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SOUTHWEST HARBOR PROJECT PHASE I GROUNDWATER CONFIRMATION MONITORING PROGRAM

Hydrologic Characterization Report

Prepared for: Port of Seattle

Project No. 990106-004-20 • January 18, 2007

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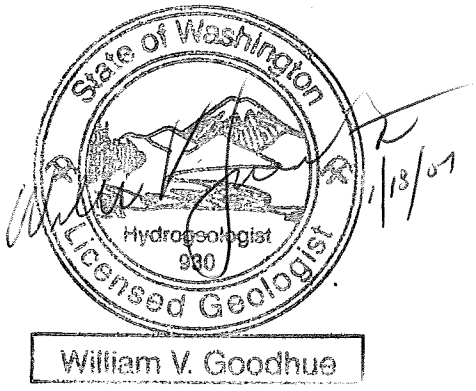

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1 Introduction

This Hydrologic Characterization Report summarizes the findings of the Southwest Harbor Project (SWHP) Phase I Groundwater Confirmation Monitoring Program (GWCMP). The Phase I GWCMP specifically addresses characterization of the post-redevelopment groundwater flow system, and forms the basis for development of a site-wide water quality monitoring program to evaluate the effectiveness of remedial actions completed in conjunction with site redevelopment. A clear understanding of the groundwater flow regime is necessary to develop an effective water quality monitoring program, which includes defining the point(s) of water quality compliance representative of the SWHP redevelopment conditions. A key component of this Phase I study was evaluation of the effect of the Longfellow Creek Overflow Line (LFOL) on groundwater flow in the Fill Aquifer. Under pre-redevelopment conditions, significant groundwater discharge occurred through the former upper (south) and lower (north) equalization basins located along the LFOL. Closure of the former equalization basins and completion of a continuous LFOL conveyance tightline across the SWHP was completed during redevelopment which altered groundwater discharge conditions.

The Phase I GWCMP was completed in accordance with the *Monitoring Plan – Phase I Ground Water Confirmation Monitoring Program (Monitoring Plan)* (Associated Earth Sciences, Inc., 2000). The *Monitoring Plan* (AESI, 2000) was developed in accordance with the consent decrees signed with Ecology for those remediation areas (RAs) that were redeveloped as part of the SWHP, and in accordance with the *March 19, 1999 Groundwater Conceptual Letter* (Port of Seattle, 1999). Copies of the *Groundwater Conceptual Letter,* and Ecology's April 14, 1999 letter of concurrence, are provided in Appendix A.

This Hydrologic Characterization Report documents current groundwater flow conditions at the SWHP, reflecting the changes resulting from the site redevelopment. Post-redevelopment groundwater and LFOL flow conditions are compared to pre-development conditions and to the assumptions utilized during formulation of the Cleanup Action Plans for the SWHP.

The post redevelopment groundwater flow conditions documented in this Hydrologic Characterization Report will form the basis for recommendations for the Phase II GWCMP Water Quality Monitoring Program. A Phase II GWCMP Water Quality Monitoring Plan documenting the recommended monitoring locations, analytical program, sampling schedule, sampling procedures, and sample handling/management will be submitted for Ecology review and approval prior to the initiation of Phase II groundwater monitoring.

1.1 Hydrologic Characterization Report Summary

A brief description of the Hydrologic Characterization Report contents is as follows:

- **Section 2: SITE HISTORY AND DESCRIPTION,** contains a description of the site and a summary of site history and present site conditions.
- **Section 3: SITE HYDROLOGIC SETTING,** contains a description of the site hydrologic setting, a summary of hydrologic conditions prior to site redevelopment, and details on assumptions regarding the effects of redevelopment on post-redevelopment groundwater flow and quality.
- **Section 4: PHASE I MONITORING PROGRAM OBJECTIVES,** presents a summary of assumptions and primary objective of the Phase I GWCMP.
- **Section 5: SUMMARY OF PREVIOUS PHASE I REPORT SUBMITTALS,** identifies previously submitted Phase I GWCMP reports, and provides a summary of key content and findings.
- **Section 6: HYDROLOGIC DATA COLLECTION,** presents detailed documentation of data collection activities and methods for the Phase I GWCMP.
- **Section 7: HYDROLOGIC DATA ANALYSES,** summarizes key findings of each element of the Phase I GWCMP and synthesizes current post-redevelopment hydrologic conditions.
- **Section 8: COMPARISON OF PRE- AND POST-REDEVELOPMENT HYDROLOGIC CONDITIONS**, Provides a detailed comparison of present hydrologic conditions to pre-development conditions.
- **Section 9: SUMMARY OF FINDINGS,** presents major Phase I GWCMP findings and conclusions, and resolution of key project objectives.
- **Section 10: PHASE II WATER QUALITY MONITORING PROGRAM**, recommends moving forward with the Phase II GWCMP groundwater quality assessment.
- **Section 11: REFERENCES,** lists references used in this report.

2 Site History and Description

The Port of Seattle SWHP is located along the base of the West Seattle highland at the confluence of the West Waterway of the Duwamish River (West Waterway) and Elliott Bay. The site location is shown on Figure 2.1. The facility includes approximately 185 acres of land exclusive of the original Terminal 5 area located immediately adjacent to the West Waterway. Most of the facility overlies former tideflats that have been filled and used for various industrial purposes including railroad yarding, wood treatment, steel scrap yarding, and municipal and wood waste landfilling. The SWHP is designated for port industrial usage in both City of Seattle and Port of Seattle (Port) land use plans.

The study area addressed in the Phase I GWCMP encompasses most of the SWHP site, including the Spokane Street Properties (RA-1), former Salmon Bay Steel Property (RA-2), former West Seattle Landfill and Purdy Scrap/Former Seattle Steel Inc. property (RA-3), and the former Lockheed Yard 2 (RA-5). The boundaries of the RAs, the configuration of the present monitoring well network, and details of the location and construction of the LFOL are shown on Figure 2.2.

The Port and Ecology negotiated Cleanup Action Plans for the SWHP that addressed specific remediation plans and goals for remediation areas RA-1, RA-2, RA-3 and RA-5 within the present-day Terminal 5 facility. Remediation area RA-4 is being addressed under the Superfund process by the U.S. Environmental Protection Agency (EPA). The individual remediation areas are depicted on Figure 2.2 and described below.

RA-1: RA-1 was occupied by the Buckley Railroad and various Spokane Street facilities. The Buckley Yard served as a rail car staging area beginning in the 1920s. From the mid 1970s to the mid 1990s, the size of the yard increased dramatically. The Spokane Street facilities included the following manufacturing and service businesses: aluminum foundry, chemical distribution warehouse, automotive repairs, fuel oil distribution and retail foods stores. The soil contamination associated with the Spokane Street facilities was remediated between 1994 and 1998. Soil contamination associated with the Buckley Yard was left in place. Asphalt and concrete covers were placed over the soil contamination in the Buckley Yard, except in the northern portion of the area east of RA-3, where 24 inches of ballast cover was placed under the railroad tracks. Presently, RA-1 is occupied by Burlington Northern Santa Fe (BNSF) rail spurs, the main access road into the American Presidents Line (APL) facility, and office buildings.

RA-2: RA-2 was historically referred to as the Salmon Bay Steel north area. The area was used to support steel mill operations from the early 1900s until the 1970s, and included two large warehouses, a scale, and railroad spurs. Beginning in the late 1800s, the tideflats on the property were gradually filled with dredge sediments, slag, and steel mill debris. This fill material is predominantly slag, and reaches depths of 25 feet in places. Between 1996 and 1998, a cleanup measure was implemented that involved covering a quarter of the site with a gravel ballast cap and the remainder of the site with an impermeable asphalt pavement cap. Prior to this effort, the contaminated soil from areas where the gravel ballast cover was to be placed was moved to areas where asphaltic

cover would be emplaced. Presently, the western portion of RA-2 is occupied by the BNSF Rail Yard, and the eastern portion is occupied by the main APL facility entrance and the south end of the APL Stack Train Yard.

RA-3: The former Seattle Steel Incorporated (SSI) property, RA-3, was the location of both the West Seattle Landfill and a scrap metal processing company. The West Seattle Landfill occupied 30 acres (approximately three-quarters of this remediation area) and was in operation from 1939 to 1966. The former landfill was almost entirely covered with slag, construction debris, steel mill debris, and an un-engineered soil cover. In the spring of 1995, near-surface refuse from the eastern portion of the landfill was relocated to a consolidation landfill area on the western portion of the site. An interim cover consisting of processed solid landfill material was placed over the property. Since this time, an engineered cover consisting of clean fill and a low-permeability geomembrane has been placed over the former landfill, and an asphalt cover has been placed over the former SSI property south of the landfill. The Port operates a landfill gas collection and treatment system in the former landfill area. Presently, the asphalt-paved area on the consolidated landfill portion of RA-3 is utilized for tenant-lease activities including truck and vehicle parking, container chassis storage, and temporary construction lay down and component assembly for Sound Transit's light rail project.

RA-5: RA-5 was originally a tideflat zone that has since been filled with dredge sediment, slag, and construction debris. The western portion of the remediation area, filled prior to 1936, was the site of Nettleton Lumber until the late 1960s. The eastern portion of the site was filled in the late 1950s, becoming the location of Lockheed Shipyard #2, which operated from 1956 to 1987 as a ship maintenance and refitting outfit. In 1994, the area used for shipbuilding operations underwent excavation and treatment of contaminated soils. Since this cleanup effort, the existing storm drain system was removed, and the associated contaminated storm drain sediments were disposed. In addition, an asphaltic concrete cap was placed over the entire site. Presently, RA-5 is currently used by APL for parking and interim container storage.

RA-4: RA-4, referred to as the Pacific Sound Resources site, is being addressed separately under the Superfund process by EPA. However, the portion of RA-4 south of Florida Street is being considered under the Ground Water Confirmation Monitoring Program in order to evaluate groundwater flow from RA-4 into the adjacent remediation areas. RA-4 was occupied by a wood treating plant until 1994, when remediation activity began. The cleanup effort involved limited removal of contaminated soils and the placement of a low-permeability asphaltic concrete cap over the entire site. The wood waste was recycled off-site and the resulting excavation pit was backfilled with fill. Where appropriate, a geotextile identifier layer was installed between clean import fill and underlying contaminated soils. In addition, a groundwater containment slurry wall was built in the northern portion of the property to limit migration of contaminants into Puget Sound. RA-4 is presently occupied by the northern end of the APL Stack Train Yard.

Access to the Terminal 5 facility and the adjacent vicinity is controlled by several different entities including the Port, APL, and BNSF. Access to the main facility and the original Terminal 5 area is through the main APL gate off Spokane Street. Access to the southwest portion of the site, including the property south of the main BNSF rail yards, is

via an access road located off Spokane Street west of the main APL gate. Access to the west part of the site, including most of RA-3, is from a gate located on Harbor Avenue west of the West Seattle Freeway. Access to the northwest portion of the site is through the Florida Street gate or through a public shoreline access road located on Harbor Avenue north of Florida Street.

3 Site Hydrogeologic Setting

The local groundwater regime beneath the SWHP includes a Fill Aquifer and a deeper Estuarine Aquifer. The Fill Aquifer consists of groundwater occurring in various fill materials between depths of 20 and 40 feet below ground surface (bgs). A sandy silt to silty fine sand tideflat deposit, typically 1 to 10 feet in thickness, occurs between the Fill and Estuarine Aquifer zones over most of the site with the exception of the easternmost portion near the West Waterway, and in isolated areas near the former axis of Longfellow Creek along the eastern edge of RA-3. Where present, this low-permeability unit results in locally confined conditions in the Estuarine Aquifer zone. The Estuarine Aquifer is underlain by a lower permeability unit that occurs at a depth of approximately 40 feet along the western boundary of the site near Harbor Avenue, and appears to dip to the east. A schematic cross-section along the line of the LFOL is provided on Figure 3.1.

The Fill Aquifer/Estuarine Aquifer system is bounded to the north by Elliott Bay and to the east by the West Waterway. The aquifers thin to the south and west and terminate to the west against the West Seattle bluff, encountering deposits of the low-permeability Lawton Clay unit.

3.1 Summary of Pre-Redevelopment Hydrologic Conditions

Prior to site remediation and redevelopment of the SWHP, the primary recharge to the Fill and Estuarine Aquifers was through direct infiltration of incident precipitation, with limited lateral groundwater inflow from the West Seattle bluffs to the west and the Longfellow Creek/Delridge basin to the south. Under pre-remediation conditions, recharge from on-site infiltration was estimated to be approximately 3.5 times higher than recharge through lateral groundwater flow from off-site (Port of Seattle, 1999). Downward vertical gradients existed between the Fill and Estuarine Aquifers under pre-redevelopment conditions, indicating that on-site infiltration was a significant recharge source to the aquifer systems.

Pre-remediation groundwater studies, primarily the site-wide tidal study by Woodward Clyde (1994), indicate that historical groundwater flow direction in the Fill Aquifer was toward the former LFOL equalization basins within much of RA-2 and RA-3 and the southern portion of RA-4, and the western portion of the original Terminal 5 area. Much of the historic Fill Aquifer groundwater discharge from these areas occurred through the LFOL via the former equalization basins, with lesser discharge through documented pre-redevelopment leaks in the LFOL. Selected groundwater elevation contour maps from the Woodward Clyde study are included in this report.

3.2 Original Model of Post-Redevelopment Hydrologic Conditions

Closure of the former equalization basins and completion of a continuous LFOL conveyance tightline across the SWHP, and subsequent repair of leaks identified in the existing LFOL, was expected to significantly affect the post-redevelopment groundwater flow regime, especially in the Fill Aquifer. The groundwater flow direction within the Fill Aquifer under post-remediation conditions was expected to be primarily to the east or northeast, with lateral groundwater flow onto the site from the highlands (to the south and west), with limited hydraulic effect along the now tightlined LFOL, and eventual diffuse discharge to the surface waters of the West Waterway and Elliott Bay. Additionally, closure of the former equalization basins and repair of the LFOL was expected to greatly reduce the upland extent of tidal influence in the Fill Aquifer.

The pre-remediation flow direction in the Estuarine Aquifer was to the north-northeast, with discharge to Elliott Bay and the West Waterway. Post-redevelopment Estuarine Aquifer flow was expected to be relatively unaffected by site development, with the exception of possible reduction in horizontal groundwater gradient, and a possible southwestward (upland) shift in the position of the salt water interface along Elliott Bay and the West Waterway.

4 Phase I Monitoring Program Objectives

4.1 Groundwater Flow Regime Evaluation Objectives

The primary goal of the Phase I GWCMP was to assess changes in groundwater flow conditions resulting from the SWHP remediation and redevelopment activities, including documenting post-remediation flow directions, recharge areas, and discharge zones, and evaluating the hydraulic effect of the LFOL and tidal influences on the groundwater flow regime in the Fill and Estuarine Aquifers. Documenting the post-redevelopment flow regime will allow subsequent identification of appropriate groundwater quality monitoring points for compliance monitoring with surface water quality standards.

The *Monitoring Plan* (AESI, 2000) identified six specific objectives for the Phase I GWCMP. The following sections detail these specific project objectives and work completed to satisfy these objectives. Additionally, summaries of the status and general findings of each objective are provided in Table 4.1.

4.1.1 Objective 1 - Implement Monitoring Network

Objective 1 addressed implementation of the monitoring network to define the SWHP post-redevelopment groundwater flow regime and provide the basis for identifying the Phase II water quality compliance monitoring network. The majority of the monitoring network was completed in late 2001, and included retrofitting existing wells and installation of new Fill and Estuarine Aquifer wells. Complete details of the monitoring network construction and operation are provided in the *Monitoring Network Construction Report* (Aspect Consulting, 2002a).

The *Monitoring Network Adequacy Technical Memorandum* (Aspect Consulting, 2003) identified data gaps in the Fill Aquifer in the Old Terminal 5 Area, and three additional Fill Aquifer wells (CMP-18, 19 and 20) were installed in the Old Terminal 5 Area in the summer 2003. Construction of these wells followed procedures in the *Monitoring Plan* (AESI, 2000). Monitoring well construction logs for these wells are included in Appendix B.

The current monitoring well network includes 25 Fill Aquifer and five Estuarine Aquifer monitoring wells. The Phase I hydrologic characterization study included collection of water level and water quality data from the network over a two-year period to assess seasonal hydrologic variations and define the site-wide groundwater flow regime.

4.1.2 Objective 2 – Document Reduced Recharge to Fill and Estuarine Aquifers

A majority of the SWHP area has been capped with low-permeability asphalt and landfill geomembrane covers. These low-permeability covers are expected to result in the reduction of on-site infiltration and corresponding reduction in recharge to the Fill Aquifer system. Objective 2 addressed characterization of the anticipated reduction in

recharge through collection of water level data over a two-year period to document anticipated site-wide declines in water levels relative to pre-redevelopment conditions.

4.1.3 Objective 3 – Confirm Reduction in Downward Vertical Gradient

This objective focused on documenting anticipated post-redevelopment reductions in downward vertical gradients, and corresponding reduction in exchange of groundwater between the Fill and Estuarine Aquifers. Reductions in downward vertical gradients were anticipated to result from reduced precipitation recharge to the Fill Aquifer. The approach to this objective was to utilize water level data over a two-year period from paired Fill and Estuarine Aquifer wells to document post-redevelopment vertical gradients between the Fill and Estuarine Aquifers across the site.

4.1.4 Objective 4 – Document Reduced Discharge to Elliott Bay and West Waterway

Objective 4 addressed documenting anticipated post-redevelopment reductions in discharge from the Fill and Estuarine Aquifers to Elliott Bay and the West Waterway. The approach to this objective focused on collecting two years of water level data to document post-redevelopment groundwater levels and gradients across the site. In addition, the completed tidal study facilitated assessment of the role of the tightlined LFOL as a preferential pathway for groundwater discharge

4.1.5 Objective 5 – Document Post-Redevelopment Effect of LFOL on Ground Water Regime

The results of the Woodward Clyde tidal study conducted in 1994 (prior to the site redevelopment and closure of the former equalization basins) clearly demonstrate that at that time the LFOL acted as a point of discharge for the Fill Aquifer. The tidally-induced hydraulic head changes that occurred in the former equalization basins along the LFOL alignment had a significant effect on the shallow groundwater regime. Closing of the former LFOL equalization basins and repair of the leaks within the LFOL was expected to result in a marked reduction of tidal influence around the former equalization basins and to reduce the extent of upland tidal influence within the Fill Aquifer. Objective 5 of the Phase I GWCMP addressed evaluation of the degree to which tightlining of the former LFOL equalization basins has reduced the hydraulic effect of the LFOL on the Fill Aquifer flow system. This objective was accomplished through a focused tidal study (*Tidal Monitoring Study Report*, Aspect Consulting, 2002b), and through long term, automated monitoring of water levels and water quality parameters in key Fill aquifer wells located along the LFOL.

4.1.6 Objective 6 – Document Reduction in Leachate Production from RA-3

Objective 6 focused on verifying the anticipated post-redevelopment reduction in leachate generation from the former West Seattle Landfill (RA-3). Reduced leachate generation was expected due to a combination of reduced precipitation infiltration through the solid waste, and lowered water levels in the Fill Aquifer resulting in less

potentially saturated solid waste. This objective was addressed through collection of two years of automated water level and water quality parameter data from key Fill and Estuarine Aquifer wells adjacent to RA-3, and comparison of these data to pre-development conditions.

5 Summary of Previous Phase I Report Submittals

5.1.1 Monitoring Plan

The *Monitoring Plan* (AESI, 2000) describes the proposed components for the hydrologic flow regime characterization phase (Phase I) of the GWCMP. This document was prepared in accordance with the consent decrees for the individual remediation areas that were redeveloped as part of the SWHP, and followed the general scope defined in the *Ground Water Conceptual Letter* (Port of Seattle, 1999). The Monitoring Plan (AESI, 2000) presented specific work scope element and procedures to develop a site-wide monitoring network adequate to characterize post-redevelopment groundwater flow conditions at the SWHP and to achieve the specific Objectives 1 through 6 identified in the Monitoring Plan (See Section 4.0 of this report). A copy of Ecology's July 5, 2001 comment letter on the *Monitoring Plan* (AESI, 2000) is included in Appendix A.

5.1.2 Addendum #1 to Monitoring Plan

Addendum #1 to Monitoring Plan (AESI, 2001) was prepared to address comments raised by Ecology at a June 5, 2001 meeting to discuss the *Monitoring Plan* (AESI, 2000). Ecology's comments were subsequently documented in a letter to the Port dated July 5, 2001 (Ecology, 2001). This letter also confirmed Ecology's approval of the *Monitoring Plan*, as amended by the *Addendum #1 to Monitoring Plan* (AESI, 2001). *Addendum #1 to Monitoring Plan* (AESI, 2001) specifically addressed retrofitting, abandonment, and replacement of selected monitoring wells that were damaged during the Nisqually Earthquake. This document also stipulated a change in the planned location of CMP-11 to outside the EPA-regulated RA-4 remediation area, and added a requirement for completion, after one year of monitoring, of a technical memorandum (the subsequent Monitoring Network Adequacy Technical Memorandum, Aspect Consulting, 2003) documenting the adequacy of the monitoring network. *Addendum #1 to Monitoring Plan* (AESI, 2001), together with the *Draft Monitoring Plan* (AESI, 200), encompass the final Ecology-approved scope for the SWHP Phase I GWCMP.

5.1.3 Monitoring Network Construction Report

The *Monitoring Network Construction Report* (Aspect Consulting, 2002a) detailed the construction of the Phase I monitoring well and surface water monitoring station network. All relevant monitoring well completion data, including survey information, were presented in tabular form, and geologic and well completion logs for new, existing, and retrofitted monitoring were included. The report also included abandonment records for wells that were deemed unsuitable for use in the program, and detailed well development records for new and existing wells. The *Monitoring Network Construction Report* (Aspect Consulting, 2002a) documented the construction of surface water monitoring stations in the LFOL, and provided detailed documentation of the installation and calibration of the In-Situ Troll® dataloggers installed in the site monitoring wells and surface water monitoring stations. This document also detailed any deviations from the

approved scope or procedures, and documented investigation-derived waste management, waste profiling, and waste treatment/disposal procedures.

5.1.4 Tidal Monitoring Study Report

The *Tidal Monitoring Study Report* (Aspect Consulting, 2002b) documents the tidal monitoring study completed as part of the Phase I GWCMP. The objectives of the documented tidal monitoring study were to evaluate potential changes in groundwater flow conditions resulting from the SWHP redevelopment activities, with specific focus on the potential effect on Fill Aquifer flow from tightlining of the LFOL. The *Tidal Monitoring Study Report* (Aspect Consulting, 2002b) documents all data collection activities associated with the tidal monitoring study and provides a detailed evaluation of the tidal monitoring data. The report presented pre-redevelopment and post-redevelopment Fill and Estuarine Aquifer groundwater elevation contour maps for different tidal stages, and provided conclusions regarding post-redevelopment changes in the Fill and Estuarine Aquifer groundwater flow regime in the vicinity of the LFOL.

5.1.5 Monitoring Network Adequacy Technical Memorandum

The *Monitoring Network Adequacy Technical Memorandum* (Aspect Consulting, 2003) was prepared after evaluation of one year of water level monitoring data from the Phase I GWCMP monitoring network. The memorandum summarized the results of the first year of monitoring, and presented an assessment of the adequacy of the monitoring network for effectively characterizing the post-redevelopment shallow hydrologic system at SWHP. The memorandum also evaluated the status of the *Monitoring Plan* (AESI, 2000) objectives after the first year of monitoring, and identified two apparent data gaps. These data gaps were:

1. Lack of adequate downgradient Fill Aquifer monitoring well coverage in the Old Terminal 5 Area, and,
2. Inadequacy of Fill Aquifer water data alone to characterize potential Fill Aquifer/LFOL interactions in the LFOL.

Recommendations were provided to address these data gaps. These recommendations included installation of three additional Fill Aquifer monitoring wells in the Old Terminal 5 Area, and completion of a focused water quality and discharge study in the LFOL to further evaluate potential Fill Aquifer/LFOL interactions. A copy of Ecology's April 15, 2003 letter approving these recommendations is included in Appendix A. The new monitoring wells (CMP-18, 19, 20) were installed in the April 2003, and the focused LFOL water quality and discharge study was completed in the summer and fall of 2004.

5.1.6 Periodic Project Status Reports

A total of 11 periodic *Project Status Reports* were completed and submitted to Ecology between December 2001 and February 2004. These reports presented updates on work completed over the reporting period, problems encountered and resolutions, work and submittals scheduled for the subsequent reporting period, and updated project schedules. Submission of periodic status reports was discontinued in early 2004 at the conclusion of the 2-year monitoring period.

6 Hydrologic Data Collection

The following sections document hydrologic data collection and analysis activities completed during the Phase I GWCMP. Where these activities have been addressed in previous project reports, the reader is directed to those by reference.

6.1 Automated Downhole Groundwater Level and Water Quality Data Collection

6.1.1 Instrumentation Setup

Automated In-Situ Troll® datalogging probes were installed in selected site monitoring wells early December 2001 to record groundwater levels. Additional Fill Aquifer monitoring wells CMP-18, 19 and 20 were instrumented with miniTroll® probes in December 2001. The Troll® 4000 (T-4000) and mini-Troll® probes measured water level (pressure head) and temperature. The Troll® MP-8000s (T-8000s) also measured pH and conductivity. A summary of the Phase I monitoring instrumentation is provided in Table 6.1. Complete monitoring equipment setup procedures are documented in the *Monitoring Network Construction Report* (Aspect Consulting, 2002a), and in the periodic *Project Status Reports*. Individual daily field reports are provided in Appendix C.

6.1.2 Water Level Data Calculation

Collection of water level elevations was a primary element of the Phase I GWCMP. The In-Situ probes measured the height of the water column (pressure head) above the probe, and an accurate probe elevation is required for conversion of the probe's pressure head reading to water level elevation. Initially, the elevation of each probe was determined by taking concurrent measurements of static water level (in feet below the top of the casing with a known elevation) and the recorded pressure. The equation used for determining the elevation of the probe is:

$$Elev_{probe} = Elev_{TOC} - SWL_{TOC} - H_{probe}$$

where Elevprobe is the elevation of the probe (ft MLLW);

ElevTOC is the elevation of the top of the casing (ft MLLW);

SWLTOC is the measured depth to water below the top of the casing (ft); and

Hprobe is the salinity-corrected freshwater equivalent head (see Section 2.5) due to water above the probe (ft) recorded by the datalogger.

Difficulty was encountered in re-establishing a constant probe elevation between download events, particularly for the probes with water quality sensors which required removal from the well to calibrate. To eliminate transducer elevation discrepancies caused by cable stretch and hanger slippage, in June 2002 all wells with In-Situ probes were equipped with spacers constructed of 1-1/2 inch diameter PVC casings. The spacers

were installed in the base of each well using stainless-steel recovery cables. The cone-shaped base of the In-Situ probes "seated" on the top of the spacers, thereby ensuring that the sensors elevations were fixed for the remainder of the study.

6.1.3 Pressure Sensor Calibration

During the December 2002 download event, all Troll® probe pressure sensors were field checked for accuracy using a three-point pressure check. The pressure checks were completed with a field-portable pressure chamber and manufacturer-calibrated reference transducer. The manufacturer's published pressure accuracy for the pressure sensors ranges from 0.015 pounds per square inch (psi) for a 15 psi sensor, to 0.03 psi for a 30 psi sensor (± 0.1% of full scale). Based on the project-specific data quality needs for the pressure measurements, we established an acceptable pressure accuracy of 0.08 psi for all sensors. All but three probes (CMP-3, CMP-7, and MW-308N) passed the field check. The three probes with pressure sensors out of the acceptable range were removed from the wells and returned to the manufacturer for re-calibration. These probes were reinstalled after calibration.

6.1.4 Water Quality Data Collection and Sensor Calibration

Collection of water quality data (pH and conductivity) was an additional element of the Phase I GWCMP. The T-8000 pH and conductivity sensors required periodic calibration to maintain accuracy. Water quality sensors (pH and conductivity) were initially calibrated prior to installation in December 2001. During each download event, water quality sensors were field checked using known solutions. pH sensor calibrations were made when measurement error was greater than ½ pH unit. pH sensors were typically tested using a solution of 7.0, so sensors that measured less than 6.5 or greater than 7.5 were calibrated. Conductivity sensor calibrations were made when measurement error was greater than 10% of the known solution. For example, a conductivity sensor might be tested using a solution of 1440 microSiemens (µS). Conductivity sensors measuring less than 1296 µS or greater than 1584 µS were calibrated. Water quality sensor calibrations were documented in the periodic *Project Status Reports*. Individual daily field reports are provided in Appendix C.

The pH sensors in the T-8000 probes had a manufacturer-published functional life of 1 year, and the pH sensors in probes CMP-2, CMP-3, CMP-4, CMP-11, CMP-13, and MW-308N failed in the second year of the monitoring program. As over a full year of valid pH data had been collected, the failed pH sensors were not replaced during the remaining Phase I Hydrologic. Conductivity sensors remained in good working order over the course of the project.

6.2 Groundwater Sample Collection And Analysis

Groundwater samples for chloride analysis were collected from all site wells in December 2001, and from selected wells thereafter. The chloride data allowed for salinity corrections for the water level data from the Estuarine Aquifer wells, and provided a check for salinities calculated from conductivity measurements in the Fill Aquifer wells. Wells initially selected for chloride analyses were those exhibiting significantly elevated

conductivity measurements during well development completed in late 2001. Initial samples were collected on December 12 and 17, 2001.

Water samples for chloride analyses were collected through 1/16" diameter dedicated polyethylene tubing installed in the wells to a depth approximately equal to the transducer elevation. A peristaltic pump was used to purge the tubing and samples were collected in 500-milliliter polyethylene containers, placed on ice and shipped to North Creek Analytical in Bothell under industry-standard chain-of-custody. All water samples were analyzed for chloride content by EPA Method 300.0. The laboratory results are provided in D. Sampling events are also documented in the individual field reports included in Appendix C.

6.2.1 Salinity Corrections to Water Level Data

The salinity data were used to allow correction of water level data for density differences, and to provide additional information regarding post-redevelopment changes in the Fill Aquifer groundwater flow system. Consistent with findings from the Woodward Clyde (1994) tidal study, groundwater salinity (thus density) was not found to alter the Fill Aquifer groundwater level data significantly. Salinity correction factors were greater than 0.98 in all Fill Aquifer wells, resulting in water level elevation corrections of generally less than 0.01 feet, with no Fill Aquifer well correction exceeding 0.11 feet. For the Estuarine Aquifer wells, salinity corrections resulted in water level differences in excess of 1 foot in well MW-44. All water elevation data recorded from these wells were corrected for salinity in accordance with the following procedures (ASTM, 1995; Woodward Clyde, 1994).

Salinity (on the Practical Salinity Scale (PSS) ($S_{0\text{-}40}$)), was calculated from conductivity, temperature, and pressure as follows:

$$S_{0-40} = S_{2-42} - \frac{A_0}{1+1.5(400R_t)+(400R_t)^2} - \frac{B_0}{1+(100R_t)^{1/2}+(100R_t)^{3/2}}\left[\frac{t-15}{1+0.0162(t-15)}\right]$$

$$S_{2-42} = a_0 + a_1 R_t^{1/2} + a_2 R_t + a_3 R_t^{3/2} + a_4 R_t^2 + a_5 R_t^{5/2} + \Delta S$$

$$\Delta S = \left[\frac{t-15}{1+0.162(t-15)}\right]\left(b_0 + b_1 R_t^{1/2} + b_2 R_t + b_3 R_t^{3/2} + b_4 R_t^2 + b_5 R_t^{5/2}\right)$$

where R_t is given by

$$R_t = \frac{R}{R_p r_t}$$

$$R_p = \left[1 + \frac{p\left(e_1 + e_2 p + e_3 p^2\right)}{1 + d_1 t + d_2 t^2 + (d_3 + d_4 t)R}\right]$$

$$r_t = \left[c_0 + c_1 t + c_2 t^2 + c_3 t^3 + c_4 t^4\right]$$

$$R = \frac{k}{k_{standard}}$$

where A_0, B_0, a_n, b_n, c_n, d_n, and e_n are coefficients,

t is temperature (^oC),
p is in situ pressure (bars),
k is the in situ conductivity (µS/cm),
$k_{standard}$ is standard conductivity at S = 35 PSS, t = 15^{o}C, p = 0 above one standard atmosphere. For our purposes, we use $k_{standard}$ = 42,914 µS/cm.

Calculate the density, ρ (kg/m^3), of the sample from salinity and temperature:

$$\rho = \rho_0 + AS + BS^{3/2} + CS^2$$

$$\rho_0 = f_0 + f_1 t + f_2 t^2 + f_3 t^3 + f_4 t^4 + f_5 t$$

$$A = g_0 + g_1 t + g_2 t^2 + g_3 t^3 + g_4 t^4$$

$$B = h_0 + h_1 t + h_2 t^2$$

$$C = i_0$$

where f_n, g_n, h_n, i_0 are coefficients,
ρ_0 is the density of fresh water at the same temperature (kg/m3),
S is salinity (PSS), and
t is temperature (^{o}C)

Compute the elevation/salinity correction factor, CF, for each well:

$$CF = \frac{\rho_0}{\rho}$$

Calculate the salinity corrected water level elevations, W_{elev} (ft MLLW):

$$W_{elev} = \left(CF \times p \times 2.307 \frac{\text{ft}}{\text{psi}} \right) + TD_{elev}$$

where p is the pressure due to water above the transducer and
TD_{elev} is the elevation of transducer sensor.

For wells with chloride analyses only (Estuarine Aquifer), salinity is calculated from chloride as follows:

S = (35/19) x [C1]

where S is salinity (PSS), and
[Cl] is chloride concentration in parts per thousand (ppt)

6.3 LFOL Water Quality and Discharge Study

As discussed in Section 5.1.5, the automated water level and water quality data alone were not adequate to resolve the degree of potential communication between the Fill Aquifer and the LFOL. A focused, phased water quality and discharge study of the LFOL was recommended in the Monitoring Network Adequacy Technical Memorandum (Aspect Consulting, 2003), and was completed in the summer 2004. The first phase of this study employed installation of In-Situ T-8000 probes at three manhole locations along the length of the LFOL to evaluate variations in both water levels and major water quality parameters within the LFOL. The second phase included sampling and analyses of discharge samples from three manhole locations, and monitoring of flow rates and discharge volumes at these locations. Details of each phase of the LFOL water quality and discharge study are provided below.

6.3.1 Continuous LFOL Water Level and Water Quality Data Collection

Figure 6.1 shows the location of the water quality and flow monitoring stations in the LFOL at manholes MH-1, MH-4 and MH-7. The monitoring stations were installed in accordance with Section 5.2 of the *Monitoring Plan*, and consisted of 2-inch-diameter slotted PVC pipe affixed to the manhole ladders using fasteners. The pipes were installed vertically in each manhole with the lower end set in the manhole sump. Each location was equipped with a T-8000 probe equipped to monitor water level, temperature, conductivity, dissolved oxygen, and pH installed with the sensors positioned marginally above the invert level of the LFOL pipe. The probes were set up to collect measurements every 10 minutes and were installed on June 3, 2004. Data was collected through July 6, 2004, at which time the probes were downloaded and removed.

After completion of the automated water level monitoring, the recorded water level and water quality data were uploaded to the project database and plotted for evaluation. Plots of these data are presented in Figures E-1 through E-3 in Appendix E.

6.3.2 LFOL Water Quality Sampling and Flow Rate Measurements

Based on the evaluation of water level and water quality data and for June 2004, the water quality sampling phase was scheduled for strong tidal cycles in late July 2004, when LFOL sampling locations were most fully flushed of tidal water and samples would be most representative of non-tidal “baseflow”. In the absence of surface water inflow, this “baseflow” should include Nucor Steel non-contact cooling water, plus any potential groundwater leakage (inflow). The calculated allowable time windows for sampling at the individual LFOL manhole locations are shown in Table 6.2.

Water quality sampling was completed between July 28 and 30, 2004, within the allowable time windows at each LFOL sampling station. Water samples were collected directly from the discharge flow into laboratory-prepared 1 liter glass bottles, and then decanted into appropriate, laboratory-supplied containers. Samples were hand-delivered or couriered to North Creek Analytical in Bothell, Washington for analyses. Each sample was analyzed for the following parameters: metals (Ca, Fe, Mg, K, Na), ferric iron,

alkalinity, chloride, ammonia, nitrate/nitrite, pH, sulfate, conductance, TDS, TSS, and turbidity. Laboratory results are presented in Table 6.3, and laboratory data reports are provided in Appendix F.

At the completion of the water quality sampling, flow velocity/discharge monitoring was conducted at each monitoring location (MH-1, MH-4 and MH-7). Initially, flow measurements were planned to be collected using a Swoffer Model 3000 current velocity meter. However, due to limited flow depths, this method was not practicable, and flow velocity measurement were collected by measuring channel profiles and flow velocities. Channel bed profiles were constructed from measurements of water depth at 0.2-foot intervals across the apparent channel width. Channel surface velocity was measured by timing the transit time of a float along a 10-foot reach of the channel. The average of five measurements was used to estimate channel velocity at the surface.

Channel flow was calculated using the average channel depth, the channel width, and an average channel velocity is 60 percent of channel velocity at the surface. Results of the flow calculations are provided in Table 6.4. Calculated average flows measured at each station in the LFOL ranged from 99 gallons per minute (gpm) to 107 gpm.

6.3.3 LFOL Inspection

During collection of flow data and discharge samples in late July 2004, limited sections of the LFOL were also inspected by Aspect Consulting personnel. Portions of the LFOL inspected included the 25 foot sections south (upstream) from Manholes MH-1, MH-2 and MH-4, the 150-foot section north (downstream) of manhole MH-8, and the 160-foot section south (upstream) of Manhole MH-7. Some minor leakage was noted around the pipe joints at the manhole locations, but no significant leaks were visible or audible during inspection of these sections. An outfall approximately 24 inches in diameter was observed at the location of Manhole MH-8, with discharge from this outfall estimated at 15 to 20 gpm. Complete LFOL inspection reports are provided in the daily field reports located in Appendix C.

6.4 Tidal, Barometric Pressure, and Precipitation Data Collection

Verified tidal data were obtained for NOAA Station Number 9447130 (SEATTLE, PUGET SOUND, WA) at the NOAA web site: “co-ops.nos.noaa.gov”. The station is located at Pier 52 (the Colman Ferry Dock). The hourly data were reported on Pacific Standard Time and in feet relative to the mean-lower-low-water (MLLW) datum. Tidal data were stored in a spreadsheet where daily average, minimum, and maximum tides were calculated, as well as monthly average tides.

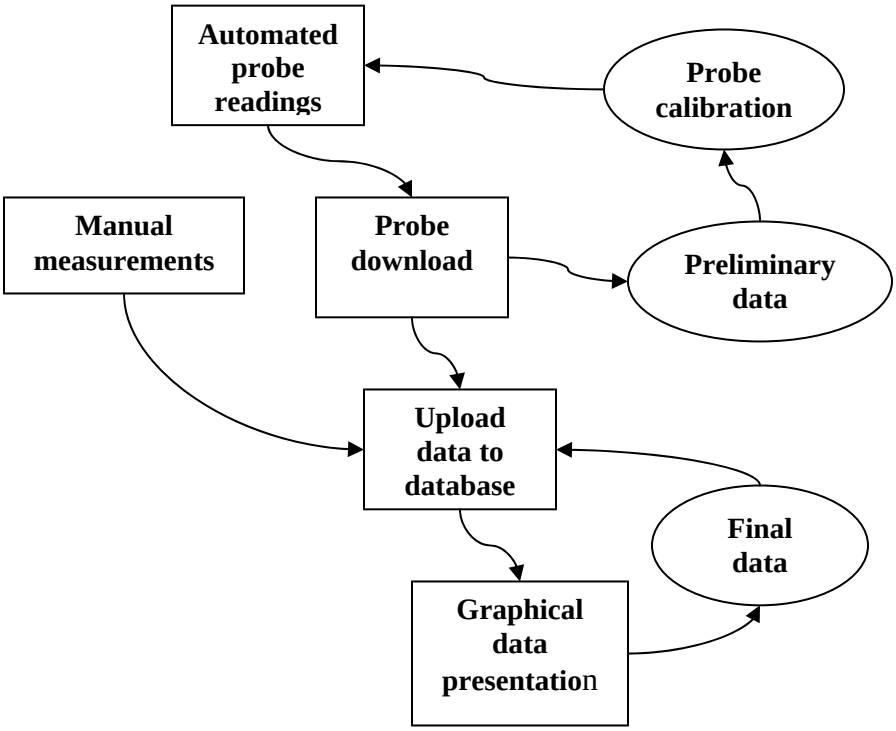
Barometric pressure data were also obtained for NOAA Station Number 9447130. The hourly data were reported in millibars using Pacific Standard Time. Barometric pressure data were stored in a spreadsheet where data were converted from millibars to feet of water head and daily averages were calculated.

Daily precipitation data were acquired from a tipping bucket located on the northeast side of Sea-Tac International Airport monitored by Taylor Associates, Inc. Precipitation data were stored in the project database, and exported to a spreadsheet for reporting.

6.5 Data Management

All manual and probe data collected during Phase I of the GWCMP are stored in a database developed by Aspect Consulting specifically for this project. Over 300 manual water level and water quality measurements were made at up to 32 locations. Nearly ½ million probe readings were made at up to 28 instrumented locations with up to 5 sensors installed on each probe. The database also is programmed to calculate the salinity correction for wells with conductivity or chloride data.

The flow of project data from collection through interpretation and eventual delivery to the port is illustrated in the diagram below:



Data originated with either automated probe readings or manual measurements. Manual measurements of depth to water and salinity were recorded on field sheets. Probes were downloaded to a field laptop with preliminary data quality assurance/quality control (QA/QC). Preliminary data QA/QC included verifying that sensor readings were within

the normal range and that transducer-calculated water levels corresponded with manual measurements. If necessary, sensors on the probes were field tested and field calibrated. After a site visit, data from field sheets were entered into the database, and probe data were uploaded to the database. The data were then exported to a spreadsheet for graphical analysis including final data QA/QC. Final QA/QC included comparisons of manual water level measurements over time and with nearby locations.

7 Hydrologic Data Analyses

7.1 Groundwater Levels and Water Quality Parameters

7.1.1 Summary of Fill Aquifer Groundwater Levels and Water Quality Parameter Data

7.1.1.1 Water Levels

Daily average water level data for monitored Fill Aquifer wells are provided in Figure 7.1. This figure also includes averaged tidal stage data for Elliot Bay, and precipitation data from Sea-Tac Airport. Individual plots of automated and manual water level, and water quality parameter data for each monitored Fill Aquifer well, are provided in Appendix G.

Review of Figure 7.1 and Figures G-1 through G-16 indicates that over the two year study period, Fill Aquifer water levels at the Site varied seasonally by as much as six feet. In general, Fill Aquifer wells inland from the shoreline exhibited from one to four feet of seasonal variation in water levels over the monitoring period, with the highest variations in inland wells occurring adjacent to the western upland at CMP-5, and in the area along the lower portion of the LFOL in the vicinity of the former lower (north) equalization basins near Florida Street. Seasonal variations in Fill Aquifer water levels beneath the central paved portion of the site ranged from one to three feet, with the smallest variations occurring beneath central portion of the site from RA-3 through the Old Terminal 5 area to the portion of RA-1 along Marginal Way SW. Site-wide seasonal variations were largest (6 feet) in strongly tidally influenced, nearshore Fill Aquifer wells CMP-16 and MW-5 located along the northern, seaward edge of RA-5. Overall, Fill Aquifer water levels appear to have stabilized after site redevelopment, with comparable seasonal elevations in both 2002 and 2003.

7.1.1.2 Temperature

Groundwater temperature variations in Fill Aquifer wells (see Figure 7.2 and Figures G-1 through G-16) followed an offset, bimodal seasonal pattern with lowest temperatures occurring in late spring, after the winter recharge, and generally a few weeks after the seasonal high water levels. Highest groundwater Fill Aquifer groundwater temperatures generally occurred late October or early November, just above the onset of the winter recharge. Many Fill Aquifer wells display a net increase in average groundwater temperature between 2002 and 2003. This increase in groundwater temperature may result from continued equilibration of the aquifer to post-redevelopment reduction in recharge.

7.1.1.3 Salinity

Salinity levels in the Fill Aquifer vary widely across the site, with highest levels typically found in wells immediately adjacent to the shoreline. Daily average salinity data for monitored Fill Aquifer wells are provided in Figure 7.3. Well CMP-16, located along the

northern edge of RA-5, exhibited elevated laboratory-reported salinity levels. Elevated salinity levels were also recorded in wells CMP-11, CMP-12 and CMP-13, located along the lower portion of the LFOL near the former lower (north) equalization basins. Fill Aquifer wells in the central portion of the site generally exhibited salinity levels less than 1 part per thousand (ppt).

Fill Aquifer groundwater salinity trends were not as consistent as temperature trends, but the wells can be grouped into three subsets that exhibited well- and/or area-specific behavior. Salinity levels in wells CMP-3, CMP-6 and MW-307A were generally constant throughout the monitoring period, suggesting stabilized conditions in the central portion of the site extending southward from the north end of RA-3 and along the eastern edge of RA-3 through RA-1. Conversely, salinity levels in nearshore wells MW-26R and MW-308N show increasing trends throughout the two-year monitoring period. These increasing trends are suggestive of landward movement of salt water intrusion into the Fill Aquifer between early 2002 and late 2003. Wells CMP-8, CMP-11, CMP-12 and CMP-13 all exhibited significant variations in salinities. CMP-8, located in the central portion of the site within the Old Terminal 5 area shows pronounced cyclical variations in salinity, with the higher salinity values occurring in the latter 6 months of each year, and roughly corresponding to lower groundwater elevations and elevated temperatures. Conversely, wells CMP-11, CMP-12 and CMP-13, located along the lower portion of the LFOL near the former lower (north) equalization basins, show generally elevated salinities during the winter months.

The cause of the salinity variations in well CMP-8 is unknown. Well CMP-4, which is in the same general area as CMP-8, but significantly closer to the LFOL, shows relatively low salinity and little salinity fluctuation. This would seem to rule out the tidal leakage from the LFOL as a cause of the elevated salinity in well CMP-8. Potential upward movement of water from the Estuarine Aquifer is not the likely the cause of the salinity variation in well CMP-8 either, as measured salinities in nearby Estuarine Aquifer well CMP-7 are much lower (less than 2 ppt) than salinities measured in CMP-8 (up to 22 ppt). The most plausible explanation of elevated salinity in well CMP-8 is periodic downgradient migration of “relic” tidal water which entered the Fill Aquifer, prior to site redevelopment, through the former upper (south) equalization basins which were located upgradient of well CMP-8.

Salinity variations in wells CMP-11, CMP-12 and CMP-13 appear related to upward movement of deeper, seawater-enriched groundwater from the Estuarine Aquifer during periods of higher averaged tides. Inspection of the LFOL in the area of the “lower” Estuarine Basins did not indicate the presence of leaks that could result in movement of seawater from the LFOL into the aquifer in this area. Upward movement of saline groundwater from the Estuarine Aquifer in this area is also suggested by the presence of observed upward vertical gradients between the Fill and Estuarine Aquifers in the MW-307 and MW-308 wells pairs in the winter months (see Section 7.3). The *Tidal Monitoring Report* (Aspect Consulting, 2002) also confirmed the potential occurrence of Fill/Estuarine Aquifer interactions in the area of the former lower (north) equalization basins.

7.1.1.4 pH

Automated measurements of pH in the monitored Fill Aquifer (see Figure 7.4 and Figures G-1 through G-16) ranged from greater than 10.7 in well CMP-3 located on the downgradient edge of RA-2, to as low as 4.3 in well CMP-4 located east and downgradient of RA-3. Elevated pH levels in RA-2 are likely indicative of groundwater contact with calcium-rich slag materials. pH levels in excess of 9 in well CMP-2, located on the upgradient side of RA-2, also suggest that groundwater is interacting with slag in areas upgradient of RA-2. Historic aerial photographs indicate extensive slag is present beneath RA-2 and in the upgradient area southwest of RA-2. There is no discernable post-redevelopment trend in groundwater pH levels in wells CMP-2 and CMP-3.

Low pH levels in well CMP-4 located immediately east of RA-3, likely result from interaction of Fill Aquifer groundwater with refuse as it migrates to eastward beneath RA-3. pH trends in this well (see Figure G-3) indicate a cyclical decrease in pH during the winter and early spring, when water levels beneath RA-3 are highest. This suggests a direct correlation between the saturated thickness of the refuse, and corresponding lowered pH levels in the Fill Aquifer east of RA-3. The overall pH trend in well CMP-4 over the monitoring was upward, with pH levels in excess of 7.6 recorded in the early summer of 2003. This overall trend suggests a general post-redevelopment decrease in the impact of RA-3 refuse on downgradient Fill Aquifer water quality.

Outside of RA-2 and area along the eastern margin of RA-3, Fill Aquifer groundwater pH levels are generally near neutral, ranging between 6 and 8 over the monitoring period. A weak seasonal trend is noted in well CMP-13, with decreasing pH levels in the winter months possibly related to increased water levels beneath RA-3. A weak seasonal trend is also noted in well CMP-14, where elevated pH levels roughly correlate with the mid-winter months. The cause of the periodic increased pH in well CMP-14 is unknown.

7.1.2 Summary of Estuarine Aquifer Groundwater Levels and Salinity Data

7.1.2.1 Water Levels

Daily averaged water level data for monitored Estuarine Aquifer wells are provided in Figure 7.5. This figure also includes averaged tidal stage data for Elliot Bay, and precipitation data from Sea-Tac Airport. Individual plots of automated and manual water level data and water quality parameter data for each monitored Estuarine Aquifer well are provided in Appendix G.

Review of Figure 7.5 and Figures G-17 through G-21 indicates that over the two year study period, Estuarine Aquifer water levels at the Site varied seasonally by as much as 7 feet. In general, the more inland Estuarine Aquifer wells (CMP-7, MW-36, MW-307BR, MW-308S) exhibited from 2.5 to 3 feet of seasonal variation in water levels over the monitoring period. In these wells, changes related to seasonal precipitation dominate, with second-order tidal fluctuations superimposed on the dominant seasonal trends. Well MW-44, located in the northeastern corner of RA-5, is dominated by strong tidal water level fluctuations of as much as 4 feet. Overall, Estuarine Aquifer water levels exhibited comparable seasonal elevations in both 2002 and 2003.

7.1.2.2 Temperature

Groundwater temperatures in all monitored Estuarine Aquifer wells (see Figure 7.6) generally exhibited no significant short term or long term trends during the monitoring period. A very slight increasing trend of around 0.25 degrees Celsius is evident in wells CMP-7, MW-307BR, and MW-308S.

7.1.2.3 Salinity

Field-measured and laboratory-reported salinity levels in the Estuarine Aquifer vary widely across the site. The highest salinities were recorded in wells MW-36 and MW-308S, with levels typically exceeding 10 ppt. Conversely, salinity levels in the other Estuarine Aquifer wells were generally less than 2 ppt. Laboratory reports for Estuarine Aquifer chloride analyses are included in Appendix D.

Due to the lack of downhole conductivity measurements, adequate data are not available to evaluate Estuarine Aquifer groundwater salinity trends in any detail. The limited available data suggest that the most significant variations in salinity levels occurred in Well MW-36, which is located approximately 800 feet inland from the shoreline. The cause of the apparent salinity variations in this well are unknown.

7.2 Groundwater Elevations

The water level elevation data for both the Fill and Estuarine Aquifers were corrected for salinity as described in Section 6.21 of this report and calculated relative to MLLW datum. The salinity-corrected water level elevation data were then used to calculate 72-hour mean groundwater elevations using the method of Serfes (1991). This method corrects for the major lunar and solar frequencies that produce the tides, and provides a mean groundwater elevation for the 72-hour time period. Eight sets of mean groundwater elevation data (4 for each aquifer) were developed, using data from four seasonal high and low groundwater elevation stages within the monitoring period. These mean (tidally averaged) potentiometric groundwater elevation data sets were then used to construct the hand-contoured groundwater elevation maps. From these contour maps, mean groundwater flow directions and hydraulic gradients were determined, which represent the seasonal net groundwater flow conditions over the course of multiple tidal cycles. In developing the groundwater elevation contour maps for the Fill Aquifer, selected manual water level measurements from non-instrumented wells were used to supplement the automated water level data. Only manual measurements from wells at distances roughly 500 feet or greater from the West Waterway or Elliot Bay were used, since they have negligible tidal response.

7.2.1 Fill Aquifer

The average groundwater elevation contour maps for the Fill Aquifer are presented on Figures 7.7 through 7.10. To facilitate comparison of pre- and post-redevelopment groundwater flow conditions, a map representing pre-redevelopment (1994) average Fill Aquifer groundwater flow conditions is presented sequentially in Figure 7.11. The Fill Aquifer groundwater flow conditions for the monitoring period, and comparison to pre-redevelopment conditions (1994), are described below.

7.2.1.1 Flow Direction

Examination of Figures 7.7 through 7.10 indicates that Fill Aquifer groundwater flows east-northeast off the West Seattle uplands, beneath RA-3, then diverges radially to the north and east, and discharges along the West Waterway and Elliot Bay. In the southern portion of the site beneath RA-1 and RA-2, Fill Aquifer groundwater flows northward onto the site from beneath the Nucor Steel facility, then verges to the northeast beneath RA-1 and discharges to the West Waterway. Primary recharge zones for the Fill Aquifer appear to be the West Seattle uplands west of RA-3, and the Delridge/Longfellow creek basin south of RA-1 and RA-2. A subtle groundwater ridge or high is evident in the vicinity of well CMP-10 on all the Fill Aquifer contour maps. This high extended northeastward beneath RA-5 in December 2001, and again in December 2003.

Fill Aquifer flow was not characterized beneath the northern, EPA-regulated portion of RA-4 during this study. The slurry wall installed along the seaward portion of this area effectively prevents discharge of groundwater through the Fill Aquifer, thereby creating a stagnation zone which would divert groundwater to the northeast and northwest, to discharge points adjacent to RA-4 along Elliott Bay. *The Upland Groundwater Remedy 2003 Annual Monitoring Report* (Retec, 2004) for RA-4 concluded that Fill Aquifer groundwater with the RA-4 slurry wall was stagnant, and that there was essentially no Fill Aquifer flow around the ends of the walls.

7.2.1.2 Horizontal Flow Gradient

Calculated groundwater gradients in the Fill Aquifer during the monitoring period were as high as 0.01 feet per foot in the winter beneath RA-3, and as high as 0.005 feet per foot beneath the southern portion of RA-1. These relatively high gradients suggest that recharge via infiltrating precipitation is occurring in uplands bordering these areas. Gradients were generally much lower beneath the main portion of the site, with calculated values of less than 0.001 feet per foot beneath the southern part of the Old Terminal 5 area in December 2003 (Figure 7.10). These low groundwater gradients indicate that once Fill Aquifer groundwater enters the site and moves beneath the Old Terminal 5 area and RA-5, groundwater flows very slowly to eventual discharge points along the West Waterway and Elliot Bay. In the area north of RA-3 and west of the RA-4 slurry wall, somewhat higher gradients suggest Fill Aquifer flow groundwater flows more rapidly to Elliot Bay in this area.

7.2.2 Estuarine Aquifer

Averaged groundwater elevation contour maps of the Estuarine Aquifer over the monitoring period are presented on Figures 7.12 through 7.15. To facilitate comparison of pre- and post-redevelopment groundwater flow conditions in the Estuarine Aquifer, a map representing pre-redevelopment (1994) average Estuarine Aquifer groundwater flow conditions is presented sequentially in Figure 7.16. The Estuarine Aquifer groundwater flow conditions for the monitoring period, and comparison to pre-redevelopment conditions (1994), are described below.

7.2.2.1 Flow Direction

Figures 7.12 through 7.15, depicting post-redevelopment groundwater flow condition in the Estuarine Aquifer, indicate that groundwater in the Estuarine Aquifer generally flows

from the southwest toward the northeast, with discharge to Elliot Bay and the West Waterway. As with the Fill Aquifer, recharge for the portion of the Estuarine Aquifer flowing beneath the site is primarily in the West Seattle Highlands to the west of Harbor Avenue. No significant post-redevelopment seasonal changes in Estuarine Aquifer flow conditions are noted. Comparison of current conditions to Figure 7.16, depicting pre-redevelopment flow conditions, confirms that current Estuarine Aquifer groundwater flow is similar to post-redevelopment conditions.

Estuarine Aquifer flow was not characterized beneath the northern, EPA-regulated portion of RA-4 during this study. The slurry wall installed along the seaward portion of this area extends to a depth of approximately 50 feet bgs. Given this depth of installation, it is likely that flow through the upper portion of the Estuarine Aquifer is diverted to northeast and northwest around a stagnation zone created by the slurry wall.

7.2.2.2 Horizontal Flow Gradient

Calculated groundwater gradients in the Estuarine Aquifer were as high as 0.004 feet per foot in the northern portion of the site north of RA-3. Gradients in the central portion of the site appear considerably lower, with typical values of 0.001 feet per foot or less beneath the northern end of the Old Terminal 5 Area and RA-5. Current Estuarine Aquifer groundwater gradients at the site are generally comparable to pre-redevelopment gradients (see Figure 7.16).

7.3 Vertical Groundwater Gradients

Vertical gradients calculated from monitoring data collected from the Fill/Estuarine Aquifer well pairs during the current study are presented as monthly averages in Figure 7.17. Post–redevelopment vertical gradients between the Fill and Estuarine Aquifers were generally weakly downward at most locations monitored, with monthly average magnitudes of approximately 0.01 feet per foot. A maximum monthly average downward vertical gradient of 0.027 feet per foot was recorded at well pair the MW-307 well pair in March 2002. Periodic upward vertical gradients were also observed at the MW-307 and MW-308 well pairs located north of RA-3. Vertical gradient was weakly upward in the MW-308 well pair in late 2002 and early 2003, and more strongly upward in the MW-307 well pair from August 2002 through April 2003, and again from July through November 2003. Monthly average upward gradients in the MW-307 well pair exceeded 0.02 feet per foot in late 2002. The period of upward vertical gradients recorded in the MW-307 and MW-308 well pairs appears to correlate to times of higher than average tides (see Figure 7.17), when higher average induced tidal pressure resulted in increased average heads in the confined Estuarine Aquifer.

7.4 LFOL Flow and Water Quality Data

Calculated average flows measured at each station in the LFOL during the late July 2004 monitoring event ranged from 99 gpm to 107 gpm. These estimates are very close to reported average discharges of 101 gpm into the LFOL between July 28 and 30, 2004, as reported by Nucor Steel (Jeremy Adams, Nucor, personal communication, 2004).

The results of the water quality samples collected from the LFOL are presented in Table 6.3. These data were further evaluated by plotting the laboratory-reported data for each sampling station on a standard trilinear Piper diagram. This diagram is included as Figure 7.18. The sodium and chloride results confirm an increasing seawater component in samples collected progressively closer to the outfall. The Piper diagram confirms this increasing saltwater component, with the plotted samples from the Manhole MH-4 and MH-7 stations converging on the seawater standard. The Piper diagram suggests that seawater mixing with the Nucor Steel baseflow adequately accounts for the compositional changes noted along the course of the LFOL. No additional inputs to inline flow, such as groundwater or storm water discharges, are indicated in the LFOL flow and water quality data collected during this study.

The LFOL water quality data, and similarity between metered Nucor discharge and measured LFOL flow, confirm that during the dry summer months, the NUCOR discharge is the primary source of baseflow to the LFOL. The flow and water quality data collected from the LFOL during this study do not indicate the presence of significant groundwater leakage into the LFOL.

8 Comparison of Pre- and Post-Redevelopment Hydrologic Conditions

8.1 Fill Aquifer

Only one historic study of the site, the *Woodward Clyde Tidal Study Report* (1994), presents tidally-averaged groundwater flow conditions that can be directly compared to current conditions documented in this study. Many other RA-specific pre-redevelopment studies were completed, but these generally focus on soil and groundwater chemistry, and contain only localized (individual RA-specific), limited groundwater elevation data. The averaged pre-redevelopment Fill Aquifer flow conditions for early April 1994 documented in the *Tidal Study Report* (Woodward Clyde, 1994) are shown in Figure 7.11. These condition contrast markedly with post-redevelopment averaged Fill Aquifer groundwater flow conditions (see Figures 7.7 through 7.10) largely due to tightening of the LFOL.

The major change in Fill Aquifer groundwater flow following SWHP redevelopment is the hydraulic influence from the LFOL. The pre-redevelopment April 1994 data indicate that the LFOL's former upper (south) and lower (north) equalization basins acted as strong hydraulic "sinks" in the Fill Aquifer under mean water level conditions (Figure 7.11). Consequently, the mean groundwater flow directions in the Fill Aquifer were locally toward the LFOL within much of RA-2 and RA-3 and the southern portion of RA-4, and the western portion of the original Terminal 5 area. The post-redevelopment data collected during this study confirm that closure of the former equalization basins and tightlining of the LFOL across the SWHP has substantially reduced or eliminated the tidal influence within the Fill Aquifer along the LFOL. Under post-redevelopment conditions, Fill Aquifer water levels are above the elevation of the top of the LFOL throughout the course of the year (see Figure 3.1), and the LFOL appears to have negligible influence on groundwater elevations, hydraulic, gradients, and resulting groundwater flow directions. The extensive groundwater lows observed around the former equalization basins in the 1994 tidal study are absent under post-redevelopment conditions. Site wide, the pervasive pre-redevelopment hydraulic gradient toward the LFOL has been eliminated by tightlining the LFOL.

The *Tidal Monitoring Study Report* (Aspect Consulting, 2002b) suggested the possibility of a weak groundwater low centered around the location of the former lower (north) equalization basins in April 2002, which could act as a weak hydraulic sink. However, the maps of averaged Fill Aquifer flow presented in this report, prepared at high and low water periods over the course of the study, do not show a significant groundwater sink in the vicinity of the lower (north) equalization basins. Additionally, the LFOL inspection and flow data collected in July 2004 do not indicate significant groundwater leakage into the LFOL in this area. It is likely that the groundwater sink observed around the former lower (north) equalization basins in April 2002 was related to transient interactions between the Fill and Estuarine Aquifers, rather than communication between the Fill

Aquifer and the LFOL. Cross-aquifer flow may result from thinning of the tidal marsh aquitard in the area of the former lower (north) equalization basins, as shown on the Figure 3.1. The lack of an effective aquitard near the former lower (north) equalization basins is supported by the observed elevated salinities during the winter months in wells CMP-11, CMP-12 and CMP-13. Landward movement of saline water through the Fill Aquifer to this area is not indicated by the lower salinity levels observed in more seaward fill Aquifer wells (i.e., MW-308N). The cause of the periodic salinity increases in wells around the former lower (north) equalization basins is best explained through periodic upward movement of deeper, seawater-enriched groundwater from the Estuarine Aquifer.

A weak groundwater high is periodically present in Fill Aquifer in the area of low horizontal gradient that extends from RA-5 southwestward through the northwestern portion of the Old Terminal 5 Area. This feature appears strongest in the late summer/fall months, when site-wide average water levels are lowest. April 1994 averaged water level contours (see Figure 7.11) suggest that this weak groundwater high was also present beneath RA-5 prior to site redevelopment. This groundwater high or ridge may result from the presence of buried bulkheads or other structures generally known to exist in this area (Enviros, 1992), and/or the presence of finer grained soils. These factors could result in delayed drainage (and consequently higher water levels) in this area during the summer and fall, when overall Fill Aquifer water levels are at seasonal lows.

Pre-redevelopment Fill Aquifer horizontal groundwater gradients were greater than post-redevelopment gradients both beneath the RA-3 and the southern portion of RA-1, where recharge enters the site from adjacent uplands, as well as within the central portion of the site in the vicinity of the former upper (south) equalization basins. In April 1994 (Woodward Clyde, 1994), horizontal gradients beneath RA-3 (see Figure 7.11) were on the order of 0.02 feet per foot, which are approximately twice the highest gradient of 0.01 feet per foot observed in this area during December 2001 (see Figure 7.7). Historic horizontal gradients as high 0.07 feet per feet were recorded in Fill Aquifer along the west side of the former upper (south) equalization basins in 1994. These historic horizontal gradients where much higher that the current Fill Aquifer horizontal gradients, which range from 0.005 feet per feet to less than 0.001 feet per feet.

Water quality parameter data collected during this study shed additional light on post-redevelopment flow conditions. In particular, increasing salinity levels noted during this study in the Fill Aquifer wells along the northern portion of RA-5 suggest continued landward movement of salt water into the Fill Aquifer between early 2002 and late 2003. Measured increases in Fill Aquifer groundwater temperature suggest ongoing equilibration of the Fill Aquifer to the post-redevelopment reduction in recharge of incident precipitation. pH levels in well CMP-4 show an increasing trend through the monitoring period suggestive of an ongoing reduction in impacts from refuse beneath RA-3.

In summary, the monitoring data collected during this study confirm that the SWHP redevelopment activities, including capping of a large portion of the site (and historical contaminant source areas), and the change in the LFOL configuration, have had a significant effect on the Fill Aquifer flow regime. The major change in Fill Aquifer groundwater flow resulting from the SWHP redevelopment is the apparent elimination of the pre-redevelopment hydraulic influence of the former equalization basins along the

LFOL. The pre-redevelopment data indicate that the LFOL's former upper (south) and lower (north) equalization basins acted as strong hydraulic sinks in the Fill Aquifer under mean water level conditions. As a result, the mean groundwater flow directions in the Fill Aquifer were toward the LFOL within much of RA-2 and RA-3 and the southern portion of RA-4, and the western portion of the original Terminal 5 area. Prior to the SWHP redevelopment, groundwater flow in the Fill Aquifer beneath the western and central portions of the SWHP was generally toward the LFOL, which served as a significant groundwater discharge pathway to surface water.

Closure of the former equalization basins and tightlining of the LFOL has effectively eliminated inland propagation of the tidal influence within the Fill Aquifer, as well as Fill Aquifer discharge through the LFOL. Additionally, capping of RA-3 has reduced precipitation recharge and appears to have resulted in lower groundwater elevations and reduced horizontal gradients beneath this area, with a subsequent reduction in groundwater flux through this area into the central portion of the site. Fill Aquifer groundwater under post-redevelopment conditions flows onto the site from recharge areas to the west and south, and then diverges radially to the north and east and discharges along the West Waterway and Elliot Bay. The presence of the slurry wall along the perimeter of RA-4 prevents Fill Aquifer discharge beneath this area, and shallow groundwater flowing north is redirected to discharge Elliot Bay east or west of RA-4. Overall, flow path lengths for Fill Aquifer groundwater are markedly increased over pre-redevelopment conditions, resulting in longer residence times for groundwater migrating across the site to discharge points along the West Waterway and Elliot Bay.

8.2 Estuarine Aquifer

The data collected from the Estuarine Aquifer monitoring wells during this study confirm that the pre-redevelopment groundwater flow directions have not changed appreciably as a result of the SWHP redevelopment. Groundwater in the Estuarine Aquifer continues to flow generally from the southwest toward the northeast, with discharge to Elliot Bay and the West Waterway. Mean groundwater flow directions are generally consistent between pre- and post-redevelopment conditions. In the northern portion of RA-4, it is likely that flow through the upper portion of the Estuarine Aquifer is diverted to northeast and northwest around a stagnation zone created by the slurry wall. Current Estuarine Aquifer groundwater gradients at the site are generally comparable to the pre-redevelopment gradients.

9 Summary of Findings

The Phase I GWCMP has successful satisfied the general intent of all project objectives identified in the *Monitoring Plan*. A site-wide monitoring network consisting of 25 Fill Aquifer and five Estuarine Aquifer monitoring wells, and several surface water monitoring stations in the LFOL was constructed, and adequate groundwater elevation, tidal influence, and water quality parameter data collected to define the post-redevelopment, site-wide groundwater flow regime

Confirmation of the expected post-redevelopment reduction in Fill Aquifer recharge at the site was documented through several lines of evidence, including a decline in groundwater elevations, especially beneath RA-3, and in the southern portion of RA-1 adjacent to recharge areas to the south. Also, site-wide increases in groundwater temperatures over the course of the monitoring period suggest a reduced component of direct infiltration.

Confirmation of anticipated post-redevelopment reductions in downward vertical gradients was somewhat hampered by limited available historic data with which to make direct comparison. This limitation notwithstanding, post-redevelopment vertical gradients between the Fill and Estuarine Aquifers were generally weakly downward except in the area between the northern end of RA-3 and Elliot Bay, where upward gradients were present for extended periods in both 2002 and 2003.

