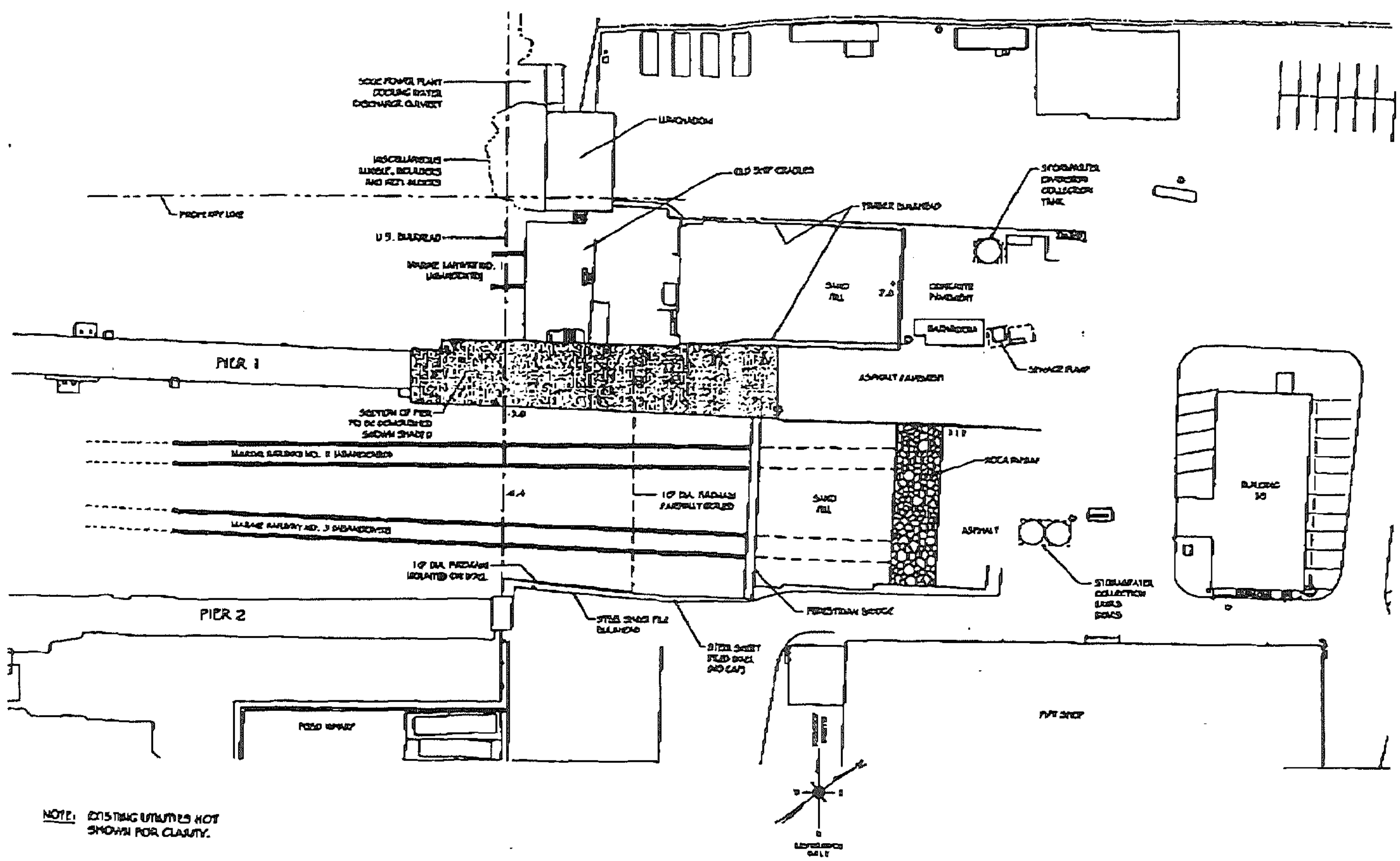

SCALE: 1" = 80'-0"

FIGURE 9

Quaywall Improvements
Preliminary Engineering - Existing Conditions

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000

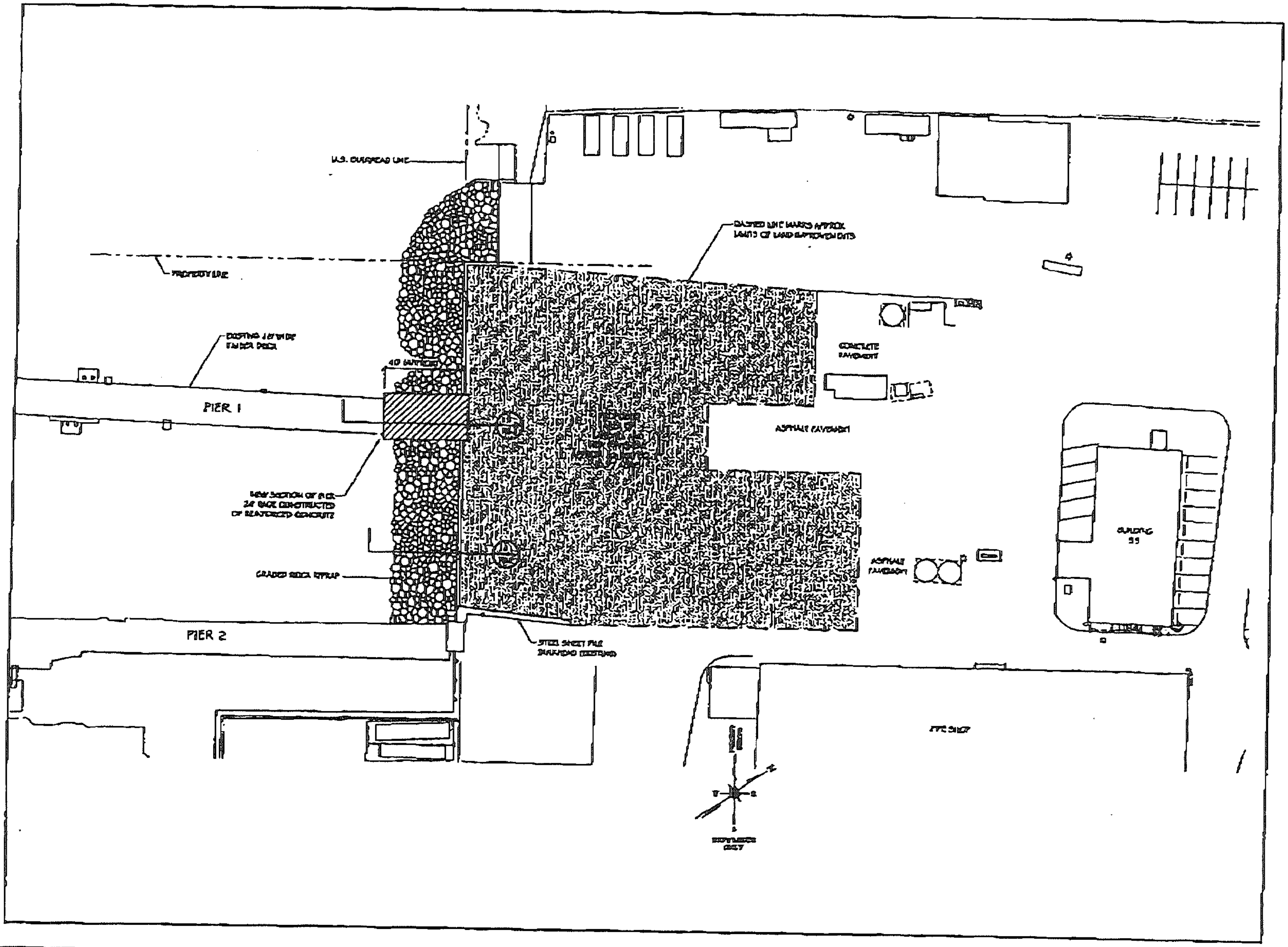

FIGURE 10

Quaywall Improvements
Alternative B - Riprap Revetment Stabilized Bulkhead - Site Plan

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000

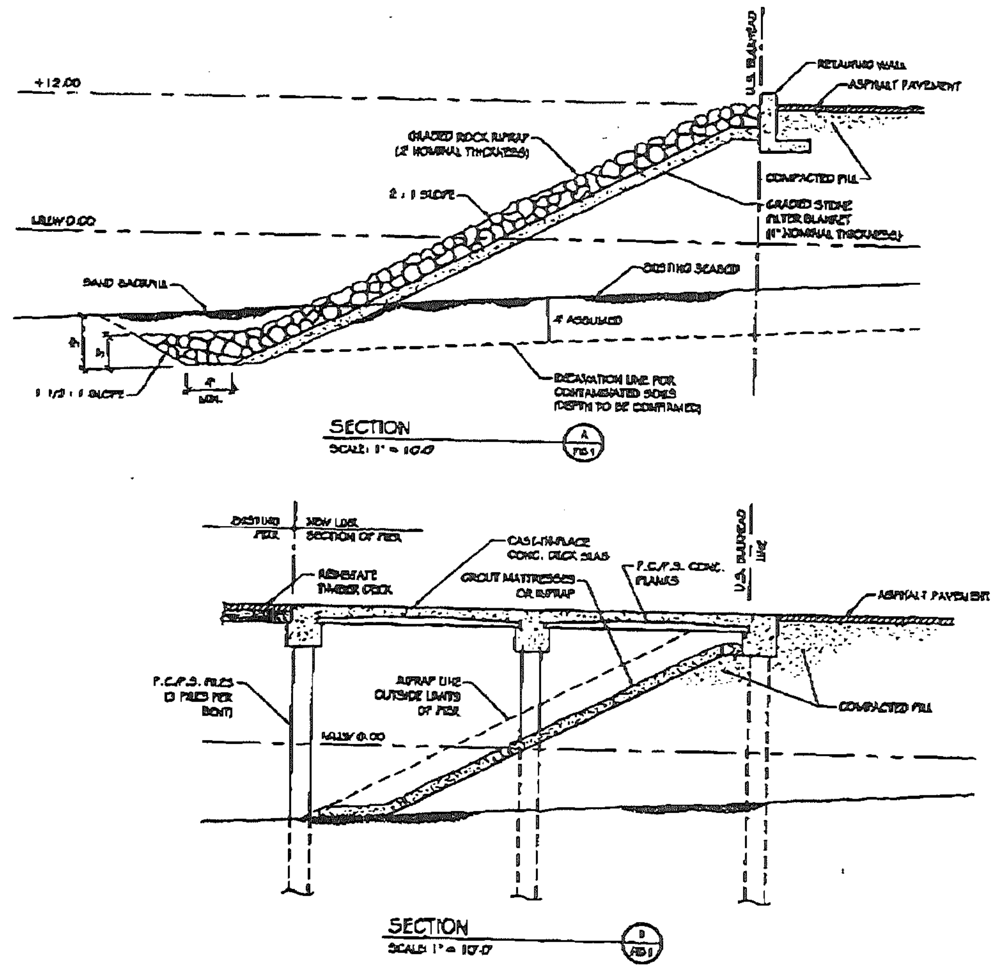

FIGURE 11

Quaywall Improvements
Alternative B - Riprap Revetment Stabilized Bulkhead - Section Plan

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000

ANCHOR
ENVIRONMENTAL CA, L.P.

28202 Cabot Road, Suite 620
Laguna Niguel, CA 92677
Phone 949.347.2780
Fax 949.347.2781
www.anchorenv.com

Letter of Transmittal

To: Shaun Halvax
BAE Systems San Diego Ship Repair Inc.
2205 East Belt, Foot of Sampson Street
San Diego, CA 92113

From: Nicole Lombre for Michael Whelan

Date: December 21, 2006

Re: BAE Systems – Bulkhead Extension and Yard Improvement Project

We are sending the following items:

Copies	Description
4	Construction Completion Report

These are transmitted:

☐ For your information ☐ For action specified below ☐ For review and comment ☒ For your use ☐ As requested

Dear Shaun,

Per Michael Whelan, enclosed are four copies of the Bulkhead Extension and Yard Improvement Project Construction Completion Report. There is a pocket in the back of each report for insertion of the CD containing the appendices.

Thank you,

Nicole Lombre

CONSTRUCTION COMPLETION REPORT
BULKHEAD EXTENSION AND YARD IMPROVEMENT PROJECT

BAE SYSTEMS SAN DIEGO SHIP REPAIR INC.

Prepared for

BAE Systems Ship Repair Inc.
2205 E. Belt Street
San Diego, California 92113

Prepared by

Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 620
Laguna Niguel, California 92677

December 2006

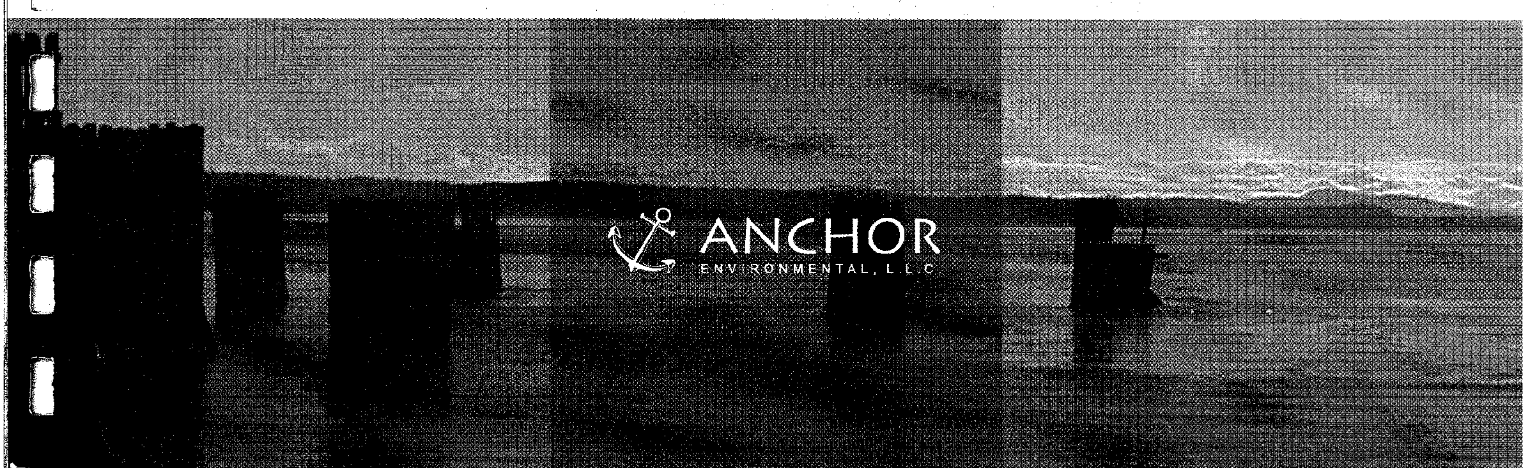

Table of Contents

List of Tables

List of Figures

List of Appendices (provided on CD)

List of Acronyms

Anchor	Anchor Environmental CA, L.P.
SDSR	BAE Systems San Diego Ship Repair Inc.
BMPs	Best Management Practices
CHHSLs	California Human Health Screening Levels
COCs	constituents of concern
CCR	California Code of Regulations
CTR	California Toxics Rule
DO	dissolved oxygen
MLLW	mean lower low water
NTUs	nephelometric turbidity units
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
the Project	Bulkhead Extension and Yard Improvement Project
SDRWQCB	California Regional Water Quality Control Board, San Diego Region
STLC	Soluble Threshold Limit Concentration
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentrations
VOCs	Volatile Organic Compounds
WQC	Water Quality Certification

1 INTRODUCTION

In 2006, BAE Systems San Diego Ship Repair Inc. (SDSR; formerly known as Southwest Marine, Inc.) completed reconfiguration of a portion of its ship repair yard. The construction, termed the Bulkhead Extension and Yard Improvement Project (henceforth, "the Project"), involved the installation of a steel sheetpile bulkhead across the mouth of a slip formerly occupied by three abandoned marine railways, removal of selected sediments from the slip, and backfilling with clean imported backfill to create additional upland yard space for the facility. This report documents the completion of the environmental aspects of the Project, including a brief narrative summary of the work and its accompanying environmental monitoring and sampling, and updated modeling of predicted long-term water quality impacts from the Project.

Figure 1 identifies the general location of the Bulkhead Extension and Yard Improvement Project relative to the entire BAE Systems San Diego Ship Repair yard and facilities. The construction was performed under U.S. Army Corps of Engineers Individual Permit No. 200301115-KW, Coastal Development Permit No. CDP-2003-10, Port of San Diego Construction Approval (Project No. 021-015-1965) and mitigated negative Declaration (UPD #83356-ND-597), and two separate 401 Water Quality Certifications ([WQCs] Files No. 03C-065 and 04C-097 for two phases of construction activity described below) from the California Regional Water Quality Control Board, San Diego Region (SDRWQCB). Among other requirements, these permits mandated certain environmental controls for the Project, including:

- Removal of in-place sediments containing chemicals in excess of California hazardous waste levels (Total Threshold Limit Concentrations, or TTLCs, per California Code of Regulations Title 22), and their disposal at permitted upland landfill facilities.
- Protection of water quality in the adjacent waters of San Diego Bay, through Best Management Practices (BMPs), and as verified by daily observations and monitoring, per the Project's Water Quality Monitoring Plan (Anchor, 2004).

Previous investigations and analyses conducted by Anchor Environmental CA, L.P. (Anchor) demonstrated the Project's overall short- and long-term protectiveness to water quality in adjoining San Diego Bay waters, and to human health and the environment (Anchor, 2005).

Mitigation for construction-related impacts to intertidal bay bottom (0.77 acres total) was achieved through the creation of additional 0.77 acres of intertidal habitat at the Sweetwater Channel/D Street Fill mitigation area, as part of a Port of San Diego mitigation project, defined in the third amendment to the BAE Systems lease with the Port of San Diego. Eelgrass mitigation was accomplished through the creation of additional eelgrass habitat (at a 1:1.2 ratio) in the vicinity of Pier 3 on the SDSR property and at the Sweetwater Channel/D Street Fill mitigation area. Documentation of these mitigation measures can be found in Appendices J and K, respectively.

1.1 Overview of Construction

Figures 2 and 3 present detailed plan and cross-sectional views of the bulkhead improvement area and proposed construction activities. The Project was performed in two phases; the general sequence of construction is illustrated as a typical cross-section on Figure 2.

Phase 1 of the Project began on March 13, 2006 and involved removing marine structures from the area and installing a new section of sheetpile bulkhead across the face of the abandoned railways (Figure 2). After completion of Phase 1, Phase 2 construction activities commenced in June 2006. Phase 2 included removal of selected sediments from the Project footprint and a "wedge" of material situated immediately behind the new bulkhead (Figure 3), then after testing to confirm chemical contaminant removal, backfilling the Project site with imported, clean, granular fill to the elevation of the surrounding grade (approximately +12 feet mean lower low water [MLLW]). Construction was completed on October 13, 2006 and the surface of the clean backfill area was paved in November 2006 to support shipyard operations.

1.2 Contents of this Report

This report provides brief narrative descriptions and documentation of the following elements of the construction activity:

- Section 2 describes the characterization of sediments in the Project area. The initial delineation of sediments requiring removal because they qualified as hazardous waste under California environmental regulations.

- Section 3 describes the excavation of sediments identified to exceed TTLC criteria, as well as confirmational sampling that was conducted to verify that sediments were sufficiently removed.
- Section 4 describes the disposal of excavated sediments at local and regional landfills, as well as characterization of the excavated sediment for approval by these landfills.
- Section 5 describes the backfilling of the Project area with clean, imported fill materials.
- Section 6 describes monitoring of water quality during the construction process.
- Section 7 presents updated modeling of chemical transport and long-term water quality impacts from the completed Project.
- Section 8 summarizes the conclusions of this report.

Supporting data is presented in tables following the text, and in a series of appendices, attached to this report in CD format.

2 SEDIMENT CHARACTERIZATION AND DELINEATION OF EXCAVATION REQUIREMENTS

Sediments in place within the Project area were characterized over the course of three different sampling and analysis efforts. The locations of samples and sediment cores are summarized on Figure 2. The three investigations are as follows:

2.1 Detailed Sediment Investigation of BAE Systems and NASSCO Shipyards (2002/2003)

A detailed site sediment investigation was conducted for both the SDSR (then known as Southwest Marine) and adjoining NASSCO shipyards in 2002 and 2003. This investigation, documented in E^xponent (2003), was conducted in response to SDRWQCB Resolution Nos. 2001-02 and 2001-03 and subsequent Water Code Section 13267 letters issued to the shipyards. The investigation involved a series of surface and core samples taken from site sediments throughout both shipyards' leasehold areas and beyond.

Sediments along and in the vicinity of the planned bulkhead were represented by cores SW04 and SW08, taken in close proximity to the alignment of the bulkhead (refer to Figure 2). Sediment chemistry from various depth intervals in these two cores are summarized in Table 1. Impacted sediments were identified in both cores to a depth of about 4 feet (although core SW04 could not be penetrated beyond this depth because refusal was reached, so deeper materials could not be sampled at this location). The primary constituents of concern (COCs) in the impacted sediments include elevated concentrations of metals, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs).

2.2 Vertical and Lateral Characterization of Sediment and Groundwater (2004)

In 2004, following meetings and communications with the SDRWQCB, SDSR commissioned an additional, site-specific study of sediments within the Project footprint in order to demonstrate to the SDRWQCB that the proposed Project would be protective of water quality in San Diego Bay, if the existing sediments were left in-place and encapsulated below clean backfill and behind the new bulkhead wall. Anchor conducted a site investigation within the Project boundaries to provide additional vertical and lateral characterization of COCs in the soil, sediment, and groundwater in and surrounding the Project area.

Continuous core samples were collected at five locations, as depicted on Figure 2. Representative composite samples were obtained from the various geologic layers that are present, including the recent near-surface sediment, upland fill from the surrounding paved area, and the underlying Bay Point Formation. Samples were analyzed for metals, PCBs, and PAHs.

The results of chemical analysis of the samples are summarized in Table 2. At core locations SW-4 in the south half of the Project area, and SW-5 in the north half of the Project area, the upper two feet of sediment was found to contain copper and/or zinc at concentrations that exceeded California hazardous waste criteria as defined by TTLC values, per California Code of Regulations (CCR) Title 22 (section 66261.24, Division 4.5, Chapter 11, Article 3). Elevated concentrations of lead and PCBs were also noted in these locations, although not above TTLC criteria. No TTLC exceedances were found below depths of 2 feet.

Groundwater was also sampled and the site hydraulic gradient measured in response to tidal fluctuation. This information was used to predict the efflux of dissolved constituents in groundwater after Project completion. Modeling demonstrated that long-term water quality in adjacent waters of San Diego Bay would not be adversely affected by the Project.

Results of this investigation and the groundwater modeling are documented in a site investigation and characterization report (Anchor, 2005).

2.3 Additional Sediment Evaluation and Delineation (2006)

In response to the investigation documented in Anchor (2005), the SDRWQCB approved issuance of a WQC for the Project, contingent on SDSR removing all sediments that exceeded TTLC criteria from the Project area (henceforth termed "TTLC sediments," as identified in cores SW-4 and SW-5). In order to better delineate the limits of TTLC sediments, Anchor obtained hand-pushed piston core samples of sediments at seven additional locations in the Project area in March 2006 (refer to Figure 2 for sampling locations). At each location, the upper 2 to 4 feet of sediment was sampled in 1-foot intervals and analyzed for key metals (Cu, Pb, and Zn) and PCBs.

The results of this sampling effort are presented in Table 3. Laboratory reports are in Appendix A, and a Data Validation Review Report on this data is included as Appendix B. Samples from locations BAE-01, BAE-02, BAE-04, and BAE-05 indicated metal concentrations in excess of TTLC criteria, to depths of 4 feet and possibly below (deeper samples were not successfully obtained); while locations BAE-03, BAE-06, and BAE-07 had no indicated exceedances of TTLC criteria.

Based on these results, the horizontal extent of TTLC sediments was projected as depicted on Figure 2. These estimated limits were used to guide the initial excavation depths for TTLC sediments, subject to confirmatory sampling during construction.

3 EXCAVATION OF TTLC SEDIMENTS

Excavation of TTLC sediments from the Project site started in June 2006, beginning with the portion of the Project area that is north of Pier 1. The entire Project area was subdivided into individual excavation segments, each assigned its own representative confirmatory post-excavation sample, as shown on Figure 4. The excavation of TTLC sediments was completed in this segment-by-segment basis.

An initial excavation depth of 4 feet was chosen for each excavated segment, since this was the depth of the 2006 cores (as described in Section 2), in an attempt to control excavation volumes while using confirmatory sampling to ensure that the full extents of TTLC sediments were removed. Upon reaching the 4-foot depth within each segment, confirmatory sediment samples were obtained from the post-excavation subgrade. The confirmatory samples were submitted to a local laboratory (CalSciences in Garden Grove, California) and tested for Cu, Pb, Zn, and PCBs. While the analytical testing was being done, the excavation contractor was instructed to hold off on further excavation from other segments of the Project area, so as to avoid any resuspension of sediments while the excavated subgrade was exposed.

When test results were received, they were compared to the TTLC criteria to see if exceedances still existed at the excavated depth. If so – or even if the measured concentrations were within about one-fifth of the TTLC criteria – then the contractor was instructed to excavate an additional 2 feet to remove additional sediment from the sampled segment. Following this re-excavation, another confirmatory sample was obtained and analyzed. Excavation was considered complete at a given location only when the latest confirmatory sample indicated that concentrations of Cu, Pb, Zn, and PCBs were well below TTLC criteria.

When excavation was considered complete at a location (i.e., remaining concentrations well below TTLC criteria), the excavated segment was backfilled up to previous grade with clean, imported sand fill, and the excavation contractor was then directed to move on to excavating the next adjacent segment. In this manner the excavation progressed in a segmental fashion.

After the final segment of TTLC sediment was removed and backfilled with clean material, the contractor excavated the sediment "wedge" from immediately behind (inside of) the bulkhead

wall (see Figure 3). Material excavated from the wedge was stockpiled separately from the expected TTLC sediments, to prevent mixing or cross-contamination of the materials. Two more confirmatory samples ("Wedge-1" and "Wedge-2" were taken from the bottom of this excavation to verify that no TTLC sediment was left at the base of the excavation).

Altogether, approximately 1,100 cubic yards of sediment – or 1,400 tons – was excavated during this process.

Table 4 presents the results of confirmatory samples obtained during excavation of TTLC sediments, and Appendix C includes the laboratory reports from all chemical analyses. In several instances (for example, BH-4, BH-8, etc.) the first confirmatory sample exceeded or nearly exceeded TTLC criteria for copper, lead, and/or zinc, so additional excavation was done and another sample obtained at the new, deeper depth (labeled BH-4.1, BH-8.1, etc.). In one case (at location BH-4), a third round of excavation and confirmatory sampling was done, to a depth of 8 feet; the final sample at this location was labeled BH-4.2.

Sediment removal was preceded by and concurrent with demolition and removal of previously existing marine cradles in the northwestern portion of the Project area, and the part of Pier 1 landward of the new bulkhead wall.

4 DISPOSAL OF CONSTRUCTION WASTE AND EXCAVATED SEDIMENTS

4.1 Characterization and Disposal of Excavated Sediment

Excavated sediment was stockpiled on-site in the paved north area of the Yard Improvement Project, in a controlled stockpiling area with concrete blocks and runoff protection around its perimeter to prevent loss of sediment and water to the surrounding environment.

As excavation proceeded, composite samples were collected from material stockpiles and analyzed for landfill acceptance. A total of 23 samples were obtained altogether, which, for 1,100 cubic yards of sediment, amounts to approximately one representative sample per every 50 cubic yards of stockpiled sediment, consistent with testing requirements for local landfills operated by Allied Waste (such as the Otay and Sycamore landfills in San Diego County). Analysis of these samples was done in two phases: first, analysis of the bulk concentrations of metals, PCBs, PAHs, and Volatile Organic Compounds (VOCs), to determine which (if any) constituents contained elevated concentrations. Next, in cases where bulk concentrations were within one-tenth of the TTLC criteria, leachability testing (by the Soluble Threshold Limit Concentration, or STLC) was conducted to evaluate the potential for leaching of those chemicals, as a requirement for potential acceptance at local landfills. Additionally, Toxicity Characterization Leaching Procedure (TCLP) was conducted on a subset of samples. No TCLP exceedances were observed.

Analytical results from sediment stockpiles are presented in Appendix D. Ultimately, the majority of the excavated sediment did not meet TTLC requirements for local landfill disposal at a San Diego County landfill, and 728.21 tons of sediment were instead hauled to the Copper Mountain Landfill, a solid waste facility operated by Allied Waste in Arizona. In addition, 673.97 tons of sediment was hauled to the Azusa Land Reclamation Landfill in Azusa, California, which accepted stockpiled sediments containing lesser (non-hazardous) concentrations of metals and PCBs. Waste Disposal Manifests for sediment hauling and disposal are presented in Appendix E.

4.2 Disposal of Demolition Debris

Wood, steel, and concrete debris was also generated during project work, from the demolition of existing site structures (marine railways, and the portion of Pier One within the Project footprint). All demolition materials were cleaned of sediment and disposed at the Otay Landfill in San Diego County and at the Simi Valley landfill in Ventura County, CA.

5 BACKFILLING OF EXCAVATION AND PROJECT AREA

After sediment excavation was completed, the Project area was completely backfilled with clean imported soil. The area was filled to a final grade of approximately elevation +11.5 feet MLLW, so that after later installation of base course and asphalt concrete pavement, the final grade would be roughly equivalent to the elevation of the surrounding land area (elevation +12.1 feet MLLW).

Backfill material was obtained from several local sources in the San Diego area. Representative samples of the imported backfills were obtained on a regular basis, and 20 of the samples (roughly one out of every five collected) were tested for key chemical constituents (Cu, Pb, Zn, and PCBs) to ensure that there were no significant concentrations of these chemicals in the fill. The number of samples analyzed from each import fill source was proportionate to the amount of fill used from that source.

The analytical results for the imported soil fill are summarized in Table 5. Metals concentrations (Cu, Pb, and Zn) were well below California TTLC Criteria, as well as Human Health Screening Levels (CHHSLs) for residential and commercial/industrial use. No PCBs were detected in any of the imported sand samples.

6 WATER QUALITY MONITORING

6.1 Water Quality Program

Water quality monitoring was performed during the excavation activities (Phase 2A) and clean fill materials placement (Phase 2B). Water quality monitoring was conducted as a condition of the 401 WQC Permit issued by the SDRWQCB. Daily visual turbidity monitoring and weekly water quality monitoring of turbidity, dissolved oxygen (DO), and pH were conducted during Phase 2 activities.

The purpose of the water quality monitoring program was to provide ongoing assessment of water quality during construction and filling activities. Compliance criteria, shown in Table 6, were established to determine if there were any water quality exceedances during construction. The objectives of the monitoring program are as follows:

- To ensure that water quality conditions were maintained within the prescribed limits of relevant regulatory requirements.
- To allow for appropriate adjustment of construction activities in a manner that would ensure protection of the environment.
- To document the results of water quality performance monitoring.

Water quality monitoring for Phase 2A was conducted at three locations during construction, as shown on Figure 6 (from Anchor 2004):

- Station A, located 500 feet bayward from the construction limits (defined as the bulkhead wall). This is the background monitoring station.
- Station B, located 250 feet bayward from the construction limits. This defines the site compliance zone boundary.
- Station C, located 125 feet bayward from the construction limits. This station is an additional "early warning" boundary.

At each location, DO, turbidity, and pH were monitored at three depths: shallow (within 3 feet of the surface); mid-depth; and deep (within 6 feet of the bottom).

6.2 Water Quality Monitoring Results and Summary

The following data are presented in Appendices to this report:

- Table of Water Quality Monitoring Results (Appendix G)
- Daily Construction Site and Waterside Photographs (Appendix H)
- Daily Monitoring Logs and Checklists (Appendix I)

BAE personnel were trained in the calibration and use of the monitoring equipment. Originally, the Hydrolab® Hydras 3 LT sonde/laptop system was calibrated and tested in the field. However, due to difficulties in operating the laptop in the field, after two monitoring events, the Hydrolab was replaced with a portable system (the Hydrolab® DS4a).

In summary, the water quality monitoring results showed the following:

- **Turbidity.** No turbidity, floatables, or oil sheens[1] were visually observed during daily monitoring. Weekly turbidity readings were consistent with historical data for the subject area of San Diego Bay (typically less than 5 nephelometric turbidity units [NTUs], per San Diego Bay Watersheds [2006] and Unified Port District of San Diego [2006] websites). The only exception to this was one sampling occasion, on June 27, 2006, when turbidity was recorded between 88.8 and 116.4 NTU. There was no construction-related event to account for this spike, and no turbidity was observed. Additionally, the lowest reading was recorded closest to the construction activity, and the highest reading was recorded at the background condition station. Altogether, therefore, this anomalous reading was not considered to reflect a construction-related impact on water quality.
- **Dissolved Oxygen.** Historically, DO levels have ranged from 5.0 to 8.1 (per San Diego Bay Watersheds [2006] and Unified Port District of San Diego [2006]). DO levels measured for this Project were consistent with the historical data, and were often greater (and therefore improved) closer to the construction activities (Station C) than at the background monitoring station (June 22, June 27, July 11, and August 17, 2006).
- **pH.** pH levels were consistently within standards set by the SDRWQCB.

[1] On March 29, 2006, a "slight" oil sheen was noted. The sheen was traced to diver air tools, and those operations were immediately terminated.

6.3 Water Quality Monitoring Conclusions

No deleterious effects to water quality were observed or measured during excavation or placement activities. There were no visual observations of turbidity, floatables, or oil sheens, and there were no observations of distressed wildlife.

There were no impacts to water quality associated with exceedences of pH, and measured DO levels were within historical ranges. Furthermore, DO levels at the monitoring station closest to construction activities were often greater than background conditions. Visual observations during construction activity indicated no evident turbidity. Monitoring showed that turbidity levels were within historical ranges on all but one monitoring event, the same day that DO was recorded at its highest level.

As a result of these measurements and observations, BAE Systems SDSR concludes that this Project did not result in adverse impacts to water quality from increased DO or turbidity levels.

7 UPDATED MODELING OF LONG-TERM WATER QUALITY

In 2005, prior to Project construction, BAE Systems completed an evaluation of the Project's protectiveness of long-term water quality. This was done to support the SDRWQCB's review of BAE Systems' application for a 401 WQC for the Project. Specifically, modeling was performed to predict the tendency of dissolved waste constituents (copper, lead, zinc, and PCBs) to be transported in groundwater from the interstices of sediment left in place within the Project footprint, through the newly placed clean fill materials and new sheetpile bulkhead, and into immediately adjacent waters of San Diego Bay. The results of this modeling were presented in Anchor (2005).

This pre-construction modeling effort utilized available site data, including analysis of samples obtained in 2004 as well as past records of site sediment concentrations. Predicted chemical concentrations within the Project footprint were based on the expectation that all sediments containing exceedances of TTLC criteria would be removed. One-dimensional chemical transport modeling was performed using the approach developed by Reible (1998) and documented in the U.S. Army Corps of Engineers' national guidance for cap design (Palermo et al., 1998). More detail on the modeling methods and inputs are presented in Anchor (2005). The modeling demonstrated that all four of the modeled chemicals remained well below California Toxics Rule (CTR) criteria for surface waters, for well beyond 100 years following Project completion.

Following the completion of the construction project in 2006, this modeling has now been updated to reflect known remaining conditions, as reflected by the actual excavation extents and confirmatory sampling documented in this report. It also reflects the fact that imported backfill was used to fill the Project site (whereas the previous modeling also considered the possibility that dredged sediment would be used as backfill). Tables 7 and 8 summarize the updated modeling inputs. For the purposes of comparison, Table 8 includes the estimated porewater concentrations in contained sediments both for the known post-construction conditions, and from the pre-construction modeling described in Anchor (2005). It can be seen that the construction project resulted in overall chemical concentrations within the Project footprint that are lower than those originally predicted.

Table 9 summarizes the results of the updated modeling as compared to the pre-construction modeling results presented in Anchor (2005). The key information in this table is the years until predicted breakthrough – the time when dissolved chemical concentrations expressed through the sheetpile are predicted to meet CTR water quality criteria. The updated modeling confirms that breakthrough will not occur for well beyond 100 years. Furthermore, three of the four predicted the times to breakthrough have increased compared to the previous modeling. This is a result of the fact that chemical concentrations within the Project footprint ended up being lower than they were originally predicted to be.

In summary, the updated modeling confirms that the completed Project is predicted to cause no significant impacts on surface water quality, verifying that the Project is fully protective of water quality.

8 CONCLUSIONS

The Bulkhead Extension and Yard Improvement Project was completed on October 13, 2006, consistent with the terms of the Project permits. Specifically,

- All sediments exceeding California hazardous waste (TTLC) criteria were removed from the Project site, as confirmed by a series of post-excavation samples.
- All excavated sediment was disposed off-site at permitted landfills.
- Clean import fill material was used to backfill the Project area.
- Daily water quality monitoring confirmed that adjacent surface waters of San Diego Bay were not adversely impacted pH, DO, or turbidity.
- Storm water protection measures were maintained in place throughout the construction process.
- The Project is projected to cause no adverse long-term impacts on water quality in adjoining waters of San Diego Bay.

This report satisfies the requirements of paragraph B.3 in the 401 WQC, stating that a report shall be submitted at the end of construction which documents the results of all water quality monitoring.

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TABLES

Table 1
Results of Detailed Sediment Investigation of BAE Systems and NASSCO Shipyards (Exponent, 2003)

Analyte of Concern	Background Sediment Concentrations [1]	California TTLC Criteria [2]	SW04 8/7/2001 0-2 cm	SW04 9/10/2002 0-2 cm	SW04 8/27/2002 0-2 ft	SW04 8/27/2002 2-4.1 ft	SW04 Depth Averaged	SW08 8/8/2001 0-2 cm	SW08 8/28/2002 0-2 ft	SW08 8/28/2002 0-2 ft	SW08 8/28/2002 2-4 ft	SW08 8/28/2002 4-6 ft	SW08 8/28/2002 6-6.5 ft	SW08 Depth Averaged
Conventionals														
Fines content (%)			31.8	-	-	-	31.8	68.8	-	-	-	-		68.8
TOC (% dry)			1.59	-	0.91	1.8	1.37	3.35	1.5	-	1.1	0.12	-	0.93
Metals (mg/kg)														
Arsenic	9	500	**95.5**	-	**67.7**	**107**	**89.65**	**25.5**	**26.6**	-	**13.2**	4.9	-	**15.12**
Cadmium	0.29	100	**2.35**	-	**0.79**	**3.17**	**2.05**	**0.67**	**1.13**	-	**0.86**	0.07	-	**0.69**
Chromium	57	2500	**64.7**	-	25.5	**97.2**	**63.36**	**77.8**	**110**	-	**109**	7.4	-	**76.00**
Copper	120	2500	**1880**	-	**370**	**2170**	**1325.60**	**1030**	**1540**	-	**1480**	49	-	**1029.94**
Lead	48	1000	**482**	-	**154**	**413**	**295.73**	**248**	**343**	-	**341**	10.6	-	**233.26**
Mercury	0.56	20	**1.19**	-	**1.14**	**7.4**	**4.36**	**2.53**	**4.97**	-	**5.95**	0.3	-	**3.75**
Nickel	17	2000	**20.1**	-	8.3	**40**	**24.87**	**22.7**	16.8	-	9.1	2.6	-	9.71
Selenium	0.72	100	**1.2**	-	**1.2 U**	**3.1**	**2.19**	**1 U**	**1.6 U**	-	**1.4 U**	1.2 U	-	**1.6 U**
Silver	1	500	**1.72**	-	0.59	**1.4**	**1.04**	1.38	**1.04**	-	0.49	0.03	-	0.53
Zinc	210	5000	**4550**	-	**669**	**1450**	**1158.31**	**859**	**1410**	-	**786**	33.7	-	**749.46**
PCB (µg/kg)														
Aroclor 1016			190 U	-	150 U	1500 U	1500 U	330 U	1900 U	950 U	1400 U	130 U	12 U	1900 U
Aroclor 1221			370 U	-	290 U	2900 U	2900 U	650 U	3800 U	1900 U	2800 U	250 U	24 U	3800 U
Aroclor 1232			190 U	-	150 U	1500 U	1500 U	330 U	1900 U	950 U	1400 U	130 U	12 U	1900 U
Aroclor 1242			190 U	-	150 U	1500 U	1500 U	330 U	1900 U	950 U	1400 U	130 U	12 U	1900 U
Aroclor 1248			190 U	-	1300	16000	8664	990	9300	12000	15000	1100	12 U	8223
Aroclor 1254			2400	-	1200	13000	7153	2400	7000	8700	12000	600	12 U	6303
Aroclor 1260			600	-	610	6500	3570	640	4100	4400	6600	290	12 U	3427
Total PCBs	170	50000	**3000**		**3110**	**35500**	**19387**	**4030**	**20400**	**25100**	**33600**	**1990**	0	**17954**
PAHs (µg/kg)														
2-Methylnaphthalene			31	-	10	460	240	32	18	-	50	6.1 U	-	25
Acenaphthene			110	-	22	3100	1594	83	54	-	110	6.1 U	-	57
Acenaphthylene			120	-	47	190	122	280	100	-	84	6.1 U	-	66
Anthracene			710	-	150	2400	1312	1500	360	-	360	10	-	258
Benz(a)anthracene			1100	-	370	3400	1937	2300	770	-	950	17	-	601
Benzo(a)pyrene			1500	-	1100	5800	3527	2900	2600	-	3000	85	-	1918
Benzo(b)fluoranthene			1600	-	950	5800	3456	3500	2900	-	3000	88	-	2025
Benzo(ghi)perylene			640	-	630	2100	1393	1300	970	-	1000	26	-	677
Benzo(k)fluoranthene			1300	-	790	5200	3065	2400	2600	-	2900	85	-	1880
Chrysene			1800	-	580	4500	2615	4900	1200	-	1200	38	-	862
Dibenzo(a,h)anthracene			230	-	120	650	395	450	310	-	370	8.4	-	233
Fluoranthene			2100	-	700	10000	5485	3500	1000	-	1200	25	-	776
Fluorene			180	-	34	1500	785	220	77	-	120	6.1 U	-	70
Indeno[1,2,3-cd]pyrene			880	-	750	2600	1711	1800	1400	-	1300	34	-	927
Naphthalene			38	-	20	3800	1949	38	19	-	58	6.1 U	-	28
Phenanthrene			1100	-	260	5000	2699	1300	490	-	620	13	-	387
Pyrene			2000	-	1400	18000	9906	2600	6000	-	8400	51	-	4826
Total PAHs		-	15439	-	7933	74500	42191	29103	20868	-	24722	510.9	-	15617

Notes:
U = analyte not detected at the indicated detection limit.
From E^{x}ponent (2003).

Table 2
Results of Vertical and Lateral Characterization of Site Sediment (Anchor, 2005)

	California TTLC	Core SW-1	Core SW-2	Core SW-3		Core SW-4					Core SW-5				
Parameter	Criteria [2]	Bay Point Formation 15' - 17'10"	Bay Point Formation 18' - 20'	Upland Fill 5' - 7'9"	Upland Fill 12'2" - 14'2"	Surface Sediment 0' - 2'1"	Surface Sediment 2'1" - 3'6"	Surface Sediment 5' - 5'9"	Surface Sediment 5'9" - 8'10"	Bay Point Formation 15' - 16'	Surface Sediment 2" - 2'	Surface Sediment 2' - 2'11"	Surface Sediment 5' - 6'5"	Surface Sediment 6'5" - 7'5"	Bay Point Formation 10' - 12'9"
Total Organic Carbon (percent)															
		0.01	0.02	0.22	0.13	1.48	0.29	0.21	0.01	0.03	0.46	0.04	0.06	0.03	0.02
Metals (mg/kg)															
Arsenic	500	3.65	1.15	3.46	3.9	154	35.4	65.9	1.42	1.56	177	3.57	3.13	2.62	6.42
Cadmium	100	0.05 J	0.04 J	0.05 J	0.07	3.13	0.73	1.13	0.05 J	0.04 J	2.83	0.08	0.08	0.08	0.06
Chromium	2500	3.6	12.3	6.46	3.89	173	138	75.2	3.22	22.4	192	8.7	5.4	21.4	4.73
Copper	2500	1.75	5.67	4.76	11.3	2540	981	1040	2.4	12.6	6950	12.7	5.85	14.1	4.52
Lead	1000	0.81	2.1	5.39	4.04	668	352	326	0.73	3.75	955	21.4	5.25	3.98	1.04
Mercury (total)	20	0.03 J	0.01 U	0.05 J	0.03 J	0.69 J	2.4 J	0.7 J	0.01 J	0.03 J	0.91 J	0.24 J	0.1 J	0.01 U	0.01 U
Nickel	2000	2.06	6.22	2.29	1.74	25.9	10.6	12	2.02	10.1	28.1	3.7	2.1	8.17	3.58
Selenium	100	0.13	0.15	0.3	0.09	2.91	0.95	1.24	0.68	0.25	3.52	0.1	0.09	0.05 J	0.8
Silver	500	0.05 U	0.05 U	0.05 U	0.05 U	1.77 J	0.55 J	0.76 J	0.05 U	0.18 J	2.1 J	0.28 J	0.15 J	0.04 J	0.05 U
Zinc	5000	23.9 J	23.9 J	17.8 J	13.7 J	6630 J	1560 J	2250 J	6.18 J	42.1 J	4470 J	28.8 J	19.3 J	49.3 J	9.77 J
PAHs (µg/kg)															
1-Methylnaphthalene		5 U	5 U	5 U	2.30 J	29.90	22.30	20.40	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
1-Methylphenanthrene		5 U	5 U	5 U	2.80 J	102	15.50	34.10	5 U	5 U	5 U	1.20 J	5.00 U	5.00 U	5 U
2,3,5-Trimethylnaphthalene		5 U	5 U	5 U	2.40 J	44.50	13.30	12.90	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
2,6-Dimethylnaphthalene		5 U	5 U	5 U	1.0 J	34.60	22.70	19.0	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
2-Methylnaphthalene		5 U	5 U	5 U	1.70 J	38.40	32.80	29.40	5 U	1.0 J	5 U	1.10 J	5.00 U	5.00 U	5 U
Acenaphthene		5 U	5 U	5 U	22.90	5 U	82.90	66.50	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
Acenaphthylene		5 U	5 U	5 U	6.80	35.70	31.90	17.60	5 U	5 U	5 U	1.40 J	1.20 J	5.00 U	5 U
Anthracene		5 U	5 U	5 U	13.90	5 U	5 U	5 U	5 U	5 U	5 U	2.70 J	2.20 J	5.00 U	5 U
Benz(a)anthracene		5 U	2.30 J	1.10 J	46.30	5 U	5 U	5 U	5 U	5 U	5 U	4.40 J	7.20 J	5.00 U	5 U
Benzo(a)pyrene		5 U	5 U	1.50 J	103	5 U	5 U	5 U	5 U	5 U	5 U	6.70	16.90 J	5.00 U	5 U
Benzo(b)fluoranthene		5 U	5 U	1.40 J	81.80	5 U	5 U	5 U	5 U	5 U	5 U	5.10	16.40 J	5.00 U	5 U
Benzo(e)pyrene		5 U	5 U	1.30 J	67.90	5 U	5 U	5 U	5 U	5 U	5 U	4.0 J	9.70 J	5.00 U	5 U
Benzo(ghi)perylene		5 U	5 U	1.40 J	101.0	5 U	5 U	5 U	5 U	5 U	5 U	5.40	14.00 J	5.00 U	5 U
Benzo(k)fluoranthene		5 U	5 U	1.20 J	77.40	5 U	5 U	5 U	5 U	5 U	5 U	4.80 J	15.30 J	5.00 U	5 U
Biphenyl		5 U	5 U	5 U	1.90 J	15.60	13.10	10.60	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
Chrysene		5 U	1.40 J	1.30 J	62.30	5 U	5 U	5 U	5 U	5 U	5 U	6.10	8.00	5.00 U	5 U
Dibenzo(a,h)anthracene		5 U	5 U	5 U	11.50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1.50 J	5.00 U	5 U
Fluoranthene		5 U	1.20 J	2.60 J	168	5 U	5 U	5 U	5 U	1.20 J	5 U	7.90	16.10	5.00 U	5 U
Fluorene		5 U	5 U	5 U	2.10 J	5 U	58.10	5 U	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
Indeno[1,2,3-cd]pyrene		5 U	5 U	5 U	89.60	5 U	5 U	5 U	5 U	5 U	5 U	4.30 J	11.90 J	5.00 U	5 U
Naphthalene		5 U	5 U	5 U	14.90	39.10	31.30	31.70	5 U	1.20 J	5 U	1.10 J	5.00 U	5.00 U	5 U
Perylene		5 U	5 U	5 U	28.30	5 U	5 U	5 U	5 U	5 U	5 U	3.20 J	4.40 J	5.00 U	5 U
Phenanthrene		1.10 J	1.30 J	1.60 J	14.70	5 U	5 U	5 U	5 U	1.40 J	5 U	4.70 J	5.00	5.00 U	5 U
Pyrene		1.30 J	10.90	8.20	178	5 U	5 U	5 U	6.50	1.30 J	5 U	130	29.60	5.00 U	5 U
Total PAHs		2.40 J	17.02	21.60	1102.50	339.80	303.90	242.20	6.50	6.10	0	194.10	159.40	0.00	0
PCBs (µg/kg)															
Aroclor 1016		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1221		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1232		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1242		20 U	20 U	20 U	20 U	379	2410	459	20 U	20 U	452	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1248		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1254		20 U	20 U	20 U	20 U	1270	2260	1100	20 U	20 U	851.0	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1260		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Total PCBs (U=0)	50000	0	0	0	0	1769	5188.10	1894.80	0	0	1310.80	0	0	0.00	0.00

Notes:
U = analyte not detected at the indicated detection limit.
J = estimated value.
Shaded values exceed California TTLC criteria.
[1] Background sediment concentrations defined as 95% UPL Final Reference Pool levels from Exponent (2003).
[2] TTLC = Total Threshold Limit Concentration, per CCR Title 22, Division 4.5, Chapter 11, Article 3.

Table 3
Results of Additional Sediment Evaluation and Delineation (2006)

Analyte of Concern	California Haz Waste Criteria (TTLC)[1]	BAE-01-A 0-2 ft	BAE-01-B 2-4 ft	BAE-02-A 0-2 ft	BAE-02-B 2-4 ft	BAE-03-A 0-2 ft	BAE-04-A 0-2 ft	BAE-04-B 2-4 ft	BAE-54-B (dup) 2-4 ft	BAE-05-A 0-2 ft	BAE-05-B 2-4 ft	BAE-55-B (dup) 2-4 ft	BAE-06-A 0-2 ft	BAE-06-B 2-4 ft	BAE-07-A 0-2 ft	BAE-07-B 2-4 ft
Metals (mg/kg)																
Copper	2500	615	**8040**	**6610**	**4290**	497	**3400**	**3380**	**3460**	2160	**3240**	**2650**	1720	1340	723	715
Lead	1000	290	644	**1560**	908	249	841	**1390**	**1420**	591	660	694	311	315	243	199
Zinc	5000	1400	**6930**	3750	2120	529	**6280**	**8570**	**9490**	**6160**	**6640**	**6640**	1350	1410	572	485
PCB (µg/kg)																
Total PCBs	50000	640	3100	21700	38000	970	960	420	730	1340	1410	1320	3600	4700	4300	3300

Notes:
[1] TTLC = Total Threshold Limit Concentration, per CCR Title 22, Division 4.5, Chapter 11, Article 3.
Yellow shading indicates exceedances of TTLC criteria.

Table 4
Results of Post-Excavation Confirmation Sampling

Sample ID	Sample Date	Depth (ft)	Cu 2500 250	Pb 1000 100	Zn 5000 500	PCBs 50000 5000
BH 1	06/13/06	4.00	230	32.8	109	700
BH 2	06/13/06	4.00	0.968	1.05	7.35	ND
BH 3	06/12/06	4.00	55.7	8.99	56.2	1160
BH 4	06/19/06	4.00	395	326	2120	2800
BH 4.1	06/21/06	6.00	**4900**	699	2310	16500
BH 4.2	06/23/06	8.00	102	140	93.8	ND
BH 5	06/16/06	4.00	33.6	10.5	544	780
BH 6	06/12/06	4.00	8.13	2.48	17.2	ND
BH 7	06/16/06	4.00	3.45	5.79	23.9	1000
BH 8	06/12/06	4.00	**3360**	598	3590	17100
BH 8.1	06/16/06	6.00	233	44.6	277	ND
BH 9	06/30/06	4.00	2090	275	2320	950
BH 9.1	09/30/06	6.00	ND	1.13	41	NA
BH 10	06/23/06	4.00	2450	791	4750	3700
BH 10.1	06/27/06	6.00	94.7	24.8	131	920
BH 11	06/23/06	4.00	**3220**	647	**5980**	1000
BH 11.1	06/27/06	6.00	293	209	333	750
BH 12	06/30/06	4.00	1480	163	186	3100
BH 12.1	09/30/06	6.00	ND	ND	10.1	NA
BH 13	06/23/06	4.00	**5100**	560	**7200**	1070
BH 13.1	06/27/06	6.00	4.6	0.984	12.2	ND
BH 14	06/23/06	4.00	**2950**	578	**5860**	1060
BH 14.1	06/27/06	6.00	12.6	3.33	18.8	ND
BH 15	06/30/06	4.00	693	251	451	4000
BH 15.1	09/30/06	6.00	ND	0.313	5.36	NA
BH 16	06/23/06	4.00	1760	452	2990	1650
BH 16.1	06/27/06	6.00	217	68.5	300	540
BH 17	06/23/06	4.00	1280	306	3110	3800
BH 17.1	06/27/06	6.00	381	125	750	202
BH 18	08/17/06	4.00	1.13	1.2	12.3	ND
BH 19	08/17/06	4.00	1.37	2.02	16.1	ND
BH 20	08/17/06	4.00	2.24	2.31	11.9	ND
Wedge 1	09/07/06	8.00	16.6	6.65	26.7	ND
Wedge 2	09/07/06	8.00	13.7	16.3	51.9	ND

Notes:
ND = Not detected.
Yellow shading indicates exceedances of TTLC criteria.

