



# **Palmdale Ditch Conversion Preliminary Design Report**

**FINAL REPORT** Hazen Project No. 20182-004 May 2024



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Appendix F: Cost Estimate and BOE

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# List of Acronyms

Abbreviation	Definition
ACPA	American Concrete Pipe Association
APE	Area of Potential Effects
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AVEK	Antelope Valley-East Kern Water Agency
AWWA	American Water Works Association
BOE	Basis Of Estimate
CCTV	Closed Circuit Television
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
cfs	Cubic Feet per Second
CMP	Corrugated Metal Pipe
CWA	Clean Water Act
DIP	Ductile Iron Pipe
DR	Dimension Ratio
DWR	California Department of Water Resources
EIR	Environmental Impact Report
ESA	Endangered Species Act
fps	Feet per second
FRP	Fiberglass Reinforced Plastic

Abbreviation	Definition
gpm	gallons per minute
HDPE	High-Density Polyethylene
HGL	Hydraulic Grade Line
ID	Inside Diameter
IS	Initial Study
ITP	Incidental Take Permit
LRCID	Littlerock Creek Irrigation District
LF	Linear feet
LRD	Littlerock Dam
MG	Million Gallons
MND	Mitigated Negative Declaration
NAVD	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum of 1929
NHPA	National Historic Preservation Act
NRCS	Natural Resource Conservation Service
OD	Outside Diameter
PACP	Pipeline Assessment Certification Program
pcf	Pounds per Cubic Foot
PE	Polyethylene
psi	Pounds per square inch
PVC	Polyvinyl chloride
PWD	Palmdale Water District
RCP	Reinforced Concrete Pipe
RR	Railroad
RWQCB	Regional Water Quality Control Board
SCE	Southern California Edison
SHPO	State Historic Preservation Office
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

Abbussistics	Definition
Abbreviation	Definition
WJT	Western Joshua Tree
WoUS	Jurisdictional Waters of the United States
WSP	Welded Steel Pipe
WTP	Water Treatment Plant

# **Executive Summary**

## Background

The Palmdale Ditch (Ditch) is owned and operated by Palmdale Water District (PWD) to convey raw water from Littlerock Reservoir to Lake Palmdale. The Ditch was constructed in the late 1800s and is approximately 8.5 miles long. PWD operates the Ditch intermittently in accordance with seasonal water availability and PWD water allocations. Approximately 30 percent of the Ditch is either lined with concrete or utilizes culverts and tunnels to cross roadways and steep terrain, and the remaining 70 percent of its total length remains an unlined earthen ditch.

PWD has been concerned about water losses from the Ditch and has previously converted segments of the Ditch to a buried pipeline. In 2021, PWD hired Hazen and Sawyer (Hazen) to prepare a feasibility study evaluating the potential water savings that could be achieved by replacing the remaining open channel segments with a buried pipeline, concluding that approximately 1,450 acre-ft per year could be conserved. This allowed PWD to receive grant funding from both the California State Department of Water Resources (DWR) and the United States Bureau of Reclamation (USBR) to convert the remaining open channel segments to an enclosed pipeline, currently referred to as the Palmdale Ditch Conversion Project (Project).

In addition to limiting future water losses, PWD plans to increase the conveyance capacity from the current maximum rate of 20 cubic feet per second (cfs) to a new flow rate of 60 cfs. This proposed 60 cfs will be combined with an additional 6 cfs from an existing connection with the Antelope Valley East Kern Water Agency (AVEK) located at Sierra Highway for a total combined flow of 66 cfs between Sierra Highway and Lake Palmdale. Therefore, the use of existing conduits and metering devices will need to be evaluated hydraulically for suitability for this ultimate flow rate.

This Preliminary Design Report (PDR) has been prepared to document the actions taken and decisions made to finalize the Project scope before preparing final detailed design documents suitable for public bidding.

## **Document Review and Field Investigations**

Various documents were reviewed, including design drawings, as-built plans, previous surveys, and property documents. Findings from these documents were documented, discussed, and incorporated into the preliminary design as applicable. A site visit was performed in September 2024 where the design team was able to walk the entirety of the Project alignment while the ditch was offline. Several photos were taken and are presented in this report. A condition assessment of existing tunnels, culverts, and pipes was also performed, using video cameras to determine which assets could be rehabilitated in place and which required replacement. A geotechnical investigation was also performed, which involved drilling 36 borings spaced at approximately 2,000 feet along the alignment.

## **Pipe Material Evaluation and Selection**

A pipe material evaluation was performed comparing reinforced concrete pipe (RCP), high density polyethylene (HDPE) pipe, ductile iron pipe (DIP), polyvinyl chloride (PVC) pipe, fiberglass reinforced pipe (FRP), and welded steel pipe (WSP). The evaluation weighed a number of factors such as the minimum radii achievable with standard pipe segments/fittings, maximum operating pressure required by the system, regional material availability, and relative cost.

Based on the factors and criteria described above, we recommend using RCP for the open-cut construction segments of this Project. Using RCP will allow the pipe to accommodate a curvilinear alignment and withstand some instances of low pressure where the pipe may become surcharged. There are also multiple local manufacturing facilities that can supply the pipe that should increase competition, lower costs, and limit lead times. Using RCP also provides a suitable product for connecting to concrete manholes and structures without the need to consider temperature fluctuations.

We also evaluated the pipe materials required for trenchless construction and recommend that auger boring be used as the installation method for the trenchless crossing of Pearblossom Highway, based on the required pipe diameter, trenchless installation length, grade requirements, and characterization of ground conditions as silty sands (SM), clayey silts (ML), and silty clays (CL) above groundwater, with minimal likelihood of cobbles and boulders. A two-pass system is also recommended in which a steel casing is advanced by auger boring, and a steel carrier pipe is inserted into the steel casing after completion of the casing installation. As the design advances, provisions for utility identification, settlement monitoring, vertical clearances and the casing/pipe profile will be incorporated into the design.

## **Hydraulic Analysis**

A hydraulic analysis was performed to evaluate the required pipe sizes and slopes to convey the design flow rate of 60 cfs from the Littlerock Reservoir to Lake Palmdale. This analysis used the hydraulic model developed as part of the 2021 Feasibility Study, and updated it to reflect more accurate horizontal and vertical alignment information.

The baseline model confirmed that the entire pipeline system could convey the maximum flow with existing constrictions, assuming the open ditch sections were converted to RCP with a minimum inside diameter of 48 inches. The baseline model results suggested that the limiting factor for pipeline capacity is the uppermost 2.4 miles of canal, which has an average slope of 0.1%, and some sections with slopes as low as 0.04%. Additional model runs showed that the diameter throughout the remainder of the pipeline could be reduced to 36 inches without overtopping the upstream debris basin due to the large vertical relief in the middle section of the Ditch's alignment.

## **Scour Analysis**

The proposed pipeline alignment crosses a number of natural drainage paths and washes which drain watersheds up to 6 square miles in area. The Palmdale area sees little precipitation, but what precipitation it does receive can be high intensity, leading to significant stormwater flows and flash floods. This analysis reviewed the scour potential of all stormwater crossings which drain greater than 0.1 square miles.

To characterize the threat posed by the washes to the proposed pipeline, Hazen conducted a stream survey and scour analysis. Scour estimates for each source were based off industry-standard empirical relationships to attributes like drainage area, bed material, stream width, and flow volume. These empirical relationships are region- and climate- dependent, and were calibrated to local conditions using data gathered during the stream survey. The total scour depth at all locations ranged from 3.0 to 8.1 feet, with 80% of locations having less than 5 feet of predicted scour. This report provides a mitigation menu of options to select from during final design.

## **Alignment Development**

While it is believed that the original Ditch was not constructed in an easement with a defined width, over time a few sections of the Ditch had easements of varying widths established based on the Ditch centerline, while other Ditch segments were constructed using blanket agreements with private property owners. It is PWD's understanding that they have the right to relocate the alignment, within reason, to replace the Ditch with a new pipeline when it is believed doing so would add value during construction, operation, and/or future maintenance.

However, should the pipeline alignment deviate from the existing Ditch location, there is a risk of increasing environmental costs and property owner concerns. Therefore, Hazen looked at various horizontal and vertical alignment options to ensure that the proposed pipeline is installed in an alignment that fosters efficient construction, mitigates environmental impacts to the extent feasible, and provides for efficient operation in the built condition.

The following criteria were used to develop an optimized Project alignment by evaluating six locations where alignment deviations were suspected of possibly providing PWD long-term value.

- Ensure gravity flow (no pumps required)
- Minimize pipe slope in steep sections
- Limit the use of new siphons
- Minimize stormwater flow impacts
- Avoid deep trenches and shallow cover over pipe
- Adhere to pipe radii constraints
- Minimize environmental impacts

## **Proposed Project Definition**

While the new pipeline will convey raw water to Lake Palmdale for treatment and subsequent distribution to the public, it will be serving the same purpose as the existing ditch which is subject to the same seismic risks; therefore, PWD has determined that the new pipeline does not require specific seismic design or mitigation measures. Should the pipeline fail following a seismic event, PWD crews will respond and make necessary repairs to reinstate the pipeline. Hazen and PWD have discussed keeping a certain amount of extra pipe segments on-hand in case any segments need to be replaced. The exact amount of pipe to be kept on-hand will be discussed with PWD during final design and included in the pipe procurement for the Project.

Based on the alignment alternatives evaluated, the preliminary design plans illustrate a proposed alignment that meets all the required design criteria for RCP pipe while generally following the horizontal alignment of the existing Ditch as much as possible. The minimum radius will generally be 90 feet unless a tighter radius of 45 feet or 22.5 feet is required. Where longer radii are required, mitered 5-degree bends will be used at various intervals. Where tighter angular deflections are required, a manhole will be used to accommodate the angle. Deflection of gasketed RCP joints is not recommended by the manufacturer.

The only trenchless installation anticipated to be required as part of this Project is the crossing beneath Pearblossom Highway. The crossing will involve using a two-pass auger boring method to install a 48-inch diameter carrier pipe within a 60-inch diameter steel casing. As the design advances, provisions for utility identification, settlement monitoring, vertical clearances, and the casing/pipe profile will be incorporated into the design.

To ensure a 50-year design life for the existing tunnels and undercrossings that are not conducive to spray-applied or cured-in-place products, we are proposing to slipline these segments with fused HDPE pipe. This will provide a new pipe whose reliability is independent of the existing tunnel/crossing structure. The annular space between the outside of the HDPE pipe and the inside of the tunnel/structure will be filled with grout to properly transfer any loads from the existing tunnel/structure to the new HDPE pipe and lock the pipe in place. Both ends of the new HDPE pipe will transition to RCP using either fittings, concrete collars, or structures.

For the existing culverts and pipelines that are in good condition and will remain in operation after the pipeline is installed, it is anticipated that these segments will be rehabilitated in place with either cured-in-place pipe (CIPP) or spray-applied liners. Final rehabilitation methods will be selected during final design. If determined to be appropriate during final design, an alternative approach may be to allow the contractor to bid multiple options to ensure the best possible price while also meeting project objectives.

## **Encroachment and Access Coordination**

It is anticipated the Project will require encroachment permits, coordination, and/or general rights-of-entry from the following agencies:

- City of Palmdale
- MetroLink
- Los Angeles County
- Los Angeles Metro
- California Department of Water Resources
- Southern California Edison
- Los Angeles Department of Water and Power

## **Environmental Compliance**

Hazen teamed with Rincon Consultants, Inc. (Rincon) to perform the environmental compliance and environmental permitting work for this Project.

Because the Project extends onto Federal property, the Project will be subject to environmental review under the National Environmental Policy Act (NEPA), which is similar but distinct from the California Environmental Quality Act (CEQA). As such, the technical studies and documents prepared must satisfy both sets of requirements. It has been determined that USBR will be the lead NEPA agency for the Project. As the project proponent, PWD will act as the CEQA lead agency.

The Project is currently anticipated to be covered under CEQA as part of the PWD's Strategic Water Resources Plan Program Environmental Impact Report (EIR). This EIR will include a programmatic evaluation of the environmental impacts of the PWD's Strategic Water Resources Plan as well as a project-level analysis of the environmental impacts of the Project, which is part of the overall Strategic Water Resources Plan.

To satisfy USBR's NEPA requirements, the Project is anticipated to utilize a separate Environmental Assessment/Finding of No Significant Impact (EA/FONSI). Both USBR and USFS will be required to engage in consultations with United States Fish and Wildlife Service (USFWS) and the State Historic Preservation Office (SHPO) to satisfy their obligations under the Federal Endangered Species Act (ESA) and Section 106 of the National Historic Preservation Act (NHPA Section 106), respectively.

Technical studies were performed along the entire Project corridor to evaluate potential cultural and biological resources which may require mitigation if impacted by the Project. The initial field work for these studies was performed between November 2023 and January 2024.

The following environmental permits are anticipated for the project:

- Jurisdictional Waters and Wetlands:
  - United States Army Corps of Engineers Section 404 Individual Permit for potential impacts to waters of the United States (WoUS) pursuant to Section 404 of the Clean Water Act (CWA)
  - Lahontan RWQCB Water Quality Certification (WQC) pursuant to Section 401 of the CWA and Waste Discharge Requirements (WDRs) for potential impacts to waters of the State (WoS) pursuant to the Porter-Cologne Water Quality Control Act.
  - CDFW Streambed Alteration Agreement (SAA) for potential impacts to jurisdictional streambeds pursuant to Section 1600 et seq. of the California Fish and Game Code
- Federal and State Listed Species:
  - United States Fish and Wildlife Service (USFWS) Biological Opinion for potential impacts to federally listed species
  - CDFW Incidental Take Permit (ITP) for potential impacts to state listed species

#### **Construction Cost and Sequencing**

The Project's construction is currently anticipated to cost \$38 million dollars.

This Project is funded by two grants: one from USBR and one from DWR. The DWR grant is the larger of the two grants and requires that all funds be spent by December 31, 2025, while the USBR grant funds can be spent after that date. Therefore, construction has been conservatively targeted for completion by this date. Based on the time required to finish the final design, construction is expected to begin in early 2025, which leaves approximately 10 months to install all 7.2 miles of pipe and complete the construction of the outflow metering structure to Lake Palmdale that includes a bypass discharge outlet to the stormwater channel. As a result, it is anticipated that a General Contractor will likely require the use of multiple crews working in different locations to meet this aggressive schedule. Using an assumed installation rate of 200 feet per day, the bulk of the pipeline installation would be completed in 95 working days (approximately 5 months). However, factors such as contractor availability, bonding capacity, and pre-qualification requirements may require the design team to use creative strategies for packaging bid documents suitable for efficient bidding.

Other factors affecting construction efficiency include how much of the pipeline can be installed parallel to the existing Ditch as opposed to along the same alignment, and the access points available to the contractor for some of the more challenging pipeline segments.

## **Project Schedule**

While all construction work was originally targeted to be completed by December 31, 2025 in accordance with the DWR grant funding agreement the complexities of the environmental compliance work has extended the project schedule and it is likely that some construction activities will need to occur in 2026. Current anticipated project milestones are as follows:

•	60% Design Submittal	August 2024
•	Draft EIR Published	Early Fall 2024
•	Final EIR Certified	December 2024
•	100% Design Submittal	December 2024
٠	Environmental Permits Obtained	February 2025
٠	Final Bid Submittal	February 2025
•	Bid Period	February to March 2025
٠	Construction NTP	April 2025
٠	End of Pipeline Construction	January 2026
٠	Clean / Close-Out	February to April 2026

The project milestones above assume that construction means and methods will be implemented concurrently with the PWD's water delivery periods using parallel construction or bypass pumps/piping as necessary.

The following two options for accelerating the schedule and reducing risk of schedule slippage have been discussed with PWD and are presented in this report:

- Utilizing a Construction Manager At Risk (CMAR) contract for constructability review
- Pre-purchasing pipe, gate structures, appurtenances and any other project materials that may have long lead times

# 1. Background

The Palmdale Ditch (Ditch) is owned and operated by Palmdale Water District (PWD) to convey raw water from Littlerock Reservoir to Lake Palmdale (see Figure 1-1). The Ditch was constructed in the late 1800s and is approximately 8.5 miles long. PWD operates the Ditch intermittently in accordance with seasonal water availability and PWD water allocations. Approximately 30 percent of the Ditch is either lined with concrete or utilizes culverts and tunnels to cross roadways and steep terrain, and the remaining 70 percent of its total length remains an unlined earthen ditch. There is also one aerial flume supported by a steel trestle located approximately midway between Sierra Highway and Pearblossom Highway. The Ditch also crosses over the State Aqueduct by way of an aerial 36-inch diameter steel pipeline.

PWD has been concerned about water losses from the Ditch for years and has previously converted segments of the Ditch to a buried pipeline. In 1996, approximately 1,900 feet of the upstream portion of the Ditch starting at the debris basin at the base of Littlerock Dam was converted to a 54-inch diameter HDPE pipeline. In 2010, approximately 3,800 feet of the Ditch between Lake Palmdale and Sierra Highway was replaced with a 48-inch diameter reinforced concrete pipeline (RCP), leaving a short 450-foot section of open ditch remaining at the Lake Palmdale outlet.

In 2021, PWD hired Hazen and Sawyer (Hazen) to prepare a feasibility study evaluating the potential water savings that could be achieved by replacing the remaining open channel segments with a buried pipeline (see Appendix A). The study concluded that water savings of approximately 1,450 acre-ft per year could be achieved. This allowed PWD to receive grant funding from both the California State Department of Water Resources (DWR) and the United States Bureau of Reclamation (USBR) to convert the remaining open channel segments to an enclosed pipeline, currently referred to as the Palmdale Ditch Conversion Project (Project) and generally summarized in Table 1-1 below:

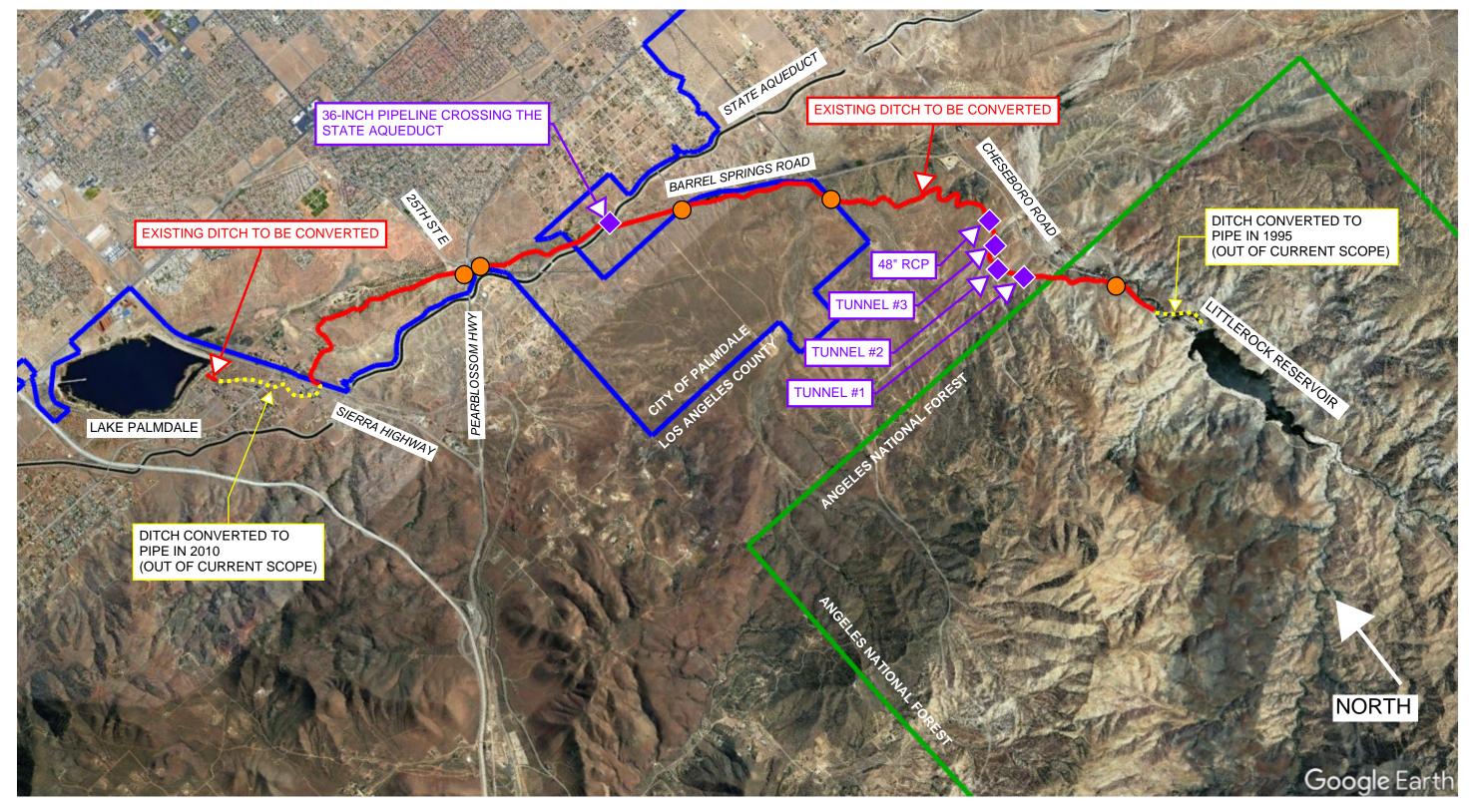
Туре	Approx. Length (ft)	Action	Notes
Open-Channel Ditch	35,400	Convert to Pipe	Includes both concrete lined and earthen sections. Includes isolated 450-foot-long segment near Lake Palmdale.
Pipeline (within scope)	1,600	Inspect/Rehab	Includes Aqueduct crossing and 48-inch pipe beneath LA DPW electrical lines.
Tunnel	1,100	Inspect/Rehab	2 concrete tunnels
Road Culvert Crossing	1,100	Inspect/Rehab/Replace	Various crossings of City and County roads
Pipeline (out of scope)	5,700	Confirm hydraulics but not slated for improvements	Ditch sections previously converted to pipelines in 1996 and 2010.

#### Table 1-1: Overall Project Scope

Any buried pipelines or tunnels within the Project limits that are expected to remain in service as part of the completed project have been inspected as part of the Project and may be rehabilitated, if necessary, to ensure a fully functioning system upon Project completion with a minimum design life of 50 years.

In addition to limiting future water losses, PWD plans to increase the capacity of seasonal water conveyance from the current maximum rate of 20 cubic feet per second (cfs) to a new flow rate of 60 cfs. This proposed 60 cfs will be combined with an additional 6 cfs from an existing connection with the Antelope Valley East Kern Water Agency (AVEK) located at Sierra Highway for a total combined flow of 66 cfs between Sierra Highway and Lake Palmdale. As such, the use of existing conduits and metering devices will need to be evaluated hydraulically for suitability for this ultimate flow rate.

This Preliminary Design Report (PDR) has been prepared to document the actions taken and decisions made to finalize the Project scope before preparing final detailed design documents suitable for public bidding.





800 WEST SIXTH STREET, SUITE 400 LOS ANGELES, CA 90017 LEGEND:

- PALMDALE CITY LIMITS
  - US FOREST SERVICE BOUNDARY
- $\bigcirc$
- EXISTING CULVERTED ROAD CROSSINGS
- EXISTING PIPELINE OR TUNNEL

# FIGURE 1-1 OVERALL PROJECT MAP

# PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

# 2. Document Review

Hazen reviewed various documents and studies to understand Project constraints and requirements. This section summarizes findings from the review of the following documents:

- Project Drawings
- Previous Survey Information
- Easement / Property Documentation
- Utility Records Search
- Additional Information Provided by PWD

## 2.1 Project Drawings and Survey Datum

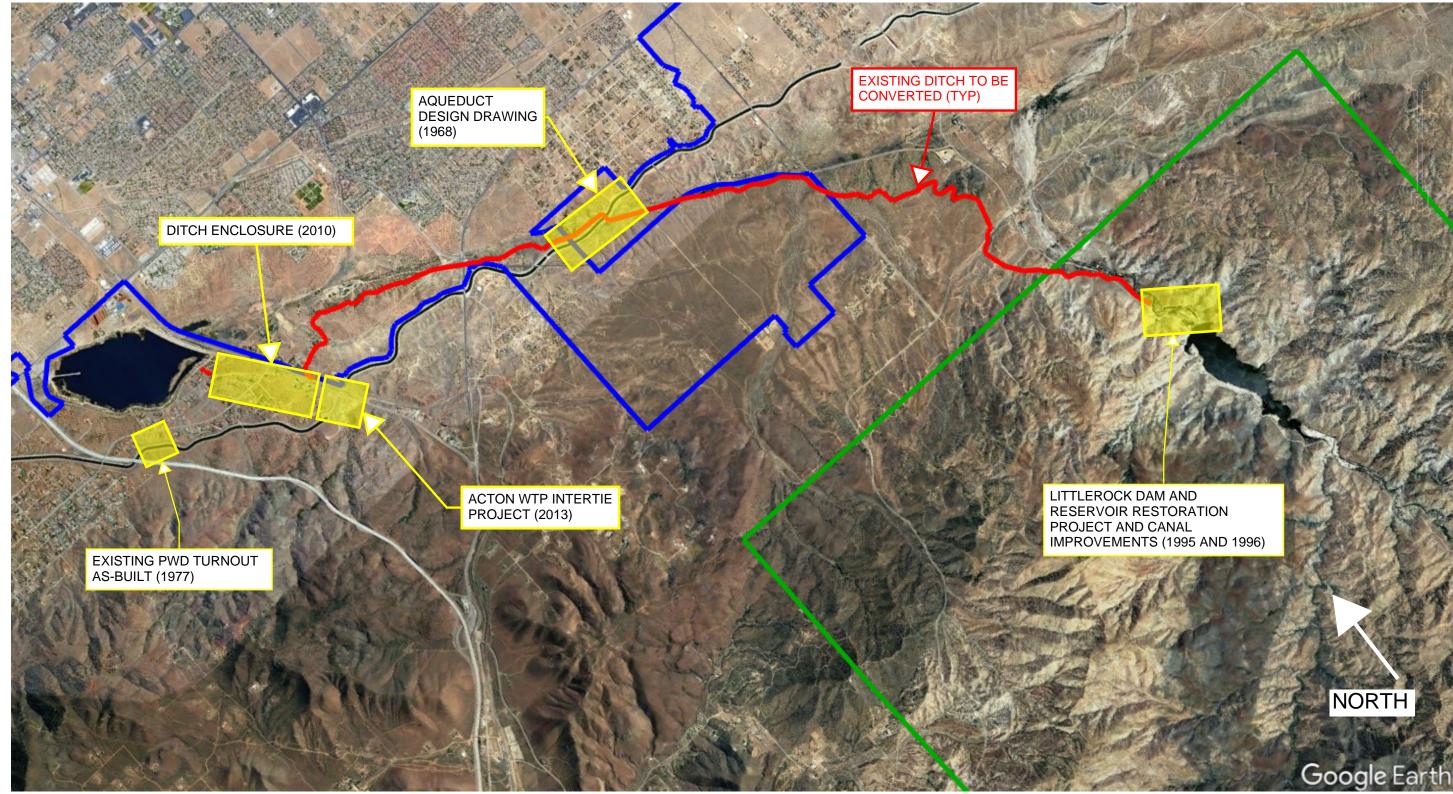
Table 2-1 summarizes the as-builts and record drawings that were provided by PWD and reviewed by Hazen. Due to size, these drawings have not been included in this report. See Figure 2-1 for a map of the approximate location that is covered by each document.

Document Type	Description	Date	Vertical Datum
Design Drawing	Palmdale Ditch Relocation Preliminary Plan/Profile drawing of State Aqueduct Crossing (Exhibit B, Sheet 1 of 4, Agreement No. 955761)	1968	NGVD 29
As-built	Lake Palmdale DWR Turnout	1977	NGVD 29
As-built	Littlerock Dam and Reservoir Restoration Project	1994	NGVD 29
Record Drawing	Littlerock Canal Improvements, prepared by Quad (Job Number 94135)	1996	NGVD 29
As-built	Palmdale Ditch Enclosure, PWD Specification 0602, prepared by MWH	2010	NAVD 88
As-built	Acton WTP Intertie Project, prepared by AECOM for the Antelope Valley – East Kern Water Agency (AVEK)	2013	NAVD 88

 Table 2-1: Reference Drawing Summary

#### 2.1.1 Survey Datum

As shown above, the reference drawings provided use a mix of the National Geodetic Vertical Datum of 1929 (NGVD 29) and the North American Vertical Datum of 1988 (NAVD 88) for project datums, which results in incongruous elevations. NAVD 88 will be used as the vertical datum for the Project; therefore, elevations that use NGVD 29 will be converted to NAVD 88 elevations when necessary for inclusion in project drawings or hydraulic analyses. Per the National Geodetic Survey Coordinate Conversion and Transformation Tool, the conversion from NGVD 29 to NAVD 88 at the Project location is +2.98 feet. This conversion is rounded to +3.0 for the purposes of this Project.





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LEGEND:

PALMDALE CITY LIMITS

US FOREST SERVICE BOUNDARY

# FIGURE 2-1 REFERENCE DOCUMENT MAP

# PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

Key findings from the drawings provided are summarized in the following sections.

#### 2.1.2 California Aqueduct Crossing Plans (1968)

These plans indicate how the Ditch was relocated during construction of the California Aqueduct (Aqueduct). The upstream end of the 1968 improvements ties into the existing Ditch south of the Aqueduct with a pipeline and headwall structure. The buried pipeline penetrates the Aqueduct embankment and transitions to an exposed section of pipe that crosses the Aqueduct perpendicularly. Once north of the Aqueduct, the improvements include a new 0.5-mile-long segment of open, concrete lined channel running parallel to the Aqueduct. The plans include a profile drawing and construction details related to trenching, backfill, pipe materials, headwalls, and pipe supports. Precise survey benchmarks are unknown.

The buried portions of the pipeline are indicated to be 36-inch diameter Class B reinforced concrete pipe (RCP) while the exposed aerial pipeline is indicated to be 36-inch diameter welded steel pipe. The aerial pipeline is supported on concrete abutments at each end of the crossing and on one additional concrete support in the middle of the Aqueduct. The pipeline is located immediately adjacent to an existing concrete stormwater channel that allows stormwater flows to cross over the Aqueduct. The concrete stormwater overcrossing and aerial pipeline are both visible on current aerial photography.

The scope of this Project included assessing the condition of the existing pipeline and its hydraulic capacity to determine whether replacement or rehabilitation was more appropriate. As described later in this report, the pipeline appears to be in acceptable condition and is adequately sized to handle the design flow rate. The final pipeline rehabilitation requirements will be coordinated with and approved by DWR.

#### 2.1.3 Existing DWR Turnout (1977)

This plan provides a full cross section with elevations, structural details, and connection details for the turnout. The exact location of this turnout has not been provided by PWD, but it is known to exist near Lake Palmdale, outside of the Project limits, approximately 1 mile west of Sierra Highway.

#### 2.1.4 Littlerock Dam and Reservoir Restoration Project (1994)

Although the improvements contained in the plans are outside of the scope of this Project, they provide insight into the elevations and flow control methods related to system hydraulics for optimal hydraulic modeling and system evaluation. Per these plans, water leaves the reservoir through a 42-inch diameter steel pipe with a 42-inch butterfly valve. The flow then splits into two 16-inch diameter steel pipes, each equipped with a flow meter and 16-inch gate valve, before spilling into a concrete debris basin which is open to the atmosphere. This debris basin was later modified in 1996 with the "Littlerock Canal Improvements" (see summary below).

#### 2.1.5 Littlerock Canal Improvements (1996)

These improvements involved enclosing approximately 1,900 feet of open channel within a 54inch diameter pipe and expanding and improving the debris basin at the pipe's upstream end. The project began at the debris basin immediately downstream of the Littlerock Dam and ended just downstream of the former aerial wood flume that was demolished as part of the project. The flume was replaced with a buried 48-inch diameter ductile iron pipe (DIP) siphon, and the existing concrete channel was utilized, where appropriate, by installing a new 54-inch diameter high-density polyethylene (HDPE) pipe inside the concrete channel which was then capped with concrete. Plans include profile drawings and associated details for connections, structures, trenching, backfill, and appurtenances.

The downstream termination of these improvements will serve as the upstream tie-in location for the current Ditch Conversion Project. Similarly, due to limited access and environmental constraints, the concept of placing a new HDPE pipe within the remaining sections of existing concrete "U"-channel within the Project limits is assumed to be the most appropriate method for enclosing these sections within a new pipe (described in more detail later in this report). Additionally, the concept of replacing the flume with a buried siphon is assumed to be the most appropriate solution to replacing the existing flume between Sierra Highway and Pearblossom Highway (also described later in this report).

#### 2.1.6 Ditch Enclosure Plans (2010)

These improvements involved enclosing approximately 3,800 feet of the Ditch from a downstream starting point approximately 600 feet south of Lake Palmdale to the buried concrete box culvert crossing under both Sierra Highway and the MetroLink railroad tracks. 48-inch diameter RCP was installed and new manholes were placed at a spacing of approximately 500 feet. The project appears to have utilized the existing 48-inch diameter pipe beneath Barrel Springs Road, and included the installation of a 24-inch Ultra Mag Electromagnetic Flow Meter (Model UM06) with remote reading head installed in PWD's Well 5 building. Plans include profile drawings and associated details for the outlet structure, cross sections, structural components/joints, and fencing. Improvements are based on a vertical survey datum of NAVD88 and a horizontal datum of NAD 83 California State Plane Coordinates Zone 5, including the use of two (2) National Geodetic Survey (NGS) monuments.

Although the plans included a revision to include 1.5-inch diameter schedule 80 conduit with pull rope for a future chemical feed line between the metering manhole and the Well 5 building, PWD has stated that this potential chemical feed line does not need to be considered for this Project. The plans also indicate that the box culvert buried beneath Sierra Highway and MetroLink tracks is a 3-foot by 6-foot concrete box culvert, although the culvert elevations shown do not appear to be consistent with surveyed elevations (see Section 4 for a more detailed description of this crossing based on a condition assessment inspection performed for this Project). In general, it appears the new pipe was placed in the flowline of the ditch and backfilled. PWD easement limits are listed as "approximate" and identify an easement width of 50 feet centered on the Ditch.

#### 2.1.7 AVEK Intertie Improvements (2013)

These plans depict the installation of a 20-inch diameter cement mortar lined and coated steel pipeline and a 12-inch metered PVC "raw water return" pipeline. The 12-inch diameter pipeline conveys raw water from AVEK's Acton water treatment plant to PWD's box culvert beneath Sierra Highway.

The location of the tie-in to PWD's Ditch (culvert) is outside of the limits of this Project. However, PWD has noted that any improvements downstream of this tie-in (i.e., modifications to the outfall structure or metering flume near Lake Palmdale) will need to account for an additional 4 MGD of flow on top of what the new upstream pipeline is sized to convey.

## 2.2 Previous Survey Information

PWD provided survey data of the Ditch prepared by Site Surveying (Lancaster, CA) dated April 1991. The survey appears to have been performed using an assumed coordinate basis using the southwest corner of Section 2, Township 5 North, Range 12 West as point 50,000.00N, 1,000.00E. The extent of the survey is from the centerline of Cheseboro Road to a point approximately 50 feet south of the Peripheral Canal on the south side of Lake Palmdale. The data included a list of monuments used; a centerline survey that includes stations, coordinates, and elevations; and cross sections at various locations along the Ditch.

PWD also provided undated, unfinished plan and profile drawings for the ditch alignment surveyed in 1991 (Specification 9002).

Unfortunately, due to the assumed coordinate system, this survey data was only used to compare against current field observations for certain cross-sections. It is our understanding that this survey information was not used to construct either the 1996 or 2010 Ditch enclosure improvements, and thus was not used during the planning and preparation of the aerial topographic survey for this Project.

## 2.3 Easement / Property Documentation

PWD provided eight (8) documents related to previous land rights issues and mapping efforts. Unfortunately, those documents contained minimal information related to easement widths, locations, bearings, distances, or access/construction rights. That said, one document mentioned a 20-foot-wide easement dedicated by Lillian Young to PWD in 1914 (recorded as Deeds, Book 5902, Page 179, LA Couty). This easement appears to cover the portion of the Ditch between E. Barrel Springs Road and 37<sup>th</sup> Street East (excluding those portions that are now controlled by DWR).

Hazen searched online databases managed by Los Angeles County for any additional PWD property and/or easement information. All available Assessor's Parcel maps, Records of Survey, and Parcel Maps were downloaded and reviewed for any references to easements or agreements detailing PWD property rights related to the Ditch. The only document yielding useful information was Record of Survey Book 115, Page 77 which includes a note referencing

"...blanket rights, obligations, and easements related to the Palmdale Irrigation District as set forth in Instrument No. 5090 recorded February 14, 1963 in Book M-1200, page 784." Page 784 of Book M-1200 obtained from LA County appears to establish blanket rights to PWD for building and maintaining facilities over portions of Section 12, Township 5 North, Range 12 West, and Section 8, Township 5 Range 11 West. This translates to short areas near Pearblossom Highway and near E. Barrel Springs Road between 37<sup>th</sup> Street East and 40<sup>th</sup> Street East.

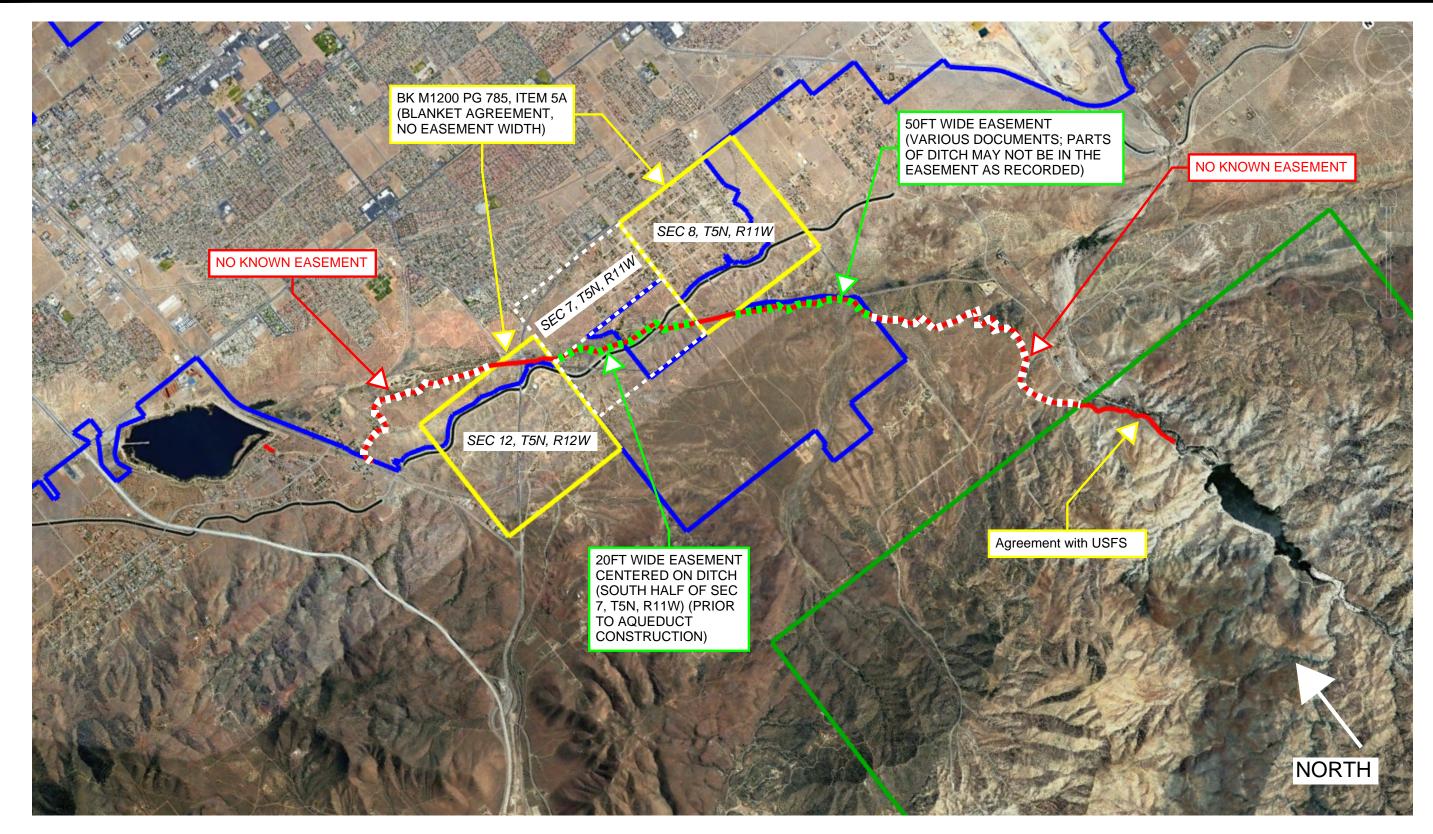
A general internet search yielded the discovery and review of a specific plan for the development titled "Foothill Ranch" dated June 2009 (originally called "College Park" in 2006 according to the water supply study provided by PWD). This development is bounded by E. Barrel Springs Road to the north, 37<sup>th</sup> Street East to the west, and 47<sup>th</sup> Street East to the east. This specific plan indicates that the Ditch crosses this property within an existing 50-foot-wide easement centered on the Ditch, running roughly parallel to and just south of E. Barrel Springs Road. This easement is referenced in Appendix A of the specific plan as Page 849 of Book D-1970, Official Records.

The above summary of easement documents captures Hazen's understanding of the known extent of documents establishing PWD's easement and access rights along the Ditch. While additional documentation may exist, it has not been provided to Hazen.

Because the Ditch has been delivering water to PWD since the late 1880s for irrigation, and more recently as a water supply source for PWD's Leslie O Carter Water Treatment Plant, PWD has operated and continues to operate with the understanding that PWD has the historic right to operate, maintain, and construct facilities as necessary to convey water from Littlerock Reservoir to Lake Palmdale by way of blanket agreements, and intends to coordinate as necessary with all property owners to ensure that a mutual understanding and agreement exists between PWD and all affected property owners along the Project alignment.

Figure 2-2 illustrates our understanding of PWD easement/access rights related to the Ditch.

All documents used for interpreting property and/or easement rights have been assembled in Appendix B of this PDR.





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PALMDALE CITY LIMITS

US FOREST SERVICE BOUNDARY

EXISTING DITCH

# FIGURE 2-2 EXISTING EASEMENT SCHEMATIC

# PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

## 2.4 Utility Records Search

In accordance with Hazen's standard best practices, our team obtained a list of utility providers from DigAlert that are known to have utility infrastructure in or near the Project area. The list was then provided to PWD to confirm that the agencies and associated contact information were current and as comprehensive as possible. Table 2-2 below summarizes the utility outreach efforts.

Utility	Facilities Present?	Map(s)/Plan(s) Received?	Summary
AT&T Distribution	Yes	Yes	Some underground @ Pearblossom / Barrel Springs
Antelope Valley – East Kern Water Agency (AVEK)	Yes	Yes	Sierra Hwy culvert Tie-In only
Department of Water Resources (DWR)	Yes	Yes	Aqueduct only
MCI / Verizon	Yes	Yes	Only present along Aqueduct on State property
City of Palmdale	Yes	Yes	Pearblossom / Barrel Springs signal plans; Barrel Springs Trail
SoCal Gas Distribution	No	Yes	No facilities within project limits
SoCal Gas Transmission	No	No	No facilities within project limits
Southern CA Edison (SCE)	Yes	Yes	Overhead transmission lines only in select locations
Sprint	Yes	Yes	Fiber optic line along MetroLink RR r/w
Little Rock Irrigation	No	No	No facilities within project limits
County Sanitation Districts of LA	No	No	No facilities within project limits

Table 2-2: Utility Outrea	ch Summary
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## 2.5 Additional Information Provided by PWD

Table 2-3 summarizes additional documents that were provided by PWD and reviewed by Hazen and our subconsultants:

Table 2-3: Miscellaneous Reference Document Summary				
Document Type	Description	Date		
Geotech Report	2010 Ditch Enclosure, prepared by Earth Systems Southern California (Job No. PL-06763-01)	2006		
Initial Study	2010 Ditch Enclosure Project, prepared by PWD	2006		
Letter	Response from DWR to the "Notification of Preparation of a Programmatic Environmental Impact Report for the 2023 Strategic Water Resources Plan Update, SCH #2023080290"	2023		
PWD Standard	List of Approved Materials	2023		
PWD Standard	Development Services Guidelines	2023		
PWD Standard	Standard Drawings	2023		
PWD Standard	Standard Specifications	2023		
Imagery	NearMap Aerial Imagery	2022		

Table 2-3: Miscellaneous Reference Document Summary

# 3. Overall Existing Site Summary

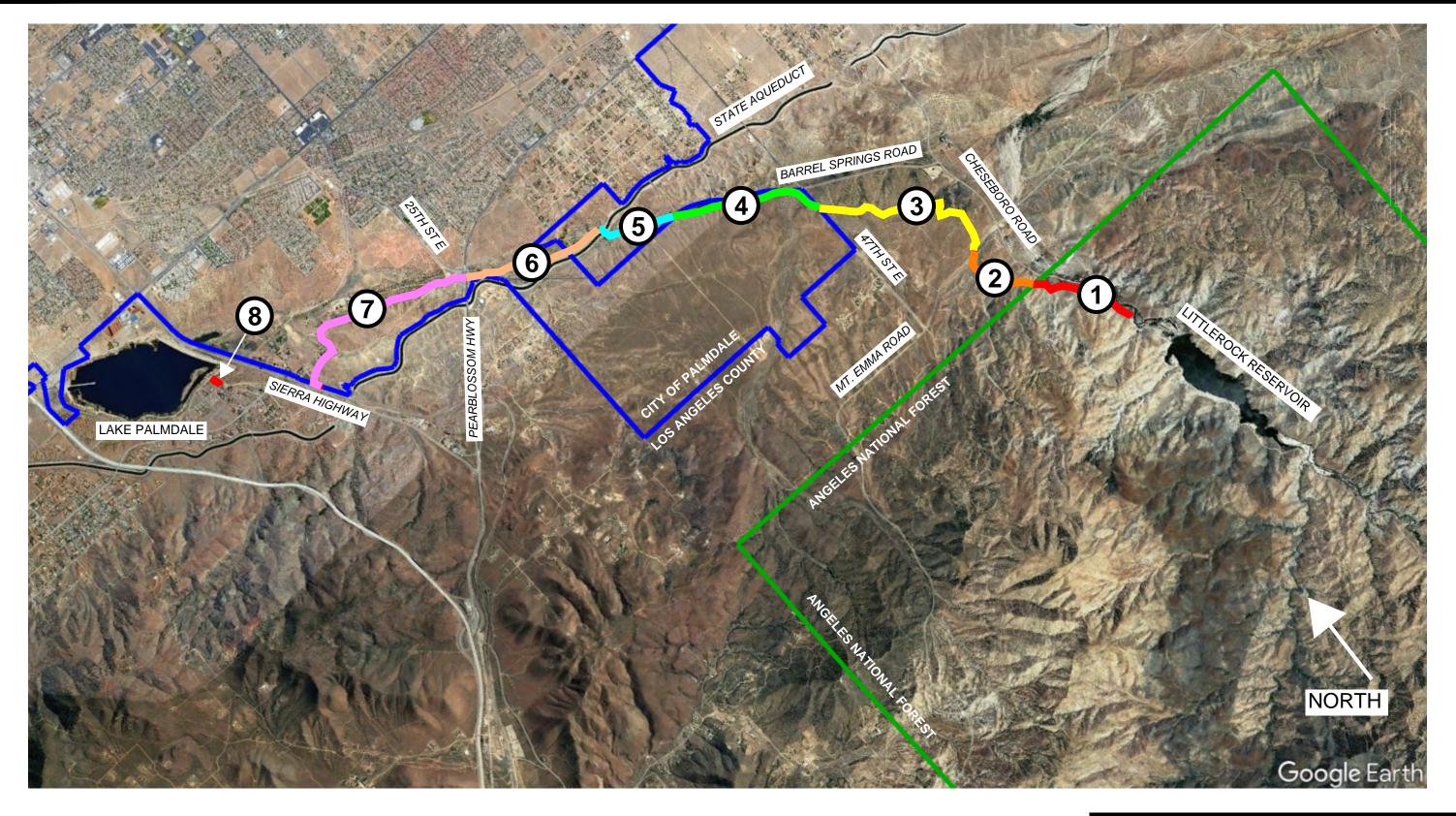
Hazen conducted an initial site visit along the entire project alignment on October 5<sup>th</sup> and 6<sup>th</sup>, 2023. The purpose of the visit was to evaluate potential alignment considerations and obtain photos of existing conditions. Site observations were made to document the following information:

- 1. Bedding and lining conditions within the existing Ditch
- 2. Existing topography and vegetation
- 3. Existing stormwater drainage paths both entering and crossing the Ditch
- 4. Improvements made by property owners such as fences and bridges
- 5. Traffic congestion and road conditions
- 6. The size and condition of culverts at roadway crossings
- 7. Potential alternative alignments in select areas
- 8. Any other considerations important for successful project planning and design

The site visit began at the downstream outlet of the siphon beneath Littlerock Creek near Littlerock Reservoir and proceeded along the Ditch in the downstream direction until reaching the MetroLink railroad tracks near Sierra Highway. Water was not flowing in the ditch during the site visit, allowing Hazen's team to walk the invert of the ditch and obtain a clear, unobstructed view of the bottom and sides of the ditch.

This section describes the highlights and findings obtained during the site visit, divided into the following 8 reaches summarized in Table 3-1 proceeding from upstream to downstream (See Figure 3-1 for a graphical representation of all reaches):

Reach	From	То	Length (ft)	Avg Slope (%)
1	Littlerock Siphon Gate	Forest Service Boundary	4,100	0.05
2	Forest Service Boundary	Mt. Emma Road	3,000	0.1
3	Mt. Emma Road	47 <sup>th</sup> Street East	8,300	0.1
4	47 <sup>th</sup> Street East	Barrel Springs Road	5,500	0.1
5	Barrel Springs Road	State Aqueduct	2,600	3.0
6	State Aqueduct	Pearblossom Highway	5,500	6.0
7	Pearblossom Highway	MetroLink Rail Tracks	8,700	0.15
8	Existing Pipe Outfall	Existing Metering Flume	500	0.3





HAZEN AND SAWYER 800 WEST SIXTH STREET, SUITE 400 LOS ANGELES, CA 90017

## LEGEND:



PALMDALE CITY LIMITS

US FOREST SERVICE BOUNDARY



DITCH REACH NUMBER

# FIGURE 3-1 DITCH REACH SUMMARY MAP

# PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

## 3.1 Reach 1: Littlerock Siphon Gate to U.S. Forest Service Boundary

As previously mentioned, PWD enclosed the most upstream 1,900 feet of the Ditch in 1996. Therefore, Reach 1 begins at the existing slide gate located on the northwest (downstream) side of the existing Littlerock Creek siphon (see Photo 1). This reach is approximately 4,100 feet long. A slide gate acts as a secondary control for flow from the buried pipeline to the open ditch. The Ditch is located on the side of a significant slope and consists of a U-shaped concrete channel for approximately the first 800 feet of the Ditch (see Photo 2). It then transitions to a ditch of varying slide slopes, constructed of large cobblestones and mortar (see Photo 3). Despite the flat longitudinal slope of this section of the Ditch, negligible debris was observed in this reach.

Approximately 1,300 feet downstream of the slide gate is a trapezoidal concrete section that appears to have been constructed as a previous repair (see Photo 4). The Ditch then crosses beneath Cheseboro Road through a corrugated steel arch culvert with a concrete base channel, the dimensions of which appear to be large enough to accommodate sliplining should this crossing remain in its current location (see Photo 5).

Downstream of the Cheseboro Road crossing, there is an existing turnout and slide gate that was observed to be filled with sediment and did not appear to be operational (see Photo 6). PWD has informed Hazen that this turnout belongs to the Littlerock Creek Irrigation District (LRCID) and will need to be restored as part of the Project based on the agreement to provide LRCID water per the "Rehabilitation, Operation, and Maintenance Agreement" dated 1992 (see Section 10.7.6 of this report for additional discussion).

The next 2,000 feet of Ditch runs along the toe of the westerly hill slope and has a dirt access road running alongside much of the east side of the Ditch. The invert and sidewalls begin as native earth, transition to mortared cobbles, and later become a trapezoidal concrete channel (see Photos 7 through 12). The Ditch runs beneath two bridges made of cobbles, rock, and concrete that provide a path for vehicular access and appear to serve as stormwater overcrossings. The bridges appear to be large enough to accommodate sliplining, although once the Ditch is filled in, the bridges may no longer be needed. The invert material varies between sections of fine dirt, concrete, and cobbles with minimal to moderate levels of sediment and debris.



Photo 1: Existing slide gate at the upstream limit of the Project



Photo 2: Looking north along the concrete channel within US Forest Service property



Photo 3: Looking downstream along cobble and mortar section of channel immediately downstream of concrete section



Photo 4: Looking downstream at concrete repair section within cobble/mortar section



Photo 5: Looking downstream along CMP arch culvert beneath Cheseboro Road



Photo 6: Non-operational LRCID turnout on US Forest Service property west of Cheseboro Road



Photo 7: Looking downstream along overgrown channel with native soil bottom downstream of Cheseboro Road



Photo 8: Looking downstream through first bridge downstream of Cheseboro Road



Photo 9: Close-up of vertical cobble/mortar wall



Photo 10: Looking downstream along cobble/mortar Ditch invert



Photo 11: Transition from mortar/cobble to concrete lining



Photo 12: Looking downstream along vertical concrete U-channel with moderate debris along the bottom of the Ditch

## 3.2 Reach 2: U.S. Forest Service Boundary to Mt. Emma Road

Reach 2 begins at the northerly boundary of the U.S. Forest Service property and is approximately 3,000 feet long, consisting of much of the same materials and variation as the previous reach. It includes two short concrete bridges and two tunnels totaling approximately 1,100 feet that are large enough for manned entry. The first 380-foot-long tunnel (Tunnel 1) was inspected during the site visit (see Photo 13) while the longer 700-foot-long tunnel (Tunnel 2) was inspected by National Plant Services (NPS) during the condition assessment performed in December 2023 (described in Section 44 below). Downstream of Tunnel 2, the Ditch transitions to a native material channel bottom before reaching Mt. Emma Road.

The Mt. Emma Road undercrossing tunnel (Tunnel 3) is made up of a concrete U-channel with vertical concrete walls topped with a corrugated metal arch which appears to be large enough to accommodate sliplining (see Photos 17 and 18). There is a significant amount of debris and sediment both within and at either end of this crossing.



Photo 13: Looking downstream inside Tunnel 1. The tunnel has negligible debris, and the concrete appears to be in good condition.



Photo 14: View looking downstream at Tunnel 2 portal



Photo 15: Upstream end of Tunnel 2 (700-foot)



Photo 16: Looking downstream from Tunnel 2 along native earthen channel with vegetation



Photo 17: Looking downstream along Tunnel 3 beneath Mt. Emma Road. The tunnel consists of vertical stone and concrete walls supporting a CMP archway. The tunnel has significant sediment accumulation.



Photo 18: Looking upstream along Tunnel #3 beneath Mt. Emma Road (opposite view of Photo 17)

## 3.3 Reach 3: Mt. Emma Road to 47<sup>th</sup> Street East

Reach 3 is approximately 8,300 feet long and includes the following components:

- 1. 48-inch diameter RCP pipeline approximately 680 feet long
- 2. Overhead high-voltage transmission lines and associated easements and rights-of-way
- 3. Tight curves along alignment "switchbacks"
- 4. The steepest portion of the Ditch (approximately 20% grade for 250 feet)

The Ditch on the north side of Mt. Emma Road is currently receiving runoff from a roadway drain inlet installed in the roadway shoulder (see Photo 19). This drain pipe will need to be considered during final design so that roadway drainage and the new PWD pipeline do not adversely impact each other.

The Ditch enters a 48-inch diameter pipe just north of Mt. Emma Road that is protected with a trash rack on the upstream end and appears to be in good condition (see Photos 20 and 21). As such, this pipe is anticipated to remain in use as part of the proposed system. The downstream end of the pipe discharges within one of the deepest sections of the Ditch with limited access (see Photo 22).

The Ditch in this section is largely made up of an unlined earthen channel with varying side slopes and heights and dense vegetation on both sides (see Photos 23 through 26). Ditch materials later transition to a concrete-lined channel as the slope steepens and drops in elevation as it approaches 47<sup>th</sup> Street East (see Photo 27). Native earth materials along the Ditch invert vary from medium cobbles to fine sands with some portions consisting of solid bedrock.

Approximately 270 feet upstream of the 47<sup>th</sup> Street East undercrossing, there is a small bridge made of a steel arch and concrete over the concrete-lined portion of the ditch (see Photo 28). It is anticipated that this bridge will be removed during construction.

The 47<sup>th</sup> Street East undercrossing consists of another 48-inch diameter pipe protected with a trash rack on the upstream side that appears to be in good condition (see Photos 29 and 30). As such, it is anticipated that this pipe will remain in operation as part of the proposed system.



Photo 19: Road drainage from Mt. Emma Road is currently discharging into the Ditch via the pipe shown to the right of the Mt. Emma Road undercrossing.



Photo 20: Existing trash rack on the upstream side of the existing 48-inch diameter pipe just north of Mt. Emma Road



Photo 21: Looking upstream at the existing 48-inch diameter pipe, referenced in Photo 20



Photo 22: Looking downstream from above the outlet of the 48-inch diameter pipe. The pipe discharges into the deepest section of the Ditch.



Photo 23: This section of the channel has varying gradations of soil and rock along the bottom. Moderate rocks/cobbles shown here.



Photo 24: Looking downstream where the Ditch bottom has a finer soil gradation.



Photo 25: Larger rocks/boulders shown here will need to be removed if the pipe is placed in the bottom of the Ditch.



Photo 26: Some sections show evidence along the bottom of the Ditch of possibly requiring rock excavation or increasing bedding depths to install the pipe in the bottom of the Ditch.



Photo 27: As the Ditch approaches 47th Street East it transitions to a trapezoidal lined concrete channel.



Photo 28: There is one steel/concrete bridge over the Ditch approximately 440 feet from 47th Street East. This bridge does not provide sufficient capacity to convey 60 cfs and will need to be removed as part of the Project.



Photo 29: Looking downstream at the 48-inch RCP culvert beneath 47 Street East. It is anticipated that this trash rack will be removed for connection to the new pipeline.



Photo 30: Looking upstream inside the 48-inch RCP culvert beneath 47th Street East.

## 3.4 Reach 4: 47<sup>th</sup> Street East to East Barrel Springs Road

Reach 4 is approximately 5,000 feet long, located west of 47<sup>th</sup> Street East and south of East Barrel Springs Road. This reach is primarily an unlined earthen channel with significant vegetation growth on both sides (see Photo 31), except for a short concrete-lined segment approximately 240 feet long (see Photo 34). There is currently a non-operational water quality monitoring station located across East Barrel Springs Road from PWD's Well Sites 18 & 19 that is anticipated to be replaced as part of the Project (see Photo 32). There is also an area with many trees and vegetation near the intersection of East Barrel Springs Road and 40<sup>th</sup> Street East.

This reach roughly parallels East Barrel Springs Road, which runs behind a handful of residences fronting Palmdale Hills Drive. As such, this segment may be one of the few areas where construction noise may affect local residents.

One notable observation is the existence of a private memorial consisting of a bench and a cross that is apparently being maintained by private citizens (see Photo 35). Should this memorial require disturbance during construction, public outreach will be necessary during the design phase regarding any required mitigation measures. Alternatively, it is recommended that the Project be designed with a revised alignment that eliminates the potential for impacting the memorial.

Downstream of the memorial, the bottom of the Ditch consists of very fine sand laid on top of what appears to be geotextile fabric (see Photo 36).

Just upstream of East Barrel Springs Road, there is a dirt access road that crosses over dual 48inch diameter CMP culverts (see Photo 37). The downstream headwall is damaged. Although the CMP culverts appear to be in relatively good condition (see Photo 38), the culverts are anticipated to be demolished during construction since vehicles will now be allowed to cross over the buried pipeline.

The undercrossing of East Barrel Springs Road is a 48-inch diameter RCP approximately 300 feet long installed at a roughly 30-degree skew to the road centerline. Although the pipe appears to be in good condition, it appears to have been installed too shallow to accommodate the proposed pipeline profile, and therefore is anticipated to either be replaced with a deeper pipeline crossing or remain in place to convey stormwater across Barrel Springs Road.



Photo 31: Looking downstream along the Ditch along E. Barrel Springs Road



Photo 32: Existing water quality monitor across from PWD Well Sites 18 & 19



Photo 33: Portions of the Ditch along E. Barrel Springs Road have a moderately rocky bottom.



Photo 34: The Ditch transitions to another concrete channel approximately 600 feet southeast of the intersection of 42nd Street East and E. Barrel Springs Road



Photo 35: View of the existing private memorial located approximately 350 feet southeast of the intersection of 42nd Street East and E. Barrel Springs Road



Photo 36: The Ditch transitions to a sandy bottom underlain by a geotextile fabric as it approaches E. Barrel Springs Road.



Photo 37: Looking upstream at the downstream end of dual CMP culverts approximately 500 southeast of E. Barrel Springs Road.



Photo 38: Looking upstream at the inside of one of the CMP culverts shown in Photo 37.

# 3.5 Reach 5: East Barrel Springs Road to the State Aqueduct

Reach 5 is approximately 2,900 feet long. The East Barrel Springs Road undercrossing discharges to a concrete-lined channel that conveys flows in a relatively straight alignment parallel to a dirt access road prior to transitioning to a 36-inch diameter pipe that crosses the State Aqueduct. The open channel has both trapezoidal and U-shaped sections (see Photos 39 and 40). According to the as-builts of the State Aqueduct crossing, the crossing consists of buried RCP that transitions to a welded steel pipe aerial crossing of the State Aqueduct. The steel pipe crossing is supported by a single concrete support in the middle of the Aqueduct and runs parallel to a concrete stormwater crossing (see Photos 43 and 44).



Photo 39: Looking downstream along the trapezoidal concrete-lined channel north of E. Barrel Springs Road.



Photo 40: Looking downstream as the Ditch transitions to a narrow concrete U-channel with vertical walls. It is anticipated this channel will be demolished to install the new pipe.



Photo 41: Upstream end of buried 36-inch diameter RCP pipeline that crosses the State Aqueduct as an aerial 36-inch steel pipe.



Photo 42: View behind trash rack of pipe described in the previous photo.



Photo 43: 36-inch steel pipe crossing the State Aqueduct



Photo 44: The 36-inch steel pipe is located parallel to the concrete U-channel that conveys stormwater runoff across the State Aqueduct.

## 3.6 Reach 6: State Aqueduct to Pearblossom Highway

Reach 6 is approximately 5,300 feet long and consists of both concrete-lined and unlined earthen segments. The first 2,500 feet of this section is a trapezoidal concrete-lined channel that was constructed in the 1960s when the State Aqueduct was constructed and required a portion of the Ditch to be realigned (see Photo 45). The Ditch then transitions to a sandy bottom with large debris (see Photo 46). A significant stormwater flow path appears to discharge into the Ditch as the Ditch turns toward the north and away from the State Aqueduct (see Photo 47).

The Ditch crosses beneath East Barrel Springs Road via a 48-inch diameter RCP culvert before traversing another 550 feet to the Pearblossom Highway undercrossing. The undercrossing is possibly the shallowest road crossing within the Project limits, utilizing a small concrete box culvert, and does not appear to be adequately sized to handle the proposed 60 cfs flow (see Photos 49 and 50). As such, it is anticipated that a new crossing will need to be installed as part of the Project.



Photo 45: Looking upstream at the section of Ditch that was relocated in the 1960s when the Aqueduct was built. An access road runs parallel to the Ditch. The Ditch is generally located within State property along this section.



Photo 46: The concrete channel shown in the previous photo transitions to a natural channel as it traverses through a tight curve over large debris.



Photo 47: A large stormwater surface drainage course appears to discharge into the existing Ditch as it leaves State property.



Photo 48: The Ditch has a fine-grained sandy bottom as it approaches E. Barrel Springs Road and Pearblossom Highway.



Photo 49: The crossing beneath Pearblossom Highway is an existing concrete box that is not anticipated to be sufficient to convey the required 60 cfs and will be replaced with a deeper, larger undercrossing.



Photo 50: Upstream end of the Pearblossom crossing. Minimal existing cover likely requires a new deeper crossing to be constructed.

## 3.7 Reach 7: Pearblossom Highway to MetroLink Rail Tracks

Reach 7 is the longest reach, extending approximately 8,000 feet from the Pearblossom Highway crossing to the east side of the MetroLink rail tracks. The first 1,100 feet is a trapezoidal concrete-lined channel while the remaining 6,900 feet is a curvilinear unlined earthen channel. The section includes two drop structures (see Photos 52 and 60), and one aerial steel flume (see Photos 55 through 57). It is anticipated that the aerial flume will be demolished as part of this Project and replaced with an underground siphon. Several smaller stormwater drainages also appear to flow into this section of the Ditch (see Photo 53). The scour depth potential at these locations has been considered and is described in Section 8 of this report.

The City of Palmdale (City) constructed the Barrel Springs Trail (i.e., a recreation path) in 1996 that crosses the Ditch in two locations (see Photos 51 and 61). The as-builts for these pedestrian bridges have been obtained from the City. The bridges are anticipated to be demolished as part of the Project and the path/fence will be restored over the top of the pipe following pipeline installation.

There is also one location where a bridge no longer exists, but the concrete abutments are still present (see Photos 58 and 59). It is our understanding that there are no plans to reuse these concrete abutments, but they will likely need to be demolished as part of the Project.

One property owner appears to have constructed a wooden bridge over the Ditch that will need to be demolished as part of the Project (see Photos 62 and 63).

The end of this reach is located approximately 100 feet from the centerline of the MetroLink tracks. While the Project will not disturb the tracks, the last 300 feet of the Ditch is located within the railroad right-of-way and, due to existing topography, does not appear to be able to be relocated outside of the railroad right-of-way without significant trenching and modification of the existing hillside (see Photo 64). The reach will terminate at the upstream end of the existing concrete box culvert that crosses beneath the railroad tracks (see Photos 65 and 66).



Photo 51: The City has crossed the Ditch in two places with pedestrian bridges that may need to be removed depending on the final pipeline alignment.



Photo 52: Looking upstream at the easterly drop structure along this segment.



Photo 53: Looking upstream where a stormwater flow path appears to discharge into the Ditch (from the right of the photo)



Photo 54: Much of the Ditch in this section has a fine-grained sandy bottom with no concrete lining and moderate vegetation.



Photo 55: Looking downstream along the existing steel flume. The flume will be demolished as part of the Project and replaced with a buried siphon.



Photo 56: Side view looking downstream along the existing flume.



Photo 57: Looking south at the aerial flume.



Photo 58: North side of the existing Ditch where old concrete bridge abutments exist.



Photo 59: Looking south at the opposite side of the abandoned bridge abutments.



Photo 60: Looking upstream at the 2nd drop structure.



Photo 61: Northerly bridge built by City for pedestrians and vehicles to cross the Ditch. It is anticipated that this bridge will be removed as the path will simply cross above the backfilled pipe.



Photo 62: Bridge built by private resident to cross the Ditch.



Photo 63: Top side of bridge in previous photo.



Photo 64: Looking upstream at the native earthen Ditch within MetroLink's right-of-way. Steep slopes from the east (right) prevent installing the new pipeline outside of MetroLink right-of-way.



Photo 65: Upstream end of box culvert beneath MetroLink rail tracks.



Photo 66: View of box culvert behind trash rack shown in previous photo.

# 3.8 Reach 8: Existing Pipe Outfall to Lake Palmdale

This reach extends from the existing pipe outfall installed in 2010 to the existing concrete spillway at Lake Palmdale. The pipe outfall is the termination of the 48-inch RCP pipeline installed in 2010, approximately 700 feet south of Lake Palmdale. From the outfall, there is about 450 feet of heavily vegetated open channel before the Ditch reaches a concrete spillway equipped with a metering flume. The Ditch then transitions to a culvert beneath an existing concrete stormwater channel and access road before entering Lake Palmdale via a final length of ditch cut at the lake surface level, an additional length of 250 feet. The scope of this Project will involve replacing the remaining 450 feet of open channel with a new pipeline and replacing the existing concrete spillway to adequately handle the proposed 66 cfs.



Photo 67: Discharge location of pipe installed in 2010 near Lake Palmdale.



Photo 68: Looking upstream at pipe discharge location shown in previous photo.



Photo 69: The Ditch downstream of the existing pipe discharge location is curvilinear, overgrown, and undersized to convey a desired flow of 60 cfs.



Photo 70: Recent grading has occurred just upstream of the existing metering flume at Lake Palmdale



Photo 71: The existing metering flume at Lake Palmdale is undersized to handle the ultimate flow rate of 60 cfs and will need to be replaced as part of this Project.



Photo 72: The existing concrete culvert beneath the stormwater channel downstream of the metering flume will remain in place and is not included in this Project.

# 4. Condition Assessment

Hazen subcontracted with National Plant Services (NPS) to perform inspections of buried assets using closed-circuit television (CCTV). No destructive testing or other multi-sensor inspections (i.e., laser profiling, sonar, pH, etc.) were performed. The purpose of the condition assessment was to identify any internal defects in order to better understand the tunnel/pipe condition and evaluate the remaining useful life of the tunnels and pipes that may remain in service as part of the new buried system. At the time the condition assessment was performed, it was not confirmed which assets would be replaced or abandoned versus which would remain in service, so Hazen conservatively instructed NPS to inspect all buried assets within the Project limits that were not inspected by manned entry during the October site visit (i.e., Tunnel 1 and Tunnel 3). See Figure 4-1 for a map of the assets inspected.

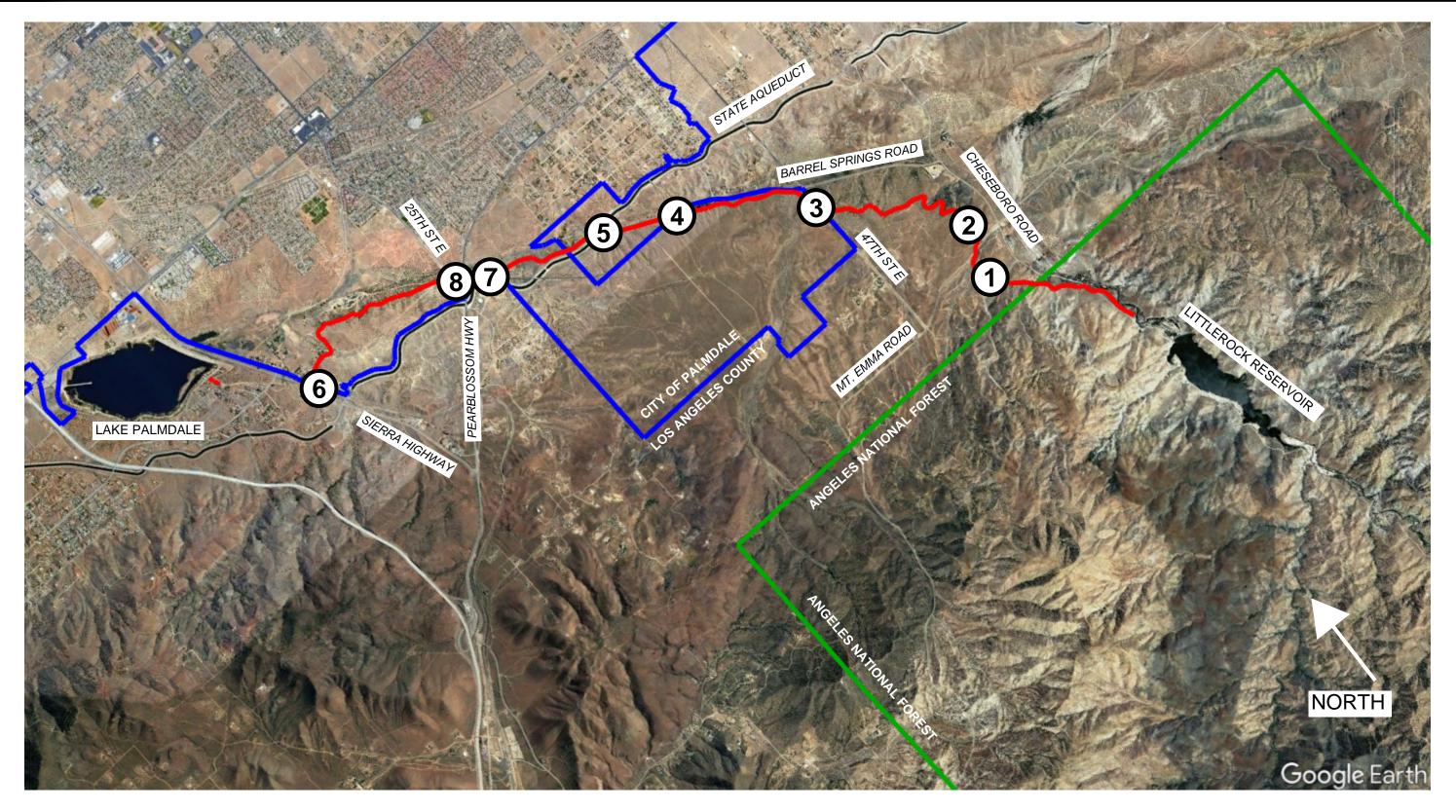
### 4.1 Field Investigation

Field work was performed between December 18<sup>th</sup> and December 20<sup>th</sup>, 2023. At this time, PWD was operating the Ditch to deliver water to Lake Palmdale, and a temporary Ditch shutdown was required to allow the field inspections to take place. This shutdown allowed inspection of the assets, but still produced standing water in some areas due to the limited time between the shutdown of the Ditch and the beginning of the inspections. Table 4-1 summarizes the segments that were inspected.

Segment ID	Conduit Type	Location	Inspection Direction	Size / Dimensions	Length Inspected (ft)
1	Tunnel	South of Mt. Emma Road (Tunnel 2)	Upstream	67" x 65"	717
2	Culvert	North of Mt. Emma Road	Upstream	48" dia	686
3	Culvert	Crossing 47 <sup>th</sup> St E	Upstream	48" dia	351
4	Culvert	Crossing Barrel Springs Road	Upstream	48" dia	304
5	Pipe	Aqueduct Crossing	Upstream	36" dia	335
5	Pipe	Aqueduct Crossing	Downstream	36" dia	165
6	Culvert	MetroLink / Sierra Hwy Crossing	Upstream	48" dia	397
6	Box Culvert	MetroLink / Sierra Hwy Crossing	Downstream	36" x 72"	140
7	Culvert	Crossing Barrel Springs Road	Downstream	48" dia	153
8	Box Culvert	Crossing Pearblossom Highway	Upstream	27" x 48"	99

Table 4-1: Condition Assessment Inspection Summary

Tunnel #1 and Tunnel #3 were inspected during the October site visit and are not included in this discussion (see Section 3.2 above).





### LEGEND:



PALMDALE CITY LIMITS US FOREST SERVICE BOUNDARY

DITCH REACH NUMBER

PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

> FIGURE 4-1 CONDITION ASSESSMENT LOCATION MAP

## 4.2 PACP Scoring Overview and Summary

Each segment was inspected with CCTV and defects were identified and coded in accordance with the standard system developed for the Pipeline Assessment Certification Program (PACP) by the National Association of Sewer Service Companies (NASSCO). This system standardizes pipeline inspection results across all conduit sizes and materials to assist with proper prioritization of maintenance, rehabilitation, and replacement of pipeline assets. Each defect is identified and given a score of 1 to 5, with 1 representing the least severe defect and 5 representing the most severe defect. Those scores were then converted to the Structural Quick Score, O&M Quick Score, and Overall Score for streamlined comparison. Each "quick score" is formatted as shown in Figure 4-2 below. If greater than 9 defect occurrences exist, the letters A through Z are used to represent additional occurrences.

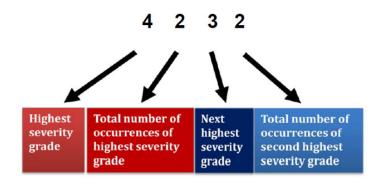


Figure 4-2: PACP Quick Score Definition

Credit for graphic given to 360pipes.com (https://360pipes.com/understanding-nassco-pipe-rating-system-360-pipes/)

Table 4-2 below summarizes the relative "quick" PACP scores for the inspected segments.

Table 4-2: PACP Scoring Summary								
Segment ID	PACP Structural Quick Score	PACP O&M Quick Score	Overall PACP Score					
1	413V	3125	2.91					
2	342Z	4122	2.02					
3	3X00	0000	3.00					
4	3A2U 0000		2.08					
5	4211	422D	2.21					
5	2300	2100	2.00					
6	0000	5131	2.11					
6	3100	4100	3.50					
7	3100	0000	3.00					
8	5342	0000	3.88					

Complete condition assessment reports have been included in Appendix C.

## 4.3 Findings

This section provides a qualitative summary of the inspection results and describes any recommendations for improvements should these assets continue to serve as a functional component of the proposed system.

#### 4.3.1 Segment 1: Concrete Tunnel South of Mt. Emma Road (Tunnel 2)

Debris was observed at the downstream end of the tunnel. This was also observed during the site visit. Due to this debris, the typical water line height appears to vary along the tunnel, reaching a maximum of approximately 50% up the side wall at the downstream end (approximately 3 feet deep) and only approximately 18 inches at the upstream end. Standing water was noted at the downstream end during the inspection while the upstream end was completely dry. This indicates an inefficient flow condition that may be corrected by removing the downstream debris.

Several locations of previously patched concrete at joints are present, and isolated instances where concrete has fallen away and exposed sheet metal that appears to have been used to form the tunnel roof are also present. Some instances of groundwater infiltration appear to exist as evidenced by staining on the sidewalls stemming from the joint between the roof and the wall. These observations are consistent with comments from PWD that the tunnel joints are known to leak.

Overall, per the visual inspection, this tunnel appears to be in relatively good condition and does not appear to warrant substantial rehabilitation for continued operation. Minimum recommendations would involve removing debris, patching mortar in areas of spalling, and coating the inside of the tunnel with a polymer liner to seal joints, stop infiltration, and improve flow. A more robust option could involve sliplining the tunnel with a new pipe such as HDPE that would be jointless and provide a minimum 50-year design life.



Photo 73: Downstream end of Tunnel #2. Debris and highwater mark is visible.

Photo 74: Sheet metal exposed in the roof of the tunnel



Photo 75: Previous concrete patching, joint weeping, and partially exposed metal in the roof.



Photo 76: Side wall staining and surface corrosion from joint infiltration



Photo 77: Bird nests on roof, moderate cracking on left side wall, and significant mortar patching on right wall joint.

Photo 78: Upstream end of tunnel was dry and water mark is only approximately 18 inches above the floor.

#### 4.3.2 Segment 2: 48-inch Diameter RCP North of Mt. Emma Road

The pipe was completely dry during the inspection so there was good visibility of the invert. No debris was observed. Similar to the inspection of Tunnel #2, the typical water level indicates a normal flow depth of approximately 50% of the total pipe diameter near the downstream end, but a shallower flow depth at the upstream end (approximately 30%). Mild corrosion appears to be present at the 5 o'clock and 7 o'clock positions. The existing pipe joints appear to be mortared joints with little signs of infiltration. A large rock was found in the pipe approximately 273 feet from the downstream end, but it was removed during the inspection by manned entry. Approximately 322 feet from the downstream end, a much larger pile of large rocks were observed inside the pipe that will need to be removed during construction.

The inspection of this pipe indicates it is in good condition and requires minimal rehabilitation to continue functional operation. Due to the limited corrosion observed, installing a cured-in-place-pipe (CIPP) liner is likely not warranted. However, it would be prudent to remove the existing rocks and apply a spray-applied geopolymer or epoxy to ensure joints are sealed, any further corrosion near the water line is halted, and design life is extended to better match that of the new pipeline that will be installed.



Photo 79: A pile of rocks is present within the pipeline and needs to be removed during construction.

Photo 80: Existing mortared joints are in good condition. Mild corrosion exists at the typical water level mark.

#### 4.3.3 Segments 3, 4, & 8: 48-inch Culverts Beneath 47<sup>th</sup> Street East and Barrel Springs Road

No significant defects exist in these RCP segments. Mild corrosion exists near the water mark. Similar to Segment 2, the inspections indicate these pipes are in good condition and require minimal rehabilitation to continue functional operation. Due to the limited corrosion observed, installing a cured-in-place-pipe (CIPP) liner is likely not warranted. However, it may be prudent to apply a spray-applied geopolymer or epoxy to ensure joints are sealed, any further corrosion near the water line is halted, and design life is extended to better match that of the new pipeline that will be installed. Due to the lack of defects, photos have not been included for these segments.

#### 4.3.4 Segment 5: 36-inch Diameter Aqueduct Crossing

As observed on the as-builts provided by PWD, the inspection confirmed that the pipe is made up of a combination of RCP and welded steel (WSP). Mild joint separations were noted in the upstream segment of RCP (south of the Aqueduct). Mild rebar exposure looks to exist at varying stages along the invert of the RCP. At approximately 151 feet from the upstream end, a 20% water level sag was noted before an angled fitting. Based on the as-builts, this is understandable as the pipe was constructed with a low point on the south side of the Aqueduct. Mild sand and stone deposits are visible below the surface of the standing water. Because of the sag, the downstream inspection was abandoned, and an upstream inspection was performed.

The upstream inspection recorded two angled fittings 29 feet and 157 from the downstream end, along with a medium joint separation at the second fitting where the pipeline transitions from RCP to WSP. The locations of the fittings and the pipe material transition appear to match up well with the provided as-built drawings.

For the WSP section that spans the Aqueduct, the typical high-water mark appears at approximately 40% to 50% of the total pipe capacity. As-builts indicate the interior of the pipe was originally lined with coal tar epoxy. The inspection indicates mild mineral growth and discoloration of the liner within the WSP. It is difficult to discern whether the discoloration also indicates mild interior pipeline surface corrosion. In some locations, mild degradation of the liner discoloration on the western side of the pipeline as opposed to the easter side. This may be explained by the western side of the pipeline receiving greater amounts of sunlight and heat when compared to the east side of the pipeline that is partially protected by the sidewall of the stormwater overcrossing. In some locations, the inside crown of the pipe appears to have a difficult time drying completely as wet areas are visible at various intervals.

The inspection notes another angled fitting at 291 feet from the downstream end before revealing the northerly end of the standing water noted in the downstream inspection, all of which appears to confirm the as-built configuration.

The pipeline generally appears to be in good condition with limited visible corrosion. However, due to the costly price tag that would be required to physically repair or replace the aerial segment of this pipeline should it ever fail, it is recommended that an AWWA Class III or Class IV pipeline liner be installed as part of the Project to ensure its expected service life is extended another 50 years.



Photo 4-9: Sand and pebbles can be seen beneath the water at the existing sag. Mild to moderate rebar exposure is also evident.



Photo 4-10: Coal tar liner discoloration is more prominent on the west (right) side of the pipe compared to the east (left) side.

#### 4.3.5 Segment 6: MetroLink Rail/Sierra Highway Undercrossing

This segment was not included in the original scope of work, but an inspection was performed to provide PWD with an understanding of the segment's existing condition. The current project scope ends at the upstream end of this segment. The downstream end of the segment is the upstream end of the segment that was converted to a pipeline in 2010.

Beginning at the upstream end, the Ditch appears to be a channel constructed of vertical masonry sidewalls and a metal roof. 40 feet into the inspection, a pile of rocks has built up along the bottom of the culvert. The channel gradually bends to the right until it reaches the upstream end of dual CMP culverts of unknown size and a concrete headwall approximately 140 feet into the inspection. The CMP pipes appear to be filled with sand to approximately 50% of the total diameter. The metal roof of the channel also appears to be rusted and damaged just before the concrete headwall. At this point, the downstream inspection was abandoned due to the amount of sand present.

The upstream inspection begins with a similar channel made up of vertical masonry sidewalls and a metal roof. The inspection quickly shows a significant build-up of sand along the bottom of the channel. 130 feet into the inspection there appears to be a wood frame that marks where the roof transitions from metal to concrete. At 140 feet into the inspection, the channel opens to a wider section that is also filled with sand. At 155 feet into the inspection, the AVEK tie-in can be observed just above the top of the built-up sand debris. The wider section then transitions back to the standard narrower width at 180 feet into the inspection, and at 200 feet, the roof transitions from concrete back to metal. At 230 feet, the amount of debris appears to become negligible. At approximately 390 feet into the inspection, the same two sand-filled CMP culverts are observed.

Although this segment is currently outside of the Project scope, the findings of this inspection suggest that PWD should not leave this segment in its current condition to ensure optimal performance of the finished pipeline. As such, PWD has chosen to clean this segment and perform an additional inspection to gain a better understanding of the condition of the CMP culverts beneath the railroad tracks. Any final rehabilitation or replacement recommendations will be revisited with PWD prior to submitting the 60% design documents pending completion of the cleaning and additional inspection.



Photo 4-11: Looking downstream at debris. Note the vertical masonry sidewalls and metal roof.

Photo 4-12: Looking downstream at extreme debris deposits. Dual CMP culverts appear to exist beneath the existing rail tracks.



Photo 4-13: Looking upstream. Masonry/metal channel transitions to a cast-in-place concrete box beneath Sierra Highway.



Photo 4-14: The concrete box expands and deepens. This box is filled with approximately 24 inches of sand.



Photo 4-15: Looking upstream. The AVEK tie-in beneath Sierra Highway can be seen on the right wall. Per as-builts, this pipe was installed with the invert 24 inches above the floor of the culvert, but is now in danger of being blocked by sand.

Photo 4-16: Looking upstream at west end of CMP culverts beneath the rail tracks.

#### 4.3.6 Segment 7: Pearblossom Highway Crossing

This culvert is generally in good condition, but not as good of condition as the other RCP culverts. Significant concrete spalling and rebar exposure was noted in a few locations. The current project scope assumes that this crossing will be replaced closer to the intersection at a deeper elevation and so the condition of this culvert is not as critical as other pipes/channels.



Photo 4-17: Significant concrete loss on both sides of the culvert at this location.



Photo 4-18: Exposed aggregate on the right wall and roof.

### 4.4 Assessment Summary

Based on the anticipated horizontal and vertical alignment, required flow capacity, and inspection results, Table 4-3 provides a summary of the improvement recommendations for these existing buried assets to reliably serve PWD with a minimum design life of 50 years. The table includes Tunnel #1 and Tunnel #3 that were inspected during the October site visit.

Segment ID	Conduit Type	Location	Rehab or Replace	Improvement	Approx. Length (ft)
N/A	Tunnel	Tunnel #1	Rehab	Slipline with 54" HDPE	380
1	Tunnel	Tunnel #2	Rehab	Slipline with 54" HDPE	717
N/A	Tunnel	Tunnel #3	Rehab	Slipline with 54" HDPE	140
2	Culvert	North of Mt. Emma Road	Rehab	Spray-Applied Lining or CIPP	686
3	Culvert	Crossing 47 <sup>th</sup> St E	Rehab	Spray-Applied Lining or CIPP	350
4	Culvert	Crossing Barrel Springs Road	Replace	New 48" dia. pipe via open-cut installation method	304
5	Pipe	Aqueduct Crossing	Rehab	Spray-Applied Lining or CIPP	500
6	Culvert	MetroLink / Sierra Hwy Crossing	TBD	TBD after PWD performs cleaning and add'l inspection	540
7	Culvert	Crossing Barrel Springs Road	Replace	New 48" dia pipe via open-cut installation method	153
8	Box Culvert	Crossing Pearblossom Hwy	Replace	New 48" dia. pipe via trenchless installation method	100

Table 4-3: Improvement Summary for Existing Buried Assets

# 5. Geotechnical Considerations

Hazen subcontracted with Bruin Geotechnical Services, Inc. (Bruin) to provide geotechnical engineering services for the Project. Their scope included performing field borings, performing laboratory testing on the samples taken, developing design recommendations, and documenting all findings and recommendations in a report. For a complete discussion of geotechnical considerations, see the geotechnical report included in Appendix D.

## 5.1 Field Investigation

Hazen worked with Bruin to develop a boring location map (see Figure 5-1) to ensure a proper understanding of the Project soils. As shown on the map, 36 borings were performed approximately every 2,000 feet along the Project alignment. 30 borings were performed to a depth of 10 feet while 5 borings were performed to a depth of 50 feet. These deeper borings were performed where either potential scour over the pipeline is a concern or where new trenchless crossings were deemed to be a possibility. The borings were performed in November and December of 2023.

See Appendix D for the final boring logs.

### 5.2 Geotechnical Recommendations

A draft geotechnical report was provided by Bruin on February 20<sup>th</sup>, 2024, and the following sections summarize the primary findings and geotechnical recommendations. See the report for a full discussion of recommendations and design parameters.

#### 5.2.1 Groundwater

While historical references indicate that regional groundwater typically ranges between 20 to 68 feet below existing grade, free groundwater was encountered in three of the borings (B17, B18, and B19) at depths from 12 to 29 feet below existing grade.

It is understood that the depth of excavation will generally range from 8 to 10 feet, and that much of the construction will be performed during the Spring and Summer months. However, in the areas where borings yielded free groundwater observations, the contractor may need to be prepared to mitigate the effects of seasonal groundwater on trenching operations using pumps and/or trench stabilization techniques.

#### 5.2.2 Bedrock

Bedrock was encountered while drilling Borings 27 and 29. These borings correlate to field observations made during the site walk where large flat rock faces make up portions of the Ditch bottom. This bedrock will be considered while developing the final pipeline profile to limit excavation depths and costly rock excavation.

#### 5.2.3 Seismic Hazards and Liquefaction

Approximately 3.5 miles of the pipeline is in close proximity to the active San Andreas Fault zone, a large strike-slip fault which can produce significant earthquakes, faulting, and ground movement. The fault is capable of producing ground accelerations of 0.5g (8.4 on the Richter Scale) with an average occurrence interval of 150 years. According to the California Geological Survey, portions of the project lie within Liquefaction, Landslide, and Earthquake Zones. See the geotechnical report in Appendix D for the seismic design parameters per the requirements of the California Building Code.

A liquefaction potential analysis was not completed as part of the geotechnical report. However, it is noted that liquefaction is probable due to soil properties encountered. Other seismically related hazards include dynamic settlement, lateral spreading, slow slides, and foundation bearing failure.

#### 5.2.4 Trench Design

Due to the granular soils encountered, most of the trench bottoms are anticipated to only require minor stabilization. Some native soils encountered have a sand equivalent value of 30 or higher which would be suitable for use as trench bedding. In most cases, typical traditional open-trench construction methods including typical shoring systems for trenches greater than 5 feet deep will be acceptable.





HAZEN AND SAWYER 800 WEST SIXTH STREET, SUITE 400 LOS ANGELES, CA 90017

## LEGEND:



PALMDALE CITY LIMITS

US FOREST SERVICE BOUNDARY

APPROXIMATE BORING LOCATION

# FIGURE 5-1 GEOTECHNICAL BORING LOCATIONS

# PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

# 6. Pipe Material Evaluation and Selection

The selection of pipe materials for this Project involves considering various design criteria that are critical for both Project success and efficient system operation. This section compares different potential pipe materials for both open-cut and trenchless construction methods and evaluates their suitability for the Project.

### 6.1 Selection Criteria

Because this Project involves using both open-cut construction and trenchless installation methods, pipe materials were evaluated separately for each type of installation. This section outlines the criteria considered for each installation method.

#### 6.1.1 Open-Cut Construction

Open-cut construction is anticipated to be used for most of this Project, with the crossing of Pearblossom Highway and the replacement of some existing culverts within the City's jurisdiction being the only trenchless crossings anticipated. As such, the following criteria will dictate the largest portion of pipe used on the Project. The following is a list of selection criteria used for evaluating potential pipe materials to be installed by open-cut construction.

- Minimum Radius Achievable
- Maximum Operating Pressure Allowed
- Availability of Pipe Materials/Sizes
- Complexity of Installation
- Long-term Joint Integrity
- PWD familiarity with Material
- Anticipated Material Cost
- Corrosion Resistance
- External Loading Strength

#### 6.1.2 Trenchless Construction

Trenchless design generally requires additional considerations to those listed above to ensure a successful installation. These considerations typically involve looking at a combination of the suitable trenchless methods together with the pipe materials they can install. See Section 6.2.2 for more discussion.

## 6.2 Pipe Material Options

There are several pipe materials that we have considered for this Project. The following sections describe the potential materials for each construction method. A discussion of pipe materials and their applicability for open-cut construction is followed by a similar discussion for trenchless installation.

#### 6.2.1 Pipe Material Options – Open-Cut Construction

The feasibility study prepared in 2021 considered four (4) pipe materials for open-cut construction, as follows:

- 1. Reinforced Concrete Pipe (RCP)
- 2. Ductile Iron Pipe (DIP)
- 3. Polyvinyl Chloride (PVC) pipe
- 4. High-Density Polyethylene (HDPE) pipe

Based on our understanding of the Project, we believe there is merit to also evaluating welded steel pipe (WSP) and fiberglass reinforced plastic (FRP) pipe. As such, we have also included a discussion regarding those materials below.

A discussion about each of these six pipe types is included below, and a summary table is provided in Table 6-1.

#### 6.2.1.1 Reinforced Concrete Pipe (RCP)

RCP is typically used to convey non-pressurized sewage and stormwater flows. It is a rigid pipe available in diameters up to 144 inches and is widely used in the water and wastewater industry. The pipe is primarily designed for external loading conditions and is not typically intended to convey pressurized flow, although RCP meeting the standards of ASTM C361 can be designed to handle internal pressures up to 125 feet of head (or approximately 54 psi). The pipe generally comes in 8-foot-long segments with bell and spigot joints and can be manufactured to work with O-ring gaskets in accordance with ASTM C443. RCP is a durable, proven product and is generally not susceptible to corrosion in a raw water system such as this unless the reinforcement becomes exposed.

Because the Project requires the pipe to be installed with several tightly curved sections, the minimum radius of installation that can be achieved without compromising the pipe joint is a key factor for pipe material selection. The American Concrete Pipe Association (ACPA) indicates that there are two primary methods for achieving curved RCP: 1) deflecting straight pipe segments at joints, and 2) using pipe commonly referred to as "radius" pipe or "mitered" pipe that is manufactured with a bevel on either end or both ends of the pipe. According to "Design Data 21" published by ACPA, the approximate minimum radius achieved with standard straight 8-foot-long pipe segments of 48-inch diameter RCP with each joint "pulled" to a maximum of 1

inch is 464 feet; however, this radius is too large to be used in many segments of the Project, and manufacturers currently do not recommend pulling joints when using gasketed pipe in order to achieve a leak-free system. To achieve a smaller radius, it is possible to manufacture gasketed, mitered RCP to accommodate various radii and bend configurations. The current industry standard that is being manufactured at Southern California facilities is a bevel of five (5) degrees at either one or both ends of the pipe stick. Varying the lengths of these mitered pipe segments and the number of bevels (i.e., single or double), standard minimum radii of 22.5 feet, 45 feet, and 90 feet are achieved. Longer radii can be achieved using a mix of straight pipe and 5-degree bevels as required. Custom bevel angles and specially-made bends/elbows can also be constructed as necessary for increased cost.

#### 6.2.1.2 Ductile Iron Pipe (DIP)

DIP is available in diameters up to 64 inches and comes in pressure ratings up to 350 psi. Inside diameters for DIP are typically larger than nominal diameters. Laying lengths are a maximum of 20 feet. Standard joints are single-gasketed, push-on types. Thrust restraint can be provided by concrete thrust blocks or a wide variety of proprietary restrained joint systems.

Cement mortar for lining is available in addition to polyurethane lining or fused epoxy. Polyethylene encasement or polyurethane coatings, with or without cathodic protection, can reduce a pipe's susceptibility to external corrosion, but polyurethane coatings can add significantly to the cost. However, if cathodically protected, less current will be required for pipes with polyurethane coatings. Because of the lower current requirement, stray current risks are lower if polyurethane coatings are specified. DIP manufacturers have taken the position that they will not bid projects where any coating other than the standard asphaltic material with polyethylene encasement is specified.

Most manufacturers of DIP are in the eastern United States, with only a few foundries in the west. The western foundries typically make 24-inch-diameter pipe and smaller, with the larger diameter DIP manufactured in eastern foundries.

Today, various manufacturers produce many different types of non-restrained and restrained joints for DIP. Most joints are proprietary and are illustrated in Appendix A of AWWA M41.

Non-restrained joints include rubber gasketed, push-on types, flexible couplings, and mechanical joints. Restrained joints include flanges, grooved couplings, flexible couplings with thrust harnesses, and several types of rubber gasketed, push-on proprietary thrust restraint systems. Some of these restrained push-on joints employ setscrews, multiple-acting wedges, or field-welded retainers and are not recommended for use. Restrained joints, which rely on friction between the pipe and a wedge or setscrew, are not as reliable as other types of restrained joints; following installation and testing, corrosion or vibration can cause the system to loosen and fail unexpectedly.

DIP is typically preferred to suit applications within pressurized systems and/or to accommodate high external loads. Over the past year or so, there have also been availability issues with DIP. Due to the difficulties with curving DIP coupled with the lack of a need to accommodate high

internal pressure or high external loads, it is likely not worth the extra cost or lead time to procure DIP for this Project.

# 6.2.1.3 Polyvinyl Chloride (PVC) Pipe

PVC pipe manufactured under ASTM F697 is intended for use as non-pressurized sanitary sewers, but is not generally manufactured at diameters larger than 36 inches. PVC pipe for this Project would likely be the closed-profile type manufactured in accordance with ASTM F1803, such as Vylon pipe. As an alternative, PVC pipe manufactured in accordance with AWWA standard C900 would allow for higher pressure resistance, higher bending radii, and additional manufacturers that could supply it although higher pressure resistance is not required for the Project.

PVC pipe is considered a flexible pipe and therefore its ability to withstand external loading depends on side support from the surrounding soils. While the pipe is available in diameters up to 54 inches, it has a limited history in diameters greater than 24-inch (the first installation of Vylon pipe in a direct bury gravity flow application was in 19887). Joints are O-ring push-on type gaskets. PVC is electrically nonconductive and will not rust or corrode.

PVC pipe is lightweight, relatively easy to install, and generally readily available. However, 48-inch diameter pipe will likely be more difficult to procure than standard smaller diameter PVC.

Although PVC pipe is flexible, bending PVC pipe of this diameter to achieve a curved alignment is not feasible. Therefore, curved alignments are achieved with either manufactured angled fittings or using shorter pipe segments deflected at the joint a degree or two. To obtain the most leak-free joint, angled fittings would provide a better seal than using joint deflection, and would have a comparable cost to manufacturing customized shorter pipe segments. The Contractor must also be careful not to over-insert or under-insert the pipe spigot into the pipe bell to ensure proper joint integrity prior to backfilling the pipe.

Vylon also makes a slipliner pipe that could be used inside the casings of new trenchless installations which would have joints compatible with those segments installed using open-cut construction.

### 6.2.1.4 High Density Polyethylene (HDPE) Pipe

HDPE is a thermoplastic, which means it is a polymetric material. It can be softened and formed into useful shapes by the application of heat and pressure, and it hardens when cooled. HDPE pipe has ten different dimension ratios for nominal pipe sizes, ranging from 4 inches through 63 inches. The outside diameter is manufactured to controlled standards to match either iron pipe sizes or ductile iron pipe sizes. For this Project, the inside diameter of a 48-inch diameter DR 32.5 pipe is slightly less than 45 inches. Additionally, HDPE pipe of this size starts to push the limits of HDPE manufacturing capability.

Joints for HDPE are fusion welded on site, have a very low profile, and result in a joint that is as strong as a continuous section of pipe. A typical open-cut installation involves fusing the pipe

segments together above ground outside the trench and then lowering the fused sections into the trench. The number of joints and ultimate length of fused pipe is limited only by the pipe alignment, available staging area, and contractor's equipment and personnel availability. Therefore, hundreds of feet of pipe could potentially be fused together and laid in the trench at one time.

HDPE used in water piping applications is an electrically nonconductive material and is not adversely affected by soil conditions. Therefore, it is not subject to galvanic action and will not rust or corrode. This material quality of HDPE means that no cathodic protection is required to protect the pipe, even in the most corrosive environments.

Pressure classes depend on the resin used and range from 40 psi to 254 psi. Since this pipeline is not required to withstand high pressures, the specified wall thickness (and, hence, dimension ratio, DR) would be governed by size availability and desired bending radius. This ability to curve the pipe in the field would allow the contractor to bend it to fit the Project's curvilinear alignment. As an example, 48-inch diameter DR 32.5 HDPE can withstand 64 psi of internal pressure and can accommodate a minimum bending radius of approximately 170 feet.

HDPE is also sensitive to temperature changes. Where HDPE pipe is exposed to diurnal temperature fluctuations before backfilling, pipe lengths have been noted to expand/shrink several inches, even in moderate coastal climates. Therefore, the temperature fluctuations and extreme heat common in a desert climate such as Palmdale's will likely complicate connections to structures and fittings during installation. Based on Chapter 6 of the Handbook of Polyethylene Pipe published by the Plastics Pipe Institute, it is estimated that HDPE pipe will lengthen/extend approximately one inch for every 100 feet of pipe for every 10 degrees Fahrenheit of temperature change. Assuming a temperature range of 70 degrees during the summertime (i.e., 50 deg F at the low, 120 deg F at the high), a 150-foot pipe string (i.e. three 50-foot sticks of pipe fused together) can be expected to expand/contract up to about 13 inches. Therefore, failure to make connections at the appropriate time can cause strain on both pipe and structures as the pipe tries to expand and contract. That said, once the pipeline is installed and buried, expansion and contraction due to temperature fluctuations is anticipated to be minimal. Due to these construction challenges, it would be critical to conduct a contractor procurement process that would ensure the contract was awarded to a contractor with sufficient experience to successfully complete the job.

#### 6.2.1.5 Welded Steel Pipe (WSP)

WSP has a long service history, offers high strength, and can deflect under a load while still providing resistance to that load. WSP is readily available at a diameter of 48 inches. Diameters are specified either by the outside diameter of the steel cylinder or by the nominal inside diameter including the thickness of the steel cylinder and lining. WSP comes in relatively long lengths, typically 40 feet, and can be designed and constructed to meet the highest pressure the pipeline will experience on this project. It is susceptible to internal and external corrosion. Epoxy, cement mortar, or polyurethane linings can be used to minimize internal corrosion. Polyethylene tape, cement mortar, or polyurethane coatings with or without cathodic protection systems can reduce the susceptibility of steel to external corrosion. Cement mortar "rockshields"

are often used over bonded coatings on larger diameter pipe to minimize damage to the bonded coatings during handling and installation of the pipe.

Bell and spigot gasketed pipe joints available for steel pipe include the Carnegie type joint, welded lap joints or butt joints. The bell and spigot type joints allow for some deflection at the joint while still maintaining a positive seal under internal pressure and are commonly used for 48-inch-diameter and smaller pipe. Usually thrust blocks must be constructed, or welded joints specified, at all bends in pressure pipe applications; however, the amount of thrust restraint required for this Project would be minimal due to the low internal pressures experienced in the system.

If WSP is used, we recommend the use of a welded or double rubber-gasket Carnegie joint with welded joints where the pipeline must resist thrust. A testing port can be tapped into the double gasketed joint and the joint tested before backfilling occurs, allowing defective joints to be identified and corrected before the pipeline is backfilled. After a successful joint test, the testing port is closed, either with a threaded plug or by welding. Leakage at a Carnegie joint can be repaired by welding (butt strap, lap weld, or fillet weld) if necessary.

# 6.2.1.6 Fiberglass Reinforced Polymer (FRP) Pipe

Fiberglass reinforced plastic (FRP) pipe, consists of a centrifugally-cast glass fiber and sandfortified reinforced plastic pipe. This type of pipe is available in diameters up to 120 inches and lengths up to 20 feet. Maximum working pressures can be as high as 450 psi. The standard joints are rubber-ring sealed bell and spigot joints (flush bell for microtunnel installations). Joints can be sealed further by installation of a fiberglass patch across the interior of the joint after the pipe is installed. Thrust restraint for this type of pipe can be achieved using thrust blocks. The pipe provides excellent resistance to corrosion and good flow characteristics.

# 6.2.1.7 Pipe Material Summary – Open-Cut Construction

Table 6-1 below summarizes the pipe material evaluation for segments to be installed using an open-cut construction method. The comparison assumes the use of 48-inch diameter pipe.

Std Min

Radius<sup>3</sup>

(ft)

22 5 45

Std Lay

Lengths<sup>2</sup>

(ft)

Material<sup>1</sup>

Table	6-1: Open-Cut	Pipe Materia	I Summary	
Max Operating Pressure <sup>4</sup> (psi)	Joint Type	Material Cost (\$/LF)	Manufacturer Location	Additional Notes
10	Bell and spigot with gaskets (ASTM C443)	150	Southern CA	Weight of pipe requires heavier equipment but avoids flotation when using CLSM backfill (if used); curves don't require deflecting joints
150	Bell and spigot with gaskets	810	Alabama	12-14 week lead time; metal is susceptible to corrosion and tuberculation;
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RCP	8	90 90	10	gaskets (ASTM C443)	150	Southern CA	backfill (if used); curves don't require deflecting joints
DIP	20	380	150	Bell and spigot with gaskets	810	Alabama	12-14 week lead time; metal is susceptible to corrosion and tuberculation;
PVC	13	115	10	Bell and spigot with gaskets	270	Ohio	Long-term reliability is highly dependent on quality of bedding & backfill installation & compaction
HDPE	50	168	64	Fused	120	Utah	Sensitive to thermal expansion/contraction; long sections of fused pipe can be onerous to handle
WSP	40	Designed to Suit	Designed to Suit	Welded	370	Southern CA / Texas	Installation requires welding and mortaring joints; several tight curves would require several special pieces;
FRP	40	286	25	Bell and spigot with gaskets	1,000	Texas	Lighter than RCP; more corrosion resistant than RCP

Table 6-1 Footnotes:

- 1. All pipes assumed to have a diameter of 48 inches although final pipe diameters may be smaller. PVC pipe properties taken from Vylon product information. FRP pipe properties taken from Hobas product information.
- 2. Custom lay lengths can be achieved and/or provided for many materials, but will require additional cost to manufacture or install.
- 3. Pipe Radius Assumptions
  - a. RCP: standard mitered (i.e., "radius") pipe using 4-foot and 8-foot lay lengths at manufacturer's standard 5-degree bevel angles.
    - b. DIP: standard 20-foot lay length at 3-degree joint deflection.
  - c. PVC: standard 5-foot lay length at 2-degree joint deflection.
  - d. HDPE a minimum allowable ratio "a" of 42, dimension ration (DR) of 32.5, and outside diameter (OD) of 48" (R<sub>inches</sub> = a[OD])
  - e. FRP: standard 5-foot lay length and max 1-deg deflection.
- 4. Pressure Assumptions
  - a. RCP: ASTM C361, Class D-25 (i.e., 25 feet of head); higher pressure classes available at a cost premium
  - b. DIP: based on Pressure Class 150; higher pressure classes are available, but not necessary for this Project
  - c. PVC: limited by manufacturer's joint test pressure
  - *d. HDPE: DR 32.5*
  - e. FRP: standard non-pressure application pipe.

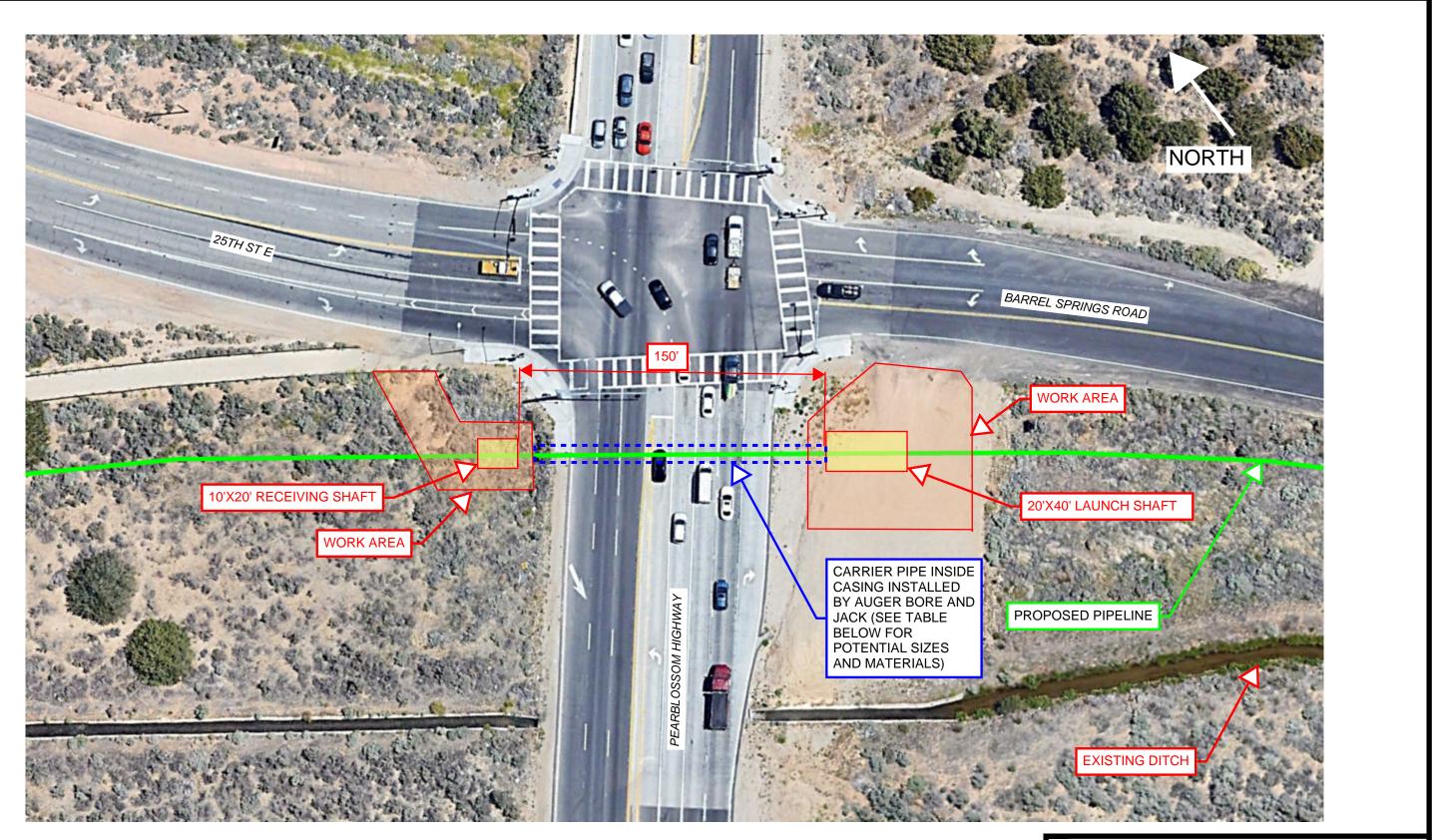
#### 6.2.2 Trenchless Construction Methods and Pipe Materials

While most of the Project is expected to be completed using open-cut construction, there is one trenchless installation anticipated as part of this Project. The existing culvert beneath Pearblossom Highway is not adequately sized to convey the ultimate flow rate of 60 cfs; therefore, a new crossing will need to be installed. Since the crossing needs to be replaced, it will also benefit the vertical alignment to place this new crossing deeper than the existing culvert. Although this highway is not within Caltrans jurisdiction, the City has stated that they will require a trenchless installation for this crossing due to the high traffic volumes witnessed along Pearblossom Highway and the recently completed roadway improvement project that they do not want to trench through. The new trenchless crossing is being considered along with pipeline alignment that would place the new crossing just south of the Barrel Springs Road intersection.

#### 6.2.2.1 Design Parameters

The following parameters were used for consideration of the Pearblossom Highway trenchless crossing:

- Minimum carrier pipe size: 48-inch inside diameter
- Minimum casing inside diameter: 12 inches larger than carrier outside pipe diameter
- Annular space between casing and carrier: Use casing spacers, fill with sand and seal casing pipe with end seals, or grout annular space
- External grout/backfill/contact grouting: Use grout ports and provide external grouting along the casing
- Maximum length of crossing: 150 feet
- Minimum separation from existing pipelines and structures: 1 x casing diameter or approximately 5 to 6 feet





Carrier Pipe Material	ID	OD	Steel Casing ID
RCP	48"	66" @ barrel	78"
HDPE	48"	54"	66"
WSP	48"	49"	60"

# FIGURE 6-1 PEARBLOSSOM HIGHWAY CROSSING

# PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

## 6.2.2.2 Ground Conditions

Ground conditions at the proposed crossing have been investigated through site visits and geotechnical borings drilled in the vicinity of the crossing. Based on a geotechnical review of the borings performed near the Pearblossom Highway location (Borings B8 and B9), the soil types consist of silty sands (SM), clayey silts (ML), and silty clays (CL).

Boring 8 was drilled to a depth of 15 feet below ground surface, and consisted of medium-dense to dense material, ranging from slightly moist to moist. Poorly graded sand (SP) was encountered in the upper 10 feet of soil, while the remaining depth to 15 feet contains clayey sand (SC).

Boring 9 was drilled to a depth of 30 feet below ground surface, and consisted of loose to dense material, ranging from moist to very moist. Silty sand (SM) was encountered in the upper 12 feet of soil, while the remaining depth to 30 feet contains fine to medium sandy silt with coarse sand and clay binder.

No groundwater or caving was encountered within B8 or B9. Also, no large rocks or boulders or otherwise impenetrable soils were encountered in the exploratory borings.

Based on the anticipated crossing geometry and ground conditions, there is a range of trenchless methods that could possibly provide feasible pipeline installation options for the Pearblossom Highway crossing. These methods include auger boring, pipe ramming, microtunneling, and open shield pipe jacking. Each of these methods is described in the following sections.

# 6.2.2.3 Auger Boring

Auger boring involves simultaneously jacking steel casing segments forward while removing the spoils within the casing via a rotating auger flight. Rotation of the auger removes soil near the face while carrying the spoils back to the jacking pit where they can be removed using a clam shell or excavator. Since the auger method is not always capable of providing continuous face support, groundwater can be problematic as it could cause the soil to flow and flood the steel casing potentially causing catastrophic settlement at the face of the excavation. As a result, auger boring is typically limited to stable soils located above the water table or in those soils that can be dewatered along the entire alignment. Dense soil is ideal for auger boring as it retains stability at depth, mitigating the risk of surface subsidence.

The maximum drive length for auger boring is dictated by the torque available to turn the auger flights and is typically about 300 to 350 feet. The method provides only minor grade control with primitive steering techniques, resulting in accuracies on the order of 1 percent of drive length.

The ideal geotechnical conditions for auger boring are medium-dense to dense clays, with silts and sands, above the water table. For most soils below the water table, dewatering or other methods of soil stabilization must be utilized to successfully complete the augered casing installation without surface settlement. For the Pearblossom Highway application, a two-pass system would be used consisting of an initial pass to install the steel casing, and a second pass to install the final carrier pipe. Launch and reception areas are required for auger boring operations. The launching (or jacking) shaft should be approximately 10 to 15 feet longer than the casing pipe section length, and approximately 6 to 10 feet wider than the casing. The reception side must be large enough to receive the auger boring head and make necessary connections or tie-ins. Expected jacking shaft dimensions for this crossing are 40 feet long by 20 feet wide (to allow up to 20-foot casing and carrier pipe lengths), and expected receiving shaft dimensions are 10 feet long by 20 feet wide. In addition, the launching shaft will require a surrounding work area of approximately 5,000 square feet.

# 6.2.2.4 Pipe Ramming

Pipe ramming consists of using repeated percussive blows from a pneumatic hammer powered by an air compressor or by a hydraulic hammer to ram an open-ended steel pipe through the ground. Soil enters the open end (forward) of the casing throughout the ramming process, forming a soil plug that provides face support by counterbalancing soil overburden and groundwater pressures. Establishment of an adequate soil plug within the casing is essential to prevent settlement when groundwater is expected along the alignment.

After the casing has been rammed forward and reaches the final location in the reception shaft, spoils are removed from within the casing. It should be noted, that on longer rams, it is rare to ram from the ramming shaft to the reception shaft without some removal of soil to reduce frictional loads along the casing. This is typically done using auger flights; however, compressed air, or water jetting can be used; but extreme safety measures may be required with either of these methods.

Pipe ramming is not a steerable method of installation. The leading edge of the casing is not fitted with a steering head; therefore, line and grade are dictated by the initial setup of the pipe and the response of the pipe to the native soil conditions as it is driven forward through the soil. Depending on the precision of the initial pipe alignment, the accuracy of this method is generally on the order of one percent of the drive length both vertically and horizontally. Deviations from line and grade may also result from impacts with objects, crossing geologic contacts which will result in the pipe following the path of least resistance during the hammering, or deviations in the welding process which could introduce a slight angle in the pipe.

The most critical part of the pipe ram is the lead cutting shoe that is fitted to the front end of the rammed casing. This cutting shoe must be designed to withstand the force of the impact with aggressive soil and maintain the strength required to resist buckling. Calculations need to be performed prior to tunneling to determine the necessary thickness of the cutting shoe.

Pipe ramming is suitable for a wide variety of soils, provided that there is sufficient material to form an adequate soil plug during casing installation beneath sensitive structures or below the groundwater table. Alternatively, sandbags or controlled density fill (CDF) may be used to form an effective plug within the first casing section prior to the start of the ramming process. There is no limitation on the length of the plug in the pipe except practicality of installation. Pipe plugs made with sandbags have been as long as a single pipe section (~20 feet) but there would need to be a considerable amount of groundwater pressure for this to be necessary. Pipe ramming is one

of the most effective trenchless methods for the installation of pipelines in soils containing gravel, cobbles, and boulders.

The lack of good line and grade control limits the typical length for this installation method from 100 to 200 feet, with 250 to 300 feet being a typical maximum length. For the Pearblossom Highway application, a two-pass system would be used consisting of an initial pass to install the steel casing, and a second pass to install the final carrier pipe. Typical ramming shaft dimensions are 40 feet long by 20 feet wide (to allow up to 20-foot casing and carrier pipe lengths), and typical exit shaft dimensions are in the range of 15 to 20 feet on each side.

## 6.2.2.5 Microtunneling

Microtunneling is a closed-face pipe jacking operation where positive face stabilization is provided to the excavation using pressurized slurry at the face of the tunneling machine. This feature allows tunneling beneath groundwater with a much lower risk of losing ground stability. As soil and rock are excavated by the cutter head of the tunneling machine, they pass through the crushing chamber into the slurry chamber. Within the chamber, the spoils mix with water to form slurry which is then pumped up to the surface for separation and removal. The 'cleaned' slurry is then pumped back to the face of the machine for ground support and additional spoil removal.

The microtunneling machine is operated from a control center located on the ground surface and all machine functions are operated by remote control. No personnel are required in the tunnel during pipe or casing jacking operations. Microtunneling operations are steerable and guided with a laser or theodolite system. Tolerances of plus or minus one inch over one thousand feet are achievable.

Microtunneling takes place from within a jacking shaft that is constructed to the depth of the casing/pipeline. A main jacking unit located in the jacking shaft pushes the tunneling machine via the pipe or casing string from the jacking shaft to the receiving shaft. The machine is removed upon reaching the receiving shaft, leaving the pipeline or casing installed along the alignment. When casing is used, after casing installation the carrier pipe is installed using the same jacking equipment that placed the casing. The shafts are then typically backfilled, and the shoring system removed or cutoff at a suitable depth near the surface. Microtunneling can be accomplished with a single-pass system using reinforced concrete jacking pipe, or a two-pass system using steel casing with carrier pipe inserted in the casing after completion of tunneled casing installation.

Microtunneling is feasible for a wide variety of soils, but the ideal geotechnical conditions are medium-dense to dense sandy soils that are easily excavated by the machine. Softer silty and clayey soils are also easily excavated with microtunneling so long as they have sufficient bearing capacity to support the weight of the machine. Open-graded gravel (gravels with less than 5% fines) can be very challenging for microtunneling, as it tends to flow rapidly into the face of the machine, interlocking within the crushing chamber.

The typical work area needed at the launch shaft is a minimum of 10,000 square feet to allow room for a crane, separation plant, control cabin, generators, spoil storage and pipe storage,

along with space needed for truck access to the separation plant. The typical work area needed at the reception shaft is 5,000 square feet primarily to allow crane access for machine removal. The typical jacking shaft dimension along the pipeline is 35 to 40 feet, and typical reception shaft dimension along the alignment is about 20 to 25 feet.

# 6.2.2.6 Open Shield Pipe Jacking

Open Shield Pipe Jacking is similar to microtunneling in that the pipe is jacked directly behind the shield. Guidance may be provided by a laser mounted in the shaft or by conventional survey instruments. However, unlike microtunneling, excavation may be accomplished using a rotating cutter wheel, a digger boom, or pneumatic spades and no positive face pressure is applied to counterbalance the groundwater. This system is usually a manned operation within the tunnel. Soil is typically removed from the face of the shield on a conveyor which transports the spoils via a conveyor (shorter tunnels) or track-mounted muck hopper (longer tunnels). On the longer tunnels, the muck hopper is then transported in and out of the tunnel by a locomotive. Due to the muck removal process, the smallest diameter for effectively completing open shield pipe jacking is approximately 54 inches. Most contractors do not own equipment less than 54 inches in diameter.

The casing pipe material is most commonly steel or concrete. The casing string is jacked through the soil using hydraulic jacks located in the jacking shaft. However, unlike microtunneling which is controlled remotely, open shield pipe jacking is operated from within the mechanized shield at the face controlling the excavation, while a separate operator controls the jacking unit. Line and grade accuracy is typically within 3% of the outside diameter of the casing. The rate of excavation and advance is balanced by jacking the pipe forward at the same rate as the mechanized shield excavates the soil. Open shield pipe jacking can be accomplished with a single-pass system using reinforced concrete jacking pipe, or a two-pass system using steel casing with carrier pipe inserted in the casing after completion of the jacked casing installation.

Open shield pipe jacking does allow access to the face for removal of obstructions and can operate with groundwater levels as high as the crown of the tunnel if the soils are not expected to flow; however, these circumstances may require the machine to be fitted with closable doors or sand shelves. In very stable soils, it may be possible to operate the equipment with groundwater levels above the crown of the tunnel; however, these levels should be limited to less than three feet of head. As long as the face of the tunnel heading remains stable without flowing ground conditions, low volumes of groundwater inflow can be accommodated using sump pumps.

The typical work area needed at the jacking shaft is a minimum of 10,000 square feet to allow room for the jacking shaft, a crane, generators, spoil storage, pipe storage, and truck access. The minimum work area needed at the reception shaft is 5,000 square feet.

# 6.3 Recommendations

This section summarizes our recommendations for the pipeline materials to be used for each type of installation method.

## 6.3.1 Recommendation – Open-Cut Construction

Based on the factors and criteria described above, we recommend using RCP for the open-cut construction segments of this Project. Using RCP will allow the pipe to accommodate a curvilinear alignment and withstand some instances of low pressure where the pipe may become surcharged. There are also multiple local manufacturing facilities that can supply the pipe that should increase competition, lower costs, and limit lead times. Using RCP also provides a suitable product for connecting to concrete manholes and structures without the need to consider temperature fluctuations.

## 6.3.2 Recommendation – Trenchless Construction

Based on required pipe diameter, trenchless installation length, grade requirements, and characterization of ground conditions with silty sands (SM), clayey silts (ML), and silty clays (CL), above groundwater, with minimal likelihood of cobbles and boulders, auger boring is recommended for the trenchless crossing of Pearblossom Highway. A two-pass system is recommended in which a steel casing pipe is advanced by auger boring, and a carrier pipe (HDPE) is inserted into the steel casing after completion of the casing installation. As the design advances, provisions for utility identification, settlement monitoring, vertical clearances, carrier pipe type, and the casing/pipe profile will be incorporated into the design.

# 7. Hydraulic Analysis

A hydraulic analysis was performed to evaluate the required pipe sizes and slopes to convey the design flow rate of 60 cfs from the Littlerock Reservoir to Lake Palmdale. This analysis used the hydraulic model developed as part of the 2021 Feasibility Study, updated to reflect more accurate horizontal and vertical alignment information. In this section, all reference elevations shall be assumed to be based on the NAVD 88 datum unless otherwise specified. See Section 2.1 for discussion of datum conversions used. This section is divided into the following topics:

- 1. System Operations and Boundary Conditions
- 2. Model Development and Assumptions
- 3. Supporting Calculations
- 4. Results and Recommendations

# 7.1 System Operations and Boundary Conditions

The objective of the Project is to convey a maximum flow of 60 cfs from Littlerock Reservoir to Lake Palmdale in an enclosed pipeline via gravity. Because this Project will remove the existing slide gate at the downstream end of the Littlerock Creek siphon, flow will solely be controlled at the existing valve house at the base of the Littlerock Dam. The valve house contains twin 16-inch diameter pipelines with meters and gate valves that have a free discharge into a debris basin, which is open to atmospheric pressure (constructed in 1994, see Figure 7-1). The water exits the same debris basin which was expanded per the as-built plans dated 1996, and flows over a weir into an existing 54-inch diameter HDPE pipe (Figure 7-2). From as-built data, the debris basin outfall weir has a crest elevation of 3145.0 feet NGVD 29, which converts to 3148.0 feet NAVD 88. This elevation is used as the maximum upstream hydraulic grade line (HGL) allowed at 60 cfs.

Broad-crested weir calculations show that a flow of 60 cfs requires a flow depth of 18 inches over the 12-foot-wide weir. An additional 6-inch allowance for a factor of safety gives a maximum water surface elevation (WSE) of 3150.0 feet within the debris basin. Note that at a WSE of 3147.5 feet, it appears water may back up through a sump drain into the valve room, meaning that high flows may result in standing water in the valve room. The maximum WSE results in 4.5 feet of freeboard under the debris basin rim elevation of 3154.5 feet.

The downstream boundary condition is assumed to be a free outfall at the location of the existing flow measurement weir, at an elevation of 2825 feet per the elevations shown in the 2010 pipeline drawings. Here, the flow enters the final 3-foot by 6-foot culvert that flows into Lake Palmdale. This culvert is not included in the model.

The pipeline system will have 3 interconnections, one of which is included in the model, as follows:

• An outlet for LRCID will be installed at approximately Station 407+50. This outlet is for future deliveries to LRCID and will not be modeled.

- An inlet coming off the State Aqueduct will be installed at approximately Station 175+00. This inlet will be sized for a maximum flow of 20 cfs, and will only be used when the new Pipeline is not conveying water from Littlerock Reservoir. Therefore, this inlet is not modeled, as pipeline operations downstream of this connection will fall within the range of scenarios modeled for baseline conditions.
- A receiving interconnection with AVEK exists under Sierra Highway, within the existing culvert structure. This interconnection can receive up to 6 cfs, and will be retained. Therefore, this interconnection is modeled by adding 6 cfs to the maximum flow rate downstream of the interconnection at Sierra Highway, for a total design flow of 66 cfs.

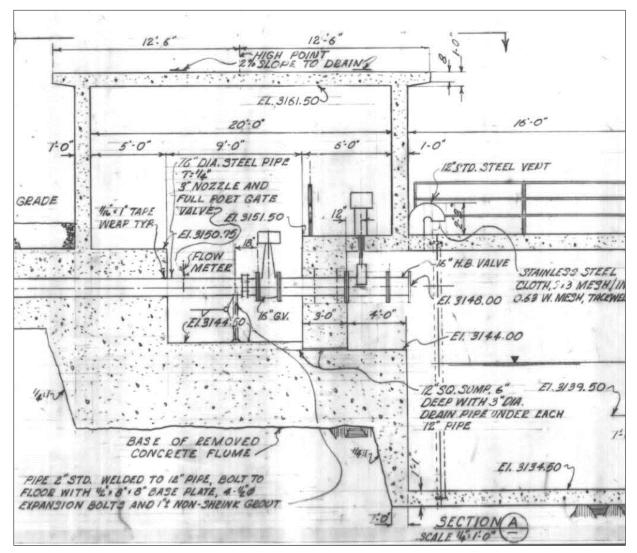


Figure 7-1: Section of Valve House at base of Littlerock Dam (1994)

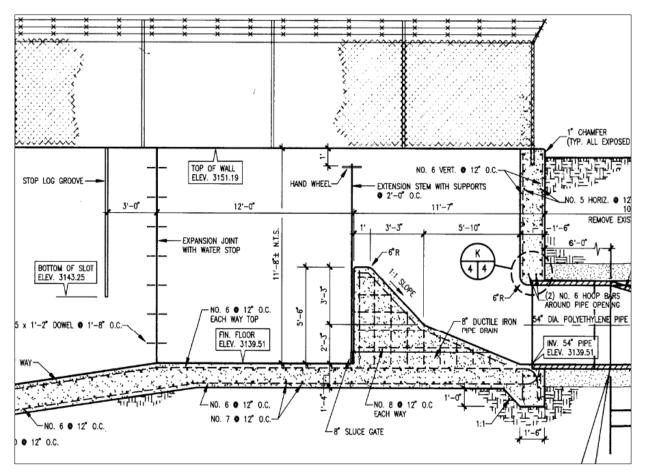


Figure 7-2: Debris Basin Outlet Weir Section (1996)

# 7.2 Model Development

This section discusses the scope of the hydraulic model, model development and assumptions, model scenarios, and validation via hand calculations.

### 7.2.1 Scope

The scope of this modeling effort includes the entire conveyance system from the debris basin at Littlerock Dam to the Lake Palmdale outfall. Although some sections of the system are not being improved as part of this Project scope, all sections of the system were modeled to ensure acceptable hydraulic performance of the system as a whole. This system is composed of the following sections (upstream to downstream):

- 1. Dam outlet to Littlerock Creek Siphon 2.4 miles of pipeline installed in 1996
- 2. Project Reach 1 7.3 miles of existing canals, tunnels, and culverts
- 3. MetroLink Railroad / Sierra Highway Culvert
- 4. Sierra Highway to Lake Palmdale 3,800 feet of pipeline installed in 2010
- 5. Project Reach 2 450 feet of existing earthen channel



See Figure 7-3 for a map of the modeling scope.

Figure 7-3: Model Network

### 7.2.2 2021 Hydraulic Model Development

A hydraulic model was developed for the 2021 Feasibility Study to (1) confirm that the ditch could be converted to a pipeline, and (2) find the smallest diameter pipe that could convey the maximum flow of 60 cfs via gravity. This model network was built using the 1991 survey data as well as record drawings of the ditch-to-pipeline improvements at the north and south ends of the project. For the surveyed section of ditch, the new pipe invert elevation was assumed to be the surveyed ditch invert. The uppermost ditch section was modeled using 54-inch diameter HDPE pipe as shown in the 1994 as-builts, and the section between Sierra Highway and Lake Palmdale was modeled with 48-inch diameter RCP as shown in the 2010 as-builts. The model was built using Infoworks ICM due to the presence of both pressurized and open channel pipe flow regimes. This 2021 model was used as a starting point for the updated baseline model used in this analysis.

### 7.2.3 Infoworks ICM

Infoworks ICM is a one-dimensional (1-D) hydraulic model which is commonly used to model open-channel and pressurized flows within pipe networks of conduits and nodes. Frictional head loss in the model is calculated using Manning's equation, where pipe wall roughness is represented by Manning's "n" value. Manning's n values used in the model for various conduit materials are shown below in Table 7-1. Due to the nature of designing a new pipeline and the lack of flow level data from the existing pipeline reaches, these roughness values could not be calibrated, and industry standard roughness values are assumed for design. Multiple sources were consulted to arrive at these values, including the "Civil Engineering Reference Manual", Lindeburg, 2015. Generally, existing pipes are given higher roughness values due to their age, unknown condition, and possible sediment accumulation.

Table 7-1. Fipe Rough	
Ріре Туре	Manning's "n"
HDPE (existing)	0.011
HDPE (new)	0.009
RCP (existing / lined)	0.013
RCP (new)	0.011
WSP / DIP (existing / lined)	0.013
Corrugated culverts	0.030
Corrugated culverts (lined)	0.020
Existing concrete	0.015

Table 7-1: Pipe Roughness Values

The standard ICM "Full" model solution type is appropriate for modeling gravity flow in pipelines, and was used for the entire model network. There were no instabilities or mass loss in the model results using this solution type. All model scenarios were run using InfoWorks ICM, version 2021.9.0. All simulations assume steady-state flow conditions.

# 7.2.4 Model Assumptions

The model relies on several simplifications and assumptions to facilitate efficient model development while minimizing deviations from physical reality. In general, sections of existing open ditch are modeled as 48-inch diameter RCP. Existing sections of pipe are modeled in their current condition. Existing tunnels and culverts are assumed to be rehabilitated in some form, as described in Table 7-2 below.

Location	Approx. Length (ft)	Size	Material / Treatment
1996 HDPE Pipeline	1,380	48" ID	Existing 54" HDPE – Assume 48" ID (DR 21)
Littlerock Creek Siphon	480	48" ID	Existing 48" DIP
Concrete channel downstream of Littlerock siphon	800	48" ID	HDPE inside existing concrete channel
Cheseboro Road culvert	60	48" ID	Slipline with HDPE
Tunnel 1	380	48" ID	Slipline with HDPE
Tunnel 2	700	48" ID	Slipline with HDPE
Tunnel 3 (Mt. Emma Road)	140	48" ID	Slipline with HDPE
Tunnel 4	675	48" ID	Geopolymer or epoxy spray-applied liner
Steep Section 1 (South of 47 <sup>th</sup> St.)	-	Varies	Assume 21% slope reduced to 10%
47 <sup>th</sup> Street East Culvert	300	48" ID	Geopolymer or epoxy spray-applied liner
Steep Section 2 (North of 47 <sup>th</sup> St.)	-	Varies	Assume 50% slope reduced to 10%
Barrel Springs Culvert 1 (South)	300	48" ID	Geopolymer or epoxy spray-applied liner
California Aqueduct Crossing	590	36" ID	CIPP
Barrel Springs Culvert 2 (North)	160	48" ID	Geopolymer or epoxy spray-applied liner
Pearblossom Highway Crossing	200	48" ID	New RCP trenchless crossing
MetroLink Railway Undercrossing	650	6'x3' 48" ID	<ul> <li>Concrete invert, masonry sides, corrugated roof (550 ft);</li> <li>Twin 48-inch CMP culverts (100 ft);</li> <li>Existing debris is removed</li> </ul>
2010 RCP Pipeline	3,800	48" ID	Includes 24" WSP reach with flow meter

Table 7-2: Model Segment Assumptions

Additional qualitative assumptions for the model are as follows:

- All minor bridges or culverts not mentioned above are assumed to be removed.
- The 1996 pipeline reach and siphon immediately downstream of Littlerock Dam is in good condition, without any significant debris or sediment deposits.
- The 2010 pipeline reach upstream of Lake Palmdale is in good condition, without any significant debris or sediment deposits.
- All flow conditions are steady-state.
- Air entrainment and air accumulation are not considered in the model, but will be considered and addressed as necessary during final design based on the pipe profile and expected HGL.
- Vacuum formation and surge events are not common in gravity systems and are not considered.
- Minor head losses from structure entrances and exits, valves, bends, and other appurtenances are not included in model calculations.

### 7.2.5 Model Scenarios

The ICM model network was run for the scenarios summarized in Table 7-3 below. Each scenario was run at a maximum design flow of 60 cfs (66 cfs downstream of the AVEK connection) and a minimum flow of 20 cfs.

Scenario No.	Scenario Name	Description	Percent 48" RCP	Percent 36" RCP	Percent HDPE
0	2021 Preliminary Model	Exact ditch alignment and profile; all pipe assumed to be 48" dia. RCP	100	0	0
1	Baseline - 48-inch RCP	Base model updated with existing tunnels and culverts sliplined with 48" dia. HDPE	90	0	5
2	Diameter Sensitivity – Opt. A	3.5 miles of 48" pipe reduced to 36" pipe	50	40	5
3	Diameter Sensitivity – Opt. B	4.9 miles of 48" pipe reduced to 36" pipe	30	60	5
4	Pipe Roughness Sensitivity	Scenario 3 pipe type changed to HDPE	0	0	95

Table 7-3: Model Scenarios

#### 7.2.6 Model Validation

Calibration and validation of the ICM model is not applicable to this analysis, as the evaluated pipeline is a proposed future improvement. Model results were instead cross-checked using open channel flow hand calculations. Assuming steady state conditions, flow depth and velocity was calculated for a range of pipe diameters, materials, and slopes, the results of which are presented in Table 7-4 below. These tables were used to confirm the HGLs in the upstream flat section did not overtop the Littlerock Dam debris basin, as well as confirm the highest velocities that may be expected, based on pipe type and diameter.

Velocity (fps)	For n=	0.013	d=	48 ir	า		Veloci	Velocity (fps)		0.013	d=	36 i	n	
			Flow (	cfs)							Flow	(cfs)		
Slope	2	10	20	30	60	66	Slope		2	10	20	30	60	66
0%	0.2	0.8	1.6	2.4	4.8	5.3		0%	0.3	1.4	2.8	4.2	8.5	9.3
0.01%	0.8	1.2	1.6	2.4	4.8	5.3		0.01%	0.8	1.4	2.8	4.2	8.5	9.3
0.02%	1.0	1.6	1.8	2.4	4.8	5.3		0.02%	1.1	1.5	2.8	4.2	8.5	9.3
0.05%	1.4	2.3	2.7	2.9	4.8	5.3		0.05%	1.5	2.3	2.8	4.2	8.5	9.3
0.1%	1.8	2.9	3.5	3.9	4.8	5.3		0.1%	1.9	3.0	3.4	4.2	8.5	9.3
0.2%	2.3	3.7	4.5	5.0	5.8	5.8		0.2%	2.4	3.8	4.5	4.8	8.5	9.3
0.5%	3.2	5.2	6.3	7.1	8.4	8.6		0.5%	3.3	5.3	6.4	7.1	8.5	9.3
1%	4.0	6.6	8.1	9.0	10.9	11.2		1%	4.2	6.8	8.2	9.2	10.7	10.8
2%	5.2	8.4	10.3	11.6	14.1	14.5		2%	5.4	8.7	10.6	11.9	14.1	14.4
5%	7.1	11.6	14.2	16.0	19.6	20.1		5%	7.4	11.9	14.7	16.4	20.0	20.4
10%	9.2	14.8	18.0	20.5	25.0	25.8		10%	9.5	15.4	18.8	21.2	25.7	26.4
20%	11.5	19.0	23.0	26.0	32.0	33.0		20%	12.1	19.5	24.0	27.1	33.0	33.9

Table 7-4: Slope-Velocity Tables

# 7.3 Results and Recommendations

The baseline model confirmed that the entire proposed pipeline system could convey the maximum flow with existing constrictions, assuming the open ditch sections were converted to RCP with a minimum inside diameter of 48 inches. The baseline model results suggested that the limiting factor for pipeline capacity is the uppermost 2.4 miles of canal, which has an average slope of 0.1%, and some sections with slopes as low as 0.04%. Additional model runs showed that the pipe diameter throughout the remainder of the pipeline could be decreased to 36 inches without overtopping the upstream debris basin, due to the large vertical relief in the middle

section of the Ditch's alignment. Tabular results depicting the maximum water surface elevation at the upstream boundary condition as well as maximum pressure exerted on the pipeline for each scenario at the design flow of 60 cfs is summarized in Table 7-5 below.

Scenario No.	Scenario Name	Upstream WSE in Debris Basin (ft)	Maximum Pressure (psi)	Percent of Pipe Surcharged (%)
1	Baseline - 48-inch RCP	3146.0	<5	49
2	Diameter Sensitivity – Opt. A	3146.0	7	63
3	Diameter Sensitivity – Opt. B	3146.0	19	72
4	Pipe Roughness Sensitivity (HDPE)	3144.6	13	62

Table 7-5: Model Results	Summary – Design Flow
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Each scenario was also run at the minimum flow of 20 cfs. For all scenarios, the results were similar, with no surcharging of the pipe occurring (see Table 7-6 below).

	I able 7-6: Model	Results Summary –	· Minimum Flow	
Scenario No.	Scenario Name	Upstream WSE in Debris Basin (ft)	Maximum Pressure (psi)	Percent of Pipe Surcharged (%)
3	Diameter Sensitivity – Opt. B	3143.5	0	0

# Table 7-6: Model Results Summary – Minimum Flow

Additional findings are stated as follows:

- Existing pipeline results:
  - 1996 pipeline: The maximum flow HGL suggests that existing manholes may become surcharged. There is some uncertainty as to the degree of surcharge, due to the flat pipeline grade, unknown pipe condition, and high sensitivity to assumed pipe roughness values.
  - 2010 pipeline: The maximum flow HGL suggests that existing manholes may become surcharged. The 24-inch diameter flow metering constriction at approx. Station 28+00 is expected to raise the HGL by at least 4 feet. Therefore, all 6 manholes above the constriction should be considered vulnerable to surcharging and spilling. The AVEK tie-in location may also become surcharged at high flows. The AVEK pipeline should have enough head that this surcharging should not affect the ability to transfer water.
- Both RCP and HDPE are feasible pipe types from a hydraulic perspective, and can convey the required maximum flow without overtopping the upstream debris basin (Table 7-5). In general, HDPE will have a higher capacity than RCP for an equivalent inside diameter, and will see higher velocities in steep sections due to its smoother walls (Table 7-4). Note that HDPE is often marketed by its nominal diameter, and so may need to be sized up to achieve the inside diameter required. For example, the a 48-inch inside diameter requires a nominal 54-inch HDPE pipe, with a maximum dimension ratio (DR) of 21.

- High flow velocities exceeding 20 fps may be encountered where the existing ditch has slopes exceeding 5 percent. There are three distinct reaches with high velocity concerns, with maximum slopes ranging from 10 to 20 percent. As seen in Table 7-4, these slopes could result in velocities well over 30 fps. It is recommended that these steep sections be graded such that maximum slopes do not exceed 10 percent, which will keep velocities below 30 fps. Below 30 fps, high velocity sections of pipe can be managed by either thickening the pipe lining material or changing pipe material. Additionally, drop or check structures could be used to reduce high velocities.
- The large vertical relief provided by the steep slope sections located in the middle of the project reach (Station 286+00 to Station 122+00) presents an opportunity to reduce the pipe diameter, both to reduce project cost and help alleviate high flow velocities. Results for Scenario 3 show that up to 60 percent of the new pipeline could be reduced to 36 inches in diameter with no impact to the upstream boundary HGL. This option also increases the amount of steep pipe that is surcharged, which effectively reduces the maximum flow velocity in those sections. See Table 7-5 and Figure 7-7.
- None of the realignment options considered will have any major impact on the pipeline HGL. However, the realignments may have positive impacts related to limiting maximum velocities.

A summary of the hydraulic model results by section is provided in tabular format (see Figure 7-4. The HGL for Sections 1 through 4 is provided in Figures 7-5 through 7-8 including the minimum flow HGL for Scenario 3 only, Figure 7-9.

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					Ave. Slope		Scenari All 48" F			DCD: 26" f	Scenar rom Steep Secti			PCD: 26	Scenario 3 from Steep Section	to Deerbl			Scenario 4 " from Steep Section	e to De avhi	
Station						May Valacity	Max Pressure	-	[	Max Velocity			prings I H		Max Pressure Pipe				Max Pressure Pipe		ossom
	Station End	Section #	Section Name	Length (ft)				-	Pipe Type	(fps)		-	Pipe Type		(psi) Dia		Pipe Type	(fps)	(psi) Dia		Pipe Type
430+40	422+40		Concrete Flume	800	0.04%	4.8		48	HDPE	4.8	1.9	48		4.8	1.9	48	HDPE	4.8	1.2	48	HDPE
422+40	413+20		Flat Section 1	920	0.06%	4.8	1.8	48	RCP	4.8	1.8	48	RCP	4.8	1.8	48	RCP	4.8	1.1	48	HDPE
413+20	412+60		Cheseboro Rd Culvert	60	0%	4.8	1.4	48	HDPE	4.8	1.4	48	HDPE	4.8	1.4	48	HDPE	4.8	0.9	48	HDPE
412+60	384+00	1.4	Flat Section 2	2,860	0.04%	4.8	1.4	48	RCP	4.8	1.4	48	RCP	4.8	1.4	48	RCP	4.8	0.C.	48	HDPE
384+00	380+00	2.1	Tunnel 1	400	0.25%	8.6	0.C.	48	HDPE	8.6	O.C.	48	HDPE	8.6	O.C.	48	HDPE	8.6	0.C.	48	HDPE
380+00	372+50	2.2	Flat Section 3	750	0.06%	4.8	0.C.	48	RCP	4.8	O.C.	48	RCP	4.8	0.C.	48	RCP	4.8	0.C.	48	HDPE
372+50	365+50	2.3	Tunnel 2	700	0.21%	7.9	0.C.	48	HDPE	7.9	0.C.	48	HDPE	7.9	O.C.	48	HDPE	7.9	0.C.	48	HDPE
365+50	359+85		Flat Section 4 Tunnel 3 (Mt Emma	565	0.06%	4.8	0.C.	48	RCP	4.8	O.C.	48	RCP	4.8	O.C.	48	RCP	4.8	0.C.	48	HDPE
359+85	358+45	2.5	•	140	0%	4.8	O.C.	48	HDPE	4.8	O.C.	48	HDPE	4.8	O.C.	48	HDPE	4.8	O.C.	48	HDPE
358+45	354+75	3.1	Flat Section 5	370	0.06%	4.8	0.C.	48	RCP	4.8	O.C.	48	RCP	4.8	O.C.	48	RCP	4.8	0.C.	48	HDPE
354+75	347+75	3.2	Tunnel 4	700	0.70%	10.8	1.3	48	RCP-Lined	10.8	1.3	48	RCP-Lined	10.8	1.3	48	RCP-Lined	10.8	0.C.	48	RCP-Lined
347+75	286+00	3.3	Flat Section 6	6,175	(0.4%)	8.8	1.5	48	RCP	8.8	1.5	48	RCP	8.8	1.5	48	RCP	10.5	0.C.	48	HDPE
286+00	276+80	3.4	Steep Section 1	920	(10.0%)	28.2	0.C.	48	RCP	29	6.8	36	RCP	29.0	6.6	36	RCP	33.5	4.0	36	HDPE
276+80	273+30	3.5	47th St E Culvert	350	0.70% 0.59%	10.8	0.C.	48	RCP-Lined	10.8	6.5	48	RCP-Lined	10.8	6.5	48	RCP-Lined	10.8	3.8	48	RCP-Lined
273+30	220+75		Steep Section 2 Barrel Springs	5,255	(10.0%)	28.2	0.C.	48	RCP	29	6.7	36	RCP	29.0	6.5	36	RCP	33.5	3.9	36	HDPE
220+75	217+75		Culvert 1	300	1.10% 2.89%	12.8	0.C.	48	RCP-Lined	12.8	O.C.	48	RCP-Lined	12.8	O.C.	48	RCP-Lined	12.8	O.C.	48	RCP-Lined
217+75	194+60	5.1	Steep Section 3	2,315	(4.15%) 4.19%	20.4	0.C.	48	RCP	20.8	O.C.	36	RCP	20.8	O.C.	36	RCP	25.0	0.C.	36	HDPE
194+60	188+75	5.2	Aqueduct Crossing	585	(12.5%) 0.69%	31.0	2.3	36	WSP-Lined	31.0	2.3	36	WSP-Lined	31.0	2.1	36	WSP-Lined	31.0	2.3	36	WSP-Lined
188+75	142+40		Steep Section 4 Barrel Springs	4,635	(1.3%)	13.6	0.C.	48	RCP	13.6	7.2	36	RCP	13.6	10.0	36	RCP	15.0	4.5	36	HDPE
142+40	140+80		Culvert 2 Pearblossom	160	0.80%	11.4	0.C.	48	RCP-Lined	11.4	1.9	48	RCP-Lined	11.4	5.0	48	RCP-Lined	11.4	1.5	48	RCP-Lined
140+80	135+50	6.3	Reroute Pearblossom Hwy	530	0.10%	4.8	0.C.	48	RCP	4.8	1.5	36	RCP	4.8	4.4	36	RCP	8.5	1.1	36	HDPE
135+50	133+50	6.4	Culvert	200	2.30% 3.3%	16.7	0.C.	48	RCJP	17	TBD	36	RCJP	17.0	TBD	36	RCJP	17.0	0.C.	36	RCJP
133+50	122+00	7.1	Steep Section 5	1,150	(4.0%)	20.4	3.7	48	RCP	20.8	3.9	36	RCP	20.8	18.7	36	RCP	25.0	12.6	36	HDPE
122+00	46+65		Flat Section 7 Lake Palmdale	7,535	0.15%	5.9	3.7	48	RCP	5.9	3.7	48	RCP	8.5	18.7	36	RCP	8.5	12.6	36	HDPE
4+50	0	8.1	Channel	450	0.10%	4.8	0.C.	48	RCP	4.8	0.C.	48	RCP	4.8	0.C.	48	RCP	4.8	0.C.	48	HDPE

Figure 7-4: Hydraulic Model Results by Section

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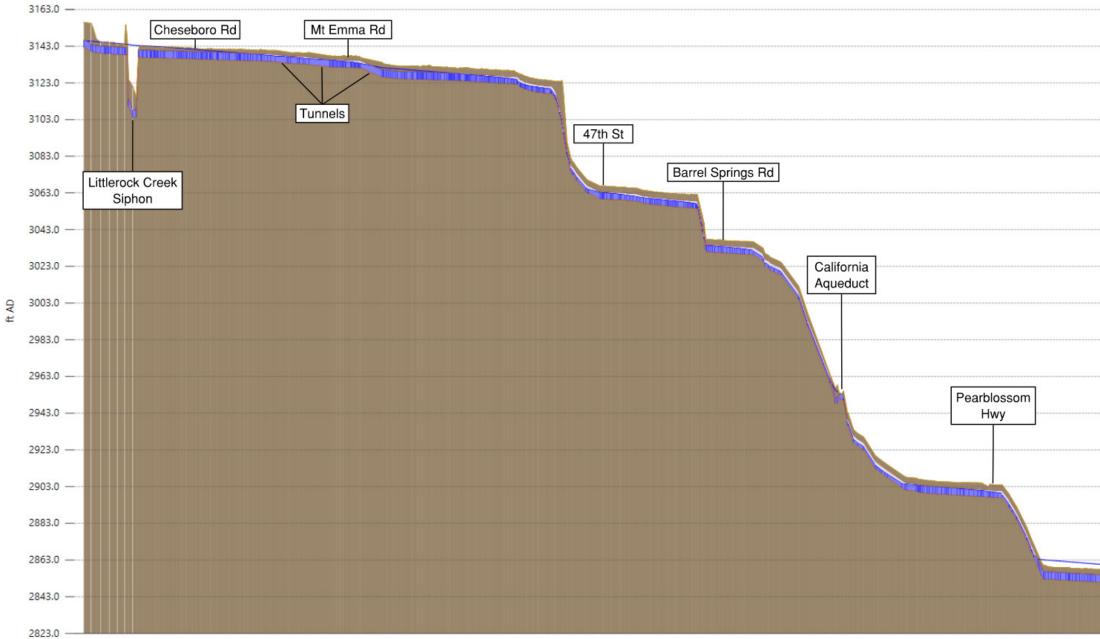


Figure 7-5:Scenario 1 HGL

Lake Palmdale
Sierra Hwy

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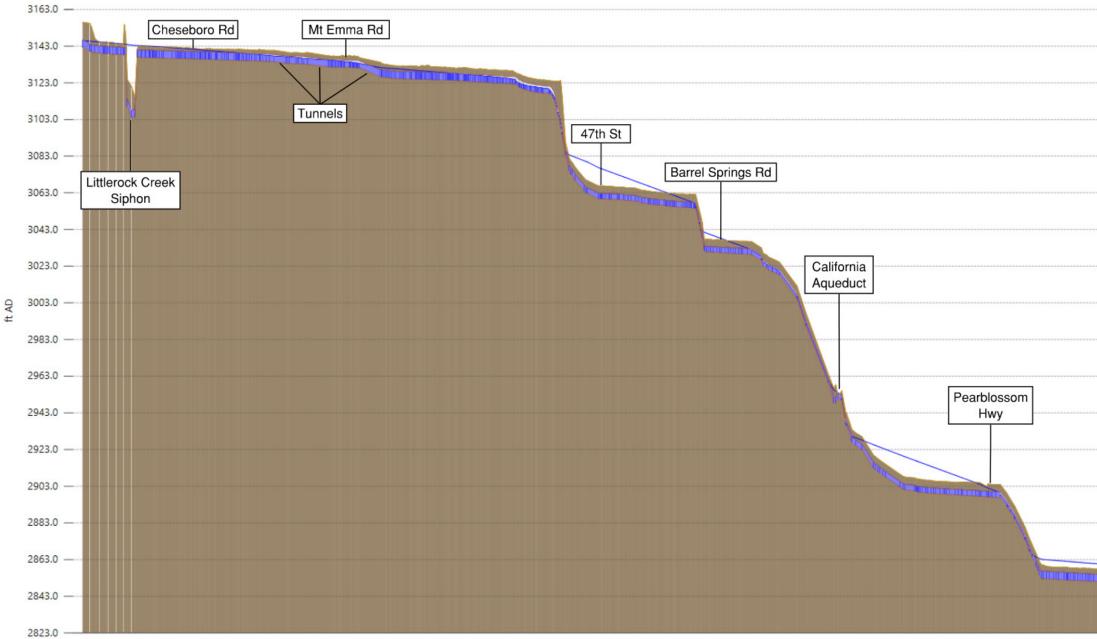


Figure 7-6: Scenario 2 HGL

Lake Palmdale
Sierra Hwy

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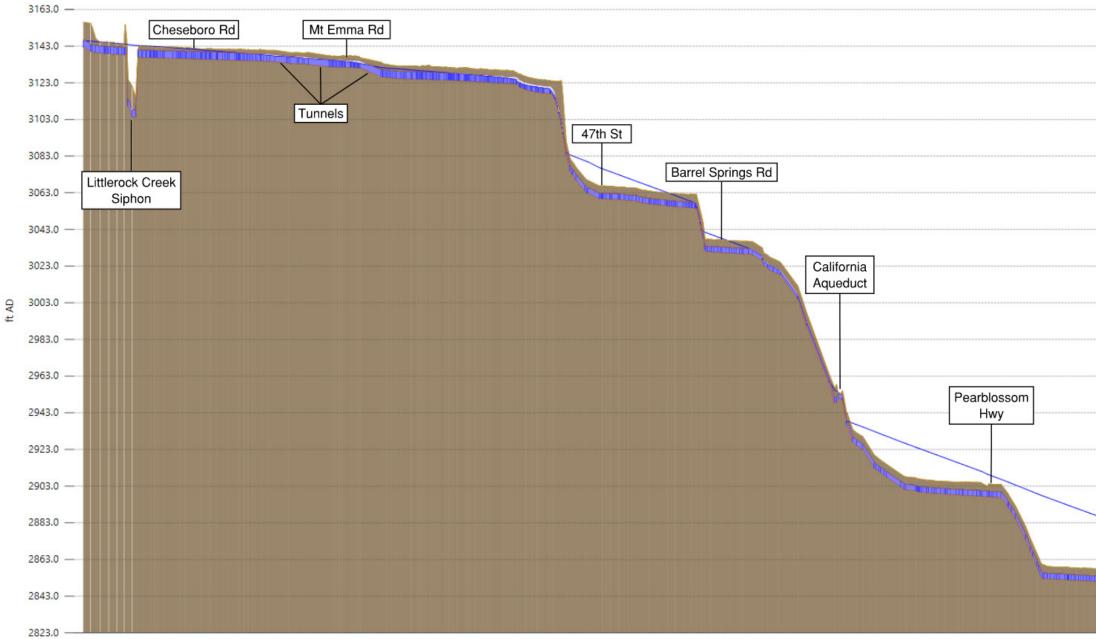


Figure 7-7: Scenario 3 HGL

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Lake Palmdale
Sierra Hwy
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Palmdale Water District

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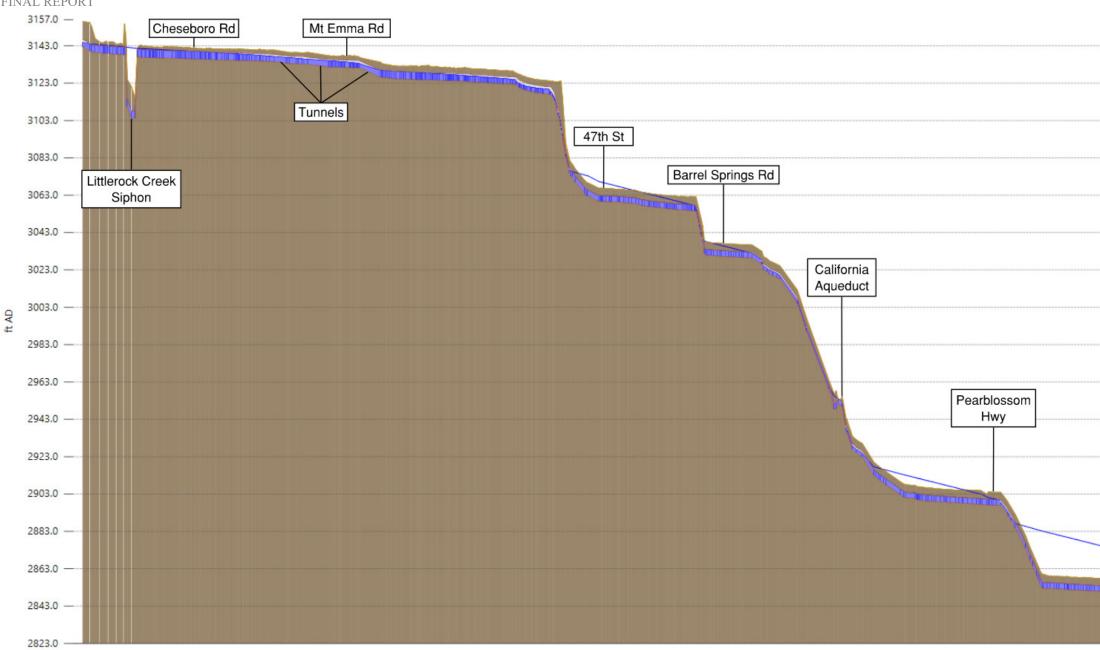


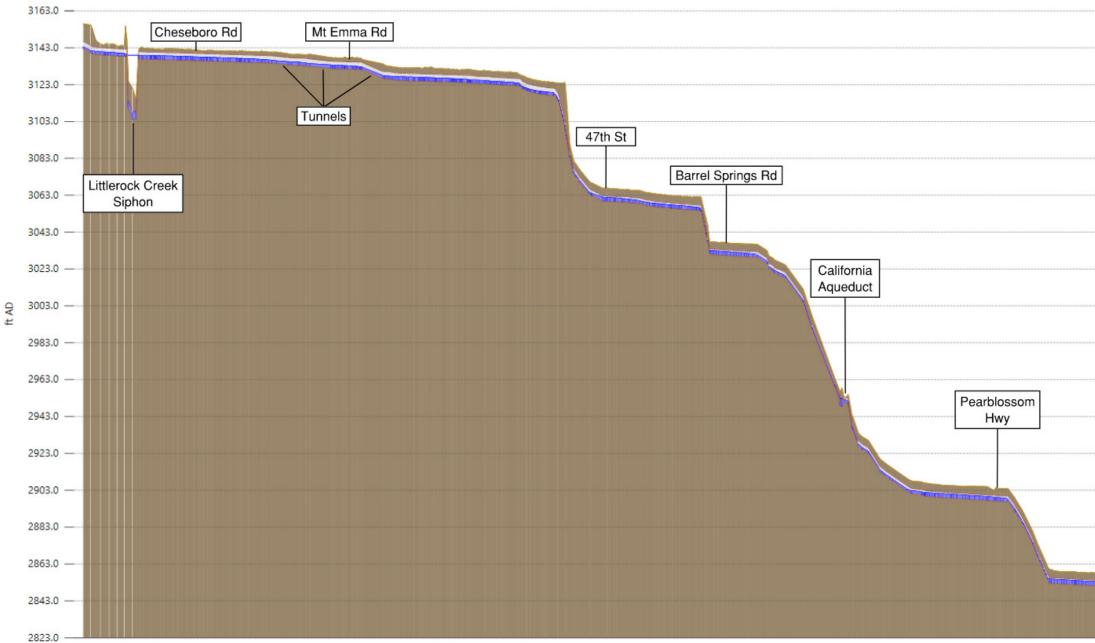
Figure 7-8: Scenario 4 HGL

Lake Palmdale
Sierra Hwy

Palmdale Water District

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# Figure 7-9: HGL at Minimum Flow (Scenario 3)

Lake Palmdale
Sierra Hwy

# 8. Scour Analysis

This section discusses the design approach to mitigating the effects of stormwater where it may cross the buried pipeline alignment.

