APPENDIX I – WASTEWATER

TECHNICAL MEMORANDUM

TO: Kristin Faoro, Environmental Planner, PMC

FROM: Jeff Lodge, Project Manager, Wood Rodgers, Inc.

DATE: October 27, 2011

SUBJECT: City of Pittsburg Mt. Resource Recovery Park Project Wastewater Study - DRAFT

INTRODUCTION

The purpose of this assessment is to determine the affect to downstream sewage facilities of increased flows from the Mt. Diablo Resource Recovery Facility, at 1300 Loveridge Road in City of Pittsburg (City), California. The subject site has proposed an increase in sewer flows to the collection system from a new biomass unit. The flow discharge quantity from the unit to the sewer will increase from 20,000 gallons per day (gpd) to an ultimate flow of 40,000 gpd. In addition, there is a planned increase in employees for various shifts at the facility from 83 to 145 with the peak shift increase from 46 to 90 employees. The property is currently served by a privately owned wastewater system that pumps directly to Delta Diablo Sanitation District's wastewater treatment plant (WWTP). The privately owned facilities consist of three sequenced pump stations with 4-inch diameter force mains spanning the facilities. Each pump station consists of a wet well with two submersible pumps.

The City has recently updated the wastewater collection system master plan (City of Pittsburg Wastewater Collection System Master Plan, Amendment No. 3, dated August 2011). A base wastewater flow unit of 600 gpd/acre for industrial land use was assigned to the subject area for wastewater planning. Additionally, a peaking factor of 2.11 was assigned to the area based on the results of flow monitoring. The following analysis compares the capacities of the existing facilities to the flows generated by three different scenarios: Existing Flows, Proposed Flows with Biomass Discharge Added, and Master Planned Flows.

EXISTING FACILITIES

The existing sewer facilities serving the subject area are privately-owned and operated, and are independent of the of City's sewer collection system. The facilities include three sewage lift stations, force mains, and sewer pipes draining from the buildings on site to the lift station wet wells. The lift stations are connected in sequence, the first pumps to the second, the second to the third, and the third pumps directly to the WWTP.

The proposed wastewater from the biomass unit will drain to the first of the three pump stations, located east of the site buildings near Loveridge Road. The name of this lift station is unknown but will be labeled LS-1 for the purpose of this Technical Memorandum. LS-1 consists of an E/One SPD-type packaged wastewater pumping station by E/One Corp., Niskayuna, NY. The unit includes a 150 gallon wet well, two submersible pumps in a parallel duplex pumping arrangement (1-HP each pump), and associated stand-alone controls. The capacity of each pump

is approximately 13.5 gpm (19,440 gpd) at a computed total dynamic head (TDH) of 15.3 feet. The total station capacity with both pumps running continuously is therefore about 38,880 gpd; however, only the "firm" capacity (capacity with largest pump out of service) of the sewer lift station can be used for planning and design to mitigate the chances of a sewer spill during an equipment failure. The firm pumping capacity of PS-1 is therefore 13.5 gpm (19,440 gpd).

PS-1 pumps to a 4-inch diameter force main, which is 1,021 foot long and constructed with SDR-11 HDPE pipe. The force main discharges into the wet well of a second pump station (LS-2), located on the west side of the industrial buildings. LS-2 facilities consist of a 4-foot diameter wet well and two submersible pumps in a parallel duplex pumping arrangement. A set of plans were provided that indicate that the pumps in LS-2 have a pumping capacity of 75 gpm at a design TDH of 20 feet (see drawings. G1 and C1 "Recycling Center & Transfer Station", Cullen Engineering Associates, Inc., Feb/Mar 1995). An improvement to the facilities in the area is reflected on the drawings entitled "Contra Costa Industrial Park On-site Septic System Abandonment and Sanitary Sewer Station/Force Main Construction 1251 Loveridge Road Pittsburg California 94565," by Jaime A. Ziegler Civil Engineering dated September 26, 2005. The improvements depicted in these drawings reflect only changes to LS-1 and do not indicate any pumping facility changes to LS-2. However, the property managers who maintain LS-2 (Hall Equities Group) have provided pump capacity information which indicates that the currently installed pumps at LS-2 are Gould submersible sewage pumps model WS_BHF, Series Model 3887BHF. The provided information indicates that each of the two pumps has a pumping capacity of 220 gpm (316,800 gpd). The total station capacity with both pumps running continuously is therefore about 633,600 gpd; however, the firm pumping capacity of PS-2 is limited to the capacity of only one pump.

Information was not available for analysis of the third lift station, which conveys flow to the WWTP. The engineering drawings reviewed by Wood Rodgers did not indicate the location of the third lift station. A schematic of the collection system shown on Exhibit F indicates that the third pump station is located to the east of Loveridge Road on the east side of the currently developed site. We recommend that information about this third lift station be gathered and reviewed, along with information on the upstream facilities that are connected to it. If records are not available, we recommend that a field investigation be conducted to obtain facility configuration, sizing, and pumping equipment capacity information.

