North Valley Regional Recycled Water Program
Final Report

Prepared by:

In Association with:

Engineers...Working Wonders With Water™

May 2015

Table of Contents

List of Tables

List of Figures

Appendices

List of Abbreviations

AF	acre-feet
AFY	acre-feet per year
APE	Area of Potential Effect
ANSI	American National Standards Institute
AWWA	American Water Works Association
CCI	Construction Cost Index
CDEC	California Data Exchange Network
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
cfs	cubic-feet per second
CLSM	controlled low strength material
CNFR	California Northern Railway
CVFPB	Central Valley Floor Protection Board
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DDW	SWRCB Division of Drinking Water
Delta	Sacramento-San Joaquin River Delta
DFW	Department of Fish and Wildlife
DIP	Ductile iron pipe
DMC	Delta-Mendota Canal
DPWD / District	Del Puerto Water District
DWR	California Department of Water Resources
ENR	Engineering News-Record
fps	feet per second
gpd	gallons per day
GPD/cap	gallons per day per capita
ID	Irrigation District
HDD	Horizontal directional drill
HDPE	High density polyethylene
HGL	Hydraulic grade line

HI	Hydraulic Institute
HP	Horsepower
HWY	Highway
kWh	kilowatt hour
LF	linear feet
LIT	Level monitor
MJ	mechanical joint
mgd	million gallons per day
MLCSP	Mortar-line and coated steel pipe
MSL	mean sea level
MTBM	microtunneling bore machine
N/A	Not applicable
NPDES	National Pollutant Discharge Elimination System
NVRRWP	North Valley Regional Recycled Water Program
NWR / refuge	National Wildlife Refuge
Partner Agencies	City of Turlock, City of Modesto, Del Puerto Water District
PCPP	Prestressed concrete pressure pipe
PG&E	Pacific Gas and Electric Company
PID	Patterson Irrigation District
PLC	Programmable logic controller
psi	Pounds per square inch
PVC	Polyvinyl chloride
QA / QC	Quality Assurance / Quality Control
Reclamation	United State Bureau of Reclamation
RCPP	Reinforced concrete pressure pipe
RD	Reclamation District
RPM	Rotations per minute
RW	Recycled Water
RWQCB	Regional Water Quality Control Board
RWQCF	Regional Water Quality Control Facility
SCADA	Supervisory control and data acquisition
SLDMWA	San Luis Delta-Mendota Water Authority
SWRCB	State Water Resources Control Board

TEFC	Totally-enclosed, fan-cooled
TID	Turlock Irrigation District
Feasibility Study	Title XVI Feasibility Study
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
UPS	Uninterruptable power supply
WPII	Weather Protection, Level 2
WQCF	Water Quality Control Facility
WWMP	Wastewater Master Plan

Chapter 1 Introduction

1.1 Background

Del Puerto Water District (DPWD or District), City of Modesto, and City of Turlock (Partner Agencies) propose to implement the North Valley Regional Recycled Water Program (NVRRWP or proposed project) to address two critical objectives of the partner agencies. First, the NVRRWP represents an opportunity for the cities of Modesto and Turlock to permanently remove their wastewater discharges from the San Joaquin River; this reduces the cities' exposure to increasingly stringent regulatory requirements and allows for their recycled water to be put to beneficial reuse. Second, the NVRRWP is a regional solution to address water supply shortages within DPWD's service area on the west side of the San Joaquin River in San Joaquin, Stanislaus and Merced Counties, south of the Sacramento-San Joaquin River Delta (Delta). Specifically, the NVRRWP proposes to deliver up to 59,000 acre feet per year (AFY) of recycled water produced by the cities of Modesto and Turlock directly to the United States Bureau of Reclamation (Reclamation)-owned Delta-Mendota Canal (DMC). The blended recycled water would then be conveyed to DPWD customers or banked within Reclamation's south of Delta Central Valley Project (CVP) system for storage during low water demand periods. In addition to uses within DPWD's service area, this project also proposes to provide water to select National Wildlife Refuges (NWRs) and wildlife areas (collectively referred to as "refuges") located south of the Delta to meet their need for water supply.

The NVRRWP is primarily located within San Joaquin, Stanislaus and Merced Counties, as shown in Figure 1-1. Tertiary-treated water (blended with DMC water) would be delivered to farms within DPWD's service area in Stanislaus, San Joaquin and Merced Counties as well as to south of the Delta Central Valley Project Improvement Act (CVPIA)-designated Refuges.

1.2 Purpose

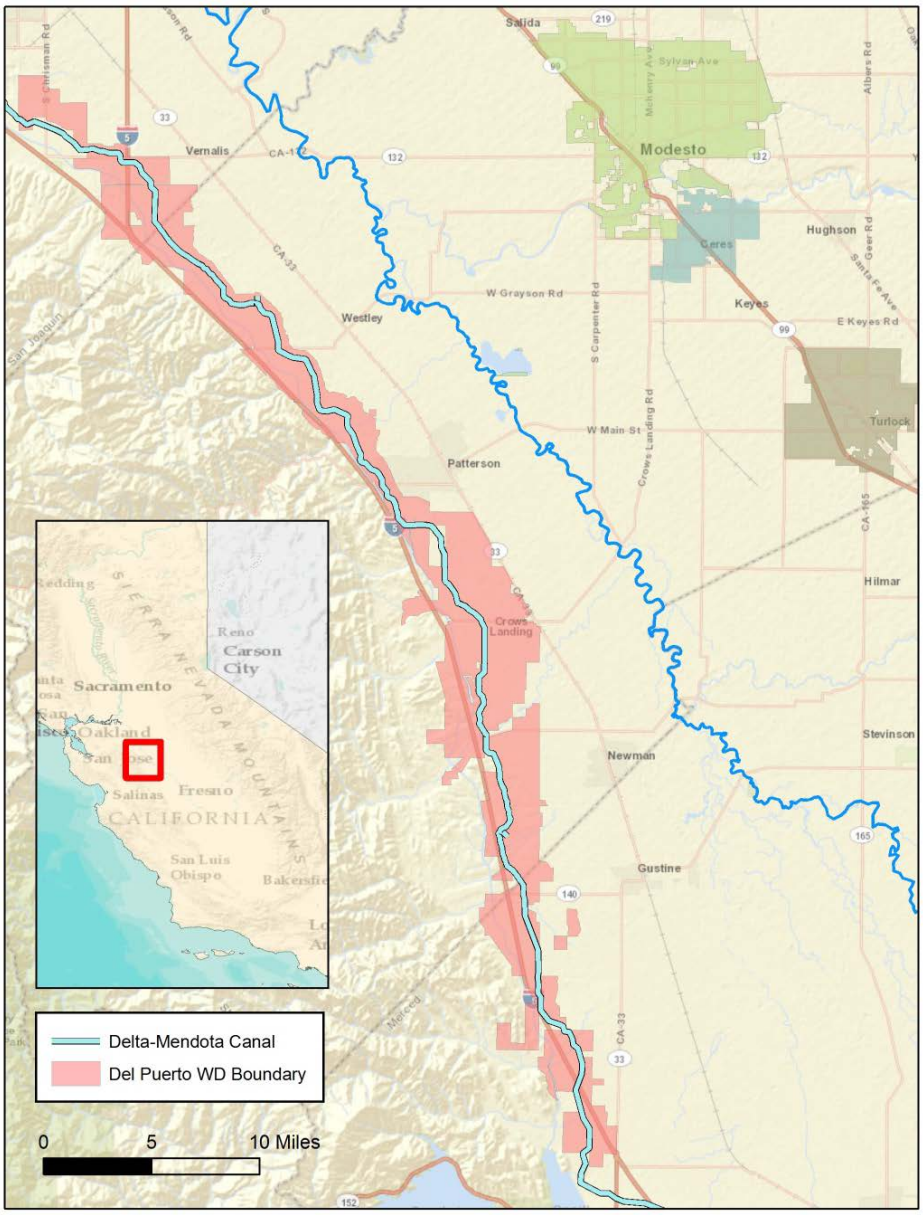
Currently, the region lacks infrastructure that would allow the NVRRWP to meet its goals of water delivery to DPWD and refuges. The proposed project facilities (pipelines, pump stations, and appurtenance improvements) would generally be located west of the cities of Modesto and Turlock, in Stanislaus County.

The purpose of this Facilities Plan is the following:

- Define the criteria that will be used to design the pipelines, pump stations, and other facilities included in the NVRRWP.
- Describe the facility sizing, preliminary design, hydraulics, and operation for the project alternatives under consideration at this time.

Provide budgetary cost estimates for the project alternatives under consideration.

Figure 1-1: Overview of Project Location



1.3 Project Overview

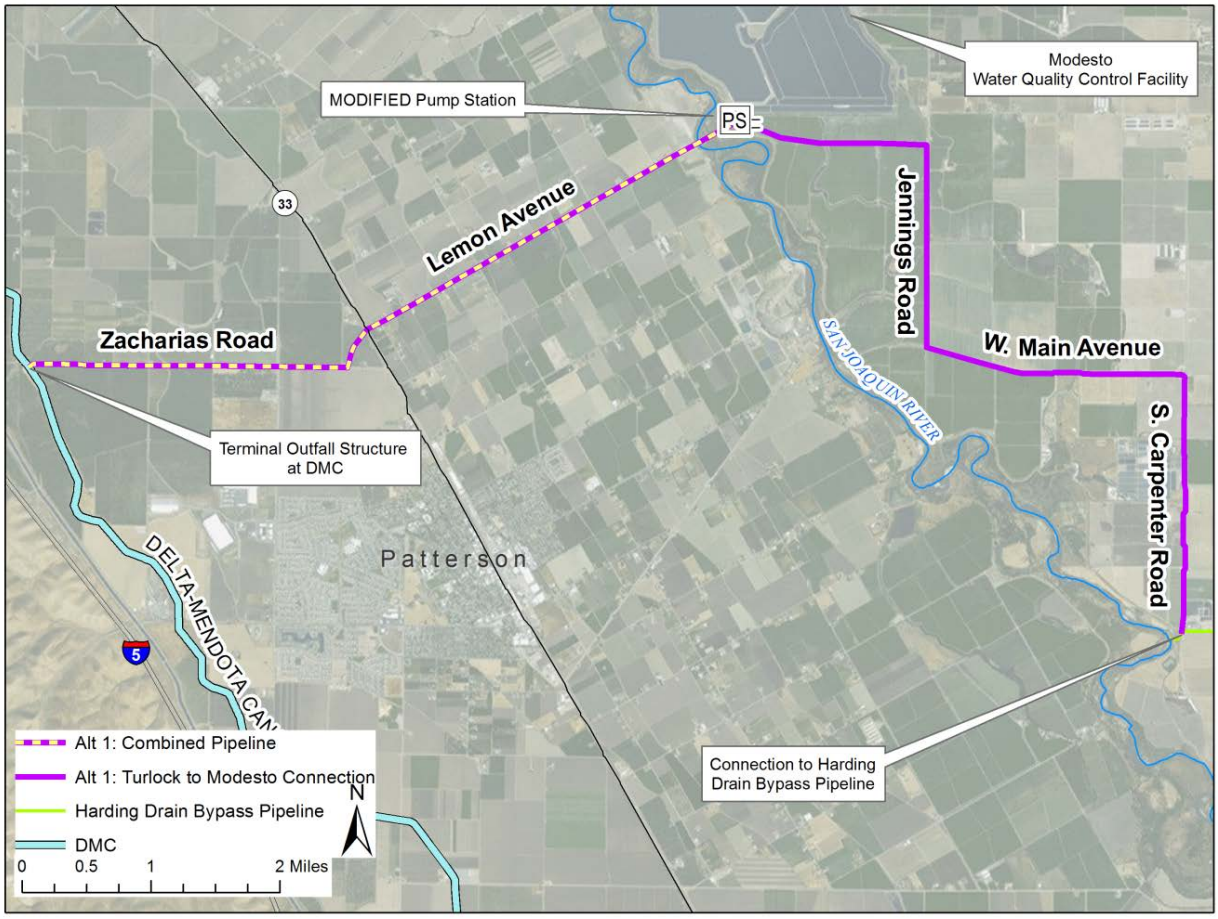
This Facilities Plan is a planning-level document intended to describe the facilities required to deliver recycled water from the Turlock and Modesto treatment facilities to the DMC and the DPWD. The DPWP and partner agencies are currently considering the following project alternatives, which differ primarily on how the recycled water is conveyed to the DMC.

- Alternative 1: Combined Alignment Alternative
- Alternative 2: Separate Alignment Alternative

Alternative 1 would utilize Turlock's existing Harding Drain Pump Station to convey recycled water to the standpipe at the Harding Drain Pump Station outfall site, recycled water would then flow by gravity to Modesto's Water Quality Control Facility (Jennings Plant). Recycled water from both cities would be

combined and pumped to the DMC (see **Figure 1-2**) by Modesto's existing River Outfall Pump Station located at the Jennings Plant. The River Outfall Pump Station will not be used by the City after 2018 and is available to be repurposed to pump recycled water to the DMC. Pumping, piping, and electrical equipment modifications are required at the River Outfall Pump Station to pump water to the DMC; the modifications are described in detail in this Facility Plan.

Figure 1-2: Alternative 1 - Combined Alignment Alternative



Alternative 2 would convey recycled water from each City's treatment facilities via independent pipeline and pump station facilities to the DMC as shown in Figure 1-3. Similar to Alternative 1, modifications to Modesto's river outfall pump station are required to deliver flow to the DMC. Alternative 2 also requires a new pump station at Turlock's Harding Drain Bypass Pipeline outfall site to deliver Turlock's flow to the DMC. This facilities plan provides a detailed description of the project components for each alternative in subsequent chapters.

Figure 1-3: Alternative 2 - Separate Alignment Alternative

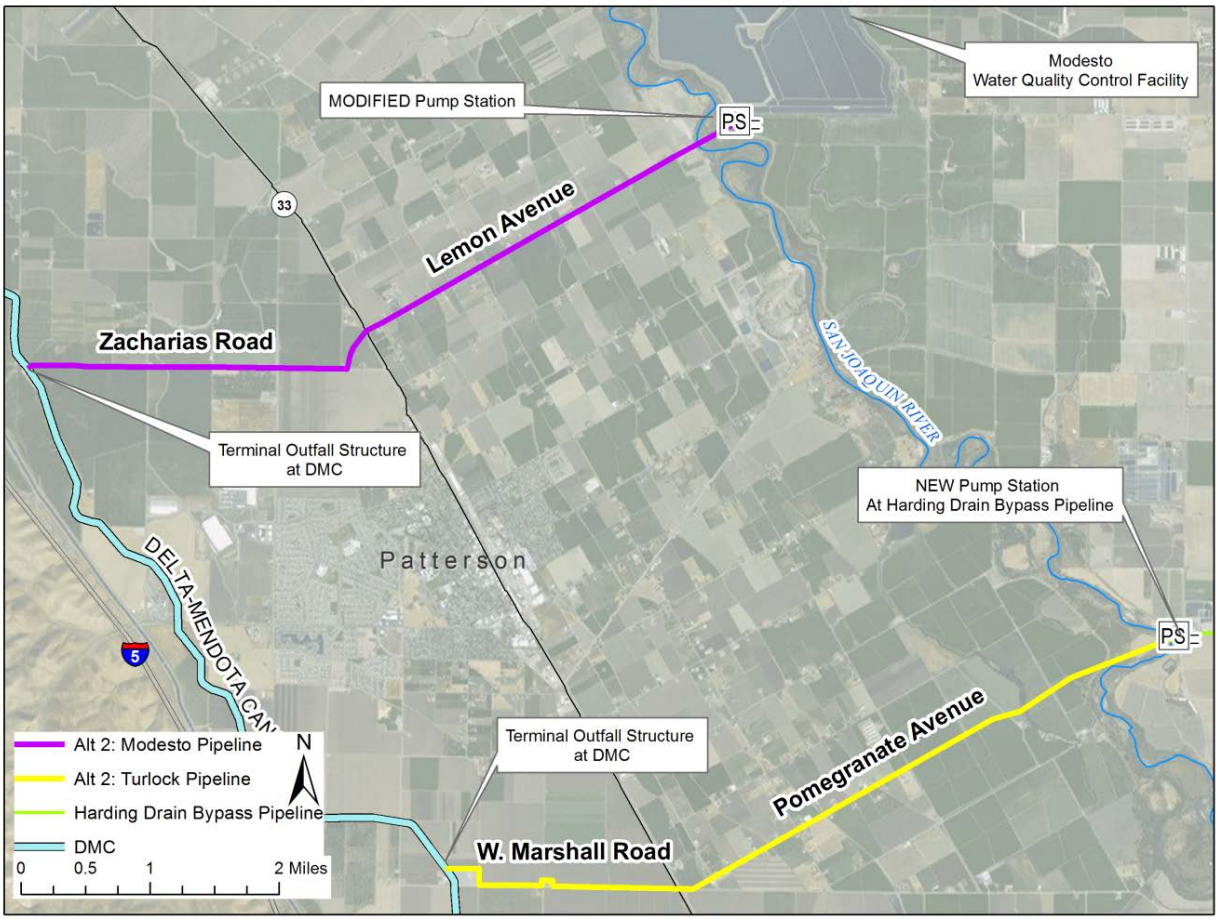


Figure 1-4 and Figure 1-5 present the flow schematics for Alternative 1 and 2, respectively. The schematics also show how the proposed NVRRWP facilities will interface with existing facilities.

Figure 1-4: Alternative 1 System Schematic

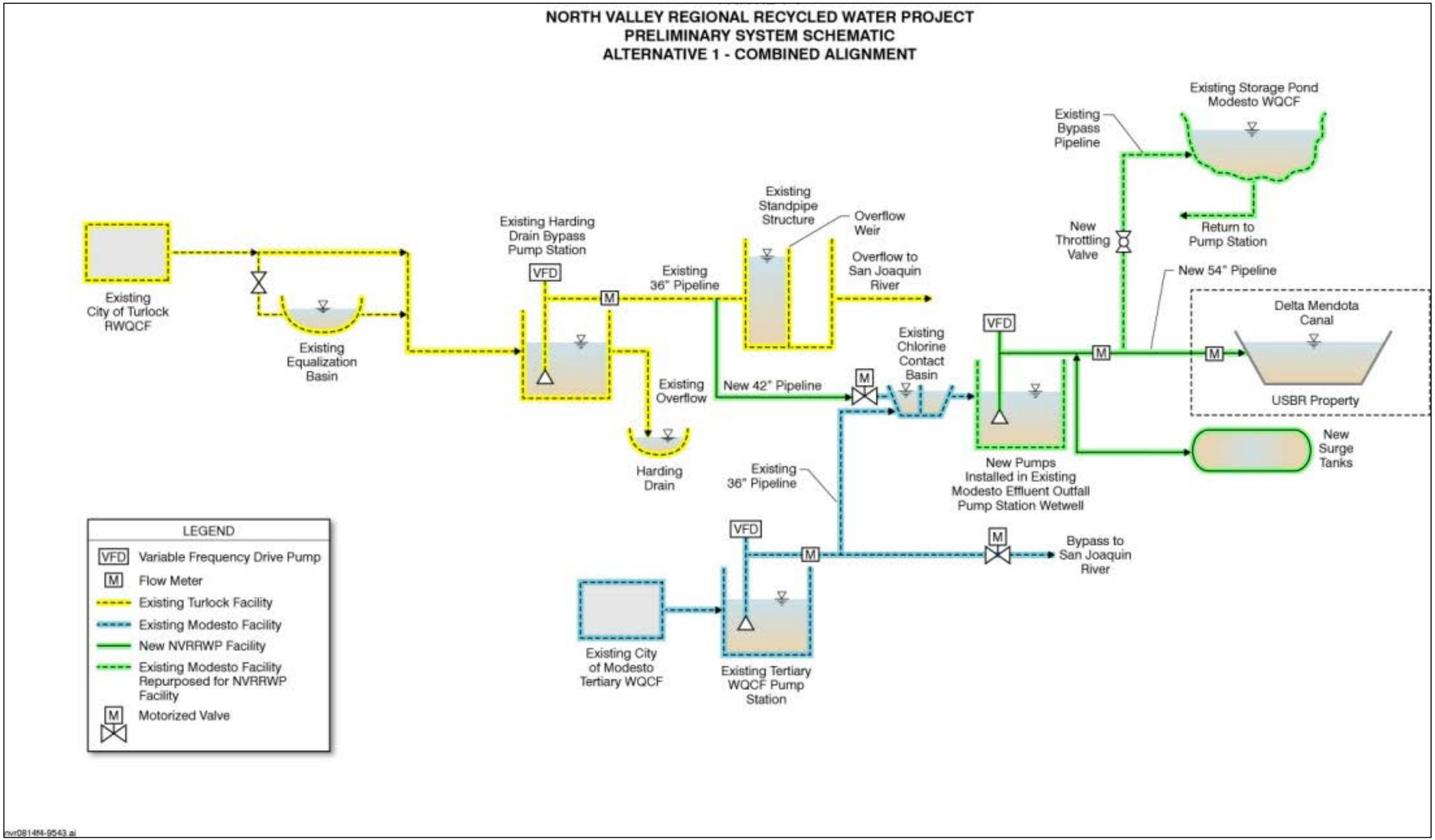
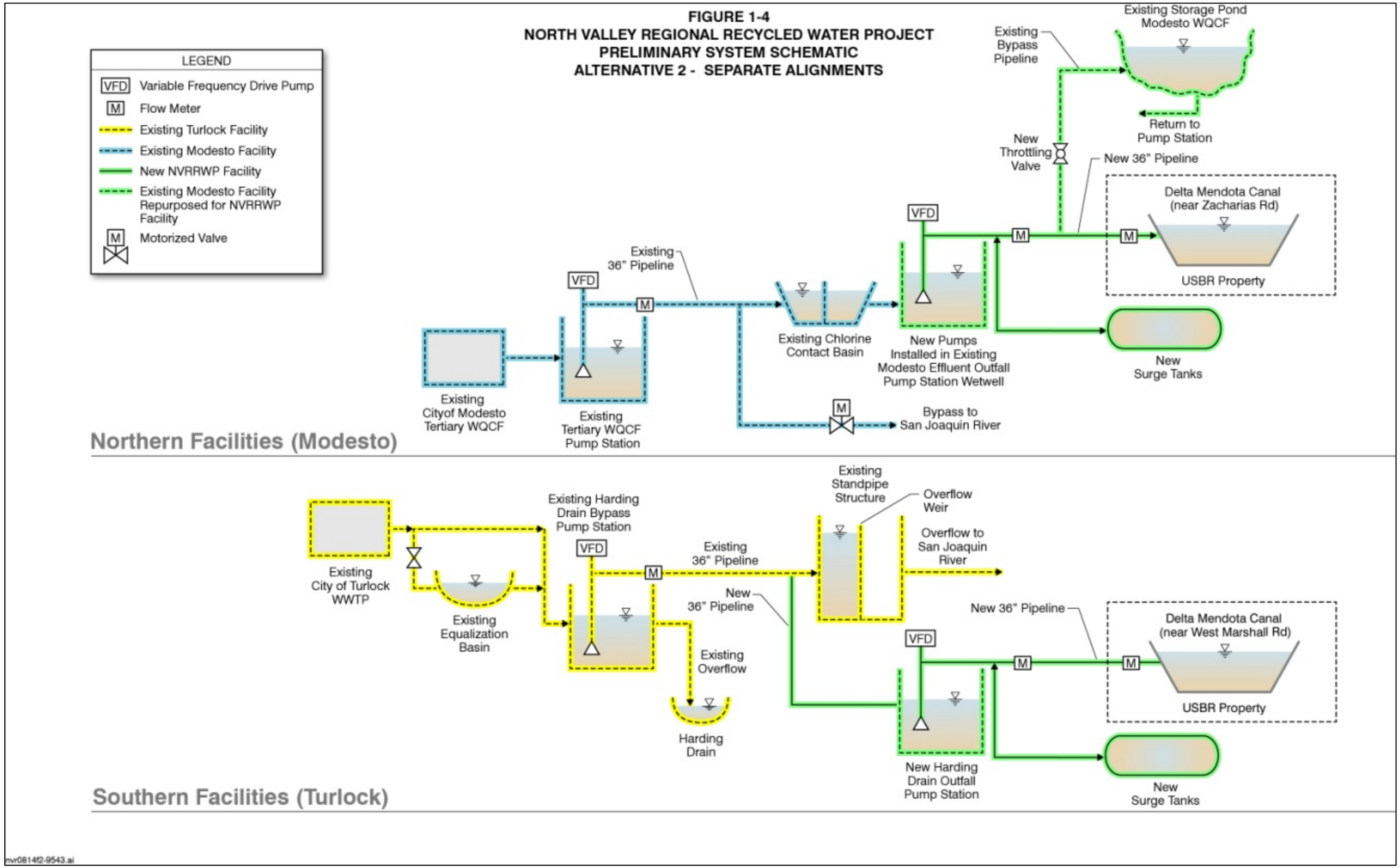


Figure 1-5: Alternative 2 System Schematic



1.4 Alternative Descriptions

A Title XVI Feasibility Study (Feasibility Study)[1] determined that Alternative 1: Combined Pipeline Alignment is the recommended alternative moving forward towards design. However, because the federal and state environmental impact studies and the final Project governance structure have yet to be finalized, Alternative 2: Separate Pipeline Alignment will also be progressed forward by this analysis, and subsequent analyses until a final Alternative has been chosen. This purpose of continuing with Alternative 2 is to have a contingency project in the event either Modesto or Turlock decides not to be a Partner Agency of the NVRRWP or if the Alternative 1 is an environmentally inferior approach. It is anticipated that the Program Agencies will decide on the preferred alternative before design begins.

This report is structured to present Alternative 1 as the recommended alternative for moving forward to design.

1.4.1 Feasibility Study Alignment

The Feasibility Study for the project (RMC, December 2013) evaluated a variety of project alternatives that accomplish the Program's goals. The Alternatives were evaluated based on the following criteria:

- Technical feasibility
- Ability to reduce the potential need for treatment upgrades
- Degree of institutional issues and obstacles
- Ability to establish an alternative, reliable, long-term water supply for up to 59,000 AFY of recycled water for DPWD;
- Ability to maximize beneficial use of recycled water by DPWD customers and south of Delta CVPIA designated wildlife refuges
- Ability to maximize project partners' control of operations and delivery of water;
- Ability to establish a long-term water right to allow for the beneficial use of recycled water
- Ability to maximize use of existing facilities for treatment / delivery of recycled water
- Ability to avoid or minimize impacts to environmental resources such as surface water, groundwater levels and groundwater quality, land subsidence, and biological resources including species
- Ability to deliver recycled water to DPWD at a cost that supports regional economic sustainability

The Feasibility Study determined the 'Direct Pipeline to DMC' alternative stood out as the best alternative when considering the above criteria. Within that alternative, two sub-alternative pipeline alignments (see Figure 1-2 and Figure 1-3) were chosen to move forward for inclusion in the Project's Environmental Impact Review and Environmental Impact Statement (EIR/EIS). These NVRRWP alignments are described in in *Chapter 7: Alternatives Analysis* of the Feasibility Study[1].

[1] RMC Water and Environment (RMC) 2013. North Valley Regional Recycled Water Program: Title XVI Feasibility Study, December 2013

1.4.2 Refined Alignment

The Feasibility Study 'Direct Pipeline to DMC' alternative pipeline alignments were refined as part of the current phase of work. To refine the evaluation, the following issues were considered:

- Potential impacts to existing agricultural practices, vegetation, land use and environmental settings
- Environmental permitting constraints
- Topographical constraints
- Construction access requirements
- Permanent and temporary pipeline easement considerations
- Use of existing Modesto and Turlock facilities to reduce costs and construction impacts
- Existing utilities
- Impacts to local traffic
- Local permitting agency requirements
- Long-term erosion control and pipeline easement maintenance

The project environmental team performed the initial biological surveys and environmental reviews required by the EIR/EIS for each of the alignments. The environmental team established the Area of Potential Impact (APE) region for each alignment (refer to Appendix B) to evaluate the impacts to existing agricultural practices, vegetation, land use, and environmental settings to validate and refine the alignment presented in the EIR/EIS. The purpose of the assessment was to review the previous work performed during the feasibility phase and to address areas of concern, including consideration of alignment adjustments to avoid potential impacts. The Alternative 1 and 2 alignments were also refined based on field visits, preliminary utility information gathered to date, and in consultation with the property owners, as held through a public meeting held on October 29, 2013.

The Alternative 1 and 2 pipeline alignments discussed herein were developed based on preliminary information and the criteria listed above. It should be noted detailed topographic surveys, geotechnical information, and easement acquisition reviews have not been performed at this time and the pipeline alignments may be further modified during final design.

1.4.3 Alternative 1: Combined Alignment

Alternative 1 would convey recycled water from Turlock's Harding Drain Bypass Pipeline to Modesto's Water Quality Control Facility outfall pump station, where it would be combined with Modesto tertiary effluent and conveyed together in a pipeline west to the DMC (see Figure 1-2).

For each alternative, the NVRRWP facilities can be considered as two distinct sets of facilities: East of San Joaquin River and West of San Joaquin River. This differentiation is used to consolidate common design criteria in terms of materials, hydraulics, and existing facilities.

General Facilities

Alternative 1 contains the following general facilities:

East of San Joaquin River
Facilities east of the San Joaquin River for Alternative 1 include (see Figure 1-2):

- 37,800 linear feet of 36-inch to 42-inch diameter pipeline connecting the Harding Drain Bypass Pipeline and the Modesto WQCF along South Carpenter Road, West Main Avenue, and Jennings Road
- Upgrades to the existing Modesto WQCF effluent pump station
- Trenchless pipeline crossing under the San Joaquin River

West of San Joaquin River
Facilities west of the San Joaquin River for Alternative 1 include:

- 32,000 linear feet of 48-in to 54-inch diameter pipeline between the San Joaquin River crossing and the DMC along Lemon Avenue and Zacharias Road
- The terminal outfall structure conveying project water into the DMC

1.4.4 Alternative 2: Separate Alignment Alternative

Alternative 2 includes independent conveyance facilities from each City's treatment facility to the DMC (see Figure 1-3). Similar to Alternative 1, modifications to Modesto's river outfall pump station are required to deliver flow to the DMC. Alternative 2 also requires a new pump station at Turlock's Harding Drain outfall site to deliver Turlock's flow to the DMC. This facilities plan provides a detailed description of the project components in subsequent chapters.

General Facilities

Alternative 2 contains the following general facilities:

East of San Joaquin River
Facilities east of the San Joaquin River for Alternative 2 include:

- 1 new pump station at the Turlock Harding Drain Bypass Pipeline connection
- Modifications to Modesto's effluent pump station
- 2 trenchless pipeline crossings of the San Joaquin River, 1 at each pump station

West of San Joaquin River
Facilities west of the San Joaquin River for Alternative 2 include:

- 32,000 linear feet of pipeline between the San Joaquin River at Modesto and the DMC along Lemon Avenue and Zacharias Road
- 34,000 linear feet of pipeline between the San Joaquin River at Turlock's Harding Drain Bypass Pipeline and the DMC along Pomegranate Avenue and West Marshall Road
- 2 terminal outfall structures conveying project water into the DMC at the west end of each pipeline

Chapter 2 System Hydraulics Evaluation

Implementation of the NVRRWP will require the modification or construction of critical pump station facilities to ensure proper operation of the system. These facilities include the re-purposed Modesto WQCF effluent pump station for Alternatives 1 or 2, and the Turlock Harding Drain Bypass Pipeline pump station for Alternative 2. These facilities are referred to as the Modesto Pump Station and the Turlock Pump Station, respectively.

The preliminary hydraulic design development of these facilities is described in this chapter. Design criteria for specific engineering disciplines, including structural, electrical, and mechanical will be included in subsequent design phases.

2.1 NVRRWP Water Production

2.1.1 City of Modesto Recycled Water Flows

Current flow projections for the City of Modesto are based on their Wastewater Master Plan. The Master Plan provides for an expansion of the tertiary treatment facilities in 5 phases, ultimately reaching a capacity of 27.5 mgd. Phase 1A (2.3 mgd capacity) is now operational; Phase 2 (12.5 mgd capacity) is currently under construction and expected to be operational by the summer of 2015. Two additional expansion phases are anticipated to reach the buildout capacity of 27.5 mgd. It is estimated that 0.2 mgd will be used for in-facility recycled water use, leaving 27.3 mgd available at buildout for the NVRRWP.

2.1.2 City of Turlock Recycled Water Flows

Current flow projections for Turlock are based on their Wastewater Master Plan. The City of Turlock has several long-term commitments for recycled water use from the facility. The first commitment is for one to two (2) mgd for 40 years at Turlock Irrigation District's (TID) Walnut Energy Center. Although the commitment is for up to two (2 mgd, the actual deliveries in 2012 have averaged 1.0 mgd. For the sake of assessing availability of recycled water, the contractual commitment of two (2) mgd will be reserved for delivery to TID. The other current recycled water use in Turlock is for irrigation at Pedretti Park. The average irrigation use for the park is assumed to be 0.1 mgd, which was the average use in 2012. Therefore, in calculating the recycled water that would be available for the NVRRWP, it is assumed that 2.1 mgd will be reserved for in-City use, leaving 25.4 mgd available at buildout for the NVRRWP.

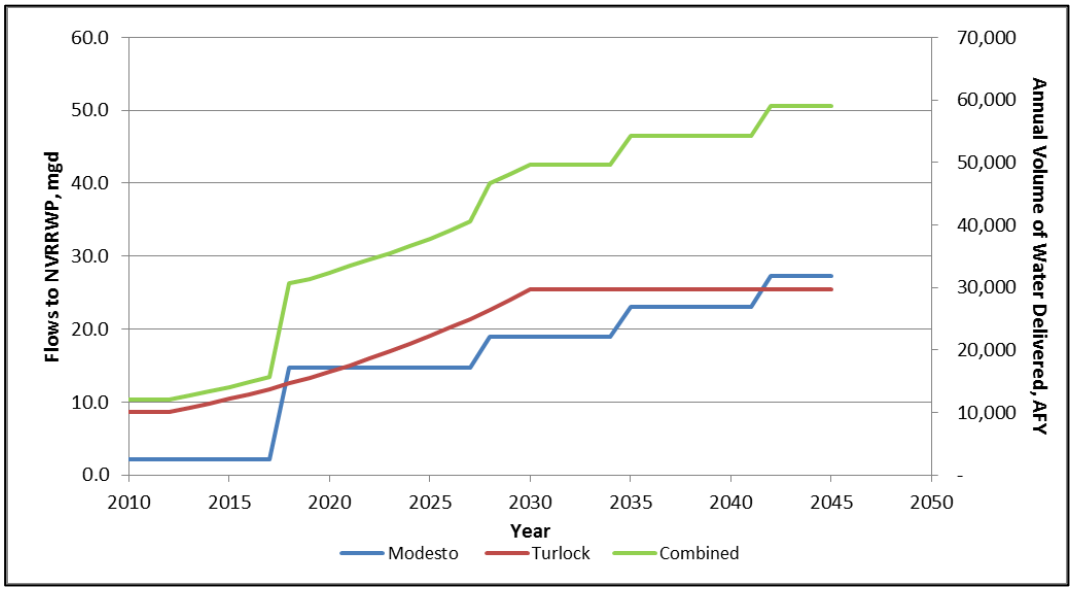
2.1.3 Total NVRRWP Flows

Based on the Cities' evaluation of buildout flows, it is estimated that approximately 52.7 mgd (59,000 AFY) of recycled water may be available by the year 2043 for the NVRRWP.

Figure 2-1 summarizes the estimated recycled water flows annually from now until buildout.

The data associated with the calculations of buildout flows may be found in Appendix C.

Figure 2-1 NVRRWP Tertiary Flow Production Rates



2.1.4 Facilities Phasing

Recycled water flows from Modesto and Turlock are projected to increase over time as discussed in the previous section. Table 2-1 summarizes the projected flows used for preliminary sizing of hydraulic features of the NVRRWP system including pumps, pipelines, and appurtenant facilities.

Table 2-1: Design Flow Summary[1]

	City of Modesto Flow (mgd)	City of Turlock Flow (mgd)	Combined Flow (mgd)
Initial (2018)	14.9	12.5	27.4
Buildout (2044)	27.3	25.4	52.7

1. Buildout flows are based on City projections updated from their respective Wastewater Mater Plans

To accommodate the projected increase in flows without over sizing facilities for near term flows, only the facilities that would be costly and difficult to upsize in the future for buildout were sized for buildout flows. In particular, the pipelines for each alternative were sized to accommodate future flows; however pumps are relatively easy and cost effective to replace in the future and therefore are sized only to meet initial flows.

Pumps and drives can be replaced in 15 to 20 years when flows begin to approach or exceed the pump station capacity, which coincides with the typical assumed life of this equipment. It is also inefficient to install oversized pumps initially; the future flow and head requirements are much different than near term, and pumps in general are not designed to efficiently accommodate such a wide range of conditions. To accommodate future pump replacement, some of the pump station infrastructure that will be installed initially (power supply facilities, buried conduits, structures, and piping) will be sized for future conditions. Further information regarding preliminary design of the pump stations is presented later in this Chapter.

2.2 System Hydraulics

The following is a discussion of the criteria and recommendations from the hydraulic analyses.

2.2.1 Pipeline Hydraulic Design Criteria

Flow Velocity

The maximum recommended flow velocity in the pipelines is 7 feet per second (fps) to limit the dynamic head loss in pumping systems and scouring of pipe interiors. The minimum recommended velocity is 2 feet per second to prevent sediment accumulation within the pipeline. The project conveys highly treated recycled water from Turlock and Modesto's treatment facilities and the recycled water is not expected to contain a significant amount of sediment, however it is good practice to maintain 2.0 feet per second as the minimum flushing velocity.

Pipeline Friction Losses

The Hazen-Williams equation was used to estimate friction losses in the pipelines. The hydraulic analysis assumes a range of Hazen-Williams "C" factors to estimate the hydraulic performance for both the new and aged pipe conditions. The Hazen-William "C" of 150 was selected to simulate the head loss in a new pipe, and a Hazen Williams "C" of 120 was selected to simulate aged pipe. Minor losses at bends, outlets, valves, and fittings were estimated by multiplying the flow velocity head by the appropriate "K" factors which are provided in the Hydraulic Institute Standards and other hydraulic manuals. Table 2-2 summarizes the hydraulic criteria for velocity and friction losses.

Table 2-2: Pipeline Velocity and Friction Loss Design Criteria

Item	Criteria
Flow Velocity and Head loss	
Maximum Flow Velocity (feet per second)	7.0
Minimum Flow Velocity (feet per second)	2.0
Pipe Material (for hydraulics evaluation)	Welded Steel Pipe, Mortar Lined
Hazen-Williams "C" for New Pipe	150
Hazen-Williams "C" for Aged Pipe	120
Head loss calculation (friction losses)	Hazen-Williams equation
Minor losses (k factors)	Hydraulic Institute

Based on these criteria, Table 2-3 shows the recommended pipe sizes (interior diameters) for each alternative. Note that the velocities for near term and buildout flows fall within the recommended criteria.

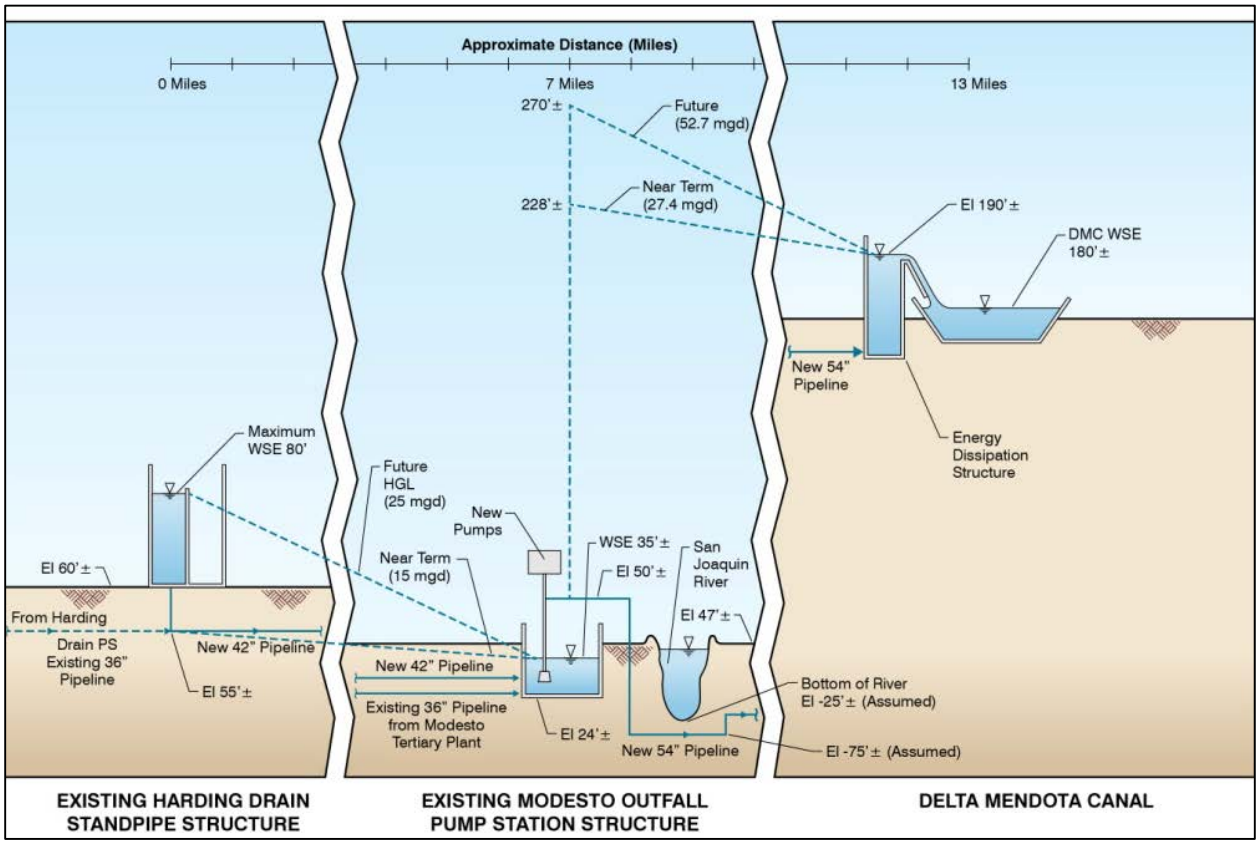
Table 2-3: Pipe Size Recommendations

	Recommended Pipe Size (Inner Diameter)	Average Velocity at near term (fps)	Average Velocity at buildout (fps)
Alternative 1: East of River (Turlock to Modesto)	42-inch	2.4	4.1
Alternative 1: West of River (Modesto to DMC)	54-inch	2.9	5.2
Alternative 2: Modesto to DMC Pipeline	36-inch	3.3	6.1
Alternative 2: Turlock to DMC Pipeline	36-inch	3.2	5.5

2.2.2 Results of Alternative 1 Hydraulic Analysis

Figure 2-2 presents the preliminary hydraulic profile for Alternative 1 and shows the key hydraulic control elevations. The profile represents the hydraulic grade elevation along the 13 miles of pipeline as shown in the figure; the maximum hydraulic grade elevation is at the Modesto Pump Station discharge and is approximately 228 feet for the near term flow, and 270 feet for future flow. The pipeline design pressure is governed by the future (buildout) hydraulic grade elevation and for the portion of pipeline leading from the pump station to the river crossing the design pressure is approximately 77 psi. The portion of pipeline crossing under the river will operate at higher pressure because of its depth, which is assumed to be 50 feet below the river bottom, with a corresponding design operating pressure of approximately 150 psi. The river bottom elevations will be confirmed during design by a bathymetric survey and pressure calculations will be refined accordingly.

Figure 2-2: Alternative 1 Preliminary Hydraulic Profile



Pipeline between Harding Drain and Modesto Pump Station

As shown in Figure 2-2 there is 20 to 45 feet of available head between the Harding Drain pipe connection and Modesto PS well. The minimum head condition would occur when water flows by gravity from the point of connection to the existing pipe (approximately elevation 55 feet) to the wet well at the Modesto PS (elevation 35 feet). However this operating condition would affect the performance of the existing Harding Drain Bypass pumps since the discharge elevation would be much lower than the design. The pumps are designed to discharge to the Harding Drain standpipe weir at elevation 80 feet. A throttling valve at the outlet from the 42" pipeline as it enters the Modesto PS is recommended to maintain surcharged conditions (i.e. pressurized) in the pipeline. Figure 1-4 shows the proposed location of the throttling valve on the 42" pipe entering the Modesto PS. The throttling valve would allow the existing Harding Drain Bypass pumps to operate at their design discharge elevation, and also control air entrainment into the pipeline by keeping it full at all times. Air will accumulate at high points if the pipeline is allowed to operate partially full, and at higher flows when the pipe surcharges, the entrapped air could restrict flow capacity. Air relief valves will be installed at high points to release air, however they might not always be effective under the anticipated low operating pipeline pressures or if the pipeline is allowed to fluctuate between pressurized and gravity flow (partially full pipe). The recommended approach is to keep the pipeline full at all times using a throttling valve as described above.

2.2.3 Results of Alternative 2 Hydraulic Analysis

Figure 2-3 presents the preliminary hydraulic profile for Alternative 2 (Modesto to DMC) and shows the key hydraulic control elevations. As shown in the figure, the maximum hydraulic grade elevation is at the

Modesto Pump Station discharge and is approximately 247 feet for near term flow, and 333 feet for future flow. These are higher than Alternative 1 because the pipeline is smaller diameter (36" vs. 54") and operates at higher velocity and head loss than Alternative 1. As with Alternative 1, the pipeline design pressure is governed by the future (buildout) hydraulic grade elevation. The portion of pipeline leading from the pump station to the river crossing will operate at a design pressure of approximately 123 psi under future flows. Using the same assumptions as the Alternative 1, the portion of pipeline crossing under the river will operate at a design pressure of approximately 177 psi.

Figure 2-3: Alternative 2 Preliminary Hydraulic Profile – Modesto to DMC

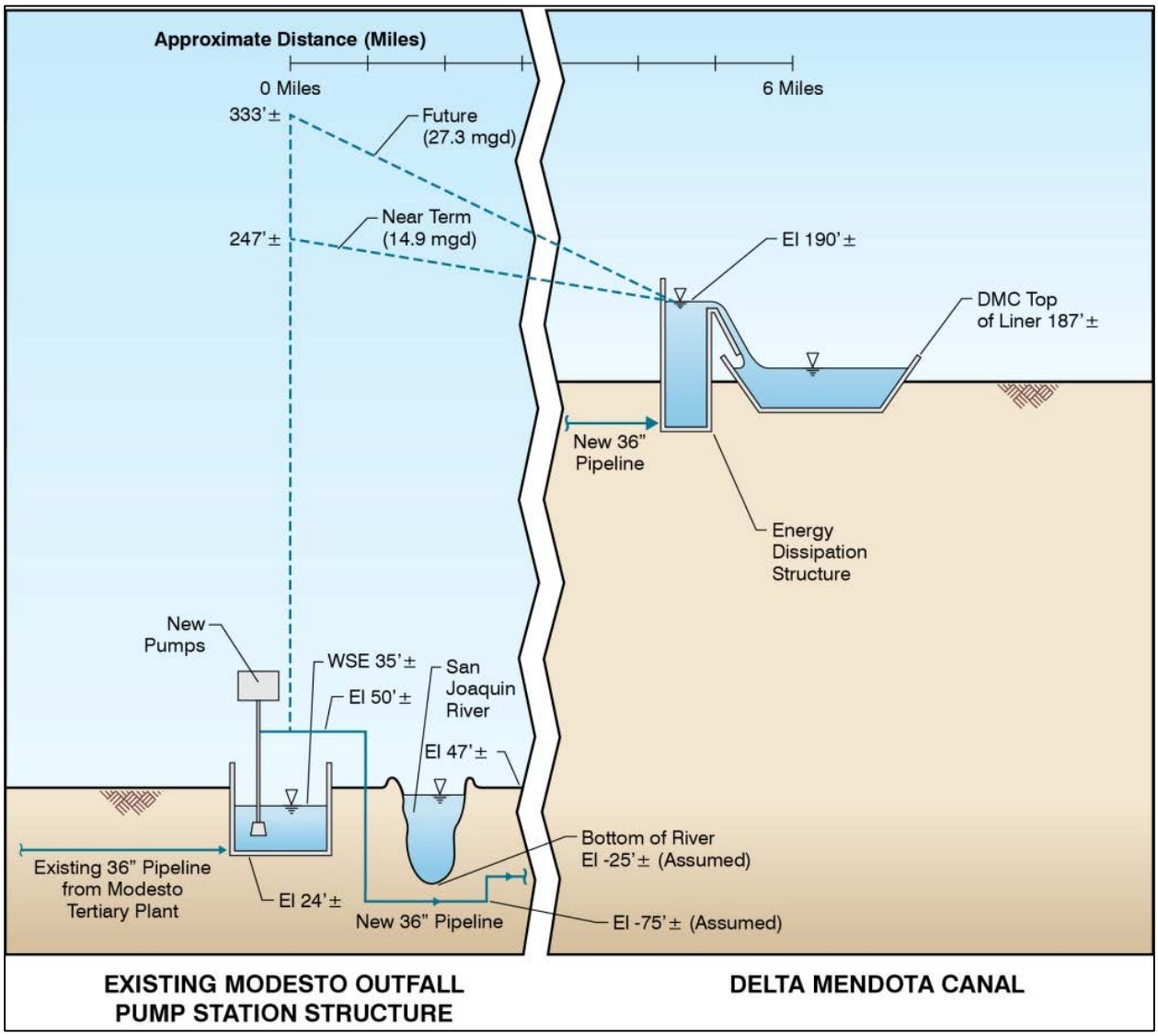
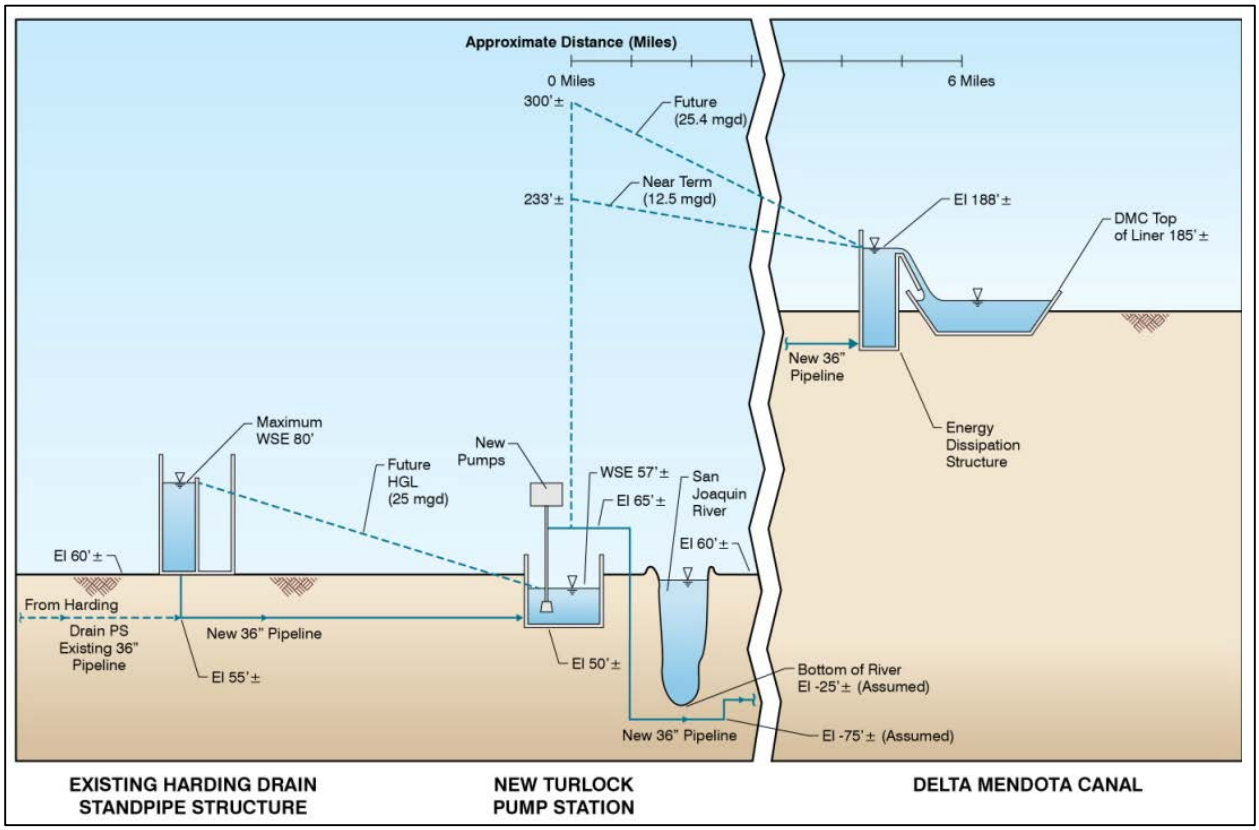


Figure 2-4 presents the preliminary hydraulic profile for Alternative 2 (Turlock to DMC) and shows the key hydraulic control elevations. As shown in the figure, the maximum hydraulic grade elevation is at the Turlock Pump Station discharge and is approximately 233 feet for near term flow, and 300 feet for future flow. The portion of pipeline leading from the pump station to the river crossing will operate at a design pressure of approximately 102 psi under future flows. Using the same assumptions as the Alternative 1, the portion of pipeline crossing under the river will operate at a design pressure of approximately 163 psi.