# 8.1 Stormwater Watershed Overview

The proposed pipeline alignment crosses a number of natural drainage paths and washes which drain watersheds up to 6 square miles in area. The Palmdale area sees little precipitation, but what precipitation it does receive can be high intensity, leading to significant stormwater flows and flash floods. This analysis reviewed the scour potential of all stormwater crossings which drain greater than 0.1 square miles, shown below in Figure 8-1.

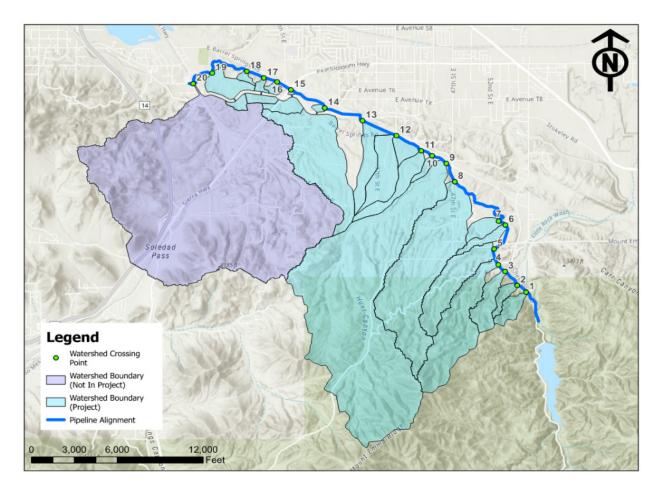


Figure 8-1: Project Watersheds

# 8.2 Scour Analysis

To characterize the threat posed by the washes to the proposed pipeline, Hazen conducted a stream survey and scour analysis. Scour estimates for each source were based off industry-standard empirical relationships to attributes like drainage area, bed material, stream width, and flow volume. These empirical relationships are region- and climate- dependent, and were calibrated to local conditions using data gathered during the stream survey.

Four different sources of scour were estimated to arrive at the total scour estimate. These sources are as follows:

- General scour Scour that could occur from any 2-year storm event.
- Long-term scour A measure of additional scouring caused by infrequent but intense rain events, e.g., the 1% (100-year) storm.
- Bedform scour Scour due to dune rippling in sand-bedded streams.
- Local scour Increased scour around an object in the path of flow.

These scour estimates were added together, and a factor of safety of 1.3 was applied to come to the total scour presented in Table 8-1.

Drainage No.	Watershed Area (Sq. Mi.)	General Scour (ft)	Long- Term Scour (ft)	Bedform Scour (ft)	Local Scour (ft)	Total Scour (ft)
1	0.1	0.4	0.8	0.1	1.1	3.0
2	0.1	0.6	0.8	0.1	1.2	3.6
3	0.2	0.7	0.9	0.2	1.3	4.0
4	0.7	0.8	1.4	0.3	1.5	5.1
5	0.5	0.8	1.2	0.3	1.4	4.8
6	0.1	0.6	0.8	0.1	1.2	3.6
7	0.1	0.6	0.8	0.1	1.2	3.6
8	1.4	0.9	1.7	0.2	1.3	5.3
9	3.6	0.9	2.2	0.1	1.2	5.8
10	0.2	0.7	0.9	0.2	1.3	4.0
11	0.4	0.8	1.1	0.3	1.4	4.6
12	0.3	0.6	1.0	0.0	0.9	3.4
13	0.4	0.8	1.1	0.3	1.4	4.6
14	0.9	0.7	1.5	0.1	1.1	4.4
15	0.1	0.6	0.7	0.1	1.2	3.5
16	0.03	0.6	0.5	0.1	1.1	2.9
17	0.1	0.5	0.7	0.3	1.4	3.7
18	0.03	0.6	0.5	0.2	1.3	3.3
19	0.2	0.6	0.9	0.1	1.1	3.5
20	6.0	1.2	2.6	0.7	1.7	8.1

Table 8-1: Scour Estimates

# 8.3 Scour Mitigation Options

The following options are possibilities for mitigating the threat of scour where the new pipeline crosses active stormwater washes.

- Option 1: Install pipeline below scour depth
- Option 2: Anchored HDPE Crossing
- Option 3: Concrete encasement
- Option 4: Hardened stream crossing
- Option 5: No mitigation

# 8.3.1 Option 1: Install pipeline below scour depth (Recommended)

The most straightforward option to avoid scour impacts to the pipeline is to install the pipeline at a depth such that the crown of the pipeline is below the estimated scour depth. This option is considered the most desirable option for most wash crossings, due to its durability over time, lower cost of implementation, and lower risk. It is anticipated that most wash crossings can meet the scour depth. For locations where estimated scour exceeds 5 feet, or where the pipeline installation depth is otherwise limited, the following three options may be considered.

# 8.3.2 Option 2: Anchored HDPE crossing

Another option for mitigating the effects of scour would be to design the pipeline to withstand scour, undermining, or movement. This could be accomplished by installing a flexible, jointless pipe type such as HDPE across the wash. The pipeline segment would be anchored on either side of the wash crossing to resist pullout forces in case the pipeline is exposed or undermined. After a scour event occurs, the pipeline can be moved back into the proper alignment and re-buried where necessary. This option would substantially increase costs and should be carefully considered before implementing.

### 8.3.3 Option 3: Concrete encasement

In areas where it is not feasible to meet the estimated scour depth, the pipeline may be encased in concrete to avoid direct damage to the pipeline if it were to be exposed due to scour. However, this option may actually exacerbate scour when the encasement is exposed by encouraging local scour. Further, this option would make maintenance or repair of the pipeline much more difficult. This option and its drawbacks should be carefully considered before implementing.

### 8.3.4 Option 4: Hardened stream crossing

A final option to protect the pipeline where scour depth cannot be met is to harden the surface of the stream crossing over the pipeline. This hardening could take multiple forms, including a concrete apron, placed riprap and rock, a polymer mat, or a geotextile. This option has similar

concerns as the concrete encasement option, in that the materials placed to protect the pipeline could actually increase local scour. This option should be carefully considered before implementing.

## 8.3.5 Option 5: No Mitigation

If the potential consequences of scour are determined to be acceptable within the project's defined level of service, the pipeline could be installed through the stormwater washes at standard cover, without any scour protection. In this case, the District would monitor the crossings on an annual basis and after every significant storm event to look for signs of scour. Any scour would be repaired or monitored. Any significant exposure, undermining or other damage to the pipeline would be immediately repaired.

# 8.4 Scour Mitigation Design

The applicability of these mitigation options will be considered on a case-by-case basis for each location during final design.

# 9. Alignment Development

This section describes the background of the existing Ditch alignment, project corridor development, design criteria used during the alternatives evaluation, descriptions of the alignment deviations considered during preliminary design, and a description of our proposed alignment depicted in the preliminary plan and profile sheets included in this PDR as Appendix E.

# 9.1 Background

The Ditch was originally constructed in the 1880s using a curvilinear alignment that follows the existing topography. Based on discussions with PWD and a review of available documentation, the Ditch was not constructed in an easement. Over time, a few sections of the Ditch had easements of varying widths established based on the Ditch centerline. It is PWD's understanding that they have the right to relocate the alignment, within reason, to replace the Ditch with a new pipeline.

Anytime the pipeline alignment deviates from the existing Ditch location, there is a risk of increasing environmental costs and property owner concerns; however, the benefits that may be realized during construction, operation, and maintenance of the pipeline may outweigh the anticipated costs. Therefore, Hazen looked at various horizontal and vertical alignment options to ensure that the proposed pipeline is installed in an alignment that fosters efficient construction, minimizes environmental impacts to the extent feasible, and provides for efficient operation in the built condition.

# 9.2 Alignment Criteria

The following criteria were used to develop an optimized Project alignment.

# 9.2.1 Gravity System Operation

The Ditch has operated without pumps (i.e., by gravity) for over 100 years; therefore, it is a primary Project objective to keep PWD's operational costs down and ensure that the new pipeline also operates by gravity. Although the location of the new pipeline is not restricted by the limits of an existing easement, it is apparent that locating the pipeline generally along the existing alignment allows the new pipeline to follow the existing topography and operate without the addition of pumps. The farther the proposed pipeline alignment strays from the existing Ditch, the greater the chances that gravity flow becomes less feasible.

# 9.2.2 Hydraulic Considerations

Minimum and maximum slopes were evaluated during alignment development due to the range of acceptable flow velocities and flowrates being considered. Minimum slopes dictate maximum

flowrates for flatter pipeline sections while maximum slopes help to ensure flow velocities do not get too high and introduce concerns related to corrosion/scouring of the proposed pipe invert.

## 9.2.2.1 Minimum Slopes

Segments of the existing Ditch use a minimum slope of approximately 0.1%, with some segments being slightly flatter. Knowing that the new pipeline will greatly reduce the Manning's "n" value experienced by the flow which will improve the hydraulic capacity at a similar slope, we have attempted to maintain a minimum slope of 0.1% where feasible. This slope is understood to convey a range of flows from 20 to 66 cfs at acceptable velocities so long as sufficient upstream head is provided.

## 9.2.2.2 Maximum Slopes

The steepest section of the existing Ditch is approximately 20%. While the existing Ditch has operated for over a century at this slope, the proposed maximum flowrate will be increased by three times what is currently conveyed. Limiting the maximum slope to 10% or less is expected to maintain velocities below 30 cfs and help mitigate the concern related to high flows at high velocities eroding the inside of the pipe.

## 9.2.2.3 Siphons

While the system generally follows the existing topography, the original Ditch required the use of two aerial flumes to avoid siphons. In 1996, the aerial flume just downstream of the Littlerock Dam was demolished and replaced with a buried siphon beneath Littlerock Creek. The other remaining aerial flume exists in a remote area between Sierra Highway and Pearblossom Highway. Since the siphon near Littlerock Dam appears to have performed successfully for the last 30 years, we propose that this remaining flume now be demolished and replaced with another buried siphon as part of this Project. The installation of this siphon also allows some flexibility regarding the minimum slopes for the section of pipe upstream of this area.

### 9.2.3 Stormwater Flow Paths

Based on the site visit and desktop review, it appears the Ditch has intercepted stormwater runoff from various watersheds and culverts since its construction over 100 years ago. Therefore, converting the Ditch to a buried pipeline will allow stormwater to return to its natural flow path. As such, the pipeline alignment has been designed to provide sufficient cover to allow stormwater runoff to flow over the buried pipeline.

### 9.2.4 Depth of Trench

In general, the proposed alignment will adhere to PWD's request to keep the depth to the bottom of the trench to 8 feet. This depth of trench assumes a minimum cover of 3 feet and a 5-foot outside pipeline diameter (for a 48-inch diameter pipe). Limiting the depth of the trench provides PWD staff the ability to perform future repairs using reasonable effort with standard equipment.

However, in certain locations, the depth of the existing Ditch invert compared to the top of the adjacent earth side slopes is greater than 8 feet. Conversely, some segments of the Ditch are fairly shallow, which will either require the new pipeline to be relocated farther into the existing hillside to achieve sufficient cover, or steeper sections of the Ditch may need to be flattened out. Due to the existing topography, as well as the concern of scour where the pipeline will cross existing stormwater flow paths, these adjustments may cause trench sections to be deeper than the requested 8-foot maximum.

### 9.2.5 Minimum Pipeline Radii

As discussed within our pipe material evaluation above, maintaining proximity to the existing curvilinear alignment requires a pipe that can navigate several curves. Assuming gasketed RCP is the pipe material installed, standard radii of 22.5 feet, 45 feet, and 90 feet have been used to lay out the alignment. To avoid the need for custom fabrications, additional radii were not considered unless the added cost was considered worth the added value provided to PWD.

## 9.2.6 Earthwork Requirements

Placing the new pipeline within the existing Ditch requires a multi-step process to provide adequate trench support. In general, the Ditch would need to be demolished (where concrete exists), vegetation would need to be cleared, the Ditch would need to be filled in and compacted, and then a new trench would be excavated in the fill material. Moving the alignment outside of and parallel to the Ditch would allow the contractor to excavate a new trench without the initial demolition, fill, and compaction, ultimately limiting the amount of import material required.

### 9.2.7 Environmental Considerations

Existing environmental considerations such as the presence of wetlands, species habitat, and Western Joshua Trees have been taken into consideration to the extent feasible during alignment development so as not to adversely affect the environment more than is necessary or can be mitigated.

# 9.3 Corridor Development

Due to the possibility of deviating from the existing alignment, a final project corridor needed to be developed prior to performing any field investigations or environmental evaluations. The corridor is defined as the geographic envelope which encompasses all possible pipeline alignments. The purpose of the corridor was to 1) set the limits of environmental field investigations, 2) finalize boring locations, and 3) finalize aerial topo coverage area.

The initial evaluation consisted of a desktop review of the following resources:

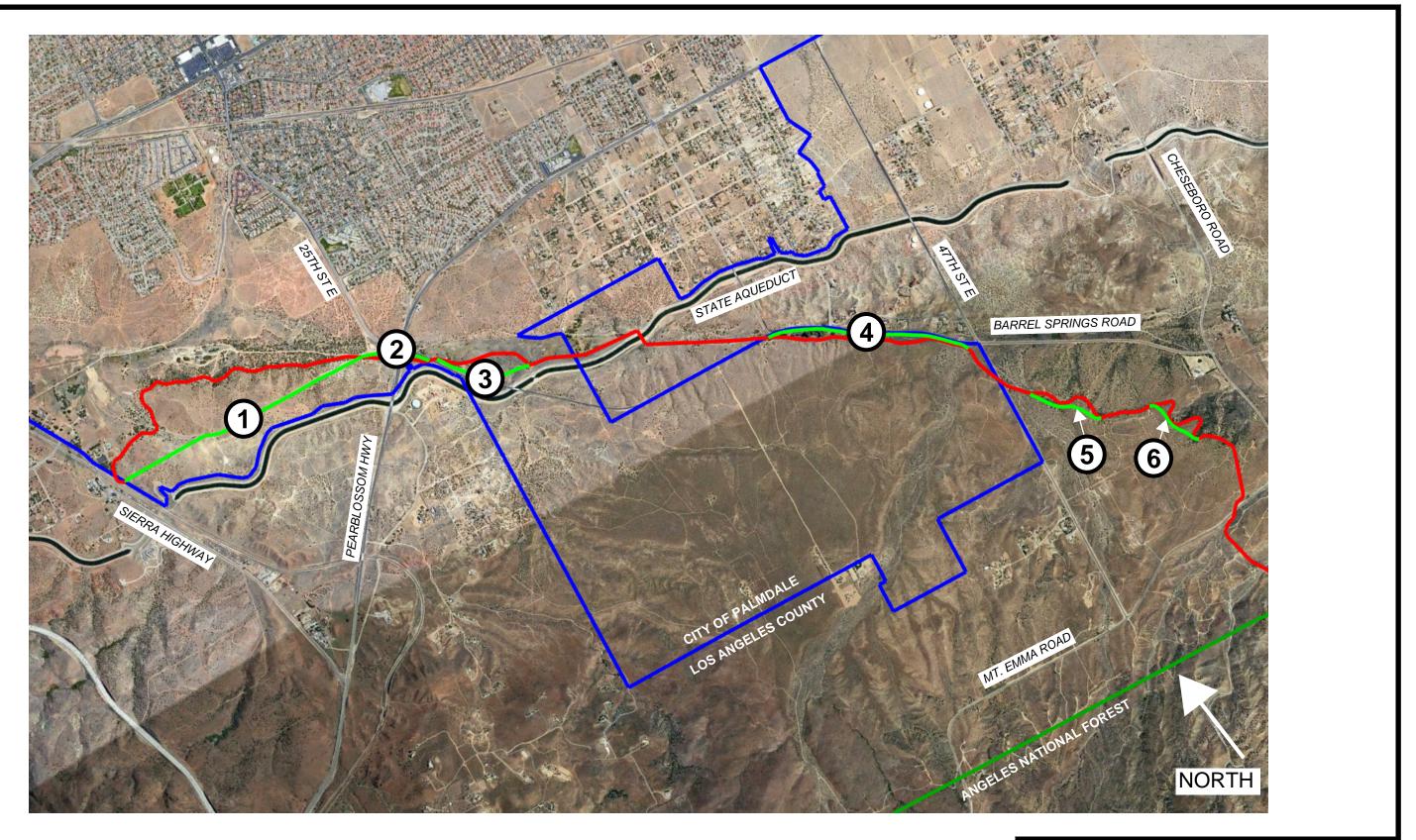
- 1. Contour data obtained from the United States Geological Survey (USGS)
- 2. NearMap aerial imagery provided by PWD
- 3. As-built information summarized earlier in this PDR.

The evaluation was necessary to ensure that any alignment modifications made during the design process would be adequately covered with all field investigations.

The original scope assumed that a 300-foot-wide corridor centered on the existing ditch would be sufficient. However, initial review of potential pipe alignments using the references listed above suggested that portions of the new alignment may extend beyond those limits due to required pipeline cover, pipeline slope, and overall horizontal and vertical alignment optimization.

This high-level alignment evaluation identified six options that were initially thought to possibly warrant significantly deviating from the existing Ditch alignment. Those options are depicted in Figure 9-1 and described below.

- Option 1: 5,900 feet located between the existing MetroLink tracks and 25<sup>th</sup> Street East
- Option 2: 1,500 feet between the entrance to the Barrel Springs Trail, crossing Pearblossom Highway, terminating at Barrel Springs Road.
- Option 3: 2,200 feet located between E. Barrel Springs Road and the portion of ditch parallel to the Aqueduct
- Option 4: 4,500 feet located along E. Barrel Springs Road from 40<sup>th</sup> Street East to 47<sup>th</sup> Street East
- Option 5: 1,700 feet located east of 47<sup>th</sup> Street East
- Option 6: 1,400 feet located north of the existing overhead electrical transmission facilities near the portions of the Ditch that currently follow a "switchback" alignment.





LEGEND:

PALMDALE CITY LIMITS US FOREST SERVICE BOUNDARY INITIAL REALIGNMENT OPTION

# FIGURE 9-1 REALIGNMENT OPTIONS OVERVIEW

# PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

The initial desktop evaluation determined that Locations 2 through 6 were worthy of further consideration, and the overall Project corridor was expanded to include these additional areas. Although Location 1 had the most potential to save on construction costs, it was not recommended for further evaluation due to the existing topography, hydraulic concerns, operational considerations, and additional property rights coordination.

Key considerations used during final corridor development are summarized in Table 9-1 below. The cost savings outlined below only consider the anticipated net reduction in pipe length at an estimated installed cost of \$450 per foot for 48-inch diameter RCP.

Option No.	Approx Net Length Reduction (ft)	Approx. Cost Savings (\$)	Max Trench Depth w/out New High Points (ft)	Approx Max Distance from Ex Ditch (ft)	Affects New Parcels?	Include in Corridor?
1	1,600	720,000	75	1,580	Yes	No
2	n/a	n/a	15	120	No	Yes
3	55	25,000	13	290	No	Yes
4	110	50,000	8	240	No	Yes
5	n/a	n/a	12	150	No	Yes
6	500	225,000	23	800	No	Yes

#### Table 9-1: Summary of Realignment Options During Corridor Development

On September 28, 2023, PWD staff approved the final project corridor via email as recommended by Hazen, which increased the project corridor from the initially estimated 275 acres to 338 acres. This was an approximate increase of 23% from the initial 300-foot-wide corridor to be evaluated with field investigations and desktop studies. This corridor was communicated to Arrow Engineering Services, Inc. (AES, surveyor), Bruin Geotechnical Services, Inc. (Bruin), and Rincon Consultants, Inc. (Rincon, environmental subconsultant) for their use in finalizing their respective field work plans, and the corridor became the Area of Potential Effects (APE) for all environmental evaluations. See Figure 9-2 for an illustration of the final Project corridor.





LEGEND:

PALMDALE CITY LIMITS

US FOREST SERVICE BOUNDARY

SHEET 1 OF 2

PALMDALE DITCH CONVERSION

PALMDALE WATER DISTRICT

FIGURE 9-2 FINAL PROJECT CORRIDOR





LEGEND:

PALMDALE CITY LIMITS

US FOREST SERVICE BOUNDARY

SHEET 2 OF 2

PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

# FIGURE 9-2 FINAL PROJECT CORRIDOR

# 9.4 Proposed Alignment Deviations

Once the corridor was established, a detailed evaluation of Options 2 through 6 was performed to determine final feasibility and suitability to meet Project objectives (as discussed in Section 9-3, Option 1 was removed from consideration prior to establishing the corridor). The results of the detailed evaluation are summarized below.

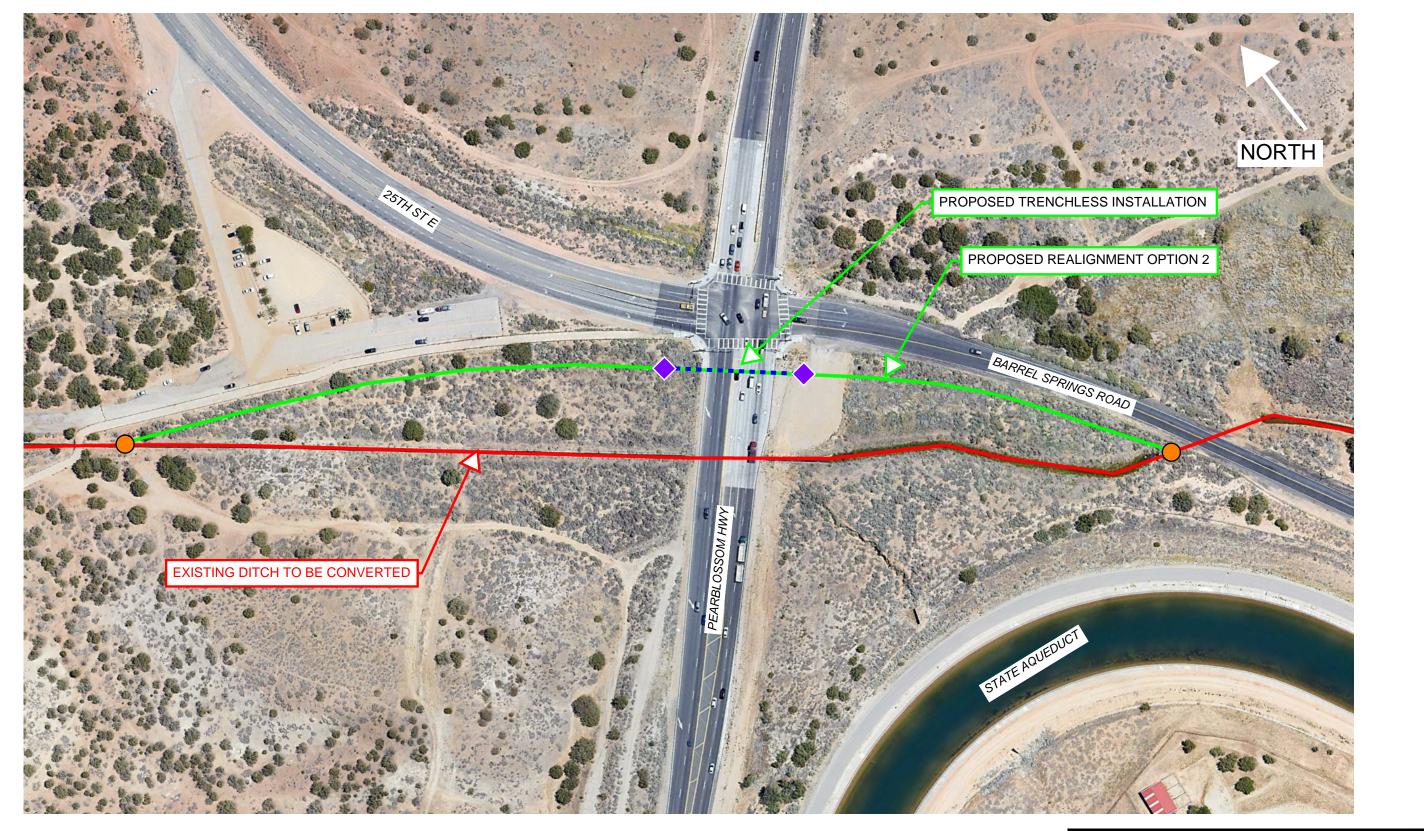
### 9.4.1 Option 2: Pearblossom Highway Crossing and Adjacent Segments

The Ditch currently runs through the middle of a triangular-shaped parcel at the southeast corner of the intersection of Pearblossom Highway and Barrel Springs Road. PWD has suggested that the proposed alignment be shifted north out of the middle of this parcel to more closely parallel Barrel Springs Road. Because the culverts beneath Pearblossom Highway and Barrel Springs Road need to be replaced to meet both capacity and depth requirements, relocating this segment of the pipeline is feasible and has been included in the final Project alignment. This relocation will involve shifting approximately 1,500 feet of the existing alignment towards Barrel Springs Road and 25<sup>th</sup> Street East, extending from approximately 860 feet west of Pearblossom Highway to approximately 640 feet east of Pearblossom Highway.

This alignment alternative is depicted in Figure 9-3.

## 9.4.2 Option 3: Bear Creek Road to Barrel Springs Road

The portion of the Ditch north of the State Aqueduct and east of Barrel Springs Road is an earthen channel that becomes extremely shallow and crosses a major stormwater flow path. Although it was believed that shifting this portion of the alignment up to 500 feet to the south could remove bends and improve access, the existing topography would require a trench over 20 feet deep to cut through an existing high point in the terrain. Therefore, the pipeline will still likely shift to the south to provide sufficient cover, but it will not be a significant deviation from the existing alignment.





LEGEND:

APPROXIMATE PROPOSED MANHOLE

APPROXIMATE JACKING OR RECEIVING PIT

# FIGURE 9-3 REALIGNMENT OPTION 2

# PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

#### 9.4.3 Location 4: East Barrel Springs Road West of 47<sup>th</sup> Street East

Documents indicate that Barrel Springs Road has been established with a 100-foot-wide right-ofway west of 47<sup>th</sup> Street East. The road is currently a two-lane road with wide unpaved shoulders. After reviewing documents and discussing this right-of-way with the City, it is understood that the north half of the right-of-way is in County jurisdiction while the south half of the right-ofway is in the City's jurisdiction. PWD also operates a water quality monitoring station that connects to PWD's Well 18/19 site along East Barrel Springs Road. Rather than locate the pipe south of the current Ditch which presents difficult terrain and would require deep installation depths while also crossing various surface drainage courses, placing the pipe within the East Barrel Springs Road right-of-way provides the following benefits:

- Provides easier access for any necessary future repairs
- Locates the pipeline closer to PWD's Well 18/19 facility for water quality station reinstatement
- Straightens the alignment for more efficient hydraulics and operations
- Avoids the private memorial that exists along the existing Ditch

Placing the pipeline in the right-of-way requires the existing 48-inch diameter RCP culvert beneath East Barrel Springs Road at 40<sup>th</sup> Street East to be replaced at a deeper elevation to provide sufficient cover over the proposed pipeline. It also requires additional manholes to accommodate the existing curvilinear roadway. The City has expressed some concern about allowing the pipeline to be placed within the right-of-way due to the possibility of conflicting with potential future improvements that are currently unknown.

We have generated Figure 9-4 to illustrate the conceptual location of the water line in this area. The figure illustrates approximately how this location translates to existing conditions. This overall realignment option is depicted in Figure 9-5.

We will discuss this concept in more detail with the City as the design progresses.

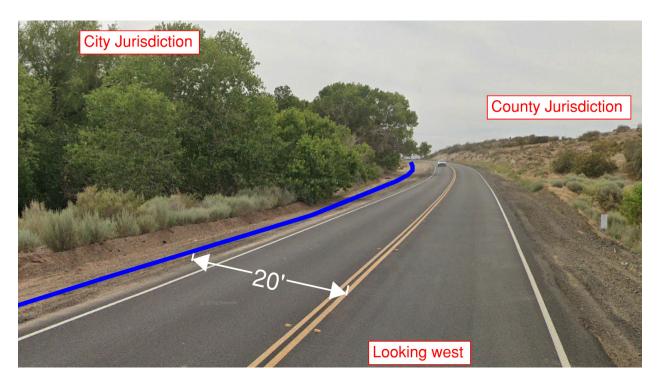
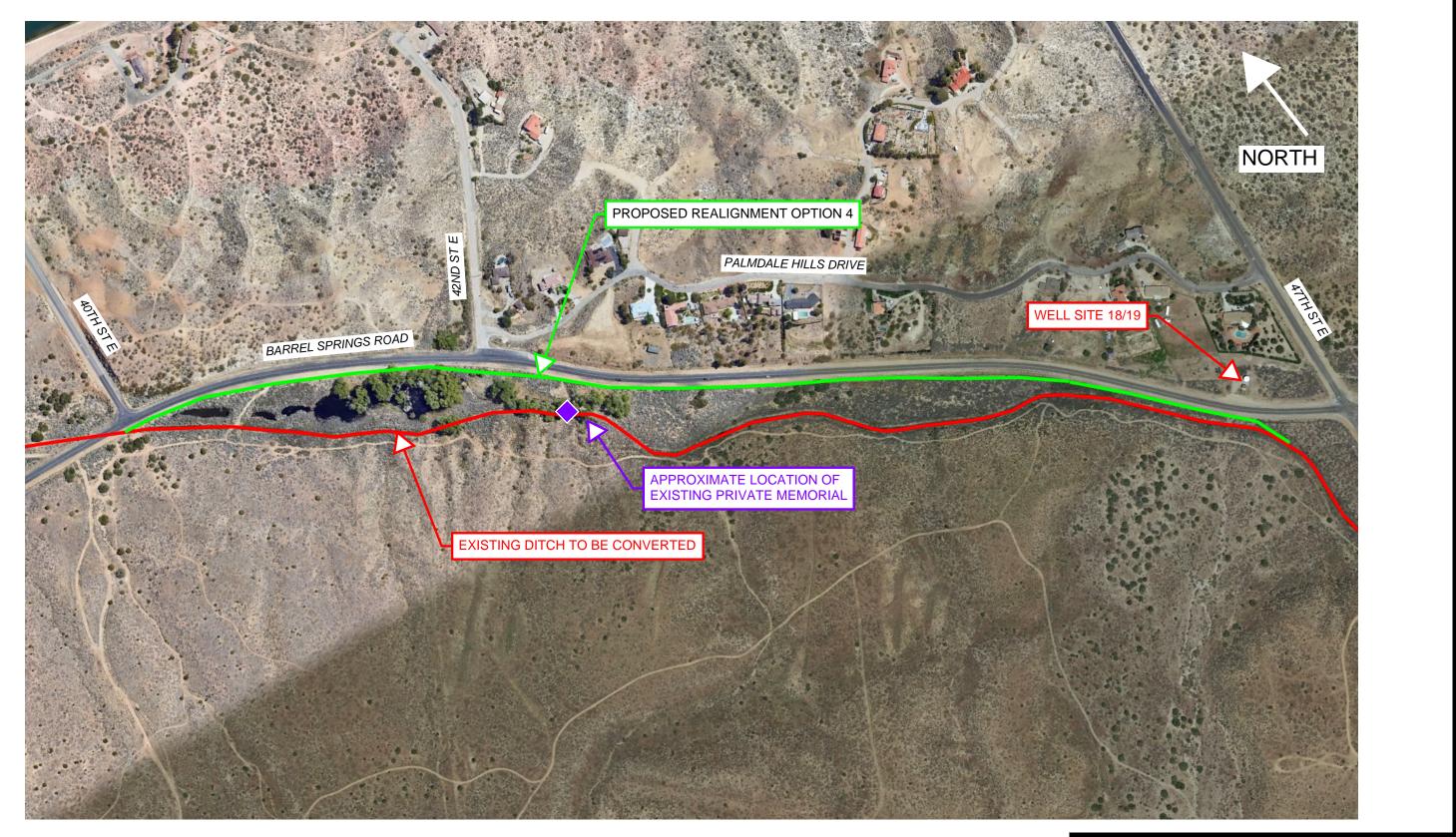


Figure 9-4: Barrel Springs Road - Pipeline In Shoulder





PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

> FIGURE 9-5 REALIGNMENT OPTION 4

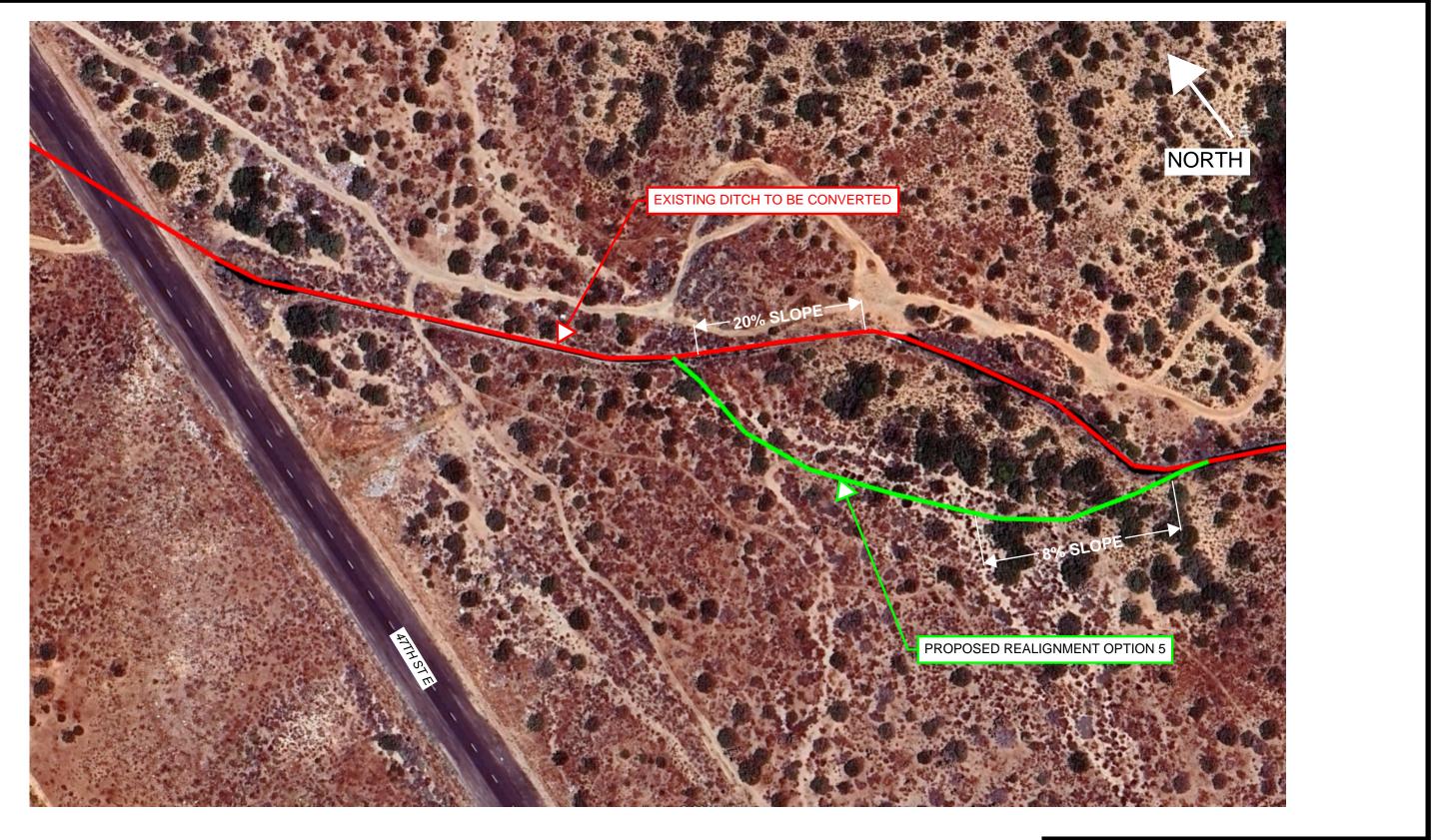
#### 9.4.4 Location 5: Flattening the Steepest Segment

The Ditch currently flows down a particularly steep segment with an approximate slope of 20%. This is due to the steep existing terrain. In general, the piped system is going to experience high velocities that need to be mitigated along the alignment. Therefore, flattening the slope of this segment is one component necessary to reduce system velocities to acceptable levels. Preliminary topographic information suggests that a gentler slope exists farther to the south where flatter pipe slopes may be more feasible. Note that, per the October site visit, there are several Western Joshua Trees that exist in this general area that will need to be avoided or removed, which would require mitigation should this alternative be implemented.

This alignment alternative is depicted in Figure 9-6.

#### 9.4.5 Location 6: Switchbacks west of Cheseboro Road

Initially, Hazen investigated straightening out the alignment in this area of the Project. However, in order to avoid using any siphons, the existing topography dictates that the trench depth would exceed 15 feet in some cases. Once it was confirmed that RCP could be installed along curves tight enough to follow the existing Ditch, the concept of removing the switchbacks was no longer considered a preferred option.





# FIGURE 9-6 REALIGNMENT OPTION 5

PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

# **10. Proposed Project Definition**

This section describes the overall project scope, including the segments to be realigned as summarized above, the segments to be installed using trenchless methods, and the segments proposed to be rehabilitated in place. See Appendix E for the full set of preliminary plan and profile sheets.

# 10.1 Level of Service

When there is potential for a seismic event to impact a pipeline where the pipeline crosses a fault line or where a pipeline traverses a slope that experiences movement as the result of a seismic event, setting the pipeline's seismic performance level, or Level of Service (LOS) using the American Lifeline Alliance (ALA) Seismic Guidelines for Water Pipelines (March 2005) is a common industry practice. These Guidelines provide a cost-effective approach to the seismic design of water pipelines by establishing a seismic return interval (see the geotechnical report in Appendix D for a table of return intervals) based on the selected pipe function class shown in Table 10-1 below.

Table 10-1: American Lifelines Alliance Pipe Function Classes		
Pipe Function Class	Seismic Importance	Description
I	Very low to none	Pipelines that represent very low hazard to human life in the event of failure. Not needed for post-earthquake system performance, response, or recovery.
		Widespread damage resulting in long restoration times (weeks or longer) will not materially harm the economic wellbeing of the community.
II	Ordinary/Normal	Normal and ordinary pipeline use, common pipelines in most water systems. All pipes not identified as Function Class I, II, IV.
Ш	Critical	Critical pipelines serving large numbers of customers and present significant economic impact to the community or a substantial hazard to human life and property in the event of failure.
IV	Essential	Essential pipelines required for post-earthquake response and recovery and intended to remain functional and operational during and following a design earthquake.

Table 10-1: American Lifelines Alliance Pipe Function Classes

While the new pipeline will convey raw water to Lake Palmdale for treatment and subsequent distribution to the public, it will be serving the same purpose as the existing ditch and will be subject to the same seismic risks as the ditch; therefore, PWD has determined that the new pipeline falls under the Pipe Function Class I and as such, does not require specific seismic design or mitigation measures. Should the pipeline fail following a seismic event, PWD crews will respond and make necessary repairs to reinstate the pipeline. Hazen and PWD have discussed keeping a certain amount of extra pipe segments on-hand in case any segments need to

be replaced. The exact amount of pipe to be kept on-hand will be discussed with PWD during final design and included in the pipe procurement for the Project.

## **10.2 Alignment Overview**

Based on the alignment alternatives described above, the preliminary design plans illustrate a proposed alignment that meets all the required design criteria as well as the installation requirements of RCP pipe while generally following the existing Ditch as much as possible. The minimum radius will generally be 90 feet unless a tighter radius of 45 feet or 22.5 feet is required. Where longer radii are required, mitered pipe using a 5-degree deflection will be used at various intervals. Where harsher angular deflections are required, a manhole will be used to accommodate the angle. Deflection of gasketed RCP joints is not recommended by the manufacturer.

Table 10-2 below summarizes the extents, lengths, construction methods, and sizes proposed for the Project.

Approx Start Station	Approx End Station	Length (ft)	Method	Size and Material	Notes
50+00	137+00	5,350	Open-Cut	48" RCP	Siphon replaces flume from 103+50 to 104+80
137+00	138+50	150	Bore/Jack	48" RCP	Pearblossom Hwy crossing
138+50	191+50	5,300	Open-Cut	48" RCP	
191+50	195+50	400	Rehab	36" SIPP/CIPP	Aqueduct crossing
195+50	275+50	8,000	Open-Cut	48" RCP	
275+50	279+00	350	Rehab	48" SIPP/CIPP	47 <sup>th</sup> St E culvert
279+00	351+00	7,200	Open-Cut	48" RCP	
351+00	358+00	700	Rehab	48" SIPP/CIPP	Existing pipe beneath transmission power line north of Mt. Emma Road
358+00	361+50	350	Open-Cut	48" RCP	
361+50	363+00	150	Rehab	48" HDPE	Slipline Tunnel #3
363+00	368+75	575	Open-Cut	48" RCP	
368+75	375+75	700	Rehab	48" HDPE	Slipline Tunnel #2
375+75	383+75	800	Open-Cut	48" RCP	
383+75	387+25	450	Rehab	48" HDPE	Slipline Tunnel #1
387+25	416+00	2,875	Open-Cut	48" RCP	
416+00	416+50	50	Rehab	48" HDPE	Slipline Cheseboro Road undercrossing
416+50	425+00	850	Open-Cut	48" RCP	
425+00	434+00	900	Rehab	54" HDPE	Placed inside existing concrete channel with concrete cap
TBD	TBD	450	Open-Cut	48" RCP	At Lake Palmdale

Table 10-2: Project Segment Summary

May 2024

# 10.3 Open-Cut Installation

Open-cut construction will involve the installation of RCP in accordance with ASTM standards and American Concrete Pipe Association (ACPA) guidelines. Trench bedding will be approximately 6 inches thick while backfill material will either be imported aggregate, suitable native material, native slurry backfill, or imported controlled low-strength material (CLSM), to be determined during final design. The trench for a 48-inch diameter pipe is expected to have an approximate width of 8 feet.

Existing sections of concrete Ditch or mortar/cobbles may need to be demolished prior to pipeline installation. A suitable trench bottom will need to be established and any existing rock outcropping will need to be removed prior to placing bedding. Compaction of backfill and pavement restoration within vehicular areas will conform to City or County standards while compaction in unpaved, non-vehicular areas will only be as necessary to protect the pipeline. All earthwork operations will comply with the recommendations in the geotechnical report.

# **10.4 Trenchless Installations**

There is currently only one pipeline segment that is expected to be installed using trenchless methods. As described in Section 6.3.2 above, the crossing of Pearblossom Highway will be installed using a two-pass auger boring method. The crossing will involve the installation of a 48-inch diameter carrier pipe within a 60-inch diameter steel casing. As the design advances, provisions for utility identification, settlement monitoring, vertical clearances and the casing/pipe profile will be incorporated into the design.

# 10.5 Slipline Installation

To ensure a 50-year design life for the existing tunnels and undercrossings that are not conducive to spray-applied or cured-in-place products, Hazen is proposing to slipline these segments with fused HDPE pipe. This will provide a new pipe whose reliability is independent of the existing tunnel/crossing structure. The annular space between the outside of the HDPE pipe and the inside of the tunnel/structure will be filled with grout to properly transfer any loads from the existing tunnel/structure to the new HDPE pipe and lock the pipe in place. Both ends of the new HDPE pipe will transition to RCP using either fittings, concrete collars, or structures.

# 10.6 Pipeline Rehabilitation

For culverts and pipelines that are in good condition and will remain in operation after the pipeline is installed, it is anticipated that these segments will be rehabilitated in place. As described earlier, these segments are still in relatively good condition and likely do not warrant fully-structural solutions such as CIPP. That said, final rehabilitation methods will be selected during final design and will consist of either a spray-applied geopolymer or epoxy liner, or CIPP. If determined to be appropriate during final design, an alternative approach may be to allow the contractor to bid multiple options to ensure the best possible price while also meeting project objectives.

## **10.7 Structures and Appurtenances**

To ensure proper operation of the new pipeline, the Project will require the construction and installation of a few structures and appurtenances. The only structures that currently exist along the Ditch are drop structures, utilized to slow the rate of flow, and trash grates on the upstream ends of culverts. The new pipeline will continue to operate by gravity, minimizing the need for new structures and appurtenances such as in-line valves. This will also keep PWD's maintenance and operations costs down. Also, PWD staff want to limit above-ground structures to minimize the opportunity for vandalism or tampering.

That said, conveying three times the current flow in a buried pipeline does introduce new maintenance and operations considerations, such as:

- Air entrainment
- Surcharging
- Access for cleaning and inspections

To address these concerns, the Project may include blow-off assemblies, air release/vent structures, manholes, and hydraulic structures used to decrease pressure or "break head." PWD has also requested one (1) water quality monitoring / sampling station be installed at the Lake Palmdale outfall. Some of these appurtenances will require monitoring and operating capabilities via Supervisory Control and Data Acquisition (SCADA), discussed in the subsequent section.

#### 10.7.1 Blow-off Assemblies

Blow-off assemblies are used to flush out accumulated sediments at low spots and dead-ends of pipelines, and to drain pipelines for inspection, repairs, and maintenance. Blow-off assemblies will be installed in the Project pipeline where needed to assist with dewatering and sediment removal should any low points be designed into the final profile. One location is the siphon that is planned to replace the flume to be demolished west of 25<sup>th</sup> Street East.

#### 10.7.2 Air Vents

Air vent structures are used to release air from a pipeline during filling, draining, and normal operations. As such, the air vent structures will be sized and placed at strategic locations to optimize these operations.

#### 10.7.3 Manholes

Manholes provide points of access to the interior of the pipeline for inspection, cleaning, and potential future rehabilitation. Typical municipal wastewater systems space manholes every 500 feet along the sewer main. However, since raw water does not carry the same level of solids and debris that wastewater systems do, manholes for this Project will generally be spaced every 1,000 feet along the pipeline. This spacing should allow a standard CCTV truck to inspect up to 500 feet in either direction to capture the entirety of the pipeline segment. Manholes will also be placed where acute changes in vertical or horizontal direction are necessary. Additional critical

locations may include the beginning and/or ending of tight reverse curves to avoid future conflicts with CCTV inspection, and on either end of existing tunnels and significant culverts.

### 10.7.4 Water Quality Monitoring / Sampling Stations

One continuous water quality monitoring station will be located near the outlet at Lake Palmdale and will be connected either by conduit and wiring/Fiber Optic or radio to the District's existing SCADA system at their treatment plant site. Grab samples can be obtained at other locations throughout the pipeline as necessary via the planned manholes.

#### 10.7.5 Flow Metering and Diversion at Lake Palmdale

The Palmdale Ditch currently has three flow metering locations: two flow meters in the valve house below Littlerock Dam, a metering flume at the Lake Palmdale outlet, and a 24-inch magnetic meter located approximately 2,850 feet southeast of Lake Palmdale that was constructed as part of the 2010 ditch conversion project. According to PWD, this flow meter does not provide accurate flow data due to the pipe not flowing full at the meter location. Therefore, the 24-inch flow metering reach will be demolished and replaced with 48-inch pipe to match the pipeline on either side. The existing metering flume at Lake Palmdale is currently undersized and will be replaced with a new metering facility that is capable of conveying and measuring the maximum design flow of 66 cfs.

Two alternatives are being considered for the Lake Palmdale flow metering and diversion facilities to provide PWD with flow metering capabilities and a diversion to facilitate diverting flow from discharging into Lake Palmdale to discharging into the existing concrete stormwater channel. These alternatives are described in general terms in the following sections, the selected alternative and specifics of the design (for instance, flow meter type/style, valve style, etc.) will be determined during the final design phase in coordination with PWD.

## 10.7.5.1 Alternative 1

This alternative consists of a flow meter facility capable of measuring partial to full pipe flow and a bifurcation facility with an isolation valve on each discharge pipe that will allow flow to be diverted to either Lake Palmdale (normally open) or the stormwater channel, see Figure 10-1. Because of the modeled higher HGL if both valves are inadvertently closed, this alternative requires an emergency pressure relief or overflow appurtenance, not shown in Figure 10-1.

## 10.7.5.2 Alternative 2

Alternative 2 is a passive diversion facility that consists of a flow meter capable of measuring partial to full pipe flow adjacent to an open channel flow structure with a Lake Palmdale discharge isolation slide gate to facilitate stopping flow to Lake Palmdale, see Figure 10-2. The open channel flow structure includes an open connected diversion pipeline that would convey pipeline flow to the stormwater channel when the HGL rises after the isolation slide gate is closed.

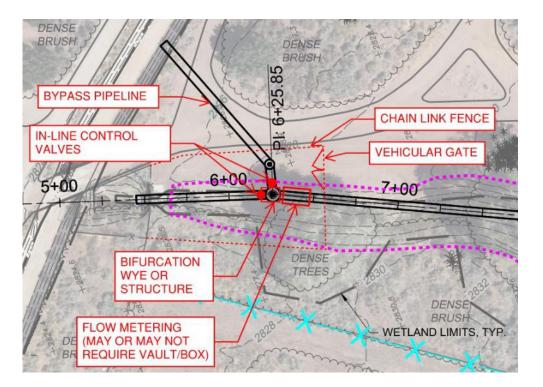


Figure 10-1: Lake Palmdale Outfall Alternative 1

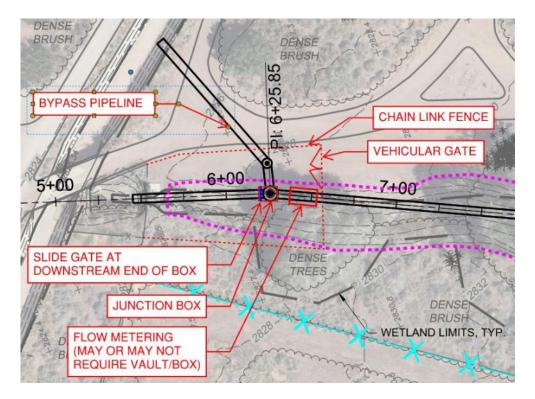


Figure 10-2: Lake Palmdale Outfall Alternative 2

#### 10.7.6 Turnouts

As previously mentioned, one turnout connection point will be constructed with this Project: LRCID near Cheseboro Road. During the preparation of this PDR, PWD and Hazen investigated the potential for a new turnout from the State Aqueduct near where the existing ditch crosses over the State Aqueduct. However, after developing a conceptual plan and several meetings with DWR staff, including a field meeting, PWD decided to postpone further development and design of the State Aqueduct turnout as part of this Project. As an alternative to the State Aqueduct turnout, Hazen completed a preliminary evaluation of an existing AVEK turnout and interconnection as a potential redundant supply alternative to the State Aqueduct turnout. The existing AVEK infrastructure includes a turnout on the State Aqueduct near their Acton WTP, along with raw water interconnection pipeline that flows via gravity to the Palmdale Ditch box culvert crossing of Sierra Highway. Based on the preliminary evaluation, if the existing 12-inch interconnection pipeline is increased to 24-inch diameter, 30 cfs could be conveyed to the PWD culvert crossing of Sierra Highway.

#### 10.7.6.1 LRCID Turnout

The LRCID turnout will replace the existing turnout just west of Cheseboro Road that has become inoperable. According to PWD, the sizing of this turnout shall be able to supply LRCID with the volume of water outlined in the "Littlerock Creek Dam and Reservoir Rehabilitation, Operation, and Maintenance Agreement" dated December 22, 1992. This agreement stipulates that in lieu of contributing money towards the rehabilitation of Littlerock Creek Dam, LRCID must sell PWD a portion of their water rights for a 50-year duration, which expires in 2042. After that time, the agreement will revert to the terms of the original contract between LRCID and PWD from 1922.

According to the 1992 agreement, until 2042, LRCID is "...entitled to purchase from PWD in any one calendar year 1,000 acre feet or 25 percent of the yield..." in Littlerock Reservoir, whichever is less ("yield" is defined as the amount of water available for release within Littlerock Reservoir). The agreement further stipulates that PWD is obligated to provide water to LRCID at an aggregate maximum rate of 2,000 gpm. Therefore, the new turnout will be designed to provide a flow rate of 2,000 gpm or 5.4 cfs, which is currently estimated to require a pipeline connection between 12 and 18 inches in diameter.

Conversely, the 1922 agreement is more difficult to interpret, and therefore, unless otherwise directed by PWD, the new turnout will be sized for 2,000 gpm, and may or may not be sufficient to deliver the water volumes stipulated in the 1922 agreement when the current agreement expires in 2042.

#### **10.8 Instrumentation and Control**

PWD's SCADA telemetry network currently consists of a mixture of hardline, radio, and fiber optic and they are currently developing a plan for updating their telemetry system. The existing flume flow meter does not have any communication capabilities and PWD would like the Project to incorporate the flow meter and water quality monitor at the Lake Palmdale flow metering

facility into their SCADA system. The details of this connection will be determined as part of the final design.

# **11. Encroachment and Access Coordination**

Encroachment permits, coordination, and/or general rights-of-entry will be required from several agencies to complete the Project. Environmental permitting agencies are discussed separately in Section 12.3. Agencies discussed in this section include:

- City of Palmdale
- Los Angeles County
- MetroLink / LA Metro
- Department of Water Resources (DWR)

A summary of primary personnel names and contact information from these agencies is presented in Table 11-1 below.

Table 11-1. Agency ocordination contacts			
Agency	Department Name		Email Address
City of Palmdale	Public Works	Lynn Glidden	lglidden@cityofpalmdale.org
City of Palmdale	Public Works	Bill Padilla	bpadilla@cityofpalmdale.org
MetroLink	Right-of-Way	Eric Reese	rightofentry@scrra.net
LA Metro	Real Estate	Aaron Demirci	ream@metro.net
DWR	Encroachment Permits	Delia Grijalva	Delia.grijalva@water.ca.gov
DWR	Delivery Structures	Haley Hattendorf	Haley.Hattendorf@water.ca.gov

#### Table 11-1: Agency Coordination Contacts

## 11.1 City of Palmdale

Just under 4 miles of the Project's total length falls within the jurisdiction of the City of Palmdale (City). Our team reached out to the City and provided an overview of the Project on January 4, 2024, via a virtual meeting using MS Teams to discuss the Project components discussed in the following paragraphs.

## 11.1.1 Culvert Beneath MetroLink Tracks

The City confirmed that the culvert beneath the MetroLink tracks is not in their jurisdiction, and they have no records of the installation of that culvert.

## 11.1.2 Barrel Springs Trail Crossings

The City confirmed that there are no special requirements related to constructing the pipeline across Barrel Springs Trail so long as the trail and railings are restored to their existing condition. The City is also open to installing education/interpretive signage should that become a requirement as a result of discussions with the SHPO.

#### 11.1.3 Pearblossom Highway and Barrel Springs Road Crossings

The City confirmed that the existing crossing of Pearblossom Highway is within the City's jurisdiction. The City recently completed a significant roadway improvement project at this intersection which will require any new pipeline installation to be performed using a trenchless installation method such as auger bore and jack. The City will require a casing for every trenchless installation.

### 11.1.4 Barrel Springs Road Alignment Between 40th Street East and 47th Street East

It is our understanding that the City has jurisdiction over the south half of this roadway, while the County has jurisdiction over the north half. The City requires that new utilities installed within the Barrel Springs Road right-of-way either be placed in the road shoulder with at least 4 feet of horizontal separation from the edge of pavement, or rebuild the entire road from edge of pavement to road centerline.

### 11.1.5 Encroachment Permit Process

The City confirmed that the design will need to comply with their standard encroachment permit process. Once the design has been approved by the City and construction begins, the City will inspect the work that crosses their facilities or right-of-way.

## **11.2 Los Angeles County**

It is understood that Los Angeles County (County) will require an encroachment permit for any work performed within their right-of-way. Therefore, the work in and near Mt. Emma Road, 47<sup>th</sup> St. East, and Barrel Springs Road is anticipated to require an encroachment permit. Discussing the approach with PWD, it was decided to wait until a complete preliminary set of plans is available before introducing the Project to the County. The design team anticipates obtaining feedback from the County prior to submitting the 60% design submittal.

## 11.3 MetroLink / LA Metro

The existing Ditch conveys water beneath the existing railroad tracks located east of and parallel to Sierra Highway. While the undercrossing itself is not in the current Project scope, the westerly end of the Project terminates within the existing railroad right-of-way. For this reason, coordination with MetroLink / LA Metro is unavoidable; however, it is still a Project objective to optimize or limit the level of encroachment into railroad right-of-way that is required. Ideally, the new pipeline would be installed outside of the railroad right-of-way; however, the existing terrain presents significant hill slopes that pose challenges to shifting the alignment due to access, work areas, and a trench depth that could reach up to 30 feet deep. Therefore, since encroachment into the railroad right-of-way cannot be avoided, the current alignment is proposed to follow the existing Ditch.

The following sections discuss both the administrative and engineering considerations related to the work planned in the vicinity of the existing railroad tracks.

#### 11.3.1 Track Ownership Research

While different sources reference different owners for these tracks, County mapping resources indicate that the land is owned by the LA County Transportation Commission (LACTC), which later merged with the Southern California Rapid Transit District (SCRTD) and became the LA County Metropolitan Transportation Authority (LACMT) and is branded as "Metro".

MetroLink is the train service that is operated by the Southern California Regional Rail Authority (SCRRA), and Metro is one of their member agencies.

### 11.3.2 MetroLink Outreach

Initial contact was made with Eric Reese, Right-of-Way Coordinator for MetroLink. Mr. Reese communicated that MetroLink manages encroachment requests while LA Metro owns the right-of-way and manages license agreements. Encroachment requests are required for work occurring within Metro's right-of-way while license agreements are required for permanent facilities installed within Metro's right-of-way.

Based on MetroLink's requirement for plans to be included with the initial encroachment application, the encroachment application will not be submitted until the 30% plans have been completed.

#### 11.3.3 LA Metro Outreach

To learn more about the license agreement requirements, Eric Reese referred us to Aaron Demirci, Principal Real Estate Officer for LA Metro. Mr. Demirci responded to our initial outreach and stated that if an existing license agreement exists for the existing culvert beneath the railroad tracks, the County (or whoever installed it) would need to find it and present it to avoid requesting a new license agreement. Mr. Demirci stated that all plans need to be reviewed and approved by MetroLink before LA Metro issues a license agreement.

## 11.3.4 History and Status of Existing Undercrossing

The existing Ditch in the vicinity of Sierra Highway and the existing railroad tracks was constructed in a curvilinear alignment that is depicted on several maps illustrating the approximate path of the Ditch. These records suggest the undercrossing does not cross perpendicular to the track alignment as would generally be required by current railroad right-of-way managers. Despite requesting as-builts for this undercrossing from the railroad, County, City, and PWD, no as-builts have been provided to date. Information regarding the alignment, materials, and condition of the undercrossing were provided by the CCTV inspection described in Section 4.

While the existing undercrossing is not within the current Project scope, we now know that this undercrossing has defects, including significant debris build-up, instances of channel roof damage/corrosion, and a lack of an ability to adequately inspect the existing CMP culvert beneath the railroad tracks. Therefore, it is advisable that PWD consider options for rehabilitating or replacing this undercrossing, either as part of this Project or as a separate project or maintenance effort. Two options have been considered and are described below.

#### 11.3.5 Railroad Undercrossing Rehabilitation

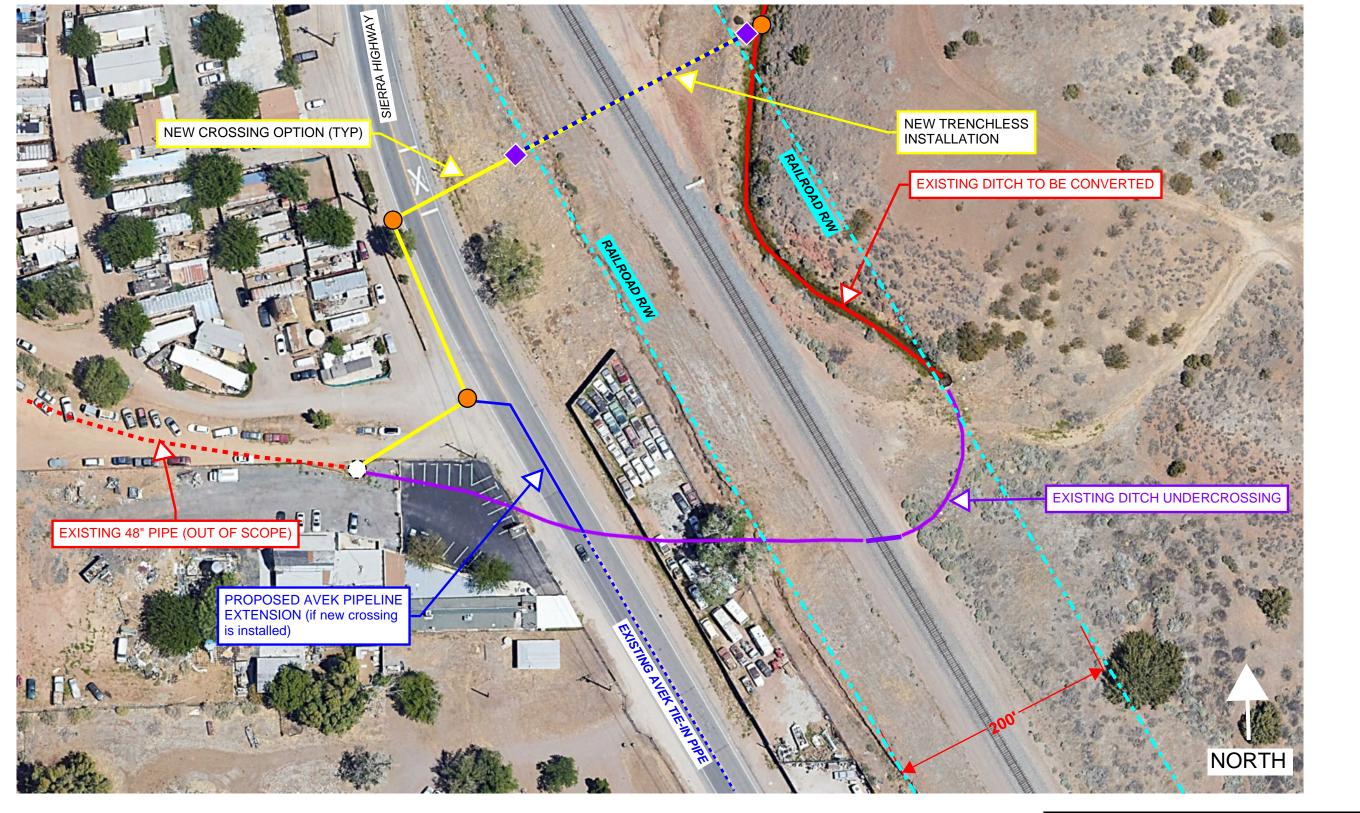
The structure of the undercrossing visually appears to be in relatively good condition. The major defects include a severe build-up of sand within the channel, especially within the CMP culverts directly beneath the railroad tracks as well as a few locations where the metal roof the channel appears to be damaged and/or corroded. Suggested rehabilitation operations include removing the sand from the entire stretch, repairing the damaged portions of roof, and lining all interior faces with a sealant/protectant. It is believed that this work could be added to the scope of this Project for relatively low cost although it would take significant manual labor to remove all the sand that exists.

As an alternative to adding more cost to the current Project, especially due to the aggressive schedule constraints, the rehabilitation options mentioned above could also be made into a separate future project, or even possibly performed over time by PWD staff or contractors.

#### 11.3.6 Replace the Undercrossing with a New Crossing

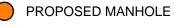
Because the current Project already requires coordination with the railroad, an alternative option could involve designing and constructing a new pipeline undercrossing beneath the railroad tracks as part of this Project. This concept would involve a new trenchless crossing beneath the tracks, but would also require open-cut installation of additional pipe to return to the existing alignment as well as tie-in the existing AVEK pipe within Sierra Highway. This excavation would occur within County right-of-way and impact Sierra Highway traffic flows. See Figure 11-1 for a depiction of this potential concept as well as the alternative that was considered for the current scope.

Further discussion with PWD about these possibilities will occur during final design.





## LEGEND:

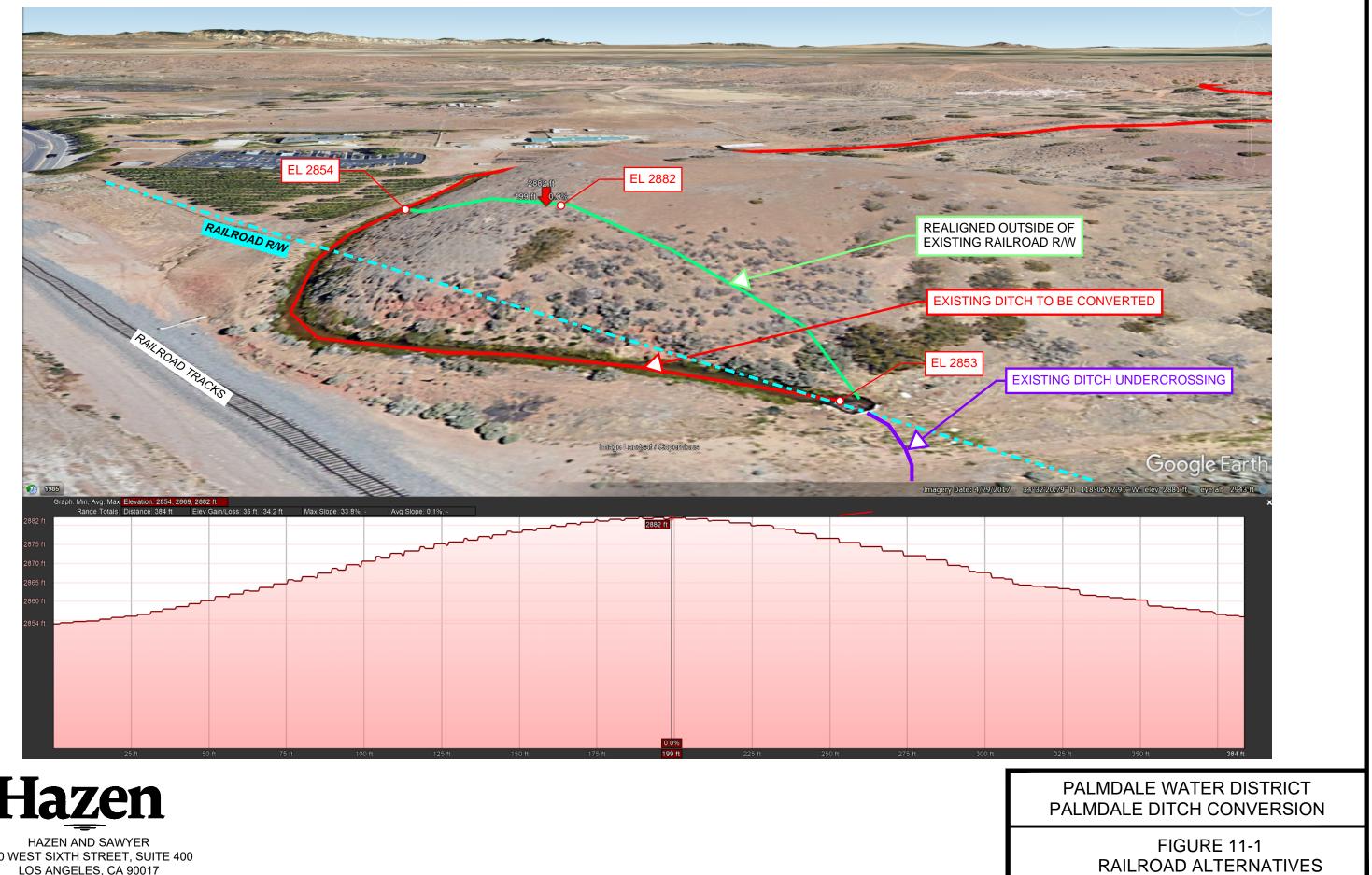


() EXISTING STRUCTURE

PROPOSED JACKING/RECEIVING PIT

# PALMDALE WATER DISTRICT PALMDALE DITCH CONVERSION

FIGURE 11-1 RAILROAD ALTERNATIVES SHEET 1 OF 2





SHEET 2 OF 2

# 11.4 Department of Water Resources (DWR)

There are two Project elements that require coordination with DWR:

- 1. The rehabilitation of the existing pipeline crossing of the State Aqueduct
- 2. Access permissions to install pipeline segments on State property

## 11.4.1 State Aqueduct Pipeline Crossing

The existing Ditch alignment crosses the State Aqueduct approximately 0.5 mile west of 40<sup>th</sup> Street East. This crossing consists of a 36-inch diameter steel aerial pipeline that was constructed parallel to an existing stormwater overcrossing in the 1960s. Hydraulic analyses indicate that the crossing can convey the maximum flow of 60 cfs in a surcharged flow regime, provided the pipeline is in acceptable condition. Retaining and rehabilitating the existing crossing is expected to streamline project completion by not having to install a new pipeline across the State Aqueduct.

Visual observations of the outside of the pipe do not show evidence of significant corrosion, and the internal CCTV inspection performed by NPS also suggests that the pipe is in reasonable condition. Therefore, to ensure a 50-year design life, we are proposing to perform an internal rehabilitation of the pipeline.

## 11.4.2 State Property Access Permissions

Sections of the existing Ditch appear to be located on State property near the Aqueduct. Therefore, PWD will need permission to both access and construct the new pipeline on State property.

## 11.4.3 Coordination Results

PWD provided Hazen with the contact information for Delia Grijalva at DWR. Initial outreach was performed on December 5, 2023 via email and an introductory call was held via MS Teams on January 5, 2024. According to Delia, rehabilitation of the existing aerial pipeline and gaining construction access permissions for the pipeline installation will be covered by the State's standard encroachment permit process. However, based on a preliminary title report acquired for Assessor's Parcel Number 3052-016-902 owned by DWR, PWD's original easement rights from 1920 were preserved when the State Aqueduct was constructed by the recording of a Joint Use and Occupancy Agreement (filed in Los Angeles County as Document No. 79-691840 on June 25, 1979) between DWR and PWD. The Joint Use and Occupancy agreement indicates that PWD's rights are senior to those of DWR and apply to a strip of land 20 feet wide centered on the Ditch. Hazen will continue coordinate with DWR regarding permitting requirements during the final design phase.

# **12. Environmental Compliance Considerations**

Hazen teamed with Rincon Consultants, Inc. (Rincon) to perform the environmental compliance and environmental permitting work for this Project. This section describes the overall environmental compliance process, the technical studies that were performed, and the anticipated environmental permit requirements for the Project.

## 12.1 Compliance Process Overview

Because the Project extends onto Federal property, the Project will be subject to environmental review under the National Environmental Policy Act (NEPA), which is similar but distinct from the California Environmental Quality Act (CEQA). As such, the technical studies and documents prepared must satisfy both sets of requirements. For each process, a "lead agency" is identified to assume the principal responsibility for carrying out and/or approving the Project, and for conducting the required environmental analysis. On the federal side, initial coordination with both USBR (as a funding agency for the Project) and USFS (as the Federal landowner for the Project) was required to determine who would ultimately be the lead agency for the NEPA aspects of this Project. At this time, USFS has indicated that they will defer to USBR to serve as lead NEPA agency because their approval authority (for grant funding) extends to the whole of the project whereas the approval authority of USFS only extends to the portion of the Project within Angeles National Forest. As the project proponent, PWD will act as the CEQA lead agency.

The Project is currently anticipated to be covered under CEQA as part of the PWD's Strategic Water Resources Plan Program Environmental Impact Report (EIR). This EIR will include a programmatic evaluation of the environmental impacts of the PWD's Strategic Water Resources Plan as well as a project-level analysis of the environmental impacts of the Project, which is part of the overall Strategic Water Resources Plan.

To satisfy USBR's NEPA requirements, the Project is anticipated to utilize a separate Environmental Assessment/Finding of No Significant Impact (EA/FONSI). USFS staff have indicated USFS can rely on the EA/FONSI prepared by USBR to satisfy their limited NEPA obligations for the Project. Both Federal agencies will also be required to engage in consultations with United States Fish and Wildlife Service (USFWS) and the State Historic Preservation Office (SHPO) to satisfy their obligations under the Federal Endangered Species Act (ESA) and Section 106 of the National Historic Preservation Act (NHPA Section 106), respectively. However, USFS will be able to rely on the results of USBR's consultation with USFWS. In addition, USBR and USFS are in the process of designating USBR as the lead agency for purposes of consultation under NHPA Section 106, such that USFS will also be able to rely on USBR's consultation with SHPO and avoid conducting their own separate consultation for the Project.

# 12.2 Technical Studies

Technical studies were performed along the entire Project corridor to evaluate potential cultural and biological resources which may require mitigation if impacted by the Project. The initial field work for these studies was performed between November 2023 and January 2024. The limits of field work were defined by the Area of Potential Effects (APE) developed by Hazen and provided to Rincon for review and analysis (see Figure 9-2).

## 12.2.1 Cultural Resources

A cultural resources study in compliance with CEQA and NHPA Section 106 was performed within the APE. This included consultation with SHPO and a Phase I pedestrian survey which identified the potential need to conduct Phase II cultural resources testing in certain areas of the APE. As part of the Phase I pedestrian survey, the team identified 5 previously recorded archaeological sites, 12 new archaeological sites, and 39 new isolates. Three of the archaeological sites within the APE require further evaluation as to whether they are considered significant under CEQA/NEPA and the extent to which the Project may impact these resources. As a result, the team will be conducting Extended Phase I and potential Phase II cultural resources testing to determine whether these resources extend into the Project's impact area and to evaluate whether they meet the criteria for consideration as significant and the Project cannot be designed to avoid impacting these resources, a Phase III data recovery program may be required. In addition, because of the high archaeological sensitivity of the APE, mitigation measures such as archaeological and NAtive American monitoring will likely be required as part of the Project's CEQA and NEPA documents.

Additionally, documentation provided by USFS indicates USFS in consultation with SHPO determined the Ditch itself is eligible for inclusion on the National Register of Historic Places. As such, the Project's environmental documentation and permitting activities needs to consider the historical significance of the Ditch and mitigate any significant adverse impacts accordingly. Because the Project involves conversion of the entirety of the remaining Ditch to a pipeline, the team is completing an evaluation to determine whether Project impacts to this historic resource may be significant and unavoidable, which will be primarily based on the criteria under which the Ditch qualifies for eligibility for the National Register of Historic Places and the California Register of Historical Resources. Mitigation such as a treatment plan and photo-documentation will likely be required as part of the Project's CEQA and NEPA commitments.

## 12.2.2 Biological Resources

A biological resource study in compliance with CEQA and NEPA was performed for the APE. The literature review and field reconnaissance survey suggested that the following species have a moderate to high potential to be present within the Project area based on habitat suitability factors:

- Rare plants, including Western Joshua Tree
- Mohave ground squirrel (State threatened)

- Tricolored blackbird (State threatened)
- Least Bell's vireo (Federal and State endangered)
- Southwestern willow flycatcher (Federal and State endangered)
- Burrowing owl (CDFW Species of Special Concern)
- Crotch bumblebee (State candidate endangered)
- Swainson's hawk (State threatened)
- Southwestern pond turtle (Federal proposed threatened)
- Special status bats

To avoid impacts to least Bell's vireo and southwestern willow flycatcher, which have the potential to be present along Little Rock Wash near Littlerock Reservoir, the Project team intends to avoid direct impacts to suitable habitat for these species by avoiding the need for vegetation removal in this area and to avoid indirect impacts (e.g., noise, dust) to these species by scheduling construction activities in this area to occur outside the nesting season for these two migratory species. Similarly, to avoid impacts to tricolored blackbird, which has the potential to be present in Lake Palmdale, the Project team intends to avoid direct impacts to suitable habitat for the species and to avoid indirect impacts by scheduling construction activities near Lake Palmdale to occur outside the nesting season for this species. For the remaining species, additional species-specific protocol surveys and rare plant surveys will be conducted between March and September 2024 to determine presence/absence of these species and the extent to which they are present. The results of these surveys will be used to inform permitting and mitigation requirements under CEQA and NEPA, and under the Federal and California ESAs.

## 12.2.2.1 Jurisdictional Waters Delineation

The Antelope Valley Watershed is generally a closed basin which lacks a downstream surface connection to jurisdictional waters of the United States (WoUS), as documented in prior USACE approved jurisdictional determinations. However, Lake Palmdale and its tributaries are notable exceptions as the lake is navigable and its tributaries, including the Palmdale Ditch, have been considered WoUS in the past. As such, Rincon conducted a jurisdictional delineation of waters and wetlands within the survey area to the level appropriate for a full jurisdictional waters field delineation, conducted in accordance with USACE Wetland Delineation Manual (1987), applicable regional supplements to the manual, and the latest guidance from CDFW and the Lahontan Regional Water Quality Control Board (RWQCB).

The delineation concluded that a minimum of 40 potentially jurisdictional features occur in the BSA, including the Palmdale Ditch, Lake Palmdale, Littlerock Wash, the California Aqueduct, one unnamed pond, 19 unnamed drainages, and 16 wetlands. Two additional potentially jurisdictional wetlands may also be present, but due to access limitations, jurisdictional boundaries could not be confirmed. The delineated features included natural and man-made perennial, intermittent, and ephemeral streams; culverts; a pond; a lake; and isolated wetlands that may be subject to USACE, RWQCB, and/or CDFW jurisdiction. A summary of potential jurisdictional waters identified within the Area of Potential Effect is shown by agency in Table 1.

Jurisdictional Water Type	Amount (acres)
USACE Jurisdiction	
Non-Wetland Waters of the U.S.	7.60
Culverted Non-Wetland Waters of the U.S.	0.51
Wetland Waters of the U.S.	0.15
Total Waters of the U.S.	8.26
RWQCB Jurisdiction	
Non-Wetland Waters of the State	9.45
Culverted Non-Wetland Waters of the State	0.54
Wetland Waters of the State	5.13
Total Waters of the State	15.12
CDFW Jurisdiction	
CDFW-Jurisdictional Streambed	21.53
CDFW-Jurisdictional Lake	4.34
Total CDFW Jurisdiction	25.87
Potentially Jurisdictional	
Not Accessible	0.16

Table 12-1: Potential Jurisdictional Waters within the Area of Potential Effects

The Project's final design will seek to minimize impacts to jurisdictional waters to the extent feasible. However, the Ditch itself is likely subject to USACE, RWQCB, and CDFW jurisdiction; therefore, the proposed conversion is expected to require permitting and mitigation through all three agencies. Mitigation may take the form of purchase of credits at an approved mitigation bank, on-site restoration of temporarily impacted jurisdictional features, and/or off-site restoration to compensate for permanently impacted features.

#### 12.2.2.2 Western Joshua Tree (WJT) Census and Report

WJTs are protected through the California ESA as a candidate threatened species and under the Western Joshua Tree Conservation Act (WJTCA) as of July 2023. The WJTCA sets forth procedures by which incidental take of Joshua trees can be authorized. Rincon's evaluation was conducted in accordance with the WJTCA and the current CDFW guidance for WJT censuses.

Because the exact locations of the pipeline alignment and construction staging/laydown areas were not known at the time of the survey, the survey area included the project footprint and 50-foot buffer in all directions. Upon survey completion, Rincon had identified over 3,450 WJTs within the survey area that are classified into three height classes per CDFW guidelines (e.g., less than 1 meter, 1 meter to 5 meters, greater than 5 meters).

The Project's final design will seek to minimize WJT impacts (and resulting mitigation) to the extent feasible. According to CDFW's website, all trees expected to have work performed within 50 feet of their trunk will need to be included in the final census report. As such, the design team will use 50 feet as a standard clearance requirement from WJTs, where feasible. For those trees that need to be impacted to implement the Project, the WJCTA allows payment of mitigation fees in lieu of traditional mitigation (e.g., restoration, compensatory mitigation) based on the number of WJTs impacted (dead or alive) and their height class. Table 12-1 summarizes the current standard mitigation fees posted on CDFW's website.

	June 1100 million June 1100
Tree Height	In-Lieu Fee (\$)
5 meters or greater	2,500
1 meter or greater but less than 5 meters	500
less than 1 meter	340

## Table 12-2: Western Joshua Tree Mitigation Fees

### **12.3 Environmental Permit Requirements**

This section describes the anticipated environmental permits required for the Project for potential impacts to the various resources found onsite:

- Jurisdictional Waters and Wetlands:
  - United States Army Corps of Engineers Section 404 Individual Permit for potential impacts to waters of the United States (WoUS) pursuant to Section 404 of the Clean Water Act (CWA)
  - Lahontan RWQCB Water Quality Certification (WQC) pursuant to Section 401 of the CWA and Waste Discharge Requirements (WDRs) for potential impacts to waters of the State (WoS) pursuant to the Porter-Cologne Water Quality Control Act.
  - CDFW Streambed Alteration Agreement (SAA) for potential impacts to jurisdictional streambeds pursuant to Section 1600 et seq. of the California Fish and Game Code
- Federal and State Listed Species:
  - United States Fish and Wildlife Service (USFWS) Biological Opinion for potential impacts to federally listed species
  - CDFW Incidental Take Permit (ITP) for potential impacts to state listed species

#### 12.3.1 Jurisdictional Waters and Wetlands

Based on the Jurisdictional Delineation Report, the Project is expected to impact both WoUS and WoS under the jurisdictions of the USACE, RWQCB, and CDFW, triggering the need for permits from all three agencies. Rincon will prepare permit packages for the Project for the three agencies according to agency requirements. Rincon will also prepare an alternatives analysis required by the USACE and RWQCB pursuant to the Section 404(b)(1) Guidelines and a compensatory mitigation plan required by all three agencies. Rincon will coordinate closely with Hazen and PWD to identify the alternatives to be analyzed in the alternatives analysis. In addition, in accordance with United States Environmental Protection Agency (USEPA) regulations, Rincon will submit a letter requesting a Pre-Filing Meeting to Lahontan RWQCB. This meeting request must be submitted at least 30 days before an application can be submitted to the RWQCB. Additional technical studies to be appended to the applications would include

those prepared by Hazen and PWD (e.g., geotechnical investigations, structural evaluation, hydrologic and hydraulics analyses, design plans, and project cost, as appropriate). PWD will also be required to pay permit application fees to USACE, RWQCB, and CDFW.

Given the extent of potential impacts to jurisdictional waters that may require mitigation, it is likely the mitigation approach will involve the purchase of credits from an established mitigation bank as opposed to extensive on-site or off-site restoration or property acquisition and management.

Following submittal, review and approval of the applications by the regulatory agencies typically require at least four to six months, but the process can take up to nine months or longer based on various external factors, such as agency review times and responses to inquiries. Review times also vary with perceived project complexity. Ongoing coordination with USACE, RWQCB, and CDFW may be needed to answer questions and to ensure any potential issues are made known to the project team and resolved at the earliest opportunity. To facilitate a smooth agency review process, regular communication with agency representatives to ensure the project remains a priority is recommended along with timely responses to agency requests for additional information, which arise frequently during their review of projects of this nature.

Agency engagement and permit applications can be initiated during preparation of the Programmatic Draft EIR. Permit applications can be submitted to the agencies with the technical studies (and potentially the Draft EIR) appended to expedite agency review. However, the agencies will not issue permits until the Final EIR is provided and accepted. (A key factor in this permitting approach is that no significant changes in project scope, design, or impacts can occur between the Draft EIR and Final EIR). If the Final EIR is significantly different, agency review timelines will likely be extended. The agencies typically require one to two months to deem the applications complete and an additional four months or more to provide completed permits. Permit processing timeframes can vary based on multiple factors; therefore, this timeframe cannot be guaranteed but is considered a reasonable estimate.

It is recommended that PWD requests to review the draft permits/authorizations from each of the resource agencies to help ensure the mitigation measures are feasible in light of the anticipated Project construction methods. If the agencies agree to allow a preview of the draft permits, the project team can review the documents to identify any problematic or unexpected mitigation requirements for which PWD may wish to negotiate with each individual agency prior to accepting. This will also allow for the Contract Documents to be updated to capture draft permit conditions.

## 12.3.2 Federal and State Listed Species

Based on the results of the biological resources study and species-specific surveys, permitting for potential Project impacts to federal and state listed species may be required. If so, consultation with USFWS on potential impacts to federally-listed species will be conducted by USBR as the lead federal agency for the Project. If the USFWS determines the Project may adversely affect federally listed species, it will issue a Biological Opinion, including an Incidental Take Statement for the Project that will authorize take and likely include mitigation requirements for

the potentially affected species. The federal ESA establishes a 135-day timeline for the consultation process to be completed, although the agencies do not always achieve this goal.

If the Project's environmental review determines impacts to state listed species are likely to occur, an incidental take permit (ITP) will be required from CDFW to authorize such take. This process involves submittal of a California ESA ITP application to CDFW. CDFW will review the application and issue an ITP that will likely include species-specific avoidance and minimization measures, as well as mitigation to minimize and fully mitigate Project impacts to the state listed species. The timeline for issuance of a CDFW ITP for potential impacts to state listed species can take at least six months from the time the application is deemed complete by CDFW (i.e., all required documentation is submitted). Actual consultation and processing times can vary based on external factors, such as agency review times and responses to inquiries.

This Project is funded by two grants: one from USBR and one from DWR. The DWR grant is the larger of the two grants and requires that all funds be spent by December 31, 2025, while the USBR grant funds can be spent after that date. As such, we have been conservatively targeting all construction to be completed by this date. Based on the time required to finish the final design, construction is expected to begin in early 2025, which leaves approximately 10 months to install all 7.2 miles of pipe. As a result, we anticipate that a General Contractor will likely require multiple crews working in different locations to meet this aggressive schedule. Using an assumed installation rate of 200 feet per day, the bulk of the pipeline installation would be completed in 95 working days (approximately 5 months).

The following sections highlight the primary considerations necessary to stay on schedule and effectively complete the improvements.

# 13.1 Project Packaging Strategy

Three factors that can impact project progress and the Project's ability to meet the schedule constraint imposed by the grant funding deadlines include:

- **Contractor availability** If at the time of bidding the contractors that typically perform pipeline construction have a coinciding construction workload and do not believe that they will have adequate staffing to pursue the Project, they may choose to not bid on the Project, which will reduce the number of bidders putting the Project at risk of not meeting the funding completion date.
- Contractor bonding capacity Depending on the final engineer's cost opinion and ultimately the bidding contractors bid, the whole project may exceed a single or multiple contractor's bonding capacity, precluding them from submitting a bid. Like contractor availability, this will reduce the number of bidders putting the Project at risk of not meeting the funding completion date.
- **Contractor pre-qualification requirements** For larger, complex, or specialized construction projects, owners can choose to pre-qualify contractors (who have successfully completed the same or similar work previously). Like contractor availability and bonding capacity factors, pre-qualification requirements could reduce the number of bidders, putting the project at risk of meeting the funding completion date.

While these factors can impact how much work and what work can be completed, they represent opportunities to ensure the Project is completed within the funding deadline by meeting with potential contractors early to confirm their availability, potentially breaking the Project into smaller packages to make the Project to available to smaller (but qualified) contractors, and carefully crafting the pre-qualification requirements. Hazen will work with PWD during development of the 60% design to identify which, if any, of these factors need to be included in the construction documents.

## **13.2 Parallel Construction Versus Ditch Demolition**

A primary construction consideration is whether the pipeline is place in the same location as the existing Ditch or if it is installed parallel to the existing Ditch. Placing the pipeline parallel to the existing Ditch avoids bypass requirements, demolition needs, backfilling of the Ditch prior to trenching, and implications related to the historic nature of the Ditch. But it may create the need for PWD to have additional conversations with property owners. Placing the pipeline in the same location as the Ditch maintains the historical location of the flow path, but triggers the potential need for all the items mentioned above. The final design will clearly identify when each scenario is necessary.

## 13.3 Access

There are several points of access along the alignment that should allow the Contractor to have sufficient access without the need for extensive negotiations with private property owners. In some cases, access roads may need to be improved slightly to accommodate equipment and deliveries. Some access points are relatively close to the alignment while others are located much farther from the nearest public road. Access points will be identified on the final plans including which ones are locked versus which ones are not restricted.

## 13.4 Flow Diversion/Bypass

In some cases, it may be necessary to perform clearing/demolition or to install the new pipeline in the same location as the existing Ditch while water deliveries need to be made. This will require the use of a bypass system to ensure continued water deliveries during construction. PWD staff has mentioned that existing flows are about 20 cfs (13 MGD). To bypass this flow, a wet well will need to be constructed at the upstream end of the segment from which water can be pumped out and conveyed in an above-ground HDPE pipe to the downstream end of the segment. This setup can be as long as the contractor needs it to be, or a shorter system can be methodically shifted along the alignment as the contractor installs shorter segments at a time. If shorter bypass segments are used, the pipe will need to be tested and put into service in sections to allow it to be used to convey flow as work proceeds upstream.

In general, the Project is expected to be constructed from the downstream end to the upstream end. This means that the Ditch will likely need to be turned off to make the first tie-in near the railroad tracks due to the inability to run a bypass line over the railroad tracks. Once this first tie-in/section is installed, it can be tested and put into service while the next section is constructed.

## 13.5 Clearing and Grubbing

As seen in the photos earlier in the report, many sections of the existing Ditch are overgrown with significant foliage. Whether the pipeline is installed at the location of the existing Ditch or off on a parallel alignment, a significant amount of clearing and grubbing will be required. In some locations, tree removal may also be required. Trees to be protected, including WJTs, will be flagged and fenced off. Clearing and grubbing will only be performed where necessary to complete the improvements.

## 13.6 Rough Grading

For sections where the new pipeline will be installed in the same location as the existing Ditch, the Ditch will need to be filled in and compacted to provide a substantial base in which to construct a vertical trench. In areas where stormwater crosses or enters the Ditch, some minor rough grading may be required to ensure that stormwater flows can continue to flow without impacting the proposed pipeline. Some rough grading may also be required along the Project corridor to ensure proper construction access is available.

# **13.7 Environmental Constraints**

Environmental field studies are ongoing at the time of writing this report; therefore, final construction sequencing constraints related to environmental factors are not currently known. However, the design team will document work constraints related to environmental regulations in the final bid documents so the selected contractor will prepare their bid understanding seasonal or schedule/sequencing constraints that may apply to environmental mitigation measures. It will be the responsibility of the contractor to sequence the work and staff the job as necessary to meet the required schedule deadlines imposed by the Project's funding agreements and contract documents.

# 14. Construction Cost Estimate

The Project's construction is currently anticipated to cost \$38 million dollars. A complete cost estimate and Basis of Estimate Memo is included as Appendix F.

# 15. Project Schedule

While all work was originally targeted to be completed by December 31, 2025, in accordance with the DWR grant funding agreement, the complexities of the environmental compliance work have pushed the schedule so that it is likely that some construction activities will need to occur in 2026. Current anticipated project milestones are as follows:

•	60% Design Submittal	August 2024
•	Draft EIR Published	Early Fall 2024
•	Final EIR Certified	December 2024
•	100% Design Submittal	December 2024
•	Environmental Permits Obtained	February 2025
•	Final Bid Submittal	February 2025
•	Bid Period	February to March 2025
•	Construction NTP	April 2025
•	End of Pipeline Construction	January 2026
•	Clean / Close-Out	February to April 2026

The project milestones above assume that construction means and methods will be implemented concurrently with the PWD's water delivery periods using parallel construction or bypass pumps/piping as necessary.

Options for accelerating the schedule and reducing risk of schedule slippage have been discussed with PWD, and the following two options are thought to provide the most value:

- Utilizing a Construction Manager At Risk (CMAR) contract for constructability review
- Pre-purchasing pipe, gate structures, appurtenances and any other project materials that may have long lead times

The following sections provide detailed discussions about the costs and benefits of implementing these approaches.

# 15.1 Construction Manager At Risk (CMAR)

Implementing a CMAR delivery method would require PWD to hire a construction firm or construction manager early in the design (prior to reviewing the 60% plans) who will also oversee the project's construction. The construction manager would provide services alongside Hazen during the project's final design phase. These pre-construction services include constructability review, value engineering, and cost estimating. These services would facilitate

an efficient and effective design. The construction manager would then act as the general contractor during the construction phase by possibly self-performing certain construction activities and sequencing subcontractors to complete the required construction work.

The method is known as construction manager "at risk" because PWD and the construction manager negotiate a guaranteed maximum price (GMP) during the design phase, and the construction manager will be responsible for any costs that exceed that amount. CMAR can be a complex process and the specifics of the delivery method vary by jurisdiction. If done properly, CMAR can reduce risk by obtaining input from a qualified general contractor during the design phase allowing the final design to be better tailored to the contractor's means and methods while being able to begin some construction before the full design is complete. However, CMAR may limit the competitiveness of bids received, leading to increased construction costs.

Because of the relatively short 10-month construction duration, it is imperative that the contractor be able to start work as soon as possible and proceed with minimal delays and/or change orders. With CMAR, the contractor is already under contract when the final design is completed and therefore can start full construction immediately without the need for PWD to go through the bid advertisement, submission, and contracting process ultimately adding months to the construction period.

#### **15.2 Pre-Purchasing Materials**

The most critical material for the Project is the pipe. RCP is manufactured in Southern California and is relatively available so it should require a long lead time. However, if at least a portion of the pipe is already onsite and available for install, the contractor won't have to go through the procurement process and wait for pipe delivery. There are currently no long lead items anticipated to be required for the Project, but if during the course of final design any such items are identified, these could also be pre-purchased to limit procurement times, further streamlining the contractor's operations and timeframes.

# Appendix A: Ditch Conversion Feasibililty Study



July 30, 2021

To: Scott Rogers, PE Palmdale Water District Engineering/Grants Manager 2029 East Q Avenue Palmdale, CA 93550

From: Jack Adam, PE Hallie Thornburrow

cc: Dave Jones, PE

# Palmdale-Littlerock Ditch Conversion Feasibility Study

90 Percent Submittal

### Introduction

The Palmdale Water District is looking to replace the existing Palmdale-Littlerock Ditch, a 7.2-mile earthen or concrete-lined ditch that conveys water from Littlerock Dam to Lake Palmdale with a pipeline. Once completed, the project will provide the following benefits:

- Increase flow capacity from 25 cubic feet per second (cfs) to 60 cfs.
- Reduce seepage and evapotranspiration losses.
- Mitigate downstream flooding that occurs when Littlerock Dam is spilling.

The purpose of this feasibility study is as follows:

- Perform hydraulics analysis and pipe sizing to convey 60 cfs from Littlerock Dam to Lake Palmdale.
- Complete a pipe materials evaluation and recommend a material selection.
- Evaluate water loss savings.
- Develop feasibility level cost estimates for construction.
- Prioritize ditch sections for replacement.



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Appendix C NRCS Data Output
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# List of Acronyms

Abbreviation	Definition
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CEQA	California Environmental Quality Act
cfs	Cubic Feet per Second
CMP	Corrugated metal pipe
DI	Ductile Iron
fps	Feet per second
gpm	gallons per minute
HDPE	High-Density Polyethylene
HGL	Hydraulic Gradeline
LF	Linear feet
LRD	Littlerock Dam
MG	Million Gallons
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resource Conservation Service
OD	Outside diameter
PE	Polyethylene
psi	Pounds per square inch
PVC	Polyvinyl chloride
PWD	Palmdale Water District
RCP	Reinforced Concrete Pipe
USBR	United States Bureau of Reclamation

# Hazen

# 1. Project Description

#### 1.1 Introduction

The Palmdale Water District (PWD) is evaluating the feasibility of replacing the existing Palmdale-Littlerock Ditch with a pipeline. The ditch was originally constructed in the 1880s and almost 70 percent of its total length remains an unlined earthen ditch. The remaining 30 percent of the ditch is either concrete-lined or enclosed in tunnels or culverts. There is also one remaining steel trestle located west of Pearblossom Highway at approximate station 387+03. The upstream and downstream ends of the ditch have been previously improved by other projects and therefore are not included in the scope of this analysis. In 1995, approximately 1,900 feet of the ditch starting at the debris basin downstream of Littlerock Dam was converted to 54-inch pipe. The new pipe alignment differs slightly from the alignment of the original ditch, which was not demolished. Therefore, a section of the covered concrete channel still exists to the east of the new 54-inch pipe but is no longer in use. In 2010, approximately 3,800 feet of the ditch from Lake Palmdale to Sierra Highway was replaced with a 48-inch diameter reinforced concrete pipeline (RCP). An overview of the ditch with approximate stationing is shown in **Figure 1-1**.The length of the ditch included in the scope of this analysis is shown in white. The upstream and downstream ends of the ditch which have been previously improved, as described above, and are shown in yellow.

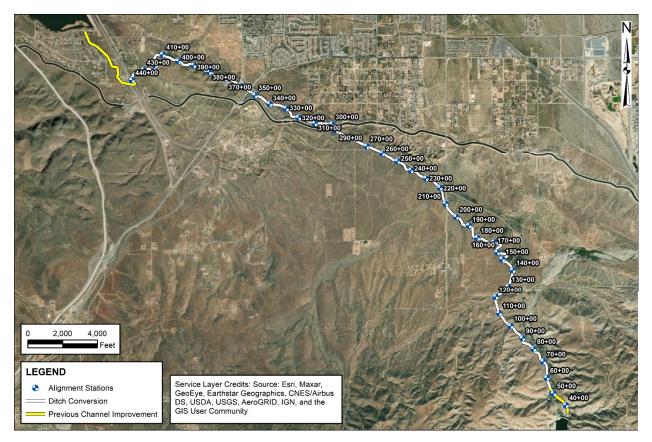


Figure 1-1 Palmdale-Littlerock Ditch Alignment



PWD operates the ditch intermittently to transfer water from the Littlerock Reservoir to Lake Palmdale for treatment and beneficial as potable supply within its service area. The purpose of this study is as follows:

- Perform hydraulics analysis and pipe sizing to convey 60 cubic feet per second (cfs) from Littlerock Dam to Lake Palmdale.
- Complete a pipe materials evaluation and recommend a material selection.
- Evaluate water loss savings.
- Develop feasibility level cost estimates for construction.
- Prioritize ditch sections for replacement.

During design, an Initial Study (IS) similar to the IS completed for the 1995 and 2010 projects and in compliance with the California Environmental Quality Act (CEQA) will need to be completed to determine if the project will have significant impact on the environment and to determine what type of environmental documentation will be required. Based on the Initial Study prepared as part of the design for the enclosure of the lower portion of the ditch, it is anticipated that that the construction work described in this report will require at a minimum a Mitigated Negative Declaration.

#### 1.2 Background Information

Information provided by PWD to assist with this feasibility includes the following:

- April 1991 survey of the centerline of Palmdale-Littlerock Ditch from Cheseboro Road to approximately 50-feet south of the Peripheral Canal on the south side of Lake Palmdale. (Google Earth images and elevations were used to supplement the survey information South of Cheseboro Road to Littlerock Dam).
- July 2010 Record Drawings for the Palmdale Ditch enclosure (Specification 0602).
- August 1994 Record Drawings for the Littlerock Canal Improvements (Job number 94135).
- Various undated ditch plan and profile drawings for the ditch alignment surveyed in 1991 (Specification 9002)
- Littlerock Dam (LRD) to Lake Palmdale Water Loss Data from 1997 to 2020.
- Geotechnical and Groundwater level data for the area (5 million gallon (MG) Water Storage Tank Report of Compaction Tests and Well No. 18 and 19 Static and Pumping Levels for May 2021).

To evaluate the existing ditch conditions, the above information was used to identify sections of ditch that appeared to be earthen-lined, concrete-lined, or enclosed with pipelines, culverts, trestles or tunnels. This information was used to assist in assessing water loss in the existing ditch and replacement costs. A summary of the existing ditch features is included in **Appendix A**. Based on our evaluation of the 7.2-

mile section of ditch being evaluated, approximately 73% is earthen lined, 17% is concrete-lined and 10% is enclosed in a pipeline or tunnel.

It should be noted that field work and inspections were not included in the scope of this project. All evaluations were desktop studies which used the best available information as summarized herein. All information has been referenced and limitations and assumptions have been stated.

# 2. Hydraulics Analysis

#### 2.1 Hydraulic Model

Hydraulic modeling was conducted to evaluate the required pipe size to convey 60 cfs from the Littlerock Reservoir to Lake Palmdale. Infoworks ICM software was used to create a steady state model of the ditch alignment capable of modeling both open channel and pressurized gravity flow.

The Infoworks ICM hydraulic model was developed using data provided in the 1991 survey as well as record drawing of improvements at the north and south ends of the project. For the surveyed section, the pipe invert elevation was assumed to be the surveyed ditch invert. The upstream section of the model was replaced with a 54-inch pipeline in 1994. This section was modeled using the as-build drawings of the pipeline. The ditch alignment between Sierra Highway and Lake Palmdale was replaced with a 48-inch pipeline in 2010; this section was also modeled using as-built drawings of the pipeline.

The upstream boundary of the model reach is the open-air concrete debris basin at the foot of the Littlerock Dam, where the flow leaves the reservoir outfall and enters the pipeline. From as-built data, this basin has an invert elevation of 3139.5 ft. Two boundary conditions are considered at this upstream boundary: a constant water surface elevation within the debris basin assuming 1 foot of freeboard, under which the pipeline is continuously surcharged under 10'8" of static head, and a steady flow of 60 cfs leaving the debris basin over a weir and entering the existing 54" pipeline at atmospheric conditions.

The downstream model boundary is the outfall from the 48-inch pipeline to Lake Palmdale. The outfall is modeled as a free-flowing outfall without hydraulic restrictions, as the pipeline discharges to atmosphere into an energy dissipator, which transitions to an earthen lined channel and discharges to the lake surface and without the possibility of submergence.

Based on the material selection presented in Section 3, the pipe material is assumed to be RCP. Friction loss is calculated using the Manning's equation. A pipe roughness value of n = 0.11 has been used simulating an average pipe condition. Minor losses at bends or appurtenances are assumed to be minimal and have not been included.

#### 2.2 Model Results

Both 42- and 48-inch pipelines were modeled. Results show a minimum 48-inch pipe is required to convey the design flow of 60 cfs without surcharging manholes or spilling. For the 42-inch alternative,

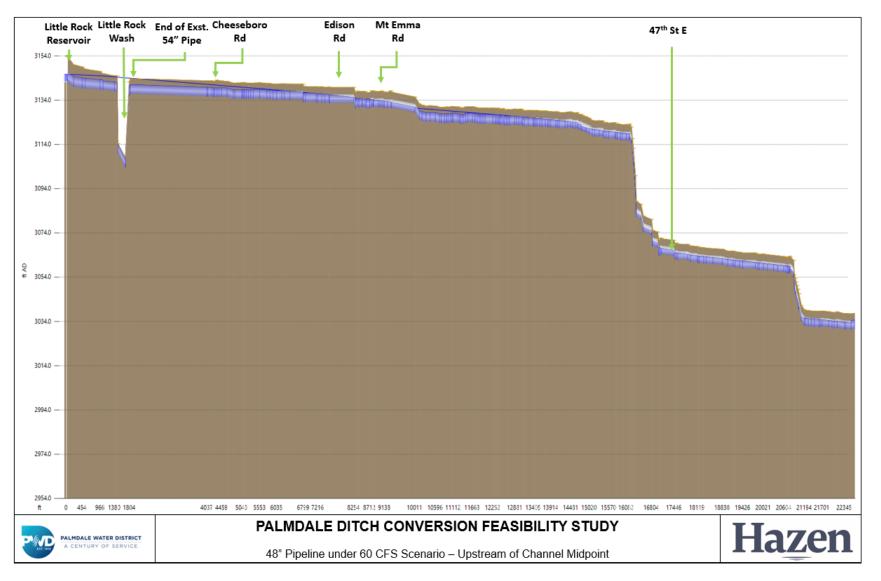


the hydraulic grade line (HGL) is above ground surface for significant lengths indicating an overflow condition. The HGL for the 48-inch pipe size are shown in **Figure 2-1** and **Figure 2-2**.

Results of this analysis suggest that the existing enclosed 48-inch pipe at the downstream end of the alignment can remain unchanged, therefore this segment is not included in the cost estimate or in the water loss calculations in subsequent sections. Additional model results are included in **Appendix B**.

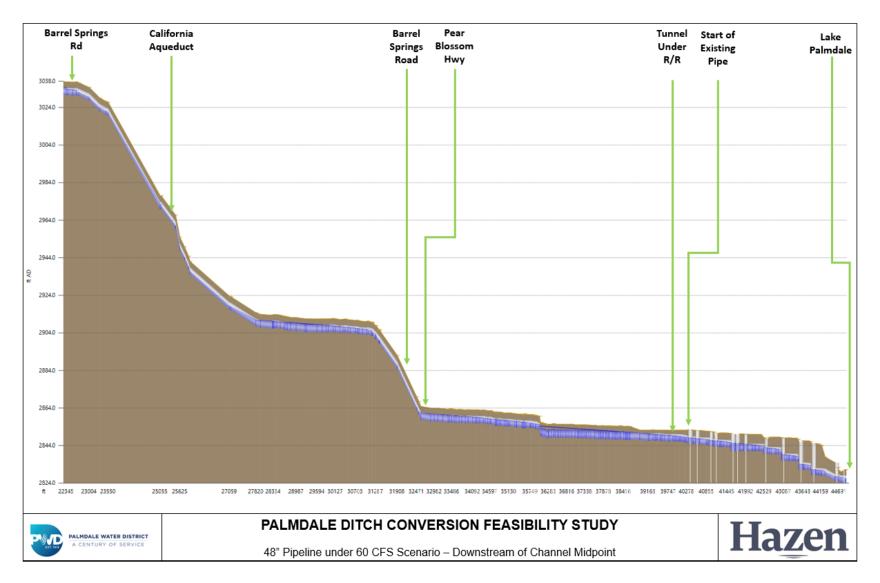
It should also be noted that because of the steep slopes and drops in the exiting ditch, some reaches have high velocities (exceeding 20 feet per second [fps]). These specific areas should be carefully evaluated during design and slopes flatten as practical or drop structures introduced as necessary to limit velocities to a maximum of 10 fps in accordance with AWWA best practices. Details of these high velocity areas along the profile are included in the Appendix.















## 3. Pipe Material Evaluation

#### 3.1 Material Selection

Four pipe materials were considered for use in the conversion of the ditch from an open channel to an enclosed pipeline. The materials are described below and summarized in **Table 3-1**.

- RCP per American Society for Testing and Materials (ASTM) C76: RCP pipe is reinforced concrete product intended for use in the conveyance of sewage and stormwater. RCP is a rigid pipe, available in diameters up to 144-inch diameter and is widely used in the water and wastewater industry as gravity flow pipelines. The pipe is primarily design to for external loading conditions as is not intended for pressure service. Bell and spigot joints are available with O-ring gaskets in accordance with ASTM C443.
- Ductile Iron Gravity Pipe (DI) per ASTM A746: DI pipe manufacture under ASTM A746 is identical in pipe manufactured under the American Water Works Association (AWWA) C 150/151 standards. DI is considered a semi-rigid pipe, available up to 64-inch diameter, and suitable for both pressure and gravity applications. The interior of the pipe is provided with a mortar lining to protect against internal corrosion. The exterior is provided with an asphaltic coating and the pipe is typically polyethylene encased in accordance with AWWA C105 to protect against long term external corrosion. Joints are gasketed, typically either O-ring for pushon type or glandular for mechanical type.
- **Polyvinyl chloride (PVC) Gravity Sewer Pipe per ASTM F679:** PVC pipe manufactured under ASTM F697 is intended for use as non-pressurized sanitary sewers. PVC pipe is considered a flexible pipe and therefore its ability to withstand external loading depends on side support from the surrounding soils. The pipe is available in diameters up to 60-inch, however it has a limited history in diameters greater than 24-inch. Joints are O-ring gaskets push on type. PVC is an electrically nonconductive and will not rust or corrode.
- **High-Density Polyethylene Pressure Pipe (HDPE) per AWWA C906:** HDPE, also referred to as polyethylene (PE), is typically used in pressure applications and is available in diameters up to 63-inch and pressures up to 254 psi. Joints are fusion welded. Typical installation methods include fusing pipe sections above ground outside the trench, then lowered into the trench. HDPE pipe is considered a flexible pipe and, therefore, its ability to withstand external loading depends on side support from the surrounding soils. HDPE also has a high coefficient of thermal expansion therefore, for installations that experience high temperature variation, thermal expansion and contraction must be accommodated. HDPE is an electrically nonconductive material and is not subject to galvanic action and will not rust or corrode.



#### Table 3-1 Pipe Material Comparison

Material	Lay Length (ft)	Pipe cost per foot	Service Life	Pros	Cons
RCP	8	\$140	75-100 years	<ul> <li>Available up to 144" diameter</li> <li>Typically used in gravity applications</li> <li>Generally not susceptible to corrosion unless reinforcing becomes exposed.</li> <li>Durable product with a long service history</li> <li>Lowest cost</li> </ul>	<ul> <li>Not suitable for pressure applications</li> <li>Short lay lengths introduce more joints/leakage potential</li> <li>Lowest construction productivity due to short lay length and weight</li> <li>Rigid pipe less likely to perform well in seismic event</li> </ul>
DIP	20	\$330	75-100 years	<ul> <li>Available up to 64" diameter</li> <li>Typically used in both pressure and gravity applications</li> <li>Long track record of use</li> </ul>	<ul> <li>Metallic and may be susceptible to corrosion if integrity of poly bag is breached.</li> <li>May require corrosion monitoring in highly corrosive soils.</li> <li>High costs</li> <li>Long periods with the ditch out of service and dry will be detrimental to mortar lining in the DI pipe.</li> <li>Semi-Rigid pipe less likely to perform well in seismic event</li> </ul>
PVC	20	\$170	50-100 years	<ul> <li>Available up to 60" diameter</li> <li>Typically used in both pressure and gravity applications</li> <li>Not susceptible to corrosion</li> <li>Flexible likely to perform better in seismic event, however, pipe may be subject to cracking with bending.</li> </ul>	<ul> <li>Does not have a long history of use in diameters greater than 24-inch.</li> <li>Successful installation highly dependent on high level of compaction around for side support to carry external soil loads.</li> <li>Can become brittle in colder temperatures and weaker in high temperature climates</li> </ul>
HDPE	50	\$230	50-100 years	<ul> <li>Available up to 63" outside diameter.</li> <li>Not susceptible to corrosion.</li> <li>Flexible, fused likely to perform better in seismic event, however, pipe may be pullout at expansion joints.</li> </ul>	<ul> <li>High thermal coefficient of expansion will require thermal expansion joints.</li> <li>Repairs in-trench difficult due to need of fusing equipment.</li> <li>Likely requires 54-inch outside diameter (OD) to meet hydraulic requirements.</li> <li>Successful installation highly dependent on high level of compaction around for side support to carry external soil loads.</li> <li>Can become brittle in colder temperatures and weaker in high temperature climates.</li> </ul>

Based on the above comparison table, **RCP is recommended for use of this project**.



#### 3.2 Allowable Leakage

Actual leakage from a properly constructed pipeline is negligible. However, allowable leakage criteria have been developed by various agencies and associations to test pipelines to assess proper installation. Section 306-7.8.2.2 of the Standard Specification for Public Work Construction (Greenbook) provides for water exfiltration test of gravity sewers (See Equation 1, below). For the purposes of estimating the maximum volume of water that could be lost due to leakage in a pipeline replacing the ditch, this allowable leakage criterion was used. For this type of pipeline allowable leakage is calculated by the following formula:

#### Equation 1 Allowable Leakage

 $E = 0.00002 \text{LD}\sqrt{H}$ Where: E = allowable leakage in gallons per minute (gpm) L = Length of pipeline tested in feet D = Internal diameter of pipeline in inches H = Difference in elevation in feet between the water surface in the upper manhole tested and the invert of the pipe in the lower manhole of the section tested.

To apply this equation to the pipeline, it is assumed that the pipe is operating slightly surcharged with the water surface elevation one foot above the crown of the pipe. This is a conservative assumption since the hydraulics show the pipe flowing in an open channel condition at the maximum flowrate of 60 cfs.

Inputs to the calculation are as follows:

L = 38,200 feet based on google earth measurements

D = 48-inch

H = 5 feet (invert of the pipe to one foot above the crown)

Based on the above equation and assumptions, the maximum allowable leakage for the entire pipeline is approximately 82 gpm or approximately 0.36-acre feet per day.

# 4. Ditch Losses

#### 4.1 Seepage Losses

To estimate seepage losses in the existing ditch, a desktop study was performed to evaluate the varying conditions along the alignment to attempt to determine and delineate the most susceptible segments/regions where considerable infiltration should be anticipated. There are many variables that impact water loss along this route, i.e., time of year of releases, rainfall preceding releases impacting soil saturation, degree of saturation achieved during releases, evaporation caused by temperature, evaporation caused by wind, vegetation and organic cover on the unlined areas restricting infiltration, inline structures causing changes in velocity/ponding which impacts wetted perimeter/head, ditch geometry, ditch profile, discharge rate, condition/integrity of partial/total lined sections, and soil types/properties. Due to this list of channel variables, estimates of seepage losses presented in this section should be considered



approximate and are intended to be used for comparative purposes. More detailed field investigations involving full-scale in-situ ponding test, and/or geotechnical drilling, installation of numerous observation/monitoring wells and pump-in water tests to determine subsurface conditions, restrictive layers, in-situ rate of infiltration, soil saturation and hydraulic conductivity would be needed to allow further refinement of this evaluation.

There are several conditions that exist along the ditch route between Littlerock Reservoir and Lake Palmdale, ranging from earthen and concrete bottom tunnels, unlined earth, and partial/total lined concrete channels of varying dimensions, vertical and slope sided (trapezoidal shape) channels, single and double 48-inch diameter corrugated metal pipe (CMP)/ and RCP segments, and varying vertical profiles. Additionally, a mitigation loss exists between the Littlerock Dam and the Littlerock Creek crossing which consists of a 4-inch open pipe to supply water to the abandoned concrete box which was previously part of the ditch which is now inhabited by a bat colony. It was assumed that these losses were insignificant compared to the overall losses and is not accounted for as part of this analysis.

A simplified summary of these features is presented in **Appendix A**. In addition to the different noted structures and elevations, it is understood the physical condition of these features varies.

The anticipated seepage losses also vary with the condition of the ditch improvements. Improved sections with fully lined concrete channels and CMP/RCP in good condition should be expected to have minimal to no seepage losses, while the same sections experiencing varying degrees of deterioration could experience considerable losses, especially if these poorer quality areas exist in the more gradual sloped conveyance profiles. Once the water is allowed to exit these improved structures, the ditch profile and the underlying bedding materials and soil conditions begin to control the rate of infiltration, water transmission, soil saturation and seepage losses. No information is known about the bedding materials underlying the improved sections, but it has been assumed that these materials, when used, would be more permeable than the underlying soils.

Based on sparse and widespread water well data for the area, it is understood that seasonal groundwater levels range from about 20 feet to in excess of 40 feet below the ground surface. As such, soils underlying and along the conveyance route would generally be considered unsaturated to partially saturated depending on seasonal and climatic conditions.

The online Web Soil Survey developed and maintained by the Natural Resource Conservation Service (NRCS) was used as a reference to develop an understanding of the different soil types along the alignment. The specific soil information and engineering properties developed by the NRCS and used during this desktop study are summarized in **Table 4-1**. The soil types intersecting the alignment with stationing and approximate lined sections of the channel are shown in **Figure 4-1** and **Figure 4-2** respectively. Additional NRCS reference information is included in **Appendix C**.



Soil Series Name	Soil Series Designation	Hydrologic Group	% Slope	% Sand	Depth to Restrictive Layer (cm)	Saturated Hydraulic Conductivity- Ksat (ft/day)
Riverwash	#21	Not Rated	N/A	94	>200	26.1
Triago family, dry-Lithic Xerorthents (Mountains/Residuum weathered from Granodiorite rock)	#711	В	50-80	66	>200	8.6
Amargosa, rocky coarse sandy loam	AmF2	D	9-55	67	46	7.2
Chino loam	Со	C/D		24	>200	1.3
Gaviota, rocky sandy loam	GaE2	D	15-30	67	36	7.2
Greenfield, sandy loam	GsC	А	2-9	67	>200	8.6
Greenfield, sandy loam	GsD2	А	9-15	67	>200	8.6
Hanford, coarse sandy loam	HbC	А	2-9	76	>200	8.6
Hanford, sandy loam	HcC	А	2-9	71	>200	8.6
Ramona, gravelly sandy loam	ReC	С	2-9	59	>200	2.2
Ramona, gravelly sandy loam	ReE	С	9-30	59	>200	2.2
Terrace escarpments	TsF	Not Rated	Not Rated	Not Rated	>200	Not Rated
Wyman, gravelly loam	WgC	В	2-9	37	>200	2.6

#### Table 4-1 NRCS Soil Classification and Selected Engineering Properties Along Ditch

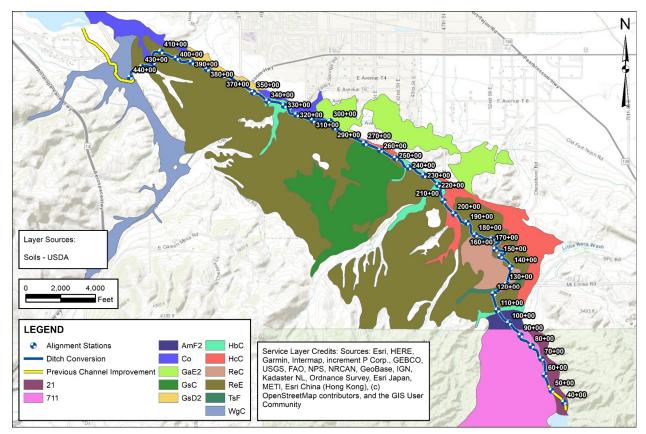


Figure 4-1 NRCS Soil Classification Along Alignment with Approximate Stationing



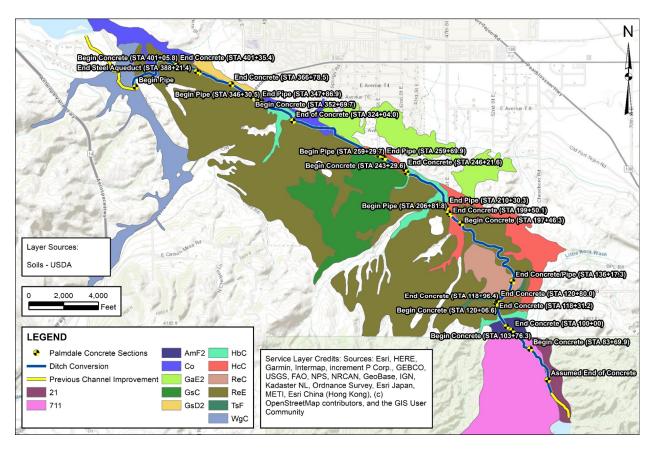


Figure 4-2 USDA Soil Types with Concrete Sections

The engineering properties of the soils indicate considerable variability along the ditch alignment. This variability, along with other factors including slope/gradient, saturation, development of hydraulic gradients; restrictive layers such as shallow rock and other fine-grained soils; and soil gradation/permeability will all have some impact on rate of infiltration. In addition, this does not include impacts due to any manmade changes along the alignment. In the absence of much of this information and without significant field studies, the Hydrologic Groups and to a lesser degree the Saturated Hydraulic Conductivity/Permeability values are considered the best available indicators to develop an understanding of the shallow soils present along the conveyance route and their ability to accept and convey surface and subsurface water (water transmission).

#### 4.1.1 Hydrologic Groups

The NRCS places the various Soil Series into differing Hydrologic Soil Groups based on their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting and when the soil is not frozen. These properties include depth to a seasonal high-water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.



The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

**Group A.** Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

**Group B**. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained, or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

**Group C**. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

**Group D**. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Based on the above information, Hydrologic Soil Groups A and B exhibit moderate to high infiltration and water transmission rate when thoroughly wet (saturated soil conditions). It should be noted that infiltration rates for unsaturated to partially saturated soils conditions are less predictable and can vary up 3 to 5 orders of magnitude difference from saturated conditions. It is hypothesized that soils within Groups A and B are the most likely suspects of allowing significant infiltration and water transmission, especially if these type soils exist in the flatter unlined/partially lined segments of the conveyance route. The Group A soils identified are within the Greenfield Series (GsC and GsD2) and Hanford Series (HbC and HcC) representing approximately 10,360 linear feet (LF), or 27% of the route length. The Group B soils identified are within the Triago family (#711) and Wyman Series (WgC). The Triago family soils, located generally downstream of Cheseboro Road, represents approximately 2,900 feet, or 8% of the route length. The Wyman Series (WgC) represents approximately 590 feet, or 2% of the route length. It is our opinion, the slope of the terrain ranging from 50%-80% and the presence of a restrictive layer at relatively shallow depth, further limits surface infiltration into the Triago family soils; however, NRCS lists these soils as having moderate infiltration capability and will be considered as such for this study.

The "Riverwash" soils are "not rated" and therefore do not fall within any Hydrologic Soil Group. These soils by nature are considered outwash (alluvial) deposits, which primarily occur between the dam and Cheseboro Road within the original Littlerock Wash, which generally diverges from the ditch alignment just upstream of Cheseboro Road. These soils represent a length of ditch that could have a very significant impact on infiltration and seepage losses due to the nature of the depositions and presence of potential preferential seepage paths with open graded gravels. Based on the available mapping, it is anticipated that



the "Riverwash" area is underlain by residual materials like those represented by Soil Series #711. The depth of scour/erosion and deposition is unknown. The "Riverwash" represents approximately 1,090 linear feet, or 3% of the route length.

The remaining Soil Series fall with Hydrologic Groups C and D and include the Chino loam (Co), Ramona gravelly sandy loam (ReC and ReE), Amargosa rocky coarse sandy loam (AmF2 with rock outcrops), and the Gaviota rocky sandy loam (GaE2). These soils are considered to have lesser impact to the overall infiltration and seepage losses along the conveyance route. These soils represent approximately 23,200 linear feet, or approximately 62% of the route length.

#### 4.1.2 Saturated Hydraulic Conductivity (Permeability)

Saturated hydraulic conductivity (Ksat) is a measure of how easily a saturated soil can transmit water. However, the strict use of saturated coefficients of permeability K(sat) values for evaluation of seepage losses in this arid area is not very reliable as most of the soils within the zone of influence likely do not achieve full (essentially 100%) saturation. Based on the available water well data, the normal groundwater table within the area west of Cheseboro Road is likely at least 20 feet, and very possibly >40 feet, below the ground surface during an annual cycle. Historical research indicates that the unsaturated hydraulic conductivity K(unsaturated) could differ from saturated by an order of magnitude of as much as 3 to 5, generally exhibiting higher permeability/infiltration until soils become fully saturated. Therefore, the initial water losses could be substantially higher than predicted using the K(sat) values, but with longer duration releases, the water loss may decrease somewhat as the soil conditions vary between unsaturated and saturated conditions. Therefore, it is recommended to only use the Ksat values for a general qualitative order of magnitude comparison of potential seepage losses for the various Soil Series, in lieu of attempting to estimate partially saturated hydraulic conductivity values.

For example, the Soil Series #21 (Riverwash) exhibits the highest estimated Ksat of 26.1 feet/day, or approximately 3 to 4 times more permeable than the Group A Greenfield and Hanford Series soils. The Group A Greenfield and Hanford Series soils exhibit a Ksat value of approximately 8.6 feet/day, or approximately 4 times more permeable than the Group C Ramona Series soils.

#### 4.1.3 Approximation of Seepage Losses Per Soil Series/Group

As discussed previously, it is difficult with any degree of accuracy to predict the segments/regions where significant seepage losses are occurring due to the considerable number of physical, subsurface, and environmental variables that may exist along the conveyance route. For a general comparison of seepage losses, while limiting variables, we have used the United States Bureau of Reclamation (USBR) (1978) channel seepage formula for free drainage conditions which considers only ditch geometry, depth of water/head and soil permeability. The Ksat values determined from NRCS have been applied, but with the realization that unsaturated to partially saturated K values exists, and soil conditions could be much more permeable than predicted, especially during initial releases following prolonged delays between releases. This is a simplified method that does not consider the conveyance profile, channel improvements/conditions of improvements, vegetation cover or other head losses that could result in slower velocity flows and increased infiltration/water transmission opportunity.



#### **Equation 2 USBR Channel Seepage**

 $q_s = \frac{K(B+2H)}{3.5}$ 

. 5 Where:

 $q_s$  = the seepage rate, cubic feet per linear foot of channel per day

K = the hydraulic conductivity adjacent to the channel, feet per day

B = the width of water in the channel, feet

H = the depth of water in the channel, feet

3.5 is the factor used by USBR to adjust hydraulic conductivity test values to seepage losses due to ponding.

A uniform width of water = 10 feet and depth of water = 2 feet was assumed.

Using calculated Ksat values determined from data provided by NRCS, we estimate the following seepage loss information:

Soil Series Groups	Hydrologic Group Designation	Average Ksat (ft/day)	Overall Length of Impacted Conveyance (If)	q₅ (cf/lf per day	Percent Unlined Channel (No Improvements)	Total Seepage Losses (acre- ft/year) *
GsC, GsD2, HbC, HcC	A	8.6	10,360	34.4	66%	568
#21(Riverwash)	N/A	26.1	1,090	104.4	77%	212
#711 (Triago)	В	8.6	2,900	34.4	45%	108
WgC	В	2.6	590	10.4	97%	14
ReC, ReE	С	2.2	19,590	8.8	77%	322
GaE2	D	7.2	590	28.8	31%	12
AmF2	D	7.2	1,380	28.8	6%	5
Со	C/D	1.3	1,600	5.2	36%	7
					Total	1,250

#### Table 4-2 Estimated Ditch Seepage Loss by Soil Type

\* Losses per year are calculated based on a 5-year average transfer duration of 105 days.

As shown above, the #21-Riverwash followed by Group A Greenfield (GsC and GsD2) Hanford (HbC and HcC) and Group B #711 Series soils exhibit soil/physical properties most receptive to significant water infiltration and transmission during releases from Littlerock Reservoir and have considerable lengths of unlined conveyance.

For the concrete lined sections of ditch, reference seepage values were used to approximate water losses. The USBR suggests that acceptable seepage rates for good quality canals could range between 0.03 to 0.10 cf/day per linear foot of wetted perimeter, with seepage rates up to 0.50 cf/day per linear foot of wetted perimeter or more for poorly lined canals. The same area assumptions that were used to calculate the soil seepage were used to calculate the losses for the lined canal. The results for the varying concrete conditions are presented in **Table 4-3**.

Since the concrete condition is unknown and the survey data shows that the lining is 30+ years old, it is assumed that the lining is in poor condition as a conservative assumption. As a result, the 7 cf/lf/day value was used in the water savings analysis.



Assumed Condition	Seepage Rate (cf/day per linear foot of wetted perimeter)	Calculated Seepage Rate (cf/lf/day)			
Good Quality Lining	0.05	0.7			
Moderate Quality Lining	0.2	2.8			
Poor Quality Lining	0.5	7.0			

#### Table 4-3 Seepage Losses Lined Canals

#### 4.2 Evaporation Losses

Evaporation losses were estimated using evaporation data from the National Oceanic and Atmospheric Administration (NOAA) Technical Report 34 (TR34), Mean Monthly, Seasonal and Actual Pan Evaporation for the United States document. No data specific to Palmdale was available therefore the evaporation rates for the Mojave Desert were used for this analysis.

The duration and timing of the water releases vary from year to year as indicated by the release data provide by PWD. The average release duration over the past five years (2021 to is 105 days or approximately three and a half months. The release data also indicated that the four consecutive months with the highest frequency of release events were April to July, which are the months with the highest evaporation rates aside from August (which has the second highest evaporation rate). TR34 indicates that evaporation from a shallow water body, or other moist natural surfaces is roughly 70 percent of evaporation of a Class A Pan, therefore the assumed evaporation rates for the ditch as shown in **Table 4-4** were taken as 70 percent of the values provided in TR34.

Month	Mean Pan Evaporation (inches/month, TR34)	Assumed Evaporation, Ev (in)			
April	10.00	7.00			
May	13.86	9.70			
June	15.91	11.14			
July	17.6 12.32				
Total (in)	40.16				
Total (ft)	3.35				
Loss Rate (ft/day)	0.0	027			

#### Table 4-4 Mean Evaporation Rates for Release Months

Similar to the seepage analysis, the water width in the channel was assumed to be 10 ft. To calculate the total water loss, only the open area portion of the channels were used to calculate surface area applicable to evaporation. With all tunnels, culverts and pipes excluded the total distance of open channel was assumed to be 34,600 ft. This produces a total evaporation loss of 22.85 acre-ft per year for a typical release event assuming the average duration for the last 5 years.



## 5. Water Savings

The results of the analyses presented in Sections 3 and 4 were used to calculate the approximate water savings by converting the current alignment to a 48-inch diameter RCP with the same segments used for the cost analysis. The potential water savings are calculated by summing up the existing losses for each segment (seepage losses and evaporation losses) and subtracting the allowable pipe leakage.

The calculated seepage losses for each soil cover by segment are shown in **Table 5-1**. The seepage losses per year are summarized for the various soil types along the alignment and the lined sections, assuming a release duration of 105 days (the average of the release data from 2017 to 2021). Analysis of the survey data and Google Maps imagery were used to estimate stationing of the lined, unlined and enclosed (tunnels and pipes) portions of the ditch. Geospatial analysis was used to distinguish the approximate stationing of each soil type boundary. This data was used to distinguish the unlined lengths of each soil type along each segment. The lined lengths for all soil type were summed for each segment. These lengths were then multiplied by the unit seepage values presented in **Section 4.1.3** and summed to get the total seepage values for each segment.



							Seep	age loss	es (cf/da	ıy)				
Segment	STA Start	STA End	Length (ft)	GsC, GsD2, HbC, HcC	#21	#711	WgC	ReC, ReE	GaE2	AmF2	Co	Lined	Total	Seepage Loss Total (Ac-ft/yr)
	Unit Seepage F	Rate (cf/lf/day)	-	34.4	104.4	34.4	10.4	8.8	28.8	28.8	5.2	7.0		
1	55+00	108+70	5,370	-	88,114	45,002	-	-	-	2,206	-	21,988	157,310	379
2	108+70	140+10	3,140	35,298	-	-	-	4,526	-	-	-	11,200	51,024	123
3	140+10	198+40	5,830	-	-	-	-	50,437	-	-	-	692	51,130	123
4	198+40	243+20	4,480	63,900	-	-	-	13,392	-	-	-	7,705	84,996	205
5	243+20	310+70	6,250	42,271	-	-	-	11,169	5,184	-	-	25,004	83,628	202
6	310+70	369+30	5,860	95,453	-	-	-	1,637	-	-	-	20,294	117,384	283
7	369+30	424+00	5,470	-	-	-	-	41,564	-	-	2,964	1,238	45,766	110
8	424+00	442+10	1,810	-	-	-	5,962	10,736	-	-	-	117	16,815	41
	Total		38,210	236,921	88,114	45,002	5,962	92,763	5,184	2,206	2,964	88,238	608,052	1,466

#### Table 5-1 Segment Seepage Losses by Soil Type



**Table 5-2** presents a summary of the total water savings by segment, these values are presented in total savings and unit savings (per linear foot). The seepage values vary depending on the percentage of lined ditch and soil type along the alignment, segments with a higher percentage of the concrete lining will have lower seepage losses. The evaporation losses for each segment are dependent on the percentage of the alignment which is covered. The evaporation rate is assumed to be linear along the uncovered sections of ditch, while evaporation along section in pipes or tunnels is assumed to be zero. The pipe leakage is assumed to be distributed equally along the new pipe; therefore, it will have no comparative impact along the water savings per linear foot.

Comparing the unit seepage rates presented in **Table 5-1** to the unit water loss rates presented in **Table 5-2** shows that even the lowest unit seepage rate is over ten-fold that of the water loss rates, meaning the impact of lining (concrete or soil type) will have a larger impact on water loss than the evaporation and pipe leakage.

				Tetel	Evap.	Pipe	Water	Savings
Segment	STA Start	STA End	Length (ft)	Total Seepage Loss	Losses (cf/day)	Leakage (cf/day)	Ac-	cf/lf/day
			( 7	(cf/day)	0.28 (cf/lf/day)	0.42 ft/year (cf/lf/day)	cimiday	
1	55+00	108+70	5,370	157,310	1,274	2,204	377	29.1
2	108+70	140+10	3,140	51,024	464	1,289	121	16.0
3	140+10	198+40	5,830	51,130	1,599	2,393	121	8.6
4	198+40	243+20	4,480	84,996	1,125	1,839	203	18.8
5	243+20	310+70	6,250	83,628	1,456	2,565	199	13.2
6	310+70	369+30	5,860	117,384	1,536	2,405	281	19.9
7	369+30	424+00	5,470	45,766	1,500	2,245	109	8.2
8	424+00	442+10	1,810	16,815	492	743	40	9.2
		Tota	al Estimate	ed Savings			1,450	123

The segment with the highest estimated water savings is Segment 1. This is due to the significant length of unlined ditch along the Riverwash (#21) soil type, which has a seepage loss rate of 104.4 cy/lf/day. Inspection of available data suggests that lining the approximately 840 ft of the unlined river wash portion of the alignment (approximate station 61+60 to 70+30) could save over two acre-ft per day of water from seepage losses alone.

The next segment with the best unit water savings is Segment 6, which has a high percentage of unlined channel falling within permeable soils. The entire length of Segment 3 falls within an unlined portion of the channel, however these soils are anticipated to have a relatively low permeability.

As previously mentioned, the volume of water loss per release is dependent on a number of variables. Due to the limitations of this study, many assumptions were made to predict the water loss per segment.



These assumptions were consistent for each segment and, therefore, the values are appropriate to compare the losses and potential water savings between one and other. A brief comparative analysis was performed to compare historical data to the results presented in **Table 5-2.** A summary of this data is presented in **Table 5-3**.

The historical volume losses were normalized for a typical release event (105 days) in order to perform an apples-to-apples comparison between the total water savings presented in **Table 5-2**. Results showed that predicted water savings is approximately 115 % of the average normalized water loss for the past 5 years.

The calculated volume loss per day for each year shows considerable variation between each year changing from 0.3 acre-ft to 33 acre-ft per day. Years 2018 and 2020 show low percent losses and could be considered outliers because they can be attributed to the release months occurring during the wet season. When analyzing the average normalized volume loss for the past five years with these years excluded, the predicted water savings is 93% of this total value.

In conclusion, the potential water savings resulting from this analysis appear to be within acceptable range when compared to the normalized volume loss for a release of similar duration.

Year	Total volume Loss (af-ft)	% Loss	Release Duration (day)	Volume Loss/Day (af-ft)	Normalized Volume Loss (acre-ft per 105 days)
2013	724	31%	79	9.2	962
2014	257	27%	30	8.6	899
2015	991	24%	30	33.0	3,469
2016	NA	NA	NA	NA	NA
2017	278	23%	52	5.3	561
2018*	349	10%	114	3.1	321
2019	2012	36%	110	18.3	1,921
2020*	59	9%	171	0.3	36
Average (past 5 releases)	738	21%		12.0	1,262
Average (2013 through 2015, 2017,2019)	852	28%		14.9	1,562

#### Table 5-3 Volume Loss - Historical Data Comparison

6. Feasibility Level Construction Cost

A feasibility level construction cost estimate was completed for the length of the alignment between the flow control structure near Littlerock Dam to the entrance of the piped portion of the alignment near the Sierra Highway.

The estimate serves for budget authorization and alternative analysis and is considered to be an AACE Class 5 level. Class 5 has a typical accuracy range of -50% on the low side and +100% on the high side.



A 25% design contingency has been added to the estimate based on the project being at a feasibility level, the nature of the project and the estimate classification.

Assumptions and limitations of this estimate are listed below. The full basis of estimate is presented in **Appendix D**.

- The alignment was divided the reaches where the soil type changed while keeping them roughly 1-mile in length, when possible.
- Ditch is replaced with 48-inch diameter RCP.
- A constant cross section was assumed for the open channel and tunneled sections.
- Rock excavation was included as required in each segment as designated by the NRCS Web Soil Survey data. The following soil typed were assumed to likely include rock; 21, 711, AMF2 and GaE2. Along these lengths it was assumed that rock extends the entire excavation depth.
- Pipe to be placed on existing channel bed. A two foot over excavation was assumed for pipe bedding.
- Backfill entire ditch/tunnel/pipe section was assumed with import fill.
- Costs for manholes were included every 500 ft.
- Costs do not include hazardous material abatement or environmental mitigation.

A summary of cost per reach is presented below in **Table 6-1**. These costs represent construction costs and do not include costs for engineering, construction management, but do include items such as contractor overhead, escalation, bond and insurance and contingency.



Item	Description	Construction Cost	Starting Station	Ending Station	Total Length	Unit Costs (\$/If)
1	Segment 1	\$2,800,000	55+00	108+70	5,370	\$521
2	Segment 2	\$1,500,000	108+70	140+10	3,140	\$478
3	Segment 3	\$2,700,000	140+10	198+40	5,830	\$463
4	Segment 4	\$2,100,000	198+40	243+20	4,480	\$469
5	Segment 5	\$3,000,000	243+20	310+70	6,250	\$480
6	Segment 6	\$2,700,000	310+70	369+30	5,860	\$461
7	Segment 7	\$2,500,000	369+30	424+00	5,470	\$457
8	Segment 8	\$800,000	424+00	442+10	1,810	\$442
Тс	otal Costs	\$18,100,000			39,210	

#### Table 6-1 Cost Estimate Summary

Although the cost per linear feet of pipe varies by reach, in general the piping costs account for about two thirds of the total cost, with the remaining one third including the demolition, excavation and fill costs. On average, construction of one mile of 48-inch diameter RCP is approximately \$1.6 million.

### 7. Segment Prioritization

Three factors were used to prioritize segments including water savings, project costs and proximity of segments to each other. The cost per unit of water savings was calculated and used to rank the eight segments as presented in **Table 7-2**. These values were used as a tool to prioritize the construction sequencing for each segment. The ditch conversion construction work was broken up into years. It was assumed that a \$4 million construction budget is available for each year. This is based on PWD receiving a \$2 million grant from the USBR with \$2 million of matching funds from PWD. In the first year, it was assumed that \$500,000 will be needed for design and permitting and the full \$4 million would be available for construction in subsequent years until the project is completed. Segment prioritization was based on lowest unit cost per acre foot of water saved. Construction packages were developed that include sections adjacent to the highest ranked sections to keep construction in one reach, even if those the adjacent section may not have been the next highest ranked. The suggested prioritization of each segment is presented in **Table 7-2** in order of priority from top to bottom.



Segment No.	Length (ft)	Unit Cost for Water Savings (\$ K per acre-ft/yr)			
1	5,370	7.4			
6	5,860	9.6			
4	4,480	10.3			
2	3,140	12.3			
5	6,250	15.1			
8	1,810	20.0			
3	5,830	22.3			
7	5,470	23.0			

#### Table 7-1 Segment Prioritization Summary

#### Table 7-2 Segment Prioritization Summary

Year	Assumed Budget (\$ M)	Segment No.	Length (ft)	% of Segment	Unit Water Savings (cf/lf/day)	Construction Costs (\$ M)	\$ K/acre- ft/yr	Water Savings (ac- ft/year)
1	3.5	1	5,370	100%	29.1	2.8	7.4	433
I	3.5	2	1,466	47%	16.0	0.7	12.4	433
2	4	6	5,860	100%	19.9	2.7	9.6	367
2	4	5	2,708	60%	13.2	1.3	15.1 307	
3	3.8	4	4,480	100%	18.8	2.1	10.3	316
3	3.0	5	3,542	57%	13.2	1.7	15.1	310
4	3.5	2	1,675	53%	16.0	0.8	12.4	186
4	3.5	3	5,830	100%	8.6	2.7	22.3	100
F	2.2	8	1,810	100%	9.2	0.8	20.0	148
5	3.3	7	5,470	100%	8.2	2.5	23.0	140
Total	18.0							1,450





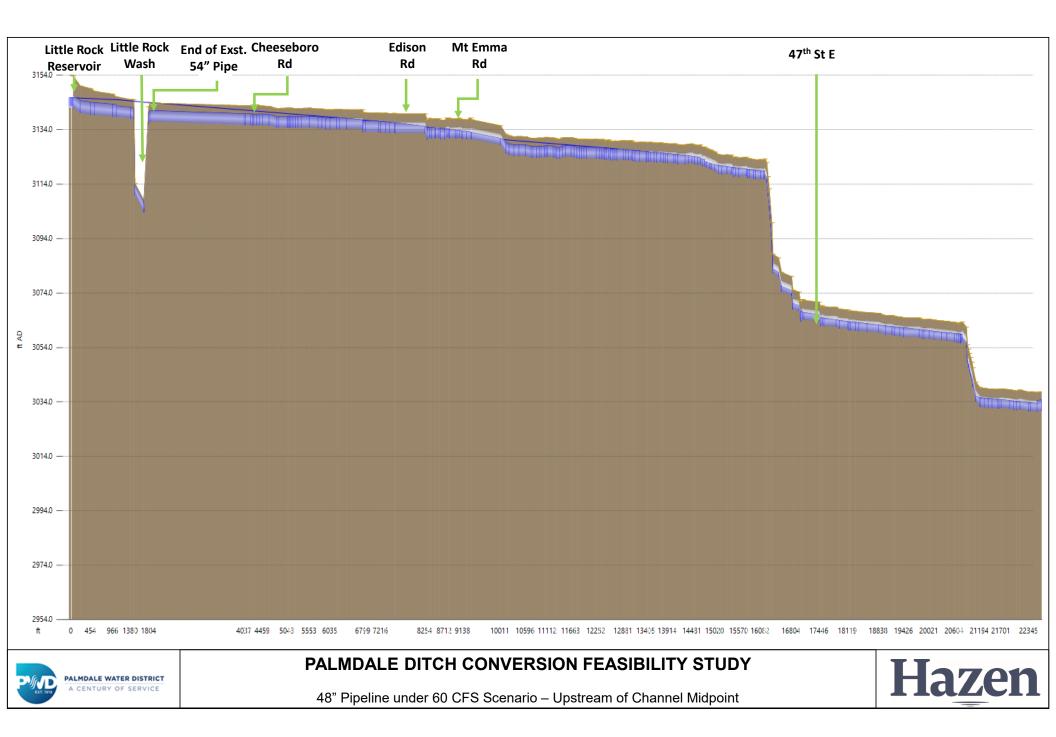
Appendix A: Existing Ditch Features

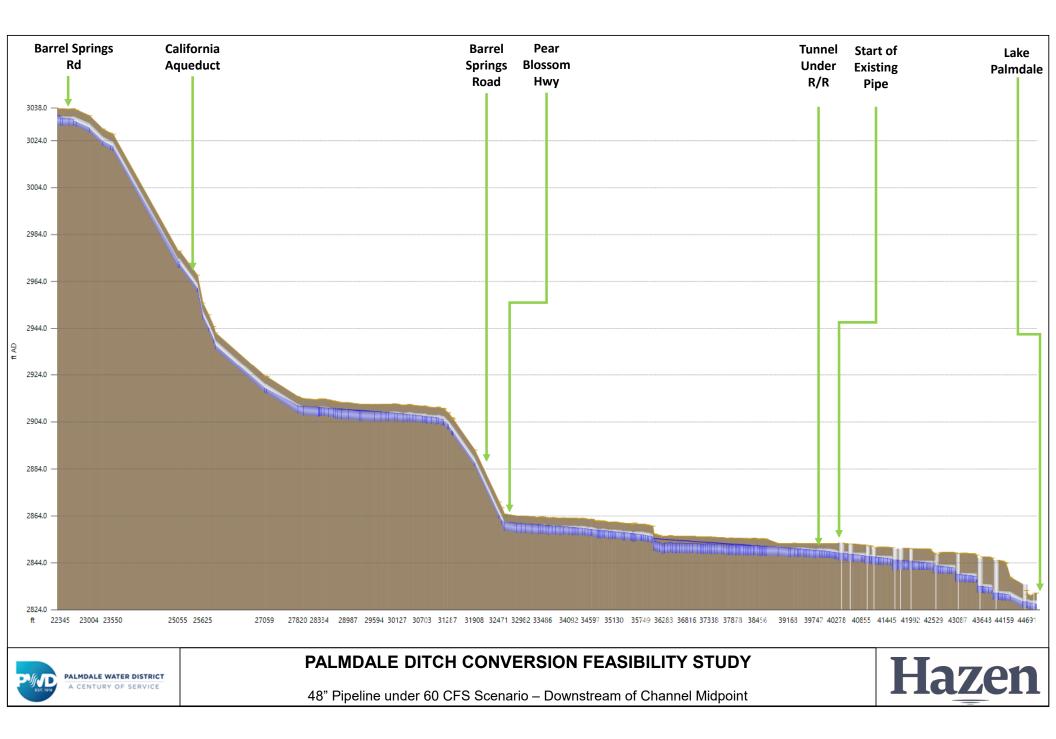
tarting Station	Ending Station	Length (ft)	Туре	Source	
55+00	61+36	636	Concrete Lining		
61+36	61+86	50	Tunnel under road	No Survey/Interpreted from Google E	
61+86	76+14	1428	Earthen Channel		
76+14.40	78+05.80	191.4	Earthen Channel		
78+05.80	78+37.10	31.3	Tunnel	Palmdale Ditch 1991 Survey	
78+37.10	83+69.90	532.80	Earthen Channel	Google Earth	
83+69.90	86+38.10	268.20	Concrete Channel	Google Earth	
86+38.10	86+68.60	30.5	Tunnel	Palmdale Ditch 1991 Survey	
86+68.60	100+00.00	1331.4	Concrete Channel	Google Earth	
100+00.00	103+76.30	376.3	Tunnel	Palmdale Ditch 1991 Survey	
103+76.30	107+48.60	372.3	Concrete Channel	Google Earth	
107+48.60	107+93.40	44.8	Tunnel	Palmdale Ditch 1991 Survey	
107+93.40	111+32.60	339.2	Earthen Channel	Google Earth	
111+32.60	118+31.20	698.6	Tunnel	Palmdale Ditch 1991 Survey	
118+31.20	118+41.40	10.2	Earthen Channel	Google Earth	
118+41.40	118+96.60	55.2	Concrete Channel	Google Earth	
118+96.60	119+80.60	84	Earthen Channel	Google Earth	
119+80.60	120+63.60	83	Concrete Channel	Google Earth	
120+63.60	120+80.00	16.4	Tunnel	Palmdale Ditch 1991 Survey	
120+80.00	124+01.60	321.6	Earthen Channel	Google Earth	
124+01.60	125+36.50	134.9	Tunnel	Palmdale Ditch 1991 Survey	
125+36.50	129+01.00	364.5	Earthen Channel	Google Earth	
129+01.00	129+14.60	13.6	Concrete Channel	Google Earth	
129+14.60	135+90.30	675.7	48" Pipe	Palmdale Ditch 1991 Survey	
135+90.30	197+41.50	6151.2	Earthen Channel	Google Earth	
197+41.50	203+88.40	646.9	Concrete Channel	Google Earth	
203+88.40	204+18.40	30	Tunnel	Palmdale Ditch 1991 Survey	
204+18.40	205+92.55	174.15	Concrete Channel	Google Earth	
205+92.55	206+81.80	89.25	Earthen Channel	Google Earth	
206+81.80	210+30.30	348.5	48" Pipe	Palmdale Ditch 1991 Survey	
210+30.30	243+29.60	3299.3	Earthen Channel	Google Earth	
243+29.60	259+29.70	1600.1	Concrete Channel	Google Earth	
259+29.70	259+69.90	40.2	2- 48" Pipe	Palmdale Ditch 1991 Survey	
259+69.90	262+88.20	318.3	Earthen Channel	Google Earth	
262+88.20	265+89.50	301.3	48" Pipe	Palmdale Ditch 1991 Survey	
265+89.50	286+40.50	2051	Earthen Channel	Google Earth	
286+40.50	286+70.50	30	Tunnel/Covered Ditch	Palmdale Ditch 1991 Survey	
286+70.50	289+00.00	229.50	Earthen Channel	Google Earth	
289+00.00	Station Break				
Station Break	300+00.00	600	36" Tunnel	Palmdale Ditch 1991 Survey	
300+00.00	324+04.00	2404.00	Concrete Channel	Google Earth	
324+04.00	346+30.50	2226.5	Earthen Channel	Google Earth	
346+30.50	347+86.90	156.4	48" Pipe	Palmdale Ditch 1991 Survey	
347+86.90	352+69.70	482.8	Earthen Channel	Google Earth	
352+69.70	353+71.20	101.5	Concrete Channel	Google Earth	
353+71.20	354+73.70	102.5	Tunnel	Palmdale Ditch 1991 Survey	
354+73.70	366+78.50	1204.8	Concrete Channel	Google Earth	
366+78.50	386+81.30	2002.80	Earthen Channel	Google Earth	
386+81.30	387+03.50	22.2	Concrete Channel	Google Earth	
387+03.50	387+21.40	17.9	Steel Aqueduct	Palmdale Ditch 1991 Survey	
387+21.40	388+28.50	107.1	Concrete Channel	Google Earth	
388+28.50	401+05.80	1277.3	Earthen Channel	Google Earth	
401+05.80	401+35.40	29.6	Concrete Channel	Google Earth	
401+35.40	441+93.30	4057.90	Earthen Channel	Google Earth	
441+93.30	442+10.00	16.70	Tunnel	Google Earth	
		38209.6	ft.		

