City of Vista

April 23, 2007

Mr. John Robertus
Executive Officer
Calif. Reg. Water Quality Control Board, San Diego Region
9174 Sky Park Court, Suite 100
San Diego, California 92123-4353

DISCHARGER RESPONSE TO INVESTIGATIVE ORDER NO. R9-2007-0060, DISCHARGE OF UNTREATED SEWAGE INTO THE BUENA VISTA LAGOON WITHIN THE CITY OF CARLSBAD SAN DIEGO COUNTY
(Reference: NCRU:01-0743.02 & 01-0764.02:ebecker)

Dear Mr. Robertus,

The attached document constitutes the dischargers response to Investigative Order No. R9-2007-0060 requiring the completion of a technical investigation and submittal of a technical report to the Regional Board no later than April 23, 2007. As the spill is a recent event and environmental response and forensic analyses are still underway, this report should be viewed as preliminary and is based on the best available information available to the Dischargers at the time of the report preparation. As updated information becomes available and investigations are completed, the dischargers shall provide supplemental information to Regional Board staff in order to further your consideration of the event.

The two cities both appreciate the assistance and counsel of your staff and other responding agencies with respect to the immediate spill response and subsequent remediation efforts. We look forward to continued cooperative efforts in the future as we work towards continued resource recovery and resolution of this unfortunate discharge violation.

I certify under penalty of law that this document and all attachments were prepared under my *direction or supervision in accordance with* a *system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on* my *inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of* my *knowledge and belief, true, accurate, and complete. I* am *aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

Rita Geldert
City Manager, City of Vista

City of Carlsbad

Public Works - Engineering

April 23, 2007

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Executive Officer
Calif. Reg. Water Quality Control Board, San Diego Region
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Please note that as a matter of administrative clarification, the parties under the discharge order should be identified as the City of Vista and the City of Carlsbad. The Investigative Order erroneously identifies the Carlsbad Municipal Water District as one of the dischargers instead of the City of Carlsbad.

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Glenn Pruim
Public Works Director, City of Carlsbad

1635 Faraday Avenue • Carlsbad, CA 92008-7314 • (760) 602-2720 • FAX (760) 602-8562

DISCHARGER RESPONSE TO INVESTIGATIVE ORDER NO. R9-2007-0060, DISCHARGE OF UNTREATED SEWAGE INTO THE BUENA VISTA LAGOON WITHIN THE CITY OF CARLSBAD, SAN DIEGO COUNTY

(Reference: NCRU:01-0743.02 & 01-0764.02:ebecker)

April 23, 2007

DISCHARGERS: CITY OF VISTA
600 Eucalyptus Avenue
Vista, California 92084
Attn: Rita Geldert, City Manager

CITY OF CARLSBAD
1635 Faraday Avenue
Carlsbad, California 92008
Attn: Glenn Pruim, Public Works Director

I certify under penalty of law that this document and all attachments were prepared under my *direction or supervision in accordance with* a *system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on* my *inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of* my *knowledge and belief, true, accurate, and complete. I* am *aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

Rita Geldert, City Manager
City of Vista

Glenn Pruim, Public Works Director
City of Carlsbad

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(Reference: NCRU:01-0743.02 & 01-0764.02:ebecker)

April 23, 2007

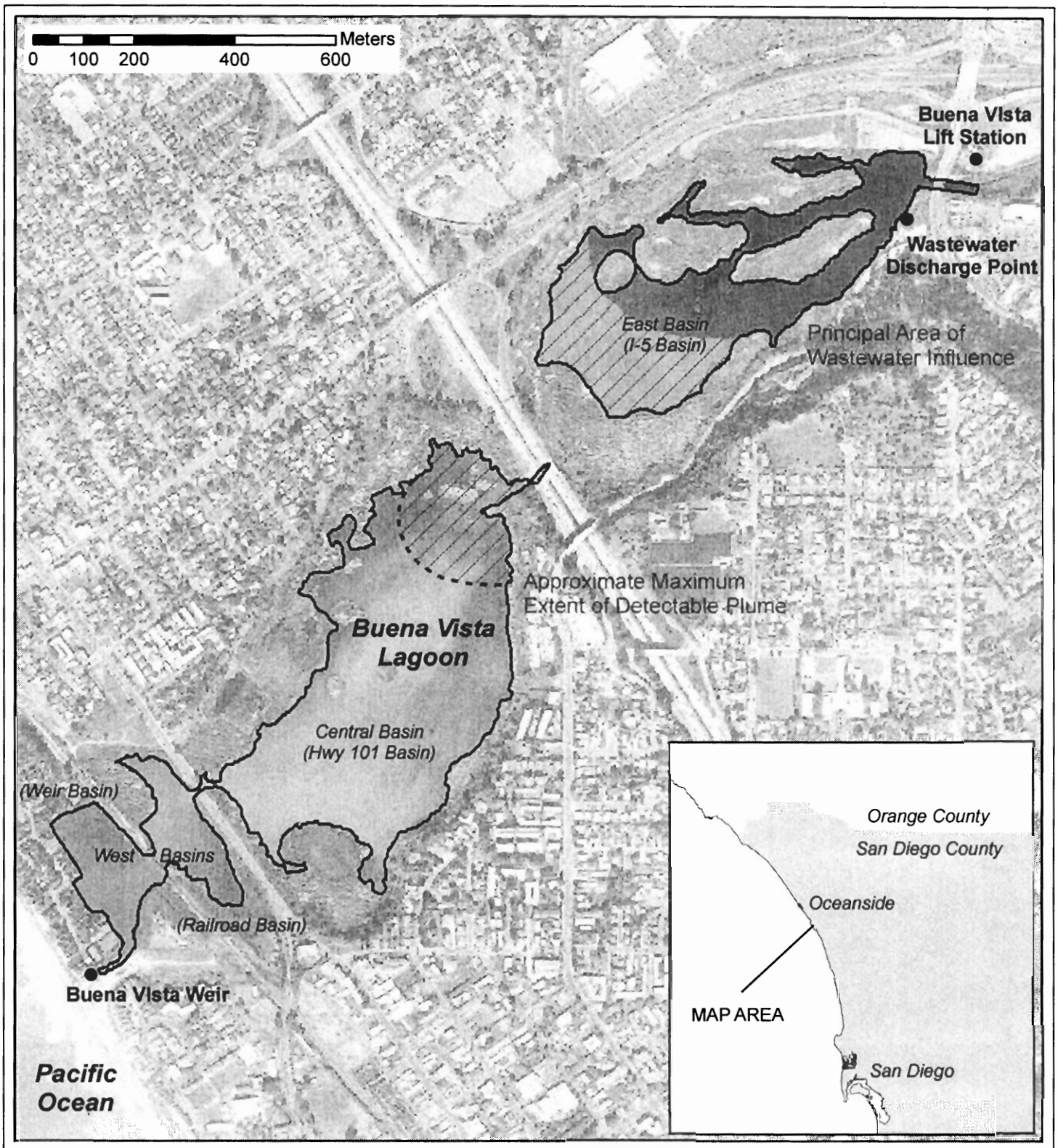
1.0 BACKGROUND

The City of Vista and the City of Carlsbad, hereinafter known as "Dischargers", jointly own and operate a 24-inch force sewer main located south of Buena Vista Lagoon near Jefferson Street in the City of Carlsbad. The City of Vista owns 89.6% of the line; while the City of Carlsbad owns 10.4%. This force main connects the Buena Vista Sewage Lift Station with the Encina Wastewater Authority's treatment plant located on Avenida Encina in Carlsbad. The Dischargers' sanitary sewer systems, including this sewer main, are regulated by Waste Discharge Requirements (WDRs) Order No. R9-2007-0005, Waste Discharge Requirements for Sewage Collection Agencies in the San Diego Region.

From March 31, 2007 through April 3, 2007, the Dischargers spilled an estimated 7.329 million gallons of untreated sewage from a rupture of the sewer main and as a result of repair period overflow from the containment berm at the adjacent Buena Vista Sewer Lift Station into Buena Vista Lagoon (Figure 1). As a result of the spill into Buena Vista Lagoon, the Regional Board requested information to evaluate the actions taken to prevent the sewage discharge, to repair the failed pipeline, and to investigate the impacts to water quality (WQ) from the sewage discharges. This request was tendered to the Dischargers on April 6, 2007 in the form of Investigative Order (IO) No. R9-2007-0060. The IO requires technical investigations and submittal of a technical report to the Regional Board no later than April 23, 2007. This document, and attachments hereto, constitutes the Dischargers' response to Investigative Order No. R9-2007-0060.

As the spill is a very recent event and environmental response and forensic analyses are still underway, this report should be viewed as preliminary and is based on the best information available to the Dischargers at the time of the report preparation. As updated information becomes available and investigations are completed, the dischargers will provide supplemental information to the Regional Board in order to further its consideration of the event.

M&A #02-059-60



Incident Area Map
Buena Vista Sewer Force Main Discharge
April 2007

Figure 1

Merkel & Associates, Inc.

2.0 IDENTIFICATION OF DISCHARGERS

As a matter of administrative clarification, the parties under the discharge order should be identified as the City of Vista and the City of Carlsbad, collectively referred to in this document as "Dischargers". Please note the Investigative Order erroneously identifies the Carlsbad Municipal Water District as one of the dischargers instead of the City of Carlsbad. This correction should be made in the Board's files.

3.0 DATA COLLECTION AND VERIFICATION

Data gathered for the preparation of this report has been derived from many sources including the Dischargers, cooperative agencies responding to the spill, consultants and contractors to the Dischargers, as well as resource and regulatory agency staff and regulatory agency files. In most instances, data have been fully evaluated and verified by collection of field logs and site records, completion and review of calculations by multiple parties, and compilation of synoptic accounts to confirm response actions. Water quality data has been collected using regularly calibrated equipment, and Encina Wastewater Authority (E.L.A.P. Certification No. 1441) has processed bacterial samples from the monitoring program.

In some instances, however, data collection and analyses are ongoing and data are preliminary in nature. Where data are considered to be preliminary, this has been noted. Most specifically, preliminary data exist for the lagoon environmental monitoring program and for forensic analysis of the causative agents to pipeline failure. For both of these investigations, data collection and analyses are ongoing, and thus it is not possible to provide final results at this time.

Documentation supporting the information provided in this report is provided as appendices to this document. The appendices are organized in accordance with the numbered information requested in the Board's IO. The supporting documentation includes reference data and calculations, laboratory analysis and reports, photographs and logs, and similar information.

4.0 SPECIFIC DATA REQUESTS

This section comprises the bulk of the technical response to IO No. R9-2007-0060. The section is organized to follow the format of information requested in the IO. For completeness, the request made by the Board is repeated herein followed by the Discharger's response. Where applicable, reference is made to the requisite supporting documentation related to the response. This information is found in the appendices to this report.

4.1 EXPLANATION OF OVERFLOW DISCOVERY

A complete, detailed explanation of how and when the overflow from the sewer main was discovered, including the tabular and graphical summaries of the daily total influent flows to the Encina Water Pollution Control Facility (EWPCF) and flow data from the Buena Vista Pump Station from March 6, 2007 through April 6, 2007. ***(RWQCB #1)***

The spill discovery was made by a private citizen who observed possible sewage overflow entering Buena Vista Lagoon at a regularly used formal wildlife observation area located at the east end of Buena Vista Lagoon off of Jefferson Street. The citizen contacted Carlsbad PD Dispatch at 6:52:54 PM on Sunday 4/1/07 (see Carlsbad PD dispatch logs regarding sewer discharge response, Appendix 1a). Dispatch called the City of Carlsbad duty person, Pedro Rodriguez. Mr. Rodriguez responded to the site at 6:55 PM on Sunday 4/1/07.

Mr. Rodriguez positively identified overflow entering Buena Vista Lagoon and called Mr. Jesse Castaneda, City of Carlsbad Public Works Supervisor at home to advise him. Mr. Castaneda responded to the location at 7:10 PM and met with Mr. Rodriguez. Mr. Castaneda confirmed it was the Buena Vista force main that had broken causing the sewage release. Following the City of Carlsbad Sanitary Sewer Overflow Response Plan, Mr. Castaneda contacted Mr. Don Wasko, City of Carlsbad Acting Public Works Superintendent. Mr. Wasko responded to the site at 7:40 PM. Mr. Wasko and Mr. Castaneda worked together to notify senior management and began to prepare for repairs and immediate response actions to mitigate the overflow. Additional staff members were also called in for assistance.

Within 3 minutes of the initial notification, the Dischargers had responded to the site. A detailed account as to the subsequent actions taken to terminate and mitigate the waste discharge is provided elsewhere in this document.

Appendix 1b provides a summary of influent flow to the Encina Wastewater Pollution Control Facility from March 6, 2007-April 6, 2007. Appendix 1c provides a summary of the total discharge flows from the Buena Vista Pump Station from March 6, 2007-April 6, 2007. Spill volume calculations are provided elsewhere in this document.

4.2 CAUSE OF THE DISCHARGE

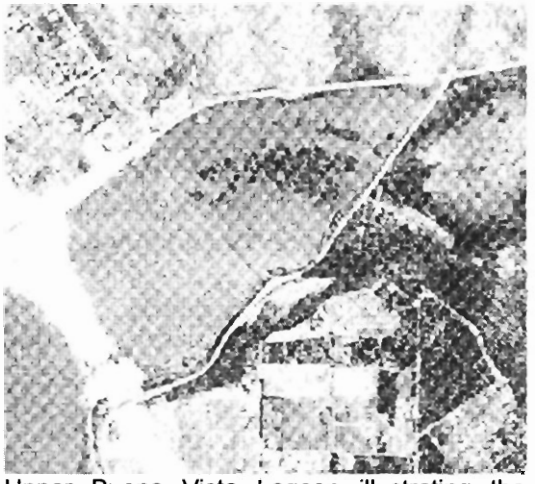
A detailed report of the cause and/or causes of the overflow, including any testing or technical evaluation of the condition of the sewer main. The report should also include the rationale for the original selection of the iron pipe and an evaluation of the appropriateness of installing this type of pipe in the lagoon. ***(RWQCB #2)***

It would not be accurate to consider the present discharge to be an overflow of the sewer main. An overflow suggests a discharge from a location of intentional access

such as at a manhole, valve, inspection port, or vent. In the case of the force main, the present event is a rupture of the side of a heavy-walled pipe section intended to meet the pressure requirements of a force main.

A detailed analysis into the cause of the pipeline failure was initiated early in the spill response, and this effort continues at the present time with ongoing forensic analysis being conducted on segments of the pipeline failure area and soil taken from around the rupture site. The pipeline is only 25 years old and should have a useful life of more than double its current age. As a result, the Dischargers have been exploring the failure event in an effort to better understand what may have triggered such an unanticipated failure in a pipe that would not normally be scheduled for replacement for many years.