PROPOSED FLOW COMPARED TO PLANNING

The "City of Pittsburg Wastewater Collection System Master Plan – Amendment No. 3," by MWH, dated August 2011, designates the land areas around Loveridge Road/Pittsburg-Antioch Highway, including the subject parcels on Loveridge Road, as "Industrial" land-types with a unit wastewater generation flow factor for planning of 600 gpd/acre. The master plan included the results of a flow monitoring study that indicates a wet weather peaking factor value of 2.11 for sewer flows in the subject area. The currently developed gross area along Loveridge Road to the north of the Pittsburg/Antioch Highway consists of about 100 acres of land area, of this, only about 20 acres is served by pump stations PS-1 and PS-2. The planned sewer flow for the area served by the pump stations is therefore approximately 29,242 gpd, using planning values. Hall Equity Group reported that the sewer flow generated in September 2011 is 737 cubic feet. (5,513 gallons) based on their sewer billing invoice. This equates to an average flow of 184 gpd,

assuming a constant discharge. The existing sewer flow generated from the facility is therefore less than 1% of the planned flow for the served area. The first phase of flow generated by the biomass unit (20,000 gpd) is within the planning value of sewer flow for the served area (*i.e.* 29,242 gpd). The ultimate discharge from the biomass unit plus 90 additional peak shift employees (40,000 gpd + 1,170 = 41,170) exceeds the sewer generation assumptions of the master plan for the served area; however, it is probable that surrounding areas currently undeveloped with industrial land use designations will develop with lower sewer generation values, which will even out the effect of the exceedance of the current area. We recommend that the areas surrounding the currently developed land be reassessed in terms of sewer flow generation before the ultimate flow is reached to determine the sewer flows at the time and compare them with planning assumptions and available capacity at the WWTP.

PROPOSED FLOW AND EXISTING SEWER FACILITIES

The firm pumping capacity at LS-1 is 19,400 gpd, assuming constant operation. The discharge quantity of 20,000 gpd from the first phase biomass units slightly exceeds the firm pumping capacity of the existing pump station. The existing flow quantity to the pump station is unknown; however, the increase in flow quantity alone will necessitate the operation of both pumps at LS-1 for at least part of the time to serve the facility. We recommend that the existing peak flow to the pump station be measured and that the pumps at LS-1 be upsized to handle both the existing and proposed phase 1 flow from the biomass unit. The ultimate flow of 41,170 gpd from the biomass facility will exceed the pump station capacity in terms of pumping and wet well size. The need for a new pump station facility should be evaluated for the ultimate flow condition.

Alternatively, a feasibility analysis could be conducted to send the flow from the biomass unit directly to PS-2, which has the capacity to convey the ultimate flow from the biomass unit.

The firm pumping capacity at LS-2 is 316,800 gpd, assuming constant operation. As stated previously, the existing totalized flow measured at this pump station for September 2011, was about 5,513 gallons, equating to an average daily flow of only 184 gpd, well under the reported capacity of LS-2. Even with the ultimate flow of 41,170 gpd, there is plenty of firm capacity available at LS-2 for future flows. The instantaneous flow rate from the proposed biomass process to the sewer system is unknown at this time and therefore, the current analysis was conducted assuming constant and continuous flow. If the process is operated intermittently, but with the same overall daily totalized volumes discharging to the sewer, the analysis should be updated to reflect this condition.

The drawings indicate that both LS-1 and LS-2 pump wastewater into 4-inch diameter force mains. The diameter and length of the force main extending from the third lift station to the WTP is unknown. This information should be gathered to conduct a full assessment. Sewer force mains are sized to prevent excessive frictional losses caused by wastewater pumping. Fluid velocities in excess of about 7 feet-per-second (fps) within a force main can begin to create excessive energy losses which can increase pumping operational costs and can reduce lift station pumping capacity. If increased losses are indicated by the 7 fps screening criteria, a more detailed analysis is typically conducted to compare total dynamic head system losses (frictional plus static elevation head losses) to pump performance curves to confirm available capacity and

pumping efficiency. The flow velocities in the 4-inch diameter force mains connected to LS-1 and LS-2 were assessed for the following flow conditions: Existing Flow, Existing Flow plus Ultimate Biomass Discharge Flow, and Buildout Flow for the entire master planned area that could drain to these facilities. The resulting velocities were 0.003 fps, 0.730 fps, and 0.52 fps, respectively. The analysis indicates that the force mains have excess capacity under all conditions, which will serve to minimize frictional losses due to pumping.

