

Castroville Community Services District



Moss Landing Sewer System Risk Assessment

FINAL

OCTOBER
2017

AKEL
ENGINEERING GROUP, INC.





CASTROVILLE COMMUNITY SERVICES DISTRICT

MOSS LANDING

SEWER SYSTEM RISK ASSESSMENT

Final

October 2017



AKEL
ENGINEERING GROUP, INC.

Monday October 23, 2017

Castroville Community Services District
11499 Geil Street
Castroville, CA 95012

Attention: Eric Tynan
General Manager

Subject: Moss Landing – Sewer System Risk Assessment

Dear Eric:

We are pleased to submit this evaluation documenting the Moss Landing Sewer System Risk Assessment. This report includes a review of condition and risk for the sewer system assets in the community of Moss Landing.

The report documents the recommended improvements intended to improve the levels of service to the existing customers, and to limit risk exposure due to sewer pipeline or force main failures. This assessment also documents improvements intended to increase public and maintenance staff safety, and secure facilities to prevent vandalism.

We are extending our thanks to you and District staff for your valuable input and reviews during the completion of this study.

Sincerely,

AKEL ENGINEERING GROUP, INC.

A handwritten signature in blue ink that reads "Tony Akel". The signature is stylized with a large, sweeping initial "T" and a long horizontal line extending to the right.

Tony Akel, P.E.
Principal

Enclosure: Report

Castroville Community Services District

Moss Landing Sewer System Risk Assessment

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MOSS LANDING SEWER SYSTEM RISK ASSESSMENT

1.0 BACKGROUND AND PURPOSE

The community of Moss Landing is located northwest of Castroville and along the Pacific Coast of California (**Figure 1**). The sewer system for Moss Landing was constructed in 1985 as a part of the Monterey County Public Works and services residential, commercial, and institutional customers.

The Castroville Community Services District merged with the Moss Landing County Sanitation District in 2011 to provide operation and maintenance services for existing customers. The system includes four (4) wastewater pump stations flowing to the Moss Landing Pump Station, which discharges directly to the Regional Wastewater Treatment Plant.

The system is approximately 30 years old, and District staff have identified the need to rehabilitate the wastewater infrastructure. As such, District staff are in the process of preparing a grant funding application for the rehabilitation and replacement of critical sewer system infrastructure. The District contracted with Akel Engineering Group, Inc. to prepare a risk assessment of the Moss Landing sewer infrastructure in an effort define the highest risk assets and prioritize rehabilitation and replacement needs.

2.0 SCOPE OF WORK

The District entered into an agreement with Akel Engineering Group on July 19, 2017 to complete a sewer system risk assessment to identify potential high risk and critical sewer infrastructure that may need rehabilitation or replacement. This report includes the following elements for each area:

- Develop the Moss Landing Sewer System GIS
- Document the condition of the existing facilities
- Define the risk criteria
- Develop a risk analysis of the existing facilities
- Prepare a letter report

3.0 SYSTEM DATA REVIEW

The following data was used as a basis for this risk assessment. The review included field inspections, closed-circuit television (CCTV) review, and as-built data review.

- **Field Inspection.** A visual field inspection performed on July 31st, 2017, which included review of each of the 4 lift stations and the Lift Station 2 force main. The field inspection consisted of evaluating site constraints, physical condition of the equipment, and documenting known operational concerns.
- **CCTV Review.** CCTV video from 2007 and 2011 was provided by the District and documents the physical condition of the pipelines. The videos from 2007 note the defects, and were performed using a camera mounted robotic unit. The 2011 videos were completed using a push camera.
- **As-Built Data.** As-Built information for the initial construction of the sewer system was provided at the onset of the project. The as-built data was used to complete a GIS development of the sewer system.

4.0 EXISTING SYSTEM DESCRIPTION

The existing sewer system is composed of approximate 7.88 miles of 8-inch gravity sewer and 4-inch and 6-inch force mains ([Table 1](#)). The system generally conveys wastewater by gravity to lift stations, where flow is pumped downstream to the Monterey One Water Moss Landing pump station located on the east side of Moss Landing Road, approximately 900 feet south of Sandholdt Road ([Figure 2](#)). Flows are then conveyed to the Monterey One Water Regional Wastewater Facility.

The lift stations are discussed as follows:

- **Lift Station Number 1. Struve Road.** The lift station is comprised of two 20 horsepower Flygt submersible pumps with a capacity of 153 gallons per minute. The discharge pipe is a 4-inch diameter force main. Maintenance is achieved by lifting the pumps up the double slide rail system incorporated into the design of the station. The liquid levels and control settings are monitored by pressure sensors located at the bottom of the wet well. The lift station is located partially in road right of way and partially in an easement from the neighboring property.
- **Lift Station Number 2. Little Baja.** The lift station is comprised of two 20 horsepower Flygt submersible pumps with a capacity of 127 gallons per minute. The discharge pipe is a 4-inch diameter force main. Maintenance is achieved by lifting the pumps up the double slide rail system incorporated into the design of the station. The liquid levels and control settings are monitored by pressure sensors located at the bottom of the wet well. The lift station is located adjacent to State Highway 1.
- **Lift Station Number 3. Sandholdt Road.** The lift station is comprised of two 5 horsepower Flygt submersible pumps with a capacity of 83 gallons per minute. The discharge pipe is a 4-inch diameter force main. Maintenance is achieved by lifting the pumps up the double slide rail system incorporated into the design of the station. The

liquid levels and control settings are monitored by pressure sensors located at the bottom of the wet well. The lift station is located in the Sandholdt Road right of way.