This study has adequately characterized the effect that closing of the former LFOL equalization basins and tightlining the LFOL has had on Fill Aquifer flow conditions. Inland tidal influence along the former equalization basins has been eliminated, and the LFOL currently appears to have little or no effect on the Fill Aquifer flow regime. Fill Aquifer groundwater no longer discharges to the LFOL through the former equalization basins, but instead flows north and east across the site along much longer flow paths, eventually discharging along the West Waterway and Elliot Bay. Post-redevelopment Fill Aquifer water levels beneath the main portion of the site could not be directly compared to historic data, due to a lack of available data and the complicating effect of the former equalization basins. However, pre-development Fill Aquifer horizontal gradients recorded in the vicinity of the former equalization basins were as much as an order of magnitude higher than average post-redevelopment gradients, indicating that groundwater discharge rates, especially for water flowing beneath RA-3, were considerably higher under pre-redevelopment conditions, when much of the Fill Aquifer "short circuited" into the former equalization basins and out the LFOL. Under post-redevelopment conditions, the low horizontal Fill Aquifer gradients beneath RA-5 and the old Terminal 5 area confirm that shallow groundwater water is moving very slowly towards the West Waterway and Elliot Bay.

The expected post-redevelopment reduction in leachate generation from the former West Seattle Landfill (RA-3) can be demonstrated through several lines of evidence. Reduced precipitation infiltration through the solid waste is evidenced by the generally lower post-redevelopment groundwater elevations and horizontal gradients beneath RA-3 recorded

during this study. Additionally, generally increasing pH levels in well CMP-4 along the eastern margin of RA-3 suggest that lower water levels beneath RA-3 are resulting in decreased water quality impacts from saturated refuse.

10 Phase II Water Quality Monitoring Program

The findings of the Phase I GWCMP indicate that overall Fill Aquifer flow conditions at the site have equilibrated sufficiently to proceed with water quality evaluation. Continued equilibration of Fill Aquifer water quality is possible into the future, since aquifer residence times are high and it may take an extended period of time for groundwater representative of pre-redevelopment conditions to flush from the site. However, given that flow conditions at the site appear to have stabilized, it is appropriate to initiate the Phase II evaluation of site groundwater quality.

The Phase II evaluation will involve sampling of selected wells twice yearly for three years, as stipulated in the *Groundwater Conceptual Letter* (Port of Seattle, 1999). Complete documentation of the recommended monitoring locations, analytical program (as specified in the *Groundwater Conceptual Letter)*, sampling schedule, sampling procedures, and sample handling/management will be provided in a comprehensive GWCMP Phase II Monitoring Plan. The GWCMP Phase II Monitoring Plan will be submitted for Ecology review and approval prior to the initiation of the Phase II groundwater monitoring.

11 References

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Limitations

Work for this project was performed and this report prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Port of Seattle for specific application to the referenced property. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

Table 4.1
Summary of Monitoring Program Objectives and Findings
SWHP Phase 1 Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

PROJECT OBJECTIVE	OBJECTIVE STATUS	FINDINGS TO DATE
Objective #1 - Implement a site-wide ground water monitoring network to establish the SWHP post-development flow regime and support development of the Phase II ground water quality monitoring network, including assisting in defining compliance points.	Objective accomplished.	Site-wide monitoring network installed and 2 years of water level and water quality parameter monitoring completed.
Objective #2 - Document post-development assumption of reduced recharge to Fill and Estuarine Aquifers.	Objective accomplished. Adequate hydrologic information collected to satisfy Objective #2.	Documented through several lines of evidence, including reduced groundwater levels, especially beneath RA-3 and in the southern portion of RA-2 and by site-wide increases in groundwater temperatures.
Objective #3 - Confirm post-development assumption of reduction in downward vertical gradient between Fill and Estuarine Aquifers.	Objective accomplished. Adequate hydrologic information collected to satisfy Objective #3.	Post-development vertical gradients between the Fill and Estuarine Aquifers were weakly downward except in the area between the northern end of RA-3 and Elliot Bay, where upward gradients were documented.
Objective #4 - Document post-development assumption of reduced discharge to the Elliot Bay and the West Waterway from the Fill Aquifer.	Objective accomplished. Adequate hydrologic information collected to satisfy Objective #4.	Lower post-redevelopment Fill Aquifer water levels and reduced horizontal gradients, coupled with lack of discharge "short-circuiting" through the LFOL, confirm reduced post-redevelopment groundwater discharge from the site.
Objective #5 - Document post-development assumption that LFOL repair and closing of equalization basins has resulted in reduced discharge of the Fill Aquifer through or around the LFOL. Determine the post-development effect of the LFOL on the SWHP ground water system.	Objective accomplished. Adequate hydrologic information collected to satisfy Objective #5.	Tightling of LFOL appears to have resulted in elimination of groundwater discharge to the LFOL. In-line flow rate monitoring and water quality data indicate LFOL is not receiving significant groundwater leakage.
Objective #6 - Document assumed post-development reduction in leachate production from RA-3, and subsequent reduction in leachate loading to the Fill and Estuarine Aquifers.	Objective accomplished. Adequate hydrologic information collected to satisfy Objective #6.	Documented significant post-redevelopment reduction in Fill Aquifer water levels beneath RA-3, resulting in reduced saturated refuse thickness. Upward pH trend in well CMP-4 downgradient of RA-3 confirms reduced leachate generation.

Table 6.1
Summary of Phase I Monitoring Network
SWHP Phase 1 Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

Well Identification	Aquifer Unit	Installation Date	Total Boring Depth (feet bgs)	Screen Interval Depth (feet bgs)	Data Collection Method	General Site Location and Monitoring Purpose
CMP-1	Fill	9/19/2001	19	7 to 17	Manual	Upgradient of RA-2.
CMP-2	Fill	9/18/2001	19	7 to 17	8000	Upgradient of RA-2.
CMP-3	Fill	9/19/2001	17.5	6 to 16	8000	Downgradient of RA-2.
CMP-4	Fill	9/18/2001	17.5	7 to 17	8000	Upgradient of RA-1, downgradient of RA-3.
CMP-5	Fill	10/29/2001	19	5 to 15	Manual	Upgradient of RA-3.
CMP-6	Fill	9/18/2001	17.5	7 to 17	8000	Downgradient of RA-1 and RA-3, paired with Estuarine Aquifer well CMP-7.
CMP-8	Fill	9/18/2001	19	7 to 17	8000	Downgradient of RA-1 and RA-3.
CMP-9	Fill	9/18/2001	19	7 to 17	Manual	Downgradient of RA-1 and RA-3.
CMP-10	Fill	9/19/2001	16.5	5 to 15	Manual	Downgradient of RA-1, RA-3, and RA-4.
CMP-11	Fill	9/17/2001	19	6 to 16	8000	Downgradient of RA-1 and RA-3, LFOL north-south transect well.
CMP-12	Fill	9/17/2001	19	6 to 16	8000	Downgradient of RA-1 and RA-3, LFOL north-south transect well.
CMP-13	Fill	9/17/2001	19	6 to 16	8000	Downgradient of RA-1 and RA-3, LFOL north-south transect well.
CMP-14	Fill	11/5/2001	17	6.5 to 16.5	8000	Downgradient of RA's 1, 3, and 4, paired with Estuarine Aquifer well MW-36.
CMP-15	Fill	11/5/2001	17.4	7 to 17	Manual	Downgradient portion of RA-5.
CMP-16	Fill	11/5/2001	17	6.2 to 16.2	4000	Downgradient portion of RA-5.
CMP-17	Fill	11/6/2001	16.5	6 to 16	Manual	Downgradient of RA-1.
CMP-18	Fill	4/2/2003	19	7 to 17	MiniTroll	In old Terminal 5 Area, downgradient of RA's 1, 2, and 3.
CMP-19	Fill	4/2/2003	19	7 to 17	MiniTroll	In old Terminal 5 Area, downgradient of RA's 1, 3, and 4.
CMP-20	Fill	4/2/2003	19	7 to 17	MiniTroll	In old Terminal 5 Area, downgradient of RA's 1, 3, and 4.
MW-26R	Fill	11/6/2001	17	6.5 to 16.5	8000	Downgradient of RA-5, paired with Estuarine Aquifer well MW-44.
MW-5	Fill	8/3/1989	25	5 to 25	Manual	Downgradient of RA-5.
MW-125	Fill	5/13/1994	16.5	5 to 15	Manual	Downgradient of RA-1.
MW-307A	Fill	4/7/1994	26.5	15 to 20	8000	Cross/downgradient of RA-3, paired with MW-307-B, LFOL north-south transect well.
MW-308N	Fill	4/5/1994	21.5	12.5 to 17.5	8000	Downgradient of RA-1 and RA-3, paired with Fill Aquifer well MW-308-S.
FM-105	Fill	9/29/1992	19	7 to 17	Manual	Upgradient of RA-1.
CMP-7	Estuarine	11/7/2001	49	37 to 47	4000	Downgradient of RA-1 and RA-3, paired with Fill Aquifer well CMP-6.
MW-307BR	Estuarine	11/9/2001	40	29 to 39	4000	Downgradient of RA-3, paired with Estuarine Aquifer well MW-307A.
MW-36	Estuarine	7/8/1990	73	58 to 73	4000	Downgradient of RA-1 and RA-3, cross/downgradient of RA-4, upgradient of RA-5, paired with MW-8.
MW-44	Estuarine	6/23/1992	78.5	59 to 74	4000	Downgradient in RA-5, paired with Fill Aquifer well MW-26.
MW-308S	Estuarine	4/6/1994	40	35 to 40	4000	Downgradient of RA-1 and RA-3, paired with Estuarine Aquifer well MW-308-N.

Table 6.2
Allowable Time Windows for LFOL Flow and Water Quality Sampling
July 2004 Sampling Event

SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Date	Lower-low Tide		MH-7		MH-4		MH-1	
	Time	Tide Level	Sampling Elevation - Low Tide	Time Window for Sampling	Sampling Elevation - Low Tide	Time Window for Sampling	Sampling Elevation - Low Tide	Time Window for Sampling
	(PDT)	(ft MLLW)	(ft)	(h:mm)	(ft)	(h:mm)	(ft)	(h:mm)
7/26/2004	6:42	0.32	-3.79	0:15	0.29	0:20	0.56	0:30
7/27/2004	7:48	-0.84	-2.63	0:15	1.45	1:10	1.72	1:25
7/28/2004	8:36	-1.89	-1.58	0:15	2.50	1:40	2.77	1:50
7/29/2004	9:36	-2.71	-0.76	0:15	3.32	1:55	3.59	2:00
7/30/2004	10:24	-3.22	-0.25	0:15	3.83	2:05	4.10	2:10
7/31/2004	11:18	-3.33	-0.14	0:15	3.94	2:05	4.21	2:10

Note:

Time window indicates allowable period for water sampling to occur at each location.

Table 6.3
Summary of LFOL Water Sample Analysis
SWHP Phase 1 Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

Chemical Name/Parameter	Sample Location, Designator and Date Collected		
	MANHOLE MH-1	MANHOLE MH-4	MANHOLE MH-7
	MH1-W-072804 07/28/04	MH4-W-072904 07/29/04	MH7-W-073004 07/30/04
Octasulfur in uS/cm	812	4360	8270
pH in pH Units	9.15	9.13	7.61
Total Dissolved Solids in mg/l	400	2000	4300
Total Suspended Solids in mg/l	4.0 U	4.0 U	400
Turbidity in NTU	1.00 U	2.6	157
Sulfate in mg/l	32.4	182	328
Chloride in mg/l	158	1300	2330
Total Alkalinity in mg/L as CaCO3	107	102	244
Ammonia-Nitrogen in mg/l as N	0.158	0.336	2.01
Nitrate/Nitrite-Nitrogen in mg/l as N	0.291	0.156	0.0318
Total Iron in mg/l	0.150 U	0.238	42.2
Total Potassium in mg/l	10.7	35.6	66
Total Sodium in mg/l	112	722	1380
Total Calcium in mg/l	31.1	45.8	111
Ferric Iron in mg/l	0.250 U	0.250 U	42
Total Magnesium in mg/l	12.3	80.8	166

Table 6.4
LFOL Channel Dimension Measurements and Flow Rate Calculations
SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

LFOL MH-1
Approximately 600' downstream from SW Spokane ST

Location (ft)	Depths (ft)	Adj. Depths (ft)	10' Travel Time (sec)
0.00	0.01	0.01	10
0.20	0.10	0.10	11
0.40	0.23	0.10	10
0.60	0.21	0.10	14
0.80	0.13	0.10	10
1.00	0.18	0.10	
1.20	0.10	0.10	
1.40	0.10	0.10	
1.60	0.18	0.18	
1.80	0.20	0.20	
2.00	0.22	0.22	
2.20	0.22	0.22	
2.40	0.25	0.25	
2.60	0.24	0.24	
2.80	0.19	0.19	
3.00	0.11	0.11	
3.20	0.01	0.01	
Width of Channel (ft)	**3.20**		
Average Depth (ft)		**0.14**	
Average Travel Time (s)			**11.0**
Velocity at Channel Surface (ft/s)			**0.91**
Average Channel Velocity (60% surface velocity) (ft/s)			**0.55**
Average Flow Rate (cfs)			**0.24**
Average Flow Rate (gpm)			**107**

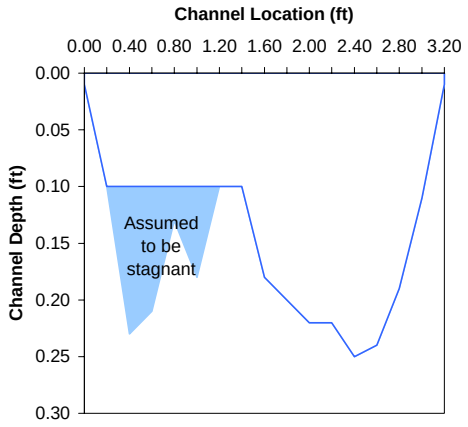
LFOL MH-4
Approximately 1400' downstream of MH-1

Location (ft)	Depths (ft)	10' Travel Time (sec)
0.00	0.05	12
0.40	0.10	11
0.80	0.12	11
1.20	0.14	11
1.60	0.12	11
2.00	0.14	
2.40	0.14	
2.80	0.15	
3.20	0.18	
3.60	0.00	
3.6		
	0.11	
		11.2
		0.89
		0.54
		0.22
		99

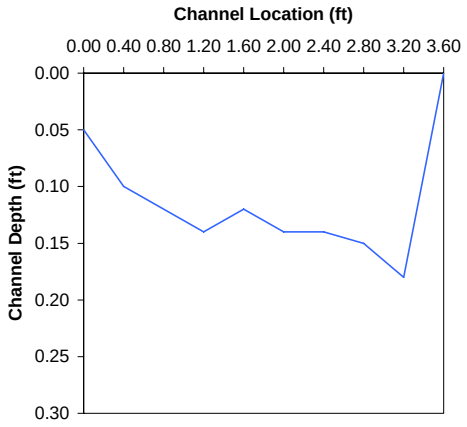
LFOL MH-7
Approximately 2050' downstream of MH-4

Location (ft)	Depths (ft)	10' Travel Time (sec)
0.00	0.00	12
0.40	0.25	8
0.80	0.20	9
1.20	0.18	9
1.60	0.20	9
2.00	0.16	
2.40	0.07	
2.80	0.04	
3.00	0.00	
3		
	0.12	
		9.4
		1.06
		0.64
		0.23
		105

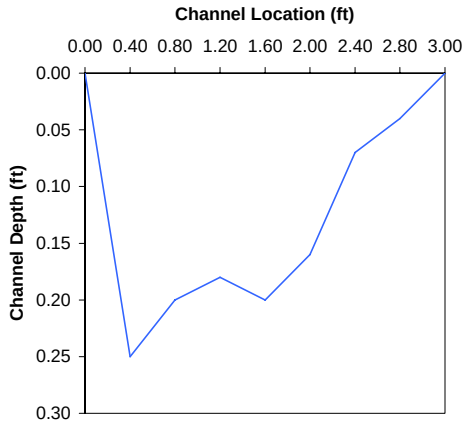
MH-1 Channel Profile

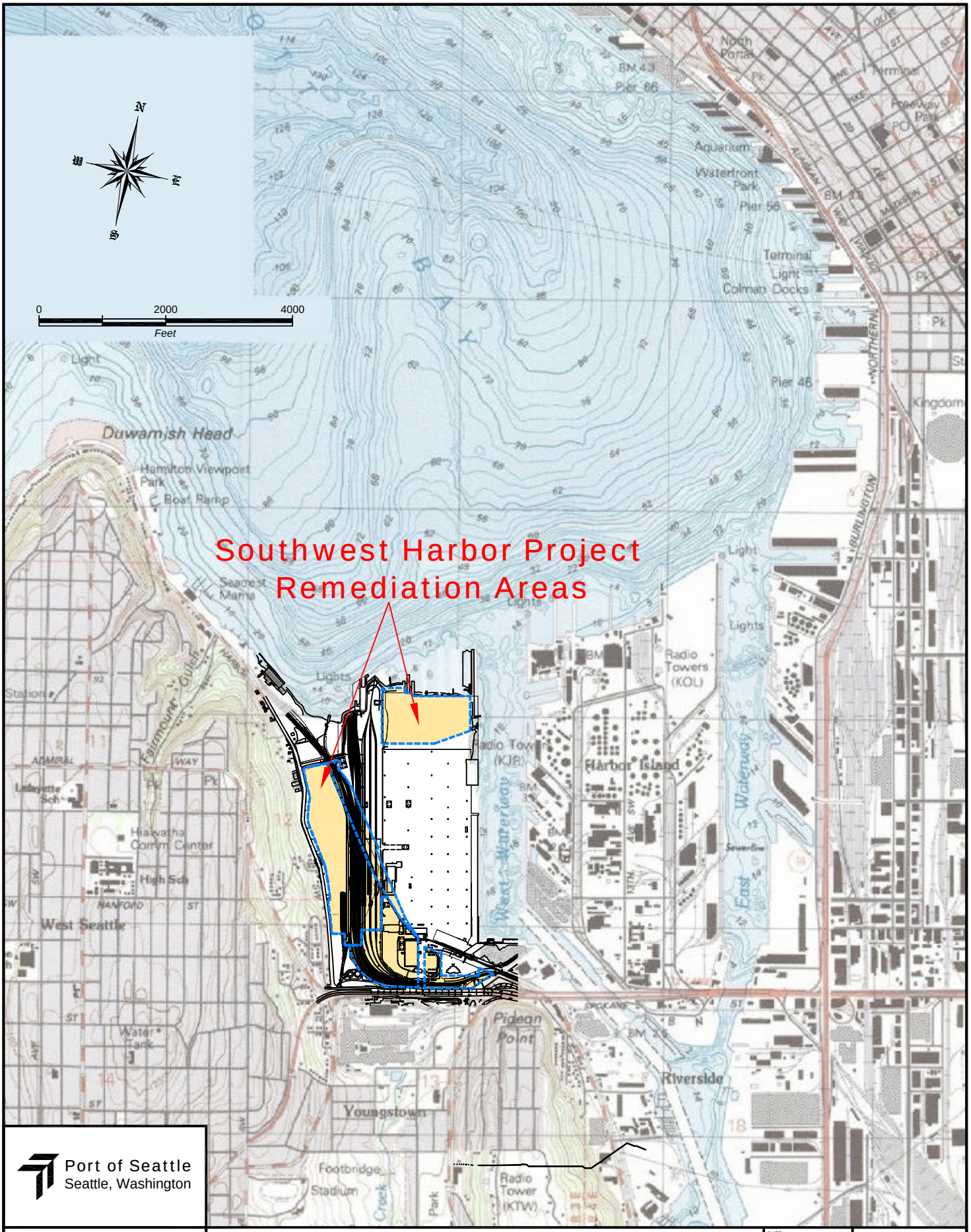


MH-4 Channel Profile



MH-7 Channel Profile





Port of Seattle
Seattle, Washington

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Site Vicinity Map

SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE: March 2005	PROJECT NO. 990106
DESIGNED BY: WVG	
DRAWN BY: JJR	FIGURE NO. 2.1
REVISED BY: SDM/PMB	

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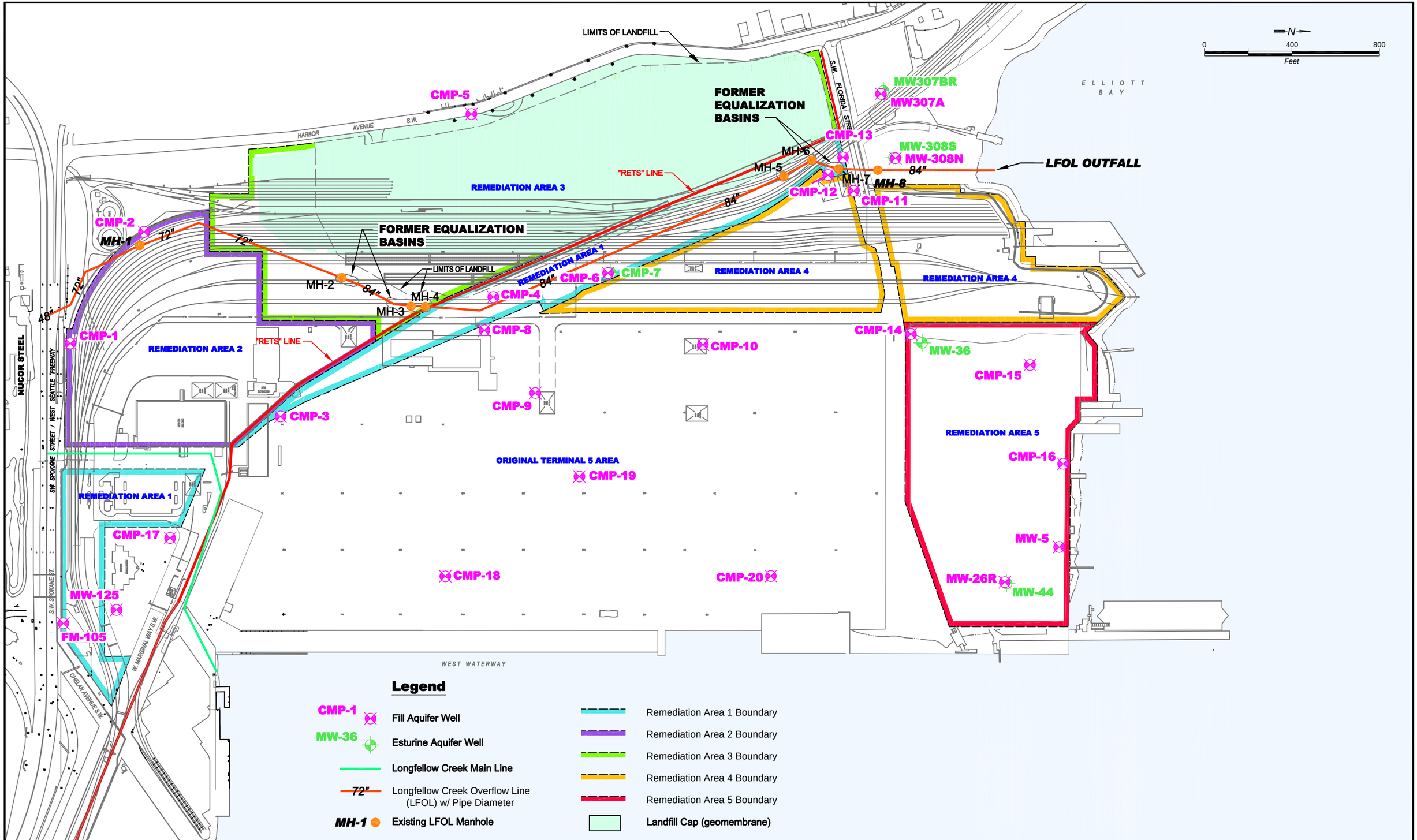

Legend

CMP-1	Fill Aquifer Well
MW-36	Esturine Aquifer Well
	Longfellow Creek Main Line
72"	Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
MH-1	Existing LFOL Manhole
	Remediation Area 1 Boundary
	Remediation Area 2 Boundary
	Remediation Area 3 Boundary
	Remediation Area 4 Boundary
	Remediation Area 5 Boundary
	Landfill Cap (geomembrane)

Survey Update 1/8/02

Ground Water Elevation Datum: MLLW

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Site Plan

SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE: March 2005	PROJECT NO. 990106
DESIGNED BY: WVG	
DRAWN BY: PMB	FIGURE NO. 2.2
REVISED BY: PMB	

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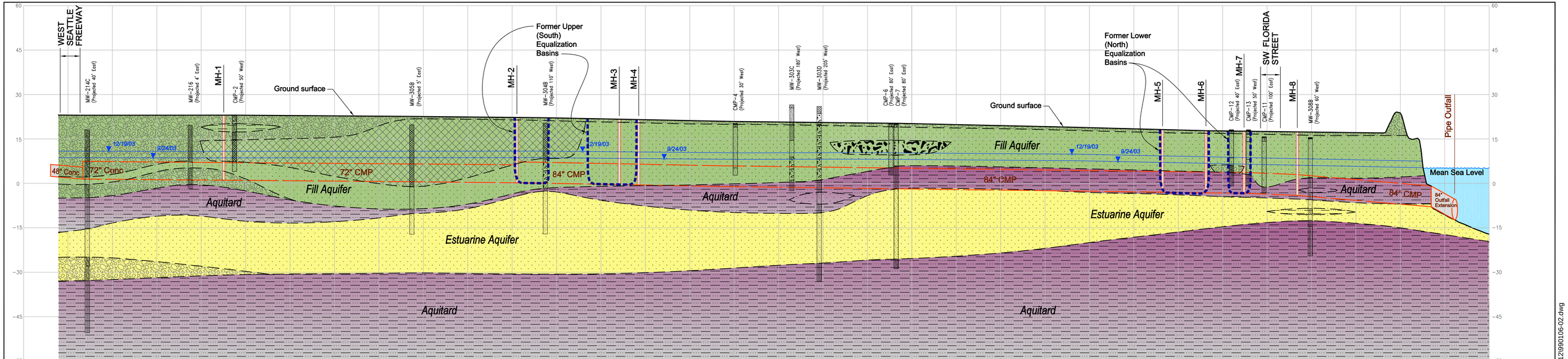

USCS Borehole Graphics

- USCS Well-graded Gravel
- Fill (made ground)
- Asphalt
- USCS Poorly-graded Sand
- USCS Silty Gravel
- USCS Poorly-graded Gravel
- USCS Silty Sand
- USCS Silt
- Refuse

Hydrologic Units and Generalized Soil Types

- Silt, Sandy Silt, Silty Sand
- Sand, Gravelly Sand
- Gravel, Sandy Gravel, Silty Gravel
- Refuse
- Slag
- Fill Aquifer
- Estuarine Aquifer
- Aquitard

LFOL Construction

48" Conc 72" CMP

Conc = Concrete Pipe

CMP = Corrugated Metal Pipe

72 Hour Mean Fill Aquifer Water Levels

12/19/03 — Dec 19, 2003

9/24/03 — Sept 24, 2003

Profile

Scale: 1" = 150' Horiz
1" = 15' Vertical
Datum: MLLW

Note: Zones of refuse inferred to be present along line of section only in areas where refuse was noted in explorations located east of the line of section.

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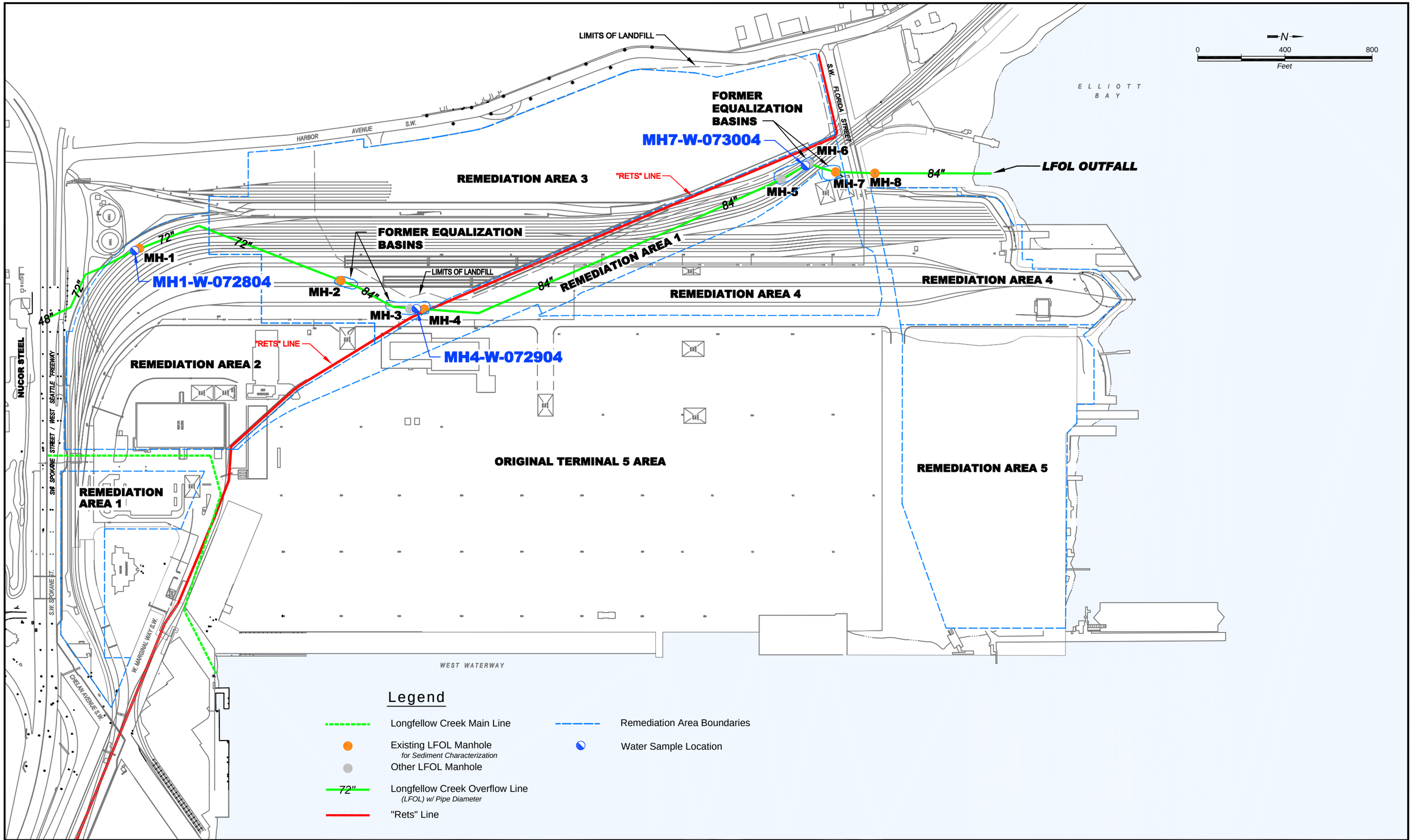
Schematic Cross-Section along LFOL

SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE:	PROJECT NO.
Dec 2006	990106
DESIGNED BY: WVG	
DRAWN BY: PMB	FIGURE NO. 3.1
REVISED BY: PMB	

Q:\PROS\990106 Terminal 5\2006-12\990106-02.dwg



Survey Update 1/8/02

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LFOL Water Quality and Flow Monitoring Stations

SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE: March 2005	PROJECT NO. 990106
DESIGNED BY: WVG	
DRAWN BY: PMB	FIGURE NO. 6.1
REVISED BY: PMB	

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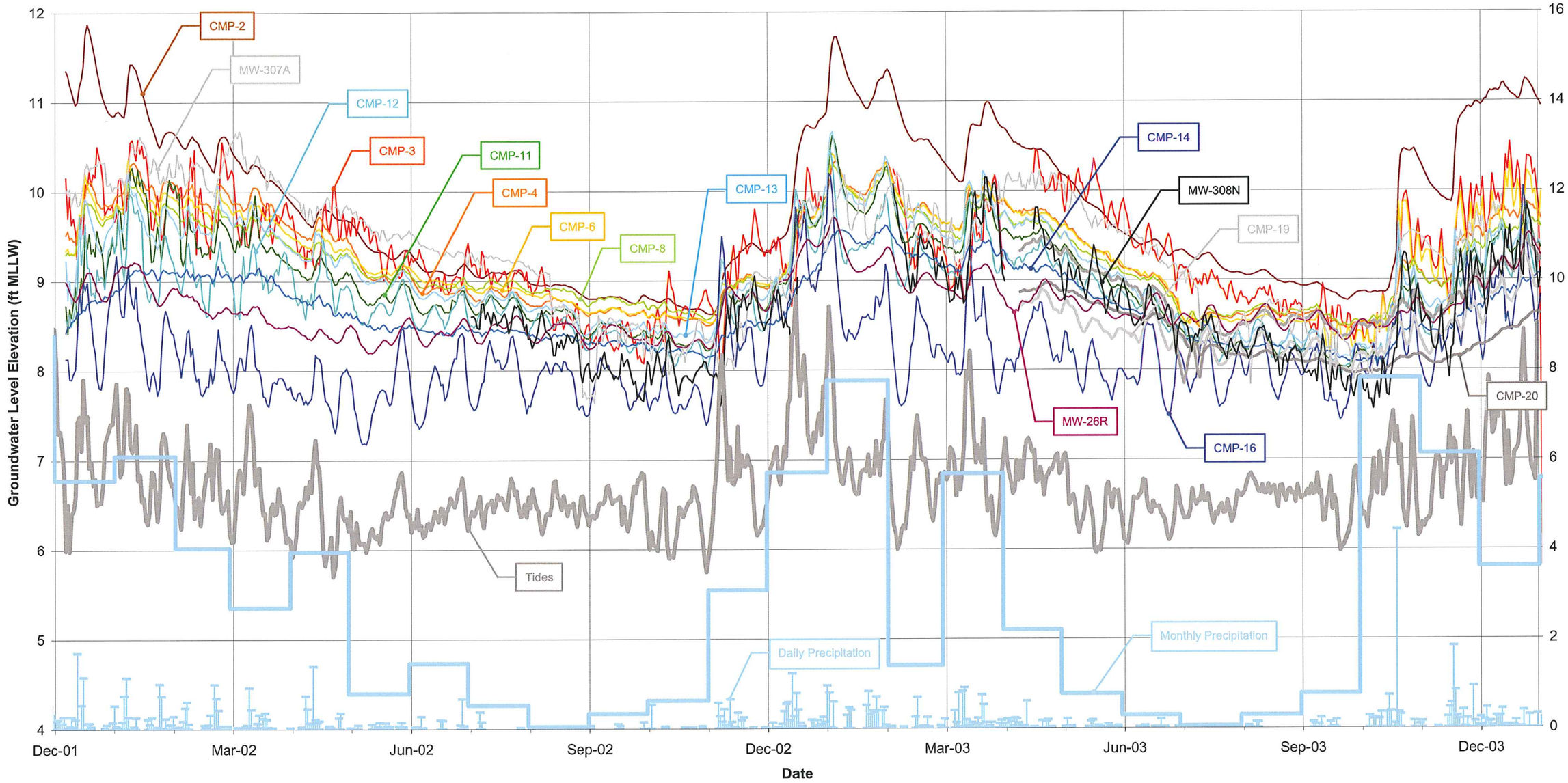
Q:\POS\990106 Terminal 5\2006-01 Hydrologic Characterization\Figure_7.1.dwg January 2007



Daily Average Ground Water Level in Fill Aquifer Wells
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

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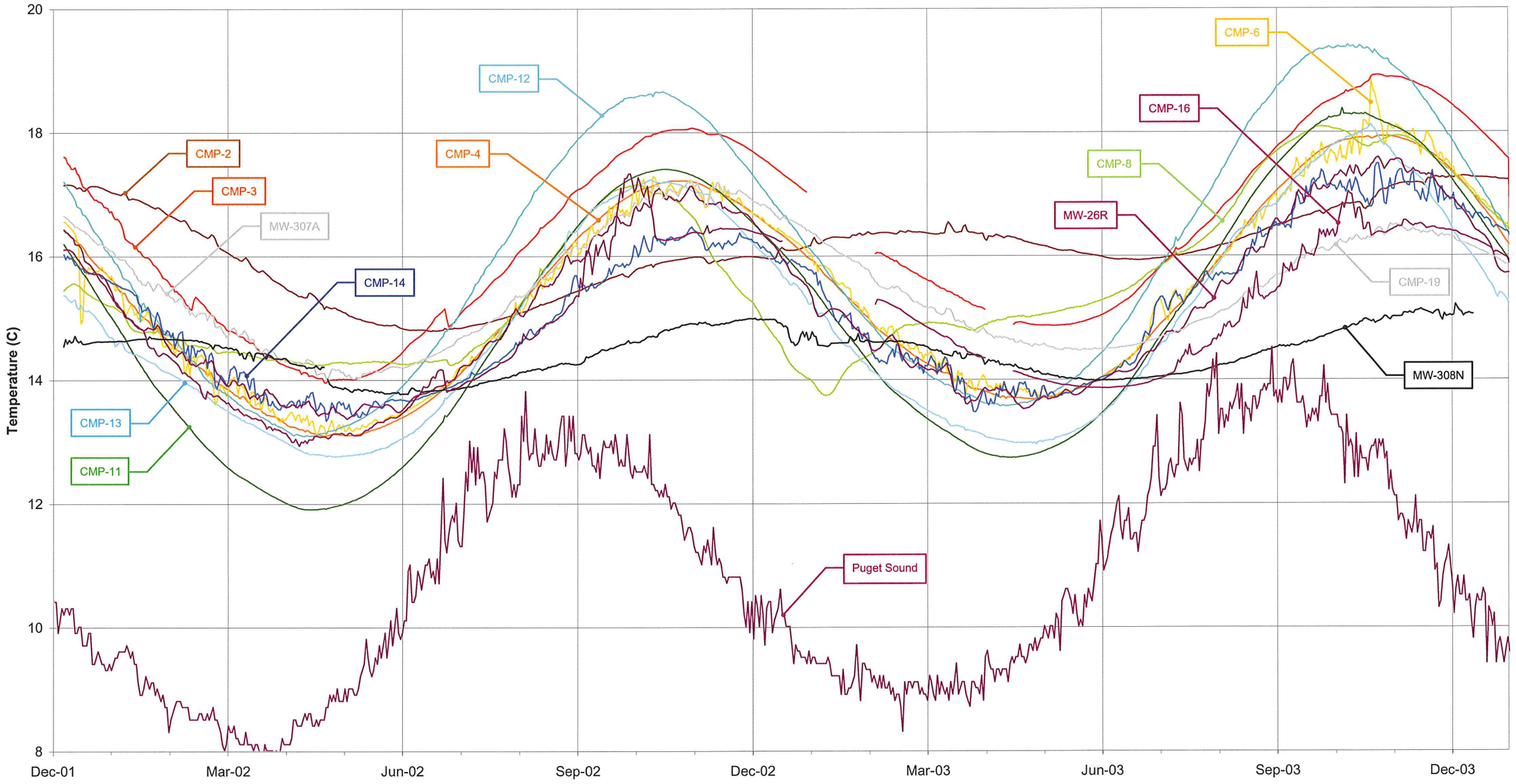
Figure 7.1

Q:\POS\990106 Terminal 5\2006-01 Hydrologic Characterization\Figure_7.2.dwg January 2007



Daily Average Temperature in Fill Aquifer Wells
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

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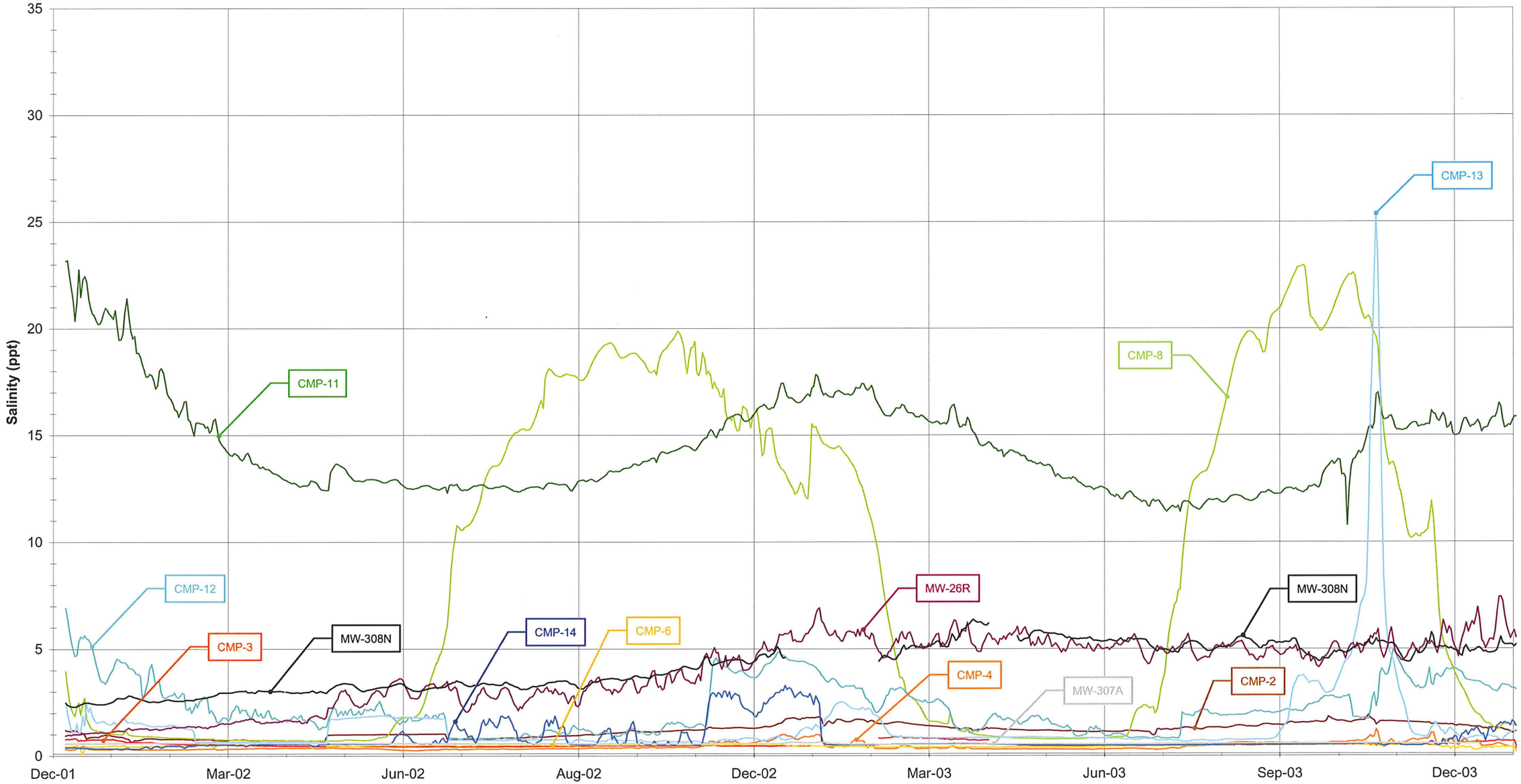
Figure 7.2

Q:\POS\990106 Terminal 5\2006-01 Hydrologic Characterization\Figure_7.3.dwg January 2007



Daily Average Salinity in Fill Aquifer Wells
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

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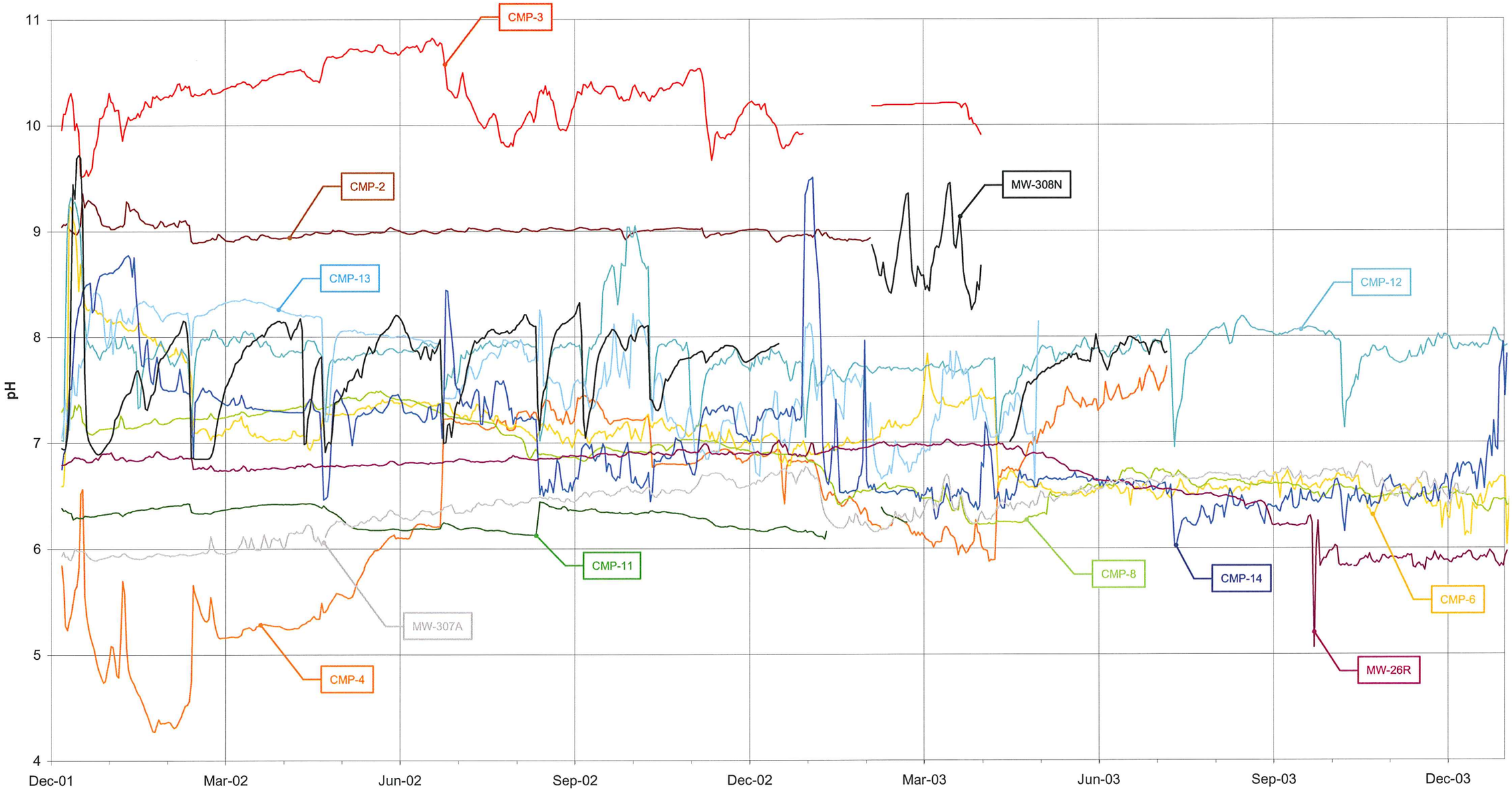
Figure 7.3

Q:\POS\990106 Terminal 5\2006-01 Hydrologic Characterization\Figure_7.4.dwg January 2007



Daily Average pH in Fill Aquifer Wells
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

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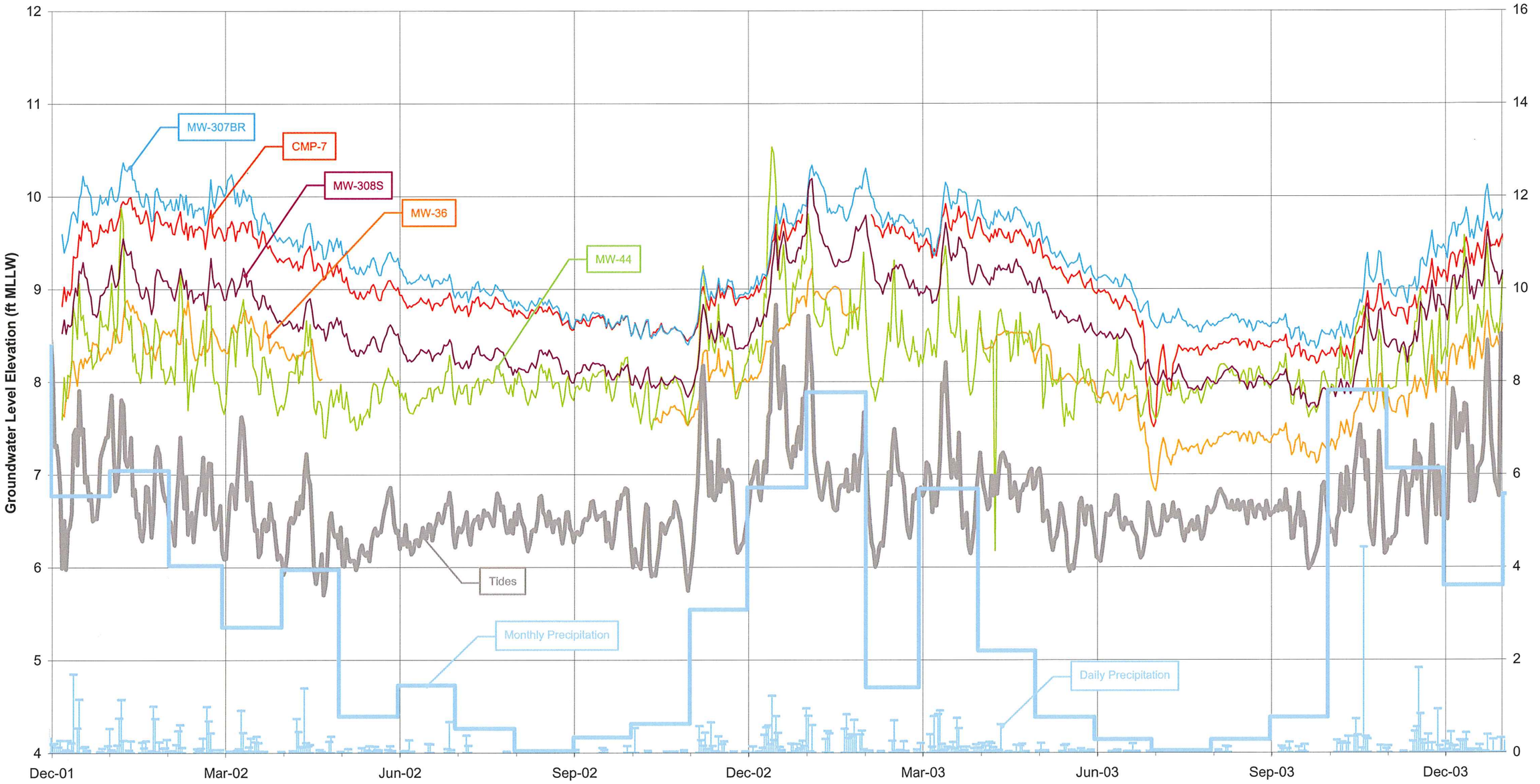
Figure 7.4

Q:\POS\990106 Terminal 5\2006-01 Hydrologic Characterization\Figure_7.5.dwg January 2007



Daily Average Groundwater Level Elevation in Estuarine Aquifer Wells
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

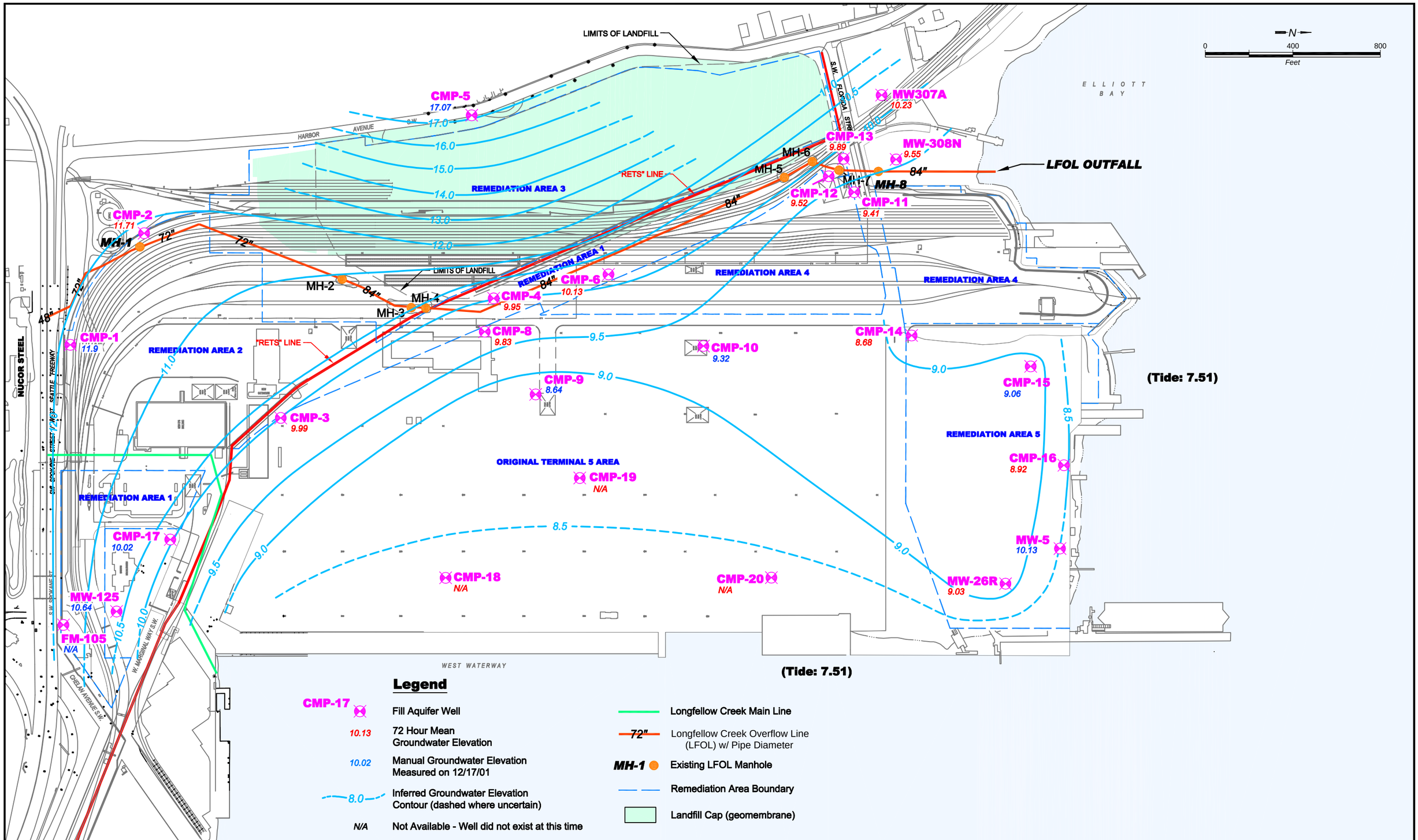
Figure 7.5

Q:\POS\990106 Terminal 5\2006-01 Hydrologic Characterization\Figure_7.6.dwg January 2007

Daily Average Temperature in Estuarine Aquifer Wells
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure 7.6



Legend

CMP-17	Fill Aquifer Well
10.13	72 Hour Mean Groundwater Elevation
10.02	Manual Groundwater Elevation Measured on 12/17/01
8.0	Inferred Groundwater Elevation Contour (dashed where uncertain)
N/A	Not Available - Well did not exist at this time
	Longfellow Creek Main Line
72"	Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
MH-1	Existing LFOL Manhole
	Remediation Area Boundary
	Landfill Cap (geomembrane)

Survey Update 1/8/02

Note: Manual data from MW-5 not used in contouring.

Ground Water Elevation Datum: MLLW

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Fill Aquifer Groundwater Elevation Contours
72 Hour Mean 12-17-01

SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE: March 2005	PROJECT NO. 990106
DESIGNED BY: WVG	
DRAWN BY: PMB	FIGURE NO. 7.7
REVISED BY: PMB	

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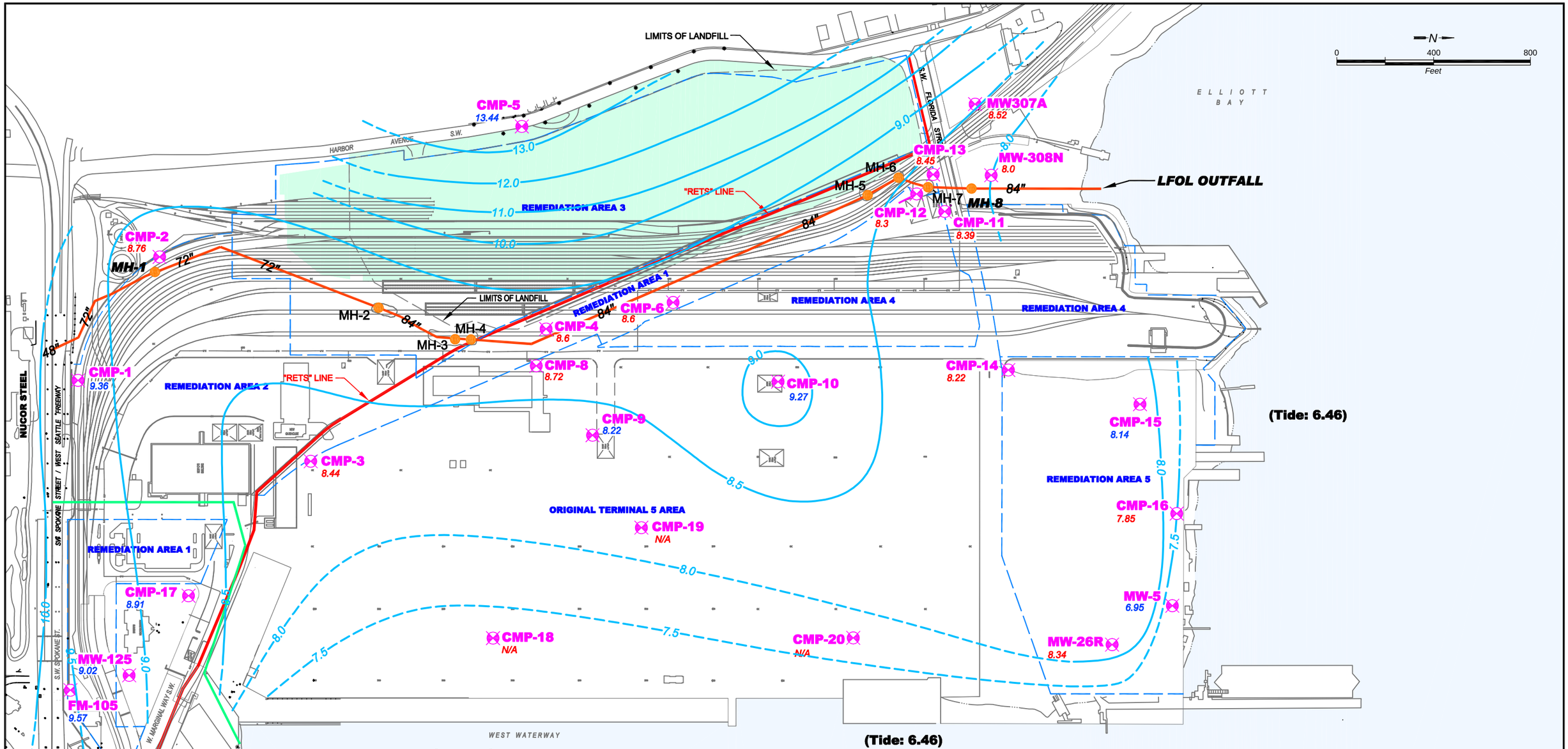

(Tide: 6.46)

Legend

CMP-17	Fill Aquifer Well
8.44	72 Hour Mean Groundwater Elevation
8.91	Manual Groundwater Elevation Measured on 10/08/02
8.0	Inferred Groundwater Elevation Contour (dashed where uncertain)
N/A	Not Available - Well did not exist at this time
	Longfellow Creek Main Line
72"	Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
MH-1	Existing LFOL Manhole
	Remediation Area Boundary
	Landfill Cap (geomembrane)

Survey Update 1/8/02

Note: Manual data from MW-5 not used in contouring.

Ground Water Elevation Datum: MLLW

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Fill Aquifer Groundwater Elevation Contours
72 Hour Mean 10-08-02

SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE: March 2005	PROJECT NO. 990106
DESIGNED BY: WVG	
DRAWN BY: PMB	FIGURE NO. 7.8
REVISED BY: PMB	

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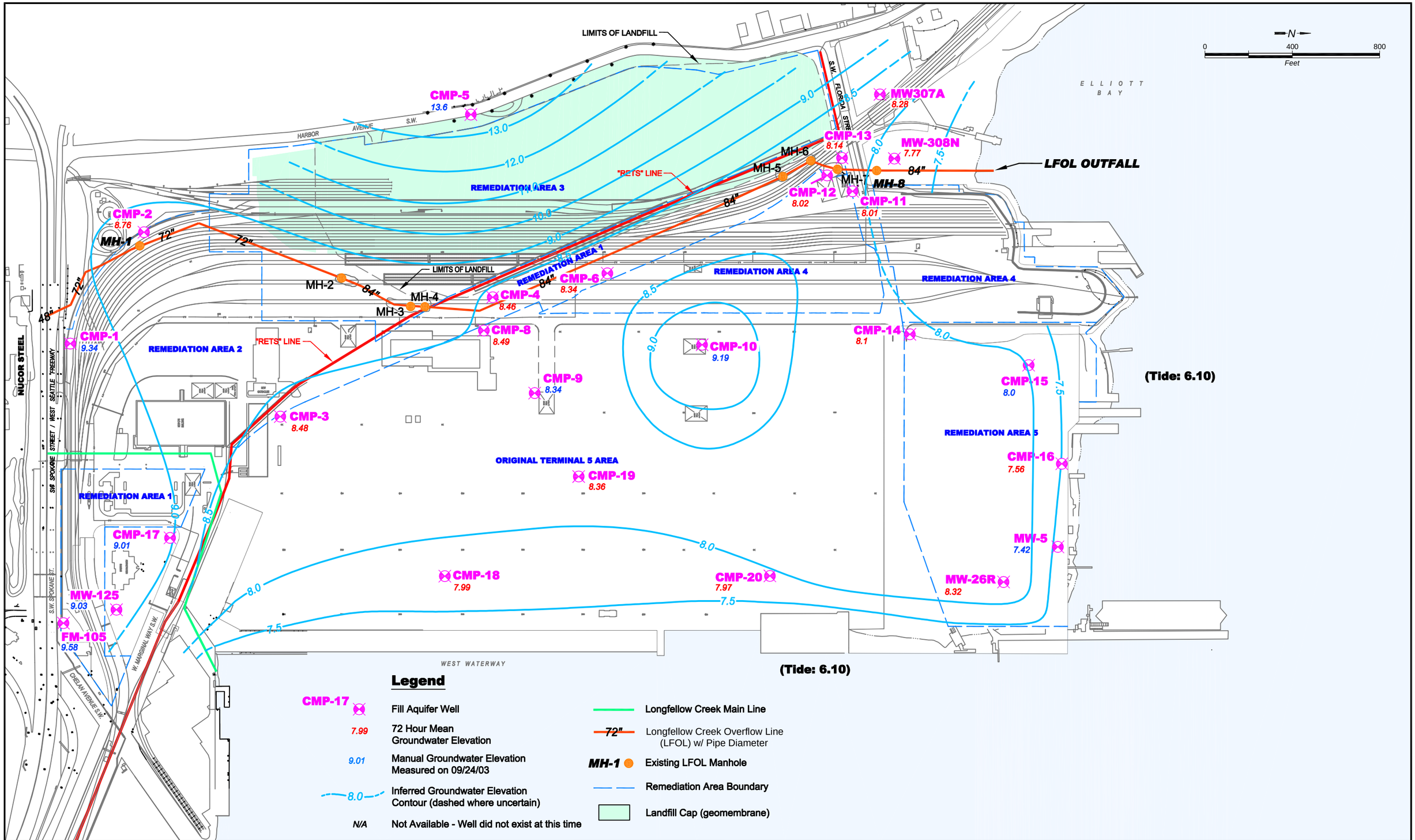

Legend

CMP-17	Fill Aquifer Well
7.99	72 Hour Mean Groundwater Elevation
9.01	Manual Groundwater Elevation Measured on 09/24/03
8.0	Inferred Groundwater Elevation Contour (dashed where uncertain)
N/A	Not Available - Well did not exist at this time
	Longfellow Creek Main Line
72"	Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
MH-1	Existing LFOL Manhole
	Remediation Area Boundary
	Landfill Cap (geomembrane)

Survey Update 1/8/02

Ground Water Elevation Datum: MLLW

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Fill Aquifer Groundwater Elevation Contours
72 Hour Mean 09-24-03

SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE: March 2005	PROJECT NO. 990106
DESIGNED BY: WVG	
DRAWN BY: PMB	FIGURE NO. 7.9
REVISED BY: PMB	

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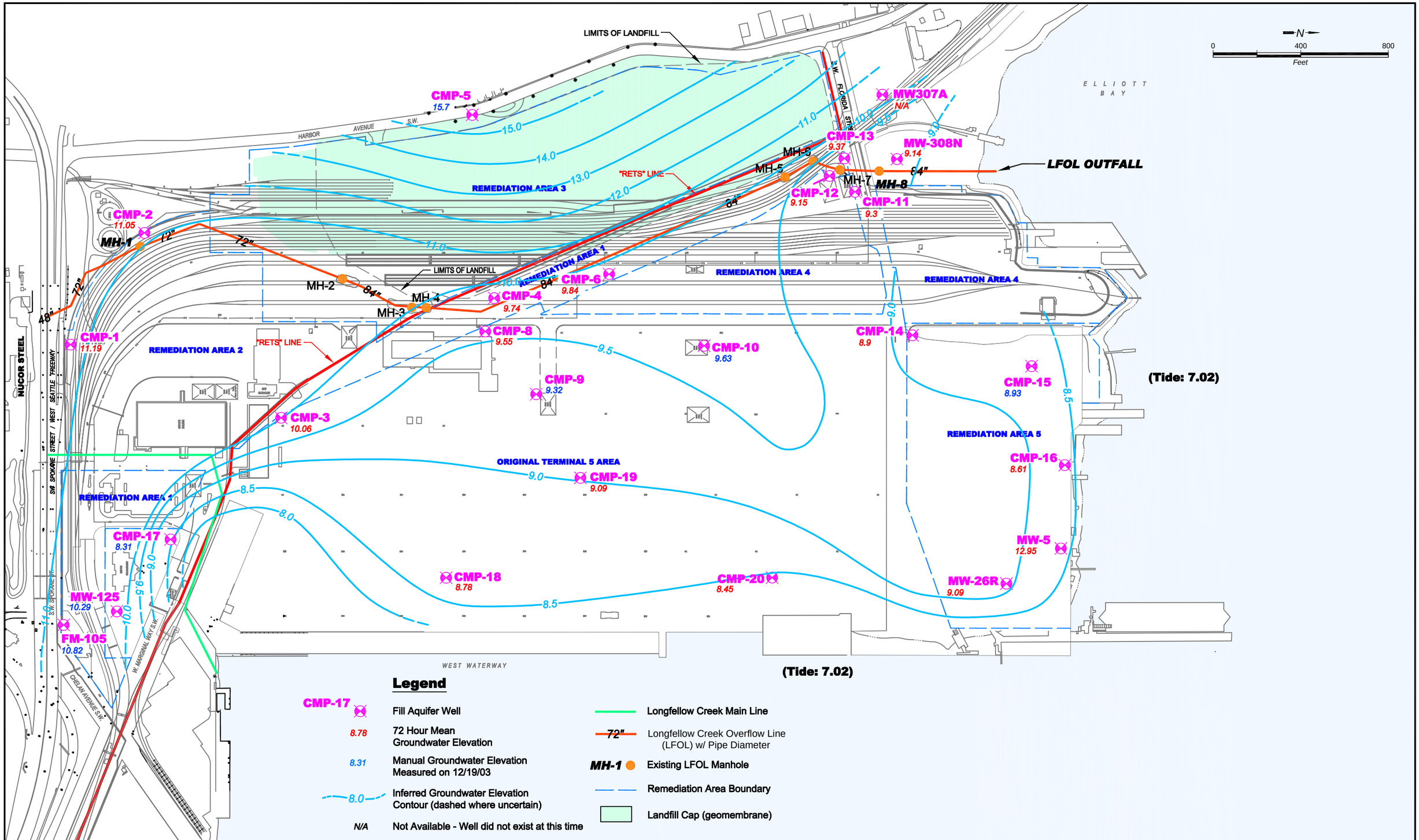

(Tide: 7.02)

Legend

CMP-17	Fill Aquifer Well
8.78	72 Hour Mean Groundwater Elevation
8.31	Manual Groundwater Elevation Measured on 12/19/03
8.0	Inferred Groundwater Elevation Contour (dashed where uncertain)
N/A	Not Available - Well did not exist at this time
	Longfellow Creek Main Line
72"	Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
MH-1	Existing LFOL Manhole
	Remediation Area Boundary
	Landfill Cap (geomembrane)

Survey Update 1/8/02

Ground Water Elevation Datum: MLLW

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Fill Aquifer Groundwater Elevation Contours
72 Hour Mean 12-19-03

SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE: March 2005	PROJECT NO. 990106
DESIGNED BY: WVG	
DRAWN BY: PMB	FIGURE NO. 7.10
REVISED BY: PMB	

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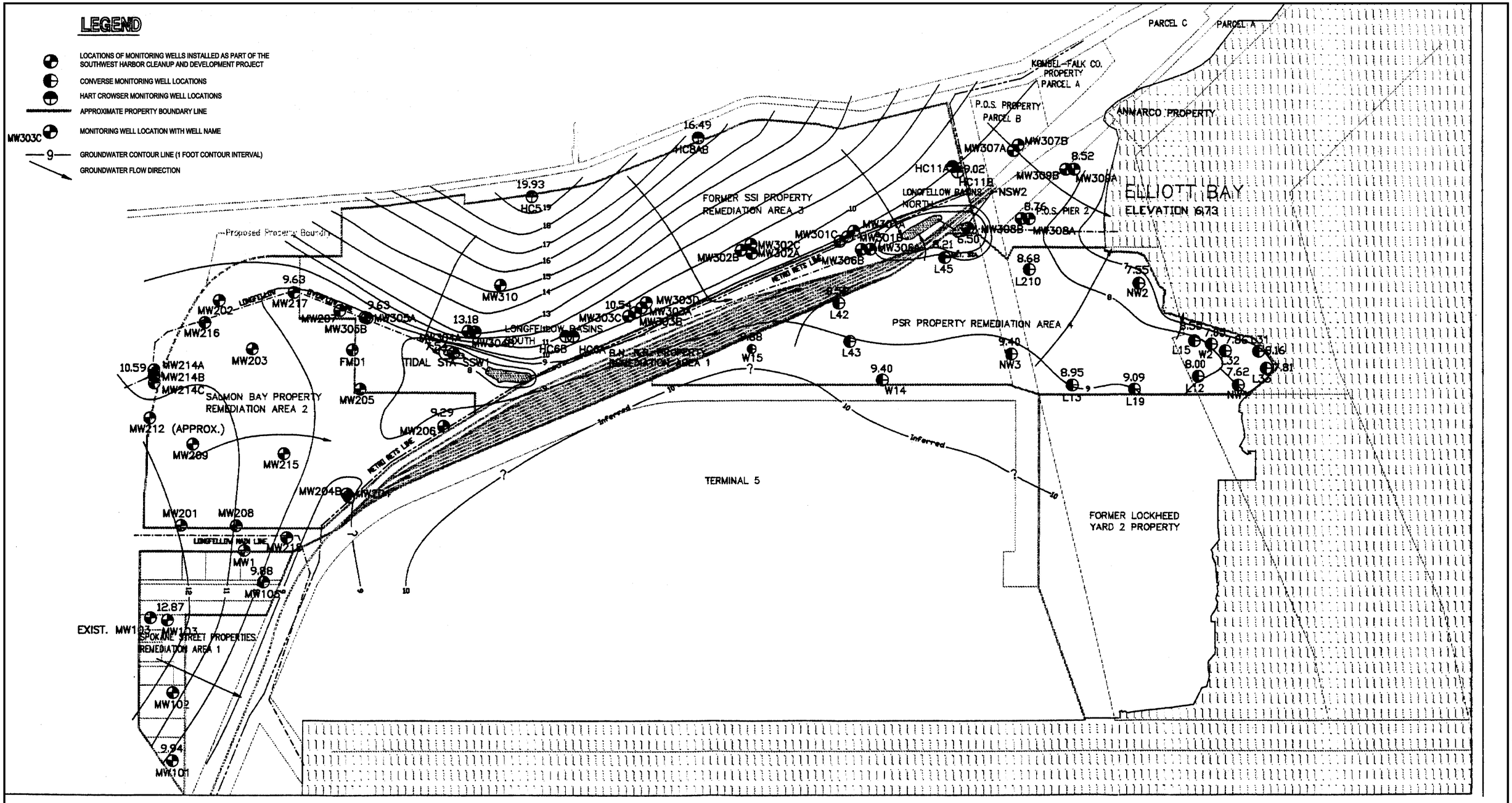

NOTES:

1. Elevation referenced to Port of Seattle Datum (-6.21 feet from mean sea level)

2. Elliott Bay elevation measured at Coleman Dock (located in Downtown Seattle)

Reference:

Woodward-Clyde Consultants
Tidal Study Report - Figure 3
Southwest Harbor Project - July, 1994

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Fill Aquifer Groundwater Elevation Contours (72-Hour Mean) 4-29-94

SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE:	PROJECT NO.
March 2005	990106
DESIGNED BY: WVG/SJG	
DRAWN BY: JJR	FIGURE NO. 7.11
REVISED BY: PMB	

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LIMITS OF LANDFILL

HARBOR AVENUE S.W.

