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Prepared For

DEPARTMENT OF THE NAVY
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STORM SEWER STUDY TECHNICAL MEMORANDUM ADDENDUM AND RESPONSE TO AGENCY COMMENTS ON THE DRAFT FINAL STORM SEWER STUDY REPORT

ALAMEDA POINT
ALAMEDA, CALIFORNIA

August 30, 2001

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TC.0202.11178

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August 30, 2001

Ms. Glenna Clark
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Subject: **STORM SEWER STUDY TECHNICAL MEMORANDUM ADDENDUM AND RESPONSE TO AGENCY COMMENTS ON THE DRAFT FINAL STORM SEWER STUDY REPORT**
ALAMEDA POINT, ALAMEDA, CALIFORNIA
CLEAN Contract No. N62474-94-D-7609, Contract Task Order No. 202

Dear Ms. Clark:

Enclosed please find seven copies of the Storm Sewer Study Technical Memorandum Addendum and Response to Agency Comments on the Draft Final Storm Sewer Study Report for Alameda Point. Three bound copies are for your use, three bound copies are for the Navy Admin Record, and one unbound copy is for the basic contract file.

This deliverable completes the technical tasks under CTO 202, as discussed last week with you. Please contact me at (916) 853-4501 if you have any questions or comments.

Sincerely,

Neal Hutchison
Project Manager

cc: File

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August 30, 2001

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DRAFT FINAL
STORM SEWER STUDY REPORT
TOTAL PETROLEUM HYDROCARBON ADDENDUM

DATED 15 JANUARY 2001

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ACRONYMS AND ABBREVIATIONS

BTEX	benzene, toluene, ethylbenzene, and xylenes
CAA	corrective action area
CAP	corrective action plan
CCC	criteria continuous concentrations
CERCLA	Comprehensive Environmental Response, Compensation, And Liability Act
CMC	criteria maximum concentrations
DGS	data gap sampling
DNAPL	dense, non-aqueous phase liquid
DTSC	Department of Toxic Substances Control
EBS	environmental baseline survey
EPA	U.S. Environmental Protection Agency
ERV	ecological reference value
HDPE	high-density polyethylene
MCL	maximum contaminant level
MTBE	Methyl tertiary butyl ether
NOAA	National Oceanic And Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OU	operable unit
PRC	preliminary remediation criteria
RI/FS	remedial investigation and feasibility study
RWQCB	Regional Water Quality Control Board
SWMP	storm water management plan
TPH	total petroleum hydrocarbons
TtEMI	Tetra Tech EM Inc.

TC.0202.11178

1.0 INTRODUCTION

This technical memorandum was prepared by Tetra Tech EM Inc. (TtEMI) under contract to the Navy's Engineering Field Division Southwest in support of the Alameda Point remedial investigation/treatability study (RI/FS) program as related to the storm sewer system at Alameda Point. This technical memorandum addresses the following issues:

- Regulatory agency comments on the draft final storm sewer study report (TtEMI 2000) and the storm sewer study total petroleum hydrocarbon (TPH) addendum (TtEMI 2001a)
- The Navy's recently developed strategy for data gap sampling for operable unit (OU)-1 and OU-2 as it relates to the storm sewer system
- The Navy's CAP strategy for addressing TPH corrective action areas (CAA), as it relates to the storm sewer system

Based on comments received from the regulatory agencies the Navy has reprioritized sections of storm sewer line based on the potential for contaminated groundwater to infiltrate into storm sewers passing through contaminated groundwater plumes and then exfiltrate from the storm sewer system potentially contaminating downgradient parcels. The Navy has also responded to regulatory agency comments in developing its data gap sampling investigation for OU-1 and OU-2. This includes developing baseline conditions for the storm sewer system by sampling at manholes and catch basins downgradient of groundwater plumes (primary sampling locations), sampling manholes or catch basins closest to outfalls (secondary sampling locations), and sampling areas where high permeability bedding materials may exist. Investigations and remedial activities related to TPH CAAs will be completed consistent with the Navy's TPH corrective action plan (CAP) strategy (TtEMI 2001b). This includes the use of preliminary remediation goals and ecological reference values provided in the CAP strategy.

Overall, the Navy will complete its storm sewer investigations and remedial activities as part of the data gap sampling and IR program for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related chemicals, and through the CAP for TPH compounds. No future base-wide storm sewer investigations are anticipated.

2.0 BACKGROUND AND OBJECTIVES

The major focus of this technical memorandum is the following:

- Provide responses to comments received from the San Francisco Regional Water Quality Control Board (RWQCB), the California Environmental Protection Agency Department of Toxic Substances Control (DTSC), and the U.S. Environmental Protection Agency, Region IX (EPA) on the draft final storm sewer study report (TtEMI 2000) and TPH addendum (TtEMI 2001a).

- Reprioritize the condition of the storm sewer system based on comments provided by the regulatory agencies on the draft final storm sewer reports. Reprioritization takes into account the potential for contaminated groundwater to be transported via the storm sewer system downstream and potentially affect non-contaminated areas of the installation, thus limiting the Navy's ability to transfer the these areas without restrictive conditions.

- Summarize the Navy's current approach for addressing remaining issues related to the Alameda Point storm sewer system. An earlier version of the Navy's approach for addressing storm sewer issues was discussed in, "Technical Memorandum for Reconfiguration of Installation Restoration Site 18" (Navy 2001). For chemicals regulated under CERCLA, storm sewer issues are being addressed through its IR program. For TPH compounds, the Navy is addressing storm sewer issues through the CAP and the identification of CAAs. Specific data gaps related to the storm sewer system and IR sites are currently being investigated through the data gap investigation for OU-1 and OU-2.

The remainder of this section summarizes the approaches taken for the draft final storm sewer report (TtEMI 2000), and the TPH addendum (TtEMI 2001a). Section 3.0 provides responses to regulatory agency comments on the draft final report and the TPH addendum. Section 4.0 provides a reprioritization of the storm sewer system based on regulatory agency comments. Section 5.0 provides additional discussion, conclusions, and recommendations that integrate information from the Navy's data gap investigation for OU-1 and OU-2, and information obtained through the CAP for TPH.

Response to agency comments on the draft final storm sewer study report and the TPH addendum are presented in the following section.

3.0 REGULATORY AGENCY COMMENTS ON THE DRAFT FINAL STORM SEWER STUDY REPORT AND THE TOTAL PETROLEUM HYDROCARBON ADDENDUM

This section provides a summary of regulatory agency comments as well as specific comments and associated responses. Section 3.1 provides responses to RWQCB comments, Section 3.2 provides responses to DTSC comments, and Section 3.3 provides responses to EPA comments.
Comments provided by the RWQCB acknowledged that the draft final report and the TPH addendum represent an adequate response to regulatory agency comments on the draft report and that the locations where contaminant plumes may enter the storm sewer system were well characterized. RWQCB stated, however, that the maps showing contaminant plumes in groundwater should be used to assign priority for removal and remedial actions rather than for repairs to the storm sewer system. RWQCB also recommended that the documents remain draft final and not be revised. Other comments made by RWQCB include the following:

- The Navy should work with the City of Alameda to upgrade the storm sewer system by removing sections of storm sewer line that traverse IR Site 5 and other IR sites. Sections of line that are not removed should be replaced with surface drainage or drainage above the water table.
- A storm water monitoring plan (SWMP) should be implemented.

Subsequent to receiving RWQCB comments, during a teleconference with Mr. Brad Job of the RWQCB, Mr. Job indicated that the Navy should revise its process for prioritizing lines in the storm sewer system. Mr. Job suggested that such revisions should address the potential for contaminated groundwater to adversely affect downgradient groundwater in previously uncontaminated areas of the installation, which would potentially affect the ability of the Navy to transfer portions of the installation without restrictive controls. In addition, Mr. Job expressed concern about the unknown quantity of contaminants that may be migrating to surface waters, such as San Francisco Bay (the Bay), through the storm sewer system.

DTSC concurred with the RWQCB that isoconcentration maps of groundwater contaminants should be used to prioritize removal and remedial actions rather than to complete repairs to the storm sewer system. DTSC also provided several comments on specific sections of text and the isoconcentration maps for consideration during any future revisions of the draft final report.

EPA stated that information in the draft final report and addendum (TtEMI 2000, 2001a) should be used to support future RI reports. EPA also concurred with the RWQCB and DTSC in prioritizing removal and remedial actions to reduce the amount of contamination that could enter the storm sewer system. The following subsections present the Navy's responses to agency comments on the aforementioned documents.

3.1 SPECIFIC RESPONSES TO REGIONAL WATER QUALITY CONTROL BOARD COMMENTS ON THE DRAFT FINAL STORM SEWER STUDY REPORT AND TOTAL PETROLEUM HYDROCARBON ADDENDUM

1. **Comment:** **The maps in the documents provide a good first step in prioritizing sites for early action to remove sources of groundwater pollution that appears to be exfiltrating fro*m Alameda Point groundwater.**

   Response: Comment noted. The Navy is proceeding with (1) removal actions for dissolved phase contaminants in groundwater and for dense non-aqueous phase liquid (DNAPL) and (2) the data gap sampling (DGS) program for OU-1 and OU-2. Information obtained as part of the draft final report is being used to support the DGS program. The Navy's approach for addressing potential exfiltration (discharge) of contaminated groundwater is discussed in the section entitled "Reprioritization of Storm Sewer Lines."

2. **Comment:** **The Navy should partner with the City of Alameda to upgrade or modify the existing drainage system at Alameda Point to minimize exfiltration of polluted groundwater where practicable.**

   Response: Corrective actions related to exfiltration of contaminated groundwater will be addressed through the Navy's remedial investigation and feasibility study (RI/FS) or CAP for specific sites and OUs.

3. **Comment:** **The Navy should implement a monitoring and analysis plan to better prioritize those sites where storm drain impacts have been observed or are anticipated.**

   Response: Sampling and analysis activities related to historical Naval activities at Alameda Point are being addressed through the DGS program. Ongoing storm water monitoring for National Pollutant Discharge Elimination System (NPDES) compliance is currently being addressed by the City of Alameda.

4. **Comment:** **We recommend that the documents remain draft final unless the Navy can identify an overarching need to finalize the documents. We appreciate the efforts of the individuals involved in this project and look forward to implementation of groundwater source removal action at Sites 4 and 5.**

Response: Comment noted. This document and the accompanying tables and figures will serve as the final storm sewer study report for Alameda Point. No revisions to the draft final report will be issued.

3.2 SPECIFIC RESPONSES TO DEPARTMENT OF TOXIC SUBSTANCES CONTROL COMMENTS ON THE DRAFT FINAL REPORT AND TOTAL PETROLEUM HYDROCARBON ADDENDUM

1. **Comment:** **History of the Storm Sewer System (Table 1-1): During the radiological removal action on the west side of Building 5, the Navy encountered several feet of repaired storm sewer. This work was judged to have taken place during the 1970s, based on some documentation that was discovered during a subsequent information search. Please document this repair/replacement work in the history of the storm sewer system.**

Response: Comment noted. This information will be incorporated into future removal actions and RI/FS activities at IR Site 5.

2. **Comment:** **Figures depicting the extent of various contaminants: Isoconcentration contours drawn give a false impression of the limited extent of various contaminants. In many cases there are not enough control points to draw the isoconcentration contours as depicted. In some cases contours are missing. These errors should be corrected as the maps are revised for specific sites or operable units.**

Response: Comment noted. It should be noted, however, that the isoconcentration contours were drawn with the objective of determining sections of storm sewer lines that could be affected by groundwater plumes. This affected the shading and use of solid and dashed lines in completing the contours. As maps are redrawn as part of DGS and the RI/FS process, control points will be reevaluated to more clearly show the extent of potential groundwater contamination.