This response has been prepared as a compilation of information collected from an investigation into the history of the pipeline alignment and construction and the preliminary results of an investigation by the corrosion consultants, Schiff Associates, Inc., which was initiated on April 3rd during pipeline repairs. The consultant's preliminary findings are presented under a separate report titled "City of Carlsbad 24-Inch Force Main Failure, Buena Vista Lagoon, Carlsbad, California" (Appendix 2a). Additional testing of the polyethylene liner surrounding the pipe was performed to evaluate compliance with specifications. Preliminary results of this testing are also provided (Appendix 2b).



Upper Buena Vista Lagoon illustrating the original alignment of Jefferson Street on lagoon shoreline.

Buena Vista Lagoon with current Jefferson Street Alignment

Background on the Force Main

The alignment of the force main is shown on the exhibit titled "Buena Vista Force Main Alignment (Figure 2). The force main, originally constructed in 1963, conveys wastewater from the Buena Vista Lift Station to a gravity interceptor sewer located west of Interstate 5. The original pipe was a 16-inch diameter asbestos cement pipe (ACP) and was located entirely within Jefferson Street. At the time of construction of the original pipeline construction, Jefferson Street was aligned along the lagoon edge, and the utilities, including the force main, were constructed within the roadway below pavement and subgrade. The new 24-inch ductile iron pipeline replaced the older pipeline. Jefferson Street was realigned away from the lagoon edge, making room for the present wildlife viewing area, while the underground utilities have remained in their current alignment.

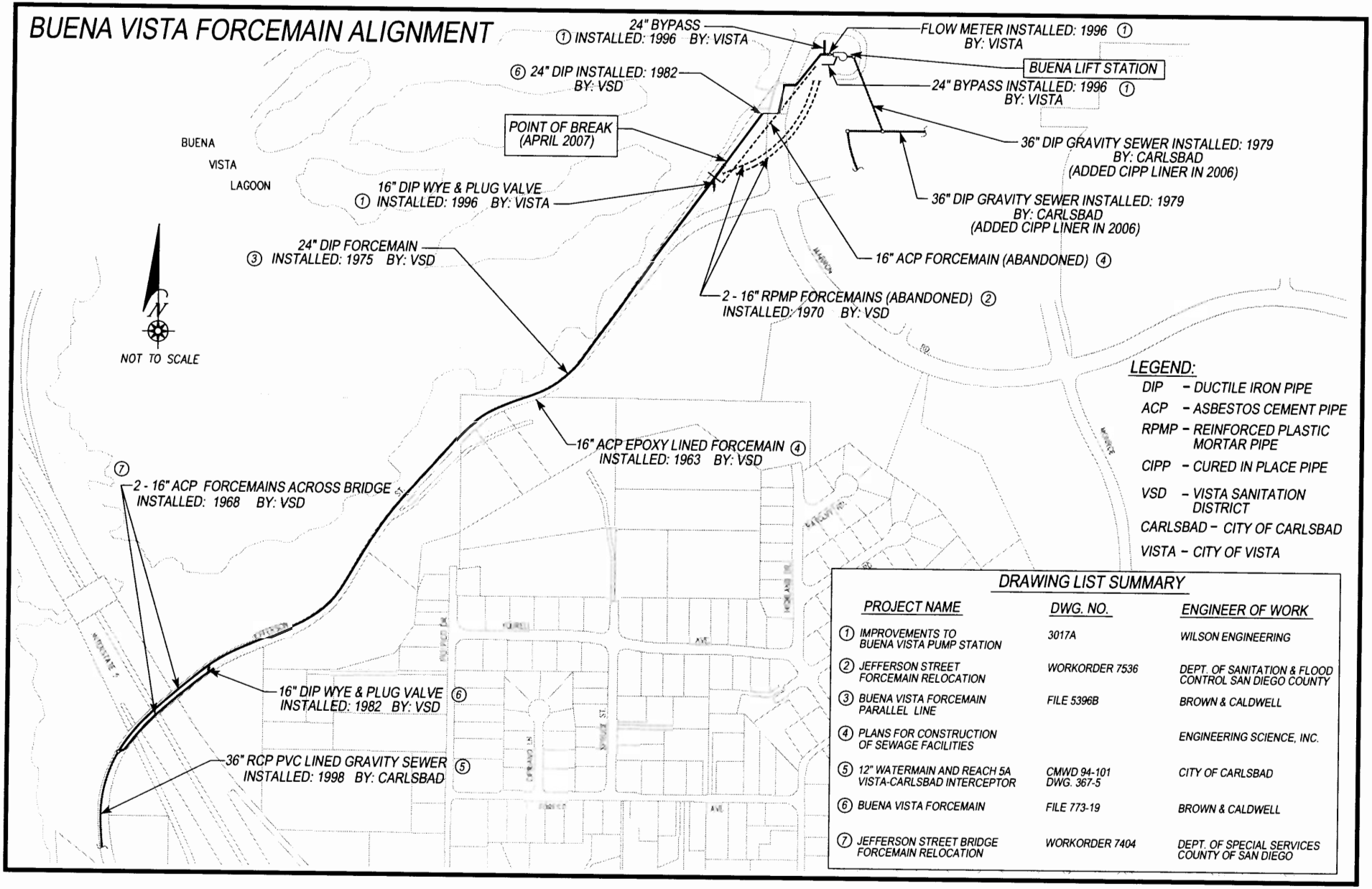
When Interstate 5 was constructed in about 1968, a new bridge overpass was built for Jefferson Street, and a two-barrel pipeline, consisting of 16-inch diameter ACP, was constructed in the bridge. The original force main was connected to one pipe barrel in the bridge. In approximately 1970, two 16-inch diameter reinforced plastic mortar pipes (RPMP) were constructed to replace the easterly most portion of the original ACP force main because of a realignment of Jefferson Street. One of the RPMP pipes was connected to the original 16-inch diameter ACP force main. In 1975, a 24-inch diameter ductile iron pipe (DIP) was constructed in Jefferson Street, parallel to the original force main. On one end, the 24-inch DIP connected to the second16-inch RPMP pipe, and at the other end, it connected to the remaining 16-inch pipe barrel located in the bridge crossing Interstate 5. At that point in time, the force main consisted of two pipelines.

While considered state-of-the-art in the 1970s and expected to have 50-year plus life spans, RPMP pipes began to show high failure rates, with breaks from fatigue occurring fairly often. Although the two 16-inch force mains in Jefferson Street had not suffered any failures, these pipes were retired in 1982 after only 12 years of service and replaced with a superior 24-inch DIP that extended from the Buena Vista Lift Station west to the existing 24-inch DIP that had been installed in 1975 (Figure 2). The 1982 24-inch DIP is the specific pipeline that failed in this event. The other pipelines installed previously have never had a similar failure on them. One of the four spills that occurred previously on the present system was the result of a contractor drilling through a 16-inch segment of the force main pipe inside of the Buena Vista Lift Station facility.

Force Main Design Specifications

The 1982 24-inch DIP force main was designed by the firm of Brown and Caldwell Consulting Engineers through an agreement with Vista Sanitation District (Appendix 2c). The location of the pipe was not constructed in the lagoon, but followed and was within the Jefferson Street alignment where it replaced a 16-inch diameter force main.

BUENA VISTA FORCEMAIN ALIGNMENT



LEGEND:

- DIP – DUCTILE IRON PIPE
- ACP – ASBESTOS CEMENT PIPE
- RPMP – REINFORCED PLASTIC MORTAR PIPE
- CIPP – CURED IN PLACE PIPE
- VSD – VISTA SANITATION DISTRICT
- CARLSBAD – CITY OF CARLSBAD
- VISTA – CITY OF VISTA

DRAWING LIST SUMMARY

	PROJECT NAME	DWG. NO.	ENGINEER OF WORK
①	IMPROVEMENTS TO BUENA VISTA PUMP STATION	3017A	WILSON ENGINEERING
②	JEFFERSON STREET FORCEMAIN RELOCATION	WORKORDER 7536	DEPT. OF SANITATION & FLOOD CONTROL SAN DIEGO COUNTY
③	BUENA VISTA FORCEMAIN PARALLEL LINE	FILE 5396B	BROWN & CALDWELL
④	PLANS FOR CONSTRUCTION OF SEWAGE FACILITIES		ENGINEERING SCIENCE, INC.
⑤	12" WATERMAIN AND REACH 5A VISTA-CARLSBAD INTERCEPTOR	CMWD 94-101 DWG. 367-5	CITY OF CARLSBAD
⑥	BUENA VISTA FORCEMAIN	FILE 773-19	BROWN & CALDWELL
⑦	JEFFERSON STREET BRIDGE FORCEMAIN RELOCATION	WORKORDER 7404	DEPT. OF SPECIAL SERVICES COUNTY OF SAN DIEGO

In 1982, the material specified for the pipe where the break occurred was 24-inch diameter ductile iron pipe, cement mortar lined, thickness Class 51, with a polyethylene encasement. Thickness Class 51 DIP has a wall thickness of 0.41-inches and an outside diameter of 25.80-inches. This pipe can handle an internal working pressure of up to 300 psi. The discharge pressure from the pumping station varies but is a maximum of approximately 40 psi; and therefore, internal pressure requirements are not a concern. Each joint of the DIP has a rubber gasket and incorporates a restrained joint mechanism for thrust resistance.

The pipe bedding, according to the plans, consisted of Class I bedding under the pipe, minimum 6" thick, Class II bedding from pipe invert (flowline of pipe) to springline (halfway up the pipe), and native backfill above the springline. This bedding is suitable for the location of the pipe. Using this pipe bedding, the depth of cover could be as high as 32-feet without risk of loading failures. Actual cover depth at point of break was less than 15-feet; therefore, earth load conditions were not a concern in construction and are not believed to be a factor in the pipeline failure. No evidence of such load stresses were observed in the pipe section removed at the damage point.

Pipe Corrosion Analysis

As indicated above, Schiff Associates, Inc. is in the process of completing corrosion analysis and forensic assessments of the pipe failure to better understand and describe the causes of the failure and to assess potential for other failures on this line. Preliminary results have been provided. These results, combined with other field observations made during the repairs, underpin the present corrosion analysis discussions.

Internal Corrosion

Internal corrosion of sewer lines is almost always associated with hydrogen sulfide generation and corrosion in a gaseous environment. Because force mains are generally fluid filled when in operation, hydrogen sulfide gas from the wastewater cannot generally accumulate in the top of the pipe where internal corrosion would normally occur. In the case of the present event, the rupture point is a low point in the force main profile, and the pipe would remain full of wastewater even when the pumps were not in operation. Further, the break area was centered below the springline of the pipe in an area where it is very uncommon to find failures due to internal corrosion.

Inspection of the pipe at the rupture site showed the internal surfaces were in excellent condition, with no observable internal corrosion. The section removed was inspected in greater detail and also showed no internal corrosion of the mortar lining. In fact, the pipe appeared to be in excellent condition internally as would be expected for this sewage force main. Based on these reviews, it is not believed that internal corrosion played any role in the failure of this line.

External Corrosion

It does preliminarily appear that the cause of the failure was external corrosion. The early testing of soils from the site by Schiff Associates, Inc. indicates a highly corrosive

nature. This is consistent with the placement of polyethylene encasement around the pipe that would be normal for use in corrosive soil environments. By appearances, the polyethylene encasement around the pipe was installed in accordance with American Water Works Association (AWWA) Standard C105 and was used for exterior corrosion protection of the DIP. The encasement requirements provided in pipeline construction documents were in accordance with design standards (Appendix 2c - 1982 Construction Documents). Using polyethylene encasement for corrosion protection is also included in Section 207-9.2.6 in the Standard Specifications for Public Works Construction (Greenbook).

Polyethylene encasement, at the time of design, was used to protect DIP from an aggressive soil environment. A common procedure used to determine if the soil is aggressive to iron pipe is the 10-point soil evaluation procedure outlined in Appendix A of the ANSI/AWWA C105/A21.5 Standard "Polyethylene Encasement for Ductile-Iron Pipe Systems." If the soil tests corrosive to DIP, then corrosion protection is warranted. An aggressive soil environment includes resistivity, pH, Oxidation-Reduction (redox) potential, sulfides, and moisture in its determination. Polyethylene encasement also protects against stray electrical currents generated by cathodic protection systems.

Polyethylene encasement is the corrosion protection method normally recommended by the Ductile Iron Pipe Research Association and the manufacturers of ductile iron pipe. If the soil is determined corrosive when tested in accordance with Appendix A of ANSI/AWWA C105/A21.5 and the pipe is encased with polyethylene in accordance with the standard, ductile iron pipe could have a life expectancy of 100 years according to the standards. The Dischargers had applied a 50-year life expectancy to this force main. Following the pipe rupture incident, Carlsbad's corrosion consultant sent a sample of the polyethylene encasement from the 24-inch pipe to the Ductile Iron Pipe Research Association in Birmingham Alabama for testing to determine its compliance with governing standards and requirements applicable at the time of installation. This allows evaluation of the material to determine if it was in accordance with specifications. Preliminary testing results on the polyethylene liner found material to be in compliance with the requirements of the applicable ANSI/AWWA C105/A21.5 Standard for Polyethylene Encasement for Ductile Iron Pipe Systems (Appendix 2b).

In order to perform properly and obtain maximum protection, the polyethylene encasement must be installed correctly. This requires correct wrapping and sealing of encasement sections. It also requires care be given to prevent rips or tears during installation. By examination of available design documentation for the pipeline construction and testing that has been performed on the *in situ* pipe and polyethylene liner materials, there is nothing to suggest that corrosion damage is more widespread than that found on the specific segment of the pipe where the failure occurred. In fact, the pipeline extending in both directions from the 3'9" segment that was removed and replaced is in excellent condition and shows no corrosion (see photo).

Corroded segment of pipe being removed.

During the excavation of the line, a deep PVC irrigation line transitioning from 2.5-inch diameter to a 3-inch diameter was unearthed directly over the location of the line break. The line had compression couplers at either end of a replacement segment of pipe, suggesting a prior repair was made to this line. The line is presently inactive, and no data could be located regarding the prior repairs. While this may in fact be coincidental, the pipe is inordinately deep for an irrigation line with a separation from the deep sewer force main of approximately 4 feet. It is possible that a failure event from this irrigation line may have eroded a large void over the force main. If so, a subsequent repair to this irrigation line would have required replacement and recompaction of fills in the void. It is possible that damage to the polyethylene encasement liner may have occurred at the time of the irrigation line repairs and not during pipeline placement.