Table 5
Concentrations of Key Chemicals in Representative Samples of Imported Sand Fill

		Residential CHHSL [1]	3000	150	23000	0.089
		Commercial/Industrial CHHSL [1]	38000	3500	100000	0.3
Sample ID	Import Location	Delivery/ Sample Date	Cu	Pb	Zn	PCBs
F1	Coronado High School	6/14/06	7.94	56.3	69.1	ND
F2	Coronado High School	6/14/06				
F3	Coronado High School	6/14/06				
F4	Coronado High School	6/14/06				
F5	Coronado High School	6/14/06				
F6	Coronado High School	6/14/06	15.8	11.8	47.7	ND
F7	Coronado High School	6/14/06				
F8	Coronado High School	6/14/06				
F9	Coronado High School	6/14/06				
F10	Coronado High School	6/14/06				
F11	Coronado High School	6/14/06	7.73	2.88	22.9	ND
F12	Coronado High School	6/14/06				
F13	Coronado High School	6/14/06				
F14	Coronado High School	6/14/06				
F15	Coronado High School	6/14/06				
F16	Coronado High School	6/16/06	12.6	6.33	30.4	ND
F17	Coronado High School	6/16/06				
F18	Coronado High School	6/16/06				
F19	Coronado High School	6/16/06				
F20	Coronado High School	6/16/06				
F21	Coronado High School	6/16/06	20.2	9.67	48.2	ND
F22	Coronado High School	6/16/06				
F23	Coronado High School	7/17/06				
F24	Coronado High School	7/17/06				
F25	Coronado High School	7/17/06				
F26	Coronado High School	7/17/06	34.1	11.1	49.3	ND
F27	La Jolla	7/18/06				
F28	La Jolla	7/18/06	7.21	3.38	49.6	ND
F29	La Jolla	7/18/06				
F30	La Jolla	7/18/06				
F31	La Jolla	7/18/06				
F32	La Jolla	7/18/06				
F33	La Jolla	7/19/06				
F34	La Jolla	7/19/06				
F35	La Jolla	7/19/06	9.75	3.07	60.8	ND
F36	La Jolla	7/19/06				
F37	La Jolla	7/19/06				
F38	La Jolla	7/19/06				
F39	La Jolla	7/19/06				
F40	La Jolla	7/19/06				
F41	La Jolla	7/19/06				
F42	La Jolla	7/19/06	4.14	4.99	24.3	ND
F43	La Jolla	7/19/06				
F44	La Jolla	7/19/06				
F45	No Sample					
F46	52nd & Polk, San Diego	7/20/06	4.73	13.5	39.5	ND
F47	52nd & Polk, San Diego	7/20/06				
F48	52nd & Polk, San Diego	7/20/06				
F49	52nd & Polk, San Diego	7/20/06				
F50	52nd & Polk, San Diego	7/20/06				
F51	52nd & Polk, San Diego	7/20/06	5.67	17.4	50.1	ND

Table 5
Concentrations of Key Chemicals in Representative Samples of Imported Sand Fill

		Residential CHHSL[1]	3000	150	23000	0.089
		Commercial/Industrial CHHSL[1]	38000	3500	100000	0.3
Sample ID	**Import Location**	**Delivery/ Sample Date**	**Cu**	**Pb**	**Zn**	**PCBs**
F52	52nd & Polk, San Diego	7/20/06				
F53	52nd & Polk, San Diego	7/20/06				
F54	52nd & Polk, San Diego	7/20/06				
F55	Hotel Del Coronado	7/21/06	1.02	2.04	7.29	ND
F56	Hotel Del Coronado	7/21/06				
F57	Coronado High School	8/3/06				
F58	Coronado High School	8/3/06	4.83	26.9	51	ND
F59	Coronado High School	8/3/06				
F60	Coronado High School	8/3/06				
F61	Children's Hospital	8/16/06				
F62	Children's Hospital	8/16/06	3.28	2.96	14.4	ND
F63	Children's Hospital	8/16/06				
F64	Children's Hospital	8/16/06				
F65	Children's Hospital	8/17/06				
F66	Children's Hospital	8/17/06				
F67	Children's Hospital	8/17/06	3.04	2.21	12.8	ND
F68	Children's Hospital	8/17/06				
F69	10th & K, San Diego	8/17/06	5.21	3.32	19.7	ND
F70	10th & K, San Diego	8/17/06				
F71	Coronado High School	8/19/06				
F72	Coronado High School	8/19/06				
F73	Coronado High School	8/19/06				
F74	Coronado High School	8/19/06				
F75	Aero Drive	8/24/06				
F76	Aero Drive	8/24/06				
F77	Aero Drive	8/24/06	4.89	2.64	24.3	ND
F78	Aero Drive	8/24/06				
F79	Aero Drive	8/24/06				
F80	La Jolla	8/24/06	24.1	8.7	104	ND
F81	La Jolla	8/24/06				
F82	La Jolla	8/24/06				
F83	La Jolla	8/24/06				
F84	La Jolla	8/24/06				
F85	La Jolla	8/24/06	23.5	8.64	102	ND
F86	La Jolla	8/24/06				
F87	8th & D, National City	10/3/06				
F88	8th & D, National City	10/3/06	5.77	24.1	45.6	ND
F89	8th & D, National City	10/4/06				
F90	8th & D, National City	10/4/06				
		AVERAGE	**10.3**	**11.1**	**43.6**	**ND**

Notes:
ND = Not Detected.
[1] CHHSL values = California Human Health Screening Levels.
From http://www.calepa.ca.gov/Brownfields/documents/2005/NumberReport.pdf

BAE00085669

Table 6
Water Quality Compliance Criteria

Parameter	Compliance Boundary Standard
Turbidity	No more than 20% above background turbidity levels
	Shall not exceed a maximum of 225 NTU at any time
Dissolved oxygen	Not depressed more than 10% below the background DO levels
pH	No more that 0.2 above or below background levels
	Within limits of 6.0 and 9.0 at all times
Visual	Floating particulates, suspended materials, grease, or oil shall not be visible
	No aesthetically undesirable discoloration of the water surface
Fish and Wildlife	No toxic, radioactive, or deleterious materials are allowed to affect the most sensitive biota
	If any distressed or dying fish are observed, the contractor will be required to cease the offending construction activity

Table 7
Updated (Post-Construction) Summary of Modeling Parametric Analyses

Parameter	Co (mg/kg)[1]	Kd (L/kg)	Co (mg/L)	Information Source
Copper	323	20,452	**0.016**	Kd values calculated from E^{x}ponent sediment partitioning equations (2003)
	323	85	**3.80**	Kd values calculated per Aziz et al. 2001
Lead	92	15402	**0.006**	Kd values calculated from E^{x}ponent sediment partitioning equations (2003)
	92	1150	**0.08**	Kd values calculated per Aziz et al. 2001
Zinc	324	20067	**0.016**	Kd values calculated from E^{x}ponent sediment partitioning equations (2003)
	324	140	**2.31**	Kd values calculated per Aziz et al. 2001
PCBs	0.71	602	**0.0012**	(TOC = 0.01)[2] weighted average of Aroclors 1254 and 1242 Koc (RAIS 2004)
	0.71	8200	**0.000087**	(TOC = 0.01)[2] using total PCB Koc (RAIS 2004)

Notes:

[1] Calculated as 95% Upper Confidence Limit of all samples taken within the project footprint.

[2] TOC = Total Organic Carbon of sediments in which concentrations were measured.

Table 8
Updated (Post-Construction) Fate and Transport Modeling Input Parameters

Parameter	Units	Constituents Modeled				Information Source
		Copper	Lead	Zinc	Total PCBs	
Controlling Cap Layer	NA	Sand	Sand	Sand	Sand	Possible cap alternatives.
Cap Layer Thickness	cm	90	90	90	90	Assumed effective thickness was 100 cm minus 10 cm at bioturbation.
Cap Material Porosity	unitless	0.4	0.4	0.4	0.4	Typical values for placed sand
Specific Gravity of Cap	g/cm^3	2.5	2.5	2.5	2.5	Typical values for placed sand
In Situ Bulk Density Cap	g/cm^3	1.5	1.5	1.5	1.5	Calculated from porosity and specific gravity per page B24 of Reible (1998).
Cap TOC Content [1]	fraction	0.001	0.001	0.001	0.001	Typical values for sand imported from local sources
PCB K_{oc} [2]	L/kgOC	n/a	n/a	n/a	60,200	Weighted average of Aroclors found in sediment (1242 and1254; RAIS 2004).
Cap K_d [3]	L/kg	100	1,200	200	60.2	PCB $K_d = K_{oc}$ * TOC. Kd values for Copper, Lead, and Zinc are from Aziz et al., 2001.
Groundwater Seepage Velocity	cm/yr	17.79	17.79	17.79	17.79	$Vx = Q/(n_e*A)$, where Q = discharge and A = cross-sectional area. Or: $Vx = (k\,dh)/(n_e\,dl)$ Assume K = 0.00003 cm/sec, ne = 0.25, dh/dl = 0.0047.
Diffusion Coefficient	cm^2/yr	225	267	222	190	Conservatively high value from range of diffusion coefficients for PCBs (RAIS 2004); For metals D = (RT/F2)(lambda/charge of the ion).
Porewater Concentration in Underlying Sediments	mg/L	**3.80**	**0.080**	**2.31**	**0.0012**	95 percent UCL porewater concentration calculated from post-construction sampling.
Porewater Concentration in Underlying Sediments (pre-construction estimate) [5]	*mg/L*	***3.89***	***0.094***	***2.66***	***0.0023***	*95 percent UCL porewater concentration calculated from bulk chemistry cores obtained prior to construction.*

Notes:

[1] TOC = Total Organic Carbon.

[2] Koc = Organic carbon partitioning coefficient.

[3] Kd = Partitioning coefficient.

[4] Calculated as shown in Table 7, using the most conservative (highest) value.

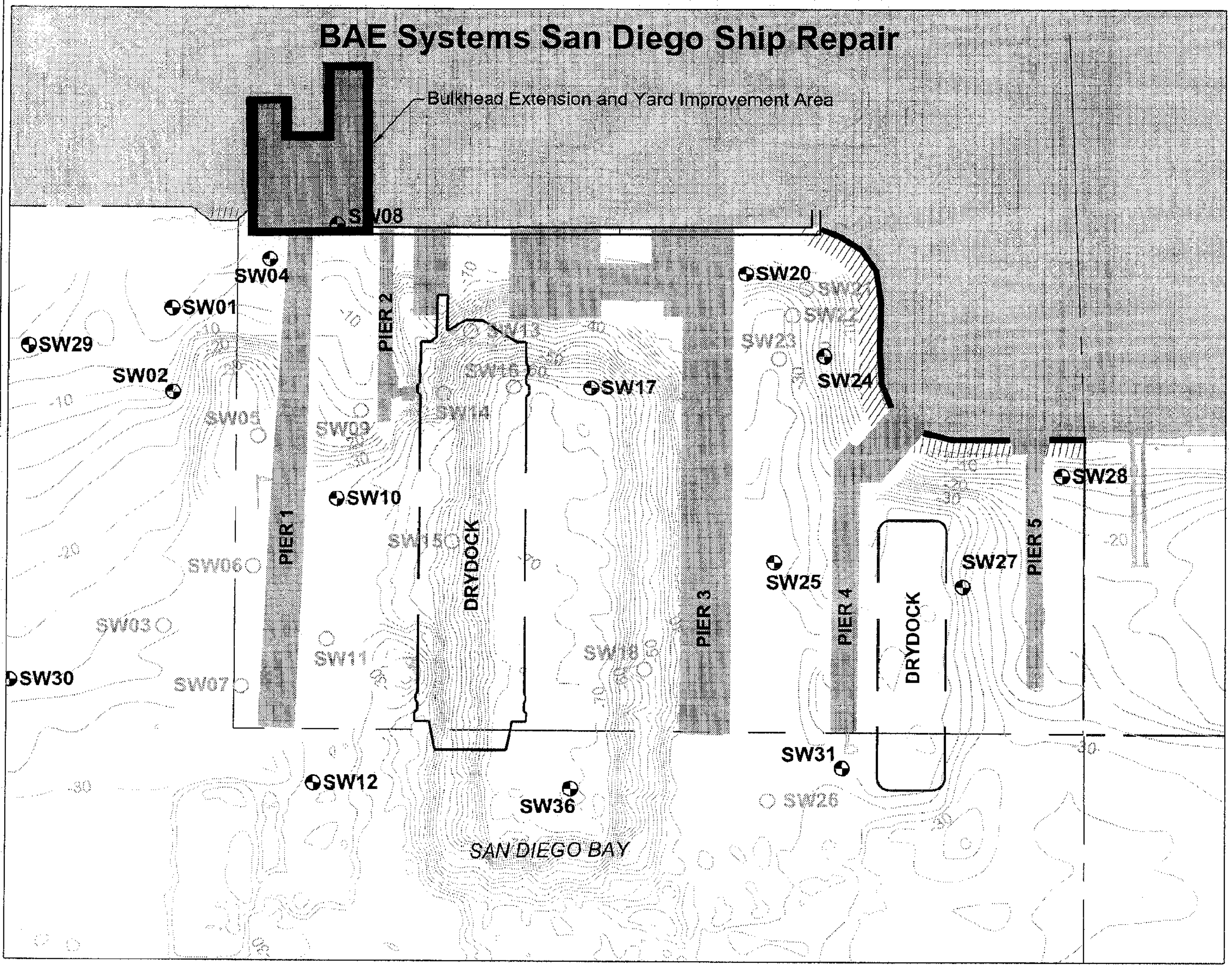
[5] Based on pre-construction data and projections, as presented in Anchor (2005).

Table 9
Updated (Post-Construction) Fate and Transport Modeling Results

Chemical	Predicted concentrations in water (mg/L)			California Toxics Rule WQ Criteria (mg/L)	Years until predicted breakthrough	*Years until predicted breakthrough (pre-construction estimate)* [1]
	25 yrs after construction	50 yrs after construction	100 yrs after construction			
Copper	0	0	0	3.1E-03	**690**	***690***
Lead	0	0	0	8.1E-03	**14,000**	***13,600***
Zinc	0	0	0	0.081	**2,060**	***1,760***
Total PCBs	0	0	0	3.25E-10	**250**	***185***

Notes:
[1] Based on pre-construction data and projections, as presented in Anchor (2005).

FIGURES



Existing Shoreline

Bulkhead Wall

Revetted Slope

Previous Sediment Investigation Sample Location and Number (Exponent, 2003)

SW06 – Surface Sample

SW32 – Subsurface Core

0 200
Scale in Feet

Notes:

1. Bathymetric contours from "Southwest Marine Bathymetric Survey" by Racal Pelagos, dated Janurary 25, 2000; and supplemented by neashore soundings by URS (2002)

2. 10 foot contours labeled. 2 foot contours also shown.

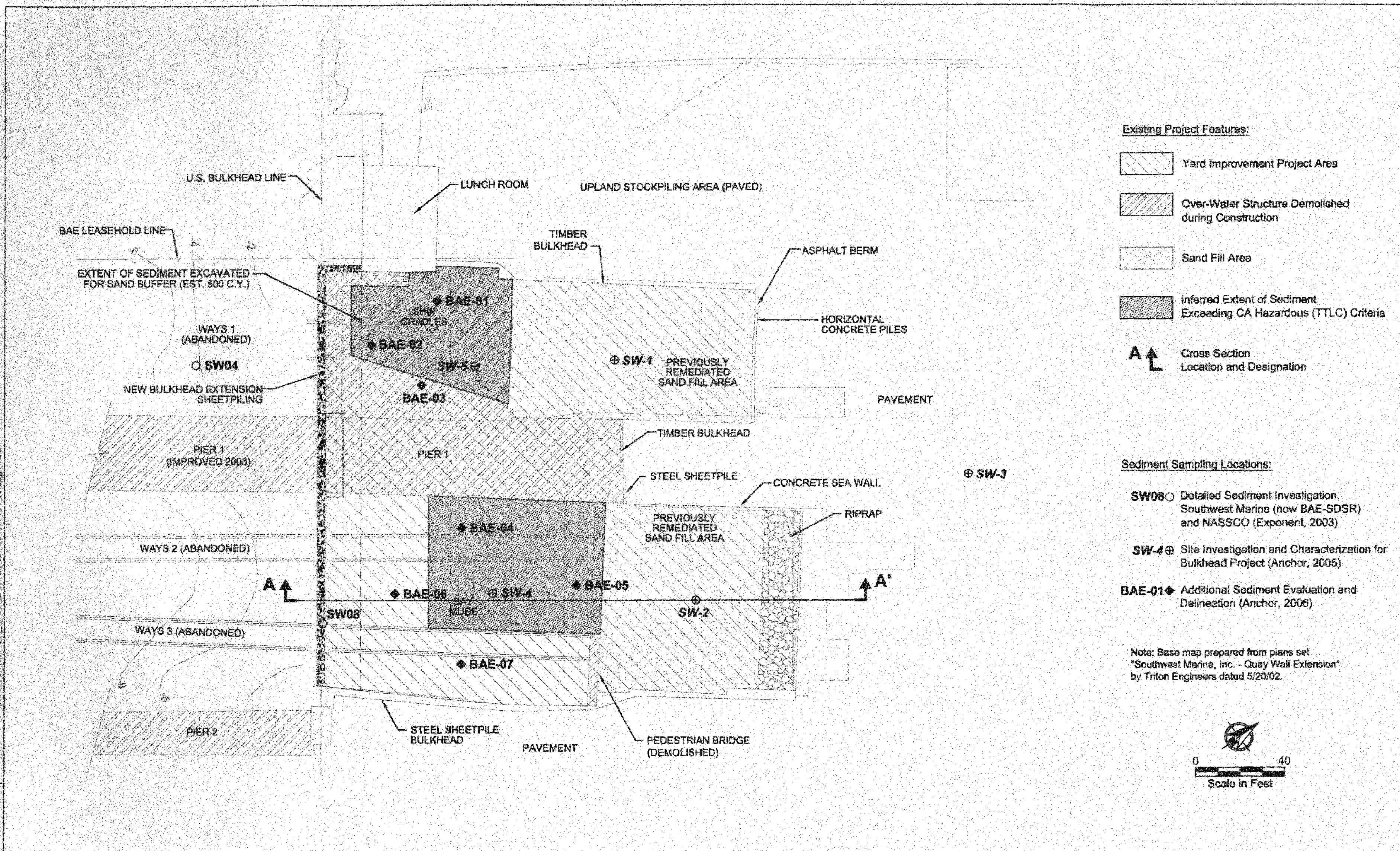
3. Horizontal Datum is UTM NAD83 Zone 11 North, Meters.

4. Vertical Datum is MLLW in Feet

Nov 28, 2006 3:11pm cdavidson K:\Jobs\040277-SW_MARINE\04027701\04027701-01.dwg Fig 1

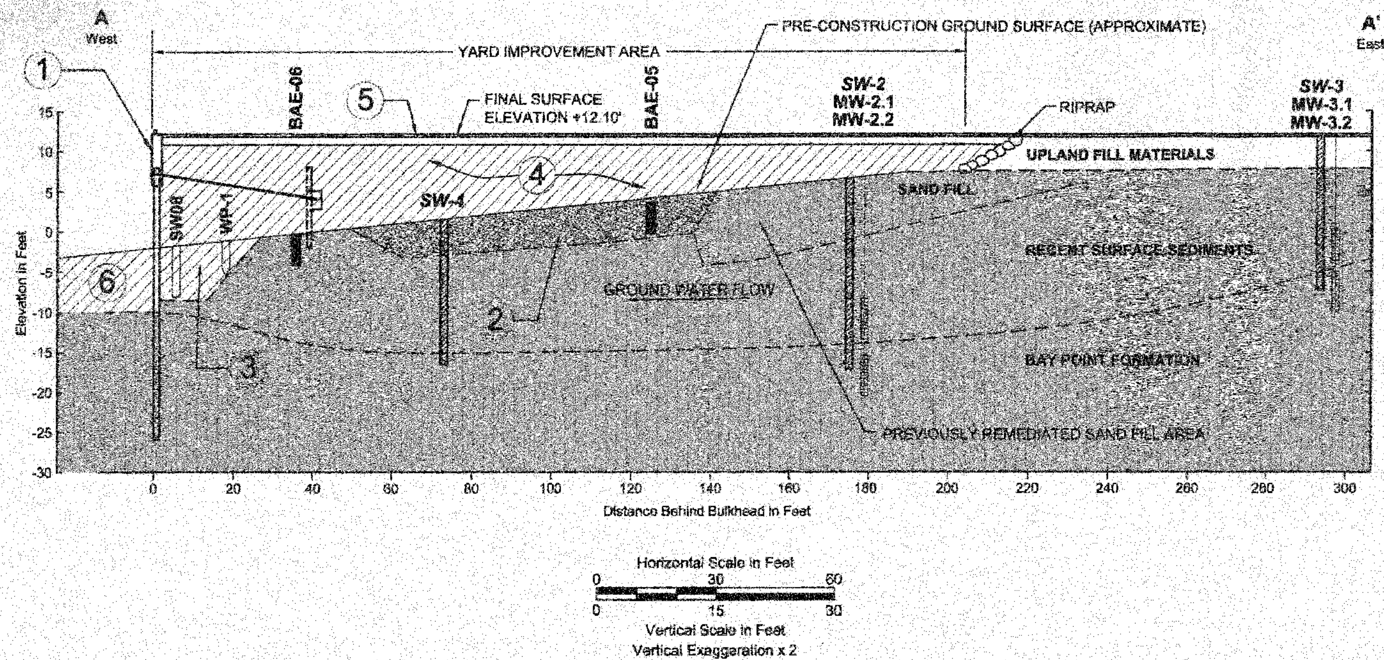
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 1
Project Location Plan
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2
Project Site Plan and Initial Delineation of Sediment Chemistry
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



Project Construction Sequence
(refer to circled numbers on cross section above)

1. Sheetpile Bulkhead Installed.
2. Hazardous Waste Sediments Excavated from Project Area, where present.
3. Chemically Impacted Sediment Excavated from "Wedge" immediatery behind Installed Bulkhead.
4. Excavation and Yard Improvement Area Backfilled with Compacted Import Fill.
5. Aggregate Base and Asphalt to be Placed Over Entire Yard Improvement Area.
6. Sheetpile Wall Designed for Potential Future Removal of Sediments Outside Wall.

Clean Backfill

Inferred Extent of Sediment Exceeding CA Hazardous Waste (TTLC) Criteria

SW08 — Previously Advanced Sediment Core (Exponent, 2003)

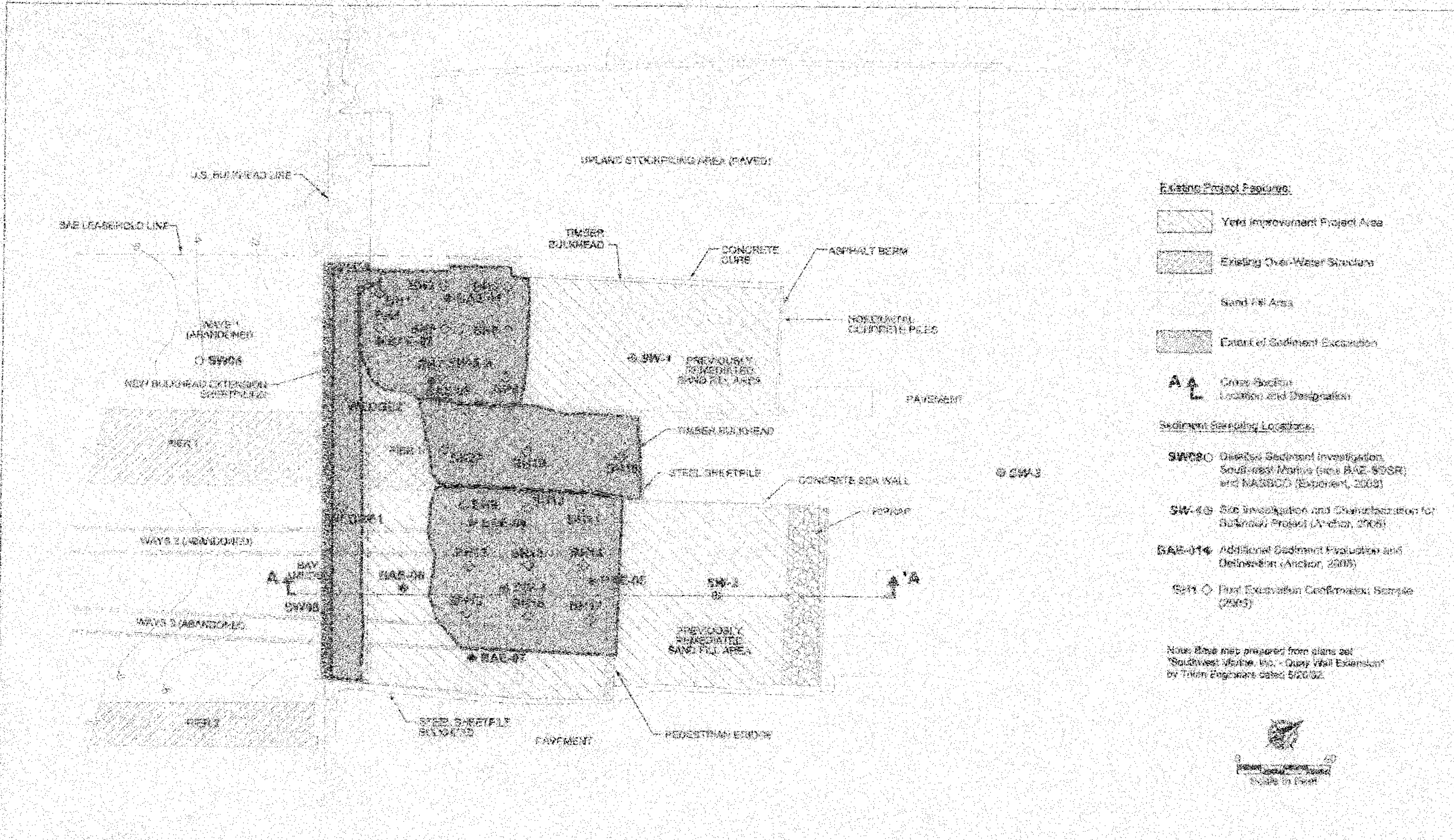
SW-2 MW-2.1 — Sediment Core and Monitoring Well (Anchor, 2005)

BAE-05 — Sediment Core, 2006

Note:
Structural features and existing ground surface based on plans set "Southwest Marine, Inc. - Quay Wall Extension" by Triton Engineers Dated 5/20/02.

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 3
Project Site Cross-Section and Initial Delineation of Sediment Chemistry
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5
Extents of Sediment Excavation
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair

BAE00085678

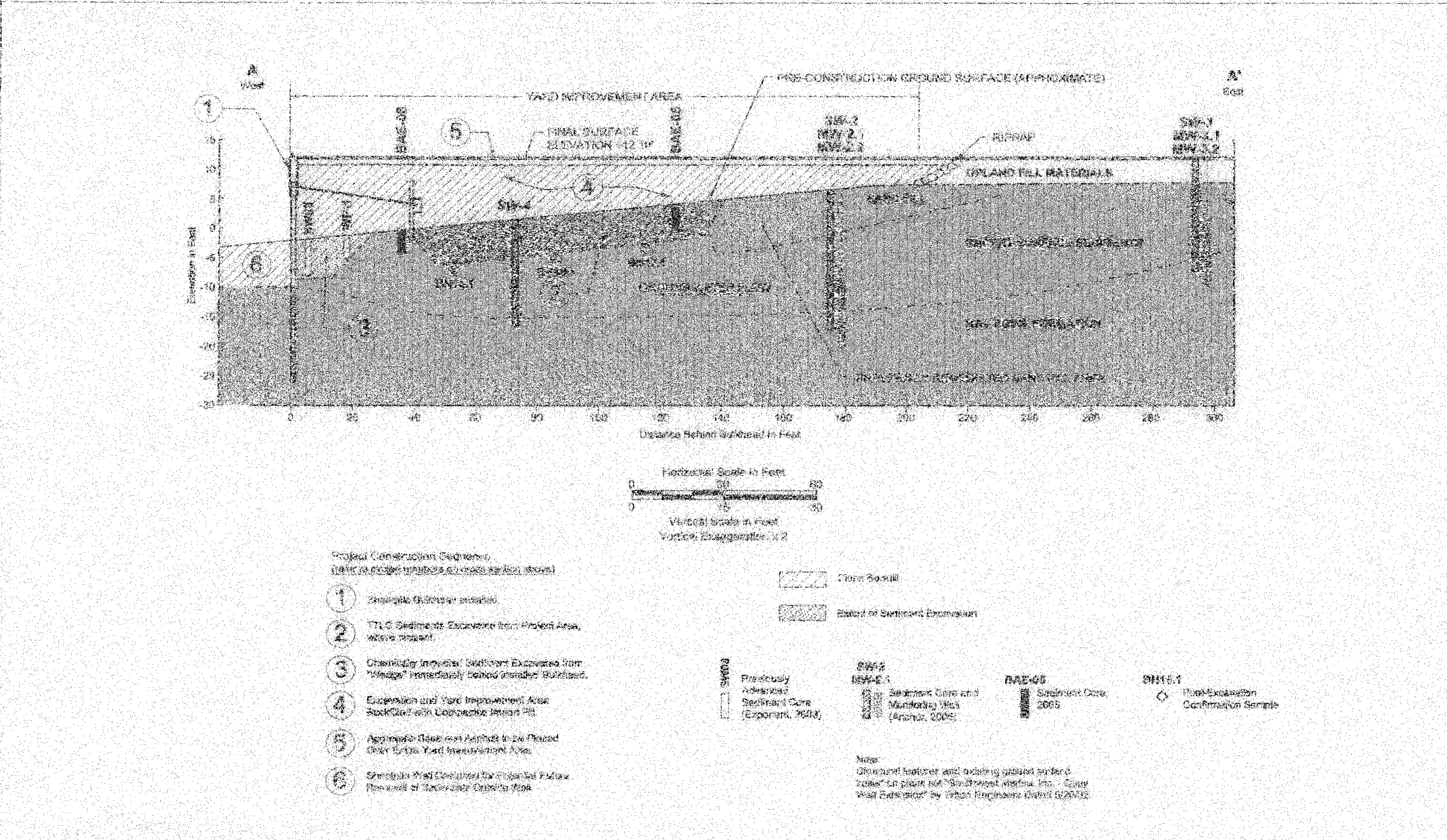
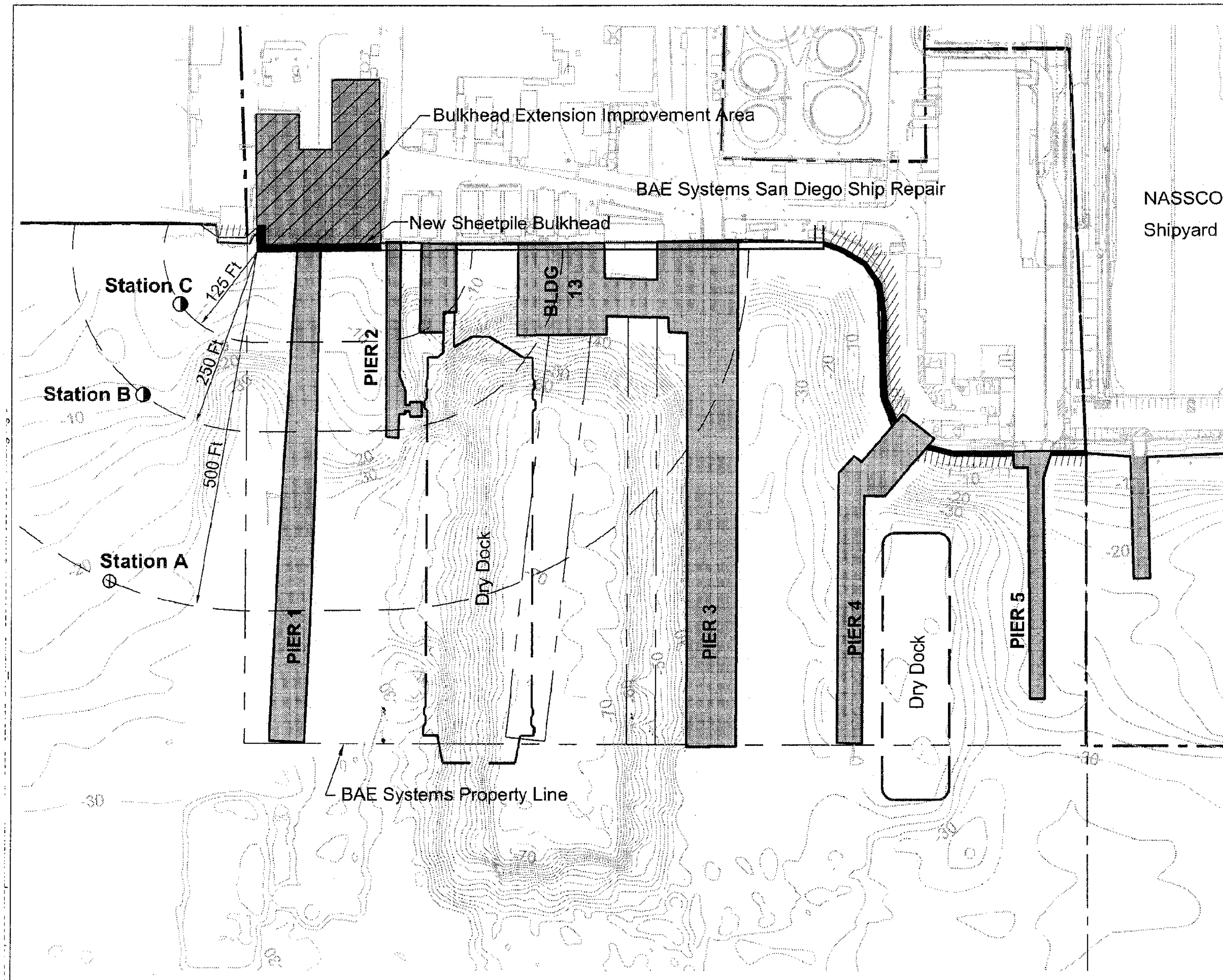


Figure 5
Cross-Section of Sediment Excavation and Backfilling
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair

ANCHOR



◑ – Water Quality Monitoring Location

⊕ – Background Water Quality Monitoring Location

Note:

Actual monitoring locations will be varied along lines shown in response to tidal currents, construction conditions, shipyard obstructions and other factors.

0 200
Scale in Feet

Base Map Notes:

1. Bathymetric contours from "Southwest Marine Bathymetric Survey" by Racal Pelagos, dated Janurary 25, 2000; and supplemented by neashore soundings by URS (2002)

2. 10 foot contours labeled. 2 foot contours also shown.

3. Horizontal Datum is UTM NAD83 Zone 11 North, Meters.

4. Vertical Datum is MLLW, Feet.

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 6
Water Quality Monitoring Locations
Bulkhead Extension Project
BAE Systems San Diego Ship Repair, Inc

APPENDICES

(ENCLOSED ON CD)

Appendix A	Results of 2006 Sediment Characterization Sampling for CA Hazardous Waste
Appendix B	Data Validation Review Review Report for 2006 Sediment Characterization Sampling
Appendix C	Results of Confirmational Sampling during TTLC Sediment Excavation
Appendix D	Results of Testing for Landfill Acceptance
Appendix E	Waste Disposal Manifests
Appendix F	Testing Results on Selected Samples of Imported Backfilling Materials
Appendix G	Results of Water Quality Monitoring
Appendix H	Daily Construction and Water Quality Photographs
Appendix I	Daily Site and Water Condition Logs

Anchor Environmental, L.L.C.
1423 Third Avenue #300
Seattle, WA 98101
T 206.287.9130
F 206.287.9131

Technical Memorandum

To: Shaun Halvax, Southwest Marine, Inc.

From: Michael Whelan, P.E. and David Keith, R.G, C.HG., Anchor Environmental

Date: September 26, 2003

Re: Evaluation of Sediments for Placement Behind Bulkhead Extension
Southwest Marine Shipyard, San Diego

CC: David Templeton and Rebecca Desrosiers, Anchor Environmental

---

The purpose of this memorandum is to present our recommended course of action for further evaluation of sediments that are planned for placement behind the bulkhead extension planned for your site. The intention of this evaluation will be to demonstrate how sediments placed behind the bulkhead extension can be stabilized to improve their structural and chemical leachability characteristics.

1 INTRODUCTION

1.1 Rationale for Placing Chemically Impacted Sediments Behind Bulkhead Extension

We believe that there are a number of advantages for Southwest Marine (SWM) to continue to explore the possibility of placing dredged sediment behind their bulkhead extension. As SWM moves toward site cleanup as required by the California Regional Water Quality Control Board, San Diego Region (the Board), the planned bulkhead extension provides an opportunity to expedite removal of chemically impacted sediments from selected areas as an independently executed precursor to the overall site action. This in turn could give SWM significant leverage in its dealings with the Board on the remaining shipyards remedial action.

1.2 Identification of Candidate Sediment for Confinement Behind Bulkhead

Phase 1 and Phase 2 shipyard sediment characterizations previously conducted by Exponent (2003) indicate areas where sediment removal will be necessary once SCLs are promulgated. These areas are candidates for dredging and placement behind the constructed bulkhead. These sediments are best represented by cores SW01, SW02, SW04, and SW08, located outside of and near to the bulkhead extension area on the north and south sides of Pier 1. These sediment appear likely to require removal, due to their relatively high chemical concentrations of PCBs and metals (pending final selection of cleanup levels by the Board). In addition, operational considerations along Pier 1 (i.e., needs for berthing depth) may also dictate removal of these sediments (as opposed to capping).

1.3 Review of Permit Application Process to Date

In March, 2003, we provided text with supporting figures and tables for possible use in preparing your permit application for the quay wall work. This included a general description of the bulkhead extension project, a preliminary dredging plan for sediments that can be placed behind the bulkhead, structural and design considerations, and a preliminary evaluation of environmental issues related to the confinement of contaminated sediment behind the constructed bulkhead. We concluded this evaluation by stating that additional testing of a representative sediment sample is needed to better identify the need for engineering controls and/or amendment of the dredged material, in order to ensure that surface water is not impacted outside the constructed bulkhead.

In May, SWM elected to postpone the presentation of this option to regulatory agencies until the necessary supporting environmental testing was completed. Instead, SWM decided to submit a version of the permit application that did not include a description of depositing dredged sediments behind the bulkhead. SWM also proposed modifications to the preliminary dredging plan.

The remainder of this memorandum describes our recommended approach for sampling and analyzing sediments identified for placement behind the bulkhead extension, in order to support further progress on obtaining permits for the work.

2 PROPOSED SAMPLING AND ANALYSIS PROGRAM

2.1 Field Sampling Program

Our understanding of the extent of impacted sediments in the SWM shipyard area is based on a series of cores obtained from Exponent's Phase I and II characterization of the area. We propose to collect six additional cores in order to better define the leaching characteristics of the sediment and in order to collect enough sediment to support chemical testing. The cores would be taken from within the area of impacted sediment and used to create a composite sample that is representative of the sediment planned for dredging. The cores would be obtained using a piston coring sampler with a two-person crew on a small boat. Each core would be advanced to the depth at which refusal is encountered (an estimated 4 to 6 feet, based on Exponent's previous work in the area).

2.2 Proposed Chemical and Physical Testing Program

Material from each core will be combined to form a single composite sample for subsequent analytical and bench-scale testing. An aliquot of this composite will be used for evaluation of water quality impacts and potential leachability of compounds from the untreated sediment, by conducting a standard soluble threshold limit concentration (STLC) test. The STLC is a standard test required for upland disposal in California, and would be required whether the sediment is placed behind the bulkhead extension or whether it is sent to disposal at an in-state uplands facility. It involves saturating the composited sediment in a specified water mixture, which is theoretically representative of precipitation. The water collected from the test will then undergo analysis to determine the potential for contaminant leaching from the sediment matrix into adjacent water sources. The analysis will include measurements of metals, PAHs, and PCBs, as well as basic index property tests such as grain size and Atterberg limits.

It may be advantageous to stabilize the sediment using concrete, fly ash, or other pozzolanic admixtures, so as to improve its structural characteristics and lessen its potential for contaminant leaching. We will evaluate means of achieving this stabilization by performing a series of up to three additional STLC tests on portions of the sediment composite which have been stabilized by adding such admixtures. This will allow us to assess the relative benefits of the stabilization process with respect to leachate control, and to distinguish the relative success of the various mixes at accomplishing this.

The addition of admixtures for stabilization of sediment prior to placement behind the bulkhead extension is also expected to enhance the internal strength of the material. The magnitude of this benefit depends on the composition of the raw sediment and the proportions of amendment agents added. Therefore, upon successful demonstration of the mixtures' ability to prevent contaminant leachate production, we will perform a suite of geotechnical tests on the mix design that appears to have been most successful, to characterize the amended material in terms of its enhanced strength and compressibility properties. These tests will include Modified Proctor (for compaction), unconfined compression (for strength), and consolidation analysis (for settlement).

2.3 Reporting

Following the completion of our testing, we will prepare a brief technical memorandum summarizing the results of our field investigation and laboratory testing and their implications on the bulkhead extension's ability to confine contaminated sediments. This memorandum will ultimately be suitable for submission to the permitting agencies and the Board, to aid in their review of your proposal to place stabilized dredged material behind the new bulkhead.

2 weeks to collect Sample

CONSTRUCTION COMPLETION REPORT
BULKHEAD EXTENSION AND YARD IMPROVEMENT PROJECT

BAE SYSTEMS SAN DIEGO SHIP REPAIR INC.

Prepared for

BAE Systems Ship Repair Inc.
2205 E. Belt Street
San Diego, California 92113

Prepared by

Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 620
Laguna Niguel, California 92677

December 2006

Table of Contents

List of Tables

List of Figures

List of Appendices (provided on CD)

List of Acronyms

Anchor	Anchor Environmental CA, L.P.
SDSR	BAE Systems San Diego Ship Repair Inc.
BMPs	Best Management Practices
CHHSLs	California Human Health Screening Levels
COCs	constituents of concern
CCR	California Code of Regulations
CTR	California Toxics Rule
DO	dissolved oxygen
MLLW	mean lower low water
NTUs	nephelometric turbidity units
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
the Project	Bulkhead Extension and Yard Improvement Project
SDRWQCB	California Regional Water Quality Control Board, San Diego Region
STLC	Soluble Threshold Limit Concentration
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentrations
VOCs	Volatile Organic Compounds
WQC	Water Quality Certification

1 INTRODUCTION

In 2006, BAE Systems San Diego Ship Repair Inc. (SDSR; formerly known as Southwest Marine, Inc.) completed reconfiguration of a portion of its ship repair yard. The construction, termed the Bulkhead Extension and Yard Improvement Project (henceforth, "the Project"), involved the installation of a steel sheetpile bulkhead across the mouth of a slip formerly occupied by three abandoned marine railways, removal of selected sediments from the slip, and backfilling with clean imported backfill to create additional upland yard space for the facility. This report documents the completion of the environmental aspects of the Project, including a brief narrative summary of the work and its accompanying environmental monitoring and sampling, and updated modeling of predicted long-term water quality impacts from the Project.

Figure 1 identifies the general location of the Bulkhead Extension and Yard Improvement Project relative to the entire BAE Systems San Diego Ship Repair yard and facilities. The construction was performed under U.S. Army Corps of Engineers Individual Permit No. 200301115-KW, Coastal Development Permit No. CDP-2003-10, Port of San Diego Construction Approval (Project No. 021-015-1965) and mitigated negative Declaration (UPD #83356-ND-597), and two separate 401 Water Quality Certifications ([WQCs] Files No. 03C-065 and 04C-097 for two phases of construction activity described below) from the California Regional Water Quality Control Board, San Diego Region (SDRWQCB). Among other requirements, these permits mandated certain environmental controls for the Project, including:

- Removal of in-place sediments containing chemicals in excess of California hazardous waste levels (Total Threshold Limit Concentrations, or TTLCs, per California Code of Regulations Title 22), and their disposal at permitted upland landfill facilities.
- Protection of water quality in the adjacent waters of San Diego Bay, through Best Management Practices (BMPs), and as verified by daily observations and monitoring, per the Project's Water Quality Monitoring Plan (Anchor, 2004).

Previous investigations and analyses conducted by Anchor Environmental CA, L.P. (Anchor) demonstrated the Project's overall short- and long-term protectiveness to water quality in adjoining San Diego Bay waters, and to human health and the environment (Anchor, 2005).

Mitigation for construction-related impacts to intertidal bay bottom (0.77 acres total) was achieved through the creation of additional 0.77 acres of intertidal habitat at the Sweetwater Channel/D Street Fill mitigation area, as part of a Port of San Diego mitigation project, defined in the third amendment to the BAE Systems lease with the Port of San Diego. Eelgrass mitigation was accomplished through the creation of additional eelgrass habitat (at a 1:1.2 ratio) in the vicinity of Pier 3 on the SDSR property and at the Sweetwater Channel/D Street Fill mitigation area. Documentation of these mitigation measures can be found in Appendices J and K, respectively.

1.1 Overview of Construction

Figures 2 and 3 present detailed plan and cross-sectional views of the bulkhead improvement area and proposed construction activities. The Project was performed in two phases; the general sequence of construction is illustrated as a typical cross-section on Figure 2.

Phase 1 of the Project began on March 13, 2006 and involved removing marine structures from the area and installing a new section of sheetpile bulkhead across the face of the abandoned railways (Figure 2). After completion of Phase 1, Phase 2 construction activities commenced in June 2006. Phase 2 included removal of selected sediments from the Project footprint and a "wedge" of material situated immediately behind the new bulkhead (Figure 3), then after testing to confirm chemical contaminant removal, backfilling the Project site with imported, clean, granular fill to the elevation of the surrounding grade (approximately +12 feet mean lower low water [MLLW]). Construction was completed on October 13, 2006 and the surface of the clean backfill area was paved in November 2006 to support shipyard operations.

1.2 Contents of this Report

This report provides brief narrative descriptions and documentation of the following elements of the construction activity:

- Section 2 describes the characterization of sediments in the Project area. The initial delineation of sediments requiring removal because they qualified as hazardous waste under California environmental regulations.

- Section 3 describes the excavation of sediments identified to exceed TTLC criteria, as well as confirmational sampling that was conducted to verify that sediments were sufficiently removed.
- Section 4 describes the disposal of excavated sediments at local and regional landfills, as well as characterization of the excavated sediment for approval by these landfills.
- Section 5 describes the backfilling of the Project area with clean, imported fill materials.
- Section 6 describes monitoring of water quality during the construction process.
- Section 7 presents updated modeling of chemical transport and long-term water quality impacts from the completed Project.
- Section 8 summarizes the conclusions of this report.

Supporting data is presented in tables following the text, and in a series of appendices, attached to this report in CD format.

2 SEDIMENT CHARACTERIZATION AND DELINEATION OF EXCAVATION REQUIREMENTS

Sediments in place within the Project area were characterized over the course of three different sampling and analysis efforts. The locations of samples and sediment cores are summarized on Figure 2. The three investigations are as follows:

2.1 Detailed Sediment Investigation of BAE Systems and NASSCO Shipyards (2002/2003)

A detailed site sediment investigation was conducted for both the SDSR (then known as Southwest Marine) and adjoining NASSCO shipyards in 2002 and 2003. This investigation, documented in Exponent (2003), was conducted in response to SDRWQCB Resolution Nos. 2001-02 and 2001-03 and subsequent Water Code Section 13267 letters issued to the shipyards. The investigation involved a series of surface and core samples taken from site sediments throughout both shipyards' leasehold areas and beyond.

Sediments along and in the vicinity of the planned bulkhead were represented by cores SW04 and SW08, taken in close proximity to the alignment of the bulkhead (refer to Figure 2). Sediment chemistry from various depth intervals in these two cores are summarized in Table 1. Impacted sediments were identified in both cores to a depth of about 4 feet (although core SW04 could not be penetrated beyond this depth because refusal was reached, so deeper materials could not be sampled at this location). The primary constituents of concern (COCs) in the impacted sediments include elevated concentrations of metals, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs).

2.2 Vertical and Lateral Characterization of Sediment and Groundwater (2004)

In 2004, following meetings and communications with the SDRWQCB, SDSR commissioned an additional, site-specific study of sediments within the Project footprint in order to demonstrate to the SDRWQCB that the proposed Project would be protective of water quality in San Diego Bay, if the existing sediments were left in-place and encapsulated below clean backfill and behind the new bulkhead wall. Anchor conducted a site investigation within the Project boundaries to provide additional vertical and lateral characterization of COCs in the soil, sediment, and groundwater in and surrounding the Project area.

Continuous core samples were collected at five locations, as depicted on Figure 2. Representative composite samples were obtained from the various geologic layers that are present, including the recent near-surface sediment, upland fill from the surrounding paved area, and the underlying Bay Point Formation. Samples were analyzed for metals, PCBs, and PAHs.

The results of chemical analysis of the samples are summarized in Table 2. At core locations SW-4 in the south half of the Project area, and SW-5 in the north half of the Project area, the upper two feet of sediment was found to contain copper and/or zinc at concentrations that exceeded California hazardous waste criteria as defined by TTLC values, per California Code of Regulations (CCR) Title 22 (section 66261.24, Division 4.5, Chapter 11, Article 3). Elevated concentrations of lead and PCBs were also noted in these locations, although not above TTLC criteria. No TTLC exceedances were found below depths of 2 feet.

Groundwater was also sampled and the site hydraulic gradient measured in response to tidal fluctuation. This information was used to predict the efflux of dissolved constituents in groundwater after Project completion. Modeling demonstrated that long-term water quality in adjacent waters of San Diego Bay would not be adversely affected by the Project.

Results of this investigation and the groundwater modeling are documented in a site investigation and characterization report (Anchor, 2005).

2.3 Additional Sediment Evaluation and Delineation (2006)

In response to the investigation documented in Anchor (2005), the SDRWQCB approved issuance of a WQC for the Project, contingent on SDSR removing all sediments that exceeded TTLC criteria from the Project area (henceforth termed "TTLC sediments," as identified in cores SW-4 and SW-5). In order to better delineate the limits of TTLC sediments, Anchor obtained hand-pushed piston core samples of sediments at seven additional locations in the Project area in March 2006 (refer to Figure 2 for sampling locations). At each location, the upper 2 to 4 feet of sediment was sampled in 1-foot intervals and analyzed for key metals (Cu, Pb, and Zn) and PCBs.

The results of this sampling effort are presented in Table 3. Laboratory reports are in Appendix A, and a Data Validation Review Report on this data is included as Appendix B. Samples from locations BAE-01, BAE-02, BAE-04, and BAE-05 indicated metal concentrations in excess of TTLC criteria, to depths of 4 feet and possibly below (deeper samples were not successfully obtained); while locations BAE-03, BAE-06, and BAE-07 had no indicated exceedances of TTLC criteria.

Based on these results, the horizontal extent of TTLC sediments was projected as depicted on Figure 2. These estimated limits were used to guide the initial excavation depths for TTLC sediments, subject to confirmatory sampling during construction.

3 EXCAVATION OF TTLC SEDIMENTS

Excavation of TTLC sediments from the Project site started in June 2006, beginning with the portion of the Project area that is north of Pier 1. The entire Project area was subdivided into individual excavation segments, each assigned its own representative confirmatory post-excavation sample, as shown on Figure 4. The excavation of TTLC sediments was completed in this segment-by-segment basis.

An initial excavation depth of 4 feet was chosen for each excavated segment, since this was the depth of the 2006 cores (as described in Section 2), in an attempt to control excavation volumes while using confirmatory sampling to ensure that the full extents of TTLC sediments were removed. Upon reaching the 4-foot depth within each segment, confirmatory sediment samples were obtained from the post-excavation subgrade. The confirmatory samples were submitted to a local laboratory (CalSciences in Garden Grove, California) and tested for Cu, Pb, Zn, and PCBs. While the analytical testing was being done, the excavation contractor was instructed to hold off on further excavation from other segments of the Project area, so as to avoid any resuspension of sediments while the excavated subgrade was exposed.

When test results were received, they were compared to the TTLC criteria to see if exceedances still existed at the excavated depth. If so – or even if the measured concentrations were within about one-fifth of the TTLC criteria – then the contractor was instructed to excavate an additional 2 feet to remove additional sediment from the sampled segment. Following this re-excavation, another confirmatory sample was obtained and analyzed. Excavation was considered complete at a given location only when the latest confirmatory sample indicated that concentrations of Cu, Pb, Zn, and PCBs were well below TTLC criteria.

When excavation was considered complete at a location (i.e., remaining concentrations well below TTLC criteria), the excavated segment was backfilled up to previous grade with clean, imported sand fill, and the excavation contractor was then directed to move on to excavating the next adjacent segment. In this manner the excavation progressed in a segmental fashion.

After the final segment of TTLC sediment was removed and backfilled with clean material, the contractor excavated the sediment "wedge" from immediately behind (inside of) the bulkhead

wall (see Figure 3). Material excavated from the wedge was stockpiled separately from the expected TTLC sediments, to prevent mixing or cross-contamination of the materials. Two more confirmatory samples ("Wedge-1" and "Wedge-2" were taken from the bottom of this excavation to verify that no TTLC sediment was left at the base of the excavation).

Altogether, approximately 1,100 cubic yards of sediment – or 1,400 tons – was excavated during this process.

Table 4 presents the results of confirmatory samples obtained during excavation of TTLC sediments, and Appendix C includes the laboratory reports from all chemical analyses. In several instances (for example, BH-4, BH-8, etc.) the first confirmatory sample exceeded or nearly exceeded TTLC criteria for copper, lead, and/or zinc, so additional excavation was done and another sample obtained at the new, deeper depth (labeled BH-4.1, BH-8.1, etc.). In one case (at location BH-4), a third round of excavation and confirmatory sampling was done, to a depth of 8 feet; the final sample at this location was labeled BH-4.2.

Sediment removal was preceded by and concurrent with demolition and removal of previously existing marine cradles in the northwestern portion of the Project area, and the part of Pier 1 landward of the new bulkhead wall.

4 DISPOSAL OF CONSTRUCTION WASTE AND EXCAVATED SEDIMENTS

4.1 Characterization and Disposal of Excavated Sediment

Excavated sediment was stockpiled on-site in the paved north area of the Yard Improvement Project, in a controlled stockpiling area with concrete blocks and runoff protection around its perimeter to prevent loss of sediment and water to the surrounding environment.

As excavation proceeded, composite samples were collected from material stockpiles and analyzed for landfill acceptance. A total of 23 samples were obtained altogether, which, for 1,100 cubic yards of sediment, amounts to approximately one representative sample per every 50 cubic yards of stockpiled sediment, consistent with testing requirements for local landfills operated by Allied Waste (such as the Otay and Sycamore landfills in San Diego County). Analysis of these samples was done in two phases: first, analysis of the bulk concentrations of metals, PCBs, PAHs, and Volatile Organic Compounds (VOCs), to determine which (if any) constituents contained elevated concentrations. Next, in cases where bulk concentrations were within one-tenth of the TTLC criteria, leachability testing (by the Soluble Threshold Limit Concentration, or STLC) was conducted to evaluate the potential for leaching of those chemicals, as a requirement for potential acceptance at local landfills. Additionally, Toxicity Characterization Leaching Procedure (TCLP) was conducted on a subset of samples. No TCLP exceedances were observed.