CONCULSIONS AND RECOMMENDATIONS

The analysis revealed the following conclusions:

- The pumps in LS-1 should be upsized to gain a "firm" pumping capacity that can handle the 20,000 gpd flow increase from the initial phase of biomass unit discharge.

- The projected ultimate flows from the biomass unit will either require a new pumping facility to replace LS-1, or rerouting flow directly to LS-2.

- The pumps in LS-2 are sized to handle both the increase of flow generated by the proposed biomass unit and the projected buildout wastewater flow from the area with excess capacity remaining.

- Because information was unavailable about the third lift station (downstream of LS-2) or about the force main connecting the third lift station to the WWTP, a capacity assessment could not be conducted.

We recommend the following based on our analysis:

- Verify the type and models of the pumps in LS-2. They seem to be oversized for the planned build out flow, plus the added flow from the proposed biomass facilities under the ultimate flow condition. It is possible that the pumps were over-designed; however, the magnitude of the oversizing raises suspicion.

- Collect information about the third lift station, including pumping capacity, facility sizing/configuration, and existing upstream discharge volumes/flow rates to the facility. As-built drawings and pump make and model information is desirable.

- Obtain information about the force main that spans between the third pump station and the WWTP, including diameter, pipe material, and inlet and outlet elevations.

Carlson, Barbee & Gibson, Inc.
CIVIL ENGINEERS • SURVEYORS • PLANNERS

December 12, 2011
Job No.: 1362-000

M E M O R A N D U M

TO: Leigha Schmidt, City of Pittsburg

FROM: Angelo J. Obertello, P.E., LEED AP, Project Manager

CC: Bob Hammons, Garaventa Enterprises

SUBJECT: Mount Diablo Resource Recovery Park
Wastewater System Improvements
Pittsburg, California

BACKGROUND

The following describes the existing wastewater system and the proposed system improvements for the Mt. Diablo Resource Recovery Park (MDRRP), located at 1300 Loveridge Road in Pittsburg, California. A vicinity map of the project site is depicted on Figure 1. The current operations at this facility include receiving, sorting, processing, recycling and transporting of municipal solid waste, recyclables, green waste and mixed construction / demolition materials. The operations at the MDRRP are proposed to be expanded, increasing the amount of materials processed and incorporating a new Biomass Gasification Unit. The wastewater flows generated by the project site will increase with the proposed expansion.

Wastewater flows from the project site are currently collected and conveyed via a private system of pump stations and pipelines which eventually discharge to the Delta Diablo Sanitation District's (DDSD) wastewater treatment plant (WWTP). The wastewater conveyance system for the project site will require improvements described below to provide capacity for the increased wastewater flows associated with the MDRRP expansion.

EXISTING SYSTEM

Overview
The existing wastewater facilities serving the project site are privately owned and maintained. Wastewater flows from the site are currently conveyed to an existing pump station located on the west side of the on-site buildings, near the scale house. A 4-inch force main then conveys flows from the pump station south, parallel to the building and then turns eastward, generally in alignment with the site main access driveway. The force main continues eastward, across

Loveridge Road and the adjacent property, the Contra Costa Industrial Park (CCIP). The wastewater flows from both the project site and CCIP eventually are conveyed to another pump station located near the eastern property line of the CCIP. This pump station conveys the flows southward crossing Kirker Creek and connects to the DDSD trunk main within Pittsburg/Antioch (P/A) Highway. The DDSD trunk main conveys flows west to east and eventually discharges to the DDSD WWTP. The existing wastewater system is depicted on Figure 2.

Existing On-Site Pump Station
A field assessment of the existing pump station on the project site was conducted in November 2011. The results of this assessment are outlined in the attached memorandum prepared by Coleman Engineering. This pump station was found to be in fair condition. The pipelines and pump were operable and functioning as needed to convey the typical wastewater flows generated by the current on-site operations. The existing pump has a pumping capacity of 75 gpm. The pumps are controlled by a simple timer that is currently set to operate the pumps twice per day for a duration sufficient to convey all wastewater from the site.

Existing On-Site Force Main
The existing force main within the project site and leaving the pump station described above is a 4-inch diameter pipeline. There is one clean-out located just after the pump station as the force main turns to head southward. The site staff did indicate that the system has backed-up in the past due to the force main clogging with debris, such as rags or straps.

Existing Off-Site Facilities
The existing off-site facilities include conveyance pipelines, an additional pump station and force main located on the adjacent CCIP property. These facilities convey the wastewater flows from both the project site and the CCIP. This system is owned by the property owners of the CCIP. The capacities and conditions of the existing off-site system were not available or reviewed for purposes of this assessment.

There is an existing agreement between the project site and the CCIP requiring cost sharing of maintenance costs associated with the shared wastewater system within the CCIP. The agreement also requires that the project site discontinue use of the shared system as soon as is practicable and precludes increasing the capacity of this system for purposes of the project site.

