949) 858-0277, at least 48 hours in advance of the scheduled Board meeting. Notification at least 48 hours prior to the meeting will assist the District in making reasonable arrangements to accommodate your request. The Board Meeting Room is wheelchair accessible.

The District may conduct future meetings electronically (via teleconferencing) during the current ongoing emergency situation.

TRABUCO CANYON WATER DISTRICT
ENGINEERING/OPERATIONAL COMMITTEE MEETING | MARCH 3, 2021

ADMINISTRATIVE MATTERS
ITEM 1: ENGINEERING/OPERATIONAL COMMITTEE MEETING RECAP

RECOMMENDED ACTION:
Approve the following Engineering/Operational Committee Meeting Recap(s) and recommend that the Board receive and file same (Consent Calendar):

1. *February 3, 2021*

CONTACTS (staff responsible): PALUDI/PEREA

TRABUCO CANYON WATER DISTRICT
ENGINEERING/OPERATIONAL COMMITTEE MEETING RECAP | FEBRUARY 3, 2021

DIRECTORS VIA CONFERENCE CALL
Ed Mandich, Committee Chair
Stephen Dopudja, Committee Member

STAFF PRESENT
Fernando Paludi, General Manager
Michael Perea, Assistant General Manager/District Secretary
Gary Kessler, Water Department Superintendent
Jason Stroud, Maintenance Superintendent

STAFF PRESENT VIA CONFERENCE CALL
Lorrie Lausten, District Engineer
Karen Warner, Senior Accountant
Lisa Marie Sangi, Administrative Assistant

DISTRICT CONSULTANTS PRESENT VIA CONFERNECE CALL
Mike Swan, PSOMAS Engineering
Kyle Bohn, Tetra Tech Engineers
Joey Gutierrez, JIG Consultants

PUBLIC PRESENT VIA CONFERNECE CALL
None

CALL MEETING TO ORDER
Director Mandich called the February 3, 2021 Engineering/Operational Committee Meeting to order at 7:00 AM. Public access to the meeting was made available by video broadcast.

VISITOR PARTICIPATION
No comments were received.

ORAL COMMUNICATION
No comments were received.

COMMITTEE MEMBER COMMENTS
None

REPORT FROM THE GENERAL MANAGER
Mr. Paludi had no comments

ITEM 1: ENGINEERING/OPERATIONAL COMMITTEE MEETING RECAP

Mr. Paludi presented the Engineering/Operational Committee Meeting Recap for Committee review in accordance with the agenda. Director Mandich requested that the recap be updated to reflect his comments concerning Hunsaker and Associates contract with the William Lyon Company is closed and has had no contact with Taylor Morrison.

RECOMMENDED ACTION
The Committee recommended that the Engineering/Operational Committee Meeting Recap be forwarded to the Board of Directors for approval as amended (Consent Calendar).

ITEM 2: DISCUSSION AND POSSIBLE ACTION(S) RELATING TO TCWD'S DOMESTIC WATER STORAGE AND RESERVOIR SITING STUDY UPDATE

Ms. Lausten presented this matter for Committee review, and she provided a brief overview of the District's 2016 Domestic Water Storage Siting Study (Study). Ms. Lausten introduced Mr. Mike Swan to the Committee, and she reported that Mr. Swan has prepared an update for the Study. Mr. Swan delivered a PowerPoint presentation which provided an overview of the District's domestic water storage needs throughout the service area. Discussion occurred concerning system demand changes since the original Study from 2016 and the methodology used to determine total days of storage. Director Dopudja recommended that District staff identify storage capacity and user demands on the east and west sides of the District respectively. Ms. Lausten reported that District staff will return with the information at the following Committee meeting.

RECOMMENDED ACTION:
Committee to receive information at the time of the Committee Meeting.

ITEM 3: DISCUSSION AND POSSIBLE ACTION(S) CONCERNING PORTER PROPERTY RESERVOIR PLANNING LEVEL CONSTRUCTION COST ESTIMATE

Ms. Lausten provided an update on this matter to the Committee, and she reported that District staff worked with Tetra Tech to incorporate the Committee's comments from the prior meeting. Mr. Kyle Bohn, Tetra Tech, delivered a PowerPoint presentation which provided a planning level construction cost estimate for an onsite reservoir at the District's Porter Property. Discussion occurred concerning certain alternative cost items and environmental impacts. The Committee recommended District staff work with Tetra Tech to finalize the report.

RECOMMENDED ACTION:
The Committee received the status update. There was no action taken.

ITEM 4: DISCUSSION AND POSSIBLE ACTION(S) CONCERNING BELL CANYON SEWER LIFT STATION REHABILITATION PROJECT

Ms. Lausten provided a brief update on this project, and she reported that there has been a minor schedule delay due to temporary electrical power provisions from Southern California Edison (SCE). Ms. Lausten added that the scheduled project completion date is currently June 2021. Ms. Lausten mentioned that she has reached out to surrounding affected customers concerning vibration testing associated with the project, and she reported that certain customers have retained legal counsel concerning the matter.

RECOMMENDED ACTION:
The Committee received the status update. There was no action taken.

ITEM 5: DISCUSSION AND POSSIBLE ACTIONS(S) CONCERNING THE DIMENSION WATER TREATMENT PLANT BACKWASH WASTE TANK REPLACEMENTS

Ms. Lausten provided a brief update on this project, and she introduced Mr. Joey Gutierrez, JIG Consultants, to the Committee. Mr. Gutierrez provided a brief review of the findings in the technical memorandum, and he highlighted the planned improvements at the Dimension Water Treatment Plant (DWTP). Ms. Lausten reported that District staff is procuring quotes for the onsite backwash tank, and that she will receive them prior to the

Regular Board Meeting. Mr. Gutierrez reported that the engineer's estimate for the onsite tank is approximately $150,000 to $175,000. The Committee recommended agendizing this matter for Board consideration at the following Regular Board Meeting.

RECOMMENDED ACTION:
The Committee received the status update. Take to Board.

ITEM 6: OTHER ENGINEERING AND OPERATIONS PROJECTS

1. Saddle Crest Development
Mr. Paludi presented this project for Committee review, and he provided a brief report on recent discussions with the developer concerning the acceptance of the onsite facilities.

2. Saddleback Meadows Development
Ms. Lausten provided a brief update on this project, and she reported that District staff is currently in discussion with the developer concerning the potential for onsite storage to meet the projected water demands.

3. Joplin Property/SCADA Upgrade
Mr. Paludi reported that District staff is currently in discussion with Orange County Public Works (OCPW) staff on an operating licensing agreement related to the SCADA upgrades at the Joplin Youth Camp Reservoir.

4. Policy and Procedures for Commercial Communication Facilities Located on District Property
Ms. Lausten reported that District staff is working with its consultant ATS Communications to prepare a Policy and Procedures for current and future commercial communications facilities on District properties. Ms. Lausten added that this matter will be agendized for the following Committee meeting.

5. Other Projects
None

RECOMMENDED ACTION
The Committee received the status update. There was no action taken.

ITEM 7: WATER SYSTEM UPDATES

Mr. Kessler reviewed the projects and repairs for January 2021, and he provided the additional highlights:

1. Water Operations staff repaired the struck water service lines, responsible by the resident on Rose Canyon Road in the Canyon Community.
2. Water Operations staff worked with Ferriera Construction to repair a 10-inch water main line to the Cooks reservoir.
3. Water Operations staff worked with Ferriera Construction to replace a 12"x10" transition coupling on High Country in the Trabuco Highlands Community.
4. Water Operations staff replaced an influent valve and an actuator on Filter #2 at Dimension Water Treatment Plant.

Mr. Kessler reviewed the Monthly Water System Operations Summary with the Committee, and he reported that there are some system anomalies associated with the meter at Ridgeline Booster Pump Station that will be adjusted in a future summary.

RECOMMENDED ACTION
The Committee received the status update. There was no action taken.

ITEM 8: WASTEWATER SYSTEM UPDATES

Mr. Perea reviewed the projects and repairs for January 2021, and he provided the additional highlights:

1. Wastewater Operations staff drained, cleaned, and repaired the aeration system of the aerobic digester at the Robinson Ranch Wastewater Treatment Plant (WWTP).
2. Wastewater Operations staff worked with Maintenance Department to repair the Hoffman Blower motor for the East Sequencing Batch Reactor (SBR) at the WWTP.
3. Wastewater Operations staff cleaned the Bell Canyon Sewer Lift Station wet well and station general area prior to Ferreira Construction beginning the rehabilitation project.
4. Wastewater Operations staff received, reviewed, and provided input on the Wastewater Operator I recruitment process.

Mr. Perea reviewed the Monthly Wastewater System Operations Summary and he provided a brief update on the installation of a new odor control system at the Bell Canyon Sewer Lift Station the prior week. Discussion occurred concerning the sanitary sewer system characteristics and the production of hydrogen sulfide gas.

RECOMMENDED ACTION

The Committee received the status update. There was no action taken.

ITEM 9: MAINTENANCE DEPARTMENT UPDATES

Mr. Stroud reviewed the projects and repairs for December 2020, and he provided the additional highlights:

1. Maintenance Department staff sent the crane truck in for electrical repair.
2. Maintenance Department staff worked with TESCO Controls on upcoming SCADA upgrades.
3. Maintenance Department staff worked with Flo Service to install a small backwash pump at Dimension Water Treatment Plant.
4. Maintenance Department staff completed the Maintenance office remodel.
5. Maintenance Department staff assisted the Water Department on the water main break on High Country Drive in the Trabuco Highlands Community.
6. Maintenance Department staff performed investigative work on the Hofmann Blower on the West SBR at Wastewater Water Treatment Plant.
7. Maintenance Department staff assisted with staging of public awareness for the asphalt work done by Champion Paving at the Dove Recycle Booster Station.
8. Maintenance Department staff assisted with staging of public awareness for the slurry done by Mission Paving at the Robinson Ranch Wastewater Treatment Plant access road.

RECOMMENDED ACTION

The Committee received the status update. There was no action taken.

ITEM 10: OTHER MATTERS/REPORTS

None

RECOMMENDED ACTION

There was no action taken.

ADJOURNMENT

Director Mandich adjourned the February 3, 2021 Engineering/Operational Committee Meeting at 8:34 AM.

TRABUCO CANYON WATER DISTRICT
ENGINEERING/OPERATIONAL COMMITTEE MEETING | MARCH 3, 2021

ENGINEERING MATTERS
ITEM 2: DISCUSSION AND POSSIBLE ACTION(S) RELATING TO TCWD'S DOMESTIC WATER STORAGE AND RESERVOIR SITING STUDY UPDATE

In March 2016, District Staff, working with PSOMAS, completed a Domestic Water Storage and Reservoir Siting Study (Study). The purpose of the Study was to evaluate storage requirements and the feasibility of locating a site for a 2.0 MG reservoir. The purpose of this Domestic Water Storage and Reservoir Siting Study Update (Study Update, Exhibit 1) is to update the Study of the same title conducted in 2016 to reflect current overall District demands, development projections and storage conditions as of the end of 2020.

Trabuco Canyon Water District's (District) water storage is monitored on a daily basis and reported monthly based on average monthly system production (demand plus non-revenue water). Depending on each month's system production, the average days of storage can vary from as low as 2 days during the peak summer months to as much as 6 days during wet weather periods in the winter (reference: 2014 through current 2020 monthly water system operations summary reports). With the Saddle Crest Reservoir coming on-line in early 2021, current effective storage volume is increased to 10.73 million gallons (MG). The average demand over the past seven-year period from the referenced monthly reports is 3.28 cfs or 2.14 MGD, which when divided into 10.73 MG yields an average storage volume of 5 days. To augment the District's storage requirements, the District relies on the following: 1) the ability to receive untreated MET water or stored water in Irvine Lake through the Baker Pipeline and to the Dimension Water Treatment Plant, 2) capacity in the South County System and the AMP, and 3) through emergency interties with adjacent agencies. The completion of the Baker Water Treatment Plant, with access to Irvine Lake, increases the District's reliability and access to storage during an emergency.

The Water Reliability and Emergency Storage (WRES) Fees, effective January 2010, included the construction of a new 2.0 MG domestic water storage reservoir (along with distribution improvements) to increase the District's storage capacity and to provide reliability and redundancy should an existing reservoir need to be taken out of service for maintenance or emergency repairs. Since then, the District purchased 0.62 MG of storage in the Saddle Crest Reservoir, which increases total effective storage in the system to 10.73 MG. The Study Update has shed new light on the necessity and timing of a new storage reservoir, particularly considering the projected construction costs of new storage facility options that staff has studied over the past several months and the relative inadequacy of WRES funds collected for this purpose.

More information may be presented at the time of the meeting. Mike Swan of PSOMAS will be in attendance to present the findings of the Study Update.

FUNDING SOURCE:
Not Applicable

FISCAL IMPACT:
Not Applicable

ENVIRONMENTAL COMPLIANCE:
Not applicable

RECOMMENDED ACTIONS:
Committee to receive information at the time of the Committee Meeting.

EXHIBIT(S):
1. Domestic Water Storage and Reservoir Siting Study Update-Draft
2. Trabuco Tanks Storage Option

CONTACTS (staff responsible): PALUDI/LAUSTEN

DOMESTIC WATER STORAGE AND RESERVOIR SITING STUDY

February 2021 Update

Prepared for:
TRABUCO CANYON WATER DISTRICT
32003 Dove Canyon Drive
Trabuco, CA 92679

Prepared by:
PSOMAS
5 Hutton Centre Drive, Suite 300
Santa Ana, CA 92707

Project No. 2TRA132701

Water Storage System Overview

Trabuco Canyon Water District's (TCWD or District) water storage system is described in detail in TCWD's 1999 Master Plan (Master Plan). The Master Plan also discusses emergency storage and the reliability of water supply from TCWD's wholesale water importer, the Metropolitan Water District of Southern California (Metropolitan). The Master Plan notes Metropolitan requires that retailers provide for up to seven average days of demand through emergency storage or other sources of supply.

South Orange County relies heavily on water from Metropolitan, which supplies imported water through the State Water Project and the Colorado River Aqueduct. These imported water supplies are further managed by the Municipal Water District of Orange County (MWDOC) of which TCWD is a member agency. Unlike the northern areas of Orange County, where there are large groundwater aquifers from which water can be extracted during an emergency, South Orange County has very little to no available sources of groundwater and groundwater storage.

In 2010, through a Proposition 218 process, TCWD adopted the Water Reliability and Emergency Storage Fee (WRES) to finance the following three major capital projects: 1) 2 cubic feet per second (cfs) capacity in the Baker Water Treatment Plant, a regional water treatment facility in Orange County with access to stored water in Irvine Lake, 2) Trabuco Creek Wells Facility, a water treatment plant for treatment of local groundwater in Trabuco Creek, and 3) a 2.0 million gallon (MG) water storage reservoir and distribution improvements for increasing emergency storage supplies.

The purpose of this Domestic Water Storage and Reservoir Siting Study Update (Study) is to update the Study of the same title conducted in 2016 to reflect current overall District demands, development projections and storage conditions as of the end of 2020.

TCWD's Master Plan identifies the following three components of domestic water storage in a public water system:

- Operational Storage
- Fire Protection Storage
- Emergency Storage

Storage is required in a water system to balance variations in demand above and below normal supply settings (operational storage), to provide water for fighting fires (fire storage), and to provide water when normal supplies are reduced or unavailable due to unusual circumstances (emergency storage). TCWD has requirements for each of these in order to ensure system functionality and reliability. TCWD's Master Plan and subsequent individual Sub Area Master Plans (SAMPs) prepared for new developments discuss and determine these storage components.

Current Storage Condition

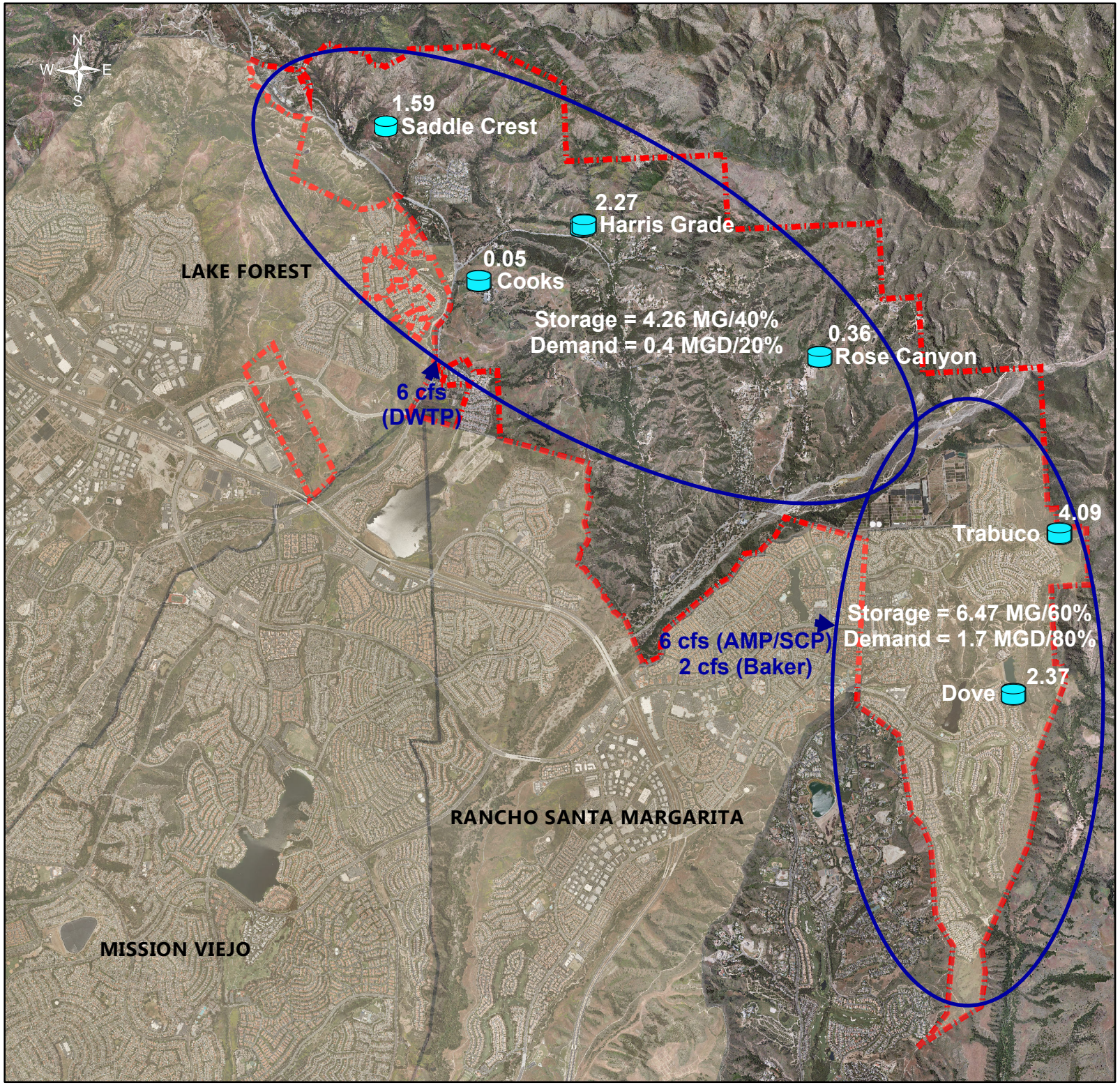
Table 1 shows TCWD's existing domestic water storage reservoirs and their characteristics and Figure 1 shows their respective locations. It should be noted that the Total Effective Storage available is reduced over Total Volume to account for normal operating conditions such as allowing for adequate "freeboard" to prevent overflowing the tank and wasting water and other operational factors. In early 2021 the Saddle Crest Reservoir will be brought on-line. This reservoir was constructed by the Saddle Crest developer but the reservoir was funded jointly by the developer and TCWD with the District paying for 0.62 million gallons (MG) of total storage volume.

Table 1
TCWD Water Storage Reservoirs

Reservoir[1]	As-Built Diameter (i.d.-feet)	Top of Shell Height (feet)	Height of Overflow[2] (feet)	Operating Height[3] (feet)	Effective Volume (MG)	Year Built	HGL Max.[4]
Cooks	21.5	24	22.5	20	0.05	1963	1,165
Harris Grade No. 1	104	32	31	30	1.91	1980	1,504
Harris Grade No. 2	55	24	23	20	0.36	1965	1,496
Rose Canyon	55	24	23	20	0.36	1979	1,357
Trabuco No. 1	99	24	26	23.5	1.35	1984	1,686
Trabuco No. 2	141	24	26	23.5	2.74	1986	1,686
Dove	116	32	33	30	2.37	1988	1,418
Saddle Crest	95	32	31.5	30	1.59	2020	1,508
Total Effective Storage (2021)					**10.73**		

1. Storage reservoirs are all steel, welded or bolted, and above grade
2. Height of Overflow; met design criteria for freeboard at time of design. Trabuco and Dove Tanks overflow is set above top of shell
3. Maximum height at which reservoir is operated
4. Hydraulic Grade Line Elevation in feet above mean sea level

Figure 1 also shows the effective volume of each reservoir as well as the storage volume east and west of Trabuco Creek compared to the average day demand for those areas. What is taken from this analysis is the fact that 40% of the District's storage volume lies in the west where there is only 20% of the demand. And conversely, 60% of the storage is in the east where 80% of the demand is found. While this is somewhat out of balance and could be an issue if the pipeline crossing Trabuco Creek is lost temporarily, the supply source locations and amounts are also shown on this figure illustrating geographic supply redundancy. And since normal operating conditions utilize the Dimension Water Treatment Plant (DWTP) supply as the primary feed it is operationally important to have a sufficient amount of storage near that source, in the western portion of the District.



TRABUCO CANYON WATER DISTRICT

Figure 1

Existing Reservoir Locations & Storage, Demand and Supply Distribution

Eff. Vol. (MG) Reservoirs

Service Area Boundary

East vs. West Breakdown
Storage = Vol./% of Total
Demand = ADD/% of Total

Supply Sources
Peak Capacity (Source)

Abbreviations/Notes

DWTP: Dimension Water Treatment Plant
AMP: Allen McCulloch Pipeline
SCP: South County Pipeline
Baker: Baker Water Treatment Plant

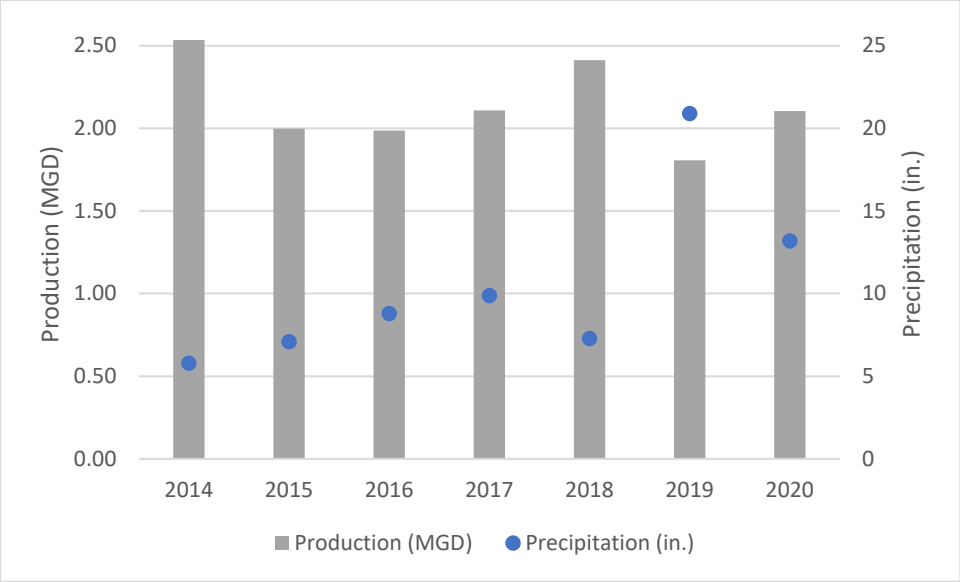
Note: Well supply not shown due to intermittent status

TCWD monitors its available storage on a daily basis taking into account that water levels fluctuate hourly based on system water demands and production rate. The number of available days of storage is calculated based on total storage and water demands or production. Over the past seven calendar years domestic water production has averaged 3.28 cfs, which is 6.55 acre-feet per day or 2.14 million gallons per day (MGD) as shown in Table 2 along with precipitation figures from the California Irrigation Management Information System (CIMIS) Station 75 in Irvine (Great Park). Figure 2 is a plot of this information, which shows the relationship between demand and precipitation. Although there has been some growth within the District over this period, demands are trending slightly downward, most likely due to continued conservation. It should be noted that the closest year to the average demand over this period occurred in 2017, which was also the closest year to the average rainfall over the seven-year period.

Table 2
Average Domestic Water Production and Rainfall

	2014	2015	2016	2017	2018	2019	2020	AVERAGE
cfs	3.92	3.09	3.05	3.26	3.66	2.77	3.22	3.28
Acre-Feet/Day	7.78	6.13	6.10	6.47	7.40	5.54	6.46	6.55
Production (MGD)	2.53	2.00	1.99	2.11	2.41	1.81	2.11	2.14
Precipitation (in.)	5.8	7.1	8.8	9.9	7.3	20.9	13.2	10.43

Figure 2
Average Domestic Water Production and Rainfall



Assuming average production of 2.14 MGD from Table 2 and existing effective storage of 10.73 MG from Table 1, the District has just over 5 days of storage (10.73/2.14). Using average production from 2019 of 1.81 MGD, would increase that to just under 6 days of

storage. If, during an emergency, existing customers were to reduce water use to water demands of about 2.0 cfs or 1.29 MGD, then 8.3 days of storage would be available. Reducing demands to 2.0 cfs or even below that amount for a period of one or two weeks should be completely achievable as the total monthly production has been at or below this amount for the five full months shown in Table 3 during the past two winters. In fact, average production of about 1.35 cfs was recorded over the two-month period of February and March of 2019. Therefore, indoor-only water demands should be below 1.5 cfs, which should be attainable with effective communication to all District customers requesting they eliminate all non-essential irrigation during such an emergency condition.

Table 3
Total Monthly Production (cfs)

March 2020	2.0
December 2019	1.8
March 2019	1.4
February 2019	1.3
January 2019	2.0

Metropolitan indicated in its *2018 Evaluation of Metropolitan's Emergency Storage Objective* report that "a retail water demand cutback of 25 to 35 percent appears reasonable based on levels of conservation achieved during the recent drought". Using that rationale, and TCWD's average demand over the past seven years of 3.28 cfs, a 25 to 35 percent cutback would result in demands of 2.46 to 2.13 cfs, respectively. The total effective storage volume of 10.73 MG puts the District in the "reasonable" range of demand cutbacks assumed by Metropolitan as achievable, which would equate to a 28.2 percent cutback to maintain seven days of storage. As Saddle Crest and other proposed developments come online, a higher percentage would be required but additional conservation is also likely to occur and moving towards a 35 percent reduction would provide more days of storage.

Projections for new developments and their anticipated additional average day demands are detailed on Table 4 in five-year increments to Year 2035 (next pages). Taking the cumulative total demand projections from Table 4 and adding them to the average demand from the past seven years from Table 2, which is assumed as the existing demand, yields the demand projections shown in the first row of Table 5. These projections are believed to be conservative as they assume no additional conservation from the seven-year average assumed as the current demand.

Table 4 - Estimated Dwelling Units, Demand Factors and Demands for New Developments[a]

ID	Potential New Development	APN	Housing Density Assumed	Op+Em Storage (Gallons/DU)[d]	Per Unit Demand Factor (gpd)	Acres	FTSP/Master Plan	2025		2030		2035	
								2025 Connect	2025 Demand (gpd)	2030 Connect	2030 Cum'l Demand (gpd)	2035 Connect	2035 Cum'l Demand (gpd)
1	Zadeh	866-081-12 +	Low	7978	*1850*	41.88	20 (4 Existing)	6	11,100	5	20,350	5	29,600
2	Saddle Crest[b]	858-011-09 +	Low	7978	*1850*	114.04	218 (SAMP lowered #)	25	46,250	40	120,250		120,250
3	Saddleback Meadows[c]	856-081-01 +	Medium	7978	*650*		299 (SAMP lowered #)	20	13,000	100	78,000	61	117,650
4	Nurseries	842-071-180+	Medium	3795	*880*	198.09	600 both nurseries			150	132,000	300	396,000
5	Varshney	105-202-58 +	Low	7978	*1850*	22.58	25 (cut back per Zadeh)			7	12,950	7	25,900
6	Geraci/Joley (Randazzo)	866-031-13	Low	7978	*1850*	6				1	1,850		1,850
7	Mills (Shimomura)	858-011-10 +	Low	7978	*1850*	75.2				15	27,750	14	53,650
8	Vawser	858-021-22	X			7.48	(1 existing DU)						
9	Matthews	858-021-13	Low	7978	*1850*	4.4	4	2	3,700		3,700		3,700
10	County of Orange (Adams)	866-032-12	X			5.3	3 (Now open space)						
11	Reilly	858-021-21	X			14.96	(1 existing DU)						
12	Oaks at Trabuco	856-171-01+	Low	7978	*1850*	32.03	9 (3 Existing meter)	3	5,550	3	11,100		11,100
13	Richardson (Haefele)	606-021-07	Low	7978	*1850*	1.1		1	1,850		1,850		1,850
14	Live Oak Ltd	856-011-22	X			23.4	21 (Now open space)						
15	Live Oak-A (Ramirez)	856-013-04	Low	7978	*1850*	1		1	1,850		1,850		1,850
16	Live Oak-B (various owners)	856-021-20+	Medium	3795	*880*	2.24		4	3,520		3,520		3,520
17	McCarthy (Serrano)	606-021-05+	Medium	3795	*880*	5		3	2,640		2,640		2,640
18	StanPac-Sky Ridge[e]	856-061-06+	X			16.6							
19	Shah (Tittle)	856-012-06	Low	7978	*1850*	17.7	Commercial	4	7,400		7,400		7,400
20	Rutter (Waston/Haskell)	858-021-11+	Low	7978	*1850*	98.3		24	44,400	24	88,800		88,800
21	Bach	856-042-15	Low	7978	*1850*	148.44				14	25,900	14	51,800
22	Beardslee	842-081-17	Low	7978	*1850*	40.3				8	14,800		14,800
23	Saddle Club LLC (Bishop of Orange)	125-035-34	Low	7978	*1850*	30.96				3	5,550		5,550
24	Lin (Federal S&L Insurance Corp)	856-052-14	Low	7978	*1850*	90.2				14	25,900	13	49,950
25	Felch	856-052-10	Low	7978	*1850*	5.3				1	1,850		1,850
26	Various owners (Ferber)	842-051-13	Low	7978	*1850*	155.9	OCTA portion should be 0			8	14,800		14,800
27	Their (Fossil Resources)	842-011-01+	Low	7978	*1850*	78.7						6	11,100
28	Politski (Grier)	856-041-05	Low	7978	*1850*	27.7				5	9,250		9,250
29	Trabuco Canyon Water District (Porter)	842-061-07+	Medium	3795	*880*	119.4							
30	Live Oak (various owners)	856-031-01+	Low	7978	*1850*	47.54	Combined C,D,E,F			10	18,500	10	37,000

SEE FOOTNOTES ON NEXT PAGE - FOR LOCATION OF DEVELOPMENTS SEE FIGURE 2-1 FROM 2016 REPORT INCLUDED IN APPENDIX

Table 4 - Estimated Dwelling Units, Demand Factors and Demands for New Developments[a]

ID	Potential New Development	APN	Housing Density Assumed	Op+Em Storage (Gallons/DU)[d]	Per Unit Demand Factor (gpd)	Acres	FTSP/Master Plan	2025		2030		2035	
								2025 Connect	2025 Demand (gpd)	2030 Connect	2030 Cum'l Demand (gpd)	2035 Connect	2035 Cum'l Demand (gpd)
31	OC Transportation Authority (Lucarelli)	125-035-33	X			116.07	(Now open space)						
32	Laval (Mithcell-East)	842-061-04	Low	7978	*1850*	39.8				3	5,550		5,550
33	Laval (Mitchell-West)	842-081-12	Low	7978	*1850*	101.7				7	12,950	8	27,750
34	Moutain View Road	842-091-36+	Low	7978	*1850*		47 (26 existing)			8	14,800	8	29,600
35	Newell (various owners)	856-052-12+	Low	7978	*1850*	54.81				5	9,250	6	20,350
36	Wm. Lyon	833-011-25	Medium	3795	*880*	2.8				5	4,400	4	7,920
37	Keeler (Racki)	856-052-03	Low	7978	*1850*	39.3				8	14,800	7	27,750
38	Rose Canyon (various owners)	842-122-11+	Low	7978	*1850*	25.11	20 (8 existing)			5	9,250	4	16,650
39	McKittrick (Schwendeman-West)	842-081-20	Low	7978	*1850*	4.8				2	3,700		3,700
40	McKittrick (Schwendeman-East)	842-061-02	Low	7978	*1850*	40.9				3	5,550	3	11,100
41	Wm. Lyon Plano[f]	833-731-01	High	1164	*270*	1.83					-		
42	Trabuco PWT Corporation	842-061-01	Low	7978	*1850*	118.3				9	16,650	9	33,300
43	Uysugi	856-042-08	Low	7978	*1850*	13.4		3	5,550		5,550		5,550
44	Trabuco Ranches (various owners)	842-121-11+	Low	7978	*1850*	50.72	24 (13 existing)			4	7,400	4	14,800
45	Baywood Development (Saddleback Canyon)	858-044-24+	Low	7978	*1850*	8.93							
46	Various owners (Ferber)	842-041-05+	Low	7978	*1850*	285.91	50 (lower portion now OS)					11	20,350
47	Joplin Boys' Ranch (built out)	842-011-06+	X			311.2							
	Total DU Connections							96		462		494	
	Total Average Demand								146,810		740,410		1,286,230

(a) Average Water Demands for High, Medium, and Low Density Developments, with 75% development of plan (FTSP) levels in Canyon Areas (Unincorporated OC).

(b) Saddle Crest constructed storage at development site. Total requirement is per SAMP (0.88 MG) and phased requirement is prorated by dwelling units.

(c) Storage location for Saddleback Meadows still under investigation. Saddelback Meadows demand per draft SAMP for residential and HOA use and 181 dwelling units.

(d) Includes Emergency Storage per Master Plan.

(e) Sky Ridge Development receives supply and storage from TCWD purchased capacity in the SMWD system.

(f) Average domestic water demand based on high density development with recycled water for common areas.

FOR LOCATION OF DEVELOPMENTS SEE FIGURE 2-1 FROM 2016 REPORT INCLUDED IN APPENDIX

Table 5
Demand Projections and Storage Situation

	2020	2025	2030	2035
Average Demand (MGD)	2.14	2.28	2.88	3.42
35% Reduction in Demand (MGD)	1.39	1.48	1.87	2.22
7 Days Reduced Demand (MG)	9.72	10.39	13.08	15.57
2021 Effective Storage (MG)	10.73	10.73	10.73	10.73
Surplus (Deficiency) (MG)[1]	1.01	0.34	(2.35)	(4.84)
Demand Reduction Required[2]	28.2%	32.8%		

1) Existing Effective Storage minus 7 days of 35% reduced demand
2) Demand reduction required to yield exactly 7 days of storage

The second and third rows in Table 5 show an assumed 35 percent reduction in demand in MGD and seven days of that reduced demand in MG. The next two rows show the existing effective storage volume from Table 1 and the surplus or deficiency in storage volume if you subtract the seven days of reduced demand from the existing Effective Storage.

As illustrated in Table 5, the current storage volume would be adequate with these assumptions until around 2026. The last row of Table 5 shows the demand reduction required to yield exactly seven days of storage, which also shows that the District should be within the "reasonably achievable cutback" range used by Metropolitan in their study of 25 to 35 percent until around 2026.

Recommendations

It is recommended that the District continue planning studies on development of a recommended storage site for constructing the next reservoir providing an additional volume of approximately 2.25 MG, including storage needs for the proposed Saddleback Meadows development (less, if excluded). These recent studies have evaluated the District's Harris Grade Reservoir and the Porter Ranch sites in more detail. In the meantime, water production volumes (demand minus non-revenue water) should continue to be monitored and the tables above updated annually. When it appears production at a 35 percent reduction will not last seven days at some point within an upcoming two-year period, design should commence on the then recommended best alternative site. That will allow ample time for design, permitting, and construction.

In order to ensure funding is in place for that alternative, it is recommended an analysis of existing funding sources versus best available reservoir site alternatives be conducted. For one thing, the District's current Water Storage Fee does not even appear to cover the construction cost of an above-ground welded steel tank alone, not including the cost of land purchase, grading, site work, yard piping, inlet/outlet piping, access roads, etc., or any design and other technical services required.

The draft studies performed for the Harris Grade and Porter Ranch reservoir studies used a cost of between $0.73 and $1.00 per gallon for steel tank construction only. Looking at actual costs for the Saddle Crest Reservoir, the tank and appurtenant reservoir related items such as piping, valving, etc. (excluding grading and land costs) equated to about $1.13 per gallon. The District's current Water Storage Fee is set at $2,050 per equivalent dwelling unit (EDU) with one EDU being equal to 459 gallons per day (gpd) of average day demand. Using the District's storage requirements for new developments and the current Water Storage Fee, a typical new development of 200 EDUs would generate $410,000 in Water Storage Fees or be required to construct 717,413 gallons of storage, which equates to $0.57 per gallon ($410,000/717,413). Therefore, if new developments are only generating on the order of $0.60 per gallon to contribute to the District's Water Storage Fee Fund, that amount is not covering the cost of constructing reservoirs based on recent cost estimates for reservoir site construction options currently available to the District.