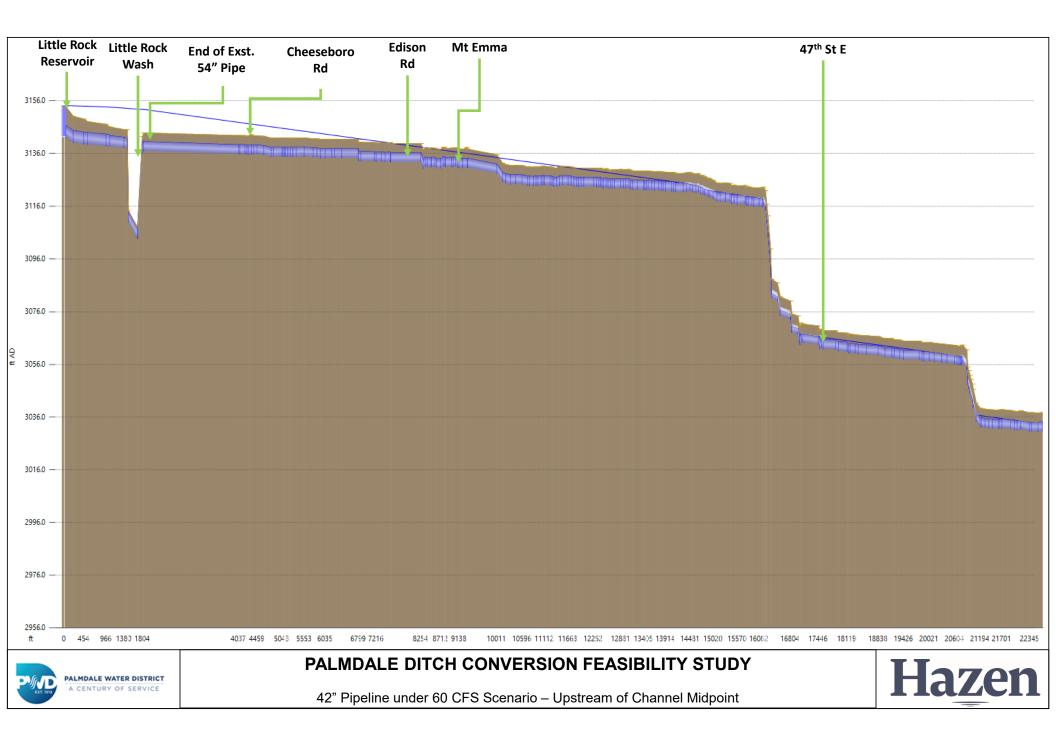


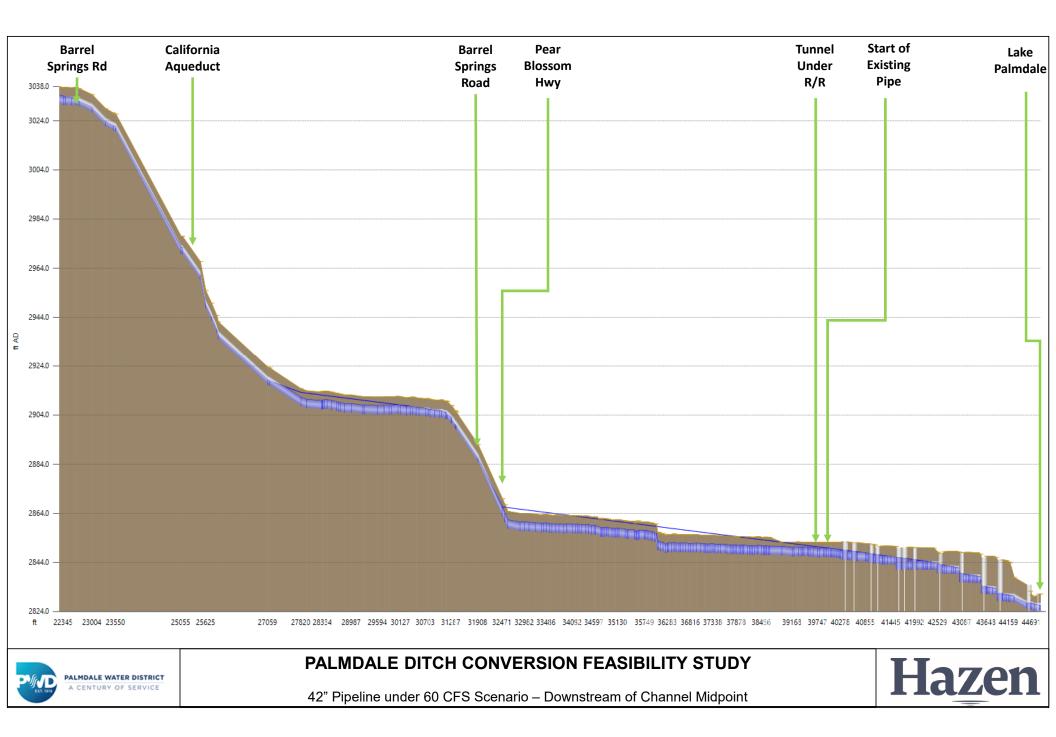


Appendix B: Hydraulic Analysis









					Max US	Max DS				
				Max US	total	total	Max US	Max DS	Max DS	Max US
Approximate		Segment	Culmulative	flow	head (ft	head (ft	velocity	velocity	Froude	Froude
US Station	Length (ft)	Length	Distance	(ft3/s)	AD)	AD)	(ft/s)	(ft/s)	number	number
3635.7	40.0			60.3	3146.1	3146.0	4.8	4.3	0.4	0.5
3675.7	169.3	40.0	40.0	60.3	3146.0	3145.7	4.3	3.6	0.0	0.4
3845.0 4090.0	245.0 90.4	169.3 245.0	209.3 454.3	60.3 60.3	3145.7 3145.6	3145.6 3145.5	3.6 3.6	3.6 3.6	0.0	0.0
4090.0	421.1	245.0 90.4	454.3 544.7	60.3	3145.6	3145.2	3.6	3.0 3.6	0.0	0.0
4601.5	84.9	421.1	965.8	60.3	3145.2	3145.2	3.6	3.6	0.0	0.0
4686.4	329.4	84.9	1050.7	60.3	3145.3	3144.9	4.6	4.6	0.0	0.0
5015.8	75.2	329.4	1380.1	60.3	3144.9	3144.8	4.6	4.6	0.1	0.1
5091.0	27.6	75.2	1455.3	60.3	3144.8	3144.6	4.6	3.9	0.1	0.1
5118.6	208.4	27.6	1482.9	60.3	3144.6	3144.3	3.9	3.8	0.0	0.1
5327.0	113.0	208.4	1691.3	60.3	3144.3	3144.3	3.8	4.5	0.1	0.0
5440.0	33.0	113.0	1804.3	60.3	3144.3	3144.3	4.5	4.6	0.1	0.1
5473.0	2200.0	33.0	1837.3	60.3	3144.3	3141.5	4.6	4.6	0.1	0.1
7673.0	23.9	2200.0	4037.3	60.3	3141.5	3141.4	4.6	4.6	0.1	0.1
7696.9	121.3	23.9	4061.2	60.3	3141.4	3141.3	4.6	4.6	0.1	0.1
7818.2	46.3	121.3	4182.5	60.3	3141.3	3141.2	4.6	4.6	0.1	0.1
7864.5	31.3	46.3	4228.8	60.3	3141.2	3141.2	4.6	4.6	0.1	0.1
7895.8	66.6	31.3	4260.1	60.3	3141.2	3141.1	4.6	4.6	0.1	0.1
7962.4	58.0	66.6	4326.7	60.3	3141.1	3141.0	4.6	4.6	0.1	0.1
8020.4 8094.5	74.1	58.0	4384.7 4458.8	60.3	3141.0	3140.9 3140.7	4.6	4.6	0.1	0.1
8094.5	158.0 176.2	74.1 158.0	4458.8 4616.8	60.3 60.3	3140.9 3140.7	3140.7	4.6 4.6	4.6 4.6	0.1	0.1
8428.7	46.7	138.0	4010.8	60.3	3140.7	3140.3	4.6	4.0	0.1	0.1
8475.4	203.0	46.7	4839.7	60.3	3140.4	3140.2	4.6	4.6	0.1	0.1
8678.4	18.5	203.0	5042.7	60.3	3140.2	3140.2	4.6	4.6	0.1	0.1
8696.9	30.6	18.5	5061.2	60.3	3140.2	3140.1	4.6	4.6	0.1	0.1
8727.5	26.7	30.6	5091.8	60.3	3140.1	3140.1	4.6	4.6	0.1	0.1
8754.2	56.1	26.7	5118.5	60.3	3140.1	3140.0	4.6	4.6	0.1	0.1
8810.3	54.1	56.1	5174.6	60.3	3140.0	3140.0	4.6	4.6	0.1	0.1
8864.4	64.3	54.1	5228.7	60.3	3140.0	3139.9	4.6	4.6	0.1	0.1
8928.7	77.4	64.3	5293.0	60.3	3139.9	3139.8	4.6	4.6	0.1	0.1
9006.1	182.5	77.4	5370.4	60.3	3139.8	3139.5	4.6	4.6	0.2	0.1
9188.6	207.4	182.5	5552.9	60.3	3139.5	3139.3	4.6	4.6	0.1	0.2
9396.0	86.1	207.4	5760.3	60.3	3139.3	3139.2	4.6	4.7	0.2	0.1
9482.1	91.4	86.1	5846.4	60.3	3139.2	3139.0	4.7	4.6	0.1	0.2
9573.5	97.1	91.4	5937.8	60.3	3139.0	3138.9	4.6	4.6	0.2	0.1
9670.6	156.4	97.1	6034.9	60.3	3138.9	3138.7	4.6	4.7	0.3	0.2
9827.0	70.8	156.4 70.8	6191.3	60.3	3138.7 3138.6	3138.6 3138.4	4.7	4.8	0.3	0.3 0.3
9897.8 10058.9	161.1 376.4	161.1	6262.1 6423.2	60.3 60.3	3138.6	3138.4	4.8 4.9	4.9 5.5	0.3 0.5	0.3
10038.3	9.9	376.4	6799.6	60.3	3138.4	3138.0	5.5	4.7	0.3	0.5
10445.2	51.9	9.9	6809.5	60.3	3137.8	3137.7	4.7	4.7	0.2	0.2
10497.1	310.4	51.9	6861.4	60.3	3137.7	3137.4	4.7	4.9	0.3	0.2
10807.5	44.8	310.4	7171.8	60.3	3137.4	3137.3	4.9	4.8	0.3	0.3
10852.3	116.4	44.8	7216.6	60.3	3137.3	3137.1	4.8	4.9	0.4	0.3
10968.7	93.0	116.4	7333.0	60.3	3137.1	3137.0	4.9	4.9	0.3	0.4
11061.7	115.7	93.0	7426.0	60.3	3137.0	3136.9	4.9	5.2	0.4	0.3
11177.4	14.0	115.7	7541.7	60.3	3136.9	3136.8	5.2	5.0	0.4	0.4
11191.4	698.6	14.0	7555.7	60.3	3136.8	3136.1	5.0	7.7	1.0	0.4
11890.0	49.7	698.6	8254.3	60.3	3136.1	3135.2	8.3	4.6	0.1	1.1
11939.7	49.6	49.7	8304.0	60.3	3135.2	3135.2	4.6	5.0	0.4	0.1
11989.3	49.5	49.6	8353.6	60.3	3135.2	3135.1	5.0	4.8	0.3	0.4
12038.8	79.0	49.5	8403.1	60.3	3135.1	3135.0	4.8	5.0	0.4	0.3
12117.8	20.4	79.0	8482.1	60.3	3135.0	3135.0	5.0	5.1	0.4	0.4
12138.2	79.5	20.4	8502.5	60.3	3135.0	3134.9	5.1	5.1	0.4	0.4

	+-	+								
12217.7	33.0	79.5	8582.0	60.3	3134.9	3134.8	5.1	4.8	0.3	0.4
12250.7	97.2	33.0	8615.0	60.3	3134.8	3134.7	4.8	4.9	0.3	0.3
12347.9	50.6	97.2	8712.2	60.3	3134.7	3134.8	4.9	6.0	0.6	0.3
12398.5	41.5	50.6	8762.8	60.3	3134.8	3134.7	6.0	6.2	0.7	0.6
12440.0	20.1	41.5	8804.3	60.3	3134.7	3134.6	6.2	5.5	0.5	0.7
12460.1	134.9	20.1	8824.4	60.3	3134.6	3134.4	5.5	6.2	0.7	0.5
12595.0	46.0	134.9	8959.3	60.3	3134.4	3134.4	6.2	6.5	0.7	0.7
12641.0	59.2	46.0	9005.3	60.3	3134.4	3134.5	6.5	7.4	0.9	0.7
12700.2	44.7	59.2	9064.5	60.3	3134.5	3134.2	7.4	6.5	0.7	0.9
12744.9	28.5	44.7	9109.2	60.3	3134.2	3134.1	6.5	6.4	0.7	0.7
12773.4	84.7	28.5	9137.7	60.3	3134.1	3134.0	6.4	6.6	0.7	0.7
12858.1	99.5	84.7	9222.4	60.3	3134.0	3133.9	6.6	7.7	1.0	0.7
12957.6	13.7	99.5	9321.9	60.3	3133.9	3133.9	7.7	7.9	1.0	1.0
12971.3	675.8	13.7	9335.6	60.3	3133.9	3131.8	8.1	8.1	1.0	1.0
13647.1	132.7	675.8	10011.4	60.3	3131.8	3130.6	8.9	4.6	0.1	1.2
13779.8	71.2	132.7	10144.1	60.3	3130.6	3130.5	4.6	4.6	0.1	0.1
13851.0	115.0	71.2	10215.3	60.3	3130.5	3130.3	4.6	4.6	0.1	0.1
13966.0	114.8	115.0	10330.3	60.3	3130.3	3130.2	4.6	4.6	0.1	0.1
14080.8	151.0	114.8	10445.1	60.3	3130.2	3130.0	4.6	4.6	0.1	0.1
14231.8	126.4	151.0	10596.1	60.3	3130.0	3129.8	4.6	4.6	0.1	0.1
14358.2	51.2	126.4	10722.5	60.3	3129.8	3129.8	4.6	4.6	0.1	0.1
14409.4	82.7	51.2	10773.7	60.3	3129.8	3129.7	4.6	4.6	0.1	0.1
14492.1	59.8	82.7	10856.4	60.3	3129.7	3129.6	4.6	4.6	0.1	0.1
14551.9	48.9	59.8	10916.2	60.3	3129.6	3129.5	4.6	4.6	0.1	0.1
14600.8	77.3	48.9	10965.1	60.3	3129.5	3129.4	4.6	4.6	0.1	0.1
14678.1	36.9	77.3	11042.4	60.3	3129.4	3129.4	4.6	4.6	0.1	0.1
14715.0	33.0	36.9	11079.3	60.3	3129.4	3129.3	4.6	4.6	0.1	0.1
14748.0	126.3	33.0	11112.3	60.3	3129.3	3129.2	4.6	4.6	0.1	0.1
14874.3	53.3	126.3	11238.6	60.3	3129.2	3129.1	4.6	4.6	0.1	0.1
14927.6	40.5	53.3	11291.9	60.3	3129.1	3129.0	4.6	4.6	0.1	0.1
14968.1	63.3	40.5	11231.3	60.3	3129.0	3129.0	4.6	4.6	0.1	0.1
15031.4	65.0	63.3	11395.7	60.3	3129.0	3128.9	4.6	4.6	0.1	0.1
15096.4	71.7	65.0	11355.7	60.3	3123.0	3128.8	4.6	4.6	0.1	0.1
15168.1	130.3	71.7	11532.4	60.3	3128.8	3128.6	4.6	4.7	0.1	0.1
15298.4	70.7	130.3	11552.4	60.3	3128.6	3128.5	4.0	4.7	0.2	0.2
15369.1	61.1	70.7	11733.4	60.3	3128.5	3128.5	4.6	4.6	0.2	0.2
15430.2	64.5	61.1	11755.4	60.3	3128.5	3128.4	4.6	4.6	0.1	0.2
			11794.5							
15494.7	45.5	64.5		60.3	3128.4	3128.3	4.6	4.6	0.1	0.1
15540.2	54.7	45.5	11904.5	60.3	3128.3	3128.3	4.6	4.6	0.1	0.1
15594.9	62.6	54.7	11959.2	60.3	3128.3	3128.2	4.6	4.6	0.1	0.1
15657.5	230.0	62.6	12021.8	60.3	3128.2	3127.9	4.6	4.7	0.3	0.1
15887.5	69.2	230.0	12251.8	60.3	3127.9	3127.8	4.7	4.7	0.2	0.3
15956.7	49.5	69.2	12321.0	60.3	3127.8	3127.7	4.7	4.7	0.2	0.2
16006.2	34.0	49.5	12370.5	60.3	3127.7	3127.7	4.7	4.8	0.3	0.2
16040.2	38.8	34.0	12404.5	60.3	3127.7	3127.6	4.8	4.7	0.2	0.3
16079.0	33.4	38.8	12443.3	60.3	3127.6	3127.6	4.7	4.6	0.1	0.2
16112.4	68.8	33.4	12476.7	60.3	3127.6	3127.5	4.6	4.8	0.3	0.1
16181.2	42.2	68.8	12545.5	60.3	3127.5	3127.4	4.8	4.6	0.2	0.3
16223.4	49.8	42.2	12587.7	60.3	3127.4	3127.4	4.6	4.7	0.2	0.2
16273.2	42.9	49.8	12637.5	60.3	3127.4	3127.3	4.7	4.7	0.2	0.2
16316.1	49.3	42.9	12680.4	60.3	3127.3	3127.3	4.7	4.7	0.2	0.2
16365.4	150.8	49.3	12729.7	60.3	3127.3	3127.1	4.7	4.9	0.4	0.2
16516.2	59.4	150.8	12880.5	60.3	3127.1	3127.0	4.9	4.9	0.3	0.4
16575.6	53.8	59.4	12939.9	60.3	3127.0	3126.9	4.9	5.0	0.4	0.3
16629.4	71.0	53.8	12993.7	60.3	3126.9	3126.8	5.0	5.2	0.4	0.4
16700.4	36.1	71.0	13064.7	60.3	3126.8	3126.7	5.2	4.9	0.3	0.4
16736.5	50.2	36.1	13100.8	60.3	3126.7	3126.6	4.9	4.7	0.3	0.3
	111 1	50.2	13151.0	60.2	3126.6	3126.5	4.7	4.9	0.3	0.3
16786.7	114.4	50.2	13131.0	60.3	5120.0	5120.5	4.7	4.9	0.5	0.3

17075         345         27.1         13431.8         60.3         3126.3         3126.2         3126.2         51.5         0.5         0.6           17102.0         64.1         345.5         1365.5         60.3         3126.1         51.5         5.5         0.4         0.4           17221.2         61.4         866.1         413955.5         60.3         3125.0         3125.9         51.1         5.5         0.5         0.4         0.4           17291.9         67.2         99.3         61.375.0         60.3         3125.8         3125.7         5.3         5.4         0.5 </th <th>17067.5 17102.0 17145.1 17231.2 17292.6 17391.9 17459.1 17496.4 17549.5 17740.5 17786.8 17740.5 17786.8 17786.8 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18817.1 1 18937.0 1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19460.4 19548.0 19596.1 1 19717.7</th> <th>34.5         43.1         86.1         61.4         99.3         67.2         37.3         53.1         40.0         51.0         46.3         77.1         86.9         63.6         75.8         54.3         51.1         51.8         40.9         86.3         33.6         82.2         79.8         81.7         119.9         104.7         41.1</th> <th>27.1 34.5 43.1 86.1 61.4 99.3 67.2 37.3 53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7</th> <th>13431.8 13466.3 13509.4 13595.5 13656.9 13756.2 13823.4 13860.7 13913.8 14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7</th> <th>60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3</th> <th>3126.3 3126.2 3126.2 3126.1 3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.4 3124.4 3123.6 3123.1 3122.7</th> <th>3126.2 3126.2 3126.1 3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.1 3125.1 3125.1 3124.7 3124.6 3124.0 3124.0 3123.6 3123.1 3122.7</th> <th>4.9 5.1 5.3 5.2 5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.5 7.6 6.8 6.6 9.5 7.3 11.3 9.9 10.0</th> <th>5.1 5.3 5.2 5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3</th> <th>0.4 0.5 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.6 0.4 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3</th> <th>0.4 0.4 0.4 0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5</th>	17067.5 17102.0 17145.1 17231.2 17292.6 17391.9 17459.1 17496.4 17549.5 17740.5 17786.8 17740.5 17786.8 17786.8 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18817.1 1 18937.0 1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19460.4 19548.0 19596.1 1 19717.7	34.5         43.1         86.1         61.4         99.3         67.2         37.3         53.1         40.0         51.0         46.3         77.1         86.9         63.6         75.8         54.3         51.1         51.8         40.9         86.3         33.6         82.2         79.8         81.7         119.9         104.7         41.1	27.1 34.5 43.1 86.1 61.4 99.3 67.2 37.3 53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	13431.8 13466.3 13509.4 13595.5 13656.9 13756.2 13823.4 13860.7 13913.8 14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3126.3 3126.2 3126.2 3126.1 3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.4 3124.4 3123.6 3123.1 3122.7	3126.2 3126.2 3126.1 3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.1 3125.1 3125.1 3124.7 3124.6 3124.0 3124.0 3123.6 3123.1 3122.7	4.9 5.1 5.3 5.2 5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.5 7.6 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.1 5.3 5.2 5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3	0.4 0.5 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.6 0.4 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.4 0.4 0.4 0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5
171020       44.1       34.5       13466.3       60.3       3126.2       3126.1       5.3       5.2       0.4       0.4         17251.2       61.4       86.1       13595.5       60.3       3126.1       3126.0       5.2       5.1       0.4       0.4         17291.9       67.2       93.3       1376.2       60.3       3125.9       3125.5       5.3       5.3       0.5	17102.0 17145.1 17231.2 17292.6 17391.9 17459.1 17496.4 17549.5 17740.5 17786.8 17740.5 17786.8 17786.8 17786.8 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18655.6 18735.4 18817.1 18937.0 19041.7 19082.8 19134.2 19205.6 1 19393.2 19460.4 19596.1 1 19717.7	43.1         86.1         61.4         99.3         67.2         37.3         53.1         140.0         51.0         46.3         170.1         72.2         86.9         63.6         75.8         54.3         51.1         51.8         40.9         86.3         33.6         82.2         79.8         81.7         119.9         104.7         41.1	34.5 43.1 86.1 61.4 99.3 67.2 37.3 53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	13466.3 13509.4 13595.5 13656.9 13756.2 13823.4 13860.7 13913.8 14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3126.2 3126.2 3126.1 3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.4 3124.0 3124.4 3123.6 3123.1 3122.7	3126.2 3126.1 3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.0 3124.0 3124.0 3123.6 3123.1 3122.7	5.1 5.3 5.2 5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.5 7.6 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.3 5.2 5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3	0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.4 0.5 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.6 0.4 0.4 0.5 0.7 0.9 0.8 0.8 1.3 0.9 1.7 1.4
17451       86.1       43.1       13500.4       60.3       3176.2       3126.1       55.3       5.2       0.4       0.4         17291.2       61.4       13655.9       60.3       3125.9       5.1       5.5       0.5       0.5         17491.9       67.2       99.3       1376.2       60.3       3125.8       3125.5       5.3       5.4       0.5	17145.1 17231.2 17292.6 17391.9 17459.1 17496.4 17549.5 17740.5 17786.8 17786.8 17786.8 17786.8 177956.9 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18573.4 18655.6 18735.4 18817.1 18937.0 19041.7 19082.8 19134.2 19205.6 1 19393.2 19460.4 19548.0 19596.1 1 19717.7	86.1           61.4           99.3           67.2           37.3           53.1           40.0           51.0           46.3           170.1           72.2           86.9           63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	43.1 86.1 61.4 99.3 67.2 37.3 53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	13509.4 13595.5 13656.9 13756.2 13823.4 13860.7 13913.8 14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3126.2 3126.1 3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.4 3124.4 3123.6 3123.1 3122.7	3126.1 3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	5.3 5.2 5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.5 7.6 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.2 5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3	0.4 0.4 0.5 0.5 0.5 0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.6 0.4 0.4 0.5 0.7 0.9 0.8 0.8 1.3 0.9 1.7 1.4
172312       64.4       86.1       13399.5       60.3       3126.1       3126.0       51.2       5.1       0.4       0.4         17391.9       67.2       99.3       13736.2       60.3       3125.9       3125.8       5.5       5.5       0.5       0.5         17496.4       53.1       37.3       1386.7       60.3       3125.7       3125.6       5.4       5.2       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6       0.5       0.6	17231.2 17292.6 17391.9 17459.1 17496.4 17549.5 17740.5 17740.5 17786.8 17786.8 1 17956.9 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18655.6 18735.4 18817.1 1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19423.5 19460.4 19548.0 19596.1 1 19717.7	61.4           99.3           67.2           37.3           53.1           140.0           51.0           46.3           170.1           72.2           86.9           63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	86.1 61.4 99.3 67.2 37.3 53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	13595.5 13656.9 13756.2 13823.4 13860.7 13913.8 14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3126.1 3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	5.2 5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.9 9.3	0.4 0.5 0.5 0.5 0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.4 0.5 0.5 0.5 0.5 0.5 0.6 0.4 0.4 0.5 0.7 0.9 0.8 0.8 0.8 1.3 0.9 1.7 1.4
1729.6       99.3       16.4       13656.9       60.3       3125.9       3125.5       5.1       5.5<	17292.6 17391.9 17459.1 17496.4 17549.5 17740.5 17740.5 17786.8 1 17956.9 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18655.6 18735.4 18817.1 1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19460.4 19548.0 19596.1 1 19717.7	99.3           67.2           37.3           53.1           140.0           51.0           46.3           170.1           72.2           86.9           63.6           75.8           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	61.4 99.3 67.2 37.3 53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	13656.9 13756.2 13823.4 13860.7 13913.8 14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3126.0 3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	5.1 5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.9 9.3	0.5 0.5 0.5 0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.4 0.5 0.5 0.5 0.5 0.6 0.4 0.4 0.5 0.7 0.9 0.8 0.8 0.8 1.3 0.9 1.7 1.4
173919       672       993       137562       603       31259       31257       53       5.4       0.5       0.5         17496.4       573       672       13824.4       603       31257       3125.6       5.4       5.2       0.5       0.5         17496.4       531       13060.7       60.3       3125.6       3125.4       5.2       5.6       0.5       0.5       0.5       0.6       0.7         1748.5       51.0       1400.1       14053.8       60.3       3125.4       3125.2       52.5       7       5.2       0.4       0.6       0.6       0.6       0.6       0.7       0.6       0.6       0.7       0.6       0.7       0.6       0.6       0.6<	17391.9 17459.1 17496.4 17549.5 17740.5 17740.5 17786.8 1 17956.9 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18817.1 1 18937.0 1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19460.4 19548.0 19596.1 1 19717.7	67.2           37.3           53.1           (40.0)           51.0           46.3           (70.1)           72.2           86.9           63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	99.3 67.2 37.3 53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	13756.2 13823.4 13860.7 13913.8 14053.8 14104.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3125.9 3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3125.8 3125.7 3125.6 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	5.5 5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.5 7.6 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3	0.5 0.5 0.5 0.6 0.4 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.5 0.5 0.5 0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 0.8 0.8 1.3 0.9 1.7 1.4
174991       37.3       67.2       13823.4       60.3       3125.8       3125.7       5.3       5.4       5.2       0.5       0.5         17999.4       53.1       373.3       13860.7       60.3       3125.6       3125.4       5.2       5.6       0.5       0.5       0.5         17689.5       51.0       140.0       14053.8       60.3       3125.4       3125.4       5.2       5.7       7.5       0.6       0.7         17780.5       46.3       170.1       14321.2       60.3       3125.0       3125.0       5.6       6.5       0.7       0.7         18020.1       86.9       72.2       14393.4       60.3       3125.1       3124.7       5.6       6.6       0.8       0.0         18176.0       63.6       63.6       14480.3       60.3       3124.7       3124.6       6.8       6.6       0.8       0.0       1325.4       3124.0       7.3       0.9       1       13300.7       5.1       1.447.9       60.3       3124.6       3124.0       7.3       0.9       1       3434.3       3124.8       3124.0       7.3       0.9       1       3434.3       3124.8       3124.0       7.3       0.9       <	17459.1 17496.4 17549.5 17740.5 17740.5 17786.8 1 17956.9 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18817.1 18937.0 1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19460.4 19548.0 19596.1 1 19717.7	37.3         53.1         440.0         51.0         46.3         170.1         72.2         86.9         63.6         75.8         54.3         51.1         51.8         40.9         86.3         33.6         82.2         79.8         81.7         119.9         104.7         41.1	67.2 37.3 53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	13823.4 13860.7 13913.8 14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3125.8 3125.7 3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3125.7 3125.6 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	5.3 5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3	0.5 0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.5 0.5 0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 1.3 0.9 1.7 1.4
173964       53.1       37.3       138607       60.3       3125.6       5.4       5.2       5.6       0.5       C         17595       140.0       53.1       13913.8       60.3       3125.4       3125.4       5.2       5.6       0.5       C       C         17786.8       170.1       46.3       1410.4       8       60.3       3125.4       3125.2       5.2       5.6       0.5       C       C         17786.8       170.1       46.3       1415.1       60.3       3125.1       352.5       5.2       5.6       0.5       C       C       C       0.5       C       C       0.5       C       C       0.5       C       C       C       0.5       C       C       C       C       0.5       C <td>17496.4 17549.5 17740.5 17740.5 17786.8 1 17956.9 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18655.6 18735.4 18817.1 1 18937.0 1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19460.4 19548.0 19596.1 1 19717.7</td> <td>53.1           140.0           51.0           46.3           70.1           72.2           86.9           63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1</td> <td>37.3 53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7</td> <td>13860.7 13913.8 14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7</td> <td>60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3</td> <td>3125.7 3125.6 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7</td> <td>3125.6 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7</td> <td>5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.8 6.6 9.5 7.3 11.3 9.9 10.0</td> <td>5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.6 7.7 7.3 7.3 7.9 9.9 9.9 9.9 9.3</td> <td>0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3</td> <td>0.5 0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 0.8 1.3 0.9 1.7 1.4</td>	17496.4 17549.5 17740.5 17740.5 17786.8 1 17956.9 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18655.6 18735.4 18817.1 1 18937.0 1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19460.4 19548.0 19596.1 1 19717.7	53.1           140.0           51.0           46.3           70.1           72.2           86.9           63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	37.3 53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	13860.7 13913.8 14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3125.7 3125.6 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3125.6 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	5.4 5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.6 7.7 7.3 7.3 7.9 9.9 9.9 9.9 9.3	0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.5 0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 0.8 1.3 0.9 1.7 1.4
175495       1400       3531       19913.8       60.3       3125.4       3125.4       52.4       5.6       5.7       6.6       6.7         177805.5       51.0       1400.4       60.3       3125.4       3125.2       5.7       5.2       0.6       6.7         17786.8       170.1       46.3       14151.1       60.3       3125.0       3125.1       5.6       6.5       0.7       0.7         18029.1       86.9       72.2       1701.1       14321.2       60.3       3125.1       3124.7       7.6       6.8       0.8       0.8       0.0         18116.0       63.6       86.9       14480.3       60.3       3124.7       3124.6       6.8       6.6       0.8       0.8       0.0         18309.7       51.1       54.3       14619.7       60.3       3124.4       3124.0       7.3       0.9       1.4       1.1       1.8       1.3       9.9       1.4	17549.5       1         17689.5       1         17740.5       1         17786.8       1         17956.9       1         18029.1       1         18116.0       1         18179.6       1         18255.4       1         18309.7       1         18360.8       1         18412.6       1         18453.5       1         18573.4       1         18655.6       1         18735.4       1         18937.0       1         19041.7       1         19082.8       1         19134.2       1         19393.2       1         19460.4       1         19548.0       1         19596.1       1         19717.7       1	40.0           51.0           46.3           170.1           72.2           86.9           63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	53.1 140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	13913.8 14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3125.6 3125.4 3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	5.2 5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3	0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 0.8 1.3 0.9 1.7 1.4
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	17689.5 17740.5 17786.8 1 17956.9 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18817.1 1 18937.0 1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19423.5 19460.4 19548.0 19596.1 1 19717.7	51.0           46.3           470.1           72.2           86.9           63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	140.0 51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	14053.8 14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	5.6 5.7 5.2 5.6 6.5 7.6 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.7 5.2 5.6 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3	0.6 0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.4 1.3	0.5 0.6 0.4 0.5 0.7 0.9 0.8 0.8 0.8 1.3 0.9 1.7 1.4
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	17740.5 17786.8 17956.9 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18817.1 18937.0 1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19423.5 19460.4 19548.0 19596.1 1 19717.7	46.3           170.1           72.2           86.9           63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	51.0 46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	14104.8 14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3125.4 3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	5.7 5.2 5.6 6.5 7.6 6.8 6.6 9.5 7.3 11.3 9.9 10.0	5.2 5.6 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.9 9.3	0.4 0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.6 0.4 0.5 0.7 0.9 0.8 0.8 0.8 1.3 0.9 1.7 1.4
17786.8       170.1       446.3       14151.1       60.3       3125.2       3125.1       5.6       0.5       0.7         17956.9       72.2       170.1       14321.2       60.3       3125.1       5.6       6.5       0.7       0.7         18116.0       63.6       88.9       14480.3       60.3       3125.1       3124.7       7.6       6.8       0.8       0.0         18157.6       75.8       63.6       14543.9       60.3       3124.6       3124.7       6.6       7.7       1.0       0.0         18360.8       51.8       51.1       14775.1       60.3       3124.6       3124.0       9.5       7.3       0.9       1.4       1.0         18450.8       65.3       40.9       1437.8       60.3       3124.0       7.3       7.9       1.0       0.0         18453.5       65.3       40.9       1437.8       60.3       3122.1       1.2       9.9       9.4       4.1         18453.5       65.3       14994.1       60.3       3122.1       3122.7       10.0       9.3       1.3       1.1       1.1       1.1       1.4       1.1       1.4       1.4       1.4       1.4       1.4 <td>17786.8       1         17956.9       1         18029.1       1         18116.0       1         18179.6       1         18255.4       1         18309.7       1         18360.8       1         18412.6       1         18453.5       1         18573.4       1         18573.4       1         18937.0       1         19041.7       1         19082.8       1         19134.2       1         19393.2       1         19460.4       1         19548.0       1         19717.7       1</td> <td>170.1           72.2           86.9           63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1</td> <td>46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7</td> <td>14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7</td> <td>60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3</td> <td>3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7</td> <td>3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3124.0 3123.6 3123.1 3122.7</td> <td>5.2 5.6 6.5 7.6 6.8 6.6 9.5 7.3 <b>11.3</b> 9.9 10.0</td> <td>5.6 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.9 9.3</td> <td>0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.4 1.3</td> <td>0.4 0.5 0.7 0.9 0.8 0.8 1.3 0.9 1.7 1.4</td>	17786.8       1         17956.9       1         18029.1       1         18116.0       1         18179.6       1         18255.4       1         18309.7       1         18360.8       1         18412.6       1         18453.5       1         18573.4       1         18573.4       1         18937.0       1         19041.7       1         19082.8       1         19134.2       1         19393.2       1         19460.4       1         19548.0       1         19717.7       1	170.1           72.2           86.9           63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	46.3 170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	14151.1 14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3125.2 3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3125.0 3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3124.0 3123.6 3123.1 3122.7	5.2 5.6 6.5 7.6 6.8 6.6 9.5 7.3 <b>11.3</b> 9.9 10.0	5.6 6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.9 9.3	0.5 0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.4 1.3	0.4 0.5 0.7 0.9 0.8 0.8 1.3 0.9 1.7 1.4
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	17956.9 18029.1 18116.0 18179.6 18255.4 18309.7 18360.8 18412.6 18453.5 18539.8 18573.4 18655.6 18735.4 18817.1 19041.7 19082.8 19134.2 19205.6 1 19393.2 19423.5 19460.4 19548.0 19596.1 1 19717.7	72.2         86.9         63.6         75.8         54.3         51.1         51.8         40.9         86.3         33.6         82.2         79.8         81.7         119.9         104.7         41.1	170.1 72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	14321.2 14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3125.0 3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3125.1 3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.6 3123.1 3122.7	5.6 6.5 7.6 6.8 6.6 9.5 7.3 <b>11.3</b> 9.9 10.0	6.5 7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3	0.7 0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.4 1.3	0.5 0.7 0.9 0.8 0.8 1.3 0.9 1.7 1.4
18029.1         86.9         72.2         14393.4         60.3         3125.1         3125.1         6.5         7.6         0.9         0           18116.0         65.6         64543.9         60.3         3124.7         7.6         6.8         0.6         0.8         0.0           18255.4         57.8         65.6         14543.9         60.3         3124.7         6.6         8         6.6         0.8         0.0           18309.7         51.1         54.3         14619.7         60.3         3124.0         3124.0         9.5         7.3         0.9         9.9         1.4         0.1         0.0         1.8         1.4         1.0         0.3         3122.4         3123.1         9.9         9.9         1.4	18029.1         18116.0         18179.6         18255.4         18309.7         18360.8         18412.6         18453.5         18539.8         18573.4         18655.6         18735.4         18817.1         18937.0         19041.7         19082.8         19134.2         19205.6         19393.2         19460.4         19548.0         19596.1         19717.7	86.9         63.6           75.8         54.3           51.1         51.8           40.9         86.3           33.6         82.2           79.8         81.7           119.9         104.7           41.1         1	72.2 86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	14393.4 14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3125.1 3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3125.1 3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	6.5 7.6 6.8 6.6 9.5 7.3 <b>11.3</b> 9.9 10.0	7.6 6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3	0.9 0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.7 0.9 0.8 0.8 1.3 0.9 1.7 1.4
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	18116.0         18179.6         18255.4         18309.7         18360.8         18412.6         18453.5         18573.4         18655.6         18735.4         18817.1         19041.7         19082.8         19134.2         19205.6         19393.2         19460.4         19596.1         19717.7	63.6           75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	86.9 63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	14480.3 14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3125.1 3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3124.7 3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	7.6 6.8 9.5 7.3 <b>11.3</b> 9.9 10.0	6.8 6.6 7.7 7.3 7.9 9.9 9.9 9.9 9.3	0.8 0.8 1.0 0.9 1.0 1.4 1.4 1.4 1.3	0.9 0.8 0.8 1.3 0.9 1.7 1.4
18179.0         75.8         66.6         14543.9         60.3         3124.7         3124.6         6.8         6.6         0.8           18255.4         54.3         75.8         14613.7         60.3         3124.6         3124.0         9.5         7.3         0.9         9           18300.7         51.1         54.3         14674.0         60.3         3124.0         3124.0         7.3         7.9         1.0         0.0           18451.5         86.3         40.9         51.8         1477.6         60.3         3122.4         3123.6         11.3         9.9         1.4         1.1           18532.6         86.3         40.9         14817.8         60.3         3122.1         3122.1         10.0         9.3         1.3         1.1           18532.6         79.8         82.2         15019.9         60.3         3122.1         3121.1         121.1         5.9         6.6         0.6         1.1         1.1           1887.1         119.9         1530.1.3         60.3         3122.1         3121.1         312.0         5.4         0.5         0.6         0.6         0.5         0.6         0.5         0.5         0.5         0.6         0	18179.6         18255.4         18309.7         18360.8         18412.6         18453.5         18539.8         18573.4         18655.6         18735.4         18817.1         19041.7         19082.8         19134.2         19205.6         19393.2         19423.5         19548.0         19596.1         19717.7	75.8           54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	63.6 75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	14543.9 14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3124.7 3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3124.6 3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	6.8 6.6 9.5 7.3 <b>11.3</b> 9.9 10.0	6.6 7.7 7.3 7.9 9.9 9.9 9.3	0.8 1.0 0.9 1.0 1.4 1.4 1.3	0.8 0.8 1.3 0.9 1.7 1.4
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	18255.4         18309.7         18360.8         18412.6         18453.5         18539.8         18573.4         18655.6         18735.4         18817.1         19041.7         19082.8         19134.2         19205.6         19393.2         19460.4         19548.0         19596.1         19717.7	54.3           51.1           51.8           40.9           86.3           33.6           82.2           79.8           81.7           119.9           104.7           41.1	75.8 54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	14619.7 14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3124.6 3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3124.7 3124.0 3124.0 3123.6 3123.1 3122.7	6.6 9.5 7.3 <b>11.3</b> 9.9 10.0	7.7 7.3 7.9 9.9 9.9 9.3	1.0 0.9 1.0 1.4 1.4 1.3	0.8 1.3 0.9 1.7 1.4
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	18309.7         18360.8         18412.6         18453.5         18539.8         18573.4         18655.6         18735.4         18817.1         18937.0         19041.7         19082.8         19134.2         19205.6         19393.2         19460.4         19548.0         19596.1         19717.7	51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7 119.9 104.7 41.1	54.3 51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	14674.0 14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3 60.3 60.3	3124.8 3124.0 3124.4 3123.6 3123.1 3122.7	3124.0 3124.0 3123.6 3123.1 3122.7	9.5 7.3 <b>11.3</b> 9.9 10.0	7.3 7.9 9.9 9.9 9.3	0.9 1.0 1.4 1.4 1.3	1.3 0.9 1.7 1.4
1880.8       51.8       51.1       14775.9       60.3       3124.0       7.2       7.9       1.0       0         1841.6       40.9       51.8       14776.9       60.3       3123.4       3123.6       11.3       9.9       1.4       1         18435.5       86.3       40.9       14417.8       60.3       3123.1       3122.7       10.0       9.3       1.3       1         18539.8       33.6       14937.7       60.3       3122.1       3122.2       9.3       8.5       1.1       1         18555.6       79.8       82.2       15019.9       60.3       3122.2       312.1       8.5       6.1       0.6       1         18735.4       81.7       79.8       15099.7       60.3       3121.2       312.1       5.9       6.8       0.8       0.6       0       0.6       0.7       0.6       0.7       0.6	18360.8         18412.6         18453.5         18539.8         18573.4         18655.6         18735.4         18817.1         18937.0         19041.7         19082.8         19134.2         19205.6         19393.2         19460.4         19548.0         19596.1         19717.7	51.8 40.9 86.3 33.6 82.2 79.8 81.7 119.9 104.7 41.1	51.1 51.8 40.9 86.3 33.6 82.2 79.8 81.7	14725.1 14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3 60.3	3124.0 3124.4 3123.6 3123.1 3122.7	3124.0 3123.6 3123.1 3122.7	7.3 11.3 9.9 10.0	7.9 9.9 9.9 9.3	1.0 1.4 1.4 1.3	0.9 1.7 1.4
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	18412.6         18453.5         18539.8         18573.4         18655.6         18735.4         18817.1         18937.0         19041.7         19082.8         19134.2         19205.6         19393.2         19423.5         19548.0         19596.1         19717.7	40.9 86.3 33.6 82.2 79.8 81.7 119.9 104.7 41.1	51.8 40.9 86.3 33.6 82.2 79.8 81.7	14776.9 14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3 60.3	3124.4 3123.6 3123.1 3122.7	3123.6 3123.1 3122.7	<mark>11.3</mark> 9.9 10.0	9.9 9.9 9.3	1.4 1.4 1.3	1.7 1.4
18453.5       86.3       40.9       14817.8       60.3       3123.6       3123.1       9.9       9.9       1.4       1         18539.8       33.6       86.3       14904.1       60.3       3122.7       110.0       9.3       1.3       1         18573.4       82.2       135.019.9       60.3       3122.2       3121.4       8.5       6.1       0.6       1         18735.4       81.7       79.8       15099.7       60.3       3122.1       3121.1       5.9       6.8       0.8       0.6	18453.5         18539.8         18573.4         18655.6         18735.4         18817.1         18937.0         19041.7         19082.8         19134.2         19205.6         19393.2         19423.5         19460.4         19596.1         19717.7	86.3 33.6 82.2 79.8 81.7 119.9 104.7 41.1	40.9 86.3 33.6 82.2 79.8 81.7	14817.8 14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3 60.3	3123.6 3123.1 3122.7	3123.1 3122.7	9.9 10.0	9.9 9.3	1.4 1.3	1.4
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	18539.8         18573.4         18655.6         18735.4         18817.1         18937.0         19041.7         19082.8         19134.2         19205.6         19393.2         19423.5         19460.4         19596.1         19717.7	33.6 82.2 79.8 81.7 119.9 104.7 41.1	86.3 33.6 82.2 79.8 81.7	14904.1 14937.7 15019.9 15099.7	60.3 60.3 60.3	3123.1 3122.7	3122.7	10.0	9.3	1.3	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	18573.4         18655.6         18735.4         18817.1         18937.0         19041.7         19082.8         19134.2         19205.6         19393.2         19423.5         19460.4         19596.1         19717.7	82.2 79.8 81.7 119.9 104.7 41.1	33.6 82.2 79.8 81.7	14937.7 15019.9 15099.7	60.3 60.3	3122.7					1 /
18655.6       79.8       82.2       15019.9       60.3       3122.2       3121.4       8.5       6.1       0.6       1         18735.4       81.7       79.8       1509.7       60.3       3121.4       3121.2       6.1       5.9       0.6       0         18817.1       119.9       81.7       15181.4       60.3       3121.1       3121.0       6.8       7.3       0.9       0         18937.0       104.7       119.4       104.7       15406.0       60.3       3121.1       3121.0       6.8       7.3       0.9       0       0         19082.8       51.4       41.1       15497.1       60.3       3120.5       3120.4       5.9       5.6       0.5       0	18655.6         18735.4         18817.1       1         18937.0       1         19041.7       1         19082.8       1         19134.2       1         19205.6       1         19393.2       1         19423.5       1         19548.0       1         19596.1       1         19717.7       1	79.8 81.7 119.9 104.7 41.1	82.2 79.8 81.7	15019.9 15099.7	60.3		3122.2	0 2	Q 5	1 1	1.4
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	18735.4         18817.1       1         18937.0       1         19041.7       1         19082.8       1         19134.2       1         19205.6       1         19393.2       1         19423.5       1         19548.0       1         19596.1       1         19717.7       1	81.7 119.9 104.7 41.1	79.8 81.7	15099.7		3122.2		5.5	0.0		1.3
18817.1119.981.715181.460.33121.23121.15.96.80.80.919941.741.1104.7119.915301.360.33121.13120.57.35.40.9019041.741.1104.715406.060.33120.53120.57.35.40.9019022.851.441.115447.160.33120.53120.55.45.90.6019134.271.451.415498.560.33120.53120.45.95.60.5019205.6187.671.415569.960.33120.43120.25.67.00.8019233.536.930.315787.560.33119.93119.95.76.00.6019460.487.636.915824.760.33119.93119.76.05.70.6019480.487.636.915824.760.33119.93119.75.56.10.6019596.1121.648.115960.460.33119.33119.55.56.10.6019595.1121.648.115960.460.33119.33119.55.56.10.6019793.120.775.416157.460.33112.33119.35.97.30.90019813.846.320.716253.960.33122.7237.729.06.5	18817.1       1         18937.0       1         19041.7       1         19082.8       1         19134.2       1         19205.6       1         19393.2       1         19423.5       1         19548.0       1         19596.1       1         19717.7       1	119.9 104.7 41.1	81.7		60.3	J122.2	3121.4	8.5	6.1	0.6	1.1
18937.0       104.7       119.9       15301.3       60.3       3121.1       3121.0       6.8       7.3       0.9       0         19041.7       41.1       104.7       15406.0       60.3       3120.5       7.3       5.4       0.5       0         19082.8       51.4       41.1       15447.1       60.3       3120.5       3120.5       5.4       5.9       0.6       0         19134.2       71.4       5156       60.3       3120.4       3120.2       5.6       7.0       0.8       0         19205.6       187.6       71.4       15569.9       60.3       3120.2       3119.9       7.0       5.7       0.6       0         19205.6       187.6       71.4       15569.9       60.3       3119.9       3119.9       7.0       5.7       0.6       0         19404.4       87.6       36.9       1582.7       60.3       3119.9       3119.7       6.0       5.7       0.6       0         19548.0       48.1       87.6       15912.3       60.3       3119.5       3119.6       5.9       7.3       0.9       0       0         19596.1       121.6       48.1       1596.4       60.3 <td>18937.0       1         19041.7       1         19082.8       1         19134.2       1         19205.6       1         19393.2       1         19423.5       1         19548.0       1         19596.1       1         19717.7       1</td> <td>LO4.7 41.1</td> <td></td> <td>16101 4</td> <td></td> <td>3121.4</td> <td>3121.2</td> <td>6.1</td> <td>5.9</td> <td>0.6</td> <td>0.6</td>	18937.0       1         19041.7       1         19082.8       1         19134.2       1         19205.6       1         19393.2       1         19423.5       1         19548.0       1         19596.1       1         19717.7       1	LO4.7 41.1		16101 4		3121.4	3121.2	6.1	5.9	0.6	0.6
19041.7         41.1         104.7         15406.0         60.3         3121.0         3120.5         7.3         5.4         0.5         0.6           19082.8         51.4         41.1         15447.1         60.3         3120.5         5120.5         5.4         5.9         0.6         0.6           19134.2         71.4         51.4         15498.5         60.3         3120.5         3120.4         5.9         5.6         0.5         0.6           19205.6         187.6         71.4         15569.9         60.3         3120.2         3119.9         7.0         5.7         0.6         0.6           19405.4         87.6         36.9         1577.5         60.3         3119.9         3119.7         6.0         5.7         0.6         0.6           19460.4         87.6         36.9         15824.7         60.3         3119.7         3119.6         5.7         5.0         5.5         6.1         0.6         0.6           19548.0         48.1         15960.4         60.3         3119.5         3119.3         6.1         5.9         5.5         6.1         0.6         0.6           19573.7         75.4         121.6         16082.0	19041.7 19082.8 19134.2 19205.6 1 19393.2 19423.5 19460.4 19548.0 19596.1 1 19717.7	41.1	119.9	10101.4	60.3	3121.2	3121.1	5.9	6.8	0.8	0.6
19082.8 $51.4$ $41.1$ $15447.1$ $60.3$ $3120.5$ $3120.5$ $5.4$ $5.9$ $0.6$ $0.6$ 19134.2 $71.4$ $51.4$ $15498.5$ $60.3$ $3120.5$ $3120.4$ $5.9$ $5.6$ $0.5$ $0.6$ 19205.6 $187.6$ $71.4$ $15569.9$ $60.3$ $3120.4$ $3120.2$ $5.6$ $7.0$ $0.8$ $0.6$ 19393.2 $30.3$ $187.6$ $15757.5$ $60.3$ $3120.4$ $3120.9$ $7.0$ $5.7$ $0.6$ $0.6$ 19423.5 $36.9$ $30.3$ $15787.8$ $60.3$ $3119.9$ $3119.9$ $5.7$ $6.0$ $0.6$ $0.6$ 19420.4 $87.6$ $36.9$ $15824.7$ $60.3$ $3119.7$ $3119.6$ $5.7$ $5.5$ $0.5$ $0.6$ 19596.1 $121.6$ $48.1$ $15960.4$ $60.3$ $3119.5$ $3119.3$ $5.6$ $1.6$ $0.6$ 19717.7 $75.4$ $121.6$ $16082.0$ $60.3$ $3119.3$ $3119.6$ $5.9$ $7.3$ $0.9$ $0.6$ 1973.1 $20.7$ $75.4$ $16157.4$ $60.3$ $3122.0$ $3122.6$ $16.9$ $3.1$ $319.6$ 19813.8 $46.3$ $20.7$ $16178.1$ $60.3$ $3122.5$ $3122.7$ $29.0$ $6.5$ $6.6$ 1988.6 $27.9$ $29.5$ $16231.8$ $60.3$ $3122.7$ $3123.7$ $29.7$ $29.0$ $6.5$ $6.6$ 1988.6 $27.9$ $29.5$ $16231.8$ $60.3$ $3122.5$ $3122.7$ </td <td>19082.8         19134.2         19205.6       1         19393.2         19423.5         19460.4         19548.0         19596.1       1         19717.7</td> <td></td> <td></td> <td>15301.3</td> <td>60.3</td> <td>3121.1</td> <td>3121.0</td> <td>6.8</td> <td>7.3</td> <td>0.9</td> <td>0.8</td>	19082.8         19134.2         19205.6       1         19393.2         19423.5         19460.4         19548.0         19596.1       1         19717.7			15301.3	60.3	3121.1	3121.0	6.8	7.3	0.9	0.8
19134.271.451.415498.560.33120.53120.45.95.60.50.519205.6187.671.415569.960.33120.43120.25.67.00.80.619333.230.3187.615757.560.33120.23119.97.05.70.60.619423.536.930.315787.860.33119.93119.76.05.70.60.60.619460.487.636.915824.760.33119.93119.55.56.10.60.60.619548.048.187.615912.360.33119.63119.55.56.10.60.60.60.719596.1121.648.115960.460.33119.53119.55.56.10.60.60.60.70.90.60.60.70.90.60.60.70.90.60.60.70.90.60.60.70.90.60.60.60.70.90.6 </td <td>19134.2         19205.6       1         19393.2       19423.5         19460.4       19548.0         19596.1       1         19717.7       1</td> <td>E1 /</td> <td>104.7</td> <td>15406.0</td> <td>60.3</td> <td>3121.0</td> <td>3120.5</td> <td>7.3</td> <td>5.4</td> <td>0.5</td> <td>0.9</td>	19134.2         19205.6       1         19393.2       19423.5         19460.4       19548.0         19596.1       1         19717.7       1	E1 /	104.7	15406.0	60.3	3121.0	3120.5	7.3	5.4	0.5	0.9
19205.6187.671.415569.960.33120.43120.25.67.00.8019393.230.3187.615757.560.33120.23119.97.05.70.6019460.487.636.915824.760.33119.93119.76.05.70.6019548.048.187.615912.360.33119.73119.65.75.50.5019546.1121.648.115960.460.33119.53119.36.15.90.6019717.775.4121.616082.060.33119.53119.36.15.90.6019733.120.775.416157.460.33122.03120.616.93.1319860.129.546.316224.460.33122.03123.729.729.06.561988.627.929.516253.960.33121.73119.329.029.06.561988.627.929.516253.960.33122.7318.231.031.07.1719977.124.259.616341.460.33122.73085.238.211.91.8220001.3134.924.216365.660.33085.2308.231.031.07.1719977.124.259.660.33085.2308.230.29.29.21.3420049	19205.6         1           19393.2         19423.5           19460.4         19548.0           19596.1         1           19717.7         1	51.4	41.1	15447.1	60.3	3120.5	3120.5	5.4	5.9	0.6	0.5
19393.2         30.3         187.6         15757.5         60.3         3120.2         3119.9         7.0         5.7         0.6         0           19423.5         36.9         30.3         15787.8         60.3         3119.9         3119.9         5.7         6.0         0.6         0           19460.4         87.6         36.9         15824.7         60.3         3119.9         3119.7         6.0         5.7         0.6         0           19596.1         121.6         48.1         15960.4         60.3         3119.5         5.5         6.1         0.6         0           19717.7         75.4         121.6         16082.0         60.3         3119.3         6.1         5.9         0.6         0           19713.1         20.7         75.4         16157.4         60.3         312.0         312.0         16.9         16.9         3.1         33         198.0         2.9.7         2.0.0         6.5         6         6         1988.9         2.9.7         2.0.0         6.5         6         6         198.9         1.9         1.9         1.8         2.9.0         2.5         6.5         6         6         312.7         3119.3         3.0	19393.2         19423.5         19460.4         19548.0         19596.1       1         19717.7	71.4	51.4	15498.5	60.3	3120.5	3120.4	5.9	5.6	0.5	0.6
19423.5         36.9         30.3         15787.8         60.3         3119.9         3119.9         5.7         6.0         0.6         C           19460.4         87.6         36.9         15824.7         60.3         3119.9         3119.7         6.0         5.7         0.6         C           19548.0         48.1         87.6         15912.3         60.3         3119.7         3119.6         5.7         5.5         0.5         C         0           19596.1         121.6         48.1         15960.4         60.3         3119.5         3119.3         6.1         5.9         0.6         C           19717.7         75.4         121.6         16682.0         60.3         3119.3         3119.3         6.1         5.9         7.3         0.9         C           1973.1         20.7         75.4         16157.4         60.3         3122.0         312.6         16.9         16.9         3.1         33         198.6         29.7         29.0         6.5         6         6         1988.6         27.9         29.5         1623.8         60.3         312.7         3119.3         31.0         31.0         7.1         7         7         7	19423.5 19460.4 19548.0 19596.1 1 19717.7	187.6	71.4	15569.9	60.3	3120.4	3120.2	5.6	7.0	0.8	0.5
19460.4       87.6       36.9       15824.7       60.3       3119.9       3119.7       6.0       5.7       0.6       0         19548.0       48.1       87.6       15912.3       60.3       3119.7       3119.6       5.7       5.5       0.5       0.6         19596.1       121.6       48.1       15960.4       60.3       3119.5       3119.3       6.1       5.9       0.6       0         19717.7       75.4       121.6       16082.0       60.3       3119.5       3119.3       6.1       5.9       7.3       0.9       0.6         19713.1       20.7       75.4       16157.4       60.3       3122.0       3120.6       16.9       1.1       31.3       3.9       0.9       0.6	19460.4           19548.0           19596.1         1           19717.7	30.3	187.6	15757.5	60.3	3120.2	3119.9	7.0	5.7	0.6	0.8
19548.0       48.1       87.6       15912.3       60.3       3119.7       3119.6       5.7       5.5       0.5       0.5         19596.1       121.6       48.1       15960.4       60.3       3119.5       3119.5       5.5       6.1       0.6       0.6         19717.7       75.4       121.6       16082.0       60.3       3119.3       3119.6       5.9       7.3       0.9       0.6         19713.1       20.7       75.4       16157.4       60.3       3119.3       3119.6       5.9       7.3       0.9       0.6         19813.8       46.3       20.7       16178.1       60.3       3122.0       3123.7       25.7       29.0       6.5       6         19860.1       29.5       46.3       16224.4       60.3       3123.7       3119.3       29.0       29.0       6.5       6         19987.5       59.6       27.9       16281.8       60.3       3121.1       3108.6       31.0       31.0       7.1       77         19977.1       24.2       16365.6       60.3       3085.2       3082.2       11.9       1.8       20         20001.3       134.9       24.2       16365.6       60.3	19548.0 19596.1 1 19717.7	36.9	30.3	15787.8	60.3	3119.9	3119.9	5.7	6.0	0.6	0.6
19596.1       121.6       48.1       15960.4       60.3       3119.6       3119.5       5.5       6.1       0.6       0         19717.7       75.4       121.6       16082.0       60.3       3119.3       3119.3       6.1       5.9       0.6       0         19793.1       20.7       75.4       16157.4       60.3       3119.3       3119.6       5.9       7.3       0.9       0       0         19813.8       46.3       20.7       16178.1       60.3       3122.0       3120.6       16.9       16.9       3.1       33         19860.1       29.5       46.3       16224.4       60.3       3123.7       3119.3       29.0       29.0       6.5       6         19889.6       27.9       29.5       16253.9       60.3       3123.7       319.3       29.0       29.0       6.5       6         19977.1       24.2       59.6       16341.4       60.3       3085.2       3083.9       11.9       1.8       9       2         20001.3       134.9       24.2       16365.6       60.3       3087.2       3078.2       22.9       10.4       1.5       2         20204.9       234.6	19596.1 1 19717.7	87.6	36.9	15824.7	60.3	3119.9	3119.7	6.0	5.7	0.6	0.6
19717.7       75.4       121.6       16082.0       60.3       3119.5       3119.3       6.1       5.9       0.6       0         19793.1       20.7       75.4       16157.4       60.3       3119.3       3119.6       5.9       7.3       0.9       0         19813.8       46.3       20.7       16178.1       60.3       3122.0       3120.6       16.9       16.9       3.1       33         19860.1       29.5       46.3       16224.4       60.3       3123.7       29.7       29.0       6.5       66         19889.6       27.9       29.5       16253.9       60.3       3121.1       3108.6       31.0       31.0       7.1       77         1997.7       24.2       59.6       16341.4       60.3       3116.2       3085.2       38.2       11.9       1.8       92         20001.3       134.9       24.2       16365.6       60.3       3089.2       3078.2       308.2       10.4       1.5       4         20136.2       68.7       134.9       16500.5       60.3       3078.2       3076.7       10.4       10.4       1.5       1         20430.5       234.6       168343.3       60.3 </td <td>19717.7</td> <td>48.1</td> <td>87.6</td> <td>15912.3</td> <td>60.3</td> <td>3119.7</td> <td>3119.6</td> <td>5.7</td> <td>5.5</td> <td>0.5</td> <td>0.6</td>	19717.7	48.1	87.6	15912.3	60.3	3119.7	3119.6	5.7	5.5	0.5	0.6
19793.1       20.7       75.4       16157.4       60.3       3119.3       3119.6       5.9       7.3       0.9       0         19813.8       46.3       20.7       16178.1       60.3       3122.0       3120.6       16.9       16.9       3.1       33333         19860.1       29.5       46.3       16224.4       60.3       3123.7       3123.7       29.7       29.0       6.5       66         19889.6       27.9       29.5       16253.9       60.3       3123.7       3119.3       29.0       29.0       6.5       66         19977.1       24.2       59.6       16341.4       60.3       3116.2       3085.2       38.2       11.9       1.8       9         20001.3       134.9       24.2       16365.6       60.3       3085.2       3083.9       11.9       11.9       1.8       1         20136.2       68.7       134.9       16500.5       60.3       3078.2       3076.7       10.4       10.4       1.5       1         20439.5       30.5       234.6       16803.8       60.3       3078.2       3071.5       29.2       9.2       1.3       1         20439.5       30.5       16834.		121.6	48.1	15960.4	60.3	3119.6	3119.5	5.5	6.1	0.6	0.5
19813.8       46.3       20.7       16178.1       60.3       3122.0       3120.6       16.9       16.9       3.1       31         19860.1       29.5       46.3       16224.4       60.3       3123.7       29.7       29.0       6.5       66         19889.6       27.9       29.5       16253.9       60.3       3123.7       3119.3       29.0       29.0       6.5       66         19917.5       59.6       27.9       16281.8       60.3       3121.1       3108.6       31.0       31.0       7.1       77         19977.1       24.2       59.6       16341.4       60.3       3116.2       3085.2       38.2       11.9       1.8       9         20001.3       134.9       24.2       16365.6       60.3       3083.9       11.9       11.9       1.8       9         20136.2       68.7       134.9       16500.5       60.3       3078.2       3076.7       10.4       10.4       1.5       1         20204.9       234.6       68.7       1669.2       60.3       3071.5       307.2       9.2       1.3       1         20439.5       30.5       234.6       16803.8       60.3       3071.5 </td <td>19793 1</td> <td>75.4</td> <td>121.6</td> <td>16082.0</td> <td>60.3</td> <td>3119.5</td> <td>3119.3</td> <td>6.1</td> <td>5.9</td> <td>0.6</td> <td>0.6</td>	19793 1	75.4	121.6	16082.0	60.3	3119.5	3119.3	6.1	5.9	0.6	0.6
19860.1       29.5       46.3       16224.4       60.3       3129.5       3123.7       29.7       29.0       6.5       6         19889.6       27.9       29.5       16253.9       60.3       3123.7       3119.3       29.0       29.0       6.5       6         19917.5       59.6       27.9       16281.8       60.3       3121.1       3108.6       31.0       31.0       7.1       7         19977.1       24.2       59.6       16341.4       60.3       3116.2       3085.2       38.2       11.9       1.8       9         20001.3       134.9       24.2       16365.6       60.3       3089.2       3078.2       22.9       10.4       1.5       2         20136.2       68.7       134.9       16500.5       60.3       3089.2       3078.2       22.9       10.4       1.5       4         20204.9       234.6       68.7       16569.2       60.3       3078.2       3071.5       29.2       9.2       1.3       6         20439.5       30.5       234.6       16803.8       60.3       3071.5       307.8       9.2       9.2       1.3       1         20470.0       145.3       30.5		20.7	75.4	16157.4	60.3	3119.3	3119.6	5.9	7.3	0.9	0.6
19860.1       29.5       46.3       16224.4       60.3       3129.5       3123.7       29.7       29.0       6.5       6         19889.6       27.9       29.5       16253.9       60.3       3123.7       3119.3       29.0       29.0       6.5       6         19917.5       59.6       27.9       16281.8       60.3       3121.1       3108.6       31.0       31.0       7.1       7         19977.1       24.2       59.6       16341.4       60.3       3116.2       3085.2       38.2       11.9       1.8       9         20001.3       134.9       24.2       16365.6       60.3       3089.2       3078.2       22.9       10.4       1.5       2         20136.2       68.7       134.9       16500.5       60.3       3089.2       3078.2       22.9       10.4       1.5       4         20204.9       234.6       68.7       16569.2       60.3       3078.2       3071.5       29.2       9.2       1.3       6         20439.5       30.5       234.6       16803.8       60.3       3071.5       307.8       9.2       9.2       1.3       1         20470.0       145.3       30.5			+								3.1
19889.627.929.516253.960.33123.73119.329.029.06.5619917.559.627.916281.860.33121.13108.631.031.07.1719977.124.259.616341.460.33116.23085.238.211.91.8920001.3134.924.216365.660.33085.23083.911.911.91.8920136.268.7134.916500.560.33089.23078.222.910.41.5420204.9234.668.716569.260.33078.23071.529.29.21.3620439.530.5234.616803.860.33071.53070.89.29.21.3620470.0145.330.516834.360.33071.53070.89.29.21.3120615.321.5145.316979.660.33078.33068.025.26.70.8920636.825.621.517001.160.33067.73068.15.07.30.9020636.434.736.017062.760.33067.73067.07.07.91.0020638.434.736.017062.760.33067.73067.07.07.91.0020638.434.7348.634.717097.460.33067.73067.07.07.91											6.7
19917.5       59.6       27.9       16281.8       60.3       3121.1       3108.6       31.0       31.0       7.1       77         19977.1       24.2       59.6       16341.4       60.3       3116.2       3085.2       38.2       11.9       1.8       97         20001.3       134.9       24.2       16365.6       60.3       3085.2       3083.9       11.9       11.9       1.8       97         20136.2       68.7       134.9       16500.5       60.3       3089.2       3078.2       22.9       10.4       1.5       47         20204.9       234.6       68.7       1659.2       60.3       3078.2       3076.7       10.4       10.4       1.5       14         20439.5       30.5       234.6       16803.8       60.3       3087.2       3071.5       29.2       9.2       1.3       6         20470.0       145.3       30.5       16834.3       60.3       3078.3       3068.0       25.2       6.7       0.8       5         20635.8       21.5       17001.1       60.3       3067.7       3068.1       5.0       7.3       0.9       0         20662.4       36.0       25.6       17026.7			+++++++++++				+				6.5
19977.124.259.616341.460.33116.23085.238.211.91.8920001.3134.924.216365.660.33085.23083.911.911.91.8120136.268.7134.916500.560.33089.23078.222.910.41.5420204.9234.668.716569.260.33078.23076.710.410.41.5120439.530.5234.616803.860.33087.23071.529.29.21.3620470.0145.330.516834.360.33071.53070.89.29.21.3120615.321.5145.316979.660.33078.33068.025.26.70.8520636.825.621.517001.160.33067.73068.15.07.30.9020662.436.025.617026.760.33067.73068.15.07.30.9020688.434.736.017062.760.33067.73067.07.07.91.0020733.1348.634.717097.460.33067.73067.07.07.91.0021081.739.1348.617446.060.33067.93065.512.95.80.6221120.838.639.117485.160.33065.53065.85.87.30.90<											7.1
20001.3134.924.216365.660.33085.23083.911.911.91.8120136.268.7134.916500.560.33089.23078.222.910.41.5420204.9234.668.716569.260.33078.23076.710.410.41.5120439.530.5234.616803.860.33087.23071.529.29.21.3620470.0145.330.516834.360.33071.53070.89.29.21.3120615.321.5145.316979.660.33078.33068.025.26.70.8520636.825.621.517001.160.33067.73067.76.75.00.40020662.436.025.617026.760.33067.73068.15.07.30.90020698.434.736.017062.760.33067.73067.07.07.91.00021081.739.1348.634.717097.460.33067.93065.512.95.80.6221120.838.639.117485.160.33065.53065.85.87.30.90021159.437.238.617523.760.33065.83065.47.36.20.700											9.4
20136.268.7134.916500.560.33089.23078.222.910.41.5420204.9234.668.716569.260.33078.23076.710.410.41.5120439.530.5234.616803.860.33087.23071.529.29.21.3620470.0145.330.516834.360.33071.53070.89.29.21.3120615.321.5145.316979.660.33078.33068.025.26.70.8520636.825.621.517001.160.33067.73067.76.75.00.4020662.436.025.617026.760.33067.73068.15.07.30.9020698.434.736.017062.760.33067.73067.07.07.91.0020733.1348.634.717097.460.33067.93065.512.95.80.6221120.838.639.117485.160.33065.53065.85.87.30.9021159.437.238.617523.760.33065.83065.47.36.20.70			+++++++++++								1.8
20204.9234.668.716569.260.33078.23076.710.410.41.51020439.530.5234.616803.860.33087.23071.529.29.21.3620470.0145.330.516834.360.33071.53070.89.29.21.3120615.321.5145.316979.660.33078.33068.025.26.70.8520636.825.621.517001.160.33068.03067.76.75.00.4020662.436.025.617026.760.33067.73068.15.07.30.9020698.434.736.017062.760.33067.73067.07.07.91.0020733.1348.634.717097.460.33067.93065.512.95.80.6221120.838.639.117485.160.33065.53065.85.87.30.90021159.437.238.617523.760.33065.83065.47.36.20.700											4.7
20439.5       30.5       234.6       16803.8       60.3       3087.2       3071.5       29.2       9.2       1.3       60         20470.0       145.3       30.5       16834.3       60.3       3071.5       3070.8       9.2       9.2       1.3       1         20615.3       21.5       145.3       16979.6       60.3       3078.3       3068.0       25.2       6.7       0.8       5         20636.8       25.6       21.5       17001.1       60.3       3067.7       3070.8       5.0       0.4       0         20662.4       36.0       25.6       17026.7       60.3       3067.7       3068.1       5.0       7.3       0.9       0         20698.4       34.7       36.0       17062.7       60.3       3067.7       3067.7       8.1       7.0       0.8       1         20733.1       348.6       34.7       17097.4       60.3       3067.9       3065.5       12.9       5.8       0.6       2         21081.7       39.1       348.6       17446.0       60.3       3067.9       3065.5       12.9       5.8       0.6       2         21120.8       38.6       39.1       17485.1			+								1.5
20470.0       145.3       30.5       16834.3       60.3       3071.5       3070.8       9.2       9.2       1.3       1         20615.3       21.5       145.3       16979.6       60.3       3078.3       3068.0       25.2       6.7       0.8       5         20636.8       25.6       21.5       17001.1       60.3       3068.0       3067.7       6.7       5.0       0.4       0         20662.4       36.0       25.6       17026.7       60.3       3067.7       3068.1       5.0       7.3       0.9       0         20698.4       34.7       36.0       17062.7       60.3       3067.7       3067.7       8.1       7.0       0.8       1         20733.1       348.6       34.7       17097.4       60.3       3067.9       3065.5       12.9       5.8       0.6       2         21081.7       39.1       348.6       17446.0       60.3       3067.5       3065.5       12.9       5.8       0.6       2         21120.8       38.6       39.1       17485.1       60.3       3065.5       3065.8       5.8       7.3       0.9       0         21159.4       37.2       38.6       1			+								6.5
20615.3       21.5       145.3       16979.6       60.3       3078.3       3068.0       25.2       6.7       0.8       5         20636.8       25.6       21.5       17001.1       60.3       3068.0       3067.7       6.7       5.0       0.4       0         20636.8       25.6       21.5       17001.1       60.3       3068.0       3067.7       6.7       5.0       0.4       0         20662.4       36.0       25.6       17026.7       60.3       3067.7       3068.1       5.0       7.3       0.9       0         20698.4       34.7       36.0       17062.7       60.3       3067.7       3067.7       8.1       7.0       0.8       11         20733.1       348.6       34.7       17097.4       60.3       3067.9       3065.5       12.9       5.8       0.6       2         21081.7       39.1       348.6       17446.0       60.3       3067.5       3065.5       12.9       5.8       0.6       2         21120.8       38.6       39.1       17485.1       60.3       3065.5       3065.8       5.8       7.3       0.9       0         21159.4       37.2       38.6       1		+									1.3
20636.8       25.6       21.5       17001.1       60.3       3068.0       3067.7       6.7       5.0       0.4       0         20662.4       36.0       25.6       17026.7       60.3       3067.7       3068.1       5.0       7.3       0.9       0         20698.4       34.7       36.0       17062.7       60.3       3067.7       3068.1       5.0       7.3       0.9       0         20733.1       348.6       34.7       17097.4       60.3       3067.7       3067.0       7.0       7.9       1.0       0         21081.7       39.1       348.6       17446.0       60.3       3067.5       12.9       5.8       0.6       2         21120.8       38.6       39.1       17485.1       60.3       3065.5       3065.8       5.8       7.3       0.9       0         21159.4       37.2       38.6       17523.7       60.3       3065.8       3065.4       7.3       6.2       0.7       0											5.3
20662.4         36.0         25.6         17026.7         60.3         3067.7         3068.1         5.0         7.3         0.9         0           20698.4         34.7         36.0         17062.7         60.3         3068.1         3067.7         8.1         7.0         0.8         1           20733.1         348.6         34.7         17097.4         60.3         3067.7         3067.0         7.0         7.9         1.0         0           21081.7         39.1         348.6         17446.0         60.3         3067.9         3065.5         12.9         5.8         0.6         2           21120.8         38.6         39.1         17485.1         60.3         3065.5         3065.8         5.8         7.3         0.9         0           21159.4         37.2         38.6         17523.7         60.3         3065.8         3065.4         7.3         6.2         0.7         0											0.8
20698.434.736.017062.760.33068.13067.78.17.00.8120733.1348.634.717097.460.33067.73067.07.07.91.0021081.739.1348.617446.060.33067.93065.512.95.80.6221120.838.639.117485.160.33065.53065.85.87.30.9021159.437.238.617523.760.33065.83065.47.36.20.70										·	0.4
20733.1348.634.717097.460.33067.73067.07.07.91.0021081.739.1348.617446.060.33067.93065.512.95.80.6221120.838.639.117485.160.33065.53065.85.87.30.9021159.437.238.617523.760.33065.83065.47.36.20.70											1.0
21081.7         39.1         348.6         17446.0         60.3         3067.9         3065.5         12.9         5.8         0.6         22           21120.8         38.6         39.1         17485.1         60.3         3065.5         3065.8         5.8         7.3         0.9         00           21159.4         37.2         38.6         17523.7         60.3         3065.8         3065.4         7.3         6.2         0.7         00											
21120.8         38.6         39.1         17485.1         60.3         3065.5         3065.8         5.8         7.3         0.9         0           21159.4         37.2         38.6         17523.7         60.3         3065.8         3065.4         7.3         6.2         0.7         0											0.8
21159.4 37.2 38.6 17523.7 60.3 3065.8 3065.4 7.3 6.2 0.7 0		39.1						<b></b>			2.1
+++++++++++		20 0	+++++++++++								0.6
		+	+								0.9
++++++++++++++		37.2		17560.9	60.3 60.3	3065.4	3065.2 3064.6	6.2 7.8	7.8 6.3	1.0 0.7	0.7 1.0
21196.6 281.4 37.2 17560.9 60.3 3065.4 3065.2 6.2 7.8 1.0	20698.4 20733.1 3 21081.7 21120.8 21159.4	34.7 348.6	36.0 34.7 348.6 39.1 38.6	17062.7 17097.4 17446.0 17485.1 17523.7	60.3 60.3 60.3 60.3 60.3 60.3	3068.1 3067.7 3067.9 3065.5 3065.8	3067.7 3067.0 3065.5 3065.8 3065.4	8.1 7.0 <b>12.9</b> 5.8 7.3	7.0 7.9 5.8 7.3	0.8 1.0 0.6 0.9 0.7	

21554	1.8 199.9	76.8	17919.1	60.3	3064.6	3064.3	6.3	6.9	0.8	0.7
21754		199.9	18119.0	60.3	3064.3	3064.0	6.9	5.6	0.5	0.8
21784	1.4 37.9	29.7	18148.7	60.3	3064.0	3064.1	5.6	6.1	0.6	0.5
21822	2.3 115.4	37.9	18186.6	60.3	3064.1	3063.9	6.1	6.1	0.6	0.6
21937	7.7 68.2	115.4	18302.0	60.3	3063.9	3063.7	6.1	5.9	0.6	0.6
22005	5.9 199.9	68.2	18370.2	60.3	3063.7	3063.4	5.9	6.2	0.7	0.6
22205	5.8 267.2	199.9	18570.1	60.3	3063.4	3063.0	6.2	6.8	0.8	0.7
22473	3.0 156.9	267.2	18837.3	60.3	3063.0	3062.5	6.8	5.6	0.5	0.8
22629	9.9 155.6	156.9	18994.2	60.3	3062.5	3062.3	5.6	6.2	0.7	0.5
22785	5.5 59.2	155.6	19149.8	60.3	3062.3	3062.1	6.2	5.6	0.5	0.7
22844	1.7 120.7	59.2	19209.0	60.3	3062.1	3062.0	5.6	5.8	0.6	0.5
22965	5.4 95.6	120.7	19329.7	60.3	3062.0	3061.8	5.8	5.3	0.5	0.6
23061	L.O 360.3	95.6	19425.3	60.3	3061.8	3061.4	5.3	6.6	0.8	0.5
23421		360.3	19785.6	60.3	3061.4	3061.1	6.6	5.8	0.6	0.8
23482		61.2	19846.8	60.3	3061.1	3061.0	5.8	5.7	0.6	0.6
23529		46.5	19893.3	60.3	3061.0	3060.9	5.7	6.5	0.7	0.6
23656		127.4	20020.7	60.3	3060.9	3060.6	6.5	6.3	0.7	0.7
23769		113.5	20134.2	60.3	3060.6	3060.3	6.3	6.2	0.7	0.7
23941		171.1	20305.3	60.3	3060.3	3060.1	6.2	6.3	0.7	0.7
24066		125.5	20430.8	60.3	3060.1	3059.8	6.3	6.2	0.7	0.7
24239		172.8	20603.6	60.3	3059.8	3059.7	6.2	5.8	0.6	0.7
24300		61.0	20664.6	60.3	3059.7	3059.5	5.8	5.6	0.5	0.6
24346		45.9	20710.5	60.3	3059.5	3059.6	5.6	6.3	0.7	0.5
24379		33.4	20743.9	60.3	3059.6	3059.5	6.3	5.6	0.5	0.7
24387		8.3	20752.2	60.3	3059.5	3059.5	5.6	5.9	0.6	0.5
24393		5.8	20758.0	60.3	3059.5	3059.8	5.9	7.3	0.9	0.6
24420		26.7	20784.7	60.3	3061.3	3059.5	14.7	14.7	2.5	2.5
24517		97.1 25.2	20881.8	60.3	3071.9	3056.7	32.5	21.9	4.4	7.6
24542		25.2	20907.0 20932.3	60.3 60.3	3056.7 3054.9	3054.9 3053.3	21.9 21.7	21.7 21.7	4.3	4.4
24593		25.2	20952.5	60.3	3053.5	3051.0	22.0	20.7	4.1	4.4
24617		23.9	20981.4	60.3	3051.0	3049.3	20.7	20.7	4.1	4.1
24648		30.9	21012.3	60.3	3051.4	3048.6	23.8	22.8	4.6	4.9
24671		23.6	21035.9	60.3	3048.6	3038.1	22.8	11.7	1.8	4.6
24740		68.5	21104.4	60.3	3038.1	3036.0	11.7	5.8	0.6	1.8
24829		89.3	21193.7	60.3	3036.0	3035.9	5.8	5.3	0.5	0.6
24860		31.2	21224.9	60.3	3035.9	3035.8	5.3	5.4	0.5	0.5
24938	3.9 88.7	78.3	21303.2	60.3	3035.8	3035.6	5.4	5.2	0.5	0.5
25027	7.6 88.2	88.7	21391.9	60.3	3035.6	3035.5	5.2	5.3	0.5	0.5
25115	5.8 133.0	88.2	21480.1	60.3	3035.5	3035.3	5.3	5.4	0.5	0.5
25248	3.8 39.5	133.0	21613.1	60.3	3035.3	3035.3	5.4	5.7	0.5	0.5
25288	3.3 47.6	39.5	21652.6	60.3	3035.3	3035.3	5.7	6.1	0.6	0.5
25335		++	21700.2	60.3	3035.3	3035.0	6.1	6.1	0.6	0.6
25529		++	21893.9	60.3	3035.0	3034.8	6.1	5.8	0.6	0.6
25626		kk	21991.1	60.3	3034.8	3034.6	5.8	5.6	0.5	0.6
25690		63.3	22054.4	60.3	3034.6	3034.7	5.6	6.7	0.8	0.5
25770		+	22134.8	60.3	3034.7	3034.2	6.7	5.8	0.6	0.8
25979		++	22344.1	60.3	3034.2	3034.2	5.8	6.1	0.6	0.6
26020		kk	22384.3	60.3	3034.2	3033.9	6.1	6.2	0.7	0.6
26171		+	22535.5	60.3	3033.9	3034.0	6.2	7.7	1.0	0.7
26271		łł	22635.6	60.3	3034.3	3033.8	11.1	11.1	1.7	1.7
26338		67.3	22702.9	60.3	3033.9	3031.5	11.5	11.5	1.8	1.8
26639		łł	23003.3	60.3	3032.5	3025.9	14.7	12.1	1.9	2.5
26948		kk	23312.8	60.3	3025.9	3024.1	12.1	11.5	1.8	1.9
27123		++	23487.8	60.3	3024.1	3023.5	11.5	11.5	1.8	1.8
27185		kk	23549.9	60.3	3025.9	2973.3	17.7	7.6	0.9	3.3
28690		++	25054.8	60.3	2973.3	2973.3	7.6	7.9	1.0	0.9
28720		kk	25085.0	60.3	2975.4	2965.0	16.0 24 5	16.0 18.6	2.8	2.8
29134	1.9 125.0	414.2	25499.2	60.3	2970.0	2954.5	24.5	18.6	3.5	5.1

29902.9         117.5         133.0         2575.7         60.3         2940.2         194.4         194         3.7         3.7           3095.7.6         1141.6         42.2         2591.6         60.3         2930.7         230.0         11.3         1.7         1           3077.5         715.0         143.1         2710.1         60.3         2920.3         2931.5         14.2         10.3         0.6         0.6         2           3145.5         136.2         7755.6         60.3         2911.0         201.0         5.0         0.4         0.4         0.3           31931.4         49         1.3         2845.5         60.3         2910.5         201.0         5.0         5.2         0.4         0.0           31936.4         33.4         12.3         2813.6         60.3         2910.5         291.0         5.0         5.2         0.5         0.0         30         30.0         339.0         5.1         5.5         0.5         0.0         3200.3         10.0         5.5         5.6         0.5         0.0         3200.1         5.0         0.4         0.0         30         320.0         320.0         320.0         320.0         320.0										·	
29510.4         42.2         117.5         2957.4         2959.7         22.6         143.1         2.4         4           3955.4         1341.6         22.2         2950.5         60.3         2950.7         393.0         34.1         113         1.7         2           30737.5         718.0         43.1         2710.5         60.3         2950.2         2911.3         11.6         6.0         5.0         0.4         0         0           3195.1         346.5         136.2         2705.5         60.3         2910.5         2910.5         5.0         4.9         0.4         0         0           3195.1         346.5         2830.2         60.3         2910.5         5.0         5.0         5.0         0.4         0 <td> </td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>3.5</td>											3.5
295526         1341.6         122         29519.5         603         2939.7         3920.3         113         113         1.7         12           30737.3         7180         43.1         2710.5         603         2220.2         2931.3         11.3         1.13         1.7         1           30737.3         7180         43.1         2710.5         603         2931.3         931.6         6.0         5.0         0.4         0           31455.1         3165.2         7755.6         603         2910.5         5.0         5.2         0.4         0           31956.2         12.6         4.9         2820.5         503         2910.5         5.2         5.3         0.5         0           32063.3         100.0         1.1         7842.7         603         2910.4         910.4         5.5         5.6         0.5         0         3         0.4         0.3         0         3         0.3         0         3         0.4         3         0.4         3         0         3         0         3         0         3         0         3         0         3         0         3         0         3         0         3								+			3.7
100942         41.1         114.16         27058.5         60.3         2920.2         291.3         11.3         11.3         1.7         1           13077.3         718.0         27819.6         60.3         2911.0         224.0         60.0         50.0         6.0         0           13193.1.3         346.5         136.2         27955.5         60.3         2911.0         2291.0.5         5.0         6.4         0         0           31393.0         13.3         436.5         2830.2.5         60.3         2910.5         2.2         5.0         5.0         0.4         0           31396.1         14.9         13.3         2820.5         60.3         2910.5         2.2         5.0         0.5 <td< td=""><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>4.3</td></td<>											4.3
30727.3         718.0         718.0         7210.6         60.3         2920.2         2911.3         52.0         60.5         0.4         0           31391.5         346.5         136.2         27955.8         60.3         2910.5         5.0         4.9         5.0         0.4         0           31391.5         346.5         136.2         2920.5         2910.5         5.0         4.9         5.0         0.4         0           31361.3         4.9         13.3         2831.6         60.3         2910.5         5.3         5.5         0.5         0           313663.8         31.4         12.6         2833.1         60.3         2910.4         5.5         5.6         0.5         0           32063.3         110.0         0.6         11.1         28247.6         60.3         2910.0         5.3         5.5         0.5         0         0         2233.3         0.6         7.7         0.3         0         0         2233.3         0.7         5.2         2.872.4         60.3         2909.9         4.8         4.8         0.3         0           32333.3         6.7         5.2         2.5         0.0         0.0         3.282.7											2.4
31455.3         136.2         778.0         60.3         2911.0         2911.0         6.0         5.0         0.4         0.0           31393.0         13.3         346.5         28302.3         60.3         2911.0         5.0         4.9         0.4         0.0           31651.3         4.9         13.3         28316.6         60.3         2910.5         2.9         5.2         5.3         0.5         0.4         0.0           31666.8         33.4         12.6         4.9         2820.5         60.3         2910.5         5.2         5.5         0.5         0.0           32002.2         61.1         33.4         2826.5         60.3         2910.2         5.4         5.5         0.5         0.0           32063.3         100.0         61.1         2842.7.6         60.3         2910.2         5.0         4.8         0.3         0.0           32370.0         64.0         36.7         25778.3         60.3         2900.9         7.8         4.7         4.7         0.2         0.0           32282.4         35.2         261.0         2907.7         2609.5         4.7         4.7         0.2         0.0           32282.4											1.7
1919.15         346.5         1362.2         2993.5         5.0         4.9         0.4         0.4           31336.1         343.3         346.5         2280.5         2910.5         2910.5         5.0         5.2         0.4         0           31366.2         12.6         4.9         2820.5         60.3         2910.5         5.3         5.5         0.5         0           31366.8         31.4         12.6         2833.1         60.3         2910.5         5.3         5.5         0.5         0           32063.3         100.0         61.1         28427.6         60.3         2910.4         5.5         5.6         0.5         0           32233.3         36.7         51.1         28697.6         60.3         2900.9         5.0         4.8         0.3         0           323246.0         158.4         96.0         2890.7         290.9         5.0         4.7         4.7         0.2         0           32324.4         55.2         272.1         2890.7         290.7         4.8         4.7         0.2         0           32324.6         158.4         980.6         60.3         2900.7         2.90.7         4.8 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>											
31938.0         13.3         346.5         28802.3         60.3         2910.5         2910.5         5.0         5.2         0.4         0           31956.2         12.6         4.9         28302.5         60.3         2910.5         5.2         5.3         0.5         0           31968.8         33.4         12.6         28332.1         60.3         2910.5         5.3         5.5         0.5         0           32002.2         6.1         13.4         28466.5         60.3         2910.4         251.6         5.2         0.5         0           32163.3         100.0         6.1         28427.6         60.3         2910.0         290.0         5.0         4.8         0.3         0           32370.0         94.0         36.7         2873.3         60.3         2009.7         200.5         4.7         4.7         0.2         0           32462.4         261.0         158.4         28828.3         60.3         2009.2         24.7         4.7         0.2         0           32483.4         35.2         261.0         158.4         28828.3         60.3         2900.4         290.4         4.7         0.3         0         33381.1											0.6
31951.3         4.9         13.3         28315.6         60.3         2910.5         5.0         5.2         6.4         0           31968.8         33.4         12.6         28333.1         60.3         2910.5         5.3         5.5         0.5         0           2000.2         61.1         33.4         2866.5         60.3         2910.2         52.6         5.2         0.5         0           22163.3         118.8         100.0         28527.6         60.3         2910.2         52.6         5.0         0.4         0           32333.3         56.7         51.2         28697.6         60.3         2900.9         290.9         4.8         4.8         0.3         0           32370.0         44.0         36.7         2897.3         60.3         2909.9         24.8         4.7         0.2         0           32464.0         158.4         94.0         2887.3         60.3         2909.7         24.7         4.7         0.2         0           32288.1         53.3         310.2         2938.2         60.3         2909.2         4.7         4.7         0.2         0           33322.1         10.0.8         310.2 <t< td=""><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td>+</td><td></td><td></td><td>0.4</td></t<>								+			0.4
31956.2         12.6         4.9         28370.5         60.3         2910.5         5.2         5.3         0.5         0           31968.8         33.4         12.6         28333.1         60.3         2910.5         5.3         5.5         0.5         0           32006.3         100.0         6.1         28427.6         60.3         2910.4         2910.2         5.6         5.2         0.5         0           32163.3         100.0         6.1         28427.6         60.3         2910.0         290.9         5.0         4.8         0.3         0           32333         36.7         15.2         2897.6         60.3         2900.9         290.9         4.8         4.8         0.3         0           32370.0         94.0         36.7         2878.4         60.3         2909.7         4.8         4.7         0.2         0           32464.0         158.4         2846.7         60.3         2909.2         290.7         4.8         4.7         0.2         0           32388.4         35.2         2947.7         60.3         2908.2         290.2         4.7         4.7         0.3         0           33492.9         58.7											0.4
1998.8         33.4         12.6         283321         60.3         2910.5         23.3         55         0.5         0.5           32063.3         100.0         61.1         28427.6         60.3         2910.4         55         5.6         0.5         0.0           32163.3         118.8         100.0         2827.7.6         60.3         2910.2         2910.0         5.2         5.0         0.4         0.0           32333.3         35.7         51.2         28697.6         60.3         2909.9         4.8         4.8         0.3         0           32370.0         94.0         36.7         55.2         2869.7         60.3         2909.7         4.8         4.7         0.2         0           32464.0         158.4         940.0         28282.3         60.3         2909.2         4.7         4.7         0.2         0           3218.6         310.2         2593.1         60.3         2908.2         4.7         4.7         0.2         0           3332.1         110.8         153.3         29746.4         60.3         2908.4         4.9         5.1         0.4         0           3342.2         58.7         110.8											0.4
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$											0.4
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$											0.5
321633         11188         100.0         22852.6         60.3         2910.0         5.2         5.0         0.4         0.3           32333.3         3.6,7         51.2         28697.6         60.3         2909.9         5.0         4.8         0.3         0           32330.0         94.0         36.7         2874.3         60.3         2909.9         2809.7         4.8         4.8         0.3         0           32462.4         158.4         94.0         28828.3         60.3         2909.7         4.8         4.7         0.2         0           32838.4         35.2         29247.7         60.3         2909.2         4.7         4.7         0.2         0           33228.8         153.3         310.2         29247.7         60.3         2906.4         4.7         4.7         0.4         0.4         0           333228.8         153.3         310.2         2925.9         60.3         2908.4         5.1         5.4         0.4         0           33351.6         144.1         897.6         60.3         2907.8         2.22         6.0         6.6         0           333695.7         66.5         130.6         65.3											0.5
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$											0.5
32333         36.7         51.2         28697.6         60.3         2909.9         4.8         4.8         0.3         0           32370.0         94.0         36.7         2874.4         60.3         2909.7         4.8         4.7         0.2         0           32462.4         94.0         158.4         2882.8         60.3         2909.5         247         4.7         4.7         0.2         0           32622.4         261.0         158.4         2898.6         7         60.3         2909.2         24.7         4.7         0.2         0           32838.4         35.2         2928.2         9         60.3         2908.6         4.7         4.7         0.3         0           33322.8         153.3         310.2         2928.7         60.3         2908.4         2908.4         4.9         5.1         0.4         0           33351.6         144.1         58.7         2995.9         60.3         2908.4         2908.5         5.2         6.0         0.6         0           33865.7         66.9         144.1         3006.0         60.3         2908.1         2907.8         5.4         1.0.6         0           33892.								+			0.4
323700         94.0         36.7         287243         60.3         2909.7         4.8         4.7         0.2         0           32622.4         261.0         158.4         94.0         28828.3         60.3         2909.7         290.5         4.7         4.7         0.2         0           32883.4         35.2         261.0         2924.7         60.3         2909.2         2909.2         4.7         4.7         0.2         0           32818.6         310.2         2553.1         60.3         2909.2         2909.2         4.7         4.7         0.2         0           33282.8         153.3         310.2         29593.1         60.3         2908.4         4.9         5.1         0.4         0           33492.9         58.7         110.8         155.3         2975.7         60.3         2908.4         2908.2         5.2         6.0         0.6         0           33657         66.9         144.1         30060.0         60.3         2908.2         290.8         6.1         0.6         0         0         0         33893.2         89.6         302.67         60.3         2907.8         5.4         6.1         0.6         0         <											0.3
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$											0.3
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$								+			0.2
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$				28986.7			2909.2				0.3
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	32883.4	35.2	261.0	29247.7	60.3	2909.2	2909.2	4.7	4.7	0.2	0.2
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	32918.6	310.2	35.2	29282.9	60.3	2909.2	2908.8	4.7	4.7	0.3	0.2
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	33228.8	153.3	310.2	29593.1	60.3	2908.8	2908.6	4.7	4.9	0.4	0.3
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	33382.1	110.8	153.3	29746.4	60.3	2908.6	2908.4	4.9	5.1	0.4	0.4
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	33492.9	58.7	110.8	29857.2	60.3	2908.4	2908.4	5.1	5.2	0.4	0.4
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	33551.6	144.1	58.7	29915.9	60.3	2908.4	2908.2	5.2	6.0	0.6	0.4
33893.2         89.6         130.6         30257.5         60.3         2907.8         2907.8         5.4         6.1         0.6         0           33982.8         60.2         89.6         30347.1         60.3         2907.8         2907.7         6.1         6.8         0.8         0           34043.0         76.5         60.2         30407.3         60.3         2907.7         5.2         6.8         6.4         0.7         0           34182.0         156.4         62.5         76.5         30483.8         60.3         2907.4         2907.1         6.2         6.6         0.7         0           34387.9         43.4         59.5         156.4         30702.7         60.3         2907.1         290.6         7.2         6.4         0.7         0           34347.9         43.4         59.5         30762.2         60.3         2906.6         2906.6         6.4         6.3         0.7         0           344655.3         47.6         109.6         31019.6         60.3         2906.6         2906.1         8.7         7.9         1.0         1           34702.9         84.1         31151.3         60.3         2906.6         2906.	33695.7	66.9	144.1	30060.0	60.3	2908.2	2908.1	6.0	5.8	0.6	0.6
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	33762.6	130.6	66.9	30126.9	60.3	2908.1	2907.8	5.8	5.4	0.5	0.6
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		89.6	130.6	30257.5	60.3			5.4	6.1	0.6	0.5
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$					60.3			6.1	6.8	0.8	0.6
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$								+			0.8
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$											0.7
34397.9         43.4         59.5         30762.2         60.3         2907.1         2906.8         7.2         6.4         0.7         0           34441.3         104.4         43.4         30805.6         60.3         2906.8         2906.6         6.4         6.3         0.7         0           3455.7         109.6         104.4         30910.0         60.3         2906.6         2906.6         6.7         7.7         1.0         0           34655.3         47.6         109.6         31019.6         60.3         2906.6         2906.1         8.7         7.9         1.0         1           34787.0         33.9         84.1         31151.3         60.3         2906.7         2906.5         12.5         12.5         2.0         2           34837.4         85.1         16.5         31201.7         60.3         2906.3         2904.2         8.9         8.9         1.2         2           34922.5         12.0         85.1         31286.8         60.3         2904.2         8.9         8.9         1.2         2           34934.5         80.4         12.0         31298.6         60.3         2904.2         16.0         16.0         2.8								+			0.7
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$											0.7
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$								+			0.9
34655.3         47.6         109.6         31019.6         60.3         2906.4         2906.6         6.7         7.7         1.0         0           34702.9         84.1         47.6         31067.2         60.3         2906.6         2906.1         8.7         7.9         1.0         1           34787.0         33.9         84.1         31151.3         60.3         2906.1         2906.5         12.5         12.5         2.0         2           34820.9         16.5         33.9         31185.2         60.3         2906.7         2906.5         12.5         12.5         2.0         2           34837.4         85.1         16.5         31201.7         60.3         2906.8         2904.3         13.6         8.9         1.2         1           34934.5         80.4         12.0         31298.8         60.3         2904.2         8.9         8.9         1.2         1           34934.5         80.4         12.0         31298.8         60.3         2904.2         16.0         16.0         2.8         2           35014.9         10.1         80.4         31379.2         60.3         2903.0         2902.7         14.1         14.1											0.7
34702.9         84.1         47.6         31067.2         60.3         2906.6         2906.1         8.7         7.9         1.0         1           34787.0         33.9         84.1         31151.3         60.3         2906.1         2906.0         7.9         7.9         1.0         1           34820.9         16.5         33.9         31185.2         60.3         2906.7         2906.5         12.5         12.5         2.0         2           34837.4         85.1         16.5         31201.7         60.3         2906.8         2904.3         13.6         8.9         1.2         2           34922.5         12.0         85.1         31286.8         60.3         2904.2         8.9         8.9         1.2         1           34934.5         80.4         12.0         31298.8         60.3         2904.2         8.9         8.9         1.2         1           35014.9         10.1         80.4         31379.2         60.3         2903.0         16.4         14.1         2.4         2           35043.4         500.0         18.4         31407.7         60.3         2903.0         2820.7         14.1         14.1         2.4         2 <td></td>											
34787.0         33.9         84.1         31151.3         60.3         2906.1         2906.0         7.9         7.9         1.0         1           34820.9         16.5         33.9         31185.2         60.3         2906.7         2906.5         12.5         12.5         2.0         2           34837.4         85.1         16.5         31201.7         60.3         2906.8         2904.3         13.6         8.9         1.2         2           34932.5         12.0         85.1         31286.8         60.3         2904.2         8.9         8.9         1.2         1           34934.5         80.4         12.0         31298.8         60.3         2904.2         16.0         16.0         2.8         2           35014.9         10.1         80.4         31379.2         60.3         2903.0         16.4         14.1         2.4         2           35025.0         18.4         10.1         31389.3         60.3         2903.0         2902.7         14.1         14.1         2.4         2           35043.4         500.0         18.4         31407.7         60.3         2890.5         16.2         16.2         2.9         2								k			·
34820.9         16.5         33.9         31185.2         60.3         2906.7         2906.5         12.5         12.5         2.0         2           34837.4         85.1         16.5         31201.7         60.3         2906.8         2904.3         13.6         8.9         1.2         2           34922.5         12.0         85.1         31286.8         60.3         2904.2         8.9         8.9         1.2         1           34934.5         80.4         12.0         31298.8         60.3         2904.2         204.2         16.0         16.0         2.8         2           35014.9         10.1         80.4         31379.2         60.3         2903.0         2902.7         14.1         14.1         2.4         2           35025.0         18.4         10.1         31389.3         60.3         2903.0         2902.7         14.1         14.1         2.4         2           35043.4         500.0         18.4         31407.7         60.3         2903.6         2890.5         16.2         16.2         2.9         2           35543.4         562.3         32470.0         60.3         2861.7         2865.8         18.8         15.8								k			
34837.4       85.1       16.5       31201.7       60.3       2904.3       13.6       8.9       1.2       2         34922.5       12.0       85.1       31286.8       60.3       2904.3       2904.2       8.9       8.9       1.2       1         34934.5       80.4       12.0       31298.8       60.3       2904.2       16.0       16.0       2.8       2         35014.9       10.1       80.4       31379.2       60.3       2904.4       2903.0       16.4       14.1       2.4       2         35025.0       18.4       10.1       31389.3       60.3       2903.0       2902.7       14.1       14.1       2.4       2         35043.4       500.0       18.4       31407.7       60.3       2903.6       2890.5       16.2       16.2       2.9       2         35043.4       562.3       500.0       31907.7       60.3       2891.8       2869.7       18.9       18.8       3.5       33         36105.7       62.3       562.3       32470.0       60.3       2861.7       2865.8       18.8       15.8       2.8       33         36168.0       61.8       62.3       32594.1       60.3											
34922.5       12.0       85.1       31286.8       60.3       2904.3       2904.2       8.9       8.9       1.2       1         34934.5       80.4       12.0       31298.8       60.3       2906.2       2904.2       16.0       16.0       2.8       2         35014.9       10.1       80.4       31379.2       60.3       2904.4       2903.0       16.4       14.1       2.4       2         35025.0       18.4       10.1       31389.3       60.3       2903.0       2902.7       14.1       14.1       2.4       2         35043.4       500.0       18.4       31407.7       60.3       2903.6       2890.5       16.2       16.2       2.9       2         35543.4       562.3       500.0       31907.7       60.3       2891.8       2869.7       18.9       18.8       3.5       33         36105.7       62.3       562.3       32470.0       60.3       2869.7       2865.8       18.8       15.8       2.8       33         36168.0       61.8       62.3       32532.3       60.3       2861.7       2861.2       5.3       4.8       0.3       00         36516.9       99.9       287.1 <td> </td> <td></td>											
34934.580.412.031298.860.32906.22904.216.016.02.8235014.910.180.431379.260.32904.42903.016.414.12.4235025.018.410.131389.360.32903.02902.714.114.12.4235043.4500.018.431407.760.32903.62890.516.216.22.9235543.4562.3500.031907.760.32891.82869.718.918.83.5336105.762.3562.332470.060.32869.72865.818.815.82.8336168.061.862.332532.360.32861.72861.818.85.30.5236516.999.9287.161.832594.160.32861.72861.25.34.80.3036616.8103.499.932981.160.32861.22861.14.84.90.3036616.8103.499.932981.160.32861.22861.14.84.90.3036720.2150.9103.433084.560.32860.85.05.00.4036871.1141.0150.933235.460.32860.65.04.95.10.4037012.152.5141.033376.460.32860.54.95.10.40<											
35014.9         10.1         80.4         31379.2         60.3         2904.4         2903.0         16.4         14.1         2.4         2           35025.0         18.4         10.1         31389.3         60.3         2903.0         2902.7         14.1         14.1         2.4         2           35043.4         500.0         18.4         31407.7         60.3         2903.6         2890.5         16.2         16.2         2.9         2           35543.4         562.3         500.0         31907.7         60.3         2891.8         2869.7         18.9         18.8         3.5         3           36105.7         62.3         562.3         32470.0         60.3         2869.7         2865.8         18.8         15.8         2.8         3           36168.0         61.8         62.3         32532.3         60.3         2861.7         2865.8         18.8         15.8         2.8         3           36229.8         287.1         61.8         32594.1         60.3         2861.7         2861.2         5.3         4.8         0.3         0           36516.9         99.9         287.1         32881.2         60.3         2861.2         2861.1 <td></td>											
35025.0       18.4       10.1       31389.3       60.3       2903.0       2902.7       14.1       14.1       2.4       2         35043.4       500.0       18.4       31407.7       60.3       2903.6       2890.5       16.2       16.2       2.9       2         35543.4       562.3       500.0       31907.7       60.3       2891.8       2869.7       18.9       18.8       3.5       3         36105.7       62.3       562.3       32470.0       60.3       2869.7       2865.8       18.8       15.8       2.8       3         36168.0       61.8       62.3       32532.3       60.3       2865.8       2861.7       15.8       5.3       0.5       2         36229.8       287.1       61.8       32594.1       60.3       2861.7       2861.2       5.3       4.8       0.3       00         36516.9       99.9       287.1       32881.2       60.3       2861.1       2861.0       4.9       5.0       0.4       00         36670.2       150.9       103.4       33084.5       60.3       2860.8       2860.6       5.0       4.9       0.3       00         36871.1       141.0       150.9 </td <td></td>											
35043.4500.018.431407.760.32903.62890.516.216.22.9235543.4562.3500.031907.760.32891.82869.718.918.83.5336105.762.3562.332470.060.32869.72865.818.815.82.8336168.061.862.332532.360.32865.82861.715.85.30.5236229.8287.161.832594.160.32861.72861.25.34.80.3036516.999.9287.132881.260.32861.22861.14.84.90.3036616.8103.499.932981.160.32861.22861.04.95.00.4036720.2150.9103.433084.560.32860.85.05.00.4037012.152.5141.033376.460.32860.52860.55.15.20.4037064.656.952.533428.960.32860.52860.55.15.20.4037121.574.656.933485.860.32860.52860.35.25.10.40								+			
35543.4         562.3         500.0         31907.7         60.3         2891.8         2869.7         18.9         18.8         3.5         3           36105.7         62.3         562.3         32470.0         60.3         2869.7         2865.8         18.8         15.8         2.8         3           36105.7         62.3         562.3         32532.3         60.3         2869.7         2865.8         18.8         15.8         2.8         3           36168.0         61.8         62.3         32532.3         60.3         2865.8         2861.7         15.8         5.3         0.5         2           36229.8         287.1         61.8         32594.1         60.3         2861.7         2861.2         5.3         4.8         0.3         0           36516.9         99.9         287.1         32881.2         60.3         2861.1         2861.0         4.9         0.3         0           36616.8         103.4         99.9         32981.1         60.3         2861.0         2860.8         5.0         5.0         0.4         0           36871.1         141.0         150.9         33235.4         60.3         2860.6         5.0         4.9								+			·
36105.7         62.3         562.3         32470.0         60.3         2869.7         2865.8         18.8         15.8         2.8         3           36168.0         61.8         62.3         32532.3         60.3         2865.8         2861.7         15.8         5.3         0.5         2           36229.8         287.1         61.8         32594.1         60.3         2861.7         2861.2         5.3         4.8         0.3         0           36516.9         99.9         287.1         32881.2         60.3         2861.2         2861.1         4.8         4.9         0.3         0           36616.8         103.4         99.9         32981.1         60.3         2861.0         2860.8         5.0         0.4         0           36720.2         150.9         103.4         33084.5         60.3         2860.8         2860.6         5.0         0.4         0           36871.1         141.0         150.9         33235.4         60.3         2860.6         5.0         4.9         0.3         0           37012.1         52.5         141.0         33376.4         60.3         2860.5         4.9         5.1         0.4         0								+			·
36168.0         61.8         62.3         32532.3         60.3         2865.8         2861.7         15.8         5.3         0.5         2           36229.8         287.1         61.8         32594.1         60.3         2861.7         2861.2         5.3         4.8         0.3         0           36516.9         99.9         287.1         32881.2         60.3         2861.2         2861.1         4.8         4.9         0.3         0           36616.8         103.4         99.9         32981.1         60.3         2861.0         2861.0         4.9         5.0         0.4         0           36720.2         150.9         103.4         33084.5         60.3         2861.0         2860.8         5.0         5.0         0.4         0           36871.1         141.0         150.9         33235.4         60.3         2860.8         2860.5         4.9         0.3         0           37012.1         52.5         141.0         33376.4         60.3         2860.5         4.9         5.1         0.4         0           37064.6         56.9         52.5         33428.9         60.3         2860.5         5.1         5.2         0.4         0								+			·
36229.8         287.1         61.8         32594.1         60.3         2861.7         2861.2         5.3         4.8         0.3         0           36516.9         99.9         287.1         32881.2         60.3         2861.2         2861.1         4.8         4.9         0.3         0           36516.9         99.9         287.1         32881.2         60.3         2861.2         2861.1         4.8         4.9         0.3         0           36616.8         103.4         99.9         32981.1         60.3         2861.0         2861.0         4.9         5.0         0.4         0           36720.2         150.9         103.4         33084.5         60.3         2861.0         2860.8         5.0         5.0         0.4         0           36871.1         141.0         150.9         33235.4         60.3         2860.8         2860.6         5.0         4.9         0.3         0           37012.1         52.5         141.0         33376.4         60.3         2860.5         4.9         5.1         0.4         0           37064.6         56.9         52.5         33428.9         60.3         2860.5         5.1         5.2         0											·
36516.9         99.9         287.1         32881.2         60.3         2861.2         2861.1         4.8         4.9         0.3         0           36616.8         103.4         99.9         32981.1         60.3         2861.1         2861.0         4.9         5.0         0.4         0           36720.2         150.9         103.4         33084.5         60.3         2861.0         2860.8         5.0         5.0         0.4         0           36871.1         141.0         150.9         33235.4         60.3         2860.8         2860.6         5.0         4.9         0.3         0           37012.1         52.5         141.0         33376.4         60.3         2860.5         4.9         5.1         0.4         0           37064.6         56.9         52.5         33428.9         60.3         2860.5         5.1         5.2         0.4         0           37121.5         74.6         56.9         33485.8         60.3         2860.5         2860.3         5.2         5.1         0.4         0											
36720.2         150.9         103.4         33084.5         60.3         2861.0         2860.8         5.0         5.0         0.4         0           36871.1         141.0         150.9         33235.4         60.3         2860.8         2860.6         5.0         4.9         0.3         0           37012.1         52.5         141.0         33376.4         60.3         2860.6         2860.5         4.9         5.1         0.4         0           37064.6         56.9         52.5         33428.9         60.3         2860.5         2860.5         5.1         5.2         0.4         0           37121.5         74.6         56.9         33485.8         60.3         2860.5         2860.3         5.2         5.1         0.4         0								+			
36720.2         150.9         103.4         33084.5         60.3         2861.0         2860.8         5.0         5.0         0.4         0           36871.1         141.0         150.9         33235.4         60.3         2860.8         2860.6         5.0         4.9         0.3         0           37012.1         52.5         141.0         33376.4         60.3         2860.6         2860.5         4.9         5.1         0.4         0           37064.6         56.9         52.5         33428.9         60.3         2860.5         2860.5         5.1         5.2         0.4         0           37121.5         74.6         56.9         33485.8         60.3         2860.5         2860.3         5.2         5.1         0.4         0								+			
36871.1         141.0         150.9         33235.4         60.3         2860.8         2860.6         5.0         4.9         0.3         0           37012.1         52.5         141.0         33376.4         60.3         2860.6         2860.5         4.9         5.1         0.4         0           37064.6         56.9         52.5         33428.9         60.3         2860.5         2860.5         5.1         5.2         0.4         0           37121.5         74.6         56.9         33485.8         60.3         2860.5         2860.3         5.2         5.1         0.4         0		150.9	103.4	33084.5				+		0.4	
37064.6         56.9         52.5         33428.9         60.3         2860.5         2860.5         5.1         5.2         0.4         0           37121.5         74.6         56.9         33485.8         60.3         2860.5         2860.3         5.2         5.1         0.4         0	36871.1	141.0	150.9	33235.4	60.3	2860.8	2860.6	5.0	4.9	0.3	0.4
37064.6         56.9         52.5         33428.9         60.3         2860.5         2860.5         5.1         5.2         0.4         0           37121.5         74.6         56.9         33485.8         60.3         2860.5         2860.3         5.2         5.1         0.4         0	37012.1	52.5	141.0	33376.4	60.3	2860.6	2860.5	4.9	5.1	0.4	0.3
<u>37121.5</u> 74.6 56.9 33485.8 60.3 2860.5 2860.3 5.2 5.1 0.4 0	37064.6		52.5	33428.9	60.3	2860.5	2860.5	5.1	5.2	0.4	0.4
371961 505 746 335604 603 28603 28602 51 49 03 0	37121.5	74.6	56.9	33485.8	60.3	2860.5	2860.3	5.2	5.1	0.4	0.4
	37196.1	50.5	74.6	33560.4	60.3	2860.3	2860.2	5.1	4.9	0.3	0.4

37246.6	88.6	50.5	33610.9	60.3	2860.2	2860.2	4.9	5.2	0.4	0.3
37240.0	76.3	88.6	33699.5	60.3	2860.2	2860.2	4.9	5.2	0.4	0.3
37411.5	109.4	76.3	33775.8	60.3	2860.1	2859.9	5.2	5.1	0.4	0.4
37520.9	76.4	109.4	33885.2	60.3	2859.9	2859.9	5.1	5.5	0.5	0.4
37597.3	129.9	76.4	33961.6	60.3	2859.9	2859.7	5.5	5.7	0.6	0.5
37727.2	71.8	129.9	34091.5	60.3	2859.7	2859.6	5.7	5.7	0.6	0.6
37799.0	40.2	71.8	34163.3	60.3	2859.6	2859.6	5.7	6.0	0.6	0.6
37839.2	40.4	40.2	34203.5	60.3	2859.6	2859.5	6.0	6.2	0.7	0.6
37879.6	55.4	40.4	34243.9	60.3	2859.5	2859.4	6.2	6.0	0.6	0.7
37935.0	100.0	55.4	34299.3	60.3	2859.4	2859.3	6.0	6.8	0.8	0.6
38035.0	55.8	100.0	34399.3	60.3	2859.3	2859.2	6.8	6.9	0.8	0.8
38090.8	74.1	55.8	34455.1	60.3	2859.2	2858.9	6.9	6.2	0.7	0.8
38164.9	67.3	74.1	34529.2	60.3	2858.9	2859.0	6.2	7.2	0.9	0.7
38232.2	22.2	67.3	34596.5	60.3	2859.0	2858.9	7.2	7.0	0.8	0.9
38254.4	125.0	22.2	34618.7	60.3	2858.9	2858.4	7.0	5.6	0.5	0.8
38379.4	27.2	125.0	34743.7	60.3	2858.4	2858.3	5.6	5.7	0.6	0.5
38406.6	19.7	27.2	34770.9	60.3	2858.3	2858.3	5.7	5.7	0.6	0.6
38426.3	30.4	19.7	34790.6	60.3	2858.3	2858.3	5.7	5.8	0.6	0.6
38456.7	53.7	30.4	34821.0	60.3	2858.3	2858.3	5.8	6.4	0.7	0.6
38510.4	40.9	53.7	34874.7	60.3	2858.3	2858.2	6.4	6.1	0.6	0.7
38551.3	86.2	40.9	34915.6	60.3	2858.2	2858.0	6.1	5.8	0.6	0.6
38637.5	51.3	86.2	35001.8	60.3	2858.0	2857.9	5.8	6.0	0.6	0.6
38688.8	38.1	51.3	35053.1	60.3	2857.9	2857.9	6.0	6.1	0.6	0.6
38726.9	37.6	38.1	35091.2	60.3	2857.9	2857.9	6.1	6.5	0.7	0.6
38764.5	37.1	37.6	35128.8	60.3	2857.9	2857.8	6.5	6.4	0.7	0.7
38801.6	140.0	37.1	35165.9	60.3	2857.8	2857.5	6.4	6.3	0.7	0.7
38941.6	44.0	140.0	35305.9	60.3	2857.5	2857.3	6.3	5.6	0.5	0.7
38985.6	19.5	44.0	35349.9	60.3	2857.3	2857.4	5.6	6.1	0.6	0.5
39005.1	145.1	19.5	35369.4	60.3	2857.4	2857.2	6.1	6.5	0.7	0.6
39150.2	22.6	145.1	35514.5	60.3	2857.2	2857.1	6.5	6.1	0.7	0.7
39172.8	27.0	22.6	35537.1	60.3	2857.1	2856.9	6.1	5.7	0.5	0.7
39199.8	17.0	27.0	35564.1	60.3	2856.9	2856.9	5.7	5.7	0.6	0.5
39216.8	31.3	17.0	35581.1	60.3	2856.9	2857.0	5.7	6.4	0.7	0.6
39248.1	19.1	31.3	35612.4	60.3	2857.0	2857.0	6.4	6.6	0.7	0.7
39267.2	116.5	19.1	35631.5	60.3	2857.0	2856.9	6.6	7.5	0.9	0.7
39383.7	20.5	116.5	35748.0	60.3	2856.9	2856.9	7.5	7.8	1.0	0.9
39404.2	44.6	20.5	35768.5	60.3	2856.9	2856.8	7.8	7.9	1.0	1.0
39448.8	39.0	44.6	35813.1	60.3	2856.8	2856.6	8.1	7.8	1.0	1.0
39487.8	50.6	39.0	35852.1	60.3	2856.6	2856.4	7.8	7.5	0.9	1.0
39538.4	31.8	50.6	35902.7	60.3	2856.4	2856.4	7.5	7.9	1.0	0.9
39570.2	57.7	31.8	35934.5	60.3	2856.4	2856.0	8.0	7.1	0.9	1.0
39627.9	28.6	57.7	35992.2	60.3	2856.0	2856.0	7.1	7.7	1.0	0.9
39656.5	29.7	28.6	36020.8	60.3	2856.4	2854.7	11.2	4.6	0.1	1.7
39686.2	30.0	29.7	36050.5	60.3	2854.7	2854.6	4.6	4.6	0.1	0.1
39716.2	46.4	30.0	36080.5	60.3	2854.6	2854.6	4.6	4.6	0.1	0.1
39762.6	52.6	46.4	36126.9	60.3	2854.6	2854.5	4.6	4.6	0.1	0.1
39815.2	62.0	52.6	36179.5	60.3	2854.5	2854.4	4.6	4.6	0.1	0.1
39877.2	40.8	62.0	36241.5	60.3	2854.4	2854.4	4.6	4.6	0.1	0.1
39918.0	18.1	40.8	36282.3	60.3	2854.4	2854.3	4.6	4.6	0.1	0.1
39936.1	76.0	18.1	36300.4	60.3	2854.3	2854.2	4.6	4.6	0.1	0.1
40012.1	61.8	76.0	36376.4	60.3	2854.2	2854.2	4.6	4.6	0.1	0.1
40073.9	43.3	61.8	36438.2	60.3	2854.2	2854.1	4.6	4.6	0.1	0.1
40117.2	62.6	43.3	36481.5	60.3	2854.1	2854.0	4.6	4.6	0.1	0.1
40179.8	34.1	62.6	36544.1	60.3	2854.0	2854.0	4.6	4.6	0.1	0.1
40213.9	59.5	34.1	36578.2	60.3	2854.0	2853.9	4.6	4.6	0.1	0.1
40273.4	55.7	59.5	36637.7	60.3	2853.9	2853.8	4.6	4.6	0.1	0.1
40329.1	72.9	55.7	36693.4	60.3	2853.8	2853.8	4.6	4.6	0.1	0.1
40402.0	49.3	72.9	36766.3	60.3	2853.8	2853.7	4.6	4.6	0.1	0.1
40451.3	61.5	49.3	36815.6	60.3	2853.7	2853.6	4.6	4.6	0.1	0.1

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40512.8	71.4	61.5	36877.1	60.3	2853.6	2853.5	4.6	4.6	0.1	0.1
40584.2	99.3	71.4	36948.5	60.3	2853.5	2853.4	4.6	4.6	0.1	0.1
40683.5	83.4	99.3	37047.8	60.3	2853.4	2853.3	4.6	4.6	0.1	0.1
40766.9	30.5	83.4	37131.2	60.3	2853.3	2853.3	4.6	4.6	0.1	0.1
40797.4	40.3	30.5	37161.7	60.3	2853.3	2853.2	4.6	4.6	0.1	0.1
40837.7	44.4	40.3	37202.0	60.3	2853.2	2853.1	4.6	4.6	0.1	0.1
40882.1	44.0	44.4	37246.4	60.3	2853.1	2853.1	4.6	4.6	0.1	0.1
40926.1	47.5	44.0	37290.4	60.3	2853.1	2853.0	4.6	4.6	0.1	0.1
40973.6	43.9	47.5	37337.9	60.3	2853.0	2853.0	4.6	4.6	0.1	0.1
41017.5	68.6	43.9	37381.8	60.3	2853.0	2852.9	4.6	4.6	0.1	0.1
41086.1 41147.2	61.1 103.0	68.6 61.1	37450.4 37511.5	60.3 60.3	2852.9 2852.8	2852.8 2852.7	4.6 4.6	4.6 4.6	0.1	0.1
41147.2	45.0	103.0	37614.5	60.3	2852.7	2852.6	4.0	4.6	0.1	0.1
41295.2	76.9	45.0	37659.5	60.3	2852.6	2852.5	4.6	4.6	0.1	0.1
41235.2	36.6	76.9	37039.5	60.3	2852.5	2852.5	4.6	4.6	0.1	0.1
41408.7	31.7	36.6	37773.0	60.3	2852.5	2852.4	4.6	4.6	0.1	0.1
41440.4	37.1	31.7	37804.7	60.3	2852.4	2852.4	4.6	4.6	0.1	0.1
41477.5	36.2	37.1	37841.8	60.3	2852.4	2852.3	4.6	4.6	0.1	0.1
41513.7	53.5	36.2	37878.0	60.3	2852.3	2852.3	4.6	4.6	0.1	0.1
41567.2	40.0	53.5	37931.5	60.3	2852.3	2852.2	4.6	4.6	0.1	0.1
41507.2	43.0	40.0	37931.5	60.3	2852.2	2852.2	4.6	4.0	0.2	0.1
41650.2	29.9	43.0	38014.5	60.3	2852.2	2852.1	4.7	4.7	0.2	0.2
41680.1	79.9	29.9	38044.4	60.3	2852.1	2852.0	4.7	4.6	0.2	0.2
41760.0	52.9	79.9	38124.3	60.3	2852.0	2852.0	4.6	4.7	0.2	0.2
41812.9	32.4	52.9	38177.2	60.3	2852.0	2851.9	4.7	4.7	0.2	0.2
41845.3	35.6	32.5	38209.6	60.3	2851.9	2851.9	4.7	4.7	0.2	0.2
41880.9	49.4	35.6	38245.2	60.3	2851.9	2851.8	4.7	4.7	0.2	0.2
41930.3	52.6	49.4	38294.6	60.3	2851.8	2851.8	4.7	4.7	0.3	0.2
41982.9	25.6	52.6	38347.2	60.3	2851.8	2851.7	4.7	4.9	0.3	0.3
42008.5	82.9	25.6	38372.8	60.3	2851.7	2851.6	4.9	4.8	0.3	0.3
42091.4	39.6	82.9	38455.7	60.3	2851.6	2851.6	4.8	4.8	0.3	0.3
42131.0	28.2	39.6	38495.3	60.3	2851.6	2851.5	4.8	4.7	0.2	0.3
42159.2	24.9	28.2	38523.5	60.3	2851.5	2851.5	4.7	4.9	0.3	0.2
42184.1	27.1	24.9	38548.4	60.3	2851.5	2851.5	4.9	4.8	0.3	0.3
42211.2	34.1	27.1	38575.5	60.3	2851.5	2851.4	4.8	4.8	0.3	0.3
42245.3	33.2	34.1	38609.6	60.3	2851.4	2851.4	4.8	4.8	0.3	0.3
42278.5	279.4	33.2	38642.8	60.3	2851.4	2851.0	4.8	5.1	0.4	0.3
42557.9	245.2	279.4	38922.2	60.3	2851.0	2850.7	5.1	4.9	0.3	0.4
42803.1	33.5	245.2	39167.4	60.3	2850.7	2850.7	4.9	5.0	0.4	0.3
42836.6	106.6	33.5	39200.9	60.3	2850.7	2850.5	5.0	5.4	0.5	0.4
42943.2	57.8	106.6	39307.5	60.3	2850.5	2850.5	5.4	5.3	0.5	0.5
43001.0	28.5	57.8	39365.3	60.3	2850.5	2850.5	5.3	5.7	0.6	0.5
43029.5	37.6	28.5	39393.8	60.3	2850.5	2850.4	5.7	5.6	0.5	0.6
43067.1	77.5	37.6	39431.4	60.3	2850.4	2850.4	5.6	6.2	0.7	0.5
43144.6	30.5	77.5	39508.9	60.3	2850.4	2850.2	6.2	5.7	0.6	0.7
43175.1	39.2	30.5	39539.4	60.3	2850.2	2850.2	5.7	6.0	0.6	0.6
43214.3	60.8	39.2	39578.6	60.3	2850.2	2850.1	6.0	5.8	0.6	0.6
43275.1	106.9	60.8	39639.4	60.3	2850.1	2849.9	5.8	5.7	0.5	0.6
43382.0	43.9	106.9	39746.3	60.3	2849.9	2849.8	5.7	5.6	0.5	0.5
43425.9	88.0	43.9	39790.2	60.3	2849.8	2849.9	5.6	6.5	0.7	0.5
43513.9	40.6	88.0	39878.2	60.3	2849.9	2849.8	6.5	6.4	0.7	0.7
43554.5	38.3	40.6	39918.8	60.3	2849.8	2849.7	6.4	6.3	0.7	0.7
43592.8	39.7	38.3	39957.1	60.3	2849.7	2849.7	6.3	6.8	0.8	0.7
43632.5	48.6	39.7	39996.8	60.3	2849.7	2849.6	6.8	6.8	0.8	0.8
43681.1	28.0	48.6	40045.4	60.3	2849.6	2849.7	6.8	7.4	0.9	0.8
43709.1	33.7	28.0	40073.4	60.3	2849.7	2849.6	7.4	7.3	0.9	0.9
43742.8	33.7	33.7	40107.1	60.3	2849.6	2849.5	7.3	7.3	0.9	0.9
43776.5	45.0	33.7	40140.8	60.3	2849.5	2849.4	7.3	7.3	0.9	0.9
43821.5	34.6	45.0	40185.8	60.3	2849.4	2849.3	7.3	7.3	0.9	0.9

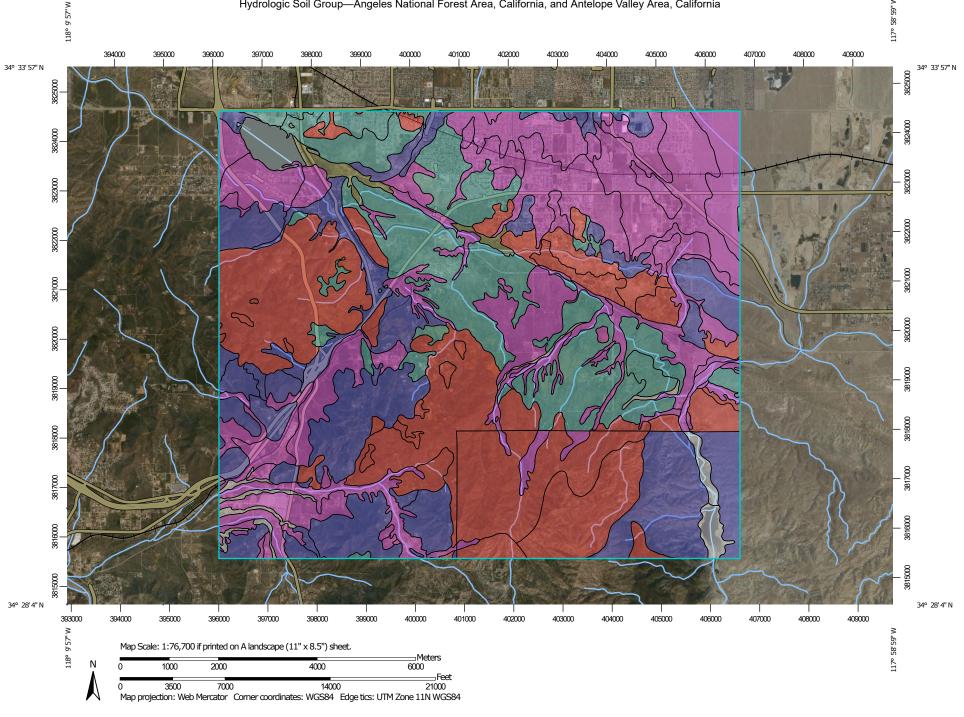
43856.1	26.8	34.6	40220.4	60.3	2849.3	2849.2	7.3	7.2	0.9	0.9
43882.9	30.2	26.8	40220.4	60.3	2849.2	2849.0	7.3	6.8	0.5	0.9
43913.1	105.4	30.2	40277.4	60.3	2849.0	2848.7	6.8	5.9	0.6	0.8
44018.5	90.5	105.4	40382.8	60.3	2848.7	2848.6	5.9	6.3	0.0	0.6
44109.0	62.8	90.5	40473.3	60.3	2848.6	2848.5	6.3	6.7	0.8	0.7
44171.8	47.7	62.8	40536.1	60.3	2848.5	2848.2	6.7	6.0	0.6	0.8
44219.5	79.2	47.7	40583.8	60.3	2848.2	2848.1	6.0	6.2	0.7	0.6
44298.7	191.0	79.2	40663.0	60.3	2848.1	2847.9	6.2	7.1	0.8	0.7
44489.7	24.0	191.0	40854.0	60.3	2847.9	2847.9	7.1	7.3	0.9	0.8
44513.7	68.9	24.0	40878.0	60.3	2847.9	2847.8	7.3	7.9	1.0	0.9
44582.6	30.5	68.9	40946.9	60.3	2847.8	2847.4	7.9	6.3	0.7	1.0
44613.1	65.5	30.5	40977.4	60.3	2847.4	2847.3	6.3	6.2	0.7	0.7
44678.6	32.9	65.5	41042.9	60.3	2847.3	2847.2	6.2	6.2	0.7	0.7
44711.5	58.1	32.9	41075.8	60.3	2847.2	2847.0	6.2	5.8	0.6	0.7
44769.6	39.5	58.1	41133.9	60.3	2847.0	2847.0	5.8	5.9	0.6	0.6
44809.1	61.8	39.5	41173.4	60.3	2847.0	2846.9	5.9	6.0	0.6	0.6
44870.9	22.0	61.8	41235.2	60.3	2846.9	2846.9	6.0	6.1	0.6	0.6
44892.9	37.1	22.0	41257.2	60.3	2846.9	2846.8	6.1	6.2	0.7	0.6
44930.0	58.1	37.1	41294.3	60.3	2846.8	2846.7	6.2	6.5	0.7	0.7
44988.1	91.4	58.1	41352.4	60.3	2846.7	2846.6	6.5	7.0	0.8	0.7
45079.5	71.6	91.4	41443.8	60.3	2846.6	2846.5	7.0	7.5	0.9	0.8
45151.1	40.3	71.6	41515.4	60.3	2846.5	2846.5	7.5	7.9	1.0	0.9
45191.4	62.9	40.3	41555.7	60.3	2846.5	2846.0	8.3	7.1	0.8	1.1
45254.3	131.7	62.9	41618.6	60.3	2845.6	2845.4	4.7	4.8	0.3	0.2
45386.0	95.1	131.7	41750.3	60.3	2845.4	2845.3	4.8	4.9	0.4	0.3
45481.1	51.6	95.1	41845.4	60.3	2845.3	2845.2	4.9	5.0	0.4	0.4
45532.7	50.3	51.6	41897.0	60.3	2845.2	2845.2	5.0	5.1	0.4	0.4
45583.0	43.4	50.3	41947.3	60.3	2845.2	2845.1	5.1	5.2	0.4	0.4
45626.4	40.2	43.4	41990.7	60.3	2845.1	2845.1	5.2	5.2	0.5	0.4
45666.6	36.1	40.2	42030.9	60.3	2845.1	2845.0	5.2	5.3	0.5	0.5
45702.7	94.6	36.1	42067.0	60.3	2845.0	2844.9	5.3	5.5	0.5	0.5
45797.3	32.6	94.6	42161.6	60.3	2844.9	2844.9	5.5	5.6	0.5	0.5
45829.9	48.2	32.6	42194.2	60.3	2844.9	2844.8	5.6	5.8	0.6	0.5
45878.1	22.5	48.2	42242.4	60.3	2844.8	2844.8	5.8	5.9	0.6	0.6
45900.6	22.4	22.5	42264.9	60.3	2844.8	2844.8	5.9	6.0	0.6	0.6
45923.0	67.9	22.4	42287.3	60.3	2844.8	2844.7	6.0	6.3	0.7	0.6
45990.9	26.6	67.9	42355.2	60.3	2844.7	2844.6	6.3	6.4	0.7	0.7
46017.5	46.1	26.6	42381.8	60.3	2844.6	2844.6	6.4	6.7	0.8	0.7
46063.6	100.0	46.1	42427.9	60.3	2844.6	2844.5	6.7			
46163.6	25.9	100.0	42527.9	60.3	2844.5	2844.5	7.6	7.9	1.0	0.9
46189.5	11.1	25.9	42553.8	60.3	2845.3	2843.3	12.5 5 7	5.7	0.6	2.0
46200.6	108.5	11.1	42564.9	60.3	2843.3 2843.1	2843.1 2843.0	5.7	6.0 6.1	0.6	0.6
46309.1 46365.7	56.6 112.3	108.5 56.6	42673.4 42730.0	60.3 60.3	2843.1 2843.0	2843.0	6.0 6.1	6.1 6.6	0.6 0.7	0.6 0.6
46478.0	45.6	112.3	42750.0	60.3	2843.0	2842.9	6.6	6.8	0.7	0.0
46523.6	43.0	45.6	42887.9	60.3	2842.9	2842.8	6.8	0.8 7.1	0.8	0.7
46566.5	42.9 87.0	43.0	42007.9	60.3	2842.8	2842.8	7.1	7.1	1.0	0.8
46653.5	68.4	42.9 87.0	43017.8	60.3	2846.3	2839.6	19.2	5.8	0.6	3.6
46721.9	26.9	68.4	43017.8	60.3	2839.6	2839.6	5.8	5.8	0.6	0.6
46748.8	63.4	26.9	43113.1	60.3	2839.6	2839.5	5.8	5.8	0.6	0.0
46812.2	56.0	63.4	43176.5	60.3	2839.5	2839.4	6.0	6.2	0.0	0.6
46868.2	31.6	56.0	43232.5	60.3	2839.4	2839.4	6.2	6.3	0.7	0.0
46899.8	63.2	31.6	43264.1	60.3	2839.4	2839.3	6.3	6.6	0.7	0.7
46963.0	37.3	63.2	43327.3	60.3	2839.3	2839.3	6.6	6.8	0.8	0.7
47000.3	44.5	37.3	43364.6	60.3	2839.3	2839.2	6.8		0.8	0.7
47044.8	28.8	44.5	43409.1	60.3	2839.2	2839.2	7.0	7.0	0.0	0.8
47073.6	72.2	28.8	43437.9	60.3	2839.2	2839.1	7.0	7.2	1.0	0.9
47145.8	73.7	72.2	43510.1	60.3	2843.8	2834.8	21.1	6.8	0.8	4.2
47219.5	63.0	73.7	43583.8	60.3	2834.8	2834.7	6.8	6.9	0.8	0.8
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47282.5	24.8	63.0	43646.8	60.3	2834.7	2834.6	6.9	7.0	0.8	0.8
47307.3	32.4	24.8	43671.6	60.3	2834.6	2834.6	7.0	7.1	0.8	0.8
47339.7	82.3	32.4	43704.0	60.3	2834.6	2834.4	7.1	7.4	0.9	0.8
47422.0	80.5	82.3	43786.3	60.3	2834.4	2834.3	7.4	7.9	1.0	0.9
47502.5	88.7	80.5	43866.8	60.3	2836.2	2831.8	15.7	6.5	0.7	2.8
47591.2	68.2	88.7	43955.5	60.3	2831.8	2831.7	6.5	6.7	0.8	0.7
47659.4	51.7	68.2	44023.7	60.3	2831.7	2831.6	6.7	6.8	0.8	0.8
47711.1	33.6	51.7	44075.4	60.3	2831.6	2831.6	6.8	7.0	0.8	0.8
47744.7	49.2	33.6	44109.0	60.3	2831.6	2831.5	7.0	7.2	0.9	0.8
47793.93	26.3	49.2	44158.2	60.3417	2831.491	2831.449	7.162	7.296	0.88	0.854
47820.23	97.7	26.3	44184.5	60.3417	2831.449	2831.31	7.296	7.877	0.996	0.88
47917.93	342.2	97.7	44282.2	60.3417	2831.776	2828.41	11.417	7.949	1.01	1.744
48260.13	35.4	342.2	44624.4	60.3417	2828.41	2828.303	7.949	7.949	1.01	1.01
48295.53	30.2	35.4	44659.8	60.3417	2828.303	2828.21	7.949	7.949	1.01	1.01
48325.73	53.3	30.2	44690	60.3417	2828.22	2827.678	8.358	6.802	0.782	1.093
48379.03	118	53.3	44743.3	60.3417	2827.678	2827.61	6.802	7.897	1	0.782
48497.03	26.4	118	44861.3	60.3417	2827.625	2827.525	8.469	8.469	1.116	1.116





Appendix C: NRCS Data Output



USDA **Natural Resources Conservation Service**  58' 59" W

MAP LEGEND MAP INFORMATION The soil surveys that comprise your AOI were mapped at Area of Interest (AOI) С 1:24.000. Area of Interest (AOI) C/D Please rely on the bar scale on each map sheet for map Soils D measurements. Soil Rating Polygons Not rated or not available А Source of Map: Natural Resources Conservation Service Web Soil Survey URL: Water Features A/D Coordinate System: Web Mercator (EPSG:3857) Streams and Canals В Maps from the Web Soil Survey are based on the Web Mercator Transportation projection, which preserves direction and shape but distorts B/D Rails +++ distance and area. A projection that preserves area, such as the С Albers equal-area conic projection, should be used if more Interstate Highways accurate calculations of distance or area are required. C/D US Routes ~ This product is generated from the USDA-NRCS certified data as D Major Roads of the version date(s) listed below. Not rated or not available Local Roads ~ Soil Survey Area: Angeles National Forest Area, California Soil Rating Lines Survey Area Data: Version 14, May 27, 2020 Background А -Aerial Photography Soil Survey Area: Antelope Valley Area, California Survey Area Data: Version 13. May 27. 2020 A/D Your area of interest (AOI) includes more than one soil survey в area. These survey areas may have been mapped at different B/D scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil С properties, and interpretations that do not completely agree C/D across soil survey area boundaries. D Soil map units are labeled (as space allows) for map scales 1:50,000 or larger. Not rated or not available an ai Date(s) aerial images were photographed: Apr 18, 2016—Jul 8, Soil Rating Points 2019 А The orthophoto or other base map on which the soil lines were A/D compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor В shifting of map unit boundaries may be evident. B/D 

# Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
7	Hanford family, 3 to 25 percent slopes	A	129.9	0.5%
21	Riverwash		75.2	0.3%
89	Pismo-Trigo, dry- Exchequer, dry families complex, 30 to 70 percent slopes	D	119.3	0.5%
711	Trigo family, dry-Lithic Xerorthents, warm complex, 50 to 80 percent slopes	В	1,192.6	5.0%
755	Haploxerols, shallow- Lithic Xerorthents, warm complex, 45 to 75 percent slopes	D	795.8	3.3%
765	Haploxerolls, shallow- Trigo family, dry- Haploxeralfs complex, 90 percent slopes	D	1,259.6	5.3%
766	Water		108.5	0.5%
Subtotals for Soil Surv	vey Area	1	3,680.8	15.5%
Totals for Area of Inter	rest		23,772.6	100.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AcA	Adelanto coarse sandy loam, 2 to 5 percent slopes	A	418.9	1.8%
AmF2	Amargosa rocky coarse sandy loam, 9 to 55 percent slopes, eroded	D	257.0	1.1%
AsB	Arizo gravelly loamy sand, 0 to 5 percent slopes	A	420.3	1.8%
CaA	Cajon loamy sand, 0 to 2 percent slopes	A	1,042.3	4.4%
CkD	Castaic silty clay loam, 9 to 15 percent slopes	С	129.0	0.5%
CmF2	Castaic-Balcom silty clay loams, 30 to 50 percent slopes, eroded	С	58.3	0.2%
Co	Chino loam	C/D	172.1	0.7%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
GaE2	Gaviota rocky sandy loam, 15 to 30 percent slopes, eroded	D	509.2	2.1%
GaF2	Gaviota rocky sandy loam, 30 to 50 percent slopes, eroded	D	361.0	1.5%
GP	Gravel pits		5.0	0.0%
GsC	Greenfield sandy loam, 2 to 9 percent slopes	A	1,356.8	5.7%
GsD2	Greenfield sandy loam, 9 to 15 percent slopes, eroded	A	260.4	1.1%
HbA	Hanford coarse sandy loam, 0 to 2 percent slopes	A	99.7	0.4%
HbC	Hanford coarse sandy loam, 2 to 9 percent slopes	A	1,745.0	7.3%
HbD	Hanford coarse sandy loam, 9 to 15 percent slopes	A	135.3	0.6%
HcC	Hanford sandy loam, 2 to 9 percent slopes	A	701.2	2.9%
HdC	Hanford gravelly sandy loam, 2 to 9 percent slopes	A	490.6	2.1%
HkA	Hesperia fine sandy loam, 0 to 2 percent slopes	A	356.0	1.5%
LaE	Las Posas loam, 9 to 30 percent slopes	D	290.5	1.2%
LdF	Las Posas-Toomes rocky loams, 30 to 50 percent slopes	D	3,054.2	12.8%
RcB	Ramona coarse sandy loam, 2 to 5 percent slopes	С	37.1	0.2%
RcC	Ramona coarse sandy loam, 5 to 9 percent slopes	с	42.0	0.2%
RcD	Ramona coarse sandy loam, 9 to 15 percent slopes	с	27.2	0.1%
RdE2	Ramona sandy loam, 9 to 30 percent slopes, eroded	С	909.2	3.8%
ReC	Ramona gravelly sandy loam, 2 to 9 percent slopes	С	293.3	1.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ReE	Ramona gravelly sandy loam, 9 to 30 percent slopes	С	2,448.8	10.3%
Rg	Riverwash	A	71.2	0.3%
Ro	Rosamond fine sandy loam	В	84.9	0.4%
Rp	Rosamond loam	В	106.9	0.4%
Rs	Rosamond loam, sandy loam substratum	В	22.8	0.1%
RzF	Rough broken land		0.6	0.0%
SoB	Soboba cobbly loamy sand, 2 to 5 percent slopes	A	44.4	0.2%
TsF	Terrace escarpments		175.2	0.7%
VbB	Vernalis loam, 2 to 5 percent slopes	В	40.6	0.2%
VsD2	Vista coarse sandy loam, 9 to 15 percent slopes, eroded	В	180.4	0.8%
VsE	Vista coarse sandy loam, 15 to 30 percent slopes	В	23.2	0.1%
VsE2	Vista coarse sandy loam, 15 to 30 percent slopes, eroded	В	54.2	0.2%
VsF	Vista coarse sandy loam, 30 to 50 percent slopes	В	2,211.6	9.3%
VsF2	Vista coarse sandy loam, 30 to 50 percent slopes, eroded	В	577.7	2.4%
W	Water		221.2	0.9%
WgC	Wyman gravelly loam, 2 to 9 percent slopes	В	504.9	2.1%
WgD	Wyman gravelly loam, 9 to 15 percent slopes	В	148.9	0.6%
Subtotals for Soil Surv	vey Area	1	20,089.2	84.5%
Totals for Area of Inter	rest		23,772.6	100.0%

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

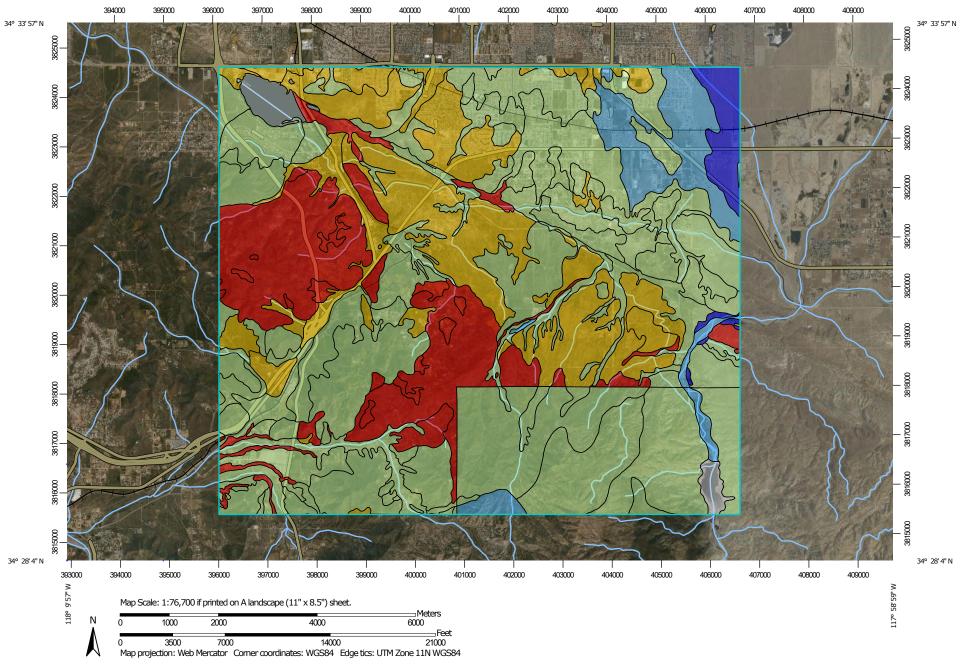
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## **Rating Options**

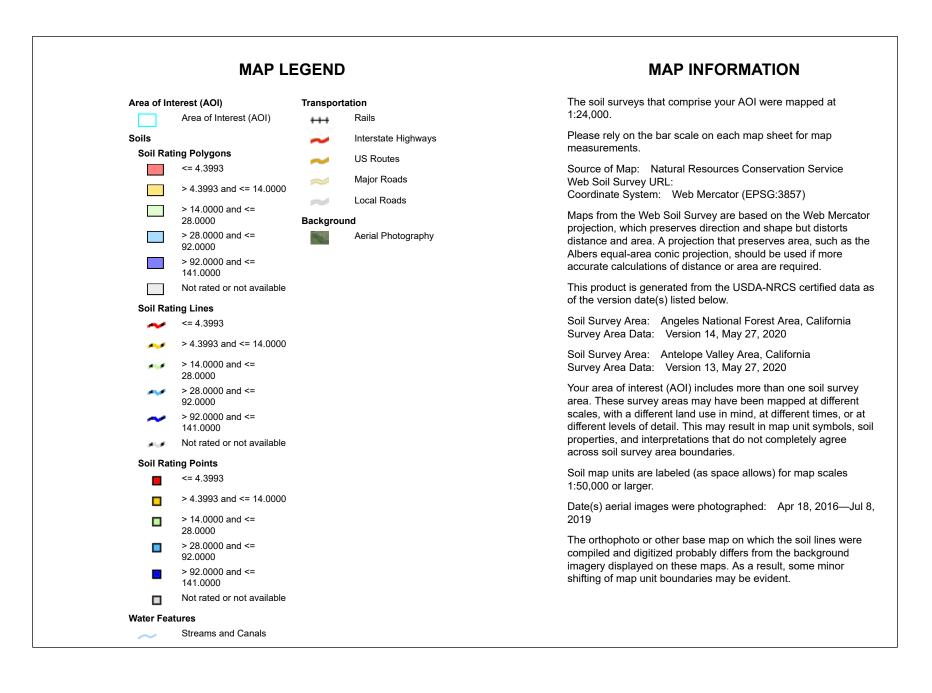
Aggregation Method: Dominant Condition Component Percent Cutoff: None Specified Tie-break Rule: Higher





USDA Natural Resources Conservation Service

118° 9' 57''W



# Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
7	Hanford family, 3 to 25 percent slopes	28.0000	129.9	0.5%
21	Riverwash	92.0000	75.2	0.3%
89	Pismo-Trigo, dry- Exchequer, dry families complex, 30 to 70 percent slopes	92.0000	119.3	0.5%
711	Trigo family, dry-Lithic Xerorthents, warm complex, 50 to 80 percent slopes	28.0000	1,192.6	5.0%
755	Haploxerols, shallow- Lithic Xerorthents, warm complex, 45 to 75 percent slopes	28.0000	795.8	3.3%
765	Haploxerolls, shallow- Trigo family, dry- Haploxeralfs complex, 90 percent slopes	28.0000	1,259.6	5.3%
766	Water		108.5	0.5%
Subtotals for Soil Survey Area			3,680.8	15.5%
Totals for Area of Inter	Totals for Area of Interest			100.0%

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
AcA	Adelanto coarse sandy loam, 2 to 5 percent slopes	19.3716	418.9	1.8%
AmF2	Amargosa rocky coarse sandy loam, 9 to 55 percent slopes, eroded	23.0000	257.0	1.1%
AsB	Arizo gravelly loamy sand, 0 to 5 percent slopes	138.4211	420.3	1.8%
CaA	Cajon loamy sand, 0 to 2 percent slopes	92.0000	1,042.3	4.4%
CkD	Castaic silty clay loam, 9 to 15 percent slopes	2.4645	129.0	0.5%
CmF2	Castaic-Balcom silty clay loams, 30 to 50 percent slopes, eroded	2.4645	58.3	0.2%
Co	Chino loam	4.3993	172.1	0.7%

USDA

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
GaE2	Gaviota rocky sandy loam, 15 to 30 percent slopes, eroded	23.4419	509.2	2.1%
GaF2	Gaviota rocky sandy loam, 30 to 50 percent slopes, eroded	23.4419	361.0	1.5%
GP	Gravel pits		5.0	0.0%
GsC	Greenfield sandy loam, 2 to 9 percent slopes	28.0000	1,356.8	5.7%
GsD2	Greenfield sandy loam, 9 to 15 percent slopes, eroded	28.0000	260.4	1.1%
HbA	Hanford coarse sandy loam, 0 to 2 percent slopes	28.0000	99.7	0.4%
HbC	Hanford coarse sandy loam, 2 to 9 percent slopes	28.0000	1,745.0	7.3%
HbD	Hanford coarse sandy loam, 9 to 15 percent slopes	28.0000	135.3	0.6%
HcC	Hanford sandy loam, 2 to 9 percent slopes	28.0000	701.2	2.9%
HdC	Hanford gravelly sandy loam, 2 to 9 percent slopes	28.0000	490.6	2.1%
HkA	Hesperia fine sandy loam, 0 to 2 percent slopes	28.0000	356.0	1.5%
LaE	Las Posas loam, 9 to 30 percent slopes	1.6934	290.5	1.2%
LdF	Las Posas-Toomes rocky loams, 30 to 50 percent slopes	1.7425	3,054.2	12.8%
RcB	Ramona coarse sandy loam, 2 to 5 percent slopes	9.1048	37.1	0.2%
RcC	Ramona coarse sandy loam, 5 to 9 percent slopes	9.1048	42.0	0.2%
RcD	Ramona coarse sandy loam, 9 to 15 percent slopes	9.1048	27.2	0.1%
RdE2	Ramona sandy loam, 9 to 30 percent slopes, eroded	6.7847	909.2	3.8%
ReC	Ramona gravelly sandy loam, 2 to 9 percent slopes	7.3624	293.3	1.2%

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
ReE	Ramona gravelly sandy loam, 9 to 30 percent slopes	7.3624	2,448.8	10.3%
Rg	Riverwash	92.0000	71.2	0.3%
Ro	Rosamond fine sandy loam	11.5000	84.9	0.4%
Rp	Rosamond loam	9.0000	106.9	0.4%
Rs	Rosamond loam, sandy loam substratum	14.0000	22.8	0.1%
RzF	Rough broken land		0.6	0.0%
SoB	Soboba cobbly loamy sand, 2 to 5 percent slopes	141.0000	44.4	0.2%
TsF	Terrace escarpments	0.0000	175.2	0.7%
VbB	Vernalis loam, 2 to 5 percent slopes	9.0000	40.6	0.2%
VsD2	Vista coarse sandy loam, 9 to 15 percent slopes, eroded	28.0000	180.4	0.8%
VsE	Vista coarse sandy loam, 15 to 30 percent slopes	28.0000	23.2	0.1%
VsE2	Vista coarse sandy loam, 15 to 30 percent slopes, eroded	28.0000	54.2	0.2%
VsF	Vista coarse sandy loam, 30 to 50 percent slopes	28.0000	2,211.6	9.3%
VsF2	Vista coarse sandy loam, 30 to 50 percent slopes, eroded	28.0000	577.7	2.4%
W	Water		221.2	0.9%
WgC	Wyman gravelly loam, 2 to 9 percent slopes	9.0000	504.9	2.1%
WgD	Wyman gravelly loam, 9 to 15 percent slopes	9.0000	148.9	0.6%
Subtotals for Soil Surv	vey Area		20,089.2	84.5%
Totals for Area of Inter	rest		23,772.6	100.0%

# Description

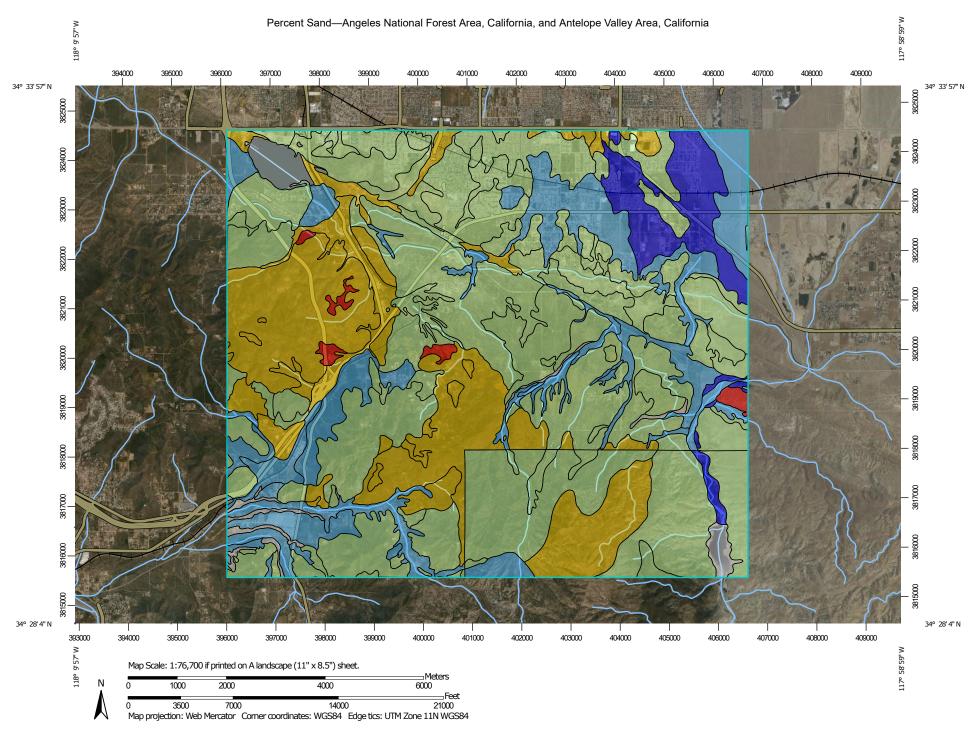
Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

## **Rating Options**

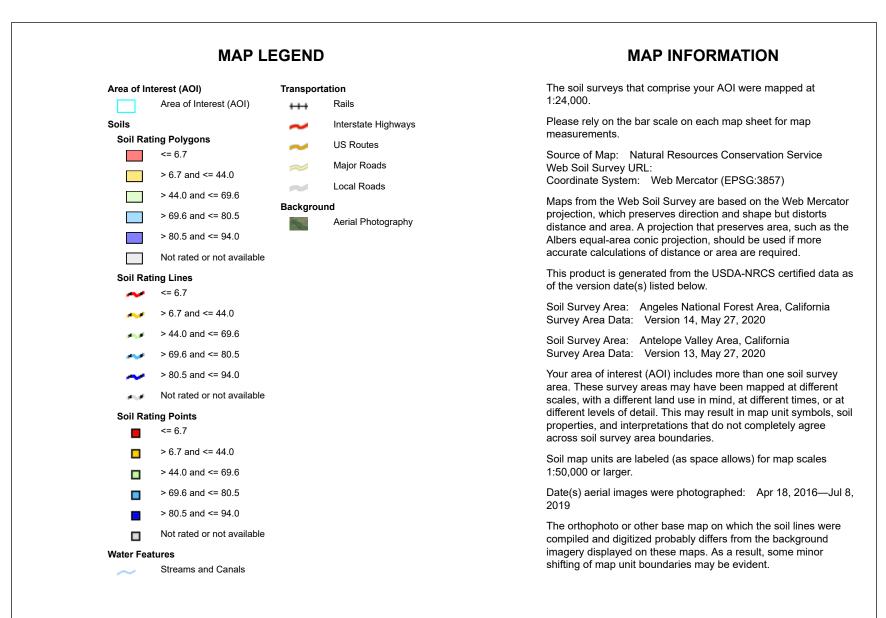
Units of Measure: micrometers per second Aggregation Method: Dominant Component Component Percent Cutoff: None Specified Tie-break Rule: Fastest Interpret Nulls as Zero: No Layer Options (Horizon Aggregation Method): All Layers (Weighted Average)



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Web Soil Survey National Cooperative Soil Survey



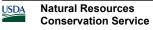
Percent Sand—Angeles National Forest Area, California, and Antelope Valley Area, California



# **Percent Sand**

Map unit symbol	Map unit name	Rating (percent)	Acres in AOI	Percent of AOI
7	Hanford family, 3 to 25 percent slopes	68.6	129.9	0.5%
21	Riverwash	94.0	75.2	0.3%
89	Pismo-Trigo, dry- Exchequer, dry families complex, 30 to 70 percent slopes	80.2	119.3	0.5%
711	Trigo family, dry-Lithic Xerorthents, warm complex, 50 to 80 percent slopes	65.9	1,192.6	5.0%
755	Haploxerols, shallow- Lithic Xerorthents, warm complex, 45 to 75 percent slopes	44.0	795.8	3.3%
765	Haploxerolls, shallow- Trigo family, dry- Haploxeralfs complex, 90 percent slopes	56.4	1,259.6	5.3%
766	Water		108.5	0.5%
Subtotals for Soil Survey Area			3,680.8	15.5%
Totals for Area of Interest			23,772.6	100.0%

Map unit symbol	Map unit name	Rating (percent)	Acres in AOI	Percent of AOI
AcA	Adelanto coarse sandy loam, 2 to 5 percent slopes	68.2	418.9	1.8%
AmF2	Amargosa rocky coarse sandy loam, 9 to 55 percent slopes, eroded	66.8	257.0	1.1%
AsB	Arizo gravelly loamy sand, 0 to 5 percent slopes	80.5	420.3	1.8%
CaA	Cajon loamy sand, 0 to 2 percent slopes	93.5	1,042.3	4.4%
CkD	Castaic silty clay loam, 9 to 15 percent slopes	6.7	129.0	0.5%
CmF2	Castaic-Balcom silty clay loams, 30 to 50 percent slopes, eroded	6.7	58.3	0.2%
Со	Chino loam	24.0	172.1	0.7%



Map unit symbol	Map unit name	Rating (percent)	Acres in AOI	Percent of AOI
GaE2	Gaviota rocky sandy loam, 15 to 30 percent slopes, eroded	66.8	509.2	2.1%
GaF2	Gaviota rocky sandy loam, 30 to 50 percent slopes, eroded	66.8	361.0	1.5%
GP	Gravel pits		5.0	0.0%
GsC	Greenfield sandy loam, 2 to 9 percent slopes	66.6	1,356.8	5.7%
GsD2	Greenfield sandy loam, 9 to 15 percent slopes, eroded	66.6	260.4	1.1%
HbA	Hanford coarse sandy loam, 0 to 2 percent slopes	75.7	99.7	0.4%
HbC	Hanford coarse sandy loam, 2 to 9 percent slopes	75.7	1,745.0	7.3%
HbD	Hanford coarse sandy loam, 9 to 15 percent slopes	75.7	135.3	0.6%
HcC	Hanford sandy loam, 2 to 9 percent slopes	70.6	701.2	2.9%
HdC	Hanford gravelly sandy loam, 2 to 9 percent slopes	70.6	490.6	2.1%
HkA	Hesperia fine sandy loam, 0 to 2 percent slopes	69.6	356.0	1.5%
LaE	Las Posas loam, 9 to 30 percent slopes	31.2	290.5	1.2%
LdF	Las Posas-Toomes rocky loams, 30 to 50 percent slopes	31.2	3,054.2	12.8%
RcB	Ramona coarse sandy loam, 2 to 5 percent slopes	61.1	37.1	0.2%
RcC	Ramona coarse sandy loam, 5 to 9 percent slopes	61.1	42.0	0.2%
RcD	Ramona coarse sandy loam, 9 to 15 percent slopes	61.1	27.2	0.1%
RdE2	Ramona sandy loam, 9 to 30 percent slopes, eroded	59.8	909.2	3.8%
ReC	Ramona gravelly sandy loam, 2 to 9 percent slopes	59.3	293.3	1.2%

Map unit symbol	Map unit name	Rating (percent)	Acres in AOI	Percent of AOI
ReE	Ramona gravelly sandy loam, 9 to 30 percent slopes	59.3	2,448.8	10.3%
Rg	Riverwash	70.7	71.2	0.3%
Ro	Rosamond fine sandy loam	24.8	84.9	0.4%
Rp	Rosamond loam	21.4	106.9	0.4%
Rs	Rosamond loam, sandy loam substratum	37.3	22.8	0.1%
RzF	Rough broken land		0.6	0.0%
SoB	Soboba cobbly loamy sand, 2 to 5 percent slopes	90.4	44.4	0.2%
TsF	Terrace escarpments		175.2	0.7%
VbB	Vernalis loam, 2 to 5 percent slopes	31.5	40.6	0.2%
VsD2	Vista coarse sandy loam, 9 to 15 percent slopes, eroded	66.8	180.4	0.8%
VsE	Vista coarse sandy loam, 15 to 30 percent slopes	66.8	23.2	0.1%
VsE2	Vista coarse sandy loam, 15 to 30 percent slopes, eroded	66.8	54.2	0.2%
VsF	Vista coarse sandy loam, 30 to 50 percent slopes	66.8	2,211.6	9.3%
VsF2	Vista coarse sandy loam, 30 to 50 percent slopes, eroded	66.8	577.7	2.4%
W	Water		221.2	0.9%
WgC	Wyman gravelly loam, 2 to 9 percent slopes	37.1	504.9	2.1%
WgD	Wyman gravelly loam, 9 to 15 percent slopes	37.1	148.9	0.6%
Subtotals for Soil Surv	vey Area		20,089.2	84.5%
Totals for Area of Inter	rest		23,772.6	100.0%

## Description

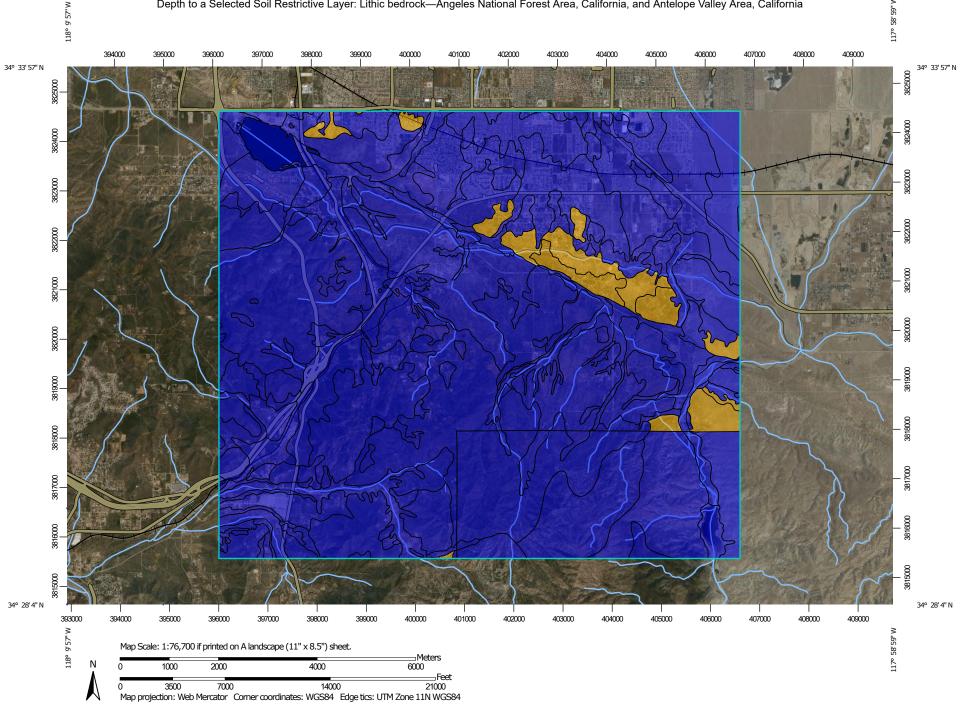
Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In the database, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

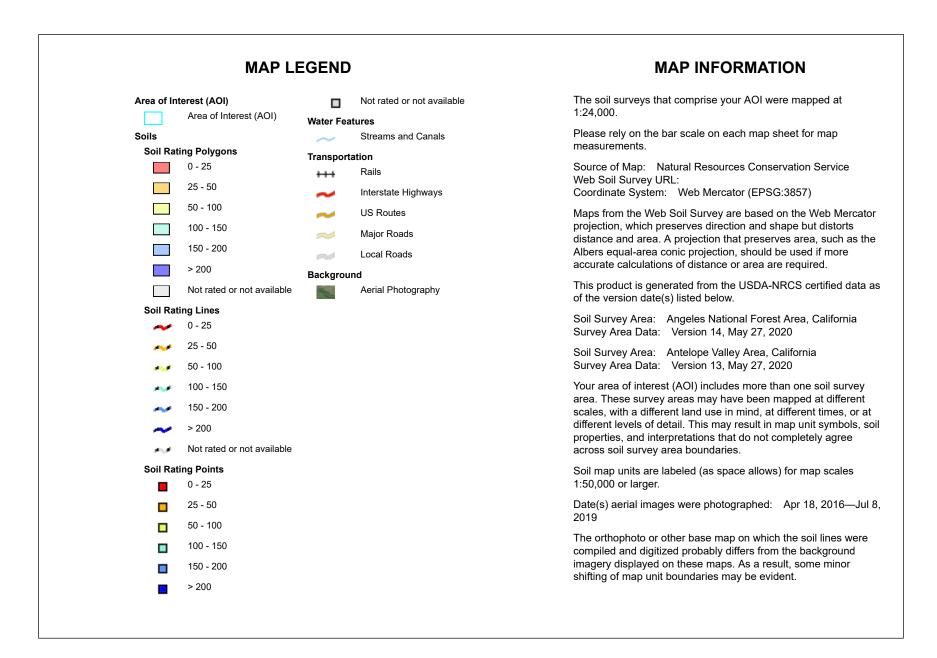
## **Rating Options**

Units of Measure: percent Aggregation Method: Dominant Component Component Percent Cutoff: None Specified Tie-break Rule: Higher Interpret Nulls as Zero: No Layer Options (Horizon Aggregation Method): All Layers (Weighted Average)





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# Depth to a Selected Soil Restrictive Layer: Lithic bedrock

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
7	Hanford family, 3 to 25 percent slopes	>200	129.9	0.5%
21	Riverwash	>200	75.2	0.3%
89	Pismo-Trigo, dry- Exchequer, dry families complex, 30 to 70 percent slopes	>200	119.3	0.5%
711	Trigo family, dry-Lithic Xerorthents, warm complex, 50 to 80 percent slopes	>200	1,192.6	5.0%
755	Haploxerols, shallow- Lithic Xerorthents, warm complex, 45 to 75 percent slopes	>200	795.8	3.3%
765	Haploxerolls, shallow- Trigo family, dry- Haploxeralfs complex, 90 percent slopes	>200	1,259.6	5.3%
766	Water	>200	108.5	0.5%
Subtotals for Soil Survey Area			3,680.8	15.5%
Totals for Area of Inter	rest		23,772.6	100.0%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
AcA	Adelanto coarse sandy loam, 2 to 5 percent slopes	>200	418.9	1.8%
AmF2	Amargosa rocky coarse sandy loam, 9 to 55 percent slopes, eroded	46	257.0	1.1%
AsB	Arizo gravelly loamy sand, 0 to 5 percent slopes	>200	420.3	1.8%
CaA	Cajon loamy sand, 0 to 2 percent slopes	>200	1,042.3	4.4%
CkD	Castaic silty clay loam, 9 to 15 percent slopes	>200	129.0	0.5%
CmF2	Castaic-Balcom silty clay loams, 30 to 50 percent slopes, eroded	>200	58.3	0.2%
Со	Chino loam	>200	172.1	0.7%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
GaE2	Gaviota rocky sandy loam, 15 to 30 percent slopes, eroded	36	509.2	2.1%
GaF2	Gaviota rocky sandy loam, 30 to 50 percent slopes, eroded	36	361.0	1.5%
GP	Gravel pits	>200	5.0	0.0%
GsC	Greenfield sandy loam, 2 to 9 percent slopes	>200	1,356.8	5.7%
GsD2	Greenfield sandy loam, 9 to 15 percent slopes, eroded	>200	260.4	1.1%
HbA	Hanford coarse sandy loam, 0 to 2 percent slopes	>200	99.7	0.4%
HbC	Hanford coarse sandy loam, 2 to 9 percent slopes	>200	1,745.0	7.3%
HbD	Hanford coarse sandy loam, 9 to 15 percent slopes	>200	135.3	0.6%
HcC	Hanford sandy loam, 2 to 9 percent slopes	>200	701.2	2.9%
HdC	Hanford gravelly sandy loam, 2 to 9 percent slopes	>200	490.6	2.1%
HkA	Hesperia fine sandy loam, 0 to 2 percent slopes	>200	356.0	1.5%
LaE	Las Posas loam, 9 to 30 percent slopes	>200	290.5	1.2%
LdF	Las Posas-Toomes rocky loams, 30 to 50 percent slopes	>200	3,054.2	12.8%
RcB	Ramona coarse sandy loam, 2 to 5 percent slopes	>200	37.1	0.2%
RcC	Ramona coarse sandy loam, 5 to 9 percent slopes	>200	42.0	0.2%
RcD	Ramona coarse sandy loam, 9 to 15 percent slopes	>200	27.2	0.1%
RdE2	Ramona sandy loam, 9 to 30 percent slopes, eroded	>200	909.2	3.8%
ReC	Ramona gravelly sandy loam, 2 to 9 percent slopes	>200	293.3	1.2%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
ReE	Ramona gravelly sandy loam, 9 to 30 percent slopes	>200	2,448.8	10.3%
Rg	Riverwash	>200	71.2	0.3%
Ro	Rosamond fine sandy loam	>200	84.9	0.4%
Rp	Rosamond loam	>200	106.9	0.4%
Rs	Rosamond loam, sandy loam substratum	>200	22.8	0.1%
RzF	Rough broken land	>200	0.6	0.0%
SoB	Soboba cobbly loamy sand, 2 to 5 percent slopes	>200	44.4	0.2%
TsF	Terrace escarpments	>200	175.2	0.7%
VbB	Vernalis loam, 2 to 5 percent slopes	>200	40.6	0.2%
VsD2	Vista coarse sandy loam, 9 to 15 percent slopes, eroded	>200	180.4	0.8%
VsE	Vista coarse sandy loam, 15 to 30 percent slopes	>200	23.2	0.1%
VsE2	Vista coarse sandy loam, 15 to 30 percent slopes, eroded	>200	54.2	0.2%
VsF	Vista coarse sandy loam, 30 to 50 percent slopes	>200	2,211.6	9.3%
VsF2	Vista coarse sandy loam, 30 to 50 percent slopes, eroded	>200	577.7	2.4%
W	Water	>200	221.2	0.9%
WgC	Wyman gravelly loam, 2 to 9 percent slopes	>200	504.9	2.1%
WgD	Wyman gravelly loam, 9 to 15 percent slopes	>200	148.9	0.6%
Subtotals for Soil Survey Area			20,089.2	84.5%
Totals for Area of Interest			23,772.6	100.0%

## Description

A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

This theme presents the depth to the user selected type of restrictive layer as described in for each map unit. If no restrictive layer is described in a map unit, it is represented by the "greater than 200" depth class.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

# **Rating Options**

Units of Measure: centimeters Restriction Kind: Lithic bedrock Aggregation Method: Dominant Component Component Percent Cutoff: None Specified Tie-break Rule: Lower Interpret Nulls as Zero: No





Appendix D: Cost Estimate

# Hazen Memorandum

July 6, 2021

To:Hazen Design TeamFrom:Chris Portner, PE, CEP

Re: City of Palmdale Ditch Conversion Feasibility Study

## 1. Introduction

This memorandum is a supplement to the cost estimate that corresponds to the Feasibility Study Estimate submitted to the client in July 2021. The project work is to be performed in Los Angeles County, California. This estimate is for replacement of an open canal with a buried pipeline.