PROPOSED SYSTEM IMPROVEMENTS

The following describes the required improvements to the on-site wastewater system to provide capacity for the MDRRP expansion. Additionally, because of the restrictions associated with the continued use of the shared system, the following outlines the improvements necessary to discontinue use of the shared CCIP system and connect directly to the DDSD system.

Proposed Wastewater Flows
The proposed MDRRP expansion will increase the wastewater flows from the project site. The increase is associated with additional employee shifts and the incorporation of a Biomass Gasification Unit. The biomass unit is proposed to be implemented in two phases, each generating a wastewater flow of 20,000 gpd.

The proposed ultimate wastewater flows from the MDRRP expansion are estimated to be the sum of 40,000 gpd generated from the ultimate biomass unit and 1,200 gpd generated from 90 peak shift employees, totaling 41,200 gpd. The City of Pittsburg's Wastewater Collection System Master Plan assigns a peaking factor of 2.11 based on flow monitoring to establish peak flows. Applying this peaking factor, the peak wastewater flows from the proposed MDRRP project is approximately 86,930 gpd (60.4 gpm).

Proposed Pump Station Improvements
The existing on-site pump station is in fair condition and has an existing pumping capacity of 75 gpm, which exceeds the proposed ultimate peak flow of 60.4 gpm. There are no required improvements to the existing on-site pump station in order to convey flows from the proposed MDRRP expansion.

The field assessment identified a number of improvements that could be incorporated to the existing pump station, which would improve the performance and reliability of this facility. These improvements are recommended to be incorporated to the pump station when it is most practicable, either as part of other site work or typical site maintenance improvements. The recommended pump station improvements include:

- Add float controls for On, Off, and High Water Alarm and set operating range of the wet well to 1-foot.
- Provide a rail system improving access to the pump for servicing.
- Replace the eccentric manhole cone section with barrel section and flat top lid to improve accessibility.
- Epoxy line the wet well and piping.
- Seal all electrical and control conduits.
- Add a redundant pump.

Proposed Force Main Modifications
The existing force main leaving the on-site pump station is 4-inches in diameter. The velocity in the force main based upon the existing pumping rate of 75 gpm is approximately 1.91 fps. The force main has adequate capacity to convey the ultimate peak flow rate. The recommended minimum velocity of the force main is 2 fps to maintain solids in suspension. The pumping rate of any pump replacements, upgrades or the addition of a new redundant pump is recommended to be 85 gpm in order to achieve 2 fps.

An additional clean-out is recommended to be constructed at the angle point in the force main alignment where it turns from south to the east direction. This will improve the accessibility for maintenance and removal of any blockages.

In order to discontinue wastewater discharge to the shared CCIP system to the east, the force main is proposed to be reconfigured to discharge directly to the DDSD trunk main in P/A Highway. The proposed reconfiguration is depicted on Figure 3 and consists of the following improvements:

- Connect a new force main to the existing force main on the west side of Loveridge Road near the project site main driveway.
- Disconnect or plug the existing force main prior to the existing Loveridge Road crossing, such that use of the shared CCIP system is discontinued.
- Construct a new force main southward on the west side of Loveridge Road from the project site main driveway to the north side of the Kirker Creek crossing.
- Connect to the existing 4-inch force main lateral serving the adjacent parcel south of the project site and currently occupied by the GWF power plant.
- Construct check valves at the connection to the existing GWF lateral to maintain the proper flow directions.
- Utilize the existing GWF lateral to convey the project site wastewater to the existing DDSD trunk main manhole at the southeast corner of the P/A Highway and Loveridge Road intersection.

In the case that the GWF lateral is not available to connect to, the new 4-inch force main can be continued southward and across Kirker Creek and the P/A Highway and Loveridge Road intersection to connect to the DDSD trunk main manhole.

The exact location of the proposed force main will need to avoid the numerous of undocumented existing pipelines in Loveridge Road. The existing pipelines are being encountered and documented through the current City of Pittsburg 20-inch waterline installation project in this area. Once the results of this project are available, an alignment of the force main will be determined.

The proposed reconfiguration of the force main described above allows for the MDRRP project site to discontinue use of and maintenance participation to the shared CCIP system.

SUMMARY

The existing on-site pump station and force main are sufficient for conveying the wastewater flows from the current project site operations as well as the proposed ultimate peak wastewater flows of the MDRRP expansion. The force main is proposed to be reconfigured to extend southward in Loveridge Road and directly connect to the DDSD trunk main in P/A Highway. This reconfiguration includes construction of a new force main along the west side of Loveridge Road. It also allows the MDRRP site to discontinue use of the shared CCIP system.