Table A-1 TCWD Water Production Reports for 2014-2020

TABLE A-1
TCWD Water Production Reports for 2014-2020

							2014						
DIMENSION WTP	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
SAC METER AC/FT	251	196	*	*	271	279	309	306	275	214	227	135	2,463
BACKWASH AC/FT	5	4	5	5	5	5	3	4	4	4	7	5	54
FLUSHWATER AC/FT	10	8	11	12	8	11	9	9	8	10	14	9	118
WTP EFFLUENT AC/FT	249	193	182	210	269	277	310	306	273	211	225	133	2,838
WELLS													
TRABUCO CREEK GWTF	0	0	0	0	0	0	0	0	0	0	0	0	0
US WELL AC/FT	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP WATER													
SMWD AC/FT	0	0	0	0	11	17	45	12	9	46	0	0	139
IRWD AC/FT	0	0	0	0	0	0	0	0	3	28	0	0	31
TOTAL SUPPLY													
AC/FT	244	189	177	205	275	289	352	315	281	281	217	128	2,952
CFS DAILY AVERAGE	4.0	3.1	2.9	3.3	4.5	4.7	5.7	5.1	4.5	4.6	3.5	2.1	4
AC/FT PER DAY	7.9	6.1	5.7	6.7	8.9	9.3	11.3	10.2	9.0	9.1	7.0	4.0	8
OPERATIONS in GAL.													
WTP DOMESTIC	27,696	22,664	33,286	32,388	34,258	29,322	20,794	21,842	17,877	21,019	28,642	24,684	314,472
WWTP DOM	1,330	900	1,380	2,360	3,110	2,990	1,480	1,340	2,140	2,860	4,520	5,110	29,520
OPERATIONS (AF)													
SUPPLEMENT TO RW	14	31	0	0	0	5	34	15	0	18	5	0	120
LOSSES in GAL.													
FLUSHING (gal.)	0	0	0	0	0	0	0	0	0	0	0	0	0
SEWER CLEANING (gal.)	0	0	10,000	10,000	10,000	0	10,000	10,000	10,000	10,000	10,000	10,000	90,000
LINE BREAKS (gal.)	36,000	0	0	0	43,000	0	0	0	0	0	0	12,000	91,000
***SYSTEM DEMAND ** ***													
CFS DAILY AVERAGE	3.8	3.0	2.8	3.4	4.5	4.8	5.2	4.9	4.9	4.3	3.6	2.1	3.92
AC/FT PER DAY	7.5	5.9	5.6	6.8	8.9	9.5	10.3	9.6	9.6	8.5	7.1	4.1	7.78
RESERVOIR STORAGE													
MONTHLY AVG (MG)	8.0	8.2	8.0	8.2	7.9	7.9	8.2	8.0	8.2	8.4	8.2	8.2	8
DAYS OF STORAGE	3	4	4	4	3	3	2	3	3	3	4	6	3
ZONES (AF)													
RIDGELINE PS	219	195	182	195	262	253	281	291	271	231	222	115	2,717
EL TORO P.S.	26	4	2	18	16	30	25	27	16	40	4	18	226
TOPANGA	1	1	2	4	6	4	3	3	4	4	3	1	35
FALCON	0.9	0.4	0.6	0.8	1.0	1.1	1.1	0.9	0.8	1.0	0.7	0.1	9
ROSE PRV/ OAKS	8	7	8	10	15	11	12	15	13	11	10	7	127
CANYON CREEK	0.4	0.3	0.3	0.3	0.4	0.5	0.5	0.4	0.5	0.4	0.3	0.2	4
ROSE P.S.	1.3	0.4	0.7	0.7	1.1	1.2	1.5	2.5	1.6	1.6	1.2	0.9	15
ROBINSON RANCH	64	51	45	59	84	102	151	146	107	103	65	26	1,003
DOVE CANYON	83	69	85	83	95	93	81	66	75	82	74	50	935
PORTOLA HILLS	14	11	10	15	13	15	20	15	15	18	13	10	171

* Usage estimated new meter installed

TABLE A-1
TCWD Water Production Reports for 2014-2020

							2015						
DIMENSION WTP	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
SAC METER AC/FT	172	173	210	107	201	211	185	235	195	187	182	155	2,213
BACKWASH AC/FT	5	6	6	3	4	5	4	6	6	5	6	6	62
FLUSHWATER AC/FT	11	10	12	6	9	9	10	13	11	11	11	11	125
WTP EFFLUENT AC/FT	165	171	210	106	200	211	182	234	194	186	181	154	2,194
WELLS													
TRABUCO CREEK GWTF	0	0	0	0	0	0	0	0	0	0	0	0	0
US WELL AC/FT	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP WATER													
SMWD AC/FT	0	0	0	73	0	0	19	0	7	0	0	0	99
IRWD AC/FT	0	0	0	59	0	0	0	0	0	0	0	0	59
TOTAL SUPPLY													
AC/FT	160	166	203	235	195	205	197	228	195	181	175	148	2,289
CFS DAILY AVERAGE	2.6	2.7	3.3	3.8	3.2	3.3	3.2	3.7	3.2	3.0	2.8	2.4	3
AC/FT PER DAY	5.2	5.4	6.6	7.6	6.3	6.6	6.4	7.4	6.3	5.9	5.6	4.5	6
OPERATIONS in GAL.													
WTP DOMESTIC	0.08	0.07	0.10	0.08	0.06	0.08	0.06	0.09	0.07	0.06	0.07	0.07	0.9
WWTP DOM	1.16	0.97	1.02	1.14	1.28	0.43	0.50	0.29	0.24	0.17	0.18	0.23	7.61
OPERATIONS (AF)													
SUPPLEMENT TO RW	0	0	0	20	0	0	0	0	0	0	0	0	20
LOSSES in GAL.													
FLUSHING (gal.)	0	0	0	0	0	0	0	0	0	0	0	0	0
SEWER CLEANING (gal.)	10,000	10,000	10,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	75,000
LINE BREAKS (gal.)	0	0	6,000	414,000	0	0	50,000	0	0	0	0	30,000	500,000
SYSTEM DEMAND **													
CFS DAILY AVERAGE	2.6	2.7	3.3	3.5	3.1	3.5	3.3	3.7	3.3	3.0	2.9	2.4	3.09
AC/FT PER DAY	5.2	5.3	6.6	6.9	6.2	6.9	6.4	7.3	6.5	5.9	5.8	4.7	6.13
RESERVOIR STORAGE													
MONTHLY AVG (MG)	8.2	8.2	8.2	8.2	8.4	8.3	8.3	8.1	8.2	8.1	7.8	7.9	8
DAYS OF STORAGE	5	5	4	4	4	4	4	3	4	4	4	5	4
ZONES (AF)													
RIDGELINE PS	166	156	196	165	184	210	179	237	183	177	181	137	2,170
EL TORO P.S.	3	5	11	24	31	2	7	0	12	10	0	10	116
TOPANGA	1	2	2	3	2	3	2	2	2	1	1	1	21
FALCON	0.4	0.5	0.7	0.6	0.4	0.3	0.5	0.5	0.4	0.4	0.5	0.2	5
ROSE PRV/ OAKS	7	7	10	10	10	11	10	14	12	10	4	3	107
CANYON CREEK	0.2	0.2	0.4	0.4	0.3	0.4	0.4	0.5	0.3	0.3	0.3	0.3	4
ROSE P.S.	1.0	0.9	1.1	0.9	1.0	1.3	0.8	0.8	0.6	0.6	0.5	0.5	10
ROBINSON RANCH	38	42	61	62	68	55	56	63	49	45	47	35	620
DOVE CANYON	59	59	82	87	81	69	53	79	66	64	61	53	815
PORTOLA HILLS	12	10	10	15	12	11	15	10	14	10	6	12	137
* Usage estimated new meter installed													

TABLE A-1
TCWD Water Production Reports for 2014-2020

							2016						
DIMENSION WTP	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
SAC METER AC/FT	130	92	133	152	170	160	257	307	250	168	71	145	2,035
BACKWASH AC/FT	6	3	4	5	6	4	5	5	5	5	2	6	56
FLUSHWATER AC/FT	3	6	8	8	9	8	10	10	10	3	5	11	91
WTP EFFLUENT AC/FT	127	91	130	146	174	158	253	308	262	167	69	146	2,031
WELLS													
TRABUCO CREEK GWTF	0	0	0	0	0	0	0	0	0	0	0	0	0
US WELL AC/FT	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP WATER													
SMWD AC/FT	0	14	0	0	0	21	0	7	0	41	62	0	145
IRWD AC/FT	0	32	0	0	0	27	0	0	0	25	64	0	148
TOTAL SUPPLY													
AC/FT	122	133	126	141	170	206	257	314	250	233	195	146	2,293
CFS DAILY AVERAGE	2.0	2.3	2.1	2.6	2.8	3.4	4.2	5.0	4.0	3.7	3.1	2.3	3
AC/FT PER DAY	3.9	4.6	4.1	5.1	5.5	6.9	8.3	9.9	8.1	7.5	6.3	4.7	6
OPERATIONS in GAL.													
WTP DOMESTIC	0.07	0.04	0.26	0.21	0.05	0.05	0.07	0.08	0.08	0.09	0.07	0.12	1.2
WWTP DOM	0.25	0.23	0.27	0.22	0.18	0.15	0.25	0.29	0.23	0.23	0.33	0.35	2.98
OPERATIONS (AF)													
SUPPLEMENT TO RW	0	0	0	0	0	0	6	29	35	34	15	0	119
LOSSES in GAL.													
FLUSHING (gal.)	0	0	0	0	0	0	0	0	0	0	0	0	0
SEWER CLEANING (gal.)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	60,000
LINE BREAKS (gal.)	0	215,000	0	0	10,000	120,000	10,000	0	2,000	0	90,000	0	447,000
SYSTEM DEMAND **													
CFS DAILY AVERAGE	2.0	2.3	2.1	2.6	2.7	3.2	4.1	4.9	4.3	2.8	3.2	2.4	3.05
AC/FT PER DAY	4.0	4.6	4.1	5.1	5.3	6.5	8.3	10.0	8.5	5.6	6.5	4.7	6.10
RESERVOIR STORAGE													
MONTHLY AVG (MG)	8.1	8.2	8.0	8.0	8.4	8.3	8.3	8.2	8.1	8.0	7.8	7.9	8
DAYS OF STORAGE	6	5	6	5	5	4	3	3	3	4	4	5	4
ZONES (AF)													
RIDGELINE PS	118	113	113	138	145	184	252	281	252	187	134	129	2,046
EL TORO P.S.	13	25	16	16	16	27	6	21	8	25	64	12	250
TOPANGA	1	1	1	1	1	2	2	2	2	1	2	1	17
FALCON	0.1	0.3	0.3	0.4	0.5	0.6	0.6	0.6	0.7	0.6	0.4	0.2	5
ROSE PRV/ OAKS	3	3	4	4	9	5	6	7	6	4	4	2	57
CANYON CREEK	0.2	0.2	0.2	0.3	0.3	0.5	0.5	0.4	0.5	0.4	0.4	0.2	4
ROSE P.S.	0.4	0.4	0.6	0.5	0.6	0.4	0.6	1.0	0.8	0.6	0.5	0.5	7
ROBINSON RANCH	29	35	34	45	54	56	87	161	129	86	63	31	810
DOVE CANYON	46	54	53	57	67	92	87	23	65	77	56	52	729
PORTOLA HILLS	8	9	10	9	10	15	12	12	16	12	14	10	137
* Usage estimated new meter installed													

TABLE A-1
TCWD Water Production Reports for 2014-2020

							2017						
DIMENSION WTP	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
SAC METER AC/FT	84	93	25	66	114	170	247	168	245	253	161	222	1,848
BACKWASH AC/FT	5	5	1	3	4	5	5	3	5	5	4	5	50
FLUSHWATER AC/FT	8	11	3	7	7	9	10	7	10	10	7	7	96
WTP EFFLUENT AC/FT	84	89	28	64	114	168	248	172	247	257	162	225	1,858
WELLS													
TRABUCO CREEK GWTF	0	0	102	119	87	39	0	0	0	0	0	0	347
US WELL AC/FT	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP WATER													
SMWD AC/FT	22	4	7	5	0	0	4	57	7	3	18	4	131
IRWD AC/FT	0	0	0	0	0	0	1.4	42.5	0	0	25.25	0	69
TOTAL SUPPLY													
AC/FT	106	93	137	188	201	207	253	271	254	260	205	229	2,404
CFS DAILY AVERAGE	1.7	2.8	2.2	3.2	3.3	3.5	4.2	4.4	4.3	4.2	3.4	3.7	3
AC/FT PER DAY	3.4	3.1	4.4	6.4	6.5	6.9	8.2	8.7	8.5	8.4	6.8	7.4	7
OPERATIONS in GAL.													
WTP DOMESTIC	22,739	28,125	10,696	27,975	28,125	37,400	43,758	27,900	36,420	39,644	19,822	30,070	352,674
WWTP DOM	1,050	1,060	1,100	970	1,070	1,020	2,341	2,847	2,775	2,992	3,378	3,257	23,860
OPERATIONS (AF)													
SUPPLEMENT TO RW	0	0	0	0	0	0	0	17	9	13	0	6	45
LOSSES in GAL.													
FLUSHING (gal.)	0	0	0	0	0	0	10,000	0	0	0	0	0	10,000
SEWER CLEANING (gal.)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	60,000
LINE BREAKS (gal.)	4,000	4,000	0	0	1,000	1,000	0	45,000	0	1,000	0	0	56,000
SYSTEM DEMAND **													
CFS DAILY AVERAGE	1.6	1.5	2.1	3.1	3.2	3.5	4.3	4.4	4.4	4.2	3.3	3.6	3.26
AC/FT PER DAY	3.2	2.9	4.0	6.2	6.4	6.9	8.1	8.7	8.6	8.4	6.8	7.4	6.47
RESERVOIR STORAGE													
MONTHLY AVG (MG)	8.0	7.8	8.0	8.2	8.1	8.3	8.1	8.2	8.0	8.1	8.0	7.9	8
DAYS OF STORAGE	8	8	6	4	4	4	3	3	3	3	4	3	4
ZONES (AF)													
RIDGELINE PS	34	62	19	11	101	173	254	173	247	246	141	184	1,645
EL TORO P.S.	44	20	9	53	11	0	2	39	0	14	46	41	279
TOPANGA	1	1	1	1	1	3	3	3	2	3	2	3	23
FALCON	0.1	0.1	0.4	0.6	0.6	0.6	0.6	0.8	0.6	0.6	0.5	0.5	5.9
ROSE PRV/ OAKS	2	8	3	4	5	8	7	9	11	13	9	7	86
CANYON CREEK	0.1	0.1	0.2	0.5	0.3	0.4	0.5	0.5	0.3	0.4	0.3	0.4	4.1
ROSE P.S.	0.6	1.8	0.7	0.6	0.8	0.7	0.7	1.0	1.3	1.1	0.8	1.4	11.5
ROBINSON RANCH	16	18	29	53	56	65	83	74	76	75	57	67	669
DOVE CANYON	47	36	61	78	86	91	96	108	94	98	69	78	942
PORTOLA HILLS	8	10	8	10	8	14	13	17	14	13	15	13	143
* Usage estimated new meter installed													

TABLE A-1
TCWD Water Production Reports for 2014-2020

							2018						
DIMENSION WTP	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
SAC METER AC/FT	166	114	143	218	219	236	250	289	255	220	194	136	2,440
BACKWASH AC/FT	4	3	5	5	5	5	5	6	5	5	5	4	57
FLUSHWATER AC/FT	6	6	9	9	9	10	11	14	9	9	7	7	106
WTP EFFLUENT AC/FT	167	113	143	220	220	239	250	289	262	217	194	135	2,449
WELLS													
TRABUCO CREEK GWTF	0	0	0	0	0	0	0	0	0	0	0	0	0
US WELL AC/FT	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP WATER													
SMWD AC/FT	9	28	0	0	0	29	60	44	33	6	6	0	215
IRWD AC/FT	12.1	44	0	0	0	0	0	0	0	6	19	12	93
TOTAL SUPPLY													
AC/FT	188	185	143	220	220	268	310	333	295	223	213	147	2,745
CFS DAILY AVERAGE	3.1	3.3	2.4	3.7	3.6	4.5	5.0	5.4	4.0	3.6	3.5	2.2	44
AC/FT PER DAY	6.1	6.6	4.6	7.3	7.1	8.9	10.0	10.7	9.8	7.2	7.1	4.4	90
OPERATIONS in GAL.													
WTP DOMESTIC	32,987	15,035	23,412	27,826	28,723	30,219	30,818	31,865	31,715	40,616	28,274	25,357	346,847
WWTP DOM	19,060	18,700	12,400	14,180	13,176	14,180	15,280	18,246	16,284	17,274	18,246	16,284	193,310
OPERATIONS (AF)													
SUPPLEMENT TO RW	0	0	0	21	30	30	32	33	4	0	0	0	151
LOSSES in GAL.													
FLUSHING (gal.)	0	0	0	0	0	0	0	0	0	0	0	0	0
SEWER CLEANING (gal.)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	60,000
LINE BREAKS (gal.)	977,574	0	30,000	3,000	1,000	1,000	2000	5,000	1,000	815,000	0	0	1,835,574
SYSTEM DEMAND **													
CFS DAILY AVERAGE	3.0	3.2	2.5	3.7	3.7	4.4	5.0	5.3	4.1	3.5	3.4	2.1	3.66
AC/FT PER DAY	6.1	6.6	4.5	7.3	7.2	8.9	9.9	10.5	9.9	7.0	6.8	4.1	7.40
RESERVOIR STORAGE													
MONTHLY AVG (MG)	8.1	8.0	7.9	8.2	8.1	8.0	8.2	8.1	7.9	7.8	8.0	8.4	8
DAYS OF STORAGE	4	4	5	3	3	3	3	2	3	3	4	6	4
ZONES (AF)													
RIDGELINE PS	156	146	134	224	221	243	254	263	264	214	213	136	2,468
EL TORO P.S.	11	43	9	0	0	0	0	26	0	3	19	13	124
TOPANGA	2	2	1	2	2	3	3	3	3	3	4	2	30
FALCON	0.4	0.4	0.2	0.5	0.4	0.4	0.1	0.3	Inop.	Inop.	Inop.	0.1	3
ROSE PRV/ OAKS	4	6	6	5	4	4	6	5	4	4	2	3	53
CANYON CREEK	0.2	0.2	0.2	0.3	0.3	1.1	1.0	0.6	0.4	0.3	0.4	0.2	5
ROSE P.S.	0.5	0.8	1.2	0.7	0.7	0.5	0.8	0.9	1.3	1.4	1.3	1.5	12
ROBINSON RANCH	49	49	37	60	58	75	96	115	87	62	61	33	782
DOVE CANYON	68	57	52	92	101	106	119	105	85	78	46	50	959
PORTOLA HILLS	9	13	9	8	14	11	14	17	16	11	13	15	150

* Usage estimated new meter installed

TABLE A-1
TCWD Water Production Reports for 2014-2020

							2019						
DIMENSION WTP	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
SAC METER AC/FT	116	23	7	79	42	0	0	207	237	226	119		1,056
BACKWASH AC/FT	4	1	0.3	3	2	0	0	5	5	5	5	4	34
FLUSHWATER AC/FT	7	2	0.6	4	3	0	0	9	8	9	8	7	58
WTP EFFLUENT AC/FT	120	21	7	79	40	0	0	210	243	227	197	117	1,261
WELLS													
TRABUCO CREEK GWTF	0	51	84	93	96	92	70	35	0	0	0	0	521
US WELL AC/FT	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP WATER													
SMWD AC/FT	0	0	0	0	12	86	98	1	0	1	0	0	198
IRWD AC/FT	0	0	0	0	0	0	64	3	3	0	0	0	70
TOTAL SUPPLY													
AC/FT	120	72	91	172	148	178	232	249	246	228	197	117	2,050
CFS DAILY AVERAGE	2.0	1.3	1.4	2.9	2.4	3.1	3.8	4.0	3.9	3.7	3.3	1.8	34
AC/FT PER DAY	3.9	2.6	2.9	5.7	4.8	5.9	7.5	8.0	7.9	7.4	6.6	3.7	67
OPERATIONS in GAL.													
WTP DOMESTIC	21,916	5,460	2,917	13,464	8,901	0	0	67,395	37,325	67,021	31,266	25,133	280,798
WWTP DOM	16,479	12,285	14,998	16,490	16,410	17,421	15,400	15,900	11,800	14,300	18,260	16,060	185,803
OPERATIONS (AF)													
SUPPLEMENT TO RW	0	0	0	0	0	0	0	0	0	0	0	0	0
LOSSES in GAL.													
FLUSHING (gal.)	0	0	0	0	0	0	70,000	50,000	60,000	0	60,000	0	240,000
SEWER CLEANING (gal.)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	60,000
LINE BREAKS (gal.)	0	10,000	10,000	0	70,000	2,000	2000	0	50,000	1,000	1000	0	146,000
SYSTEM DEMAND **													
CFS DAILY AVERAGE	2.0	1.3	1.4	2.8	2.4	3.0	3.8	3.9	3.8	3.7	3.3	1.8	2.77
AC/FT PER DAY	3.9	2.6	2.9	5.6	4.8	5.8	7.3	8.0	7.9	7.4	6.6	3.7	5.54
RESERVOIR STORAGE													
MONTHLY AVG (MG)	8.9	9.0	8.8	8.9	8.8	8.7	8.6	8.5	8.6	8.5	8.3	8.9	9
DAYS OF STORAGE	4	4	4	4	4	4	4	4	4	4	4	4	4
ZONES (AF)													
RIDGELINE PS	99	6	1	62	28	0	0	216	241	216	88	0	957
EL TORO P.S.	21	15	7	17	12	0	64	0	0	11	109	117	373
TOPANGA	1	1	1	2	2	3	4	4	4	4	2	2	30
FALCON	0.2	0.1	0.2	0.5	0.3	0.8	0.6	0.6	0.6	0.6	0.4	0.1	5
ROSE PRV/ OAKS	2	1	2	2	2	2	2	4	5	5	4	3	34
CANYON CREEK	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.4	0.3	0.2	3
ROSE P.S.	1.5	1.0	0.5	0.7	0.7	1.1	0.4	0.2	0.1	0.2	0.2	0.2	7
ROBINSON RANCH	21	12	15	45	30	39	51	64	68	60	48	15	468
DOVE CANYON	147	34	47	73	71	80	92	97	88	83	73	43	928
PORTOLA HILLS	10	8	7	8	12	11	12	14	16	12	13	11	134

* Usage estimated new meter installed

TABLE A-1
TCWD Water Production Reports for 2014-2020

							2020						
DIMENSION WTP	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
SAC METER AC/FT	152	166		68	147	13	Offline	199	264				1,009
BACKWASH AC/FT	5	4	4.0	3	5	1	0	3	5	5	5	5	45
FLUSHWATER AC/FT	9	9	9.0	5	9	2	0	9	10	8	8	6	84
WTP EFFLUENT AC/FT	153	168	128	68	151	10	0	199	268	252	195	212	1,804
WELLS													
TRABUCO CREEK GWTF	0	0	0	68	81	58	59	25	0	0	0	0	291
US WELL AC/FT	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP WATER													
SMWD AC/FT	0	0	0	0	0	36	10	4	0	0	0	0	50
IRWD AC/FT	0	0	0	0	0	111	122	24	0	0	0	0	257
TOTAL SUPPLY													
AC/FT	153	168	128	136	232	197	191	252	268	252	195	212	2,384
CFS DAILY AVERAGE	2.4	2.9	2.1	2.3	3.8	3.3	3.1	4.0	4.5	4.1	3.3	3.4	39
AC/FT PER DAY	4.9	5.8	4.1	4.5	7.5	6.6	6.2	8.1	8.9	8.1	6.5	6.8	78
OPERATIONS in GAL.													
WTP DOMESTIC	28,424	26,778	32,688	18,700	37,176	3,740	75	59,242	45,254	43,758	42,412	82,878	421,125
WWTP DOM	6,000	20,570	14,630	11,110	27,170	22,800	23,430	17,710	16,170	15,070	10,546	14,855	200,061
OPERATIONS (AF)													
SUPPLEMENT TO RW	0	0	0	0	0	0	0	0	0	0	0	0	0
LOSSES in GAL.													
FLUSHING (gal.)	144,000	468,000	0	0	0	0	384,000	198,000	210,000	186,000	355,200	0	1,945,200
SEWER CLEANING (gal.)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	60,000
LINE BREAKS (gal.)	1,000	350,000	350,000	30,000	5,000	1,000	0	1,000	350,000	0	0	0	1,088,000
SYSTEM DEMAND **													
CFS DAILY AVERAGE	2.4	2.9	2.0	2.2	3.7	3.3	3.1	4.0	4.5	4.1	3.2	3.4	3.2
AC/FT PER DAY	4.9	5.7	4.1	4.5	7.4	6.6	6.2	8.1	9.0	8.1	6.4	6.8	6.5
RESERVOIR STORAGE													
MONTHLY AVG (MG)	8.8	8.6	8.8	8.9	8.6	8.8	8.5	8.2	8.8	8.7	8.8	8.7	9
DAYS OF STORAGE	4	3	4	4	3	4	3	3	4	4	4	4	4
ZONES (AF)													
RIDGELINE PS	Offline	Offline	Offline	Offline	20	10	122	199	252	237	174	170	1,184
EL TORO P.S.	153	168	128	68	131	111	122	24	0	0	0	0	905
TOPANGA	3	2	2	1	3	3	4	4	4	3	3	3	35
FALCON	0.5	0.6	0.2	0.2	0.7	0.7	0.8	0.8	0.8	0.6	0.5	0.4	7
ROSE PRV/ OAKS	3	3	3	5	6	6	7	7	6	6	Inop.	Inop.	52
CANYON CREEK	0.2	0.3	0.2	0.2	0.3	0.4	0.4	0.6	0.6	0.4	0.2	0.2	4
ROSE P.S.	0.2	0.1	1.5	0.3	1.5	0.8	0.8	1.4	0.9	0.8	0.9	0.4	10
ROBINSON RANCH	26	30	19	24	49	47	56	73	81	72			477
DOVE CANYON	60	63	51	39	87	91	97	99	90	90			767
PORTOLA HILLS	8	11	9	8	11	13	16	15	16	15			122

* Usage estimated new meter installed

TABLE A-1
TCWD Water Production Reports for 2014-2020

DIMENSION WTP	**AVG 2014-20**
SAC METER AC/FT	2,009
BACKWASH AC/FT	52
FLUSHWATER AC/FT	99
WTP EFFLUENT AC/FT	2,105
WELLS	
TRABUCO CREEK GWTF	145
US WELL AC/FT	0
AMP WATER	
SMWD AC/FT	154
IRWD AC/FT	78
TOTAL SUPPLY	
AC/FT	2,456
CFS DAILY AVERAGE	15
AC/FT PER DAY	31
OPERATIONS in GAL.	
WTP DOMESTIC	215,799
WWTP DOM	72,084
OPERATIONS (AF)	
SUPPLEMENT TO RW	76
LOSSES in GAL.	
FLUSHING (gal.)	41,667
SEWER CLEANING (gal.)	67,500
LINE BREAKS (gal.)	512,596
SYSTEM DEMAND **	
CFS DAILY AVERAGE	3.3
AC/FT PER DAY	6.6
RESERVOIR STORAGE	
MONTHLY AVG (MG)	8
DAYS OF STORAGE	4
ZONES (AF)	
RIDGELINE PS	2,000
EL TORO P.S.	228
TOPANGA	26
FALCON	6
ROSE PRV/ OAKS	77
CANYON CREEK	4
ROSE P.S.	10
ROBINSON RANCH	725
DOVE CANYON	885
PORTOLA HILLS	145
* Usage estimated new meter installed	

Potential New Develpoments (Previous Owner)

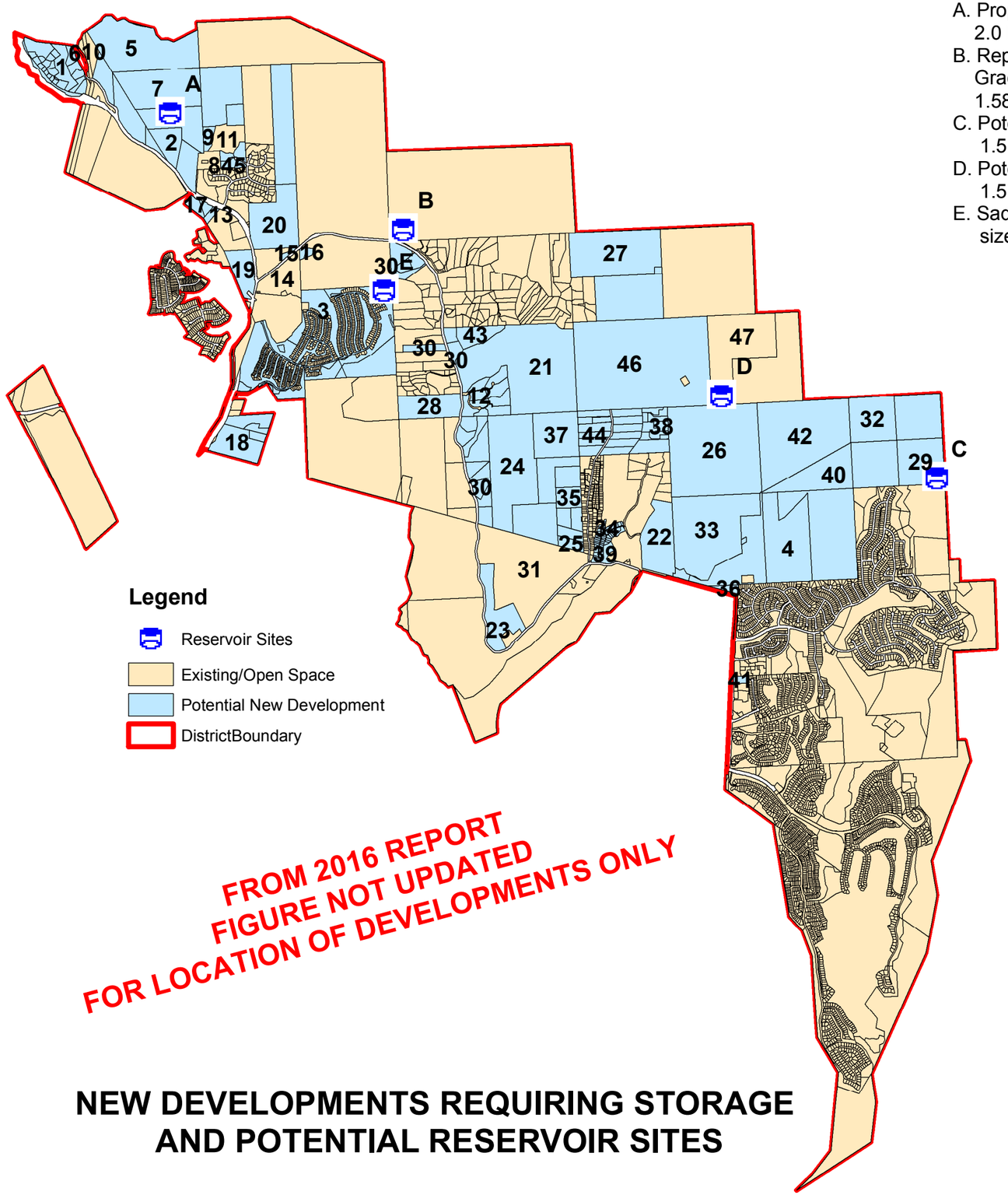
1. Zadeh
4. Nurseries
5. Varshney
6. Geraci/Joley (Randazzo)
7. Mills (Shimomura)
9. Matthews
12. Oaks at Trabuco
13. Ricahrdson (Haefele)
15. Live Oak-A (Ramirez)
16. Live Oak -B (Various Owners)
17. McCarthy (Serrano)
19. Shah (TIttle)
20. Rutter (Watson/Haskell)
21. Bach
22. Beardslee
23. Saddle Club LLC (Bishop of Orange)
24. Lin (Federal S & L Insurance Corp)
25. Felch
26. Various Owners (Ferber)
27. Their (Fossil Resources)
28. Politski (Greir)
29. Trabuco Canyon Water District (Porter)
30. Live Oak (Various Owners)
32. Laval (MItchell-East)
33. Laval (Mitchell-West)
34. Mountain View Road
35. Newell (Various Owners)
36. Wm. Lyon
37. Keeler (Racki)
38. Rose Canyon (Various Owners)
39. McKittrick (Schwendman-West)
40. McKittrick (Schwendman-East)
41. Wm. Lyon Plano
42. Trabuco PWT Corporation
43. Uysugi
44. Trabuco Ranches (Various Owners)
45. Baywood Development (Saddleback Canyon)
46. Various Owners (Ferber)

Developments Not Needing Storage

2. Saddle Crest : Storage on Site
3. Saddleback Meadow : Storage on Site
8. Vawser
10. County of Orange (Adams)
11. Reilly
14. Live Oak Ltd
18. StanPac-Sky Ridge
31. OC Transportation Authority (Lucarelli)
47. Joplin Boys' Ranch

Potential Reservoir Sites

A. Proposed Saddle Crest Reservoir :
2.0 MG, HWL ≈ 1508'
B. Replace Existing 0.42 MG Harris
Grade Reservoir with 2.0 MG Reservoir :
1.58 MG, HWL ≈ 1504'
C. Potential Porter Property Reservoirs :
1.5 to 4.0 MG, HWL ≈ 1508'
D. Potential Joplin Property Reservoirs :
1.5 to 4.0 MG, HWL ≈ 1508'
E. Saddleback Meadows Property Reservoir:
sized for development, HWL ≈ 1600'



NEW DEVELOPMENTS REQUIRING STORAGE AND POTENTIAL RESERVOIR SITES

PSOMAS

Figure 2-1

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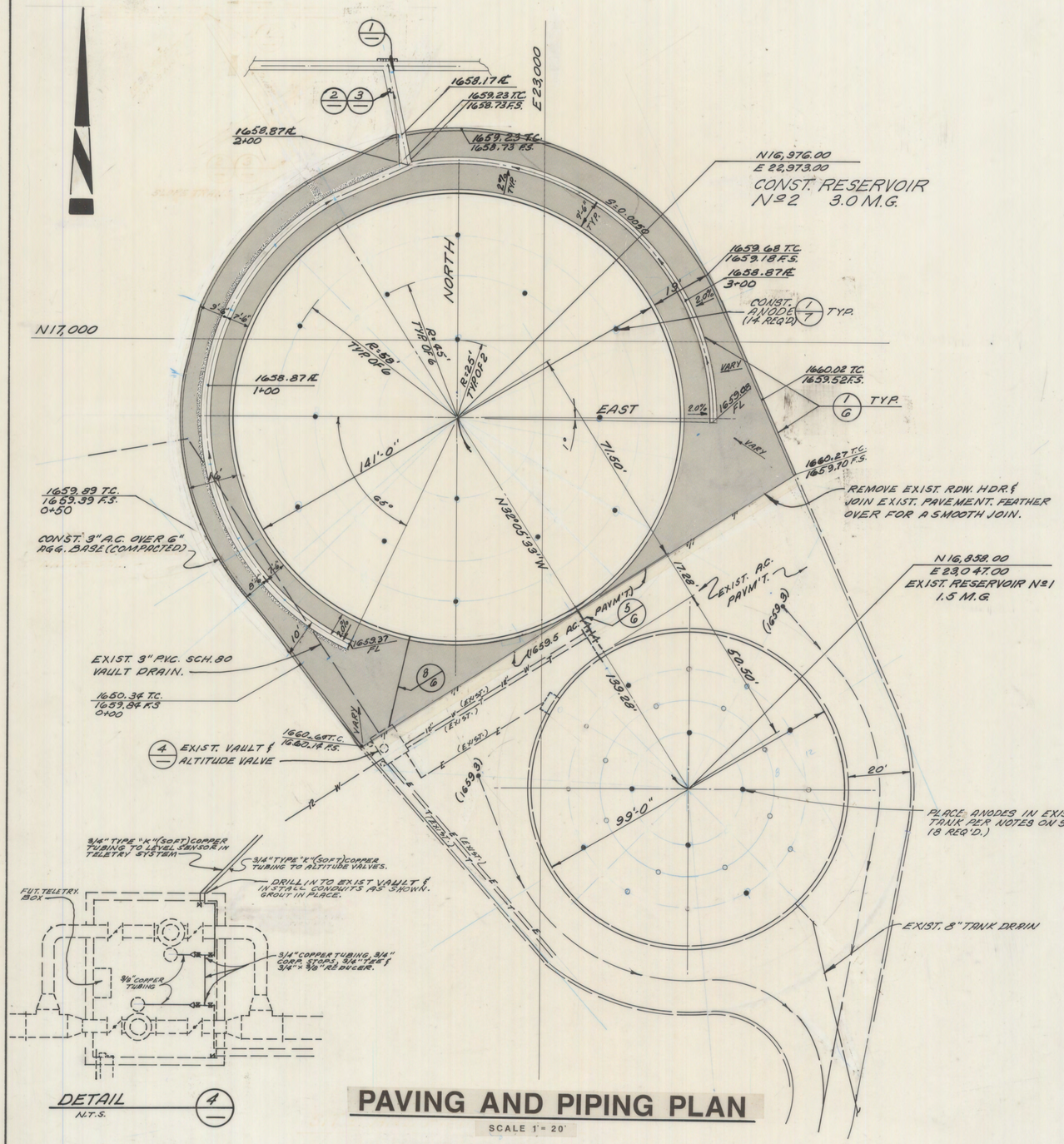
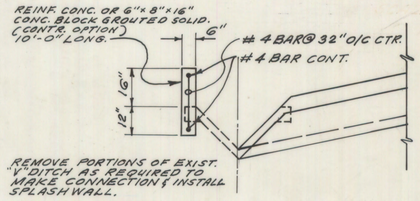


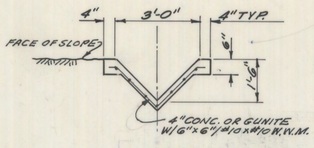
DETAIL 4 N.T.S.

PAVING AND PIPING PLAN

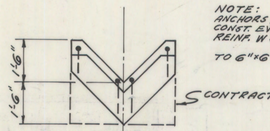
SCALE 1" = 20'



SPLASH WALL AND CONNECTION DETAIL 1 N.T.S.

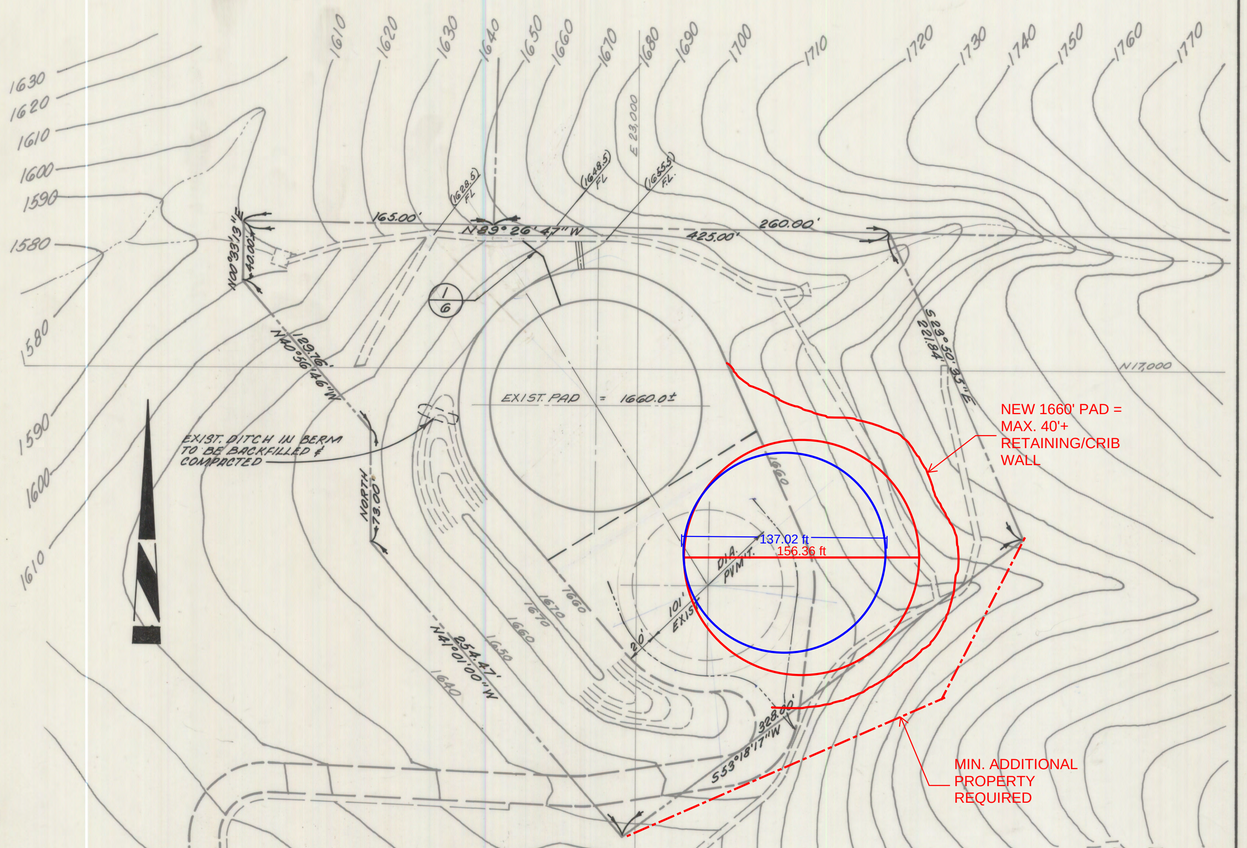


TYPICAL "V" DITCH 2 N.T.S.



ANCHOR DETAIL 3 N.T.S.

NOTE: ANCHORS (8") CONST. EVERY REINF. W##B TO 6"x6"/#10x#10 W.W.M.



SITE AND EXISTING GRADING PLAN

SCALE 1" = 50'

STORAGE REQUIREMENT		
2.00	MG	Reservoir Fee Storage Requirement
-0.62	MG	District Acquired Share in Saddelcrest Reservoir
1.38	MG	Additional Storage Requirement
0.87	MG	Saddleback Meadows Storage Requirement
2.25	MG	Total Additional Storage Requirement
2,250,000	gal	
300,802	cu. ft.	Change to 23.5'
h= 26	ft.	(from Water System Schematic, 1686-1660)
121	ft.	diameter
		128' dia.
1.50	MG	Existing Small Trabuco Tank
3.75	MG	Replacement if Remove Small Trabuco Tank
3,750,000	gal.	
501,337	cu. ft.	Change to 23.5'
h= 26	ft.	
157	ft.	diameter
		165' dia.

RECORD DRAWING

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REVISIONS

SANTA ANA MOUNTAINS COUNTY WATER DISTRICT

TRABUCO DOMESTIC RESERVOIR No 2

PAVING AND PIPING, SITE AND EXISTING GRADING PLAN

WOODSIDE/KUBOTA & ASSOCIATES, INC.
CONSULTING ENGINEERS
501 West Dyer Road • Santa Ana, California 92707 • Phone: (714) 979-5240

DESIGN TFM	DRAWN TFM	APPROVED BY: R.D. Woodside 2-5-86	SHEET 3
CHECKED JRN	DATE	R.D. WOODSIDE R.C.E. 11853 DATE	OF 7 SHEETS

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TRABUCO CANYON WATER DISTRICT
ENGINEERING/OPERATIONAL COMMITTEE MEETING | MARCH 3, 2021

ENGINEERING MATTERS
ITEM 3: DISCUSSION AND POSSIBLE ACTION(S) CONCERNING PORTER PROPERTY RESERVOIR PLANNING LEVEL CONSTRUCTION COST ESTIMATE

Trabuco Canyon Water District (District) owns an approximately 120-acre property commonly known as the "Porter Property". In April 2002, the District purchased the property with a potential purpose of placement of District facilities, including onsite domestic water and non-domestic water reservoirs. At the September 2, 2020 Engineering/Operational Committee Meeting, the Committee recommended that District staff evaluate the feasibility of constructing a reservoir on the District's Porter Property and bring the matter back for Board consideration. District staff worked with Tetra Tech to prepare a planning level evaluation for an onsite reservoir on the District's Porter Property and the Draft Study is attached as Exhibit 1. The previous completed Harris Grade Siting Study is included as a reference as Exhibit 2.

The following table summarizes the costs of the two alternatives in the reports:

RESERVOIR SITING STUDY SUMMARY		
SITE	**TANK SIZE**	**COST (includes 30% contingency)**
Harris Grade	2.7 MG	$7,900,000
Porter	2.25 MG	*$9,115,000- $11,600,000

*Alternative-developed Nursery

It should be noted that there are advantages to replacing the smaller Harris Grade Tank that would optimize operations at the site. Currently, the two tanks (2.0 MG and 0.42 MG) have different HGL's so they cannot float off one another. There is an intertie and a small pump between the tanks and water is pumped from the small tank to the larger tank to maintain water quality. This pump operates throughout the day and adds additional electrical cost and staff time to manage the operation. In addition, the smaller tank was built in 1965 and the recent inspection report indicates that there is severe corrosion in the tank. The tank is approaching the end of its service life and Staff recommends either replacing the tank (at a height of 32' vs. 24') or removal/abandonment of the tank and unnecessary piping.