S.W. FLORIDA STREET

ELLIOTT BAY

N

0 400 800

Feet

MW307BR
10.04

MW-308S
9.19

LFOL OUTFALL

"RETS" LINE

REMEDIATION AREA 3

MH-1 MH-2 MH-3 MH-4 MH-5 MH-6 MH-7 MH-8

48" 72" 72" 72" 84" 84" 84" 84"

8.5 8.0 9.5 9.0

LIMITS OF LANDFILL

REMEDIATION AREA 4

CMP-7
9.56

REMEDIATION AREA 2

"RETS" LINE

MW-36
8.21

NUCOR STEEL

SW SPOKANE STREET / WEST SEATTLE FREEWAY

S.W. SPOKANE ST.

REMEDIATION AREA 1

W. MARGINAL WAY S.W.

CHELAN AVENUE S.W.

ORIGINAL TERMINAL 5 AREA

REMEDIATION AREA 5

8.5

MW-44
8.73

(Tide: 7.51)

WEST WATERWAY

(Tide: 7.51)

Legend

- MW-36 — Estuarine Aquifer Well
- 8.21 — 72 Hour Mean Groundwater Elevation
- 8.0 — Inferred Groundwater Elevation Contour (dashed where uncertain)
- Longfellow Creek Main Line
- 72" — Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
- MH-1 — Existing LFOL Manhole
- Remediation Area Boundary
- Landfill Cap (geomembrane)

Survey Update 1/8/02

Ground Water Elevation Datum: MLLW

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Estuarine Aquifer Groundwater Elevation Contours
72 Hour Mean 12-17-01

SWHP Phase I Groundwater Confirmation Monitoring Program
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DATE: March 2005	PROJECT NO. 990106
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DRAWN BY: PMB	FIGURE NO. 7.12
REVISED BY: PMB	

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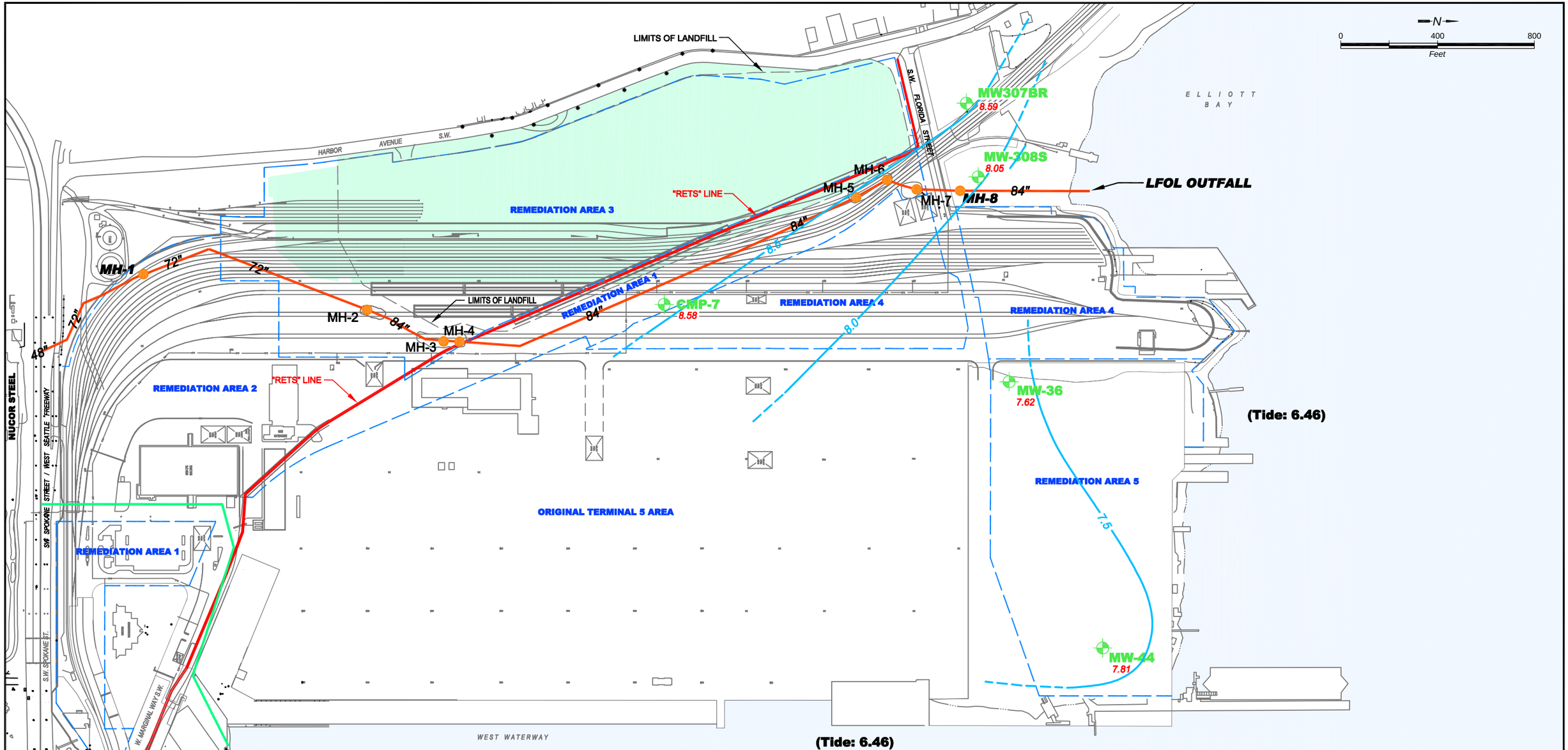

Legend

- MW-36 — Estuarine Aquifer Well
- 7.62 — 72 Hour Mean Groundwater Elevation
- 8.0 — Inferred Groundwater Elevation Contour (dashed where uncertain)
- Longfellow Creek Main Line
- 72" — Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
- MH-1 — Existing LFOL Manhole
- Remediation Area Boundary
- Landfill Cap (geomembrane)

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Note: Elevation for MW-36 collected manually.

Ground Water Elevation Datum: MLLW

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Estuarine Aquifer Groundwater Elevation Contours
72 Hour Mean 10-08-02

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Hydrologic Characterization Report

DATE: March 2005	PROJECT NO. 990106
DESIGNED BY: WVG	
DRAWN BY: PMB	FIGURE NO. 7.13
REVISED BY: PMB	

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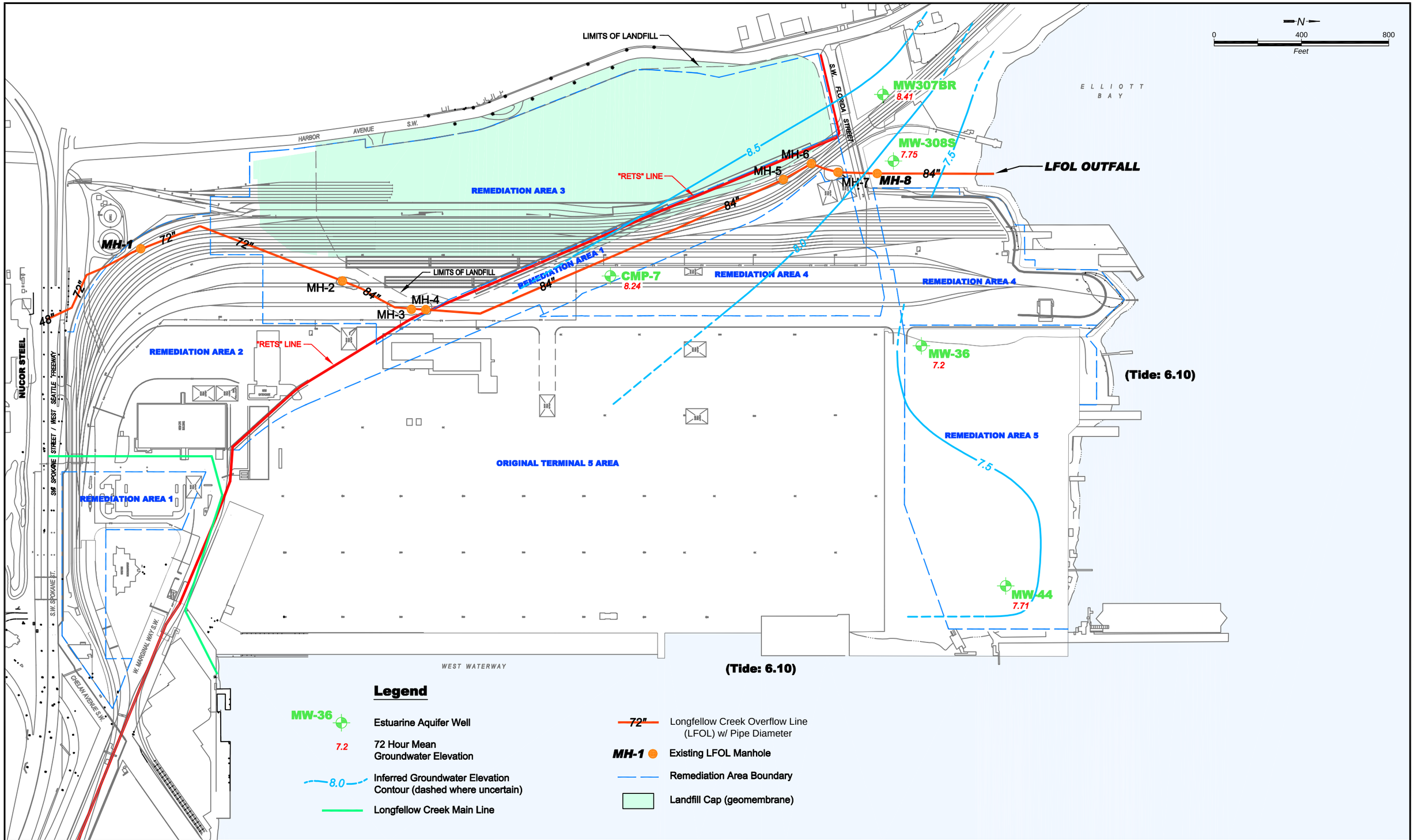

Legend

- MW-36 — Estuarine Aquifer Well
- 7.2 — 72 Hour Mean Groundwater Elevation
- 8.0 — Inferred Groundwater Elevation Contour (dashed where uncertain)
- Longfellow Creek Main Line
- 72" — Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
- MH-1 — Existing LFOL Manhole
- Remediation Area Boundary
- Landfill Cap (geomembrane)

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Ground Water Elevation Datum: MLLW

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Estuarine Aquifer Groundwater Elevation Contours
72 Hour Mean 09-24-03
SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE: March 2005	PROJECT NO. 990106
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DRAWN BY: PMB	FIGURE NO. 7.14
REVISED BY: PMB	

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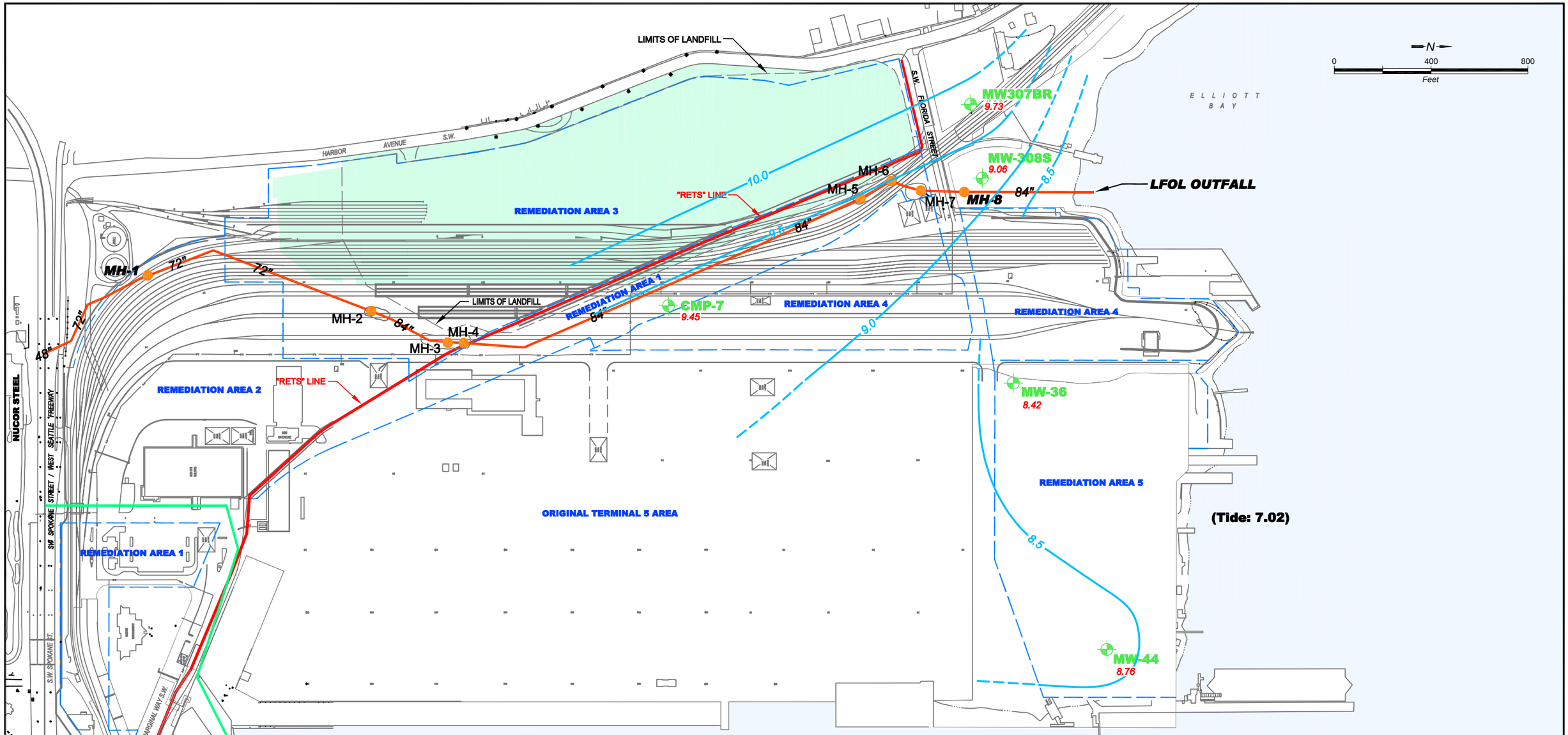

Legend

- MW-36 / 8.42 — Estuarine Aquifer Well; 72 Hour Mean Groundwater Elevation
- 8.0 — Inferred Groundwater Elevation Contour (dashed where uncertain)
- Longfellow Creek Main Line
- 72" — Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
- MH-1 — Existing LFOL Manhole
- Remediation Area Boundary
- Landfill Cap (geomembrane)

Survey Update 1/8/02

Ground Water Elevation Datum: MLLW

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Estuarine Aquifer Groundwater Elevation Contours
72 Hour Mean 12-19-03

SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE:	PROJECT NO.
March 2005	990106
DESIGNED BY: WVG	
DRAWN BY: PMB	FIGURE NO. 7.15
REVISED BY: PMB	

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LEGEND

- LOCATIONS OF MONITORING WELLS INSTALLED AS PART OF THE SOUTHWEST HARBOR CLEANUP AND DEVELOPMENT PROJECT
- CONVERSE MONITORING WELL LOCATIONS
- HART CROWSER MONITORING WELL LOCATIONS
- APPROXIMATE PROPERTY BOUNDARY LINE
- MW303C — MONITORING WELL LOCATION WITH WELL NAME
- 9 — GROUNDWATER CONTOUR LINE (1 FOOT CONTOUR INTERVAL)
- GROUNDWATER FLOW DIRECTION

PARCEL C
PARCEL A
KOMBEL-FALK CO. PROPERTY PARCEL A
P.O.S. PROPERTY PARCEL B
ANNARCO PROPERTY
HC8AB
HC5
FORMER SSI PROPERTY REMEDIATION AREA 3
Proposed Property Boundry
HC11A
HC11B
MW307A
MW307B
MW309B
MW309A
LONGFELLOW BASINS NORTH
NSW2
P.O.S. PIER 2
MW308B
MW308A
ELLIOTT BAY
ELEVATION 6.73
MW301C
MW301A
MW301B
MW306A
MW306B
MW302C
MW302A
MW302B
L45
L210
NW2
L42
MW310
MW303D
MW303A
MW303B
MW303C
LONGFELLOW BASINS SOUTH
HC6B
HC6A
PSR PROPERTY REMEDIATION AREA 4
L43
W15
NW3
L15
W2
L32
L31
L30
L12
NW1
L13
L19
W14
MW202
MW217
MW207
MW305B
MW305A
MW304A
MW304B
MW216
MW214A
MW214B
MW214C
MW203
FMD1
TIDAL STA SSW1
B.N. RR PROPERTY REMEDIATION AREA 1
SALMON BAY PROPERTY REMEDIATION AREA 2
MW205
MW212 (APPROX.)
MW209
MW215
MW206
MW204B
MW204A
TERMINAL 5
MW201
MW208
MW218
MW1
MW105
FORMER LOCKHEED YARD 2 PROPERTY
EXIST. MW103
MW103
SPOKANE STREET PROPERTIES REMEDIATION AREA 1
MW102
MW101

9.32
8.11
8.5
9.98
9.29
8.81
8.5
8.19
8.20
8 7.5 7
9

METRO BEITS LINE
LONGFELLOW MAIN LINE
OVERFLOW LINE

N

SCALE 0 400 800 1600 FEET

NOTES:

1. Elevation referenced to Port of Seattle Datum (-6.21 feet from mean sea level)
2. Elliott Bay elevation measured at Coleman Dock (located in Downtown Seattle)

Reference:

Woodward-Clyde Consultants
Tidal Study Report - Figure 7
Southwest Harbor Project - July, 1994

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Estuarine Aquifer Groundwater Elevation Contours (72-Hour Mean) 4-29-94

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Hydrologic Characterization Report

DATE:	PROJECT NO.
March 2005	990106
DESIGNED BY: WVG/SJG	
DRAWN BY: JJR	FIGURE NO. 7.16
REVISED BY: PMB	

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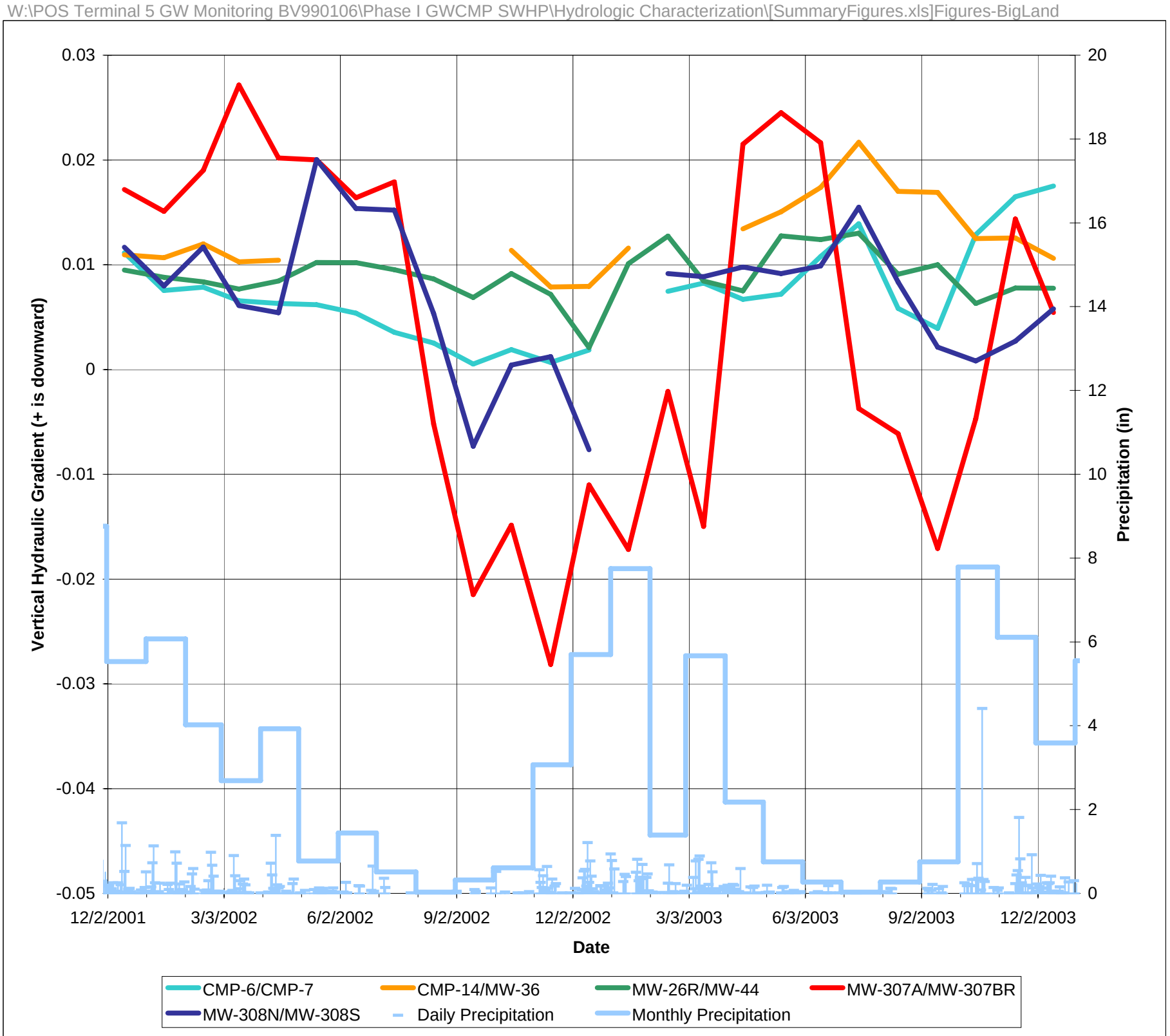
W:\POS Terminal 5 GW Monitoring BV990106\Phase I GWCMP SWHP\Hydrologic Characterization\[SummaryFigures.xls]Figures-BigLand



Monthly Average Vertical Groundwater Gradients and Tidal Data
Fill Aquifer/Estuarine Aquifer Well Pairs
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

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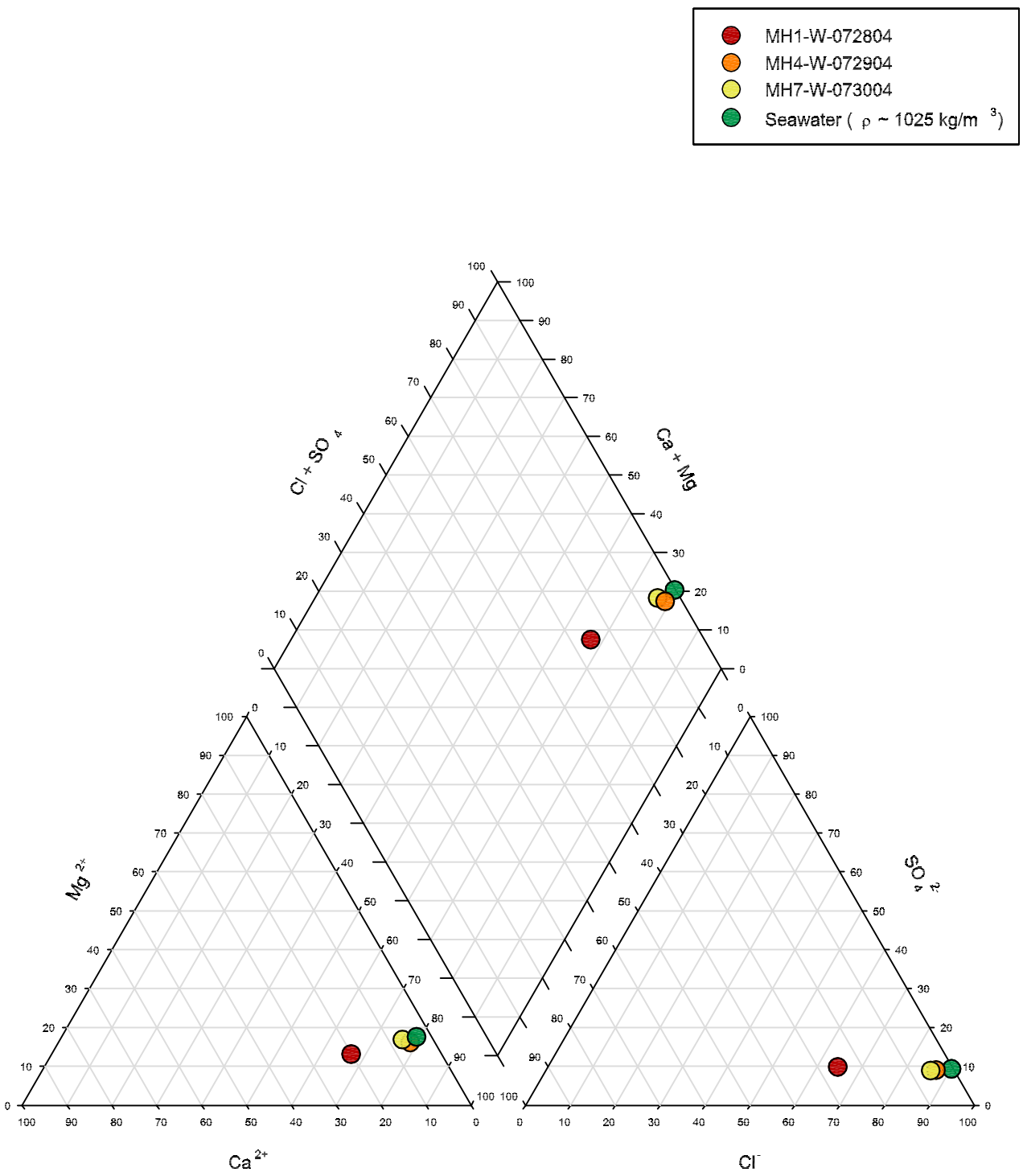
IN-DEPTH PERSPECTIVE

Figure 7.17



Seawater Composition From:
Drever, J.I. (1982). The Geochemistry of Natural Waters. Eaglewood Cliffs: Prentice-Hall.

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Ternary (Piper) Diagram of Major Ions
LFOL Samples
SWHP Phase I Groundwater Confirmation Monitoring Program
Hydrologic Characterization Report

DATE:	March 2005
DESIGNED BY:	WVG
DRAWN BY:	PMB
REVISED BY:	PMB
PROJECT NO.	990106
FIGURE NO.	7.18

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APPENDIX A

Supporting Documents

Port of Seattle

March 19, 1999

Ms. Glynis Carrosino
Department of Ecology
3190 160th Avenue SE
Bellevue, WA 98008-5452

SUBJECT: **Southwest Harbor Project Groundwater Confirmation Monitoring**
Project No. 93CO4231

Dear Glynis:

This letter presents the Port of Seattle's conceptual approach to groundwater confirmation monitoring, in accordance with the Southwest Harbor Project (SWHP) consent decrees and Washington Administrative Code (WAC) 173-340-410.

PROJECT OVERVIEW

The purpose of the Groundwater Confirmation Monitoring Program is to confirm the effectiveness of soil remediation conducted under the site-wide Cleanup Action Plans for the SWHP remediation areas. This letter describes the proposed Groundwater Confirmation Monitoring Program, and provides information for the Washington State Department of Ecology (Ecology) to understand the intent and goals of the monitoring program proposed by the Port of Seattle.

The groundwater monitoring program addresses most of the SWHP site, including the following sites which are shown on Figure 1:

- Remediation Area 1 (RA-1) - Spokane Street Properties. This site contained both various Spokane Street facilities and the Buckley Railyard.

- Remediation Area 2 (RA-2) - Former Salmon Bay Steel Property. This site contained scrap metal storage area, steel slag processing and storage areas, and steel warehouses.

- Remediation Area 3 (RA-3) - Former Landfill and Purdy Scrap Yard. This site contained both a historical City of Seattle Municipal Landfill (the West Seattle Landfill) and the Purdy Scrap Yard and Steel Recycling facility.

- The southern part of Remediation Area 4 (RA-4) - the Pacific Sound Resources (PSR) site south of Florida Street. This site (often referred to as the former Wycoff Site) is currently being addressed as part of the Superfund process with USEPA Region10 as the lead agency. Wells could be placed on this site as part of the Southwest Harbor Groundwater Monitoring Program if needed to evaluate groundwater flow directions and groundwater quality associated with groundwater that potentially enters the RA3 site from the adjacent PSR site.

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- Remediation Area 5 (RA-5) - Former Lockheed Yard 2. This site contains the Former Lockheed Yard 2, a shipbuilding and repair facility. Requirements for Confirmation Monitoring under WAC 173-340-410 are presented in Section 8.4.3 of the 1994 Cleanup Action Plan (Enviros 1994) for the facility. The following general conceptual approach to Groundwater monitoring was identified:

  "Confirmational monitoring will consist of shallow groundwater monitoring which will include periodic groundwater sampling from twelve (12) shallow wells (screened intervals between depths of 5 and 25 feet below grade). Groundwater samples will be analyzed for priority pollutant metals (arsenic, lead antimony, chromium, copper, and nickel,) and hydrocarbons (TPH, CPAH). "

The plan was written when the site was to be studied individually. The Lockheed site is now a portion of the overall SWHP area, and may now best be evaluated in a sitewide context. In addition, we now have more information and a greater understanding of the hydrogeology of the entire SWHP site and believe that fewer wells are necessary to identify if the remedial actions at RA-5 have been adequate. We therefore intend to incorporate the Lockheed area into the overall conceptual approach described in this letter and defer groundwater quality monitoring until after the flow regime has been studied and characterized.

Construction at the SWHP site is now complete and the monitoring program is expected to commence in mid 1999.

After Ecology approves this conceptual monitoring program, a work plan will be developed with Ecology involvement which will include a Quality Assurance Project Plan and Sampling and Analysis Plan, as described in WAC 173-340-410. The specifics of the Work Plan will be discussed with Ecology during its development, and will include details pertaining to well siting, sample collection, etc.

PURPOSE AND SCOPE OF MONITORING PROGRAM

The purpose of the Groundwater Confirmation Monitoring Program is to confirm that soil remediation conducted under the Cleanup Action Plans for the SWHP various remediation areas is protective of surface water quality for the site as a whole.

The scope of the Groundwater Confirmation Monitoring Program includes installation of a groundwater monitoring network and subsequent monitoring sufficient to confirm that the post-remedial groundwater flow regime is consistent with assumptions contained in the Cleanup Action Plans for the remediation areas, and to evaluate groundwater quality as it effects surface water quality.

NON-DRINKING-WATER STATUS

In a letter dated September 30, 1994, Ecology concurred with the Port of Seattle's proposal to designate the shallow aquifer underlying the SWHP as a non-drinking-water aquifer. This designation was based on the following:

- The aquifer is not currently used for drinking purposes.

- A municipal drinking water supply is available and is the preferred source by the King County Department of Health.

- The shallow groundwater in the SWHP area does not pose a threat to deep groundwater supplies.

- The groundwater in the deeper portion of the regional shallow aquifer (the estuarine aquifer) generally has a total dissolved solid concentration greater than 1,000 mg/L, which exceeds the drinking water standard of 250 mg/L.

- Pumping shallow groundwater for municipal drinking water supply would cause saltwater intrusion, resulting in a non-potable water supply.

GROUNDWATER FLOW REGIME ASSUMPTIONS

This letter includes a description of the current groundwater regime, the assumed post-remediation groundwater conditions, and the groundwater monitoring program. As described in the following sections, it is expected that the flow regime has been influenced by the remediation-related construction activities. Therefore an evaluation of the flow regime will precede finalization of groundwater quality monitoring well locations.

Groundwater Occurrence

The SWHP groundwater regime consists of a fill aquifer and a deeper estuarine aquifer (Figure 2). The fill aquifer is generally defined as the groundwater within the fill units 20 to 40-feet below the ground surface (bgs). In the western portion of the SWHP (formerly RA-2 and RA-3) the base of the fill aquifer is defined by a lower permeability layer, which appears to be a remnant of the former tidal flat. On the eastern portion of the SWHP (formerly RA-1, RA-4, and RA-5), the fill generally consists of hydraulic dredge material, and the distinction between the fill aquifer and deeper estuarine aquifer is less distinct. Generally, this distinction is based on depth. The base of the deeper estuarine aquifer system is defined as a lower permeability clay unit that is encountered on the western boundary of the SWHP at a depth of approximately 40 feet bgs and appears to dip toward the east to northeast. From a regional perspective, these two aquifer units are defined collectively as the shallow aquifer.

The fill and estuarine aquifers are bounded to the north by Elliott Bay and to the east by the West Waterway. They are bounded to the south and west by the shallowing of the lower permeability clay/silt layer, also referred to as the undifferentiated layer, and additionally on the west by the presence of the Lawton clay unit, which forms the lower portion of the West Seattle Bluff and appears to extend beneath the estuarine aquifer on the far west end of the site.

Pre-Remediation Recharge and Discharge Conditions

The shallow aquifer system recharges through limited groundwater flow from the south and west and on-site infiltration. Under predevelopment conditions, recharge through on-site

infiltration is approximately 3.5 times higher than recharge through groundwater flow from off-site. This is consistent with the presence of low permeability formations west and south of the SWHP boundaries and the lack of observation of surface water runoff from the SWHP site during the remedial investigations. Downward vertical gradients observed between the fill aquifer and the deeper estuarine aquifer indicated that limited amounts of groundwater flows from the overlying fill aquifer to the deeper estuarine aquifer within the SWHP area. This observation also supports the importance of on-site infiltration as a recharge source to these aquifer systems.

Discharge from the fill aquifer on the western and central portions of the SWHP is to the Longfellow Overflow Line, which transects the central portion of the SWHP site from south to north. Discharge to this line appears to occur through small leaks in the line, through discharge to one of four equalization basins along the line, and into permeable backfill, particularly along the northern portions of the Longfellow Overflow Line. This line appears to receive groundwater discharge from the fill aquifer for a majority of the former RA-2 and RA-3 remediation areas, the southern portion of former RA-4 (south of Florida Street), and the western portion of the existing Terminal 5 property. Discharge from the southeastern former Spokane Street properties on RA-1 appears to be toward the northeast to the West Waterway. Local discharge from these properties also may be impacted by backfill material along the main Longfellow Creek discharge pipe, which underlies West Marginal Way. A tidal study conducted on RA-5 indicated that discharge was to Elliott Bay and the West Waterway for a majority of the site. Discharge from the deeper estuarine aquifer is also toward the West Waterway and Elliott Bay.

Pre-remediation Groundwater Flow Regime

Groundwater flow in the fill aquifer on the western and central portions of the SWHP is toward the Longfellow Overflow Line. Two tidal studies conducted as part of the remedial investigations for RA-1 through RA-4 indicated that tidal fluctuations influenced groundwater flow in the immediate vicinity of the four equalization basins along the Longfellow Overflow Line and on the northern portion of RA-4 (north of Florida Street), in the proximity of Elliott Bay. Tidal fluctuation did not influence groundwater flow across the majority of RA-1 through RA-4. A tidal study conducted on the former RA-5 (Lockheed) site during the remedial investigation indicated that the groundwater flow direction on this site reversed from low to high tides, but that the mean groundwater flow direction was toward Elliott Bay and the West Waterway. The only portion of RA-5 not impacted by tidal fluctuations was an area in the southwestern corner of the site.

The groundwater flow in the fill aquifer underlying the Spokane Street properties was generally toward the northeast. Tidal fluctuations were not observed in the groundwater monitoring wells located on these properties.

Groundwater flow in the underlying estuarine aquifer is generally toward the north-northeast, discharging to Elliott Bay or the West Waterway. Recharge to this aquifer occurs through groundwater flow from the south and west and from the overlying fill aquifer. The total dissolved solids (TDS) concentration in the estuarine aquifer is generally higher than the overlying fill aquifer, reflecting the limited fresh water recharge to this system and the influence of the adjacent saline water bodies. As expected, the TDS concentration increases toward Elliott Bay and the West Waterway.

Post-remediation Groundwater Regime Assumptions

Once construction and development of the Terminal 5 expansion on the SWHP sites is complete, a majority of the site will be covered with asphalt and landfill membrane, thereby greatly decreasing the permeability compared to the current ground surface. These low permeability covers combined with improved surface drainage will reduce the on-site infiltration portion of recharge to the shallow aquifer system by approximately 95 percent or more. As stated above, recharge from on-site infiltration is currently approximately 3.5 times greater than recharge from upgradient sources. Therefore, a dramatic decrease in the on-site infiltration will directly decrease the total recharge to the shallow aquifer by 2 to 3 orders of magnitude. This decrease in recharge will impact the groundwater conditions on the project site. These impacts may not be discernible immediately; it is anticipated that the groundwater flow regime will take a number of years to adjust to these new conditions, as seasonal meteorological and hydrological changes will have to propagate throughout the SWHP area.

Post-remediation Recharge and Discharge to the Fill Aquifer System

The decrease in recharge to the fill aquifer will decrease the total discharge from this aquifer to the Longfellow Overflow Line, Elliott Bay, and the West Waterway. This decrease in discharge is expected to be reflected by a decrease in the groundwater gradient across the project site.

Closing the four equalization basins within the Longfellow Overflow Line occurred as part of the SWHP construction and redevelopment. Beginning in October 1996, pipes were installed connecting the Longfellow Overflow Line on either side of each basin and the basins were then backfilled. The remedial investigations conducted for the SWHP indicated that a majority of the discharge to the Longfellow Overflow Line from the fill aquifer occurred through these equalization basins. Therefore, although we anticipate that the Longfellow Overflow Line will continue to be a line discharge for the fill aquifer, the change in the Longfellow Overflow Line configuration may decrease the total discharge to this line.

In contrast to the decrease in recharge volume across the SWHP site, there is a possibility of an increase in recharge at the southwest boundary of the SWHP property if Birmingham Steel operates the ringwall structures as infiltration basins. There is a very small possibility Birmingham Steel could elect to operate these ringwall structures as stormwater infiltration basins. Recent communication with Birmingham Steel has indicated that they are able to treat their stormwater onsite and the need for infiltration has diminished. In any event, the use of these systems would probably not start for at least two years and would therefore not impact the hydrologic portion of this proposed program. Additional groundwater measurements may be required during groundwater sampling, in the event the ringwalls are used for infiltration in the future.

Since the freshwater recharge from the upland areas to the site is not expected to change appreciably, (unless the ringwalls are used for infiltration), the greatest influence on post-remediation groundwater flux in the fill aquifer will likely be attributable to .the decrease in recharge across the site and modification to the Longfellow Overflow basins. The current mean groundwater flow direction is toward Elliott Bay and the West Waterway, and this is not expected to change.

Post-remediation Recharge and Discharge to the Estuarine Aquifer System

We anticipate that the estuarine aquifer system will be less impacted by the decrease in recharge volume and decrease in discharge to the Longfellow Overflow Line than the fill aquifer system. The groundwater flow direction will be generally consistent with the current flow direction (toward Elliott Bay and the West Waterway). However, due to the decrease in on-site infiltration, it is likely that the downward gradient from the fill aquifer to the estuarine aquifer will decrease. The only exception would be in the vicinity of the ringwall infiltration basins (if Birmingham Steel chooses this alternative for discharge of stormwater and non-contact cooling water), where the downward gradient would be expected to increase.

The decrease in fresh water recharge may impact the position of the salt water wedge along the shoreline. Sea water from Elliott Bay and brackish water from the West Waterway may move farther into the aquifers. This likely will impact the estuarine aquifer salinity more than the fill aquifer salinity. We anticipate that the mean groundwater flow direction will continue to be towards Elliott Bay and the West Waterway; however, the groundwater gradient will likely decrease (this would lead to a decrease in the flux from the aquifer systems to these surface water bodies).

GROUNDWATER CONFIRMATION MONITORING PROGRAM

The purposes of the groundwater monitoring program are twofold:

- The first purpose is to evaluate the post-remediation groundwater flow regime to assess the change in flow conditions resulting from the remediation activities. This evaluation will likely necessitate installing groundwater monitoring wells in the fill and estuarine aquifer systems and collecting water levels over a two-year period.

- The second purpose is to evaluate groundwater quality downgradient of the remediation areas with respect to its effect on surface water quality. The groundwater monitoring network needed for this evaluation is dependent on the results of the first evaluation. As discussed further below, the two networks may not be identical.

These two purposes are both distinct and sequential in their development; therefore, they form the basis for the two primary tasks in the proposed Groundwater Confirmation Monitoring Program: (1) Task 1 - Groundwater Flow Regime Evaluation, and (2) Task 2 - Groundwater Quality Evaluation.

Task 1 - Groundwater Flow Regime Evaluation

The objective of groundwater flow regime evaluation is to establish post-remediation flow directions, discharge points, recharge areas, flow rates, and discharge rates. Additionally, the tidal influence on the system will be evaluated to correctly interpret the system, especially along the Longfellow Overflow Line.

This task will evaluate two aspects of the groundwater flow regime: (1) the overall groundwater flow pattern across the site and (2) the tidal changes of those sections of the flow regime that are under tidal influence.

The network for the evaluation will consist of 10 to 20 fill aquifer wells and 2 to 3 deeper estuarine aquifer wells as follows:

- Approximately four fill aquifer wells upgradient of the SWHP sites: 2 along the western bluff (upgradient of RA-2 and RA-3), one upgradient of RA-2 along Spokane Street, and one upgradient of RA-1 along Spokane Street.

- Two sets of wells on either side of the Longfellow Overflow Line to evaluate both the gradient across the line and the tidal influence along the line. The wells will form a 4-well transect that crosses the line near the location of the historical Northern Ponds. Note that the location of these wells is limited by railroad tracks and utility corridors.

- Six to eight wells in suspected downgradient areas spread across the Southwest Harbor site in order to gather sufficient data to construct potentiometric surfaces representative of groundwater flow directions.

Two other areas may require additional monitoring wells as follows-

- Vertical gradients will be assessed either within or downgradient of the landfill on RA-3 to confirm that fill aquifer groundwater does not discharge into the estuarine aquifer at rates that would effect groundwater quality in the lower aquifer. This can be accomplished with the installation of two or three well pairs. Water levels from the fill aquifer wells will be used to assess both vertical gradients and potentiometric surfaces within the aquifer. Water levels from the estuarine aquifer wells will be used solely to assess vertical gradients.

- If Birmingham Steel decides to complete implementation of the surface water discharge into the ring walls, then it will be critical to evaluate the effect on this discharge on the fill aquifer flow regime. This evaluation will use the monitoring wells required as part of Birmingham's discharge permit.

Figure 3 identifies areas in which shallow and/or deep groundwater monitoring wells consistent with this program could be installed.. Information from an upcoming well survey will be used to locate existing monitoring wells on Figure 3 as part of this program.

This network will be installed after the completion of the remedial activities and site development. The groundwater system may not reach a steady-state in a year, but trends may be established that will indicated the configuration of the post-remediation groundwater regime. Therefore, it will be important to monitor the water levels in the network once every two months for approximately 2 years after installation. This will also allow for the evaluation of seasonal trends on the groundwater regime.

A sufficient number of water level and salinity readings (see below) will be made in select monitoring wells to allow an evaluation of tidal influences on the groundwater regime; and particularly to determine if the Longfellow Overflow Line continues to be a significant discharge boundary for the site. The pattern of tidal influence will be examined over several different time periods during the study to assess the post-remediation groundwater regime.

Salinity

Changes in the groundwater flow regime and potentiometric surface are expected to result in changes in location and rate of salt water intrusion into the groundwater system. At the same time, decreased infiltration of surface water is expected to result in the production of less landfill and fill leachate. Many of these changes will be readily apparent in changing salinity or conductance readings.

This information will be easily obtained and inexpensive, and will allow us to monitor the changes in salt water intrusions and leachate production. Gathering this information at the same time as water level information allows for a rapid comparison between groundwater flow and a general measure of water quality,

Groundwater Flow Regime Evaluation Reporting

At the completion of two years of monitoring (or earlier, if deemed appropriate from periodic data review), a written report will be submitted for agency review. This report will contain the evaluation of the groundwater flow regime and the proposed groundwater quality monitoring network as described below. No further water level monitoring will occur until monitoring of the groundwater quality network begins, unless the groundwater quality monitoring is delayed due to continuing changes in the groundwater flow regime. If this is happening, periodic groundwater level monitoring will continue in order to track the system. The criteria for determining that the post remediation groundwater flow regime is "characterized" will be the identification of predictable hydraulic or salinity gradients over a range of tidal and seasonal (i.e., rainfall and upland recharge) conditions.

Task 2 - Groundwater Quality Monitoring

After the flow regime has been evaluated, the monitoring well network for the groundwater quality evaluation will be identified. This network should be sufficient to evaluate the effect of groundwater quality on surface water. To meet this criterion, additional wells may need to be installed. All wells will be located in the fill aquifer, unless significant downward gradients into the estuarine aquifer are found during the groundwater flow regime evaluation. The final location and number of the monitoring wells used to monitor groundwater quality will be established after the groundwater flow regime evaluation.

The groundwater quality monitoring evaluation will commence approximately 2 years after the beginning of groundwater level monitoring. Should the groundwater flow regime still be undergoing significant changes, groundwater quality monitoring may be delayed until the flow regime further stabilizes. Groundwater quality monitoring will occur twice yearly unless significant seasonal effects are identified during Task 1. The time of year for sample collection will be based on the results of Task 1, and will be established to represent high water level and low water level conditions.

Analytical Schedule

The analytical schedule for the water quality monitoring is given in Table 1. Five analytes, plus field parameters and water levels, will be monitored across the site: total petroleum

hydrocarbons (TPH), polychlorinated biphenyls (PCBs), carcinogenic polycyclic aromatic hydrocarbons (CPAHs), bis(2-ethyl-hexyl)phthalate, and arsenic. Additional analytes were identified at specific remediation areas or associated with specific operational areas; they are listed below and may be added to the monitoring program for specific wells. If they are not detected or found to be present below levels of concern, they would then be dropped from the analytical suite.

- Chlorinated volatile organic compounds (specifically the chlorinated ethenes and ethanes) near the Spokane Street Properties at RA-1.

- Cyanide in the wells nearest the ringwalls if the ringwalls near RA-2 are used for disposal of treated waste water and storm water as currently proposed by Birmingham Steel.

- Additional metal analytes (antimony, chromium, copper, and nickel) may be monitored at RA-5 (Lockheed) unless further evaluation indicates that these metals are no longer chemicals of concern for the Lockheed site.

- Lead in select wells downgradient of former remediation areas known to potentially contain lead soil contaminants.

The analytical schedule may be modified slightly based on Task 1 findings. The final analytical schedule will be included in the Task 2 work plans.

Completion of the Groundwater Quality Evaluation

Soil concentrations used for cleanup levels at the various remediation areas are believed to be protective of groundwater quality whose highest beneficial use is discharge to surface water. Consequently, it is not intended for the groundwater monitoring program to continue indefinitely. Its goal is to confirm that the remediation activities are protective of surface water quality using the same type of evaluation set forth in Appendix W – Risk Evaluation Tasks for the Southwest Harbor Project (Environmental Toxicology International 1994). Once this has been established, groundwater monitoring will stop. At the completion of two years of monitoring (4 sampling events), the written Groundwater Quality Monitoring Evaluation will be submitted for agency review. Groundwater quality monitoring will continue for 1 more year while the evaluation is being prepared and reviewed. Depending upon results, additional monitoring beyond the three-year period may occur in select wells and for select analytes if Ecology and the Port of Seattle mutually agree it is warranted under the provisions of the consent decree and is necessary to meet this program's objectives.

GROUNDWATER QUALITY CONFIRMATION MONITORING PROGRAM SCHEDULE

The schedule for groundwater monitoring is based on the date of completion of the facility remediation and development. Construction is scheduled to be complete in 1998. Task 1 -Groundwater Flow Regime Evaluation will begin with well installation in mid-1999. The completed Task 1 report will be submitted in mid-2001. If additional wells are needed for the Task 2 - Groundwater Quality Evaluation, they will be installed in late 2001, with water quality

monitoring to begin early in 2002. The Groundwater Quality Evaluation will be submitted in mid to late 2004. Schedule details will be included in the Work Plan.

CLOSING

The approach for the Groundwater Confirmation Monitoring Program presented in this letter is designed to confirm the effectiveness of the various remedial activities at the Southwest Harbor Project in a timely, but realistic manner. We look forward to continuing to work with you on this site and to reaching final resolution on the successful cleanup and redevelopment of the Southwest Harbor Project.

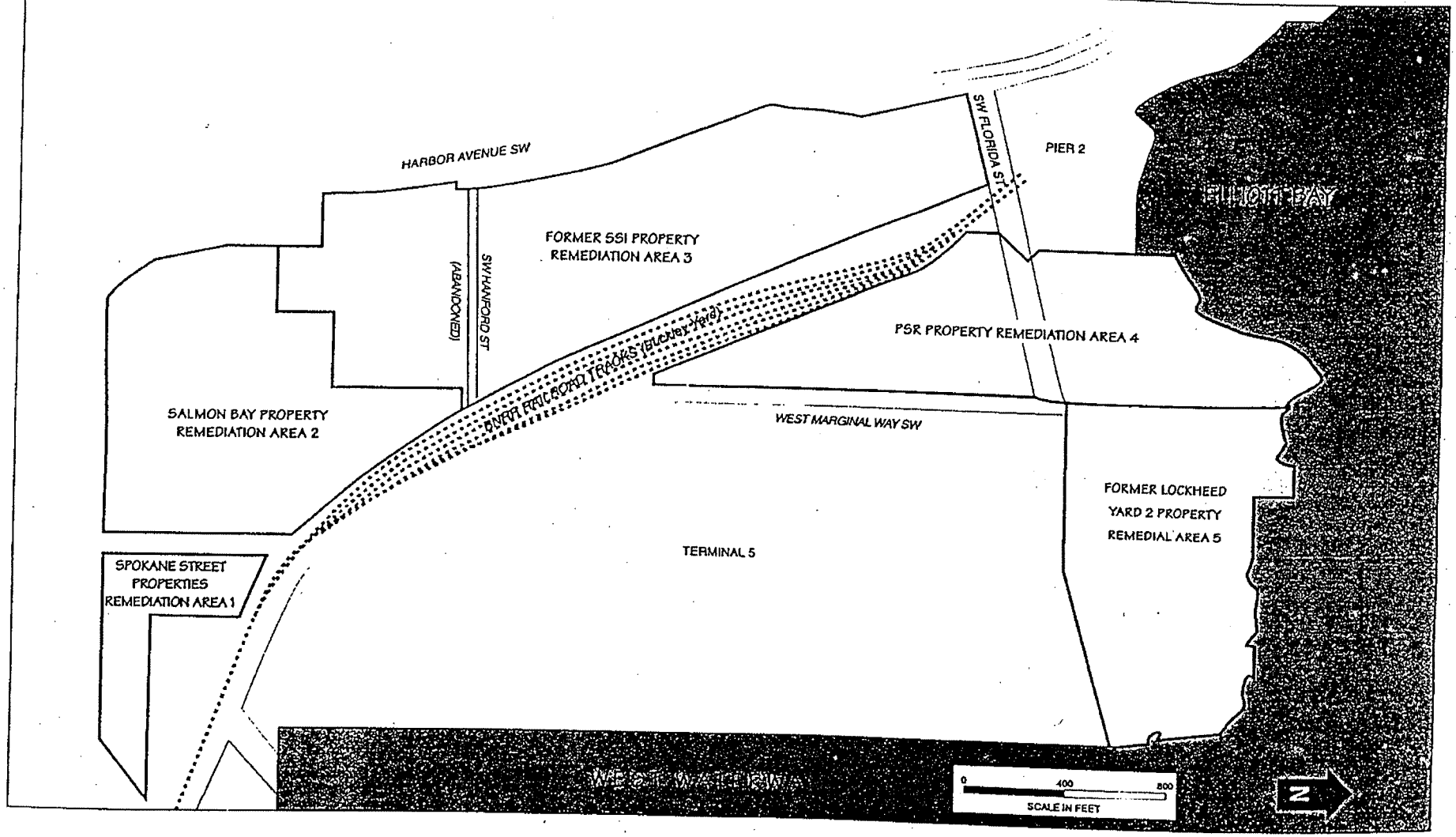
Sincerely,

Elizabeth Leavitt
Port of Seattle

Attached: Table 1, Figures 1 and 2
Enclosed: Figure 3 (drawing)

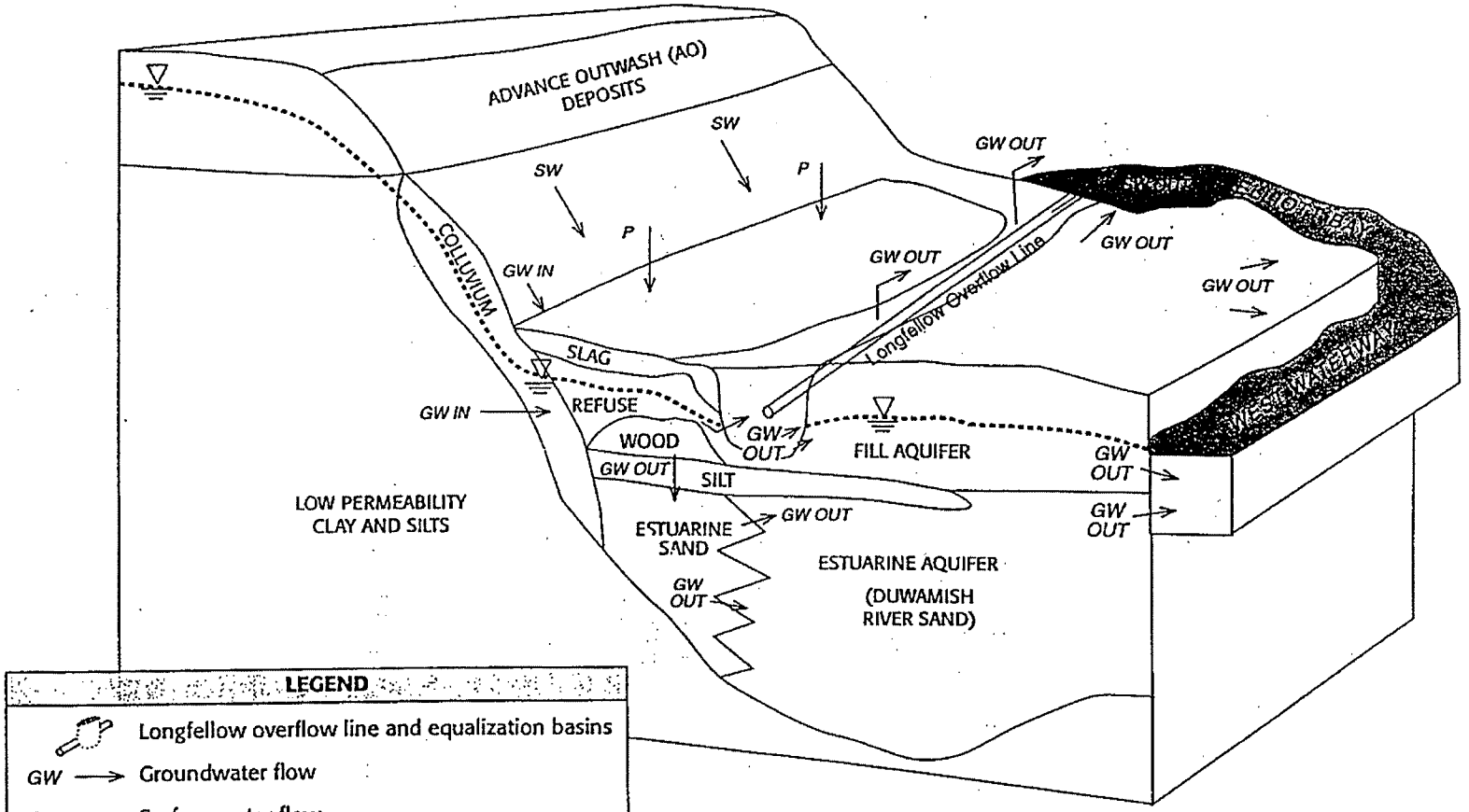
TABLE 1.
Groundwater Monitoring Analytical Schedule
Southwest Harbor Project
Seattle, Washington

Analyte	Method	Comments
Field Parameters (pH, specific conductance, temperature)	Standard Methods	
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)	USEPA 8270 or USEPA 8310	Modified for lower PQLs
Polychlorinated Biphenyis (PCBS)	USEPA 8080	Modified for lower PQLs
Total Petroleum Hydrocarbons (TPH)	Approved Washington State Method	Diesel and motor oil range
Bis(2-ethyl hexyl)phthalate	USEPA 8270	
Arsenic	USEPA 7000 Series or USEPA 6010 - Trace	
Volatile Organic Compounds	USEPA 8010, 8240, or8260	Optional. May be analyzed in selected wells.
Cyanide	USEPA method 9000 Series	Optional. May be analyzed in selected Ringwall wells if surface discharge occurs through wells.



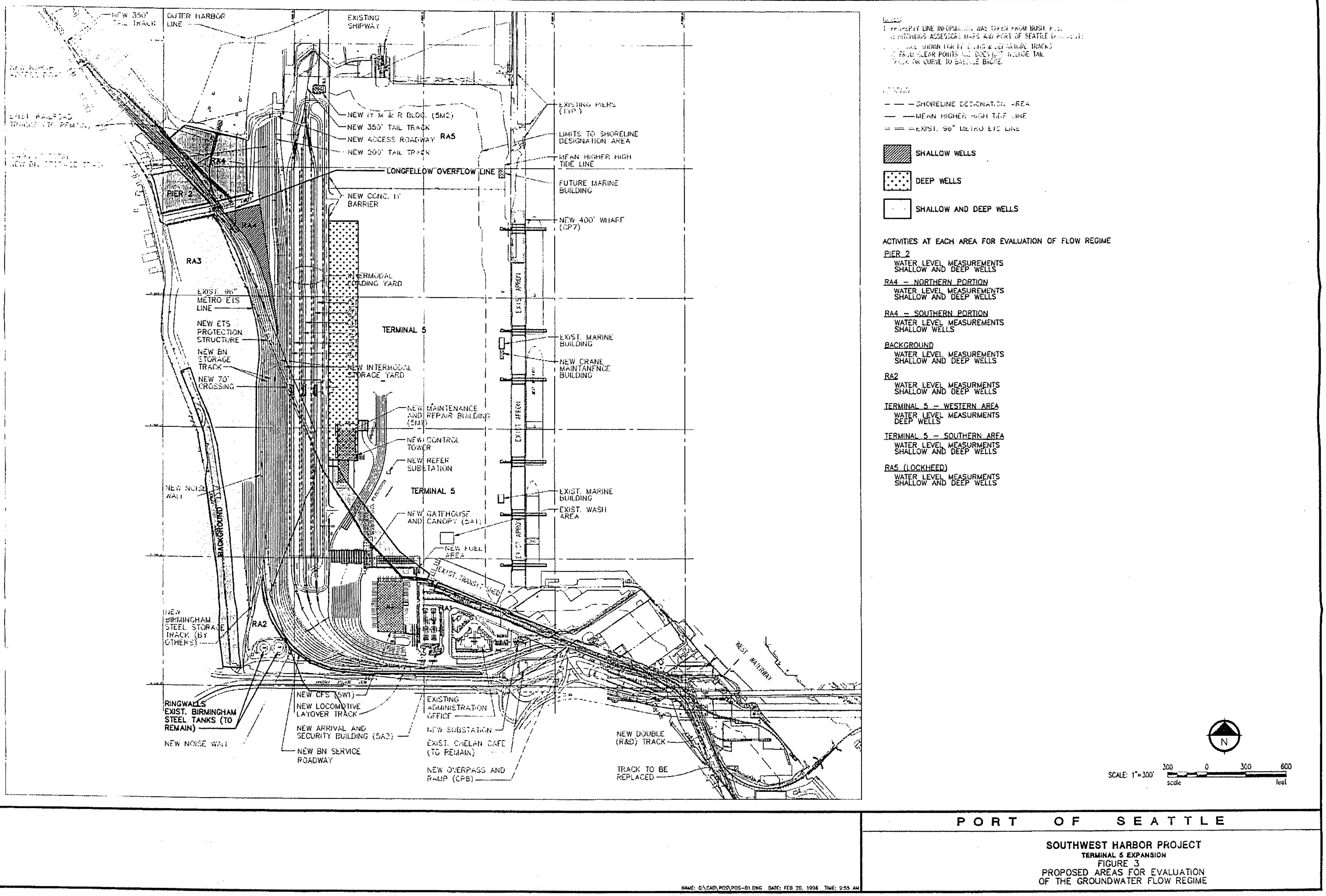
GR040/03/SEA

Southwest Harbor Project	Project No. 93C0423	Southwest Harbor Project Remediation Areas	Figure 1
Woodward-Clyde Consultants			



GR040/11/SEA

Southwest Harbor Project	Project No. 93C0423I	Site Hydrogeological Conceptual Model	Figure 2
Woodward-Clyde Consultants			



PORT OF SEATTLE

SOUTHWEST HARBOR PROJECT
TERMINAL 5 EXPANSION
FIGURE 3
PROPOSED AREAS FOR EVALUATION OF THE GROUNDWATER FLOW REGIME

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Northwest Regional Office, 3190 - 160th Ave S.E. Bellevue, Washington 98008-5452 (425) 649-7000
April 14, 1999

Ms. Elizabeth Leavitt
Port of Seattle
P.O. Box 1209
Seattle, WA 98111

RE: **Southwest Harbor Project - Transmittal of Groundwater Monitoring Program Conceptual Letter dated March 19, 1999**

Dear Elizabeth:

I have received and reviewed the final copy of the Groundwater Monitoring Conceptual letter you submitted for the Southwest Harbor Project. This letter presents the Port of Seattle's conceptual approach to groundwater confirmation monitoring,, in accordance with the Southwest Harbor Project (SV~HP) Consent Decrees and the requirements stipulated in MTCA WAC 173-340-410.

WAC 173-340-410 presents compliance monitoring requirements to confirm the long-term effectiveness of the site cleanup action through attainment of the site-specific cleanup standards. MTCA requirements for compliance monitoring, include the development of performance, protection and confirmational monitoring plans.

Ecology and the Port have held several discussions to characterize the intent of the groundwater monitoring program, the portions of the SV~HP site it will address, and assumptions pertaining to the site's post-remediation groundwater conditions. This Groundwater Conceptual Letter from the Port presents these details and the two-fold purposes of the groundwater monitoring program:

- The first purpose is to evaluate the post-remediation groundwater flow regime to assess the change in flow conditions resulting from the remediation activities. We anticipate that the flow regime has changed due to the construction remediation activities. This evaluation will require installing groundwater monitoring wells in the fill and estuarine aquifer systems and collecting water levels over a minimum two year period.
- The second purpose is to evaluate groundwater quality downgradient of the remediation areas with respect to its affect on surface water quality. The groundwater quality monitoring, network needed for this evaluation will be determined from the results of the first evaluation, and will commence at least two years after the initiation

of groundwater level monitoring. The network must be sufficient to evaluate the effect of groundwater quality on surface water. It is anticipated that additional wells will need to be installed to meet this criteria.

This March 19, 1999 letter satisfies the requirements specified in our January 7, 1999 meeting, and presents the criteria for meeting, the specifications of the Consent Decree in respect to Model Toxics Control Act requirements in WAC 173-340-410.

I look forward to receiving the work plan details associated with the proposed sampling and analysis activities, along with quality assurance and control requirements.

If you should have any questions, please feel free to contact me at 425-649-7263.

Sincerely,

Glynis A. Carrosino, Project Manager
Toxics Cleanup Program

cc: Steven Alexander, Ecology
Warren Hansen, Onsite Enterprises, Inc.
Lisa Dally-Wilson, Dally Environmental

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

July 5, 2001

Ms. Kathy Bahnick
Port of Seattle
P.O. Box 1209
Seattle, WA 98111-1209

RE: Southwest Harbor Project – Monitoring Plan
Transmittal of Phase 1 Groundwater Confirmation Monitoring Program
December 21, 2000

Dear Kathy:

The Washington State Department of Ecology has received and reviewed the Phase 1 Groundwater Confirmation Monitoring Program Plan submitted by your office for the Southwest Harbor Project. This Plan presents the Port of Seattle's approach to the overall site groundwater confirmation monitoring, in accordance with the Southwest Harbor Project (SWHP) Consent Decrees and the requirements stipulated in MTCA WAC 173-340-410.

WAC 173-340-410 presents compliance monitoring requirements to confirm the long-term effectiveness of the site cleanup action through attainment of the site-specific cleanup standards. MTCA requirements for compliance monitoring include the development of performance, protection and confirmational monitoring plans. As previously discussed by Ecology and the Port, remedial actions associated with specific SWHP remediation areas and overall SWHP development activities are anticipated to affect the post-development ground water flow regime. The planned Phase I monitoring network will provide the basis for verifying the conceptual understanding of post-development ground water conditions as a key component in supporting the Phase II water quality compliance program.