The estimate serves for budget authorization and alternative analysis and is considered to be an AACE Class 5 level. Class 5 has a typical accuracy range of -50% on the low side and +100% on the high side. A 25% design contingency has been added to the estimate based on current status of the design documents, the nature of the project and the estimate classification.

## 2. Estimate Basis

Estimate costs are derived from the following:

1. Discussions with Design Team.

## 3. Planning Basis

Base Assumptions are the following

- 1. Construction NTP was assumed to be fourth quarter 2022.
- 2. Construction Duration was assumed to be 9 months.
- 3. The project is assumed to be procured as a single prime contract through a traditional design/bid/build process.

### 4. Cost Basis

- 1. Wage rates utilized are based on prevailing wages published for Los Angeles County current to June 30, 2021.
- 2. A 40-hour work week is assumed, no shift, weekend or other premium time is provided.
- 3. Wherever possible, equipment rates are based on current published rental rates as listed in the AED Blue Book, supplemented by RS Mean's data, the AED Green Book and local rental



suppliers.

- 4. Crews, equipment and productivity used for work items are based mostly on standards specific to each trade. Some information was supplemented by RS Mean's data modified where necessary by estimator judgment.
- 5. No vendor quotes were used for this estimate.

# 5. Itemized Estimate Notes

Note that the project is divided into segments for bidding purposes. The scope of each segment is similar. The scope for the entire run is provided below for simplicity.

#### 1. **Demolition**

- Clear and grub unlined portions of the reach (17-ft wide at top and 8-ft wide at bottom and 4.5-ft deep).
- Demolish existing concrete lined portions of the run (assume 17-ft wide at top and 8-ft wide at bottom x 4.5-ft deep).
- Demolish existing tunnel portions of the run (assume 6-ft wide x 5-ft deep).
- Demolish existing pipe portions of the run (assume 48-inch diameter).
   Include excavation to uncover pipe, assume 3-ft cover.
- Include rock excavation as required in each section. Where rock detected assume it extends the entire excavation depth.

#### 2. Buried Pipe

- Furnish/install 48-inch diameter RCP.
- Assume pipe to be placed on existing channel bed.
  - Include 2-ft overexcavation for pipe bedding.
  - Include backfill entire canal/tunnel/pipe section (see above for dimensions) with import fill.
- Include manholes every 500lf.

# 6. Below the Line Adders

The following adders were used:

Below the Line Adders		
Item	%	
General Conditions (Div01)	5	
Contractor Overhead	5	
Contractor Profit	8	
Escalation to mid-point of construction 3		
Insurance and Bonding 3		
Contingency	25	



These factors are generally in-line with recent estimated projects in this location and of this size and conform to the AACE Class of each scope.

# 7. Other Assumptions

Additional assumptions to the estimate include:

- 1. It is assumed that high groundwater will not impact excavations.
- 2. It is assumed that normal soils are present for excavation purposes and are suitable as backfill.
- 3. It is assumed that no hazardous materials are present.
- 4. It is assumed that no sensitive, protected or endangered species are present in the work area and no environmental mitigation or other measures will be required.

## 8. Exclusions

The following items are specifically excluded from the scope of this estimate:

- 1. Hazardous material abatement, removal or disposal.
- 2. Environmental mitigation.

# 9. Exceptions

None taken.

# **10. Risks and Opportunities**

Some risk items and opportunities need to be considered in the process of reviewing estimated costs. These are the following:

- 1. Whenever performing underground work, there is the risk that previously unmarked utilities, cultural artifacts or other unknown buried objects will be uncovered that will lead to delays and cost impacts to the project.
- 2. The current pandemic has affected supply chains for both materials and labor. A recent surge in demand has led to a dramatic increase in commodity prices. It is unclear how long this disruption will last or if costs will continue in the short term. Depending upon the time horizon of the project, the bidding environment may still be affected as a result of the pandemic which could affect the number and price of bids received.

# 11. Estimate Quality Assurance

Estimate review has been ongoing. No second party review has been undertaken.



# 12. Estimating Team

Oversight to the estimating team is provided by Hallie Thornburrow and Jack Adam, PE.

The principal or lead estimator is Chris Portner, P.E, CEP.

All estimate reviews have been internally reviewed by the Design and Estimating Teams.

# Appendix B: Property / Easement References

# FOOTHILL RANCH

# SPECIFIC PLAN

JUNE 2009

### FOOTHILL RANCH SPECIFIC PLAN

**JUNE 2009** 

# Originally Prepared by:

Crosby Mead Benton & Associates 6345 Balboa Blvd. Suite 140 Encino, California 91316 (818) 343~5384

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# SECTION ONE EXECUTIVE SUMMARY

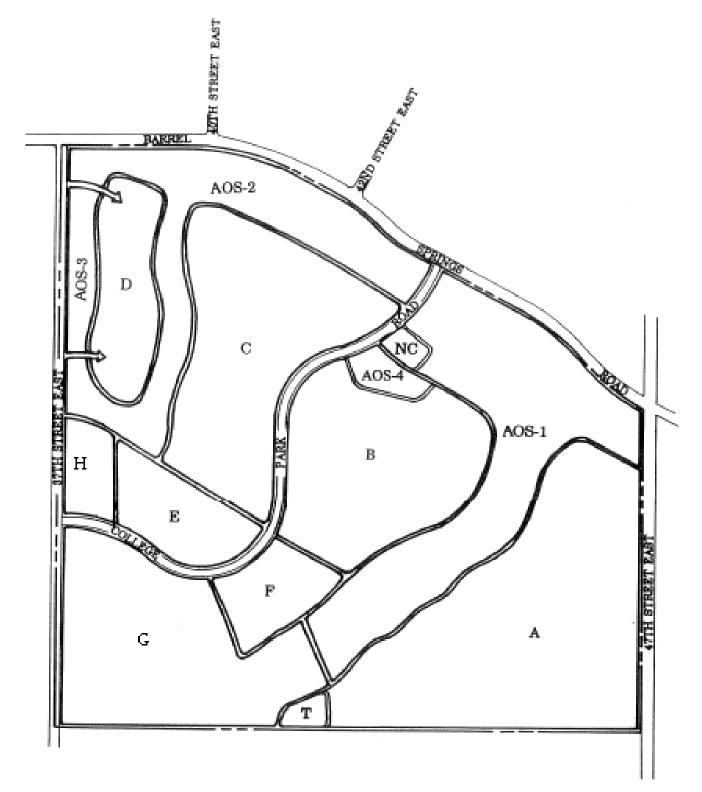
The Foothill Ranch Specific Plan (formerly known as the Bushnell Specific Development Area and the College Park Palmdale Specific Plan) establishes a framework of design concepts and regulatory programs for the development of approximately 540 acres located in the southern region of the City of Palmdale. The site is located south of Pearblossom Highway at the southeast corner of Barrel Springs Road and 47th Street East.

The Foothill Ranch Specific Plan sets forth a conceptual development program for the construction a mixed-use development incorporating residential, commercial, and open space uses within a planned community. The Plan is organized in six sections, as follows:

- SECTION ONE: EXECUTIVE SUMMARY This section provides an overview of the proposed Specific Plan and an abstract of the key elements of the plan's design and a land use summary.
- SECTION TWO: INTRODUCTION This section examines the City's General Plan requirements related to the subject property, evaluates existing physical characteristics, and establishes the goals for the future development of the site.
- SECTION THREE: DEVELOPMENT PLAN This section sets forth the conceptual plan for the provision of a residential neighborhoods, commercial services, recreation opportunities, architectural and landscape guidelines, and the public facilities and infrastructure necessary to support the Specific Plan.
- SECTION FOUR: GENERAL PLAN CONSISTENCY This section evaluates how the Specific Plan is consistent with goals of the City of Palmdale General Plan.
- SECTION FIVE: SITE DEVELOPMENT STANDARDS This section describes a set of design standards that will guide the development of the various uses proposed for the property. These standards contain zoning criteria as well as design guidelines related to trails, grading, streets, and energy conservation.
- SECTION SIX: PLAN IMPLEMENTATION This section establishes the regulatory structure under which the future development of the site shall proceed.

The Foothill Ranch Specific Plan is comprised of a mixed-use community with the following land use elements:

- •
- THE RESIDENTIAL ELEMENT This element provides for detached housing products with minimum lots sizes of one acre or more. Overall gross density for the site is one unit per acre with a total plan buildout not to exceed 380 dwelling units.
- THE OPEN SPACE AND AMENITIES ELEMENT This element provides over 150 acres of open space uses for the site. Open space uses include natural open space, trails, a five-acre neighborhood park site, and associated neighborhood commercial center.



# LAND USE SUMMARY

Component	Planning Area	Acreage	Target Units
Single-Family One Acre Minimum	A	108.0	108
Single-Family One Acre Minimum	B C	60.0 _71.1	60 71
Subtotal		131.1	131
Single-Family One Acre Minimum	D	23.4	23
Single-Family One Acre Minimum	E F	21.2 <u>17.3</u>	21 _17
Subtotal		38.5	38
Single-Family	G (was AVCC-1)	70	70
One Acre Minimum	H (was AVCC-2)	<u>10</u>	<u>10</u>
Subtotal		80	<u>80</u>
Subtotal		381.0	380

# Residential Element

# Amenities and Open Space Element

Component	Planning Area	Acreage	Comment
Open Space NC: 2 ac T: 2 ac Subtotal	AOS-1, AOS-2 AOS-3, AOS-4	<u>155.0</u> 159.0	Park site and associated commercial within these Planning Areas

Overall Site Density	Total Site Area
0.7 du/gross acres	540.0 acres

# SECTION TWO

#### 2.1 Purpose

The Foothill Ranch Specific Plan is a comprehensive planning document which sets forth detailed guidelines for the development of the subject property which are consistent with the goals of the City of Palmdale General Plan. These guidelines provide the blueprint for future development of the subject property. In addition, the Foothill Ranch Specific Plan also establishes developmental controls which will provide the City an assurance that development of the site will accurately reflect its objectives as set forth by approval of this document.

#### 2.2 Legal Authority

The California Government Code (Article 8, Sections 65450 through 65457) and the City of Palmdale Resolution No. 90-43 authorize the City of Palmdale to prepare, adopt and amend specific plans for those areas they deem necessary. Adoption of the Foothill Ranch Specific Plan by the City Council will establish this document as the governing standard for the development of the subject property. This document sets forth a development concept describing land uses and infrastructure systems as well as site development standards which will serve as the zoning provisions for the property. Implementation mechanisms are established to assure that build-out of the Plan area is consistent with the Foothill Ranch Specific Plan.

As outlined in Article 8 of the California Government Code, a Specific Plan shall include text and diagrams which discuss the following:

- The distribution, location, and extent of the uses of land, including open space, within the area covered by the plan.
- The proposed distribution, location, and extent and intensity of major components of public and private transportation, sewage, water, drainage, solid waste disposal, energy, and other essential facilities proposed to be located within the area covered by the plan and needed to support the land uses described in the plan.
- Standards and criteria by which development will proceed, and standards for the conservation, development, and utilization of natural resources, where applicable.

- A program of implementation measures including regulations, programs, public works projects, and financing measures necessary to carry out the above items.
- A statement of the relationship of the specific plan to the general plan.
- The fiscal impact of the proposed development including both public costs and public revenue.
- 2.3 Specific Plan Setting
  - 2.3.1 Specific Plan Location

The Foothill Ranch property (previously known as the Bushnell Property and College Park Palmdale) is that portion of Section 17, Township 5 North, Range 11 West, San Bernardino Meridian, south of Barrel Springs Road, as shown on EXHIBITS 1 and 2. The site encompasses approximately 540.6 acres and is bounded by the following:

- East boundary 47th Street East.
- South boundary southerly line of Section 17.
- West boundary 37th Street East.
- North boundary Barrel Springs Road.

The subject property was annexed into the City of Palmdale in 1999.

2.3.2 Community Setting/Development Trends

The Foothill Ranch property is a vacant parcel of land at the southerly limits of existing development of greater Palmdale. As of June 2009, the site is designated by the City of Palmdale General Plan as SP-17 (College Park Palmdale Specific Plan) with residential density of 1.6 units per acre and PF-S (Public Facility – School). The General Plan Circulation Map, as shown on EXHIBIT 3, also identifies three secondary arterial highways which serve the area: Barrel Springs Road, 47th Street East and 40th Street East. These secondary arterials connect to Pearblossom Highway, a major arterial as identified in the General Plan, connecting westerly to the Antelope Valley Freeway (State Highway 14) and easterly to State Highway 138. North of Pearblossom Highway, the three secondary arterials connect to or are upgraded to major highways providing circulation to Palmdale Boulevard.

Historically, development in this area began with an existing neighborhood known as the Southside area. The Southside neighborhood lies between the California Aqueduct and Pearblossom Highway. Lots within this area range in size from one to five acres.

A small group of lots was also created along the north side of Barrel Springs Road known as the Palmdale Estates. This neighborhood is located south of the California Aqueduct and is adjacent to the subject property. Access to these lots is provided by improved streets. Development is characterized by custom hillside homes on lots ranging in size from one to four acres

Development to the south and west of the property is sporadic in nature on lots averaging 2-3 acres in size.

North of the Southside neighborhoods, urban areas have expanded from Avenue S to Pearblossom Highway. This has occurred through the development of a number of large and moderately-sized subdivisions recorded in the 1980's with average densities of 4 to 5 dwelling units per acre. These subdivisions have expanded urban development to the northern boundary of the Southside area.

As the demands for increased growth and new housing continue, development trends indicate that additional growth will move to the south and west, beyond the Southside area to properties along Barrel Springs Road. This is demonstrated by several development proposals in the Barrel Springs corridor over the last twenty years. These proposals include the Ryder property (Vesting Tentative Tract 46391) which was approved by the City in 1990 but has since expires and the Seville property (Tentative Tract 46013) an active map located within unincorporated Los Angeles County.

The General Plan also recognizes the trend of development moving into the Barrel Springs corridor. In forecasting development trends up to the year 2000, the General Plan states:

"Residential development will continue to expand south into the Barrel Springs and Vincent Hills areas. The principal constraint to growth in these areas is lack of backbone infrastructure planning and construction. If development interests combine their resources to plan for locations and alignments of major facilities, this area will open up for development."

Given the property's location, access to existing arterial roadways, and planning of infrastructure, the development of the site is a logical progression of current and anticipated development patterns and growth trends in the area.

#### 2.3.3 General Plan Designation

At the time the Foothill Ranch Specific Plan was adopted, the property was not within the City of Palmdale's incorporation boundary, but was within the City's sphere of influence. The property was included in the Land Use Section of the City's General Plan, as adopted by the City Council on January 25, 1993.

The General Plan land use designation for the site was Special Development (SD) and the property was formerly known as the Bushnell Special Development Area. The General Plan states that "the Special Development (SD) designation is appropriate for areas which merit focused planning efforts to ensure orderly and logical development in accordance with General Plan policies. The SD designation is placed upon areas which, due to lack of infrastructure and public services, topography, environmental sensitivity, and development constraints, require comprehensive planning prior to development which goes beyond the level of detail normally associated with the General Plan. This planning could be accomplished through the Specific Plan process." The intent of the SD designation is to establish residential land uses, with a gross density of up to 2 dwelling units per gross acre. However, supportive neighborhood commercial uses are envisioned within the Special Development designation. Final residential densities and intensity of commercial uses are to be based upon the site's capacity to accommodate the development.

As originally adopted in January of 1993, the General Plan established site-specific policies for identified areas with the Special Development designation. Those site-specific policies for the Bushnell Special Development Area were subsequently amended by the City Council on January 7, 1997 (Resolution No. 97-002) when General Plan Amendment 94-1 was adopted, leading the way for the adoption of the Specific Plan.

As of June 2009, the General Plan sets forth the following site specific policies for the Foothill Ranch site:

Policy L7.1.9: Ensure that future development within the College Park Palmdale Specific Plan (formerly known as Bushnell Special Development Area) considers physical constraints on the property, including earthquake faults and canyon areas, and that densities are established which maintain consistency with the south side area in accordance with the following criteria:

- a. Clustering of residential units shall be used to ensure preservation of open space in steeper areas and within fault zones.
- b. Concurrent with tract recordation of Phase 3 (as determined by the approved Specific Plan), a covenant shall be recorded on land encompassing Hunt Canyon and along Barrel Springs Road as determined by the approved Specific Plan to ensure that these areas remain as open space. In addition, should these areas not be developed as a golf course in accordance with the College Park Palmdale Specific Plan and related Development Agreement, a system of hiking and equestrian trails, passive open space, and park improvements such as picnic and seating areas and open play areas shall be developed at the same schedule required of the golf course development.
- c. A trails system shall be provided which connects to a regional system to the extent feasible.
- d. All neighborhood commercial uses proposed as a part of the Specific Plan shall be limited to those serving only the short-term goods and service needs of the community college and nearby residential areas. No 24-hour uses or gas or service stations shall be permitted. Design of any commercial facilities shall be compatible with the overall community design theme.
- e. Design and operation of any commercial facilities shall reduce impacts on nearby residential areas to the extent

feasible through limiting hours of operation to no later than midnight, allowing light fixtures no higher than 14 feet to minimize glare, providing a minimum of 10% of the site for landscaping, and architecturally screening all equipment and utility devices. If rooftop equipment cannot be screened from adjacent or nearby properties, ground-mounted equipment shall be provided and screened. Design of any neighborhood commercial center shall be compatible with the overall community design theme of the College Park Palmdale Specific Plan.

- f. A Master Drainage Plan shall be provided utilizing natural open space and drainage areas to the maximum extent feasible. A master infrastructure plan shall be provided for the area, considering sewer, water, roads, and public services.
- g. Access to the Community College Campus shall be provided on 37th Street East and College Park Road. Driveway access to the neighborhood commercial site will be allowed from College Park Road or other appropriate internal street. The design of such access shall be subject to review and approval of the City Traffic Engineer and Planning Director at the time of development review. Primary access to Barrel Springs Road for the residential portions of the project shall be limited to one (1) access point, in addition to 37th Street East, except that additional residential access to Barrel Springs Road may be allowed as temporary or emergency access only where deemed necessary by the City Engineer. Parking will be prohibited along Barrel Springs Road.
- h. A minimum of one-acre (1) lots and/or open spaces shall be provided at the periphery of the non-college portion of the project area, to assure consistency with the surrounding rural area; specifically, this requirement applies to the street frontage on the south of Barrel Springs Road, west of 47<sup>th</sup> Street East, the east side of 37th Street East and north of the alignment of Avenue V.
- i. Subject to the availability of the necessary and appropriate State financing for construction of the campus and necessary infrastructure, an approximately eighty-acre site

will be set aside for the establishment of a community college land use. This site shall be located on the southwest corner of the site and shall take access from 37<sup>th</sup> Street East and College Park Road.

- j. Subject to the development of the Community College Campus described in criteria (i), the following shall apply:
  - The following residential densities may be allocated to and/or transferred to the residentially-designated portions of the project site for the purpose of determining a maximum unit count:

Residential acreage: two (2) du/ac College acreage: two (2) du/ac Golf acreage: one-half (.5) du/ac

With respect to the areas designated for Community College Campus and Golf Course/Open Space uses, the proposed dwelling units described above shall represent the entire residential development potential for those areas, and all dwelling units shall be transferred from those areas to the portion of the site designated for residential uses. No residential uses shall be permitted within the Community College Campus or Golf Course/Open Space portions of the project site.

- 2) Minimum lot sizes for the interior portion of the residentially-designated areas of the project may be less than 7,000 square feet in area, provided that all other design policies on the project are met, but shall in no instance be less than 5,000 square feet in area.
- k. Residential density may not exceed three (3) dwelling units per acre (gross) within residentially-designated land within the Alquist-Priolo Fault Zone; this policy specifically excludes golf course property, parks and open space, neighborhood commercial and college property from the calculation of gross densities.
- A General Plan Amendment (GPA 09-03) application is being processed

concurrently with a Specific Plan Amendment (SPA 09-01). The General Plan Amendment proposes amending Policy L.7.1.9. by renaming the Specific Plan from College Park Palmdale to Foothill Ranch, eliminating the Community College Campus and academic academy from the Plan and allowing this area to be designated for residential uses, eliminating the golf course and utilizing this area as open space with trails, amending the residential density to 0.7 dwelling units per acre, amending the minimum lot size requirement to not less than one acre and amending all references from College Park Palmdale to Foothill Ranch; as provided below. Additionally, the Community College Campus site, currently designated PF – S (Public Facility – School) on the General Plan Land Use Map, would be amended to show as SP-17 (Foothill Ranch)

**Policy L7.1.9:** Ensure that future development within the Foothill Ranch Specific Plan (formerly the Bushnell Special Development Area and the College Park Palmdale Specific Plan) considers physical constraints on the property, including earthquake faults and canyon areas, and that densities are established which maintain consistency with the south side area in accordance with the following criteria:

- 1. A covenant shall be recorded on land encompassing Hunt Canyon and along Barrel Springs Road as determined by the approved Specific Plan to ensure that these areas remain as open space. A system of hiking trails, passive open space, and park improvements such as picnic and seating areas and open play areas shall be developed at the same schedule required of within Appendix D of the Foothill Ranch Specific Plan.
- 2. A trails system shall be provided which connects to a regional system to the extent feasible.
- 3. All neighborhood commercial uses proposed as a part of the Specific Plan shall be limited to those serving only the shortterm goods and services needs of the nearby residential areas. No 24-hour uses or gas or service stations shall be permitted. Design of any commercial facilities shall be compatible with the overall community design theme.
- 4. Design and operation of any commercial facilities shall reduce impacts on nearby residential areas to the extent feasible through limiting hours of operation to no later than

midnight, allowing light fixtures no higher than 14 feet to minimize glare, providing a minimum of 10% of the site for landscaping, and architecturally screening all equipment and utility devices. If rooftop equipment cannot be screened from adjacent or nearby properties, ground-mounted equipment shall be provided and screened. Design of any neighborhood commercial center shall be compatible with the overall community design theme of the Foothill Ranch Specific Plan.

- 5. A Master Drainage Plan shall be provided utilizing natural open space and drainage areas to the maximum extent feasible.
- 6. A master infrastructure plan shall be provided for the area, considering sewer, water, roads, and public services. All lots must be connected to a public sanitary sewer system, no septic tanks are permitted.
- 7. Driveway access to the neighborhood commercial site will be allowed from Foothill Ranch Road or other appropriate internal street. The design of such access shall be subject to review and approval of the City Traffic Engineer and Planning Director at the time of development review. Primary access to Barrel Springs Road for the residential portions of the site shall be limited to one (1) access point, in addition to 37<sup>th</sup> Street East, except that additional residential access to Barrel Springs Road may be allowed as temporary or emergency access only where deemed necessary by the City Engineer. Parking will be prohibited along Barrel Spring Road.
- 8. A minimum of one-acre (1) residential lots shall be provided to assure consistency with the surrounding rural area.
- No residential density shall be calculated for any seismic set back zone adjacent to active or potentially active fault traces where construction of habitable structures are not permitted, as delineated by a site-specific geotechnical report. However, seismic set back zones may be included in the calculation of minimum lot area and building setbacks.
- 10. No residential uses shall be permitted within the Open Space

or commercial portions of the site.

#### 2.3.4 Existing Land Use

The Foothill Ranch site is undeveloped, vacant land. There are no structures on the site. The only existing surface feature is the Palmdale Ditch which traverses the northern portion of the property.

The existing land uses surrounding the site, as shown on EXHIBITS 5 and 6 are described as follows:

- East These properties are vacant and range in size from 5 to 40 acre parcels. The Antelope Valley Areawide General Plan as prepared by Los Angeles County designates these properties Non-Urban 1 (N-1), with densities at one dwelling unit per two gross acres. The Palmdale General Plan designates these properties Low Density Residential (LDR), with densities at one dwelling unit per gross acre.
- South A few scattered houses currently exist to the south of the subject property. These houses are located on 1 to 5 acre parcels with vehicular access provided by unimproved roads. The Antelope Valley Areawide General Plan as prepared by Los Angeles County designates these properties Non-Urban 1 (N-1), with densities at one dwelling unit per two gross acres. The Palmdale General Plan designates these properties Low Density Residential (LDR), with densities at one dwelling unit per gross acre.
- West To the west of the site are fractionalized ownerships varying from 5 to 40 acres. These properties are vacant with the exception of an existing house on a 2.5 acre parcel along the southerly boundary. The Antelope Valley Areawide General Plan as prepared by Los Angeles County designates these properties Non-Urban 1 (N-1), with densities at one dwelling unit per two gross acres. The Palmdale General Plan designates these properties Low Density Residential (LDR), with densities at one dwelling unit per gross acre.

Approximately one-half mile west of the subject property is Tract 46391, Desert Mountain Estates. This tract was annexed by the City of Palmdale and was approved in 1990 with 369 units. This approval expired in 1993 and there are no current approvals of the

site. The Palmdale General Plan designates Desert Mountain Estates as Single Family (SFR-1), with densities at two dwelling units per gross acre.

• North - Immediately north of the site is the Palmdale Estates development which has an average lot size of one acre. This development is located between Barrel Springs Road and the California Aqueduct. Northerly of the aqueduct lies a neighborhood known as the Southside area. This area is also characterized by one acre lots. The Southside area is generally bounded by Cheseboro Road on the east, 32nd Street East on the west, Barrel Springs Road on the south and Pearblossom Highway on the north. The Antelope Valley Areawide General Plan as prepared by Los Angeles County designates these properties Non-Urban 1 (N-1), with densities at one dwelling unit per two gross acres and Non-Urban 2 (N-2), with densities at one dwelling unit per gross acre. This area is designated by the City of Palmdale General Plan as Low Density Residential (LDR), with densities at one dwelling unit per gross acre.

Properties northerly of Pearblossom Highway, within the current limits of the City of Palmdale, are characterized by urban densities and are designated Single Family (SFR-3), with densities at 3.1 to 6 dwelling units per gross acre.

2.3.5 Existing Zoning

As of June, 2009, the site is zoned SP (College Park Palmdale Specific Plan) and PF (Public Facility). A Zone Change is proposed to amend the Zoning Map to remove the PF (Public Facility) zone and rename the site SP (Foothill Ranch Specific Plan).

The existing zoning surrounding the site, as shown on EXHIBIT 7, is described as follows:

- East Los Angeles County zoning Heavy Agriculture (A-2-1).
- South Los Angeles County zoning Heavy Agriculture (A-2-1).
- West Adjacent to the subject site is zoned Los Angeles County Heavy Agriculture (A-2-1). The Desert Mountain Estates property is zoned by the City of Palmdale as -R-1-1 (Single Family

Residential, 1 acre minimum lot size)

• North - The Palmdale Estates development, adjacent to the site, is zoned by Los Angeles County as Light Agriculture (A-1-1).

#### 2.3.6 Environmental Documentation

The City of Palmdale's code mandates the preparation and submittal of an environmental questionnaire/initial study to determine the scope of a comprehensive Environmental Impact Report (EIR).

At public hearings before the City Council in December 1996 and January 1997, an EIR was certified for the then-proposed College Park Palmdale Specific Plan. That Specific Plan and associated EIR identified 898 single-family dwelling units with the Community College Campus and neighborhood commercial located along 47th Street East. A Specific Plan Amendment approved in June, 1999 identified a reduction in single-family dwelling units to 837 and relocated the Community College Campus and neighborhood commercial to other portions of the site. In conjunction with the Specific Plan Amendment, a Supplement to the certified EIR was prepared to evaluate the proposed changes to the Specific Plan. This Supplement was certified June 9, 1999. In February 2000, the City Council clarified that the residential components of the College Park Palmdale Specific Plan consisted of a maximum of 847 units.

The current Specific Plan Amendment proposes a further reduction in single-family units from 847 to approximately 380 with a minimum lot size of one acre, the elimination of the Community College Campus, academic academy and golf course and that the Development Plan (Exhibit 14) be amended to allow for residential density within the 80 acres of the old campus area.

The College Park Palmdale Final Environmental Impact Report was certified by the Palmdale City Council (Resolution No. CC 96-103) on August 12, 1996. The project consisted of the development of a 100-acre community college, 18 estate homes, 719 single-family homes, 343 clustered housing units, a 8.3 acre neighborhood commercial facility, a 183.6-acre golf course and 12.3 acres of neighborhood parks.

The College Park Palmdale Supplemental Final Environmental Impact Report was certified by the Palmdale City Council (Resolution No. CC 1999-081) on June 9, 1999. The Supplemental FEIR was prepared to analyze the potential impacts from the development of a community college, 134 estate homes, 713 single-family homes, a 20,000 square foot neighborhood commercial facility, a 150-acre golf course and a neighborhood park.

These two documents, the College Park Palmdale Final Environmental Impact Report and College Park Palmdale Supplemental Final Environmental Impact Report now serve as the master environmental document for development of the site.

In compliance with the provisions of Section 6.4 of the Specific Plan and the EQA Guidelines, an Addendum to the College Park Palmdale Supplemental Final Environmental Impact Report has been prepared for the proposed Specific Plan Amendment (09-01)

All subsequent submittals, such as tentative tract maps, shall be evaluated by the City to determine potential environmental impacts associated with the site specific project. For a negative declaration, finding of consistency or mitigated negative declaration, such proposed development standards must be consistent with the intent, density, use and development standards of the Foothill Ranch Specific Plan and the findings of the Master EIR. Otherwise, a focused EIR, EIR addendum or supplemental EIR will be required. A focused EIR, EIR addendum or supplemental EIR may also be required if conditions change as defined under CEQA.

#### 2.3.7 Relationship to the General Plan

This Specific Plan provides a site specific program of regulations, standards, and guidelines for the implementation of the General Plan Update's goals, objectives and policies. The Specific Plan must be in conformance with the General Plan in order to meet this purpose. A detailed analysis of conformance to applicable provisions of the General Plan is provided in Section 4.0 of this document.

#### 2.3.8 Relationship Between The Specific Plan & Zoning Ordinance

Development standards set forth in Section 5.0 of this document are intended to act as zoning standards for the Foothill Ranch Specific Plan. These standards are based upon the City of Palmdale's Zoning Ordinance, however, may deviate slightly from the zoning ordinance to allow for site specific criteria. 2.3.9 Physical Characteristics

The Foothill Ranch property contains a variety of physical features and natural resources. These environmental features have influenced and set a framework for the design of the plan set forth in the Specific Plan. The following sections provide an analysis of these features.

#### 2.3.9.1 Natural Terrain

The onsite topography can be characterized as having four distinct areas, as shown on EXHIBIT 8:

- Region 1 This region encompasses the extreme northern portion of the site parallel to Barrel Springs Road. This region consists of relatively flat terrain associated with and parallel to the San Andreas Fault. The average elevation for this area varies from 3,060 near the easterly boundary to 3,030 near 40th Street East.
- Region 2 This region consists of Hunt Canyon. This canyon is a flat bottom arroyo with a meandering flow line and moderately steep side slopes. The bottom area varies in width from 400 feet to 800 feet. This canyon ranges from 3,220 at the southerly site boundary to 3,060 at the northeast corner. This arroyo has a contributory drainage area of approximately 2,125 acres that extends southerly into the Angeles National Forest.
- Region 3 This region can be described as a flat plain that sits above Regions 1 and 2. This "plain" consists of older and younger alluvial fan surfaces. These alluvial fans have relatively uniform topography with occasional defined drainage courses which direct drain off to the north. The highest point in this region is located near the southwest corner and has an elevation of 3,270. The site then falls at a relatively constant rate to an elevation of 3,045 near the northern boundary.
- Region 4 This region can be described as a plateau

area east of Hunt Canyon. This region constitutes approximately 100 acres of the subject site and has a unique terrain of its own. This plateau has a saddle form to its topography with higher elevations to the north and south, 3,170 feet and 3,220 feet, respectively. The central portion of the plateau is therefore hidden from view when the site is viewed from the north.

The terrain surrounding the site is described as follows:

- East This area consists of north-facing, rolling terrain that gently slopes towards Barrel Springs Road and is traversed by the Palmdale Ditch.
- South This area consists of north facing terrain that is traversed by Hunt Canyon and other contributory drainage areas.
- West This area consists of a north facing plain with uniform topography gently sloping north to Barrel Springs Road.
- North This area rises in elevation north of Barrel Springs Road to an existing ridge with average elevations of 3,100 feet. This ridge creates a natural barrier between the site and the valley floor. Northerly of the ridge, the terrain drops in elevation into the valley floor.

#### 2.3.9.2 Geology

The Foothill Ranch site is situated between the Western Transverse Ranges (San Gabriel Mountains) and the Western Mojave Desert Geomorphic Provinces. The contact between the Western Ranges and the Western Mojave Desert is defined by the San Andreas Fault, which generally parallels the northern property line of the site.

A majority of the site is within the northern foothills of the San Gabriel Mountains. This area contains Miocene to Holocene age deposits that have been eroded from the mountains and deposited into the Mojave Desert "basin".

The topography of the northern foothills is characterized by a series of connecting Quaternary age alluvial fans that have been eroded to varying degrees by modern drainage channels flowing north from the foothills into the Mojave Desert.

Surface deposits, as shown on EXHIBIT 10, are comprised of Older Fan Deposits with Holocene age alluvium within the arroyos and lower reaches of drainage channels. These deposits are underlain by, in descending order of age, Boulder Gravels of Little Rock Creek (well-rounded boulders in a sandy clay matrix), Juniper Hills Formation (a range of silty sandstone to pebbly conglomerate), Ritter Formation (sandstone and conglomerate) and Granitic and Quartz Diorite rocks. These deposits are exposed by varying degrees of erosion.

Soils conditions are suitable for intended development and should react favorably to standard engineering practices.

#### 2.3.9.3 Seismic Analysis

A majority of the Foothill Ranch site is within the Alquist-Priolo Special Studies Zone (APZ). The APZ requires special subsurface trenching and analysis to determine the existence of active faults (by definition, active within the last 11,000 years). In addition, the APZ determines appropriate setbacks to preclude the location of critical structures and structures designed for human habitation from being constructed across active fault traces.

The property owner, in keeping with the APZ requirements, has performed extensive analysis on the subject site. This analysis is based upon the excavation and review of 11,018 lineal feet (2.08 miles) of trenching. Trenching patterns were designed to overlap and traverse all areas of suspected faulting. Trenching, field inspection and geotechnical analysis were all reviewed by the City's Engineering Department. As a result, the trenching program has provided precise and accurate locations for active faulting which affects the site.

The major seismic feature is the San Andreas Fault, which generally parallels the northern property boundary and represents a major structural feature separating the North American Plate to the east from the Pacific Plate to the west. For the San Andreas, two distinct setback zones were analyzed: structural setback zone and restricted use setback zone.

Zones delineated as structural setback zones are intended to restrict structures for human habitation, occupation and/or critical support facilities. Private yard improvements are acceptable within this zone provided improvements are not attached to habitable structures outside of the setback. Further, improvements should not be designed to accommodate human occupation beyond 2,000 person hours per year.

Restricted use zones are intended to act as an additional buffer between the structural setback zone for the San Andreas fault and proposed development. No evidence, however, of active faulting was found within trenched areas in this zone. The restricted use zone is suitable for roadways, private yards and related private yard improvements. Human habitable structures are not recommended for this zone.

The structural setback, as shown on EXHIBIT 11, for the San Andreas fault is 400 feet wide, measured southerly from the main trace of the fault. Further, an additional restricted use setback is designated 100 feet south of the structural setback. This added setback is an additional safety factor, but does not preclude all construction of structures.

Positioned within the San Andreas setback zones is Fault B. Since this fault is within the structural setback zone for the San Andreas, it will require no additional setbacks.

Outside of the San Andreas setback zones, four other faults requiring setback determination were identified and accurately located. These faults include Faults E, F, G and H

(the Nadeau Fault). The following setbacks, as shown on EXHIBIT 11, have been determined by the results of the Alquist-Priolo Study:

- A 100-foot structural setback zone is designated for Faults E and F. This zone consists of a 50-foot setback measured from each side of the centerline of the fault.
- An 85-foot structural setback zone is designated for Fault G. This zone includes a 35-foot setback from the north side of the fault and a 50-foot setback from the south side of the fault.
- An 85-foot structural setback zone is designated for Fault H (the Nadeau Fault). This zone includes a 35foot setback from the north side of the fault and a 50foot setback from the south side of the fault.

Based on the of the Alquist-Priolo Fault study, the City of Palmdale's Engineering Department has determined that the development of the site is geotechnically feasible. The Alquist-Priolo Fault study was approved by the City's engineering geologist on June 19, 1991.

### 2.3.9.4 Vegetation

The site is predominately covered by upland drought tolerant species, such as mormon tea, creosote bush and juniper. In addition, the subject property has a limited number of isolated Joshua trees scattered throughout the site.

A group of willows, cottonwoods and related plant types have been identified in the lowlands area adjoining Barrel Springs Road. This plant life is not native to the area and is the result of water leaking from breaks in the Palmdale Ditch as it traverses the property. The Palmdale Ditch was constructed around the turn of the century to convey water from Little Rock Creek Reservoir to Lake Palmdale. However, it has fallen into disrepair in recent years. Repair of this portion of the Palmdale Ditch could seriously affect the continued survival of this vegetation.

2.3.9.5 Existing Drainage Patterns

The Foothill Ranch site is traversed by three major drainage areas, as shown on EXHIBIT 12:

• Hunt Canyon Drainage Area - Hunt Canyon is the major drainage component of the site. This arroyo enters the site at the central portion of the southern property boundary and drains northerly to the northeastern portion of the property. This canyon is a flat bottom arroyo with a meandering flow line and moderately steep side slopes. The bottom area varies in width from 400 feet to 800 feet. Hunt Canyon has a tributary area of approximately 2,125 acres before entering the site. This tributary area extends south to Mt. Emma in the Angeles National Forest.

Once flows from Hunt Canyon exit the site, they drain easterly along Barrel Springs Road and then northerly across the Cheseboro Siphon of the California Aqueduct and eventually to the proposed Hunt Canyon Retention Basin along 57th Street East. This basin is part of the Los Angeles County's Master Plan of Drainage Facilities.

- Westerly Drainage Area This drainage area contains the westerly portion of the site with an offsite drainage area of 6 acres. This portion of the site is traversed by several small arroyos and swales that eventually drain to the remaining portions of the Palmdale Ditch that parallels Barrel Springs Road or to a swale that also parallels Barrel Springs Road. Storm water in the Palmdale Ditch and drainage swale cross Barrel Springs Road in separate culverts. The drainage, along with the water in the Palmdale Ditch, flows towards a crossing of the California Aqueduct directly north of the site.
- Southeast Drainage Area This drainage area is a

250-foot wide arroyo that crosses the extreme southeast corner of the site, with a tributary offsite area of approximately 320 acres. Drainage from this area flows towards the northeast over properties east of the subject site and is eventually collected by either the Palmdale Ditch or is combined with drainage from Hunt Canyon along Barrel Springs Road.

#### 2.3.9.6 Views

Foothill Ranch has distinct local and distant views. Local views from the property are as follows:

- East Local views to the east consist of undeveloped areas with native desert vegetation. The density of vegetation is generally greater east of 47th Street East than on the subject property. No structures are visible.
- South Local views to the south consist of a few scattered houses built on large ownerships. These houses lie in the transitional foothills leading to the Angeles National Forest. Vegetation is similar to that found on the subject property.
- West Local views to the west consist largely of vacant property with desert vegetation. One residence exists along the southwesterly corner of the property. Vegetation is similar to that found on the subject property.
- North Local views to the north consist of existing houses located southerly of Barrel Springs Road and easterly of 42nd Street East within the Palmdale Estates development. These houses are located on one acre minimum lots and have been built by individual owners. No consistent architectural treatments or community landscape features are present. West of 42nd Street East is an undeveloped foreground ridge that rises to an average elevation of 3,100 feet. Vegetation on the undeveloped properties is similar to that found on the subject property, while

vegetation surrounding individual homes is dominated by non-native plant species.

Distant views from the property are as follows:

- East Distant views to the east consist of undeveloped areas of the lower foothills of the San Gabriel Mountains.
- South Distant views to the south consist of the Mount Emma Range and the San Gabriel Mountains. Elevations in the Mount Emma Range average 5,000 feet.
- West Distant views to the west consist of undeveloped areas backdropped by the Ana Verde Hills and the Sierra Pelona. Elevations in the Sierra Pelona Range average 5,000 feet.
- North Distant views to the north consist of outlying vistas of the City of Palmdale and the City of Lancaster. Due to the local foreground ridge described above (Local Views), views of the city are restricted generally from Avenue S north. These views consist of urban neighborhoods and commercial districts in the City of Palmdale with elevations ranging from 2,680 feet to 2,580 feet. Further north, views are dominated by large aerospace facilities and the urban neighborhoods of Lancaster.

#### 2.3.9.7 Existing Circulation

Access to the site from the Greater Los Angeles Basin is provided via Antelope Valley Freeway, Sierra Highway and Pearblossom Highway to Barrel Springs Road. Access from the Antelope Valley is provided by the Antelope Valley Freeway and Palmdale Boulevard to either 25th Street East, 40th Street East or 47th Street East. Access from the east is along Pearblossom Highway to 47th Street East as shown on EXHIBIT 3. The following represents the major roads and arterials which surround the site:

• Barrel Springs Road - This street currently exists as a two-lane paved secondary arterial. The Circulation Element of the General Plan classifies this road for ultimate construction as a four-lane secondary arterial.

Barrel Springs Road connects to 25th Street East northerly of Pearblossom Highway. This street currently exists as a two-lane paved roadway for most of its length with the exception of a segment between Avenue S and 4,200 feet south of Avenue S where it exists as a four-lane road. 25th Street East is classified as a major arterial north of Avenue S and as a secondary arterial to the south where it intersects with Barrel Springs Road.

- 40th Street East This roadway is classified as a secondary arterial south of Pearblossom Highway with ultimate improvement projected at four lanes. This road currently exists as a two-lane paved street.
- 47th Street East This roadway is classified as a secondary arterial south of Pearblossom Highway with ultimate improvement projected at four lanes.
   47th Street East currently exists as a two-lane paved road over most of its length, except for the segment between Palmdale Boulevard and Fort Tejon Road, where it exists with four lanes.
- 37th Street East The design for the site proposes utilizing 37th Street East which currently exists as a dirt road. 37th Street East is not analyzed by the General Plan, but will be utilized as a collector for the Plan area.

## 2.3.9.8 Encumbrances

The subject site is encumbered by several easements, as shown on EXHIBIT 13 and are listed as follows:

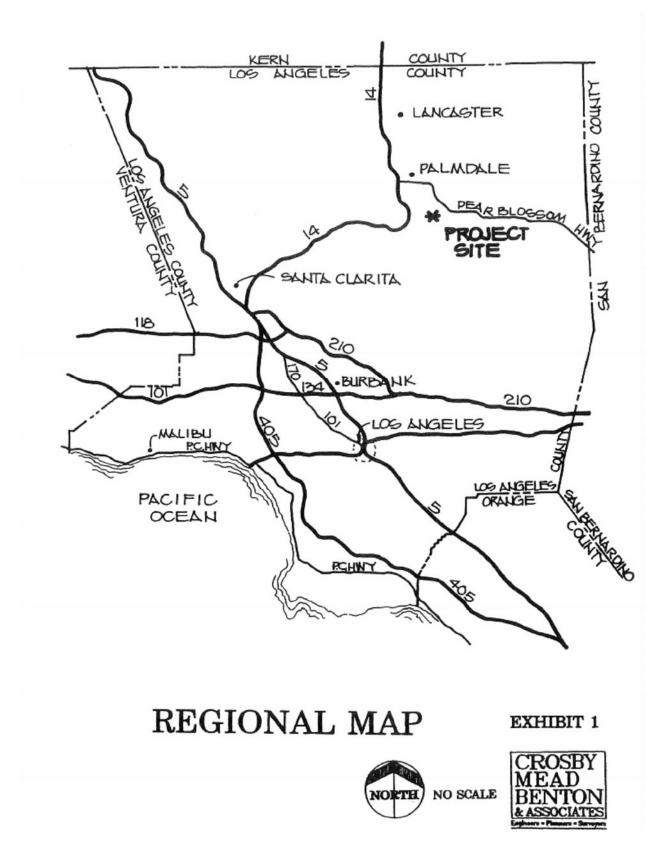
- a. There are four easements that pertain to the Palmdale Ditch, paralleling Barrel Springs Road along the northern property boundary. Two are granted to the Palmdale Water Company and the other two to the Palmdale Irrigation District. The Palmdale Water Company's easements are for ditch and pole line purposes. The Palmdale Irrigation District's easements are for conduits, pipe line, pole line, canal, and structural purposes.
- b. A 10-foot wide easement for underground conduits to Pacific Telephone and Telegraph Company parallels the south and west boundary.
- c. A 100-foot wide roadway easement (Barrel Springs Road) parallels the northern boundary of the subject property.
- d. An easement for pole lines to Southern California Edison parallels the western boundary. The deed states that no poles are to be erected on the grantors property, however crossbars or guys may affect this area.

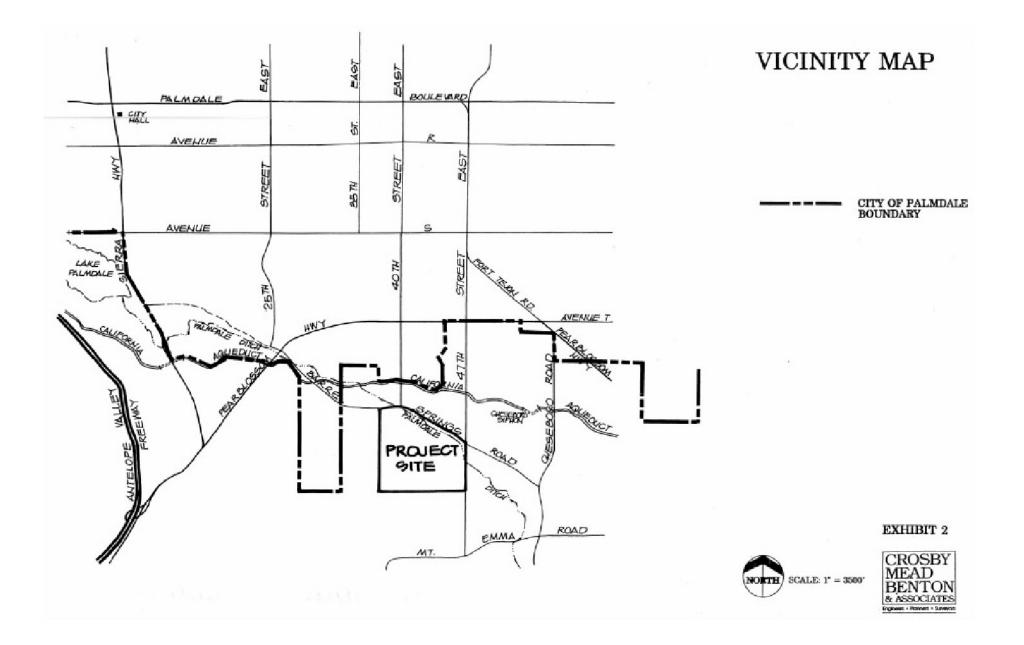
## 2.4 SPECIFIC PLAN GOALS

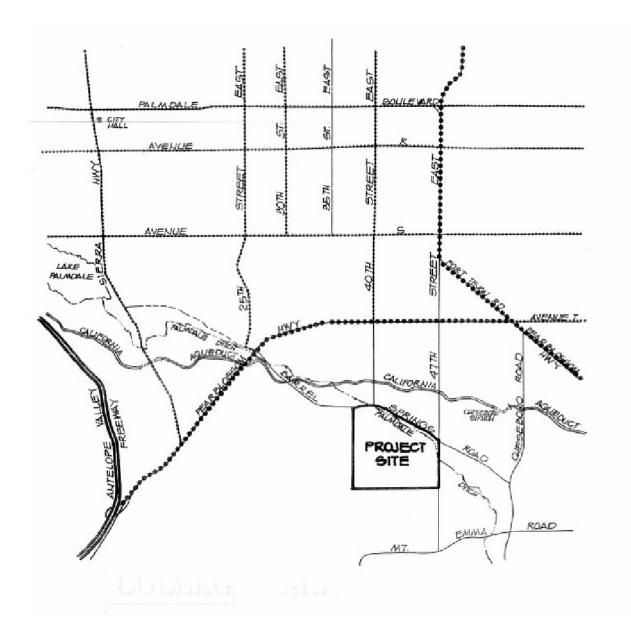
The following goals have been set forth to guide the development of the Foothill Ranch property:

- Establish a sense of a planned community through the provision of open space, a well-designed circulation system, cohesive architectural design, and appropriate landscaping.
- Provide a diversity of housing types to meet various market demands.
- In the design of the Plan area, mitigate threats to life, health, and property resulting from natural hazards.
- Establish a common set of architectural standards to promote an integrated and aesthetically pleasing development.

- Designate a site for neighborhood commercial use which is well-related to the Specific Plan land uses and the surrounding community.
- Develop a circulation system that provides emergency access.
- Integrate a pedestrian system to provide circulation within the Plan area and connection with the regional system.
- Integrate drainage improvements within open space areas to promote joint use of these areas.
- Establish procedures for the administration of this specific plan while allowing sufficient design flexibility to meet changing market demands







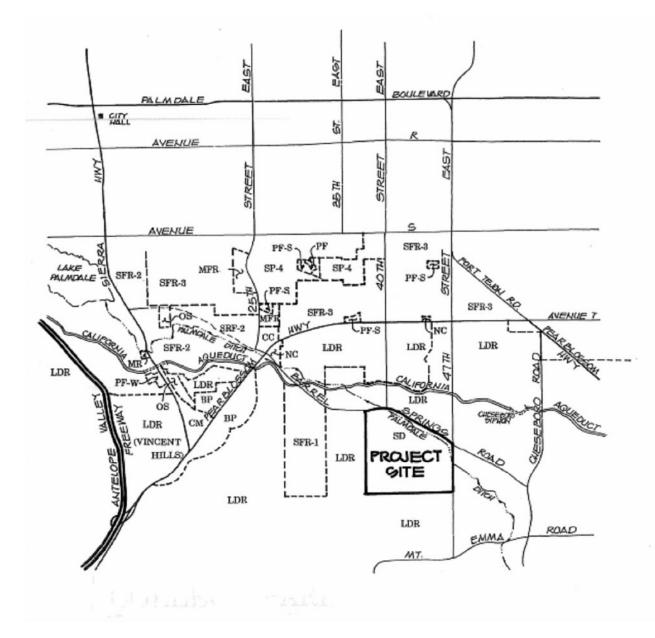
# CITY OF PALMDALE REGIONAL CIRCULATION PLAN FREEWAY REGIONAL ARTERIAL MAJOR ARTERIAL SECONDARY ARTERIAL

FUTURE SECONDARY ARTERIAL

EXHIBIT 3





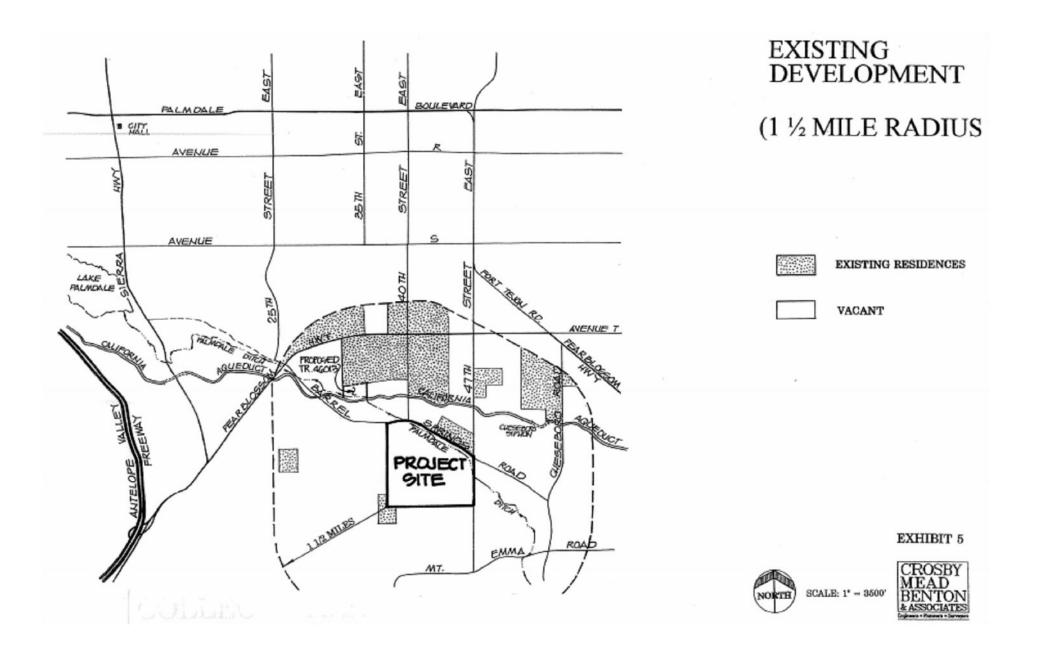


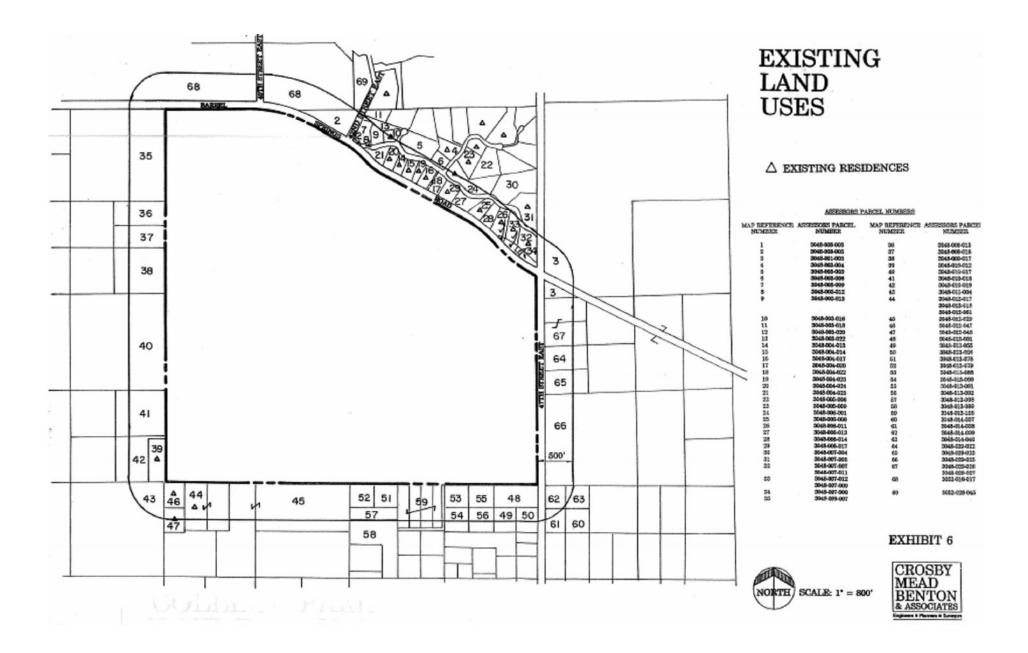
# CITY OF PALMDALE GENERAL PLAN DESIGNATIONS

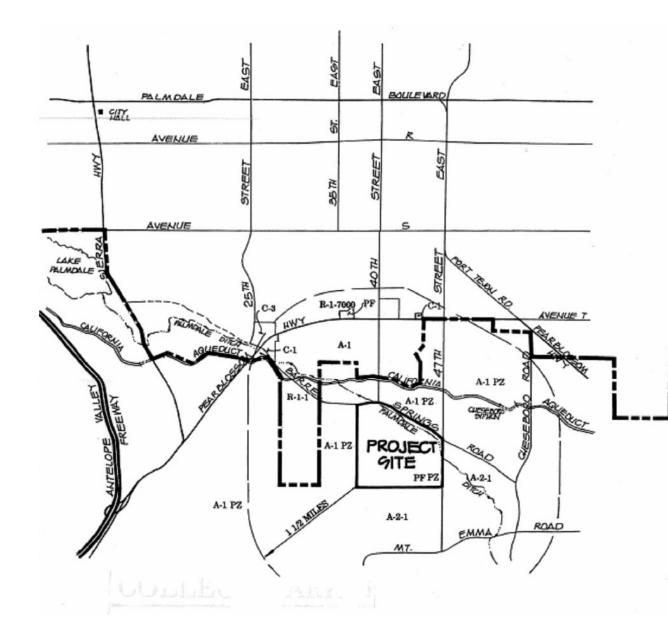
EXHIBIT 4



CROSBY MEAD BENTON & ASSOCIATES







# EXISTING ZONING

#### CITY OF PALMDALE BOUNDARY

#### CITY OF PALMDALE

- A-1 LIGHT AGRICULTURE
- A-2 HEAVY AGRICULTURE
- R-1-7000 SINGLE FAMILY RESIDENTIAL 7000 SQ. FT. MIN. LOT SIZE
- R-1-1 SINGLE FAMILY RESIDENTIAL
- C-1 LIGHT COMMERCIAL

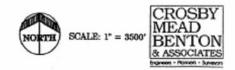
C-3 GENERAL COMMERCIAL

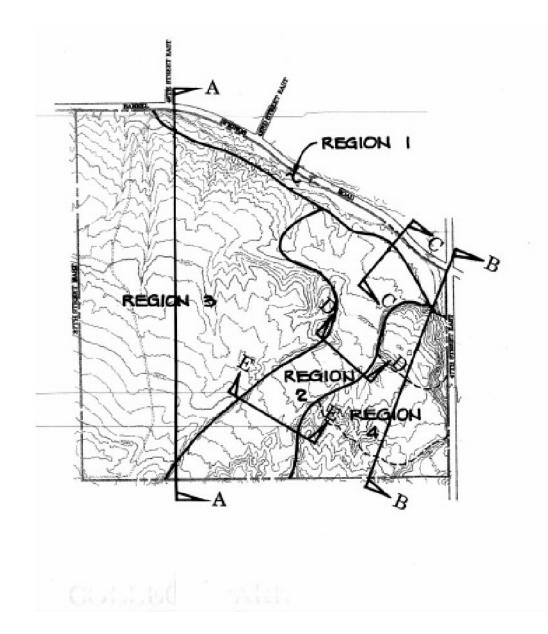
#### COUNTY OF LOS ANGELES

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A-1-1 - LIGHT AGRICULTURE A-2-1 - HEAVY AGRICULTURE R-1-20,000 - SINGLE FAMILY RESIDENTIAL 20,000 SQ. FT. MIN. LOT SIZE

EXHIBIT 7



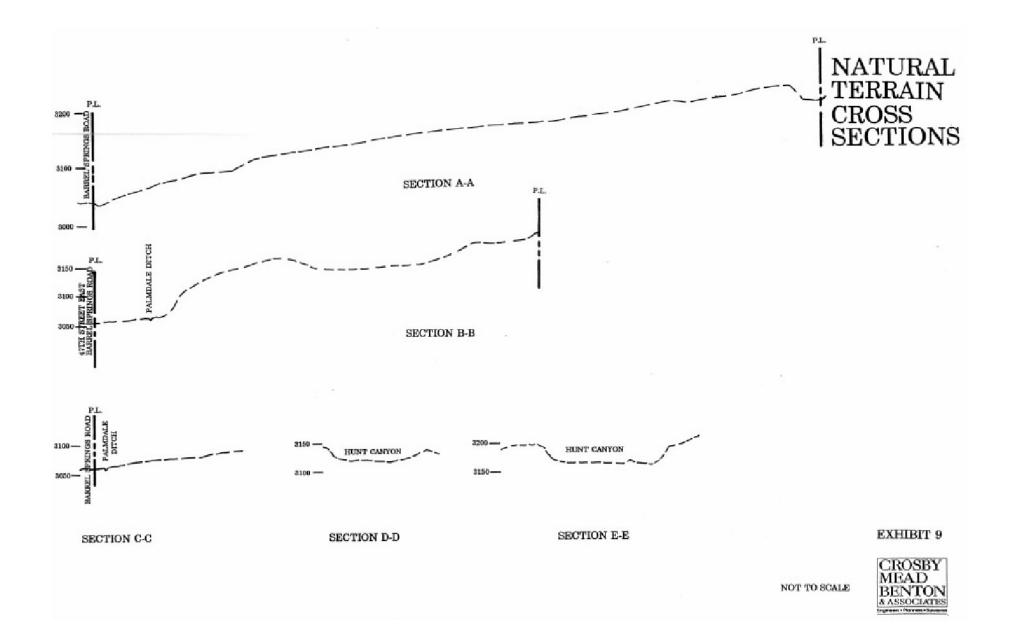


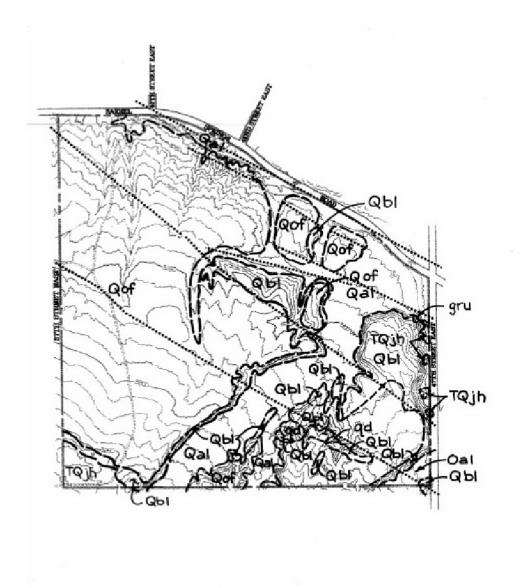


NOTE. CONTOUR INTERVAL IS 10 FEET

EXHIBIT 8







# GEOLOGY

----- FAULT

SURFACIAL UNITS

Qal - ALLUVIUM

Qof - OLDER FAN DEPOSITS

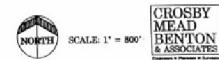
Qbl - BOULDER GRAVELS

#### BEDROCK UNITS

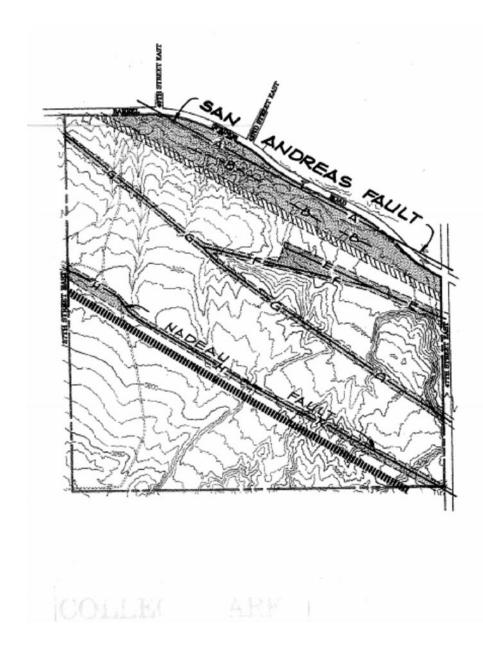
TQH - JUNIPER FORMATION qd - QUATRZ DIORITE gru - GRANITE ROCK

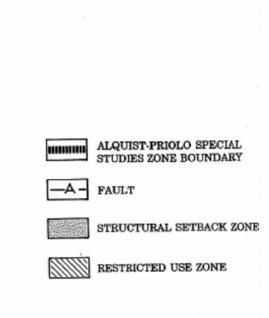
SOURCE: PACIFIC SOILS INC.

EXHIBIT 10



& ASSOCIATES

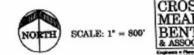




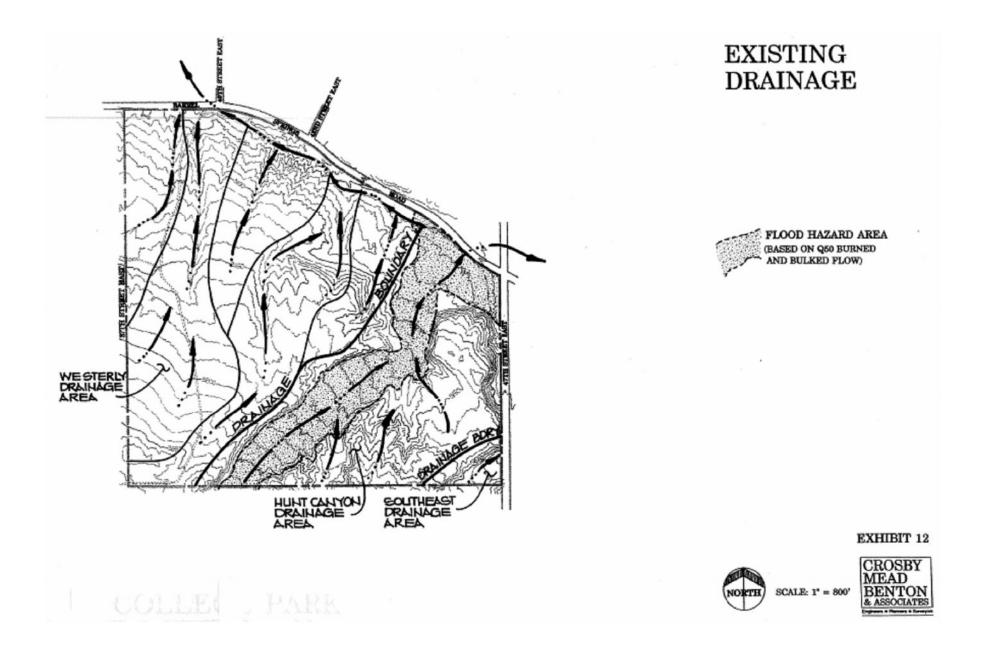
SEISMIC

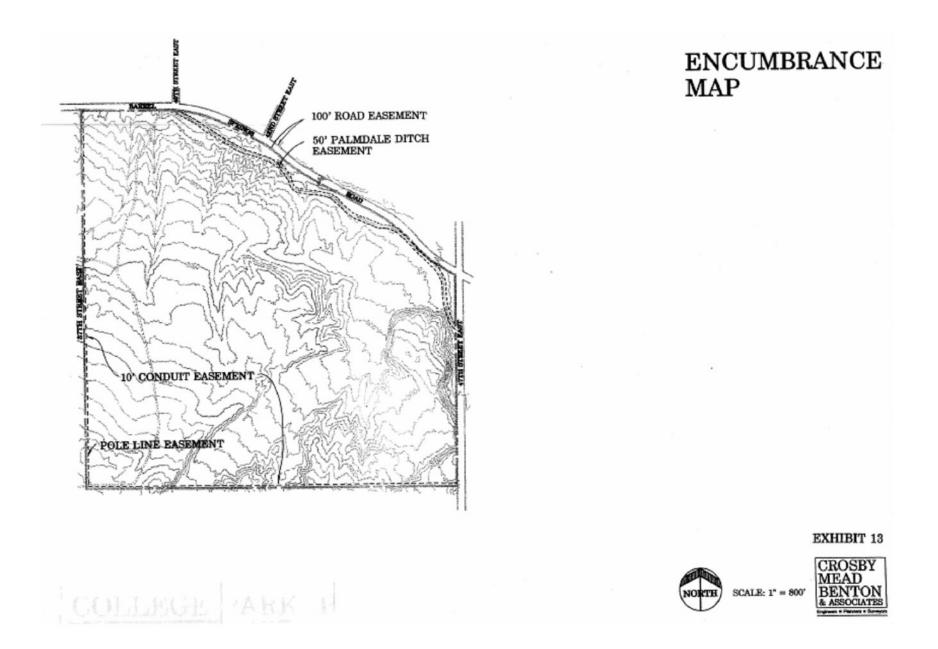
SOURCE: PACIFIC SOILS INC.

EXHIBIT 11



CROSBY MEAD BENTON & ASSOCIATES





## SECTION THREE DEVELOPMENT PLAN

The Foothill Ranch Development Plan establishes a comprehensively planned community that is designed to work with the site's natural characteristics and constraints. This is accomplished through open space, a well-designed circulation system, cohesive architectural design, and appropriate landscaping.

The Development Plan is organized into a series of elements which describe the key aspects of the Plan area. These elements are as follows:

- Residential Element This element describes the residential aspects of the Plan area, totaling 380 detached dwelling units with a minimum lot size of one acre.
- Amenities and Open Space Element This element describes the recreational facilities that include 155 acres of open space, a 5-acre neighborhood park site, both with multi-purpose trails and a neighborhood commercial center.
- Public Facilities Element This element establishes a network of infrastructure and public services necessary to support the Plan. Infrastructure and services include an extensive circulation system for both vehicular and pedestrian uses, a drainage system to control major storm flows, sewer/water/utility systems to provide necessary services for Plan area residents, as well as, programs for fire and police protection and solid waste.
- Conceptual Grading Element This element sets forth a Plan area-wide approach for grading of the Plan area.
- Community Design Element This element describes overall design criteria to control community design.
- 3.1 This section reserved.
- 3.2 Residential Element

The Residential Element consists of a maximum of 380 units a minimum of one acre in size.

For planning purposes, the residential components of the Specific Plan have been further divided into eight separate Planning Areas as shown on EXHIBIT 14. As discussed herein in greater detail, each Planning Area has been designated for a target unit count and a gross area. Gross areas for the various Planning Areas are approximate and include streets. The primary purpose of the target unit count is to provide a method of calculation of the total unit count for the entire Plan area.

Development of the various Planning Areas which make up the Residential Element should be designed in accordance with the criteria established by this Specific Plan and, where appropriate, the Community Design Element of the General Plan and the Subdivision Design Guidelines of the City of Palmdale.

## 3.2.1 Single Family Detached – One Acre Minimum Lot Size

The minimum lot size for all residential lots shall be one acre. If private streets are utilized within any Planning Area, lot area may be calculated as one acre gross, with lot lines extending to the centerline of the right-of-way. If public streets are utilized, all lots shall be one acre net (exclusive of right-of-way).

## 3.2.1.1 Planning Area A

This Planning Area is located in the southeastern quadrant of the Plan area east of Hunt Canyon. The major access for Planning Area A will be provided by two connections to 47th Street East. Internal loop roads will provide access to individual lots. This Planning Area will contain a target unit count of 108 dwelling units within an area of approximately 108 acres.

The final design of this Planning Area should consider the following:

- The design of local street and lot patterns that encourage views of surrounding vistas, as well as, promote adequate interior circulation.
- The internal loop roads should provide a minimum of two access points to 47th Street East.
- The use of rolled curbs and other rural characteristics.
- Gating opportunities may be considered for this Planning Area.
- The incorporation of the structural setback zones established for Faults G and H into the subdivision

design. The local streets should be designed to cross perpendicular to identified fault zones.

 Provide a 32-foot half street easement for Avenue V along the southern boundary. This easement will be reserved for future dedication and street construction (by others). If it is determined that the future construction of Avenue V is to have a different alignment, the half street easement will be vacated to the future adjacent Foothill Ranch property owners.

## 3.2.1.2 Planning Area B

This Planning Area is located in the central region of the Plan area between Hunt Canyon and Foothill Ranch Road. Access to Planning Area B will be provided from Foothill Ranch Road. Internal access will be provided through looped local roads with a minimum of two connection points with Foothill Ranch Road. This Planning Area will contain a target unit count of 60 dwelling units within an area of approximately 60.0 acres.

The ultimate design of Planning Area B should consider the following:

- The design of local street and lot patterns that encourage views of local vistas, as well as promote adequate interior circulation.
- The incorporation of the structural setback zone established for Faults F and G into subdivision design. The local streets should be designed to cross perpendicular to identified fault zones.
- Subdivision design should incorporate the structural setback zone established for Fault H to allow for a transition in density with Planning Area F. The setback zone should be located within the private yard areas of lots in Planning Area B.

## 3.2.1.3 Planning Area C

This Planning Area is located in the central region of the

Plan area on the west side of Foothill Ranch Road across from Planning Area B. Access to Planning Area C will be provided from Foothill Ranch Road. Internal access will be provided through looped local roads with a minimum of three connection points with Foothill Ranch Road. This Planning Area will contain a target unit count of 71 dwelling units within an area of approximately 71.1 acres.

The ultimate design of Planning Area C should consider:

- The design of local street and lot patterns that encourage views of local vistas, as well as promote adequate interior circulation.
- The incorporation of the structural setback zone established for Fault G into subdivision design. The local streets should be designed to cross perpendicular to identified fault zones.
- Design of the structural setback zone established for Fault H should be oriented to allow for a transition in density with Planning Area E. The setback zone should be located within the private yard areas of lots in Planning Area C.

## 3.2.1.4 Planning Area D

Planning Area D is located near the northwest corner of the Plan area. 37th Street East will provide major access to this site. This Planning Area will contain a target unit count of 23 dwelling units within an area of approximately 23.4 acres.

The final design of Planning Area D should consider the following:

- Local street circulation connections from 37th Street East with two points of ingress/egress.
- Gating opportunities may be considered of this Planning Area.
- The design of local street and lot patterns that encourage views of local vistas, as well as promote

adequate interior circulation.

• The design of local street and lot patterns that account for the structural setback zone established for Fault G.

## 3.2.1.5 Planning Area E

Planning Area E is located in the south-central portion of the site on the south side of Foothill Ranch Road, which will provide access to this site. This Planning Area will contain a target unit count of 21 dwelling units within an area of approximately 21.2 acres.

The ultimate design of this Planning Area should consider the following:

- The design of local street and lot patterns that encourage views of local vistas, as well as promote adequate interior circulation.
- Local street circulation connections from Foothill Ranch Road with two points of ingress/egress.

## 3.2.1.6 Planning Area F

Planning Area F is located south of Planning Area B. Access to this Planning Area will be provided by Foothill Ranch Road. This Planning Area will contain a target unit count of 17 dwelling units within an area of approximately 17.3 acres.

The final design of this Planning Area should consider the following:

- The design of local street and lot patterns that encourage views of local vistas, as well as promote adequate interior circulation.
- Local street circulation connections from Foothill Ranch Road with two points of ingress/egress.

## 3.2.1.7 Planning Area G

Planning Area G is located in the southwestern portion of the site on the south side of Foothill Ranch Road. Access will be provided to this site from both 37<sup>th</sup> Street East and Foothill Ranch Road. This Planning Area will contain a target unit count of 70 dwelling units within an area of approximately 70 acres.

The ultimate design of this Planning Area should consider the following:

- The design of local street and lot patterns that promote adequate interior circulation.
- Local street circulation connections from Foothill Ranch Road and 37<sup>th</sup> Street East with two points of ingress/egress.
- Provide a 32-foot half street easement for Avenue V along the southern boundary. This easement will be reserved for future dedication and street construction (by others). If it is determined that the future construction of Avenue V is to have a different alignment, the half street easement will be vacated to the future adjacent Foothill Ranch property owners.

## 3.2.1.8 Planning Area H

Planning Area H is located in the southwestern portion of the site east side of 37<sup>th</sup> Street East. Access will be provided to this site from both 37<sup>th</sup> Street East and Foothill Ranch Road. This Planning Area will contain a target unit count of 10 dwelling units within an area of approximately 10 acres.

- The design of local street and lot patterns that promote adequate interior circulation.
- Local street circulation connections from Foothill Ranch Road and 37<sup>th</sup> Street East with two points of ingress/egress.

3.3 The Amenities and Open Space Element

The Amenities and Open Space Element is intended to provide for passive and active facilities for Plan area and surrounding residents, as well as the City of Palmdale as a whole. These facilities include a 155 acres of open space, a 5-acre neighborhood park site, neighborhood commercial, and a multi-purpose trail system.

The Amenities and Open Space Element is represented in the following components:

- 3.3.1 This section reserved.
- 3.3.2. Neighborhood Commercial Component

The gross leaseable square footage for the neighborhood commercial uses will be a maximum of 20,000 square feet. The envisioned uses will include but are not limited to the following:

- Convenience Stores
- Book stores
- Restaurants
- Specialty Retail Business.
- 3.3.3 Open Space/Trails Component

The Foothill Ranch Specific Plan has been designed to incorporate an open space and multi-purpose (pedestrian, bicycle and horse) back bone trail system which will benefit the needs of the residents of the community and includes Planning Areas AOS-1, AOS-2 and AOS-3.

The multi-use back bone trail system, as shown on EXHIBIT 15, will connect the residential neighborhoods with the amenities and open space elements of the Specific Plan. This back bone trail system will accommodate the multi-use trail needs of the Plan area and will be fed internally by sidewalks and local streets. In addition, this trail system will provide for future connection to the multi-use trail located on the north side of Barrel Springs Road.

The multi-use back bone trail system will be constructed within an enhanced parkway adjacent to the right-of-way for Foothill Ranch Road. This enhanced parkway is located along the westerly side of the street and shall be 22 feet wide. The parkway will accommodate a meandering trail and enhanced landscape treatment. This trail system shall be at least 10 feet wide to accommodate pedestrian and bicycle travel and horse riding. The trail system shall constructed to the trail standards set forth by the City of Palmdale's Park and Recreation Department.

An additional trail system will be provided to link the residents of Planning Area A to the backbone trail system along Foothill Ranch Road. This trail system will traverse Hunt Canyon and the passive open space between Planning Area F and Planning Area B or G.

#### 3.3.4 Neighborhood Park Component

A five-acre neighborhood park is provided within Planning Area AOS-4 along Foothill Ranch Road located near the neighborhood commercial center at the northerly entrance of the Plan area, as shown on EXHIBIT 14. This park will enhance the visual identification for the community and provide active recreational opportunities for Plan area residents. This park contemplates the provision of recreational areas, including a tot lot, picnic and play areas, hard courts, landscaping, parking and restroom facilities.

This neighborhood park will be improved in accordance with General Plan and Zoning Standards and shall be constructed and offered for dedication to the City of Palmdale for use by residents prior to issuance of a building permit for the 250th residential unit. Final planning of this site will be determined by the City Department of Parks and Recreation and subject to approval of the City through approval of a Site Plan Review application. Construction of park improvements will include construction of all abutting off-site public improvements, including but not limited to streets, curbs, gutters, and the like and all necessary drainage improvements.

#### 3.4 Public Facilities Element

#### 3.4.1 Circulation

The major circulation system for Foothill Ranch will consist of the existing roads that are peripheral to the site: Barrel Springs Road, 47th Street East and 37th Street East, as shown on EXHIBIT 16.

In addition to the aforementioned roads, a hierarchy of collector streets, local streets and cul-de-sacs will complete the vehicular circulation system. These streets are comprised of Foothill Ranch Road and the local streets constructed within individual Planning Areas. The exact locations of the local streets and cul-de-sacs will be determined during the subdivision design process. The design of these roads shall adhere to the requirements of the special study zones with respect to access and crossing of fault zones.

The major circulation system includes the following:

## 3.4.1.1 Barrel Springs Road

Barrel Springs Road extends along the northerly boundary as an existing two lane secondary arterial. The circulation element of the Palmdale General Plan identifies Barrel Springs Road as a secondary arterial having an ultimate right-of-way dedication of 92 feet with 4 lanes of travel and a painted median.

The Specific Plan proposes to retain the alignment of Barrel Springs Road as it currently exists along the northern Plan area boundary. Current dedication of Barrel Springs Road provides 100 feet of right-of-way with 50 feet of right-of-way measured north and south of centerline.

The current dedication provides 4 additional feet of parkway on each side of the road, as shown on EXHIBIT 17, than is necessary for the 92-foot ultimate dedication. This would provide an overall parkway width of twelve feet on each side of the roadway. Bicycle traffic will be accommodated by an on-street striped bike lane.

The County of Los Angeles is currently initiating the conversion of excess road right-of-way to riding and hiking trails (multi-use trail) uses along the north side of Barrel Springs Road. These trails will be 10 feet wide. The 12-foot parkway, identified above, should be sufficient in width to accommodate this trail.

As prescribed in Land Use Policy L7.1.10 of the General Plan, access points along Barrel Springs Road between 37th and 47th Street East shall be limited to one location. This access point is Foothill Ranch Road.

## 3.4.1.2 47th Street East

47th Street East is constructed as a two lane secondary arterial southerly of Fort Tejon Road. Along the easterly boundary of the Plan area site, it is constructed as a two lane road with dirt shoulders.

The circulation element of the General Plan designates 47th Street East south of Pearblossom Highway as a secondary highway with an 84' right-of-way. The current Plan area boundary is offset 50 feet from the centerline of 47th Street East. Therefore, no additional dedication will be required.

47th Street East provides access to Planning Area A. In order to promote rural character, 47th Street East shall not be improved unless warranted by a traffic report approved by the City of Palmdale and subject to the approval of the City Traffic Engineer during city review of individual development proposals. Bicycle traffic will be accommodated by an onstreet striped bike lane.

Should improvements be necessary, the roadway section shall employ a rolled curb design with a multi-use trail from the intersection of Barrel Springs Road to the southerly boundary of the Plan area site.

## 3.4.1.3 37th Street East

37th Street East is an existing dirt road that provides access to three houses southwesterly of the Plan area. This road also provides access to Avenue V, an existing dirt road extending westerly of the site.

This section of 37th Street East was not analyzed by the General Plan. Therefore, no right-of-way requirement was established for it.

37th Street East will provide a major link in the circulation system for the Foothill Ranch Specific Plan. This road shall be designed as a 64-foot wide collector having 40 feet of paving.

The centerline of this roadway is the Foothill Ranch's

westerly boundary which will need to be widened to 64 feet for a full right-of-way with full curb-to-curb improvements.

In order to promote a rural character, the roadway section shall employ a rolled curb design with a trail along the easterly side of the right-of-way. Bicycle traffic will be accommodated by on-street striped bike lanes.

## 3.4.1.4 Foothill Ranch Road

Foothill Ranch Road is the internal collector for the Foothill Ranch Specific Plan area and is the Plan area entry for a majority of the residential portions of the Plan area, extending from Barrel Springs Road through the development to 37th Street East.

Foothill Ranch Road shall be dedicated as a 92-foot collector with a 12-foot raised median and 46 feet of paving. This dedication includes 10 additional feet to the 12 foot standard parkway along the westerly side, which will be added to accommodate the separated multi-use back bone trail system that runs parallel to the roadway. The standard 12foot parkway will be provided on the easterly side as shown on EXHIBIT 17.

At its intersection with Barrel Springs Road, Foothill Ranch Road will be divided with an expanded center median. This median will be approximately 20 to 30 feet wide at its widest point and will contain entry monumentation and landscape elements. The width of the median will diminish to the south of the intersection until Foothill Ranch Road becomes the divided roadway as described above. Dimensions and geometry of these median improvements will be further defined as part of the tentative map and subdivision process.

### 3.4.1.5 40th Street East

Along with 47th Street East, 40th Street East will be an important north/south link between Foothill Ranch and downtown Palmdale.

40th Street East is an existing two lane road. The General Plan designates 40th Street East as a secondary arterial

with an 84 foot right-of-way from Pearblossom Highway to Barrel Springs Road.

No improvements are anticipated for 40th Street East.

## 3.4.1.6 Avenue V

Avenue V along the southern boundary of the Foothill Ranch Specific Plan will be a 64 foot street.

A 32 foot easement west of Hunt Canyon will be graded, landscaped and integrated into the design of Planning Area G until Avenue V is constructed. Until such time as Avenue V is dedicated and constructed, the easement shall provide access to the proposed water tank and the proposed drainage basin in Hunt Canyon. The easement shall also provide continued access to a small group of existing homes that are adjacent to the southwesterly corner of the Plan area.

The easement east of Hunt Canyon will retain its natural grade and vegetation.

Should alignment studies determine that the ultimate rightof-way of Avenue V will be south of the Plan area boundary, the easement will be quitclaimed to the future adjacent Foothill Ranch residents.

## 3.4.1.7 Internal Loop and Local Streets

Internal loop and local residential streets shall be incorporated within the residential planning areas of Foothill Ranch. Precise alignment of these internal loops will be determined by the subdivision process and individual planning area buildout.

All internal loop streets shall be dedicated with a minimum of 64 feet of right-of-way and shall conform to City of Palmdale's standards. Should these internal loops exceed one half mile in length and traffic volumes in excess of 1,500 vehicles per day, direct residential access shall be discouraged. Unless a neighborhood is proposed to be gated with private streets, all internal loop streets shall be offered for dedication to the City of Palmdale by the individual tract builder.

Collectors, local interior streets and cul-de-sacs shall conform to the street standards and the subdivision guidelines of the City of Palmdale, as shown on EXHIBIT 18. Local streets will be designed with adequate intersection spacing and shall encourage four-way intersections on Foothill Ranch Road and T-intersections on local streets and cul-de-sacs.

## 3.4.2 Drainage

The Foothill Ranch site is divided by two ridges into three drainage areas: (1) the Westerly Area, (2) the Southeasterly Area and (3) the Hunt Canyon Area, as shown on EXHIBIT 12.

Westerly Drainage Area - The westerly drainage area drains towards Barrel Springs Road in the vicinity of 40th Street East. Drainage from this area is collected in the Palmdale Ditch, a concrete lined ditch. Per the Palmdale Water District, the reported capacity of the ditch is 60 cubic feet per second (cfs). Drainage is conveyed through Barrel Springs Road in a pipe and outlet into a continuation of the concrete-lined ditch.

As the stormwater crosses the California Aqueduct, it is conveyed through a steel pipe and again through a concrete-lined ditch discharging into Lake Palmdale. Drainage which exceeds the capacity of the Palmdale Ditch is conveyed by culvert across Barrel Springs Road, an outlet on the surface, flowing across the California Aqueduct through a concrete flume.

- Southeasterly Drainage Area The southeasterly drainage area contains 14 acres located in the extreme southeastern corner of the site. Runoff from 320 acres of tributary offsite drainage area is conveyed through this region flowing northerly to the Palmdale Ditch. Drainage, which exceeds the capacity of the Palmdale Ditch flows northeasterly to the proposed Hunt Canyon Basin. This basin is proposed by the Los Angeles County Master Plan of Drainage.
- Hunt Canyon Drainage Area The Hunt Canyon drainage area has an offsite tributary drainage area of approximately 2,332 acres. This

drainage drains from approximately the middle of the southerly boundary to the northeasterly portion of the property. Drainage exits the site on the surface across Barrel Springs Road, flowing southeasterly along Barrel Springs Road to Cheseboro Road and thence northerly towards the Cheseboro Siphon of the California Aqueduct. The Aqueduct is underground at this point and the drainage crosses the aqueduct on the natural surface. From this point the drainage "fans out" in a northerly direction. The Los Angeles County's Master Plan of Drainage proposes a retention basin in this area at the corner of Cheseboro Road and Avenue T-8.

The Foothill Ranch site is within the Los Angeles County Flood Control District boundary. The Plan area's storm drainage design is based upon the Los Angeles County's hydrology method. These results were to calculate and meet the City of Palmdale's detention requirement. EXHIBIT 19 shows the proposed master plan of drainage for the College Park Palmdale site. This exhibit shows only "backbone" improvements and is conceptual in nature, all facilities will be designed to meet the applicable agency design standards.

The overall goal of the drainage system for the Foothill Ranch Specific Plan is to limit the peak runoff from the Plan area at buildout or phased development to 85% of the peak runoff which flows from the property in its natural condition. This will be accomplished through the construction of debris and detention basins, pipes, open conduits and other appropriate drainage devices. These facilities shall be designed into a coordinated system that will enhance the drainage control and flood protection aspects of the Plan area.

The Los Angeles County Public Works Department identifies the 2,332 acres of offsite watershed as debris producing. The Specific Plan proposes a combination debris/detention basin located at the southerly boundary. This basin will remove silt, mud, and vegetation from the storm water and also detain the runoff to reduce the peak flow rate. Debris and storm water will be stored on the adjacent property, owned by others, southerly of the site. Easements on or purchase of this adjacent property is required. If the easements or property are not secured, the debris/detention basin will be relocated on the site and incorporated into the design of the Planning Area G. The primary maintenance responsibility of such a dual use improvement will be the developer/Home Owners Association with back-up responsibility to the City of Palmdale. Access to this basin will be provided by an access road through Planning

Area G or along the half street easement for the future dedication of Avenue V.

As storm water is released from this detention basin, it will flow through water courses and drainage devises to prevent excessive damage. The exact design and location of the water course and drainage devices shall be determined through a coordinated effort between the civil engineer, geotechnical engineer and the City Engineer.

This storm water will then be concentrated into an additional detention basin near the intersection of Barrel Springs Road and 47th Street East. The combination of these basins will reduce the developed peak runoff to 85% of the undeveloped peak runoff.

The storm water flow in the Hunt Canyon area will exit the site through a storm drain culvert into an energy dissipator on the north side of Barrel Springs Road for release into the existing natural channel.

Storm drainage from the Planning Area G shall be directed to the Plan area's storm drain system through a series of catch basins and drain pipes.

Off-site drainage tributary to the Southeasterly Drainage Area shall be directed through the site by a natural swale and conveyed under 47th Street East by a culvert designed to convey both the drainage and debris.

Storm water for the residential portion of Foothill Ranch will be conveyed by a combination of streets, catch basins, storm pipes, and open drainage devices. Appropriate drainage devices will be employed to prevent damage to the site and development from storm water.

### 3.4.3 Sewers

Foothill Ranch is within the tributary area of the Los Angeles County Sanitation District No. 20. The property will require LAFCO annexation into District No. 20 in order to connect to the district's trunk line network. As such, the sewer system for the Plan area should be designed and constructed to the satisfaction of the County Sanitation District No. 20 as well as the City Engineer.

## 3.4.3.1 Offsite Sewer

The nearest trunk line to the proposed Plan area is a 12" line located at Avenue S and 35th Street East. The closest actual service connection point is an existing 8" sewer line located in 40th Street East at Hata Way. However, the existing 8" sewer line does not have adequate capacity to serve this Plan area. Therefore, two options, as shown on EXHIBIT 20, have been considered for offsite sewer extensions:

The first option would build a sewer line from Barrel Springs Road and 40th Street East northerly in 40th Street East to Avenue S, then west in Avenue S to connect to the existing 12" trunk line in 35th Street East. The sewer line would vary from an 8" line at Barrel Springs Road and 40th Street East to an 18" line at the connection with the trunk line.

The second option would include the construction of an additional sewer line parallel the existing system. The existing sewer flows northerly in 40th Street East from Hata Way to Noll Drive, then west in Noll Drive through existing Tract 44556. The 8" line exits this subdivision through Hallowglen Drive. It continues northerly in 37th Street East to Avenue S. At Avenue S, it continues westerly in a 10" line to its connection with a Los Angeles County Sanitation District 12" trunk line in 35th Street East. The second option proposes to build a line that parallels this system with an 8" sewer to Hata Way, then a 10" line to Noll Drive and a 15" line for the remaining length.

The construction of the second option would be more difficult than the first option, due to existing infrastructure through Tract 44556.

### 3.4.3.2 Onsite Sewer

The Plan area sewer system will consist of an underground network of sanitary sewer lines. These sewers shall operate by gravity, with a common confluence point at 40th Street East and Barrel Springs Road.

Sewer lines will cross faults at or near right angles. Within

fault zones, sewer lines should utilize flex-couplings that allow for movement during a seismic event, thus reducing the chance for breakage.

EXHIBIT 21 shows a conceptual sewer line layout. No local or individual lines are shown. All sewer lines within the boundaries of Foothill Ranch are anticipated to be 8" and should be located within street right of ways where practical. Collection lines within Barrel Springs Road will range in size from 8" to 12" before connecting into the offsite facilities described above.

Planning Area A site will be served through an 8" sewer line built within 47th Street East with eventual connection to 40th Street East. However, if feasible, this Planning Area may be alternatively served by a sewer line within an easement in the open space area.

The neighborhood commercial and Planning Areas B, C, E, F, G and H will be served by an 8" line in Foothill Ranch Road.

Planning Area D would be sewered by an 8" line in 37th Street East, this line ties into an 8" sewer in Barrel Springs Road and eventually to 40th Street East.

### 3.4.4 Water Plans

Foothill Ranch is within the Palmdale Water District's boundary and principal services area.

## 3.4.4.1 Offsite Water

There is currently no water service available to the property. However, the Palmdale Water Master Plan indicates future service to the site. This service includes the construction of a 16" water line extension from the existing tanks located at 47th Street East and the California Aqueduct. This 16" water line will be extended approximately 7,600 feet south in 47th Street East to a proposed 3.0 MG tank located just south of the Plan area at Avenue V-5 and 47th Street East.

This tank is to be located in the 3,250 elevational zone.

Given the Plan area's terrain, this new tank will not service the entire site.

A second water tank would be required to service the upper portions of the site. The District's Master Plan proposes to construct a 1 MG tank located on Mt. Emma Road, which is located in the 3,400+ elevational zone. This tank would provide gravity water service for the remainder of the Plan area and would require the additional extension of 6,800 linear feet of 12" transmission line from the tank located at 47th Street East south of the site.

These above described facilities are all included in the Palmdale Water District's master plan and will be funded by capital improvement fees.

Preliminary discussions with the Palmdale Water District have indicated a potential to revise the location of these Master Plan Facilities to better accommodate any development in accordance with this Specific Plan.

This revision would include relocating the 3 MG tank within the 3,250 elevational zone to an onsite location. This tank would be relocated to Planning Area T near Hunt Canyon, as shown on EXHIBITS 22 and 23. Connection to this tank from 47th Street East would occur by constructing the Palmdale Water District 16" water line through Hunt Canyon (Planning Area AOS-1) to Planning Area T as shown on EXHIBIT 23.

This tank site would be sized to accommodate a booster pump facility with connection to the 1 MG tank in 3400+ elevational zone located at Mt. Emma Road. Connection to the Mt. Emma Road tank would occur by redirecting the 12" water line westerly across the Community College Campus site to 37th Street East. From this point, the water line would be directed southerly along the extended alignment of 37th Street East to the Mt. Emma Tank.

These above facilities would be Master Plan Facilities and would also be funded by capital improvement fees.

## 3.4.4.2 Onsite Water

Topography of Foothill Ranch will require water system improvements in two pressure zones, one at 3,250 foot elevation and the other at 3,400+ foot elevation. The Homeowners Association may consider the option of establishing a mutual water company to provide service to the site.

EXHIBIT 23 details a conceptual onsite water system. This water system is subject to the Palmdale Water District's review and approval. This Exhibit shows only main service lines 8 inches or above.

This proposed onsite water system will built as two separate pressure zoned systems as follows:

• 3,250 Pressure Zone

Service to the 3,250 zone will be provided through connections to Palmdale Water District's 16" line proposed in 47th Street East and the 3 MG water tank in Planning Area T. A 16" line will be constructed in Barrel Springs Road between 37th Street East and the 16" line in 47th Street East. A 12" line will be constructed in 37th Street East from College Park Road to the 16" line in Barrel Springs Road. This 12" water line will service Planning Area D.

Palmdale Water District requires all systems be looped. Therefore, a 12" line will be constructed across Planning Area AVCC-1 from the water tank in Planning Area T to College Park Road.

An 8" line will be constructed in Foothill Ranch Road from the 12" line in 37th Street East to the 16" line in Barrel Springs Road, with connection to the 12" line in Planning Area H. This water line will service the lower portions of Planning Areas B and C. • 3400+ Pressure Zone

Service to the 3400+ zone will be provided by connection to the 12" water line that joins the booster pump (located with 3 MG tank in Planning Area T) and the Mt. Emma Road tank. The residential portions of the Plan area within this zone will be provided service through the construction of a 12" line in 37th Street East, from the 12" line from the booster pump, to Foothill Ranch Road.

An 8" line will be constructed in Foothill Ranch Road from 37th Street East to the northernmost entrances of Planning Areas B and C within this zone. This water line will service Planning Areas B and C.

From Planning Area B, the 8" line will be directed across Planning Area AOS-1 and through Planning Area A with connection to the existing 6" line in 47th Street East. This line will serve a portion of Planning Area A.

An 8" line will be constructed across Planning Area A from the 12" line at the booster pump to the existing 6" line in 47th Street East. This line will service the remainder of Planning Area A.

## 3.4.4.3 Reclaimed Water

The feasibility of using reclaimed water for landscaping is currently being evaluated by the City of Palmdale.

## 3.4.4.4 Palmdale Ditch

The Palmdale Ditch, under the jurisdiction of the Palmdale Water District, conveys water from the Little Rock Reservoir to Lake Palmdale. The ditch also collects surface runoff from upstream areas and directs these flows to Lake Palmdale for storage. Serving in this capacity, it is important to restrict surface runoff that may enter the ditch from urban areas, thereby reducing the possibilities of water contamination. In some segments, the ditch is either concrete lined or contained in box culverts, but the majority of its length exists as an earthen ditch.

Within the Plan area, the ditch is located adjacent to Barrel Springs Road. The ditch is constructed as a concrete vditch. Large portions are in disrepair due to erosive actions.

In order to prevent urban runoff from collecting in the ditch, the Palmdale Water District is requesting that the existing concrete ditch be replaced with an underground pipe through the entire site. The Palmdale Water District has stated that the ditch carries approximately 60 cfs. A 48" reinforced concrete pipe, accompanying inlet and outlet structures, and manholes are required to convey this flow. The pipe shall be placed underground and routed adjacent to Barrel Springs Road.

### 3.4.5 Dry Utilities

### 3.4.5.1 Gas

Gas service for the Foothill Ranch will be provided by Southern California Gas Company. A service main is available at 47th Street East and Avenue T-8. This will be extended southerly in 47th Street East to the Plan area boundary. From this point, the gas lines will be directed either westerly on Barrel Springs Road to serve the residential and commercial elements or southerly in 47th Street East to serve Planning Area A.

Once on site, these facilities shall be located within the collector and local street systems of the Plan area.

### 3.4.5.2 Electricity

Electrical service for the Plan area will be provided by Southern California Edison. Edison facilities to serve the Plan area are located at Barrel Springs Road and 42nd Street East.

Electrical facilities will all be underground and located within collector and local streets to serve the residential portion of

the Plan area.

To serve Planning Area A, electrical lines will need to be extended easterly on Barrel Springs Road and then southerly on 47th Street East.

Electrical lines located along the south boundary may require relocation to accommodate the debris/detention basin.

### 3.4.5.3 Telephone

AT&T will provide telephone service to Foothill Ranch. AT&T has existing facilities to serve at 47th Street East and Barrel Springs Road.

Planning Area A will obtain service in lines extended southerly in 47th Street East.

Telephone service to residential and associated commercial portions of the Plan area will be provided within the collector and local street systems of the Plan area.

### 3.4.6 Schools

The Foothill Ranch site is within the Keppel Union School District which serves the eastern and southeastern sections of the City of Palmdale planning area and the Antelope Valley Union High School District which serves the City of Palmdale.

The Keppel Union School District has been consulted over the potential for a school on the Plan area. The location of a school on the site appears to be without merit based upon the number of students estimated to be generated by construction of Foothill Ranch and its distant location from other higher density residential areas within Keppel Union, meaning a high cost to bus students to the site. With respect to the school districts, the mandated obligation of the developer for payment of school fees will be made at the time of development of the residential units.

### 3.4.7 Fire/Police

### 3.4.7.1 Fire

Fire protection for Foothill Ranch will be provided by Los Angeles County Fire Department, Fire Station 131, located at the intersection of Avenue S and 27th Street East. Additional fire protection is provided by Fire Station 37, located at 38318 9th Street East. The site is also within the U.S. Forest Service Mutual Aid Area, which will provide additional fire protection for the site.

### 3.4.7.2 Police

Police protection for the Foothill Ranch site will be provided by the Los Angeles County Sheriff Department. The Sheriff Department currently has a station located at 750 East Avenue Q.

### 3.4.8 Solid Waste

Solid waste disposal for Foothill Ranch will be provided by Waste Management, Inc. The solid waste will be transported to the Antelope Valley Landfill also operated by Waste Management, Inc. Each home and/or business will be billed directly by the disposal company.

Foothill Ranch shall participate in the City's adopted Integrated Waste Management Plan for recycling.

3.4.9 Public Transit

At the time of development, an extension of public transit facilities to residential elements of the Plan area should be explored.

### 3.5 Conceptual Grading Element

The overall grading concept for Foothill Ranch generally reflects the existing topographic characteristics. It is anticipated that every planning area will require some degree of grading activity. This is typical of any development, regardless of terrain, because building pads, park uses and roadways require flat, well-drained surfaces in order to be functional.

The overall grading concept should adhere to the recommendations of the City of

Palmdale Engineering Department and respect the seismic setbacks established by the Alquist-Priolo Fault study, as shown on EXHIBIT 25.

The Foothill Ranch grading concept is described by the following areas:

• Planning Area A: The grading concept for this Planning Area should incorporate the natural terrain, where feasible.

Grading of this Planning Area should use techniques that soften the edge conditions as visible from outside the planning area. These techniques include, but are not limited to, daylight fills or cuts and contour grading. Where feasible, the site should be designed to locate slopes in the rear portions of residential lots for private maintenance. Slopes should be designed in accordance with the City of Palmdale's Hillside Management Ordinance.

• Residential Planning Areas B, C, D, E, F, G and H: These residential areas will require grading to provide efficient drainage and sanitary sewer systems. This may be accomplished by incorporating the gently upsloping terrain of Region 3 as described in Section Two of this document.

Grading for the residential areas will likely require a general terracing of land site to accommodate the proposed streets and building pads. The site should be designed to locate slopes within the individual planning area boundaries. Within each individual planning area, slopes should be located in the rear yard portions of residential lots for private maintenance. Slopes should be designed in accordance with the City of Palmdale Hillside Management Ordinance.

The overall grading design of the Residential Planning Areas should minimize large manufactured slopes.

Preliminary grading designs for Residential Planning Areas will be provided to the City for review to demonstrate compliance with the aforementioned concepts as well as the grading standards contained in Section 5.10.

Final grading design for the Plan area should emphasize the ability of each Planning Area to independently balance cut and fill earthwork quantities. This shall allow development to occur in response to market demands. Where circumstances make this impractical, grading for adjacent Planning Areas should be coordinated to minimize impacts associated with earth borrow sites and/or stock piles. Earth borrow and/or stockpile areas shall be designed to the satisfaction of the City Engineer. Grading operations within the Residential Planning Areas should balance within each phase, as identified in Section 6.14 of this document. However, grading may be required outside of individual phases in order to achieve an overall earthwork quantity balance. The overall grading volume for the Foothill Ranch Specific Plan area is estimated at approximately 2,700,000 cubic yards, as shown on EXHIBIT 26.

### 3.6 Community Design Element

The primary goal of the Community Design Element is to establish a framework to ensure the visual continuity of the area. This framework is to manage the visual image and interface of the Plan area from the surrounding community as well as from within the limits of the Plan area. Design issues not specifically addressed in this section will be regulated by the City's General Plan Community Design Element.

The perimeter of the subject property is bounded by a number of parcels ranging up to 40 acres in size. These parcels include the Palmdale Estates subdivision along the north boundary of the site, as well as, other individual parcels along the west, east and south boundaries. These edge conditions are shown on EXHIBIT 27.

The Community Design Element is based upon an analysis of the visual aspects of the subject property with community design, architecture, landscape architecture and lighting concepts to guide implementation of the Specific Plan.

### 3.6.1 Visual Analysis

The Foothill Ranch property is located within the transitional areas of the Antelope Valley between the Valley floor and the foothills of the San Gabriel mountains. A visual analysis was performed to determine the visible areas of the Plan area. The analysis was performed using topography and cross-sections along with field observations. These cross-sections are illustrated on EXHIBITS 28 through 32.

From the results of these analyses, it was determined that the Plan area could be viewed from two viewshed areas: Local (adjacent to Barrel Springs Road) and Distant (views from the valley floor north of Avenue S).

Local Views

The northerly portion of the Plan area will be visible from Barrel

Springs Road. The primary visual element will be the northerly portions of Planning Areas A, B, C and D. Given the unique terrain of this portion of the site, views of the southerly portion of the Plan area will be obstructed from Barrel Springs Road.

Local views also include views from the Palmdale Estates neighborhood. Houses in this area are constructed above Barrel Springs Road. Therefore, more of the southerly portion of the Plan area will be visible from this neighborhood. Visual elements will include proposed residential neighborhoods.

Distant Views

Distant views of the Plan area are limited to areas in the valley floor north of Avenue S. Due to a local foreground ridge located between the site's northerly boundary and the California Aqueduct, the site is not visible from properties south of Avenue S. Avenue S is approximately two miles north of the Plan area boundary. At this distance, the visual scale of the development will be fine grain with visual aspects related to overall building mass.

3.6.2 Community Design

At the time of development is proposed, the architecture and overall design of the neighborhood commercial component shall be consistent with the requirements of the Community Design Element of the General Plan and the residential component shall be consistent with the General Plan and the standards contained within Section 41.09 - Standards of Development of the Zoning Ordinance.

- 3.6.3 This section reserved.
- 3.6.4 Landscape Architecture

Landscape architecture plays an important role in the design and function of Foothill Ranch. Both natural and improved open space areas work together to physically link important community elements, create a strong identity and provide visual relief enhancing the aesthetic character of the community.

Designated open space areas consist of private, semi-public and publicly owned facilities under various ownership. The open space in Foothill Ranch can be classified into two basic categories: Streetscapes and Amenities, and the Community College Campus. The Landscape Element defines the conceptual landscape character of these categories and the open space areas within them including, Foothill Ranch Road trail and neighborhood entries. A conceptual landscape plan is shown on EXHIBIT 33.

- 3.6.4.1 Streetscapes
  - Foothill Ranch Road

Foothill Ranch Road is envisioned as the primary organizing element of Foothill Ranch. Foothill Ranch Road meanders through the site in a north/south direction. Ample setbacks and attractive landscaping along the roadway will create a setting for community architecture and a focus for public and semi-public uses as conceptually shown on EXHIBIT 34. The key facility along Foothill Ranch Road will be the neighborhood commercial Planning Area. The design of Foothill Ranch Road will specifically incorporate the following elements:

- In addition to the standard street right-of-way, an expanded landscape parkway will be dedicated along the length of Foothill Ranch Road. The landscape parkway will consist of approximately twenty-two feet on the west and the standard twelve feet on the east.
- o The landscape character of Foothill Ranch Road should be a park-like setting comprised of evergreen and deciduous trees, alternating turf and other ground covers, and shrubs providing seasonal color. A limited palette of appropriate plant materials should be selected and patterned to reinforce a continuity in the landscape and acknowledge water conservation principles.
- Public access to Foothill Ranch Road will be maximized along its length especially where public and semi-public uses front.
- o The design of free standing walls that are

immediately visible from Foothill Ranch Road should be consistent an established community theme wall. Specifications for the community theme wall are provided in section 5.13 of the Specific Plan (Walls and Fencing).

- Planning area entries along Foothill Ranch Road have been identified as significant locations where neighborhood landscape themes must integrate with the landscape theme of Foothill Ranch Road to maintain continuity.
- The use of Foothill Ranch Road should be predominately for recreation and visual enjoyment. The width of Foothill Ranch Road should accommodate pedestrian and bicycle facilities separated from the roadway right-of-way by 3' minimum planting strips. These facilities should connect to adjoining planning areas and public and semi-public uses positioned along Foothill Ranch Road. Other improvements along Foothill Ranch Road, which may be provided by the individual tract builders in conformance with the City Landscape Architect during tentative map subdivision design review, may include:
  - a. Standardized street furniture, pedestrian and street lighting
  - b. Seating and shade opportunities at pedestrian nodes
  - c. Integrated community directional signage
- Barrel Springs Road

Barrel Springs Road, along the northern Specific Plan boundary, serves as the east/west vehicular access to the main community entry. The southern edge of Barrel Springs Road should respond to the natural landscape character that currently exists and the functional requirements of the Specific Plan. Therefore, appropriate enhancement planting along Barrel Springs Road should be divided into three landscape zones, as conceptually shown on EXHIBITS 35 and 36: (1) a desert indigenous zone from 47th Street East, transitioning to (2) a deciduous upright tree mass enhanced with indigenous shrubs and grasses, evolving to (3) an evergreen buffer zone from 40th Street East to 37th Street East. These landscape elements should be located along Barrel Springs Road with a variable width 50 to 100. Landscape planting should allow visibility to the open space area and community in all three zones.

• 47th Street East

47th Street East, along the eastern boundary, serves primarily as vehicular access to the Planning Area A and continues on to serve adjacent properties beyond.

• 37th Street East

37th Street East, along the western boundary, serves as the primary vehicular access to the western planning areas, the southern community entry, and adjacent properties. The landscape will provide a natural, informal character with enhanced indigenous plantings.

• Community and Neighborhood Entry Monumentation

A community-wide entry marker system will be an integral part of Foothill Ranch to maintain continuity throughout. In all cases, entry monuments will be designed with similar appearing materials and type styles with scale being the main difference between marker categories. All entry monuments will be located within the rights-of-way for the dedicated streets. Four primary and several secondary entry nodes have been established and should be designed per the following standards:

o Community Entry Monuments: Primary entry monuments (community entries) will be located

at the intersections of Barrel Springs Road and Foothill Ranch Road, Barrel Springs Road and 47th Street East, Barrel Springs Road and 37th Street East, and at 37th Street East and Foothill Ranch Road. The monuments will be large boulder (real or simulated) massings with engraved lettering/logos and may be accented by enhanced indigenous landscape planting and/or accent water features, as conceptually shown on EXHIBITS 37 and 38.

- Planning Area Entry Monuments: Secondary entry monuments (planning area entries) will be located on both sides of planning area entries within the street right of ways. The monuments will be scaled down boulder groupings (real or simulated) with engraved lettering/logos, as conceptually shown on EXHIBIT 39. Accent planting adjacent to the monuments will be consistent with the planting theme of that particular planning area and form a smooth transition to the adjacent streetscape.
- Planning Areas

Internal Planning Area streetscapes should be improved by individual builders in accordance with the approved development standards. Landscape character will relate to the planning area architectural theme. Plant material will be selected from the approved community plant palette. Developers and individual homeowners will be required to design and install landscaping in accordance with the Landscape Water Conservation Ordinance of the City of Palmdale and in conformance with the landscape character established by this Specific Plan.

- 3.6.4.2 This section reserved.
- 3.6.4.3 This section reserved.
- 3.6.4.4 Walls

Walls are an integral part of the community architecture. Consistency in the design of walls is essential in establishing a continuity in the streetscape. Walls can provide decorative appeal, privacy, security, buffering of incompatible land uses and screening of unsightly uses. Types of walls include the Community Theme Wall, Planning Area Walls, View Walls, Recreation Area Fencing, Off-Street Parking Screen Walls, and Retaining Walls as shown on EXHIBIT 42. The following defines the conceptual design character or each wall type. Refer to section 5.13 of the Specific Plan for wall and fencing design standards.

• Community Theme Walls:

In order to establish a recognizable and cohesive appearance throughout Foothill Ranch, a common theme wall design concept has been established. The community theme wall will serve as the basis for all other wall design. The community theme wall design should allow flexibility in height, opaqueness and location to allow for both privacy and view potential. Planning Area developers should install the common community theme wall in certain locations along the length of frontage adjoining Foothill Ranch Road and 37th Street East.

• Planning Area Walls:

Planning Area Walls enclose a Planning Area development parcel providing privacy, security or decorative appeal for the development. Planning Area Walls (that are not also a community theme wall) will be allowed more flexibility in design and appearance but should be generally compatible with the established community theme wall. The planning area wall design should allow flexibility in height, opaqueness and location to allow for both privacy and view potential.

• View Walls:

View wall segments are encouraged in all wall designs including Community Theme walls where

privacy or screening is not required. View wall segments should be compatible with the established community theme wall and/or planning area walls. Most commonly, view wall segments may be appropriate for locations fronting open space elements as well as the following:

- o Private recreation center enclosures
- Areas between Planning Areas and along boundaries where significant grade breaks occur.
- Off-Street Parking Screen Walls:

Walls may be necessary to screen off-street parking areas at the commercial center. A combination of landscape planting, berming, and/or low walls are encouraged to a minimum height of thirty-six (36) inches above grade to lessen the visual impact of parking areas and vehicles. The parking screen walls should be compatible with the established community theme wall and/or planning area walls.

• Retaining Walls:

Retaining walls are a common necessity, but should be kept to a minimum wherever possible. When necessary, retaining walls should be designed with equally spaced terraces of retained earthen material with landscape planting and berming to reduce the negative visual impact of excessive vertical surface area. The exposed side character of retaining walls should be compatible with the community theme walls and/or planning area walls.

### 3.6.5 Lighting

Given the visual sensitivity of the surrounding area, nighttime views will be important. The lighting concept for Foothill Ranch will limit the number and type of street lights to the minimum required for safe and efficient circulation. Street lights should be designed to focus light downward only with limited lateral illumination to the satisfaction of the City Engineer. Exterior lighting associated and incorporated with proposed structures should be designed to that necessary to promote public safety and identify pedestrian circulation.

### 3.7 Development Plan Demographics

3.7.1 Population

The preliminary phasing for the Foothill Ranch Specific Plan assumes that development of the residential portion of the Plan area would occur in six phases. Build out and market absorption of the total residential component of approximately 380 dwelling units is anticipated to take 5 to 10 years from start of construction, depending on market conditions and fluctuations.

Using the figures released by the State Department if Finance, dated January 1, 2009, of 3.538 persons per household, the total development would yield a population of 1,344. Given the above average market absorption, the development would contribute an average population of 231 persons per year through build out.

PHASE	NO. OF UNITS	POPULATION	CUMULATIVE POPULATION
1	71	251	251
2	21	74	325
3	40	142	467
4	60	212	679
5	80	283	962
6	108	382	1,344
TOTAL	380	1,344	1,344

The following tables provide population figures by phase and product type:

### 3.6.2 Job Opportunities and Employment

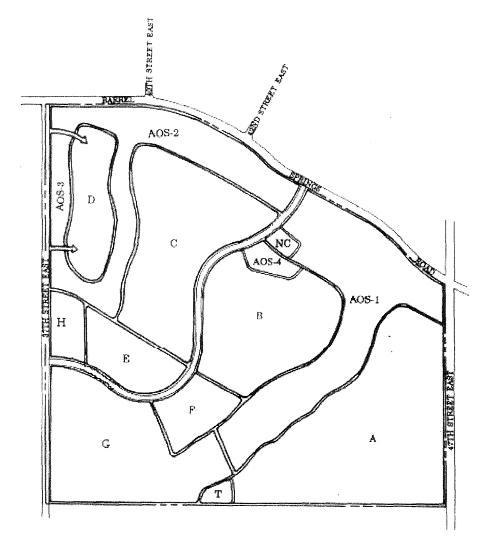
The Foothill Ranch Specific Plan development will provide additionally job opportunities and employment in the Palmdale area. This is due to the proposed commercial use.

The neighborhood commercial use will provide an estimated 18 jobs. .

The residential component of the Plan area will also increase the demand

for retail and service-oriented employment. These additional opportunities include professional and residential services including gardeners, plumbers, contractors, personal services, entertainment, and other similarly related jobs.

## DEVELOPMENT PLAN

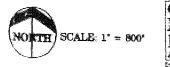


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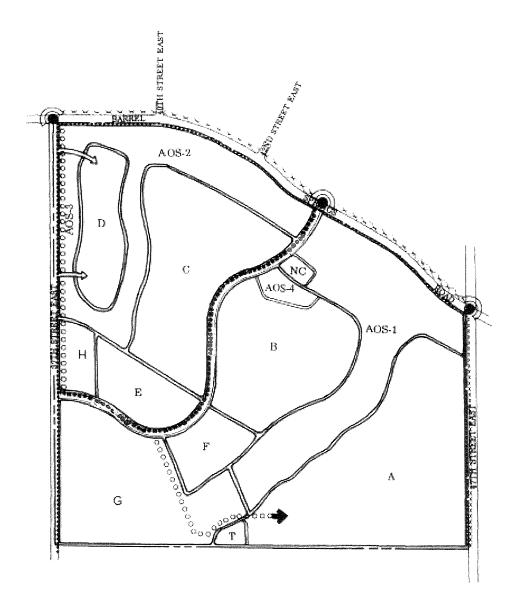
#### LAND USE SUMMARY

Residential Element					
Component	Planning Area	Acreage	Target Units		
Single-Family One Acre Minimum	A	108.0	108		
Single-Family One Acre Minimum	B C	60.0 <u>71.1</u>	60 <u>71</u>		
Subtotal		131.1	131		
Single-Family One Acre Minimum	D	23.4	23		
Single-Family One Acre Minimum	E F	21.2 <u>17.3</u>	21 <u>17</u>		
Subtotal		38.5	38		
Single-Family	G (was AVCC-1)	70	70		
One Acre Minimum	H (was AVCC-2)	<u>10</u>	<u>10</u>		
Subtotal		80	80		
Subtotal		381.0	380		

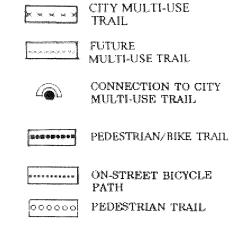
Amenities and Open Space Element					
Component	Planning Area	Acreage	Comment		
Open Space NC: 2 ac T: 2 ac	AOS-1, AOS-2 AOS-3, AOS-4	<u>155.0</u>	Park site and associated commercial within these Planning Areas		
Subtotal		159.0			
Overall Site Density		Total Site Area			
0.7 du/gross acres		540.0 acres			







# TRAILS PLAN







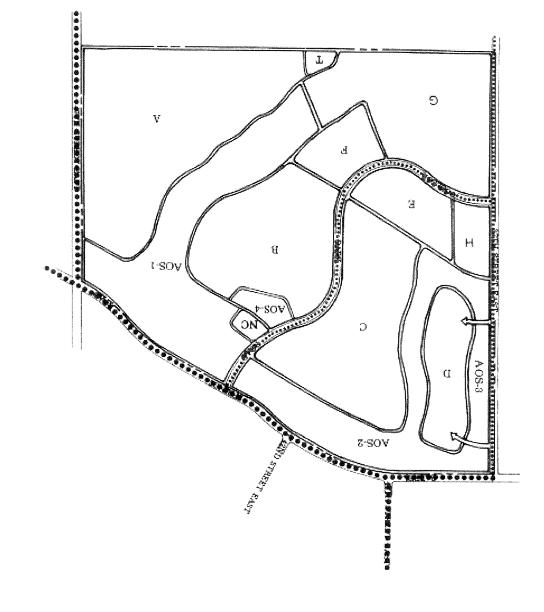


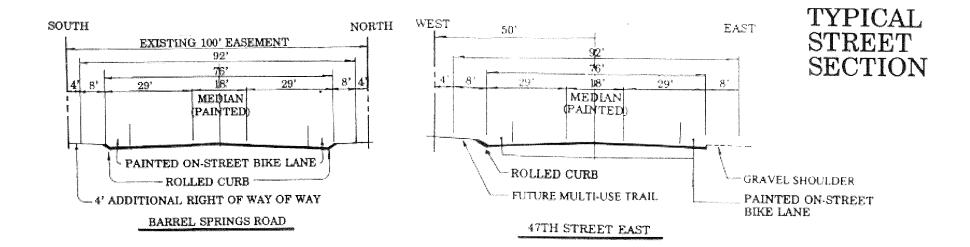
**\*\*\*\*\*\*\*** SECONDARY ARTERIAL

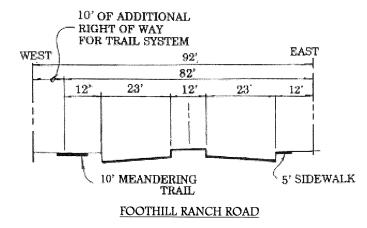
COLLECTORS





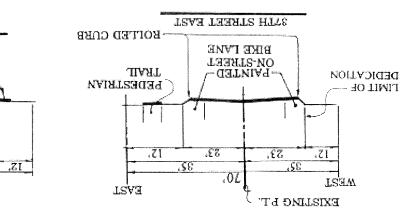


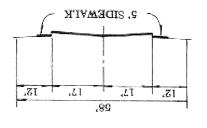












INTERNAL LOOP

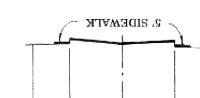
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LOCAL INTERIOR STREETS

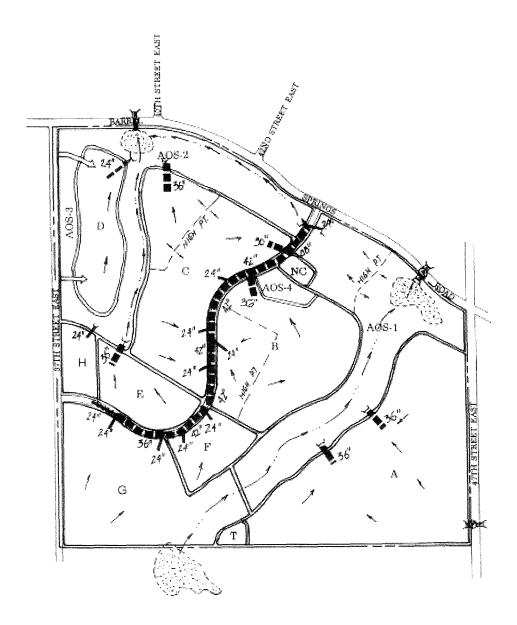
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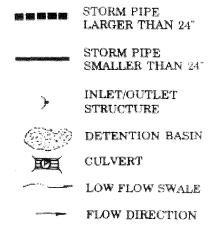
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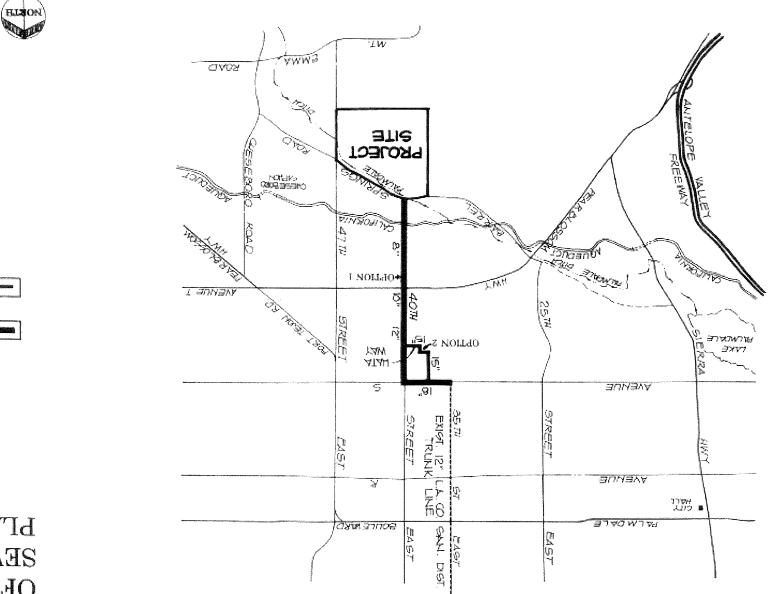










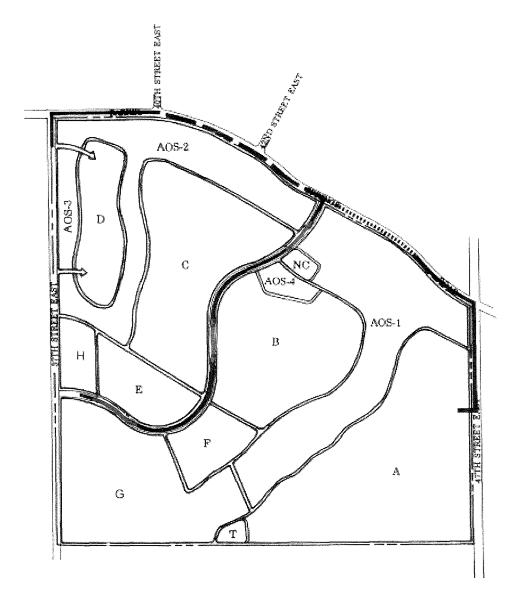




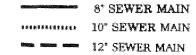
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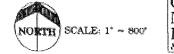
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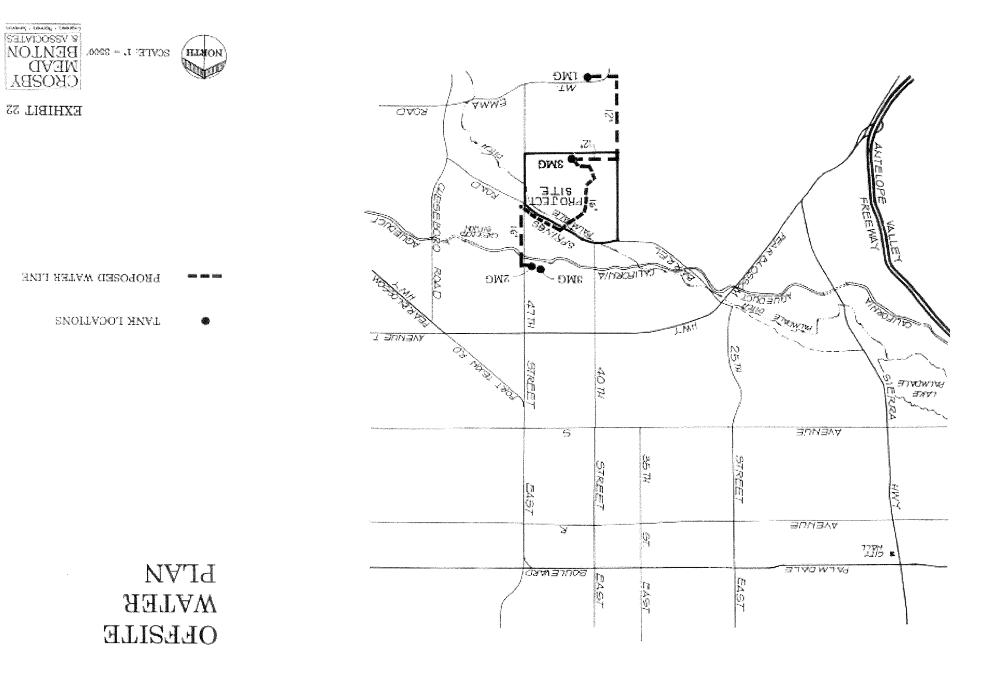


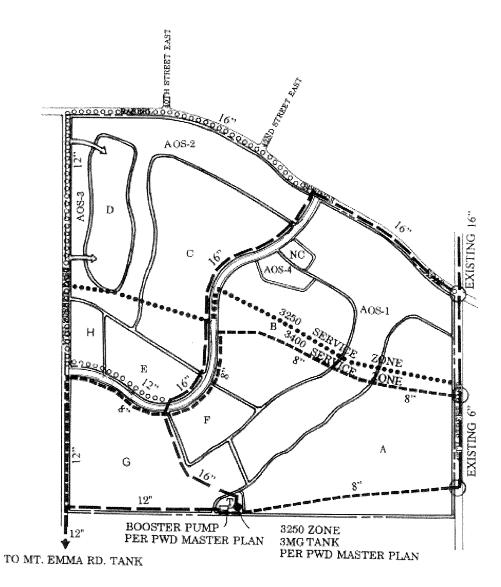




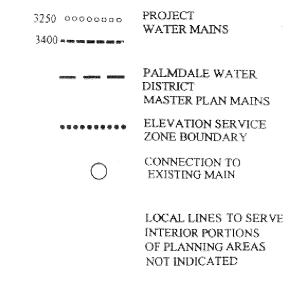






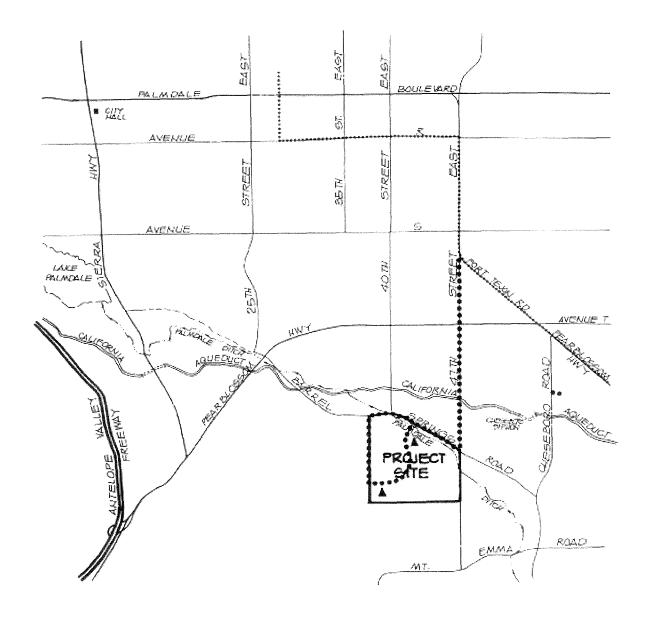


## ONSITE WATER PLAN









# PUBLIC TRANSIT

EXISTING ANTELOPE VALLEY TRANSIT AUTHORITY (AVTA) RED LINE ROUTE

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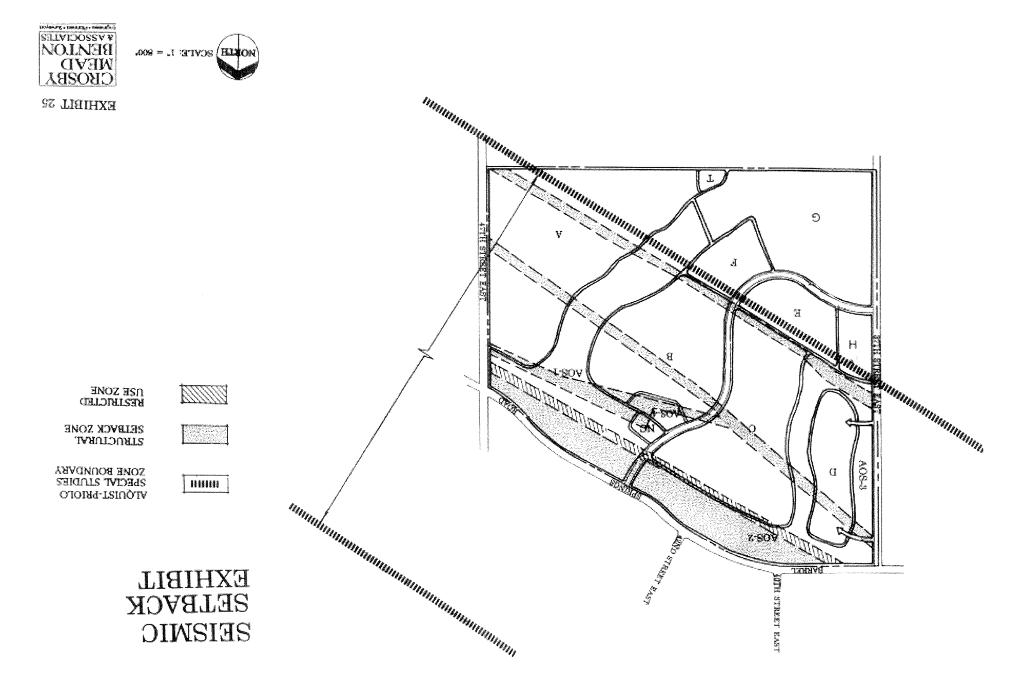
PROPOSED RED LINE EXTENSION

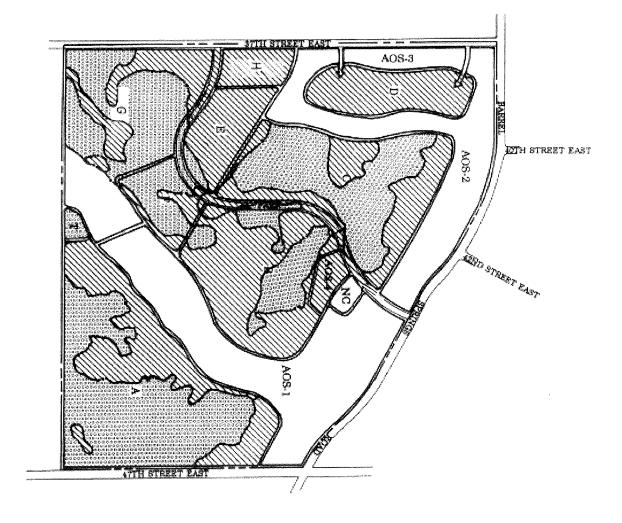
PROPOSED AVTA STOPS

#### EXHIBIT 24

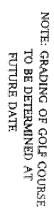


CROSBY MEAD BENTON & ASSOCIATES





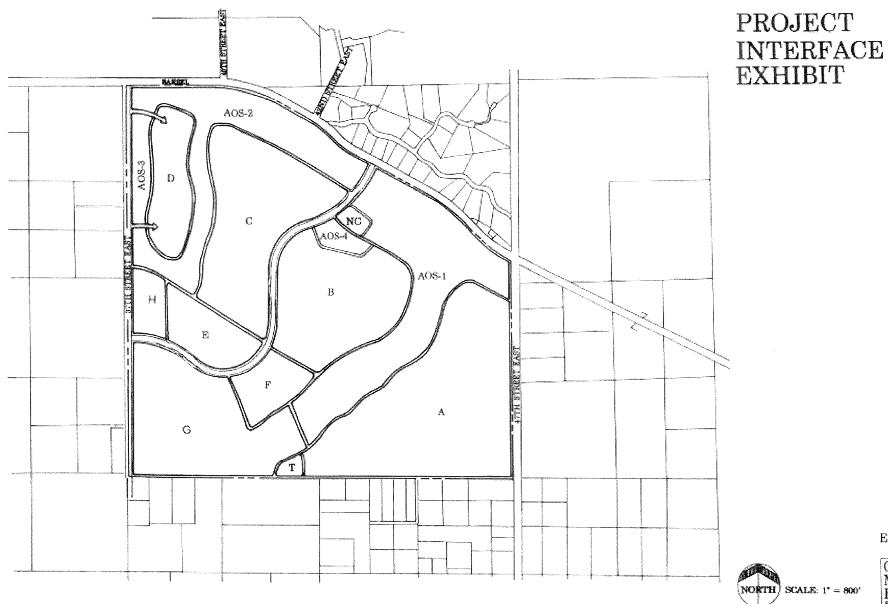




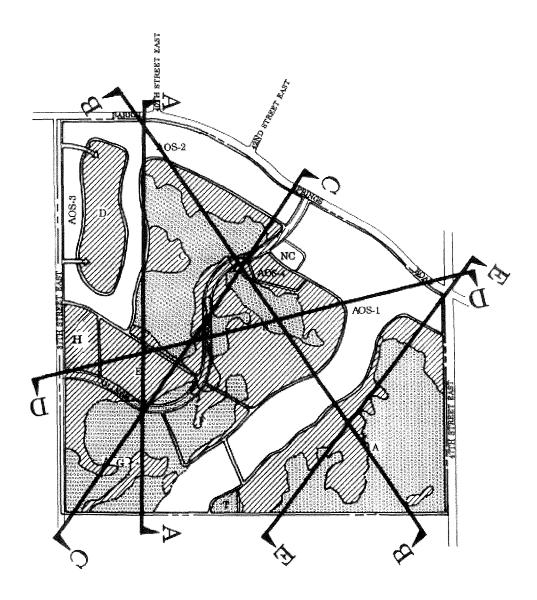


FILL









### LOCAL VIEWS CROSS SECTION BASE MAP

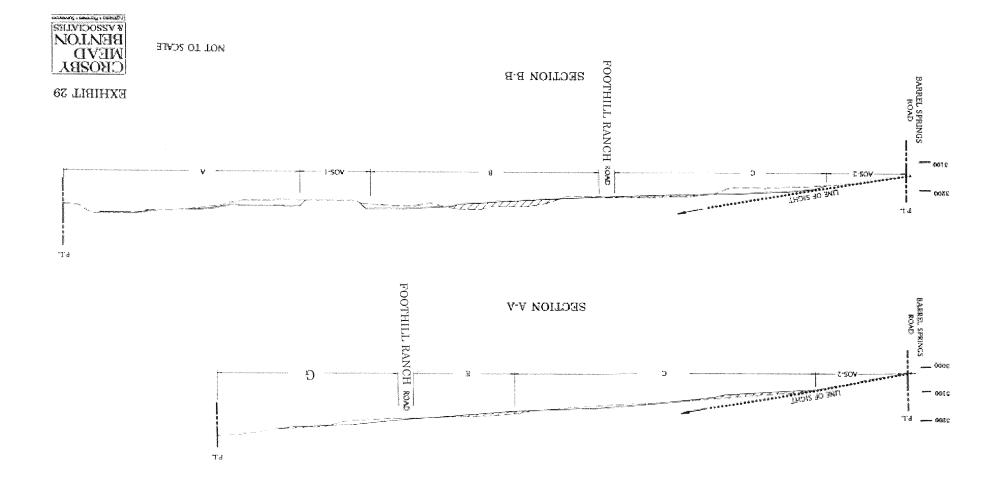


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NOTE: GRADING OF GOLF COURSE TO BE DETERMINED AT FUTURE DATE

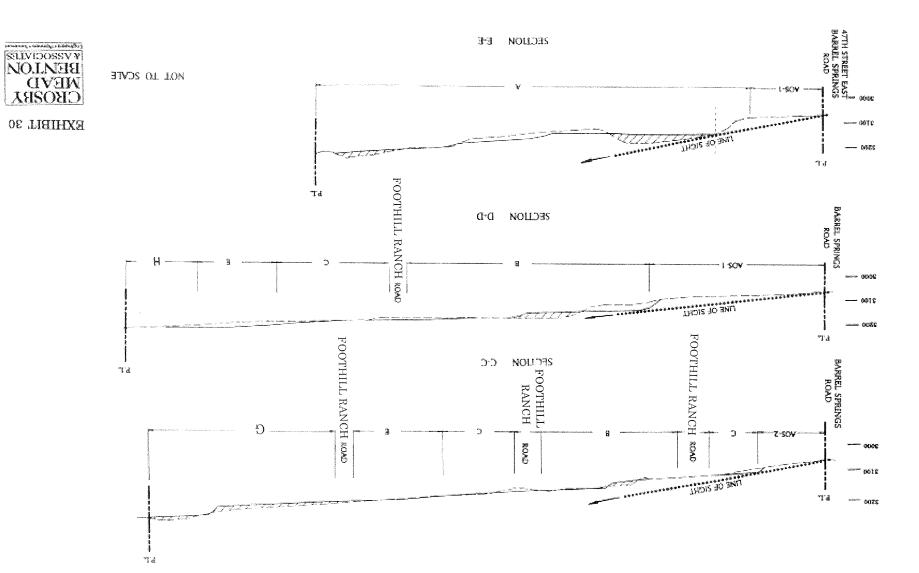






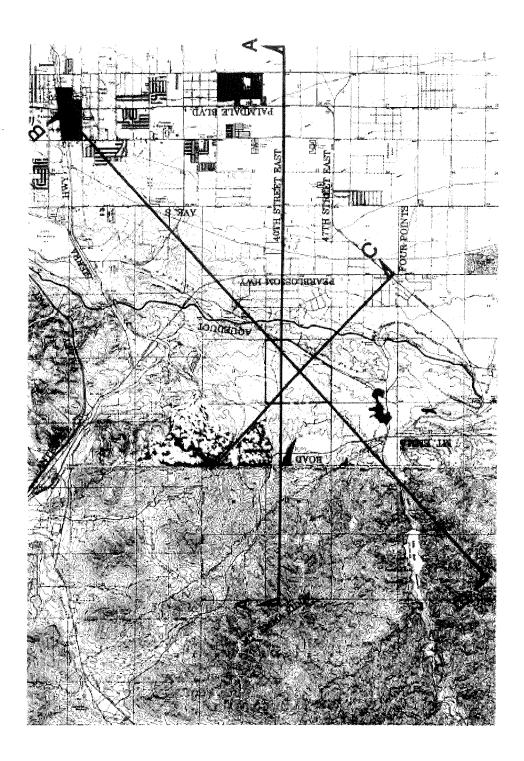
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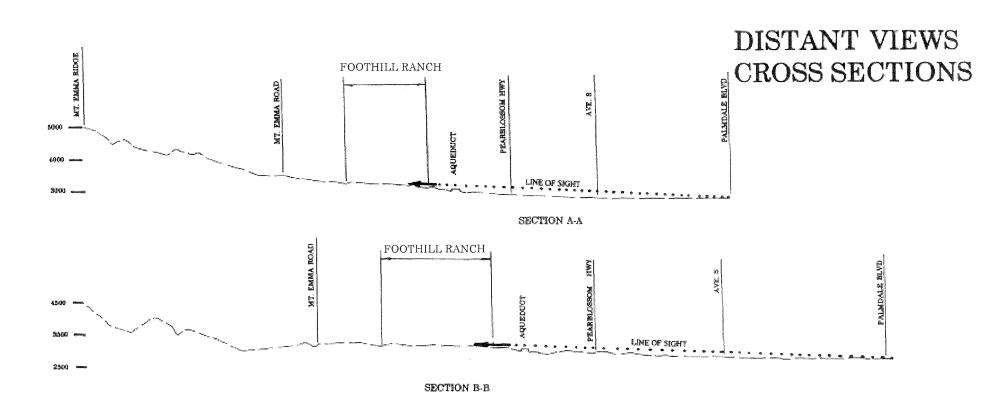
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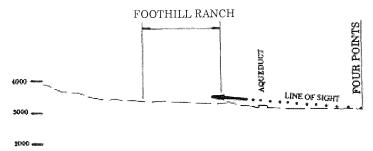


DISTANT VIEWS CROSS SECTION BASE MAP

CROSBY MEAD BENTON MASSOCIATIES **EXHIBIT** 31







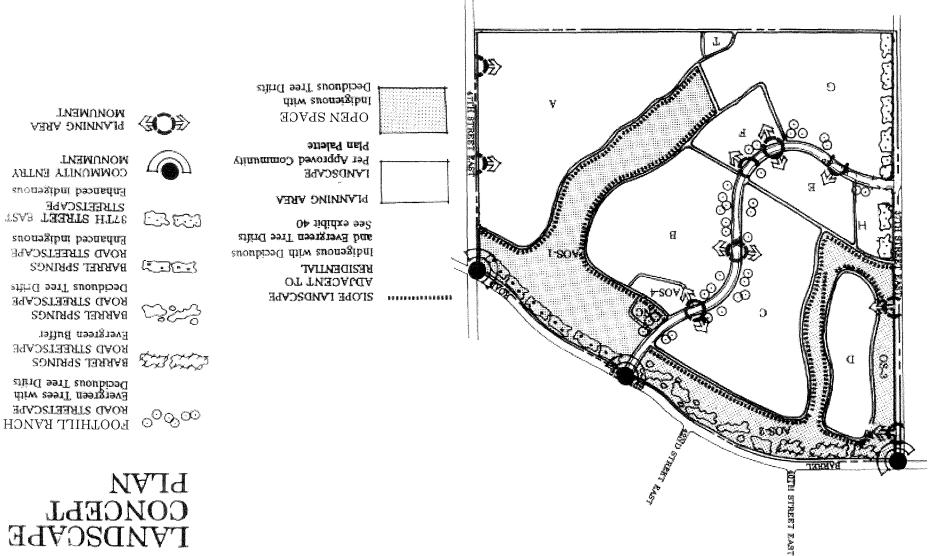
SECTION C-C

#### EXHIBIT 32



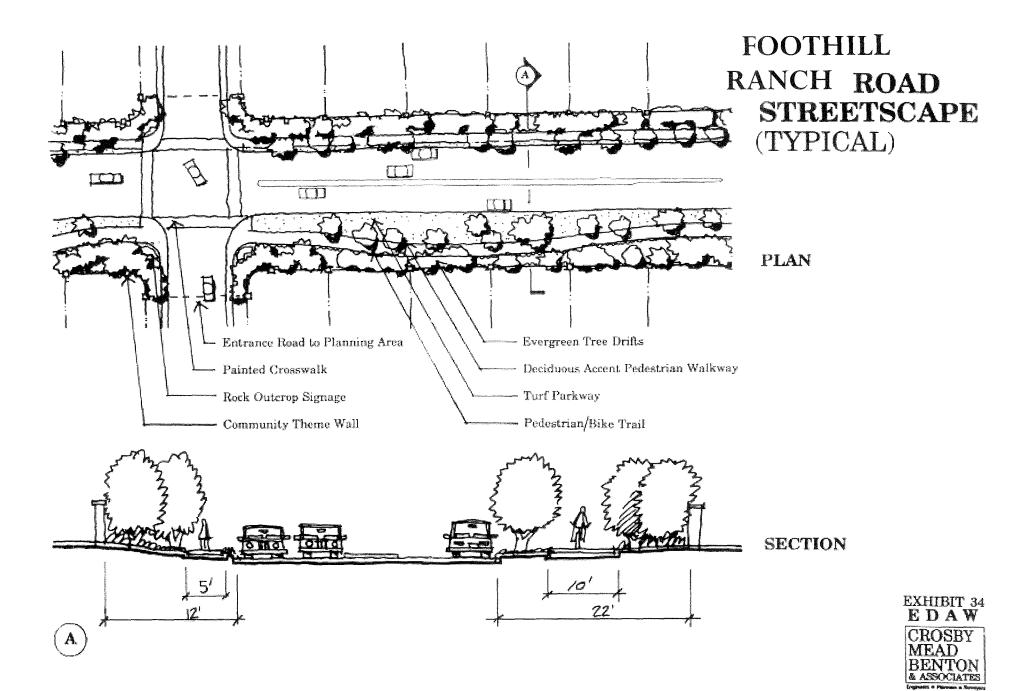
NOT TO SCALE

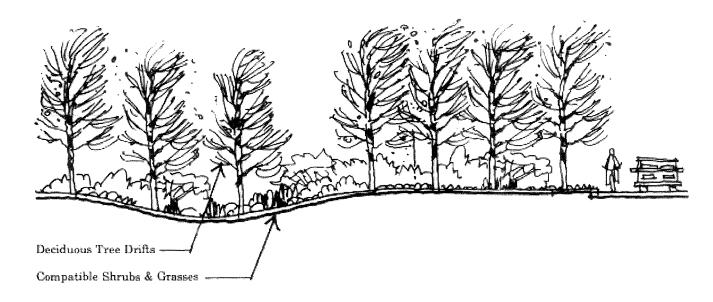
### PLAN CONCEPT **LANDSCAPE**





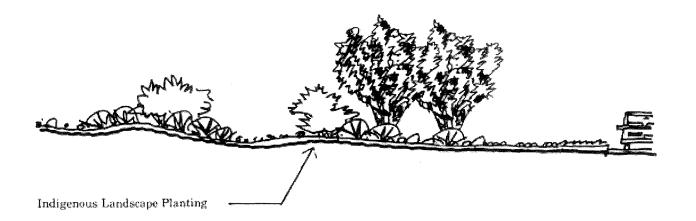






### BARREL SPRINGS ROAD STREETSCAPE

SECTION Between Foothill Ranch Road and 40th Street East



### SECTION

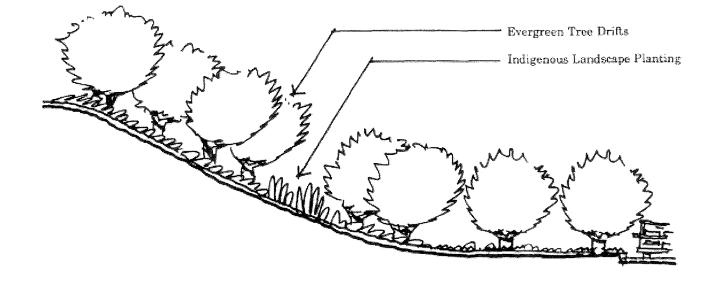
Between 47th Street East and Foothill Ranch Road

Note: Similar, indigenous landscape plantings will be provided along east side of 37th Street East





### BARREL SPRINGS ROAD STREETSCAPE

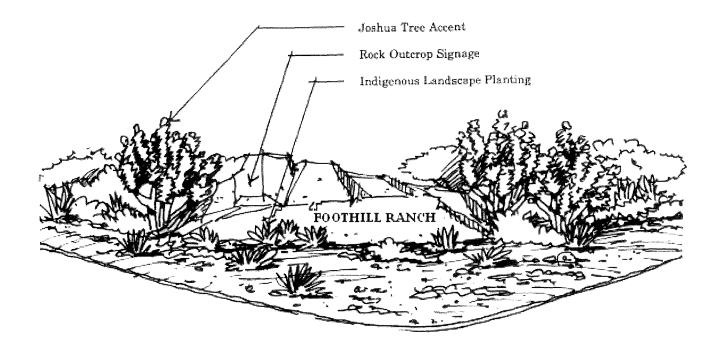


SECTION Between 40th Street East and 37th Street East

HINON



### COMMUNITY ENTRY MONUMENT



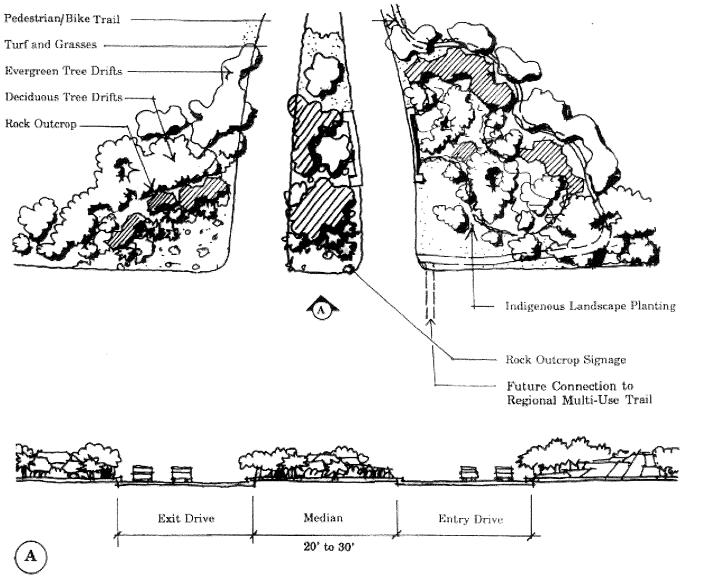
#### NOTES

Approximately 10' High, 30' Wide Monument of Random Rock Outcroppings with Natural, Indigenous Coloration.

12" - 18" High Typeface on Sandblasted Rock Face

VIGNETTE Barrel Springs Road and 47th Street East





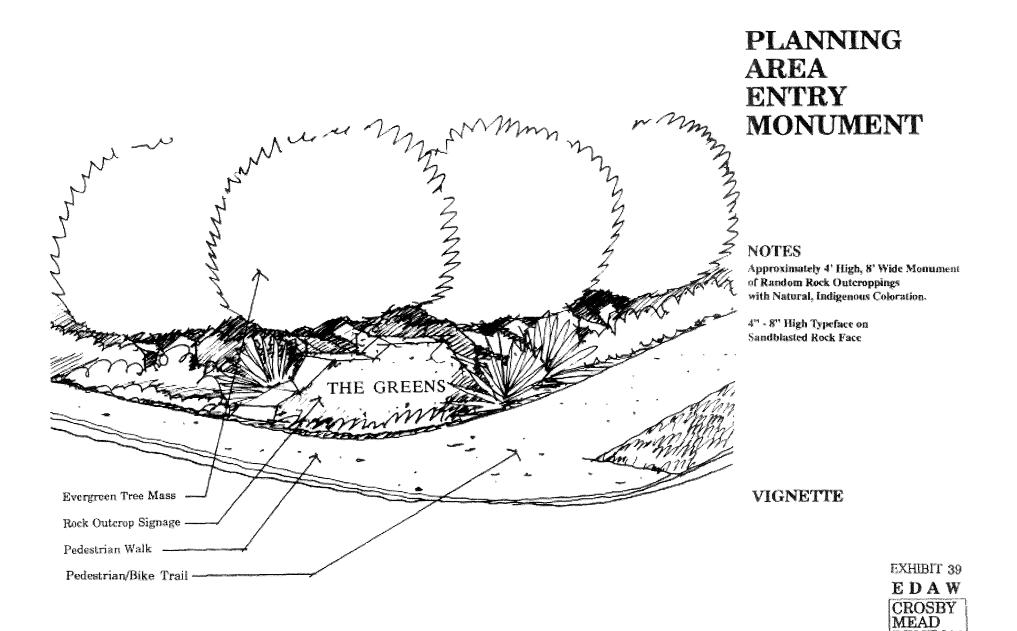
### COMMUNITY ENTRY MONUMENT

PLAN Barrel Springs Road and Foothill Ranch Road

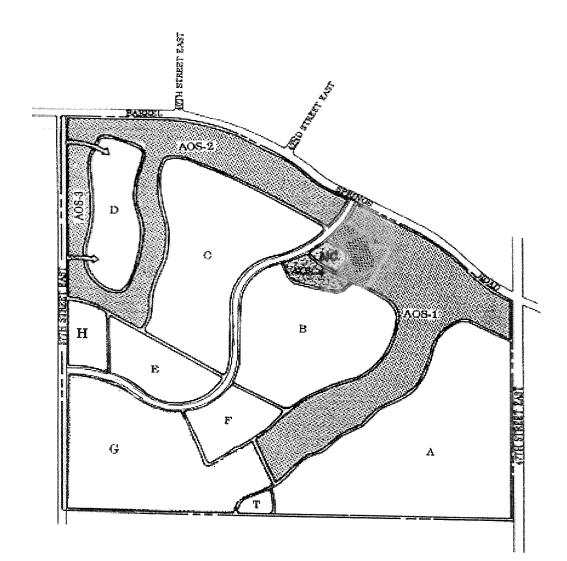
**ELEVATION** Barrel Springs Road and Foothill Ranch Road







BENTON



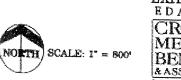
### AMENITIES PLAN

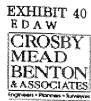


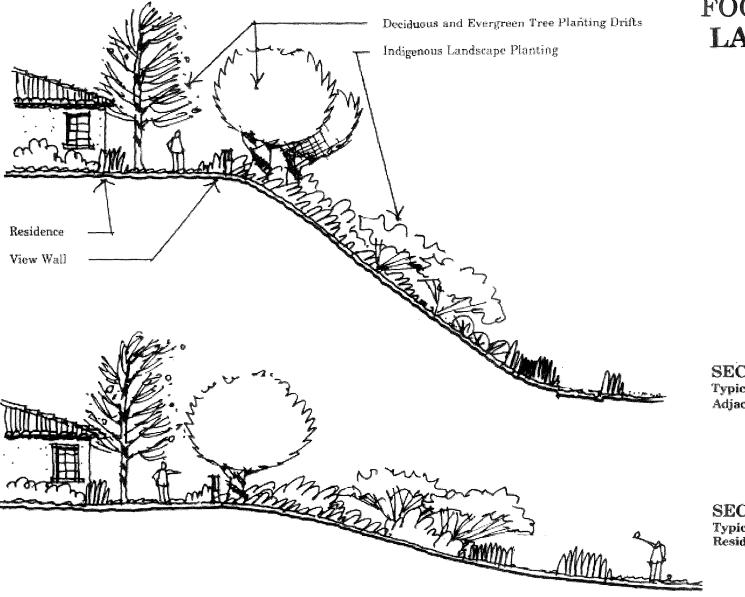












### FOOTHILL RANCH LANDSCAPE

SECTION Typical Slope Bank Condition Adjacent to Residential

SECTION Typical Condition Adjacent to Residential







NOTE: VIEW WALL TO BE AT STREET EAST.