More information may be presented at the time of the meeting.

FUNDING SOURCE:
General Fund and Developer Fees

FISCAL IMPACT:
$131,091

ENVIRONMENTAL COMPLIANCE:
Not applicable

RECOMMENDED ACTION:
Committee to receive information at the time of the Committee Meeting.

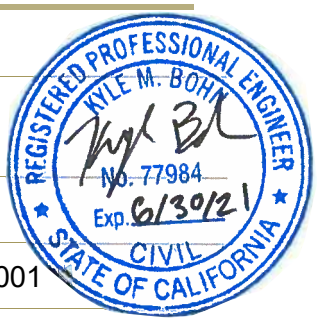
EXHIBIT(S):
1. Porter Property Planning Level Study and Cost Estimate- Final Draft
2. Harris Grade Reservoir Siting Study-Final

CONTACTS (staff responsible): PALUDI/LAUSTEN

TETRA TECH

DRAFT Memorandum

Date:	February 25, 2021 (Revised)		
To:	Lorrie Lausten P.E. Trabuco Canyon Water District		
From:	Kyle Bohn P.E.		
Project:	Harris Grade Reservoir Siting Study	***Project Number:***	200-09339-20001
Subject:	Porter Property Planning Level Construction Cost Estimate		2/25/2021



BACKGROUND AND OBJECTIVE

In 2016 the Trabuco Canyon Water District (District) completed the "Domestic Water Storage and Reservoir Siting Study" to determine locations within the District's service area for additional water storage for future planned developments and emergencies. The study identified four sites within the District's service area to be potential locations for future reservoirs, one of which was the Harris Grade Reservoir Site. Tetra Tech completed the Harris Grade Reservoir Siting Study, exploring the feasibility of constructing a new tank at the Harris Grade site.

As a supplement to the Harris Grade Reservoir Siting Study, the District requested that Tetra Tech prepare a planning level construction cost estimate for a new reservoir to be constructed at the District's Porter Property. The intent of this planning level estimate is to compare construction costs for new reservoirs at the Harris Grade site and the Porter Property. The Porter Property was also identified by the 2016 Domestic Water Storage and Reservoir Siting Study to have an appropriate surface elevation to be able to float on the Harris Grade Pressure Zone (1,504 feet). Additionally, the 2016 study identified the Porter Property to be located near future planned developments.

This technical memorandum presents a planning level construction cost estimate for the construction of a new reservoir at the District's Porter Property, including the design criteria and assumptions that were used in developing the planning level estimate.

PROJECT LOCATION

The District's Porter property is a 120-acre parcel of land near the eastern edge of the District's service area. The majority of the site is undeveloped with unpaved access roads throughout the site. Elevations at the property range from approximately 1,200 feet to just over 1,600 feet. The main paved access entrance to the site is from Shadow Rock Lane within a residential neighborhood. The site is bounded by the residential properties to the south, a nursery to the west, Trabuco Canyon and Trabuco Creek to the north and Cleveland National Forest to the East.

Located to the southwest of the Porter Property is the District's Shadow Rock Detention Basins and Pumping Station. The detention basins and pumping station are part of the District's Urban Water Recovery Project, capturing storm runoff to be treated and conveyed for reuse in the District's recycled water system. Figure 1 shows the District's Porter property and surrounding area.

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AVAILABLE INFORMATION

The following available information was used to develop this memorandum:

- Engineering Study (Draft) for Dove Canyon and Robinson Ranch Recycled Water Pump Station Rehabilitation – Phase 1 (Engineering Study)
- Preliminary Porter Property road alignment over Google Earth image received from the District on September 3, 2020
- Domestic Water Storage and Reservoir Siting Study, March 2016
- Available USGS elevations and images to approximate elevation and location of the tank pad and pipeline alignment
- Compilation of Previous Reports Due Diligence for Porter Ranch Property Trabuco Canyon, California, November 2001

DESIGN CRITERIA

The following is a summary of minimum design criteria and assumptions used to develop preliminary construction costs:

Table 1 – Design Criteria Summary
Tank Material: Welded carbon steel
Reservoir Design Standards: The new tank shall be designed to the following design standards. 1. California Department of Drinking Water (DDW) requirements outlined in the California Code of Regulations Title 22 "Design and Construction of Water Distribution Reservoirs" 2. American Water Works Association (AWWA), Standard D100, "Welded Carbon Steel Tanks for Water Storage" 3. Trabuco Canyon Water District Standard Plans and Specifications
Minimum Storage Volume: 2.25 MG
Floor Elevation: 1,474 feet
High Water Level Elevation (Match Harris Grade Pressure Zone): 1,504 feet
Sidewater Depth: 30 feet
Minimum Required Clearance Around Tank: 12 feet
Inlet/Outlet Piping and Valves: 16-inch separate inlet and outlet connections (assumes similar fill/draw rate as the Harris Grade Tank)
Overflow and Drain: A drain pipeline or concrete v-gutter will be required to convey site drainage, tank overflow and tank drain water down the access road to the Shadow Rock Detention Basin.
Electrical Service: Service from the Shadow Rock Pump Station

Storage Requirements

The new reservoir will be a minimum of 2.25 MG based on the following storage requirements:

1. A minimum of 1.38 MG of additional storage is required within the District to meet the requirements of the Water Reliability Emergency Storage (WRES) fund. District customers are contributing to the WRES fund, which is reserved for an additional 2.0 MG storage within the District. A portion of the required storage has been built at the Saddlecrest development (0.62 MG) in 2019, but the remaining 1.38 MG is still pending.
2. A minimum of 0.87 MG of storage is required for the future Saddleback Meadows development.

Tank Size

The proposed steel tank will be located to provide a high water level of approximately 1,504 feet, so that the new tank will float on the Harris Grade pressure zone. This results in a pad elevation of approximately 1,474 feet. Dimensions of the proposed tank are summarized in the table below.

Table 2 – Steel Tank Dimensions
Tank Inside Diameter: 116 feet
Tank Height: 32 foot steel shell plus 3 foot radius steel knuckle (35 foot wall height)
Tank High Water Level: 30 feet above finished floor

Site Grading and Tank Location

Tetra Tech reviewed the existing site topography utilizing topographic information from USGS. The Porter Property is a large expansive property with several ridge lines and the Trabuco Creek flowing through it.

The location of the tank was established by the following:

1. A pad constructed either completely in fill or cut at elevation 1,474 feet.
2. Located as close as practical to the Shadow Rock Lane entrance to minimize road and pipeline construction as well as tank construction costs.

The elevations at the property range from approximately 1,200 feet to just over 1,600 feet. There is a low point on the westerly side of the property. The site varies in grades with flatter slopes along western side of the property and steeper slopes to the east.

We reviewed both a filled pad and cut pad scenario and based on our review of the existing topography a pad cut into the steepening portion of the site results in less earthwork. For the purposes of this memorandum it was assumed the slope would be cut back at a slope of 2:1 to provide a flat pad. We have assumed a reservoir pad with a diameter of 176 feet, providing for a clearance around the tank for construction access and a future 15 foot wide access road.

Geotechnical investigation should be completed during preliminary design to verify the suitability of the site for a tank and to provide geotechnical design recommendations, and geotechnical hazards.

The proposed tank location is shown in Figure 2.

Site Access

Approximately 2,300 linear feet of existing unpaved access road traverses between the proposed tank location and the Shadow Rock entrance. The existing access road varies from 12 to 16 feet wide. For the purposes of this memorandum a 16 foot wide paved access road has been assumed from the Shadow Rock Lane entrance to the reservoir site. During preliminary design the access road should be further evaluated to confirm the appropriate design vehicle can access the site.

Grades along the existing access road range from 5% to 10% up to approximately 300 feet west of the proposed reservoir site, where the slope of the access road begins to increase to approximately 20%. Typically, at grades greater than 12% to 14% concrete trucks will not be able to carry full loads, resulting in increased construction costs during the pouring of the tank foundation and other concrete placement. To facilitate construction of the tank and future access at the site it is recommended that approximately 300 feet of new access road be designed

with a maximum slope of 10% connecting the tank site to the existing access road. The proposed access road has been assumed to wrap around the tank. A preliminary sketch of the new access road and tank location is shown in the attached Figure 2.

Inlet and Outlet Piping and Appurtenances

We have assumed the design of the new tank will include the following inlet and outlet piping design features:

- Separate inlet and outlet connections designed to fill and draw from the tank at opposite sides to promote tank mixing.
- The fill and draw rates of the reservoir have been assumed to be similar to those of the Harris Grade Reservoir, resulting in 16-inch diameter inlet and outlet tank connections.
- Flexible expansion joints installed at all tank connections to protect the piping and tank against differential settlement or movement during a seismic event.
- An altitude valve will be placed on the tank inlet to prevent the tank from overfilling.

A common 16-inch inlet and outlet line will need to convey water from the new tank, down the site access road, to a suitable connection point within the District's system. For the purposes of this memorandum, the District has determined the 16-inch pipeline within Plano Trabuco Drive a suitable connection point. As part of this preliminary estimate we considered the following alignment alternatives (as shown in Figure 3):

- Alternative A: This alternative is only viable if the nursery to the east of the Porter Property is developed. The proposed alignment will travel down streets of the proposed development to the Plano Trabuco connection point. The District could realize a savings if the pipeline is combined with the development's distribution system. For the purposes of this memorandum it was assumed that the District would pay the difference in cost between an 8-inch pipeline (assumed to be required for the development) and a 16-inch pipeline (required for the reservoir inlet/outlet). The total length of this alternative alignment is 8,050 linear feet.

- Alternative B: This alternative utilizes existing District easements located behind the residential properties on Shadow Rock Lane and north of Robinson Ranch Road between residential properties and an existing nursery. Within the District easements there is minimal contractor access and sloping terrain which will result in difficult construction and slowed contractor production rates. Additionally, there are existing District utilities already in the easement, potentially creating a tight corridor for the new alignment. For these reasons this alignment was not further considered.

- Alternative C: This alternative exits the site at Shadow Rock Lane, continues west on Robinson Ranch Road to the connection point in Plano Trabuco Road. This alignment will be more costly than Alternative A because the Contractor will have additional challenges associated with typical in-street construction such as: existing utility crossings, traffic control, and pavement replacement. The total length of this alternative alignment is 10,000 linear feet.

Drain and Overflow Piping

The proposed reservoir will be designed with an overflow structure to prevent the tank from overfilling. The overflow structure will feature an air gap to a catch basin which will convey the water to the on-site drainage system.

A tank drain will be provided to remove unusable water from the reservoir. This is usually the last few feet that cannot be sent to the system and/or any wash down water due to tank cleaning. On a steel tank a flush type

cleanout will be provided through the tank wall, near the bottom of the tank wall. The cleanout will convey water through an air gap into the on-site drainage system.

Site Drainage

Site surface runoff will be collected from the drainage basin surrounding the tank. Concrete terrace drains and v-gutters will intercept surface flows and convey these around the tank site. On-site grading will result in surface flows draining away from the tank and being collected in either a pipe or directed to a concrete v-gutter. Off-site and on-site drainage will need to be conveyed along the access road from the tank site. Based on the topography there is a low spot on the site. It is assumed that the collected water can be drained to the Shadow Rock Detention Basin. For the purposes of this technical memorandum it has been assumed that a concrete v-gutter will convey runoff down the access road to a low point in the topography, located near the southern border of the property, where runoff will be collected into an assumed 18-inch diameter storm drain the remainder of the way to the Shadow Rock Detention Basin. During future preliminary design development, the contributing off-site water shed, and the collected on-site surface flows should be determined. The permanent drainage facilities should also consider flow rates from a reservoir overflow event and the drainage facilities should be designed to convey the controlling flow scenario.

The proposed storm drain alignment used for this study is shown on Figure 4.

GEOTECHNICAL FINDINGS

A geotechnical site assessment was completed in 2001 by URS consisting of a review of previous geotechnical reports, a review of published regional geologic maps and reports, and a limited geological site reconnaissance. No subsurface field investigation or laboratory testing was performed.

The report found that the site is generally underlain by sedimentary and volcanic rock, with local areas of alluvial and slope wash deposits. Summarized below are the geological characteristics of the site.

- Western part of the property is underlain by conglomerate of the Trabuco Formation (weakly indurated, uncemented, massively bedded, and has boulders up to 7 feet in diameter).
- Northern part of the property in Arroyo Trabuco by alluvial deposits (generally consist of sand, gravel, and boulders that are unconsolidated).
- Eastern part of the property by Santiago Volcanic rock.

Faulting and Seismicity: There are no known active or potentially active faults traversing the site.

The 2001 Geotechnical Site Assessment recommended the following geological hazards be further investigated, as they may be present at the site.

- Earthquake-induced ground motions and land slide potential
- Location of the Aliso fault trace
- Flooding and liquefaction
- Surficial failures and erosion

PERMITTING

It is anticipated that permitting and coordination with the following agencies will be required:

- County of Orange
- Regional Water Quality Control Board
- California Department of Drinking Water

- Encroachment permit for pipeline from the City of Rancho Santa Margarita
- Environmental permits: In 2001 URS completed a Phase 1 Environmental Site Assessment (ESA) Review and Update on the District's Porter Property. The ESA recommended that a wetland delineation survey be completed to better define the status of the on-site drainages as wetlands that could be jurisdictional and/or require mitigation if impacted by development. Based on the wetland delineation survey a Corps of Engineers Section 404 permit and California Division of Fish and Game Section 1601 agreement may be required. Additionally, the ESA recommended a protocol survey for the Quino Checkerspot Butterfly habitat was recommended.

Continued permit coordination and development should continue in preliminary and final design.

CONSTRUCTION CONSIDERATIONS

The following items were considered when developing this memorandum:

Site Access: It is anticipated that minor grading and clearing of brush and trees along the edges of the access road will be required. During preliminary design the access road should be evaluated to confirm required design vehicles can access the site.

Work Area: 30 feet of work area around the tank has been provided. The contractor will require additional staging and laydown area during construction. It has been assumed that a temporary laydown area will be graded near the reservoir site and will be further developed during preliminary design.

Construction Water: It has been assumed the Contractor can get temporary construction water from the 8-inch PVC waterline in Shadow Rock Lane.

Electrical Service: For the purposes of this memorandum the electrical equipment assumed at the site was security lighting, level sensors, communication equipment, and intrusion alarms. Additionally, the Contractor will need power for construction activities. An electrical service for the new reservoir site can be pulled from the same source as the Shadow Rock Pump Station, assumed to be approximately 4,500 linear feet away. Overhead and below grade alternatives were both considered for the service run. Overhead power lines to the reservoir site would disturb the view of adjacent residences overlooking the property, and after discussions with the District was an unfavorable alternative. A buried service run will result in additional construction costs.

Due to the unfavorable costs and aesthetics of a service line, a solar power and backup battery system was also considered for this site. However, the regular required maintenance for cleaning and maintaining panels and 15 year service life of the solar equipment makes it an unfavorable option for the District.

For the purposes of this memorandum it has been assumed that underground electrical lines will convey power to the new reservoir site.

Grading and Drainage Impacts: Runoff from the access road and reservoir site will be captured by gutters and collected in a drain line, conveying the water to the Shadow Rock Detention Basins.

The amount of runoff from a new tank and paved access road will decrease the overall site permeability consequently increasing overall site runoff. During preliminary design the District may be required to provide an on-site BMP to treat runoff prior to discharging it.

CONSTRUCTION PHASING AND DURATION

Construction Phasing

In general, the following construction sequencing is recommended:

1. Site access road rough grading and improvements: Tree and brush removal, pruning, and rough grading along the access road to accommodate construction vehicles.
2. Site preparation: clearing of the site and preparing the site for grading activities.
3. Perform rough grading of reservoir pad.
4. Construct new tank, onsite piping, new 16-inch pipe to Plano Trabuco Road, valving, drains, overflow, new 18-inch storm drain to the Shadow Rock Detention Basin, electrical, etc.
5. Disinfect and hydrotest new tank.
6. Fill tank and bring new reservoir online.
7. Complete final site grading, final access road paving, landscaping, and miscellaneous site work.

Further refinement of the construction sequencing and phasing should be undertaken during the preliminary and final design phases of this project.

Construction Duration

The construction duration of this project is expected to require approximately 19 months with the following required durations:

1. Site access road rough grading and improvements – 1 month
2. Reservoir construction including grading operations, shoring, piping and appurtenances, and 18-inch storm drain to Shadow Rock Detention Basins – 9 months
3. 16-inch pipeline to Plano Trabuco – 6 months
4. Piping connections – 2 weeks
5. Reservoir disinfection and testing – 2 weeks
6. Final grading, site work, landscaping, and miscellaneous work – 2 months

PLANNING LEVEL CONSTRUCTION COST

The table below compares the estimated planning level construction costs for a new tank at the Porter Property and a new tank at the Harris Grade site. The construction costs for the Harris Grade tank were developed for the Harris Grade Siting Study.

Table 3 – Planning Level Construction Cost Estimate

	Porter Property 2.25 MG Tank (Alignment A – Future Development)	Porter Property 2.25 MG Tank (Alignment C – Existing Streets)	Harris Grade 2.7 MG Tank
Estimated Construction Cost	$7,012,000	$8,884,500	$6,100,000
30% Contingency	$2,103,000	$2,715,500	$1,800,000
Total Estimated Construction Cost	**$9,115,000**	**$11,600,000**	**$7,900,000**

An estimated breakdown of construction costs is attached in the Appendix.

In general, the costs for the new Harris Grade Reservoir are a more developed preliminary engineer's construction cost estimate, while the Porter Property estimate is a planning level estimate with more assumptions and unknowns.

In addition to the assumptions outlined in the memorandum above the following assumptions were made in developing the planning level estimate for the Porter Property Tank:

- Geotechnical: It was assumed that from a geotechnical standpoint this project including access road, reservoir location, and grading concept is feasible. A future geotechnical investigation should be conducted to confirm our assumptions.
- Electrical Service: The cost of the underground electrical service can vary greatly depending on SCE's existing infrastructure. The cost for an electrical service to the site can be anywhere from $500,000 to $1,000,000. For the purposes of this memorandum $850,000 was assumed for the electrical service cost.
- Site Drainage: It has been assumed that the Shadow Rock Detention Basin and pump station can accommodate the site runoff and an overflow event. A concrete V-gutter and 18-inch diameter storm drain pipe were assumed to convey runoff from the reservoir site to the Shadow Rock Detention Basin.

- Trench Excavation and Safety Measures: Assumed to be 2% of the pipeline costs.
- Inlet/Outlet Piping: It was assumed that the fill draw rate of the tank will be similar to that of the Harris Grade Reservoirs. 16-inch piping was assumed.
- Alignment Alternatives: Alternative A includes the alignment alternative through the future western development. The District realizes a cost savings because costs of the pipeline would be shared with the developer. However, Alternative A is only feasible if the adjacent western property is developed. If the adjacent western property is not developed, the District would realize the full cost for the alignment within existing streets, shown in Alternative C.

HARRIS GRADE AND PORTER PROPERTY SITE EVALUATION

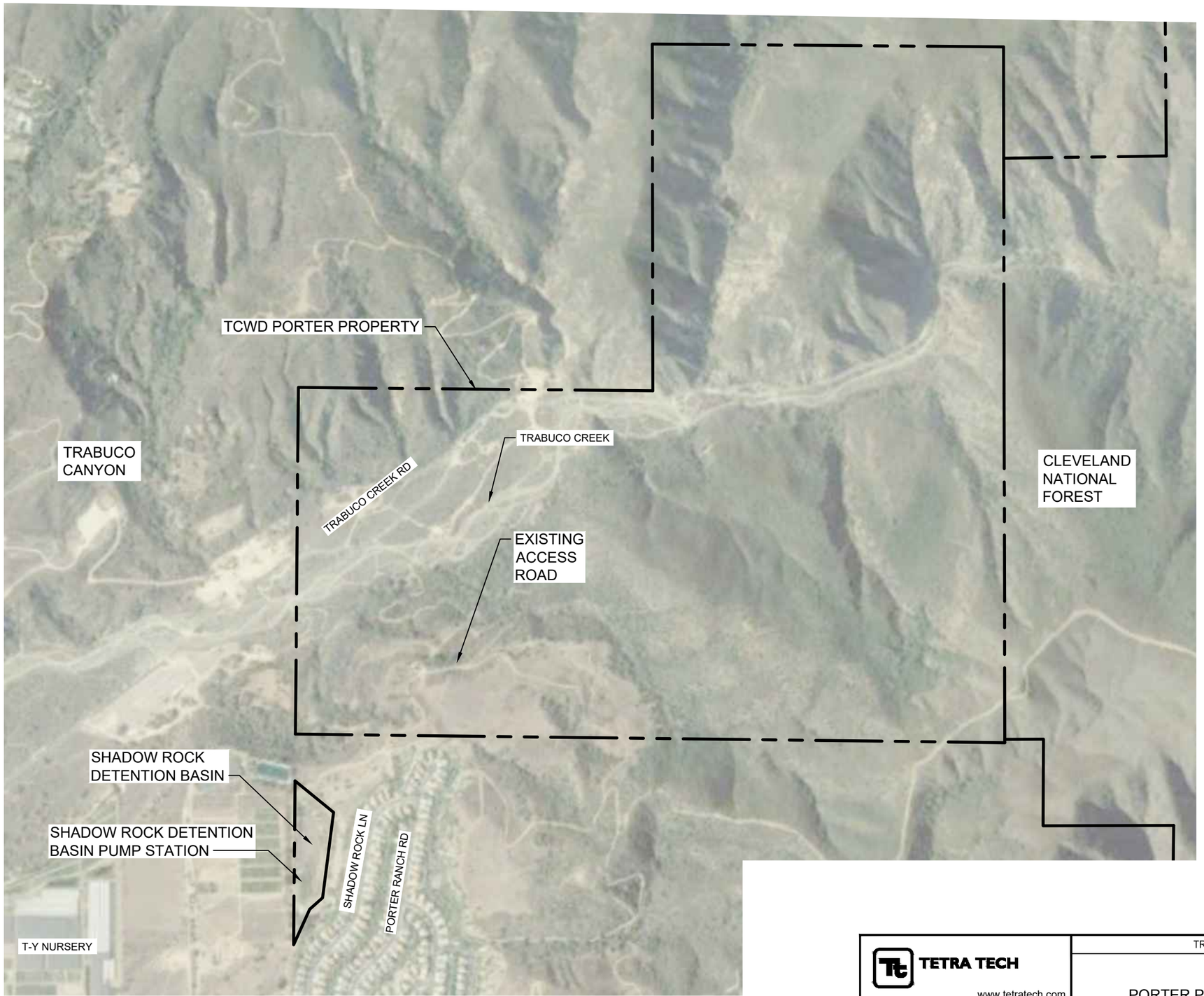
The Harris Grade site has more existing infrastructure surrounding it than the Porter Property (existing reservoir site, access road, electrical service, adjacent property owners, etc.) resulting in more difficult construction, and additional coordination.

The Porter Property is mostly undeveloped and requires new infrastructure to be built to the site, resulting in additional costs to develop the site.

Summarized in the table below is an evaluation of constructability issues at each site.

Table 4 – Harris Grade and Porter Property Site Evaluation

Constructability Issues	Porter Property 2.25 MG Tank		Harris Grade 2.7 MG Tank
Impacts to System	No storage impacts during construction.		District has 0.42 MG less storage during construction due to the removal of the existing tank at the Harris Grade Site.
Contractor Work Area and Staging Area	Additional grading may be required to grade a flat pad for additional Contractor staging.		Reduced work area and staging area, will require phased staging of materials and coordination with adjacent property owners to secure the lower staging area.
Site Access	2,300 linear feet of paved site access road will need to be constructed.		Minor grading improvements to existing access road will be required.
Inlet/Outlet Piping	Alternative A: 8,050 linear feet of 16-inch piping is required to tie into system. Cost savings was considered for portion of pipeline through future development.	Alternative C: 10,000 linear feet of 16-inch piping required to tie into system. Higher construction costs than Alternative A, but is a feasible alternative if the western property is not developed.	400 linear feet of 16-inch piping is required to tie into system.
Site Drainage	1,500 linear feet of drain pipe and 2,000 linear feet of concrete v-gutter is required.		Site can sheet flow off the property, no additional storm drain is required.
Electrical Service	An electrical service will need to be taken to the site approximately 3,500 linear feet away.		A new electrical service is not required.
Coordination/Permitting	Minimal coordination required with adjacent property owners.		Requires coordination with the Forest Service and adjacent property owners to secure staging areas.



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SCALE: 1" = 800'

TETRA TECH

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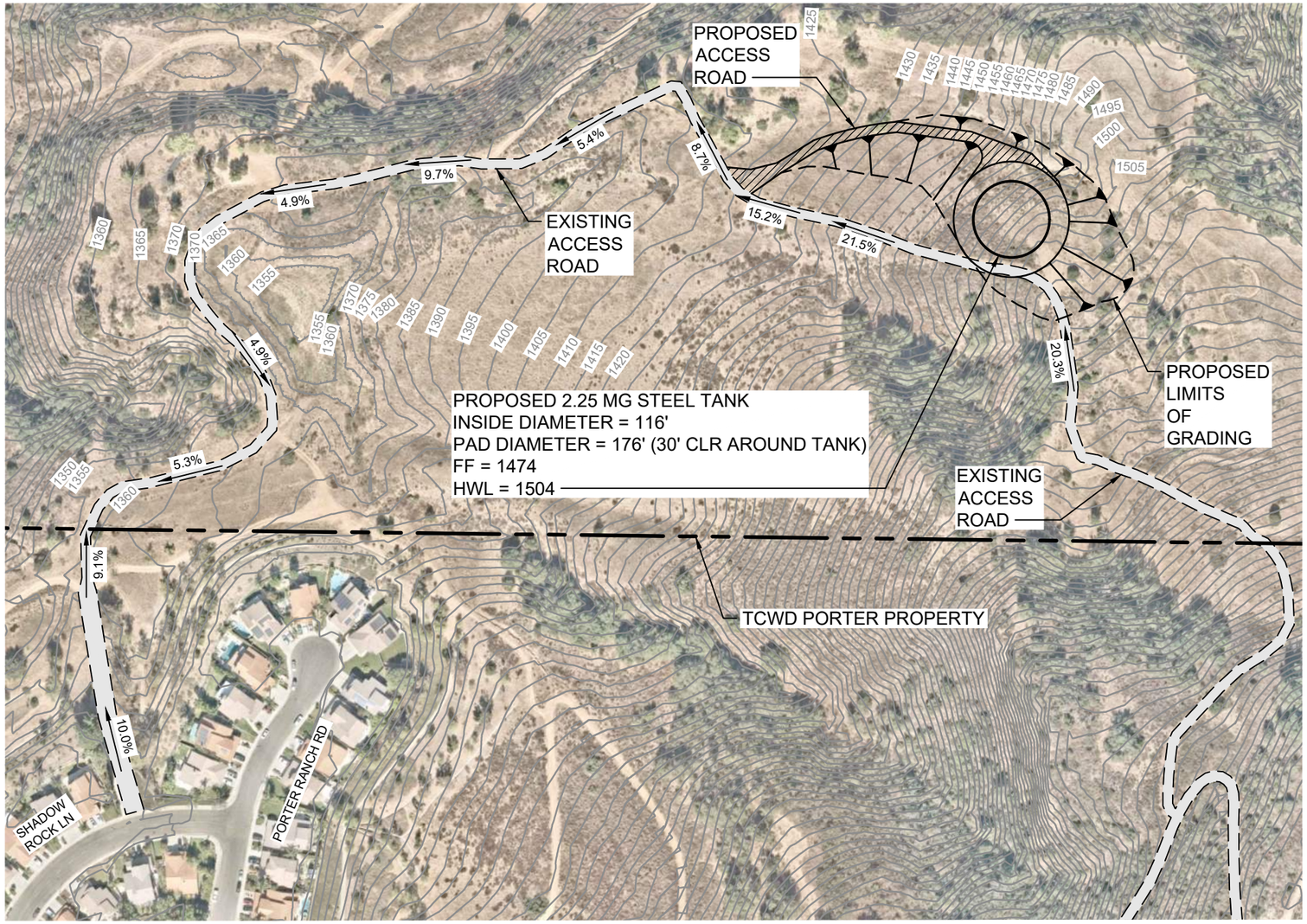
TRABUCO CANYON WATER DISTRICT

PORTER PROPERTY OVERALL SITE PLAN

Project No.:	200-09339-20001
Date:	DECEMBER 2020
Designed By:	KMB

FIGURE
1

Bar Measures 1 inch



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SCALE: 1" = 200'

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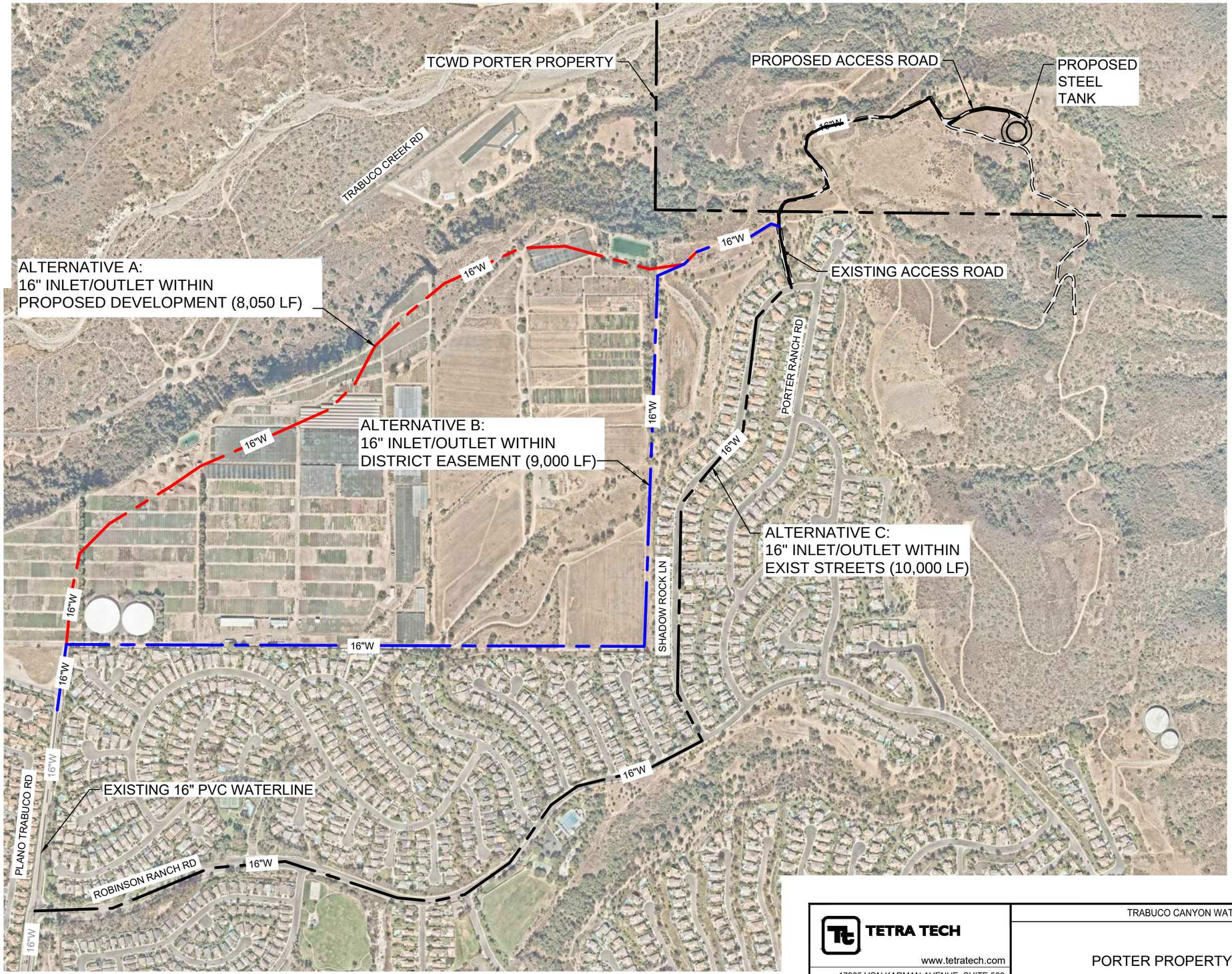
TRABUCO CANYON WATER DISTRICT

PORTER PROPERTY
TANK LOCATION AND ACCESS ROAD

Project No.:	200-09339-20001
Date:	DECEMBER 2020
Designed By:	KMB

FIGURE
2

Bar Measures 1 inch



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SCALE: 1" = 600'

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TRABUCO CANYON WATER DISTRICT

PORTER PROPERTY PIPING PLAN

Project No.:	200-09339-20001
Date:	DECEMBER 2020
Designed By:	KMB
FIGURE	3

Bar Measures 1 inch

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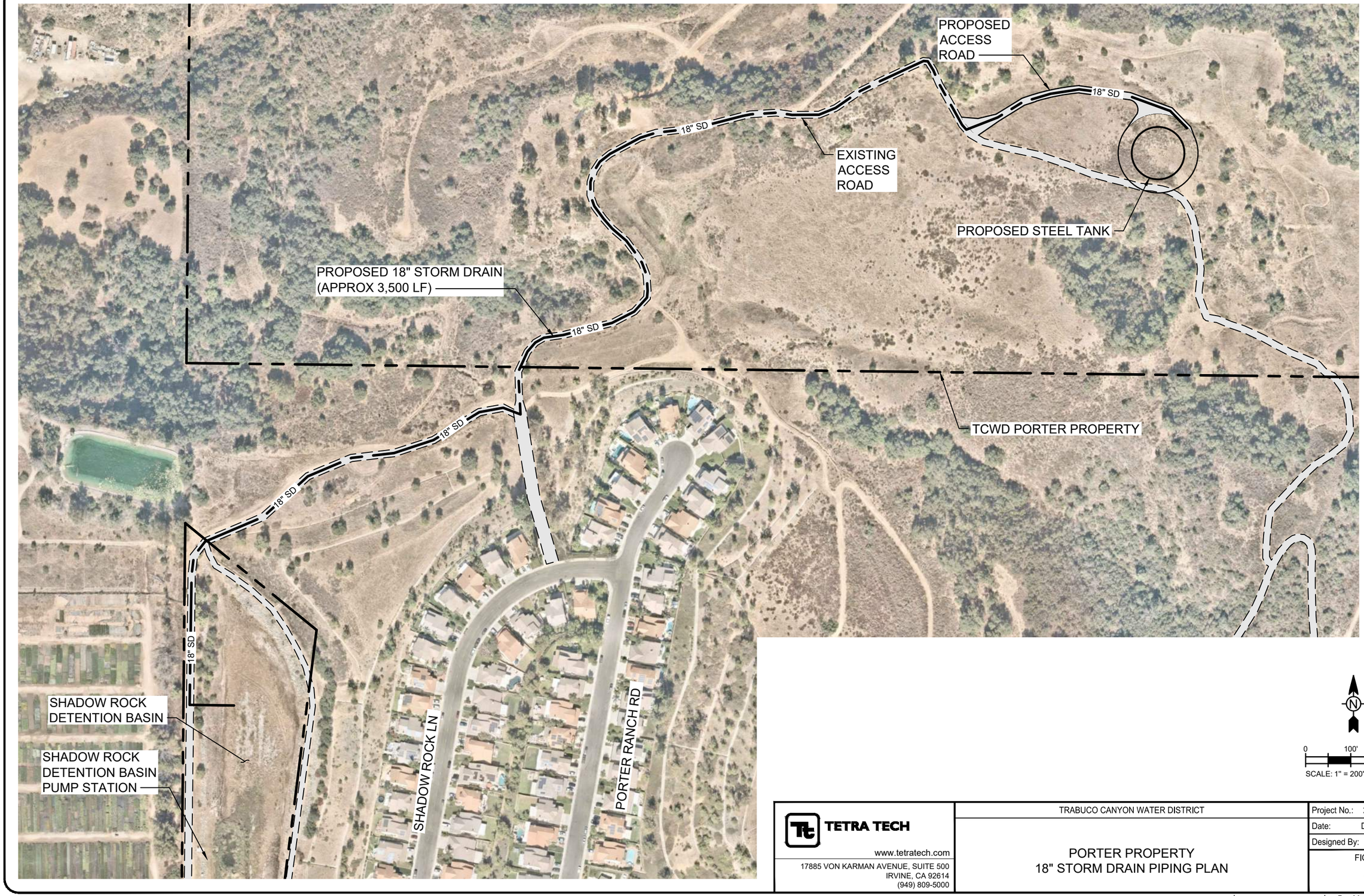

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TRABUCO CANYON WATER DISTRICT

PORTER PROPERTY
18" STORM DRAIN PIPING PLAN

Project No.:	200-09339-20001
Date:	DECEMBER 2020
Designed By:	KMB
FIGURE	4

Bar Measures 1 inch

TRABUCO CANYON WATER DISTRICT
Porter Ranch Property - 2.25 MG Tank
Planning Level Construction Cost Estimate

DATE: Feb 19, 2021
Project No.: 200-09339-20001

Pipeline Alternative A - In Future Development

Porter Property					
Item No.	**Description**	**Total**	**Unit**	**Unit Cost**	**Total**
1	Mobilization and Demobilization	1	LS	$325,000	$325,000
2	Trench excavation and safety measures	1	LS	$45,500	$45,500
3	Clear and grub site	1	LS	$15,000	$15,000
4	Construct access road improvements	1	LS	$840,000	$840,000
5	Site grading	1	LS	$175,000	$175,000
6	Storm Drain Piping	1	LS	$400,000	$400,000
7	Inlet/outlet piping along access road	1	LS	$690,000	$690,000
8	Implement interim erosion control and BMP maintenance	1	LS	$20,000	$20,000
9	Construct 2.25 MG Steel Tank	1	LS	$1,632,000	$1,632,000
10	Furnish and Install yard piping	1	LS	$130,000	$130,000
11	Construct 16-inch piping to Plano connection point (Assumes piping through future development)	1	LS	$1,051,500	$1,051,500
12	Construct miscellaneous site work and AC Paving	1	LS	$668,000	$668,000
13	Electrical Improvements	1	LS	$850,000	$850,000
14	Disinfection Startup and testing	1	LS	$20,000	$20,000
15	Environmental Mitigation Measures and Monitoring	1	LS	$150,000	$150,000
				Sub Total:	**$7,012,000**
				30% Contingency:	**$2,103,000**
				TOTAL:	**$9,115,000**

TRABUCO CANYON WATER DISTRICT
Porter Ranch Property - 2.25 MG Tank
Planning Level Construction Cost Estimate

DATE: Jan. 26, 2021
Project No.: 200-09339-20001

Pipeline Alternative C - In Existing Streets

Porter Property					
Item No.	**Description**	**Total**	**Unit**	**Unit Cost**	**Total**
1	Mobilization and Demobilization	1	LS	$425,000	$425,000
2	Trench excavation and safety measures	1	LS	$87,000	$87,000
3	Clear and grub site	1	LS	$15,000	$15,000
4	Construct access road improvements	1	LS	$840,000	$840,000
5	Site grading	1	LS	$175,000	$175,000
6	Storm Drain Piping	1	LS	$400,000	$400,000
7	Inlet/outlet piping along access road	1	LS	$690,000	$690,000
8	Implement interim erosion control and BMP maintenance	1	LS	$20,000	$20,000
9	Construct 2.25 MG Steel Tank	1	LS	$1,632,000	$1,632,000
10	Furnish and Install yard piping	1	LS	$130,000	$130,000
11	Construct 16-inch to Plano connection point (Piping In Street)	1	LS	$2,782,500	$2,782,500
12	Construct miscellaneous site work and AC Paving	1	LS	$668,000	$668,000
13	Electrical Improvements	1	LS	$850,000	$850,000
14	Disinfection Startup and testing	1	LS	$20,000	$20,000
15	Environmental Mitigation Measures and Monitoring	1	LS	$150,000	$150,000
				Sub Total:	**$8,884,500**
				30% Contingency:	**$2,715,500**
				TOTAL:	**$11,600,000**

Trabuco Canyon Water District

Harris Grade Reservoir Siting Study

TETRA TECH

January 2021

Harris Grade Reservoir Siting Study

January 2021

PREPARED FOR

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1. PROJECT OBJECTIVES AND BACKGROUND

1.1 PURPOSE

In 2016 the Trabuco Canyon Water District (District) completed the "Domestic Water Storage and Reservoir Siting Study" to determine ideal locations within the District's service area for additional water storage for future planned developments and emergencies. The study determined that the Harris Grade Reservoir site is one of four locations for adding potable water storage within the District.

The District retained Tetra Tech to conduct a Reservoir Siting Study evaluating the feasibility of demolishing an existing 0.42 MG steel reservoir and constructing a new 2.0 to 2.7 MG reservoir, including upgrading of the inlet and outlet piping leading up the slope to the site. This siting study will present alternatives on the location, shape, and size for a new reservoir at the existing Harris Grade Site. Additionally, this siting study will address the reservoir type (prestressed concrete, steel, or conventional cast in place concrete), interconnections with the existing facilities, inlet and outlet piping, drainage impacts, site access, and any required site modifications or relocations.