Figure 2-4: Alternative 2 Preliminary Hydraulic Profile – Turlock to DMC

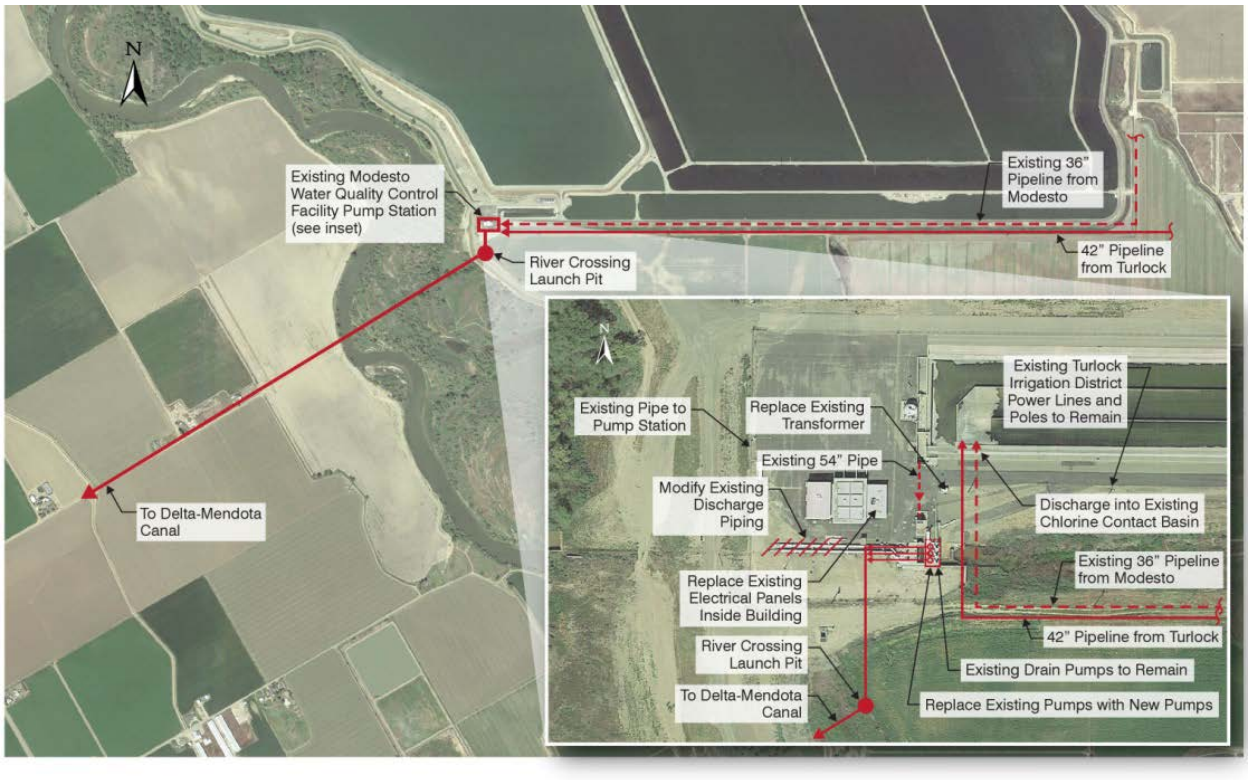


2.3 Pump Station Locations and Design Features

Alternative 1

The location for the proposed Modesto Pump Station for Alternative 1 is shown on Figure 2-5. As described previously, the pump station for Alternative 1 is at the existing river discharge pump station to the southwest of the Modesto WQCF treatment ponds. The existing pumps will be replaced with new larger pumps within the same wet well structure. The inset for Figure 2-5 shows the conceptual modifications to existing pumps, piping, and other facilities. The proposed location of the launch pit for the river crossing is also shown. Additional information for the existing pump station is included in Appendix D.

Figure 2-5: Proposed Repurposed Modesto Pump Station at Modesto WQCF



The layout and design features of the new pump station including the wet well, control building, power poles, transformer location, roads and other features will largely remain as is. Preliminary recommendations for pump selections are presented later in this chapter. The existing 1.5 million gallon chlorine contact basin at Modesto will receive flows from the Turlock and Modesto pipelines and convey water from the basin into the pump station wet well through existing piping. Using the existing basin will provide operational volume for the pump station and will help stabilize the water surface elevation in the wet well.

Use of Existing Modesto WQCF Storage Ponds

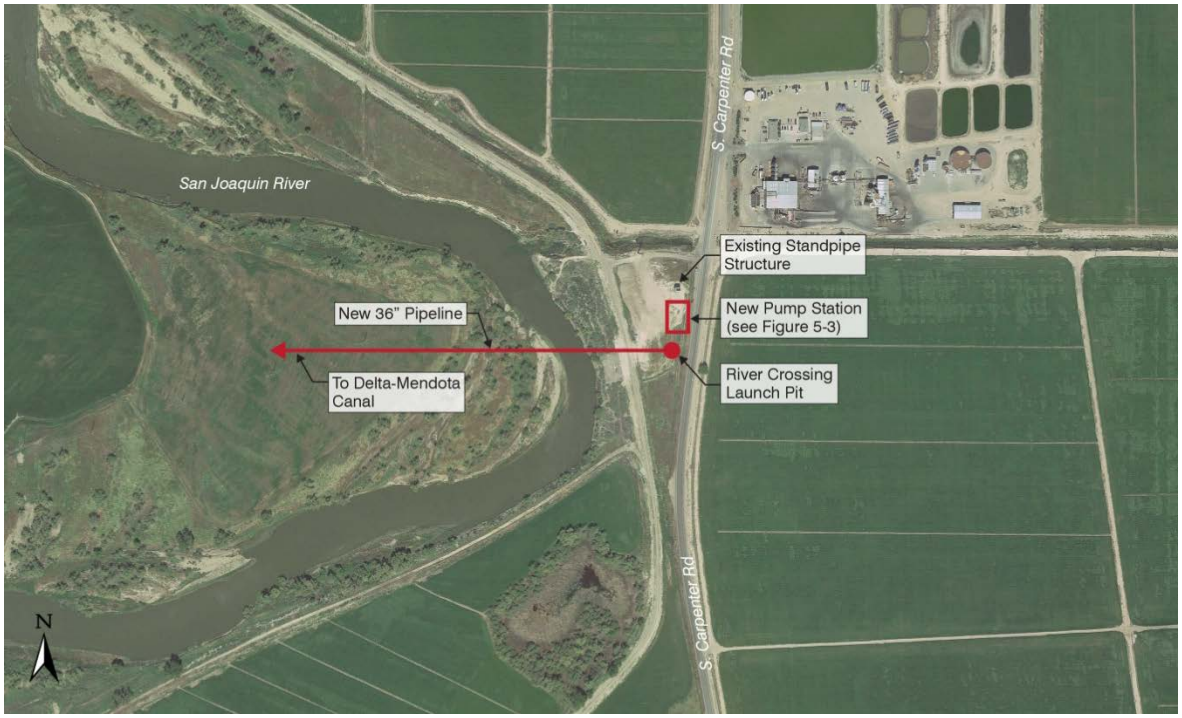
As a result of Modesto increasing its tertiary treatment capacity (and reducing production of secondary effluent), there will be available storage in the existing ponds at the site to store NVRRWP water, if needed. There may be a need to store NVRRWP water, for example, while maintenance or repairs are made to the DMC or the NVRRWP discharge pipeline. Water would be pumped from the pump station wetwell through the existing 48-inch bypass pipe to the irrigation forebay of the pond system. Modifications to the existing bypass piping may be required to re-route the flow to the storage pond. Additionally, any cross connections between ponds used for secondary treatment and the pond used for NVRRWP tertiary effluent storage will need to be identified during design and disconnected.

The NVRRWP pump station facilities would need to bypass to the San Joaquin River during an emergency event if the Modesto WQCF storage ponds are not available. Discharging recycled water to the San Joaquin River during an emergency condition would require updating Turlock and Modesto's discharge permits. It should be noted the City of Turlock's existing discharge permit allows emergency discharge into the Harding Drain in the event of power failure, or other emergency condition.

Alternative 2

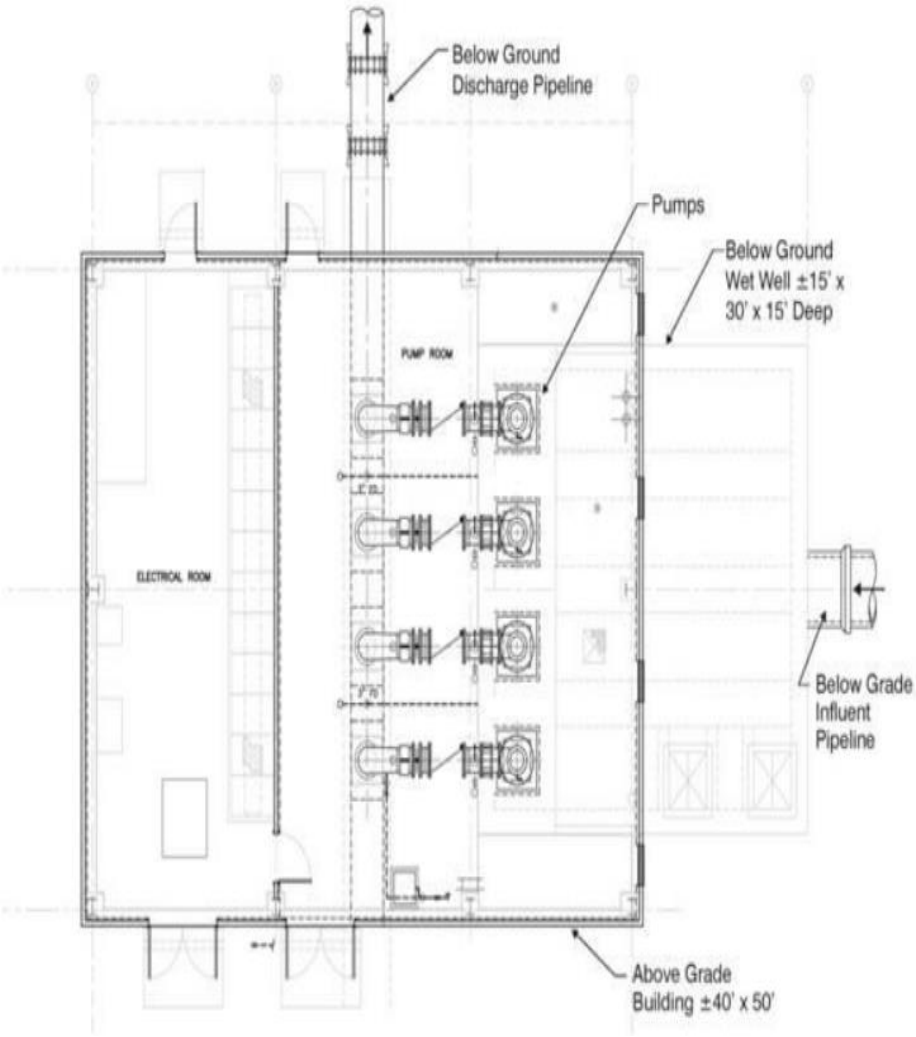
The location of the proposed Turlock Pump Station for Alternative 2 (shown on Figure 2-6) is on property owned by the City of Turlock on the west side of Carpenter Avenue at the terminus of the existing Harding Drain Bypass pipeline. The existing standpipe structure at the end of the pipeline is shown on Figure 2-6 along with the approximate locations of the pump station and river crossing launch pit. As shown, the launch pit is approximately 200 feet west of the levee (same distance as the existing standpipe structure) and is understood to meet requirements of the Central Valley Flood Protection Board. However, the final recommended location cannot be made until field investigations are completed, a trenchless technology is selected, and further discussions are held with the CVFPB and USACE.

Figure 2-6: Proposed Turlock Pump Station at Harding Drain



The proposed layout and design features of the new pump station would be similar to the existing Harding Drain Bypass Pump Station located approximately 5 miles to the east. Figure 2-7 shows the main features of the building, pumps, and ancillary facilities.

Figure 2-7: Layout and Features of New Harding Drain Pump Station



2.3.2 Pump Station Design Criteria

Figure 2-7 presents key criteria for proposed pump stations. The following is a discussion of criteria presented in the table.

Table 2-4: Key Pump Station Design Criteria

Item	Criteria
Pump Type	Vertical Turbine with variable frequency drives
Operational Redundancy	Provide full capacity with one pump (largest installed) out of operation
Minimum Pump Efficiency at rated flow and head	85 %
Wet well sizing and configuration	Hydraulic Institute Standards
Surge Tank Sizing	As needed to maintain surge pressure within allowable limits for the pipelines. Surge pressures to be determined during final design using dynamic hydraulic modeling.
Pump Motor Sizing	Non-overloading for entire range of pump operation
Back-up Power Supply	Not preferred. Flows will discharge to the San Joaquin River during power outages.

2.3.3 Pump Type

Vertical turbine pumps are used extensively by both Turlock and Modesto and are recommended for the new pump stations. Additionally, the existing pumps at the Modesto WQCF outfall pump station are vertical turbine and are installed in an existing wet well that is proposed to be re-purposed for the NVRRWP. It would be expensive and impractical to install pumps other than vertical turbine, for example split case centrifugal, at this location. All pumps will be driven by variable frequency drives to accommodate variable flows pumped from the Turlock and Modesto tertiary facilities.

2.3.4 Operational Redundancy

The Turlock and Modesto tertiary facilities will rely on the NVRRWP for conveying effluent to the DMC. Likewise, DPWD will rely on water supply from these facilities to meet irrigation demands. For these reasons, it is critical that the proposed facilities have sufficient redundancy to meet conveyance requirements. Since the existing Modesto WQCF outfall pump station has space and other provisions for three vertical pumps, it will be repurposed with three new pumps to fit within the same space. Redundancy will be provided by sizing the pumps such that the full flow capacity can be met with one pump not in operation. The third will serve as a back-up. The duty and standby pump assignments will automatically rotate between the pumps to maintain equal run time and wear.

2.3.5 Minimum Pump Efficiency

Because the proposed NVRRWP pump stations will run continuously throughout the year, it will be important for them to operate efficiently to minimize power costs and pump wear. The industry standard for pump efficiency for a continuously operated facility ranges from 80 percent to 90 percent. Accordingly, a minimum efficiency of 85 percent was selected for the proposed NVRRWP facilities. Pump selections will be made such that the efficiency at the rated head and flow will be within 5 percent of the best efficiency point, but not less than 85 percent. The minimum pump efficiency for operation at reduced speed is assumed to be 70 percent.

2.3.6 Wet Well Sizing and Configuration

The Hydraulic Institute (HI) provides recommendations for wet well sizing to ensure efficient operation of pump systems. The existing wet well at the Modesto outfall pump station was evaluated for compliance with the HI standards for the initial and future NVRRWP flow rates. The wet well dimensions and baffling

were found to be in compliance for near term flows up to approximately 40 mgd. However, at the future flow conditions the existing wet well does not meet HI standards for baffling. Considering that this pump station has operated in the past at flow rates up to 80 mgd, future operation of the pump station up to 53 mgd is not anticipated to present problems. Poor pump performance and signs of pump cavitation will be evident in the future if the wet well is not performing as expected at the higher flows. Modifications to the wet well baffling or the pump intakes (e.g. vortex breakers) can be made in the future to correct any observed deficiencies.

2.3.7 Surge Tank Sizing

Because the pumps and discharge pipelines will operate at approximately 100 psi, a surge pressure control system will be required to minimize potential surge pressures that could damage facilities. Surge tanks are frequently used for this purpose in combination pump discharge control valves and air/vacuum relief valves along the pipeline and are recommended for this project. Sizing of the tanks will be conducted during design using a hydraulic model that predicts pressure rises during a sudden loss of pump power, rapid valve closure, or other events that cause either up-surge or down-surge in the pipeline. Two tanks sized to operate in parallel to meet peak flow requirements are recommended. This sizing arrangement would allow one tank to be temporarily taken out of operation for maintenance or repairs if needed during lower flows.

2.3.8 Pump Motor Sizing

The pump motors must be sized to handle the torque requirements of the pump for all flow and head conditions (from pump shut-off to run-out). Motor sizes will be determined from the pump performance curves such that they are non-overloading (i.e. do not exceed their horsepower rating) and do not rely on the motor service factor (typically 1.15) to meet all operating requirements. The type of pump motor enclosures (Totally Enclosed, Fan Cooled (TEFC), Weather Proof, Type II (WPII), etc.) and voltage (480V or 4160V) will be determined during design.

2.3.9 Backup Power Supply

Because Modesto and Turlock will rely on the NVRRWP facilities for conveying their tertiary effluent, a reliable means for backup conveyance or disposal is recommended for the pump stations. Both Cities have, or will have, permits to discharge to the San Joaquin River in the event of an emergency. This method of backup disposal is an economical solution. Diesel driven generators are frequently used for this purpose and should also be considered for this project either during the initial facility construction or in the future in case river discharge permit conditions change. To protect against overflows at the Modesto PS during a power outage with no generators in place, a motorized valve, as previously described, will be installed at the end of the 42” pipeline from Turlock before it enters the Modesto PS. The motorized valve will close automatically if a power outage occurs at Modesto. After the valve closes, flow from Turlock will overflow into the river at the existing Harding Drain Bypass standpipe structure. Flow from the Modesto tertiary facility will overflow through existing piping at the Modesto PS to the river during a power outage. Additionally, an uninterruptible power supply (UPS) is recommended for control and instrumentation systems, and for the motorized valve described above. The UPS system provides a continuous battery backup for these small loads and allows a seamless transfer of power in the event of a power outage.

2.3.10 Pump Operating Conditions

The pump design operating conditions for flow and pressure were determined using the pipe sizes, friction factors, and static lifts previously described. Preliminary estimates of pipe lengths, bends, fittings, and other hydraulic features were developed for each alternative. The resulting head loss versus flow rate (i.e. system curves) were plotted to determine the required pump operating pressures and power at the design flows. The system curves are presented in Appendix D.

2.3.11 Alternative 1 – Preliminary Pump Selections

Preliminary pump selections were made using the design criteria described above. There are several vertical turbine pump manufacturers who can meet the required flow and head conditions and will be included in the final design specifications. For this preliminary selection, Goulds Pumps was used as the basis for selection. Appendix D provides the selected pump curves.

Alternative 1

Table 2-5 presents the preliminary pump selection and key design features for new pumps to be installed in the repurposed wet well at the Modesto PS for Alternative 1. The Modesto PS will house three pumps; two duty and one standby to meet the design flow and discharge head conditions shown. The minimum flow rate that can be produced with one pump operating at minimum speed is also shown. For initial flows, the selected pumps will provide a range of approximately 6.5 mgd (one pump at minimum speed) to 27.4 mgd (two pumps at full speed). At buildout the flow range is approximately 8.0 mgd to 53 mgd.

Table 2-5: Preliminary Pump Selections for Alternative 1

Design Flow and Discharge Head (MGD per pump/Feet)	No. of Duty Pumps/Standby Pumps	Goulds Pump Model No.	Efficiency at Rated Condition (%)	Approx. Operating Speed Range (RPM)[1]	Approx. Flow at Minimum Speed (MGD)[1]	Maximum Horsepower per Pump (HP)[2]
Initial 13.7 /175	2/1	VIT 30 BLC	88	720-890	6.5	500
Buildout 26.5/220	2/1	VIT 42WMCE	87	900-1180	8.0	1220

1. Minimum speed and flow shown corresponds to one pump operating at 70% efficiency. Lower flows are possible but are at lower pump efficiencies not recommended for sustained operation.
2. Horsepower shown is maximum required for full range of pump operation (non-overloading). Does not include motor service factor.

2.3.12 Alternative 2 – Northern Facilities

Table 2-6 presents the preliminary pump selection and key design features for new pumps to be installed in the repurposed wet well at the Modesto PS for Alternative 2. As with Alternative 1, the Modesto PS will house three pumps; two duty and one standby to meet the design flow and discharge head conditions shown. For initial flows, the selected pumps will provide a range of approximately 3.5 mgd (one pump at minimum speed) to 15 mgd (two pumps at full speed). At buildout the flow range is approximately 5.5 mgd to 28 mgd.

Table 2-6: Preliminary Pump Selections for Alternative 2 (Modesto)

Design Flow and Discharge Head (MGD per pump/Feet)	No. of Duty Pumps/Standby Pumps	Goulds Pump Model No.	Efficiency at Rated Condition (%)	Approx. Operating Speed Range (RPM)[1]	Approx. Flow at Minimum Speed (MGD)[1]	Maximum Horsepower per Pump (HP)[2]
Initial 7.5 /184	2/1	VIT 24 EHC	88	750-890	3.5	280
Buildout 14.0/280	2/1	VIT 24 GLC	87	800-1180	5.5	830

1. Minimum speed and flow shown corresponds to one pump operating at 70% efficiency. Lower flows are possible but are at lower pump efficiencies not recommended for sustained operation.
2. Horsepower shown is maximum required for full range of pump operation (non-overloading). Does not include motor service factor.

2.3.13 Alternative 2 – Southern Facilities

Table 2-7 presents the preliminary pump selection and key design features for pumps at the new Turlock PS for Alternative 2. The Turlock PS is assumed to house three pumps, similar to Modesto PS; two duty and one standby to meet the design flow and discharge head conditions shown. For initial flows, the selected pumps will provide a range of approximately 3.5 mgd (one pump at minimum speed) to 12.5 mgd (two pumps at full speed). At buildout the flow range is approximately 6.5 mgd to 25 mgd.

Table 2-7: Preliminary Pump Selections for Alternative 2 (Turlock)

Design Flow and Discharge Head (MGD per pump/Feet)	No. of Duty Pumps/Standby Pumps	Goulds Pump Model No.	Efficiency at Rated Condition (%)	Approx. Operating Speed Range (RPM)[1]	Approx. Flow at Minimum Speed (MGD)[1]	Maximum Horsepower per Pump (HP)[2]
Initial 6.25 /148	2/1	VIT 20 GHO	89	600-710	3.5	190
Buildout 12.5/230	2/1	VIT 26 GHO	89	900-1180	6.5	780

1. Minimum speed and flow shown corresponds to one pump operating at 70% efficiency. Lower flows are possible but are at lower pump efficiencies not recommended for sustained operation.
2. Horsepower shown is maximum required for full range of pump operation (non-overloading). Does not include motor service factor.

2.4 System Operations Assumptions

2.4.1 Controls / Facilities Operations

Figure 2-8 shows the conceptual telemetry and control schematic for Alternative 1. The proposed facilities will have new control and monitoring equipment including programmable logic controllers (PLCs) and radio communication (telemetry) that will interface with existing SCADA and telemetry equipment at the Turlock and Modesto facilities.

2.4.2 Pump Station Control Concepts

The proposed Modesto PS will receive flows from the Turlock and Modesto tertiary facilities. Both of these facilities have pumps with variable frequency drives that modulate pump output to match incoming

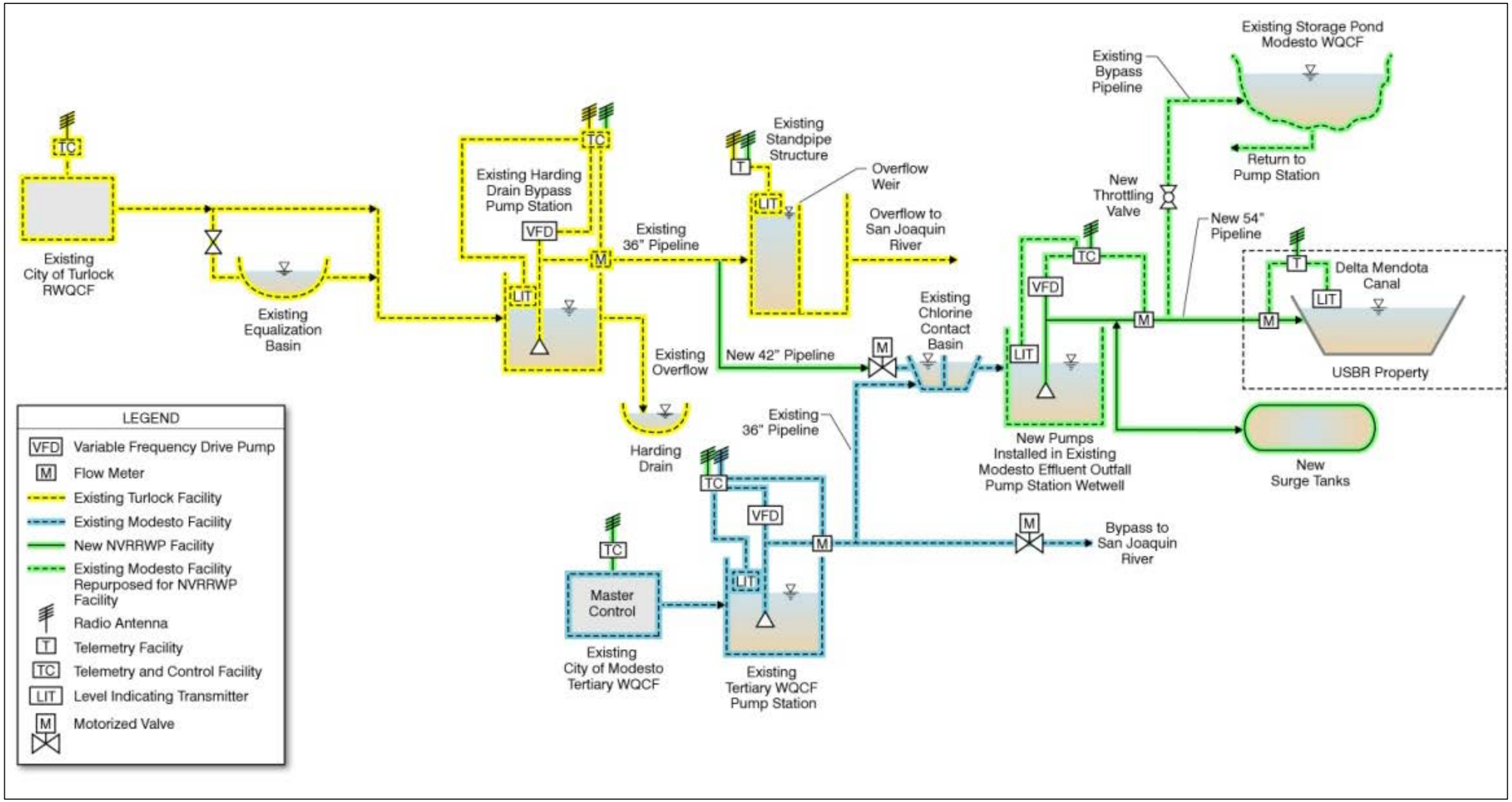
flows. This is done by monitoring the water level in their respective pump station wet wells and adjusting the output of the pumps to maintain a steady water level. The same pump control concept will be used for the new pumps. All new pumps will be equipped with variable frequency drives that modulate pump output to maintain a steady water level in the wet well. This control concept will accommodate the variable flows coming into the pump station from the Modesto and Turlock facilities. The variable frequency drives will be controlled through a local PLC that receives signals from a level monitor (LIT) in the pump station wet well. The PLC will also transmit signals, including alarms, through a radio system to a master control facility located in the control room at the Modesto tertiary facility. The details of this concept including coordination with existing SCADA systems will be developed during design.

Master Control Facility

For Alternative 1, a proposed new master control facility will be located in the control room at the Modesto tertiary facility to receive the following system operating signals through new and existing telemetry equipment.

1. Discharge Facility at DMC
    - NVRRWP flow rate into DMC
    - Water level in the new energy dissipation structure (outlet to DMC)
    - Water level in the DMC at the energy dissipation structure
    - Alarms signals from DMC discharge facility (security, loss of power, high water level)
2. Modesto tertiary pump station
    - Flow from Modesto tertiary pump station
    - Alarm signals (loss of power, high water level, pump failure)
3. Turlock tertiary pump station (Harding Drain Bypass Pump Station)
    - Flow rate
    - Water level in existing Harding Drain standpipe
    - Alarm signals (loss of power, high water level in standpipe, pump failure)
4. Proposed Modesto PS
    - Flow rate
    - Water level in wet well
    - Pump discharge pressure
    - Surge tank water levels
    - Pump speed
    - Uninterruptible Power Supply (UPS) monitoring
    - Alarms (loss of power, high water level, pump failure, security)

Figure 2-8: Telemetry and Control Schematic



A dedicated work station with graphics (SCADA screens) and touch screen controls will be included in the master control facility. In addition to monitoring, the master control facility will have capability to remotely control the Modesto PS. Under normal operations, the local PLC at the pump station will control the pumps and report to the master facility. However, the master control facility can take over control if there is a local PLC malfunction or other reason to operate the pumps remotely. Control of the Turlock (Harding Drain) facilities will remain in its current configuration and will not have the capability to be controlled through the master facility.

Radio Telemetry

Because of the long distances, alignments, river crossing, and other obstacles between the proposed NVRRWP facilities, it would not be practical to install dedicated fiber optic cables to communicate between facilities. Likewise, use of existing telephone wires would not be practical nor responsive (fast) enough to provide the required level of monitoring and control. Radio systems are extensively used for remote monitoring and control of facilities such as the proposed NVRRWP. Radio surveys will need to be conducted during design to confirm line-of-sight between the new and existing telemetry facilities, and to determine the height requirements for new radio antennas. Various telemetry technologies are available and will be evaluated during design.

Alternative 2 Operations

The control concept for Alternative 2 pump stations would be similar to Alternative 1, along with monitoring of the same operating functions. The main difference would be that there would likely not be a master control facility. Instead, the new Turlock and Modesto pump systems would be monitored and controlled independently. Communication between the Modesto and Turlock facilities would be provided as needed, for example to monitor the total quantity of flow being conveyed to the DMC from both pump stations.

Chapter 3 NVRRWP Pipelines

This section describes the preliminary alignments and connection locations to Modesto and Turlock's existing facilities.

3.1 Pipeline Reaches

The Alternative pipeline alignments may be further broken down into reaches of common design and construction criteria. Reaches were defined based on the following attributes:

- Assumed inner-diameter of the pipeline
- Public or private Right-of-Way access
- Open-cut or Trenchless pipeline installation
- Traffic control impacts

Figure 3-1 presents the breakdown of pipeline reaches. Reach A through Reach G are components of Alternative 1. Reach D through Reach G, and Reach H through Reach L are components of Alternative 2. Figure 3-1 presents the reaches and their associated criteria.

Figure 3-1: Alignment Reach Map

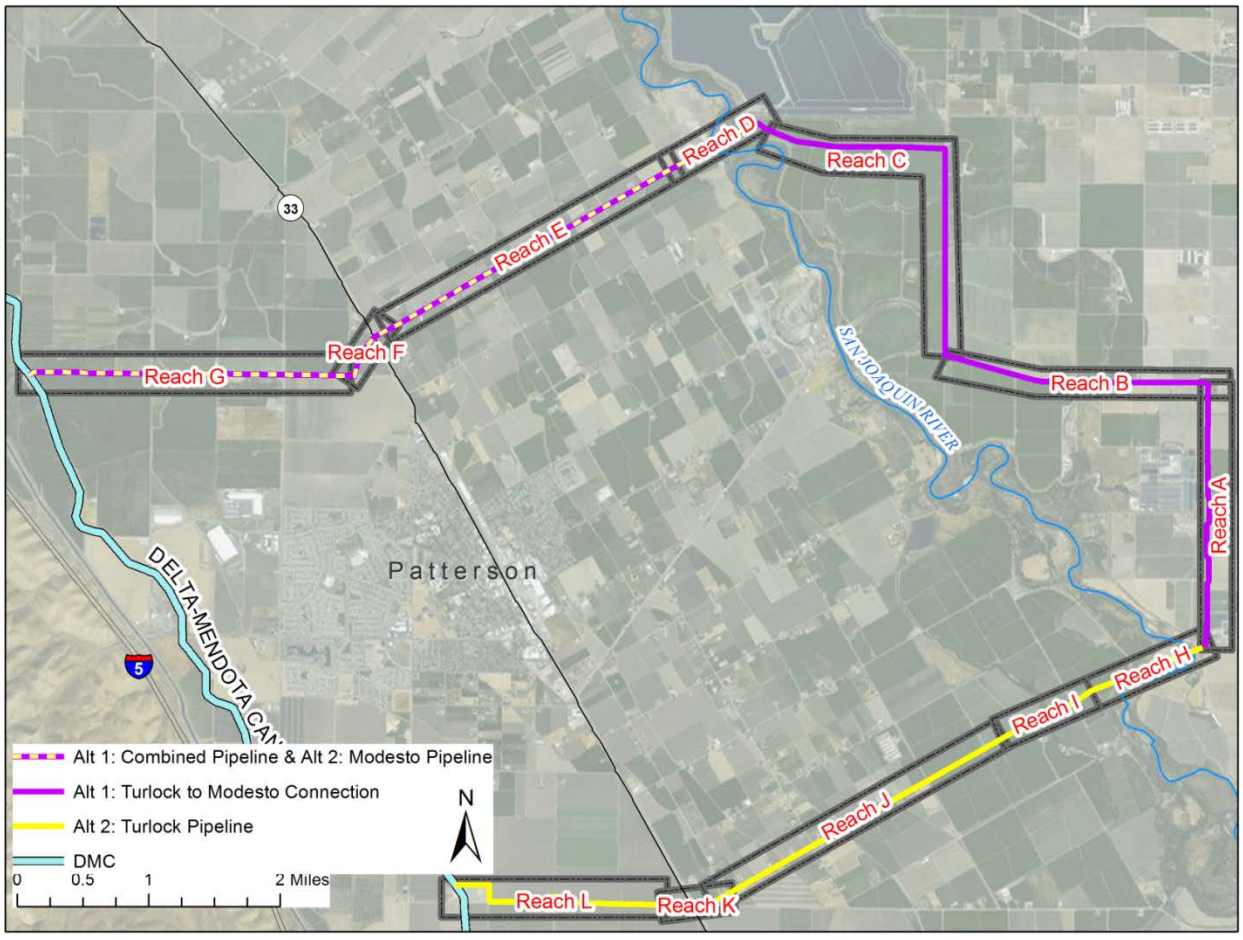


Table 3-1: NVRRWP Alternative Reach Data

Reach	Description	Reach Start	Reach End	Right-of-Way	Length (LF)	Pipeline Diameter (in)	Open Cut / trenchless	Roads	Major Crossings	Traffic Control
Reach A	Harding Drain Bypass Connection to West Main Avenue	Connection to Harding Drain Bypass Pipeline at intersection of South Carpenter Road and Harding Road	Intersection of South Carpenter Road and West Main Avenue	Public ROW	10,500’	42”	Open Cut	South Carpenter Road, Harding Road, West Main Avenue	N/A	High Traffic – partial / full lane closure
Reach B	West Main Avenue to Jennings Road	Intersection of West Main Avenue and South Carpenter Road	Intersection of West Main Avenue and Jennings Road	Public ROW	10,500’	42”	Open Cut	West Main Avenue	Cross under West Main Avenue	High Traffic – partial / full lane closure
1Reach C	Jennings Road to Modesto WQCF	Intersection of West Main Avenue and Jennings Road	Modesto WQCF Pump Station at southwest corner of surface ponds	Private Land	16,000’	42”	Open Cut	Jennings Road	N/A	Low Traffic – partial / full lane closure
Reach D	San Joaquin River Crossing at Modesto WQCF	Modesto WQCF Pump Station at southwest corner of surface ponds	West side of San Joaquin River near eastern end of Lemon Avenue	Private Land	4,000’	Alt 1: 54” Alt 2: 36”	Trenchless	N/A	Cross under San Joaquin River	N/A
Reach E	Lemon Avenue to CA State Highway 33	Eastern most end of Lemon Avenue	Intersection of Lemon Avenue and Quince Avenue	Public ROW	13,500’	Alt 1: 54” Alt 2: 36”	Open Cut / Trenchless	Lemon Avenue	Cross underneath Patterson I.D. canal siphons	Low Traffic – full lane closure
Reach F	CA State Highway 33 Crossing	Intersection of Lemon Avenue and Quince Avenue	West of intersection of Highway 33 and Zacharias Avenue, along Zacharias Avenue	Public ROW / Private Land	1,000’	Alt 1: 54” Alt 2: 36”	Open Cut / Trenchless	Quince Avenue, CA State Highway 33, Zacharias Avenue	Cross under CA State Highway 33, CFNR ([Type of Trenchless)]	Low Traffic – full fane closure
Reach G	Zacharias Avenue to Delta-Mendota Canal	West of intersection of Highway 33 and Zacharias Avenue, along Zacharias Avenue	Intersection of Zacharias Avenue and Delta-Mendota Canal	Public ROW / Private Land	15,500’	Alt 1: 54” Alt 2: 36”	Open Cut / Trenchless	Zacharias Avenue	Cross under irrigation siphons	Low Traffic – full lane closure
Reach H	San Joaquin River Crossing at Harding Drain Bypass Pipeline	Intersection of South Carpenter Road and Harding Road	West side of San Joaquin River levee	Public ROW / Private Land	4,000’	Alt 2: 36””	Trenchless	N/A	Cross under San Joaquin River ([Type of trenchless])	N/A
Reach I	Cross Country from San Joaquin River to Pomegranate Avenue	West side of San Joaquin River levee	East end of Pomegranate Avenue	Public ROW / Private Land	4,500’	Alt 2: 36”	Open Cut	N/A	Cross under Unknown Drainage Ditch ([Type of trenchless])	N/A
Reach J	Pomegranate Avenue to CA Highway 33	East end of Pomegranate Avenue	Intersection of East Marshall Road and CA Highway 33	Public ROW	14,000’	Alt 2: 36”	Open Cut / Trenchless	N/A	Cross underneath Patterson I.D. canal siphons ([Type of Trenchless])	Low Traffic – full lane closure

Reach K	CA State Highway 33 Crossing	East side of CA State Highway 33 along East Marshall Avenue	West side of CA State Highway 33 along West Marshall Road	Public ROW	1,000’	Alt 2: 36”	Trenchless	N/A	Cross under CA State Highway 33, CFNR ([Type of trenchless])	High Traffic – partial / full lane closure
Reach L	CA State Highway 33 to Delta-Mendota Canal	West side of CA State Highway 33	Intersection of West Marshall Road and Delta-Mendota Canal	Public ROW / Private Land	10,000’	Alt 2: 36”	Open Cut	N/A	N/A	Low Traffic – full fane closure

3.2 Pipeline Facilities Design Criteria

This section provides recommendations for pipeline design criteria. Design criteria recommendations are based on the hydraulic performance requirements presented in Chapter 2, recognized industry standards, and site-specific conditions. This chapter also includes sizing and recommendations for pipeline appurtenances to facilitate operations and maintenance, horizontal and vertical clearances, and installation requirements.

3.2.1 Horizontal Alignment Criteria

Basic criteria for establishing recycled water pipeline horizontal alignment are defined in Title 17 of the California Code of Regulations (California Regulations Related to Drinking Water). Additional guidance is also provided in the State of California Department of Health Services (currently the SWRCB Division of Drinking Water (DDW))[2]. The requirements for separation of new recycled water mains are:

- 4-foot minimum horizontal separation from existing water mains
- 1-foot horizontal separation from existing water mains with special permission and special design (i.e., no pipe joints, concrete encasement, etc.), approved by the local Department of Public Health on a case-by-case basis

There are no DPH separation requirements for recycled water pipelines from sanitary sewers or storm drains. A target separation distance of 4 feet from all existing utility lines and structures should be provided where possible. Where adjacent to existing structures or parallel pipelines, the pipeline must be located to prevent undermining of the adjacent improvement. Where this is not possible, the construction must utilize continuously supported excavation methods or other mitigating installation techniques to prevent damage to the adjacent improvement.

3.2.2 Vertical Profile Criteria

The basic criterion for establishing the vertical pipeline profile should be to maintain a minimum cover depth of 4 feet over the pipe. Deeper installation may be necessary where crossing under existing utilities. Profile grade will be established to provide minimum 1-foot vertical clearance between the new pipeline and existing utilities. The one-foot clear criterion meets the separation guidelines for crossing below water mains (when approved by the local DPH). Approval typically requires that the recycled water pipeline must go under an existing water main, no rubber gasket joints allowed in the recycled water pipeline, or the pipeline must be encased within 10 feet of each side of the crossing water main.

For pipelines traveling through agricultural fields, the pipe depth and allowable type of crop planted within the permanent easement will need to be negotiated with the landowner. To allow access to the pipeline for operations and maintenance, it is preferable to plant crops that do not restrict access. It is also preferable to not plant trees, or other crops with significant restructure, over the pipeline because the roots can wrap around the pipe and cause damage is the tree blows over, or is removed. The pipeline will also be sloped to the blowoff valves to allow it to be drained for operations and maintenance.

3.2.3 Utility Potholing

Existing utilities will be depicted on the drawings based on best available information provided by the utility owner and the topographical survey. Where necessary, utilities will be potholed to determine actual horizontal location and/or depth. The contract documents will also require the construction contractor to field verify all utilities.

[2] California Department of Public Health, 2003. Guidance Memo No. 2003-02: Guidance Criteria for the Separation of Water Mains and Non-Potable Pipelines, April 14, 2003 (revised date: October 16, 2003).

An Underground Service Alert inquiry was conducted in June 2014 to identify existing utilities within the proposed pipeline NVRRWP corridor. Table 3-2 presents the utilities within the NVRRWP project vicinity and their respective contact information. The utility owners will need to be contacted during subsequent design phases to coordinate appropriately.

Table 3-2: Utility Contact Information

Utility	Contact	Phone	Address
Comcast	Mike McCall	209 384 7696	1717 Miles Court, Merced, CA 95340
Stanislaus County	Roger Cole	209 499 3989	
City of Patterson	Sonia Delgado	209 895 8060	
Frontier Patterson	Tim Watts	530 310 5000	1010 Main St, Susanville, CA 96130
Kinder Morgan	Don Quinn	714 292 1806	
Pacific Bell (AT&T)			870 N. McCarthy Blvd, Milpitas, CA 95035
Patterson Irrigation District	Steve Trinta	209 499 5379	PO BOX 685, Patterson, CA 95363
Patterson Vegetable Company	Michael Chase	209 892 2611 x219	
Pacific Gas and Electric (PG&E) Modesto	R R	800 743 5000	
Turlock Irrigation District	Kirk Tabar		333 E. Canal Drive, Turlock, CA 95380
Western Hill Water District	Patrick Garvey	209 895 9493	

3.3 Pipeline Design Criteria

3.3.1 Hydraulic Criteria

The pipelines are sized for the buildout hydraulic requirements presented in Chapter 2. Preliminary pipeline pressure requirements are summarized in Table 3-3 and Table 3-4.

Table 3-3: Pipeline Design Pressures and Allowable Stresses – Alternative 1

Pressure Criteria	East of San Joaquin River[1]	San Joaquin River Crossing[2]
Estimated Maximum Working Pressure	77 psi	150 psi
Allowable Pipe Wall Stress for Maximum Working Pressure Conditions	50% of Pipe Material Yield Stress[3]	
Estimated Maximum Surge Pressure	To be determined during final design based on hydraulic modeling	
Allowable Pipe Wall Stress for Maximum Surge Pressure Conditions	75% of Pipe Material Yield Stress[3]	

1. The design maximum pressure for the pipeline occurs at the discharge of the Modesto PS, east of the river.
2. Refer to Section 2.2 for river crossing assumptions.
3. Based on AWWA M11 recommendations.

Table 3-4: Pipeline Design Pressures and Allowable Stresses – Alternative 2

Pressure Criteria	Modesto Pipeline[1]/River Crossing[2]	Turlock Pipeline[1]/River Crossing[2]
Estimated Maximum Working Pressure	123 psi/177 psi	102 psi psi/163 psi
Allowable Pipe Wall Stress for Maximum Working Pressure Conditions	50% of Pipe Material Yield Stress[3]	
Estimated Maximum Surge Pressure	To be determined during final design based on hydraulic modeling	
Allowable Pipe Wall Stress for Maximum Surge Pressure Conditions	75% of Pipe Material Yield Stress[3]	

1. The design maximum pressure for the pipeline occurs at the discharges of the Modesto PS and Turlock PS.
2. Refer to Section 2.2 for river crossing assumptions.
3. Based on AWWA M11 recommendations.

3.3.2 Pipeline Materials

Potentially suitable materials for the proposed pipeline are:

- Ductile Iron Pipe (AWWA C151)
- Mortar Lined and Coated Steel Pipe (AWWA C200)
- Reinforced Concrete Pressure Pipe, Steel Cylinder Type (AWWA C300)
- Prestressed Concrete Pressure Pipe, Steel-Cylinder Type (AWWA C301)
- Reinforced Concrete Pressure Pipe, Non-Cylinder Type (AWWA C302)
- Polyvinyl Chloride Pipe (AWWA C905)

Depending on which method of trenchless technology is chosen for the San Joaquin River crossing, materials may vary compared to the trenched portions of pipeline.

Ductile Iron Pipe (DIP), AWWA C151

Ductile iron pipe is a flexible pipe commonly used for pressure distribution pipelines and also used for water transmission pipelines. Ductile iron pipe 42-inches to 54-inches in diameter is manufactured in 150, 200, 250-, 300- and 350-psi pressure class, as well as special thickness classes 50 through 56. Selecting the appropriate pipe class (wall thickness) can help make large projects more economical. Standard lay lengths are 18 feet or 20 feet.

Unrestrained joints would be push-on, gasketed joints. Restrained joints would be used to resist thrust forces. Restrained joints for pipe larger than 36-inch diameter would be Lok-Ring type joints by American Ductile Iron Pipe or similar. Restrained mechanical joints (MJ), where required, would be MJ coupled joints American Ductile Iron Pipe or similar. DIP restrained joint elbows fittings 42-inches diameter and larger are available in 5-5/8, 11.25-, 22.5-, 30-, 45-, 60-, and 90-degree bends and are rated up to 250 psi working pressure. In addition, ductile iron pipe joints can be “pulled” to obtain minor changes in direction. The design should allow for up to 50% of the manufacturer’s maximum recommended pulled joint deflection angle. Pulling joints in lieu of fittings for changes in direction will reduce thrust restraint requirements.

DIP should be cement mortar lined, asphaltic coated (for buried pipe) or epoxy coated (for exposed pipe). External corrosion protection should be provided based on the recommendations of the corrosion evaluation performed for final design (see below), but is often achieved using a polyethylene sleeve (baggie) around the pipe and, if required, a cathodic protection system. The polyethylene sleeve acts as a dielectric barrier

that inhibits corrosion cell formation along the pipeline. Welded bonding cables would be required on each joint to achieve electrical continuity for corrosion monitoring and protection systems.

DIP in sizes larger than 24-inch are manufactured to a specific project's requirements, primarily in Alabama, which tends to increases the material cost of the pipe for larger diameters due to shipping.

Mortar-lined and Coated Steel Pipe (MLCSP), AWWA C200

Cement mortar-lined and coated steel pipe (MLCSP) is a custom fabricated pipe flexible pipe commonly used for water transmission. MLSCP can be fabricated to the size and pressure ratings needed for this project. Any horizontal or vertical bend can be achieved using pulled (or deflected) gasketed joints (typically up to 2 degrees depending on pipe size), mitered joints (up to 5 degrees) or fabricated fittings. MLCSP is adaptable to field modifications using high quality welding procedures.

Unrestrained joints should be push-on gasketed joints. Restrained joints should be single or double lap welded joints. Welded joints provide thrust restraint and electrical continuity for corrosion protection and monitoring as well as high reliability in seismic events. Flanged or coupled joints, where required, should require joint bonding to maintain electrical continuity. External corrosion protection should be provided based on the recommendations of the corrosion evaluation (see below).

Flexible coatings for steel pipe are available and may be considered during design development.

MLCSP in the size range and pressure class required is readily available from local manufacturers, including Ameron in Tracy, CA.

Reinforced Concrete Pressure Pipe (RCPP), Steel Cylinder Type, AWWA C300

Reinforced concrete pressure pipe, steel cylinder type is a rigid pipe consisting of a welded steel cylinder with a steel joint ring welded at each end; a cage or cages of steel reinforcing bars or wire; and an encasing wall of concrete. The pipe is available in sizes ranging from 30 inches to 144 inches in diameter and is generally made in 16-ft through 24-ft laying lengths. RCPP is typically used for transmission pipelines and is limited to working pressures up to 260 psi. Horizontal and vertical changes in direction can be accommodated by deflecting pipe joints, beveled ends, or fabricated fittings as required. Unrestrained joints should be push-on gasketed joints. Thrust restraint should be provided and accommodated by thrust blocks, although joint restraint is possible by field welding joints and could be considered.

RCPP in the size range and pressure class required is readily available from local manufacturers, including Ameron in Tracy, CA. This design of RCPP typically has a higher material cost than other options available for this project, but could be considered where the advantages of steel pipe are desired and site/geotechnical conditions warrant the use of a rigid pipe.

Prestressed Concrete Pressure Pipe (PCPP) Steel-Cylinder Type, AWWA C301

Pre-stressed concrete pressure pipe is generally suitable for 36-inch to 54-inch transmission pipelines, but is not widely used at this time. For this reason, PCPP should not be considered for final design.

Reinforced Concrete Pressure Pipe (RCPP), Non-Cylinder Type, AWWA C302

Reinforced concrete pressure pipe, non-cylinder type is a rigid pipe made with one or more cages of steel reinforcing bars or wire encased in concrete. The pipe is manufactured in sizes ranging from 12 inches to 144 inches in diameter and is generally made in 8-ft through 24-ft laying lengths. This type of RCPP is often used for low-pressure transmission pipelines, and is limited to working pressures up to 55 psi. Horizontal and vertical changes in direction can be accommodated by pulling pipe joints or elbow fittings. Unrestrained joints should be push-on gasketed joints. Thrust restraint is accommodated by thrust blocks, although joint restraint is possible by field welding joints.

RCPP in the size range and pressure class required is readily available from local manufacturers, including Ameron in Tracy, CA.

Polyvinyl Chloride Pipe (PVC), AWWA C905

PVC pipe in accordance with AWWA C905 is available from 16 inches through 48 in inches in diameter, with standard lengths of 20 feet. PVC 42-inches diameter is available with a working pressure rating up to 165 psi (DR 25). PVC is not available in 54-inch diameter.

Horizontal and vertical changes in direction for PVC can be accommodated by pulling pipe joints for very small deflection angles or using elbow fittings. Fittings for PVC are typically ductile iron and require corrosion protection at each fitting. Unrestrained joints are push-on gasketed joints. Thrust restraint can be accommodated with thrust blocks or mechanical joint restraints by Ebaa Iron or approved equal.

PVC is not widely used for large diameter transmission mains due to concerns such as potential for third party damage (due to digging), pipe availability, and potential for deflection at joints if PVC is poorly installed. PVC is not recommended for the project.

High Density Polyethylene Pipe (HDPE), AWWA C906

HDPE pipe in accordance with AWWA C906 is available in nominal diameters from 3 inches through 63 inches with standard lengths of 40 to 50 feet. Various inside diameters are available and depend on the resin specified (PE 3608/3408 or PE 4710), size designation (iron pipe size or ductile iron pipe size), and dimension ration (DR). A 41.4-inch inside diameter pipe is available in pressure ratings up to 139 psi (48-inch nominal diameter, PE 4710, IPS, DR 15.5), and a 56.6-inch inside diameter pipe is available in pressure ratings up to 101 psi (63” nominal diameter, PE 4170, IPS, DR 21).

There have been concerns raised in the industry regarding potential for oxidative degradation of HDPE used for chlorinated water applications. Some studies have concluded that oxidative degradation could result in long term issues with crack propagation and failure of HDPE pipe. This concern is highly contested in the industry, and there have been numerous studies with conflicting results. Unfortunately, American Water Works Association (AWWA) and American Society for Testing and Materials (ASTM) have not addressed the issue of oxidative degradation in HDPE pipe to date. It is beyond the scope of this Report to evaluate and determine whether oxidative degradation would occur under the project conditions. Many utility owners have stopped using HDPE for chlorinated water service until the issue is resolved.

Pipe Materials to be considered during Design

DIP, MLCSP, and RCPP (cylinder type) are potentially acceptable materials for the 42-inch diameter, lower pressure reach east of the San Joaquin River and will be investigated further during design. DIP and MLCPS are potentially acceptable materials for the 54-inch, higher pressure reach west of the San Joaquin River. RCPP, cylinder type can be considered for the western reach if a rigid pipe is required, however this pipe material will likely cost more than the other alternatives. Depending on conditions encountered during the final design, all or some of these acceptable materials could be included as either base bid materials and/or bid alternates.

Based on the hydraulic analyses presented in Chapter 2 and the pipe material attributes described in this chapter, Table 3-5 and Table 3-6 present the recommended materials to consider for design.

Table 3-5: Pipeline Material Recommendations – Alternative 1

Alternative 1 Reach	Material Recommendations
East of San Joaquin River	MLCSP, RCPP (Cylinder Type),
West of San Joaquin River	DIP, MLCSP, RCPP (Cylinder Type),

Table 3-6: Pipeline Material Recommendations – Alternative 2

Alternative 1 Reach	Material Recommendations
East of San Joaquin River	DIP, MLCSP, RCPP (Cylinder Type)
West of San Joaquin River	DIP, MLCSP, RCPP (Cylinder Type)

3.3.3 Pipe Design Methodology

Pipe design will be in general accordance with the recommendations of applicable AWWA Manuals, including:

- AWWA M11 for steel pipe;
- AWWA M41 for ductile iron pipe;
- AWWA M9 for concrete pressure pipes (AWWA C300, 302 and 303);

3.3.4 Geotechnical Considerations

A geotechnical investigation should be performed for the final design to develop pipeline design and construction recommendations. Pipe selection may be refined as geotechnical analyses are completed.

3.3.5 Corrosion Monitoring and/or Protection Systems

A corrosion investigation should be performed for the final design. The investigation should include an evaluation of soil pH, chlorides, sulfates and resistivity to develop appropriate design measures to protect proposed facilities. The evaluation should review site conditions such as major utility crossings and possible sources of stray currents to develop design recommendations for the project. Final design will include applicable corrosion protection plans, details and specifications. Corrosion monitoring and protection will be a key component of the pipeline design due to the critical nature of the pipeline.

Pipe selection may be refined as corrosion analyses are completed.

