

# **PRELIMINARY SITE FEASIBILITY STUDY APPLE COLONY LIFT STATION**

August 2022

Prepared for:



Prepared by:



**FORSGREN**  
*Associates Inc.*

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## EXECUTIVE SUMMARY

The Apple Colony Lift Station (ACLS) was constructed in 1966 near the entrance to the Tuolumne City Sanitary District (TCSD) Wastewater Treatment Plant (WWTP). The lift station pumps raw sewage collected from Apple Colony Basin (the basin) up to the headworks of the WWTP. Due to its age and condition, as well as a lack of redundancy, the ACLS will soon need to be rehabilitated, expanded, replaced, or some combination thereof. TCSD has asked Forsgren Associates (Forsgren) to help evaluate the feasibility of using the existing site for the needed improvements. The purpose of this report is to document the findings from the feasibility study and make recommendations whether the site can be feasibly used to upgrade the ACLS. This study evaluates flood risks due to proximity to Turnback Creek, property boundaries, potential permitting requirements, and constructability. This study also conceptually evaluates wet well capacity and pumping cycles to determine whether the existing footprint is sufficient for the ACLS improvements. The intent of an expansion of the ACLS would not be to significantly increase capacity, rather, it would be to add redundancy and the ability to shut down and rehabilitate the existing system while maintaining service to the basin.

With appropriate mitigation measures, the existing site is feasible for either rehabilitation and expansion, or a full replacement of all equipment. A flood risk analysis was performed, and risks from 100-year flood were found to be minimal. The existing slope near the creek is heavily vegetated, which has provided adequate erosion control of the fill on which the ACLS is built. Additional erosion control and waterproofing measures can be implemented as part of the rehabilitation process to protect the ACLS.

According to documents available at the time of this report, the ACLS site extends outside of a public utility easement onto private property north of the easement. It is not known at this time if the property owners are aware of the intrusion, or if there are agreements in place to allow TCSD to use this section of property.

Two conceptual site plan designs were developed for the expansion of the ACLS. One design incorporates the existing infrastructure and adds an additional similarly sized wet well and pump. The other design replaces the existing wet wells with a larger single wet well with a dual pump system. There are several pump configurations and options that could work well for either design, and these details will be flushed out in subsequent design phases.

During the course of the study and subsequent meetings with the District, it was determined that it may be a viable option to relocate the ACLS to an existing overflow pond on the WWTP property. This relocation would require adjustments to the overflow piping in the WWTP driveway, and the cost of these adjustments may be justified since this relocation would eliminate many risks inherent to construction on a public easement adjacent to a creek and road. Pump configurations at the overflow pond would be similar to the other configurations discussed.

## 1. Introduction

The Apple Colony Lift Station (ACLS) was constructed in 1966 near the entrance to the Tuolumne City Sanitary District (TCSD) Wastewater Treatment Plant (WWTP). The lift station pumps raw sewage collected from Apple Colony Basin (the basin) up to the headworks of the WWTP. Due to its age and condition, as well as a lack of redundancy, the ACLS will soon need to be rehabilitated, expanded, replaced, or some combination thereof. TCSD has asked Forsgren Associates (Forsgren) to help evaluate the feasibility of using the existing site for the needed improvements. The purpose of this report is to document the findings from the feasibility study, and make recommendations whether the site can be feasibly used to upgrade the ACLS. This study evaluates flood risks due to proximity to Turnback Creek, property boundaries, potential permitting requirements, and constructability. This study also conceptually evaluates wet well capacity and pumping cycles to determine whether the existing footprint is sufficient for the ACLS improvements. A preliminary, conceptual site plan is included in this Report.

### 1.1 ACLS Background

The ACLS was constructed in 1966 near the entrance to the TCSD WWTP. The lift station pumps raw sewage collected from the basin up to the headworks of the WWTP. Due to its age and condition, the ACLS will soon need to be rehabilitated or replaced. In 2013, the power supply at the ACLS was upgraded from 220 V to 480 V. The pumps were rewired at that time to accommodate this change in voltage. No as-built or design drawings of the ACLS are believed to exist.

### 1.2 Location

The ACLS is located just before the entrance bridge to the WWTP at the end of Box Factory Road on the north side of the road, in an easement between the road and the adjacent Turnback Creek.

### 1.3 ACLS Site Description

The existing ACLS site is constructed on fill in a fenced area between Box Factory Road, and the flood-overbank area of Turnback Creek. A combination of vegetation, trees, and rip rap helps to protect the riverbank from erosion. The majority of the fenced boundary area is located within a utility easement; however, a portion of the boundary is located outside of the easement on what is believed to be private property.