- **Lift Station Number 4. Potrero Road.** The lift station is comprised of two 5 horsepower Flygt submersible pumps with a capacity of 92 gallons per minute. The discharge pipe is a 4-inch diameter force main. Maintenance is achieved by lifting the pumps up the double slide rail system incorporated into the design of the station. The liquid levels and control settings are monitored by pressure sensors located at the bottom of the wet well. The lift station is located in road right of way.

5.0 RISK ASSESSMENT CRITERIA

This section documents the risk assessment criteria for the pipelines and pump stations.

5.1 Pipelines

The criteria used for evaluating the risk for pipeline assets within the existing system was divided into two categories:

- **Consequence of Failure:** This category represents the impact of failure on nearby water bodies, disruptions to major thoroughfares, or disruptions to critical facilities.
- **Likelihood of Failure:** This category represents the probability of failure of a particular asset.

5.1.1 Consequence of Failure

The consequence of failure criteria is documented on [Table 2](#), and summarized as follows:

- **Water Body Crossing.** This category includes pipes crossing water bodies, including the Elkhorn Slough, and accounts for 60 percent of the overall consequence of failure scoring.
- **Highway 1 Proximity.** This category includes pipes within close proximity to State Route 1, and accounts for 20 percent of the overall consequence of failure scoring.
- **Critical Facilities.** This category includes pipelines adjacent to critical facilities, including marine laboratories, and accounts for 20 percent of the overall consequence of failure score.

5.1.2 Likelihood of Failure

The likelihood of failure criteria is documented on [Table 2](#). The pipeline peak score was based on the physical condition of the pipeline, which was assessed using CCTV video from 2007 and 2011. The videos from 2007 note the defects, and were performed using a camera mounted

robotic unit. The 2011 videos were completed using a push camera. Defects that were apparent in the videos were noted and scored based on current NASSCO PACP rating.

5.2 Lift Stations

Lift station risk was based on a visual field inspection performed on July 31st, 2017. The field inspection included review of each of the 4 lift stations. The following criteria were considered in the field visits:

- **Condition of the Lift Station.** This category is based on the results of the visual site inspection. The wet wells and electrical were reviewed for evident defects.
- **Location of the Lift Station.** This category is based on the results of the visual site inspection. Right-of-way constraints, safety, public impact, and security were considered in this review.
- **Operational Concerns.** This category was based on District staff input, and required periodic maintenance schedules.

6.0 RISK ASSESSMENT

This section documents the condition and risk assessment of the pipelines and lift stations. The risk represents a combination of the likelihood that a pipeline may fail, and the consequence of a failure.

6.1 Pipelines

The pipeline condition and risk assessment are documented in the following sections.

6.1.1 Sewer Condition Assessment

The condition of the sewer mains was evaluated to provide an overall estimation of improvements necessary to maintain adequate levels of service for the customers of the Moss Landing sewer system, and to mitigate the potential impacts of failures within the system. The condition assessment involved review of CCTV of the sewer lines from 2007 and 2011. The review of the CCTV was completed in accordance with National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) scoring. This included determining structural, operational and maintenance, construction, and miscellaneous defects.

The gravity sewer mains are generally in good condition. Defects within the system generally consist of separated joints or offset joints. District staff indicate that these defects were first noticed following the Loma Prieta earthquake.

Additionally, the force main crossing the Elkhorn Slough was assessed during a site visit. This pipeline was prioritized for inspection due to exposure to the elements, and environmentally sensitive surroundings. The portion of the force main crossing the bridge deck is suspended by used of steel hangers. These hangers have experienced weathering and corrosion due to their exposure, and are considered beyond their useful life ([Figure 3](#)).

The portion of the force main that extends into the bridge abutment and piling foundation structures appears to rest on the bottom of the sleeve. Moisture between the sleeve and the steel force main has severely corroded the bottom portion of the force main ([Figure 4](#)).

Finally, District staff indicated that several manholes were corroded due to sulfide gas. The District recently rehabilitated manholes 29 through 27. However, no protective coating was applied. Additionally, manholes 26 through 47 have not been rehabilitated. These manholes have experienced significant spalling, and with the rebar exposed in some cases ([Figure 5](#)). As such, these manholes are considered beyond their useful life and close to failure.

6.1.2 Sewer Pipeline Risk Assessment

A risk assessment was performed to evaluate the potential failure for pipelines and lift stations in the Moss Landing sewer system. The risk score is a combination of the consequence and likelihood of failure criteria discussed in a previous section.

The risk scores were combined into 3 separate categories: low, medium, and high ([Figure 6](#)). The high-risk pipelines represent the most critical assets in the system. Failure of these assets results in the largest impact to customer level of service and environmental hazards.