1.2 BACKGROUND

The Harris Grade Pressure Zone (HGL 1504-feet) is the largest pressure zone within the District and receives water from the Cooks Pressure Zone (HGL 1250-feet) via the Ridgeline Booster Pump Station, which boosts the water through 14-inch and 10-inch pipelines on Live Oak Canyon Road. The Harris Grade site sits on a hill, with slopes as great as 2:1, above Live Oak Canyon Road and is connected to the waterlines in the road with an existing 10-inch and 14-inch pipeline running in a 20-foot wide easement down the hillside.

The site is located within the Cleveland National Forest on land leased to the District from the United States Forest Service. The site can be accessed from Live Oak Canyon Road through a 10-foot wide access road within a 20-foot wide easement. The grade of the existing access road to the reservoir site varies from flat to 16 to 17 percent. Overhead electrical lines coming from Live Oak Canyon Road provide the site power. The overall site is shown on Figure 1-1.

The District owns and operates two reservoirs within the Harris Grade Reservoir Site, one 2.0 MG steel reservoir constructed in 1981 (Reservoir No. 1) and one 0.42 MG steel reservoir, constructed in 1965 (Reservoir No. 2). Summarized below are the characteristics of the existing Harris Grade Reservoirs. The existing Harris Grade Reservoir site is shown on Figure 1-2.

Table 1 – Existing Harris Grade Reservoir Characteristics

	Reservoir No. 1	Reservoir No. 2
Material	Steel (Circular)	Bolted Steel (Circular)
Capacity	2.0 MG	0.42 MG
Year Constructed	1981	1965
Finished Floor **High Water Level (HWL)**	1473 feet 1504 feet	1473 feet 1496 feet

Due to the high water elevation difference between the two tanks; they are unable to float off each other. The District operates an on-site bypass pump to pump water from the small tank to the larger tank.

2. DESIGN CRITERIA

Design criteria for the new tank and appurtenances is summarized in the table below:

Table 2 – Design Criteria Summary
Reservoir Design Standards: The new tank shall be designed to the following design standards. 1. California Department of Drinking Water (DDW) requirements outlined in the California Code of Regulations Title 22 "Design and Construction of Water Distribution Reservoirs." 2. American Water Works Association (AWWA). a. For pre-stressed concrete tanks: Standard D110; "Wire and Strand-Wound Circular Prestressed Concrete Water Tanks." b. For steel tanks: Standard D100; "Welded Carbon Steel Tanks for Water Storage." 3. Trabuco Canyon Water District Standard Plans and Specifications.
Storage Volume: 1. Minimum Storage Volume: 2.0 MG. 2. Desired Storage Volume: 2.7 MG.
Floor Elevation (Match Existing): 1473-feet (record drawings – NGVD29) / 1475.4 (survey – NAVD88).
High Water Level Elevation (Match Existing): 1504-feet (record drawings – NGVD29) / 1506.4 (survey – NAVD88).
Sidewater Depth: 31-feet.
Inlet/Outlet Piping and Valves: 16-inch separate inlet and outlet connections.
Overflow and Drain Piping: • Overflow and drain pipes of the existing reservoirs empty to the surface and sheet flow off site to the adjacent natural terrain. It is anticipated the new overflow and drains will similarly sheet flow off the site. • The overflow size of the new reservoir will be confirmed during preliminary design based on the maximum anticipated fill rate of the reservoir. It is anticipated the proposed tank overflow will go through the tank wall and feature an air gap facility to meet California Department of Drinking Water (DDW) requirements. • A tank drain should be provided to remove unusable water from the reservoir and feature an air gap facility to meet California Department of Drinking Water (DDW) requirements.
Tank Intertie Piping: Tank intertie piping is assumed to be 16-inches to match the new piping from Live Oak Canyon Road (size to be based on the system fill and draw rates and should be confirmed during preliminary design).
Minimum Required Clearance Around Tank: 12-feet.
Assumed Temporary Cantilever Shoring Height: 14-feet.
Assumed Permanent Retaining Wall Height: 12-feet.
Site Access Design Vehicle Size (Interim Site): Single Unit Truck – 30-feet long x 8-feet wide; 42-foot turning radius.
Site Access Design Vehicle Size (Final Site): Pickup truck.

2.1 STORAGE REQUIREMENTS

The District has the following storage requirements for the Harris Grade Site:

1. A minimum of 1.38 million gallons (MG) of additional storage is required within the District to meet the requirements of the Water Reliability Emergency Storage (WRES) fund. District customers are contributing to the WRES fund, which is reserved for an additional 2.0 MG storage within the District. A portion of the required storage has been built at the Saddlecrest development (0.62 MG) in 2019, but the remaining 1.38 MG is still pending.

2. A minimum of 0.87 MG of storage is required for the future Saddleback Meadows development.
3. A minimum of 0.42 MG of storage is required to replace the existing steel Reservoir No. 2 to be demolished to make room for a new tank.

In order to meet the storage requirements above a minimum 2.7 MG tank is needed.

2.2 PIPING AND APPURTENANCES

The existing piping and appurtenances at the Harris Grade Reservoirs consists of combined tank inlet/outlet pipes, overflow pipes, drain pipes, tank intertie piping, and combined inlet/outlet piping to Live Oak Canyon Road as shown on Figure 1-2. Currently the Reservoirs No. 1 and 2 are operated as follows to promote tank mixing:

1. Flow is let into Reservoir No. 2 through a 6-inch altitude valve and 8-inch inlet/outlet pipeline.
2. Flow is pumped out of Reservoir No. 2 into Reservoir No. 1 through a 6-inch tank intertie. A pump is required because the high water level (HWL) of Reservoir No. 2 is 8-feet higher than that of Reservoir No. 1.
3. Flow to the distribution system is conveyed through a 14-inch outlet on Reservoir No. 1.

The new tank will be designed to float with the existing Reservoir No. 1, therefore both tanks will have identical HWL and finished floor elevations, and a pumped tank intertie will not be required. The proposed tank will have separate inlet and outlet connections, overflow structure, drain line, and intertie piping. Proposed tank piping layouts are shown on Figures 4-1.1, 4-2.1, and 4-3.1. The proposed piping will be configured to accommodate the following:

1. System fills and draws from either tank, while the other tank is isolated.
2. System fills one tank and draws from the other.
3. System fills and draws from both tanks simultaneously.

2.2.1 Piping to Live Oak Canyon Road

Currently the District has a 20-foot wide easement containing existing 10-inch and 14-inch steel pipelines connecting the Harris Grade Reservoirs No. 1 and No. 2 to 10-inch (steel) and 14-inch (ACP) waterlines in Live Oak Canyon Road. The District has determined that the existing 10-inch pipeline will need to be upsized to 16-inches to meet the expected increased system demands.

Constructability of the new 16-inch pipeline is discussed further in Section 5.

2.2.2 Tank Inlet Outlet Piping

Reservoir No. 1

The existing 2.0 MG Reservoir No. 1 was originally designed with a 14-inch combined inlet/outlet pipeline. A 12-inch outlet connection was constructed as a modification to the original design intended to be used as a separate outlet, but is no longer used. The no longer used 12-inch outlet connection contains above grade piping, pump, gate valve, double ball expansion joint, and Cla-Val and is shown in the photo following this paragraph.

Photo 1 – Existing Reservoir No. 1 Inlet Piping Modification

The 12-inch tank outlet was originally intended to boost water approximately 10 psi to give higher pressures at the outskirts of the system, but is no longer in use.

There are two below grade pipe penetrations coming off the 12-inch tank connections. Record drawings are not available showing how the piping from the 12-inch tank connection ties back to the main line. It is recommended that during preliminary design the below grade pipes be located to determine how they are connected to the system.

Currently the District fills to Reservoir No. 2 and draws from Reservoir No. 1. When Reservoir No. 2 is out of service during construction all Reservoir No. 1 will need to operate independently. It is recommended that the unused 12-inch connection be converted to a separate inlet connection with an altitude valve to protect the tank against overfilling.

New Harris Grade Reservoir

The design of the new tank should include the following inlet and outlet design features:

- Separate inlet and outlet connections designed to fill and draw from the tank at opposite sides to promote tank mixing.
- The size of the inlet and outlet lines has been assumed to be 16-inchs to match the diameter of the new pipeline from Live Oak Canyon Road. The size should be confirmed during preliminary design and based on the anticipated tank fill and draw rates.
- A new altitude valve should be sized during preliminary design and be placed on the inlet pipe to prevent overfilling the tank.

- Flexible expansion joints installed at all tank connections to protect the piping and tank against differential settlement or movement during a seismic event.

2.2.3 Tank Overflow and Drain Piping

Overflow and drain pipelines of the existing reservoirs empty to the surface and sheet flow to a riprap pad then off site to the adjacent natural terrain. It is anticipated the new overflow and drain pipelines will also be directed to riprap and sheet flow off the site in a similar manner.

The overflow size of the new reservoir will be confirmed during preliminary design based on the maximum anticipated fill rate of the reservoir. It is anticipated the proposed tank overflow will penetrate through the tank wall and feature an air gap to meet California Department of Drinking Water (DDW) requirements.

A tank drain should be provided to remove unusable water from the reservoir. This is usually the last few feet that cannot be sent to the system and/or any wash down water due to tank cleaning. On a concrete tank the drain will penetrate through the floor and collect in a manhole, where the water can be dechlorinated and released to sheet flow to riprap and then offsite to the natural terrain. On a steel tank a flush type cleanout will be provided through the tank wall, near the bottom of the tank wall.

The required size and connection points of the drain and overflow facilities should be studied in more detail during the preliminary design phase to determine the environmental mitigation measures related to draining the tank.

2.2.4 Tank Intertie Connection

The existing tank intertie connection and pump will be removed and replaced. The new tank will be designed to float off the existing Reservoir No. 1. The new tank intertie should be designed for the maximum tank fill and draw rates in order to fill through one tank and draw from the other. Isolation valves and flexible expansion joints should be placed at each tank connection.

2.3 SITE DESIGN REQUIREMENTS

The following site design elements were considered when developing the tank siting alternatives.

Construction clearance: A minimum of 12-feet of clearance is required around the tank during construction.

Site access (Final): The final site will have similar vehicle accessibility as the existing. The existing site has space for a pickup truck to enter the site and drive around the existing reservoir.

Site access (Interim): The interim construction site will have access for large a single unit truck, approximately the size of a concrete truck or crane (30-feet long x 8-feet wide; 42-foot turning radius).

Final site grading: The site will be graded so that the surface slopes away from the tanks, to avoid ponding adjacent to the tank foundation.

Cantilever shoring: A maximum 14-foot high cantilever shoring was assumed for the purposes of this siting study. Ultimately the shoring design is part of the Contractor's means and methods, however it is recommended that a conceptual shoring plan be developed in the preliminary design phase of the project.

On-site retaining wall: A maximum 12-foot high retaining wall was assumed for the purposes of this siting study. The final retaining wall height and design will be developed during the preliminary design phase of the project.

3. GEOTECHNICAL INVESTIGATION

A "Preliminary Geotechnical Exploration Report" for the project was completed by Leighton Consulting, dated June 18, 2020. As part of the preliminary investigation two hollow-stem auger borings were taken at the site, ranging in depths from 33 to 41 feet below the existing grade. Both borings were terminated due to auger refusal. The complete geotechnical report can be found in Appendix A of this report.

This section summarizes the findings of the preliminary geotechnical report and outlines additional geotechnical investigations required for final design.

3.1 GEOTECHNICAL FINDINGS

Summarized below are geotechnical characteristics of the site and recommendations outlined in the preliminary geotechnical report.

Table 3 – Geotechnical Characteristics
Subsurface Conditions: In general, the borings at the site consisted of artificial fill, alluvium, and bedrock. The southern side of the site consisted of deeper artificial fill and alluvium layers (up to 25 feet below grade), while bedrock was encountered as high as 1 foot below grade at the northern side of the site.
Groundwater: Groundwater was not encountered during the field exploration to a maximum depth of 41-feet. Groundwater is not anticipated to adversely impact the proposed project.
Expansive Soil Characteristics: The expansion potential of the near-surface onsite soils is considered to be low; however, variability in the expansion potential of the near surface onsite soils should be anticipated.
Soil Corrosivity: • Soils exhibit negligible potential for sulfate attack on concrete. • Soils exhibit low corrosion potential to buried ferrous metal in direct contact with the soils.
Rippability: • Near surface bedrock is expected to be excavatable using conventional heavy duty earth moving equipment. • Deeper bedrock excavations may require special ripping techniques such as jackhammers or other percussion devices.
Faulting and Seismicity: There are no known active or potentially active faults traversing the site.
Secondary Seismic Hazards: • Liquefaction Potential is very low. • Seismically-Induced Landslides: The western portion of the site and northerly ascending slope are located within an area that has been identified by the State of California as being potentially susceptible to the occurrence of seismically-induced landslides. • Earthquake-Induced Flooding: The site is not located within an inundation area for dam failure, however the potential for earthquake-induced flooding may exist if the existing reservoir does not meet the current seismic design standards.

3.2 FUTURE GEOTECHNICAL INVESTIGATIONS

Based on the preliminary geotechnical investigation the proposed project is feasible from a geotechnical standpoint. The geotechnical report provided in the attached Appendix A provides recommendations on foundation design parameters, concrete slab on grade design, retaining wall and shoring design parameters, seismic design parameters, and pavement design.

The report found that the potential for seismically-induced landslides exists and should be further evaluated during final design, once a site plan is developed for the project. For this reason it is recommended that a supplemental geotechnical report be prepared during a future phase of design to conduct additional slope stability analysis and confirm geotechnical subsurface conditions.

4. SITING ALTERNATIVES

Based on the design criteria and geotechnical information outlined in the previous sections Tetra Tech has developed the following reservoir siting alternatives shown in Table 4 below.

Table 4 – Summary of Tank Alternatives

Alternative	Description	Material/Shape	Capacity
1A	• 0.42 MG Reservoir No. 2 is demolished, making room for a new reservoir cut into the northern slope of the site. • Retaining wall (12-feet high max). • 2:1 and 1:1 permanent slopes.	Steel / Circular (97-feet ID)	1.7 MG
1B	Same layout and requirements as Fig 4-1A.	Concrete / Circular (97-feet ID)	1.7 MG
2	• 0.42 MG Reservoir No. 2 is demolished, making room for a new reservoir cut into the northern slope of the site. • Partially buried tank. • Temporary shoring required (assumed 14-feet max high cantilever shoring).	Concrete / Circular (109-feet ID)	2.0 MG
3	• 0.42 MG Reservoir No. 2 is demolished, making room for a new reservoir cut into the northern slope of the site. • Partially buried tank. • Temporary shoring required (assumed 14-feet max high cantilever shoring). • Temporary construction easement from US Forest Service.	Concrete / Circular (125-feet ID)	2.7 MG
4	• 2.0 MG Reservoir No. 1 and 0.42 MG Reservoir No. 2 are demolished for a new reservoir, using the whole site. • Requires both tanks to be out of service during construction (approx. 18 months). • Partially buried tank. • Temporary shoring required (assumed 14-feet max high cantilever shoring).	Concrete / Rectangular (200-feet x 91-feet, inside wall dimensions)	4.0 MG

As shown in the table above, the only alternative that meets the District's desired 2.7 MG storage volume is Alternative 3. Conceptual final grading and site plan, interim grading plan, and sections are shown in Figures 4-3.1, 4-3.2, and 4-3.3, respectively. As shown in the conceptual grading plans, this alternative requires a temporary easement from the US Forest Service for interim grading operations. The grade around the tank wall varies from 17 feet along the north side and tapers to the finished floor grade along the south of the tank). An AWWA D-110 steel tank is not a feasible tank material for this alternative because steel tanks cannot have differential fill around the tank wall.

The largest tank that can be provided, keeping all grading operations within the limits of the District's lease limits is 2.0 MG, shown in Alternative 2. Similar to Alternative 3, an AWWA D-100 Steel Tank is not a feasible material because the final grading plan requires the north portion of the tank to be partially buried. Conceptual final grading and site plan, interim grading plan, and sections are shown in Figures 4-2.1, 4-2.2, and 4-2.3, respectively.

The largest AWWA D-100 Steel Tank that can be provided on the site is a 1.7 MG tank, as shown in Alternative 4-1. Alternative 4-1 can accommodate circular welded steel AWWA D-100 tank or a prestressed concrete cylinder tank per AWWA D-110 because either tank can be constructed with the clearances shown.

The rectangular concrete tank, Alternative 4-4, can provide approximately 4.0 MG of storage. However, this alternative does not meet District storage requirements when an additional 2.0 MG is included to account for the existing Reservoir No. 1 that will need to be removed for the 4.0 MG tank to be constructed. Additionally, this alternative takes all storage away from the Harris Grade site for the duration of construction. For these reasons, this alternative is not favorable, and has not been developed further in this study.

Alternatives 1, 2, and 3 each meet the District's WRES storage requirement, however Alternatives 1 and 2 do not meet the Saddleback Meadows storage requirement. Additional storage within the District is still required for the Saddleback Meadows development if Alternatives 1 or 2 are selected.

5. CONSTRUCTION CONSIDERATIONS

The three feasible alternatives (1, 2, and 3) presented in Section 4 have been further developed in this section. The three alternatives all have relatively similar impacts and challenges as described below.

5.1 CONSTRUCTION ACCESS, CONTRACTOR STAGING AREA, AND HAUL ROUTES

During construction of the new tank and demolition of the existing 0.42 MG tank construction equipment will need access to and around the construction site. The existing construction access road is single lane, 10-feet wide, with grades as steep as 16 to 17 percent. We evaluated the existing access road for access by large trailered vehicles. A program was used to simulate the following two design vehicles:

- Tractor trailer: 69-feet long x 8-feet wide and has a 50-foot turning radius.
- Single unit truck: 30-feet long x 8-feet wide and has a 42-foot turning radius.

Based on the results of this analysis, the larger tractor trailer cannot stay within the 20-foot limits of the access lease and cannot turn onto the access road from Live Oak Canyon. Large delivery vehicles will need to deliver materials to a staging area at the bottom of the access road, then the materials will need to be taken to the reservoir site using a smaller vehicle. This results in increased handling of materials, increased staging, and increased overall project costs. We recommend that the improvements be made and confirmed in preliminary design to widen the access road entrance at Live Oak Canyon Road to accommodate a tractor trailer delivery vehicle. If this improvement is not done the Contractor will be required to limit delivery vehicle size, resulting in additional deliveries and increased project costs.

There are portions of the access road that we recommend localized improvements to widen the roadbed to a 16-feet to accommodate the smaller single unit truck. This additional width at these localized areas are to facilitate the turning radius of the vehicle. Localized improvements to the road width as well as clearing of brush and overhanging trees is recommended and should be confirmed during the preliminary design phase of the project. Additionally, as shown on Figures 4-1.1, 4-2.1, and 4-3.1 a widened site entrance is recommended at the top of the access road near the gate. The widened sit entrance will allow a single unit truck to more easily enter the site and turn around the tanks. If the improvements are not done, then the Contractor will be required to limit the vehicle size and this will result in increased staging, increased handling of material and increased costs.

The local improvements to the access road and pruning of overhanging brush and trees can be completed by the District or the Contractor. If completed by the District time should be built into the contract for the District to meet with the Contractor to determine the limits of grading and pruning. The District may also consider performing the grading and pruning activities in advance, however there is some risk as these will be based on assumptions and not on the specific Contractor's needs and requirements for their equipment and means and methods. If the District performs the work in advance, the Contractor may still need to make modifications.

Due to the steep grade of the access road it is expected concrete trucks will not be able to carry full loads up to the site, resulting in increased construction costs.

There is an existing hiking/biking trail that crosses the access road, as shown in Figure 1-1. Coordination with the Forest Service will be required during preliminary design and construction to provide a trail detour or closure.

Three potential Contractor staging area have been identified below, and shown in Figure 5-1.

1. ***Lower staging area:*** The proposed lower staging area closes a portion of the private access road to provide approximately 6,000 square feet for Contractor staging area. A detour can be provided, as shown in Figure 5-1, through the Hamilton Oaks Private Community gates to reach the area blocked by the proposed staging area. Further coordination with the community will be required to secure this staging area. If this staging area cannot be secured the Contractor will need to find an offsite storage and staging area, increasing the cost of the overall project.
2. ***Upper staging area (east of tank):*** It is recommended that a working pad be built up to the east of the site within the lease area. This will act as a temporary laydown area for the Contractor. The Contractor will need a minimum of approximately 5,000 square feet of laydown area adjacent to the proposed tank. Assuming a 2:1 grade can be built up along the east side of the lease area, approximately 2,500 square feet of Contractor staging area can be provided. Due to the reduced staging area near the tank it is anticipated that the Contractor will be required to double handle materials, increasing the overall project costs.
3. ***Upper staging area (outside of lease boundary):*** Due to the limited working area within the lease boundary, additional Contractor laydown area, outside of the lease boundary was investigated. A flat pad can be graded to the south of Reservoir No. 1 providing the Contractor up to an additional 10,000 SF of laydown area, as shown in Figures 5-1 and 5-2. This laydown area will require the removal of approximately 4,000 cubic yards of material, but will decrease tank construction costs and increase the contractors production rate while constructing the tank. This laydown area will require a temporary construction easement from the Forest Service and should be investigated further during preliminary design.

The anticipated haul route to the site from the Interstate 5 Freeway, is north along El Toro Road, then east along Live Oak Canyon Road.

5.2 IMPACTS TO EXISTING FACILITIES

The three reservoir alternatives all have relatively similar site impacts and challenges as follows:

- Demolition of Reservoir No. 2 (0.42 MG): Each alternative requires the demolition of the existing Reservoir No. 2. In addition to the removal of the steel tank, the removal of the 6-inch altitude valve vault, 8-inch inlet piping, tank intertie piping and pump, tank overflow and drain piping will be required.
- During demolition activities the existing Reservoir No. 1 must stay in service. An isolation valve on the Reservoir No. 2 8-inch inlet/outlet pipeline and a valve on the 6-inch tank intertie can be closed to isolate the 0.42 MG Reservoir No. 2 from the system.
- Reservoir No. 2 will need to be drained before demolition. The District should plan to drain the tank to the system as much as possible to prepare for the Contractor's demolition. The Contractor will drain any remaining water through the tank's drain line to the existing surface which will sheet flow off the site.
- Overhead Electrical Line and Power Poles: Two power poles are located within the site, both to the east of the tank. A smaller power pole containing the site's electrical service will need to be relocated, as shown in the grading figures. A large transmission pole serving the site, located north of the site entrance must be protected in place. The conceptual grading figures keep a 10-foot clear buffer around the existing transmission pole, however SCE clearance requirements will need to be confirmed during preliminary design. The transmission pole serving the site contains overhead lines that go down to Live Oak Canyon Road. These overhead lines cross the site access road and will need to be considered during construction and clearance requirements will need to be coordinated with SCE. The overhead line will limit the height of the Contractor's equipment that can pass under it.
- Site fencing: The site fencing will need to be revised to enclose the larger site.

- Tree and brush pruning and/or removal is anticipated and will need to be coordinated with the Forest Service. Further investigation during primary design should be completed to determine environmental requirements.

5.3 SITE GRADING AND DRAINAGE IMPACTS

The site grading and drainage impacts for Alternatives 1, 2, and 3 are all similar and they do not significantly alter how the site is graded and drains. These three alternatives all feature a built-up pad on the north east of the site, and a widened entrance at the access gate. These features will allow for more room when constructing the tank and provide additional useable space at the site. Overall site drainage patterns will be maintained, sending runoff away from the tanks, off site.

Alternative 2 and 3 (shown in Figures 4-2.1 and 4-2.3) feature a final grading concept with a partially buried concrete tank. In order to maintain drainage away from the tank a concrete v-ditch will need to be constructed around the northern perimeter of the tank. The concrete v-ditch will catch runoff coming towards the tank from the adjacent hillside and direct it around the tank and off site.

The amount of runoff from a new, larger tank will decrease the overall site permeability consequently increasing overall site runoff. During final design the District may be required to provide an on-site BMP to treat runoff prior to discharging it.

5.4 PIPELINE CONSTRUCTION TO LIVE OAK CANYON

The District has requested that the existing 10-inch steel pipeline located within the 20-foot wide easement from Live Oak Canyon Road up to the Harris Grade Reservoir site be upsized to a 16-inch pipeline to meet future demands. The following two conceptual alignments and cross sections were developed and shown in Figure 5-3.

- Alternative A: This alignment uses the available 10-foot wide corridor between the existing 10-inch pipeline and the edge of easement.
- Alternative B: This alignment uses the same corridor as the existing 10-inch pipeline and requires replace-in-place construction.

Both alignments have the following construction considerations:

- **Environmental:** Similar to the adjacent areas surrounding the site and access road, the existing 20-foot wide easement is covered in mature trees and brush. Before construction can begin clearing and grubbing of the existing surface will be required. During preliminary design additional environmental investigations should determine any environmental mitigation measures required during construction.

- **Pipe Construction in Slope:** The existing 20-foot wide easement extends from the Harris Grade Site down the hill to Live Oak Canyon Road. Grades on the hill side are as much as 2:1. It is recommended that concrete slope anchors are be constructed at intervals throughout the trench to hold backfill in place, and to achieve good compaction over the pipe. It is unknown if concrete slope anchors were installed on the existing 10-inch and 14-inch lines. If slope anchors were installed on the existing pipe, the Contractor may encounter them during excavation and have difficulty constructing the proposed trench.

  The geotechnical report determined that this area was susceptible to seismically induced landslides. During preliminary design additional slope stability investigations should be conducted by a geotechnical engineer to confirm any bedding and backfill, trenching, shoring, or construction requirements to mitigate seismically induced landslides.

- **Utility separation:** The ideal minimum trench-to-trench horizontal clearance from the proposed water pipeline to parallel existing utilities is 3-feet. As excavation activities get closer to existing utilities, the Contractor runs the risk of running into unstable, previously disturbed soils, resulting in the trench caving in. The 20-foot easement only allows space for a 2 foot to 2.5 foot trench to trench clearance. The minimal clearance will likely slow the Contractor's production rate, as they will need to excavate carefully to avoid impacting the adjacent trench.

- **Work area:** The ideal work area to install the proposed pipeline is approximately 24 feet wide, however the existing easement limits the work area to 20-feet. During preliminary design the District may want to investigate an additional 10 to 15 foot temporary construction easement, which will allow the Contractor additional staging and laydown area, resulting in an increased production rate and lower installation costs.

  If a temporary easement cannot be obtained the existing 20-foot easement can be utilized. The existing easement limits the available staging area for materials and slows the production rate because work will need to be sequenced.

Advantages and disadvantages to each alternative are summarized below:

Alternative A:

- Does not require removal of existing 10-inch.
- More room on the south east side of the pipe staging of materials and spoils.
- Farther away from the existing 14-inch water and therefore, a lower risk of disturbing the existing 14-inch pipe to be protected in place.
- Without the temporary easement Alternative A is only 5-feet from the edge of the existing easement. The Contractor will not have access to the north west side of the pipe trench, this will require additional sequencing of material, resulting in a slower production rate.
- Excavating in undisturbed soil, may lead to less ripable soils and less favorable production rates.

Alternative B:

- Excavation in previously disturbed soil, can lead to more favorable production rates.
- Requires removal and disposal of the existing 10-inch steel pipe.
- Typically, concrete slope anchors are constructed for pipeline construction along steep grades. It is unknown based on record drawings if concrete slope anchors were constructed over the existing 10-inch. If they were the contractor would need to remove the existing concrete slope anchors.

5.5 PERMITTING

It is anticipated that permitting and coordination with the following agencies will be required:

- County of Orange.
- Regional Water Quality Control Board.
- California Department of Drinking Water.
- US Forest Service: Temporary construction easements will be required for Alternative 3, and the upper contractor staging area shown in Figures 4-3.1 and 5-1 (if the District elects to pursue this additional staging area).
- Environmental permits (a table of anticipated environmental requirements is given in Appendix C).

Continued permit coordination and development should continue in preliminary and final design.

5.6 CONSTRUCTION PHASING

Planning, sequencing, and phasing of construction activities will be critical to keep the Reservoir No. 1 in service during construction. In general, the following construction sequencing is recommended.

1. Site access road improvements: Tree and brush removal and pruning along the access road to accommodate construction vehicles.
2. Site preparation: clearing of the site and preparing the site for grading activities.
3. Construct piping modifications to Reservoir No. 1: Install altitude valve on inlet piping; remove pump and abandoned equipment.
4. Close valves and isolate Reservoir No. 2 from the system.
5. Demolish Reservoir No. 2 and appurtenances.
6. Construct temporary shoring/retaining walls and site grading.
7. Construct new tank, onsite piping, new 16-inch pipe to Live Oak Canyon Road, valving, drains, overflow, electrical, etc.
8. Construct the tank intertie connection and connect the new 16-inch pipeline to Live Oak Canyon Road to the existing 14-inch.
9. Disinfect and hydrotest new tank.
10. Fill tank and bring new reservoir online.
11. Complete final site grading, landscaping, and miscellaneous site work.

Further refinement of the construction sequencing and phasing should be undertaken during the preliminary and final design phases of this project.

5.7 CONSTRUCTION DURATION

Each alternative is anticipated to have a similar construction duration. The construction duration of this project is expected to require approximately 24 months with the following required durations:

1. Site preparation and clearing of access road – 1 month.
2. Reservoir No. 1 piping modifications – 2 months.
3. Demolition of Reservoir No. 2 – 2 months.
4. Reservoir construction, including grading operations, shoring, piping and appurtenances, and pipeline construction to Live Oak Canyon Road – 15 months.
5. Piping connections – 2 weeks.
6. Reservoir disinfection and testing – 2 weeks.
7. Final grading, site work, landscaping, and miscellaneous work – 2 months.

5.8 RESERVOIR TYPE

The reservoir types under consideration in this study are:

1. Circular pre-stressed (wire-wrapped) concrete reservoir per AWWA D110.
2. Welded steel reservoir per AWWA D100.

A welded steel reservoir is not feasible for Alternatives 2 and 3 because the conceptual final grading plan includes a partially buried tank. Steel tanks are typically are only buried if the loading can be distributed equally around the tank. In these alternatives the partially buried, north portion of the tank would have additional dead load on the tank wall. A welded steel reservoir is only feasible for Alternative 1. The structural/construction advantages and disadvantages of the two reservoir types are listed below:

Table 5 – Reservoir Type Advantages and Disadvantages		
	Prestressed Concrete Reservoir	**Steel Reservoir**
Construction Cost	Higher capital cost.	Lower capital cost.
Useful Life	75 to 100 years.	50 to 75 years.
Maintenance Cost	Lower maintenance cost.	Typically higher maintenance (re-painting tank outside; re-coating inside surfaces; and replacement of underside floor cathodic protection and interior anodes).
Water Quality	In an unmixed tank 9-inch to 12-inch thick walls provide enhanced insulation, keeping water cooler and a more consistent temperature within the tank.	In an unmixed tank thinner walls result in warmer water and dead zones near the top of the tank, leading to poor tank circulation and water quality issues.
Fire Resistance	Enhanced fire resistance.	More susceptible to fire damage.
Appurtenances	Tank connections are below grade through the reservoir floor slab. This leaves more useable space above the site for vehicle access around the tank.	Tank connections are above grade through the reservoir wall. This leaves less space for vehicle access round the tank.

6. CONSTRUCTION COST

Construction cost estimates were prepared for each of the four feasible alternatives and are presented in the table below.

Table 6 – Reservoir Alternative Cost Analysis

Alternative	Estimated Construction Cost
1A – 1.7 MG Steel Tank.	$4,500,000
1B – 1.7 MG Concrete Tank.	$5,100,000
2 – 2.0 MG Concrete Tank.	$7,100,000
3 – 2.7 MG Concrete Tank.	$7,900,000

The cost estimates above include a 30% contingency.

7. ALTERNATIVES ANALYSIS

The advantages and disadvantages of each of the three reservoir siting alternatives are presented below.

Table 7 – Alternative Analysis

Alternative	Advantages	Disadvantages	Construction Cost
1A/1B – 1.7 MG Steel or Concrete Tank (Material Analysis in Table 5)	1. Requires least amount of temporary grading/shoring. 2. More contractor work area is available at the site. 3. Largest feasible steel tank. 4. Temporary construction easements from USFS are not required.	1. Does not meet minimum storage requirement, additional storage at Saddleback Development is required.	$4,500,000 (Steel) $5,100,000 (Concrete)
2 – 2.0 MG Concrete Tank	1. Temporary construction easements from USFS are not required. 2. Requires less grading/shoring than Alternative 3.	1. Does not meet minimum storage requirement, additional storage at Saddleback Development is required. 2. Steel tank not feasible.	$7,100,000
3 – 2.7 MG Concrete Tank	1. Meets minimum storage requirement.	1. Requires temporary construction easement from USFS. 2. Requires the most amount of temporary grading and shoring. 3. Steel tank not feasible.	$7,900,000

8. CONCLUSION AND RECOMMENDATION

Based on the information presented herein Alternatives, 1, 2, and 3, are feasible reservoir siting alternatives. Alternative 4 is not recommended because construction of the rectangular tank will require the demolition of both existing reservoirs on the site, taking 2.42 MG of storage out of the District's system for the duration of construction. Additionally, the rectangular tank does not meet the District's storage requirements when additional volume is added to make up for both demolished tanks.

Alternatives 1, 2, and 3 each meet the District's WRES storage requirement, however Alternative 3 is the only one to meet the total storage required for the WRES and Saddleback Meadows development. Alternatives 1 and 2 both require additional storage within the District to meet the demands of the Saddleback Meadows development.

The District's preferred alternative is Alternative 3. Alternative 3 will maximize the storage at the Harris Grade site, so that additional storage does not need to be developed elsewhere within the District's service area. Alternative 3 consists of partially buried, AWWA D110, circular concrete tank, with 125-feet inside diameter. This alternative requires an easement from the US Forest Service, temporary shoring and extensive site grading for construction, and has an estimated construction cost of $7,900,000

Appendix A. Preliminary Geotechnical Exploration Report

PRELIMINARY GEOTECHNICAL EXPLORATION REPORT
TRABUCO CANYON WATER DISTRICT
HARRIS GRADE RESERVOIR REPLACEMENT
FEASIBILITY STUDY
18975 LIVE OAK CANYON ROAD
TRABUCO CANYON, ORANGE COUNTY, CALIFORNIA

Prepared for:

TETRA TECH, INC.

17885 Von Karman Avenue, Suite 500
Irvine, California 92614

Project No. 12753.001

June 18, 2020

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

June 18, 2020

Project No. 12753.001

Tetra Tech, Inc.
17885 Von Karman Avenue, Suite 500
Irvine, California 92614

Attention: Mr. Kyle Bohn, PE

Subject: Preliminary Geotechnical Exploration Report
Trabuco Canyon Water District
Harris Grade Reservoir Replacement Feasibility Study
18975 Live Oak Canyon Road
Trabuco Canyon, Orange County, California

In accordance with your request, Leighton Consulting, Inc. has performed a preliminary geotechnical exploration as your subconsultant for the Trabuco Canyon Water District (District) Harris Grade Reservoir Replacement Feasibility Study. This report is prepared in accordance with our revised proposal dated January 29, 2019, and information provided by you.

Earth materials encountered during the field exploration consisted mostly of bedrock of the Silverado Formation (clayey sandstone, sandstone and siltstone). At the southern portion of the site, Quaternary-aged alluvium/colluvium consisting of medium stiff clay and medium dense to dense clayey sand was encountered to a depth of 25 feet. Groundwater was not encountered in any of our borings drilled to a maximum depth of 41 feet below the existing grade.

Geotechnical aspects of the site that should be considered in the feasibility study include potential for seismically-induced landslides on the northerly and westerly slopes, the presence of undocumented fill and alluvium/colluvium at the southern portion of the site, and the potential presence of hard rock concretions within the bedrock if deep excavations are planned.

17781 Cowan ▪ Irvine, CA 92614-6009
949.250.1421 ▪ 949.250.1114 Fax

The proposed project is feasible from a geotechnical standpoint, provided the findings and preliminary recommendations presented in this report are considered in development of the project plan and preliminary design. Additional subsurface exploration and analysis may be required when a site plan is available to verify the geotechnical conditions throughout the site are generally consistent with the conditions encountered during our limited field exploration. This report presents the results of our field exploration, laboratory testing, and geotechnical analyses, and provides our preliminary recommendations for the proposed project.

Our professional services were performed in accordance with the prevailing standard of professional care as practiced by other geotechnical engineers in the area. We do not make any warranty, either expressed or implied. The report may not be used by others or for other projects without the expressed written consent of our client and our firm.

We appreciate the opportunity to work with you on this project. If you have any questions or if we can be of further service, please contact us at your convenience.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

Christian Delgadillo, PE, GE 3144
Senior Project Engineer

Jeff Pflueger, PG, CEG 2499
Associate Geologist

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Djan Chandra, PE, GE 2376
Senior Principal Engineer

CD/DJC/JMP/lr

Distribution: (1) Addressee

Leighton

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1.0 INTRODUCTION

1.1 Site Location and Proposed Project

The Harris Grade Reservoir site is located in the unincorporated community of Trabuco Canyon in the foothills of the Santa Ana Mountains in eastern Orange County. The site location (latitude N33.6869° and longitude W117.6061°) and immediate vicinity is shown on Figure 1, *Site Location Map.*

The project site is occupied by a 2.0 million gallon (MG) steel reservoir built in 1981 and a 0.42 MG steel reservoir built in 1965. The site for the existing facility appears to have been partially cut down into the ridgelines on the northern and southwestern sides of the existing reservoirs.

The District plans to replace the 0.42 MG reservoir with a new 2.0 to 2.55 MG reservoir and upgrade the inlet/outlet pipe leading up the slope to the site in a northeasterly direction from Live Oak Canyon Road.

1.2 Purpose and Scope of Exploration

The purpose of our preliminary geotechnical exploration was to evaluate the subsurface conditions and general soil/bedrock characteristics at the project site in order to assist Tetra Tech in identifying project constraints and preparation of preliminary layouts of the new reservoir. The scope of this exploration included the following tasks:

- *Background Review* – A background review was performed of readily available, relevant geotechnical and geological literature pertinent to the site. References reviewed in preparation of this report are listed in Section 4.0.

- *Pre-Field Exploration Activities* – Exploration locations were coordinated with Tetra Tech and the District, and marked in the field. Underground Service Alert (USA) was then notified to locate and mark existing underground utilities prior to our subsurface exploration.

- *Field Exploration* – We advanced two hollow-stem auger borings (LB-1 and LB-2) to depths ranging from 33 to 41 feet below existing grade on May 7, 2020. Both borings were terminated due to auger refusal. The approximate boring locations are shown on Figure 2, *Boring Location Map*. The borings were geotechnically logged and sampled using Standard Penetration Test (SPT) and

California Ring samplers at selected intervals. The SPT and Ring samplers were driven with a 140-pound hammer, free falling 30 inches. The number of blows was noted for every 6 inches of sampler penetration. Relatively undisturbed samples were collected from the borings using the Ring sampler. The sampling procedures generally followed ASTM D 1586 for SPT and D 3550 for split-barrel ring sampling. In addition to driven samples, representative bulk soil samples were also collected from the borings. Each sample collected was described in general conformance with the Unified Soil Classification System (USCS). The samples were sealed, packaged, and transported to our laboratory for testing. The soil and bedrock descriptions and depths are noted on the boring logs included in Appendix A, *Boring Logs*.

- *Laboratory Tests* – Laboratory tests were performed on selected soil and bedrock samples obtained during our field investigation. The laboratory testing program was designed to evaluate the physical and engineering characteristics of the onsite soil and bedrock. Tests performed during this exploration include:

  - Moisture Content and Dry Density (ASTM D 2216 and ASTM D 2937);
  - Consolidation (ASTM D 2435);
  - Direct Shear (ASTM D 3080);
  - R-Value (California Test Method 301); and
  - Corrosivity Suite – pH, Sulfate, Chloride, and Resistivity (California Test Methods 417, 422, and 643).

  Results of moisture content and dry density testing are presented on the boring logs in Appendix A. Other laboratory test results are presented in Appendix B, Laboratory Test Results.

- *Engineering Analysis* - The data obtained from our background review, field exploration, and laboratory testing program were evaluated and analyzed to develop the preliminary recommendations presented in this report for the proposed project.

- *Report Preparation* - The results of the exploration are summarized in this report presenting our findings, conclusions and recommendations.

2.0 FINDINGS

2.1 Geologic Setting

Regionally, the subject property lies within the central northwesterly portion of the Peninsular Ranges Geomorphic Province of California, one of eleven distinctly separate areas designated within the general boundaries of California. The provinces are defined on the basis of similarities in their topographic, geomorphic, tectonic and other geologic characteristics. The Peninsular Ranges are composed of an uplifted, westerly-tilted structural block that is manifest in an alternating series of northwest-trending mountain ranges and intervening valleys. Locally, the subject site lies within an area of foothills that flank the southwestern margin of the Santa Ana Mountains.

While the Santa Ana Mountain range is underlain by cretaceous age batholithic and metasedimentary bedrock units, the foothills are underlain by a well-mapped sequence of marine to non-marine sedimentary geologic formations of Cenozoic age through Quaternary age.