3.4 Pipeline Appurtenances

Appurtenances along the pipeline are needed to facilitate operations and maintenance. These include:

- Isolation valves - to allow isolation of pipeline reaches for a maintenance shut down or other events
- Air valves - to manage entrained air in the operating pipelines, to allow air into the pipeline during draining, and expel air during filling
- Blowoffs - to facilitate pipeline draining
- Access ways - to facilitate entry into the pipeline for inspection and repairs

3.4.1 Isolation Valves

Isolation valves on the main pipeline will be buried butterfly valves in accordance with AWWA C504, Class 250B. Isolation valves will include a 6-inch valve bypass with a resilient wedge gate valve to allow for controlled filling of the pipeline. Isolation valves on service lines and appurtenant facilities 12-inch diameter and less will be resilient wedge gate valves in accordance with AWWA C509.

Isolation valves will be located at key intersections, major crossings (each side of the river, railroad and highway crossings) and at locations needed to facilitate draining segments of pipeline at low points.

3.4.2 Air Valves

Air valves will generally conform to AWWA C512. Three different air valves may be required on this project: air release valves, air/vacuum valves, and combination air valves. These valves will be located and sized as described below. Air valves will be located above-grade in steel enclosures. Where required, air valves can be installed in buried vaults, though this is less preferable for cost and valve access. Critical air valves will be provided as duplex valves (one duty, one backup) for redundancy. This will be assessed through a surge analysis.

Figure 3-2 illustrates a general above-ground air valve assembly detail, and Figure 3-3 illustrates a below-ground air valve assembly detail.

Figure 3-2: Above Ground Air Valve Detail

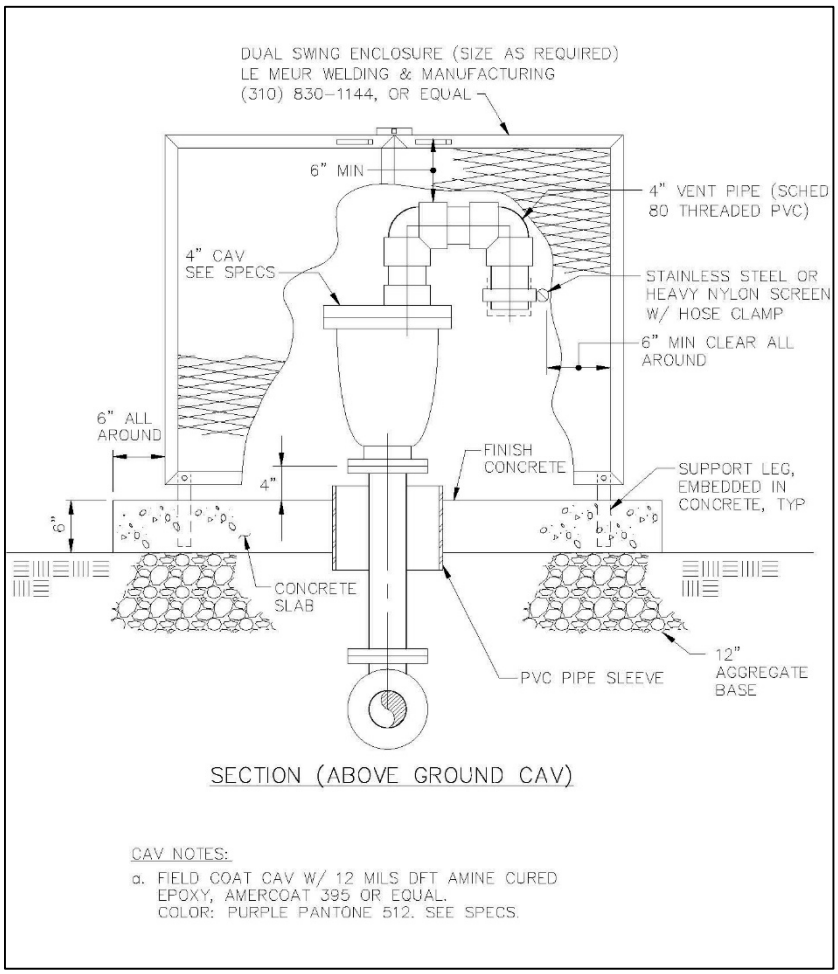
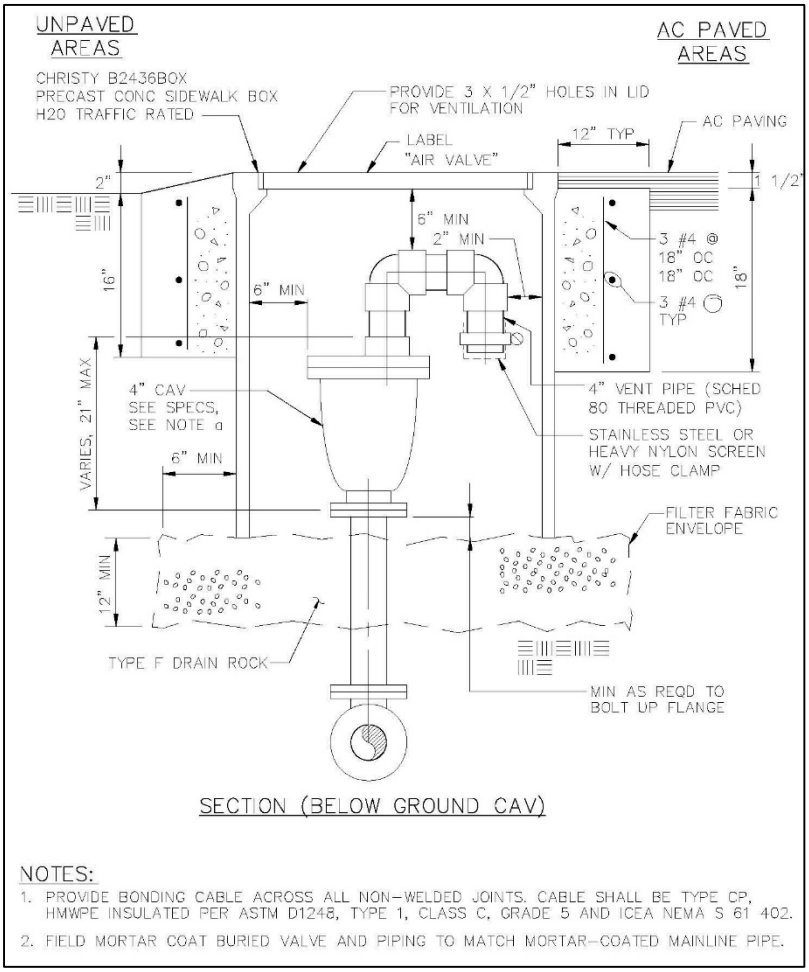


Figure 3-3: Below Ground Air Valve Detail



Air Release Valves

Air release valves expel slowly accumulating air in the pressurized pipeline. Air release valves or combination air valves (see below) will be located at high points in the pipeline. Air release valves will be sized and located in accordance with the recommendations of AWWA M51.

Air/Vacuum Valves

Air/vacuum valves allow large volumes of air to enter the pipeline during dewatering operations (or under a pipeline break), and purge large volumes of air during pipeline filling. Air/vacuum valves or combination air valves (see below) will generally be located at high points on pipeline and on the down-gradient side of line isolation valves to facilitate dewatering of individual isolated reaches of the pipeline.

Air/vacuum valves will be sized and located in accordance with the recommendations of AWWA M51, except that the large orifice sizing for gravity flow (pipe breakage scenario) will replace the diameter of the pipe (d) with a rupture diameter of 30% of the pipe diameter. Sizing and location of air/vacuum valves will also take into account the results of the project surge analysis, which may recommend air/vacuum valves to eliminate negative pressure conditions under transient conditions.

Combination Air Valves

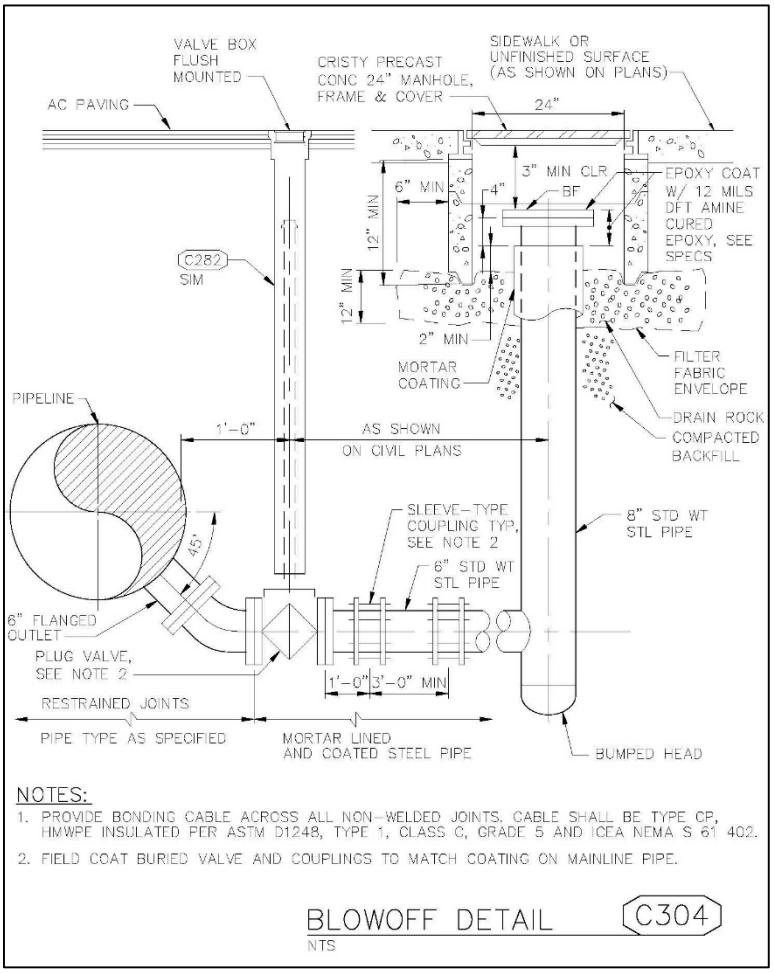
Combination air valves perform the function of both air release valves and air/vacuum valves. Combination air valves will be provided where the functions of both air/vacuum valves and air release valves are required. Sizing will be in accordance with the sizing above for air release valves and air/vacuum valves.

3.4.3 Blowoffs

Blowoffs will be provided at selected low points in the pipeline to facilitate pipeline dewatering for operations and maintenance. Blowoffs will consist of a 6-inch diameter or larger outlet from the bottom of the main line pipe, a matching plug valve for isolation, piping, and an 8-inch diameter or larger vertical sump pipe with blind flange opening at the top in a utility box. Velocities within the blowoff piping will be limited to a maximum of 12 ft/s to avoid damage to the lining of blowoff piping. The locations of 6-inch diameter blowoffs will allow the pipeline to be drained at the low points and available drainage locations. Blowoffs may be installed either above or below grade, dependent on the location and discretion of the parcel in which it is located on. Figure 3-4 illustrates a general blowoff detail.

As the pipe is to drain water for maintenance, the discharge from the blowoff valves must be disposed of properly. The project team will review potential discharge locations for the flow from each blowoff valve during design and address permitting requirements, or agreements with local landowners.

Figure 3-4: Blowoff Standard Detail

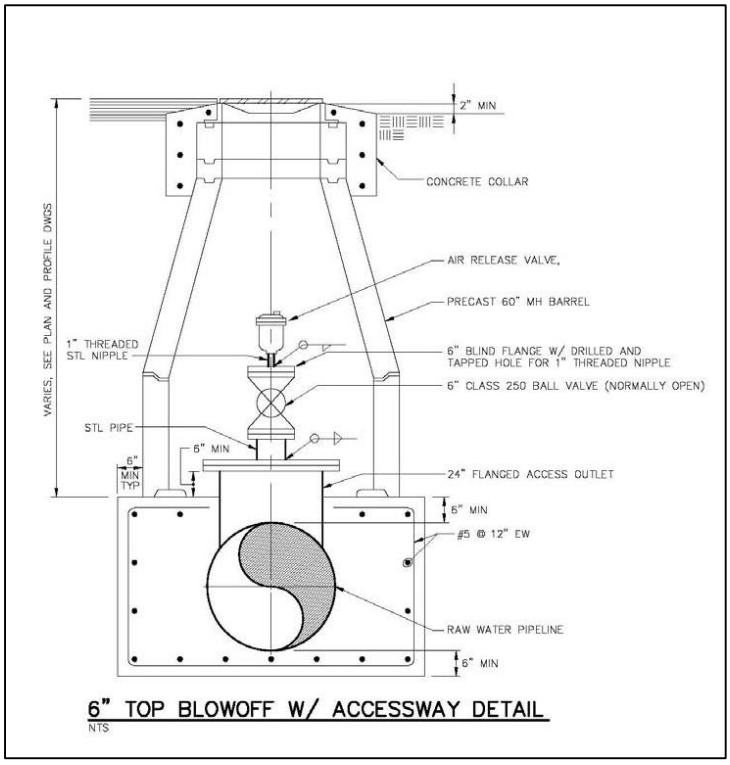


3.4.4 Access Ways

Access ways will be located approximately every 1,000 lineal feet along the pipeline to provide long-term access for inspection and maintenance inside the pipeline. Access ways will consist of a 24-inch flanged outlet nozzle with a blind flanged end. Construction access manholes will be buried side outlets, while maintenance access ways will be top outlets with precast concrete manholes constructed over the access way. The access way will trap air in the pipeline, and an air-release valve will be provided on the blind flange to vent the air under pressure.

Where possible, access ways will be combined with air valve and blowoff assemblies to reduce project costs. Figure 3-5 illustrates a general access way detail with blowoff.

Figure 3-5: Access Way with Blowoff Detail



3.5 Pipeline Installation

The pipeline generally will be installed by open cut method. Installation will be consistent with industry standards (AWWA, ANSI, etc.), site-specific conditions, and the recommendations of the project engineer. The following are examples of special considerations that would be incorporated into the project specifications.

- **Temperature Control for Steel Pipe.** During hot weather conditions, the pipeline needs to be installed in a manner that minimizes thermal stresses in the pipeline when the pipe steel temperature drops from the installation temperature to the in-service temperature. Depending on the installation method, the contractor may be required to install a closure joint to allow the pipe to cool before the final joints are installed.
- **CLSM for Backfill Material.** Controlled low strength material (CLSM) will be allowed as an alternative to imported or select native granular pipe zone backfill material. No mechanical

compaction is required using CLSM, therefore the trench width can be reduced significantly. Laborer time in the trench is reduced significantly, which benefits safety, especially in deeper trenches. The material cost of CLSM is higher than granular backfill but may be advantageous for the contractor because of reduced installation time.

3.6 Trenchless Pipeline Crossings Design Criteria

Trenchless construction methods would be used for specific crossings. They are used to minimize the area of surface disruption required for pipeline installation or where open cut construction is not practical or not allowed.

3.6.1 San Joaquin River Crossing

The San Joaquin River crossing may be completed using microtunneling or Horizontal Directional Drilling (HDD), depending on soil conditions and other design factors. For the San Joaquin River crossing, the launching and receiving pits would be deep shafts for microtunneling or shallow pits for HDD, located on either side of the waterway, outside the river levees and floodplains.

Permitting Requirements for River Crossing

The Central Valley Flood Protection Board (CVFPB), a department within the State of California Department of Water Resources, is the permitting agency for all work within the floodways of the river, including levee crossings. They work closely with the United States Army Corps of Engineers (USACE) and local Reclamation Districts (RD) for permitting and maintaining levees and floodways. They also consult with other State agencies including the Department of Fish and Wildlife (DFW), and federal agencies.

A meeting was held with CVFPB staff on July 9, 2014 at their office in Sacramento to introduce the NVRRWP and receive initial input on the permitting requirements. Following are key notes from the meeting.

- The applicant for the crossing must initiate contact with the local RDs (RD2091 and possibly 1602) to begin the permitting process. The RD will then notify the CVFPB who will administer the design review and approval process.
- CVFPB will review the project design and construction for compliance with CCR Title 23, Section 123. CVFPB will also submit the design to USACE for review and approval. All project communication with USACE should go through CVFPB.
- USACE will review the design for compliance with the USACE Engineering Manual No. 11102-2-1913. This manual refers to guidelines in two reports sponsored by USACE for directional drilling and microtunneling. These guidelines in general are much more restrictive than Title 23 guidelines used by CVFPB.
- CVFPB recommends meeting with USACE as soon as decisions are made about the construction technique and location for river crossing (after 30% design) to get their initial comments. Expect up to 6 months for their review.
- CEQA needs to be complete before CVFPB can issue their permit for the river crossing.
- CVFPB will issue an approval letter for exploratory geotechnical borings in the floodway during design. A separate CEQA document (Notice of Exemption) needs to be completed prior to submitting the permit request to CVFPB to conduct borings.
- CVFPB will comment on the draft EIS/EIR for the NVRRWP. A copy of the draft EIS/EIR should be sent directly to them.

- An intermediate pit for microtunneling is likely not a problem. Would need to backfill with grout. No permanent structures are allowed to remain above-ground in the floodway.
- Work in floodway is typically not permitted during the flood season (November 1 through July 15).
- CVFPB noted that California Fish and Wildlife Department (formerly CDFG) is taking a more active role in reviewing tunneling projects under rivers. Their primary concern is "frac-out" of drilling fluid into the river.

3.6.2 Highway 33 / Railroad Crossing

Protective casings for the pipelines will be required by the Caltrans and the railroad company for the buried pipelines beneath Highway 33 and the railroad tracks. The casing will be installed using the jack and bore method. Horizontal directional drilling (HDD) is not practical for installing casings for the proposed large pipe diameters.

3.6.3 Other Trenchless Crossings

Patterson Irrigation District (PID) owns a series of irrigation water conveyance canals on the west side of the San Joaquin River that run perpendicular to the direction of proposed pipe for the NVRRWP project. These canals run underneath the county roads through siphon structures. At this point in the design phase, it is assumed that these siphons will remain in place and need to be crossed via trenchless methods. These crossings are likely to be made using Jack and Bore pipe jacking methods.

3.6.4 Trenchless Technology Descriptions

Horizontal Directional Drill (HDD)

HDD is a trenchless pipeline installation method that can be used for crossing major roadway intersections and waterways with minimal impact on the surrounding area. HDD is used when trenching or excavating is not practical and is suitable for a variety of soil conditions and crossings including roads, landscapes, and rivers. For the NVRRWP, HDD could apply to any crossings under the San Joaquin River and Highway 33.

HDD crossings are installed between an entry and exit pit. Entry angles are typically in the range of 10 to 15 degrees, but can be more if dictated by the circumstances. The exit angles are typically in the range of 8 to 10 degrees to minimize the bend radius needed to install the pipe during pullback. The pilot bore is typically a small diameter (6 to 12 inch diameter) hole drilled along a pre-determined horizontal and vertical alignment (inverted 'U' profile) from the entry pit to the exit pit. This pilot hole can be guided using electromagnetic readings transmitted from the drill bit back to the drill rig. Excavation takes place by introducing pressurized slurry through the drill string to the bit. The slurry pressure in combination with a rotating drill bit excavates the material which is then transported back to the entry pit along the outside of the drill string.

Entry and pullback pits are required at each side of the crossing. The pits are approximately 50 to 100 feet square by approximately 5 feet deep, and are used as the collection point for Bentonite drilling mud and drill spoil. This fluid is the pumped to a slurry separation plant to separate the cutting from the fluid so that the fluid can be reused. The pilot hole is then enlarged by pulling larger reamers, or reaming heads, from the pilot exit pit back towards the drilling rig. The pipeline is then pulled into place behind the last reamer head

The entry side requires work area of approximately 1,500 to 3,000 square feet for the drill rig, slurry separation plant, material storage and other support equipment. The exit side requires a work area of about 1,000 to 1,500 square feet for the pullback. This area is exclusive of the area needed for the pipe assembly

and laydown area. Typically, a corridor about 15 feet wide by the length of the pipe is needed for the buildup and laydown

Pipes would be installed at varying depths depending on features being avoided, the existing underlying utilities, soil types, environmental constraints, entry and exit constraints, and bend radius of the installed product and drill pipe. Although the exact depths of the pits and drilling have not been defined as design has not yet been initiated, for the purpose of this analysis, it is assumed that the depth of construction would vary from 30 to 50 feet under the River bed and 10 to 15 feet under the highway/railroad/canals.

For the pipe diameters being considered in the alignment alternatives, HDD will likely require pits 1,000 to 1,500 feet apart to make the geometry work, satisfy the bend radius of the pipe, and satisfy separation requirements (river bottom or utilities as the case may be). As such, HDD is considered feasible for the river crossing(s) and it may not be practical to use for short (<1000 feet) road, canal, or siphon crossings.

Jack and Bore

Jack and bore is a method that is often used for major roadway intersections and railroad crossings where crossings are generally less than 300 feet long and above the ground water level. Jack and bore would involve the use of a hydraulic jack and auger stem (situated in a pit located at one end of the crossing) to excavate the ground while simultaneously installing a casing under the crossing. The pipeline is then installed in the casing and grouted in place. The jacking pit is excavated (and shored) with typical dimensions of 8 to 12 feet wide and 25 to 35 feet long depending on the casing length selected. The depth would depend on the feature to be avoided (e.g., irrigation canal, existing utilities, or separation requirements imposed by the stakeholder. The exact depths of the pits and drilling have not been defined because design has not yet been initiated; however, for the purpose of this analysis, it is assumed that the depth of construction would be on the order of 15 to 20 feet deep for canal, railroad and highway crossings. Jack and bore typically has very limited steering control and it is not the method of choice if precise line and grade control is required. Jack and bore is not feasible for the river crossing for many reasons.

Shoring, appropriate to the pit depth, would be used to support the excavation. In addition, the back wall of the jacking pit would need to be constructed so as to withstand the reactive forces from the jacking frame. An additional area of about 1,500 to 2,000 square feet would be needed around the pit for temporary storage of pipe sections and for loading material removed from the bore. The receiving pit at the other end of the crossing would be smaller, encompassing approximately 100 square feet. Pits and work areas would be located within existing ROW and along streets, where appropriate. After pipeline construction and installation is complete, the work area would be restored to preconstruction conditions.

Jack and bore pipe jacking is considered feasible for shallow alignments above the groundwater, or slightly below groundwater if ground conditions are predominantly cohesive clay and silt, and for short crossings such as Highway 33 and the adjacent railroad, or canal and siphon structure crossings.

Microtunneling

Microtunneling is a remotely-controlled pipe jacking process that provides continuous positive support of the face and counterbalances groundwater pressures at the face of the excavation. Similar to HDD, microtunneling provides an alternative trenchless crossing method for roads, rivers, and other crossings where minimal disturbance is desired.

The microtunneling boring machine (MTBM) is advanced through the ground by incrementally adding jacking pipe segments to the end of the pipe string and advancing the pipe string from a jacking pit to a receiving pit on the opposite side of the crossing. The carrier or product pipe may be jacked directly or installed inside an oversized casing in a separate operation.

A cutter wheel excavates material at the face as the machine is jacked forward. The excavated material is mixed with clean drilling fluid and pumped to the surface for separation and muck removal. Routine personnel entry into the pipe is not required for microtunneling.

Jacking pits for microtunneling are typically 10 to 14 feet wide. The length is dictated by the pipe segment length that would be installed. Ten foot segments require a pit about 15 feet long and 20 foot pipe segments require a pit about 25 long. Circular shafts would require slightly larger shafts due to their geometry to provide the equivalent area to a rectangular pit. Receiving pits are typically 12 to 16 feet square. Pit depths would vary depending on the feature being avoided, existing utilities, and the presence of ground horizons that are more favorable to tunnel than others. The exact depths of the pits and drilling have not been defined because design has not yet been initiated. For the purpose of this analysis, it is assumed that the depth of construction would approximately 15 to 25 feet under the river channel. Microtunnel operations require a work area (including the area of the pit) of approximately 2,000 to 3,000 square feet at the jacking pit. Work area at the receiving pit can be smaller, but is typically a minimum of 1,000 square feet. Off-site staging areas can be used to reduce work areas at each shaft.

3.6.5 Summary

Field investigations including topographic and bathymetric (river bottom) surveying, and geotechnical evaluations for the river crossing(s) will dictate the selection of technologies to used and associated design details. This work needs to be completed to allow design decisions to be made and initiate the permitting process.

Chapter 4 Delta-Mendota Canal Outfall

The Federally-owned and San Luis Delta-Mendota Water Authority (SLDMWA)-operated Delta-Mendota Canal will serve as the terminal outfall body of water for receiving the NVRRWP project water. A meeting with representatives from Reclamation, SLDMWA, and DPWD was held on June 26, 2014 in order to:

- Evaluate alternatives and facilities options for discharging water into the DMC,
- Understand design and construction constraints for the NVRRWP connection to the DMC, and
- Understand permanent constraints for the NVRRWP connection to the DMC.

Meeting minutes from this meeting are provided in Appendix E. This section provides the discussion results and design direction for moving forward.

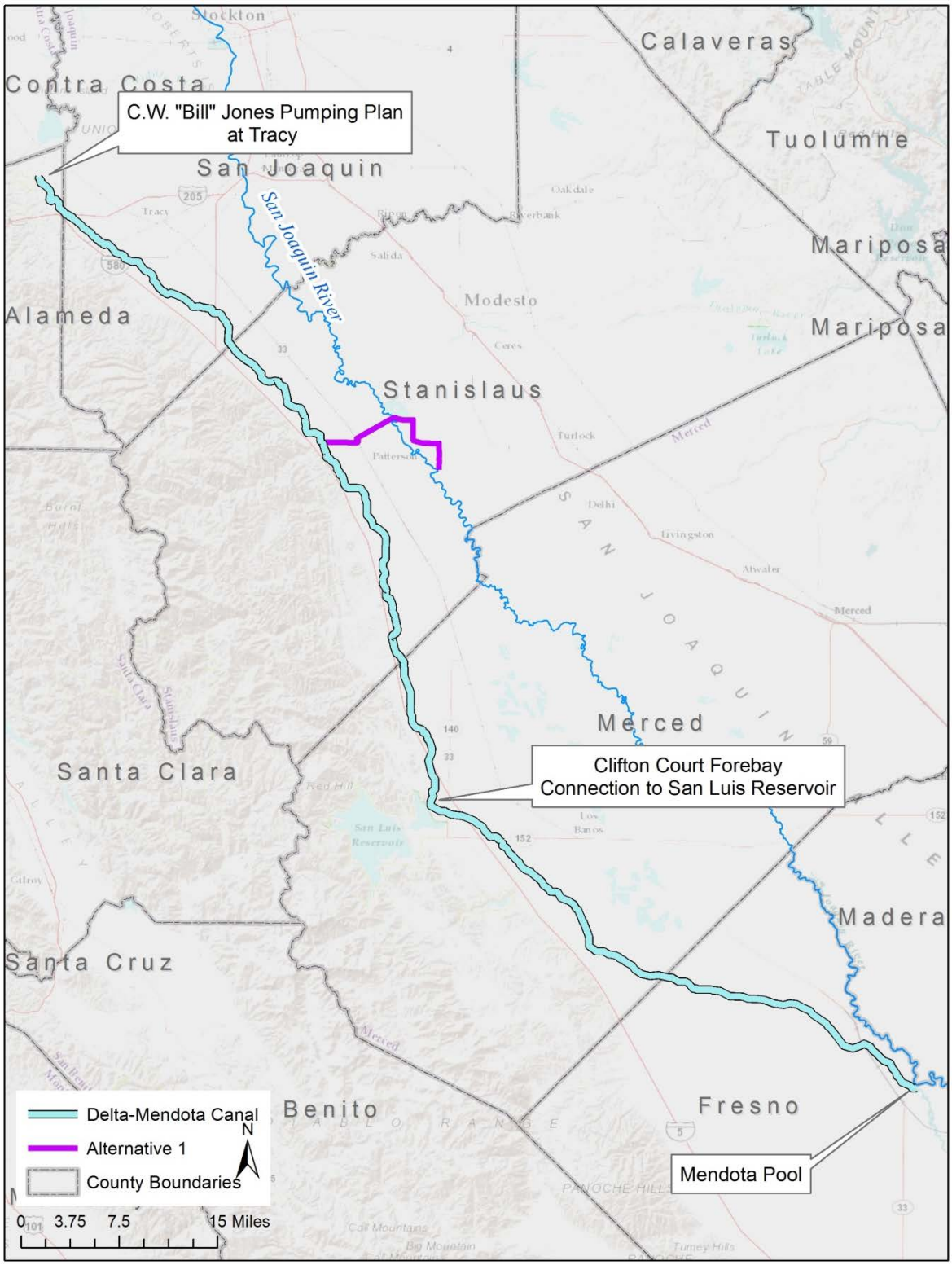
4.1 Delta-Mendota Canal General Info

The Delta-Mendota Canal extends from the southwest edge of the Sacramento-San Joaquin Delta 2.5 miles to the C.W. “Bill” Jones Pumping Plant near Tracy, CA, where water is pumped to an elevation of 198 feet above sea level and delivered to Central Valley Project water service contractors, exchange contractors, and wildlife refuges. The canal travels south along the west side of the San Joaquin Valley, following the Coastal Range foothills for 117 miles to the Mendota Pool on the San Joaquin River.

The capacity of the DMC is 4,600 cfs between the C.W. “Bill” Jones Pumping Plant and the O’Neill Forebay, and 4,200 cfs between the O’Neill Forebay and Mendota Pool.

The DMC’s connection to the O’Neill Forebay allows for the use of the San Luis Reservoir for the storage of NVRRWP project water during the low water demand periods (e.g. certain winter / spring months). Because both cities’ WQCFs operate 24 hours per day and existing Reclamation-owned facilities could potentially be used for storage, the project would be operated year round. Figure 4-1 illustrates the location and extent of the DMC.

Figure 4-1: Delta-Mendota Canal Extent



4.2 Terminal Outfall Alternatives and Facilities Options

Based on the discussion held at the June 26, 2014 meeting, Reclamation and SLDMWA have a number of approved structure types for conveying project water into the DMC. They range from simple above-grade 'gooseneck' pipelines to more complicated fixed-elevation weir structures.

4.2.1 Gooseneck Pipeline

Gooseneck structures generally consist of the terminus of a pipeline with the discharges of the effluent water above the water surface of receiving body. Typically, gooseneck pipelines do not alter the geometry or existing concrete channel lining. See Figure 4-2 for Patterson Irrigation District's 'gooseneck' outfall structure.

Figure 4-2: PID Outfall Structure into DMC[3]

Gooseneck pipelines are advantageous in that they are relatively simple to design, are low cost, and do not require the disruption of the receiving body during construction.

The PID outfall seen in Figure 4-2 consists of a 36-inch pipeline. Based on the hydraulic analyses in Chapter 2, the Alternative 1 outfall would be a 54-inch pipeline. This sized pipeline may impose limitations with gooseneck pipelines due to the weight and forces associated with the pipeline situated unsupported over the receiving body's edge.

Figure 4-3 and Figure 4-4 illustrate this type of structure schematically.

[3] PID outfall structure as seen on April 23, 2013. The 36" pipeline has a maximum southwest conveyance capacity of 35 cubic-feet per second (cfs). This structure is located at the intersection of the DMC and Ward Avenue, 3 miles south of Patterson, CA (DMC mile marker 42.5, approx.).

Figure 4-3: DMC Gooseneck Outfall Plan

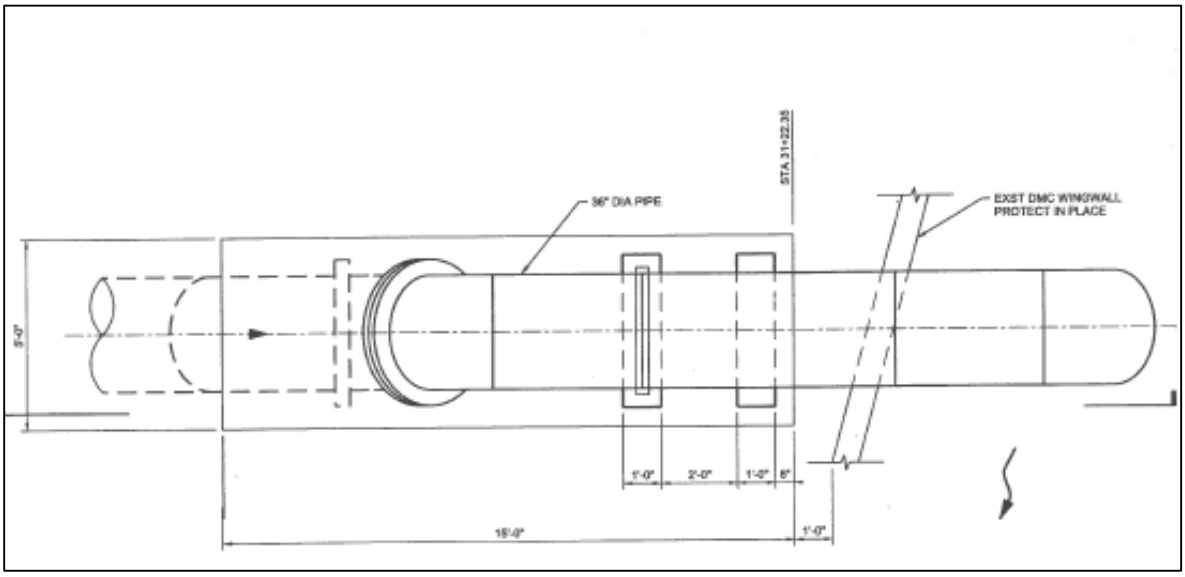
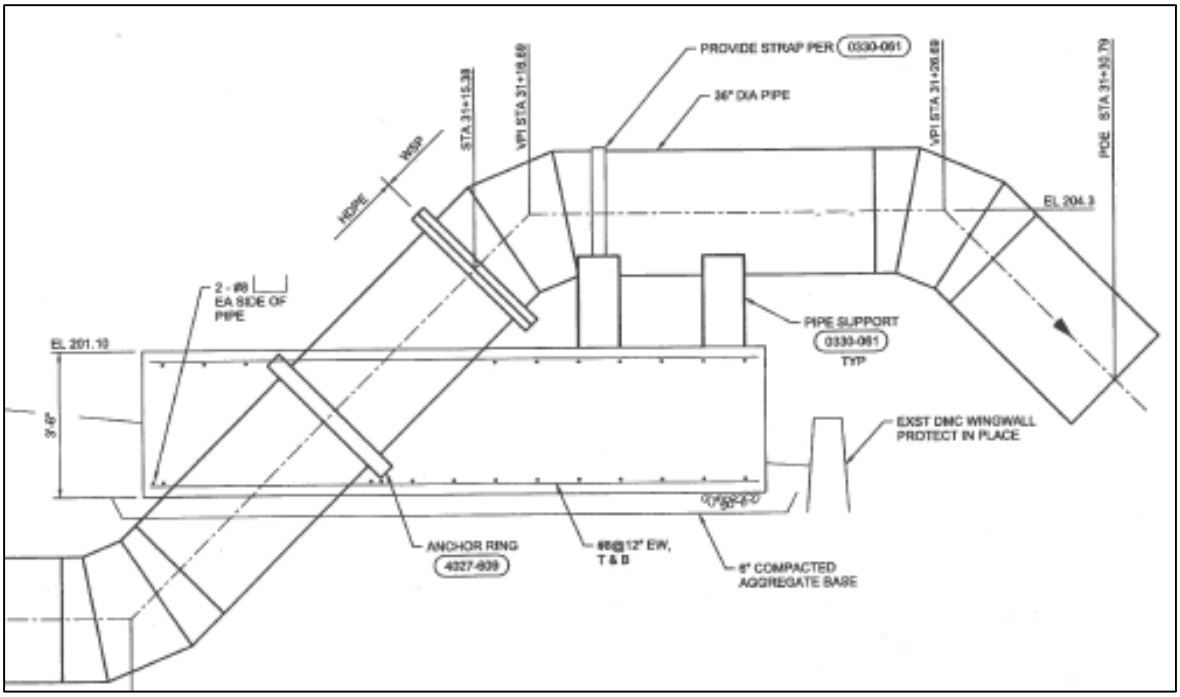


Figure 4-4: DMC Gooseneck Outfall Section



4.2.2 Baffled Pipe Outlet

Baffled pipe outlets provide a structure that dissipates the energy of the effluent water with a solid baffle near the end of the pipe. The water then flows down a gradual slope into the proposed body of water.

These structures are advantageous in that they provide energy dissipation to the effluent flow, thus allowing for the flow to enter the receiving body at a laminar flow state.

Figure 4-5 and Figure 4-6 illustrate this type of structure schematically.

Figure 4-5: Baffled Pipe Outlet Plan

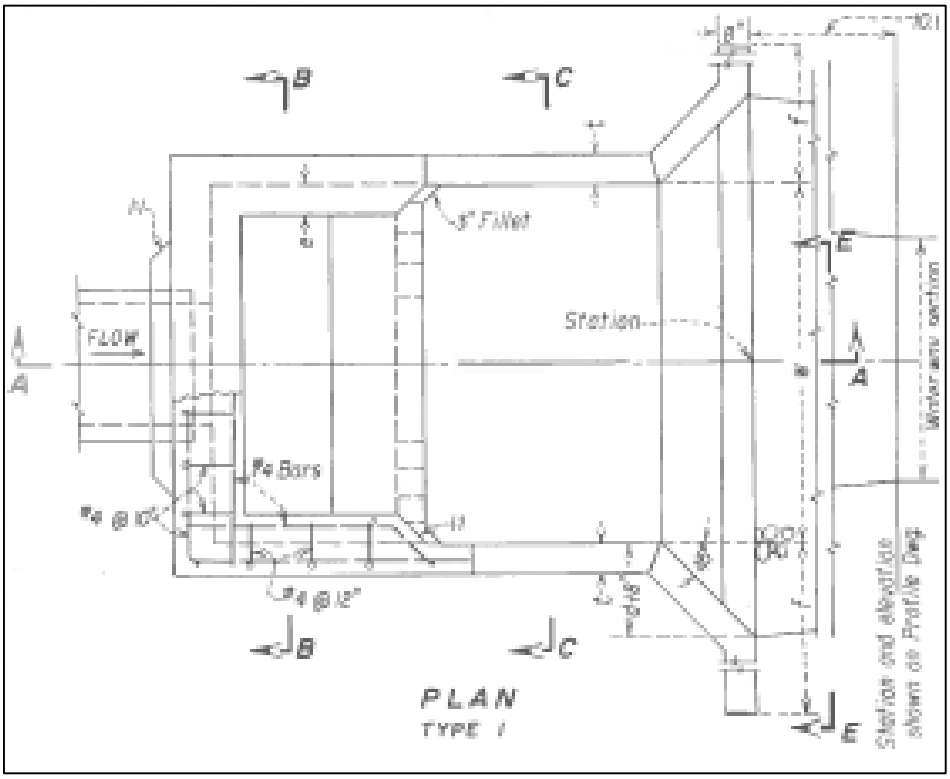
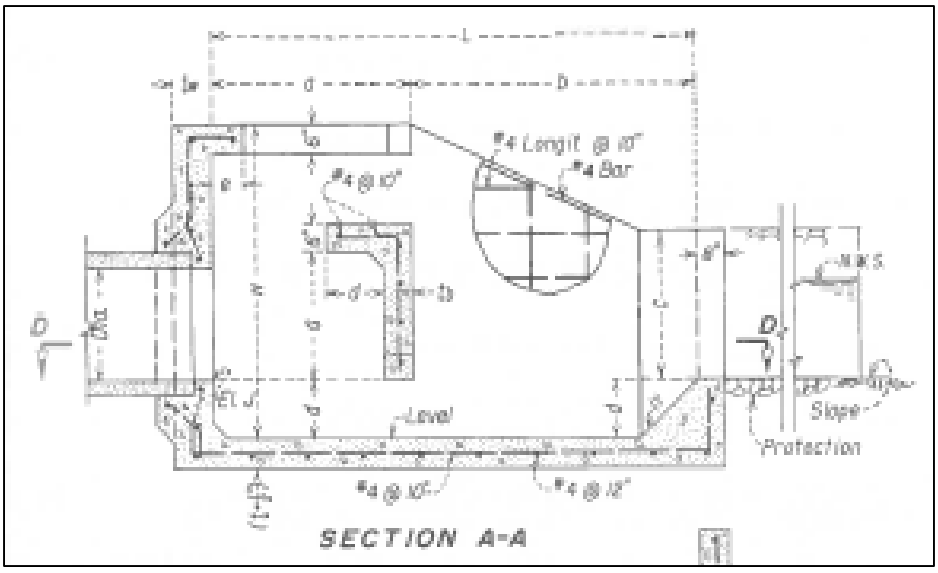


Figure 4-6: Baffled Pipe Outlet Section



4.2.3 Sharp- or Broad-Crested Weir

A weir provides an obstruction in an open channel flow path, and is commonly used for precise measurements of open channel flow rate. A weir functions by causing water to rise above the obstruction in order to flow over it, and the height of water above the obstruction correlates to flow rate. Compared to

the gooseneck pipe and baffled outfall alternatives, a weir provides a more stable hydraulic grade control point for which the pumps may be able to operate to.

4.2.4 Recommended Facility Design

Table 4-1 presents a breakdown of the various outfall design options compared to their design complexity, cost, and hydraulic stability.

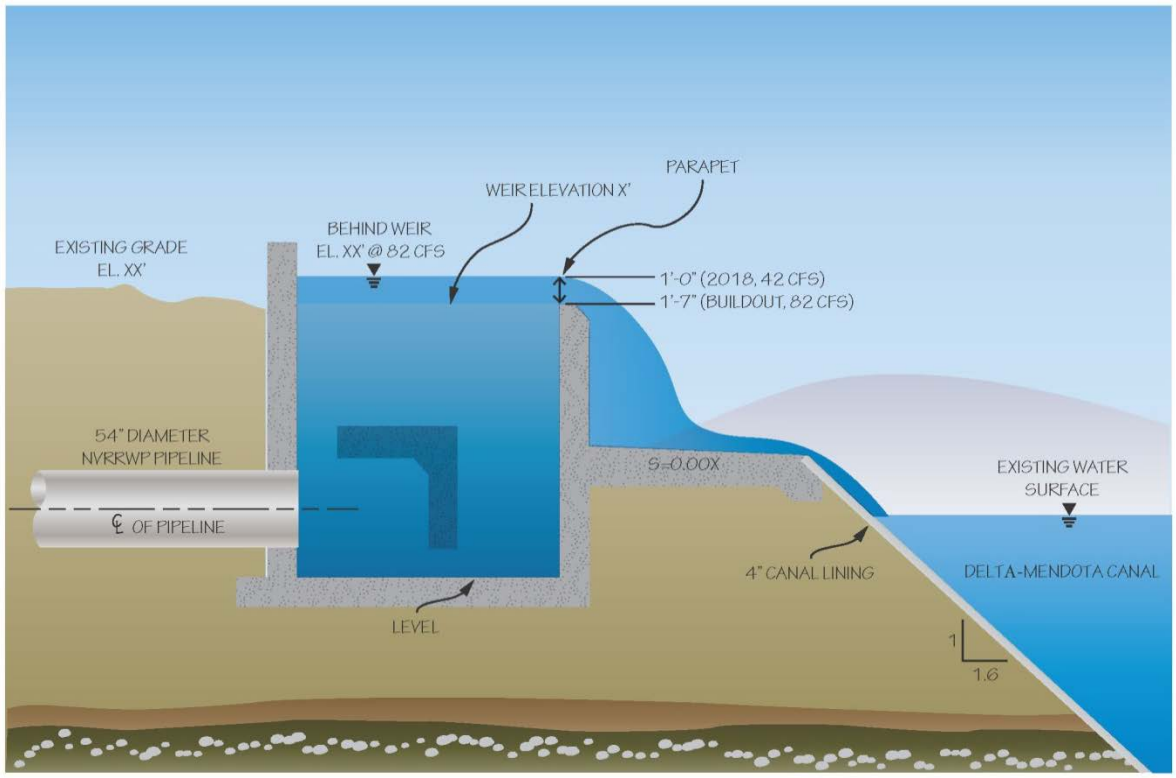
Table 4-1: DMC Outfall Design Criteria

Structure Type	Cost	Complexity of Design	Operational Stability
Gooseneck Pipe	$	Simple	Stable
Baffled Pipe Outlet	$$	Moderate Complexity	Stable
Sharp-Crested or Broad-Crested Weir	$$	Moderate Complexity	Most Stable

The recommended terminal outfall facility would incorporate aspects of both a baffle pipe outlet with a sharp crested weir. Further, the proposed terminal outfall facility will be located adjacent to and on the approaching (east) side of the existing DMC concrete lining. The footprint of the facility will be approximately 30 feet by 50 feet, and will be enclosed with secure fencing. The structure itself will consist of a reinforced concrete, open-ended rectangular box, situated below and above grade similar to that of the baffled pipe outlet design. Within the rectangular box will consist of weir for hydraulic stability. Figure 4-7 and Figure 4-8 represent a conceptual image of the terminal outfall structure.

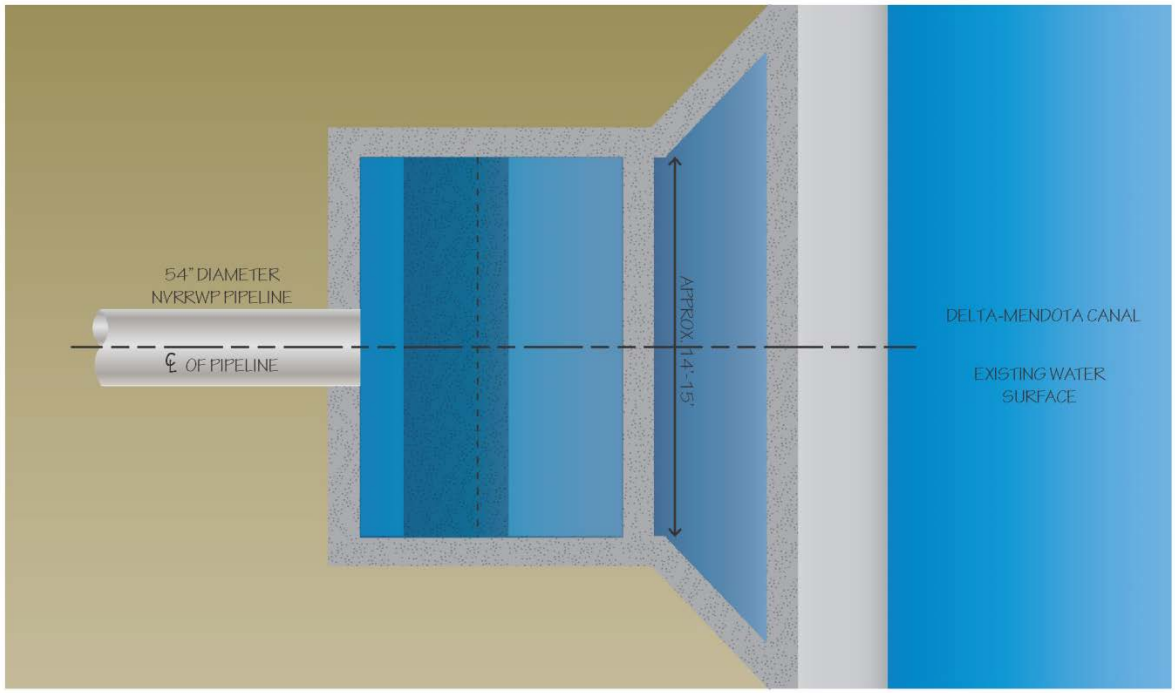
The design team will work with SLDMWA throughout the design phase: The conceptual / Pre design structure will be sent to Bob Martin of SLDMWA who will review and send to Don Winch of Reclamation for review. The 65-80% Design will be sent just to Bob Martin review and comments, and then the 90% design will be sent to both Bob and Don again for final review.

Figure 4-7: Terminal Weir - Section View[4]



[4] Terminal outfall structure not to scale

Figure 4-8: Terminal Weir - Plan View



4.3 Outfall Requirements

SLDMWA will require the following telemetry and infrastructure at the terminal outfall structure(s):

- A flow meter for project water introduced into the DMC. This flow meter will be located on the DMC right-of-way parcel boundary.
- Water quality of some constituents, the extent of which have not been determined at this time.
- An isolation valve at or near DMC / Reclamation parcel boundary.
- Security features including fencing and potential video surveillance

4.4 Construction Limitations

Based on the June 26th meeting, the following construction limitations will need to be taken into consideration for the final design:

- No construction between Fall through February
- The DMC uses the full design capacity during the irrigation season in order to make deliveries

On a typical water year, the Tracy Pumps decrease operations for approximately 30 days in April and May; this would represent the best time frame and most operational and construction flexibility.

Chapter 5 Power Evaluation

Power supply for the proposed new Turlock Pump Station at Turlock's Harding Drain Bypass outfall would be furnished by the nearby electric grid system operated by Turlock Irrigation District (TID). The existing TID power supply to the proposed Modesto Pump Station located at the Jennings Plant, which consists of above-grade wires mounted on poles, would be used for the re-purposed pump station. Cathodic protection rectifiers along the pipeline alignment and at the DMC will also require power supply. These power supply needs were evaluated by a local electrical engineering firm (Miller-Pezzoni and Associates, Inc.).A full summary of the NVRRWP power evaluation is provided in Appendix F.

5.1 Existing and Recommended Power Supply Systems

5.1.1 Modesto PS Power Supply Systems

The existing power supply system serving the existing Jennings Plant river outfall facilities consists of overhead TID primary distribution conductors operating at 12.47 KV. The existing facility consists of 480/277 volt secondary metered service and distribution at 480/277 volts serving the outfall pumping system.

The capacity of the existing secondary system at the outfall facility will not support the planned loads for the proposed new pumps and will require an upgrade. Moreover, the large pumps particularly will necessitate primary distribution to alleviate/mitigate the high secondary voltage inrush characteristics for starting the large motor as mandated by TID as well as sound engineering practices. The existing overhead primary system serving this area appears to have adequate capacity to serve the planned loads, including the much larger buildout loads.

A new 12.47KV primary voltage service could be installed at the existing Modesto outfall facility. The service voltage may then be transformed down to the design motor voltage of either 4160 Y or 2400 Delta (medium voltage). It is recommended that a 2400 volt system be installed, as medium voltage motors are readily available at 2400 volts but are usually special order, long-lead items at 4160 volts, with a corresponding higher price. This option will be further evaluated during design.

5.1.2 Turlock PS Power Supply Systems

The existing power supply system serving the existing equipment at the current Harding Drain outfall does not have adequate capacity to accommodate the proposed new pump loads, particularly the buildout loads. It is recommended that a new TID service be established at this location for the purpose of serving these new loads.

A secondary service voltage of 480/277 volts would be adequate to serve the near term loads with lower power requirements, however, the buildout loads should be operated at medium voltage to reduce starting inrush and to comply with TID requirements regarding motor inrush. It is recommended that a primary service be established from TID at 12.47 KV. The service options for Turlock are the same as for the Modesto facility, as outlined above

5.1.3 DMC Outfall Power Supply Systems

Instrumentation systems including level controls, SCADA Systems and miscellaneous sampling systems will be provided at each of two connection points into the Delta Mendota Canal. Each of these locations will require a reliable power source to serve the control and monitoring systems operations as well as to power systems to initiate alarms as may be necessary.

5.2 Summary

The proposed pump station locations will require substantial power systems with reliable back-up power capabilities. Cost estimates for the proposed power system upgrades are included in Appendix F.

Chapter 6 Right-of-Way

The majority of the NVRRWP pipeline will be located in public right-of-way within Stanislaus County roads. A small portion of the pipeline will require a cross-country type of alignment within private property. Based on preliminary mapping, a designated APE during construction and operation and maintenance requirements, a formal permanent easement and temporary construction easements may be appropriate to allow for the use of the shoulders along the traveled way for staging pipe and materials during construction. Verification of existing public utility easements and the potential to facilitate the NVRRWP pipeline within these easements will be made as the detailed design proceeds. Initial estimates for private ROW easement requirements are around 10% of the pipeline alignment, and vary in use and function.

6.1.1 Temporary Construction Easements

A typical width of 45 to 60 feet will be necessary in most areas of pipeline construction. Accordingly, for the most part, an additional 15 to 25 feet of temporary construction easement will be required during the pipeline construction period depending on the reach. Typical cross sections along the pipeline alignments with approximate distances are shown in the following figures.