### 1.4 ACLS Operational Description

The ACLS is comprised of two submersible pumps, each housed in a 48-inch inner diameter x 13-ft deep concrete wet well. The two wet wells are connected to each other by a 24-inch concrete pipe at the bottom of the wet wells. Sewage is collected from the basin and flows through a 6-inch and an 8-inch pipe to a manhole across the street from the ACLS. The collected sewage flows through an 8-inch pipe from the manhole to the first wet well (ww-1). Because of the 24-inch connection pipe, the two wet wells fill at the same rate, but the fats, oil, and grease (FOGs) float to the surface in ww-1 where they are trapped. This baffled design minimizes FOGs interference with the control floats located in the second wet well (ww-2). The two pumps are designed to operate in alternating pumping cycles controlled by the level floats in ww-2. There are no flow meters on the ACLS, but historic pumping data shows that each pump can



pump approximately 120 gallons per minute (gpm) of flow during their cycles. TCSD has periodically changed the cycle time by repositioning the level floats, and the most current measured cycle time is approximately 2 minutes and 45 seconds per pump, or 330 gallons per pumping cycle per pump.

The pumps discharge through 4-inch above grade pipes into a buried 6-inch header pipe that runs across Turnback Creek to the WWTP headworks. When the pumps shut down for extended periods of time, flow backs up through the 8-inch wet well feed pipe into the collection manhole across the street. As the manhole fills, the sewage is forced to flow through a 10-inch overflow pipe to an overflow pond at the WWTP. Due to the topography of the WWTP entrance, the overflow pipe has a high point in the driveway entrance to the WWTP, creating an inverted siphon. For the sewage to flow over this high point, enough head must be created to force the flow through the pipe; subsequently, the rims of the manhole, and both wet wells are approximately 4 feet above finished grade to accommodate the water level needed to create this head.

## 1.5 Project Goals

At the most rudimentary level, the goal of the ACLS improvement project is to allow the transfer of sewage from the colony to the WWTP headworks to continue indefinitely with routine maintenance and equipment replacement. There are several lift station locations and configurations that would accomplish this goal. The scope of this study is limited to the existing ACLS site; thus, the purpose of *this* study is to help TCSD determine if the current ACLS site is a feasible location to install the necessary improvements to the ACLS facility to allow the lift station to continue to function far into the future.

The goals for improvements to the current ACLS site include:

1. Modernizing the ACLS pumps, appurtenances, wet wells, and controls;
2. Installing a flow metering device;
3. Providing redundancy of pumps so that repairs and maintenance can be completed with minimal or no effects on service;
4. Maintaining or improving the current level of service;
5. Maintaining the WWTP's status as a good neighbor, and, as always;
6. Complying with permit requirements, property boundaries, environmental regulations, and laws.

## 2. Facility Assessment

This section assesses the ACLS facility to determine if the site is suitable for expansion and/or rehabilitation. A survey of site topography, surface features, relevant pipe inverts, and property boundaries was initiated to help with this evaluation. Easement boundaries, flood risks, and slope stability were evaluated as part of a site analysis to assess project feasibility. The condition of the existing facilities was also evaluated to determine whether rehabilitation, replacement, or expansion of the ACLS is feasible.

## 2.1 Site Analysis

### 2.1.1 Property and Easement Boundaries

Most of the ACLS fenced boundary is within a utility easement, however, the north part of the site crosses the easement boundary onto private property. It is not known whether there has been a lot line adjustment, or agreement with the property owner to allow the ACLS boundary to encroach onto the neighboring property. Further investigation is warranted to determine whether the encroachment was previously agreed to, if the current property owner is aware of the encroachment, and if action needs to be taken by TCSD to either acquire the property or make adjustments to the ACLS.

### 2.1.2 Flood Risk Evaluation

A flood hazard assessment was performed to determine the risk of flood exposure from Turnback Creek during a 100-year flood event. Site topography and USGS StreamStat data were used to develop a hydraulic model to determine water surface elevation, and stream flow velocity during the flood event. At an elevation of 2,530 ft above sea level, the ACLS site appears to be at a high enough elevation to be at little risk from flood hazards due to a 100-year storm, which was modeled to have a high-water elevation of 2327.57 ft. The modeled water surface elevation from a 500-year storm event is 2,530.4 ft, which would cover the ground at the site, but would not reach the rim of the wet wells or sensitive electrical equipment. The covers on the existing wet wells are not currently sealed to be watertight, however, future upgrades can solve this problem.

The Flood Hazard Assessment is included in Appendix A.

### 2.1.3 Slope Stability

The ACLS site is constructed on fill that does not appear to have been eroded away by previous high-water events. The creek overbank area below the site contains dense brush, mature trees, and boulders that help provide structural stability to the site. TCSD has expressed that they may wish to remove dead trees from the overbank as part of this project, which could potentially reduce slope stability. Installation of riprap from the toe of the overbank slope below the ACLS site up to the 100-year water surface elevation would help prevent erosion of the slope and increase stability. Figure 1 shows the creek overbank area.