FIGURE 1

VICINITY MAP

MT DIABLO RESOURCE RECOVERY PARK

CITY OF PITTSBURG CONTRA COSTA COUNTY CALIFORNIA

DATE: DECEMBER 12, 2011 SCALE: 1" = 500'

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G:\1362\ACAD\EXHIBITS\XB_FIGURE 1_VICINITY MAP.DWG

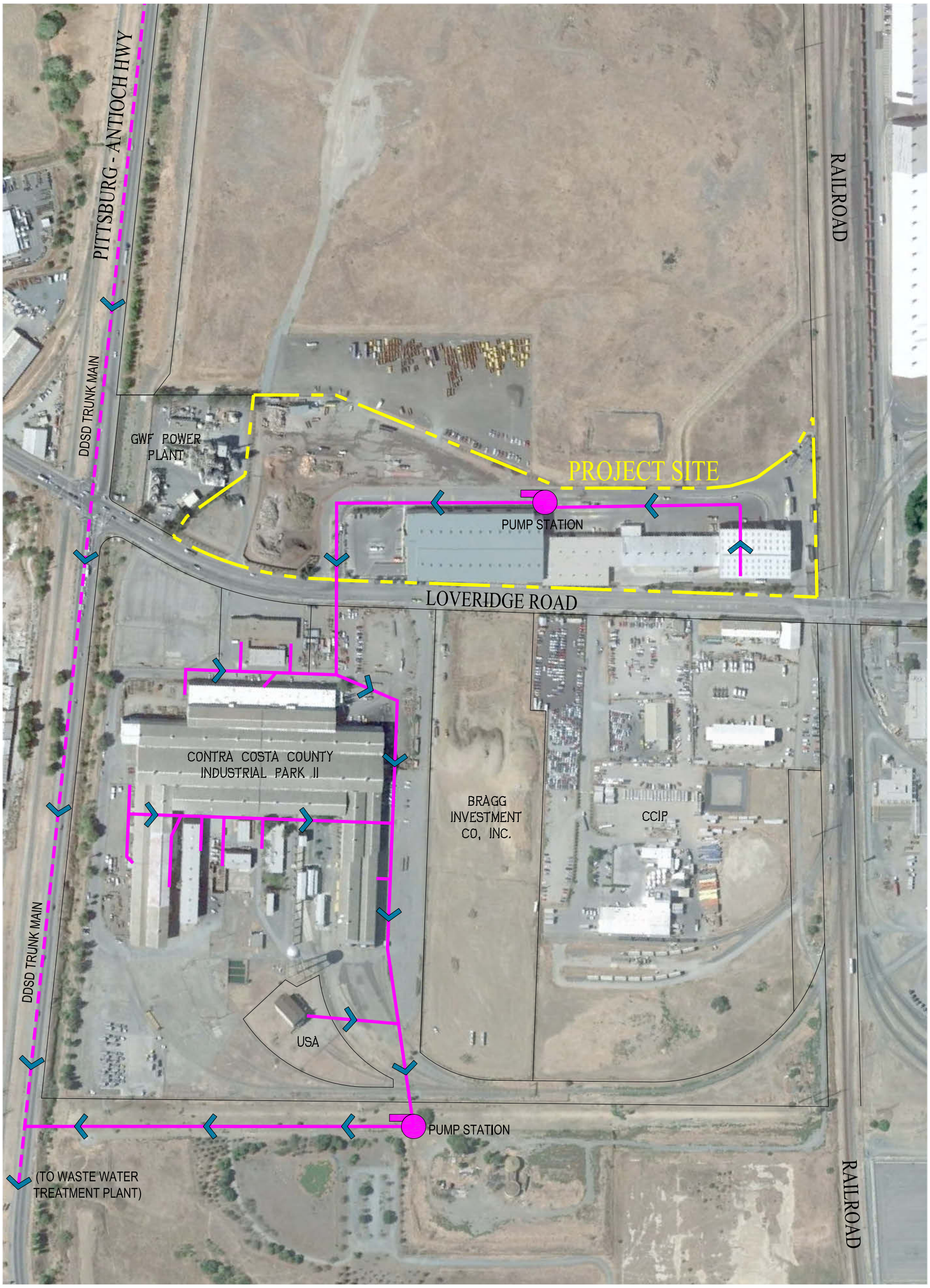

FIGURE 2

EXISTING WASTEWATER SYSTEM

MT DIABLO RESOURCE RECOVERY PARK

CITY OF PITTSBURG CONTRA COSTA COUNTY CALIFORNIA

DATE: DECEMBER 12, 2011 SCALE: 1" = 300'