Figure 6-1: Cross Section - Lemon Avenue

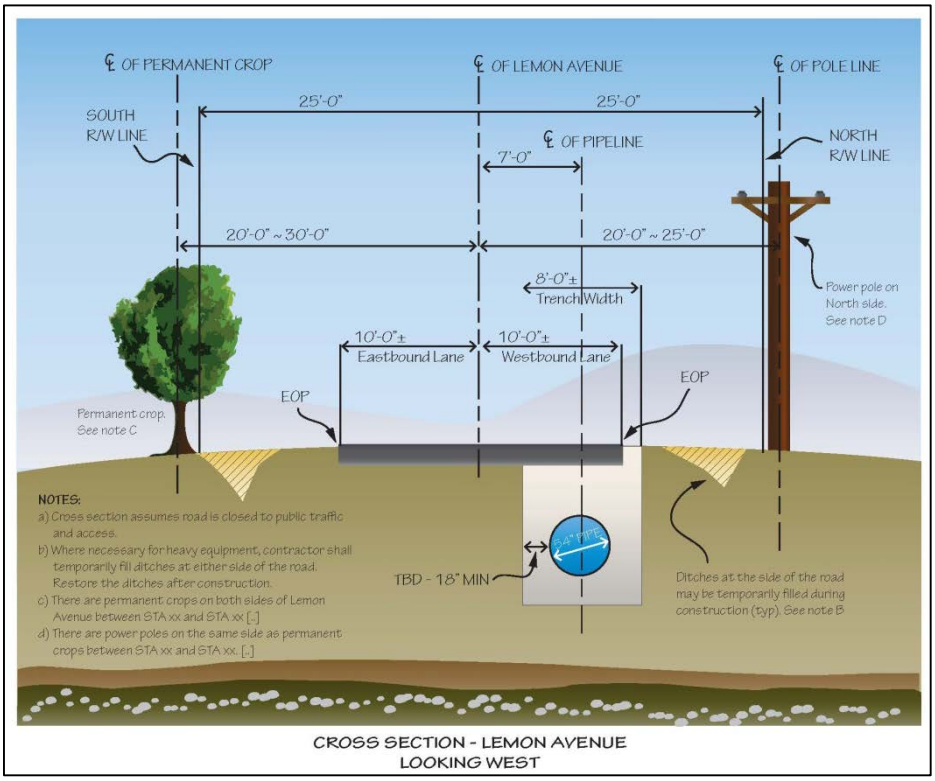


Figure 6-2: Cross Section - Cross Country

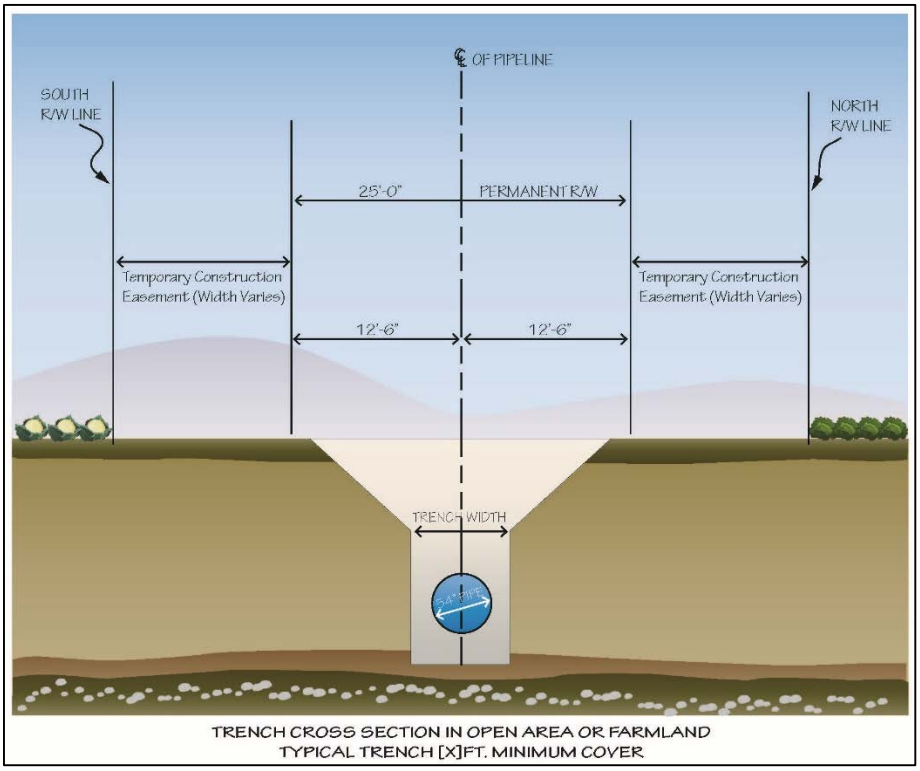


Figure 6-3: Cross Section - Zacharias Road (HWY 33)

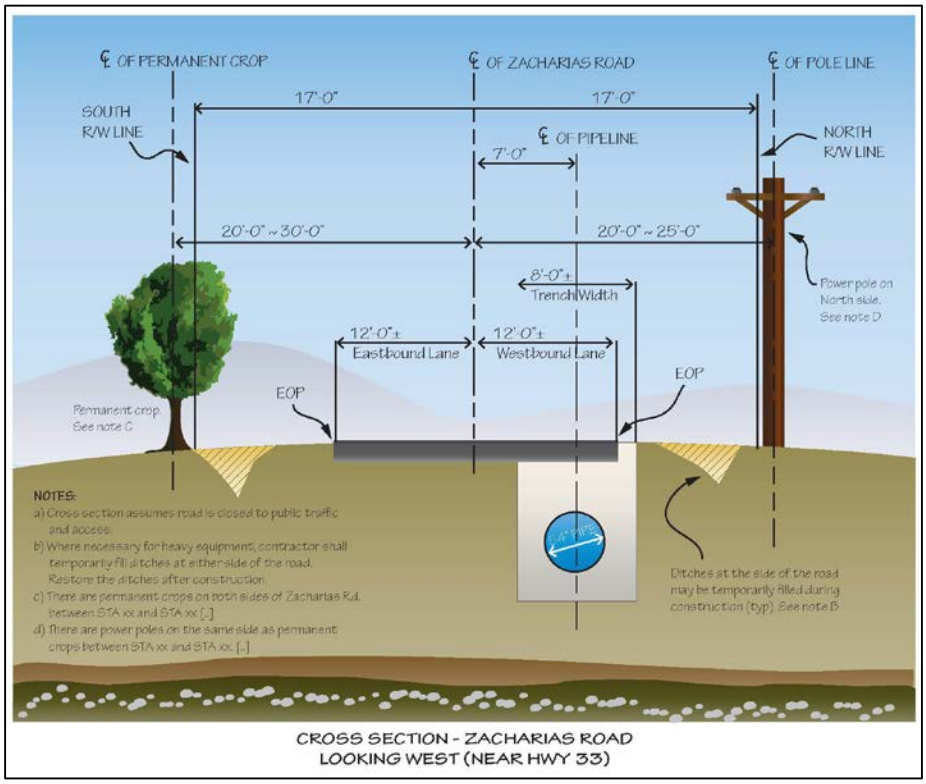
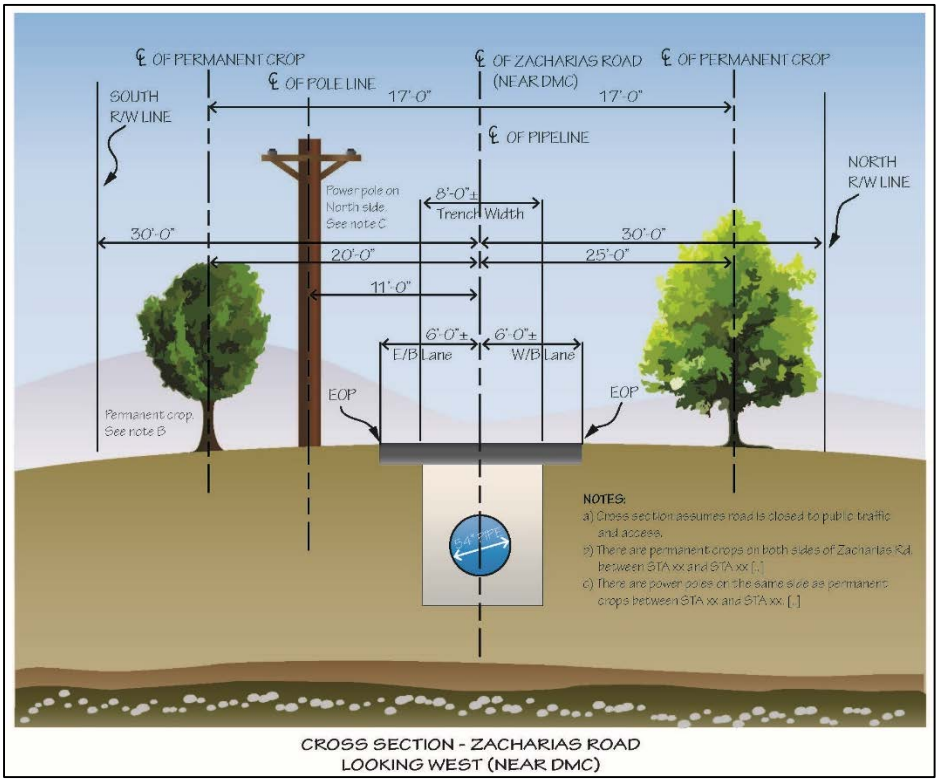


Figure 6-4: Cross Section - Zacharias Road (DMC)



Temporary construction easements will be identified and developed to allow for use of both shoulders along the traveled way of public roadways and to provide a total construction with of 45 to 60 feet along the roadways and cross-country portions of the pipeline. Wherever practical, the temporary construction easement will be placed on one side of the permanent construction easement in order to minimize the number of properties temporarily impacted by the NVRRWP construction and to limit the number of parcels for which easements must be required.

In addition to the lineal temporary construction easements required along the length of all reaches, additional temporary construction easements and / or right of access will be required to allow for the temporary storage of construction materials and equipment along the pipe alignment and for turnaround of delivery trucks in lengthy and narrow corridors. A list of possible locations for these activities will be identified as meetings with property owners take place during the detailed design phase.

6.1.2 Permanent Easements

Based on the initial work performed during the preparation of the EIR/EIS, the typical permanent easement width within private parcels will be restricted to 25 feet. Similar to temporary construction easements, an additional 15 to 35 feet of temporary construction easement will be required during the pipeline construction period.

Chapter 7 Opinion of Probable Construction Cost

7.1 Basis for Estimate

Conceptual construction cost estimates for the two project alternatives are summarized below and in Table 7-1 and Table 7-2. Appendix G provides details for each estimate including quantities, unit prices, and estimating assumptions.

- Alternative 1- Combined Pipeline to DMC: $76,410,000
- Alternative 2 - Separate Pipelines to DMC: $81,820,000

The project is currently in the facilities planning phase and the design has not been developed in detail. The geotechnical and topographical survey field investigations have also not been performed. The construction cost estimates are consistent with an AACE International Class 5 budget estimate with an accuracy range of +50 percent to -30 percent of the actual project cost. Carollo led the estimating for the pipelines and pump station facilities. Miller-Pezzoni and Associates, a subconsultant, provided a preliminary cost estimate for the electrical facilities required for each alternative. Jacobs and Associates, a subconsultant, provided preliminary cost estimates for the pipeline crossings beneath the San Joaquin River and trenchless crossings under Highway 33 and the adjacent railroad tracks. Refer to Appendix G for a detailed breakdown of the construction cost estimates.

Table 7-1: Alternative 1 Construction Cost Summary

Item	Estimated Cost
Pipeline East of San Joaquin River	$14,320,000
Pipeline West of San Joaquin River	$18,410,000
Pump Station Improvements (at Modesto WQCF)	$3,050,000
Harding Drain Pump Station Standby Power	$1,000,000
San Joaquin River Crossing	$8,240,000
Mobilization and Demobilization	$2,000,000
Subtotal	$47,020,000
Contingency (30%)	$14,110,000
Subtotal	$61,130,000
General Contractor Overhead, Profit (12%)	$7,340,000
Subtotal	$68,470,000
Escalation to Mid-Point (assumes completion date of 12/2017)	$5,140,000
Subtotal	$73,600,000
Sales Tax (7.625% on half the direct cost)	$2,810,000
TOTAL ESTIMATED CONSTRUCTION COST	**$76,410,000**

Table 7-2: Alternative 2 Construction Cost Summary

Item	Estimated Cost
Modesto Pipeline to DMC	$12,120,000
Modesto Pump Station (at Modesto WQCF)	$2,650,000
Modesto San Joaquin River Crossing	$6,890,000
Turlock Pipeline to DMC	$12,270,000
Turlock Pump Station (at Harding Drain Outfall Site)	$5,000,000
Turlock San Joaquin River Crossing	$8,430,000
Turlock Harding Drain Pump Station Emergency Power	$1,000,000
Mobilization and Demobilization	$2,000,000
Subtotal	$50,350,000
Contingency (30%)	$15,110,000
Subtotal	$65,460,000
General Contractor Overhead, Profit (12%)	$7,860,000
Subtotal	$73,320,000
Escalation to Mid-Point (assumes completion date of 12/2017)	$5,500,000
Subtotal	$78,820,000
Sales Tax (7.625% on half the direct cost)	$3,000,000
TOTAL ESTIMATED CONSTRUCTION COST	**$81,820,000**

7.1.1 ENR Benchmark

Providing a cost benchmark for construction estimates is useful in documenting the time of estimate preparation and in allowing for projections and escalations to later dates using the equivalent index value.

This preliminary design cost estimate is benchmarked to the Construction Cost Indices (CCI) published by the Engineering News Record (ENR) for July 2014. Typically, for the Modesto/Turlock/Patterson region, an average of the ENR 20 Cities and ENR San Francisco CCI is used since a cost index for this region is not available, and the cost of construction is typically 10-20 percent lower in this region compared to the San Francisco Bay Area.

The ENR 20 Cities CCI and the ENR San Francisco CCI for July 2014 were 9835 and 10898 respectively; averaging the two results in a CCI of 10366.

7.1.2 Unit Costs

Unit costs have been researched and used for the major pipeline and structure components of the Project. These major components include water piping, pumps, valving, structures, and appurtenances.

Unit costs have been developed using preliminary quotations received from equipment and material manufacturers supplemented with installation costs based on past experience with similar projects, available recent bid data, or cost estimating guidelines derived from estimating guides such as the 2014 RS Means Heavy Construction Data publication.

7.1.3 Contingencies

Contingencies are typically applied to a construction estimate at the design development phase to account for construction items not yet identified, and construction design unknowns. As the design is refined and finalized, the contingency, typically expressed as a percent of the raw construction cost, will trend downward. At the completion of the design, the contingency should represent only a reasonable construction change order allowance. Agencies typically retain contingency within their project budgets, even when construction contract award values are known, to cover the cost of deal with unforeseen conditions.

A 30% contingency, calculated based on the raw construction cost, has been included in both Alternatives for the NVRRWP cost estimates. This is in alignment with the recommendations for a project at an AACE Class 5 level of development.

Chapter 8 Design and Construction Assumptions

This chapter provides a summary of critical field investigations necessary to begin design and the permitting process. This chapter also describes the overall project implementation schedule and project delivery methods.

The design phase will include the following critical field investigations early in the process. The following field investigations are necessary to facilitate the preliminary design and permitting process.

8.1.1 Topographic Survey

A topographic survey will be performed for the project and will include:

- Aerial Survey: A photogrammetric aerial survey will be performed along the pipeline alignment and at key facility locations bathymetric survey
- Ground Survey: A topographic ground survey will be performed to obtain detailed elevations and horizontal locations of key facilities.
- Bathymetric Survey: A bathymetric survey of the San Joaquin River will be performed to obtain the detailed bathymetric information necessary to design the trenchless crossing(s) of the San Joaquin River.

8.1.2 Geotechnical Field Investigations

A geotechnical field investigation to perform the project will include:

- Geotechnical Borings: Borings will be performed along the pipeline alignment, at the river crossings, and at permanent facility locations. The geotechnical information will be used during final design to design the trenchless crossings and permanent structures.
- Pump Test: The geotechnical engineer will perform pump tests at critical locations to estimate the dewatering discharge during construction.

8.1.3 Disinfection

Concerning pipeline operation and maintenance, periodic disinfection may be required to maintain water quality for the receiving water (DMC). Further evaluation of water age and options for disinfection will be addressed during design.

8.2 Implementation Schedule

The implementation schedule for the remainder of the project may take the form of a number of sequences. The current drivers pushing the schedule include, and are not limited to, the following:

- DPWD’s need for reliable water supply
- Potential need to avoid discharge of recycled water into the San Joaquin River for NPDES permit constraints
- Low interest financing

Currently, three pathways are being considered for schedule comparisons. The following table presents a comparison of the schedule options.

Table 8-1: NVRRWP Schedule Comparison

	Design-Bid Build (CEQA First)	Design-Bid Build (Accelerated)	Progressive Design Build
Critical Path	CEQA and Design	Water Rights	Water Rights
Design Start Milestone	Final EIR	JPA Approval	JPA Approval
Construction Start Milestone	Reclamation Approval	Reclamation Approval	Reclamation Approval
Project Online	June 2018	February 2018	October 2017
Advantages	Lowest Risk	Low Risk	Higher risk, Online sooner, possibly 2017 irrigation season

Key milestone dates for project implementation for each schedule option are shown Figure 8-1, Figure 8-2, and Figure 8-3.

Figure 8-1: Design-Bid Build (CEQA First) Key Milestones

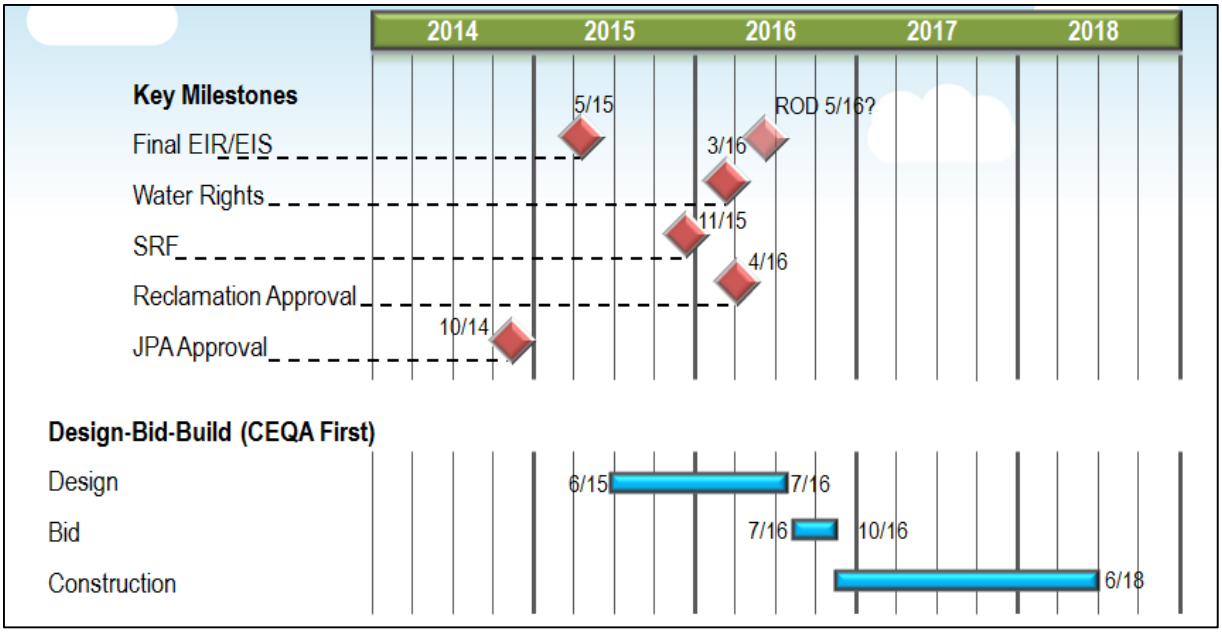


Figure 8-2: Design-Bid-Build (Accelerated) Key Milestones

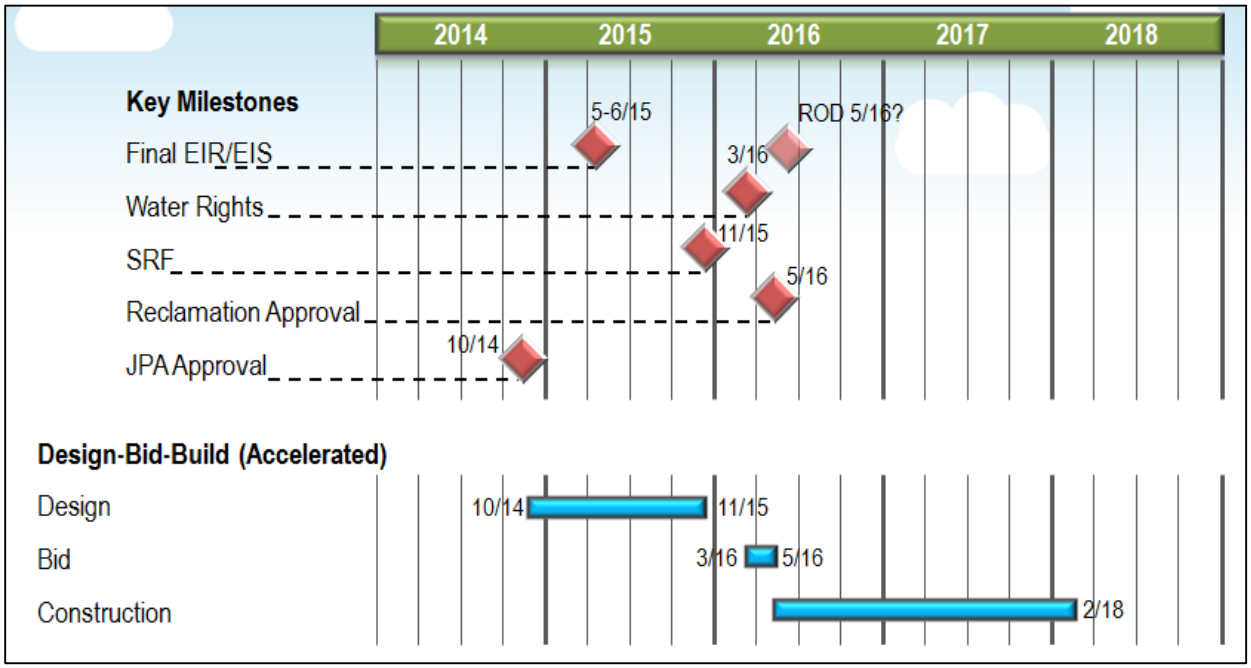
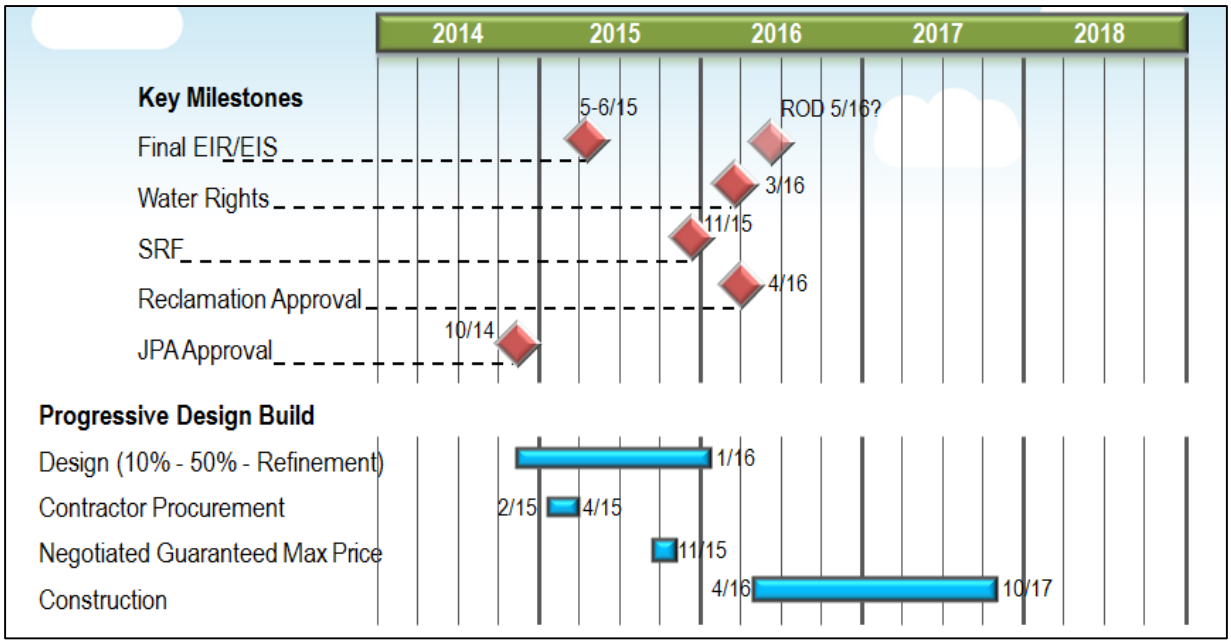


Figure 8-3: Progressive Design Build Key Milestones



Appendix A - Area of Potential Effect (APE) Maps

NVRRWP APE

Impact

Continuous Trenching

Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM

NVRRWP APE

Impact

Continuous Trenching

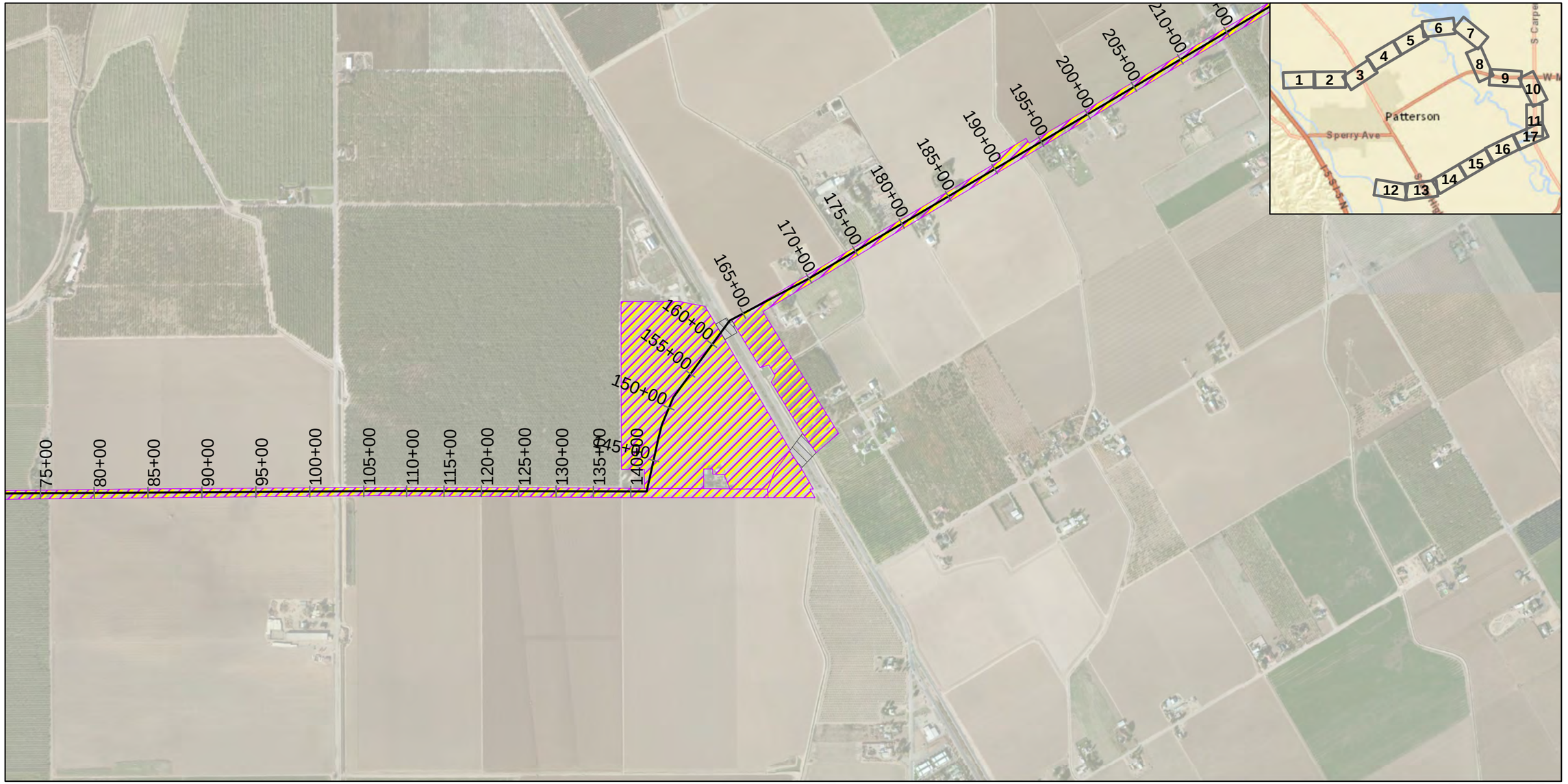
Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

Continuous Trenching

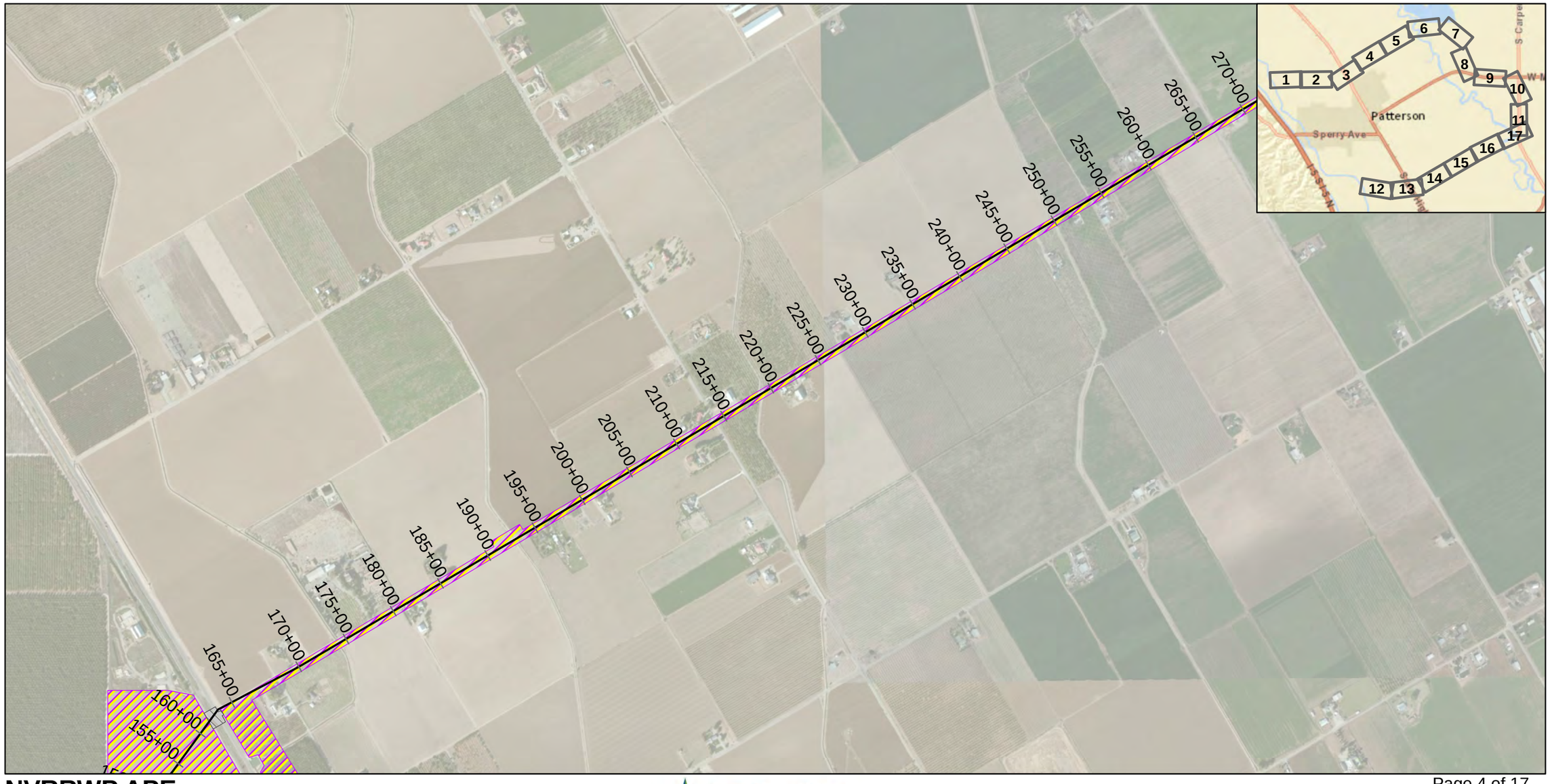
Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

- Continuous Trenching
- Trenchless - No Surface Impact

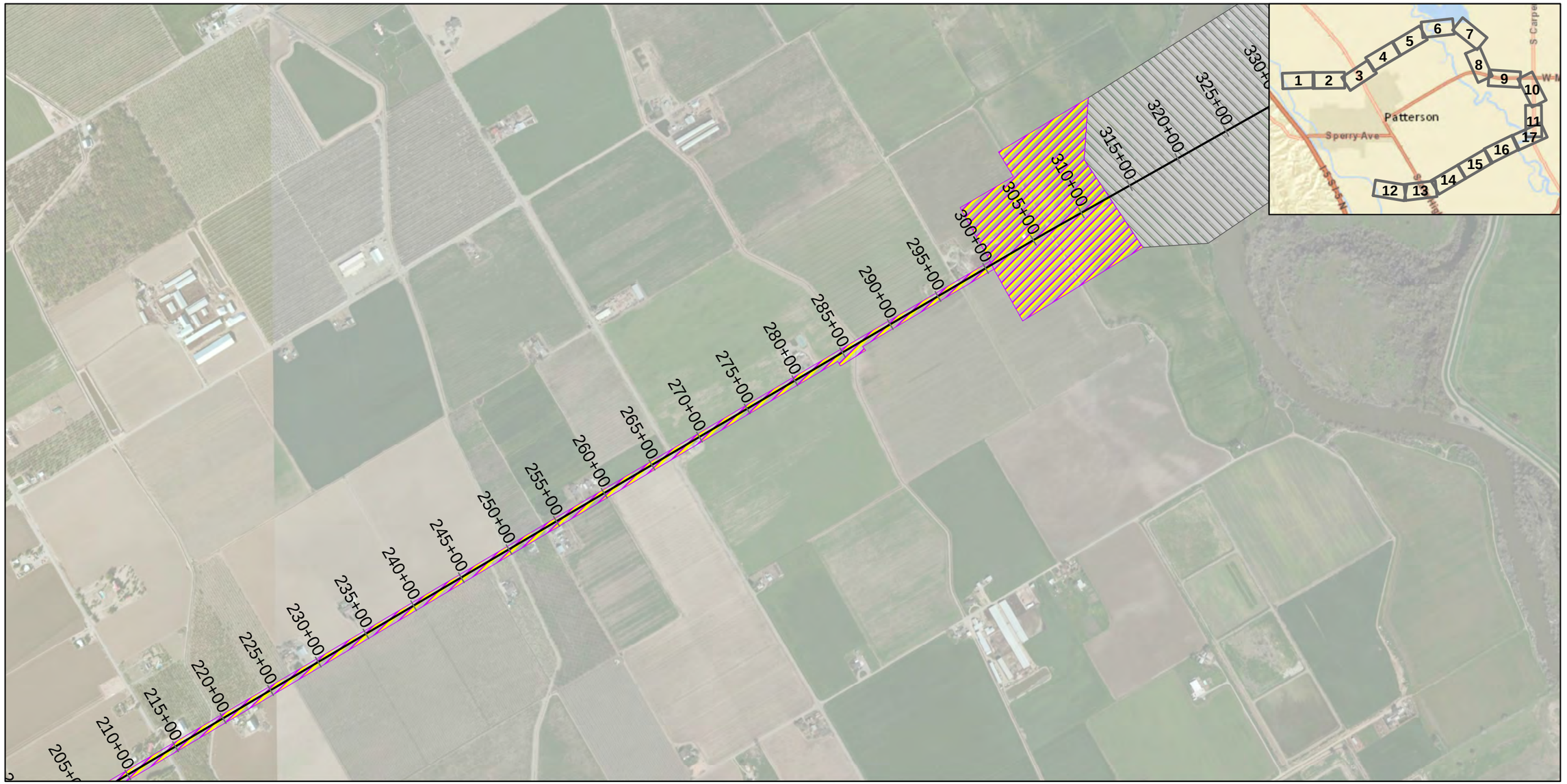
0 660 1,320 2,640 Feet

RMC water and environment

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

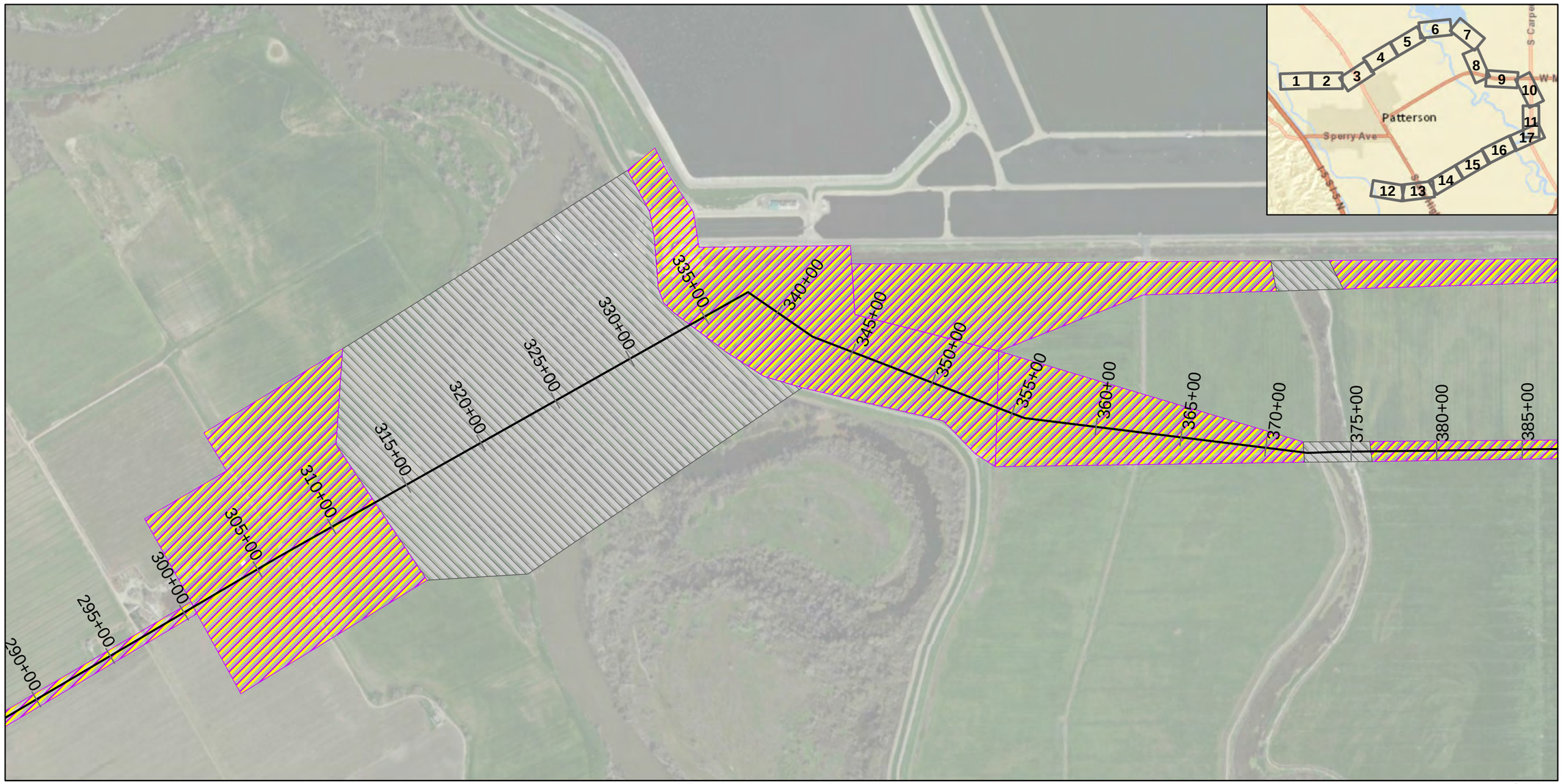
- Continuous Trenching
- Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

- Continuous Trenching
- Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM

NVRRWP APE

Impact

Continuous Trenching

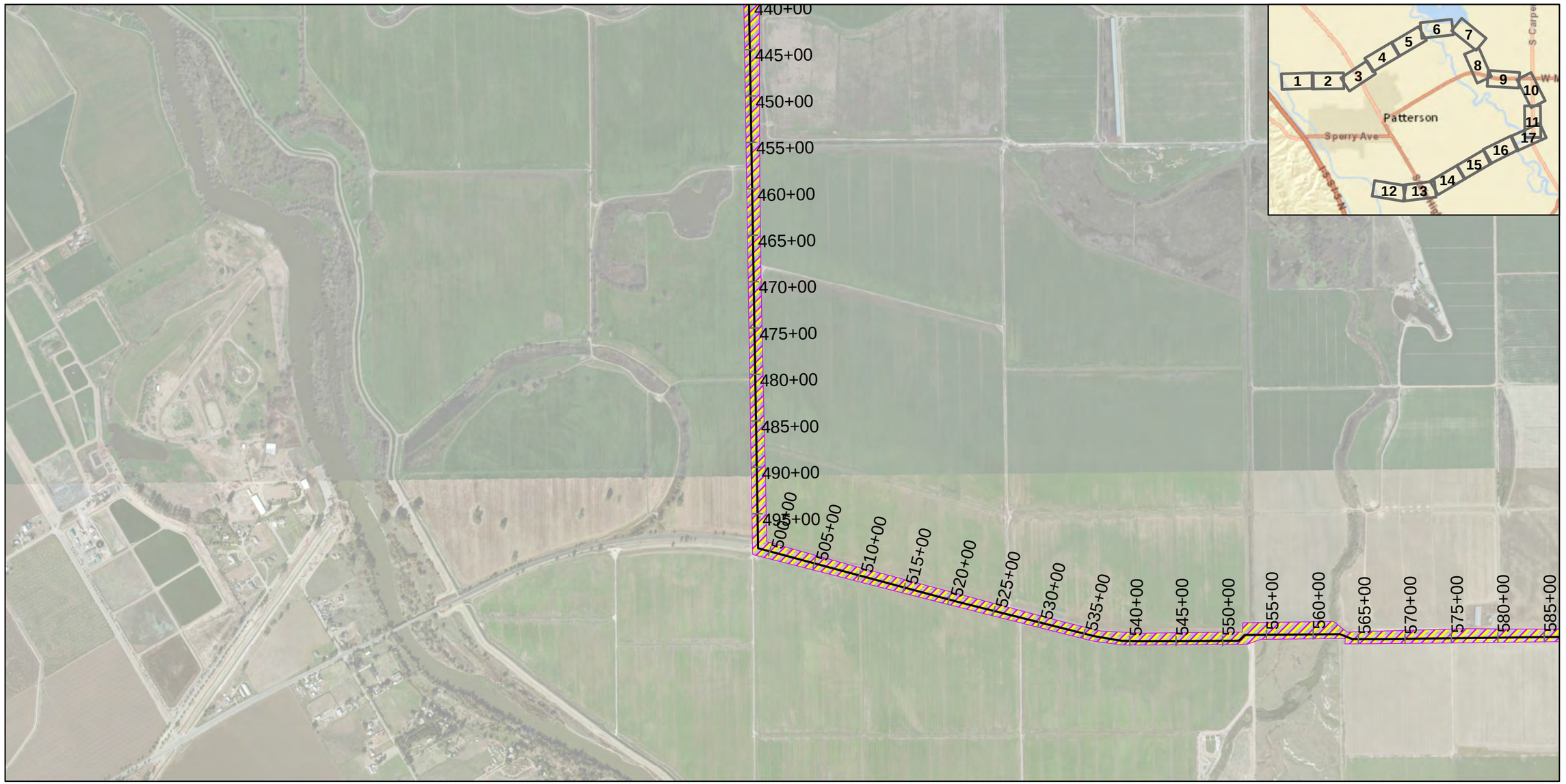
Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

Continuous Trenching

Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

RMC water and environment

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM

NVRRWP APE

Impact

Continuous Trenching

Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

RMC water and environment

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM

NVRRWP APE

Impact

- Continuous Trenching
- Trenchless - No Surface Impact

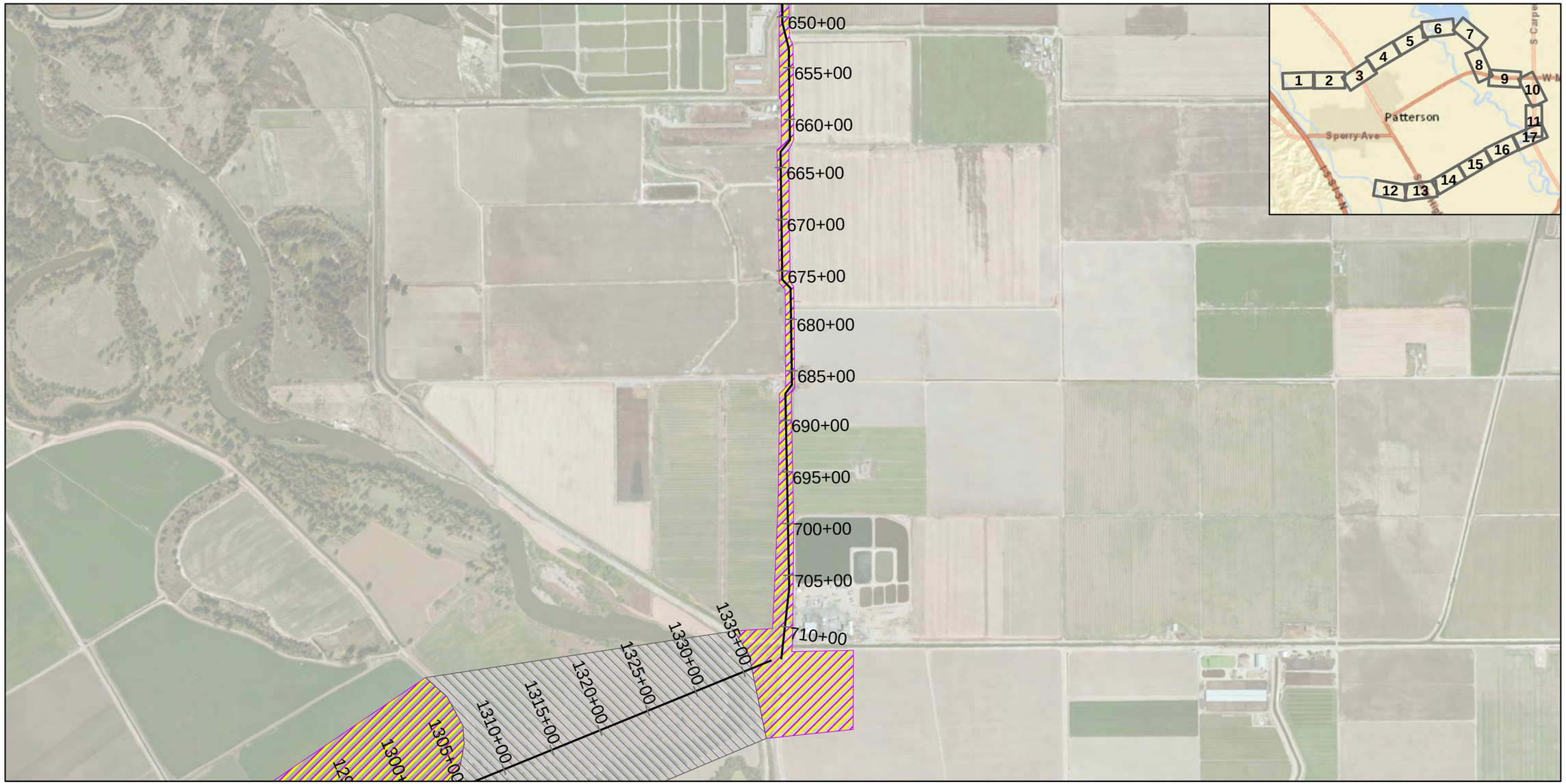
0 660 1,320 2,640 Feet

RMC water and environment

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

- Continuous Trenching
- Trenchless - No Surface Impact

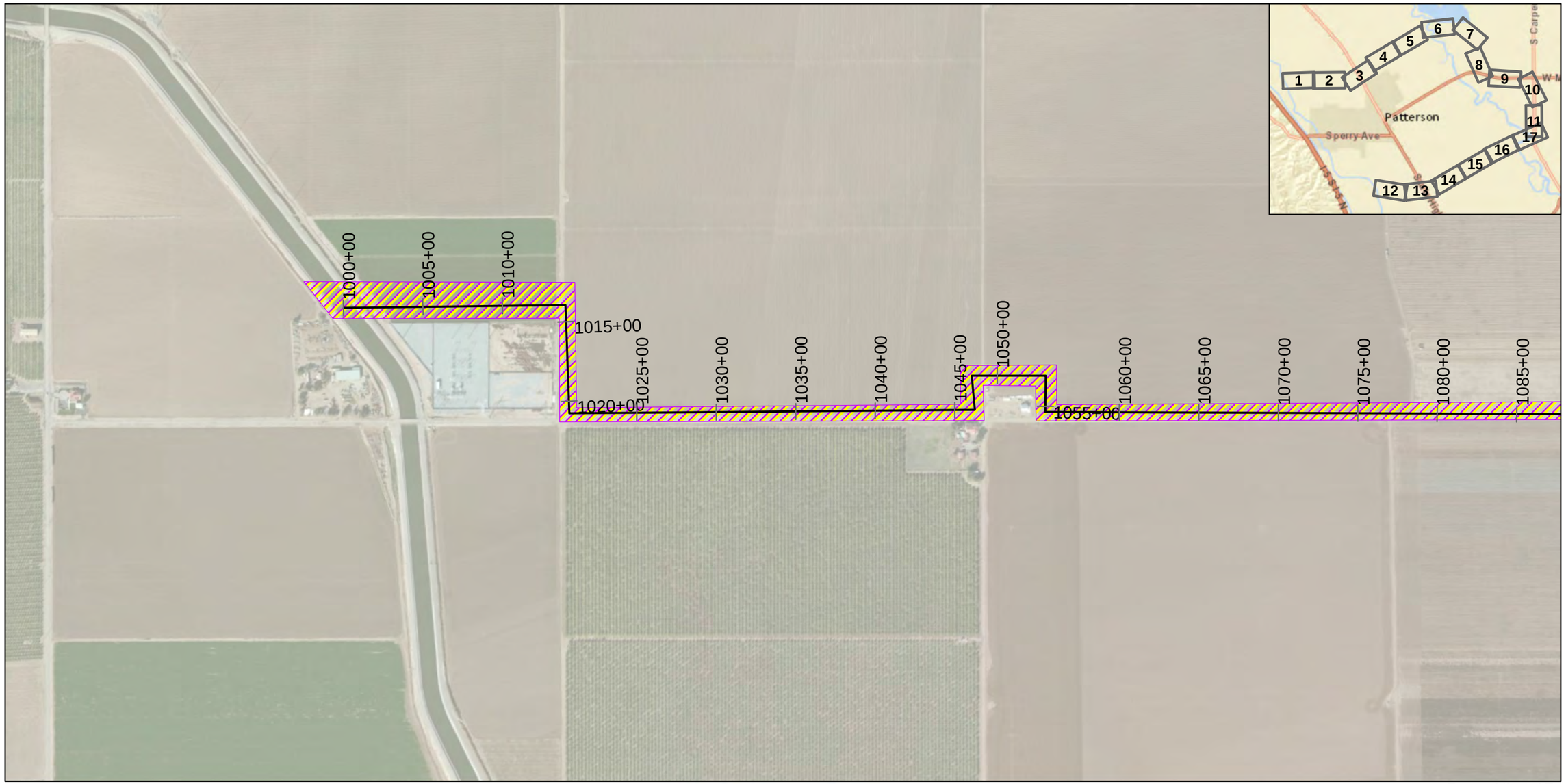
0 660 1,320 2,640 Feet

RMC water and environment

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

- Continuous Trenching
- Trenchless - No Surface Impact

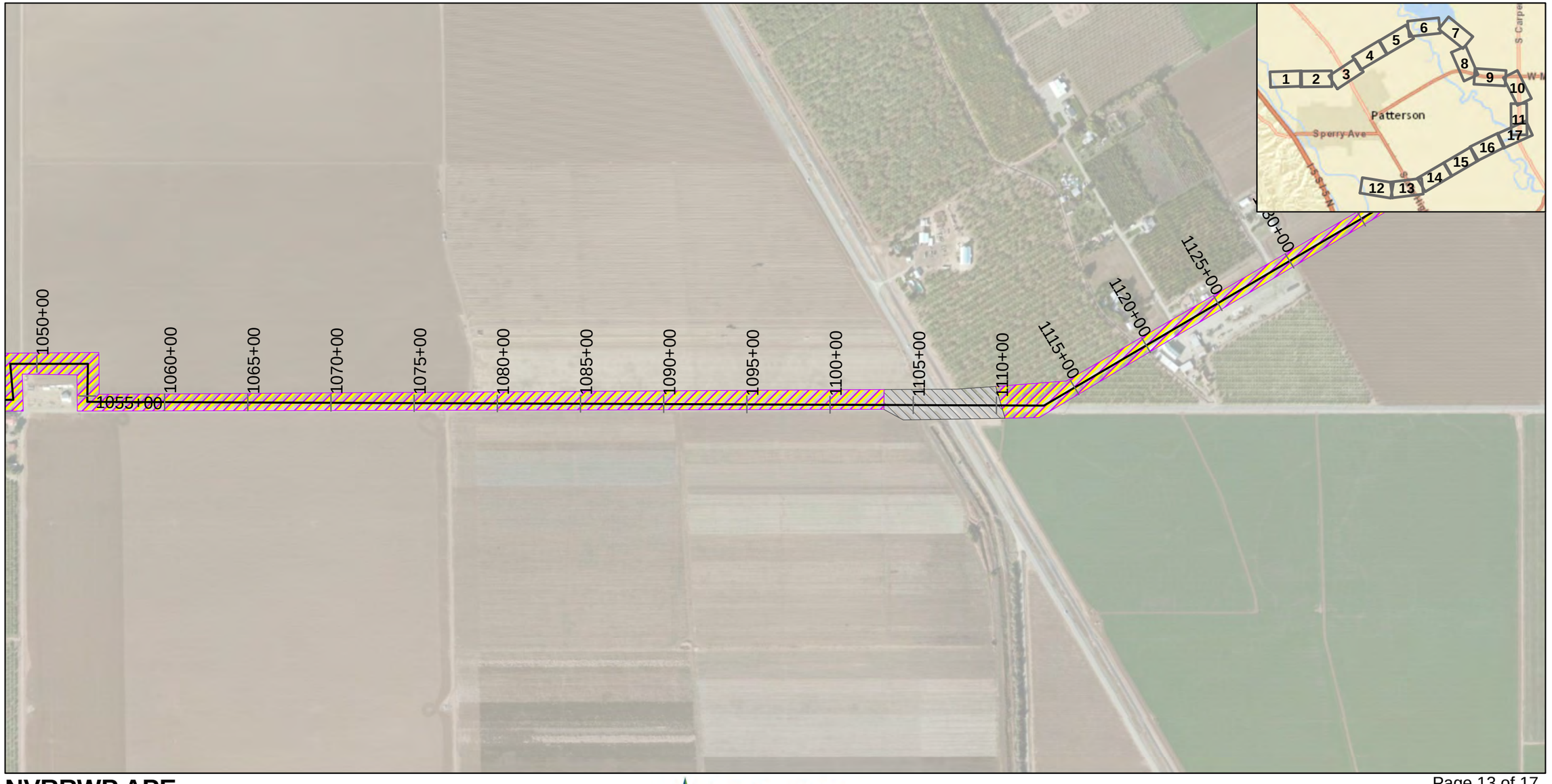
0 660 1,320 2,640 Feet

RMC water and environment

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

Continuous Trenching

Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM

NVRRWP APE

Impact

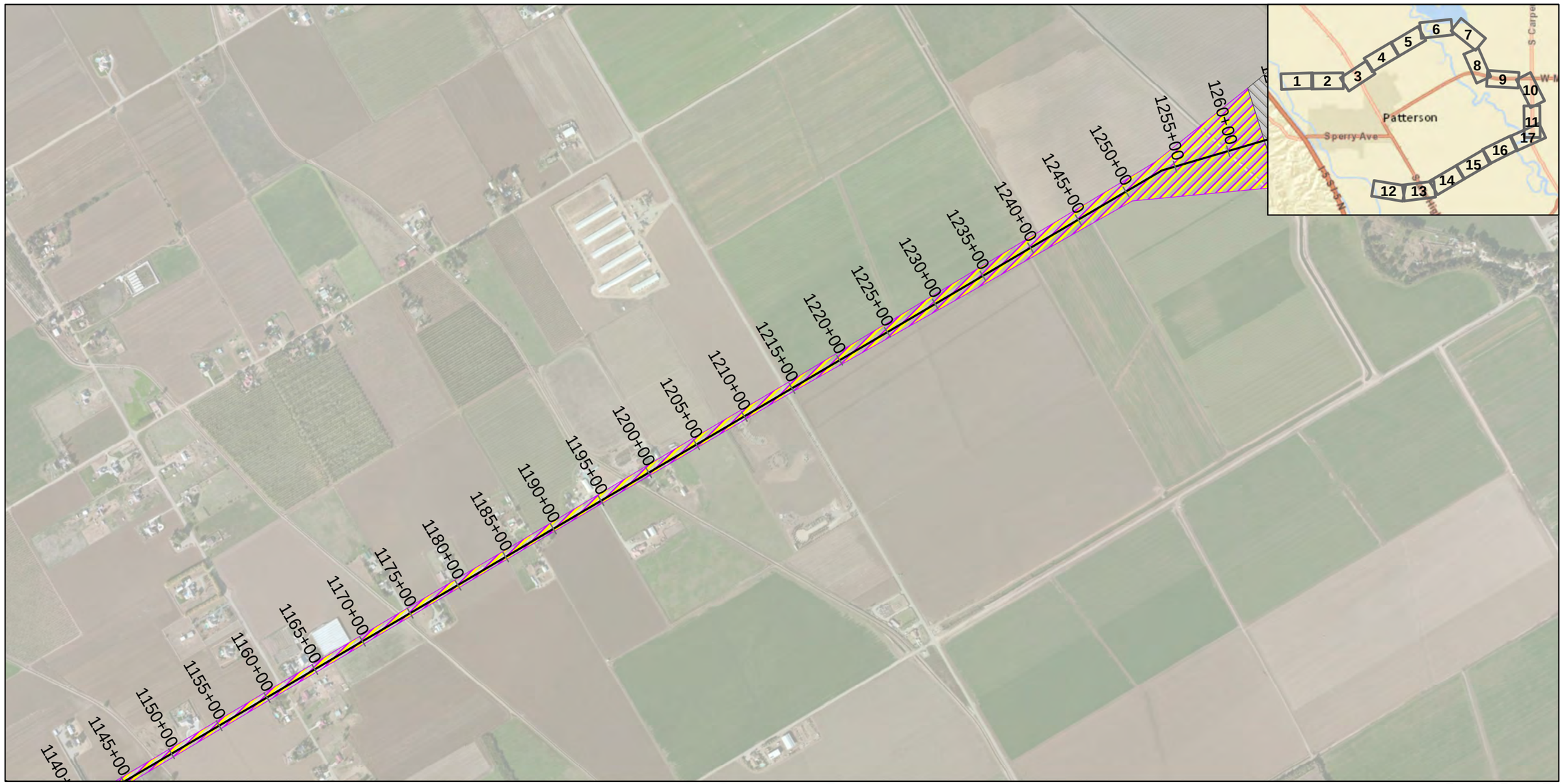
- Continuous Trenching
- Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