Analytical results from sediment stockpiles are presented in Appendix D. Ultimately, the majority of the excavated sediment did not meet TTLC requirements for local landfill disposal at a San Diego County landfill, and 728.21 tons of sediment were instead hauled to the Copper Mountain Landfill, a solid waste facility operated by Allied Waste in Arizona. In addition, 673.97 tons of sediment was hauled to the Azusa Land Reclamation Landfill in Azusa, California, which accepted stockpiled sediments containing lesser (non-hazardous) concentrations of metals and PCBs. Waste Disposal Manifests for sediment hauling and disposal are presented in Appendix E.

4.2 Disposal of Demolition Debris

Wood, steel, and concrete debris was also generated during project work, from the demolition of existing site structures (marine railways, and the portion of Pier One within the Project footprint). All demolition materials were cleaned of sediment and disposed at the Otay Landfill in San Diego County and at the Simi Valley landfill in Ventura County, CA.

5 BACKFILLING OF EXCAVATION AND PROJECT AREA

After sediment excavation was completed, the Project area was completely backfilled with clean imported soil. The area was filled to a final grade of approximately elevation +11.5 feet MLLW, so that after later installation of base course and asphalt concrete pavement, the final grade would be roughly equivalent to the elevation of the surrounding land area (elevation +12.1 feet MLLW).

Backfill material was obtained from several local sources in the San Diego area. Representative samples of the imported backfills were obtained on a regular basis, and 20 of the samples (roughly one out of every five collected) were tested for key chemical constituents (Cu, Pb, Zn, and PCBs) to ensure that there were no significant concentrations of these chemicals in the fill. The number of samples analyzed from each import fill source was proportionate to the amount of fill used from that source.

The analytical results for the imported soil fill are summarized in Table 5. Metals concentrations (Cu, Pb, and Zn) were well below California TTLC Criteria, as well as Human Health Screening Levels (CHHSLs) for residential and commercial/industrial use. No PCBs were detected in any of the imported sand samples.

6 WATER QUALITY MONITORING

6.1 Water Quality Program

Water quality monitoring was performed during the excavation activities (Phase 2A) and clean fill materials placement (Phase 2B). Water quality monitoring was conducted as a condition of the 401 WQC Permit issued by the SDRWQCB. Daily visual turbidity monitoring and weekly water quality monitoring of turbidity, dissolved oxygen (DO), and pH were conducted during Phase 2 activities.

The purpose of the water quality monitoring program was to provide ongoing assessment of water quality during construction and filling activities. Compliance criteria, shown in Table 6, were established to determine if there were any water quality exceedances during construction. The objectives of the monitoring program are as follows:

- To ensure that water quality conditions were maintained within the prescribed limits of relevant regulatory requirements.
- To allow for appropriate adjustment of construction activities in a manner that would ensure protection of the environment.
- To document the results of water quality performance monitoring.

Water quality monitoring for Phase 2A was conducted at three locations during construction, as shown on Figure 6 (from Anchor 2004):

- Station A, located 500 feet bayward from the construction limits (defined as the bulkhead wall). This is the background monitoring station.
- Station B, located 250 feet bayward from the construction limits. This defines the site compliance zone boundary.
- Station C, located 125 feet bayward from the construction limits. This station is an additional "early warning" boundary.

At each location, DO, turbidity, and pH were monitored at three depths: shallow (within 3 feet of the surface); mid-depth; and deep (within 6 feet of the bottom).

6.2 Water Quality Monitoring Results and Summary

The following data are presented in Appendices to this report:

- Table of Water Quality Monitoring Results (Appendix G)
- Daily Construction Site and Waterside Photographs (Appendix H)
- Daily Monitoring Logs and Checklists (Appendix I)

BAE personnel were trained in the calibration and use of the monitoring equipment. Originally, the Hydrolab® Hydras 3 LT sonde/laptop system was calibrated and tested in the field. However, due to difficulties in operating the laptop in the field, after two monitoring events, the Hydrolab was replaced with a portable system (the Hydrolab® DS4a).

In summary, the water quality monitoring results showed the following:

- **Turbidity.** No turbidity, floatables, or oil sheens[1] were visually observed during daily monitoring. Weekly turbidity readings were consistent with historical data for the subject area of San Diego Bay (typically less than 5 nephelometric turbidity units [NTUs], per San Diego Bay Watersheds [2006] and Unified Port District of San Diego [2006] websites). The only exception to this was one sampling occasion, on June 27, 2006, when turbidity was recorded between 88.8 and 116.4 NTU. There was no construction-related event to account for this spike, and no turbidity was observed. Additionally, the lowest reading was recorded closest to the construction activity, and the highest reading was recorded at the background condition station. Altogether, therefore, this anomalous reading was not considered to reflect a construction-related impact on water quality.
- **Dissolved Oxygen.** Historically, DO levels have ranged from 5.0 to 8.1 (per San Diego Bay Watersheds [2006] and Unified Port District of San Diego [2006]). DO levels measured for this Project were consistent with the historical data, and were often greater (and therefore improved) closer to the construction activities (Station C) than at the background monitoring station (June 22, June 27, July 11, and August 17, 2006).
- **pH.** pH levels were consistently within standards set by the SDRWQCB.

[1] On March 29, 2006, a "slight" oil sheen was noted. The sheen was traced to diver air tools, and those operations were immediately terminated.

6.3 Water Quality Monitoring Conclusions

No deleterious effects to water quality were observed or measured during excavation or placement activities. There were no visual observations of turbidity, floatables, or oil sheens, and there were no observations of distressed wildlife.

There were no impacts to water quality associated with exceedences of pH, and measured DO levels were within historical ranges. Furthermore, DO levels at the monitoring station closest to construction activities were often greater than background conditions. Visual observations during construction activity indicated no evident turbidity. Monitoring showed that turbidity levels were within historical ranges on all but one monitoring event, the same day that DO was recorded at its highest level.

As a result of these measurements and observations, BAE Systems SDSR concludes that this Project did not result in adverse impacts to water quality from increased DO or turbidity levels.

7 UPDATED MODELING OF LONG-TERM WATER QUALITY

In 2005, prior to Project construction, BAE Systems completed an evaluation of the Project's protectiveness of long-term water quality. This was done to support the SDRWQCB's review of BAE Systems' application for a 401 WQC for the Project. Specifically, modeling was performed to predict the tendency of dissolved waste constituents (copper, lead, zinc, and PCBs) to be transported in groundwater from the interstices of sediment left in place within the Project footprint, through the newly placed clean fill materials and new sheetpile bulkhead, and into immediately adjacent waters of San Diego Bay. The results of this modeling were presented in Anchor (2005).

This pre-construction modeling effort utilized available site data, including analysis of samples obtained in 2004 as well as past records of site sediment concentrations. Predicted chemical concentrations within the Project footprint were based on the expectation that all sediments containing exceedances of TTLC criteria would be removed. One-dimensional chemical transport modeling was performed using the approach developed by Reible (1998) and documented in the U.S. Army Corps of Engineers' national guidance for cap design (Palermo et al., 1998). More detail on the modeling methods and inputs are presented in Anchor (2005). The modeling demonstrated that all four of the modeled chemicals remained well below California Toxics Rule (CTR) criteria for surface waters, for well beyond 100 years following Project completion.

Following the completion of the construction project in 2006, this modeling has now been updated to reflect known remaining conditions, as reflected by the actual excavation extents and confirmatory sampling documented in this report. It also reflects the fact that imported backfill was used to fill the Project site (whereas the previous modeling also considered the possibility that dredged sediment would be used as backfill). Tables 7 and 8 summarize the updated modeling inputs. For the purposes of comparison, Table 8 includes the estimated porewater concentrations in contained sediments both for the known post-construction conditions, and from the pre-construction modeling described in Anchor (2005). It can be seen that the construction project resulted in overall chemical concentrations within the Project footprint that are lower than those originally predicted.

Table 9 summarizes the results of the updated modeling as compared to the pre-construction modeling results presented in Anchor (2005). The key information in this table is the years until predicted breakthrough – the time when dissolved chemical concentrations expressed through the sheetpile are predicted to meet CTR water quality criteria. The updated modeling confirms that breakthrough will not occur for well beyond 100 years. Furthermore, three of the four predicted the times to breakthrough have increased compared to the previous modeling. This is a result of the fact that chemical concentrations within the Project footprint ended up being lower than they were originally predicted to be.

In summary, the updated modeling confirms that the completed Project is predicted to cause no significant impacts on surface water quality, verifying that the Project is fully protective of water quality.

8 CONCLUSIONS

The Bulkhead Extension and Yard Improvement Project was completed on October 13, 2006, consistent with the terms of the Project permits. Specifically,

- All sediments exceeding California hazardous waste (TTLC) criteria were removed from the Project site, as confirmed by a series of post-excavation samples.
- All excavated sediment was disposed off-site at permitted landfills.
- Clean import fill material was used to backfill the Project area.
- Daily water quality monitoring confirmed that adjacent surface waters of San Diego Bay were not adversely impacted pH, DO, or turbidity.
- Storm water protection measures were maintained in place throughout the construction process.
- The Project is projected to cause no adverse long-term impacts on water quality in adjoining waters of San Diego Bay.

This report satisfies the requirements of paragraph B.3 in the 401 WQC, stating that a report shall be submitted at the end of construction which documents the results of all water quality monitoring.

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TABLES

Table 1
Results of Detailed Sediment Investigation of BAE Systems and NASSCO Shipyards (Exponent, 2003)

Analyte of Concern	Background Sediment Concentrations [1]	California TTLC Criteria [2]	SW04 8/7/2001 0-2 cm	SW04 9/10/2002 0-2 cm	SW04 8/27/2002 0-2 ft	SW04 8/27/2002 2-4.1 ft	SW04 Depth Averaged	SW08 8/8/2001 0-2 cm	SW08 8/28/2002 0-2 ft	SW08 8/28/2002 0-2 ft	SW08 8/28/2002 2-4 ft	SW08 8/28/2002 4-6 ft	SW08 8/28/2002 6-6.5 ft	SW08 Depth Averaged
Conventionals														
Fines content (%)			31.8	-	-	-	31.8	68.8	-	-	-	-		68.8
TOC (% dry)			1.59	-	0.91	1.8	1.37	3.35	1.5	-	1.1	0.12	-	0.93
Metals (mg/kg)														
Arsenic	9	500	**95.5**	-	**67.7**	**107**	89.65	**25.5**	**26.6**	-	**13.2**	4.9	-	15.12
Cadmium	0.29	100	**2.35**	-	**0.79**	**3.17**	2.05	**0.67**	**1.13**	-	**0.86**	0.07	-	0.69
Chromium	57	2500	**64.7**	-	**25.5**	**97.2**	63.36	**77.8**	**110**	-	**109**	7.4	-	76.00
Copper	120	2500	**1880**	-	**370**	**2170**	1325.60	**1030**	**1540**	-	**1480**	49	-	1029.94
Lead	48	1000	**482**	-	**154**	**413**	295.73	**248**	**343**	-	**341**	10.6	-	233.26
Mercury	0.56	20	**1.19**	-	**1.14**	**7.4**	4.36	**2.53**	**4.97**	-	**5.95**	0.3	-	3.75
Nickel	17	2000	**20.1**	-	8.3	**40**	24.37	**22.7**	16.8	-	9.1	2.6	-	9.71
Selenium	0.72	100	**1.2**	-	**1.2 U**	**3.1**	2.19	**1 U**	**1.6 U**	-	**1.4 U**	1.2 U	-	1.6 U
Silver	1	500	**1.72**	-	0.59	**1.4**	1.04	**1.38**	**1.04**	-	0.49	0.03	-	0.53
Zinc	210	5000	**4550**	-	**669**	**1450**	1156.31	**859**	**1410**	-	**786**	33.7	-	749.46
PCB (µg/kg)														
Aroclor 1016			190 U	-	150 U	1500 U	1500 U	330 U	1900 U	950 U	1400 U	130 U	12 U	1900 U
Aroclor 1221			370 U	-	290 U	2900 U	2900 U	650 U	3800 U	1900 U	2800 U	250 U	24 U	3800 U
Aroclor 1232			190 U	-	150 U	1500 U	1500 U	330 U	1900 U	950 U	1400 U	130 U	12 U	1900 U
Aroclor 1242			190 U	-	150 U	1500 U	1500 U	330 U	1900 U	950 U	1400 U	130 U	12 U	1900 U
Aroclor 1248			190 U	-	1300	16000	8664	990	9300	12000	15000	1100	12 U	8223
Aroclor 1254			2400	-	1200	13000	7153	2400	7000	8700	12000	600	12 U	6303
Aroclor 1260			600	-	610	6500	3670	640	4100	4400	6600	290	12 U	3427
Total PCBs	170	50000	**3000**		**3110**	**35500**	19387	**4030**	**20400**	**25100**	**33600**	**1990**	0	17954
PAHs (µg/kg)														
2-Methylnaphthalene			31	-	10	460	240	32	18	-	50	6.1 U	-	25
Acenaphthene			110	-	22	3100	1594	83	54	-	110	6.1 U	-	57
Acenaphthylene			120	-	47	190	122	280	100	-	84	6.1 U	-	66
Anthracene			710	-	150	2400	1312	1500	360	-	360	10	-	258
Benz(a)anthracene			1100	-	370	3400	1937	2300	770	-	950	17	-	601
Benzo(a)pyrene			1500	-	1100	5800	3527	2900	2600	-	3000	85	-	1918
Benzo(b)fluoranthene			1600	-	950	5800	3456	3500	2900	-	3000	88	-	2025
Benzo(ghi)perylene			640	-	630	2100	1393	1300	970	-	1000	26	-	677
Benzo(k)fluoranthene			1300	-	790	5200	3065	2400	2600	-	2900	85	-	1880
Chrysene			1800	-	580	4500	2615	4900	1200	-	1200	38	-	862
Dibenzo(a,h)anthracene			230	-	120	650	395	450	310	-	370	8.4	-	233
Fluoranthene			2100	-	700	10000	5485	3500	1000	-	1200	25	-	776
Fluorene			180	-	34	1500	785	220	77	-	120	6.1 U	-	70
Indeno[1,2,3-cd]pyrene			880	-	750	2600	1711	1800	1400	-	1300	34	-	927
Naphthalene			38	-	20	3800	1949	38	19	-	58	6.1 U	-	28
Phenanthrene			1100	-	260	5000	2699	1300	490	-	620	13	-	387
Pyrene			2000	-	1400	18000	9906	2600	6000	-	8400	51	-	4826
Total PAHs		-	15439	-	7933	74500	42191	29103	20868	-	24722	510.9	-	15617

Notes:
U = analyte not detected at the indicated detection limit.
From E[x]ponent (2003).

Table 2
Results of Vertical and Lateral Characterization of Site Sediment (Anchor, 2005)

	California	Core SW-1	Core SW-2	Core SW-3		Core SW-4					Core SW-5				
	TTLC	Bay Point Formation	Bay Point Formation	Upland Fill	Upland Fill	Surface Sediment	Surface Sediment	Surface Sediment	Surface Sediment	Bay Point Formation	Surface Sediment	Surface Sediment	Surface Sediment	Surface Sediment	Bay Point Formation
Parameter	Criteria [2]	15' - 17'10"	18' - 20'	5' - 7'9"	12'2" - 14'2"	0' - 2'1"	2'1" - 3'6"	5' - 5'9"	5'9" - 8'10"	15' - 16'	2" - 2'	2' - 2'11"	5' - 6'5"	6'5" - 7'5"	10' - 12'9"
Total Organic Carbon (percent)															
		0.01	0.02	0.22	0.13	1.48	0.29	0.21	0.01	0.03	0.46	0.04	0.06	0.03	0.02
Metals (mg/kg)															
Arsenic	500	3.65	1.15	3.46	3.9	154	35.4	65.9	1.42	1.56	177	3.57	3.13	2.62	6.42
Cadmium	100	0.05 J	0.04 J	0.05 J	0.07	3.13	0.73	1.13	0.05 J	0.04 J	2.83	0.08	0.08	0.08	0.06
Chromium	2500	3.6	12.3	6.46	3.89	173	138	75.2	3.22	22.4	192	8.7	5.4	21.4	4.73
Copper	2500	1.75	5.57	4.76	11.3	2540	981	1040	2.4	12.6	6950	12.7	5.85	14.1	4.52
Lead	1000	0.81	2.1	5.39	4.04	668	352	326	0.73	3.75	955	21.4	5.25	3.98	1.04
Mercury (total)	20	0.03 J	0.01 U	0.05 J	0.03 J	0.69 J	2.4 J	0.7 J	0.01 J	0.03 J	0.91 J	0.24 J	0.1 J	0.01 U	0.01 U
Nickel	2000	2.06	6.22	2.29	1.74	25.9	10.6	12	2.02	10.1	28.1	3.7	2.1	8.17	3.58
Selenium	100	0.13	0.15	0.3	0.09	2.91	0.95	1.24	0.68	0.25	3.52	0.1	0.09	0.05 J	0.8
Silver	500	0.05 U	0.05 U	0.05 U	0.05 U	1.77 J	0.55 J	0.76 J	0.05 U	0.18 J	2.1 J	0.28 J	0.15 J	0.04 J	0.05 U
Zinc	5000	23.9 J	23.9 J	17.8 J	13.7 J	6630 J	1560 J	2250 J	6.18 J	42.1 J	4470 J	28.8 J	19.3 J	49.3 J	9.77 J
PAHs (µg/kg)															
1-Methylnaphthalene		5 U	5 U	5 U	2.30 J	29.90	22.30	20.40	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
1-Methylphenanthrene		5 U	5 U	5 U	2.80 J	102	15.50	34.10	5 U	5 U	5 U	1.20 J	5.00 U	5.00 U	5 U
2,3,5-Trimethylnaphthalene		5 U	5 U	5 U	2.40 J	44.50	13.30	12.90	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
2,6-Dimethylnaphthalene		5 U	5 U	5 U	1.0 J	34.60	22.70	19.0	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
2-Methylnaphthalene		5 U	5 U	5 U	1.70 J	38.40	32.80	29.40	5 U	1.0 J	5 U	1.10 J	5.00 U	5.00 U	5 U
Acenaphthene		5 U	5 U	5 U	22.90	5 U	62.90	66.50	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
Acenaphthylene		5 U	5 U	5 U	6.80	35.70	31.90	17.60	5 U	5 U	5 U	1.40 J	1.20 J	5.00 U	5 U
Anthracene		5 U	5 U	5 U	13.90	5 U	5 U	5 U	5 U	5 U	5 U	2.70 J	2.20 J	5.00 U	5 U
Benz(a)anthracene		5 U	2.30 J	1.10 J	46.30	5 U	5 U	5 U	5 U	5 U	5 U	4.40 J	7.20 J	5.00 U	5 U
Benzo(a)pyrene		5 U	5 U	1.50 J	103	5 U	5 U	5 U	5 U	5 U	5 U	6.70	16.90 J	5.00 U	5 U
Benzo(b)fluoranthene		5 U	5 U	1.40 J	81.80	5 U	5 U	5 U	5 U	5 U	5 U	5.10	16.40 J	5.00 U	5 U
Benzo(e)pyrene		5 U	5 U	1.30 J	67.90	5 U	5 U	5 U	5 U	5 U	5 U	4.0 J	9.70 J	5.00 U	5 U
Benzo(ghi)perylene		5 U	5 U	1.40 J	101.0	5 U	5 U	5 U	5 U	5 U	5 U	5.40	14.00 J	5.00 U	5 U
Benzo(k)fluoranthene		5 U	5 U	1.20 J	77.40	5 U	5 U	5 U	5 U	5 U	5 U	4.80 J	15.30 J	5.00 U	5 U
Biphenyl		5 U	5 U	5 U	1.90 J	15.60	13.10	10.60	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
Chrysene		5 U	1.40 J	1.30 J	62.30	5 U	5 U	5 U	5 U	5 U	5 U	6.10	8.00	5.00 U	5 U
Dibenzo(a,h)anthracene		5 U	5 U	5 U	11.50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1.50 J	5.00 U	5 U
Fluoranthene		5 U	1.20 J	2.60 J	168	5 U	5 U	5 U	5 U	1.20 J	5 U	7.90	16.10	5.00 U	5 U
Fluorene		5 U	5 U	5 U	2.10 J	5 U	58.10	5 U	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
Indeno[1,2,3-cd]pyrene		5 U	5 U	5 U	89.60	5 U	5 U	5 U	5 U	5 U	5 U	4.30 J	11.90 J	5.00 U	5 U
Naphthalene		5 U	5 U	5 U	14.90	39.10	31.30	31.70	5 U	1.20 J	5 U	1.10 J	5.00 U	5.00 U	5 U
Perylene		5 U	5 U	5 U	28.30	5 U	5 U	5 U	5 U	5 U	5 U	3.20 J	4.40 J	5.00 U	5 U
Phenanthrene		1.10 J	1.30 J	1.60 J	14.70	5 U	5 U	5 U	5 U	1.40 J	5 U	4.70 J	5.00	5.00 U	5 U
Pyrene		1.30 J	10.90	8.20	178	5 U	5 U	5 U	6.50	1.30 J	5 U	130	29.60	5.00 U	5 U
Total PAHs		2.40 J	17.02	21.60	1102.50	339.80	303.90	242.20	6.50	6.10	0	194.10	169.40	0.00	0
PCBs (µg/kg)															
Aroclor 1016		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1221		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1232		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1242		20 U	20 U	20 U	20 U	379	2410	459	20 U	20 U	452	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1248		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1254		20 U	20 U	20 U	20 U	1270	2260	1100	20 U	20 U	851.0	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1260		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Total PCBs (U=0)	50000	0	0	0	0	1769	5198.10	1894.80	0	0	1310.80	0	0	0.00	0.00

Notes:
U = analyte not detected at the indicated detection limit.
J = estimated value.
Shaded values exceed California TTLC criteria.
[1] Background sediment concentrations defined as 95% UPL Final Reference Pool levels from Exponent (2003).
[2] TTLC = Total Threshold Limit Concentration, per CCR Title 22, Division 4.5, Chapter 11, Article 3.

Table 3
Results of Additional Sediment Evaluation and Delineation (2006)

Analyte of Concern	California Haz Waste Criteria (TTLC)[1]	BAE-01-A 0-2 ft	BAE-01-B 2-4 ft	BAE-02-A 0-2 ft	BAE-02-B 2-4 ft	BAE-03-A 0-2 ft	BAE-04-A 0-2 ft	BAE-04-B 2-4 ft	BAE-54-B (dup) 2-4 ft	BAE-05-A 0-2 ft	BAE-05-B 2-4 ft	BAE-55-B (dup) 2-4 ft	BAE-06-A 0-2 ft	BAE-06-B 2-4 ft	BAE-07-A 0-2 ft	BAE-07-B 2-4 ft
Metals (mg/kg)																
Copper	2500	615	**8040**	**6610**	**4290**	497	**3400**	**3380**	**3460**	2160	**3240**	**2650**	1720	1340	723	715
Lead	1000	290	644	**1560**	908	249	841	**1390**	**1420**	591	660	694	311	315	243	199
Zinc	5000	1400	**6930**	3750	2120	529	**6280**	**8570**	**9490**	**6160**	**6640**	**6640**	1350	1410	572	485
PCB (µg/kg)																
Total PCBs	50000	640	3100	21700	38000	970	960	420	730	1340	1410	1320	3600	4700	4300	3300

Notes:
[1] TTLC = Total Threshold Limit Concentration, per CCR Title 22, Division 4.5, Chapter 11, Article 3.
Yellow shading indicates exceedances of TTLC criteria.

Table 4
Results of Post-Excavation Confirmation Sampling

			Cu	Pb	Zn	PCBs
			2500	1000	5000	50000
Sample ID	Sample Date	Depth (ft)	250	100	500	5000
BH 1	06/13/06	4.00	230	32.8	109	700
BH 2	06/13/06	4.00	0.968	1.05	7.35	ND
BH 3	06/12/06	4.00	55.7	8.99	56.2	1160
BH 4	06/19/06	4.00	395	326	2120	2800
BH 4.1	06/21/06	6.00	**4900**	699	2310	16500
BH 4.2	06/23/06	8.00	102	140	93.8	ND
BH 5	06/16/06	4.00	33.6	10.5	544	780
BH 6	06/12/06	4.00	8.13	2.48	17.2	ND
BH 7	06/16/06	4.00	3.45	5.79	23.9	1000
BH 8	06/12/06	4.00	**3360**	598	3590	17100
BH 8.1	06/16/06	6.00	233	44.6	277	ND
BH 9	06/30/06	4.00	2090	275	2320	950
BH 9.1	09/30/06	6.00	ND	1.13	41	NA
BH 10	06/23/06	4.00	2450	791	4750	3700
BH 10.1	06/27/06	6.00	94.7	24.8	131	920
BH 11	06/23/06	4.00	**3220**	647	**5980**	1000
BH 11.1	06/27/06	6.00	293	209	333	750
BH 12	06/30/06	4.00	1480	163	186	3100
BH 12.1	09/30/06	6.00	ND	ND	10.1	NA
BH 13	06/23/06	4.00	**5100**	560	**7200**	1070
BH 13.1	06/27/06	6.00	4.6	0.984	12.2	ND
BH 14	06/23/06	4.00	**2950**	578	**5860**	1060
BH 14.1	06/27/06	6.00	12.6	3.33	18.8	ND
BH 15	06/30/06	4.00	693	251	451	4000
BH 15.1	09/30/06	6.00	ND	0.313	5.36	NA
BH 16	06/23/06	4.00	1760	452	2990	1650
BH 16.1	06/27/06	6.00	217	68.5	300	540
BH 17	06/23/06	4.00	1280	306	3110	3800
BH 17.1	06/27/06	6.00	381	125	750	202
BH 18	08/17/06	4.00	1.13	1.2	12.3	ND
BH 19	08/17/06	4.00	1.37	2.02	16.1	ND
BH 20	08/17/06	4.00	2.24	2.31	11.9	ND
Wedge 1	09/07/06	8.00	16.6	6.65	26.7	ND
Wedge 2	09/07/06	8.00	13.7	16.3	51.9	ND

Notes:
ND = Not detected.
Yellow shading indicates exceedances of TTLC criteria.

Table 5
Concentrations of Key Chemicals in Representative Samples of Imported Sand Fill

		Residential CHHSL [1]	3000	150	23000	0.089
		Commercial/Industrial CHHSL [1]	38000	3500	100000	0.3
Sample ID	**Import Location**	**Delivery/ Sample Date**	**Cu**	**Pb**	**Zn**	**PCBs**
F1	Coronado High School	6/14/06	7.94	56.3	69.1	ND
F2	Coronado High School	6/14/06				
F3	Coronado High School	6/14/06				
F4	Coronado High School	6/14/06				
F5	Coronado High School	6/14/06				
F6	Coronado High School	6/14/06	15.8	11.8	47.7	ND
F7	Coronado High School	6/14/06				
F8	Coronado High School	6/14/06				
F9	Coronado High School	6/14/06				
F10	Coronado High School	6/14/06				
F11	Coronado High School	6/14/06	7.73	2.88	22.9	ND
F12	Coronado High School	6/14/06				
F13	Coronado High School	6/14/06				
F14	Coronado High School	6/14/06				
F15	Coronado High School	6/14/06				
F16	Coronado High School	6/16/06	12.6	6.33	30.4	ND
F17	Coronado High School	6/16/06				
F18	Coronado High School	6/16/06				
F19	Coronado High School	6/16/06				
F20	Coronado High School	6/16/06				
F21	Coronado High School	6/16/06	20.2	9.67	48.2	ND
F22	Coronado High School	6/16/06				
F23	Coronado High School	7/17/06				
F24	Coronado High School	7/17/06				
F25	Coronado High School	7/17/06				
F26	Coronado High School	7/17/06	34.1	11.1	49.3	ND
F27	La Jolla	7/18/06				
F28	La Jolla	7/18/06	7.21	3.38	49.6	ND
F29	La Jolla	7/18/06				
F30	La Jolla	7/18/06				
F31	La Jolla	7/18/06				
F32	La Jolla	7/18/06				
F33	La Jolla	7/19/06				
F34	La Jolla	7/19/06				
F35	La Jolla	7/19/06	9.75	3.07	60.8	ND
F36	La Jolla	7/19/06				
F37	La Jolla	7/19/06				
F38	La Jolla	7/19/06				
F39	La Jolla	7/19/06				
F40	La Jolla	7/19/06				
F41	La Jolla	7/19/06				
F42	La Jolla	7/19/06	4.14	4.99	24.3	ND
F43	La Jolla	7/19/06				
F44	La Jolla	7/19/06				
F45	No Sample					
F46	52nd & Polk, San Diego	7/20/06	4.73	13.5	39.5	ND
F47	52nd & Polk, San Diego	7/20/06				
F48	52nd & Polk, San Diego	7/20/06				
F49	52nd & Polk, San Diego	7/20/06				
F50	52nd & Polk, San Diego	7/20/06				
F51	52nd & Polk, San Diego	7/20/06	5.67	17.4	50.1	ND

Table 5
Concentrations of Key Chemicals in Representative Samples of Imported Sand Fill

Sample ID	Import Location	Delivery/ Sample Date	Cu	Pb	Zn	PCBs
		Residential CHHSL [1]	3000	150	23000	0.089
		Commercial/Industrial CHHSL [1]	38000	3500	100000	0.3
F52	52nd & Polk, San Diego	7/20/06				
F53	52nd & Polk, San Diego	7/20/06				
F54	52nd & Polk, San Diego	7/20/06				
F55	Hotel Del Coronado	7/21/06	1.02	2.04	7.29	ND
F56	Hotel Del Coronado	7/21/06				
F57	Coronado High School	8/3/06				
F58	Coronado High School	8/3/06	4.83	26.9	51	ND
F59	Coronado High School	8/3/06				
F60	Coronado High School	8/3/06				
F61	Children's Hospital	8/16/06				
F62	Children's Hospital	8/16/06	3.28	2.96	14.4	ND
F63	Children's Hospital	8/16/06				
F64	Children's Hospital	8/16/06				
F65	Children's Hospital	8/17/06				
F66	Children's Hospital	8/17/06				
F67	Children's Hospital	8/17/06	3.04	2.21	12.8	ND
F68	Children's Hospital	8/17/06				
F69	10th & K, San Diego	8/17/06	5.21	3.32	19.7	ND
F70	10th & K, San Diego	8/17/06				
F71	Coronado High School	8/19/06				
F72	Coronado High School	8/19/06				
F73	Coronado High School	8/19/06				
F74	Coronado High School	8/19/06				
F75	Aero Drive	8/24/06				
F76	Aero Drive	8/24/06				
F77	Aero Drive	8/24/06	4.89	2.64	24.3	ND
F78	Aero Drive	8/24/06				
F79	Aero Drive	8/24/06				
F80	La Jolla	8/24/06	24.1	8.7	104	ND
F81	La Jolla	8/24/06				
F82	La Jolla	8/24/06				
F83	La Jolla	8/24/06				
F84	La Jolla	8/24/06				
F85	La Jolla	8/24/06	23.5	8.64	102	ND
F86	La Jolla	8/24/06				
F87	8th & D, National City	10/3/06				
F88	8th & D, National City	10/3/06	5.77	24.1	45.6	ND
F89	8th & D, National City	10/4/06				
F90	8th & D, National City	10/4/06				
		AVERAGE	**10.3**	**11.1**	**43.6**	**ND**

Notes:
ND = Not Detected.
[1] CHHSL values = California Human Health Screening Levels.
From http://www.calepa.ca.gov/Brownfields/documents/2005/NumberReport.pdf

Table 6
Water Quality Compliance Criteria

Parameter	Compliance Boundary Standard
Turbidity	No more than 20% above background turbidity levels
	Shall not exceed a maximum of 225 NTU at any time
Dissolved oxygen	Not depressed more than 10% below the background DO levels
pH	No more that 0.2 above or below background levels
	Within limits of 6.0 and 9.0 at all times
Visual	Floating particulates, suspended materials, grease, or oil shall not be visible
	No aesthetically undesirable discoloration of the water surface
Fish and Wildlife	No toxic, radioactive, or deleterious materials are allowed to affect the most sensitive biota
	If any distressed or dying fish are observed, the contractor will be required to cease the offending construction activity

Table 7
Updated (Post-Construction) Summary of Modeling Parametric Analyses

Parameter	Co (mg/kg)[1]	Kd (L/kg)	Co (mg/L)	Information Source
Copper	323	20,452	**0.016**	Kd values calculated from E^xponent sediment partitioning equations (2003)
	323	85	**3.80**	Kd values calculated per Aziz et al. 2001
Lead	92	15402	**0.006**	Kd values calculated from E^xponent sediment partitioning equations (2003)
	92	1150	**0.08**	Kd values calculated per Aziz et al. 2001
Zinc	324	20067	**0.016**	Kd values calculated from E^xponent sediment partitioning equations (2003)
	324	140	**2.31**	Kd values calculated per Aziz et al. 2001
PCBs	0.71	602	**0.0012**	(TOC = 0.01)[2] weighted average of Aroclors 1254 and 1242 Koc (RAIS 2004)
	0.71	8200	**0.000087**	(TOC = 0.01)[2] using total PCB Koc (RAIS 2004)

Notes:
[1] Calculated as 95% Upper Confidence Limit of all samples taken within the project footprint.
[2] TOC = Total Organic Carbon of sediments in which concentrations were measured.

Table 8
Updated (Post-Construction) Fate and Transport Modeling Input Parameters

Parameter	Units	Constituents Modeled				Information Source
		Copper	Lead	Zinc	Total PCBs	
Controlling Cap Layer	NA	Sand	Sand	Sand	Sand	Possible cap alternatives.
Cap Layer Thickness	cm	90	90	90	90	Assumed effective thickness was 100 cm minus 10 cm at bioturbation.
Cap Material Porosity	unitless	0.4	0.4	0.4	0.4	Typical values for placed sand
Specific Gravity of Cap	g/cm^3	2.5	2.5	2.5	2.5	Typical values for placed sand
In Situ Bulk Density Cap	g/cm^3	1.5	1.5	1.5	1.5	Calculated from porosity and specific gravity per page B24 of Reible (1998).
Cap TOC Content [1]	fraction	0.001	0.001	0.001	0.001	Typical values for sand imported from local sources
PCB K_{oc} [2]	L/kgOC	n/a	n/a	n/a	60,200	Weighted average of Aroclors found in sediment (1242 and 1254; RAIS 2004).
Cap K_d [3]	L/kg	100	1,200	200	60.2	PCB $K_d = K_{oc}$ * TOC. Kd values for Copper, Lead, and Zinc are from Aziz et al., 2001.
Groundwater Seepage Velocity	cm/yr	17.79	17.79	17.79	17.79	$Vx = Q/(n_e*A)$, where Q = discharge and A = cross-sectional area. Or: $Vx = (kdh)/(n_e dl)$ Assume K = 0.00003 cm/sec, ne = 0.25, dh/dl = 0.0047.
Diffusion Coefficient	cm^2/yr	225	267	222	190	Conservatively high value from range of diffusion coefficients for PCBs (RAIS 2004); For metals D = (RT/F2)(lambda/charge of the ion).
Porewater Concentration in Underlying Sediments	mg/L	**3.80**	**0.080**	**2.31**	**0.0012**	95 percent UCL porewater concentration calculated from post-construction sampling.
Porewater Concentration in Underlying Sediments (pre-construction estimate) [5]	*mg/L*	***3.89***	***0.094***	***2.66***	***0.0023***	*95 percent UCL porewater concentration calculated from bulk chemistry cores obtained prior to construction.*

Notes:

[1] TOC = Total Organic Carbon.

[2] Koc = Organic carbon partitioning coefficient.

[3] Kd = Partitioning coefficient.

[4] Calculated as shown in Table 7, using the most conservative (highest) value.

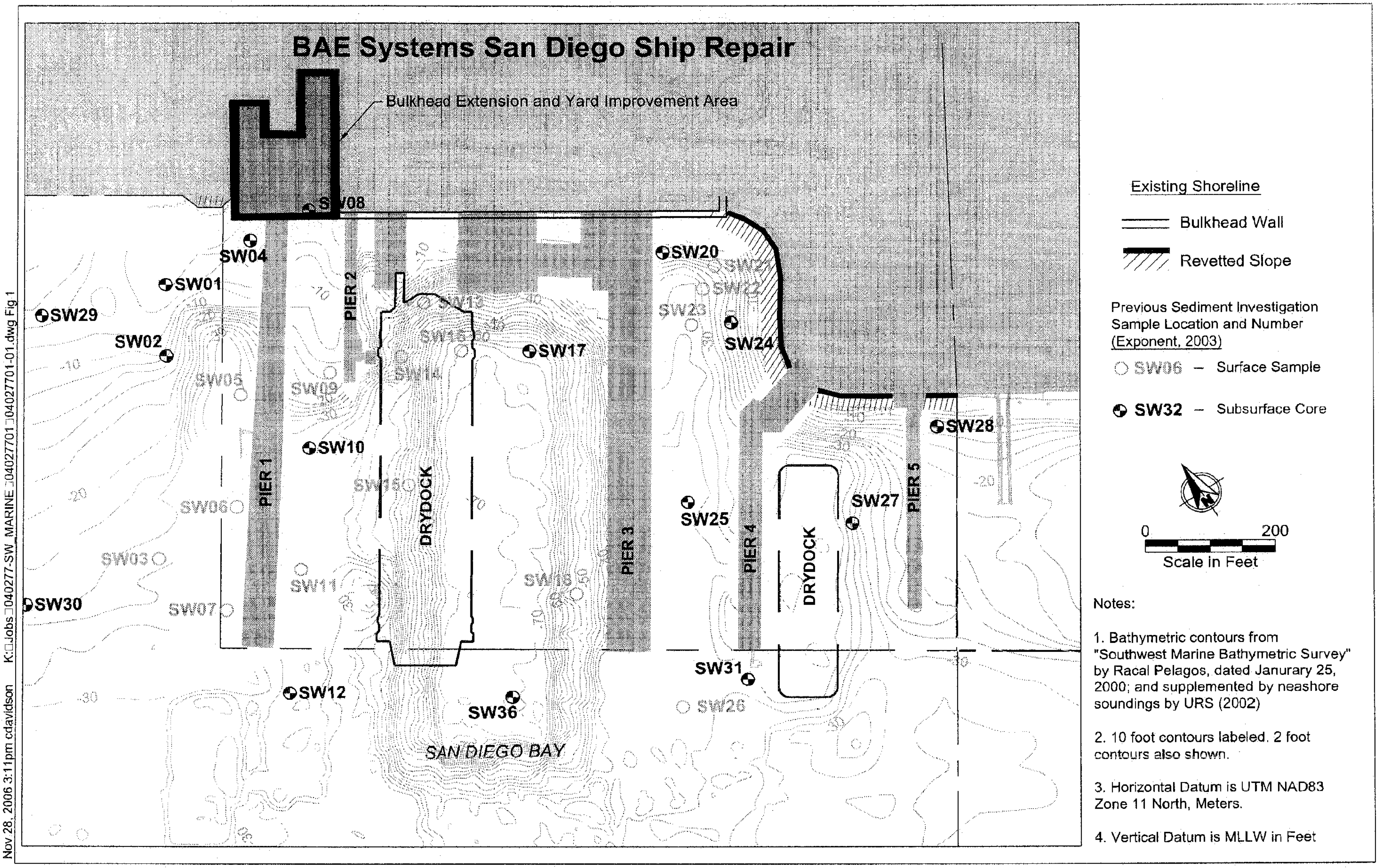
[5] Based on pre-construction data and projections, as presented in Anchor (2005).

Table 9
Updated (Post-Construction) Fate and Transport Modeling Results

Chemical	Predicted concentrations in water (mg/L)			California Toxics Rule WQ Criteria (mg/L)	Years until predicted breakthrough	*Years until predicted breakthrough (pre-construction estimate)* [1]
	25 yrs after construction	50 yrs after construction	100 yrs after construction			
Copper	0	0	0	3.1E-03	**690**	***690***
Lead	0	0	0	8.1E-03	**14,000**	***13,600***
Zinc	0	0	0	0.081	**2,060**	***1,760***
Total PCBs	0	0	0	3.25E-10	**250**	***185***

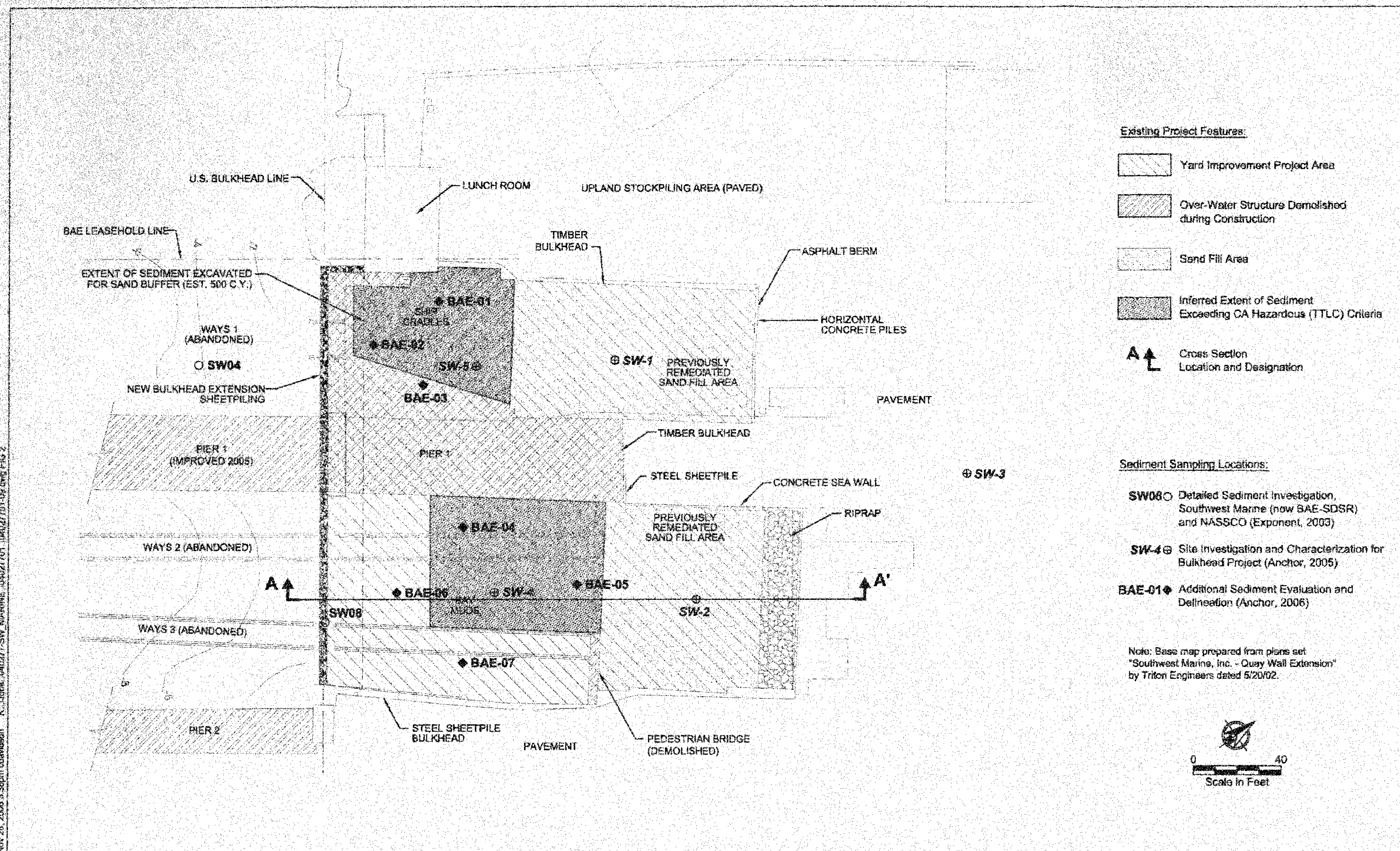
Notes:
[1] Based on pre-construction data and projections, as presented in Anchor (2005).

FIGURES



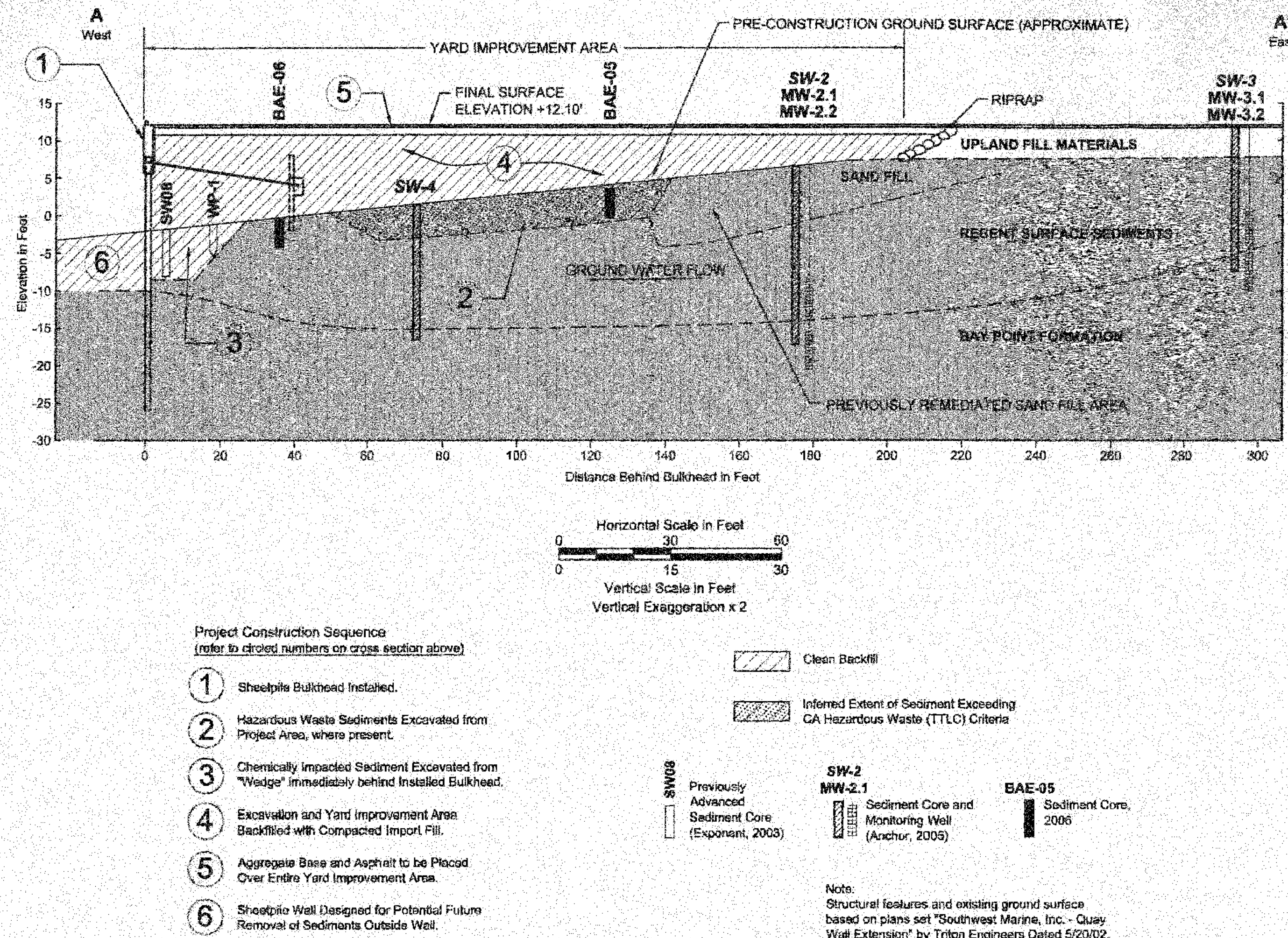
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 1
Project Location Plan
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2
Project Site Plan and Initial Delineation of Sediment Chemistry
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



Nov 28, 2006 4:00pm cdavidson K:\Jobs\040277-SW_MARINE\04027701\04027701-10.dwg FIG 3

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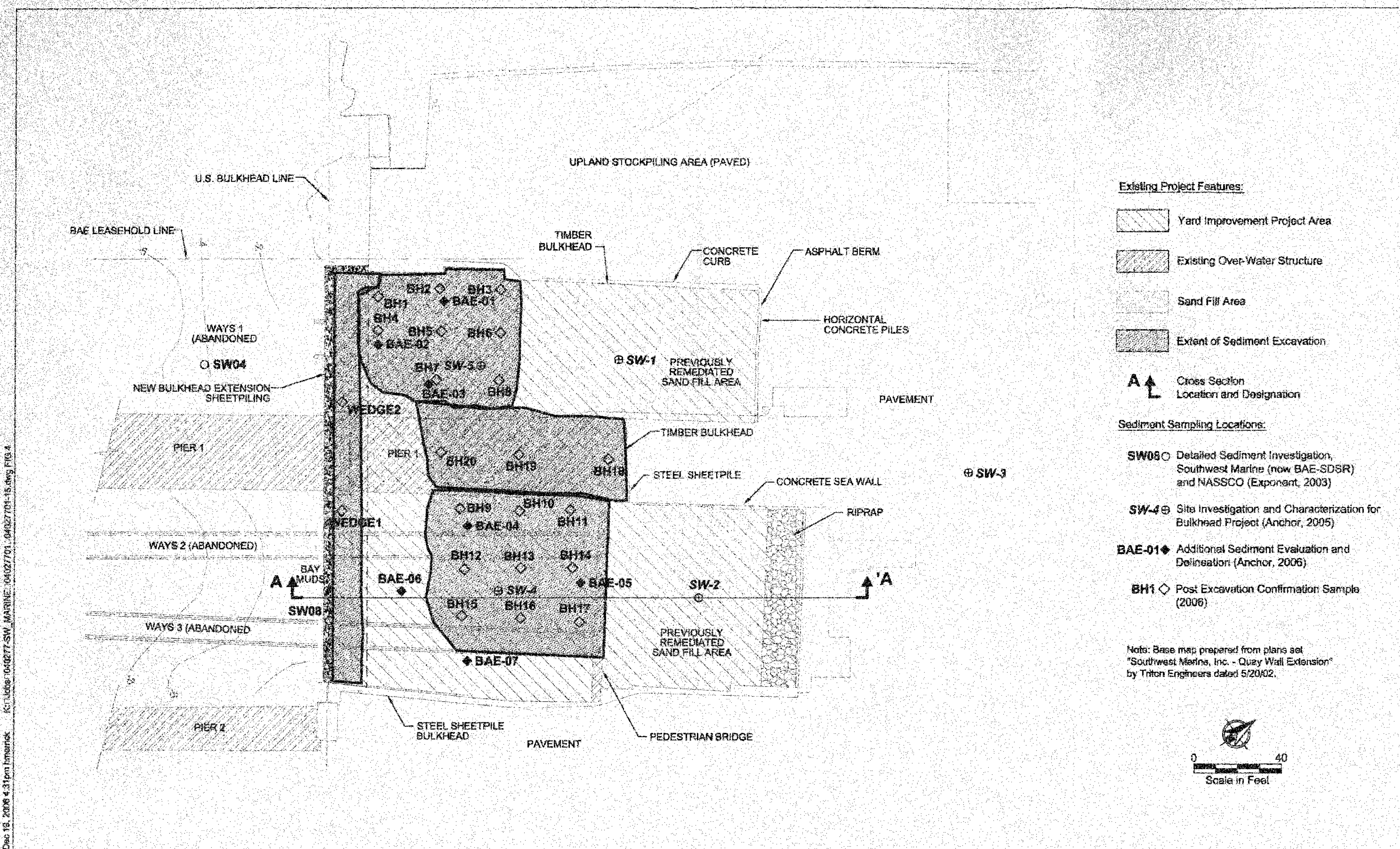
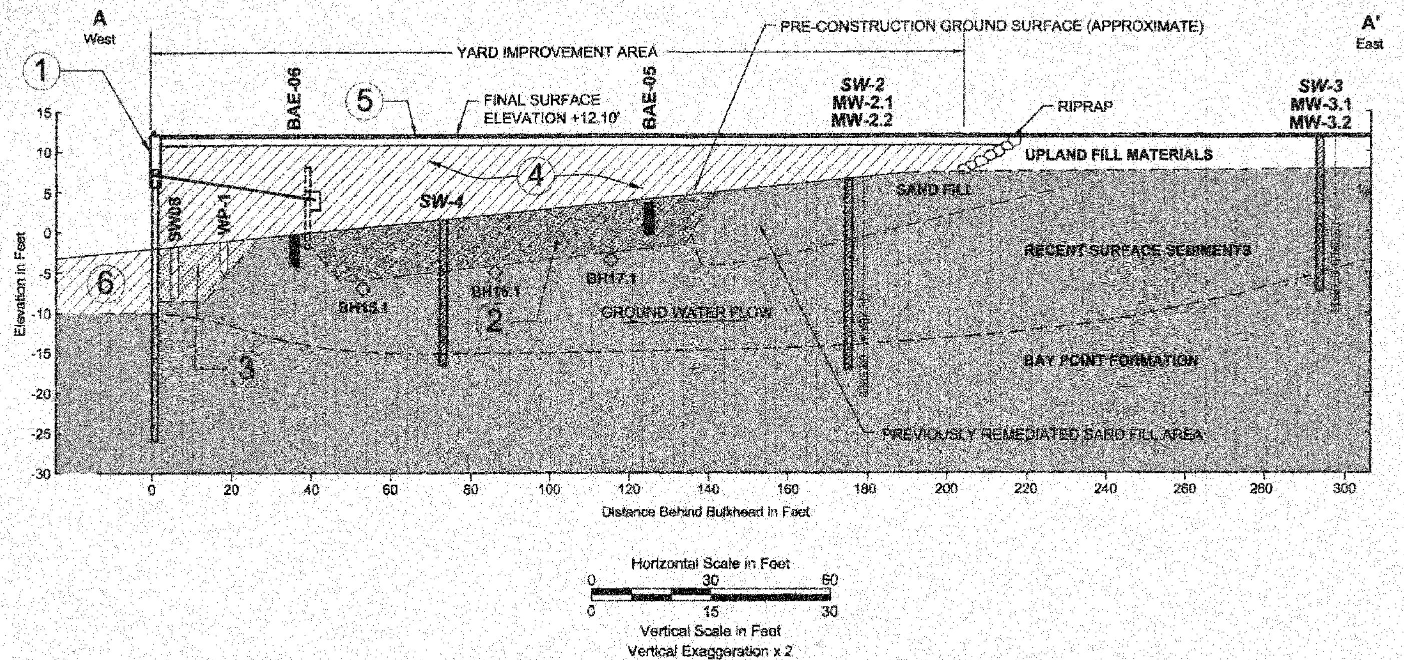
Figure 3
Project Site Cross-Section and Initial Delineation of Sediment Chemistry
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 4
Extents of Sedimetn Excavation
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



Project Construction Sequence
(refer to circled numbers on cross section above)

1. Sheetpile Bulkhead Installed.
2. TTLC Sediments Excavated from Project Area, where present.
3. Chemically Impacted Sediment Excavated from "Wedge" immediately behind Installed Bulkhead.
4. Excavation and Yard Improvement Area Backfilled with Compacted Import Fill.
5. Aggregate Base and Asphalt to be Placed Over Entire Yard Improvement Area.
6. Sheetpile Wall Designed for Potential Future Removal of Sediments Outside Wall.