Three major northwest-trending blocks are recognized within the province, which are separated by major active paralleling fault systems including the Whittier-Elsinore Fault Zone, Newport-Inglewood Fault Zone, and the San Jacinto and San Andreas Fault systems. While interior areas of the structural blocks contain numerous faults, including the nearby Cristianitos and Mission Viejo faults, they are not classified as active by the California Geologic Survey (Bryant and Hart, 2007).

2.2 Surficial Geology

The site is mapped to be underlain by sedimentary bedrock of the Tertiary age Silverado Formation (Morton and Miller, 2006; Schoellhamer et al., 1981). This formation is mapped as a narrow zone of bedrock at the site in fault contact to the north and south with Cretaceous-age bedrock units and other Tertiary-age bedrock units trending in a northwest-southeast direction consistent with the ridgeline located immediately south of the existing reservoirs. The inclination of the bedrock is steeply dipping (roughly 50 degrees from horizontal) and is reported to have been overturned due to local tectonic movement. An overview of regional geology of the area is presented on Figure 3, *Regional Geology Map.*

2.3 Subsurface Conditions

Geologic units encountered in the borings at this site consist of undocumented artificial fill, Quaternary-aged alluvium/colluvium and Tertiary age Silverado Formation bedrock, as described in the following sections. Variations in subsurface geologic materials should be considered. Care should be exercised in interpolating or extrapolating geologic conditions between or beyond borings as the bedrock and soils generated from weathering of the units can vary widely with respect to geotechnical properties.

Artificial Fill (Af): The fill encountered in our borings varied from approximately 1 to 6 feet in thickness, and consisted generally of grayish brown and olive brown clay and sandy clay. The fill material is assumed to have been placed during grading of the existing reservoir site and associated improvements. Localized deeper accumulations of fill associated with the development of the site should be anticipated.

Quaternary Alluvium/Colluvium (Qa/Qcol): Alluvium/colluvium was encountered in the southern portion of the site in boring LB-2 at approximately 6 feet deep below existing grade, and consisted of brown and olive brown, medium stiff clay and medium dense to dense clayey sand. The alluvium/colluvium extends to a depth of approximately 25 feet below existing grade at the location of boring LB-2.

Silverado Formation (Tsi): Bedrock of the Silverado Formation underlies the site at depths varying from 1 to 25 feet. The Silverado Formation consists of non-marine and marine basal conglomerate overlain by relatively thin sequence of sandstone and siltstone. As encountered in our borings, the Silverado Formation generally consisted of yellow brown, olive reddish brown and blue-gray, fine- to medium-grained sandstone, clayey sandstone, and siltstone. Minor conglomerate lenses and locally hard and cemented zones should be anticipated within the formation.

2.4 Groundwater

Groundwater was not encountered during our field exploration to a maximum depth of 41 feet. Since the project site is located in an area mapped to be underlain by sedimentary bedrock, there is no historic high groundwater level information available for the site (CGS, 2002a). Groundwater may exist at greater depths in more granular layers of bedrock or in fractures within the bedrock. Based on our

field exploration and our experience in the project vicinity, groundwater is not anticipated to adversely impact the proposed project.

Fluctuations of the groundwater level, localized zones of perched water, and an increase in soil moisture should be anticipated during and following the rainy seasons or periods of locally intense rainfall or storm water runoff.

2.5 Expansive Soil Characteristics

Based on our exploration, the near-surface onsite soils are variable and generally consist of sand, clayey sand and sandy clay. Expansion Index (EI) testing conducted on a representative bulk sample of the near-surface onsite soils from boring LB-2 (i.e. upper 5 feet below ground surface) yielded an EI of 32 (see Appendix B). The expansion potential of the near-surface onsite soils is considered to be low; however, variability in the expansion potential of the near-surface onsite soils should be anticipated.

2.6 Soil Corrosivity

In general, soil environments that are detrimental to concrete have high concentrations of soluble sulfates and/or pH values of less than 5.5. Soils with chloride content greater than 500 ppm per California Test 422 are considered corrosive to steel, either in the form of reinforcement protected by concrete cover or plain steel substructures, such as steel pipes. Additionally, soils with a minimum resistivity of less than 1,000 Ohm-cm are considered corrosive to ferrous metal (Caltrans, 2018). Corrosivity test results are included in Appendix B of this report and summarized in Table 1.

Table 1 – Summary of Corrosivity Test Results

Test Parameter	Test Results	General Classification of Hazard
Water-soluble sulfate content	49 to 53 ppm	Negligible sulfate exposure to buried concrete (per ACI 318-14)
Water-soluble chloride Content	40 to 110 ppm	Non-corrosive to buried concrete (per Caltrans Specifications)
pH	7.2 to 8.0	Neutral to moderately alkaline, relatively passive to buried metals
Minimum resistivity (in saturated condition)	1,260 to 1,498 Ohm-cm	Non-corrosive to buried ferrous pipes (per Caltrans Specifications)

Based on the laboratory test results, the near-surface (upper 5 feet) soils at the site exhibit “negligible” potential for sulfate attack on concrete, and have low corrosion potential to buried ferrous metal in direct contact with the soils.

2.7 Rippability

Bedrock of the Silverado Formation (Tsi) was encountered in borings LB-1 and LB-2 at depths of 1 and 25 feet, respectively. However, refusal of the 8-inch diameter hollow-stem auger was encountered in both borings LB-1 and LB-2 at depths of 41 and 33 feet, respectively.

The near-surface bedrock can generally be excavated using conventional heavy-duty earth moving equipment in good working order. Localized hard and cemented zones may also exist and should be expected. As such, excavation difficulties should be anticipated where deeper excavations are planned into the bedrock. These localized areas may require special ripping techniques such as jackhammers or other percussion device and may produce oversized material that will require processing if the material is to be used as general site fill for structural support.

2.8 Faulting and Seismicity

Our review of available in-house literature indicates that there are no known active or potentially active faults traversing the site and the site is not located within a State of California designated Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007). The principal seismic hazard that could affect the site is ground shaking resulting from an earthquake occurring along any one of several major active faults in the region. Known regional active faults that could produce significant ground shaking at the site include the Whittier-Elsinore, San Joaquin Hills Blind Thrust and Chino faults located approximately 7.1 miles, 8.5 miles and 9.7 miles, respectively, from the site. The San Andreas fault is the largest fault in the region and is located approximately 38 miles from the site. Major regional faults with surface expression in proximity to the site are shown on Figure 4, *Regional Fault Map*.

The intensity of ground shaking at a given location depends primarily upon the earthquake magnitude, the distance from the source, and the site response characteristics. Peak horizontal ground accelerations are generally used to evaluate the intensity of ground motion. Using the SEAOC/OSHPD Seismic

Design Maps Tool (https://seismicmaps.org/) to obtain seismic design parameter values from the United States Geological Survey (USGS), the peak ground acceleration for the Maximum Considered Earthquake (MCE_G) adjusted for the Site Class effects (PGA_M) is 0.61g. Based on the USGS online interactive deaggregation program (USGS, 2020a), the modal seismic event is Moment Magnitude (M_W) 6.5 at a distance of 13 miles.

2.9 Secondary Seismic Hazards

Secondary seismic hazards in the region could include soil liquefaction and associated surface manifestations, earthquake-induced landsliding and flooding, seiches, and tsunamis. The potential for these secondary seismic hazards at the site is discussed below.

Liquefaction Potential - Review of the Seismic Hazard Zone Map for the Santiago Peak 7.5 Minute Quadrangle (CGS, 2002b) indicate the subject site is not located within an area that has been identified by the State of California as being potentially susceptible to the occurrence of liquefaction (see Figure 5, *Seismic Hazard Map*). In addition, the presence of relatively shallow bedrock and lack of groundwater at the site also indicate that the liquefaction potential is very low.

Seismically-Induced Landslides - Review of the Seismic Hazard Zone Map for the Santiago Peak 7.5 Minute Quadrangle (CGS, 2002b) indicate that the western portion of subject site and the northerly ascending slope are located within an area that has been identified by the State of California as being potentially susceptible to the occurrence of seismically-induced landslides (see Figure 5). Therefore, the potential for seismically-induced landslides exists at the site and should be further evaluated once a site plan is developed for the project. Additional subsurface exploration and analysis may be required to evaluate slope stability and the potential for seismically-induced landslides.

Earthquake-Induced Flooding - Earthquake-induced flooding can be caused by failure of water-retaining structures as a result of earthquakes. According to the California Department of Water Resources Division of Safety of Dams (DSOD) Dam Breach Inundation Maps website (https://fmds.water.ca.gov/maps/damim/), the site is not located within an inundation area for dam failure. With regard to the subject site, the potential for earthquake-induced flooding depends on conditions and design of the existing reservoirs. The potential for earthquake-induced flooding

may exist if the existing reservoirs do not meet the current seismic design standards.

Seiches and Tsunamis - Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Under certain seismic conditions, a seiche could form within the newly constructed and existing reservoirs. The new reservoir should be designed to meet the current code for seismic requirements to reduce the potential for a seiche. Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. Based on the inland hilltop location of the site, tsunami risks at the site are not a consideration.

3.0 PRELIMINARY RECOMMENDATIONS

Based on our study, the proposed project is feasible from a geotechnical standpoint. Presented below are the preliminary geotechnical recommendations for the project. Additional subsurface exploration and analysis may be required once a site plan is developed and the recommendations may need to be revised and/or amended.

3.1 Site Grading

The northern portion of the site by boring LB-1 is underlain by a thin layer of fill and bedrock. If the new reservoir is located in this area and the finish pad elevation is at or close to the existing elevation, minor grading is required for site preparation and the reservoir foundation is expected to be supported entirely on bedrock. Shallow fill or alluvium/colluvium, if exposed within the reservoir footprint, may be removed and replaced with two sack sand/cement slurry or the foundation may be partially deepened to bedrock. Localized hard concretion of the bedrock may be encountered if deep excavations are planned. Depending on the footprint and layout of the new reservoir, a retaining wall may be needed at the toe of the ascending slope to the north and the reservoir may encroach into the landslide susceptibility zone. Moving the reservoir to the east is favorable from a slope stability standpoint but it would require placement of roughly 10 to 20 feet of fill to achieve the pad grade of the existing reservoirs.

Placing the new reservoir on the southern portion of the site would require cuts on the order of 10 to 20 feet into the existing ascending ridgeline that is located to the south. It would also require removal and recompaction of the existing fill and unsuitable alluvium/colluvium. The depth of removal is expected to be 5 to 10 feet below the existing grade.

The onsite soils are suitable for use as compacted structural fill provided that they are free of organic material, construction debris, and oversized materials larger than 6 inches. Imported fill soil, if any, should be noncorrosive with Expansion Index less than 50 and be approved by the geotechnical engineer prior to placement as fill. Fill soils should be placed in loose lifts not exceeding 8 inches, moisture-conditioned to at least 2 to 4 percentage points above optimum moisture content, and compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D 1557.

3.2 Foundation Design Parameters

The proposed reservoir may be supported on a mat foundation system bearing on either undisturbed, competent bedrock or compacted fill. Appurtenant structures such as office/equipment building may be supported on a conventional shallow foundation system such as spread footings bearing on undisturbed, competent bedrock or compacted fill.

Mat Foundation – Mat foundation bearing on undisturbed, competent bedrock or properly compacted structural fill may be designed using a maximum allowable bearing capacity 3,000 psf and a modulus of subgrade reaction of 150 pounds per cubic inch (pci). Total and differential settlements of the mat foundation due to the static loads are expected to be on the order of 1 inch and ½ over a distance of 30 feet, respectively. The bearing capacity may be increased by one-third for wind or seismic loading. The mat foundation should have a thickened edge of at least 12 inches below the lowest adjacent grade.

Conventional Shallow Foundation – Conventional shallow foundations may be used to support the loads of other proposed structures. Footings should have a minimum embedment depth of 12 inches and a minimum width of 12 inches. An allowable bearing pressure of 2,200 psf may be used based on the minimum embedment depth and width. The allowable bearing value may be increased by 300 psf per foot increase in depth or width to a maximum allowable bearing pressure of 3,000 psf. The allowable bearing pressures are for the total dead load and frequently applied live loads and may be increased by one third when considering loads of short duration, such as those imposed by wind and seismic forces. The allowable bearing pressures are net values; the weight of the footing may be neglected for design purposes. All continuous footings should be reinforced with top and bottom steel to provide structural continuity and to permit spanning of local irregularities.

The recommended allowable bearing capacity for shallow footings is generally based on a total allowable static settlement of 1 inch. Since settlement is a function of footing size and contact bearing pressure, differential settlement can be expected between adjacent columns or walls where a large differential loading condition exists. The differential settlement Is expected to be less than approximately ½ inch, assuming no more than 50 percent variation in dead plus sustained live load between adjacent columns.

Lateral Load Resistance – Resistance to lateral loads will be provided by a combination of friction between the soils and foundation interface and passive pressure acting against the vertical portion of the foundation. A friction coefficient of 0.35 may be used at the soil-concrete interface for calculating the sliding resistance. A passive pressure based on an equivalent fluid pressure of 390 pounds per cubic foot (pcf) may be used for calculating the lateral passive resistance. The lateral passive resistance can be taken into account only if it is ensured that the soils against embedded structures will remain intact with time. The above values do not contain an appreciable factor of safety, so the structural engineer should apply the applicable factors of safety and/or load factors during design.

3.3 Slab-On-Grade

Concrete slabs-on-grade subjected to special loads should be designed by the structural engineer. Where conventional light floor loading conditions exist, the following minimum recommendations for conventional slabs-on-grade should be used. More stringent requirements may be required by local agencies, the structural engineer, the architect, or the CBC.

- A minimum slab thickness of 5 inches. Slab reinforcement should be designed by the structural engineer but as a minimum should consist of No. 3 rebar placed at 24 inches on center in each direction and provided with adequate concrete cover.

- A vapor barrier, 10-mil or thicker, should be placed below slabs where moisture-sensitive floor coverings or equipment is planned. The vapor barrier should be properly sealed at all joints and any penetrations.

- To reduce the potential for excessive cracking, concrete slabs-on-grade should be provided with construction or weakened plane joints at frequent intervals. Joints should be laid out to form approximately square panels.

- The subgrade soil should be wetted prior to placing the vapor barrier, steel, or concrete.

Our experience indicates that use of reinforcement in slabs can generally reduce the potential for drying and shrinkage cracking. Some cracking should be expected as the concrete cures. Minor cracking is considered normal; however, it is often aggravated by a high water/cement ratio, high concrete temperature at the

time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. The use of low slump concrete can reduce the potential for shrinkage cracking.

3.4 Lateral Earth Pressures

Retaining walls may be backfilled with onsite or imported non-expansive soils. The following lateral earth pressures may be used for the design of retaining walls with a level backfill.

Table 2 – Equivalent Fluid Pressure

Condition	Level Backfill
Active	37 pcf
At-Rest	57 pcf
Passive	390 pcf (Maximum of 3,900 psf)

Walls retaining bedrock may be designed using active lateral earth pressures of 29 pcf and 38 pcf for level and 2:1 (horizontal:vertical) slope, respectively.

Walls retaining more than 6 feet of soil should consider a seismic earth pressure increment with an inverted triangular distribution of 22 psf/foot in addition to the active earth pressure provided above. The above values do not contain an appreciable factor of safety, so the structural engineer should apply the applicable factors of safety and/or load factors during design.

Cantilever walls that are designed to yield at least 0.001H, where H is equal to the wall height, may be designed using the active condition. Rigid walls and walls braced at the top should be designed using the at-rest condition.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure or traffic loading, should be considered in the design of the retaining wall.

Lateral earth pressure design parameters recommended above are based upon drained conditions. Design and construction of the walls will, therefore, require some form of permanent subsurface drainage system behind the wall. If no drainage is provided, hydrostatic pressure should be considered in the wall design.

3.5 Seismic Design Parameters

Design parameters for minimum seismic load based on the 2019 California Building Code are included in Table 3 below.

Table 3 - 2019 CBC Based Seismic Design Parameters (Mapped Values)

Categorization/Coefficient	Design Value
Site Latitude	33.6869°
Site Longitude	-117.6061°
Site Class	C
Mapped Spectral Response Acceleration at Short Period (0.2 sec), S_S	1.424g
Mapped Spectral Response Acceleration at Long Period (1 sec), S_1	0.501g
Short Period (0.2 sec) Site Coefficient, F_a	1.2
Long Period (1 sec) Site Coefficient, F_v	1.499
Adjusted Spectral Response Acceleration at Short Period (0.2 sec), S_{MS}	1.708g
Adjusted Spectral Response Acceleration at Long Period (1 sec), S_{M1}	0.751g
Design Spectral Response Acceleration at Short Period (0.2 sec), S_{DS}	1.139g
Design Spectral Response Acceleration at Long Period (1 sec), S_{D1}	0.501g
Mapped Geometric Mean MCE_G Peak Ground Acceleration, PGA	0.509g
Site Coefficient, F_{PGA}	1.2
PGA adjusted for Site Class, $PGA_M = F_{PGA}$ *PGA	0.611g

3.6 Pavement Design

New pavements for the subject project may be constructed using conventional asphalt concrete (AC) over aggregate base (AB). We have designed the pavement sections using a design R-value of 10 for different Traffic Indices (TI) and the minimum pavement thickness is presented in Table 4 below. The pavement design was performed using the method in the *Caltrans Highway Design Manual*.

Table 4 - Pavement Sections

Traffic Index	Flexible Pavement (inches)	
	AC	AB
5 or less	4	7
6	4½	10½
7	5	12½

Concrete pavement, if used, may consist of 6 inches of Portland Cement Concrete (PCC) over 6 inches of AB. Because concrete will crack, the PCC pavement sections should be provided with crack-control joints spaced no more than 10 feet on-center each way, to control where cracks develop. As a minimum, we suggest concrete pavement be reinforced using No. 3 rebar, 18 inches on center in both directions, placed at mid-thickness. Concrete reinforcement should be designed by the structural engineer for appropriate loading conditions.

3.7 Cement Type and Corrosion

Based on the results of laboratory testing, concrete structures in contact with the onsite soil are expected to have negligible exposure to water-soluble sulfates in the soil. Common Type II cement may be used for concrete construction onsite and the concrete should be designed in accordance with CBC requirements. However, Type V cement should be used for concrete expected to be in contact with recycled water.

Based on our laboratory testing, the onsite soils are not considered corrosive to ferrous metals.

3.8 Surface Drainage

Ponding of water adjacent to structures should be avoided. During and after construction, positive drainage should be provided to direct surface water away from structures towards suitable, non-erosive drainage devices. Drainage of surface water away from the proposed structures should be provided by adequate slopes to all graded and paved surfaces. Where good surface drainage is not possible, subdrains should be provided, such as within planter areas to prevent accumulation of water within the upper soils.

3.9 Future Geotechnical Investigation

Findings and recommendations presented in this report are preliminary based on the information gained from our limited field exploration and review of available documents as well as our understanding of the current project plan. The nature of many sites is such that differing geotechnical or geological conditions can occur within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. A supplemental geotechnical investigation may be necessary during future phase of the project to develop

additional recommendations and update the preliminary recommendations in this report based on the actual soil condition and any modification of the current plans.

Future field exploration may consist of exploratory borings to verify the geotechnical conditions throughout the site are generally consistent with the conditions encountered during our limited field exploration. The borings may include a bucket auger boring downhole logged by a Certified Engineering Geologist to further evaluate slope stability and the potential for seismically-induced landslides. California Ring and Standard Penetration Test (SPT) samples should be obtained at selected depth intervals within the borings. Laboratory testing should be performed on the collected soil samples to determine the in-place moisture and density, consolidation and strength characteristics, corrosion potential, and R-value for pavement design. Site-specific recommendations for design and construction of the proposed project should be developed based on geotechnical analyses of the borings and laboratory test results.

4.0 REFERENCES

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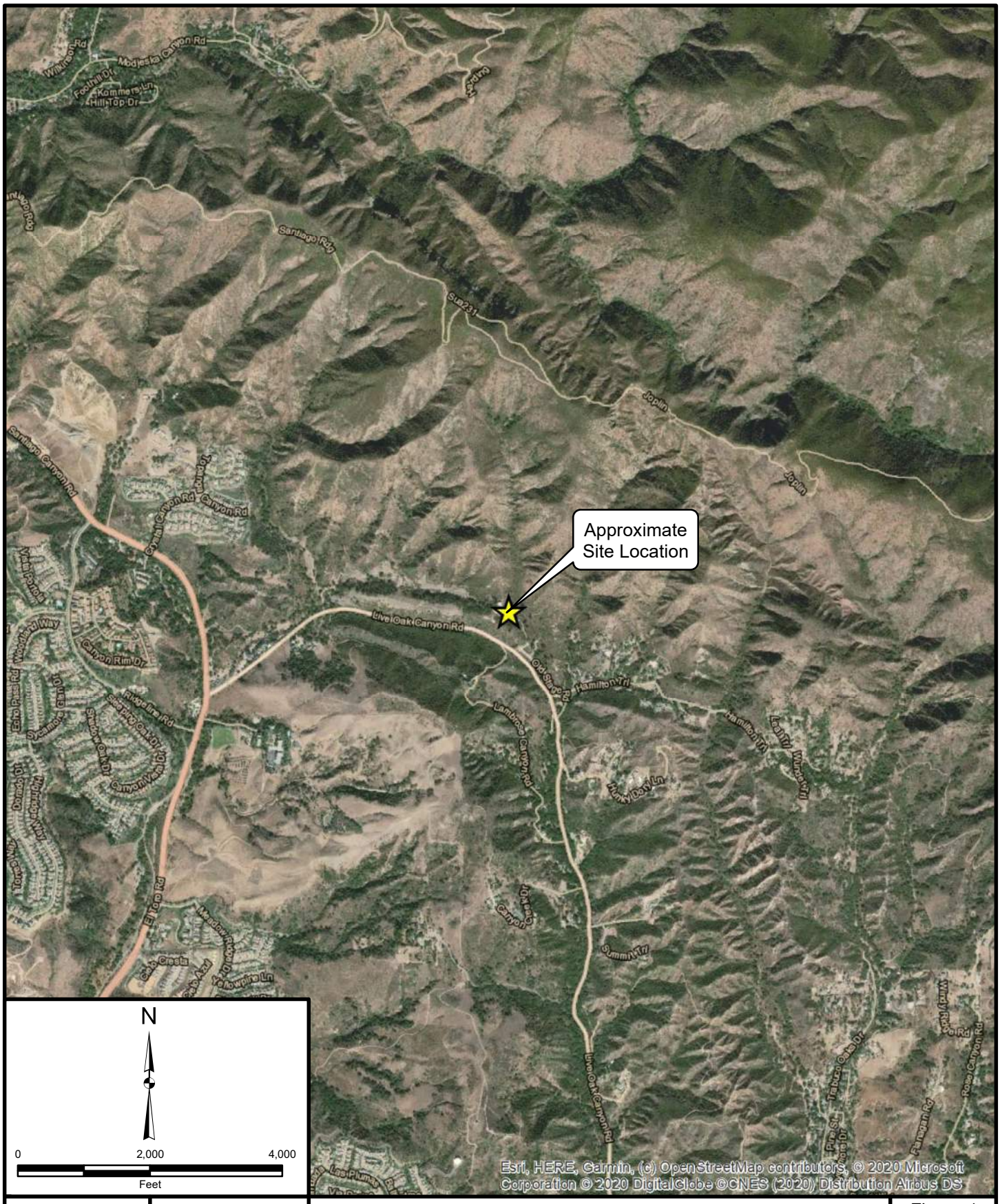

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Scale:1 " = 2,000 '	Date: June 2020

Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

SITE LOCATION MAP

Harris Grade Reservoir Replacement
18975 Live Oak Canyon Road
Trabuco Canyon, California

Figure 1

Leighton

Map Saved as V:\Drafting\12753\001\Maps\2753-001_F01-SLM_2020-06-10.mxd on 6/9/2020 4:45:27 PM

Legend

Approximate location of hollow-stem auger boring showing total depth in feet below existing ground surface and groundwater (GW) conditions at the time of drilling (Leighton, 2020)

Project: 12753.001	Eng/Geol: DJC/JMP
Scale: 1 " = 50 '	Date: June 2020

Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

BORING LOCATION MAP

Harris Grade Reservoir Replacement
18975 Live Oak Canyon Road
Trabuco Canyon, California

Figure 2

Leighton

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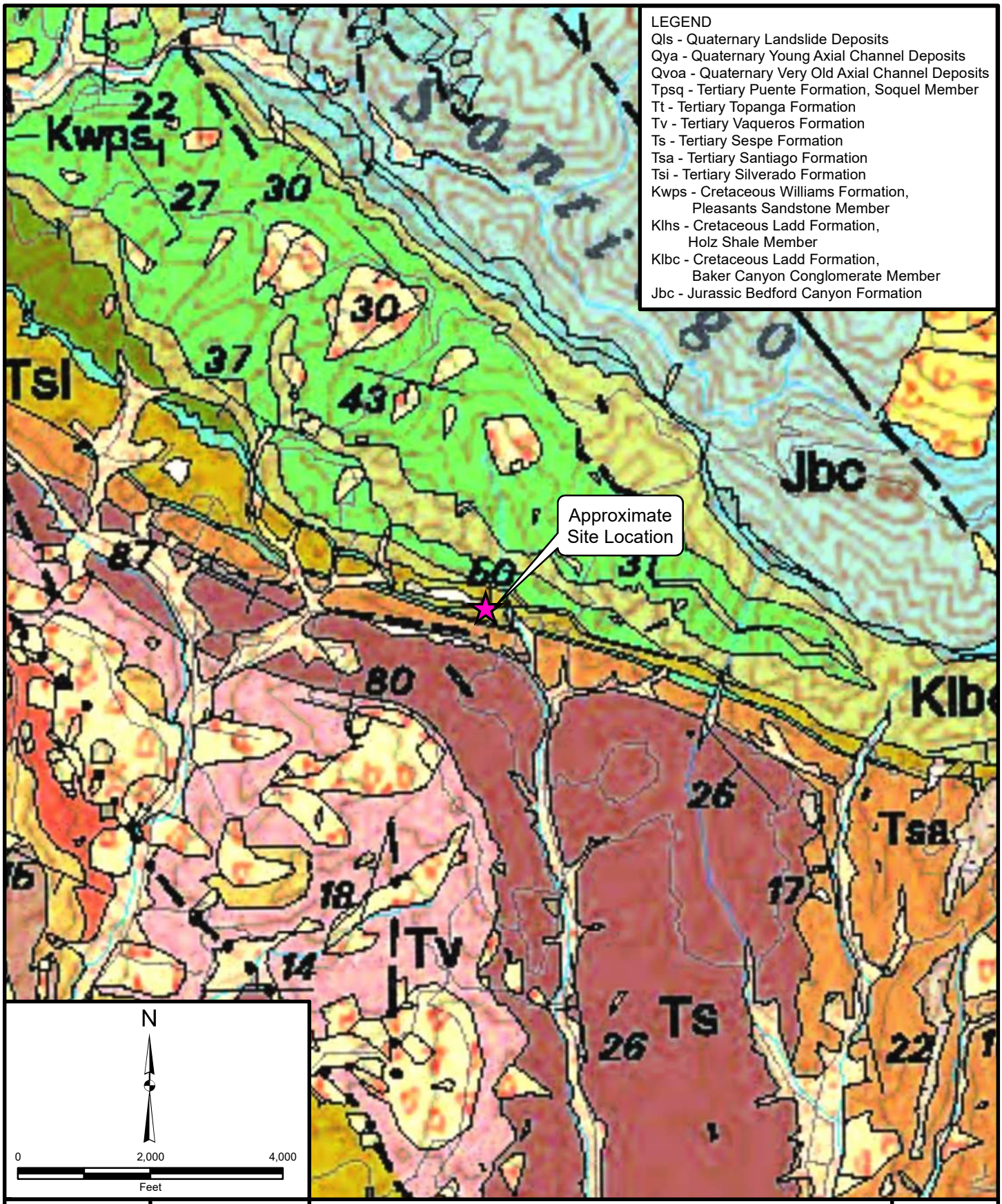


Project: 12753.001	Eng/Geol: DJC/JMP
Scale:1 " = 2,000 '	Date: June 2020

Base Map: Geologic Map of The San Bernardino and Santa Ana Quadrangles, California.
Compiled by Douglas M. Morton and Fred K. Miller
Thematic Information: Leighton, USGS
Author: Leighton Geomatics (btran)

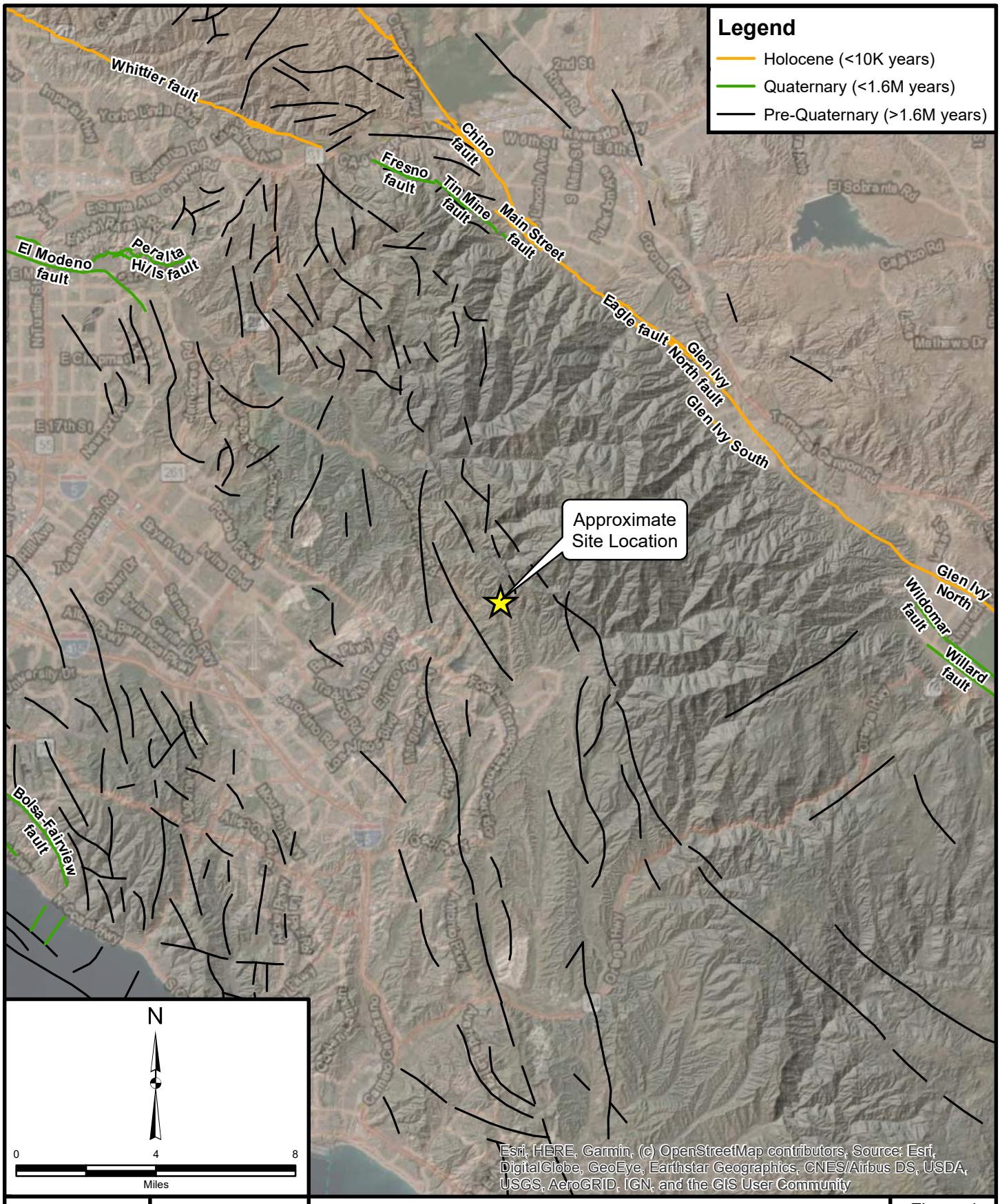
REGIONAL GEOLOGY MAP

Harris Grade Reservoir Replacement
18975 Live Oak Canyon Road
Trabuco Canyon, California

Figure 3

Leighton

Map Saved as V:\Drafting\12753\001\Maps\12753-001_F03-RGM_2020-06-15.mxd on 6/11/2020 3:36:01 PM



Project: 12753.001	Eng/Geol: DJC/JMP
Scale:1 " = 4 miles	Date: June 2020

Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton, Bryant, W. A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: CGS
Author: Leighton Geomatics (btran)

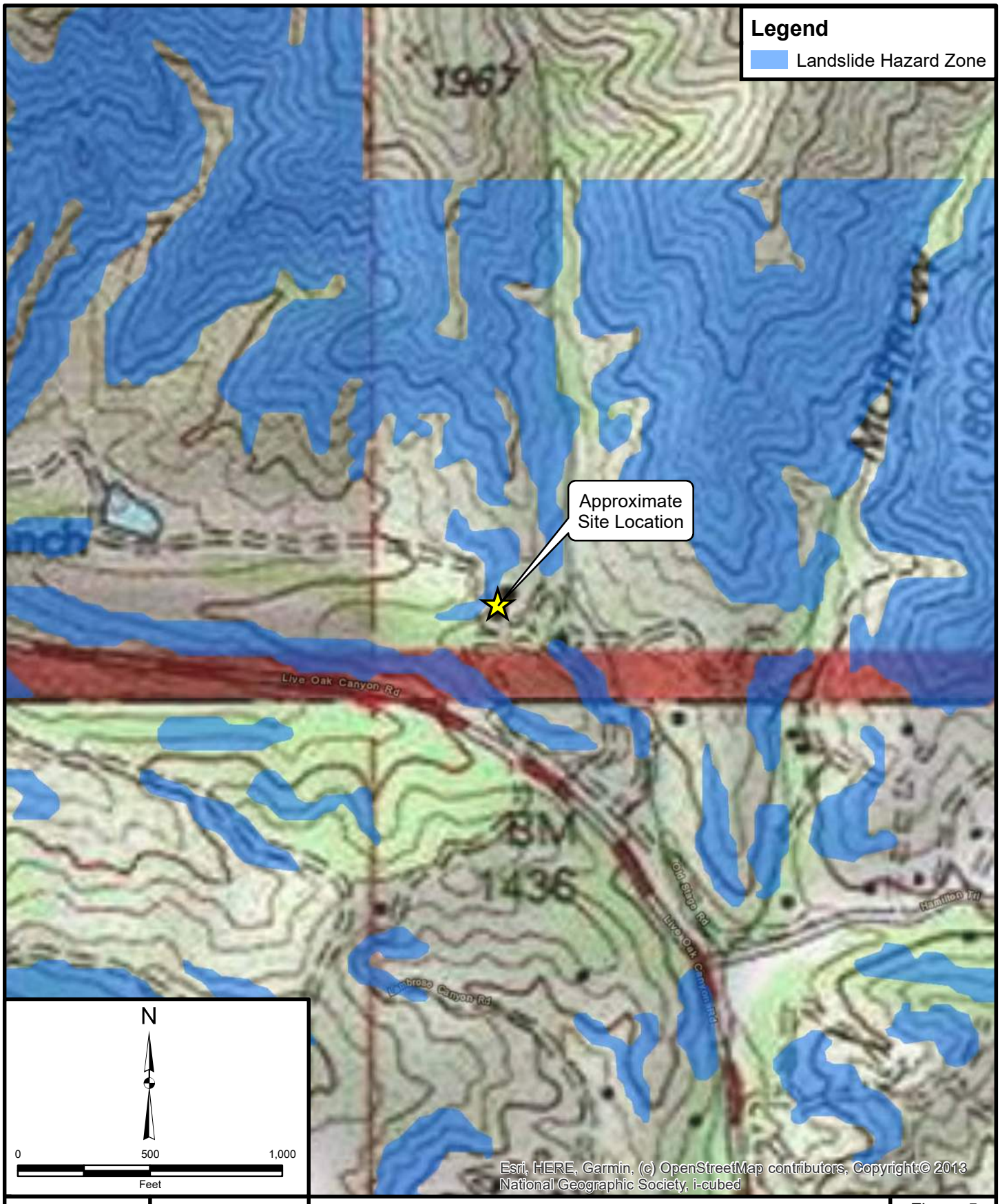
REGIONAL FAULT MAP

Harris Grade Reservoir Replacement
18975 Live Oak Canyon Road
Trabuco Canyon, California

Figure 4

Leighton

Map Saved as V:\Drafting\12753\001\Maps\2753-001_F04-RFM_2020-06-10.mxd on 6/9/2020 4:42:01 PM



Project: 12753.001	Eng/Geol: DJC/JMP
Scale:1 " = 500 '	Date: June 2020

Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton, CGS
Author: Leighton Geomatics (btran)

SEISMIC HAZARD MAP

Harris Grade Reservoir Replacement
18975 Live Oak Canyon Road
Trabuco Canyon, California

Figure 5

Leighton

Map Saved as V:\Drafting\12753\001\Maps\2753-001_F05-SHM_2020-06-11.mxd on 6/11/2020 11:27:27 AM

APPENDIX A

BORING LOGS

Leighton

GEOTECHNICAL BORING LOG LB-1

Project No.	12753.001	**Date Drilled**	5-7-20
Project	Harris Grade Reservoir Replacement	**Logged By**	JMP
Drilling Co.	2R Drilling, Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Figure 2- Boring Location Map	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B1				ML/CL	**Artificial Fill (Af):** @0': Sandy SILT to Lean CLAY; orange brown to gray brown; moist; fine to medium sand.	CR
									Tertiary Silverado Formation (Tsi):	
				R1	27 50/5"	122	13		@2.5': Clayey SANDSTONE; hard; yellow brown; moist; fine to medium sand; moderately cemented; micaceous.	
	5			R2	50/6"	121	10		@5': Clayey SANDSTONE; hard; yellow brown; moist; fine to medium sand; micaceous; moderately cemented.	
				R3	18 38 50/5"	127	9		@7.5': Clayey SANDSTONE; hard; yellow brown to olive; moist; fine to medium sand; moderately cemented.	
	10			S1	17 30 42				@10': Clayey SANDSTONE; hard; yellow brown to olive; moist; fine to medium sand; moderately cemented.	
	15			R4	50/4"				@15': SANDSTONE; hard; light yellow brown; slightly moist; fine to medium sand; moderately cemented.	
	20			S2	12 18 40				@20': SILTSTONE; hard; olive brown to blue gray; slightly moist.	
	25			R5	50/6"				@25': SANDSTONE; hard; light yellow brown to orange brown; slightly moist; fine to coarse sand; oxidized; moderately cemented.	
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-1

Project No.	12753.001	**Date Drilled**	5-7-20
Project	Harris Grade Reservoir Replacement	**Logged By**	JMP
Drilling Co.	2R Drilling, Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Figure 2- Boring Location Map	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S3	24 28 38				@30': SANDSTONE; hard; reddish brown; slightly moist; fine to medium sand.	
	35			S4	20 50/3"				@35': SANDSTONE; hard; reddish brown; slightly moist; fine to medium sand.	
	40			S5	50/6"				@40': SANDSTONE; hard; blue gray; slightly moist; fine to medium sand; unoxidized. @41': Refusal, very difficult drilling.	
	45								**Total Depth: 41 feet** **No groundwater encountered.** **Backfilled with cuttings.**	
	50									
	55									
	60									

Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-2

Project No.	12753.001	**Date Drilled**	5-7-20
Project	Harris Grade Reservoir Replacement	**Logged By**	JMP
Drilling Co.	2R Drilling, Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Figure 2- Boring Location Map	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B1				CL	**Artificial Fill (Af):**	EI, RV, CR
				R1	4 4 5	107	13		@2.5': Sandy CLAY; medium stiff; mottled medium brown and dark brown; very moist; fine to medium sand.	
	5			R2	4 5 6	115	14		@5': Lean CLAY; medium stiff; mottled olive brown and dark brown; very moist; fine to medium sand.	DS
									Colluvium/Alluvium (Qcol//Qal): @6': Lean CLAY; medium stiff; dark brown; very moist; trace sand.	
				R3	3 6 10	115	17		@7.5': Stiff; dark olive brown; very moist; trace sand.	CN
	10			R4	10 18 30	122	12	SC	@10': Clayey SAND; dense; dark brown; moist; fine sand.	
	15			S1	4 5 6				@15': Clayey SAND; medium dense; medium brown; moist; fine to medium sand.	
	20			R5	7 12 12	115	11	SC-SM	@20': Silty Clayey SAND; medium dense; medium brown with pockets of light brown; moist; fine to medium sand.	
	25			S2	8 12 14				**Tertiary Silverado Formation (Tsi):** @25': SILTSTONE; moderately hard; olive yellow brown; moist; moderately weathered.	
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-2

Project No.	12753.001	**Date Drilled**	5-7-20
Project	Harris Grade Reservoir Replacement	**Logged By**	JMP
Drilling Co.	2R Drilling, Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Figure 2- Boring Location Map	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			R6	50/6"				@30': SANDSTONE; hard; light yellow brown with orange oxidation; slightly moist; fine to medium sand; moderately cemented.	
				S3	24 50/6"				@32': SANDSTONE; hard; light yellow to light olive; slightly moist; fine to medium sand; moderately cemented. Very difficult drilling. Auger refusal. Stopped drilling and drove SPT sampler.	
	35								**Total Depth: 33 feet** **No groundwater encountered.** **Backfilled with cuttings.**	
	40									
	45									
	50									
	55									
	60									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