Continuous Trenching

Trenchless - No Surface Impact

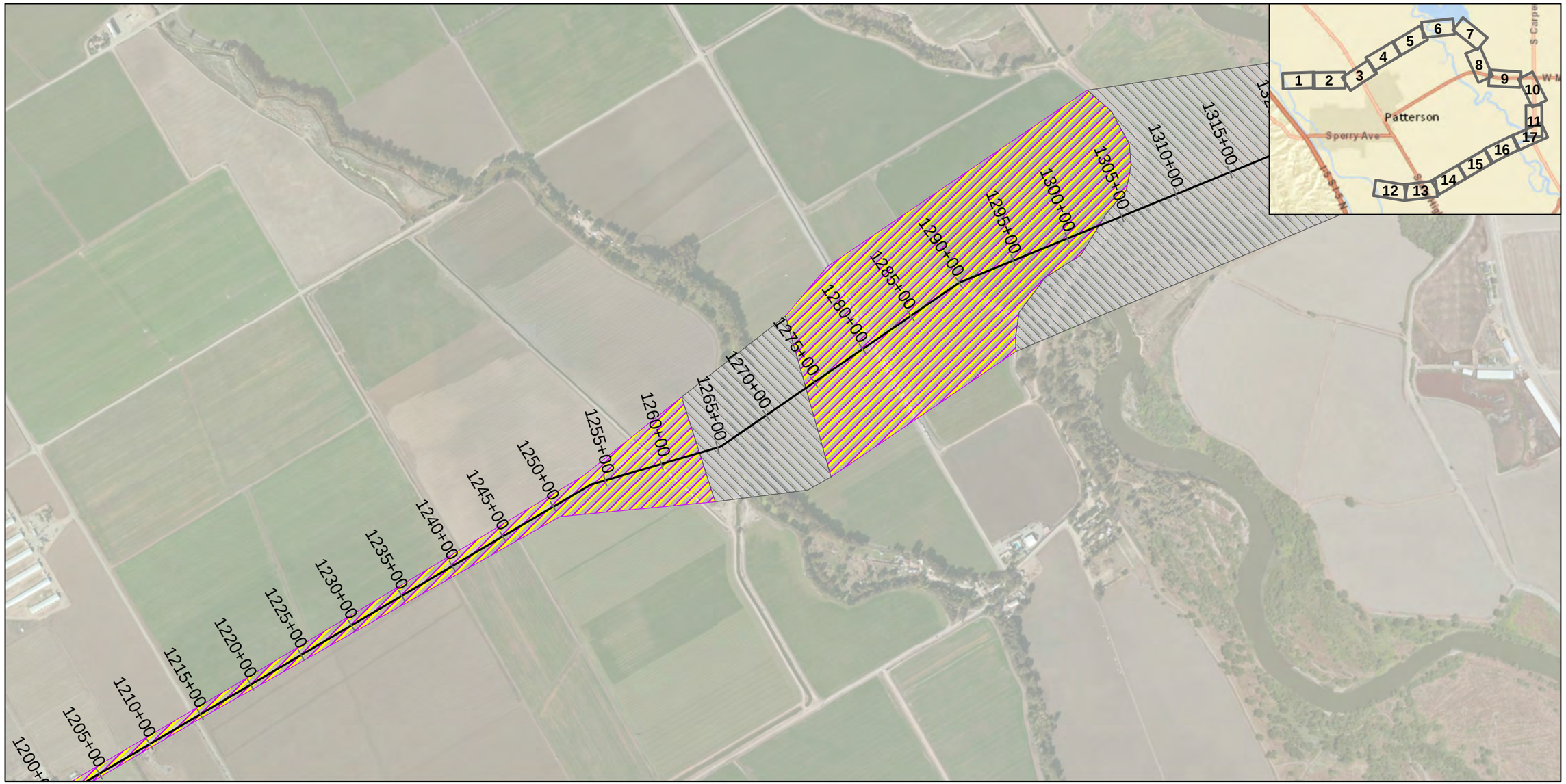
0 660 1,320 2,640 Feet

RMC water and environment

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

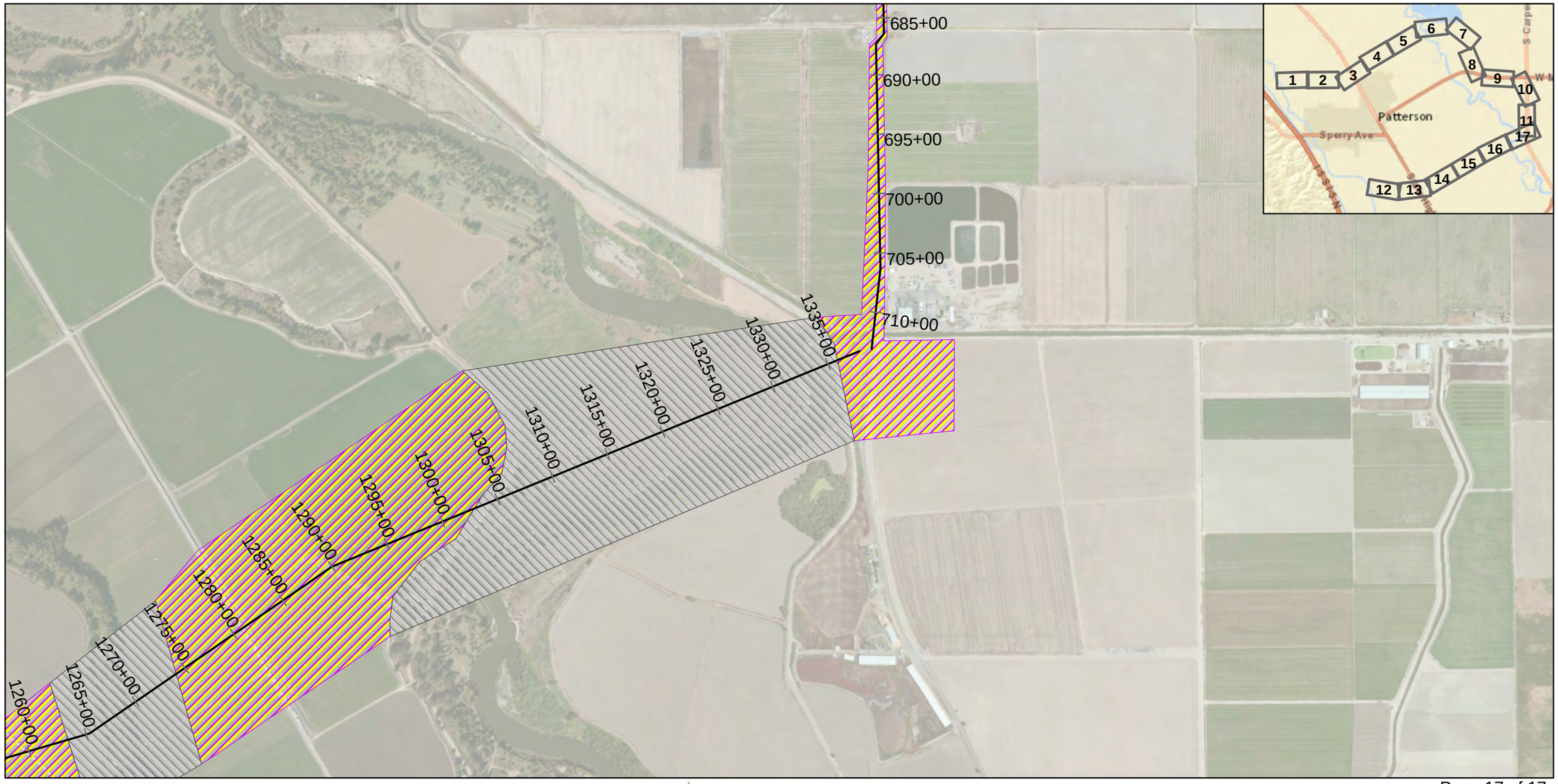
- Continuous Trenching
- Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM



NVRRWP APE

Impact

Continuous Trenching

Trenchless - No Surface Impact

0 660 1,320 2,640 Feet

Area of Potential Effect Maps
North Valley Regional Recycled Water Program

N

Date Saved: 6/17/2014 12:00:31 PM

Appendix B - NVRRWP Calculation of Buildout Flows

DRAFT Memorandum

North Valley Regional Recycled Water Project

Subject:	**Calculation of NVRRWP Buildout Flows**
Prepared For:	North Valley Regional Recycled Water Program
Prepared by:	Marilyn Bailey
Reviewed by:	
Date:	May 3, 2013
Task	4.4

1 Purpose

This memorandum calculates the NVRRWP recycled water supply available at buildout conditions from the Cities of Turlock and Modesto based on input from the staff of both Cities. The flows included in this memorandum will be used for sizing project facilities and calculating unit costs of water. Note that the buildout flows in this memo supersede the flow rates calculated in the memorandum entitled "NVRRWP Design Criteria and Assumptions" (October 26 2012).

Based on the Cities' evaluation of buildout flows, it is now estimated that approximately 52.7 mgd (59,000 AFY) of recycled water may be available by the year 2043 for the NVRRWP project.

2 Recycled Water Availability

2.1 City of Modesto

The City of Modesto has reviewed the flow projections for the City based on the City's current land use, and using the flow coefficients found in the City's Wastewater Master Plan. The City's build-out flow is projected to be around 40.6 MGD. However, based on outside factors, such as the economic downturn, water metering, etc, the City has seen reductions in population and sewer flow, which would impact the project build-out year. In the 2007 WWMP, the City's sphere of influence was projected to reach build out in 2030. With the preliminary design of the City's Phase 2 BNR/Tertiary Treatment project, the build-out date was revised to 2038.

The City of Modesto had a population of 201,165 in 2011 and 202,290 in 2012. Domestic Flow into the City's Treatment Plants decreased between 2006 through 2012, from 27.2 MGD to 20.4 MGD. The decrease in flows may be attributed to water conservation (due to water metering), foreclosures, or reduction of year-round commercial industrial flows.

From that starting point, and using the same growth rates that were in the 2008 WWMP Supplement, it is assumed that there would be gradual growth of 0.6% in 2013-14, 1.6% from 2015-16, and 1.75% from then on, the City developed a reasonable projection of anticipated sewer connections in Modesto Municipal Sewer District #1, including Empire, North Ceres and County Islands. These assumptions include commercial and minor industrial growth, but exclude large scale industrial (canning) growth.

The 2007 WWMP used a per capita flow in 2005 of 117.3 GPD/cap, based on population and flow into the plant. Currently, flow per capita is estimated at 94.9 GPD/cap. A 5 year average (between 2008 to 2012) is 102.4 GPD/cap and 8 year average (between 2005-2012) is 109 GPD/cap. Based on these per capita flows, the estimated build-out date for the City of Modesto is between 2043 and 2046.

The City also estimated that expansion of the tertiary treatment facilities would occur in 5 phases, ultimately reaching a capacity of 27.5 mgd. Communication with the City indicates there will probably be some onsite uses of tertiary treated water, such as a demonstration irrigation project in the future. This memorandum estimates that 0.2 mgd will be used for in-facility recycled water use, leaving 27.3 mgd available at buildout for NVRRWP.

2.2 City of Turlock

The City of Turlock General Plan Update estimated the City would reach an influent flow of 27.5 mgd at buildout in the year 2030. City staff has reviewed the projected buildout flows for the Turlock Regional Water Quality Control Facility and has researched the data provided to City planning staff and their consultants for the General Plan Update. Based on that review, the buildout flows and timing listed in the General Plan are the best reasonable estimate at this time and are reflective of projected job growth, not just population growth.

The Turlock RWQCF receives flow well in excess of what one would normally see for a City of 70,000 because they have a number of food processors, etc. The General Plan projects job growth commensurate with population growth, i.e. does not overestimate job growth. However, a significant portion of the job growth will occur in water intensive industries. The City has zoned a significant amount of land (1,700 acres) for new industrial development and has seen significant interest from food processors considering a move to Turlock. Therefore wastewater flows will increase significantly over time.

The City of Turlock has several long term commitments for recycled water use from the facility. The first commitment is for 2 mgd for 50 years for use at Turlock Irrigation District's (TID) Walnut Energy Center. Although the commitment is for up 2 mgd, the actual deliveries in 2012 have averaged 1.0 mgd. For the sake of assessing availability of recycled water, the contractual commitment of 2 mgd will be reserved for delivery to TID. The other current recycled water use in Turlock is for irrigation at Pedretti Park. The average irrigation use for the park is assumed to be 0.1 mgd, which was the average use in 2012. Therefore, in calculating the recycled water that would be available for NVRRWP, it is assumed that 2.1 mgd will be reserved for in-City use, leaving a flow rate of 25.4 mgd available at buildout for NVRRWP.

2.3 NVRRWP Flows

Based on the Cities' evaluation of buildout flows, it is estimated that approximately 52.7 mgd (59,000 AFY) of recycled water may be available by the year 2043 for the NVRRWP project.

Figures 1 and 2 summarize the estimated recycled water flows annually from now until buildout. The detailed spreadsheet of the flow estimates is included as an attachment.

Figure 1 NVRRWP Flow Rates at Buildout, mgd

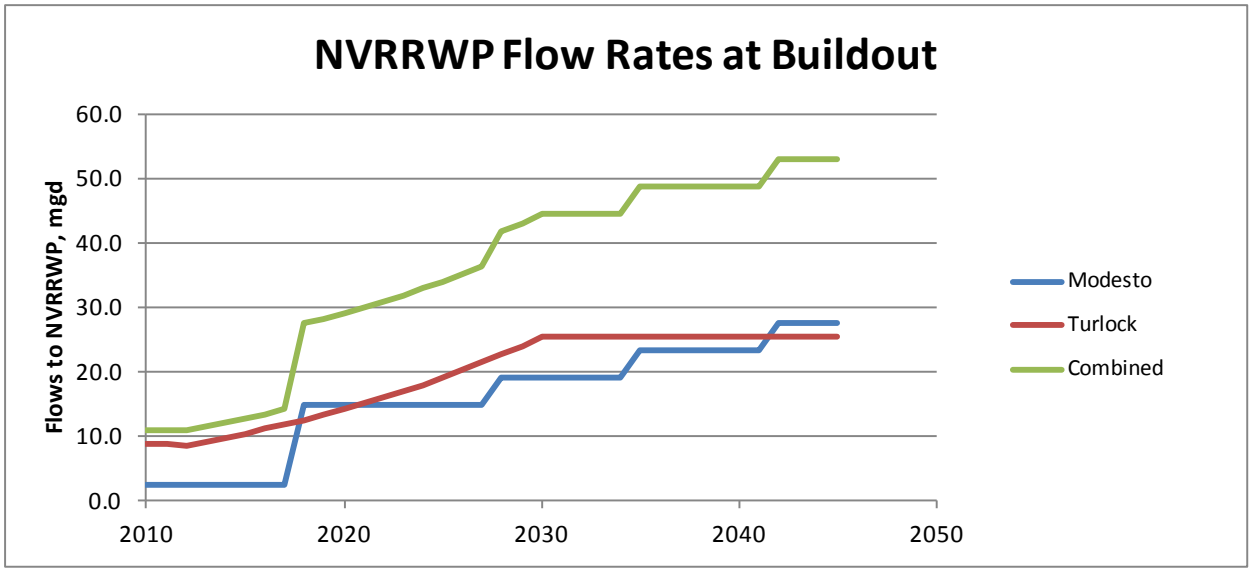
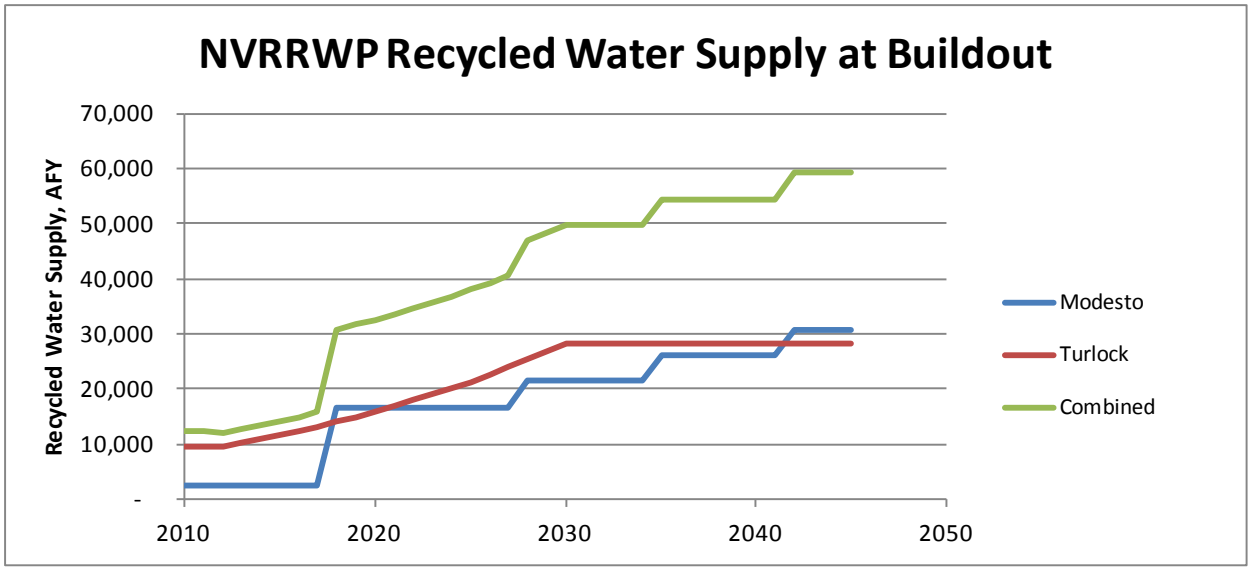


Figure 2 NVRRWP Recycled Water Supply at Buildout, AFY



Appendix C - Pump Curves

Model: VIT	Size: 30BLC	60Hz	RPM Variable	Stages: 3

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

1 Pump Alt 1
VARIABLE SPEED
Initial Flows

Issued by :
Quotation No. :
Date : 09/08/2014
Rev. : 0

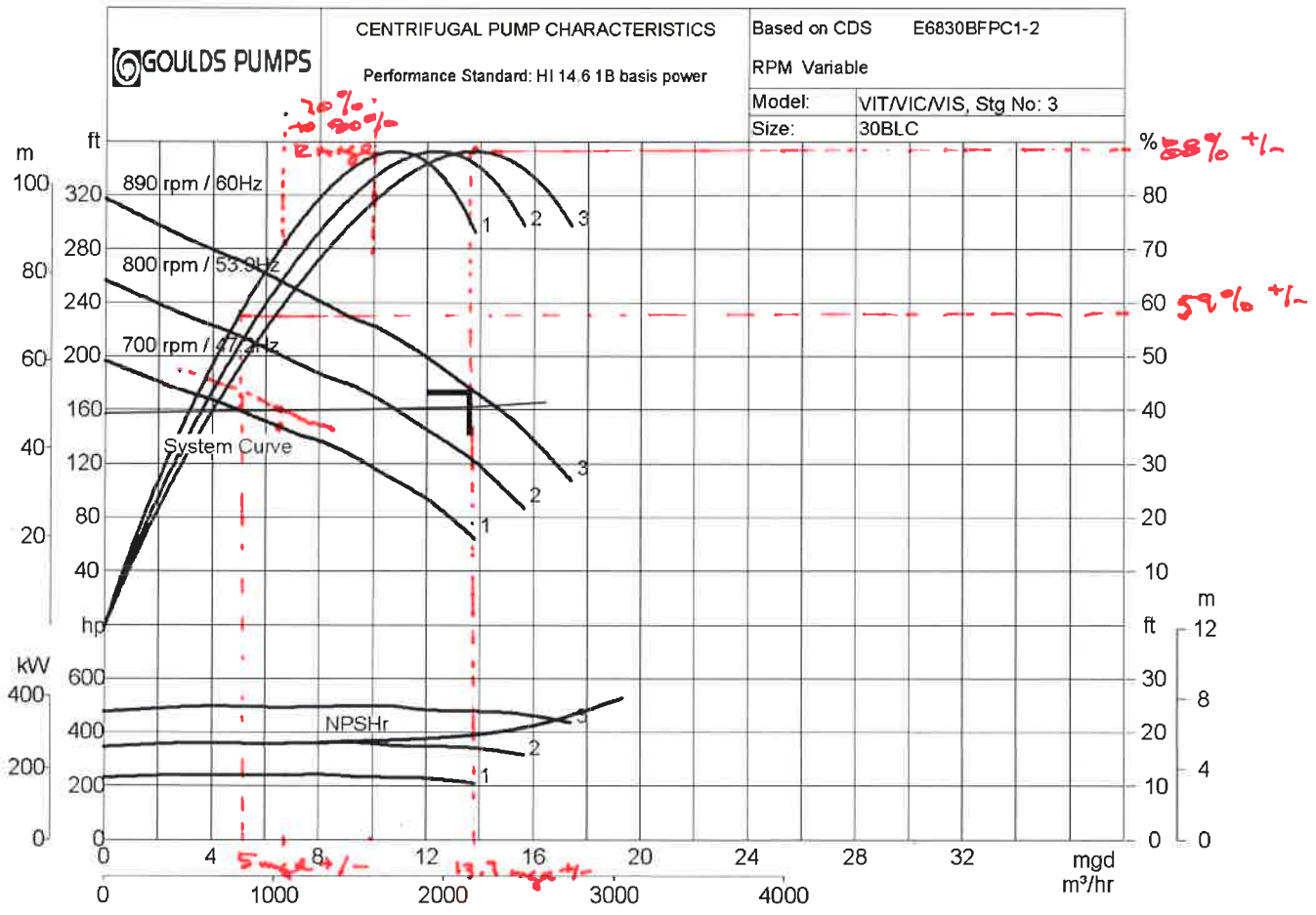
Operating Conditions

Liquid:	Water	Published Efficiency:	87.7 %
Temp.:	70.0 deg F	Rated Pump Efficiency:	87.7 %
S.G./Visc.:	1.000/1.000 cp	Rated Total Power:	478.9 hp
Flow:	13.70 mgd	Non-Overloading Power:	498.9 hp
TDH:	~~175.0~~ ft	Imp. Dia. First 1 Stg(s):	17.81 in
NPSHa:	0.0 ft	NPSHr:	19.5 ft
Solid size:		Shut off Head:	317.3 ft
% Susp. Solids (by wtg):		Vapor Press:	
Max. Solids Size:	1.8700 in		

Pump Performance @ 890 RPM

Specific Speed 1st stg:	3,591 gpm(US) ft
Specific Speed Adl stg:	
Min. Hydraulic Flow:	7.029 mgd
Imp. Dia. Adl Stg(s):	17.81 in

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Model: VIT	Size: 30BLC	60Hz	RPM Variable

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

2 pumps ALT 1 variable speed
Initial flows

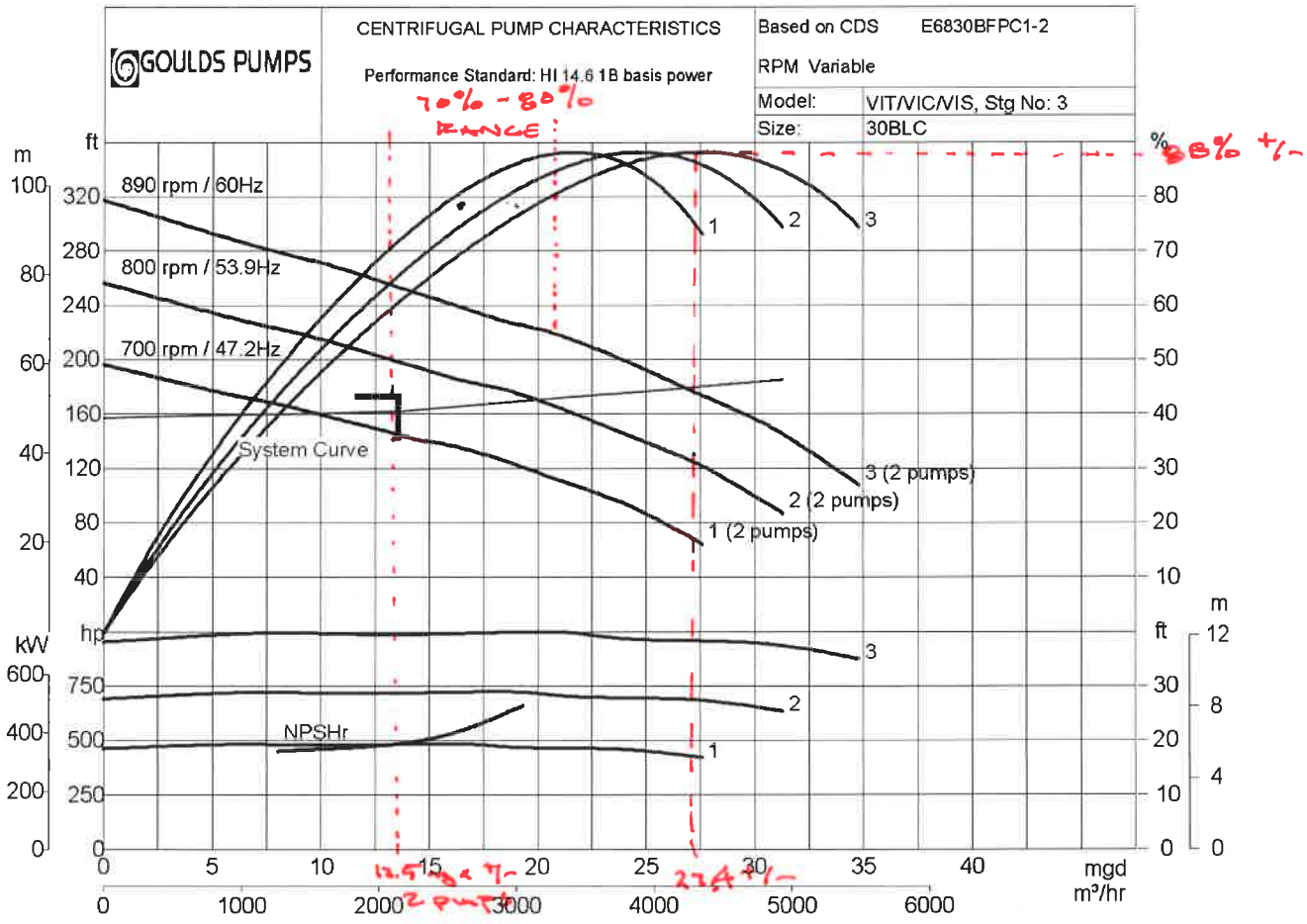
Issued by :
Quotation No. :
Date : 09/08/2014
Rev. : 0

Operating Conditions

Liquid:	Water	Published Efficiency:	87.7 %	Specific Speed 1st stg:	3,591 gpm(US) ft
Temp.:	70.0 deg F	Rated Pump Efficiency:	87.7 %	Specific Speed Adl stg:	
S.G./Visc.:	1.000/1.000 cp	Rated Total Power:	478.9 hp	Min. Hydraulic Flow:	7.029 mgd
Flow:	13.70 mgd	Non-Overloading Power:	498.9 hp		
TDH:	175.0 ft	Imp. Dia. First 1 Stg(s):	17.81 in	Imp. Dia. Adl Stg(s):	17.81 in
NPSHa:	0.0 ft	NPSHr:	19.5 ft		
Solid size:		Shut off Head:	317.3 ft		
% Susp. Solids (by wtg):		Vapor Press:			
Max. Solids Size:	1.8700 in				

Pump Performance @ 890 RPM

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Model: VIT	Size: 42WMCE	60Hz	RPM Variable	Stages: 1

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

1 Pump ALT
Variable Speed
Buildout

Issued by :
Quotation No. :
Date : 09/09/2014
Rev. : 0

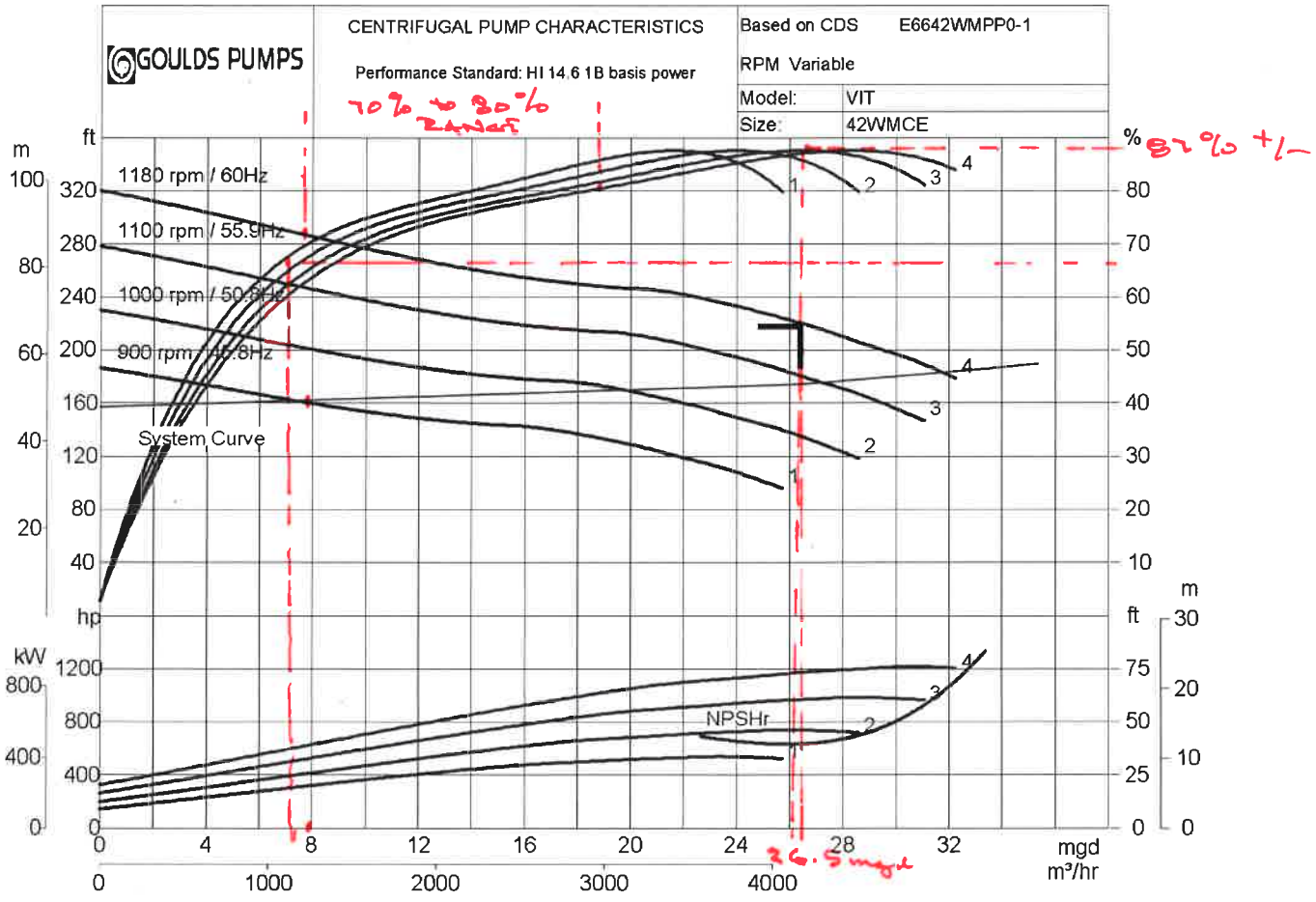
Operating Conditions

Liquid:	Water
Temp.:	70.0 deg F
S.G./Visc.:	1.000/1.000 cp
Flow:	26.50 mgd
TDH:	~~220.0~~ ft
NPSHa:	0.0 ft
Solid size:	
% Susp. Solids (by wtg):	
Max. Solids Size:	0.0000 in

Pump Performance @ 1180 RPM

Published Efficiency:	0.0 %	Specific Speed 1st stg:	2,566 gpm(US) ft
Rated Pump Efficiency:	86.5 %	Specific Speed Adl stg:	
Rated Total Power:	1,175.0 hp	Min. Hydraulic Flow:	
Non-Overloading Power:	1,217.7 hp		
Imp. Dia. First 1 Stg(s):	24.92 in		
NPSHr:	39.8 ft		
Shut off Head:	320.3 ft		
Vapor Press:			

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Model: VIT	Size: 42WMCE	60Hz	RPM Variable

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

2 pumps ALT 1 Variable Speed Buildout

Issued by :
Quotation No. :
Date : 09/09/2014
Rev. : 0

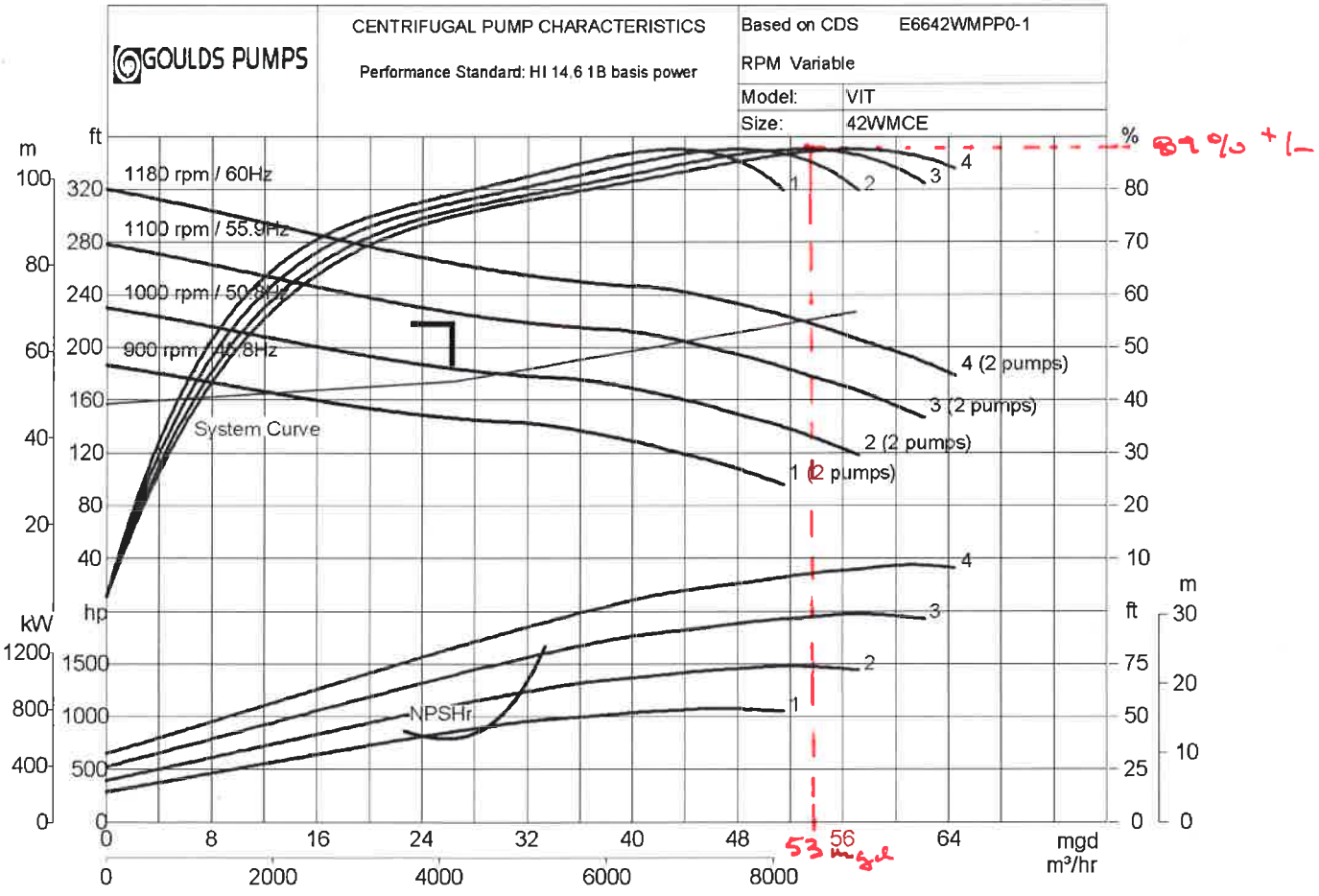
Operating Conditions

Liquid:	Water	Published Efficiency:	0.0 %
Temp.:	70.0 deg F	Rated Pump Efficiency:	86.5 %
S.G./Visc.:	1.000/1.000 cp	Rated Total Power:	1,175.0 hp
Flow:	26.50 mgd	Non-Overloading Power:	1,217.7 hp
TDH:	220.0 ft	Imp. Dia. First 1 Stg(s):	24.92 in
NPSHa:	0.0 ft	NPSHr:	39.8 ft
Solid size:		Shut off Head:	320.3 ft
% Susp. Solids (by wtg):		Vapor Press:	
Max. Solids Size:	0.0000 in		

Pump Performance @ 1180 RPM

Specific Speed 1st stg: 2,566 gpm(US) ft
Specific Speed Adl stg:
Min. Hydraulic Flow:

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Model: VIT	Size: 24EHC	60Hz	RPM Variable	Stages: 4

1 Pump ALT 2 - North
Variable Speed
Initial Flows

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

Issued by :
Quotation No. :

Date : 09/09/2014
Rev. : 0

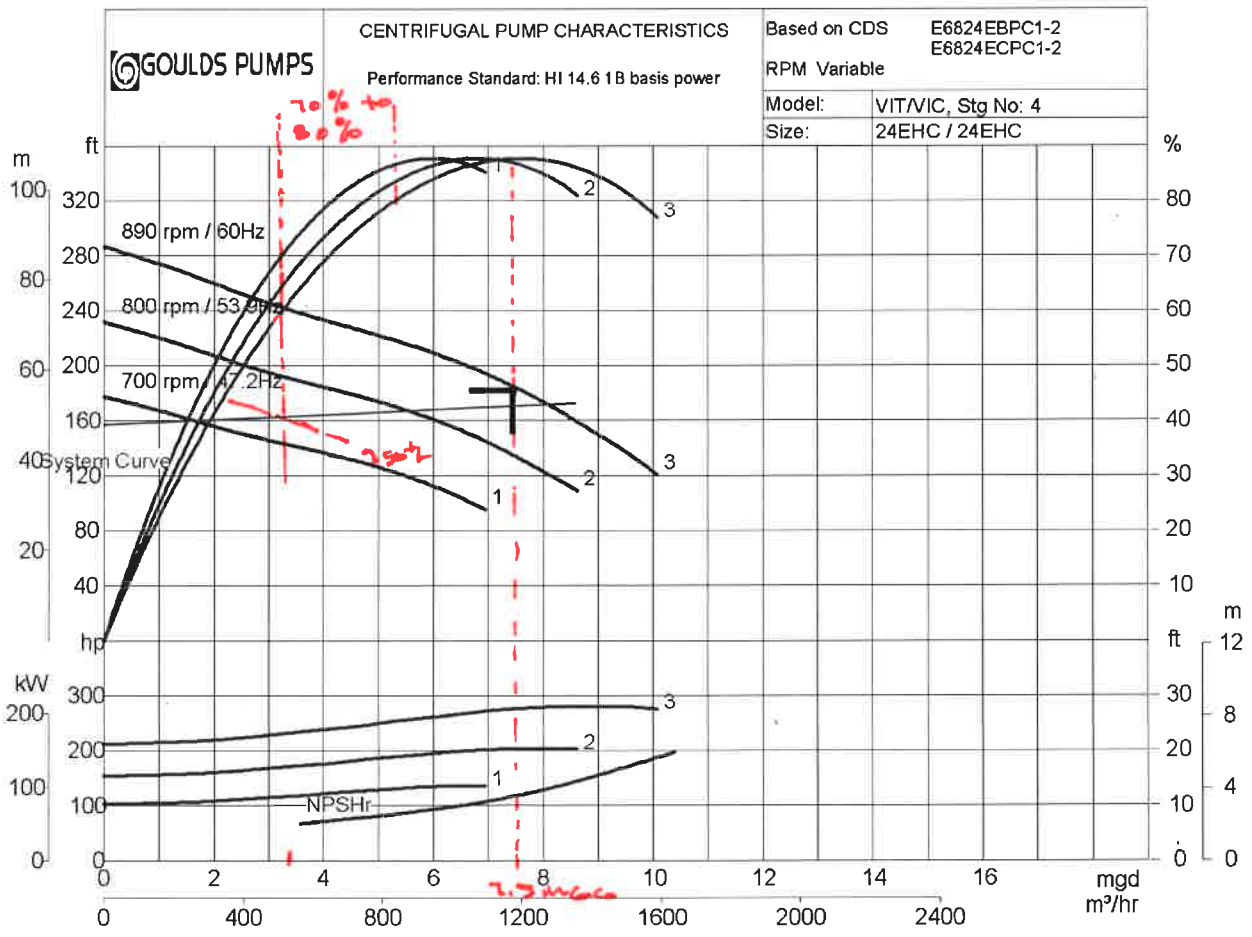
Operating Conditions

Liquid:	Water
Temp.:	70.0 deg F
S.G./Visc.:	1.000/1.000 cp
Flow:	7.50 mgd ✓
TDH:	184.0 ft ✓
NPSHa:	0.0 ft
Solid size:	
% Susp. Solids (by wtg):	
Max. Solids Size:	2.0000 in

Pump Performance @ 890 RPM

Published Efficiency:	87.7 %	Specific Speed 1st stg:	3,297 gpm(US) ft
Rated Pump Efficiency:	87.5 %	Specific Speed Adl stg:	
Rated Total Power:	276.4 hp	Min. Hydraulic Flow:	3.615 mgd
Non-Overloading Power:	279.9 hp		
Imp. Dia. First 1 Stg(s):	15.44 in	Imp. Dia. Adl Stg(s):	14.74 in
NPSHr:	11.8 ft		
Shut off Head:	286.6 ft		
Vapor Press:			

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Model: VIT	Size: 24EHC	60Hz	RPM Variable

2 pumps Alt 2 - North Variable Speed

Initial Flows

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

Issued by :
Quotation No. :
Date : 09/09/2014
Rev. : 0

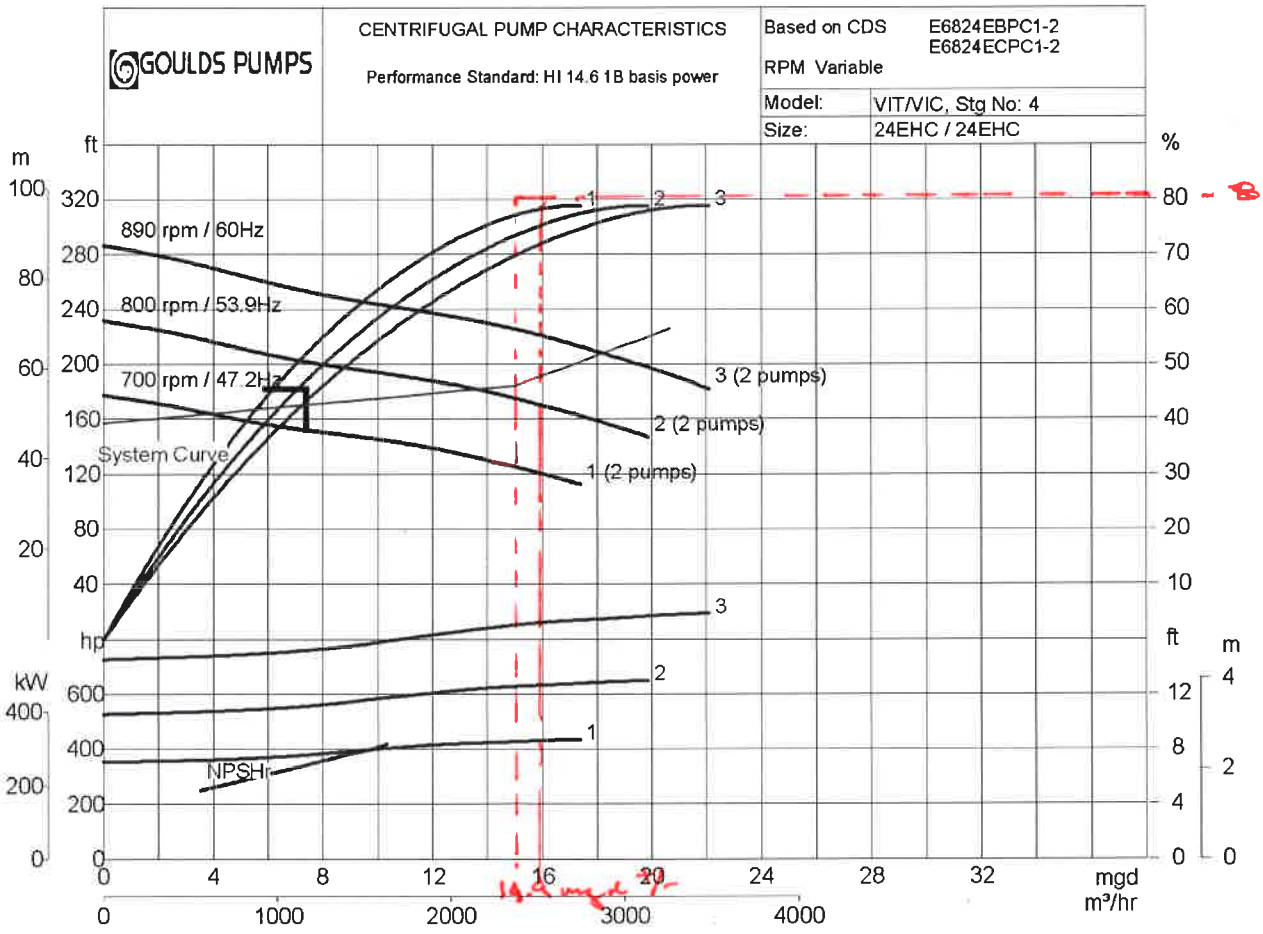
Operating Conditions

Liquid:	Water
Temp.:	70.0 deg F
S.G./Visc.:	1.000/1.000 cp
Flow:	7.50 mgd
TDH:	184.0 ft
NPSHa:	0.0 ft
Solid size:	
% Susp. Solids (by wtg):	
Max. Solids Size:	2.0000 in

Pump Performance @ 890 RPM

Published Efficiency:	87.7 %	Specific Speed 1st stg:	3,297 gpm(US) ft
Rated Pump Efficiency:	87.5 %	Specific Speed Adl stg:	
Rated Total Power:	276.4 hp	Min. Hydraulic Flow:	3.615 mgd
Non-Overloading Power:	279.9 hp		
Imp. Dia. First 1 Stg(s):	15.44 in	Imp. Dia. Adl Stg(s):	14.74 in
NPSHr:	11.8 ft		
Shut off Head:	286.6 ft		
Vapor Press:			

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



~80% +/-

14.2 mgd +/-

Model: VIT	Size: 24GHXC / 24GLC	60Hz	RPM Variable	Stages: 4

1 pump VLT 2 - North variable Speed Buildout

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

Issued by :
Quotation No. :