Clean Backfill

Extent of Sediment Excavation

SW08 — Previously Advanced Sediment Core (Exponent, 2003)

SW-2 / MW-2.1 — Sediment Core and Monitoring Well (Anchor, 2005)

BAE-05 — Sediment Core, 2006

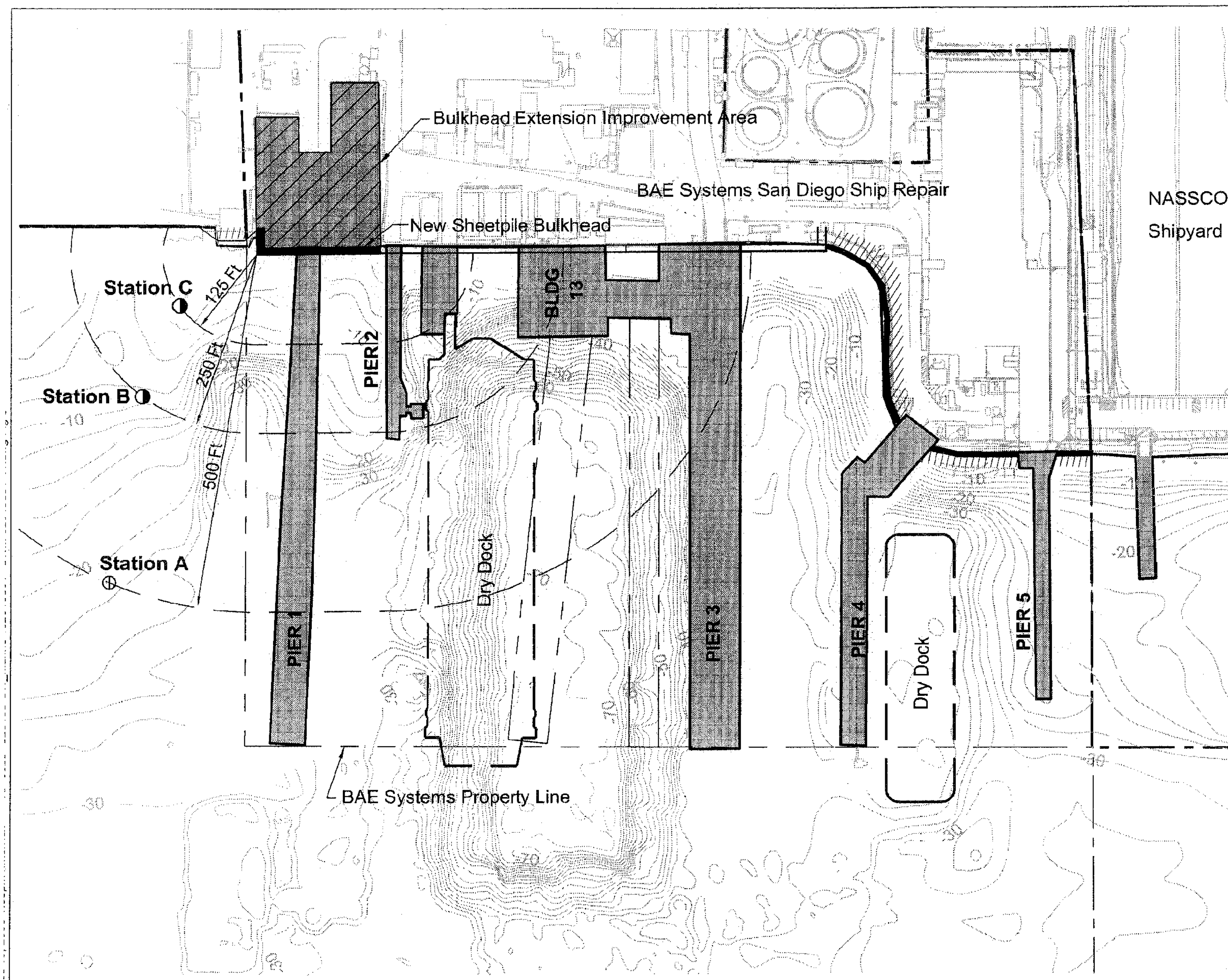
BH15.1 — Post-Excavation Confirmation Sample

Note:
Structural features and existing ground surface based on plans set "Southwest Marine, Inc. - Quay Wall Extension" by Triton Engineers Dated 5/20/02.

Dec 18, 2006 4:32pm hmerrick K:\Jobs\040277-SW_MARINE\04027701\04027701-15.dwg FIG 5

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5
Cross-Sectoin of Sediment Excavation and Backfilling
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



◐ – Water Quality Monitoring Location

⦶ – Background Water Quality Monitoring Location

Note:

Actual monitoring locations will be varied along lines shown in response to tidal currents, construction conditions, shipyard obstructions and other factors.

0 200
Scale in Feet

Base Map Notes:

1. Bathymetric contours from "Southwest Marine Bathymetric Survey" by Racal Pelagos, dated Janurary 25, 2000; and supplemented by neashore soundings by URS (2002)

2. 10 foot contours labeled. 2 foot contours also shown.

3. Horizontal Datum is UTM NAD83 Zone 11 North, Meters.

4. Vertical Datum is MLLW, Feet.

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 6
Water Quality Monitoring Locations
Bulkhead Extension Project
BAE Systems San Diego Ship Repair, Inc

APPENDICES

(ENCLOSED ON CD)

Appendix A	Results of 2006 Sediment Characterization Sampling for CA Hazardous Waste
Appendix B	Data Validation Review Review Report for 2006 Sediment Characterization Sampling
Appendix C	Results of Confirmational Sampling during TTLC Sediment Excavation
Appendix D	Results of Testing for Landfill Acceptance
Appendix E	Waste Disposal Manifests
Appendix F	Testing Results on Selected Samples of Imported Backfilling Materials
Appendix G	Results of Water Quality Monitoring
Appendix H	Daily Construction and Water Quality Photographs
Appendix I	Daily Site and Water Condition Logs

California Regional Water Quality Control Board
San Diego Region

Terry Tamminen
Secretary for Environmental Protection

Internet Address: http://www.swrcb.ca.gov/~rwqcb9/
9174 Sky Park Court, Suite 100, San Diego, California 92123
Phone (858) 467-2952 • FAX (858) 571-6972

Arnold Schwarzenegg
Governor

September 14, 2004

Mr. Scott McKay
Southwest Marine, Inc.
P.O. Box 13308
San Diego, CA 92170-3308

Dear Mr. McKay:

The California Regional Water Quality Control Board, San Diego Region (Regional Board) found your application for 401 Water Quality Certification for the Southwest Marine Bulkhead Extension Project (Project) (File No. 04C-097) to be complete on August 23, 2004. However, before we can issue a Water Quality Certification, we need supplemental information to determine the project's long-term impacts to water quality.

The Data Evaluation Report prepared by Anchor Environmental (August 2004) which was included in your Revised 401 Water Quality Certification Application (August 3, 2004) provided the following information:

- Sediment samples collected within and adjacent to the Project area (SW04 and SW08) contain elevated concentrations of metals, PCBs, and PAHs. For example, a total PCBs concentration of 33.6 mg/kg was reported in the 2 to 4 foot sample collected in SW08.
- Pore water (SW08) and groundwater samples (ASW-WP1 and ASW-WP2) collected within the Project area contain elevated concentrations of metals, PCBs, and PAHs.

The Data Evaluation Report also included an assessment of the potential for the contaminated groundwater to impact surface water quality. However, there is insufficient information for the Regional Board to determine the project's long-term impacts to water quality, primarily because there is no information on the vertical and lateral extent of the waste constituents reported in the groundwater samples collected at ASW-WP1 and ASW-WP2 and the sediment in the Project area behind the proposed bulkhead location.

Therefore, additional site investigation and characterization activities are required to assess the Project's long-term impacts to water quality. The work shall include:

- Development of a site conceptual model (SCM). The SCM shall identify the source(s) and/or potential source(s)of metals, PCBs, and PAHs; the affected media; three dimensional spatial extent of the constituents; routes and/or potential routes of waste constituent migration; and the actual and potential exposure routes for all potential receptors.
- Development and implementation of a Site Investigation Workplan (Workplan). The Workplan shall be designed to determine the vertical and lateral extent of the waste

constituents in all media. In addition, samples should be collected to evaluate physical properties of soils and aquifer materials. The Workplan shall include the SCM and a schedule for completion of all activities. The Workplan shall also include a description of the proposed actions including field methodologies, analytical methods, detection limits, and proposed sampling locations for both soil and groundwater. The Workplan shall include a Quality Assurance Project Plan (QAPP) to ensure that data collected are of adequate quality given the Workplan objectives[1].

- Submittal of a Site Investigation and Characterization Report (Report). The Report shall contain the following information:
    - Site Conceptual Model – updated based on the results of the investigation.
    - Source Characterization – results of an investigation of all potential sources of waste constituent discharges to the soil, groundwater, and storm water conveyance system based on historical records of operations, site reconnaissance, and previous and current studies.
    - Geological Characterization – of the subsurface material at the site, including the hydrogeological characteristics and identification of geologic features that may affect groundwater flow and contaminant migration.
    - Groundwater Flow Characterization – the magnitude and direction of groundwater flow at the site, in both the horizontal and vertical dimensions, for all water bearing units potentially affected by the waste constituents.
    - Waste Constituent Characterization – a characterization of the lateral and vertical extent of waste constituents in soil, sediment, and groundwater to background conditions[2]. Maps, figures, and cross-sections shall be of sufficient number and scale to fully present the results and describe the vertical and lateral extent of waste constituents.
    - Fate and Transport – an assessment of the movements, dispositions and transformations of waste constituents within and between environmental media (soil, surface water, groundwater, and biota).
    - Field Methodologies – the field methodologies used for the investigation and characterization.
    - Chemical Analyses – a description of the analytical methods used for each environmental medium. The chemical analyses must be adequate to identify the full range of waste constituents that may occur.
    - Sample Location and Number – The locations, type, and number of samples should be identified and shown on a site map and cross sections. The number of samples and suite of chemical analyses must

---

[1] For additional information on QAPPs, including a QAPP template, see http://www.swrcb.ca.gov/swamp/qapp.html

[2] Background conditions means the conditions of water, soil, and sediment that has not been affected by a release from the Site.

be sufficient to identify the nature of waste constituent sources, to define the distribution of waste constituents in the subsurface, and to provide data for fate and transport evaluation, risk assessment, remedy selection, and remedial design, if necessary.

If you have any questions, please contact Mr. Phil Hammer of my staff at 858-627-3988 or at hammp@rb9.swrcb.ca.gov.

Sincerely,

John H. Robertus
Executive Officer

CC: Shaun Halvax
Southwest Marine, Inc.
P.O. Box 13308
San Diego, CA 92170-3308

U.S. Army Corps of Engineers
Regulatory Branch
16885 W. Bernardo Dr., Suite 300 A
San Diego, CA 92127
(858) 674-5388 (fax)

U.S. Army Corps of Engineers
Regulatory Branch
P.O. Box 532711
Los Angeles, CA 90053-2325
(213) 452-4196 (fax)

State Water Resources Control Board
Division of Water Quality

Mr. John Odermatt
San Diego RWQCB

CONSTRUCTION COMPLETION REPORT
BULKHEAD EXTENSION AND YARD IMPROVEMENT PROJECT

BAE SYSTEMS SAN DIEGO SHIP REPAIR, INC.

DRAFT FOR CLIENT REVIEW

Prepared for

BAE Systems Ship Repair, Inc.
2205 E. Belt Street
San Diego, California 92113

Prepared by

Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 620
Laguna Niguel, California 92677

November 2006

List of Tables

List of Figures

List of Appendices (provided on CD)

Anchor	Anchor Environmental CA, L.P.
BAE-SDSR	BAE Systems San Diego Ship Repair, Inc.
BMPs	Best Management Practices
CHHSLs	California Human Health Screening Levels
COCs	constituents of concern
CCR	California Code of Regulations
DO	dissolved oxygen
MLLW	mean lower low water
NPDES	National Pollutant Discharge Elimination System
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
the Project	Bulkhead Extension and Yard Improvement Project
SDRWQCB	California Regional Water Quality Control Board, San Diego Region
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentrations
VOCs	Volatile Organic Compounds
WQC	Water Quality Certification

1 INTRODUCTION

Systems

In 2006, BAE Systems San Diego Ship Repair, Inc. (BAE-SDSR; formerly known as Southwest Marine, Inc.) completed reconfiguration of a portion of its ship repair yard. The construction, termed the Bulkhead Extension and Yard Improvement Project (henceforth, "the Project"), involved the installation of a steel sheetpile bulkhead across the mouth of a slip formerly occupied by a pair of now abandoned marine railways, removal of selected sediments from the slip, and backfilling with clean imported backfill to create additional upland yard space for the facility. This report documents the completion of the environmental aspects of the Project, including a brief narrative summary of the work and its accompanying environmental monitoring and sampling.

No. 2003 01115-KW

Figure 1 identifies the general location of the bulkhead extension and yard improvement project relative to the entire BAE Systems San Diego Ship Repair yard and facilities. The construction was performed under a U.S. Army Corps of Engineers Individual Permit, ~~a National Pollutant Discharge Elimination System (NPDES) General Permit for storm water discharges during construction (No. 99-08-DWQ)~~, a Coastal Development Permit, and two separate 401 Water Quality Certifications ([WQCs] Files No. 03C-065 and 04C-097 for two phases of construction activity described below) from the California Regional Water Quality Control Board, San Diego Region (SDRWQCB). Among other requirements, these permits mandated certain environmental controls for the project, including:

- Removal of in-place sediments containing chemicals in excess of California hazardous waste levels (Total Threshold Limit Concentrations, or TTLCs, per California Code of Regulations Title 22), and their disposal at permitted upland landfill facilities.
- Protection of water quality in the adjacent waters of San Diego Bay, through Best Management Practices (BMPs), and as verified by daily observations and monitoring, per the project's Water Quality Montiorng Plan (Anchor, 2004).

Previous investigations and analyses conducted by Anchor Environmental CA, L.P. (Anchor) demonstrated the project's overall short- and long-term protectiveness to water quality in adjoining San Diego Bay waters, and to human health and the environment (Anchor, 2005).

BAE00086778

Mitigation for construction-related impacts to intertidal bay bottom (0.77 acres total) was achieved through the creation of additional 0.77 acres of intertidal habitat at the Sweetwater Channel/D Street Fill mitigation area, and through the creation of additional eelgrass habitat (at a 1:1.2 ratio)~~ in the vicinity of Pier 3 on the BAE-SDSR property~~. Documentation of these mitigation measures can be found in _______ (Shaun please provide ref's)

1.1 Overview of Construction

Figures 2 and 3 present detailed plan and cross-sectional views of the bulkhead improvement area and proposed construction activities. The project was performed in two phases; the general sequence of construction is illustrated as a typical cross-section on Figure 2.

Phase 1 of the project involved removing marine structures from the area and installing a new section of sheetpile bulkhead across the face of the abandoned railways (Figure 2). After completion of Phase 1 ~~in 2005,~~ Phase 2 construction activities commenced in June 2006. Phase 2 included removal ~~of~~ selected sediments from the project footprint and a "wedge" of material situated immediately behind the new bulkhead (Figure 3), then after testing to confirm chemical contaminant removal, backfilling the project site with imported, clean, granular fill to the elevation of the surrounding grade (approximately +12 feet mean lower low water [MLLW]). The surface of the clean backfill area was paved in November 2006 to support shipyard operations.

1.2 Contents of this Report

This report provides brief narrative descriptions and documentation of the following elements of the construction activity:

- Section 2 describes the characterization of sediments in the Project area. The initial delineation of sediments requiring removal because they qualified as hazardous waste under California environmental regulations.
- Section 3 describes the excavation of sediments identified to exceed TTLC criteria, as well as confirmational sampling that was conducted to verify that sediments were sufficiently removed.

- Section 4 describes the disposal of excavated sediments at local and regional landfills, as well as characterization of the excavated sediment for approval by these landfills.
- Section 5 describes the backfilling of the project area with clean, imported fill materials.
- Section 6 describes monitoring of water quality during the construction process.

Supporting data is presented in tables following the text, and in a series of appendices, attached to this report in CD format.

2 SEDIMENT CHARACTERIZATION AND DELINEATION OF HAZARDOUS WASTE EXTENTS

Sediments in place within the Project area were characterized over the course of three different sampling and analysis efforts. The locations of samples and sediment cores are summarized on Figure 2. The three investigations are as follows:

2.1 Detailed Sediment Investigation of BAE and NASSCO Shipyards (2002/2003)

A detailed site sediment investigation was conducted for both the BAE-SDSR (then known as Southwest Marine) and adjoining NASSCO shipyards in 2002 and 2003. This investigation, documented in Exponent (2003), was conducted in response to SDRWQCB Resolution Nos. 2001-02 and 2001-03 and subsequent Water Code Section 13267 letters issued to the shipyards. The investigation involved a series of surface and core samples taken from site sediments throughout both shipyards' leasehold areas and beyond.

Sediments along and in the vicinity of the planned bulkhead were represented by cores SW04 and SW08, taken in close proximity to the alignment of the bulkhead (refer to Figure 2). Sediment chemistry from various depth intervals in these two cores are summarized in Table 1. Impacted sediments were identified in both cores to a depth of about 4 feet (although core SW04 could not be penetrated beyond this depth because refusal was reached, so deeper materials could not be sampled at this location). The primary constituents of concern (COCs) in the impacted sediments include elevated concentrations of metals, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs).

2.2 Vertical and Lateral Characterization of Sediment and Groundwater (2004)

In 2004, following meetings and communications with the SDRWQCB, BAE-SDSR commissioned an additional, site-specific study of sediments within the Project footprint in order to demonstrate to the SDRWQCB that the proposed project would be protective of water quality in San Diego Bay, if the existing sediments were left in-place and encapsulated below clean backfill and behind the new bulkhead wall. Anchor conducted a site investigation within the Project boundaries to provide additional vertical and lateral characterization of COCs in the soil, sediment, and groundwater in and surrounding the Project area.

Continuous core samples were collected at five locations, as depicted on Figure 2. Representative composite samples were obtained from the various geologic layers that are present, including the recent near-surface sediment, upland fill from the surrounding paved area, and the underlying Bay Point Formation. Samples were analyzed for metals, PCBs, and PAHs.

The results of chemical analysis of the samples are summarized in Table 2. At core locations SW-4 in the south half of the project area, and SW-5 in the north half of the project area, the upper two feet of sediment was found to contain copper and/or zinc at concentrations that exceeded California hazardous waste criteria as defined by TTLC values, per California Code of Regulations (CCR) Title 22 (section 66261.24, Division 4.5, Chapter 11, Article 3). Elevated concentrations of lead and PCBs were also noted in these locations, although not above TTLC criteria. No TTLC exceedances were found below depths of 2 feet.

Groundwater was also sampled and the site hydraulic gradient measured in response to tidal fluctuation. This information was used to predict the efflux of dissolved constituents in groundwater after project completion. Modeling demonstrated that long-term water quality in adjacent waters of San Diego Bay would not be adversely affected by the project.

Results of this investigation and the groundwater modeling are documented in a site investigation and characterization report (Anchor, 2005).

2.3 Additional Sediment Evaluation and Delineation (2006)

In response to the investigation documented in Anchor (2005), the SDRWQCB approved issuance of a WQC for the project, contingent on BAE-SDSR removing all sediments that exceeded TTLC criteria from the project area (henceforth termed "TTLC sediments," as identified in cores SW-4 and SW-5). In order to better delineate the limits of TTLC sediments, Anchor obtained hand-pushed piston core samples of sediments at seven additional locations in the Project area in March 2006 (refer to Figure 2 for sampling locations). At each location, the upper 2 to 4 feet of sediment was sampled in 1-foot intervals and analyzed for key metals (Cu, Pb, and Zn) and PCBs.

The results of this sampling effort are presented in Table 3. Laboratory reports are in Appendix A, and a Data Validation Review Report on this data is included as Appendix B. Samples from locations BAE-01, BAE-02, BAE-04, and BAE-05 indicated metal concentrations in excess of TTLC criteria, to depths of 4 feet and possibly below (deeper samples were not successfully obtained); while locations BAE-03, BAE-06, and BAE-07 had no indicated exceedances of TTLC criteria.

Based on these results, the horizontal extent of TTLC sediments was projected as depicted on Figure 2. These estimated limits were used to guide the initial excavation depths for TTLC sediments, subject to confirmatory sampling during construction.

3 EXCAVATION OF TTLC SEDIMENTS

Excavation of TTLC sediments from the Project site started in June 2006, beginning with the portion of the project area that is north of Pier 1. The entire project area was subdivided into individual excavation segments, each assigned its own representative confirmatory post-excavation sample, as shown on Figure 4. The excavation of TTLC sediments was completed in this segment-by-segment basis.

An initial excavation depth of 4 feet was chosen for each excavated segment, since this was the depth of the 2006 cores (as described in Section 2), in an attempt to control excavation volumes while using confirmatory sampling to ensure that the full extents of TTLC sediments were removed. Upon reaching the four-foot depth within each segment, confirmatory sediment samples were obtained from the post-excavation subgrade. The confirmatory samples were submitted to a local laboratory (CalSciences in Garden Grove, California) and tested for Cu, Pb, Zn, and PCBs. While the analytical testing was being done, the excavation contractor was instructed to hold off on further excavation from other segments of the project area, so as to avoid any resuspension of sediments while the excavated subgrade was exposed.

When test results were received, they were compared to the TTLC criteria to see if exceedances still existed at the excavated depth. If so – or even if the measured concentrations were within about one-fifth of the TTLC criteria – then the contractor was instructed to excavate two additional feet to remove additional sediment from the sampled segment. Following this re-excavation, another confirmatory sample was obtained and analyzed. Excavation was considered complete at a given location only when the latest confirmatory sample indicated that concentrations of Cu, Pb, Zn, and PCBs were well below TTLC criteria.

When excavation was considered complete at a location (i.e., remaining concentrations well below TTLC criteria), the excavated segment was backfilled up to previous grade with clean, imported sand fill, and the excavation contractor was then directed to move on to excavating the next adjacent segment. In this manner the excavation progressed in a segmental fashion.

After the final segment of TTLC sediment was removed and backfilled with clean material, the contractor excavated the sediment "wedge" from immediately behind (inside of) the bulkhead

wall (see Figure 3). Material excavated from the wedge was stockpiled separately from the expected TTLC sediments, to prevent mixing or cross-contamination of the materials. Two more confirmatory samples ("Wedge-1" and "Wedge-2" were taken from the bottom of this excavation to verify that no TTLC sediment was left at the base of the excavation).

Altogether, approximately 1,100 cubic yards of sediment – or 1,400 tons – was excavated during this process.

Table 4 presents the results of confirmatory samples obtained during excavation of TTLC sediments, and Appendix C includes the laboratory reports from all chemical analyses. In several instances (for example, BH-4, BH-8, etc.) the first confirmatory sample exceeded or nearly exceeded TTLC criteria for copper, lead, and/or zinc, so additional excavation was done and another sample obtained at the new, deeper depth (labeled BH-4.1, BH-8.1, etc.). In one case (at location BH-4), a third round of excavation and confirmatory sampling was done, to a depth of 8 feet; the final sample at this location was labeled BH-4.2.

Sediment removal was preceded by and concurrent with demolition and removal of previously existing marine cradles in the northwestern portion of the Project area, and the part of Pier 1 landward of the new bulkhead wall.

4 DISPOSAL OF CONSTRUCTION WASTE AND EXCAVATED SEDIMENTS

4.1 Characterization and Disposal of Excavated Sediment

Excavated sediment was stockpiled on-site in the paved north area of the yard improvement project, in a controlled stockpiling area with concrete blocks and runoff protection around its perimeter to prevent loss of sediment and water to the surrounding environment.

As excavation proceeded, composite samples were collected from material stockpiles and analyzed for landfill acceptance. A total of 23 samples were obtained altogether, which, for 1,100 cubic yards of sediment, amounts to approximately one representative sample per every 50 cubic yards of stockpiled sediment, consistent with testing requirements for local landfills operated by Allied Waste (such as the Otay and Sycamore landfills in San Diego County). Analysis of these samples was done in two phases: first, analysis of the bulk concentrations of metals, PCBs, PAHs, and Volatile Organic Compounds (VOCs), to determine which (if any) constituents contained elevated concentrations. Next, in cases where bulk concentrations were within one-tenth of the TTLC criteria, leachability testing (by the Toxicity Characteristic Leaching Procedure, or TCLP) was conducted to evaluate the potential for leaching of those chemicals, as a requirement for potential acceptance at local landfills.

Analytical results from sediment stockpiles are presented in Appendix D. Ultimately, the majority of the excavated sediment did not meet TCLP requirements for local landfill disposal at a San Diego County landfill, and 728.21 tons of sediment were instead hauled to the Copper Mountain Landfill, a solid waste facililty operated by Allied Waste in Arizona. In addition, 673.97 tons of sediment was hauled to the Azusa Land Reclamation Landfill in Azusa, California, which accepted stockpiled sediments containing lesser concentrations of metals and PCBs. Waste Disposal Manifests for sediment hauling and disposal are presented in Appendix E.

4.2 Disposal of Demolition Debris

Wood, steel, and concrete debris was also generated during project work, from the demolition of existing site structures (marine railways, and the portion of Pier One within the project footprint). All demolition materials were cleaned of sediment and disposed at the Otay Landfill in San Diego County and at the Simi Valley landfill in Ventura County, CA. ~~Unless Special Waste Man~~

5 BACKFILLING OF EXCAVATION AND PROJECT AREA

After sediment excavation was completed, the project area was completely backfilled with ~~compacted sand~~ clean imported backfill. The area was filled to a final grade of approximately elevation +11.5 feet MLLW, so that after later installation of base course and asphalt concrete pavement, the final grade would be roughly equivalent to the elevation of the surrounding land area (elevation +12.1 feet MLLW).

~~Sand~~ backfill material was obtained from several local sources in the San Diego area. Representative samples of the imported backfills were obtained on a regular basis, and 20 of the samples (roughly one out of every five collected) were tested for key chemical constituents (Cu, Pb, Zn, and PCBs) to ensure that there were no significant concentrations of these chemicals in the fill. The number of samples analyzed from each import fill source was proportionate to the amount of fill used from that source.

The analytical results for the imported soil fill are summarized in Table 5. Metals concentrations (Cu, Pb, and Zn) were well below California TTLC Criteria, as well as Human Health Screening Levels (CHHSLs) for residential and commercial/industrial use. No PCBs were detected in any of the imported sand samples.

6 WATER QUALITY MONITORING

6.1 Water Quality Program

Water quality monitoring was performed during the excavation activities (Phase 2A) and clean fill materials placement (Phase 2B). Water quality monitoring was conducted as a condition of the 401 WQC Permit ~~and Construction NPDES~~ issued by the SDRWQCB. Daily visual turbidity monitoring and weekly water quality monitoring of turbidity, dissolved oxygen (DO), and pH were conducted during Phase 2 activities.

established

The purpose of the water quality monitoring program was to provide ongoing assessment of water quality during construction and filling activities. Compliance criteria, shown in Table 6, were ~~set~~ to determine if there were any water quality exceedences during construction. The objectives of the monitoring program are as follows:

- To ensure that water quality conditions were maintained within the prescribed limits of relevant regulatory requirements.
- To allow for appropriate adjustment of construction activities in a manner that would ensure protection of the environment.
- To document the results of water quality performance monitoring.

Water quality monitoring for Phase 2A was conducted at three locations during construction, as follows:

- Station A, located 500 feet bayward from the construction limits (defined as the bulkhead wall). This is the background monitoring station.
- Station B, located 250 feet bayward from the construction limits. This defines the site compliance zone boundary.
- Station C, located 125 feet bayward from the construction limits. This station is an additional "early warning" boundary.

At each location, DO, turbidity, and pH were monitored at three depths: shallow (within 3 feet of the surface); mid-depth; and deep (within 6 feet of the bottom).

6.2 Water Quality Monitoring Results and Summary

The following data are presented in Appendices to this report:

- Table of Water Qualty Monitoring Results (Appendix G)
- Daily Construction Site and Waterside Photographs (Appendix H)
- Daily Monitoring Logs and Checklists (Appendix I)

BAE personnel were trained in the calibration and use of the monitoring equipment. Originally, the Hydrolab Hydras 3 LT sonde/laptop system was calibrated and tested in the field. However, due to difficulties in operating the laptop in the field, after two monitoring events, the Hydrolab was replaced with a portable system (the Hydrolab DS4a).

In summary, the water quality monitoring results showed the following:

- **Turbidity.** No turbidity, floatables, or oil sheens[1] were visually observed during daily monitoring. Weekly turbidity readings were consistent with historical data for the subject area of San Diego Bay (typically less than 5 NTU, per San Diego Bay Watersheds [2006] and Unified Port District of San Diego [2006] websites). The only exception to this was one sampling occasion, on June 27, 2006, when turbidity was recorded between 88.8 and 116.4 NTU. There was no construction-related event to account for this spike, and no turbidity was observed. Additionally, the lowest reading was recorded closest to the construction activity, and the highest reading was recorded at the background condition station. Altogether, therefore, this anomalous reading was not considered to reflect a construction-related impact on water quality.
- **Dissolved Oxygen.** Historically, DO levels have ranged from 5.0 to 8.1 (per San Diego Bay Watersheds [2006] and Unified Port District of San Diego [2006]). DO levels measured for this project were consistent with the historical data, and were often greater (and therefore improved) closer to the construction activities (Station C) than at the background monitoring station (June 22, June 27, July 11, and August 17, 2006).
- **pH.** pH levels were consistently within standards set by the SDRWQCB.

[1] On March 29, 2006, a "slight" oil sheen was noted.

6.3 Water Quality Monitoring Conclusions

No deleterious effects to water quality were observed or measured during excavation or placement activities. There were no visual observations of turbidity, floatables, or oil sheens, and there were no observations of distressed wildlife.

There were no impacts to water quality associated with exceedences of pH, and measured DO levels were within historical ranges. Furthermore, DO levels at the monitoring station closest to construction activities were often greater than background conditions. Visual observations during construction activity indicated no evident turbidity. Monitoring showed that turbidity levels were within historical ranges on all but one monitoring event, the same day that DO was recorded at its highest level.

As a result of these measurements and observations, BAE-SDSR concludes that this project did not result in adverse impacts to water quality from increased DO or turbidity levels.

7 CONCLUSIONS

on Oct 13, 2006

The Bulkhead Extension and Yard Improvement project was completed on Oct 13, 2006 consistent with the terms of the Project permits. Specifically,

- All sediments exceeding California hazardous waste (TTLC) criteria were removed from the project site, as confirmed by a series of post-excavation samples.
- All excavated sediment was disposed off-site at permitted landfills.
- Clean import fill ~~sands were~~ material was used to backfill the project area.
- Daily water quality monitoring confirmed that adjacent surface waters of San Diego Bay were not adversely impacted pH, DO, or turbidity.
- Storm water protection measures were maintained in place throughout the construction process.

This report satisfies the requirements of paragraph B.3 in the 401 WQC, stating that a report shall be submitted at the end of construction which documents the results of all water quality monitoring.

REFERENCES

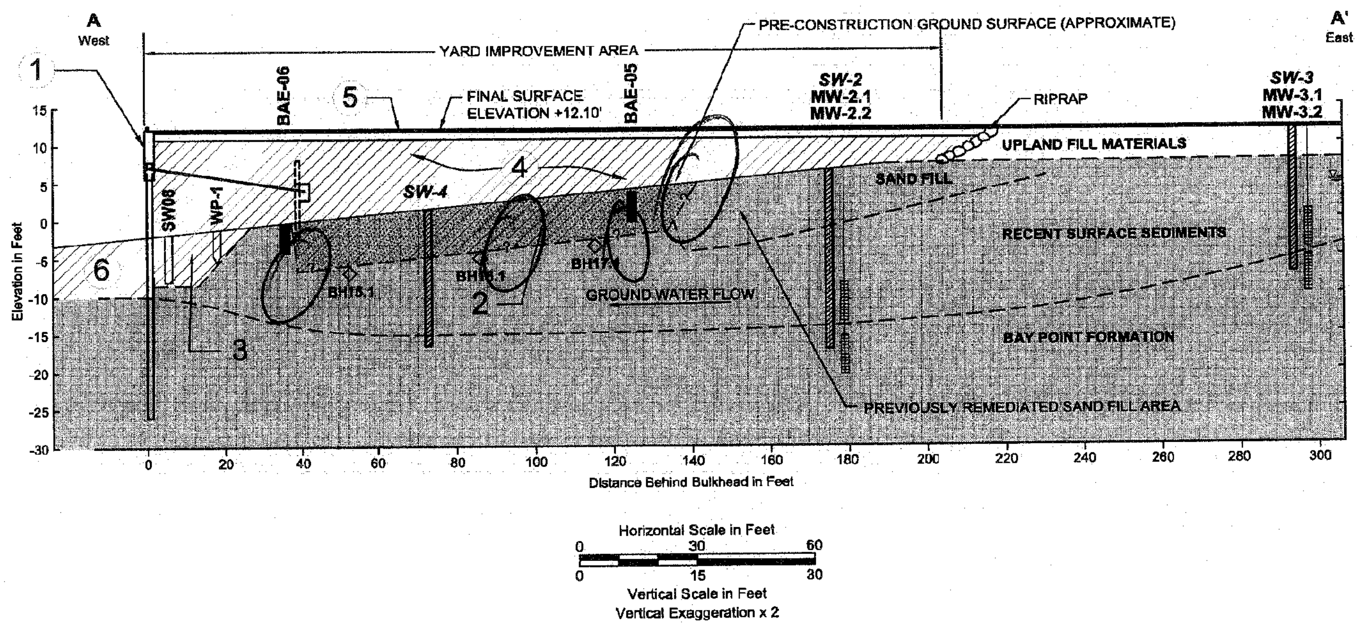
Anchor, 2004. Water Quality Monitoring Plan for Bulkhead Extension Project Phase 1 and Phase 2 Activities. August 2004.

Anchor, 2005. Site Investigation and Characterization Report for 401 Water Quality Certification, Bulkhead Extension and Yard Improvement Phase 2 Activities. Submitted to the California Regional Water Quality Control Board, San Diego Region. August 2005.

Exponent, 2003. NASSCO and Southwest Marine Detailed Sediment Investigation, prepared for NASSCO and Southwest Marine, September 2003.

San Diego Bay Watersheds, 2006. Common Ground Project Website: http://www.sdbay.sdsu.edu/IMS/Website/CommonGroundNew/viewer.htm

Unified Port District of San Diego, 2006. Website for San Diego Bay water quality: http://www.portofsandiego.org/sandiego_environment/bay_water_sampling.asp



Project Construction Sequence
(refer to circled numbers on cross section above)

1. Sheetpile Bulkhead Installed.
2. ~~Hazardous Waste~~ TTLC Sediments Excavated from Project Area, where present.
3. Chemically Impacted Sediment Excavated from "Wedge" immediately behind Installed Bulkhead.
4. Excavation and Yard Improvement Area Backfilled with Compacted Import Fill.
5. Aggregate Base and Asphalt to be Placed Over Entire Yard Improvement Area.
6. Sheetpile Wall Designed for Potential Future Removal of Sediments Outside Wall.

Clean Backfill

Extent of Sediment Excavation

SW08 — Previously Advanced Sediment Core (Exponent, 2003)

SW-2 MW-2.1 — Sediment Core and Monitoring Well (Anchor, 2005)

BAE-05 — Sediment Core, 2006

BH15.1 — Post-Excavation Confirmation Sample

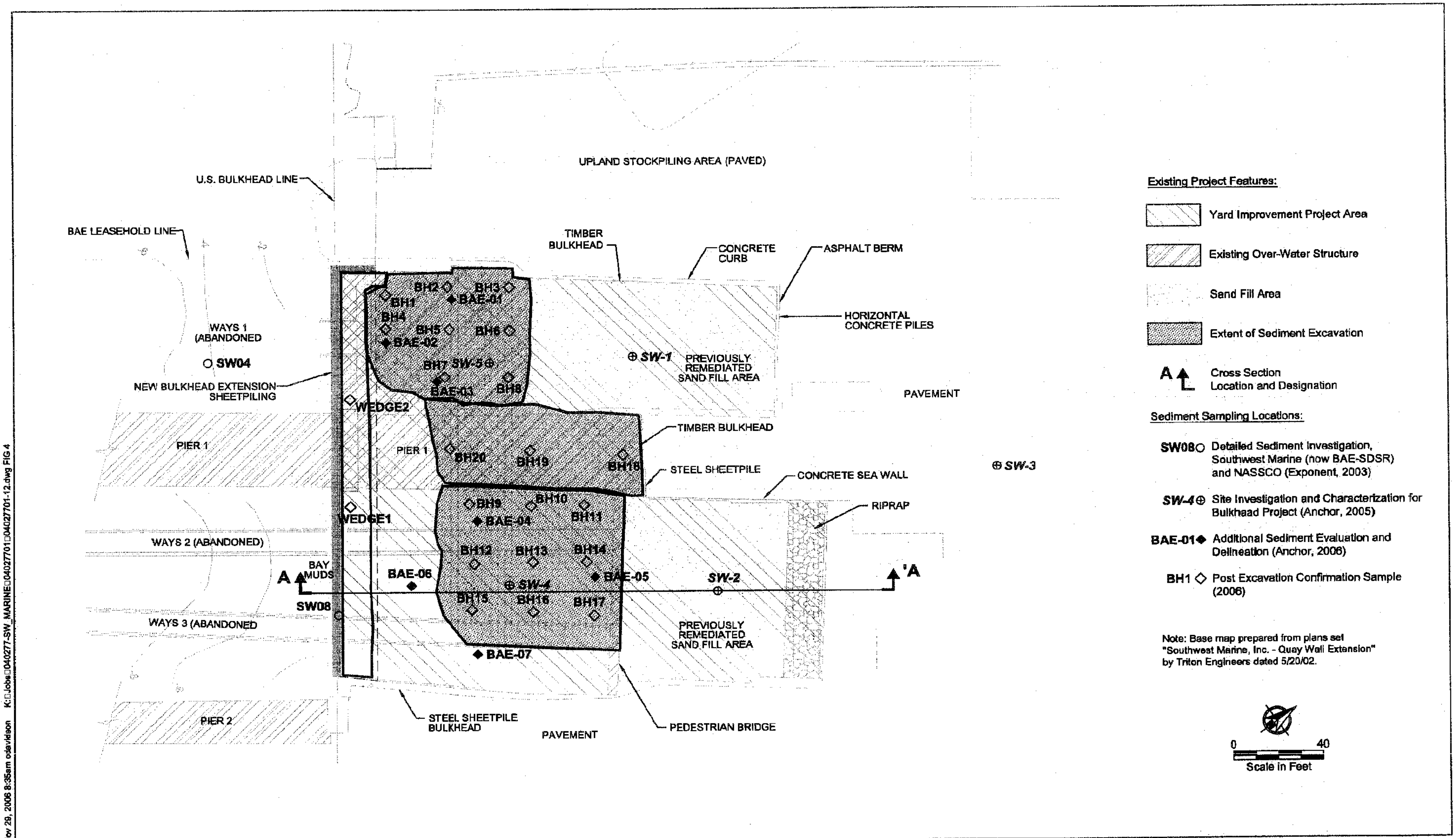
Note:
Structural features and existing ground surface based on plans set "Southwest Marine, Inc. - Quay Wall Extension" by Triton Engineers Dated 5/20/02.

Nov 28, 2006 4:35pm cdavidson K:\Jobs\040277-SW_MARINE\04027701\04027701-10.dwg FIG 5

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5
Cross-Sectoin Showing Extent of Excavation of TTLC Sediments
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair

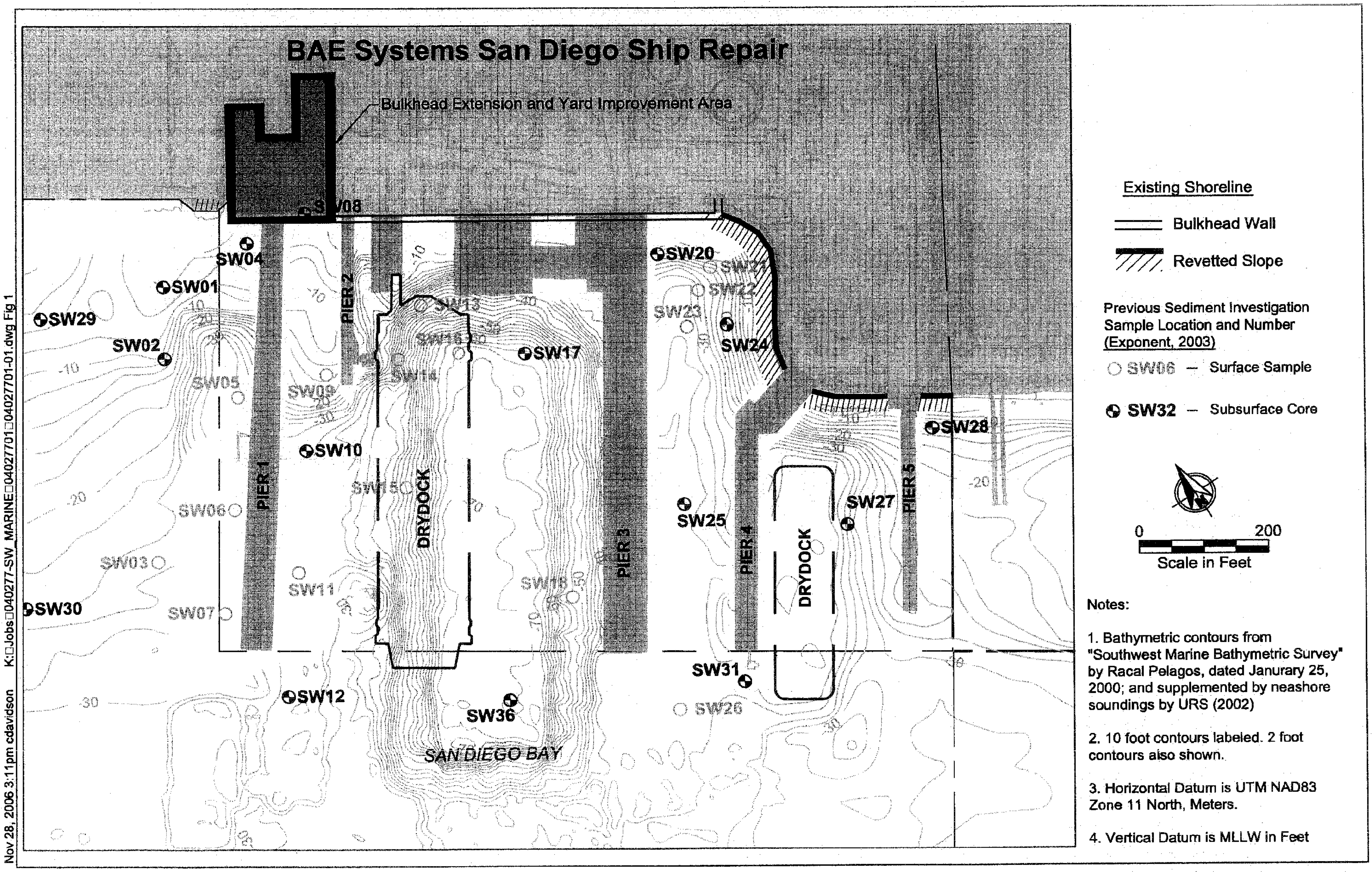
BAE00086794



Nov 29, 2006 8:35am odavidson K:\Jobs\040277-SW_MARINE\04027701\04027701-12.dwg FIG 4

ANCHOR ENVIRONMENTAL, L.L.C.

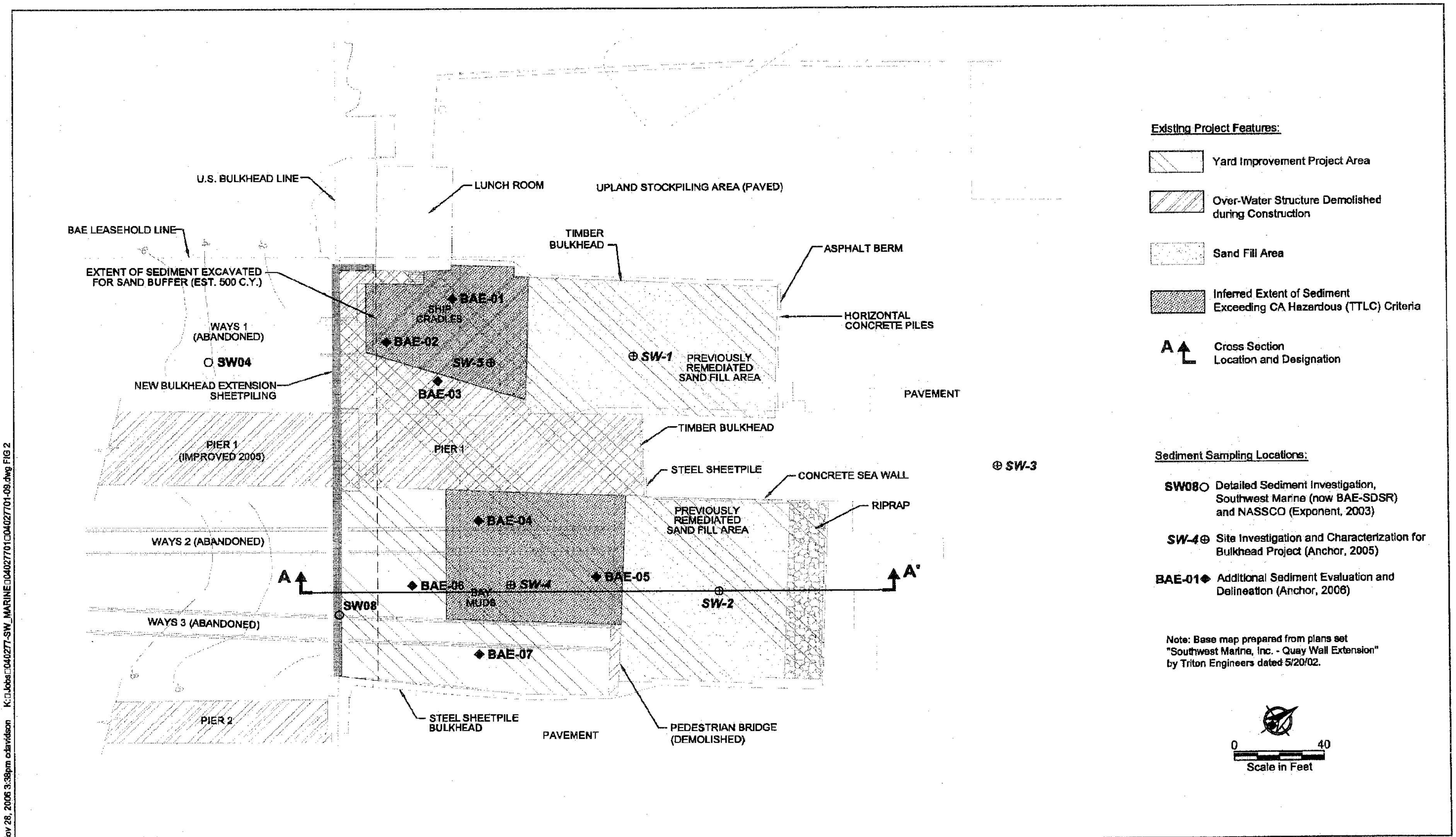
Figure 4
Extent of Excavation of TTLC Sediments
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 1
Project Location Plan
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair

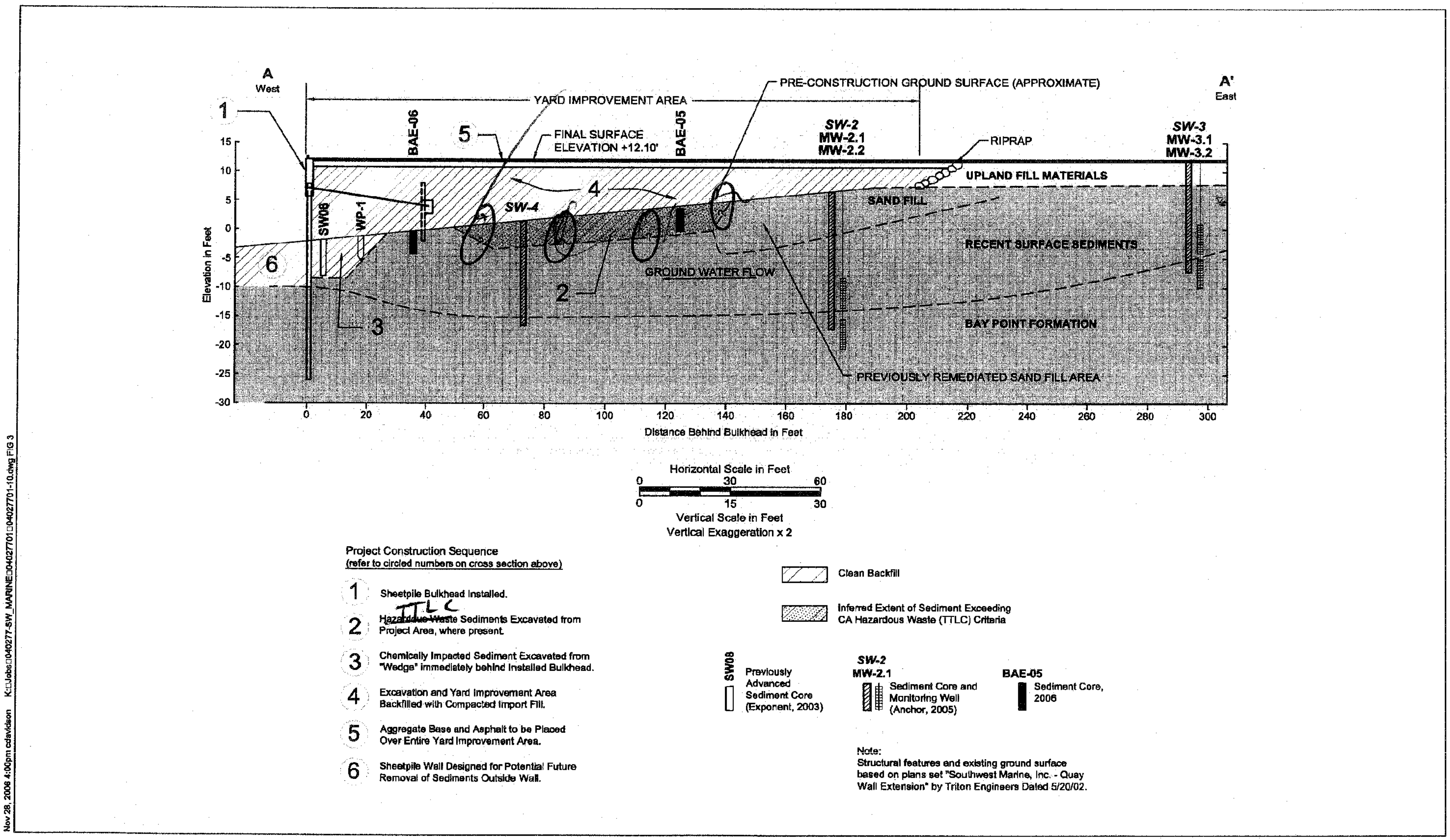
BAE00086796



Nov 28, 2006 3:38pm cdavidson K:\Jobs\040277-SW_MARINE\04027701\04027701-09.dwg FIG 2

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2
Project Site Plan and Initial Delineation of Sediment Chemistry
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



Nov 28, 2006 4:00pm cdavidson K:\Jobs\040277-SW_MARINE\04027701\04027701-10.dwg FIG 3

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 3
Project Site Cross-Section and Initial Delineation of Sediment Chemistry
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair

Calscience Environmental Laboratories, Inc.

INVOICE

COPY

Date: 8/26/2006
Invoice Number: 1106383

Shaun Halvax
BAE Systems
P.O. Box 13308
San Diego, CA 92170-3308

Report Sent To: Shaun Halvax
Calscience Work Order No: 06-08-1086
Project Name/No : Bulk Head
Terms: Net 30

Total Amount Due : $ 636.00

Matrix	Test	TAT	Qty	Unit Cost	Subtotal	Rush Surcharge	Total
Soil	EPA 8082 PCBs	1	3	$70.00	$210.00	$210.00	$420.00
Soil	Zn, Pb, Cd by EPA 6010B	1	3	$36.00	$108.00	$108.00	$216.00

Total Amount Due : $636.00

Amounts not paid within terms are subject to a 1.5% per month service charge.
Please include invoice number with your remittance.

PLEASE REMIT TO: **19433 E. WALNUT DRIVE SOUTH**
CITY OF INDUSTRY, CA 91748-2316

7440 Lincoln Way, Garden Grove, CA 92841-1427 • TEL:(714) 895-5494 • FAX: (714) 894-7501

CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1427
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 8/17/06

Page 1 of 1

LABORATORY CLIENT: BAE Systems SDSR
ADDRESS: 2205 ft of Sampson St.
CITY San Diego STATE CA ZIP 92170
TEL: 619-238 1000 ext 2040 E-MAIL:

TURNAROUND TIME: ☐ SAME DAY ☒ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY): ☐ RWQCB REPORTING FORMS ☐ COELT EDF ☐

SPECIAL INSTRUCTIONS:

CLIENT PROJECT NAME / NUMBER: BULKHEAD
PROJECT CONTACT: SHAUN HALVAX
SAMPLER(S): (PRINT) S Halvax
COELT LOG CODE: ☐ ☐ ☐ ☐
P.O. NO.:
LAB USE ONLY: 08-08-0826
COOLER RECEIPT TEMP = ____ °C

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	FIELD POINT NAME (FOR COELT EDF)	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or	BTEX / MTBE (8260B) or	OXYGENATES (8260B)	VOCs (8260B)	5035 ENCORE PREP	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	CAC, T22 METALS (6010B) / 747	PNAs (8310) or (8270C)	VOCs (TO-14A) or (TO-15)	TPH(G) (TO-3M)	Cu, Pb, Zn, 3050B, 6010B				
	BH 18		8/17/06	0849	SOIL	1									X					X				
	BH 19		8/17/06	0805	SOIL	1									X					X				
	BH 20		8/17/06	0811	SOIL	1									X					X				

Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
S Halvax 8/17/6	CEL	8/17/06	1400
Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature/Affiliation) CEL	8/17/6	1710

DISTRIBUTION: White with final report, Green and Yellow to Client.
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the Green and Yellow copies respectively.