The site observations of the irrigation line and the absence of indications of inappropriate installation standards of care leave great uncertainty with respect to if and how corrosive conditions may have entered the liner and reached the pipe. It is, however, preliminarily believed by Schiff Associates, that the liner was locally damaged. While the repairs were being made, visual inspection of the external condition of the pipe to either side of the failure point, and even above the failure point, suggested localized corrosion within the viewable portions of the pipe. This would lend credence to the belief that the polyethylene encasement had been breached. It is not anticipated

that the forensic analysis will allow a determination as to if there was installation period or later damage to the liner, however further analysis may assist in understanding more about this issue.

Conclusions

Properly designed and installed ductile iron pipe systems could have a life expectancy of more than 100 years. The Dischargers had conservatively applied a 50-year life expectancy to the pipe. The pipe in which the failure occurred is only 25-years old. Unlike other pipe materials, the physical properties of DIP do not change with age. As long as Ductile Iron pipe is not subjected to loadings and pressures in excess of its original capabilities, the only factor that will generally shorten pipe life expectancy is corrosion. Based on the information known at the time of pipe installation, the use of DIP with polyethylene encasement was suitable for this location, and design and installation practices appear to have been appropriate. The identified corrosion preliminarily appears to be the result of localized polyethylene liner breach; however at present, the cause of the breach and the corrosive agents are not known.

4.3 CHRONOLOGY OF SPILL RESPONSE EVENTS

> *A detailed chronological description of all actions taken by the Dischargers to terminate the overflow, repair the failed pipeline, and mitigate its impacts. Also include an evaluation of the results of these actions.* ***(RWQCB #3)***

Appendix 3 includes a detailed chronology of the discharge response activities and subsequent actions taken to mitigate damage associated with the spill. The chronology has been put together from a compendium of information recorded in incident logs, field notebooks, call logs and records, and photographic records. The exact chronology of events has been assembled as best as possible recognizing that records of timetables and details vary with recorders.

The spill was responded to under a regimented Incident Command System (ICS) that allowed for rapid response with parallel action tracks and redundancy in the response preparation. As a result of parallel work tracks and multiple operations occurring simultaneously, the raw chronology can, at times, be somewhat confusing unless time is taken to track parallel courses of action. This section provides a more focused summary of milestone actions and describes the principal events that occurred regarding the response.

Response Day 1

The spill was reported to Carlsbad Police Department Dispatch at 6:52:54 PM on Sunday 4/1/07. At that time, dispatch called the City of Carlsbad duty person who responded to the site three minutes later. Upon verification of the spill, response protocols went into play with contacts to the Carlsbad Public Works Supervisor and subsequently to Don Wasko, City of Carlsbad Acting Public Works Superintendent, who arrived at the site 47 minutes after the initial spill report had been received by the PD. By this time, response analyses were underway to confirm the source of the leak was

the force main and identify response options. After confirming the source to be the force main, Don Wasko contacted the Oceanside emergency number and requested that Oceanside divert all sewage coming into the system possible. This would enable the diversion of approximately 800-1,000 GPM from the Vista/Carlsbad line. After confirming that there was a diversion possibility, actions were undertaken to identify further diversion options that ultimately led to additional pumping diversions to Oceanside at 1,500 GPM beginning at 5 AM Monday morning. These actions would ultimately result in removal of over 2 million gallons of wastewater from the spill volume.

By 9 PM on Sunday, most of the senior Public Works staff of Carlsbad, Vista, and Encina Wastewater Authority was on site for the response, and an ICS was in place. A backhoe had been delivered to the site, and vegetation clearing over the leak commenced through Carlsbad staff, while Vista Engineering staff coordinated emergency mark-out for utilities and Public Works staff secured site preparation equipment such as scene lighting. Following mark-out, Carlsbad commenced digging with a Case 580 backhoe in hopes of uncovering the pipeline, but not knowing the depth of the line, excavation progressed slowly to avoid hitting the pipe and expanding the rupture. After excavating down 10 to 12 feet without reaching the pipe, it was determined that continuing with small equipment was not a safe and practical solution, and a larger contractor would need to be brought in to affect repairs and buttress slopes of the excavation against failure. After concluding that the repairs required larger equipment and a specialty contractor, crews went to work preparing the site for move in of larger equipment.

Response Day 2

Having already assumed a major pipeline contactor would be required, parallel efforts were underway to locate a contractor capable of responding immediately with appropriate equipment and expertise to excavate and repair the pipe, while a pumping company was called to explore additional diversion to Oceanside's system. At approximately 1:30 AM, Engineers and Public Works Supervisors pursued plans for the sewer to assist in guiding repairs. These were not readily located at that time, and the depth of the sewer could not be verified. Alan Manges, Encina Wastewater Shift Supervisor, contacted the California Department of Fish and Game (CDFG). Cari Dale, City of Carlsbad Public Works Manager, and Don Wasko contacted the Office of Emergency Services (OES) at 2 AM and were assigned a tracking number (OES #07-2061).

Two local contractors were contacted about the repairs but were not equipped to accomplish the work required in a timely fashion. Other contractors were also contacted; and at dawn, the specialty contracting company, Vadnais, came to the site and confirmed that they could make the repairs. They were retained to accomplish the repairs, and they contacted McMahon Construction to provide sheetpiling to shore-up trench walls for the deep excavation.

While coordination of the repair work commenced, Atlas Pumping trucks was contacted to deliver four 5,500 gallon capacity trucks to the site in order to recover some of the

sewage and begin shipping sewage to the Carlsbad collection system downstream of the break. In addition, D.L. Hubbard Contracting was requested to initiate logistical work preparing an alternative to the Vadnais excavation and pipeline repair. The alternative was to construct a temporary highline that would run from the Buena Vista Pump Station all the way to Interstate 5.

At 7:45 AM on 4/2, with pumper trucks present, the Buena Vista Lift Station was shut off to facilitate inspections, and wastewater began to back up into the 1 million gallon capacity containment berm around the lift station. Trucks began pumping and transporting wastewater from the containment area around the Buena Vista Lift Station to a manhole on the downstream gravity line located to the west of the force main. Trucks ran continuously from this point until repairs were made and the sewer line was put back into operation. The use of pumper trucks and vactor trucks to collect and transport sewage that had left the sanitary sewer system and was within the containment berm ultimately resulted in the recapture of 669,000 gallons of sewage.

By 8:00 AM, calculations were completed regarding the highline requirements, and it was determined that a hot tap of approximately 12-14 inches would be required. It was also determined that any combination of lines that would provide half the cross-sectional area of the 24-inch line may provide the required capacity. A concern existed, however, regarding the capacity of the Buena Vista Lift Station to bear the additional backpressure of reduced line diameters. Encina was contacted regarding the issues.

Field efforts commenced to post waters as contaminated, sample waters for bacteria, and respond to wastewater release impacts to the lagoon waters. Encina was charged with first response for signage posting and sampling. Shortly after initiation, City of Carlsbad Environmental Programs was contacted to provide assistance to Encina and commence efforts to assess environmental monitoring and response needs.

At 8:20 AM, Cari Dale requested that Steve Plyler, City of Carlsbad Public Works Superintendent, follow up with Dave Cammel who works at the CalTip Hotline of the CDFG. Steve entered Dave Cammel's voice mail where he obtained another number. When he called that number, he spoke to an operator who said it's not their area and they would transfer to the SD office; so he asked for that number before being transferred. Steve was successfully transferred and talked to Candice with CDFG in San Diego. She took brief info and asked if we have an OES number. Steve said he wasn't sure but he would find out and call her back. She said don't worry, if it had been previously reported that it would be forwarded to her by OES.

At 8:25 AM, Clay Clifton, Environmental Health Specialist with San Diego County Department of Health Services, was contacted. Clay requested information regarding the spill location, volume, status, mitigation, and posting. At that time, Mike Hogan, Encina General Manager, had already commenced posting of the lagoon and adjacent beach areas using Encina Wastewater staff. The bacterial monitoring program had already been initiated at this time, and the first samples were drawn at 8:37 AM.

At 9:00 AM, the Regional Water Quality Control Board (RWQCB) was contacted, and a message was left for Bob Morris. When Bob called back, he directed the call to Brian Kelly, and a message was left for Brian. At 9:45 AM, contact was made with Brian Kelly who asked questions regarding the event time, postings, cause of the failure, and repair mitigation underway.

Per direction of San Diego County Department of Environmental Health, contaminated waters signs were posted along the beach 600 feet south and 1,200 feet north of the Buena Vista Lagoon outlet as a precautionary measure. It would later be determined that contamination did not reach sampling stations at Highway 101 or downstream areas at the beach. EWA staff expanded sampling to the coastal waters north and south of the lagoon outlet.

At 11 AM, Eric Becker, RWQCB Water Resources Control Engineer, visited the site. At 11:20 AM, CDFG Game Warden, Noel Richards, arrived at the site. He indicated he wanted a call when the leak had been stopped. At approximately 12:14 PM, Hubbs Sea World was contacted regarding potential recommendations for minimizing damage to the lagoon and dealing with any wildlife casualties.

At 12:30 PM, with work underway for sheetpile shoring and planning of the repair operations for the point of rupture repairs, Carlsbad crews were also moving forward with the temporary highline alternative. They had already removed concrete thrust restraints from the force main lines on the bridge to expose it for a highline connection. With the engineering assistance of Carlos Mendoza, City of Vista Senior Engineer, the intent was to tap in two 10-inch tees for the highline to provide a high-pressure highline bypass. While it appeared workable, the construction timelines for each alternative suggested that the highline could not be completed prior to the point repairs. Based on this analysis, the highline option was put on hold. Vactor trucks were used during this period to remove spilled sewage.

Exploration of aeration commenced on the afternoon of 4/2, with calls being made to the area agencies to amass equipment that could be used for aeration. By approximately 7 PM, pumps had been obtained from Oceanside. Additional pumps were rounded up to dewater the repair excavation site. The Buena Vista force main was operated intermittently to draw down wastewater to the treatment plant.

At 7:04 PM, Elaine Lukey, City of Carlsbad Storm Water Manager, was designated as the lead for environmental coordination and testing issues. Environmental response monitoring commenced following guidance provided by the EWA Sanitary Sewer Overflow Response Plan (SSORP) and monitoring and immediate response plans implemented in 1994 and 1997. Dissolved oxygen (DO) monitoring began in the lagoon at 8 PM. Following response plans, the first aeration pump was installed on the northern shore of the east basin at 9 PM.

Response Day 3

With the trench shoring driven in the early hours of the morning, Vadnais began removing material. Pumps were used to dewater the excavation, and gravel was placed as a working surface. Work progressed through the early morning. By 5 AM on 4/3, access to the leak had been achieved, and handwork was underway to expose a large enough area to affect repairs. The outside diameter of the pipe was confirmed, and insert materials were sent to the site.

Hubbard was put on stand-by for the highline work in the event the repairs could not be affected as contemplated. At 7:05 AM, cutting out of the broken section of pipe was initiated. Because of the size of the main and wall thickness, a second saw was put to work. The pipe was removed in two sections. By 7:30 AM, it was confirmed that a highline would not be required.

At 8 AM, Elaine Lukey and Paul Hartman, City of Carlsbad Senior Environmental Specialist, met with CDFG representatives in the field to discuss the sampling program and obtain further guidance. It was determined at this meeting that fish collection should be initiated on a twice-daily basis, and the Department wanted two specimens of each species collected and transferred to the Department. Monitoring for DO would continue twice daily, and efforts would be initiated to search for sick or dead birds. The DO monitoring along lagoon shorelines followed the Buena Vista Response Plan of EWA and the monitoring program applied during the 1997 lagoon discharge.

The top section of the pipe was removed from the trench by 8:13 AM. The bottom section came out of the trench at 8:39 AM. A replacement section of 24-inch ductile iron pipe was cut to insert into the prepared gap.

Urban Corps crews were brought to the site to begin trash removal and clean-up of spill and response trash. Vactor trucks from Vista, Vallecitos, Oceanside, and Encinitas responded to initiate overflow cleanups through an informal mutual aid agreement.

At 9:08 AM, Carlos Mendoza contacted Don Wasko from the site of a second, unrelated line break near the Raceway in the Agua Hedionda Basin to request diversion of the unused 10-inch highline to the Raceway spill site. This was delivered to the Raceway site at about 10:30 AM.

At 9:16 AM, corrosion consultant, Schiff Associates, Inc., was contacted to come inspect the pipe, the trench, and the removed segments to provide insights into the cause of the failure. Graham Bell of Schiff Associates, Inc. arrived at approximately 11:15 AM to inspect the pipe in the trench. This forensic assessment has been ongoing off-site since the initial site inspections performed by Schiff Associates, Inc. Preliminary data are reported elsewhere in this document.

At 9:21 AM, Kim McKee, CDFG Reserve Manager, arrived on the site and advised that trench spoils should not be replaced and they needed to be hauled away. Additional

crews and trucks were brought in to begin hauling soils away for disposal. Clean suitable backfill was located on a project site being developed in Carlsbad.

Keith Merkel, Principal Ecologist with Merkel & Associates, was retained to assist in response oversight and resource recovery and to help identify any additional agency contacts that should be made, as well as to assist in formulating a response program to further the reduction of environmental harm and resource recovery where impacts had already occurred. At that time, the Army Corps Of Engineers (ACOE) and CDFG streambed alteration program staff, Jeannette Baker and Tamara Spear, were made aware of the spill and advised of the potential need for emergency permitting.

Additional aerators were established at the Jefferson Street Bridge at 9:55 AM and at the "Duck Pond" at 12:45 PM, and efforts continued to locate more aeration resources. At 11 AM, Weston Solutions, Inc. was brought in to conduct on-water monitoring for dissolved oxygen in accordance with the 1997 spill response program.

Onsite, repair couplings were installed to connect the replacement pipe segment to the existing cut ends of the exposed pipe. By 12:27 PM, valves to the repaired force main were opened, and one Buena Vista Lift Station pump was turned on. At 12:53 PM, the berm overflow at the lift station stopped as wastewater was drawn down at the station and pumped down the repaired force main. By 1:39 PM, the lift station was operating at 12,500 GPM and maximum operational pressures, without leakage being observed at the repair.

A helicopter survey of the lagoon by Elaine Lukey; Bill Paznokas, CDFG Staff Environmental Specialist; Joe Garuba, City of Carlsbad Senior Management Analyst; and the Carlsbad Fire Department photographer documented that the majority of the discharge appeared to be limited to the East basin, with a small incursion into the central basin of the lagoon. Bill Paznokas requested additional dissolved oxygen monitoring stations under and West of the I-5 Bridge.