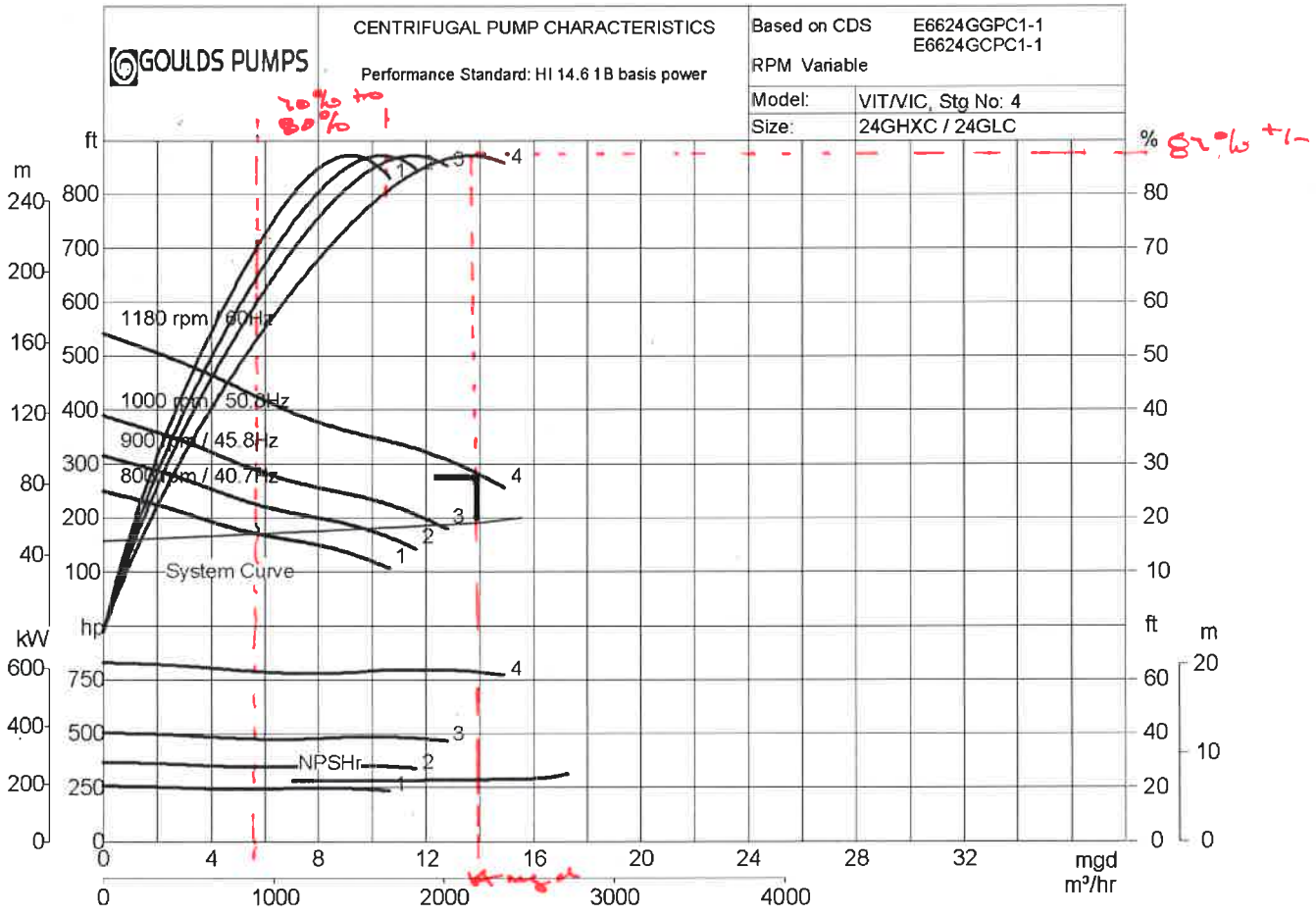
Date : 09/09/2014
Rev. : 0

Operating Conditions

Liquid:	Water	Published Efficiency:	87.5 %	Specific Speed 1st stg:	4,175 gpm(US) ft
Temp.:	70.0 deg F	Rated Pump Efficiency:	87.5 %	Specific Speed Adl stg:	
S.G./Visc.:	1.000/1.000 cp	Rated Total Power:	785.4 hp	Min. Hydraulic Flow:	7.111 mgd
Flow:	14.00 mgd	Non-Overloading Power:	829.4 hp		
TDH:	280.0 ft CDS ✓	Imp. Dia. First 1 Stg(s):	15.78 in	Imp. Dia. Adl Stg(s):	15.10 in
NPSHa:	0.0 ft	NPSHr:	23.0 ft		
Solid size:		Shut off Head:	541.7 ft		
% Susp. Solids (by wtg):		Vapor Press:			
Max. Solids Size:	1.7500 in				

Pump Performance @ 1180 RPM

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Model: VIT	Size: 24GHXC / 24GLC	60Hz	RPM Variable

2 pumps Set 2 - North
variable speed
Buildout

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

Issued by :
Quotation No. :

Date : 09/09/2014
Rev. : 0

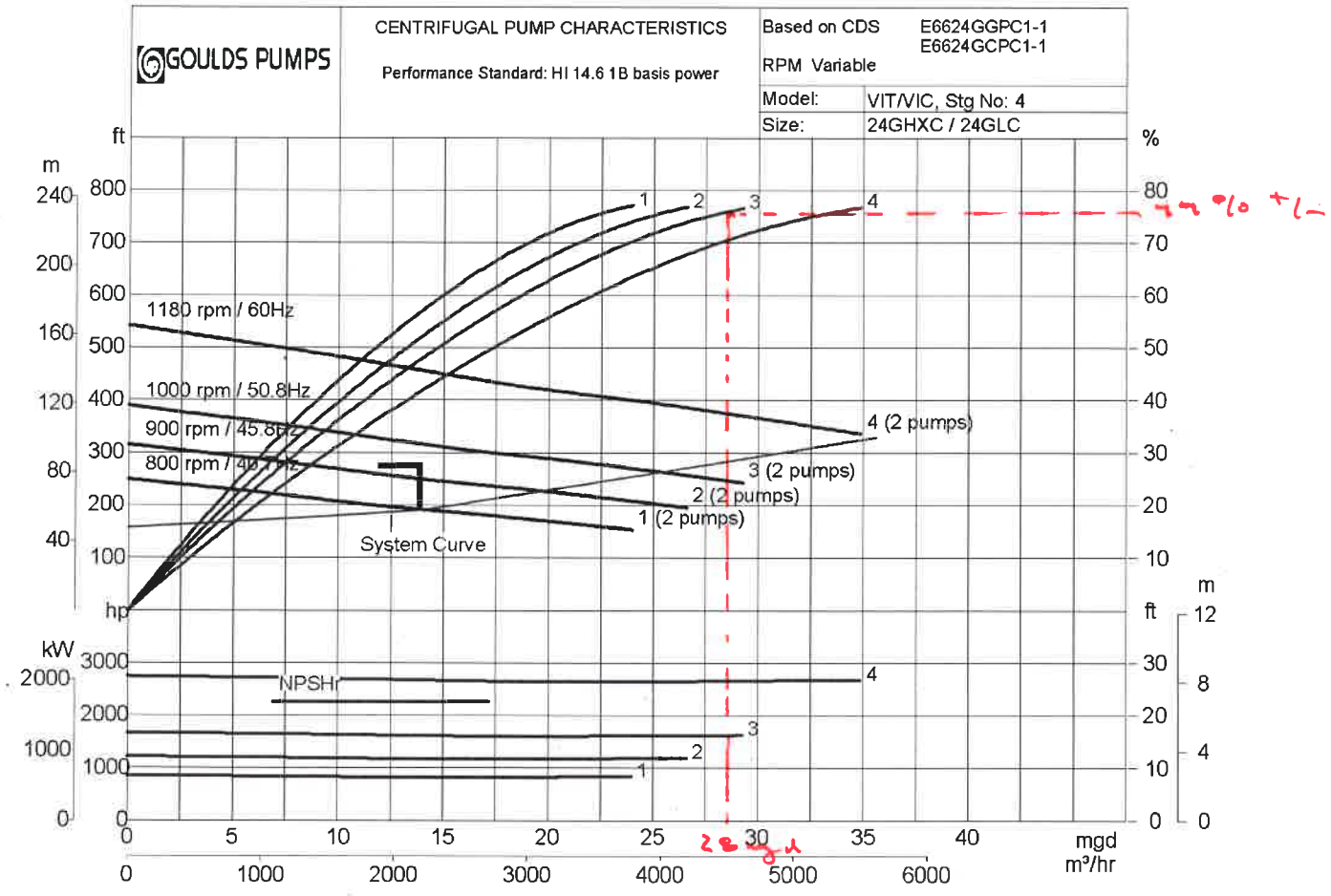
Operating Conditions

Liquid:	Water
Temp.:	70.0 deg F
S.G./Visc.:	1.000/1.000 cp
Flow:	14.00 mgd
TDH:	280.0 ft
NPSHa:	0.0 ft
Solid size:	
% Susp. Solids (by wtg):	
Max. Solids Size:	1.7500 in

Pump Performance @ 1180 RPM

Published Efficiency:	87.5 %	Specific Speed 1st stg:	4,175 gpm(US) ft
Rated Pump Efficiency:	87.5 %	Specific Speed Adl stg:	
Rated Total Power:	785.4 hp	Min. Hydraulic Flow:	7.111 mgd
Non-Overloading Power:	829.4 hp		
Imp. Dia. First 1 Stg(s):	15.78 in	Imp. Dia. Adl Stg(s):	15.10 in
NPSHr:	23.0 ft		
Shut off Head:	541.7 ft		
Vapor Press:			

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Model: VIT	Size: 20GHO	60Hz	RPM Variable	Stages: 7

1 pump ALT 2 - South
variable speed
Initial Flows

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

Issued by :
Quotation No. :

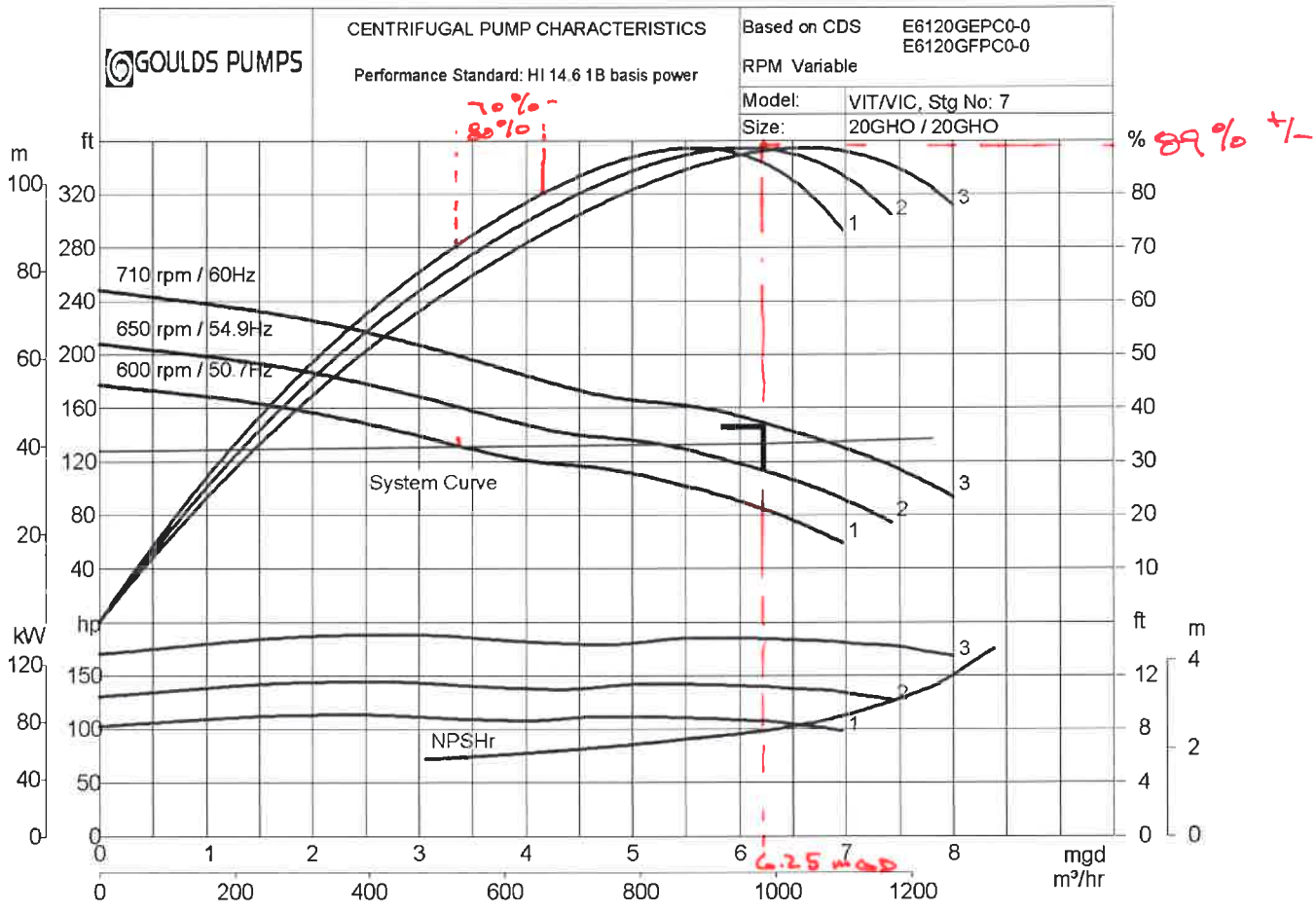
Date : 09/11/2014
Rev. : 0

Operating Conditions

Liquid:	Water	Published Efficiency:	87.2 %	Specific Speed 1st stg:	4,970 gpm(US) ft
Temp.:	70.0 deg F	Rated Pump Efficiency:	88.1 %	Specific Speed Adl stg:	
S.G./Visc.:	1.000/1.000 cp	Rated Total Power:	184.4 hp	Min. Hydraulic Flow:	3.079 mgd
Flow:	6.25 mgd	Non-Overloading Power:	188.5 hp		
TDH:	148.0 ft ✓	Imp. Dia. First 1 Stg(s):	13.75 in	Imp. Dia. Adl Stg(s):	13.06 in
NPSHa:	0.0 ft	NPSHr:	7.9 ft		
Solid size:		Shut off Head:	248.3 ft		
% Susp. Solids (by wtg):		Vapor Press:			
Max. Solids Size:	1.5600 in				

Pump Performance @ 710 RPM

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Model: VIT	Size: 20GHO	60Hz	RPM Variable

2 pumps ALT2 - South
Variable Speed
Initial Flows

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

Issued by :
Quotation No. :

Date : 09/11/2014

Rev. : 0

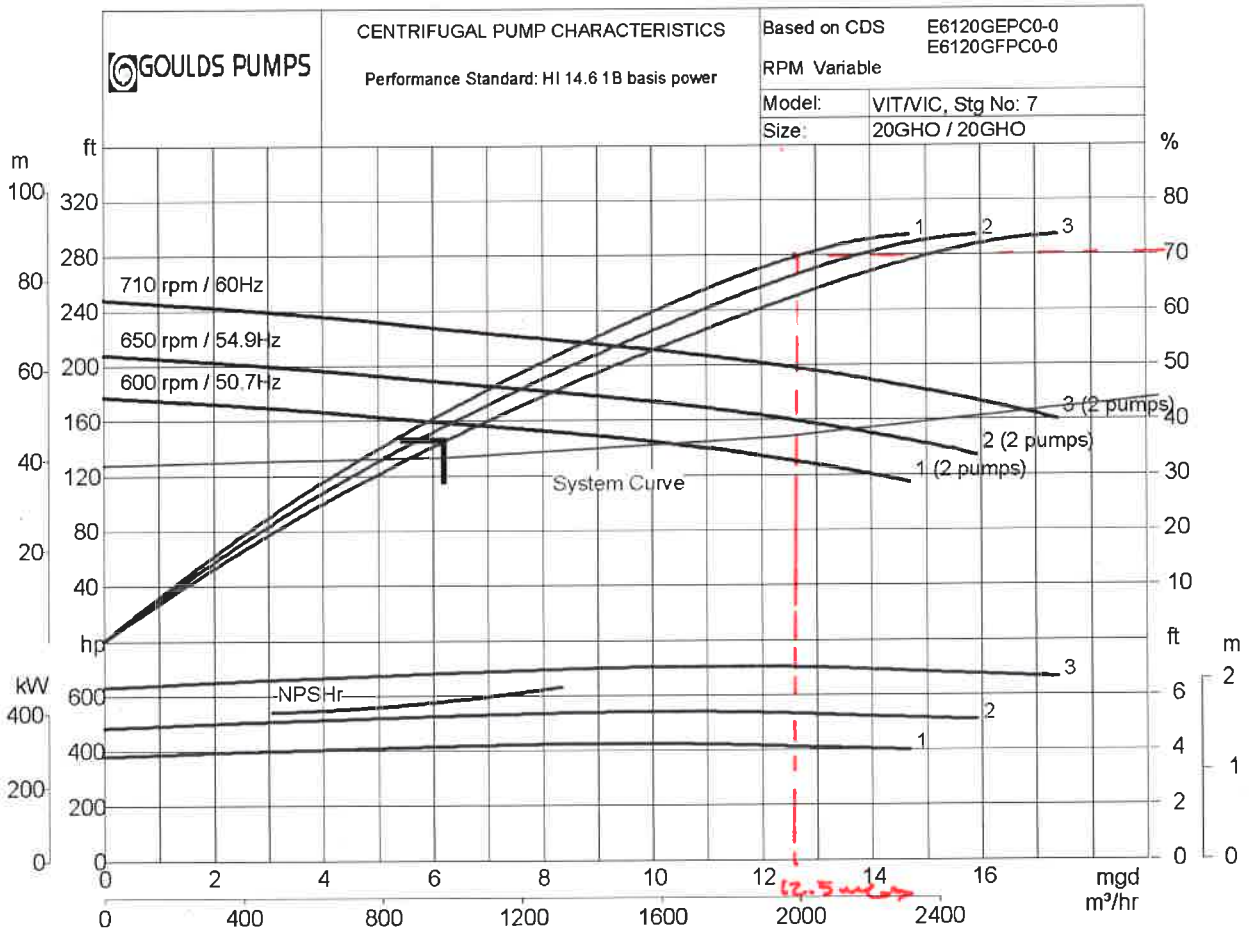
Operating Conditions

Liquid:	Water
Temp.:	70.0 deg F
S.G./Visc.:	1.000/1.000 cp
Flow:	6.25 mgd
TDH:	148.0 ft
NPSHa:	0.0 ft
Solid size:	
% Susp. Solids (by wtg):	
Max. Solids Size:	1.5600 in

Pump Performance @ 710 RPM

Published Efficiency:	87.2 %	Specific Speed 1st stg:	4,970 gpm(US) ft
Rated Pump Efficiency:	88.1 %	Specific Speed Adl stg:	
Rated Total Power:	184.4 hp	Min. Hydraulic Flow:	3.079 mgd
Non-Overloading Power:	188.5 hp		
Imp. Dia. First 1 Stg(s):	13.75 in	Imp. Dia. Adl Stg(s):	13.06 in
NPSHr:	7.9 ft		
Shut off Head:	248.3 ft		
Vapor Press:			

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Model: VIT	Size: 28CHC	60Hz	RPM Variable	Stages: 1

1 Pump ALT2 - South
Variable Speed
Backfitted out

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

Issued by :
Quotation No. :

Date : 09/12/2014
Rev. : 0

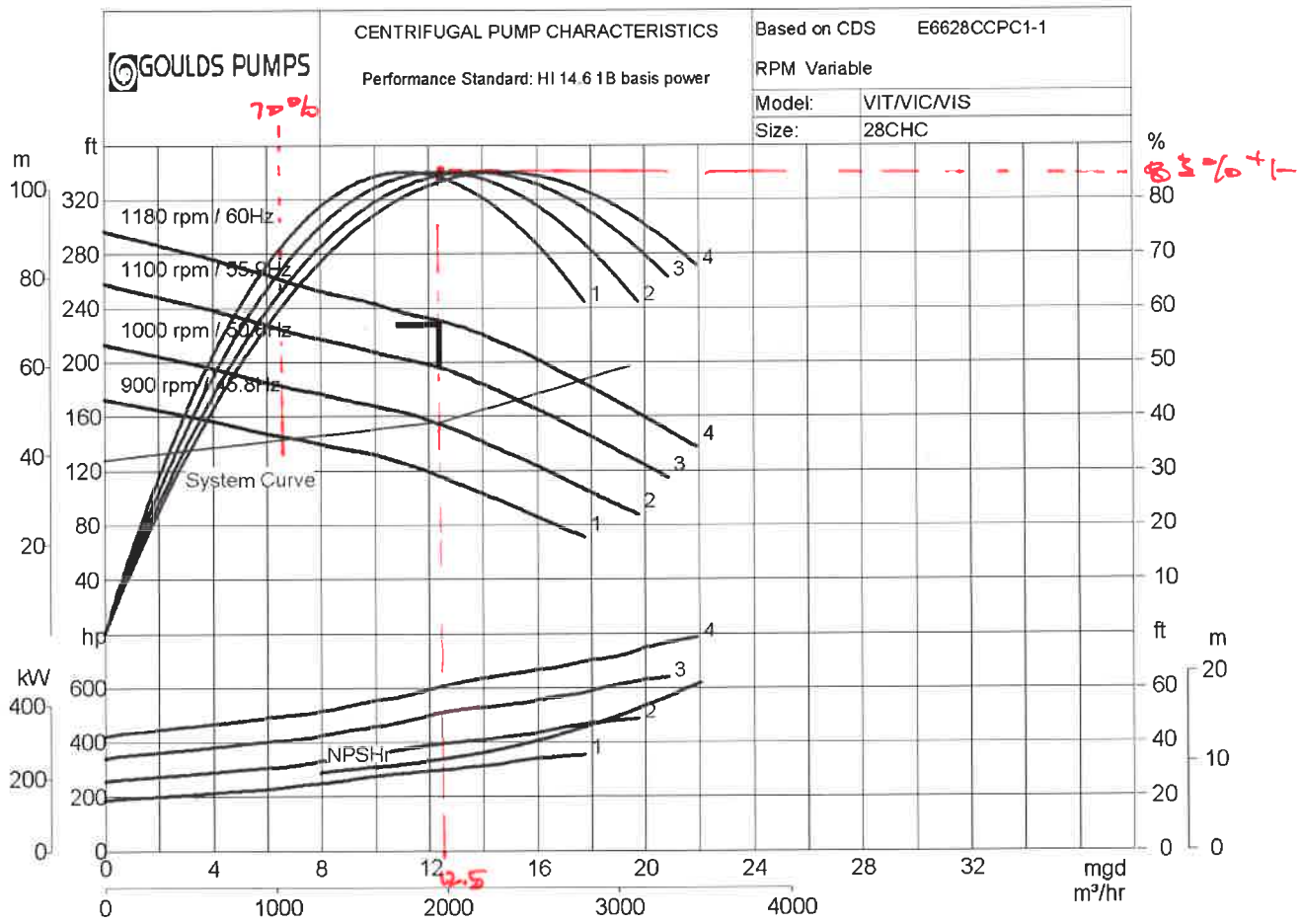
Operating Conditions

Liquid:	Water
Temp.:	70.0 deg F
S.G./Visc.:	1.000/1.000 cp
Flow:	12.50 mgd
TDH:	230.0 ft ✓
NPSHa:	0.0 ft
Solid size:	
% Susp. Solids (by wtg):	
Max. Solids Size:	1.7500 in

Pump Performance @ 1180 RPM

Published Efficiency:	0.0 %	Specific Speed 1st stg:	2,232 gpm(US) ft
Rated Pump Efficiency:	83.0 %	Specific Speed Adl stg:	
Rated Total Power:	607.3 hp	Min. Hydraulic Flow:	4.735 mgd
Non-Overloading Power:	781.1 hp		
Imp. Dia. First 1 Stg(s):	21.86 in		
NPSHr:	34.0 ft		
Shut off Head:	296.8 ft		
Vapor Press:			

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Model: VIT	Size: 28CHC	60Hz	RPM Variable

2 pumps AT 2-south
Bullard

Job/Inq.No. :
Purchaser : UNDEFINED
End User :
Item/Equip.No. : ITEM 001
Service :
Order No. :

Issued by :
Quotation No. :

Date : 09/12/2014
Rev. : 0

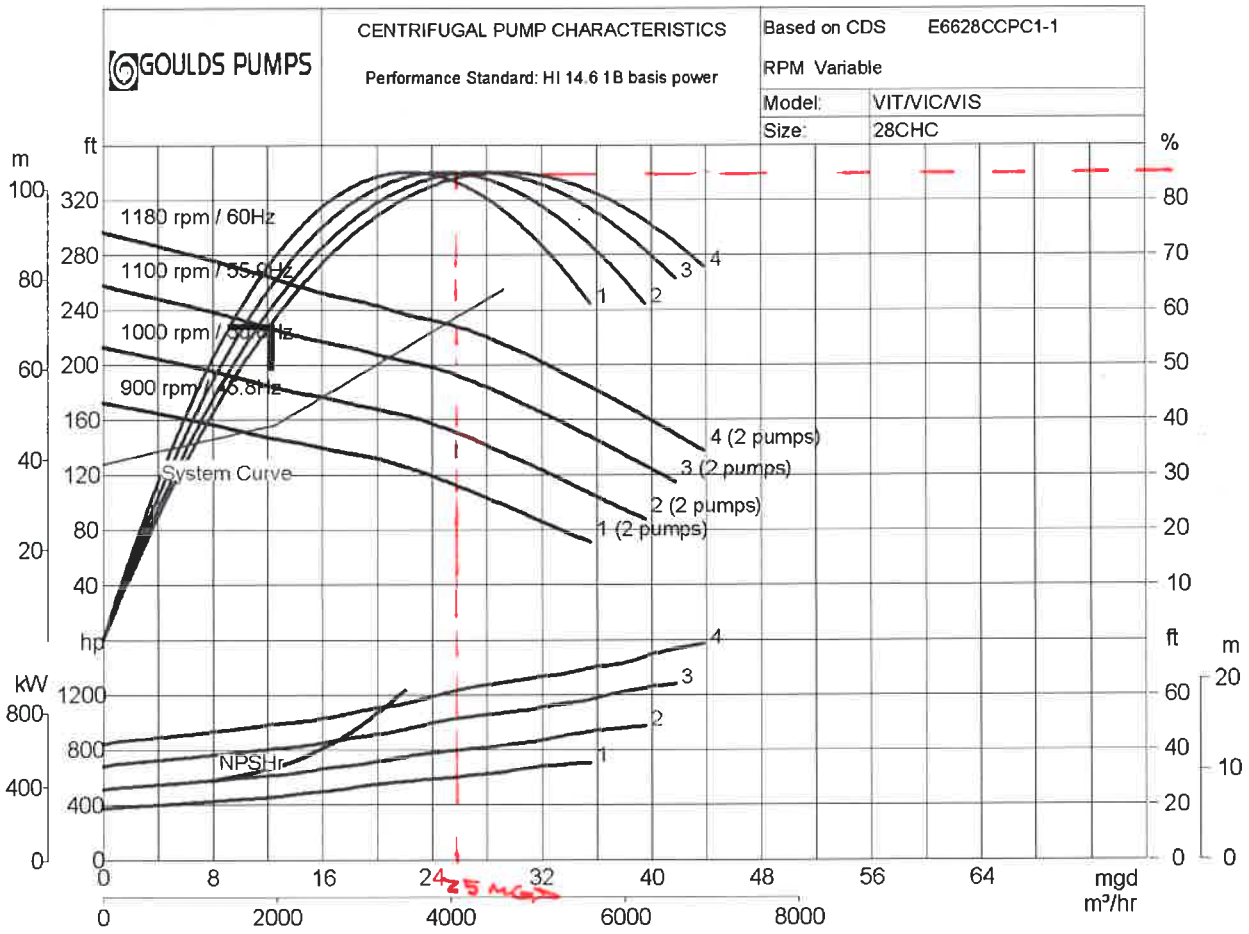
Operating Conditions

Liquid:	Water
Temp.:	70.0 deg F
S.G./Visc.:	1.000/1.000 cp
Flow:	12.50 mgd
TDH:	230.0 ft
NPSHa:	0.0 ft
Solid size:	
% Susp. Solids (by wtg):	
Max. Solids Size:	1.7500 in

Pump Performance @ 1180 RPM

Published Efficiency:	0.0 %	Specific Speed 1st stg:	2,232 gpm(US) ft
Rated Pump Efficiency:	83.0 %	Specific Speed Adl stg:	
Rated Total Power:	607.3 hp	Min. Hydraulic Flow:	4.735 mgd
Non-Overloading Power:	781.1 hp		
Imp. Dia. First 1 Stg(s):	21.86 in		
NPSHr:	34.0 ft		
Shut off Head:	296.8 ft		
Vapor Press:			

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included. 4. Non Overloading power does not reflect v-belt/gear losses.



Appendix D - SLDMWA Connection Meeting Minutes

DRAFT Meeting Notes

North Valley Regional Recycled Water Program

Subject:	NVRRWP Connection to the DMC
Prepared By:	Carrie Del Boccio, RMC
Date/Time:	June 26, 2014 / 10am
Location:	SLDMWA office, Byron, CA
Project Number:	0453-003

Attendees:
Frances Mizuno, SLDMWA
Don Wintch, SLDMWA
Bob Martin, USBR
Anthea Hansen, DPWD
Carrie Del Boccio, RMC
Ryan Doyle, RMC

Meeting Objectives:

- Understanding permanent constraints for the North Valley project's connection to the DMC
- Understanding the construction constraints for the North Valley's project connection to the DMC
- Understanding of connection options

Notes:

- License requirements for DMC access/use
    a. As part of the licensing agreement for using a facility to put water into the DMC, SLDMWA has a standard review process for the design in which the Authority coordinates with Reclamation.
    b. Once the contractor finishes construction on the outfall facility, they will turn the facility over to Reclamation / SLDMWA who then leases the facility back to the JPA (or whoever owns the project facilities) using the licensing agreement.
    c. 6 to 9 months required for license review, and can submit as soon as ROD is in place. Then project team can schedule meeting with Sheryl Carter (Chief of Lands Division) and Laura to initiate the license review.
    d. The license application will be submitted concurrently with the design effort.
- Construction Review Process
    a. The design team will work with SLDMWA throughout the design phase: The conceptual / pre design structure concept will be sent to Bob (SLDMWA) who will review and send to Don (Reclamation) for review. The 65-80% Design will be sent just to Bob (SLDMWA) for review and comments, and then the 90% design will be sent to both Bob and Don again for final review.
    b. Any work with Reclamation will need to be included in an LOA – possibly within the LOA already set up with DPWD.
- Construction Limitations
    a. Canal is fullest from fall through February and construction will need to accommodate full flows during this time period.
    b. On a typical year, the Tracy Pumps wind down for approximately 30 days in April and May; this would present the best timeframe and most operational flexibility with SLDMWA in regards to manipulating each check within the DMC.

c. Water for construction may be sourced with DMC / CVP water and taken out of DPWD allocations.

d. A hydraulic report showing there will be no backwater effects in the DMC due to the construction cofferdam will be required before construction.

e. SLDMWA would prefer that all construction on the connection be done at once; phasing construction for current and future flows is not preferable.

- Design Considerations

a. SLDMWA will require a flow meter for project water introduced into the DMC. The flow meter will need to be accessible by SLDMWA for monthly readings. Flow meter should be of a style that is accurate +/- 2%. SLDMWA is currently converting all meters to include telemetry and would prefer if the North Valley design includes the feature for remote reading.

b. Water quality monitoring of some constituents for SLDMWA will also be required. The extent of constituents has not yet been determined but an automatic sampler would be allowed if applicable.

c. Chris Eacock (Reclamation, Fresno Office) is the main contact for all water quality inquiries. Any telemetry discussion will go through SLDMWA.

d. SLDMWA will require an isolation valve at or near the parcel boundary.

e. There is a turnout downstream of the siphon structure. Bob stated that the NVRRWP outfall structure should be located downstream of the turnout.

f. Security fencing and other safety and security facilities are allowed and recommended. Designers should be aware that the public have shot at equipment located along the DMC.

Action Items:

- SLDMWA/USBR

a. Gather additional examples of acceptable connection facilities, if available.

Appendix E - Power Evaluation

MILLER
PEZZONI
& ASSOCIATES, INC.
CONSULTING
ELECTRICAL ENGINEERS

~~N~~VRRWP PROJECT
PUMP STATION POWER SUPPLY EVALUATION
CITY OF MODESTO AND TURLOCK, CALIFORNIA

JULY 31, 2014

PREPARED FOR:

CAROLLO ENGINEERS, INC.
2700 YGNACIO VALLEY ROAD
WALNUT CREEK, CALIFORNIA 94598
MR. SCOTT WEDDLE, P.E. ASSOCIATE V.P.

PREPARED BY:

MILLER-PEZZONI & ASSOCIATES, INC.
CONSULTING ELECTRICAL ENGINEERS
MODESTO - SAN FRANCISCO
& SANTA BARBARA, CA.

TABLE OF CONTENTS

1. SCOPE AND OBJECTIVES:

The purpose of this Preliminary Design Report is to identify and confirm the overall Electrical scope and objectives, including development of various alternatives.,The overall project scope is as defined in the information provided by Carollo Engineers for each of the various pumping and monitoring sites identified.

Miller-Pezzoni & Associates, Inc. has carefully reviewed the project information and has reviewed each of the various remote equipment and pumping sites. This site information along with our extensive experience with these facilities has served as a basis for the development of the design approach and Alternates presented herein.

The Scope of the project is to design and construct a reliable water pumping system to convey effluent from the Wastewater Treatment Facilities owned and operated by the City of Modesto and the City of Turlock, California respectively. The proposed water system will transport the effluent from the city Treatment Facilities across a portion of the Central Valley spanning several miles, and to deliver the effluent flows into the Delta Mendota Canal (DMC) system running along the East side of the Central Valley of California.

The Project will be put forth in two-increments, or Phases, in which an initial system will be placed into service, and then a second phase will increase the flows and the corresponding pumping plant capacities. The new pumping Facilities will be located at each Treatment Plant "outfall" consisting of duplex duty pumps and related controls and instrumentation.

These locations will require substantial power systems with reliable back-up power capabilities. Instrumentation Systems including level controls, SCADA Systems and miscellaneous sampling systems will be provided at each of two connection points into the Delta Mendota Canal system. Each of these locations will require a reliable power source to serve the control and monitoring systems operations as well as to power systems to initiate alarms as may be necessary.

2. PROJECT TEAM:

Our Project Team selected for this critical project consists of our most senior and experienced electrical Engineers and support staff. Mr. Miller has over 33 years of design experience with wastewater and related system including many years as the Electrical Engineer for the City of Modesto. Mr. Pezzoni, THE Project Manager, has completed numerous successful projects for the City of /Modesto and the City of Turlock over many years.
Project Team:

Project Manager: Kevin Pezzoni, P.E. Sr. V.P.

Electrical Engineer: Gregg E. Miller President

3. ELECTRICAL NARRATIVE:

The Electrical requirements for each of the Pumping and Monitoring sites is as outlined as follows:

A. PUMPING PLANT - MODESTO TREATMENT FACILITY:

The projected loads for the pumping site at the Modesto Wastewater Site re as follows:

Phase 1:

Option A: 2 Each duty 300 HP Pumps	**Stand-alone Modesto System**
Option B: 2 Each duty 500 HP Pumps	**Combined Modesto & Turlock**

Option A Demand:	**0.600 MW**
Option B Demand:	**0.930 MW**

Phase 2:

Option A: 2 Each duty 700 HP Pumps	**Stand-alone Modesto System**
Option B: 2 Each duty 1000 HP Pumps	**Combined Modesto & Turlock**

Option A Demand: **1.285 MW**
Option B Demand: **1.825 MW**

The existing power systems serving the present outfall structures consist of an overhead TID Primary distribution served at 12.47 KV. This facility consists of an existing 480/277 volt secondary metered service and distribution at 480/277 volts serving the outfall pumping system.

The capacity of this secondary system will not support the planned loads and will require an upgrade. Moreover, the large pumps, particularly including the 500 HP and 1000 HP motors, will necessitate primary distribution so as ot alleviate/mitigate the high secondary voltage inrush characteristics for starting these large motor as mandated by the Serving Utility Company as well as sound engineering practices.

The existing overhead primary system serving this area appears to have adequate capacity to serve the planed loads, including the much larger Phase 2 loads.

We are proposing a new 12.47KV Primary voltage service be installed a this location. The service voltage may then be transformed down to the motor utilization voltage of either 4160 Y or 2400 Delta. We recommend the 2400 volt system, as medium voltage motors are readily available at 2400 volts but are usually special order, long-lead items at 4160 volts, with a corresponding higher price. Should a replacement 4160 volt motor be needed there likely will be a long wait.
The service primary configuration may be accomplished in one of two ways as described below:

Service Alternate 1: Pole-mounted Re-closer System:

This option represents a very cost-effective means of providing metered primary power. A low-cost re-closer assembly is installed on a Class 1 drop pole adjacent to a Class 1 Metering pole containing the Utility Company metering devices. The Re-closer acts as the system main breaker.

The advantage of the Re-closer system is the lower cost. The disadvantages include much poorer reliability, as the re-closer contacts will degrade after only a few trips, plus the difficulty in servicing or repairing, as an aerial bucket will be needed to access the device.

Service Alt. 2: Metal-clad Switchgear Mounted Metering and Main:

This option includes a primary voltage switchgear line-up containing the Utility metering devices as well as a Vacuum Type Man Breaker. This equipment may be housed within a control building electrical room or outdoors with NEMA 3R equipment.

The reliability and overall performance of the vacuum main breaker far exceeds that for the Pole Mounted Re-closer. Additionally, the equipment is much more easily and safely serviced, as all equipment is ground-mounted and in easy access and does not require an aerial bucket or pole climbing. The disadvantage is the higher cost, as outlined in our cost projections.

The primary voltage main device, either the pole mounted re-closer or Switchgear mounted Vacuum Breaker will serve a pad mounted transformer, 3,750 KVA 12.47 KV to 2400 Volt Delta. This transformer will then serve a medium voltage switchgear line-up comprised of the two medium voltage VFD's as well as a dry-type 2400/120/240 volt secondary system to serve lighting, general power and metering equipment. The Variable Speed Drives will accommodate the variable flow rates from the City wastewater facilities.

The 2400 Volt transformer secondary feeder will connect to the switchgear through a medium voltage automatic transfer switch in which to provide back-up power for the entire pumping system.

Motor starters will be electronic VFD drives with the optional integral cooling packages.

The Emergency Power system will be comprised of one of more, 2400 volt delta engine-generators. Depending upon the reliability requirements of the system, either one of both of the pumps may be operated on stand-by power, and one or perhaps two synchronized gensets will be provided.

B. PUMPING PLANT - TURLOCK TREATMENT FACILITY:

The projected demand loads for the Turlock Wastewater Site are as follows**:**

Phase 1:
2 Each duty 250 HP Pumps

Approximate Demand: 481.0 KVA

Phase 2:
2 Each duty 500 HP Pumps

Approximate Demand: 940.12 KVA

The existing power systems service th existing equipment at this location do not appear adequate to accommodate these demand loads, particularly the Phase 2 loads. We are therefor recommending that a new TID service be established at this location for the purpose of serving these new loads.
A secondary service voltage of 480/277 volts would be adequate to serve the Phase one loads with a maximum HP of 250 HP motors, however, the Phase 2 loads should be operated at medium voltage to reduce starting inrush and to comply with the serving utility requirements regarding motor inrush. We are therefor recommending that a primary service be established from TID at 12.47 KV. The service options for this service are the same as for the Modesto Facility, as outlined above.

Alt. 1: **Pole Mounted re-closer.**

Alt. 2.: **Metal-Clad Switchgear with Vacuum Type Main Breaker**

As with the Modesto Facility, we recommend alternate 2, the Metal-Clad Switchgear based upon reliability and safety

The Primary Service will ten serve a pad mounted transformer, 12/47KV/2400 V Delta, 1500 KVA. This 2400 volt system will then serve the motor loads through VFD's to accommodate the variable flow from the wastewater facility. The VFD's will be installed within the medium -voltage switchgear line-up with the optional cooling option. A dry-type transformer within the line-up will provide 120/240 volt power for such items as genral power, site security lighting, controls and SCADA system and related devices.

C. MONITORING SITE - MODESTO CONNECTION AT DMC

The power and controls systems serving the remote connection sites at the Delta Mendota Canal will power all SCADA and related controls and monitoring devices. The SCADA System will relay, via radio or ground-based communication, all control, signal and alarm functions. The system will measure such parameters as flows, malfunction alarms, security alarms and related control and alarm functions.

The total load for such system will be relatively light in comparison to the Pumping Plants, and may be served by secondary voltage services.

We are proposing 200 amp 120/240 volt single phase systems for this site. The panels will be constructed of vandal resistant pedestal type enclosures with a separate vandal resistant enclosure to house the SCADA and related controls. Back-up power will be provided by UPS Units with a minimum of 8 hours of battery life..

D. MONITORING SITE - TURLOCK CONNECTION AT DMC:

The power and controls systems serving the remote connection sites at the Delta Mendota Canal will power all SCADA and related controls and monitoring devices. The SCADA System will relay, via radio of ground-based communications, all control, signal and alarm functions. The system will measure such parameters as flow, malfunctions alarms, security alarms and related control and alarm functions.

The total load for such systems will be relatively light in comparison to the Pumping Plants, and may be served by secondary voltage services.
The service configuration will be as described above for the Modesto connection to the DMC.

4. ELECTRICAL CONSTRUCTION COST PROJECTIONS:

The following consists of our pre-design cost projections for each Pumping Site as well as the two connection sites to the DMC. Additionally, the projected costs for each of the design alternates for the pumping sites is listed separately.

These costs are approximate and may vary due to market conditions prevailing at the time of bidding and other factors. We will provide a comprehensive cost projection at the completion of the Construction Design Phase of the project.

A. Modesto Pumping Plant:

Option A - Stand-alone Modesto System:

Primary Service and Metering:	$	190,000.00
3750 Pad Mounted transformer, in place:	$	115,000.00
Medium Voltage Line-up, Complete	$	325,000.00
Motor Connections, LS:	$	48,000.00
Security Lighting	$	5,000.00
Controls and SCADA connections	$	27,000.00
Grounding and Bonding LS:	$	4,200.00
Raceways and Feeders, LS:	$	120,000.00
Service Fees, TID: est.	$	50,000.00
Medium Voltage ATS	$	80,000.00
Emergency Power System, 3.5 MW:	$	985,000.00
Total Electrical Option A	**$**	**1,949,200.00**

For Alternate Re-closer Main in lieu of Metal-Clad Switchgear deduct $ 115,000.00

$1,834,200.00

Option B: Combined Modesto & Turlock Facilities

Primary Service Section and Metering:	$	190,000.00
3750 Pad Mounted Transformer, in place	$	115,000.00
Medium Voltage Line-up, Complete:	$	425,000.00
Motor Connections, LS:	$	48,000.00
Security Lighting	$	5,000.00
Controls and SCADA connections:	$	27,000.00
Grounding and Bonding, LS:	$	4,200.00
Raceways and Feeders, LS:	$	120,000.00
Service Fees, TID: est.	$	50,000.00
Medium Voltage ATS:	$	80,000.00
Emergency Power System	$	985,000.00
Total Electrical Alternate 2	**$**	**2,049,200.00**

For Alternate Re-closer Main in lieu of Metal-Clad Main Switchgear deduct $ 115,000.00

$1,934,200.00

B. Modesto Connection at DMC:

TID Secondary Service Fees, est.:	$	10,000.00
Service Panel, secondary 200 A.	$	45,000.00
SCADA Connection(Equip NIC):	$	15,000.00
Controls and Alarm Connections, LS:	$	20,000.00
Site/Security lighting/General Power:	$	15,000.00
Total Electrical Modesto DMC:	**$**	**105,000.00**

C. Turlock Pumping Plant:

Alternate 1 - Re-closer Service Configuration:

Pole Mounted Re-closer, in place:	$	48,000.00
Primary Metering pole & metering:	$	28,000.00
1500 KVA Pad Mounted Xfmer:	$	80,000.00
Medium Voltage Line-up, complete:	$	285,000.00
Motor Connections, LS:	$	30,000.00
Security Lighting, LS:	$	5,000.00
Controls and SCADA Connections, LS:	$	27,000.00
Grounding and Bonding:	$	4,000.00
Raceways and Feeders, LS:	$	80,000.00
Service Fees, TID, est.:	$	50,000.00
Medium Voltage ATS:	$	60,000.00
Emergency Power System, L.S.:	$	430,000.00
Total Electrical Alternate 1:	**$**	**1,127,000.00**

Alternative 2 - Metal Clad Service Configuration:

Primary Service Section and Metering:	$	170,000.00
1500 KVA Pad Mounted Xfmer:	$	80,000.00
Medium Voltage Line-up, Complete:	$	285,000.00
Motor Connections, LS:	$	30,000.00
Security Lighting, L.S.:	$	5,000.00
Controls and SCADA Connections, L.S.:	$	27,000.00
Grounding and Bonding, L.S.:	$	4,000.00
Raceways and Feeders, L.S.:	$	80,000.00
Service Fees, TID, est.:	$	50,000.00
Medium Voltage ATS, L.S.:	$	60,000.00
Emergency Power System, L.S.:	$	430,000.00
Total Electrical Alternate 2:	**$**	**1,221,000.00**

D. Turlock Connection at DMC:

TID Secondary Service Fees, est.:	$	10,000.00
Service Panel, secondary 200A.:	$	45,000.00
SCADA Connection(Equip. NIC):	$	15,000.00
Controls and Alarm Connections, L.S.:	$	20,000.00
Site/Security Lighting/Gemeral Power:	$	15,000.00
Total Electrical Turlock DMC:	**$**	**105,000.00**

Appendix F - Cost Estimate Detail

Engineers...Working Wonders With Water®

PROJECT SUMMARY

Project:	**Alt #1 - NVRRWP Combined Alignment**	**Estimate Class:**	**5**
Client:	**Del Puerto Water District**	**PIC:**	**MJB**
Location:	**Patterson/Modesto/Ceres/Turlock**	**PM:**	**SW**
Zip Code:	**95363**	**Date:**	**04.20.2015**
Carollo Job #	**9543A.10**	**By:**	**DGB**
		Reviewed:	**SW**

NO.	DESCRIPTION		TOTAL
01	Pipeline East of SJ River		$14,320,715
02	Pipeline West of SJ River		$18,414,760
03	Pump Station at Modesto WWTP		$3,049,200
04	Harding Drain PS		$1,000,000
5	San Joaquin River Crossing		$8,239,400
6	Mobilization and Demobilization		$2,000,000
	TOTAL DIRECT COST		**$47,024,075**
	Contingency	30.0%	$14,107,223
	Subtotal		**$61,131,298**
	General Contractor Overhead, Profit & Risk	12.0%	$7,335,756
	Subtotal		**$68,467,054**
	Escalation to Mid-Point (assumes completion date of 12/2017)	5.0%	$5,135,029
	Subtotal		**$73,602,083**
	Sales Tax (7.625% on half the direct cost)	7.6%	$2,806,079
	Subtotal		**$76,408,162**
	Bid Market Allowance	0.0%	$0
	TOTAL ESTIMATED CONSTRUCTION COST		**$76,408,162**
	Engineering, Legal & Administration Fees	15.0%	$11,461,224
	Owner's Reserve for Change Orders	5.0%	$3,820,408
	TOTAL ESTIMATED PROJECT COST		**$91,689,795**

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Carollo Engineers have no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. Carollo Engineers cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented as shown.

carollo
Engineers...Working Wonders With Water®

DETAILED COST ESTIMATE

Project: Alt #1 - NVRRWP Combined Alignment
Client: Del Puerto Water District
Location: Patterson/Modesto/Ceres/Turlock
Element: 01 Pipeline East of SJ River

Date : 04.20.2015
By : DGB
Reviewed: SW

SPEC. NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
	Division 01 - General Conditions					
01000	Traffic Control Allowance	1	LS	$100,000.00	$100,000	
01000	Permanent Easement Aquisition	187500	SF	$.17	$31,875	
	Total					**$131,875**
	Division 02 - Site Construction					
02260	Solid Shoring, 16' D, Wood Planks, Stringers & X-Bracing	10000	LF	$85.36	$853,600	
02300	Cat 235 Trackhoe 2.75Cy Bucket, Class B (Medium Digging), 0-20' D	104852	CY	$2.19	$229,370	
02300	Imported Pipe Bed & Zone/Confined Structure Backfill, Class A Material	32200	CY	$66.82	$2,151,745	
02300	Native Trench Backfill/Unconfined Struct. Bf, Class A Material	59111	CY	$14.43	$852,740	
02501	Pipe Trench Cutoff Wall	55	EA	$2,000.00	$110,000	
02503	Dewatering Allowance	1	LS	$500,000.00	$500,000	
02742	4" Ac Paving On 12" Abc	190000	SF	$4.56	$867,238	
	Total					**$5,564,694**
	Division 15 - Mechanical					
15001	Cathodic Protection Monitoring	39000	LF	$7.00	$273,000	
15251	42" 1/4" Wall Bell/Spigot CS Pipe in Open Trench	19500	LF	$135.00	$2,632,500	
15252	42" 1/4" Wall Wld Cs Pipe In Open Trench	19500	LF	$254.80	$4,968,646	
15500	Blow Off Assembly	10	EA	$15,000.00	$150,000	
15501	Air Release Valve	10	EA	$15,000.00	$150,000	
15502	Man Inspection Tee	10	EA	$20,000.00	$200,000	
15503	Allowance for pipe bends	1	LS	$250,000.00	$250,000	
	Total					**$8,624,146**
	Grand Total					**$14,320,715**

carollo
Engineers...Working Wonders With Water®

DETAILED COST ESTIMATE

Project: Alt #1 - NVRRWP Combined Alignment
Client: Del Puerto Water District
Location: Patterson/Modesto/Ceres/Turlock
Element: 02 Pipeline West of SJ River

Date : 04.20.2015
By : DGB
Reviewed: SW

SPEC. NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
	Division 01 - General Conditions					
01000	Traffic Control Allowance	1	LS	$75,000.00	$75,000	
01000	Permanent Easement Aquisition	62500	SF	$.17	$10,625	
	Total					**$85,625**
	Division 02 - Site Construction					
02000	Allowance for facilities at DMC Discharge	1	LS	$500,000.00	$500,000	
02000	Jack/bore at Hwy 33 and RR	1.00	LS	$767,175.00	$767,175	
02300	Cat 235 Trackhoe 2.75Cy Bucket, Class B (Medium Digging), 0-20' D	97,417	CY	$2.19	$213,105	
02300	Imported Pipe Bed & Zone/Confined Structure Backfill, Class A Material	38,028	CY	$66.82	$2,541,226	
02300	Native Trench Backfill/Unconfined Struct. Bf, Class A Material	40,833	CY	$14.43	$589,064	
02501	Pipe trench cutoff wall	55	EA	$2,000.00	$110,000	
	Total					**$4,720,570**
	Division 15 - Mechanical					
15000	Blow Off Assembly	30	EA	$15,000.00	$450,000	
15001	Cathodic Protection Monitoring	31500	LF	$7.00	$220,500	
15251	54" C200 3/8" Wall bell/spigot in open trench	15750	LF	$250.00	$3,937,500	
15252	54" C200 3/8" Wall Wld Cs Pipe In Open Trench	15750	LF	$514.00	$8,095,565	
15500	Blow Off Assembly	10	EA	$15,000.00	$150,000	
15501	Air Release Valve	10	EA	$15,000.00	$150,000	
15502	Man Inspection Tee	10	EA	$25,000.00	$250,000	
15503	Allowance for Pipe Bends	1	LS	$250,000.00	$250,000	
	Total					**$13,503,565**
	Division 16 - Electrical					
16000	Electrical at DMC Discharge	1	LS	$105,000.00	$105,000	
	Total					**$105,000**
	Grand Total					**$18,414,760**

carollo
Engineers...Working Wonders With Water®

DETAILED COST ESTIMATE

Project: Alt #1 - NVRRWP Combined Alignment
Client: Del Puerto Water District
Location: Patterson/Modesto/Ceres/Turlock
Element: 03 Pump Station at Modesto WWTP

Date : 04.20.2015
By : DGB
Reviewed: SW

SPEC. NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
	Division 02 - Site Construction					
02000	Allowance for pipe connections	1	LS	$250,000.00	$250,000	
	Total					**$250,000**
	Division 11 - Equipment					
11312	500 hp Vertical Turbine Pump and Motor	3	EA	$250,000.00	$750,000	
	Total					**$750,000**
	Division 16 - Electrical					
16001	Primary Service Section and Metering	1	EA	$190,000.00	$190,000	
16002	Transformer	1	EA	$115,000.00	$115,000	
16003	Medium Voltage Lineup	1	EA	$425,000.00	$425,000	
16004	Motor Connections	1	LS	$48,000.00	$48,000	
16005	Security Lighting	1	LS	$5,000.00	$5,000	
16006	Controls and Scada Connections	1	LS	$27,000.00	$27,000	
16007	Grounding and Bonding	1	LS	$4,200.00	$4,200	
16008	Raceways and Feeders	1	LS	$120,000.00	$120,000	
16009	TID Service Fees	1	LS	$50,000.00	$50,000	
16010	Medium Voltage ATS	1	LS	$80,000.00	$80,000	
16011	Emergency Power System	1	LS	$985,000.00	$985,000	
	Total					**$2,049,200**
	Grand Total					**$3,049,200**

Engineers...Working Wonders With Water®

DETAILED COST ESTIMATE

Project: Alt #1 - NVRRWP Combined Alignment
Client: Del Puerto Water District
Location: Patterson/Modesto/Ceres/Turlock
Element: 04 Harding Drain PS

Date : 04.20.2015
By : DGB
Reviewed: SW

SPEC. NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
	Division 16 - Electrical					
16001	Emergency power system	1	LS	$1,000,000.00	$1,000,000	
	Total					**$1,000,000**
	Grand Total					**$1,000,000**

ESTIMATE FOR 54-inch CROSSING ALTERNATIVE

Microtunneling - Casing w/ Carrier Pipe

	Station	Shaft size	Shaft Depth	Tunnel Length	Unit Direct Cost	Total Direct Cost	Activity Mobilization Cost (5%)	Activity Overhead Cost (35%)	Activity Profit (15%)	Activity Contingency (35%)	Total Activity Cost	Total cost Activity Unit Cost
Sheet Pile Jacking Shaft	10+00	30 x 12	15		$ 19,025	$ 285,375	$ 14,269	$ 104,875	$ 60,678	$ 162,819	$ 628,016	$ 41,868
Micro-Tunnel w/ 72-in steel casing				150	$ 2,808	$ 421,200	$ 21,060	$ 154,791	$ 89,558	$ 240,313	$ 926,922	$ 6,179
Install 54-inch Carrier Pipe				150	$ 404	$ 60,600	$ 3,030	$ 22,271	$ 12,885	$ 34,575	$ 133,361	$ 889
Receiving Shaft	11+50	No cost - Daylight to open trench / trench box										
											$ 1,690,000	

Direct Cost	$ 767,175	
Mobilization	$ 38,359	5%
Overhead	$ 280,000	35%
Profit	$ 160,000	15%
Contingency	$ 440,000	35%
Total	$ 1,690,000	

ESTIMATE FOR 54-inch CROSSING ALTERNATIVE

Microtunneling - Casing w/ Carrier Pipe

	Station	Shaft size	Shaft Depth	Tunnel Length	Unit Direct Cost	Total Direct Cost	Activity Mobilization Cost (5%)	Activity Overhead Cost (35%)	Activity Profit (15%)	Activity Contingency (35%)	Total Activity Cost	Total cost Activity Unit Cost
Sheet Pile Jacking Shaft	10+00	30 x 12	50		$ 16,203	$ 810,150	$ 40,508	$ 297,730	$ 172,258	$ 462,226	$ 1,782,872	$ 35,657
Micro-Tunnel w/ 72-in steel casing				2100	$ 2,808	$ 5,896,800	$ 294,840	$ 2,167,074	$ 1,253,807	$ 3,364,382	$ 12,976,903	$ 6,179
Install 54-inch Carrier Pipe				2100	$ 404	$ 848,400	$ 42,420	$ 311,787	$ 180,391	$ 484,049	$ 1,867,047	$ 889
Sheet Pile Receiving Shaft	31+00	20 x 12	50		$ 13,681	$ 684,050	$ 34,203	$ 251,388	$ 145,446	$ 390,280	$ 1,505,367	$ 30,107
											$ 18,130,000	