05/10/06 Revision

Q&Q Graphic 714-898-9702

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 06 - 0 8 - 1 0 8 6

Cooler 1 of 1

SAMPLE RECEIPT FORM

CLIENT: BAE

DATE: 8/17/6

TEMPERATURE – SAMPLES RECEIVED BY:

CALSCIENCE COURIER:

_____ Chilled, cooler with temperature blank provided.
_____ Chilled, cooler without temperature blank.
✓ Chilled and placed in cooler with wet ice.
_____ Ambient and placed in cooler with wet ice.
_____ Ambient temperature.
3.7 °C Temperature blank.

LABORATORY (Other than Calscience Courier):

_____ °C Temperature blank.
_____ °C IR thermometer.
_____ Ambient temperature.

Initial: [initials]

CUSTODY SEAL INTACT:

Sample(s): _____ Cooler: _____ No (Not Intact) : _____ Not Applicable (N/A): ✓

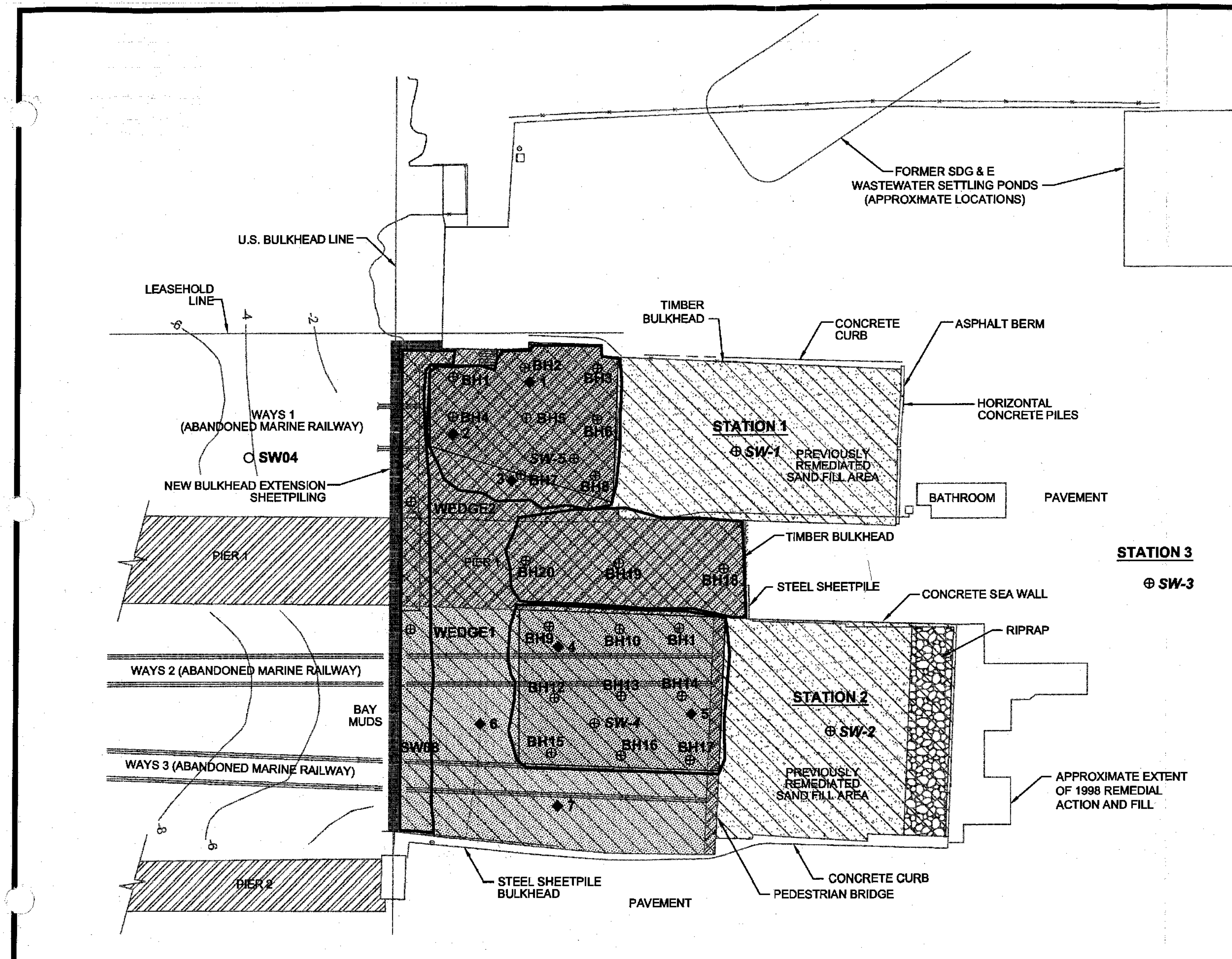
Initial: [initials]

SAMPLE CONDITION:

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples	✓		
Sampler's name indicated on COC	✓		
Sample container label(s) consistent with custody papers	✓		
Sample container(s) intact and good condition	✓		
Correct containers and volume for analyses requested	✓		
Proper preservation noted on sample label(s)			✓
VOA vial(s) free of headspace.			✓
Tedlar bag(s) free of condensation			✓

Initial: [initials]

COMMENTS:



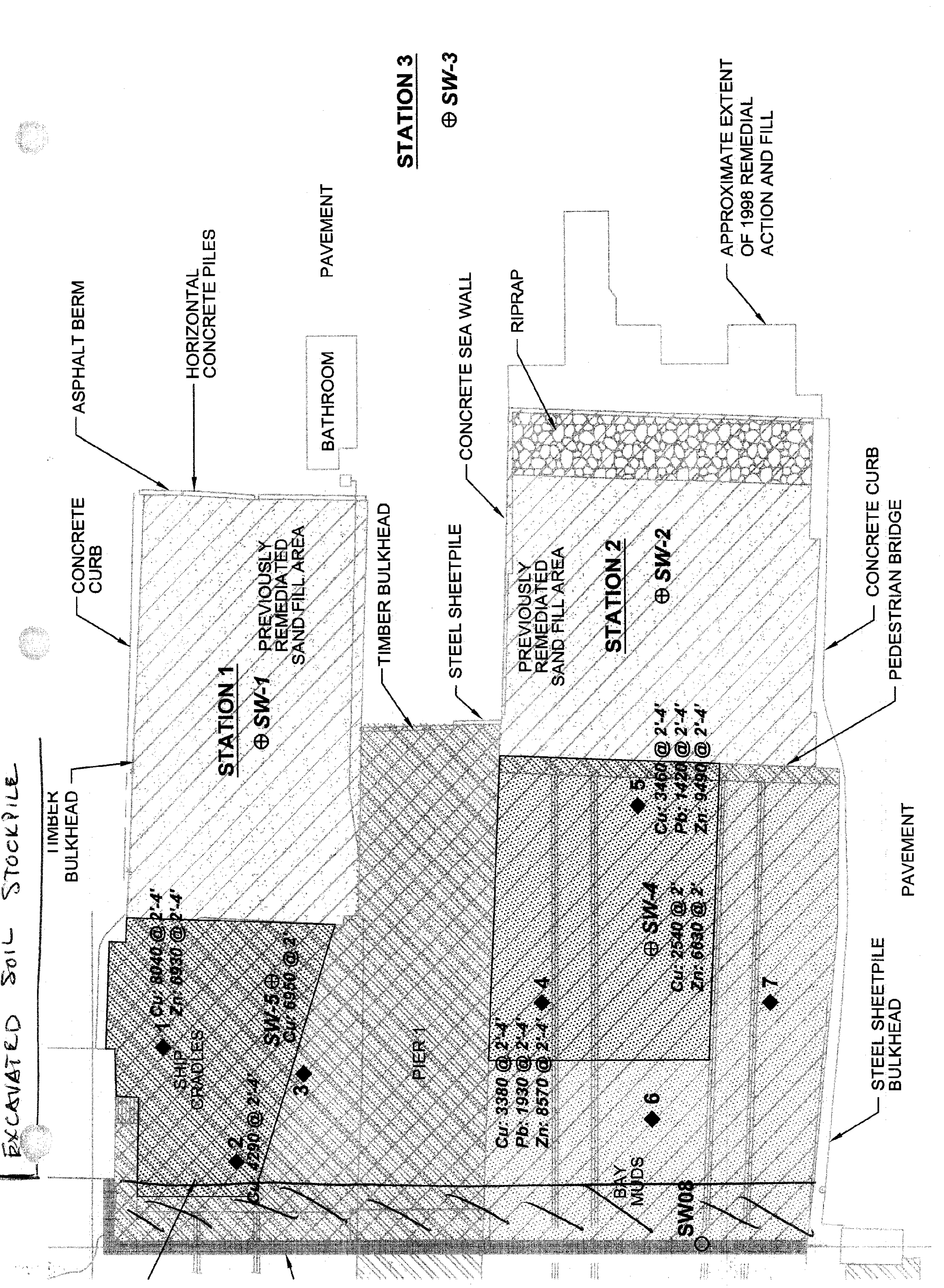
BAE SYSTEMS

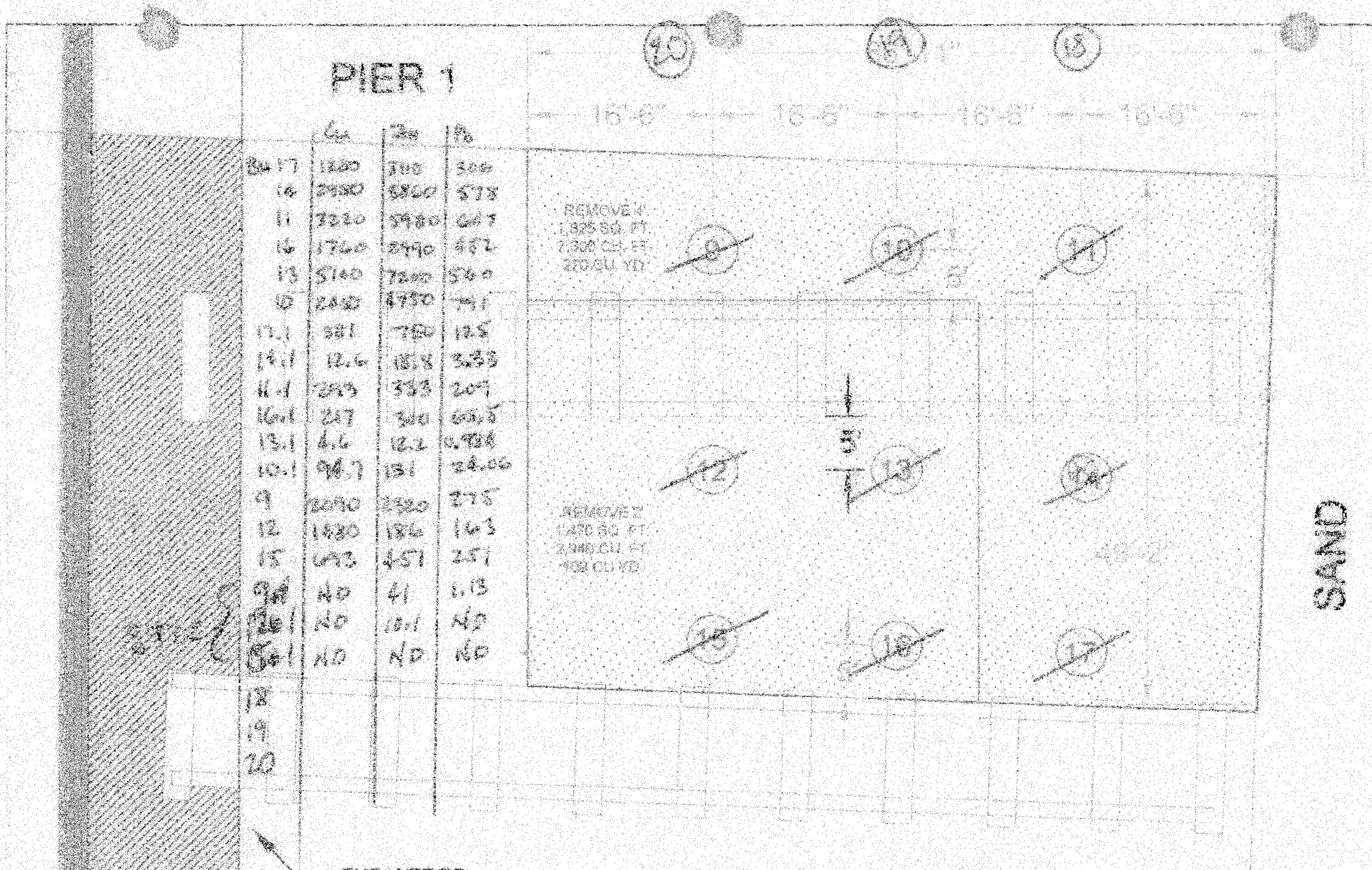
Confirmation Sample Results in BOLD

ID	Cu	Pb	Zn	PCB
1*	8040	644	6930	3,100
2*	6610	1560	3750	38,000
3*	497	249	529	970
4*	3380	1390	8570	960
5*	3240	660	6640	1410
6*	**1340**	**315**	**1410**	**4700**
7*	**723**	**243**	**572**	**4300**
BH1	230	32.8	109	700
BH2	.968	1.05	7.35	ND
BH3	55.7	8.99	56.2	1160
BH4	395	326	2120	2800
BH4.1	4900	699	2310	1650
BH4.2	**102**	**140**	**93.8**	**660**
BH5	**33.6**	**10.5**	**544**	**780**
BH6	**8.13**	**2.48**	**17.2**	**ND**
BH7	**3.45**	**5.79**	**23.9**	**1,000**
BH8	3360	589	3590	16100
BH8.1	**233**	**44.6**	**277**	**ND**
BH9	**2090**	**275**	**2320**	**950**
BH9.1**	**ND**	**41**	**1.13**	**NA**
BH10	2450	791	4750	3700
BH10.1	**94.7**	**24**	**131**	**920**
BH11	3220	647	5980	3200
BH11.1	**293**	**209**	**333**	**750**
BH12	**1480**	**163**	**186**	**3100**
BH12.1**	**ND**	**ND**	**10.1**	**NA**
BH13	5100	560	7200	1070
BH13.1	**4.6**	**0.98**	**12.2**	**ND**
BH14	2950	578	5860	1060
BH14.1	**12.6**	**3.33**	**18.8**	**ND**
BH15	**693**	**251**	**451**	**4000**
BH15.1**	**ND**	**0.313**	**5.36**	**NA**
BH16	1760	452	2990	1650
BH16.1	**217**	**68.5**	**300**	**540**
BH17	1280	306	3110	3800
BH17.1	**381**	**125**	**750**	**202**
BH18	**1.13**	**1.20**	**12.3**	**ND**
BH19	**1.37**	**2.02**	**16.1**	**ND**
BH20	**2.24**	**2.31**	**11.9**	**ND**
WEDGE1	**16.6**	**6.65**	**26.7**	**ND**
WEDGE2	**13.7**	**16.3**	**51.9**	**ND**
SWO8	1480	341	786	33600

*Pre-excavation sample results
** STLC

Soil Excavated


EXCAVATED SOIL STOCKPILE
TIMBER BULKHEAD
CONCRETE CURB
ASPHALT BERM
HORIZONTAL CONCRETE PILES
BATHROOM
PAVEMENT
STATION 3
SW-3
CONCRETE SEA WALL
RIPRAP
APPROXIMATE EXTENT OF 1998 REMEDIAL ACTION AND FILL
STATION 1
SW-1
PREVIOUSLY REMEDIATED SAND FILL AREA
TIMBER BULKHEAD
STEEL SHEETPILE
PREVIOUSLY REMEDIATED SAND FILL AREA
STATION 2
SW-2
CONCRETE CURB
PEDESTRIAN BRIDGE
1 Cu: 8040 @ 2'-4' Zn: 6930 @ 2'-4'
SHIP CRADLES
SW-5 Cu: 6950 @ 2'
3
2 Cu: 4290 @ 2'-4'
PIER 1
Cu: 3380 @ 2'-4' Pb: 1930 @ 2'-4' Zn: 8570 @ 2'-4'
4
6
BAY MUDS
SW08
5 Cu: 3460 @ 2'-4' Pb: 1420 @ 2'-4' Zn: 9490 @ 2'-4'
SW-4 Cu: 2540 @ 2' Zn: 6630 @ 2'
7
PAVEMENT
STEEL SHEETPILE BULKHEAD

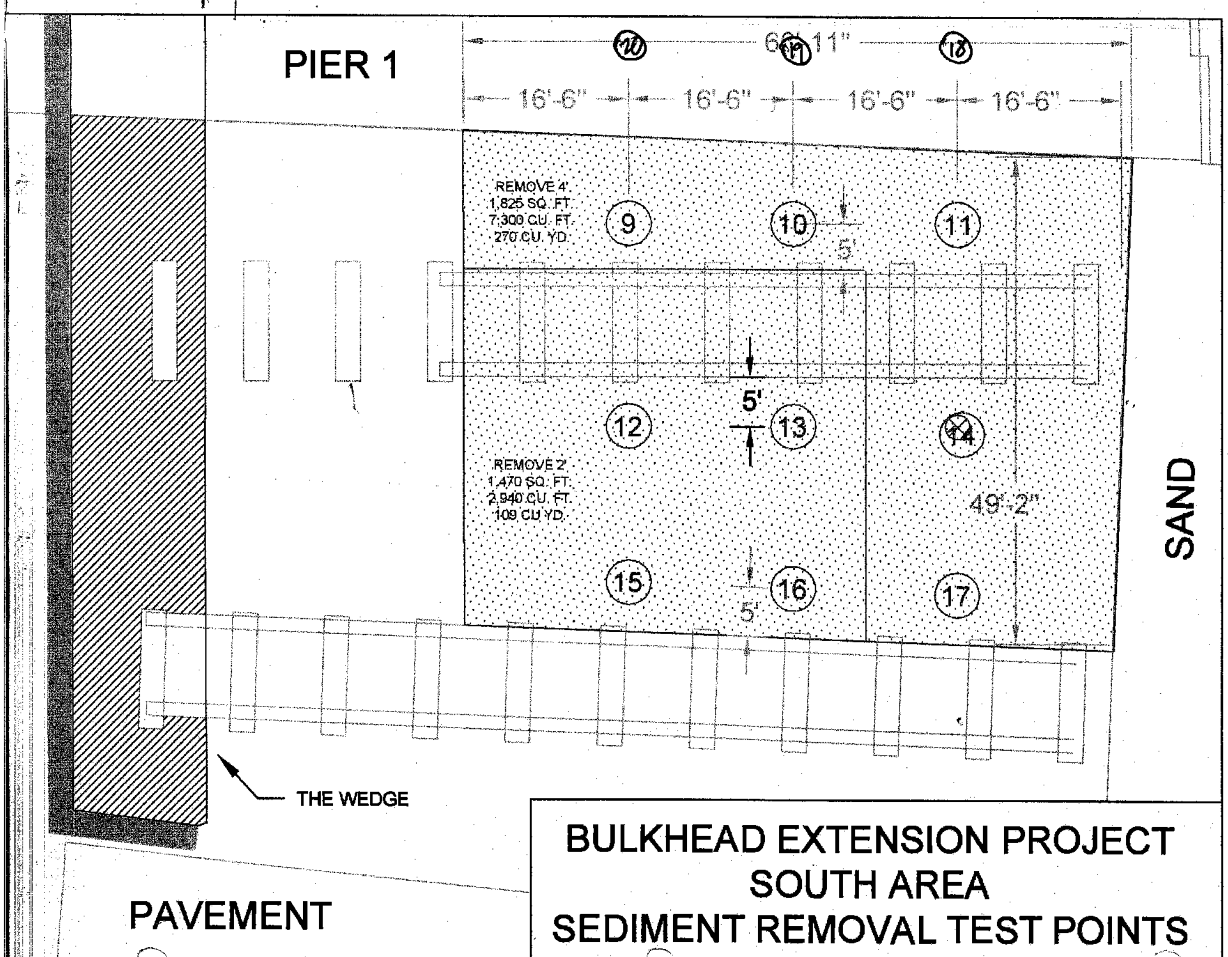


	Cu	Zn	Pb
B-17	1880	3110	300
16	2950	5860	575
11	7220	5980	647
16	1760	2490	452
13	5140	7200	560
10	2450	4750	791
17.1	381	780	12.5
14.1	12.6	1818	333
11.1	293	353	209
16.1	217	300	65.5
13.1	4.6	12.2	6.928
10.1	98.7	151	24.06
9	2090	2320	275
12	1430	186	163
15	693	457	257
9.1	ND	41	1.13
12.1	ND	10.1	ND
15.1	ND	ND	ND
18			
19			
20			

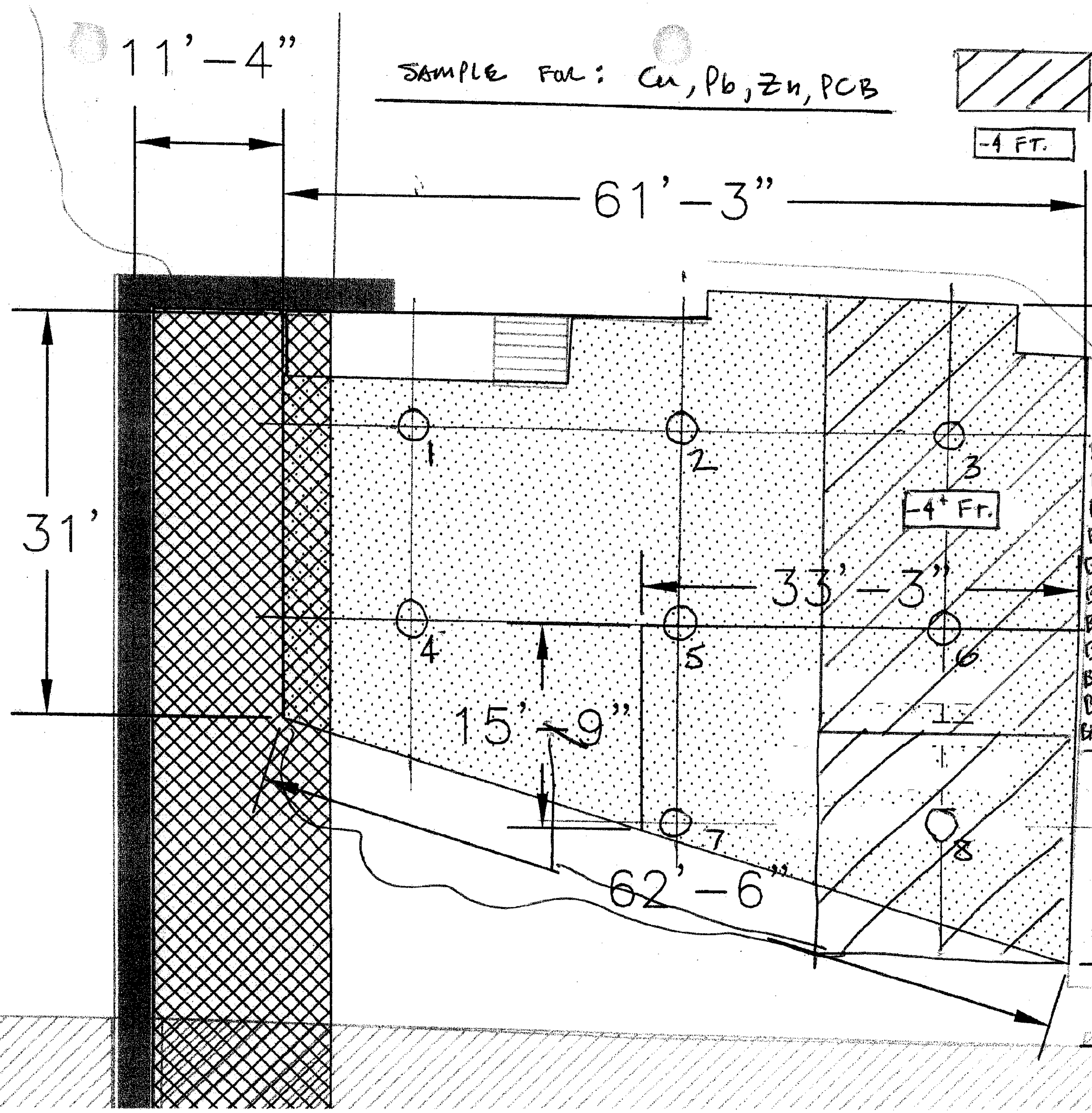
BULKHEAD EXTENSION PROJECT
SOUTH AREA
SEDIMENT REMOVAL TEST POINTS

98' Remediation

BH	ID#	DATE	TIME
BH	17	6/23/06	0655
BH	14	6/23/06	0703
BH	11	6/23/06	0709
BH	16	6/23/06	0727
BH	13	6/23/06	0730
BH	10	6/23/06	0735
BH	10.1	6/27/6	11:27
BH	11.1	6/27/6	11:17
BH	13.1	6/27/6	11:33
BH	14.1	6/27/6	11:05
BH	16.1	6/27/6	11:48
BH	17.1	6/27/6	10:48
BH	9	6/30/6	12:52
BH	12	6/30/6	12:45
BH	15	6/30/6	12:43
BH	18	8/17/6	8:48
BH	19	8/17/6	8:03
BH	20	8/17/6	8:11



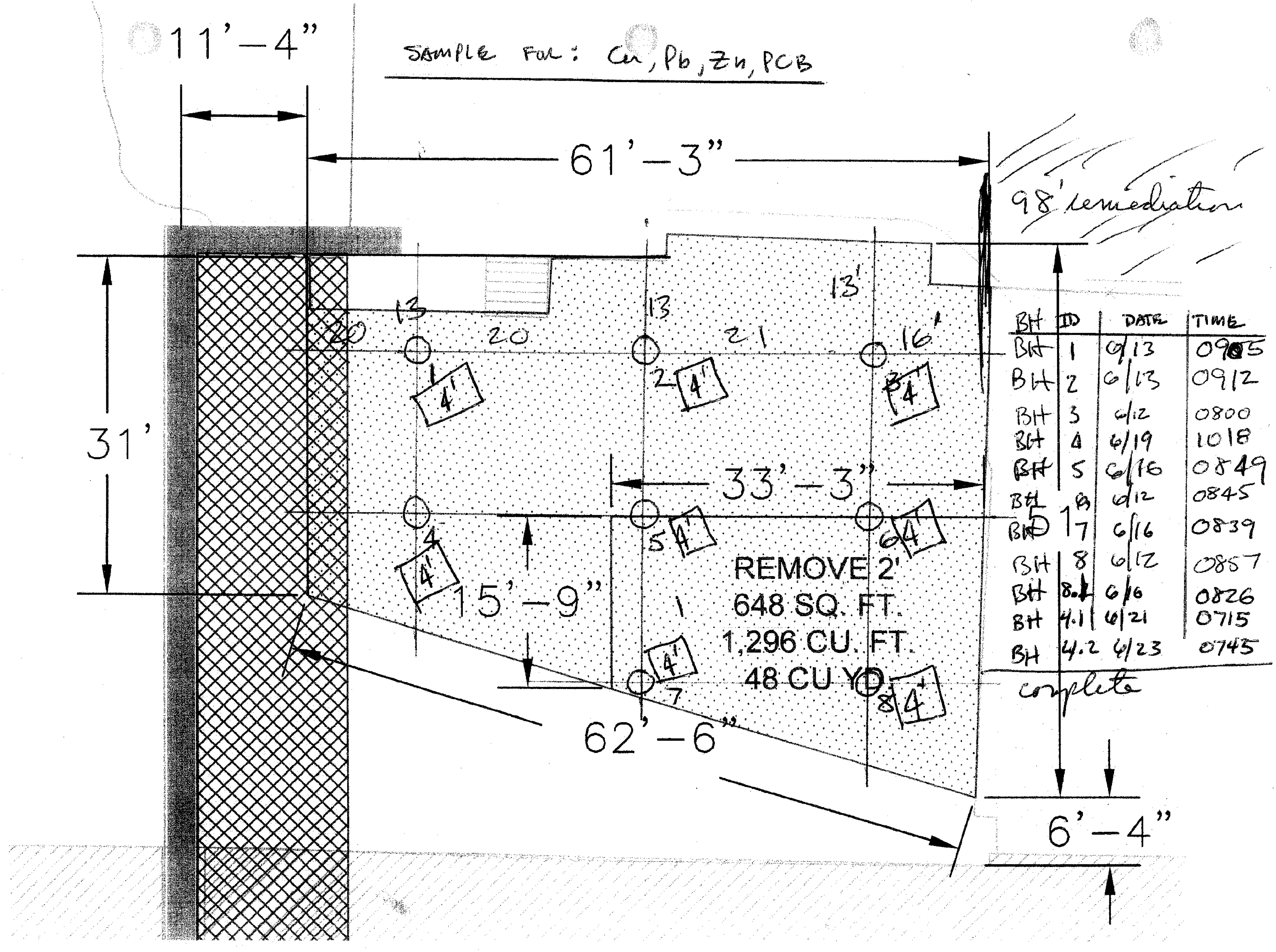
BULKHEAD EXTENSION PROJECT
SOUTH AREA
SEDIMENT REMOVAL TEST POINTS



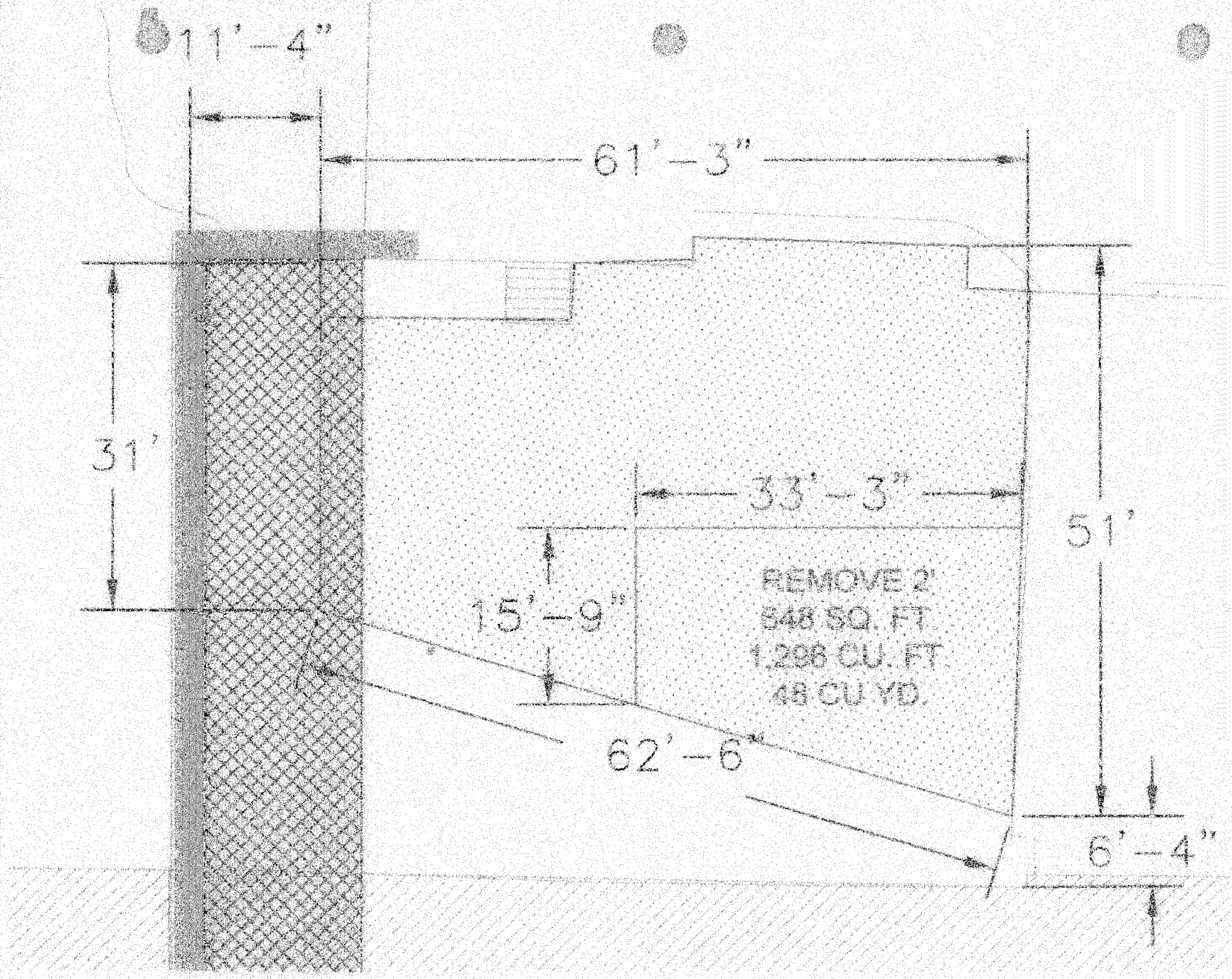
ID	Cu	Pb	Zn	PCBs
BH1	230	32.8	109	700
BH2	0.968	1.05	7.35	ND
BH3	55.7	8.99	56.2	1,160
BH4	395	326	2120	2,800
BH5	33.6	10.5	544	780
BH6	8.13	2.48	17.2	ND
BH7	3.45	5.79	23.9	1000
BH8	3360	589	3590	16,100
BH8.1	233	44.6	277	ND
BH4.1	4900	699	2310	1650
BH4.2	102	140	93.8	660

COMPLETE

SAMPLE FOR: Cu, Pb, Zn, PCB



BH	ID	DATE	TIME
BH	1	6/13	0905
BH	2	6/13	0912
BH	3	6/12	0800
BH	4	6/19	1018
BH	5	6/16	0849
BH	6	6/12	0845
BH	7	6/16	0839
BH	8	6/12	0857
BH	8.1	6/16	0826
BH	4.1	6/21	0715
BH	4.2	6/23	0745



BAE00086818

Calscience Environmental Laboratories, Inc.

Supplemental Report 1

June 21, 2006

Michael Whelan, P.E.
Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 620
Laguna Niguel, CA 92677-1271

Subject: **Calscience Work Order No.: 06-06-0834**
Client Reference: Bulk Head

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 6/13/2006 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Systems Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Robert Stearns
Project Manager

Calscience Environmental Laboratories, Inc.

Analytical Report

Anchor Environmental CA, L.P.	Date Received: 06/13/06
28202 Cabot Road, Suite 620	Work Order No: 06-06-0834
Laguna Niguel, CA 92677-1271	Preparation: EPA 3050B / EPA 7471A Total
	Method: EPA 6010B / EPA 7471A
	Units: mg/kg
Project: Bulk Head	Page 1 of 1

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
COMP (W1SP 1,2)	06-06-0834-5	06/13/06	Solid	06/14/06	06/15/06	060614L03

Comment(s): -Mercury was analyzed on 6/15/2006 3:11:33 PM with batch 060614L01

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Arsenic	22.6	0.8	1		Mercury	2.73	0.92	11.0	
Cadmium	0.855	0.500	1		Nickel	18.4	0.2	1	
Chromium	50.4	0.2	1		Selenium	1.40	0.75	1	
Copper	1400	5	10		Silver	0.573	0.250	1	
Lead	221	0.500	1		Zinc	2090	10	10	

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	099-04-007-3,978	N/A	Solid	06/14/06	06/14/06	060614L01

Parameter	Result	RL	DF	Qual
Mercury	ND	0.0835	1	

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	097-01-002-7,747	N/A	Solid	06/14/06	06/15/06	060614L03

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Arsenic	ND	0.750	1		Nickel	ND	0.250	1	
Cadmium	ND	0.500	1		Selenium	ND	0.750	1	
Chromium	ND	0.250	1		Silver	ND	0.250	1	
Copper	ND	0.500	1		Zinc	ND	1.00	1	
Lead	ND	0.500	1						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

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Anchor Environmental CA, L.P.	Date Received: 06/13/06
28202 Cabot Road, Suite 620	Work Order No: 06-06-0834
Laguna Niguel, CA 92677-1271	Preparation: EPA 3545
	Method: EPA 8270C
	Units: mg/kg

Project: Bulk Head

Page 1 of 1

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
COMP (W1SP 1.2)	06-06-0834-5	06/13/06	Solid	06/19/06	06/20/06	060619L10

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Naphthalene	1.4	0.4	1		Benzo (a) Anthracene	1.7	0.4	1	
Acenaphthylene	ND	0.40	1		Chrysene	1.7	0.4	1	
Acenaphthene	5.3	0.4	1		Benzo (k) Fluoranthene	0.97	0.40	1	
Fluorene	5.3	0.4	1		Benzo (b) Fluoranthene	0.77	0.40	1	
Phenanthrene	19	0.40	1		Benzo (a) Pyrene	0.87	0.35	1	
Anthracene	3.4	0.4	1		Indeno (1,2,3-c,d) Pyrene	ND	0.40	1	
Fluoranthene	6.9	0.4	1		Dibenz (a,h) Anthracene	ND	0.40	1	
Pyrene	12	0.40	1		Benzo (g,h,i) Perylene	ND	0.40	1	
Surrogates:	REC (%)	Control Limits		Qual	Surrogates:	REC (%)	Control Limits		Qual
2-Fluorophenol	93	42-120			Phenol-d6	95	46-118		
Nitrobenzene-d5	96	42-150			2-Fluorobiphenyl	94	38-134		
2,4,6-Tribromophenol	122	36-132			p-Terphenyl-d14	159	35-167		

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	095-01-002-1,608	N/A	Solid	06/19/06	06/20/06	060619L10

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Naphthalene	ND	0.40	1		Benzo (a) Anthracene	ND	0.40	1	
Acenaphthylene	ND	0.40	1		Chrysene	ND	0.40	1	
Acenaphthene	ND	0.40	1		Benzo (k) Fluoranthene	ND	0.40	1	
Fluorene	ND	0.40	1		Benzo (b) Fluoranthene	ND	0.40	1	
Phenanthrene	ND	0.40	1		Benzo (a) Pyrene	ND	0.35	1	
Anthracene	ND	0.40	1		Indeno (1,2,3-c,d) Pyrene	ND	0.40	1	
Fluoranthene	ND	0.40	1		Dibenz (a,h) Anthracene	ND	0.40	1	
Pyrene	ND	0.40	1		Benzo (g,h,i) Perylene	ND	0.40	1	
Surrogates:	REC (%)	Control Limits		Qual	Surrogates:	REC (%)	Control Limits		Qual
2-Fluorophenol	82	42-120			Phenol-d6	83	46-118		
Nitrobenzene-d5	83	42-150			2-Fluorobiphenyl	82	38-134		
2,4,6-Tribromophenol	99	36-132			p-Terphenyl-d14	66	35-167		

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 620
Laguna Niguel, CA 92677-1271

Date Received:	06/13/06
Work Order No:	06-06-0834
Preparation:	EPA 3545
Method:	EPA 8082
Units:	ug/kg

Project: Bulk Head

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
COMP (W1SP 1,2)	06-06-0834-5	06/13/06	Solid	06/16/06	06/19/06	060616L05

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Aroclor-1016	ND	250	5		Aroclor-1248	2200	250	5	
Aroclor-1221	ND	250	5		Aroclor-1254	1500	250	5	
Aroclor-1232	ND	250	5		Aroclor-1260	ND	250	5	
Aroclor-1242	ND	250	5		Aroclor-1262	ND	250	5	
Surrogates:	REC (%)	Control Limits		Qual	Surrogates:	REC (%)	Control Limits		Qual
Decachlorobiphenyl	174	50-130		1,2	2,4,5,6-Tetrachloro-m-Xylene	76	50-130		

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	099-07-009-885	N/A	Solid	06/16/06	06/17/06	060616L05

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Aroclor-1016	ND	50	1		Aroclor-1248	ND	50	1	
Aroclor-1221	ND	50	1		Aroclor-1254	ND	50	1	
Aroclor-1232	ND	50	1		Aroclor-1260	ND	50	1	
Aroclor-1242	ND	50	1		Aroclor-1262	ND	50	1	
Surrogates:	REC (%)	Control Limits		Qual	Surrogates:	REC (%)	Control Limits		Qual
Decachlorobiphenyl	119	50-130			2,4,5,6-Tetrachloro-m-Xylene	117	50-130		

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

7440 Lincoln Way, Garden Grove, CA 92841-1427 • TEL:(714) 895-5494 • FAX: (714) 894-7501

Calscience Environmental Laboratories, Inc.

Analytical Report

Anchor Environmental CA, L.P.	Date Received: 06/13/06
28202 Cabot Road, Suite 620	Work Order No: 06-06-0834
Laguna Niguel, CA 92677-1271	Preparation: EPA 5030B
	Method: EPA 8260B
	Units: ug/kg

Project: Bulk Head

Page 1 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
COMP (W1SP-1,2)	06-06-0834-5	06/13/06	Solid	06/17/06	06/17/06	060617L01

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Acetone	88	50	1		1,3-Dichloropropane	ND	5.0	1	
Benzene	ND	5.0	1		2,2-Dichloropropane	ND	5.0	1	
Bromobenzene	ND	5.0	1		1,1-Dichloropropene	ND	5.0	1	
Bromochloromethane	ND	5.0	1		c-1,3-Dichloropropene	ND	5.0	1	
Bromodichloromethane	ND	5.0	1		t-1,3-Dichloropropene	ND	5.0	1	
Bromoform	ND	5.0	1		Ethylbenzene	ND	5.0	1	
Bromomethane	ND	25	1		2-Hexanone	ND	50	1	
2-Butanone	ND	50	1		Isopropylbenzene	ND	5.0	1	
n-Butylbenzene	ND	5.0	1		p-Isopropyltoluene	ND	5.0	1	
sec-Butylbenzene	ND	5.0	1		Methylene Chloride	ND	50	1	
tert-Butylbenzene	ND	5.0	1		4-Methyl-2-Pentanone	ND	50	1	
Carbon Disulfide	ND	50	1		Naphthalene	460	50	1	
Carbon Tetrachloride	ND	5.0	1		n-Propylbenzene	ND	5.0	1	
Chlorobenzene	ND	5.0	1		Styrene	ND	5.0	1	
Chloroethane	ND	5.0	1		1,1,1,2-Tetrachloroethane	ND	5.0	1	
Chloroform	ND	5.0	1		1,1,2,2-Tetrachloroethane	ND	5.0	1	
Chloromethane	ND	25	1		Tetrachloroethene	ND	5.0	1	
2-Chlorotoluene	ND	5.0	1		Toluene	ND	5.0	1	
4-Chlorotoluene	ND	5.0	1		1,2,3-Trichlorobenzene	ND	10	1	
Dibromochloromethane	ND	5.0	1		1,2,4-Trichlorobenzene	ND	5.0	1	
1,2-Dibromo-3-Chloropropane	ND	10	1		1,1,1-Trichloroethane	ND	5.0	1	
1,2-Dibromoethane	ND	5.0	1		1,1,2-Trichloroethane	ND	5.0	1	
Dibromomethane	ND	5.0	1		1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	50	1	
1,2-Dichlorobenzene	ND	5.0	1		Trichloroethene	ND	5.0	1	
1,3-Dichlorobenzene	ND	5.0	1		1,2,3-Trichloropropane	ND	5.0	1	
1,4-Dichlorobenzene	ND	5.0	1		1,2,4-Trimethylbenzene	ND	5.0	1	
Dichlorodifluoromethane	ND	5.0	1		Trichlorofluoromethane	ND	50	1	
1,1-Dichloroethane	ND	5.0	1		1,3,5-Trimethylbenzene	ND	5.0	1	
1,2-Dichloroethane	ND	5.0	1		Vinyl Acetate	ND	50	1	
1,1-Dichloroethene	ND	5.0	1		Vinyl Chloride	ND	5.0	1	
c-1,2-Dichloroethene	ND	5.0	1		p/m-Xylene	ND	5.0	1	
t-1,2-Dichloroethene	ND	5.0	1		o-Xylene	ND	5.0	1	
1,2-Dichloropropane	ND	5.0	1		Methyl-t-Butyl Ether (MTBE)	ND	5.0	1	
Surrogates:	REC (%)	Control Limits		Qual	Surrogates:	REC (%)	Control Limits		Qual
Dibromofluoromethane	99	73-139			1,2-Dichloroethane-d4	87	73-145		
Toluene-d8	95	90-108			1,4-Bromofluorobenzene	93	71-113		

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

Anchor Environmental CA, L.P.	Date Received: 06/13/06
28202 Cabot Road, Suite 620	Work Order No: 06-06-0834
Laguna Niguel, CA 92677-1271	Preparation: EPA 5030B
	Method: EPA 8260B
	Units: ug/kg
Project: Bulk Head	Page 2 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	**099-10-005-12,370**	**N/A**	**Solid**	**06/17/06**	**06/17/06**	**060617L01**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Acetone	ND	50	1		1,3-Dichloropropane	ND	5.0	1	
Benzene	ND	5.0	1		2,2-Dichloropropane	ND	5.0	1	
Bromobenzene	ND	5.0	1		1,1-Dichloropropene	ND	5.0	1	
Bromochloromethane	ND	5.0	1		c-1,3-Dichloropropene	ND	5.0	1	
Bromodichloromethane	ND	5.0	1		t-1,3-Dichloropropene	ND	5.0	1	
Bromoform	ND	5.0	1		Ethylbenzene	ND	5.0	1	
Bromomethane	ND	25	1		2-Hexanone	ND	50	1	
2-Butanone	ND	50	1		Isopropylbenzene	ND	5.0	1	
n-Butylbenzene	ND	5.0	1		p-Isopropyltoluene	ND	5.0	1	
sec-Butylbenzene	ND	5.0	1		Methylene Chloride	ND	50	1	
tert-Butylbenzene	ND	5.0	1		4-Methyl-2-Pentanone	ND	50	1	
Carbon Disulfide	ND	50	1		Naphthalene	ND	50	1	
Carbon Tetrachloride	ND	5.0	1		n-Propylbenzene	ND	5.0	1	
Chlorobenzene	ND	5.0	1		Styrene	ND	5.0	1	
Chloroethane	ND	5.0	1		1,1,1,2-Tetrachloroethane	ND	5.0	1	
Chloroform	ND	5.0	1		1,1,2,2-Tetrachloroethane	ND	5.0	1	
Chloromethane	ND	25	1		Tetrachloroethene	ND	5.0	1	
2-Chlorotoluene	ND	5.0	1		Toluene	ND	5.0	1	
4-Chlorotoluene	ND	5.0	1		1,2,3-Trichlorobenzene	ND	10	1	
Dibromochloromethane	ND	5.0	1		1,2,4-Trichlorobenzene	ND	5.0	1	
1,2-Dibromo-3-Chloropropane	ND	10	1		1,1,1-Trichloroethane	ND	5.0	1	
1,2-Dibromoethane	ND	5.0	1		1,1,2-Trichloroethane	ND	5.0	1	
Dibromomethane	ND	5.0	1		1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	50	1	
1,2-Dichlorobenzene	ND	5.0	1		Trichloroethene	ND	5.0	1	
1,3-Dichlorobenzene	ND	5.0	1		1,2,3-Trichloropropane	ND	5.0	1	
1,4-Dichlorobenzene	ND	5.0	1		1,2,4-Trimethylbenzene	ND	5.0	1	
Dichlorodifluoromethane	ND	5.0	1		Trichlorofluoromethane	ND	50	1	
1,1-Dichloroethane	ND	5.0	1		1,3,5-Trimethylbenzene	ND	5.0	1	
1,2-Dichloroethane	ND	5.0	1		Vinyl Acetate	ND	50	1	
1,1-Dichloroethene	ND	5.0	1		Vinyl Chloride	ND	5.0	1	
c-1,2-Dichloroethene	ND	5.0	1		p/m-Xylene	ND	5.0	1	
t-1,2-Dichloroethene	ND	5.0	1		o-Xylene	ND	5.0	1	
1,2-Dichloropropane	ND	5.0	1		Methyl-t-Butyl Ether (MTBE)	ND	5.0	1	
Surrogates:	REC (%)	Control Limits		Qual	Surrogates:	REC (%)	Control Limits		Qual
Dibromofluoromethane	108	73-139			1,2-Dichloroethane-d4	98	73-145		
Toluene-d8	99	90-108			1,4-Bromofluorobenzene	87	71-113		

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

nelac

Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 620
Laguna Niguel, CA 92677-1271

Date Received: 06/13/06
Work Order No: 06-06-0834
Preparation: EPA 3050B
Method: EPA 6010B

Project Bulk Head

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
06-06-0855-1	Solid	ICP 3300	06/14/06	06/15/06	060614S03

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Arsenic	99	102	75-125	2	0-20	
Cadmium	99	100	75-125	1	0-20	
Chromium	102	101	75-125	1	0-20	
Copper	100	110	75-125	6	0-20	
Lead	96	98	75-125	1	0-20	
Nickel	102	103	75-125	1	0-20	
Selenium	96	97	75-125	1	0-20	
Silver	111	108	75-125	2	0-20	
Zinc	92	92	75-125	0	0-20	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 620
Laguna Niguel, CA 92677-1271

Date Received: 06/13/06
Work Order No: 06-06-0834
Preparation: EPA 7471A Total
Method: EPA 7471A

Project Bulk Head

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
06-06-0855-1	Solid	Mercury	06/14/06	06/14/06	060614S01

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Mercury	120	119	76-136	1	0-16	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 620
Laguna Niguel, CA 92677-1271

Date Received:	06/13/06
Work Order No:	06-06-0834
Preparation:	EPA 3545
Method:	EPA 8270C

Project Bulk Head

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
06-06-1174-3	Solid	GC/MS J	06/19/06	06/20/06	060619S10

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Phenol	82	96	57-123	16	0-16	
2-Chlorophenol	81	95	57-111	16	0-17	
1,4-Dichlorobenzene	82	97	49-127	17	0-20	
N-Nitroso-di-n-propylamine	88	104	54-144	17	0-17	
1,2,4-Trichlorobenzene	82	100	42-132	20	0-20	
4-Chloro-3-Methylphenol	91	112	50-128	21	0-17	4
Acenaphthene	86	106	49-133	20	0-18	4
4-Nitrophenol	90	110	30-144	20	0-21	
2,4-Dinitrotoluene	85	100	50-128	16	0-18	
Pentachlorophenol	92	104	29-113	13	0-22	
Pyrene	72	104	47-149	37	0-20	4

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 620
Laguna Niguel, CA 92677-1271

Date Received: 06/13/06
Work Order No: 06-06-0834
Preparation: EPA 3545
Method: EPA 8082

Project Bulk Head

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
06-06-1104-3	Solid	GC 10	06/16/06	06/19/06	060616S05

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Aroclor-1260	175	124	50-135	34	0-25	3,4

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Anchor Environmental CA, L.P.		Date Received:	06/13/06
28202 Cabot Road, Suite 620		Work Order No:	06-06-0834
Laguna Niguel, CA 92677-1271		Preparation:	EPA 5030B
		Method:	EPA 8260B

Project Bulk Head

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
06-06-1058-3	Solid	GC/MS S	06/17/06	06/17/06	060617S01

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Benzene	96	88	79-115	9	0-13	
Carbon Tetrachloride	91	81	55-139	11	0-15	
Chlorobenzene	102	94	79-115	8	0-17	
1,2-Dichlorobenzene	95	91	63-123	4	0-23	
1,1-Dichloroethene	87	75	69-123	15	0-16	
Toluene	99	89	79-115	10	0-15	
Trichloroethene	98	91	66-144	8	0-14	
Vinyl Chloride	103	91	60-126	12	0-14	
Methyl-t-Butyl Ether (MTBE)	93	88	68-128	5	0-14	
Tert-Butyl Alcohol (TBA)	81	80	44-134	2	0-37	
Diisopropyl Ether (DIPE)	89	83	75-123	8	0-12	
Ethyl-t-Butyl Ether (ETBE)	89	85	75-117	5	0-12	
Tert-Amyl-Methyl Ether (TAME)	93	91	79-115	2	0-12	
Ethanol	102	57	42-138	57	0-28	4

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

Anchor Environmental CA, L.P.		Date Received:	N/A
28202 Cabot Road, Suite 620		Work Order No:	06-06-0834
Laguna Niguel, CA 92677-1271		Preparation:	EPA 3050B
		Method:	EPA 6010B

Project: Bulk Head

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
097-01-002-7,747	Solid	ICP 3300	06/15/06	060614-I-03	060614L03

Parameter	Conc Added	Conc Recovered	LCS %Rec	%Rec CL	Qualifiers
Arsenic	25.0	25.9	104	80-120	
Cadmium	25.0	26.8	107	80-120	
Chromium	25.0	26.8	107	80-120	
Copper	25.0	24.0	96	80-120	
Lead	25.0	26.1	104	80-120	
Nickel	25.0	27.7	111	80-120	
Selenium	25.0	24.8	99	80-120	
Silver	12.5	13.2	105	80-120	
Zinc	25.0	25.8	103	80-120	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

Anchor Environmental CA, L.P.	Date Received: N/A
28202 Cabot Road, Suite 620	Work Order No: 06-06-0834
Laguna Niguel, CA 92677-1271	Preparation: EPA 7471A Total
	Method: EPA 7471A

Project: Bulk Head

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-04-007-3,978	Solid	Mercury	06/14/06	06/14/06	060614L01

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Mercury	101	101	82-124	0	0-16	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

Anchor Environmental CA, L.P.
28202 Cabot Road, Suite 620
Laguna Niguel, CA 92677-1271

Date Received:	N/A
Work Order No:	06-06-0834
Preparation:	EPA 3545
Method:	EPA 8270C

Project: Bulk Head

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
095-01-002-1,608	Solid	GC/MS J	06/19/06	06/20/06	060619L10

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Phenol	85	88	59-125	3	0-15	
2-Chlorophenol	85	86	60-114	2	0-15	
1,4-Dichlorobenzene	86	88	61-121	2	0-21	
N-Nitroso-di-n-propylamine	90	93	64-136	3	0-15	
1,2,4-Trichlorobenzene	87	89	58-118	2	0-18	
4-Chloro-3-Methylphenol	96	97	61-121	1	0-14	
Acenaphthene	94	95	59-125	2	0-15	
4-Nitrophenol	94	98	38-152	5	0-31	
2,4-Dinitrotoluene	91	93	51-141	2	0-16	
Pentachlorophenol	72	86	38-116	18	0-20	
Pyrene	61	62	51-141	2	0-14	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

Anchor Environmental CA, L.P.		Date Received:	N/A
28202 Cabot Road, Suite 620		Work Order No:	06-06-0834
Laguna Niguel, CA 92677-1271		Preparation:	EPA 3545
		Method:	EPA 8082

Project: Bulk Head

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-07-009-885	Solid	GC 10	06/16/06	06/17/06	060616L05

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Aroclor-1260	134	122	50-135	9	0-25	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

Anchor Environmental CA, L.P.		Date Received:	N/A
28202 Cabot Road, Suite 620		Work Order No:	06-06-0834
Laguna Niguel, CA 92677-1271		Preparation:	EPA 5030B
		Method:	EPA 8260B

Project: Bulk Head

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-10-005-12,370	Solid	GC/MS S	06/17/06	06/17/06	060617L01

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Benzene	94	94	84-114	0	0-7	
Carbon Tetrachloride	95	95	66-132	0	0-12	
Chlorobenzene	101	103	87-111	2	0-7	
1,2-Dichlorobenzene	94	94	79-115	0	0-8	
1,1-Dichloroethene	88	87	73-121	0	0-12	
Toluene	97	96	78-114	1	0-7	
Trichloroethene	94	95	84-114	1	0-8	
Vinyl Chloride	104	105	63-129	1	0-15	
Methyl-t-Butyl Ether (MTBE)	91	95	77-125	4	0-11	
Tert-Butyl Alcohol (TBA)	84	88	47-137	4	0-27	
Diisopropyl Ether (DIPE)	90	92	76-130	2	0-8	
Ethyl-t-Butyl Ether (ETBE)	93	92	76-124	1	0-12	
Tert-Amyl-Methyl Ether (TAME)	95	95	82-118	0	0-11	
Ethanol	96	107	59-131	10	0-21	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Glossary of Terms and Qualifiers

Work Order Number: 06-06-0834

Qualifier	Definition
*	See applicable analysis comment.
1	Surrogate compound recovery was out of control due to a required sample dilution, therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike or Matrix Spike Duplicate compound was out of control due to matrix interference. The associated LCS and/or LCSD was in control and, therefore, the sample data was reported without further clarification.
4	The MS/MSD RPD was out of control due to matrix interference. The LCS/LCSD RPD was in control and, therefore, the sample data was reported without further clarification.
5	The PDS/PDSD associated with this batch of samples was out of control due to a matrix interference effect. The associated batch LCS/LCSD was in control and, hence, the associated sample data was reported with no further corrective action required.
A	Result is the average of all dilutions, as defined by the method.
B	Analyte was present in the associated method blank.
C	Analyte presence was not confirmed on primary column.
E	Concentration exceeds the calibration range.
H	Sample received and/or analyzed past the recommended holding time.
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
N	Nontarget Analyte.
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
U	Undetected at the laboratory method detection limit.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.