3. **Comment:** **Colors/Color Key: The colors depicted on some maps are not consistent with colors shown in the legend, for example, Figure 3-1, Submerged and Non-submerged Storm Sewers. Please correct this error in future map revisions.**

Response: Comment noted. The consistency between the legend and lines drawn on the maps will be checked in future revisions as they may appear in RI/FS reports.

4. **Comment:** **Storm Sewer Prioritization: The condition of the 5G and 6G storm sewers is unknown. These lines should receive further investigation.**

Response: The condition of the line 5G to 6G is known. The condition of the line is shown in Figure 3-2 of the draft final report. Plumes of contaminated groundwater do not intersect this line, and the line is not submerged. Further investigation of this line does not appear to be warranted.

5. **Comment:** **Pipe Bursting: It seems that the pipe-bursting breaks and expands the existing pipe, thus requiring a subsequent technology to restore pipe integrity and smoothness. The text is not clear as to how the restoration/replacement is accomplished.**

Response: As described in Section 4.5 of the draft final report, the pipe bursting technology employs a cone-shaped steel head attached to a winch system at the lead end and a high density polyethylene (HDPE) pipe at the tail end. As the tool is winched through the host pipe, the steel cone shatters it and forces the broken fragments aside into the surrounding soil. HDPE pipe is attached to the rear of the same tool and is drawn into the space left by the former pipe. Thus, the rear of the tool replaces the host pipe at the same time the front of the tool breaks apart the host pipe.

6. **Comment:** **Cost Estimates: It is not clear why 2,249 linear feet are presented in the cost estimate tables, while on 852 linear feet have high priority, and 4,509 feet have low priority.**

Response: The intent of the cost estimates was to focus on the high priority lines; however, because the prioritization process has been changed at the request of the regulatory agencies, the cost estimates will not be used for decision-making purposes. Any future cost estimating related to the storm sewer system will reconcile differences between high and low priority lines.

3.3 SPECIFIC RESPONSES TO U.S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS ON THE DRAFT FINAL REPORT AND TOTAL PETROLEUM HYDROCARBON ADDENDUM

1. **Comment:** **At this time, it does not seem appropriate to assign primary document status to the Storm Sewer Study Report as the information contained in both versions of the document will serve only as feeder information for the appropriate Remedial Investigation Reports.**

Response: Comment noted. The storm sewer study reports as well as the TPH addendum will not be assigned primary document status. Information found in the documents will be used to complete future RI/FS reports.

2. **Comment:** **EPA expects that implementation of the DNAPL and dissolved phase groundwater removal actions later this year will serve to reduce the amount of contamination that is currently entering the storm sewer system.**

Response: Comment noted. The Navy is proceeding with implementation of these removal actions.

3. **Comment:** **The Storm Sewer Study Report references closeout and removal of IR 18 from the Navy's IR program. As discussed at the February 20, 2001 BCT meeting, IR 18 is neither closed nor removed, but "reconfigured". Please ensure that future references to the new approach to addressing IR 18 use the term "reconfigure" (as in Section 4 of the Technical Memorandum issued by the Navy on February 16, 2000).**

Response: Comment noted. The Navy has revised the IR Site 18 technical memorandum (Navy 2001) to indicate that IR Site 18 is reconfigured.

4. **Comment:** **EPA appreciates the opportunity to review and provide comments on these documents. We anticipate addressing any problems with the storm sewer system as part of determining the appropriate remedies for each IR site.**

Response: Comment noted. As stated previously, issues related to the Alameda Point storm sewer system will be addressed through the Navy's RI/FS and corrective action programs.

4.0 REPRIORITIZATION OF STORM SEWER LINES

In response to the draft final storm sewer study report and TPH addendum, RWQCB indicated that priority should be assigned to storm sewer lines based on the potential for contaminated groundwater to be transported downgradient to unaffected areas of the installation. Transport of contaminated groundwater may be occurring by infiltrating into storm sewer lines through breaks or cracks in the lines and then exfiltrating though breaks and cracks at downstream locations. The potential for contaminated groundwater to enter submerged storm sewer lines and migrate to clean areas of the installation or the Bay will be evaluated during the OU-1 and OU-2 data gap sampling investigation as described in Section 5.1.

Based on agency comments, the Navy reevaluated the potential for specific sections of storm sewer line to act as direct preferential pathways. Results of this evaluation are summarized in the attached tables and figures. Storm sewer lines have been reprioritized according to their potential for transporting contaminated groundwater from plume areas to uncontaminated downstream areas of the installation and placed in one of the following seven priority related categories:

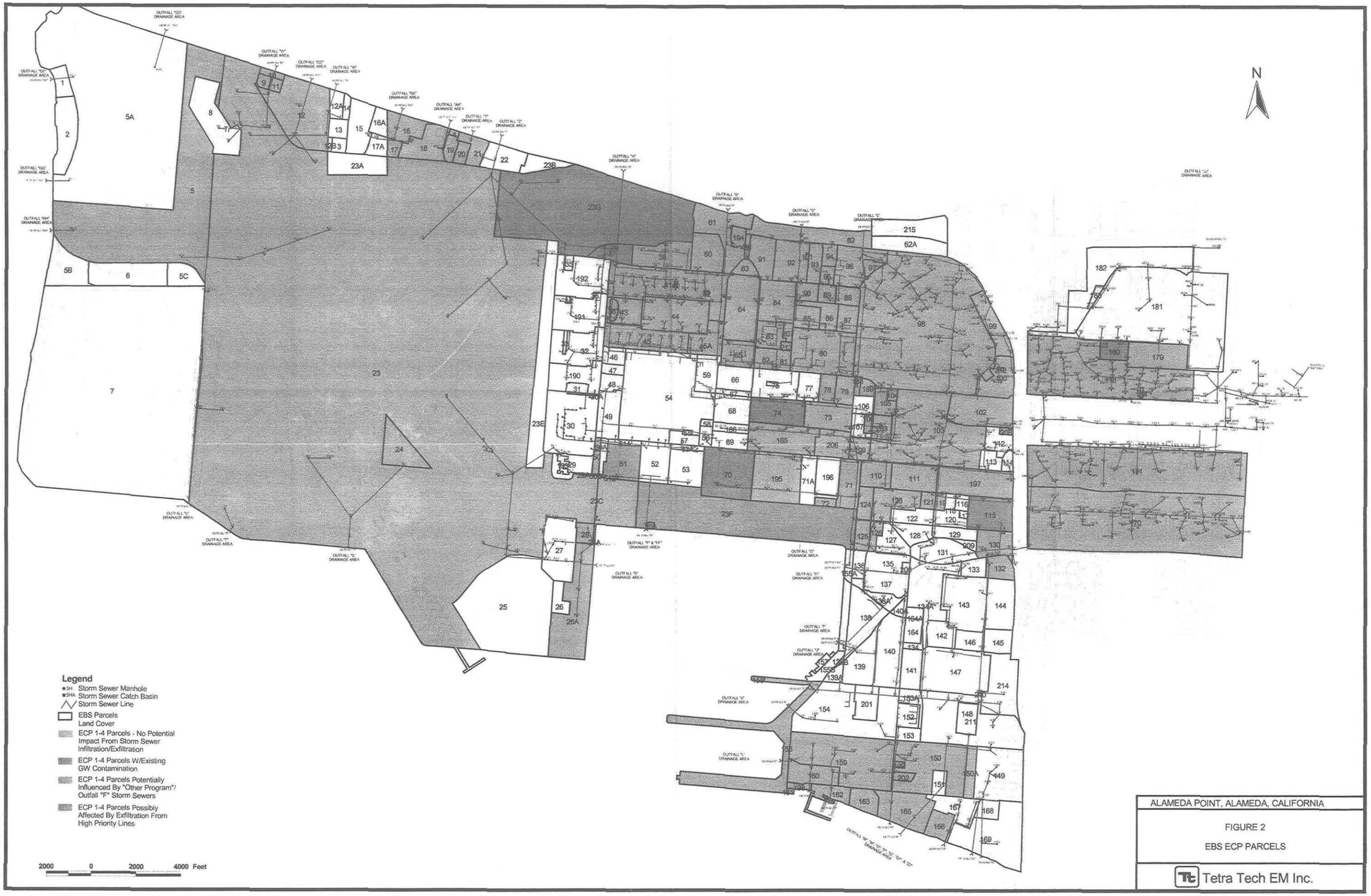
- Damaged, high priority lines
- Damaged, low-priority lines
- Damaged, no potential for transport (and exfiltration to clean areas) lines
- Undamaged, non-priority lines
- Unknown condition, high priority lines
- Unknown condition, low priority lines
- Lines addressed by other programs

These categories are discussed in detail below. In addition, Figure 1 depicts a revised prioritization map showing damaged high and low priority lines, high and low priority unknown condition lines, storm sewer flow directions, drainage areas, and proposed data gap sampling locations. Figure 2 depicts areas of the installation using Environmental Baseline Survey (EBS) Parcel boundaries that may be impacted by damaged storm sewer lines.

ALAMEDA POINT, ALAMEDA, CALIFORNIA

FIGURE 1
STORM SEWER PRIORITIZATION
AND PROPOSED DATA GAP
SAMPLING LOCATIONS

Tetra Tech EM Inc.



ALAMEDA POINT, ALAMEDA, CALIFORNIA

FIGURE 2

EBS ECP PARCELS

Tetra Tech EM Inc.

4.1 DAMAGED, HIGH PRIORITY LINES

Damaged, high priority lines are considered to have the highest potential for transporting contaminants at concentrations above ecological reference values (ERV) to uncontaminated parcels. These lines have the following characteristics:

- Lie within areas of contaminated groundwater where contaminant concentrations exceed ERVs
- Are submerged and intersect with a contaminant plume
- Are damaged and intersect a contaminant plume
- Are upgradient of uncontaminated areas of the installation where (1) damaged lines have been identified that may act as potential exfiltration points or (2) where the condition of the lines is unknown

Approximately 452 feet of damaged storm sewer line is assigned high priority status. Potential remedies to be considered will include plugging or bypassing these sections of storm sewer line. Detailed information concerning these lines is found in Table 1.

4.2 DAMAGED, LOW PRIORITY LINES

Damaged, low priority lines are considered to have potential for transporting contaminated groundwater to uncontaminated areas of the installation, but contaminant concentrations are less than ERVs. These lines have the following characteristics:

- Lie within areas of contaminated groundwater where contaminant concentrations are less than ERVs
- Are submerged and intersect with a contaminant plume
- Are damaged and intersect with a contaminant plume
- Are upgradient of uncontaminated areas of the installation where (1) damaged lines have been identified that may act as potential exfiltration points or (2) where the condition of the lines is unknown

TABLE 1

DAMAGED, HIGH PRIORITY STORM SEWER LINES
ALAMEDA POINT, CALIFORNIA

Outfall	IR Site or Parcel	Section		Length (feet)	Diameter (inch)	Material	Depth (feet bgs)	Submerged[1]	Line Conditions	Videotape	COC	Infiltration Potential[2]	Infiltraton Line Comments	Potential Exfiltration Point(s)[3]			Exfiltration Potential[4]	Potentially Affected ECP 1-4 Parcels[5]
		From	To											From	To	Condition		
AfZ	Parcel 37	5Z	11A	452.2	30	CON	8	U	D, I	C046	TPH, BTEX,	High	Damage and infiltration in 5Z to 11A within total TPH plume and near	5Z	11A	D, I	High	Parcel 23G
											PAH	High	BTEX and PAH plumes.	2Z	2ZA	D, I	High	Parcel 23G

Notes:

(1) Based on interpolation between monitoring well data and line inverts.