During our meeting held June 5, Ecology and the Port discussed the details of the Plan and the multiple purposes of the groundwater monitoring program. The outcome will be a Hydrogeologic Characterization Report that shall:

- Summarize the results of the Phase I hydraulic characterization
- Update the site-wide conceptual model of ground water flow conditions
- Compare existing site groundwater flow conditions to current conditions, including critiquing various assumptions

- Develop the groundwater quality monitoring program (Phase II – long term)
- Propose appropriate points of compliance

Phase I wells will be sited to optimize potential use as future Phase II water quality monitoring points. To develop the necessary site-wide monitoring network of monitoring wells, existing wells may need to be abandoned, and new wells installed. The network must be sufficient to assess the change in flow conditions resulting from the remediation activities, as well as evaluate groundwater quality downgradient of the remediation areas with respect to affect on surface water quality. At the June 5 meeting Ecology concluded that there would be too many issues associated with seismic concerns (result of February 28, 2000 earthquake) to retrofit affected wells. The Phase I Groundwater Confirmation Monitoring Plan will present a new schedule; some text clarification; and a clarification of wells planned for installation or replacement. A letter from the Port will suffice for this requirement.

The Phase I Groundwater Confirmation Monitoring Program for the Southwest Harbor Project dated 12/21/2000 satisfies the requirements specified by the Department of Ecology, and criteria for meeting the specifications of the Southwest Harbor Project Consent Decrees in respect to Model Toxics Control Act requirements in WAC 173-340-410.

I look forward to receiving the work plan details associated with the proposed sampling and analysis activities.

If you should have any questions, please feel free to contact me at 425-649-7263.

Sincerely,

Glynis A. Carrosino, Project Manager
Toxics Cleanup Program

cc: Steven Alexander, Ecology
Warren Hansen, Onsite Enterprises, Inc.
Tim Flynn, Assoc Earth Sciences, Inc.

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

April 15, 2003

Kathy Bahnick
Environmental Management
Port of Seattle
Pier 69
P.O. Box 1209
Seattle, WA 98101

RE: Southwest Harbor Project
Monitoring Network Adequacy Technical Memorandum Submittal dated 3/19/03
Site Field Visit 4/2/03

Dear Kathy:

The Department of Ecology has completed its review of the Port's submittal of the Southwest Harbor Project Monitoring Network Adequacy Memorandum, dated March 19, 2003, and received April 2, 2003. Comments are presented in this letter. This Memorandum was initially prepared in draft and discussed in conference call meetings between Ecology, the Port and Aspect Consulting prior to the April 2, 2003 submittal. A field visit of the site to view the planned monitoring well installations, assess the current conditions of the terminal and to view computerized data gathering at selected probes also was conducted April 2, 2003.

The Phase I Groundwater Confirmation Monitoring Program was to be undertaken during the course of two years, with project findings assessed at the one year mark (this year). The overall goal of the program is to assess the groundwater flow regime of the Southwest Harbor Project since completion of site redevelopment, in order to develop an effective Compliance Monitoring Program per MTCA requirements. Project findings to date warrant limited additions to the ground water and surface water monitoring network at the Southwest Harbor Project.

Two significant data gaps were identified. These gaps and proposed assessments were discussed extensively by Ecology, the Port and Aspect Consulting. The goal is to address these data gaps in the current (second) year of the Phase I GWCM program to achieve project objectives.

Three new Fill Aquifer wells are recommended to better resolve water level and water quality data in the old Terminal 5 area downgradient of RA 1, 2, 3. Ecology had noted in the past that this area had limited monitoring points, and the additional issue of extreme weather (abnormally high precipitation that occurred in late 2001 and early 2002) warrant the installation of additional

wells. Ecology reviewed draft proposals for the placement and installation depth of these wells, which met our expectations.

A more complete assessment of the degree of communication between the Longfellow Flow Overflow Line (LFOL) and the Fill Aquifer is being proposed to better evaluate the magnitude of potential discharge of ground water to Elliott Bay through the LFOL. Ecology concurs with your recommendation of a focused, phased water quality and discharge study to be completed in the LFOL. A complete evaluation of the data, as well as a comparison of present and historic LFOL water quality data, will be presented in the site Hydrogeologic Characterization Report (completion of the Phase I portion of the GWCMP). Initial determinations and evaluation will be presented to Ecology prior to final Report submittal.

Should you have any questions, please feel free to contact me at 425-649-7263.

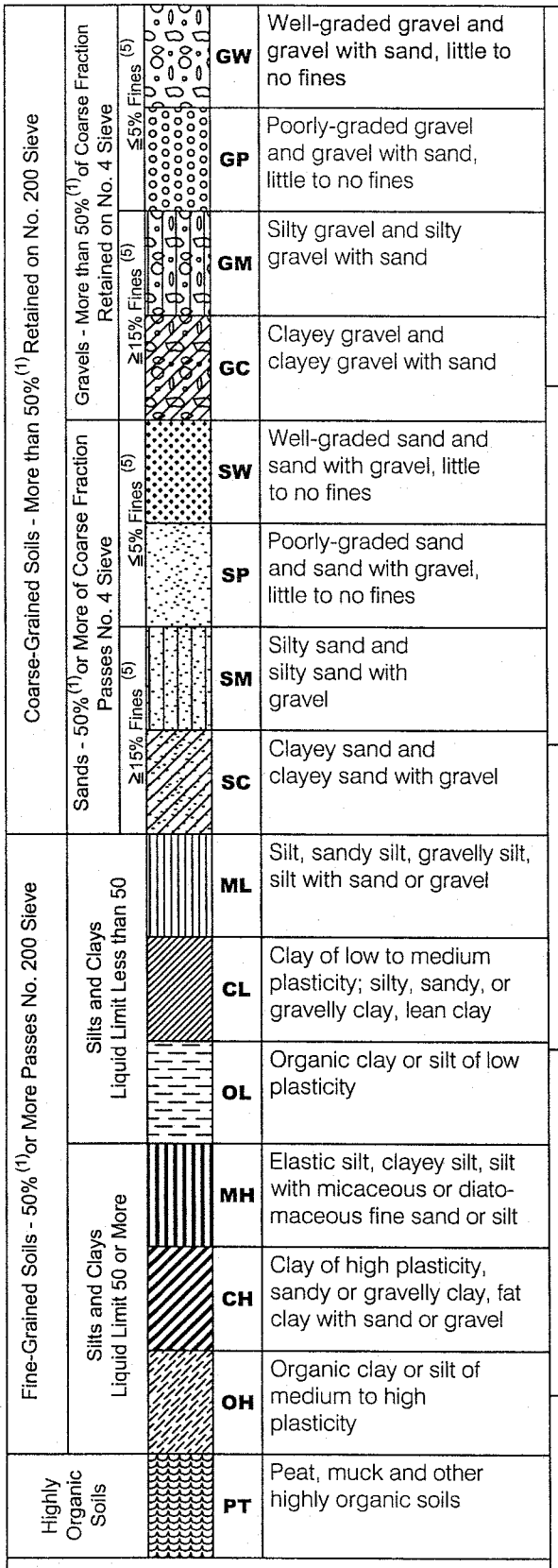
Sincerely,

Glynis A. Carrosino, Project Manager
Toxics Cleanup Program

Cc: Steve Alexander, Ecology NWRO
Chip Goodhue, Aspect Consulting

APPENDIX B

Monitoring Well Construction Logs –
Wells CMP- 18, 19, and 20



Terms Describing Relative Density and Consistency

	Density	SPT[2] blows/foot
Coarse-Grained Soils	Very Loose	0 to 4
	Loose	4 to 10
	Medium Dense	10 to 30
	Dense	30 to 50
	Very Dense	>50

	Consistency	SPT[2] blows/foot
Fine-Grained Soils	Very Soft	0 to 2
	Soft	2 to 4
	Medium Stiff	4 to 8
	Stiff	8 to 15
	Very Stiff	15 to 30
	Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

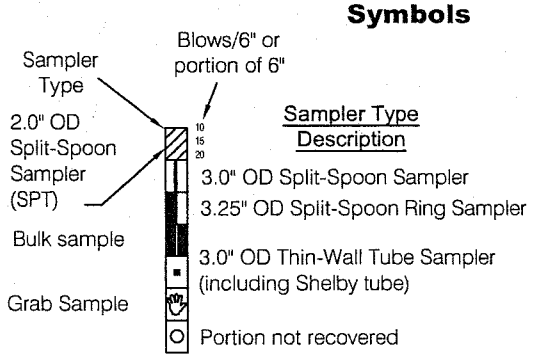
[3] Estimated Percentage

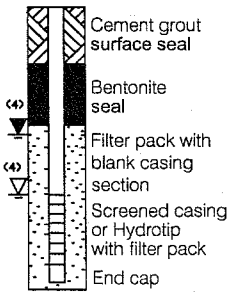
Percentage by Weight	Modifier
<5	Trace
5 to 15	Slightly (sandy, silty, clayey, gravelly)
15 to 30	Sandy, silty, clayey, gravelly)
34 to 49	Very (sandy, silty, clayey, gravelly)

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

Symbols





(1) Percentage by dry weight
(2) (SPT) Standard Penetration Test (ASTM D-1586)
(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)
(4) Depth of groundwater — ▼ ATD = At time of drilling; ▽ Static water level (date)
(5) Combined USCS symbols used for fines between 5% and 15% as estimated in General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

Aspect consulting
IN-DEPTH PERSPECTIVE
179 Madrone Lane North
Bainbridge Island, WA 98110
(206) 780-9370
811 First Avenue #480
Seattle, WA 98104
(206)-328-7443

Exploration Log Key

DATE:
DESIGNED BY:
DRAWN BY:
REVISED BY:
PROJECT NO.
FIGURE NO.
A-1

Q:_ACAD Standards\Drawings\Exploration Log Key.dwg

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
990106	CMP-18	1 of 1

Project Name: Southwest Harbor Project
Location: Seattle, Washington
Drilling Method: 4" Hollow Stem Auger ; Holt Drilling
Sampling Method: 2" Diameter, Split Spoon Sampler, 140 lb hammer

Top of PVC Casing Elev. (ft mllw):
Depth to Water (ft BTC):
Start Date: April 2, 2003
Finish Date: April 2, 2003

Depth feet	Well Construction	Sample Drive\Recovery	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	Flush POS spec monument					**ASPHALT**
	Concrete surface seal					Base course 1-1/4" minus GRAVEL (GW) with sand
			10 50/3	S-1		very dense, damp, brown sandy GRAVEL (GW); rock in shoe smooth after 3 feet
	Bentonite chips					
5						
	2" PVC casing					
			6 12 12	S-2		medium dense, moist, brown SAND; sand fine to medium (SW)
10	10-20/20-40 Filter pack					
			4 7 8	S-3		medium dense, wet, dark gray SAND (SW); sand fine to medium
15	2" PVC V-Wrap 10 slot screen		1 2 3	S-4		loose, wet, dark gray SAND; sand fine to medium (SW)
	4" PVC threaded sump					
			3 4 8	S-5		stiff, wet, gray SILT (MH); trace sand and organics
						Bottom of boring at 19 feet

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
Water Level (ATD)
Static Water Level

Logged by: RRH
Approved by: WVG
Figure No.

MW_GEOLG SWHARBOR.GPJ March 3, 2005

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
990106	CMP-19	1 of 1

Project Name: Southwest Harbor Project
Location: Seattle, Washington
Drilling Method: 4" Hollow Stem Auger ; Holt Drilling
Sampling Method: 2" Diameter, Split Spoon Sampler, 140 lb hammer

Top of PVC Casing Elev. (ft mllw):
Depth to Water (ft BTC):
Start Date: April 2, 2003
Finish Date: April 2, 2003

Depth feet	Well Construction	Sample Drive\Recovery	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	Flush POS spec monument					**ASPHALT**
	Concrete surface seal					Dense, damp, dark brown SAND (SW); sand fine to medium; trace brick
	Bentonite Chips Medium	0.9	12 22 21	S-1		
5	2" PVC casing	0.2	5 8 8	S-2		Medium dense, damp, dark brown to black sandy GRAVEL; Trace silt with steel debris - slag like material; Iron staining
	10/20 Filter pack	0.2	2 3 3	S-3		Loose, very moist to wet, brown gravelly SAND with silt; trace wood and slag-like material
10						Medium dense, wet, gray-brown SAND; trace silt with silty interbeds; sands fine - grades to
	2" PVC V-Wrap, 10 slot screen	0.3	3 6 17	S-4		
15		0.3	6 9 12	S-5		Medium dense, wet, gray-brown silty SAND with silty interbeds; sand fine
	4" Sump					stiff, wet, gray SILT; trace sand and organics
		0.3	2 3 3	S-6		
						Bottom of boring at 19 feet

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
Water Level (ATD)
Static Water Level

Logged by: RRH
Approved by: WVG
Figure No.

MW_GEOLG SWHARBOR.GPJ March 3, 2005

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
990106	CMP-20	1 of 1

Project Name: Southwest Harbor Project
Location: Seattle, Washington
Drilling Method: 4" Hollow Stem Auger ; Holt Drilling
Sampling Method: 2" Diameter, Split Spoon Sampler, 140 lb hammer

Top of PVC Casing Elev. (ft mllw):
Depth to Water (ft BTC):
Start Date: April 2, 2003
Finish Date: April 2, 2003

Depth feet	Well Construction	Sample Drive\Recovery	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	Flush POS spec monument					**ASPHALT**
	Concrete Seal					Base Course, 1 1/4" minus GRAVEL with sand
		0	13 16 21	S-1		
	Bentonite Chips					Dense, moist, light brown sandy GRAVEL; trace silt, concrete at 3.5 feet; dark brown sandy silt in shoe
5	2" PVC casing					
		0	7 9 10	S-2		Medium dense, wet, brown SAND; sand fine to medium
10	10-20/20-40 Filter pack					
		0	3 8 8	S-3		Medium dense, wet, gray silty SAND; silt inner beds; sand fine
15	2" PVC V-Wrap 10 slot screen	0	3 6 5	S-4		Medium dense, wet, silty fine SAND
	4" PVC threaded sump					
		0	3 5 9	S-5		Stiff, wet, gray SILT; trace sand and organics
						Bottom of boring at 19 feet

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
Water Level (ATD)
Static Water Level

Logged by: RRH
Approved by: WVG
Figure No.

MW_GEOLG SWHARBOR.GPJ March 3, 2005

APPENDIX C

Field Reports

Associated Earth Sciences, Inc.

DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
9/10/01	BV99106	Southwest Harbor Project	Clear 70's

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED Holt Drilling B-59, compressor, jack hammer, backhoe

THE FOLLOWING WAS NOTED:

Start-up of field work for the southwesr harbor project. Met on-site with Holt Drilling dropped off equipment. Picked up steel plates from terminal 91 to cover wells during construction. Began abandonning MW-22. Monument construction does not meet estimate. Abundant rebar and 8" well casing used in former retrofitting. Kathy Bahnick contacted regarding possible variance from Ecology to abandon without over-drilling. Kathy Bahnick is fine with variance if Ecology agrees. Chip Goodhue will contact Ecology regarding variance.

Plan to abandon MW-25, 27 and 31 tomorrow.

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Page No. 1 of 1	**AESI PROJECT MANAGER:** Chip Goodhue

Associated Earth Sciences, Inc.

DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
9/11/01	BV99106	Southwest Harbor Project	Clear 70's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED B-59, backhoe, compressor,jackhammer			

THE FOLLOWING WAS NOTED:

Continued with well abandonments at terminal 5. Wells abandoned today were MW-25, 27 and 31. MW-31 located in a pit was abandoned by pulling casing back 2-feet using a backhoe, then breaking out the bottom of the well using a steel bar followed by filling hole with bentonite chips hydrated with water.

MW- 25 and MW-27 were abandoned by overdrilling and grouting hole with a bentonite slurry by tremie.

Still waiting for Ecology response on variance for abandonments.

Tomorrow will begin retrofitting of wells outside of RA-5.

Contacted Garth Olson at GT Towing to get bus moved to allow access to 307 wells. Should be moved by tomorrow.

Called 1-call for utility locates for all well locations. Called Lee Miller KCDNR regarding locating along the rets line.

Began locating boring locations.

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Associated Earth Sciences, Inc.

DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
9/12/01	BV99106	Southwest Harbor Project	Clear 70's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED: B-59, compressor, jack hammer, backhoe			

THE FOLLOWING WAS NOTED:

Holt Drilling on site to continue abandonments and retrofits. Old monuments were jack hammered out and holes excavated to 18-inches on wells MW-308N, 307A and 307B. The monument from FM-105 was removed and replaced per POS specifications. On well MW-X2 the monument was removed and drill rig was set up over hole for overdrilling tomorrow.

All soil cuttings placed on visqueen and covered. POS is scheduling delivery of drop box for cuttings.

All open holes covered with steel plates awaiting concrete next week.

Seatte Water Department on site and cleared all monitoring well locations of water lines.

Lee Davidson from King Co. will be on site tomorrow to clear well locations for RETS line.

Left message with Jimmy Pang BNRR to contact me regarding CMP-1 and 2.

Tomorrow will set monuments and rebar in retrofit wells above.

Awaiting word on variance for abandonments.

Jkjjk	**FIELD REP.:** Bob Hanford
Page No. 1 of 1	**AESI PROJECT MANAGER:** Chip Goodhue

Associated Earth Sciences, Inc.

DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
9/13/01	BV99106	Southwest Harbor Project	Clear 80's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED B-59, Backhoe Compressor, Jackhammer			

THE FOLLOWING WAS NOTED:

Holt overdrilled MW-X2 and pulled casing and well screen. Bentonite grout was tremied down augers while pulling out. A head of grout was kept in the augers at all times. The surfaced will be filled with concrete next week. A steel plate was placed over the opening.

Monuments and rebar was placed in all retrofit wells prepared yesterday.

Still awaiting Ecology response on abandonment variances.

AESI met with Lee Davidson from King CO. to obseve placement of monitoring wells. All wells were cleared for drilling in regards to the RETS line. CMP-3 was moved 25-feet to the northeast at the request of Mr. Davidson.

Met with Kelly Garbar from APL. Visited each well site. AESI will keep Mr. Garbar informed of activities and will supply a tentative schedule on Monday. Mr. Garbar will be the point man for APL and will notify stack train, container yard, maintenance and security personel.

Left message for Jimmy Pang BNRR regarding CMP-1 and 2 drilling. No return call.

Discussed CMP-5 location with Warren Hansen. He will look at as-builts and get back to me. Liner apparently goes all the way to the curb and dives deep under the bike path. Will probably need to drill in street. Locate will clear 50-foot radius from center of Harbor AVE and Harbor drive.

Holt will not be on-site tomorrow but will return Monday.

Locate meeting scheduled for 0800 tomorrow.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
9/14/01	BV99106	Southwest Harbor Project	Clear 70's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED			

THE FOLLOWING WAS NOTED:

On site at 0700 to complete locate for proposed monitoring wells. APS and Locating Inc. were on site at 0800. Locating Inc. cleared wells CMP-11, 12, 13, 1 and 2 for PSE, and QUEST. APS completed the private locate for all wells but will return Monday to recheck CMP-3, 8, 9, and 10. In addition wells 3, 8, 9, and 10 will be cleared by APS using a air/vacuum utility potholer. APS potholer will be on-site Monday at 1200. Seattle City Light did not show up at locate and was requested to site Monday the 17th. In addition Metro sewer was requested on site Monday.

Talked with Gary Wallinder regarding BNSF and CMP-1 and 2. Gary called Jimmy Pang and ok'd drilling locations. No permitting will be required per Gary Wallinder.

Met with Warren Hansen to review drilling locations. Observed locations of CMP-1, 2, 5, 11, 12 and 13. All locations appeared fine to Mr. Hansen. Retuned to office on the 2:10 boat.

Holt Drilling not on site today will return on Monday.

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Page No. 1 of 1	**AESI PROJECT MANAGER:** Chip Goodhue

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
9/17/01	BV99106	Southwest Harbor Project	O/C 60's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED B-61 drill, backhoe, Air Vacuum potholer			

THE FOLLOWING WAS NOTED:

On site at 0700 to clear power utilities and sewer. Seattle City light cleared all public power at monitoring wells. Only CMP-5 and CMP-1 have public power near them. Metro sewer did not show.

Holt Drilling on-site at 0830. Completed, except for monuments were CMP-11, 12, and 13. Wells completed today were screened with 10-feet of 10-slot screen from 6 to 16 feet. See boring logs for detailed information on drilling and well installation. Steel plates were placed over wells until concrete seals and monuments are placed on Friday. All soil cuttings were placed on visqeen and covered inside the fenced area at the north end of RA-1. All auger and drill tools were steam cleaned between each boring. Decon water is presently being stored in the decon trailer until a tank is delivered to the site. Holt has several 55-gallon drums if needed for water storage.

Samples were collected at 2.5 to 5 foot intervals. All samples were screened using a Mini-Rae photo-ionization detector. Periodic air monitoring was completed during drilling using the PID and a H2S meter. No hydrgen sulfide or PID readings were noted.

All wells were drilled and installed according to work plan specification with the following exception. Ten slot rather than V-wrap screen was installed due to shipping problem encountered from last week terrorist attack. Per conversation with Chip Goodhue it was approved to use the ten slot screen. CMP-11 was moved approximately 25-feet north of location shown in work plan and addendum. Per conversation with Chip Goodhue this was due to a bad plot on the maps. The new location placed Cmp-11 outside of area RA-4 as intended.

APS locating was on site with the Air vac potholer to further check on utility locations that were in question. Well locations CMP-11, CMP-9 and CMP-8 were air-vac'd to depths of 11.0, 10.8 and 8.0 feet respectively. APS will return on Thurday to vacuum CMP-1 and CMP-3. APS was on site today from 1200 to 1800.

Activities for tomorrow include CMP-8, 9, 4 and 6.

Holt on site today from 0830 to 1600.

APS on site today for 3-hours. APS locating (not vacuum) total hours 12.0

AESI REP on site from 0700 to 1800.

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Page No. 1 of 1	**AESI PROJECT MANAGER:** Chip Goodhue

Associated Earth Sciences, Inc.

DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
9/18/01	BV99106	Southwest Harbor Project	O/C 50's & 60's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED B-61 Drill Rig, Backhoe			

THE FOLLOWING WAS NOTED:

Holt on site at 0615. Drilled and installed CMP-4, CMP-6, CMP-2, CMP-9 and CMP-8. See Boring Logs for detailed information on drilling and well construction.

Steel plates were placed over wells until concrete seals and monuments are placed on Friday. All soil cuttings were placed on visqeen and covered inside the fenced area at the north end of RA-1. All auger and drill tools were steam cleaned between each boring. Decon water is presently being stored in the decon trailer until a tank is delivered to the site. Holt has several 55-gallon drums if needed for water storage.

Samples were collected at 2.5 to 5 foot intervals. All samples were screened using a Mini-Rae photo-ionization detector. Periodic air monitoring was completed during drilling using the PID and a H2S meter. No hydrgen sulfide or PID readings were noted.

All wells were drilled and installed according to work plan specification with the following exception. Ten slot rather than V-wrap screen was installed due to shipping problem encountered from last weeks terrorist attack. Per conversation with Chip Goodhue it was approved to use the ten slot screen.

Activities for tomorrow include drilling and installation of CMP-3, 10, and 1 and if variance is in place abandonment of wells MW-1, 6, 21 AND X1.

Holt took monument lids back to shop to weld in ID numbers. Monitoring well placards will be glued onto lids using epoxy. Sealant for the concrete/asphalt needs to have concrete cured for at least a week and will be applied on Holt's next mobilization to the site.

APS Air Vac was cancelled for Thursday due to expected slag material at CMP-1.

Holt on site today from 0615 to 1730.

AESI REP on site from 0615 to 1730.

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Associated Earth Sciences, Inc.

DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
9/19/01	BV99106	Southwest Harbor Project	Ptly Cldy, 60's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED B-61 drill, backhoe			

THE FOLLOWING WAS NOTED:

Arrived on site with Holt drilling at 0615. Drilled and installed monitoring wells at CMP-3, CMP-10, AND CMP-1. See boring logs for drilling and installation details.

Locating Inc. cleared PSE and telephone on CMP-10.

Steel plates were placed over wells until concrete seals and monuments are placed on Friday. All soil cuttings were placed on visqeen and covered inside the fenced area at the north end of RA-1. All auger and drill tools were steam cleaned between each boring. Decon water is presently being stored in the decon trailer and a 55-gallon drum. An 1100 gallon water tank will be delivered mid day tomorrow per conversation with Eric Lottsfeldt POS.

Samples were collected at 2.5 to 5 foot intervals. All samples were screened using a Mini-Rae photo-ionization detector. Periodic air monitoring was completed during drilling using the PID and a H2S meter. No hydrgen sulfide or PID readings were noted.

All wells were drilled and installed according to work plan specification with the following exceptions.Ten slot rather than V-wrap screen was installed due to shipping problem encountered from last weeks terrorist attack. Per conversation with Chip Goodhue it was approved to use the ten slot screen. Per discussion with Chip Goodhue, CMP-10 was complete and screened from 5 to 15 feet. Due to the silt encountered in the screened interval observations including water levels and some developing will be collected prior to completing monument. If insufficient water is noted in CMP-10, the monument will not be installed and the well will be abandoned.

Activities for tomorrow include abandonment of wells MW-1, 6, 21 AND X1 and retrofit of wells MW-5, 26, 36, AND 44. Retrofits for above wells will include placing a rubber packer a minimum of 3 feet below first joint in 4-inch PVC riser pipe and placing cement/bentonite grout in the anular space between the 2 and 4 inch riser pipe.

Holt on site today from 0615 to 1500.

AESI REP on site from 0615 to 1500.

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Page No. 1 of 1	**AESI PROJECT MANAGER:** Chip Goodhue

Associated Earth Sciences, Inc.

DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
9/20/01	BV99106	Southwest Harbor Project	Cloudy, 60's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED B-61 drill			

THE FOLLOWING WAS NOTED:

Arrived on site with Holt drilling at 0800. Concrete for monuments will be delivered Friday at 1000.

Abandoned wells MW-1, MW-6, MW-22, and MW-X1. All wells grouted in place with tremied bentonite grout, as specified in the variance received from the Dept. of Ecology (9/19/01).

Retrofitted wells MW-5, MW-26, MW-36, MW-44. Retrofits for above wells included placing a rubber packer a minimum of 3 feet below first joint in 4-inch PVC riser pipe, hydrating bentonite chips in the first 1.5 feet of the annular space between the 2 and 4 inch riser pipe, and placing cement/bentonite grout in the remaining annular space.

Installed monuments in wells CMP-4, and CMP-6.

Performed pump test on well CMP-10. SWL initially 7.83 ft. Pumped well dry with 12-V pump – total pumpage 4 gal over 1 min. Recovered to 12.8 ft after 3 min.

Tasks for tomorrow (Friday) include attaching Ecology Well IDs, installing monuments, and collecting a complete round of SWLs.

Holt on site today from 0800 to 1530.

AESI REP on site from 0800 to 1530.

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Associated Earth Sciences, Inc.

DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
9/21/01	BV99106	Southwest Harbor Project	Cloudy, 60's

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED Backhoe, water level indicator

THE FOLLOWING WAS NOTED:

Arrived on site with Holt drilling at 0830.

Holt arrived on site at 0900. Concrete truck arrived on site at 1000.

5 monuments picked up from T-30. Associated o-rings, lids, bolts, and washers also picked up.

Monuments installed at CMP-1, CMP-2, CMP-3, CMP-8, CMP-9, CMP-10, CMP-11, CMP-12, CMP-13, MW-307A, MW-307B, MW-308A.

Water levels taken in CMP-1, CMP-2, CMP-3, CMP-4, CMP-6, CMP-8, CMP-9, CMP-10, CMP-11, CMP-12, CMP-13, FM-105, MW-5, MW-26, MW-36, MW-44, MW-125, MW-307A, MW-307B, MW-308A.

Holt on site today from 0900 to 1530.

Concrete truck on site today from 1000 to 1500.

AESI REP on site from 0830 to 1700.

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Associated Earth Sciences, Inc.

DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
10/17/01	BV99106	Southwest Harbor Project	Prtly Cldy 55

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED Sounder, Truck, Weighted tape

THE FOLLOWING WAS NOTED:

AESI Rep. On site to begin development activities of the new and retrofitted wells. Wells MW- 5, 26, 44 and CMP-1,2,3,4,6,8,and 9 were sounded for water level and depth to sediment. Set up staging area for development water and decon. Development water will be transported in 55-gallon drums to the fenced area and pumped into the 1100-gallon storage tank provided by the POS. Actual well development will begin tomorrow 10-18-01.

Aesi REP on site 12:30 to 16:30.

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Associated Earth Sciences, Inc.

DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
10/18/01	BV99106	Southwest Harbor Project	Cloudy, 50's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED Sounder, Truck, Weighted tape, EC,PH, turbidity, 12volt sub.Homda pump waterra system			

THE FOLLOWING WAS NOTED:

AESI Rep. On site to development monitoring wells. Wells developed today included CMP-1, 2 ,and13. Wells were developed using a Waterra foot valve with a surge block, followed with pumping using a 12-volt submersible pump.

Additiional surging was performed intermittent with pumping. All wells were developed until clear with no sediment and below 10 ntu turbidity.

All development water was pumped into an 1100-gallon storage tank in the fenced area at the north end of RA-1. Development equipment was deconed in between wells using an alconox wash and a tap water rinse. All development data was recorded on a well development spread sheet as readings were collected.

AESI Rep. On site 0800 to 1630.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
10/23/01	BV99106	Southwest Harbor Project	Mostly sunny, 50's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED Sounder, Truck, Weighted tape, EC,PH, turbidity, 12volt sub.Homda pump waterra system			

THE FOLLOWING WAS NOTED:

AESI Reps. On site to development monitoring wells. Wells developed today included CMP-10, 4,and11, 12 and MW-26. Wells were developed using a Waterra foot valve with a surge block, followed with pumping using a 12-volt submersible pump.

Additiional surging was performed intermittent with pumping. Wells CMP-4 and CMP-11 were developed until clear with no sediment. Both wells developed to below 10 ntu turbidity. Wells CMP-10 and CMP-12 had very slow recovery and cannot be fully developed due to lack of water in the wells.

Well MW-26 in RA-5 was found to have an apparent broken well screen at 17.5 feet. Total depth of well was reported to be 25 feet. Durring attmpted development approximatly 1 foot of sand (both black marine silts and fine sand and silica sand) was removed from well. Maximum depth attained today was 19.6 feet with a "soft bottom". Well appears to make sand when pumped and it is recommended that this well be abandoned and replaced prior to the tidal study tentatively scheduled for December.

The damage to this well would appear consistent with earthquake damage to other wells in the vicinity.

All development water was pumped into an 1100-gallon storage tank in the fenced area at the north end of RA-1. Development equipment was deconed in between wells using an alconox wash and a tap water rinse. All development data was recorded on a well development spread sheet as readings were collected.

A Street Use/Utility Permit was aquired from the City of Seattle today for the completion of CMP-5.

AESI Rep. On site 0800 to 1630.

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Associated Earth Sciences, Inc.
179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
10/25/01	BV99106	Southwest Harbor Project	Mostly sunny, 50's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED Sounder, Truck, Weighted tape, EC,PH, turbidity, 12volt sub.Homda pump waterra system			

THE FOLLOWING WAS NOTED:

AESI Reps. On site to development monitoring wells. Wells developed today included CMP-3, 8, 9, MW-308N (south), MW-308S(north), MW-36 and MW-44. Wells were developed using a Waterra foot valve with a surge block, followed with pumping using a 12-volt submersible pump. Additiional surging was performed intermittent with pumping. Wells were developed until clear with no sediment and below 10 ntu turbidity. Well MW-308S had very slow recovery and could not be fully developed at this time.

CMP-3 had an elevated temperature and Ph. Temperature ranged from 28 to 23 celsius and ph from 9.8 to 10.1.

There is some confusion regarding well cluster MW-308. MW-308A(the north well) was retrofitted in error. It is the shallow well with a depth of 18 feet. The 12 volt pump could make it to the bottom of the well. MW-308B (the deep well to the south had depth of approximately 40 feet. The deep well in this cluster should have been retrofitted. Both wells are 2".

All development water was pumped into an 1100-gallon storage tank in the fenced area at the north end of RA-1. Development equipment was deconed in between wells using an alconox wash and a tap water rinse. All development data was recorded on a well development spread sheet as readings were collected.

Approximately 450 gallons are now in the 1100 gallon storage tank.

AESI Rep. On site 0900 to 1730.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
10/29/01	BV99106	Southwest Harbor Project	Ptly Cldy, 50's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED B-61 Mobile Drill			

THE FOLLOWING WAS NOTED:

Arrived on site with Holt drilling at 0900. Cascade Coring under subcontract with Holt Drilling cut a 2.5X2.5 square in 9-inch road surface. Holt drilled and installed monitoring well at CMP-5 location in turn lane at Sw Harbor Avenue and Harbor Lane. See boring logs for drilling and installation details. Boring was advance to 16.0 feet with monitoring well installed from 15.2 to 5.2 feet.

A Morris flush mount monument was used instead of the Port monument to eliminate 1/8" stickup of lid in roadway.

City of Seattle inspector Janelle Trokey was notified by voice mail on 10/25/01 that work on permit #71843 would be performed today. A second message was left 10/26/01 and also this morning.

All soil cuttings were placed on visqeen and covered inside the fenced area at the north end of RA-1. All auger and drill tools were steam cleaned before and after drilling. Decon water was placed in the 1100 gallon water tank at the north end of RA-1.

Samples were collected at 2.5 to 5 foot intervals. All samples were screened using a Mini-Rae photo-ionization detector. Periodic air monitoring was completed during drilling using the PID and a H2S meter. No hydrgen sulfide or PID readings were noted.

CMP was drilled and installed according to work plan specification. Ten slot V-wrap screen was installed.
Activities will resume on Wednesday 10/31 with the drilling of CMP-7

Holt personnel sealed all joints in well installs and abandonments completed to date.
Holt on site today from 0900 to 1700.

AESI Rep completed development of the shallow well Mw-308A see well development spread sheet for details. It does not appear that the kink noted in EQ evaluations will effect placement of Troll data logger in well. The well cleared to below 10 NTU with no sediment.

Attempted development of MW-307B (deep well) The well clean up adequately but a bend in casing was noted 4 to 5 feet beow ground surface. The lower stage of the 12 volt submersible pump hung up on bend and was lost down hole.
The bend in the casing appears to be consistent with earthquake related damage seen at other locations on site. No EQ evaluation was completed on this well because access was blocked by wrecked bus.

AESI REP on site from 0830 to 1630.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
10/31/01	BV99106	Southwest Harbor Project	Windy, 50's Showers
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED B-59 Mobile Drill, Backhoe			

THE FOLLOWING WAS NOTED:

Arrived on site at 0800. Holt drilling on site at 0845. See boring log for drilling information. Boring was advance to 25.0 feet with 10-inch ID HAS then backed out 5 feet. Betonite chips were placed in the boriing from 20 to 25 feet then the 10-inch ID auger was set back at 25 feet. Four inch ID hollow stem auger was then advanced through the 10 inch to a depth of 49 feet. Durring the drilling and well installation the 10 inch auger dropped at least 10 feet below ground surface. Holt attempted to recover auger with no success today. Holt will attempt to retrieve auger again tomorrow. It is likely that this boring will have to be abandoned and another installed.

A tremied bentonite slurry was placed durring the install and is currently at 10 feet below ground surface.

Cuttings were placed on visqueen until a backhoe was delivered to the site at 11:30. All cutting were moved to the fenced area at the north end of RA-1. A new stockpile was started for cuttings for CMP-7 due to the presence of creosote like materials in the drill cuttings.

The drill site was cleaned up and the hole covered with a steel plate prior to Holt leaving site.

Chip Goodhue on site from 10:30 to 14:00.

AESI REP on site from 0830 to 17:15

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DAILY REPORT

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DATE	PROJECT NO.	PROJECT NAME	WEATHER
11/01/01	BV99106	Southwest Harbor Project	O/C 50's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED B-59 Mobile Drill, Backhoe			

THE FOLLOWING WAS NOTED:

Holt Drilling on-site to try and retrieve 10-inch auger lost in the ground during the installation of CMP-7. Holt used 4-inch auger to try and lock on to the larger diameter auger. The ten inch auger is located 15-feet below ground surface. Holt had hold of the auger but could not retrieve it. Due to stack train operations Friday additional efforts to retrieve auger will take place next week.

Aspect representative developed CMP-5 using the waterra system for purging and surging and pumping until clear using a peristaltic pump. See well development spread sheet for parameters and other development data. Development water was pumped into 1000 gallon storage tank at the north end of RA-1.

Aspect on site 13:00 to 17:30.

Holt on-site 0900 to 15:00. No charge Holt working to retrieve auger.

Work will resume on Monday, November 05, 2001. Holt has indicated that they will work on the earthquake replacement wells on Monday and have a second rig available on Tuesday to allow for fishing for the auger.

All drilling an abandonments are scheduled to be complete next week.

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DATE	PROJECT NO.	PROJECT NAME	WEATHER
11/05/01	BV99106	Southwest Harbor Project	Ptly Cldy, 50's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED B-61 drill, backhoe			

THE FOLLOWING WAS NOTED:

Arrived on site with Holt drilling at 0800. Drilled and installed monitoring wells at CMP-16, CMP-14, AND CMP-15. See boring logs for drilling and installation details.

All well location cleared for utilities.

Steel plates were placed over wells until concrete seals and monuments are placed. All soil cuttings were placed on visqeen and covered inside the fenced area at the north end of RA-1. Cuttings were placed in a third stockpiled to keep the earthquake replacement cuttings separate. All auger and drill tools were steam cleaned between each boring. Decon water was stored in 55-gallon drums.

Samples were collected at 2.5 to 5 foot intervals. All samples were screened using a Mini-Rae photo-ionization detector. Periodic air monitoring was completed during drilling using the PID and a H2S meter. No hydrgen sulfide or PID readings were noted.

All wells were drilled and installed according to work plan specification with ten slot V-wrap screen.

Activities for tomorrow include completion of wells MW-26R, and CMP-17, auger retrieval from CMP-7 redrill and installation of CMP-7 and possible abandoments.

Holt on site today from 0830 to 1700

AESI REP on site from 0800 to 1700.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
11/06/01	BV99106	Southwest Harbor Project	Ptly Cldy, 40's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED Lars 10-T drill, backhoe			

THE FOLLOWING WAS NOTED:

Arrived on site with Holt drilling at 0900. Drilled and installed monitoring wells MW-26R, and CMP-17. See boring logs for drilling and installation details. These wells were replaced under the earthquake damaged well contract. Wells drilled today were completed with a track mounted Lars 10-T auger drill.

All well location cleared for utilities.

Steel plates were placed over wells until concrete seals and monuments are placed. All soil cuttings were placed on visqeen and covered inside the fenced area at the north end of RA-1. Cuttings were placed in a third stockpiled to keep the earthquake replacement cuttings separate. All auger and drill tools were steam cleaned between each boring. Decon water was stored in 55-gallon drums.

Samples were collected at 2.5 to 5 foot intervals. All samples were screened using a Mini-Rae photo-ionization detector. Periodic air monitoring was completed during drilling using the PID and a H2S meter. No hydrgen sulfide or PID readings were noted.

All wells were drilled and installed according to work plan specifications with pvc, ten slot V-wrap screen.

Activities for tomorrow include completion of well monuments MW-26R, CMP-17, CMP-14, CMP-15 and CMP-16.

A second Holt rig on-site today to attempt retrieval of 10-inch auger from CMP-7.

Contacted City of Seattle regarding Street Use Permit for CMP-5. Jennelle Troskey reported that work was completed satisfactory and permit conditions were fullfilled. OK to do monitoring in future.

Holt Crew (Lars Rig) on site today from 0900 to 1700
Holt Crew (B-59) on site today from 0900 to
AESI REP on site from 0800 to 1700.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
11/07/01	BV99106	Southwest Harbor Project	Sunny, 50's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED Lars B-59 drill, backhoe			

THE FOLLOWING WAS NOTED:

Arrived on site with American Leak Detection at 0900. Videoed MW-26 and MW-307B. Recorded on tape. MW-26 showed what appeared to be separated casing at 16.1'. The top of a rectanglular block (1" x 0.5"?) was at 17.7'. Sediment started at 18.7'. SWL at 10.15'. Retrofit is readily seen in video.

MW-307B (northern well) has an apparent failure at 3-4'. SLW at 8.0'

American Leak Detection left site at approx. 1130.

Developed well CMP-14. Initial SWL/TD = 10.1'/16.0' (soft). Surged with Watera system and pumped with peristaltic pump. Temperature was 18C. pH was 8.1. Conductivity was 400 microSiemens. Turbidity was 300 NTUs after 50 gallons.

Drilled and installed CMP-7 at new location 10 feet north of CMP-6. Drilled to 20 feet using 10-inch id casing with samples collected at 15, 17.5, and 20 feet. No recovery was achieved in any of the above sample intervals due to abundant gravels encountered in boring believed to be an old railroad grade. The 10 inch was pulled back to 19-feet and bentonite chips were place in hole. The ten inch auger was redrilled to 20 feet and 3-feet of bentonite chips were placed in auger. Hole was then completed to 47.5 feet using 4-inch id auger and a 2-inch monitoring well installed with 10 feet of v-wrap 10-slot screen from 37 ro 47 feet.

A steel plate was placed over well until concrete seal and monument is placed. All soil c uttings were placed on visqeen and covered inside the fenced area at the north end of RA-1. Cuttings were placed in in the same stockpile as cuttings from the first CMP-7 attempt. Soil were observed to have a creosote like odor and sheen. All auger and drill tools were steam cleaned between borings. Decon water pumped into 1000 gallon storage tank.

Samples were collected at 2.5 to 5 foot intervals below 15 feet. All samples were screened using a Mini-Rae photo-ionization detector. Periodic air monitoring was completed during drilling using the PID and a H2S meter. No hydrgen sulfide or PID readings were noted.

All wells were drilled and installed according to work plan specifications with pvc, ten slot V-wrap screen.

Holt completed monumonts on CMP-14, 15, 16, 17, and MW-26R.
Holt Crew (B-59) on site today from 0800 to 1730
AESI REPs on site from 0845 to 1715.

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DAILY REPORT

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DATE	PROJECT NO.	PROJECT NAME	WEATHER
11/08/01	BV99106	Southwest Harbor Project	Sunny, 50's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED Lars B-59 drill, backhoe			

THE FOLLOWING WAS NOTED:

Arrived on site with Holt Drilling at 0830. Baker tank volume at 490 gallons. Decon water and development water from 11/7 transferred to baker tank.

Drilled MW-307B R (EQD replacement). Drilled and set 10" casing to 22'. Set chips in bottom of hole. Let set for approx. ½ hour. Continued drilling 4" hollow stem auger to 41.5'. Well completed at approx. 40' with screen from 30'-40'. Sand approx 27' to 41.5'.

MW-307A developed. Tubidity at 26 NTU after approx 25 gallons.

MW-307B abandoned by filling well with bentonite slurry.

Development water transferred to baker tank.

Transferred cuttings to stockpile. Recovered all three stockpiles with new plastic.

Holt Crew (B-59) on site today from 0830 to 1630

Aspect REPs on site from 0800 to 1630.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
11/09/01	BV99106	Southwest Harbor Project	Sunny, 50's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED Lars B-59 drill			

THE FOLLOWING WAS NOTED:

Arrived on site at 0830. Holt drilling already there.

Baker tank volume at 550 gallons. Decon water from 11/7-11/8 (EQD) transferred to baker tank. Estimated 100 gal added.

MW-307B R (EQD replacement) monument installed. MW-307B cemented to grade.

MW-8 abandoned with bentonite slurry, bentonite chips, and cement to grade. Total depth of 22.5' 4" casing filled with approx. 30 gal of slurry, with difference of chips and cement.

MW-33 abandoned as above. TD of 22.5' 4" casing filled with approx. 30 gal slurry, with difference of chips and cement.

MW-26 abandoned as above. TD of 20' 4" casing with 2" retrofit filled with approx. 20 gal slurry, with difference of chips and cement.

MW-13 abandoned as above. TD of 29' 4" casing filled with approx. 40 gal slurry with difference of chips and cement.

MW-149 abandoned as above. TD of 15.3' 2" casing filled with approx. 10 gal slurry with difference of chips and cement.

CMP-7 monument installed. Cemented abandoned hole to grade.

Transferred decon dregs to CMP-7 stockpile.

Holt Crew (B-59) on site today from 0800 to 1430

Aspect REP on site from 0830 to 1430.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
11/15/01	BV99106	Southwest Harbor Project	Partly cloudy, 50's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED			

THE FOLLOWING WAS NOTED:

Arrived on site at 10:00. Met with Eric Lottsfeldt and Joel from the POS survey crew. Eric left site and Aspect rep. Escorted survey crew to all well and LFOL manhole locations. Survey crew expects to begin survey this afternoon or tomorrow.

Survey crew to survey X,Y and elevation. Elevation measurments to be collectd from ground surface, monument rim and top of PVC casing on the north side.

Aspect rep worked on sealing monuments the remainder of the day. Rubber gromets were placed on all bolts and extra set of bolt holes sealed with silicon caulkin. Work on monuments will continue tomorrow with installation of Troll hinged well caps. Most wells will need to be cut down to facilitate well caps.

Received lap top computer and rubber seals for monuments from Eric Lottsfeldt today.
Aspect REP on site from 10:00 to 17:00.

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
11/16/01	BV99106	Southwest Harbor Project	Partly cloudy, 50's

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED

THE FOLLOWING WAS NOTED:

Arrived on site at 07:30. Aspect rep worked on sealing monuments. Rubber gromets were placed on all bolts and extra set of bolt holes sealed with silicon caulkin. Troll hinged well caps were installed on wells MW-125, CMP-5, CMP-11, CMP-12, CMP-13, MW-308S, CMP-8 and CMP-9.

Monuments were bailed out and monument vacumned clean. Wet dry vac. Worked extremely good cleaning out well.

Remaining caps will be completed on Monday.
Aspect REP on site from 0730 to 17:00.

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
11/19/01	BV99106	Southwest Harbor Project	Heavy rain, 40's

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED

THE FOLLOWING WAS NOTED:

Arrived on site at 08:00. Aspect rep worked on sealing monuments. Rubber gromets were placed on all bolts and extra set of bolt holes sealed with silicon caulkin. Troll hinged well caps were installed on wells CMP-17, FM-105, CMP-1, CMP-2, CMP-7, CMP-6, CMP-4, CMP-3, MW-44 and MW-26R. Monuments were bailed out and monument vacumned clean. Wet dry vac. Worked extremely good cleaning out well.

Remaining caps will be completed on Monday.
Aspect REP on site from 0730 to 17:00.

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
12/06/01	BV99106	Southwest Harbor Project	Heavy rain, 40's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: Laptop, water level indicator, total depth indicator, vacuum

THE FOLLOWING WAS NOTED:

Arrived on site at 08:00. Aspect reps installed calibrated and programmed TROLL probes in respective wells. The typical procedure included installing a well cap and measuring the top of the well cap to a surveyed point (if necessary); measuring the total depth of the well; measuring the depth to water in the well; installing sample tubing for chloride sampling on the probe (if necessary); installing the probe to the proscribed depth (typically 2 to 3 feet above the bottom of the well); connecting the probe to the laptop to verify programmed data and take initial readings.

TROLL probes were installed in the following wells: CMP-2, CMP-3, CMP-4, CMP-6, CMP-7, CMP-8, CMP-11, CMP-12, CMP-13, CMP-14, CMP-16, MW-26R, MW-36, MW-44, MW-307A, MW-307BR, MW-308N, MW-308S.

The TROLL temperature and pressure probes were factory-calibrated by In-Situ, Inc. Where necessary, pH and conductivity probes were calibrated by Aspect representatives. pH was calibrated using two-point calibration (7 and 10 calibration solutions). Conductivity was calibrated for 5 different conductivities (450, 1413, 4500, 12880, and 45000 uS/cm).

Aspect REP on site from 0730 to 1700.

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DATE	PROJECT NO.	PROJECT NAME	WEATHER
12/10/01	BV99106	Southwest Harbor Project	Heavy rain, 40's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED: Laptop, total depth indicator, vacuum			

THE FOLLOWING WAS NOTED:

Arrived on site at 1400. Aspect reps installed calibrated and programmed TROLL probes in respective wells. The typical procedure included measuring the total depth of the well; installing the probe to the proscribed depth (typically 2 to 3 feet above the bottom of the well); connecting the probe to the laptop to verify programmed data and take initial readings.

TROLL probes were installed in the following wells: CMP-9, CMP-15, CMP-17, MW-5, MW-125, MH-1, and MH-8.

The TROLL temperature and pressure probes were factory-calibrated by In-Situ, Inc. Where necessary, pH and conductivity probes were calibrated by Aspect representatives. pH was calibrated using two-point calibration (7 and 10 calibration solutions). Conductivity was calibrated for 5 different conductivities (450, 1413, 4500, 12880, and 45000 uS/cm).

Aspect REP on site from 1400 to 2000.

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Aspect consulting
IN-DEPTH PERSPECTIVE

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
01/15/02	990106-004-10	Southwest Harbor Project	Cloudy, 40's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: Waterra system, 12-V submersible pump, handheld water quality sensors, water level indicator.

THE FOLLOWING WAS NOTED:

Arrived on site at 0845.

Developed MW-5 to 32.5 NTU. Total discharge: 18 gallons.

Developed MW-125 to 68.0 NTU. Total discharge: 16 gallons.

Developed FM-105 to 71.4 NTU. Total discharge: 15 gallons.

Redeveloped MW-307BR to 73.1 NTU. T-4000 removed before development and reinstalled after development. Total discharge: 30 gallons.

All development water was pumped into baker tank. The tank held 790 gallons upon arrival.

Replaced o-rings in CMP-14, CMP-15, and CMP-16.

Left site at 1640.

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Aspect consulting
IN-DEPTH PERSPECTIVE

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
01/16/02	990106-004-10	Southwest Harbor Project	Cloudy, 40's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: Waterra system, 12-V submersible pump, handheld water quality sensors, water level indicator.

THE FOLLOWING WAS NOTED:

Arrived on site at 0845.

Redeveloped CMP-12 (slow recovery well) to 53.3 NTU. T-8000 removed before development, placed in purge water to keep pH bulb wet during development, and reinstalled after development. Total discharge: 20 gallons.

Redeveloped CMP-10 (slow recovery well) to 156 NTU. Spent a total of 4 hours developing. Two feet of recovery required approximately 30 minutes. Total discharge: 13 gallons.

Redeveloped CMP-9 to 82.5 NTU. Total discharge: 15 gallons.

Redeveloped CMP-6 to 87.1 NTU. T-8000 removed before development, placed in purge water to keep pH bulb wet during development, and reinstalled after development. Total discharge: 27.5 gallons.

All development water was pumped into baker tank.

The following monuments did not collect water and the o-rings were in good condition: MW-308N(A), MW-308S(B), CMP-6, CMP-10, CMP-11, CMP-12, CMP-13.

CMP-9 monument was full of water (to the vent in the well cap), and the o-ring was in good condition. The monument rim, the o-ring seat, and the lid were thoroughly cleaned and vacuumed before resealing the lid.

The lid for MW-308N(A) needs the well ID welded on it.

Left site at 1600.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
01/17/02	990106-004-08	Southwest Harbor Project	Cloudy, 40's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: Honda pump, 12-V submersible pump, soil sampling kit, level and tape measure

THE FOLLOWING WAS NOTED:

Arrived on site at 0845.

Waited for BNSF flagger until 0915 (was scheduled to arrive at 0900). Called Jimmy Pang to confirm a flagger had been sent. He said one would arrive at 1000.

Pumped remaining purge water into baker tank. Final volume was 940 gallons. Took water samples from baker tank.

Met with BNSF flagger at 1000. Measured MH-1 rim to top of PVC casing and rim to top of top rung. Removed PVC casing.

Took 3-point composite soil samples from each stockpile: main stockpile, earthquake damaged well stockpile, and CMP-7 stockpile. Recovered all stockpiles with tarp.

Measured MH-8 rim to top of PVC casing. Removed PVC casing.

Organized site.

Left site at 1145.

Delivered samples to a North Creek Analytical courier at 1200.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
02/08/02	990106-004-15	Southwest Harbor Project	Cloudy, 40's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: YSI-33 (T,C,S), water level indicator.

THE FOLLOWING WAS NOTED:

Arrived on site at 0800.

Recorded water level (w/ time) and temperature/conductivity (w/ depth) for all the non-instrumented monitoring wells, including: CMP-1, CMP-5, FM-105, MW-125, CMP-17, CMP-10, CMP-9, CMP-15.

All data were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database.

Temperature and conductivity were measured near the top of the water column and approximately every two feet until the bottom of the well was reached.

Any water in the monument was noted and then removed.

The water level indicator and YSI-33 were decontaminated using potable water w/ alconox and a DI water rinse. Decon water (~3 gallons) was added to the storage tank.

Left site at 12:45.

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179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
02/12/02	990106-004-15	Southwest Harbor Project	Clear, 40's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: Laptop, TROLL calibration kit, YSI-33 (T,C,S), water level indicator.

THE FOLLOWING WAS NOTED:

Arrived on site at 0830.

For the instrumented monitoring wells, including: CMP-2, MW-308A (N), MW-308B (S), CMP-13, CMP-12, CMP-11, MW-307A (S), MW-307BR (N), CMP-3, CMP-8.

- Recorded water level (w/ time) and temperature/conductivity (w/ depth);
- Downloaded data set (Short-term TS, 10-min intervals) and deleted test;
- Installed new test (Long-term TS, 1-hour intervals) to begin the following hour;
- Calibrated pH (one-point) and conductivity probes (two-point) on T-8000s.

All manual measurements were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database. Water levels were usually measured before and after calibration. Temperature and conductivity were usually measured before the instrument was extracted, starting near the top of the water column and then approximately every two feet.

The calibration procedure included:

1. extracting the instrument from the well,
2. rinsing the instrument in deinonized water,
3. rinsing the instrument in a calibration rinse solution,
4. setting the instrument in calibration solution for calibration,
5. repeating steps 2-4 for other calibration solutions,
6. reinstalling the instrument in the well.

Any water in the monument was noted and then removed.

The cable holders were secured with zip-ties at the top and bottom of the holder. Zip-ties were added to prevent any slipping.

Excess cable was coiled around the casing inside the well monument. The connector was placed inside the casing. Where necessary, the hinged cap was removed and placed inside the monument. This was done to minimize movement of the instrument during downloads.

The water level indicator and YSI-33 were decontaminated using potable water w/ alconox and a DI water rinse. Decon water (~3 gallons) was added to the storage tank.

Left site at 15:20.

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DATE	PROJECT NO.	PROJECT NAME	WEATHER
02/13/02	990106-004-15	Southwest Harbor Project	Clear, 40's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: Laptop, TROLL calibration kit, YSI-33 (T,C,S), water level indicator.

THE FOLLOWING WAS NOTED:

Arrived on site at 0830.

For the instrumented monitoring wells, including: CMP-7, CMP-6, CMP-14, MW-36, CMP-4, CMP-16, MW-26R, MW-44

- Recorded water level (w/ time);
- Recorded temperature/conductivity (w/ depth) for deep wells only;
- Downloaded data set (Short-term TS, 10-min intervals) and deleted test;
- Installed new test (Long-term TS, 1-hour intervals) to begin the following hour;
- Calibrated pH (one-point) and conductivity probes (one- or two-point) on T-8000s.

All manual measurements were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database. Water levels were usually measured before and after calibration. Temperature and conductivity were usually measured before the instrument was extracted, starting near the top of the water column and then approximately every five feet.

The calibration procedure included:

1. extracting the instrument from the well,
2. rinsing the instrument in deinonized water,
3. rinsing the instrument in a calibration rinse solution,
4. setting the instrument in calibration solution for calibration,
5. repeating steps 2-4 for other calibration solutions,
6. reinstalling the instrument in the well.

Any water in the monument was noted and then removed.

The cable holders were secured with zip-ties at the top and bottom of the holder. Zip-ties were added to prevent any slipping.

Excess cable was coiled around the casing inside the well monument. The connector was placed inside the casing. Where necessary, the hinged cap was removed and placed inside the monument. This was done to minimize movement of the instrument during downloads.

The water level indicator and YSI-33 were decontaminated using potable water w/ alconox and a DI water rinse. Decon water (~3 gallons) was added to the storage tank.

Left site at 15:00.

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179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
03/12/02	990106-004-07	Southwest Harbor Project	Raining, windy, 30's

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED: Case 580B backhoe, dump truck

THE FOLLOWING WAS NOTED:

Arrived on site at 0745 to meet with Phillip Environmental and Clearcreek Contractors.

Phillip arrived at 0800, directed them to drums and container, where they began pumping water into truck.

Phillip completed pumping at 0830. Five drums were sealed, labeled as empty and turned over for future use.

Phillip left site at 0835

Clearcreek Contractors arrived at 0830. Began loading miscellaneous bags, broken PVC pipe and other un-usable materials into truck. Volume of soil in 3 stockpiles was estimated before being loaded onto truck.

SOIL VOLUMES: CMP-7 = 3 cy; EQ Damage = 4 cy; SWHP = 6 cy. All estimates are approximate

Clearcreek personnel cleaned up site with broom and shovel before leaving for Rabanco disposal facility. Empty drums, wash tub, and steel monuments were placed around water tank for storage.

Clearcreek and JJM left site at 1130.

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179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
04/12/02	990106-004-15	Southwest Harbor Project	Raining, Cloudy, 50's

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED: YSI-33 (T,C,S), water level indicator

THE FOLLOWING WAS NOTED:

Arrived on site at 14:30

Recorded water level (w/ time) and conductivity (w/ depth) for all the non-instrumented monitoring wells, including: CMP-1, CMP-5, FM-105, MW-125, MW-5, CMP-10, CMP-9, CMP-15, RW-12S, EW-6, EW-7.

All data were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database.

Temperature and conductivity were measured near the top and middle of the water column.

Any water in the monument was removed.

The water level indicator and YSI-33 were decontaminated using potable water w/ alconox and a DI water rinse.

Left site at 18:00.

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DATE	PROJECT NO.	PROJECT NAME	WEATHER
04/22/02	990106-004-15	Southwest Harbor Project	Overcast, Mist, 50s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED: Laptop, TROLL calibration kit, water level indicator.			

THE FOLLOWING WAS NOTED:

Arrived on site at 0800.

For the instrumented monitoring wells, including: CMP-2, CMP-3, CMP-4, CMP-11, CMP-6, CMP-7, CMP-8, CMP-14, CMP-16, MW-26R, MW-36, MW-44, MW-307A (S), MW-307BR (N):

- For T-8000s, recorded static water level (w/ time); logger battery and memory remaining; manual electronic probe readings of temperature, pressure, pH, and conductivity (w/ logger time); field checked pH and conductivity (if field check indicated probe out of calibration, a field calibration was performed);
- For T-4000s, recorded static water level (w/ time); logger battery and memory remaining; manual electronic probe readings of temperature and pressure;
- Downloaded data set (Long-term TS, 1-hour intervals);
- Reinstalled probe and recorded static water level (w/ time) and manual electronic probe readings.

All measurements and parameters were recorded on a field data sheet. Static water levels will be input into the POS FSDS database. Water levels were measured before moving the probe and after the probe was reinstalled.

The calibration procedure included:

1. Extracting the instrument from the well,
2. rinsing the instrument in deinonized water,
3. rinsing the instrument in a calibration rinse solution,
4. setting the instrument in calibration solution for calibration,
5. repeating steps 2-4 for other calibration solutions,
6. reinstalling the instrument in the well.

The probe in MW-36 did not communicate with the laptop software. Probe readings could not be made, nor could the data set be downloaded. Troubleshooting attempts included testing alternate computer cables and alternate probe cables. The probe was removed from the well to be sent to the manufacturer for evaluation.

Left site at 1530.

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DATE	PROJECT NO.	PROJECT NAME	WEATHER
04/23/02	990106-004-15	Southwest Harbor Project	Clear, 50s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED: Laptop, TROLL calibration kit, water level indicator.			

THE FOLLOWING WAS NOTED:

Arrived on site at 0830.

For the instrumented monitoring wells, including: CMP-11, CMP-12, CMP-13, MW-308A (N), MW-308B (S):

- For T-8000s, recorded static water level (w/ time); logger battery and memory remaining; manual electronic probe readings of temperature, pressure, pH, and conductivity (w/ logger time); field checked pH and conductivity (if field check indicated probe out of calibration, a field calibration was performed);
- For T-4000s, recorded static water level (w/ time); logger battery and memory remaining; manual electronic probe readings of temperature and pressure;
- Downloaded data set (Long-term TS, 1-hour intervals);
- Reinstalled probe and recorded static water level (w/ time) and manual electronic probe readings.

All measurements and parameters were recorded on a field data sheet. Static water levels will be input into the POS FSDS database. Water levels were measured before moving the probe and after the probe was reinstalled.

The calibration procedure included:

1. Extracting the instrument from the well,
2. rinsing the instrument in deinonized water,
3. rinsing the instrument in a calibration rinse solution,
4. setting the instrument in calibration solution for calibration,
5. repeating steps 2-4 for other calibration solutions,
6. reinstalling the instrument in the well.

Left site at 1030.

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179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
06/19/02	990106-004-15	Southwest Harbor Project	Sunny, 70s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: YSI-30 and water level indicator

THE FOLLOWING WAS NOTED:

Arrived on site to measure water levels at 08:30

Recorded water levels, conductivity, temperature and salinity for all the non-instrumented monitoring wells, including: CMP-5, FM-105, MW-125, MW-5, CMP-9, CMP-15, RW-12S, EW-6, EW-7. CMP-10 was scheduled for measurement, but was covered by a container at the time of our visit.

All data were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database.

Temperature, conductivity and salinity were measured near the top and bottom of the water column.

Any water in the monument was removed, and monuments were cleaned as needed.

The water level indicator and YSI-30 were decontaminated using an alconox wash, potable water rinse, hexane rinse and final DI water rinse.

Water level measurements were completed at 12:30

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DATE	PROJECT NO.	PROJECT NAME	WEATHER
06/24/02	990106-004-15	Southwest Harbor Project	Clear, 70's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED: Laptop, TROLL calibration kit, YSI-30 (T,C,S), water level indicator.			

THE FOLLOWING WAS NOTED:

Arrived on site at 0730.

For the instrumented monitoring wells, including: CMP-2, CMP-4, CMP-11, CMP-12, CMP-13, CMP-14, MW-307A (S), MW-307BR (N), MW-308N (A), MW-308S (B)

- For T-8000s, recorded static water level (w/ time); logger battery and memory remaining; manual electronic probe readings of temperature, pressure, pH, and conductivity (w/ logger time); field checked pH and conductivity (if field check indicated probe out of calibration, a field calibration was performed);
- For T-4000s, recorded static water level (w/ time); logger battery and memory remaining; manual electronic probe readings of temperature and pressure; and YSI-30 measurements of temperature, conductivity, and salinity at the water table and the deepest available location (top of transducer or 50 ft);
- Downloaded data set (Long-term TS, 1-hour intervals);
- Installed spacer in well for probe to rest on;
- Reinstalled probe on spacer;
- Attached desiccant pack to surface connector.

All measurements and parameters were recorded on a field data sheet. Static water levels will be input into the POS FSDS database. Water levels were measured before moving the probe. Measurements made with the YSI-30 were made before the probe was moved.

The calibration procedure included:

1. extracting the instrument from the well,
2. rinsing the instrument in deinonized water,
3. rinsing the instrument in a calibration rinse solution,
4. setting the instrument in calibration solution for calibration,
5. repeating steps 2-4 for other calibration solutions,
6. reinstalling the instrument in the well.

Spacers were installed to provide a constant probe elevation. Stainless steel wire connected to the spacers is attached to the well cap for removing the spacer.

Desiccant packs were installed to prevent moisture from entering the vent tube and corroding the circuitry.

The gate to CMP-12 and CMP-13 was inaccessible because of the configuration of the locks and chain.

The APL stack train rail yard supervisor requested that permission to enter the rail yard be acquired (daily) prior to any future visits – for safety reasons – from the personnel on the 5th floor of the yard control tower. Frank ??? (933-4705); Gene ??? (933-4501); John ??? (933-4579); Craig Johnston (948-3828).

Left site at 1630.

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DATE	PROJECT NO.	PROJECT NAME	WEATHER
06/25/02	990106-004-15	Southwest Harbor Project	Clear, 70's
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED: Laptop, TROLL calibration kit, YSI-30 (T,C,S), water level indicator.			

THE FOLLOWING WAS NOTED:

Arrived on site at 0730.

Received permission from Craig Johnston for visiting CMP-6 and CMP-7 within the APL stack train rail yard area.

For the instrumented monitoring wells, including: CMP-3, CMP-6, CMP-7, CMP-8, CMP-16, MW-26R, MW-36, MW-44:

- For T-8000s, recorded static water level (w/ time); logger battery and memory remaining; manual electronic probe readings of temperature, pressure, pH, and conductivity (w/ logger time); field checked pH and conductivity (if field check indicated probe out of calibration, a field calibration was performed);
- For T-4000s and Mini-Troll, recorded static water level (w/ time); logger battery and memory remaining; manual electronic probe readings of temperature and pressure; and YSI-30 measurements of temperature, conductivity, and salinity at the water table and the deepest available location (top of transducer or 50 ft);
- Downloaded data set (Long-term TS, 1-hour intervals);
- Installed spacer in well for probe to rest on;
- Reinstalled probe on spacer;
- Attached desiccant pack to surface connector.

All measurements and parameters were recorded on a field data sheet. Static water levels will be input into the POS FSDS database. Water levels were measured before moving the probe. Measurements made with the YSI-30 were made before the probe was moved.

The calibration procedure included:

1. extracting the instrument from the well,
2. rinsing the instrument in deinonized water,
3. rinsing the instrument in a calibration rinse solution,
4. setting the instrument in calibration solution for calibration,
5. repeating steps 2-4 for other calibration solutions,
6. reinstalling the instrument in the well.

Spacers were installed to provide a constant probe elevation. Stainless steel wire connected to the spacers is attached to the well cap for removing the spacer.

The spacers in MW-36 and MW-44 were connected directly to the probe, due to the well retrofit installation and the potential for the probe to slip past the spacer if not connected.

A Mini-Troll was installed in MW-36 to replace a faulty T-4000. The logger name, clock, and data collection setup were reset to be consistent with the other probes.

Desiccant packs were installed to prevent moisture from entering the vent tube and corroding the circuitry.

Left site at 1230.

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DATE	PROJECT NO.	PROJECT NAME	WEATHER
06/26/02	990106-004-15	Southwest Harbor Project	Sunny, 70s

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED: YSI-30 and water level indicator

THE FOLLOWING WAS NOTED:

Arrived on site at 07:30

Recorded water level, conductivity, temperature and salinity in CMP-1 for input into the POS FSDS database.

Temperature, conductivity and salinity were measured near the top and bottom of the water column. Water in the monument was removed, and the monument was cleaned. The water level indicator and YSI-30 were decontaminated using an alconox wash, potable water rinse, hexane rinse and final DI water rinse.

Collected ground water samples from wells MW-36, MW-44, and CMP-308S. Sampling procedures included the installation of dedicated 3/8" ID polyethylene tubing to a depth above the newly installed instrumentation. Approximately 1 gallon of water (> 3 tubing volumes) was pumped from each well using a peristaltic pump, and then a sample was collected through the pump into a 500 ml poly bottle, labeled and placed on ice in a cooler.

GW levels were recorded in each well before installing the poly tubing.

MW-36 – 9.64 @ 0923

MW-44 – (see 6/19/02 data) @ 0945

CMP-308S – 5.91 @ 0830

Left site at 10:30

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
08/09/02	990106-004-15	Southwest Harbor Project	Sunny, 70s

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED: YSI-30, water level indicator, peristaltic pump, sample equipment, decon equp.

THE FOLLOWING WAS NOTED:

Arrived on site to measure water levels at 07:30

Recorded water levels, conductivity, temperature and salinity for all the non-instrumented monitoring wells, including: CMP-1, CMP-5, FM-105, MW-125, MW-5, CMP-9, CMP-10, CMP-15. We also collected ground water levels, conductivity and temperature in monitoring wells MW-36, MW-44, and MW-308S.

All data were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database.

Temperature, conductivity and salinity were measured at the bottom of the water column.

Any water in the monument was removed, and monuments were cleaned as needed.

The water level indicator and YSI-30 were decontaminated between wells using an alconox wash, potable water rinse, hexane rinse and final DI water rinse.

Ground water samples were collected from wells MW-36, MW-44, and CMP-308S. Approximately 1 gallon of water (> 3 tubing volumes) was pumped from each well before sampling, using a peristaltic pump, and then a sample was collected through the pump into a 500 ml poly bottle, labeled and placed on ice in a cooler. The 3 ground water samples were delivered under chain of custody to the North Creek Analytical laboratory in Bothell, WA for analysis.

Water level measurements and ground water sampling were completed at 12:30

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
8/13/02	990106-004-15	Southwest Harbor Project	Clear, 80s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: Laptop, Troll calibration kit, water level indicator, YSI-30 salinity probe

THE FOLLOWING WAS NOTED:

Arrived on site at 0800.