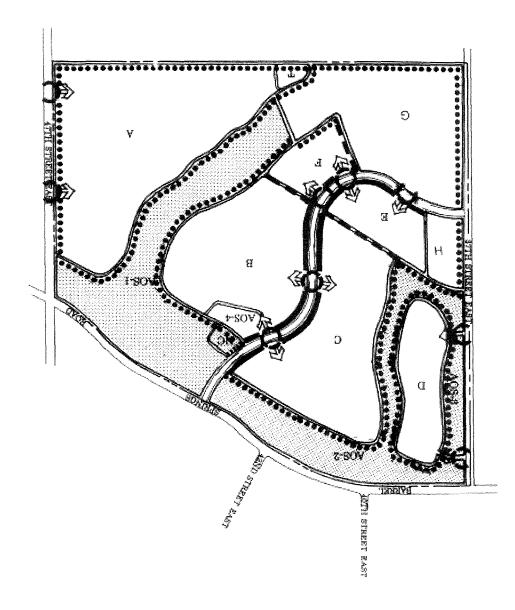
SCREEN WALT OFF-STREET PARXING

TTVM MEIA \*\*\*\*\*\*

PLANNING AREA WALL
 View Wall Segments
 Optional

Optional View Wall Segments COMMUNITY





#### SECTION FOUR GENERAL PLAN CONSISTENCY

The California Government Code and the City of Palmdale Resolution No. 90-43 require a discussion of the consistency of the proposed Specific Plan with the adopted General Plan. The City of Palmdale General Plan, adopted January 25, 1993 (Resolution No. 93-10) and subsequently amended by additional City Council actions, is organized into a series of elements. These elements discuss issues related to land use, circulation, environmental resources, public services, safety, noise, and housing. Within each element, the General Plan establishes goals, objectives and policies to provide a comprehensive, long term approach for the future physical development of the City of Palmdale.

It is the intent of this section to describe how the Foothill Ranch Specific Plan is in conformance with the General Plan. The discussion uses the organizational structure of the City's General plan, listing elements, goals, objectives and, where appropriate, policies (Land Use Element only) with a statement of conformance (shown in bold type).

#### 4.1 LAND USE ELEMENT

<u>GOAL L1</u> :	Create a vision for long-term growth and development in the City of Palmdale which provides for orderly, functional patterns of land uses within urban areas, a unified an coherent urban form, and a high quality of life for its residents.	
Objective L1.1:	Establish a blueprint for the physical form and development of the City.	
Policy L1.1.1:	Through adoption of the Land Use Map, direct future growth to areas which can accommodate development based upon topography, environmental factors, availability of infrastructure, and/or comprehensive planning. These areas include the following:	
	a. Vacant land within urbanized areas (infill lots), where backbone infrastructure is available or planned for;	
	b. Areas governed by adopted Specific Plans	;;

# c. Areas in which infrastructure master planning has occurred.

A Specific Plan for this area was originally submitted October 19, 1990 as the Bushnell Specific Plan. The College Park Palmdale Specific Plan for this same area was approved by the City Council on June 9, 1999 under Resolution No. CC-1999-081. In February 2000, at the request of the developer, the Palmdale City Council determined that the final residential unit count permitted under the College Park Palmdale Specific Plan was 847 units. The Specific Plan was revised in March 2000 to reflect this determination.

This Specific Plan Amendment eliminate the community college campus and golf course and revises the residential density to no more than 1 dwelling unit per gross acre.

This Specific Plan sets forth provisions for infrastructure including water, sewer, storm drain, circulation, and public services. This Specific Plan also identifies how the project's terrain and topography, as well as environmental factors, accommodate the proposed development.

Policy L1.1.2: Provide incentives to promote infill development, in order to foster more cohesive neighborhoods, maximize use of infrastructure, consolidate development patterns and enhance community appearance.

The subject property is on the current edge of development. Therefore, this policy does not apply to this specific plan.

# Policy L1.1.3: Respond to the rapidly changing needs of the City by reviewing the General Plan every five to seven years, and updating each Element as needed.

The Environmental Safety, Noise, Housing, Public Services and Safety elements were last updated in

2004, the Parks, Recreation and Trails element was last updated in 2003. The City is currently in the process of updating the Circulation Element. An amendment to the Specific Plan is necessary in order to incorporate revised policies and objectives adopted by the City since the adoption of the College Park Specific Plan in 1999 and due to changed circumstances.

Policy L1.1.4: In considering requests to amend the Land Use Map, discourage proposals for development requiring urban services in those areas which are functionally separated from developed portions of the City by lack of infrastructure, expanses of vacant land, significant topographic or jurisdictional barriers, or other similar constraints.

> The Foothill Ranch Specific Plan proposes to amend the Land Use Map of the General Plan to change the land use designation from Special Development (SD) to Specific Plan. The provisions of the Special Development designation recommend that development proposals be approved through a comprehensive planning process, such as a specific plan. Therefore, the purpose in the change in land use designation is to recognize the Foothill Ranch Specific Plan.

- Objective L1.2: Implement annexation policies that promote logical and orderly boundaries, respond to community concerns, and minimize fiscal impacts to the City.
- Policy L1. 2.1: Focus planning efforts within the present sphere of influence during the planning period.

The Foothill Ranch Specific Plan area is located within the current General Plan Sphere of Influence.

Policy L1.2.2: Seek to negotiate equitable property tax transfers with the County of Los Angeles for areas proposed for annexation, to ensure cost recovery to the City for increased municipal services to

#### these areas.

Prior to the annexation of the property, both the City of Palmdale and County of Los Angeles adopted a tax transfer resolution, transferring a negotiated rate of 7 percent of the general property tax levy, from the County of Los Angeles to the City of Palmdale following annexation of the area.

# Policy L1.2.3:Consider the provisions of adopted<br/>Memorandums of Understanding in establishing<br/>land use regulations for areas to be annexed.

This area was the subject of an adopted Memorandum of Understanding (College Park Project MOU). The City complied with the provisions of the MOU when it approved the General Plan Amendment allowing for the adopting of the College Park Palmdale Specific Plan and the a Conditional Use Permit for the construction of the community college campus.

In addition, a Memorandum of Understanding has been established for the area north of the project site (Southside MOU). The Southside MOU sets forth design criteria related to additional development occurring within its boundaries. The Foothill Ranch Project is not within the boundary limits of the Southside MOU.

Policy L1.2.4: Encourage Los Angeles County to apply City of Palmdale land use policies and standards to development proposals within the City's sphere of influence.

This policy does not apply to this specific plan.

## Policy L1.2.5: Evaluate future annexations to consider the following criteria:

- a. No annexation should occur unless:
  - 1. An equitable property tax transfer can be negotiated with the County to

ensure cost recovery to the City for providing municipal services to these areas; or

- 2. The area to be annexed would provide benefits including but not limited to employment opportunities, increased jobs-housing balance, recreational amenities or other elements having a citywide benefit which outweigh the potential long term fiscal costs; or
- 3. Sales tax or other revenue sources resulting from annexation will adequately offset service costs to the City, as determined by the City Council
- b. Evaluation of annexation proposals should fully consider all costs, including capital facilities, maintenance and administration costs, associated with each proposal. These costs may include but are not limited to upgrading, retrofitting and maintenance of infrastructure facilities, including but not limited to sewer, water, streets, street lighting and storm drainage; code enforcement; housing rehabilitation needs; provision of social and recreational programs; law enforcement, fire protection and emergency services; and City administration.
- c. No annexation of largely undeveloped areas should occur unless adequate master planning of infrastructure has been completed to the satisfaction of the City.
- d. The annexation of land to the City shall represent a logical expansion of City boundaries and provide for a planned, orderly and efficient pattern of urban development. Annexation requests shall

not be approved where the City Council finds that such expansion of the City's boundary may be determined to the value and development potential of property within the existing municipal boundaries.

- e. A primary function of the City of Palmdale is to provide municipal services to support urban development. Therefore, future annexations should focus on those areas which are planned for and represent a logical extension of urban services and development. Servicing of non-urban areas should remain a function of the County.
- f. The City should focus annexation efforts on "County islands" and other areas which are infill in nature, where affected residents and property owners are generally supportive of such annexation efforts, and should give priority to annexing these islands over further expansion into outlying areas.
- g. Annexation of any area which is within the boundaries of an adopted community standards district shall consider and respect the provisions of such standards in any future land use approvals.

The Specific Plan area was annexed in December, 1999 therefore this no longer applies.

- Objective L1.3: Ensure compatibility between land uses which have different functions, requirements and impacts.
- Policy L1.3.1: On the Land Use Map, designate land uses in consideration of topography, environmental constraints, availability of infrastructure, and intensity of adjacent uses.

The subject property is designated as Special Development (SD). The purpose of this land use designation is to recognize properties which have

	development potential and require the preparation of comprehensive planning studies be prepared prior to project approval. Studies related to topography, environmental constraints, infrastructure and adjacent uses are encompassed within the Foothill Ranch Specific Plan and its accompanying documents.
Policy L1.3.2:	Adopt standards for transition areas between potentially incompatible uses.
	The Foothill Ranch Specific Plan provides for compatibility between land uses.
Policy L1.3.3:	Through the development review process, evaluate proposals with respect to their impacts on adjacent properties, including their impacts on existing uses of those properties, and require that project designs employ appropriate techniques to increase compatibility between uses.
	All of the lots within the Specific Plan area will be a minimum of one acre to be compatible with adjacent properties and to reduce the development's impact on those properties.
Objective L1.4:	Adopt land use policies which minimize exposure of residents to natural hazards, protect natural resources, and utilize land with limited development potential for open space and recreational uses where feasible.
Policy L1.4.1:	Establish the following transitional standards between Mineral Resources Extraction designations and less intensive uses, in order to protect residents from noise and dust while preserving the availability of mineral resources:
	a. Where feasible, encourage a transition of uses between quarry operations and less intensive uses.
	<ul> <li>Separate residential neighborhoods from mineral extraction zones by public streets, setbacks, berms, landscaping, green belts,</li> </ul>

trail systems, or other similar buffers or combinations thereof.

c. When land designated for less extensive uses abuts mineral extraction areas, the responsibility for providing adequate buffers should be borne equitably by both quarry operators and adjacent developers, where feasible based upon existing conditions and existing approvals.

This policy does not apply to this specific plan.

Policy L1.4.2: Establish the following standards in and adjacent to Alquist-Priolo Earthquake Fault zones and active fault zones, in order to protect residents, property and infrastructure systems from damage by seismic activity:

- a. Restrict development of habitable structures in these zones in accordance with requirements of State Law.
- b. Establish a maximum permitted density within all land between the outer boundaries of the Alquist-Priolo Earthquake Fault Zone of three (3) dwelling units per acre gross within residentially-designated land within the project site, except where the Land Use Map indicates lower densities in these areas. This policy specifically excludes any non-residential land uses within the project site from calculation of gross densities.
- c. Require placement of roads, utilities and other infrastructure to be located outside of active fault zones, where feasible.

An extensive geotechnical study has been completed and reviewed in accordance with the State Alquist-Priolo requirements. Potentially active faults have been mapped with appropriate structural setbacks, thereby defining areas where development may occur. The circulation system has been designed so that streets generally cross perpendicular to fault lines. The specific plan requires that utilities avoid setback areas and cross faults in a perpendicular fashion.

Of the project site's 540 acres, 393 acres are located within the Alquist-Priolo Zone, of which 238.4 acres are designated by the Specific Plan as residential. As the project proposes a minimum lot size of one acre, no more than 238 residential units can be located within the Alquist-Priolo Fault Zone.

### Policy L1.4.3: Establish the following standards for development in hillside areas:

- a. Development in hillside areas should minimize grading, conform to natural topography, preserve ridgelines and exhibit sensitivity to natural landforms.
- b. Development should be restricted on natural slopes of fifty percent and greater.
- c. Visually prominent ridges and hillsides should be retained in a natural condition.
- d. Flexibility in land use regulations may be permitted when it can be demonstrated that such flexibility will meet hillside management objectives.

The grading concept for the site employs natural terrain wherever possible. Where practical, moderately steep slopes exceeding 50% slope will be incorporated into the passive open space areas, and/or larger single-family lots, thereby allowing the property to retain its existing land form.

# Policy L1.4.4: Establish the following land use policies adjacent to airport uses:

a. On the Land Use Plan, designate uses adjacent to airport uses which minimize

land use conflicts with future expansion of airport operations.

- b. When considering land use proposals adjacent to airport uses, evaluate such proposals with respect to the policies developed by the Joint Land Use Committee which have been incorporated into the Noise and Safety Elements.
   This policy does not apply to this specific plan.
- Objective L1.5: Identify areas within the City which, through deterioration of structures, high vacancy rates, vandalism, or health and safety concerns, merit special attention, and develop programs to revitalize these areas.
- Policy L1.5.1: Develop a coordinated effort between City departments and agencies administering the municipal, zoning and building codes, law enforcement, fire prevention, public health, housing and social services, to upgrade blighted areas within the City.

This policy does not apply to this Specific Plan.

- **GOAL L2:** Adopt land use and development policies which encourage growth and diversification of the City's economic base.
- Objective L2.1: Promote creation and retention of businesses within the City, to increase employment opportunities within the Antelope Valley.
- Policy L2.1.1: Promote establishment of incentives for new industrial development in Palmdale through all available programs, including local, state and federal programs.

This policy does not apply to this Specific Plan.

Policy L2.1.2: Adopt comprehensive land use documents to designate areas for business and industrial users,

such as specific plans, which will simplify
environmental and development review
processing for new businesses and ensure
coordinated infrastructure planning.

The Foothill Ranch Specific Plan establishes business-oriented uses (neighborhood commercial in conjunction with the provision of necessary infrastructure. Infrastructure construction will occur in concert with the phasing of these various uses in accordance with the project's phasing plan.

Policy L2.1.3: Adopt strategies to provide opportunities for a wide range of business needs, including start up, expansion, and relocation.

This policy does not apply to this Specific Plan.

Policy L2.1.4: Cooperate with local financial institutions through the Community Reinvestment Act to facilitate establishment and retention of new business in Palmdale.

This policy does not apply to this Specific Plan.

Policy L2.1.5: Promote opportunities for transportation-related industries which utilize air, rail and highway facilities, specially with respect to freight transfer and distribution facilities.

This policy does not apply to this Specific Plan.

Policy L2.1.6: Consider the jobs/housing balance in evaluating new development proposals.

The Foothill Ranch Specific Plan proposes a mix of uses, including business-oriented and residential opportunities. The neighborhood commercial will provide some new jobs and tax base for the City.

## Policy L2.1.7: Support new technologies which may result in increased business opportunities within the City.

This policy does not apply to this Specific Plan.

Policy L2.1.8:	Support creation and adoption of a separate air quality management plan for the Southeast Desert Air Basin portion of the South Coast Air Quality Management District.
	This policy does not apply to this Specific Plan.
Objective L2.2:	Provide assistance to business owners and users through all available means, including education, outreach, coordination and financing.
	This objective does not apply to this Specific Plan.
Objective L2.3:	Revitalize the core area of Palmdale so as to maintain and enhance its economic viability.
	This objective does not apply to this Specific Plan.
Objective L2.4:	Address the special needs of existing businesses and minimize the amount of land in the downtown area devoted to vehicle storage in proportion to that utilized for active businesses.
	This objective does not apply to this Specific Plan.
GOAL L3:	Provide a high quality of life for all existing and future residents, meeting the needs of a variety of lifestyles.
Objective L3.1:	Provide for the distribution of residential densities and housing types to meet the varied lifestyles and needs of existing and future City residents.
	The existing General Plan designates the site SP-17 (Foothill Ranch Specific Plan). The proposed Specific Plan will provide for residential, commercial and open space areas within the 540 acres. The minimum lot size of one acre will provide opportunities for a rural-residential lifestyle, including the housing of horses, adjacent to the countywide trail system designed for such uses.

Policy L3.1.2: In calculating the actual permitted density on a

parcel of land, the following constraints will be considered:

- a. No residential density shall be calculated for any seismic setback zone adjacent to active or potential active fault traces where construction of habitable structures is not permitted, as delineated by site-specific geotechnical report. However, seismic setback zones may be included in the calculation of minimum lot area and building setbacks. Areas located within the Alquist-Priolo Earthquake Zone, as delineated by the State Geologist, are subject to the density limitations described in Policy L1.4.2.
- A maximum residential density of .5 (one/half) dwelling unit per acre shall be calculated for flood hazard areas shown on the latest Flood Insurance Rate Map as Zone A, and within the historic high water mark of Amargosa Creek, Ana Verde Creek, Littlerock Wash, Big Rock Creek, Hunt Canyon or any natural blue-line creek, except where the Land Use Map indicates lower densities in these areas.
- c. In hillside areas, density calculation will also be subject to the provisions of the City's Hillside Management Ordinance.

On January 7, 1997, City Council adopted a general plan amendment (Resolution No. 97-002) detailing site specific policies related to the development of the subject property. These site specific policies regulate ultimate development of the property. Therefore, the above city wide policies do not apply to this Specific Plan.

Objective L3.2: Adopt policies for residential uses within the City to enhance the quality of residential neighborhoods.

Policy L3.2.1:	Permit a range of residential densities and housing types throughout the City, rather than concentrating higher densities in limited areas.
	The proposed project will provide for rural-residential style housing on lots of one acre or more. This type of residential development is largely unavailable with the city due to existing physical and developmental constraints. The density of development is highly compatible with the physical limitations of the area, including Hunt Canyon and the San Andreas Fault Zone, as well as access to the countywide trail system which traverses the property.
Policy L3.2.2:	Direct the location of senior and multi-family housing to areas accessible to public transportation, supportive commercial uses, and community facilities.
	This objective does not apply to this Specific Plan.
Policy L3.2.3:	Maintain the useability of residential yard areas through development of standards for accessory structures in residential districts, and through exclusion of required landscape easements from calculation of required lot area.
	The Specific Plan establishes appropriate yard setbacks for residential uses. Landscape features have been established outside of individual single- family residential lots wherever possible. Unless specifically noted in this plan, lot area calculations shall be in accordance with the City's subdivision and zoning code.
Policy L3.2.4:	Maintain 7,000 square feet as the minimum lot size standard for single family residential subdivisions; permit flexibility from this standard in conjunction with approval of a comprehensive planning document such as a specific plan or planned residential development.
	The minimum lot size permitted in the Foothill Ranch Specific Plan is one acre.

Policy L3.2.5:	Preserve the viability and value of existing multi- family neighborhoods by considering the long- term impacts of proposed condominium conversions on residents as well as on adjacent properties, and develop standards and criteria to guide decisions on proposed conversions.
	This policy does not apply to this Specific Plan.
Policy L3.2.6:	Require disclosure, as deemed appropriate, on proposed residential developments which are affected by existing conditions such as, but not limited to, mineral resource extraction, noise, dust, odors, light seismic hazards, and frequent overflight of aircraft.
	Disclosures will be provided to project residents regarding seismic hazards as outlined in the Implementation Section of this Specific Plan.
Objective L3.3:	Protect existing mobile home parks as an affordable housing alternative, and provide opportunities for development of new mobile home or manufactured housing communities.
	This objective does not apply to this Specific Plan.
Objective L3.4:	Consider underlying topography, existing parcelization, existing land uses, infrastructure availability, and relationship between uses in designating and developing residential land uses.
Policy L3.4.1:	Encourage flexible siting and design techniques and density transfers in hillside or physically constrained areas to preserve steep slopes or unique physical features.
	Residential land uses are located within the flatter developable areas of the site. Steeper terrain is incorporated into the areas of natural open space along Barrel Springs Road and up Hunt Canyon.
Policy L3.4.2:	Adopt rural design standards in areas where

# minimum net lot size is 40,000 square feet or larger.

Rural design standards may be implemented on a case by case basis. This may include rolled curb, limited sidewalks and minimal lighting levels with a standard right-of-way dedication. Specific Planning Areas within the Specific Plan may eligible for this type of development standard, though this will be determined at the time tentative map(s) are submitted for approval.

### Policy L3.4.3: Avoid designating land for higher density uses where prevailing existing development patterns are rural residential with lot sizes of one (1) acre or more.

The existing density of the project is currently 1.6 du/acre, the proposed General Plan Amendment and this Specific Plan Amendment will lower this to 0.7 du/ gross acre. This is consistent with the existing development patterns within the surrounding area which consist of lots of one to five acres.

Policy L3.4.4: Encourage subdivision design techniques that reflects underlying physical topography. Density and intensity of development should decrease as slope steepness increases.

> Residential land uses are located within the flatter developable areas of the site. Steeper terrain is incorporated into the areas of natural open space along Barrel Springs Road and up Hunt Canyon.

Policy L3.4.5: When residential development is proposed outside the urban core, where urban infrastructure does not exist and no plans exist for provision of backbone infrastructure, require the preparation and approval of comprehensive planning documents such as specific plans, area plans and master facilities studies to assess the project's needs and impacts.

Appropriate master plan studies have been prepared

to set forth infrastructure systems to support the residential and neighborhood commercial aspects of the Specific Plan and will be required to be updated when development is proposed.

- Objective L3.5: Ensure that future residential development provides an attractive living environment and creates long-term value for residents as well as the community.
- Policy L3.5.1: Adopt design standards for multi-family development which will create a safe, convenient, attractive environment with public or private open space and recreational on-site amenities.

This policy does not apply to this Specific Plan.

Policy L3.5.2: Adopt standards for the design of single family subdivisions that will ensure functional integration with existing development, community facilities and supportive services.

> The project has been designed to incorporate significant amounts of open space with the residential neighborhoods of the project. This is accomplished with the development of the active and passive recreational facilities, connected by passive recreation areas and a landscaped trail system.

Policy L3.5.3: Consider intensity as well as density of development in evaluating residential projects, building mass and coverage should be proportional to the size of parcel being developed.

> The subject property is approximately 540 acres. Large amounts of open space uses have been located within the project to distribute building mass associated with the residential components of the project.

Policy L3.5.4: Require mobilehome parks and subdivisions to provide sufficient open space and recreational amenities to adequately serve their residents and assure consistency with surrounding

#### development.

Foothill Ranch provides for the active and passive recreational facilities to serve the needs of project residents. These active and passive recreational facilities are available for public use and are connected to a trail system which ties the residential neighborhoods. In addition, the project's trail system connects to a regional multi-use trail along the north side of Barrel Springs Road.

Policy L3.5.5: Require that development is designated to be sensitive to the preservation and protection of the desert environment and that building orientation and design consider and complement the natural characteristics of the desert environment.

Steeper terrain and areas of significant existing vegetation have been incorporated into the natural open space along Barrel Springs Road and up Hunt Canyon. Proposed structures have been located in areas of flatter terrain and sparse vegetation.

Objective L3.6: Maintain the integrity, safety, and attractiveness of existing residential neighborhoods.

This objective does not apply to this Specific Plan.

- GOAL L4: Provide opportunities for a wide range of retail and service commercial uses, to serve neighborhood, community and regional needs and provide economic benefit to the City of Palmdale.
- Objective L4.1: Provide sufficient land to accommodate a variety of commercial land uses to meet community needs.
- Policy L4.1.1: On the Land Use Map, establish land use designations to meet the City's long-term needs as follows:
  - a. Office Commercial: The Office Commercial

(OC) designation is designed to accommodate a variety of professional office uses, including medical, personal, business, legal, insurance, real estate, financial, and other similar uses. Limited retail, service, child care and eating establishments may be permitted to support the primary office users within this designation, provided that they function as a supportive use and do not detract from the stated intent of this designation. Vocational, technical and trade schools, private or public college or universities, and supportive commercial uses may be consistent with this designation, provided that land use compatibility and infrastructure are adequately addressed through the design review process. This designation is appropriate between more intensive commercial uses and residential designations, or within commercial areas serving the administrative and professional service needs of businesses and the general public. The maximum floor area ratio within this designation is 1.0. Mixed use residential/office should be encouraged within the Office Commercial designated portion of the Downtown Revitalization area through the development of appropriate mixed use development standards.

 b. Neighborhood Commercial: The Neighborhood Commercial (NC) designation provides for convenience type retail and service activities designed to serve the daily needs of the immediate neighborhood. Goods and services provided serve the short-term needs of local residents. Typical neighborhood commercial development is located on sites of 15 acres or less with a maximum floor area ratio of .50. Site and building designs for neighborhood commercial development should be sensitive to adjacent residential

### uses. Buffering should be both effective and aesthetic with site design emphasizing both automobile and pedestrian needs.

Foothill Ranch Specific Plan proposes the development of neighborhood commercial uses. This commercial use will provide convenient retail and service activities for area residents. The neighborhood commercial services will be carefully designed so that the Plan's trail system will provide pedestrian access for area residents.

Objective L4.2: Adopt policies for siting and development of commercial land uses which ensure that designs are efficient, functional, and attractive to users and adjacent properties.

Policy L4.2.1: Encourage development of commercial uses in nodes accessible from major streets and intersections, rather than in long, continuous strips.

The neighborhood commercial uses will be located on Foothill Ranch Road, which serves as the major collector road through the Plan area.

- Policy L4.2.2: Ensure that commercial uses are spaced at appropriate intervals throughout the City in order to adequately serve users while minimizing land use interface conflicts and preserving the capacity of arterial streets, through the following measures:
  - Avoid the creation of strip commercial development along arterial roadways.
     Cluster commercial development in nodes to the extent feasible.
  - b. Require that nodes of commercial development intended to serve primarily a neighborhood service function be spaced at no closer than one-half mile from other commercial designations.

	c. Preserve a minimum spacing of one mile between commercial areas serving primarily community or regional service functions, to the extent feasible.
	The proposed commercial facility is intended to contain neighborhood retail and services. No other commercial uses are within one-half mile of the site.
Policy L4.2.3:	Avoid overdesignating commercial land uses, in order to maintain the value of existing commercial designations and void high vacancy rates.
	The proposed neighborhood commercial will serve local residents needs related to convenience goods and services only.
Policy L4.2.4:	Develop and permit uses that promote the City's role as a center of regional retail commercial uses.
	This policy does not apply to this Specific Plan.
Policy L4.2.5:	Discourage future strip commercial development along Palmdale Boulevard. Consider the designation of less intensive uses such as professional offices or residential with non- Palmdale Boulevard access points.
	This policy does not apply to this Specific Plan.
Policy L4.2.6:	Encourage lot consolidation and shared parking and driveways in areas of small existing parcel sizes.
	This policy does not apply to this Specific Plan.
Policy L4.2.7:	Consider future commercial land use needs on the City's far west side and designate additional commercial land as deemed appropriate to serve west side residents.
	This policy does not apply to this Specific Plan

This policy does not apply to this Specific Plan.

Policy L4.2.8:	Establish site specific siting criteria for commercial land uses as set forth below:	
	a.	Commercial development should be located in areas free from major topographic variation.
	b.	Commercial uses should be located and designed in such a way as to minimize interface conflicts with existing and planned residential neighborhood.
	C.	Commercial sites should have a high level of visibility from public streets.
	adjac	eighborhood commercial uses will be located ent to Foothill Ranch Road. This road serves as ajor collector road through the Plan area.
Policy L4.2.9:	Avoid designating land for commercial uses simply because residential uses appear inappropriate. Consider other alternatives, including but not limited to the following:	
	а.	Creating an environment suitable for residential uses by employing design techniques to minimize noise/traffic impacts such as sound walls, landscaped setbacks, frontage roads, use of drainage basins, linear parks, greenbelts and trail systems to buffer dwelling units from major transportation corridors.
	b.	Considering alternative uses such as industrial, open space, public facilities, or commercial office.
	This p	policy does not apply to this Specific Plan.
Policy L4.2.10:	conve to mi	lop standards for location and operation of enience stores and other 24-hour businesses nimize impacts on residential borhoods.

Commercial building construction will be buffered by passive natural open space and is significantly set back from Barrel Springs Road to lessen impacts to residents in the Palmdale Estates neighborhood.

Policy L4.2.11: Establish design criteria for neighborhood shopping centers that promote pedestrian elements and design integration with surrounding residential uses.

> The neighborhood commercial uses have been carefully located so that the Plan area's trail system will provide pedestrian access for Plan area residents.

Policy L4.2.12: Ensure that impacts from adult entertainment and sexually oriented businesses are minimized by providing sufficient separation from residential neighborhoods, churches, schools, and other sensitive uses.

This policy does not apply to this Specific Plan.

Policy L4.2.13: Develop standards to ensure that development of all commercial buildings within a center are designed to be consistent with an overall design theme, utilizing unifying architectural styles, colors and material schemes, integrated pedestrian walkways, and similar measures.

This policy will be implemented with development approvals.

Policy L4.2.14: Adopt standards for parking lot landscaping to enhance aesthetic appeal and to provide a tree canopy for vehicular shading.

Landscaping standards for parking lots have been incorporated within this Specific Plan and shall govern the design of these facilities within the Plan area.

Policy L4.2.15: Develop design criteria and development standards to ensure that commercial developments are planned, phased and

	constructed in a manner which integrates design elements, including but not limited to parking, landscaping, access and building orientation within an overall development plan.
	The architectural and landscape concepts for the Plan area requires that the design of the commercial structures are integrated with the entire Plan area.
<u>GOAL L5</u> :	Provide opportunities for a wide range of manufacturing and related industrial uses in the City, so as to facilitate expansion and diversification of the City's economic base and provide additional employment opportunities.
Objective L5.1:	Provide sufficient land to accommodate a wide variety of industrial uses to meet community needs.
	This objective does not apply to this Specific Plan.
Objective L5.2:	Adopt policies for siting and development of industrial land uses which ensure that designs are efficient, functional, and attractive to users and adjacent properties.
	This objective does not apply to this Specific Plan.
<u>GOAL L6</u> :	Plan for and reserve land to accommodate uses needed for public benefit, including open space, recreation, public improvements, schools and community facilities.
Objective L6.1:	Ensure that adequate land is available for uses serving or providing benefit to the general public.
Policy L6.1.1:	On the Land Use Map, designate land for public uses to meet community needs for schools, parks, community facilities, open space, utilities, and infrastructure.
	The Foothill Ranch Specific Plan proposes a variety of significant community facilities. These facilities include a 5-acre neighborhood park site, pedestrian

and bicycle facilities and a link of the City's proposed multi-use trail.

- Objective L6.2: Adopt development standards for public uses to ensure compatibility with adjacent properties, minimize adverse impacts and maintain a high standard of quality for development within the City.
- Policy L6.2.1:Consider acceptance of natural open space<br/>dedications to the City if such dedication is<br/>consistent with City plans for an open<br/>space/greenbelt network. Lands proposed for<br/>dedication which lack potential for linkage with an<br/>overall system or lack valuable natural resources<br/>may not be suitable for acceptance by the City.

The Specific Plan proposes a variety of active and passive recreational facilities. The Plan's trail system will connect to the City's proposed multi-use trail located along the north side of Barrel Springs Road, incorporating the Plan area with the community-wide trail plan.

Policy L6.2.2: Provide a 1,000 foot buffer between the Antelope Valley landfill and future residential developments.

This policy does not apply to this Specific Plan.

GOAL L7:Provide proactive comprehensive planning within<br/>designated areas of the City where unique<br/>development opportunities or physical conditions<br/>warrant special planning efforts.

Objective L7.1: Identify areas within the City which merit special planning considerations and develop policies containing development criteria for these areas.

The General Plan designates the site as Special Development. This designation is described by Policy L7.1.8, as follows:

Policy L7.1.8: On the Land Use Map, establish a land use

designation that may be utilized in areas of the City currently lacking urban services but where future development is anticipated upon establishment of plans for infrastructure and related development issues as defined below:

#### **Special Development Designation**

The Special Development (SD) designation is appropriate for areas for which focused planning efforts to ensure orderly and logical development in accordance with General Plan policies are ongoing. The SD designation is placed upon areas which, due to lack of infrastructure and public services, topography, environmental sensitivity, and development constraints, require comprehensive planning prior to development which goes beyond the level of detail normally associated with the General Plan. This planning could be accomplished through the Specific Plan process, although other methods may be acceptable if they provide the following: 1) A detailed implementation program, including facility phasing and funding; 2) carefully prescribed balance of development and open space within a Planning Area, in an economically feasible manner; 3) special regulations that are responsive to unique local conditions; and 4) necessary flexibility for long-range planned community projects.

Other than single-family dwellings on existing lots, development is primarily intended to be residential in nature, with a gross density of 0-2 dwelling units per acre. However, supportive commercial uses are anticipated within the (SD) designation. Actual permitted residential densities and the location and intensity of commercial uses are to be determined based upon a site's capacity to accommodate the proposed development, considering such factors as availability of urban services; adequacy of existing and proposed roads to service the proposed densities; physical constraints, including slopes, drainage courses, faults, or similar features; compatibility with adjacent land uses; or other requirements of development, as identified through the review process. In no instance shall the density range established for this designation be interpreted as a guarantee of permitted density.

Upon preparation, review and adoption of one or more comprehensive Specific Plans or similar comprehensive planning document(s) for property within this designation, higher residential density and the location and intensity of supportive commercial uses may be established based upon environmental, topographic, and infrastructural capacity of the land as defined by supporting documentation. With approval of such Specific Plan or comprehensive planning studies, a General Plan Amendment may be approved to amend the land use designation as determined appropriate pursuant to those studies.

In accordance with this designation, the overall land use density for the proposed Plan area is 0.7 units per gross acre.

The Foothill Ranch Specific Plan has been designed in accordance with specific criteria set forth by General Plan Policy L7.1.9 as follows:

Policy L7.1.9:Ensure that future development within the College<br/>Park Palmdale Specific Plan (formerly the<br/>Bushnell Special Development Area) considers<br/>physical constraints on the property, including<br/>earthquake faults and canyon areas, and that<br/>densities are established which maintain<br/>consistency with the south side area in<br/>accordance with the following criteria:

1. Clustering of residential units shall be used to ensure preservation of open space in steeper areas and within fault zones.

The Specific Plan provides large areas of open

space interspersed with residential neighborhoods. The Specific Plan provides approximately 155 acres of open space area.

The Specific Plan has been drafted to consider physical constraints, including earthquake faults, structural setbacks and Canyon areas.

2. **Concurrent with tract recordation of Phase** 3 (as determined by the approved Specific Plan) a covenant shall be recorded on land encompassing Hunt Canyon and along Barrel Springs Road as determined by the approved Specific Plan to ensure that these areas remain open space. In addition, should these areas not be developed as a golf course in accordance with the College Park Palmdale Specific Plan and related **Development Agreement, a system of** hiking trails, passive open space, and park improvements such as picnic and seating areas and open play areas shall be developed at the same schedule required of the golf course development.

> The Specific Plan Amendment proposes elimination the golf course and utilizing this area as open space. Construction of amenities within the open space will be governed by Appendix D of the Specific Plan and will be consistent with the previous development timeline for the golf course.

# 3. A trails system shall be provided which connects to a regional system to the extent feasible.

The Foothill Ranch Specific Plan will provide for connections to the planned multi-use trail along the north side of Barrel Springs Road. The Specific Plan provides an interior multi-use trail system to connect the area's residential, neighborhood commercial and open space uses to the multi-use trail. 4. All neighborhood commercial uses proposed as part of the Specific Plan shall be limited to those serving only the shortterm goods and services needs of the community college and nearby residential areas. No 24-hour uses or gas or service stations shall be permitted. Design of any commercial facilities shall be compatible with the overall community design theme.

> Neighborhood commercial uses will include, but are not limited to convenience stores, book store, and restaurants to serve the nearby residential areas. Drive through and major tenant businesses are not permitted. Gas and service stations are not included in the permitted use lists.

The Neighborhood Commercial Standards under Section 5 of this Specific Plan establish uses permitted, as well as uses permitted through Site Plan Review, Conditional Use Permit and Planning Director Determination. The purpose of these standards is to provide development provisions which are responsive to changing economic and market requirements over time.

The neighborhood commercial area will offer an opportunity to strengthen the community character of the Plan area through the application of a common set of architectural design criteria compatible with the overall community design theme.

5. Design and operation of any commercial facilities shall reduce impacts on nearby residential areas to the extent feasible through limiting hours of operation to no later than midnight, allowing light fixtures no higher than 14 feet to minimize glare, providing a minimum of 10% of the site for landscaping, and architecturally screening

all equipment and utility devices. If rooftop equipment cannot be screened from adjacent or nearby properties, groundmounted equipment should be provided and screened. Design of any neighborhood commercial center shall be compatible with the overall community theme of the College Park Palmdale Specific Plan.

The commercial facilities are interior to the Specific Plan, convenient to project residential taking access from Foothill Ranch Road.

Design and operation of commercial facilities consistent with this item are provided under Item 5.6 of Section Five, Development Standards of the Foothill Ranch Specific Plan, which establishes commercial site development standards. These standards include, but are not limited to: limiting the hours of operation, restricting lighting fixtures to fourteen (14) feet in height, screening of ground and rooftop equipment, landscaping design standards for compatibility with the overall community theme of the Foothill Ranch Specific Plan.

6. A Master Drainage Plan shall be provided utilizing natural open space and drainage areas to the extent feasible. A master infrastructure plan shall be provided for the area, considering sewer, water, roads and public services.

> Exhibit 19 shows the proposed master drainage plan for the Foothill Ranch site. This item is consistent with the provisions under Item 3.4.2 of Section Three, Development Plan of the Foothill Ranch Specific Plan.

7. Access to the Community College Campus shall be provided on 47th Street East. Driveway access to the neighborhood commercial site will be allowed from Barrel Springs Road and 47th Street East. The design of such access shall be subject to the review and approval of the City Traffic Engineer and Planning Director at the time of development review. Primary access to Barrel Springs Road for the residential portions of the project shall be limited to one (1) access point, in addition to 37th Street East, except that additional residential access to Barrel Springs Road may be allowed as temporary or emergency access only where deemed necessary by the City Engineer. Parking will be prohibited along all Barrel Springs Road.

The General Plan Amendment proposes to eliminate the Community College Campus and associated academic academy. Residential units are proposed for the 80 acres previously designated for the college.

Primary access to Barrel Springs Road for the residential portions of the project is limited to one (1) access point (Foothill Ranch Road), in addition to 37th Street East. Parking is prohibited along all arterial roadways.

8. A minimum of one-acre (1) lots and/or open spaces shall be provided at the periphery at the periphery of the non-college portion of the project area, to assure consistency with the surrounding rural area; specifically, this requirement applies to land south of Barrel Springs Road, west of 47<sup>th</sup> Street East, the east of 37th Street East and north of the alignment of Avenue V.

> The General Plan Amendment proposes the elimination of the Community College Campus and that the area currently designated for the college campus be utilized for residential development, with a minimum of one-acre lots, ensuring consistency with the existing development patterns of the surrounding area.

9. Subject to the availability of the necessary and appropriate State financing for construction of the Community College Campus and necessary infrastructure, an approximately eighty-acre site will be set aside for the establishment of a community college land use. This site shall be located in the southeast corner of the site and shall take access from 37th Street East and College Park Road.

> The General Plan Amendment and Specific Plan Amendment propose the elimination of the eighty acre site (seventy acres for the Community College Campus and ten acres for an Academic Academy) and that this area be designated for residential development. This area is located at the southwest corner of the site and shall take access from 37th Street East and Foothill Ranch Road.

- 10. Subject to development of the community college campus described in criteria (i), the following shall apply:
- a) The following residential densities may be allocated to and/or transferred to the residentially-designated portions of the project site for the purpose of determining a maximum unit count: Residential acreage: two (2) dwelling units/acre College acreage: two (2) dwelling units per acre Golf Course/Open Space: one-half (.5) dwelling units per acre

With respect to the areas designated for Community College and Golf Course/Open Space uses, the proposed dwelling units described above shall represent the entire residential development potential for those areas, and all dwelling units shall be transferred from those areas to the portion of the site designated for residential uses. No residential uses shall be permitted within the Community College Campus or Golf Course/Open Space portions of the project site.

The General Plan Amendment and Specific Plan Amendment propose to eliminate the Community College Campus and designate this area for residential uses. Additionally, the amendments propose to allow for a maximum density of one dwelling unit per gross acre across, with a further reduction in density based on unbuildable areas within the San Andreas Fault Zone and the Hunt Canyon drainage area.

b) Minimum lot sizes for the interior portion of the residentially-designated areas of the project may be less than 7,000 square feet in area, provided that all other design policies on the project are met, but shall in no instance be less than 5,000 square feet in area.

> The General Plan Amendment and Specific Plan Amendment propose a minimum lot size of one acre for the entire Specific Plan area to ensure consistency with the existing development patterns within the surrounding area.

11. Residential density may not exceed three (3) dwelling units per acre (gross) within residentially-designated land within the Alquist-Priolo Fault Zone; this policy specifically excludes golf course property, parks and open space, commercial and college property from the calculation of gross densities.

The proposed General Plan Amendment will

eliminate the golf course component and reduce the density across the 540 acres site to 1 dwelling unit per gross acre, with further reductions for unbuildable areas within the San Andreas Fault Zone and the Hunt Canyon drainage area. As the minimum lot size will be one acre, and approximately 238.4 acres is located within the zone, the project will not exceed 3 du/acre within residentially designated land within the Alquist-Priolo Fault Zone.

A General Plan Amendment is proposed specifically for Policy L7.1.9, as enumerated in the Implementation Section of this document.

### 4.2 CIRCULATION ELEMENT

GOAL C1:Establish, maintain and enhance a system of<br/>streets and highways which will provide for the<br/>safe and efficient movement of people and goods<br/>throughout the Planning Area, while minimizing<br/>adverse impacts on the community.

Objective C1.1: Adopt and implement a street and highway plan designed to meet existing and future circulation needs.

The Foothill Ranch Specific Plan takes access from two arterial streets identified in the General Plan: Barrel Springs Road and 47th Street East. In addition to these two arterials, the Specific Plan sets forth a hierarchy of other streets (collectors, local streets and cul-de-sacs) to organize circulation within the project. The Specific Plan also requires the improvement of 37th Street East along the westerly boundary. This improvement will enhance access to adjacent ownerships to the south and west.

Objective C1.2: Maintain and expand the arterial and regional roadway system to serve existing and future circulation needs.

The Specific Plan circulation system has been

designed to promote even traffic flow within the project and along the project's perimeter. Arterial roads are limited with respect to intersection spacing, access and parking. Appropriate traffic mitigation and intersection improvements are provided in accordance with recommendations of the traffic report prepared for the Plan area.

Objective C1.3: Establish a system of local and collector streets which serve residential neighborhoods while protecting them from intrusion of through traffic flow.

> The Specific Plan requires a local collector street system that connects the various individual planning areas of the Plan area. This includes the construction of Foothill Ranch Road, as well as local collectors within the individual planning areas themselves.

> Individual residential neighborhoods will be designed to distribute local traffic evenly to the Plan area's collector street and arterial street systems. All streets that are within the single-family neighborhoods will be constructed in accordance with the design criteria of the City Engineer.

### Objective C1.4: Adopt policies and standards for street design and construction which promote safety, convenience and efficiency.

Arterial streets will be designed and constructed in accordance with the City Traffic Engineer and the recommendations of the traffic report prepared for the Plan area. Local streets will be designed with adequate intersection spacing and shall encourage four-way intersections on collectors and Tintersections on local streets and cul-de-sacs.

### Objective C1.5: Identify and mitigate existing areas of deficiency within the street system in the Planning Area.

This objective does not apply to this Specific Plan.

Objective C1.6: Ensure that the City street system is adequately

### maintained, to promote safety and increase the useful life of these facilities.

Public streets shall be designed in accordance with the specifications of this Specific Plan and the City Engineer and shall be offered for dedication and maintenance by the City. Private streets and driveways will be owned and maintained by an appropriate quasi-public agency such as a homeowners association.

# Objective C1.7: Ensure adequate access within the Planning Area for trucks, while protecting incompatible uses from through truck traffic.

Non-residential uses which may receive some level of truck traffic are located adjacent to the two major streets which serve the Plan area : Foothill Ranch Road and 37th Street East. These streets have access to Barrel Springs Road, 47th Street East, and Pearblossom Highway, which acts as the existing route for "through" truck traffic on the south side of the City.

## Objective C1.8: Participate in multi-jurisdictional efforts to upgrade and expand the regional road network.

This objective does not apply to this Specific Plan.

Objective C1.9: Plan for the development of arterial streetscapes which present an aesthetically pleasing appearance, promote ease of use for pedestrian and non-motorized as well as vehicular traffic, and provide maximum public safety through design features.

> Barrel Springs Road will be visually enhanced with the provision of the passive natural open space along the north boundary of the Plan area. Pedestrian and bicycle connections to a multi-use trail identified by the City's Parks, Recreation and Trails Plan are included.

### **GOAL C2**: Reduce the number of trips and vehicle miles

travelled by individuals within the Planning Area, to meet regional transportation and air quality goals.

Objective C2.1: Encourage development and implementation of a variety measures to reduce trips and vehicle miles travelled by existing and future residents and workers within the Planning Area.

The Foothill Ranch Specific Plan has been designed to accommodate multiple modes of travel including vehicular, pedestrian and bicycle facilities.

Objective C2.2: Increase the public transit opportunities available to Palmdale residents in order to reduce traffic impacts on streets and highways and provide travel alternatives.

The Specific Plan encourages the extension of public transit facilities to the neighborhood commercial and residential elements of the project. Bicycle and pedestrian trails will link project residents with transit facilities which may be provided along Foothill Ranch Road and 37th Street East.

- **GOAL C3**: Encourage use of non-vehicular transportation throughout the Planning Area.
- Objective C3.1: Minimize the need for short service-oriented vehicle trips though land use and design strategies.

The project's design provides for neighborhood commercial uses and recreational facilities within a convenient distance to project residents. Pedestrian and bicycle trails connect the land uses within the project.

- GOAL C4:Promote opportunities for rail service to move<br/>goods, passengers and commuters into and out<br/>of the Planning Area.
- Objective C4.1: Promote the use of rail service to support industry in the City.

This objective does not apply to this Specific Plan.

### Objective C4.2: Encourage extension of passenger rail service to the City of Palmdale.

This objective does not apply to this Specific Plan.

<u>GOAL C5</u>: Protect and promote a variety of air transportation services within the City of Palmdale.

### Objective C5.1: Protect opportunities for full utilization and expansion of Air Force Plant 42.

This objective does not apply to this Specific Plan.

Objective C5.2: Promote development of Palmdale Regional Airport.

This objective does not apply to this Specific Plan.

#### 4.3 ENVIRONMENTAL RESOURCES

**GOAL ER1:** Preserve significant natural and man-made open space areas that give Palmdale its distinct form and identity.

## Objective ER1.1:Create and maintain and open space network<br/>throughout the City.

The project sets aside over 155 acres of open space and 5-acre neighborhood park site. In addition, a trail system will link the project amenities.

### Objective ER1.2: Protect scenic viewsheds both to and from the City of Palmdale.

The project site is located in the low-lying foothills below the San Gabriel Mountains. Given the terrain characteristics of the foreground ridge located on properties to the north of the project, views of the project from the city are limited to distant locations. The visual effect of the project will be "small grain" in nature. Therefore, appropriate architectural guidelines to control massing and color are provided within the Specific Plan framework.

Local views along Barrel Springs Road are enhanced with the provision of open space. The visual aspects of Hunt Canyon are also retained, thereby maintaining existing view corridors.

Policy ER1.2.1: development New with the potential to substantially obscure or negatively alter the City backdrop to should scenic the be discouraged. "Scenic backdrop" refers to the significant ridgelines of the San Gabriels, the Sierra Pelona and the Ritter and Portal Ridges that form the City's skyline views.

> The project will not alter the scenic backdrop of the San Gabriel Mountains by limiting the height of structures, requiring natural materials and colors on all buildings and limiting lighting on the site.

- Policy ER1.2.2: The following roadways are designated as City scenic highways. Apply special design standards for projects adjacent to these highways (as contained in the implementation section) in order to protect their scenic qualities. (General Plan Amendment 98-3, adopted by City Council June 10, 1998.)
  - 1. Barrel Springs Road
  - 2. Tierra Subida Avenue
  - 3. Sierra Highway, South of Avenue S
  - 4. Elizabeth Lake Road
  - 5. Pearblossom Highway
  - 6. Bouquet Canyon Road
  - 7. Godde Hill Road
  - 8. Antelope Valley Freeway, south of Rayburn Road

The project will be buffered from Barrel Springs Road by the open space located directly south of the roadway and the maintenance of existing native vegetation and limited new plantings. Buildings will be set back from the road and the colors and materials utilized on the buildings will ensure that residential development is compatible with the criteria for a scenic route.

Policy ER1.2.3: Encourage all new development along scenic highways to maintain sufficient spacing between buildings, perimeter walls and large growing vegetation in order to maintain scenic view corridors of hillsides and open space to the maximum extent feasible.

The project will include an open space buffer along Barrel Springs Road where the golf course was previously located.

- GOAL ER2:Protect significant ecological resources and<br/>ecosystems, including, but not limited to,<br/>sensitive flora and fauna habitat areas.
- Objective ER2.1:Identify and preserve to the greatest extent<br/>feasible significant ecological areas.

The site is not located within a Significant Ecological Area (as identified by the County of Los Angeles) nor does it contain significant joshua tree woodlands.

Objective ER2.2: Ensure local compliance with State and Federal Endangered Species Acts.

This objective does not apply to this Specific Plan.

- **GOAL ER3:** Preserve designated natural hillsides and ridgelines in the Planning Area, to maintain the aesthetic character of the Antelope Valley.
- Objective ER3.1: Establish a systematic approach to the management of land uses and development in hillside areas.

The Foothill Ranch Specific Plan provides for development to be concentrated in the flatter portions of the site. Steeper terrain is incorporated passive natural open space areas and the larger single-family lots. Grading for the project will be in conformance with the City's Hillside Management Ordinance.

### **<u>GOAL ER4</u>**: Protect the quality and quantity of local water resources.

### Objective ER4.1: Ensure that ground water supplies are recharged and remain free of contamination.

Areas of potential groundwater recharge (i.e., Hunt Canyon) have been maintained in open space uses.

### Objective ER4.2: Minimize the impacts of urban development on groundwater supplies.

Landscaping plans for the developed areas will encourage drought-tolerant plant species recommended by the City's landscape architect. Where feasible, landscape areas within open space uses shall incorporate drip irrigation systems to promote water conservation.

Objective ER4.3: Maintain and further the City's commitment to long-term water management within the Antelope Valley by promoting and encouraging planning for the conservation and managed use of water resources, including groundwater, imported water, and reclaimed water.

If made available, reclaimed water will be used for irrigation needs of landscaped areas.

## <u>GOAL ER5</u>: Promote the attainment of state and federal air quality standards.

Objective ER5.1: Minimize local air pollution caused by vehicles.

The Foothill Ranch project has been designed to accommodate multiple modes of travel including vehicular, pedestrian and bicycle facilities.

### Objective ER5.2: Minimize activities which generate dust, specifically particulate less than 10 microns in size (PM10).

The Specific Plan is drafted to compliment the natural contours of the site and reduce grading. Grading

	quantities will be balanced within the limits of the Plan area. Final grading design will be phased wherever possible to reduce grading activities to those areas under development as the Plan area builds out, avoiding the need to grade the entire site at one time.
	Through Plan area buildout, proper erosion control measures shall be maintained to control dust and potential loss of soil.
Objective ER5.3:	Reduce and/or eliminate unnecessary sources of air pollution.
	This objective does not apply to this Specific Plan.
Objective ER5.4:	Minimize emissions of air toxins and pollutants which contribute to global warming and ozone depletion.
	This objective does not apply to this Specific Plan.
Objective ER5.5:	Reduce air pollution caused by energy consumption.
	Project construction shall use energy saving fixtures and plumbing as required by state and local codes.
Objective ER5.6:	Minimize emissions from indirect sources such as commercial, residential and recreational development.
	Local trips for convenience-oriented services will be reduced by the provision of the neighborhood commercial shopping and the pedestrian trails and bicycle facilities.
<u>GOAL ER6</u> :	Ensure an adequate supply of mineral resources to meet long-term regional construction needs.
Objective ER6.1:	Recognize the regional importance of the classified and designated mineral deposits within Palmdale's Planning Area (as described in <u>Special</u> <u>Report 143, Part V. Classification of Sand and</u> <u>Gravel Resource Areas, Saugus-Newhall</u>

	Production-Consumption Region and Palmdale Production-Consumption Region, and Designation Report No. 6. Designation of Regionally Significant Construction Aggregate Resource Areas in the Saugus-Newhall and Palmdale Production-Consumption Regions and as shown on Exhibits ER-1B and ER-1C) and discourage encroachment of incompatible land uses which could threaten the long-term viability of sand and gravel mining and processing operations in the Little Rock Wash area.
Objective ER6.2:	Ensure that the MRE area located within the Little Rock Wash alluvial fan is comprehensively planned.
	This objective does not apply to this Specific Plan.
GOAL ER7:	Protect historical and culturally significant resources which contribute to the community's sense of history.
Objective ER7.1:	Promote the identification and preservation of historic structures, historic sites, archaeological sites, and paleontological resources in the City.
	The environmental reconnaissance of the subject property identified an archaeological site along Hunt Canyon. This site consisted of a disposal or rubbish pile from the early 1900's. Artifacts from this site were catalogued and collected in accordance the City's policies and procedures for archaeological sites.
	In addition, the Palmdale Ditch has been nominated for listing in the National Register of Historic Places.
GOAL ER8:	Avoid the premature conversion of agricultural lands to urban uses.
Objective ER8.1:	Identify significant farm lands pursuant to the State of California Important Farmlands Inventory and provide for their preservation as an interim

### use within the Planning Area.

This objective does not apply to this Specific Plan.

#### 4.4 PUBLIC SERVICES

GOAL PS1:Ensure that adequate public services and<br/>facilities are available to support development in<br/>an efficient and orderly manner.

### Objective PS1.1: Ensure that all new development in Palmdale provides for the infrastructure and public services needed to support it.

The Foothill Ranch Specific Plan sets forth master infrastructure systems (both onsite and offsite) to serve the proposed Plan area. These facilities will be designed per the requirements of the City of Palmdale and, where appropriate, offered for dedication.

Objective PS1.2: Ensure that new development is coordinated with provisions of backbone infrastructure within the site and with adjacent properties, to promote cost-efficient construction and maintenance, and ease of access to facilities.

Street, sewer, water, storm drain and other infrastructure has been designed to serve the needs of the Plan area and extend services to other existing adjacent properties. To promote cost-effective construction, downstream sewer improvements will be sized to accommodate those geographic areas adjacent to the site which are tributary to these systems. Wherever possible, underground facilities will be located within street rights-of-way to promote ease of access for required maintenance.

### Objective PS1.3: Utilize land use strategies to maximize use of infrastructure facilities.

The Foothill Ranch Specific Plan establishes a master plan for the provision of infrastructure and public improvements. This master plan provides for alignment and capacity, as well as, a phasing plan for timing of construction and potential financing programs for construction of improvements.

### Objective PS1.4: Develop and implement City programs to plan for, construct and maintain municipal facilities.

The Implementation Section of this document sets forth financing systems for construction and maintenance of infrastructure and public facilities.

Objective PS1.5: Coordinate with other jurisdictions in the Antelope Valley to provide for regional infrastructure improvements, minimize impacts of Palmdale development on adjacent jurisdictions, and provide unified support for mutually beneficial improvements requiring outside approvals and/or funding.

> The Specific Plan includes the construction of a debris basin in Hunt Canyon along the southern boundary of the site. The basin shall be designed in a coordinated effort with the City Engineer and the Los Angeles County Department of Public Works.

Objective PS1.6: Ensure that utilities are provided to serve development in Palmdale in an efficient and aesthetic manner.

As required, all infrastructure and service systems necessary to support the Plan area shall be placed underground along street right-of-ways. In addition, easements will be provided for the underground pipe related to the Palmdale Ditch and sewer and water systems.

- **GOAL PS2:** Ensure that all development in Palmdale is served by adequate water distribution and sewage facilities.
- Objective PS2.1: Require that all development be serviced by water supply systems meeting minimum standards for domestic and emergency supply and quality.

The Foothill Ranch Specific Plan proposes additions

to the existing regional water system necessary to serve the project. These additions will greatly enhance fire protection in the area.

Objective PS2.2: Require that all development be served by sewage disposal systems which are adequately sized to handle expected wastewater flows and designed and maintained to protect the health of residents.

All proposed uses within the Plan area shall be connected to an underground sanitary sewer system. This system includes a local network within the project and the provision of offsite systems to transport sewage northerly to the existing treatment plant.

## **GOAL PS3:** Develop and maintain adequate storm drainage and flood control facilities.

### Objective PS3.1: Maintain and implement the City's adopted Master Drainage Plan.

A retention basin along the southern boundary will provide a regional flood control benefit for downstream properties.

## Objective PS3.2: Coordinate drainage master planning with environmental resource management.

The open space will be improved to incorporate the existing drainage patterns of the subject property.

## GOAL PS4:Support the revision of local educational<br/>opportunities for community residents.

Objective PS4.1: Cooperate with school districts serving the City of Palmdale to develop and implement strategies for obtaining school sites and construction financing.

> Consultation with Keppel Union School District has determined that a school site is not required on the project site. Therefore, any development will pay school impact fees at the time building permits are

issued to assist in the construction of needed school sites.

## Objective PS4.2: Promote a variety of educational opportunities within Palmdale, to serve the needs of all segments of the population.

The Keppel Union School District has indicated that there is not need for an elementary school site on the Plan area. The Antelope Valley Union High School District has purchased property on the southwest corner of Pearblossom Highway and 47<sup>th</sup> Street East to construct a new high school to service this area. Additionally, the Antelope Valley Community College District has purchased land within Palmdale with the intention of constructing a campus within the southern portion of the Valley.

# **<u>GOAL PS5</u>**: Support the provision of adequate public and community services to meet the needs of residents.

### Objective PS5.1: Ensure provision of fire protection facilities and equipment needed to protect existing and future development.

The subject property is served by Los Angeles County Fire Station 131 and Fire Station 37. In addition, the property is within the United States Forest Service Mutual Aid Area.

Development of the Specific Plan area will also provide for the expansion of existing water storage facilities in the area, thereby enhancing the current level of fire protection.

### Objective PS5.2: Support the provision of adequate law enforcement services to meet the needs of City residents.

As part of the annexation process, negotiations occurred which transfer property taxes collected by the County of Los Angeles to the City of Palmdale. These transferred funds will offset the increased costs of police protection resulting from the project.

Objective PS5.3:	Provide library service to meet the needs of existing and future library residents.
	At the time building permits are issued, a Public Facility Impact Fee will be required to offset future demand for library services.
Objective PS5.4:	Provide adequate park and recreation facilities to meet the needs of existing and future residents.
	The Specific Plan designates over 155 acres for recreational use. This includes passive open space and 5-acre neighborhood park site as well as trail systems connecting area residents with amenities.
Objective PS5.5:	Promote adequate provision of health care services and programs which serve all segments of the population.
	This objective does not apply to this Specific Plan.
Objective PS5.6:	Provide accessible, convenient facilities for municipal services.
	This objective does not apply to this Specific Plan.
Objective PS5.7:	Provide enforcement services to ensure compliance with municipal codes and ordinances, to protect public health and safety, preserve property values, and maintain a clean and orderly environment for Palmdale residents.
	This objective does not apply to this Specific Plan.
Objective PS5.8:	Provide opportunities for cultural and artistic activities within the community.
	This objective does not apply to this Specific Plan.
GOAL PS6:	Ensure provision of adequate facilities and programs to accommodate solid waste and hazardous waste collection, handling and disposal.

Implement the City's adopted Solid Waste Management Plan (SWMP) (adopted on November 14, 1991 by Resolution 91-236)
Area residents will take part in the City's Solid Waste Management Plan through participation in City- organized recycling and domestic toxic waste disposal programs.
Adopt a City Hazardous Waste Management Plan as an element of the General Plan.
This objective does not apply to this Specific Plan.
Provide for open space elements throughout the planning area which preserve significant natural, historic, scenic and topographic features while minimizing fiscal impacts to the City and its residents.
Ensure that any land proposed to be acquired, dedicated or maintained by the City will contribute benefits to the general public, and that short- and long-term impacts of accepting responsibility for such land are adequately evaluated by the City.
The Foothill Ranch Specific Plan proposes a significant open space element. The primary open space will be passive open space with multi-use trails throughout.
The Specific Plan provides active and passive recreational facilities as a part of the 5-acre neighborhood park site. This facility is linked to a combination multi-use trail. This trail is to be constructed in a 32-foot wide parkway enhanced with significant landscape treatments. This trail shall be incorporated into an overall trail system connecting the residential portions of the Specific Plan to the neighborhood commercial uses. The trail system will also connect to the identified multi-use trail proposed by the City's Parks, Recreation and Trails Plan.

As required by the City's annexation policies, a fiscal impact report has been prepared evaluating City revenues and costs associated development.

- GOAL PS8: Encourage and facilitate a wide variety of communication services and providers to serve businesses and citizens within the City, while avoiding adverse impacts to health, land use, environmental resources, or aesthetics which may result from unregulated proliferation of communication facilities
- Objective PS8.1 Allow a two-tiered review process for communication facilities, to ensure that providers are not unnecessarily delayed on minor projects, while giving the public an opportunity to comment on projects that affect them.

This objective does not apply to this Specific Plan.

Objective PS8.2: Ensure that communication facilities are installed and operated to as to avoid adverse health impacts on residents of the community from electromagnetic radiation, improperly installed or located facilities, or other health and safety hazards.

This objective does not apply to this Specific Plan.

Objective PS8.3: Ensure that the installation and operation of communication facilities throughout the City are compatible with existing and planned land uses, and will not cause adverse environmental impacts.

This objective does not apply to this Specific Plan.

Objective PS8.4: Ensure that the general public does not bear the cost of providing communication services, that cost recovery for use of public land and infrastructure is commensurate with the benefit provided, and that providers of communication services are treated equitably within the City.

This objective does not apply to this Specific Plan.

4.5 SAFETY GOAL S1: Minimize danger and damage to public health, safety, and welfare resulting from natural hazards. **Objective S1.1:** Review development within or adjacent to geologic hazards, to ensure adequate provisions for public safety. An extensive Alquist-Priolo Special Studies Zone report has been prepared and reviewed by the City of Palmdale engineering staff. This report involved over two miles of trenching in order to physically locate and document potentially active faults within the subject property. From this data, specific structural setbacks and restricted use zones have been established to protect future structures and residents of the Specific Plan area. Streets and underground infrastructure have been aligned to generally cross fault zones in a perpendicular fashion with flexible connections to withstand seismic events. **Objective S1.2:** Minimize hazards associated with flood plains in the area. The Specific Plan provide for significant drainage structures which will benefit downstream flood control. Habitable structures within the residential and neighborhood commercial uses of the plan have been located to avoid flood hazard. **Objective S1.3:** Ensure compatible development in areas within or adjacent to natural high fire risk areas (urbanwildland interface), and other high fire risk areas. Landscaping for the Specific Plan shall incorporate drought-tolerant, fire resistant plant materials currently recognized by the City's landscape architect. Methods of ingress and egress are provided both

north and south on 47th Street East, east and west on Barrel Springs Road, and north on 40th Street East.

- GOAL S2: Minimize damage associated with man-made hazards.
- Objective S2.1: Minimize damage from catastrophic failure of infrastructure.

The proposed detention facilities associated with the natural open space area are located in Hunt Canyon or along Barrel Springs Road. No proposed residential uses are downstream of the basin area.

Objective S2.2: Minimize damage resulting from aircraft accidents.

This objective does not apply to this Specific Plan.

Objective S2.3: Protect the public from hazardous materials and the hazards associated with the transport, storage or disposal of such materials.

This objective does not apply to this Specific Plan.

Objective S2.4: Ensure that development of a federal, state, or county prison in Palmdale shall not impact the health, safety, and lifestyle of residents.

This objective does not apply to this Specific Plan.

Objective S2.5:Minimize potential hazards related to crime<br/>through the development review process and<br/>through on-going public education programs.

The safety aspects of all proposed development associated with the residential and neighborhood commercial uses shall be subject to design review prior to construction.

#### Objective S2.6: Minimize exposure of residents to other manmade hazards, to the extent feasible.

This objective does not apply to this Specific Plan.

GOAL S3:	Maintain and enhance City emergency services.
Objective S3.1:	Prepare the Palmdale community to be self- sufficient in the event of an emergency.
	This objective does not apply to this Specific Plan.
<u>GOAL S4</u> :	Protect public safety through the implementation and enforcement of City Ordinances and through public education.
Objective S4.1:	Develop, implement and enforce City Codes to insure safe and sanitary living and working conditions throughout the City.
	Recordation of the various subdivisions related to individual Planning Areas will require the preparation of appropriate CC&Rs and architectural restrictions in order to ensure the future maintenance and upkeep of structures proposed by the development.
Objective S4.2:	Support the development and continued updating of public education programs on health and safety.
	This objective does not apply to this Specific Plan.
NOISE	
<u>GOAL N1</u> :	Minimize the exposure of residents to excessive noise to the extent possible. through the land planning and the development review process.
Objective N1.1:	Utilize appropriate land use planning as the primary method of achieving noise compatibility among adjacent land uses.
	The site is not currently impacted by existing noise sources which may produce compatibility issues. In the developed condition, noise sources will be limited to Barrel Springs Road and 47th Street East. Residential structures proposed along 47th Street East will be located well above the grade of the street.

4.6

Noise mitigation for Specific Plan area residents along Barrel Springs Road will be provided by the provision of open space uses.

Objective N1.2: Protect and maintain those areas having acceptable noise environments.

As the Specific Plan area develops, construction hours will be limited in accordance with City Codes and Ordinances.

- GOAL N2:Promote noise compatible land uses within the 65CNEL contour and the Frequent Overflight Area of<br/>Air Force Plant 42.
- Objective N2.1: Ensure that land uses planned in the vicinity of Plant 42 will not be adversely affected by present and future noise levels expected to be generated by Plant 42.

This objective does not apply to this Specific Plan.

4.7 HOUSING

GOAL H1: Promote the construction of new housing affordable to all income groups.

Objective H1.1: Provide sites at a range of densities adequate to accommodate future housing needs.

The Foothill Ranch Specific Plan proposes lot sizes ranging of one acre or more. The Specific Plan will provide a residential density largely unavailable within the city due to existing physical and developmental constraints.

### Objective H1.2: Increase the supply of ownership housing affordable to households with very low, low and moderate income.

Market demands will determine the affordability of the Specific Plan .

Objective H1.3: Increase the supply of rental housing affordable

to households with very low, low and moderate income.

This objective does not apply to this Specific Plan.

Objective H1.4: Maintain the supply of housing affordable to low and very low income persons.

This objective does not apply to this Specific Plan.

### Objective H1.5: Reduce government constraints on the production of housing.

The Implementation Section of the Foothill Ranch Specific Plan sets forth processing necessary for the buildout of the area. In order to expedite processing, the Specific Plan encourages concurrent processing of subdivisions as well as conditional use permits and zoning actions where required.

- **GOAL H2:** Preserve and improve the existing supply of affordable housing.
- Objective H2.1: Bring existing housing units up to an established standard of habitability.

This objective does not apply to this Specific Plan.

Objective H2.2: Preserve existing units currently assisted by the federal, state or local government.

This objective does not apply to this Specific Plan.

**<u>GOAL H3</u>**: Increase the capacity of the City to develop and implement housing programs.

Objective H3.1: Administer adequate housing programs to meet the needs of all Palmdale residents.

This objective does not apply to this Specific Plan.

<u>GOAL H4</u>: Promote equal housing for all persons regardless of race, religion, sex, marital status, ancestry, national origin, color, age or physical condition.

Objective H4.1:	Promote fair housing practices and prohibit discrimination.
	This Specific Plan shall comply with all laws prohibiting discrimination and promoting fair housing practices.
GOAL H5:	Adequately house households with special needs.
Objective H5.1:	Expand the housing supply which is affordable for senior citizens.
	Dependent on market demands, the Specific Plan has the flexibility to provide affordability in a range of housing types, including a senior housing community.
Objective H5.2:	Address the problems of homeless persons.
	This objective does not apply to this Specific Plan.
Objective H5.3:	Encourage an increase in the supply of three and four bedroom rental units available to lower income households with large families.
	This objective does not apply to this Specific Plan.
Objective H5.4:	Increase handicapped access to housing.
	Public improvements associated with the residential and neighborhood commercial elements of the Specific Plan shall be designed in conformance with Americans With Disabilities Act (ADA) requirements.
Objective H5.5:	Expand rental assistance to the City's lower income and special needs households.
	This objective does not apply to this Specific Plan.
Objective H5.6:	Coordinate social services with housing to meet the needs of households with special needs.
	This objective does not apply to this Specific Plan.

- GOAL H6: Implement energy and water conservation measures.
- Objective H6.1: Require all newly constructed housing to utilize a full range of water and energy conservation measures.

Development of the Foothill Ranch Specific Plan will be in conformance with mitigation measures from the Specific Plan 's Environmental Impact Report regarding water conservation and energy efficiency.

Objective H6.2: Provide information and assistance to the public about energy and water saving modifications for existing housing.

This objective does not apply to this Specific Plan.

### 4.8 PARKS, RECREATION AND TRAILS

**<u>GOAL PRT1</u>**: Provide adequate parks to meet the needs of existing and future residents.

Objective PRT1.1: Adopt and implement a standard of 5 acres of parkland per 1,000 population for the City.

This Objective establishes a standard for the overall provision of parkland for Palmdale on a city-wide basis. The Foothill Ranch Specific Plan will provide significant additions to the City's current recreational facilities with the provision of a variety of recreational facilities.

Foothill Ranch provides 155 acres of open space and 5-acre neighborhood park site. With an estimated Specific Plan area population of 1,923, this equates to a Specific Plan area ratio of 80.6 acres/1,000 population.

The Specific Plan also incorporates other recreational opportunities, including significant trails and active pedestrian and bicycle facilities and a five acre neighborhood park. In order to evaluate the recreational contributions of proposed Specific Plan area developments, the City of Palmdale has adopted a Park Land Dedication Ordinance (Ordinance 505). Applicants can (1) provide park land, (2) pay an in-lieu fee to the City, or (3) provide a combination of both for the purpose of providing park and recreational facilities. Ordinance 505 states:

"The term "PARK AND RECREATION FACILITIES" shall include, but is not limited to, land and interests in land, swimming pools, tennis and volleyball and basketball courts, baseball grounds, children's recreation buildings, and other works, properties, structures and facilities necessary or convenient for public park, playground and recreation purposes; and also including any of above-described facilities constructed or installed within or upon any public school grounds where City is given a right to use the same for public playground or recreation purposes."

The approximately 5 acres of active area includes recreational facilities such as a tot lot, picnic and play area and hard courts,. The total value of the improvement costs of these active recreational facilities will meet or exceed the statutory requirements of Ordinance 505.

Objective PRT1.2: Explore various means of acquiring parkland and seek creative and flexible techniques to accomplish City park goals, including but not limited to fee vouchers in exchange for parkland.

> The Specific Plan calls for no residential density within uninhabitable portion of the Alquist-Priolo Fault Zone and the maintenance of this area as open space.

Objective PRT1.3: Wherever feasible, incorporate uses which increase the public benefit of park land, and are compatible with the goal of providing active recreation activities.

The open space along Barrel Springs Road. will be

designed to collect and convey storm water flows as well as provide storm water detention.

The 5-acre neighborhood park site is connected to the planned trail system. This trail system serves to link the various land uses of the Specific Plan area with the area's amenities.

Objective PRT1.4: Consider non-traditional types of parks to extend the range of recreational opportunity available within the City.

> The Specific Plan includes a trail system connecting the Specific Plan's residential areas with the neighborhood commercial uses, and open space uses.

## Objective PRT1.5: Ensure that parks and recreation facilities are accessible to all citizens.

Development of the recreational facilities will be in accordance with the design criteria of the City of Palmdale and the Americans With Disabilities Act.

Objective PRT1.6: To the extent feasible, incorporate active parks in the City's open space network and trails plan.

The active neighborhood park is connected to the Specific Plan's trail system, providing connection to the multi-use trail planned along the north side of Barrel Springs Road.

## Objective PRT1.7: Seek public input on design of all new neighborhood and community parks in Palmdale.

Development of the active and passive recreational facilities are regulated through designation standards in Section 5 of the Specific Plan.

<u>GOAL PRT2</u>: Provide a broad range of recreational programs, including programs for all age and activity levels, educational programs and cultural events, to enrich the lives of Palmdale residents.

Objective PRT2.1:	Provide a broad range of recreational activities for Palmdale youth.
	The neighborhood park will provide active recreational facilities and open space for City youth.
Objective PRT2.2:	Provide a variety of recreational activities for adults.
	The open space and neighborhood park will provide recreational opportunities for community residents.
Objective PRT2.3:	Continue to provide a broad range of recreational and social activities for seniors.
	The open space and neighborhood park will provide recreational opportunities for seniors within the community.
Objective PRT2.4:	Provide opportunities for cultural and artistic activities within the community.
	This objective does not apply to this Specific Plan.
Objective PRT2.5:	Continue to recognize and assist other public and private entities which provide recreation or cultural opportunities.
	This objective does not apply to this Specific Plan.
Objective PRT2.6:	Ensure that all residents have equal access to recreational and cultural programs and activities.
	The Specific Plan and its recreational facilities shall be developed in accordance with the Americans With Disabilities Act.
<u>GOAL PRT3</u> :	Provide a network of open space areas to provide for passive recreation opportunities, enhance the integrity of biological systems, and provide visual relief from the developed portions of the City.

Objective PRT3.1:	Encourage the use of open space areas for passive recreation.
	Foothill Ranch will provide passive recreational opportunities in the open space areas of the Specific Plan. Access to these areas is provided by the Specific Plan's trail system.
Objective PRT3.2:	Develop an open space network through preservation of corridors along fault zones, natural drainage courses and in hillside areas to connect with the large areas of open space designated in the General Plan Land Use Map.
	The passive open space incorporates the rift zone of the San Andreas Fault along Barrel Springs Road and Hunt Canyon running north-south through the center of the Specific Plan area.
<u>GOAL PRT4</u> :	Develop a system of multi-use trails which provide connections to the County trails system and the City of Lancaster trails system.
Objective PRT4.1:	Provide multi-use trails, for use by pedestrians, bicyclists and equestrians, connecting to existing or currently planned multi-use trails.
	The Foothill Ranch Specific Plan will provide for connections to the planned multi-use trail along the north side of Barrel Springs Road. The Specific Plan provides an interior trail system to connect the Specific Plan 's residential, neighborhood commercial and open space uses to the multi-use trail.
Objective PRT4.2:	Explore various means of acquiring trail easements or rights-of-way and pursue all available funding sources to provide trail acquisition and construction.
	Dedications and easements for the trail system will be provided through the recordation of subdivisions and agreements associated with Specific Plan area buildout.

## Objective PRT4.3: To the extent feasible, ensure that all trails are accessible to all residents.

Trails shall be designed and constructed under the direction and approval of the City Landscape Architect.

## **GOAL PRT5**: Promote bicycling as an important mode of transportation and recreation in the City of Palmdale.

### Objective PRT5.1: Encourage bicycling use by developing a comprehensive bikeway network for the City.

On-street bikeways will occur along Barrel Springs Road, 37th Street East, and 47th Street East. Connection of these facilities to the college, residential, and open space uses will be accommodated by the planned trail along Foothill Ranch Road. Linkage will be provided to the multiuse trail.

## Objective PRT5.2: Provide bikeways which suit the access needs of all bicyclists in the City of Palmdale.

On-street and off-street bikeways shall be developed to connect the various land uses. Bikeway design shall be in conformance with design criteria established by the City Engineer.

### Objective PRT5.3: Increase the level of public safety for all bicyclists.

The bikeway associated with Foothill Ranch Road is designed as a Class I grade-separated facility. Maintenance responsibility will be included within a landscape maintenance district or other appropriate agency.

### 4.9 COMMUNITY DESIGN

<u>GOAL CD1</u>: Create and maintain a well-designed built environment for the City of Palmdale, which contributes to the community's economic vitality

### and enhances the quality of life for it's residents.

## Objective CD1.1: Consider the relationship of each development project to its setting.

The Foothill Ranch Specific Plan has been designed to provide significant open space areas and landscape buffers along the edges of the Specific Plan area. This includes approximately a 500 foot setback along the north boundary (Barrel Springs Road).

Architecture and landscaping have been controlled to allow structures to blend with the site's terrain and character.

The infrastructure systems associated with the Specific Plan tie into existing systems. This includes access to two secondary highways (Barrel Springs Road and 47th Street East), access to the City's planned multi-use trail along the north side of Barrel Springs Road, a provision of significant open space in Hunt Canyon and along Barrel Springs Road providing visual open space as well as provisions for drainage improvements and connections to sewer and water systems existing and or planned for the area.

Lighting within the Specific Plan has been minimized to the greatest extent possible while still allowing for adequate security and safety. The landscaping Specific Plan has been organized to use existing vegetation including Joshua trees, Junipers, and the existing cottonwood community along Barrel Springs Road.

# Objective CD1.2: New development should contribute to the community character through design and quality workmanship.

Proposed neighborhoods are organized around the Specific Plan 's trail system as well as visual open space.

## Objective CD1.3:The history of Palmdale should be reflected in the community's design.

While the Specific Plan area's site and its surroundings have no specific historical significance, many of the architectural styles incorporate high desert architectural features. In addition, the landscaping program for the Specific Plan uses native vegetation including Joshua trees and Junipers in order to maintain continuity with the existing vegetation of the region.

## Objective CD1.4: Community design should create an environmental which is easy to understand and convenient for users.

The Foothill Ranch Specific Plan establishes a defined street pattern with a hierarchy of entry monumentation to assist Specific Plan area residents and users to their destinations. Entry points are highlighted by a combination of landscaping as well as Specific Plan area signage. In addition, pedestrian travel within the Specific Plan area is emphasized with the provision of a trail system interconnecting neighborhoods as well as land uses.

## Objective CD1.5: Functional public spaces should be created within development projects.

The Specific Plan design provides a number of functional public spaces for the use and enjoyment of residents. These spaces include the interconnecting trail systems. Passive space is kept to neighborhood level in order to enhance a sense of human scale.

### Objective CD1.6: Development should be designed to encourage and facilitate interaction of people and neighborhoods, rather than to create barriers between them.

The Specific Plan 's trail system will provide for interconnection between residential neighborhoods as well as connection to the neighborhood commercial uses of the Specific Plan. Where feasible, buildout of the local street and sidewalk systems will provide connections between neighborhoods in addition to the main trail system.

### Objective CD1.7: Site designs should provide for the comfort and safety of users.

Landscape elements and open spaces are interconnected with the project's trail system to promote pedestrian and bicycle use. Plant materials have been chosen to be compatible with extremes inherent to the Palmdale's desert environment including heat, cold and wind.

Objective CD1.8: The built environment should provide a visually interesting and stimulating setting by using varied physical forms and details which contribute to Palmdale's sense of place.

This policy will be implemented when development is proposed.

Objective CD1.9: Create an attractive environment for living, working and shopping, through adequate screening of equipment, utilities, loading and trash collection areas.

> This policy will be implemented when development is proposed. In addition, the specific plan contains language related to outdoor storage for the neighborhood commercial uses of the Specific Plan.

Objective CD1.10: All developments should relate to human scale.

Recreational open space is organized with the provision of a 5-acre neighborhood park site and the integrated trail system connecting open space uses with the other proposed uses of the Specific Plan area.

**GOAL CD2:** Enhance a "sense of place" within Palmdale by emphasizing the City's environmental setting, natural amenities, and human resources.

Objective CD2.1: Create a major focal point for community and civic activities which is centrally located, and minor focal points located within neighborhoods throughout the City, which are easily accessible, attractive, and which promote community interaction.

> The Specific Plan contains a number of focal points which will promote interaction within the proposed Specific Plan area as well as with the surrounding community.

### Objective CD2.2: Integrate the built environment with the natural environment.

The landscape concept incorporates Joshua trees and other native vegetation as well as drought tolerant vegetation from the City's identified plant list within landscape areas. architecture for the Specific Plan allows for generous eaves in the roof design as well as the potential for recessed windows and porches. Landscaping is designed to soften structural edges and Facades of buildings as well as provide retainment of mature trees and buffering along the Specific Plan area's perimeter.

#### Objective CD2.3: Emphasize and preserve the natural amenities and cultural features within Palmdale which contribute to the community's identity.

The design of Foothill Ranch uses the natural features and terrain of the Specific Plan area through provision of large areas of open space and the placement of proposed land uses. Residential land uses have been located in the flatter portions of the site.

Barrel Springs Road is identified by the City's General Plan as a scenic highway. Vistas along this scenic highway will be enhanced with the provision of natural open space. This visual open space provides approximately a 500 foot setback to proposed structures, thereby enhancing the open space characteristics of the corridor and protecting line of site vistas and panoramas of the surrounding mountains.

The specific plan provides for both solid and wrought iron view fencing. Solid walls will be incorporated in areas where rear yard privacy is an issue, while view fencing will be used in areas where views are available.

Objective CD2.4: Create a sense of arrival to Palmdale at major entrance points to the City, and enhance major focal points at designated locations throughout the City to crate a unified sense of place.

This objective does not apply to this Specific Plan.

Objective CD2.5: Recognize and encourage diversity of lifestyles in the community design for Palmdale.

This objective does not apply to this Specific Plan.

GOAL CD3: Recognize and maintain the rural character of large-lot residential development within the planning area, through establishment of rural development standards appropriate for these areas.

One-acre lots within the proposed Foothill Ranch Specific Plan are to be incorporated into the street scene of Planning Area A G and H. Therefore, the objectives, policies and design standards supporting GOAL CD 3 do not apply to this Specific Plan.

- <u>GOAL CD4</u>: Promote safe, functional, attractive single family residential neighborhoods, integrated with the surrounding community, and easily accessible by multiple transportation modes.
- Objective CD4.1: Subdivision design should ensure a functional and safe living environment for residents on each lot created.

Substantial buffering and setback from Barrel Springs and 47th Street East has been provided for residential uses within the Specific Plan. Sufficient buffering through the use of open space has been provided between residential and non-residential uses.

Other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

#### Objective CD4.2: In residential subdivisions, promote diversity within the context of an overall design theme, to provide a visually attractive neighborhood which relates well with its surroundings.

This policy and other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

# Objective CD4.3: Arterial and collector streets serving residential neighborhoods should contain varied streetscapes and views.

Significant landscape setbacks and parkways have been established for the main arterial and collector streets serving the Specific Plan area. Barrel Springs Road has approximately a 500 foot setback containing visual open space. Foothill Ranch Road has a 20-foot setback on the east side and a 32-foot setback on the west side of the street incorporating significant landscape elements as well as sidewalks and bicycle trails. Landscape features along this corridor include variations in plant massing as well as individual neighborhood entry monumentation.

Other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

### Objective CD4.4: Fences and walls within residential areas should contribute to the neighborhood identify and

#### enhance community design.

The Foothill Ranch Specific Plan establishes standards relating to the height, dimension and style of walls and fencing within the Specific Plan area.

Objective CD4.5: Residential neighborhoods shall be integrated with interconnected networks linking parks, schools, services and other neighborhoods.

> The trail system contains a pedestrian back bone trail and will connect to the neighborhood commercial uses, as well as the residential neighborhoods.

GOAL CD5: Multiple family housing shall provide a safe and pleasant living environment for residents and shall be integrated with surrounding neighborhoods so as to enhance the sense of community, through implementation of the following objectives and policies. (Exceptions may be granted for smaller projects of six or less units, or where these measures can be shown inappropriate).

Objective CD5.1: Site designs for multiple family developments shall relate to surrounding properties with respect to building locations, orientation, massing and setbacks.

This objective does not apply to this Specific Plan.

Objective CD5.2: Multiple family projects shall create a safe environment for residents.

This objective does not apply to this Specific Plan.

Objective CD5.3: Create a safe and convenient circulation system for vehicular, pedestrian and bicycle traffic, where feasible.

This objective does not apply to this Specific Plan.

Objective CD5.4: Design of multiple family developments should enrich the lives of residents by providing a variety

	of activities, places to meet and talk, visual interest in the surroundings, and screening of unsightly uses.
	This objective does not apply to this Specific Plan.
Objective CD5.5:	Ensure that manufactured housing communities meet the City's residential design goals.
	This objective does not apply to this Specific Plan.
Objective CD5.6:	Adopt standards for senior housing projects to provide for a living environment which meets people's needs in these communities over time.
	This objective does not apply to this Specific Plan.
<u>GOAL CD6</u> :	Commercial development in the City of Palmdale should enhance the community's economic vitality by providing a high quality environment for shopping and working.
Objective CD6.1:	Site planning for retail and office commercial development shall be integrated with adjacent properties and provides for optimum use of the site.
Objective CD6.1:	development shall be integrated with adjacent properties and provides for optimum use of the
Objective CD6.1:	<ul> <li>development shall be integrated with adjacent properties and provides for optimum use of the site.</li> <li>The neighborhood commercial uses have a significant setback from Barrel Springs Road. Architectural standards have been established in the specific plan for the development of the commercial structures to assure visual continuity with the rest of the Specific</li> </ul>
Objective CD6.1:	<ul> <li>development shall be integrated with adjacent properties and provides for optimum use of the site.</li> <li>The neighborhood commercial uses have a significant setback from Barrel Springs Road. Architectural standards have been established in the specific plan for the development of the commercial structures to assure visual continuity with the rest of the Specific Plan area.</li> <li>Other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by</li> </ul>

limited to driveways on Foothill Ranch Road. Parking areas will be set back to allow for a landscaped area providing visual screening.

Other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

# Objective CD6.3: Ensure that building placement, orientation and design create an attractive business environment in commercial areas.

This policy and other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

#### Objective CD6.4: Parking lot design and orientation should function well for site users and present an attractive appearance to enhance the business environment.

Parking lots shall be provided for the neighborhood commercial and uses. Appropriate parking ratios have been identified depending on the type of use and floor area. Landscape standards have been included to provide for setback and screening from adjacent streets. Landscaping within parking lot areas will provide shading for parked vehicles and soften the appearance of large areas of paved surface.

Objective CD6.5: Pedestrian elements and open space areas within commercial projects shall be designed to meet the needs of site users and enhance the development.

The Foothill Ranch Specific Plan encourages pedestrian spaces and architectural focal points including fountains, plazas and sculptures. Walkways are encouraged to provide overhangs or canopies through the design of arcades or trellises. Other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

Objective CD6.6: Lighting, walls and fences, and street furniture within commercial development should be designed to integrate with the project and the surrounding area.

The specific plan encourages location of lighting within the neighborhood commercial area to provide for public safety issues, however, lighting should be held to a minimum.

Neighborhood commercial structures will be located on Foothill Ranch Road and will be designed to provide buffering from residential uses and ensure minimal visual disturbance to surrounding residents.

Other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

Objective CD6.7: Signs should be designed as an integral part of the architecture for commercial/industrial development, in order to create a unique image for each project while contributing to the overall character of the area.

> The Foothill Ranch Specific Plan identifies sign standards related to the neighborhood commercial uses. These standards establish dimensional criteria as well as restrictions of sign type, color and lighting.

<u>GOAL CD7:</u> Establish design guidelines for mixed use project in which commercial retail, office and residential uses coexist, to ensure that such developments are attractive and functional while minimizing conflicts between used of different intensity.

While the Specific Plan provides a mix of residential,

commercial, and open space uses, it is not considered a "mixed use project" as contemplated by Goal CD7. Therefore, this goal and its supporting objectives do not apply to this Specific Plan.

GOAL CD8: Use landscaping to reinforce community identity, to create a pleasant environment, to control erosion and promote natural percolation of storm water, to provide protection from wind and hot summer sun, and to integrate new development into the surrounding district.

Objective CD8.1: Landscape design shall consider prevalent and successful landscape themes in the surrounding area, through the following measures.

The landscape concept for the Specific Plan incorporates existing native vegetation including Joshua trees and Junipers. Other plant materials for use in streetscapes and open space areas have been selected to be compatible with these native species.

Objective CD8.2: Choice and placement of plant materials should reflect the context of the site.

The landscape concept established by the specific plan provides for use of native plant species as well as deciduous and evergreen species. This will provide the Specific Plan area with a visually interesting landscape throughout the changing seasons of the year.

Plant materials have been selected for the trees as well as understory growth in streetscape and open space areas. These plant materials have been selected in conjunction with the City's identified plant list and the overall character of the site.

Other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

#### Objective CD8.3: Hardscape may be included in the overall

#### landscape design, based on the following criteria.

Policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

Objective CD8.4: Landscape design shall be sensitive to the desert environment as well as unique aspects of the site with respect to phasing of development, location, and other site features.

> Adequate erosion control and dust control shall be incorporated into the phased development of a development project. Existing mature trees and vegetation along Barrel Springs Road will be incorporated into the design of development wherever possible.

> A hierarchy of Specific Plan entry monumentation has been provided serving to establish community and neighborhood focal points with boulder groupings and landscaping.

> Various drainage basins have been incorporated into the design of the Foothill Ranch Specific Plan . These basins will serve to remove debris and provide detention resulting in downstream flood control improvement.

Other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

GOAL CD9: Incorporate a high quality of design into planning for public buildings, capital improvement projects, rights-of-ways, drainage facilities, open spaces, and other land uses owned or initiated by the City of Palmdale, to contribute to cohesive sense of place, enhance the overall quality of development in the City, and perpetuate the image which the City wishes to create.

## Objective CD9.1: Streetscape designs shall enhance and unify the community, define different districts, and be sensitive to the desert environment.

The Foothill Ranch Specific Plan takes major access from two secondary highways: Barrel Springs Road and 47th Street East. These secondary highways have no established or organized streetscape along the Specific Plan boundary or in the region. In order to create a transition from the existing conditions, the landscape concept for the Specific Plan employs a progression of plant materials along Barrel Springs Road.

In an effort to maintain continuity with the existing minimal streetscape, the Specific Plan has not proposed landscaped medians for Barrel Springs Road and 47th Street East. If medians where installed, they would be unique to the area and therefore not reflect the character of existing adjacent and contiguous streetscapes. Should future development in the region result in a change of character of the existing streetscapes, sufficient room within the street right-of-way has been reserved so that future construction of medians may occur.

The landscape concept has incorporated drought tolerant landscape materials and calls for efficient irrigation systems. Entry monumentation uses large boulders for neighborhood identification in an effort to blend with the existing character of the region.

Other policies and specific design criteria supporting this objective will be reviewed during the tentative map and site plan review process as established by the Implementation Section of this document.

Objective CD9.2: Ensure that drainage facilities are designed and landscaped to provide an attractive appearance from adjacent residences and the street, while maintaining their effectiveness in controlling stormwater runoff.

Various drainage basins have been incorporated into

the design of the Foothill Ranch Specific Plan . These basins will serve to remove debris and provide detention resulting in downstream flood control improvement.

Objective CD9.3: Create and maintain places for civic and social events which are in the public realm, in order to foster civic pride and enhance a sense of community.

Objective CD9.4:This objective does not apply to this Specific Plan.Objective CD9.4:Clearly demonstrate the quality of development<br/>desired in Palmdale, through education and<br/>example.

This objective does not apply to this Specific Plan.

Objective CD9.5: Address unmaintained properties, graffiti, litter, abandoned signs and other forms of blight which detracts from Palmdale's appearance and lifestyle.

This objective does not apply to this Specific Plan.

Goal CD 10: Facilitate creation and expansion of industrial uses within the City to accommodate manufacturing, distribution, and complementary office and support uses in order to expand the City's employment and economic base and improve the job/housing balance, while ensuring that such areas are compatible with adjacent uses and minimizing adverse impacts on more restrictive use districts.

Objective CD 10.1: In reviewing site design of projects within industrially-designated areas, consideration should be given to the location and setting of the project with respect to site visibility, adjacent uses and designations, abutting roadways, and other similar factors, to ensure that development requirements are appropriate for the vicinity and the intended use.

This objective does not apply to this Specific Plan.

Objective CD 10.2:	Industrial sites should be designed to ensure a functional, safe and visually pleasing environment for those who work in or pass through the area, through use of effective site planning. This objective does not apply to this Specific Plan.
	This objective does not apply to this Specific Flam.
Objective CD 10.3:	Design and placement of buildings in industrial designations should combine functionality with aesthetic considerations so as to present an attractive appearance to public rights of way and non-industrial areas, while serving the specialized needs of the industrial user.
	This objective does not apply to this Specific Plan.
Objective CD 10.4:	Ensure that development in industrial designations is provided with adequate access, including on and off-site circulation for both vehicular and non-vehicular traffic.
	This objective does not apply to this Specific Plan.
Objective CD 10.5:	Parking in industrial areas should be provided to meet the needs of both site visitors and employees, while minimizing excessive paving and maintaining an attractive appearance to the general public.
	This objective does not apply to this Specific Plan.
Objective CD 10.6:	Enhance the appearance of industrial areas by requiring screening of mechanical equipment, refuse storage areas, outdoor storage, loading, parking and utilities, where appropriate.
	This objective does not apply to this Specific Plan.
Objective CD 10.7:	Industrial sites should be user-friendly for employees and visitors, incorporating design features to accommodate a variety of convenient and needed facilities as site amenities.

This objective does not apply to this Specific Plan.

Objective CD 10.8: Landscaping of industrial properties should create a pleasant environment for site visitors and employees and provide adequate buffering for adjacent properties, while minimizing water usage and maintenance expense.

This objective does not apply to this Specific Plan.

Objective CD 10.9: Walls, fences and lighting within industrial areas should be designed to meet the security and functional needs of individual businesses while integrating the site with the surrounding area.

This objective does not apply to this Specific Plan.

### SECTION FIVE DEVELOPMENT STANDARDS

The purpose of this section of the Specific Plan is to provide Development Standards which serve as the zoning provisions governing the future development of Foothill Ranch.

These standards were formulated to insure compliance with the spirit and intent of the City of Palmdale Zoning Code (Ordinance No. 140). These standards govern the design of a mixed land use concept which contains residential, commercial, recreational and open space uses. Development Standards have been organized by land use elements. Within each element is a series standards that dictate permitted uses, setbacks and building heights. In addition, this section establishes standards for parking, signage lighting and grading.

#### 5.1 GENERAL PROVISIONS

- 5.1.1 All City of Palmdale Zoning Regulations in effect at the time of adoption of the Foothill Ranch Specific Plan shall apply, except where expressly addressed and/or modified by the Foothill Ranch Specific Plan or the Development Agreement if one is entered into by the City and the owner/developer.
- 5.1.2 In addition to these Development Standards, all development at Foothill Ranch is subject to the City's applicable Community Design Elements contained in Section Three of this Specific Plan. All subsequent tentative maps, conditional use permits, site plans, and planned residential developments, etc., shall be reviewed to determine consistency with these Development Standards and Community Design Elements as well as the City of Palmdale Zoning Ordinance.
- 5.1.3 The unit counts within the individual Planning Areas are subject to Planning Commission approval in conformance with the Design Elements, Development Standards and Implementation provisions contained in the Specific Plan. Should review of subsequent subdivision applications and site specific criteria relating to the physical characteristics of such areas demonstrate that the proposed number of units cannot conform within the requirements of the Specific Plan, the number of units within such Planning Areas may be reduced and transferred to another Planning Area.

- 5.1.4 If any regulation, condition, program or portion of this Specific Plan is held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct and independent provision, and the invalidity of such provision shall not affect the validity of the remaining provisions herein.
- 5.1.5 If a situation arises which is not sufficiently addressed in the Specific Plan or is not clearly understandable, then the Director of Planning shall render a determination or appropriate regulation deemed consistent with the intent of the Specific Plan and/or the City of Palmdale Zoning Ordinance.
- 5.1.6 The Development Standards of the Foothill Ranch Specific Plan were established in accordance with City of Palmdale Resolution No. 90-43 and Title 7, Division 1, Chapter 3, Article 8 of the California Government Code, Sections 65450 through 65457. If at any time a conflict arises between the Foothill Ranch Specific Plan Development Standards and the currently adopted Palmdale Municipal Code or any future modification thereof, the Foothill Ranch Specific Plan Development Standards shall prevail and be deemed applicable, unless otherwise provided herein.
- 5.1.7 All construction and development within the boundaries of the Specific Plan area shall comply with all applicable provisions of the Uniform Building Code and various related mechanical, electrical, plumbing, and subdivision codes and engineering design standards as required by the City of Palmdale.
- 5.1.8 Grading shall be subject to the standards of this specific plan and the City of Palmdale Hillside Management Ordinance.
- 5.1.9 Construction and maintenance of drainage facilities shall comply with the City's Storm Drainage Management Plan, City standards and requirements of the City Engineer.
- 5.1.10 All development shall be connected to and utilize a community sewer system for wastewater disposal. Sewer facilities shall comply with the requirements of the Los Angeles County Sanitation District and the City of Palmdale.
- 5.1.11 Water facilities shall comply with the Palmdale Water District

Requirements.

- 5.1.12 Foothill Ranch will be developed in accordance with applicable Los Angeles County Fire Department requirements.
- 5.1.13 All trails, open space and neighborhood park improvements will be in accordance with the review and approval of the City of Palmdale.
- 5.1.14 All improvements within public street rights-of-way and arterial road landscape easements shall be installed, maintained and paid for by the developer or other responsible party as specified in the Infrastructure Phasing and Financing Plan included as Appendix D.
- 5.1.15 The gross density is computed by dividing the number of dwelling units in the Specific Plan area by the total number of acres in the Specific Plan area.
- 5.1.16 When adjacent to the perimeter boundary of the specific plan, all residential lots must be a minimum lot size of 40,000 square feet.
- 5.1.17 Planning Area Boundaries
  - 5.1.17.1 Except as otherwise indicated, dimensions are measured from centerline of Foothill Ranch Road and 37th Street East and from the rights-of-way of 47th Streets East and Barrel Springs Road.
  - 5.1.17.2 Minor modifications to Planning Area boundaries may result from final road alignment and/or Final Tract Map modifications. Such minor modifications shall be permitted as provided in Section 6.6, Specific Plan Administration.
  - 5.1.17.3 Boundaries not having dimensions on the Development Plan shall be determined by Subdivision Maps or Site Plans.
- 5.1.18 Front yard setbacks and side yard setbacks when abutting a street shall be measured perpendicularly, unless otherwise specified, from the nearest point of the exterior wall, excluding allowed projections. Unless specifically stated otherwise, building setbacks shall be measured as follows:

- 5.1.18.1 Setbacks on all streets shall be measured from the right-ofway.
- 5.1.18.2 Setbacks along Arterial streets shall be measured from the right-of-way. Rear or side yard requirements shall be measured from the outside edge of the landscape easement or community wall. "Outside edge" shall be defined as the edge of the easement or community wall furthest away from the centerline of the arterial street.
- 5.1.18.3 Private street or driveway setbacks shall be measured from the outside edge of the easement for that access.

All other setbacks shall be measured perpendicularly, unless otherwise specified, from the subject property line to the nearest point of the exterior wall of the subject structure, excluding allowed projections.

- 5.1.19 Building height shall be measured as the vertical distance from the adjacent finished grade to the highest point of the coping of a flat roof, or to the deck line of a mansard roof, or to the highest peak of a pitch or hip roof.
- 5.1.20 Flag lots shall be allowed in cul-de-sac locations. No more than two flag lot per cul-de-sac will be permitted.

The stem of a flag lot shall not be counted in the total lot area. The total length of the stem of a flag lot shall only be as long as the depth of the adjacent lots. Final configuration and location of flag lots are subject to Planning Commission review and approval.

- 5.1.21 When parked for any period exceeding 72 hours, recreational vehicles in all residential designations shall be parked on concrete slabs and screened from public view.
- 5.1.22 Lots having a width of 50' or less shall be restricted to garages with a maximum width of a two car garage door.
- 5.2 This Section reserved.

#### 5.3 SINGLE-FAMILY COMPONENT STANDARDS

This section is intended to establish the standards for the development of singlefamily detached housing on lots or one acre or more.

- 5.3.1 This section reserved.
- 5.3.2 Uses Permitted Subject to Approval of the Planning Director:
  - a) Additional permitted animals in excess of the allowed number, pursuant to an Additional Animal Permit.
  - b) In-Tract Model Home Complex.
  - c) Home Occupation Permits.
  - d) Trailer coaches, motor homes or manufactured homes on active construction sites.
  - e) Temporary office modules on active construction sites.
  - f) Temporary Dependent Housing Unit.
  - g) Large family day care.
  - h) Special events.
- 5.3.3 Uses Subject to Site Plan Review Approval:
  - a) Parks and playgrounds (excluding lighted play fields).
  - b) Electric distribution substations, electric transmission substations and electric generating facilities.
  - c) Utility facilities, water tanks, building and equipment, including but not limited to water, natural gas, and sewage facilities, but excluding sewage pump stations or treatment plants.
  - d) Second dwelling units on individual parcels containing one single family dwelling unit, provided that each unit adheres to the

minimum residential standards contained in the applicable provisions of the City of Palmdale Zoning Code.

5.3.4 Uses Subject to Approval of a Conditional Use Permit:

Pursuant to the applicable provisions of the Palmdale Zoning Ordinance and applicable findings as specified in Section Six, Implementation the following uses may be allowed subject to an approved Conditional Use Permit:

- a) Bed and breakfast establishments.
- b) Churches, temples or other places used exclusively for religious worship.
- c) Convents, monasteries and retreat centers.
- d) Country clubs.
- e) Schools from kindergarten to grade twelve (12), accredited, excluding trade or commercial schools.
- f) Tennis courts.
- g) Off-site Model Home Sales.
- h) Lighted playgrounds and play fields.
- 5.3.5 Accessory Uses Permitted:
  - a) Animal keeping, subject to the following provisions. Outdoor animal enclosures shall be located pursuant to applicable provisions of the City of Palmdale Zoning Code.
    - 1) Dogs and cats, provided that not more than two (2) dogs and two (2) cats over the age of four (4) months may be kept for each dwelling unit.
    - 2) Vietnamese pot-bellied pigs maintained as a pet, provided that not more than one such animal may be kept for each

dwelling unit.

- 3) Other domestic creatures which are neither farm animals, exotic, nor wild animals, such as canaries, parakeets, cockatiels, and other similar birds; tropical fish excluding caribe; turtles; white mice, white rats, hamsters, gerbils, guinea pigs, and similar small rodents; snakes and reptiles; and other similar animals commonly sold in pet stores and kept as household pets provided that such animals are not maintained for commercial purposes, do not constitute a nuisance, and are adequately provided with food, care and sanitary facilities.
- b) Accessory dwelling units.
  - 1) Guest house, excluding kitchen facilities.
- c) Incidental uses.
  - 1) Garage sales.
- d) Accessory Structures.

The following accessory structures are permitted, provided that requirements for building setbacks, height, and other development standards are adhered to.

- 1) Private garages and carports.
- 2) Enclosed structure containing children's play space, office space, or other habitable area, provided that there is no kitchen, that such space is not intended or utilized for a separate living facility and that the building is architecturally compatible with the primary residence.
- 3) Tool houses, greenhouses, tack rooms and feed storage facilities.
- 4) Water wells, water reservoirs, and storage tanks.

- 5) Buildings and structures for the housing, nurture, confinement, or storage of animals lawfully permitted on the premises.
- 6) Vertical antennae and satellite dishes.
- 7) Recreational facilities, including pool, spa, jacuzzi, playcourt and appurtenant equipment.
- 5.3.6 Similar Uses Permitted by Planning Director Determination:

The Planning Director may determine that an unlisted use is similar to and not more objectionable to the general welfare than those uses specifically listed in the Single Family Component.

5.3.7 Site Development Standards:

The Single Family & areas within the Foothill Ranch Specific Plan area shall be subject to the following Development Standards. In addition, design of residential development shall conform to Community Design Guidelines contained within the General Plan and Section 41.09 – Standards of Development of the Zoning Ordinance. Subdivision design must be deemed consistent with applicable design guidelines and findings through the Development Review application process prior to the applicable discretionary action or permit.

- 5.3.7.1 Lot Size and Dimensions.
  - a) Development is subject to following minimum lot size and dimensions:
    - Minimum lot area: one acre. If private streets are utilized within any Planning Area, lot area may be calculated as one acre gross, with lot lines extending to the centerline of the right-ofway. If public streets are utilized, all lots shall be one acre net (exclusive of right-of-way).

2) Minimum width:

Lot Sizes: One acre or greater: 120 feet.

3) Minimum depth: One Hundred (100) feet or 110 feet when adjacent to an arterial road.

#### 5.3.7.2 Building Setbacks.

- a) Development is subject to following minimum setbacks:
  - 1) Front yard:

Twenty-five (25) feet minimum. Side-in garage: Twenty (20) feet.

2) Side:

Ten feet minimum.

- Rear: Twenty (20) feet minimum. Except as permitted in the Palmdale Zoning Code Section 41.09 D.3.(a-h).
- 4) Side yard adjacent to street: Ten (10) feet minimum.
- Architectural projections including fireplaces, eaves, bay windows, etc., may encroach two (2) feet into required setbacks and may have a maximum of twelve (12) square feet where the projection touches the ground.
- 5.3.7.3 Building Height.

Primary Residence: Maximum two (2) stories, not to exceed thirty-five (35) feet. Accessory Structure (gazebos, patios and storage sheds): Eighteen (18) feet.

#### 5.3.7.4 Fences and Walls.

- a) Maximum height: Three and one-half (3-1/2) feet in the front yard, six (6) feet in the side and rear yards.
- b) Chain link and wood fencing is prohibited.
- 5.3.7.5 Detached Accessory Building Setbacks: Minimum five (5) feet from side lot line and five (5) feet from rear lot line; however, in no case can this result in less than 1,000 square feet of useable rear yard.
- 5.3.7.6 Except air conditioning, heat pumps or pool and spa equipment, no accessory mechanical equipment shall be located in setback areas. Rooftop mechanical equipment is prohibited.
- 5.4 This Section reserved.
- 5.5 This Section reserved
- 5.6 NEIGHBORHOOD COMMERCIAL STANDARDS

The purpose of these standards is to provide for neighborhood commercial needs of the community and surrounding area and to provide development provisions which are responsive to changing economic and market requirements over time.

Drive through and major tenant businesses are not permitted.

5.6.1. Uses Permitted Without Planning Approval

The following uses are allowed in the commercial center:

- a) Field, tree, bush, berry and row crops, including nursery stock, as an interim use, provided that no permanent structures are constructed.
- b) Riding, hiking and bicycle trails and appurtenant facilities.

- c) Storage, temporary, of materials and equipment used in construction of public or private improvements, provided that all such items are stored on the construction site and pose no traffic hazard or other adverse impact on surrounding properties.
- d) Temporary and permanent facilities for detention, retention and conveyance of storm water runoff.
- 5.6.2 Uses Permitted Subject to Site Plan Review Approval:
  - a) Bakeries, including baking only when incidental to retail sales from the premises.
  - b) Bicycles, parts and accessories.
  - c) Book stores.
  - d) Confectionery and candy stores.
  - e) Gift shops.
  - f) Hobby, yarn and craft shops.
  - g) Pet shops and supplies.
  - h) Specialty clothing shops.
  - i) Variety stores.
  - j) Video rental and sales.
  - k) Coffee shops.
  - I) Delicatessens and sandwich shops.
  - m) Ice cream and yogurt shops.
  - n) Restaurants, bona-fide.
  - o) Escrow companies.

- p) Insurance offices.
- q) Mortgage services.
- r) Real estate offices.
- s) Banks, savings and loan institutions, and credit unions offering a full range of financial services and accredited by applicable agencies; branch offices of a scale compatible with surrounding neighborhoods.
- t) Studios for the performing arts or martial arts.
- u) Accountants, tax preparers and financial advisors.
- v) Utility facilities, buildings and equipment, excluding sewage pumping stations and treatment plants.
- w) Public and quasi-public uses
- 5.6.3 Uses by Conditional Use Permit
  - a) Convenience stores without gasoline sales (pursuant to Section 92.09 of the Palmdale Zoning Code).
- 5.6.4 Accessory Uses and Structures Permitted:
  - a) Structures and features associated with pedestrian or customer seating or amenity areas which adheres to the applicable provisions of Section 92.02 of the Palmdale Zoning Code, including but not limited to gazebos, arcades, fountains, seats or benches, outdoor eating areas, trash receptacles, art works or other landscape focal points.
  - b) Areas designated and designed for the temporary storage of trash and recyclable materials, including the following:
    - 1) Enclosures to screen trash bins.

- 2) Recycling areas.
- 3) Small Collection Facilities.
- 4) Trash compactors.
- c) Amusement Machines

Not more than four (4) amusement machines may be permitted as an accessory use within a primary use in the Neighborhood Commercial designation, except that no amusement machines may be permitted within a convenience store.

- d) Information kiosks.
- e) Newspaper dispensing devices.
- f) Automated Teller Machines (ATM's).
- 5.6.5 Other Similar Uses Permitted by Planning Director Determination:

The Planning Director may determine that an unlisted use is similar to and not objectionable to the general welfare than those uses specifically listed in the Neighborhood Commercial designation.

- 5.6.6 Site Development Standards:
  - a) Building site: 5,000 square foot minimum lot size
  - b) Building site width and depth: No minimum
  - c) Building height limit: Maximum two (2) stories, not to exceed thirtyfive (35) feet with architectural projections up to fifty (50) feet.
  - d) Building Setbacks:
    - 1) Front:
      - (a) A minimum thirty (30) foot setback shall be maintained from all roadways. Required minimum

setback area shall not include loading areas or other paved surfaces, but may include utility pads, walkways, access points and similar improvements.

- 2) Rear or side yard:
  - (a) A minimum thirty (30) foot setback shall be maintained from all roadways, a minimum twenty (20) foot setback from residential lots or parcel boundaries, and zero (0) feet adjacent to commercial uses. Required minimum setback area shall not include loading areas or other paved surfaces, but may include utility pads, walkways, access points and similar improvements.
- e) Off-street parking: Off-Street Parking shall be in accordance with Section 5.8 of this document.
- f) Lighting: All exterior and interior lighting shall be designed and located of minimize power consumption and to confine direct rays to the premises. Lighting fixtures shall not exceed fourteen (14) feet. A parking lot lighting photometric plan is required in accordance with the Palmdale Zoning Ordinance. Except for necessary security lighting, all lights shall remain off during nonbusiness hours.
- g) Loading: All loading shall be performed on the site, and loading platforms and areas shall be screened from view from adjacent residential areas and from streets and highways. Loading areas shall conform to the "Loading Zone Standards" Section contained herein. Where loading areas are located adjacent to existing or proposed residential property, a noise study shall be submitted at the time of development proposal.
- h) Nursery schools and day care uses are required to have separate passenger loading and unloading areas provided.
- Trash and Recycling Storage Areas: All trash and recycling storage areas shall be subject to the provisions of Article 85 of the Palmdale Zoning Code. All storage, including cartons, containers

and trash, shall be shielded from view within an architecturally compatible building or area. Trash areas shall be enclosed by an architecturally compatible masonry wall not less than six (6) feet in height with appropriate roof treatment to mitigate airborne trash due to winds. A self closing gate constructed of solid metal materials and attached to metal posts embedded in concrete shall be provided. Refuse enclosures shall be designed to meet or exceed the minimum capacity requirements of the development as determined by the Building and Safety Department and shall be located to provide unobstructed 24-hour access to refuse vehicles. No such area shall be located within fifty (50) feet of any residential area.

- j) Enclosed uses: All permitted uses, together with their resulting products, shall be contained entirely within a completely enclosed structure, except for off-street parking and loading areas, areas for sale of nursery stock, and outdoor dining areas, or other similar uses approved by the Planning Director.
- k) All buildings and structures shall be continually maintained by the owner, including exterior surfaces and colors.
- I) Screening:
  - Abutting residential areas: An opaque screen composed of a wall and/or combination wall and berm shall be installed along all site boundaries where the premises abut areas zoned for residential uses. Except as otherwise required, the screening shall have a minimum height of six (6) feet. Where there is a difference in elevation on opposite sides of the screen, the height shall be measured from the highest adjacent grade. The requirement of such barrier shall not be construed to eliminate pedestrian or bicycle access.
  - 2) A screen, as referred to in "Abutting residential areas", shall consist of the following types:
    - Walls: A wall shall consist of concrete, stone, brick, tile or similar type of solid masonry material a minimum of four (4) inches thick.

- (b) Berms: A berm shall be constructed of earthen materials and it shall be landscaped.
- 3) Intersections: Where screening occurs along streets and boundaries, it shall be installed so as not to obstruct the line of sight distance at intersections of:
  - (a) A vehicular accessway or driveway and a street.
  - (b) A vehicular accessway or driveway and a sidewalk.
  - (c) Two or more vehicular access ways, driveways or streets.
- 4) Mechanical equipment: Rooftop mechanical equipment shall be completely screened from view of adjacent streets or contiguous residential development areas. The use of "picket fence" screening is prohibited. If rooftop screening cannot be provided then ground equipment shall be employed and screened.
- 5) Parking: Where parking spaces abut the public right-of-way, a partial visual screen of berming/mounding (3:1 maximum slope), landscaping or decorative walls shall be provided within the adjacent landscape area to a minimum height of thirty six (36) inches above grade so as to lessen the visual effect of parking and vehicles.
- m) Landscaping: Where required, landscaping, consisting of evergreen or deciduous trees, shrubs, berms or ground cover, shall be installed and maintained subject to the following standards:
  - 1) Thirty (30) foot minimum width of landscaping is required along public rights-of-way. Landscaping shall be bermed, or contain a low wall, or a combination of the two, to a minimum height of thirty-six (36) inches above grade.
  - 2) A minimum of one tree shall be required to be planted within each landscape island or finger planter within parking lots.

- 3) Street trees shall be planted with spacing not to exceed twenty (20) feet on centers, average. Trees may be clustered together in grouped plantings in order to maintain "windows" of visibility into commercial sites, however, in no case may the total number of trees be decreased by the use of clustering. Street trees shall be selected from College Park Palmdale Master Plant List in Appendix B.
- 4) Trees shall be installed with a mix of the following sizes: 60 percent minimum 1" caliper (15 gallons); 30 percent 2" caliper specimen; and 10 percent 3" caliper specimen.
- 5) A six (6) foot minimum landscape planter will be required at the beginning and end of all parking space rows and at an average of every 12 parking spaces or as approved through Site Plan Review.
- 6) Separation: All landscaped areas shall be separated from adjacent vehicular areas by a wall or curb at least six (6) inches higher than the adjacent vehicular area.
- 7) Watering: A permanent automatic electric irrigation system shall be provided for all landscaped areas.
- 8) Maintenance: Required landscaping shall be maintained by the property owner in a neat, clean and healthy condition. This shall include proper pruning, mowing of lawns, weeding, removal of litter, fertilizing, replacement of plants when necessary, and the regular watering of plants which require watering to maintain a healthy condition.
- 9) Areas of native vegetation, whether natural or enhanced, are exempted from the landscape standards identified above. This exemption is not intended to exempt requirements for trash clearing and brush management for fire control purposes.
- 10) All transformer pads/equipment shall be screened with landscaping and/or walls.

11) All landscape plans shall be reviewed and approved by the City Landscape Architect and Planning Director.

#### 5.7 OPEN SPACE USE STANDARDS (OS)

This section is intended to establish standards that ensure that the development of the Open Space is within the purpose and intent of the Foothill Ranch Specific Plan.

- 5.7.1 Standards:
  - 5.7.1.1 Uses Permitted without Planning Approval:
    - a) Field, tree, bush, berry and row crops, including nursery stock, as an interim use provided that no permanent structures are constructed.
    - b) Biking, hiking and equestrian routes, trails and staging areas.
    - c) Storage, temporary, of materials and equipment used in construction of public or private improvements, provided that all such items are stored on the construction site and pose no traffic hazard or other adverse impact on surrounding properties.
    - d) Temporary and permanent facilities for detention, retention and conveyance of storm water runoff.
    - e) Conservation areas, biological preserves and natural open space.
    - f) Passive recreation areas, vista points and scenic resource areas.
  - 5.7.1.2 Uses permitted subject to Site Plan Review:
    - a) Parks, picnic areas, playgrounds and ball fields

- b) Community facilities
- c) Any other use similar in nature which is found compatible with the purpose of this Open Space section, and which is deemed appropriate by the Planning Director.
- 5.7.1.3 Uses Permitted Subject to a Conditional Use Permit:

Pursuant to the provisions of Article 22 of the Palmdale Zoning Code and applicable findings as specified in Section Six, Implementation the following uses may be allowed subject to an approved Conditional Use Permit:

- a) Fire stations/Sheriff's stations.
- 5.7.1.4 Accessory Uses and Structures Permitted:
  - a) Parking facilities.
- 5.7.1.5 Uses Permitted Subject to a Temporary Use Permit:
  - a) Carnivals, temporary, not to exceed three (3) days within a six (6) month period, provided the carnival is located on publicly owned or leased property, on any general curriculum public or private school grounds, or on property improved with a permanently established church. The sponsorship of such carnival shall be confined to a public agency or a religious, fraternal or service organization directly engaged in civic or charitable endeavors.
  - b) Pumpkin sales.
  - c) Christmas tree sales.
  - d) Temporary car washes.
  - e) Temporary storage of materials and equipment for

construction of public works and any similar agricultural, conservation, park and recreation, maintenance, open space use or accessory uses which are approved as an appropriate use by the Planning Director.

- f) Any other temporary uses which the Planning director deems warrants a Temporary Use Permit.
- 5.7.1.6 Site Development Standards:

The following standards shall apply unless modified by the approved Site Plan:

- Building site area: As indicated on the approved Site Plan (no minimum). No building should encroach into any identified drainage courses and all structures shall be built a minimum of one (1) foot above water surface elevation for the capital storm.
- b) Building height: Maximum two (2) stories, not to exceed thirty-five (35) feet (unless otherwise provided herein).
- c) Building site coverage: As indicated on the approved Site Plan (no minimum).
- d) Building setbacks:
  - All buildings shall be set back from all property lines a distance of twenty (20) feet, or as otherwise modified by the approved Site Plan.
  - 2) Thirty (30) feet is required from secondary highways and Foothill Ranch Road.
- e) Off-street parking: Off-street parking shall be provided in accordance with the requirements of Section 5.8 of this document.

- 1) A thirty (30) foot setback is required along arterial roadways and Foothill Ranch Road.
- f) Lighting: All lighting, exterior and interior, shall be designed and located of confine direct rays to the premises. A photometric lighting plan is required pursuant to Section 5.8.5.9 of this document.
- g) Trash and Recycling Storage areas: All trash and recycling storage areas shall be subject to the provisions of Article 85 of the Palmdale Zoning Code. All storage, including cartons, containers and trash, shall be shielded from view within an architecturally compatible building or area. Trash areas shall be enclosed by an architecturally compatible masonry wall not less than six (6) feet in height with appropriate roof treatment to mitigate airborne trash due to winds. A self closing gate constructed of solid metal materials and attached to metal posts embedded in concrete shall be provided. Refuse enclosures shall be designed to meet or exceed the minimum capacity requirements of the development as determined by the Building and Safety Department and shall be located to provide unobstructed 24-hour access to refuse vehicles. No such area shall be located within fifty (50) feet of any residential area.
- h) Screening:
  - 1) Screening is required when residential uses or a public or private street abut the following:
    - (a) Loading areas.
    - (b) Visually obtrusive or noisy above ground utility equipment and appurtenances.
    - (c) Portions of uses which generate excessive noise or activities not compatible with residential use.

- A screen as referred to above, may consist of two (2) of the following types:
  - (a) Walls: A wall shall consist of concrete, stone, brick, tile or similar type of solid masonry material a minimum of four (4) inches thick.
  - (b) Landscape Berms: A berm shall be constructed of earthen materials and it shall be landscaped.
  - (c) Fences, solid: A solid fence shall be constructed of masonry, wood or other materials and shall form an opaque screen.
  - (d) Landscaping: Plan materials, when used as a screen, shall consist of densely planted evergreen or deciduous plants.
  - (e) Intersections: Where screening is established near intersections, it shall consider safe sight distances so that adequate visual conditions are maintained for pedestrians and drivers of motor vehicles.
  - (f) Mechanical equipment: Rooftop mechanical equipment shall be completely screened form view of adjacent streets and contiguous development areas. Rooftop equipment shall be screened through the use of equipment wells and/or parapet walls. The use of "picket fence" screening is prohibited.

 Landscaping. Because of the open space nature of many of the permitted uses some of the following standards may not be appropriate and may be modified by the Planning Director.

Landscaping, consisting of trees, shrubs, and/or ground cover, shall be installed and maintained subject to the following standards:

- (1) Planting shall be designed so as not to hinder sight distance at intersections.
- (2) Permanent automatic electric irrigation facilities shall be provided for landscaped areas and should acknowledge water conservation principles.
- (3) Landscaping shall be maintained by property owners in a neat, clean and healthy condition.
- (4) Areas of natural open space do not require additional planting or irrigation except in areas immediately adjacent to streets.
- (5) Areas of native vegetation within all Open Space Designations (whether natural or enhanced) are exempted from the landscape standards identified above. This exemption is not intended to exempt requirements for trash clearing and brush management for fire control purposes.
- All buildings and structures will be maintained by the owner in a good state of repair, including exterior surfaces and colors.
- k) Security fences and tennis court fences shall be subject to Site Plan Review and approval. Lighting for tennis courts shall be reviewed by the Planning Director to determine impacts on adjacent parcels.

 Amenities within neighborhood park site (AOS-4): Tot lot or playground, basketball hard court, multi-use open play area, landscaped picnic area with benches and informal seating, walking trails.

# 5.8 OFF-STREET PARKING STANDARDS

This section is intended to establish standards to alleviate and prevent congestion of the public streets by establishing minimum requirements for the off-street parking and loading of motor vehicles, based upon the use of the property.

# 5.8.1 General Provisions

- 5.8.1.1 Increase or Change in Use: When any building is enlarged or increased in capacity, or when a change in use creates an increase in the amount of off-street parking space required, additional off-street parking spaces shall be required, such that parking requirements are met for both existing and proposed building areas in conformity with this section.
- 5.8.1.2 Combined Uses: When two (2) or more uses are located in the same building or structure, or are within the same common developments, the parking requirements shall be the sum of the separate requirements for each use, except as specifically provided in this section.
- 5.8.1.3 Reduction in Number of Spaces: No required off-street parking facility shall be reduced in capacity or area without providing sufficient additional on-site parking spaces or facilities in compliance with this section.
- 5.8.1.4 Tandem Parking: Except where specifically allowed herein, parking spaces may not be designed in tandem.
- 5.8.1.5 Continuing Obligation: The provision for off-street parking facilities shall be a continuing obligation of the property owner so long as any use requiring vehicle parking continues.

- 5.8.1.6 Calculation of Spaces: Any calculation of parking space requirements which results in a fraction of a parking space shall be counted as requiring a whole space.
- 5.8.1.7 Use of Parking Spaces: Required parking spaces shall be used only for parking of vehicles for property owners, guests, renters, patrons or employees. Required parking spaces shall not be used for sale, display, rental, storage or repair of motor vehicles.
- 5.8.1.8 Additional Parking Required: Nothing in this section shall be deemed to limit the power of the Planning Commission, or of the City Council on appeal, to require adequate provision of parking spaces as a condition of approval of a Conditional Use Permit, a Site Plan Review, when under the circumstances of a particular case, a greater number of parking spaces than specified in this section is found to be necessary.
- 5.8.1.9 Maintenance of Parking Facilities: All parking facilities shall be constructed and maintained in good condition in accordance with the applicable provisions of the Palmdale Municipal Code The maintenance thereof may include, but shall not be limited to the repaving, oiling and striping of a parking area and the repair, restoration and/or replacement of any parking area when deemed necessary by the Director of Planning to insure the health, safety and welfare of the general public.
- 5.8.1.10 Posting of Private Parking Lots: All private parking lots shall be posted at all entries stating that all provisions of the Palmdale Municipal Code and California Vehicle Code are enforceable on said parking lot by the Los Angeles County Sheriff's Department.
- 5.8.1.11 Posting of Fire Lanes: All Fire Lanes shall be posted "NO PARKING" in accordance with Fire Department Specifications or other applicable agency requirements.
- 5.8.2 Parking Space Requirements

Residential and Commercial uses and buildings shall provide off-street parking in the manner specified below:

- 5.8.2.1 Residential Uses
  - a) Parking Location:
    - 1) Residential: Off-street parking spaces shall be located on the same lot or parcel on which the dwelling is located.
    - 2) No parking space required by this section shall be located in the required front, side or rear setback area of any residential zone except within a detached garage or carport structure which may be located in a side or rear setback area, provided that twenty-six (26) feet of backup space is provided. Any additional parking areas shall also be paved in accordance with required standards.
  - b) Covered Parking:
    - Residential: Two (2) enclosed covered spaces shall be required for Single-Family Detached dwelling units. Other parking spaces may be uncovered.
  - c) Commercial Vehicle in Residential Zones: No vehicle which is registered for commercial purposes pursuant to applicable provisions of the Vehicle Code of the State of California or other jurisdiction and which exceeds ten thousand (10,000) pounds in gross weight shall be parked or left standing on any residentially zoned property in excess of thirty (30) consecutive minutes, unless it falls within the exceptions stated in Section 15.101 of the Palmdale Municipal Code

# 5.8.2.2 Neighborhood Commercial Uses

- Parking Location: Off-street parking shall be located on the same lot, or, with a reciprocal parking and access agreement approved by the City, on a lot contiguous to the building, structure or use to be served. In such situations any term agreements between private property owners shall be recorded and shall require City approval prior to termination. The required parking spaces shall not be located in the rear of commercial buildings, unless direct access for the customers to the facility is provided. Parking shall not be located across a street. No off-street parking space shall be located in front of an overhead loading door.
- b) Use of Spaces: Required parking spaces shall not be used or permitted to be used for the repair, servicing or storage of vehicles, or for the storage of recycling bins, property or materials. Racks and pump blocks used in auto repair shops or other similar uses shall not be considered in calculating required parking spaces.
- c) Bicycle Parking Facilities:
  - Commercial projects shall provide a minimum of two (2) bicycle rack spaces consisting of a rack or other secure device for storing and protecting bicycles from theft. For facilities requiring more than fifty (50) spaces, additional bicycle rack spaces shall be provided at a ratio of one (1) bicycle rack space per fifty (50) automobile spaces. Fractional requirements of .5 or greater shall be considered as a full bicycle rack space. Bicycle racks shall be located in such a way as to not interfere with pedestrian or vehicular traffic.
- 5.8.3 This section reserved.

5.8.4 Parking Schedule.

Off-street parking shall be provided for the following uses in the quantities specified below:

- 5.8.4.1 Churches, chapels: One (1) parking space for every four (4) fixed seats, or one (1) space per thirty-five (35) square feet of assembly area where seats are not fixed in the principal assembly area; plus one (1) space for each classroom and secondary assembly area. Eighteen (18) lineal inches of bench seating shall equal one seat.
- 5.8.4.2 Commercial uses, unspecified. One (1) space per two hundred fifty (250) square feet of gross floor area.
- 5.8.4.3 Day care centers: One (1) space for each classroom; plus one (1) space for every twenty (20) students.
- 5.8.4.4 Financial institutions, banks, savings and loans: One (1) space per two hundred (200) square feet of gross floor area.
- 5.8.4.5 Office, professional: One (1) space per two hundred fifty (250) square feet of net leasable floor area.
- 5.8.4.6 Public buildings and facilities: One (1) space per two hundred (200) square feet of floor area for public buildings or facilities frequently visited by the public. One (1) space per four hundred (400) square feet of floor area for public facilities not frequently visited by the public.
- 5.8.4.7 Restaurants and other eating or drinking places: One (1) space per one hundred (100) square feet of gross floor area, with a minimum of ten (10) spaces. Where there is no onsite consumption of food or beverages, one (1) space per two hundred fifty (250) square feet of gross floor area.
- 5.8.4.8 Retail uses: One (1) space per each two hundred fifty (250) square feet of gross floor area.

- 5.8.4.9 Schools, grades K-8: Two (2) spaces per classroom.
- 5.8.4.10 Residential: Two (2) covered enclosed spaces per unit.
- 5.8.4.11 For uses not specified, the Planning Director shall make an appropriate determination of required spaces.
- 5.8.5 Development Standards

The following development standards shall apply to all off-street parking areas.

- 5.8.5.1 Standard Spaces: A standard parking space shall have a minimum dimension of nine (9) feet in width and eighteen (18) feet in depth. The minimum interior dimension for a single car garage or carport shall be ten (10) feet wide by twenty (20) feet deep. The minimum interior dimension for a two (2) car garage or carport shall be twenty (20) feet wide by twenty-two (22) feet deep.
- 5.8.5.2 Compact Spaces: A compact parking space shall have a dimension of eight (8) feet in width and seventeen (17) feet in depth. In commercial and institutional projects with twenty or more required parking spaces, up to twenty -five (25) percent of the required spaces provided may be compact size as defined herein.
- 5.8.5.3 Handicapped Spaces: Whenever any off-street parking is required, spaces shall be provide in accordance with the latest version of Part 2, Title 24, California Code of Regulations and the Americans with Disabilities Act
- 5.8.5.4 Reduced Parking Space Length and Width Prohibited: No reduction of parking space length or width will be allowed regardless of any overhang over landscaping or required walkways.
- 5.8.5.5 Spaces Next to Walls: Any uncovered parking space located next to a wall or other solid barrier shall be widened by an additional two (2) feet.

- 5.8.5.6 Clearance for Covered Parking: In multiple bay parking structures, where covered parking occurs that provides pillars and posts for roof supports, parking stall design shall provide for a clear nine (9) feet by twenty (20) feet dimension with no encroachment of structural supports.
- 5.8.5.7 Parking Surface: All parking areas, aisles and access drives shall be paved with a minimum of two inches (2) of asphalt on four (4) inches of compact base, or four (4) inches of concrete in residential area; and four (4) inches of concrete in commercial or institutional areas. Parking areas, aisles and access drives shall be graded and drained to dispose of surface water without damage of private or public properties, streets or alleys. the City Engineer may approve alternate materials and specifications in lieu of the foregoing requirements.

# 5.8.5.8 Access Drives

- a) Except for single family detached dwellings, groups of four (4) or more parking spaces shall be located and served by an access drive in such a way that the use of the spaces and access drive will require no backup movement or other maneuvering within a street right-of way, excluding alleys.
- b) Vertical clearance of all access aisles or drives shall not be less than thirteen and one-half (13.5) feet above finished surface.
- c) Entrances from and exits to streets and alleys shall be provided at locations approved by the City. Except for Single Family detached dwellings, and unless expressly recommended otherwise by the Traffic Engineer, access drives onto public streets shall be more than one hundred fifty (150) feet apart, measured from centerline to centerline.
- d) Minimum width of access driveways for single family

detached residences and duplex residences on a single lot shall be ten (10) feet.

- e) Access drives which are not located next to parking spaces shall have a minimum width of twelve (12) feet for a one-way drive aisle and a minimum width of twenty-six (26) feet for a two-way drive aisle.
- f) For single family residences, an unobstructed paved driveway, a minimum twenty (20) feet in length, shall be provided within the required front setback. No portion of the public sidewalk shall be counted towards meeting the twenty (20) foot minimum.
- g) Private streets serving commercial developments shall have a minimum vehicle access width of forty (40) feet.
- 5.8.5.9 Required Lighting. Each plan for construction of a building with outside parking and lighting shall include the following:
  - An exterior lighting (photometric) plan consisting of a point-by-point foot candle layout (based on a ten foot grid center) extending a minimum of twenty (20) feet outside the property lines shall be prepared by an electrical engineer registered in the State of California.
  - b) Maximum overall height of fixtures shall be not more than fourteen (14) feet in, or adjacent to, residential areas; and not more than twenty (20) feet in nonresidential areas.
  - c) Fixtures shall possess sharp cut-off qualities at property lines.
  - d) There shall be no more than a seven to one (7:1) ratio (maximum to minimum) level of illumination shown between lighting Standards.

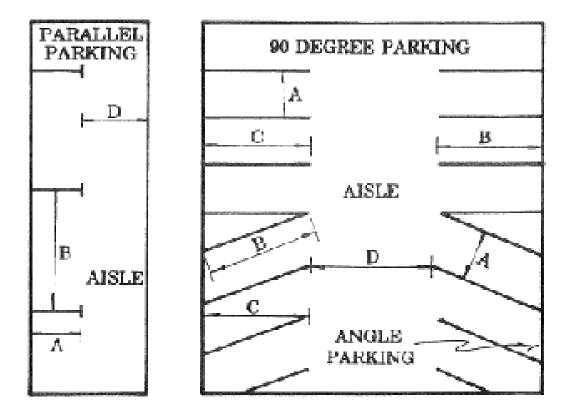
- e) No low pressure sodium lighting fixtures are allowed.
- f) There shall be no illumination or glare from the exterior lighting system onto adjacent properties or streets.
- g) Flashing lights are strictly prohibited.
- h) Lighting intensity shall be a minimum of one (1) foot candle, maintained.
- 5.8.5.10 Striping: Parking lots shall be completely striped, indicating individual parking spaces and traffic lanes as provided in a striping/parking plan submitted to and approved by the City. Except for parallel parking, the striping of all other parking spaces shall be double line, hairpin style. Handicapped spaces shall be striped, marked and signed in accordance with Title 24 of the California Code of Regulations.
- 5.8.5.11 Drainage: All parking and circulation areas shall be designed with an adequate drainage system and improvements in accordance with City standards and improvements shall consists of appropriate devices as specified by the City Engineer.
- 5.8.5.12 Slopes: All parking lot areas used exclusively for parking and turnarounds shall be designed and improved with a grade not exceeding five (5) percent slope. Parking spaces for the handicapped shall conform to the slope requirements of Title 24 of the Uniform Building Code. All parking lot driveways used exclusively for ingress and egress or interior parking lot circulation shall be designed and improved with grades not to exceed a ten (10) percent slope. Driveways providing ingress and egress to individual single family detached dwellings shall not be subject to this requirement.

# 5.8.6 Dimensional Requirements

Parking Space Table: Except as specified elsewhere in this Section, minimum off-street parking space dimensions shall be as indicated on

Section Five Development Standards

FIGURE A on the next page.



Parking Angle	Parallel	30-	45"	<u>60°</u>	<u>80°</u>
Standard space width (A)	9'	9'	9'	9'	8,
Standard space length (B)	22'	88.5'	27'	28.5'	18'
Standard space depth (C)	N/A	17'	19.5'	20.5'	18'
Compact width (A)	8,	8'	8'	8'	8'
Compact length (B)	22	31'	25'	22'	$17^{\circ}$
Compact depth (C)	N/A	$15.5^{\circ}$	18'	19'	17'
One-way aisle (D)	12	16'	18'	20'	26'
Two-way aisle (D)	26'	26'	26'	26'	26'

# **FIGURE A**

5.8.7 Landscaping:

The following landscaping requirements shall apply to all off-street parking areas. In addition, all landscaping shall be in conformance with Article 87 of the City of Palmdale Zoning Ordinance.

- 5.8.7.1 Landscape islands, a minimum six (6) feet in width, shall be provided at the end of all parking rows which directly abut buildings, sidewalks, walls, or other similar features. For parking rows containing twelve (12) or more spaces, one (1) additional landscape island within the interior of the parking row shall be provided per twelve (12) parking spaces. This requirement shall be in addition to the required row end landscape islands.
- 5.8.7.2 All landscaping and planting within paved areas shall be contained within raised planters surrounded by six inch concrete curbs.
- 5.8.7.3 Landscaping, when providing a buffer and interface between commercial uses and residential uses, shall include at least one mature tree for each two hundred (200) square feet of required landscape area. A mature tree shall be defined as a thirty-six (36) inch box tree with a trunk diameter of three (3) inches as measured four and one-half (4.5) feet above the root crown.
- 5.8.7.4 All portions of a parking lot devoted to landscaping shall be provided with an automatic electric irrigation system and should acknowledge water conservation principles.
- 5.8.8 Loading Zone Standards: Loading Zone standards shall be per the applicable provisions of the Palmdale Zoning Ordinance.

# 5.9 SIGN STANDARDS

All signs shall conform with the requirements contained within Article 88 of the City's Zoning Ordinance.

#### 5.10 GRADING STANDARDS

All grading within College Park Palmdale shall conform to the City of Palmdale Hillside Management Ordinance No. 982., City Engineering Standards and Chapter 70 of the Los Angeles County Uniform Building Code, as adopted by the City of Palmdale.

The Foothill Ranch Specific Plan acknowledges that grading is necessary and will occur with development, but that the aesthetic impacts of grading can be reduced. It is intended that site planning and grading work together to form a harmonious result in the design of individual Planning Areas. Therefore, grading policies and grading standards have been developed which incorporate desirable site planning criteria to mitigate the impacts of grading.

Comprehensive preliminary grading plans for the Residential Planning Areas shall be submitted for review and approval by the City Engineer and the Director of Planning prior to approval of the first subdivision map. Final grading plans shall be found in substantial conformance with the preliminary grading plan.

5.10.1 Grading Policies

The policies governing grading design in Foothill Ranch are as follows:

- 5.10.1.1 Encourage creative design solutions such as landform grading that utilizes techniques that emphasize variation in slope gradients, transitional slopes and the sculpture-like shaping of manufactured slopes in a manner that replicates the shapes and characteristics of natural forms.
- 5.10.1.2 Minimize exposed slopebank areas and graded surfaces to the extent possible.
- 5.10.1.3 Respect natural topography and viewshed areas between individual development projects and with adjacent developed and undeveloped properties with sensitive grading design and site planning.
- 5.10.1.4 Landscaping shall be employed to revegetate and stabilize slopes.

- 5.10.1.5 Final determination of maintenance responsibility of slopes shall be made by the City Engineer during the Development Review application process.
- 5.10.2 Grading Standards General

The following grading standards describe specific standards for certain individual Foothill Ranch Planning Areas:

- 5.10.2.1 Slopes along the perimeter of Planning Areas A, B, C, D, E, F G and H adjacent to the Planning Areas AOS-1, AOS-2 and AOS-3) shall include slope heights in excess of thirty (30) feet. These slopes shall utilize landform grading techniques.
- 5.10.2.2 Grading design of Planning Areas AOS-1, AOS-2 and AOS-3 should generally follow the terrain of the site. .

# 5.11 HILLSIDE LIGHTING

In order to decrease visual effects of night lighting in hillside areas, the following standards shall apply:

- 5.11.1 Night lighting shall be kept to minimum, such as locating lights only at intersections, pedestrian crossing and where deemed necessary for public safety.
- 5.11.2 Providing street lights at intervals greater (omit every other one) than those imposed by the Los Angeles County's Traffic and Lighting Division of Public Works.
- 5.11.3 Exterior lighting in hillside areas shall be directed downward in order to minimize the effects of stray light on night sky views. This may be accomplished by shorter poles or with "hooded" lights.

# 5.12 WALLS AND FENCING DESIGN STANDARDS

The following standards should be considered in designing walls and fencing within Foothill Ranch, as shown in Exhibit 43.

- 5.12.1 General
  - 5.12.1.1 Walls, fences and pilasters shall be designed to be compatible with the overall theme and character of Foothill Ranch.
  - 5.12.1.2 When a change in grade elevation or other transition occurs within wall segments, the wall or fence should be stepped in equal vertical intervals not to exceed 12 inches in height. The ends of walls should return into the site to maintain a finished appearance.
  - 5.12.1.3 Long stretches of unrelieved flat walls should be avoided. The design of walls should incorporate offsets and pilasters.
  - 5.12.1.4 Curvilinear sections in walls are permitted if they are compatible with the overall desired character of the development.
  - 5.13.1.5 The materials, color, and finish of all walls shall be compatible with the site architecture and with the community theme wall.
  - 5.12.1.6 Walls shall be periodically maintained and refinished. Damaged walls shall be repaired within a reasonable period of time.
  - 5.12.1.7 Wall and pilaster heights shall be limited to three feet within any required sight triangle per city code.
  - 5.12.1.8 Swimming pools, spas and hot tubs shall be enclosed, as required by municipal code. These enclosures shall also comply with the Foothill Ranch wall design standards.
- 5.12.2 Community Theme Wall
  - 5.12.2.1 Planning Area developers shall install the common community theme wall, as shown in EXHIBIT 42, in certain locations along the length of frontage adjoining Foothill Ranch Road.

- 5.12.2.2 The community theme wall shall be located at the property line or other location chosen by the Master Developer or as otherwise approved in accordance with Site Plan Review.
- 5.12.2.3 Depending on its intended purpose and location, the wall and pilaster shall be at least 36 inches in height or may vary in height up to 6 feet. When adjoining the rear and side yards of single-family or a single-loaded perimeter neighborhood street, the wall and pilaster shall be no greater than 6 feet in height not including any required retaining wall condition. When adjoining the front portion of a side yard of any residential area, such as typically occurs at a neighborhood entry, the wall and pilaster shall be lowered to a maximum height of 42 inches.
- 5.12.2.4 No wall is required when Foothill Ranch Road adjoins a park or other public or semi-public facility except where a wall is needed to screen parking areas, service areas or other features requiring screening.
  - a) When adjoining a service area or other area requiring screening, the wall shall be no less than the object being screened up to 6 feet in height.
- 5.12.2.5 The theme wall shall be constructed of concrete masonry block units and finished with stucco. Pilasters may rise no more than 12 inches from the top of the highest adjoining wall segment, and shall be placed at 50 foot average intervals or as required at the end of wall segments, property line intersections, or where walls turn. The distance between pilasters should be averaged for any given segment of wall. Generally, the distance between pilaster should range between 45 to 65 feet.

# 5.12.3 Perimeter Walls

5.12.3.1 A 6 foot maximum height wall with pilasters shall be required along interior property lines separating individual residential builder parcels not to exceed 6 feet in height (not including

any required retaining wall condition). A single wall is required where two parcels abut each-other. Walls are not required where internal open space areas abut public and semi-public open space.

- 5.12.3.2 A 6 foot maximum height wall with pilasters shall be required along the interior property line of any commercial use where service vehicle loading and unloading or similar activity would otherwise be visible from adjoining properties or the right-of-way of any adjoining street, not to exceed 6 feet in height (not including any required retaining wall condition).
- 5.12.3.3 Wall designs not fronting Foothill Ranch Road may vary from project to project. However, all perimeter walls shall be compatible in overall design with the community theme wall and shall be subject to site plan review.
- 5.12.3.4 The preferred construction material for a perimeter wall is concrete masonry units finished with stucco.
- 5.12.3.5 The color of a perimeter wall shall be compatible with the Community Theme wall and any adjacent Perimeter walls as approved in accordance with site plan review.
- 5.12.3.6 Curvilinear walls shall be permitted if their effect is consistent with the overall design character of the community.
- 5.12.3.7 View segments may be incorporated into perimeter wall designs where privacy or screening is not required. Certain locations fronting the open space system or other recreational features may be appropriate locations for view wall segments.
- 5.12.3.8 Metal or wooden gates are permitted between common areas if such gates are consistent with the character of the wall. Unless specifically requested and approved, gates shall not be allowed between the yard of any private residence and common open space. All gate designs and locations must be specifically approved in accordance with site plan review.

- 5.12.4 View Walls
  - 5.12.4.1 Full View Walls shall be a maximum six (6) feet in height. Full View Walls are made of metal with color and finish compatible to the overall character of the adjacent Community Theme or Planning Area wall.
  - 5.12.4.2 Partial View Walls may range from 18" (minimum) to 6' (maximum) in height. Solid portions of Partial View Walls shall not exceed 36" in height. The remaining upper portion of Partial View Walls shall be made of metal except where pilasters occur. Partial View Wall materials, color and finish must be compatible with adjacent Community Theme or Planning Area walls.
- 5.12.5 Recreation Area Fencing
  - 5.12.5.1 If a wall or fencing must be constructed, the design should be consistent with both adjacent building and planning area wall design. View wall segments should be incorporated to create a spacious appearance from the public right-of-way.
  - 5.12.5.2 Walls and fencing occurring along Foothill Ranch Road will be designed consistent with the community theme wall.
  - 5.12.5.3 Enclosures within private recreation centers within higher density developments shall be designed consistent with the specific planning area wall and architecture.
- 5.12.6 Off-Street Parking Screen Walls
  - 5.12.6.1 Off-street parking areas including the neighborhood commercial centershall be screened from streets with a low wall and/or landscaping no less than thirty-six inches above grade and not to exceed four feet in height except where service area screening is appropriate.
  - 5.12.6.2 The material, color and the finish of the wall shall be consistent with other project walls.

# 5.12.7 Retaining Walls

5.12.7.1 Terraced retaining walls are preferred, not to exceed 4 feet of retained soil per wall. Walls retaining more than 4' of soil are allowed only in special conditions. They should be compatible with other project walls and must receive specific approval in accordance with site plan review. Retaining walls shall be designed to the City of Palmdale's Engineering Design Standards.

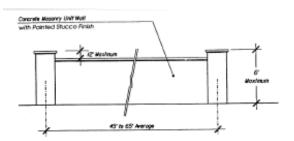
# 5.13 ENERGY CONSERVATION

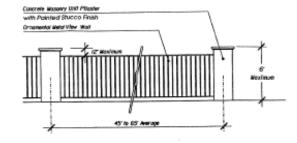
The principal means of addressing energy conservation is through the implementation of Title 24 of the Uniformed Building Code. Title 24 prescribes construction materials and techniques that allow for optimum energy conservation.

Subdivision and building design shall consider the following construction devices for energy and water conservation:

- Landscaping to shade windows.
- Deciduous plants for winter solar gain/summer shade.
- Attic ventilation.
- Solar heating for pools.
- Flow restrictions on faucets and showers.
- Weatherization.
- Lighting with efficient lighting products.

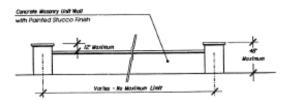
# WALL and FENCING DETAILS





Community Theme Wall Planning Area Wall

View Wall



**Off-Street Parking Screen Wall** 

EXHIBIT 43



# SECTION SIX

#### 6.1 City of Palmdale Annexation

The annexation of the Foothill Ranch Specific Plan was completed December 1, 1999.

#### 6.2 Other Annexations

This project will also require annexation to the Los Angeles County Sanitation District No. 20 in order to receive sewer service. The annexation application will be processed through the Sanitation District and LAFCO.

#### 6.3 Development Agreements

The Applicants and the City may enter into a Development Agreement to facilitate the Goals and Policies of the Foothill Ranch Specific Plan. A Development Agreement is a contract between the City of Palmdale and the Applicants which delineates the terms and conditions of the Developer's proposed project. By enacting the Development Agreement Legislation of 1979, the California Legislature provides for the following measures:

Certainty

The lack of certainty in the approval of development projects can result in a waste of resources, escalate the cost of housing and other development to the consumer, and discourage investment in and commitment to comprehensive planning which would make maximum efficient utilization of resources at the least economic cost to the public.

Assurance

Assurance is necessary to the applicant for a development project that upon approval of the project the applicant may proceed with the project in accordance with existing policies, rules and regulations, and subject to the conditions of approval. Such an assurance will strengthen the public planning process, encourage private participation in comprehensive planning, and reduce the economic cost of development (Government Code Section 65864). • Intent of Legislation

This legislation was intended both to preserve local government control over development projects and to give developers the opportunity to specify the parameters of a project in one undertaking. The Development Agreement Legislation fulfills the public needs to alleviate haphazard land regulation schemes that burden smaller, less integrated development projects, and to provide for comprehensive long-term planning and land use regulation for major developments.

Government Code Section 65864

Pursuant to California Government Code Section 65864, <u>et. seq.</u>, and citywide procedures for Development Agreements, adopted by the City of Palmdale City Council pursuant to California Government Code Section 65865, an applicant in any zone, for any proposed development, may apply for a Development Agreement.

# 6.4 CEQA Compliance

The College Park Palmdale Final EIR and College Park Palmdale Supplemental Final EIR serve as the Master EIR's for the overall project. In addition, an Addendum to the Supplemental FEIR has been prepared for the proposed General Plan Amendment and Specific Plan Amendment. All subsequent project submittals, such as tentative tract maps, shall be evaluated by the City to determine potential environmental impacts associated with the site specific project. For a negative declaration, finding of consistency or mitigated negative declaration, such proposed development standards must be consistent with the intent, density, use and development standards of the Foothill Ranch Specific Plan and the findings of the Master EIR. Otherwise, a focused EIR, EIR addendum or supplemental EIR will be required. A focused EIR, EIR addendum or supplemental EIR may also be required if conditions change as defined under CEQA.

# 6.5 General Plan Amendments

Prior to the adoption of the Foothill Ranch Specific Plan, the City of Palmdale adopted a corresponding General Plan Amendment (GPA 94-1) to the then General Plan. The General Plan Amendment amended the map designation from SD (Special Development) to Specific Plan No. 17 (College Park Palmdale Specific Plan), updated site-specific criteria described in Policy L7.1.9 of the Palmdale General Plan.

A General Plan Amendment (GPA 09-03) application is being processed concurrently with a Specific Plan Amendment (SPA 09-01). The General Plan Amendment proposes amending Policy L.7.1.9. by renaming the Specific Plan from College Park Palmdale to Foothill Ranch, eliminating the Community College Campus and academic academy from the project site and allowing this area to be designated for residential uses, eliminating the golf course and utilizing this area as open space with trails, amending the residential density to 0.7 dwelling units per acre, amending the minimum lot size requirement to not less than one acre and amending all references from College Park to Foothill Ranch. Additionally, the Community College Campus site, currently designated PF - S (Public Facility – School) on the General Plan Land Use Map, would be amended to show as SP-17 (Foothill Ranch)

Proposed language for the General Plan Amendment is located in Appendix C.

The adoption of any Amendment to the General Plan or any General Plan Update by the City shall not require amendment of the Specific Plan. However, any subsequent discretionary approval or Specific Plan Amendment must be consistent with the General Plan as amended and/or updated.

#### 6.6 Specific Plan Administration

Due to the conceptual nature of a specific plan, exact design details are difficult to pinpoint or may require substantial change that is influenced by other factors such as market conditions and development practices. Future development applications will be processed that are in substantial conformance with the specific plan or that may require an amendment to the specific plan. This section shall govern these applications and classify them into three categories: Substantial Conformance, Administrative Amendments and Specific Plan Amendments.

# 6.6.1 Substantial Conformance

The following list are items that may deviate, within certain limitations, from the adopted Specific Plan but shall be considered in Substantial Conformance. This review shall occur at staff level during either the Tentative Map Subdivision Review, Conditional Use Permit or Site Plan Review process:

- Utility service road alignments.
- Final facility sizing and alignment of water, sewer, and storm drainage improvements (as directed by the City Engineer).

- Change in utility and/or infrastructure servicing agency.
- Foothill Ranch Road alignment revisions when the centerline moves by less than 200 feet from its position as graphically shown on Exhibit 16 of this document.
- Minor landscape, wall material, wall alignment and streetscape design modifications which are consistent with the design guidelines contained in this document.
- Deletion of unnecessary infrastructure (as directed by the City Engineer).
- 6.6.2 Minor Modification

The minor modification process provides a means of reviewing requests for proposed changes to the Foothill Ranch Specific Plan which, as determined by the Planning Director based upon the criteria specified in Section 6.6.2.3 are minor in nature.

- 6.6.2.1 Application Procedure
  - An application for a Minor Modification meeting the criteria specified in Section 6.6.2.3 shall be filed prior to the commencement of any construction related to the modification.
  - A Minor Modification shall be filed by the owner of the subject property or authorized agent.
  - A request for a Minor Modification shall be submitted on a form provided for that purpose by the Planning Department, along with the required fee established by the City Council.
  - The Planning Director may require additional information and/or refer the application to pertinent departments/agencies as deemed necessary prior to taking any action on a Minor Modification.
  - If the Minor Modification, in the opinion of the Planning Director, is not consistent with the spirit and

intent of the Specific Plan, the Planning Director shall have the discretion to refer any request for a Minor Modification to the Planning Commission.

# 6.6.2.2 Applicability

The Minor Modification procedure may be utilized for the following types of revisions to the Foothill Ranch Specific Plan:

- Minor adjustments to phasing of utilities. Minor adjustments may include earlier construction, substitution or oversized facilities in adjacent phases or similar adjustments.
- Adjustment of Planning Area boundaries in which the resultant increase in acreage of an individual Planning Area is 10% or less than the original acreage.
   Adjustments, however, shall not decrease the total amount of open space as established by this Specific Plan.
- Changes in recreational facilities or conceptual park changes;
- Adjustments to final trail alignments provided that connecting of destination points are maintained.
- Adjustments to the phasing plan as described in Section 6.14 of this document.
- Minor adjustments to final grading designs that do not conform to the approved preliminary grading plan.
- Specific modifications of a similar nature to those listed above, which are deemed minor by the Planning Director, which are in keeping with the spirit and intent of the Specific Plan and which are in conformance with the General Plan.

# 6.6.2.3 Review Criteria

A Minor Modification may be approved provided that the proposed modification:

- Is listed under Section 6.6.2.2 above and does not require additional land use entitlements such as a Conditional Use Permit, Site Plan Review or a modification to the Development Agreement if one is entered into by the City and the Applicants.
- There are no violations of the Municipal Code existing on the subject property.
- Does not result in more than 3 dwelling units per acre within the residentially designated areas within the Alquist-Priolo Zone (in conformance with General Plan Policy L.7.1.10).
- Complies with the spirit and intent of the Foothill Ranch Specific Plan.
- Complies with the College Park Palmdale Final Environmental Impact Report for and the College Park Palmdale Supplemental Final Environmental Impact Report.
- 6.6.3 Specific Plan Amendments

Amendments may be requested at any time pursuant to Section 65453(a) of the Government Code. If the amendment is deemed major by the Planning Director, it will be processed as an amendment to the approved Specific Plan.

Depending upon the nature of the proposed Specific Plan Amendment, a supplemental environmental analysis may be required, pursuant to Section 15162 of CEQA. It is the applicant's responsibility to provide an analysis of the impacts of the amendment relative to the original EIR and Supplemental FEIR.

6.6.3.1 Findings for Approval of Specific Plan Amendments:

In considering approval or disapproval of Specific Plan

Amendments, the City Council shall find that the proposed Amendment is in compliance with the following:

- The proposed Amendment is consistent with the General Plan and its Elements in effect at the time of submission.
- The proposed Amendment is consistent with the overall design character and general community structure of Foothill Ranch.
- The proposed Amendment is not likely to cause substantial environmental damage, or substantially and avoidably injure significant wildlife, or their habitat.
- 6.7 This section reserved.
- 6.8 Subdivision

Development of Foothill Ranch will be implemented through a series of tentative maps, tentative parcel maps and final maps. Subsequently, in conjunction with the Phasing Plan, each Planning Area designated for development purposes will have one or more tentative subdivision maps or tentative parcel maps submitted to create developable lots or parcels. It is intended that the tentative subdivision maps will be followed by final maps at the appropriate times for phased development.

The tentative maps or tentative parcel maps shall be consistent with the City of Palmdale Subdivision Ordinance and the California Subdivision Map Act.

Tentative maps or tentative parcel maps shall be approved by the decisionmaking authority if the following findings are made. These findings are in addition to any findings required by California State Law and Palmdale Municipal Code:

- For the proposed subdivision, each provision for its design and improvement and each proposed land use is consistent with the Foothill Ranch Specific Plan because it conforms to the density, design standards, design guidelines and location given for the land use designation.
- The tentative map or tentative parcel map design provides for future passive or natural heating or cooling opportunities in the subdivision, to

the extent feasible.

- The tentative map or tentative parcel map does not propose to divide land which is subject to a contract entered into pursuant to the California Land Conservation Act of 1965, and that the property in question has not been included in any such contract.
- The discharge of waste from the proposed subdivision into an existing sewer system will not result in violation of existing requirements prescribed by the California Regional Water Quality Control Board.
- The site is physically suitable for the type of development and density proposed by the tentative map.
- The design of the subdivision and the proposed improvements are not likely to cause serious public health or safety problems because they conform to the highest and best possible use of the subject property as determined.
- The design of the subdivision and the proposed improvements will not conflict with easements acquired by the public at large for access through or use of property within the proposed subdivision.
- The proposed tentative map or tentative parcel map is in compliance with the intent and requirements set forth in the Foothill Ranch Specific Plan.
- The proposed tentative map or tentative parcel map is in compliance with the California State Subdivision Map Act.
- A water assessment shall be provided by the Palmdale Water District determining whether the projected water demand associated with the project was included in the most recently adopted Urban Water Management Plan.

Prior to approval of any final map or parcel map, the applicant of a given tentative map, tentative parcel map or final map shall comply with all standard conditions of approval required by the City of Palmdale Subdivision Ordinance relating to bonding and/or financing of infrastructure and required right-of-way improvements.

# 6.8.1 Vesting Maps

For residential subdivisions, a tentative map submitted for approval that

clearly states "Vesting Map" shall comply with the applicable development standards and design guidelines of the Foothill Ranch Specific Plan. A complete submittal package shall consist of a complete application and copies of the map. The map shall clearly state "Vesting" and graphically depict building envelopes identifying front, rear and sideyard setbacks for each lot. No additional materials relating to architectural design of the residences on individual lots, including but not limited to site plans, elevations, floor plans or renderings shall be required prior to recordation of the Final Vesting Map, except for conceptual project-wide illustrations utilized for visual analysis. The size and design of all improvements shall conform with the applicable Foothill Ranch Specific Plan Development Standards and Design Guidelines, and all primary structures shall be located within the building envelope identified on a given lot. Prior to submittal of building permit applications, plans and elevations for all improvements shall be reviewed and approved through Subdivision Development Plan Review to ensure that the proposed development is consistent with the Development Standards and Design Guidelines of the Foothill Ranch Specific Plan and the approved Vesting Map.

- 6.9 This section reserved.
- 6.10 Conditional Use Permits

Uses requiring Conditional Use Permits are identified in the Development Standards. Projects requiring a Conditional Use Permit shall be processed in accordance with Article 22 of the Palmdale Zoning Code.

Conditional Use Permit requests shall be approved by the decision-making authority if the following findings are made. These findings are in addition to any findings required by California State Law and Palmdale Zoning Code:

- The proposed conditional use is consistent with the Foothill Ranch Specific Plan.
- The nature, condition and development of adjacent uses, buildings and structures shall be considered and no proposed conditional use shall be permitted where such use will adversely affect or be materially detrimental to said adjacent uses, buildings or structures.
- The site for a proposed conditional use is adequate in size and shape to accommodate the yards, walls, fences, parking and loading facilities, landscaping and other development features prescribed in the Specific Plan, or as required by the Planning Commission as a condition in order to

integrate said use with the uses in the neighborhood.