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G:\1362\ACAD\EXHIBITS\XB_FIGURE 2_EX WASTE WATER SYSTEM.DWG

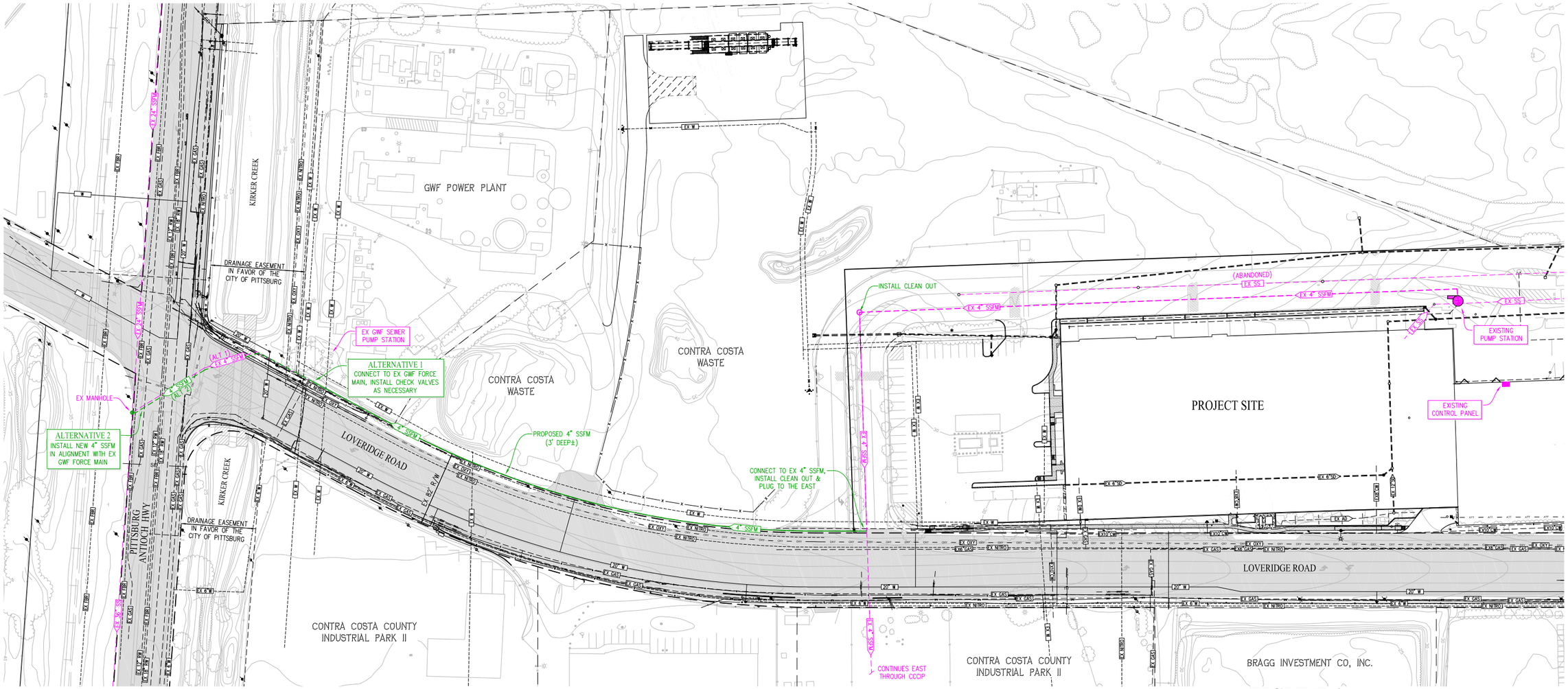

FIGURE 3
PROPOSED WASTEWATER IMPROVEMENTS
MT DIABLO RESOURCE RECOVERY PARK

CITY OF PITTSBURG CONTRA COSTA COUNTY CALIFORNIA

0' 50' 150' 200'

SCALE: 1" = 50' DATE: DECEMBER 12, 2011

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G:\1362\ACAD\EXHIBITS\XB_FIGURE 3_PROPOSED WASTE WATER IMPROVEMENTS.DWG

Memorandum

To:	Angelo Obertello
From:	Chad Coleman
Date:	November 29, 2011
Project:	Mt. Diablo Recycling Center and Transfer Station
Subject:	Wastewater Lift Station Options and Recommendations

BACKGROUND

The Mt. Diablo Recycling Center and Transfer Station site is located at 1300 Loveridge Road, Pittsburg CA. Site sewer is currently collected in a lift station located in the main driveway on the west side of the building. The lift station pumps domestic sewage into a 4-inch force main that leaves the site and discharges in another lift station located on the property across Loveridge Road to the east. All wastewater from this site is domestic waste from employee restrooms and kitchen facilities.