6.2 Lift Stations

The following sections discuss the findings of the site inspection and visual survey of each lift station performed on July 31st, 2017.

Lift Station Number 1. Struve Road.

The following documents the risks and concerns associated with Lift Station Number 1:

1. This lift station was originally constructed in 1985. Many of the components are nearing the end, or have exceeded, their useful life. Component ages range from 16 to 30 years old.
2. There is currently no water source at the lift station site, which prohibits wash down or clean-up activities.
3. The lift station and electrical control panel are located on the north side of Struve Road, just east of where the road turns South. The electrical panel is protected with steel bollards. The station is offset from the roadway, but is located in the front yard of a

single-family home. There is no security fence around the lift station, which makes the equipment susceptible to vandalism.

4. The station and its telemetry antenna are located directly under power lines and their support structure. Cranes and/or other lifting maintenance lifting equipment will interfere with these facilities creating an unsafe condition.
5. The electrical control panel is in poor condition showing signs of rust damage and age. The interior boards of the panel have cutouts in it showing the location of where certain equipment was removed/replaced. The hour meters and switches are showing their wear. The SCADA system is in good working condition. District Staff noted that the power service is poor at the lift station site, and thus a backup generator is recommended to mitigate any potential issues related to loss of power.

Lift Station Number 2. Little Baja.

The following documents the risks and concerns associated with Lift Station Number 2:

1. This lift station was originally constructed in 1985. Many of the components are nearing the end, or have exceeded, their useful life. Component ages range from 16 to 30 years old.
2. There is currently no water source at the lift station site, which prohibits wash down or clean-up activities.
3. There is no security fence around the lift station, which makes the equipment susceptible to vandalism.
4. The lift station and electrical control panel are located on the west side of State Highway 1, next to a driveway. The electrical panel is protected with steel bollards. District Staff noted that the power service is poor at the lift station site, and thus a backup generator is recommended to mitigate any potential issues related to loss of power.
5. The electrical control panel is in poor condition showing signs of rust damage and age. The interior boards of the panel have cutouts in it showing the location of where certain equipment was removed/replaced. The hour meters and switches are showing their wear. The SCADA system is in good working condition.

Lift Station Number 3. Sandholdt Road.

The following documents the risks and concerns associated with Lift Station Number 3:

1. This lift station was originally constructed in 1985. Many of the components are nearing the end, or have exceeded, their useful life. Component ages range from 16 to 30 years old.
2. There is currently no water source at the lift station site, which prohibits wash down or clean-up activities.

3. There is no security fence around the lift station, which makes the equipment susceptible to vandalism.
4. The lift station and electrical control panel are located on the east side of Sandholdt Road. Sandholdt Road is a long dead-end road with only one access. The electrical panel is protected with steel bollards.
5. The pump station is located within the street lane of traffic with its associated valve and piping box within the parking strip next to the concrete curb. When the pump station access cover is open for maintenance purposes, cars and other vehicles using the road drive dangerously close to the maintenance workers in the lane of the opposite direction. Closure of the street during these maintenance operation is problematic the businesses located at the north end of the peninsula.
6. The electrical control panel is in poor condition showing signs of rust damage and age. The interior boards of the panel have cutouts in it showing the location of where certain equipment was removed/replaced. The hour meters and switches are showing their wear. The SCADA system is in good working condition.
7. District staff also noted that the impellers for this lift station are known to deteriorate quickly due to sand and grit found in the pipelines. This condition was confirmed in the CCTV inspection of the pipelines to the south of the lift station.

Lift Station Number 4. Potrero Road.

The following documents the risks and concerns associated with Lift Station Number 4:

1. The lift station and electrical control panel are located on the north side of Potrero Road, west State Highway 1. The station is within the road right of way just off the side of the roadbed. When the station access cover is open for maintenance purposes, cars and other vehicles using the road drive dangerously close to the maintenance workers, in an unsafe manner. Additionally, the cover for the wet well is located in the low point of the roadway. Repeated vehicle travel has resulted in damage to the wet well cover, and District staff have had to replace the cover.
2. The electrical control panel is in poor condition showing signs of rust damage and age. The interior boards of the panel have cutouts in it showing the location of where certain equipment was removed/replaced. The hour meters and switches are showing their wear. The SCADA system is in good working condition.
3. There is no security fence around the lift station, which makes the equipment susceptible to vandalism.

7.0 RECOMMENDATIONS

Based on the findings of the visual inspections and the risk analysis of the existing sewer infrastructure, the following improvements are recommended to enhance the level of service

and to mitigate potential failures resulting in severe environmental and customer impact. The improvement recommendations are documented on [Figure 7](#) and listed on [Table 3](#).

7.1 Pipelines

The following are recommendations for pipeline improvements:

- **FM2-1.** Replace the section of 4-inch force main from LS-2 of the State Route 1 bridge crossing the Elkhorn Slough to approximately 1,250 feet south of the bridge. This pipeline has experienced significant corrosion within the carrier pipe in the bridge abutment, and marginal corrosion in the sections exposed under the bridge deck. Additionally, the hangers are corroded and need replacing. This project should also replace the force main discharge at manhole 14.