- The site for a proposed conditional use is served by highways or streets adequate in width and improved as necessary to carry the kind and quantity of traffic such use would generate.
- The project is consistent with the Site Plan Review findings of approval as identified in Section 6.13 of this document.

#### 6.11 Variances

All variance requests shall be processed in accordance with Article 23 of the Palmdale Zoning Code.

Variance requests shall be approved by the decision-making authority if the following findings are made. These findings are in addition to any findings required by California State Law and the Palmdale Zoning Code.

- There are special circumstances applicable to the property the strict application of the Zoning Ordinance would deprive such property of privileges enjoyed by other properties in the vicinity and under identical land use district classification;
- Granting the Variance is necessary for the preservation and enjoyment of a substantial property right possessed by other properties in the same vicinity and land use district and denied to the property for which the Variance is sought;
- Granting the Variance will not be materially detrimental to the public health, safety, or welfare, or injurious to the properties or improvements in such vicinity and land use district in which the property is located; and
- Granting the Variance does not constitute a special privilege inconsistent with the limitations upon other properties in the vicinity and land use district in which such property is located.

#### 6.12 Development Standards Review

All proposed development at Foothill Ranch is subject to the Foothill Ranch Development Standards. In conjunction with the applicable review process (i.e., Staff Review, Site Plan Review, Conditional Use Permit, Subdivision, etc.), the City of Palmdale shall review project submittals for consistency with the Foothill Ranch Development Standards. In addition to any City of Palmdale required "findings" of approval of a given development application, the following Development Standards "findings" of approval for development requests shall also be made:

- The proposed project conforms with Foothill Ranch Specific Plan including all applicable Development Standards.
- The proposed project is compatible with and enhances the established design theme of the Foothill Ranch Specific Plan.

# 6.13 Site Plan Review

The Site Plan Review process is a site specific review process aimed at providing high quality development on a given site. The Foothill Ranch Development Standards identify types of projects which require the Site Plan Review process. Projects requiring Site Plan Review shall be processed in accordance with Article 21, Site Plan Review, of the Palmdale Zoning Code. In cases where a Conditional Use Permit is required as a primary entitlement, a Site Plan Review application will be required to be processed concurrently.

Projects requiring Site Plan Review shall be approved by the decision-making authority if all the following findings are made. These findings are in addition to any findings required by California State Law and the Palmdale Zoning Code:

- The project conforms with the Foothill Ranch Specific Plan which is deemed consistent with the General Plan.
- The proposed building, structure, sign, site development or landscaping is compatible in its design, appearance and size with those concepts and standards set forth in the Foothill Ranch Specific Plan.
- The project meets all special requirements for seismically restricted or floodplain areas, if applicable.
- The project conforms with the Foothill Ranch Development Standards and is consistent with the Community Design Element.

# 6.14 Phasing Plan

The Residential and Amenities and Open Space construction program phasing will be affected by market demands and available financing. Therefore, precise timing and scheduling of the phasing is difficult to predict and will probably be modified over time. However, before the occupancy of the first phase of the Residential or Amenities and Open Space programs can occur, construction of the appropriate offsite infrastructure will be required.

The phasing plan description as provided in Appendix D is conceptual. It is subject to change. Specific infrastructure improvements, their phasing and financing, may be addressed in a development agreement if one is entered into by the City and the Applicants.

6.15 Maintenance Responsibility

This section identifies the maintenance responsibility connected with the various improvements associated with the Foothill Ranch project.

These improvements have been grouped into five categories: public rights-ofways, dedicated open space, debris basin and private property.

6.15.1 Public Rights-Of-Way

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• City of Palmdale

Foothill Ranch proposes the dedication of all on-site rights-of- way and public easements to the City of Palmdale. The City of Palmdale shall have the maintenance responsibility of all streets, storm drains and sewer lines 12" or below located within these rights- of-way and dedications.

• Palmdale Water District

The Palmdale Water District shall maintain all water lines associated with Foothill Ranch.

• Los Angeles County Sanitation District

The L.A. County Sanitation District shall maintain all sewer lines installed as a result of this project which are larger than 12".

• Utilities (Gas, Electricity and Telephone)

All utility lines within Foothill Ranch will be maintained by their respective agency as follows:

- Gas Southern California Gas
  - Electricity Southern California Edison
- Telephone AT&T

Landscape Assessment District

The maintenance of the landscaping, entry monumentation, lights, trails and sidewalks within the rights-of-way and public dedications of Foothill Ranch will be under the jurisdiction of a Landscape Assessment District or other City approved maintenance entity.

- 6.15.2 Dedicated Open Space
  - Landscape Assessment District

The open space area within Foothill Ranch will be maintained by a Landscape Assessment District or other City approved maintenance entity in cooperation with the City Park and Recreation Department. This maintenance shall include the landscaping, play facilities and any associated accessory structures.

6.15.3 Detention Basins

Detention basins located on the property shall be maintained by the Home Owners Association, Landscape Maintenance District or other entity approved by the City. The City of Palmdale shall be granted a maintenance easement and fall back maintenance agreement to this drainage facility that would provide them access to basin should the designated maintenance entity not perform its responsibility.

This same agreement shall be preserved for the drainage facilities which conveys the Hunt Canyon flows through the open space.

- 6.15.4 Private Property
  - Open Space

In addition to the previously described drainage facilities, the Home Owners Association, Landscape Maintenance District or other approved entity shall be responsible for the maintenance of all the slopes located within the open space. Neighborhood Commercial

The landscaping and facilities located on the commercial property outside of the right-of-way shall be the responsibility of the property owner(s).

Residential

Landscaping and facilities located within the individual fee ownership lots shall be the responsibility of homeowner.

Should any residential component be developed with common area facilities (recreation centers, private streets, etc.), a homeowners association shall be established for the maintenance of common area landscaping and amenities.

6.16 Infrastructure and Facilities Financing

The Foothill Ranch Specific Plan identifies and recommends several alternative financing plans to ensure that funding is available for the systematic development of the project. In addition to policies and requirements contained in this Specific Plan, terms and conditions for Foothill Ranch Capital Improvement Projects may be affected by a development agreement if one is entered into by the City and the Applicants. The Developer is responsible for paying for all community improvements and backbone infrastructure unless other financing such as the following is used:

• Community Facilities District (Mello-Roos District)

In 1982 the California State Legislature adopted the Mello-Roos Community Facilities Act ("CFA"). The CFA authorizes local jurisdictions to create defined areas, known as Community Facilities Districts ("CFD"). Upon creation of the CFD, special taxes for the purpose of financing needed public improvements and/or services may be assessed to each property in the CFD. A two-thirds majority vote of the landowners or registered voters in the CFD is required to implement the tax. The revenue generated from the tax may be utilized to pay debt service on bonds which were issued by the subject jurisdiction to finance a defined set of public improvements and the cost to maintain continued service. Bonds issued through the CFD are secured by liens against the properties in the CFD and may be repaid over a period of up to 40 years.

It is recommended that the City of Palmdale and the consider establishing

a Community Facilities District at Foothill Ranch for funding of one or more of the following improvements:

- O Acquisition of required 37th Street East public right-of-ways.
- o Construction and maintenance of the major street network.
- o Construction and maintenance of off-site and on-site utility systems.
- o Recreation and community amenities construction.
- Alternative Financing Programs

The availability of alternate and/or additional financing methods for capital improvements is essential for the development of Foothill Ranch. Outlined below are some recommended alternate financing plans:

- Exactions Exactions are used to finance infrastructure related to a given development. The exactions are paid by the developer pursuant to the provisions in the State Subdivision Map Act and/or Government Code.
- Landscaping and Lighting Assessments Funds for capital improvements and continued maintenance of public parks, medians, parkways and recreational facilities may be acquired through the use of assessments as outlined in the California 1972 Landscape and Lighting Act.
- Developer Fees These fees are established by the City or other governmental agencies to finance specific infrastructure and community facilities. These may include school impact fees, Master Plan of Traffic (impact) fees, park in-lieu-of fees, Master Plan of Drainage fees, fire safety facilities fees, and other developer fees.
- Special Benefit Assessments Streets, water, sewer, and flood control improvements can be funded through Special Benefit Assessments assessed to specific parcels which will directly benefit from the improvements. Improvements which benefit the general public such as schools and libraries are typically not eligible for Special Benefit Assessment Funding.
- o Governmental Grants and/or Loans A wide variety of state and

federal level grants and loans may be utilized for the funding and maintenance of capital improvements.

#### 6.17 Disclosures

All buyers purchasing real property in Foothill Ranch shall be advised of potential hazards and/or special circumstances in accordance with the California Department of Real Estate disclosure format and procedure.

Where the Department of Real Estate does not have jurisdiction over such circumstances, such disclosures shall be made to the satisfaction of the Planning Director. Any such disclosure may, to the extent deemed appropriate by the Developer, set forth the results of any studies assessing the risks of any such circumstances and any mitigation measures implemented by the Developer.

# **APPENDIX A**

CONTINENTAL LAWYERS TITLE COMPANY A WHOLLY OWNED SUBSIDIARY OF LAWYERS TITLE INSURANCE CORPORATION 800 EAST COLORADO BOULEVARD PASADENA, CALIFORNIA 91101 (818) 304-0040

CROSBY, MEAD, BENTON ASSOCIATION 5535 BALBOA BLVD. # 229 ENCINO, CA

ATTENTION: FRED CUNNINGHAM

YOUR NO. 538 ACRES ORDER NO. 5092574-39

DATED AS OF MAY 10, 1994 AT 7:30 A.M.

IN RESPONSE TO THE ABOVE REFERENCED APPLICATION FOR A POLICY OF TITLE INSURANCE

#### CONTINENTAL LAWYERS TITLE COMPANY

HEREBY REPORTS THAT IT IS PREPARED TO ISSUE, OR CAUSE TO BE ISSUED AS OF THE DATE HEREOF, A LAWYERS TITLE INSURANCE CORPORATION POLICY OR POLICIES OF TITLE INSURANCE DESCRIBING THE LAND AND THE ESTATE OR INTEREST THEREIN HEREINAFTER SET FORTH, INSURING AGAINST LOSS WHICH MAY BE SUSTAINED BY REASON OF ANY DEFECT, LIEN OR ENCUMBRANCE NOT SHOWN OR REFERRED TO AS AN EXCEPTION IN SCHEDULE B OR NOT EXCLUDED FROM COVERAGE PURSUANT TO THE PRINTED SCHEDULES, CONDITIONS AND STIPULATIONS OF SAID POLICY FORMS.

THE PRINTED EXCEPTIONS AND EXCLUSIONS FROM THE COVERAGE OF SAID POLICY OR POLICIES ARE SET FORTH IN THE ATTACHED LIST. COPIES OF THE POLICY FORMS SHOULD BE READ. THEY ARE AVAILABLE FROM THE OFFICE WHICH ISSUED THIS REPORT.

THIS REPORT (AND ANY SUPPLEMENTS OR AMENDMENTS HERETO) IS ISSUED SOLELY FOR THE PURPOSE OF FACILITATING THE ISSUANCE OF A POLICY OF TITLE INSURANCE AND NO LIABILITY IS ASSUMED HEREBY. IF IT IS DESIRED THAT LIABILITY BE ASSUMED PRIOR TO THE ISSUANCE OF A POLICY OF TITLE INSURANCE, A BINDER OR COMMITMENT SHOULD BE REQUESTED.

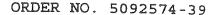
THE FORM OF POLICY OF TITLE INSURANCE CONTEMPLATED BY THIS REPORT IS:

- 1. CALIFORNIA LAND TITLE ASSOCIATION STANDARD COVERAGE POLICY 1990
- 2. AMERICAN LAND TITLE ASSOCIATION LOAN POLICY (10/17/92)
- 3. AMERICAN LAND TITLE ASSOCIATION RESIDENTIAL TITLE INSURANCE POLICY [ ] (6-1-87)
- 4. AMERICAN LAND TITLE ASSOCIATION OWNER'S POLICY (10/17/92)

Kathy Jennings

[]

TITLE OFFICER KATHY JENNINGS EXT//- 430 FAX #((818) 796-5739



#### SCHEDULE A

THE ESTATE OR INTEREST IN THE LAND HEREINAFTER DESCRIBED OR REFERRED TO COVERED BY THIS REPORT IS:

A FEE

TITLE TO SAID ESTATE OR INTEREST AT THE DATE HEREOF IS VESTED IN:

DAVID P. BUSHNELL, A MARRIED MAN, AS HIS SOLE AND SEPARATE PROPERTY

THE LAND REFERRED TO IN THIS REPORT IS SITUATED IN THE STATE OF CALIFORNIA, COUNTY OF LOS ANGELES AND IS DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF SECTION 17, TOWNSHIP 5 NORTH, RANGE 11 WEST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT OF SAID LAND APPROVED BY THE SURVEYOR GENERAL MARCH 19, 1856, LYING SOUTH OF THE CENTER LINE OF BARREL SPRINGS ROAD, 100 FEET WIDE, AS DESCRIBED IN PARCEL A, OR DEED RECORDED JUNE 19, 1962 IN BOOK D-1655 PAGE 150, OF OFFICIAL RECORDS.

EXCEPTING THEREFROM THE EASTERLY 50 FEET OF SAID SECTION 17.

THE PLAT OF A DEPENDENT RESURVEY OF A PORTION OF SAID LAND WAS FILED IN THE DISTRICT LAND OFFICE, JUNE 25, 1904.

ALSO EXCEPT FROM THE EAST HALF OF SAID SECTION 17 ONE-HALF OF ALL OIL AND MINERAL RIGHTS IN AND UNDER SAID LAND, AS RESERVED BY IRA D. VINTON AND MARGARET G. VINTON, HUSBAND AND WIFE, BY DEED RECORDED ON FEBRUARY 28, 1952 AS INSTRUMENT NO. 392 IN BOOK 38354 PAGE 85 OF OFFICIAL RECORDS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

#### SCHEDULE A-1

REQUIREMENT NO. 1:

WE WILL REQUIRE A STATEMENT OF INFORMATION FROM THE PARTIES NAMED BELOW IN ORDER TO COMPLETE THIS REPORT, BASED ON THE EFFECT OF DOCUMENTS, PROCEEDINGS, LIENS, DECREES, OR OTHER MATTERS WHICH DO NOT SPECIFICALLY DESCRIBE SAID LAND, BUT WHICH, IF ANY DO EXIST, MAY AFFECT THE TITLE OR IMPOSE LIENS OR ENCUMBRANCES THEREON. PARTIES: DAVID BUSHNELL

(NOTE: THE STATEMENT OF INFORMATION IS NECESSARY TO COMPLETE THE SEARCH AND EXAMINATION OF TITLE UNDER THIS ORDER. ANY TITLE SEARCH INCLUDES MATTERS THAT ARE INDEXED BY NAME ONLY, AND HAVING A COMPLETED STATEMENT OF INFORMATION ASSISTS THE COMPANY IN THE ELIMINATION OF CERTAIN MATTERS WHICH APPEAR TO INVOLVE THE PARTIES BUT IN FACT AFFECT ANOTHER PARTY WITH THE SAME OR SIMILAR NAME. BE ASSURED THAT THE STATEMENT OF INFORMATION IS ESSENTIAL AND WILL BE KEPT STRICTLY CONFIDENTIAL TO THIS FILE.)

ESCROW COMMENTS:

**REQUIREMENT NO. 2:** 

YOUR ORDER FOR TITLE WORK CALLS FOR A SEARCH OF PROPERTY THAT IS IDENTIFIED BY A STREET ADDRESS ONLY. BASED ON OUR RECORDS, WE BELIEVE THAT THE DESCRIPTION IN THIS REPORT COVERS THE PARCEL THAT YOU REQUESTED. HOWEVER, WE CAN GIVE NO ASSURANCE OF THIS.

TO PREVENT ERRORS AND TO BE CERTAIN THAT THE PROPER PARCEL OF LAND WILL APPEAR ON THE DOCUMENTS AND ON THE POLICY OF TITLE INSURANCE, WE REQUIRE THAT WRITTEN APPROVAL OF THE LEGAL DESCRIPTION IN THIS REPORT BE SENT TO US, SIGNED BY THE ESCROW OFFICER OR BY THE PARTIES TO THE TRANSACTION.

ESCROW COMMENTS:

REQUIREMENT NO. 3:

THIS COMPANY IS REQUIRING THAT THE ATTACHED "OWNERS INFORMATION STATEMENT" BE COMPLETED BY THE OWNER OF THE ESTATE DESCRIBED OR REFERRED TO IN SCHEDULE A, IMMEDIATELY PRIOR TO THE CLOSE OF THIS TRANSACTION AND RETURNED TO US FOR OUR APPROVAL.

THE PURPOSE OF THE OWNERS INFORMATION STATEMENT IS TO PROVIDE THIS COMPANY WITH CERTAIN INFORMATION THAT CANNOT NECESSARILY BE ASCERTAINED BY MAKING A PHYSICAL INSPECTION OF THE LAND. PLEASE CONTACT US IN THE EVENT YOU REQUIRE ASSISTANCE IN COMPLETING SAID OWNERS INFORMATION STATEMENT.

ESCROW COMMENTS:

NOTE NO. 1: IT IS THE POLICY OF THIS COMPANY TO MAKE ALL REQUIRED PAYOFFS.

THE COMPANY WILL REQUIRE CURRENT, WRITTEN PAYOFF DEMANDS. NONCURRENT AND EXPIRED DEMANDS WILL NORMALLY NOT BE ACCEPTABLE BUT THEY MAY BE ACCEPTED AT THE DISCRETION OF THE COMPANY IF VERBAL UPDATING CAN BE OBTAINED.

THE COMPANY WILL HOLD AN AMOUNT EQUAL TO ONE MONTHLY MORTGAGE PAYMENT UNTIL ACCEPTANCE BY THE LENDER OF OUR PAYOFF ON ANY NONCURRENT OR EXPIRED BENEFICIARY DEMAND, WHETHER OR NOT VERBALLY UPDATED.

THE COMPANY WILL ALSO HOLD AN AMOUNT EQUAL TO ONE MONTHLY MORTGAGE PAYMENT UNTIL ACCEPTANCE BY THE LENDER OF OUR PAYOFF ON ANY DEMAND WHICH INCLUDES A PAYMENT MADE WITHIN 21 DAYS OF CLOSING UNLESS THE COMPANY HAS BEEN PROVIDED WITH SATISFACTORY PROOF OF PAYMENT (I.E. A CANCELLED CHECK OR WRITTEN CONFIRMATION OF CHECK CLEARANCE.)

THE COMPANY WILL ALSO HOLD AN AMOUNT EQUAL TO ONE PERCENT (1%) OF THE TOTAL PAYOFF OR A MINIMUM OF \$1,000.00 UNTIL ACCEPTANCE BY THE LENDER OF OUR PAYOFF ON ANY LOAN WHICH IS IN DEFAULT OR WHICH MAY INCLUDE TRUSTEE'S FEES.

NOTE NO. 2: IF YOU ARE AWARE OF ANY IMPROVEMENTS WHATSOEVER THAT HAVE BEEN RECENTLY COMPLETED, THAT ARE ONGOING, OR CONTEMPLATED PRIOR TO CLOSING, THIS OFFICE MUST BE INFORMED OF THESE FACTS IMMEDIATELY SO THAT YOUR TRANSACTION IS NOT DELAYED.

#### TAX ADVANCE NOTE:

IN ORDER TO PROPERLY APPLY ANY PAYMENTS FOR REAL PROPERTY TAXES IN AN EFFICIENT AND TIMELY MANNER, THIS OFFICE SHOULD BE SENT THE TAX BILLS WHICH ARE IN THE POSSESSION OF THE OWNER(S), PRIOR TO THE CLOSE OF THIS TRANSACTION. THIS OFFICE WILL THEN BE ABLE TO FORWARD SAID BILLS ALONG WITH THE NECESSARY PAYMENT. IT HAS BEEN DETERMINED THAT DELAYS IN CONFIRMING TAX PAYMENTS ARE GREATLY MINIMIZED WHEN THE TAX BILLS ARE FORWARDED TO THE L. A. COUNTY TAX COLLECTOR ALONG WITH THE REQUISITE PAYMENTS.



ORDER NO. 5092574-39

#### SCHEDULE B

AT THE DATE HEREOF EXCEPTIONS TO COVERAGE IN ADDITION TO THE PRINTED EXCEPTIONS AND EXCLUSIONS IN THE POLICY FORM DESIGNATED ON THE FACE PAGE OF THIS REPORT WOULD BE AS FOLLOWS:

- A. PROPERTY TAXES, INCLUDING GENERAL AND SPECIAL TAXES, PERSONAL PROPERTY TAXES, IF ANY, AND ANY ASSESSMENTS COLLECTED WITH TAXES, TO BE LEVIED FOR THE FISCAL YEAR 1994 - 1995 WHICH ARE A LIEN NOT YET PAYABLE.
- B. PROPERTY TAXES, INCLUDING GENERAL AND SPECIAL TAXES, PERSONAL PROPERTY TAXES, IF ANY, AND ANY ASSESSMENTS COLLECTED WITH TAXES, FOR THE FISCAL YEAR SHOWN BELOW, ARE PAID. FOR PRORATION PURPOSES THE AMOUNTS ARE:

FISCAL YEAR 1993 - 1994	
1ST INSTALLMENT:	\$2,257.33
2ND INSTALLMENT:	\$2,257.32
HOMEOWNERS EXEMPTION:	SNONE
CODE AREA:	4654
ASSESSMENT NO:	3048-8-3

- C. SUPPLEMENTAL OR ESCAPED ASSESSMENTS OF PROPERTY TAXES, IF ANY, ASSESSED PURSUANT TO THE REVENUE AND TAXATION CODE OF THE STATE OF CALIFORNIA.
- D. SUPPLEMENTAL OR ESCAPED ASSESSMENTS OF PROPERTY TAXES, IF ANY, MADE PURSUANT TO PART 0.5, CHAPTER 3.5 OR PART 2, CHAPTER 3, ARTICLES 3 AND 4, RESPECTIVELY, OF THE CALIFORNIA REVENUE AND TAXATION CODE AS A RESULT OF CHANGES IN OWNERSHIP OR NEW CONSTRUCTION OCCURRING PRIOR TO DATE OF POLICY.
- 1. ANY ADVERSE INTEREST OR CLAIM OF RIGHT OF TITLE BASED UPON THE ASSERTION THAT THE SOUTH BOUNDARY OF SECTION 17, TOWNSHIP 5 NORTH, RANGE 11 WEST, SAN BERNARDINO MERIDIAN, ACCORDING TO THE OFFICIAL PLAT OF SAID LAND APPROVED BY THE SURVEYOR GENERAL, MARCH 19, 1856 IS NOT IDENTICAL WITH THE CORRESPONDING BOUNDARY OF SAID SECTION ACCORDING TO THE OFFICIAL PLAT OF SAID LAND FILED IN THE DISTRICT LAND OFFICE, JUNE 25, 1904.
- 2. AN EASEMENT 50 FEET WIDE FOR A DITCH, AS CONVEYED TO PALMDALE WATER CO., BY DEED RECORDED IN BOOK 5777 PAGE 156, OF DEEDS.

- 3. AN EASEMENT OVER SAID LAND FOR CONDUITS, PIPE LINES AND POLE LINES, CONSISTING OF PART OF THE PALMDALE WATER COMPANY'S MAIN CANAL EXTENDING FROM LITTLE ROCK CREEK TO PALMDALE MORE PARTICULARLY DESCRIBED IN THE CONFIRMATION DEED TO HELLMAN COMMERCIAL TRUST & SAVINGS BANK, RECORDED MARCH 24, 1920 IN BOOK 7085 PAGE 346 OF DEEDS, AND AS GRANTED TO PALMDALE IRRIGATION DISTRICT BY DEED RECORDED APRIL 29, 1920 IN BOOK 7209 PAGE 114 OF DEEDS.
- 4. AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT GRANTED TO: COUNTY OF LOS ANGELES PURPOSE: POLE LINES RECORDED: IN BOOK 12572 PAGE 392, OFFICIAL RECORDS

AFFECTS: SAID POLES SHALL BE LOCATED WITHIN 25 FEET OF THE CENTER LINE OF THE PALMDALE IRRIGATION DITCH PASSING THROUGH SAID LAND.

5. AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT GRANTED TO: SOUTHERN CALIFORNIA EDISON COMPANY, A CORPORATION PURPOSE: POLE LINES RECORDED: IN BOOK 32666 PAGE 267 OF OFFICIAL RECORDS

AFFECTS: SAID DEED PROVIDES THAT THE POLES OF SAID LINE SHALL BE ERECTED WITHIN THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 17.

SAID DEED FURTHER RECITES:

ALL POLES SHALL BE ERECTED AND MAINTAINED WITHIN ONE FOOT OF THE FOLLOWING DESCRIBED LINE:

A LINE AS NEAR AS PRACTICABLE TO THE WESTERLY LINE OF SAID PROPERTY OF THE GRANTORS. NO POLES ARE TO BE ERECTED ON GRANTORS PROPERTY.

6. AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT GRANTED TO: PURPOSE: RECORDED: COUNTY OF LOS ANGELES PUBLIC ROAD AND HIGHWAY PURPOSES JUNE 19, 1962 IN BOOK D-1655 PAGE 150, OFFICIAL RECORDS

AFFECTS: PARCEL A: THAT PORTION OF SECTION 17, TOWNSHIP 5 NORTH, RANGE 11 WEST, SAN BERNARDINO MERIDIAN WITHIN A STRIP OF LAND 100 FEET WIDE, LYING 50 FEET ON EACH SIDE OF THE FOLLOWING DESCRIBED CENTER LINE:

BEGINNING AT THE NORTHWEST CORNER OF SAID SECTION; THENCE NORTH 89° 59' 00" EAST ALONG THE NORTHERLY LINE OF SAID SECTION; A DISTANCE OF 1224.00 FEET TO THE BEGINNING OF A CURVE CONCAVE TO THE SOUTHWEST, TANGENT TO SAID NORTHERLY LINE AND HAVING A RADIUS OF 1800 FEET; THENCE SOUTHEASTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 27° 34' 45" A DISTANCE OF 866.43 FEET THENCE SOUTH 62° 26' 15" EAST 479.95 FEET TO THE BEGINNING OF A CURVE CONCAVE TO THE SOUTHWEST, TANGENT TO SAID LAST MENTIONED COURSE AND HAVING A RADIUS OF 1500 FEET; THENCE SOUTHEASTERLY ALONG SAID LAST MENTIONED CURVE THROUGH A CENTRAL ANGLE OF 9° 50' 53" A DISTANCE OF 257.82 FEET TO A POINT HEREBY DESIGNATED "POINT A"; A RADIAL OF SAID CURVE TO SAID POINT BEARS NORTH 37° 24' 38" EAST: THENCE CONTINUING SOUTHEASTERLY ALONG SAID LAST MENTIONED CURVE THROUGH A CENTRAL ANGLE OF 4° 58' 17" A DISTANCE OF 130.15 FEET; THENCE SOUTH 47° 37' 05" EAST 106.30 FEET TO THE BEGINNING OF A CURVE CONCAVE TO THE NORTHEAST, TANGENT TO SAID LAST MENTIONED COURSE AND HAVING A RADIUS OF 1500 FEET; THENCE SOUTHEASTERLY ALONG SAID LAST MENTIONED CURVE THROUGH A CENTRAL ANGLE OF 14° 01' 40" A DISTANCE OF 367.25 FEET; THENCE SOUTH 61° 38' 45" EAST 1101.79 FEET TO THE BEGINNING OF A CURVE CONCAVE TO THE SOUTHWEST, TANGENT TO SAID LAST MENTIONED COURSE AND HAVING A RADIUS OF 1800 FEET; THENCE SOUTHEASTERLY ALONG SAID LAST MENTIONED CURVE THROUGH A CENTRAL ANGLE OF 15° 44' 40" A DISTANCE OF 494.63 FEET; THENCE SOUTH 45° 54' 05" EAST 424.43 FEET TO THE BEGINNING OF A CURVE CONCAVE TO THE NORTHEAST, HAVING A RADIUS OF 1400 FEET, TANGENT TO SAID LAST MENTIONED COURSE AND TANGENT TO A STRAIGHT LINE WHICH BEARS NORTH 62° 47' 20" WEST, AND PASSES THROUGH A POINT IN THE EASTERLY LINE OF SAID SECTION, DISTANT NORTH 0° 10' 10" WEST THEREON 319.12 FEET FROM THE EAST QUARTER CORNER THEREOF; THENCE SOUTHEASTERLY ALONG SAID LAST MENTIONED CURVE 412.64 FEET TO SAID STRAIGHT LINE; THENCE SOUTH 62° 47' 20" EAST ALONG SAID STRAIGHT LINE TO SAID LAST MENTIONED POINT; THENCE CONTINUING SOUTH 62° 47' 20" EAST ALONG THE SOUTHEASTERLY PROLONGATION OF SAID STRAIGHT LINE 100.00 FEET.

EXCEPTING FROM SAID 100 FOOT STRIP OF LAND THAT PORTION THEREOF WHICH LIES WITHIN THOSE CERTAIN PARCELS OF LAND SHOWN AS PARCELS 20 TO 22, INCLUSIVE, ON MAP FILED IN BOOK 73, PAGES 22 AND 23 OF RECORD OF SURVEYS, IN THE OFFICE OF THE RECORDER OF THE COUNTY OF LOS ANGELES.

ALSO EXCEPTING FROM SAID 100 FOOT STRIP OF LAND THAT PORTION THEREOF WHICH LIES WITHIN THOSE CERTAIN PARCELS OF LAND DESCRIBED AS PARCELS 1 AND 2, IN DEED TO FRANK T. PETROLLO, ET UX., RECORDED AS DOCUMENT NO. 1484, ON MAY 11, 1959, IN BOOK D-462 PAGE 347, OF OFFICIAL RECORDS IN THE OFFICE OF SAID RECORDER.

PARCEL B: THAT PORTION OF ABOVE MENTIONED SECTION, WITHIN A STRIP OF LAND 60 FEET WIDE, LYING 30 FEET ON EACH SIDE OF THE FOLLOWING DESCRIBED CENTER LINE:

ORDER NO. 5092574-39

BEGINNING AT THE ABOVE DESIGNATED "POINT A", IN THE CENTER LINE OF THE 100 FOOT STRIP OF LAND ABOVE DESCRIBED AS PARCEL A" THENCE NORTH 0° 25' 00" EAST 134.78 FEET TO THE BEGINNING OF A CURVE CONCAVE TO THE EAST, HAVING A RADIUS OF 600 FEET, TANGENT TO SAID LAST MENTIONED COURSE AND TANGENT TO THE SOUTHWESTERLY PROLONGATION OF THE CENTER LINE OF THAT CERTAIN 60 FOOT STRIP OF LAND DESCRIBED AS PARCEL B IN DEED TO COUNTY OF LOS ANGELES FOR 42ND STREET, EAST RECORDED AS DOCUMENT NO. 3379, ON FEBRUARY 10, 1960, IN BOOK D-746 PAGE 296 OF OFFICIAL RECORDS, IN THE OFFICE OF SAID RECORDER; THENCE NORTHEASTERLY ALONG SAID CURVE TO SAID SOUTHWESTERLY PROLONGATION; THENCE NORTH 26° 17' 50" EAST ALONG SAID SOUTHWESTERLY PROLONGATION 177.86 FEET TO THE NORTHERLY LINE OF SAID SECTION.

THE SIDE LINES OF SAID 60 FOOT STRIP OF LAND ARE TO BE PROLONGED OR SHORTENED AT THE END THEREOF SO AS TO TERMINATE IN THE NORTHERLY LINE OF SAID SECTION.

EXCEPTING FROM SAID 60 FOOT STRIP OF LAND THAT PORTION THEREOF WHICH LIES WITHIN THE 100 FOOT STRIP OF LAND ABOVE DESCRIBED AS PARCEL A.

PARCEL C: THAT PORTION OF ABOVE MENTIONED SECTION, WITHIN THE FOLLOWING DESCRIBED BOUNDARIES:

BEGINNING AT THE INTERSECTION OF THE NORTHEASTERLY BOUNDARY OF THE 100 FOOT STRIP OF LAND ABOVE DESCRIBED TO PARCEL A, WITH THE WESTERLY BOUNDARY OF THE 60 FOOT STRIP OF LAND ABOVE DESCRIBED AS PARCEL B; THENCE NORTHERLY ALONG SAID WESTERLY BOUNDARY TO THE INTERSECTION OF THE SOUTHWESTERLY PROLONGATION OF THE CENTER LINE OF THAT CERTAIN 60 FOOT STRIP OF LAND DESCRIBED AS PARCEL B IN ABOVE MENTIONED DEED TO COUNTY OF LOS ANGELES; THENCE SOUTHWESTERLY ALONG SAID SOUTHWESTERLY PROLONGATION TO THE SAID NORTHEASTERLY BOUNDARY; THENCE SOUTHEASTERLY ALONG SAID NORTHEASTERLY BOUNDARY TO THE POINT OF BEGINNING.

ABOVE DESCRIBED PARCEL A IS TO BE KNOWN AS BARREL SPRINGS ROAD AND ABOVE DESCRIBED PARCEL B AND C ARE TO BE KNOWN AS 42ND STREET EAST.

AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT GRANTED TO: PALMDALE IRRIGATION DISTRICT, AN

PURPOSE:IRRIGATION DISTRICTPURPOSE:CANALS, PIPELINES, WORKS OR STRUCTURESRECORDED:JANUARY 12, 1963 IN BOOK D-1870 PAGE 849,<br/>OFFICIAL RECORDS

AFFECTS:

20-02

7.

A 50 FOOT STRIP OF LAND LOCATED ADJACENT TO AND SOUTHWESTERLY FROM THE SOUTHWEST LINE OF BARREL SPRINGS ROAD AS SAID ROAD IS SHOWN ON SHEET 3 OF LOS ANGELES COUNTY SURVEYORS MAP NO. B-2533 LOCATED AS FOLLOWS:

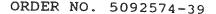
BEGINNING AT THE INTERSECTION OF THE EAST LINE OF SECTION 17, TOWNSHI. 5 NORTH, RANGE 11 WEST, SAN BERNARDINO MERIDIAN, AND THE CENTER LINE OF SAID BARREL SPRINGS ROAD; THENCE ALONG SAID CENTER LINE NORTH 62° 47' 20" WEST 129.95 FEET TO THE BEGINNING OF A CURVE HAVING A RADIUS OF 1400 FEET WHICH BEARS CONCAVE TO THE NORTHWEST; THENCE ALONG SAID CURVE A DISTANCE OF 170 FEET; MORE OR LESS, TO A POINT ON A RADIAL LINE OPPOSITE THE BEGINNING OF SAID 50 FOOT EASEMENT WHICH IS LOCATED SOUTHWESTERLY FROM AND ADJACENT TO THE SOUTHWEST LINE OF SAID BARREL SPRINGS ROAD; SAID POINT BEING LOCATED SO THAT THE CENTER LINE OF SAID 50 FOOT EASEMENT COINCIDES WITH THE CENTER LINE OF PALMDALE IRRIGATION DISTRICT'S CANAL AS SAID CANAL NOW EXISTS; THENCE CONTINUING ALONG SAID CENTER LINE OPPOSITE SAID 50 FOOT EASEMENT A DISTANCE OF 242.64 FEET, MORE OR LESS, TO THE END OF THE AFOREMENTIONED CURVE HAVING A RADIUS OF 1400 FEET; THENCE CONTINUING ALONG THE CENTER LINE OF SAID BARREL SPRINGS ROAD NORTH 45° 54' 05" WEST 424.43 FEET OPPOSITE SAID 50 FOOT EASEMENT TO THE BEGINNING OF A CURVE HAVING A RADIUS OF 1800 FEET, WHICH CURVE BEARS CONCAVE TO THE SOUTHWEST; THENCE CONTINUING ALONG SAID CURVE AND SAID CENTER LINE OPPOSITE SAID 50 FOOT EASEMENT 52 FEET, MORE OR LESS, TO A POINT ON A RADIAL LINE OPPOSITE THE END OF SAID 50 FOOT EASEMENT WHERE THE CENTER LINE OF SAID EASEMENT COINCIDES WITH THE CENTER LINE OF PALMDALE IRRIGATION DISTRICT'S CANAL AS SAID CANAL NOW EXISTS.

8. AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT GRANTED TO: PURPOSE: RECORDED: COUNTY OF LOS ANGELES PUBLIC ROAD AND HIGHWAY PURPOSES NOVEMBER 12, 1963 IN BOOK D-2252 PAGE 446, OFFICIAL RECORDS

AFFECTS:

PARCEL A: THAT PORTION OF SECTION 17, TOWNSHIP 5 NORTH, RANGE 11 WEST, SAN BERNARDINO MERIDIAN, WITHIN A STRIP OF LAND 60 FEET WIDE, LYING 30 FEET ON EACH SIDE OF THE FOLLOWING DESCRIBED CENTER LINE:

BEGINNING AT A POINT IN THAT CERTAIN COURSE DESCRIBED AS HAVING A BEARING AND LENGTH OF SOUTH 62° 26' 15" EAST 479.95 FEET IN THE CENTER LINE OF THAT CERTAIN 100 FOOT STRIP OF LAND DESCRIBED IN PARCEL A OF DEED TO COUNTY OF LOS ANGELES, RECORDED AS DOCUMENT NO. 4635, ON JUNE 19, 1962, IN BOOK D-1655 PAGE 150, OF OFFICIAL RECORDS, IN THE OFFICE OF THE RECORDER OF SAID COUNTY, DISTANT NORTH 62° 26' 15" WEST THEREON 80.40 FEET FROM THE SOUTHEASTERLY TERMINUS THEREOF; THENCE NORTH 27° 33' 45" EAST 35.00 FEET TO THE BEGINNING OF A CURVE CONCAVE TO THE SOUTHEAST, TANGENT TO SAID LAST MENTIONED COURSE AND HAVING A RADIUS OF 300 FEET; THENCE NORTHEASTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 36° 39' 00" A DISTANCE OF 191.90 FEET; THENCE NORTH 64° 12' 45" EAST 175.44 FEET TO THE BEGINNING OF A CURVE CONCAVE TO THE



NORTHWEST, HAVING A RADIUS OF 200 FEET, TANGENT TO SAID LAST MENTIONED COURSE AND TANGENT TO THAT CERTAIN COURSE DESCRIBED AS HAVING A BEARING AND LENGTH OF NORTH 26° 17' 50" EAST 177.86 FEET IN THE CENTER LINE OF THAT CERTAIN 60 FOOT STRIP OF LAND DESCRIBED IN PARCEL B OF SAID DEED TO COUNTY OF LOS ANGELES; THENCE NORTHEASTERLY ALONG SAID LAST MENTIONED CURVE 132.35 FEET TO SAID LAST MENTIONED CERTAIN COURSE.

EXCEPTING FROM ABOVE DESCRIBED PARCEL A THAT PORTION THEREOF WHICH LIES WITHIN SAID CERTAIN 100 FOOT STRIP OF LAND.

ALSO EXCEPTING FROM ABOVE DESCRIBED PARCEL A THAT PORTION THEREOF WHICH LIES WITHIN SAID CERTAIN 60 FOOT STRIP OF LAND.

PARCEL B: THAT PORTION OF ABOVE MENTIONED SECTION 17, WITHIN THE FOLLOWING DESCRIBED BOUNDARIES:

BEGINNING AT THE INTERSECTION OF THE NORTHWESTERLY BOUNDARY OF ABOVE DESCRIBED PARCEL A, WITH THE NORTHEASTERLY BOUNDARY OF ABOVE MENTIONED CERTAIN 100 FOOT STRIP OF LAND; THENCE NORTHWESTERLY A LONG SAID NORTHEASTERLY BOUNDARY 17.00 FEET; THENCE EASTERLY IN A DIRECT LINE TO A POINT IN SAID NORTHWESTERLY BOUNDARY DISTANT NORTHEASTERLY THEREON 17.00 FEET FROM THE POINT OF BEGINNING; THENCE SOUTHWESTERLY ALONG SAID NORTHWESTERLY BOUNDARY 17.00 FEET TO SAID POINT OF BEGINNING.

PARCEL C: THAT PORTION OF ABOVE MENTIONED SECTION 17, WITHIN THE FOLLOWING DESCRIBED BOUNDARIES:

BEGINNING AT THE INTERSECTION OF THE SOUTHEASTERLY BOUNDARY OF ABOVE DESCRIBED PARCEL A, WITH THE NORTHEASTERLY BOUNDARY OF ABOVE MENTIONED CERTAIN 100 FOOT STRIP OF LAND; THENCE SOUTHEASTERLY ALONG SAID NORTHEASTERLY BOUNDARY 17.00 FEET; THENCE NORTHERLY IN A DIRECT LINE TO A POINT IN SAID SOUTHEASTERLY BOUNDARY DISTANT NORTHEASTERLY THEREON 17.00 FEET FROM THE POINT OF BEGINNING; THENCE SOUTHWESTERLY ALONG SAID SOUTHEASTERLY BOUNDARY 17.00 FEET TO SAID POINT OF BEGINNING.

ABOVE DESCRIBED PARCELS A, B AND C ARE TO BE KNOWN AS 42ND STREET EAST.

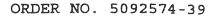
9. AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT GRANTED TO: PACIFIC TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION PURPOSE: UNDERGROUND CONDUITS

RECORDED:

AFFECTS: THE WESTERLY 10 FEET AND THE SOUTHERLY 10 FEET OF SAID SECTION 17.

OFFICIAL RECORDS

DECEMBER 16, 1966 IN BOOK D-3509 PAGE 704,



- 10. ANY DEFECT IN THE ORDER CONFIRMING SALE ENTERED DECEMBER 28, 1966 IN THE MATTER OF THE ESTATE OF ALBERT GALE, ALSO KNOWN AS ALBERT GALE, JR., ALSO KNOWN AS ALBERT F. GALE, ALSO KNOWN AS ALBERT F. GALE, JR., ALSO KNOWN AS ALBERT FELIX GALE, ALSO KNOWN AS ALBERT FELIX GALE, JR., CASE NO. NCP 282, SUPERIOR COURT, LOS ANGELES.
- 11. WATER RIGHTS, CLAIMS OR TITLE TO WATER.
- 12. MATTERS WHICH MAY BE DISCLOSED BY AN INSPECTION OR BY A SURVEY OF SAID LAND THAT IS SATISFACTORY TO THIS COMPANY, OR BY INQUIRY OF THE PARTIES IN POSSESSION THEREOF.

AN INSPECTION OF SAID LAND HAS BEEN ORDERED, WHICH MAY RESULT IN ADDITIONAL EXCEPTIONS.

13. ANY RIGHTS, INTERESTS OR CLAIMS OF THE PARTIES IN POSSESSION OF SAID LAND, INCLUDING BUT NOT LIMITED TO THOSE BASED ON AN UNRECORDED AGREEMENT, CONTRACT OR LEASE.

> END OF SCHEDULE B May 23, 1994

CC: ALAN, MATKINS, LAW OFFICES 18400 VON KARMAN, 4TH FLR. IRVINE, CA 92714

ATTN: JACK SCHOELLERMAN, ESQ. REF: BUSHNELL

#### AB 512 FUNDING NOTIFICATION

#### NOTICE:

INSURANCE CODE SECTION 12413.1 (AB 512, CHAPTER 598 OF THE LAWS OF 1989) PROHIBITS THE DISBURSEMENT OF FUNDS (AND HENCE, THE CLOSING OF TRANSACTIONS CONTINGENT ON CONCURRENT DISBURSEMENTS) UNLESS SUCH FUNDS ARE AVAILABLE FOR COLLECTION IN ACCORDANCE WITH THE SCHEDULE SET FORTH THEREIN. CUSTOMERS ARE STRONGLY ADVISED TO FAMILIARIZE THEMSELVES WITH THE AVAILABILITY SCHEDULE AND TO NOTE, IN PARTICULAR, THAT ONLY DEPOSITS MADE TO THE COMPANY'S ACCOUNTS BY CASH AND WIRE TRANSFER ENJOY SAME-DAY AVAILABILITY. RECORDINGS MAY NEVERTHELESS TAKE PLACE DESPITE A SHORTAGE IN AVAILABLE FUNDS IF THE PARTIES TO THE TRANSACTION HAVE PROVIDED WRITTEN CONSENT TO DELAYED DISBURSEMENT. THE CONSENT FORM REQUIRED BY THE COMPANY IS AVAILABLE UPON REQUEST FROM YOUR TITLE OFFICER OR SALES REPRESENTATIVE.

FOR YOUR INFORMATION OUR WIRING INSTRUCTIONS ARE AS FOLLOWS:

PASADENA OFFICE UNION BANK CENTURY CITY OFFICE 5200 W. CENTURY BLVD LOS ANGELES, CA 90045

ACCT #335014-6899 ABA 122000496 REF: CONTINENTAL LAWYERS TITLE ORDER NUMBER: 5092574-39 

# **APPENDIX B**

## FOOTHILL RANCH PALMDALE, CALIFORNIA

### MASTER TREE PLANT LIST

#### **Barrel Springs Road West**

#### **Botanic Name**

Cedrus atlantica glauca Pinus eldarica Pinus pinea Yucca brevifola

#### **Barrel Springs Road Central**

#### **Botanic Name**

Koelreuteria paniculata Platanus acerifolia Pyrus calleryana ttAristocrat" Populas fremontii

#### **Barrel Springs Road East**

**Botanic Name** 

Cupressus arizonica Calocedrus decurrens Cedrus libnani Quercus hex Yucca brevifola

### 47th Street East

#### Botanic Name

Cupressus arizonica Calocedrus decurrens Cedrus libnani Quercus ilex Yucca brevifola

#### Common Name

Blue Atlas Cedar Mondell Pine Italian Stone Pine Joshua Tree

#### Common Name

Golden Rain Tree London Plane Tree Flowering Pear Fremont Cottonwood

#### Common Name

Arizona Cypress California Incense Cedar Cedar of Lebanon Holly Oak Joshua Tree

#### Common Name

Arizona Cypress California Incense Cedar Cedar of Lebanon Holly Oak Joshua Tree

NOTE: Typical spacing of trees shall range 1 tree per 400 -900 square feet of total parkway. Naturalized clustering of trees is encouraged. Total number of street trees is equivalent 1 tree per 35 linear feet of street. Actual tree spacing along streets shall be dependent upon the proposed species.

#### 37th Street East

#### **Botanic Name**

Pinus eldarica Pistacia chinensis Gleditsia triacanthos inermis 'Shade Master'

## Foothill Ranch Road

#### **Botanic Name**

Populas fremontii Pyrus calleryana 'Aristocrat' Gleditsia triacanthos inermis 'Shade Master' Koelreuteria paniculata Pinus eldarica

#### **Planning Areas**

#### Botanic Name

Cedrus atlantica glauca Cedrus deodora Himilayan Populas fremontii Gleditsia triacanthos inermis 'Shade Master' Koelreuteria paniculata Pinus eldarica Pinus pinea Pistacia chinensis Platanus acerifolia 'Bloodgood' Pyrus calleryana 'Aristocrat' Quercus ilex Robinia "Idaho" Cupressus sempervirens Olea europaea 'Swan Hill' Yucca gloryosa Washington fihifera Cercis canadensis Juniperus chinensis torulosa Ceridum floridum Yucca brevifola

## Common Name

Mondell Pine Chinese Pistacio Thorness Honeylocust

## Common Name

Fremont Cottonwood Flowering Pear Thorness Honeylocust Golden Rain Tree Mondell Pine

## Common Name

Blue Atlas Cedar White Cedar Fremont Cottonwood **Thornless Honetlocust** Golden Rain Tree **Mondell Pine Italian Stone Pine Chinese** Pistacio London Plane Tree Flowering Pear Holly Oak Idaho Locust **Italian Cypress Fruitless Olive** Spanish Dagger California Fan Palm Eastern Redbud Twisted Juniper Blue Palo Verde Joshua Tree

NOTE: Typical spacing of trees shall range 1 tree per 400-900 square feet of total parkway. Naturalized clustering of trees is encouraged. Total number of street trees is equivalent 1 tree per 35 linear feet of street. Actual tree spacing along streets shall be dependent upon the proposed species.

## MASTER SHRUB, GROUND COVER, VINES AND GRASSES PLANT LIST

#### Shrubs

#### **Botanic Name**

Abelia grandiflora Agave americana Berberbis thumbergii Buxus microphylla 'Koreana' Chaenomeles japonica **Cotoneaster Species Ligustrum Species** Lavandula Species Photinia fraseri Pittosporum tobira Prunus caroliniana 'Compacta' **Pyracantha Species** hex vomitoria **R**aphiolepis indica **Rosmarinus** officinalis Salvia greggii Xylosma congestum Juniperus Chinensis 'pfitzeriana' Leucophyllum Frutescens Yucca whipplei Yucca Species

#### Ground Cover

#### **Botanic Name**

Baccharis pilularis Euonymus fortunei Hedera helix Hypericum calycinum Juniperus horizontalis Juniperus sabina Lonicera japonica halliana Rosmarinus officianalis Hemerocallis Species Opuntia basilaris Dalea greggii Prostrate

#### Common Name

**Glossy** Abelia **Century Plant Agave** Barberry Boxwood Flowering Quince Juniper Privet Lavender Fraser's Photinia Evergreen Mockorange **Compact Carolina Cherry** Firethorn Yaupon Indian Hawthore Rosemary Sage Shiny xylosma Pfitzer Juniper **Texas Ranger Our Lords Candle** Yucca

#### Common Name

Coyote Brush Wintercreeper English Ivy St. Johnswort 'Blue Chip' Juniper 'Buffalo' Juniper Hall's Honeysuckle Rosemary Daylilly Beaver-tail Cactus Indigo Bush

## Vines

**Botanical Name** 

Macfaydeana unguis catii Parthenocissus tricuspidata Wisteria sinensis Gelesemium sempervirens Rosa banksiae

Grasses

**Botanical Name** 

Muhienbergia Rigens Orysopsis hymenoides Common Name

Catclaw Vine Boston Ivy Chinese Wisteria Carolina Jasmin Lady Banks Rose

Common Name

Deer Grass Indian Rice Grass

# **APPENDIX C**

**Policy L7.1.9:** Ensure that future development within the Foothill Ranch Specific Plan (formerly the Bushnell Special Development Area and the College Park Palmdale Specific Plan) considers physical constraints on the property, including earthquake faults and canyon areas, and that densities are established which maintain consistency with the south side area in accordance with the following criteria:

- A covenant shall be recorded on land encompassing Hunt Canyon and along Barrel Springs Road as determined by the approved Specific Plan to ensure that these areas remain as open space. A system of hiking trails, passive open space, and park improvements such as picnic and seating areas and open play areas shall be developed at the same schedule required of within Appendix D of the Foothill Ranch Specific Plan.
- 2. A trails system shall be provided which connects to a regional system to the extent feasible.
- All neighborhood commercial uses proposed as a part of the Specific Plan shall be limited to those serving only the short-term goods and services needs of the nearby residential areas. No 24-hour uses or gas or service stations shall be permitted. Design of any commercial facilities shall be compatible with the overall community design theme.
- 4. Design and operation of any commercial facilities shall reduce impacts on nearby residential areas to the extent feasible through limiting hours of operation to no later than midnight, allowing light fixtures no higher than 14 feet to minimize glare, providing a minimum of 10% of the site for landscaping, and architecturally screening all equipment and utility devices. If rooftop equipment cannot be screened from adjacent or nearby properties, ground-mounted equipment shall be provided and screened. Design of any neighborhood commercial center shall be compatible with the overall community design theme of the Foothill Ranch Specific Plan.
- 5. A Master Drainage Plan shall be provided utilizing natural open space and drainage areas to the maximum extent feasible.
- 6. A master infrastructure plan shall be provided for the area, considering sewer, water, roads, and public services. All lots must be connected to a public sanitary sewer system, no septic tanks are permitted.
- 7. Driveway access to the neighborhood commercial site will be allowed from Foothill Ranch Road or other appropriate internal street. The design of such access shall be subject to review and approval of the City Traffic Engineer and Planning Director at the time of development review. Primary access to Barrel Springs Road for the residential portions of the site shall be limited to one (1) access point, in addition to 37<sup>th</sup> Street East, except that additional residential access to Barrel Springs Road

may be allowed as temporary or emergency access only where deemed necessary by the City Engineer. Parking will be prohibited along Barrel Spring Road.

- 8. A minimum of one-acre (1) residential lots shall be provided to assure consistency with the surrounding rural area.
- 9. No residential density shall be calculated for any seismic set back zone adjacent to active or potentially active fault traces where construction of habitable structures are not permitted, as delineated by a site-specific geotechnical report. However, seismic set back zones may be included in the calculation of minimum lot area and building setbacks.
- 10. No residential uses shall be permitted within the Open Space or commercial portions of the site.

# **APPENDIX D**

# INFRASTRUCTURE PHASING AND FINANCING PLAN

The phasing outlined below may be modified through the approval of a Minor Modification as outlined within Section 6.6.2.

Phase I

0

Consists of all residential units within Planning Area C, as shown on Exhibit 44, Phasing.

• Streets/Circulation Improvements: All street improvements will be designed and constructed in accordance with Exhibits 16, 17 and 18 and/or City standards. During all phases of development, the Foothill Ranch developer will dedicate all rights-of-way and public easements to the City of Palmdale. Construction of traffic signals may be deferred until warranted.

		Responsible Party
Const with 2 with pa	Springs Road (BSR): ruct BSR to full arterial standards eastbound and 2 westbound lanes aved and striped median between nd 47th Streets East, plus:	Developer
a.	BSR/40th St. East Intersection: Separate right-turn lane on the westbound approach; separate left-turn lane on the eastbound approach; separate right-turn and left-turn lane on the southbound approach; and install a signal.	Developer
b.	BSR/College Park Road Intersection: Separate right-turn lane on the eastbound approach; left-turn lane on the westbound; and install a signal.	Developer
C.	BSR/37th Street East Intersection: A separate right-turn lane on the eastbound approach; a separate left-turn lane on the westbound approach; and install a signal.	Developer

0	Foothill Ranch Road (FRR): Developer Construct FRR to full width as identified on Exhibit 17, between BSR and 37th Street East, including an expanded entry median between BSR and the southerly boundary of Planning Area C, plus:	
	a. FRR/BSR Intersection: Stripe for left-turn and right-turn lanes on the northbound approach.	Developer
0	37th Street East: Construct 37th Street East to full standards as identified on Exhibit 18, between BSR and southerly project boundary, except for no pedestrian trail south of FRR, plus:	Developer
	<ul> <li>a. 37th Street East/BSR Intersection:</li> <li>A right-turn lane and a left-turn</li> <li>lane on the northbound approach.</li> </ul>	Developer
0	Avenue V: Provide an easement for future 32-foot half-street roadway dedication and easement with a width based on 2:1 cut or fill along the southerly boundary of the College property west of Hunt Canyon.	Developer
0	Internal Streets: Construct internal streets in Planning Area C.	Developer
constr Distric Colleg	age Improvements: All drainage improvements will be designed ucted in accordance with Exhibit 19, Los Angeles County Floo at and/or City standards. During all phases of development, the ge District and College Park Palmdale developer will dedicate facilities, including access for maintenance, to L. A. County Floot.	od Control e Community all storm
0	Hunt Canyon Facilities (Planning Area AOS-1):	Developer

Design and construct storm water conveyance system consisting of debris and detention basins, pipes, open conduits and other appropriate devices to limit the peak runoff from the project to 85% of the pre-development peak runoff which flows from the property, plus:

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Responsible Party

	a.	On-site: Provide and construct access to debris and detention basins. The southerly basin will be accessed from the Avenue V. The northerly Hunt Canyon basin will be accessed through the future open space.			
	b.	Off-site: Storm drain culvert and energy dissipator on the north side of BSR for release into the existing natural channel.			
0	Desigr facilitie facilitie main li future	II Ranch Road: n and construction of master drainage es as shown on Exhibit 19. These es include the 24", 36", 42" and 48" ine pipes and catch basins. In addition, connection to Residential Planning will be provided.	Developer		
0	Detent with cu	ng Area AOS-2: tion basin in Planning Area AOS-2 ulverts under BSR. The basin may tially constructed for this phase.	Developer		
0	Desigr conve reside	ential Planning Areas: n and construct storm water yance system through ntial streets, catch basins, storm and open drainage devices.	Developer		
Sewer Improvements: All sewer improvements will be designed and constructed in accordance with Exhibits 20 and 21, Los Angeles County Sanitation District and City standards. During all phases of development, the Foothill Ranch developer will dedicate all public rights-of-way and sewer easements to the City of Palmdale and/or L.A. County Sanitation District.					

oOff-site Improvements:DeveloperConstruct 18"- 8" sewer line connection<br/>from 35th Street East and Avenue S to the<br/>project boundary at 40th Street East and BSR.Developer

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Res	pon	sib	le	Pa	rtv

- **On-site Improvements:** 0 **Barrel Springs Road** Developer a. 12" sewer line within BSR from 40th Street East to CPR. b. Foothill Ranch Road: Developer 8" sewer line within CPR from BSR to lateral connections for AVCC-1 and AVCC-2. Planning Area C: Developer C. All necessary sewer lines within the Planning Area. Water Improvements: All water improvements will be designed and constructed in conformance with Exhibits 22 and 23 in accordance with Palmdale Water District and City standards. During all phases of development, the Foothill Ranch Developer will dedicate all public rights-of-way and water line easements to the City of Palmdale and/or Palmdale Water District. The Homeowners Association may consider the option of establishing a mutual water company to provide service to the site. Off-site Improvements: Developer 0 Pay capital improvement fees for Palmdale Water District's master planned facilities (some master planned facilities will be located on-site).
  - On-site Improvements:
    - a. District's Master Planned Facilities: Water District To be constructed through payment of capital improvement fees.
    - b. 3250 Service Zone:

Foothill Ranch Road:DeveloperConstruct 12" water line from37th Street East to MasterPlanned 16" water line.Developer

# Responsible Party

		Planning Area C: Construct 8" water lines within Planning Area C with at least two points of connection to water line in FRR.	Developer
	C.	3400+ Service Zone:	
		37th Street East: Construct 12" water line connecting to 12" water line located at Planning Area G's southern boundary, northerly to FRR.	Developer
		Foothill Ranch Road: Construct 8" water line from 37th Street East to the northernmost entrances within the 3400+ Service Zone in Planning Areas B and C.	Developer
		Planning Area C: Construct water line loop within Planning Area C, with stub for future connection to Planning Area E and at least two points of connection to water line in FRR.	Developer
const	•	nprovements: All landscape improvements will be des n accordance with the dimensions shown in Exhibits 3 s.	•
0	landso signa	ruct streetscape improvements to include caping, street lighting and directional ge for the following roadways, plus onal streetscape amenities as listed:	
	a.	Along the south side of BSR between 37th Street East and 47th Street East, except for landscaping.	Developer
	b.	Along the east side of 37th Street East between the northerly boundary of Planning Area H and the southerly project boundary.	Developer

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Responsible Party

		C.	Along both sides and median of FRR between BSR and 37th Street East, plus street furniture, pedestrian lighting and seating amenities.	Developer
•		-	ments: All trail improvements will be designed and cor /ith Exhibit 15 of the this document and/or City standar	
	0	Const	ruct trails along the following roadways:	
		a.	Pedestrian/Bicycle Trail along the west side of FRR between BSR and 37th Street East.	Developer
		b.	Pedestrian Trail along the east side of 37th Street East between BSR and Planning Area G.	Developer
		C.	Alignment/Dedication of future Multi-use Trail along north side of BSR.	Developer
•			entation: All monumentation will be designed and con vith Exhibits 37-39 of this document.	structed in
	0		ruct entry monumentation along the following ay intersections:	
		a.	Community Entry Monumentation on BSR at the intersection of FRR.	Developer
		b.	Community Entry Monumentation on BSR at the intersection of 37th Street East.	Developer
		d.	Planning Area Monumentation at Planning Area C along FRR.	Developer
•	Other	Improve	ements:	
	0	line fro for lan	ruct a turnout and delivery om the California Aqueduct Idscape irrigation for cape areas and street landscaping.	Developer

	0	Replace existing Palmdale Ditch with an underground 48" reinforced concrete pipe through the entire project site.	Developer
Phase II			
Con	sists of a	Il residential units within Planning Area E, as shown on Exhibi	t 44, Phasing.
•	Stree	ts/Circulation Improvements:	
	0	Internal Streets: Construct internal streets in Planning Area E.	Developer
•	Drain	age Improvements:	
	0	Residential Planning Area: Design and construct storm water conveyance system through residential streets, catch basins, storm pipe and open drainage devises per City standards.	Developer
•	Sewe	r Improvements:	
	0	Residential Planning Area: Connect sewer lines between Planning Area E and sewer line in FRR.	Developer
•	Wate	mprovements:	
	0	Residential Planning Area: Construct water line loop within Planning Area E with at least two points of connection to 3400+ line in FRR and a stub connection to 3400+ line in Planning Area C.	Developer
•	Entry	Monumentation:	
	0	Construct Planning Area Entry Monumentation along FRR at entrance to Planning Area E.	Developer

#### Phase III

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Consists of all residential units within Planning Areas D and F, , a five-acre neighborhood park site and approximately 20,000 square feet of the neighborhood commercial area as shown on Exhibit 44, Phasing.

• Streets/Circulation Improvements:

0	47th Street East: Widen 47th Street East by 12 feet on the west side for an approximate distance of 100 feet north of Barrel Springs Road to provide an exclusive southbound right-turn lane; and install a signal.	Developer
0	Internal Streets: Construct internal streets in Planning Areas D and F.	Developer
Draina	ge Improvements:	
0	Open Space Area: Design and construct storm water conveyance system and complete construction of detention basin in Planning Area AOS-2.	Developer
0	Residential Planning Area: Design and construct storm water conveyance system through residential streets, catch basins, storm pipe and open drainage devices per City standards.	Developer
Sewer	Improvements:	
0	Barrel Springs Road: Construct 8" sewer line from 40th Street East to 37th Street East.	Developer
0	37th Street East: Construct 8" sewer line from BSR to northernmost entrance to Planning Area D.	Developer

				Responsible Party
	0	Reside	ential Planning Area:	
		a.	Connect sewer lines between Planning Area F and sewer line in FRR.	Developer
		b.	Connect sewer lines between Planning Area D and sewer line in 37th Street East.	Developer
•	Water	Improv	ements:	
	0	Constr	Springs Road: ruct 16" water line from 37th East to CPR.	Developer
	0	Consti	Street East: ruct 12" 3250 Service Zone water om CPR to BSR.	Developer
	0	Reside	ential Planning Area:	
		a.	Planning Area D: Construct water line loop within Planning Area D with at least two points of connection to water line in 37th Street East.	Developer
		b.	Planning Area F: Construct water line loop within Planning Area F with at least two points of connection to water line in CPR.	Developer
•	Entry I	Monum	entation	
	0	Consti Monur	ng Area D: ruct Planning Area Entry nentation at the two entry points Planning Area.	Developer
	0	Constr	ng Area F: ruct Planning Area Entry nentation along CPR.	Developer

# Responsible Party

		Outor		
		0	Construct landscaping improvements along south side of BSR as identified on Exhibit 33.	Developer
		0	Construct the five-acre neighborhood park site in AOS-4, prior to issuance of a building permit for the 400th residential unit.	Developer
Phase	e IV			
	Consi	sts of al	I residential units within Planning Area B, as shown on Exhibit	44.
	•	Street	s/Circulation Improvements:	
		0	Internal Streets: Construct internal streets in Planning Area B.	Developer
	Drainage Improvements:			
		0	Residential Planning Area: Design and construct storm water conveyance system through residential streets, catch basins, storm pipe and open drainage devices per City standards.	Developer
	•	Sewei	Improvements:	
		0	Residential Planning Area: Connect sewer lines between Planning Area B and sewer line in CPR.	Developer
	•	Water	Improvements:	
		0	Residential Planning Area: Construct water line loops within each Service Zone in Planning Area B with at least two points of connection to CPR in each zone and a 3400+ Service Zone stub across Planning Area AOS-1 for future connection to Planning Area A.	Developer

Other Improvements

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# Responsible Party

		0	Planning Area B: Construct Planning Area Entry Monumentation along FRR.	Developer
Phase	V			
	Consis	sts of all	residential units within Planning Areas G and H, as shown on	Exhibit 44.
	•	Streets	s/Circulation Improvements:	
		0	Avenue V: Provide an easement for future 32-foot half-street roadway dedication along the southerly boundary of Planning Area G west of Hunt Canyon.	Developer
		0	Internal Streets: Construct internal streets in Planning Area G and H.	Developer
	•	Draina	ge Improvements:	
		0	Residential Planning Area: Design and construct storm water conveyance system through residential streets, catch basins, storm pipe and open drainage devices per City standards.	Developer
	•	Sewer	Improvements:	
		0	Residential Planning Area: Connect sewer lines between Planning Area G and H and sewer line in FRR.	Developer
	•	Water	Improvements:	
		0	Residential Planning Area: Construct water line loop in Planning Area A, with connections to 3400+ Service Zone line stub in Planning Area AOS-1, the 12" line along the southerly boundary of Planning Area AVCC-1, and at least two points of connection to the existing 6" line in 47th Street East.	Developer

Entry Monumentation

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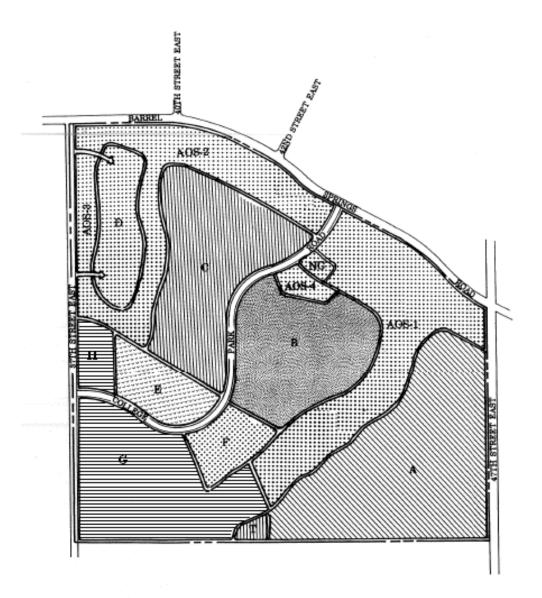
•	Entry	Monumentation:	Responsible Party	
Phase V	0	Community Entry Monumentation on 37 <sup>th</sup> Street East at the intersection of 37 <sup>th</sup> St East and FRR.	Developer	
Consists of all residential units within Planning Area A, as shown on Exhibit 44.				
	-			
•	Street	ts/Circulation Improvements:		
	0	Avenue V: Provide an easement for future 32-foot half-street roadway dedication along the southerly boundary of Planning Area A east of Hunt Canyon.	Developer	
	0	Internal Streets: Construct internal streets in Planning Area A.	Developer	
•	Drainage Improvements:			
	0	Residential Planning Area: Design and construct storm water conveyance system through residential streets, catch basins, storm pipe and open drainage devices per City standards.	Developer	
	0	Construct Storm drain culvert under 47th Street East.	Developer	
Sewer Improvements:				
	0	Barrel Springs Road: Construct 10" and 8" sewer lines from FRR to 47th Street East.	Developer	
	0	47th Street East: Construct 8" sewer line from BSR southerly to connection points in Planning Area A.	Developer	
	0	Residential Planning Area: Connect sewer lines between Planning Area A and sewer line in 47th Street East.	Developer	

#### Responsible Party

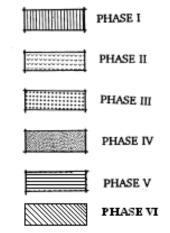
	0	Residential Planning Area: Construct water line loop in Planning Area A, with connections to 3400+ Service Zone line stub in Planning Area AOS-1, the 12" line along the southerly boundary of Planning Area G, and at least two points of connection to the existing 6" line in 47th Street East.	Developer
•	Entry I	Monumentation:	
	0	Planning Area A: Construct Planning Area Entry Monumentation along 47th Street East.	Developer
	0	Community Entry Monumentation on BSR at the intersection of BSR and 47th Street East.	Developer
•	Trails:		
	0	Offer to dedicate right of way for future Multi-use trail on west side of 47th Street East.	Developer

Water Improvements:

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# PHASING



NOTE: COLLEGE PHASING NOT PART OF THIS PROPOSAL

#### EXHIBIT 44





# Appendix C: Condition Assessment Report



CUES, Inc. 3600 Rio Vista Avenue Orlando, FL 32805 Phone: 407-849-0190 Fax: 407-425-1569

## PACP v7.0 Inspections and Scoring

<b>General Informatic</b>	on:							
Surveyed by:	Certificate number:	Reviewed b	y:	Reviewer certificate no.	Owner:		Custome	er:
J.SALAS	P0040994-012023							
P/O number:	Work order no.:	Media label	:	Project name:			Start dat	e/time:
				PALMDALE DITCH CO	<b>ONVERSION PR</b>	OJECT	2023121	8 10:38
Sheet number:	Weather:	Pre-cleaning	g:	Date cleaned:	Flow contro	1:	Purpose	
	1	Ν						
Direction:	Technology used:			Inspection status:	Consequence	ce of failure:	Pressure	value:
U				CI				
Location:								
Drainage area:	Pipe segment ref.:			Street:				
Drainage area.	1_2 TO 1_1			EMMA RD EASEMEN	r			
City:	<u></u>	Location co		Location details:	-			
PALMDALE								
Pipe:								
Pipe use:	Height:	Width:		Shape:	Material:		Lining m	ethod:
SW	67 in.	65 in.	1	H	RCP		Lining in	centrour
Coating method:	Pipe joint length:	Total length	ו .	Length surveyed:	Year constru	ucted:	Year ren	ewed:
<u> </u>		717.409 ft.	1	717.409 ft.				
Measurements:								
Upstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:		Elevation:
1_1			i di la co grader		literanigi			Lieradoni
Downstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:	I	Elevation:
1_2			to g. addi		······································			
MH coordinate system:		MH vertical datum	n:	GPS accuracy:				
Additional Informa								

	Structural:							O&M:			Overall:			
Grade	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	LoF	Risk
1	0	0				2	2							
2	73	146				5	10							
3	116	348	498	413V	2.6	1	3	15	3125	1.9	513	2.6	4.1	
4	1	4				0	0							
5	0	0				0	0							

Distance	Video Ref.	PACP Code	Continuous	Value In (mm 1st	 %	Joint	Circumferential Location At/From To	J	Image Ref.	Remarks
0.0 ft.		MWL			10		1		PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-MWL at 0.0 ft.JPG	
0.0 ft.		АМН					1		PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-AMH at 0.0 ft.JPG	1_2 DS
0.0 ft.	00:01:10	MWM			20		I		PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-MWM at 0.0 ft.JPG	t
4.9 ft.	00:01:25	DSZ			20		3 / 7	3	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-DSZ at 4.9 ft.JPG	DEBRIS
38.4 ft.	00:02:42	SSS	S02				3 / 4	2		defect wanders
43.3 ft.	00:02:52	DAZ			5		1 /	2	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-DAZ at 43.3 ft.JPG	white patches on pipe

Distance	Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd	% Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
64.1 ft.	00:03:25	SSS	S03			8 / 9	2	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-SSS at 64.1 ft.JPG	defect wanders
72.2 ft.	00:03:38	SSS	F02			3 / 4	2	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-SSS at 72.2 ft.JPG	
72.9 ft.	00:03:39	SSS				11 / 1	2	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-SSS at 72.9 ft.JPG	
77.9 ft.	00:04:19	FL	S01			3 /	3	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-FL at 77.9 ft.JPG	
357.7 ft.	00:09:44	IS				8 / 11	1	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-IS at 357.7 ft_1.JPG	
388.4 ft. (	00:10:34	SSS	F03			8 / 9	2	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-SSS at 388.4 ft.JPG	
527.4 ft.	00:13:20	IS				9 / 10	1	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-IS at 527.4 ft_2.JPG	

Distance Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd	% Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
659.1 ft. 00:15:53	FL	F01			3 /	3	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-FL at 659.1 ft_1.JPG	
659.1 ft. 00:15:53	FM				9 / 11	4	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-FM at 659.1 ft.JPG	
659.1 ft. 00:15:53	DAZ			5	11 /	2	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-DAZ at 659.1 ft.JPG	white deposits
666.4 ft. 00:16:13	DAZ			5	11 /	2	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-DAZ at 666.4 ft.JPG	white deposits
674.4 ft. 00:16:19	DAZ			5	11 /	2		white deposits
692.9 ft. 00:16:35	DAZ			5	1 /	2	PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-DAZ at 692.9 ft.JPG	white deposits
717.4 ft. 00:17:30	ADP				1		PALMDALE DITCH CONVERSION PROJECT-AMH '1_1'-AMH '1_2'-ADP at 717.4 ft.JPG	US 1_1

<b>General Informatio</b>	on:							
Surveyed by:	Certificate number	: Reviewed	by:	Reviewer certificate no.	Owner:		Custome	er:
J.SALAS	P0040994-012023	.						
P/O number:	Work order no.:	Media labe	21:	Project name:			Start dat	te/time:
				PALMDALE DITCH CO	ONVERSION PR	OJECT	2023121	13:17
Sheet number:	Weather:	Pre-cleanir	ng:	Date cleaned:	Flow contro	l:	Purpose	:
	1	N					F	
Direction:	Technology used:			Inspection status:	Consequence	ce of failure:	Pressure	e value:
U				CI				
Location:								
Drainage area:	Pipe segment ref.:			Street:				
	2_2 - 2_1			EDISON RD				
City:		Location c	ode:	Location details:				
PALMDALE								
Pipe:								
Pipe use:	Height:	Width:		Shape:	Material:		Lining m	ethod:
SW	48 in.			C	RCP		5	
Coating method:	Pipe joint length:	Total lengt	:h:	Length surveyed:	Year constru	ucted:	Year ren	ewed:
-		685.847 ft	.	685.847 ft.				
Measurements:								
Upstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting	1	Elevation:
2_1								
Downstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting	1	Elevation:
2_2			<u> </u>		5			
MH coordinate system:		MH vertical datu	n:	GPS accuracy:				
Additional Informa	ntion:							

	Structural:					0&M:					Overall:			
Grade	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	LoF	Risk
1	0	0				0	0							
2	268	536				2	4							
3	4	12	548	342Z	2.0	0	0	4	2200	2.0	552	2.0	3.4	
4	0	0				0	0							
5	0	0				0	0							

Distance	Video Ref.	PACP Code	Continuous	 Inches m) 2nd	%	Joint	Circumferent Location At/From	Rating	Image Ref.	Remarks
0.0 ft.		MWL			0		1		PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-MWL at 0.0 ft.JPG	
0.0 ft.		АМН					1		PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-AMH at 0.0 ft.JPG	2_2 DS
0.0 ft.	00:01:04	MWM			50		1		PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-MWM at 0.0 ft.JPG	t
8.5 ft.	00:01:33	SSS	S01				3 / 4	2	PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-SSS at 8.5 ft.JPG	defect wanders
8.5 ft.	00:01:33	SSS	S02				8 / 9	2	PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-SSS at 8.5 ft_1.JPG	defect wanders
220.3 ft.	00:08:03	СМ	S03				7 / 8	3		

Distance Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd	% Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
220.3 ft. 00:08:03	СМ	S04	150 2110		4 / 5	3		
228.4 ft. 00:08:17	СМ	F03			7 / 8	3	PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-CM at 228.4 ft.JPG	
228.4 ft. 00:08:17	СМ	F04			4 / 5	3	PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-CM at 228.4 ft_1.JPG	
273.5 ft. 00:09:41	OBR			5	6 /	2	PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-OBR at 273.5 ft.JPG	
327.1 ft. 00:11:44	OBR			10	5 / 7	2	PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-OBR at 327.1 ft_2.JPG	
677.4 ft. 00:19:32	SSS	F01			3 / 4	2	PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-SSS at 677.4 ft.JPG	
677.4 ft. 00:19:32	SSS	F02			8 / 9	2	PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-SSS at 677.4 ft_1.JPG	
685.8 ft. 00:20:06	AOC				I		PALMDALE DITCH CONVERSION PROJECT-AMH '2_1'-AMH '2_2'-AOC at 685.8 ft.JPG	US 2_1

<b>General Informatio</b>	n:							
Surveyed by:	Certificate number	: Reviewed I	oy:	Reviewer certificate no.	Owner:		Custome	er:
J.SALAS	P0040994-012023	<b>;</b>						
P/O number:	Work order no.:	Media labe	1:	Project name:			Start dat	e/time:
				PALMDALE DITCH CO	ONVERSION PR	ROJECT	2023121	9 08:32
Sheet number:	Weather:	Pre-cleanin	ng:	Date cleaned:	Flow contro	:	Purpose	
	1	N						
Direction:	Technology used:			Inspection status:	Consequence	ce of failure:	Pressure	value:
U				CI				
Location:								
Drainage area:	Pipe segment ref.:			Street:				
5	3_3 - 3_1			47TH ST				
City:		Location co	ode:	Location details:				
PALMDALE								
Pipe:								
Pipe use:	Height:	Width:		Shape:	Material:		Lining m	ethod:
sw	48 in.			С	RCP		5	
Coating method:	Pipe joint length:	Total lengt	h:	Length surveyed:	Year constru	ucted:	Year ren	ewed:
		351.390 ft.		351.390 ft.				
Measurements:								
Upstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting		Elevation:
3_1								
Downstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting	1	Elevation:
3_3			5		5			
MH coordinate system:		MH vertical datur	n:	GPS accuracy:				
Additional Informa	tion:							

			Structural:					O&M:				Over	all:	
Grade	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	LoF	Risk
1	0	0				0	0							
2	0	0				0	0							
3	126	378	378	3X00	3.0	0	0	0	0000	0.0	378	3.0	4.0	
4	0	0				0	0							
5	0	0				0	0							

Distance	Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd	%	Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
0.0 ft.		MWL			0		I		PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-MWL at 0.0 ft.JPG	
0.0 ft.		АМН					I		PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-AMH at 0.0 ft.JPG	3_3 DS
0.0 ft.	00:01:03	MWM			20		1		PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-MWM at 0.0 ft.JPG	t
21.6 ft.	00:02:16	FL	S01				5 /	3	PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-FL at 21.6 ft.JPG	
21.6 ft.	00:02:16	FL	S02				8 /	3	PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-FL at 21.6 ft_1.JPG	
71.1 ft.	00:03:57	FL	F02				8 /	3		

Distance	Video Ref.	PACP Code	Continuous	Value Inches % (mm) 1st 2nd	% Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
71.1 ft.	00:03:57	FL	F01			5 /	3	PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-FL at 71.1 ft.JPG	
71.1 ft.	00:03:57	СМ	S03			4 / 5	3	PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-CM at 71.1 ft.JPG	
71.1 ft.	00:03:57	СМ	S04			7 / 8	3	PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-CM at 71.1 ft_1.JPG	
82.0 ft.	00:04:21	СМ	F03			4 / 5	3	PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-CM at 82.0 ft.JPG	
82.0 ft.	00:04:21	СМ	F04			7 / 8	3		
82.0 ft.	00:04:21	FL	S05			5 /	3	PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-FL at 82.0 ft.JPG	
82.0 ft.	00:04:21	FL	S06			7 /	3	PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-FL at 82.0 ft_1.JPG	
110.1 ft.	00:05:08	FL	F05			5 /	3		

Distance Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd	% Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
119.5 ft. 00:05:25	FL	F06			71		PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-FL at 119.5 ft.JPG	
119.5 ft. 00:05:25	СМ	S07			4 / 5		PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-CM at 119.5 ft.JPG	
119.5 ft. 00:05:25	СМ	S08			7 / 8	3	PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-CM at 119.5 ft_1.JPG	
340.2 ft. 00:09:02	СМ	F07			4 / 5	3	PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-CM at 340.2 ft.JPG	
340.2 ft. 00:09:02	СМ	F08			7 / 8		PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-CM at 340.2 ft_1.JPG	
351.4 ft. 00:09:33	AEP				I		PALMDALE DITCH CONVERSION PROJECT-AMH '3_1'-AMH '3_3'-AEP at 351.4 ft.JPG	US 3_1

<b>General Informatio</b>	n:							
Surveyed by:	Certificate number	: Reviewed	by:	Reviewer certificate no	. Owner:		Custome	r:
J.SALAS	P0040994-012023	3						
P/O number:	Work order no.:	Media labe	el:	Project name:			Start dat	e/time:
				PALMDALE DITCH C	ONVERSION PR	OJECT	2023121	9 09:48
Sheet number:	Weather:	Pre-cleanii	ng:	Date cleaned:	Flow contro	l:	Purpose:	
	1	Z						
Direction:	Technology used:			Inspection status:	Consequence	e of failure:	Pressure	value:
U				CI				
Location:								
Drainage area:	Pipe segment ref.:			Street:				
5	4_4 - 4_1			BARREL SPRINGS R	D			
City:		Location c	ode:	Location details:				
PALMDALE								
Pipe:								
Pipe use:	Height:	Width:		Shape:	Material:		Lining m	ethod:
SW	48 in.			С	RCP			
Coating method:	Pipe joint length:	Total leng	th:	Length surveyed:	Year constru	ucted:	Year ren	ewed:
		303.797 ft		303.797 ft.				
Measurements:								
Upstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:	1	Elevation:
4_1					iterangi			Lioradioni
Downstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:		Elevation:
4_4			5		5			
MH coordinate system:		MH vertical datu	m:	GPS accuracy:				
Additional Informa	tion:							

			Structural:					O&M:				Over	all:	
Grade	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	LoF	Risk
1	0	0				0	0							
2	112	224				0	0							
3	10	30	254	3A2U	2.1	0	0	0	0000	0.0	254	2.1	4.0	
4	0	0				0	0							
5	0	0				0	0							

Distance	Video Ref.	PACP Code	Continuous	Value In (mm) 1st	%	Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
0.0 ft.		MWL			0		I		PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-MWL at 0.0 ft.JPG	
0.0 ft.		АМН					I		PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-AMH at 0.0 ft.JPG	4_4 DS
0.0 ft.	00:01:07	MWM			10		I		PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-MWM at 0.0 ft.JPG	
4.9 ft.	00:01:07	SSS	S01				4 /	2	PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-SSS at 4.9 ft.JPG	
4.9 ft.	00:01:07	SSS	S02				7 /	2	PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-SSS at 4.9 ft_1.JPG	

Distance	Video Ref.	PACP Code	Continuous	Value Inches % (mm) 1st 2nd	Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
4.9 ft.	00:01:07	СМ	S03			4 / 5		PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-CM at 4.9 ft.JPG	
4.9 ft.	00:01:07	СМ	S04			7 / 8	3	PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-CM at 4.9 ft_1.JPG	
27.4 ft.	00:01:50	СМ	F03			4 / 5		PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-CM at 27.4 ft.JPG	
27.4 ft.	00:01:50	СМ	F04			7 / 8	3		
283.5 ft.	00:08:54	SSS	F01			4 /		PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-SSS at 283.5 ft.JPG	
283.5 ft.	00:08:54	SSS	F02			8 /		PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-SSS at 283.5 ft_1.JPG	
303.8 ft.	00:09:58	AEP				1		PALMDALE DITCH CONVERSION PROJECT-AMH '4_1'-AMH '4_4'-AEP at 303.8 ft.JPG	US 4_1

<b>General Informatio</b>	n:							
Surveyed by:	Certificate number:	Reviewed	by:	Reviewer certificate no.	. Owner:		Custome	r:
J.SALAS	P0040994-012023							
P/O number:	Work order no.:	Media labe		Project name:			Start dat	e/time:
				PALMDALE DITCH CO	ONVERSION PR	ROJECT	2023121	9 11:30
Sheet number:	Weather:	Pre-cleanir	ng:	Date cleaned:	Flow contro	d:	Purpose:	
	1	Z						
Direction:	Technology used:			Inspection status:	Consequence	ce of failure:	Pressure	value:
U				CI				
Location:								
Drainage area:	Pipe segment ref.:			Street:				
	5_5 TO 5_1			BEAR CREEK RD				
City:		Location co	ode:	Location details:				
PALMDALE								
Pipe:								
Pipe use:	Height:	Width:		Shape:	Material:		Lining m	ethod:
sw	36 in.			C	RCP		5	
Coating method:	Pipe joint length:	Total lengt	h:	Length surveyed:	Year constr	ucted:	Year ren	ewed:
		335.158 ft		335.158 ft.				
Measurements:								
Upstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:		Elevation:
5_1			gi e e e					
Downstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:	1	Elevation:
5_5								
MH coordinate system:		MH vertical datur	n:	GPS accuracy:				
Additional Informa	tion:							

			Structural:					O&M:				Over	all:	
Grade	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	LoF	Risk
1	0	0				0	0							
2	0	0				36	72							
3	1	3	11	4231	3.7	0	0	80	422F	2.1	91	2.2	4.4	
4	2	8				2	8							
5	0	0				0	0							

Distance Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd		Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
0.0 ft.	MWL			0		1		PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-MWL at 0.0 ft.JPG	
0.0 ft.	АМН					1		PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-AMH at 0.0 ft_1.JPG	5_5 DS
0.0 ft. 00:01:09	MWM			10		1		PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-MWM at 0.0 ft.JPG	:
13.0 ft. 00:01:48	FM	S01				5/6	4	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-FM at 13.0 ft.JPG	
24.2 ft. 00:02:12	FM	F01				5 / 6	4	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-FM at 24.2 ft.JPG	

Distance Video Ref.	PACP Code	Continuous	Value Inches (mm)	% _	Joint	Circumferential Location	Rating	Image Ref.	Remarks
28.7 ft. 00:02:21	LR		1st 2nd	45		At/From To /	4	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-LR at 28.7 ft.JPG	
156.9 ft. 00:07:42	JSM					I	3	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-JSM at 156.9 ft.JPG	
162.1 ft. 00:08:12	DAZ	S02		5		11 / 9	2	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-DAZ at 162.1 ft.JPG	looks like grass/organic matter
291.2 ft. 00:12:24	LR			20		I	2	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-LR at 291.2 ft.JPG	
291.2 ft. 00:12:24	DAZ	F02		5		11 / 9	2	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-DAZ at 291.2 ft.JPG	looks like grass/organic matter
293.1 ft. 00:12:33	DAZ	S03		5		7 / 5	2	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-DAZ at 293.1 ft.JPG	looks like grass
335.2 ft. 00:15:00	MCU					J	4	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-MCU at 335.2 ft.JPG	

Distance Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd	%	Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
335.2 ft. 00:15:09	MSA					I		PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-MSA at 335.2 ft.JPG	MCU
335.2 ft. 00:15:00	DAZ	F03		5		7 / 5	2		looks like grass
335.2 ft. 00:15:00	DAZ			5		7 / 5	2	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-DAZ at 335.2 ft.JPG	looks like grass

<b>General Informati</b>	on:							
Surveyed by:	Certificate number:	Reviewed	by:	Reviewer certificate no.	Owner:		Customer	
J.SALAS	P0040994-012023							
P/O number:	Work order no.:	Media labe	el:	Project name:			Start date	/time:
				PALMDALE DITCH CC	<b>NVERSION PR</b>	OJECT	20231219	12:34
Sheet number:	Weather:	Pre-cleani	ng:	Date cleaned:	Flow contro	l:	Purpose:	
	1	Z						
Direction:	Technology used:		1	Inspection status:	Consequence	e of failure:	Pressure v	value:
D				CI				
Location:								
Drainage area:	Pipe segment ref.:			Street:				
	5_5 TO 5_1			BEAR CREEK RD				
City:		Location c	ode:	Location details:				
City: PALMDALE		Location c	ode:	Location details:				
PALMDALE		Location c	ode:	Location details:				
PALMDALE Pipe:		Location c			Material:		Lining me	thod:
,	Height: 36 in.			Location details: Shape: C	Material:		Lining me	thod:
PALMDALE Pipe: Pipe use: SW	Height: 36 in.			Shape:		ucted:	Lining me Year rene	
PALMDALE Pipe: Pipe use:	Height:	Width:		Shape:	RCP	ucted:		
PALMDALE Pipe: Pipe use: SW Coating method:	Height: 36 in.	Width: 		Shape: C Length surveyed:	RCP	ucted:		
PALMDALE Pipe: Pipe use: SW Coating method: Measurements:	Height: 36 in.	Width: Total leng 335.158 ft	th:	Shape: C Length surveyed: 164.724 ft.	RCP Year constru		Year rene	wed:
PALMDALE Pipe: Pipe use: SW Coating method: Measurements: Upstream MH No:	Height: 36 in.	Width: 		Shape: C Length surveyed:	RCP	ucted: Easting:	Year rene	
PALMDALE Pipe: Pipe use: SW Coating method:	Height: 36 in.	Width: Total leng 335.158 ft	th:	Shape: C Length surveyed: 164.724 ft.	RCP Year constru		Year rene	wed:
PALMDALE Pipe: Pipe use: SW Coating method: Measurements: Upstream MH No: 5_1	Height: 36 in.	Width: Total leng 335.158 ft Rim to invert:	th: Rim to grade:	Shape: C Length surveyed: 164.724 ft. Grade to invert:	RCP Year constru	Easting:	Year rene	wed: Elevation:

	Structural:					O&M:					Overall:			
Grade	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	LoF	Risk
1	0	0				0	0							
2	3	6				1	2							
3	0	0	6	2300	2.0	0	0	2	2100	2.0	8	2.0	2.4	
4	0	0				0	0							
5	0	0				0	0							

Distance Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd	%	Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
0.0 ft.	АМН					1		PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-AMH at 0.0 ft_2.JPG	5_1 US
0.0 ft.	MWL			0		1		PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-MWL at 0.0 ft_1.JPG	
0.0 ft. 00:01:15	MWM			15		1		PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-MWM at 0.0 ft_1.JPG	:
122.4 ft. 00:06:03	DAZ			5		11 / 2	2	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-DAZ at 122.4 ft.JPG	looks like sludge
151.2 ft. 00:06:48	MWLS	S01		20		1	2	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-MWLS at 151.2 ft.JPG	

Distance Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd		Joint	Circumferentia Location At/From T		Image Ref.	Remarks
164.7 ft. 00:07:28	MWLS	F01		20		I	2	PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-MWLS at 164.7 ft.JPG	
164.7 ft. 00:07:37	MSA					I		PALMDALE DITCH CONVERSION PROJECT-AMH '5_1'-AMH '5_5'-MSA at 164.7 ft.JPG	MWLS

<b>General Informatio</b>	n:							
Surveyed by:	Certificate number	: Reviewed	by:	Reviewer certificate no	. Owner:		Custome	er:
J.SALAS	P0040994-012023	;						
P/O number:	Work order no.:	Media labe	el:	Project name:			Start da	te/time:
				PALMDALE DITCH CO	ONVERSION PR	OJECT	202312 <sup>,</sup>	19 13:30
Sheet number:	Weather:	Pre-cleanii	ng:	Date cleaned:	Flow contro	1:	Purpose	:
	1	N						
Direction:	Technology used:			Inspection status:	Consequence	e of failure:	Pressure	e value:
D				CI				
Location:								
Drainage area:	Pipe segment ref.:			Street:				
5	7_7 - 7_1			BARREL SPRINGS R	D			
City:		Location c	ode:	Location details:				
PALMDALE								
Pipe:								
Pipe use:	Height:	Width:		Shape:	Material:		Lining m	ethod:
sw	48 in.			С	RCP		0	
Coating method:	Pipe joint length:	Total leng	th:	Length surveyed:	Year constru	ucted:	Year rer	ewed:
		152.900 ft	•	152.900 ft.				
Measurements:								
Upstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting		Elevation:
7_1							.	
Downstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting		Elevation:
7_7			30 31 200			g		
MH coordinate system:		MH vertical datu	m:	GPS accuracy:				
Additional Informa	tion:							

			Structural:			O&M:					Overall:			
Grade	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	LoF	Risk
1	0	0				0	0							
2	0	0				0	0							
3	54	162	162	3100	3.0	0	0	0	0000	0.0	162	3.0	4.0	
4	0	0	]			0	0							
5	0	0				0	0							

Distance	Video Ref.	PACP Code	Continuous	Value Inch (mm) 1st 2	es % nd	Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
0.0 ft.		MWL			5		1		PALMDALE DITCH CONVERSION PROJECT-AMH '7_1'-AMH '7_7'-MWL at 0.0 ft.JPG	
0.0 ft.		АМН					I		PALMDALE DITCH CONVERSION PROJECT-AMH '7_1'-AMH '7_7'-AMH at 0.0 ft.JPG	7_1 DS
0.0 ft.	00:01:05	MWM			10		I		PALMDALE DITCH CONVERSION PROJECT-AMH '7_1'-AMH '7_7'-MWM at 0.0 ft.JPG	:
4.9 ft.	00:01:05	СМ	S01				3 / 4	3	PALMDALE DITCH CONVERSION PROJECT-AMH '7_1'-AMH '7_7'-CM at 4.9 ft.JPG	
4.9 ft.	00:01:05	СМ	S02				8 / 9	3	PALMDALE DITCH CONVERSION PROJECT-AMH '7_1'-AMH '7_7'-CM at 4.9 ft_1.JPG	

Distance Video Ref.	PACP Code	Continuous	Value Inches % (mm) 1st 2nd	Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
139.7 ft. 00:04:25	СМ	F01			3 / 4	3	PALMDALE DITCH CONVERSION PROJECT-AMH '7_1'-AMH '7_7'-CM at 139.7 ft.JPG	
139.7 ft. 00:04:25	СМ	F02			8 / 9	3	PALMDALE DITCH CONVERSION PROJECT-AMH '7_1'-AMH '7_7'-CM at 139.7 ft_1.JPG	
152.9 ft. 00:04:58	AEP				I		PALMDALE DITCH CONVERSION PROJECT-AMH '7_1'-AMH '7_7'-AEP at 152.9 ft.JPG	US 7_1

<b>General Informatio</b>	n:							
Surveyed by:	Certificate number	: Reviewed I	oy:	Reviewer certificate no	. Owner:		Custome	r:
J.SALAS	P0040994-012023	<b>;</b>						
P/O number:	Work order no.:	Media labe	1:	Project name:			Start date	e/time:
				PALMDALE DITCH C	ONVERSION PR	ROJECT	2023122	0 08:02
Sheet number:	Weather:	Pre-cleanir	ng:	Date cleaned:	Flow contro	ol:	Purpose:	
	1	Z						
Direction:	Technology used:			Inspection status:	Consequence	ce of failure:	Pressure	value:
U				CI				
Location:	·				-			
Drainage area:	Pipe segment ref.:			Street:				
Brainage arear	6_6 TO 6_1			SIERRA HWY				
City:		Location co	ode:	Location details:				
PALMDALE								
Pipe:								
Pipe use:	Height:	Width:		Shape:	Material:		Lining me	ethod:
SW	48 in.			C	RCP			
Coating method:	Pipe joint length:	Total lengt	h:	Length surveyed:	Year constr	ucted:	Year rene	ewed:
5		397.080 ft.	.	397.080 ft.				
Measurements:								
Upstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting		Elevation:
6_1			rann to grader		Hordinigi			Lievacioni
Downstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting	]	Elevation:
6_6			Jan Congression					
MH coordinate system:		MH vertical datur	n:	GPS accuracy:				
Additional Informa	tion							

			Structural:			O&M:					Overall:			
Grade	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	LoF	Risk
1	0	0				0	0							
2	0	0				35	70							
3	0	0	0	0000	0.0	1	3	78	5131	2.1	78	2.1	5.1	
4	0	0				0	0							
5	0	0				1	5							

Distance Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd	% Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
0.0 ft.	АМН				I		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-AMH at 0.0 ft_1.JPG	6_6 DS
0.0 ft.	MWL			0	I		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MWL at 0.0 ft.JPG	
0.0 ft. 00:01:01	MWM			20	I		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MWM at 0.0 ft.JPG	t
60.0 ft. 00:03:09	MGO				I		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MGO at 60.0 ft_1.JPG	METAL TOP OF BOX
127.7 ft. 00:04:51	DSZ	S01		10	5 / 7	2	PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-DSZ at 127.7 ft.JPG	DEBRIS

Distance Video Ref.	PACP Code	Continuous Value Incl (mm) 1st 2	hes % 2nd	Joint	Circumferential Location At/From To		Image Ref.	Remarks
140.1 ft. 00:05:21	MSC	60.000			I		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MGO at 140.1 ft.JPG	
155.2 ft. 00:06:01	TF	12.000			4 /		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-TF at 155.2 ft.JPG	
185.8 ft. 00:06:53	MSC	48.000			I		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MSC at 185.8 ft.JPG	
215.9 ft. 00:07:26	DSGV	S02	5		4 / 7	2	PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-DSGV at 215.9 ft.JPG	
222.8 ft. 00:07:37	DSZ	F01	10		5 / 7	2	PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-DSZ at 222.8 ft.JPG	DEBRIS
298.3 ft. 00:09:17	DSGV	F02	5		4 / 7	2		
298.4 ft. 00:09:33	OBZ		15		5 / 7	3	PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-OBZ at 298.4 ft.JPG	POSSIBLY PLASTIC SHEET
389.9 ft. 00:11:57	MGO				I		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MGO at 389.9 ft.JPG	TWO PIPES IN BOX

Distance Video Ref.	PACP Code	Continuous	Value I (mi 1st	%	Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
397.0 ft. 00:13:17	DSZ			50		4 / 8	5	PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-DSZ at 397.2 ft.JPG	HEAVY SAND
397.1 ft. 00:13:33	MSA					1		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MSA at 397.1 ft.JPG	DSZ

<b>General Informatio</b>	on:							
Surveyed by:	Certificate number:	Reviewed	by:	Reviewer certificate no.	. Owner:		Custome	er:
J.SALAS	P0040994-012023							
P/O number:	Work order no.:	Media labe	el :	Project name:			Start dat	e/time:
				PALMDALE DITCH CO	ONVERSION PF	ROJECT	2023122	20 09:10
Sheet number:	Weather:	Pre-cleanir Z	ng:	Date cleaned:	Flow contro	ol:	Purpose:	
Direction:	rection: Technology used:			Inspection status:	Consequence	ce of failure:	Pressure	value
D				CI	Consequent		FIESSUIE	value.
Location:								
Drainage area:	Pipe segment ref.:			Street:				
	6_6 TO 6_1			SIERRA HWY				
City:		Location c	ode:	Location details:				
PALMDALE								
Pipe:								
Pipe use:	Height:	Width:		Shape:	Material:		Lining m	ethod:
SW	36 in.	72 in.		S	RCP			
Coating method:	Pipe joint length:	Total lengt	:h:	Length surveyed:	Year constr	ucted:	Year renewed:	
		397.080 ft		140.777 ft.				
Measurements:								
Upstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:		Elevation:
6_1								
Downstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:		Elevation:
6_6								
MH coordinate system:		MH vertical datu	n:	GPS accuracy:				
Additional Informa	ition:							

			Structural:				O&M:						all:	
Grade	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	LoF	Risk
1	0	0				0	0							
2	0	0				24	48							
3	1	3	3	3100	3.0	0	0	52	412C	2.1	55	2.1	4.1	
4	0	0				1	4							
5	0	0				0	0							

Distance Video Ref.	PACP Code	Continuous	Value Inch (mm) 1st 2	es % nd	Joint	Circumferential Location At/From To	, j	Image Ref.	Remarks
0.0 ft.	MWL			0		I		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MWL at 0.0 ft_1.JPG	
0.0 ft.	АМН					I		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-AMH at 0.0 ft_2.JPG	6_1 US
0.0 ft. 00:01:02	MWM			20		Ι		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MWM at 0.0 ft_1.JPG	:
21.1 ft. 00:01:44	OBR	S01		10		5 / 7	2		
52.0 ft. 00:02:40	LR			30		I	4	PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-LR at 52.0 ft_1.JPG	
134.6 ft. 00:05:04	MGO					I		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MGO at 134.6 ft.JPG	TWO PIPES IN BOX

Distance Video Ref.	PACP Code	Continuous	Value Inches (mm) 1st 2nd	% ](	oint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
139.6 ft. 00:06:17	SCP					10 / 2	3	PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-SCP at 139.6 ft_2.JPG	
139.6 ft. 00:06:24	SZ					10 / 2		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MGO at 139.6 ft.JPG	metal roof is damaged at the entrance of the left pipe
140.8 ft. 00:07:32	OBR	F01		10		5 / 7	2	PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-OBR at 140.8 ft.JPG	
140.8 ft. 00:07:40	MSA					1		PALMDALE DITCH CONVERSION PROJECT-AMH '6_1'-AMH '6_6'-MSA at 140.8 ft.JPG	HEAVY SAND

<b>General Informatio</b>	n:							
Surveyed by:	Certificate number:	Reviewed t	by: I	Reviewer certificate no.	. Owner:		Custome	r:
J.SALAS	P0040994-012023							
P/O number:	Work order no.:	Media labe	l: I	Project name:			Start dat	e/time:
				PALMDALE DITCH CO	ONVERSION PR	OJECT	2023122	0 10:09
Sheet number:	Weather:	Pre-cleanin	g: I	Date cleaned:	Flow contro	l:	Purpose:	
	1	Z						
Direction:	Technology used:		]	Inspection status:	Consequence	ce of failure:	Pressure	value:
l				CI				
Location:								
Drainage area:	Pipe segment ref.:			Street:				
	8_8 - 8_1			PEARBLOSSOM HWY	(			
City:		Location co	ode:	Location details:				
PALMDALE								
Pipe:								
Pipe use:	Height:	Width:	9	Shape:	Material:		Lining m	ethod:
SW	27 in.	48 in.		S	RCP			
Coating method:	Pipe joint length:	Total lengt	h: I	Length surveyed:	Year constru	ucted:	Year renewed:	
		99.095 ft.		99.095 ft.				
Measurements:								
Upstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:		Elevation:
8_1			Riff to grade.		Northing.	Lusting.		Lievation
Downstream MH No:		Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:		Elevation:
8_8			grader grader					
MH coordinate system:		MH vertical datum	n:	GPS accuracy:				
,				í í í				
Additional Informa								

			Structural:				O&M: Overall:							
Grade	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	LoF	Risk
1	0	0				0	0							
2	1	2				0	0							
3	2	6	29	5144	3.6	0	0	0	0000	0.0	29	3.6	5.1	
4	4	16				0	0							
5	1	5				0	0							

Distance	Video Ref.	PACP Code	Continuous	Value I (m 1st	%	Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
0.0 ft.		MWL			0		I		PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-MWL at 0.0 ft.JPG	
0.0 ft.		АМН					I		PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-AMH at 0.0 ft_1.JPG	8_8 DS
0.0 ft.	00:00:56	MWM			15		I		PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-MWM at 0.0 ft.JPG	:
5.0 ft.	00:01:17	SAM					2 / 3	4	PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-SAM at 5.0 ft.JPG	
5.0 ft.	00:01:17	SAM					9 / 10	4	PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-SAM at 5.0 ft_1.JPG	

# Observations

Distance	Video Ref.	PACP Code	Continuous	Value Inches 9 (mm) 1st 2nd	% Joint	Circumferential Location At/From To	Rating	Image Ref.	Remarks
5.0 ft.	00:01:17	SRV				2 / 3	4	PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-SRV at 5.0 ft.JPG	
5.0 ft.	00:01:17	SRV				9 / 10	4	PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-SRV at 5.0 ft_1.JPG	
82.1 ft.	00:02:55	SMW				2 / 3	5	PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-SMW at 82.1 ft.JPG	1
82.5 ft.	00:02:56	FC				10 / 2	2	PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-FC at 82.5 ft.JPG	
82.5 ft.	00:02:56	FL	S01			8 /	3	PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-FL at 82.5 ft.JPG	
92.3 ft.	00:03:04	FL	F01			8 /	3	PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-FL at 92.3 ft.JPG	
99.1 ft.	00:03:21	AEP				1		PALMDALE DITCH CONVERSION PROJECT-AMH '8_1'-AMH '8_8'-AEP at 99.1 ft.JPG	US 8_1

# Appendix D: Geotechnical Report

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Appendix C	Groundwater Well Locations					
Appendix D	Seismic Design Summary Report					
Appendix E	Design Guideline for Seismic Resistant Water Pipeline Installations					
Annondix E	General Earthwork and Grading Guidelines					
Appendix F	General cartinwork and Grading Guidelines					

#### **GEOTECHNICAL ENGINEERING REPORT** Palmdale Ditch Conversion Project Littlerock Reservoir to Lake Palmdale Palmdale, Los Angeles County, California

#### **1.0 INTRODUCTION**

This report presents the results of our geotechnical investigation performed by Bruin Geotechnical Services, Inc. for the proposed construction of buried pipe to convey water from the Littlerock reservoir to Palmdale Lake for Palmdale Water District, based on discussions and preliminary site plans provided by the client. This report is specific to the proposed development.

The purpose of this investigation was to evaluate the on-site subsurface soil conditions relative to geotechnical engineering characteristics and to provide geotechnical recommendations relative to proposed buried pipe.

The scope of the authorized geotechnical investigation included the following tasks:

- Performing a site reconnaissance
- Conducting field subsurface exploration through soil borings and sampling
- Laboratory testing program of selected soil samples
- Performing engineering analyses of the data
- Preparing this Geotechnical Engineering Report

This study also includes a review of published and unpublished literature and geotechnical maps with respect to active and potentially active faults located in proximity to the site which may have impact on the seismic design of the proposed structure.

# 2.0 SITE LOCATION AND DESCRIPTION

The subject site, herein after referred to as Site, is a corridor located between the Littlerock Reservoir extending to Lake Palmdale, in Palmdale, Los Angeles County, California. The Site currently contains an open ditch to convey the water and begins at the Littlerock Reservoir, traversing approximately seven (7) miles. The open ditch and corridor originates near the intersection of Cheseboro Road and Mt. Emma Road, winding northeast towards 47<sup>th</sup> Street East. The ditch is then enclosed and crosses beneath 47<sup>th</sup> Street east and generally parallels Barrel Springs Road from 47<sup>th</sup> Street East to 40<sup>th</sup> Street East, crossing over the California Aqueduct near Bear Creek Road, and parallels the north side of the aqueduct, beneath Pearblossom Highway, and again generally parallels Barrel Springs Road, turning south towards Alpine and Sierra Highway, connecting to existing underground pipeline to

Palmdale lake, approximately 2,100 feet southeast of Lake Palmdale. The Site is located in a semi-rural area of Palmdale, with a few residential developments along the subject corridor.

At the time of our investigation, the Site corridor contained an open ditch which conveys water. Vegetation varied along the alignment and consisted of sparse, low annual weeds and brush to heavy brush and shrubs. The Site topography is undulating, as the corridor travels along the north side of the foothills of the San Garbiel Mountains. The corridor has a general slope to the south/southwest, with drainage by sheet flow to drainage gullies. The topography varies from relatively flat and gentle to slope gradients of up to 20 percent. The elevation of the Site ranges from approximately 3,200 feet above mean sea level at the eastern origin to approximately 2,850 feet above mean sea level at the west terminus.

The aforementioned site description is intended to be illustrative and is specifically not intended for use as a legal description of the Site.

The subject site corridor contains many access points, both paved and unpaved. Access points are achieved through open land, dirt and paved roads as well as gated areas owned by Palmdale Water District (PWD).

The general location of the subject site and access points is shown on Figure 1.

# 3.0 PROPOSED GRADING AND CONSTRUCTION

Based on our review of the preliminary site plans and discussions, Bruin GSI understands that the development will consist of 36" to 48" diameter reinforced concrete pipe (RCP) or high-density polyethylene (HDPE) pipe. As it is a gravity flow system, pipe cover is anticipated to be approximately four to ten (4-10) feet thick with a maximum cover of approximately eighteen (18) feet thick. Concrete thrust blocks and trenchless horizontal borings are anticipated.

Due to the undulating topography of the pipe alignment, it appears the proposed excavation to pipe depth will include areas requiring terracing and/or shoring.

#### 4.0 GEOTECHNICAL INVESTIGATION

The geotechnical investigation included a field subsurface exploration program and a laboratory testing program on soil samples collected. These programs were performed in accordance with our proposal for Geotechnical Investigation Report dated July 28, 2023. The scope of work did not include environmental assessment or investigation for the presence or absence of hazardous substances or toxic materials in structures, soil, surface

water, groundwater, or air, below or around the site. The field subsurface exploration and laboratory testing programs are described below.

# 4.1 Field Exploration Program

A site reconnaissance was made by our representative prior to instigating the field exploration program. The Site was observed, and boundaries roughly located for purposes of underground utility locating. As required by law, Bruin GSI contacted Underground Service Alert (one-call notification service) to attain underground utility marking and clearance, a minimum of 72 hours prior to performing the field subsurface investigation.

The field exploration program was initiated on November 9, 2023, and was performed intermittently through December 20, 2023, under the technical supervision of our engineer. A total of thirty-six (36) exploratory borings were drilled using a CME 65 truck mounted drill rig and CME 55 limited access rig, both equipped with eight (8) inch hollow stem auger, in accordance with generally accepted geotechnical exploration procedures (ASTM D 1452). The borings were advanced to maximum depths of thirty (30) feet below ground surface (bgs).

The approximate locations of the borings within the area of the proposed pipeline alignment were determined by sighting and pacing from existing site improvements, such as streets, and hand-held GPS accurate to approximately ten (10) feet and should be only considered accurate to the degree implied by the method used. The borings were located in approximate 2,000 feet intervals along the proposed preliminary pipeline alignment. Actual distances varied depending on accessibility, terrain and vegetation. The boring locations are presented on Figure 2.

Soil samples were obtained at various depth intervals, consisting of relatively undisturbed brass ring samples (Modified California split-spoon sampler) and Standard Penetration Test (SPT) samples driven by a 140-pound hammer falling 30 inches. After seating of the sampler, the number of blows required to drive the sampler one foot was recorded in six (6) inch increments, in general accordance with procedures presented in ASTM D 1586.

Bulk samples were also collected at various depths from auger cuttings during drilling and represent a mixture of soils within the noted depths. The soil samples were returned to the laboratory for analysis and testing.

Final boring logs presented in Appendix A are Bruin GSI's interpretation of the field logs prepared by our representative during drilling, as well as laboratory test results. The stratification lines represent approximate boundaries between soil types. The actual soil transitions may be gradual.

#### 4.2 Site and Subsurface Conditions

Native alluvial materials and bedrock were encountered within all our exploratory trenches. The native materials were noted to be slightly moist to moist and loose, medium dense to very dense. Drilling refusal was encountered in some borings due to the dense bedrock material encountered.

The soil strata encountered consisted predominately of silty sand (SM) with poorlygraded sand (SP) and clayey sand (SC), occasional sandy silt (ML) and clay (CL). Free groundwater was encountered in three of the borings: B17, B18 and B19, at depths from 12 to 29 feet bgs.

It is our understanding that horizontal boring will be necessary at Pearblossom Highway crossing. Based on our review of the borings performed at this location (Borings B8 and B9) the soil types consist of silty sands (SM), clayey silts (ML), and silty clays (CL).

Boring 8 was drilled to a depth of 15 feet below ground surface, consisting of medium dense to dense material, ranging from slightly moist to moist. Poorly-graded sand (SP) in the upper 10 feet of soil, while the remaining depth to 15 feet contains clayey sand (SC).

Boring 9 was drilled to a depth of 30 feet below ground surface, consisting of loose to dense material, ranging from moist to very moist. Silty sand (SM) was encountered in the upper 12 feet of soil, while the remaining depth to 30 feet contains fine to medium sandy silt with coarse sand and clay binder.

No groundwater or caving was encountered within B8 or B9.

For more detailed descriptions of the subsurface materials refer to the boring logs and classification profile of all borings in graphic form of the materials encountered is presented in Appendix A.

#### 4.3 Groundwater Conditions

Bruin GSI reviewed available reports and electronic databases to assess historic water level conditions in the vicinity of the Site. Sources reviewed included the historically highest groundwater contours prepared by State of California Department of Water Resources SGMA electronic database, historically highest groundwater levels in the immediate site vicinity indicate that groundwater level at the site are between 20 to 68 feet bgs. (refer to Appendix C for groundwater well locations and depths). However, as previously mentioned, free groundwater was

encountered in borings B17, B18 and B19 at depths from 12 to 29 feet below ground surface (bgs).

#### 4.4 Laboratory Testing

The field boring logs and soil samples were reviewed to assess which samples would be analyzed further. The selected soil samples collected during trenching activities at the Site were then tested in the laboratory to assist in evaluating engineering properties of subsurface materials deemed within structural influence.

The soil samples were classified in accordance with the Unified Soils Classification System and a testing program was established. The samples were tested to determine the following:

- In-situ moisture and dry unit weight determinations were determined in accordance with ASTM D 2937.
- Relative strength characteristics were estimated from results of direct shear tests (ASTM D 3080) performed on in-place and bulk soil samples remolded to approximately 90% of the maximum dry density as determined by ASTM D 1557 test method.
- Consolidation potential was determined on select soil samples in accordance with ASTM D 2435.
- Soil chemical analysis on a soil sample from the site was performed by Anaheim Test Lab, which included pH, resistivity, soluble sulfates and soluble chlorides as well as other chemical contents.

The following additional tests were performed:

Identification of soils	ASTM D 2488
Expansion Index	ASTM D 4829
Maximum density – Optimum moisture	ASTM D 1557
Material Finer than the No. 200 Sieve	ASTM D 1140
Sand Equivalent Value	ASTM D 2419

Pertinent tabular and graphic test results are presented in Appendix B.

# 5.0 REGIONAL GEOLOGY AND SEISMIC HAZARDS

The project site is located in a seismically active area typical of Southern California and likely to be subjected to a strong ground shaking due to earthquakes on nearby faults.

The San Andreas Fault zone is the largest active fault rift zone, which is several miles wide, and passes through the Antelope Valley, extending from the Gulf of Mexico through the western portion of the State of California to a point at Cape Mendocino in northern California. The San Andreas Fault is predicted to have an event every 100-200 years based on geologic records. The San Andreas Fault has had two major eruptions in the last 150 years: 1) in the Southern California area in 1857, and 2) in San Francisco in 1906. In each event, approximately 320 kilometers of surface rupture has taken place, as well as a horizontal displacement of approximately 9 meters. Additional faulting has occurred adjacent to the San Andreas Fault causing numerous events of various magnitudes throughout the length of the San Andreas Fault.

The project site is located in an area in which active seismic occurrences are recorded on a yearly basis. Seismic studies conducted show a major break along the San Andreas Fault could be responsible for an event of approximately 8.4 on the Richter scale. A seismic event of this magnitude could cause bedrock accelerations as large as 0.5g. Events of this magnitude are anticipated to occur approximately every 150 years. The last occurrence of this magnitude was in 1857.

The San Andreas Fault has been mapped through a majority of the subject site. The potential hazards due to active fault ground rupture are considered highly likely in the next 30 years. A seismic event along this section of the San Andreas Fault could result in permanent ground deformation and excessive ground shaking. According to current publications by the State of California, the project site is located within the Alquist-Priolo special studies zone.

According to the California Department of Conservation (CGS) and California Geological Survey (CGS) online database for Zones of Required Investigation, portions of the subject area are located within a Liquefaction, Landslide, or Earthquake Zone.

#### **5.1 CBC Design Parameters**

The following coefficients have been estimated in accordance with the requirements of the 2022 CBC, utilizing the Structural Engineers Association of California and California's Office of Statewide Health Planning and Development Seismic Design Maps Application:

https://seismicmaps.org/

. ... .

The following seismic parameters are provided, based on the approximate latitude and longitude at the northeast corner of the subject site:

Latitude	34.48242908°		
Longitude	-118.16126117°		
Spectral Respon	nse Acceleration, Short Period) - S <sub>s</sub>	1.604g	0.2(sec)
Spectral Respon	nse Acceleration at 1 sec $S_1$	0.660g	1.0(sec)
Mapped Spectr	al Response, Short period - S <sub>DS</sub>	1.070g	0.2(sec)
Mapped Spectr	al Response at 1 sec S <sub>D1</sub>	*	1.0(sec)
Site Coefficient	Ξ – F <sub>A</sub>	1.0	
Site Coefficient	Ξ – F <sub>V</sub>	*	
Site Modified period -S <sub>MS</sub>	Spectral Response Acceleration, Short	t 1.604g	
Site Modified	Spectral Response Acceleration, Short	t *	

. . . . . . . . . . . .

period -S<sub>M1</sub>

Site Classification (2022 CBC, further defined in ASCE7-16 Chapter 20) = D Stiff Soil

\* The actual method of seismic design should be determined by the Structural Engineer in accordance with Section 11.4.8 Site-Specific Ground Motion Procedures of the ASCE 7-16. Refer to Appendix D for the Design Maps Summary Report provided by the Structural Engineers Association of California and California's Office of Statewide Health Planning and Development website.

The actual method of seismic design should be determined by the Structural Engineer.

#### 5.2 Liquefaction Potential

Liquefaction is a seismic phenomenon in which loose, saturated, granular (noncohesive) soils react as a fluid when subject to high-intensity ground shaking. Research and historical data indicate loose granular soils with a specific range of grain size distribution, saturated by a relatively shallow groundwater table are most susceptible to liquefaction.

The effects of liquefaction on level ground include settlement, sand boils and bearing capacity failures below structures.

A liquefaction analysis was not a part of our scope of work. However, in view of the relatively loose to dense silty sand encountered in the exploratory borings, relative

densities, and depth to static groundwater, it is Bruin GSI's opinion that the potential for on-site liquefaction or seismically induced dynamic settlement is probable.

#### 5.2.1 Other Liquefaction Associated Hazards

Potential hazards associated with liquefaction include lateral spreading and slow slides, foundation bearing failure, and ground surface settlement. Considering the upper native soils may liquefy, these hazards should be considered as design factors for this project.

#### **5.3 Other Secondary Seismic Hazards**

Seismic hazards relative to earthquakes include landslides, ground lurching, tsunamis, seiches and seismic-induced settlement. As site topography is relatively flat, hazards from landslides are considered negligible. Ground lurching is generally associated with fault rupture and liquefaction. As these hazards are considered likely, it is Bruin GSI's opinion that the potential for ground lurching is moderate. Tsunami hazards are considered nonexistent due to the site location.

#### 5.4 Erosion

The subject site drainage occurs by minor sheet flow and some concentrated ravines and erosion could occur. Appropriate analysis, grading and drainage design and site maintenance should minimize the erosion potential.

# 6.0 DISCUSSIONS AND CONCLUSIONS

Based upon the results of our investigation, the proposed development is considered feasible from a geotechnical standpoint provided the recommendations presented herein are incorporated into the design and construction. If changes in the design of the structure are made or variations of changed conditions are encountered during construction, Bruin GSI should be contacted to evaluate their effects on these recommendations.

Provided that the recommendations in this report are incorporated into the design and construction, it is Bruin GSI's opinion that the proposed pipeline construction is feasible form a geotechnical perspective.

# 6.1 Soil Engineering Properties

Physical tests were performed on bulk and relatively undisturbed samples to characterize the engineering properties of the native soils.

Moisture content and dry unit weight determinations were performed on samples to evaluate the in-situ unit weights of the different materials. Moisture contents ranged from five to thirty one (5-31) percent. In-place dry densities ranged generally from 98 pounds per cubic foot (pcf) to 129 pcf. Moisture content and dry unit weight results are shown on the excavation logs in Appendix A.

Direct shear test data indicates some of the native soils were found to have low cohesive strength.

The expansion index tests (ASTM D 4829) indicate that the surficial soils are within the "very low" expansion category.

Consolidation test results reveal that some samples tested soil has a moderate potential to hydro-consolidate.

#### **6.2 Seismic Considerations**

The proposed pipeline alignment lies within the San Andreas Fault Zone. Based on our investigation and research, it is our recommendation that the proposed water line should be classified by the Design Engineer in accordance with the Liquefaction and Landslide Transverse information found in Table 3, Table 7, and Table 11 provided in the "Design Guideline for Seismic Resistant Water Pipeline Installations", found in Appendix E.

#### 6.3 Groundwater Considerations

Groundwater was encountered in Borings B17, B18 and B19 from thirteen to twenty nine (13-29) feet bgs. Anticipated trench excavation depths in these areas are estimated to be from ten to seventeen (10-17) feet bgs. Considerations for pumping free groundwater and trench stabilization are likely to be required during construction. It is possible that free groundwater is encountered in other areas of the proposed trench alignment.

#### 7.0 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical engineering recommendations for the proposed development are based on observations from the field investigation program and the laboratory test results and our experience with sites of similar conditions. The Authority Having Jurisdiction (AHJ) should be contacted prior to start of construction to assure the project is properly permitted and inspected during construction. Any grading performed at the site shall be in compliance with the recommendations provided in this report, and the local building code.

Field observations and testing during pipe construction operations should be provided by Bruin GSI so a decision can be formed regarding the adequacy of the site preparation, the acceptability of fill materials, and the extent to which the earthwork construction and the degree of compaction comply with the project geotechnical specifications. Any work related to grading performed without the full knowledge of, and under the supervision of the Geotechnical Consultant, may render the recommendations of this report invalid.

#### 7.1 Earthwork

Prior to any grading, the site should be cleared and grubbed of all vegetation. All pavements, vegetation, trash, debris and abandoned underground utilities shall be removed from the area of pipeline construction and should not be incorporated into trench backfill.

Any depressions resulting from removals during grubbing process (trees etc.) shall be observed by the Geotechnical Consultant. Depressions requiring backfill within structural areas will require placement of engineered fill, observed, and tested by the Geotechnical Consultant.

#### 7.2 Trench Excavations

It is Bruin GSI's opinion that standard construction techniques and excavation equipment may be used. However, Bedrock was encountered between ten to twelve (10-12) feet below ground surface from Boring 27 to Boring 29. The bedrock was dense and drilling refusal was encountered. Trench depths in this area should be verified, as special excavation techniques may be necessary.

The soils encountered in the exploratory borings consist mainly of "non-cohesive" loose to medium silty sands (SM) and poorly-graded sands (SP) soil types based on the Unified Soil Classification System. Sloughing of sidewalls is likely to occur. The soils encountered in the exploratory borings can be classified as Type "C" soils according to CAL/OSHA. Trench excavations shall comply with CAL/OSHA Construction Safety Orders for Excavation, Trenches, and Earthwork.

Shoring Is likely to be necessary, even for shallow trenches. If space permits, sloping of the trench sidewalls from the base of the excavation is recommended.

As trenches are exposed and soils dry out, additional sloughing of sidewalls will likely occur.

Caving was not noted in any of our eight-inch borings, however the chances of caving will increase within larger scale excavations and should be anticipated particularly in coarse-grained material and under groundwater table, and saturated fine-grained material may cave as well.

Trench depths greater than 20 feet are not anticipated. However, if trenches exceed 20 feet, a registered professional engineer must design protective systems for trenches. The contractor should provide their own design for trench shoring and retaining and submit their design to the project engineer prior to construction.

No heavy equipment or other surcharge loads (i.e., excavation spoils) should be allowed within the top of slope a distance equal to the depth of the excavation, both measured from the top of the excavation. (*Note: lateral support shall be considered removed when the excavation extends below a plane projected downward at an angle of 45 degrees from the bottom of an excavation of an existing structure, from the edge of the public way or an adjacent property*).

# 7.3 Temporary Shoring

Proper installation of shoring is the responsibility of the contractor. The adjacent property owners must be advised of the risks and the owner and builder should provide arrangements to repair any possible damages.

The following information on the design and installation of the shoring is as complete as possible at this time. It is suggested that a review of the final shoring plans and specifications be made by this office prior to bidding or negotiating with a shoring contractor be made.

The cantilevered retrained shoring shall be designed per the following table. A trapezoidal distribution of lateral earth pressure would be appropriate where shoring is to be restrained at the top by bracing or tie backs. In addition to lateral earth pressure, these retaining walls should be designed to resist the surcharge imposed by the proposed structures, footings, and any adjacent buildings. The design values provided in the following table assuming that water table will be maintained below the bottom of the cut.

Depth of	Cantilever Shoring System	Restrained Shoring System
Shoring	Equivalent Fluid Pressure	Lateral Earth Pressure
(feet)	(p.c.f.)	(p.s.f./ft)*
	Triangular Distribution of	Trapezoidal Distribution of
	Pressure	Pressure
Up to 6		
Up to 8		
Up to 12		
Up to 18		

In addition to lateral earth pressure, these retaining walls should be designed to resist the surcharge imposed by the proposed structures, footings, any adjacent buildings, or by adjacent traffic surcharge.

It is very important to note that active pressures can only be achieved when movement in the soil (earth wall) occurs. If movement in the soil is not acceptable, such as adjacent to an existing structure, an at-rest pressure of (?) pcf should be considered for design purposes.

Where a combination of sloped embankment and shoring is utilized, the pressure will be greater and must be determined for each combination. Additional active pressures should be applied where the shoring will be surcharged by adjacent traffic or structures.

Construction excavations shall be made under the supervision of a qualified "competent person" along with periodic review performed by this office. A "competent person" as defined by California/OSHA, is one who is capable of identifying existing and predictable hazards that are unsanitary or dangerous to employees. The competent person has the authority to impose prompt corrective measures to eliminate these hazards.

Water should not be allowed to pond on top of the excavation, nor to flow toward it. **All excavations should be protected from inclement weather**. This is required to keep the surface of the open excavation from becoming saturated during rainfall. Saturation of the excavation may result in a relaxation of the soils which may result in failures. Excavations should be kept moist, not saturated, to reduce the potential for raveling and sloughing during construction.

#### 7.4 Trench Subgrade (Bottom) Stabilization and Bedding

Due to the granular nature of the soil encountered, the majority of the trench bottoms are anticipated to require only minor stabilization. Although some loose and very dense exposures should be anticipated.

Trench subgrade (bottom) should be firm and unyielding. If the trench excavation is excavated below the design invert elevation, it should be backfilled to the design elevation with compacted bedding material.

Trench bottoms (subgrade) should be scarified a minimum of eight (8) to twelve (12) inches, moisture conditioned or aerated to near optimum moisture content and compacted to minimum 90% relative compaction as determined by ASTM D1557 test method. Unstable soils, excessive moisture or free-standing water, or loose soils should be observed by the Geotechnical Consultant for the opportunity to provide recommendations prior to pipe placement.

The sand equivalent value of the soils tests ranged from two to sixty-eight (2-68). Standard specifications for pipeline construction call for pipe bedding material to have a sand equivalent value of 30 or higher. Some materials having this minimum sand equivalent were encountered along the proposed alignment. If material meeting the minimum sand equivalent requirement is encountered it may be possible to stockpile the acceptable pipe bedding material for use along the alignment. However, care will have to be utilized in collecting and segregating these materials to prevent possible contamination with other undesirable soil encountered with sand equivalents of less than 30.

Based on our investigation, boring data and laboratory test results in combination with the "Modulus of Soil Reaction (E') Values for Buried Flexible Pipe" from the Engineering and Research Center Bureau of Reclamation as well as the "Handbook of Ductile Iron Pipe" Sixth Edition, by Ductile Iron Pipe Research Association, it is recommended a value of 500 be used for the E Prime (E') value.

#### 7.5 Trenchless Horizontal Drilling (Pearblossom Highway)

Based on the materials encountered at Pearblossom Highway (silty sand and poorly-graded sand), it is our opinion that trenchless shoring is feasible. Due to some of the loose and non-cohesive soil encountered, casing may be needed to advance the horizontal boring to prevent caving. No large rocks or boulders or otherwise impenetrable soils were encountered in our exploratory borings.

# 7.6 Pipe Bedding

For purposes of this section of the report, "bedding" is defined as material placed in a trench up to one (1) foot above a utility pipe, and "backfill" is all material placed in the trench above the bedding.

Unless concrete-slurry bedding is required around utility pipes, free-draining sand should be used as bedding. Pipe bedding shall be clean sand or site soil with a sand equivalent value of 30 or higher, free of gravel. Sand or on-site soils proposed for use as bedding should be tested in our laboratory to verify its suitability and measure its compaction characteristics. The pipe bedding shall be placed in lifts not exceeding eight (8) inches, moisture conditioned to near optimum moisture content and compacted to a minimum relative compaction of 90% as determined in accordance with Test Method ASTM D 1557.

It is recommended that bedding material be placed to an elevation equal to one (1) foot over the top of the pipe.

Jetting will not be allowed unless approved by the Project Engineer and Geotechnical Consultant.

#### 7.7 Fill Placement and Compaction Requirements

The excavated native soils may be used as engineered fill to backfill the excavation. Materials for engineered fill should be free of organic material, debris, and other deleterious substances, and should not contain rocks greater than two (2) inches in maximum dimension.

All native soil shall be moisture conditioned or air dried as necessary to achieve near optimum moisture condition, placed in lifts (eight to ten inches, measured loose) and then compacted in place by mechanical compaction equipment to a minimum relative compaction of 90% as determined in accordance with Test Method ASTM D 1557.

All import soil fill (meeting the requirements of Section 13.9) should be placed in lifts eight to ten inches, measure loose), moisture conditioned or air dried as necessary to near optimum moisture condition, and then compacted in place to a minimum relative compaction of 90% as determined in accordance with Test Method ASTM D 1557.

A representative of the project consultant should be present on-site during grading operations to verify proper placement and compaction of all fill, as well as

to verify compliance with the other geotechnical recommendations presented herein.

# 7.8 Native Soil Shrinkage

A shrinkage factor of the upper site soils will vary along the trench and is dependent on many factors such as depth of trench, material encountered, in-situ density and degree of compaction. Overall, shrinkage is estimated at five to ten (5-10) percent. Areas excavated into dense bedrock will yield a much lower shrinkage factor and will affect quantities. This estimate is based on the limited data collected from the subsurface exploration and laboratory test data with an average degree of compaction of 92% and will vary depending on contractor methods.

# 7.9 Imported Soils for Backfill

If imported soils are required to complete the planned grading, these soils shall be free of organic matter and deleterious substances, meeting the following criteria:

- 100% passing a 2-inch sieve
- 60% to 100% passing the #4 sieve
- no more than 20% passing a #200 sieve
- expansion index less than 20
- liquid limit less than 35
- plasticity index less than 12
- Low corrosion potential
  - Soluble Sulfates less than 1,500 ppm
  - Soluble Chlorides less than 150 ppm
  - Minimum Resistivity greater than 8,000 ohm-cm

Prospective import soils should be observed, tested and pre-approved by this firm prior to importing the soils to the site. Final approval of the import soil will be given once the material is on site either in place or adequate quantities to finish the grading.

#### 7.10 Soil Settlement

Soil settlement behind shoring and of the backfill material can occur in trenches at the site. The soil behind shoring can settle from two primary sources:

- 1. The soil can "yield" laterally and downward toward the shoring. This is often referred to as "ground loss".
- 2. Dewatering can increase stresses in dewatered soils, which results in consolidation.

Some ground loss will occur with a shield and other shoring systems. The magnitude of this loss varies widely and is difficult to predict. For the medium dense to dense sands encountered in the borings, it is estimated that the ground loss will be in a range of one (1) percent near the trench, in the range of 0.5 percent at a distance "H" from the excavation, and to be negligible to a distance of "2H" from the excavation: "H" is equal to the trench depth and ground loss is expressed as a percent of the trench depth.

Settlement of deep trench backfill is possible, even when the backfill is properly placed and compacted. Occasional reworking or resurfacing of the trench areas where the backfill exceeds approximately ten feet may be necessary.

# 7.11 Observations and Testing

The pipeline construction shall be observed and tested by the Geotechnical Consultant to verify compliance with the recommendations. Any pipe placement or backfill performed without full knowledge of the Geotechnical Consultant may render the recommendations of this report invalid.

# 8.0 DESIGN CONSIDERATIONS

#### 8.1 Foundation Design Recommendations

Provided the recommendations in this report are incorporated into site development, foundations and thrust blocks constructed on compacted fill and dense native soil may be designed as follows:

8.1.1 Allowable Bearing Capacity

An allowable "net" bearing capacity of 1,500 psf. can be utilized for dead and sustained live loads. This value includes a minimum safety factor of three (3) and may be increased by one-third (1/3) for total loads, including seismic forces.

# 8.1.2 Lateral Load Resistance

Lateral load resistance for the footings or thrust blocks will be developed by passive soil pressure against sides of footings or thrust blocks. This passive pressure was estimated to be 300 Z PSF, where Z = Depth (in feet) below adjacent soil elevation. In passive pressure calculations, the upper one (1) foot of soil should be subtracted from the depth, "Z", unless confined by

pavement or slab. This is an ultimate value. An appropriate safety factor should be used for design calculations. Passive resistance may be combined with frictional resistance without reduction.

Friction along the footing or thrust block base may provide resistance to lateral loading. The coefficient of friction was estimated to be 0.31 for undisturbed soils or site soils compacted to 90% of the maximum dry density as determined by ASTM D 1557 test method, and may be used for dead load forces and includes a reduction factor of one-third (1/3).

# 9.0 CORROSION AND CHEMICAL ATTACK

Soluble sulfate, pH, resistivity and chloride concentration test results are presented in Appendix B. The Resistivity (CTM 643) test results on bulk soil samples from the site indicated that on-site soils range from **extremely-corrosive** to **moderately-corrosive** when in contact with ferrous material (<500 to 10,500 ohm-cm). Corrosion test results also indicate that the surficial soils at the site have negligible sulfate attack potential (0.0123% to .0967% by weight) on concrete.

Based on the preliminary chemical analysis performed on a sample of the native soil, foundation concrete shall consist of type II cement with a minimum compressive strength of 2,500 psi as indicated in the ACI 318-19 Table 19.3.2.1. A higher compressive strength may be required by the structural engineer. Additional soil chemical analysis during grading is recommended. The minimum concrete compressive strength should be determined by the structural engineer.

The chemical test results should be distributed to the project design team for their interpretations pertaining to the corrosivity or reactivity of the construction materials (ferrous metals, and piping).

# 10.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report is based on the development plans provided to our office. If structure design changes or structure locations changes occur, the conclusion and recommendations in this report may not be considered valid unless the changes are reviewed, and the conclusions of this report are modified or approved by the Geotechnical Consultant.

The subsurface conditions and characteristics described herein have been projected from individual borings or test pits placed across the subject property. Actual variations in the subsurface conditions and characteristics may occur.

If conditions encountered during construction differ from those described in this report, this office should be notified so as to consider the necessity for modifications. No responsibility for construction compliance with the design concepts, specifications, or recommendations is assumed unless on-site construction review is performed during the course of construction, which pertains to the specific recommendations contained herein.

It is recommended that Bruin GSI be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design specifications. If Bruin GSI is not accorded the privilege of making this recommended review, Bruin GSI can assume no responsibility for misinterpretation of the recommendations contained in this report.

This report has been prepared in accordance with generally accepted practice and standards in this community at this time. No warranties, either expressed or implied, are made as to the professional advice provided under the terms of the agreement and included in this report. This report has been prepared for the exclusive use of Hazen and Sawyer and their authorized agents. Unauthorized reproduction of any portion of this report without expressed written permission is prohibited.

If parties other than Bruin GSI are engaged to provide construction geotechnical services, they must be notified that they will be required to assume complete responsibility for the geotechnical phase of the project by concurring with the findings and recommendations in this report or providing alternate recommendations.

# 11.0 CLOSURE

The conclusions, recommendations, and opinions presented herein are: (1) based upon our evaluation and interpretations of the limited data obtained from our field and laboratory programs; (2) based upon an interpolation of soil conditions between and beyond the borings; (3) are subject to confirmation of the actual conditions encountered during construction; and, (4) are based upon the assumption that sufficient observation and testing will be provided during the grading, infrastructure installation and building phases of site development.