*Figure 1 Turnback Creek overbank area and ACLS slope*

## 2.2 Condition of Existing Facilities

The existing facilities show the expected signs of being more than 50 years old. Mechanical equipment is wearing out and is well beyond a typical design life. Concrete components are degrading but may not be beyond repair. The following sections provide specific details related to the condition of the ACLS components.

### 2.2.1 Pumps

The existing pumps are hard-plumbed to the four-inch discharge pipes that penetrate the wet well lid. They do not have guide rails and a self-seating faceplate, which makes removal and reinstallation of the pumps difficult. Check valves and isolation gate valves on the discharge lines are located above grade next to each wet well. In 2017, one of the pumps was removed so that the conductor windings on the motor could be rewound. The servicing company advised TCSD that this was the last time the motor could be rewound. Due to their age, replacement parts are difficult to find, and the next repairs to the pumps will likely require their replacement.

### 2.2.2 Wet wells

The wet wells are constructed of stacked three-foot tall concrete barrels with grouted joints. The concrete at the top of the chambers is deteriorating, and the chamber lids are not watertight. Even though the wet wells are not well sealed on top, TCSD has not observed or received complaints about excess odors at the lift station.





*Figure 2 Existing Wet Wells*

### **2.2.3 Overflow Facility**

The overflow manhole across the street from the ACLS is in reasonably good condition, however, TCSD has voiced concern regarding the integrity of the lining in the overflow pond to which the overflow discharges. This lining should be repaired prior to intentionally discharging flow to the pond. Figure 3 shows the overflow manhole for the ACLS, and Figure 4 shows the outfall location of the overflow pipe.



*Figure 3 Overflow Manhole*



*Figure 4 Overflow pipe discharge location*

### **3. Permitting Requirements**

Depending on the extent of rehabilitation, there is potential for permitting requirements with the following agencies:

1. Army Corps of Engineers
2. California Division of Fish and Wildlife
3. Tuolumne County
4. California Division of Water Resources
5. Federal Fish and Wildlife



## 4. Preliminary Design

Since the current system is sufficient to serve the existing Apple Colony population, and minimal growth is expected, the purpose of this project is to replace aging infrastructure and add redundancy. Using this logic, the existing pumps and wet wells are already sized appropriately, so new pumps and wet wells at the current ACLS location would be designed with similar capacity to the existing system. A new upgraded system will incorporate modern developments, such as guide rails and self-sealing faceplates for removal of pumps, a buried vault for check and isolation valves, underground piping, a pump system with a below grade discharge line and watertight sealed lids. The lid elevation of a new wet well would match the lid elevation of the existing wet wells so as not to modify the hydraulics of the already functional overflow system. The current available design data is pump cycle time measurements and pump cycle volume calculations based on the cycle time measurements. Instantaneous flow rate and pressures will need to be verified before a preliminary or final design can be completed.

With this in mind, two conceptual site plan alternatives were developed to determine whether there is enough space at the ACLS site to allow for improvements needed to meet the districts goals. The first alternative involves rehabilitating the existing ACLS and incorporating a new wet well and pump system into the existing system. The second alternative replaces the existing ACLS with a larger single wet well with a duplex pump system. Both of these conceptual site plans were developed based on pump and wet well sizes that would maintain existing levels of service. Conceptual site plan drawings of each of these alternatives is found in Appendix B.

There are several steps that would need to be taken for either of these two options at the current location.

1. Obtain Permitting.
2. Obtain an easement or property line adjustment on the north side of the ACLS where the fenced area intrudes onto private property.
3. Stabilize the toe of the fill on which the ACLS is located using riprap or some other slope stabilization method.
4. Expand the fenced area to incorporate the new infrastructure and allow vehicle access.
5. Rehabilitate the lining in the existing overflow pond.

Alternatively, a new lift station could be installed on the existing WWTP site at a lower elevation than the ACLS. in the existing overflow pond. A lift station at this location would be similar to the lift station described in section 4.2

### 4.1 Existing Wet Well Rehabilitation and Expansion

This alternative includes rehabilitation of the existing wet wells, and addition of a third wet well and pump. Construction would be phased to first install a new wet well and pump. Once the new wet well and pump is installed and online, upgrades can be made to the existing wet wells such as epoxy lining of the wet wells, replacement of pumps, installation of guide rails, and installation of watertight lids. The new pump would be housed in a new 48-inch inner-diameter wet well adjacent to and connected to ww-2. The new wet well would be connected to ww-2 near the bottom of the chamber. This will allow the FOGs to remain trapped in ww-2 during normal operations. Design criteria for the new wet well system are shown in the table below. Required horsepower, head, and flow rate have not been determined.