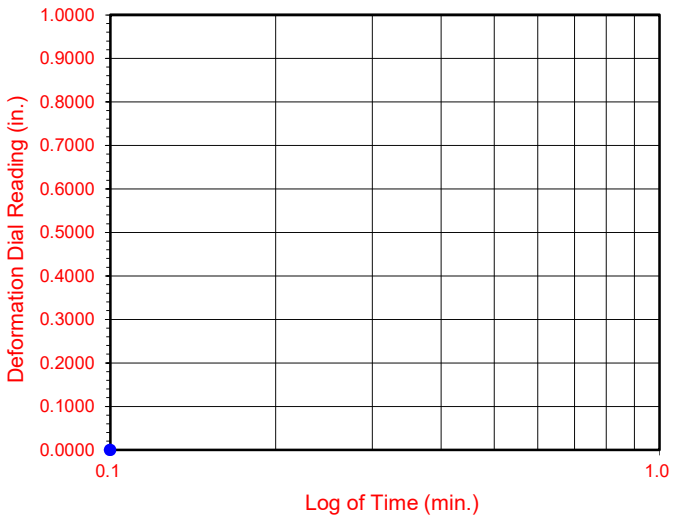
-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

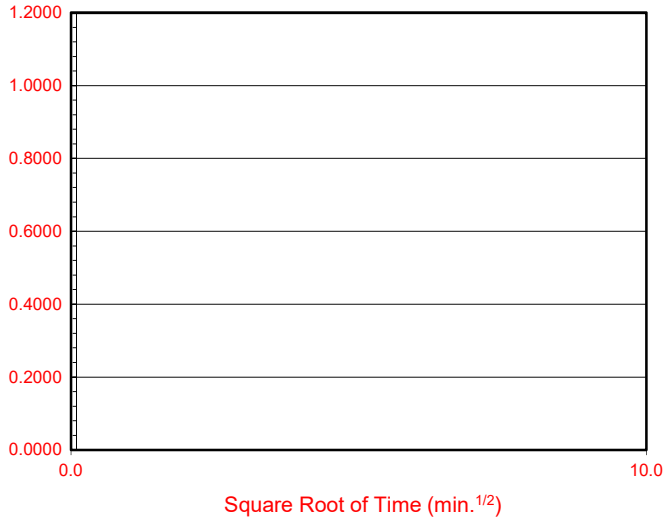
APPENDIX B

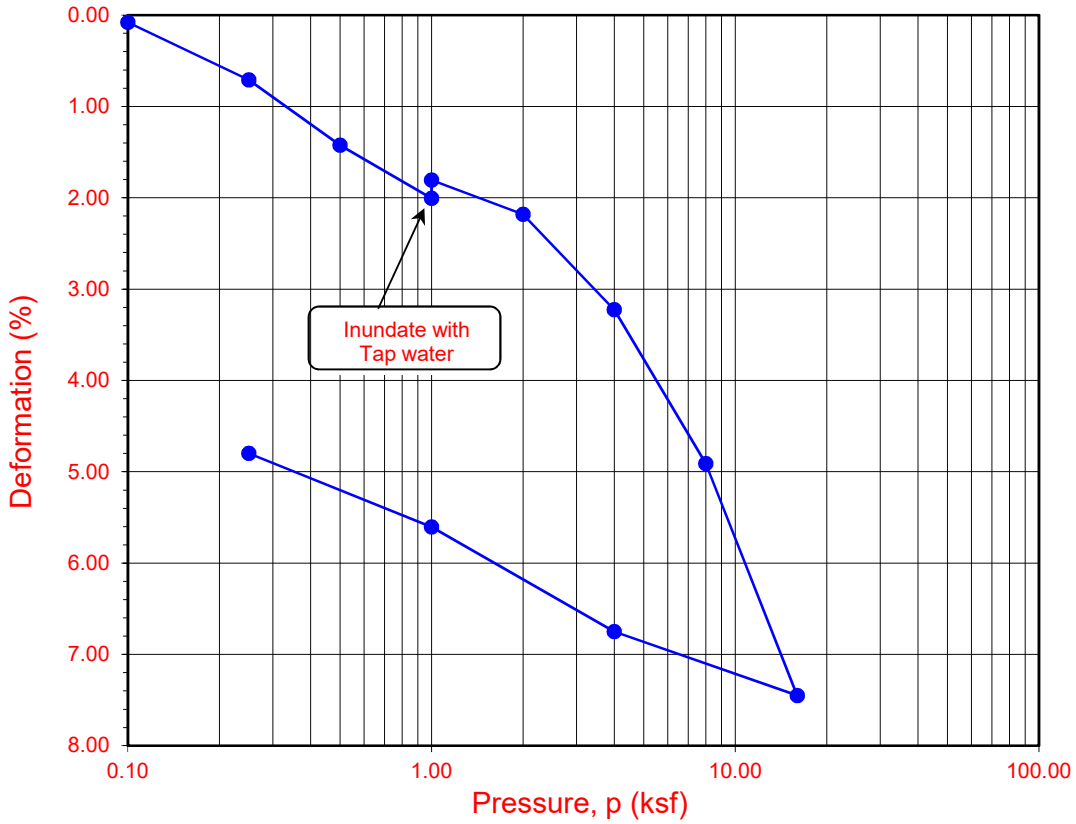
LABORATORY TEST RESULTS

Leighton

Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-2	**R3**	**7.5**	**16.9**	**15.5**	**115.0**	**120.8**	**0.465**	**0.395**	**98**	**106**

Soil Identification: Dark olive brown lean clay (CL)

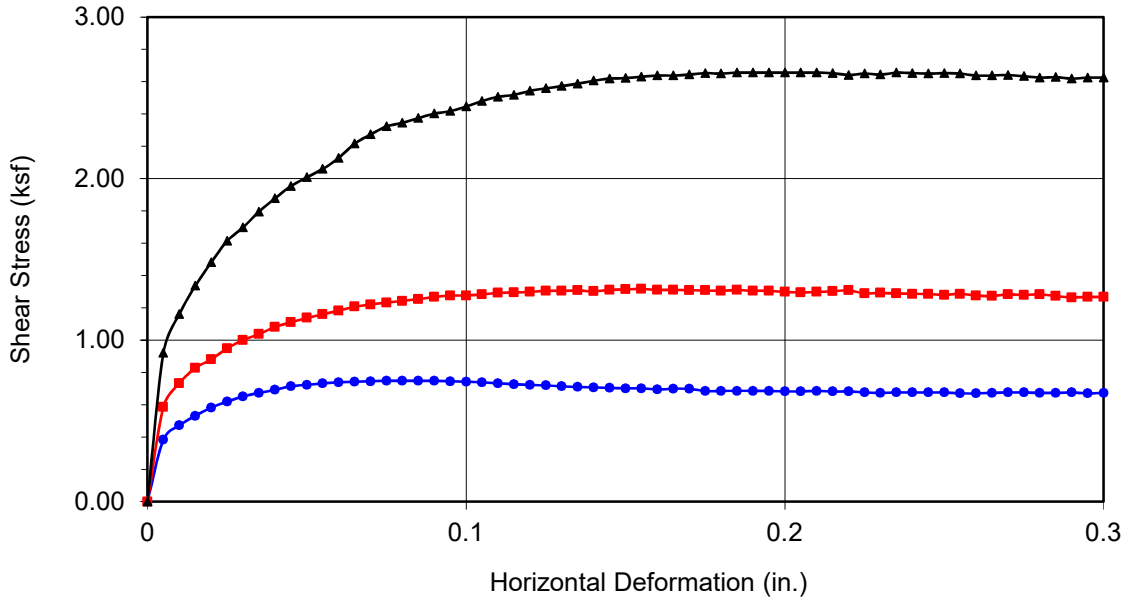
Leighton

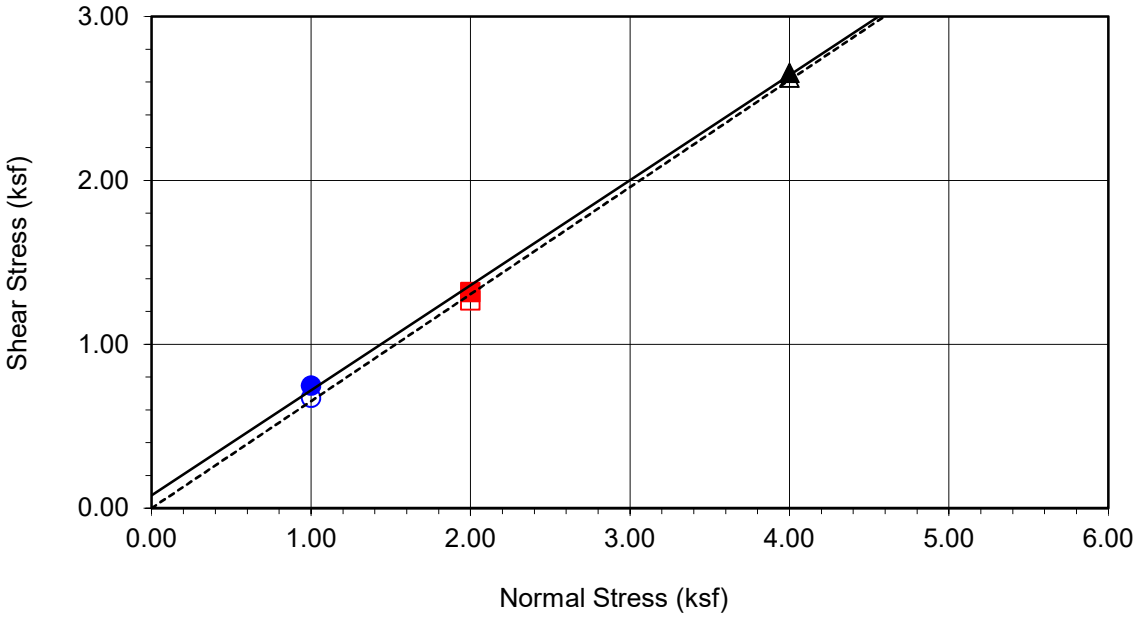
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 12753.001

Harris Grade Reservoir Replacement

05-20





Boring No.	**LB-2**
Sample No.	**R2**
Depth (ft)	**5**
Sample Type:	Ring
Soil Identification:	Olive brown lean clay (CL)

Strength Parameters

	C (psf)	ϕ (°)
Peak	78	33
Ultimate	0	33

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.748	■ 1.317	▲ 2.656
Shear Stress @ End of Test (ksf)	○ 0.673	□ 1.267	△ 2.625
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	13.92	13.92	13.92
Dry Density (pcf)	113.9	114.3	116.4
Saturation (%)	78.4	79.2	83.9
Soil Height Before Shearing (in.)	0.9870	0.9735	0.9510
Final Moisture Content (%)	16.0	15.3	14.2

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 12753.001

Harris Grade Reservoir Replacement

05-20

EXPANSION INDEX of SOILS

ASTM D 4829

Leighton

Project Name:	Harris Grade Reservoir Replacement	Tested By:	S. Felter	Date:	05/12/20
Project No.:	12753.001	Checked By:	A. Santos	Date:	05/26/20
Boring No.:	LB-2	Depth (ft.):	0-5		
Sample No.:	B1				
Soil Identification:	Dark brown lean clay with sand (CL)s				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0310
Wt. Comp. Soil + Mold (g)	600.20	432.70
Wt. of Mold (g)	201.80	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	O	O
Wet Wt. of Soil + Cont. (g)	787.90	634.50
Dry Wt. of Soil + Cont. (g)	713.10	562.35
Wt. of Container (g)	0.00	201.80
Moisture Content (%)	10.49	20.01
Wet Density (pcf)	120.2	126.6
Dry Density (pcf)	108.8	105.5
Void Ratio	0.550	0.598
Total Porosity	0.355	0.374
Pore Volume (cc)	73.4	79.9
Degree of Saturation (%) [S_{meas}]	**51.5**	90.3

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
05/12/20	9:50	1.0	0	0.6240
05/12/20	10:00	1.0	10	0.6230
Add Distilled Water to the Specimen				
05/12/20	10:15	1.0	15	0.6380
05/13/20	6:50	1.0	1250	0.6550
05/13/20	8:00	1.0	1320	0.6550

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**32**

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SOIL RESISTIVITY TEST

DOT CA TEST 643

Project Name:	Harris Grade Reservoir Replacement		Tested By :	A. Lopez	Date: 05/14/20
Project No. :	12753.001		Checked By:	A. Santos	Date: 05/26/20
Boring No.:	LB-1		Depth (ft.) :	0-5	
Sample No. :	B1				

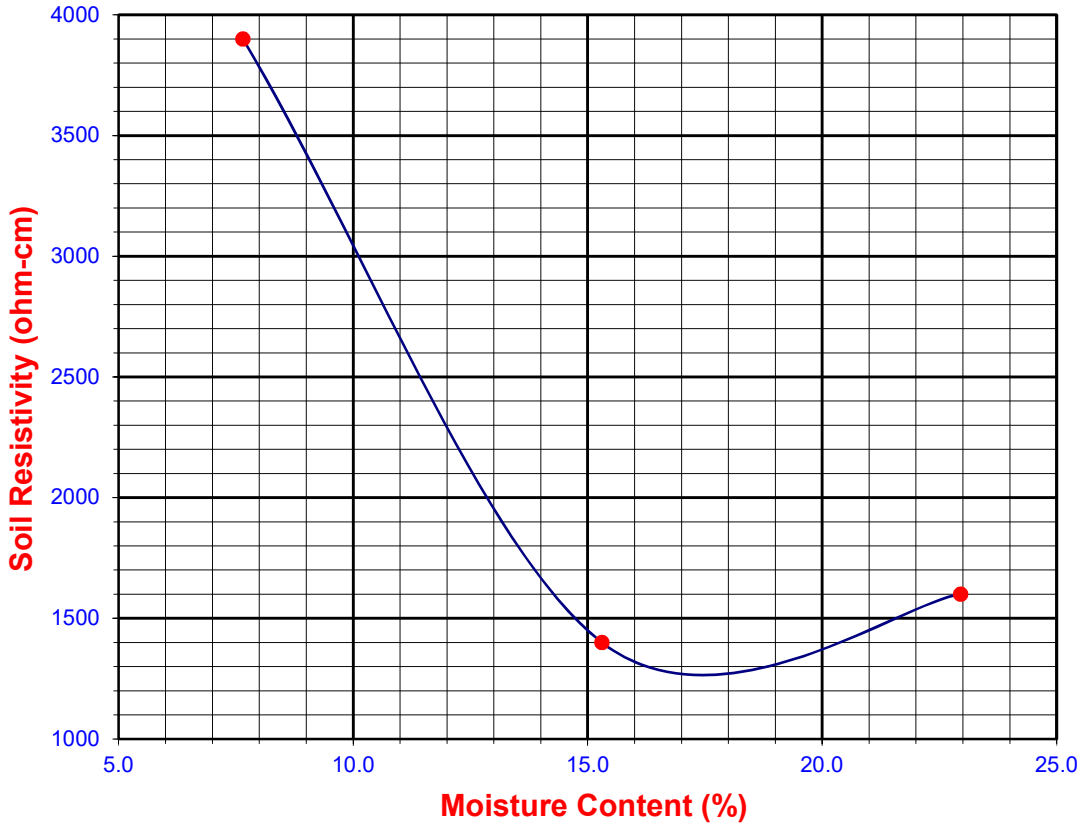
Soil Identification:* Yellowish brown (CL-ML)s

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	10	7.65	3900	3900
2	20	15.30	1400	1400
3	30	22.95	1600	1600
4				
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	0.00
Dry Wt. of Soil + Cont. (g)	0.00
Wt. of Container (g)	1.00
Container No.	
Initial Soil Wt. (g) (Wt)	130.70
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
1260	**17.5**	**49**	**40**	**7.98**	**20.6**



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SOIL RESISTIVITY TEST

DOT CA TEST 643

Project Name:	Harris Grade Reservoir Replacement		Tested By :	A. Lopez	Date: 05/14/20
Project No. :	12753.001		Checked By:	A. Santos	Date: 05/26/20
Boring No.:	LB-2		Depth (ft.) :	0-5	
Sample No. :	B1				

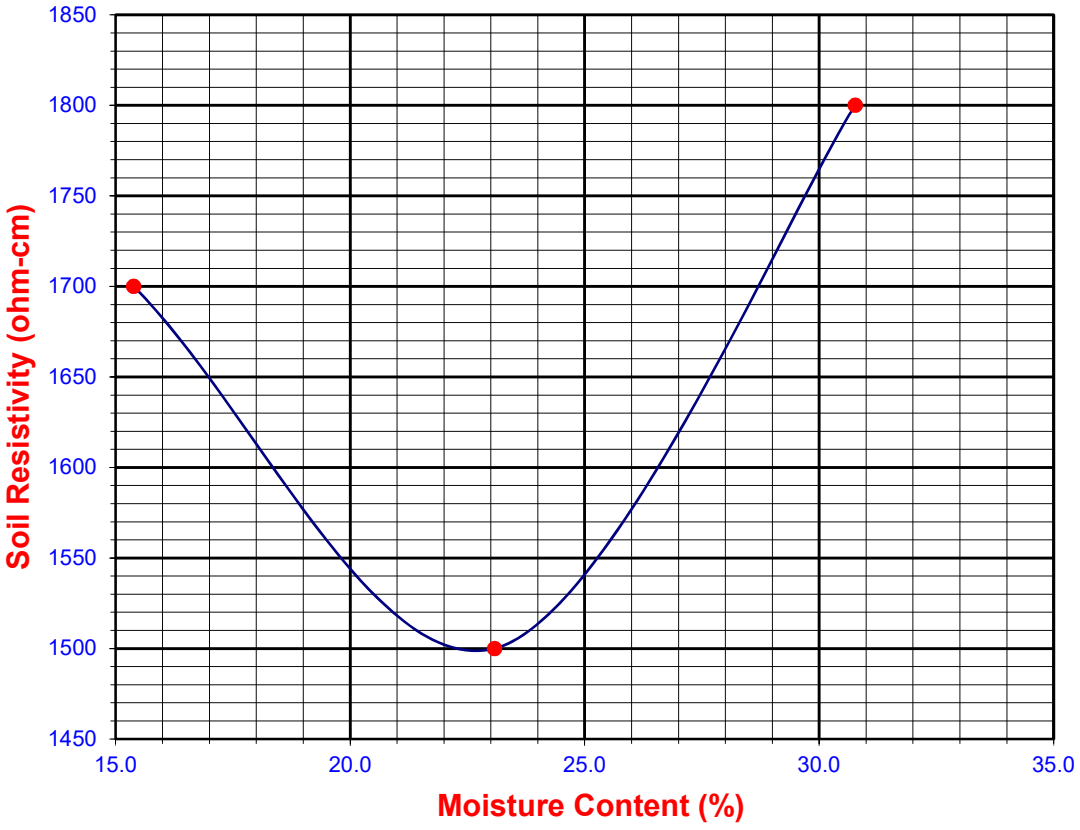
Soil Identification:* Dark brown (CL)s

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	20	15.38	1700	1700
2	30	23.08	1500	1500
3	40	30.77	1800	1800
4				
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	0.00
Dry Wt. of Soil + Cont. (g)	0.00
Wt. of Container (g)	1.00
Container No.	
Initial Soil Wt. (g) (Wt)	130.00
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
1498	**22.7**	**53**	**110**	**7.24**	**21.0**



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R-VALUE TEST RESULTS

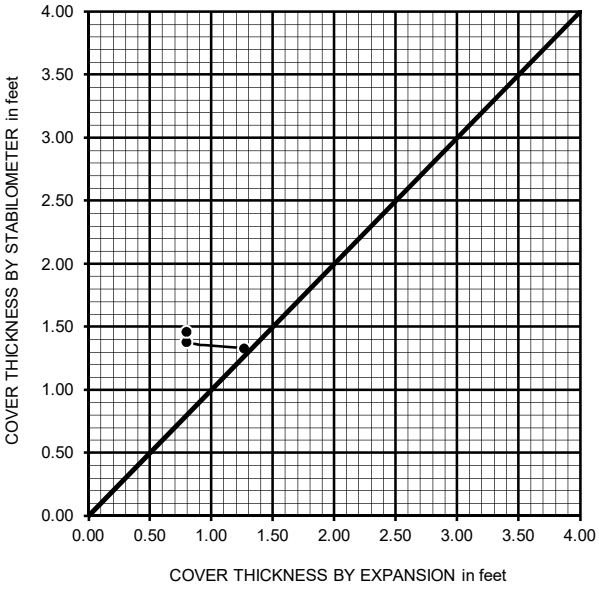
DOT CA Test 301

PROJECT NAME:	Harris Grade Reservoir Replacement	PROJECT NUMBER:	12753.001
LOCATION:	LB-2	DEPTH (FT.):	0-5
SAMPLE NUMBER:	B-1	TECHNICIAN:	O.Figueroa
SAMPLE DESCRIPTION:	Dark brown lean clay with sand (CL)s	DATE COMPLETED:	5/15/2020

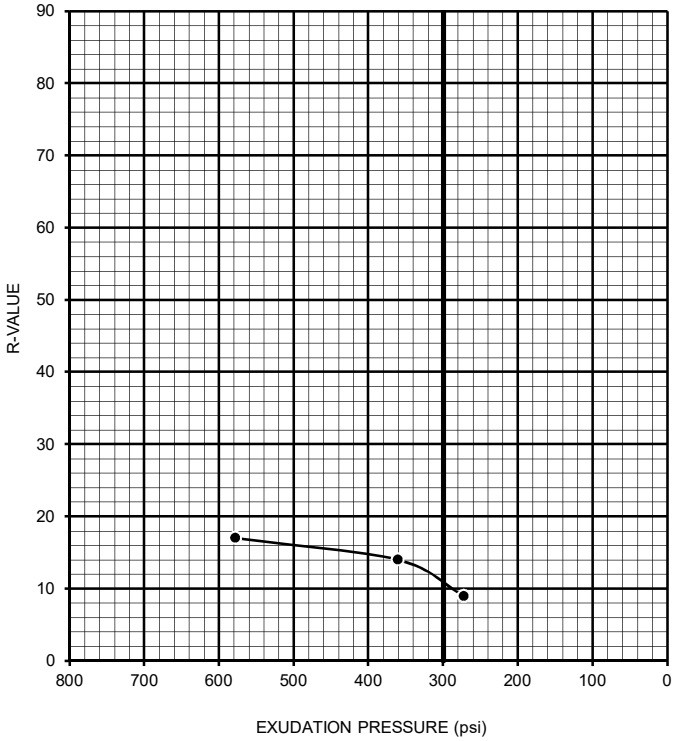
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	14.5	14.7	15.6
HEIGHT OF SAMPLE, Inches	2.42	2.59	2.57
DRY DENSITY, pcf	117.7	115.3	113.7
COMPACTOR PRESSURE, psi	75	50	50
EXUDATION PRESSURE, psi	579	361	273
EXPANSION, Inches x 10exp-4	38	24	24
STABILITY Ph 2,000 lbs (160 psi)	120	130	137
TURNS DISPLACEMENT	3.76	3.95	4.18
R-VALUE UNCORRECTED	18	13	9
R-VALUE CORRECTED	17	14	9

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.33	1.38	1.46
EXPANSION PRESSURE THICKNESS, ft.	1.27	0.80	0.80

EXPANSION PRESSURE CHART

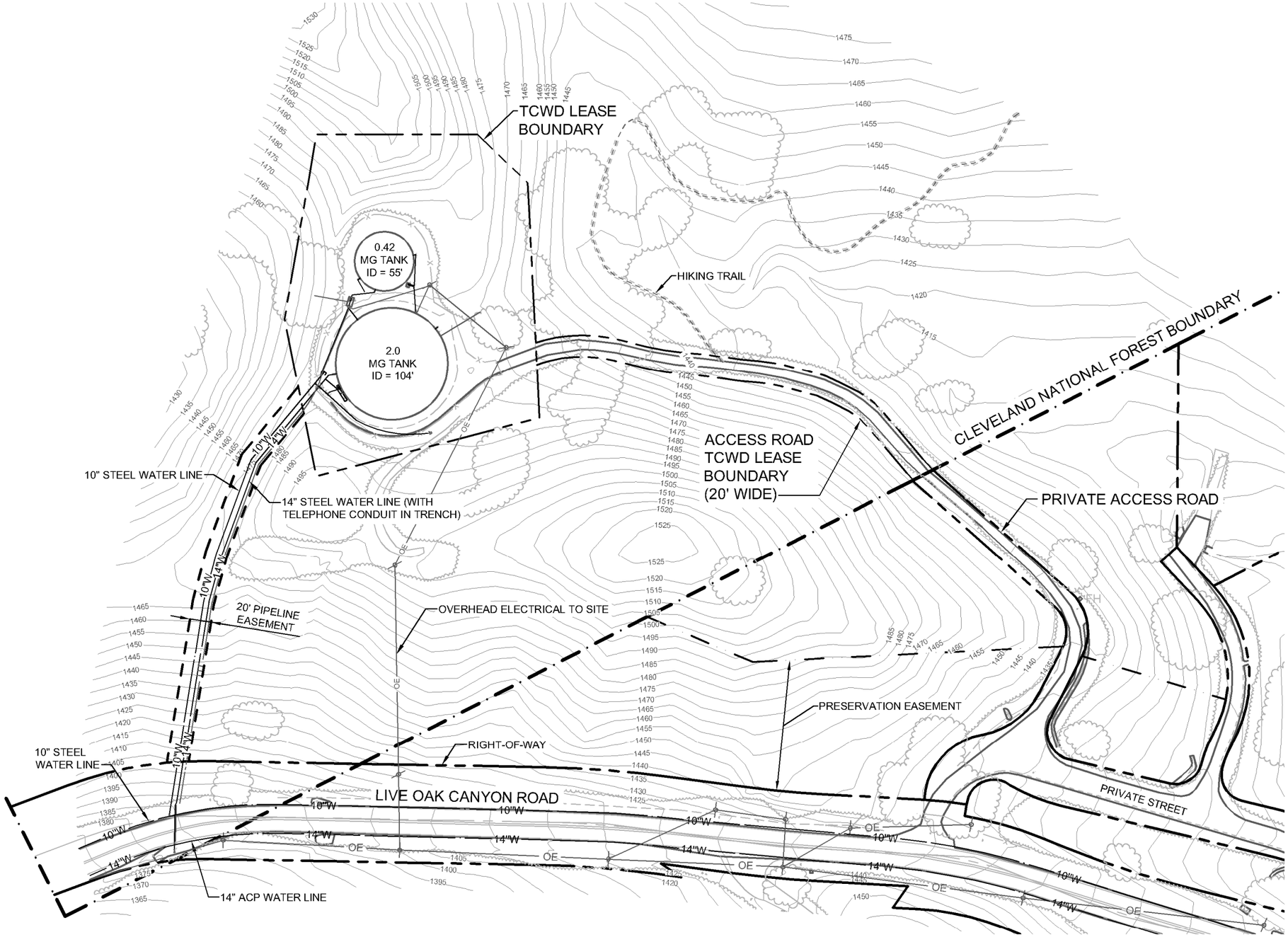


EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	16
R-VALUE BY EXUDATION:	11
EQUILIBRIUM R-VALUE:	11

Appendix B. Figures



8/26/2020 2:08:35 PM - O:\PROJECTS\IRVINE\09339\200-09339-20001\CAD\CONCEPTUAL\C-702A- (FIG 1-1) EXISTING-SITE.DWG - LERMA, JACKIE

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TRABUCO CANYON WATER DISTRICT

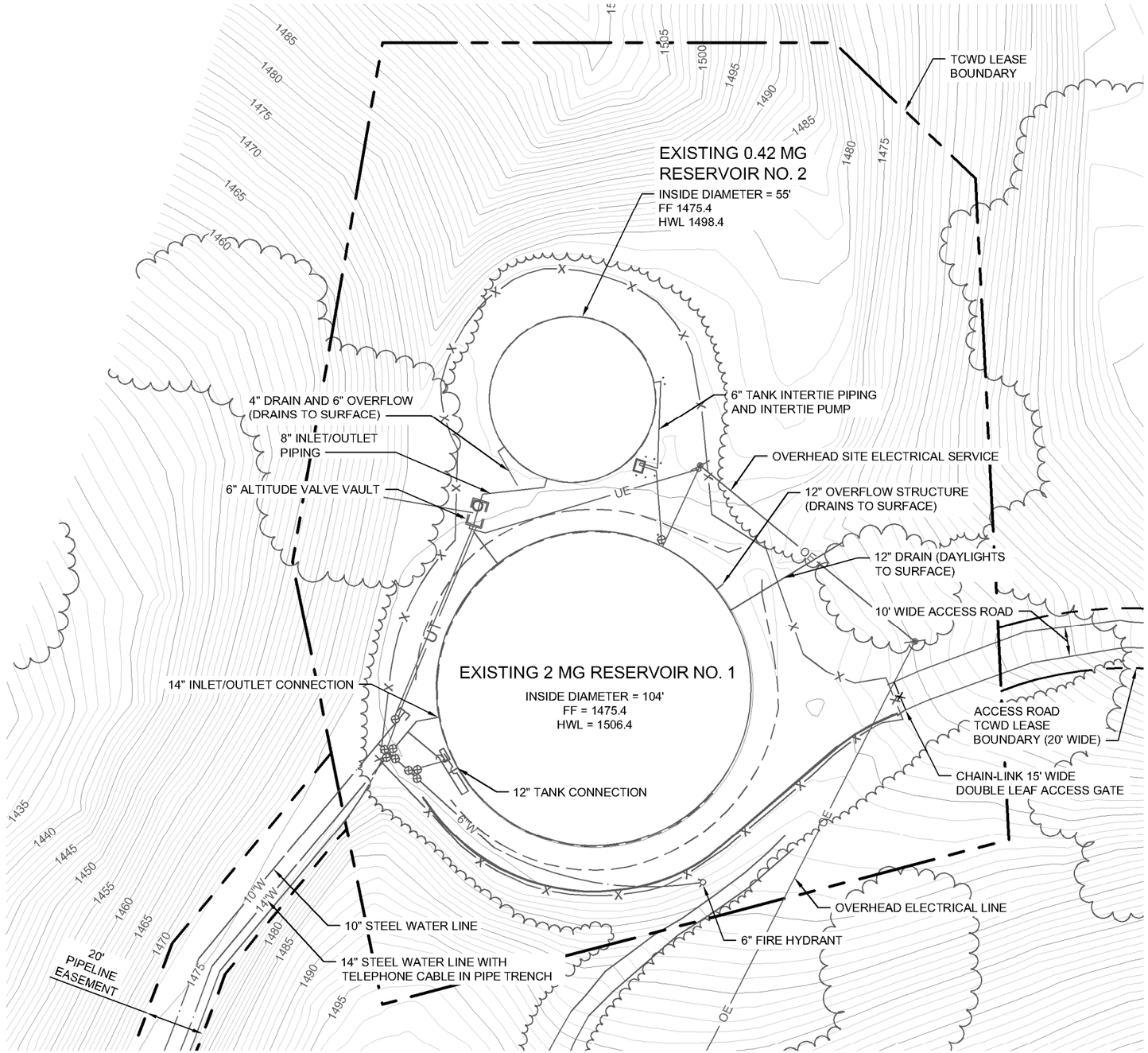
HARRIS GRADE RESERVOIR REPLACEMENT FEASIBILITY STUDY

HARRIS GRADE EXISTING SITE, PIPING, AND ACCESS TO LIVE OAK CANYON RD.

Project No.:	200-09339-20001
Date:	AUGUST 2020
Designed By:	KMB

FIGURE
1-1

Bar Measures 1 inch



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HARRIS GRADE RESERVOIR REPLACEMENT FEASIBILITY STUDY

HARRIS GRADE EXISTING SITE PLAN

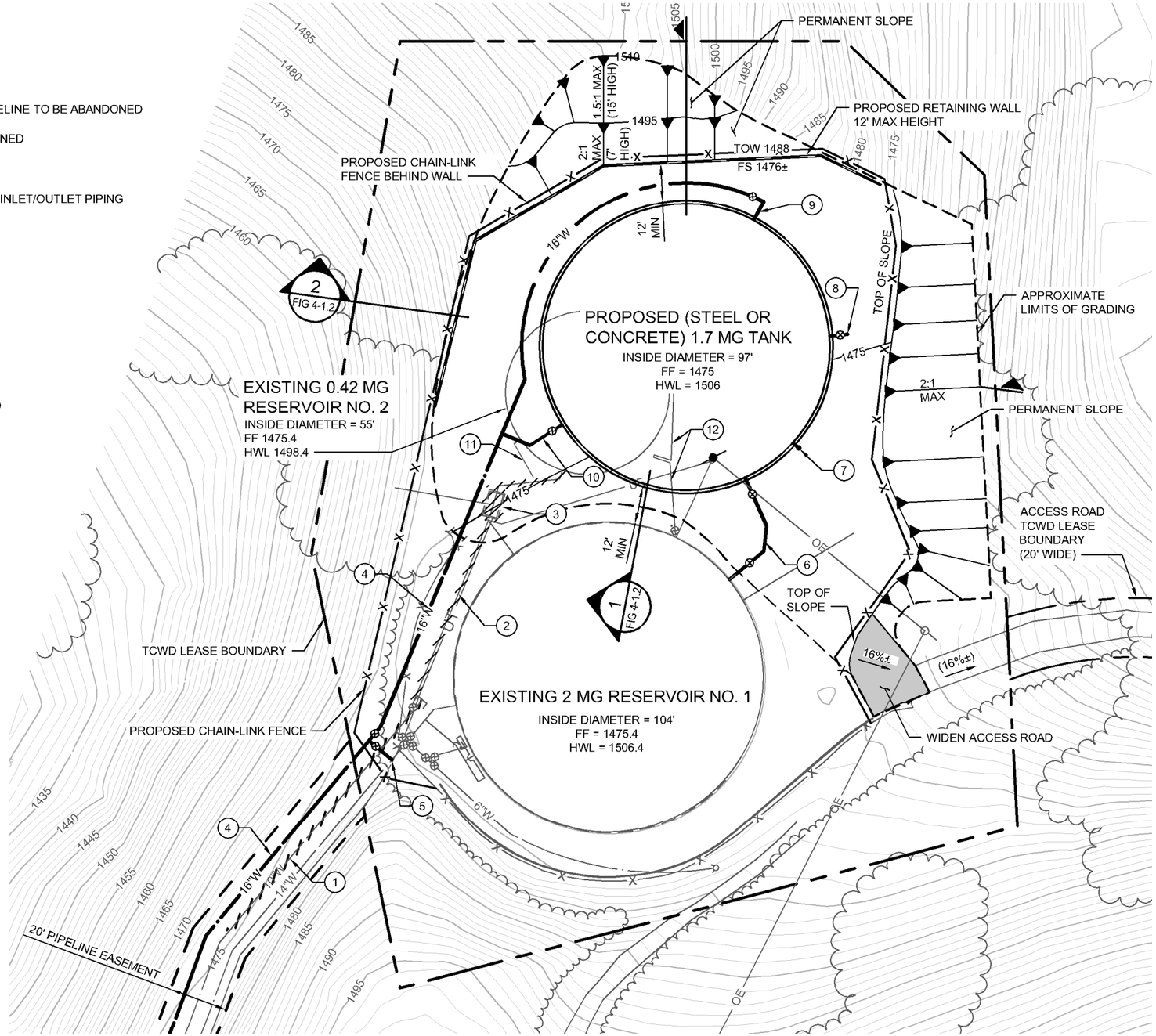
Project No.:	200-09339-20001
Date:	AUGUST 2020
Designed By:	KMB

FIGURE
1-2

Bar Measures 1 inch

PIPING NOTES:

1. EXISTING 10"W TO BE ABANDONED
2. EXISTING 8" RESERVOIR NO. 2 INLET/OUTLET PIPELINE TO BE ABANDONED
3. EXISTING ALTITUDE VALVE VAULT TO BE ABANDONED
4. PROPOSED 16" INLET/OUTLET PIPING
5. PROPOSED POINT OF CONNECTION TO EXIST 14" INLET/OUTLET PIPING
6. PROPOSED 16" TANK INTERTIE
7. PROPOSED TANK OVERFLOW
8. PROPOSED TANK DRAIN
9. PROPOSED 16" TANK INLET CONNECTION
10. PROPOSED 16" TANK OUTLET CONNECTION
11. EXISTING RESERVOIR DRAIN TO BE REMOVED
12. EXISTING TANK INTERTIE PIPING TO BE REMOVED



LEGEND:

- PROPOSED VALVE
- EXISTING VALVE
- 16"W — PROPOSED WATERLINE
- X"W — EXISTING WATERLINE
- PROPOSED RETAINING WALL
- EXISTING POWER POLE (RELOCATION REQUIRED)
- EXISTING POWER POLE PROTECT IN PLACE

NOTES:

1. ALL NEW TANK PIPING CONNECTIONS SHALL HAVE FLEXIBLE EXPANSION JOINT COUPLINGS.
2. CONCRETE TANK ALTERNATIVE SHALL HAVE BELOW GRADE FLOOR PENETRATIONS ON THE INLET, OUTLET, TANK INTERTIE, AND DRAIN PIPING CONNECTIONS.
3. STEEL TANK ALTERNATIVE WILL HAVE ABOVE GRADE WALL PENETRATIONS AT ALL PIPING CONNECTIONS.