APPENDIX A

Boring Logs Classification Profile and Key

Image         OP Tilling         Page 1 of 1           Deling technador         OP Oriling         Page 1 of 1           Deling technador         Orecado 5         AM           Deling technador         Orecado 5         MS           Dereted 5         Orecado 5         MS           Dereted 5         Orecado 5         MS           Project Number:         23-314         Orecado 5         MS           Propect Location:         Paindale         Haterial Description         Total Description           ML         Bark Brown fine to medium sandy silt w/ occ. caarse sand to 3/8" gravel 8. dray binder         7-10         98.3         8.7           Soft fine to medium sandy silt w/ occ. caarse sand to 3/8" gravel 8. dray binder         7-10         98.3         8.		Date(s) drilled	11/9/2023	100.05	POPING	1			
Drilling Method         Hollow Stem Auger           Drill Rig Type         CME 65         logged By:         AM           Drill Rig Type         Checked By:         MS         logged By:         CME           Project Location:         Sampling         CS/Bulk         logged By:         AM         logged By:         M           Project Location:         Palmdale         latomer Data         140 / 30' drop         logged By:         m         gravel           ML         Dark Brown fine to medium sandy silt w/ occ. coarse sand to 3/8'' gravel         R-8.8         17.2         7.7           Firm, sightly moist         Brown fine to medium sandy silt w/ occ. coarse sand to 3/8'' gravel         R-8.8         11.0           SM         ML         Brown fine to medium sandy silt w/ occ. coarse sand to 1/2'' gravel         S-8 <td>A D</td> <td>-</td> <td>GP Drilling</td> <td></td> <td></td> <td>T</td> <td></td>	A D	-	GP Drilling			T			
Brown fine to medium sandy silt w/ occ. coarse sand to 3/8" gravel         710         98.3         8.7           10         ML         Dark Brown fine to medium sandy silt w/ occ. coarse sand to 3/8" gravel         710         98.3         8.7           10         ML         Dark Brown fine to medium sandy silt w/ occ. coarse sand to 3/8" gravel         710         98.3         8.7           10         ML         Dark Brown fine to medium sandy silt w/ occ. coarse sand to 3/8" gravel         710         98.3         8.7           10         ML         Borom fine to medium sandy silt w/ occ. coarse sand to 3/8" gravel         7.1         98.3         8.7           10         ML         Borom fine to medium sandy silt w/ occ. coarse sand to 3/8" gravel & clay binder         7.10         98.3         8.7           10         ML         Brown fine to medium sandy silt w/ occ. coarse sand to 3/8" gravel & clay binder         7.10         98.3         8.7           10         ML         Brown fine to medium sandy silt w/ occ. coarse sand to 1/2" gravel         5.8         102.9         110           10         SM         Brown very silty fine to coarse sand w/ occ. #4 gravel         3.4-3         5.9           20         ML         Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel         6.8-8         5.4           20	7555	Drilling Method	Drilling Method Hollow Stem Auger			e 1 of 1			
Startype     S*     Under any with       Sampling     Startype     S*     Under any with       Client:     Hazen & Sawyer     Groundwirt     None Encountered     Bornhole     15' bgs       Project Number:     23-314     Bornhole fack1M     Native/ Cuttings     Note:       Project Number:     Paintale     Harmer Data     140#, 30" drop     Note:       Bornhole fack1M     Native/ Cuttings     Note:     Note:     Note:       Project Number:     Paintale     Harmer Data     140#, 30" drop     8-8     117.2     7.7       Bornhole fack1M     Native/ Cuttings     Note:     Recommender     8-8     117.2     7.7       ML     Dark Brown fine to medium sandy sit w/ occ. coarse sand to #3/8" gravel & clay binder     7-10     98.3     8.7       Startype     ML     Borown fine to coarse sand vi oz.ex and to #3/8" gravel & clay binder     7-10     98.3     8.7       Startype     ML     Borown fine to coarse sand vi oz.ex coarse sand to 3/8" gravel & clay binder     7-10     98.3     8.7       Startype     ML     Borown fine to coarse sand vi oz.ex coarse sand to 1/2" gravel     5-8     101.9     110       Startype     Startype     Borown sithy fine to medium sandy vit oz.ex coarse sand to 1/2" gravel     5-8     5.9       Sta	BRUIN	Drill Rig Type	CME 65	Logged By: AM					
Sampling (bit holds)         CSS/Bulk (bit holds)         Total Depth of 15' bgs         Total Depth of 15' bgs           Client:         Hazen & Sawyer         Groundwater         None Encountered         Buring Location: See Figure 2           Project Location:         Palmdale         Hammer Data         1408, 30" drop         Note:           Image: See Figure 2         Material Description         Image: See Figure 2         Note:           Image: See Figure 2         Material Description         Image: See Figure 2         Note:           Image: See Figure 2         Material Description         Image: See Figure 2         Note:           Image: See Figure 2         Material Description         Image: See Figure 2         Note:           Image: See Figure 2         Material Description         Image: See Figure 2         Note:           Image: See Figure 2         Material Description         Image: See Figure 2         Note:           Image: See Figure 2         Material Description         Image: See Figure 2         Ref           Image: See Figure 2         Material Description         Image: See Figure 2         Ref           Image: See Figure 2         Material Description         Image: See Figure 2         Ref           Image: See Figure 2         Material Descriptinstematere         See Figure 2         Ref </td <td></td> <td></td> <td>8"</td> <td>Checked By: MS</td> <td></td> <td></td> <td></td>			8"	Checked By: MS					
Project Number:       23-314       Borehole Backfill       Notes:         Project Location:       Palmdale       Hammer Data       140//, 30" drop         Image: State of the state	est. 2004		CSS/Bulk	15' hoc					
Project Location:       Palmdale       Hammer Data       140#, 30° drop         gg	Client: Hazen & Sawyer								
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ML       Dark Brown fine to medium sandy silt w/ occ. coarse sand to #3/8" gravel       8-8       117.2       7.7         ML       Brown fine to medium sandy silt w/ occ. coarse sand to 3/8" gravel & clay binder       7-10       98.3       8.7         S'       ML       Brown fine to medium sandy silt w/ occ. coarse sand to 3/8" gravel & clay binder       7-10       98.3       8.7         ML       Brown fine to medium sandy silt w/ occ. coarse sand to 3/8" gravel (slightly centented)       6-8       103.9       7.1         ML       ML       Brown fine to medium sandy silt w/ occ. coarse sand to 1/2" gravel       5-8       101.9       11.0         10'       SM       Brown fine to medium sand w/ coarse sand & occ. #4 gravel       5-8       101.9       11.0         10'       SM       Brown silty fine to medium sand w/ coarse sand & occ. #4 gravel       3-4-3       5.9         15'       SM       Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8-8       5.4         Medium dense, slightly moist       Boring terminated @ 15' bgs       No groundwater       No caving       10         20'       No caving       III       IIII       IIIII       IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Project Location: Palmda	ale Hammer Data	140#, 30" drop						
S'       ML       Firm, slightly moist       7-10       98.3       8.7         S'       ML       Brown fine to medium sandy silt w/ occ. 'A4 gravel (slightly centented)       6-8       103.9       7.1         ML       Brown fine to coarse sanyd silt w/ occ. 'Coarse sand to 3/8' gravel & clay binder       7-10       98.3       8.7         ML       Brown fine to coarse sanyd silt w/ occ. 'A4 gravel (slightly centented)       6-8       103.9       7.1         ML       Brown fine to medium sandy silt w/ occ. 'Coarse sand to 1/2" gravel       5-8       101.9       11.0         SM       Brown very silty fine to medium sand w/ coarse sand & occ. #4 gravel       3-4-3       5.9         10'       SM       Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8-8       5.4         Medium dense, slightly moist       Boring terminated @ 15' bgs       No groundwater       No caving       10         20'       No caving       Image: Sightly moist       Image: Sightly moist       Image: Sightly moist       Image: Sightly moist         25'       SM       Boring terminated @ 15' bgs       No caving       Image: Sightly moist       Image: Sightly moist       Image: Sightly moist         25'       SM       Image: Sightly moist       Image: Sightly moist       Image: Sightly sightly moist       Image:	Depth Sample USCS Graphic Log	М	aterial Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %		
ML       Brown fine to medium sandy silt w/ occ. tarse sand to 3/8" gravel & clay binder       7-10       98.3       8.7         S <sup>1</sup> ML       Brown fine to coarse sandy dit w/ occ. #4 gravel (slightly cemtented)       6-8       103.9       7.1         ML       Moderately firm, slightly moist       Brown fine to medium sandy silt w/ occ. coarse sand to 1/2" gravel       5-8       101.9       11.0         10'       SM       Brown very slift, fine to medium sand w/ coarse sand & occ. #4 gravel       3-4-3       5.9         10'       SM       Brown silty fine to coarse sand w/ coarse sand & occ. #4 gravel       6-8-8       5.4         15'       SM       Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8-8       5.4         15'       SM       Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8-8       5.4         20'       No groundwater       No caving       Image: slightly moist       Image: slightly moist       Image: slightly moist         20'       No groundwater       No caving       Image: slightly moist       Image: slightly moist       Image: slightly moist       Image: slightly moist         20'       Image: slightly moist         20'       Image: slightly	ML			3/8" gravei	8-8	117.2	7.7		
5'       ML       From fine to coarse sand sit w/ occ. #4 gravel (slightly centented)       6-8       103.9       7.1         10'       ML       Brown fine to coarse sand sit w/ occ. #4 gravel (slightly centented)       5-8       101.9       11.0         10'       SM       Brown very slift, fine to medium sand y cloarse sand & occ. #4 gravel       5-8       101.9       11.0         10'       SM       Brown very slift, fine to medium sand w/ coarse sand & occ. #4 gravel       3-4-3       5.9         10'       SM       Brown very slift fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8-8       5.4         15'       SM       Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8-8       5.4         15'       SM       Boring terminated @ 15' bgs       No groundwater       No caving       Indicating terminated @ 15' bgs       Indica	—			avel & clay binder	7-10	98.3	8.7		
5 <sup>-</sup> ML       Brown fine to coarse sandy silt w/ occ. #4 gravel (slightly centented)       6-8       103.9       7.1         ML       ML       Brown fine to medium sandy silt w/ occ. coarse sand to 1/2" gravel       5-8       101.9       11.0         10'       SM       Brown very silty fine to medium sand w/ coarse sand & occ. #4 gravel       3.4-3       5.9         10'       SM       Brown very silty fine to coarse sand w/ coarse sand & occ. #4 gravel       6-8.8       5.4         15'       SM       Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8.8       5.4         15'       SM       Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8.8       5.4         20'       No groundwater       No groundwater       No groundwater       Image: Sight set of the set							-		
ML Brown fine to medium sandy slit w/ occ. coarse sand to 1/2" gravel 10' SM Brown very slity fine to medium sand w/ coarse sand & occ. #4 gravel Loose, slightly moist 15' SM Brown slity fine to coarse sand w/ occ. #4 to 1/2" gravel 68-8 5.4 Medium dense, slightly moist Boring terminated @ 15' bgs No groundwater No caving	5' ML			ented)	6-8	103.9	7.1		
10     SM     Brown very silty fine to medium sand w/ coarse sand & occ. #4 gravel     3:4:3     5.9       15     SM     Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel     6:8:8     5.4       15     SM     Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel     6:8:8     5.4       10     Boring terminated @ 15' bgs     No groundwater     No caving		Moderately firm	m, slightly moist						
10'       5M       Brown very silty fine to medium sand w/ coarse sand & occ. #4 gravel       3-4-3       5.9         15'       5M       Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8-8       5.4         15'       5M       Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8-8       5.4         20'       No groundwater       No caving       No caving       1       1	ML	Brown fine to medium sandy	silt w/ occ. coarse sand to 1/2" gr	avel	5-8	101.9	11.0		
15'     SM     Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel     6-8-8     5.4       20'     No groundwater     No groundwater     No caving		Stiff, moist							
15'       SM       Brown silty fine to coarse sand w/ occ. #4 to 1/2" gravel       6-8-8       5.4         15'       SM       Medium dense, slightly moist       Image: Sightly moist       I	10' SM	Brown very silty fine to mediu	um sand w/ coarse sand & occ. #4	gravel	3-4-3		5.9		
20'     Medium dense, slightly moist       20'     Boring terminated @ 15' bgs       20'     No groundwater       No caving		Loose, slightly	moist						
20'     Medium dense, slightly moist       20'     Boring terminated @ 15' bgs       20'     No groundwater       No caving									
20'     Medium dense, slightly moist       20'     Boring terminated @ 15' bgs       20'     No groundwater       No caving									
20' 20' 20' 25' 25'	15' SM	Brown silty fine to coarse san	d w/ occ. #4 to 1/2" gravel		6-8-8		5.4		
20' No groundwater No caving		Medium dense	e, slightly moist						
20'     No caving       1     1       25'     25'		Boring terminated @ 15' bgs							
		No groundwater							
	20'	No caving							
	25'								
30'									
30'									
30'									
	30'								

	Date(s) drilled <b>12/20/2023</b>	
R D	Drilling Contractor Choice Drilling	LOG OF BORING 2
75.	Drilling Method Hollow Stem Auger	Page 1 of 1
<b>PDIIIII</b>	Drill Rig Type CME 55 Mini LAR	Logged By: AM
D K U I IN GEOTECHNICAL SERVICES INC.	Drill Bit <b>6''</b> Size/Type <b>6''</b>	Checked By: MS
est. 2004	Sampling Method(s) CSS/SPT/Bulk	Total Depth of Borehole 12'
Client: Hazen & Sawyer	Groundwater None Encountered	Boring Location: See Figure 2
Project Number: 23-314	Borehole Backfill Native/ Cuttings	Notes:
Project Location: Palmdale	Hammer Data 140#, 30" drop	
Depth Sample USCS Graphic Log	Material Description	Penetration Resistance (Blows/6") Dry Unit Weight pcf Water Content %
5'     SC     Dark yellowis       5'     SC     Dark yellowis       0     SM     Yellowish bro       10'     Dense, moist       5M     Yellowish bro       10'     Medium dens	h brown very clayley fine to medium sand w/ coar wn silty very fine to medium sand w/ coarse sand wn silty fine to medium sand w/ coarse sand & oc se, slightly moist	*se sand & occ. #4-1/2" g       7-13       114.5       9.6         & occ. #4-1/2" gravel       16-11-10       7.8
25'		

		Date(s) drilled	12/20/2023					
A start		Drilling Contractor	Choice Drilling		BORING	3		
		Drilling Method Hollow Stem Auger			e 1 of 1			
BRI		Drill Rig Type CME 55 Mini LAR Logged By: AM						
GEOTECH SERVICES	5 INC.	Drill Bit Size/Type	6"	Checked By: MS				
est. 20	04	Sampling Method(s)	CSS/SPT	Total Depth of Borehole 15'				
Client: Hazen & Sav	vyer	Groundwater	None Encountered	Boring Location: See Fig	gure 2			
Project Number:	23-314	Borehole Backfill	Native/ Cuttings	Notes:				
Project Location:	Palmdale	Hammer Data	140#, 30" drop					
Depth Sample USCS	Graphic Log	М	aterial Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %	
SM			edium sand w/ coarse sand & o	cc. #4-1/2" gravel and clay	3-8-16		10.3	
SM	Medium dens		nd w/ coarse sand & occ. #4-1"	gravel	16-36-43		6.4	
	Very dense, m			Braver	10 00 10			
5'								
	Yellowish bro	wn silty fine to c	coarse sand w/ occ. #4-1/2" grav	vel & slight clay hinder	12-21-24		8.2	
	Dense, moist	wit sitty the to c	50150 50110 W/ 500. #4 1/2 ' Brut	ici di singiri cidy sinder			0.2	
10' SM	Vollowish bro	wo clightly cilty	fine to coarse sand w/ occ. #4 to	2" gravel & clay hinder	15-30	128.1	9.8	
	Dense, moist	wit singlicity sincy			15 50	120.1	5.0	
15' SM	Yellowish bro	wn slightly silty	fine to coarse sand w/ occ. #4-1	/2" gravel	26-50/6"	126.1	7.7	
	Very dense, m	noist						
	Boring termin	ated @ 15' bgs						
	No groundwa	ter						
20'	No caving							
25'								
30'								

		Date(s) drilled	12/20/2023		00.05	BORING		
A D		Drilling Contractor	Choice Drilling	1 "	UG UF			
1 2 3		Drilling Method Hollow Stem Auger			e 1 of 1			
RRIII		Drill Rig Type CME 55 Mini LAR Logged By: AM			<u>.</u>			
GEOTECHNICA SERVICES INC	AL C.	Drill Bit Size/Type	6"	Checked By:	MS			
est. 2004		Sampling Method(s)	CSS/SPT/Bulk	Total Depth of Borehole	15'			
Client: Hazen & Sawye	er	Groundwater	None Encountered	Boring Location:	See Fig	ure 2		
Project Number:	23-314	Borehole Backfill	Native/ Cuttings	Notes:				
Project Location:	Palmdale	Hammer Data	140#, 30" drop					
Depth Sample USCS	Graphic Log	Ma	aterial Description			Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
SM			sand w/ fine sand & occ. #4-1" g	gravel		27-50/6"	126.1	7.7
	Very dense, m	noist						
SM	Yellowish broy	wn silty fine to n	nedium sand w/ coarse sand occ	#4-1/2" gravel 8	& slight c	16-25	123.4	14.4
5'	Dense, very m							
SM	Yellowish brow	wn silty fine to c	oarse sand w/ occ. #4-1/2" grave	el		50/5"		10.4
	Very dense, m	noist						
10' SM	Vollowich brou	un ciltu fina ta a	oarse sand w/ occ. #4-1/2" grave			16-30-34		8.7
	Very dense, m		Odise salid wy occ. #4-1/2 grave	21		10 30 34		0.7
SM			nedium sand w/ coarse sand & o	cc. #4-1/2" grave	el .	23-28-50/5"		5.8
	Very dense, sl							
15' SM	Pale yellowish	brown silty fine	e to medium sand w/ coarse sand	d & occ. #4-1/2" §	gravel	15-50/5"		9.5
	Very dense, m	noist						
	Boring termin	ated @ 15' bgs						
	No groundwa	ter						
20'	No caving							
25'								
25'								
30'								

	Date(s) drilled	12/20/2023			-			
R D	Drilling Contractor	Choice Drilling	LOG OF					
7353	Drilling Method	Drilling Method Hollow Stem Auger				e 1 of 1		
BRUIN	Drill Rig Type	CME 55 Mini LAR	Logged By: AM					
GEOTECHNICAL SERVICES INC.	Drill Bit Size/Type	6"	Checked By: MS					
est. 2004	Sampling Method(s)	CSS/SPT/Bulk	Total Depth of Borehole 15'					
Client: Hazen & Sawyer	Groundwater	None Encountered	Boring Location: See Fig	gure 2				
Project Number: 23-314	Borehole Backfill	Native/ Cuttings	Notes:					
Project Location: Palmda	ale Hammer Data	140#, 30" drop	1					
Depth Sample USCS Graphic Log	Μ	laterial Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %		
SM	Brown silty fine to medium sa Medium dense, slightly moist	and w/ coarse sand & occ. #4-3" g	ravel & slight clay binder	8-16	109.6	6.2		
	Brown clayley medium to coa Dense, moist	urse sand w/ fine sand & occ. #4-3	" gravel	16-20	129.2	11.4		
SC 10'	Yellowish brown clayley fine t Dense, moist	to medium sand w/ coarse sand &	k occ. #4-3" gravel	14-24		15.3		
SM	Greyish brown silty fine to coa Very dense, moist	arse sand w/ occ. #4-4" cobble		26-37		8.8		
15' SM	Greyish brown very silty fine t Very dense, slightly moist	to medium sand w/ coarse sand &	& occ. #4 gravel (Decomp	22-50/6"		6.4		
	Boring terminated @ 15' bgs No groundwater							
	No caving							
25'								
30'								

	Date(s) drilled <b>12/20/2023</b>			
K D	Drilling Contractor Choice Drilling	LOG OF	BORING 7	
	Drilling Method Hollow Stem Auger	Page	e 1 of 1	
RRIIIN	Drill Rig Type CME 55 Mini LAR	Logged By: AM		
GEOTECHNICAL SERVICES INC.	Drill Bit <b>6''</b> Size/Type	Checked By: MS		
est. 2004	Sampling Method(s) CSS/SPT	Total Depth of Borehole 15'		
Client: Hazen & Sawyer	Groundwater None Encountered	Boring Location: See Fig	ure 2	
Project Number: 23-314	Borehole Backfill Native/ Cuttings	Notes:		
Project Location: Palmdale	Hammer Data 140#, 30" drop			
Depth Sample USCS Graphic Log	Material Description		Penetration Resistance (Blows/6") Dry Unit Weight pcf	Water Content %
SC Brown cla	yley fine to medium sand w/ coarse sand & occ. #4-3	' gravel	5-14	
Medium	dense, slightly moist			
	yley fine to medium sand w/ coarse sand & occ. #4-3	' gravel	6-13 108.3	10.4
5' Medium	dense, moist			
SC Brown cla	yley fine to medium sand w/ coarse sand & occ. #4-3	' gravel	12-18 103.2	14.8
10' Dense, m		graver	12-10 103.2	14.0
CL Moderate	brown clayley fine to coarse sand w/ occ. #4-4" cobb	le	22-34	11.1
Hard, mo				
	vn silty fine to coarse sand w/ occ. #4 gravel & slight c	ay binder (Decomposed	25-50/5"	8.6
Very den	se, moist			
20'				
25'				
30'				

	$\sim$		Date(s) drilled	11/16/2023		DODULO		
	A D		Drilling Contractor	GP Drilling		BORING	8	
2	1 35.5		Drilling Method	Hollow Stem Auger	Page	e 1 of 1		
PI		<b>}</b>	Drill Rig Type	CME 65	Logged By: AM	<u> </u>		
	OTECHNICAL ERVICES INC.		Drill Bit Size/Type	8"	Checked By: MS			
	est. 2004		Sampling Method(s)	CSS/SPT/Bulk	Total Depth of Borehole 15' bgs	;		
Client: Hazen	& Sawyer		Groundwater	None Encountered	Boring Location: See Fig	ure 2		
Project Number:	23-3	314	Borehole Backfill	Native/ Cuttings	Notes:			
Project Location:	Palr	ndale	Hammer Data	140#, 30" drop			-	
Depth	USCS Graphic	Log	М	aterial Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
	ML	Yellowish bro		um sandy silt w/ coarse sand &	& calcium carbonate	13-24	120.7	5.7
	CN4	Vallauriah haa	Very stiff, sligh			19-29	120.1	6.3
5'	SM	Yellowish bro	Dense, moist	medium sand w/ coarse sand &	& occ. #4 gravel (slightly cerr	19-29	120.1	0.3
	SM	Reddish brow		edium sand w/ coarse sand &	occ. #4-1/2" gravel	28-48	119.6	7.3
			Very dense, mo					
	SM	Yellowish bro	wn silty fine to r	medium sand w/ occ. coarse sa	and & #4 gravel	12-11-11		
10'			Dense, moist					
	SC	Yellowish bro		o medium sand w/ coarse sand	d & occ. #4 gravel	7-13-20		12.0
			Dense, very mo	bist				
15'	SC	Moderate bro	wn clayey fine t	o medium sand w/ occ. coarse	e sand - #4 gravel	7-11-13		8.6
			Medium dense	e, moist				
		Device to wait						
		No groundwa	ated @ 15' bgs					
20'		No caving						
25'								
		•						
30'								
						1		

	Date(s) drilled <b>11/17/2023</b>	100.05		
A D	Drilling Contractor GP Drilling	LUG UF	BORING 9	
7.55	Drilling Method Hollow Stem Auger	Page	1 of 1	
RRIIIN	Drill Rig Type CME 65	Logged By: AM		
GEOTECHNICAL SERVICES INC.	Drill Bit <b>8"</b> Size/Type	Checked By: MS		
est. 2014	Sampling Method(s) CSS/SPT/Bulk	Total Depth of Borehole <b>30' bgs</b>		
Client: Hazen & Sawyer	Groundwater None Encountered	Boring Location: See Fig	ure 2	
Project Number: 23-314	Borehole Backfill Native/ Cuttings	Notes:		
Project Location: Palmdale	Hammer Data 140#, 30" drop			
Depth Sample USCS Graphic Log	Material Description		Penetration Resistance (Blows/6") Dry Unit	Weight pcf Water Content %
ML Light brown f	ne to medium sandy silt w/ coarse sand & occ. #4	gravel & slightly cement	5-7 107	.6 9.1
	Stiff, moist			
SM Brown silty fi	ne to medium sand w/ coarse sand & occ. #4 grave	el	2-2 106	.6 8.5
	Loose, moist			
5'				
SM Brown very s	Ity fine to coarse sand w/ occ. #4 gravel & slight c	ay binder	2-2 102	.3 12.4
	Loose, moist			
SM Brown silty fi	ne to coarse sand w/ occ. #4 gravel & clay binder		3-2 106	.0 9.2
10'	Loose, moist			
SM . Yellowish bro	wn very silty fine to medium sand w/ occ. coarse s	and to #4 gravel	10-26 120	.8 12.0
	Dense, very moist			
15' SM Brown very s	ty fine to medium sand w/ occ. coarse sand (sligh	tly cemented)	15-31-35	9.6
	Dense, moist			
	The second se			
20' SM/ML Dark yellowis	n brown very silty f-m sand w/ coarse sand & clay	binder	8-14-28	7.9
	Dense, moist			
25' ML Brown fine to	medium sandy silt w/ occ. coarse sand & 1/2" gra	vel & clay binder	8-9-13	17.2
	Firm, moist			
30' ML Olive Brown	ine to medium sandy silt w/ occ. coarse sand & 1/	2" gravel & clav binder	10-14-31	15.2
	inated @ 30' bgs, No groundwater, No cavi		-	
		0		

		Date(s) drilled	11/17/2023			10	
	R	Drilling Contractor	GP Drilling	LOG OF BORING 10			
		Drilling Method	Hollow Stem Auger	Pa	ge 1 of 1		
BRI		Drill Rig Type	CME 65	Logged By: AM			
GEOTEC	ES INC.	Drill Bit Size/Type	8"	Checked By: MS			
est. 2		Sampling Method(s)	CSS/SPT/Bulk	Total Depth of Borehole 15' b	gs		
Client: Hazen & Sa	wyer	Groundwater	None Encountered	Boring Location: See	igure 2		
Project Number:	23-314	Borehole Backfill	Native/ Cuttings	Notes:			
Project Location:	Palmdale	Hammer Data	140#, 30" drop				
Depth Sample USCS	Graphic Log	М	aterial Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
SM	Yellowish bro	wn silty fine to c	oarse sand w/ occ. #4 gravel w	slight clay binder	5-7-13		3.5
		Medium dense		5 /			
SM	Yellowish bro	wn silty fine to c	coarse sand w/ occ. #4 gravel		18-20-18		4.1
5'		Dense, slightly	moist				
SM	Yellowish bro	wn silty fine to c	coarse sand w/ occ. #4 gravel		50/6"		3.2
		Very dense, slig	ghtly moist				
SM	Yellowish bro	wn silty fine to c	coarse sand w/ occ. #4 gravel		50/5"	104.5	4.2
10'		Very dense, slig	ghtly moist				
SM	Yellowish bro	wn silty very fine	e to coarse sand w/ occ. #4 grav	el	50/5"		
		Very dense, sli	ghtly moist				
15' SM	Yellowish bro	wn silty very fine	e to coarse sand w/ occ. #4 grav	vel	50/4"	98.2	4.9
		Very dense, slig	ghtly moist				
		nated @ 15' bgs					
	No groundwa	iter					
20'	No caving						
—							
25'							
	Ť						
30'							

	Date(s) drilled <b>11/16/2023</b>	LOG OF BORING 11
A D	Drilling Contractor	
	Drilling Method Hollow Stem Auger	Page 1 of 1
BRUIN	Drill Rig Type CME 65 Logged By:	AM
GEOTECHNICAL SERVICES INC.	Drill Bit Size/Type <b>8''</b> Checked By	y: MS
est. 2014	Sampling Method(s) CSS/SPT/Bulk Total Depth Borehole	<sup>h of</sup> <b>15' bgs</b>
Client: Hazen & Sawyer	Groundwater None Encountered Boring Loca	ation: See Figure 2
Project Number: 23-314	Borehole Backfill Native/ Cuttings Notes:	
Project Location: Palmdale	Hammer Data 140#, 30" drop	
Depth Sample USCS Graphic Log	Material Description	Penetration Resistance (Blows/6") Dry Unit Weight pcf Water Content %
SM Ye	llowish brown silty fine to medium sand w/ occ. coarse sand Loose, slightly moist	3-2-1 2.9
SM Ye	llowish brown silty fine to medium sand w/ occ. coarse sand to 1/2" gra	avel 2-3-3 5.0
	Loose, slightly moist	
5' SM Ye	llowish brown silty fine to medium sand w/ occ. coarse sand to #4 grave	vel 2-3-3 6.7
	Loose, moist	
SM	llowish brown very silty fine to medium sand w/ occ. coarse sand $\&$ clay	y binder 3-4 102.5 15.8
	Loose, saturated	
10' SC Ye	llowish brown clayey fine to coarse sand w/ occ. #4 gravel	1-2 103.4 21.8
	Very loose, saturated	
15' SC Ye	llowish brown clayey fine to coarse sand w/ occ. #4 gravel	2-2 106.9 19.8
	Very loose, saturated	
Во	ring terminated @ 15' bgs	
No	groundwater	
20' No	caving	
25'		
30'		

Date(s) drilled 11/16/	/2023
Drilling Contractor GP Dril	LOG OF BORING 12
	v Stem Auger Page 1 of 1
BRIJIN Drill Rig Type CME 6	5 Logged By: AM
GEOTECHNICAL SERVICES INC. Drill Bit Size/Type 8"	Checked By: MS
Sampling Method(s) CSS/SP	PT/Bulk Total Depth of Borehole 15' bgs
Client: Hazen & Sawyer Groundwater None E	Encountered Boring Location: See Figure 2
Project Number: 23-314 Borehole Backfill Native,	/ Cuttings Notes: Refusal @ 13' bgs
Project Location: Palmdale Hammer Data 140#, 3	30" drop
Depth Graphic Log Log Materia	Penetration Bry Unit Water Content %
SM Yellowish brown silty fine to medium s	sand w/ coarse sand & occ. #4-1/2" gravel 12-13 116.3 4.3
Medium dense, slightly	
SM Yellowish brown silty fine to coarse sa	
5' Very dense, slightly moi	ist
SP Yellowish brown slightly silty medium	to coarse sand w/ fine sand & occ. #4-2" gravel (D 21-50/6" 116.3 2.9
Very dense, slightly moi	ist
SP Greenish brown slightly silty fine to co	barse sand w/ occ. #4-1" gravel (weathered bedroe 24-50/6"
10' Very dense, moist	
SP Pale brown slightly silty fine to coarse	sand w/ occ. #4-1/2" gravel & slight clay binder (v 50/6" 6.4
Very dense, moist	
15' Refusal @ 13' bgs	
No groundwater	
No caving	
20'	
25'	
30'	

	Date(s) drilled	11/16/2023					
A D	Drilling	GP Drilling	LC	DG OF E	BORING	13	
	Contractor Drilling Method	Hollow Stem Auger	-	Page	1 of 1		
1 AC	∥ ⊢──	-	Loggod Duu	0.04			
<u>BRUIN</u> GEOTECHNICAL	Drill Rig Type Drill Bit	CME 65	Logged By:	AM			
GEOTECHNICAL SERVICES INC. est. 2004	Size/Type	8"	Checked By: Total Depth of	MS			
	Sampling Method(s)	CSS/SPT	Borehole	13' bgs			
Client: Hazen & Sawyer Groundwater None Encountered Boring Location: See		-					
Project Number: 23-314 Project Location: Palmda		Native/ Cuttings 140#, 30" drop	Notes:	Refusal	@ 13' bg:	5	
	ale Hammer Data	140#, 50 drop			on ce	cf t	%
Depth Sample USCS Graphic Log	Ma	aterial Description			Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
SC	Olive brown clayey fine to coa	_			2-2-2		16.8
	Loose, saturate Olive brown clayey fine to coa				2-2-3		9.3
SC SC	Loose, very mo				2-2-5		5.5
5' SC	Olive brown clayey fine to me	dium sand w/ coarse sand & occ.	#4 gravel		1-2-2		15.3
	Loose, very mo	ist					
	Olive brown clayey fine to me	dium sand w/coarse sand & occ.	#4 gravel		6-14	121.1	14.2
	Medium dense,		n-t Braver		011		
10' SC	Olive brown slightly silty fine t	to coarse sand w/ occ. #4-1" grav	el (DG)		18-22	129.9	9.5
	Medium dense,	, moist					
SP	Olive brown slightly silty fine t	to coarse sand w/ occ. #4-1" grav	el (DG)	_	50/6"		8.9
15'	Very dense, mo	bist					
	Refusal @ 13' bgs						
	No groundwater						
	No caving						
20'							
25'							
30'							

	Date(s) drilled <b>11/16/2023</b>	100.05		
A D	Drilling Contractor		BORING 14	
7.55	Drilling Method Hollow Stem Auger	Pag	e 1 of 1	
BRUIN	Drill Rig Type CME 65	Logged By: AM		
GEOTECHNICAL SERVICES INC.	Drill Bit <b>8''</b> Size/Type	Checked By: MS		
est. 2004	Sampling Method(s) CSS/SPT	Total Depth of Borehole 15' bgs	s	
Client: Hazen & Sawyer	Groundwater None Encountered	Boring Location: See Fig	gure 2	
Project Number: 23-314	Borehole Backfill Native/ Cuttings	Notes:		
Project Location: Palmdale	Hammer Data 140#, 30" drop	1		
Depth Sample USCS Graphic Log	Material Description		Penetration Resistance (Blows/6") Dry Unit Weight pcf	Water Content %
SM/ML Light brown v	ery silty fine to medium sand w/ coarse sand & sl	ight clay binder	9-11 123.7	11.3
	Medium dense, very moist			
SM Light brown s	ilty fine to medium sand w/ coarse sand & clay bi	nder	4-4 104.4	13.2
5'	Loose, very moist			
CL Light brown o	layey fine to medium sand w/ coarse sand & occ/	#4 gravel	4-6 97.2	26.3
	Loose, saturated			
CL Reddish brow	n fine to medium sandy clay w/ occ. coarse sand	to #4 gravel	3-5-6	19.5
	Firm, saturated			
10' CL Yellowish bro	wn fine to medium sandy clay		4-6-8	11.2
	Firm, moist			
15' CL Yellowish bro	wn fine to medium sandy clay		10-12-16	18.8
	Very firm, moist			
Boring termir	ated @ 15' bgs			
No groundwa	ter			
20' No caving				
25'				
30'				

		Date(s) drilled	11/16/2023					
1. Alexandre and a second seco		Drilling Contractor	GP Drilling		OG OF BORING	15		
7.		Drilling Method	Hollow Stem Auger	_	Page 1 of 1			
BRI		Drill Rig Type	CME 65	Logged By:	AM			
GEOTECH		Drill Bit Size/Type	8"	Checked By:	мѕ			
est. 20		Sampling Method(s)	CSS/SPT/Bulk	15' bgs	s			
Client: Hazen & Sa	wyer	Groundwater	None Encountered	Boring Location:	See Figure 2			
Project Number:	23-314	Borehole Backfill	Native/ Cuttings	Notes:				
Project Location:	Palmdale	Hammer Data	140#, 30" drop					
Depth Sample USCS	Graphic Log	М	aterial Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %	
SM	Brown silty fi	ine to medium sa Medium dense	and w/ occ. coarse sand & slig	ht clay binder	4-7-11		8.9	
SM	Yellowish bro		medium sand w/ occ. coarse s	and to #4 gravel	8-11-12		8.1	
		Medium dense		U				
5' SM	Yellowish bro	own silty fine to r	medium sand w/ coarse sand a	& occ. #4-1" gravel	8-9-12		7.8	
		Medium dense	e, moist					
	Vellewich hre			0	17-27	122.7	4.4	
SM	Yellowish bro	Dense, slightly	medium sand w/ coarse sand a	& occ. #4-1" gravei	17-27	122.7	4.4	
10' SM	Yellowish bro		medium sand w/ occ. coarse s	and to #4 gravel	15-28	118.4	10.6	
		Dense, moist		-				
15' SM	Yellowish bro	own silty fine to c	coarse sand w/ occ. #4-1/2" gr	ravel	18-32	119.4	4.8	
		Dense, moist						
	Boring termir	nated @ 15' bgs						
	No groundwa	ater						
20'	No Caving							
25'								
30'								

_			Date(s) drilled	11/16/2023			10	
	A	2	Drilling Contractor	GP Drilling	LOG OF	BORING	16	
			Drilling Method	Hollow Stem Auger	- Page	e 1 of 1		
B	RU		Drill Rig Type	CME 65	Logged By: AM			
	GEOTECHNI SERVICES IN est. 2004	ICAL NC.	Drill Bit Size/Type	8"	Checked By: MS			
	est. 2004		Sampling Method(s)	CSS/SPT	Total Depth of Borehole 15' bgs			
Client: Hazer	n & Sawy	ver	Groundwater	None Encountered	Boring Location: See Fig	ure 2		
Project Number: 23-314		Borehole Backfill	Native/ Cuttings	Notes:				
Project Location	า:	Palmdale	Hammer Data	140#, 30" drop				
Depth	uscs	Graphic Log	М	aterial Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
	SM	Vellowish bro	wn very silty fine	e to medium sand w/ occ. coarse	a sand to $3/8$ " gravel (sligh	10-16	105.0	7.9
	5101	Tenowish bro	Medium dense		Sand to 5/6 graver (Singh	10 10	105.0	7.5
	SM	Yellowish bro		e to medium sand w/ occ. coarse	e sand to 3/8" gravel	10-15	110.5	4.0
5'	5141	Tellowish bro	Medium dense			10 10	11010	
			incului delise	, subjectly moise				
	SM	Yellowish bro	wn silty fine to n	nedium sand w/ occ. coarse sand	1 & #4 gravel	10-15	97.9	2.4
	0.11		Medium dense					
	SM	Yellowish bro		fine to medium sand w/ occ. coa	rse sand & #4 gravel	8-12-14		3.3
10'			Medium dense					
	SM	Yellowish bro	wn silty fine to n	nedium sand w/ occ. coarse sand	ł	12-22-25		
4			Dense, moist					
15'	SM/ML	Light yellowis	h brown very sili	ty fine to medium sand w/ occ. c	oarse sand	13-15-15		11.5
			Dense, slightly	moist				
			nated @ 15' bgs					
		No groundwa	iter					
20'		No caving						
_								
-								
25'								
30'								
		, <u>I</u>					I	L

		Date(s) drilled	11/16/2023			BORING	17		
A S	7	Drilling Contractor	GP Drilling				-		
		Drilling Method	Hollow Stem Auger		Page	e 1 of 1			
BRUI		Drill Rig Type	CME 65	Logged By:	AM				
GEOTECHNIC SERVICES INC	TAL C.	Drill Bit Size/Type	8"	Checked By:	MS				
est. 2004		Sampling Method(s)	CSS/SPT/Bulk	Total Depth of Borehole	30' bgs				
Client: Hazen & Sawye	er	Groundwater	29'	Boring Location:	See Fig	ure 2			
Project Number:	23-314	Borehole Backfill	Native/ Cuttings	Notes:	Ground	water @ 2	29'		
Project Location:	Palmdale	Hammer Data	140#, 30" drop						
Depth Sample USCS	Graphic Log	M	aterial Description			Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %	
SM	Light yellowis		e to medium sand w/ coarse san	d & occ. #4-1/2"	gravel	10-13	113.9	5.4	
		Medium dense							
SM	Light yellowis		e to medium sand w/ coarse san	d & occ. #4-1/2"	gravel	8-12	114.5	7.0	
		Medium dense	, slightly moist						
5'									
SM	Moderate bro	wn silty fine to r	medium sand w/ coarse sand & c	cc. #4-1/2" grav	el	4-5	115.4	5.5	
		Loose, moist							
SM	Moderate bro	wn silty fine to r	medium sand w/ coarse sand & c	occ. #4-1/2" grav	el	5-10	109.4	6.7	
10'		Medium dense	, moist						
SM	Moderate bro	wn silty fine to r	medium sand w/ coarse sand & o	cc. #4 gravel		5-7	112.5	7.3	
		Medium dense	, moist						
15' SM	Yellowish brow	wn silty fine to n	nedium sand w/ coarse sand & o	cc. #4 gravel		8-10-11			
		Medium dense	, moist						
20' SM	Yellowish brow	wn silty fine to n	nedium sand w/ coarse sand & o	cc. #4 gravel		13-15-18		10.8	
		Medium dense	, moist						
25' SM	Moderate bro	wn very silty fin	e to medium sand w/ occ. coarse	sand to 1/2" gr	avel	9-14-18		15.1	
		Firm, saturated		. 0					
		,							
	∇ Groundwater	encountered							
30' CL			um sandy clay w/ occ. coarse sar	ıd		6-8-9		25.0	
								0	
	Boring term	mated @ 30', (	Groundwater @ 29' bgs, No o	aving					

	Date(s) drilled <b>11/17/2023</b>	100.05				
A D	Drilling Contractor GP Drilling		BORING 18			
755	Drilling Method Hollow Stem Auge	Pag	e 1 of 1			
RRIIIN	Drill Rig Type CME 65	Logged By: AM				
GEOTECHNICAL SERVICES INC.	Drill Bit <b>8''</b> Size/Type	Checked By: MS				
est. 2004	Sampling Method(s) CSS/SPT/Bulk	ampling CSS/SPT/Bulk Total Depth of 15' bgs				
Client: Hazen & Sawyer	Groundwater <b>12.5'</b>	Boring Location: See Fig	gure 2			
Project Number: <b>23-314</b>	Borehole Backfill Native/ Cuttings	Notes: Ground	water @ 12.5' bgs			
Project Location: Palmdale	Hammer Data 140#, 30" drop					
Depth Sample USCS Graphic Log	Material Descript	ion	Penetration Resistance (Blows/6") Dry Unit Weight pcf	Water Content %		
SM Light brown	very silty fine to medium sand w/ coarse Medium dense, moist	e sand & occ. #4 gravel & clay binde	8-19 111.8	12.3		
SM Light yellow	ish brown very silty fine to medium sand Medium dense, moist	w/ coarse sand & occ. #4 gravel	8-12 110.7	12.0		
SM Light olive b	rown very silty fine to medium sand w/ o Medium dense, very moist	coarse sand & occ. #4 gravel	5-7 113.3	15.4		
10' SM Olive brown	fine to medium sandy silt w/ occ. coarse	e sand & clay binder	3-4-6	16.5		
SM Olive brown	Firm, saturated silty fine to coarse sand w/ occ. #4 grave	el & clay binder	5-8-6	12.5		
Groundwat	er @ 12.5'					
15' SM Brown silty	fine to medium sand w/ coarse sand & o	cc. #4-1/2" gravel (DG in last 3")	9-16-16	12.3		
	Medium dense, very moist					
	inated @ 15' bgs					
	er @ 12.5' bgs					
20' No caving						
25'						
30'						

	$\sim$	Date(s) drilled	11/17/2023						
	R	Drilling Contractor	GP Drilling		OG OF I	BORING	19		
		Drilling Method	Hollow Stem Auger	_	Page	e 1 of 1			
D D		Drill Rig Type	CME 65	Logged By:	АМ				
	ECHNICAL TICES INC.	Drill Bit Size/Type	8"	Checked By:	MS				
	st. 2004	Sampling Method(s)	CSS/SPT	Total Depth of Borehole	15' bgs				
Client: Hazen &	Sawyer	Groundwater	12'	Boring Location:	See Fig	ure 2			
Project Number:	23-314	Borehole Backfill	Native/ Cuttings	Notes:		water @ 12	' bgs		
Project Location:	Palmdale	Hammer Data	140#, 30" drop						
Depth Sample	USCS Graphic Log	М	aterial Description			Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %	
	SM Yellowish bro		medium sand w/ coarse sand			2-3-3		6.8	
		Loose, moist				2.2.2		0.6	
	5M Dark yellowis		e to medium sand w/ occ. coa	rse sand to #4 grav	el	3-3-3		8.6	
		Loose, moist							
5'	SM Dark yellowis	h brown silty fin	e to coarse sand w/ occ. #4-1/	2" gravel & slight c	lay binde	1-1-1		14.1	
		Very loose, ver	ry moist						
	SC Dark yellowis	h brown clayey f	fine to medium sand w/ coarse	e sand		2-3	111.7	17.9	
		Loose, over sat	turated						
10'	SC Yellowish bro	wn clayey fine to	o medium sand w/ coarse sand	1		2-2		22.6	
		Loose, over sat	turated						
	<u> </u> Groundwater	@ 12'							
15'	6M Moderate bro		coarse sand w/ occ. #4 gravel	& clay binder		10-15		13.1	
		Medium dense	e, very moist						
	Boring termir	nated @ 15' bgs							
	Groundwater								
20'	No caving								
25'									
_									
30'									
<sup>30</sup> —									
							I		

	Date(s) drilled 11/17/2023	10		20	
J. D	Drilling Contractor GP Drilling	LO	G OF BORING	20	
755	Drilling Method Hollow Stem Auger		Page 1 of 1		
BRUIN	Drill Rig Type CME 65	Logged By:	AM		
GEOTECHNICAL SERVICES INC. est. 2004	Drill Bit <b>8"</b> Size/Type	Checked By:	MS		
El	Sampling Method(s) CSS/SPT/Bulk	Total Depth of Borehole	15' bgs		
Client: Hazen & Sawyer	Groundwater None Encountered	Boring Location:	See Figure 2		
Project Number: 23-314	Borehole Backfill Native/ Cuttings	Notes:			
Project Location: Palmdale	Hammer Data 140#, 30" drop				
Depth Sample USCS Graphic Log	Material Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf Water	vater Content %
SM Brown silty fir	e to medium sand w/ occ. coarse sand & #4 grave	el	3-4	105.4	8.2
	Loose, moist				
SM Brown silty fir	e to medium sand w/ occ. coarse sand to 3/8" gra	avel	2-3	106.0 1	L4.0
5'	Loose, very moist				
SM Brown silty fir	e to medium sand w/ coarse sand & slight clay bi	nder	2-2	100.1 2	21.5
	Loose, over saturated				
CL Brown fine to	medium sandy clay		1-1-1	з	31.6
10'	Very soft, over saturated				
CL Brown fine to	medium sandy clay		1-1-1	1	L4.0
	Very soft, over saturated				
15' CL Brown fine to	medium sandy clay w/ coarse sand		1-1-1	2	23.6
	Very soft, over saturated				
Boring termin	ated @ 15' bgs				
No groundwa					
20' No caving					
25'					
30'					

	Date(s) drilled <b>11/17/2023</b>		IC 21	
A A	Drilling GP Drilling Contractor	LOG OF BORIN		
755	Drilling Method Hollow Stem Auger	Page 1 of :	1	
BRUIN	Drill Rig Type CME 65 Logg	ed By: AM		
GEOTECHNICAL SERVICES INC.	Drill Bit Size/Type <b>8''</b> Chev	cked By: MS		
est. 2004		I Depth of <b>15' bgs</b>		
Client: Hazen & Sawyer	Groundwater None Encountered Bori	ng Location: See Figure 2		
Project Number: 23-314	Borehole Backfill Native/ Cuttings Note	25:		
Project Location: Palmdale	Hammer Data 140#, 30" drop			
Depth Sample USCS Graphic Log	Material Description	Penetration Resistance	(Blows/o <sup>-</sup> ) Dry Unit Weight pcf	Water Content %
SM Yel	owish brown slightly silty fine to coarse sand w/ occ. #4-1/2" gra	avel 2-3-3		5.8
SM Bro	Loose, slightly moist wn silty fine to coarse sand w/ occ. #4-1/2" gravel	6-5-5		5.2
	Medium dense, slightly moist			5.2
5' SM Mo	derate brown silty fine to coarse sand w/ occ. #4-1" gravel	3-3-5		9.3
	Medium dense, moist			
SM	derate brown slightly silty fine to coarse sand w/ occ. #4-1" grav	el 7-9	117.7	5.6
	Medium dense, slightly moist			
10' SM Mo	derate brown silty very fine to medium sand w/ occ. coarse sand	1 & #4 gravel 5-7	103.8 1	11.1
	Medium dense, very moist			
15' SP Mo	derate brown slightly silty fine to medium sand w/ coarse sand a	& occ. #4-1/2" gravel 12-19	113.1	6.3
	Medium dense, moist			
	ing terminated @ 15' bgs			
	groundwater			
20' No	caving			
25'				
30'				

	Date(s) drilled <b>11/9/2023</b>				
R D	Drilling GP Drilling Contractor	LOG OF BORI			
7585	Drilling Method Hollow Stem Auger	Page 1 of	1		
BRUIN	Drill Rig Type CME 65	.ogged By: AM			
GEOTECHNICAL SERVICES INC. est. 2004	Drill Bit Size/Type <b>8''</b>	Checked By: MS			
est. 2004		Total Depth of Borehole 25' bgs			
Client: Hazen & Sawyer	Groundwater None Encountered	Boring Location: See Figure 2			
Project Number: 23-314	Borehole Backfill Native/ Cuttings	Notes: Refusal @ 26	bgs		
Project Location: Palmd	le Hammer Data 140#, 30" drop				
Depth Sample USCS Graphic Log	Material Description	Penetration	(Blows/6") Dry Unit Weight pcf Water Content %		
SM	Yellowish brown silty fine to coarse sand w/ occ. #4-2" gravel Dense, moist	20-3	1 124.3 6.5		
SM	Yellowish brown silty fine to coarse sand w/ occ. #4-2" gravel Very dense, slightly moist	22-50,	/5" 96.2 4.3		
ML	ight yellowish brown fine to medium sandy silt w/ occ. coarse s	and & 2" gravel 17-50,	/6" 5.4		
SM	Very stiff, slightly moist Pale brown silty fine to coarse sand w/ occ. #4 gravel (DG) Very dense, dry	23-50,	/5" 2.6		
10' SM -	Pale brown silty fine to coarse sand w/ occ. #4 gravel (DG) Very dense, dry	50/6	yu		
15' SM	Pale brown silty fine to medium sand w/ coarse sand & occ. #4 g Very dense, slightly moist	ravel (DG) 50/5	;" 3.5		
20' SM	Pale brown silty fine to coarse sand w/ occ. #4 gravel (DG) Very dense, slightly moist	50/5	;" 4.4		
25' SP	ight greyish brown slightly silty fine to coarse sand w/ occ. #4 gr Very dense, dry Bedrock refusal @ 26' bgs No groundwater	ravel (DG) 50/3	." 1.0		
30'	No caving				

	Date(s) drilled <b>11/30/2023</b>	LOG OF BORING 23
A D	Drilling Contractor GP Drilling	
7.5	Drilling Method Hollow Stem Auger	Page 1 of 1
BRUIN	Drill Rig Type CME 65 Log	gged By: AM
GEOTECHNICAL SERVICES INC. est. 2004	Drill Bit Size/Type <b>8''</b> Ch	necked By: MS
		orehole <b>15' bgs</b>
Client: Hazen & Sawyer	Groundwater None Encountered Bo	oring Location: See Figure 2
Project Number: 23-314		otes:
Project Location: Palmda	le Hammer Data 140#, 30" drop	
Depth Sample USCS Graphic Log	Material Description	Penetration Resistance (Blows/6") Dry Unit Weight pcf Water Content %
SP	Yellowish brown slightly silty fine to coarse sand w/ occ. #4-1/2" g	gravel 5-7-7 1.6
	Medium dense, dry	
SP	Yellowish brown slightly silty fine to coarse sand w/ occ. #4-1/2" g	gravel 7-8-7 5.2
	Medium dense, slightly moist	
5'		
SM	Yellowish brown very silty fine to medium sand w/ occ. coarse san	nd to 1/2' gravel 3-3-4 8.6
	Loose, moist	
SM	Olive brown very silty fine to medium sand w/ occ. coarse sand to	) #4 gravel (calcium ca 10-21 128.5 7.4
10'	Dense, moist	
ML	Greenish grey fine to medium sandy silt w/ occ. coarse sand	15-22 120.7 11.1
	Dense, moist	
15' SM/ML	Olive brown very silty fine to medium sand w/ occ. coarse sand	13-19 108.8 17.0
	Dense, saturated	
	Boring terminated @ 15' bgs	
	No groundwater	
20'	No caving	
25'		
30'		

				Date(s) drilled	11/30/2023					
	A S	7	7	Drilling Contractor	GP Drilling		OG OF I	BORING	24	
				Drilling Method	Hollow Stem Auger		Page	e 1 of 1		
B			//	Drill Rig Type	CME 65	Logged By:	АМ			
	GEOTECHNI Services in			Drill Bit Size/Type	8"	Checked By:	мѕ			
N N	est. 2004			Sampling Method(s)	CSS/SPT	Total Depth of Borehole	15' bgs			
Client: Hazer	n & Sawy	ver		Groundwater	None Encountered	Boring Location:	See Fig	ure 2		
Project Numbe	r:	23-314	1	Borehole Backfill	Native/ Cuttings	Notes:				
Project Location	n:	Palmd	ale	Hammer Data	140#, 30" drop					
Depth	uscs	Graphic Log		М	aterial Description			Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
	SP		Prown clightly	silty fina to coo	rse sand w/ occ. #4-1/2" grave	J		7-14	117.5	2.7
	Jr		DIOWIT SIIghtly	Medium dense		.1		, 14	117.5	2.7
	SP		Brown slightly		rse sand w/ occ. #4-1/2" grave			8-17	114.2	5.5
5'				Medium dense						
	SM		Yellowish brow	wn silty fine to n	nedium sand w/ coarse sand &	occ. #4 gravel		3-7	107.1	9.3
				Medium dense	, moist					
								12 15 10		
10'	SM/ML		Pale olive brow		nedium sand w/ occ. coarse sa	nd to #4 gravel (ca	alcium car	12-15-19		8.4
	SM		Olivo brown si	Dense, moist	um sand w/ coarse sand & occ	#4 gravel (calciur	n carbona	12-21-27		8.2
	5101		Onve brown s	Dense, moist			ii carbolla	12 21 27		0.2
151	Ch A (h A)			an ailte fina ta s	medium sand w/ occ. coarse sa			12-16-24		8.1
15'	SM/ML		Olive brown v	Dense, moist	medium sand w/ occ. coarse sa	and to #4 gravel (C	alcium ca	13-10-24		0.1
				Dense, moist						
			Boring termin	ated @ 15' bgs						
			No groundwat	ter						
20'			No caving							
		Κ								
25'										
-			Ť							
30'										
L		1								

		Date(s) drilled	11/9/2023		BORING	25	
A D		Drilling Contractor	GP Drilling			23	
7555		Drilling Method	Hollow Stem Auger	Pag	e 1 of 1		
RRUU		Drill Rig Type	CME 65	Logged By: AM			
GEOTECHNICAL SERVICES INC.		Drill Bit Size/Type	8"	Checked By: MS			
est. 2004		Sampling Method(s)	CSS/SPT/Bulk	Total Depth of Borehole 15' bg	s		
Client: Hazen & Sawyer		Groundwater	None Encountered	Boring Location: See Fi	gure 2		
Project Number: 23	3-314	Borehole Backfill	Native/ Cuttings	Notes:			
Project Location: Pa	almdale	Hammer Data	140#, 30" drop				
Depth Sample USCS Graphic	log	M	aterial Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
SM	Brown silty fin	e to coarse sand Dense, slightly	d w/ occ. #4-1/2" gravel		14-18-16		4.4
SM	Vellowish broy		nedium sand w/ coarse sand & c	occ #4-1/2" gravel	7-8-8		3.0
	Tenowish brow	Medium dense					0.0
5' SP	Yellowish brow		ine to coarse sand w/ occ. #4-1/	2" gravel	6-7-7		3.0
		Medium dense	, slightly moist				
SP	Yellowish brow	wn slightly silty f	ine to coarse sand w/ occ. #4-1/	'2" gravel	11-20		1.2
		Medium dense	, dry				
10' SP	Light vellowish	n brown slightly	silty fine to coarse sand w/ occ.	#4-1/2" gravel	14-20		2.1
	-0,	Dense, dry	,				
15' SP	Light yellowish	n brown slightly	silty fine to coarse sand w/ occ.	#4-1/2" gravel	11-25	117.1	3.2
		Dense, slightly	moist				
		nted @ 15' bgs					
	No groundwat	er					
20'	No caving						
25'							
<sup>30'</sup> —							
					l		

			-	Date(s) drilled	11/9/2023		DG OF BORING	26		
	A S	2		Drilling Contractor	GP Drilling			120		
				Drilling Method	Hollow Stem Auger		Page 1 of 1			
B	RUI	IN		Drill Rig Type CME 65 Logged By: AM						
	GEOTECHNIG SERVICES IN est. 2004	CAL IC.	/	Drill Bit Size/Type	8"	Checked By:	Checked By: MS			
				Sampling Method(s) CSS/SPT/Bulk Total Depth of Borehole 20' bgs						
Client: Hazen	& Sawy	er		Groundwater	None Encountered	Boring Location:	See Figure 2			
Project Number	:	23-314	1	Borehole Backfill	Native/ Cuttings	Notes:				
Project Location	:	Palmd	ale	Hammer Data	140#, 30" drop					
Depth	uscs	Graphic Log		M	aterial Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %	
	SM		Yellowish brov	wn silty fine to n Medium dense	nedium sand w/ occ. Coarse s , dry	and to 1" gravel	11-15	113.3	1.5	
	SM		Yellowish brov	wn silty fine to c Medium dense	oarse sand w/ occ. #4-2" grav , slightly moist	vel	7-15	121.8	4.1	
	SM/SP		Yellowish brov	wn slightly silty f Medium dense	fine to coarse sand w/ occ. #4 . drv	-1" gravel	12-17-20		1.9	
10'	SM/SP		Yellowish brow	wn slightly silty f	fine to coarse sand w/ occ. #4	-1" gravel	16-21-22		3.7	
	SM/SP		Yellowish brov	Medium dense, wn slightly silty f Medium dense,	fine to coarse sand w/ occ. #4	-1" gravel	9-17-30			
	SM/SP			wn slightly silty f Very dense, dry	fine to coarse sand w/ occ. #4	-1" gravel (DG)	26-50/6"		1.4	
20'	SM/SP		Light yellowisl	n brown slightly	silty fine to coarse sand w/ o	cc. #4-1" gravel (DG	i) 24-39-50/4	1"	2.5	
				Very dense, dry	1					
			Boring termina	ated @ 20' bgs						
			No groundwat	ter						
25'			No caving							
30'										

	Date(s) drilled <b>11/9/2023</b>						
R D	Drilling Contractor GP Drilling	LOG OF BORING 27					
725	Drilling Method Hollow Stem Auger	Page 1 of 1					
RRIJIN	Drill Rig Type CME 65	Logged By: AM					
GEOTECHNICAL SERVICES INC.	Drill Bit <b>8''</b> Size/Type	Checked By: MS					
est. 2004	Sampling Method(s) CSS/SPT Total Depth of Borehole 10' bgs						
Client: Hazen & Sawyer	Groundwater None Encountered	Boring Location: See Figure 2					
Project Number: 23-314	Borehole Backfill Native/ Cuttings	Notes: Refusal @ 10' bgs					
Project Location: Palmdale	Hammer Data 140#, 30" drop						
Depth Sample USCS Graphic Log	Material Description	Penetration Resistance (Blows/6") Dry Unit Weight pcf Water Content %					
SM Yellowish bro	wn silty fine to medium sand w/ coarse sand & oo Medium dense, slightly moist	cc. #4-1/2" gravel 5-6-9 3.1					
SM Yellowish bro	wn very silty fine to medium sand w/ occ. coarse	sand to #4 gravel 8-12-19 15.3					
	Dense, saturated						
5' SM Yellowish bro	wn very silty fine to medium sand w/ coarse sand	& occ. #4 gravel 18-21-15 2.1					
SM Yellowish bro	Dense, slightly moist wn silty fine to coarse sand w/ occ. #4-2" gravel	50/5" 3.4					
	Very dense, slightly moist	50,5					
10' SM (Large rock re	fusal/no recovery) Yellowish brown silty fine to c	oarse sand w/ occ. #4-4" 50/1" 94.3 8.2					
	Very dense, dry						
Refusal @ 10'	bgs						
No groundwa	er						
15' No caving							
20'							
25'							
30'							

	Date(s) drilled <b>11/9/2023</b>			20	٦				
A D	Drilling Contractor GP Drilling		OG OF BORING	28					
17 - 3 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5	Drilling Method Hollow Stem Auger	Page 1 of 1	age 1 of 1						
BRUIN	Drill Rig Type CME 65	AM							
GEOTECHNICAL SERVICES INC. est. 2004	Drill Bit Size/Type <b>8"</b>	MS							
	Sampling Method(s) CSS/SPT Total Depth of Borehole 12' bgs								
Client: Hazen & Sawyer	Groundwater None Encountered	Boring Location:	See Figure 2						
Project Number: 23-314	Borehole Backfill Native/ Cuttings	Notes:	Refusal @ 12' bgs						
Project Location: Palmdale	Hammer Data 140#, 30" drop								
Depth Sample USCS Graphic Log	Material Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf Water	Content %				
SM Yellowish bro	own silty fine to medium sand w/ fine sand & occ. Very dense, moist	#4 gravel	25-42	94.3 8.2	2				
SM Yellowish bro	own silty fine to coarse sand w/ occ. #4-1/2" grave Medium dense, slightly moist	ł	15-21	118.5 4.3	}				
	sh brown slightly silty fine to medium sand w/ occ	. coarse sand	5-11	91.1 2.2	2				
SP Light yellowis	Medium dense, dry sh brown slightly silty fine to coarse sand w/ occ.	#4-1/2" gravel	17-12-16	1.8	3				
10' SP Light yellowis	Medium dense, dry sh brown slightly silty fine to coarse sand w/ occ. 4	#4-5" cobble	18-31-50/6"	1.2	2				
SP (Bedrock refu	Very dense, dry usal) Light yellowish brown slightly silty fine to coa	Very dense, dry							
	Very dense, dry		:. #4-5" cc 50/4"	1.3					
	' bgs								
No groundwa No caving	ater								
20'									
25'	>								
30'									

	Date(s) drilled <b>11/9/2023</b>	
R D	Drilling Contractor	LOG OF BORING 29
753	Drilling Method Hollow Stem Auger	Page 1 of 1
BRUIN	Drill Rig Type CME 65 Log	ged By: AM
GEOTECHNICAL SERVICES INC.	Drill Bit Size/Type <b>8''</b> Che	cked By: MS
est. 2004	CSS/SP1/Billk	al Depth of <b>15' bgs</b>
Client: Hazen & Sawyer	Groundwater None Encountered Bori	ing Location: See Figure 2
Project Number: 23-314	Borehole Backfill Native/ Cuttings Note	es: Refusal @ 12' bgs
Project Location: Palmdale	Hammer Data 140#, 30" drop	
Depth Sample USCS Graphic Log	Material Description	Penetration Resistance (Blows/6") Dry Unit Weight pcf Water Content %
SM Brov	n silty fine to medium sand w/ coarse sand & occ. #4-1/2" grav	vel 9-9-18 2.6
	Dense, slightly moist	
SM Brow	n silty fine to medium sand w/ coarse sand & occ. #4-1/2" grav Dense, slightly moist	vel 14-14-19 3.1
5' SM Brov	n silty fine to medium sand w/ coarse sand & occ. #4-1/2" grav	vel 13-17-30 5.0
	Very dense, slightly moist	
SP Brow	n slightly silty fine to coarse sand w/ occ. #4-1/2" gravel	19-45 2.5
	Very dense, slightly moist	
10' SP Brow	n slightly silty fine to coarse sand w/ occ. #4-2" gravel (DG)	13-31 127.6 6.6
	Dense, moist	50/4
SP	n slightly silty fine to coarse sand w/ occ. #4-2" gravel (Bedroc	k Refusal) 50/4"
	Very dense, moist	
15' Refu	al @ 12' bgs	
Nog	oundwater	
No c	ving	
20'		
25'		
30'		

	Date(s) drilled <b>11/30/2023</b>	LOG OF BORING 30						
A D	Drilling Contractor GP Drilling							
7385	Drilling Method Hollow Stem Auger	Page 1 of 1						
BRUIN	Drill Rig Type CME 65 Logged	d By: AM						
GEOTECHNICAL SERVICES INC.	Drill Bit Size/Type Checked By: MS							
est. 2004	Sampling Method(s) CSS/SPT/Bulk Total D Boreho	Depth of <b>30' bgs</b>						
Client: Hazen & Sawyer	Groundwater None Encountered Boring	Location: See Figure 2						
Project Number: 23-314	Borehole Backfill Native/ Cuttings Notes:							
Project Location: Palmdale	Hammer Data 140#, 30" drop							
Depth Sample USCS Graphic Log	Material Description	Penetration Resistance (Blows/6") Dry Unit Weight pcf Water Content %						
SM Pale brown	ilty fine to coarse sand w/ occ. #4-3" gravel	17-19 122.8 2.6						
	Dense, slightly moist							
SM Pale brown	silty fine to coarse sand w/ occ. #4-3" gravel	11-13 2.6						
5'	Medium dense, slightly moist							
	rown silty fine to coarse sand w/ occ. #4-4" cobble	7-10 112.4 3.1						
	Medium dense, slightly moist							
SM Pale brown	very silty fine to coarse sand w/ occ. #4-2" gravel	10-11 110.3 4.2						
	Medium dense, slightly moist							
10' SM Pale brown	very silty fine to coarse sand w/ occ. #4-2" gravel	6-7 114.0 4.4						
	Medium dense, slightly moist							
15' SM Light brown	silty fine to medium sand w/ coarse sand & occ. #4-1" gra	avel 3-3-6 4.2						
	Medium dense, slightly moist							
	× ·							
20' SM Light brown	silty fine to medium sand w/ occ. coarse sand & 1/2" grav	vel 8-10-11 5.7						
	Medium dense, slightly moist							
25' SM Yellowish br	own silty fine to medium sand w/ coarse sand & occ. #4-1	L/2" gravel 4-4-6 8.4						
	Medium dense, moist							
	own clayley fine to coarse sand w/ occ. #4-1" gravel	5-13-9 11.1						
Boring terr	ninated @ 30' bgs, No groundwater, No caving							

			-	Date(s) drilled	12/1/2023			BORING 31						
	A S	2		Drilling Contractor	GP Drilling		4		51					
				Drilling Method	Page	e 1 of 1								
B	RU		//	Drill Rig Type	CME 65	Logged By:	AM							
	GEOTECHNI SERVICES IN	CAL IC.	/	Drill Bit Size/Type										
	est. 2004			Sampling Method(s) CSS/SPT/Bulk Total Depth of Borehole 15' bgs										
Client: Hazen	& Sawy	er		Groundwater	ure 2									
Project Number	:	23-314	1	Borehole Backfill	Native/ Cuttings	Notes:								
Project Location	1:	Palmd	ale	Hammer Data	140#, 30" drop									
Depth	uscs	Graphic Log		Ma	aterial Description			Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %				
	SM		Brown silty fir	ne to coarse sand Medium dense	d w/ occ. #4-2" gravel			8-9	113.5	2.9				
	SM		Brown silty fir		d w/ occ. #4-2" gravel			8-8	110.4	2.6				
	5141		brown sitty in	Medium dense										
5'	SP/SM		Brown slightly		rse sand w/ occ. #4-2" gravel			4-3	108.1	3.1				
				Loose, slightly r	moist									
	SP/SM		Brown slightly	silty fine to coa	rse sand w/ occ. #4-2" gravel			10-11-13		1.5				
				Medium dense										
10'	SP/SM		Light brown s		to coarse sand w/ occ. #4-2" gra	avel		11-13-13		1.5				
-				Medium dense	, dry									
15'	SP/SM		Brown slightly	silty fine to coa	rse sand w/ occ. #4-2" gravel			11-14-15		1.8				
				Medium dense	, dry									
				ated @ 15' bgs										
			No groundwa	ter										
20'			No caving											
25'														
30'														
<sup>50</sup>														

		Date(s) drilled	12/1/2023			BORING	22				
A A	2	Drilling Contractor	GP Drilling	1 "	-		52				
		Drilling Method	Hollow Stem Auger		Page	e 1 of 1					
BRUI	N	Drill Rig Type	CME 65	Logged By:	AM						
GEOTECHNIC SERVICES IN est. 2004	CAL C.	Drill Bit Size/Type	MS								
	/	Sampling Method(s)									
Client: Hazen & Sawye	er	Groundwater	None Encountered	Boring Location:	See Fig	ure 2					
,	23-314	Borehole Backfill	Native/ Cuttings	Notes:							
Project Location:	Palmdale	Hammer Data	140#, 30" drop								
Depth Sample USCS	Graphic Log	Ma	aterial Description			Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %			
SP/SM	Brown slightly	silty fine to coa	rse sand w/ occ. #4-1" gravel			3-3-3		3.5			
		Medium dense,	, slightly moist								
SP/SM	Brown slightly	silty fine to coa	rse sand w/ occ. #4-1" gravel			2-3-4		2.6			
5'		Medium dense,	, slightly moist								
SP/SM	Brown slightly	silty fine to coa	rse sand w/ occ. #4-1" gravel			4-5-6		2.1			
		Medium dense,	, dry								
SP/SM	Brown slightly	silty fine to coa	rse sand w/ occ. #4-1" gravel			6-10	112.9	3.2			
10'		Medium dense,	, slightly moist								
SP	Greyish browr	n slightly silty fin	e to coarse sand w/ occ. #4-4" c	obble		50/6"					
A		Very dense, dry	,								
15' SP	Greenish grey	slightly silty fine	e to coarse sand w/ occ. #4-4" co	bble (weathered	l bedrock	33-40	122.9	7.1			
		Very dense, slig	shtly moist								
	Boring termina	ated @ 15' bgs									
	No groundwat	ter									
20'	No caving										
25'											
30'											

			-	Date(s) drilled	12/1/2023						
	A	2	1	Drilling Contractor	GP Drilling		OG OF	BORING	33		
				Drilling Method	Page	e 1 of 1					
B	RU	$\frac{1}{1}$	//	Drill Rig Type	AM						
	GEOTECHN SERVICES II est. 2004			Drill Bit Size/Type							
	est. 2004			Sampling Method(s) CSS/SPT Total Depth of Borehole 15' bgs							
Client: Hazer	n & Sawy	/er		Groundwater	None Encountered	Boring Location:	See Fig	ure 2			
Project Number	r:	23-314		Borehole Backfill	Native/ Cuttings	Notes:					
Project Location: Palmdale				Hammer Data	140#, 30" drop						
Depth	nscs	Graphic Log		М	aterial Description			Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %	
	SP		Pale brown sli	ightly silty fine to Medium dense	o coarse sand w/ occ. #4-1" g	ravel		6-10-14		0.1	
	SP		Light olive bro		fine to coarse sand w/ occ. #	4-1" gravel		9-13-15		0.8	
			0	Medium dense							
5'	SP		Pale olive bro		ly silty fine to coarse sand w/	occ. #4-1" gravel		<b>31</b> -19-19		1.0	
				Medium dense							
	SP		Pale olive bro	wn slightly silty		11-25	110.1	1.8			
				Medium dense	, dry						
	SP		Olive brown s	lightly silty fine	to coarse sand w/ occ. #4-3" o	cobble		16-25		3.0	
10'				Dense, slightly	moist						
_											
_											
- A											
15'	SP		Olivo brown s	lightly cilty fing	to coarse sand w/ occ. #4-6" o	sabbla		50/5"			
15	35		Olive browns	Very dense, slig		Lobble		50/5			
-				very delise, sig	gitty moist						
			Boring termin	ated @ 15' bgs							
			No groundwa	ter							
20'			No caving								
		K									
25'											
			-								
30'											
<sup>30</sup> –											

		Date(s) drilled	12/1/2023		OF BORING 34							
	$\widehat{\mathcal{A}}$	Drilling Contractor	GP Drilling	- "	UG OF I	SORING	34					
7.		Drilling Method	Hollow Stem Auger		Page	ge 1 of 1						
BRI		Drill Rig Type	CME 65	Logged By:	AM							
GEOTEC Servic	ES INC.	Drill Bit Size/Type	MS									
est. 2	2004	Sampling Method(s) CSS/SPT/Bulk Total Depth of Borehole 15' bgs										
Client: Hazen & Sa	wyer	Groundwater	None Encountered	Boring Location:	See Fig	ure 2						
Project Number:	23-314	Borehole Backfill	Native/ Cuttings	Notes:								
Project Location:	Palmdale	Hammer Data	140#, 30" drop									
Depth Sample USCS	Graphic Log	М	aterial Description			Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %				
SM	Pale brown v	ery silty fine to n Loose, dry	nedium sand w/ coarse sand & o	cc. #4-2" gravel		4-5	104.0	2.2				
5' SM	Pale brown v	Pale brown very silty fine to medium sand w/ coarse sand & occ. #4-2" gravel Loose, dry										
SP	Yellowish bro		fine to coarse sand w/ occ. #4-1'	gravel		5-6	110.3	6.5				
10	V-llowish has	Medium dense				4-5-8		5.0				
10' SP	Yellowish bro	Medium dense	fine to coarse sand w/ occ. #4-1' e, slightly moist	gravei		4-3-8		5.0				
SP	Brown slightl	y silty fine to coa Medium dense	arse sand w/ occ. #4-1" gravel e, slightly moist			4-4-4						
15' SN	Brown silty fi	ne to coarse san	d w/ occ. #4-1" gravel			4-5-7		5.9				
		Medium dense	, moist									
	Boring termin	nated @ 15' bgs										
	No groundwa											
20'	No caving											
20	No caving											
25'												
30'												

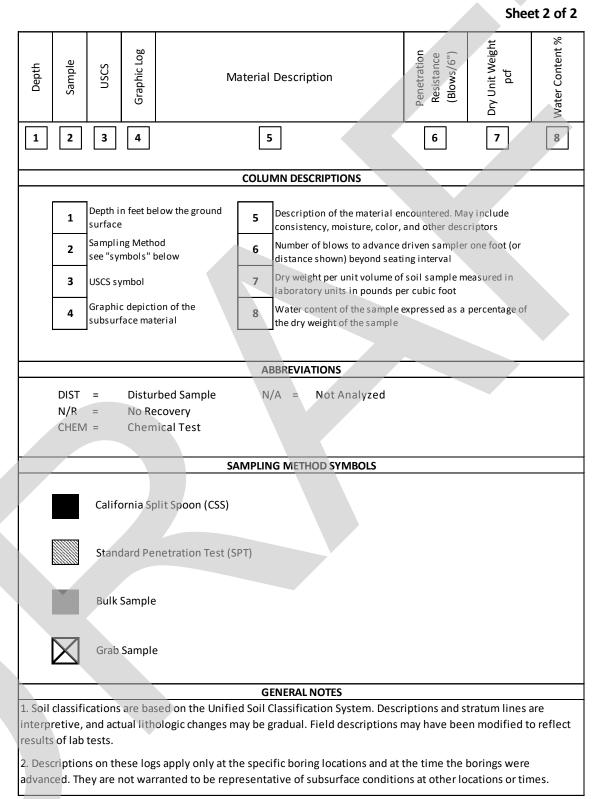
			-	Date(s) drilled	12/1/2023			BORING	25		
	A S	2	ור	Drilling Contractor	GP Drilling				33		
				Drilling Method	Page	e 1 of 1					
B	RU			Drill Rig Type							
	EOTECHNI Services in	ICAL NC.	/	Drill Bit Size/Type							
	est. 2004			Sampling Method(s)							
Client: Hazen	& Sawy	ver		Groundwater	None Encountered	Boring Location:	See Fig	ure 2			
Project Number:		23-314	1	Borehole Backfill	Native/ Cuttings	Notes:					
Project Location	Project Location: Palmdale				140#, 30" drop						
Depth Sample	uscs	Graphic Log		М	aterial Description			Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %	
	SP		Light yellowis		coarse sand w/ occ. #4-1/2" g	ravel		6-6		1.7	
				Medium dense							
	SP		Light yellowis		coarse sand w/ occ. #4-1" gra	vel		2-4		3.5	
5'				Loose, slightly i	moist						
5	SM		Yellowish bro	wn silty fine to c	coarse sand w/ frequent #4 gra	avel & occ. 3/5"-1"	vravel	3-5	99.7	3.5	
	0			Loose, slightly			5. u. e.				
	SM		Brown very si	lty fine to mediu	Im sand w/ coarse sand & occ	. #4-1/2" gravel		5-7	117.9	6.5	
10'				Medium dense	, moist						
	SM		Yellowish bro		oarse sand w/ occ. #4-2" grav	el		12-16	117.7	3.2	
				Medium dense	, moist						
15'	CL/ML		Dark yellowisl	h brown fine to i	medium sandy silt w/ occ. Coa	arse sand & clay bin	der	2-4-7		12.9	
				Firm, very mois	st						
20'	CD.		Groonish here	up clightly silt. f	ing to coorce cond w/ acc. #4	2" gravel		50/2"			
20	SP		Greenish brow	vn slightly silty f Very dense, slig	ine to coarse sand w/ occ. #4-	.ə kraver		JU/ Z			
					5						
			Boring termin	ated @ 20' bgs							
			No groundwa								
25'			No caving								
30'											
30											
		1	1					1			

	Date(s) drilled	Date(s) drilled 12/1/2023								
A D	Drilling Contractor	GP Drilling		OF BORING	36					
755	Drilling Method	Hollow Stem Auger		Page 1 of 1	e 1 of 1					
BRUIN	Drill Rig Type	CME 65	Logged By: A	M						
GEOTECHNICAL SERVICES INC. est. 2004	Drill Bit Size/Type	8"	Checked By: 🛛 🛛	IS						
est. 2004	Sampling Method(s)									
Client: Hazen & Sawyer	Groundwater	None Encountered	Boring Location: Se	ee Figure 2						
Project Number: 23-314		Native/ Cuttings	Notes:							
Project Location: Palmda	ale Hammer Data	140#, 30" drop								
Depth Sample USCS Graphic Log	М	aterial Description		Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %				
	Moderate brown fine to med	ium sandy silt w/ occ. coarse sand	l-#4 gravel & very s	light c 3-4	102.4	12.4				
	Soft, moist									
SM	Moderate brown silty fine to	medium sand w/ occ. coarse sand	l-#4 gravel & clay b	inder 3-3	94.7	20.9				
5'	Loose, saturate									
SM	Moderate brown very silty ve	ery fine to medium sand w/ occ. co	barse-1/2" gravel	2-3	105.8	21.5				
	Loose, saturate									
CL	Moderate brown fine to med	ium sandy clay		4-6-9		14.9				
10'	Firm, very moi	st								
SM .	Modorato brown silty fino to	medium sand w/ occ. coarse sand	1 1" gravel & clight	clay bi 8-11-12		13.5				
5101	Medium dense		i-i graver a sugrit			13.5				
15' SC	Moderate brown clayey fine t	to medium sand w/ occ. coarse sa	nd-1" gravel	5-9-7		14.2				
	Medium dense	e, over saturated								
	Boring terminated @ 15' bgs									
	No groundwater									
	No caving									
25'										
30'										

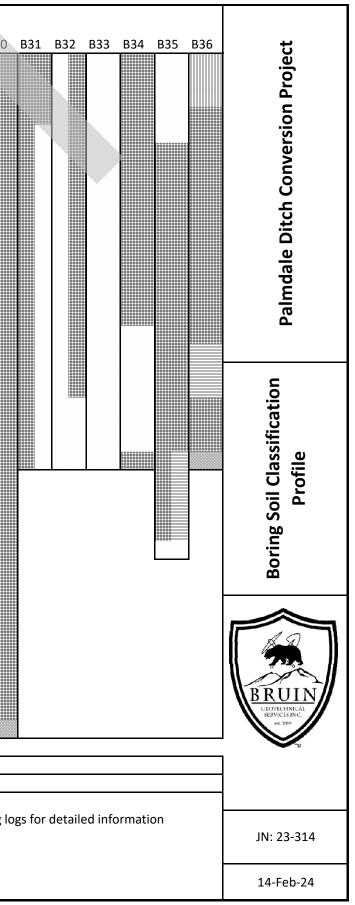
BRUIN GEOTECHNICAL SERVICES, INC. GEOTECHNICAL REPORTS | MATERIAL TESTING | CONSTRUCTION INSPECTION

		SOIL CLA	SSIFIC		(EY
	MAJOR DIVISIO	NS	SYN	/IBOL	TYPICAL NAMES
	Gravels	Clean gravels with	GW		Well graded gravels, gravel-sand mixtures
	More than half	little or no fines	GP		Poorly graded gravels, gravel-sand mixture
il <u>s</u> 200 sieve	coarse-fraction is larger than No. 4 sieve size	Gravel with over	GM		Silty gravels, poorly graded gravel-sand-sil mixtures
Coarse-fraction is larger than No. 4 sieve size Sands Sands More than half	Sieve Size	12% fines	GC		Clayey gravels, poorly graded gravel-sand- clay mixtures
	Clean sands with	SW		Well graded sands, gravelly sands	
<u>C</u> 50% or r	More than half coarse-fraction is smaller than No. 4 sieve size	little or no fines	SP		Poorly graded sands, gravelly sands
		Sands with over	SM		Silty sands, poorly graded sand-silt mixtures
		12% fines	SC		Clayey sands, poorly graded sand-clay mixtures
ŋ			ML		Inorganic silts, rock flour, clayey silts
200 sieve	Silts and Liquid limit les		CL		Inorganic clays of low to medium plasticity sandy clays, silty clays
Grained Soils maller than #2			OL		Organic clays and organic silty clays of lov plasticity
Fine Grained Soils 50% or more smaller than #200 sieve		_	MH		Inorganic silts, micaceous or diatomaceou fine sandy/silty soils, elastic silts
50% or m	Silts and Liquid limit grea		СН		Inorganic clays with high plasticity, fat clays
_,			ОН		Organic clays of medium to high plasticity organic silts
	Highly Organic S	oils	Pt		Peat and other highly organic soils
	CLASSIFICATIO	N SYSTEM BASED O	N THE UN	NIFIED SOIL	CLASSIFICATION SYSTEM

### **Boring Log Key**



Depth (FT) Bouing	В																													
	No. <u>1</u>	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20	B21	B22	B23	B24	B25	B26	B27	B28	B29	B30
1'																														
2'																														
3 Д'																									1					
5'																														
6'																														
					ble)																									
					cesi																									
					nac																									
					l) pa																									
					Omitted (Inaccesible)																									
7'					ő																									
8'																														
9'																														
10' 11'																				-										
12'																			V											
12' 13'																		$\nabla$												
14'																														
14' 15' 16' 17'																														
16'																														
18' 19' 20' 21' 22'																														
20'																														
21'																											-			
23'																														
24 <sup>°</sup> 25'																														
23' 24' 25' 26' 27'																						L	J							
27'																														
28' 29'																														
29'																	$\overline{\nabla}$													
30' Derinael				D 4 0 1		L DC			- 012						045	0.04.0		1700	10					0 0 2 4	1		0.07	0.000		
Borings Est. Pipe Depth				B4&1		B6 14' b	ngs		o B12 16' bgs							&B16 .3' bgs		17&B )'-17'						&B24 .8' bgs				&B28 4' bgs		
Est. E'				700		700			)-700						500			00	-22				700				700	- 555		
			iraphic	Legend				Graphi		nd							•							•			-			
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	~~		٦	C		Gr	ound	Water	::	$\nabla$																				
	SP:			CL:																										
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APPENDIX B

Laboratory Test Data

### ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D Irvine, CA 92618 Phone (949) 336-6544

Bruin Geotechnical Services, Inc. 44732 Yucca Avenue Lancaster, CA 93534 DATE: 1/2/2024

P.O. NO.: Transmittal

LAB NO.: C-7587, 1-2

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

Project No.: 23-314 Project: Hazen & Sawyer Littlerock Reservoir, Littlerock, CA

### **ANALYTICAL REPORT**

CORROSION SERIES SUMMARY OF DATA

	рН	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 (% by weight)	SOLUBLE CHLORIDES per CT. 422 ppm
1) B1 @ 0-5'	7.5	1,900	0.0164%	39
2) B11 @ 3-8'	7.4	2,200	0.0123%	47

**RESPECTFULLY SUBMITTED** N/T/AFAC WES BRIDGER, LAB MANAGER

### ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D Irvine, CA 92618 Phone (949) 336-6544

Bruin Geotechnical Services, Inc. 44732 Yucca Avenue Lancaster, CA 93534 DATE: 1/8/2024

P.O. NO.: Transmittal

LAB NO.: C-7602, 1-5

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

Project No.: 23-314 Project: Hazen & Sawyer Littlerock Reservoir, Palmdale, CA

### **ANALYTICAL REPORT**

CORROSION SERIES SUMMARY OF DATA

	100 million 100	per CT. 643	OLUBLE SULFATES per CT. 417 (% by weight)	SOLUBLE CHLORIDES per CT. 422 ppm
1) B14 @ 6-11'	7.5	<500	0.0967%	291
2) B22 @ 6-11'	7.7	5,000	0.0193%	34
3) B26 @ 6-11'	7.3	10,500	0.0181%	81
4) B31 @ 0-5'	7.4	10,200	0.0209%	61
5) B36 @ 0-5'	7.5	900	0.0246%	153

RESPECTFULLY SUBMITTED WES BRIDGER, LAB MANAGER

**APPENDIX C** 

**Groundwater Well Locations** 

Vicinity of Borings 1 to 6 (Location 1 & 2) Site Code: 345353N1181046W001 Local Well Name: 05N12W11B001S Latitude: 34.53530 Longitude: -118.10460 Last test: 1986 Groundwater: 50' bgs

Vicinity of Borings 7 to 16 (Location 3 & 4) Site Code: 345356N1180793W001 Local Well Name: 05N11W07E002S Latitude: 34.53560 Longitude: -118.07930 Last test: 1977 Groundwater: 20' bgs

Vicinity of Borings 17 to 20 (Location 5) Site Code: 345292N1180335W001 Local Well Name: 05N11W09Q001S Latitude: 34.52920 Longitude: -118.03350 Last test: 1971 Groundwater: 68' bgs

Vicinity of Borings 21 to 30 (Location 6 & 7) Site Code: 345147N1180301W001 Local Well Name: 05N11W16R001S Latitude: 34.51470 Longitude: -118.03010 Last test: 1978 Groundwater: 60' bgs

Vicinity of Borings 31 to 35 Site Code: 345086N1180299W001 Local Well Name: 05N11W21H002S Latitude: 34.50860 Longitude: -118.02990 Last test: 1986 Groundwater: 27' bgs

Reference: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels

**BRUIN GEOTECHNICAL SERVICES, INC.** 

44732 Yucca Avenue Lancaster, California 93534

APPENDIX D

USGS Seismic Design Summary Report

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# OSHPD

# 23-314 Hazen and Sawyer

Latitude, Longitude: 34.53822615, -118.10193376

La	imont Odett Vista Po Palm	adale Hills Trail	25th Stm Pearblossom:Hwy Pearblossom:Hwy Reinersbrings Ro
Goog		Agapos Dispensary	Build Spring
Date	JIC		Map data ©2024 Google
	ode Reference Document		2/2/2024, 3:00:27 PM ASCE7-16
Risk Cate			1
Site Class	3		D - Stiff Soil
Туре	Value	Description	
SS	2.465	MCE <sub>R</sub> ground motion. (for 0.2 second	nd period)
S <sub>1</sub>	1.05	MCE <sub>R</sub> ground motion. (for 1.0s perio	od)
S <sub>MS</sub>	2.465	Site-modified spectral acceleration	value
S <sub>M1</sub>	null -See Section 11.4.8	Site-modified spectral acceleration	value
S <sub>DS</sub>	1.643	Numeric seismic design value at 0.2	second SA
S <sub>D1</sub>	null -See Section 11.4.8	Numeric seismic design value at 1.0	second SA
Туре	Value	Description	
SDC	null -See Section 11.4.8	Seismic design category	
Fa	1	Site amplification factor at 0.2 second	
F <sub>v</sub>	null -See Section 11.4.8	Site amplification factor at 1.0 second	
PGA	1.059	MCE <sub>G</sub> peak ground acceleration	
F <sub>PGA</sub>	1.1	Site amplification factor at PGA	
PGA <sub>M</sub>	1.165	Site modified peak ground acceleration	
ΤL	12	Long-period transition period in seconds	
SsRT	2.975	Probabilistic risk-targeted ground motion. (0.2 second)	
SsUH	3.4	Factored uniform-hazard (2% probability of exceedance	
SsD	2.465	Factored deterministic acceleration value. (0.2 second	
S1RT	1.278	Probabilistic risk-targeted ground motion. (1.0 second)	
S1UH	1.467	Factored uniform-hazard (2% probability of exceedanc	. , .
S1D	1.05	Factored deterministic acceleration value. (1.0 second	
PGAd	1.059	Factored deterministic acceleration value. (Peak Groun	nd Acceleration)

2/2/24, 3:00 PM		PM	U.S. Seismic Design Maps	
	Туре	Value	Description	
	PGA <sub>UH</sub>	1.366	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration	
	C <sub>RS</sub>	0.875	Mapped value of the risk coefficient at short periods	
	C <sub>R1</sub>	0.871	Mapped value of the risk coefficient at a period of 1 s	
	CV	1.5	Vertical coefficient	

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## 23-314 Hazen and Sawyer

### Latitude, Longitude: 34.52907964, -118.07011524

		Performance Active Acti
Date		2/2/2024, 3:00:57 PM
-	ode Reference Document	ASCE7-16
Risk Cate		II D - Stiff Soil
Site Class		
Туре	Value	Description MCE <sub>R</sub> ground motion. (for 0.2 second period)
S <sub>S</sub> S <sub>1</sub>	2.5	MCE <sub>R</sub> ground motion. (for 1.0s period)
	1.065	
S <sub>MS</sub>	2.5	Site-modified spectral acceleration value
S <sub>M1</sub>	null -See Section 11.4.8	Site-modified spectral acceleration value
S <sub>DS</sub>	1.667	Numeric seismic design value at 0.2 second SA
S <sub>D1</sub>	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA
Туре	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F <sub>a</sub>	1	Site amplification factor at 0.2 second
F <sub>v</sub>	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	1.074	MCE <sub>G</sub> peak ground acceleration
F <sub>PGA</sub>	1.1	Site amplification factor at PGA
PGA <sub>M</sub>	1.181	Site modified peak ground acceleration
TL	12	Long-period transition period in seconds
SsRT	2.868	Probabilistic risk-targeted ground motion. (0.2 second) Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsUH SsD	3.251 2.5	Factored uniform-nazard (2% probability of exceedance in 50 years) spectral acceleration Factored deterministic acceleration value. (0.2 second)
S1RT	1.23	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	1.416	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.065	Factored deterministic acceleration value. (1.0 second)
PGAd	1.074	Factored deterministic acceleration value. (Peak Ground Acceleration)

https://www.seismicmaps.org

2/2/24, 3:01 PM		PM	U.S. Seismic Design Maps		
	Туре	Value	Description		
	PGA <sub>UH</sub>	1.303	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration		
	C <sub>RS</sub>	0.882	Mapped value of the risk coefficient at short periods		
	C <sub>R1</sub>	0.869	Mapped value of the risk coefficient at a period of 1 s		
	CV	1.5	Vertical coefficient		

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# OSHPD

## 23-314 Hazen and Sawyer

#### Latitude, Longitude: 34.50941976, -118.03561130

Wolfgang Expert Dog Training Palmdale	lerock=			
Wolfgang Expert Dog Training Palmdale				
Wolfgang Expert Dog Training Palmdale				
Wolfgang Expert Dog Training Palmdale				
Wolfgang Expert Dog Training Palmdale				
Wolfgang Expert Dog O Training Palmdale Mt Emma Rd				
Training Palmdale				
emma Rd				
M N				
Google Map data ©202	4 Google			
Date 2/2/2024, 3:01:47 PM				
Design Code Reference Document ASCE7-16				
Risk Category II				
Site Class D - Stiff Soil				
Type Value Description				
S <sub>S</sub> 2.457 MCE <sub>R</sub> ground motion. (for 0.2 second period)				
S <sub>1</sub> 1.046 MCE <sub>R</sub> ground motion. (for 1.0s period)				
S <sub>MS</sub> 2.457 Site-modified spectral acceleration value				
S <sub>M1</sub> null -See Section 11.4.8 Site-modified spectral acceleration value	Site-modified spectral acceleration value			
S <sub>DS</sub> 1.638 Numeric seismic design value at 0.2 second SA				
S <sub>D1</sub> null -See Section 11.4.8 Numeric seismic design value at 1.0 second SA				
Type Value Description				
SDC null -See Section 11.4.8 Seismic design category				
F <sub>a</sub> 1   Site amplification factor at 0.2 second				
F <sub>v</sub> null -See Section 11.4.8 Site amplification factor at 1.0 second				
PGA 1.056 MCE <sub>G</sub> peak ground acceleration				
F <sub>PGA</sub> 1.1 Site amplification factor at PGA				
PGA <sub>M</sub> 1.162 Site modified peak ground acceleration				
T <sub>L</sub> 12 Long-period transition period in seconds				
SsRT 2.953 Probabilistic risk-targeted ground motion. (0.2 second)	Probabilistic risk-targeted ground motion. (0.2 second)			
SsUH 3.336 Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration			
SsD     2.457     Factored deterministic acceleration value. (0.2 second)				
S1RT     1.259     Probabilistic risk-targeted ground motion. (1.0 second)				
S1UH 1.448 Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.				
S1D     1.046     Factored deterministic acceleration value. (1.0 second)				
PGAd 1.056 Factored deterministic acceleration value. (Peak Ground Acceleration)				

https://www.seismicmaps.org

2/2/24, 3:01 PM		PM	U.S. Seismic Design Maps		
Type Value		Value	Description		
	PGA <sub>UH</sub> 1.334 Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration				
C <sub>RS</sub> 0.885		0.885	Mapped value of the risk coefficient at short periods		
	C <sub>R1</sub> 0.87 Mapped value of the risk coefficient at a period of 1 s		Mapped value of the risk coefficient at a period of 1 s		
C <sub>V</sub> 1.5		1.5	Vertical coefficient		

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# OSHPD

## 23-314 Hazen and Sawyer

#### Latitude, Longitude: 34.49300941, -118.02496829

		Mt Emma Rd Mt Emma Rd			
1	çmma Rd				
Goog	Jle	Littlerock Dam Interpretive Site Temporarily closed			
Date		2/2/2024, 3:02:07 PM			
-	ode Reference Document	ASCE7-16			
Risk Categ		II D - Stiff Soil			
	Value				
Туре S <sub>S</sub>	2.307	Description MCE <sub>R</sub> ground motion. (for 0.2 second period)			
S <sub>1</sub>	0.98	MCE <sub>R</sub> ground motion. (for 1.0s period)			
S <sub>MS</sub>	2.307	Site-modified spectral acceleration value			
S <sub>M1</sub>	null -See Section 11.4.8	Site-modified spectral acceleration value			
S <sub>DS</sub>	1.538	Numeric seismic design value at 0.2 second SA			
S <sub>D1</sub>	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA			
Туре	Value	Description			
SDC	null -See Section 11.4.8	Seismic design category			
Fa	1	Site amplification factor at 0.2 second			
Fv	null -See Section 11.4.8	Site amplification factor at 1.0 second			
PGA	0.993	MCE <sub>G</sub> peak ground acceleration			
F <sub>PGA</sub>	1.1	Site amplification factor at PGA			
PGA <sub>M</sub>	1.092	Site modified peak ground acceleration			
TL	12	Long-period transition period in seconds			
SsRT	2.966	Probabilistic risk-targeted ground motion. (0.2 second)			
SsUH	3.349	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration			
SsD	2.307	Factored deterministic acceleration value. (0.2 second)			
S1RT	1.257	Probabilistic risk-targeted ground motion. (1.0 second)			
S1UH	1.439	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.			
S1D	0.98	Factored deterministic acceleration value. (1.0 second)			
PGAd	0.993	Factored deterministic acceleration value. (Peak Ground Acceleration)			

2/2/24, 3:02 PM		PM	U.S. Seismic Design Maps		
	Туре	Value	Description		
PGA <sub>UH</sub> 1.338 Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration					
C <sub>RS</sub> 0.886		0.886	Mapped value of the risk coefficient at short periods		
	C <sub>R1</sub>	0.874	Mapped value of the risk coefficient at a period of 1 s		
	CV	1.5	Vertical coefficient		

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**APPENDIX E** 

Design Guideline for Seismic Resistant Water Pipeline Installations

## DESIGN GUIDELINE FOR SEISMIC RESISTANT WATER PIPELINE INSTALLATIONS

John Eidinger<sup>1</sup>

#### ABSTRACT

Seismic design for water pipelines is not explicitly included in current AWWA standards. Compounding this problem, standard water pipeline materials and installation techniques are prone to high damage rates whenever there is significant permanent ground deformations or excessively high levels of ground shaking.

To help improve this situation, a new Design Guideline for Seismic Resistant Water Pipeline Installations (the Guidelines) has been developed. It is intended that the Guidelines be issued in March 2005. For the period from November 2004 through January 2005, the Guidelines are available in draft form for public comment. Comments from U.S., Japanese, Canadian and all other water utilities, pipeline manufacturers, AWWA, JWWA and other interested parties are welcomed.

The Guidelines provide direction for three situations:

- When the pipeline engineer has just rough estimates of the earthquake hazard, does not have the resources to do design by analysis, and wishes to rely on standardized pipeline components. The Guidelines provide the Chart Method. This is the preferred approach for common pipeline installations like 6-inch to 8-inch diameter pipes, fire hydrants and service laterals.
- When the pipeline engineer wishes to perform a limited design by analysis. The Guidelines provide the Equivalent Static Method. This is the preferred approach for medium important pipelines like 12-inch to 24-inch installations, or as a preliminary approach for major transmission pipelines.
- When the pipeline engineer has the resources to perform detailed subsurface investigations, geotechnical engineering and pipe stress analyses. The Guidelines provide the Finite Element Method. This is the preferred approach for essential non-redundant installations, like 36-inch to 120-inch pipelines.

#### **INTRODUCTION**

In most every severe earthquake, the largest negative impact to water utilities has been the damage to buried water pipelines. At the past three JWWA-AWWARF workshops (Oakland

<sup>&</sup>lt;sup>1</sup> President, G&E Engineering Systems Inc., 6315 Swainland Rd, Oakland CA 94611 USA. eidinger@earthlink.net

2000, Tokyo 2001, Los Angeles 2003), a great emphasis was placed by many participants on the rate of pipe damage, the causes of pipe damage, and the improved earthquake performance of new types of pipe.

After the Los Angeles workshop, many US participants got together and decided something ought to be done about this. Accordingly, in concert with FEMA, NIBS and the ALA, a team of engineers was assembled to put together the first ever US seismic design guideline for buried water pipelines. The American Lifelines Alliance (ALA) was formed by the Federal Emergency Management Agency (FEMA) in 1998 as a public-private partnership whose goal is to reduce risk to utility and transportation systems from natural hazards and manmade threats. In 2002, FEMA contracted with the National Institute of Building Sciences (NIBS) through its Multihazard Mitigation Council (MMC) to, among other things, assist FEMA in developing these Guidelines. The ALA sponsors this work through funding from NIBS and FEMA.

## **AmericanLifelines**Alliance



#### AUTHORS

The following people and their affiliations contributed to the Guidelines.

#### Person

Mr. John Eidinger (Chairman) Mr. Bruce Maison Mr. Luke Cheng Mr. Frank Collins Mr. Mike Conner Dr. Craig Davis Mr. Mike Matson Prof. Mike O'Rourke Prof. Tom O'Rourke Mr. Alex Tang Mr. Doug Honegger Mr. Joseph Steller Affiliation

G&E Engineering Systems Inc. East Bay Municipal Utility District San Francisco Public Utilities Commission Parsons San Diego Water Department Los Angeles Department of Water & Power Raines, Melton and Carella, Inc. Rennselaer Polytechnic Institute Cornell University Nortel Networks, Retired Consultant (Technical Oversight) NIBS (Project Management)

The Guidelines would not have been possible without the contributions from numerous staff of the San Francisco Public Utilities Commission, East Bay Municipal Utilities District, City of San Diego Water Department, the Los Angeles Department of Water and Power, and many other participating agencies.

#### **OUTLINE OF THE GUIDELINES**

The Guidelines describe the various steps in seismic water pipeline design, with commentary. The main topics included are: Goals; Performance Objectives; Earthquake Hazards; Subsurface Investigations; General Pipeline Design; Analytical Models; Transmission Pipelines; Bypass Pipelines; Distribution Pipelines; Service and Hydrant Laterals; Distribution Pipelines; and Other Components. The Guidelines are meant to be a self-standing document that can be used by pipeline designers in water utilities; as such, it is geared to provide simple procedures to achieve the overall goal. The Guidelines always allow for more detailed procedures to be used by geologists, geotechnical engineers and pipeline engineers when suitable. A link to obtain the entire draft Guidelines is listed in the Conclusions.

For the 4<sup>th</sup> AWWARF-JWWA workshop, four papers cover the major topic areas of the Guidelines. This paper describes performance goals and the design-by-chart method. The paper by Dr. Craig Davis covers reliability goals and definition of geotechnical hazards. The paper by Mr. Luke Cheng covers design issues for transmission pipelines. The paper by Mr. Bruce Maison covers the two design-by-analysis models and design issues for service laterals.

#### **GOAL OF SEISMIC DESIGN FOR WATER PIPELINES**

The goal of the Guidelines is to improve the capability of water pipelines to function and operate during and following design earthquakes for life safety and economic reasons. This is accomplished using a performance based design methodology that provides cost-effective solutions and alternatives to problems resulting from seismic hazards. Improved water pipeline performance will help create a more resilient community for post-earthquake recovery; therefore portions of the Guidelines inherently consider the community impacts if pipeline damage were to occur. The Guidelines do not intend to prevent all pipelines from being damaged.

To achieve this goal, the fundamental intent of the Guidelines is to assure a reasonably low rate of water pipeline damage throughout a water utility system, such that about 90% of customers in a system can be restored with piped water service within about three days after a design basis earthquake.

To achieve this level of performance, an acceptable damage rate will be about 0.03 to 0.06 breaks per 1,000 feet (0.1 to 0.2 breaks per kilometer) of equivalent 6-inch diameter pipe. The commentary of the Guidelines provides a calculation to convert a network of pipes of different diameters that may suffer both breaks and leaks, in conjunction with network redundancy, into a single equivalent break rate per equivalent 6-inch diameter pipe. By minimizing pipeline damage after earthquakes to this level of damage, a typical water utility serving a population of 150,000 people could expect to:

- Deliver water at serviceable pressure to 65% to 90% of all hydrants within the first hours after the earthquake, as long as there are adequate supply sources; and
- Deliver water via the pipe network to at least 90% of all customers within 3 days following an earthquake;

as long as the utility can isolate most of the leaking and broken pipes within one day or so, and repair equivalent 6-inch diameter pipes at a rate of about 20 within the first three days after the earthquake, and 20 per day thereafter.

For water utilities with limited post-earthquake repair capability, or serving pipe networks with limited or no redundancy, it is important to limit the damage rate to the lower range. For water utilities with much greater post-earthquake repair capability, it might be acceptable to sustain damage to the higher range.

#### NEW INSTALLATIONS AND REPLACEMENT / RETROFIT

It is the intent of the Guidelines that they be used for all new pipeline installations. Over a period of many years, a sufficiently high percentage of pipelines in a network will eventually have been designed per these Guidelines. Thus, it may take decades for some utilities to ultimately achieve the goals, unless a pipeline replacement / retrofit program is also adopted.

The decision to replace older pipes is a complex one. In many networks, many existing pipelines (such as cast iron pipe with caulked joints) will not meet the seismic design capability recommended by the Guidelines. Still, the Guidelines do not recommend replacing older 4-inch to 10-inch diameter cast iron pipes solely on the basis of earthquake improvement, since this is not thought to be cost effective. However, as old pipeline are thought to need replacement because they no longer provide adequate fire flows, or have been observed to require repair at a rate of more than once every 5 years, then the added benefit of improved seismic performance may justify pipe replacement. When replaced, the new pipes should be designed per the Guidelines.

Replacement of larger diameter pipelines (12-inch diameter and upwards) may be cost effective just from a seismic point of view, in areas prone to PGDs.

#### **PIPELINE FUNCTION CLASSES**

A pipeline's function within the system identifies its importance in achieving the system performance goal. Table 1 provides the 4 function classes. A pipe function identifies a performance objective of an individual pipe, but not that of an entire system.

uman life in the event
ystem performance,
esulting in long
materially harm the
pipelines in most
unction I, III, or IV.
large numbers of
impact to the
life and property in
ake response and
and operational during

#### THREE DESIGN APPROACHES

The Guidelines provide three approaches can be used in the design of buried pipelines.

- Chart method. The simplest approach. Avoids all mathematical models, and allows the designed to pick a style of pipe installation based on parameters such as regional maps for PGV and PGD hazards, and the pipeline function class.
- Equivalent static method. Uses simple quantifiable models to predict the amount of stress, strain and displacement on a pipe for a particular level of earthquake loading. The pipeline can then be designed to meet these quantified values, or pipe styles can be selected that presumably meet these quantified values without a formal capacity to demand check. Pipe selection is usually made by specification from available manufacturer's catalogs.
- Finite element method. This method uses finite element models to examine the seismic loads (whether PGA, PGV or PGD) over the length of the pipeline, and then uses beam on inelastic foundation finite element models (or sometimes use two- or three-dimensional mesh models) to examine the state of stress and strain and displacement within the pipeline and pipeline joints. Pipe design is often shown on contract drawings, covering material selection, joint preparation, trench design and other factors.

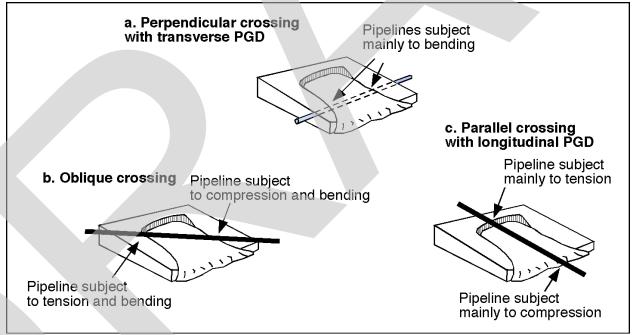


Figure 1. Direction of Permanent Ground Deformation (PGD)

#### **CHART METHOD**

#### **Transmission Pipelines**

Transmission pipelines may carry raw or treated water. Due to their importance to a great number of people, Function Class I is generally to be avoided except for those pipes whose failure would not impact any customer for 30 days or more.

Tables 2 to 5 set the pipeline design category (A, B, C, D or E). Figure 1 shows the meaning of perpendicular (transverse) and parallel (along the axis) orientations. If a portion of a pipeline has two or more categories for the various hazards (ground shaking, transverse PGDs, parallel PGDs, fault offset PGDs), then the highest category controls.

Inch/sec	Function I	Function II	Function III	Function IV
$0 < PGV \le 10$	А	А	A	А
$10 < PGV \le 20$	А	А	Α	В
$20 < PGV \le 30$	А	A	В	С
30 < PGV	А	В	С	D

Table 2. Transmission Pipelines – Ground Shaking

Inches	Function I	Function II	Function III	Function IV
$0 < PGD \le 2$	А	Α	A	A – welded steel
				B - segmented
$2 < PGD \le 6$	А	А	A	В
6 < PGD ≤ 12	A	А	В	С
12 < PGD	A	В	C	D

Table 3. Transmission Pipelines – Liquefaction and Landslide Transverse to Pipeline Alignment

Inches	Function I	Function II	Function III	Function IV
$0 < PGD \le 2$	A	Α	В	В
$2 < PGD \le 6$	А	В	В	С
$6 < PGD \le 12$	С	С	С	D
12 < <b>PGD</b>	D	D	D	Е

 Table 4. Transmission Pipelines – Liquefaction (Lateral Spread) and Landslide Along Axis of Pipeline

Inches	Function I	Function II	Function III	Function IV
$0 < PGD \le 2$	A	А	В	В
$2 < PGD \le 6$	A	В	В	С
$6 < PGD \le 12$	A	С	С	D
$12 < PGD \le 24$	A	D	D	Е
24 < PGD	A	D	Е	Е

Table 5. Transmission Pipelines – Fault Offset

#### Distribution Pipelines, Service Laterals and Fire Hydrant Laterals

In most cases, distribution pipelines are in networks. Failure of a single distribution pipeline will not fail the entire network (once the broken pipe is valved out), but the customers on the broken distribution pipeline will have no piped water service until the pipe is repaired. The engineer can assume that distribution pipelines are Function Class II, except in the following cases:

- The pipeline is the only pipe between lower elevation pump station and upper elevation pump station / reservoir in a pressure zone, and the failure of that pipeline will lead to complete loss of supply to the pump station serving a higher zone, or loss of the water in the reservoir for fire fighting purposes. For example, a 12-inch diameter pipe from lower elevation pump station that delivers water to a higher elevation tank within a pressure zone, and that also serves water to higher elevation pump stations.
- The pipeline is the only pipe delivering water to particularly important customers, such as critical care hospitals. For example, an 8-inch diameter pipe that has a service connection to a 200 bed hospital.

Past earthquakes have shown that there can be great quantity of damage to distribution pipelines, especially in areas prone to PGDs or high velocity pulses. While no single distribution pipeline is as important as a transmission pipeline, the large quantity of distribution pipe damage can lead to rapid system-wide depressurization, loss of fire fighting capability, and long outage times due to the great amount of repair work needed. Accordingly, we recommend that most distribution pipes be classified as Function Class II and very few as Function Class I (under ~5% of total pipeline inventory). A few distribution pipes serving essential facilities could be classified as Function III or IV; or they could be designated in suitable emergency response plans as prioritized for prioritized and rapid repair (generally under one day or two days at most). Once the Function Class is set, Tables 6 to 11 define the Design Category.

Inch/sec	Function I	Function II	Function III, IV
$0 < PGV \le 10$	A	Α	А
$10 < PGV \le 20$	A	Α	А
$20 < PGV \le 30$	А	A	A (with additional
			valves)
30 < PGV	A	A (with additional	В
		valves)	

Inches	Function I	Function II	Function III, IV
$0 < PGD \le 2$	Α	Α	A (with additional
			valves)
$2 \leq PGD \leq 6$	А	A (with additional	В
		valves)	
$6 < PGD \le 12$	А	В	С
12 < PGD	А	С	С

Table 6. Distribution Pipelines – Ground Shaking

Table 7. Distribution Pipelines – Liquefaction and Landslide Transverse to Pipeline Alignment

Inches	Function I	Function II	Function III, IV
$0 < PGD \le 2$	А	А	B (with additional
			valves)
$2 < PGD \le 6$	А	В	С
$6 < PGD \le 12$	А	С	D
12 < PGD	А	D	D

Table 8. Distribution Pipelines – Lateral Spread and Landslide Along Axis of Pipeline

Inches	Function I	Function II	Function III, IV
$0 < PGD \le 2$	А	В	В
$2 < PGD \le 6$	А	В	С
$6 < PGD \le 12$	А	С	D
$12 < PGD \le 24$	А	D	Е
24 < PGD	Α	Е	Е

Table 9. Distribution Pipelines – Fault Offset

#### Service Laterals and Hydrant Laterals

Inch/sec	Any Lateral
$0 < PGV \le 10$	А
$10 < PGV \le 30$	А
30 < PGV	В

Table 10. Laterals – Ground Shaking

Inches	Any Lateral
$0 < PGD \le 2$	A
$2 < PGD \le 12$	В
12 < PGD	C

Table 11. Laterals – Liquefaction, Landslide and Surface Faulting

#### **Design Categories**

There are five design categories. Category A denotes standard (non-seismic) design. The following summarizes the general design approach for Categories B, C, D and E:

- B = restrained with extra valves
- C = B + better pipe materials
- D = C +quantified seismic design; or provide bypass system.
- E = D + peer review (it is strongly recommended that FEM method be used for any pipe with Classification E)

Tables 12 to 19 provide guidance for seismic pipe design using the chart method based on the categories A through E. Note. This guidance is based on commonly available pipe and joinery as of 2004. As new pipe products become available, they can be used in the chart method as long as suitable justification (FEM, test, etc.) is provided to show that the pipe meets the intended reliability of the pipe and performance of the pipe network as a whole.

Design Category	Cost Effective Design Approach	Notes
А	Standard	
В	Extended Joints	
С	Restrained Joints	
D	Extended and Restrained Joints	Standard with bypass
E	Special Joints	Standard with bypass

Table 12. Ductile Iron Pipe

Design Category	Cost Effective Design	Notes
	Approach	
А	Standard	
В	Standard with extra insertion	
С	Restrained Joints	
D	Extended and Restrained Joints	Standard with bypass
Е	Not recommended	Standard with bypass

#### Table 13. PVC Pipe

Design Category	Cost Effective Design	Notes
	Approach	
А	Single Lap Weld	
В	Single Lap Weld	Weld $t = pipe t$
С	Double Lap Weld	Weld $t = pipe t$
D	Double Lap Weld / Butt Weld	D/t max 110 in PGD zones
Е	Butt Weld	D/t max 95 in PGD zones

Table 14. Welded Steel Pipe

Design Category	Cost Effective Design	Notes
	Approach	
А	Standard	
В	Extended Joints	
C	Restrained Joints	
D	Extended and Restrained Joints	Standard with bypass
E	Not recommended	Standard with bypass

Table 15. Gasketed Steel Pipe

Design Category	Cost Effective Design	Notes
	Approach	
А	Gasketed or Single Lap weld	
В	Single Lap Weld	Weld $t = pipe t$
С	Double Lap Weld	Weld $t = pipe t$
D	Not recommended	Standard with bypass
E	Not recommended	Standard with bypass

#### Table 16. CCP & RCCP Pipe

Design Category	Cost Effective Design Approach	Notes
А	Standard	
В	Butt Fusion Joints	
С	Butt Fusion Joints	
D	Butt Fusion Joints	
E	Butt Fusion Joints	

#### Table 17. HDPE Pipe

Design Category	Cost Effective Design	1	Notes
	Approach		
А	Standard		
В	Soldered joints		
С	Soldered joints		Expansion loop / Christie box /
			Other box

#### Table 18. Copper Pipe

Design Category	Cost Effective Design	Notes
	Approach	
A	Standard	
В	Dresser-type coupling	
С	Multiple dresser couplings	
D	EBAA flextend type couplings	
E	Not recommended	Relocate hydrant

Table 19. Segmented Pipelines Used as Hydrant Laterals

Design Category	Cost Effective Design Approach	Notes
А	Bolted, Single Lap Weld, Fusion Weld	
В	Bolted, Single Lap Weld, Fusion Weld	Weld t = pipe t
С	Bolted, Double Lap Weld, Single Lap Weld with fiber wrap, Fusion Weld	Weld t = pipe t
D	Bolted, Double Lap Weld, Single Lap Weld with fiber wrap, Butt Weld, Fusion Weld	Bolted, Double Lap Weld, Single Lap Weld with fiber wrap, Fusion Weld
E	Bolted, Double Lap Weld, Single Lap Weld with fiber wrap, Butt Weld, Fusion Weld	Bolted, Double Lap Weld, Single Lap Weld with fiber wrap, Fusion Weld

 Table 20. Continuous Pipelines Used as Hydrant Laterals

In addition to the design categories in Tables 12 to 20, the following additional requirements are made. These recommendations are cumulative (For C, include B and C recommendations).

- B. Add isolation valves on all pipes within 50 feet of every intersection, for example, four valves on a four-way cross.
- C. Maximum pipe length between connections for segmented pipe is 16 feet, or as otherwise justified by ESM or FEM.
- D. Maximum pipe length between connections for segmented pipe is 12 feet, or as otherwise justified by ESM or FEM.

#### **Bypass Pipelines**

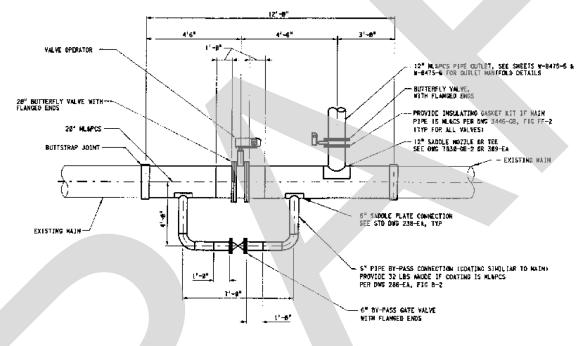
During design of a pipeline, it is typical to perform some preliminary seismic and hazard investigation. A geotechnical engineer can perform literature search of available publications and assess the seismic setting of the pipeline and identify potential hazards such as fault crossings, landslides, and zones of potential liquefaction.

With this information, the pipeline design engineer can often times route the pipeline to avoid well-defined hazards. This is the most cost-effective approach for minimizing seismic-related damage to a pipeline. However, sometimes there is no feasible way to avoid a hazard and the pipeline must be routed through the hazard.

Instead of using a higher Category Design (such as D or E), the owner can elect to provide a bypass capability, as long as the owner has the ability to install the bypass within about 1 day after the earthquake, and in consideration of the entire post-earthquake response. Bypass capability might be the most cost effective approach to mitigate many fault and landslide

crossings for Function Class III pipelines. Bypasses can be used in retrofitting existing pipelines or for new construction where loss of service cannot be tolerated for more than one day.

A typical bypass is illustrated in Figure 2, consisting of a line isolation valve, if none previously existed, and a 12-inch diameter connection and manifold assembly on either side of the defined hazard. In order for the bypass to be used effectively, the hazard must be relatively well defined. Each of the manifolds is configured to accept one or multiple large diameter hose connections. In the event of a seismic event that results in a pipeline failure within the bounds of the hazard, the hazard isolation valves are closed, thereby stopping leakage at the point of failure. The hose is then deployed across the ground between the two manifold assemblies and serves as a temporary pipe bypass, allowing restoration of flows through the system. Figure 3 shows a deployed bypass system at a fault crossing where deployment of three flex hoses was possible.



### **Typical Isolation Valve with Bypass**

Figure 2. Bypass Manifold Assembly



Figure 3. Flex Hose Attached to Manifold Outlets

The criteria for the bypass system components are included in Table 21. So called "large diameter flex hose" (diameter ~5-inches) will generally not provide sufficient flow rate at a reasonable pressure drop, for distances on the order of 1,000 feet between manifolds. So called "ultra large diameter flex hose" (diameter ~12-inches) can provide high flow rates at separation distances of 1,000 feet (or more). There are pros and cons with using either 5-inch or 12-inch hose, including: flow rate and pressure drop; cost; storage life; deployment effort and time; hose breakage and resultant pipe whip; etc.

Description	Criteria
Pipe Materials	Mortar-lined and mortar- or tape/epoxy-coated steel pipe
	Field joints shall be flanged, welded, or mechanically
	coupled with suitable restraint
	Design for anticipated internal, external, and transient
	loading conditions
	Provide cathodic protection as needed
Manifold Pit	Precast reinforced concrete with seismic design factors
	suitable for site
	Traffic rated steel plate cover
	Sized for easy hose deployment
12-inch Valves and	Butterfly or Gate
Smaller	
Flexible Hose	12 -inch flex hose, burst pressure $\sim$ 400 psi, operating
	pressure ~150 psi. Distances up to 1,000 feet or more at
	flow rates of up to 5,000 gpm
	5-inch fire hose from local Fire Department. Distances up to
	1,000 feet at flow rates of up to 500 gpm
	Connections to be coordinated with manifold configuration

Table 21. Bypass System Components Criteria

#### CONCLUSIONS

It is the intent of these Guidelines to provide a unified, comprehensive and simple approach that can be readily adopted by water utilities for the design of new pipeline installations. The draft Guidelines are available for public comment through January 2005. They may be obtained via the Internet at: <u>http://homepage.mac.com/eidinger/</u> (follow the link to downloads, and then download Seismic Guidelines.doc.) Comments should be sent to any of the authors.

The Guidelines may result in changes in pipeline installations in moderate and high seismic areas throughout the United States. Given the large economic consequences of widespread pipeline damage, the authors believe that the extra reliability afforded by these changes is worthwhile and cost effective. We hope that the Guidelines will spur water utilities to procure better pipelines in high hazard locations; in turn, the pipeline manufacturers will manufacture and supply better products. This is, in part, a "chicken and egg" process, since prior to the current moment (late 2004 – early 2005) we have not had the Guidelines for water utilities; nor have we always had suitable cost effective pipelines provided by manufacturers to meet the Guidelines.

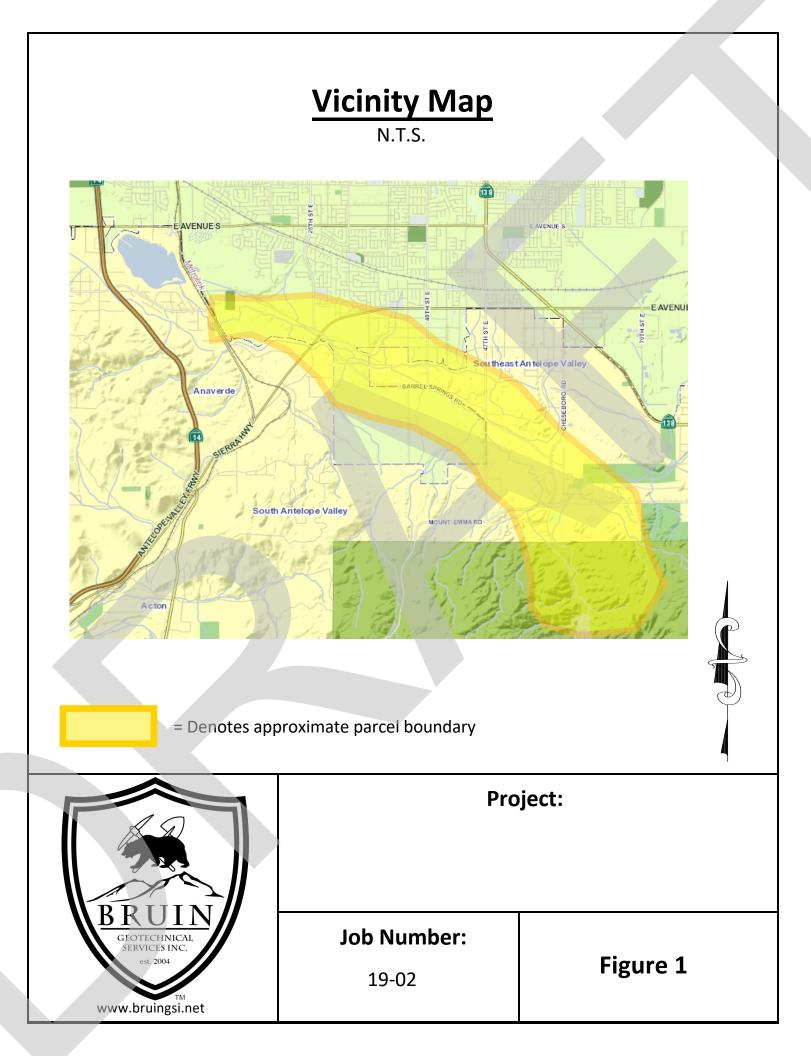
#### ABBREVIATIONS AND UNITS

Customary US units (inches, pounds, gallons) are used in this paper. Conversions to SI units are provided below. All pipe sizes are in customary US units; conversion of a customary pipe size (such as 12-inch diameter) to SI units has no precision, as a 12-inch pipe may often have outside diameter anywhere from ~12-inches to ~13-inches.

ALA	American Lifelines Alliance
AWWA	American Water Works Association
AWWARF	American Water Works Association Research Foundation
ESM	Equivalent Static Method
FEM	Finite Element Method
FEMA	Federal Emergency Management Agency
JWWA	Japan Water Works Association
MMC	Multihazard Mitigation Council
NIBS	National Institute of Building Sciences
PGA	Peak Ground Acceleration (g)
PGD	Permanent Ground Deformation (1 inch = 2.54 cm)
PGV	Peak Ground Velocity (1 inch/sec = 2.54 cm/sec)
inch	inch (1 inch = 2.54 cm)
feet	feet (1 foot = 12 inches = $30.48$ cm)
g	gravity constant (1g = $386.4$ inch/sec <sup>2</sup> = $981$ cm/sec <sup>2</sup> )
gpm	gallons per minute (1 gpm = $3.785$ liters per minute)
psi	pounds per square inch (1 psi = $6.895$ kilopascals)
sec	second

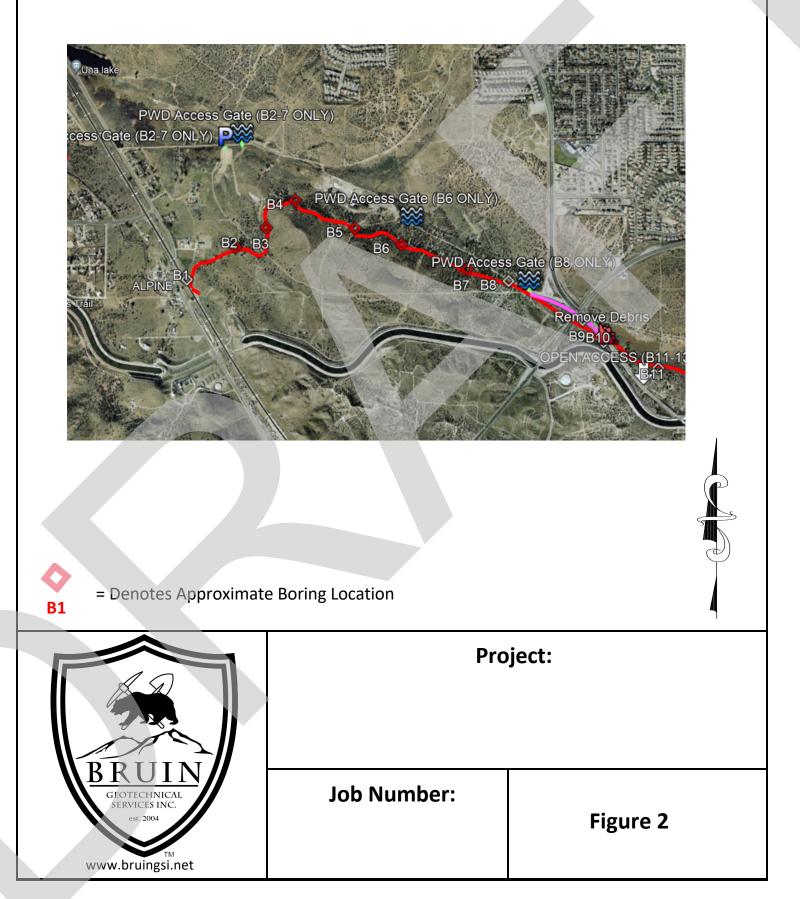
**APPENDIX F** 

General Earthwork and Grading Guidelines



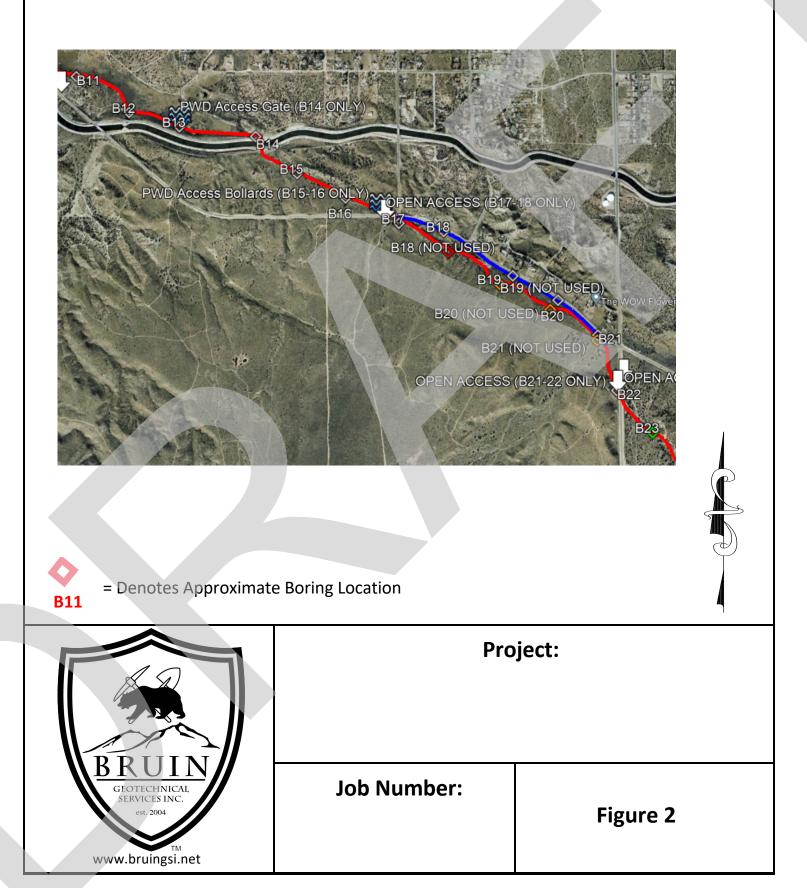
## **Boring Location Map**

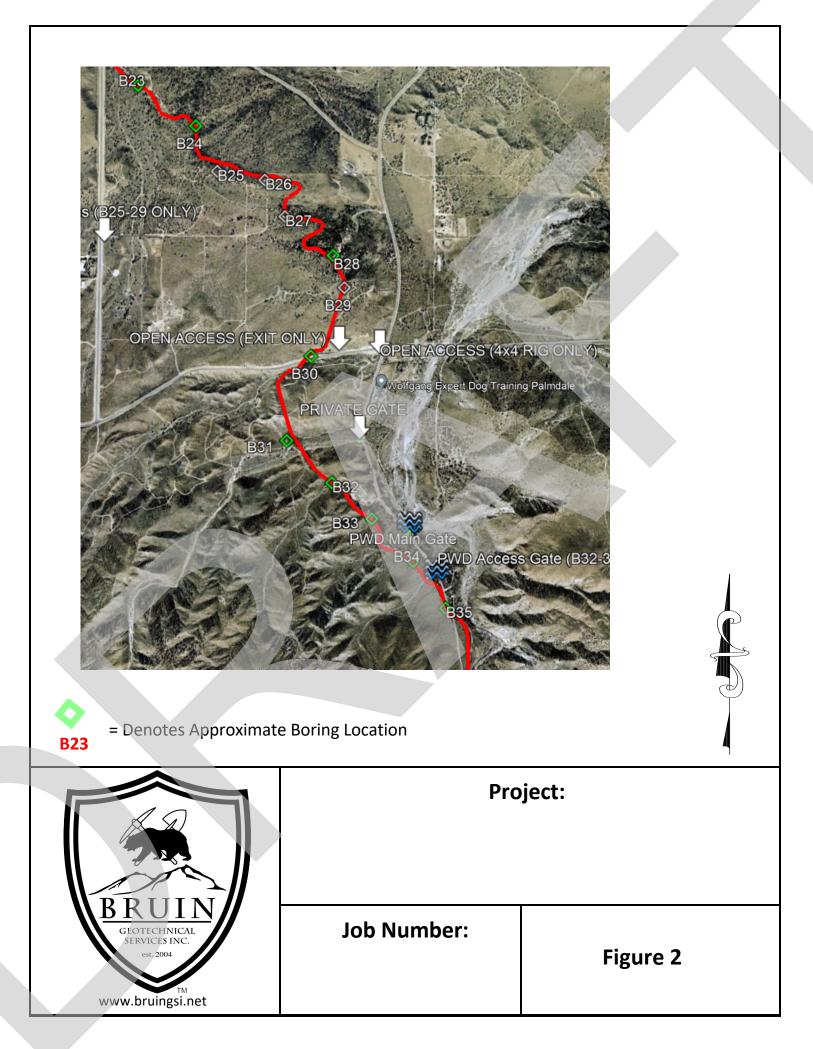
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## **Boring Location Map**

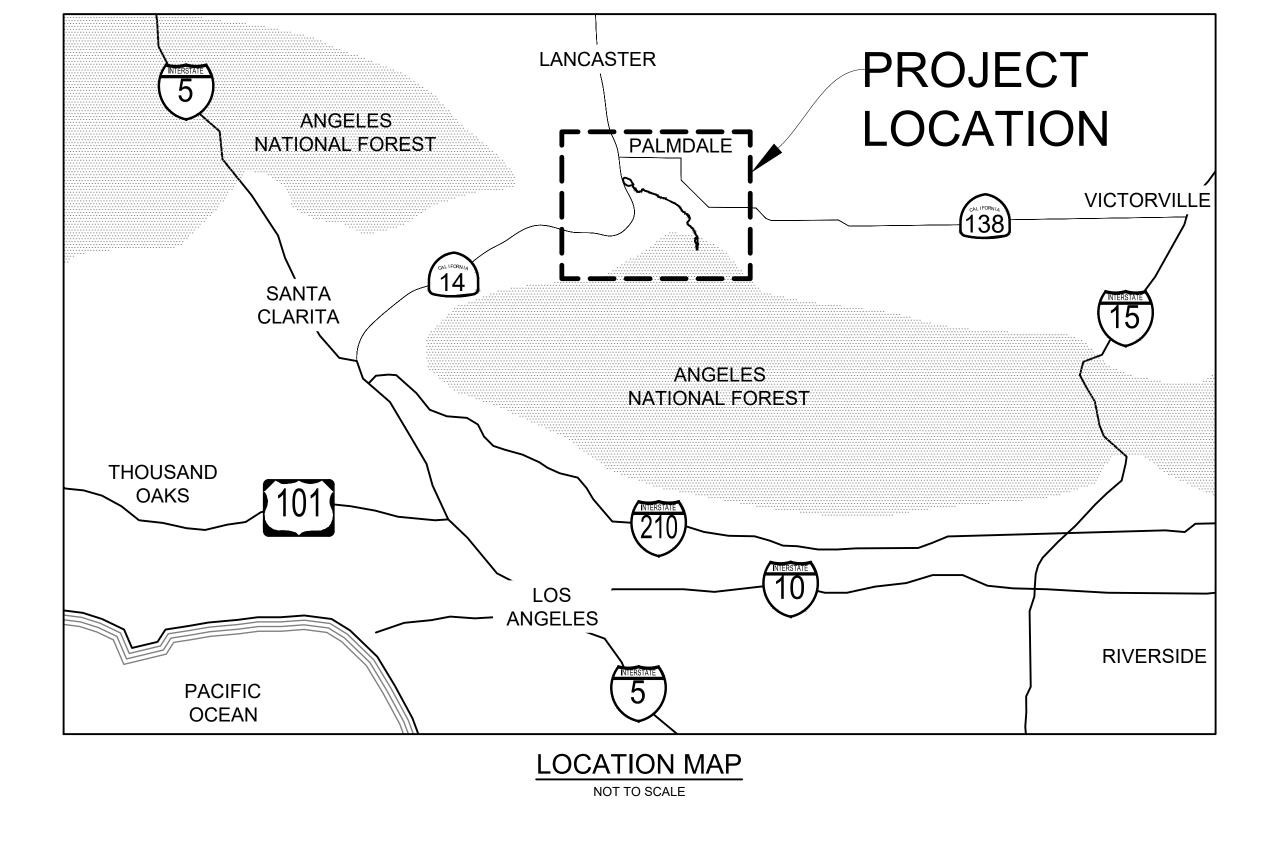
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## Appendix E: 30% Drawings



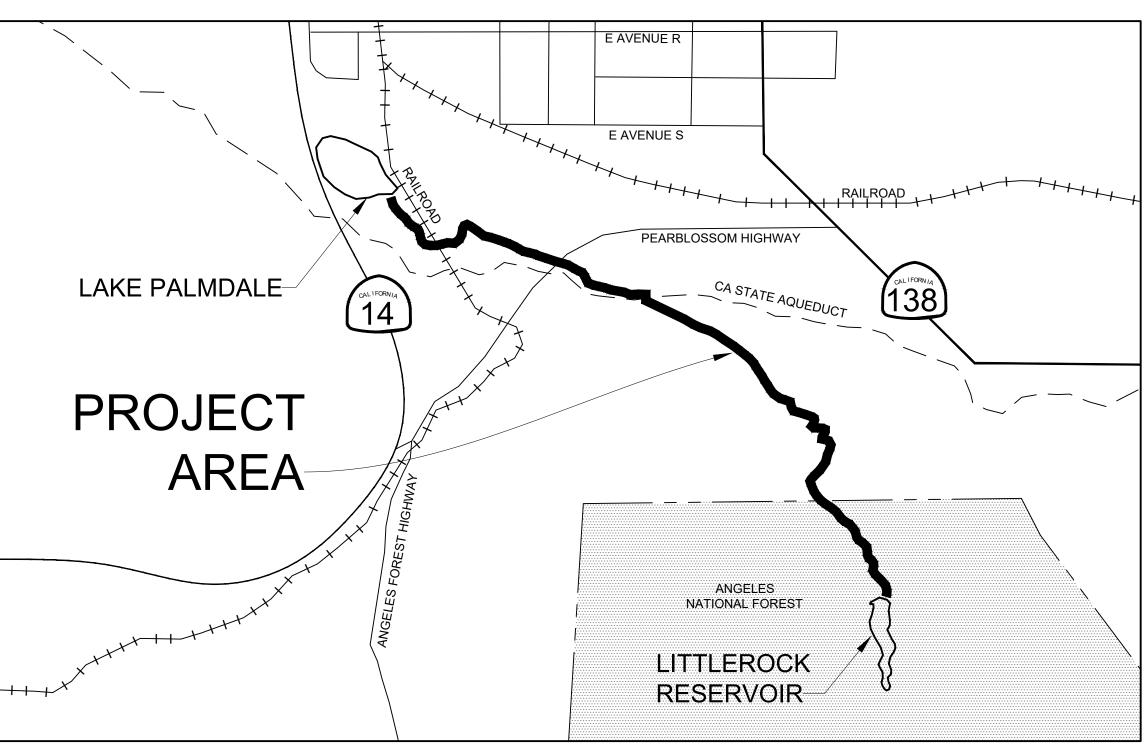


# PALMDALE WATER DISTRICT PALMDALE, CA



# PALMDALE DITCH **CONVERSION PROJECT**

HAZEN NO.: 20182-004 MARCH 2024



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GWILLIAMS					DESIGNED BY:	TBD	
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G003	General Ab
G004	General No
G005	General Le
G006	Key Plan, S
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C101	Ditch Conv
C102	Ditch Conv
C103	Ditch Conv
C104	Ditch Conv
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C106	Ditch Conv
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C129	Ditch Conv
C130	Ditch Conv
C131	Ditch Conv
C132	Ditch Conv
C300	CA Aquedu
C302	Lake Palmo



## INDEX OF DRAWINGS

DESCRIPTION

eet - Vicinity and Location Maps

ex

bbreviations lotes

egend

Survey Control and Boring Location

ndale Discharge Plan and Profile

version Plan and Profile Sta 50+00 to 62+00 version Plan and Profile Sta 62+00 to 74+00 version Plan and Profile Sta 74+00 to 86+00 version Plan and Profile Sta 86+00 to 98+00 version Plan and Profile Sta 98+00 to 110+00 version Plan and Profile Sta 110+00 to 122+00 version Plan and Profile Sta 122+00 to 134+00 version Plan and Profile Sta 134+00 to 146+00 version Plan and Profile Sta 146+00 to 158+00 version Plan and Profile Sta 158+00 to 170+00 version Plan and Profile Sta 170+00 to 182+00 version Plan and Profile Sta 182+00 to 194+00 version Plan and Profile Sta 194+00 to 206+00 version Plan and Profile Sta 206+00 to 218+00 version Plan and Profile Sta 218+00 to 230+00 version Plan and Profile Sta 230+00 to 242+00 version Plan and Profile Sta 242+00 to 254+00 version Plan and Profile Sta 254+00 to 266+00 version Plan and Profile Sta 266+00 to 278+00 version Plan and Profile Sta 278+00 to 290+00 version Plan and Profile Sta 290+00 to 302+00 version Plan and Profile Sta 302+00 to 314+00 version Plan and Profile Sta 314+00 to 326+00 version Plan and Profile Sta 326+00 to 338+00 version Plan and Profile Sta 338+00 to 350+00 version Plan and Profile Sta 350+00 to 362+00 version Plan and Profile Sta 362+00 to 374+00 version Plan and Profile Sta 374+00 to 386+00 version Plan and Profile Sta 386+00 to 398+00 version Plan and Profile Sta 398+00 to 410+00 version Plan and Profile Sta 410+00 to 422+00 version Plan and Profile Sta 422+00 to 434+00 luct Turnout - Site Plan

ndale Discharge Site Plan

ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
	HAZEN NO.:	20182-004
GENERAL	CONTRACT NO.	XX-XX-XXX
SHEET INDEX	DRAWING NUMBER:	
		G002

A/C	AIR CONDITIONE	R				E EA	EAST EACH
AB	ANCHOR BOLT					ECC ECH	ECCENTRIC ELECTRIC CABINET HEATER
AC ACP	ASBESTOS CEME AIR COMPRESSO					ED	EQUIPMENT DRAIN
ACT-MR	ACOUSTICAL CE	LING TILE,				EDH EDP	ELECTRIC DUCT HEATER EMERGENCY DISTRIBUTION
AD	MOISTURE RESIS	STANT					PANEL
ADH	ADHESIVE					EE EEW	EACH END EMERGENCY EYE WASH
ADJ AFF	ADJUSTABLE ABOVE FINISHED					EF	EACH FACE OR EXHAUST FA
AGGR	AGGREGATE	TLOOK				EFF EHH	EFFLUENT ELECTRICAL HANDHOLE
AH AHU	AIR HEATER AIR HANDLING U	міт				EL	ELEVATION
AL, ALUM	ALUMINUM	NH				ELEC	
ALLOW	ALLOWANCE/ALL	OWABLE				ELP EMH	EMERGENCY LIGHTING PANE ELECTRICAL MANHOLE
ALT APPROX	ALTERNATE APPROXIMATE					ENGR	ENGINEER
AR	AIR RECEIVER					ENT EOG	ENTRANCE EDGE OF GRAVEL
ARCH ASB	ARCHITECTURAL ASBESTOS					EOP	EDGE OF PAVEMENT
ASPH	ASPHALT					EPP EPX	EMERGENCY POWER PANEL EPOXY
AT ATF	ASPHALT TILE AIR TERMINAL UI					EQ	EQUAL
	POWERED)					EQPT	
ATS ATU	AUTOMATIC TRA AIR TERMINAL UI		ITCH			ERH ES	ELECTRIC WIRE ROPE HOIST EMERGENCY SHOWER OR
AIU	AIR TERMINAL OI						EMERGENCY SWITCH
B	BORING					ES/EEW	EMERGENCY SHOWER AND EYEWASH
BC BD	BOILER CHEMICA BOARD	LS				ET	EXPANSION TANK
BDD	BACKDRAFT DAM					EUH EW	ELECTRIC UNIT HEATER EACH WAY
BFE BH	BOTTOM OF FITT BASEBOARD HEA	-				EW EWC	ELECTRIC WATER COOLER
вн BITUM	BASEBOARD HEA BITUMINOUS					EWH	ELECTRIC WATER HEATER
В	BASELINE					EXIST/EX EXC	EXISTING EXCAVATE
BL BLDG	BUILDING LINE BUILDING					EXH	EXHAUST
BLK	BLOCK					EXP EXT	EXPANSION
BLW BM	BLOWER BENCH MARK						EXTERIOR
BM BOC	BENCH MARK BACK OF CURB					F	FAN
вом	BOTTOM OF MAS	ONRY				FAB F&C	FABRICATE FRAME AND COVER
BOT BRC	BOTTOM BRIDGE CRANE					F&G	FRAME AND GRATE
BRG	BEARING					FC FCO	FLUSHING CONNECTION FLOOR CLEANOUT
BRK BRL	BRICK BUILDING RESTR		IF			FCU	FLOOR CLEANOUT FAN COIL UNIT
BRZ	BUILDING RESTR BRONZE		· 🗠			FD	FLOOR DRAIN
ВТ	BOLT					FDN FE	FOUNDATION FIRE EXTINGUISHER/FLOW
СВ	CATCH BASIN						ELEMENT
CBD	COUNTERBALAN	CE BACKD	RAFT			FEF FH	FUME EXHAUST FAN FIRE HYDRANT
СС	DAMPER COOLING COIL					FIG	FIGURE
C/C	CENTER TO CEN					FIN	FINISH
ССР	CIRCULATING PU	MP				FIX FL	FIXTURE FLOOR
CD CDWP	CONTROL DAMPI CONDENSER WA					FLXC	FLEXIBLE CONNECTION
CE	CONSTRUCTION					FOC FPRF	FIBER OPTICS CABLE FIREPROOF
CEM CENT	CEMENT CENTRIFUGE					FPRF	FIBERGLASS REINFORCED
CER	CERAMIC					EQ	
CF	CUBIC FEET					FS FSD	FLOW SWITCH FIRE/SMOKE DAMPER
CFM CL	CUBIC FEET PER CENTERLINE	WIINUTE				FT	FEET OR FIN TUBE HEATER
CLKG	CAULKING					FTG FURR	FOOTING FURRING OR FURRED
CLR CMU	CLEAR CONCRETE MAS		-				
со	CLEANOUT					G GA	GATE OR GAS GAUGE
COL CON	COLUMN CONCENTRIC					GA GAL	GAUGE GALLON
CONC	CONCENTRIC					GALV	GALVANIZED
CONST	CONSTRUCTION	NITIN	~ .			GC GEN	GENERAL CONTRACTOR GENERATOR
CONT CONTR	CONTINUOUS, CO	INUATI	UN			GIH	GAS INFRARED HEATER
CORP	CORPORATION					GLV GPM	GLOBE HEATER GALLONS PER MINUTE
СР	CONCRETE PLAN PANEL, OR CONT					GPM GR	GALLONS PER MINUTE GRADE
СРТ	CONTROL POWE			R		GRTG	GRATING
CR	CONTROL RELAY					GST GUH	GROUND STORAGE TANK GAS UNIT HEATER
CRS CSP	COURSE CHEMICAL SERV	CE PLIMP				GW	GUY WIRE
CSSP	CHEMICAL SERV	CE SUMP I				GWH GYP	GAS WATER HEATER GYPSUM
CST CT	CHEMICAL STOR CERAMIC TILE	AGE TANK					
СТЈ	CONTROL JOINT					HC	HEATING COIL
CU	COPPER OR CON	IDENSING	UNIT			HCP	HORIZONTAL END SUCTION CENTRIFUGAL PUMP
CY	CUBIC YARD					HDW	HARDWARE
DAD	DESICCANT AIR					HE HEX	HEAT EXCHANGER HEXAGONAL
DD DEC	DESICCANT DRY	=R				HHRG	HYBRID HIGH RESISTANCE
DECEL	DECELERATION						GROUNDING
DEH						HORIZ HP	HORIZONTAL HORSEPOWER OR HEAT PUN
DEM DET	DEMISTER DETAIL					HPT	HIGH POINT
DF	DUCT FAN OR DF	RINKING				HRU HRG	HEAT RECOVERY UNIT HIGH RESISTANCE GROUND
DIA OR Ø	FOUNTAIN DIAMETER					HSCP	HORIZONTAL SPLIT CASE PU
DIAG	DIAMETER DIAGONAL					HUM	HUMIDIFIER
DIM	DIMENSION					HVAC	HEATING, VENTILATION AND CONDITIONING
DISC DISCH	DISCONNECT DISCHARGE					HW	HEADWALL
DIST	DISTRIBUTION					HWB HWCH	HEATING WATER BOILER
DKC		R (ELECTR	IC)			HWCH	HEATING WATER CABINET HEATER
DL DN	DEAD LOAD DOWN					HWL	HIGH WATER LEVEL
DOZ	DOZEN					HWP HWY	HEATING WATER PUMP HIGHWAY
DP DS	DISTRIBUTION PA DISCONNECT SW					HYD	HYDRAULIC
D/S	DOWNSTREAM						
DT	DAY TANK						
1 31 6 17 5 7 5 7 5 5	DRAWING(S) DOWEL						
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DO NOT USE FOR CONSTRUCTION

		DOLL			
I I&C	IRON INSTRUMENTATION AND	PSU PVMT	POWER SUPPLY UNIT PAVEMENT	WG WH	WIRE GLASS WALL HYDRANT OR WALL HEATER
lao	CONTROLS			WJT	WESTERN JOSHUA TREE
ID	INSIDE DIAMETER	QTY	QUANTITY	WL	WATER LEVEL
IF IN	INSIDE FACE INCH	RAD	RADIUS	WM W/O	WATER METER WITHOUT
INCL	INCLUDED	RECIR	RECIRCULATION	WP	WATERPROOF
INF	INFLUENT	RECT	RECTANGULAR	WPFG	WATER PROOFING
INSUL INT	INSULATION INTERIOR	REF REG	REFERENCE REGISTER	WSE WSP	WATER SURFACE ELEVATION WEATHER STRIP
INV	INVERT	REINF	REINFORCING	WT	WEIGHT
IPP	INSTRUMENT POWER PANEL	REM	REMOVE	WV	WATER VALVE
JB	JUNCTION BOX	REQD REST	REQUIRED RESTRAINED	WWF	WELDED WIRE FABRIC
JCT	JUNCTION	REV	REVISE	XFMR	TRANSFORMER
JT	JOINT	RFD	REFRIGERANT AIR DRYER	ХМН	EXISTING MANHOLE
I	LENGTH/ANGLE	RH RIO	ROOF HOOD REMOTE INPUT/OUTPUT	YH	YARD HYDRANT
LA	LINE AHEAD	RJ	RESTRAINED JOINT	YI	YARD INLET
LAB	LABORATORY	RM	ROOM	YD	YARD
LAM LAT	LAMINATED LATERAL	RND	ROUND ROUGH OPENING	YR	YEAR
LAT	LAVATORY	RO RPM	REVOLUTIONS PER MINUTE		FITTINGS, ETC.
LB	POUND OR LINE BACK	RR	RAILROAD	<u>v//LvL0,</u>	
LD LF	COMBINATION LOUVER/DAMPER LINEAR FEET	RT	RIGHT REMOTE TERMINAL UNIT	BFP	BACKFLOW PREVENTER
LF	LONG	RTU R/W OR ROW	RIGHT OF WAY	BF BFV	BLIND FLANGE BUTTERFLY VALVE
LI	LEVEL INDICATOR			BV	BALL VALVE
LIP	LIGHTING INDICATING PANEL LIVE LOAD	S	SOUTH OR SLOPE	CAV	COMBINATION AIR VALVE
LL LLH	LIVE LOAD LONG LEG HORIZONTAL	SB SBL	SOIL BORING SURVEY BASELINE	CV	CHECK VALVE COUPLING
LLV	LONG LEG VERTICAL	SBMP	SODIUM BISULFITE METERING	CPLG DJ	DISMANTLING JOINT
LP	LIGHTING PANEL OR LIGHT POLE	0011		EXP JT	EXPANSION JOINT
LPT LRG	LOW POINT LOW RESISTANCE GROUNDING	SCH SCG	SCHEDULE SLUICE GATE	FLEX	FLEXIBLE
LS	LEVEL SWITCH	SCR	SELECTIVE CATALYTIC	FLG FM	FLANGE FLOW METER
LTG		000	REDUCTION	FTG	FITTING
LVR LWL	LOUVER LOW WATER LEVEL	SDG SECT	SLIDE GATE SECTION	FV	
		SERV	SERVICE	GL GV	GLOBE VALVE GATE VALVE
MAINT	MAINTENANCE	SF	SQUARE FEET	HB	HOSE BIBB
MANUF MATL	MANUFACTURER MATERIAL	SG SHT(S)	SWITCH GEAR SHEET(S)	MFM	MAGNETIC FLOWMETER
MAU	MAKE UP AIR HANDLING UNIT	SI	SQUARE INCH	MJ MOV	MECHANICAL JOINT MOTOR OPERATED VALVE
MAX	MAXIMUM	SIL	SILENCER	NPT	NATIONAL PIPE THREAD
MCC MCLU	MOTOR CONTROL CENTER MOTOR CONTROL LINE-UP	SIM SMH	SIMILAR STORM MANHOLE	PE	PLAIN END
MECH	MECHANICAL	SMIT	SUMP PUMP	PRV RED	PRESSURE RELIEF VALVE REDUCER
MET	METAL	SPEC	SPECIFICATION	RPZ	REDUCER REDUCED PRESSURE ZONE
MFR MG	MANUFACTURER MILLION GALLONS	SQ SSP	SQUARE SUBMERSIBLE SUMP PUMP		ASSEMBLY
MGD	MILLION GALLONS MILLION GALLONS PER DAY	SSP	SUBMERSIBLE SUMP PUMP STAINLESS STEEL	SAV SOV	SURGE ANTICIPATOR VALVE SOLENOID OPERATED VALVE
MH	MANHOLE	STA	STATION OR STACK	TCV	TEMPERATURE CONTROL VALVE
MIN	MINIMUM MISCELLANEOUS	STD		THD	THREADED
MISC MLDG	MISCELLANEOUS MOLDING	STG STIR	STORAGE OR STOP GATE (LOG) STIRRUP		
MO	MASONRY OPENING	STL	STEEL	PIPING N	IATERIALS
MOD	MODIFY OR MODIFIED	STRU	STRUCTURAL	CIP	CAST IRON PIPE
MON MOPO	MONUMENT MAINTENANCE OF PLANT	SUB SUCT	SUBSTITUTE SUCTION	CMP	CORRUGATED METAL PIPE
	OPERATIONS	SUPT	SUPERINTENDENT	CPP	CORRUGATED PLASTIC PIPE
MTD	MOUNTED	SUR	SURFACE	CPVC	CHLORINATED POLYVINYL CHLORIDE
MTG MULT	MOUNTING MULTIPLE	SUSP SWD	SUSPENDED SIDE WATER DEPTH	CU	COPPER PIPE
MOLT		SYM	SYMMETRICAL	DIP	DUCTILE IRON PIPE
N	NORTH			FRP GSP	FIBERGLASS REINFORCED PIPE GALVANIZED STEEL PIPE
NA NAD '83	NOT APPLICABLE NORTH AMERICAN DATUM OF 1983	T&B T&G	TOP AND BOTTOM TONGUE AND GROOVE	HDPE	HIGH DENSITY POLYETHYLENE
NAVD '88	NORTH AMERICAN VERTICAL	TAN	TANGENT	PE LINING	POLYETHYLENE LINING
NO	DATUM OF 1988 NORMALLY CLOSED	TBA	TO BE ABANDONED	RCP RCCP	REINFORCED CONCRETE PIPE REINFORCED CONCRETE
NC NF	NORMALLY CLOSED NEAR FACE	TBCN TBM	TRAVELING BRIDGE CRANE TEMPORARY BENCH MARK		CYLINDER PIPE
NGVD '29	NATIONAL GEODETIC VERTICAL	TC	TOP OF CURB	SSP	STAINLESS STEEL PIPE IRON PIPE SIZE
NIC		TCP	TEMPERATURE CONTROL PANEL	IPS PVC	POLYVINYL CHLORIDE
NIC No.	NOT IN CONTRACT NUMBER	TDH TECH	TOTAL DYNAMIC HEAD TECHNICAL	PCCP	PRE-STRESSED CONCRETE
NO	NORMALLY OPEN	TEL	TELEPHONE	VCP	CYLINDER PIPE VITRIFIED CLAY PIPE
NOM		TEMP		VCF	VIIRIFIED CLAT FIFE
NTS	NOT TO SCALE	TG THK	TEMPERED GLASS THICK	PROCES	S PIPING
OC	ON CENTER	THRU	THROUGH		
OD	OUTSIDE DIAMETER OR OVERHEAD DOOR	TOC TOD	TOP OF CONCRETE TOP OF DECK	_	
OF	OVERHEAD DOOR OUTSIDE FACE	TOF	TOP OF DECK TOP OF FOOTING	D DBU	DRAIN DRYING BED UNDERDRAIN
OHE	OVERHEAD ELECTRIC	ТОМ	TOP OF MASONRY/MANHOLE	DBU DG	DRYING BED UNDERDRAIN DIGESTER GAS
OML	OIL MIST LUBRICATOR OPERATOR	TOS	TOP OF SLAB/ TOP OF STEEL	DP	DRY POLYMER
OPER OPNG	OPERATOR OPENING	TOW TOL	TOP OF WALL TOLERANCE	DS	DIGESTED SLUDGE
OPP	OPPOSITE	TYP	TYPICAL	DSU FM	DIGESTER SUPERNATANT FORCE MAIN
ORF	OIL REMOVAL FILTER			GCE	GRIT CLASSIFIER/CYCLONE
ORIG	ORIGINAL	UG UGE	UNDERGROUND UNDERGROUND ELECTRIC		EFFLUENT
P&ID	PROCESS AND	UGG	UNDERGROUND GAS	GL NG	GAS LINE NATURAL GAS
DAG		UH		NPW	NON-POTABLE WATER
PAC	PACKAGED AIR CONDITIONING UNIT	UNFIN UNO	UNFINISHED UNLESS NOTED OTHERWISE	PD	PROCESS DRAIN
PAR	PARALLEL	UPS	UNINTERRUPTIBLE POWER	PW RD	POTABLE WATER ROOF DRAIN
PC	POINT OF CURVE OR PIECE OR		SUPPLY	S	SAMPLE
PCC	PERSONAL COMPUTER POINT OF COMPOUND CURVE	U/S UTIL	UPSTREAM UTILITY	SD	
PCF	POUNDS PER CUBIC FOOT	<b>UTIL</b>		SPD SS	SUMP PUMP DISCHARGE SANITARY SEWER
PERF		VAC		TD	TANK DRAIN
PERP PF	PERPENDICULAR PROPELLER FAN	VACP VAP	VACUUM PUMP VAPORIZER	WTR	WATER MAIN
PI	POINT OF INTERSECTION	VAP VAV	VAPORIZER VARIABLE AIR VOLUME UNIT		
PL	PROPERTY LINE OR PLATE	VCD	VOLUME CONTROL DAMPER		
PLC	PROGRAMMABLE LOGIC CONTROLLER	VEL VENT	VELOCITY VENTILATING OR VENTILATION		
PLMB	PLUMBING	VERT	VERTICAL		
PNL	PANEL	VF	VANE AXIAL FAN		
PP PREFAB	POWER PANEL OR POWER POLE PREFABRICATED	VOL VTR	VOLUME VENT THROUGH ROOF		
PROP	PROPOSED	VIIX			
PRVN	POWER ROOF VENTILATOR	W	WEST OR WIDTH OR WATER		
PSF PSI	POUNDS PER SQUARE FOOT POUNDS PER SQUARE INCH	W/ WF	WITH WALL FAN		



HAZEN AND SAWYER 800 WEST 6th STREET, SUITE 400 LOS ANGELES, CALIFORNIA 90017



PALMDALE WATER DISTRICT	PALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
		HAZEN NO.:	20182-004
APPROVED BY:	GENERAL		XX-XX-XXX
	ABBREVIATIONS	DRAWING NUMBER:	
TITLE DATE			G003

## **GENERAL:**

- 1. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR SITE SAFETY ASSOCIATED WITH THE WORK UNDER THIS PROJECT AND FOR COMPLIANCE WITH ALL FEDERAL, STATE AND LOCAL HEALTH AND SAFETY LAWS, CODES, REGULATIONS, AND ORDINANCES INCLUDING, BUT NOT LIMITED TO, THOSE CURRENTLY MANDATED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).
- 2. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE DESIGN, INSTALLATION, AND MAINTENANCE OF ALL EXCAVATION SUPPORT ON THE PROJECT. ALL EXCAVATION SUPPORT SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF NORTH CAROLINA. ALL EXCAVATION SUPPORT DESIGN DOCUMENTS SHALL BE PRESENTED TO THE ENGINEER FOR REVIEW BEFORE IMPLEMENTATION. CONTRACTOR SHALL USE ADEQUATE SHORING METHODS TO ENSURE:
  - A. COMPLIANCE WITH OSHA REGULATIONS.
  - B. PROTECTION OF EXISTING PAVEMENT AND ROAD SHOULDERS, STRUCTURES AND UTILITIES.
  - C. CONSTRUCTION ACTIVITIES ARE CONFINED TO RIGHTS-OF-WAY OR EASEMENTS AS INDICATED
- 3. LIMITS OF DISTURBANCE (LOD) SHALL BE AS INDICATED ON THE CONTRACT DRAWINGS. ANY CHANGES TO THE LOD BY THE CONTRACTOR SHALL REQUIRE PRIOR APPROVAL FROM THE ENGINEER AND DEMLR LAND QUALITY SECTION.
- 4. CONTRACTOR SHALL REPAIR AT HIS OWN EXPENSE, ANY DAMAGE CAUSED BY CONSTRUCTION RELATED ACTIVITIES TO EXISTING UTILITY SERVICE LINES.
- 5. IN THE EVENT OF DAMAGE TO EXISTING UTILITIES, CONTRACTOR SHALL STOP WORK IMMEDIATELY, TAKE NECESSARY PRECAUTIONS TO PREVENT INJURY OR FURTHER DAMAGE, AND NOTIFY PROPER AUTHORITIES. CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING/REPAIRING ALL EXISTING STRUCTURES, CONDUITS, OR OTHER UTILITIES DAMAGED BY CONTRACTOR'S OPERATIONS AT NO COST TO OWNER.
- 6. REMOVAL AND REPLACEMENT OR REPAIR OF EXISTING UTILITY SERVICES SHALL BE COORDINATED WITH APPROPRIATE UTILITY COMPANY AT NO ADDITIONAL COST TO THE OWNER.
- 7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND REPLACEMENT TO ORIGINAL OR BETTER CONDITION OF ALL EXISTING PAVEMENTS, FENCES, AND MISCELLANEOUS ITEMS WHERE DAMAGED BY CONSTRUCTION ACTIVITIES OR REQUIRED TO COMPLETE THE CONSTRUCTION.
- 8. ALL HOLES, TRENCHES, AND OTHER HAZARDOUS AREAS SHALL BE ADEQUATELY PROTECTED BY BARRICADES, LIGHTS OR OTHER PROTECTIVE DEVICES.
- 9. REMOVAL OF EXCAVATED MATERIALS AND DAILY CLEANUP OPERATIONS SHALL BE PERFORMED IN COMPLIANCE WITH THE SPECIFICATIONS AND TO THE SATISFACTION OF THE OWNER/ENGINEER.
- 10. EXCESS/UNSUITABLE SPOIL TO BE REMOVED FROM SITE. PRIOR TO BEGINNING CONSTRUCTION, CONTRACTOR SHALL SUBMIT THE OFF-SITE SPOIL LOCATIONS TO BE USED AND PROVIDE DOCUMENTATION OF EROSION CONTROL MEASURES TO BE PROVIDED DURING DISPOSAL OPERATIONS. CONTRACTORS OFF-SITE SEDIMENT CONTROL MEASURES MUST BE APPROVED BY NC DEMLR PRIOR TO SPOIL DISPOSAL.
- 11. ALL EROSION AND SEDIMENTATION CONTROLS SHALL BE IMPLEMENTED BEFORE CONSTRUCTION COMMENCES AND SHALL NOT BE REMOVED UNTIL PERMANENT GROUND COVER STABILIZATION HAS BEEN ESTABLISHED.
- 12. THE CONTRACTOR SHALL RECORD AND SUPPLY TO THE ENGINEER THE FOLLOWING INFORMATION:
  - A. THE LOCATION OF ALL UTILITIES CROSSED AND THE NEW LOCATION AND DEPTH OF ALL RELOCATED AND/OR ADJUSTED UTILITIES.

## **EROSION CONTROL:**

- ADDITIONAL COST TO THE OWNER.
- SECTION AND ENGINEER.
- CONTRACT DRAWINGS.

				PROJECT ENGINEER:	TBD	
				DESIGNED BY:	TBD	
				DRAWN BY:	G. WILLIAMS	F C
				CHECKED BY:	TBD	C
				IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS	0 1/2" 1"	
REV	ISSUED FOR	DATE	BY	NOT TO FULL SCALE		

PRELIMINARY DRAWING DO NOT USE FOR CONSTRUCTION

1. ALL EROSION CONTROL MEASURES SHALL BE IN PLACE BEFORE ANY LAND CLEARING OR DISTURBANCE ACTIVITIES MAY BEGIN.

2. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY EROSION CONTROL MEASURES WHETHER OR NOT SHOWN ON THE PLANS TO PROTECT ADJACENT CREEKS, RIVERS, ROADWAYS, ETC. FROM SILTATION AND EROSION.

3. EROSION CONTROL MEASURES SHALL BE CLEANED OF ACCUMULATED SEDIMENT WHEN VOLUME OF MEASURE IS HALF FULL. SEDIMENT SHALL BE REMOVED FROM BEHIND SILT FENCING WHEN IT BECOMES APPROXIMATELY 0.5 FEET DEEP AT THE FENCE. THE SEDIMENT FENCE SHALL BE REPAIRED AS NECESSARY TO MAINTAIN THE BARRIER. REMOVED SEDIMENT SHALL BE DISPOSED OF IN SUCH A MANNER AS TO PREVENT FURTHER SEDIMENT TRANSPORT. IF NO SUITABLE ON-SITE LOCATIONS ARE AVAILABLE, ALL REMOVED SEDIMENT WILL BE LEGALLY DISPOSED OF OFF-SITE AT NO

4. ALL EXCESS SOIL RESULTING FROM EARTHWORK OPERATIONS SHALL BE REMOVED FROM SITE BY CONTRACTOR. ALL TEMPORARY SOIL STOCKPILE AREAS USED FOR BACKFILL AND OTHER ACTIVITIES SHALL BE WITHIN THE LOD AS SHOWN ON THE DRAWINGS, AND LOCATED, AT A MINIMUM, 50 FEET FROM ANY SURFACE WATERS. STOCKPILE SIDE SLOPES SHALL BE NO STEEPER THAN 3:1 AND TOP OF STOCKPILE SHALL BE SLOPED AT A MINIMUM OF 5% TO PROMOTE POSITIVE DRAINAGE. ALL ONSITE TEMPORARY SOIL STOCKPILES SHALL BE SEEDED WITH TEMPORARY AND/OR PERMANENT SEEDING MEASURES FOR THE DURATION OF CONSTRUCTION ACTIVITIES. ALL CONTRACTOR STAGING AND LAYDOWN AREAS, SOIL OR WASTE STOCKPILE AREAS SHALL HAVE PERIMETER SILT FENCE. LOCATED NO CLOSER THAN 6 FEET FROM TOE OF SLOPE TO ALLOW FOR ACCESS AND MAINTENANCE. ANY SOILS TAKEN OFF SITE BECOMES THE CONTRACTORS RESPONSIBILITY AND SHALL COMPLY WITH ALL REQUIRED STATE AND LOCAL REGULATIONS AND PERMITS.