Direct Cost	$ 8,239,400	
Mobilization	$ 411,970	5%
Overhead	$ 3,030,000	35%
Profit	$ 1,750,000	15%
Contingency	$ 4,700,000	35%
Total	$ 18,130,000	

Engineers...Working Wonders With Water®

PROJECT SUMMARY

Project:	**Alt #2 - NVRRWP Separate Alignment**	**Estimate Class:**	**5**
Client:	**Del Puerto Water District**	**PIC:**	**MJB**
Location:	**Patterson/Modesto/Ceres/Turlock**	**PM:**	**SW**
Zip Code:	**95363**	**Date:**	**04.20.2015**
Carollo Job #	**9543A.10**	**By:**	**DGB**
		Reviewed:	**SW**

NO.	DESCRIPTION		TOTAL
1	Modesto Pipeline to DMC		$12,120,347
2	Modesto Pump Station (at Modesto WQCF)		$2,649,200
3	Modesto San Joaquin River Crossing		$6,887,000
4	Turlock Pipeline to DMC		$12,270,347
5	Turlock Pump Station (at Harding Drain Outfall Site)		$5,000,000
6	Turlock San Joaquin River Crossing		$8,427,800
7	Turlock Harding Drain Pump Station Emergency Power		$1,000,000
8	Mobilization and Demobilization		$2,000,000
	TOTAL DIRECT COST		**$50,354,695**
	Contingency	30.0%	$15,106,408
	Subtotal		**$65,461,103**
	General Contractor Overhead, Profit & Risk	12.0%	$7,855,332
	Subtotal		**$73,316,436**
	Escalation to Mid-Point (assumes completion date of 12/2017)	5.0%	$5,498,733
	Subtotal		**$78,815,169**
	Sales Tax (7.625% on half the direct cost)	7.6%	$3,004,828
	Subtotal		**$81,819,997**
	Bid Market Allowance	0.0%	$0
	TOTAL ESTIMATED CONSTRUCTION COST		**$81,819,997**
	Engineering, Legal & Administration Fees	15.0%	$12,273,000
	Owner's Reserve for Change Orders	5.0%	$4,091,000
	TOTAL ESTIMATED PROJECT COST		**$98,183,996**

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Carollo Engineers have no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. Carollo Engineers cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented as shown.

carollo
Engineers...Working Wonders With Water®

DETAILED COST ESTIMATE

Project: Alt #2 - NVRRWP Separate Alignment
Client: Del Puerto Water District
Location: Patterson/Modesto/Ceres/Turlock
Element: 01 Modesto Pipeline to DMC

Date : 04.20.2015
By : DGB
Reviewed: SW

SPEC. NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
	Division 01 - General Conditions					
01000	Traffic Control Allowance	1	LS	$75,000.00	$75,000	
01000	Permanent Easement Acquisition	187500	SF	$.17	$31,875	
	Total					**$106,875**
	Division 02 - Site Construction					
02000	Allowance for DMC Discharge Facilities	1	LS	$500,000.00	$500,000	
02000	36" Jack/Bore at RR Crossing	1	LS	$652,099.00	$652,099	
02260	Solid Shoring, 16' D, Wood Planks, Stringers & X-Bracing	10000	LF	$85.36	$803,600	
02300	Cat 235 Trackhoe 2.75Cy Bucket, Class B (Medium Digging), 0-20' D	82963	CY	$2.19	$181,487	
02300	Imported Pipe Bed & Zone/Confined Structure Backfill, Class A Material	22437	CY	$66.82	$1,449,359	
02300	Native Trench Backfill/Unconfined Struct. Bf, Class A Material	52148	CY	$14.43	$702,292	
02501	Pipe Trench Cutoff Wall	55	EA	$2,000.00	$110,000	
02503	Dewatering Allowance	1	LS	$500,000.00	$500,000	
02742	4" Ac Paving On 12" Abc	190000	SF	$4.56	$867,238	
	Total					**$5,766,076**
	Division 15 - Mechanical					
15001	Cathodic Protection Monitoring	32000	LF	$7.00	$224,000	
15252	36" C200 1/4" Wall Wld Cs Pipe In Open Trench	16000	LF	$203.02	$3,248,397	
15253	36" C200 1/4" Wall Bell/Spigot in Open Trench	16000	LF	$120.00	$1,920,000	
15500	Blow Off Assembly	10	EA	$15,000.00	$150,000	
15501	Air Release Valve	10	EA	$15,000.00	$150,000	
15502	Man Inspection Tee	10	EA	$20,000.00	$200,000	
15503	Allowance for pipe bends	1	LS	$250,000.00	$250,000	
	Total					**$6,142,397**
	Division 16 - Electrical					
16000	Electrical at DMC Discharge	1	LS	$105,000.00	$105,000	
	Total					**$105,000**
	Grand Total					**$12,120,348**

carollo
Engineers...Working Wonders With Water®

DETAILED COST ESTIMATE

Project: Alt #2 - NVRRWP Separate Alignment
Client: Del Puerto Water District
Location: Patterson/Modesto/Ceres/Turlock
Element: 03 Pump Station at Modesto WWTP

Date : 04.20.2015
By : DGB
Reviewed: SW

SPEC. NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
	Division 02 - Site Construction					
02000	Allowance for pipe connections	1	LS	$100,000.00	$100,000	
	Total					**$100,000**
	Division 11 - Equipment					
11312	300 hp Vertical Turbine Pump and Motor	3	EA	$200,000.00	$600,000	
	Total					**$600,000**
	Division 16 - Electrical					
16001	Primary Service Section and Metering	1	EA	$190,000.00	$190,000	
16002	Transformer	1	EA	$115,000.00	$115,000	
16003	Medium Voltage Lineup	1	EA	$325,000.00	$325,000	
16004	Motor Connections	1	LS	$48,000.00	$48,000	
16005	Security Lighting	1	LS	$5,000.00	$5,000	
16006	Controls and Scada Connections	1	LS	$27,000.00	$27,000	
16007	Grounding and Bonding	1	LS	$4,200.00	$4,200	
16008	Raceways and Feeders	1	LS	$120,000.00	$120,000	
16009	TID Service Fees	1	LS	$50,000.00	$50,000	
16010	Medium Voltage ATS	1	LS	$80,000.00	$80,000	
16011	Emergency Power System	1	LS	$985,000.00	$985,000	
	Total					**$1,949,200**
	Grand Total					**$2,649,200**

carollo
Engineers...Working Wonders With Water®

DETAILED COST ESTIMATE

Project: Alt #2 - NVRRWP Separate Alignment
Client: Del Puerto Water District
Location: Patterson/Modesto/Ceres/Turlock
Element: 04 Turlock Pipeline to DMC

Date : 04.20.2015
By : DGB
Reviewed: SW

SPEC. NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
	Division 01 - General Conditions					
01000	Traffic Control Allowance	1	LS	$75,000.00	$75,000	
01000	Permanent Easement Acquisition	187500	SF	$.17	$31,875	
	Total					**$106,875**
	Division 02 - Site Construction					
02000	Allowance for DMC Discharge Facilities	1	LS	$500,000.00	$500,000	
02000	36" Jack/Bore at RR Crossing	1	LS	$652,099.00	$652,099	
02260	Solid Shoring, 16' D, Wood Planks, Stringers & X-Bracing	10000	LF	$85.36	$853,600	
02300	Cat 235 Trackhoe 2.75Cy Bucket, Class B (Medium Digging), 0-20' D	82963	CY	$2.19	$181,487	
02300	Imported Pipe Bed & Zone/Confined Structure Backfill, Class A Material	22437	CY	$66.82	$1,499,359	
02300	Native Trench Backfill/Unconfined Struct. Bf, Class A Material	52148	CY	$14.43	$752,292	
02501	Pipe Trench Cutoff Wall	55	EA	$2,000.00	$110,000	
02503	Dewatering Allowance	1	LS	$500,000.00	$500,000	
02742	4" Ac Paving On 12" Abc	190000	SF	$4.56	$867,238	
	Total					**$5,916,076**
	Division 15 - Mechanical					
15001	Cathodic Protection Monitoring	32000	LF	$7.00	$224,000	
15252	36" C200 1/4" Wall Wld Cs Pipe In Open Trench	16000	LF	$203.02	$3,248,397	
15253	36" C200 1/4" Wall Bell/Spigot in Open Trench	16000	LF	$120.00	$1,920,000	
15500	Blow Off Assembly	10	EA	$15,000.00	$150,000	
15501	Air Release Valve	10	EA	$15,000.00	$150,000	
15502	Man Inspection Tee	10	EA	$20,000.00	$200,000	
15503	Allowance for pipe bends	1	LS	$250,000.00	$250,000	
	Total					**$6,142,397**
	Division 16 - Electrical					
16000	Electrical at DMC Discharge	1	LS	$105,000.00	$105,000	
	Total					**$105,000**
	Grand Total					**$12,270,348**

Engineers...Working Wonders With Water®

DETAILED COST ESTIMATE

Project: Alt #2 - NVRRWP Separate Alignment
Client: Del Puerto Water District
Location: Patterson/Modesto/Ceres/Turlock
Element: 07 Harding Drain PS

Date : 04.20.2015
By : DGB
Reviewed: SW

SPEC. NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
	Division 16 - Electrical					
16001	Emergency power system	1	LS	$1,000,000.00	$1,000,000	
	Total					**$1,000,000**
	Grand Total					**$1,000,000**

ESTIMATE FOR 36-inch CROSSING ALTERNATIVE

Microtunneling - Casing w/ Carrier Pipe

	Station	Shaft size	Shaft Depth	Tunnel Length	54" Unit Direct Cost	54" Total Direct Cost	36" (85% iof 54") Adjust for 36"	Activity Mobilization Cost (5%)	Activity Overhead Cost (35%)	Activity Profit (15%)	Activity Contingency (35%)	Total Activity Cost	Total cost Activity Unit Cost
Sheet Pile Jacking Shaft	10+00	30 x 12	15		$ 19,025	$ 285,375	$ 242,569	$ 14,269	$ 104,875	$ 60,678	$ 162,819	$ 628,016	$ 41,868
Micro-Tunnel w/ 48-in steel casing				150	$ 2,808	$ 421,200	$ 358,020	$ 21,060	$ 154,791	$ 89,558	$ 240,313	$ 926,922	$ 6,179
Install 36-inch Carrier Pipe				150	$ 404	$ 60,600	$ 51,510	$ 3,030	$ 22,271	$ 12,885	$ 34,575	$ 133,361	$ 889
Receiving Shaft	11+50	No cost - Daylight to open trench / trench box											
												$ 1,690,000	

Direct Cost	$ 767,175	$ 652,099	
Mobilization	$ 38,359	$ 32,605	5%
Overhead	$ 280,000	$ 11,412	35%
Profit	$ 160,000	$ 1,712	15%
Contingency	$ 440,000	$ 599	35%
Total	$ 1,690,000	$ 700,000	

ESTIMATE FOR 36-inch CROSSING ALTERNATIVE

Microtunneling - Casing w/ Carrier Pipe

	Station	Shaft size	Shaft Depth	Tunnel Length	Unit Direct Cost	Total Direct Cost	Activity Mobilization Cost (5%)	Activity Overhead Cost (35%)	Activity Profit (15%)	Activity Contingency (35%)	Total Activity Cost	Total cost Activity Unit Cost
Modesto crossing												
Sheet Pile Jacking Shaft	10+00	30 x 12	50		$ 16,203	$ 810,150	$ 40,508	$ 297,730	$ 172,258	$ 462,226	$ 1,782,872	$ 35,657
Micro-Tunnel w/ 56-in steel casing				2100	$ 2,221	$ 4,664,100	$ 233,205	$ 1,714,057	$ 991,704	$ 2,661,073	$ 10,264,139	$ 4,888
Install 36-inch Carrier Pipe				2100	$ 347	$ 728,700	$ 36,435	$ 267,797	$ 154,940	$ 415,755	$ 1,603,627	$ 764
Sheet Pile Receiving Shaft	31+00	20 x 12	50		$ 13,681	$ 684,050	$ 34,203	$ 251,388	$ 145,446	$ 390,280	$ 1,505,367	$ 30,107
subtotal						$ 6,887,000	$ 344,350	$ 2,530,973	$ 1,464,348	$ 3,929,335	$ 15,156,006	
Turlock crossing												
Sheet Pile Jacking Shaft	10+00	30 x 12	50		$ 16,203	$ 810,150	$ 40,508	$ 297,730	$ 172,258	$ 462,226	$ 1,782,872	$ 35,657
Micro-Tunnel w/ 56-in steel casing				2700	$ 2,221	$ 5,996,700	$ 299,835	$ 2,203,787	$ 1,275,048	$ 3,421,380	$ 13,196,750	$ 4,888
Install 36-inch Carrier Pipe				2700	$ 347	$ 936,900	$ 46,845	$ 344,311	$ 199,208	$ 534,542	$ 2,061,807	$ 764
Sheet Pile Receiving Shaft	37+00	20 x 12	50		$ 13,681	$ 684,050	$ 34,203	$ 251,388	$ 145,446	$ 390,280	$ 1,505,367	$ 30,107
subtotal						$ 8,427,800	$ 421,390	$ 3,097,217	$ 1,791,961	$ 4,808,429	$ 48,860,000	

Direct Cost	$ 15,314,800	
Mobilization	$ 765,740	5%
Overhead	$ 5,630,000	35%
Profit	$ 3,260,000	15%
Contingency	$ 8,740,000	35%
Total	$ 33,710,000	

carollo
Engineers...Working Wonders With Water™

PROJECT SUMMARY

Project:	**Turlock Recycled Water PS (based on Harding Drain PS Estimate)**	**Estimate Class:**	**5**
Job #:	**9453A10**	**CSM**	**db**
Location:	**Turlock, CA**	**PM:**	**scw**
Zip Code:	**95380**	**Date:**	**April 20, 2015**
		By:	**scw**

NO.	DESCRIPTION			TOTAL*
01	Pump Station			$637,092
02	PS Wet Well structure			$1,044,000
03	Civil and Site Work			$637,647
04	Electrical			$1,003,000
05	Landscaping			$26,520
06	Emergency Generator			$1,000,000
07	Connections to existing pipes, standpipe			$500,000
08	New power supply (TID)			$200,000
	TOTAL DIRECT COST			**$5,048,000**
	Contingency		30.0%	$1,514,000
		Subtotal		**$6,562,000**
	General Contractor Overhead, Profit & Risk		12.0%	$787,000
		Subtotal		**$7,349,000**
	Sales Tax (Based on 50% of Direct Costs)		7.250%	$183,000
		Subtotal		**$7,532,000**
	TOTAL ESTIMATED CONSTRUCTION COST			**$7,532,000**

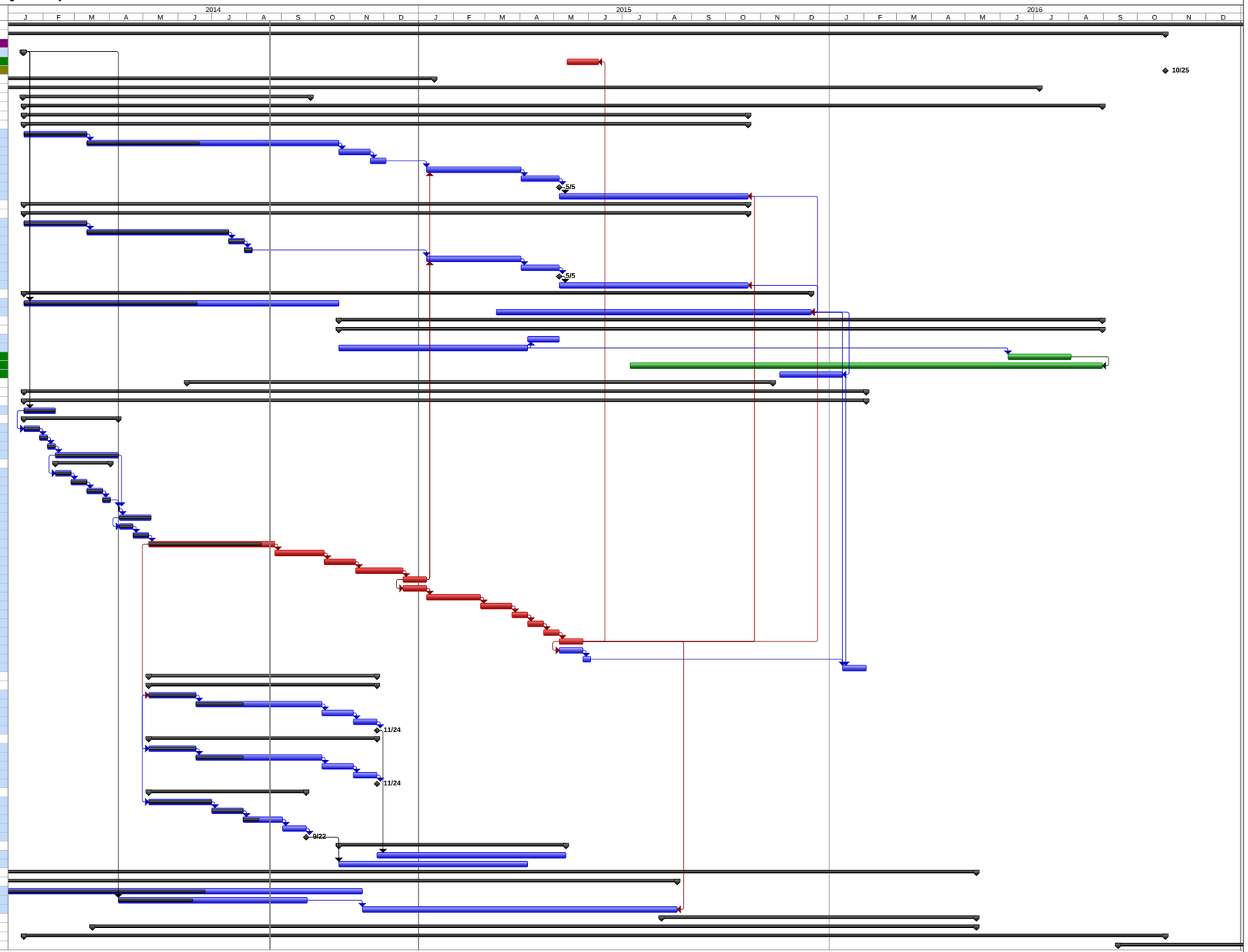
*Cost rounded to the nearest thousand, costs based on the 20 Cities ENR index listed above.

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects ou r professional opinion of accurate costs at this time and is subject to change as the project design matures. Carollo Engineers have no control over v ariances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of dete rmining prices, competitive bidding or market conditions, practices or bidding strategies. Carollo Engineers cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented as shown.

Appendix G - NVRRWP Design and Construction Schedule

North Valley Regional Recycled Water Program- Project Schedule: Design-Bid-Build (CEQA First)

ID	Task Name	Duration	% Complete	Start	Finish	Predecessors
1	**NVRRWP- Implementation Schedule**	**1330 days**	**22%**	**Wed 5/1/13**	**Tue 6/5/18**	
2	**Project Phase Authorization**	**910 days**	**5%**	**Wed 5/1/13**	**Tue 10/25/16**	
3	Phase 2	0 days	100%	Wed 5/1/13	Wed 5/1/13	
4	**Phase 3**	**1 day**	**100%**	**Tue 1/14/14**	**Tue 1/14/14**	
6	Phase 4	20 days	0%	Wed 5/13/15	Tue 6/9/15	25,164,108FF+10 days
7	Phase 5	0 days	0%	Tue 10/25/16	Tue 10/25/16	174,184,194
8	**Feasibility Study**	**446 days**	**65%**	**Wed 5/1/13**	**Wed 1/14/15**	
15	**Outreach**	**801 days**	**33%**	**Tue 6/11/13**	**Tue 7/5/16**	
18	**Governance**	**184 days**	**78%**	**Tue 1/14/14**	**Fri 9/26/14**	
27	**Water Rights**	**685 days**	**22%**	**Wed 1/15/14**	**Tue 8/30/16**	
28	**Turlock**	**460 days**	**26%**	**Wed 1/15/14**	**Tue 10/20/15**	
29	**Wastewater Change Petition**	**460 days**	**26%**	**Wed 1/15/14**	**Tue 10/20/15**	
30	Verification of Water Rights Approach	40 days	100%	Wed 1/15/14	Tue 3/11/14	5
31	Complete Petition for Change and Environmental Forms	160 days	45%	Wed 3/12/14	Tue 10/21/14	30
32	Review Draft Forms	20 days	0%	Wed 10/22/14	Tue 11/18/14	31
33	Finalize and Submit Forms to SWRCB	10 days	0%	Wed 11/19/14	Tue 12/2/14	32
34	SWRCB issues public notice petition	60 days	0%	Thu 1/8/15	Wed 4/1/15	33,101
35	Public Review Period	24 days	0%	Thu 4/2/15	Tue 5/5/15	34
36	Public Notice of Petition Hearing	0 days	0%	Tue 5/5/15	Tue 5/5/15	35
37	SWRCB Issues Order Approving Change	120 days	0%	Wed 5/6/15	Tue 10/20/15	36,108FF+40 days
38	**Modesto**	**460 days**	**42%**	**Wed 1/15/14**	**Tue 10/20/15**	
39	**Wastewater Change Petition**	**460 days**	**42%**	**Wed 1/15/14**	**Tue 10/20/15**	
40	Verification of Water Rights Approach	40 days	100%	Wed 1/15/14	Tue 3/11/14	5
41	Complete Petition for Change and Environmental Forms	90 days	100%	Wed 3/12/14	Tue 7/15/14	40
42	Review Draft Forms	10 days	100%	Wed 7/16/14	Tue 7/29/14	41
43	Finalize and Submit Forms to SWRCB	5 days	100%	Wed 7/30/14	Tue 8/5/14	42
44	SWRCB issues public notice petition	60 days	0%	Thu 1/8/15	Wed 4/1/15	43,101
45	Public Review Period	24 days	0%	Thu 4/2/15	Tue 5/5/15	44
46	Public Notice of Petition Hearing	0 days	0%	Tue 5/5/15	Tue 5/5/15	45
47	SWRCB Issues Order Approving Change	120 days	0%	Wed 5/6/15	Tue 10/20/15	46,108FF+40 days
48	**Del Puerto**	**500 days**	**28%**	**Wed 1/15/14**	**Tue 12/15/15**	
49	Discussions with Reclamation	200 days	55%	Wed 1/15/14	Tue 10/21/14	4
50	Exchange Agreement or Warren Act Contract (Full Project)	200 days	0%	Wed 3/11/15	Tue 12/15/15	108FF+40 days,37FF+40 days,47FF+40 days
51	**Reclamation Approval**	**485 days**	**0%**	**Wed 10/22/14**	**Tue 8/30/16**	
52	**License agreement with Reclamation**	**485 days**	**0%**	**Wed 10/22/14**	**Tue 8/30/16**	
53	Submit Application	20 days	0%	Wed 4/8/15	Tue 5/5/15	54
54	Reclamation Conceptual Design Review	120 days	0%	Wed 10/22/14	Tue 4/7/15	164
55	Reclamation Final Design Review	40 days	0%	Wed 6/8/16	Tue 8/2/16	172FF+20 days,54
56	License agreement terms negotiations	300 days	0%	Wed 7/8/15	Tue 8/30/16	55FF+20 days
57	Approval for RW in DMC	40 days	0%	Wed 11/18/15	Tue 1/12/16	50FF+20 days
58	**Funding**	**373 days**	**4%**	**Mon 6/9/14**	**Wed 11/11/15**	
80	**Environmental Documentation**	**535 days**	**37%**	**Wed 1/15/14**	**Tue 2/2/16**	
81	**EIR/EIS**	**535 days**	**47%**	**Wed 1/15/14**	**Tue 2/2/16**	
82	Develop CEQA/NEPA Strategy	20 days	100%	Wed 1/15/14	Tue 2/11/14	10,4
83	**NOI**	**60 days**	**100%**	**Wed 1/15/14**	**Tue 4/8/14**	
84	Draft NOI	10 days	100%	Wed 1/15/14	Tue 1/28/14	82SS
85	USBR Local Review	5 days	100%	Wed 1/29/14	Tue 2/4/14	84
86	Final NOI	5 days	100%	Wed 2/5/14	Tue 2/11/14	85
87	USBR NOI Publication Process	40 days	100%	Wed 2/12/14	Tue 4/8/14	86
88	**NOP**	**35 days**	**100%**	**Wed 2/12/14**	**Tue 4/1/14**	
89	Project Description/NOP	10 days	100%	Wed 2/12/14	Tue 2/25/14	87SS
90	Partner Review	10 days	100%	Wed 2/26/14	Tue 3/11/14	89
91	Screen Check NOP	10 days	100%	Wed 3/12/14	Tue 3/25/14	90
92	Partner Review	5 days	100%	Wed 3/26/14	Tue 4/1/14	91
93	Publish NOI and NOP	1 day	100%	Wed 4/9/14	Wed 4/9/14	87,92
94	NOI/NOP Review Period (scoping)	20 days	100%	Thu 4/10/14	Wed 5/7/14	93
95	Scoping Meeting	8 days	100%	Thu 4/10/14	Mon 4/21/14	94SS
96	Scoping Report	10 days	100%	Tue 4/22/14	Mon 5/5/14	95
97	Prepare Administrative Draft EIR/EIS	80 days	90%	Tue 5/6/14	Mon 8/25/14	96
98	Review Admin Draft EIR/EIS	32 days	0%	Tue 8/26/14	Wed 10/8/14	97
99	Prepare Screen check Draft EIR/EIS	20 days	0%	Thu 10/9/14	Wed 11/5/14	98
100	Review Screen check Draft EIR/EIS	30 days	0%	Thu 11/6/14	Wed 12/17/14	99
101	Public Draft EIR/EIS	15 days	0%	Thu 12/18/14	Wed 1/7/15	100
102	Publish NOA for DEIS	15 days	0%	Thu 12/18/14	Wed 1/7/15	101SS
103	Public Review of Draft EIS	34 days	0%	Thu 1/8/15	Tue 2/24/15	102
104	Prepare Draft Response to Comments (RTC)	20 days	0%	Wed 2/25/15	Tue 3/24/15	103
105	Review RTC	10 days	0%	Wed 3/25/15	Tue 4/7/15	104
106	Screen check RTC	10 days	0%	Wed 4/8/15	Tue 4/21/15	105
107	Review Screen check RTC	10 days	0%	Wed 4/22/15	Tue 5/5/15	106
108	Final EIR/EIS Published	15 days	0%	Wed 5/6/15	Tue 5/26/15	107
109	Publish Federal Register NOA for FEIS	15 days	0%	Wed 5/6/15	Tue 5/26/15	108SS
110	FEIR Certified	5 days	0%	Wed 5/27/15	Tue 6/2/15	109
111	Record of Decision	15 days	0%	Wed 1/13/16	Tue 2/2/16	110,50,57
112	**Environmental Surveys**	**145 days**	**49%**	**Tue 5/6/14**	**Mon 11/24/14**	
113	**Biological Surveys**	**145 days**	**41%**	**Tue 5/6/14**	**Mon 11/24/14**	
114	Perform Biological Surveys	30 days	100%	Tue 5/6/14	Mon 6/16/14	97SS,150SS+21 days
115	Prepare Draft Biological Assessment (BA)	80 days	38%	Tue 6/17/14	Mon 10/6/14	114
116	Review Draft BA by USBR	20 days	0%	Tue 10/7/14	Mon 11/3/14	115
117	Prepare Final BA	15 days	0%	Tue 11/4/14	Mon 11/24/14	116
118	Submit Final BA to USBR	0 days	0%	Mon 11/24/14	Mon 11/24/14	117
119	**Wetlands Surveys**	**145 days**	**41%**	**Tue 5/6/14**	**Mon 11/24/14**	
120	Perform Wetland Surveys	30 days	100%	Tue 5/6/14	Mon 6/16/14	114SS
121	Prepare Draft Wetlands Delineation (WD)	80 days	38%	Tue 6/17/14	Mon 10/6/14	120
122	Review WD by USBR	20 days	0%	Tue 10/7/14	Mon 11/3/14	121
123	Prepare Final WD	15 days	0%	Tue 11/4/14	Mon 11/24/14	122
124	Submit Final WD to Corps	0 days	0%	Mon 11/24/14	Mon 11/24/14	123
125	**Cultural Surveys**	**100 days**	**70%**	**Tue 5/6/14**	**Mon 9/22/14**	
126	Perform Cultural Surveys	40 days	100%	Tue 5/6/14	Mon 6/30/14	114SS
127	Prepare Draft Cultural Resources Report (CRR)	20 days	100%	Tue 7/1/14	Mon 7/28/14	126
128	Review CRR by USBR	25 days	40%	Tue 7/29/14	Mon 9/1/14	127
129	Prepare Final CRR	15 days	0%	Tue 9/2/14	Mon 9/22/14	128
130	Submit Final CRR to USBR	0 days	0%	Mon 9/22/14	Mon 9/22/14	129
131	**Environmental Coordination**	**144 days**	**0%**	**Wed 10/22/14**	**Mon 5/11/15**	
132	Section 7 Consultation / Biological Opinion	120 days	0%	Tue 11/25/14	Mon 5/11/15	118,164
133	Section 106 Compliance	120 days	0%	Wed 10/22/14	Tue 4/7/15	130,164
134	**Regulatory & Permitting**	**790 days**	**19%**	**Wed 5/1/13**	**Tue 5/10/16**	
135	**NPDES/WDR for Discharge to DMC**	**600 days**	48%	**Wed 5/1/13**	**Tue 8/18/15**	
136	Preliminary Coordination with RWQCB	400 days	75%	Wed 5/1/13	Tue 11/11/14	3
137	Prepare ROWD	120 days	40%	Wed 4/9/14	Tue 9/23/14	4FS+60 days
138	RWQCB Approval	200 days	0%	Wed 11/12/14	Tue 8/18/15	137,108FF+60 days
139	**Permitting**	**200 days**	**0%**	**Wed 8/5/15**	**Tue 5/10/16**	
148	**Easements and Rights of Way**	**562 days**	**11%**	**Mon 3/17/14**	**Tue 5/10/16**	
160	**Design**	**725 days**	**10%**	**Wed 1/15/14**	**Tue 10/25/16**	
195	**Construction**	**450 days**	**0%**	**Wed 9/14/16**	**Tue 6/5/18**	



North Valley Regional Recycled Water Program- Project Schedule: Design-Bid-Build (Accelerated)

ID	Task Name	Duration	Remaining Duration	% Complete	Start	Finish	Predecessors
1	**NVRRWP- Implementation Schedule**	**1239 days**	*996.6 days*	**20%**	**Wed 5/1/13**	**Mon 1/29/18**	
2	**Project Phase Authorization**	**799 days**	*760.95 days*	**5%**	**Wed 5/1/13**	**Mon 5/23/16**	
3	Phase 2	0 days	*0 days*	100%	Wed 5/1/13	Wed 5/1/13	
4	**Phase 3**	**1 day**	*0 days*	**100%**	**Tue 1/14/14**	**Tue 1/14/14**	
5	**Pase 3 Kick off Meeting**	**1 day**	*0 days*	**100%**	**Tue 1/14/14**	**Tue 1/14/14**	
6	Phase 4	20 days	*20 days*	0%	Tue 9/30/14	Mon 10/27/14	165,26FF+10 days
7	Phase 5	0 days	*0 days*	0%	Mon 5/23/16	Mon 5/23/16	175,185,195
8	**Feasibility Study**	**446 days**	*156 days*	**65%**	**Wed 5/1/13**	**Wed 1/14/15**	
9	Prepare Draft Feasibility Study (FS)	106 days	*0 days*	100%	Wed 5/1/13	Wed 9/25/13	3
10	Review Draft FS	20 days	*0 days*	100%	Thu 9/26/13	Wed 10/23/13	9
11	Prepare updated draft FS	10 days	*0 days*	100%	Thu 10/24/13	Wed 11/6/13	10
12	Client Review of FS	40 days	*0 days*	100%	Thu 11/7/13	Wed 1/1/14	11
13	Incorporate Comments	10 days	*0 days*	100%	Thu 1/2/14	Wed 1/15/14	12
14	USBR FS Review	260 days	*156 days*	40%	Thu 1/16/14	Wed 1/14/15	13
15	**Outreach**	**800 days**	*536 days*	**33%**	**Tue 6/11/13**	**Mon 7/4/16**	
16	DPWD Customers	800 days	*536 days*	33%	Tue 6/11/13	Mon 7/4/16	183FF,173FF
17	DMC Customers and Agencies	800 days	*536 days*	33%	Tue 6/11/13	Mon 7/4/16	183FF,173FF
18	**Governance**	**195 days**	*65 days*	**67%**	**Tue 1/14/14**	**Mon 10/13/14**	
19	**MOU**	**35 days**	*0 days*	**100%**	**Tue 1/14/14**	**Mon 3/3/14**	
20	Facilitated Meetings	35 days	*0 days*	100%	Tue 1/14/14	Mon 3/3/14	4SS
21	Agreement on Existing MOU	35 days	*0 days*	100%	Tue 1/14/14	Mon 3/3/14	20SS
22	**JPA**	**160 days**	*67.69 days*	**58%**	**Tue 3/4/14**	**Mon 10/13/14**	
23	Facilitated Meetings	100 days	*25 days*	75%	Tue 3/4/14	Mon 7/21/14	21
24	Develop Draft Governance Documents	100 days	*25 days*	75%	Tue 3/4/14	Mon 7/21/14	23SS
25	Review of Governance Documents	20 days	*20 days*	0%	Tue 7/22/14	Mon 8/18/14	24
26	Approval of Governance Documents	40 days	*40 days*	0%	Tue 8/19/14	Mon 10/13/14	25
27	**Water Rights**	**604 days**	*497.79 days*	**18%**	**Wed 1/15/14**	**Mon 5/9/16**	
28	**Turlock**	**434 days**	*322 days*	**26%**	**Wed 1/15/14**	**Mon 9/14/15**	
29	**Wastewater Change Petition**	**434 days**	*322 days*	**26%**	**Wed 1/15/14**	**Mon 9/14/15**	
30	Verification of Water Rights Approach	40 days	*0 days*	100%	Wed 1/15/14	Tue 3/11/14	5
31	Complete Petition for Change and Environmental Forms	160 days	*88 days*	45%	Wed 3/12/14	Tue 10/21/14	30
32	Review Draft Forms	20 days	*20 days*	0%	Wed 10/22/14	Tue 11/18/14	31
33	Finalize and Submit Forms to SWRCB	10 days	*10 days*	0%	Wed 11/19/14	Tue 12/2/14	32
34	SWRCB issues public notice petition	60 days	*60 days*	0%	Wed 12/3/14	Tue 2/24/15	33
35	Public Review Period	24 days	*24 days*	0%	Wed 2/25/15	Mon 3/30/15	34
36	Public Notice of Petition Hearing	0 days	*0 days*	0%	Mon 3/30/15	Mon 3/30/15	35
37	SWRCB Issues Order Approving Change	120 days	*120 days*	0%	Tue 3/31/15	Mon 9/14/15	36,109FF+40 days
38	**Modesto**	**494 days**	*384 days*	**22%**	**Wed 1/15/14**	**Mon 12/7/15**	
39	**Wastewater Change Petition**	**494 days**	*384 days*	**22%**	**Wed 1/15/14**	**Mon 12/7/15**	
40	Verification of Water Rights Approach	40 days	*0 days*	100%	Wed 1/15/14	Tue 3/11/14	5
41	Complete Petition for Change and Environmental Forms	100 days	*30 days*	70%	Wed 3/12/14	Tue 7/29/14	40
42	Review Draft Forms	20 days	*20 days*	0%	Wed 7/30/14	Tue 8/26/14	41
43	Finalize and Submit Forms to SWRCB	10 days	*10 days*	0%	Wed 8/27/14	Tue 9/9/14	42
44	SWRCB issues public notice petition	60 days	*60 days*	0%	Wed 9/10/14	Tue 12/2/14	43
45	Public Review Period	24 days	*24 days*	0%	Wed 12/3/14	Mon 1/5/15	44
46	Public Notice of Petition Hearing	120 days	*120 days*	0%	Tue 1/6/15	Mon 6/22/15	45
47	SWRCB Issues Order Approving Change	120 days	*120 days*	0%	Tue 6/23/15	Mon 12/7/15	46,109FF+40 days
48	**Del Puerto**	**554 days**	*401.65 days*	**28%**	**Wed 1/15/14**	**Mon 2/29/16**	
49	Discussions with Reclamation	200 days	*90 days*	55%	Wed 1/15/14	Tue 10/21/14	4
50	Exchange Agreement or Warren Act Contract (Full Project)	200 days	*200 days*	0%	Tue 5/26/15	Mon 2/29/16	109FF+40 days,37FF+40 days,47FF+60 days
51	**Reclamation Approvals**	**424 days**	**424 days**	**0%**	**Wed 9/24/14**	**Mon 5/9/16**	
52	**License agreement with Reclamation**	**424 days**	**424 days**	**0%**	**Wed 9/24/14**	**Mon 5/9/16**	
53	Submit Application	20 days	*20 days*	0%	Wed 9/24/14	Tue 10/21/14	54SS
54	Reclamation Conceptual Design Review	120 days	*120 days*	0%	Wed 9/24/14	Tue 3/10/15	165
55	Reclamation Final Design Review	80 days	80 days	0%	Tue 11/24/15	Mon 3/14/16	54,173
56	License agreement terms negotiations	300 days	300 days	0%	Tue 3/17/15	Mon 5/9/16	55FF+40 days
57	EIR/EIS	0 days	0 days	0%	Tue 6/23/15	Tue 6/23/15	112
58	Approval for RW in DMC	40 days	40 days	0%	Tue 2/2/16	Mon 3/28/16	50FF+20 days
59	**Funding**	**373 days**	*368.82 days*	**1%**	**Mon 6/9/14**	**Wed 11/11/15**	
60	**Financing Plan**	**60 days**	*60 days*	**0%**	**Tue 10/14/14**	**Mon 1/5/15**	
61	Develop Financing Plan	60 days	*60 days*	0%	Tue 10/14/14	Mon 1/5/15	26
62	**Bridge Financing**	**180 days**	*180 days*	**0%**	**Tue 12/23/14**	**Mon 8/31/15**	
69	**SRF**	**282 days**	*282 days*	**0%**	**Tue 10/14/14**	**Wed 11/11/15**	
70	**Prepare and Submit SRF Application Packages**	**62 days**	*62 days*	**0%**	**Tue 10/14/14**	**Wed 1/7/15**	
71	General Information	20 days	*20 days*	0%	Tue 10/14/14	Mon 11/10/14	26
72	Technical Package	40 days	*40 days*	0%	Tue 10/14/14	Mon 12/8/14	71SS
73	Environmental Package	40 days	*40 days*	0%	Thu 11/13/14	Wed 1/7/15	102FF
74	Financial Security Package	60 days	*60 days*	0%	Tue 10/14/14	Mon 1/5/15	71SS
75	Adopt SRF Resolutions	40 days	*40 days*	0%	Thu 1/8/15	Wed 3/4/15	71,72,73,74
76	SRF Review	60 days	*60 days*	0%	Thu 3/5/15	Wed 5/27/15	75
77	Approval of SRF Agreement	120 days	*120 days*	0%	Thu 5/28/15	Wed 11/11/15	76,109FF+40 days
78	**Prop 84**	**151 days**	*134.52 days*	**11%**	**Mon 6/9/14**	**Mon 1/5/15**	
79	Coordinate with IRWM on Application	31 days	*23.25 days*	25%	Mon 6/9/14	Mon 7/21/14	
80	Final Awards Announced	40 days	*40 days*	0%	Tue 11/11/14	Mon 1/5/15	79FS+80 days
81	**Environmental Documentation**	**375 days**	*270.09 days*	**28%**	**Wed 1/15/14**	**Tue 6/23/15**	
82	**EIR/EIS**	**375 days**	*229.69 days*	**39%**	**Wed 1/15/14**	**Tue 6/23/15**	
83	Develop CEQA/NEPA Strategy	20 days	*0 days*	100%	Wed 1/15/14	Tue 2/11/14	10,4
84	**NOI**	**60 days**	*0 days*	**100%**	**Wed 1/15/14**	**Tue 4/8/14**	
85	Draft NOI	10 days	*0 days*	100%	Wed 1/15/14	Tue 1/28/14	83SS
86	USBR Local Review	5 days	*0 days*	100%	Wed 1/29/14	Tue 2/4/14	85
87	Final NOI	5 days	*0 days*	100%	Wed 2/5/14	Tue 2/11/14	86
88	USBR NOI Publication Process	40 days	*0 days*	100%	Wed 2/12/14	Tue 4/8/14	87
89	**NOP**	**35 days**	*0 days*	**100%**	**Wed 2/12/14**	**Tue 4/1/14**	
90	Project Description/NOP	10 days	*0 days*	100%	Wed 2/12/14	Tue 2/25/14	88SS
91	Partner Review	10 days	*0 days*	100%	Wed 2/26/14	Tue 3/11/14	90
92	Screen Check NOP	10 days	*0 days*	100%	Wed 3/12/14	Tue 3/25/14	91
93	Partner Review	5 days	*0 days*	100%	Wed 3/26/14	Tue 4/1/14	92
94	Publish NOI and NOP	1 day	*0 days*	100%	Wed 4/9/14	Wed 4/9/14	88,93
95	NOI/NOP Review Period (scoping)	20 days	*0 days*	100%	Thu 4/10/14	Wed 5/7/14	94
96	Scoping Meeting	8 days	*0 days*	100%	Thu 4/10/14	Mon 4/21/14	95SS
97	Scoping Report	10 days	*0 days*	100%	Tue 4/22/14	Mon 5/5/14	96
98	Prepare Administrative Draft EIR/EIS	80 days	*48 days*	40%	Tue 5/6/14	Mon 8/25/14	97
99	Review Admin Draft EIR/EIS	32 days	*32 days*	0%	Tue 8/26/14	Wed 10/8/14	98
100	Prepare Screen check Draft EIR/EIS	20 days	*20 days*	0%	Thu 10/9/14	Wed 11/5/14	99
101	Review Screen check Draft EIR/EIS	30 days	*30 days*	0%	Thu 11/6/14	Wed 12/17/14	100
102	Public Draft EIR/EIS	15 days	*15 days*	0%	Thu 12/18/14	Wed 1/7/15	101
103	Publish NOA for DEIS	15 days	*15 days*	0%	Thu 12/18/14	Wed 1/7/15	102SS
104	Public Review of Draft EIS	34 days	*34 days*	0%	Thu 1/8/15	Tue 2/24/15	103
105	Prepare Draft Response to Comments (RTC)	20 days	*20 days*	0%	Wed 2/25/15	Tue 3/24/15	104
106	Review RTC	10 days	*10 days*	0%	Wed 3/25/15	Tue 4/7/15	105
107	Screen check RTC	10 days	*10 days*	0%	Wed 4/8/15	Tue 4/21/15	106
108	Review Screen check RTC	10 days	*10 days*	0%	Wed 4/22/15	Tue 5/5/15	107
109	Final EIR/EIS Published	15 days	*15 days*	0%	Wed 5/6/15	Tue 5/26/15	108
110	Publish Federal Register NOA for FEIS	15 days	*15 days*	0%	Wed 5/6/15	Tue 5/26/15	109SS
111	FEIR Certified	5 days	*5 days*	0%	Wed 5/27/15	Tue 6/2/15	110
112	Record of Decision	15 days	*15 days*	0%	Wed 6/3/15	Tue 6/23/15	111
113	**Environmental Surveys**	**105 days**	*70.32 days*	**33%**	**Tue 5/6/14**	**Mon 9/29/14**	
114	**Biological Surveys**	**105 days**	*72 days*	**31%**	**Tue 5/6/14**	**Mon 9/29/14**	
115	Perform Biological Surveys	30 days	*0 days*	100%	Tue 5/6/14	Mon 6/16/14	98SS,151SS+21 days
116	Prepare Draft Biological Assessment (BA)	40 days	*37 days*	8%	Tue 6/17/14	Mon 8/11/14	115
117	Review Draft BA	20 days	*20 days*	0%	Tue 8/12/14	Mon 9/8/14	116
118	Prepare Final BA	15 days	*15 days*	0%	Tue 9/9/14	Mon 9/29/14	117
119	Submit Final BA to USBR	0 days	*0 days*	0%	Mon 9/29/14	Mon 9/29/14	118
120	**Wetlands Surveys**	**105 days**	*73.25 days*	**30%**	**Tue 5/6/14**	**Mon 9/29/14**	
121	Perform Wetland Surveys	30 days	*0 days*	100%	Tue 5/6/14	Mon 6/16/14	115SS
122	Prepare Draft Wetlands Delineation (WD)	40 days	*38.25 days*	4%	Tue 6/17/14	Mon 8/11/14	121
123	Review WD	20 days	*20 days*	0%	Tue 8/12/14	Mon 9/8/14	122
124	Prepare Final WD	15 days	*15 days*	0%	Tue 9/9/14	Mon 9/29/14	123
125	Submit Final WD to Corps	0 days	*0 days*	0%	Mon 9/29/14	Mon 9/29/14	124
126	**Cultural Surveys**	**95 days**	*59 days*	**38%**	**Tue 5/6/14**	**Mon 9/15/14**	
127	Perform Cultural Surveys	40 days	*4 days*	90%	Tue 5/6/14	Mon 6/30/14	115SS
128	Prepare Draft Cultural Resources Report (CRR)	20 days	*20 days*	0%	Tue 7/1/14	Mon 7/28/14	127
129	Review CRR	20 days	*20 days*	0%	Tue 7/29/14	Mon 8/25/14	128
130	Prepare Final CRR	15 days	*15 days*	0%	Tue 8/26/14	Mon 9/15/14	129
131	Submit Final CRR to USBR	0 days	*0 days*	0%	Mon 9/15/14	Mon 9/15/14	130
132	**Environmental Coordination**	**124 days**	*124 days*	**0%**	**Wed 9/24/14**	**Mon 3/16/15**	
133	Section 7 Consultation / Biological Opinion	120 days	*120 days*	0%	Tue 9/30/14	Mon 3/16/15	119,165
134	Section 106 Compliance	120 days	*120 days*	0%	Wed 9/24/14	Tue 3/10/15	131,165
135	**Regulatory & Permitting**	**629 days**	*511.32 days*	**19%**	**Wed 5/1/13**	**Mon 9/28/15**	
136	**NPDES/WDR for Discharge to DMC**	**600 days**	*310 days*	48%	**Wed 5/1/13**	**Tue 8/18/15**	
137	Preliminary Coordination with RWQCB	400 days	*100 days*	75%	Wed 5/1/13	Tue 11/11/14	3
138	Prepare ROWD	120 days	*72 days*	40%	Wed 4/9/14	Tue 9/23/14	4FS+60 days
139	RWQCB Approval	200 days	*200 days*	0%	Wed 11/12/14	Tue 8/18/15	138,109FF+60 days
140	**Permitting**	**200 days**	*200 days*	**0%**	**Tue 12/23/14**	**Mon 9/28/15**	
141	404 Permit	200 days	*200 days*	0%	Tue 12/23/14	Mon 9/28/15	125,133FF+40 days,134FF+40 days,142FF,167SS+40 days
142	401 Water Quality Certification	120 days	*120 days*	0%	Tue 2/17/15	Mon 8/3/15	125,133FF+40 days,134FF+40 days,167,177,165
143	Air Pollution Control Dist Permit to Construct	80 days	*80 days*	0%	Tue 12/23/14	Mon 4/13/15	167SS+40 days
144	County of Stanislaus Encroachment Permit	80 days	*80 days*	0%	Tue 12/23/14	Mon 4/13/15	167SS+40 days
145	Caltrans Encroachment Permit	120 days	*120 days*	0%	Tue 12/23/14	Mon 6/8/15	167SS+40 days
146	RWQCB NOI - Low-Threat Discharge Order	180 days	*180 days*	0%	Tue 12/23/14	Mon 8/31/15	167SS+40 days
147	DFG Streambed Alteration Agreement	180 days	*180 days*	0%	Tue 12/23/14	Mon 8/31/15	167SS+40 days
148	DFG Incidental Take Permit	180 days	*180 days*	0%	Tue 12/23/14	Mon 8/31/15	167SS+40 days
149	**Easements and Rights of Ways**	**401 days**	*356.44 days*	**11%**	**Mon 3/17/14**	**Mon 9/28/15**	
150	**Environmental Survey Access**	**60 days**	*0 days*	**100%**	**Mon 3/17/14**	**Fri 6/6/14**	
151	Acquire Access Agreements	60 days	*0 days*	100%	Mon 3/17/14	Fri 6/6/14	4
152	**Pipelines**	**200 days**	*200 days*	**0%**	**Tue 12/23/14**	**Mon 9/28/15**	
153	Identify Parcels- Pipelines	20 days	*20 days*	0%	Tue 12/23/14	Mon 1/19/15	167SS+40 days
154	Acquire Easements and Rights of Ways- Pipelines	180 days	*180 days*	0%	Tue 1/20/15	Mon 9/28/15	153
155	**Pump stations**	**140 days**	*140 days*	**0%**	**Tue 12/23/14**	**Mon 7/6/15**	
156	Identify Parcels- PS	20 days	*20 days*	0%	Tue 12/23/14	Mon 1/19/15	177SS+40 days
157	Acquire Easements and Rights of Ways- PS	120 days	*120 days*	0%	Tue 1/20/15	Mon 7/6/15	156
158	**River Crossing**	**140 days**	*140 days*	**0%**	**Tue 1/20/15**	**Mon 8/3/15**	**156**
159	Identify Parcels- River Crossing	20 days	*20 days*	0%	Tue 1/20/15	Mon 2/16/15	187SS+30 days
160	Acquire Easements and Rights of Ways- River Crossing	120 days	*120 days*	0%	Tue 2/17/15	Mon 8/3/15	159
161	**Design**	**614 days**	*562.29 days*	**8%**	**Wed 1/15/14**	**Mon 5/23/16**	
162	**Facilities Planning**	**180 days**	*68 days*	**62%**	**Wed 1/15/14**	**Tue 9/23/14**	
163	Develop Draft Facility Plan	140 days	*28 days*	**80%**	Wed 1/15/14	Tue 7/29/14	
164	Review Draft Facility Plan	20 days	*20 days*	**0%**	Wed 7/30/14	Tue 8/26/14	163
165	Finalize Facility Plan	20 days	*20 days*	**0%**	Wed 8/27/14	Tue 9/23/14	164
166	**Pipelines**	**410 days**	*410 days*	**0%**	**Tue 10/28/14**	**Mon 5/23/16**	
167	30% Design- Pipeline Field Investigations, Mapping, Utility Coordina	80 days	*80 days*	0%	Tue 10/28/14	Mon 2/16/15	6
168	Prepare and review preliminary design report	60 days	*60 days*	0%	Tue 12/23/14	Mon 3/16/15	167FF+20 days
169	60% Design- Pipeline	80 days	*80 days*	0%	Tue 3/17/15	Mon 7/6/15	168
170	60% Design review workshops	20 days	*20 days*	0%	Tue 7/7/15	Mon 8/3/15	169
171	90% Design- Pipeline	30 days	*30 days*	0%	Tue 8/4/15	Mon 9/14/15	170
172	90% Design review workshops	20 days	*20 days*	0%	Tue 9/15/15	Mon 10/12/15	171
173	Final Design Documents- Pipeline	30 days	*30 days*	0%	Tue 10/13/15	Mon 11/23/15	172
174	Bid Period- Pipeline	40 days	*40 days*	0%	Tue 3/1/16	Mon 4/25/16	173,141,143,144,145,146,148,160,139,50,77
175	Construction Contract Approval- Pipeline	20 days	*20 days*	0%	Tue 4/26/16	Mon 5/23/16	174
176	**Pump stations**	**410 days**	*410 days*	**0%**	**Tue 10/28/14**	**Mon 5/23/16**	
186	**River Crossing**	**410 days**	*410 days*	**0%**	**Tue 10/28/14**	**Mon 5/23/16**	
196	**Construction**	**440 days**	*440 days*	**0%**	**Tue 5/24/16**	**Mon 1/29/18**	
197	**Pipelines**	**440 days**	*440 days*	**0%**	**Tue 5/24/16**	**Mon 1/29/18**	
198	Mobilization - Pipelines	30 days	*30 days*	0%	Tue 5/24/16	Mon 7/4/16	112,175,58,56
199	Pipeline Submittals and Lay Drawings	120 days	*120 days*	0%	Tue 7/5/16	Mon 12/19/16	198
200	Pipeline Fabrication (first delivery of pipe to site)	90 days	*90 days*	0%	Tue 10/25/16	Mon 2/27/17	199SS+80 days
201	Construction - Pipelines (2 headings @175ft/day)	200 days	*200 days*	0%	Tue 2/28/17	Mon 12/4/17	200
202	Testing/Startup - Pipelines	40 days	*40 days*	0%	Tue 12/5/17	Mon 1/29/18	201
203	**Pump station**	**360 days**	*360 days*	**0%**	**Tue 5/24/16**	**Mon 10/9/17**	
204	Mobilization	20 days	*20 days*	0%	Tue 5/24/16	Mon 6/20/16	185,112,58,56
205	Equipment Submittals	120 days	*120 days*	0%	Tue 6/21/16	Mon 12/5/16	204
206	Pump Station Structure and Building Construction	120 days	*120 days*	0%	Tue 8/16/16	Mon 1/30/17	205SS+40 days
207	Equipment Fabrication	180 days	*180 days*	0%	Tue 8/16/16	Mon 4/24/17	205SS+40 days
208	Equipment Installation	120 days	*120 days*	0%	Tue 2/28/17	Mon 8/14/17	207FS-40 days
209	Final Close Out	40 days	*40 days*	0%	Tue 8/15/17	Mon 10/9/17	208,206
210	**River Crossing**	**360 days**	*360 days*	**0%**	**Tue 5/24/16**	**Mon 10/9/17**	
211	Mobilization - River Crossing	80 days	*80 days*	0%	Tue 5/24/16	Mon 9/12/16	195,112,58,56
212	Construction - River Crossing	240 days	*240 days*	0%	Tue 9/13/16	Mon 8/14/17	211
213	Testing/Startup - River Crossing	40 days	*40 days*	0%	Tue 8/15/17	Mon 10/9/17	212