(2) Infiltration potential evaluates the ability of the storm sewer line to be infiltrated by contaminated groundwater. The potential is considered to be "high" if a damaged or unknown section of the line lies within groundwater that contains COCs above ecological reference values (ERVs); "low" if damaged or unknown conditi i.e. plumes are enclosed by the outermost contour for which adequate control data are available, or it is possible for the ERV plume to migrate toward the damaged or unknown area; "none" if the lines are within plumes but are known to be intact.

(3) Potential exfiltration points are defined as storm sewer lines in parcels that are within ECP-1, -2, -3, or -4, and that are in damaged or unknown condition (see also Note 3 below)

(4) Exfiltration potential evaluates whether it is possible for contaminated groundwater to exfiltrate into clean parcels. The potential is considered "high" if damaged lines are in parcels that are within ECP-1, -2, -3, or -4, downstream of a damaged line within groundwater that contains COCs above ecological reference values are within COC extents plumes, i.e. plumes are enclosed by the outermost contour for which adequate control data are available, and "none" if no ECP 1-4 parcels are downstream and there is no damage where lines pass through the parcels.

(5) ECP Parcels with priorities of 1 through 4 do not have existing contamination identified.

bgs	Below ground surface	CON	Concrete	NA	Not applicable
BTEX	Benzene, toluene, ethylbenzene, and xylenes	D	Damaged	PI	Potential infiltration
CHC	Chlorinated hydrocarbons	I	Infiltration	RCP	Reinforced concrete
COC	Chemical of concern	IR	Installation restoration	U	Unknown

Approximately 1,989 feet of storm sewer line is assigned low priority status. Potential remedies to be considered will include plugging or bypassing these sections of storm sewer line. Detailed information concerning these lines is found in Table 2.

4.3 DAMAGED, NO POTENTIAL FOR TRANSPORT AND EXFILTRATION TO CLEAN AREAS OF THE INSTALLATION

This category includes storm sewer lines that are damaged but have no potential to transport or exfiltrate contaminated groundwater to uncontaminated areas of the installation. These lines have the following characteristics:

- Lie within areas of contaminated groundwater where contaminant concentrations are less than ERVs
- Are submerged and intersect with a contaminant plume
- Are damaged and intersect with a contaminant plume
- Are not upgradient of uncontaminated EBS parcels or there are no damaged or unknown condition lines that have been identified that may act as potential exfiltration points

Approximately 3,251 feet of damaged storm sewer line is identified as damaged but without the potential for transport and exfiltration of contaminated groundwater into clean downgradient areas of the installation. Detailed information concerning these lines is found in Table 3.

4.4 UNDAMAGED, NON-PRIORITY

Some storm sewer lines are considered to have minimal potential to transport contaminated groundwater to uncontaminated areas of the installation. These lines are considered undamaged, non-priority lines and have the following characteristics:

- Lie within contaminant plumes
- Are submerged and intersect a contaminant plume, but are undamaged, or lie above the water table at the intersection of a contaminant plume

TABLE 2

DAMAGED, LOW PRIORITY STORM SEWER LINES
ALAMEDA POINT, CALIFORNIA

Outfall	IR Site or Parcel	Section		Length (feet)	Diameter (inch)	Material	Depth (feet bgs)	Submerged[1]	Line Conditions	Videotape	COC	Infiltration Potential[4]	Infiltration Line Comments	Potential Exfiltration Point(s)[5]			Exfiltration Potential[7]	Potentially Affected ECP 1-4 Parcels[6]	Exfiltration Line Comments
		From	To											From	To	Condition			
A	Parcel 37	11A	12A	455	27	CON	5.5	U	D, I	C046	BTEX, PAH	Low	Damaged areas near BTEX, PAH ERV plumes. Plume edges	5Z	11A	D, I	Low	Parcel 23G	
													about 30 feet east of infiltration point.	2Z	2ZA	D, I	Low	Parcel 23G	
A	Parcel 37	12A	12A-1	350	15	CON	7	U	D, I	C022,	BTEX, PAH	Low	Damaged area within BTEX, PAH extents plumes.	5Z	11A	D, I	Low	Parcel 23G	
										C039				2Z	2ZA	D, I	Low	Parcel 23G	
G	IR Site 6	5G-2A	5G-2B	20	U	U	U	SUB	Poor[2]	No tape	CHC	Low	The line is in poor condition and within extents plume.	5G	5G-1	Poor[3]	Low	Parcel 71	
G	IR Site 8	10G	11G	273	18	U	U	SUB	Poor[2]	No tape	BTEX, PAH	Low	The line is in poor condition and within extents plumes.	7G	8G	D, I	Low	Parcel 73	
													BTEX and PAH contamination associated with IR Site 8	8G	9G	Poor[3]	Low	Parcel 74	
													in groundwater in Parcel 74.	9G	10G	Poor[3]	Low	Parcel 74	
G	IR Site 6	5G-3	5G-7	100	U	U	U	SUB	Poor[3]	No tape	CHC	Low	The line is in poor condition and within extents plume.	5G	5G-1	Poor[3]	Low	Parcel 71	
G	IR Site 6	5G-7	5G-2	197	24	RC	U	SUB	Poor[3]	No tape	CHC	Low	The line is in poor condition and within extents plume.	5G	5G-1	Poor[3]	Low	Parcel 71	
G	IR Site 6	5G-2A	MAIN	27	U	U	U	SUB	Poor[3]	No tape	CHC	Low	The line is in poor condition and within extents plume.	5G	5G-1	Poor[3]	Low	Parcel 71	
G	IR Site 6	5G-7	5G-7A	100	U	U	U	SUB	Poor[3]	No tape	CHC	Low	The line is in poor condition and within extents plume.	5G	5G-1	Poor[3]	Low	Parcel 71	
G	IR Site 6	5G-7B	MAIN	67	U	U	U	U	Poor[3]	No tape	CHC	Low	The line is in poor condition and within extents plume.	5G	5G-1	Poor[3]	Low	Parcel 71	
G	IR Site 12	6G-18-1A	6G-18-1B	293	U	U	U	U	Poor[3]	No tape	BTEX	Low	The line is in poor condition and within extents plume.	6G-17	6G-18	Poor[3]	Low	Parcel 185	
														6G-16	6G-17	D, I	Low	Parcels 206, 109	
G	IR Site 12	6G-18-1A	6G-18	107	U	U	U	U	Poor[3]	No tape	BTEX	Low	The line is in poor condition and within extents plume.	6G-17	6G-18	Poor[3]	Low	Parcel 185	
														6G-16	6G-17	D, I	Low	Parcels 206, 109	

Notes:

(1) Based on interpolation between monitoring well data and line inverts.

(2) Storm sewer cleaned and inspected in 1991 and reported to be in poor condition.

(3) Storm sewer line reported to be in poor condition in 1991. Not cleaned or inspected.

(4) Infiltration potential evaluates the ability of the storm sewer line to be infiltrated by contaminated groundwater. The potential is considered to be "high" if a damaged or unknown section of the line lies within groundwater that contains COCs above ecological reference values (ERVs); "low" if damaged or unknown condition sections are within a COC extents plume, i.e. plumes are enclosed by the outermost contour for which adequate control data are available, or it is possible for the ERV plume to migrate toward the damaged or unknown area; "none" if the lines are within plumes but are known to be intact.

(5) Potential exfiltration points are defined as storm sewer lines that have damage or are in unknown condition in an ECP 1-4 Parcel (see also Note[5] below)

(6) ECP Parcels with priorities of 1 through 4 do not have existing contamination identified.

(7) Exfiltration potential evaluates whether it is possible for contaminated groundwater to exfiltrate into clean parcels. The potential is considered "high" if damaged lines are in parcels that are within ECP-1, -2, -3, or -4, downstream of a damaged line within groundwater that contains COCs above ecological reference values (ERVs), "low" if damaged or unknown areas are within COC extents plumes, i.e. plumes are enclosed by the outermost contour for which adequate control data are available, and "none" if no ECP 1-4 parcels are downstream and there is no damage where lines pass through the parcels.

BTEX	Benzene, toluene, ethylbenzene, and xylenes	ERV	Ecological reference value	I	Infiltration
CHC	Chlorinated hydrocarbons	NA	Not applicable	PAH	Polycyclic aromatic hydrocarbons
COC	Chemical of concern	NFA	No further action	PI	Potential infiltration
CON	Concrete	O/F	Outfall	RCP	Reinforced concrete
D	Damaged	IR	Installation restoration	U	Unknown

TABLE 3

DAMAGED, NO POTENTIAL FOR TRANSPORT STORM SEWER LINES
ALAMEDA POINT, CALIFORNIA

Outfall	IR Site or Parcel	Section From	Section To	Length (feet)	Diameter (inch)	Material	Depth (feet bgs)	Submerged[1]	Line Conditions	Videotape	COC	Infiltration Potential[2]	Infiltration Line Comments	Potential Exfiltration Point(s)[3] From	Potential Exfiltration Point(s)[3] To	Potential Exfiltration Point(s)[3] Condition	Exfiltration Potential[6]	Potentially Affected ECP 1-4 Parcels[4]	Exfiltration Line Comments
H	IR Site 21	3H	4H	390	36	CON	10	SUB	D, I	C076	CHC ERV	Low	Points of infiltration near CHC extents plume. Plumes edge about 13 feet north of infiltration point.	1H	1-1H	Unknown	None	None[5]	
J	IR Sites 13, 23	5-JF	6-J	234	36	RCP	U	SUB	D, I	1999A, B	TPH, BTEX ERVs	Low	Damaged section near ERV plumes.	1-5	1-C	Unknown	None	Parcel 155[7]	
														1-C	Outfall J	Unknown	None	Parcel 155[7]	
J	IR Site 4	5J-3B	5J-3C	233	18	CON	5	SUB	D, PI	C040A	CHC ERV	Low	COC plume intersects significant sag.	1-5	1-C	Unknown	None	Parcel 155[7]	
														1-C	Outfall J	Unknown	None	Parcel 155[7]	
J	IR Sites 13 and 22	6J-1A	6J-1B	332	12	RCP	U	U	D, PI	1999A, B	TPH, BTEX, PAH ERVs	Low	Damaged area near TPH ERV and within BTEX and PAH extents plumes, but not within ERV plumes.	1-5	1-C	Unknown	None	Parcel 155[7]	
														1-C	Outfall J	Unknown	None	Parcel 155[7]	
JJ	IR Site 25	7JJH	7JJC	360	36	CON	10	U	D, I	C089	BTEX, PAH ERVs	Low	Damaged area within BTEX and PAH extents plumes. ERV plume edge about 78 feet northeast of infiltration point.	NA	NA	NA	None	None[5]	
JJ	IR Site 25	37JJ	38JJ	382	14	CON	4	U	D, PI	C078	BTEX ERV	Low	Damaged area long distance away and upstream; however, TPH and BTEX ERV plumes are intersecting line.	NA	NA	NA	None	None[5]	
H	IR Site 3	6H-2B	6H-2C	64	8	CON	2	Yes	D, PI	C077	TPH ERV	High	Offset joint 42.5 feet from 6H-2C	NA	NA	NA	None	None[5]	
J	IR Sites 4, 13	5J-3	5J-3A	76	24	Other	7	Yes	D, I	C092	TPH ERV	High	Infiltration observed 57 feet from 5J-3.	1-5	1-C	Unknown	None	Parcel 155[7]	
														1-C	Outfall J	Unknown	None	Parcel 155[7]	
J	IR Site 13	5J-3	6J-1	328	U	PVC	U	U	D, PI	1999A, B	TPH ERV	High	Possible hole 9.0 feet from 5J-3.	1-5	1-C	Unknown	None	Parcel 155[7]	
														1-C	Outfall J	Unknown	None	Parcel 155[7]	
J	IR Site 4	5J-3F	5J-3H	70	15	RCP	U	Yes	D, PI	1999A, B	BTEX ERV	High	Small crack 10.5 feet from 5J-3F. Damaged area within plume.	1-5	1-C	Unknown	None	Parcel 155[7]	
														1-C	Outfall J	Unknown	None	Parcel 155[7]	
J	IR Sites 13, 23	6-J	6-JC	270	12	CON	2	U	D, PI	C090	TPH, Xylene, Ethylbenzene ERVs	High	Line collapsed 2.6 feet from 6-J, within BTEX ERV plume.	1-5	1-C	Unknown	None	Parcel 155[7]	
														1-C	Outfall J	Unknown	None	Parcel 155[7]	
J	IR Sites 13, 23	6J-1	6-JF	440	15	RCP	U	U	D, PI	1999A, B	BTEX ERV	High	Significant spalling in line and root intrusion within ERV plume.	1-5	1-C	Unknown	None	Parcel 155[7]	
														1-C	Outfall J	Unknown	None	Parcel 155[7]	
JJ	NA	9JJC	9JJD	72	12	CON	4	U	D, PI	C086	BTEX ERV	High	Damaged area within ERV plume.	NA	NA	NA	None	None[5]	

Notes:

(1) Based on interpolation between monitoring well data and line inverts.