In addition to the aforementioned activities normal to both alternatives, this alternative also includes the following activities:

1. Install a new 48-inch wet well and pump system with minimum duty points that match the existing pumps. The new wet well would be connected to ww-2 near the bottom of the chamber. This will allow the FOGs to remain trapped in ww-2 during normal operations. The top of the new wetwell should be located at the same elevation as the existing wetwells to allow the overflow to continue to function as intended. New piping and valving would be buried, and the valving will be contained in a concrete vault and accessed via a watertight hatch.
2. Inspect and recoat the existing wetwells.
3. Install new pumps with guide rails in the rehabilitated wet wells.

Table 1 summarizes the configuration for this alternative:

*Table 1 Existing Wet Well Rehabilitation and Expansion Configuration*

<b>Pump Configuration</b>	Single submersible pump with guide rails and self-seating faceplate
<b>Pump Cycle Volume</b>	330-660 Gallons
<b>Valve Configuration</b>	Single check and ball valve in buried concrete vault
<b>Pump discharge tie-in To Existing System</b>	Tie-in 3-inch PVC pipe to existing 6-inch header upstream of existing pump discharge lines
<b>Bottom of Wet Well Elevation</b>	2,516.5
<b>Headworks Elevation</b>	2,550
<b>Wet well Tie-in</b>	Concrete connector pipe at base of wet well

## 4.2 Full Wet Well Replacement

This alternative involves decommissioning and removing the existing wet wells and installing a new larger single wet well with a duplex pumping system. For this analysis, a 96-inch wet well was selected due to flow rates, off-the-shelf availability, and site constraints. The existing ACLS feed piping would be tied into the new wet well, and the pump discharge line would be below grade. The lid elevation of the new wet well would match the elevation of the existing wet well lids so as not to interfere with the functionality of the existing overflow system. Valving would be installed in a buried concrete vault with a watertight lid. Wet well water levels would be monitored with an ultrasonic level meter or pressure transducer that would signal the pumps to start and stop.

Implementation of this alternative would likely include:

1. Decommission and remove existing wet well system.
2. Install a new 96-inch wet well and pump system with minimum duty points that match the existing pumps. The existing ACLS feed piping would tie in to the new wet well. The top of the new wetwell should be located at the same elevation as the existing wetwells to

allow the overflow to continue to function as intended. New piping and valving would be buried, and the valving will be contained in a concrete vault and accessed via a watertight hatch.

3. New pump discharge will tie-in to the existing 6-inch ACLS pump discharge pipe.

Table 2 summarizes the configuration for this alternative.

*Table 2 Full Wet Well Replacement Configuration*

<b>Pump Configuration</b>	Duplex submersible pump with guide rails and self-seating faceplate or duplex pump with above lid mounted pump motor system.
<b>Pump Cycle Volume</b>	330-660 Gallons
<b>Valve Configuration</b>	Double check and ball valve in buried concrete vault
<b>Pump discharge tie-in To Existing System</b>	Tie-in 6-inch PVC pipe to existing 6-inch ACLS discharge pipe
<b>Bottom of Wet Well Elevation</b>	2,510
<b>Headworks Elevation</b>	2,550

### 4.3 Relocation to Existing WWTP Property

The wet well configuration for this alternative would be similar to that discussed in section 4.2. This alternative involves relocating the ACLS to a location on the existing WWTP property (eg: existing overflow pond). and would require that the inverted siphon in the existing overflow pipe be removed so that sewage from the basin could flow by gravity to the wet well. This change would require burying the pipe at a significant depth. The benefits of relocating the ACLS to an already disturbed area on the WWTP property are not trivial. These benefits include:

1. Ease of access for operators
2. Reduced permitting requirements related to work near a creek
3. Reduced need for creek slope stability and anti-erosion measures
4. Power line runs from the site and generator are shortened
5. Short signal cable run for tie-in with plant SCADA
6. Risk of vehicle damage eliminated
7. Ease of construction
8. Simpler to maintain service during construction
9. Work area is within a well-defined property boundary
10. Reduced impact to neighbors

## 5. Conclusions and Recommendations

The ACLS site is a feasible location for future use, however, there may be more optimal locations located within the WWTP fencing.

Forsgren recommends an alternatives analysis to compare the three alternatives presented in section 4. This analysis would compare the two configurations at the current ACLS location against a location in the existing WWTP property. It may be feasible to reconfigure the overflow piping by burying the piping through the driveway at a deeper depth. This would allow the basin's sewage to flow by gravity to the existing overflow pond, where a new lift station could potentially be installed. This configuration could allow for a more modern design with redundancy, lid(s) at grade instead of 4 feet above grade, buried discharge piping, and all valving located in buried concrete vaults.