Downloaded and calibrated (if necessary) Troll probes. Procedure at each well included:

1) Static water level measured with water level indicator and recorded – without moving probe. Salinity measured with YSI-30 and recorded – without moving probe
2) Troll probe connected to computer. Corresponding electronic readings recorded, including battery remaining, memory remaining, temperature, pressure, pH, and conductivity. Data downloaded from probe.
3) Probe removed from well for field check and rinsed in deionized water.
4) pH field check involved putting probe in standard pH calibration solution near the last reading (usually pH 7.0). An equilibrium electronic reading was taken. If reading was off by more than 0.25 pH, a one-point recalibration was made. The corresponding slope (5309) and offset were recorded.
5) Conductivity field check involved putting probe in a standard specific conductance solution near the last reading. Specific conductance = actual conductivity/(1+0.0191*(temperature(°C) – 25)). An equilibrium electronic reading was taken. If reading was off more than 10%, a recalibration was made. The corresponding Kcell was recorded.
6) Probe was reinstalled in well. If a calibration was made, a new data collection schedule was loaded into the probe.

The probes in all of the instrumented wells were downloaded, including: CMP-2, -3, -4, -6, -7, -8, -11, -12, -13, -14, -16, MW-26R, -36, -44, -307A, -307BR, -308N, -308S.

The following probes were recalibrated for pH: CMP-8 and CMP-11.

The following probes were recalibrated for conductivity: CMP-6, -8, MW-26R.

Left site at 1600.

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
10/08/02	990106-004-15	Southwest Harbor Project	Overcast 60s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: YSI-30, water level indicator, peristaltic pump, sample equipment, decon equp.

THE FOLLOWING WAS NOTED:

Arrived on site to measure water levels at 10:30

Recorded water levels, conductivity, temperature and salinity for all the non-instrumented monitoring wells, including: CMP-1, CMP-5, FM-105, MW-125, MW-5, CMP-9, CMP-10, CMP-15. We also collected ground water levels, conductivity and temperature in monitoring wells MW-36, MW-44, and MW-308S.

All data were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database.

Temperature, conductivity and salinity were measured at the bottom of the water column.

Any water in the monument was removed, and monuments were cleaned as needed.

The water level indicator and YSI-30 were decontaminated between wells using an alconox wash, potable water rinse, hexane rinse and final DI water rinse.

Ground water samples were collected from wells MW-36, MW-44, and CMP-308S. Approximately 1 gallon of water (> 3 tubing volumes) was pumped from each well before sampling, using a peristaltic pump, and then a sample was collected through the pump into a 500 ml poly bottle, labeled and placed on ice in a cooler. The 3 ground water samples were delivered under chain of custody to the North Creek Analytical laboratory in Bothell, WA for analysis.

Water level measurements and ground water sampling were completed at 16:00

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Aspect Consulting LLC
179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
10/11/02	990106-004-15	Southwest Harbor Project	Partly Cloudy, 60s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: Laptop, Troll calibration kit, water level indicator, YSI-30 salinity probe

THE FOLLOWING WAS NOTED:

Arrived on site at 0900.

Downloaded and calibrated (if necessary) Troll probes. Procedure at each well included:

1) Static water level measured with water level indicator and recorded – without moving probe. Salinity measured with YSI-30 and recorded – without moving probe
2) Troll probe connected to computer. Corresponding electronic readings recorded, including battery remaining, memory remaining, temperature, pressure, pH, and conductivity. Data downloaded from probe.
3) Probe removed from well. A zero-pressure probe reading was recorded. The probe was rinsed in deionized water.
4) Total depth to spacer at bottom of well measured and recorded. The measured transducer elevation was compared to the elevation calculated from electronic measurements and SWL.
5) pH field check involved putting probe in standard pH calibration solution near the last reading (usually pH 7.0). An equilibrium electronic reading was taken. If reading was off by more than 0.25 pH, a one-point recalibration was made. The corresponding slope (5309) and offset were recorded.
6) Conductivity field check involved putting probe in a standard specific conductance solution near the last reading. Specific conductance = actual conductivity/(1+0.0191*(temperature(°C) – 25)). An equilibrium electronic reading was taken. If reading was off more than 10%, a recalibration was made. The corresponding Kcell was recorded.
7) Probe was reinstalled in well. If a calibration was made, a new data collection schedule was loaded into the probe.

Data were recorded electronically on field sheets on the laptop (FieldSheets_Filled 10-11-02.xls).

The probes in all of the instrumented wells were downloaded, including: CMP-2, -3, -4, -6, -7, -8, -11, -12, -13, -14, -16, MW-26R, -36, -44, -307A, -307BR, -308N, -308S.

The MiniTroll in MW-36 was extracted and sent to In-Situ to evaluate the transducer (drift in pressure indicates failed transducer). A rental MiniTroll was hung in the well – the 50 ft length of cable precluded using the spacer.

The salinity tubing in MW-44 was lost down the hole when the probe was lifted to measure the total depth of the hole.

The following probe was recalibrated for pH: CMP-4.

None of the probes required conductivity recalibration.

The following probes exceeded the 0.05% psi range accuracy (0.008 psi [0.02 ft] for 15-psi probes, 0.015 psi [0.03 ft] for 30-psi probes) for zero pressure: CMP-3 (0.289 psi), CMP-8 (0.033 psi), CMP-12 (0.010 psi), CMP-13 (0.01 psi), CMP-16 (0.139 psi), MW-26R (0.014 psi), MW-44 (0.067 psi), MW-307BR (0.074 psi), MW-308S (0.032 psi).

The following probes exceeded the 0.05% psi range + 0.05 ft accuracy (0.07 ft for 15-psi probes, 0.08 for 30-psi probes) for transducer elevation: CMP-2 (0.12 ft), CMP-3 (0.74 ft), CMP-4 (0.18 ft), CMP-6 (0.11 ft), CMP-7 (0.11 ft), CMP-8 (0.18 ft), CMP-11 (0.15 ft), CMP-12 (0.16 ft), CMP-13 (0.14 ft), CMP-16 (0.10 ft), MW-26R (0.12 ft), MW-44 (0.09 ft), MW-307A (0.17 ft), MW-308N (1.02 ft), MW-308S (0.35 ft).

Left site at 1630.

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IN-DEPTH PERSPECTIVE

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
12/10/02	990106-004-15	Southwest Harbor Project	Raining, 40s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: YSI-30, water level indicator, peristaltic pump, sample equipment, decon equp.

THE FOLLOWING WAS NOTED:

Aspect representative arrived on site to measure water levels and conductivity in selected wells at 11:30

Recorded water levels, conductivity, temperature and salinity for all the non-instrumented monitoring wells, including: CMP-1, CMP-5, FM-105, MW-125, MW-5, CMP-9, and CMP-10. CMP-15 was covered by containers, and was not monitored. We also collected ground water levels, conductivity and temperature in monitoring wells MW-36 and MW-308S before sampling.

All data were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database.

Temperature, conductivity and salinity were measured at the bottom of the water column.

Any water in the monument was removed, and monuments were cleaned as needed.

The water level indicator and YSI-30 were decontaminated between wells using an alconox wash, potable water rinse, and final DI water rinse.

Ground water samples were collected from wells MW-36 and CMP-308S. Approximately 1-½ gallons of water (> 3 tubing volumes) was pumped from each well before sampling, using a peristaltic pump. A sample was collected through the pump into a 500 ml poly bottle, labeled and placed on ice in a cooler. The 3 ground water samples were delivered under chain of custody to the North Creek Analytical laboratory in Bothell, WA for analysis.

Water level measurements and ground water sampling were completed at 15:30

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
12/17/02	990106-004-15	Southwest Harbor Project	Raining, 40s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: YSI-30, water level indicator, field laptop computer, calibration and maintenance kit, decon equp.

THE FOLLOWING WAS NOTED:

Aspect representatives arrived on site to perform download/calibration procedures for Troll probes at 8:30.

The probes in the following wells were downloaded and field checked: CMP-7, CMP-13, CMP-16, MW-44, MW-307BR, MW-308N, MW-308S. Measured water levels and salinity in each well before moving probe. Downloaded dataloggers.

The probe in MW-308N could not be removed from the well for field checks. Initially the probe would not move from the bottom of the well, where it was resting on a spacer, as though it was hooked on something. After jiggling the cable, the probe moved approximately ½ foot up before stopping, as though it had become wedged. Visual inspection of the well showed the cable entering the water in the western quarter, as opposed to the center. One possible reason for this was the ~10 ft pile of gravel stored approximately 40 feet to the west of the well.

The probe in CMP-13 could not be field checked for pressure.

Aspect representatives left the site at 16:00.

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DAILY REPORT

DATE Wednesday 01/22/03	PROJECT NO. 990106-004-15	PROJECT NAME Southwest Harbor Project	WEATHER Raining, 40s
CLIENT Port of Seattle		PROJECT LOCATION Terminal 5	
EQUIPMENT USED:			

THE FOLLOWING WAS NOTED:

Aspect representatives arrived at the MW-308 compound at 17:00 to observe current site conditions.

Many areas of distressed asphalt paving were noted between the gate and the north fence (the driving areas). Several areas of standing water were observed along the north and east fence lines. Approximately 10,000 square feet of water was noted in the northeast corner of the compound, and a pond of water was noticed between MW-308N and MW-308S.

We noted stockpiles of soil, crushed rock and asphalt in the western part of the compound.

Aspect representatives left the site at 17:30.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
01-29-03	990106-004-15	Southwest Harbor Project	Raining, 40s

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED: Water level indicator

THE FOLLOWING WAS NOTED:

Aspect arrived on site at 8:45 to exchange the rental transducer in MW-36 with the new transducer. The transducer and spacer bar was set up and at 9:05 a water level was taken. The rental transducer was then removed from the well and the new transducer with spacer attached was inserted.

Aspect left the site at 9:15.

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
03-11-03	990106-004-15	Southwest Harbor Project	Raining, 40s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: YSI-30, water level indicator, peristaltic pump, sample equipment, decon equipment

THE FOLLOWING WAS NOTED:

11:30 Aspect representative arrived on site to measure water levels and conductivity in selected groundwater monitoring wells

Recorded water levels, conductivity, temperature and salinity for all the non-instrumented monitoring wells, including: CMP-1, CMP-5, FM-105, MW-125, MW-5, CMP-9, CMP-10, and CMP-15. We also collected ground water levels, conductivity and temperature in monitoring wells MW-36 and MW-308S before sampling.

All data were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database.

Temperature, conductivity and salinity were measured at the bottom of the water column.

Any water in the monument was removed, and monuments were cleaned as needed.

The water level indicator and YSI-30 were decontaminated between wells using an alconox wash, potable water rinse, and final DI water rinse.

Ground water samples were collected from wells MW-36 and CMP-308S. Approximately 1-½ gallons of water (> 3 tubing volumes) was pumped from each well before sampling, using a peristaltic pump. A sample was collected through the pump into a 500 ml poly bottle, labeled and placed on ice in a cooler. The 2 ground water samples were delivered under chain of custody to the North Creek Analytical laboratory in Bothell, WA for analysis.

16:30 Water level measurements and ground water sampling were completed

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
3/31/03	990106	Southwest Harbor Project	Partly Cloudy, 50s

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED: Holt Drilling Mobile B-59

THE FOLLOWING WAS NOTED:

On-site at 0830

Aspect Consulting on-site to meet with utility locators to clear monitoring well locations CMP-18, 19, and 20. All water, electrical, phone and gas utilities are clear at the marked location. Metro sewer had previously cleared all sites.

Left site at 1130

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
4/02/03	990106	Southwest Harbor Project	Partly Cloudy, 50s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED: Holt Drilling Mobile B-59			

THE FOLLOWING WAS NOTED:

Aspect Consulting on-site to observe the drilling and installation of three monitoring wells as part of the SW Harbor Project. Holt Drilling arrived on-site at 0800 with a truck mounted Mobile B-59 hollow stem auger drill rig. All monitoring well locations had previously been marked and cleared off all utilities. All boring were completed to the apparent native silt deposits. Wells were screened above the native silt deposits. All three monitoring wells completed today were screened from 7 to 17-feet below ground surface. Soil samples were collected every 5 feet with one extra sample collected at 15-feet. All wells were screened using a 2-inch, 10-slot PVC wire wrapped screen. Sand packs consisted of 10/20 Colorado sand to 7-feet and 20/40 Colorado sand to 5 feet. Flush mount traffic bearing monuments supplied by the Port were used in completion. The permanent well designation was stamped on the lid of each monument. All drilling and installation information was recorded on Aspect Consulting Boring Log forms and As-Built Monitoring Well forms.

All drill cuttings were placed in 55-gallon DOT approved drums and moved to the Northeast corner of the terminal for storage. Decon water from steam cleaning operations was placed in a 55-gallon drum and stored with the soil drums. There are four soil drums, 1 decon water drum and 2 empty drums currently on-site. All drums were labeled with source and date.

Well development will be completed next week.

Kathy Bahnick form the POS and Chip Goodhue from Aspect visited the drilling operation today along with a representative from Ecology.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
04-02-03	990106-004-15	Southwest Harbor Project	40s, overcast
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	
EQUIPMENT USED: Water level indicator, InSitu download kit, Troll replacement battery packs			

THE FOLLOWING WAS NOTED:

Aspect representatives arrived on site at 7:30.

Probes in wells CMP-2, CMP-3, CMP-13, CMP-14, CMP-16, MW-26R, MW-36, MW-44, MW-307A, MW-307BR, MW-308N and MW-308S were field checked for pressure, pH (if necessary), conductivity (if necessary). Probes from CMP-3 and MW-308N were removed to have the pressure sensor checked in the lab. Battery packs were replaced if necessary.

Aspect representatives left the site at 15:00.

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179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
04-10-03	990106-004-15	Southwest Harbor Project	40s, overcast
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: Water level indicator, InSitu download kit, Troll replacement battery packs

THE FOLLOWING WAS NOTED:

Aspect representatives arrived on site at 7:30.

Probes in wells CMP-4, CMP-6, CMP-7, CMP-8, CMP-11, CMP-12 were field checked for pressure, pH (if necessary), conductivity (if necessary). Probes from CMP-3 and MW-308N were removed to have the pressure sensor checked in the lab. Battery packs were replaced if necessary.

New wells (CMP-18, CMP-19, and CMP-20) were developed. Due to time constraints, only ~25 gallons were developed from each well. Further development is necessary to achieve the <100 NTU turbidity.

Aspect representatives left the site at 16:00.

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179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
07-08-03	990106-004-15	Southwest Harbor Project	Cloudy, 60s

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED: YSI-30, water level indicator, peristaltic pump, sample equipment, decon equipment

THE FOLLOWING WAS NOTED:

08:00 Aspect personnel arrived on site to measure water levels and conductivity in selected groundwater monitoring wells

Recorded water levels, conductivity, temperature and salinity for all the non-instrumented monitoring wells, including: CMP-1, CMP-5, FM-105, MW-125, MW-5, CMP-9, CMP-10, and CMP-15. We also collected ground water levels, conductivity and temperature in monitoring wells MW-36 and MW-308S before sampling.

All data were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database.

Temperature, conductivity and salinity were measured at the bottom of the water column.

Any water in the monument was removed, and monuments were cleaned as needed.

The water level indicator and YSI-30 were decontaminated between wells using an alconox wash, potable water rinse, and final DI water rinse.

Ground water samples were collected from wells MW-36 and CMP-308S. Approximately 1-½ gallons of water (> 3 tubing volumes) was pumped from each well before sampling, using a peristaltic pump. A sample from each well was collected through the pump into 1-liter amber bottle, labeled and placed on ice in a cooler. The 2 ground water samples were delivered under chain of custody protocol to North Creek Analytical laboratory in Bothell, WA for analysis.

13:30 Water level measurements and ground water sampling were completed

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DAILY REPORT

DATE	PROJECT NO.	PROJECT NAME	WEATHER
07-11-03	990106-004-15	Southwest Harbor Project	Sunny, 60-70
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: Water level indicator, InSitu download kit, Troll replacement battery packs, laptop PC

THE FOLLOWING WAS NOTED:

Aspect representatives arrived on site at 8:00.

Probes in wells CMP-2, CMP-3, CMP-8, CMP-11, CMP-12, CMP-13, CMP-14, CMP-16, CMP-19, CMP-20, MW-26R, MW-36, MW-44, MW-307A, MW-307BR, MW-308N and MW-308S were field checked for pressure, pH (if necessary), conductivity (if necessary). Static water levels were measured before each download.

Aspect representatives left the site at 17:00.

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
07-16-03	990106-004-15	Southwest Harbor Project	Sunny, 70s

CLIENT Port of Seattle

PROJECT LOCATION Terminal 5

EQUIPMENT USED: Water level indicator, InSitu download kit, Troll replacement battery packs, laptop PC

THE FOLLOWING WAS NOTED:

Aspect representatives arrived on site at 15:00.

Probes in wells CMP-4, CMP-6, CMP-7, and CMP-18 were field checked for pressure, pH (if necessary), conductivity (if necessary).

Aspect representatives left the site at 17:00.

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DAILY REPORT

179 Madrone Lane North
Bainbridge Island, Washington 98110
(206) 780-9370

811 First Avenue, Suite 480
Seattle, Washington 98104
(206) 328-7443

DATE: 7/31& 8/4/03	**PROJECT NO.** 990106	**WEATHER:** Sunny, 70s
PROJECT NAME: Terminal 5	**CLIENT:** POS	
EQUIPMENT USED: -	**PROJECT LOCATION:** -	

THE FOLLOWING WAS NOTED:

JM visited T-5 to inventory drums and miscellaneous materials located within the 308 compound, and also in the northeast corner of the main terminal.

DRUMS IN NE CORNER OF PIER:

4 SOIL, 2 WATER, 1 EMPTY from installation of CMP-18, CMP19, CMP-20

Miscellaneous Materials
1 – approx. 500 gallon poly tank
3 – steel monuments
1 – 10" diameter x 6' steel pipe filled with cement
1 – 10' x 1½" PVC
6 – 10' x ¾" threaded PVC
2 – plastic tubs
2 – rubber hoses

NORTH OF POLY TANK
10 – 55 gallon drums (empty)
5 – 85 gallon overpack drums (empty)
6 – 55 gallon drums of soil (RETEC drums)

SOUTH OF POLY TANK
27 – 55 gallon drums – RETEC soil
2 – PPE drums
1 bag of absorbent boom material

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FIELD REP.: John McNulty

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DAILY REPORT

179 Madrone Lane North Bainbridge Island, Washington 98110 (206) 780-9370

DATE	PROJECT NO.	PROJECT NAME	WEATHER
12-19-03	990106-004-15	Southwest Harbor Project	Overcast, 50s
CLIENT Port of Seattle		**PROJECT LOCATION** Terminal 5	

EQUIPMENT USED: YSI-30, water level indicator, peristaltic pump, sample equipment, decon equipment

THE FOLLOWING WAS NOTED:

09:00 Aspect personnel arrived on site to measure water levels and conductivity in selected groundwater monitoring wells

Recorded water levels, conductivity, temperature and salinity for all the non-instrumented monitoring wells, including: CMP-1, CMP-5, FM-105, MW-125, MW-5, CMP-9, CMP-10, and CMP-15. We also collected ground water levels, conductivity and temperature in monitoring wells MW-36 and MW-308S before sampling.

All data were recorded on a "Ground Water Sampling Record" sheet to be later input into the POS FSDS database.

Temperature, conductivity and salinity were measured at the bottom of the water column.

Any water in the monument was removed, and monuments were cleaned as needed.

The water level indicator and YSI-30 were decontaminated between wells using an alconox wash, potable water rinse, and final DI water rinse.

Ground water samples were collected from wells MW-36 and CMP-308S. Approximately 2- gallons of water (> 3 tubing volumes) was pumped from each well before sampling, using a peristaltic pump. A sample from each well was collected through the pump into 500 ml poly bottles, labeled and placed on ice in a cooler. The two groundwater samples were delivered under chain of custody protocol to North Creek Analytical laboratory in Bothell, WA for analysis.

13:30 Water level measurements and ground water sampling were completed

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DAILY REPORT

179 Madrone Lane North
Bainbridge Island, Washington 98110
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811 First Avenue, Suite 480
Seattle, Washington 98104
(206) 328-7443

DATE: June 3, 2004	**PROJECT NO.** 990106	**WEATHER:** Clear, 70s
PROJECT NAME: Southwest Harbor Project		**CLIENT:** Pos
EQUIPMENT USED: Confined Space Entry - Harness, Tripod, Air Monitoring Equipment		**PROJECT LOCATION:** Terminal 5 - Longfellow Overflow Line

THE FOLLOWING WAS NOTED:

0900 – Arrived on site with BNSF flagger. Set up for confined space. Waited approximately ½ hour for train activity to cease.

0930 – Entered MH-1 for observations and to install data logger. Depth of sediment at and upstream of culvert lip was 1.6 feet. Depth of sediment in manhole sump was 2.85. Approximate depth of flowing water in culvert was 0.25 feet. Width of channel was 1.6 feet. Diameter of culvert up stream and down stream was 72 inches.

Installed 2" pvc screen in man hole for transducer.

1100 – Entered MH-7. Depth of sediment in culvert 0.7 feet. Sediment in sump was a gravely sand. Depth of flowing water in 1.5 foot channel was 0.3 feet.

Installed 2" pvc screen in man hole for transducer.

1345 – Entered MH-4. 84" concrete culvert up stream and 84" corrugated steel culvert down stream. Sediment in sump was 2.5 feet deep and consisted very soft clayey silt. Depth of flowing water in 5.2 foot channel was 0.15 feet.

Installed 2" pvc screen in man hole for transducer.

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FIELD REP.: Name, Designation

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DAILY REPORT

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(206) 780-9370

811 First Avenue, Suite 480
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(206) 328-7443

DATE: July 6, 2004	**PROJECT NO.** 990106	**WEATHER:** Clear 70's
PROJECT NAME: T-5 SW Harbor	**CLIENT:** Port Of Seattle	
EQUIPMENT USED:	**PROJECT LOCATION:** T-5	

THE FOLLOWING WAS NOTED:

0810 Peter Bannister arrived on site and met with Warren Hansen to discuss LFOL and contributing surface and storm water drains.

0830 – Pulled T-8000 from MH-7

1000 – Pulled T-8000 from MH-4.

1010 – Pulled T-8000 from MH-1.

1020 – Left site.

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FIELD REP.: Peter Bannister

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DAILY REPORT

179 Madrone Lane North
Bainbridge Island, Washington 98110
(206) 780-9370

811 First Avenue, Suite 480
Seattle, Washington 98104
(206) 328-7443

DATE: July 28, 2004	**PROJECT NO.** 990106	**WEATHER:** Clear 70's
PROJECT NAME: T-5 SW Harbor	**CLIENT:** Port Of Seattle	
EQUIPMENT USED: Confine Space Entry	**PROJECT LOCATION:** T-5	

THE FOLLOWING WAS NOTED:

0630 - Bob Hanford and Peter Bannister arrived on site at MH-2, Called Stack Train Operations for OK to proceed. Set up for confined space entry. Calibrated air monitoring equipment. Set up tripod. Completed entry form.

0700 – Bob Hanford entered MH-2. Upstream was 72-inch corrugated steel culvert. Down stream is a 84-inch concrete culvert. No audible falling water or inlets visible. Sediment thickness up stream is 1.35 feet. Collected sediment sample from 25' upstream of the sump. Sediment sample was collected with a 3" polybicarbonate core tube from the surface down 1 foot. The core tube was pushed into the sediment, top cap placed on core tube, then a bottom cap placed on tube prior to removing sample. Clear water was visible above the sediment in the tube and recovery was 100%.

Down stream sediment thickness 1.25 feet. Sediment thickness in manhole sump 3.05 feet. A stream channel is present on top of the sediment. Stream channel is approximately 3-feet across and 2-inches deep and is consistent from up stream through the culvert and continues down stream. Barnacles and mussels visible to 4.3 feet above culvert bottom. Sediment thickness and descriptions recorded. Exit MH-2 at 0830.

0900 – Set up at MH-1. BNSF flagger onsite. Waited approximately ½ hour for train activity to cease.

0930 – Bob Hanford entered MH-1 after completing initial air monitoring and entry form. Corrugated steel culverts 72 "up stream and down stream. Culvert sump is brick lined at the bottom with concrete on the upper portion. Minor seepage was visible from the brick and at culvert joints. Sediment thickness in the sump was 3.1 feet. Up stream and down stream sediment thicknesses were 1.9 and 1.15 feet respectively.

Collected a water sample from 25' up stream of the culvert. Water was collected by directly filling a new clean 1-liter glass jar and transferring the water into the appropriate jar. Water was observe to be clear and colorless. No field parameters were collected due to the confined space entry.

Collected sediment sample from 25" upstream of the sump. Sediment sample was collected with a 3" polybicarbonate core tube from the surface down 1 foot. The core tube was pushed into the sediment, top cap placed on core tube, then a bottom cap placed on tube prior to removing sample. Clear water was visible above the sediment in the tube and recovery was 100%. Sediment thickness and descriptions recorded. Exited manhole at 10:15.

COPIES TO: File, Client	**Aspect Consulting PROJECT MANAGER:** Name, Designation

FIELD REP.: Name, Designation

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Aspect consulting
IN-DEPTH PERSPECTIVE

DAILY REPORT

179 Madrone Lane North
Bainbridge Island, Washington 98110
(206) 780-9370

811 First Avenue, Suite 480
Seattle, Washington 98104
(206) 328-7443

DATE: July 29, 2004	**PROJECT NO.** 990106	**WEATHER:** Clear 70's
PROJECT NAME: T-5 SW Harbor	**CLIENT:** Port Of Seattle	
EQUIPMENT USED: Confine Space Entry	**PROJECT LOCATION:** T-5	

THE FOLLOWING WAS NOTED:

0830 - Bob Hanford, Dave Heffner and Peter Bannister arrived on site at MH-8. Set up for confined space entry. Calibrated air monitoring equipment. Set up tripod. Completed entry form.

0900 – Bob Hanford and Peter Bannister entered MH-8. Upstream was 84-inch concrete culvert. Down stream was 84-inch concrete culvert. A 24" steel culvert enters from the east side into the LFOL at the manhole. Approximate flow 15 to 20 gpm. No other inlets visible at MH-8. Approximate water level in culvert 3.5'. Sediment thickness 10' up stream is 1.75 feet. Sediment thicknesses down stream at 10', 50', 100', and 150' respectively were 2.0, 1.35, 1.05, and 1.15. Collected sediment samples from 50', 100, and 150 down stream of the sump. Sediment samples were collected with a 3" polybicarbonate core tube from the surface down 1 foot. The core tube was pushed into the sediment at each location, top cap placed on core tube, then a bottom cap placed on tube prior to removing sample. Clear water was visible above the sediment in all samples and recovery was above 90%. Sediment thickness at the sump was not measured but was observed to be about 1 foot deep of sandy gravel. Exit MH-8 at 0930.

1030 – Set up at MH-4. Contacted stack train operations. OK to proceed.

1040 – Bob Hanford and Peter Bannister entered MH-4 after completing initial air monitoring and entry form. Corrugated steel culvert 72 "down stream and 84" concrete up stream. Culvert sump is concrete. No seepage was visible from the sump or culverts. Sediment thickness in the sump was 2.4 feet. Up stream and down stream sediment thicknesses twenty and thirty feet from the man hole were 1.2 and 1.10 feet respectively.

Collected water and sediment sample from thirty feet up stream of sump. Water was collected by directly filling a new clean 1-liter glass jar and transferring the water into the appropriate jar. Water was observed to be clear and colorless. No field parameters were collected due to the confined space entry.

Collected sediment sample from 30 feet upstream of the sump. Sediment sample was collected with a 3" polybicarbonate core tube from the surface down 1 foot. The core tube was pushed into the sediment, top cap placed on core tube, then a bottom cap placed on tube prior to removing sample. Clear water was visible above the sediment in the tube and recovery was over 90%. Sediment thickness and descriptions recorded.

A stream channel is present on top of the sediment. Stream channel is approximately 4.2-feet across and 1 to 2-inches deep and is consistent from up stream through the culvert and continues down stream. Barnacles and mussels visible to top of culvert. Sediment thickness and descriptions recorded. Exit MH-4 at 1100.

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FIELD REP.: Bob Hanford, Peter Bannister and Dave Heffner

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IN-DEPTH PERSPECTIVE

DAILY REPORT

179 Madrone Lane North
Bainbridge Island, Washington 98110
(206) 780-9370

811 First Avenue, Suite 480
Seattle, Washington 98104
(206) 328-7443

DATE: July 30, 2004	**PROJECT NO.** 990106	**WEATHER:** Clear 70's
PROJECT NAME: T-5 SW Harbor	**CLIENT:** Port Of Seattle	
EQUIPMENT USED: Confine Space Entry	**PROJECT LOCATION:** T-5	

THE FOLLOWING WAS NOTED:

0930 - Dave Heffner and Peter Bannister arrived on site at MH-7. Set up for confined space entry. Calibrated air monitoring equipment. Set up tripod. Completed entry form.

1000 –Peter Bannister entered MH-7. Upstream was 84-inch concrete culvert. Down stream was an 84-inch corrugated culvert. Two inlets were observed at the manhole location. A 12" concrete pipe enters from the SW with a flow estimated at 5 gpm. The second pipe is an 8" pvc pipe with a slight flow entering the man hole from the SE.

Sediment thickness 1' down stream is 1.45 feet of sandy gravel. At the sump the sediment thickness was measured at 3.0 feet of coarse sand and gravel. Sediment thickness at 1' up stream was 1.0 foot.

Flow between MH-7 and MH-6 was noted as very turbid. Collected water sample from 140 feet up stream of sump (13' upstream of MH-6). Water was collected by directly filling a new clean 1-liter glass jar and transferring the water into the appropriate jar. Water was observed to be clear and colorless. No field parameters were collected due to the confined space entry.

Collected a sediment samples from 160' up stream of the sump (33 feet up stream of MH-6). Sediment sample were collected with a 3" polybicarbonate core tube from the surface down 1 foot. The core tube was pushed into the sediment at each location, top cap placed on core tube, then a bottom cap placed on tube prior to removing sample. Clear water was visible above the sediment in all samples and recovery was above 90%. Exit MH-7 at 1115. Water flow had reversed flow and was moving up stream

Sediment thickness and descriptions recorded.

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FIELD REP.: Peter Bannister and Dave Heffner

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APPENDIX D

Laboratory Results – Groundwater Chloride Analyses

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09 February 2002

Chip Goodhue
Aspect Consulting
179 Madrone Lane N
Bainbridge Island, WA/USA 98110

RE: SW Harbor

Enclosed are **amended** results of analyses for samples received by the laboratory on 12/19/01 09:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

S. Wo

Scott A. Woerman
Project Manager

www.ncalabs.com

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February 08, 2002

Aspect Consulting
Attn.: Mr. Chip Goodhue
179 Madrone Lane N
Bainbridge Island, WA 98110

Subject: Chloride Analysis for Work Order Number B1L0486

Mr. Goodhue:

NCA's QA department reviewed the chloride data associated with the aforementioned work order when notified by NCA Project Manager Scott Woerman of discrepancies in the results reported for samples MW-44121301 (B1L0486-07) and CMP-11121701 (B1L0486-20). In the course of this review, additional data was discovered that confirmed the chloride results for most of the other samples in this work order. This data came predominantly from less than optimal dilutions, which are adequate for the purpose of screening or confirming. The comparison of this supplemental data with the reported results also uncovered a new discrepancy pertaining to sample CMP-12121701 (B1L0486-19). A split of this sample and the other samples, for which confirmation data did not initially exist, were prepared and introduced into the lab as blind duplicates (different client name, different project name and different work order number). For sample CMP-12121701 (B1L0486-19), the result from the split agreed favorably with a dilution not associated with the result originally reported. Therefore, the result originally reported for this sample is suspect. The results obtained from the splits of the other samples agreed favorably with those previously reported.

Based on this review, its believed that incorrect dilution factors were applied in the original analysis of samples MW-44121301 (B1L0486-07) and CMP-11121701 (B1L0486-20) and that a sample misidentification occurred in the original analysis CMP-12121701 (B1L0486-19). An amended report was issued for this work order.

North Creek Analytical regrets any inconvenience this may have caused. If you have any questions or need additional information, please let me know.

Sincerely,
North Creek Analytical

D. a Wunderlich

Dave Wunderlich
QA Manager

www.ncalabs.com

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Aspect Consulting
179 Madrone Lane N
Bainbridge Island WA/USA, 98110

Project: SW Harbor
Project Number: BU 99106
Project Manager: Chip Goodhue

Amended Report
Issued: 02/09/02 14:03

ANALYTICAL REPORT FOR SAMPLES - Amended

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
CMP-2121201	B1L0486-01	Water	12/12/01 12:10	12/19/01 09:30
MW-808N121201	B1L0486-02	Water	12/12/01 12:55	12/19/01 09:30
CMP-13121201	B1L0486-03	Water	12/12/01 13:55	12/19/01 09:30
CMP-12121201	B1L0486-04	Water	12/12/01 13:35	12/19/01 09:30
CMP-11121201	B1L0486-05	Water	12/12/01 13:50	12/19/01 09:30
CMP-8121201	B1L0486-06	Water	12/12/01 14:40	12/19/01 09:30
MW-44121301	B1L0486-07	Water	12/13/01 11:50	12/19/01 09:30
MW-26R121301	B1L0486-08	Water	12/13/01 12:30	12/19/01 09:30
MW-5121301	B1L0486-09	Water	12/13/01 13:00	12/19/01 09:30
CMP-16121301	B1L0486-10	Water	12/13/01 13:25	12/19/01 09:30
CMP-7121301	B1L0486-11	Water	12/13/01 14:30	12/19/01 09:30
MW-308S121301	B1L0486-12	Water	12/13/01 15:15	12/19/01 09:30
MW-36121301	B1L0486-13	Water	12/13/01 15:45	12/19/01 09:30
MW-308N121701	B1L0486-14	Water	12/17/01 09:30	12/19/01 09:30
MW-5121701	B1L0486-15	Water	12/17/01 10:50	12/19/01 09:30
CMP-2121701	B1L0486-16	Water	12/17/01 13:45	12/19/01 09:30
MW-308S121701	B1L0486-17	Water	12/17/01 14:05	12/19/01 09:30
CMP-13121701	B1L0486-18	Water	12/17/01 14:25	12/19/01 09:30
CMP-12121701	B1L0486-19	Water	12/17/01 14:40	12/19/01 09:30
CMP-11121701	B1L0486-20	Water	12/17/01 14:55	12/19/01 09:30
CMP-8121701	B1L0486-21	Water	12/17/01 16:40	12/19/01 09:30
CMP-7121701	B1L0486-22	Water	12/17/01 17:25	12/19/01 09:30
MW-36121701	B1L0486-23	Water	12/17/01 18:15	12/19/01 09:30
CMP-16121701	B1L0486-24	Water	12/17/01 18:40	12/19/01 09:30
MW-44121701	B1L0486-25	Water	12/17/01 18:55	12/19/01 09:30
MW-26R121701	B1L0486-26	Water	12/17/01 19:05	12/19/01 09:30

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Scott A. Woerman, Project Manager

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Aspect Consulting
179 Madrone Lane N
Bainbridge Island WA/USA, 98110

Project: SW Harbor
Project Number: BU 99106
Project Manager: Chip Goodhue

Amended Report
Issued: 02/09/02 14:03

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
CMP-2121201 (B1L0486-01) Water Sampled: 12/12/01 12:10 Received: 12/19/01 09:30									
Chloride	**487**	20.0	mg/l	100	1L28007	12/27/01	12/27/01	EPA 300.0	
MW-808N121201 (B1L0486-02) Water Sampled: 12/12/01 12:55 Received: 12/19/01 09:30									
Chloride	**992**	20.0	mg/l	100	1L26020	12/22/01	12/22/01	EPA 300.0	
CMP-13121201 (B1L0486-03) Water Sampled: 12/12/01 13:55 Received: 12/19/01 09:30									
Chloride	**769**	20.0	mg/l	100	1L26042	12/22/01	12/22/01	EPA 300.0	
CMP-12121201 (B1L0486-04) Water Sampled: 12/12/01 13:35 Received: 12/19/01 09:30									
Chloride	**2020**	100	mg/l	500	1L26045	12/22/01	12/22/01	EPA 300.0	
CMP-11121201 (B1L0486-05) Water Sampled: 12/12/01 13:50 Received: 12/19/01 09:30									
Chloride	**12400**	1000	mg/l	5000	1L26045	12/22/01	12/22/01	EPA 300.0	
CMP-11121201 (B1L0486-05RE1) Water Sampled: 12/12/01 13:50 Received: 12/19/01 09:30									
Chloride	**14800**	1000	mg/l	5000	2A25031	01/23/02	01/23/02	EPA 300.0	I-02
CMP-8121201 (B1L0486-06) Water Sampled: 12/12/01 14:40 Received: 12/19/01 09:30									
Chloride	**851**	20.0	mg/l	100	1L26020	12/22/01	12/22/01	EPA 300.0	
MW-44121301 (B1L0486-07) Water Sampled: 12/13/01 11:50 Received: 12/19/01 09:30									
Chloride	**44900**	1000	mg/l	5000	1L26045	12/22/01	12/22/01	EPA 300.0	
MW-44121301 (B1L0486-07RE1) Water Sampled: 12/13/01 11:50 Received: 12/19/01 09:30									
Chloride	**19400**	1000	mg/l	5000	2A25031	01/23/02	01/23/02	EPA 300.0	I-02

S. Wo

Scott A. Woerman, Project Manager

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179 Madrone Lane N
Bainbridge Island WA/USA, 98110

Project: SW Harbor
Project Number: BU 99106
Project Manager: Chip Goodhue

Amended Report
Issued: 02/09/02 14:03

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-26R121301 (B1L0486-08) Water Sampled: 12/13/01 12:30 Received: 12/19/01 09:30									
Chloride	**412**	40.0	mg/l	200	1L26020	12/22/01	12/22/01	EPA 300.0	
MW-5121301 (B1L0486-09) Water Sampled: 12/13/01 13:00 Received: 12/19/01 09:30									
Chloride	**13800**	1000	mg/l	5000	1L26045	12/22/01	12/22/01	EPA 300.0	
CMP-16121301 (B1L0486-10) Water Sampled: 12/13/01 13:25 Received: 12/19/01 09:30									
Chloride	**9500**	1000	mg/l	5000	1L26045	12/22/01	12/22/01	EPA 300.0	
CMP-7121301 (B1L0486-11) Water Sampled: 12/13/01 14:30 Received: 12/19/01 09:30									
Chloride	**569**	20.0	mg/l	100	1L26020	12/22/01	12/22/01	EPA 300.0	
MW-308S121301 (B1L0486-12) Water Sampled: 12/13/01 15:15 Received: 12/19/01 09:30									
Chloride	**8730**	1000	mg/l	5000	1L26045	12/22/01	12/22/01	EPA 300.0	
MW-36121301 (B1L0486-13) Water Sampled: 12/13/01 15:45 Received: 12/19/01 09:30									
Chloride	**15400**	1000	mg/l	5000	1L26056	12/23/01	12/23/01	EPA 300.0	
MW-308N121701 (B1L0486-14) Water Sampled: 12/17/01 09:30 Received: 12/19/01 09:30									
Chloride	**962**	40.0	mg/l	200	1L26045	12/22/01	12/22/01	EPA 300.0	
MW-5121701 (B1L0486-15) Water Sampled: 12/17/01 10:50 Received: 12/19/01 09:30									
Chloride	**12300**	1000	mg/l	5000	1L26045	12/22/01	12/22/01	EPA 300.0	
CMP-2121701 (B1L0486-16) Water Sampled: 12/17/01 13:45 Received: 12/19/01 09:30									
Chloride	**387**	20.0	mg/l	100	1L26020	12/22/01	12/22/01	EPA 300.0	

Scott A. Woerman, Project Manager

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Aspect Consulting	Project: SW Harbor	
179 Madrone Lane N	Project Number: BU 99106	**Amended Report**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	Issued: 02/09/02 14:03

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-308S121701 (B1L0486-17) Water Sampled: 12/17/01 14:05 Received: 12/19/01 09:30									
Chloride	**8900**	200	mg/l	1000	1L26042	12/22/01	12/22/01	EPA 300.0	
CMP-13121701 (B1L0486-18) Water Sampled: 12/17/01 14:25 Received: 12/19/01 09:30									
Chloride	**232**	20.0	mg/l	100	1L26056	12/23/01	12/23/01	EPA 300.0	
CMP-12121701 (B1L0486-19) Water Sampled: 12/17/01 14:40 Received: 12/19/01 09:30									
Chloride	**5070**	200	mg/l	1000	1L27005	12/26/01	12/26/01	EPA 300.0	
CMP-12121701 (B1L0486-19RE1) Water Sampled: 12/17/01 14:40 Received: 12/19/01 09:30									
Chloride	**2470**	200	mg/l	1000	2B01015	01/31/02	01/31/02	EPA 300.0	I-02
CMP-11121701 (B1L0486-20) Water Sampled: 12/17/01 14:55 Received: 12/19/01 09:30									
Chloride	**52700**	2000	mg/l	10000	1L27005	12/26/01	12/26/01	EPA 300.0	
CMP-11121701 (B1L0486-20RE1) Water Sampled: 12/17/01 14:55 Received: 12/19/01 09:30									
Chloride	**13700**	1000	mg/l	5000	2A25031	01/24/02	01/24/02	EPA 300.0	I-02
CMP-8121701 (B1L0486-21) Water Sampled: 12/17/01 16:40 Received: 12/19/01 09:30									
Chloride	**880**	40.0	mg/l	200	1L26056	12/23/01	12/23/01	EPA 300.0	
CMP-7121701 (B1L0486-22) Water Sampled: 12/17/01 17:25 Received: 12/19/01 09:30									
Chloride	**519**	20.0	mg/l	100	1L26056	12/23/01	12/23/01	EPA 300.0	
MW-36121701 (B1L0486-23) Water Sampled: 12/17/01 18:15 Received: 12/19/01 09:30									
Chloride	**15500**	1000	mg/l	5000	1L26056	12/23/01	12/23/01	EPA 300.0	

Scott A. Woerman, Project Manager

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Aspect Consulting	Project: SW Harbor	
179 Madrone Lane N	Project Number: BU 99106	**Amended Report**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	Issued: 02/09/02 14:03

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
CMP-16121701 (B1L0486-24) Water	**Sampled: 12/17/01 18:40**		**Received: 12/19/01 09:30**						
Chloride	**11500**	400	mg/l	2000	1L26056	12/23/01	12/23/01	EPA 300.0	
MW-44121701 (B1L0486-25) Water	**Sampled: 12/17/01 18:55**		**Received: 12/19/01 09:30**						
Chloride	**18200**	1000	mg/l	5000	1L26056	12/23/01	12/23/01	EPA 300.0	
MW-44121701 (B1L0486-25RE1) Water	**Sampled: 12/17/01 18:55**		**Received: 12/19/01 09:30**						
Chloride	**18900**	1000	mg/l	5000	2A25031	01/23/02	01/23/02	EPA 300.0	I-02
MW-26R121701 (B1L0486-26) Water	**Sampled: 12/17/01 19:05**		**Received: 12/19/01 09:30**						
Chloride	**357**	20.0	mg/l	100	1L26056	12/23/01	12/23/01	EPA 300.0	

Scott A. Woerman, Project Manager

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Aspect Consulting	Project: SW Harbor	
179 Madrone Lane N	Project Number: BU 99106	**Amended Report**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	Issued: 02/09/02 14:03

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1L26020: Prepared 12/22/01 Using General Preparation										
Blank (1L26020-BLK1)										
Chloride	ND	0.200	mg/l							
LCS (1L26020-BS1)										
Chloride	1.91	0.200	mg/l	2.00		95.5	90-110			
LCS Dup (1L26020-BSD1)										
Chloride	1.97	0.200	mg/l	2.00		98.5	90-110	3.09	20	
Duplicate (1L26020-DUP1)					**Source: B1L0486-16**					
Chloride	283	20.0	mg/l		387			31.0	25	Q-07
Matrix Spike (1L26020-MS1)					**Source: B1L0486-16**					
Chloride	489	20.0	mg/l	200	387	51.0	54-124			Q-15
Batch 1L26042: Prepared 12/22/01 Using General Preparation										
Blank (1L26042-BLK1)										
Chloride	ND	0.200	mg/l							
LCS (1L26042-BS1)										
Chloride	1.99	0.200	mg/l	2.00		99.5	90-110			
LCS Dup (1L26042-BSD1)										
Chloride	1.97	0.200	mg/l	2.00		98.5	90-110	1.01	20	
Duplicate (1L26042-DUP1)					**Source: B1L0343-12**					
Chloride	1480	100	mg/l		1470			0.678	25	

S. Wo

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Aspect Consulting	Project: SW Harbor	
179 Madrone Lane N	Project Number: BU 99106	**Amended Report**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	Issued: 02/09/02 14:03

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1L26042: Prepared 12/22/01 Using General Preparation										
Duplicate (1L26042-DUP2)					**Source: B1L0343-01**					
Chloride	1130	40.0	mg/l		1120			0.889	25	
Matrix Spike (1L26042-MS1)					**Source: B1L0343-12**					
Chloride	2350	100	mg/l	1000	1470	88.0	54-124			
Matrix Spike (1L26042-MS2)					**Source: B1L0343-01**					
Chloride	1540	40.0	mg/l	400	1120	105	54-124			
Batch 1L26045: Prepared 12/22/01 Using General Preparation										
Blank (1L26045-BLK1)										
Chloride	ND	0.200	mg/l							
LCS (1L26045-BS1)										
Chloride	2.00	0.200	mg/l	2.00		100	90-110			
LCS Dup (1L26045-BSD1)										
Chloride	1.99	0.200	mg/l	2.00		99.5	90-110	0.501	20	
Duplicate (1L26045-DUP1)					**Source: B1L0486-14**					
Chloride	930	40.0	mg/l		962			3.38	25	
Matrix Spike (1L26045-MS1)					**Source: B1L0486-14**					
Chloride	1340	40.0	mg/l	400	962	94.5	54-124			
Batch 1L26056: Prepared 12/23/01 Using General Preparation										
Blank (1L26056-BLK1)										
Chloride	ND	0.200	mg/l							

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Aspect Consulting
179 Madrone Lane N
Bainbridge Island WA/USA, 98110

Project: SW Harbor
Project Number: BU 99106
Project Manager: Chip Goodhue

Amended Report
Issued: 02/09/02 14:03

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1L26056: Prepared 12/23/01 Using General Preparation										
LCS (1L26056-BS1)										
Chloride	2.12	0.200	mg/l	2.00		106	90-110			
LCS Dup (1L26056-BSD1)										
Chloride	2.12	0.200	mg/l	2.00		106	90-110	0.00	20	
Duplicate (1L26056-DUP2)					**Source: B1L0486-18**					
Chloride	208	20.0	mg/l		232			10.9	25	
Matrix Spike (1L26056-MS2)					**Source: B1L0486-18**					
Chloride	397	20.0	mg/l	200	232	82.5	54-124			
Batch 1L27005: Prepared 12/26/01 Using General Preparation										
Blank (1L27005-BLK1)										
Chloride	ND	0.200	mg/l							
LCS (1L27005-BS1)										
Chloride	1.82	0.200	mg/l	2.00		91.0	90-110			
LCS Dup (1L27005-BSD1)										
Chloride	1.84	0.200	mg/l	2.00		92.0	90-110	1.09	20	
Duplicate (1L27005-DUP3)					**Source: B1L0343-11**					
Chloride	4700	400	mg/l		4650			1.07	25	
Matrix Spike (1L27005-MS3)					**Source: B1L0343-11**					
Chloride	8390	400	mg/l	4000	4650	93.5	54-124			

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Aspect Consulting	Project: SW Harbor	
179 Madrone Lane N	Project Number: BU 99106	**Amended Report**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	Issued: 02/09/02 14:03

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1L28007: Prepared 12/27/01 Using General Preparation										
Blank (1L28007-BLK1)										
Chloride	ND	0.200	mg/l							
LCS (1L28007-BS1)										
Chloride	1.83	0.200	mg/l	2.00		91.5	90-110			
LCS Dup (1L28007-BSD1)										
Chloride	1.84	0.200	mg/l	2.00		92.0	90-110	0.545	20	
Duplicate (1L28007-DUP1)					**Source: B1L0486-01**					
Chloride	456	20.0	mg/l		487			6.57	25	
Duplicate (1L28007-DUP2)					**Source: B1L0528-01**					
Chloride	10600	400	mg/l		10700			0.939	25	
Matrix Spike (1L28007-MS1)					**Source: B1L0486-01**					
Chloride	654	20.0	mg/l	200	487	83.5	54-124			
Matrix Spike (1L28007-MS2)					**Source: B1L0528-01**					
Chloride	14400	400	mg/l	4000	10700	92.5	54-124			
Batch 2A25031: Prepared 01/23/02 Using General Preparation										
Blank (2A25031-BLK1)										
Chloride	ND	0.200	mg/l							
LCS (2A25031-BS1)										
Chloride	1.17	0.200	mg/l	1.20		97.5	90-110			

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Aspect Consulting	Project: SW Harbor	
179 Madrone Lane N	Project Number: BU 99106	**Amended Report**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	Issued: 02/09/02 14:03

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2A25031: Prepared 01/23/02 Using General Preparation										
LCS Dup (2A25031-BSD1)										
Chloride	1.17	0.200	mg/l	1.20		97.5	90-110	0.00	20	
Duplicate (2A25031-DUP1)					**Source: B1L0486-20RE1**					
Chloride	13900	1000	mg/l		13700			1.45	25	
Matrix Spike (2A25031-MS1)					**Source: B1L0486-20RE1**					
Chloride	19100	1000	mg/l	6000	13700	90.0	54-124			
Batch 2B01015: Prepared 01/31/02 Using General Preparation										
Blank (2B01015-BLK1)										
Chloride	ND	0.200	mg/l							
LCS (2B01015-BS1)										
Chloride	1.10	0.200	mg/l	1.20		91.7	90-110			
LCS Dup (2B01015-BSD1)										
Chloride	1.09	0.200	mg/l	1.20		90.8	90-110	0.913	20	
Duplicate (2B01015-DUP2)					**Source: B2A0625-10**					
Chloride	2380	200	mg/l		2470			3.71	25	
Matrix Spike (2B01015-MS2)					**Source: B2A0625-10**					
Chloride	2970	200	mg/l	1200	2470	41.7	54-124			Q-15

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Aspect Consulting	Project: SW Harbor	
179 Madrone Lane N	Project Number: BU 99106	**Amended Report**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	Issued: 02/09/02 14:03

Notes and Definitions

I-02	This sample was analyzed outside of the recommended holding time.
Q-07	The RPD value for this QC sample is above the established control limit. Review of associated QC indicates the high RPD does not represent an out-of-control condition for the batch.
Q-15	Analyses are not controlled on matrix spike RPD and/or percent recoveries when the sample concentration is significantly higher than the spike level.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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CHAIN OF CUSTODY REPORT

Work Order #: B1C0486

CLIENT: Aspect Consulting LLC
REPORT TO: Chip Goodhue
ADDRESS: 179 Madrone LN N
Bainbridge Island WA 98110
PHONE: 206 780 9370 FAX: 206 780 9438

INVOICE TO: SAME
P.O. NUMBER:

PROJECT NAME: SW Harbor
PROJECT NUMBER: BU 99106
SAMPLED BY: Peter Bannister

TURNAROUND REQUEST in Business Days*
Organic & Inorganic Analyses: [X] 10 [7] [5] [4] [3] [2] [1] [<1]
STD. Petroleum Hydrocarbon Analyses: [5] [4] [3] [2] [1] [<1]
STD. [OTHER] Please Specify
*Turnaround Requests less than standard may incur Rush Charges.

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	REQUESTED ANALYSES: WTPH 418.1	MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1. MW-308N121701	12-17-01 / 0930	X	W	1		-14
2. MW-5 121701	12-17-01 / 1050	X	W	1		-15
3. CMP-2 121701	12-17-01 / 1345	X	W	1		-16
4. MW-308S 121701	12-17-01 / 1405	X	W	1		-17
5. CMP-13 121701	12-17-01 / 1425	X	W	1		-18
6. CMP-12 121701	12-17-01 / 1440	X	W	1		-19
7. CMP-11 121701	12-17-01 / 1455	X	W	1		-20
8. CMP-8 121701	12-17-01 / 1640	X	W	1		-21
9. CMP-7 121701	12-17-01 / 1725	X	W	1		-22
10. MW-36 121701	12-17-01 / 1815	X	W	1		-23
11. CMP-16 121701	12-17-01 / 1840	X	W	1		-24
12. MW-44 121701	12-17-01 / 1855	X	W	1		-25
13. MW-26R 121701	12-17-01 / 1905	X	W	1		-26
14.						
15.						

RELINQUISHED BY: Peter Bannister FIRM: Aspect DATE: 12-18-01 TIME: 1000
RECEIVED BY: BRANT TONTZ FIRM: NCA DATE: 12/19/01 TIME: 0930
RELINQUISHED BY: PRINT NAME: FIRM: DATE: TIME:
RECEIVED BY: PRINT NAME: FIRM: DATE: TIME:

ADDITIONAL REMARKS:
COC REV 3/99
COC
TEMP: 4.6
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CHAIN OF CUSTODY REPORT

Work Order #: B1L0486

CLIENT: Aspect Consulting LLC
REPORT TO: Chip Goodhue
ADDRESS: 179 Madrone LN N
Bainbridge Is WA 98110
PHONE: 206 780 9370 FAX: 206-780

INVOICE TO: SAME
P.O. NUMBER: BV99106

PROJECT NAME: SW Harbor
PROJECT NUMBER: BV 99106
SAMPLED BY: Bob Hanford

TURNAROUND REQUEST in Business Days*
Organic & Inorganic Analyses: ~~10~~ 7 5 4 3 2 1 <1 (STD.)
Petroleum Hydrocarbon Analyses: 5 4 3 2 1 <1 (STD.)
OTHER Please Specify
*Turnaround Requests less than standard may incur Rush Charges.

		REQUESTED ANALYSES																
CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	Cl EPA 300														MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1. CMP-2 121201	12/12/01 12:10	x														W	1		01
2. MW-808W121201	12/12/01 1255	x															1		02
3. CMP-13 121201	12/12/01 1325	x															1		03
4. CMP-12 121201	12/12/01 1335	x															1		04
5. CMP-11 121201	12/12/01 1350	x															1		05
6. CMP-8 121201	12/12/01 1440	x															1		06
7. MW-44 121301	12/13/01 1150	x															1		07
8. MW-26R 121301	12/13/01 1230	x															1		08
9. MW-5 121301	12/13/01 1300	x															1		09
10. CMP-16 121301	12/13/01 1325	x															1		10
11. CMP-7 121301	12/13/01 1430	x															1		11
12. MW-30S 121301	12/13/01 155	x															1		12
13. MW-36 121301	12/13/01 1545	x															1		13
14.																			
15.																			

RELINQUISHED BY: Peter Bannister DATE: 12-18-00
PRINT NAME: PETER BANNISTER FIRM: Aspect TIME: 1015
RECEIVED BY: Tony DATE: 12/19/01
PRINT NAME: PRANY TONTY FIRM: NCA TIME: 0930

RELINQUISHED BY: DATE:
PRINT NAME: FIRM: TIME:
RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:

ADDITIONAL REMARKS: WCS
TEMP: 4.6
COC REV 3/99
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Aspect Consulting
179 Madrone Lane N
Bainbridge Island WA/USA, 98110

Project: T5 - Earthquake Repair
Project Number: [none]
Project Manager: Chip Goodhue

Reported:
07/12/02 10:37

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW36	B2F0772-01	Water	06/26/02 09:35	06/28/02 09:30
MW44	B2F0772-02	Water	06/26/02 09:50	06/28/02 09:30
CMP 308S	B2F0772-03	Water	06/26/02 09:00	06/28/02 09:30

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Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting	Project: T5 - Earthquake Repair	
179 Madrone Lane N	Project Number: [none]	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	07/12/02 10:37

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW36 (B2F0772-01) Water Sampled: 06/26/02 09:35 Received: 06/28/02 09:30									
Chloride	**12700**	2000	mg/l	5000	2G02013	07/01/02	07/01/02	EPA 300.0	
MW44 (B2F0772-02) Water Sampled: 06/26/02 09:50 Received: 06/28/02 09:30									
Chloride	**47.3**	10.0	mg/l	25	2G02013	07/01/02	07/01/02	EPA 300.0	
CMP 308S (B2F0772-03) Water Sampled: 06/26/02 09:00 Received: 06/28/02 09:30									
Chloride	**8610**	800	mg/l	2000	2G02013	07/01/02	07/01/02	EPA 300.0	

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Aspect Consulting	Project: T5 - Earthquake Repair	
179 Madrone Lane N	Project Number: [none]	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	07/12/02 10:37

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2G02013: Prepared 07/01/02 Using General Preparation										
Blank (2G02013-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (2G02013-BS1)										
Chloride	2.02	0.400	mg/l	2.00		101	90-110			
LCS Dup (2G02013-BSD1)										
Chloride	1.99	0.400	mg/l	2.00		99.5	90-110	1.50	20	
Duplicate (2G02013-DUP1)					**Source: B2F0758-01**					
Chloride	2.97	0.400	mg/l		3.14			5.56	25	
Matrix Spike (2G02013-MS1)					**Source: B2F0758-01**					
Chloride	7.84	0.800	mg/l	4.00	3.14	118	54-124			

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Aspect Consulting	Project: T5 - Earthquake Repair	
179 Madrone Lane N	Project Number: [none]	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	07/12/02 10:37

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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Jeff Gerdes, Project Manager

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CHAIN OF CUSTODY REPORT

Work Order #: B2F0772

CLIENT: Aspect Consulting
REPORT TO: Chip Goodhue
ADDRESS: 179 Madrone Lane N
Bainbridge Is, WA 98110
PHONE: 206 780 9370 FAX: 206 780-9438

INVOICE TO: Aspect
P.O. NUMBER:

PROJECT NAME: T5
PROJECT NUMBER:
SAMPLED BY: John McNulty

TURNAROUND REQUEST in Business Days*
Organic & Inorganic Analyses: [10] STD. [7] [5] [4] [3] [2] [1] [<1]
Petroleum Hydrocarbon Analyses: [5] STD. [4] [3] [2] [1] [<1]
[OTHER] Please Specify
*Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	REQUESTED ANALYSES: Chloride EPA 300	MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1.	MW36	6-26-02 0935	✓	W	1		-01
2.	MW44	6-26-02 0950	✓	W	1		-02
3.	CMP 308S	6-21-02 0900	✓	W	1		-03
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							

Samples were not @2-6C Upon Receipt

RELINQUISHED BY: JMcNulty	DATE: 6/27/02	RECEIVED BY: Cathy Crumble	DATE: 6/28/02
PRINT NAME: John McNulty FIRM: Aspect	TIME: 0900	PRINT NAME: Cathy Crumble FIRM: NCA	TIME: 9:30
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:
PRINT NAME: FIRM:	TIME:	PRINT NAME: FIRM:	TIME:

ADDITIONAL REMARKS: w/ CS

TEMP: 10.8

COC REV 3/99

PAGE OF

Aspect Consulting	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	08/26/02 16:39

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-36	B2H0201-01	Water	08/09/02 10:30	08/09/02 12:57
MW-44	B2H0201-02	Water	08/09/02 09:50	08/09/02 12:57
MW-3085	B2H0201-03	Water	08/09/02 11:15	08/09/02 12:57

North Creek Analytical - Bothell

Jeff Gerdes

Jeff Gerdes, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Aspect Consulting 179 Madrone Lane N Bainbridge Island WA/USA, 98110	Project: T-5 PSR Project Number: 990106 Project Manager: Chip Goodhue	**Reported:** 08/26/02 16:39

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-36 (B2H0201-01) Water Sampled: 08/09/02 10:30 Received: 08/09/02 12:57									
Chloride	**12300**	1600	mg/l	4000	2H26014	08/25/02	08/25/02	EPA 300.0	
MW-44 (B2H0201-02) Water Sampled: 08/09/02 09:50 Received: 08/09/02 12:57									
Chloride	**63.0**	8.00	mg/l	20	2H26014	08/25/02	08/25/02	EPA 300.0	
MW-3085 (B2H0201-03) Water Sampled: 08/09/02 11:15 Received: 08/09/02 12:57									
Chloride	**8440**	800	mg/l	2000	2H26014	08/25/02	08/25/02	EPA 300.0	

North Creek Analytical - Bothell

Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	08/26/02 16:39

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2H26014: Prepared 08/25/02 Using General Preparation										
Blank (2H26014-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (2H26014-BS1)										
Chloride	1.95	0.400	mg/l	2.00		97.5	90-110			
LCS Dup (2H26014-BSD1)										
Chloride	1.98	0.400	mg/l	2.00		99.0	90-110	1.53	20	
Duplicate (2H26014-DUP1)					**Source: B2H0463-02**					
Chloride	52.2	8.00	mg/l		50.9			2.52	25	
Duplicate (2H26014-DUP2)					**Source: B2H0463-04**					
Chloride	36.4	4.00	mg/l		36.2			0.551	25	
Matrix Spike (2H26014-MS1)					**Source: B2H0463-02**					
Chloride	148	20.0	mg/l	100	50.9	97.1	54-124			
Matrix Spike (2H26014-MS2)					**Source: B2H0463-04**					
Chloride	80.8	10.0	mg/l	50.0	36.2	89.2	54-124			

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

Aspect Consulting	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	08/26/02 16:39

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

Jeff Gerdes

Jeff Gerdes, Project Manager

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CHAIN OF CUSTODY REPORT

Work Order #: B2H2201

CLIENT: Aspect Consulting
REPORT TO: Chip Goodhue
ADDRESS: 179 Madrone Lane N
Bainbridge Is, 98110
PHONE: 206 780 9570 FAX: 780-9558

INVOICE TO: SAME
P.O. NUMBER:

PROJECT NAME: TS
PROJECT NUMBER: 990106
SAMPLED BY: J McNulty

TURNAROUND REQUEST in Business Days*
Organic & Inorganic Analyses: (10) STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1
Petroleum Hydrocarbon Analyses: 5 | 4 | 3 | 2 | 1 | <1 (STD.)
OTHER — Please Specify
*Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	REQUESTED ANALYSES: Chloride EPA 300.0	MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1.	MW-36	8-9-02 1030	✓			confirm method	-01
2.	MW-44	950	✓				-02
3.	MW-308S	1115	✓				-03
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							

RELINQUISHED BY: John McNulty — DATE: 8/9/02 — TIME: 1257
PRINT NAME: John McNulty — FIRM: Aspect
RECEIVED BY: Colette Weaver — DATE: 8-9-02 — TIME: 1257
PRINT NAME: Colette Weaver — FIRM: NCA

RELINQUISHED BY: — DATE: — TIME:
PRINT NAME: — FIRM:
RECEIVED BY: — DATE: — TIME:
PRINT NAME: — FIRM:

ADDITIONAL REMARKS:

COC REV 3/99

TEMP: 8.9°C PAGE OF

Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106-004-15	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	10/22/02 15:58

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-36	B2J0248-01	Water	10/08/02 15:00	10/09/02 10:30
MW-44	B2J0248-02	Water	10/08/02 14:40	10/09/02 10:30
MW-30BS	B2J0248-03	Water	10/08/02 15:40	10/09/02 10:30

North Creek Analytical - Bothell

Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106-004-15	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	10/22/02 15:58

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-36 (B2J0248-01) Water Sampled: 10/08/02 15:00 Received: 10/09/02 10:30									
Chloride	**14000**	2000	mg/l	5000	2J16011	10/15/02	10/15/02	EPA 300.0	
MW-44 (B2J0248-02) Water Sampled: 10/08/02 14:40 Received: 10/09/02 10:30									
Chloride	**90.2**	20.0	mg/l	50	2J16011	10/15/02	10/15/02	EPA 300.0	
MW-30BS (B2J0248-03) Water Sampled: 10/08/02 15:40 Received: 10/09/02 10:30									
Chloride	**9540**	800	mg/l	2000	2J16011	10/15/02	10/15/02	EPA 300.0	

North Creek Analytical - Bothell

Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106-004-15	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	10/22/02 15:58

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2J16011: Prepared 10/15/02 Using General Preparation										
Blank (2J16011-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (2J16011-BS1)										
Chloride	1.97	0.400	mg/l	2.00		98.5	90-110			
LCS Dup (2J16011-BSD1)										
Chloride	2.01	0.400	mg/l	2.00		100	90-110	2.01	20	
Duplicate (2J16011-DUP2)					**Source: B2J0223-01**					
Chloride	1.54	0.400	mg/l		1.49			3.30	25	
Matrix Spike (2J16011-MS2)					**Source: B2J0223-01**					
Chloride	3.36	0.400	mg/l	2.00	1.49	93.5	54-124			

North Creek Analytical - Bothell

Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106-004-15	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	10/22/02 15:58

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

Jeff Gerdes

Jeff Gerdes, Project Manager

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CHAIN OF CUSTODY REPORT

Work Order #: B20D248

CLIENT: Aspect Consulting
REPORT TO: Chip Goodhue
ADDRESS: 179 Madrone Lane N Bainbridge IS, WA
PHONE: 206 780-9370 FAX: 780-[illegible]38

INVOICE TO: Aspect
P.O. NUMBER:

PROJECT NAME: 990106-004-15
PROJECT NUMBER: T-5
SAMPLED BY: JMcAuley

TURNAROUND REQUEST in Business Days*

Organic & Inorganic Analyses: [10] STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1

Petroleum Hydrocarbon Analyses: [5] STD. | 4 | 3 | 2 | 1 | <1

Please Specify OTHER

*Turnaround Requests less than standard may incur Rush Charges.