(2) Infiltration potential evaluates the ability of the storm sewer line to be infiltrated by contaminated groundwater. The potential is considered to be "high" if a damaged or unknown section of the line lies within groundwater that contains COCs above ecological reference values (ERVs); "low" if damaged or unknown condition sections are within a COC extents plume, i.e. plumes are enclosed by the outermost contour for which adequate control data are available, or it is possible for the ERV plume to migrate toward the damaged or unknown area; "none" if the lines are within plumes but are known to be intact.

(3) Potential exfiltration points are defined as storm sewer lines that have damage or are in unknown condition in an ECP 1-4 Parcel (see also Note (3) below)

(4) ECP Parcels with priorities of 1 through 4 do not have existing contamination identified.

(5) No uncontaminated parcels downstream of line section that may be affected by contamination transport from the storm sewer line within contaminated groundwater.

(6) Exfiltration potential evaluates whether it is possible for contaminated groundwater to exfiltrate into clean parcels. The potential is considered "high" if damaged lines are in parcels that are within ECP-1, -2, -3, or -4, downstream of a damaged line within groundwater that contains COCs above ecological reference values (ERVs), "low" if damaged or unknown areas are within COC extents plumes i.e. plumes are enclosed by the outermost contour for which adequate control data are available, and "none" if no ECP 1-4 parcels are downstream and there is no damage where lines pass through the parcels.

(7) Catchbasins 1-C and 1-5 installed on pilings over harbor and dump directly into it, so there is no transfer of contamination to parcel groundwater.

BTEX	Benzene, toluene, ethylbenzene, and xylenes	ERV	Ecological reference value	PAH	Polycyclic aromatic hydrocarbon
CHC	Chlorinated hydrocarbon	IR	Installation restoration	PI	Potential Infiltration
CI	Corrugated iron	NA	Not applicable	PIC	Paved invert corrugated iron
COC	Chemical of concern	NFA	No further action	PVC	Polyvinyl chloride
CON	Concrete	O/F	Outfall	U	Unknown

Approximately 12,728 feet of storm sewer line is assigned non-priority status. No further actions are recommended for these lines. Detailed information concerning these lines is found in Table 4.

4.5 UNKNOWN CONDITION, HIGH PRIORITY

The potential for certain lines to transport contaminated groundwater to uncontaminated areas of the installation is unknown; however, uncontaminated areas are located downgradient of these lines. These lines are designated as unknown condition, high priority lines, and have the following characteristics:

- Lie within contaminant plumes that contain chemical concentrations above ERVs
- Are submerged and intersect with a contaminant plume
- Lines are of unknown condition at the intersection with a contaminant plume
- Lie upgradient of one or more areas with no existing contamination and with damaged lines or lines of unknown condition (where exfiltration may occur)

Storm sewer line BBB to BBC is assigned high priority, unknown condition status. This storm sewer line will be further investigated to determine if it is a potential pathway for transporting groundwater contamination to EBS Parcel 16 as part of the OU-1 and OU-2 data gap investigation (TtEMI 2001c). Detailed information concerning these lines is found in Table 5.

4.6 UNKNOWN CONDITION, LOW PRIORITY

Storm sewer lines designated as unknown condition, low priority do not have the potential to transport contaminated groundwater to uncontaminated parcels because no uncontaminated areas of the installation are located downstream. These lines have the following characteristics:

- Lie within contaminant plume containing chemicals at concentrations below ERVs
- Are submerged and intersect with contaminant plume
- Include lines of unknown condition at intersection with contaminant plume

TABLE 4

UNDAMAGED, NON-PRIORITY STORM SEWER LINES
ALAMEDA POINT, CALIFORNIA
(Page 1 of 3)

Outfall	IR Site or Parcel	Section		Length (feet)	Diameter (inch)	Material	Depth (feet bgs)	Submerged[1]	Line Conditions	Videotape	COC	Infiltration Potential[1,2]	Infiltration Line Comments	Potential Exfiltration Point(s)[1,3]			Exfiltration Potential[1,3]	Potentially Affected ECP 1-4 Parcels[1,5]
		From	To											From	To	Condition		
A	Parcel 37	11A	11AB	18	30	CON	1	U	Good[2]	C022	TPH, BTEX, PAH ERVs	None	NFA	NA	NA	NA	None	NA
A	Parcel 37	11AC	Main	5	10	CON	2.5	U	Good[2]	C047	TPH, BTEX, PAH ERVs	None	NFA	NA	NA	NA	None	NA
A	Parcel 37	11AD	Main	5	10	CON	25	U	Good[2]	C047	TPH, BTEX, PAH ERVs	None	NFA	NA	NA	NA	None	NA
A	Parcel 37	11AE	Main	5	12	CON	2	U	Good[2]	C022	TPH, PAH ERVs	None	NFA	NA	NA	NA	None	NA
A	Parcel 37	11A-1	Main	46	12	CON	6	U	Good[2]	C022, C045	PAH ERV	None	NFA	NA	NA	NA	None	NA
A	Parcel 190	14A-5	14A-2	144	12	CON	U	U	Good[2]	C006	Benzene extents	None	NFA	NA	NA	NA	None	NA
A	Parcel 190	14A-6	14A-5	202	12	CON	U	U	Good[2]	C007	TPH, BTEX ERVs	None	NFA	NA	NA	NA	None	NA
A	Parcel 37	3A	11A	143	30	CON	8	U	Good[2]	C022	BTEX, PAH ERVs	None	Plume edges about 20 feet east of infiltration point; however, the line is shallow and above groundwater. NFA.	NA	NA	NA	None	NA
A	Parcel 37	3A	3AA	57	10	CON	1	U	PI	C046	PAH ERV	None	NFA	NA	NA	NA	None	NA
D	IR Site 8	11D	SOUTH	230	12	CON	5	No	U[5]	C034	BTEX, PAH ERVs	None	Line conditions unknown after line passes under building due to unknown conditions and laterals.	NA	NA	NA	None	NA
D	IR Site 8	11D	SO/WEST	293	U	U	U	No	U	No Tape	BTEX, PAH ERVs	None	Line to west inaccessible.	NA	NA	NA	None	NA
EE	IR Site 1	EEA	O/F EE	250	18	PIC	U	U	Good[3]	No Tape	BTEX, PAH ERVs	None	NFA	NA	NA	NA	None	NA
F	IR Site 5	5F-2/5F-3	SOUTH	70	U	U	U	No	U	No Tape	CHC extents	None	NFA	NA	NA	NA	None	NA
F	IR Site 5	5F-3	5F-4	265	U	U	U	No	U	No Tape	TPH and BTEX ERV; CHC extents.	None	NFA	NA	NA	NA	None	NA
G	IR Site 21	3G-1	3G-1C	104	12	U	U	Yes	Good[4]	No Tape	TPH, Xylene ERVs	None	NFA	NA	NA	NA	None	NA
G	IR Site 21	3G-1	3G-1B	157	6	U	U	No	Good[4]	No Tape	Ethylbenzene ERV	None	NFA	NA	NA	NA	None	NA
G	IR Site 6	4G-2	4G-3	313	21	CON	U	Yes	Good[2]	A003, C001	CHC extents	None	NFA	NA	NA	NA	None	NA
G	Parcel 70	4G-5	4G-6	265	12	CON	3	U	Good[2]	C030	Xylene ERV	None	NFA	NA	NA	NA	None	NA
G	IR Site 7	6G-14	Main	85	U	U	U	Yes	U	No Tape	TPH	None	None.	6H-11A	6H-18	D, PI	None	Parcel 103
G	IR Site 8	11G	North	137	8	CON	U	Yes	Good[2]	C014	CHC ERV	None	NFA	NA	NA	NA	None	NA
G	IR Site 5	12G	13G	60	U	U	U	No	Good[4]	No tape	CHC ERV	None	NFA	NA	NA	NA	None	NA
G	IR Site 5	13G	14G	80	27	RC	U	No	Good[4]	No tape	CHC ERV	None	NFA	NA	NA	NA	None	NA
G	IR Site 5	14G	14GB	96.4	15	CON	U	U	Good[2]	A015	CHC extents	None	NFA	NA	NA	NA	None	NA
G	IR Site 5	14G	15G	250	27	RC	U	Yes	Good[4]	No tape	CHC ERV, BTEX extents	None	NFA	NA	NA	NA	None	NA
G	IR Site 5	15G	North	420	10	U	U	No	Good[4]	No tape	CHC ERV, BTEX extents	None	NFA	NA	NA	NA	None	NA
G	IR Site 5	6B/15G	East	138	U	U	U	No	U	No tape	CHC extents	None	NFA	NA	NA	NA	None	NA
H	IR Sites 11, 21	1H	2H	156	U	U	U	Yes	Good[4]	No tape	TPH, CHC ERV	None	NFA	NA	NA	NA	None	NA
H	IR Sites 11, 21	1H	3H	166	36	CON	10	U	Good[2]	C076	CHC	None	NFA	NA	NA	NA	None	NA
H	IR Sites 11, 21	2H	2H-1	98	U	U	5	U	Good[2,4]	C027	TPH ERV; CHC extents	None	NFA	NA	NA	NA	None	NA
H	IR Sites 11, 21	2H	3HA	34	U	U	U	Yes	Good[4]	No tape	TPH, CHC ERVs	None	NFA	NA	NA	NA	None	NA
H	IR Sites 11, 21	2H-1	2H-1A	39	6	VC	5	Yes	Good[2,4]	C027	TPH ERV	None	NFA	NA	NA	NA	None	NA
H	IR Sites 11, 21	2H-1A	2H-1B	98	6	VC	5	U	Good[2,4]	C027	TPH ERV	None	NFA	NA	NA	NA	None	NA
H	IR Sites 11, 21	3HA	3H	34	U	U	U	Yes	Good[4]	No tape	CHC ERV	None	NFA	NA	NA	NA	None	NA
H	IR Sites 11, 21	4H	5H	98	U	U	U	Yes	Good[4]	No tape	CHC extents	None	NFA	NA	NA	NA	None	NA
H	IR Sites 11, 21	4HA	Main	21	10	CON	5	U	Good[2]	C077	CHC extents	None	NFA	NA	NA	NA	None	NA
H	IR Site 7	6G-11A	6G-15	254	8	U	U	U	U	No tape	TPH, BTEX, PAH ERVs	None	During the emergency repair action of April 1999, it was discovered that there is no connection between 6G-15 and 6G-11. NFA.	NA	NA	NA	None	NA
H	IR Site 7	6G-14	East	85	U	U	U	No	U	No tape	TPH ERV	None	6G-14 buried, no access to line.	NA	NA	NA	None	NA

