Tang, Lila@Waterboards

From:	martinezb@ci.pacifica.ca.us
Sent:	Monday, December 03, 2012 1:32 PM
To:	Tang, Lila@Waterboards
Cc:	mkenyon@bwslaw.com; grommd@ci.pacifica.ca.us; rhodess@ci.pacifica.ca.us; cosgrovej@ci.pacifica.ca.us
Subject:	RE: a couple of questions
Attachments:	Copy of Force Main Insp Project Schedule_11 30 12.xlsx; Pacifica_Force Main Insp_11 30 12.docx
Follow Up Flag:	Follow up
Flag Status:	Flagged

Lila, that is a fair statement as far as the condition assessment of force mains. The report from Brown & Caldwell also covers some of the reasons. As for CCTV of our force mains, we have not completed any at this time but we will have CCTV'd 3 of our 5 FM's by the March 2012 deadline. They are next on the CCTV crew's list to assess.

We have 5 force mains total. The 3 we plan to CCTV are: Skyridge approximately 1500 ft, Brighton approximately 840 feet and Rockaway which is approximately 330 feet. The Linda Mar & Sharp Park force mains are the ones we would like to propose the alternatives to. I am attaching the report Brown & Caldwell prepared and an Excel sheet documenting the needed timeframe. We believe we need until the end of 2013 to complete the condition assessments.

Thank you,

Brian K. Martinez Sr.
Collection System Manager
City of Pacifica
700 Coast Hwy.
Pacifica, Ca. 94044
Office (650) 738-4669
Fax (650) 355-5721
martinezb@ci.pacifica.ca.us
www.cityofpacifica.org

From: Tang, Lila@Waterboards [mailto:Lila.Tang@waterboards.ca.gov]
Sent: Monday, December 03, 2012 12:16 PM
To: Martinez, Brian
Subject: a couple of questions

Hi Brian – I am starting on the CDO amendment and have a couple of questions.

1. How much, in miles or feet, of the force mains has the City completed thus far? I recall mentioned that the City has done some CCTV'ing.
2. Is this statement correct, or would you suggest changes? "In July 2012, the Discharger became aware of the need for unique condition assessment methodologies and technologies that were becoming more widely accepted for force mains, and the limitations of the usefulness of CCTV inspection of force mains. The limitations include advanced corrosion of the outside wall of a force main due to highly

> corrosive soils. The new technologies include acoustic, electromagnetic, ultrasound, and soil corrosivity testing."

This information aims to give our Board a sense that the City hasn't been ignoring the requirement and there is a good reason for an amendment.

City of Pacifica Force Main Inspection

	2012	2013											
Task	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Wet Weather Season													
RFP/Contractual Bid Preparation													
City Exec. Management and Council Approval Process													
Bid Awarding Process													
Project Field Work													
Develop Report/Recommendations													
Contingency Time (to account for unforeseen issues)													

General Force Main Inspection Information

Field inspection of force mains is generally challenging. The exterior of most force mains is inaccessible. The majority of force mains are constructed without redundancy, which requires that the pipelines remain in service 24/7. Constructed access to the interior does not exist, and the pipelines cannot typically be taken out of service and drained, and have the water removed (dewatered) from the pipeline, to allow for inspection. Even if they could be taken out of service, drained, dewatered and recharged, this process can create stress on the pipeline and increase risk of failure during the process.

Examining the exterior of the entire length of a force main requires that the pipeline be excavated along its full length. This is impractical, disruptive and exceedingly cost prohibitive. Limited spot inspections at carefully selected high-risk and/or consequence-of-failure locations are more practical, less disruptive, and can be performed at lesser cost.

Inspecting pipeline interiors using CCTV is possible when the camera can be positioned above the flow stream. Gravity sewer pipelines often operate in a manner that accommodates CCTV inspection. Force mains typically flow full and do not lend themselves to inspection via CCTV technology. Inspecting the interior of the entire length of force mains via visual inspection technologies, such as CCTV, is largely impractical owing to limited access to the interior of the pipeline, physical configuration, and limitations of currently available technology. Using non-visual inspection technologies, such as leak detection technologies and/or visual inspection at limited, carefully selected high-risk and/or consequence-of-failure locations is often more practical. An exception is when the force main discharge is down-gradient, causing the hydraulic gradient to drop below the pipe soffit for the last section of force main prior to discharge to a manhole or other structure. This exposes the upper portions of the pipe wall to potentially corrosive gases. This section can be examined by inserting the CCTV transporter through the discharge manhole and running the tool up the pipeline. However, this section is typically of very limited length.

Based on a review of our system information, the following is a summary and some recommendations for inspecting the City's two primary force main systems.