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HARRIS GRADE RESERVOIR REPLACEMENT FEASIBILITY STUDY

ALTERNATE 1
1.7 MG TANK CONCEPTUAL FINAL GRADING, YARD PIPING, AND SITE PLAN

Project No.:	200-09339-20001
Date:	AUGUST 2020
Designed By:	KMB

FIGURE
4-1.1

Bar Measures 1 inch

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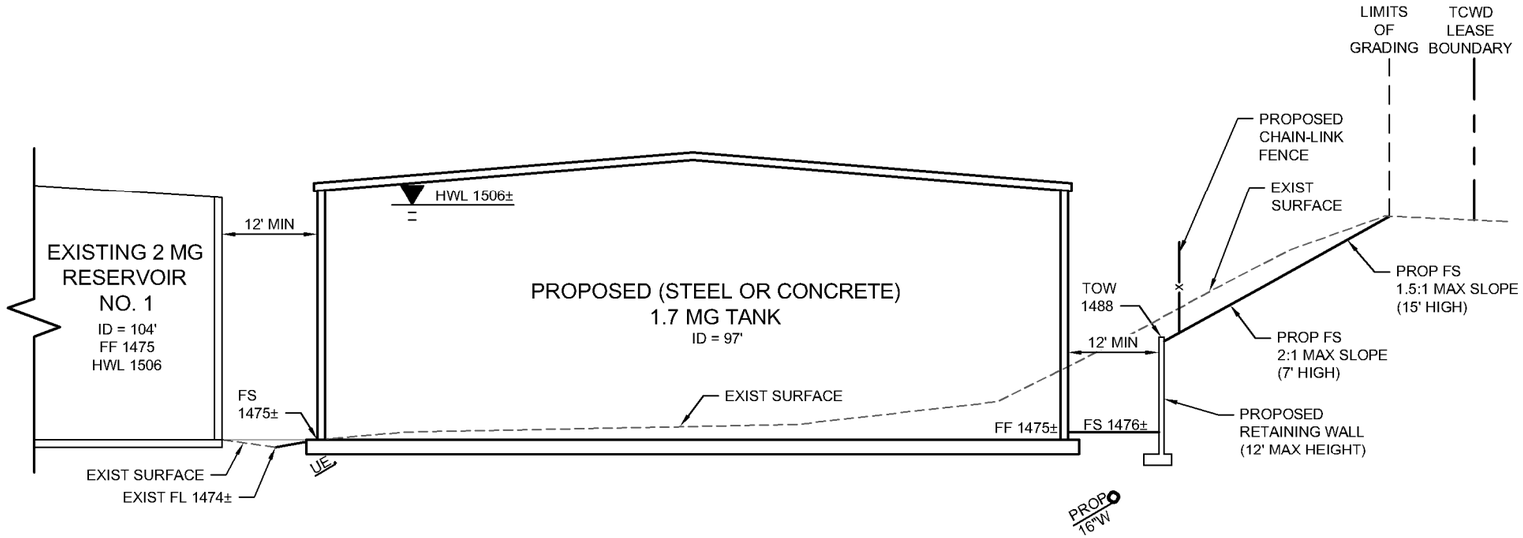
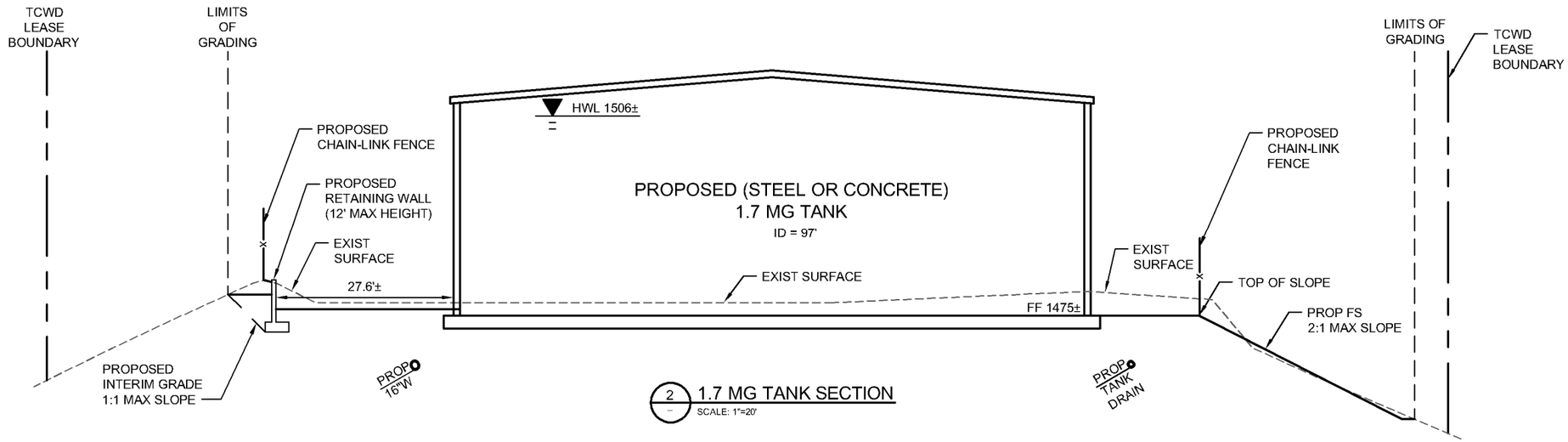


1 — 1.7 MG TANK SECTION
SCALE: 1"=20'



2 — 1.7 MG TANK SECTION
SCALE: 1"=20'

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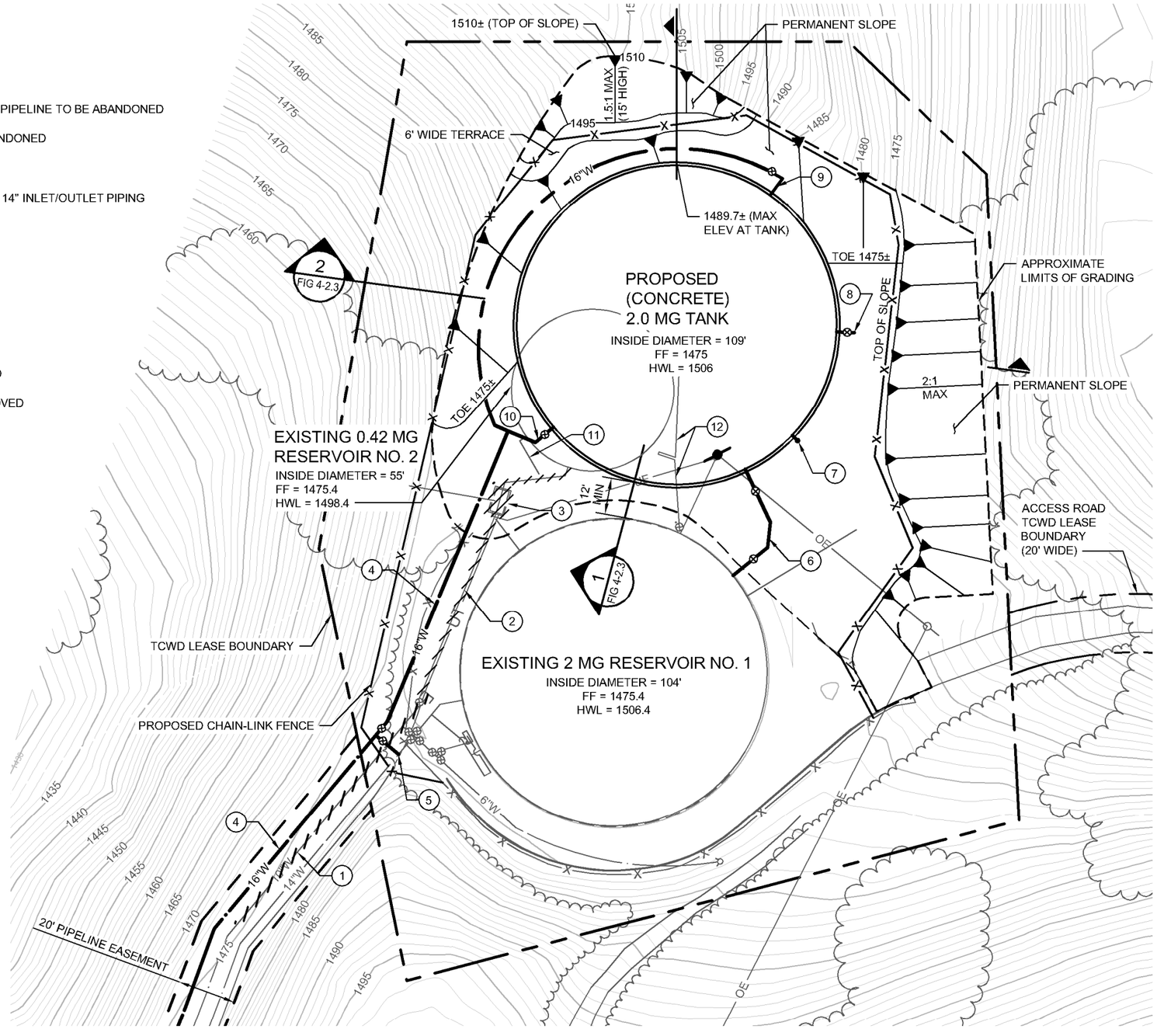
Bar Measures 1 inch

PIPING NOTES:

1. EXISTING 10"W TO BE ABANDONED
2. EXISTING 8" RESERVOIR NO. 2 INLET/OUTLET PIPELINE TO BE ABANDONED
3. EXISTING ALTITUDE VALVE VAULT TO BE ABANDONED
4. PROPOSED 16" INLET/OUTLET PIPING
5. PROPOSED POINT OF CONNECTION TO EXIST 14" INLET/OUTLET PIPING
6. PROPOSED 16" TANK INTERTIE
7. PROPOSED TANK OVERFLOW
8. PROPOSED TANK DRAIN
9. PROPOSED 16" TANK INLET CONNECTION
10. PROPOSED 16" TANK OUTLET CONNECTION
11. EXISTING RESERVOIR DRAIN TO BE REMOVED
12. EXISTING TANK INTERTIE PIPING TO BE REMOVED



LEGEND:

- PROPOSED VALVE
- EXISTING VALVE
- 16"W — PROPOSED WATERLINE
- X"W — EXISTING WATERLINE
- EXISTING POWER POLE (RELOCATION REQUIRED)
- EXISTING POWER POLE PROTECT IN PLACE

NOTES:

1. ALL NEW TANK PIPING CONNECTIONS SHALL HAVE FLEXIBLE EXPANSION JOINT COUPLINGS.

0 20' 40'
SCALE: 1" = 40'

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HARRIS GRADE RESERVOIR REPLACEMENT FEASIBILITY STUDY

ALTERNATIVE 2
2.0 MG TANK CONCEPTUAL FINAL GRADING, YARD PIPING, AND SITE PLAN

Project No.:	200-09339-20001
Date:	AUGUST 2020
Designed By:	KMB

FIGURE
4-2.1

Bar Measures 1 inch

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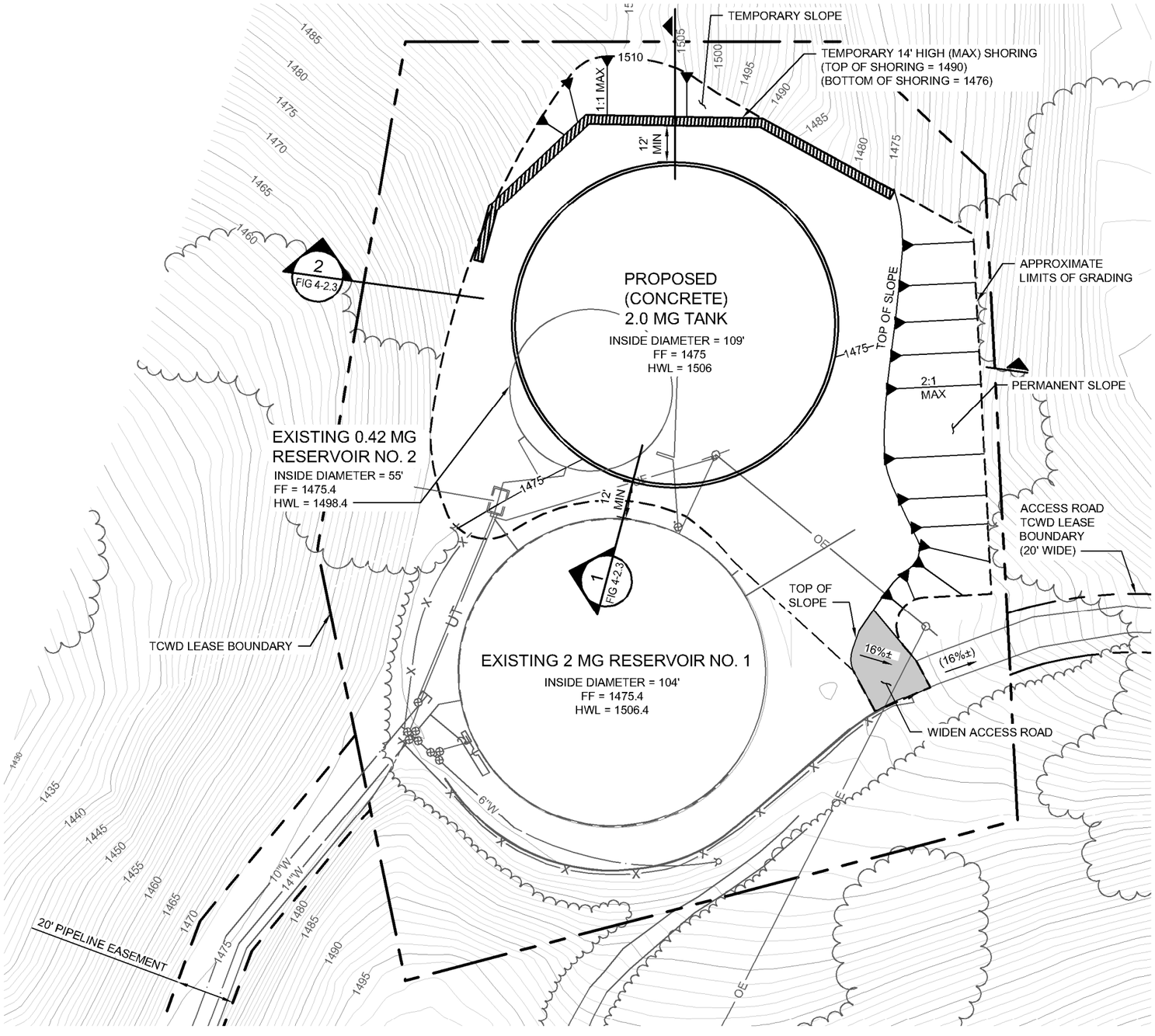

0 20' 40'

SCALE: 1" = 40'

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HARRIS GRADE RESERVOIR REPLACEMENT FEASIBILITY STUDY

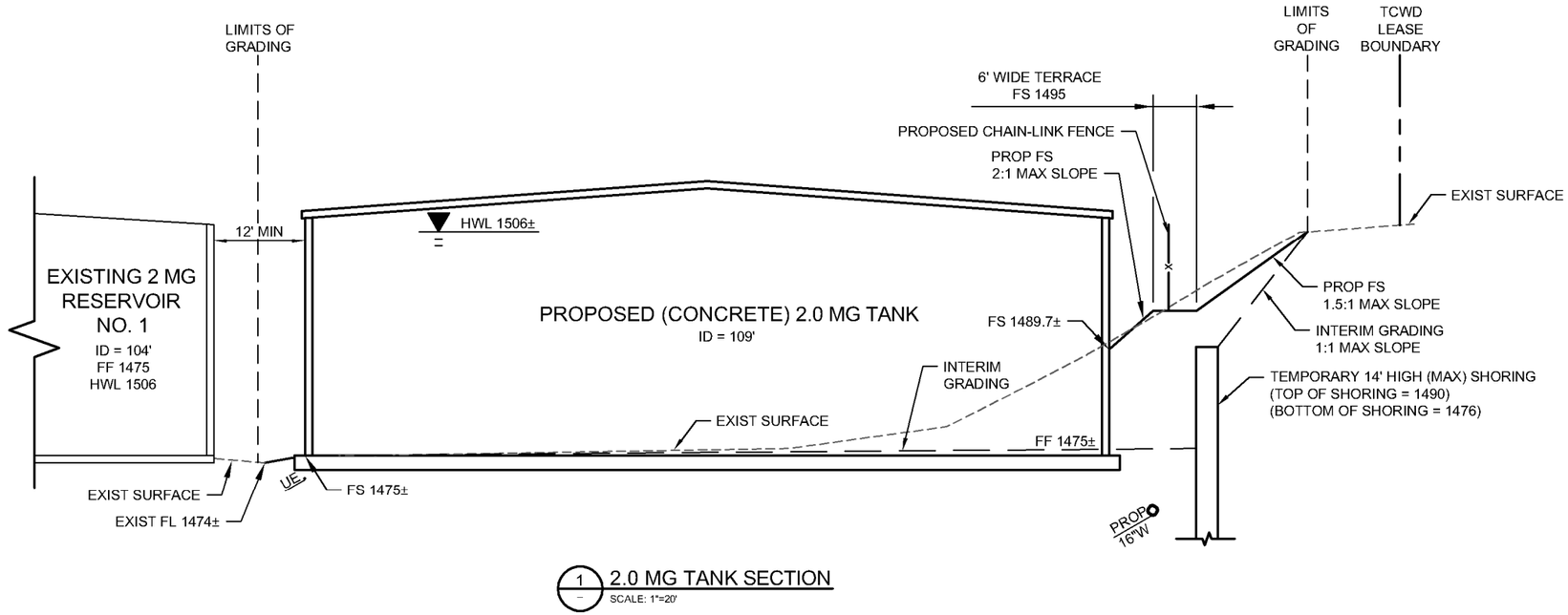
ALTERNATIVE 2
2.0 MG TANK CONCEPTUAL INTERIM GRADING

Project No.:	200-09339-20001
Date:	AUGUST 2020
Designed By:	KMB

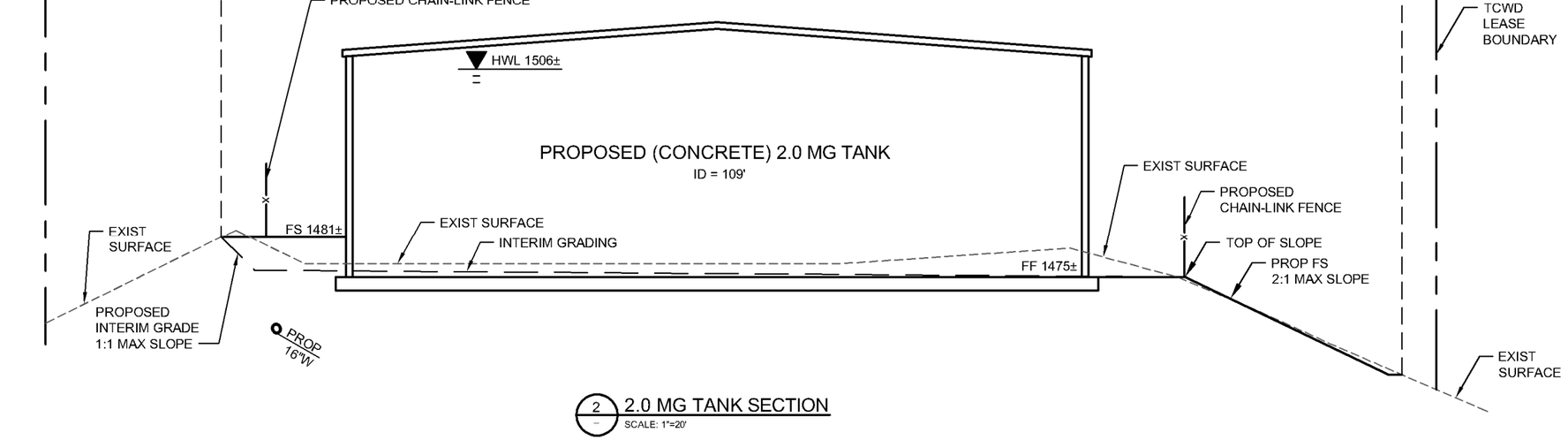
FIGURE
4-2.2

Bar Measures 1 inch

8/26/2020 2:17:09 PM - O:\PROJECTS\IRVINE\09339\200-09339-20001\CAD\CONCEPTUAL\C-704C- (FIG 4-2.2) 2.0 MG TANK (INTERIM).DWG - LERMA, JACKIE



1 — 2.0 MG TANK SECTION
SCALE: 1"=20'



2 — 2.0 MG TANK SECTION
SCALE: 1"=20'

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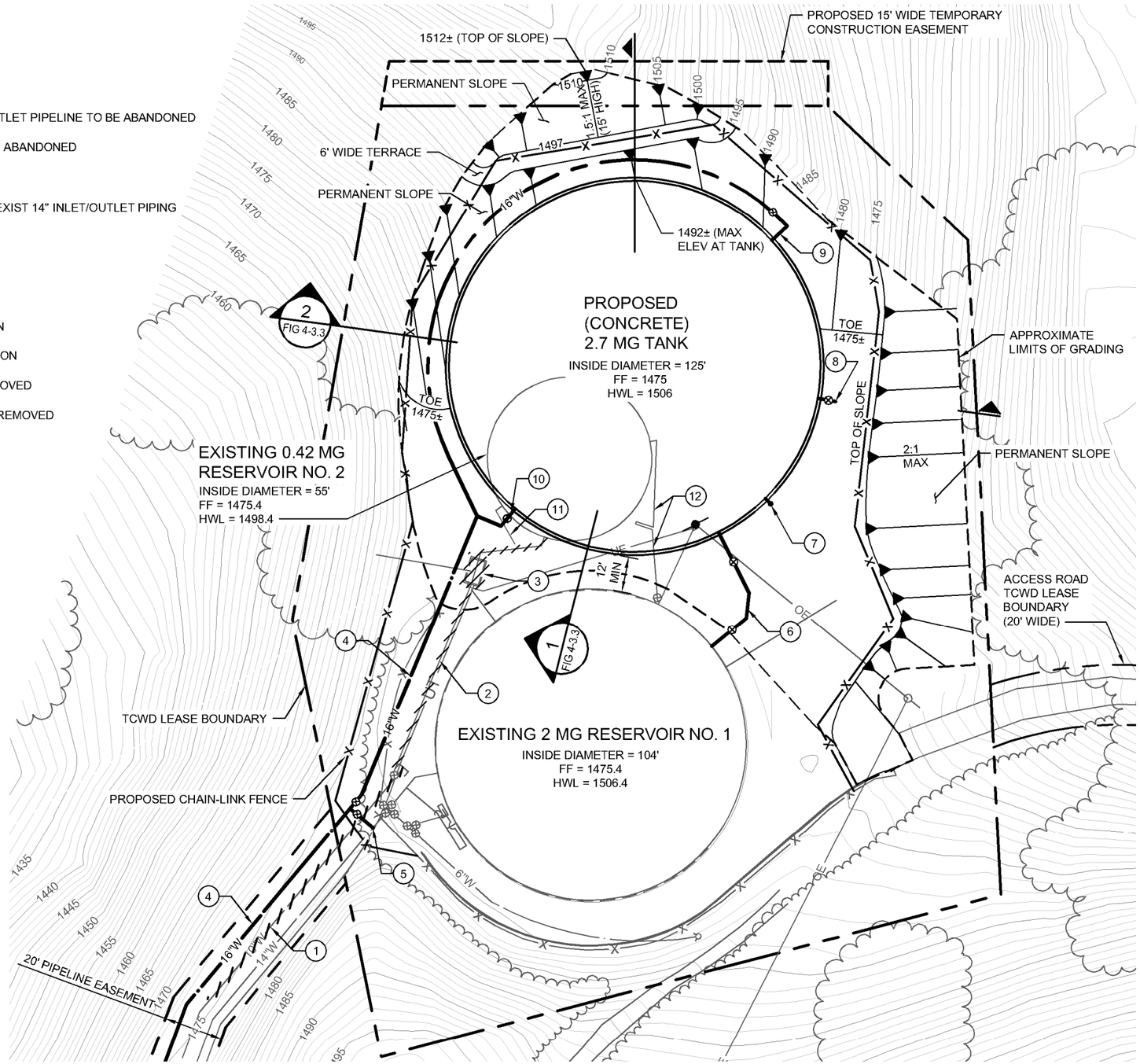
Bar Measures 1 inch

PIPING NOTES:

1. EXISTING 10"W TO BE ABANDONED
2. EXISTING 8" RESERVOIR NO. 2 INLET/OUTLET PIPELINE TO BE ABANDONED
3. EXISTING ALTITUDE VALVE VAULT TO BE ABANDONED
4. PROPOSED 16" INLET/OUTLET PIPING
5. PROPOSED POINT OF CONNECTION TO EXIST 14" INLET/OUTLET PIPING
6. PROPOSED 16" TANK INTERTIE
7. PROPOSED TANK OVERFLOW
8. PROPOSED TANK DRAIN
9. PROPOSED 16" TANK INLET CONNECTION
10. PROPOSED 16" TANK OUTLET CONNECTION
11. EXISTING RESERVOIR DRAIN TO BE REMOVED
12. EXISTING TANK INTERTIE PIPING TO BE REMOVED



LEGEND:

- PROPOSED VALVE
- EXISTING VALVE
- 16"W — PROPOSED WATERLINE
- X"W — EXISTING WATERLINE
- EXISTING POWER POLE (RELOCATION REQUIRED)
- EXISTING POWER POLE PROTECT IN PLACE

NOTES:

1. ALL NEW TANK PIPING CONNECTIONS SHALL HAVE FLEXIBLE EXPANSION JOINT COUPLINGS.

0 20' 40'

SCALE: 1" = 40'

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HARRIS GRADE RESERVOIR REPLACEMENT FEASIBILITY STUDY

ALTERNATIVE 3
2.7 MG TANK CONCEPTUAL FINAL GRADING, YARD PIPING, AND SITE PLAN

Project No.:	200-09339-20001
Date:	AUGUST 2020
Designed By:	KMB

FIGURE
4-3.1

Bar Measures 1 inch

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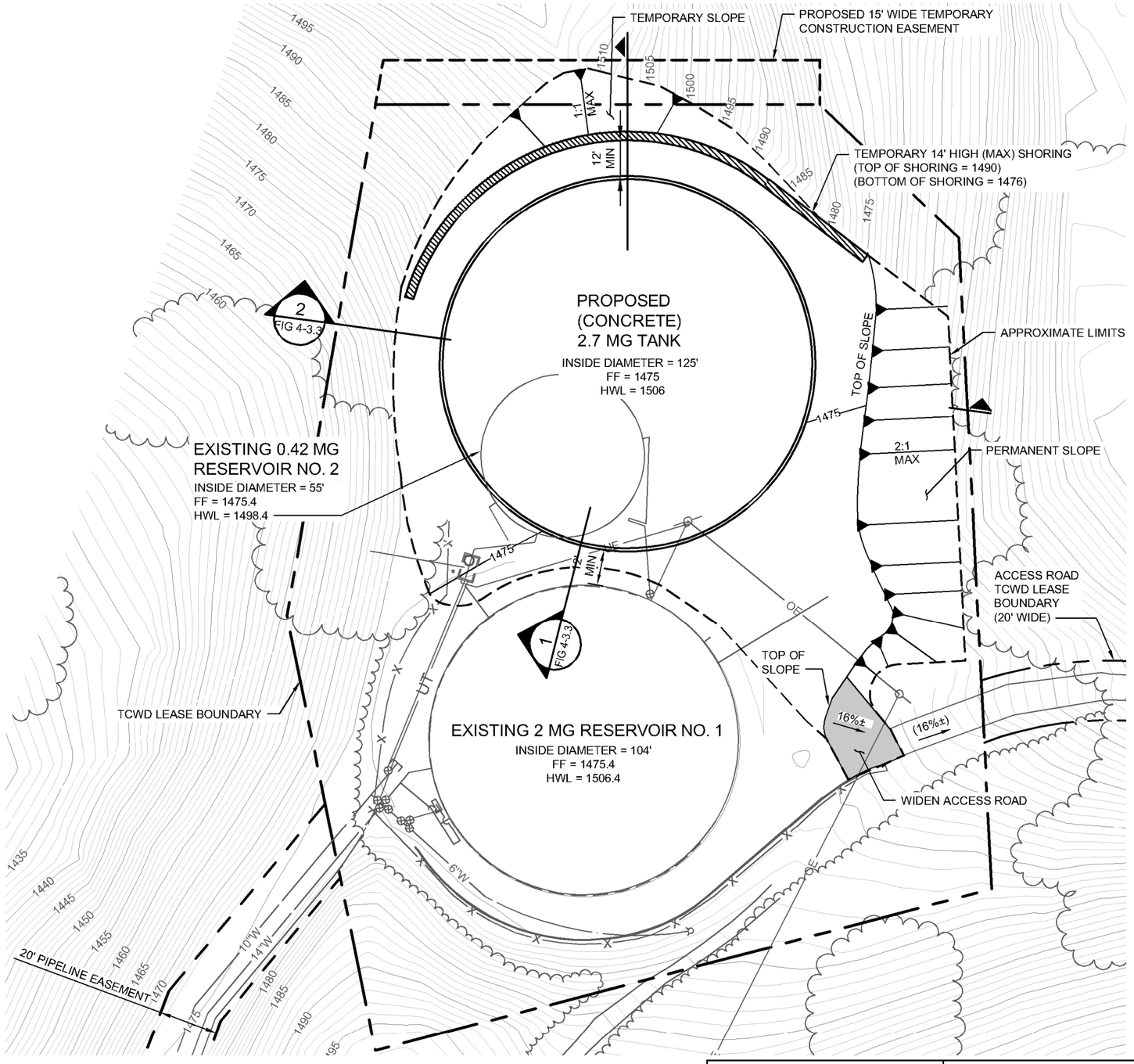

8/26/2020 2:25:31 PM - O:\PROJECTS\IRVINE\09339\200-09339-20001\CAD\CONCEPTUAL\C-704H- (FIG 4-3.2) 2.7 MG TANK (INTERIM).DWG - LERMA, JACKIE

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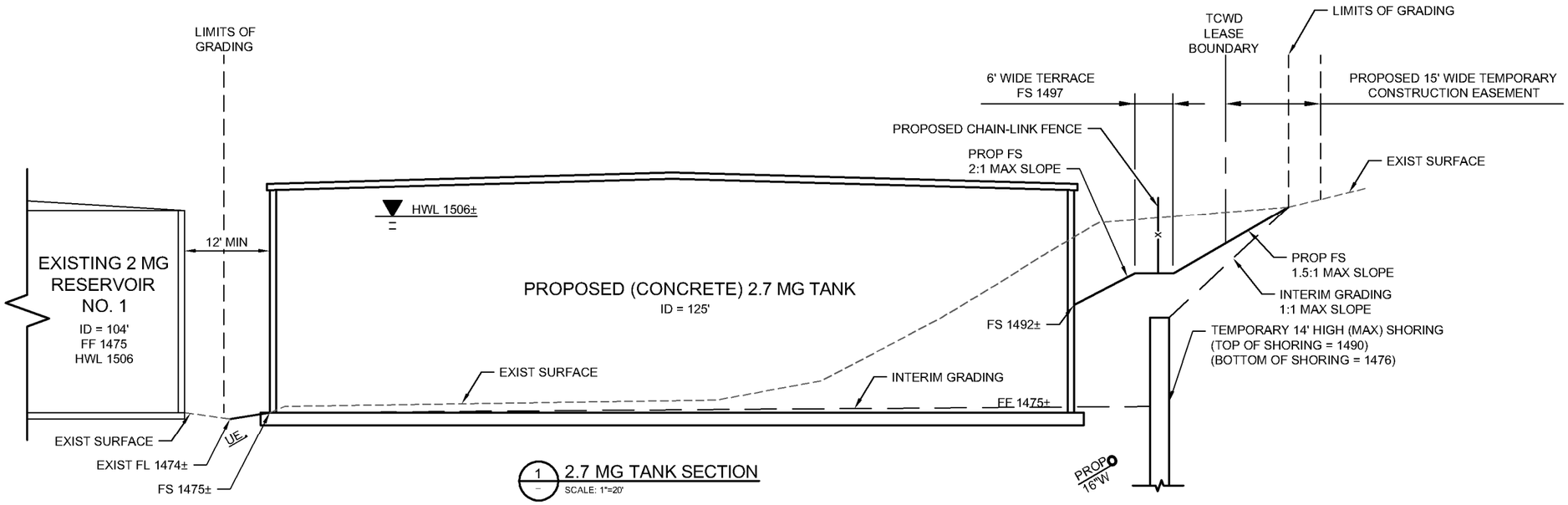
HARRIS GRADE RESERVOIR REPLACEMENT FEASIBILITY STUDY

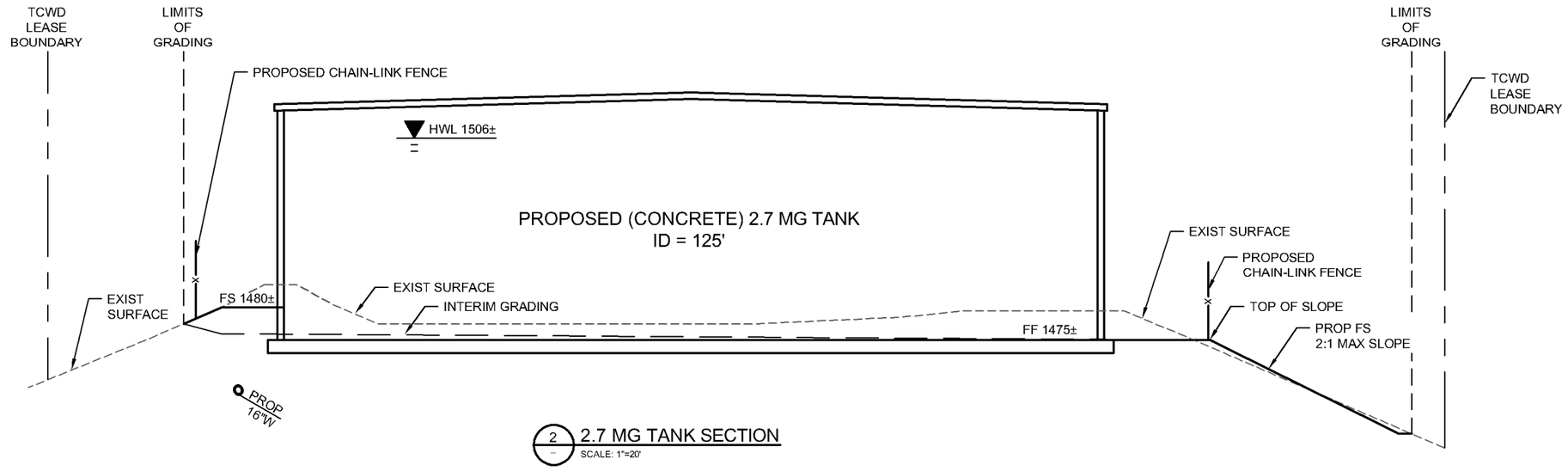
ALTERNATIVE 3
2.7 MG TANK CONCEPTUAL INTERIM GRADING

Project No.:	200-09339-20001
Date:	AUGUST 2020
Designed By:	KMB

FIGURE
4-3.2

Bar Measures 1 inch





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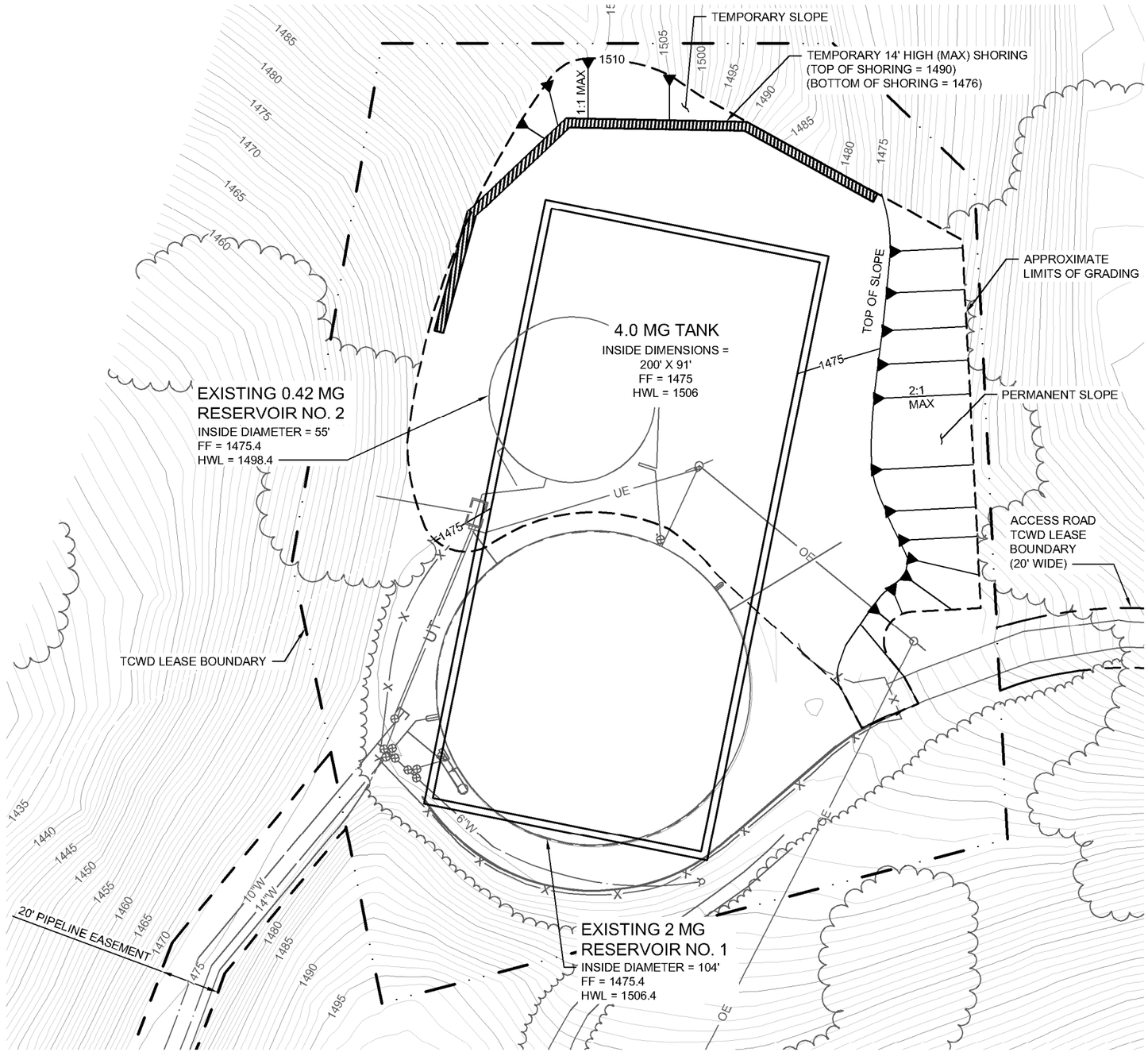
HARRIS GRADE RESERVOIR REPLACEMENT FEASIBILITY STUDY

ALTERNATIVE 3
2.7 MG TANK CONCEPTUAL GRADING SECTIONS

Project No.:	200-09339-20001
Date:	AUGUST 2020
Designed By:	KMB

FIGURE
4-3.3

Bar Measures 1 inch



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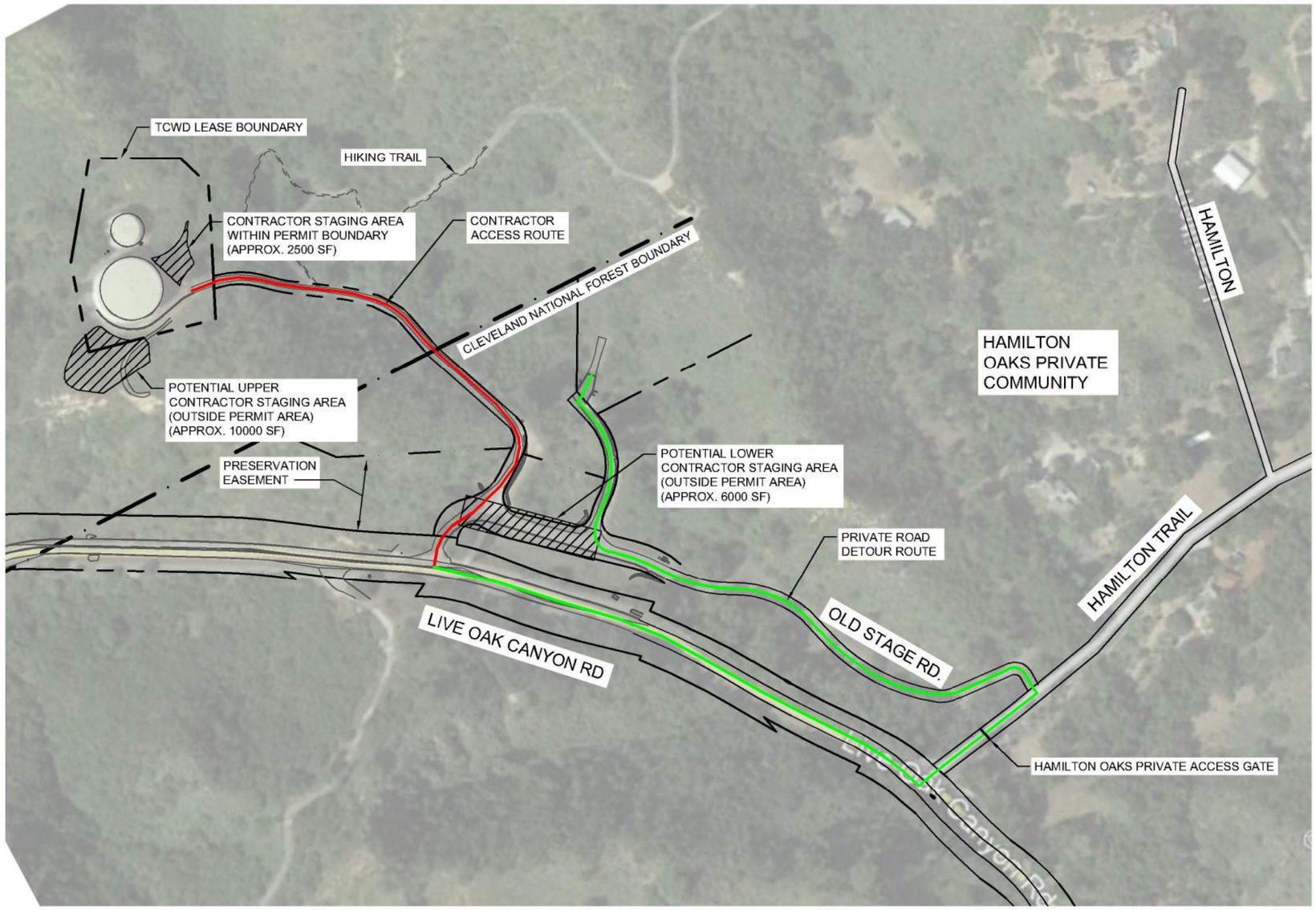
Bar Measures 1 inch



LEGEND:

CONTRACTOR ACCESS

POTENTIAL DETOUR

0 100' 200'

SCALE: 1" = 200'