At 2 PM, an agency coordination and response action meeting was held at the City of Vista to discuss measures going forward to further minimize harm to the lagoon. Elaine Lukey went through the environmental response and testing actions that were underway. These measures included aeration, monitoring in accordance with guidance provided by prior 1994 and 1997 spill response plans, supplemental monitoring that has been added in response to the current spill, dead fish collection and documentation per prior spill responses and requests of CDFG, and an intent to initiate pump-back to the sewage lift station now that repairs had been completed. Bill Paznokas discussed the system response to the prior spills. Keith Merkel recommended that more aeration be added to increase consumption of BOD and that pump-back from the east end of the lagoon be increased to benefit recovery by helping to remove sewage and pulling plume waters back towards the east end of the lagoon. Keith also recommended that Oceanside rebuild the barrier beach berm at the mouth of the lagoon since the lagoon had started spilling and bacterial testing data were not yet in. It was also recommended that benthic infaunal samples be collected to provide a pre-spill baseline before any

dead animals have had a chance to decompose. Mr. Merkel contacted wildlife care center to advise of potential for sick birds and to confirm capacity to receive birds. Mr. Merkel confirmed that he would follow up with the ACOE, CDFG, and California Coastal Commission (CCC) regarding the incident.

Environmental work at the site continued, with field reviews by CDFG and Merkel & Associates and supplemental monitoring being initiated by Carlsbad Environmental Program staff. A pump-back pump was put into operation at 5 PM to begin to draw water back to the sanitary sewer from the lagoon. At 7 PM, a fourth aeration pump was put into operation near the Jefferson Street Bridge. A second pump-back pump was put into operation at 8 PM.

A 24-hour staffing program was put into place to tend aeration pumps and pump-back facilities until changes in the program were dictated by recovery monitoring data. Staffing was accomplished by City of Carlsbad and City of Vista crews.

Response Day 4 through Day 23

Daily monitoring and testing for lagoon and beach bacteria levels continued to be performed by Encina Wastewater Authority. The dissolved oxygen sampling, as well as fish and bird collection, were conducted by environmental program staff of the Cities of Carlsbad and Vista and Weston Solutions, Inc., with data review and analysis being performed by Merkel & Associates to coordinate recovery program changes and assessment of environmental affects. Two additional aerators were put into service in the afternoon of April 7th. Monitoring responsibilities transferred over to Merkel & Associates on April 7th for shoreline DO monitoring and April 12th for other monitoring in association with overall data analysis, remediation coordination, and reporting obligations. Over the course of the subsequent weeks, pump-back operations and aeration have been phased out in response to monitoring results and lagoon recovery conditions. These program changes have been coordinated with resource and regulatory agencies through coordination meetings and briefings.

Analysis of the break incident, discharge volumes, and environmental damage resulting from the spill were initiated during the spill response and continued after the spill. On April 6, an Investigative Order (IO No. R9-2007-0060) was sent by the Regional Board requesting documentation be prepared and submitted in response to the spill event no later than April 23rd. The initial investigations by the Dischargers and EWA to understand the failure, along with subsequent work to respond to the Board's request, have been ongoing throughout the time since the spill.

4.4 CALCULATION OF WASTEWATER DISCHARGE VOLUME

A detailed report of the total overflow volume including how the Dischargers calculated the volume. ***(RWQCB #4)***

The total discharge volume resulting from the spill incident has been calculated to be 7.329 million gallons discharged between Saturday, March 31, and Tuesday, April 3,

2007. Calculations of releases were performed under the direction of Mr. Michael Hogan, Encina Wastewater Authority General Manager (Appendix 4). The spill volume was calculated using flow variance from average flows from the 4 prior weeks for the same days of the week during which the spill occurred. Measurements are based on monitoring of incoming flows to the EWA treatment plant from the influent system, including the ruptured Buena Vista force main. This method was selected over using 30-day averages or 90-day averages due to the substantial variability of flows from week days to weekends and the disproportionate weighting of the present spill with weekend days (50% weekend days versus 28.6% weekend days that occur in a full week). Alternative means of calculating the discharge using running averages were examined as a means to verify the reasonableness of the calculations. The basis for analyses is provided in Appendix 4.

4.5 VOLUME OF WATER PUMPED FROM LAGOON TO SEWER

The volume of water pumped back into the sanitary sewer system from the Buena Vista Lagoon. ***(RWQCB #5)***

Following the completion of pipe repairs, withdraw of effluent was initiated from the Eastern end of the lagoon. This was accomplished following the protocols established first in response to the 1994 spill and as documented in the Encina Wastewater Authority SSORP. The pump back effluent was conveyed from the lagoon through two 6-inch diesel powered pumps to the Buena Vista Pump Station, where the discharge was conveyed into the waste stream destined for the EWA treatment plant. Pumps were placed into operation at approximately 5 PM and 8 PM on 4/3. The pumps, rated at 2,200 gpm, operated at a calculated flow of approximately 1,500 gpm after losses due to intake and discharge hose friction and lift to the pump station.

Dissolved oxygen measurements and visual observations of the plume distribution that were made by Elaine Lukey, City of Carlsbad, and Bill Paznokas, CDFG, from helicopter surveys suggested that the plume was principally restricted to the eastern lagoon basin and just marginally had entered into the central lagoon basin. This situation, combined with the relatively low inflow to the lagoon from Buena Vista Creek and persistent Westerly winds, suggested that a substantial sustained withdraw at the east end of the lagoon could reverse the flow gradients in the system and pull the plume back towards the east. This would limit the footprint of adverse affect within the lagoon both from an ecological perspective as well as a human health risk. The reversal of flow gradient towards the east end of the lagoon prevented sewage from reaching much beyond the Interstate 5 Bridge between the eastern and central lagoon basins. As a result, dissolved oxygen levels and bacterial levels measured from Highway 101/Carlsbad Boulevard down to the weir and beach verified that these waters never received sewage inflows.

During the pump-back operation, 42.3 million gallons of combined wastewater and lagoon water was withdrawn from the lagoon (Appendix 5a). The two pumps operated concurrently from 4/3 through 11 am on 4/10. On 4/9, at a resource agency field

briefing, Keith Merkel recommended that the program be modified with a reduction of pump back to just balance inflows from Buena Vista Creek. The purpose of this recommendation was that dissolved oxygen levels had generally hit a point of substantial recovery throughout the east basin by 4/8 and DO levels were not low enough to result in further organism mortality, however the pump-back was beginning to lower lagoon water levels. A reduction to static inflow rates would generally maintain stasis in the plume distribution allowing bacterial levels to continue to drop without allowing spread to unaffected waters. Resource agencies and the Dischargers accepted this recommendation, with an effective date being 4/10/07.

Based on the recommendation, Jayne Strommer, City of Vista Program Manager, contracted Landis & Associates to measure the Buena Vista Creek flow rates to determine what a balance in rates would require. Landis & Associates gaged the stream flows near the El Camino Avenue Bridge at approximately 2.6 cfs (Appendix 5b). This rate required the elimination of one of the two pumps.

The second pump continued to operate until 4/16. On this date, at a resource agency briefing, Keith Merkel advised that the benefits of pump-back had been fully achieved with recovered DO and that bacterial levels were within health standards except at the easternmost end of the east basin. A recommendation to terminate all pump-back was made and accepted by resource agencies. The last pump was turned off at approximately 4 pm on 4/16.

4.6 MAINTENANCE AND INCIDENT HISTORY OF FORCE MAIN

Since 1994, the date and extent of preventive maintenance and/or inspection (e.g., line cleaning, closed-circuit television inspection) that was performed on the sewer line and other structures involved in the sewer overflow. Also report on any other problems experienced with the relevant force main in the past and what actions, if any, that have been taken to correct such problems. ***(RWQCB #6)***

Past Maintenance and Inspection

The system facilities involved in the spill include the specific 24-inch force main that failed, connecting segments of force main, and the Buena Vista Lift Station. The force main system is designed to be a self-scouring, fully flooded conveyance with high pressure capacities requiring little maintenance. The large size and design of the force main both dictate a lack of requirement for internal inspection and cleaning as well as a lack of capability to perform such inspections. In the case of the Buena Vista force main, deposition of solids in the pipe does not occur because the flow velocities on a daily basis achieve velocities of at least 4.25 feet per second during peak flow conditions in the 24-inch diameter force main. This flow velocity is more than sufficient to suspend any solids that might deposit in the pipe during low flow conditions or when the pumps are not operating. Engineering standards for force mains require a minimum flow velocity of approximately 2 feet per second under peak flow conditions to maintain self-cleaning properties.

For smaller force mains where internal blockage is possible, a common method for cleaning is by the use of a polyurethane swab (poly pig) inserted into a pipeline and pressurized to launch the pig down the line scraping the sides of the pipe. Due to the pipe size and the considerable bends in the Buena Vista force main line, as well as a lack of launching or retrieval port, maintenance by pigging could not be performed. Internal video inspection cannot be done in a flooded force main and is not generally required in a fully flooded force main that is self-scouring and not subject to high rates of internal corrosion. As was discussed in section 4.2, internal corrosion is a common problem in gravity sewers where hydrogen sulfide gas corrodes pipe in a gaseous environment. It is very uncommon for internal corrosion to occur in force mains, and according to Schiff Associates, internal corrosion was not a factor in this failure.

The Buena Vista Lift Station has been regularly maintained with staff present at the lift station on a daily basis. Regular servicing of pumps and valves, as well as alarm systems and electronic monitoring equipment, is performed at the station, and records of the service are available through EWA. While this facility was not responsible for the present pipeline rupture, two of the system spills occurring in the last 13 years occurred as a result of pump station problems. Both of the pump station events occurred in 1997.

Standard maintenance for a force main of the Buena Vista force main type would be maintenance and exercising of valves, and inspection and maintenance of force main air release valves. Inspection and maintenance of valves at the Buena Vista Lift Station and the single force main air release valve on the pipe have been performed regularly by EWA. The lift station maintenance is on going, and the air release valve has been inspected or maintained a total of 34 times since 2000.

In conducting the analysis of system maintenance, the Dischargers discovered that the three control valves outside of the lift station have not been maintained. While these valves were not involved in the system failure and proved operable and useful in system repairs, they have not been exercised and serviced to ensure reliability in the event of future need. Modifications to the maintenance program to address this lack of past service will be made.

Incident History on Facilities

There have been four prior incidents of discharge of wastewater related to the Buena Vista force main system, including the lift station or in the immediate area of the system. None of these prior incidents are similar in nature or related to the present discharge. In fact, none of the prior releases were corrosion related in any way. The releases that have occurred on the force main system are listed below:

- 8/22/94: In violation of mark-out requirements, a contractor drilling a dewatering well at the Buena Vista Lift Station accidentally drilled into a 16-inch diameter force main, causing 4.75 million gallons of sewage to spill into the Buena Vista Lagoon. Greater controls on contractor mark-outs and

inspections within the pump station have been incorporated in subsequent construction contracts.

- 1/11/95: An interceptor sewer on Jefferson Street spilled 1,000 gallons of sewage into the Buena Vista Lagoon. The cause of the spill was a collapsed manhole downstream of the force main. This is not related to the force main system, but due to proximity, it is included in this discussion. The City of Carlsbad replaced the interceptor sewer and manholes in 1999 and installed T-Lock PVC Liners onto the pipe and manholes to prevent further corrosion downstream of the force main.

- 1/15/97: The Buena Vista Lift Station potentially surged and pumped sufficient flows to lift a manhole cover on the gravity flow pipeline in Jefferson Street downstream of the force main. This resulted in a spill volume of approximately 35 gallons. A letter was sent to the Pump Station operator at the Encina Wastewater Authority, directing them not to run pumps over 80% speed in order to prevent surcharge in the Vista/Carlsbad Interceptor Sewer gravity pipeline. This problem was addressed and will not occur in the future because the interceptor sewer was replaced with a larger 36-inch diameter pipe in 1999 that will handle all projected peak wet weather flow conditions under full pumping capacity at the lift station.

- 2/25/97: The Buena Vista Lift Station had a failure resulting from a flange failure within the lift station that failed during a flow test event to verify correct operation of pumps, valves, and switches under maximum load. Following shutdown of the pumps, an alarm went off indicating that the dry well within the lift station was flooding. With the station flooding, access to necessary valves to alter flows was cut off by rising sewage in the station. Several failed attempts to close the valves occurred during the day with the final closure of the isolation valve to the dry well being accomplished by a diver. The spill event resulted in an estimated 1.75 million gallons of raw sewage spilling into the lagoon between 11:45 am and 5:00 pm on 2/25/97. Pump-back from the lagoon removed 4.7 million gallons of wastewater and lagoon water following protocols established in 1994. Subsequent to the spill, modifications to the pump station were made to improve alarm systems, incorporate additional failsafe measures for valves.

4.7 PHOTOGRAPHIC AND VIDEOGRAPHIC DOCUMENTATION

Copies of any photographs and/or video taken during or after the sanitary sewer overflow. Photographs and/or video shall include appropriate identifying information, such as date taken, name of photographer/videographer, and textual summary of information being presented, as well as its relevance. ***(RWQCB #7)***

Attached, as Appendices 7a and 7c are photos taken during and subsequent to the event. Because of the inordinate number of photos and the numerous photographers that collected photos of the incident, the Dischargers have amassed well over 1,000 photographs, as well as a video of the event (Appendix 7b). Based on the Board's request, an effort commenced to identify, label, and summarize the information in these photographs. Recognizing that the effort would be unwieldy and that many photographs taken were irrelevant to the incident, Keith Merkel contacted Bob Morris, RWQCB Senior Waste Resource Control Engineer, on April 13th regarding possible omission of irrelevant photos from the record. Mr. Morris discussed the issue with Mark Alpert RWQCB Senior Engineering Geologist, and it was agreed between Mssrs. Morris, Alpert, and Merkel that all photos would be collected and provided, but that irrelevant photos would be batch labeled and submitted in bulk. The submitted photos are only those that are immediately available to the Dischargers. It is acknowledged that the public, news crews, resource and regulatory agency staff, and a number of others collected photos that were not acquired by the Dischargers. Photos taken by Schiff Associates, Inc. are not included in this section, as they have been incorporated into the preliminary forensic analysis of the pipe failure (Appendix 2a).

4.8 SANITARY SEWER OVERFLOW RESPONSE PLAN

> *A copy of the Dischargers' current sanitary sewer overflow response plan.* ***(RWQCB #8)***

Copies of the Sanitary Sewer Overflow Response Plans (SSORP) for Carlsbad and Vista are provided as Appendix 8a and Appendix 8b, respectively. Because the Encina Wastewater Authority SSORP specifically addresses actions within Buena Vista Lagoon as a response program to spills from the Buena Vista Lift Station, this plan has been included in this response as well (Appendix 8c). The Dischargers made use of specific guidance provided under this plan both because of the similarity in location of the pipeline break and the pump station and because collateral spills associated with shutting down the pumps at the pump station to make repairs, resulted in releases from the pump station containment area.