It should be noted that the condition of the force main beyond the bridge abutments is unknown. In the course of design review, it is recommended that additional locations be potholed to determine the extent of the deterioration of the force main.

- **P-1.** Repair the section of pipe from manhole 36 to manhole LS3. This pipeline has several joint separations as a result of the Loma Prieta earthquake.
- **P-2.** Rehabilitate the section of pipe from manhole 39 to manhole 38. This pipeline has experienced significant deposit settlement, mainly in the form of sand. It is recommended that the District explore the feasibility of requiring service connections install grit/grease separators prior to discharge. This will limit adverse impacts to the pipes and downstream lift station 3.
- **MH-1.** Manholes 27 through 30 were recently rehabilitated, but should be resin coated to stop future corrosion of the manhole.
- **MH-2.** Manholes 47 through 41 and manholes 21 to 26 should be rehabilitated with Type 5, High Sulfate Resistance cement and coated with a resin coating.

7.2 Lift Stations

The following are recommendations for improvements to the Moss Landing Lift Stations:

Lift Station Number 1. Struve Road. It is recommended that the lift station be relocated away from the power lines and the residential structure. An area outside of the property fence, away from the street right of way, is located directly to the west. The parent parcel of the site where the station is located is large and relocation would be to another area of that parcel. A new electrical control panel controlling and monitoring the lift station is also recommended and should be relocated to a position away from the travelled way. Bollards should be installed protecting not only the pump station, but also the electrical control panel.

Lift Station Number 2. Little Baja. A new electrical control panel controlling and monitoring the pump lift station is recommended and can be reconstructed in its current location.

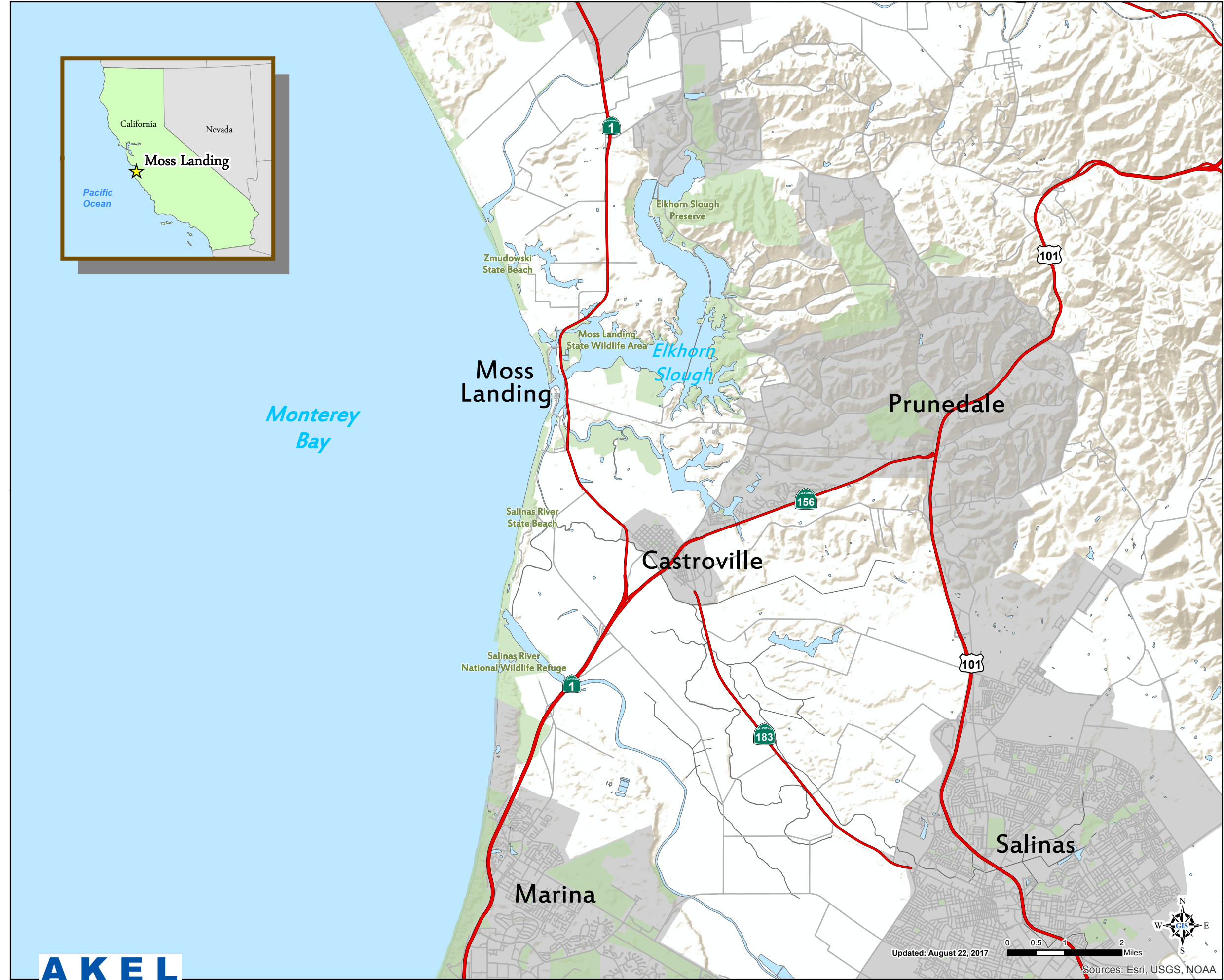
Lift Station Number 3. Sandholdt. It is recommended that the lift station be relocated, away from the lane of traffic. A new electrical control panel controlling and monitoring the pump lift station is also recommended and should be relocated to a position in a protected location.