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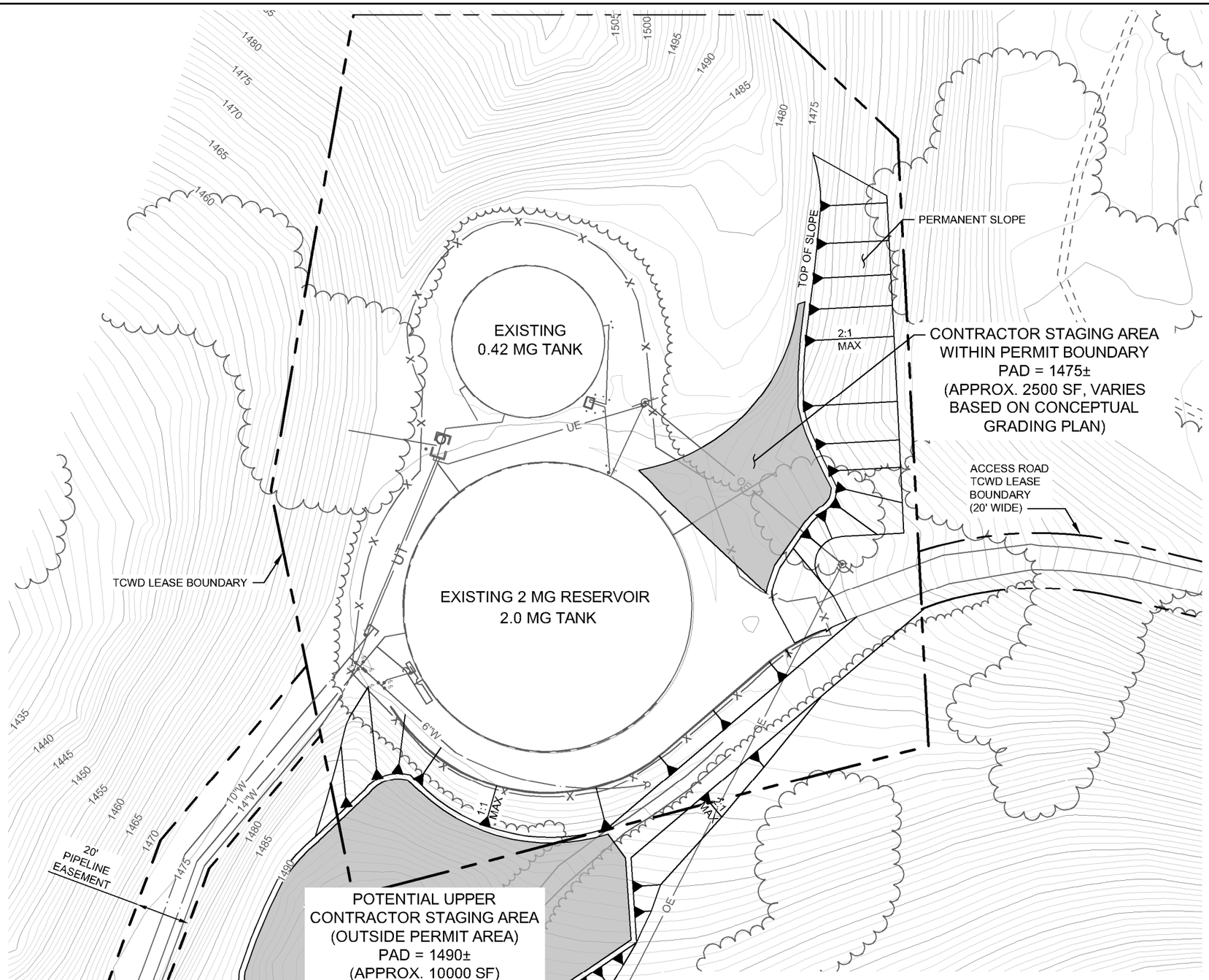
Bar Measures 1 inch



TETRA TECH www.tetratech.com 17885 VON KARMAN AVENUE, SUITE 500 IRVINE, CA 92614 (949) 809-5000	TRABUCO CANYON WATER DISTRICT HARRIS GRADE RESERVOIR REPLACEMENT FEASIBILITY STUDY CONTRACTOR STAGING PLAN	Project No.: 200-09339-20001 Date: AUGUST 2020 Designed By: KMB FIGURE 5-2

Bar Measures 1 inch

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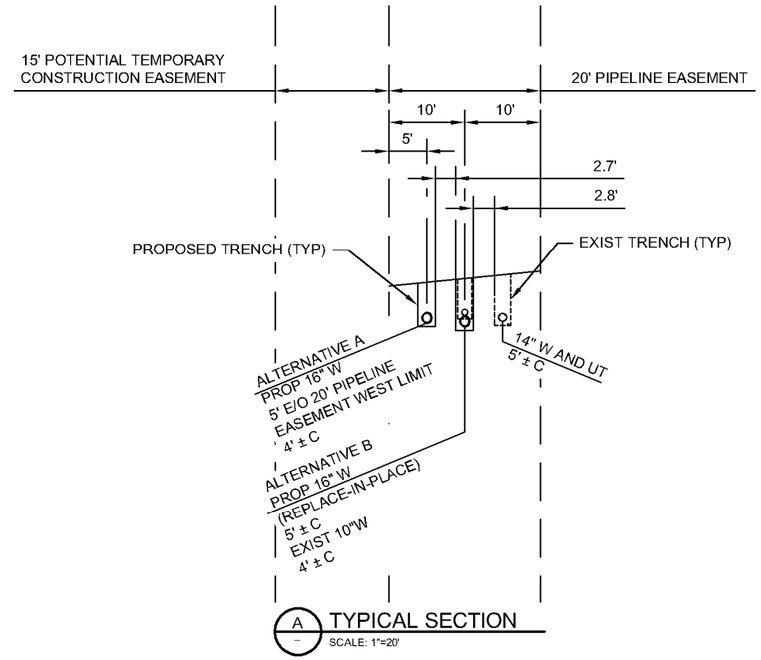
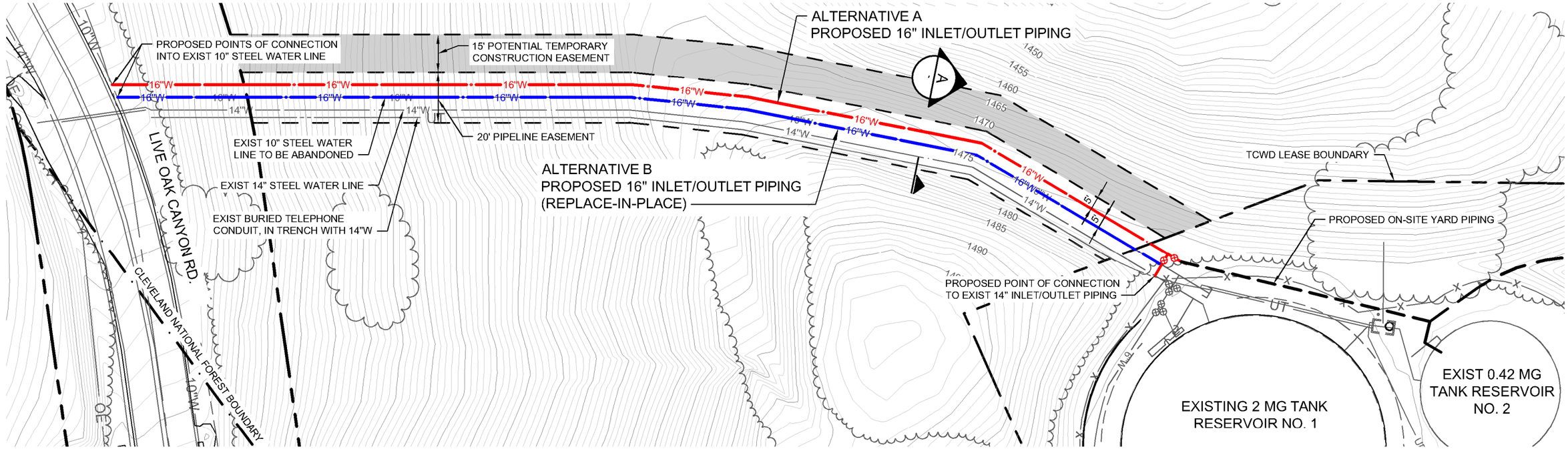


A TYPICAL SECTION
SCALE: 1"=20'



0 20' 40'
SCALE: 1" = 40'

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IRVINE, CA 92614
(949) 809-5000

TRABUCO CANYON WATER DISTRICT
HARRIS GRADE RESERVOIR REPLACEMENT FEASIBILITY STUDY

CONCEPTUAL 16-INCH PIPELINE ALIGNMENTS

Project No.:	200-09339-20001
Date:	AUGUST 2020
Designed By:	KMB

FIGURE
5-3

Bar Measures 1 inch

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Appendix C. Anticipated Environmental Permits

Requirement	Authority	Explanation
Federal		
Environmental Impacts	National Environmental Policy Act (NEPA)	Projects which require federal action must comply with the NEPA, including disclosure of the potential environmental impacts of the Project through an Environmental Assessment (EA) or Environmental Impact Statement (EIS), and a process of public and agency review and comment. Federal actions which require review under NEPA include federal funding, interconnection to a federal power marketing agency, or issuance of a federal permit such as an ITP under the ESA. *Triggered by project location on federal land; will need to explore potential "categorical exclusions" of the U.S. Forest Service that could apply. Otherwise likely to require preparation of an EA.*
Biological Resources - Endangered Species	Endangered Species Act (ESA)	The ESA and its implementing regulations in Title 50 CFR Section 17 prohibit the take of any fish or wildlife species that is federally listed as threatened or endangered without prior approval pursuant to either Section 7 or Section 10 of the ESA. Species can be listed as endangered, threatened, proposed for listing (proposed for listing in Federal Register), or candidates for listing (where listing is warranted, but precluded by higher priority listing activities). *This project is likely to need a biological assessment of the property and adjacent habitat since there is potential for undisturbed habitat. If threatened or endanger species (or habitat) are found, an Incidental Take Permit (ITP) may be required for each species identified.*
Biological Resources - Migratory Birds	Migratory Bird Treaty Act (MBTA)	The MBTA implements the Unites States' obligations under four treaties for the protection of migratory birds. The MBTA is administered by the USFWS, which maintains a list of all species protected by the MBTA (50 CFR Section 10.13). This list includes over 1,000 species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. *A biological assessment would also address potential for impacts to migratory bird species. If any are found to be present, or if suitable habitat is identified, an Incidental Take Permit (ITP) may be required for each species so identified.*
Biological Resources - Eagle Protection	Bald and Golden Eagle Protection Act (BGEPA)	The BGEPA prohibits the take, sale, purchase, offer of sale, purchase, or barter, transport, export or import, at any time or in any manner of any bald or golden eagle, alive or dead, or any part, nest, or egg thereof, 16 USC Section 668. The BGEPA also defines take to include "pursue, shoot, shoot

Requirement	Authority	Explanation
		at, poison, wound, kill, capture, trap, collect, molest, or disturb," 16 USC Section 668c, and includes criminal and civil penalties for violating the statute. See 16 USC Section 668. The term "disturb" is defined as agitating or bothering an eagle to a degree that causes, or is likely to cause, injury to an eagle, or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior (50 CFR Section 22.3). *A biological assessment also addresses potential for impacts to either bald or golden eagles. If either species is identified in the area, or if suitable habitat is found, an Incidental Take Permit (ITP) could be required (though is not likely).*
Cultural Resources	National Historic Preservation Act (NHPA)	The NHPA requires that federal agencies consider the effects of their proposed actions on historic properties (cultural resources eligible for inclusion in or listed on the NRHP). Generally, any project which requires federal permits, monies, or lands will require review under Section 106. This process involves surveys for archaeological resources, historic built environment resources, and traditional cultural properties, and consultation with state and tribal historic preservation staff. The NRHP recognizes both historical-period and prehistoric properties, including archaeological sites, that are significant at the national, state, and local levels. To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects of potential significance must meet one or more established criteria *A cultural resources survey will likely be necessary to evaluate the potential for archaeological resources on site, and whether or not any of the structures located on site have historical significance.*
State of California		
Environmental Impacts	California Environmental Quality Act (CEQA)	CEQA) was enacted in 1970 by the California Legislature for decision-makers and the public to be made aware of anticipated significant environmental effects of a proposed project and identify possible ways to avoid or minimize those significant environmental effects by recommending mitigation measures or feasible alternatives to the project. In accordance with CEQA all "projects" within the State of California are required to undergo environmental review to determine potential impacts associated with implementation of the project (see California Public Resources Code, Sections 21000 through 21189). The "Lead Agency" under CEQA is required

Requirement	Authority	Explanation
		to conduct an environmental review to analyze the potential environmental effects associated with proposed projects located within the jurisdiction. *A CEQA review and document preparation will be needed, and the potential impacts defined primarily through the biological and cultural resource assessments will establish the level of assessment; whether an Initial Study/Mitigated Negative Declaration (IS/MND) is possible or a full Environmental Impact Report (EIR) is needed. If possible, a combined federal and state assessment document is preferred.*
Biological Resources - Endangered Species	California Endangered Species Act (CESA)	The CESA establishes state policy to conserve, protect, restore, and enhance threatened or endangered species and their habitats. The CESA mandates that state agencies should not approve projects that would jeopardize the continued existence of threatened or endangered species if reasonable and prudent alternatives are available that would avoid jeopardy. There are no state agency consultation procedures under the CESA. For projects that would affect a listed species under both the CESA and the ESA, compliance with the ESA would satisfy the CESA if the CDFW determines that the federal incidental take authorization is "consistent" with the CESA under California Fish and Game Code Section 2080.1. For projects that would result in take of a species listed under the CESA only, the project operator would have to apply for a take permit under Section 2081(b). *The biological assessment performed for the site will address species of concern at both the federal and state levels. Results will determine what safeguards, if any, are needed for state-listed species.*
Cultural Resources	California Public Resources Code, Section 5024.19(a)	The California Register of Historical Resources (CRHR) was created in 1992 and implemented in 1998 as "an authoritative guide in California to be used by State and local agencies, private groups, and citizens to identify the State's historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change." Certain properties, including those listed in or formally determined eligible for listing in the NRHP and California Historical Landmarks numbered 770 and higher, are automatically included in the CRHR. Other properties recognized under the California Points of Historical Interest program, identified as significant in historical resources surveys or designated by local landmarks programs, may be nominated for inclusion in the CRHR. A resource, either an individual property or a contributor to a historic district, may be listed in the CRHR if the State Historical Resources Commission

Requirement	Authority	Explanation
		determines that it meets one or more established criteria, which are modeled on NRHP criteria. *The cultural assessment performed for the site will address concern at both the federal and state levels. Results will determine what resources may be present, if any, and what protection measures may be necessary prior to project implementation.*
Construction Stormwater Permit	Federal Clean Water Act (CWA), National Pollutant Discharge Elimination System (NPDES); jointly administered by the California Regional Water Quality Control Board (RWQCB), Santa Ana, and the Orange County Department of Public Works.	If one or more acres of land are proposed to be disturbed and have a point source discharge of storm water to Waters of the State, a National Pollutant Discharge Elimination System (NPDES) Permit must be obtained. State Water Resources Control Board establishes policies and regulations that help protect and restore the water quality in California, coordinates with and supports RWQCB efforts, and reviews their actions. The RWQCBs monitor and enforce state and federal plans, policies, and regulations. Each RWQCB makes critical water quality decisions for its region. *The NPDES program provides for Construction General Permits. Most construction projects that disturb 1 acre of land or more are required to obtain coverage through an NPDES General Permit for Construction Activities (or Construction General Permit), which requires the applicant to file a public notice of intent to discharge stormwater and to prepare and implement a stormwater pollution prevention plan (SWPPP).*
Orange County		
Water Quality	Local NPDES program and the County of Orange, the Orange County Flood Control District, and cities of Orange County (the Permittees).	A Model Water Quality Management Plan (WQMP) and Technical Guidance Document (TGD) are provided by the County to aid development project proponents in addressing post-construction urban runoff and stormwater pollution from new development and significant redevelopment projects that qualify as Priority Projects. The criteria for defining a "Priority Project" is provided in the Model WQMP and TGD. These documents describe the process that developers should follow in preparing a Project WQMP for individual new development and significant redevelopment projects. A Project WQMP is a plan for minimizing the adverse effects of urbanization on site hydrology, runoff flow rates and pollutant loads. It also includes measures to help reduce the impacts from "hydromodification." *A project specific WQMP and Erosion and Sediment Control Plan (ESCP) will likely be needed for this project.*

Not expected to be necessary for the proposed project at this location are the following:

- Wetland Permit, Section 404 WQA (U.S. Army Corps of Engineers)
- Water Quality Certification, Section 401 WQA (RWQCB),
- Lake and Streambed Alteration Agreement (CDFW),
- Conditional Use Permit, or other Land Use Zoning adjustment (Orange County).

TRABUCO CANYON WATER DISTRICT
ENGINEERING/OPERATIONAL COMMITTEE MEETING | MARCH 3, 2021

ENGINEERING MATTERS
ITEM 4: DISCUSSION AND POSSIBLE ACTION(S) CONCERNING BELL CANYON SEWER LIFT STATION REHABILITATION PROJECT

Trabuco Canyon Water District (District) owns and operates the Bell Canyon Lift Station (Station) in the Dove Canyon community. The station was built in the late 1980's as part of the Dove Canyon Development and is located at the end of Bell Canyon Drive. The station lifts sewage from 130 homes via a 4" PVC force main, 4500 LF to a manhole at the intersection of Willowglade and Golf Ridge Dr., which then gravity flows to Golf Club Lift Station.

The station footprint is 30'x15' and includes a wet well with two sets of submersible pumps working in series, a dry pit/valve vault, electrical/MCC panel, a chlorine tank and a backup diesel generator. On September 2, 2019, a complete failure of the station occurred and required Wastewater Operations and Maintenance Staff to install an emergency bypass system to prevent a Sanitary Sewer Overflow (SSO). Two days later, operations were able to restore service to one set of pumps, removed the bypass system and installed a temporary pumping system to back up the operational pumps.

District staff, along with JIG Consultants, identified areas that required rehabilitation and replacement, and completed a bid package for this work in April 2020. At the May 20, 2020 Regular Board Meeting, the Board of Directors authorized the General Manager to execute a contract with Ferreira Construction for the Bell Canyon Lift Station Rehabilitation in the amount of $1,496,228, with a $75,000 contingency, for a not to exceed amount of $1,571,228. At the June 15, 2020 Regular Board Meeting, the Board of Directors authorized the General Manager to execute a contract with Butier Engineering, Inc. for Construction Management Services in the amount of $180,830.

The construction completion date is July 1, 2021 (Exhibit 1). The following is the budget for the project:

ITEM	BELL CANYON LIFT STATION REHABILITATION PROJECT COSTS-UPDATED TASK DESCRIPTION	BUDGET
1	Construction – Ferreira Construction (Includes $75,000 Allowance for Field Orders and $75,000 Approved Contingency)	**$1,571,228**
	• *Fence Revision*	*$12,468.00*
	• *Wet Well Replacement*	*$52,952.93*
	• *By-Pass Valve on Surge Tank*	*$5,369.67*
	• *Odor Control During Construction*	*$11,341.97*
	Total:	*$82,132.57*
2	Geotechnical Site Investigation, Vibration Monitoring, Video Survey, Additional Boring - GMU Geotechnical	***$17,300.00**
3	Engineering Design/Services During Construction – JIG Consultants	**$117,625.00**
4	Construction Management/Inspection-Butier	**$180,830.00**
5	Design Site Survey/Construction Monitoring – DMc Engineering	***$8,280.00**
6	Easement Procurement - DMc Engineering/CPSI Right-of-Way Services	***$4,000.00**
7	Service/Meter Plan/Arc Flash Study - SCE	***$3,000.00**
	Total:	**$1,902,263.00**

FUNDING SOURCE:
Emergency Reserves

FISCAL IMPACT:
$1,903,000.00 (FY19-20 & FY20-21)

TRABUCO CANYON WATER DISTRICT
ENGINEERING/OPERATIONAL COMMITTEE MEETING | MARCH 3, 2021

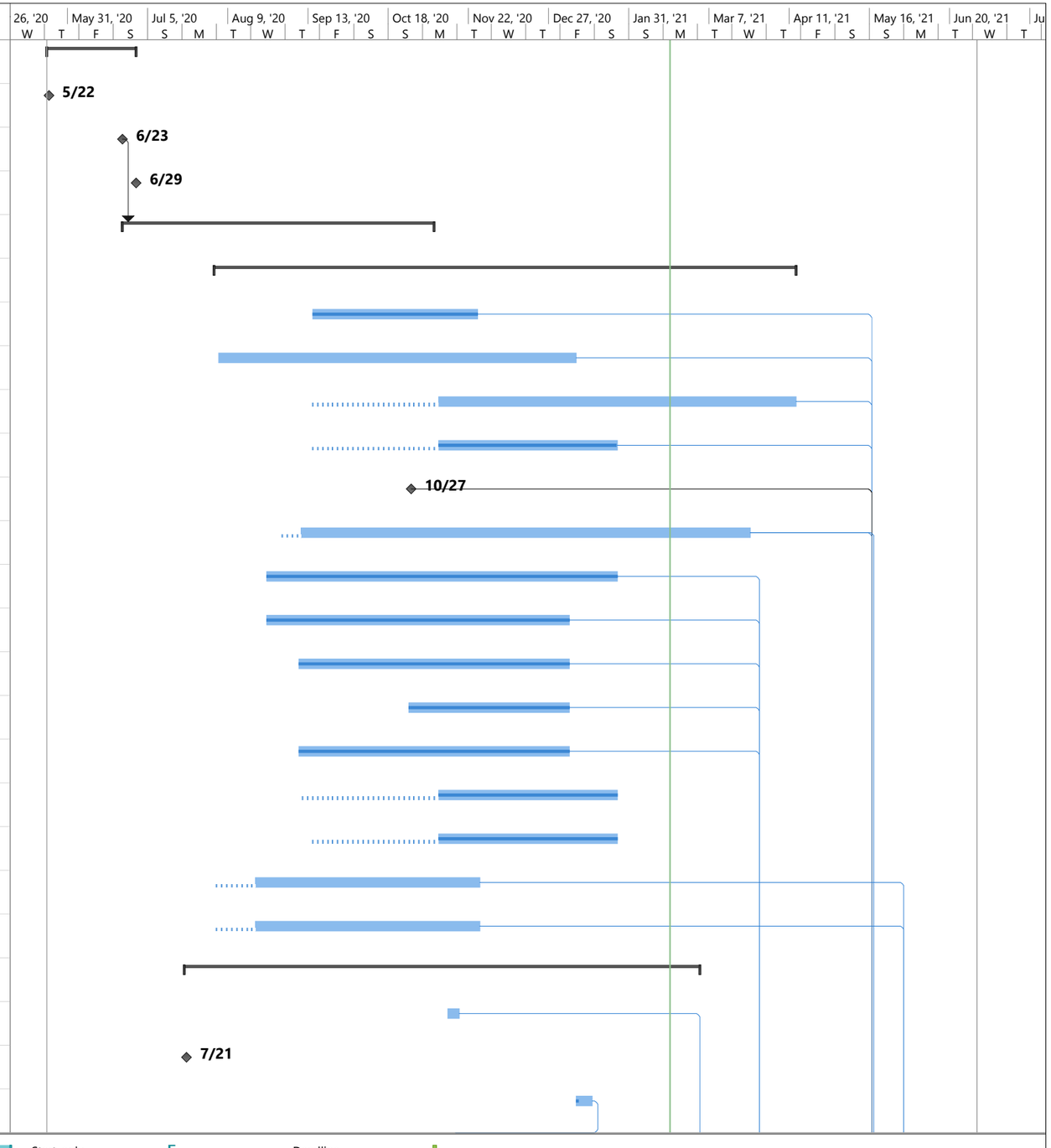
ENVIRONMENTAL COMPLIANCE:
Notice of Exemption was filed with the County of Orange on June 16, 2020

RECOMMENDED ACTION:
Committee to receive information at the time of the Committee Meeting.

EXHIBIT(S):
1. Project Schedule-Updated

CONTACTS (staff responsible): PALUDI/LAUSTEN

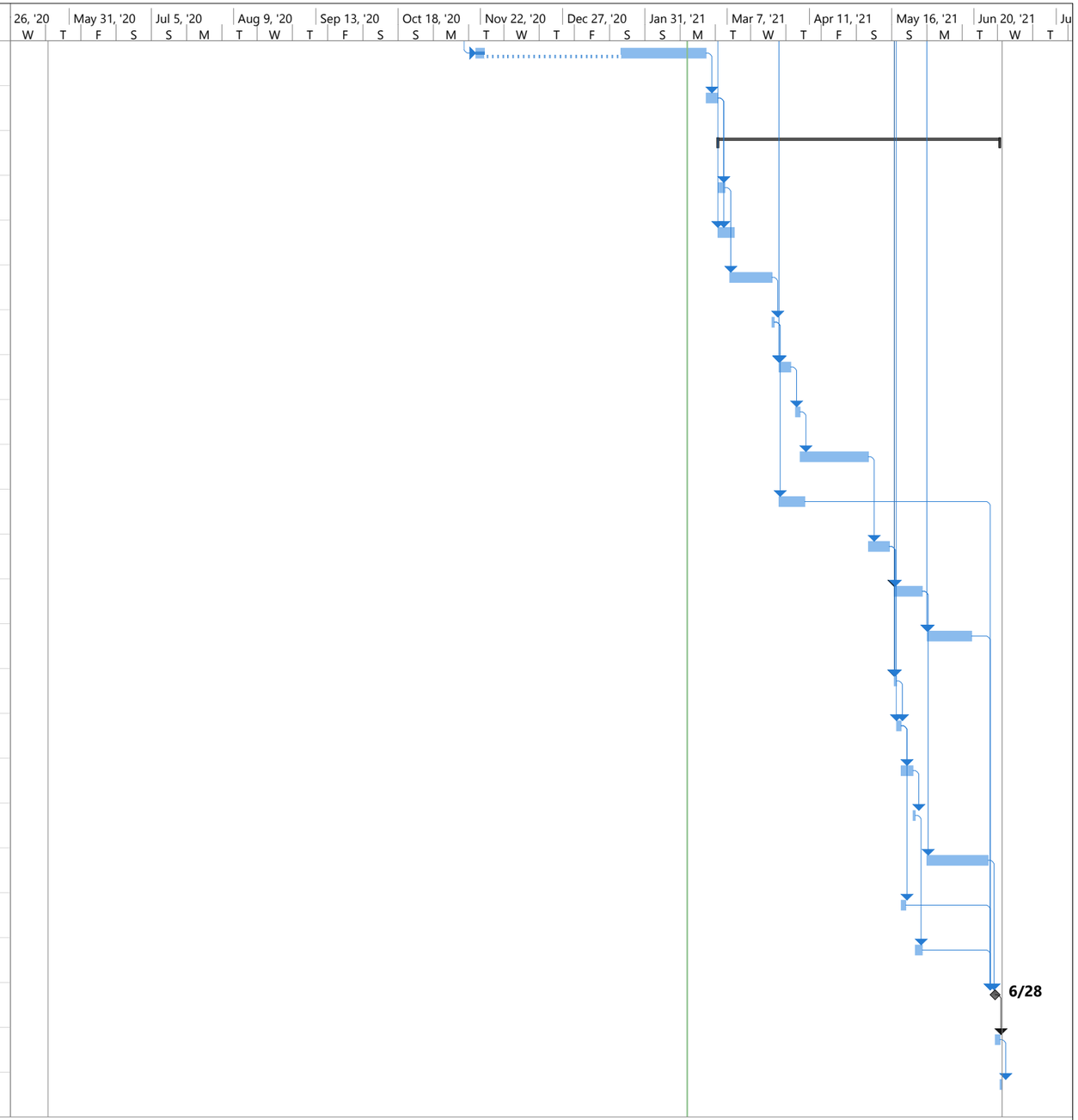
ID	Task Mode	Task Name	Duration	Start	Finish
1		**Project Setup**	**27 days**	**Fri 5/22/20**	**Mon 6/29/20**
2		Notice to Award	1 day	Fri 5/22/20	Fri 5/22/20
3		Pre-Construction Meeting	1 day	Tue 6/23/20	Tue 6/23/20
4		NTP	1 day	Mon 6/29/20	Mon 6/29/20
5		**Submittals**	**98 days**	**Wed 6/24/20**	**Fri 11/6/20**
69		**Material Procurement (Long Lead Items)**	**182 days**	**Mon 8/3/20**	**Tue 4/13/21**
70		Chemical Feed Unit	52 days	Tue 9/15/20	Wed 11/25/20
71		Bladder Surge Tank	112 days	Wed 8/5/20	Thu 1/7/21
72		Tesco Motor Control Center	112 days	Mon 9/14/20	Tue 4/13/21
73		Tesco Switch Board	56 days	Mon 9/14/20	Mon 1/25/21
74		ASCO ATS	0 days	Tue 9/1/20	Tue 10/27/20
75		CAT Generator	140 days	Tue 9/1/20	Wed 3/24/21
76		Sump Pump	109 days	Wed 8/26/20	Mon 1/25/21
77		Plug Valves	94 days	Wed 8/26/20	Mon 1/4/21
78		Check Valves	84 days	Wed 9/9/20	Mon 1/4/21
79		Sewer Air/Vac	50 days	Tue 10/27/20	Mon 1/4/21
80		Flow Meter	84 days	Wed 9/9/20	Mon 1/4/21
81		Sump Termination Panels	56 days	Wed 9/9/20	Mon 1/25/21
82		Instrumentation and Control	56 days	Mon 9/14/20	Mon 1/25/21
83		E-4 LED Wall Packs	70 days	Mon 8/3/20	Thu 11/26/20
84		Light Pole	70 days	Mon 8/3/20	Thu 11/26/20
85		**Project Start Up**	**161 days**	**Tue 7/21/20**	**Tue 3/2/21**
86		Call in USA	3 days	Fri 11/13/20	Tue 11/17/20
87		Assess Wet Well	1 day	Tue 7/21/20	Tue 7/21/20
88		TCWD Inspect and Release Panel/Temp Fence/TPP	5 days	Fri 1/8/21	Thu 1/14/21



Project: FCC5342 - TCWD Bell C
Date: Thu 2/18/21

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

ID	Task Mode	Task Name	Duration	Start	Finish
89		Power for Bypass Pumps	28 days	Fri 11/20/20	Thu 2/25/21
90		Setup Bypass	3 days	Fri 2/26/21	Tue 3/2/21
91		**Project Demo and Installation**	**86 days**	**Wed 3/3/21**	**Wed 6/30/21**
92		Surveying	3 days	Wed 3/3/21	Fri 3/5/21
93		Demo of Above Ground Structures, Gates, Wall	5 days	Wed 3/3/21	Tue 3/9/21
94		Shoring, Footings and Wall	14 days	Mon 3/8/21	Thu 3/25/21
95		Exc & Install Vault & Epoxy Well/Replace Wet Well	1 day	Fri 3/26/21	Fri 3/26/21
96		Install Piping	5 days	Mon 3/29/21	Fri 4/2/21
97		Trench for Electrical Conduits	2 days	Mon 4/5/21	Tue 4/6/21
98		Site Underground Conduit System	21 days	Wed 4/7/21	Wed 5/5/21
99		Level Transducer/Floats at Well, Cond. Inst at Vault	9 days	Mon 3/29/21	Thu 4/8/21
100		Form & Pour Concrete Slabs	7 days	Thu 5/6/21	Fri 5/14/21
101		Install MCC, Sump Term. Panel, Switchboard, ATS	10 days	Mon 5/17/21	Fri 5/28/21
102		Install Wiring and Lighting	15 days	Mon 5/31/21	Fri 6/18/21
103		Install Equipment and Tanks	1 day	Mon 5/17/21	Mon 5/17/21
104		Conduit Connection at Generator	2 days	Tue 5/18/21	Wed 5/19/21
105		Ornamental Fence	3 days	Thu 5/20/21	Mon 5/24/21
106		Asphalt Paving	1 day	Tue 5/25/21	Tue 5/25/21
107		SCE Metering/Cable Install for Power to Switchboard	20 days	Mon 5/31/21	Fri 6/25/21
108		Remove Bypass & Testing	2 days	Thu 5/20/21	Fri 5/21/21
109		Concrete Restoration	3 days	Wed 5/26/21	Fri 5/28/21
110		Substantial Completion	1 day	Mon 6/28/21	Mon 6/28/21
111		Punch List	2 days	Tue 6/29/21	Wed 6/30/21
112		Project Complete	1 day	Thu 7/1/21	Thu 7/1/21



Project: FCC5342 - TCWD Bell C
Date: Thu 2/18/21

Task	Project Summary	Manual Task	Start-only	Deadline	
Split	Inactive Task	Duration-only	Finish-only	Progress	
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress	
Summary	Inactive Summary	Manual Summary	External Milestone		

TRABUCO CANYON WATER DISTRICT
ENGINEERING/OPERATIONAL COMMITTEE MEETING | MARCH 3, 2021

ENGINEERING MATTERS
ITEM 5: OTHER ENGINEERING AND OPERATIONS PROJECT UPDATES

1. Saddle Crest Development
2. Saddleback Meadows Development
3. Joplin Property/SCADA Upgrade
4. Golf Club Sewer Lift Station
5. Other Projects

RECOMMENDED ACTION:
Committee to receive project status updates at time of the Committee Meeting.

EXHIBIT(S):
None

CONTACTS (staff responsible): PALUDI/PEREA/LAUSTEN

TRABUCO CANYON WATER DISTRICT
ENGINEERING/OPERATIONAL COMMITTEE MEETING | MARCH 3, 2021

OPERATIONAL MATTERS
ITEM 6: WATER SYSTEM UPDATES

The following is a brief report of the water system for **February 2021**.

Projects and Repairs

1. Water Operations staff repaired a struck abandoned two-inch water service on Robinson Ranch Rd. in the Robinson Ranch Community.
2. Water Operations staff pulled the Rose and Lang Well pumps at the Ground Water Treatment Facility.
3. Water Operations staff participated in crane and electrical training.
4. Water Operations staff replaced leaking hydrants on Bell Canyon Dr. and Promontory in the Dove Canyon Community.
5. Water Operations staff preformed Pressure Regulator Valve maintenance at the Canyon Creek Pump Station and Robinson Ranch Pump Station.
6. Water Operations staff is preparing to take the Dimension Water Treatment Plant offline for two weeks due to maintenance being performed on the Lower Feeder at Lake Matthews

Monthly Water System Operations Summary

The Monthly Water System Operations Summary is attached for the Committee's review. Any anomalies will be presented at the time of the Engineering/Operational Committee Meeting.

RECOMMENDED ACTION:

Committee to receive system status updates. No action required.

EXHIBITS

1. Monthly Water System Operations Summary

CONTACTS (staff responsible): PALUDI/KESSLER

TRABUCO CANYON WATER DISTRICT
MONTHLY WATER SYSTEM OPERATIONS SUMMARY

2021													
DIMENSION WTP													
	JAN	**FEB**	**MARCH**	**APRIL**	**MAY**	**JUNE**	**JULY**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	***TOTAL***
SAC METER AC/FT													
BACKWASH AC/FT	4												
FLUSHWATER AC/FT	7												
WTP EFFLUENT AC/FT	175												
Wells													
TRABUCO CREEK GWTF	0												
US WELL AC/FT	0												
AMP WATER													
SMWD AC/FT	0.12												
IRWD AC/FT	0												
TOTAL SUPPLY													
AC/FT	175												
CFS DAILY AVERAGE	2.8												
AC/FT PER DAY	5.6												
OPERATIONS in GAL.													
WTP DOMESTIC	32,239												
WWTP DOM	17,354												
OPERATIONS (AF)													
SUPPLEMENT TO RW	0												
LOSSES in GAL.													
FLUSHING (gal.)	0												
SEWER CLEANING (gal.)	5,000												
LINE BREAKS (gal.)	100,000												
SYSTEM DEMAND **													
CFS DAILY AVERAGE	2.8												
AC/FT PER DAY	5.6												
RESERVOIR STORAGE													
MONTHLY AVG (MG)	9.0												
DAYS OF STORAGE	4												
ZONES (AF)													
RIDGELINE PS	127												
EL TORO P.S.	18												
TOPANGA	2												
FALCON	0.3												
ROSE PRV/ OAKS	1												
CANYON CREEK	0.1												
ROSE P.S.	0.3												
ROBINSON RANCH	31												
DOVE CANYON	61												
PORTOLA HILLS	11												
* Usage estimated new meter installed					** Excludes Operational use, losses, and supplement to Recycled Water Reservoir (RW)								

TRABUCO CANYON WATER DISTRICT
ENGINEERING/OPERATIONAL COMMITTEE MEETING | MARCH 3, 2021

OPERATIONAL MATTERS
ITEM 7: WASTEWATER SYSTEM UPDATES

The following is a brief report of the wastewater system for **February 2021.**

Projects and Repairs

1. Wastewater Operations staff repaired/replaced the inline polymer pump and polymer line at belt press building.
2. Wastewater Operations staff installed a surge arrestor on the Sequencing Batch Reactor (SBR) decant valve flush line to reduce/prevent water hammer.
3. Wastewater Operations staff installed a new disinfection feed line at the Dove Recycled Water Pump Station.
4. Wastewater Operations staff cleaned Golf Club and Bell Canyon Sewer Lift Station wet wells.
5. Wastewater Operations staff coordinated with third-party contractor to install and operate the permanent odor control system and equipment at Bell Canyon Sewer Lift Station.

Sewer System Management Plan (SSMP) Report

1. *SSMP Communication Program*: The purpose of the program is to communicate on a regular basis with the public on the development, implementation, and performance of TCWD's SSMP. Status updates on the work and type of work performed on the sewer system will be provided, including sewer line and manhole cleaning, system repairs, lift station cleaning, and updates from satellite facilities:

- Sewer System – Cleaned **20,443** feet of gravity sewer line
- Satellite and Contract Facilities:
  - The Oaks at Trabuco Wet Well was pumped out **8** times.
  - O'Neill Park Sewer System (Gravity Sewer, Lift Station, and Force Main)
    - Status: Ok | Repairs: None
- Sewer System Quarterly Report:
  - Next Scheduled Report – **March 2021**

2. *SSMP Program Audits*: Periodic internal audits shall be conducted, at a minimum every two years, with reports kept on file. The audit shall focus on evaluating the effectiveness of the SSMP and TCWD's compliance with the mandatory elements of TCWD's SSMP:

- Next scheduled Report Due: **January 2022**

Monthly Recycled Water System Operations Summary

The Monthly Recycled Water System Operations Summary is attached for the Committee's review. Any anomalies will be presented at the time of the Engineering/Operational Committee Meeting.

RECOMMENDED ACTION:

Committee to receive system status updates. No action required.

EXHIBITS

1. Monthly Recycled Water System Operations Summary

CONTACTS (staff responsible): PALUDI/PEREA

TRABUCO CANYON WATER DISTRICT | NON-DOMESTIC WATER SYSTEM SUMMARY - 2021

RECYCLED WATER SUPPLY	MAX	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	TOTAL	FIVE YEAR AVG
WWTP Reclaimed Water Production, AF	78.3	50.6												50.6	550.04
Reclaimed Reservoir Level, FT	1274.5	1,266.0												-	-
Reclaimed Reservoir Free Board, FT	25.5	8.5												-	-
Reclaimed Reservoir Storage, AF	145.5	96.4												-	-
Supplemental Domestic Water Added, AF	N/A	0.0												0.0	72.88

RECYCLED WATER SYSTEM DEMAND NON DOMESTIC WATER USER	ALLOC. AF	8% JAN	17% FEB	25% MAR	33% APR	42% MAY	50% JUN	58% JUL	67% AUG	75% SEP	83% OCT	92% NOV	100% DEC	TOTAL	ALLOC. %
Dahlia Court	8.2	0.2												0.2	3%
Dove Canyon Golf Course	106.7	6.6												6.6	6%
Dove Canyon Master Association	279.3	5.5												5.5	2%
Robinson Ranch	80.2	0.9												0.9	1%
Trabuco Highlands	159.7	3.7												3.7	2%
City of RSM	0.1	0.0												0.0	0%
Construction Water	N/A	0.0												0.0	N/A
Sakaida Nursery	1.1	0.0												0.0	0%
SMWD	N/A	0.0												0.0	N/A
TY Nursery	17.9	0.0												0.0	0%
TOTAL, AF	**653.2**	**16.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**16.8**	**3%**
PERCENTAGE OF NDW ALLOCATION/YEAR		**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**		
TOTAL ANNUAL AVG. NDW AVAILABLE**	**774.36**														

URBAN RUNOFF CAPTURE AND REUSE DISTRICT FACILITY		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	FIVE YEAR AVG
Shadow Rock Detention Basin Production		0.0												0.0	21.2
Dove | Tick Creek Production*	*Dry Season*	0.0												0.0	102.7
	TCWD Portion	0.0												0.0	-
	SMWD Portion	0.0												0.0	-
Dove Lake Water Pumped		0.0												0.0	201.7
Dove Lake Free Board, Ft		5.6												-	-
Dove Lake Storage		128.0												-	-
Total Rainfall, In.		1.7												1.7	14.5

**** SMWD share of Dove/Tick Pump Station Dry Season Water is 50% of production.***

***** Based on 5-Year Average Reclaimed Water Reservoir Base Supply & Recycled Water Production***

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OPERATIONAL MATTERS
ITEM 8: MAINTENANCE DEPARTMENT UPDATES

The following is a brief report of the wastewater system for **February 2021.**

Projects and Repairs

1. Maintenance Department staff participated in an electrical class (passed).
2. Maintenance Department staff participated in a crane certification class (passed practical exam, waiting results from written).
3. Maintenance Department staff assisted with an emergency repair at the Golf Club Lift Station stage I (submersible) pump.
4. Maintenance Department staff assisted with an electrical service upgrade at the Dove Tank Water Reservoir.
5. Maintenance Department staff replaced an electric motor at the Wastewater Treatment Plant on the East Sutorbilt aeration blower.
6. Maintenance Department staff conducted ongoing upgrades to the Jet Pump at the Wastewater Treatment Plant (80% complete).
7. Maintenance Department staff assisted Water Operations with the setup of the Rose and Lang Wells camera inspection and cleaning.
8. Maintenance Department staff procured new tires on District vehicles, #2, #4, #14.
9. Maintenance Department staff assisted with the ongoing work at Bell Canyon Lift Station.

RECOMMENDED ACTION:
Committee to receive system status updates. No action required.

EXHIBITS
None

CONTACTS (staff responsible): PALUDI/STROUD

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REGULATORY AND OTHER MATTERS
ITEM 9: OTHER MATTERS/REPORTS

Other Matters/Reports from the General Manager and/or District staff may be provided at the time of the Engineering/Operational Committee Meeting.

RECOMMENDED ACTION:
Hear Other Matters/Reports that may have arisen after the posting of the agenda.

EXHIBITS
None

CONTACTS (staff responsible): PALUDI