Forsgren also recommends that instantaneous flow measurements be taken and recorded at the existing ACLS. A strap on ultrasonic flow meter could be installed on the exposed pump discharge piping under the bridge. This will provide flow data for design of the selected pump station alternative with minimal interference to operations and service.

Forsgren recommends that state and federal funds be used to pay for planning, alternative evaluation, and construction of this project.

# **APPENDIX A**

## **FLOOD HAZARD ASSESSMENT**

### **TECHNICAL MEMORANDUM**



# MEMORANDUM

**DATE:** April 8, 2022  
**TO:** Brian Gach P.E., Senior Engineer  
**FROM:** Ron Manning, P.E.  
**SUBJECT:** Flood hazard assessment - Turnback Creek near Tuolumne City Sanitary District (TCSD) Apple Colony Lift Station (ACLS)

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## 1.0 NEED AND PURPOSE

The purpose of this document is to identify existing flood hazards surrounding the Tuolumne City Sanitary District (TCSD) Apple Colony Lift Station (ACLS) located on Turnback Creek in the City of Tuolumne, California. A 1-Dimensional (1D) hydraulic model using HEC-RAS was developed for the site using GPS survey data collected in February 2022. This assessment reviews the 1D HEC-RAS model and existing information to provide comments on the potential flood risk on the project site. Further study is required before formal recommendations or designs can be offered. The intent of this document is to cover due diligence regarding flood risk at this location and provide information that supports the conclusion that there are no significant flood risk impacts anticipated at this site.

## 2.0 BACKGROUND

The ACLS is located just east of the bridge to the TCSD Wastewater Treatment Plant (WWTP) at the end of Box Factory Rd., adjacent to Turnback Creek. The site is located outside of any published FEMA flood hazard areas and there was no evidence or records of flood waters overtopping the banks at this location or contacting the existing bridge low chord. The lift station was constructed around 1966 to lift sewage generated from the Apple Colony Basin up to the headworks. The ACLS appears to have been constructed on fill based on topography and site observations. Forsgren Associates (FA) is assessing the current site for the feasibility of expanding the existing ACLS to the east of the existing facility.

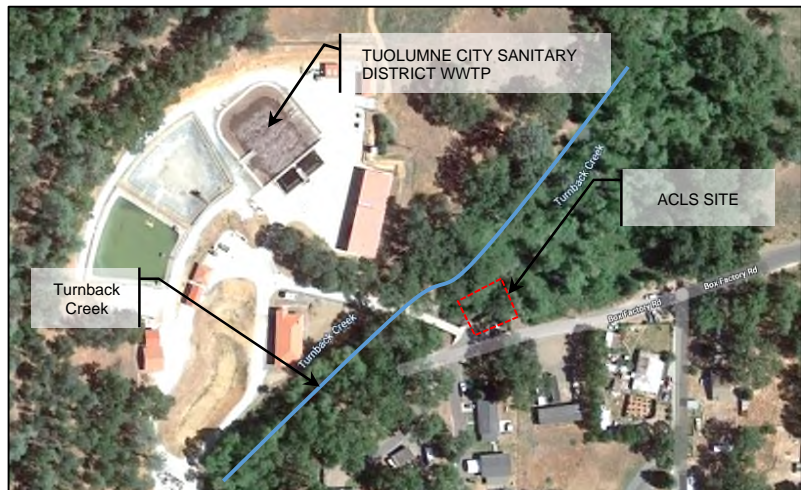
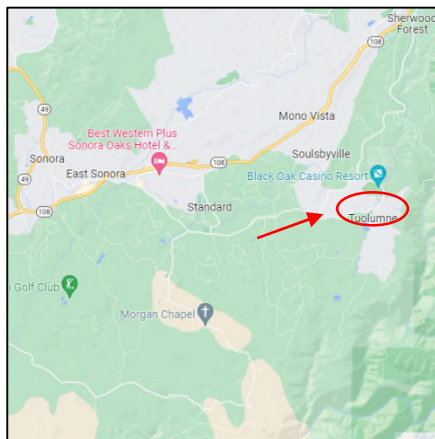


Figure 1. Vicinity and Site Map

### 3.0 ANALYSIS METHODS

An estimate of the 100-yr (1% annual exceedance probability) flow was based on the USGS StreamStats tool, yielding a peak flow of 2,150 cfs. Topographic survey data were collected by FA in February 2022 using GPS ground shots referenced to the NAD83 California Zone 3 U.S. foot coordinate reference system. Topographic survey data of the channel and existing lift station were used to create the digital terrain surface from which the 1D hydraulic model was based. This model was used to estimate the base flood elevations and flow velocities for the project area. The bridge was not represented in the model as the 100-yr water surface elevation did not contact the bridge.