Force Main from Sharp Park Pump Station to Golf Course

General

- **Physical Properties**
  - **Constructed circa 1997**
  - **26" high density polyethylene (HDPE) pipe**
  - **Approximately 3,600 lf length**
    - **Approximately 2,500 lf is constructed within roadway**
    - **Approximately 1,100 lf is constructed outside of roadway**
  - **Depth of burial varies and is approximately 2 to 6 feet**
  - **Two combination air release/air vacuum valves (ARAVs)**
- **Horizontal alignment**
  - **Multiple angular changes, serpentine**
  - **Multiple 90-degree bends**
  - **Multiple bends between 90 and 120 degrees**
- **Vertical alignment**

- Generally follows ground surface elevation, undulates
- Two locations where the vertical profile transitions from a negative to a positive slope; ARAVs installed at these two locations

HDPE pipe materials are generally inert and not subject to chemical attack of its exterior or interior. HDPE pipes tend to fail from external stresses induced on the pipewall. This includes stress from bedding materials, and loading from traffic or other like sources. Once HDPE pipe becomes out of round it has deformed from its original circular shape and is more susceptible to failure.

The physical construction of this HDPE force main does not readily lend itself to inspection with CCTV technology, even when void of water. HDPE pipe is typically dark, and the lighting required for visual CCTV inspection generally renders the material highly difficult to inspect owing to either light absorption or reflection. Identifying non-circular, deformed HDPE pipe with CCTV is difficult at best.

Using a tethered CCTV transporter would be problematic owing to the cumulative angular changes/bends along the pipeline. The serpentine horizontal profile and undulating vertical profile of this force main would require that multiple structures be constructed to gain interior access to the pipeline. Even if this was accomplished, the force main would need to be removed from service, drained and dewatered to accommodate CCTV technology, which has limited application in HDPE materials as described above.

Laser inspection, which is good for identifying deformation, and hydrotesting, which is good for identifying leaks, also suffer from similar issues as CCTV regarding the need to construct access structures and are not recommended.

As an alternative to the currently proposed CCTV inspection method for this force main pipeline, Brown and Caldwell recommends:

- Verifying the proper operation and maintenance of the valves
- Reviewing available information; selecting limited, key locations where pipeline burial is thought to be shallow; examining the pipe via excavation for roundness and/or deformation; possibly removing a section of pipe for laboratory structural analysis

Force Main from Linda Mar Pump Station to Calera Creek WRP

General

- Physical Properties
- Constructed circa 1971
- 20" reinforced concrete pipe (RCP) – Note: plans unclear; materials require confirmation – could be steel cylinder reinforced concrete pipe (SCRCP)
- Approximately 9,000 lf in length
- Approximately 1,500 lf is constructed within roadway
- Approximately 6,500 lf is constructed outside of roadway
- Depth of burial varies and is approximately 3 to 10 feet

- Two ARAVs
- Three blow off valves
- No known cathodic protection systems
- Horizontal alignment
- Multiple angular changes, serpentine
- Multiple 90-degree bends
- Multiple bends between 90 and 120 degrees
- Vertical alignment
- Generally follows ground surface elevation; undulates
- Multiple locations where vertical profile transitions from a negative to a positive slope; ARAVs installed at high-elevation locations; blow off valves constructed at low-elevation locations

RCP materials are subject to chemical attack of their exterior or interior materials. RCP pipes tend to fail from corrosion. This includes corrosion of the interior surfaces from hydrogen sulfide (H2S) attack and corrosion of the exterior from surrounding soils and/or varying wet/dry cycles. Once RCP pipe begins to corrode it is more susceptible to failure.

The physical construction of this force main does not readily lend itself to inspection with CCTV technology. Use of a tethered CCTV transporter would be problematic owing to the cumulative angular changes/bends along the pipeline. The serpentine horizontal profile and undulating vertical profile of this force main would require that multiple structures be constructed to gain interior access to the pipeline. Even if this was accomplished, the force main would need to be removed from service, drained and dewatered to accommodate CCTV technology. The pipeline would likely require cleaning via hydrojetting or similar method to remove accumulated debris to allow for visual inspection.

As an alternative to the currently proposed CCTV inspection method for this force main pipeline, Brown and Caldwell recommends:

- Verifying the proper operation and maintenance of the valves
- Conducting soils resistivity testing to identify aggressive (hot) soils that may be corrosive to concrete.
- Reviewing available information and selecting limited, key locations for excavation and inspection, such as:
- Locations at/below the seasonal groundwater table where the pipe is subjected to repetitive wet/dry cycles
- Locations/areas where the pipeline is subject to brackish water or seawater
- High elevation locations where the interior of the pipeline may be exposed to air
- Possibly removing a coupon for examination for evidence of H2S attack and corrosion or removing a section of pipe for laboratory structural analysis
- Inspecting internal pipe condition at ARAV manhole locations by inserting a borescope to look at a very small area of the pipe to identify internal corrosion
- If possible, using CCTV to inspect the force main at the discharge.
- As a secondary level of inspection, BC would investigate the potential for conducting acoustic leak detection to identify leaks or areas where air pockets have formed in the system. The presence of air pockets, if any, would help to

further identify the need for additional inspections and the methodology or methodologies best employed.