5. ALL EROSION CONTROL MEASURES SHALL REMAIN IN PLACE UNTIL ENTIRE SITE IS PERMANENTLY STABILIZED WITH VEGETATION AS PER SEEDING SPECIFICATIONS AND SCHEDULE. ALL TEMPORARY EROSION CONTROL DEVICES ARE TO BE REMOVED AFTER PERMANENT STABILIZATION HAS BEEN ACHIEVED AND APPROVAL HAS BEEN GRANTED BY THE LAND QUALITY

6. RESTORE ALL DISTURBED AREAS INCLUDING DITCHES/SWALES, STAGING/LAYDOWN/PARKING AREAS TO ORIGINAL GRADE AND ELEVATION AND ORIGINAL OR BETTER CONDITION, EXCEPT WHERE NOTED ON THE



HAZEN AND SAWYER 800 WEST 6th STREET, SUITE 400 LOS ANGELES, CALIFORNIA 90017



PALMDALE WATER DISTRICT

APPROVED BY

TITLE

DATE

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ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
	HAZEN NO.:	20182-004
GENERAL	CONTRACT NO.:	XX-XX-XXX
NOTES	DRAWING NUMBER:	
		G004

## LINETYPE LEGEND

EX BUILDING	EXISTING	NEW BUILDING -	NEW
EX RETAINING WALL		NEW DITCH LINE -	· · · ·
EX OVERHEAD COMMUNICATION LINE	OHC	NEW OVERHEAD ELECTRIC -	OHE
EX DITCH LINE	· · · ·	NEW UNDERGROUND ELECTRIC -	UGE
EX OVERHEAD ELECTRIC	OHE	NEW FENCE LINE -	X
EX FENCE LINE	X	NEW PIPE	
EX GAS LINE	GAS	NEW EDGE OF PAVEMENT	
EX SLUDGE LINE		NEW TREELINE	
EX EASEMENT		NEW SEWER LINE (FORCE MAIN)	FM
EX PROPERTY LINE		NEW SEWER LINE (GRAVITY)	ss
EX RIGHT-OF-WAY LINE		NEW STORM LINE	
EX ROAD CENTERLINE		NEW WATERLINE	w
EX EDGE OF PAVEMENT			
EX GUARDRAIL			
EX EDGE OF GRAVEL			
EX PAVEMENT MARKING			
EX TREELINE			
EX SEWER LINE (GRAVITY	() ss		
EX STORM LINE	SD		
EX SIDEWALK			
EX EDGE OF RIVER			
	+++++++++++++++++++++++++++++++++++++++		
EX RAILROAD			
EX KAILROAD			
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		EROSION AN	D SEDIMENT CONT
	CH PATTERNS	EROSION AN	STREAM SWALE WITH LINING
	CH PATTERNS	 	STREAM SWALE WITH LINING STABILIZED OUTLET FOR SILT FENCE
	CH PATTERNS EX ASPHALT PAVEMENT		STREAM SWALE WITH LINING STABILIZED OUTLET FOR SILT FENCE YARD INLET PROTECTION
	CH PATTERNS EX ASPHALT PAVEMENT	 	STREAM SWALE WITH LINING STABILIZED OUTLET FOR SILT FENCE
	CH PATTERNS   EX ASPHALT PAVEMENT   ASPHALT OVERLAY   ASPHALT PAVEMENT		STREAM SWALE WITH LINING STABILIZED OUTLET FOR SILT FENCE YARD INLET PROTECTION GRAVEL CONSTRUCTION ENTRANCE SILT FENCE
	CH PATTERNS EX ASPHALT PAVEMENT ASPHALT OVERLAY		STREAM SWALE WITH LINING STABILIZED OUTLET FOR SILT FENCE YARD INLET PROTECTION GRAVEL CONSTRUCTION ENTRANCE SILT FENCE LIMITS OF DISTURBANCE
	CH PATTERNS   EX ASPHALT PAVEMENT   ASPHALT OVERLAY   ASPHALT PAVEMENT		SWALE WITH LINING STABILIZED OUTLET FOR SILT FENCE YARD INLET PROTECTION GRAVEL CONSTRUCTION ENTRANCE SILT FENCE

٨S					PROJECT ENGINEER:	TBD	Γ
GWILLIAMS					DESIGNED BY:	TBD	
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DATE: 3/8/2024					IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS	0 1/2" 1"	
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PRELIMINARY DRAWING DO NOT USE FOR CONSTRUCTION

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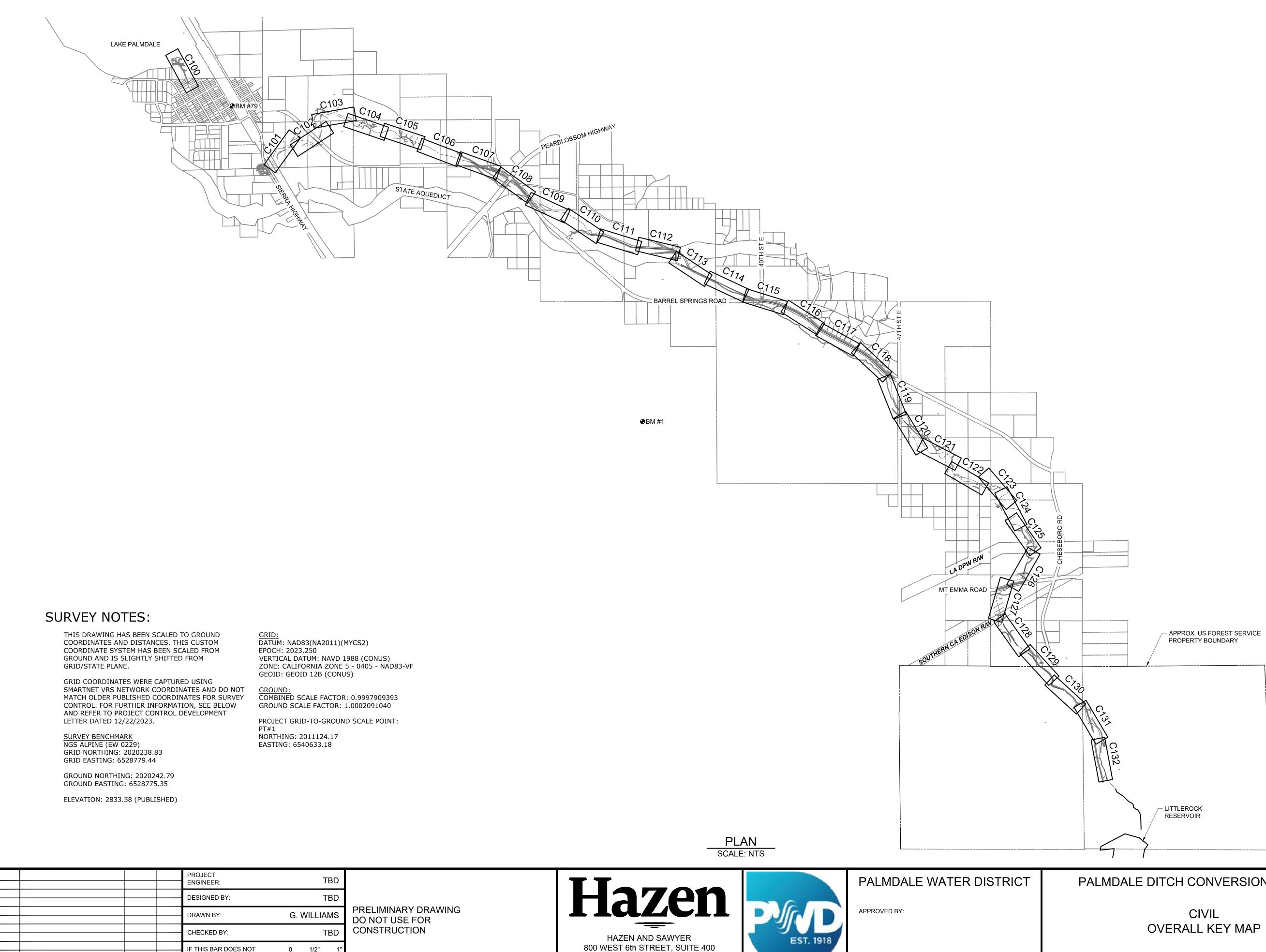
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C	ELECTRICAL POWER POLE		TREELINE	~~~~~	$\frown /$
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-\$ <del>`</del> -	WATER HYDRANT (YARD)	О ҮН	CONTOUR LINES	<u>- 800 801</u>	
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ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
	HAZEN NO.:	20182-004
GENERAL	CONTRACT NO.:	XX-XX-XXX
LEGEND	DRAWING NUMBER:	
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LOS ANGELES, CALIFORNIA 90017

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ile: C:/USERS/GWILLIAMS/DC/ACCDOCS/HAZEN AND SA LOT DATE: 3/11/2024 5:27 PM BY: GWILLIAMS					PROJECT ENGINEER:	TBD	
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ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL OVERALL KEY MAP	HAZEN NO.:	20182-004
	CONTRACT NO.	XX-XX-XXX
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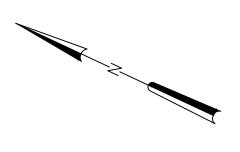
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PLAN SCALE: 1" = 50'



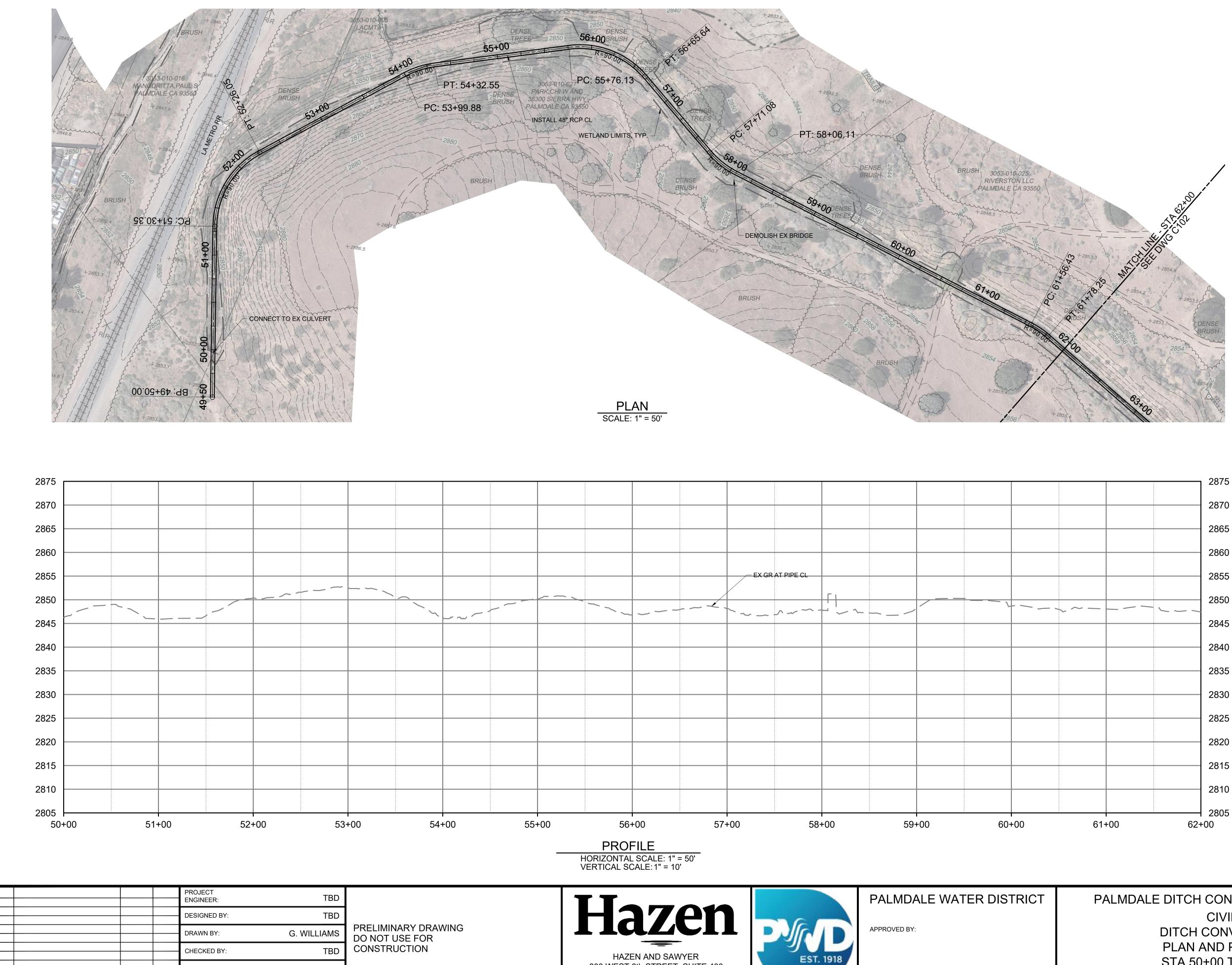




### NOTES:

- TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO.:	XX-XX-XXX
PALMDALE DISCHARGE PLAN AND PROFILE	DRAWING NUMBER:	
		C100



800 WEST 6th STREET, SUITE 400

LOS ANGELES, CALIFORNIA 90017

TITLE

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IF THIS BAR DOES NOT 0 1/2" 1' MEASURE 1" THEN DRAWING IS

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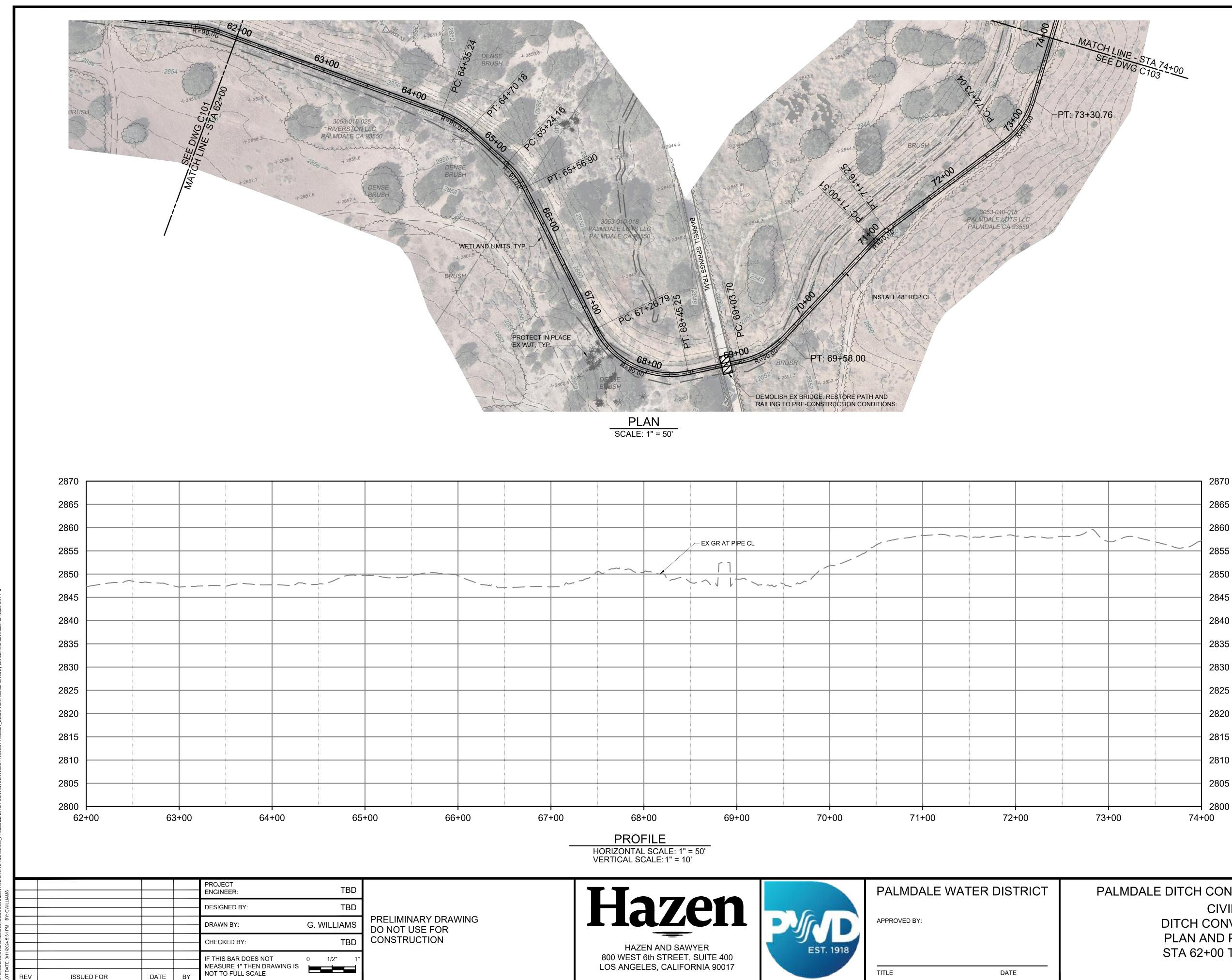


## NOTES:

- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
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ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
PLAN AND PROFILE	DRAWING NUMBER:	
STA 50+00 TO 62+00		
		C101



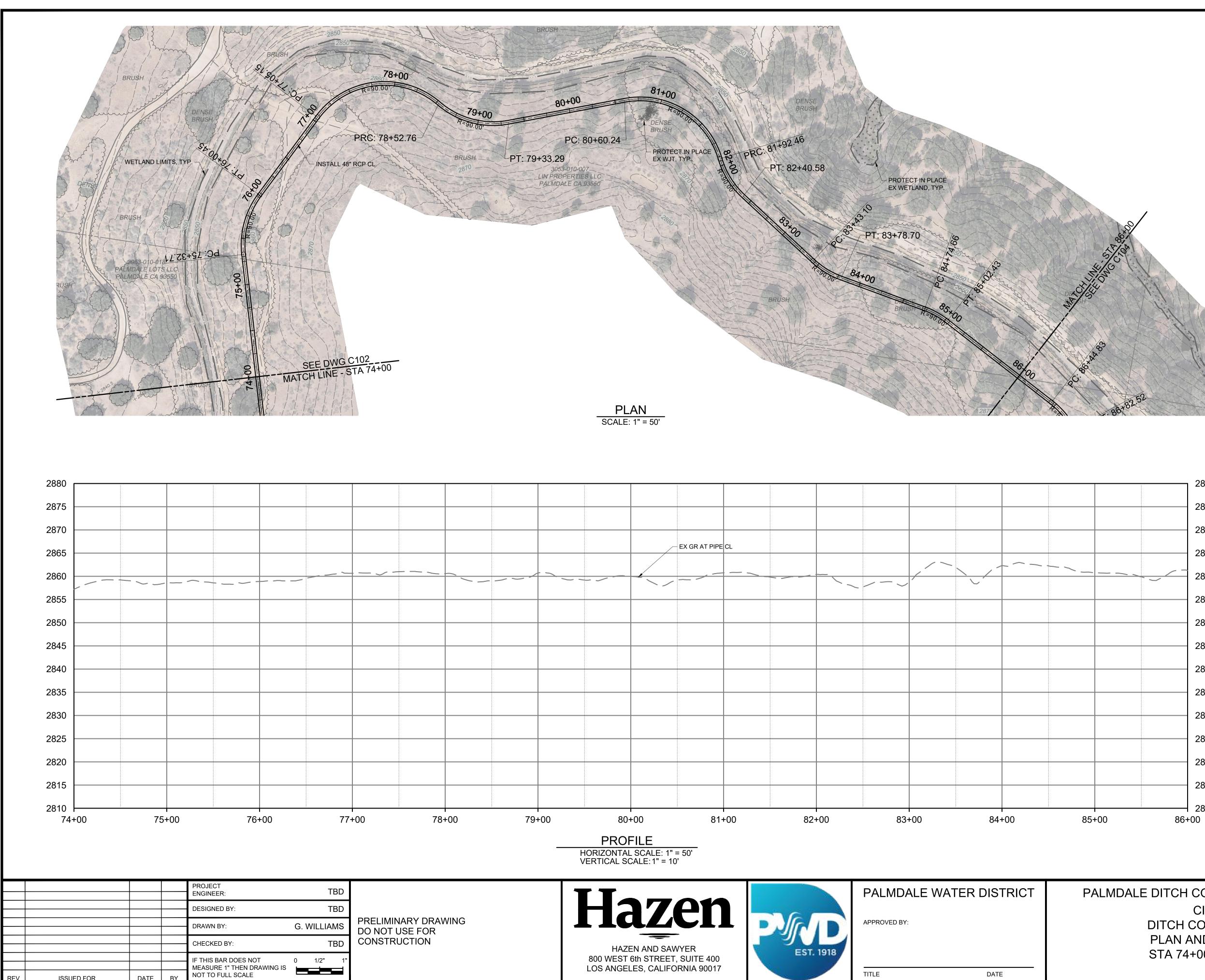






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ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
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LOS ANGELES, CALIFORNIA 90017

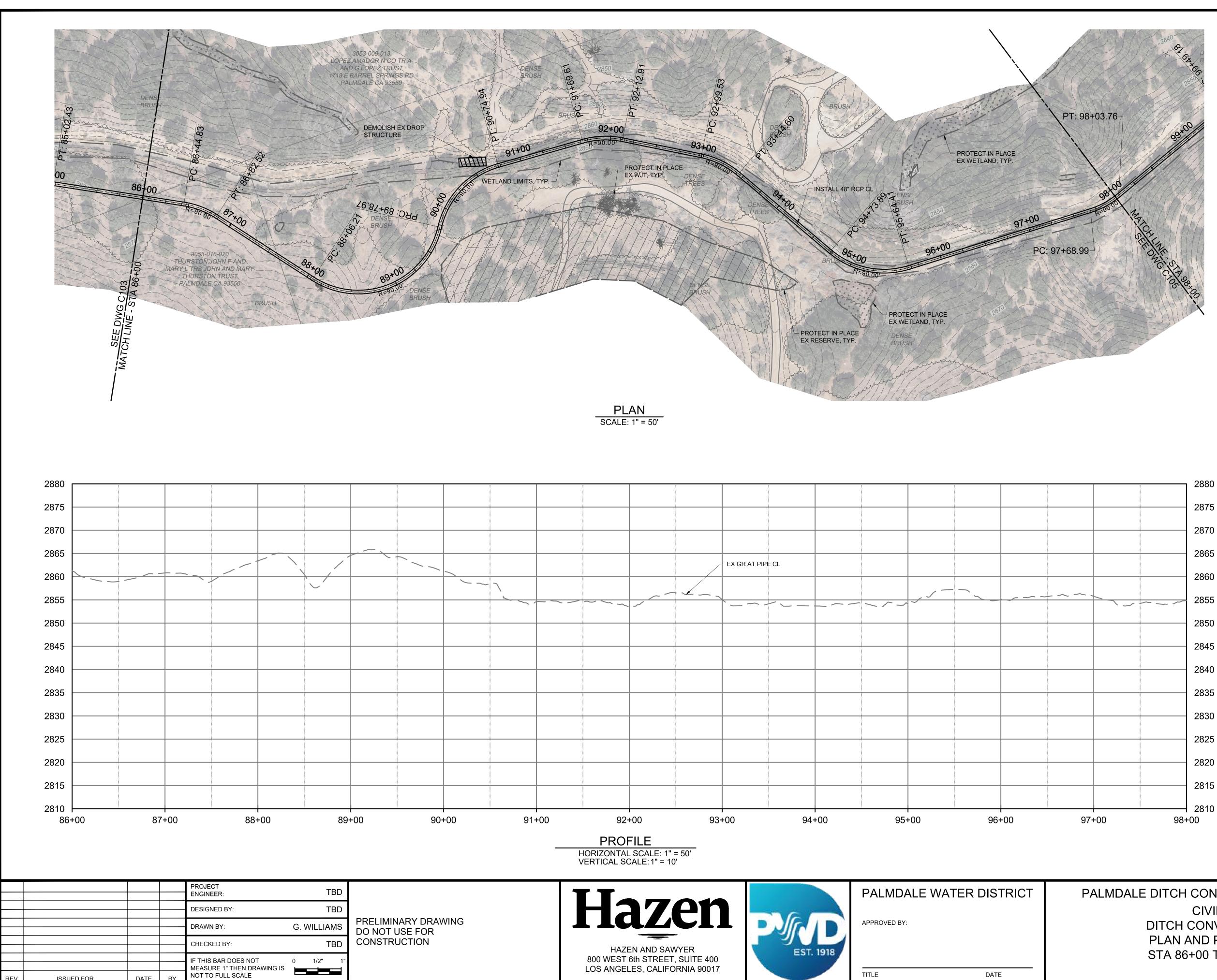
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ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
PLAN AND PROFILE	DRAWING NUMBER:	
STA 74+00 TO 86+00		0400
		C103

- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

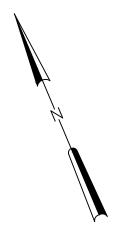


ISSUED FOR

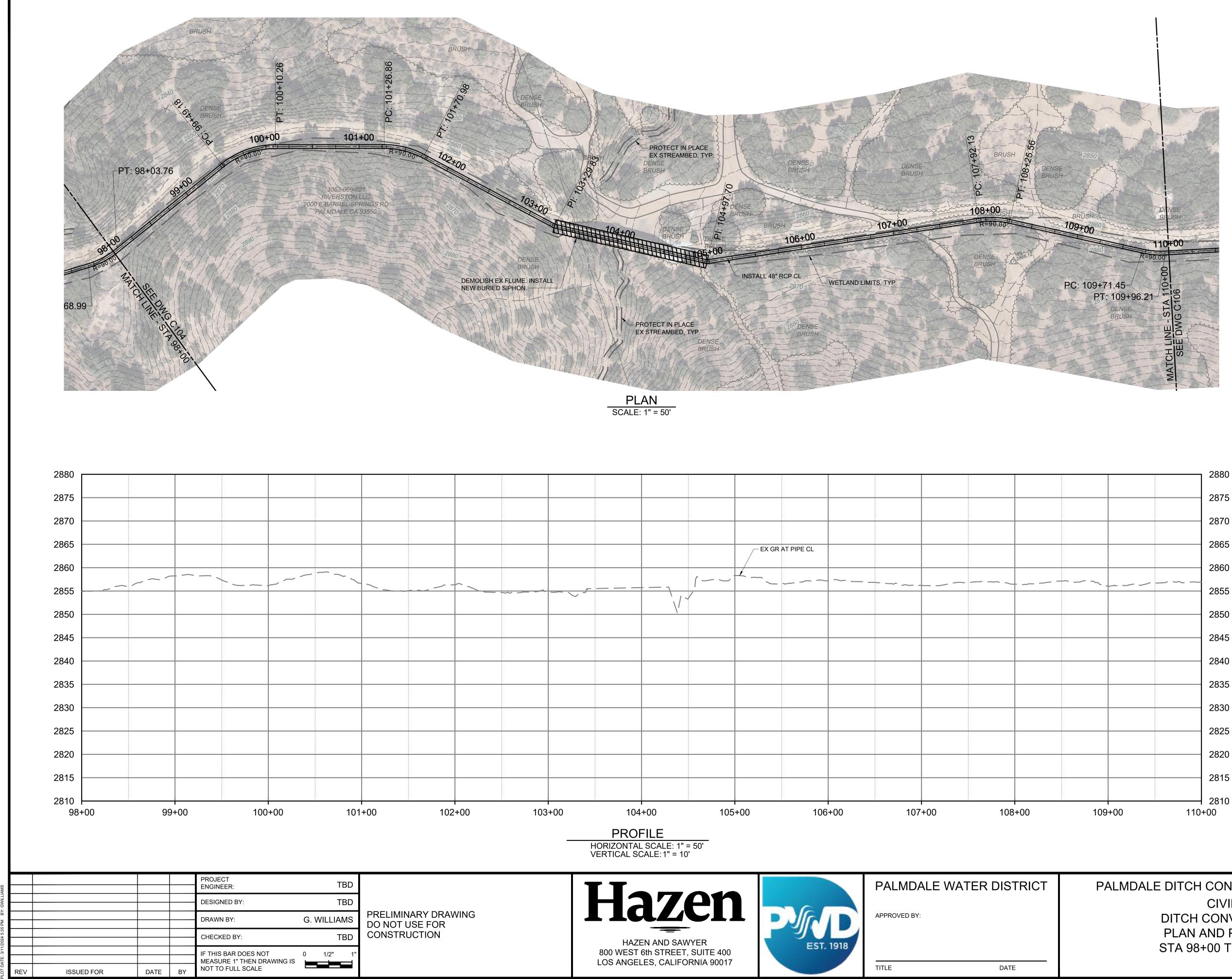
DATE

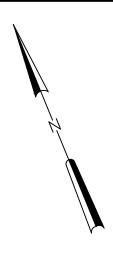
ΒY

	PALMDALE WATER DISTRICT	PALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
6		CIVIL	HAZEN NO.:	20182-004
	APPROVED BY:	DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
EST. 1918		PLAN AND PROFILE	DRAWING NUMBER:	
		STA 86+00 TO 98+00		C104
	TITLE DATE		1	0104



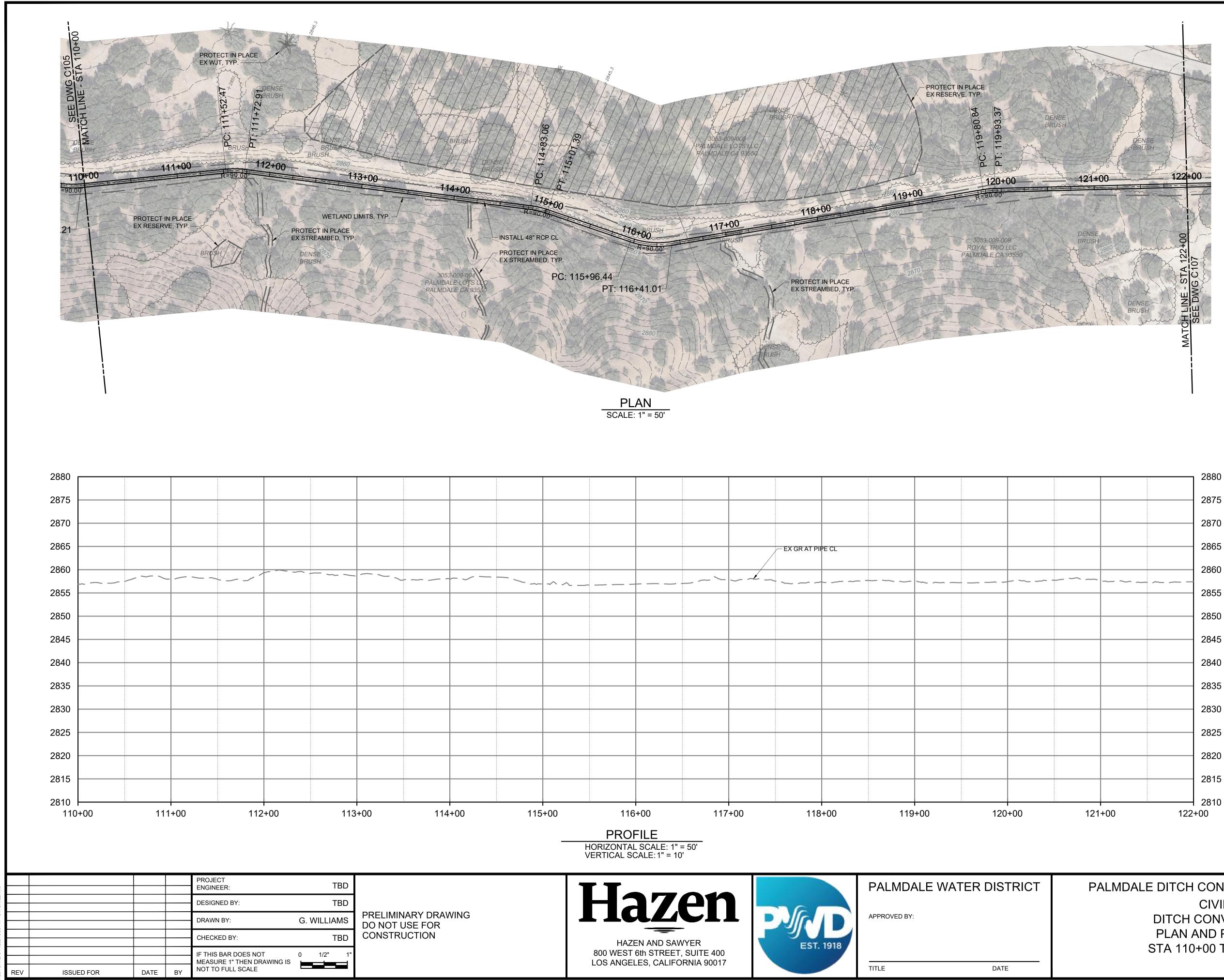
- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

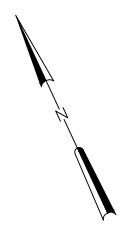




- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

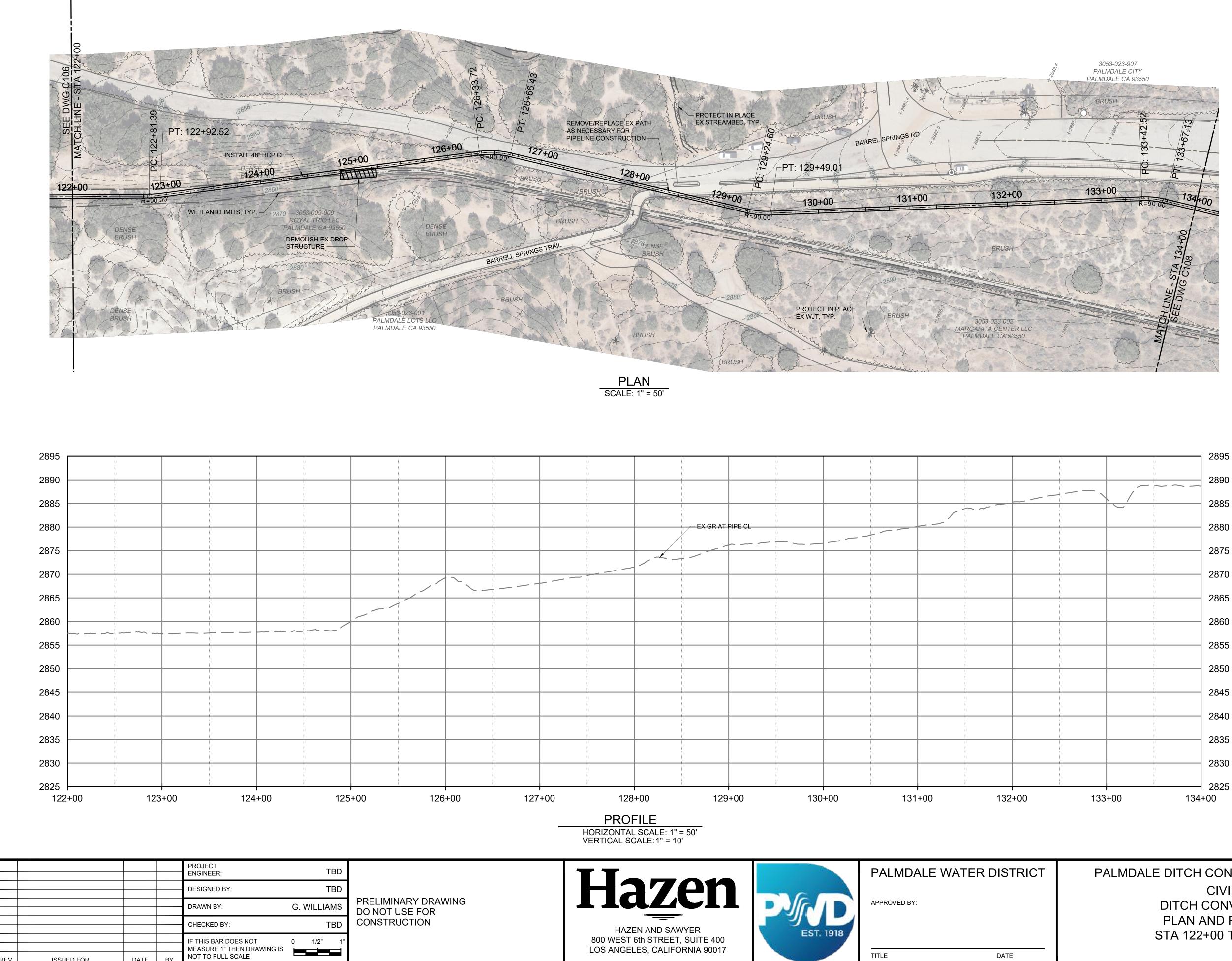
ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
PLAN AND PROFILE	DRAWING NUMBER:	
STA 98+00 TO 110+00	NUMBER.	
		C105





- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
PLAN AND PROFILE	DRAWING NUMBER:	
STA 110+00 TO 122+00	NUMBER.	
		C106

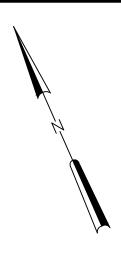


DATE

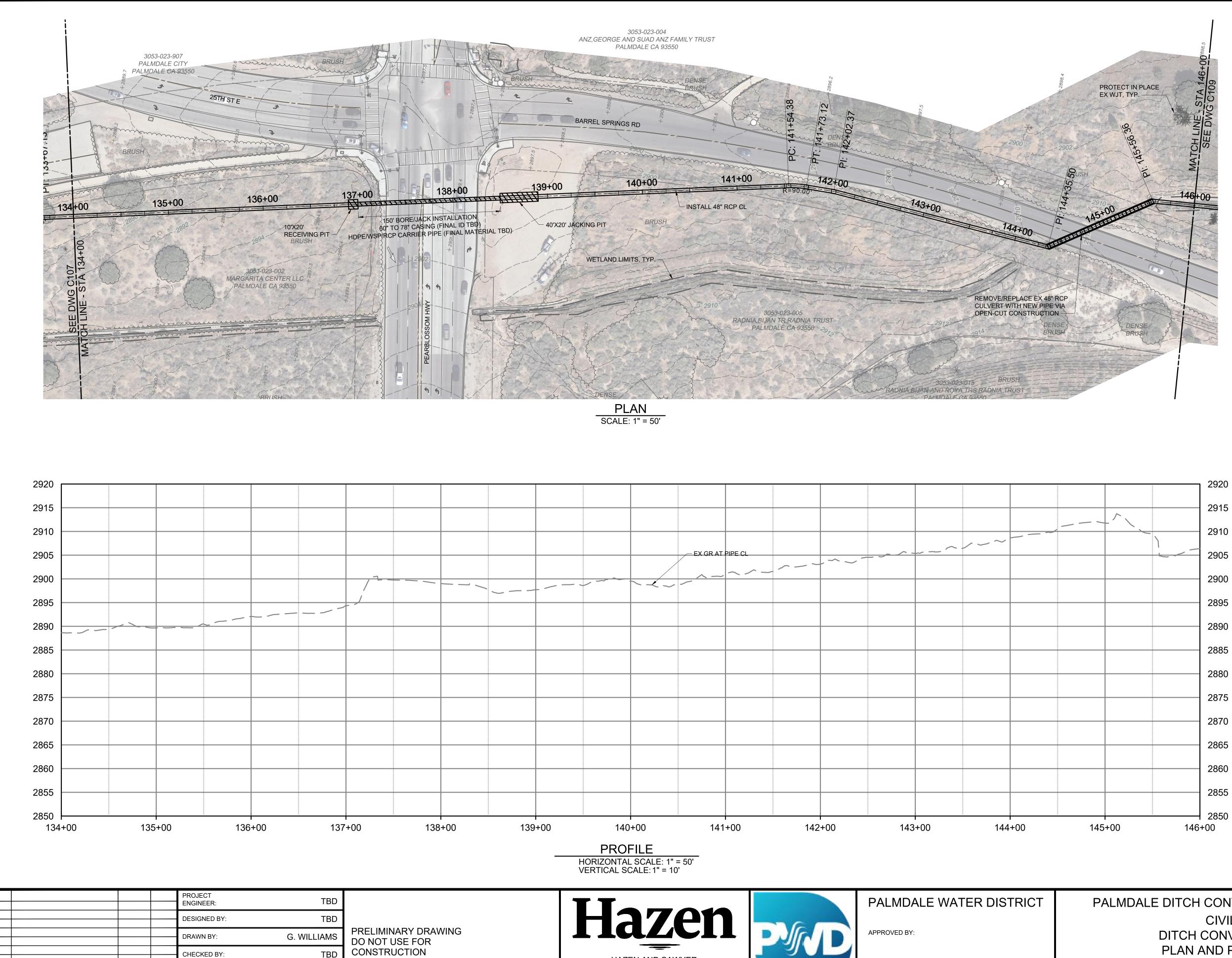
ΒY

ISSUED FOR

	PALMDALE WATER DISTRICT	PALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
		CIVIL	HAZEN NO.:	20182-004
	APPROVED BY:	DITCH CONVERSION	CONTRACT NO.:	XX-XX-XXX
EST. 1918		PLAN AND PROFILE STA 122+00 TO 134+00	DRAWING NUMBER:	
	 TITLE DATE	STA 122100 TO 134100		C107



- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.



ISSUED FOR

DATE

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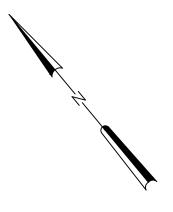
TBD 0 1/2"

IF THIS BAR DOES NOT

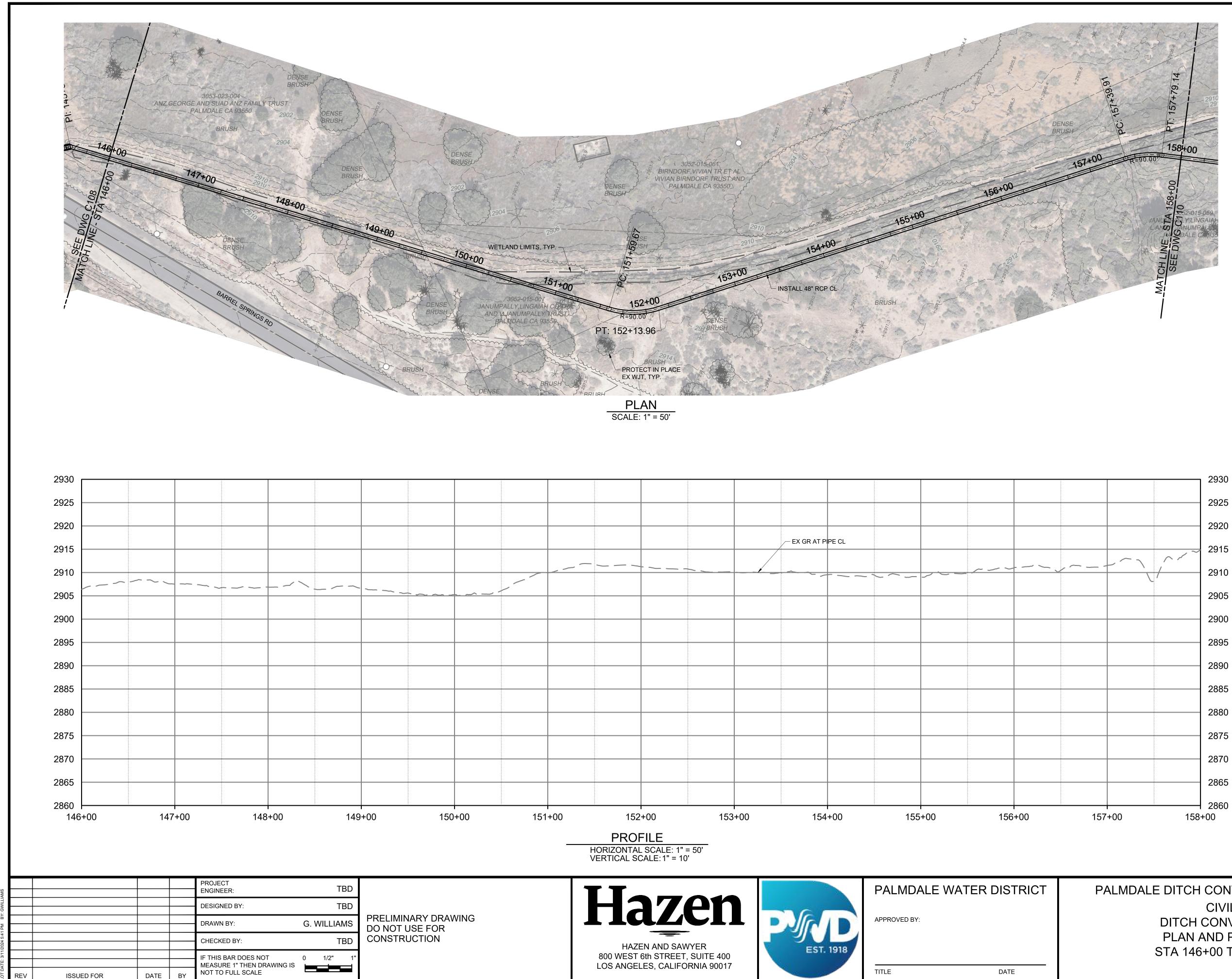
MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

CONSTRUCTION

												2880		
												2875		
												2870		
												2865		
												2860		
												2855		
												2850		
139+00	14	0+00	141+00	142+00	143	8+00	144-	-00	145	+00	146	+00		
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									1					
	TT	aze			PALMD	ALE WAT	FER DIST	RICT	PA	ALMDAL	E DITCH	CONVERSION PROJECT	DATE:	MARCH 2024
		<b>A7C</b>										CIVIL	HAZEN NO.:	20182-004
			┻┻╽		APPROVED BY	:							CONTRACT N	IO.: XX-XX-XXX
	HA	ZEN AND SAWYER		EST. 1918								AND PROFILE +00 TO 146+00	DRAWING NUMBER:	
		F 6th STREET, SUITE ELES, CALIFORNIA 9			TITLE		DATE				51A 154			C108
	•				-				-					



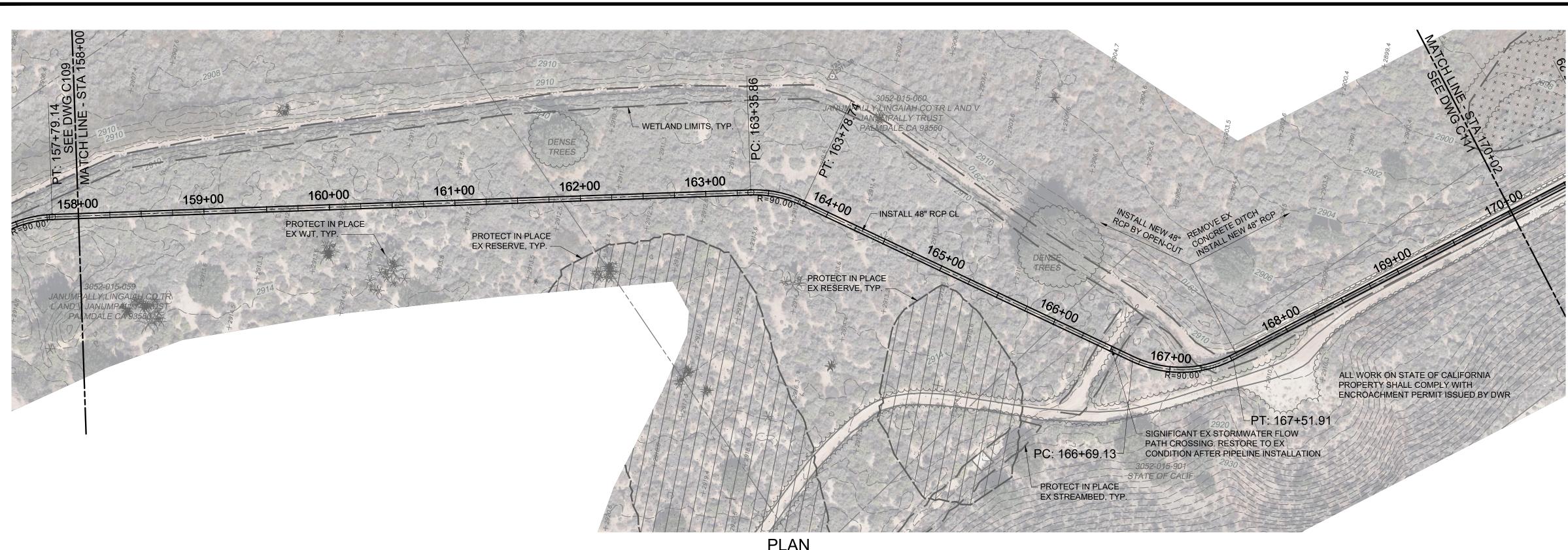
- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

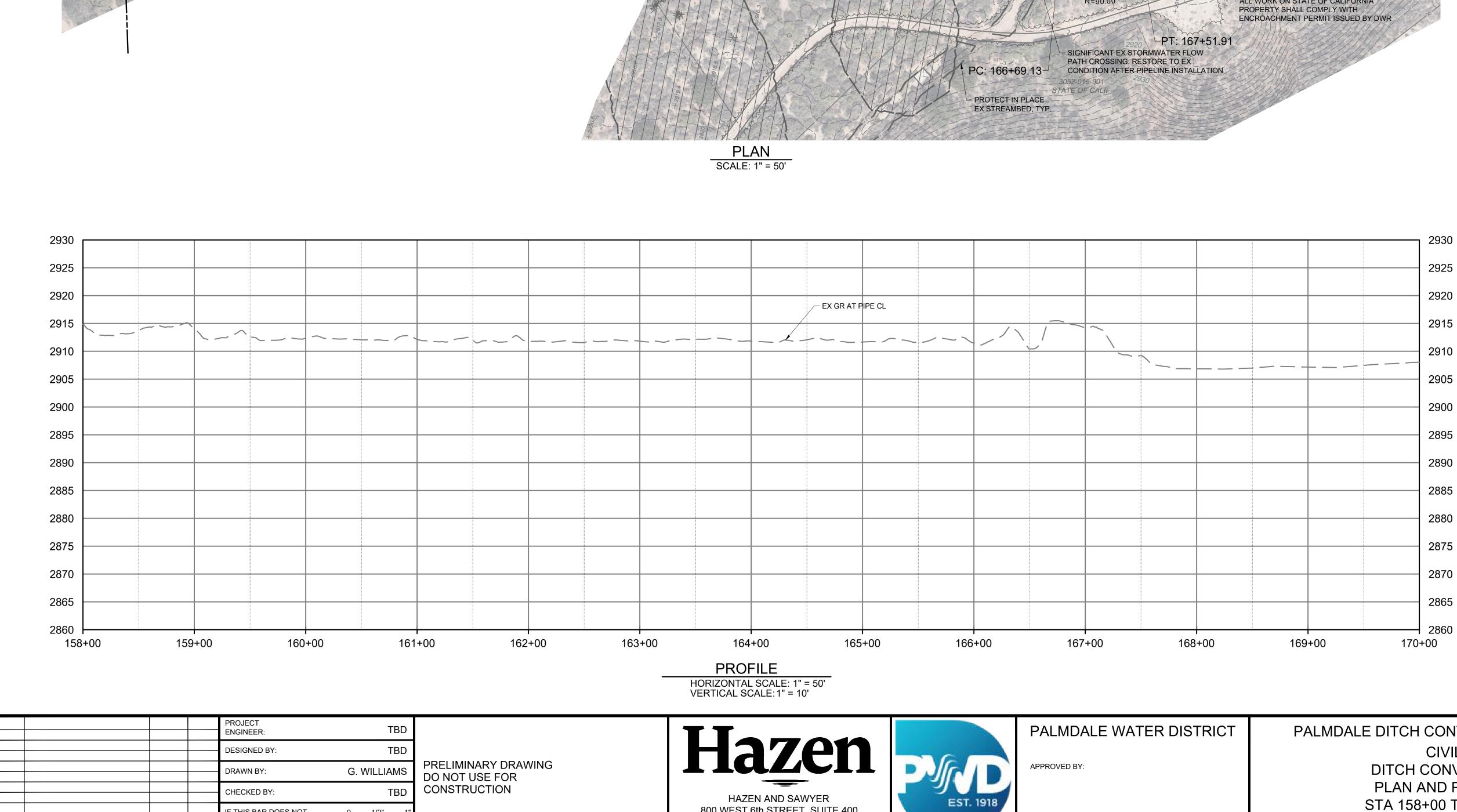


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- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
PLAN AND PROFILE	DRAWING NUMBER:	
STA 146+00 TO 158+00	NUMBER.	
		C109



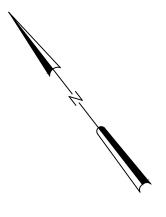


AMS					PROJECT ENGINEER:	TBD
BY: GWILLIAMS					DESIGNED BY:	TBD
					DRAWN BY:	G. WILLIAMS
3/11/2024 5:42 PM					CHECKED BY:	TBD
DATE: 3/11/					IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS	0 1/2" 1"
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800 WEST 6th STREET, SUITE 400 LOS ANGELES, CALIFORNIA 90017

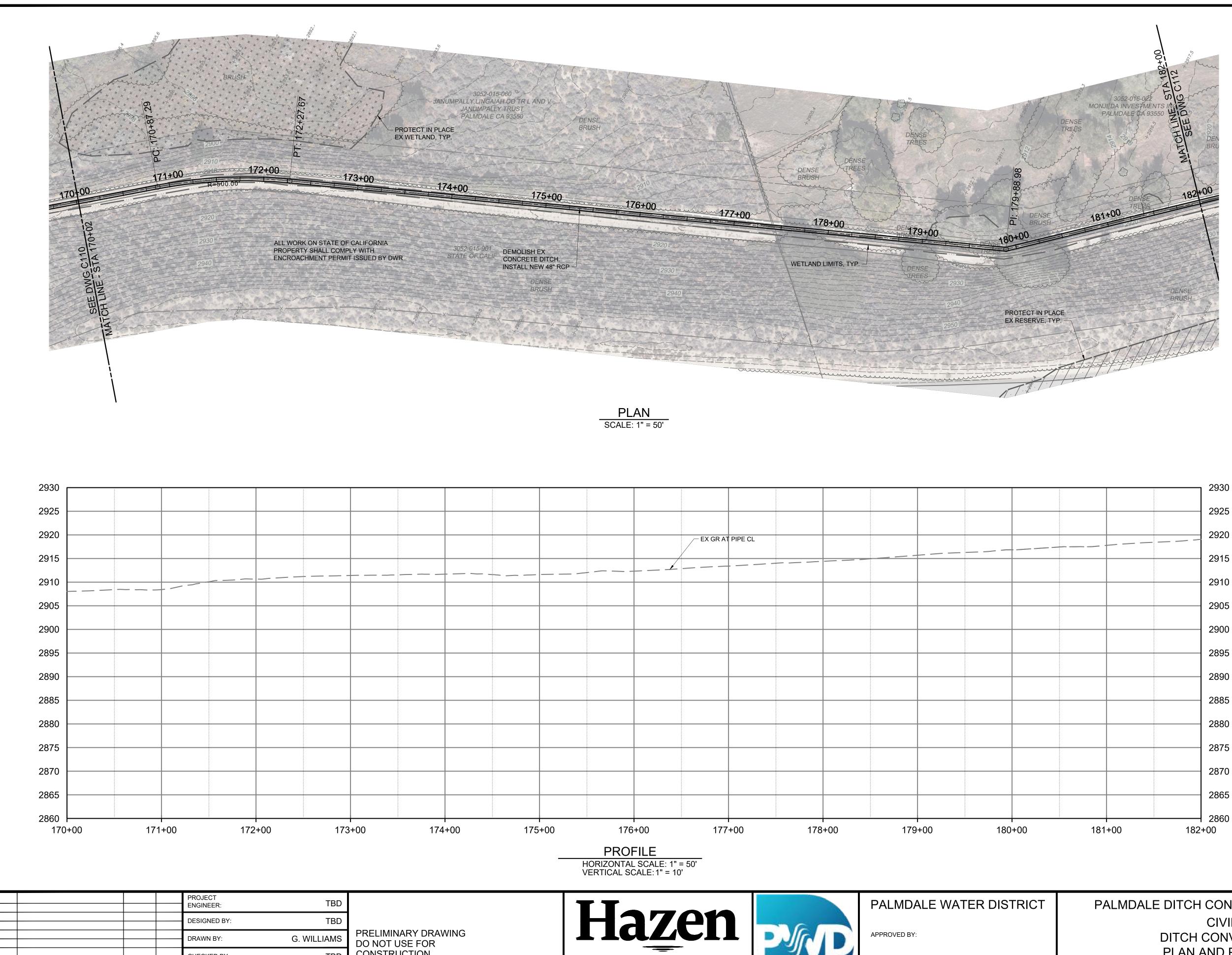
TITLE

DATE



- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
PLAN AND PROFILE		
STA 158+00 TO 170+00	NUMBER:	
		C110



			ENGINEER:	IDD	
			DESIGNED BY:	TBD	
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			DRAWN BY:	G. WILLIAMS	DO NOT
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			IF THIS BAR DOES NOT	0 1/2" 1"	
			MEASURE 1" THEN DRAWING IS		
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HAZEN AND SAWYER 800 WEST 6th STREET, SUITE 400 LOS ANGELES, CALIFORNIA 90017



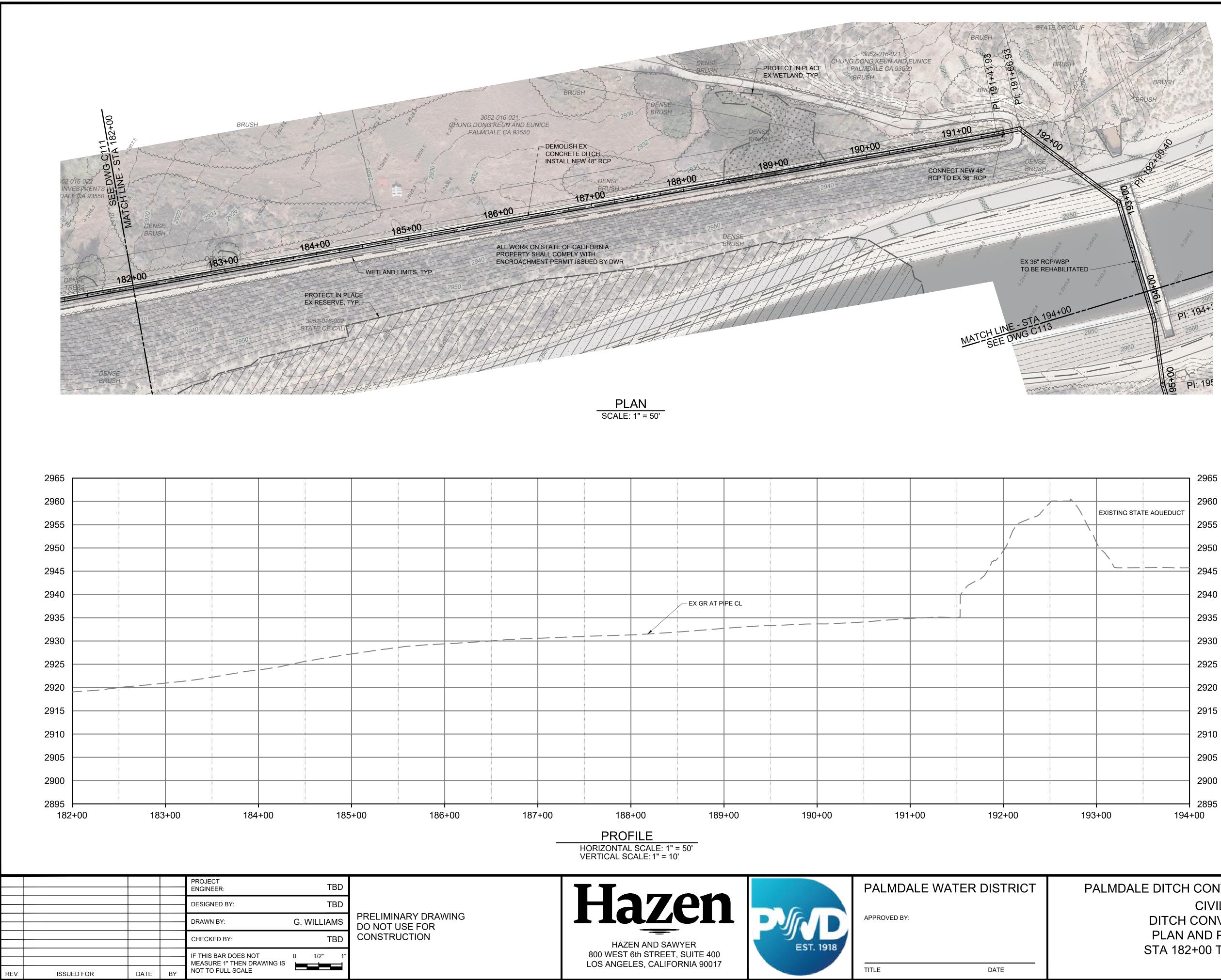
TITLE

DATE



- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
PLAN AND PROFILE	DRAWING NUMBER:	
STA 170+00 TO 182+00	NOWBEN.	
		C111



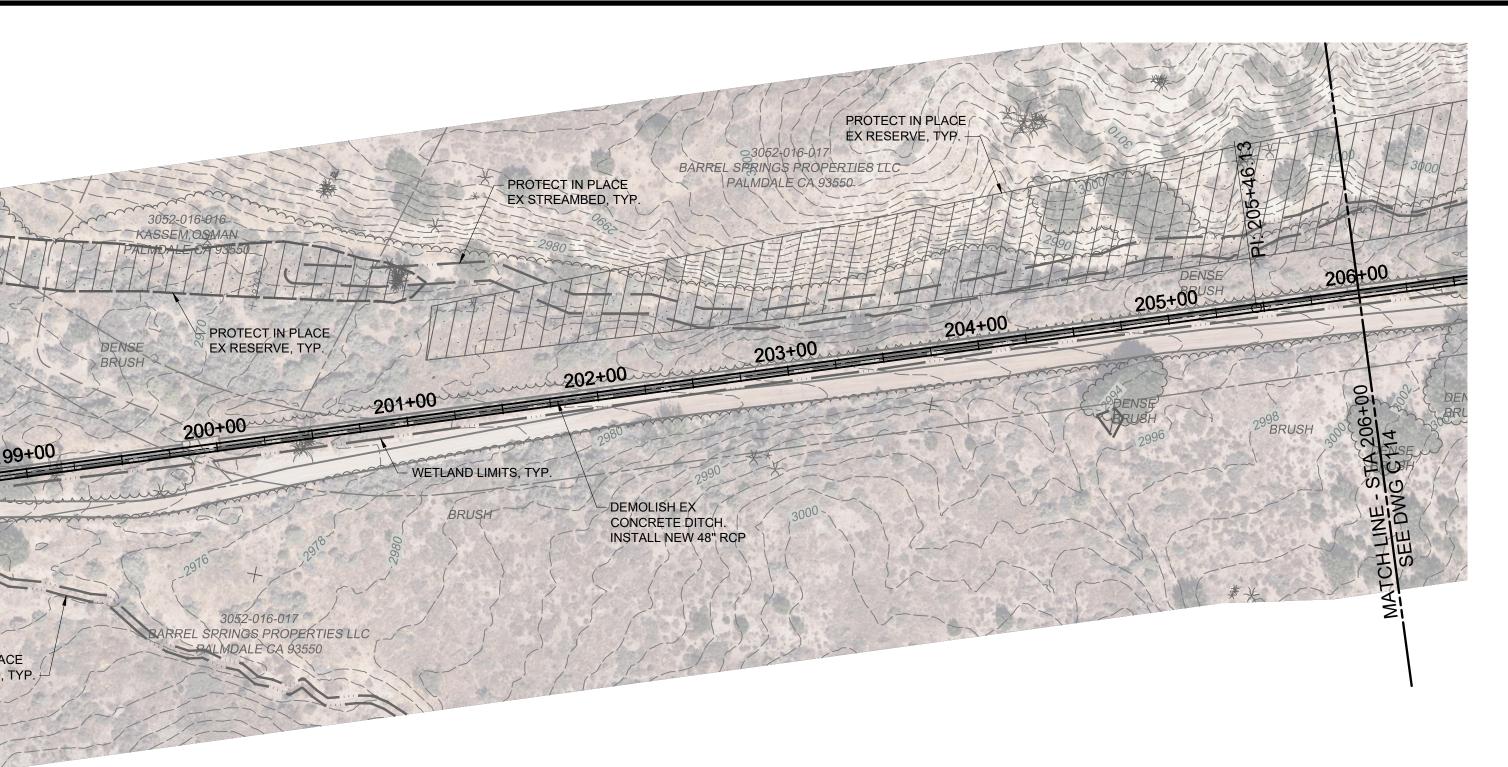


- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

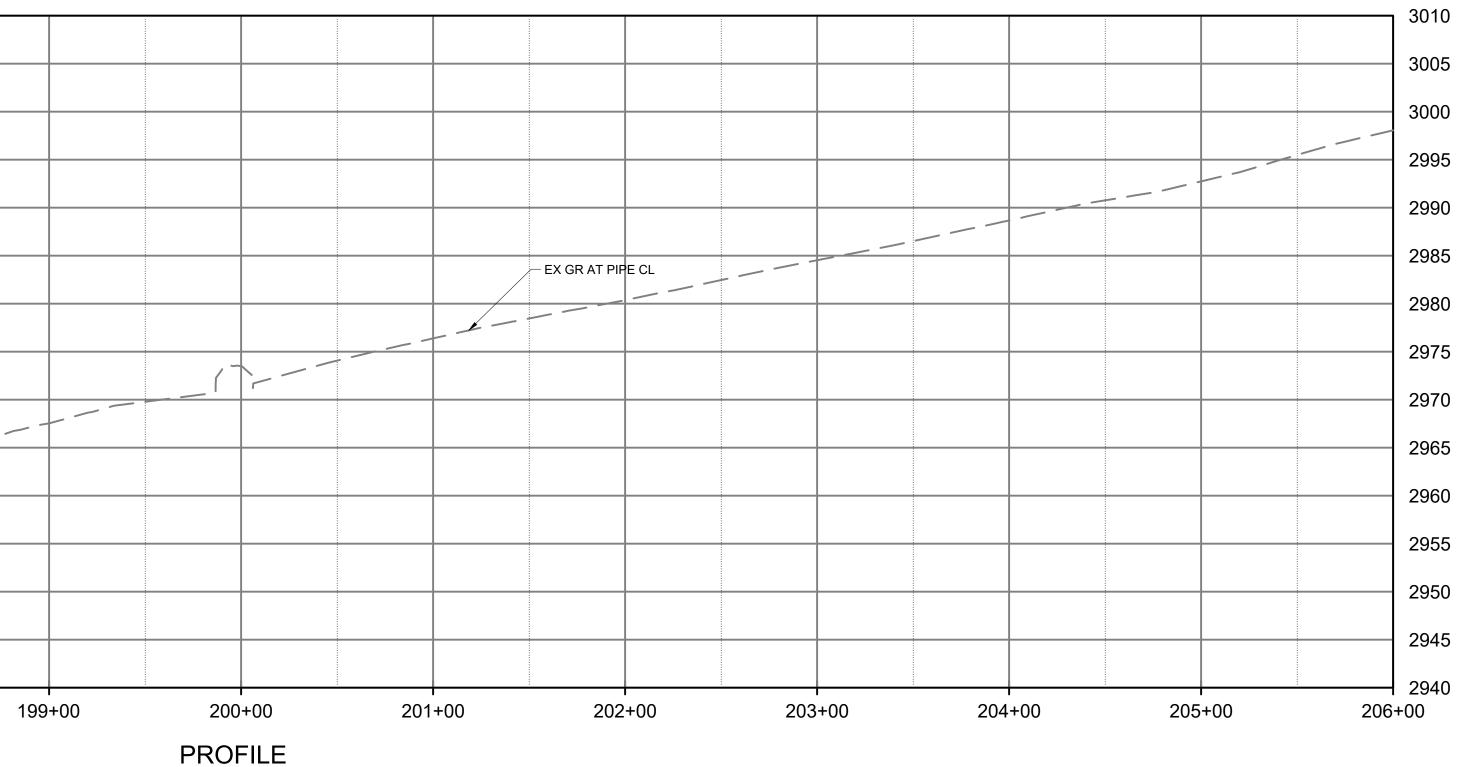
ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
PLAN AND PROFILE	DRAWING NUMBER:	
STA 182+00 TO 194+00		C112

	EX 36" RCP/WSP TO BE REHABILITA		406+00	Place EX 36" RCP NEW 48" RCP BY PEN-CUT CONSTRUCT	197+00 MITH		3+00
	CONNEC	95+59.47 T NEW 48" EX 36" RCP ACE YP.	BRUSH 2950	NEW 46 PEN-CUT CONSTRUT 8500 T IN PLACE	STION 20	7 - 20	2968 2970 PROTECT EX STREA PROTECT IN PLACE EX WJT, TYP.
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3005							
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2940 H 194+	-00	195+00		196+00	197	7+00	198+00
			PROJECT ENGINEER:		TBD		
			DESIGNED BY: DRAWN BY:	G.	TBD WILLIAMS	PRELIMINAR DO NOT USE	
			CHECKED BY:		TBD	CONSTRUCT	
			IF THIS BAR DOES	NOT 0	1/2" 1"		

1. 194+31.40



PLAN SCALE: 1" = 50'

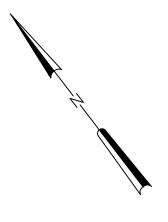


HORIZONTAL SCALE: 1" = 50' VERTICAL SCALE: 1" = 10'

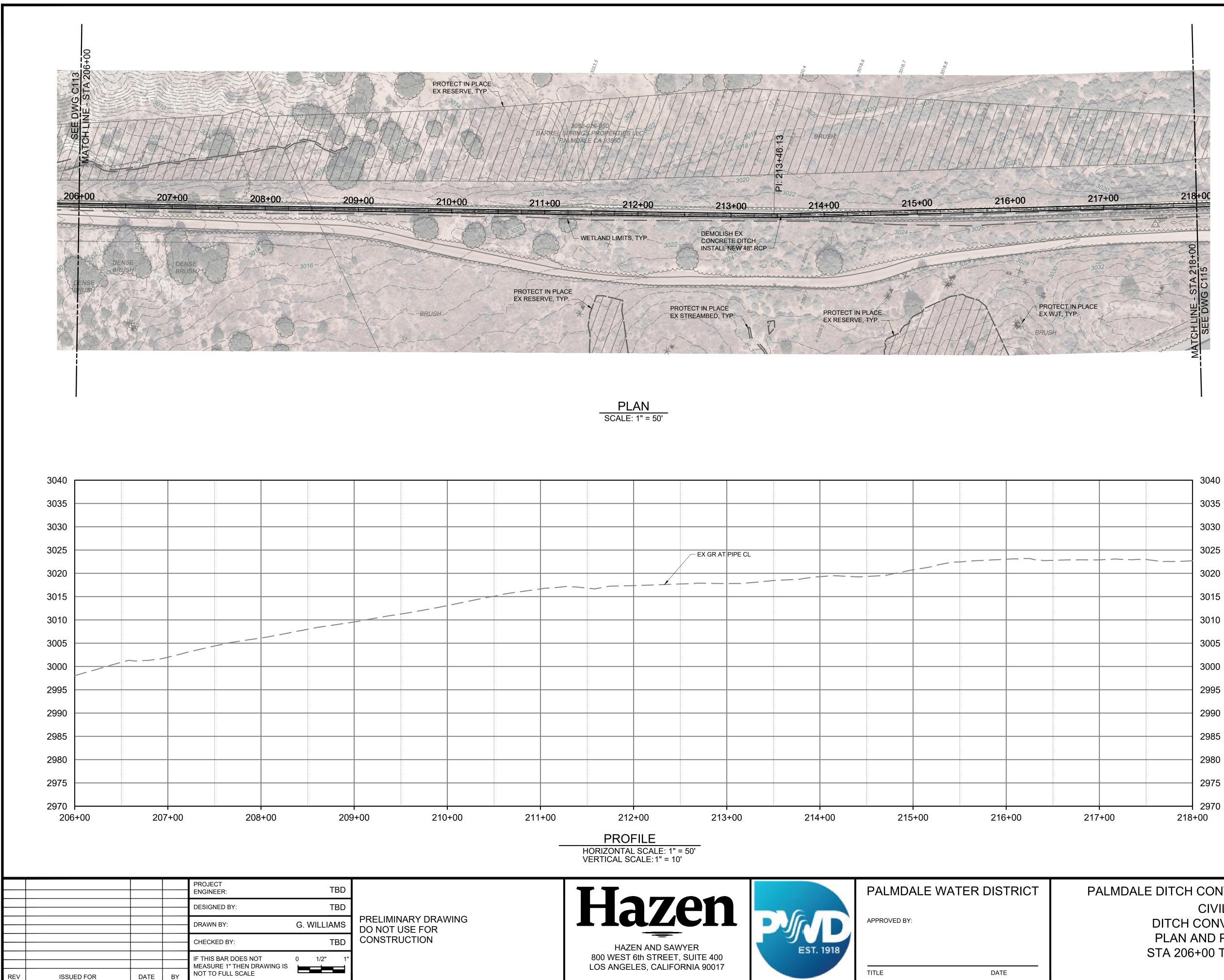




PALMDALE WATER DISTRICT	PALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
	CIVIL	HAZEN NO.:	20182-004
APPROVED BY:	DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
	PLAN AND PROFILE	DRAWING NUMBER:	
	STA 194+00 TO 206+00	NOMBER.	
TITLE DATE			C113

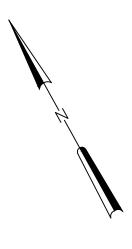


- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
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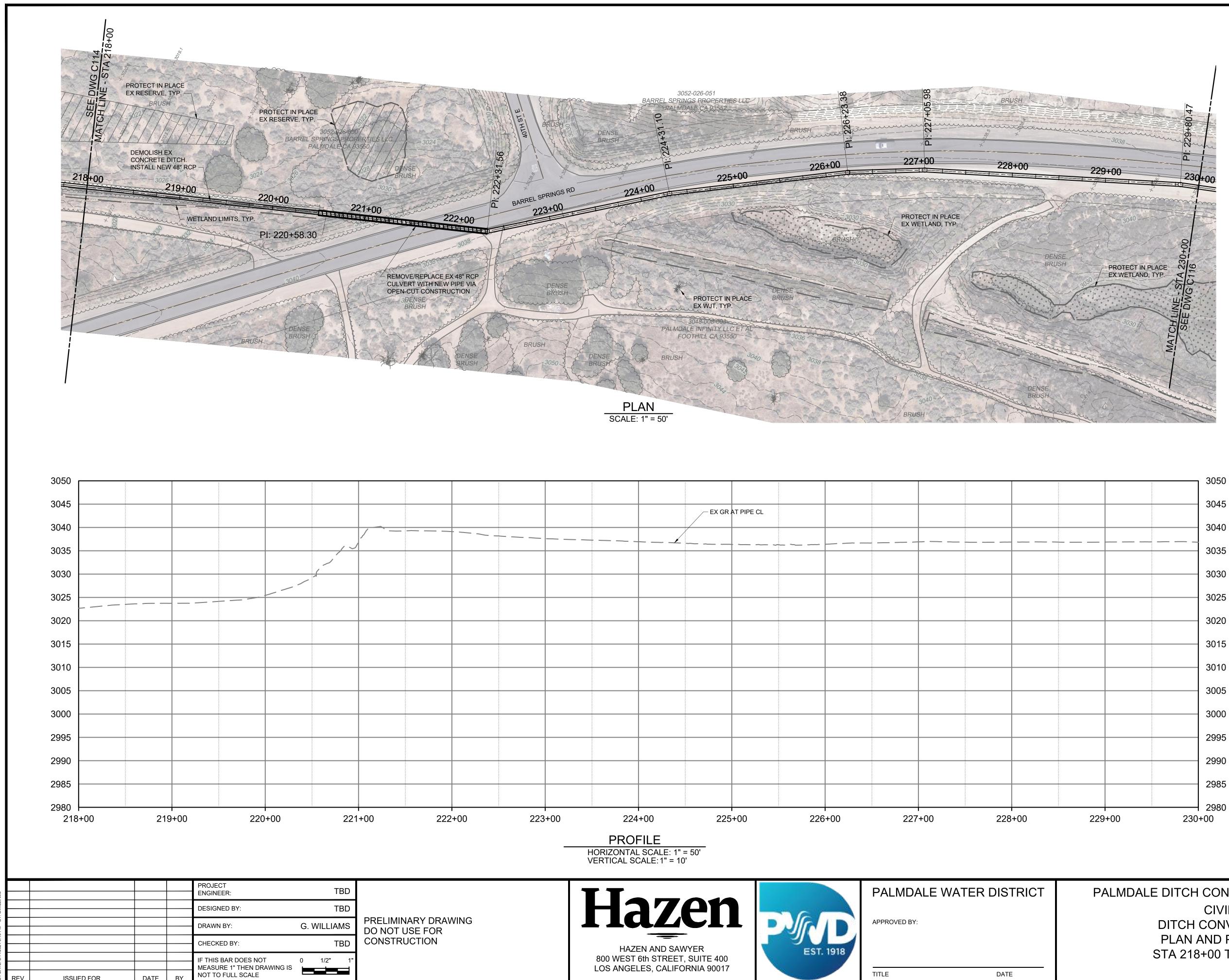


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PALMDALE WATER DISTRICT	PALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
	CIVIL	HAZEN NO.:	20182-004
APPROVED BY:	DITCH CONVERSION	CONTRACT NO .:	XX-XX-XXX
	PLAN AND PROFILE	DRAWING NUMBER:	
	STA 206+00 TO 218+00	NUMBER.	
TITLE DATE			C114



- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.



RE\

DATE

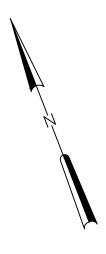
ΒY

ISSUED FOR



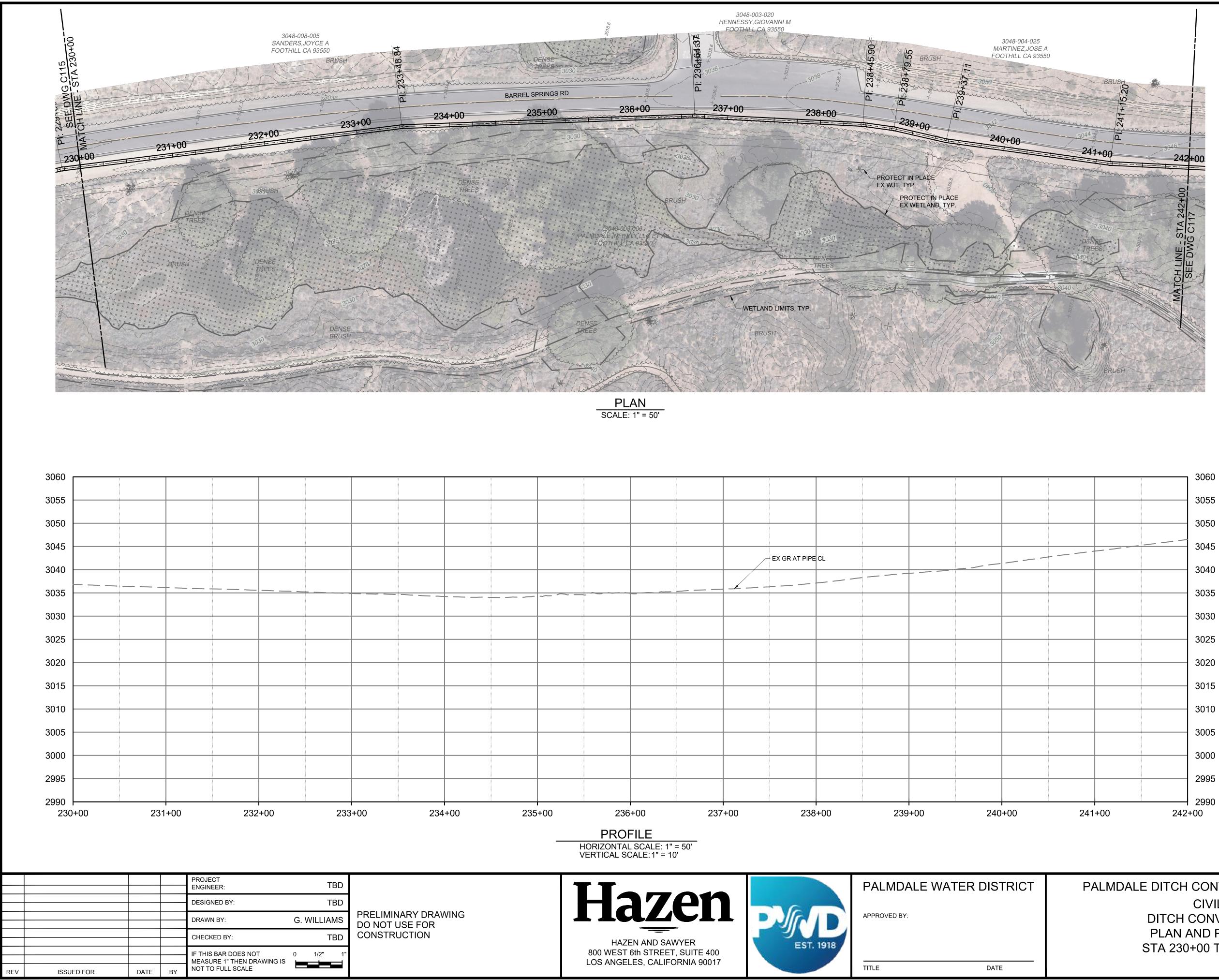
PROFILE	
HORIZONTAL SCALE: 1" = 50 VERTICAL SCALE: 1" = 10'	•

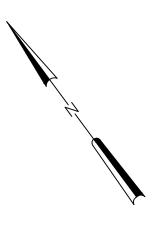
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			EX GR A	T PIPE CL							



- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
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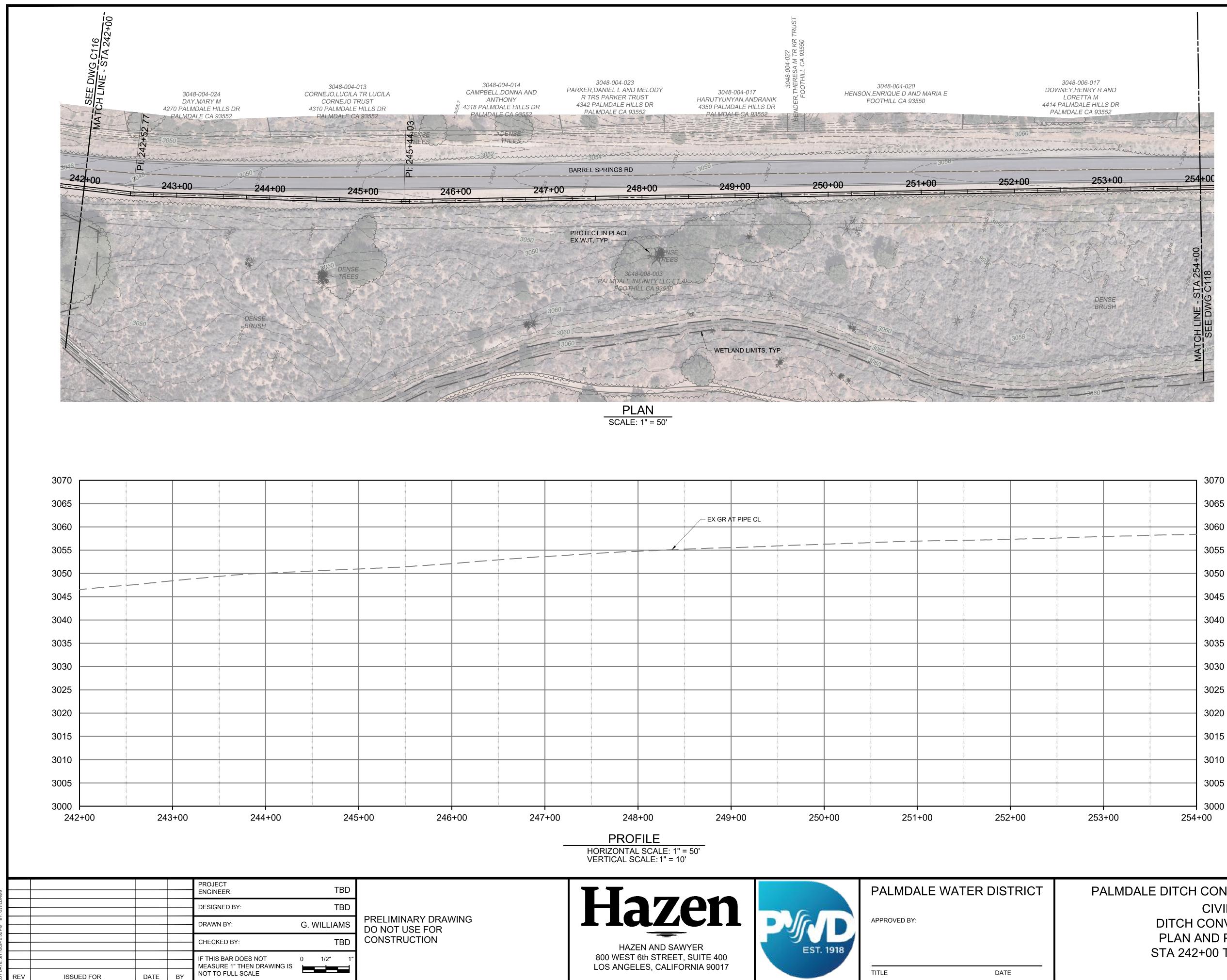
ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO.	XX-XX-XXX
	DRAWING NUMBER:	
STA 218+00 TO 230+00		0115
		C115





- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

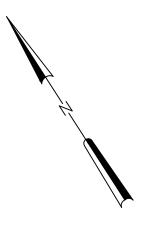
ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO.	XX-XX-XXX
PLAN AND PROFILE STA 230+00 TO 242+00	DRAWING NUMBER:	
STA 230+00 TO 242+00		C116





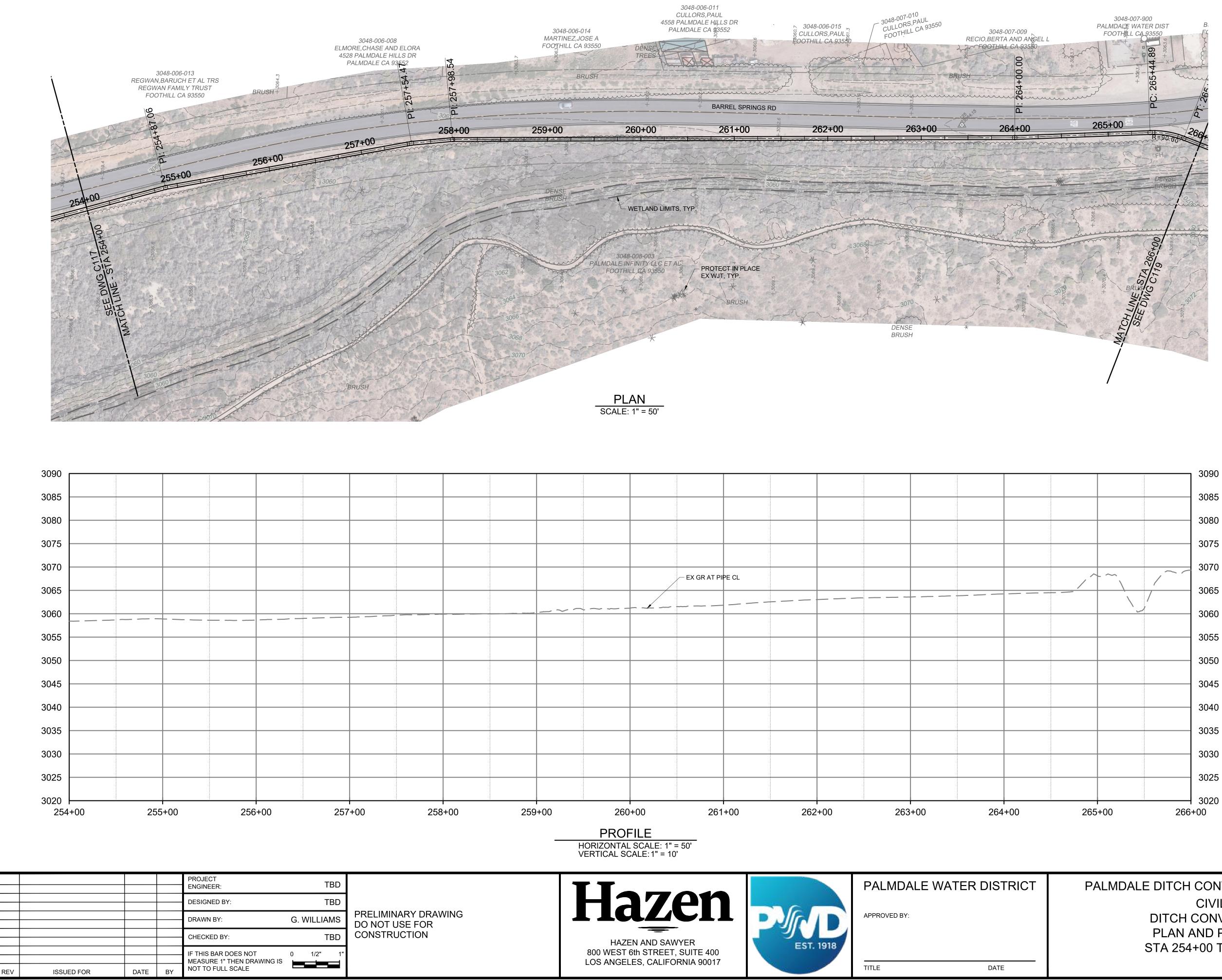
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247-	+00 248	3+00	249	+00	250	+00	251	+00	252	+00	253+





- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
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ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO.	XX-XX-XXX
PLAN AND PROFILE	DRAWING	
STA 242+00 TO 254+00	NUMBER:	
		C117





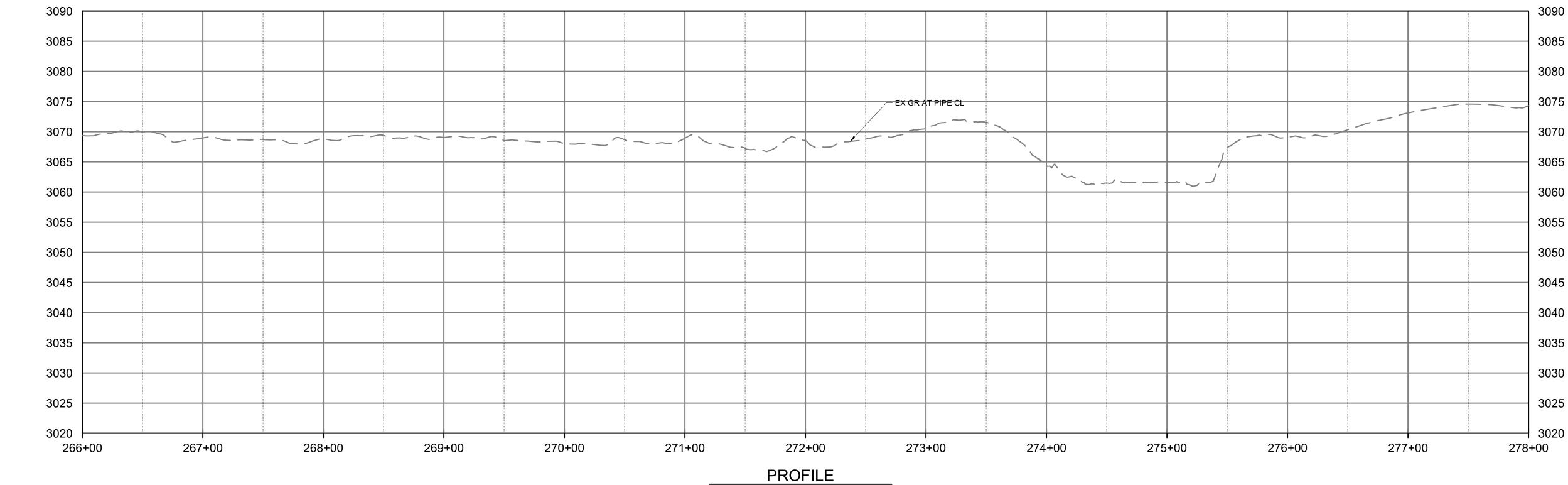
- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
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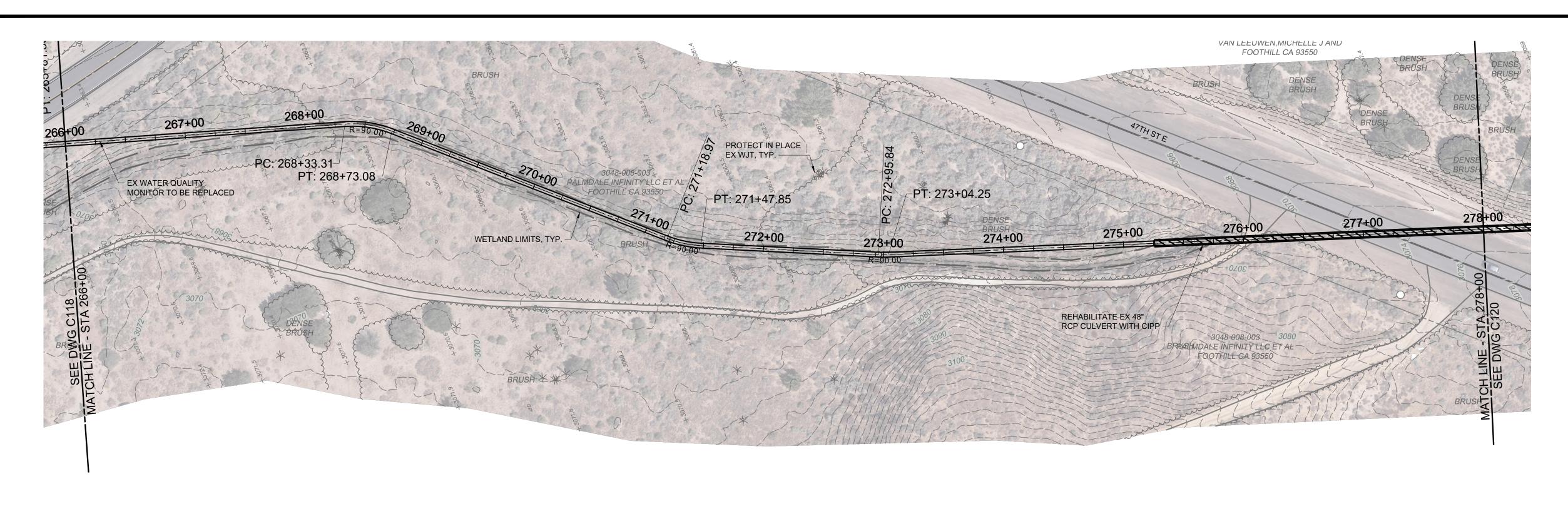
ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO.:	XX-XX-XXX
PLAN AND PROFILE	DRAWING NUMBER:	
STA 254+00 TO 266+00	NOMBER.	
		C118

ĸ					PROJECT ENGINEER:	TBD	
BY: ABROWN					DESIGNED BY:	TBD	
1:23 PM BY					DRAWN BY:	G. WILLIAMS	] F [
3/27/2024 1:2:					CHECKED BY:	TBD	
DATE: 3/27/					IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS	0 1/2" 1"	
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PRELIMINARY DRAWING DO NOT USE FOR CONSTRUCTION

3ROWNIDC/ACCDOCS\HAZEN AND SAWYER\20182-004\_PALMDALE DITCH CONVER SERVICES\PROJECT FILES\01\_DESIGN\CIVIL\C119 Saved by GWILLIAMS Save date: 3/8/2024 11:59 AM



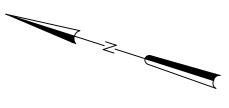


PLAN SCALE: 1" = 50'

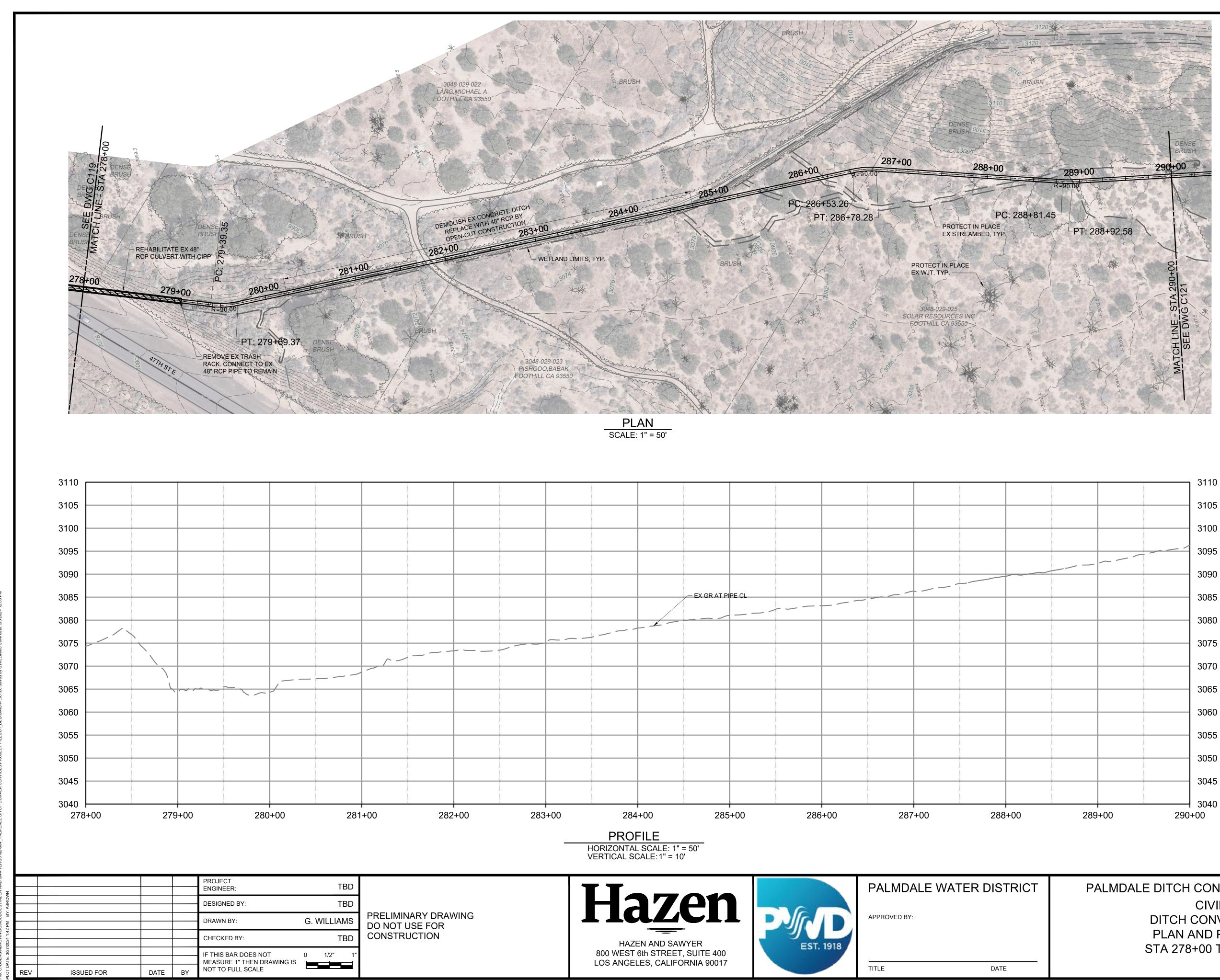
HORIZONTAL SCALE: 1" = 50' VERTICAL SCALE: 1" = 10'

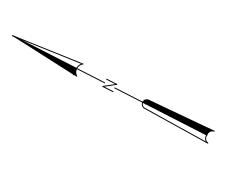


	PALMDALE WATER DISTRICT	PALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
		CIVIL	HAZEN NO.:	20182-004
	APPROVED BY:	DITCH CONVERSION	CONTRACT NO.	XX-XX-XXX
1		PLAN AND PROFILE	DRAWING NUMBER:	
		STA 266+00 TO 278+00	NOMBER.	
	TITLE DATE			C119



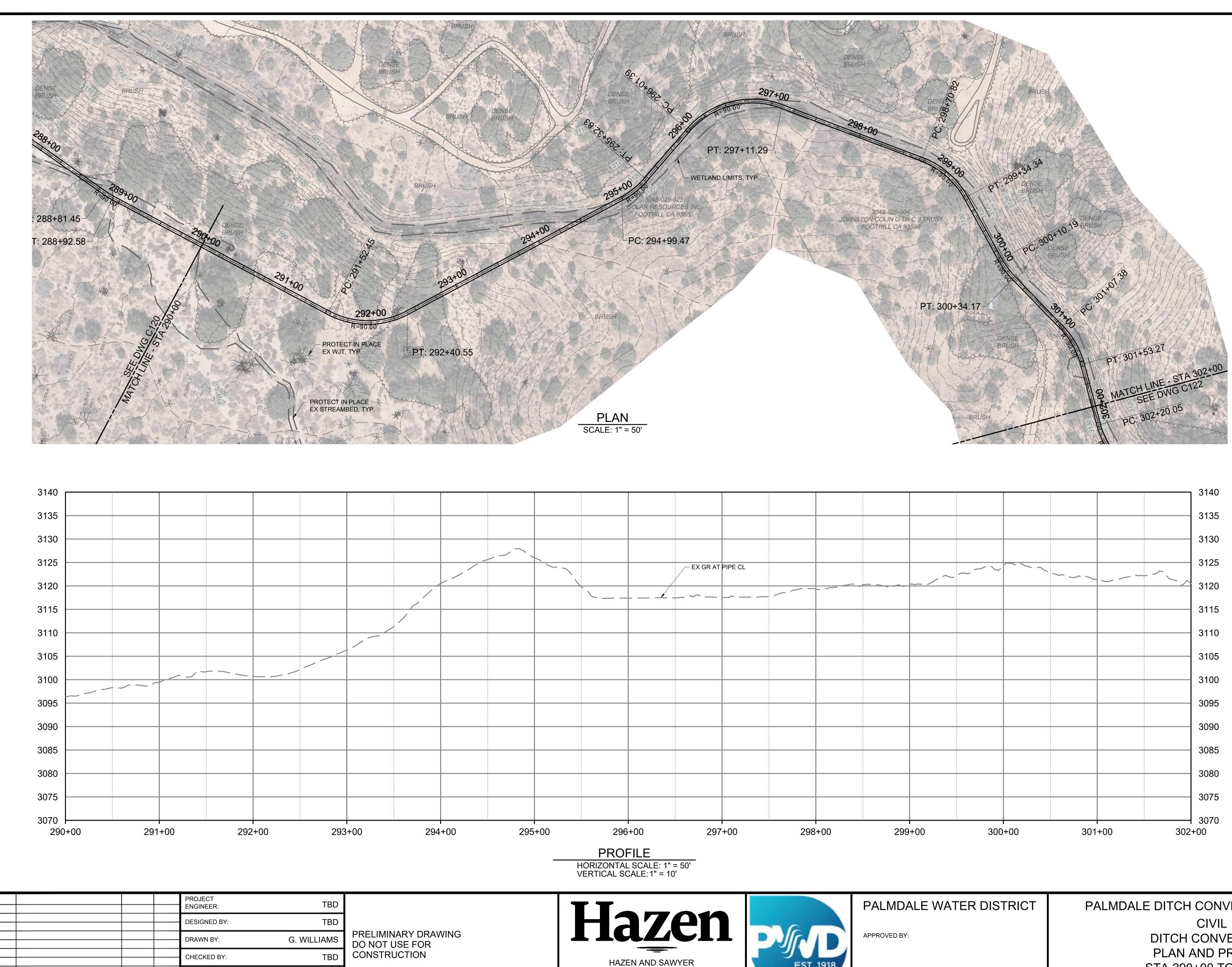
- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
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- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
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ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO.	XX-XX-XXX
PLAN AND PROFILE	DRAWING NUMBER:	
STA 278+00 TO 290+00	NUMBER.	
		C120



ISSUED FOR

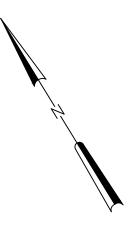
DATE

ΒY

IF THIS BAR DOES NOT 0 1/2" 1' MEASURE 1" THEN DRAWING IS

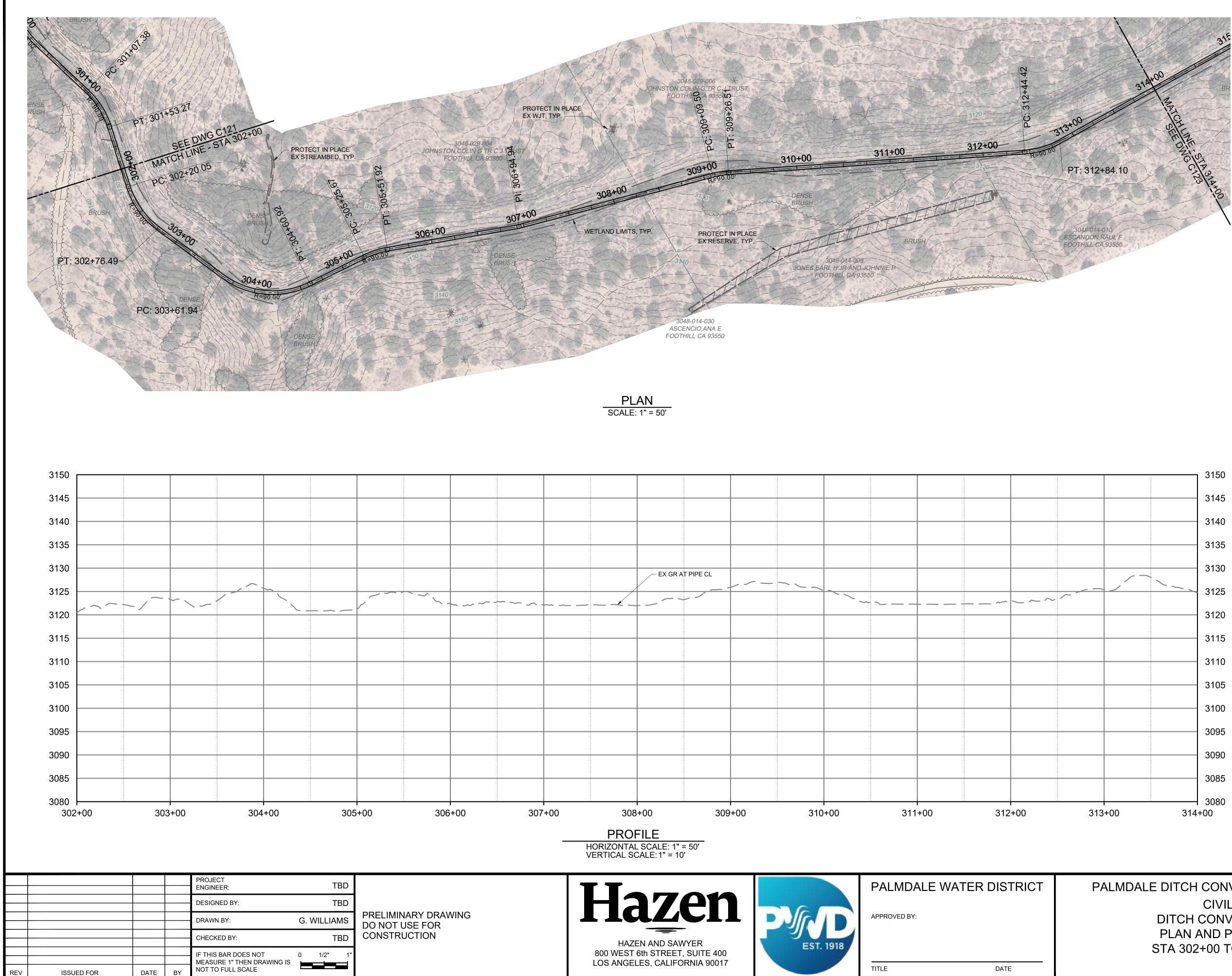


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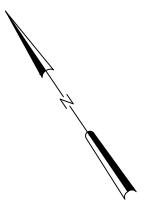


- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

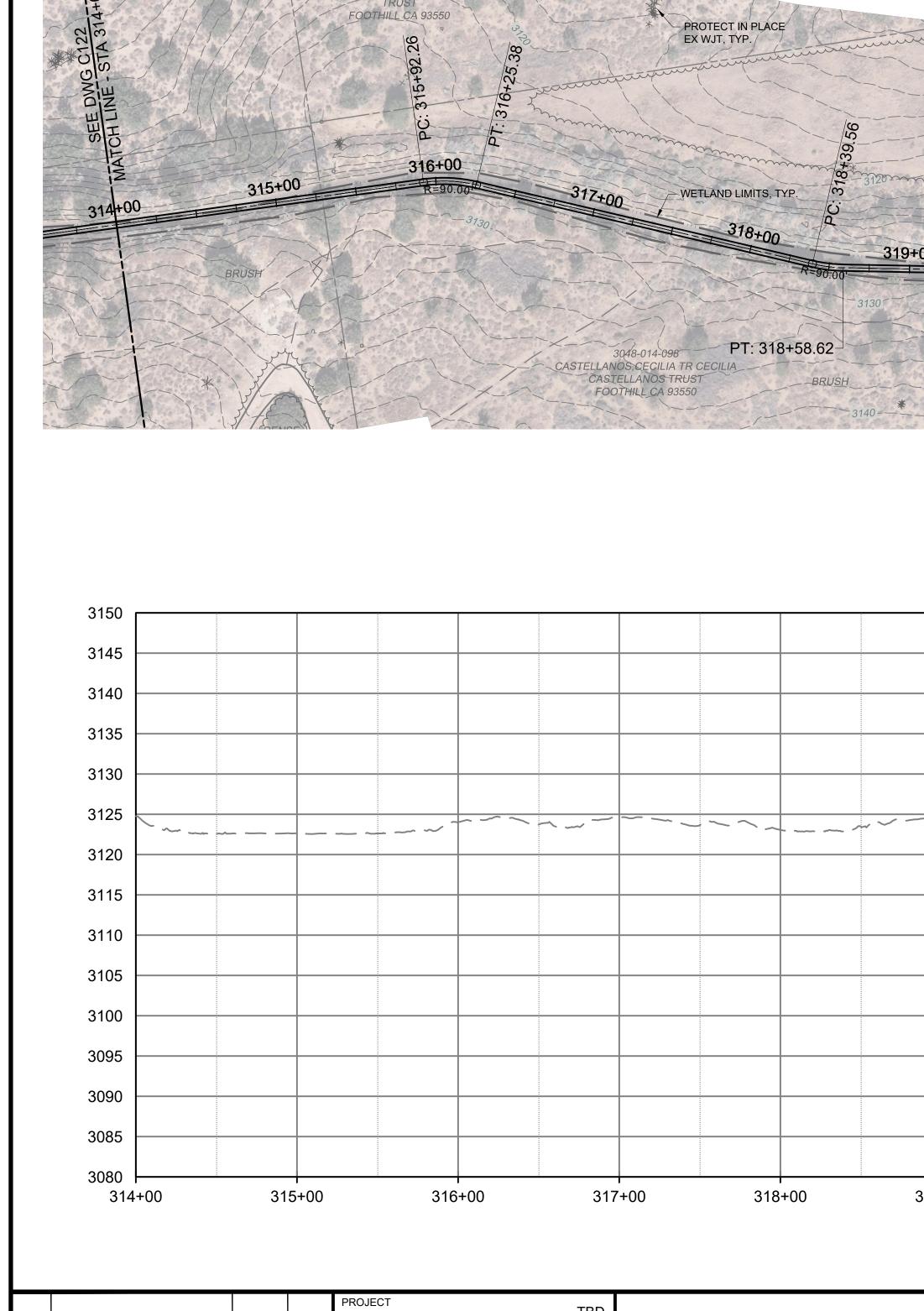
ALMDALE DITCH CONVERSION PROJECT	DATE:	MARCH 2024
CIVIL	HAZEN NO.:	20182-004
DITCH CONVERSION	CONTRACT NO.	XX-XX-XXX
PLAN AND PROFILE	DRAWING NUMBER:	
STA 290+00 TO 302+00	-	
		C121



07+00 	308+00 PROFILE HORIZONTAL SCALE: 1" = 50' VERTICAL SCALE: 1" = 10'	309+00	310+00	311+00	312+00	313+00	314+00		
	Haze	n		PALMDALE WAT	ER DISTRICT	PALMDALE	E DITCH CONVERSION PROJECT CIVIL DITCH CONVERSION	DATE: HAZEN NO.: CONTRACT N	MARCH 2024 20182-004
	HAZEN AND SAWYER 800 WEST 6th STREET, SUITE LOS ANGELES, CALIFORNIA 9		EST. 1918	TITLE	DATE		PLAN AND PROFILE STA 302+00 TO 314+00	DRAWING NUMBER:	C122



- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.



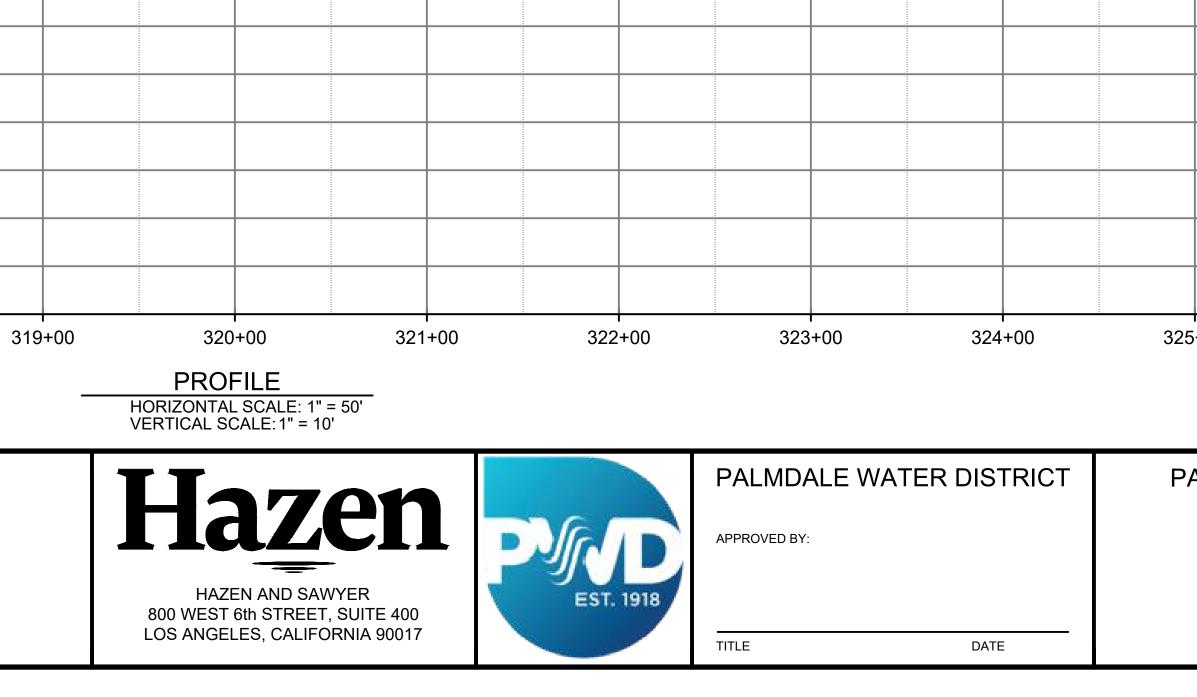
JOHNSTON,COLING TR TRUST

OOTHILL CA 93550

AMS					PROJECT ENGINEER:	TBD	
BY: GWILLIAMS					DESIGNED BY:	TBD	
					DRAWN BY:	G. WILLIAMS	F C
3/11/2024 6:00 PM					CHECKED BY:	TBD	C
					IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS	0 1/2" 1"	
LOT DATE:	REV	ISSUED FOR	DATE	BY	NOT TO FULL SCALE		

PRELIMINARY DRAWING DO NOT USE FOR CONSTRUCTION

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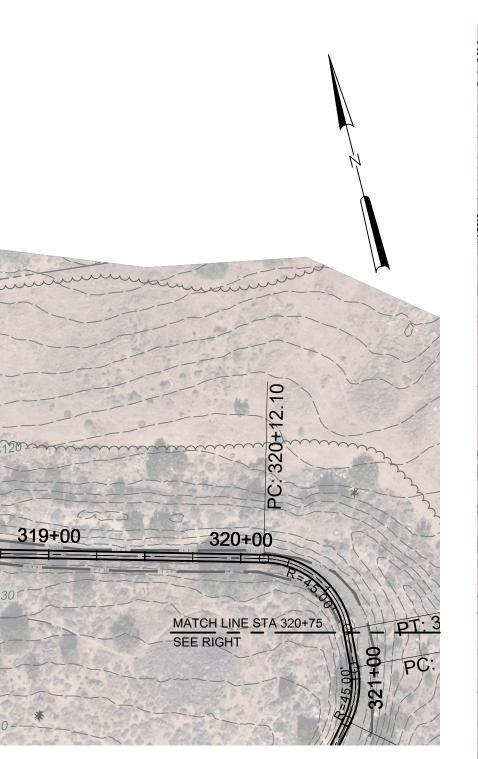


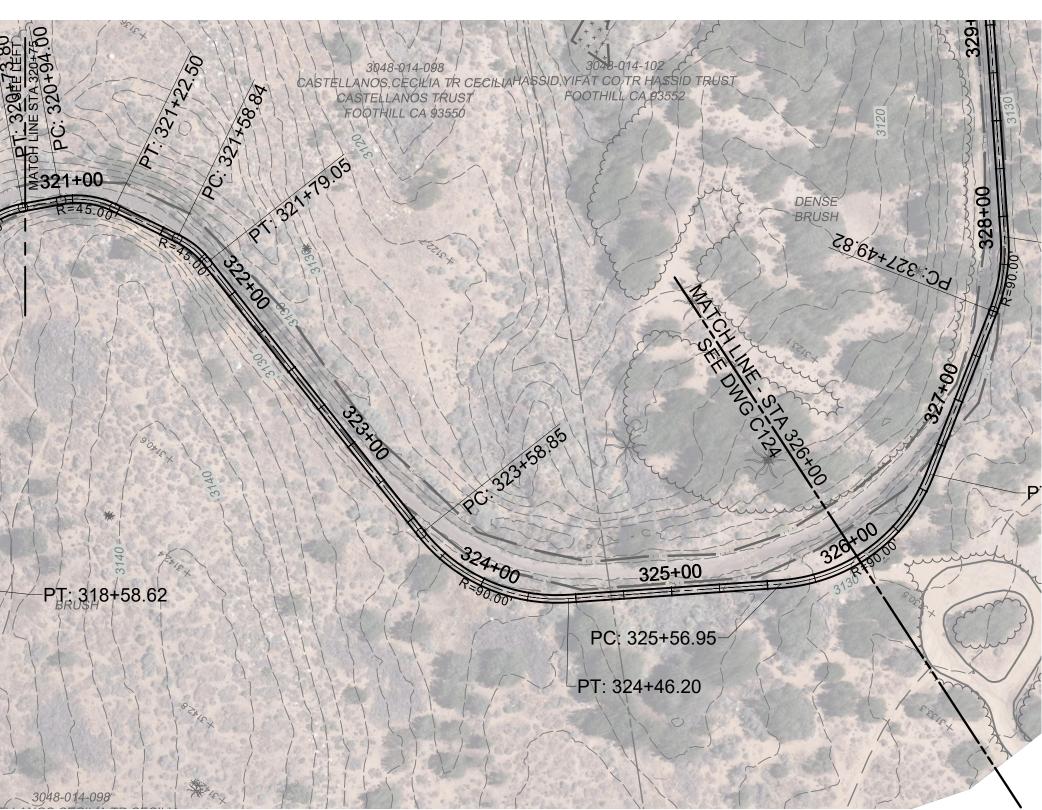


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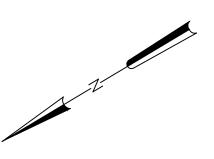
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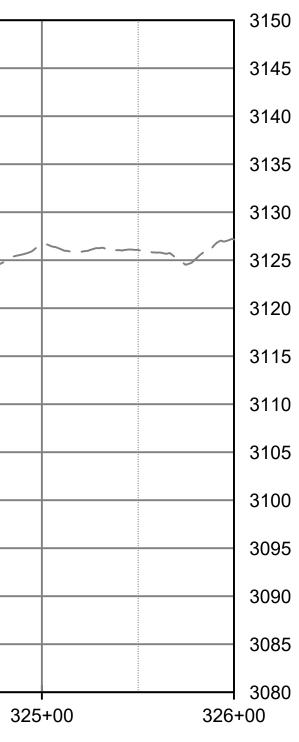


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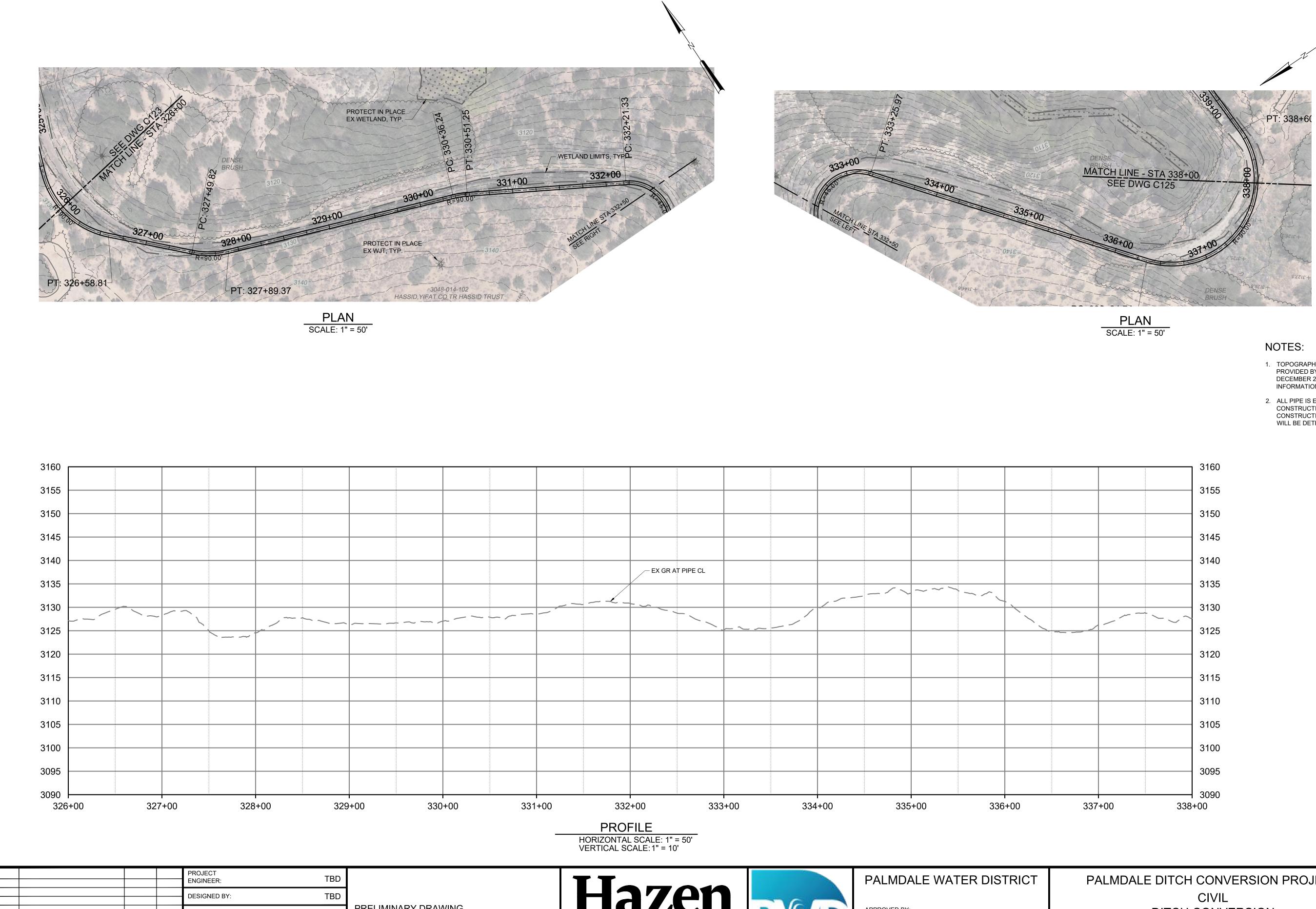
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- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.



| ALMDALE DITCH CONVERSION PROJECT | DATE:        | MARCH 2024 |
|----------------------------------|--------------|------------|
| CIVIL                            | HAZEN NO.:   | 20182-004  |
| DITCH CONVERSION                 | CONTRACT NO. | XX-XX-XXX  |
| PLAN AND PROFILE                 |              |            |
| STA 314+00 TO 326+00             | NUMBER:      |            |
|                                  | 1            | C123       |



|     |            |      |    | PROJECT<br>ENGINEER:                               | TBD         |          |
|-----|------------|------|----|--|-------------|----------|
|     |            |      |    | DESIGNED BY:                                       | TBD         | ]        |
|     |            |      |    | DRAWN BY:  | G. WILLIAMS | PF<br>DC |
|     |            |      |    | CHECKED BY:  | TBD         | CC       |
|     |            |      |    | IF THIS BAR DOES NOT<br>MEASURE 1" THEN DRAWING IS | 0 1/2" 1"   | ]        |
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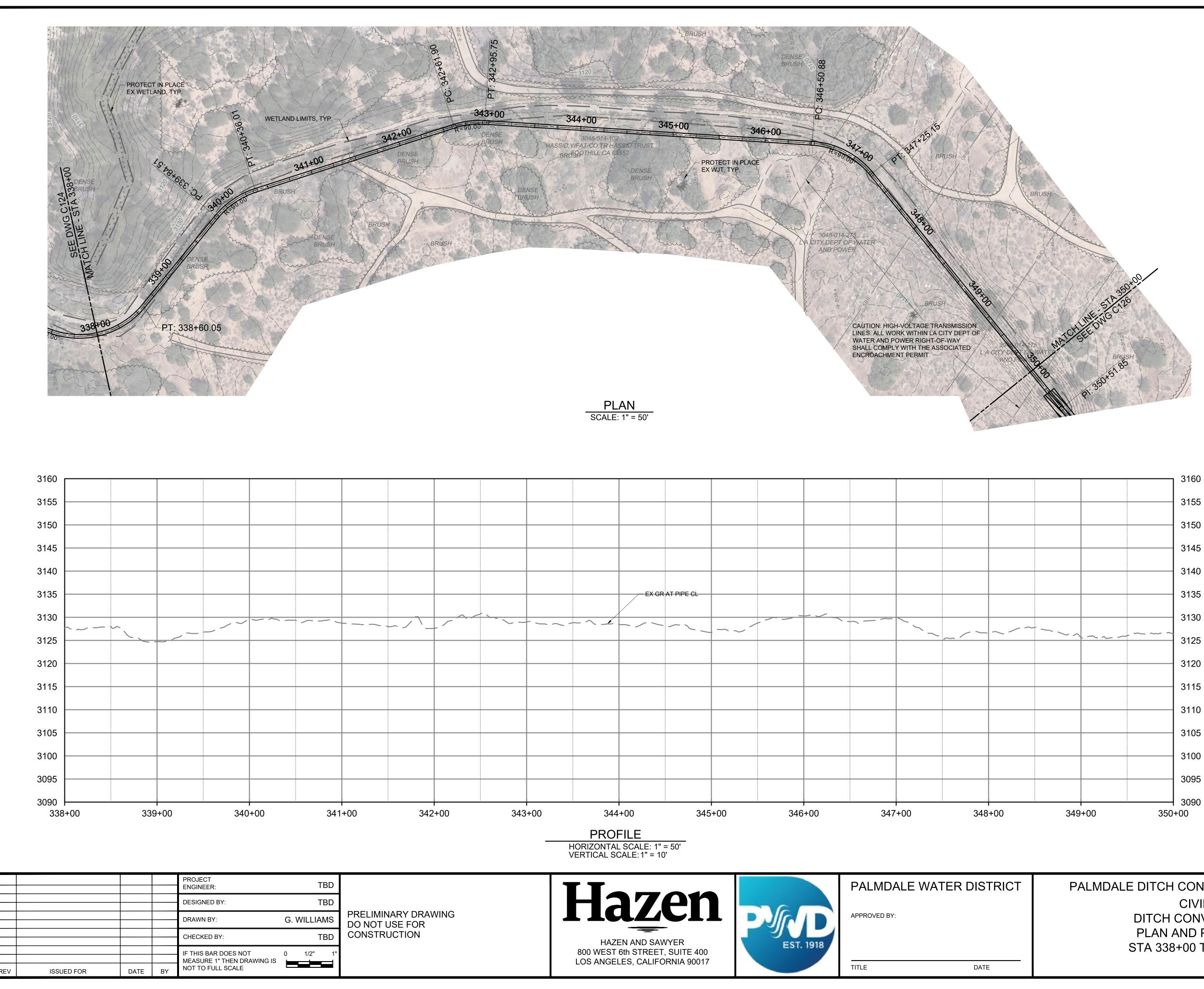
PRELIMINARY DRAWING DO NOT USE FOR CONSTRUCTION



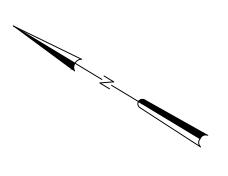
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- TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
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| ALMDALE DITCH CONVERSION PROJECT | DATE:              | MARCH 2024 |
|----------------------------------|--------------------|------------|
| CIVIL                            | HAZEN NO.:         | 20182-004  |
| DITCH CONVERSION                 | CONTRACT NO .:     | XX-XX-XXX  |
| PLAN AND PROFILE                 | DRAWING<br>NUMBER: |            |
| STA 326+00 TO 338+00             | NOMBER.            |            |
|                                  |                    | C124       |



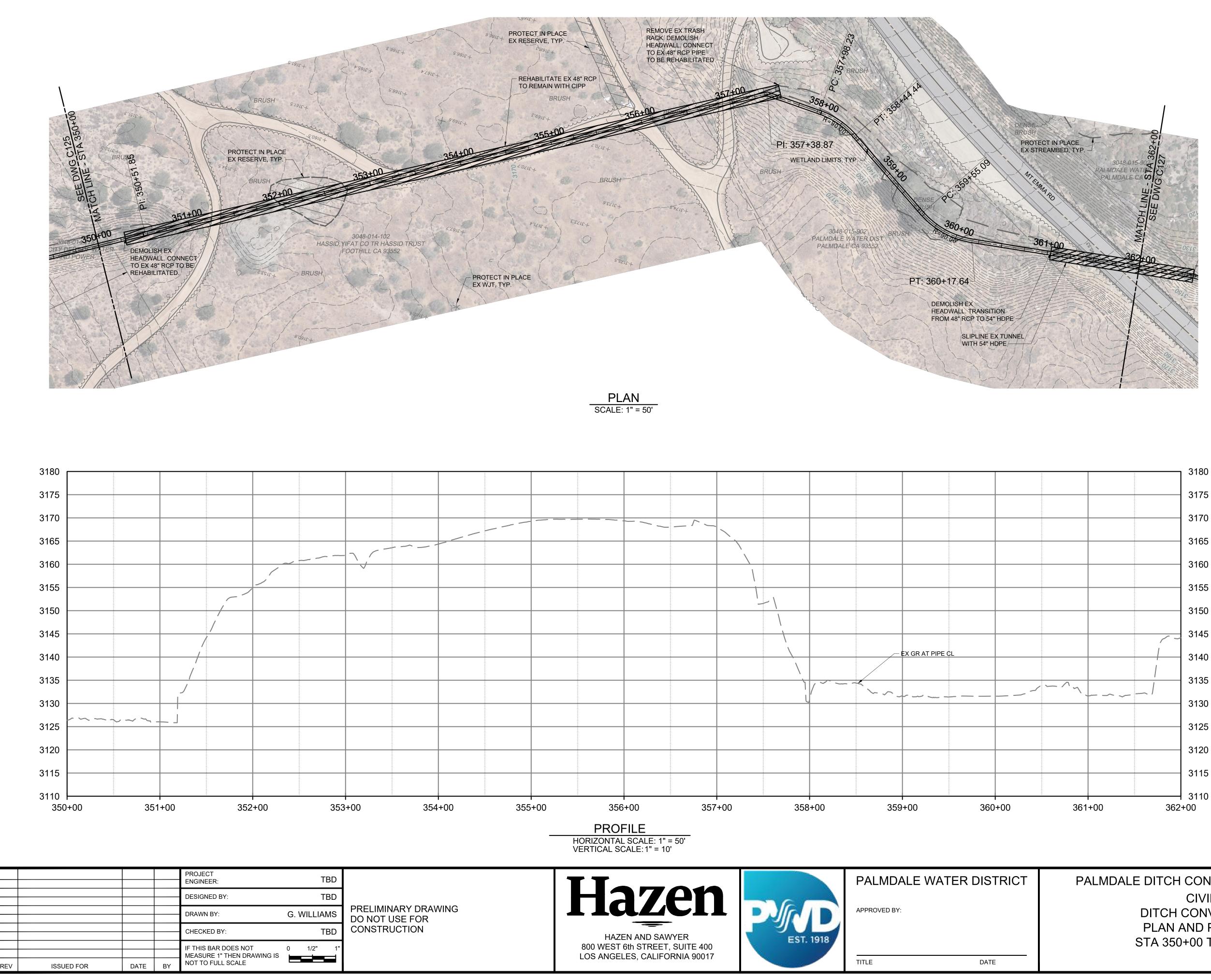
|  |             | PROJECT<br>ENGINEER:  |         | TBD  |              |
|--|-------------|---|---------|------|--------------|
|  |             | DESIGNED BY:  |         | TBD  |              |
|  |             | DRAWN BY:   | G. WILL | IAMS | PREL<br>DO N |
|  |             | CHECKED BY:   |         | TBD  | CON          |
|  |             | IF THIS BAR DOES NOT<br>MEASURE 1" THEN DRAWING IS<br>NOT TO FULL SCALE | 0 1/2"  | 1"   |              |
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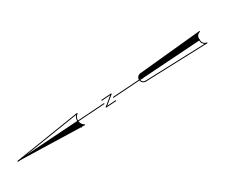


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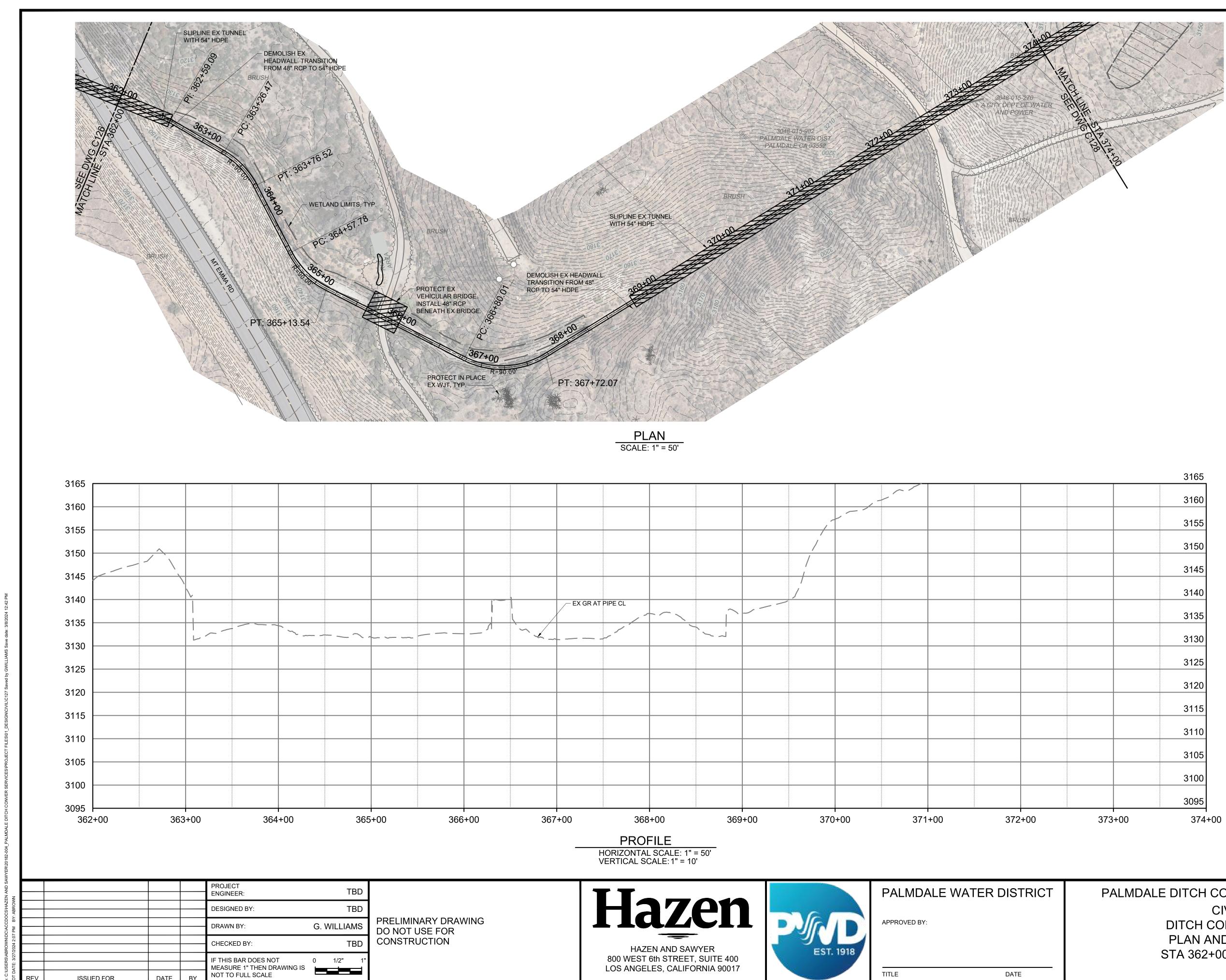
| ALMDALE DITCH CONVERSION PROJECT | DATE:              | MARCH 2024 |
|----------------------------------|--------------------|------------|
| CIVIL                            | HAZEN NO.:         | 20182-004  |
| DITCH CONVERSION                 | CONTRACT NO .:     | XX-XX-XXX  |
| PLAN AND PROFILE                 | DRAWING<br>NUMBER: |            |
| STA 338+00 TO 350+00             | NOMBER.            |            |
|                                  |                    | C125       |





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| ALMDALE DITCH CONVERSION PROJECT         | DATE:              | MARCH 2024 |
|--|--------------------|------------|
| CIVIL                                    | HAZEN NO.:         | 20182-004  |
| DITCH CONVERSION                         | CONTRACT NO.       | XX-XX-XXX  |
| PLAN AND PROFILE<br>STA 350+00 TO 362+00 | DRAWING<br>NUMBER: |            |
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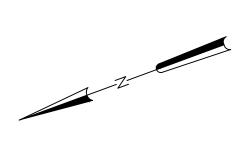
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| HORIZONTAL SCALE: $1" = 50'$ |
| VERTICAL SCALE: 1" = 10'     |

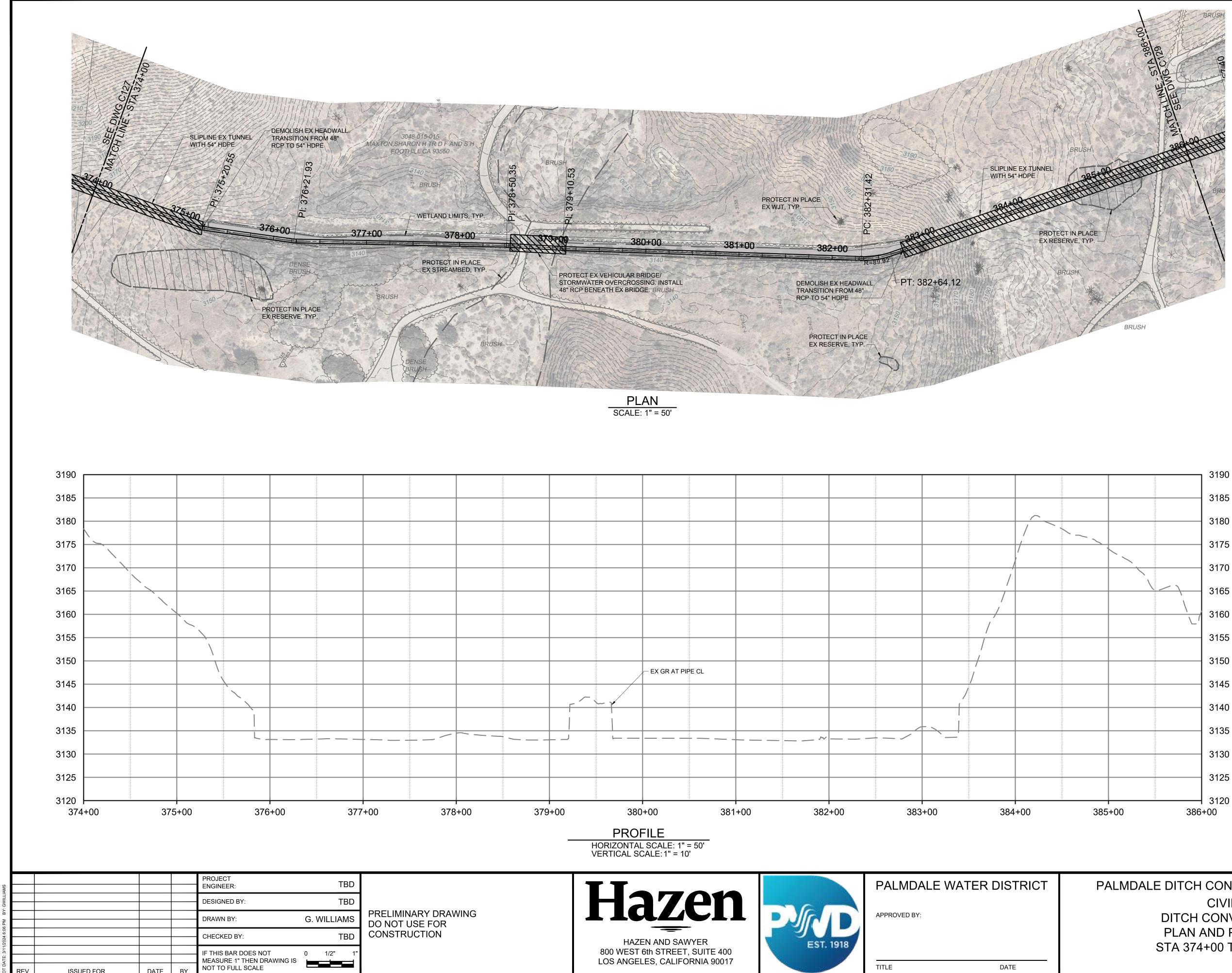
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|     |            |     |      |         |     |     |     |     |     |     |     |       | 3165   |





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| ALMDALE DITCH CONVERSION PROJECT | DATE:              | MARCH 2024 |
|----------------------------------|--------------------|------------|
| CIVIL                            | HAZEN NO.:         | 20182-004  |
| DITCH CONVERSION                 | CONTRACT NO .:     | XX-XX-XXX  |
|                                  | DRAWING<br>NUMBER: |            |
| STA 362+00 TO 374+00             |                    | 0407       |
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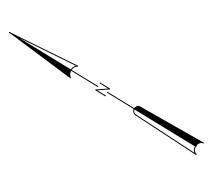
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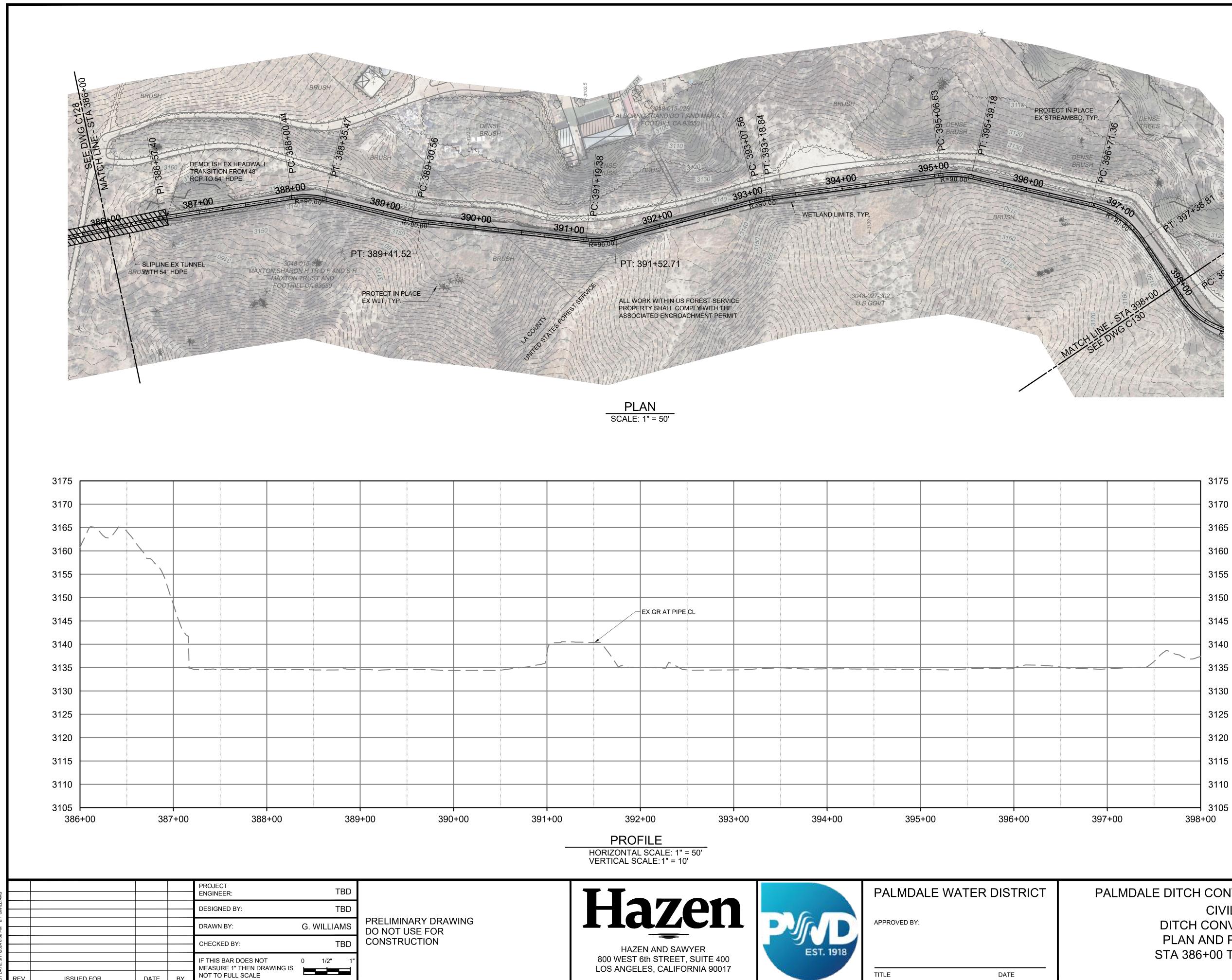


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| ALMDALE DITCH CONVERSION PROJECT | DATE:          | MARCH 2024 |
|----------------------------------|----------------|------------|
| CIVIL                            | HAZEN NO.:     | 20182-004  |
| DITCH CONVERSION                 | CONTRACT NO .: | XX-XX-XXX  |
| PLAN AND PROFILE                 |                |            |
| STA 374+00 TO 386+00             | NUMBER:        |            |
|                                  |                | C128       |



DATE

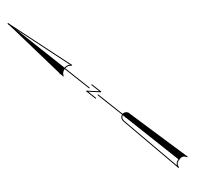
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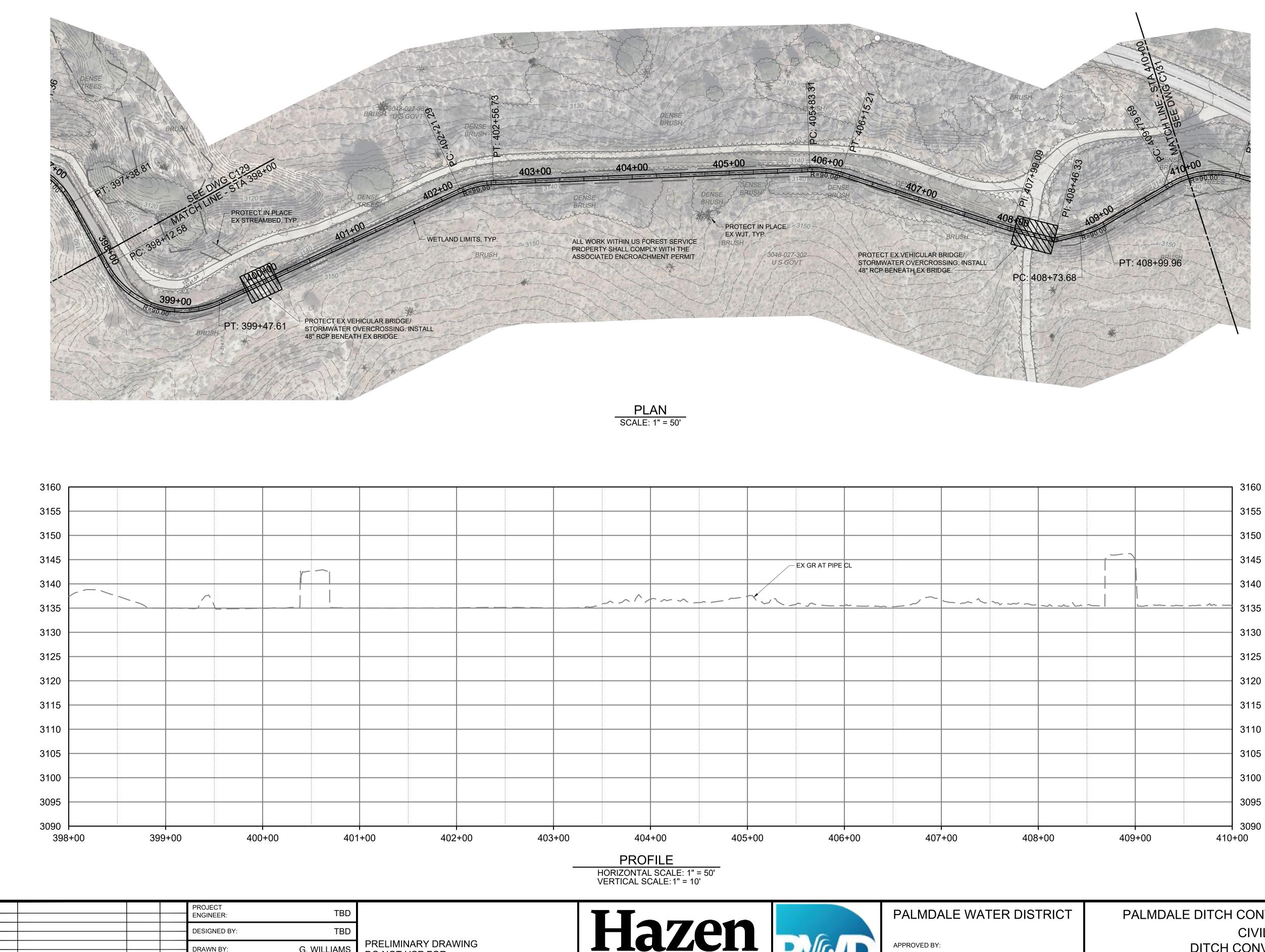


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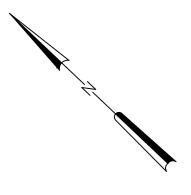
| ALMDALE DITCH CONVERSION PROJECT | DATE:              | MARCH 2024 |
|----------------------------------|--------------------|------------|
| CIVIL                            | HAZEN NO.:         | 20182-004  |
| DITCH CONVERSION                 | CONTRACT NO .:     | XX-XX-XXX  |
| PLAN AND PROFILE                 | DRAWING<br>NUMBER: |            |
| STA 386+00 TO 398+00             |                    |            |
|                                  |                    | C129       |



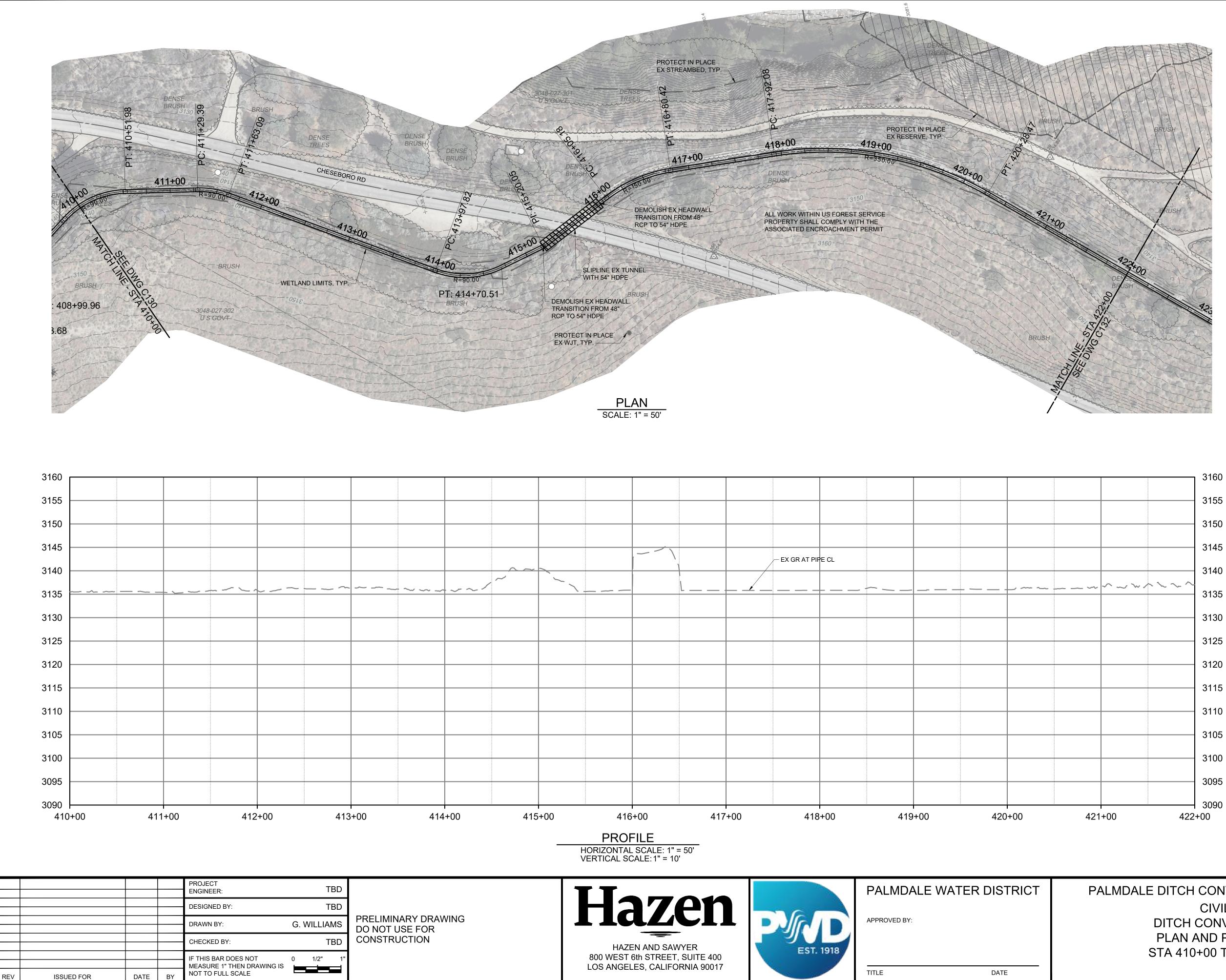
| AMS            |     |            |      |    | PROJECT<br>ENGINEER:                               | TBD         |                |
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| ': GWILLIAMS   |     |            |      |    | DESIGNED BY:                                       | TBD         |                |
| 6:09 PM BY:    |     |            |      |    | DRAWN BY:  | G. WILLIAMS | PF<br>DC<br>CC |
| 3/11/2024 6:09 |     |            |      |    | CHECKED BY:  | TBD         | CC             |
| DATE: 3/11/    |     |            |      |    | IF THIS BAR DOES NOT<br>MEASURE 1" THEN DRAWING IS | 0 1/2" 1"   |                |
|                | REV | ISSUED FOR | DATE | BY | NOT TO FULL SCALE                                  |             |                |

DO NOT USE FOR CONSTRUCTION

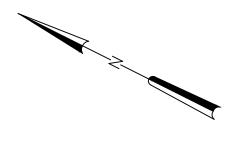
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|        | VERTICAL SO | CALE:1" = 10             | )'         |        |      |              |                  |                  |      |     |     |         |                    |             |   |
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|        | Ha          |                          | 01         |        |      |              |                  |                  |      |     |     |         | CIVIL              | HAZEN NO.:  | 20182-004                               |
|        |             |                          |            |        |      | APPROVED BY: |                  |                  |      |     |     | DITCH   | CONVERSION         | CONTRACT NO |   |
|        |             | - <b>-</b>               | -          |        |      |              |                  |                  |      |     |     |         | AND PROFILE        | DRAWING     | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, |
|        |             | EN AND SAW<br>6th STREET |            | EST.   | 1918 |              |                  |                  |      |     |     | STA 398 | +00 TO 410+00      | NUMBER:     |   |
|        |             | LES, CALIFO              |            |        |      | <br>TITLE    |                  | DATE             |      |     |     |         |                    |             | C130                                    |



- 1. TOPOGRAPHIC SURVEY AND AERIAL PHOTOGRAPHY WERE PROVIDED BY ARROW ENGINEERING SERVICES, INC. DATED DECEMBER 2023. SEE SHEET C010 FOR SURVEY CONTROL INFORMATION.
- 2. ALL PIPE IS EXPECTED TO BE INSTALLED BY OPEN-CUT CONSTRUCTION UNLESS OTHERWISE NOTED. FINAL CONSTRUCTION AND REHABILITATION METHODS AND LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

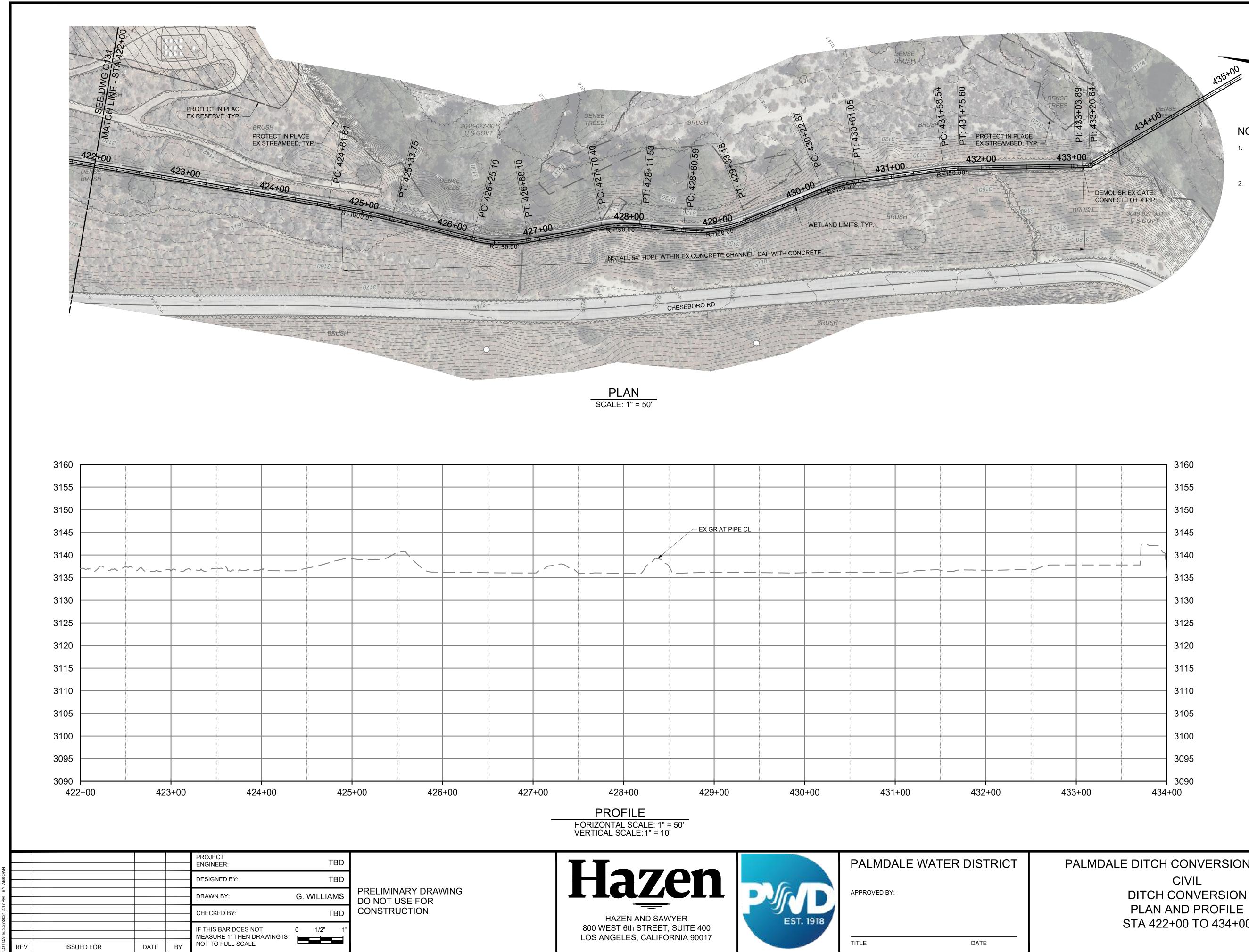


|            |      |    | PROJECT<br>ENGINEER:                               | TBD         |   |
|------------|------|----|--|-------------|---|
|            |      |    | DESIGNED BY:                                       | TBD         |   |
|            |      |    | DRAWN BY:  | G. WILLIAMS |   |
|            |      |    | CHECKED BY:  | TBD         |   |
|            |      |    | IF THIS BAR DOES NOT<br>MEASURE 1" THEN DRAWING IS | 0 1/2" 1"   | ] |
| ISSUED FOR | DATE | BY | NOT TO FULL SCALE                                  |             |   |



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| ALMDALE DITCH CONVERSION PROJECT | DATE:         | MARCH 2024 |
|----------------------------------|---------------|------------|
| CIVIL                            | HAZEN NO.:    | 20182-004  |
| DITCH CONVERSION                 | CONTRACT NO.: | XX-XX-XXX  |
| PLAN AND PROFILE                 |               |            |
| STA 410+00 TO 422+00             | NUMBER:       |            |
|                                  |               | C131       |



| +00     | 420  | 100 | 423    |              | -00 | 100 | 401 | .00 | 402 | .00 | 400 | • |
|---------|------|-----|--------|--------------|-----|-----|-----|-----|-----|-----|-----|---|
|         | //28 | +00 | /20    |              | 430 | +00 | /31 | +00 | 432 | +00 | 433 | + |
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| ALMDALE DITCH CONVERSION PROJECT | DATE:        | MARCH 2024 |
|----------------------------------|--------------|------------|
| CIVIL                            | HAZEN NO.:   | 20182-004  |
| DITCH CONVERSION                 | CONTRACT NO. | XX-XX-XXX  |
| PLAN AND PROFILE                 |              |            |
| STA 422+00 TO 434+00             | NUMBER:      |            |
|                                  |              | C132       |

# Appendix F: Cost Estimate and BOE



March 29, 2024

| To:   | Hazen Design Team       |
|-------|-------------------------|
| From: | Chris Portner, PE, CEP  |
| Re:   | City of Palmdale        |
|       | <b>Ditch Conversion</b> |

**<u>30 Percent Submittal Estimate</u>** 

#### 1. Introduction

This memorandum is a supplement to the cost estimate that corresponds to the 30 Percent Submittal Estimate submitted to the client in March 2024. The project work is to be performed in Los Angeles County, California. This estimate is for replacement of an open canal with a buried pipeline and associated appurtenances.

The estimate serves for budget baseline and is considered to be an AACE Class 3 level. Class 3 has a typical accuracy range of -20% on the low side and +30% on the high side. A 15% design contingency has been added to the estimate based on current status of the design documents, the nature of the project and the estimate classification.

#### 2. Estimate Basis

Estimate costs are derived from the following:

- 1. 30 Percent Design Drawings dated March 2024.
- 2. Discussions with Design Team.
- 3. Reference costs for environmental monitoring.

#### 3. Planning Basis

Base Assumptions are the following:

- 1. Construction NTP was assumed to be Q22025.
- 2. Construction Duration was assumed to be 11 months.
- 3. The project is assumed to be procured as a single prime contract through a traditional design/bid/build process.

#### 4. Cost Basis

1. Wage rates utilized are based on prevailing wages published for Los Angeles County current to June 30, 2024.



- 2. A 40-hour work week is assumed, no shift, weekend or other premium time is provided.
- 3. Wherever possible, equipment rates are based on current published rental rates as listed in the AED Blue Book, supplemented by RS Mean's data, the AED Green Book and local rental suppliers.
- 4. Crews, equipment and productivity used for work items are based mostly on standards specific to each trade. Some information was supplemented by RS Mean's data modified where necessary by estimator judgment.
- 5. No vendor quotes were used for this estimate.

#### 5. Itemized Estimate Notes

- 1. Lake Palmdale Discharge
  - Demolish existing flume
  - Construct flume, assume 6-ft throat, 48-inch width and 60-in depth, cast-in-place concrete
    - Include ultrasonic level indicator
    - Include solar panel
    - Include radio
- 2. Connection to Existing Culvert (C-101)
  - Cast-in-place concrete headwall
- 3. Open cut through hiking area (C-101 through C-107)
  - o Furnish/install 48-inch diameter RCP
  - Furnish/install 2 3-inch diameter sch 40 PVC conduits
    - Include pullbox every 250lf
    - Include sand backfill
  - o Include manholes every 1000lf
  - Include excavation (assume 4-ft cover), 2:1 sloped excavation (13.5-ft width at grade), backfill (reuse), offsite stock piling, clearing and grubbing (20-ft width)
    - Crossing on existing walking bridge (2 locations)
      - Replacement of gravel path below
  - Demolish concrete drop structure
- 4. Siphon

0

- Demolish existing flume
- Furnish/install 48-inch diameter RCP
  - Assume 8-ft cover
- Include excavation (assume 4-ft cover), 2:1 sloped excavation (13.5-ft width at grade), backfill (reuse), offsite stock piling
- Include manhole at either end
- 5. Open cut next to roadway (C-107 through C-108 and C-115 through C-118)
  - Same assumptions as open cut through hiking area with the following modifications:
    - No replacement of walking bridges
    - No demolition of drop structure
    - Add in traffic control



- 6. Jack and bore crossing (C-108)
  - Launch shaft (10-ft x 40-ft x 15-ft) and receiving shaft (10-ft x 10-ft x 15-ft)
  - 60-inch jacking pipe 48-inch RCP carrier pipe
  - Include manholes at either end
- 7. Open cut roadway crossing (C-108 and C-115)
  - Same assumptions as open cut through hiking area with the following modifications:
    - No replacement of walking bridges
    - No demolition of drop structure
    - Include pavement removal and replacement
    - Include traffic control
    - Include demolition of culvert
- 8. Open cut through open area (C-109 through C-110, C-118 through C-132)
  - $\circ$  Same assumptions as open cut through hiking area with the following modifications:
    - No replacement of walking bridges
    - No demolition of drop structure
- 9. Open cut within existing concrete ditch (C-110 through C-115, C-120)
  - Same assumptions as open cut through hiking area with the following modifications:
    - No replacement of walking bridges
    - No demolition of drop structure
    - Include demolition of existing concrete channel (assume 6-ft with at bottom, 11-ft width at grade, 5-ft depth)
    - Backfill entire ditch area with import fill
- 10. CIPP (C-112 through C-113, C-119 through C-120, C-126 through C-127)
  - CIPP existing 36-inch diameter pipe (48-inch diameter for C-119 through C-120, C-126, C-127
  - Include pipe cleaning pre- and post work
  - Include manhole at either end
  - Furnish/install 2 3-inch diameter sch 40 PVC conduits
- 11. Vehicular Bridge Crossing (C-127 through C-128, C-130)
  - Furnish/install 48-inch diameter RCP beneath existing bridge (4 locations)
  - o Furnish/install 2 3-inch diameter sch 40 PVC conduits
- 12. Slip Line (C-126 through C-129, C-131)
  - Remove trash rack
  - Slip line 54-inch diameter HDPE within existing pipe/tunnel, assume 60-inch diameter, include annular grouting
  - Include manholes at either end
  - $\circ \quad \mbox{Furnish/install 2 3-inch diameter sch 40 PVC conduits}$ 
    - Include pullbox every 250lf
- 13. Installation within existing concrete channel (C-132)
  - Furnish/install 54-inch diameter HDPE
    - Furnish/install 2 3-inch diameter sch 40 PVC conduits
      - Include pullbox every 250lf
  - Include flowable fill backfill (5-ft depth, 6-foot base width, 11.5-ft at grade)
  - Include manholes every 1000lf

 $\cap$ 



#### 14. Air vents

- $\circ$  Allow for 3.
- Assume 8-inch CARV within a 5-ft diameter manhole, concrete encasement around the carrier pipe and a tapping sleeve
  - Include gate valve and gooseneck at surface
- 15. Turnout to California Aqueduct
  - Cast-in-place concrete turnout (18-ft x 34-ft)
    - Include wing walls (15-ft in height, sloped)
    - Include headwall (18-ft x 15-ft)
    - Include stop log frame
    - Include trashrack
    - Include concrete pad at grade (4-ft x 4-ft)
    - Include flow meter vault (10-ft x 10-ft x 15-ft)
      - Include 24-inch diameter flow control valve and flow meter
    - Include 24-inch diameter RCP
    - Include 24-inch x 24-inch MOV slide gate
    - Perimeter fencing and personnel gate
    - CMU structure above flow meter vault
  - Include manhole (2)
  - Allow for power/communication from nearby facility
  - Include coffer dam and pump to dewater
- 16. Environmental monitoring
  - Assume 11months construction (210 working days)
  - Paleontological \$2,650/day
    - Include report/training
  - Archaeological \$2,000/day
    - Include report/training
  - o Cultural \$1,500/day



#### 6. Below the Line Adders

The following adders were used:

| Below the Line Adders                   |    |
|---|----|
| Item                                    | %  |
| General Conditions (Div01)              | 5  |
| Contractor Overhead                     | 5  |
| Contractor Profit                       | 8  |
| Escalation to mid-point of construction | 3  |
| Insurance and Bonding                   | 3  |
| Contingency                             | 15 |

These factors are generally in-line with recent estimated projects in this location and of this size and conform to the AACE Class of each scope.

#### 7. Other Assumptions

Additional assumptions to the estimate include:

- 1. It is assumed that high groundwater will not impact excavations.
- 2. It is assumed that normal soils are present for excavation purposes and are suitable as backfill and will be disposed of offsite. Spoils will be stockpiled onsite and backfilled.
- 3. It is assumed that no hazardous materials are present.

#### 8. Exclusions

The following items are specifically excluded from the scope of this estimate:

- 1. Hazardous material abatement, removal or disposal.
- 2. Additional work requirements related to construction in the railroad right-of-way.
- 3. Mitigation or other measures required to accommodate sensitive, protected, or endangered species present in the work area. Environmental monitoring is included as noted above but not other cost associated with environmental or regulatory requirements are included.

#### 9. Exceptions

None taken.



#### 10. Reconciliation

The previous probable construction cost was \$19.2M. The current probable construction cost is \$38.3M, an increase of \$19M. The previous probable construction cost was from July 2021, escalating that cost using the Bureau of Labor Statistics Producer Price Index results in an escalated cost of \$25.6M. The remainder of the increase was related to changes in scope or assumptions:

- 1. Previous assumption was 2-ft cover, current assumption is 5-ft cover, this leads to an additional 84,500 cy of excavated material for an additional cost of \$3.3M
- 2. Flowable fill is provided in the concrete canal section of the project. Previously this was all earth fill resulting in an additional cost of \$0.8M
- 3. Conduits and pullboxes were added which resulted in an additional cost of \$4.3M
- 4. The California Aqueduct turnout was added, resulting in an additional \$1.6M
- 5. The discharge structure at Lake Palmdale was added, resulting in an additional \$0.4M
- 6. A jack-and-bore crossing was added, resulting in an additional \$1.3M
- 7. Work crossing roadways or in a roadway shoulder required traffic control, resulting in an additional \$0.3M
- 8. Environmental monitoring was added resulting in an additional \$1.3M
- 9. Vent structures were added resulting in an additional \$0.3M

#### **11. Risks and Opportunities**

Some risk items and opportunities need to be considered in the process of reviewing estimated costs. These are the following:

- 1. Whenever performing underground work, there is the risk that previously unmarked utilities, cultural artifacts or other unknown buried objects will be uncovered that will lead to delays and cost impacts to the project.
- 2. The current pandemic has affected supply chains for both materials and labor. A recent surge in demand has led to a dramatic increase in commodity prices. It is unclear how long this disruption will last or if costs will continue in the short term. Depending upon the time horizon of the project, the bidding environment may still be affected as a result of the pandemic which could affect the number and price of bids received.

#### **12. Estimate Quality Assurance**

Estimate review has been ongoing. No second party review has been undertaken.

#### 13. Estimating Team

Oversight to the estimating team is provided by Adam Brown, P.E. and Jerimy Borchardt, P.E.

The principal or lead estimator is Chris Portner, P.E, CEP.

All estimate reviews have been internally reviewed by the Design and Estimating Teams.



#### Palmdale Water District Palmdale Ditch Conversion Project 30 Percent Submittal

#### Estimate Summary - CSI Division by WBS

| 3/29/2024 |
|-----------|
| 3/29/2024 |

|    |                                     | <br>5/29/2024    |
|----|-------------------------------------|------------------|
|    | Description                         | Total            |
| 1  | Lake Palmdale Discharge             | \$<br>374,000    |
| 2  | Open Cut through Hiking Area        | \$<br>5,231,000  |
| 3  | Walking Bridge Replacement          | \$<br>44,000     |
| 4  | Siphon                              | \$<br>295,000    |
| 5  | Open Cut in Shoulder                | \$<br>4,718,000  |
| 6  | Jack and Bore Crossing              | \$<br>1,113,000  |
| 7  | Open Cut in Roadway                 | \$<br>194,000    |
| 8  | Open Cut                            | \$<br>10,367,000 |
| 9  | Open Cut in Existing Concrete Ditch | \$<br>3,804,000  |
| 10 | CIPP                                | \$<br>775,000    |
| 11 | Conduit and Pullboxes               | \$<br>4,331,000  |
| 12 | Water Quality Monitor               | \$<br>37,000     |
| 13 | Slip Line                           | \$<br>989,000    |
| 14 | Vehicular Bridge Crossing           | \$<br>61,000     |
| 15 | Manhole                             | \$<br>1,496,000  |
| 16 | Concrete Channel                    | \$<br>1,207,000  |
| 17 | Air vent                            | \$<br>270,000    |
| 18 | Aqueduct Turnout                    | \$<br>1,604,000  |
| 19 | Environmental Monitoring            | \$<br>1,327,000  |
| 20 | Total (rounded):                    | \$<br>38,237,000 |