The purpose of the study was the following:

1. Make a cursory investigation of the conditions of the existing lift station;
2. Calculate lift station and force main sizing required to serve an upsized site;
3. Explore options for discontinuing sewer discharge to the property to the east;
4. Make recommendations for lift station improvements.

EXISTING LIFT STATION CONDITIONS

The existing lift station appears to have been constructed in 1995 based on plans prepared by Cullen Engineering Associates, Inc. Plans summarize the following design conditions:

- Standard 4-foot diameter concrete manhole barrel sections
- Eccentric cone
- Standard 24-inch frame and cast iron manhole cover
- Three separate gravity inlet pipes to the wet well
- One submersible pump with the following characteristics:
    - 75 gpm
    - 20-feet head
    - 4-inch discharge
    - Explosion proof motor
- 4-inch force main

COLEMAN ENGINEERING

- Valve pit including a check valve and gate valve

The lift station electrical panel is located inside the nearby industrial building. The control panel is a simple timer that is set to operate twice per day for a duration sufficient to empty the wet well.

Visual observations from the ground surface during a site visit on November 22, 2011 indicated that the lift station is in fair condition. Concrete that was visible and accessible from the surface appeared to be reasonably competent when probed with an iron pick. In addition, metallic piping appeared to be in place and functioning. The pump was operated and seemed to function as expected.

Site staff did indicate that the lift station "backs up" at times resulting in sewage overflows from the cleanout near the Scale House. Site staff did not indicate any reasons or recurring timing for the overflows. They did say that the pump has clogged with rags or straps in the past.

LIFT STATION AND FORCE MAIN SIZING

Three components of the lift station were analyzed to verify their sizes versus existing and future service conditions:

- The pump
- The force main
- The wet well

Pump Sizing

A base wastewater flow unit of 600 gpd/acre for industrial land was assigned in the City of Pittsburg Wastewater Collection System Master Plan, Amendment No. 3, dated August 2011. Given the current size of the property, the site is projected to generate 20,000 gpd.

Ultimate flows for the site should double based on an increased site area so that the average wastewater flow rate will be 40,000 gpd. The master plan also assigned a peaking factor of 2.11 based on the results of flow monitoring.

A wastewater pump should be sized to convey the peak flow entering the lift station. Peak flows for the current and ultimate site conditions are calculated below.

Current peak flow: $(20{,}000\ gpd) * \left(\frac{1\ day}{1{,}440\ min}\right) * (2.11) = 29.3\ gpm$

Ultimate peak flow: $(40{,}000\ gpd) * \left(\frac{1\ day}{1{,}440\ min}\right) * (2.11) = 55.6\ gpm$

Therefore, in order to convey ultimate peak flows, the pump should be sized to move a minimum of 55.6 gpm. According to the plans, the current pump is rated for 75 gpm, so with respect to conveying ultimate flows, the current pump is sufficient as is.

Force Main Sizing

A sewer force main should be sized so that flow moves at a velocity between 2 and 7 feet per second. This velocity is intended to keep solids in suspension but not cause excessive head loss or scouring of the pipe.

The existing force main is 4-inches in diameter. Therefore, the pumping rate should be selected to match the existing force main. The calculation of force main flow yielding a minimum velocity of 2 fps follows:

Force Main Flow: $(2fps) * (\frac{\pi 4^2}{4}) = 85\ gpm$

Therefore, in order for the force main to flow at the minimum velocity of 2 fps, a pumping rate of 85 gpm is required.

Wet Well Sizing

Optimal wet well sizing is intended to facilitate automatic cycling of the pumps. Wet wells should not be sized or used for storage of wastewater. Wet wells that are too large, or that are used for storage of wastewater, tend to become anaerobic. As wastewater becomes anaerobic, it creates hydrogen sulfide gas which combines with moisture to form sulfuric acid. This acid is particularly corrosive to concrete and can easily result in catastrophic damage to the wet well structure and connecting piping.

Ideally, the wet well should be sized so that the operating volume is approximately equal to one pump capacity in gpm. This will result in a minimum pump run time of one minute.

The existing wet well is constructed using 4-foot diameter manhole barrels. A 4-foot diameter cylinder has a capacity of about 94 gallons per foot of height. Therefore, assuming that the new pump works at a rate of 85 gpm, the new operating volume of the wet well should be set for approximately 1-foot. This will minimize long wastewater detention times and remove sewage much more frequently throughout the day so that grease and fats have less time to solidify on the surface and clog the pump.

Sizing Summary

Based on analysis of the existing lift station components and future conditions, it appears that the system will not require major upgrades. The following is a summary:

- The current pump is 75 gpm but ideal minimum force main velocities will be achieved at 85 gpm. A new pump is not warranted for such a small increase in flow but the next time a pump is required, it should pump at a minimum rate of 85 gpm.
- The force main is sized adequately at 4-inches diameter. No changes are recommended for the force main.