#### 3.1 Hydrology

USGS StreamStats was able to provide recurrence flows at the site. This point of Turnback Creek has a drainage area of approximately 11.2 square miles. The 1-percent chance flood (100-yr) was reported to have an average standard error of prediction of 58%. This standard error is considered within an acceptable range for this level of analysis. The StreamStats report generated for the site is enclosed.

#### 3.2 Hydraulics

The hydraulic analysis consisted of using HEC-RAS (v6.2) software to develop the 1D hydraulic model. Since the creek at this location does not appear to have a floodplain and consists of a relatively straight channel geometry, it was determined that a 1D model was sufficient for modeling the base flood elevations and velocities at the site.

Manning's n values used in the model were estimated from recent site photographs. A Manning's n value of 0.05 was selected for the cobbled creek channel and 0.09 for the overbanks which consisted of densely vegetated cover (see photo of site under Section 5.0). A sensitivity analysis was completed at the downstream normal depth boundary condition concluding that the project site WSE and velocity were not sensitive to variations to the downstream boundary condition. The model simulations of various recurrence intervals all completed without major errors. The Water Surface Elevation, Depth, and Velocity results appeared appropriate.

### 4.0 RESULTS

The 1D modeling results for the 100-yr water surface elevations and velocities are presented in the summary table below. The water surface elevation profile for Turnback Creek and the 100-yr floodplain are shown in Figures 2 & 3 along with the cross-section locations.

**Table 1. Hydraulic model results summary**

River Sta.	Water Surface Elevation (ft)	Channel Velocity (ft/s)	Left Overbank Velocity (ft/s) <sup>2</sup>	Right Overbank Velocity (ft/s)
389	2528.42	11.09	3.57	3.47
337	2528.40	8.45	2.61	3.19
287	2527.65	9.38	2.87	3.10
245	2526.46	10.64	1.22	3.07
186	2525.10	11.55	-	-
122	2523.82	10.96	-	-
54	2523.06	9.33	0.73	2.09