Bob Stearns

From: Michael Whelan [mwhelan@anchorenv.com]
Sent: Wednesday, June 14, 2006 1:59 PM
To: Bob Stearns
Subject: Scope of work for testing stockpile samples

Hello Bob,
Following up on our conversation earlier today, here is how I would like you to analyze stockpile samples for the BAE Systems San Diego Shipyards project. You received the first sample yesterday (6/13/06), in the form of two jars labeled W1SP.1 and W1SP.2, which I would like you to composite into a single sample at your lab prior to testing. (Future stockpile samples - there will be one or two - will be collected in single jars, using the larger sample jars that you sent down yesterday.)

The stockpile samples will be analyzed in two steps. First, analyze for the following constituents (with my understanding of price, per your price quote dated 3/2/06 and in subsequent communications):

EPA 6010B Metals Zn, Se, Pb, Ni, Cu, Cr, Cd, As, Ag ($80)
EPA 7471A Mercury ($25)
EPA 8082 PCB Aroclors ($70)
EPA 8270C PAHs ($150)
EPA 8260 VOCs (aromatics and semi-volatiles) ($115)

Use standard (5-day) turnaround time, and provide full Level III data packages (I understand there is a 15% markup for that).

Following this initial testing step, we will most likely perform a TCLP Extraction, with analysis of constituents to be determined. It is also possible we will do a WET instead - is there a price difference, if so?

Michael Whelan, P.E.
Anchor Environmental CA, L.P.

New Southern California contact info:
28202 Cabot Road, Suite 620
Laguna Niguel, CA 92677
Direct office phone (949) 347-2783
Fax (949) 347-2781
Cell phone is unchanged: (760) 845-2983

-----Original Message-----
From: Bob Stearns [mailto:BStearns@calscience.com]
Sent: Tuesday, June 13, 2006 5:11 PM
To: Michael Whelan
Cc: halvaxs@swmarine.com
Subject: Bulk Head / CEL 06-06-0760 (Preliminary)

<<06-06-0760(prelim).pdf>>
Michael- prelim. data attached. As I mentioned in the voice mail, we still have a final dilution for sample BH8, since the 10x dilution was still not large enough. Will have final data tomorrow.

Bob Stearns
Client Services Director
Calscience Environmental
Laboratories, Inc.
7440 Lincoln Way
Garden Grove, CA 92841-1427

CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1427
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 6/13/06
Page 1 of 1

LABORATORY CLIENT: BAE Systems SDSR
ADDRESS: 2205 E. Belt\Foot of Sampson St.
CITY: San Diego STATE: CA ZIP: 92113
TEL: 619-238-1000 x2060 FAX: 595-0459 E-MAIL:

CLIENT PROJECT NAME / NUMBER: Bulk Head
P.O. NO.:
PROJECT CONTACT: Sandor Halvax
LAB USE ONLY: 06-0834
SAMPLER(S): (SIGNATURE)
COELT LOG CODE: ☐☐☐☐
COOLER RECEIPT TEMP = ____ °C

TURNAROUND TIME: ☐ SAME DAY ☒ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY): ☐ RWQCB REPORTING FORMS ☐ COELT EDF ☐ ____

SPECIAL INSTRUCTIONS:
① Project Name: BULKHEAD
② Anchor to Define Methods.

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	FIELD POINT NAME (FOR COELT EDF)	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or	BTEX / MTBE (8260B) or	OXYGENATES (8260B)	VOCs (8260B)	5035 ENCORE PREP	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	CAC, T22 METALS (6010B) / 747	PNAs (8310) or (8270C)	VOCs (TO-14A) or (TO-15)	TPH(G) (TO-3M)	Cu, Pb, Zn, PCB				
1	W1SP.1	Bulk head	6/13/06	9:50	S	1														X				
2	W1SP.2	Bulk head	6/13/06	9:55	S	1														X				
3	BH 1	Bulk head	6/13/06	9:05	S	1														X				
4	BH 2	Bulk head	6/13/06	9:12	S	1														X				

Relinquished by: (Signature)	Received by: (Signature)	Date	Time
[signature]	[signature] CEL	6/13/06	1305
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature) [signature]	Received for Laboratory by: (Signature) [signature] CEL	6/13/06	1630

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10/20/04 Revision

Q&Q Graphic 714-898-9702

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 06 - 0 6 - 0 8 3 4

Cooler 1 of 1

SAMPLE RECEIPT FORM

CLIENT: BAE System DATE: 6/13/06

TEMPERATURE – SAMPLES RECEIVED BY:

CALSCIENCE COURIER:

- ____ Chilled, cooler with temperature blank provided.
- ____ Chilled, cooler without temperature blank.
- ✓ Chilled and placed in cooler with wet ice.
- ____ Ambient and placed in cooler with wet ice.
- ____ Ambient temperature.
- 3.4 °C Temperature blank.

LABORATORY (Other than Calscience Courier):

- ____ °C Temperature blank.
- ____ °C IR thermometer.
- ____ Ambient temperature.

Initial: [signature]

CUSTODY SEAL INTACT:

Sample(s): ____ Cooler: ____ No (Not Intact) : ____ Not Applicable (N/A): ✓

Initial: [signature]

SAMPLE CONDITION:

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples	✓		
Sampler's name indicated on COC		✓	
Sample container label(s) consistent with custody papers	✓		
Sample container(s) intact and good condition	✓		
Correct containers and volume for analyses requested	✓		
Proper preservation noted on sample label(s)			✓
VOA vial(s) free of headspace			✓
Tedlar bag(s) free of condensation			✓

Initial: [signature]

COMMENTS:

CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1427
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 6/23/06

Page 1 of 1

LABORATORY CLIENT: BAE Systems
ADDRESS: 2205 [illegible] of Sampson
CITY: San Diego STATE: CA ZIP: 92170
TEL: (619) 2381000 ext 2060 FAX: E-MAIL:

TURNAROUND TIME: ☐ SAME DAY ☒ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY): ☐ RWQCB REPORTING FORMS ☐ COELT EDF ☐

SPECIAL INSTRUCTIONS:

CLIENT PROJECT NAME / NUMBER: BULKHEAD
PROJECT CONTACT: Shaun Halvax
SAMPLER(S): (SIGNATURE) Alicia A. Ortiz
COELT LOG CODE:
P.O. NO.:
LAB USE ONLY: ☐☐-☐☐☐☐
COOLER RECEIPT TEMP = °C

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	FIELD POINT NAME (FOR COELT EDF)	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or	BTEX / MTBE (8260B) or	OXYGENATES (8260B)	VOCs (8260B)	5035 ENCORE PREP	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	CAC, T22 METALS (6010B) / 747	PNAs (8310) or (8270C)	VOCs (TO-14A) or (TO-15)	TPH(G) (TO-3M)	Cu, Pb, Zn 3050B / 6010B				
	BH 4,2		6/23/06	0745	SOIL	1									X					X				
	BH 17		"	0655	SOIL	1									X					X				
	BH 14		"	0703	SOIL	1									X					X				
	BH 11		"	0709	SOIL	1									X					X				
	BH 16		"	0727	SOIL	1									X					X				
	BH 13		"	0730	SOIL	1									X					X				
	BH 10		"	0735	SOIL	1									X					X				

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
[signature]	[signature] CEL	6/23/06	1255
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received for Laboratory by: (Signature)	Date:	Time:

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10/20/04 Revision

BAE00087039

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   1.1. "Calscience" means Calscience Environmental Laboratories, Inc., a wholly-owned subsidiary of Calscience Engineering & Laboratories, Inc., its divisions and its employees, servants, agents and representatives.
   1.2. "Client" means the individual or entity who may request laboratory, consulting, or sampling services, and his or its heirs, successors, assigns and representatives.
   1.3. "T/C" means those terms and conditions of sale, including the Fee Schedule and any additions or amendments hereto which are agreed to in writing by Calscience.
   1.4. "Fee Schedule" means Calscience's standard price schedule as such document may be amended or reissued from time to time by Calscience.
   1.5. "Sample Receipt" means the point in time when Calscience receives samples at its facility located at 7440 Lincoln Way, Garden Grove, CA 92841-1432.
   1.6. "Holding Time" means the time between sample collection and the initiation of the preparation and/or analysis as specified in the applicable regulatory method or other authoritative reference.
   1.7. "Results" means either data generated by Calscience from the analysis of one or more samples or the work product generated by Calscience in the performance of testing services.
   1.8. "Preliminary Results" means any verbal, facsimile, or e-mail draft Results that are provided to the Client in advance of the final report.
2. **ORDERS**
   2.1. The Client may order services by submitting a written purchase order to Calscience, by completing and submitting a completed chain-of-custody, or by negotiated contract. Any such order constitutes (1) an acceptance by the Client of Calscience's offer to do business with the Client under the established T/Cs, and (2) an agreement to be bound by the established T/Cs. The Client's relinquishing of samples to Calscience or initiation of testing services constitutes the Client's express assent to be governed by the established T/Cs. Calscience reserves the right to refuse to proceed with work at any time based upon an unfavorable Client credit report.
3. **PRICES AND PAYMENT TERMS**
   3.1. Services performed by Calscience will be in accordance with prices quoted and later confirmed in writing or as stated in the Fee Schedule. Prices are subject to change periodically without notice. The Client should confirm the current price with Calscience prior to placing an order for work. A $50 minimum per work order applies.
   3.2. Payment terms are net 30 days from the date of invoice by Calscience unless otherwise specified in writing. All overdue payments are subject to an additional interest and service charge of one and one-half percent (1.5%) per month or portion thereof from the due date until the date of payment. All payments shall be made in United States currency.
4. **RECEIPT OF SAMPLES, DELIVERY OF SERVICES, AND DISPOSAL OF SAMPLES**
   4.1. Prior to Sample Receipt, the entire risk of loss of, or damage to, such sample(s) will remain with the Client, except when Calscience is the courier. In no event will Calscience have any responsibility or liability for the action or inaction of Client's courier or any third party courier shipping or delivering any sample to or from Calscience's premises.
   4.2. Calscience reserves the absolute right, exercisable at any time, to refuse Sample Receipt for any sample which in the sole judgment of Calscience a) is of unsuitable volume, b) may be or become unsuitable for, or may pose a risk in, handling, transport or processing for any health, safety, environmental or other reason, whether or not due to the presence in the sample of any hazardous substance and whether or not such presence has been disclosed to Calscience by the Client, or c) holding times cannot be met.
   4.3. Where applicable, Calscience will use analytical methodologies which are in substantial conformity with USEPA, state agency, ASTM, Standard Methods for the Examination of Water and Wastewater, or other recognized methodologies. Calscience reserves the right to deviate from these methodologies if necessary or appropriate due to the nature or composition of the sample, or otherwise based on the reasonable judgment of Calscience, which deviations, if any, will be made on a basis consistent with recognized standards of the industry and/or Calscience's Quality Assurance Program Manual and referenced SOPs.
   4.4. Sample receipt by Calscience will be contingent upon resolution of inconsistencies in the sample chain-of-custody forms, breakage, receipt of sufficient documentation, and project guidance regarding work orders and change orders. Calscience is obligated to initiate preparation and/or analysis within holding times provided that Sample Receipt occurs within 72 hours of sampling or 1/2 of the holding time for the test, whichever is less. Where inconsistencies cannot be resolved within this period, Calscience will use its best efforts to meet holding times and will proceed with the work provided that there are no inconsistencies in the chain-of-custody or definition of the scope of work. Calscience shall be remitted the full price of the analyses without penalty for missing holding times for samples received after the time period described above.
   4.5. Upon timely delivery of samples, Calscience will use its best efforts to meet mutually agreed upon turnaround times (TATs). All TATs will be calculated from date and time of Sample Receipt if said Sample Receipt occurs during normal business hours (0830 – 1730 hours Monday through Friday). If samples are received outside of normal business hours, the TAT shall be calculated from 0830 hours the following business day. Calscience's ability to meet TAT commitments is based upon advance knowledge of the sample delivery schedule.
   4.6. At Calscience's sole discretion, Preliminary Results may be given in advance of the written report of Results. Such Preliminary Results are tentative Results only, subject to confirmation or change based on final review.
   4.7. Calscience reserves the right, unless otherwise specified in writing, to subcontract services ordered by the Client to another laboratory or laboratories if, in Calscience's sole judgment, it is reasonably necessary, appropriate, or advisable to do so. Calscience will, in no way, be liable for any subcontracted services except in the case where Calscience is certified or otherwise qualified to perform the services being subcontracted.
   4.8. Unless otherwise specified in writing, Calscience maintains all samples under refrigerated conditions for a period of not less than 30 days after Sample Receipt and under ambient conditions for a period of not less than 30 days after removal from refrigerated conditions. If specified in writing, Client samples will be archived beyond 60 days after Sample Receipt at a unit cost as specified in the Fee Schedule. At Calscience's sole option, Client may be billed for sample disposal at a cost not exceeding $5.00 per sample.
   4.9. Where the Client provides Calscience a minimum of one working day written notification of the need for courier services, Calscience will, at no charge, provide courier services within a 50 mile radius of Garden Grove, CA. In the event a Client provides less than one day written notification and/or the pickup/delivery location is beyond a 50 mile radius of Garden Grove, CA, at Calscience's sole option, the Client may be billed for said courier services.
   4.10. At Client request Calscience will provide additional hardcopy or facsimile reports and/or supporting raw data that has previously been provided at a cost of $25 plus $0.05 per page.
5. **CHANGE ORDERS**
   5.1. Changes to the scope of work, including but not limited to increasing or decreasing the work, changing test and analysis specifications, or acceleration in the

CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1427
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 6/23/06
Page 1 of 1

LABORATORY CLIENT: BAE Systems
ADDRESS: 2205 ft of Sampson
CITY: San Diego STATE: CA ZIP: 92170
TEL: (619) 2381000 ext FAX: 2060 E-MAIL:

CLIENT PROJECT NAME / NUMBER: BULKHEAD
PROJECT CONTACT: Shaun Halvay
SAMPLER(S) (SIGNATURE): Alicia A. Ortiz
COELT LOG CODE:
P.O. NO.:
LAB USE ONLY: ☐☐-☐☐☐☐
COOLER RECEIPT TEMP = °C

TURNAROUND TIME: ☐ SAME DAY ☒ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY): ☐ RWQCB REPORTING FORMS ☐ COELT EDF ☐ ______

SPECIAL INSTRUCTIONS:

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	FIELD POINT NAME (FOR COELT EDF)	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or	BTEX / MTBE (8260B) or	OXYGENATES (8260B)	VOCs (8260B)	5035 ENCORE PREP	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	CAC, T22 METALS (6010B) / 747	PNAs (8310) or (8270C)	VOCs (TO-14A) or (TO-15)	TPH(G) (TO-3M)	Cu, Pb, Zn 3050 B 6010 B			
	BH 4.2'		6/23/06	0745	SOIL	1									X					X			
	BH 17		"	0655	SOIL	1									X					X			
	BH 14		"	0703	SOIL	1									X					X			
	BH 11		"	0707	SOIL	1									X					X			
	BH 16		"	0727	SOIL	1									X					X			
	BH 13		"	0730	SOIL	1									X					X			
	BH 10		"	0735	SOIL	1									X					X			

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
[signature]	[signature] CEL	6/23/06	1255
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received for Laboratory by: (Signature)	Date:	Time:

DISTRIBUTION: When with final report, Green to file, Yellow to Client.
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the Green and Yellow copies respectively.

Q&Q Graphic 714-898-9702
10/20/04 Revision

BAE00087041

TERMS AND CONDITIONS OF SALE

performance of the work may be initiated by the Client after Sample Receipt. Such a change will be documented in writing and may result in a change in cost and TAT. Calscience's acceptance of such changes is contingent upon technical feasibility and operational capacity.

5.2. Suspension or termination of all or any part of the work may be initiated by the Client. Calscience will be compensated consistent with Section 3 of these T/Cs. Calscience will complete all work in progress and be paid in full for all work completed.

6. WARRANTIES, LIABILITY AND INDEMNIFICATION

6.1. **Calscience warrants only the accuracy of the Results for the samples analyzed. Calscience disclaims any other warranty expressed or implied, including the fitness for intended use or merchantability of said Results.** Calscience's liability is limited to (1) the retesting of samples if upon re-examination of the Results if, Calscience, in its sole judgement, determines that there is a deficiency in the Results or (2) refunding in full or in part fees paid by the Client for any analyses or other services which do not fulfill obligations set forth in Section 4.4 above. Calscience's obligation to repeat any services with respect to any sample will be contingent on the Client's providing, at the request of Calscience and at the Client's expense, additional sample(s) as necessary. Calscience will not be held liable for consequential or incidental damages in connection with the Results delivered, and Calscience will be indemnified and held harmless against any third party claims made in connection with the Results or its use by the Client, unless such damages or claims result from the negligence of Calscience.

6.2. Should the Results delivered by Calscience be used by the Client or Client's client, even though subsequently determined not to meet the warranties described in Section 6.1 above, then the compensation described in Section 3 will be adjusted based upon mutual agreement. In no case shall the Client unreasonable withhold Calscience's right to independently defend its data.

6.3. In no event shall Calscience have any responsibility or liability to the Client for any failure or delay in performance by Calscience which Results, directly or indirectly, in whole or in part, from any cause or circumstance beyond the reasonable control of Calscience. Such causes and circumstances shall include, but not be limited to, acts of God, acts of Client, acts or orders of any governmental authority, strikes or other labor disputes, natural disasters, accidents, wars, civil disturbances, difficulties or delays in transportation, mail or delivery services, or any other cause beyond Calscience's reasonable control.

6.4. Calscience warrants that it possesses and maintains all licenses and certifications which are required to perform services under these T/Cs provided that such requirement is documented in writing to Calscience prior to Sample Receipt. Calscience will notify the Client in writing of any decertification or revocation of any license, or notice of either, which affects work in progress.

6.5. All Results provided by Calscience are strictly for the use of its Client, and Calscience is in no way responsible for use of such Results by any third party. All Results should be considered in their entirety, and Calscience is in no way responsible for the separation, detachment, or other use of any portion of the Results.

6.6. The Client represents and warrants that any sample delivered to Calscience will be preceded or accompanied by complete written disclosure of the presence of any hazardous substances known or suspected by the Client. The Client further warrants that any sample containing any hazardous substance which is to be delivered to Calscience's premises will be packaged, labeled, transported and delivered properly and in accordance with applicable laws.

6.7. Calscience shall indemnify Client against any and all claims or suits for injury to or death of persons or for damage to or destruction of property resulting from any and all negligent acts of Calscience or its employees while at Client's facilities.

7. ENTIRE AGREEMENT; SEVERABILITY

7.1. These T/Cs, together with any additions or revisions which may be agreed to in writing by Calscience, embody the whole agreement of the parties and provide the only remedies available. There are no promises, terms, conditions, understanding, obligations or agreements other than those contained herein, unless made in accordance with Section 8.1; and these T/Cs shall supersede all previous communications, representations, or agreements, either verbal or written, between the Client and Calscience. Calscience specifically rejects all additional, inconsistent or conflicting terms, whether printed or otherwise set forth in any purchase order or other communication from the Client to Calscience.

7.2. The invalidity or unenforceability, in whole or in part of any provision, term or condition hereof shall not affect in any way the validity or enforceability of the remainder of these T/Cs, the intent of the parties being that the provisions be severable.

7.3. The obligations, liabilities, and remedies of the parties, as provided herein, are exclusive and in lieu of any others available at law or in equity. Indemnifications, releases from liability and limitations of liability shall apply, notwithstanding the fault, negligence or strict liability of the party to be indemnified, released, or whose liability is limited, except to the extent of sole negligence or willful misconduct.

8. AMENDMENTS AND WAIVERS

8.1. Calscience shall not be deemed to have amended or waived any provision, term or condition, or to have given any required consent or approval, or to have waived any breach by the Client of any of these T/Cs unless specifically set forth in writing and executed on behalf of Calscience by a duly authorized representative. No other employee, servant, agent or representative of Calscience has any authority whatsoever to add to, delete, alter or vary any of these T/Cs in any manner, or to give any consent, approval or waiver, and Calscience shall not be bound by any such purported addition, deletion, alteration, variation, consent, approval or waiver.

9. INSURANCE

9.1. Calscience shall maintain in force during the performance of services under these T/Cs, Workers' Compensation and Employer's Liability Insurance (limit of $1,000,000) in accordance with the laws of the State of California. Calscience shall also maintain during such period, Comprehensive General Liability Insurance (limit $1,000,000), Commercial Automobile Liability Insurance [owned and non-owned] (limit of $1,000,000), and Professional Liability Insurance (limit of $1,000,000).

10. GOVERNING LAW

10.1. These T/Cs, and any transactions or agreements to which they apply, shall be governed both as to interpretation and performance by the laws of the State of California.

11. DISPUTE RESOLUTION

11.1. Except to the extent it may invalidate or prejudice any insurance coverage of either party, all disputes shall be decided by arbitration in accordance with the applicable existing rules of the American Arbitration Association (AAA).

11.2. Written notice of demand for arbitration must be given to the other party and to the AAA within a reasonable time after the dispute has arisen, in no event after the date when the institution of court proceedings begin on such dispute would be barred by the applicable statute of limitations.

11.3. The cost of arbitration shall be apportioned between the parties as the arbitrator may decide, consistent with the parties' intent that the nonprevailing party should bear said costs.

11.4. The arbitrator's award shall be final. The award and the agreement to arbitrate may be specifically enforced by any court having jurisdiction thereof.

98804

See photos... need to get full-size co.

SDGE

A Sempra Energy utility

SAN DIEGO GAS & ELECTRIC

ONSITE HYDROLOGY/DRAINAGE STUDY

SILVERGATE 230/69kV SUBSTATION
1348 SAMPSON STREET
SAN DIEGO, CA 92113

PREPARED BY:
SAN DIEGO GAS & ELECTRIC
CIVIL / STRUCTURAL ENGINEERING
8316 CENTURY PARK CT.; CP52G
SAN DIEGO, CA 92123

BY: TYLER W. LONSDALE

DATE: 3/14/06

APPROVED BY: CRAIG H. RIKER
R.C.E. # 32108

DATE: 3-14-06

TABLE OF CONTENTS

1.0 Introduction & Objective

San Diego Gas & Electric (SDG&E) is proposing to build the Silvergate 230/69kV Substation located at 1348 Sampson Street San Diego, CA 92113. The existing SDG&E owned Silvergate Power Plant and facilities occupy approximately 3.2 acres of the proposed 5.07 acres of substation development. The proposed development includes the new substation, perimeter security wall, retaining walls, driveways, sidewalks, and underground storm drain facilities. Approximately 3.0 acres of the proposed site currently drains by means of surface sheet flow to Sampson Street. The remaining 2.07 acres drain through the existing cooling water tunnels to the San Diego Bay. The cooling water tunnels will be decommissioned and sealed during the removal of the existing power plant. The drainage of the 2.07 acres will be redirected to the existing storm drain system on Sampson Street. Please refer to the Figures 4 and 5 for the existing and proposed site plans.

According to the City of San Diego Drawing Numbers 24356 2 D and 2682 L, a 30" RCP storm drain exists on the East side of Sampson Street. Prior to the intersection of Sampson Street and Belt Street, a 24" RCP lateral storm drain ties into the 30" RCP. The 24" lateral is tied to a catch basin just outside the southeast corner of the SDG&E owned property. Shortly after the intersection of the 24" RCP with the 30" RCP the storm drain is increased to a 42" storm drain.

The objective of this study is to show that the 24" RCP storm drain will be able to convey the additional drainage resulting from the proposed site. This will be accomplished by calculating and comparing the following items:

- The peak discharge (cfs), that flows to Sampson Street, of existing site (approx. 3 acres) analyzed by the Rational Method for a 6 hour 100 year flood.
- The peak discharge (cfs) of the proposed site, that flows to Sampson Street, analyzed by the Rational Method for a 6 hour 100 year flood.

2.0 References

1. San Diego County Hydrology Manual June 2003
2. Hydraulic Engineering, Roberson, Cassidy, Chadhry 1998
3. Evaluation of Rational Method "C" Values, Joe Hill June 2002
4. Initial Time of Concentration Analysis of Parameters Joe Hill June 2002
5. Water Group 445 Sampson Street – 8" Pipe Belt St. to Harbor Drive, As-Built 21547 5 D 2/27/85
6. San Diego County Drainage Design Manual July 2005
7. City of San Diego Drawings 2682 – L
8. City of San Diego Drainage Design Manual, March 1989/April 1984

3.0 Brief Summary

The calculations show that the amount of peak discharge 9.93 (cfs) generated from the proposed site is less than the peak discharge 12.47 (cfs) currently flowing into the 24" RCP storm drain on Sampson Street. The overall watershed area is increased by approximately 2 acres yet the run off coefficient is reduced as the majority of the site is covered with Class II Aggregate Base ($C \approx 0.57$). Therefore, the permeable surface area is increased reducing the peak discharge as shown in the calculations.

4.0 Declaration of Responsible Charge

DECLARATION OF RESPONSIBLE CHARGE

I, HERBY DECLARE THAT I AM THE CIVIL ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF THE PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

Craig Riker — 3-14-06

CRAIG HALL RIKER — **DATE**
R.C.E. # 32108
EXP. DECEMBER 31, 2006

REGISTERED PROFESSIONAL ENGINEER
CRAIG HALL RIKER
No. 32108
Exp. 12-31-06
CIVIL
STATE OF CALIFORNIA

5.0 Watershed Boundary

5.1 Existing Conditions

As shown in the aerial photograph Figure 3, the existing SDG&E owned property contains the decommissioned Silvergate Power Plant. The roof and cooling water deck (south-west of the power house) currently drain into the cooling water tunnels. The SDG&E owned property north-east of the power house currently drains to a storm drain on Sampson Street. The parcel within the bounds of the proposed site, owned by Kelco and the adjacent parcel owned by PCE (Propulsion Control Engineering) drain to the storm drain on Sampson Street. Figure 4 of the existing site plan shows the elevations of the watershed area. The site drains to the west side of Sampson Street where the runoff flows to a curb inlet and catch basin (prior to the intersection of the railroad tracks on Sampson Street). From the catch basing and curb inlet a 24" storm drain connects to the 30" RCP storm drain on the east side of Sampson Street (as shown on the City of San Diego drawing # 24356-2-D). Ground surface elevations range from approximately 25 feet above Mean Sea Level (MSL) at the northeast property line, to approximately 15 feet above MSL at the south corner (as shown in Figure 1).

5.2 Proposed Conditions

The proposed improvements consist of altering approximately 5 acres of existing industrial land to produce a relatively level substation pad maintaining an approximate of 1% slope for positive drainage. The finished grades are shown on Figure 5. Surface runoff in the new substation will sheet flow into the driveway surfaces. The center of the driveways will contain concrete swales, which will capture the flow and transport it to the catch basins and storm drain system along the southwest side of the property. The proposed storm drain system on our property will connect to the 24" storm drain on west side of Sampson Street. The proposed grading and drainage plan is shown in Figure 5. Prior to running off site, all storm water will filtered per the City of San Diego Municipal Code Land Development Manual and the Storm Water Standards.

6.0 Drainage Analysis

The watershed hydrology calculations are described in the following section. See Figures 3 to 5 for the watershed area and conceptual grading and drainage design.

6.1 Hydrology and Hydrology Calculations

The hydrology calculations for this study were completed per the San Diego County Hydrology Manual dated June 2003. According to the manual, the Rational Method (RM) can be utilized for watersheds less than 1 square mile in area for any storm frequency.

The RM formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and rainfall intensity (I) for a duration equal to the time of concentration (Tc), which is the time required for water to flow from the most remote point of the basin to the location being analyzed. The formula is expressed as follows:

$$Q = C\,I\,A$$

Where:
Q = peak discharge, in cubic feet per second (cfs)
C = runoff coefficient, proportion of the rainfall that runs off the surface (no units)
I = average rainfall intensity for a duration equal to the Tc for the area, in inches per hour
A = drainage area contributing to the design location, in acres

Runoff Coefficient, C:

Table 1 in Appendix C lists the estimated runoff coefficients for urban areas. Soil type "D" was used in this analysis for developing the appropriate C value for design. The runoff coefficients used in this study consist of the following:

- Paved Areas: C = 0.90
- Substation Class II Surface: C = 0.57

Rainfall Intensity, I:

The rainfall intensity (I) is the rainfall in inches per hour (in/hr) for a duration equal to the Tc for a selected storm frequency. Per SDG&E standards, all substation drainage is designed to convey 100 year storm flows. The rainfall intensities for the study were calculated using the following equation:

$$I = 7.44\ P6\ D^{-0.645}$$

$$I = 7.44\, P6\, D^{-0.645}$$

Where:
P6 = adjusted 6-hour storm rainfall amount
D = duration in minutes (Tc)

Time of Concentration, Tc:

The Time of Concentration (Tc) is the time required for runoff to flow from the most remote part of the drainage area to the point of interest. Urban overland flow methods are used to determine the initial times of concentration (Ti). Pipe and open channel flows are added to the initial times where applicable (Tt).

Time of Concentration: Tc = Ti + Tt

Drainage Basin Area, A:

For both the existing and proposed drainage calculations, the site was divided into sub-areas based on varying site characteristics. The drainage basin areas, in acres, are shown on Figure 4 & 5.

SEE APPENDIX B FOR ALL HYDROLOGY CALCULATIONS

7.0 Results and Conclusions:

Results of the hydrology calculations indicate the peak discharge and drainage characteristics of the site are enhanced by the proposed construction. The proposed conditions will yield an approximate 20% reduction in peak discharge introduced to the existing storm drain on Sampson Street during a 100-year storm event.

The peak discharge introduced into the Sampson Street storm drain system for a 100 year storm event is 12.47 cfs and the peak discharge for the same storm event for the proposed development is 9.93 cfs. The 20% decrease in the peak discharge is mostly due to the removal of the existing pavement and impermeable surfaces and replacing it with the substation Class II aggregate base ($C \approx 0.57$). Hydraulic calculations and design details will be completed for the grading plan submittal in accordance with the City of San Diego's Drainage Design Manual.

APPENDIX B – RATIONAL METHOD CALCULATIONS

APPENDIX B

Existing Site Hydrology, captured by Sampson Street storm drain (approx. 3 acres) See Figure 4

*All Calculations are based on a preliminary grading plan.

Rational Method: $Q = CiA$

Existing Site Dimensions (area):

From Figure 4

Overland flow length: $L_o := 560 \cdot ft$

Gutter Flow Length: $L_g := 145\ ft$

Total Area:

$A_t := 129373.2 \cdot ft^2 \qquad A_t = 2.97\,acre$

Area 1:

Class II Base Area:

$A_{CII} := 14260 \cdot ft^2$ (from exhibit 2)

$A_{CII} = 0.327\,acre$

Asphalt Concrete and Impermeable Area:

$A_{ac} := A_t - A_{CII}$

$A_{ac} = 2.643\,acre$

Run off Coefficient:

$C_1 := 0.57$ (Class II Aggregate Base)

$C_2 := 0.90$ (AC & Concrete Paving)

$$C_t := C_1 \cdot \left(\frac{A_{CII}}{A_t}\right) + C_2 \cdot \left(\frac{A_{ac}}{A_t}\right)$$

$C_t = 0.864$

Intensity - (assumed Limited Industrial Table 3-2 SDCHM) SEE FIGURE 1, APPENDIX C

Overland Flow:

$t_{i1} := 3.1$ min $\quad L_{max} := 70 \cdot ft$

remaining length: $\quad L_1 := L_o - L_{max} \quad L_1 = 490\ ft$ in miles = 0.093 miles

Use Kirpich formula:

$$t_{i2} := \left[\frac{\left[11.9 \cdot (L_1)^3\right]}{\Delta E}\right]^{0.385}$$

where L1 is in miles

$\Delta E := 11.2 \cdot ft$

$t_{i2} := 3.94$ min

$t_i := t_{i1} + t_{i2} \qquad t_i = 7.04$ min

Gutter Flow: (Per Figure 3-6 SDCHM) SEE FIGURE 2, APPENDIX C

From Figure 3 - 6

Assume Q = 12.5 cfs $\quad$ s = 2% $\quad v := 255 \dfrac{ft}{min}$

$t_t := \dfrac{L_g}{v} \qquad t_t = 0.569$

$t_c := t_i + t_t \qquad t_c = 7.609$ min

$P_6 := 2.4$ in $\quad$ 100 yr 6 hour event (from rainfall Isopluvial Map)

$P_{24} := 3.9$ in $\quad$ 100 yr 24 hour event (from rainfall Isopluvial Map)

(FIGURE 3-1, SDCHM) SEE FIGURE 3, APPENDIX C

$P_6 := \text{if}\left[0.45 < \left(\frac{P_6}{P_{24}}\right) < 0.65, P_6, \text{"NO GOOD"}\right] \qquad P_6 = 2.4$ in

$i := 7.44 \cdot P_6 \cdot (t_c)^{-0.645} \cdot \dfrac{in}{hr} \qquad i = 4.823 \dfrac{in}{hr}$

Peak Discharge (cfs)

$Q := C_t \cdot i \cdot A_t \qquad Q = 12.475 \dfrac{ft^3}{s}$ $\quad$ Assumed Q = 12.5cfs for Tt O.K.

Proposed Site Hydrology, captured by Sampson Street storm drain
(approx. 5 acres composed of 4 watershed areas) See Figure 5
*All Calculations are based on a preliminary grading plan.

Area 1

Rational Method: $Q = CiA$

Existing Site Dimensions (area):

From Figure 5

Overland flow length: $L_o := 180 \cdot ft$

Gutter Flow Length: $L_g := 230\ ft$

Storm Drain Flow: $L_{sd} := 425\ ft$

Total Area:

$A_t := 1.25 \cdot acre$

Area 1:

Class II Base Area:

$A_{CII} := 29600 \cdot ft^2$ (from figure 5)

$A_{CII} = 0.68\ acre$

Area foundation:

$A_{fd} := 1850 \cdot ft^2$

$A_{fd} = 0.042\ acre$

Asphalt Concrete and Impermeable Area:

$A_{ac} := A_t - A_{CII} - A_{fd}$

$A_{ac} = 0.528\ acre$

Run off Coefficient:

$C_1 := 0.57$ (Class II Aggregate Base)

$C_2 := 0.90$
$C_3 := C_2$ (AC & Concrete Paving)

$$C_t := C_1 \cdot \left(\frac{A_{CII}}{A_t}\right) + C_2 \cdot \left(\frac{A_{ac}}{A_t}\right) + C_3 \cdot \left(\frac{A_{fd}}{A_t}\right)$$

$C_t = 0.721$

Intensity - (assumed Limited Industrial Table 3-2 SDCHM) SEE FIGURE 1, APPENDIX C

Overland Flow:

$t_{i1} := 7.9$ min $L_{max} := 65 \cdot ft$

remaining length: $L_1 := L_o - L_{max}$ $L_1 = 115\,ft$ in miles = 0.022 miles

Use Kirpich formula:

$$t_{i2} := \left[\frac{\left[11.9 \cdot (L_1)^3\right]}{\Delta E}\right]^{0.385}$$

where L1 is in miles

$\Delta E := 1.8 \cdot ft$

$t_{i2} := 1.5$ min

$t_i := t_{i1} + t_{i2}$ $t_i = 9.4$ min

Gutter Flow: (Per Figure 3-6, SDCHM) SEE FIGURE 2, APPENDIX C

From Figure 3 - 6

Assume Q = 2.25 cfs s = 1% assumed avg. $v := 138 \frac{ft}{min}$

$t_{t1} := \frac{L_g}{v}$ $t_{t1} = 1.667$

Pipe Flow: Assume Q = 2.25 cfs and diameter of the storm drain = 30 in

Q = VA

$A_{sd} := \left(\frac{\pi}{4}\right) \cdot 2.5^2$ $A_{sd} = 4.909\ ft^2$

$v_1 := \left(\frac{2.25}{A_{sd}}\right) \cdot 60$ $v_1 = 27.502 \frac{ft}{min}$

$t_{t2} := \frac{L_{sd}}{v_1}$ $t_{t2} = 15.453$ min

$t_c := t_i + t_{t1} + t_{t2}$ $t_c = 26.52$ min

$P_6 := 2.4$ in 100 yr 6 hour event (from rainfall Isopluvial Map)

$P_{24} := 3.9$ in 100 yr 24 hour event (from rainfall Isopluvial Map)

(FIGURE 3-1, SDCHM) SEE FIGURE 3, APPENDIX C

$$P_6 := \text{if}\left[0.45 < \left(\frac{P_6}{P_{24}}\right) < 0.65, P_6, \text{"NO GOOD"}\right] \qquad P_6 = 2.4 \text{ in}$$

$$i := 7.44 \cdot P_6 \cdot (t_c)^{-0.645} \cdot \frac{in}{hr} \qquad i = 2.156 \frac{in}{hr}$$

Peak Discharge (cfs)

$$Q_1 := C_t \cdot i \cdot A_t \qquad Q_1 = 1.958 \frac{ft^3}{s}$$

Assumed Q = 2.25cfs for Tt O.K.

Area 2

Rational Method: $Q = CiA$

Existing Site Dimensions (area):

From Figure 5

Overland flow length: $L_o := 120 \cdot ft$

Gutter Flow Length: $L_g := 485\ ft$

Storm Drain Flow: $L_{sd} := 425\ ft$

Total Area:

$A_t := 2.47 \cdot acre$

Area 1:

Class II Base Area:

$A_{CII} := 65335 \cdot ft^2$ (from figure 5)

$A_{CII} = 1.5\ acre$

Area foundation:

$A_{fd} := 13065 \cdot ft^2$

$A_{fd} = 0.3\ acre$

Asphalt Concrete and Impermeable Area:

$A_{ac} := A_t - A_{CII} - A_{fd}$

$A_{ac} = 0.67\ acre$

Run off Coefficient:

$C_1 := 0.57$ (Class II Aggregate Base)

$C_2 := 0.90$ (AC & Concrete Paving)

$C_3 := C_2$

$$C_t := C_1 \cdot \left(\frac{A_{CII}}{A_t}\right) + C_2 \cdot \left(\frac{A_{ac}}{A_t}\right) + C_3 \cdot \left(\frac{A_{fd}}{A_t}\right)$$

$C_t = 0.7$

Intensity - (assumed Limited Industrial Table 3-2 SDCHM) SEE FIGURE 1, APPENDIX C

Overland Flow:

$t_{i1} := 7.9$ min $\quad L_{max} := 65 \cdot ft$

remaining length: $L_1 := L_o - L_{max}$ $\quad L_1 = 55\,ft$ in miles = 0.010 miles

Use Kirpich formula:

$$t_{i2} := \left[\frac{\left[11.9 \cdot (L_1)^3\right]}{\Delta E}\right]^{0.385}$$

where L1 is in miles

$\Delta E := 1.2 \cdot ft$

$t_{i2} := 0.75$ min

$t_i := t_{i1} + t_{i2}$ $\quad t_i = 8.65$ min

Gutter Flow: (Per Figure 3-6 SDCHM) SEE FIGURE 2, APPENDIX C

From Figure 3 - 6

Assume Q = 4.5 cfs $\quad$ s = 1% $\quad$ assumed avg. $\quad v := 156 \, \frac{ft}{min}$

$t_{t1} := \frac{L_g}{v}$ $\quad t_{t1} = 3.109$

Pipe Flow: $\quad$ Assume Q = 4.5 cfs and diameter of the storm drain = 30 in

Q = VA

$A_{sd} := \left(\frac{\pi}{4}\right) \cdot 2.5^2$ $\quad A_{sd} = 4.909 \; ft^2$

$v_1 := \left(\frac{4.5}{A_{sd}}\right) \cdot 60$ $\quad v_1 = 55.004 \, \frac{ft}{min}$

$t_{t2} := \frac{L_{sd}}{v_1}$ $\quad t_{t2} = 7.727$ min

$t_c := t_i + t_{t1} + t_{t2}$ $\quad t_c = 19.486$ min

$P_6 := 2.4$ in $\quad$ 100 yr 6 hour event (from rainfall Isopluvial Map)

$P_{24} := 3.9$ in $\quad$ 100 yr 24 hour event (from rainfall Isopluvial Map)

(FIGURE 3-1, SDCHM) SEE FIGURE 3, APPENDIX C

$$P_6 := \text{if}\left[0.45 < \left(\frac{P_6}{P_{24}}\right) < 0.65, P_6, \text{"NO GOOD"}\right] \qquad P_6 = 2.4 \ \text{in}$$

$$i := 7.44 \cdot P_6 \cdot (t_c)^{-0.645} \cdot \frac{\text{in}}{\text{hr}} \qquad i = 2.63 \frac{\text{in}}{\text{hr}}$$

Peak Discharge (cfs)

$$Q_2 := C_t \cdot i \cdot A_t \qquad Q_2 = 4.582 \frac{\text{ft}^3}{\text{s}}$$

Assumed Q = 4.5 cfs for Tt O.K.

Area 3

Rational Method: Q = CiA

Existing Site Dimensions (area):

From Figure 5

Overland flow length: $L_o := 155 \cdot ft$

Gutter Flow Length: $L_g := 275\ ft$

Storm Drain Flow: $L_{sd} := 75\ \ ft$

Total Area:

$A_t := 1.08 \cdot acre$

Area 1:

Class II Base Area:

$A_{CII} := 22845 \cdot ft^2$ (from figure 5)

$A_{CII} = 0.524\,acre$

Area foundation:

$A_{fd} := 4355 \cdot ft^2$

$A_{fd} = 0.1\,acre$

Asphalt Concrete and Impermeable Area:

$A_{ac} := A_t - A_{CII} - A_{fd}$

$A_{ac} = 0.456\,acre$

Run off Coefficient:

$C_1 := 0.57$ (Class II Aggregate Base)

$C_2 := 0.90$ (AC & Concrete Paving)

$C_3 := C_2$

$$C_t := C_1 \cdot \left(\frac{A_{CII}}{A_t}\right) + C_2 \cdot \left(\frac{A_{ac}}{A_t}\right) + C_3 \cdot \left(\frac{A_{fd}}{A_t}\right)$$

$C_t = 0.74$

Intensity - (assumed Limited Industrial Table 3-2 SDCHM) SEE FIGURE 1, APPENDIX C

Overland Flow:

$t_{i1} := 7.9$ min $\quad L_{max} := 65 \cdot ft$

remaining length: $L_1 := L_o - L_{max}$ $\quad L_1 = 90\,ft$ $\quad$ in miles = 0.017 miles

Use Kirpich formula:

$$t_{i2} := \left[\left[\frac{\left[11.9 \cdot (L_1)^3\right]}{\Delta E}\right]\right]^{0.385}$$

where L1 is in miles

$\Delta E := 1.55 \cdot ft$

$t_{i2} := 1.2$ min

$t_i := t_{i1} + t_{i2}$ $\quad t_i = 9.1$ min

Gutter Flow: (Per Figure 3-6, SDCHM) SEE FIGURE 2, APPENDIX C

From Figure 3 - 6

Assume Q = 2.75 cfs $\quad$ s = 1% $\quad$ assumed avg. $\quad v := 144 \frac{ft}{min}$

$t_{t1} := \frac{L_g}{v}$ $\quad t_{t1} = 1.91$

Pipe Flow: $\quad$ Assume Q = 2.75 cfs and diameter of the storm drain = 30 in

Q = VA

$A_{sd} := \left(\frac{\pi}{4}\right) \cdot 2.5^2$ $\quad A_{sd} = 4.909 \; ft^2$

$v_1 := \left(\frac{2.75}{A_{sd}}\right) \cdot 60$ $\quad v_1 = 33.614 \; \frac{ft}{min}$

$t_{t2} := \frac{L_{sd}}{v_1}$ $\quad t_{t2} = 2.231$ min

$t_c := t_i + t_{t1} + t_{t2}$ $\quad t_c = 13.241$ min

$P_6 := 2.4$ in $\quad$ 100 yr 6 hour event (from rainfall Isopluvial Map)

$P_{24} := 3.9$ in $\quad$ 100 yr 24 hour event (from rainfall Isopluvial Map)

(FIGURE 3-1, SDCHM) SEE FIGURE 3, APPENDIX C

$$P_6 := \text{if}\left[0.45 < \left(\frac{P_6}{P_{24}}\right) < 0.65, P_6, \text{"NO GOOD"}\right] \qquad P_6 = 2.4 \text{ in}$$

$$i := 7.44 \cdot P_6 \cdot \left(t_c\right)^{-0.645} \cdot \frac{in}{hr} \qquad i = 3.374 \frac{in}{hr}$$

Peak Discharge (cfs)

$$Q_3 := C_t \cdot i \cdot A_t \qquad Q_3 = 2.718 \frac{ft^3}{s}$$

Assumed Q = 2.75 cfs for Tt O.K.

Area 4

Rational Method: Q = CiA

Existing Site Dimensions (area):

From Figure 5

Gutter Flow Length: $L_g := 420\ \text{ft}$

Total Area:

$A_t := 0.10 \cdot \text{acre}$

Area 1: (conservatively assume the landscape area and driveways have a runoff coefficient equivalent to Class II Base.)

Class II Base Area:

$A_{CII} := A_t$ (from figure 5)

$A_{CII} = 0.1\ \text{acre}$

Run off Coefficient:

$C_1 := 0.57$ (Class II Aggregate Base)

$C_t := C_1$

$C_t = 0.57$

Gutter Flow: (Per Figure 3-6, SDCHM) SEE FIGURE 2, APPENDIX C

Assume all Area 4 drains into the curb and has gutter flow.

From Figure 3 - 6

Assume Q = 0.75 cfs s = 3% assumed avg. $v := 216\ \frac{\text{ft}}{\text{min}}$

$t_{t1} := \frac{L_g}{v}$ $t_{t1} = 1.944$

$t_c := t_{t1}$ $t_c = 1.944\ \text{min}$

$P_6 := 2.4\ \text{in}$ 100 yr 6 hour event (from rainfall Isopluvial Map)

$P_{24} := 3.9\ \text{in}$ 100 yr 24 hour event (from rainfall Isopluvial Map)

(FIGURE 3-1, SDCHM) SEE FIGURE 3, APPENDIX C

$$P_6 := \text{if}\left[0.45 < \left(\frac{P_6}{P_{24}}\right) < 0.65, P_6, \text{"NO GOOD"}\right] \qquad P_6 = 2.4\ \text{in}$$

$$i := 7.44 \cdot P_6 \cdot \left(t_c\right)^{-0.645} \cdot \frac{\text{in}}{\text{hr}} \qquad i = 11.628\,\frac{\text{in}}{\text{hr}}$$

Peak Discharge (cfs)

$$Q_4 := C_t \cdot i \cdot A_t \qquad Q_4 = 0.668\,\frac{\text{ft}^3}{\text{s}}$$

Assumed Q = 0.75 cfs for Tt O.K.