North Valley Regional Recycled Water Program- Project Schedule: Design-Bid-Build (CEQA First)

ID	Task Name	Duration	Remaining Duration	% Complete	Start	Finish	Predecessors
1	**NVRRWP- Implementation Schedule**	**1330 days**	*1068.39 days*	**20%**	**Wed 5/1/13**	**Tue 6/5/18**	
2	**Project Phase Authorization**	**910 days**	*866.67 days*	**5%**	**Wed 5/1/13**	**Tue 10/25/16**	
3	Phase 2	0 days	*0 days*	100%	Wed 5/1/13	Wed 5/1/13	
4	**Phase 3**	**1 day**	*0 days*	**100%**	**Tue 1/14/14**	**Tue 1/14/14**	
5	**Pase 3 Kick off Meeting**	**1 day**	*0 days*	**100%**	**Tue 1/14/14**	**Tue 1/14/14**	
6	Phase 4	20 days	*20 days*	0%	Wed 5/13/15	Tue 6/9/15	25,165,109FF+10 days
7	Phase 5	0 days	*0 days*	0%	Tue 10/25/16	Tue 10/25/16	175,185,195
8	**Feasibility Study**	**446 days**	*156 days*	**65%**	**Wed 5/1/13**	**Wed 1/14/15**	
9	Prepare Draft Feasibility Study (FS)	106 days	*0 days*	100%	Wed 5/1/13	Wed 9/25/13	3
10	Review Draft FS	20 days	*0 days*	100%	Thu 9/26/13	Wed 10/23/13	9
11	Prepare updated draft FS	10 days	*0 days*	100%	Thu 10/24/13	Wed 11/6/13	10
12	Client Review of FS	40 days	*0 days*	100%	Thu 11/7/13	Wed 1/1/14	11
13	Incorporate Comments	10 days	*0 days*	100%	Thu 1/2/14	Wed 1/15/14	12
14	USBR FS Review	260 days	*156 days*	40%	Thu 1/16/14	Wed 1/14/15	13
15	**Outreach**	**801 days**	*536.67 days*	**33%**	**Tue 6/11/13**	**Tue 7/5/16**	
16	DPWD Customers	800 days	*536 days*	33%	Tue 6/11/13	Tue 7/5/16	183FF,173FF
17	DMC Customers and Agencies	800 days	*536 days*	33%	Tue 6/11/13	Tue 7/5/16	183FF,173FF
18	**Governance**	**175 days**	*50.81 days*	**71%**	**Tue 1/14/14**	**Mon 9/15/14**	
19	**MOU**	**35 days**	*0 days*	**100%**	**Tue 1/14/14**	**Mon 3/3/14**	
20	Facilitated Meetings	35 days	*0 days*	100%	Tue 1/14/14	Mon 3/3/14	4SS
21	Agreement on Existing MOU	35 days	*0 days*	100%	Tue 1/14/14	Mon 3/3/14	20SS
22	**JPA**	**140 days**	*52.5 days*	**63%**	**Tue 3/4/14**	**Mon 9/15/14**	
23	Facilitated Meetings	100 days	*25 days*	75%	Tue 3/4/14	Mon 7/21/14	21
24	Develop Draft Governance Documents	100 days	*25 days*	75%	Tue 3/4/14	Mon 7/21/14	23SS
25	Review of Governance Documents	20 days	*20 days*	0%	Tue 7/22/14	Mon 8/18/14	24
26	Approval of Governance Documents	20 days	*20 days*	0%	Tue 8/19/14	Mon 9/15/14	25
27	**Water Rights**	**685 days**	*561.94 days*	**18%**	**Wed 1/15/14**	**Tue 8/30/16**	
28	**Turlock**	**434 days**	*322 days*	**26%**	**Wed 1/15/14**	**Mon 9/14/15**	
29	**Wastewater Change Petition**	**434 days**	*322 days*	**26%**	**Wed 1/15/14**	**Mon 9/14/15**	
30	Verification of Water Rights Approach	40 days	*0 days*	100%	Wed 1/15/14	Tue 3/11/14	5
31	Complete Petition for Change and Environmental Forms	160 days	*88 days*	45%	Wed 3/12/14	Tue 10/21/14	30
32	Review Draft Forms	20 days	*20 days*	0%	Wed 10/22/14	Tue 11/18/14	31
33	Finalize and Submit Forms to SWRCB	10 days	*10 days*	0%	Wed 11/19/14	Tue 12/2/14	32
34	SWRCB issues public notice petition	60 days	*60 days*	0%	Wed 12/3/14	Tue 2/24/15	33
35	Public Review Period	24 days	*24 days*	0%	Wed 2/25/15	Mon 3/30/15	34
36	Public Notice of Petition Hearing	0 days	*0 days*	0%	Mon 3/30/15	Mon 3/30/15	35
37	SWRCB Issues Order Approving Change	120 days	*120 days*	0%	Tue 3/31/15	Mon 9/14/15	36,109FF+40 days
38	**Modesto**	**494 days**	*384 days*	**22%**	**Wed 1/15/14**	**Mon 12/7/15**	
39	**Wastewater Change Petition**	**494 days**	*384 days*	**22%**	**Wed 1/15/14**	**Mon 12/7/15**	
40	Verification of Water Rights Approach	40 days	*0 days*	100%	Wed 1/15/14	Tue 3/11/14	5
41	Complete Petition for Change and Environmental Forms	100 days	*30 days*	70%	Wed 3/12/14	Tue 7/29/14	40
42	Review Draft Forms	20 days	*20 days*	0%	Wed 7/30/14	Tue 8/26/14	41
43	Finalize and Submit Forms to SWRCB	10 days	*10 days*	0%	Wed 8/27/14	Tue 9/9/14	42
44	SWRCB issues public notice petition	60 days	*60 days*	0%	Wed 9/10/14	Tue 12/2/14	43
45	Public Review Period	24 days	*24 days*	0%	Wed 12/3/14	Mon 1/5/15	44
46	Public Notice of Petition Hearing	120 days	*120 days*	0%	Tue 1/6/15	Mon 6/22/15	45
47	SWRCB Issues Order Approving Change	120 days	*120 days*	0%	Tue 6/23/15	Mon 12/7/15	46,109FF+40 days
48	**Del Puerto**	**554 days**	*401.65 days*	**28%**	**Wed 1/15/14**	**Mon 2/29/16**	
49	Discussions with Reclamation	200 days	*90 days*	55%	Wed 1/15/14	Tue 10/21/14	4
50	Exchange Agreement or Warren Act Contract (Full Project)	200 days	*200 days*	0%	Tue 5/26/15	Mon 2/29/16	109FF+40 days,37FF+40 days,47FF+60 days
51	**Reclamation Approval**	**505 days**	**505 days**	**0%**	**Wed 9/24/14**	**Tue 8/30/16**	
52	**License agreement with Reclamation**	**505 days**	**505 days**	**0%**	**Wed 9/24/14**	**Tue 8/30/16**	
53	Submit Application	20 days	*20 days*	0%	Wed 3/11/15	Tue 4/7/15	54
54	Reclamation Conceptual Design Review	120 days	*120 days*	0%	Wed 9/24/14	Tue 3/10/15	165
55	Reclamation Final Design Review	40 days	40 days	0%	Wed 6/8/16	Tue 8/2/16	173FF+20 days,54
56	License agreement terms negotiations	300 days	300 days	0%	Wed 7/8/15	Tue 8/30/16	55FF+20 days
57	EIR/EIS	0 days	0 days	0%	Tue 6/23/15	Tue 6/23/15	112
58	Approval for RW in DMC	40 days	40 days	0%	Tue 2/2/16	Mon 3/28/16	50FF+20 days
59	**Funding**	**373 days**	*368.82 days*	**1%**	**Mon 6/9/14**	**Wed 11/11/15**	
60	**Financing Plan**	**60 days**	*60 days*	**0%**	**Tue 9/16/14**	**Mon 12/8/14**	
61	Develop Financing Plan	60 days	*60 days*	0%	Tue 9/16/14	Mon 12/8/14	26
62	**Bridge Financing**	**180 days**	*180 days*	**0%**	**Tue 11/25/14**	**Mon 8/3/15**	
69	**SRF**	**302 days**	*302 days*	**0%**	**Tue 9/16/14**	**Wed 11/11/15**	
70	**Prepare and Submit SRF Application Packages**	**82 days**	*82 days*	**0%**	**Tue 9/16/14**	**Wed 1/7/15**	
71	General Information	20 days	*20 days*	0%	Tue 9/16/14	Mon 10/13/14	26
72	Technical Package	40 days	*40 days*	0%	Tue 9/16/14	Mon 11/10/14	71SS
73	Environmental Package	40 days	*40 days*	0%	Thu 11/13/14	Wed 1/7/15	102FF
74	Financial Security Package	60 days	*60 days*	0%	Tue 9/16/14	Mon 12/8/14	71SS
75	Adopt SRF Resolutions	40 days	*40 days*	0%	Thu 1/8/15	Wed 3/4/15	71,72,73,74
76	SRF Review	60 days	*60 days*	0%	Thu 3/5/15	Wed 5/27/15	75
77	Approval of SRF Agreement	120 days	*120 days*	0%	Thu 5/28/15	Wed 11/11/15	76,109FF+40 days
78	**Prop 84**	**151 days**	*134.52 days*	**11%**	**Mon 6/9/14**	**Mon 1/5/15**	
79	Coordinate with IRWM on Application	31 days	*23.25 days*	25%	Mon 6/9/14	Mon 7/21/14	
80	Final Awards Announced	40 days	*40 days*	0%	Tue 11/11/14	Mon 1/5/15	79FS+80 days
81	**Environmental Documentation**	**375 days**	*270.09 days*	**28%**	**Wed 1/15/14**	**Tue 6/23/15**	
82	**EIR/EIS**	**375 days**	*229.69 days*	**39%**	**Wed 1/15/14**	**Tue 6/23/15**	
83	Develop CEQA/NEPA Strategy	20 days	*0 days*	100%	Wed 1/15/14	Tue 2/11/14	10,4
84	**NOI**	**60 days**	*0 days*	**100%**	**Wed 1/15/14**	**Tue 4/8/14**	
85	Draft NOI	10 days	*0 days*	100%	Wed 1/15/14	Tue 1/28/14	83SS
86	USBR Local Review	5 days	*0 days*	100%	Wed 1/29/14	Tue 2/4/14	85
87	Final NOI	5 days	*0 days*	100%	Wed 2/5/14	Tue 2/11/14	86
88	USBR NOI Publication Process	40 days	*0 days*	100%	Wed 2/12/14	Tue 4/8/14	87
89	**NOP**	**35 days**	*0 days*	**100%**	**Wed 2/12/14**	**Tue 4/1/14**	
90	Project Description/NOP	10 days	*0 days*	100%	Wed 2/12/14	Tue 2/25/14	88SS
91	Partner Review	10 days	*0 days*	100%	Wed 2/26/14	Tue 3/11/14	90
92	Screen Check NOP	10 days	*0 days*	100%	Wed 3/12/14	Tue 3/25/14	91
93	Partner Review	5 days	*0 days*	100%	Wed 3/26/14	Tue 4/1/14	92
94	Publish NOI and NOP	1 day	*0 days*	100%	Wed 4/9/14	Wed 4/9/14	88,93
95	NOI/NOP Review Period (scoping)	20 days	*0 days*	100%	Thu 4/10/14	Wed 5/7/14	94
96	Scoping Meeting	8 days	*0 days*	100%	Thu 4/10/14	Mon 4/21/14	95SS
97	Scoping Report	10 days	*0 days*	100%	Tue 4/22/14	Mon 5/5/14	96
98	Prepare Administrative Draft EIR/EIS	80 days	*48 days*	40%	Tue 5/6/14	Mon 8/25/14	97
99	Review Admin Draft EIR/EIS	32 days	*32 days*	0%	Tue 8/26/14	Wed 10/8/14	98
100	Prepare Screen check Draft EIR/EIS	20 days	*20 days*	0%	Thu 10/9/14	Wed 11/5/14	99
101	Review Screen check Draft EIR/EIS	30 days	*30 days*	0%	Thu 11/6/14	Wed 12/17/14	100
102	Public Draft EIR/EIS	15 days	*15 days*	0%	Thu 12/18/14	Wed 1/7/15	101
103	Publish NOA for DEIS	15 days	*15 days*	0%	Thu 12/18/14	Wed 1/7/15	102SS
104	Public Review of Draft EIS	34 days	*34 days*	0%	Thu 1/8/15	Tue 2/24/15	103
105	Prepare Draft Response to Comments (RTC)	20 days	*20 days*	0%	Wed 2/25/15	Tue 3/24/15	104
106	Review RTC	10 days	*10 days*	0%	Wed 3/25/15	Tue 4/7/15	105
107	Screen check RTC	10 days	*10 days*	0%	Wed 4/8/15	Tue 4/21/15	106
108	Review Screen check RTC	10 days	*10 days*	0%	Wed 4/22/15	Tue 5/5/15	107
109	Final EIR/EIS Published	15 days	*15 days*	0%	Wed 5/6/15	Tue 5/26/15	108
110	Publish Federal Register NOA for FEIS	15 days	*15 days*	0%	Wed 5/6/15	Tue 5/26/15	109SS
111	FEIR Certified	5 days	*5 days*	0%	Wed 5/27/15	Tue 6/2/15	110
112	Record of Decision	15 days	*15 days*	0%	Wed 6/3/15	Tue 6/23/15	111
113	**Environmental Surveys**	**105 days**	*70.32 days*	**33%**	**Tue 5/6/14**	**Mon 9/29/14**	
114	**Biological Surveys**	**105 days**	*72 days*	**31%**	**Tue 5/6/14**	**Mon 9/29/14**	
115	Perform Biological Surveys	30 days	*0 days*	100%	Tue 5/6/14	Mon 6/16/14	98SS,151SS+21 days
116	Prepare Draft Biological Assessment (BA)	40 days	*37 days*	8%	Tue 6/17/14	Mon 8/11/14	115
117	Review Draft BA	20 days	*20 days*	0%	Tue 8/12/14	Mon 9/8/14	116
118	Prepare Final BA	15 days	*15 days*	0%	Tue 9/9/14	Mon 9/29/14	117
119	Submit Final BA to USBR	0 days	*0 days*	0%	Mon 9/29/14	Mon 9/29/14	118
120	**Wetlands Surveys**	**105 days**	*73.25 days*	**30%**	**Tue 5/6/14**	**Mon 9/29/14**	
121	Perform Wetland Surveys	30 days	*0 days*	100%	Tue 5/6/14	Mon 6/16/14	115SS
122	Prepare Draft Wetlands Delineation (WD)	40 days	*38.25 days*	4%	Tue 6/17/14	Mon 8/11/14	121
123	Review WD	20 days	*20 days*	0%	Tue 8/12/14	Mon 9/8/14	122
124	Prepare Final WD	15 days	*15 days*	0%	Tue 9/9/14	Mon 9/29/14	123
125	Submit Final WD to Corps	0 days	*0 days*	0%	Mon 9/29/14	Mon 9/29/14	124
126	**Cultural Surveys**	**95 days**	*59 days*	**38%**	**Tue 5/6/14**	**Mon 9/15/14**	
127	Perform Cultural Surveys	40 days	*4 days*	90%	Tue 5/6/14	Mon 6/30/14	115SS
128	Prepare Draft Cultural Resources Report (CRR)	20 days	*20 days*	0%	Tue 7/1/14	Mon 7/28/14	127
129	Review CRR	20 days	*20 days*	0%	Tue 7/29/14	Mon 8/25/14	128
130	Prepare Final CRR	15 days	*15 days*	0%	Tue 8/26/14	Mon 9/15/14	129
131	Submit Final CRR to USBR	0 days	*0 days*	0%	Mon 9/15/14	Mon 9/15/14	130
132	**Environmental Coordination**	**124 days**	*124 days*	**0%**	**Wed 9/24/14**	**Mon 3/16/15**	
133	Section 7 Consultation / Biological Opinion	120 days	*120 days*	0%	Tue 9/30/14	Mon 3/16/15	119,165
134	Section 106 Compliance	120 days	*120 days*	0%	Wed 9/24/14	Tue 3/10/15	131,165
135	**Regulatory & Permitting**	**790 days**	*642.19 days*	**19%**	**Wed 5/1/13**	**Tue 5/10/16**	
136	**NPDES/WDR for Discharge to DMC**	**600 days**	*310 days*	48%	**Wed 5/1/13**	**Tue 8/18/15**	
137	Preliminary Coordination with RWQCB	400 days	*100 days*	75%	Wed 5/1/13	Tue 11/11/14	3
138	Prepare ROWD	120 days	*72 days*	40%	Wed 4/9/14	Tue 9/23/14	4FS+60 days
139	RWQCB Approval	200 days	*200 days*	0%	Wed 11/12/14	Tue 8/18/15	138,109FF+60 days
140	**Permitting**	**200 days**	*200 days*	**0%**	**Wed 8/5/15**	**Tue 5/10/16**	
141	404 Permit	200 days	*200 days*	0%	Wed 8/5/15	Tue 5/10/16	125,133FF+40 days,134FF+40 days,142FF,167SS+40 days
142	401 Water Quality Certification	120 days	*120 days*	0%	Wed 9/30/15	Tue 3/15/16	125,133FF+40 days,134FF+40 days,167,177,165
143	Air Pollution Control Dist Permit to Construct	80 days	*80 days*	0%	Wed 8/5/15	Tue 11/24/15	167SS+40 days
144	County of Stanislaus Encroachment Permit	80 days	*80 days*	0%	Wed 8/5/15	Tue 11/24/15	167SS+40 days
145	Caltrans Encroachment Permit	120 days	*120 days*	0%	Wed 8/5/15	Tue 1/19/16	167SS+40 days
146	RWQCB NOI - Low-Threat Discharge Order	180 days	*180 days*	0%	Wed 8/5/15	Tue 4/12/16	167SS+40 days
147	DFG Streambed Alteration Agreement	180 days	*180 days*	0%	Wed 8/5/15	Tue 4/12/16	167SS+40 days
148	DFG Incidental Take Permit	180 days	*180 days*	0%	Wed 8/5/15	Tue 4/12/16	167SS+40 days
149	**Easements and Rights of Ways**	**562 days**	*499.56 days*	**11%**	**Mon 3/17/14**	**Tue 5/10/16**	
150	**Environmental Survey Access**	**60 days**	*0 days*	**100%**	**Mon 3/17/14**	**Fri 6/6/14**	
151	Acquire Access Agreements	60 days	*0 days*	100%	Mon 3/17/14	Fri 6/6/14	4
152	**Pipelines**	**200 days**	*200 days*	**0%**	**Wed 8/5/15**	**Tue 5/10/16**	
153	Identify Parcels- Pipelines	20 days	*20 days*	0%	Wed 8/5/15	Tue 9/1/15	167SS+40 days
154	Acquire Easements and Rights of Ways- Pipelines	180 days	*180 days*	0%	Wed 9/2/15	Tue 5/10/16	153
155	**Pump stations**	**140 days**	*140 days*	**0%**	**Wed 8/5/15**	**Tue 2/16/16**	
156	Identify Parcels- PS	20 days	*20 days*	0%	Wed 8/5/15	Tue 9/1/15	177SS+40 days
157	Acquire Easements and Rights of Ways- PS	120 days	*120 days*	0%	Wed 9/2/15	Tue 2/16/16	156
158	**River Crossing**	**140 days**	*140 days*	**0%**	**Wed 9/2/15**	**Tue 3/15/16**	**156**
159	Identify Parcels- River Crossing	20 days	*20 days*	0%	Wed 9/2/15	Tue 9/29/15	187SS+30 days
160	Acquire Easements and Rights of Ways- River Crossing	120 days	*120 days*	0%	Wed 9/30/15	Tue 3/15/16	159
161	**Design**	**725 days**	*663.95 days*	**8%**	**Wed 1/15/14**	**Tue 10/25/16**	
162	**Facilities Planning**	**180 days**	*68 days*	**62%**	**Wed 1/15/14**	**Tue 9/23/14**	
163	Develop Draft Facility Plan	140 days	*28 days*	**80%**	Wed 1/15/14	Tue 7/29/14	
164	Review Draft Facility Plan	20 days	*20 days*	**0%**	Wed 7/30/14	Tue 8/26/14	163
165	Finalize Facility Plan	20 days	*20 days*	**0%**	Wed 8/27/14	Tue 9/23/14	164
166	**Pipelines**	**340 days**	*340 days*	**0%**	**Wed 6/10/15**	**Tue 9/27/16**	
167	30% Design- Pipeline Field Investigations, Mapping, Utility Coordina	80 days	*80 days*	0%	Wed 6/10/15	Tue 9/29/15	6
168	Prepare and review preliminary design report	60 days	*60 days*	0%	Wed 8/5/15	Tue 10/27/15	167FF+20 days
169	60% Design- Pipeline	80 days	*80 days*	0%	Wed 10/28/15	Tue 2/16/16	168
170	60% Design review workshops	20 days	*20 days*	0%	Wed 2/17/16	Tue 3/15/16	169
171	90% Design- Pipeline	30 days	*30 days*	0%	Wed 3/16/16	Tue 4/26/16	170
172	90% Design review workshops	20 days	*20 days*	0%	Wed 4/27/16	Tue 5/24/16	171
173	Final Design Documents- Pipeline	30 days	*30 days*	0%	Wed 5/25/16	Tue 7/5/16	172
174	Bid Period- Pipeline	40 days	*40 days*	0%	Wed 7/6/16	Tue 8/30/16	173,141,143,144,145,146,148,160,139,50,77,58
175	Construction Contract Approval- Pipeline	20 days	*20 days*	0%	Wed 8/31/16	Tue 9/27/16	174
176	**Pump stations**	**330 days**	*330 days*	**0%**	**Wed 6/10/15**	**Tue 9/13/16**	
177	30% Design- PS Field Investigations, Utility Coordination	60 days	*60 days*	0%	Wed 6/10/15	Tue 9/1/15	6
178	Prepare and review preliminary design report	60 days	*60 days*	0%	Wed 7/8/15	Tue 9/29/15	177FF+20 days
179	60% Design- PS	80 days	*80 days*	0%	Wed 9/30/15	Tue 1/19/16	178
180	60% Design review workshops	20 days	*20 days*	0%	Wed 1/20/16	Tue 2/16/16	179
181	90% Design- PS	40 days	*40 days*	0%	Wed 2/17/16	Tue 4/12/16	180
182	90% Design review workshops	20 days	*20 days*	0%	Wed 4/13/16	Tue 5/10/16	181
183	Final Design Documents- PS	30 days	*30 days*	0%	Wed 5/11/16	Tue 6/21/16	182
184	Bid Period- PS	40 days	*40 days*	0%	Wed 6/22/16	Tue 8/16/16	183,141,143,144,145,146,148,160,139,50,77,58
185	PS Construction Contract Approval- PS	20 days	*20 days*	0%	Wed 8/17/16	Tue 9/13/16	184
186	**River Crossing**	**360 days**	*360 days*	**0%**	**Wed 6/10/15**	**Tue 10/25/16**	
187	30% Design- River Crossing, Field Investigations, Mapping	90 days	*90 days*	0%	Wed 6/10/15	Tue 10/13/15	6
188	Prepare and review preliminary design report	60 days	*60 days*	0%	Wed 8/19/15	Tue 11/10/15	187FF+20 days
189	60% Design- River Crossing	80 days	*80 days*	0%	Wed 11/11/15	Tue 3/1/16	188
190	60% Design review workshops	20 days	*20 days*	0%	Wed 3/2/16	Tue 3/29/16	189
191	90% Design- River Crossing	30 days	*30 days*	0%	Wed 3/30/16	Tue 5/10/16	190
192	90% Design review workshops	20 days	*20 days*	0%	Wed 5/11/16	Tue 6/7/16	191
193	Final Design Documents- River Crossing	40 days	*40 days*	0%	Wed 6/8/16	Tue 8/2/16	192
194	Bid Period- River Crossing	40 days	*40 days*	0%	Wed 8/3/16	Tue 9/27/16	191,143,144,145,146,147,148,160,139,50,77,193,58
195	Construction Contract Approval- River Crossing	20 days	*20 days*	0%	Wed 9/28/16	Tue 10/25/16	194
196	**Construction**	**450 days**	*450 days*	**0%**	**Wed 9/14/16**	**Tue 6/5/18**	
197	**Pipelines**	**440 days**	*440 days*	**0%**	**Wed 9/28/16**	**Tue 6/5/18**	
198	Mobilization - Pipelines	30 days	*30 days*	0%	Wed 9/28/16	Tue 11/8/16	112,175,56
199	Pipeline Submittals and Lay Drawings	120 days	*120 days*	0%	Wed 11/9/16	Tue 4/25/17	198
200	Pipeline Fabrication (first delivery of pipe to site)	90 days	*90 days*	0%	Wed 3/1/17	Tue 7/4/17	199SS+80 days
201	Construction - Pipelines (2 headings @175ft/day)	200 days	*200 days*	0%	Wed 7/5/17	Tue 4/10/18	200
202	Testing/Startup - Pipelines	40 days	*40 days*	0%	Wed 4/11/18	Tue 6/5/18	201
203	**Pump station**	**360 days**	*360 days*	**0%**	**Wed 9/14/16**	**Tue 1/30/18**	
204	Mobilization	20 days	*20 days*	0%	Wed 9/14/16	Tue 10/11/16	185,112,56
205	Equipment Submittals	120 days	*120 days*	0%	Wed 10/12/16	Tue 3/28/17	204
206	Pump Station Structure and Building Construction	120 days	*120 days*	0%	Wed 12/7/16	Tue 5/23/17	205SS+40 days
207	Equipment Fabrication	180 days	*180 days*	0%	Wed 12/7/16	Tue 8/15/17	205SS+40 days
208	Equipment Installation	120 days	*120 days*	0%	Wed 6/21/17	Tue 12/5/17	207FS-40 days
209	Final Close Out	40 days	*40 days*	0%	Wed 12/6/17	Tue 1/30/18	208,206
210	**River Crossing**	**360 days**	*360 days*	**0%**	**Wed 10/26/16**	**Tue 3/13/18**	
211	Mobilization - River Crossing	80 days	*80 days*	0%	Wed 10/26/16	Tue 2/14/17	195,112,56
212	Construction - River Crossing	240 days	*240 days*	0%	Wed 2/15/17	Tue 1/16/18	211
213	Testing/Startup - River Crossing	40 days	*40 days*	0%	Wed 1/17/18	Tue 3/13/18	212

North Valley Regional Recycled Water Program- Project Schedule- Progressive Design Build

ID	Task Name	Duration	Remaining Duration	% Complete	Start	Finish	Predecessors
1	**NVRRWP- Implementation Schedule**	**1169 days**	*938.02 days*	**20%**	**Wed 5/1/13**	**Mon 10/23/17**	
2	**Project Phase Authorization**	**769 days**	*732.38 days*	**5%**	**Wed 5/1/13**	**Mon 4/11/16**	
3	Phase 2	0 days	*0 days*	100%	Wed 5/1/13	Wed 5/1/13	
4	**Phase 3**	**1 day**	*0 days*	**100%**	**Tue 1/14/14**	**Tue 1/14/14**	
5	**Pase 3 Kick off Meeting**	**1 day**	*0 days*	**100%**	**Tue 1/14/14**	**Tue 1/14/14**	
6	Phase 4	20 days	*20 days*	0%	Wed 9/24/14	Tue 10/21/14	25,165,26
7	Phase 5	0 days	*0 days*	0%	Mon 4/11/16	Mon 4/11/16	182,190,198
8	**Feasibility Study**	**446 days**	*156 days*	**65%**	**Wed 5/1/13**	**Wed 1/14/15**	
9	Prepare Draft Feasibility Study (FS)	106 days	*0 days*	100%	Wed 5/1/13	Wed 9/25/13	3
10	Review Draft FS	20 days	*0 days*	100%	Thu 9/26/13	Wed 10/23/13	9
11	Prepare updated draft FS	10 days	*0 days*	100%	Thu 10/24/13	Wed 11/6/13	10
12	Client Review of FS	40 days	*0 days*	100%	Thu 11/7/13	Wed 1/1/14	11
13	Incorporate Comments	10 days	*0 days*	100%	Thu 1/2/14	Wed 1/15/14	12
14	USBR FS Review	260 days	*156 days*	40%	Thu 1/16/14	Wed 1/14/15	13
15	**Outreach**	**800 days**	*536 days*	**33%**	**Tue 6/11/13**	**Mon 7/4/16**	
16	DPWD Customers	800 days	*536 days*	33%	Tue 6/11/13	Mon 7/4/16	
17	DMC Customers and Agencies	800 days	*536 days*	33%	Tue 6/11/13	Mon 7/4/16	
18	**Governance**	**175 days**	*50.81 days*	**71%**	**Tue 1/14/14**	**Mon 9/15/14**	
19	**MOU**	**35 days**	*0 days*	**100%**	**Tue 1/14/14**	**Mon 3/3/14**	
20	Facilitated Meetings	35 days	*0 days*	100%	Tue 1/14/14	Mon 3/3/14	4SS
21	Agreement on Existing MOU	35 days	*0 days*	100%	Tue 1/14/14	Mon 3/3/14	20SS
22	**JPA**	**140 days**	*52.5 days*	**63%**	**Tue 3/4/14**	**Mon 9/15/14**	
23	Facilitated Meetings	100 days	*25 days*	75%	Tue 3/4/14	Mon 7/21/14	21
24	Develop Draft Governance Documents	100 days	*25 days*	75%	Tue 3/4/14	Mon 7/21/14	23SS
25	Review of Governance Documents	20 days	*20 days*	0%	Tue 7/22/14	Mon 8/18/14	24
26	Approval of Governance Documents	20 days	*20 days*	0%	Tue 8/19/14	Mon 9/15/14	25
27	**Water Rights**	**574 days**	*473.06 days*	**18%**	**Wed 1/15/14**	**Mon 3/28/16**	
28	**Turlock**	**434 days**	*322 days*	**26%**	**Wed 1/15/14**	**Mon 9/14/15**	
29	**Wastewater Change Petition**	**434 days**	*322 days*	**26%**	**Wed 1/15/14**	**Mon 9/14/15**	
30	Verification of Water Rights Approach	40 days	*0 days*	100%	Wed 1/15/14	Tue 3/11/14	5
31	Complete Petition for Change and Environmental Forms	160 days	*88 days*	45%	Wed 3/12/14	Tue 10/21/14	30
32	Review Draft Forms	20 days	*20 days*	0%	Wed 10/22/14	Tue 11/18/14	31
33	Finalize and Submit Forms to SWRCB	10 days	*10 days*	0%	Wed 11/19/14	Tue 12/2/14	32
34	SWRCB issues public notice petition	60 days	*60 days*	0%	Wed 12/3/14	Tue 2/24/15	33
35	Public Review Period	24 days	*24 days*	0%	Wed 2/25/15	Mon 3/30/15	34
36	Public Notice of Petition Hearing	0 days	*0 days*	0%	Mon 3/30/15	Mon 3/30/15	35
37	SWRCB Issues Order Approving Change	120 days	*120 days*	0%	Tue 3/31/15	Mon 9/14/15	36,109FF+40 days
38	**Modesto**	**494 days**	*384 days*	**22%**	**Wed 1/15/14**	**Mon 12/7/15**	
39	**Wastewater Change Petition**	**494 days**	*384 days*	**22%**	**Wed 1/15/14**	**Mon 12/7/15**	
40	Verification of Water Rights Approach	40 days	*0 days*	100%	Wed 1/15/14	Tue 3/11/14	5
41	Complete Petition for Change and Environmental Forms	100 days	*30 days*	70%	Wed 3/12/14	Tue 7/29/14	40
42	Review Draft Forms	20 days	*20 days*	0%	Wed 7/30/14	Tue 8/26/14	41
43	Finalize and Submit Forms to SWRCB	10 days	*10 days*	0%	Wed 8/27/14	Tue 9/9/14	42
44	SWRCB issues public notice petition	60 days	*60 days*	0%	Wed 9/10/14	Tue 12/2/14	43
45	Public Review Period	24 days	*24 days*	0%	Wed 12/3/14	Mon 1/5/15	44
46	Public Notice of Petition Hearing	120 days	*120 days*	0%	Tue 1/6/15	Mon 6/22/15	45
47	SWRCB Issues Order Approving Change	120 days	*120 days*	0%	Tue 6/23/15	Mon 12/7/15	46,109FF+40 days
48	**Del Puerto**	**554 days**	*401.65 days*	**28%**	**Wed 1/15/14**	**Mon 2/29/16**	
49	Discussions with Reclamation	200 days	*90 days*	55%	Wed 1/15/14	Tue 10/21/14	4
50	Exchange Agreement or Warren Act Contract (Full Project)	200 days	*200 days*	0%	Tue 5/26/15	Mon 2/29/16	109FF+40 days,37FF+40 days,47FF+60 days,1
51	**Reclamation Approval**	**454 days**	**454 days**	**0%**	**Wed 7/2/14**	**Mon 3/28/16**	
52	**License agreeemnt with Reclamation**	**300 days**	**300 days**	**0%**	**Wed 7/2/14**	**Tue 8/25/15**	
53	Submit Application	20 days	*20 days*	0%	Wed 9/24/14	Tue 10/21/14	54SS
54	Reclamation Conceptional Design Review	120 days	*120 days*	0%	Wed 9/24/14	Tue 3/10/15	165
55	Reclamation Final Design Review	80 days	80 days	0%	Wed 3/11/15	Tue 6/30/15	54
56	License agreeemnt terms negotations	300 days	300 days	0%	Wed 7/2/14	Tue 8/25/15	55FF+40 days
57	EIR/EIS	0 days	0 days	0%	Tue 6/23/15	Tue 6/23/15	112
58	Approval for RW in DMC	40 days	40 days	0%	Tue 2/2/16	Mon 3/28/16	50FF+20 days
59	**Funding**	**373 days**	*368.82 days*	**1%**	**Mon 6/9/14**	**Wed 11/11/15**	
60	**Financing Plan**	**60 days**	*60 days*	**0%**	**Tue 9/16/14**	**Mon 12/8/14**	
61	Develop Financing Plan	60 days	*60 days*	0%	Tue 9/16/14	Mon 12/8/14	26
62	**Bridge Financing**	**180 days**	*180 days*	**0%**	**Tue 11/25/14**	**Mon 8/3/15**	
63	**SRF**	**302 days**	*302 days*	**0%**	**Tue 9/16/14**	**Wed 11/11/15**	
64	**Prepare and Submit SRF Application Packages**	**82 days**	*82 days*	**0%**	**Tue 9/16/14**	**Wed 1/7/15**	
65	General Information	20 days	*20 days*	0%	Tue 9/16/14	Mon 10/13/14	26
66	Technical Package	40 days	*40 days*	0%	Tue 9/16/14	Mon 11/10/14	71SS
67	Environmental Package	40 days	*40 days*	0%	Thu 11/13/14	Wed 1/7/15	102FF
68	Financial Security Package	60 days	*60 days*	0%	Tue 9/16/14	Mon 12/8/14	71SS
69	Adopt SRF Resolutions	40 days	*40 days*	0%	Thu 1/8/15	Wed 3/4/15	71,72,73,74
70	SRF Review	60 days	*60 days*	0%	Thu 3/5/15	Wed 5/27/15	75
71	Approval of SRF Agreement	120 days	*120 days*	0%	Thu 5/28/15	Wed 11/11/15	76,109FF+40 days
72	**Prop 84**	**151 days**	*134.52 days*	**11%**	**Mon 6/9/14**	**Mon 1/5/15**	
73	Coordinate with IRWM on Application	31 days	*23.25 days*	25%	Mon 6/9/14	Mon 7/21/14	
74	Final Awards Announced	40 days	*40 days*	0%	Tue 11/11/14	Mon 1/5/15	79FS+80 days
75	**Environmental Documentation**	**375 days**	*270.09 days*	**28%**	**Wed 1/15/14**	**Tue 6/23/15**	
76	**EIR/EIS**	**375 days**	*229.69 days*	**39%**	**Wed 1/15/14**	**Tue 6/23/15**	
77	Develop CEQA/NEPA Strategy	20 days	*0 days*	100%	Wed 1/15/14	Tue 2/11/14	10,4
78	**NOI**	**60 days**	*0 days*	**100%**	**Wed 1/15/14**	**Tue 4/8/14**	
79	Draft NOI	10 days	*0 days*	100%	Wed 1/15/14	Tue 1/28/14	83SS
80	USBR Local Review	5 days	*0 days*	100%	Wed 1/29/14	Tue 2/4/14	85
81	Final NOI	5 days	*0 days*	100%	Wed 2/5/14	Tue 2/11/14	86
82	USBR NOI Publication Process	40 days	*0 days*	100%	Wed 2/12/14	Tue 4/8/14	87
83	**NOP**	**35 days**	*0 days*	**100%**	**Wed 2/12/14**	**Tue 4/1/14**	
84	Project Description/NOP	10 days	*0 days*	100%	Wed 2/12/14	Tue 2/25/14	88SS
85	Partner Review	10 days	*0 days*	100%	Wed 2/26/14	Tue 3/11/14	90
86	Screen Check NOP	10 days	*0 days*	100%	Wed 3/12/14	Tue 3/25/14	91
87	Partner Review	5 days	*0 days*	100%	Wed 3/26/14	Tue 4/1/14	92
88	Publish NOI and NOP	1 day	*0 days*	100%	Wed 4/9/14	Wed 4/9/14	88,93
89	NOI/NOP Review Period (scoping)	20 days	*0 days*	100%	Thu 4/10/14	Wed 5/7/14	94
90	Scoping Meeting	8 days	*0 days*	100%	Thu 4/10/14	Mon 4/21/14	95SS
91	Scoping Report	10 days	*0 days*	100%	Tue 4/22/14	Mon 5/5/14	96
92	Prepare Administrative Draft EIR/EIS	80 days	*48 days*	40%	Tue 5/6/14	Mon 8/25/14	97
93	Review Admin Draft EIR/EIS	32 days	*32 days*	0%	Tue 8/26/14	Wed 10/8/14	98
94	Prepare Screen check Draft EIR/EIS	20 days	*20 days*	0%	Thu 10/9/14	Wed 11/5/14	99
95	Review Screen check Draft EIR/EIS	30 days	*30 days*	0%	Thu 11/6/14	Wed 12/17/14	100
96	Public Draft EIR/EIS	15 days	*15 days*	0%	Thu 12/18/14	Wed 1/7/15	101
97	Publish NOA for DEIS	15 days	*15 days*	0%	Thu 12/18/14	Wed 1/7/15	102SS
98	Public Review of Draft EIS	34 days	*34 days*	0%	Thu 1/8/15	Tue 2/24/15	103
99	Prepare Draft Response to Comments (RTC)	20 days	*20 days*	0%	Wed 2/25/15	Tue 3/24/15	104
100	Review RTC	10 days	*10 days*	0%	Wed 3/25/15	Tue 4/7/15	105
101	Screen check RTC	10 days	*10 days*	0%	Wed 4/8/15	Tue 4/21/15	106
102	Review Screen check RTC	10 days	*10 days*	0%	Wed 4/22/15	Tue 5/5/15	107
103	Final EIR/EIS Published	15 days	*15 days*	0%	Wed 5/6/15	Tue 5/26/15	108
104	Publish Federal Register NOA for FEIS	15 days	*15 days*	0%	Wed 5/6/15	Tue 5/26/15	109SS
105	FEIR Certified	5 days	*5 days*	0%	Wed 5/27/15	Tue 6/2/15	110
106	Record of Decision	15 days	*15 days*	0%	Wed 6/3/15	Tue 6/23/15	111
107	**Environmental Surveys**	**105 days**	*70.32 days*	**33%**	**Tue 5/6/14**	**Mon 9/29/14**	
108	**Biological Surveys**	**105 days**	*72 days*	**31%**	**Tue 5/6/14**	**Mon 9/29/14**	
109	Perform Biological Surveys	30 days	*0 days*	100%	Tue 5/6/14	Mon 6/16/14	98SS,151SS+21 days
110	Prepare Draft Biological Assessment (BA)	40 days	*37 days*	8%	Tue 6/17/14	Mon 8/11/14	115
111	Review Draft BA	20 days	*20 days*	0%	Tue 8/12/14	Mon 9/8/14	116
112	Prepare Final BA	15 days	*15 days*	0%	Tue 9/9/14	Mon 9/29/14	117
113	Submit Final BA to USBR	0 days	*0 days*	0%	Mon 9/29/14	Mon 9/29/14	118
114	**Wetlands Surveys**	**105 days**	*73.25 days*	**30%**	**Tue 5/6/14**	**Mon 9/29/14**	
115	Perform Wetland Surveys	30 days	*0 days*	100%	Tue 5/6/14	Mon 6/16/14	115SS
116	Prepare Draft Wetlands Delineation (WD)	40 days	*38.25 days*	4%	Tue 6/17/14	Mon 8/11/14	121
117	Review WD	20 days	*20 days*	0%	Tue 8/12/14	Mon 9/8/14	122
118	Prepare Final WD	15 days	*15 days*	0%	Tue 9/9/14	Mon 9/29/14	123
119	Submit Final WD to Corps	0 days	*0 days*	0%	Mon 9/29/14	Mon 9/29/14	124
120	**Cultural Surveys**	**95 days**	*59 days*	**38%**	**Tue 5/6/14**	**Mon 9/15/14**	
121	Perform Cultural Surveys	40 days	*4 days*	90%	Tue 5/6/14	Mon 6/30/14	115SS
122	Prepare Draft Cultural Resources Report (CRR)	20 days	*20 days*	0%	Tue 7/1/14	Mon 7/28/14	127
123	Review CRR	20 days	*20 days*	0%	Tue 7/29/14	Mon 8/25/14	128
124	Prepare Final CRR	15 days	*15 days*	0%	Tue 8/26/14	Mon 9/15/14	129
125	Submit Final CRR to USBR	0 days	*0 days*	0%	Mon 9/15/14	Mon 9/15/14	130
126	**Environmental Coordination**	**124 days**	*124 days*	**0%**	**Wed 9/24/14**	**Mon 3/16/15**	
127	Section 7 Consultation / Biological Opinion	120 days	*120 days*	0%	Tue 9/30/14	Mon 3/16/15	119,165
128	Section 106 Compliance	120 days	*120 days*	0%	Wed 9/24/14	Tue 3/10/15	131,165
129	**Regulatory & Permitting**	**625 days**	*508.06 days*	**19%**	**Wed 5/1/13**	**Tue 9/22/15**	
130	**NPDES/WDR for Discharge to DMC**	**600 days**	*310 days*	48%	**Wed 5/1/13**	**Tue 8/18/15**	
131	Preliminary Coordination with RWQCB	400 days	*100 days*	75%	Wed 5/1/13	Tue 11/11/14	3
132	Prepare ROWD	120 days	*72 days*	40%	Wed 4/9/14	Tue 9/23/14	4FS+60 days
133	RWQCB Approval of NPDES	200 days	*200 days*	0%	Wed 11/12/14	Tue 8/18/15	138,109FF+60 days
134	**Permitting**	**200 days**	*200 days*	**0%**	**Wed 12/17/14**	**Tue 9/22/15**	
135	404 Permit	200 days	*200 days*	0%	Wed 12/17/14	Tue 9/22/15	125,133FF+40 days,134FF+40 days,142FF,176
136	401 Water Quality Certification	120 days	*120 days*	0%	Wed 2/11/15	Tue 7/28/15	125,133FF+40 days,134FF+40 days,176,184,16
137	Air Pollution Control Dist Permit to Construct	80 days	*80 days*	0%	Wed 12/17/14	Tue 4/7/15	176SS+40 days
138	County of Stanislaus Encroachment Permit	80 days	*80 days*	0%	Wed 12/17/14	Tue 4/7/15	176SS+40 days
139	Caltrans Encroachment Permit	120 days	*120 days*	0%	Wed 12/17/14	Tue 6/2/15	176SS+40 days
140	RWQCB NOI - Low-Threat Discharge Order	180 days	*180 days*	0%	Wed 12/17/14	Tue 8/25/15	176SS+40 days
141	DFG Streambed Alteration Agreement	180 days	*180 days*	0%	Wed 12/17/14	Tue 8/25/15	176SS+40 days
142	DFG Incidental Take Permit	180 days	*180 days*	0%	Wed 12/17/14	Tue 8/25/15	176SS+40 days
143	**Easements and Rights of Ways**	**397 days**	*352.89 days*	**11%**	**Mon 3/17/14**	**Tue 9/22/15**	
144	**Environmental Survey Access**	**60 days**	*0 days*	**100%**	**Mon 3/17/14**	**Fri 6/6/14**	
145	Acquire Access Agreements	60 days	*0 days*	100%	Mon 3/17/14	Fri 6/6/14	4
146	**Pipelines**	**200 days**	*200 days*	**0%**	**Wed 12/17/14**	**Tue 9/22/15**	
147	Identify Parcels- Pipelines	20 days	*20 days*	0%	Wed 12/17/14	Tue 1/13/15	176SS+40 days
148	Acquire Easements and Rights of Ways- Pipelines	180 days	*180 days*	0%	Wed 1/14/15	Tue 9/22/15	153
149	**Pump stations**	**140 days**	*140 days*	**0%**	**Wed 12/17/14**	**Tue 6/30/15**	
150	Identify Parcels- PS	20 days	*20 days*	0%	Wed 12/17/14	Tue 1/13/15	184SS+40 days
151	Acquire Easements and Rights of Ways- PS	120 days	*120 days*	0%	Wed 1/14/15	Tue 6/30/15	156
152	**River Crossing**	**140 days**	*140 days*	**0%**	**Wed 1/14/15**	**Tue 7/28/15**	**156**
153	Identify Parcels- River Crossing	20 days	*20 days*	0%	Wed 1/14/15	Tue 2/10/15	192SS+30 days
154	Acquire Easements and Rights of Ways- River Crossing	120 days	*120 days*	0%	Wed 2/11/15	Tue 7/28/15	159
155	**Design**	**584 days**	*539.2 days*	**8%**	**Wed 1/15/14**	**Mon 4/11/16**	
156	**Facilities Planning**	**180 days**	*68 days*	**62%**	**Wed 1/15/14**	**Tue 9/23/14**	
157	Develop Draft Facility Plan	140 days	*28 days*	**80%**	Wed 1/15/14	Tue 7/29/14	
158	Review Draft Facility Plan	20 days	*20 days*	**0%**	Wed 7/30/14	Tue 8/26/14	163
159	Finalize Facility Plan	20 days	*20 days*	**0%**	Wed 8/27/14	Tue 9/23/14	164
160	**Design Builder**	**190 days**	**190 days**	**0%**	**Wed 2/11/15**	**Tue 11/3/15**	
161	Design Builder Procurement	40 days	40 days	0%	Wed 2/11/15	Tue 4/7/15	176
162	Design Review- Pipelines	80 days	80 days	0%	Wed 4/8/15	Tue 7/28/15	167,178SS
163	Design Review- Pump Station	80 days	80 days	0%	Wed 4/8/15	Tue 7/28/15	167,186SS
164	Design Reivew- River Crossing	80 days	80 days	0%	Wed 4/8/15	Tue 7/28/15	167,194SS
165	Contractor Subs Bidding- Pipeline	20 days	*20 days*	0%	Wed 7/29/15	Tue 8/25/15	168,179
166	Contractor Subs Bidding- PS	20 days	*20 days*	0%	Wed 7/29/15	Tue 8/25/15	169,187
167	Contractor Subs Bidding- River Crossing	20 days	*20 days*	0%	Wed 8/12/15	Tue 9/8/15	170,195
168	Negotiated Guaranteed Maximum Price	40 days	40 days	0%	Wed 9/9/15	Tue 11/3/15	171,172,173
169	**Pipelines**	**384 days**	*384 days*	**0%**	**Wed 10/22/14**	**Mon 4/11/16**	
170	10% Design- Pipeline Field Investigations, Mapping, Utility Coordination	80 days	*80 days*	0%	Wed 10/22/14	Tue 2/10/15	6
171	Prepare and review preliminary design report	60 days	*60 days*	0%	Wed 12/17/14	Tue 3/10/15	176FF+20 days
172	50% Design- Pipeline	80 days	*80 days*	0%	Wed 3/11/15	Tue 6/30/15	177
173	50% Design review workshops	20 days	*20 days*	0%	Wed 7/1/15	Tue 7/28/15	178
174	Refined Design Package- Pipeline	30 days	*30 days*	0%	Wed 11/4/15	Tue 12/15/15	174
175	Refined Design Package review workshops	20 days	*20 days*	0%	Wed 12/16/15	Tue 1/12/16	180
176	Construction Contract Approval- Pipeline	10 days	*10 days*	0%	Tue 3/29/16	Mon 4/11/16	141,143,144,145,146,148,160,139,77,58
177	**Pump stations**	**384 days**	*384 days*	**0%**	**Wed 10/22/14**	**Mon 4/11/16**	
178	10% Design- PS Field Investigations, Utility Coordination	60 days	*60 days*	0%	Wed 10/22/14	Tue 1/13/15	6
179	Prepare and review preliminary design report	60 days	*60 days*	0%	Wed 11/19/14	Tue 2/10/15	184FF+20 days
180	50% Design- PS	80 days	*80 days*	0%	Wed 2/11/15	Tue 6/2/15	185
181	50% Design review workshops	20 days	*20 days*	0%	Wed 6/3/15	Tue 6/30/15	186
182	Refined Design Package- Pump stations	40 days	*40 days*	0%	Wed 11/4/15	Tue 12/29/15	174
183	Refined Design Package review workshops	20 days	*20 days*	0%	Wed 12/30/15	Tue 1/26/16	188
184	PS Construction Contract Approval- PS	10 days	*10 days*	0%	Tue 3/29/16	Mon 4/11/16	141,143,144,145,146,148,160,139,77,58
185	**River Crossing**	**384 days**	*384 days*	**0%**	**Wed 10/22/14**	**Mon 4/11/16**	
186	10% Design- River Crossing, Field Investigations, Mapping	90 days	*90 days*	0%	Wed 10/22/14	Tue 2/24/15	6
187	Prepare and review preliminary design report	60 days	*60 days*	0%	Wed 12/31/14	Tue 3/24/15	192FF+20 days
188	50% Design- River Crossing	80 days	*80 days*	0%	Wed 3/25/15	Tue 7/14/15	193
189	50% Design review workshops	20 days	*20 days*	0%	Wed 7/15/15	Tue 8/11/15	194
190	Refined Design Package- River Crossing	30 days	*30 days*	0%	Wed 11/4/15	Tue 12/15/15	174
191	Refined Design Package review workshops	20 days	*20 days*	0%	Wed 12/16/15	Tue 1/12/16	196
192	Construction Contract Approval- River Crossing	10 days	*10 days*	0%	Tue 3/29/16	Mon 4/11/16	143,144,145,146,147,148,160,139,77,58
193	**Construction**	**400 days**	*400 days*	**0%**	**Tue 4/12/16**	**Mon 10/23/17**	
194	**Pipelines**	**400 days**	*400 days*	**0%**	**Tue 4/12/16**	**Mon 10/23/17**	
195	Mobilization - Pipelines	30 days	*30 days*	0%	Tue 4/12/16	Mon 5/23/16	112,182,56
196	Pipeline Submittals and Lay Drawings (Shorter for DB)	80 days	*80 days*	0%	Tue 5/24/16	Mon 9/12/16	201
197	Pipeline Fabrication (first delivery of pipe to site)	90 days	*90 days*	0%	Tue 8/16/16	Mon 12/19/16	202SS+60 days
198	Construction - Pipelines (2 headings @175ft/day)	180 days	*180 days*	0%	Tue 12/20/16	Mon 8/28/17	203
199	Testing/Startup - Pipelines	40 days	*40 days*	0%	Tue 8/29/17	Mon 10/23/17	204
200	**Pump station**	**280 days**	*280 days*	**0%**	**Tue 4/12/16**	**Mon 5/8/17**	
201	Mobilization	20 days	*20 days*	0%	Tue 4/12/16	Mon 5/9/16	190,112,56
202	Equipment Submittals	80 days	*80 days*	0%	Tue 5/10/16	Mon 8/29/16	207
203	Pump Station Structure and Building Construction	120 days	*120 days*	0%	Tue 7/5/16	Mon 12/19/16	208SS+40 days
204	Equipment Fabrication	100 days	*100 days*	0%	Tue 7/5/16	Mon 11/21/16	208SS+40 days
205	Equipment Installation	120 days	*120 days*	0%	Tue 9/27/16	Mon 3/13/17	210FS-40 days
206	Final Close Out	40 days	*40 days*	0%	Tue 3/14/17	Mon 5/8/17	211,209
207	**River Crossing**	**320 days**	*320 days*	**0%**	**Tue 4/12/16**	**Mon 7/3/17**	
208	Mobilization - River Crossing	80 days	*80 days*	0%	Tue 4/12/16	Mon 8/1/16	198,112,56
209	Construction - River Crossing	200 days	*200 days*	0%	Tue 8/2/16	Mon 5/8/17	214
210	Testing/Startup - River Crossing	40 days	*40 days*	0%	Tue 5/9/17	Mon 7/3/17	215