4.9 MEASURES TO MITIGATE IMPACTS

> *Measures the Dischargers have taken, or will take, to prevent and mitigate the impacts of future overflows from force mains or other sewer lines, particularly in ecologically sensitive areas. This could include such tasks as monitoring of force main flows, increased monitoring frequency of sewer lines in sensitive areas, use of additional equipment to recover sewage overflows, etc.* ***(RWQCB #9)***

The Dischargers have a good record of maintenance of facilities and extremely good spill response. This can be attributed to a variety of factors including 1) regular sewer master plan updates that are used to evaluate system monitoring, upgrade, and replacement needs; 2) strong inspection and cleaning programs for sewers within the

service area, and 3) a cooperative interagency preparedness program that involves annual spill drills and mutual assistance by North County agencies. This section elaborates on these established practices and provides a retrospective on means by which further improvements may be possible.

Sewer Master Plans

Both the City of Vista and the City of Carlsbad have recent sewer master plans that include evaluations of pipeline capacities and pipeline conditions of their interceptor and trunk sewers. For both Vista and Carlsbad, 2003 Sewer Master Plans are the most current plans. These sewer master plans are regularly updated. The City of Carlsbad has prepared many sewer master plans over the years since it was incorporated in 1952. Four of the most recent Sewer Master Plans were prepared in 1987, 1992, 1997, and the present plan in 2003. The City of Vista has completed Sewer Master Plan updates in 1982, 1993, and 2001, with minor updates in 2003. Vista has a comprehensive Master Plan update in progress now that is scheduled for completion in the summer of 2007.

The latest update incorporates a GIS-integrated parcel loaded updateable sewer model that, along with a flow-monitoring program, will incorporate an extensive infiltration and inflow analysis to help prioritize projects. The sewer master plan and model update is paired with a comprehensive storm drain GIS mapping, modeling, and CIP update project that allows integrated management of all the City's gravity infrastructure. From 2004-2007, the City developed a GIS program to maintain data. The data are available at: http://www.cityofvista.com/departments/engineering/GISSewerAtlas.cfm

The importance of these master plans to discharge control is they assist the cities in analyzing capacity requirements, infrastructure condition, maintenance and inspection needs, and trouble areas. These regular reviews provide for prioritization of actions including inspection, maintenance, system enhancements, and replacement of aging or problem infrastructure. Both of the cities maintain a rolling list of capital improvement projects (CIPs) based on the master plans. Inspection, maintenance, and facility replacements and expansions are funded based on the master plan needs identification and CIPs.

The outcome of these analyses is a recommended long-term Capital Improvement Program (CIP) for improvement of existing wastewater collection and treatment facilities. With this information, an updated sewer connection fee is calculated for future expansions to finance the recommended facilities. The cities also contribute to a replacement fund annually to be able to replace facilities when they reach their useful life. The cities consider all sewer pipelines to have a useful life of 50 years.

For both cities, there has been a great amount of effort placed on regular cleaning of sewer pipelines and making repairs or replacements where required. Recent examples in ecologically sensitive areas or where preventative and reactive replacements or maintenance have occurred include the following:

- **Carlsbad -** The Batiquitos Lagoon Interceptor Sewer from El Camino Real to the Batiquitos Lift Station included a CCTV and condition evaluation report performed in 2006. Previous to that work, but downstream of the Batiquitios Lift Station, Carlsbad has replaced the forcemain and the manholes. The new manholes are PVC lined concrete. In addition, an air jumper was installed in 2004 to convey sewer gases across an inverted siphon along Avendia Encinas, which effectively conveys the sewer gases downstream with the sewer flows.

- **Carlsbad -** On the Agua Hedionda Lagoon Interceptor sewer, Carlsbad completed 2005 installation of a new lift station and parallel interceptor sewer on the south side of the lagoon to reduce flows in the existing north side interceptor sewer. Other improvements included rehabilitation of manholes on the north side interceptor from Cove Drive to El Camino Real and complete upgrading and pump replacement of the downstream lift station on the North Agua Hedionda Lagoon interceptor sewer. One reach of the North Agua Hedionda Lagoon Interceptor sewer has been a challenge to replace due to environmental constraints; however, severely deteriorated sections of the pipeline between Cove Drive and Hoover Street are now to be addressed by microtunneling a replacement sewer alignment rather than using an open trench method.

- **Carlsbad -** Carlsbad is also in design to replace the remaining portion of the Vista/ Carlsbad Interceptor sewer from Agua Hedionda Lagoon to the Encina Water Pollution Control Facility. Issues with the California Coastal Commission and the North County Transit District are a significant restraint; however, and obtaining the needed Coastal Development permit and license agreement is anticipated to take some time to complete.

- **Carlsbad -** One project in the CIP that was identified in Carlsbad's 2003 Sewer Master Plan, is to install a parallel 24-inch diameter force main from the Buena Vista Lift Station to the bridge crossing Interstate 5. The purpose of this parallel pipeline is to provide additional conveyance capacity upon installation of the final pump at the Buena Vista Lift Station. In an era of ever evolving technology, it is anticipated that pipe material for the parallel force main will likely be high-density polyethylene (HDPE) to remove any concern from external corrosion. HDPE can be specified with sufficient wall thickness to handle the internal pressures and the external earth and live loads along this alignment.

- **Vista -** CIP 7035 – VC1-3 Rehabilitation – Earth Tech prepared an assessment report, dated February 2001, for the City of Vista for the DIP Gravity lines comprising reaches VC1, VC2, and VC3 of the Vista Carlsbad Interceptor. Based on the recommendations from this report, a rehabilitation project was designed, and construction was completed in June 2006. The project rehabilitated all 37 manholes on the reach with mortar patching and epoxy coating, installed 4,196 feet of 36-inch diameter structural Cured-in-Place Polyurethane resin (CIPP) liner, and 4,524 feet of 42-inch diameter structural CIPP liner.

- **Vista** - CIP 8049 – Mass/Citrus Sewer Replacement – Approximately 8000 linear feet of clay pipe, manholes, and appurtenances were replaced with PVC in widened easements. This project was completed on or about April of 2005. The project addressed a hard to access cracked and root intruded 1960's era sewer line that was prone to spills.

- **Vista** - CIP 8086 – NCTD Sewer Relocations – This project replaced and relocated sewers conflicting with the NCTD Sprinter Construction Project. It improved access to sewers in numerous locations adjacent to the NCTD Rail easements.

- **Vista** - CIP 8076 – Raceway Sewer Pump Station Replacement – Replaces a 1986 sewer pump station that was prone to failures. This project is currently scheduled for completion on or about May of 2007.

- **Vista** - CIP 8079 Buena Outfall Force Main Phase II – This project replaces approximately 6,200 linear feet of DIP force main with new PVC force main within the new Faraday Road alignment and out of an inaccessible tributary to the Agua Hedionda watershed. The new force main is in operation and Notice of Completion is expected on or about June 2007.

- **Vista** - CIP 8050 / 328 Buena Outfall Force main Phase I – This project replaced approximately 2,200 linear feet of DIP with PVC pipeline within an easement road adjacent to a tributary to the Agua Hedionda watershed. The project was completed in 2004.

- **Vista** - CIP 8046 – York Drive Sewer Replacement Project – This project installed approximately 5,000 feet of PVC pipeline, 1,500 feet of CIPP liner, 23 manholes, 60 service reconnections, and 7,000 feet of environmentally friendly access roads. The project replaced 1963-1965 era sewer lines in a 5-10 foot easement centered on fenced property lines in a floodplain that had become root infested due to the development of large trees and growth on this inaccessible alignment. After a November 7, 2002 sewage spill, the District escalated the priority of this difficult easement sewer replacement and access improvement project. A design was nearly completed in conformance with the environmental report on or about 2002. Based on extensive Community input, the District redesigned the project and acquired ROW in 2005-2006. A Notice of Completion was filed on December 12, 2006.

- **Vista** - CIP 8027 – South Santa Fe Avenue Phase III – This project replaced approximately 2,900 feet of existing clay sewer lines along the realigned South Santa Fe Avenue within the City of San Marcos from Bosstick to Rancho Santa Fe. The project was recently completed and Notice of Completion is anticipated by June 2007.

- **Vista** - CIP 8070 – Mimosa, Juniper, Grand, and Green Oak Sewer Replacement – Sewer Replacement and Rehabilitation – The design for this project is anticipated to be awarded in May 2007. The project will replace, relocate, and upsize approximately 3,100 feet of 12-inch diameter trunk sewers adjacent to sensitive tributaries of the Agua Hedionda Watershed. This project is anticipated to be completed within the next two years.

It is important to note that based on analysis criteria, the 1982 24-inch ductile iron Buena Vista force main has not been prioritized for maintenance or replacement under the Sewer Master Plan. This is because the pipe failure occurred after only 25 years on a pipe with a predicted 100-year lifespan and a 50-year service life under the master plan. Further, the pipe has had no other failures of any kind, and in fact, replaced poor piping materials when it went into service. For these reasons, the present failure could not have been predicted based on standards of assessment used to establish maintenance or replacement actions.

Inspections and Maintenance Programs

Both of the Discharger cities have aggressive inspection and maintenance programs. To describe these programs, the cities are discussed separately because they have somewhat differing programs that achieve the same goals.

Since 1996, efforts in Vista have been focused on meeting requirements of Board Order 96-04 and the new Order No. R9-2007-0005 incorporating prohibitions on any discharge of sewage from the sanitary sewer system upstream of a sewage treatment plant. To accomplish this, the wastewater division was reformatted to focus priorities on maintenance and inspection on a regular circuit during which problem areas are documented and capital project actions are assessed and initiated.

Daily maintenance efforts have been reformatted to include the following:

Cleaning of all accessible sewer line segments, filming of lines that have resulted in spills or blockages, and the support work necessary to provide reasonable access for all sewer maintenance equipment. This includes, but is not limited to, the following established crews.

- **1996-04 Compliance Cleaning Crew** - The City has been divided into three subareas that have been assigned one Vactor and two crewmen per subarea. The crews have a target goal of cycling through cleaning of all accessible line segments at least once every 6-8 months. Also assigned to this crew are one immediate supervisor/ Crew Chief to oversee work and respond to emergencies.

- **Video Inspection Crew and Easements** - In support of 96-04 and R9-2007-0005, a video inspection truck is used to perform assessment and diagnostic work to provide important information by conducting internal inspections looking into pipes to evaluate problem lines. This crew has also been charged with work from the Engineering Department requiring an extensive video inspection

program to film all new lines whether private development, CIP, or other forms of development.

- **Service and Repair Crew-** This three-man crew installs easement gates, maintains easement roads, repairs lines as needed during emergency breaks up to 10" pipe, and maintains and operates the old raceway pump station. The crew also installs raised manholes and clean outs, repairs trench failures, and other ancillary support work needed by the 96-04 crews.

During and after heavy rains, crews patrol all main trunk lines to be sure no areas have been compromised. Crews also respond as needed to assist sister JPA members and other North County agencies for mutual aid type support as needed. All of the wastewater crews receive regular training to maintain current expertise with work, regulations, safety, and spill response. To track progress and performance, the City employs several software programs. Daily sewer cleaning efforts are tracked using Accella and Sussex based software programs. Training programs are tracked in Excel formats.

In Carlsbad, similar city crew inspections and maintenance are performed on a regular basis. In addition, Carlsbad has also used contract services to perform considerable video inspection. In a contract between Carlsbad and National Plant Services, a CCTV inspection and cleaning was conducted of reaches VC1, VC2, VC3, VC13, VC14, and VC15 of the Vista/ Carlsbad Interceptor Sewer (gravity flow pipeline sections). These reaches extend from the City limits with Vista to the Buena Pumping Station and from Agua Hedionda lagoon to the Encina Water Pollution Control Facility. The remaining reaches of the gravity flow pipelines were being replaced at the time with a new larger pipeline; and therefore, were not included in the contract. The force main from the Buena Lift Station to its point of discharge was not cleaned and was not inspected internally under this contract for reasons explained in prior responses.

Spill Preparedness and Response

The Encina Wastewater Authority, the City of Carlsbad, and the City of Vista conduct overflow and emergency drills on an annual basis. Other JPA agencies and non-member agencies are also participants at times when the spill scenario may affect facilities or resources at which direct involvement may occur. Scenarios and/or after action reports are attached for several of the past years drills (Appendix 9). Of note is the parallelism between the present response chronology and the Incident Command Structure (ICS) consistently employed in the spill drills. The familiarity with the process of all of the respondents to the present spill can be credited with the rapid and affected multifaceted response program. For several reasons, it is beneficial to examine the 2004 Spill Drill After Action Report within the appendix. This particular drill was a spill at the Buena Vista Lift Station, and the response drill identified several solutions to problems that were encountered in the present pipeline rupture such as flow diversion, communications, and traffic control needs. The benefits of this drill were invaluable at guiding the response process and needs for the current spill.

Another factor that has been critical to the development and maintenance of response capabilities for major emergencies has been the development of mutual assistance programs between agencies. The facilities and resources of any single entity within San Diego North County are highly limited. However, through mutual assistance programs, emergency needs can be met by amassing resources from neighboring agencies. In the present spill, respondents to the spill not only included Carlsbad and Vista, but also Encina Wastewater Authority, Oceanside, Encinitas, Leucadia, and Vallecitos. Supplemental resources, field response, and technical assistance were derived from multiple cooperating contractors, consultants, and resource and regulatory agencies. Through the cooperative efforts of multiple parties working on numerous different, but coordinated response needs, a potentially much greater spill and environmental damage was averted.

Future Action Opportunities

Ongoing investigations into the pipe failure and response program continue to yield possible areas of improvement and issues to explore for future actions. These can be categorized as follows: 1) discharge avoidance; 2) leak detection; 3) response time and resources; and 4) impact minimization and recovery. In some instances, it remains uncertain if improvements may be made; however, retrospective evaluation suggests that these are areas that bear further exploration. Many of these possibilities fit squarely within the development of Sewer System Management Plans (SSMPs) required of the cities in accordance with established milestone dates in WDR Order 2006-003-DWQ.

Discharge Avoidance

This category focuses on means of improving detection of system weakness and responding to maintenance or operational needs prior to infrastructure failures. The present failure poses an interesting dilemma for the Dischargers in that there presently exists no means by which the failure could have been predicted using existing data or inspection capabilities. In fact, because the pipe is wrapped and the failure point appears to be a very localized point of substantial corrosion (the corroded area removed was fully captured in a segment of pipe only 3'9" in length), even high intensity pothole inspection would be unlikely to identify additional points of corrosion if they exist. This is especially true since the present failure point was in about the 4:30 position on the pipe and thus it would not have been detected without full exposure of all portions of the pipeline surface within relatively deep excavations requiring shoring and large equipment to accomplish the excavation. Further, because the inspection would require opening the polyethylene liner, the inspection itself may result in greater potential for future breaches.