Proposed Total Peak Discharge (cfs):

$$Q_{peak} := Q_1 + Q_2 + Q_3 + Q_4$$

$$Q_{peak} = 9.927\,\frac{\left(\text{ft}^3\right)}{\text{s}}$$

APPENDIX C – RATIONAL METHOD SUPPORTING TABLES AND FIGURES

FIGURE # 1 APPENDIX C

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

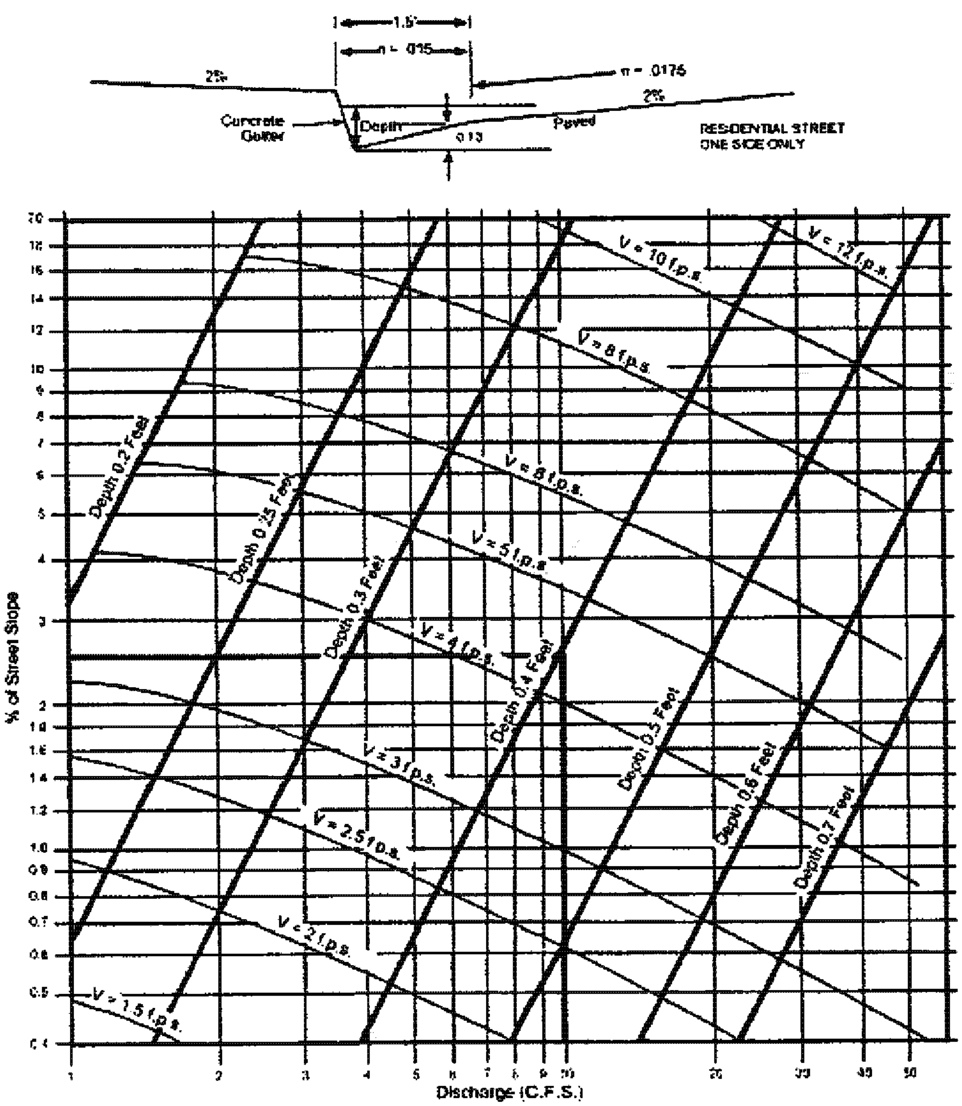
Element*	DU/	.5%		1%		2%		3%		5%		10%	
	Acre	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description

*source: San Diego County Hydrology Manual, June 2003

Project: Silvergate 230/69kV Substation	Page ____ of ____
Subject: Hydrology Calculations (Proposed Site)	Computed By: TWL Date_____
	Checked By:___ Date_____

FIGURE # 2 APPENDIX C



EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

FIGURE **3-6**

Gutter and Roadway Discharge - Velocity Chart

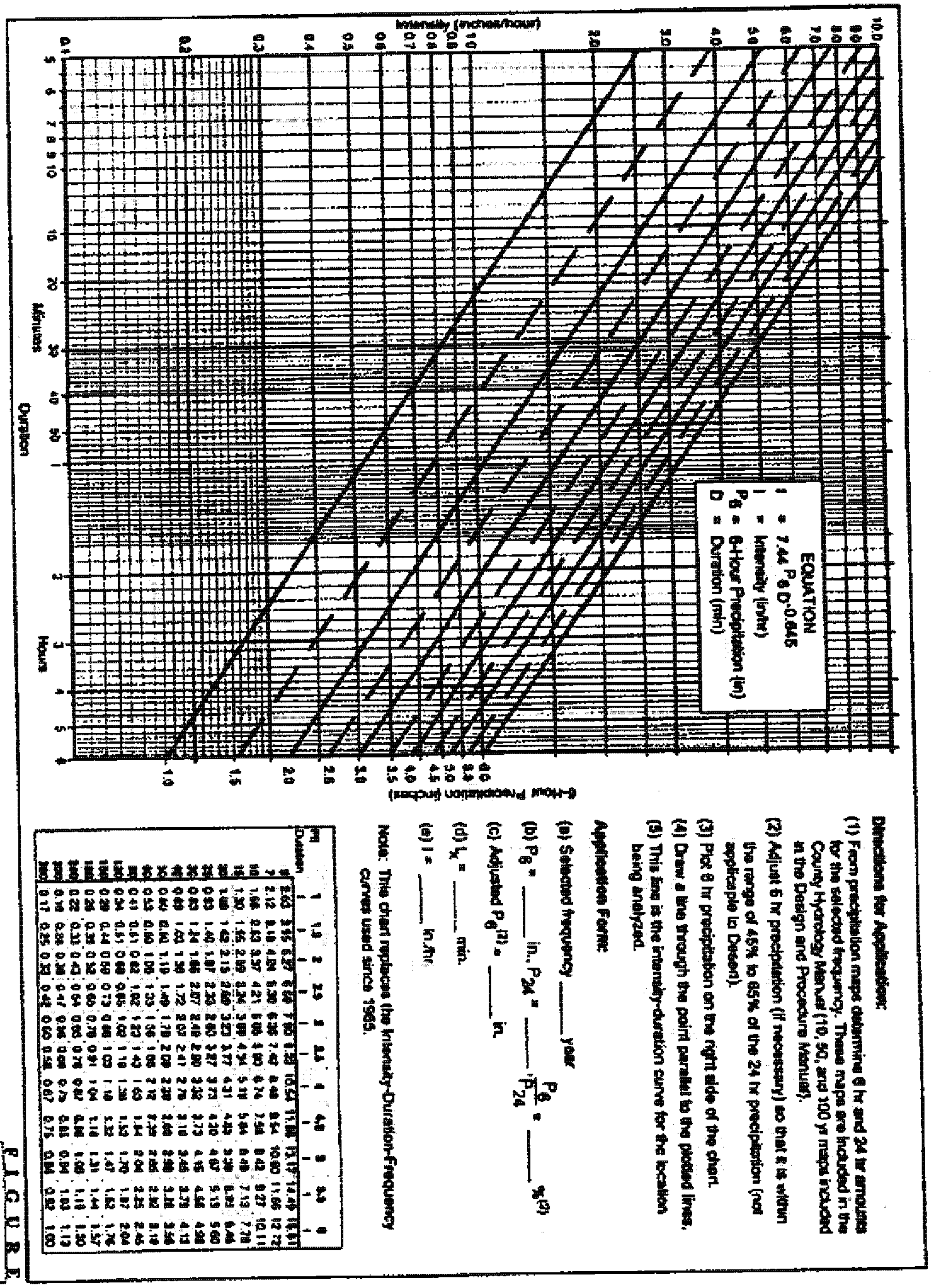
*source: San Diego County Hydrology Manual, June 2003

COSD011832

Project: Silvergate 230/69kV Substation	Page ____ of ____
Subject: Hydrology Calculations (Proposed Site)	Computed By: TWL Date_____
	Checked By:___ Date_____

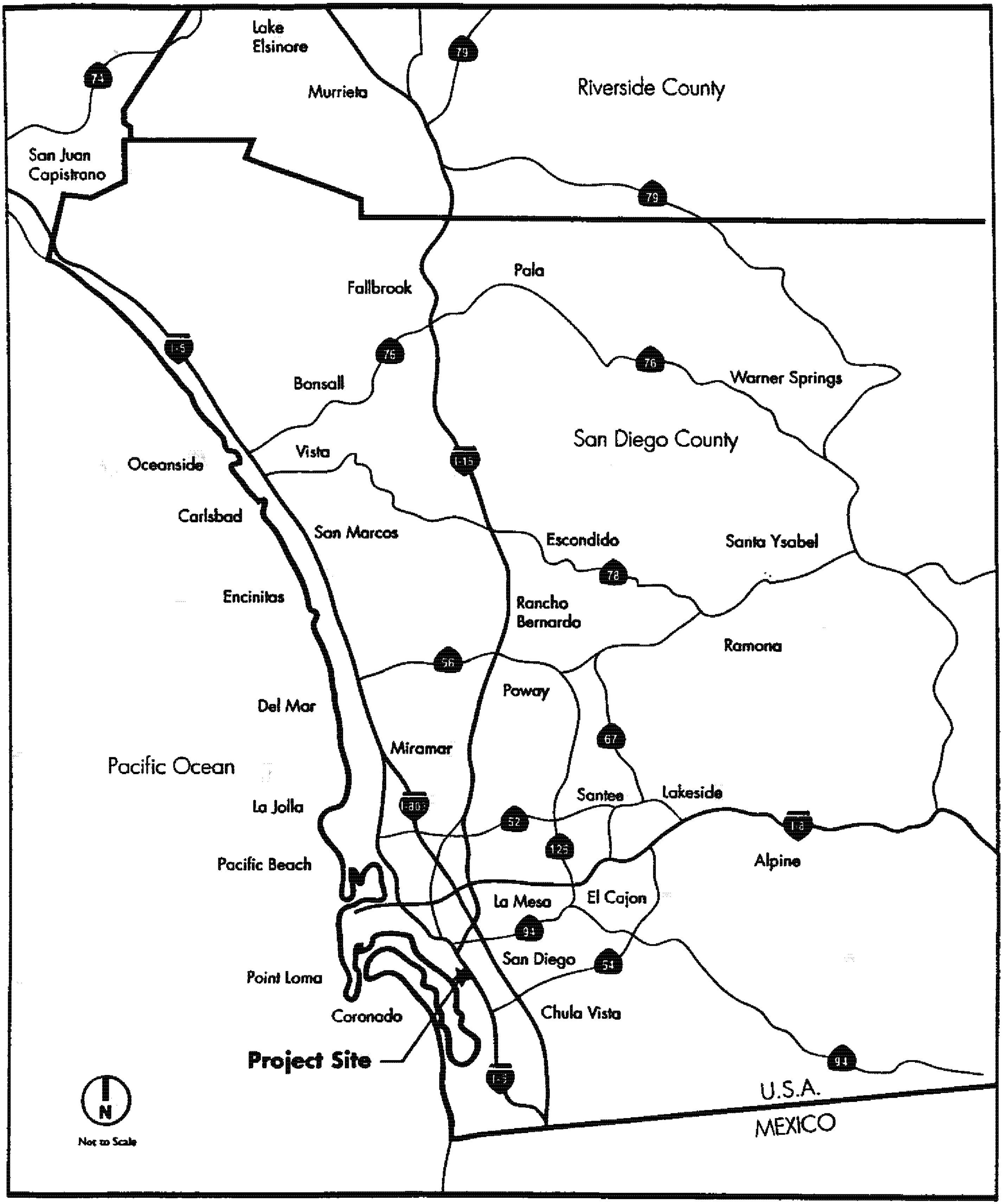
FIGURE # 3 APPENDIX C

*source: San Diego County Hydrology Manual, June 2003



P6 / Duration	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

FIGURE 1 – PROJECT LOCATION



RBF CONSULTING

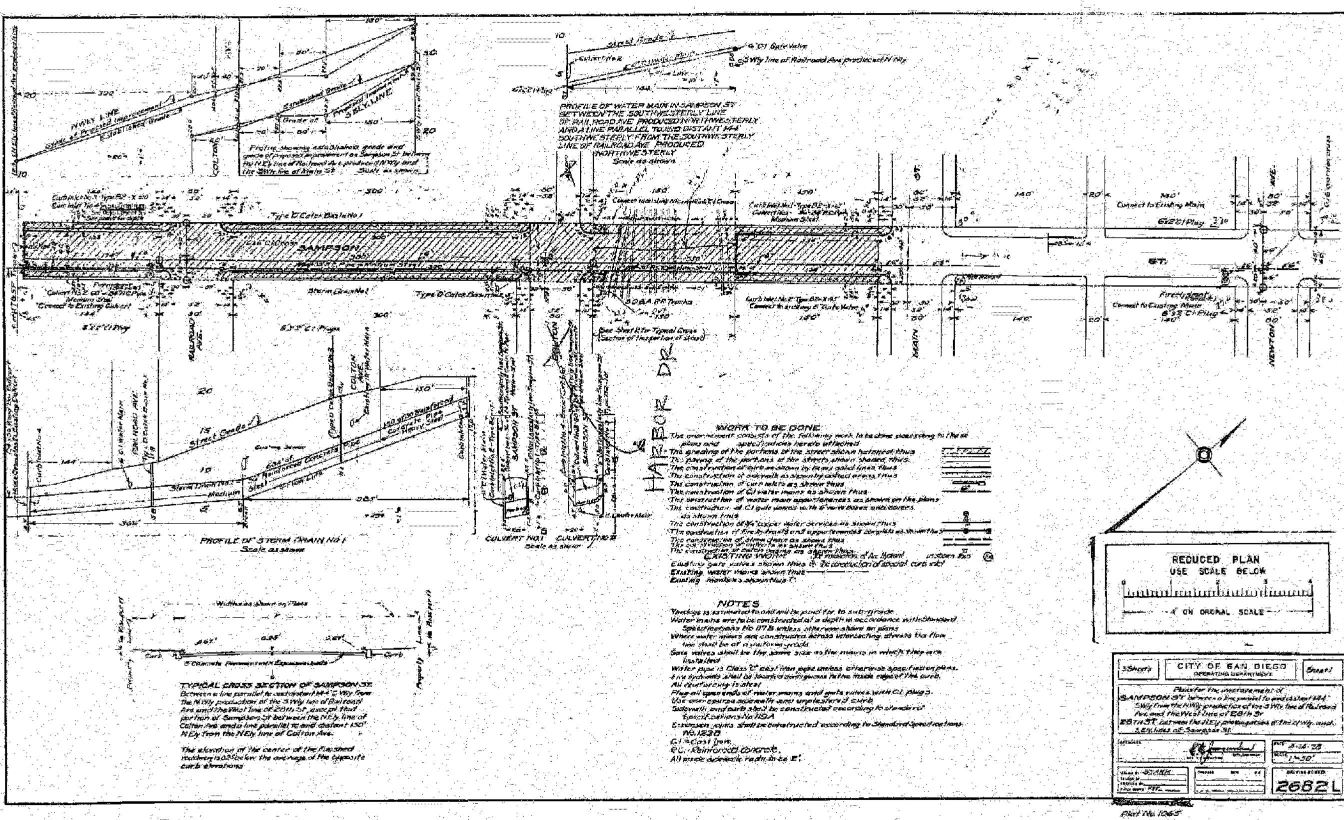
Regional Map

SDG&E Silvergate Transmission Substation

Figure 1

SOURCE: SDG&E'S PEA DOCUMENT MARCH 30, 2005

COSD011835



MICROFILMED

GENERAL NOTES

UNDERGROUND UTILITIES: THE CONTRACTOR SHALL NOTIFY THE SAN DIEGO GAS AND ELECTRIC CO. PRIOR TO STARTING WORK NEAR COMPANY UTILITIES AND SHALL COORDINATE HIS ACTIVITIES WITH THE COMPANY REPRESENTATIVE. BEFORE EXCAVATING FOR THIS CONTRACT, THE CONTRACTOR SHALL VERIFY THE LOCATION OF UNDERGROUND UTILITIES BY TELEPHONING THE FOLLOWING:

1)	GAS AND ELECTRIC	800-422-4133
2)	UNDERGROUND SERVICES ALERT	800-422-4133
3)	WATER AND SEWER	236-5650
4)	FIRE ALARM	236-6154
5)	COMMUNICATIONS DIVISION	236-5503
6)	BUILDING AND IRRIGATION	236-5500
7)	SOUTHWESTERN CABLE TV	800-422-4133
8)	SAN DIEGO PIPE CO.	236-6811

EXISTING WORK: THE LOCATION AND ELEVATION OF IMPROVEMENTS TO BE MET BY WORK TO BE DONE SHALL BE CONFIRMED BY FIELD MEASUREMENTS PRIOR TO CONSTRUCTION.

ADJUST M.H. RIMS, GATE VALVE COVERS, WATER METERS, ETC., TO NEW GRADE AS REQUIRED.

USE SIGNS, DELINEATORS, BARRICADES, ETC., AS PER 1985 STATE OF CALIFORNIA TRAFFIC CONTROL MANUAL. DELINEATORS AND STEADY BURN LIGHTS TO OUTLINE THE TRAFFIC PATH; BARRICADES TO PROTECT THE WORK AREA.

SPECIAL NOTES

ALL ELEVATIONS SHOWN ARE TO FINISHED GRADE, UNLESS OTHERWISE NOTED.

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE CITY OF SAN DIEGO 48 HOURS BEFORE BEGINNING OF WORK AND TO CALL FOR INSPECTION 24 HOURS IN ADVANCE. ANY WORK PERFORMED WITHOUT INSPECTION WILL BE SUBJECT TO REJECTION AND REMOVAL.

[illegible]

UNPAVED AREAS TO SLOPE AT NOT LESS THAN 1%.

THE CONTRACTOR SHALL CHECK THE RELATIVE LOCATION OF THE CONSTRUCTION STAKES AS SET BY THE ENGINEER OF WORK TO ASCERTAIN THAT THEY ARE SET IN CORRECT LOCATIONS SO THAT THE CONSTRUCTION OF IMPROVEMENTS AS SHOWN ON THESE PLANS CAN BE PERFORMED. IF THE CONTRACTOR THINKS THAT A STAKE IS SET WRONG, HE SHALL IMMEDIATELY NOTIFY THE ENGINEER OF WORK.

PROTECTION OF EXISTING UTILITIES: THE EXISTANCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. THE CONTRACTOR SHALL TAKE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN ON THESE PLANS AND ANY OTHER LINES WHICH MAY NOT BE OF RECORD NOR SHOWN ON THESE PLANS. THE CONTRACTOR SHALL MAKE EXPLORATORY EXCAVATIONS TO LOCATE EXISTING UNDERGROUND FACILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT REVISIONS TO PLANS AS REQUIRED TO MEET EXISTING CONDITIONS.

LOCATION AND ELEVATION OF IMPROVEMENTS TO BE MET BY WORK TO BE DONE SHALL BE CONFIRMED BY FIELD MEASUREMENTS PRIOR TO CONSTRUCTION OF NEW WORK. CONTRACTOR SHALL MAKE EXPLORATORY EXCAVATIONS AND LOCATE EXISTING UNDERGROUND FACILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT REVISIONS TO PLANS IF REVISIONS ARE NECESSARY BECAUSE OF ACTUAL LOCATION OF EXISTING FACILITIES.

WATER AND SEWER NOTES

EACH LOT SHALL RECEIVE A 2-INCH WATER SERVICE AND 6-INCH SEWER CONNECTION, UNLESS OTHERWISE INDICATED ON THE PLANS OR SPECIAL SPECIFICATIONS. LOCATION TO BE DETERMINED IN THE FIELD BY THE ENGINEER OF WORK. THE "AS-BUILT" LOCATIONS SHALL BE SHOWN ON THESE PLANS AND THE SEWER LATERAL TABLE COMPLETED PRIOR TO ACCEPTANCE OF THE WATER FACILITIES.

LOCATE WATER SERVICES AND SEWER HOUSE CONNECTIONS OUT OF DRIVEWAYS. THE SEWER HOUSE CONNECTION SHALL BE A MINIMUM 5-FEET DISTANCE DOWNHILL FROM THE WATER SERVICE.

ALL CONNECTIONS TO EXISTING WATER MAINS ARE TO BE DONE BY THE CITY'S WATER UTILITIES DEPARTMENT FOR WHICH FEES WILL BE PAID TO THE CITY. CONTRACTOR SHALL CONFIRM FEE FOR "TIE" CONNECTION PRIOR TO BIDDING. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO EXPOSE THE EXISTING MAIN AT THE CONNECTION POINT AND TO INSTALL THE NEW MAIN AT THE ALIGNMENT AND GRADE WHICH WILL PERMIT THE CITY TO MAKE A "STRAIGHT IN" CONNECTION WITHOUT USING MORE THAN 10 LINEAL FEET OF PIPE.

ALL VALVES TO BE FLANGED TO TEES AND CROSSES.

ALL DUCTILE IRON AND GRAY CAST IRON FITTINGS, VALVES AND APPURTENANCES DIRECTLY BURIED IN THE GROUND SHALL BE WRAPPED WITH POLYETHELENE FILM IN CONFORMANCE WITH SECTION 5-4 OF AWWA-C105.

ALL GATE VALVES TO BE RESILIENT SEATED.

WATER CONNECTIONS

CONNECTION NO. 1: 2" WET TAP WATER SERVICE	$ [illegible]
CONNECTION NO. 2: 4" WET TAP FIRE LINE	$ 240.00
KILLING EXISTING 3/4" WATER SERVICE	$[illegible]
[illegible]	[illegible]

SITE DEVELOPMENT

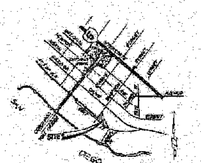
THIS PERMIT DOES NOT INCLUDE LAND DEVELOPMENT. SHOULD LAND DEVELOPMENT BE REQUIRED AT A LATER DATE, A SEPARATE PERMIT WILL BE OBTAINED.

LEGAL

PARCEL 1 OF PARCEL MAP 14649 IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, RECORDED JANUARY 15, 1987 AS FILE NO. 87-049755 IN THE BOOK OF PARCEL MAPS, PAGE 14649 ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

ADT

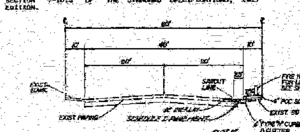
ADIT STREET	LOCAL
SAMPSON STREET	5,000



VICINITY MAP
NO SCALE

TRAFFIC NOTE

MAINTAINING TRAFFIC - THE CONTRACTOR SHALL MAINTAIN ONE TRAFFIC LANE IN EACH DIRECTION ON TWO LANE STREETS AND TWO LANES IN EACH DIRECTION FOR TRAFFIC ON ALL FOUR OR MORE LANE STREETS DURING THE WORKING HOURS OF 8:30 AM. TO 3:30 PM. FULL WIDTH OF ALL TRAVEL LANES ON EXISTING ROADWAYS MUST BE MAINTAINED DURING THE HOURS OF 3:30 PM. TO 8:30 AM. DAILY, AND ON SATURDAYS, SUNDAYS AND DESIGNATED LEGAL HOLIDAYS, OR WHEN CONSTRUCTION OPERATIONS ARE NOT ACTIVELY IN PROGRESS ON WORKING DAYS. A FOUR FOOT WIDE PEDESTRIAN ACCESS SHALL BE PROVIDED AND MAINTAINED IN ACCORDANCE WITH SECTION 7-10.1 OF THE STANDARD SPECIFICATIONS. FOR CLARIFICATION OF THE ABOVE, CONTRACTOR MAY CONTACT TRAFFIC ENGINEERING AT 236-6040. ANY MODIFICATION OR CHANGE IN ALIGNMENT OF THE EXISTING PARKING OR TRAVEL LANES OF ONE WAY OR TWO WAY STREETS SHALL RECEIVE PRIOR APPROVAL FROM THE CITY TRAFFIC ENGINEER AND SHALL BE IN ACCORDANCE WITH SECTION 7-10.3 OF THE STANDARD SPECIFICATIONS, 1985 EDITION.



TYPICAL SECTION SAMPSON STREET
NO SCALE

NOTE: [illegible]

BENCH MARK

[illegible]
ELEV. [illegible]
PER CITY OF SD VERTICAL CONTROL

WORK TO BE DONE

THE IMPROVEMENTS CONSISTS OF THE FOLLOWING WORK TO BE DONE ACCORDING TO THESE PLANS AND SPECIFICATIONS AND STANDARD DRAWINGS OF THE CITY OF SAN DIEGO.

STANDARD SPECIFICATIONS

1. STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION (1985 EDITION).
2. STANDARD SPECIAL PROVISIONS, AND
3. CITY OF SAN DIEGO STANDARD SPECIAL PROVISIONS, DOCUMENT NO. 769545, FILED APRIL 7, 1986.
4. STANDARD SPECIAL PROVISIONS ADDENDUM PERTAINING TO STREET LIGHTING, DOCUMENT NO. 768664, FILED APRIL 8, 1985.
5. CALIFORNIA DEPARTMENT OF TRANSPORTATION, "MANUAL OF TRAFFIC CONTROLS, FOR CONSTRUCTION AND MAINTENANCE WORK ZONES" (1985 EDITION), DOCUMENT NO. 769189 FILED APRIL 16, 1985.

STANDARD DRAWINGS

CITY OF SAN DIEGO STANDARD DRAWINGS DOCUMENT NO. 769374, FILED JUNE 3, 1986.

LEGEND

DESCRIPTION	STD DWG NO.	SYMBOL
EXIST. EDGE OF PAVEMENT		
EXIST CURB AND GUTTER		
STREET CENTERLINE		
TYPE "G" CURB AND GUTTER	G-2	
4" PCC SIDEWALK	G-7, G-9	
CONCRETE DRIVEWAY	G-14	
SCHEDULE I PAVEMENT	SDG-105	
AC OVERLAY		
EXIST FIRE HYDRANT		
CURB INLET (TYPE A)	D-1	
AREA TO BE REMOVED		
WATER SERVICE	[illegible]	
WATER METER BOX	W-5	
FIRE SERVICE	[illegible]	

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THAT DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

KERCHEVAL ENGINEERS
4740 Murphy Canyon Road Suite 310
San Diego, California 92123
(619) 571-0828

By [signature] Date [illegible]

R.C.E. No. [illegible]

PLAN FILE NO.
A002285-12 [illegible] PERMIT
A001148-[illegible] PERMIT

SITE ADRESS:
1401 SAMPSON ST.
SAN DIEGO CA. [illegible]

PRIVATE CONTRACT ENGINEERING PERMIT NO. [illegible]

PLANS FOR THE IMPROVEMENT OF:

PORTION OF SAMPSON ST.

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING DEPARTMENT
SHEET 1 OF 2 SHEETS

[illegible] 701781

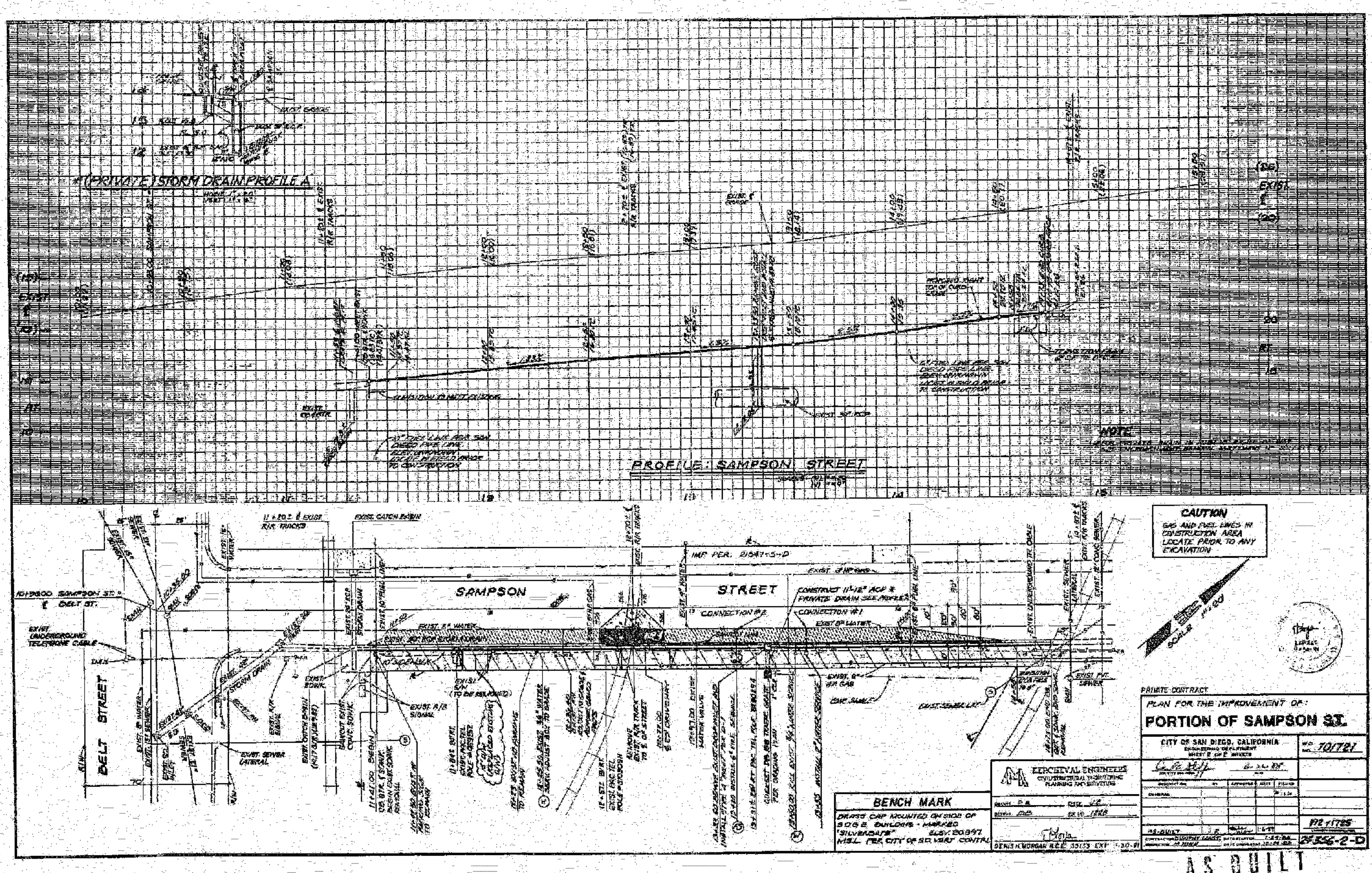
KERCHEVAL ENGINEERS
CIVIL ENGINEERING, PLANNING AND SURVEYING

192 - 1725

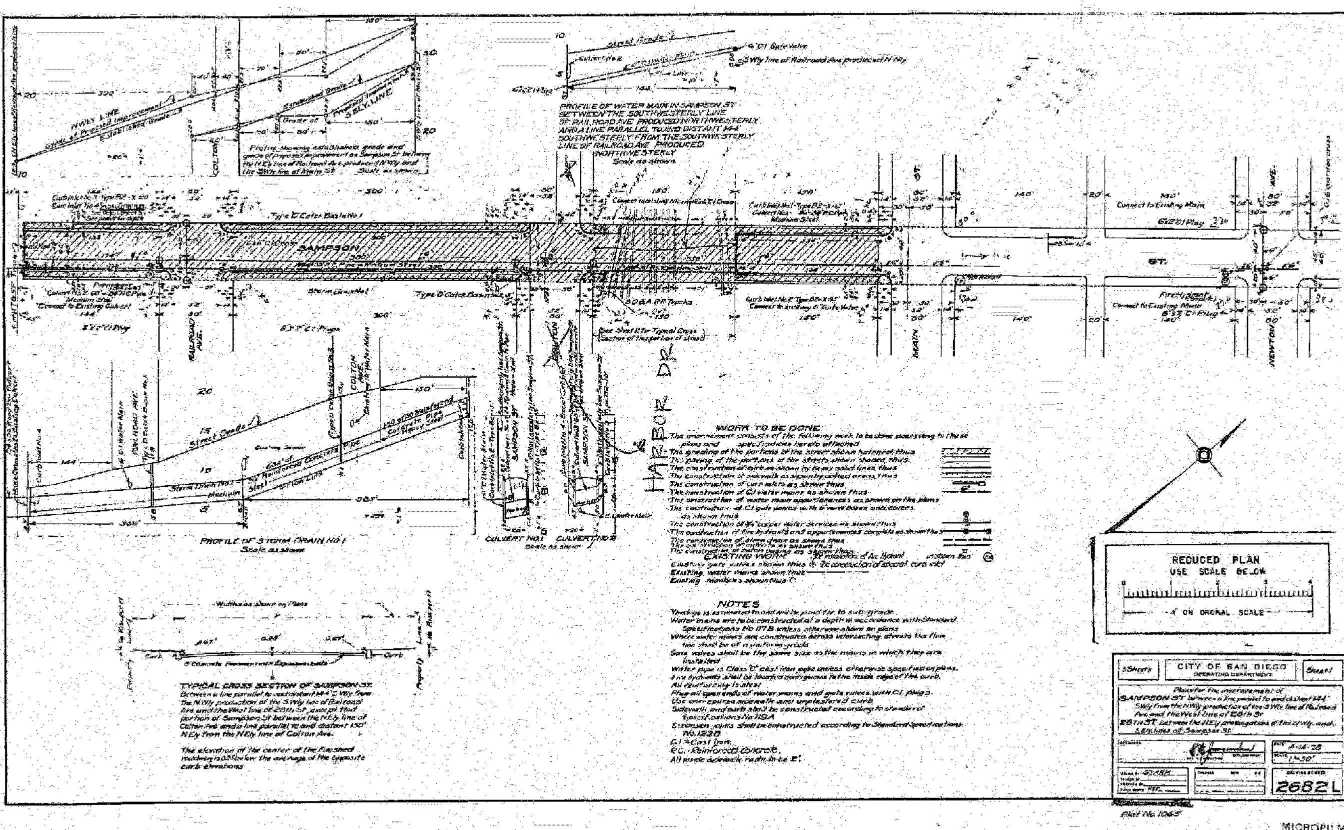
24356-1-D

AS BUILT

COSD011980


#1 (PRIVATE) STORM DRAIN PROFILE A
PROFILE: SAMPSON STREET
NOTE
SAMPSON
STREET
BELT STREET
CONSTRUCT 11"-12" ACP & PRIVATE DRAIN SEE PROFILE
CONNECTION #1
CONNECTION #2
EXIST. UNDERGROUND TELEPHONE CABLE
CAUTION
GAS AND FUEL LINES IN CONSTRUCTION AREA LOCATE PRIOR TO ANY EXCAVATION
SCALE 1"=20'
BENCH MARK
BRASS CAP MOUNTED ON SIDE OF S.D.G.E. BUILDING - MARKED "SILVERGATE" ELEV. 20.897 M.S.L. PER CITY OF S.D. VERT. CONTROL
PERCIVAL ENGINEERS
CIVIL/STRUCTURAL ENGINEERING PLANNING AND SURVEYING
DENIS H. MORGAN R.C.E. 33153 EXP. 3-30-91
PRIVATE CONTRACT
PLAN FOR THE IMPROVEMENT OF:
PORTION OF SAMPSON ST.
CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING DEPARTMENT
SHEET 2 OF 2 SHEETS
W.O. NO. 70/721
AS-BUILT
192-1725
25356-2-D

AS BUILT


SAMPSON
HARBOR DR.
MAIN
NEWTON AVE.
WORK TO BE DONE
NOTES
TYPICAL CROSS SECTION OF SAMPSON ST.
PROFILE OF STORM DRAIN NO. 1
CULVERT NO. 1
REDUCED PLAN
USE SCALE BELOW
4" ON ORIGINAL SCALE
CITY OF SAN DIEGO
OPERATING DEPARTMENT
3 Sheets
Sheet 1
2682 L
Plat No. 1065
MICROFILMED

GENERAL NOTES

UNDERGROUND UTILITIES: THE CONTRACTOR SHALL NOTIFY THE SAN DIEGO GAS AND ELECTRIC CO. PRIOR TO STARTING WORK NEAR COMPANY UTILITIES AND SHALL COORDINATE HIS ACTIVITIES WITH THE COMPANY REPRESENTATIVE. BEFORE EXCAVATING FOR THIS CONTRACT, THE CONTRACTOR SHALL VERIFY THE LOCATION OF UNDERGROUND UTILITIES BY TELEPHONING THE FOLLOWING:

1)	GAS AND ELECTRIC	800-422-4133
2)	UNDERGROUND SERVICES ALERT	800-422-4133
3)	WATER AND SEWER	236-5650
4)	FIRE ALARM	236-6184
5)	COMMUNICATIONS DIVISION	236-5503
6)	BUILDING AND IRRIGATION	236-5500
7)	SOUTHWESTERN CABLE TV	800-422-4133
8)	SAN DIEGO PIPE CO.	232-6811

EXISTING WORK: THE LOCATION AND ELEVATION OF IMPROVEMENTS TO BE MET BY WORK TO BE DONE SHALL BE CONFIRMED BY FIELD MEASUREMENTS PRIOR TO CONSTRUCTION.

ADJUST M.H. RIMS, GATE VALVE COVERS, WATER METERS, ETC., TO NEW GRADE AS REQUIRED.

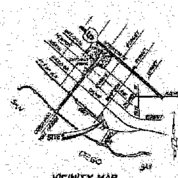
USE SIGNS, DELINEATORS, BARRICADES, ETC., AS PER 1985 STATE OF CALIFORNIA TRAFFIC CONTROL MANUAL. DELINEATORS AND STEADY BURN LIGHTS TO OUTLINE THE TRAFFIC PATH; BARRICADES TO PROTECT THE WORK AREA.

LEGAL

PARCEL 1 OF PARCEL MAP 14649 IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, RECORDED JANUARY 17, 1987 AS FILE NO. 87-049155 IN THE BOOK OF PARCEL MAPS, PAGE 14649 ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

ADT

ADJT STREET	LOCAL
SAMPSON STREET	5,000



VICINITY MAP

NO SCALE

SPECIAL NOTES

ALL ELEVATIONS SHOWN ARE TO FINISHED GRADE, UNLESS OTHERWISE NOTED.

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE CITY OF SAN DIEGO 48 HOURS BEFORE BEGINNING OF WORK AND TO CALL FOR INSPECTION 24 HOURS IN ADVANCE. ANY WORK PERFORMED WITHOUT INSPECTION WILL BE SUBJECT TO REJECTION AND REMOVAL.

[illegible]

UNPAVED AREAS TO SLOPE AT NOT LESS THAN 1%.

THE CONTRACTOR SHALL CHECK THE RELATIVE LOCATION OF THE CONSTRUCTION STAKES AS SET BY THE ENGINEER OF WORK TO ASCERTAIN THAT THEY ARE SET IN CORRECT LOCATIONS SO THAT THE CONSTRUCTION OF IMPROVEMENTS AS SHOWN ON THESE PLANS CAN BE PERFORMED. IF THE CONTRACTOR THINKS THAT A STAKE IS SET WRONG, HE SHALL IMMEDIATELY NOTIFY THE ENGINEER OF WORK.

PROTECTION OF EXISTING UTILITIES: THE EXISTANCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. THE CONTRACTOR SHALL TAKE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN ON THESE PLANS AND ANY OTHER LINES WHICH MAY NOT BE OF RECORD NOR SHOWN ON THESE PLANS. THE CONTRACTOR SHALL MAKE EXPLORATORY EXCAVATIONS TO LOCATE EXISTING UNDERGROUND FACILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT REVISIONS TO PLANS AS REQUIRED TO MEET EXISTING CONDITIONS.

LOCATION AND ELEVATION OF IMPROVEMENTS TO BE MET BY WORK TO BE DONE SHALL BE CONFIRMED BY FIELD MEASUREMENTS PRIOR TO CONSTRUCTION OF NEW WORK. CONTRACTOR SHALL MAKE EXPLORATORY EXCAVATIONS AND LOCATE EXISTING UNDERGROUND FACILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT REVISIONS TO PLANS IF REVISIONS ARE NECESSARY BECAUSE OF ACTUAL LOCATION OF EXISTING FACILITIES.

WATER AND SEWER NOTES

EACH LOT SHALL RECEIVE A 2-INCH WATER SERVICE AND 6-INCH SEWER CONNECTION, UNLESS OTHERWISE INDICATED ON THE PLANS OR SPECIAL SPECIFICATIONS. LOCATION TO BE DETERMINED IN THE FIELD BY THE ENGINEER OF WORK. THE "AS-BUILT" LOCATIONS SHALL BE SHOWN ON THESE PLANS AND THE SEWER LATERAL TABLE COMPLETED PRIOR TO ACCEPTANCE OF THE WATER FACILITIES.

LOCATE WATER SERVICES AND SEWER HOUSE CONNECTIONS OUT OF DRIVEWAYS. THE SEWER HOUSE CONNECTION SHALL BE A MINIMUM 5-FEET DISTANCE DOWNHILL FROM THE WATER SERVICE.

ALL CONNECTIONS TO EXISTING WATER MAINS ARE TO BE DONE BY THE CITY'S WATER UTILITIES DEPARTMENT FOR WHICH FEES WILL BE PAID TO THE CITY. CONTRACTOR SHALL CONFIRM FEE FOR "TIE" CONNECTION PRIOR TO BIDDING. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO EXPOSE THE EXISTING MAIN AT THE CONNECTION POINT AND TO INSTALL THE NEW MAIN AT THE ALIGNMENT AND GRADE WHICH WILL PERMIT THE CITY TO MAKE A "STRAIGHT IN" CONNECTION WITHOUT USING MORE THAN 10 LINEAL FEET OF PIPE.

ALL VALVES TO BE FLANGED TO TEES AND CROSSES.

ALL DUCTILE IRON AND GRAY CAST IRON FITTINGS, VALVES AND APPURTENANCES DIRECTLY BURIED IN THE GROUND SHALL BE WRAPPED WITH POLYETHELENE FILM IN CONFORMANCE WITH SECTION 5-4 OF AWWA-C105.

ALL GATE VALVES TO BE RESILIENT SEATED.

WATER CONNECTIONS

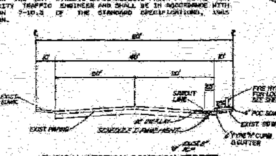
CONNECTION NO. 1: 2" WET TAP WATER SERVICE	$ 10.00
CONNECTION NO. 2: 4" WET TAP FIRE LINE	$ 240.00
KILLING EXISTING 3/4" WATER SERVICE	$1010.00
KILLING EXISTING 3/4" WATER SERVICE	[illegible]

SITE DEVELOPMENT

THIS PERMIT DOES NOT INCLUDE LAND DEVELOPMENT. SHOULD LAND DEVELOPMENT BE REQUIRED AT A LATER DATE, A SEPARATE PERMIT WILL BE OBTAINED.

TRAFFIC NOTE

MAINTAINING TRAFFIC - THE CONTRACTOR SHALL MAINTAIN ONE TRAFFIC LANE IN EACH DIRECTION ON TWO LANE STREETS AND TWO LANES IN EACH DIRECTION FOR TRAFFIC ON ALL FOUR OR MORE LANE STREETS DURING THE WORKING HOURS OF 7:30 AM. TO 3:30 PM. FULL WIDTH OF ALL TRAVEL LANES ON EXISTING ROADWAYS MUST BE MAINTAINED DURING THE HOURS OF 3:30 PM. TO 8:30 AM. DAILY, AND ON SATURDAYS, SUNDAYS AND DESIGNATED LEGAL HOLIDAYS, OR WHEN CONSTRUCTION OPERATIONS ARE NOT ACTIVELY IN PROGRESS ON WORKING DAYS. A FOUR FOOT WIDE PEDESTRIAN ACCESS SHALL BE PROVIDED AND MAINTAINED IN ACCORDANCE WITH SECTION 7-10.1 OF THE STANDARD SPECIFICATIONS. FOR CLARIFICATION OF THE ABOVE, CONTRACTOR MAY CONTACT TRAFFIC ENGINEERING AT 236-6040. ANY MODIFICATION OR CHANGE IN ALIGNMENT OF THE EXISTING PARKING OR TRAVEL LANES OF ONE WAY OR TWO WAY STREETS SHALL RECEIVE PRIOR APPROVAL FROM THE CITY TRAFFIC ENGINEER AND SHALL BE IN ACCORDANCE WITH SECTION 7-10.3 OF THE STANDARD SPECIFICATIONS, 1985 EDITION.



TYPICAL SECTION SAMPSON STREET

NO SCALE

NOTE:

WORK TO BE DONE

THE IMPROVEMENTS CONSISTS OF THE FOLLOWING WORK TO BE DONE ACCORDING TO THESE PLANS AND SPECIFICATIONS AND STANDARD DRAWINGS OF THE CITY OF SAN DIEGO.

STANDARD SPECIFICATIONS

1. STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION (1985 EDITION).
2. STANDARD SPECIAL PROVISIONS, AND
3. CITY OF SAN DIEGO STANDARD SPECIAL PROVISIONS, DOCUMENT NO. 749545, FILED APRIL 7, 1986.
4. STANDARD SPECIAL PROVISIONS ADDENDUM PERTAINING TO STREET LIGHTING, DOCUMENT NO. 748664, FILED APRIL 6, 1983.
5. CALIFORNIA DEPARTMENT OF TRANSPORTATION, "MANUAL OF TRAFFIC CONTROLS, FOR CONSTRUCTION AND MAINTENANCE WORK ZONES" (1985 EDITION), DOCUMENT NO. 769188 FILED APRIL 14, 1985.

STANDARD DRAWINGS

CITY OF SAN DIEGO STANDARD DRAWINGS DOCUMENT NO. 749574, FILED JUNE 3, 1986.

LEGEND

DESCRIPTION	STD DWG NO	SYMBOL
EXIST. EDGE OF PAVEMENT		
EXIST CURB AND GUTTER		
STREET CENTERLINE		
TYPE "G" CURB AND GUTTER	G-2	
4" P.C.C. SIDEWALK	G-7, G-9	
CONCRETE DRIVEWAY	G-14	
SCHEDULE I PAVEMENT	SDG-105	
A.C. OVERLAY		
EXIST. FIRE HYDRANT		
CURB INLET (TYPE A)	D-1	
AREA TO BE REMOVED		
WATER SERVICE		
WATER METER BOX	W-5	
FIRE SERVICE		

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

LERCHEVAL ENGINEERS
4740 Murphy Canyon Road Suite 310
San Diego, California 92123
(619) 571-0820

R.C.E. No.

PLAN FILE NO.

BENCH MARK

PORTION OF SAMPSON ST.

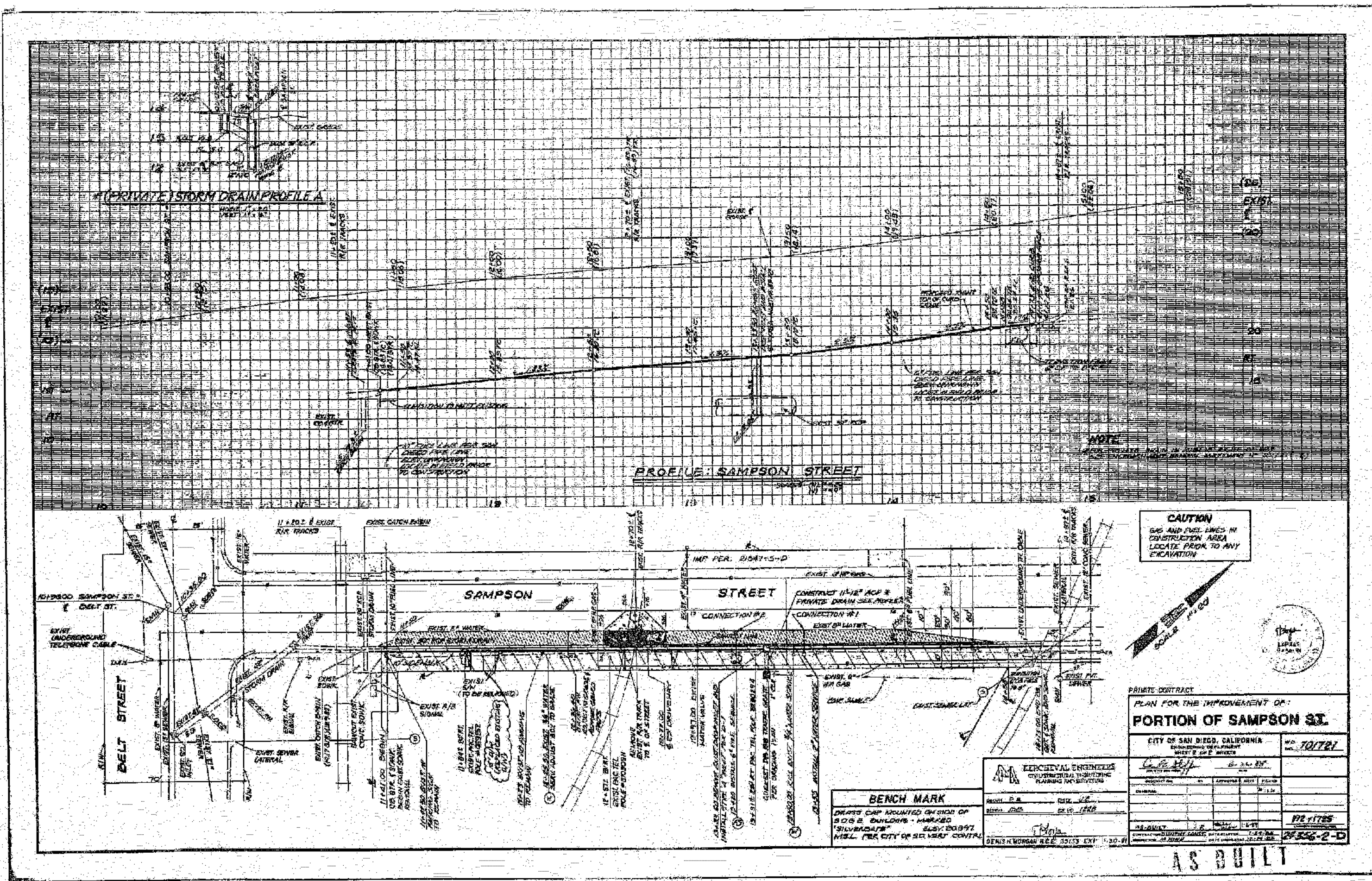
CITY OF SAN DIEGO, CALIFORNIA

701781

24336-1-D

AS BUILT

COSD011974



#1 (PRIVATE) STORM DRAIN PROFILE A
PROFILE: SAMPSON STREET
EXIST.
SAMPSON
STREET
BELT STREET
CONSTRUCT 11'-12" ACP & PRIVATE DRAIN SEE PROFILE A
CONNECTION #1
CONNECTION #2
EXIST. 8" WATER
EXIST. CATCH BASIN
IMP. PER. 21547-5-D
EXIST. UNDERGROUND TELEPHONE CABLE
CAUTION
GAS AND FUEL LINES IN CONSTRUCTION AREA LOCATE PRIOR TO ANY EXCAVATION
SCALE 1"=20'
NOTE
PRIVATE CONTRACT
PLAN FOR THE IMPROVEMENT OF:
PORTION OF SAMPSON ST.
CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING DEPARTMENT
W.O. 70/721
BENCH MARK
BRASS CAP MOUNTED ON SIDE OF S.D.G.& E. BUILDING - MARKED "SILVERGATE" ELEV. 20.897 M.S.L. PER CITY OF S.D. VERT. CONTROL
PERCIVAL ENGINEERS
CIVIL/STRUCTURAL ENGINEERING PLANNING AND SURVEYING
DENIS H. MORGAN R.C.E. 33133 EXP. 1-30-91
AS-BUILT
212-1725
21356-2-D
AS BUILT

COSD011975

SPECIAL NOTES:

THE FOLLOWING NOTES ARE PROVIDED TO GIVE DIRECTIONS TO THE CONTRACTOR BY THE ENGINEER OF WORK. THE CITY ENGINEER'S SIGNATURE ON THESE PLANS DOES NOT CONSTITUTE APPROVAL OF ANY OF THESE NOTES AND THE CITY WILL NOT BE RESPONSIBLE FOR THEIR ENFORCEMENT.

1. NEITHER THE OWNER, NOR THE ENGINEER OF WORK WILL ENFORCE SAFETY MEASURES OR REGULATIONS. THE CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.

2. CONTRACTOR WILL MAKE EXPLORATORY EXCAVATIONS AND LOCATE EXISTING UNDERGROUND FACILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT REVISIONS TO PLANS IF REVISIONS ARE NECESSARY BECAUSE OF ACTUAL LOCATION OF EXISTING FACILITIES.

3. LOCATION AND ELEVATION OF IMPROVEMENTS TO BE MET BY WORK TO BE DONE SHALL BE CONFIRMED BY FIELD MEASUREMENTS PRIOR TO CONSTRUCTION OF NEW WORK.

4. BEFORE EXCAVATING FOR THIS CONTRACT VERIFY LOCATION OF UNDERGROUND UTILITIES. THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO OTHER EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS.

5. CONTRACTOR IS REQUIRED TO TAKE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN HEREON AND ANY OTHER EXISTING LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

6. CONTRACTOR SHALL NOTIFY THE SAN DIEGO GAS AND ELECTRIC COMPANY PRIOR TO STARTING WORK NEAR COMPANY FACILITIES AND SHALL COORDINATE HIS WORK WITH COMPANY REPRESENTATIVES.

NOTICE: ALL ELECTRICAL AND GAS SERVICES WITHIN THIS PROJECT ARE "UNDERGROUND INSTALLATIONS". FOR LOCATION OF ELECTRICAL CABLES AND GAS PIPING AND APPURTENANCES CONTACT THE SAN DIEGO GAS AND ELECTRIC COMPANY TELEPHONE [illegible]

7. CONTRACTOR SHALL NOTIFY THE PACIFIC TELEPHONE COMPANY PRIOR TO STARTING WORK NEAR COMPANY FACILITIES AND SHALL COORDINATE HIS WORK WITH THE COMPANY REPRESENTATIVES.

NOTICE: ALL TELEPHONE SERVICES WITHIN THIS PROJECT ARE "UNDERGROUND INSTALLATIONS". FOR LOCATION OF CABLES AND APPURTENANCES CONTACT THE PACIFIC BELL COMPANY, TELEPHONE [illegible]

8. RESTORE TRENCHED AREAS TO CONDITION PRIOR TO WORK. STREET AREAS SHALL BE RESTORED AS PER CITY STANDARD SPECIFICATIONS.

9. CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND SHALL NOT BE LIMITED TO NORMAL WORKING HOURS, AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THAT ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

10. THE ENGINEER OF WORK SHALL BE NOTIFIED WHEN CONSTRUCTION COMMENCES AND OF ANY CHANGES OR ADDITIONS MADE DURING THE PROCESS OF CONSTRUCTION.

11. THE CONTRACTOR IS RESPONSIBLE FOR THE PREVENTION OF DAMAGE TO THE ADJACENT PROPERTY. NO PERSON SHALL EXCAVATE ON LAND SO CLOSE TO THE PROPERTY LINE AS TO ENDANGER ANY ADJOINING PUBLIC STREET, SIDEWALK, ALLEY OR ANY OTHER PUBLIC OR PRIVATE PROPERTY WITHOUT SUPPORTING AND PROTECTING SUCH PROPERTY FROM SETTLING, CRACKING, EROSION, SILTING, SCOUR OR OTHER DAMAGE WHICH MIGHT RESULT FROM THE GRADING DESCRIBED ON THIS PLAN.

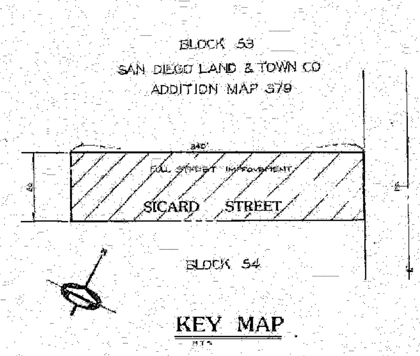
12. ALL UNDERGROUND UTILITIES OR STRUCTURES ARE SHOWN PER RECORDS EXAMINED AND ARE INDICATED WITH THEIR APPROXIMATE LOCATION AND EXTENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE EXISTING UTILITIES OR STRUCTURES FOUND AT THE SITE AND IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE ENGINEER OF WORK OF ANY POTENTIAL CONFLICT BEFORE STARTING WORK.

13. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER TO CONTACT THE UTILITY AGENCIES, ADVISE THEM OF THE PROPOSED IMPROVEMENTS, AND BEAR THE COST OF RELOCATIONS, IF NEEDED.

TRAFFIC NOTES:

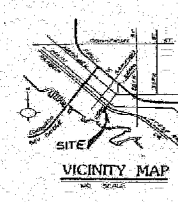
1. USE SIGNS, DELINEATORS, BARRICADES, ETC. AS PER [illegible] STATE OF CALIFORNIA TRAFFIC CONTROL MANUAL. DELINEATORS AND STEADY BURN LIGHTS TO OUTLINE THE TRAFFIC PATH, BARRICADES TO PROTECT THE WORK AREA.

2. THE CONTRACTOR SHALL MAINTAIN ONE TRAFFIC LANE IN EACH DIRECTION ON TWO-LANE STREETS AND TWO LANES IN EACH DIRECTION FOR TRAFFIC ON ALL FOUR OR MORE LANE STREETS DURING THE WORKING HOURS OF [illegible] A.M. TO [illegible] P.M. FULL WIDTH OF ALL TRAVEL LANES ON EXISTING ROADWAYS MUST BE MAINTAINED DURING THE HOURS OF [illegible] P.M. TO [illegible] A.M. DAILY, AND ON SATURDAYS, SUNDAYS, AND DESIGNATED LEGAL HOLIDAYS, OR WHEN CONSTRUCTION OPERATIONS ARE NOT ACTIVELY IN PROGRESS ON WORKING DAYS. A FOUR FOOT WIDE PEDESTRIAN ACCESS SHALL BE PROVIDED AND MAINTAINED IN ACCORDANCE WITH SECTION [illegible] OF THE STANDARD SPECIFICATIONS. FOR CLARIFICATION OF THE ABOVE, THE CONTRACTOR MAY CONTACT TRAFFIC ENGINEERING AT [illegible]. ANY MODIFICATION OR CHANGE IN THE ALIGNMENT OF THE EXISTING PARKING OR TRAVEL LANES OF ONE-WAY OR TWO-WAY STREETS SHALL RECEIVE PRIOR APPROVAL FROM THE CITY TRAFFIC ENGINEER AND SHALL BE IN ACCORDANCE WITH SECTION [illegible] OF THE STANDARD SPECIFICATIONS, 1979 EDITION.



KEY MAP

N.T.S.



VICINITY MAP

NO SCALE

UNDERGROUND FACILITIES

1. BEFORE EXCAVATING, VERIFY LOCATION OF UNDERGROUND UTILITIES CONTACT:

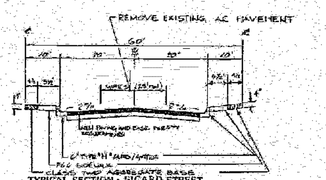
PACIFIC BELL TELEPHONE	1-800-[illegible]
SAN DIEGO GAS & ELECTRIC	[illegible]
SEWER	236-[illegible]
COMMUNICATIONS DIVISION	236-[illegible]
BUILDINGS & NAVIGATION	236-[illegible]
WATER	236-5600

SITE DEVELOPMENT

THERE WILL BE NO SITE DEVELOPMENT AS PART OF THIS PROJECT. SHOULD SITE DEVELOPMENT BE REQUIRED AT A LATER DATE A SEPARATE LAND DEVELOPMENT PERMIT WILL BE OBTAINED.