1. Elevation values refer to NAVD88 datum

2. Overbank near ACLS site.

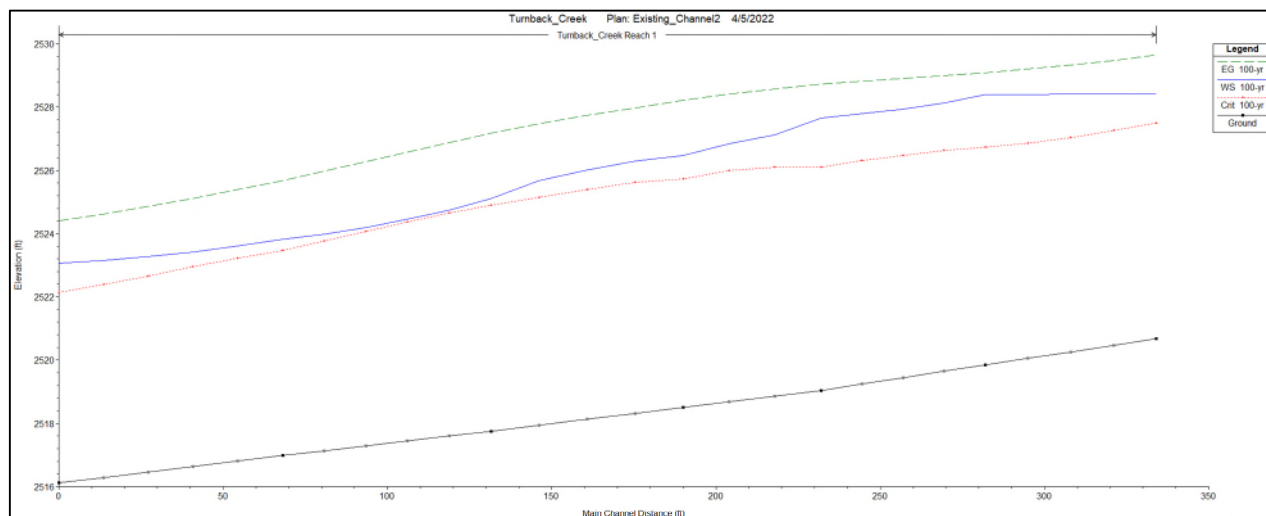


Figure 2. 100-yr WSE Profile at Turnback Creek

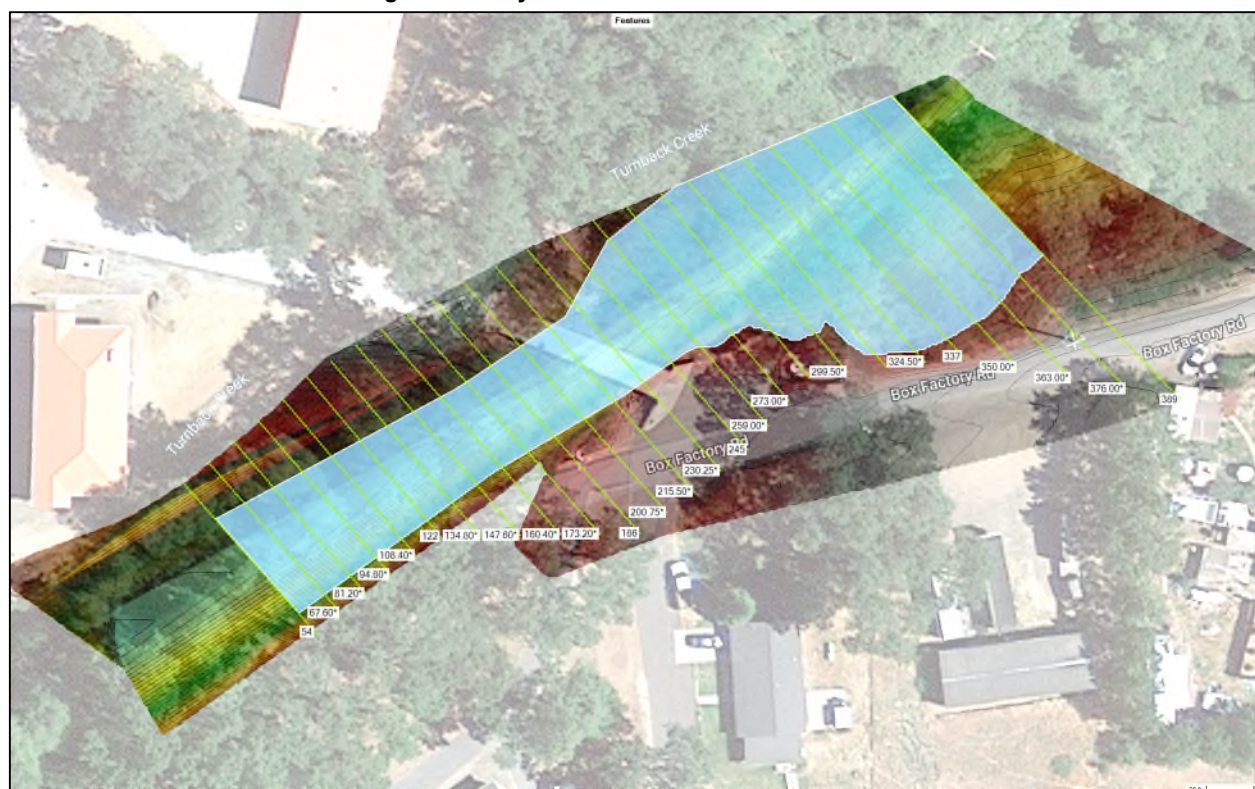


Figure 3. 100-yr Floodplain and for Turnback Creek with cross-section locations (interpolated cross-sections noted with an asterisk\*).



## 5.0 CONCLUSION & RECOMMENDATIONS

Upon review of the 1D hydraulic model and existing information, there does not appear to be substantial flood hazard risk to the existing ACLS site and proposed expansion as described. The existing pump chambers are constructed to be watertight apart from the chamber lid which does not have a seal. The control panels were intended to be watertight as well, however the seal leak detection is not operational. It cannot be assumed the panels are fully watertight. The existing lift station components susceptible to water damage are raised above the ground elevation surveyed at 2,530.00-ft (NAVD88).



Existing ACLS site (Left) and Turnback Creek overbank below the ACLS site (Right).

### 5.1 Water Surface Elevation

According to the hydraulic model, the average 100-yr water surface elevation in the vicinity of the lift station is 2,527.57-ft (NAVD88), several feet below the existing ground elevation where the ACLS site is located. The estimated 500-year water surface elevation reaches an elevation of 2,530.40-ft, still below the elevation of the sensitive system components. We recommend the proposed wet wells be constructed with flood-sensitive components elevated a minimum of 2-feet above the existing grade.

### 5.2 Erosion Protection

Velocities in the main creek channel during the 100-yr flood reach magnitudes in excess of 10.00 ft/s in the vicinity of the lift station. The channel bed material contains large cobbles and boulders, providing resistance to erosion during high flows indicated during flood events. Lower velocities (>3 fps) and shallower depths (>2.5-ft) are indicated in the overbank area just downhill from the ACLS site. The overbank area consists of dense brush and some mature trees and boulders that provide structural stability to the slope (photo above). Riprap revetment similar to the existing riprap protecting the bridge abutments just downstream could be added to the toe of the overbank slope below the ACLS site up to the 100-yr water surface elevation (2,527.57-ft) for further protection of the fill area that serves as the foundation for the lift station.

The existing water surface elevation, water depths, and velocities in the area of the ACLS site show a low risk of flood hazards to the site. The figures below illustrate the existing 100-yr water depths and velocity magnitude at the ACLS site.