TABLE 4

UNDAMAGED, NON-PRIORITY STORM SEWER LINES
ALAMEDA POINT, CALIFORNIA
(Page 2 of 3)

Outfall	IR Site or Parcel	Section		Length (feet)	Diameter (inch)	Material	Depth (feet bgs)	Submerged[1]	Line Conditions	Videotape	COC	Infiltration Potential[12]	Infiltration Line Comments	Potential Exfiltration Point(s)[13]			Exfiltration Potential[14]	Potentially Affected ECP 1-4 Parcels[15]
		From	To											From	To	Condition		
H	IR Site 7	6G-15	6G-15B	N/A	N/A	N/A	N/A	N/A	Removed[6]	N/A	TPH, BTEX, PAH ERVs	None	NFA	NA	NA	NA	None	NA
H	IR Site 7	6G-15A	6G-15B	N/A	N/A	N/A	N/A	N/A	Removed[6]	N/A	TPH, BTEX, PAH ERVs	None	NFA	NA	NA	NA	None	NA
H	IR Site 7	6G-15A	6G-15C	N/A	N/A	N/A	N/A	N/A	Removed[6]	N/A	TPH, BTEX, PAH ERVs	None	NFA	NA	NA	NA	None	NA
H	IR Sites 3, 4	6H	7H-4	410	U	U	U	Yes	Good[4]	No tape	CHC ERV	None	NFA	NA	NA	NA	None	NA
H	IR Site 8	6H-11	6H-11A	78.3	8	VC	U	U	Good[7]	C073	PAH extents	None	NFA	NA	NA	NA	None	NA
H	IR Site 7	6H-11A	North	133	6	VC	2	U	U	C073, C077	BTEX, PAH	None	Survey blocked 8 feet from 6H-11A. Line is shallow and above ground water level.	NA	NA	NA	None	NA
H	IR Site 3	6H-2A	6H-2B	41	10	CON	3	Yes	Good[2]	C077	TPH ERV	None	NFA	NA	NA	NA	None	NA
H	IR Sites 3, 4	6HA	Main	59	U	U	4	Yes	Good[2]	C077	CHC extents	None	NFA	NA	NA	NA	None	NA
H	IR Sites 3, 4	7H-4A	7H-4	24	8	Other	4	Yes	Good[2]	C077	CHC extents	None	NFA	NA	NA	NA	None	NA
H	IR Sites 3, 4	7H-4B	7H-4A	44	8	Other	4	Yes	Good[2]	C077	CHC ERV	None	NFA	NA	NA	NA	None	NA
H	Parcels 115 and 130	8HB	Main	196	12	U	U	U	Good[2]	C073	Ethylbenzene ERV	None	NFA	NA	NA	NA	None	NA
H	Parcels 115 and 130	8HB	North	261	12	U	U	U	Good[2]	C073	Ethylbenzene ERV	None	NFA	NA	NA	NA	None	NA
I	IR Site 11	I	IB	12	9	CON	9	Yes	Good[2]	C077	CHC extents	None	NFA	NA	NA	NA	None	NA
J	Parcels 139 and 155	2J-2	2J-2B	104	12	CON	4	Yes	Good[2]	C090, C092	Ethylbenzene ERV	None	NFA	NA	NA	NA	None	NA
J	Parcels 139 and 155	2J-2	2J-2A	52	12	CON	4	U	Good[2]	C090, C093	Ethylbenzene ERV	None	NFA	NA	NA	NA	None	NA
J	Parcels 139 and 155	2J-2	2J-3	241	12	CON	4	No	Good[2]	C090, C093	Ethylbenzene ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 11	3J-3A	3J-3	263	10	PIC	U	U	Good[4]	No tape	CHC extents	None	NFA	NA	NA	NA	None	NA
J	IR Sites 13, 19	4J-1	4-J-1C	380	18	PIC	U	U	Good[4]	No tape	PAH extents	None	NFA	NA	NA	NA	None	NA
J	IR Sites 4, 19	4J-1A	4J-1	351	15	PIC	U	Yes	Good[4]	No tape	BTEX ERV; CHC and PAH extents	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	4J-1A	4J-1B	78	15	PIC	U	U	Good[4]	No tape	TPH, CHC ERV; BTEX extents	None	NFA	NA	NA	NA	None	NA
J	IR Sites 13, 23	5-J	5-JF	137	30	PIC	U	Yes	Good[4]	No tape	BTEX ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 13	5J-1	5J-3	30	30	RCP	U	U	Good[9]	199A, B	TPH ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 13	5J-3	West	130	8	PVC	U	U	Good[8]	No tape	TPH ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	5J-3B	5J-3C	234	18	CON	U	Yes	Good[4]	No tape	CHC extents	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	5J-3C	5J-3D	88	18	CON	U	Yes	Good[4]	No tape	CHC extents	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	5J-3D	5J-3E	351	15	CON	U	Yes	Good[4]	No tape	CHC ERV; BTEX extents	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	5J-3E	5J-3F	146	15	CON	U	Yes	Good[4]	No tape	BTEX, CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	5J-3F	5J-3G	107	U	U	U	Yes	U	No Tape	BTEX, CHC ERV	None	Line condition unknown. Capped at 5J-3F, obstructed at 5J-3G. NFA.	NA	NA	NA	None	NA
J	IR Site 4	5J-3F	5J-3H	77	18	CON	1	Yes	Good[2]	C040	BTEX, CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	5J-3H	5J-3L	117	8	PVC	U	U	Good[8]	No tape	CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	5J-3H	5J-3M	98	10	COR	2	Yes	Good[2]	C040	CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	5J-3I	5J-3J	96	12	CON	2	No	Good[2]	C040	CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	5J-3J	5J-3K	90	18	COR	1	No	Good[2]	C040	CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	5J-3K	5J-3H	179	18	COR	1	No	Good[2]	C040	CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 23	5-JA	5-J	156	12	CON	3	Yes	Good[2]	C089	Within PAH extents plume, but not within PAH ERV plume.	None	NFA	NA	NA	NA	None	NA
J	IR Sites 13, 23	5-JF	5-JG	49	12	COR	6	Yes	Good[2]	C044	BTEX ERV	None	NFA	NA	NA	NA	None	NA

TABLE 4

UNDAMAGED, NON-PRIORITY STORM SEWER LINES
ALAMEDA POINT, CALIFORNIA
(Page 3 of 3)

Outfall	IR Site or Parcel	Section		Length (feet)	Diameter (inch)	Material	Depth (feet bgs)	Submerged[1]	Line Conditions	Videotape	COC	Infiltration Potential[12]	Infiltration Line Comments	Potential Exfiltration Point(s)[13]			Exfiltration Potential[14]	Potentially Affected ECP 1-4 Parcels[15]
		From	To											From	To	Condition		
J	IR Sites 13, 23	5-JF	North	59	2	CON	2	No	Good[2]	C080	BTEX ERV	None	NFA	NA	NA	NA	None	NA
J	IR Sites 13, 23	6-J	6-JA	20	12	CON	8	Yes	Good[2]	C044	TPH, BTEX ERVs	None	NFA	NA	NA	NA	None	NA
J	IR Sites 13, 23	6-JA	6-JB	247	6 to 8	PVC	7	U	Good[2]	C044	TPH, BTEX ERVs	None	NFA	NA	NA	NA	None	NA
J	IR Sites 13, 23	6-JB	6-JC	137	8	PVC	U	U	Good[8]	No tape	TPH ERV	None	NFA	NA	NA	NA	None	NA
J	IR Sites 13, 23	6-J	6-JF	135	21	PIC	U	U	Good[4]	No tape	TPH, BTEX ERVs	None	NFA	NA	NA	NA	None	NA
J	IR Sites 13, 23	6-JF	6-JG	290	15	CON	2	U	Good[2]	C044	TPH, BTEX ERVs	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	6J-1B	6J-3	312	15	PIC	U	Yes	Good[4]	No tape	CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	6J-3	6J-3A	351	15	PIC	U	Yes	Good[4]	No tape	CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 4	6J-3	West	68	U	U	U	No	U	No tape	CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Site 11	I24	3J-3A	117	2	CI	U	No	Good[4]	No tape	CHC ERV	None	NFA	NA	NA	NA	None	NA
J	IR Sites 13, 23	6J-1	6J-1A	68	18	PIC	U	U	Good[4]	No tape	TPH, BTEX ERVs	None	NFA	NA	NA	NA	None	NA
P	IR Site 23	3-P-1	3-P	NA[10]	NA[10]	NA[10]	NA[10]	NA[10]	NA[10]	NA[10]	TPH ERV	None	NFA	NA	NA	NA	None	NA
P	IR Site 23	5-PA	5-P	157	12	PVC	U	Yes	Good[8]	No tape	TPH ERV	None	NFA	NA	NA	NA	None	NA
BB	IR Site 14	BBC	BBD	203	15	CON	2	Yes	Good[2]	C087	TPH ERV	None	NFA	NA	NA	NA	None	NA
JJ	IR Site 25	9JJA	9JJB	312	30	CON	U	10	Good[2]	C082	TPH, Xylene ERVs	None	NFA	NA	NA	NA	None	NA
JJ	IR Site 25	9JJB	9JJB-1C	219	30	CON	U	8	Good[2]	C083	TPH, Xylene ERVs	None	NFA	NA	NA	NA	None	NA
JJ	IR Site 25	36JJ	37JJ	114	12	CON	4	U	Good[2]	C082	TPH, BTEX ERVs	None	NFA	NA	NA	NA	None	NA
JJ	IR Site 25	37JJ	37JJA	39	12	CON	2	U	Good[2]	C080	BTEX ERV	None	NFA	NA	NA	NA	None	NA
JJ	IR Site 25	36JJ	36JJB	146	12	U	U	U	U	No tape	BTEX ERV	None	The line is plugged at 36JJ. NFA.	NA	NA	NA	None	NA
JJ	IR Site 25	53JJ	NA	NA	NA	NA	NA	NA	NA	No tape	Xylene ERV	None	Line abandoned, not connected to storm sewer system. NFA.	NA	NA	NA	None	NA

Notes:

(1) Based on interpolation between monitoring well data and line inverts.

(2) Cleaned and inspected in 1997 as part of the time critical storm sewer solids and debris removal and found to be in good condition.

(3) Line was inspected during follow-up work to the time critical storm sewer solids and debris removal in 1997 and found to be in good condition.

(4) Storm sewer system line cleaned and inspected in 1991 and found to be in good condition. Not cleaned in 1997.

(5) Line conditions unknown after line passes under building due to unknown conditions and laterals.

(6) Lines removed during emergency repair activities in June 1999 .

(7) Reported to be in poor condition in 1991. Resurveyed in 1997 and no points of infiltration or potential infiltration were found.

(8) Storm sewer line replaced with PVC in 1991.

(9) Storm sewer line cleaned and inspected by MK in 1999 and found to be in good condition.

(10) IT found that line does not exist during follow-up work to the time critical storm sewer solids and debris removal of 1997.