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	Chloride EPA 300	MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1. MW-36	10-8-02/1500	✓	W	1		-01
2. MW-44	/1440	✓	W	1		-02
3. MW-30BS	/1540	✓	W	1		-03
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						

REQUESTED ANALYSES

RELINQUISHED BY: JMcAuley
PRINT NAME: John McAuley FIRM: Aspect DATE: 10/9/02 TIME: 0830

RECEIVED BY: Cathy Gamble
PRINT NAME: Cathy Gamble FIRM: NCA DATE: 10/9/02 TIME: 10:30

RELINQUISHED BY:
PRINT NAME: FIRM: DATE: TIME:

RECEIVED BY:
PRINT NAME: FIRM: DATE: TIME:

ADDITIONAL REMARKS: w/cs

TEMP: 4.0

PAGE OF

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Anchorage 3209 Denali Street, Anchorage, AK 99503
907.334.9338 fax 907.334.9339

Aspect Consulting - Bainbridge Island	Project: Not Provided	
179 Madrone Lane N	Project Number: Not Provided	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	12/20/02 17:30

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-308 5	B2L0247-01	Water	12/10/02 12:30	12/11/02 10:20
MW-36	B2L0247-02	Water	12/10/02 15:00	12/11/02 10:20

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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907.334.9338 fax 907.334.9339

Aspect Consulting - Bainbridge Island	Project: Not Provided	
179 Madrone Lane N	Project Number: Not Provided	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	12/20/02 17:30

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-3085 (B2L0247-01) Water Sampled: 12/10/02 12:30 Received: 12/11/02 10:20									
Chloride	**8010**	800	mg/l	2000	2L16005	12/15/02	12/15/02	EPA 300.0	
MW-36 (B2L0247-02) Water Sampled: 12/10/02 15:00 Received: 12/11/02 10:20									
Chloride	**4660**	400	mg/l	1000	2L14001	12/13/02	12/13/02	EPA 300.0	

North Creek Analytical - Bothell

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907.334.9338 fax 907.334.9339

Aspect Consulting - Bainbridge Island 179 Madrone Lane N Bainbridge Island WA/USA, 98110	Project: Not Provided Project Number: Not Provided Project Manager: Chip Goodhue	**Reported:** 12/20/02 17:30

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2L14001: Prepared 12/13/02 Using General Preparation										
Blank (2L14001-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (2L14001-BS1)										
Chloride	1.98	0.400	mg/l	2.00		99.0	90-110			
LCS Dup (2L14001-BSD1)										
Chloride	1.95	0.400	mg/l	2.00		97.5	90-110	1.53	20	
Duplicate (2L14001-DUP2)					**Source: B2L0169-01**					
Chloride	18.4	2.00	mg/l		18.3			0.545	25	
Matrix Spike (2L14001-MS2)					**Source: B2L0169-01**					
Chloride	20.4	2.00	mg/l	2.00	18.3	105	54-124			
Batch 2L16005: Prepared 12/15/02 Using General Preparation										
Blank (2L16005-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (2L16005-BS1)										
Chloride	1.96	0.400	mg/l	2.00		98.0	90-110			
LCS Dup (2L16005-BSD1)										
Chloride	1.96	0.400	mg/l	2.00		98.0	90-110	0.00	20	
Duplicate (2L16005-DUP2)					**Source: B2L0247-01**					
Chloride	7860	800	mg/l		8010			1.89	25	

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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907.334.9338 fax 907.334.9339

Aspect Consulting - Bainbridge Island	Project: Not Provided	
179 Madrone Lane N	Project Number: Not Provided	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	12/20/02 17:30

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2L16005: Prepared 12/15/02 Using General Preparation										
Matrix Spike (2L16005-MS2)					**Source: B2L0247-01**					
Chloride	7460	800	mg/l	2.00	8010	-27500	54-124			Q-15

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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907.334.9338 fax 907.334.9339

Aspect Consulting - Bainbridge Island	Project: Not Provided	
179 Madrone Lane N	Project Number: Not Provided	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	12/20/02 17:30

Notes and Definitions

Q-15	Analyses are not controlled on matrix spike RPD and/or percent recoveries when the sample concentration is significantly higher than the spike level.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Jeff Gerdes, Project Manager

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CHAIN OF CUSTODY REPORT

Work Order #: B2L0247

CLIENT: Aspect Consulting
REPORT TO: Chip Goodhue
ADDRESS: 179 Madrone Lane N Bainbridge Is, WA
PHONE: 206 780-9370 FAX: 206 780-9438

INVOICE TO: Same
P.O. NUMBER:

PROJECT NAME:
PROJECT NUMBER:
SAMPLED BY:

TURNAROUND REQUEST in Business Days*

Organic & Inorganic Analyses: [X] STD. [7] [5] [4] [3] [2] [1] [<1]

Petroleum Hydrocarbon Analyses: [5] STD. [4] [3] [2] [1] [<1]

[OTHER] Please Specify

*Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	REQUESTED ANALYSES: Chloride EPA 300	MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1.	MW-308S	12-10-02/ 1230	✓	W	1		01
2.	MW-36	12-10-02/ 1500	✓	W	1		02
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							

RELINQUISHED BY: [signature] DATE: 12-11-02
PRINT NAME: John McNulty FIRM: Aspect TIME: 0800

RECEIVED BY: [signature] DATE: 12-11-02
PRINT NAME: Scott Woerman FIRM: NCA TIME: 0940

RELINQUISHED BY: [signature] DATE: 12/11/02
PRINT NAME: Scott Woerman FIRM: NCA TIME: 1020

RECEIVED BY: [signature] DATE: 12/11/02
PRINT NAME: Don Numann FIRM: TIME: 1020

ADDITIONAL REMARKS:

TEMP: 5.1°C

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Anchorage 3209 Denali Street, Anchorage, AK 99503
907.334.9200 fax 907.334.9210

Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	03/25/03 12:52

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-36	B3C0327-01	Water	03/11/03 15:15	03/12/03 14:30
MW-308	B3C0327-02	Water	03/11/03 15:50	03/12/03 14:30

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Jeff Gerdes

Jeff Gerdes, Project Manager

www.ncalabs.com

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541.383.9310 fax 541.382.7588
Anchorage 3209 Denali Street, Anchorage, AK 99503
907.334.9200 fax 907.334.9210

Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	03/25/03 12:52

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-36 (B3C0327-01) Water Sampled: 03/11/03 15:15 Received: 03/12/03 14:30									
Chloride	**10300**	2000	mg/l	5000	3C22012	03/21/03	03/21/03	EPA 300.0	
MW-308 (B3C0327-02) Water Sampled: 03/11/03 15:50 Received: 03/12/03 14:30									
Chloride	**8710**	800	mg/l	2000	3C22012	03/21/03	03/21/03	EPA 300.0	

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	03/25/03 12:52

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3C22012: Prepared 03/21/03 Using General Preparation										
Blank (3C22012-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (3C22012-BS1)										
Chloride	1.98	0.400	mg/l	2.00		99.0	90-110			
LCS Dup (3C22012-BSD1)										
Chloride	2.00	0.400	mg/l	2.00		100	90-110	1.01	20	
Duplicate (3C22012-DUP2)					**Source: B3C0398-02**					
Chloride	4.01	0.800	mg/l		4.01			0.00	25	
Matrix Spike (3C22012-MS2)					**Source: B3C0398-02**					
Chloride	6.00	0.800	mg/l	2.00	4.01	99.5	52-134			

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island WA/USA, 98110	Project Manager: Chip Goodhue	03/25/03 12:52

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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Environmental Laboratory Network
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20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711 (541) 383-9310 FAX 382-7588

CHAIN OF CUSTODY REPORT

Work Order #: B3C0327

CLIENT: Aspect Consulting
REPORT TO: Chip Goodhue
ADDRESS: 179 Madrone Lane N, Bainbridge 98110
PHONE: 206 780-9370 FAX: 206 780 9438

INVOICE TO: Same
P.O. NUMBER:

PROJECT NAME: T-5
PROJECT NUMBER: 990106004.15
SAMPLED BY: JMcNulty

TURNAROUND REQUEST in Business Days*
Organic & Inorganic Analyses: [10] STD. [7] [5] [4] [3] [2] [1] [<1]
Petroleum Hydrocarbon Analyses: [5] STD. [4] [3] [2] [1] [<1]
[OTHER] Please Specify
*Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	REQUESTED ANALYSES: Chloride EPA 300.0	MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1.	MW-36	3-11-03 / 1515	✓	W	1		-01
2.	MW-30S	3-11-03 / 1550	✓	W	1		-02
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.						Samples were not @2-6C Upon Receipt	
13.							
14.							
15.							

RELINQUISHED BY: John McNulty DATE: 3-12-03
PRINT NAME: John McNulty FIRM: Aspect TIME: 1143
RECEIVED BY: Aaron Dockter
PRINT NAME: Aaron Dockter FIRM: NCA TIME: 11:43

RELINQUISHED BY: Aaron Dockter DATE: 3/12/03
PRINT NAME: Aaron Dockter FIRM: NCA TIME: 1430
RECEIVED BY:
PRINT NAME: BRANT TOWN FIRM: NCA TIME: 1430

ADDITIONAL REMARKS:

COC REV 3/99

NO TEMP: 13.6 PAGE OF

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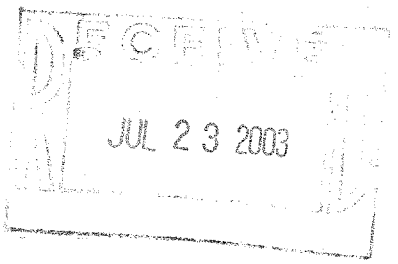
541.383.9310 fax 541.382.7588
Anchorage 2000 W. International Airport Road, Suite A10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	07/21/03 13:33

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-36-070803	B3G0200-01	Water	07/08/03 11:30	07/08/03 16:35
MW-308S-070803	B3G0200-02	Water	07/08/03 12:40	07/08/03 16:35



North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	07/21/03 13:33

Anions by EPA Method 300.0
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-36-070803 (B3G0200-01) Water	**Sampled: 07/08/03 11:30**		**Received: 07/08/03 16:35**						
Chloride	**10600**	2000	mg/l	5000	3G10054	07/10/03	07/10/03	EPA 300.0	
MW-308S-070803 (B3G0200-02) Water	**Sampled: 07/08/03 12:40**		**Received: 07/08/03 16:35**						
Chloride	**7630**	800	mg/l	2000	3G10054	07/10/03	07/10/03	EPA 300.0	

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	07/21/03 13:33

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3G10054: Prepared 07/10/03 Using General Preparation										
Blank (3G10054-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (3G10054-BS1)										
Chloride	1.94	0.400	mg/l	2.00		97.0	90-110			
LCS Dup (3G10054-BSD1)										
Chloride	1.98	0.400	mg/l	2.00		99.0	90-110	2.04	20	
Duplicate (3G10054-DUP2)					**Source: B3G0014-05**					
Chloride	3.48	0.400	mg/l		3.50			0.573	25	
Matrix Spike (3G10054-MS2)					**Source: B3G0014-05**					
Chloride	5.53	0.800	mg/l	2.00	3.50	102	52-134			

North Creek Analytical - Bothell

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907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	07/21/03 13:33

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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3209 Denali St, Anchorage, AK 99503-4030 907-334-9200 FAX 334-9210

CHAIN OF CUSTODY REPORT

Work Order #: B3G0200

CLIENT: Aspect Consulting
REPORT TO: Chip Goodhue
ADDRESS: 179 Madrone Lane N. Bainbridge Is., WA 98110
PHONE: 206-780-9377 FAX: 206-780-9438

INVOICE TO: SAME
P.O. NUMBER:

PROJECT NAME: Terminal 5
PROJECT NUMBER: 99106
SAMPLED BY: John McNulty

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: 10 STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1
Petroleum Hydrocarbon Analyses: 5 STD. | 4 | 3 | 2 | 1 | <1
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	PRESERVATIVE	REQUESTED ANALYSES: Chloride BY 300.0	MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	NCA WO ID
1	MW-3b-070803	7-8-03/1130		✓	W	1		-01
2	MW-308S-070803	7-8-03/1240		✓	W	1		-02
3								
4								
5								
6								
7								
8								
9								
10								

RELEASED BY: John McNulty DATE: 7-8-03
PRINT NAME: John McNulty FIRM: Aspect TIME: 1500
RECEIVED BY: [signature] DATE: 7/8/03
PRINT NAME: PRANAY TONEY FIRM: NCA TIME: 1635

RELEASED BY: DATE:
PRINT NAME: FIRM: TIME:
RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:

ADDITIONAL REMARKS:
Samples were not @2-6C Upon Receipt
TEMP: 7.5

COC REV 1/03

PAGE OF

W/cs

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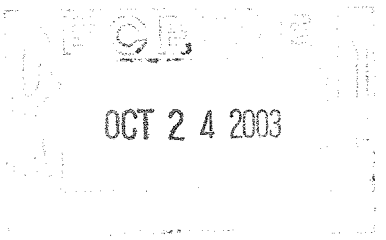
22 October 2003



Chip Goodhue
Aspect Consulting - Bainbridge Island
179 Madrone Lane N
Bainbridge Island, WA/USA 98110

RE: T-5 PSR

Enclosed are the results of analyses for samples received by the laboratory on 10/09/03 13:00. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeff Gerdes
Project Manager

North Creek Analytical, Inc.
Environmental Laboratory Network

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907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	10/22/03 08:50

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-36	B3J0272-01	Water	10/08/03 15:00	10/09/03 13:00
MW-308S	B3J0272-02	Water	10/08/03 10:40	10/09/03 13:00

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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Anchorage 2000 W. International Airport Road, Suite A10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	10/22/03 08:50

Anions by EPA Method 300.0
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-36 (B3J0272-01) Water Sampled: 10/08/03 15:00 Received: 10/09/03 13:00									
Chloride	**11500**	2000	mg/l	5000	3J21015	10/20/03	10/20/03	EPA 300.0	
MW-308S (B3J0272-02) Water Sampled: 10/08/03 10:40 Received: 10/09/03 13:00									
Chloride	**8490**	800	mg/l	2000	3J21015	10/20/03	10/20/03	EPA 300.0	

North Creek Analytical - Bothell

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907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	10/22/03 08:50

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3J21015: Prepared 10/20/03 Using General Preparation										
Blank (3J21015-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (3J21015-BS1)										
Chloride	1.98	0.400	mg/l	2.00		99.0	90-110			
LCS Dup (3J21015-BSD1)										
Chloride	1.98	0.400	mg/l	2.00		99.0	90-110	0.00	20	
Duplicate (3J21015-DUP1)					**Source: B3J0536-01**					
Chloride	2.14	0.400	mg/l		2.15			0.466	25	
Matrix Spike (3J21015-MS1)					**Source: B3J0536-01**					
Chloride	4.30	0.400	mg/l	2.00	2.15	108	52-134			

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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Anchorage 2000 W. International Airport Road, Suite A10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	10/22/03 08:50

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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3209 Denali St, Anchorage, AK 99503-4030 907-334-9200 FAX 334-9210

CHAIN OF CUSTODY REPORT

Work Order #: B3J0272

CLIENT: Aspect Consulting

REPORT TO: Chip Goodhue
ADDRESS: 179 Madrone Lane N.
Bainbridge Is, WA 98110
PHONE: 206 780-9370 FAX: 206 780 9438

INVOICE TO: Same

P.O. NUMBER:

PROJECT NAME: Terminal 5

PROJECT NUMBER: 990106

SAMPLED BY: John McNulty

TURNAROUND REQUEST
in Business Days *
Organic & Inorganic Analyses: ~~10~~ STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1
Petroleum Hydrocarbon Analyses: 5 STD. | 4 | 3 | 2 | 1 | <1
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	PRESERVATIVE	REQUESTED ANALYSES: Chloride EPA 300.0	MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	NCA WO ID
1	MW-36	10-8-03/1500		✓	W	1		01
2	MW-308S	10-8-03/1040		✓	W	1		02
3								
4								
5								
6								
7								
8								
9								
10								

RELEASED BY: John McNulty DATE: 10-9-03
PRINT NAME: John McNulty FIRM: Aspect TIME: ~~0800~~ 1104
RECEIVED BY: [signature] DATE: 10/9/03
PRINT NAME: Scott Workman FIRM: NCA TIME: 1104

RELEASED BY: [signature] DATE: 10/9/03
PRINT NAME: Scott Workman FIRM: NCA TIME: 1300
RECEIVED BY: [signature] DATE: 10/9/03
PRINT NAME: Aaron DeBoer FIRM: NCA TIME: 13:00

ADDITIONAL REMARKS:

w/o

TEMP: 5.3

COC REV 1/03

PAGE OF

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907.563.9200 fax 907.563.9210

30 December 2003

Chip Goodhue
Aspect Consulting - Bainbridge Island
179 Madrone Lane N
Bainbridge Island, WA/USA 98110

RE: T-5 PSR

Enclosed are the results of analyses for samples received by the laboratory on 12/22/03 14:15. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeff Gerdes
Project Manager

www.ncalabs.com

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907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	12/30/03 17:16

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-36	B3L0733-01	Water	12/19/03 12:25	12/22/03 14:15
MW-3085	B3L0733-02	Water	12/19/03 13:05	12/22/03 14:15

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	12/30/03 17:16

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-36 (B3L0733-01) Water Sampled: 12/19/03 12:25 Received: 12/22/03 14:15									
Chloride	**6610**	800	mg/l	2000	3L30002	12/29/03	12/29/03	EPA 300.0	
MW-3085 (B3L0733-02) Water Sampled: 12/19/03 13:05 Received: 12/22/03 14:15									
Chloride	**7380**	800	mg/l	2000	3L30002	12/29/03	12/29/03	EPA 300.0	

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Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	12/30/03 17:16

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3L30002: Prepared 12/29/03 Using General Preparation										
Blank (3L30002-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (3L30002-BS1)										
Chloride	2.07	0.400	mg/l	2.00		104	90-110			
LCS Dup (3L30002-BSD1)										
Chloride	1.88	0.400	mg/l	2.00		94.0	90-110	9.62	20	
Duplicate (3L30002-DUP2)					**Source: B3L0739-02**					
Chloride	274	40.0	mg/l		273			0.366	25	
Duplicate (3L30002-DUP3)					**Source: B3L0739-07**					
Chloride	1.99	0.400	mg/l		2.03			1.99	25	
Matrix Spike (3L30002-MS2)					**Source: B3L0739-02**					
Chloride	388	40.0	mg/l	100	273	115	52-134			
Matrix Spike (3L30002-MS3)					**Source: B3L0739-07**					
Chloride	3.71	0.400	mg/l	2.00	2.03	84.0	52-134			

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: T-5 PSR	
179 Madrone Lane N	Project Number: 990106	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	12/30/03 17:16

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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3209 Denali St, Anchorage, AK 99503-4030 907-334-9200 FAX 334-9210

CHAIN OF CUSTODY REPORT

Work Order #: B312033

CLIENT: Aspect Consulting
REPORT TO: Chip Goodhue
ADDRESS: 179 Madrone Lane N.
Bainbridge Is, WA 98110
PHONE: 206 780 9370 FAX: 206 780 9488

INVOICE TO: Aspect
P.O. NUMBER:

PROJECT NAME: Terminal 5
PROJECT NUMBER: 990106
SAMPLED BY: JMcNulty

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: ~~10~~ STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1
Petroleum Hydrocarbon Analyses: 5 STD. | 4 | 3 | 2 | 1 | <1
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	PRESERVATIVE	REQUESTED ANALYSES: Chloride EPA 300.0	MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	NCA WO ID
1	MW-36	12-19-03 / 1225		✓	W	1		01
2	MW-308S	12-19-03 / 1305		✓	W	1		02
3								
4								
5								
6								
7								
8								
9								
10								

RELEASED BY: John McNulty — DATE: 12-22-03
PRINT NAME: John McNulty — FIRM: Aspect — TIME: 0730
RECEIVED BY: Jenny Slatter — DATE: 12-22-03
PRINT NAME: Jenny Slatter — FIRM: NCA — TIME: 8:14:5

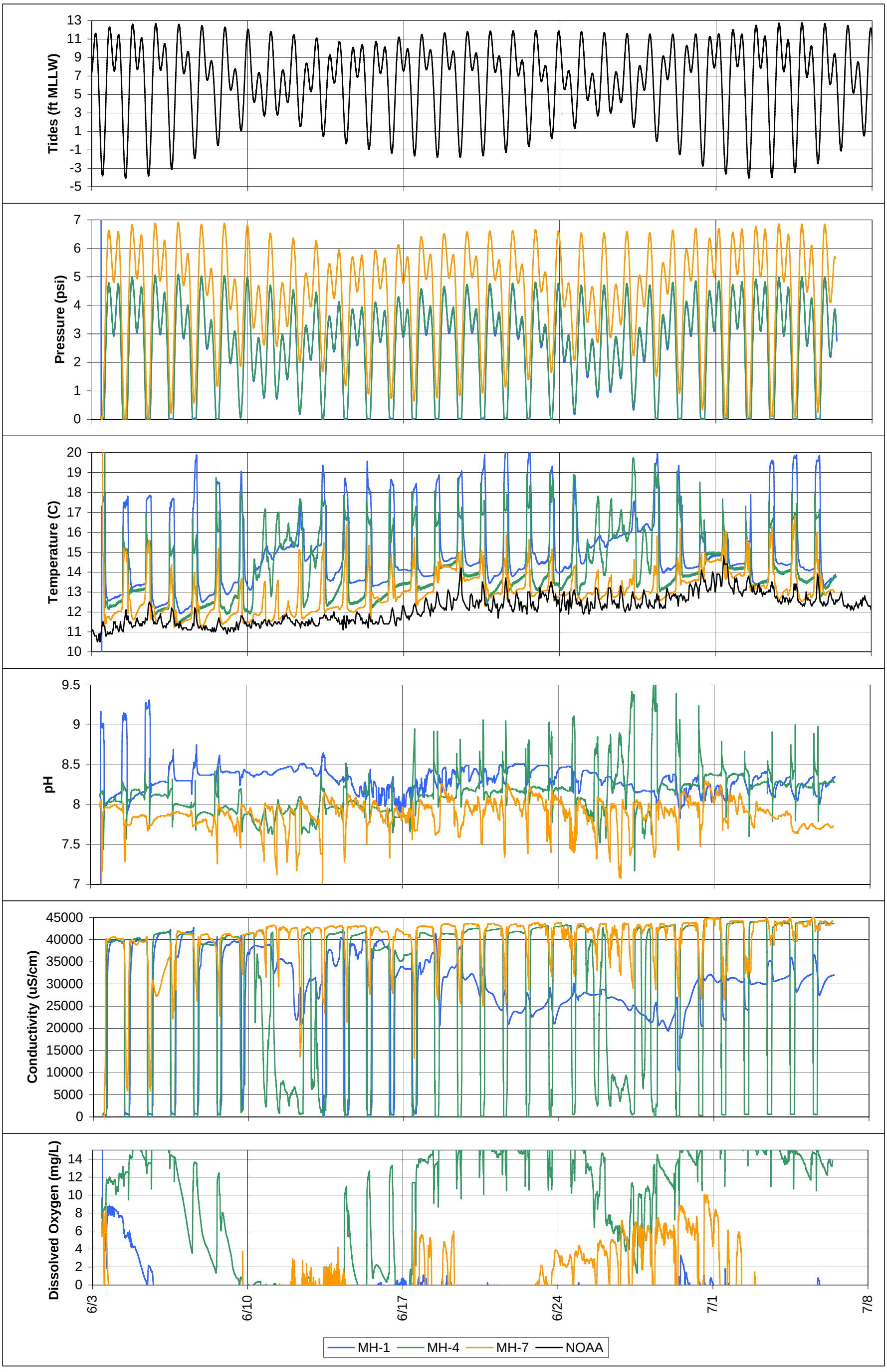
RELEASED BY: — DATE:
PRINT NAME: — FIRM: — TIME:
RECEIVED BY: — DATE:
PRINT NAME: — FIRM: — TIME:

ADDITIONAL REMARKS: W/CS
TEMP: 4.4
COC REV 1/03
PAGE OF

APPENDIX E

LFOL Flow Monitoring Data

W:\POS Terminal 5 GW Monitoring BV990106\Phase I GWCMP SWHP\Hydrologic Characterization\LFOL_Monitoring_20040617.xls



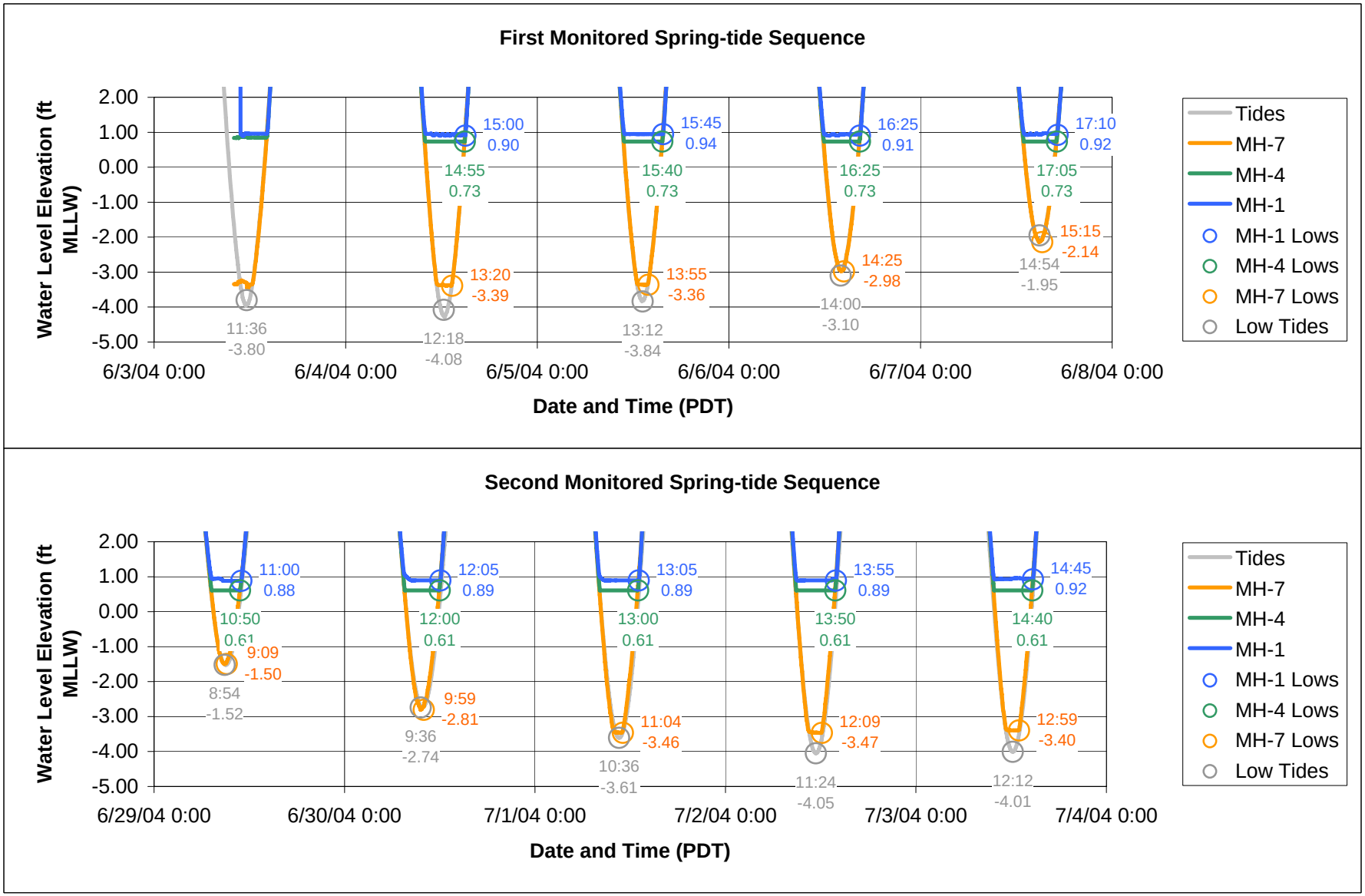
Longfellow Overflow Line Monitoring Data - June 3, 2004 to July 8, 2004

SWHP Phase I Groundwater Confimation Monitoring Program

Hydrologic Characterization Report

Figure E-1

Aspect consulting
IN-DEPTH PERSPECTIVE



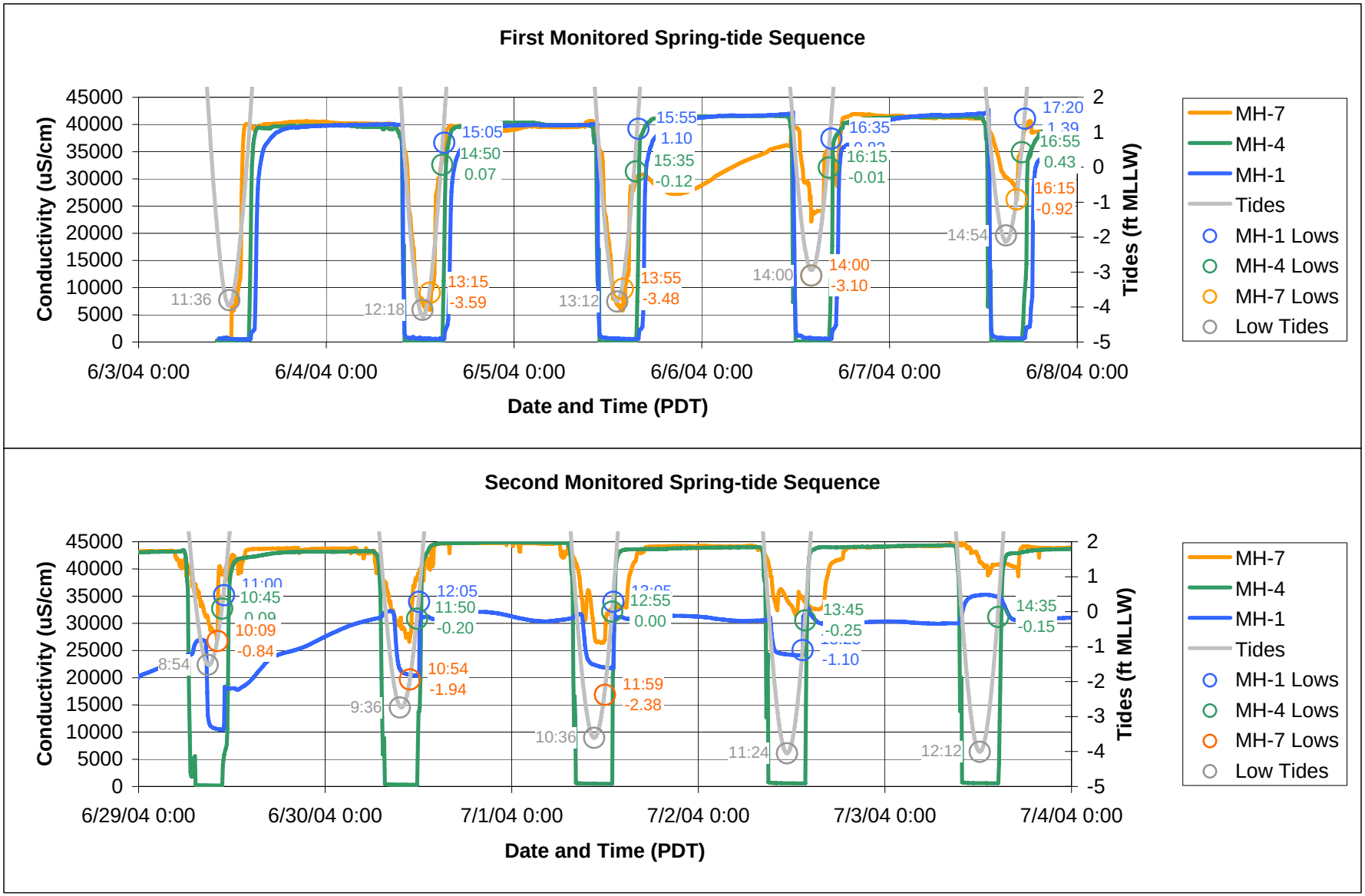
Comparison of Monitored Water Levels During Spring-tide Sequences in LFOL - June/July 2004

SWHP Phase I Groundwater Confimation Monitoring Program

Hydrologic Characterization Report

Figure E-2

Aspect consulting
IN-DEPTH PERSPECTIVE



Comparison of Monitored Conductivities During Spring-tide Sequences in LFOL - June/July 2004

SWHP Phase I Groundwater Confimation Monitoring Program

Hydrologic Characterization Report

Figure E-3

Aspect consulting
IN-DEPTH PERSPECTIVE

APPENDIX F

Laboratory Results – LFOL Water Samples Analyses

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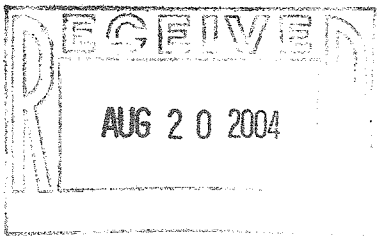
11 August 2004



Chip Goodhue
Aspect Consulting - Bainbridge Island
179 Madrone Lane N
Bainbridge Island, WA/USA 98110

RE: SW Harbor - LFOL

Enclosed are the results of analyses for samples received by the laboratory on 07/28/04 14:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeff Gerdes
Project Manager

North Creek Analytical, Inc.
Environmental Laboratory Network

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907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MH2-SED-072804	B4G0753-01	Sediment	07/28/04 07:30	07/28/04 14:30
MH1-W-072804	B4G0753-02	Water	07/28/04 09:00	07/28/04 14:30
MH1-SED-072804	B4G0753-03	Sediment	07/28/04 09:45	07/28/04 14:30

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Total Metals by EPA 6000/7000 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH1-W-072804 (B4G0753-02) Water	**Sampled: 07/28/04 09:00**		**Received: 07/28/04 14:30**						
Calcium	**31.1**	0.250	mg/l	1	4G29031	07/29/04	07/30/04	EPA 6010B	
Iron	ND	0.150	"	"	"	"	"	"	
Potassium	**10.7**	2.00	"	"	"	"	"	"	
Magnesium	**12.3**	0.500	"	"	"	"	"	"	
Sodium	**112**	0.250	"	"	"	"	"	"	

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH1-W-072804 (B4G0753-02) Water	**Sampled: 07/28/04 09:00**		**Received: 07/28/04 14:30**						
Total Alkalinity	**107**	5.00	mg/L as CaCO3	1	4H03034	08/03/04	08/03/04	EPA 310.1	
Ammonia-Nitrogen	**0.158**	0.100	mg/l as N	"	4G29059	07/29/04	07/29/04	EPA 350.3	
Ferric Iron	ND	0.250	mg/l	"	4G29031	07/29/04	08/11/04	SM 3500-Fe D	I-05
Nitrate/Nitrite-Nitrogen	**0.291**	0.0100	mg/l as N	"	4H01002	07/29/04	08/30/04	EPA 353.2	
pH	**9.15**		pH Units	"	4G29048	07/28/04	07/28/04	EPA 150.1	
Total Dissolved Solids	**400**	10	mg/l	"	4H03042	08/03/04	08/05/04	EPA 160.1	
Total Suspended Solids	ND	4.0	"	"	4H03047	"	08/04/04	EPA 160.2	
Turbidity	ND	1.00	NTU	"	4G29047	07/28/04	07/28/04	EPA 180.1	

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH1-W-072804 (B4G0753-02) Water	**Sampled: 07/28/04 09:00**		**Received: 07/28/04 14:30**						
Chloride	**158**	20.0	mg/l	50	4H06038	08/05/04	08/05/04	EPA 300.0	
Sulfate	**32.4**	2.00	"	5	4H05020	08/04/04	08/04/04	"	

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Physical Parameters by APHA/ASTM/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH1-W-072804 (B4G0753-02) Water	**Sampled: 07/28/04 09:00**		**Received: 07/28/04 14:30**						
Specific Conductivity	**812**	1.00	uS/cm	1	4G30054	07/29/04	07/29/04	EPA 120.1	

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

North Creek Analytical, Inc.
Environmental Laboratory Network

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Anchorage 2000 W. International Airport Road, Suite A10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G29031: Prepared 07/29/04 Using EPA 3010A										
Blank (4G29031-BLK1)										
Calcium	ND	0.250	mg/l							
Iron	ND	0.150	"							
Potassium	ND	2.00	"							
Magnesium	ND	0.500	"							
Sodium	ND	0.250	"							
LCS (4G29031-BS1)										
Calcium	4.85	0.250	mg/l	5.00		97.0	80-120			
Iron	5.02	0.150	"	5.00		100	80-120			
Potassium	9.90	2.00	"	10.0		99.0	80-120			
Magnesium	5.00	0.500	"	5.00		100	80-120			
Sodium	5.09	0.250	"	5.00		102	80-120			
LCS Dup (4G29031-BSD1)										
Calcium	4.70	0.250	mg/l	5.00		94.0	80-120	3.14	20	
Iron	4.87	0.150	"	5.00		97.4	80-120	3.03	20	
Potassium	9.75	2.00	"	10.0		97.5	80-120	1.53	20	
Magnesium	4.85	0.500	"	5.00		97.0	80-120	3.05	20	
Sodium	4.93	0.250	"	5.00		98.6	80-120	3.19	20	
Matrix Spike (4G29031-MS1)					**Source: B4G0718-02**					
Calcium	50.6	0.250	mg/l	5.00	47.5	62.0	75-125			Q-03
Iron	54.6	0.150	"	5.00	50.8	76.0	75-125			
Potassium	14.4	2.00	"	10.0	4.12	103	80-120			
Magnesium	23.8	0.500	"	5.00	19.6	84.0	80-120			
Sodium	62.1	0.250	"	5.00	58.6	70.0	75-125			Q-03
Matrix Spike Dup (4G29031-MSD1)					**Source: B4G0718-02**					
Calcium	49.6	0.250	mg/l	5.00	47.5	42.0	75-125	2.00	20	Q-03
Iron	53.7	0.150	"	5.00	50.8	58.0	75-125	1.66	20	Q-03
Potassium	14.2	2.00	"	10.0	4.12	101	80-120	1.40	20	
Magnesium	23.6	0.500	"	5.00	19.6	80.0	80-120	0.844	20	
Sodium	62.0	0.250	"	5.00	58.6	68.0	75-125	0.161	20	Q-03

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G29031: Prepared 07/29/04 Using EPA 3010A										
Post Spike (4G29031-PS1)					**Source: B4G0718-02**					
Calcium	49.7		ug/ml	5.00	47.5	44.0	75-125			Q-03
Iron	53.7		"	5.00	50.8	58.0	75-125			Q-03
Potassium	13.7		"	10.0	4.12	95.8	75-125			
Magnesium	23.5		"	5.00	19.6	78.0	75-125			
Sodium	62.2		"	5.00	58.6	72.0	75-125			Q-03

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G29047: Prepared 07/28/04 Using General Preparation										
Blank (4G29047-BLK1)										
Turbidity	ND	1.00	NTU							
LCS (4G29047-BS1)										
Turbidity	18.4	1.00	NTU	20.0		92.0	85-115			
LCS Dup (4G29047-BSD1)										
Turbidity	18.6	1.00	NTU	20.0		93.0	85-115	1.08	20	
Duplicate (4G29047-DUP1)					**Source: B4G0753-02**					
Turbidity	0.230	1.00	NTU		0.260			12.2	20	
Batch 4G29048: Prepared 07/28/04 Using General Preparation										
Duplicate (4G29048-DUP1)					**Source: B4G0753-02**					
pH	9.15		pH Units		9.15			0.00	10	
Batch 4G29059: Prepared 07/29/04 Using General Preparation										
Blank (4G29059-BLK1)										
Ammonia-Nitrogen	ND	0.100	mg/l as N							
LCS (4G29059-BS1)										
Ammonia-Nitrogen	4.54	0.100	mg/l as N	5.00		90.8	90-110			
LCS Dup (4G29059-BSD1)										
Ammonia-Nitrogen	4.50	0.100	mg/l as N	5.00		90.0	90-110	0.885	20	

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G29059: Prepared 07/29/04 Using General Preparation										
Duplicate (4G29059-DUP1)					**Source: B4G0736-01**					
Ammonia-Nitrogen	0.199	0.100	mg/l as N		0.198			0.504	25	
Matrix Spike (4G29059-MS1)					**Source: B4G0736-01**					
Ammonia-Nitrogen	4.58	0.100	mg/l as N	5.00	0.198	87.6	75-140			
Batch 4H01002: Prepared 07/29/04 Using General Preparation										
Blank (4H01002-BLK1)										
Nitrate/Nitrite-Nitrogen	ND	0.0100	mg/l as N							
LCS (4H01002-BS1)										
Nitrate/Nitrite-Nitrogen	1.01	0.0100	mg/l as N	1.00		101	90-110			
LCS Dup (4H01002-BSD1)										
Nitrate/Nitrite-Nitrogen	1.02	0.0100	mg/l as N	1.00		102	90-110	0.985	20	
Matrix Spike (4H01002-MS1)					**Source: B4G0743-07**					
Nitrate/Nitrite-Nitrogen	3.12	0.0200	mg/l as N	0.250	2.86	104	36-150			
Matrix Spike Dup (4H01002-MSD1)					**Source: B4G0743-07**					
Nitrate/Nitrite-Nitrogen	3.14	0.0200	mg/l as N	0.250	2.86	112	36-150	0.639	20	
Batch 4H03034: Prepared 08/03/04 Using General Preparation										
Blank (4H03034-BLK1)										
Total Alkalinity	ND	5.00	mg/L as CaCO3							

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H03034: Prepared 08/03/04 Using General Preparation										
LCS (4H03034-BS1)										
Total Alkalinity	51.0	5.00	mg/L as CaCO3	50.0		102	90-110			
LCS Dup (4H03034-BSD1)										
Total Alkalinity	49.8	5.00	mg/L as CaCO3	50.0		99.6	90-110	2.38	20	
Duplicate (4H03034-DUP1)					**Source: B4G0638-01**					
Total Alkalinity	42.8	5.00	mg/L as CaCO3		42.8			0.00	20	
Duplicate (4H03034-DUP2)					**Source: B4H0045-03**					
Total Alkalinity	105	5.00	mg/L as CaCO3		107			1.89	20	
Batch 4H03042: Prepared 08/03/04 Using General Preparation										
Blank (4H03042-BLK1)										
Total Dissolved Solids	ND	10	mg/l							
Duplicate (4H03042-DUP1)					**Source: B4G0753-02**					
Total Dissolved Solids	410	10	mg/l		400			2.47	20	
Batch 4H03047: Prepared 08/03/04 Using General Preparation										
Blank (4H03047-BLK1)										
Total Suspended Solids	ND	4.0	mg/l							
Duplicate (4H03047-DUP1)					**Source: B4G0851-01**					
Total Suspended Solids	410	4.0	mg/l		400			2.47	19	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H05020: Prepared 08/04/04 Using General Preparation										
Blank (4H05020-BLK1)										
Sulfate	ND	0.400	mg/l							
LCS (4H05020-BS1)										
Sulfate	6.09	0.400	mg/l	6.00		102	90-110			
LCS Dup (4H05020-BSD1)										
Sulfate	6.14	0.400	mg/l	6.00		102	90-110	0.818	20	
Duplicate (4H05020-DUP1)					**Source: B4H0074-04**					
Sulfate	35.7	2.00	mg/l		35.4			0.844	25	
Duplicate (4H05020-DUP2)					**Source: B4H0074-06**					
Sulfate	12.7	0.800	mg/l		12.8			0.784	25	
Matrix Spike (4H05020-MS1)					**Source: B4H0074-04**					
Sulfate	41.4	2.00	mg/l	6.00	35.4	100	58-135			
Matrix Spike (4H05020-MS2)					**Source: B4H0074-06**					
Sulfate	18.5	0.800	mg/l	6.00	12.8	95.0	58-135			
Batch 4H06038: Prepared 08/05/04 Using General Preparation										
Blank (4H06038-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (4H06038-BS1)										
Chloride	1.95	0.400	mg/l	2.00		97.5	90-110			

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H06038: Prepared 08/05/04 Using General Preparation										
LCS Dup (4H06038-BSD1)										
Chloride	1.95	0.400	mg/l	2.00		97.5	90-110	0.00	20	
Duplicate (4H06038-DUP1)					**Source: B4G0758-01**					
Chloride	1.60	0.400	mg/l		1.61			0.623	25	
Duplicate (4H06038-DUP2)					**Source: B4G0772-03**					
Chloride	2.17	0.400	mg/l		2.25			3.62	25	
Matrix Spike (4H06038-MS1)					**Source: B4G0758-01**					
Chloride	3.28	0.400	mg/l	2.00	1.61	83.5	52-134			
Matrix Spike (4H06038-MS2)					**Source: B4G0772-03**					
Chloride	3.70	0.400	mg/l	2.00	2.25	72.5	52-134			

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Physical Parameters by APHA/ASTM/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G30054: Prepared 07/29/04 Using General Preparation										
Blank (4G30054-BLK1)										
Specific Conductivity	ND	1.00	uS/cm							
LCS (4G30054-BS1)										
Specific Conductivity	991	1.00	uS/cm	1030		96.2	90-110			
LCS Dup (4G30054-BSD1)										
Specific Conductivity	990	1.00	uS/cm	1030		96.1	90-110	0.101	20	
Duplicate (4G30054-DUP1)					**Source: B4G0753-02**					
Specific Conductivity	813	1.00	uS/cm		812			0.123	20	
Duplicate (4G30054-DUP2)					**Source: B4G0795-02**					
Specific Conductivity	4380	1.00	uS/cm		4360			0.458	20	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Notes and Definitions

I-05	Since the sample was out of hold at the time of receipt, the preparation/analysis of the sample could not be initiated within the method-specified hold time.
Q-03	The percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

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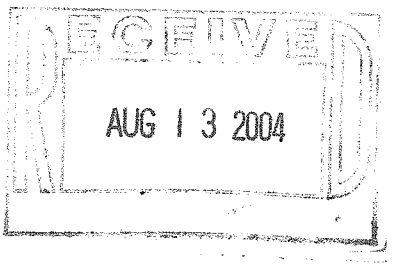
12 August 2004



Chip Goodhue
Aspect Consulting - Bainbridge Island
179 Madrone Lane N
Bainbridge Island, WA/USA 98110

RE: SW Harbor - LFOL

Enclosed are the results of analyses for samples received by the laboratory on 07/29/04 14:50. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeff Gerdes
Project Manager

North Creek Analytical, Inc.
Environmental Laboratory Network

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MH4-SED-072904	B4G0795-01	Sediment	07/29/04 11:00	07/29/04 14:50
MH4-W-072904	B4G0795-02	Water	07/29/04 10:45	07/29/04 14:50

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Total Metals by EPA 6000/7000 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH4-W-072904 (B4G0795-02) Water	**Sampled: 07/29/04 10:45**		**Received: 07/29/04 14:50**						
Calcium	**45.8**	0.250	mg/l	1	4H06019	08/06/04	08/07/04	EPA 6010B	
Iron	**0.238**	0.150	"	"	"	"	"	"	
Potassium	**35.6**	2.00	"	"	"	"	"	"	
Magnesium	**80.8**	0.500	"	"	"	"	"	"	
Sodium	**722**	2.50	"	10	"	"	08/09/04	"	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH4-W-072904 (B4G0795-02) Water	**Sampled: 07/29/04 10:45 Received: 07/29/04 14:50**								
Total Alkalinity	**102**	5.00	mg/L as CaCO3	1	4H03034	08/03/04	08/03/04	EPA 310.1	
Ammonia-Nitrogen	**0.336**	0.100	mg/l as N	"	4H03038	07/30/04	07/30/04	EPA 350.3	
Ferric Iron	ND	0.250	mg/l	"	4H06019	08/06/04	08/11/04	SM 3500-Fe D	I-05
Nitrate/Nitrite-Nitrogen	**0.156**	0.0100	mg/l as N	"	4H02048	08/02/04	08/02/04	EPA 353.2	
pH	**9.13**		pH Units	"	4H03025	08/03/04	08/03/04	EPA 150.1	I-02
Total Dissolved Solids	**2000**	10	mg/l	"	4H03042	08/03/04	08/05/04	EPA 160.1	
Total Suspended Solids	**4.0**	4.0	"	"	4H03047	"	08/04/04	EPA 160.2	
Turbidity	**2.60**	1.00	NTU	"	4H02047	08/02/04	08/02/04	EPA 180.1	I-02

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH4-W-072904 (B4G0795-02) Water	**Sampled: 07/29/04 10:45**		**Received: 07/29/04 14:50**						
Chloride	**1300**	200	mg/l	500	4H11021	08/10/04	08/10/04	EPA 300.0	
Sulfate	**182**	8.00	"	20	4H12014	08/11/04	08/11/04	"	

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Physical Parameters by APHA/ASTM/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH4-W-072904 (B4G0795-02) Water	**Sampled: 07/29/04 10:45**		**Received: 07/29/04 14:50**						
Specific Conductivity	**4360**	1.00	uS/cm	1	4G30054	07/29/04	07/29/04	EPA 120.1	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H06019: Prepared 08/06/04 Using EPA 3010A										
Blank (4H06019-BLK1)										
Calcium	ND	0.250	mg/l							
Iron	ND	0.150	"							
Potassium	ND	2.00	"							
Magnesium	ND	0.500	"							
Sodium	ND	0.250	"							
LCS (4H06019-BS1)										
Calcium	4.81	0.250	mg/l	5.00		96.2	80-120			
Iron	4.89	0.150	"	5.00		97.8	80-120			
Potassium	10.3	2.00	"	10.0		103	80-120			
Magnesium	4.82	0.500	"	5.00		96.4	80-120			
Sodium	4.82	0.250	"	5.00		96.4	80-120			
LCS Dup (4H06019-BSD1)										
Calcium	4.93	0.250	mg/l	5.00		98.6	80-120	2.46	20	
Iron	5.02	0.150	"	5.00		100	80-120	2.62	20	
Potassium	10.0	2.00	"	10.0		100	80-120	2.96	20	
Magnesium	4.96	0.500	"	5.00		99.2	80-120	2.86	20	
Sodium	4.96	0.250	"	5.00		99.2	80-120	2.86	20	
Matrix Spike (4H06019-MS1)					**Source: B4G0865-03**					
Calcium	46.9	0.250	mg/l	5.00	40.0	138	75-125			Q-03
Iron	46.2	0.150	"	5.00	38.9	146	75-125			Q-03
Potassium	15.1	2.00	"	10.0	4.11	110	80-120			
Magnesium	17.6	0.500	"	5.00	12.0	112	80-120			
Sodium	104	0.250	"	5.00	92.6	228	75-125			Q-03
Matrix Spike Dup (4H06019-MSD1)					**Source: B4G0865-03**					
Calcium	46.8	0.250	mg/l	5.00	40.0	136	75-125	0.213	20	Q-03
Iron	46.3	0.150	"	5.00	38.9	148	75-125	0.216	20	Q-03
Potassium	15.0	2.00	"	10.0	4.11	109	80-120	0.664	20	
Magnesium	17.5	0.500	"	5.00	12.0	110	80-120	0.570	20	
Sodium	104	0.250	"	5.00	92.6	228	75-125	0.00	20	Q-03

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H06019: Prepared 08/06/04 Using EPA 3010A										
Post Spike (4H06019-PS1)					**Source: B4G0865-03**					
Calcium	43.4		ug/ml	5.00	40.0	68.0	75-125			Q-03
Iron	43.0		"	5.00	38.9	82.0	75-125			
Potassium	14.4		"	10.0	4.11	103	75-125			
Magnesium	16.5		"	5.00	12.0	90.0	75-125			
Sodium	96.8		"	5.00	92.6	84.0	75-125			

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H02047: Prepared 08/02/04 Using General Preparation										
Blank (4H02047-BLK1)										
Turbidity	ND	1.00	NTU							
LCS (4H02047-BS1)										
Turbidity	18.3	1.00	NTU	20.0		91.5	85-115			
LCS Dup (4H02047-BSD1)										
Turbidity	18.4	1.00	NTU	20.0		92.0	85-115	0.545	20	
Duplicate (4H02047-DUP1)					**Source: B4G0795-02**					
Turbidity	2.57	1.00	NTU		2.60			1.16	20	
Batch 4H02048: Prepared 08/02/04 Using General Preparation										
Blank (4H02048-BLK1)										
Nitrate/Nitrite-Nitrogen	ND	0.0100	mg/l as N							
LCS (4H02048-BS1)										
Nitrate/Nitrite-Nitrogen	0.952	0.0100	mg/l as N	1.00		95.2	90-110			
LCS Dup (4H02048-BSD1)										
Nitrate/Nitrite-Nitrogen	0.960	0.0100	mg/l as N	1.00		96.0	90-110	0.837	20	
Matrix Spike (4H02048-MS1)					**Source: B4G0803-01**					
Nitrate/Nitrite-Nitrogen	1.79	0.0100	mg/l as N	0.250	1.47	128	36-150			
Matrix Spike Dup (4H02048-MSD1)					**Source: B4G0803-01**					
Nitrate/Nitrite-Nitrogen	1.80	0.0100	mg/l as N	0.250	1.47	132	36-150	0.557	20	

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H03025: Prepared 08/03/04 Using General Preparation										
Duplicate (4H03025-DUP1)					**Source: B4G0795-02**					
pH	9.13		pH Units		9.13			0.00	10	
Batch 4H03034: Prepared 08/03/04 Using General Preparation										
Blank (4H03034-BLK1)										
Total Alkalinity	ND	5.00	mg/L as CaCO3							
LCS (4H03034-BS1)										
Total Alkalinity	51.0	5.00	mg/L as CaCO3	50.0		102	90-110			
LCS Dup (4H03034-BSD1)										
Total Alkalinity	49.8	5.00	mg/L as CaCO3	50.0		99.6	90-110	2.38	20	
Duplicate (4H03034-DUP1)					**Source: B4G0638-01**					
Total Alkalinity	42.8	5.00	mg/L as CaCO3		42.8			0.00	20	
Duplicate (4H03034-DUP2)					**Source: B4H0045-03**					
Total Alkalinity	105	5.00	mg/L as CaCO3		107			1.89	20	
Batch 4H03038: Prepared 07/30/04 Using General Preparation										
Blank (4H03038-BLK1)										
Ammonia-Nitrogen	ND	0.100	mg/l as N							
LCS (4H03038-BS1)										
Ammonia-Nitrogen	4.80	0.100	mg/l as N	5.00		96.0	90-110			

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Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H03038: Prepared 07/30/04 Using General Preparation										
LCS Dup (4H03038-BSD1)										
Ammonia-Nitrogen	4.82	0.100	mg/l as N	5.00		96.4	90-110	0.416	20	
Duplicate (4H03038-DUP1)					**Source: B4G0795-02**					
Ammonia-Nitrogen	0.436	0.100	mg/l as N		0.336			25.9	25	Q-06
Matrix Spike (4H03038-MS1)					**Source: B4G0795-02**					
Ammonia-Nitrogen	2.76	0.100	mg/l as N	2.50	0.336	97.0	75-140			
Batch 4H03042: Prepared 08/03/04 Using General Preparation										
Blank (4H03042-BLK1)										
Total Dissolved Solids	ND	10	mg/l							
Duplicate (4H03042-DUP1)					**Source: B4G0753-02**					
Total Dissolved Solids	410	10	mg/l		400			2.47	20	
Batch 4H03047: Prepared 08/03/04 Using General Preparation										
Blank (4H03047-BLK1)										
Total Suspended Solids	ND	4.0	mg/l							
Duplicate (4H03047-DUP1)					**Source: B4G0851-01**					
Total Suspended Solids	410	4.0	mg/l		400			2.47	19	

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Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H11021: Prepared 08/10/04 Using General Preparation										
Blank (4H11021-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (4H11021-BS1)										
Chloride	2.04	0.400	mg/l	2.00		102	90-110			
LCS Dup (4H11021-BSD1)										
Chloride	2.04	0.400	mg/l	2.00		102	90-110	0.00	20	
Duplicate (4H11021-DUP1)					**Source: B4G0847-01**					
Chloride	0.0310	0.400	mg/l		0.0410			27.8	25	
Matrix Spike (4H11021-MS1)					**Source: B4G0847-01**					
Chloride	2.06	0.400	mg/l	2.00	0.0410	101	52-134			
Batch 4H12014: Prepared 08/11/04 Using General Preparation										
Blank (4H12014-BLK1)										
Sulfate	ND	0.400	mg/l							
LCS (4H12014-BS1)										
Sulfate	6.09	0.400	mg/l	6.00		102	90-110			
LCS Dup (4H12014-BSD1)										
Sulfate	6.15	0.400	mg/l	6.00		102	90-110	0.980	20	
Duplicate (4H12014-DUP1)					**Source: B4G0865-03**					
Sulfate	37.5	2.00	mg/l		38.0			1.32	25	

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Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H12014: Prepared 08/11/04 Using General Preparation										
Duplicate (4H12014-DUP2)					**Source: B4G0638-02**					
Sulfate	8.29	0.400	mg/l		8.31			0.241	25	
Matrix Spike (4H12014-MS1)					**Source: B4G0865-03**					
Sulfate	43.0	2.00	mg/l	6.00	38.0	83.3	58-135			
Matrix Spike (4H12014-MS2)					**Source: B4G0638-02**					
Sulfate	13.7	0.800	mg/l	6.00	8.31	89.8	58-135			
Matrix Spike Dup (4H12014-MSD1)					**Source: B4G0865-03**					
Sulfate	42.8	2.00	mg/l	6.00	38.0	80.0	58-135	0.466	25	

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Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Physical Parameters by APHA/ASTM/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G30054: Prepared 07/29/04 Using General Preparation										
Blank (4G30054-BLK1)										
Specific Conductivity	ND	1.00	uS/cm							
LCS (4G30054-BS1)										
Specific Conductivity	991	1.00	uS/cm	1030		96.2	90-110			
LCS Dup (4G30054-BSD1)										
Specific Conductivity	990	1.00	uS/cm	1030		96.1	90-110	0.101	20	
Duplicate (4G30054-DUP1)					**Source: B4G0753-02**					
Specific Conductivity	813	1.00	uS/cm		812			0.123	20	
Duplicate (4G30054-DUP2)					**Source: B4G0795-02**					
Specific Conductivity	4380	1.00	uS/cm		4360			0.458	20	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Notes and Definitions

I-02	This sample was analyzed outside of the recommended holding time.
I-05	Since the sample was out of hold at the time of receipt, the preparation/analysis of the sample could not be initiated within the method-specified hold time.
Q-03	The percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
Q-06	Analyses are not controlled on RPD values from sample concentrations less than 5 times the reporting limit.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

North Creek Analytical, Inc.
Environmental Laboratory Network

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3209 Denali St, Anchorage, AK 99503-4030 907-334-9200 FAX 334-9210

CHAIN OF CUSTODY REPORT

Work Order #: B4G0795

CLIENT: ASPECT

REPORT TO: CHIP GOODHUE
ADDRESS: 179 Madrone LN N
Bainbridge Island WA 98110
PHONE: FAX:

INVOICE TO: SAME

P.O. NUMBER:

PROJECT NAME: SW HARBOR
PROJECT NUMBER: 990106-004-23
SAMPLED BY: PSB/RRH

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: ~~10~~ STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1

Petroleum Hydrocarbon Analyses: ~~X~~ STD. | 4 | 3 | 2 | 1 | <1

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

PRESERVATIVE

REQUESTED ANALYSES

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	Metals*	Ferric Fe	ALK	Cl⁻	NH₃	NO₃/NO₂	pH	SO₄	Cond/TDS	Turb	GRAIN SIZE	MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	NCA WO ID
1	MH4-SED-072904	7/29/04 1100											X			1 CORE → LAB HOLD 1 CORE → ARI	-01
2	MH4-W-072904	7/29/04 1045	X	X	X	X	X	X	X	X	X	X					-02
3																	
4																	
5		NOTE:	HOLD	1	CORE	SED	AT	LAB									
6			FOR	POSSIBLE									ANALYSES				
7																	
8																	
9																	
10																	

RELEASED BY: PETER BANNISTER FIRM: ASPECT DATE: 7/29/04 TIME: 12:00
RECEIVED BY: Cathy Gamble FIRM: N/A DATE: 7/29/04 TIME: 17:50

RELEASED BY: PRINT NAME: FIRM: DATE: TIME:
RECEIVED BY: PRINT NAME: FIRM: DATE: TIME:

ADDITIONAL REMARKS:
* Metals: Ca, Fe, Mg, K, Na
** GRAIN SIZE BY ARI USING SIEVE AND HYDROMETER

TEMP: 2.1°C w/o

COC REV 4/03 PAGE OF

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17 August 2004

Chip Goodhue
Aspect Consulting - Bainbridge Island
179 Madrone Lane N
Bainbridge Island, WA/USA 98110

RE: SW Harbor - LFOL

Enclosed are the results of analyses for samples received by the laboratory on 07/30/04 17:35. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeff Gerdes
Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MH7-W-073004	B4G0851-01	Water	07/30/04 10:30	07/30/04 17:35
MH7-SED-073004	B4G0851-02	Sediment	07/30/04 10:55	07/30/04 17:35

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Total Metals by EPA 6000/7000 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH7-W-073004 (B4G0851-01) Water	**Sampled: 07/30/04 10:30**		**Received: 07/30/04 17:35**						
Calcium	**111**	0.250	mg/l	1	4H06019	08/06/04	08/07/04	EPA 6010B	
Iron	**42.2**	0.150	"	"	"	"	"	"	
Potassium	**66.0**	2.00	"	"	"	"	"	"	
Magnesium	**166**	0.500	"	"	"	"	"	"	
Sodium	**1380**	2.50	"	10	"	"	08/09/04	"	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH7-W-073004 (B4G0851-01) Water	**Sampled: 07/30/04 10:30 Received: 07/30/04 17:35**								
Total Alkalinity	**244**	5.00	mg/L as CaCO3	1	4H03034	08/03/04	08/03/04	EPA 310.1	
Ammonia-Nitrogen	**2.01**	0.100	mg/l as N	"	4H03056	"	"	EPA 350.3	
Ferric Iron	**42.0**	0.250	mg/l	"	4H06019	08/06/04	08/13/04	SM 3500-Fe D	I-05
Nitrate/Nitrite-Nitrogen	**0.0318**	0.0100	mg/l as N	"	4H02048	08/02/04	08/02/04	EPA 353.2	
pH	**7.61**		pH Units	"	4H01004	07/31/04	07/31/04	EPA 150.1	
Total Dissolved Solids	**4300**	10	mg/l	"	4H03042	08/03/04	08/05/04	EPA 160.1	
Total Suspended Solids	**400**	4.0	"	"	4H03047	"	08/04/04	EPA 160.2	
Turbidity	**157**	10.0	NTU	10	4H01013	08/01/04	08/01/04	EPA 180.1	

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH7-W-073004 (B4G0851-01) Water	**Sampled: 07/30/04 10:30**		**Received: 07/30/04 17:35**						
Chloride	**2330**	200	mg/l	500	4H12014	08/11/04	08/11/04	EPA 300.0	
Sulfate	**328**	20.0	"	50	"	"	"	"	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Physical Parameters by APHA/ASTM/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH7-W-073004 (B4G0851-01) Water	**Sampled: 07/30/04 10:30**		**Received: 07/30/04 17:35**						
Specific Conductivity	**8270**	1.00	uS/cm	1	4H02059	08/02/04	08/02/04	EPA 120.1	

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H06019: Prepared 08/06/04 Using EPA 3010A										
Blank (4H06019-BLK1)										
Calcium	ND	0.250	mg/l							
Iron	ND	0.150	"							
Potassium	ND	2.00	"							
Magnesium	ND	0.500	"							
Sodium	ND	0.250	"							
LCS (4H06019-BS1)										
Calcium	4.81	0.250	mg/l	5.00		96.2	80-120			
Iron	4.89	0.150	"	5.00		97.8	80-120			
Potassium	10.3	2.00	"	10.0		103	80-120			
Magnesium	4.82	0.500	"	5.00		96.4	80-120			
Sodium	4.82	0.250	"	5.00		96.4	80-120			
LCS Dup (4H06019-BSD1)										
Calcium	4.93	0.250	mg/l	5.00		98.6	80-120	2.46	20	
Iron	5.02	0.150	"	5.00		100	80-120	2.62	20	
Potassium	10.0	2.00	"	10.0		100	80-120	2.96	20	
Magnesium	4.96	0.500	"	5.00		99.2	80-120	2.86	20	
Sodium	4.96	0.250	"	5.00		99.2	80-120	2.86	20	
Matrix Spike (4H06019-MS1)					**Source: B4G0865-03**					
Calcium	46.9	0.250	mg/l	5.00	40.0	138	75-125			Q-03
Iron	46.2	0.150	"	5.00	38.9	146	75-125			Q-03
Potassium	15.1	2.00	"	10.0	4.11	110	80-120			
Magnesium	17.6	0.500	"	5.00	12.0	112	80-120			
Sodium	104	0.250	"	5.00	92.6	228	75-125			Q-03
Matrix Spike Dup (4H06019-MSD1)					**Source: B4G0865-03**					
Calcium	46.8	0.250	mg/l	5.00	40.0	136	75-125	0.213	20	Q-03
Iron	46.3	0.150	"	5.00	38.9	148	75-125	0.216	20	Q-03
Potassium	15.0	2.00	"	10.0	4.11	109	80-120	0.664	20	
Magnesium	17.5	0.500	"	5.00	12.0	110	80-120	0.570	20	
Sodium	104	0.250	"	5.00	92.6	228	75-125	0.00	20	Q-03

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H06019: Prepared 08/06/04 Using EPA 3010A										
Post Spike (4H06019-PS1)					**Source: B4G0865-03**					
Calcium	43.4		ug/ml	5.00	40.0	68.0	75-125			Q-03
Iron	43.0		"	5.00	38.9	82.0	75-125			
Potassium	14.4		"	10.0	4.11	103	75-125			
Magnesium	16.5		"	5.00	12.0	90.0	75-125			
Sodium	96.8		"	5.00	92.6	84.0	75-125			

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H01004: Prepared 07/31/04 Using General Preparation										
Duplicate (4H01004-DUP1)					**Source: B4G0851-01**					
pH	7.59		pH Units		7.61			0.263	10	
Batch 4H01013: Prepared 08/01/04 Using General Preparation										
Blank (4H01013-BLK1)										
Turbidity	ND	1.00	NTU							
LCS (4H01013-BS1)										
Turbidity	18.5	1.00	NTU	20.0		92.5	85-115			
LCS Dup (4H01013-BSD1)										
Turbidity	18.5	1.00	NTU	20.0		92.5	85-115	0.00	20	
Duplicate (4H01013-DUP1)					**Source: B4G0850-01**					
Turbidity	ND	1.00	NTU		ND			NA	20	
Batch 4H02048: Prepared 08/02/04 Using General Preparation										
Blank (4H02048-BLK1)										
Nitrate/Nitrite-Nitrogen	ND	0.0100	mg/l as N							
LCS (4H02048-BS1)										
Nitrate/Nitrite-Nitrogen	0.952	0.0100	mg/l as N	1.00		95.2	90-110			
LCS Dup (4H02048-BSD1)										
Nitrate/Nitrite-Nitrogen	0.960	0.0100	mg/l as N	1.00		96.0	90-110	0.837	20	

North Creek Analytical - Bothell

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H02048: Prepared 08/02/04 Using General Preparation										
Matrix Spike (4H02048-MS1)					**Source: B4G0803-01**					
Nitrate/Nitrite-Nitrogen	1.79	0.0100	mg/l as N	0.250	1.47	128	36-150			
Matrix Spike Dup (4H02048-MSD1)					**Source: B4G0803-01**					
Nitrate/Nitrite-Nitrogen	1.80	0.0100	mg/l as N	0.250	1.47	132	36-150	0.557	20	
Batch 4H03034: Prepared 08/03/04 Using General Preparation										
Blank (4H03034-BLK1)										
Total Alkalinity	ND	5.00	mg/L as CaCO3							
LCS (4H03034-BS1)										
Total Alkalinity	51.0	5.00	mg/L as CaCO3	50.0		102	90-110			
LCS Dup (4H03034-BSD1)										
Total Alkalinity	49.8	5.00	mg/L as CaCO3	50.0		99.6	90-110	2.38	20	
Duplicate (4H03034-DUP1)					**Source: B4G0638-01**					
Total Alkalinity	42.8	5.00	mg/L as CaCO3		42.8			0.00	20	
Duplicate (4H03034-DUP2)					**Source: B4H0045-03**					
Total Alkalinity	105	5.00	mg/L as CaCO3		107			1.89	20	
Batch 4H03042: Prepared 08/03/04 Using General Preparation										
Blank (4H03042-BLK1)										
Total Dissolved Solids	ND	10	mg/l							

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H03042: Prepared 08/03/04 Using General Preparation										
Duplicate (4H03042-DUP1)					**Source: B4G0753-02**					
Total Dissolved Solids	410	10	mg/l		400			2.47	20	
Batch 4H03047: Prepared 08/03/04 Using General Preparation										
Blank (4H03047-BLK1)										
Total Suspended Solids	ND	4.0	mg/l							
Duplicate (4H03047-DUP1)					**Source: B4G0851-01**					
Total Suspended Solids	410	4.0	mg/l		400			2.47	19	
Batch 4H03056: Prepared 08/03/04 Using General Preparation										
Blank (4H03056-BLK1)										
Ammonia-Nitrogen	ND	0.100	mg/l as N							
LCS (4H03056-BS1)										
Ammonia-Nitrogen	4.64	0.100	mg/l as N	5.00		92.8	90-110			
LCS Dup (4H03056-BSD1)										
Ammonia-Nitrogen	4.66	0.100	mg/l as N	5.00		93.2	90-110	0.430	20	
Duplicate (4H03056-DUP1)					**Source: B4G0851-01**					
Ammonia-Nitrogen	1.99	0.100	mg/l as N		2.01			1.00	25	
Matrix Spike (4H03056-MS1)					**Source: B4G0851-01**					
Ammonia-Nitrogen	6.56	0.100	mg/l as N	5.00	2.01	91.0	75-140			

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H12014: Prepared 08/11/04 Using General Preparation										
Blank (4H12014-BLK1)										
Chloride	ND	0.400	mg/l							
Sulfate	ND	0.400	"							
LCS (4H12014-BS1)										
Chloride	2.00	0.400	mg/l	2.00		100	90-110			
Sulfate	6.09	0.400	"	6.00		102	90-110			
LCS Dup (4H12014-BSD1)										
Chloride	2.00	0.400	mg/l	2.00		100	90-110	0.00	20	
Sulfate	6.15	0.400	"	6.00		102	90-110	0.980	20	
Duplicate (4H12014-DUP1)					**Source: B4G0865-03**					
Chloride	11.2	2.00	mg/l		11.4			1.77	25	
Sulfate	37.5	2.00	"		38.0			1.32	25	
Duplicate (4H12014-DUP2)					**Source: B4G0638-02**					
Chloride	2.97	0.400	mg/l		2.84			4.48	25	
Sulfate	8.29	0.400	"		8.31			0.241	25	
Matrix Spike (4H12014-MS1)					**Source: B4G0865-03**					
Chloride	13.0	2.00	mg/l	2.00	11.4	80.0	52-134			
Sulfate	43.0	2.00	"	6.00	38.0	83.3	58-135			
Matrix Spike (4H12014-MS2)					**Source: B4G0638-02**					
Chloride	4.80	0.400	mg/l	2.00	2.84	98.0	52-134			
Sulfate	13.7	0.800	"	6.00	8.31	89.8	58-135			
Matrix Spike Dup (4H12014-MSD1)					**Source: B4G0865-03**					
Chloride	13.1	2.00	mg/l	2.00	11.4	85.0	52-134	0.766	25	
Sulfate	42.8	2.00	"	6.00	38.0	80.0	58-135	0.466	25	

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Physical Parameters by APHA/ASTM/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H02059: Prepared 08/02/04 Using General Preparation										
Blank (4H02059-BLK1)										
Specific Conductivity	ND	1.00	uS/cm							
LCS (4H02059-BS1)										
Specific Conductivity	1010	1.00	uS/cm	1030		98.1	90-110			
LCS Dup (4H02059-BSD1)										
Specific Conductivity	1010	1.00	uS/cm	1030		98.1	90-110	0.00	20	
Duplicate (4H02059-DUP1)					**Source: B4G0851-01**					
Specific Conductivity	8290	1.00	uS/cm		8270			0.242	20	

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Notes and Definitions

I-05	Since the sample was out of hold at the time of receipt, the preparation/analysis of the sample could not be initiated within the method-specified hold time.
Q-03	The percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

Analytical Resources, Incorporated
Analytical Chemists and Consultants

August 17, 2004

Mr. Jeff Gerdes
North Creek Analytical, Inc.
11720 North Creek Parkway, Suite 400
Bothell, WA 98011-8244

Subject: **Project No.: B4G0795, B4G0851, B4H0008**
ARI Project Nos.: GX28, GX29, GX30

Dear Mr. Gerdes;

Samples from the referenced project were received for testing on August 8, 2004. The samples were for ASTM grain size distribution. The results are on the following pages. A copy of this report will be kept in electronic format should you need a copy in the future.

Please call me to discuss any questions, or comments you may have on the data or its presentation.