Two feasible locations were identified for the relocation of the lift station and control panel, and are documented as follows:

- Move the existing piping and valve box to the south of its present position along the east curb of Sandholdt Road. Move the pump station to the east of its present location to the previous location of the piping and valve box, near the east curb of Sandholdt Road. This location will be within the parking area of the street. Maintenance activities will not cause traffic disruptions along the road or cause safety concerns about maintenance staff working near and alongside moving traffic. The area will need to be designated as “No Parking” as the diamond steel plate access covers are susceptible to damage from heavy loads.
- Move the complete pump station and electrical control panel to the west to behind the westerly property line. The area appears to be a setback for the business located on that parcel and that it could be made available for the District’s use. It does not appear that the business will be affected by this change of use of the parcel.

Lift Station Number 4. Potrero Road. It is recommended that the lift station and electrical panel be relocated northerly, away from the road bed, but still within the road right of way. A new electrical control panel controlling and monitoring the pump lift station is also recommended and should be relocated to a position along the right of way line. Bollards should be installed protecting not only the pump station, but also the electrical control panel.

Figures



Legend

- Major Highways
- Urbanized Area
- Protected Open Space
- ~ Rivers/Streams
- Waterbodies

Figure 1
Regional Location Map
 Moss Landing Risk Assessment
 Castroville Community Services District