(11) Line 6G-14 was searched for extensively and found to not exist. Further, all lines leading east from manhole 6G-11A were plugged by IT as documented in IT Corp. Removal of Fuel Lines and Underground Storage Tanks, Alameda Point, Alameda, CA Draft As-Built Report, December 1999.

(12) Infiltration potential evaluates the ability of the storm sewer line to be infiltrated by contaminated groundwater. The potential is considered to be "high" if a damaged or unknown section of the line lies within groundwater that contains COCs above ecological reference values (ERVs); "low" if damaged or unknown condition sections are within a COC extents plume, i.e. plumes are enclosed by the outermost contour for which adequate control data are available, or it is possible for the ERV plume to migrate toward the damaged or unknown area; "none" if the lines are within plumes but are known to be intact.

(13) Potential exfiltration points are defined as storm sewer lines that have damage or are in unknown condition in an ECP 1-4 Parcel (see also Note[3] below)

(14) ECP Parcels with priorities of 1 through 4 do not have existing contamination identified.

(15) Exfiltration potential evaluates whether it is possible for contaminated groundwater to exfiltrate into clean parcels. The potential is considered "high" if damaged lines are in parcels that are within ECP-1, -2, -3, or -4, downstream of a damaged line within groundwater that contains COCs above ecological reference values (ERVs), "low" if damaged or unknown areas are within COC extents plumes, i.e. plumes are enclosed by the outermost contour for which adequate control data are available, and "none" if no ECP 1-4 parcels are downstream and there is no damage where lines pass through the parcels.

BTEX	Benzene, toluene, ethylbenzene, and xylenes	ERV	Ecological reference value	PAH	Polycyclic aromatic hydrocarbon
CHC	Chlorinated hydrocarbon	IR	Installation restoration	PI	Potential Infiltration
CI	Corrugated iron	NA	Not applicable	PIC	Paved invert corrugated iron
COC	Chemical of concern	NFA	No further action	PVC	Polyvinyl chloride
CON	Concrete	O/F	Outfall	U	Unknown

TABLE 5

UNKNOWN CONDITION, HIGH PRIORITY STORM SEWER LINES
ALAMEDA POINT, CALIFORNIA
(Page 1 of 1)

Outfall	IR Site or Parcel	Section		Length (feet)	Diameter (inch)	Material	Depth (feet bgs)	Submerged[1]	Line Conditions	Videotape	COC	Infiltration Line Comments	Infiltration Potential[2]	Potential Exfiltration Point(s)[3]			Exfiltration Potential[6]	Potentially Affected ECP 1-4 Parcels[4]
		From	To											From	To	Condition		
BB	IR Site 14	BBB	BBC	124	15	CON	2	Yes	U	C087	TPH	Camera blocked at access (BBC).	High	BBA	Outfall BB	Unknown	High	Parcel 16

Notes:

(1) Based on interpolation between monitoring well data and line inverts.

(2) Infiltration potential evaluates the ability of the storm sewer line to be infiltrated by contaminated groundwater. The potential is considered to be "high" if a damaged or unknown section of the line lies within groundwater that contains COCs above ecological reference values (ERVs); "low" if damaged within a COC extents plume, i.e. plumes are enclosed by the outermost contour for which adequate control data are available, or it is possible for the ERV plume to migrate toward the damaged or unknown area; "none" if the lines are within plumes but are known to be intact.

(3) Potential exfiltration points are defined as storm sewer lines that have damage or are in unknown condition in an ECP 1-4 Parcel (see also Note (5) below)

(4) ECP Parcels with priorities of 1 through 4 do not have existing contamination identified.

(5) No uncontaminated parcels downstream of line section that may be affected by contamination transport from the storm sewer line within contaminated groundwater.

(6) Exfiltration potential evaluates whether it is possible for contaminated groundwater to exfiltrate into clean parcels. The potential is considered "high" if damaged lines are in parcels that are within ECP-1, -2, -3, or -4, downstream of a damaged line within groundwater that contains COCs above ecologi damaged or unknown areas are within COC extents plumes, i.e. plumes are enclosed by the outermost contour for which adequate control data are available, and "none" if no ECP 1-4 parcels are downstream and there is no damage where lines pass through the parcels.

(7) Catchbasins 1-C and 1-5 installed on pilings over harbor and dump directly into it, so there is no transfer of contamination to parcel groundwater.

Approximately 2,429 feet of storm sewer line is assigned unknown condition, low priority status. No immediate corrective actions are recommended for these lines because there is no potential to transport contaminated groundwater downgradient to uncontaminated parcels. Detailed information concerning these lines is found in Table 6.

4.7 STORM SEWER LINES ADDRESSED THROUGH OTHER PROGRAMS

Approximately 2,118 feet of line in storm sewer Subsystem F (shown on figure in Attachment 2) lies within contaminant plumes; however, Subsystem F received radium 226-contaminated wastes from Building 5 and is under investigation as part of ongoing radiological removal actions being conducted for OU-2C. Potential remedies to be considered will include removal and replacement, permanently plugging, or bypassing these sections of storm sewer line. Detailed information concerning these lines is found in Table 7.

TABLE 6

UNKNOWN CONDITION, LOW PRIORITY STORM SEWER LINES
ALAMEDA POINT, CALIFORNIA
(Page 1 of 1)

Outfall	IR Site or Parcel	Section		Length (feet)	Diameter (inch)	Material	Depth (feet bgs)	Submerged[1]	Line Conditions	Videotape	COC	Infiltration Line Comments	Infiltration Potential[2]	Potential Exfiltration Point(s)[3]			Exfiltration Potential[6]	Potentially Affected ECP 1-4 Parcels [4]
		From	To											From	To	Condition		
J	IR Site 9	3-J-1	South	555	U	U	U	U	U	No Tape	BTEX, CHC		High	1-5	1-C	Unknown	Low	Parcel 155
														1-C	Outfall J	Unknown	Low	Parcel 155
J	IR Site 9	4-J-1	South	605	U	U	U	U	U	No Tape	BTEX, CHC		High	1-5	1-C	Unknown	Low	Parcel 155
														1-C	Outfall J	Unknown	Low	Parcel 155
H	IR Site 21	1H	1-1H	55	U	U	U	Yes	U	No Tape	TPH, CHC	Distal end of outfall system and is inaccessible to survey equipment.	High	NA	NA	NA	Low	None[5]
I	Parcels 138, 155, IR Site 11	IA	Outfall I	496	12	VC	U	Yes	U	No Tape	TPH, Xylene	Distal end of outfall system and is inaccessible to survey equipment.	High	Seaplane Lagoon	Seaplane Lagoon	NA	Low	None[5]
I	Parcel 138	IA	IB	196	12	VC	U	Yes	U	No Tape	TPH, Xylene		High	NA	NA	NA	Low	None[5]
I	Parcel 138	IA/IB	North	209	12	VC	U	U	U	No Tape	TPH		High	NA	NA	NA	Low	None[5]
J	IR Site 13	5J-2	5J-4	52	10	CON	U	Yes	U	C089	TPH	Camera blocked 4 feet from 5J-2.	High	1-5	1-C	Unknown	Low	Parcel 155
														1-C	Outfall J	Unknown	Low	Parcel 155
W	IR Site 14	WA	Outfall W	261	18	PIC	U	U	U	No Tape	TPH	Access to line, WA, buried and is inaccessible to survey equipment.	High	NA	NA	NA	Low	None[5]

Notes:

(1) Based on interpolation between monitoring well data and line inverts.

(2) Infiltration potential evaluates the ability of the storm sewer line to be infiltrated by contaminated groundwater. The potential is considered to be "high" if a damaged or unknown section of the line lies within groundwater that contains COCs above ecological reference values (ERVs); "low" if damaged within a COC extents plume, i.e. plumes are enclosed by the outermost contour for which adequate control data are available, or it is possible for the ERV plume to migrate toward the damaged or unknown area; "none" if the lines are within plumes but are known to be intact.

(3) Potential exfiltration points are defined as storm sewer lines that have damage or are in unknown condition in an ECP 1-4 Parcel (see also Note (5) below)

(4) ECP Parcels with priorities of 1 through 4 do not have existing contamination identified.

(5) No uncontaminated parcels downstream of line section that may be affected by contamination transport from the storm sewer line within contaminated groundwater.

(6) Exfiltration potential evaluates whether it is possible for contaminated groundwater to exfiltrate into clean parcels. The potential is considered "high" if damaged lines are in parcels that are within ECP-1, -2, -3, or -4, downstream of a damaged line within groundwater that contains COCs above ecologi damaged or unknown areas are within COC extents plumes, i.e. plumes are enclosed by the outermost contour for which adequate control data are available, and "none" if no ECP 1-4 parcels are downstream and there is no damage where lines pass through the parcels.

(7) Catchbasins 1-C and 1-5 installed on pilings over harbor and dump directly into it, so there is no transfer of contamination to parcel groundwater.

TABLE 7

LINES BEING ADDRESSED UNDER THE RADIOLOGICAL PROGRAM
ALAMEDA POINT, CALIFORNIA

Outfall	IR Site or Parcel	Section From	Section To	Length (feet)	Diameter (inch)	Material	Depth (feet bgs)	Submerged[1]	Line Conditions	Videotape	COC	Comments
F	Parcels 29 and 193	3F	3F-5	333	U	U	U	Yes	U	No Tape	Xylene, Ethylbenzene	Storm sewer system being addressed under radiological action.
F	IR Sites 5, 10	4F-2	4F-3	234	U	U	U	Yes	U	No Tape	TPH, BTEX	Storm sewer system being addressed under radiological action.
F	IR Sites 5, 10	4F-2A	4F-2B	88	U	U	U	U	U	No Tape	BTEX, PAH, TCE extents (not ERV)	Storm sewer system being addressed under radiological action.
F	IR Sites 5, 10	4F-2C	4F-2D	88	U	U	U	U	U	No Tape	Within BTEX extents plume, but not within BTEX ERV plumes.	Storm sewer system being addressed under radiological action.
F	IR Sites 5, 10	4F-2E	4F-2F	88	U	U	U	U	U	No Tape	Within TPH ERV; within BTEX extents plume, but not within BTEX ERV plumes.	Storm sewer system being addressed under radiological action.
F	IR Sites 5, 10	4F-3	4F-4	273	U	U	U	Yes	U	No Tape	BTEX, TCE extents (not ERV)	Storm sewer system being addressed under radiological action.
F	IR Sites 5, 10, 12	4F-4	4F-4A	88	U	U	U	U	U	No Tape	Within CHC extents plume, but not within CHC ERV plume. Within TCE plume.	Storm sewer system being addressed under radiological action.
F	IR Sites 5, 10, 12	4F-4A	4F-4B	88	U	U	U	U	U	No Tape	Within CHC extents plume, but not within CHC ERV plume. Within TCE plume.	Storm sewer system being addressed under radiological action.
F	IR Sites 5, 10, 12	4F-4A	4F-4C	88	U	U	U	U	U	No Tape	Within CHC extents plume, but not within CHC ERV plume. Within TCE plume.	Storm sewer system being addressed under radiological action.
F	IR Site 5	5F-1	5F-2	273	U	U	U	U	U	No Tape	BTEX, CHC	Storm sewer system being addressed under radiological action.
F	IR Site 5	5F-2	5F-3	360	U	U	U	Yes	U	No Tape	TPH, BTEX, CHC, TCE	Storm sewer system being addressed under radiological action.
F	Parcel 190	6F-5	6F-4	117	U	U	U	U	U	No Tape	Within BTEX extents plume, but not within BTEX ERV plumes.	Storm sewer system being addressed under radiological action.

Notes:

[1] Based on interpolation between monitoring well data and line inverts.