For this reason, the Cities are considering contracting with a specialized infrastructure firm to conduct a risk assessment of force mains and siphons in the City. The risk assessment might be an element of the design and performance provision of the WDR Order 2006-003-DWQ and could consider pipeline age, pipeline material, operation conditions, and soil, as well as other factors as parameters that would extend or reduce the probable service life of infrastructure or play a major role in shaping inspection and

replacement decisions. The environmental, human health, and economic consequences and likelihood of pipeline failure may be further factors that could also influence further investigations such as a condition assessment of select pipelines.

Means to conduct further analysis of the risk of additional failures on the existing 24-inch force main pipe continue to be an issue the Cities are grappling with at this time. Unfortunately, technologies available today for conducting thorough condition assessments are emerging technologies and not yet commercially available to public utilities. These include borrowed technologies from the oil and gas industries such as eddy current techniques where a soft seascape or hydroscope is propelled or pulled through the pipeline. Limitations to these technologies exist and require that the line be shutdown and that an access port be available for launching and retrieval of the instrument. Additionally, this technology is only available for pipelines up to 12 inches in diameter and can only operate effectively in pipelines with minimal bends. Still other technologies have been developed for steel pipe, but the ability to apply it to mortar-lined iron pipe remains unknown. These present limitations may preclude applications in many of the region's sewer mains as the technology is furthered.

The City of Carlsbad is also studying the feasibility of using emerging technology to conduct a condition assessment of force mains. Those contacted include Tuboscope Pipeline Service, General Electric Power Systems, and Sahara Leak Location System. Tuboscope and General Electric conduct ultrasonic metal loss detection studies for oil and gas force mains, and Sahara conducts leak detection studies in water pipelines. Jason Consultants, an engineering firm working with WERF to develop Inspection Guidelines for Ferrous Force Mains, has also been contacted.

Consistent with the adopted WDR Order 2006-003-DWQ, the Cities will determine the feasibility of completing system modifications to the 24-inch ductile iron force main at Buena Vista lagoon such as relocating the line to Jefferson Street or relining the existing pipe with a polyethylene encasement. Moving the force main to match the street alignment would result in a minor separation of the pipe from an ecologically sensitive area and allow for ongoing maintenance activities and/or repairs to occur outside of the lagoon embankment. In a similar failure however, it would do little to prevent the spill from discharging to the lagoon. Consistent with the milestone dates in the adopted WDR Order 2006-003-DWQ, the Cities will perform regular video pipeline monitoring of gravity sewer lines. Although there are presently no guidelines for inspection of force mains, the Cities are considering televising the Buena Vista force main. This option is presently not considered feasible given that the line must be emptied, drained, flushed, and bypassed. This option will be revisited, however, due to the changed conditions of the current failure and following completion of the forensic corrosion analysis where it is hoped that some internal manifestation of a pending external corrosion failure may be identified.

Leak Detection

This category of potential actions addresses potential means to enhance detection of discharges. At present, wastewater flows are monitored by ADS, Inc. flow meters and

flow measurement devices at 16 metered locations within the Encina Wastewater Authority service area. These meters are employed in the billing of member agencies of the JPA. Data from the meters do not, however, provide member agencies real time updates, nor do they provide a means to evaluate variation as a means of assessing system losses. In light of the present availability of system upgrades that would provide real time access to flow information, the Cities of Carlsbad and Vista will pursue the implementation of such upgrades through EWA and will encourage all member agencies to upgrade their systems as well.

Preliminary indications are that there may be additional means to enhance the ADS system or install alternative systems that would improve leak detection through use of system pressure and flow variance and point-to-point differential. While these tools are widely available for potable and raw water pipelines, it is not clear if comparable systems are readily available for wastewater systems. The Dischargers are committed to investigating means to install automated alarm systems for potential leaks in this and other force main systems within their individual and collective operations areas. It should be noted, however, that real-time alarms still rely on flow or pressure differential ranges. As such, small leaks, or early ruptures may still go undetected, while larger ruptures should be detected earlier. The full detection capacity of such equipment and its application to the Cities systems remains uncertain.

In 1998, the City of Carlsbad, through a contract with MGD Technologies, Inc., collected sewer flow data at 4 locations to verify depth, velocity and quantity information as well as minimum, average daily, and peak flows to be conducted during the rainy season. Other agreements have been subsequently approved with MGD Technologies, Inc. to monitor flows in the gravity flow sections of all major interceptor and trunk sewers in Carlsbad. This process of monitoring will be reviewed as to whether it offers a practical solution to more permanent monitoring of gravity sewers for potential capacity exceedence overflow events. In addition, the Encina Wastewater Authority has flow-monitoring stations on the major interceptor sewers that they primarily use to invoice treatment capacities to its member agencies. These flow-monitoring stations continually chart the flows tributary to the treatment facility. Potential opportunities to install level alarms on gravity lines will be investigated by the Dischargers.

Response Time and Resources

The response time and effectiveness of the actions taken after leak detection were immediate and comprehensive. There are, however, a few points where improvement may occur. These include accessibility and retrieval of sewer improvement plan data and accessibility of equipment resources distributed among cooperating mutual assistance agencies. The early response record indicates difficulty among the agencies in locating pertinent design data that would have assisted in early determination that a force main rupture was too deep to access using a backhoe. This may have led to an earlier identification of larger equipment needs. Rapid system improvement plan access may also have assisted, or may assist in the future, with the identification of waste rerouting options. To address these issues, the following measures are to be undertaken:

- The Cities will evaluate plan archival systems and will consider the possibility of a central repository or indexing process that would allow more rapid access to data on trunk and main sewers, bypass interconnects, lift stations, and other critical infrastructure.

- Asset inventories across mutual assistance agencies do not exist for emergency response coordination and the requisition process to collect needed equipment can be hampered by fruitless calls to agencies or departments that lack needed resources. While it may be impractical to maintain a full list of resources, the Cities will upgrade call lists and create a general inventory of assets that may be called upon in the case of emergencies.

- To further resource readiness, the City of Carlsbad Public Works staff has requested the following items for inclusion in the budget during the 07/08 fiscal year: 2 new vactors; 1 new bypass trailer;. 1 new CCTV van; replacement of 2 ½ ton pickups for use with the vactors; 1 new compact pickup truck; replacement of 1 1Ton pickup for working on the lift stations; and adding 1 Public Works Supervisor, 4 Maintenance workers, and 1 Office Specialist for the collections system. Some or all of the proposed positions may be staffed by outside contracts. Vactors and pickup trucks will be used for line cleaning and maintenance on the lift stations, the CCTV van will be used to video inspect the sewer pipelines, and the bypass trailer will be used to bypass sewer lines under construction, repair, or when inoperable due to blockages.

- The City of Vista Public Works Department is well staffed for sewer maintenance but has similarly requested equipment replacements and new equipment in upcoming years to stay current with resource reliability and upgrades. In FY07-08, the Department has included the following equipment replacements in its budget request: 1 vactor, 1 dump truck, and a flatbed crane truck. New equipment requested is an easement crawler hose cart machine. In FY 08-09, the Department has requested 1 new vactor be added to inventory.

Impact Minimization and Recovery

While each spill scenario encountered may have somewhat differing needs, almost any sizable spill into an inland lake, pond, or coastal lagoon will benefit from immediate and effective aeration. For this reason, it is the Cities' intent to identify equipment needs and options for immediate availability for future events. This will allow environmental response to be initiated immediately and independent of repair response crew activities.

Staff of the Dischargers will be reviewing the incident response actions for the present spill and will further critique the response. This process will lead to the preparation of an updated Sanitary Sewer Overflow Response Plan during FY 07/08. In this plan, consideration will be given to adding an element addressing incident response and damage minimization guidelines for various ecologically sensitive areas potentially affected by spills from the existing systems.

4.10 WATER QUALITY DATA

All water quality data collected as part of monitoring of the Buena Vista Lagoon after the overflow. Identify sampling locations, methods and circumstances. If historical data is available, provide this data as well. ***(RWQCB #10)***

Water quality monitoring in association with the April 2007 spill event has included bacteriological monitoring, as well as dissolved oxygen monitoring. The monitoring program has been guided by sampling programs and station locations established during the 1994 and 1997 spill events and formalized in the Encina Wastewater Authority's SSORP. In addition to the established WQ monitoring program, responsive monitoring has been adapted to meet the needs of the specific spill circumstances. Modifications of the sampling programs have been made at the requests of the County of San Diego Department of Environmental Health, CDFG, and Merkel & Associates for water column bacteria. Dissolved oxygen (DO) monitoring stations were also added at the request of CDFG, based on aerial review of the plume distribution patterns. As event monitoring proceeded, DO monitoring was reduced through coordination with resource and regulatory agencies. The first reduction was the omission of afternoon DO monitoring. After the consumption of spill-related biochemical oxygen demand (BOD), afternoon DO levels fluctuated at high levels with super saturation occurring on a regular basis. As a result, these measurements were not helpful in understanding system status and oxygen depletion. Subsequent monitoring has incorporated deployment of continuously recording meters that will be operated for one month with weekly retrieval of DO data. Data from this deployed logger effort has not been incorporated into the present report as the first full download event has not yet occurred.

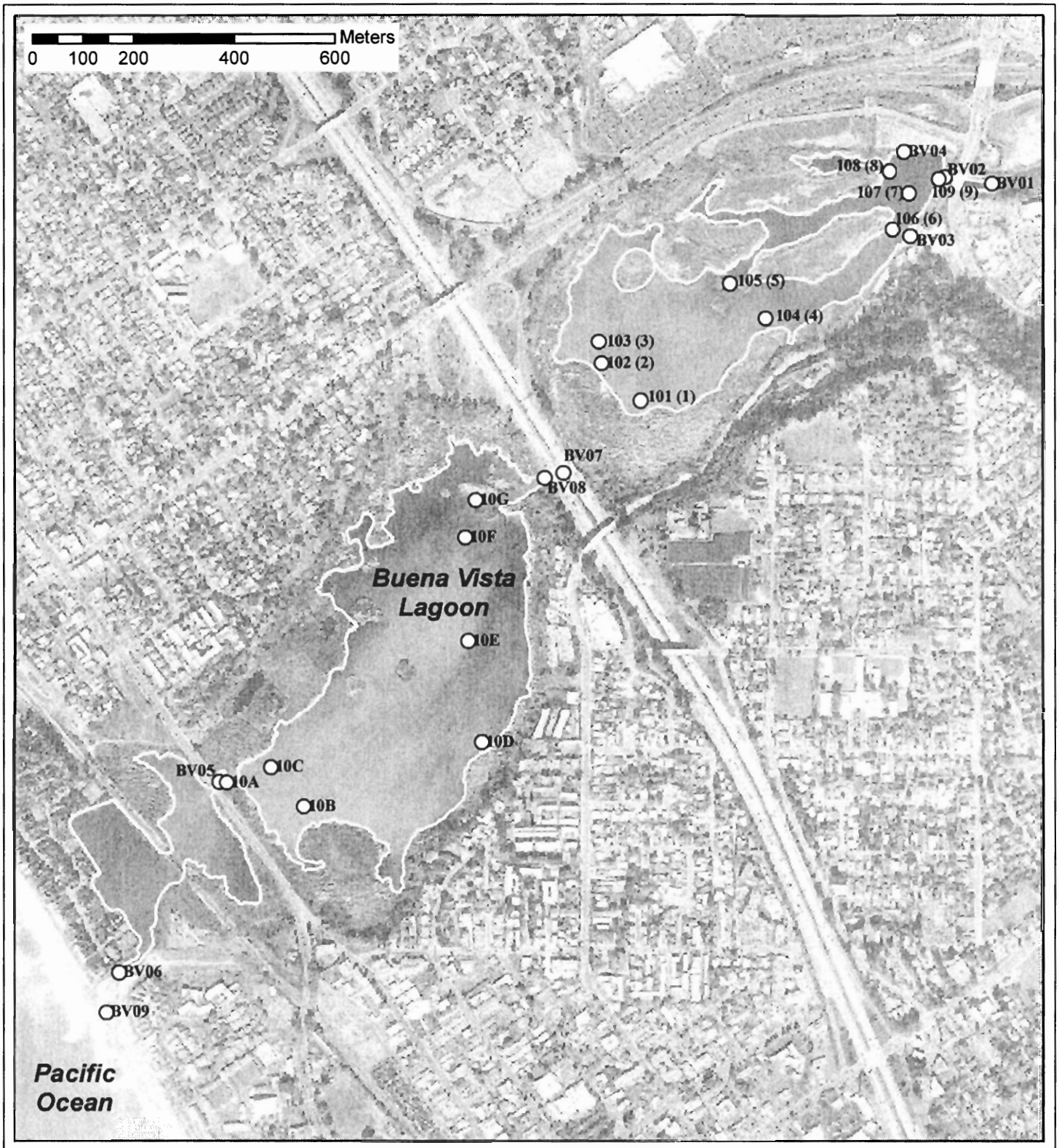
Figure 3 illustrates all WQ sampling stations employed during the post spill monitoring. Shoreline WQ monitoring commenced on April 2nd, at 8:30 AM, with bacteriological sampling conducted by EWA. Dissolved oxygen monitoring also commenced on April 2nd through the actions of Carlsbad Environmental Programs staff. This monitoring program was supplemented on April 3rd by Weston Solutions, Inc. performing on-water monitoring in accordance with the EWA SSORP and 1997 spill monitoring method. On April 7th,Merkel & Associates took over field monitoring for shoreline DO, and on April 12th, Merkel & Associates took over field monitoring on the water. Summary data tables for bacteriological and dissolved oxygen data are incorporated in Appendix 10a. Bacteriological laboratory reports from the Encina Wastewater Laboratory are provided as Appendix 10b. Appendix 10c includes field data sheets for dissolved oxygen monitoring. Early spill period dissolved oxygen monitoring results were recorded in field notebooks and are not included in this appendix. However, all monitoring results are provided on the data summary sheets (Appendix 10a).

Historic background water quality and sediment quality data for the lagoon has been collected from the Buena Vista Lagoon Restoration Feasibility Analysis (Everest International Consultants 2004) and the water quality sections of the Buena Vista Lagoon Land Management Plan Elements (Coastal Environments 2000). Pertinent

sections of these documents are provided as Appendices 10d and 10e, respectively. Prior spill monitoring occurred in 1997 (MEC Analytical Systems, March 25, 1997) and 1994 (MEC Analytical Systems, September 30, 1994). These documents are incorporated as Appendices 10f and 10g, respectively.