Best Regards,
Analytical Resources Incorporated

Harold Benny

Harold Benny
Geotechnical Division Manager

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: North Creek Analytical	Project No.: GX28
Client Project: B4G0795, B4G0851, B4H0008	

Case Narrative

1. The samples were submitted for grain size analysis according to ASTM methodology.
2. The samples were run together in a batch.
3. The data is provided in summary tables and plots.
4. There were no noted anomalies in the samples or methods on this project.

Approved by: Harold Benny Date: 8/17/04
Title: Geotechnical Division Manager

120°c

SUBCONTRACT ORDER

North Creek Analytical - Bothell

B4H0008

SENDING LABORATORY:

North Creek Analytical - Bothell
11720 North Creek Parkway North, Suite 400
Bothell, WA 98011-8223
Phone: (425) 420-9200
Fax: (425) 420-9210
Project Manager: Jeff Gerdes

RECEIVING LABORATORY:

ARI
4611 S 134th Pl Ste 100
Tukwila, WA/USA 98168
Phone :206-621-6490
Fax: 206-621-7523

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: B4H0008-01	**Water**	**Sampled:07/29/04 09:10**	GX30A	**ON MISC. SHELF IN WALK IN.OTHER AN**
Misc. Subcontract 1	08/10/04 23:00	01/25/05 09:10		GRAIN SIZE USING SIEVE AND HYDROMETER
Containers Supplied: Plastic Core (A)				
Sample ID: B4H0008-02	**Water**	**Sampled:07/29/04 09:15**	GX30B	**ON MISC. SHELF IN WALK IN. OTHER AN**
Misc. Subcontract 1	08/10/04 23:00	01/25/05 09:15		GRAIN SIZE USING SIEVE AND HYDROMETER
Containers Supplied: Plastic Core (A)				
Sample ID: B4H0008-03	**Water**	**Sampled:07/29/04 09:15**	GX30C	**ON MISC. SHELF IN WALK IN. OTHER AN**
Misc. Subcontract 1	08/10/04 23:00	01/25/05 09:15		GRAIN SIZE USING SIEVE AND HYDROMETER
Containers Supplied: Plastic Core (B)				

Released By	Date	Received By	Date
[signature]	8-2-04	[signature]	8/2/04 1505

ANALYTICAL RESOURCES INCORPORATED

North Creek Analytical
B4G0795, B4G0851, B4H0008

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	Data Qualifier	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
B4G0795-01		100.0	100.0	98.2	58.9	45.1	41.4	38.9	36.1	34.6	31.7	13.0	7.2	6.5	5.8	4.3
B4G0851-02		100.0	100.0	99.6	81.5	71.0	64.2	58.5	51.0	43.4	35.9	25.4	15.0	13.5	10.5	7.5
B4H0008-01		100.0	99.4	98.3	91.2	86.9	81.4	71.7	56.4	38.7	36.1	28.0	22.0	18.7	12.0	6.7
B4H0008-02		100.0	99.8	98.5	85.1	80.3	77.6	73.9	66.2	53.8	51.0	44.1	38.6	29.7	20.7	11.0
B4H0008-03		100.0	99.9	98.9	88.1	82.6	79.5	75.9	69.1	44.1	38.4	29.9	25.6	19.9	12.8	5.7

Testing performed according to ASTM D421/D422

GX28, GX29, GX30

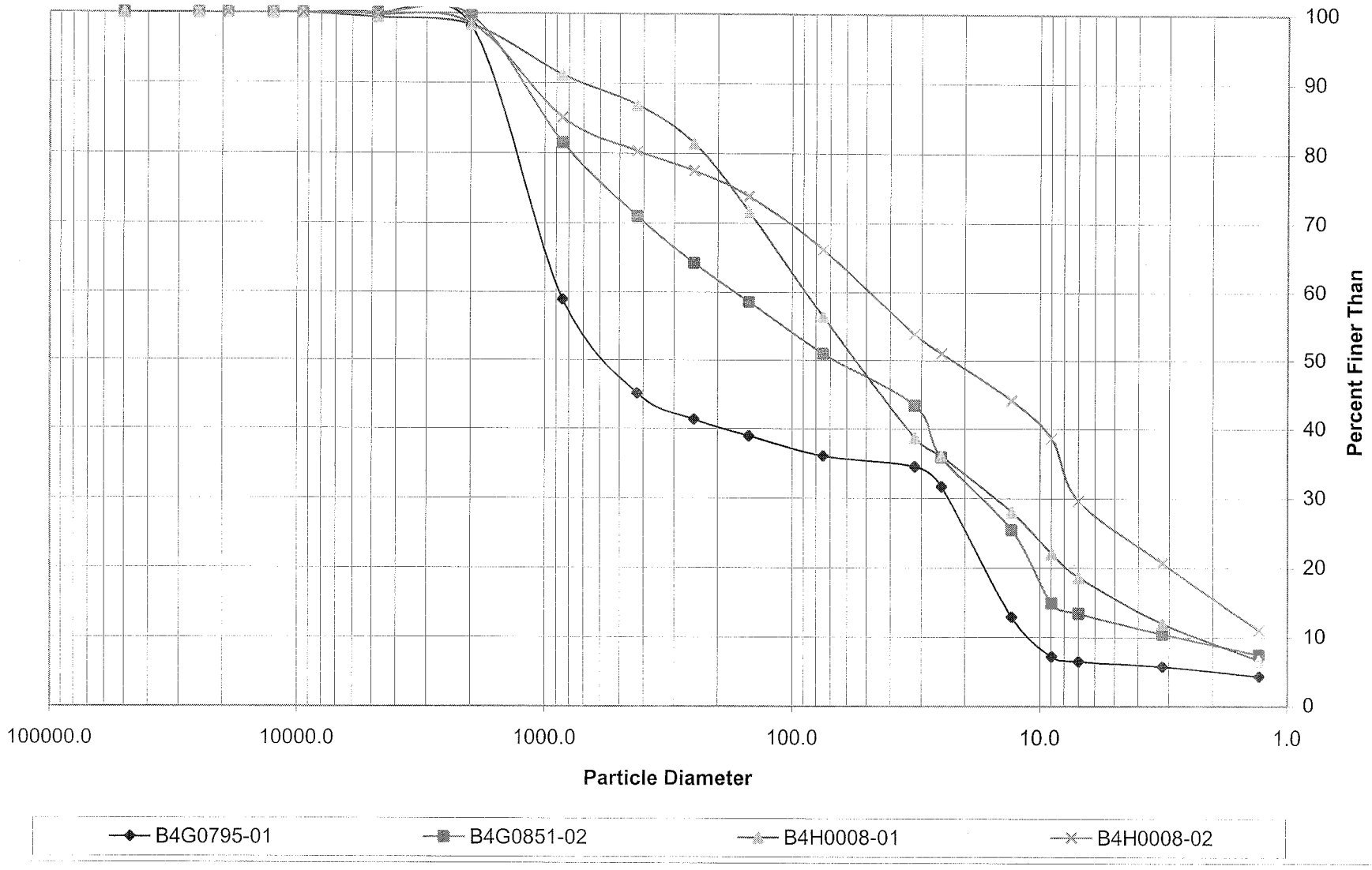
North Creek Analytical
B4G0795, B4G0851, B4H0008

Percent Retained in Each Size Fraction

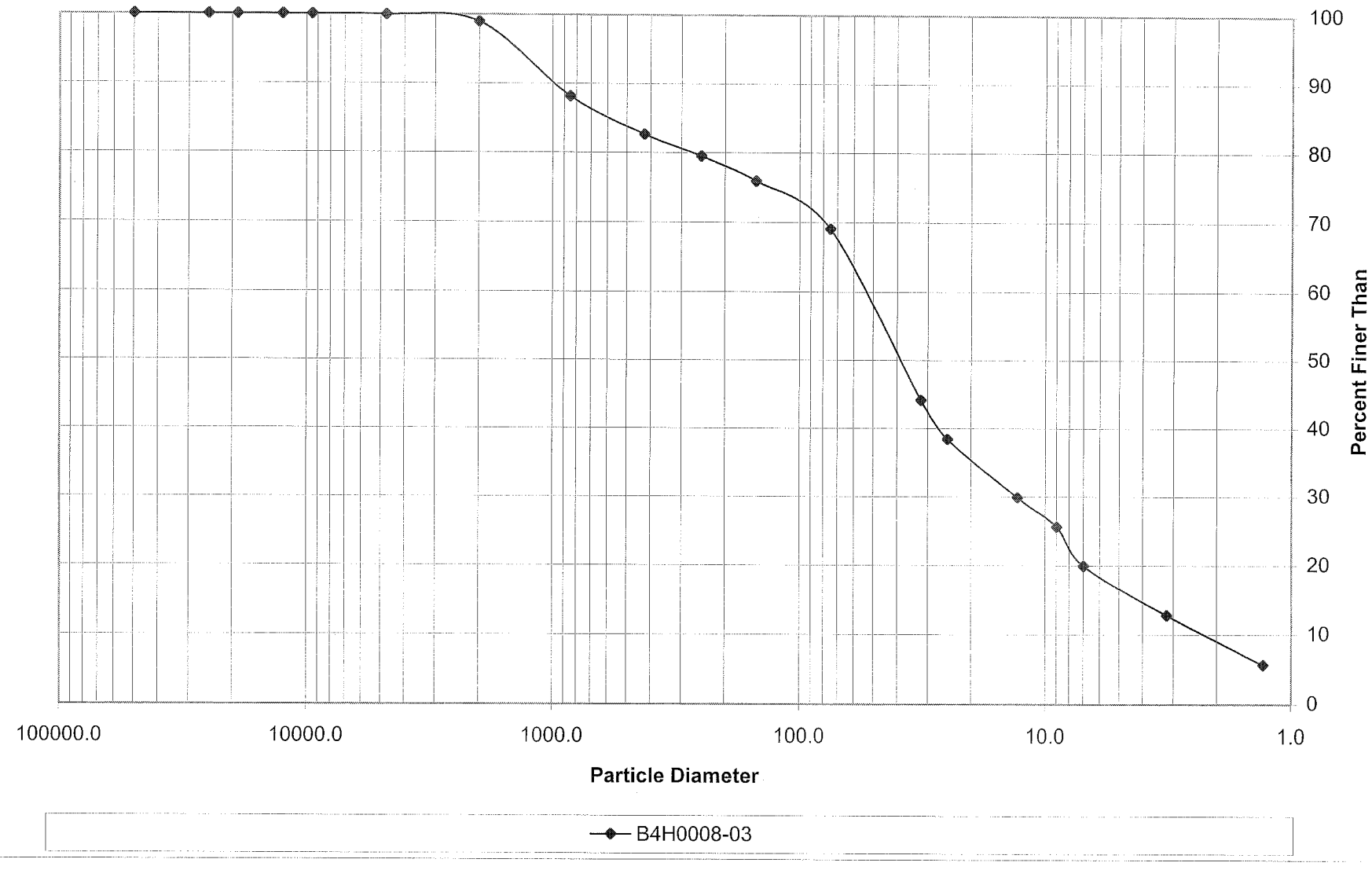
Sample No.	% Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Total Sand	% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Very Fine Silt	% Clay
Size (microns)	> 4750	4750-2000	2000-425	425-75	4750-75	75-32	32-22	22-13	13-9	9-3.2	<3.2
B4G0795-01	0.0	1.8	53.1	9.0	63.9	1.5	2.9	18.7	5.8	1.4	5.8
B4G0851-02	0.0	0.4	28.6	20.0	49.0	7.6	7.5	10.5	10.5	4.5	10.5
B4H0008-01	0.6	1.0	11.4	30.5	43.0	17.6	2.7	8.0	6.0	10.0	12.0
B4H0008-02	0.2	1.3	18.2	14.1	33.5	12.5	2.8	6.9	5.5	17.9	20.7
B4H0008-03	0.1	1.0	16.3	13.6	30.9	25.0	5.7	8.5	4.3	12.8	12.8

GX28, GX29, GX30

Grain Size Distribution by Hydrometer



Grain Size Distribution by Hydrometer



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CHAIN OF CUSTODY REPORT

Work Order #: B4G0851

CLIENT: ASPECT

INVOICE TO: same

REPORT TO: CHIP GOODHUE
ADDRESS: 179 Madrone Ln N
Bainbridge Island WA 98110
PHONE: FAX:

P.O. NUMBER:

PROJECT NAME: SW Harbor
PROJECT NUMBER: 990106-004-23
SAMPLED BY: PSB

TURNAROUND REQUEST
in Business Days *

Organic & Inorganic Analyses: ~~10~~ STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1

~~5~~ STD. Petroleum Hydrocarbon Analyses: 4 | 3 | 2 | 1 | <1

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

PRESERVATIVE

REQUESTED ANALYSES

#	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	Metals*	Ferric Fe	ALK	Cl⁻	NH4	NO3/NO2	pH	SO4	Cond/TDS	Turbidity		GRAIN SIZE		MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	NCA WO ID
1	MH7-W-073004	7/30/04 1030	X	X	X	X	X	X	X	X	X	X						~~1 CORE ⇒~~	-01
2	MH7-SED-073004	7/30/04 1055												X				1 CORE → LAB HOLD 1 CORE → ARI	-02
3																			
4																			
5		NOTE: 1.)	HOLD	1	SED	CORE	AT	LAB	FOR										
6			POSSIBLE	ANALYSES															
7		2.)	SEND	1	SED	CORE	TO	ARI	FOR										
8			GRAIN	SIZE	USING	SIEVE	AND												
9			HYDROMETER																
10																			

RELEASED BY: PETER BANNISTER DATE: 7/30/04
PRINT NAME: PETER BANNISTER FIRM: ASPECT TIME: 1215

RECEIVED BY: PRANAV PANTE DATE: 7/30/04
PRINT NAME: PRANAV PANTE FIRM: NCA TIME: 1735

RELEASED BY: DATE:
PRINT NAME: FIRM: TIME:

RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:

ADDITIONAL REMARKS:
* METALS: Ca, Fe, Mg, K, Na ~~**~~ GRAIN SIZE BY ARI USING SIEVE AND HYDROMETER

TEMP: 20.4

COC REV 1/03

PAGE OF

Samples were not @2-6c upon receipt!

2/0

APPENDIX F

Laboratory Results – LFOL Water Samples Analyses

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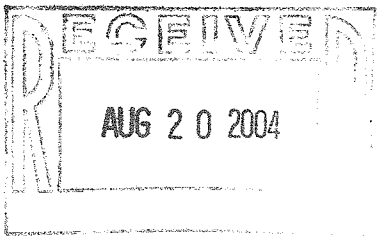
11 August 2004



Chip Goodhue
Aspect Consulting - Bainbridge Island
179 Madrone Lane N
Bainbridge Island, WA/USA 98110

RE: SW Harbor - LFOL

Enclosed are the results of analyses for samples received by the laboratory on 07/28/04 14:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeff Gerdes
Project Manager

North Creek Analytical, Inc.
Environmental Laboratory Network

www.ncalabs.com

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MH2-SED-072804	B4G0753-01	Sediment	07/28/04 07:30	07/28/04 14:30
MH1-W-072804	B4G0753-02	Water	07/28/04 09:00	07/28/04 14:30
MH1-SED-072804	B4G0753-03	Sediment	07/28/04 09:45	07/28/04 14:30

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Total Metals by EPA 6000/7000 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH1-W-072804 (B4G0753-02) Water	**Sampled: 07/28/04 09:00**		**Received: 07/28/04 14:30**						
Calcium	**31.1**	0.250	mg/l	1	4G29031	07/29/04	07/30/04	EPA 6010B	
Iron	ND	0.150	"	"	"	"	"	"	
Potassium	**10.7**	2.00	"	"	"	"	"	"	
Magnesium	**12.3**	0.500	"	"	"	"	"	"	
Sodium	**112**	0.250	"	"	"	"	"	"	

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH1-W-072804 (B4G0753-02) Water	**Sampled: 07/28/04 09:00**		**Received: 07/28/04 14:30**						
Total Alkalinity	**107**	5.00	mg/L as CaCO3	1	4H03034	08/03/04	08/03/04	EPA 310.1	
Ammonia-Nitrogen	**0.158**	0.100	mg/l as N	"	4G29059	07/29/04	07/29/04	EPA 350.3	
Ferric Iron	ND	0.250	mg/l	"	4G29031	07/29/04	08/11/04	SM 3500-Fe D	I-05
Nitrate/Nitrite-Nitrogen	**0.291**	0.0100	mg/l as N	"	4H01002	07/29/04	08/30/04	EPA 353.2	
pH	**9.15**		pH Units	"	4G29048	07/28/04	07/28/04	EPA 150.1	
Total Dissolved Solids	**400**	10	mg/l	"	4H03042	08/03/04	08/05/04	EPA 160.1	
Total Suspended Solids	ND	4.0	"	"	4H03047	"	08/04/04	EPA 160.2	
Turbidity	ND	1.00	NTU	"	4G29047	07/28/04	07/28/04	EPA 180.1	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH1-W-072804 (B4G0753-02) Water	**Sampled: 07/28/04 09:00**		**Received: 07/28/04 14:30**						
Chloride	**158**	20.0	mg/l	50	4H06038	08/05/04	08/05/04	EPA 300.0	
Sulfate	**32.4**	2.00	"	5	4H05020	08/04/04	08/04/04	"	

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Physical Parameters by APHA/ASTM/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH1-W-072804 (B4G0753-02) Water	**Sampled: 07/28/04 09:00**		**Received: 07/28/04 14:30**						
Specific Conductivity	**812**	1.00	uS/cm	1	4G30054	07/29/04	07/29/04	EPA 120.1	

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G29031: Prepared 07/29/04 Using EPA 3010A										
Blank (4G29031-BLK1)										
Calcium	ND	0.250	mg/l							
Iron	ND	0.150	"							
Potassium	ND	2.00	"							
Magnesium	ND	0.500	"							
Sodium	ND	0.250	"							
LCS (4G29031-BS1)										
Calcium	4.85	0.250	mg/l	5.00		97.0	80-120			
Iron	5.02	0.150	"	5.00		100	80-120			
Potassium	9.90	2.00	"	10.0		99.0	80-120			
Magnesium	5.00	0.500	"	5.00		100	80-120			
Sodium	5.09	0.250	"	5.00		102	80-120			
LCS Dup (4G29031-BSD1)										
Calcium	4.70	0.250	mg/l	5.00		94.0	80-120	3.14	20	
Iron	4.87	0.150	"	5.00		97.4	80-120	3.03	20	
Potassium	9.75	2.00	"	10.0		97.5	80-120	1.53	20	
Magnesium	4.85	0.500	"	5.00		97.0	80-120	3.05	20	
Sodium	4.93	0.250	"	5.00		98.6	80-120	3.19	20	
Matrix Spike (4G29031-MS1)					**Source: B4G0718-02**					
Calcium	50.6	0.250	mg/l	5.00	47.5	62.0	75-125			Q-03
Iron	54.6	0.150	"	5.00	50.8	76.0	75-125			
Potassium	14.4	2.00	"	10.0	4.12	103	80-120			
Magnesium	23.8	0.500	"	5.00	19.6	84.0	80-120			
Sodium	62.1	0.250	"	5.00	58.6	70.0	75-125			Q-03
Matrix Spike Dup (4G29031-MSD1)					**Source: B4G0718-02**					
Calcium	49.6	0.250	mg/l	5.00	47.5	42.0	75-125	2.00	20	Q-03
Iron	53.7	0.150	"	5.00	50.8	58.0	75-125	1.66	20	Q-03
Potassium	14.2	2.00	"	10.0	4.12	101	80-120	1.40	20	
Magnesium	23.6	0.500	"	5.00	19.6	80.0	80-120	0.844	20	
Sodium	62.0	0.250	"	5.00	58.6	68.0	75-125	0.161	20	Q-03

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G29031: Prepared 07/29/04 Using EPA 3010A										
Post Spike (4G29031-PS1)					**Source: B4G0718-02**					
Calcium	49.7		ug/ml	5.00	47.5	44.0	75-125			Q-03
Iron	53.7		"	5.00	50.8	58.0	75-125			Q-03
Potassium	13.7		"	10.0	4.12	95.8	75-125			
Magnesium	23.5		"	5.00	19.6	78.0	75-125			
Sodium	62.2		"	5.00	58.6	72.0	75-125			Q-03

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G29047: Prepared 07/28/04 Using General Preparation										
Blank (4G29047-BLK1)										
Turbidity	ND	1.00	NTU							
LCS (4G29047-BS1)										
Turbidity	18.4	1.00	NTU	20.0		92.0	85-115			
LCS Dup (4G29047-BSD1)										
Turbidity	18.6	1.00	NTU	20.0		93.0	85-115	1.08	20	
Duplicate (4G29047-DUP1)					**Source: B4G0753-02**					
Turbidity	0.230	1.00	NTU		0.260			12.2	20	
Batch 4G29048: Prepared 07/28/04 Using General Preparation										
Duplicate (4G29048-DUP1)					**Source: B4G0753-02**					
pH	9.15		pH Units		9.15			0.00	10	
Batch 4G29059: Prepared 07/29/04 Using General Preparation										
Blank (4G29059-BLK1)										
Ammonia-Nitrogen	ND	0.100	mg/l as N							
LCS (4G29059-BS1)										
Ammonia-Nitrogen	4.54	0.100	mg/l as N	5.00		90.8	90-110			
LCS Dup (4G29059-BSD1)										
Ammonia-Nitrogen	4.50	0.100	mg/l as N	5.00		90.0	90-110	0.885	20	

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Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G29059: Prepared 07/29/04 Using General Preparation										
Duplicate (4G29059-DUP1)					**Source: B4G0736-01**					
Ammonia-Nitrogen	0.199	0.100	mg/l as N		0.198			0.504	25	
Matrix Spike (4G29059-MS1)					**Source: B4G0736-01**					
Ammonia-Nitrogen	4.58	0.100	mg/l as N	5.00	0.198	87.6	75-140			
Batch 4H01002: Prepared 07/29/04 Using General Preparation										
Blank (4H01002-BLK1)										
Nitrate/Nitrite-Nitrogen	ND	0.0100	mg/l as N							
LCS (4H01002-BS1)										
Nitrate/Nitrite-Nitrogen	1.01	0.0100	mg/l as N	1.00		101	90-110			
LCS Dup (4H01002-BSD1)										
Nitrate/Nitrite-Nitrogen	1.02	0.0100	mg/l as N	1.00		102	90-110	0.985	20	
Matrix Spike (4H01002-MS1)					**Source: B4G0743-07**					
Nitrate/Nitrite-Nitrogen	3.12	0.0200	mg/l as N	0.250	2.86	104	36-150			
Matrix Spike Dup (4H01002-MSD1)					**Source: B4G0743-07**					
Nitrate/Nitrite-Nitrogen	3.14	0.0200	mg/l as N	0.250	2.86	112	36-150	0.639	20	
Batch 4H03034: Prepared 08/03/04 Using General Preparation										
Blank (4H03034-BLK1)										
Total Alkalinity	ND	5.00	mg/L as CaCO3							

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Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H03034: Prepared 08/03/04 Using General Preparation										
LCS (4H03034-BS1)										
Total Alkalinity	51.0	5.00	mg/L as CaCO3	50.0		102	90-110			
LCS Dup (4H03034-BSD1)										
Total Alkalinity	49.8	5.00	mg/L as CaCO3	50.0		99.6	90-110	2.38	20	
Duplicate (4H03034-DUP1)					**Source: B4G0638-01**					
Total Alkalinity	42.8	5.00	mg/L as CaCO3		42.8			0.00	20	
Duplicate (4H03034-DUP2)					**Source: B4H0045-03**					
Total Alkalinity	105	5.00	mg/L as CaCO3		107			1.89	20	
Batch 4H03042: Prepared 08/03/04 Using General Preparation										
Blank (4H03042-BLK1)										
Total Dissolved Solids	ND	10	mg/l							
Duplicate (4H03042-DUP1)					**Source: B4G0753-02**					
Total Dissolved Solids	410	10	mg/l		400			2.47	20	
Batch 4H03047: Prepared 08/03/04 Using General Preparation										
Blank (4H03047-BLK1)										
Total Suspended Solids	ND	4.0	mg/l							
Duplicate (4H03047-DUP1)					**Source: B4G0851-01**					
Total Suspended Solids	410	4.0	mg/l		400			2.47	19	

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H05020: Prepared 08/04/04 Using General Preparation										
Blank (4H05020-BLK1)										
Sulfate	ND	0.400	mg/l							
LCS (4H05020-BS1)										
Sulfate	6.09	0.400	mg/l	6.00		102	90-110			
LCS Dup (4H05020-BSD1)										
Sulfate	6.14	0.400	mg/l	6.00		102	90-110	0.818	20	
Duplicate (4H05020-DUP1)					**Source: B4H0074-04**					
Sulfate	35.7	2.00	mg/l		35.4			0.844	25	
Duplicate (4H05020-DUP2)					**Source: B4H0074-06**					
Sulfate	12.7	0.800	mg/l		12.8			0.784	25	
Matrix Spike (4H05020-MS1)					**Source: B4H0074-04**					
Sulfate	41.4	2.00	mg/l	6.00	35.4	100	58-135			
Matrix Spike (4H05020-MS2)					**Source: B4H0074-06**					
Sulfate	18.5	0.800	mg/l	6.00	12.8	95.0	58-135			
Batch 4H06038: Prepared 08/05/04 Using General Preparation										
Blank (4H06038-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (4H06038-BS1)										
Chloride	1.95	0.400	mg/l	2.00		97.5	90-110			

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Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H06038: Prepared 08/05/04 Using General Preparation										
LCS Dup (4H06038-BSD1)										
Chloride	1.95	0.400	mg/l	2.00		97.5	90-110	0.00	20	
Duplicate (4H06038-DUP1)					**Source: B4G0758-01**					
Chloride	1.60	0.400	mg/l		1.61			0.623	25	
Duplicate (4H06038-DUP2)					**Source: B4G0772-03**					
Chloride	2.17	0.400	mg/l		2.25			3.62	25	
Matrix Spike (4H06038-MS1)					**Source: B4G0758-01**					
Chloride	3.28	0.400	mg/l	2.00	1.61	83.5	52-134			
Matrix Spike (4H06038-MS2)					**Source: B4G0772-03**					
Chloride	3.70	0.400	mg/l	2.00	2.25	72.5	52-134			

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Physical Parameters by APHA/ASTM/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G30054: Prepared 07/29/04 Using General Preparation										
Blank (4G30054-BLK1)										
Specific Conductivity	ND	1.00	uS/cm							
LCS (4G30054-BS1)										
Specific Conductivity	991	1.00	uS/cm	1030		96.2	90-110			
LCS Dup (4G30054-BSD1)										
Specific Conductivity	990	1.00	uS/cm	1030		96.1	90-110	0.101	20	
Duplicate (4G30054-DUP1)					**Source: B4G0753-02**					
Specific Conductivity	813	1.00	uS/cm		812			0.123	20	
Duplicate (4G30054-DUP2)					**Source: B4G0795-02**					
Specific Conductivity	4380	1.00	uS/cm		4360			0.458	20	

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/11/04 23:47

Notes and Definitions

I-05	Since the sample was out of hold at the time of receipt, the preparation/analysis of the sample could not be initiated within the method-specified hold time.
Q-03	The percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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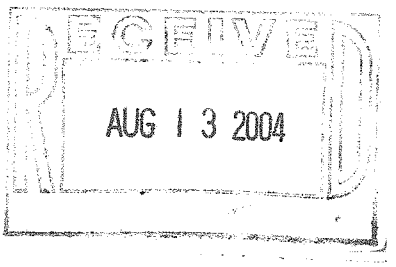
12 August 2004



Chip Goodhue
Aspect Consulting - Bainbridge Island
179 Madrone Lane N
Bainbridge Island, WA/USA 98110

RE: SW Harbor - LFOL

Enclosed are the results of analyses for samples received by the laboratory on 07/29/04 14:50. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeff Gerdes
Project Manager

North Creek Analytical, Inc.
Environmental Laboratory Network

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MH4-SED-072904	B4G0795-01	Sediment	07/29/04 11:00	07/29/04 14:50
MH4-W-072904	B4G0795-02	Water	07/29/04 10:45	07/29/04 14:50

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Total Metals by EPA 6000/7000 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH4-W-072904 (B4G0795-02) Water	**Sampled: 07/29/04 10:45**		**Received: 07/29/04 14:50**						
Calcium	**45.8**	0.250	mg/l	1	4H06019	08/06/04	08/07/04	EPA 6010B	
Iron	**0.238**	0.150	"	"	"	"	"	"	
Potassium	**35.6**	2.00	"	"	"	"	"	"	
Magnesium	**80.8**	0.500	"	"	"	"	"	"	
Sodium	**722**	2.50	"	10	"	"	08/09/04	"	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH4-W-072904 (B4G0795-02) Water	**Sampled: 07/29/04 10:45 Received: 07/29/04 14:50**								
Total Alkalinity	**102**	5.00	mg/L as CaCO3	1	4H03034	08/03/04	08/03/04	EPA 310.1	
Ammonia-Nitrogen	**0.336**	0.100	mg/l as N	"	4H03038	07/30/04	07/30/04	EPA 350.3	
Ferric Iron	ND	0.250	mg/l	"	4H06019	08/06/04	08/11/04	SM 3500-Fe D	I-05
Nitrate/Nitrite-Nitrogen	**0.156**	0.0100	mg/l as N	"	4H02048	08/02/04	08/02/04	EPA 353.2	
pH	**9.13**		pH Units	"	4H03025	08/03/04	08/03/04	EPA 150.1	I-02
Total Dissolved Solids	**2000**	10	mg/l	"	4H03042	08/03/04	08/05/04	EPA 160.1	
Total Suspended Solids	**4.0**	4.0	"	"	4H03047	"	08/04/04	EPA 160.2	
Turbidity	**2.60**	1.00	NTU	"	4H02047	08/02/04	08/02/04	EPA 180.1	I-02

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH4-W-072904 (B4G0795-02) Water	**Sampled: 07/29/04 10:45**		**Received: 07/29/04 14:50**						
Chloride	**1300**	200	mg/l	500	4H11021	08/10/04	08/10/04	EPA 300.0	
Sulfate	**182**	8.00	"	20	4H12014	08/11/04	08/11/04	"	

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Physical Parameters by APHA/ASTM/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH4-W-072904 (B4G0795-02) Water	**Sampled: 07/29/04 10:45**		**Received: 07/29/04 14:50**						
Specific Conductivity	**4360**	1.00	uS/cm	1	4G30054	07/29/04	07/29/04	EPA 120.1	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H06019: Prepared 08/06/04 Using EPA 3010A										
Blank (4H06019-BLK1)										
Calcium	ND	0.250	mg/l							
Iron	ND	0.150	"							
Potassium	ND	2.00	"							
Magnesium	ND	0.500	"							
Sodium	ND	0.250	"							
LCS (4H06019-BS1)										
Calcium	4.81	0.250	mg/l	5.00		96.2	80-120			
Iron	4.89	0.150	"	5.00		97.8	80-120			
Potassium	10.3	2.00	"	10.0		103	80-120			
Magnesium	4.82	0.500	"	5.00		96.4	80-120			
Sodium	4.82	0.250	"	5.00		96.4	80-120			
LCS Dup (4H06019-BSD1)										
Calcium	4.93	0.250	mg/l	5.00		98.6	80-120	2.46	20	
Iron	5.02	0.150	"	5.00		100	80-120	2.62	20	
Potassium	10.0	2.00	"	10.0		100	80-120	2.96	20	
Magnesium	4.96	0.500	"	5.00		99.2	80-120	2.86	20	
Sodium	4.96	0.250	"	5.00		99.2	80-120	2.86	20	
Matrix Spike (4H06019-MS1)					**Source: B4G0865-03**					
Calcium	46.9	0.250	mg/l	5.00	40.0	138	75-125			Q-03
Iron	46.2	0.150	"	5.00	38.9	146	75-125			Q-03
Potassium	15.1	2.00	"	10.0	4.11	110	80-120			
Magnesium	17.6	0.500	"	5.00	12.0	112	80-120			
Sodium	104	0.250	"	5.00	92.6	228	75-125			Q-03
Matrix Spike Dup (4H06019-MSD1)					**Source: B4G0865-03**					
Calcium	46.8	0.250	mg/l	5.00	40.0	136	75-125	0.213	20	Q-03
Iron	46.3	0.150	"	5.00	38.9	148	75-125	0.216	20	Q-03
Potassium	15.0	2.00	"	10.0	4.11	109	80-120	0.664	20	
Magnesium	17.5	0.500	"	5.00	12.0	110	80-120	0.570	20	
Sodium	104	0.250	"	5.00	92.6	228	75-125	0.00	20	Q-03

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H06019: Prepared 08/06/04 Using EPA 3010A										
Post Spike (4H06019-PS1)					**Source: B4G0865-03**					
Calcium	43.4		ug/ml	5.00	40.0	68.0	75-125			Q-03
Iron	43.0		"	5.00	38.9	82.0	75-125			
Potassium	14.4		"	10.0	4.11	103	75-125			
Magnesium	16.5		"	5.00	12.0	90.0	75-125			
Sodium	96.8		"	5.00	92.6	84.0	75-125			

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179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H02047: Prepared 08/02/04 Using General Preparation										
Blank (4H02047-BLK1)										
Turbidity	ND	1.00	NTU							
LCS (4H02047-BS1)										
Turbidity	18.3	1.00	NTU	20.0		91.5	85-115			
LCS Dup (4H02047-BSD1)										
Turbidity	18.4	1.00	NTU	20.0		92.0	85-115	0.545	20	
Duplicate (4H02047-DUP1)					**Source: B4G0795-02**					
Turbidity	2.57	1.00	NTU		2.60			1.16	20	
Batch 4H02048: Prepared 08/02/04 Using General Preparation										
Blank (4H02048-BLK1)										
Nitrate/Nitrite-Nitrogen	ND	0.0100	mg/l as N							
LCS (4H02048-BS1)										
Nitrate/Nitrite-Nitrogen	0.952	0.0100	mg/l as N	1.00		95.2	90-110			
LCS Dup (4H02048-BSD1)										
Nitrate/Nitrite-Nitrogen	0.960	0.0100	mg/l as N	1.00		96.0	90-110	0.837	20	
Matrix Spike (4H02048-MS1)					**Source: B4G0803-01**					
Nitrate/Nitrite-Nitrogen	1.79	0.0100	mg/l as N	0.250	1.47	128	36-150			
Matrix Spike Dup (4H02048-MSD1)					**Source: B4G0803-01**					
Nitrate/Nitrite-Nitrogen	1.80	0.0100	mg/l as N	0.250	1.47	132	36-150	0.557	20	

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Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H03025: Prepared 08/03/04 Using General Preparation										
Duplicate (4H03025-DUP1)					**Source: B4G0795-02**					
pH	9.13		pH Units		9.13			0.00	10	
Batch 4H03034: Prepared 08/03/04 Using General Preparation										
Blank (4H03034-BLK1)										
Total Alkalinity	ND	5.00	mg/L as CaCO3							
LCS (4H03034-BS1)										
Total Alkalinity	51.0	5.00	mg/L as CaCO3	50.0		102	90-110			
LCS Dup (4H03034-BSD1)										
Total Alkalinity	49.8	5.00	mg/L as CaCO3	50.0		99.6	90-110	2.38	20	
Duplicate (4H03034-DUP1)					**Source: B4G0638-01**					
Total Alkalinity	42.8	5.00	mg/L as CaCO3		42.8			0.00	20	
Duplicate (4H03034-DUP2)					**Source: B4H0045-03**					
Total Alkalinity	105	5.00	mg/L as CaCO3		107			1.89	20	
Batch 4H03038: Prepared 07/30/04 Using General Preparation										
Blank (4H03038-BLK1)										
Ammonia-Nitrogen	ND	0.100	mg/l as N							
LCS (4H03038-BS1)										
Ammonia-Nitrogen	4.80	0.100	mg/l as N	5.00		96.0	90-110			

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H03038: Prepared 07/30/04 Using General Preparation										
LCS Dup (4H03038-BSD1)										
Ammonia-Nitrogen	4.82	0.100	mg/l as N	5.00		96.4	90-110	0.416	20	
Duplicate (4H03038-DUP1)					**Source: B4G0795-02**					
Ammonia-Nitrogen	0.436	0.100	mg/l as N		0.336			25.9	25	Q-06
Matrix Spike (4H03038-MS1)					**Source: B4G0795-02**					
Ammonia-Nitrogen	2.76	0.100	mg/l as N	2.50	0.336	97.0	75-140			
Batch 4H03042: Prepared 08/03/04 Using General Preparation										
Blank (4H03042-BLK1)										
Total Dissolved Solids	ND	10	mg/l							
Duplicate (4H03042-DUP1)					**Source: B4G0753-02**					
Total Dissolved Solids	410	10	mg/l		400			2.47	20	
Batch 4H03047: Prepared 08/03/04 Using General Preparation										
Blank (4H03047-BLK1)										
Total Suspended Solids	ND	4.0	mg/l							
Duplicate (4H03047-DUP1)					**Source: B4G0851-01**					
Total Suspended Solids	410	4.0	mg/l		400			2.47	19	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H11021: Prepared 08/10/04 Using General Preparation										
Blank (4H11021-BLK1)										
Chloride	ND	0.400	mg/l							
LCS (4H11021-BS1)										
Chloride	2.04	0.400	mg/l	2.00		102	90-110			
LCS Dup (4H11021-BSD1)										
Chloride	2.04	0.400	mg/l	2.00		102	90-110	0.00	20	
Duplicate (4H11021-DUP1)					**Source: B4G0847-01**					
Chloride	0.0310	0.400	mg/l		0.0410			27.8	25	
Matrix Spike (4H11021-MS1)					**Source: B4G0847-01**					
Chloride	2.06	0.400	mg/l	2.00	0.0410	101	52-134			
Batch 4H12014: Prepared 08/11/04 Using General Preparation										
Blank (4H12014-BLK1)										
Sulfate	ND	0.400	mg/l							
LCS (4H12014-BS1)										
Sulfate	6.09	0.400	mg/l	6.00		102	90-110			
LCS Dup (4H12014-BSD1)										
Sulfate	6.15	0.400	mg/l	6.00		102	90-110	0.980	20	
Duplicate (4H12014-DUP1)					**Source: B4G0865-03**					
Sulfate	37.5	2.00	mg/l		38.0			1.32	25	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H12014: Prepared 08/11/04 Using General Preparation										
Duplicate (4H12014-DUP2)					**Source: B4G0638-02**					
Sulfate	8.29	0.400	mg/l		8.31			0.241	25	
Matrix Spike (4H12014-MS1)					**Source: B4G0865-03**					
Sulfate	43.0	2.00	mg/l	6.00	38.0	83.3	58-135			
Matrix Spike (4H12014-MS2)					**Source: B4G0638-02**					
Sulfate	13.7	0.800	mg/l	6.00	8.31	89.8	58-135			
Matrix Spike Dup (4H12014-MSD1)					**Source: B4G0865-03**					
Sulfate	42.8	2.00	mg/l	6.00	38.0	80.0	58-135	0.466	25	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Physical Parameters by APHA/ASTM/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4G30054: Prepared 07/29/04 Using General Preparation										
Blank (4G30054-BLK1)										
Specific Conductivity	ND	1.00	uS/cm							
LCS (4G30054-BS1)										
Specific Conductivity	991	1.00	uS/cm	1030		96.2	90-110			
LCS Dup (4G30054-BSD1)										
Specific Conductivity	990	1.00	uS/cm	1030		96.1	90-110	0.101	20	
Duplicate (4G30054-DUP1)					**Source: B4G0753-02**					
Specific Conductivity	813	1.00	uS/cm		812			0.123	20	
Duplicate (4G30054-DUP2)					**Source: B4G0795-02**					
Specific Conductivity	4380	1.00	uS/cm		4360			0.458	20	

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/12/04 13:03

Notes and Definitions

I-02	This sample was analyzed outside of the recommended holding time.
I-05	Since the sample was out of hold at the time of receipt, the preparation/analysis of the sample could not be initiated within the method-specified hold time.
Q-03	The percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
Q-06	Analyses are not controlled on RPD values from sample concentrations less than 5 times the reporting limit.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

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3209 Denali St, Anchorage, AK 99503-4030 907-334-9200 FAX 334-9210

CHAIN OF CUSTODY REPORT

Work Order #: B4G0795

CLIENT: ASPECT

REPORT TO: CHIP GOODHUE
ADDRESS: 179 Madrone LN N
Bainbridge Island WA 98110
PHONE: FAX:

INVOICE TO: SAME

P.O. NUMBER:

PROJECT NAME: SW HARBOR
PROJECT NUMBER: 990106-004-23
SAMPLED BY: PSB/RRH

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: ~~10~~ STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1

Petroleum Hydrocarbon Analyses: ~~X~~ STD. | 4 | 3 | 2 | 1 | <1

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

PRESERVATIVE

REQUESTED ANALYSES

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	Metals*	Ferric Fe	ALK	Cl⁻	NH₃	NO₃/NO₂	pH	SO₄	Cond/TDS	Turb	GRAIN SIZE	MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	NCA WO ID
1	MH4-SED-072904	7/29/04 1100											X			1 CORE → LAB HOLD 1 CORE → ARI	-01
2	MH4-W-072904	7/29/04 1045	X	X	X	X	X	X	X	X	X	X					-02
3																	
4																	
5		NOTE:	HOLD	1	CORE	SED	AT	LAB									
6			FOR	POSSIBLE									ANALYSES				
7																	
8																	
9																	
10																	

RELEASED BY: PETER BANNISTER FIRM: ASPECT DATE: 7/29/04 TIME: 12:00
RECEIVED BY: Cathy Gamble FIRM: N/A DATE: 7/29/04 TIME: 17:50

RELEASED BY: PRINT NAME: FIRM: DATE: TIME:
RECEIVED BY: PRINT NAME: FIRM: DATE: TIME:

ADDITIONAL REMARKS:
* Metals: Ca, Fe, Mg, K, Na
** GRAIN SIZE BY ARI USING SIEVE AND HYDROMETER

TEMP: 2.1°C w/o

COC REV 4/03 PAGE OF

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17 August 2004

Chip Goodhue
Aspect Consulting - Bainbridge Island
179 Madrone Lane N
Bainbridge Island, WA/USA 98110

RE: SW Harbor - LFOL

Enclosed are the results of analyses for samples received by the laboratory on 07/30/04 17:35. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeff Gerdes
Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MH7-W-073004	B4G0851-01	Water	07/30/04 10:30	07/30/04 17:35
MH7-SED-073004	B4G0851-02	Sediment	07/30/04 10:55	07/30/04 17:35

North Creek Analytical - Bothell

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Jeff Gerdes, Project Manager

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Total Metals by EPA 6000/7000 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH7-W-073004 (B4G0851-01) Water	**Sampled: 07/30/04 10:30**		**Received: 07/30/04 17:35**						
Calcium	**111**	0.250	mg/l	1	4H06019	08/06/04	08/07/04	EPA 6010B	
Iron	**42.2**	0.150	"	"	"	"	"	"	
Potassium	**66.0**	2.00	"	"	"	"	"	"	
Magnesium	**166**	0.500	"	"	"	"	"	"	
Sodium	**1380**	2.50	"	10	"	"	08/09/04	"	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH7-W-073004 (B4G0851-01) Water	**Sampled: 07/30/04 10:30 Received: 07/30/04 17:35**								
Total Alkalinity	**244**	5.00	mg/L as CaCO3	1	4H03034	08/03/04	08/03/04	EPA 310.1	
Ammonia-Nitrogen	**2.01**	0.100	mg/l as N	"	4H03056	"	"	EPA 350.3	
Ferric Iron	**42.0**	0.250	mg/l	"	4H06019	08/06/04	08/13/04	SM 3500-Fe D	I-05
Nitrate/Nitrite-Nitrogen	**0.0318**	0.0100	mg/l as N	"	4H02048	08/02/04	08/02/04	EPA 353.2	
pH	**7.61**		pH Units	"	4H01004	07/31/04	07/31/04	EPA 150.1	
Total Dissolved Solids	**4300**	10	mg/l	"	4H03042	08/03/04	08/05/04	EPA 160.1	
Total Suspended Solids	**400**	4.0	"	"	4H03047	"	08/04/04	EPA 160.2	
Turbidity	**157**	10.0	NTU	10	4H01013	08/01/04	08/01/04	EPA 180.1	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Anions by EPA Method 300.0

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH7-W-073004 (B4G0851-01) Water	**Sampled: 07/30/04 10:30**		**Received: 07/30/04 17:35**						
Chloride	**2330**	200	mg/l	500	4H12014	08/11/04	08/11/04	EPA 300.0	
Sulfate	**328**	20.0	"	50	"	"	"	"	

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Physical Parameters by APHA/ASTM/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MH7-W-073004 (B4G0851-01) Water	**Sampled: 07/30/04 10:30**		**Received: 07/30/04 17:35**						
Specific Conductivity	**8270**	1.00	uS/cm	1	4H02059	08/02/04	08/02/04	EPA 120.1	

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H06019: Prepared 08/06/04 Using EPA 3010A										
Blank (4H06019-BLK1)										
Calcium	ND	0.250	mg/l							
Iron	ND	0.150	"							
Potassium	ND	2.00	"							
Magnesium	ND	0.500	"							
Sodium	ND	0.250	"							
LCS (4H06019-BS1)										
Calcium	4.81	0.250	mg/l	5.00		96.2	80-120			
Iron	4.89	0.150	"	5.00		97.8	80-120			
Potassium	10.3	2.00	"	10.0		103	80-120			
Magnesium	4.82	0.500	"	5.00		96.4	80-120			
Sodium	4.82	0.250	"	5.00		96.4	80-120			
LCS Dup (4H06019-BSD1)										
Calcium	4.93	0.250	mg/l	5.00		98.6	80-120	2.46	20	
Iron	5.02	0.150	"	5.00		100	80-120	2.62	20	
Potassium	10.0	2.00	"	10.0		100	80-120	2.96	20	
Magnesium	4.96	0.500	"	5.00		99.2	80-120	2.86	20	
Sodium	4.96	0.250	"	5.00		99.2	80-120	2.86	20	
Matrix Spike (4H06019-MS1)					**Source: B4G0865-03**					
Calcium	46.9	0.250	mg/l	5.00	40.0	138	75-125			Q-03
Iron	46.2	0.150	"	5.00	38.9	146	75-125			Q-03
Potassium	15.1	2.00	"	10.0	4.11	110	80-120			
Magnesium	17.6	0.500	"	5.00	12.0	112	80-120			
Sodium	104	0.250	"	5.00	92.6	228	75-125			Q-03
Matrix Spike Dup (4H06019-MSD1)					**Source: B4G0865-03**					
Calcium	46.8	0.250	mg/l	5.00	40.0	136	75-125	0.213	20	Q-03
Iron	46.3	0.150	"	5.00	38.9	148	75-125	0.216	20	Q-03
Potassium	15.0	2.00	"	10.0	4.11	109	80-120	0.664	20	
Magnesium	17.5	0.500	"	5.00	12.0	110	80-120	0.570	20	
Sodium	104	0.250	"	5.00	92.6	228	75-125	0.00	20	Q-03

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H06019: Prepared 08/06/04 Using EPA 3010A										
Post Spike (4H06019-PS1)					**Source: B4G0865-03**					
Calcium	43.4		ug/ml	5.00	40.0	68.0	75-125			Q-03
Iron	43.0		"	5.00	38.9	82.0	75-125			
Potassium	14.4		"	10.0	4.11	103	75-125			
Magnesium	16.5		"	5.00	12.0	90.0	75-125			
Sodium	96.8		"	5.00	92.6	84.0	75-125			

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H01004: Prepared 07/31/04 Using General Preparation										
Duplicate (4H01004-DUP1)					**Source: B4G0851-01**					
pH	7.59		pH Units		7.61			0.263	10	
Batch 4H01013: Prepared 08/01/04 Using General Preparation										
Blank (4H01013-BLK1)										
Turbidity	ND	1.00	NTU							
LCS (4H01013-BS1)										
Turbidity	18.5	1.00	NTU	20.0		92.5	85-115			
LCS Dup (4H01013-BSD1)										
Turbidity	18.5	1.00	NTU	20.0		92.5	85-115	0.00	20	
Duplicate (4H01013-DUP1)					**Source: B4G0850-01**					
Turbidity	ND	1.00	NTU		ND			NA	20	
Batch 4H02048: Prepared 08/02/04 Using General Preparation										
Blank (4H02048-BLK1)										
Nitrate/Nitrite-Nitrogen	ND	0.0100	mg/l as N							
LCS (4H02048-BS1)										
Nitrate/Nitrite-Nitrogen	0.952	0.0100	mg/l as N	1.00		95.2	90-110			
LCS Dup (4H02048-BSD1)										
Nitrate/Nitrite-Nitrogen	0.960	0.0100	mg/l as N	1.00		96.0	90-110	0.837	20	

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Jeff Gerdes

Jeff Gerdes, Project Manager

www.ncalabs.com

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907.563.9200 fax 907.563.9210

Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H02048: Prepared 08/02/04 Using General Preparation										
Matrix Spike (4H02048-MS1)					**Source: B4G0803-01**					
Nitrate/Nitrite-Nitrogen	1.79	0.0100	mg/l as N	0.250	1.47	128	36-150			
Matrix Spike Dup (4H02048-MSD1)					**Source: B4G0803-01**					
Nitrate/Nitrite-Nitrogen	1.80	0.0100	mg/l as N	0.250	1.47	132	36-150	0.557	20	
Batch 4H03034: Prepared 08/03/04 Using General Preparation										
Blank (4H03034-BLK1)										
Total Alkalinity	ND	5.00	mg/L as CaCO3							
LCS (4H03034-BS1)										
Total Alkalinity	51.0	5.00	mg/L as CaCO3	50.0		102	90-110			
LCS Dup (4H03034-BSD1)										
Total Alkalinity	49.8	5.00	mg/L as CaCO3	50.0		99.6	90-110	2.38	20	
Duplicate (4H03034-DUP1)					**Source: B4G0638-01**					
Total Alkalinity	42.8	5.00	mg/L as CaCO3		42.8			0.00	20	
Duplicate (4H03034-DUP2)					**Source: B4H0045-03**					
Total Alkalinity	105	5.00	mg/L as CaCO3		107			1.89	20	
Batch 4H03042: Prepared 08/03/04 Using General Preparation										
Blank (4H03042-BLK1)										
Total Dissolved Solids	ND	10	mg/l							

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H03042: Prepared 08/03/04 Using General Preparation										
Duplicate (4H03042-DUP1)					**Source: B4G0753-02**					
Total Dissolved Solids	410	10	mg/l		400			2.47	20	
Batch 4H03047: Prepared 08/03/04 Using General Preparation										
Blank (4H03047-BLK1)										
Total Suspended Solids	ND	4.0	mg/l							
Duplicate (4H03047-DUP1)					**Source: B4G0851-01**					
Total Suspended Solids	410	4.0	mg/l		400			2.47	19	
Batch 4H03056: Prepared 08/03/04 Using General Preparation										
Blank (4H03056-BLK1)										
Ammonia-Nitrogen	ND	0.100	mg/l as N							
LCS (4H03056-BS1)										
Ammonia-Nitrogen	4.64	0.100	mg/l as N	5.00		92.8	90-110			
LCS Dup (4H03056-BSD1)										
Ammonia-Nitrogen	4.66	0.100	mg/l as N	5.00		93.2	90-110	0.430	20	
Duplicate (4H03056-DUP1)					**Source: B4G0851-01**					
Ammonia-Nitrogen	1.99	0.100	mg/l as N		2.01			1.00	25	
Matrix Spike (4H03056-MS1)					**Source: B4G0851-01**					
Ammonia-Nitrogen	6.56	0.100	mg/l as N	5.00	2.01	91.0	75-140			

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H12014: Prepared 08/11/04 Using General Preparation										
Blank (4H12014-BLK1)										
Chloride	ND	0.400	mg/l							
Sulfate	ND	0.400	"							
LCS (4H12014-BS1)										
Chloride	2.00	0.400	mg/l	2.00		100	90-110			
Sulfate	6.09	0.400	"	6.00		102	90-110			
LCS Dup (4H12014-BSD1)										
Chloride	2.00	0.400	mg/l	2.00		100	90-110	0.00	20	
Sulfate	6.15	0.400	"	6.00		102	90-110	0.980	20	
Duplicate (4H12014-DUP1)					**Source: B4G0865-03**					
Chloride	11.2	2.00	mg/l		11.4			1.77	25	
Sulfate	37.5	2.00	"		38.0			1.32	25	
Duplicate (4H12014-DUP2)					**Source: B4G0638-02**					
Chloride	2.97	0.400	mg/l		2.84			4.48	25	
Sulfate	8.29	0.400	"		8.31			0.241	25	
Matrix Spike (4H12014-MS1)					**Source: B4G0865-03**					
Chloride	13.0	2.00	mg/l	2.00	11.4	80.0	52-134			
Sulfate	43.0	2.00	"	6.00	38.0	83.3	58-135			
Matrix Spike (4H12014-MS2)					**Source: B4G0638-02**					
Chloride	4.80	0.400	mg/l	2.00	2.84	98.0	52-134			
Sulfate	13.7	0.800	"	6.00	8.31	89.8	58-135			
Matrix Spike Dup (4H12014-MSD1)					**Source: B4G0865-03**					
Chloride	13.1	2.00	mg/l	2.00	11.4	85.0	52-134	0.766	25	
Sulfate	42.8	2.00	"	6.00	38.0	80.0	58-135	0.466	25	

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Physical Parameters by APHA/ASTM/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4H02059: Prepared 08/02/04 Using General Preparation										
Blank (4H02059-BLK1)										
Specific Conductivity	ND	1.00	uS/cm							
LCS (4H02059-BS1)										
Specific Conductivity	1010	1.00	uS/cm	1030		98.1	90-110			
LCS Dup (4H02059-BSD1)										
Specific Conductivity	1010	1.00	uS/cm	1030		98.1	90-110	0.00	20	
Duplicate (4H02059-DUP1)					**Source: B4G0851-01**					
Specific Conductivity	8290	1.00	uS/cm		8270			0.242	20	

North Creek Analytical - Bothell

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Aspect Consulting - Bainbridge Island	Project: SW Harbor - LFOL	
179 Madrone Lane N	Project Number: 990106-004-23	**Reported:**
Bainbridge Island, WA/USA 98110	Project Manager: Chip Goodhue	08/17/04 09:47

Notes and Definitions

I-05	Since the sample was out of hold at the time of receipt, the preparation/analysis of the sample could not be initiated within the method-specified hold time.
Q-03	The percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

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Jeff Gerdes

Jeff Gerdes, Project Manager

Analytical Resources, Incorporated
Analytical Chemists and Consultants

August 17, 2004

Mr. Jeff Gerdes
North Creek Analytical, Inc.
11720 North Creek Parkway, Suite 400
Bothell, WA 98011-8244

Subject: **Project No.: B4G0795, B4G0851, B4H0008**
ARI Project Nos.: GX28, GX29, GX30

Dear Mr. Gerdes;

Samples from the referenced project were received for testing on August 8, 2004. The samples were for ASTM grain size distribution. The results are on the following pages. A copy of this report will be kept in electronic format should you need a copy in the future.

Please call me to discuss any questions, or comments you may have on the data or its presentation.

Best Regards,
Analytical Resources Incorporated

Harold Benny

Harold Benny
Geotechnical Division Manager

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: North Creek Analytical	Project No.: GX28
Client Project: B4G0795, B4G0851, B4H0008	

Case Narrative

1. The samples were submitted for grain size analysis according to ASTM methodology.
2. The samples were run together in a batch.
3. The data is provided in summary tables and plots.
4. There were no noted anomalies in the samples or methods on this project.

Approved by: Harold Benny Date: 8/17/04
Title: Geotechnical Division Manager

120°c

SUBCONTRACT ORDER

North Creek Analytical - Bothell

B4H0008

SENDING LABORATORY:

North Creek Analytical - Bothell
11720 North Creek Parkway North, Suite 400
Bothell, WA 98011-8223
Phone: (425) 420-9200
Fax: (425) 420-9210
Project Manager: Jeff Gerdes

RECEIVING LABORATORY:

ARI
4611 S 134th Pl Ste 100
Tukwila, WA/USA 98168
Phone :206-621-6490
Fax: 206-621-7523

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: B4H0008-01	**Water**	**Sampled:07/29/04 09:10**	GX30A	**ON MISC. SHELF IN WALK IN.OTHER AN**
Misc. Subcontract 1	08/10/04 23:00	01/25/05 09:10		GRAIN SIZE USING SIEVE AND HYDROMETER
Containers Supplied: Plastic Core (A)				
Sample ID: B4H0008-02	**Water**	**Sampled:07/29/04 09:15**	GX30B	**ON MISC. SHELF IN WALK IN. OTHER AN**
Misc. Subcontract 1	08/10/04 23:00	01/25/05 09:15		GRAIN SIZE USING SIEVE AND HYDROMETER
Containers Supplied: Plastic Core (A)				
Sample ID: B4H0008-03	**Water**	**Sampled:07/29/04 09:15**	GX30C	**ON MISC. SHELF IN WALK IN. OTHER AN**
Misc. Subcontract 1	08/10/04 23:00	01/25/05 09:15		GRAIN SIZE USING SIEVE AND HYDROMETER
Containers Supplied: Plastic Core (B)				

Released By	Date	Received By	Date
[signature]	8-2-04	[signature]	8/2/04 1505

ANALYTICAL RESOURCES INCORPORATED

North Creek Analytical
B4G0795, B4G0851, B4H0008

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	Data Qualifier	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
B4G0795-01		100.0	100.0	98.2	58.9	45.1	41.4	38.9	36.1	34.6	31.7	13.0	7.2	6.5	5.8	4.3
B4G0851-02		100.0	100.0	99.6	81.5	71.0	64.2	58.5	51.0	43.4	35.9	25.4	15.0	13.5	10.5	7.5
B4H0008-01		100.0	99.4	98.3	91.2	86.9	81.4	71.7	56.4	38.7	36.1	28.0	22.0	18.7	12.0	6.7
B4H0008-02		100.0	99.8	98.5	85.1	80.3	77.6	73.9	66.2	53.8	51.0	44.1	38.6	29.7	20.7	11.0
B4H0008-03		100.0	99.9	98.9	88.1	82.6	79.5	75.9	69.1	44.1	38.4	29.9	25.6	19.9	12.8	5.7

Testing performed according to ASTM D421/D422

GX28, GX29, GX30

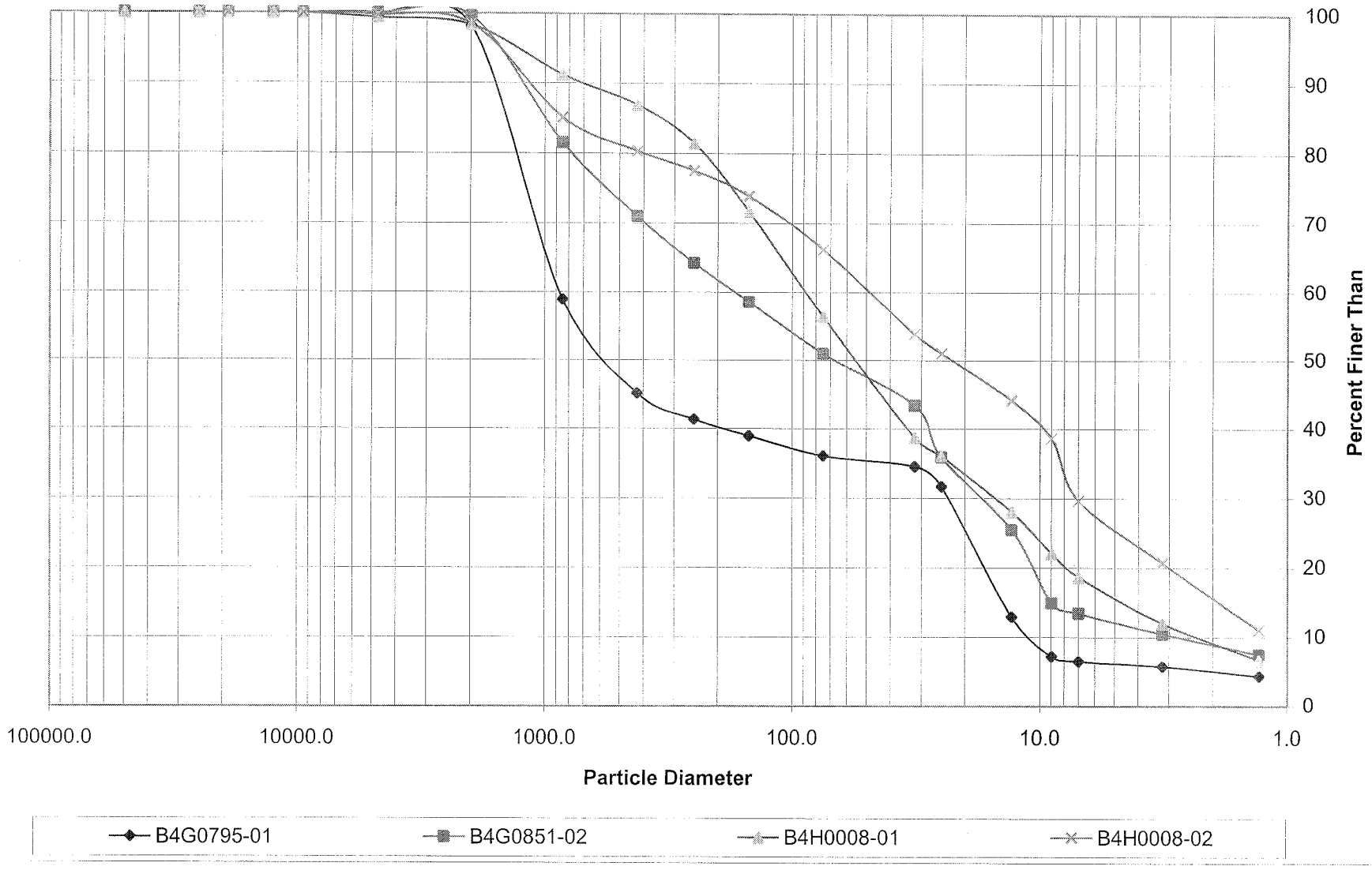
North Creek Analytical
B4G0795, B4G0851, B4H0008

Percent Retained in Each Size Fraction

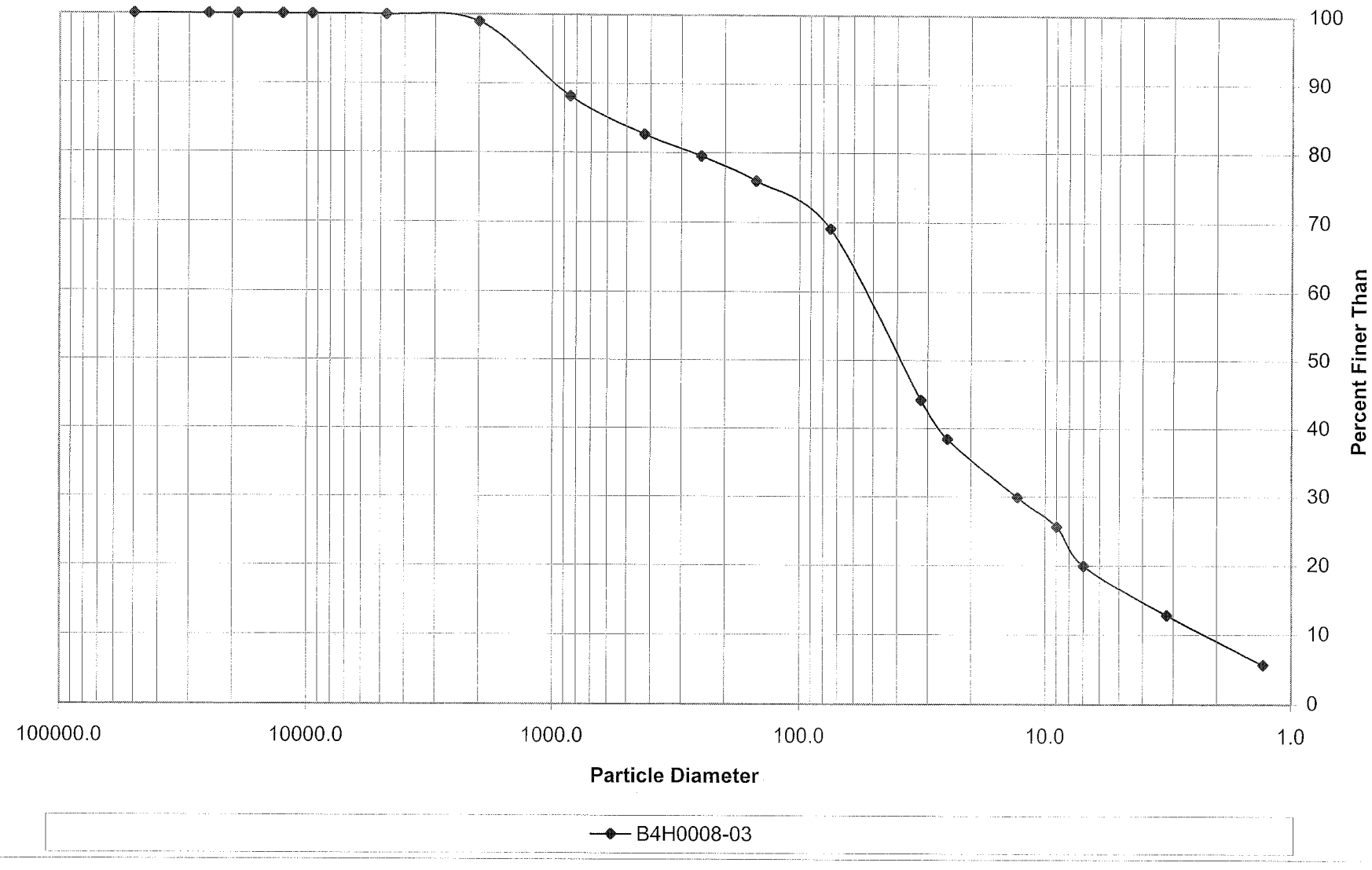
Sample No.	% Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Total Sand	% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Very Fine Silt	% Clay
Size (microns)	> 4750	4750-2000	2000-425	425-75	4750-75	75-32	32-22	22-13	13-9	9-3.2	<3.2
B4G0795-01	0.0	1.8	53.1	9.0	63.9	1.5	2.9	18.7	5.8	1.4	5.8
B4G0851-02	0.0	0.4	28.6	20.0	49.0	7.6	7.5	10.5	10.5	4.5	10.5
B4H0008-01	0.6	1.0	11.4	30.5	43.0	17.6	2.7	8.0	6.0	10.0	12.0
B4H0008-02	0.2	1.3	18.2	14.1	33.5	12.5	2.8	6.9	5.5	17.9	20.7
B4H0008-03	0.1	1.0	16.3	13.6	30.9	25.0	5.7	8.5	4.3	12.8	12.8

GX28, GX29, GX30

Grain Size Distribution by Hydrometer



Grain Size Distribution by Hydrometer



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3209 Denali St, Anchorage, AK 99503-4030 907-334-9200 FAX 334-9210

CHAIN OF CUSTODY REPORT

Work Order #: B4G0851

CLIENT: ASPECT

INVOICE TO: same

REPORT TO: CHIP GOODHUE
ADDRESS: 179 Madrone Ln N
Bainbridge Island WA 98110
PHONE: FAX:

P.O. NUMBER:

PROJECT NAME: SW Harbor
PROJECT NUMBER: 990106-004-23
SAMPLED BY: PSB

TURNAROUND REQUEST
in Business Days *

Organic & Inorganic Analyses: ~~10~~ STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1

~~5~~ STD. Petroleum Hydrocarbon Analyses: 4 | 3 | 2 | 1 | <1

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

PRESERVATIVE

REQUESTED ANALYSES

#	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	Metals*	Ferric Fe	ALK	Cl⁻	NH4	NO3/NO2	pH	SO4	Cond/TDS	Turbidity		GRAIN SIZE		MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	NCA WO ID
1	MH7-W-073004	7/30/04 1030	X	X	X	X	X	X	X	X	X	X						~~1 CORE ⇒~~	-01
2	MH7-SED-073004	7/30/04 1055												X				1 CORE → LAB HOLD 1 CORE → ARI	-02
3																			
4																			
5		NOTE: 1.)	HOLD	1	SED	CORE	AT	LAB	FOR										
6			POSSIBLE	ANALYSES															
7		2.)	SEND	1	SED	CORE	TO	ARI	FOR										
8			GRAIN	SIZE	USING	SIEVE	AND												
9			HYDROMETER																
10																			

RELEASED BY: PETER BANNISTER DATE: 7/30/04
PRINT NAME: PETER BANNISTER FIRM: ASPECT TIME: 1215

RECEIVED BY: PRANAV PANTE DATE: 7/30/04
PRINT NAME: PRANAV PANTE FIRM: NCA TIME: 1735

RELEASED BY: DATE:
PRINT NAME: FIRM: TIME:

RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:

ADDITIONAL REMARKS:
* METALS: Ca, Fe, Mg, K, Na ~~**~~ GRAIN SIZE BY ARI USING SIEVE AND HYDROMETER

TEMP: 20.4

COC REV 1/03

PAGE OF

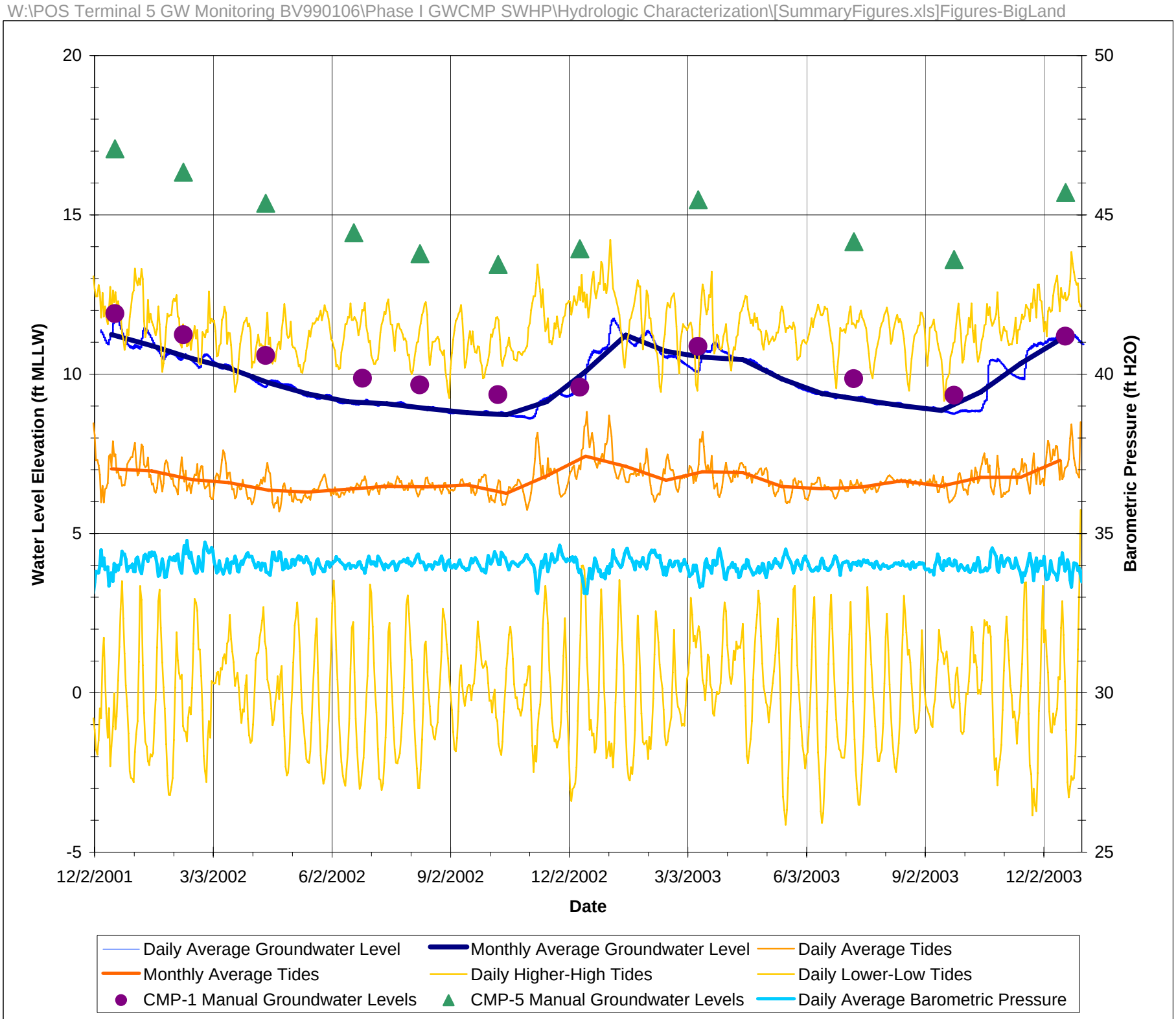
Samples were not @2-6c upon receipt!