BTEX Benzene, toluene, ethylbenzene, and xylenes
CHC Chlorinated hydrocarbon
COC Chemical of concern
ERV Ecological reference value
IR Installation restoration
PAH Polycyclic aromatic hydrocarbon
TCE Trichloroethene
U Unknown

5.0 DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This section provides additional discussion, conclusions, and recommendations related to the Navy's approach for addressing issues related to the Alameda Point storm sewer system. Section 5.1 discusses the data gap investigation for OU-1 and OU-2, as it relates to the storm sewer system. Section 5.2 discusses the CAP for TPH, as it relates to the storm sewer system. Section 5.3 provides specific conclusions and recommendations related to the storm sewer system.

5.1 DATA GAP SAMPLING FOR OU-1 AND OU-2

The role of the storm sewer system in transporting CERCLA-regulated chemicals to downgradient areas of the installation and to the Bay is being addressed through the data gap investigation for OU-1 and OU-2. In assessing the potential role of the storm sewer system as a contaminant transport pathway, the Navy will do the following:

- Develop baseline conditions related to the potential for contaminated groundwater to enter the storm sewer system via infiltration of contaminated groundwater into damaged sections of line, then travel downgradient to the Bay
- Evaluate the potential for contaminated groundwater to travel downgradient via the storm sewer system, then exfiltrate into previously uncontaminated groundwater areas

The potential for migration of chemicals through the storm sewer system includes two physical mechanisms: (1) infiltration and transport of contaminated groundwater through the storm sewer lines, and (2) transport of contaminated groundwater along high permeability bedding materials (if present). The Navy has proposed collecting baseline data for submerged sections of storm sewer lines within groundwater contaminant plumes through collection of groundwater infiltration samples and through collection of bedding material soil and groundwater samples.

Primary locations have been identified within the storm sewer system immediately downgradient of groundwater plume areas. If the concentration of any chemical identified in an upstream plume area exceeds its ERV in the downgradient primary location, then the Navy will collect additional samples further downgradient at a manhole or catch basin closest to the appropriate outfall. These additional sampling points are secondary locations. Primary and secondary data gap sampling locations are shown

in Figure 1 and are described in Tables 8 through 11. A complete, detailed description of the data gap sampling of storm sewer lines is found in the OU-1and OU-2 data gap sampling plan (TtEMI 2001c). Attachment 1 (Appendix B-4 of TtEMI [2001c]) includes the recommended sampling procedures for addressing data gaps related to the storm sewer system. Attachment 2, from TtEMI (2001c), shows the base-wide recommended data gap sampling locations.

Results of the OU-1 and OU-2 data gap sampling investigation will be presented in the resulting RI/FS reports.

5.2 CORRECTIVE ACTION PROGRAM FOR TOTAL PETROLEUM HYDROCARBONS

The Navy is currently addressing TPH issues through its CAP and identification of CAAs. This strategy includes the potential role of storm sewer lines to act as a transport pathway for TPH to the Bay. Sampling strategies are developed for each CAA based on concentrations of TPH-related compounds in groundwater. The Navy has developed TPH preliminary remediation criteria (PRC) for contaminated groundwater as part of its strategy for remediating CAAs (TtEMI 2001b). These values are presented in Table 12. The PRCs include groundwater concentrations based on California maximum contaminant levels (MCL) for potential drinking water sources, as well as ERVs based on potential effects to ecological receptors. Chemicals being addressed through the CAP include benzene, toluene, ethylbenzene, and total xylenes (BTEX); methyl tertiary butyl ether (MTBE); and lead. Sampling and analysis activities associated with TPH contamination along the storm sewer system will use the values presented in Table 12 as the basis for remedial action decision making. However, it is anticipated that sampling within storm sewers will focus on comparisons with ERVs.

Groundwater PRCs associated with the CAP include lead, which was not addressed in the TPH addendum. Therefore, the CAP may involve additional groundwater areas not identified in the TPH addendum. ERVs identified in the CAP are based on EPA ambient water quality criteria as summarized in the National Oceanic and Atmospheric Administration's (NOAA) "Screening Quick Reference Tables" (NOAA 1999). ERVs are based on criteria continuous concentrations (CCC), which are exposures to chronic concentrations of a given chemical. ERVs for benzene, toluene, and lead are based on their CCC values. If CCCs are not available, then the ERV is based on criteria maximum concentrations (CMC), which is exposure to acute concentrations of a given chemical. The ERV for ethylbenzene is based on its

TABLE 8

OPERABLE UNIT 1
PROPOSED DATA GAP SAMPLING LOCATIONS

ALAMEDA POINT, CALIFORNIA

Possible Source IR Site(s) or Parcel(s)	Location	Outfall	Rationale	Comments
IR 14	BBA	BB	See Note[1], [2]	Plume is poorly defined and may be near surface waters in this location
IR 14	BBD	BB	See Note[1]	
IR 5, 6, Parcel 70	4G-1	G	See Note[1]	
IR 5, 6	5G-1	G	See Note[1]	
IR 16	1-QA	Q & Q1	See Note[1]	
IR 14	WA	W	See Note[2]	Will have to locate and uncover WA to collect sample; see Note[4]
IR 16	1-Q	Q	See Note[2]	Sample if 1-QA COCs are above ERVs

Notes:

CB Catchbasin
COC Contaminant of concern
EBS Environmental baseline survey
ERV Ecological reference value
MH Manhole

[1] The sampling point is a primary location, located at the first manhole or catchbasin downstream of the plume areas affecting the storm sewer system or at the last manhole or catchbasin prior to the storm system outfall, if no other suitable locations are present due to the proximity of the plume to surface waters. Samples collected at this location will be used to assess the potential for COCs to migrate out of plume areas into to clean EBS parcels or surface waters via the storm sewer system.

[2] The sample point is a secondary location, located at the last manhole or catchbasin prior to the storm sewer outfall. Samples will be collected at these locations if samples collected at the primary location exceed ERVs to assess COC migration to surface waters.

[3] No sampling locations at MH or CB outside plume prior to outfall discharge to surface water

[4] Manhole location will have to be verified in the field; if it is not found or does not actually extend into plume areas, collecting a sample at this location may not be appropriate.

TABLE 9

OPERABLE UNIT 2A
PROPOSED DATA GAP SAMPLING LOCATIONS

ALAMEDA POINT, CALIFORNIA

Possible Source IR Site(s), Parcel(s), or OU(s)	Location	Outfall	Rationale	Comments
IR 4, 9, 13, 19, 22, 23	3-J	J	See Note[1]	See Note[3]
IR 9	5-O	O	Upper area of outfall system within plume areas, see Note[1]	
IR 23	2-P	P	Upper area of outfall system within plume areas, see Note[1], [2]	
OU-2A	1-5	J	See Note[2]	Sample if 3-J is above ERV

Notes:

CB Catchbasin
COC Contaminant of concern
EBS Environmental baseline survey
ERV Ecological reference value
MH Manhole

[1] The sampling point is a primary location, located at the first manhole or catchbasin downstream of the plume areas affecting the storm sewer system or at the last manhole or catchbasin prior to the storm system outfall, if no other suitable locations are present due to the proximity of the plume to surface waters. Samples collected at this location will be used to assess the potential for COCs to migrate out of plume areas into to clean EBS parcels or surface waters via the storm sewer system.

[2] The sample point is a secondary location, located at the last manhole or catchbasin prior to the storm sewer outfall. Samples will be collected at these locations if samples collected at the primary location exceed ERVs to assess COC migration to surface waters.

[3] No sampling locations at MH or CB outside plume prior to outfall discharge to surface water

TABLE 10

OPERABLE UNIT 2B
PROPOSED DATA GAP SAMPLING LOCATIONS

ALAMEDA POINT, CALIFORNIA

Possible Source IR Site(s), Parcel(s) or OU(s)	Location	Outfall	Rationale	Comments
IR 3, 21	1-H	H	See Note[(1), (2)]	See Note[(3)]
IR 3, 21	1G	G	See Note[(1), (2)]	See Note[(3)]
IR 11, 21, Parcel 138	IA	I	See Note[(1), (2)]	COC plume poorly defined so "IA" the entire subsystem "I" may be within plume; no MH or CB near outfall "I"

Notes:

CB Catchbasin
COC Contaminant of concern
EBS Environmental baseline survey
ERV Ecological reference value
MH Manhole

(1) The sampling point is a primary location, located at the first manhole or catchbasin downstream of the plume areas affecting the storm sewer system or at the last manhole or catchbasin prior to the storm system outfall, if no other suitable locations are present due to the proximity of the plume to surface waters. Samples collected at this location will be used to assess the potential for COCs to migrate out of plume areas into to clean EBS parcels or surface waters via the storm sewer system.

(2) The sample point is a secondary location, located at the last manhole or catchbasin prior to the storm sewer outfall. Samples will be collected at these locations if samples collected at the primary location exceed ERVs to assess COC migration to surface waters.

(3) No sampling locations at MH or CB outside plume prior to outfall discharge to surface water

TABLE 11

OPERABLE UNIT 2C
PROPOSED DATA GAP SAMPLING LOCATIONS

ALAMEDA POINT, CALIFORNIA

Possible Source IR Site(s), Parcel(s) or OU(s)	Location	Outfall	Rationale	Comments
Parcel 37, IR-5, OU-6	3A	A	See Note[(1), (2)]	
IR 5	7A	A	See Note[(1)]	
IR-5	4B	B	See Note[(1)]	
IR-5	6G-18	G	See Note[(1)]	
IR 5, 8	9G	G	See Note[(1)]	
IR 5, Parcel 37	5Z	Z	See Note[(1)]	
IR 5, 8	9D	D	See Note[(1)]	
IR 5	1B	B	See Note[(2)]	Sample if 4B is above ERV
IR 8 and IR 5	1D	D	See Note[(2)]	Sample if 9D is above ERV
IR 5, 6, 8, OU-2B	2G	G	See Note[(2)]	Sample if 4G-1, 5G-1, 6G-18 or 9G are above ERV
Parcel 37, IR-5, OU-6	1Z	Z	See Note[(2)]	Sample if 5Z is above ERV

Notes:

CB Catchbasin
COC Contaminant of concern
EBS Environmental baseline survey
ERV Ecological reference value
MH Manhole

(1) The sampling point is a primary location, located at the first manhole or catchbasin downstream of the plume areas affecting the storm sewer system or at the last manhole or catchbasin prior to the storm system outfall, if no other suitable locations are present due to the proximity of the plume to surface waters. Samples collected at this location will be used to assess the potential for COCs to migrate out of plume areas into to clean EBS parcels or surface waters via the storm sewer system.

(2) The sample point is a secondary location, located at the last manhole or catchbasin prior to the storm sewer outfall. Samples will be collected at these locations if samples collected at the primary location exceed ERVs to assess COC migration to surface waters.

TABLE 12

OPERABLE UNIT 5
PROPOSED DATA GAP SAMPLING LOCATIONS

ALAMEDA POINT, CALIFORNIA

Possible Source IR Site(s) or Parcel(s)	Location	Outfall	Rationale	Comments
IR 25, Alameda Annex	35JJ	JJ	See Note(1)	
IR 25, Alameda Annex	50JJ	JJ	See Note(1)	
IR 25, Alameda Annex	47JJA	JJ	See Note(2)	Sample if 35JJ or 50JJ are above ERV

Notes:

CB Catchbasin
COC Contaminant of concern
EBS Environmental baseline survey
ERV Ecological reference value
MH Manhole

(1) The sampling point is a primary location, located at the first manhole or catchbasin downstream of the plume areas affecting the storm sewer system or at the last manhole or catchbasin prior to the storm system outfall, if no other suitable locations are present due to the proximity of the plume to surface waters. Samples collected at this location will be used to assess the potential for COCs to migrate out of plume areas into to clean EBS parcels or surface waters via the storm sewer system.