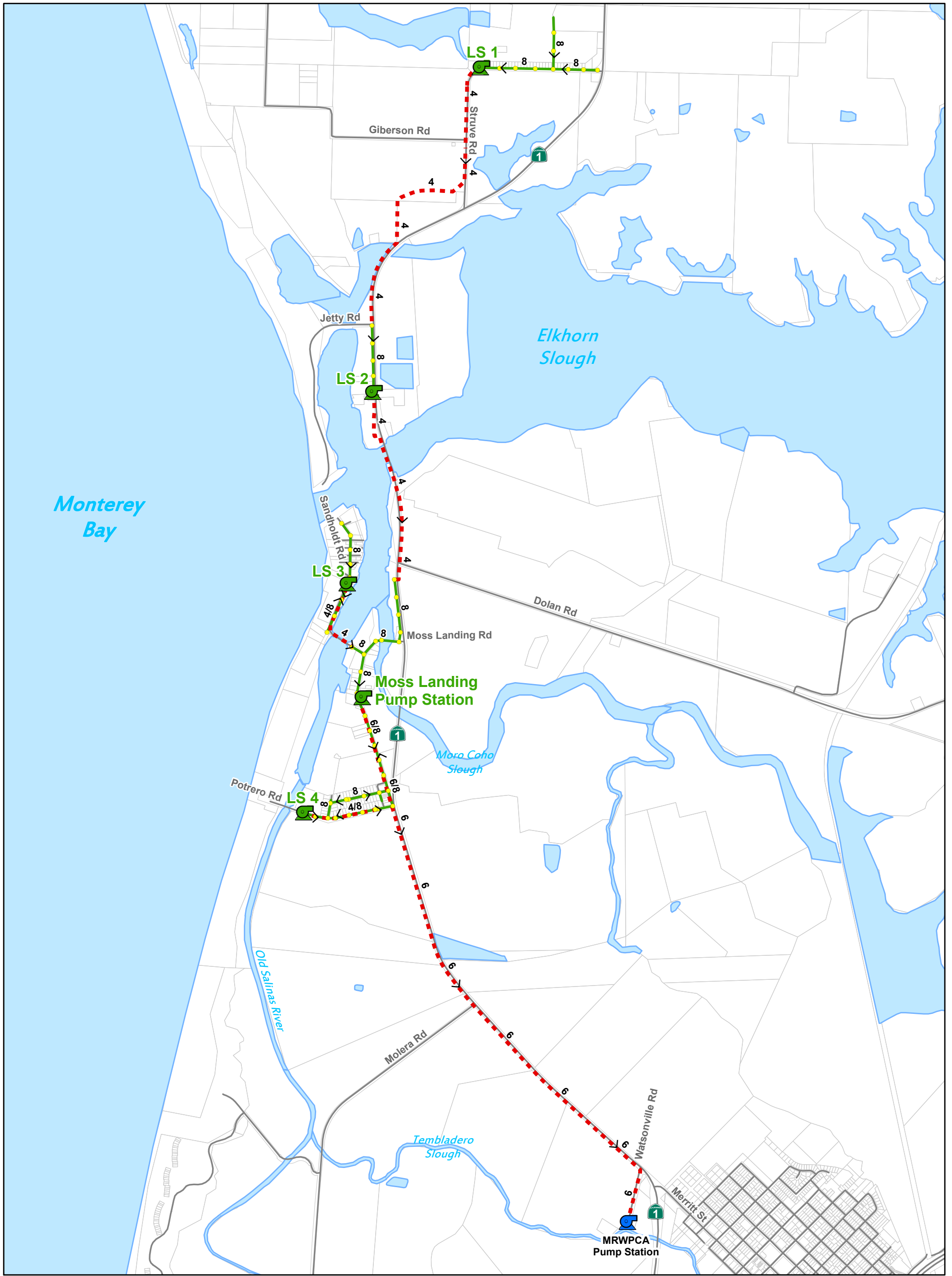


Updated: August 22, 2017



Sources: Esri, USGS, NOAA

File Path: P:\GIS\GIS Projects\Castroville\Sewer\170620-MossLandingRA\Final\ML_Fig1_RLM_082217.mxd



Legend

- | | |
|------------------------|----------------------|
| Existing System | — Street Centerlines |
| Lift Stations | Parcels |
| Manholes | Waterbodies |
| Force Mains | |
| Gravity Mains | |

Figure 2
Existing Sanitary Sewer System
 Moss Landing Risk Assessment
 Castroville Community Services District





Figure
Hanger Condition
Moss Landing Risk
Assessment
Castroville Community
Services District



August 23, 2017



Surface corrosion due to exposure.



Severe Corrosion due to direct and prolonged moisture contact.

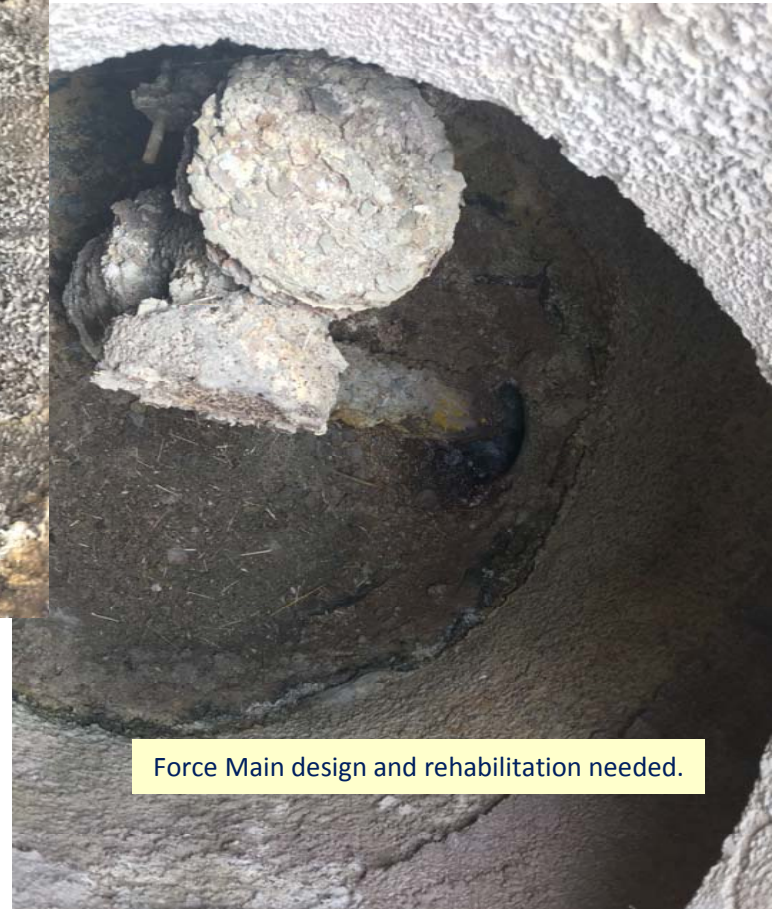
LEGEND

Figure
Force Main Condition
Moss Landing Risk Assessment
Castroville Community Services
District