Figure 4. 1D model results of existing conditions with depths and velocities (100-yr event) noted.

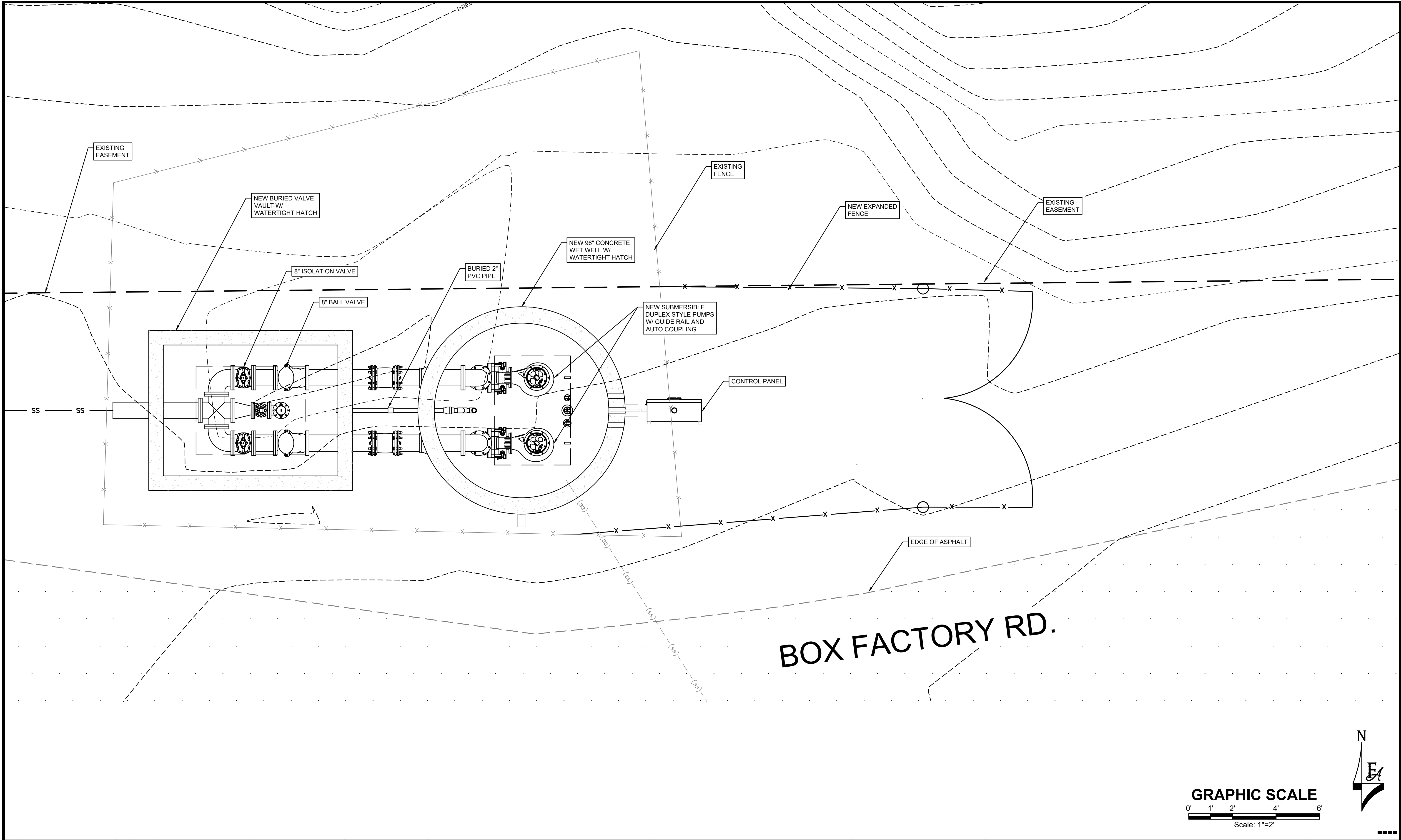


## **APPENDIX B**

### **CONCEPTUAL SITE PLANS**



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ATTENTION

LINE IS 2 INCHES  
AT FULL SIZE  
(IF NOT 1"= SCALE ACCORDINGLY)

PRELIMINARY  
DRAWING  
NOT FOR  
CONSTRUCTION

TC  
SD

Tuolumne City  
Sanitary District

FORSGREN

Associates Inc.

200 S. VIRGINIA ST, 8TH FLOOR, RENO, NV 89501  
PH: 775.399.0024

APPLE COLONY LIFT STATION

CONCEPTUAL SITE PLAN 2  
FULL WET WELL REPLACEMENT

PROJECT NO:  
07-21-0074

SHEET NO:  
2

DATE:  
JULY 2022

PAGE NO:  
2 OF 2