A.D.T. CLASSIFICATION

SICARD STREET 5,000



TYPICAL SECTION - SICARD STREET

(NO SCALE)

LEGEND

FIRE HYDRANT (EXISTING)	
FIRE HYDRANT (NEW LOCATION)	
DRAIN LINE	
RETAINING WALL	
SLOPE BANK	
POWER POLE	
SEWER LINE	
SEWER MANHOLE	
FENCING	
BUILDING	
GUTTER	
PEDESTRIAN RAMP	

WORK TO BE DONE

THE IMPROVEMENTS CONSIST OF THE FOLLOWING WORK TO BE DONE ACCORDING TO THESE PLANS AND THE SPECIFICATIONS AND STANDARD DRAWINGS OF THE CITY OF SAN DIEGO

STANDARD SPECIFICATIONS

1. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION ([illegible] EDITION).
2. STANDARD SPECIAL PROVISIONS AND
3. CITY OF SAN DIEGO STANDARD SPECIAL PROVISIONS, DOCUMENT NO. [illegible] FILED MAY [illegible] 1981.
4. STANDARD SPECIAL PROVISIONS ADDENDUM PERTAINING TO STREET LIGHTING, DOCUMENT NO. [illegible] FILED APRIL [illegible]
5. CALIFORNIA DEPARTMENT OF TRANSPORTATION "MANUAL OF TRAFFIC CONTROLS, WARNING SIGNS, LIGHTS AND DEVICES FOR USE IN PERFORMANCE OF WORK UPON HIGHWAYS" ([illegible] EDITION), DOCUMENT NO. [illegible] FILED JANUARY [illegible]

STANDARD DRAWINGS

1. SAN DIEGO REGIONAL STANDARD DRAWINGS ([illegible] EDITION) AND
2. CITY OF SAN DIEGO STANDARD DRAWINGS DOCUMENT NO. [illegible] FILED JUNE [illegible]

IMPROVEMENTS	STANDARD DRAWINGS	SYMBOL
6" TYPE "G" CURB & GUTTER	G-2	
STREET PAVEMENT SCHEDULE	[illegible]	
A.C. FEATHERING OVERLAY		
COMMERCIAL DRIVEWAY	G-16	
P.C.C. DITCH	(REINFORCED) MODIFIED D-75	
METAL BEAM GUARD RAIL W/REFLECTOR	[illegible]	
STORM DRAIN	SDG-[illegible]	
PIPE COLLAR	D-61	
SIDEWALK	G1, G-9	
GRAVEL FOR WEED CONTROL		
A.C. DIKE (DIKE)	G-6	
RIP-RAP		
SEWER MAIN (EXISTING)	S-[illegible]	
PAVEMENT CUTOFF WALL	G-11	

DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

[signature] 7-16-85

DAN S. BIGGS R.C.E. 26112
BIGGS ENGINEERING CORPORATION
[illegible] HOOVER AVENUE, SUITE 101
NATIONAL CITY, CA [illegible]

ENGINEERING PERMIT NO. W-30421

BIGGS ENGINEERING CORPORATION
CIVIL ENGINEERS • PLANNING CONSULTANTS • SURVEYORS
[illegible] HOOVER AVENUE NATIONAL CITY CA [illegible]

DATE 6-4-85 JOB NO 85,108

PLANS FOR THE IMPROVEMENT OF:

SICARD STREET

BETWEEN HARBOR DR. & BELT STREET.

CITY OF SAN DIEGO CALIFORNIA
ENGINEERING DEPARTMENT
SHEET 1 OF 2 SHEETS

W.O. 700842

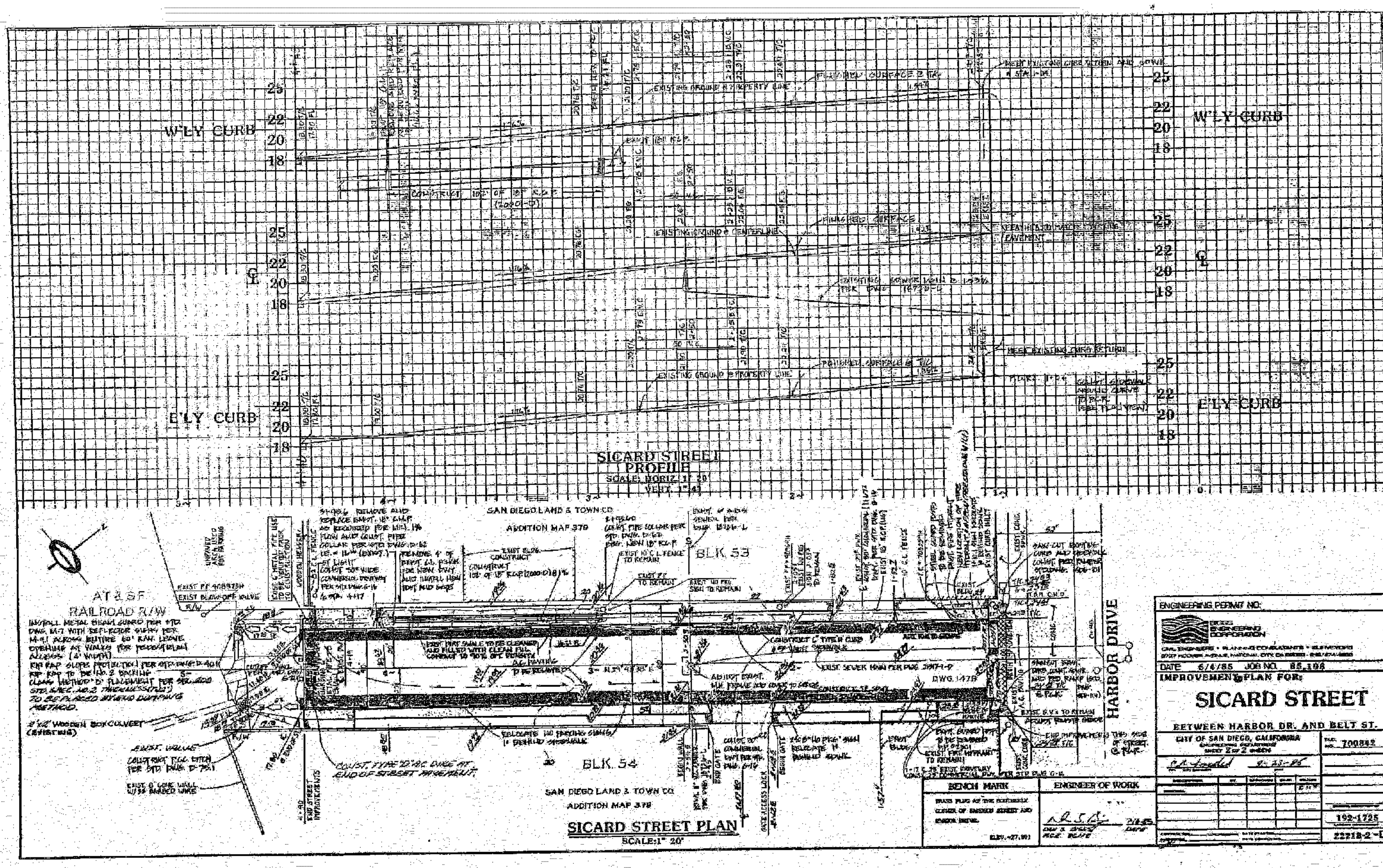
[signature] 4-23-86

BENCH MARK	ENGINEER OF WORK
BRASS PLUG AT THE SOUTHERLY CORNER OF SAMPSON STREET AND HARBOR DRIVE ELEV. 27.891	[signature] 7/16/85 DAN S. BIGGS R.C.E. 26112 DATE

192-1726

22216-1-D

COSD011976



W'LY CURB
E'LY CURB
SICARD STREET PROFILE
SCALE: HORIZ. 1" 20'
EXISTING GROUND @ PROPERTY LINE
EXISTING GROUND @ CENTERLINE
FINISHED SURFACE
SAN DIEGO LAND & TOWN CO.
ADDITION MAP 379
BLK. 53
BLK. 54
AT & SF RAILROAD R/W
HARBOR DRIVE
SICARD STREET PLAN
SCALE: 1" 20'
ENGINEERING PERMIT NO.
IMPROVEMENT PLAN FOR:
SICARD STREET
BETWEEN HARBOR DR. AND BELT ST.
CITY OF SAN DIEGO, CALIFORNIA
DATE 6/4/85
JOB NO. 85,198
700852
BENCH MARK
ENGINEER OF WORK
192-1725
22218-2-D

COSD011977

SITE INVESTIGATION AND CHARACTERIZATION REPORT FOR 401 WATER QUALITY CERTIFICATION

BAE SYSTEMS, INC.
(FORMERLY SOUTHWEST MARINE, INC.)
BULKHEAD EXTENSION AND YARD IMPROVEMENT
PHASE 2 ACTIVITIES

Submitted to

California Regional Water Quality Control Board

San Diego Region

File # 04C-097

Submitted by

BAE Systems, Inc.

2205 E. Belt Street

San Diego, California 92113

Prepared by

Anchor Environmental, CA LP

3914 Murphy Canyon Road, Suite A242

San Diego, California 92123

Revised August 2005

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Table of Contents

List of Tables

List of Figures

List of Appendices

1 OVERVIEW

1.1 Project Description and History

BAE Systems, Inc. (formerly known as Southwest Marine, Inc.) is planning to reconfigure a portion of its San Diego Ship Repair yard, currently occupied by three abandoned marine railways, by constructing a new section of sheetpile bulkhead. Material will then be placed in the area behind the sheetpile bulkhead to create additional upland yard space for the facility. Figure 1 identifies the general location of the proposed bulkhead extension and yard improvement project (henceforth, project) relative to BAE Systems' shipyard and facilities. Figures 2 and 3 present detailed plan and cross-sectional views of the bulkhead improvement area and proposed construction activities. The project will be performed in two phases; the general sequence of construction is illustrated as a typical cross-section on Figure 2.

Phase 1 of the project will be accomplished by removing marine structures from the area and installing a new section of sheetpile bulkhead across the face of the abandoned railways. BAE Systems has received a 401 Water Quality Certification (WQC; File No.03C-065) from the California Regional Water Quality Control Board, San Diego Region (SDRWQCB) for Phase 1 activities. All other permits have been received, including an approved mitigation plan, a Phase 1 Water Quality Monitoring Plan (WQ Plan), and a provisional U.S. Army Corps of Engineers (Corps) permit.

After completion of Phase 1, Phase 2 construction activities will commence, involving removal of selected sediments from the project footprint, and backfilling ~~within~~ the project site with clean material. First, a wedge of impacted sediments immediately inside the new bulkhead alignment will be removed (Figure 3), along with any near-surface sediments that have chemical concentrations exceeding the criteria established in California Code of Regulations (CCR) section 66261.24, in Title 22, Division 4.5, Chapter 11, Article 3). Second, the excavated area and the remainder of the bulkhead-enclosed area will be backfilled with imported, clean, granular fill to the elevation of the surrounding grade (approximately +12 feet Mean Lower Low Water [MLLW]). After adequate settlement, the area will be paved to support yard operations.

The provisional Corps permit for the overall project is contingent on receipt of the 401 WQC for Phase 2 construction activities, so receipt of the Phase 2 WQC, and subsequently, the Corps permit, will allow construction to commence. In support of obtaining a 401 WQC for Phase 2 construction activities, BAE Systems met with the SDRWQCB on November 12, 2004 to finalize data collection and evaluation requirements. A previous version of this Site Investigation and Characterization Report (henceforth, "Report") was submitted in January 2005, presentings the required information, evaluations, and conclusions. Following review of the January 2005 Report by the SDRWQCB and subsequent discussions with BAE Systems on August 5, 2005, the Report has been revised to be fully consistent with the SDRWQCB's expectations and requirements regarding removal of excavated sediments from the project area.

1.2 Purpose of this Report

This Report was prepared for the SDRWQCB to support BAE Systems' application for a 401 WQC from the SDRWQCB for Phase 2 construction activities. This Report provides information specifically requested by the SDRWQCB in their evaluation of the proposed project, as documented in a letter dated September 14, 2004, as discussed during a meeting on November 12, 2004, and in subsequent communications on August 5, 2005, which followed submittal of the original version of this Report in January 2005. This Report supplements previous submittals to the SDRWQCB, as indicated below.

1.3 Development and Sequence of Previous Submittals

In August 2004, BAE Systems submitted to the SDRWQCB a Data Evaluation Report (DER) for Phase 2 Activities (Anchor 2004a), that provided information supporting issuance of a 401 WQC and Waste Discharge Requirements (WDR) for Phase 2 of the work. Specifically, the DER included a detailed evaluation of the long-term potential for impacts to the surface waters of San Diego Bay associated with the placement of imported fill over impacted sediments behind the sheetpile wall. The DER documented the results of analytical testing of two groundwater samples obtained from chemically impacted sediments in the project area, and presented modeling results of tidally influenced groundwater flow and resulting potential water quality impacts from the project. The DER also included a revised WQ Plan to address both Phase 1 and Phase 2 activities.

After reviewing the DER, the SDRWQCB issued a letter dated September 14, 2004, in which the SDRWQCB requested additional site investigation and characterization activities to better define the lateral and vertical extent of waste impacts at the site, and further evaluation of mechanisms of waste transport through soil and groundwater. This letter also required BAE Systems to submit the proposed methods and approach for this investigation in a Site Investigation Workplan (henceforth, "Workplan") prior to initiating field activities. BAE Systems prepared and submitted the requested Workplan in November 2004.

BAE Systems subsequently met with SDRWQCB staff on November 12, 2004 to discuss comments on the Workplan. At this meeting, the SDRWQCB requested the following modifications to the Workplan, necessary for BAE Systems to receive a 401 WQC:

- Additional soil sampling from the underlying Bay Point Formation from each planned sediment core sample location
- Subdivision of sediment cores into a maximum of 2-foot intervals for chemical analyses, rather than compositing all sediment into a single sample from each core

The requested changes were made to the Workplan, and BAE Systems carried out the field investigation program in late November and early December of 2004. The September 14, 2004 letter from the SDRWQCB required that the results of the investigation be documented in a Site Investigation and Characterization Report. (The field investigation program and related chemical analyses are described in further detail in Section 3 of this Report.) This Report was originally submitted to the SDRWQCB in January of 2005, fulfillings the SDRWQCB's requests, and prepared in full accordance with the requirements documented in the September 14 letter. Specifically, the Report identified the nature and extent of existing site sediments, and evaluated the proposed project's overall protectiveness of site surface water and groundwater.

After the SDRWQCB reviewed the January 2005 Report, they prepared a letter to BAE Systems, dated April 1, 2005, defining the proposed project as a discharge of waste to land. This would put the project under the purview of section 13260 of the California Water Code, requiring submittal of a Report of Waste Discharge and application for Waste Discharge Requirements.

Subsequent discussions between BAE Systems and the SDRWQCB on August 5, 2005, resulted in the understanding that the project would not be subject to these requirements if the following actions were accomplished before filling the project area:

- All sediments excavated out from behind the bulkhead (creating the clean sand buffer described in Section 5.5) to be disposed off-site.
- Any sediments containing chemical concentrations in excess of levels established in CCR section 66261.24 (Title 22, Division 4.5, Chapter 11, Article 3) to be excavated and disposed off-site, subject to confirmatory sampling.

This Report is a modified version of the January 2005 Report, incorporating the above requirements.

1.4 Structure of this Report

This Report addresses the study objectives and concerns documented in the SDRWQCB letter dated September 14, 2004. The study objectives include the following specific elements, listed with the corresponding section where they are addressed in this Report:

- Site Conceptual Model – updated based on the results of the investigation (documented in Section 5.5)
- Source Characterization – results of an investigation of all potential sources of waste constituent discharges to the soil, groundwater, and stormwater conveyance systems, based on historical records of operations, site reconnaissance, and previous and current studies (documented in Section 5.4)
- Geologic Characterization – subsurface materials at the site, including the hydrogeologic characteristics and identification of geologic features that may affect groundwater flow and contaminant migration, are presented (documented in Section 5.1)
- Groundwater Flow Characterization – the magnitude and direction of groundwater flow at the site, in both the horizontal and vertical directions, for all water bearing units potentially affected by the waste constituents (documented in Section 5.2)
- Waste Constituent Characterization – characterization of the lateral and vertical extent of waste constituents in soil, sediment, and groundwater relative to existing "background" conditions (documented in Section 5.3, and in Tables 1 through 5).

- Fate and Transport – assessment of the movements, dispositions, and transformations of waste constituents within and between environmental media, such as soil, surface water, groundwater, and biota (documented in Section 6, and in Tables 7 through 9)
- Description of Field Methodologies used for the investigation and characterization study (documented in Section 3.2)
- Chemical Analyses – description of the analytical methods used for each environmental medium, adequate to identify the full range of waste constituents that may occur (documented in Section 4)
- Sample Locations and Numbers – the locations, type, and number of samples identified and shown on a site map and cross-sections; sufficient to identify the nature of waste constituent sources, to define the distribution of waste constituents in the subsurface, and to provide data for fate and transport evaluation, risk assessment, remedy selection, and remedial design, if necessary (documented in Section 3.1 and 3.2.1)

2 SUMMARY OF PREVIOUSLY AVAILABLE INFORMATION

2.1 Site Layout and History

BAE Systems' San Diego shipyard is located on the eastern shore of San Diego Bay, approximately 1 mile south of the Coronado Bridge. The shipyard has been leased by BAE Systems (formerly Southwest Marine, Inc.) from the San Diego Unified Port District since 1979, during which time BAE Systems has provided ship repair, alteration, and overhaul services for various commercial and government customers (the Navy being a prominent example).

The bulkhead extension project area under consideration will be constructed across the mouth of an intertidal embayment around the landward end of Pier 1. The embayments are occupied by abandoned shipway marine railways: Ways 1 on the northwest side of Pier 1, and Ways 2 and 3 on the southeast side (see Figure 2).

A history of the BAE Systems property area is summarized and documented in Woodward-Clyde (1995), Exponent (2003), and the San Diego Unified Port District (2004). The subject site has been used for industrial operations since the early 20th century, when the current shoreline was created by filling between 1906 and 1914. The property area was subsequently used by San Diego Marine Construction Corporation for marine vessel construction, repair, and maintenance. Historical evidence (San Diego Unified Port District 2004) indicates that marine railways were present in the project area since approximately the beginning of San Diego Marine Construction Corporation's use of the site. From this time through to the mid-1970s, sandblast and paint wastes were discharged directly to the Bay from upland and drydock areas.

Between 1952 and 1974, a pair of wastewater settling ponds were present on the adjacent San Diego Gas and Electric (SDG&E) property for separation of oil and water from the SDG&E power plant. These ponds may have contributed machine oils, hydraulic fluid, and possibly polychlorinated biphenyls (PCBs) to the subsurface (San Diego Unified Port District 2004). The approximate locations and extents of these previously existing settling ponds are shown on Figure 2.

During the 1980s and 1990s, the three marine railways in the project area generally accommodated about one to seven vessels annually for repair and maintenance, with abrasive sandblasting activities common (SWM 2004). The railways were abandoned in 1992 (Ways 1) and 1997 (Ways 2 and 3). Comprehensive pollution prevention programs and best management practices have been in place since the mid-1980s, preventing releases of contaminants from construction activities or from stormwater runoff (E^{x}ponent 2003).

2.2 Geology and Groundwater

Prior to the field investigation documented in this Report, the main source of information on sediment conditions at the site was the result of a detailed site sediment investigation conducted by the former Southwest Marine and the adjoining NASSCO shipyard in 2002 and 2003 to determine the existence and extent of potential chemical contamination associated with historical operations at the shipyards. This investigation, documented by E^{x}ponent (2003) in the report entitled, "NASSCO and Southwest Marine Detailed Sediment Investigation," was conducted in response to SDRWQCB Resolution Nos. 2001-02 and 2001-03 and subsequent Water Code Section 13267 letters issued to the shipyards. The investigation involved a series of surface and core samples taken from site sediments throughout both shipyards' leasehold areas and beyond. Figures 1 and 2 identify the locations of cores and sediment surface samples taken during the 2002/2003 investigation.

Information on subsurface geology and groundwater characteristics was provided by the site sediment investigation prepared by E^{x}ponent (2003) described above, and by a series of soil probes and borings advanced for geotechnical design of the bulkhead (Christian-Wheeler 2002).

These data sources indicate that the site is underlain by the following sequence of soil/sediment types:

- Upland areas are underlain by fill materials originally placed when the site land was constructed in the early 20th century. More recent sand fill areas within landward portions of the original railway embayment (Figure 2) were created during a 1998 remedial action undertaken by the former Southwest Marine under SDRWQCB oversight.

- Three to 11 feet of soft, geologically recent, surface sediments were observed throughout the offshore areas by E[x]ponent (2003) and by Christian-Wheeler (2002). These surface sediments consist of interbedded silts, clayey silts, and sandy silts, and contain the elevated chemical concentrations observed in the study.
- The offshore surface sediments and upland fill materials are underlain by the firmer Bay Point Formation, which is Quaternary in age and consists of intermixed, medium dense to dense sands and silty sands, and stiff to hard silty to sandy clays.

Groundwater at the site is tidally influenced, responding to the tidal action of San Diego Bay. The ground surface elevation at the site is approximately 12 feet MLLW, while tidal levels fluctuate roughly between elevations -1 and 7 feet MLLW. Borings conducted by Christian-Wheeler (2002) indicated groundwater at depths of 8.5 to 10 feet below ground surface (bgs) in upland areas. Work conducted by ENV America on the neighboring SDG&E parcel indicated groundwater at approximately 15 feet bgs in upland areas (ENV America 2002).

2.3 Waste Characterization of Existing Sediments

Sediments along and in the vicinity of the planned bulkhead are best represented by cores SW04 and SW08, which represent sediments in close proximity to the alignment of the bulkhead (Figure 2). Sediment chemistry from various depth intervals in these cores are summarized in Table 1. Impacted sediments were identified in both cores to a depth of about 4 feet (although core SW04 could not be penetrated beyond this depth because refusal was reached, so deeper materials could not be sampled at this location).

The primary constituents of concern (COCs) in the impacted sediments include elevated metals, PCBs, and polycyclic aromatic hydrocarbons (PAHs). It is likely that these chemicals exist as sorbed phases on clays and carbon-rich particulate matter in the fine-grained sediments, thus limiting their bioavailability. This is supported by bioassay testing and microbial analysis by E[x]ponent (2003), which indicate that the sediments do not exhibit significant toxicity.

In 1998, under the SDRWQCB's oversight, the former- Southwest Marine dredged chemically impacted sediments from the landward (northeastern) portions of this embayment, and replaced the dredged material with clean sand fill. Pursuant to Order No. 98-38, the action was required to remove sediments to depths sufficient to reach mandated sediment cleanup levels for copper (810 mg/kg), lead (231 mg/kg), mercury (4.2 mg/kg), zinc (820 mg/kg), and PCBs (0.95 mg/kg). Figure 2 identifies the areas where sediments were removed and clean sand fill placed (shown on the figure as "Sand Fill Areas"), and Figure 3 shows a typical section through the sand fill in cross-section. Confirmation grab samples of surface sediments were obtained at regularly spaced intervals after dredging these areas to confirm that all sediments exceeding the relevant cleanup standards were removed. The locations of the confirmation surface samples are shown on Figure 2. The analytical results from these samples are summarized in Table 2, and demonstrate that sediments remaining below the sand fill have bulk concentrations well below the cleanup levels mandated by Order 98-38 (SWM 1998). Table 2 also compares the confirmation sediment concentrations to reference background concentration levels (E^{x}ponent 2002; see further discussion of background concentrations in Section 4.1).

As part of BAE Systems' DER for Phase 2 activities (Anchor 2004a), a pair of temporary well points were installed within the upper 3 feet of site sediments near the alignment of the planned bulkhead wall. Porewater samples were obtained from each well point and analyzed for metals, PAHs, and PCBs. The locations of these two well point samples are shown on Figure 2, and the chemistry results are documented in Table 3.

The well point samples detected dissolved metals (arsenic, cadmium, chromium, lead, nickel, selenium, silver, and zinc) and PCBs. PAHs were not detected in the well point samples. These concentrations were used to predict porewater concentrations entering surface waters from the completed bulkhead project, accounting for tidal mixing behind the bulkhead wall. Results of this evaluation were presented in the previous DER and indicate that porewater expressed from the project footprint will have chemical concentrations below chronic water quality criteria upon entry into site surface waters, and are not expected to impact ambient surface water quality.

2.4 Data Gaps

This previously available site information has been supplemented by the current site investigation and characterization program requested by the SDRWQCB and presented in this Report. At the request of the SDRWQCB, the site investigation has been designed to address the following data gaps:

- Characterize lateral and horizontal extent of waste constituents within and below the chemically impacted surface sediments.
- Evaluate the presence and extent (if any) of chemical impacts to upland fill soils outside the perimeter of the project area and in the underlying Bay Point Formation.
- Document the groundwater flow regime and gradient in the immediate project area and adjacent areas.

3 SAMPLING PROGRAM

3.1 Overview of Sampling Design

This site investigation provides additional vertical and lateral characterization of COCs in the soil, sediment, and groundwater at the BAE Systems bulkhead extension/yard improvement area. All field and laboratory work has been performed in accordance with the methods and procedures described in the Workplan and accompanying Quality Assurance Project Plan (QAPP; Anchor 2004b), while incorporating additional requirements requested by the SDRWQCB during a meeting with BAE Systems representatives on November 12, 2004.

Continuous core samples were collected at three stations (labeled 1, 2, and 3 on Figure 2) to sample the upland fill and underlying Bay Point Formation. Composite samples from the Bay Point Formation at Stations 1 and 2 were analyzed for total organic carbon (TOC), metals, PCBs, and PAHs (Table 4). Samples from distinct geologic layers within the overlying material were also collected and archived for future analysis, if needed. At Station 3, samples were also collected from distinct geologic layers within the upland fill and the Bay Point Formation. The Bay Point Formation sample from Station 3 was archived and the upland fill samples were analyzed for TOC, metals, PCBs, and PAHs (Table 3).

Two additional core samples were collected near the previous well point sample locations (July 2004), and are labeled Stations 4 and 5 on Figure 2. Composite samples were collected from distinct geologic layers (determined visually), or every 2 feet if the material appeared homogeneous, for the sediment overlying the Bay Point Formation. These samples were analyzed for metals, PCBs, and PAHs. In addition, the upper 2 feet of the Bay Point Formation was also collected for sediment characterization analyses at Stations 4 and 5.

To determine the spatial extent of the chemical concentrations and the hydrologic characteristics of the site groundwater regime, a pair of nested temporary monitoring wells (piezometers) were installed at sample Stations 1, 2, and 3 (Figure 2). Groundwater was sampled from both the Bay Point Formation (well number 1 in each pair) and from the overlying upland fill and surface sediments (well number 2 in each pair). Each groundwater sample was analyzed for metals, PCBs, and PAHs (Table 5).

Logs of all cores and diagrams depicting the monitoring well installations are provided in Appendix A. Note that the logs indicate "gaps" for some depth intervals, resulting from the fact that incomplete sediment recovery was obtained for some of the cores.

Groundwater elevations were also measured during ebb, low, flood, and high tidal conditions to document hydrologic gradients for the upland fill, surface sediments, and underlying Bay Point Formation.

3.2 Field Methodologies

Detailed methods for sample collection, handling, and shipping are described in the Workplan (Anchor 2004b), and summarized in this section. Procedures for the following tasks are included:

- Locations of sampling stations
- Collecting and compositing sediment core samples
- Collecting groundwater samples and groundwater elevation measurements
- Sample packaging, handling, and shipping procedures
- Completing standard forms to document the collection effort and field conditions

3.2.1 Sample Locations and Numbers

Five sample locations are shown on Figure 2. Monitoring well and core locations were assigned designations corresponding to their station number (i.e., monitoring wells MW-1.1 and MW-1.2 at Station 1; sediment core SW-4 at Station 4, etc). In the monitoring well designations, the first number indicates the sample station and the second number identifies whether it is the deeper well (1) or the shallower well (2).

At three stations (Stations 1, 2, and 3), a continuous core sample was taken and two monitoring wells installed. Stations 1 and 2 (continuous cores SW-1 and SW-2 and wells MW-1.1, MW-1.2, MW-2.1, and MW-2.2) are located in the sand fill areas near the railways' shoreward terminus where impacted sediments were previously removed. Station 3 (continuous core SW-3 and wells MW-3.1 and MW-3.2) is located in the paved uplands area immediately east of the project area. Stations 4 and 5 (cores only; labeled SW-4 and SW-5) were co-located as close as possible to previous well point stations (WP-1 and WP-2) sampled in July 2004. Station 4 (core SW-4) is within surface sediments between Marine Railway Number 2 and Number 3. Station 5 (core SW-5) is located to the east of Pier 1 within the existing ship cradles.

Station locations were chosen relative to existing conditions in the field and as close as possible to locations described in the Workplan. Stations 1 and 2 were located by measuring the distance across the sand fill areas and placing the stations equidistant from either side of the enclosed area. Station 3 was moved slightly upland from the original location to avoid utility lines underneath the pavement. Stations 4 and 5 were placed as close as possible to the previous well point stations described above. Due to restrictions with the coring equipment, Station 4 was relocated between marine railways 2 and 3 at the water's edge at low tide, moving the original location slightly shoreward. Station 5, also restricted due to the coring equipment, was relocated slightly seaward of the original location to provide a safe and stable platform for the equipment and field crew. All of the station locations were measured in the field relative to existing landmarks, and are shown to scale on Figure 2.

3.2.2 Sample Collection

3.2.2.1 Direct-Push Continuous Cores

Continuous soil cores were collected from each station using a direct-push sampling rig, to a target depth of at least 4 feet into the Bay Point Formation or until refusal. Five foot acetate core liners were decontaminated immediately prior to use following the procedures outlined in the QAPP (Anchor 2004b). Care was taken during sampling to avoid contact of the sample tube with potentially contaminated surfaces. Push core equipment (i.e., sample tubes and extension rods) was steam cleaned prior to use and between stations.

Each core was split open vertically, photographed, and geologically characterized into a core log. In cases of incomplete recovery, the top of the recovered sediment was assumed to correlate to the top of the cored interval. The core was sectioned into two distinct geologic layers, the upland fill or surface sediment layer, and the underlying Bay Point Formation. At sampling Stations 1 and 2, a composite sample was collected from the Bay Point Formation layer and analyzed for TOC, trace metals, PCBs, and PAHs. Samples from the overlying material were archived.

At Station 3, two composite samples were collected that represented distinct geologic layers of the upland fill material. A sample was also collected from the underlying Bay Point Formation and archived.

At Stations 4 and 5, composite samples were collected from four distinct layers that were visually determined from the overlying sediment along with a composite sample from the upper 2 feet of the Bay Point Formation. Each composite sample was split into 50-gram glass containers for laboratory analysis of TOC, trace metals, PCBs, and PAHs.

At all stations, sampling information, including sample identifier, sample location, date and time of sampling, requested analysis, and sampler name, was recorded on a chain-of-custody form and on the sampling jar label. Following collection, samples were placed immediately on ice in a cooler and taken to Federal Express for delivery to CRG Laboratory the next business day by 10:30 a.m. Chain-of-custody forms were filled out as the samples were placed in the coolers and were kept with the samples in Ziplock bags at all times. The coolers were tracked the next business day using the Federal Express tracking numbers to ensure arrival at the lab.

3.2.2.2 Groundwater

Upon completion of the continuous-push cores at Stations 1, 2, and 3, two temporary monitoring wells were installed at each station. One well was installed into the same location the core sample was taken from and the other was installed approximately 1 meter from the first. Both were installed using direct-push methods. The monitoring wells consisted of 0.75-inch pre-packed well screens as per the typical detail shown on Figure 4. One screen was set approximately 1 foot below the upper boundary of the Bay Point Formation materials, and the other was placed in the overlying fill material just above the underlying Bay Point Formation materials. This process was used to determine vertical and horizontal groundwater gradients in each material type.

Groundwater elevations were measured in each monitoring well during ebb, low, flood, and high tidal conditions to characterize hydrologic gradients for the upland fill, surface sediments, and underlying Bay Point Formation. Groundwater elevations were measured using a decontaminated, electronic well probe and tape measure lowered into each well and recorded on a data sheet. The maximum tidal exchange in San Diego Bay for the day of the water level monitoring (December 6, 2004) was 3.2 feet.

Groundwater samples were collected from each well and analyzed for salinity, total dissolved solids (TDS), PAHs, dissolved metals, and PCBs. Groundwater samples were collected 24 hours after each of the wells were installed using a peristaltic pump with disposable tubing. To ensure maximum potential for groundwater inclusion, all sampling was conducted as close to low tide as possible, particularly in the wells located near the shore. Wells were purged of at least three well volumes of groundwater prior to collecting samples, which were collected by discharging water from the peristaltic pump directly into the laboratory-provided sample jars. All samples collected for dissolved metals analyses were filtered with a 0.45 μm in-line filter prior to placement in the sampling bottles. Sampling information, including sample identifier, sample location, date and time of sampling, requested analysis, and sampler name, was recorded on a chain-of-custody form and on the sampling jar label. Following collection, samples were placed immediately in a cooler on ice and delivered to the laboratory as described above.

3.2.3 Sample Processing and Record Keeping

All sample handling, labeling, packaging, documentation, chain-of-custody forms, and shipping were accomplished and recorded in full accordance with the procedures detailed in the Workplan and associated QAPP (Anchor 2004b). Sample station duplicates were obtained and analyzed as described in the QAPP to ensure project quality control objectives were met.

Results of chemical analyses, and validation of the chemistry data, are presented in the next section.

3.2.4 Field Quality Control Sample Procedures

The following quality control samples were collected in the field and analyzed in the testing laboratory with the other samples:

- Station Location Duplicates – Field duplicate samples are collected to assess the variability of chemical concentrations at the station location and provide a measure of the total analytical bias (field and laboratory variance). One field duplicate was collected from core SW-5 at depth interval 5 feet to 6 feet 5 inches and monitoring well MW 2.2, which was located in the overlying surface sediments.

3.2.5 Field Documentation and Chain-of-Custody Forms

A field log book was maintained throughout the study to document daily field activities and field observations. Core logs were produced for each continuous-push core collected. Photo documentation of each core was collected and identified in the field book with sample identification and photograph number. Repositioned station locations were noted during field sampling to update the station location map after sampling was completed.

Sample labels were completed for each sample, and included station identification, date, and time, sampling personnel, preservative, and analysis required. All labels were completed using indelible ink and covered with clear tape to prevent smearing.

Chain-of-custody forms were completed at the end of each sampling day to trace samples from collection to final disposition. The chain-of-custody form included sample identification, collection date and time, matrix, analysis requested, number of containers, and preservative. Chain-of-custody forms were completed in triplicate with one copy retained in the field notebook.

4 CHEMICAL ANALYSES

4.1 Soil/Sediment Chemistry

A total of 14 soil/sediment samples were analyzed for chemical constituents from the five sampling stations (Figure 2), and represent upland fill, overlying sediment, and Bay Point Formation material. Table 4 presents the sediment chemistry results for metals, PAHs, and PCBs measured in each of the soil/sediment samples.

For comparison purposes, and to comply with SDRWQCB guidance, chemical concentrations measured in this study have been compared to "background" chemical concentrations. In this Report, reference pool sediment concentrations as determined by E^{x}ponent in their 2003 study are considered to be reasonably representative of "background" conditions, and are included in the first column of Table 4 for comparison purposes.

Measured chemical concentrations have also been compared against State of California Total Threshold Limit Concentration (TTLC) bulk chemistry values, which, if exceeded, are one basis by which materials qualify as California hazardous waste (per CCR 66261.24, in Title 22, Division 4.5, Chapter 11, Article 3). The applicable TTLC values are included in the second column of Table 4.

Metal concentrations measured in the upland fill material at core SW-3 and in the Bay Point Formation material in cores 1 and 2 were all below background concentrations (Table 4). Metal concentrations were consistently measured above background concentrations in the upper surface sediment layers in cores SW-4 and SW-5, but were below detection limits in underlying sediment and Bay Point Formation samples. Elevated metal concentrations were identified to a depth of 5 feet 9 inches in core SW-4, and to 2 feet in core SW-5.

Elevated concentrations were also noted in these near-surface (upper two feet) samples for copper, lead, and zinc, with maximum concentrations of 6,950 mg/kg, 955 mg/kg, and 6,630 mg/kg, respectively. In these near-surface samples, measured concentrations of copper exceeded TTLC criteria in cores SW-4 and SW-5, as did the measured concentration of zinc in core SW-4. No exceedances of TTLC criteria were encountered for any other analytes, nor in any other samples.

Total PCB concentrations were detected above reference concentrations in the same surface sediment layers containing elevated metals concentrations. The maximum total PCB concentration measured was 5,198 µg/kg in core SW-4, between depths of 2 feet 1 inch, and 3 feet 6 inches; this is above the reference concentration of 170 µg/kg. Elevated total PCB concentrations were identified to the same depths in these cores as for metals (to 5 feet 9 inches in core SW-4, and to 2 feet in core SW-5). PCB concentrations did not exceed TTLC criteria (50 mg/kg).

PAHs were also detected in the same samples where metals and total PCBs were elevated (Table 4); however, reference values do not exist for PAHs, so no comparison is provided.

4.2 Groundwater Chemistry

Three pairs of temporary monitoring wells, at Stations 1, 2, and 3, were sampled for groundwater within the project area (Figure 2). The results of the groundwater chemistry analyses are shown in Table 5 along with California Toxic Rule (CTR) water quality criteria for comparison. These results show that low concentrations of dissolved metals were detected in all six wells. However, only nickel exceeded the CTR criteria in well MW-2.1 (screened in the Bay Point Formation) and copper and nickel exceeded the criteria in well MW-3.1 (also screened in the Bay Point Formation).

All other detected concentrations were below the CTR criteria. Low concentrations of some PAHs were also reported in all six wells, however, several were below the analytical detection limits. PCBs were detected only in well MW-1.1 (screened in the Bay Point Formation), where the total PCB concentration exceeded the CTR criteria of 0.03 µg/L (see Table 5).

4.3 Data Validation

Data validation and review were performed on the seven water samples and 14 sediment samples submitted to Anchor by CRG Marine Laboratories of Torrance, California. The two matrices are reported in separate data validation reports, attached to this Report in Appendix B.

5 SITE CHARACTERIZATION

A site conceptual model is a representation of the site's potential chemical sources, eaffected media, potential pathways to exposure, and receptors.

5.1 Geological Characterization

Figure 2 depicts a typical cross-section through the site and the geological layers observed in the field investigation. Geologic logs from the soil borings taken as part of this investigation are shown in Appendix A. These logs confirm earlier conclusions about the geology of the site discussed in Section 2.2. The following details specific to the proposed project area supplement and/or verify the information summarized in Section 2.2:

- Up to 6.5 feet of recent sand fill was observed in cores SW-1 and SW-2, representing backfilling of areas remediated by the former Southwest Marine in 1998.
- Fill materials and sediments overlying the Bay Point Formation in the upland area (core SW-3) are approximately 15 feet thick.
- Eleven to 18 feet of soft, geologically recent, surface sediments were observed in the offshore areas (cores SW-4 and SW-5). These surface sediments were dominated by gray silty sands.
- The offshore surface sediments and upland fill materials are underlain by the firmer Bay Point Formation at all sampling stations.

5.2 Groundwater Flow Characterization

Water levels were measured in each monitoring well under ebb, low, flood, and high tide conditions to determine the magnitude and direction of groundwater flow at the site. Table 6 provides a summary of the water level information. In general, saturated conditions were observed approximately 7 feet bgs in upland areas of the project area, typical of tidally influenced conditions.

The water level information from upland and offshore monitoring wells was used to generate piezometric surface maps for the project area for shallow and deep geologic units. Examples of these maps at low tide and high tide conditions are shown in Figures 5 through Figure 8.

The following provides a summary of the findings from the water level monitoring:

- The maximum observed groundwater gradient was 0.0047, and occurred during low tide with flow in a South/Southwest direction. This direction is essentially orthogonal to the uplands shoreline areas with flow towards the Bay. Gradient and flow were consistent for formational and fill materials.
- A complete reversal of flow during high tide was not observed during the monitoring described here, but the gradient essentially fell to a value of zero for groundwater flow from land to the Bay during high tide. It is likely there is a complete reversal of gradient during extreme tides.
- The vertical gradient between formation and fill materials was very low and reversed from net downward at low tide to net upward during high tide.

Because of the tidal action at the site, there is a small net flow of water emanating from upland areas to San Diego Bay through sediments bordering the site. The data from the monitoring wells show there is not a significant difference in the flow characteristics of groundwater in upper formational sediments and recent sediments. These data indicate the system can be functionally treated as one water-bearing unit.

5.3 Waste Constituent Characterization

Concentrations of COCs in sediments, soil, and groundwater are summarized here for the upland fill, surface sediment, and Bay Point Formation, to describe both the vertical and spatial extent of COCs in each. This information supplements the results of confirmational sampling that was done following the former Southwest Marine's 1998 sediment removal project (described in Section 2.3).

Distinct spatial gradients of sediment chemical concentrations were found both vertically and horizontally in the improvement area. Figures 9 and 10 illustrate, in plan view and in cross-sectional view, the distribution of chemically impacted sediments and groundwater at the project site. The general observed trends include:

- Concentrations of constituents measured in groundwater samples were generally below CTR concentrations in both the upland fill and Bay Point Formation wells.
- The horizontal distribution of COCs above relevant criteria was confined to the seaward portions of the project area, in the upper near-surface sediment at Stations 4 and 5 (Figures 9 and 10).

- The vertical distribution of COCs above relevant criteria, including California TTLC criteria, was confined to the upper 2 feet of near-surface sediment at Stations 4 and 5 (Figures 9 and 10).

The few COCs that were measured in groundwater at concentrations marginally above CTR values (nickel, copper, and total PCBs) were from the Bay Point Formation (wells MW-2.1 and MW-3.1; Table 5). Groundwater samples from the wells located in upper fill material did not have any elevated concentrations of COCs.

The horizontal distribution of elevated COCs in the project area was confined to the seaward sediment samples at Stations 4 and 5 (cores SW-4 and SW-5; refer to Figure 9). These stations represent the western extent of the project area both north and south of Pier 1 (Figure 2). Concentrations measured in these sediment cores are consistent with results found by E^{x}ponent in 2003 at core SW08 (Table 1), which also detected elevated COC concentrations in this area. The upland sampling station, Station 3, did not have elevated COCs in the upland fill material (Table 4). In the sand fill area where Stations 1 and 2 are located, the 1998 cleanup actions described previously removed sediment with elevated COCs to depths ranging from 3.5 to 12 feet; the excavated areas were subsequently filled with clean sand fill material (as described in Section 2.3).

Elevated COC concentrations are confined to the upper surface sediment layers at Stations 4 and 5 (Figure 10). Concentrations of metals and total PCBs are above background concentrations (as defined by E^{x}ponent 2003), above a depth of 5 feet 9 inches at Station 4 and above a depth of 2 feet at Station 5 (Table 4). The sediment layers below these depths extending down to the Bay Point Formation material do not show elevated COC concentrations. The upland fill material at Station 3 also did not have elevated concentrations of COCs, nor did Stations 1 and 2, as previously described. Bay Point Formation material had low concentrations of metals and generally no detected organics at all the sampling stations. The metal concentrations detected likely represent natural background levels.

Sediment with detected metals concentrations in excess of California TTLC limits are confined to the upper 2 feet of cores SW-4 and SW-5. Concentrations measured in nearby core SW08 (by E^x^ponent, 2003), however, did not exceed TTLC criteria (see Table 1). This indicates that sediments exceeding TTLC criteria are limited to specific areas. These specific areas are presented on Figure 9, and have a total volume estimated as approximately 1,000 cubic yards, though confirmation sampling will be performed during removal to confirm the vertical and horizontal extent of sediments exceeding the TTLC criteria.

5.4 Source Characterization

Cores taken during the E^x^ponent (2003) site investigation in 2002 and 2003, and those taken during this study, indicate that chemical concentrations were generally highest in the surface sediment and decreased with depth. Elevated chemical concentrations in soil and sediment are seen to be concentrated in shallow, near-surface sediment layers (Figures 9 and 10), as follows:

- To a depth of 4 feet in cores SW04 and SW08 taken in 2002/2003 (E^x^ponent 2003)
- To depths ranging from 3.5 to 12 feet excavated and sampled during the former Southwest Marine's remediation of the landward portions of the site (SWM 1998)
- To depths of 5 feet 9 inches and 2 feet in cores SW-4 and SW-5 sampled during this study

In each case, underlying sediments have been shown to be free of chemical concentrations above background concentrations. This is consistent with the fact that the surface sediments were deposited in recent industrial times in the vicinity of the marine railway. The nature of the elevated chemical concentrations (metals and PCBs) is consistent with past industrial uses of the marine railways (repair, maintenance, and sandblasting). Therefore, the potential sources of waste constituent discharges at the project site appear to be, overall, primarily confined to historical ship repair and maintenance activities.

There does not appear to be chemical impacts to shallow porewater from the sediment bulk chemistry observed in this investigation. As is discussed in Section 5.3, more chemical detections were noted in the deeper monitoring wells screened in the Bay Point Formation, than from the shallower wells screened in overlying sediment. The concentrations of some metals observed in wells screened in the Bay Point Formation likely reflect ambient conditions.

BAE Systems has controlled all stormwater runoff from the site since the mid-1980s, routing all surface water runoff into a site stormwater collection and treatment system. As a result, site groundwater chemistry is unaffected by site surface water influences. This is supported by the relatively low concentrations of chemicals observed in shallow monitoring wells during this study.

5.5 Site Conceptual Model

Since the surface sediments are laterally bounded by timber and steel bulkhead walls that form the perimeter of the project area, near-surface sediments with elevated chemical concentrations in the project area are not continuous with adjacent upland soils. Neither the 2002/2003 site investigation nor the 1998 remedial action involved samples taken from upland areas immediately around the bulkhead extension project area. Samples taken from Station 3 for this study indicate that the upland fill materials are free of significant chemical impacts to sediment and to groundwater.

Based on groundwater measurements made as part of this study, groundwater at the site moves in a generally horizontal direction from the uplands toward the Bay. Within and adjacent to the project site, groundwater is influenced both by overall regional gradients and by tidal action.

The potential receptor of concern for this project is the surface waters of San Diego Bay. The primary route for possible water-quality impacts is potential contaminant release from sediments behind the bulkhead, as a result of groundwater seepage through and under the sheetpile, via a sediment to groundwater to surface (Bay) water pathway. Porewater, driven by tidal flushing and groundwater gradients, could move through, around, or under the sheetpile bulkhead, thereby coming in contact with the surface water. Infiltration and percolation of surface water will be relatively insignificant because the site will be paved.

Construction of the project will provide both horizontal and vertical isolation and confinement of the existing contaminated sediments underlying the area, restricting the potential for contaminants to leach into the surrounding environment. Vertical confinement will be provided by placement of up to 15 feet of fill and an impervious asphalt surface. Horizontal confinement will be provided by the installation of sheetpiling across the front of the former shipways to a depth of about 20 to 25 feet below existing mudline and about 8 to 10 feet into the relatively impermeable Bay Point Formation, which underlies the more recent surface sediments. The presence of the sheetpile wall as a relatively impervious barrier to water flow will significantly restrict flow of aqueous contaminants into receiving waters.

To provide for additional protection, the project has been designed with a clean, imported sand buffer between impacted sediments and the bulkhead wall (Figure 3). Approximately 500 cubic yards of Iimpacted sediments along the interior of the bulkhead will be excavated, removed from the site, and replaced with imported, clean, granular fill sand. This sand buffer will both increase the distance the porewater must move and will increase tidal attenuation, adsorption, and partitioning of the migrating water within the sand as it approaches the bulkhead and surface waters of San Diego Bay.

Modeling of tidal attenuation presented in the DER for Phase 2 activities (Anchor 2004a) indicates that the overall effect of the project's design features (sheetpile bulkhead and clean sand buffer) will be to decrease concentrations in the groundwater/porewater at least 400-fold before surface waters are reached. Based on this evaluation, porewater expressed from the project site via the sediment-groundwater-surface water pathway is predicted to have chemical concentrations well below chronic WQC upon entry into site surface waters, and thus is not expected to impact ambient surface water quality.

As requested by the SDRWQCB, additional modeling has been performed using the results of this site investigation program and the updated Site Conceptual Model, to supplement and verify the conclusions cited above from the previous DER. The methods, assumptions, and results of this additional modeling are presented in the next section.

6 FATE AND TRANSPORT

Consistent with SDRWQCB requirements as documented in the letter dated September 14, 2004, this section presents a rigorous and updated evaluation of the sediment to groundwater to surface water chemical transport pathway, thus providing an assessment of the movements, dispositions, and transformations of waste constituents in soil, sediment, and groundwater within and between environmental media (soil, sediment, groundwater, surface water, and potentially biota).

Information collected during the current site investigation was combined with data collected during previous site investigations and the Site Conceptual Model (Section 5.5), to determine the fate and transport of waste constituents using a standard flow and partitioning model (Reible 1998, promulgated by the Corps). The end result of this modeling was to quantify potential water quality impacts to surface waters, to update the Site Conceptual Model (Sections 5.4 and 5.5), and to update conclusions cited in the DER (Anchor 2004a).

6.1 Modeling Approach

One-dimensional chemical transport modeling (Reible 1998) was used to conservatively assess the long-term effectiveness of the sheetpile wall as a horizontal barrier, in conjunction with clean fill placed behind the wall, to mitigate the potential transport of chemicals via the sediment-groundwater-surface water pathway to the surface waters of San Diego Bay. Reible's (1998) modeling approach is described in an appendix to nationally recognized Corps guidance on the design of sediment caps: *Guidance for Subaqueous Dredged Material Capping* (Palermo et al. 1998). Results predicted from this conservative modeling approach have then been evaluated against actual groundwater concentrations to assess the overall protectiveness of the project.

The model described by Equation B32 of Reible (1998) was executed in Microsoft Excel. This model describes advective/diffusive transport of a dissolved chemical through a homogeneous porous media, such as clean quarried sand or dredged material. The output of the model is expressed as the concentration of the COCs in porewater at specified times as it exits the project limits and enters surrounding surface waters. The model conservatively assumes no biodegradation of the chemical takes place over time.

For this assessment, copper, lead, zinc, and total PCBs were selected as COC's for modeling due to their relatively high concentrations in the project area. Although groundwater samples indicated virtually no significant chemical impacts to site groundwater at Stations 1, 2, and 3, theoretical porewater concentrations for each constituent were conservatively calculated using bulk sediment concentrations (defined as the 95% upper confidence limit [UPL] from all samples), divided by appropriate adsorption distribution coefficients (K_{oc} for PCBs; K_d for metals), and calculated for the medium through which groundwater would move (i.e., fill placed behind the sheetpile bulkhead). The planned removal of sediments exceeding TTLC criteria has been accounted for in the development of the theoretical porewater concentrations. The partitioning coefficient (K_{oc}) for PCBs was calculated using the measured organic carbon content of site sediments. A range of K_ds were considered from low literature-derived values to high, site-specific values estimated from E^x^ponent's previous work (2003; Table 7). A conservative estimate of K_d was chosen from the low end of the range and used to calculate initial porewater concentrations. The model was used to predict porewater concentrations for each COC at a point 10 centimeters behind the sheetpile wall, at 25-, 50-, and 100-year intervals after bulkhead construction.

6.2 Parameters and Assumptions

Table 8 presents the input parameters required by the model and the input values used for each COC. The model assumes a homogeneous layer of clean fill placed behind the bulkhead and over the impacted sediments within the project area. Two different types of fill materials were assessed to estimate their overall effectiveness for restricting COC migration through the different materials. The first clean fill material analyzed was a clean quarried sand with a low TOC fraction. This low TOC fraction does not allow for PCBs to adsorb to cap material and is, therefore, theoretically not as effective at controlling any PCB migration. The second clean fill material analyzed was dredged material with a higher TOC fraction, which more effectively controls PCB migration. Using K_ds, any modeled metals migration will not be affected by the differing TOC levels in these potential fill materials.

The horizontal advection of groundwater through sediment and overlying materials is a key factor in the rate of chemical migration and, therefore, is a particularly significant parameter for this model. As a result, field measurements of groundwater flow and gradient (documented in Section 5.2) were used in defining this parameter. The advection rate was calculated from Darcy's law which used the hydraulic gradient (calculated using site specific data), the hydraulic conductivity, and the effective porosity of the isolating material. For this modeling, conservative estimates of both hydraulic conductivity and effective porosity were used.

Values for all other model input parameters were obtained from standard sources noted in Table 8, including values for cap porosity, specific gravity of cap material, cap material organic carbon content, partition coefficients for PCBs, and molecular diffusion coefficients for PCBs in water.

6.3 Results

Results of cap effectiveness modeling are presented in Table 9 in terms of mg/L of COCs in isolated material porewater. The results are compared to CTR surface water criteria. Table 9 shows the dissolved concentrations of the selected COCs in porewater expressed from the project area 25, 50, and 100 years after the project is complete. All modeled COCs are well below CTR criteria well after 100 years (and for several centuries beyond in most cases). Expressed dissolved concentrations of total PCBs are below CTR criteria when quarried sand material is used as backfill, and are seen to be at even lower concentrations when a fill material with higher TOC content – such as dredged Bay sediment – is used for construction.

In summary, the modeling results demonstrate that the use of either fill material would be effective over the long term in isolating COCs from San Diego Bay waters. Notably, actual water quality impacts would be significantly less even than those predicted by the model, because measured concentrations of COCs in site groundwater (as documented in Tables 3 and 5) are lower than those that were input to the model.

Thus, the highly conservative modeling approach presented here shows no significant impacts to surface water quality, and verifies that the planned project will be fully protective of water quality.

7 CONCLUSIONS

This study addresses questions and requirements documented by the SDRWQCB in their letter dated September 14, 2004 (as well as input obtained during BAE Systems' subsequent communications with the SDRWQCB on August 5, 2005), necessary to support a 401 WQC for Phase 2 activities.

Additional coring and groundwater sampling at the site, in conjunction with past sampling events, indicate that significant chemical impacts to site sediments are confined to near-surface sediments surrounding the now defunct marine railways. The nature of chemical impacts to site sediments (namely, high metals and PCB concentrations in the upper several feet) are consistent with past industrial uses of these railways (i.e., repair, maintenance, sandblasting).

An upland sampling station (continuous core SW-3 and monitoring wells MW-3.1 and 3.2) did not show significant impacts to subsurface materials. Walls bounding the project site on the north and south separate the marine railway area from adjacent upland fills.

Chemical impacts to groundwater appears to be largely restricted to shallow depths, corresponding to the highest chemical detections in site sediment.

A standard groundwater flow and chemical partitioning model was used to predict potential long-term effects to water quality in the adjacent waters of San Diego Bay. Conservative input parameters were used, as were conservative upper 95 percent limits of measured sediment concentrations. Even with "worst case" assumptions made for model inputs, the modeling results indicate that chemical breakthrough of site COCs is not expected for time durations on the order of well over 100 years, which is consistent with typical cap design projects in San Diego and elsewhere. This model does not account for tidal mixing, which (as discussed in the DER and Anchor 2004a) would reduce water quality impacts by additional orders of magnitude.

Altogether, this study indicates that the proposed project will be fully protective of adjacent surface waters after construction, and that chemical concentrations will not exceed existing surface water quality criteria along the bulkhead wall after construction.