The environmental effects of water quality impairment have been analyzed by Merkel & Associates as discussed under the following section of this report.

M&A #02-059-60



N
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Water Quality Monitoring Stations
Buena Vista Sewer Force Main Discharge
April 2007

Figure 3

Merkel & Associates, Inc.

4.11 ASSESSMENT OF ECOLOGICAL IMPACTS

An assessment of the impacts on fish, other species, and the overall ecosystem in the Buena Vista Lagoon resulting from this overflow. Identify all species that have been affected and describe all biological monitoring conducted. ***(RWQCB #11)***

A preliminary account of the ecological impacts of the spill to the lagoon has been prepared by Merkel & Associates (Appendix 11a). The Merkel & Associates report summarizes the monitoring programs that were put into place during the spill and all supplemental monitoring that was done during or after the spill events. Summary water quality monitoring data has been provided in Appendices 10a and 10b. Biological data included collecting and inventorying dead fish and birds as well as collection of benthic samples that have not yet been processed. These benthic samples were collected early in the spill prior to any anticipated organism deterioration in order to establish a baseline condition for the benthic environment at some point in the future.

The best monitoring data available for evaluation of potential biological harm associated with wastewater spills into an aquatic environment is water column dissolved oxygen (DO) concentrations. During the spill event and for several days after the spill, DO remained significantly depressed within the eastern basin of the lagoon and most specifically, the eastern half of the eastern basin of the lagoon. The Merkel & Associates report investigates DO levels over the course of the monitoring period and has determined that oxygen levels within the eastern portion of the east basin remained depressed as a result of BOD from the spill through April 7th.

Fish Losses

On April 3rd, collection of dead organisms was initiated and twice-daily surveys were made of the lagoon to collect any fish, birds, or other dead organisms detected. These surveys were conducted by crews from the Cities of Carlsbad, Oceanside, and Vista, as well as Weston Solutions, Inc. Weston processed, identified, and counted organisms and recorded lengths for fish collected. Surveys and collections continued as long as organisms were being found.

The locations and amounts of fish mortality can be compared with the pattern of DO concentration in the lagoon. The majority if not all fish mortality likely occurred immediately after significant amounts of wastewater were spilled. At that time, fish would not have been able to seek refuges of high DO and a majority of the eastern end of the east basin was extremely low in DO. An adequate number of sampling locations were first implemented on the morning of April 4th, allowing a level of detail to produce a map of DO concentrations that likely approximated reality. Although DO measurements were taken on April 3rd, the low number and spread of sample stations created large distances of extrapolation between points and probably inaccurate reflection of DO across the lagoon. Therefore we assume that the initial spread of low DO in the lagoon likely covered a greater area than was seen on the morning of April 4th but was more localized than is reflected in the map of DO created from data taken on April 3rd.

On the morning of April 4th, 72% or 27.5 acres (111,334 m^2) of a total area of 38.4 acres (155,612 m^2) of open water in the east basin showed DO values less than 3.0 mg/l. This area amounts to 22.4% of the 122.6 acres (496,438-m^2) of open water in the lagoon.

DO values below 3.0 mg/l may result in fish kills although most of the species of warm water fish found in Buena Vista Lagoon have tolerances below this level (Table 1). Fish mortality appears to have occurred primarily in the eastern portions of the east basin as indicated in a map of the fish collection concentrations prepared by Weston (Figure 4). No dead fish were recovered on the south shoreline of the east basin but rather were recorded primarily on the northern shoreline and around the island in the center of the basin. Fish likely expired around the center of the spill location and were moved northward by the wind. Only two dead fish were found on the northern shoreline of the central basin. This would suggest that low DO might have encroached into the central basin enough to have a minor impact on fish there. However, given the location of these fish and the fact that they were both of reasonably large size, it is possible that these two fish losses are the result of injuries sustained from fishing, or other causes of mortality. The remainder of the 1,694 fish lost (99.9%) were recovered in the east basin.

Fish mortality was significantly lower during the present spill than the previous spill in 1994, despite the total volume released during the 1994 spill being less than the current event (Table 1). In 1994, 4.75 million gallons were released in comparison to 7.33 million gallons released in the current event. The decreased fish mortality is likely attributed to several factors including time of year in which the spill occurred, greater refuge from spill effects, and early aeration. Pump-back of the contaminated water as well as aeration may have decreased the severity of spill impacts through limiting the scope of the spill and accelerating BOD consumption.

Table 1. Faunal Mortality, 2007 and 1994 Spill Events, and Associated Dissolved Oxygen Tolerance

Species	Known Dissolved Oxygen Tolerance*	Mortality (no.)	
		1994	2007
Largemouth Bass	>1.5-2.0 mg/l	835	187
Bluegill	<1 mg/l	1671	648
Black Crappie		279	5
Channel Catfish	1-2 mg/l	70 lbs.	0
Bullhead	1-2 mg/l	348	604
Carp	0.5-3 mg/l	278	36
Mosquitofish	near 0 mg/l	3,000+	1+
Green Sunfish	<3 mg/l	0	210
Carp – Goldfish	O_2 deficient water	0	3
Birds		0	4
Bullfrog		0	1
Freshwater Shrimp		320,000	0
Crayfish		9,600	3

*McGinnis 1984 and Moyle 1976

Avian Losses

A total of four dead birds were found during surveys for impacts to avian species. These included one California gull, two American coots, and one gadwall. The distribution of these birds is illustrated in Figure 4. No sick birds were detected.

Amphibian Losses

One bullfrog was found dead in the east basin (Figure 4).

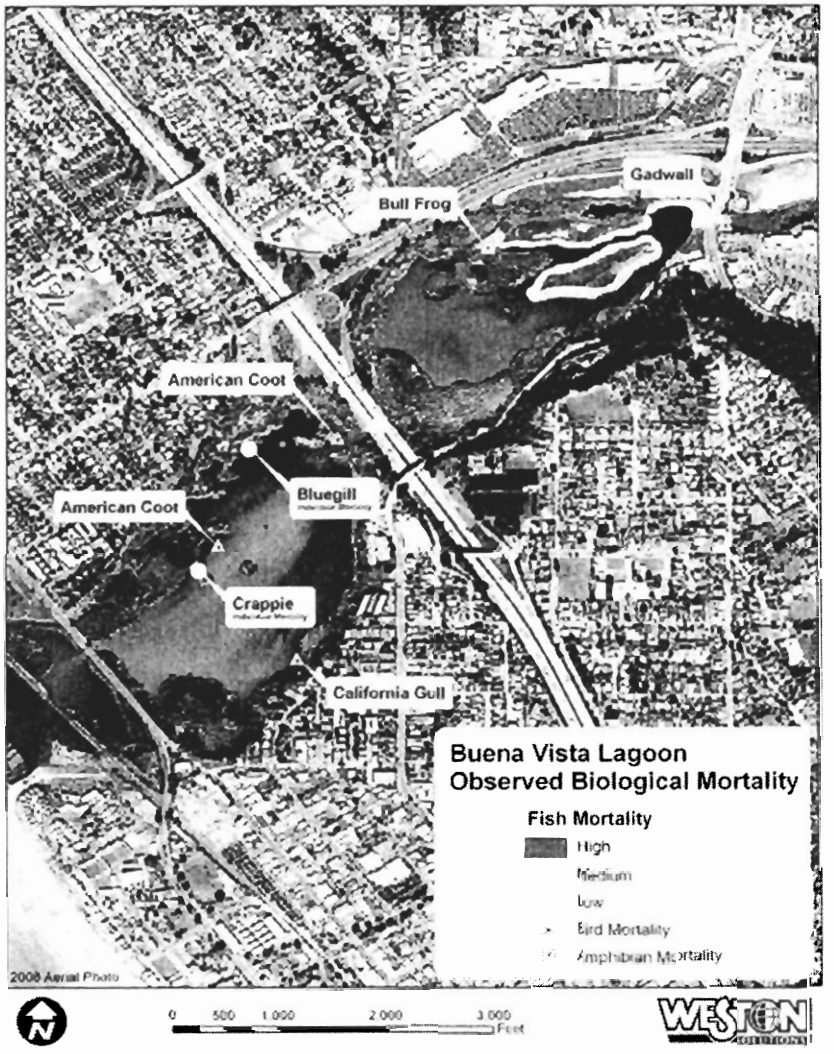

Figure 4. Distribution of fish and bird collections during April 2007 spill.

Invertebrate Losses

A total of three dead crayfish were collected from the lagoon. Two were collected from the east basin near the Jefferson Street bridge. The third was collected at the weir in a 75% decomposed condition and likely was unrelated to the spill. Notably, no freshwater shrimp were found during the present spill even though these crustaceans constituted the majority of the mortality following the 1994 spill.

Benthic infaunal sampling was conducted by Weston on April 4th and April 5th in the East, Central, and West Basins of Buena Vista Lagoon. Open water benthic invertebrate samples were collected from three locations within each of the three basins using a standard .025-m^2 Eckman grab sampling device. At each site location, the Eckman sampler was deployed and pushed into the sediment via a sampling pole for maximum penetration. The sediment was sieved on a 0.5-mm screen using site water. Material and organisms retained on the sieve were transferred to sample jars, labeled with the site information, and preserved in a 1:10 mixture of formalin and site water. At the end of each day, the preserved samples were transported in labeled coolers to Weston Solutions in Carlsbad, CA for storage. Samples were later transferred to a 70 percent ethanol solution.

Sampling took place within five days of the beginning of wastewater entry into the lagoon. If infauna were impacted by the spill, many would have been dead by the time of sampling although there would not have been time for significant decay of the organisms' tissues. Therefore, animals that may have been dead will be analyzed and counted as live. These post-spill samples represent baseline data to which post-impact samples will be compared. Post-impact samples have not yet been collected. Collections will be made after sufficient time has passed to allow decay of tissues in animals killed by conditions resulting from the spil,l so that a spill impact may be detected. Collections should not, however, occur after recovery of the system has begun. An appropriate period for collection will occur in May. None of the benthic samples have been worked up at the present time. Benthic infauna within the lagoon is known to be relatively depauperate. The April sampling will be compared both to post-impact sampling results as well as to prior investigations conducted as an element of the San Diego County Municipal CoPermittees Urban Runoff Monitoring Annual Reports for the Ambient Bay and Lagoon Monitoring Program 2002-2003 and 2004-2005 (MEC Analytical Systems 2004, 2006; Appendix 11b) and sampling performed to support preparation of the Buena Vista Lagoon Land Management Plan (Coastal Environments 2000, Appendix 11c).

4.12 SHORT AND LONG-TERM EFFECTS OF THE DISCHARGE

A report on all other short and long term effects resulting from the overflow including, but not limited to, impacts on public health and the environment. Explain how these conclusions were reached and what steps the Dischargers have taken, or will take, to mitigate these impacts. ***(RWQCB #12)***

Buena Vista Lagoon is identified in the Basin Plan as supporting the following beneficial uses: industrial service supply (IND), contact water recreation (REC-1), non-contact water recreation (REC-2), preservation of biological habitats of special significance (BIOL), warm freshwater habitat (WARM), wildlife habitat (WILD), rare, threatened, or endangered species (RARE), and marine habitat (MAR). In addition, it is identified as having the potential to support estuarine habitat (EST) as a beneficial use. To address this request, we have evaluated the discharge consequence in the context of these identified and potential beneficial uses.

Industrial Service Supply (IND)
The lagoon does not presently offer industrial service supply uses, and the discharge to the lagoon is not believed to have had adverse short or long-term affects on this use.

Contact water recreation (REC-1)
While designated for REC-1 uses, Buena Vista Lagoon is closed to on-water activities, wading, and swimming through use restrictions within the Buena Vista Lagoon Ecological Reserve and the San Diego Basin Plan. Fishing in the lagoon does occur and is designated as a REC-1 beneficial use. REC-1 designations do apply to coastal beaches that were also affected by the spill response actions, although the spill itself did not reach the coastal beaches.

On April 2nd, Encina Wastewater and the City of Carlsbad, in coordination with San Diego County Department of Environmental Health (DEH), posted Contaminated Waters signs along the beach 600 feet south and 1,200 feet north of the Buena Vista Lagoon outlet as a precautionary measure. Signs were also posted along the perimeter of the lagoon.

Beach postings remained in place for one week, and signs were removed on April 9th, when they were removed by order of County DEH. No discharge to ocean beaches occurred, however, the effects on REC-1 along the 1,800-foot long closure reach remain the same. Signage within the lagoon remained in effect through April 19th, when signage was fully removed from all areas of the lagoon. The posting and removal of signage at the lagoon had no affect on the regulatory closure of the lagoon to contact recreation as a function of the Ecological Reserve designation.

While considerable recreational fishing continued throughout the lower lagoon basins during the spill response, physical closures and access control for spill response at the eastern end of the lagoon prohibited access to this area by fishermen during and following the spill event. As a result, this REC-1 activity was impaired by both the mortality of fish in the eastern basin, as well as loss of access to this basin during the response.

The loss of approximately 1,694 fish, including 1,050 game fish (bluegill, green sunfish, largemouth bass, and black crappie), occurred principally within the upper end of the lagoon. These losses resulted in a reduction of the overall population of catchable fish in the lagoon. Replacement of these game fish through natural recruitment and growth

to maturity may require as much as 2-5 years based on species and size classes affected. No other long-term adverse affects to REC-1 are anticipated as a result of the incident.

Non-contact water recreation (REC-2)

Non-contact water recreation that was adversely affected at the lagoon principally includes wildlife viewing. The discharge occurred within a popular viewing area that was taken over by spill response activities on April 1st. This area remained closed through the spill response period. Bird watching is a principal REC-2 use at the lagoon, and the spill is preliminarily considered to have been responsible for the loss of four birds (a California gull, two American coots, and one gadwall).

No long-term adverse affects to REC-2 uses are anticipated.

Preservation of Biological Habitats of Special Significance (BIOL)

The wastewater discharge occurred into the Buena Vista Lagoon Ecological Reserve, an area designated as a State Ecological Reserve by the Fish & Game Commission under California Code of Regulations, Title 14, Section 630. The spill adversely affected freshwater and avian resources, as well as minor amounts of vegetated habitat within this reserve. The specific affects to resources are discussed under the beneficial use categories most specifically applicable including (WARM, WILD, and RARE).

The discharge did not result in any permanent losses of biological habitats of special significance. However, upland habitat damage at the spill site was in a habitat restoration area implemented by CDFG. The revegetation of this site may require up to 3 years to achieve an equivalent level of development as that existing prior to the spill.