Manhole surface corrosion and spalling

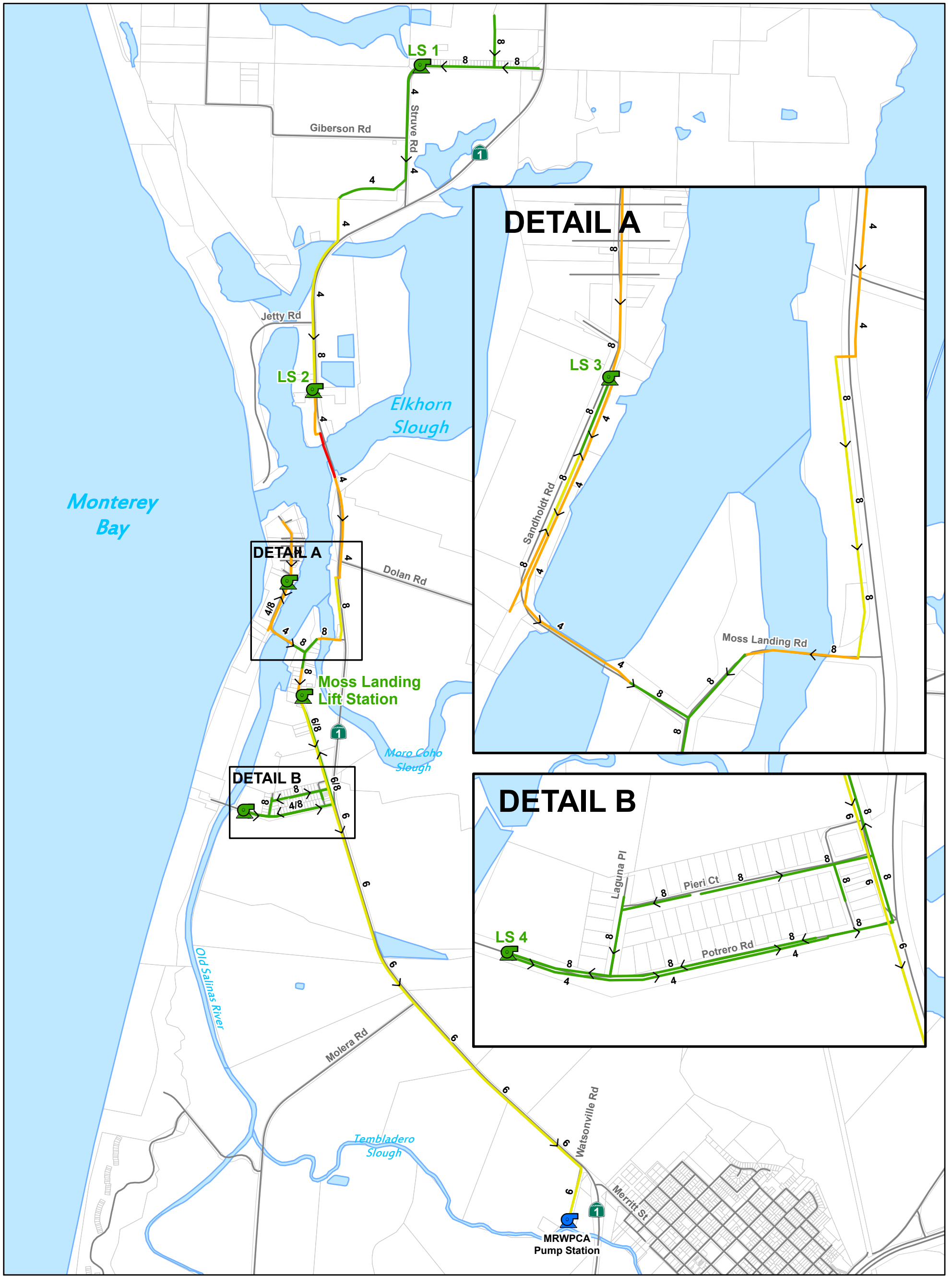


Force Main design and rehabilitation needed.

LEGEND

Figure 1
Manhole Co
Moss Landing Risk Assessment
Castroville Community Services
District