(2) The sample point is a secondary location, located at the last manhole or catchbasin prior to the storm sewer outfall. Samples will be collected at these locations if samples collected at the primary location exceed ERVs to assess COC migration to surface waters.

CMC. The ERV for MTBE is based on a specific value provided by the RWQCB. No CCC or CMC value is available for total xylenes, and no ERV is provided.

ERVs presented in the TPH addendum were based on a combination of CCCs, CMCs, and literature values. ERVs for benzene and toluene are identical in the TPH addendum and in the CAP; however, in the TPH addendum, the ERV for ethylbenzene was the CMC value divided by a factor of 10. The ERV for total xylenes was based on a value developed by Oak Ridge National Laboratory. Overall, the ERVs provided in the TPH addendum for ethylbenzene and total xylenes are more conservative than the values provided in the CAP; however, these values were provided to prioritize repairs to the storm sewer system and were not intended to be used to prioritize groundwater remedial actions. Therefore, the ERVs provided in TtEMI (2001b) will be used as the basis for evaluating the need for any groundwater remedial actions based on TPH contamination.

5.3 RECOMMENDATIONS AND CONCLUSIONS

The original objective of the Navy's storm sewer study report was to prioritize damaged sections of line for repair. Storm sewer prioritizations presented in the draft final storm sewer report (TtEMI 2000) and in the TPH addendum (TtEMI 2001a) are based on the potential for contaminated groundwater to infiltrate damaged sections of line. However, the regulatory agencies have commented that storm sewer prioritization should instead be based on the potential of contaminated groundwater to travel downgradient from contaminated source areas via the storm sewers and then exfiltrate into previously uncontaminated areas. This is the basis of the reprioritization presented in this technical memorandum. The regulatory agencies also commented that the Navy should develop a baseline for potential infiltration of contaminated groundwater into the storm sewer system and it should focus its efforts on source removal to minimize contaminant transport through the storm sewer system. Based on these comments, the Navy is integrating storm sewer issues with its OU-1 and OU-2 data gap investigation and the TPH CAP. This approach will identify specific locations that may require remedial actions.

Specific recommendations and conclusions related to these issues are as follows:

- Baseline conditions of the storm sewer system related to the potential infiltration of contaminated groundwater in OU-1 and OU-2 will be addressed through the Navy's data gap investigation. This includes sampling the primary storm sewer locations located

downgradient of groundwater plumes. This approach is discussed in Section 4.1 and sampling locations are identified in Figure 1 and in Attachment 2. Secondary sampling locations will be identified based on results of sampling the primary locations. Detailed information on the data gap investigation is found in TtEMI (2001c).

- Investigations of groundwater contaminated with TPH compounds will be completed consistent with the Navy's CAP and associated PRCs and remediation strategy for CAAs (TtEMI 2001b). Sampling within storm sewer lines will include comparisons with ERVs provided in Table 12.

- The Alameda Point storm sewer system to act as a preferential transport pathway for CERCLA- related chemicals and TPH will be addressed in the RI/FS report for OU-1 and OU-2, and through the CAP, respectively.

- Remedial decisions related to the storm sewer system, including any groundwater remediation, will be addressed through the RI/FS program (including any interim removal actions) for CERCLA-related chemicals and through the CAP strategy (TtEMI 2001b) for TPH.

- Investigations and remedial activities related to the Alameda Point storm sewer system will be completed on an OU or CAA basis, consistent with the approaches described in this technical memorandum. This will include site-specific investigations and remedial activities for CERCLA-related chemicals and TPH through the IR program and the CAP, respectively. No future base-wide storm sewer investigations are anticipated.

REFERENCES

National Oceanographic and Atmospheric Administration. 1999. "Screening Quick Reference Tables." Hazmat Report 99-1. Coastal Protection and Restoration Division, Seattle, Washington. September.

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TtEMI. 2001a. "Storm Sewer Study Report-Total Petroleum Hydrocarbon Addendum, Draft Final." Prepared for the Department of the Navy, Southwest Division, Naval Facilities Engineering Command, San Diego, California. January.

TtEMI. 2001b. "Preliminary Remediation Criteria and Closure Strategy for Petroleum-Contaminated Sites at Alameda Point, Alameda, California." Prepared for the Department of the Navy, Southwest Division, Naval Facilities Engineering Command, San Diego, California. May.

TtEMI. 2001c. "Draft Final Field Sampling Plan Supplemental Remedial Investigation Data Gap Sampling for Operable Units 1 and 2." Prepared for the Department of the Navy, Southwest Division, Naval Facilities Engineering Command, San Diego, California. May.

ATTACHMENT 1

RECOMMENDED PROCEDURES FOR DATA GAP SAMPLING

From Appendix B-4 of the "Field Sampling Plan Supplemental Remedial Investigation Data Gap Sampling for Operable Units 1 and 2, Final Revision."

B-4. PROCEDURES FOR INVESTIGATION OF STORM SEWER EXPOSURE PATHWAYS

The data quality objectives for the investigation of storm sewer exposure pathways are presented in Table A-8 of the associated QAPP. This appendix section describes the procedure for conducting the storm sewer investigation.

In support of Alameda Point IR Program, a qualitative evaluation of the storm sewer system was performed to evaluate whether the system may be affected by infiltration of contaminated groundwater. The focus of the storm sewer study report was to identify storm sewer lines that are damaged, submerged, and subject to potential infiltration of contaminated groundwater, which could then lead to flow of contaminated groundwater to down-stream sites or to the San Francisco Bay (Bay) (TtEMI 2000e).

The objective of the data gap investigation of storm sewer exposure pathways is to (1) evaluate the preferential flow of contaminated groundwater from IR sites to surface water through the coarse bedding materials of submerged storm sewer lines, (2) develop baseline conditions for potential contaminated groundwater infiltration into the storm sewer lines, in storm sewer lines down-stream of known groundwater plume areas, and (3) if concentrations of contaminants identified in the previous step exceed ERVs, determine the actual contaminant concentrations in the storm sewer system down-stream of known plumes, at a manhole or catch basin closest to the outfall.

The procedure to investigate contaminant transport in storm sewer line bedding materials is presented in Procedure A, and for transport by infiltration into storm sewer lines in Procedure B, below:

<u>Procedure A - evaluate storm sewer bedding material that may function as a preferential pathway for transport of contaminants from aquifers to down-stream sites or surface water bodies</u>

1. Identify storm sewer sections that are submerged and located near plume source areas based on recommendations from the storm sewer report (TtEMI 2000e). The sampling locations will be along storm sewers that are within and downgradient of known plumes.

2. Install a 14-inch diameter vacuum excavation boring immediately adjacent to the storm sewer line. The vacuum excavation boring will expose the side of the storm sewer pipe and extend to the bottom of the pipe. The depth to groundwater (if encountered) and the top and bottom of the pipe will be measured and the occurrence and type of bedding material around the pipe will be observed. An undisturbed sample of the bedding material will be collected using a hand driven core sampler. For comparison, a sample of the native artificial fill will also be collected at the approximate depth of the storm sewer line, 10 feet away from the storm sewer. This sample will be collected by direct push drilling.

3. Soil samples will be field-classified and submitted for laboratory analysis of geotechnical parameters including permeability, porosity, and grain size distribution. Soil will be classified according to the Unified Soil Classification System (USCS) and compared to surrounding native aquifer materials (artificial fill). If the samples indicate the absence of coarse bedding material (no pea gravel or coarse granular sand), and no groundwater is present in the borehole, no further evaluation will be conducted.

4. If groundwater is present in the borehole, a groundwater sample will be collected using a peristaltic pump and analyzed to determine if chemical concentrations exceed applicable screening criteria (ERVs for non-drinking water areas; the most restrictive criterion between ERVs, MCLs, and residential PRGs for drinking water areas).

5. If the groundwater sample from the initial location contains contaminants that exceed screening criteria and course bedding material is present around the line, as many as three step-out samples will be collected in a triangular configuration surrounding the initial sampling location. Step-out distances will be based on the step-out procedures outlined in Appendix B-1. Site-specific geotechnical data collected from the soil borings will be applied to step-out distances downstream along the bedding materials.

6. Step-out sampling will continue until concentrations are below screening criteria or other plumes are encountered.

7. Sampling locations that yield samples containing contaminant concentrations that exceed the screening criteria will be addressed through the RI/FS process to develop and analyze removal action and/or remedial alternatives.

<u>Procedure B1 – Determine baseline concentrations of contaminants in storm sewer lines down-stream of known groundwater plume areas</u>

1. Identify storm sewer sections that are submerged and located down-stream of plume source areas based on recommendations from the storm sewer report (TtEMI 2000e).

2. Identify the nearest storm sewer manhole or catch basin down-stream of the plume area that can be sampled for potential infiltration of contaminated groundwater.

3. In the selected manhole or catch basin, isolate the upstream portion of storm sewer section from potential tidal influences by using plugs to plug down-stream lines.

4. Identify major branches of the upstream storm sewer section that originate outside of the plume area and isolate them from the main line such that only areas of the storm sewer line lying in the plume contribute to flow into the manhole or catch basin to be sampled.

5. Pump the manhole or catch basin to be sampled dry directing the effluent to the next down-stream manhole.

6. If infiltration is observed coming into the manhole or catch basin from the upstream section of line, collect a water sample to determine concentrations of chemicals infiltrating into the storm sewer.

7. Chemical concentrations will be compared to ERVs. If concentrations of identified contaminants exceed the ERVs, then perform Procedure B2, below.

Procedure B2 - Determine contaminant concentrations in the storm sewer system down-stream of known plumes, at a manhole or catch basin closest to the outfall

1. Identify the storm sewer manhole or catch basin nearest the outfall down-stream of the plume area.

2. In the selected manhole or catch basin, isolate the upstream portion of storm sewer section from potential tidal influences by using a plug to plug the distal end of the line.

3. Pump the manhole or catch basin to be sampled dry directing the effluent to the Bay. (Note: for this sampling location, isolating storm sewer lines not originating in the plume area is not practical and any infiltration identified in step 4 will include dilution from infiltration of non-contaminated groundwater.)

4. If infiltration is observed coming into the manhole or catch basin from the upstream section of line, collect a water sample to determine concentrations of chemicals discharging to the Bay.

ATTACHMENT 2

FIGURE SHOWING PROPOSED INFILTRATION SAMPLING LOCATIONS

From the "Field Sampling Plan Supplemental Remedial Investigation Data Gap Sampling for Operable Units 1 and 2, Final Revision."

LEGEND

- INFILTRATION SAMPLES
- MANHOLE
- CATCH BASIN
- SIGNIFICANT INFILTRATION OBSERVED IN STORM SEWERS
- CRACKS AND SAGS OBSERVED IN STORM SEWERS
- POOR CONDITION (NOT CLEANED IN 1997)
- CONDITION UNKNOWN
- UNDER RAD PROGRAM
- INFILTRATION OBSERVED
- POTENTIAL INFILTRATION
- INSTALLATION RESTORATION (IR) SITE
- STORM SEWER LINE SYSTEM
- BUILDING
- LAND COVER

OPERABLE UNIT (OU)

- OU 1
- OU 2A
- OU 2B
- OU 2C
- OU 3
- OU 4A
- OU 4B
- OU 4C
- OU 5
- OU 6

N

300 0 300 600 1200

SCALE: 1" = 600'

FIGURE 3
STORM SEWER SYSTEM
ALAMEDA POINT
ALAMEDA, CALIFORNIA

Tetra Tech EM Inc.