- The wet well size is sufficient as is. As the lift station is upgraded, it is recommended that operating points be set so that the operating range is limited to about 1-foot.

DISCONTINUE SEWER DISCHARGE TO THE PROPERTY TO THE EAST

The existing wastewater system depends on the 4-inch force main discharging to the property to the east. The existing force main alignment leaves the lift station roughly south, parallel to the building and then turns east following the driveway. The force main alignment crosses Loveridge Road and continues across the property to a lift station located there.

There are two main options being considered as alternatives to the current alignment – both ending with a discharge in the Delta Diablo Sanitary District trunk sewer in the Pittsburg-Antioch Highway.

Option 1 – New force main to trunk sewer
The most obvious option is to construct a new force main that parallels Loveridge Road, from the intersection of the driveway to the facility to the Pittsburg-Antioch Highway. This alignment would be approximately 650-feet long. It would likely require extensive utility coordination as well as a creek/culvert crossing.

The length of the new force main alignment is attractive because it is similar to the length of the existing force main. No plans of the property to the east were made available for this study but verbal descriptions indicate that the distance to the existing downstream lift station versus the Pittsburg-Antioch Highway are similar. Also, since the flow velocity in the 4-inch force main is relatively slow, head loss is also minimized which will be advantageous to this new alignment alternative.

After more detailed plans and maps of the existing system and a new alignment are available, site specific calculations should be made to confirm these early assumptions. But, at this early stage of the study, it is reasonable to assume that any changes to the pumping condition will be minimal and negligent on long term operational and energy costs.

Option 2 – Connect to an existing force main
The property immediately south of the Recycling Facility is also connected to the sewer collection system via a lift station and force main. It is assumed that their force main connects to the trunk sewer near the intersection of Loveridge Road and the Pittsburg-Antioch Highway. It may be possible to connect to this force main near their lift station in order to avoid the majority of the utility coordination issues associated with the creek crossing and the dense utility corridor near the intersection.

Connecting two lift stations to a common force main is not a difficult issue. It depends on proper pump and force main sizing. To simplify, the hydraulics of the force main and pumps must be analyzed assuming flows are coming from both lift stations at the same time. Given the small size of both of the lift stations, it is entirely likely that this scenario could work.

In order to assess the merits of this option, we will need details on the existing lift station pumping rate and force main size and alignment for the neighboring property.

Summary
It is likely that the existing lift station, with the existing pump, will be sufficient for pumping to the proposed discharge point south of the property – either directly or in parallel with the lift station to the south.

Additional details should be studied as part of a design effort once an alternative has been selected.

The cost of simply changing the discharge point should be negligible with respect to the lift station. While other lift station improvements are recommended to address other concerns, it is entirely likely that no lift station improvements will be required to change the discharge point.

RECOMMENDED IMPROVEMENTS TO THE LIFT STATION

After a site review and subsequent calculations and analysis, a number of improvements are recommended for the sewer lift station. It is assumed that these improvements may be made as part of the site work necessary to expand the site size and operations. The table below is a prioritized list of improvements and associated benefits that should be expected from each.

Improvement	Benefit
Add float controls for On, Off, and High Water Alarm, and set operating range to 1-foot	Float controls will cycle lift station more frequently and regularly. Will minimize anaerobic conditions which lead to odors and corrosion issues. Will help to avoid buildup of grease on top. Will alert site staff of high water conditions well before an overflow occurs.
Add a second pump.	A second pump will provide redundancy in case one pump clogs or becomes non-functional for other reasons. Any new pump should be sized for 85 gpm minimum. Any new pump should be sized for head conditions consistent with future force main alignment and potential connections.
Provide a rail system for pump(s).	Rail system will aid significantly in removal and servicing of the pump. It can be added to the existing pump or added to a new duplex pumping arrangement.
Remove manhole cone section and install barrel section and flat top lid.	Opening up the top of the wet well will aid in lift station maintenance.

Improvement	Benefit
Epoxy lining of wet well and piping.	Epoxy lining will inhibit corrosion and add years of life to the existing structure and piping. Epoxy should be a product intended for wastewater applications such as Raven 405FS which can be applied both to concrete and metallic piping after proper surface preparation.
Seal all electrical and control conduits.	Sealing will prevent sewer gasses from migrating up the conduits and corroding the electrical and controls cabinets and gear.
Move lift station out of travel way.	If major re-work or replacement of the lift station is contemplated, relocation should be considered so that the lift station is out of the travel way. This will improve working and maintenance conditions for staff.
Specify grinder pumps.	Grinder pumps could be used to add a measure of robustness to the lift station. Grinder pumps are made to chop and pass stringy matter than has clogged the lift station in the past. However, a grinder pump is probably not warranted if other improvements which are suggested above are implemented.