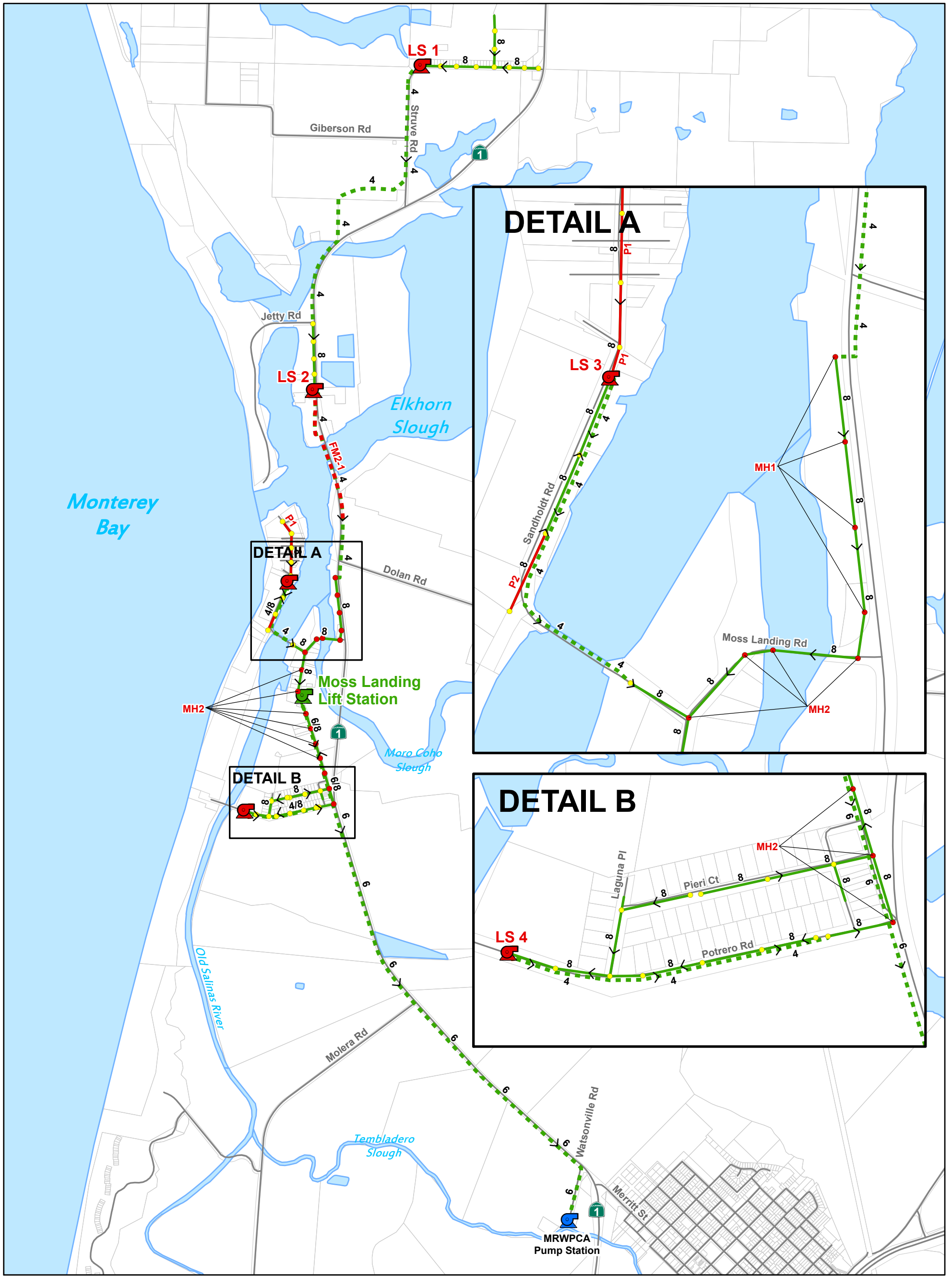


Legend

- | | |
|-----------------------------|--------------------|
| Pipe Risk by Grading | Lift Stations |
| Low | Street Centerlines |
| Medium | Parcels |
| High | Waterbodies |
| Extreme | |

Figure 6
Pipeline Risk Assessment
 Moss Landing Risk Assessment
 Castroville Community Services District





Legend

- | | | |
|---------------------------------|------------------------|----------------------|
| Recommended Improvements | Existing System | — Street Centerlines |
| Lift Stations | Lift Stations | Parcels |
| Manhole Rehabilitation | Manholes | Waterbodies |
| Force Mains | Force Mains | |
| Gravity Mains | Gravity Mains | |

Figure 7
Recommended Improvements
 Moss Landing Risk Assessment
 Castroville Community Services District



Tables

Table 1 Existing GIS Pipe Inventory
 Moss Landing Risk Assessment
 Castroville Community Services District

Pipe Size	Length	
	(in)	(ft)
Gravity Mains		
8	15,948	3.02
Force Mains		
4	13,403	2.54
6	12,259	2.32
Total	41,611	7.88

8/22/2017

Table 2 Risk Assessment Criteria

Moss Landing Risk Assessment

Castroville Community Services District

Criteria		Scoring	Weighting	Description
Consequence of Failure				
Critical Customers	Within 150 feet of: Schools, Research Facilities, Laboratories	5	20%	Failures adjacent to schools and research facilities may require greater levels of clean up, and more critical response.
	Other Mains	1		
Water Body Crossing	Pipelines Crossing Water Body	5	60%	Failures near water body crossings pose environmental hazards and potentially costly mitigation measures.
	Pipelines within 200 ft of Water Body	3		
	Other Mains	1		
Highway Crossing	Pipelines within 200 feet of Highway	5	20%	Failures at highway crossing are more costly and involve multiple jurisdictions.
	Other Mains	1		
Likelihood of Failure				
CCTV Results	Peak Score		100%	Pipelines with higher peak scores have more significant defects, and therefore are more likely to fail.
	5	5		
	4	4		
	3	3		
	2	2		
	1	1		

Table 3 Schedule of Improvements
 Sewer System Risk Assessment
 Castroville Community Services District

Improvement ID	Alignment	Limits	Parallel, Replace, or New	Size (in)	Recommended Improvement		
					(in)	Quantity	Unit
Pipeline Improvements							
FM2-1	State Route 1	From approximately 1000 ft n/o the Elkhorn Slough to approximately 1,250 south of the Elkhorn Slough	Replace	4	4	2,500	LF
P-1	Standholt Road	From the end of Standholdt Road to Whale Way	Replace	8	8	1,250	LF
P-2	Standholdt Road	From approximately 850 ft w/o Moss Landing Rd, north approximately 350 ft	Rehab	8	8	350	LF
Manhole Improvements							
MH-1	State Route 1	Rehabilitate and Coat Manholes along State Route 1	Rehab			4	each
MH-2	Moss Landing Road	Rehabilitate and Coat Manholes along Moss Landing Road to 2,300 feet s/o the Moss Landing Pump Station	Rehab			13	each
Lift Station Improvements							
Lift Station Number 1		Misc Rehab. See Report description.					
Lift Station Number 2		Misc Rehab. See Report description.					
Lift Station Number 3		Misc Rehab. See Report description.					
Lift Station Number 4		Misc Rehab. See Report description.					