Warm Freshwater Habitat (WARM)

A detailed account of the early effects of the spill is provided previously and in Appendix 11a. The spill resulted in mortality of a documented 1,694 non-native freshwater fish from affected portions of the lagoon. The cause of fish mortality is presumed to have been acute hypoxia brought about by biochemical oxygen demand (BOD) loading within the upper end of the lagoon and significant oxygen consumption during the spill and for as much as four days following the spill through April 7th. Following this date, dissolved oxygen levels had recovered throughout the impact area to levels that would not result in further loss of fish.

Based on prior benthic sampling in the lagoon (Appendix 11b and 11c), the lagoon supports a relatively depauperate benthic faunal assemblage. Low taxonomic diversity was specifically noted during the 2004-2005 Ambient Bay and Lagoon Monitoring Program where 91.4% of the 165 invertebrates collected were comprised of two species of organism (MEC Analytical Systems 2006). In 2003-2004, only three organisms were documented in the sampling (MEC Analytical Systems 2004). While the species comprising the lagoon's benthic invertebrate fauna are generally ephemeral short-lived species that are tolerant of intermittently low DO concentrations, natural variability in DO levels consists of broad fluctuations that result in low diurnal oxygen levels for a matter

of hours, prior to returning to higher levels. Several organisms have evolved to withstand these predictable conditions. The prolonged depressed DO levels associated with the spill event, however, would be expected to result in losses of benthic infauna within the upper end of the east basin of the lagoon. On April 4th, benthic samples were collected to document organisms within the lagoon sediments of the east and central basins. These samples would be expected to represent the community present in the sampled areas prior to the spill. Subsequent sampling has not been done as yet and the baseline samples have not been processed. For this reason, the short-term degree of impact to benthic communities is not yet known.

Long-term effects of the discharge on WARM beneficial uses are not yet known. While DO levels generally returned to levels that are protective of ecological resources within days of the spill termination, there remains a potential for future long-term affects of nutrient loading to the lagoon. With the sewage discharge, additional nitrogen and phosphorus were released to the system. The bacterial monitoring evidence suggests that limited spread of effluent occurred within the lagoon, and none of the sewage was exported from the system. Absent relatively immediate consumption by algae, these nutrients may be temporarily sequestered in the lagoon sediments until released as the lagoon warms and algal and vascular vegetation growth is accelerated. At the present time, plant growth is just commencing for the 2007 spring and summer growing seasons. Considerable sediment nutrients may result in spring algal blooms and thus hugely cyclic diurnal DO levels. Such theoretical effects may be readily speculated, but there does not appear to be any references to such affects occurring in specific association with the 1994 and 1997 spill events.

The lagoon is recognized in the San Diego Basin Plan as impaired for aquatic life, contact recreation, and non-contact recreation (RWQCB 1996 and 1998). Pollutants determined to be critical in the 303(d) listing as impaired waters were nutrients, sediment, and bacteria. As such, any additional nutrient load or bacterial load would be a concern. In both the 1996 and 2002 303(d) lists, nutrients and bacteria were listed as low priority in the list of priority pollutants.

To predict the role the spill may have on nutrient loading within the lagoon and future spring-summer algal blooms, a mass loading calculation was completed. The loading analysis estimated the approximate percentage of the total annual load of nitrogen, in the form of total nitrogen, and total phosphorus contributed to the lagoon by the spill. Annual lagoon loading estimates of nitrogen and phosphorus were derived from watershed analyses completed in the Buena Vista Lagoon Restoration Feasibility Analysis Report – Final Report, June 2004 (Everest International Consultants 2004, sections found in Appendix 10d). From this report, total nitrogen inputs from the watershed were estimated to be 71.6 tons/year, while total phosphorus was estimated at 6.7 tons/year.

Based on typical nitrogen and phosphorus concentrations in raw urban wastewater, it is expected that concentrations of nitrogen are in the 10s of mg/L, while phosphorus loading ranges less than 10 mg/L. In one study of the treatment plant influent for the

town of Ashland, Wisconsin, nitrogen concentrations totaled 40 mg/L, while phosphorus totaled 5.6 mg/L (Wisconsin Department of Natural Resources 1994). For the influent to the Encina Wastewater Authority's treatment plant, phosphorus loading is comparable to the Wisconsin concentrations ranging from approximately 1mg/L to 4mg/L while the loads for nitrogen are about 20mg/L mostly in the form of ammonia (pers. comm. Doug Campbell, Laboratory Supervisor, Encina Wastewater Authority. For the current spill, these concentrations of nitrogen and phosphorus when accumulated over the entire spill volume would translate into mass loading rates of approximately 0.61 tons of nitrogen and 0.03-0.12 tons of phosphorus assuming no benefits of atmospheric loss of ammonia and no reduction of sewage from the pump-back operation, both highly conservative assumptions.

Even without discounting the loading by an unknown but substantial percentage of effluent recapture and atmospheric ammonia loss, the annual percentage of nitrogen loading contributed to the lagoon would be approximately 0.85% of the total annual load. For phosphorus, the load would be approximately 0.4%-1.8%. While these values can be considered important in the context of a system that is already considered impaired by nutrient loading, the proportionality of the load percentages would not suggest that the spill would drive substantial seasonal algal blooms, but rather may be contributory to blooms that occur under baseline conditions. Low run-off during this last winter likely benefited the lagoon through lower than average loading from watershed input sources. Baseline data collection for the preparation of the Buena Vista Lagoon Land Management Plan Elements (Coastal Environments 2000, Appendix 11c) examined the seasonal algal blooms within the lagoon and documented a substantial coverage of the eastern end of the east basin to support blooms, but much of the western end of the basin does not typically support blooms. In the discussion of fish communities and eutrophic conditions, Coastal Environments noted that the lagoon is dominated by mobile species that can readily move to areas of higher oxygen during periods when DO concentrations are low. It was also noted, however, that the eutrophic conditions that sporadically occur in the lagoon have in the past resulted in some fish kills

Given the relatively minor contribution to nutrient loading of the spill and the low rainfall winter, it is not expected that the lagoon will experience particularly high algal blooms during the Spring and Summer 2007 seasons. For this reason, subsequent fish or invertebrate losses are not expected.

Wildlife Habitat (WILD)

Wildlife habitat impacts from the spill are limited to effects of the spill response. Non-wetland upland habitat was removed from the wildlife viewing area and at an entry point where a fence was taken down to access the north side of the lagoon from South Vista Way. Wetland habitat impacts are predominantly temporary in nature and have resulted from establishing pumping and aeration sites at existing clearings. These impacts have been due to water access by response crew labor at these existing clearings.

Impacts resulting from the emergency response are as follows:

HABITAT	AREA (SQ. FT.)
Disturbed Atriplex/Isocoma Scrub	9,292
Disturbed Exotic Vegetation	378
Non-tidal Alkali Marsh	350
Freshwater Marsh	152
TOTAL	**10,172**

The principal impacts occurred within the actual repair area in a location that has been a restoration site. As a result, it is contemplated that the restoration of this damaged area will be coordinated with CDFG with the intent of rapid recovery to a state comparable to the conditions prior to the spill event. Wetlands that have been damaged have generally been damaged by driving pumps into place at clearings made by fishing activities and damaging minor fringes of wetlands at these areas. Additional damage has occurred in an area where CDFG has previously cleared cattail marsh at the wildlife viewing area. Young cattails have been damaged by access taken in this clearing as a result of biological monitoring activities to access boats. In all cases where the wetland damage has occurred, it is expected that viable rootstock will allow for rapid recovery of the trampled vegetation.

Restoration of the damaged native upland habitat may require up to 3 years to achieve the maturity of prior vegetation in this area. Wetlands are expected to recover by the end of the 2007 summer season through natural plant regeneration of remaining live rootstock.

Rare, Threatened, or Endangered Species (RARE)

At the present time, there is no evidence that rare, threatened, or endangered species have been harmed as a result of the spill. There are two resident species of principal concern. The first is the state-listed Belding's Savannah sparrow, a species that nests in pickleweed marsh and which forages on insects within low-lying marshlands. This species is most abundant on the tops of the islands found in the eastern portion of the east basin. It is also found along the north side of the lagoon in better-developed pickleweed marsh vegetation. No adverse effects are anticipated to have occurred to this species.

The second species of concern is the federal and state-listed endangered light-footed clapper rail. This species is found within freshwater cattail marsh habitat throughout the lagoon. In 2006 and 2007, Dick Zembal, Orange County Water District Light-footed Clapper Rail Recovery Team Member, located an estimated 8 pairs of rails during each year throughout the lagoon. The most current survey was performed on March 28, 2007. Based on field survey maps provided by the Fish & Wildlife Service (FWS), it appears that rails were detected approximately 800-1,000 feet west of the repair site and on the southern and northern islands at the east end of the east basin. An additional single bird was detected at the northwestern portion of the east basin. The remaining birds were detected in the more western basins. Based on the survey maps, it does not appear that the work conducted in association with the pipeline repairs

occurred in or near marshes where clapper rails were detected. No vegetation impacts occurred within marsh areas in which birds were detected.

Following the 1.75 million gallon lift station spill on February 25th, a similar on-water response of aeration and pump-back operations was implemented. During the 1997 year, the highest rail count in the lagoon was recorded (7 pairs) (Everest International Consultants 2004, Coastal Environments 2000). Based on this prior event experience and the separation between the present operations and the identified rails in the 2007 surveys, it is not believed that direct impacts to rails are likely to have occurred.

Clapper rails are omnivorous and opportunistic foragers principally consuming epibenthic macroinvertebrates and insects. In freshwater systems, crayfish, insects and insect larvae, tadpoles, snails, small fish, and even small mammals are consumed by rails. Differing from the 1994 spill, there were very few dead crayfish (3 total) collected and no freshwater shrimp. Further, only one dead mosquito fish was collected. These collections would suggest a very low proportion of rail prey items were lost as a result of the spill. It is not believed that the losses of fish, principally larger individuals, resulted in an adverse effect on rails. As a result, no long-term adverse effects to rail populations are anticipated in association with the wastewater release.

Marine Habitat (MAR)
Marine Habitat beneficial uses were not adversely affected by the spill, and no long-term affects to these resources are anticipated.

Estuarine Habitat (EST)
The potential beneficial use of Estuary Habitat was not adversely affected by the spill.

4.13 ADDITIONAL PERTINENT INFORMATION

> *Any other pertinent information that will assist my staff in evaluating the discharges.* ***(RWQCB #13)***

The information presented in this document has been accumulated through a number of sources, and as a result, some variation in timeframes or action accounts may be expected. The best efforts possible within the reporting timeframe have been made to address disparities and present a true and accurate account of the event. As indicated in various sections of this document, forensic analysis of the pipe rupture is still under way, and environmental response and monitoring continues as of this date. For this reason, reporting on these efforts is limited to the information available at the time this report was prepared. Additional information may be developed that adds further to the Dischargers' and the Board's understanding of the incident.

Throughout the spill event and to this date, the Cities and our consultants have been open and cooperative with the Board staff and other agencies and have benefited from insights, discussions, and recommendations regarding the response actions taken to address the spill. This is evidenced by the considerable field coordination with agencies

as shown in the incident chronology log (Appendix 3). It is also illustrated by the considerable efforts that have gone into the preparation of a full and complete response to the Board's Investigative Order request and agency updates and coordination. A glimpse into these efforts can be seen by the numerous focused multi-agency meetings that have occurred on 4/3, 4/7, 4/9, 4/9, 4/13, 4/16, and 4/19 with the specific purpose of responding to and/or communicating with resource and regulatory agency staff (Appendix 13a). In addition, on two separate occasions during the early event history, formal presentations were made to the Board and other resource and regulatory agencies with respect to the state of the events (Appendices 13b and 13c). The Board should anticipate that as further data and analyses become available regarding the event, these data will similarly be shared with the Board in the same manner as has occurred to this date. The Dischargers would ask that the Board recognize and accept any new information into the process and consider these submittals as if they were attached to this document at this time.

The present spill event has been the largest faced by either of the Dischargers. Despite the considerable resource support of all of the mutual assistance parties that have engaged in the response, the equipment, contracting, and city staff commitments that have gone into the immediate response and on-going environmental follow-up have been substantial. At the present, the Cities have not tallied the full costs of the spill and subsequent response; however, these response and remediation costs are likely to be in excess of $1 million.

5.0 CONCLUSIONS

The present external corrosion associated rupture of the Buena Vista force main has been a unique event, completely unrelated to any past failures of the Cities' sewage system and unpredictable based on evaluation of discharge histories within the Cities. The life expectancy of the pipe is estimated to be approximately 100 years, while its useful life has been considered to be 50 years by the Cities. The rupture of the pipe after only 25 years was unexpected. The failure of the pipe was likely undetectable through commercially available technology.

The Dischargers' response to the sewage release was immediate and consistent throughout the spill event and follow-up remedial actions. The first responder was on-site within three minutes of the call made to the Carlsbad PD dispatch center. Within a matter of two hours, a full fledged incident response was well underway, with most of the senior Public Works staff being present on-site and dividing courses of action in accordance with an established Incident Command Structure and following processes that had been tested, evaluated, and refined on an annual basis through spill scenario drills involving multiple agencies. While the facility on which the rupture occurred was owned by the Cities of Vista and Carlsbad, numerous cooperative agencies responded with staff and equipment assets that were folded into the response in an effective manner. This resulted in reducing the time of the spill and volume of wastewater

discharged, as well as increasing the capacity to aerate the lagoon and pump wastewater back to the sanitary sewer once repairs were made.

The rapid response of repair crews and environmental staff resulted in less fish losses than occurred during the 1994 spill, despite the present spill being 35% larger than the 1994 spill. In large measure, this can be attributed to the response program and response planning benefits drawn from the prior spill events.

While it is certainly appropriate to acknowledge the effectiveness of the response, it would be inappropriate to dismiss the other factors illuminated through retrospective review. The Dischargers have undertaken a considerable effort to best identify where strengths and weakness exist in present systems and capabilities. While at the present time there does not appear to be available technology to identify likely failure points of the type that occurred here, continued consideration of inspection methods or potential preemptive improvements is in order and will be pursued. An obvious conclusion to an inability to predict a failure of a pipeline that, by all present investigative conclusions, was designed correctly, constructed of appropriate materials, and had considerable remaining programmatic lifespan, would be to consider possible options for enhanced failure detection. While this would not serve to further reduce failure risk, it may result in more rapid leak detection and less volume discharge if another spill were to occur. The Cities are pursuing this line of investigation with Encina Wastewater Authority as well as examining alternative flow monitoring and alarm capabilities. As with any incident and the spill drills that are regularly conducted by multiple jurisdictions in the Encina Wastewater Authority JPA, this event will be further examined and will play a key role in updating and enhancing further response measures in the future.

6.0 REFERENCES

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