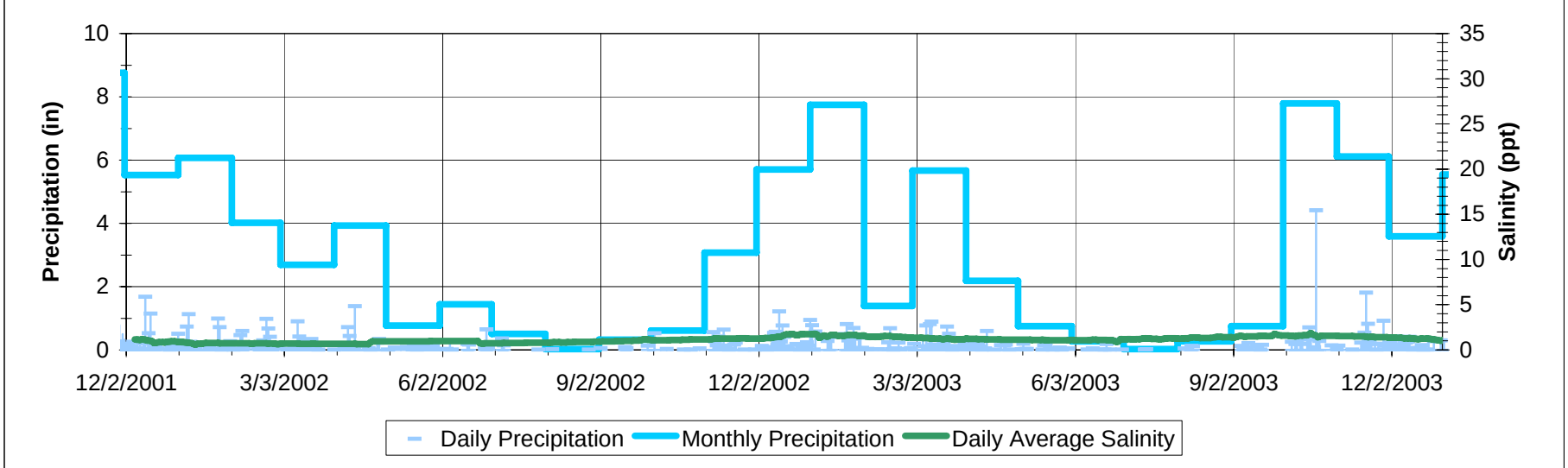
2/0

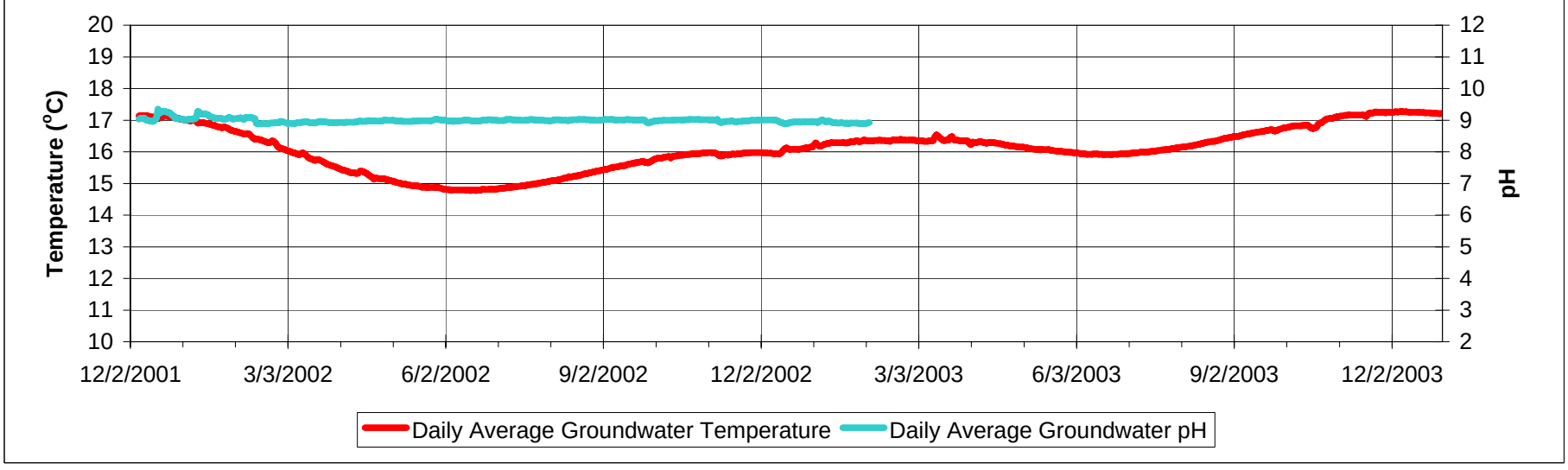
APPENDIX G

Water Level and Water Quality Plots
for Individual Wells

W:\POS Terminal 5 GW Monitoring BV990106\Phase I GWCMP SWHP\Hydrologic Characterization\[SummaryFigures.xls]Figures-BigLand





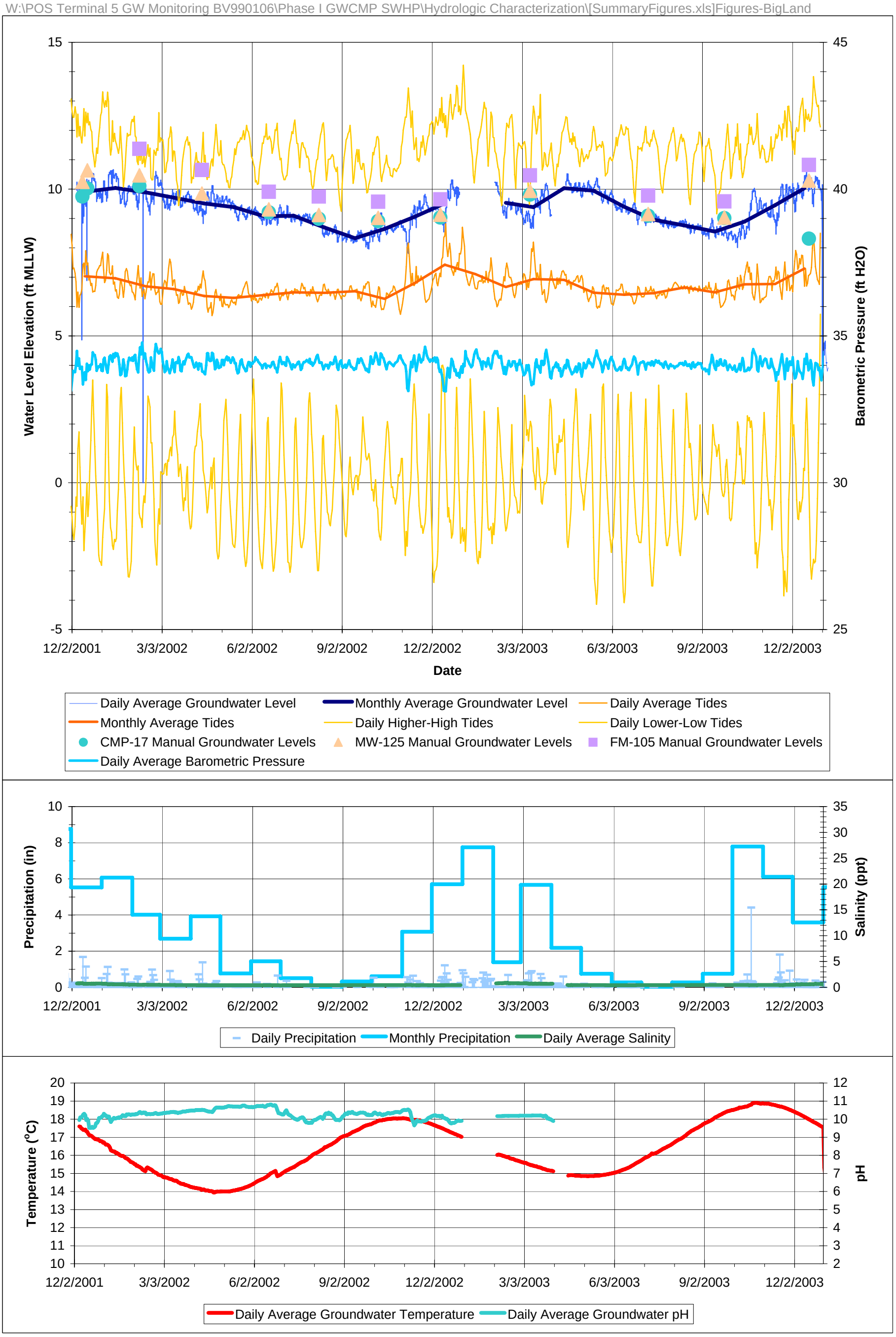


Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-2
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-1

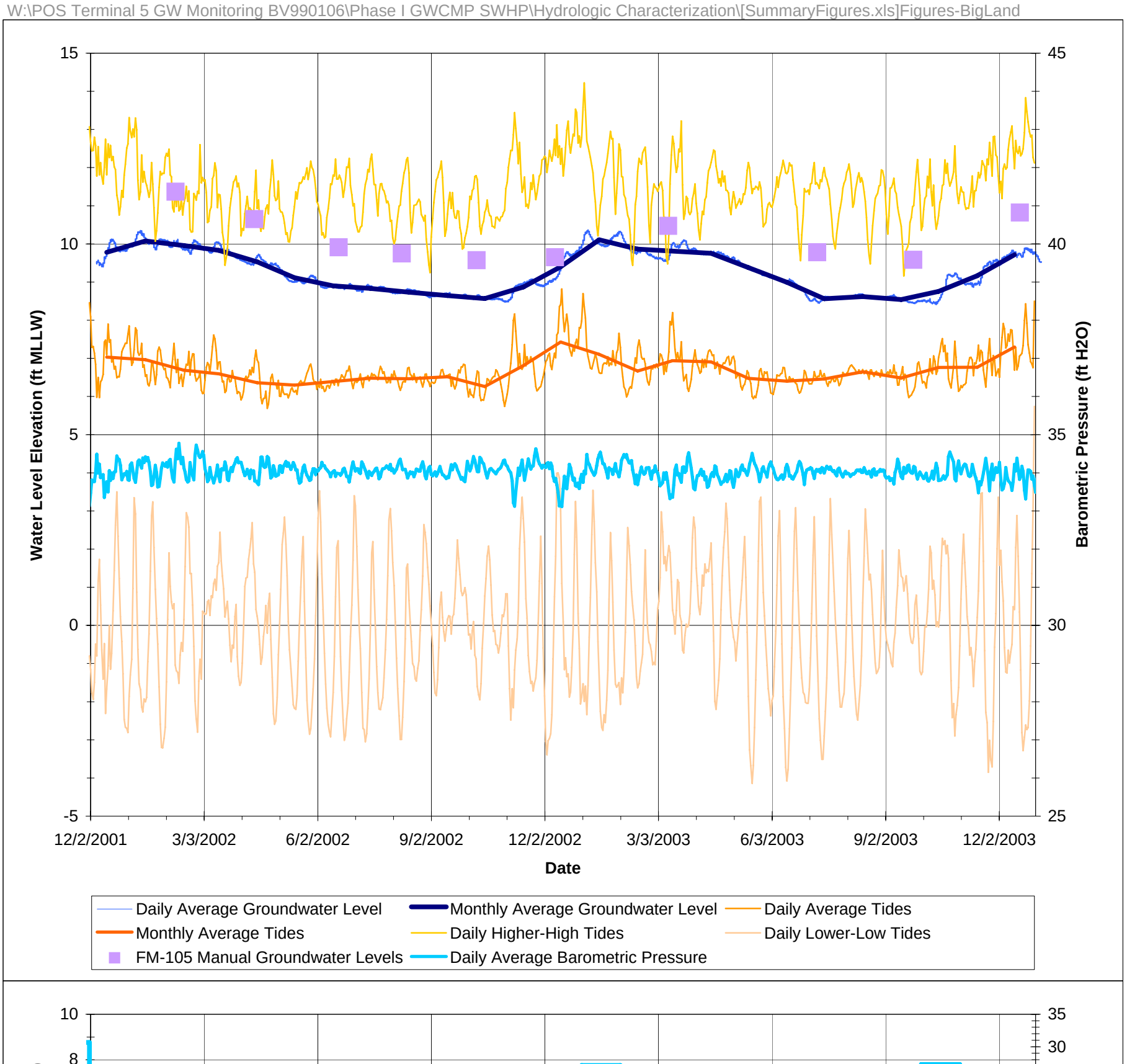
W:\POS Terminal 5 GW Monitoring BV990106\Phase I GWCMP SWHP\Hydrologic Characterization\[SummaryFigures.xls]Figures-BigLand

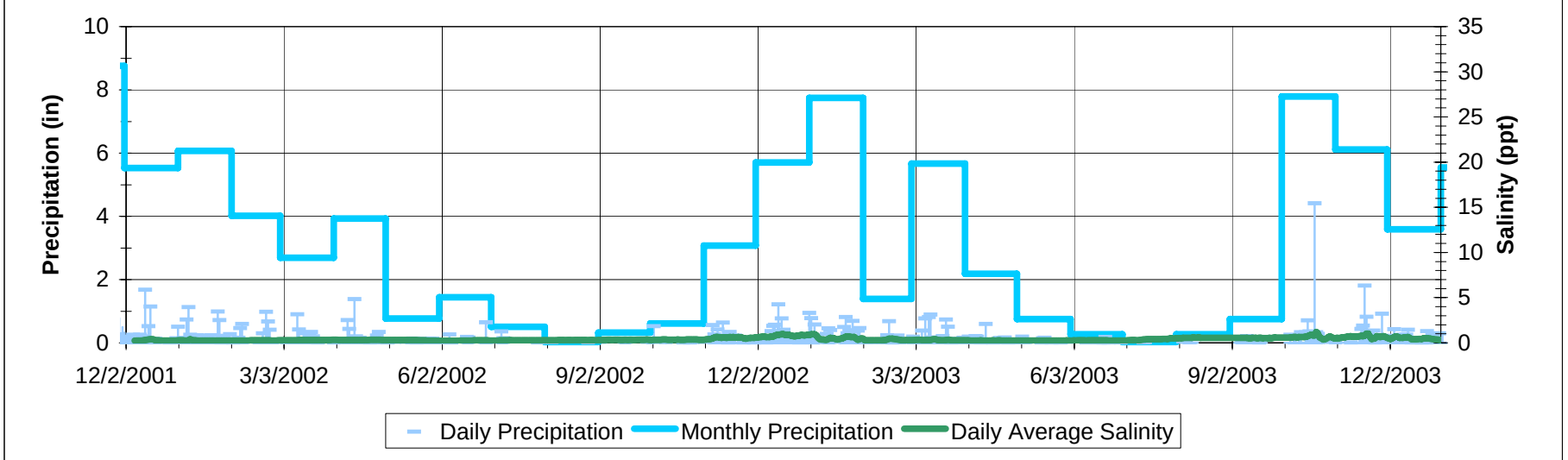


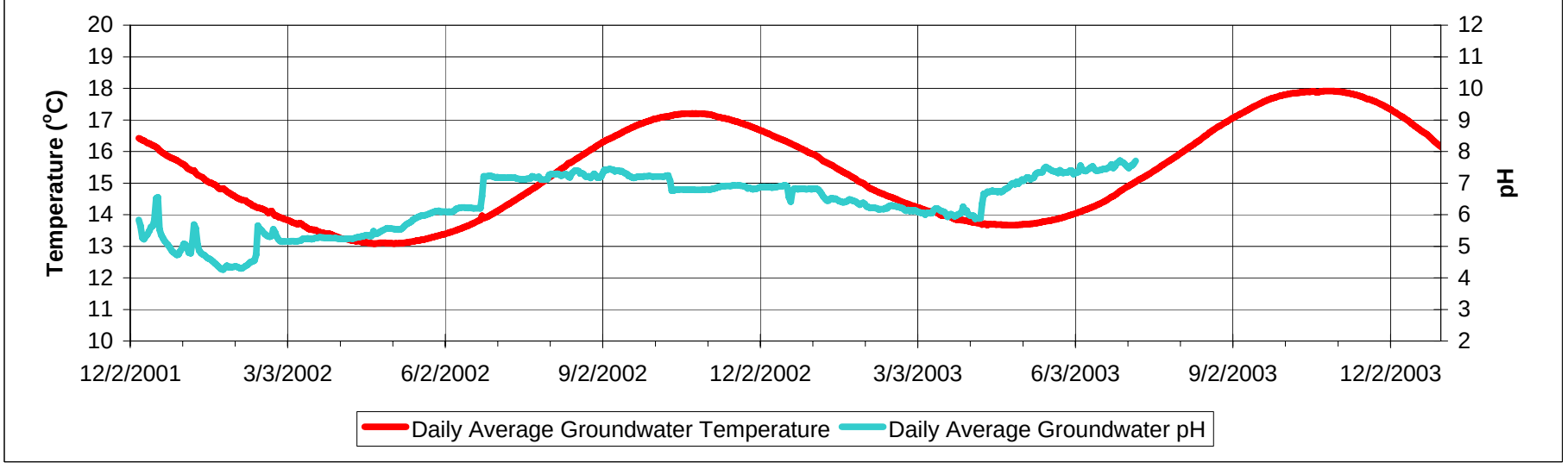
Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-3
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Figure G-2

W:\POS Terminal 5 GW Monitoring BV990106\Phase I GWCMP SWHP\Hydrologic Characterization\[SummaryFigures.xls]Figures-BigLand







Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-4
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-3

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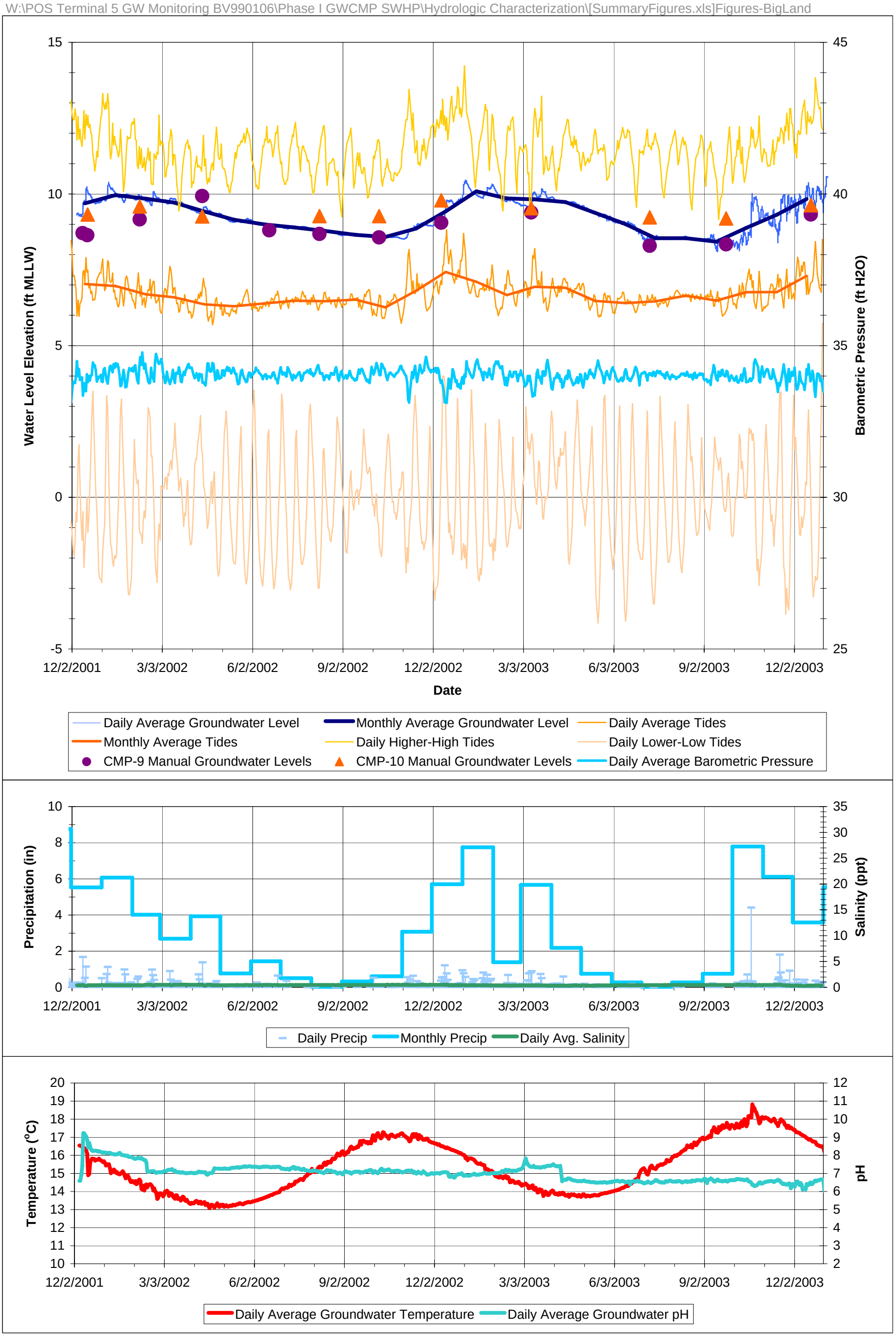

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-6
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Figure G-4

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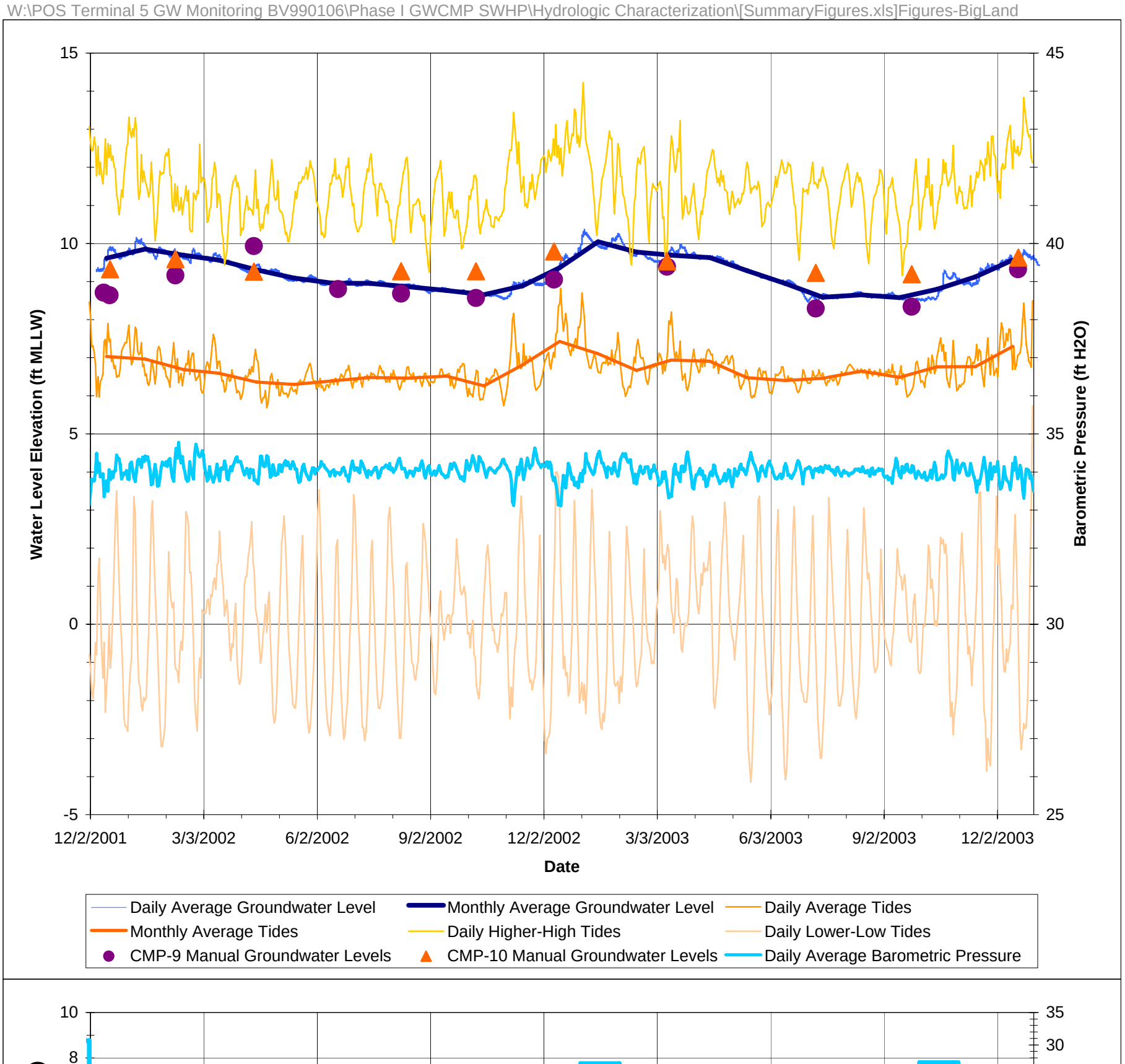

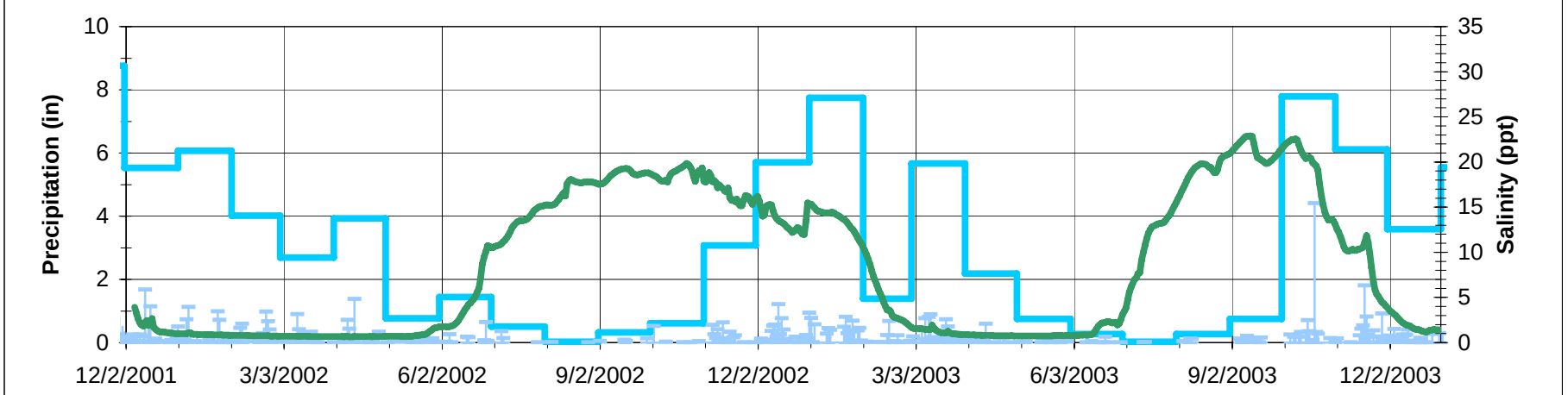

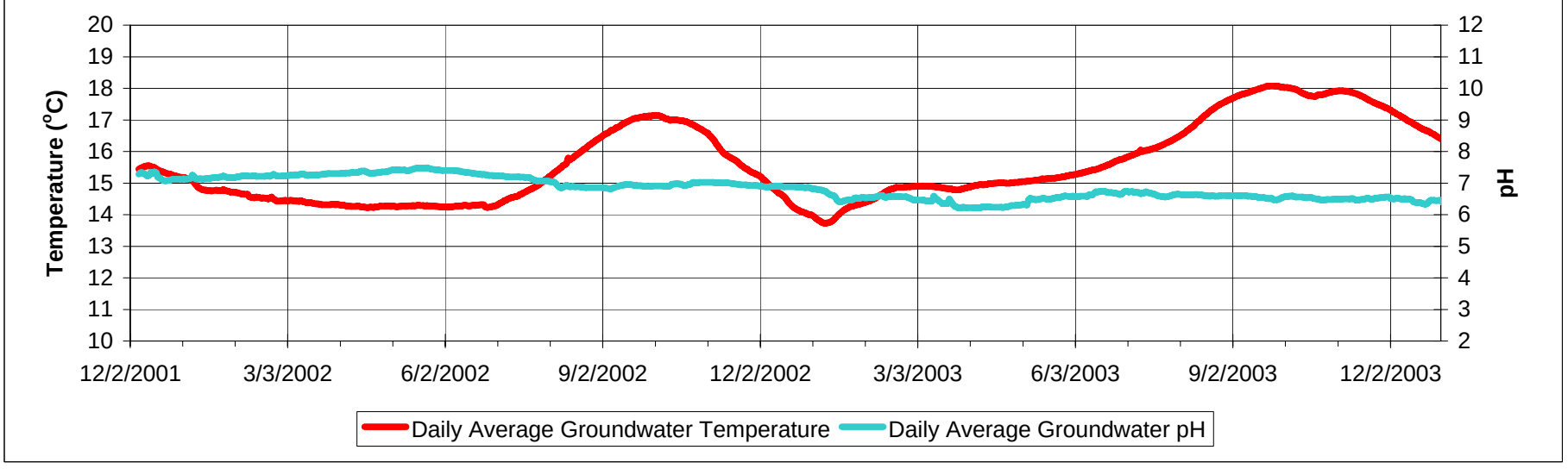

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-8
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-5

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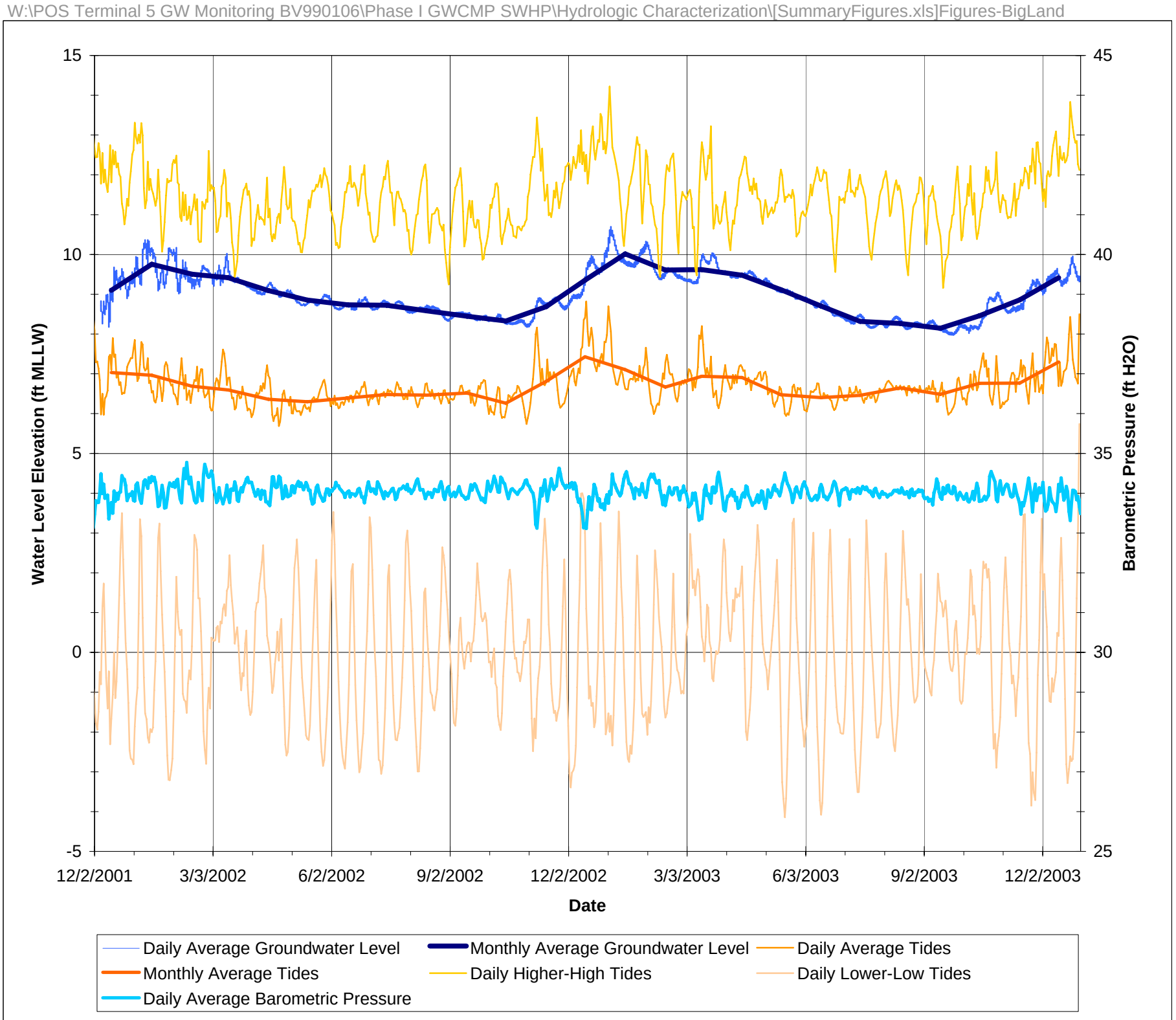

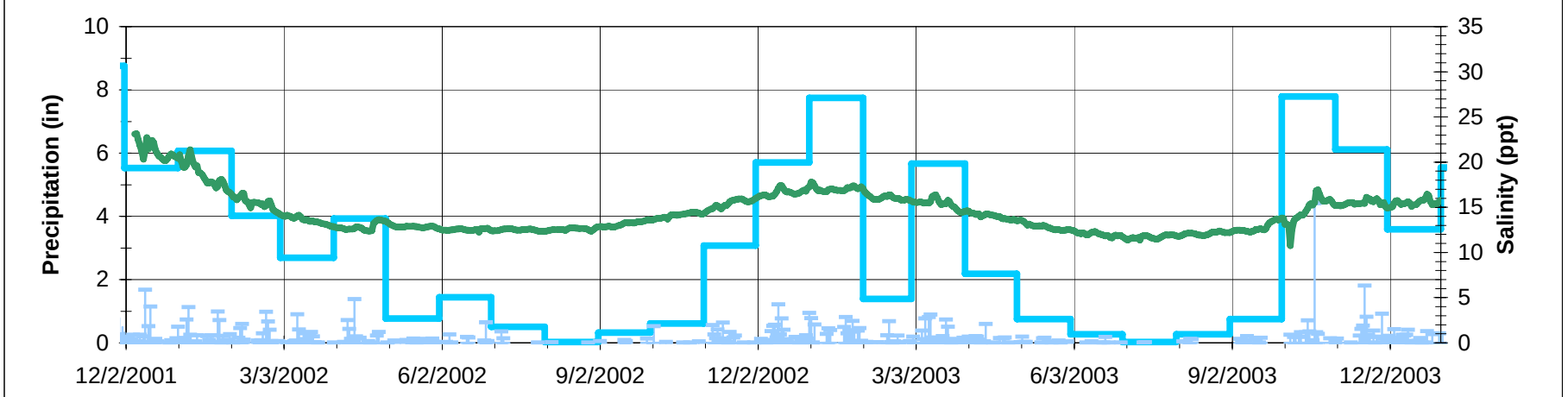

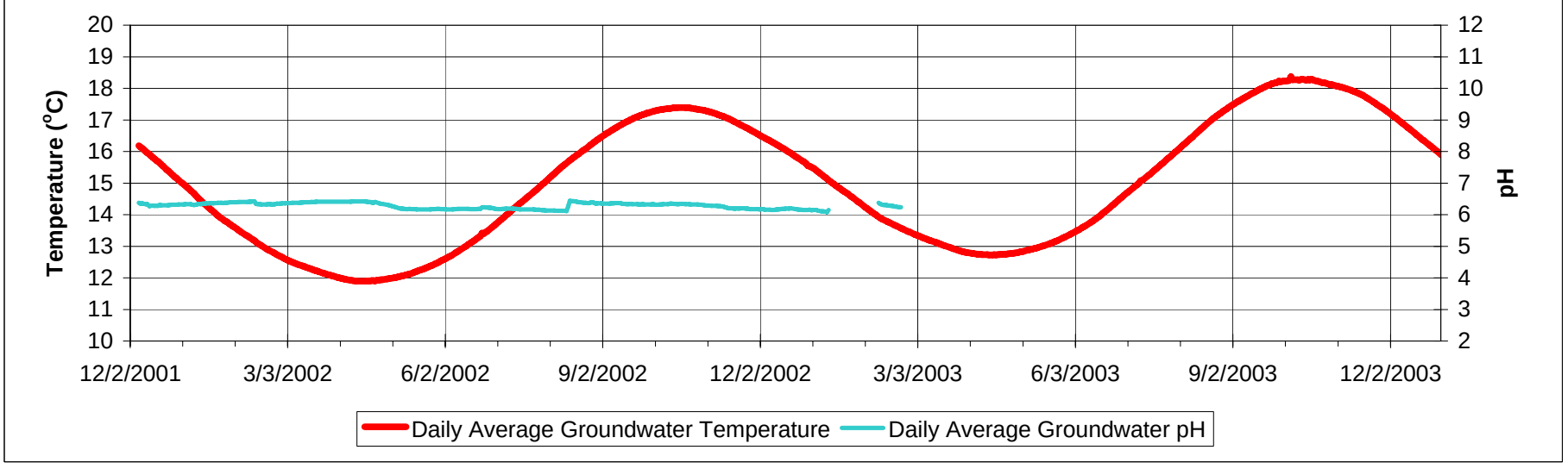

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-11
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-6

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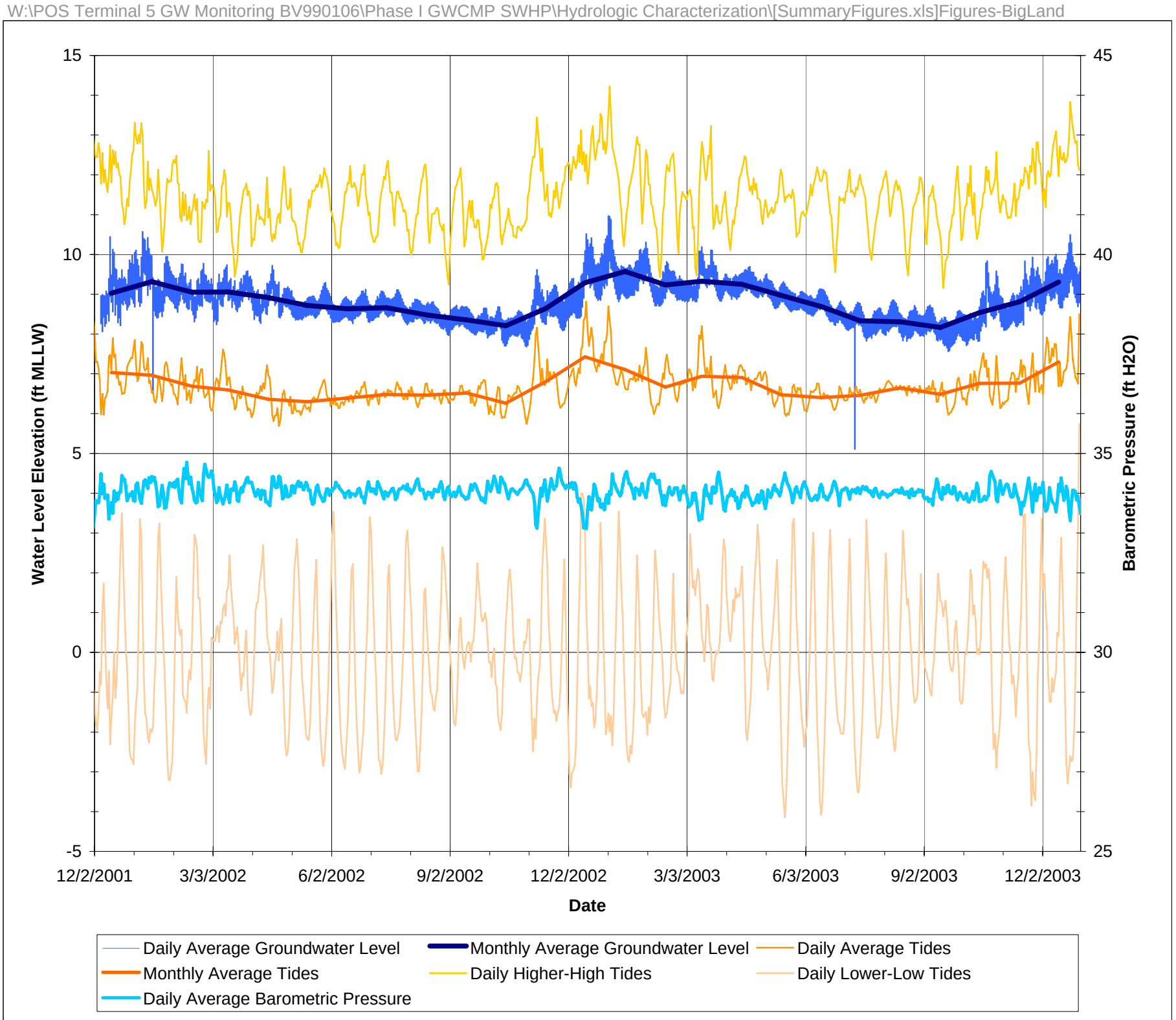

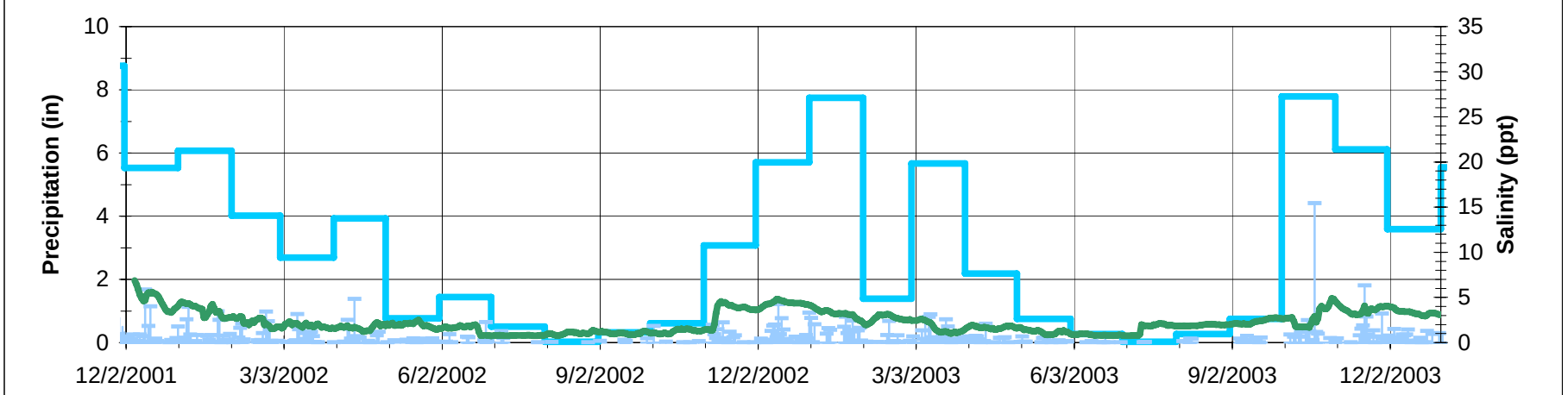

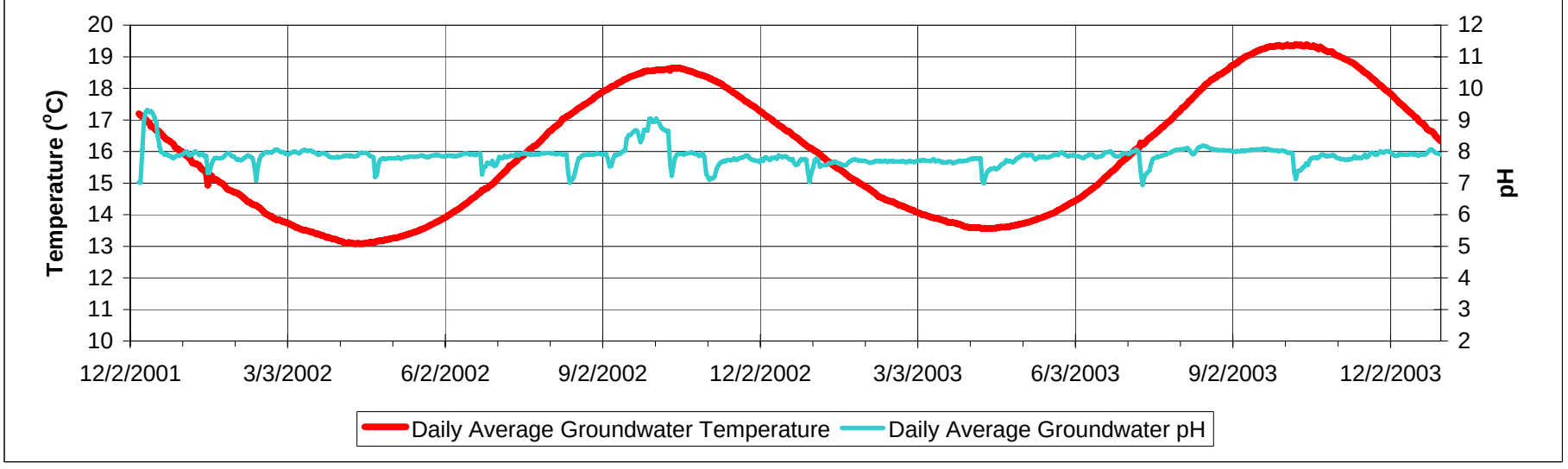

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-12
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-7

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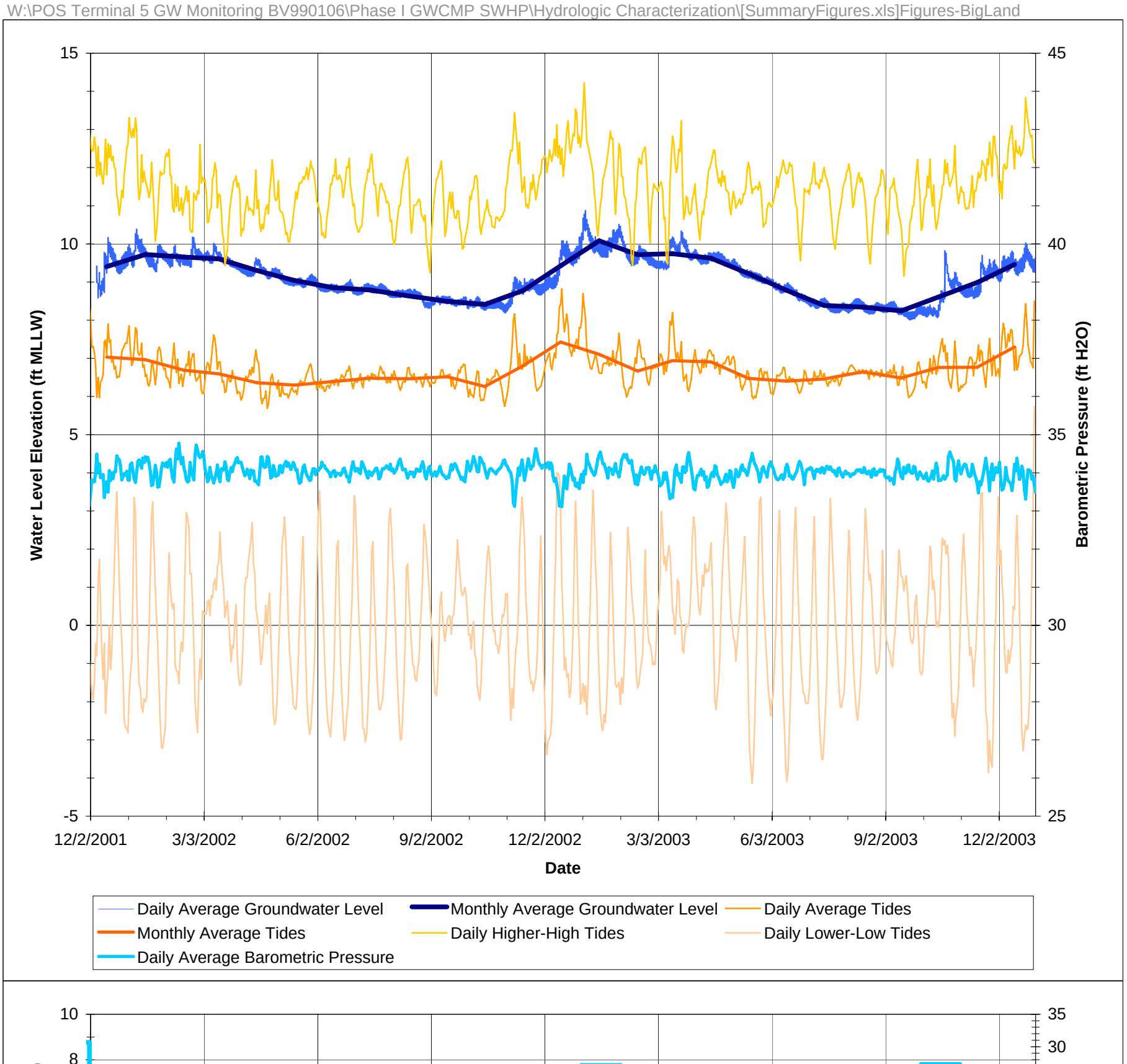

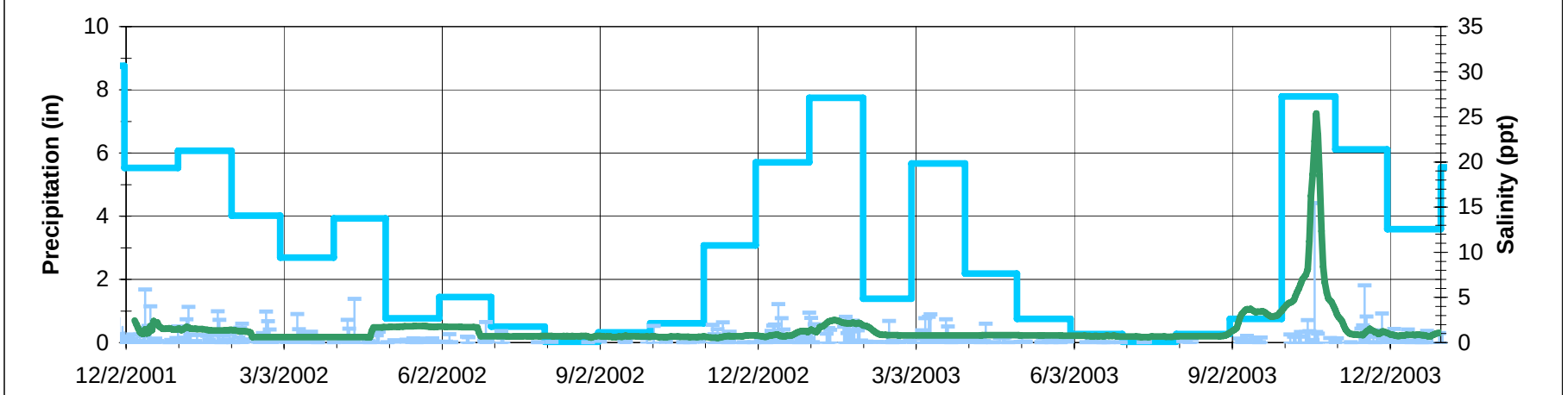

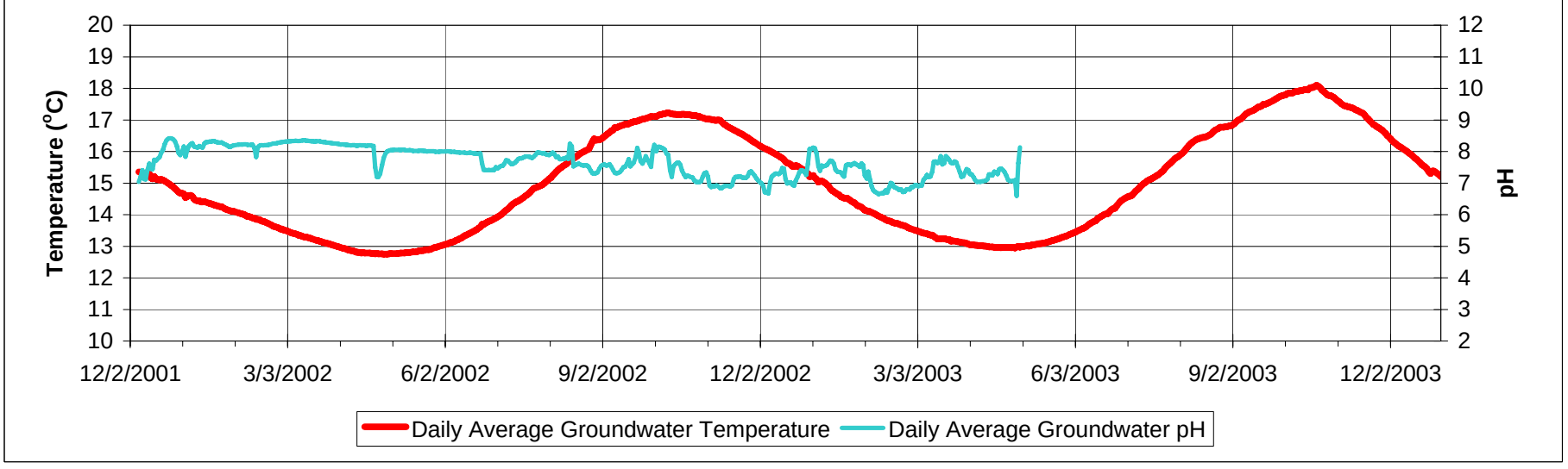

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-13
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-8

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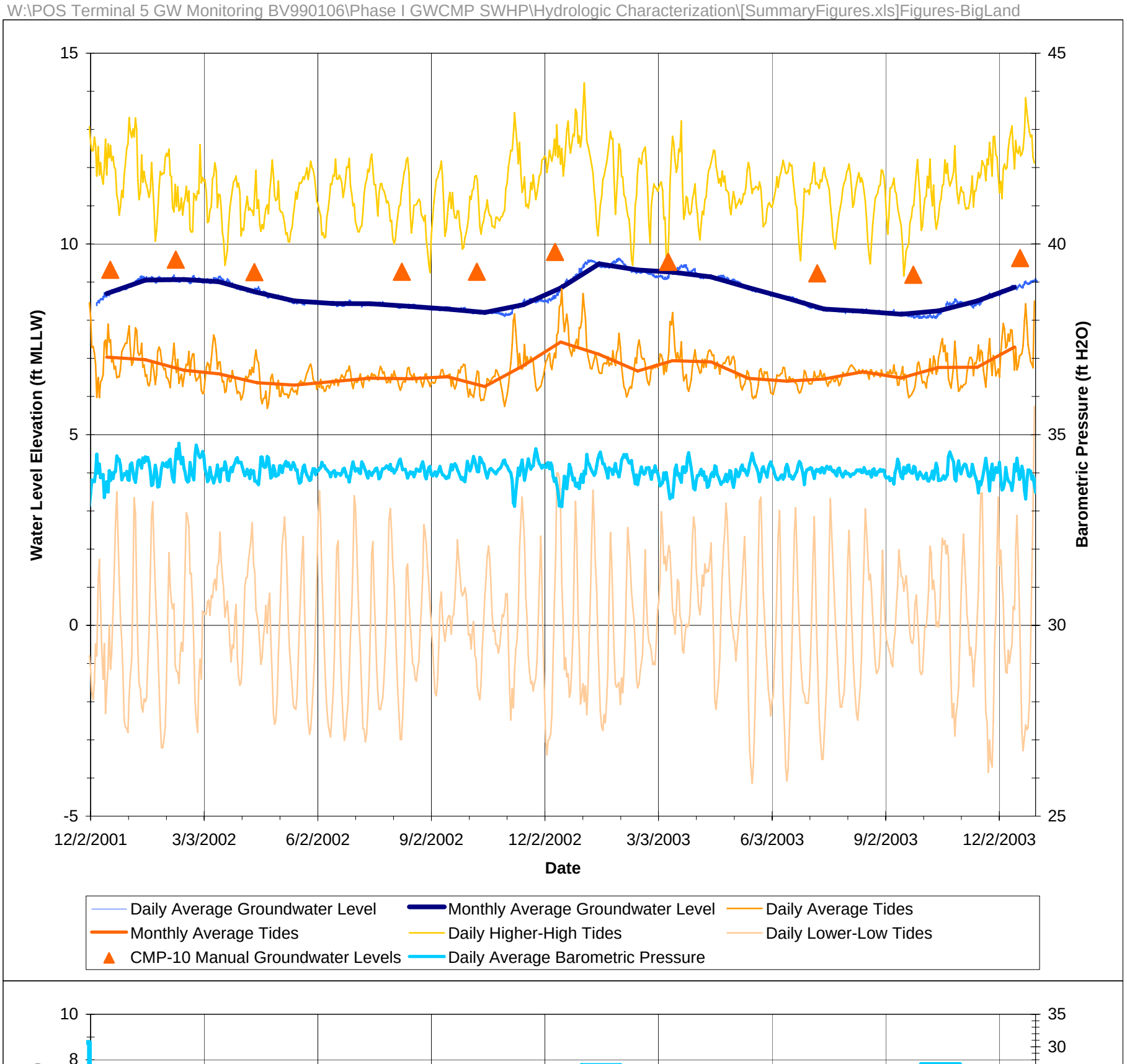

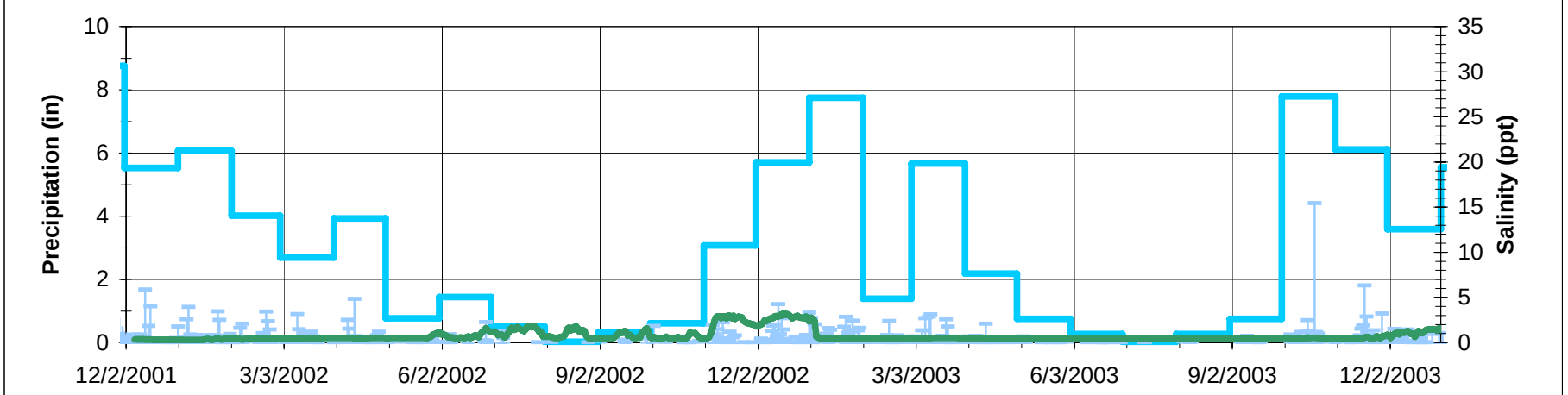

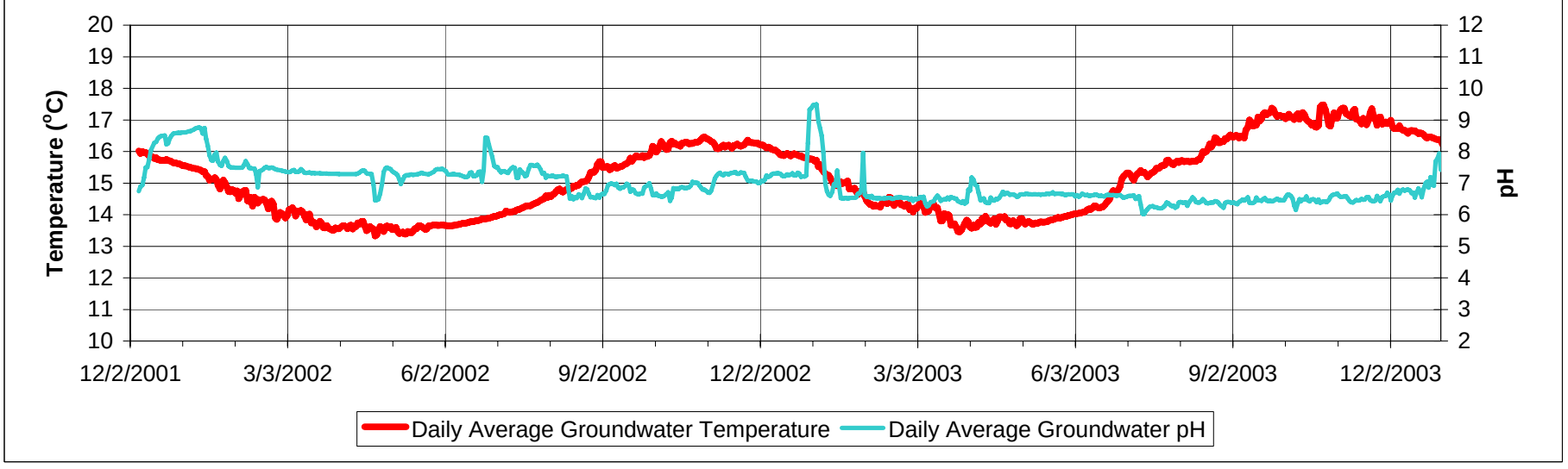

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-14
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-9

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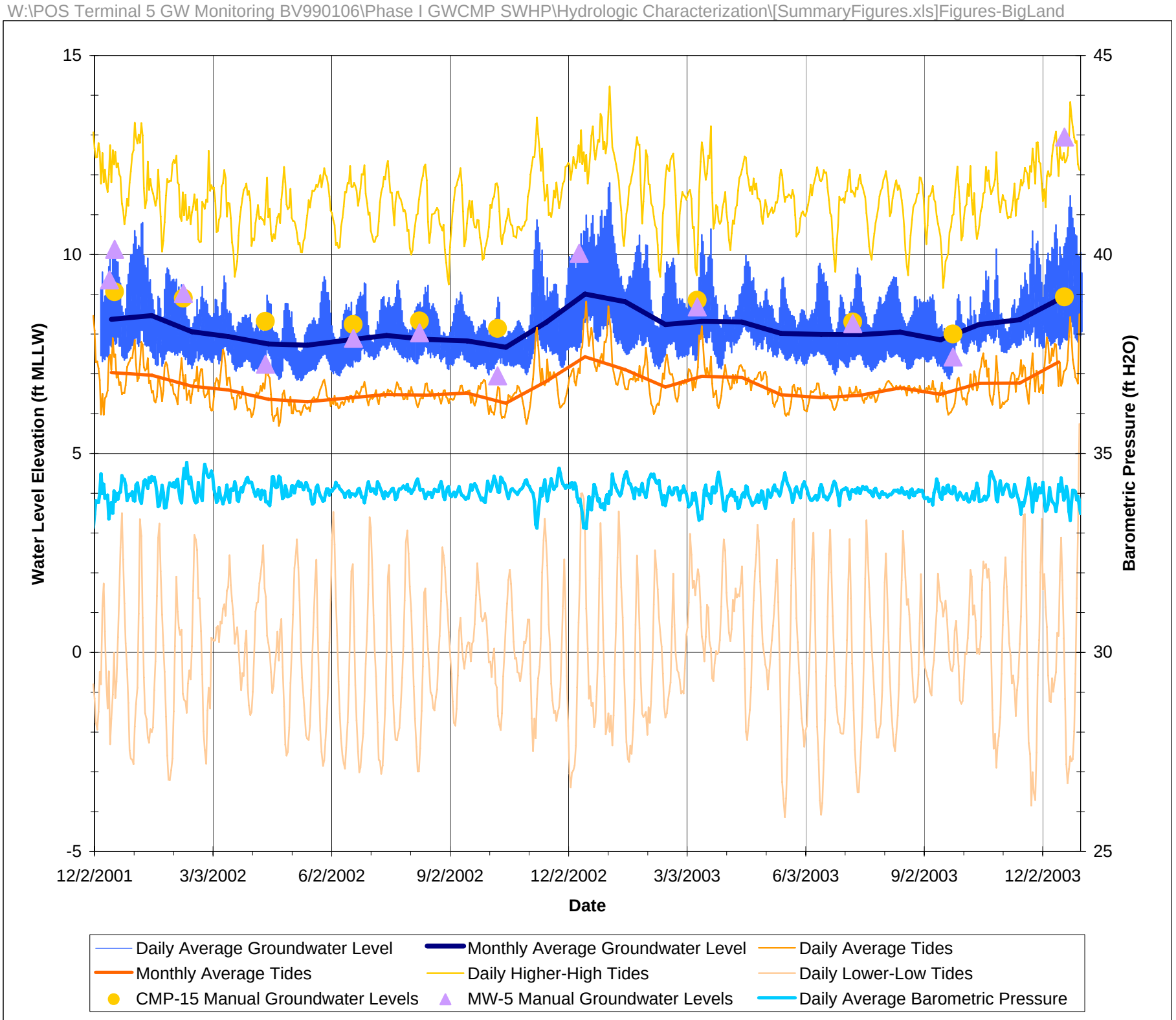

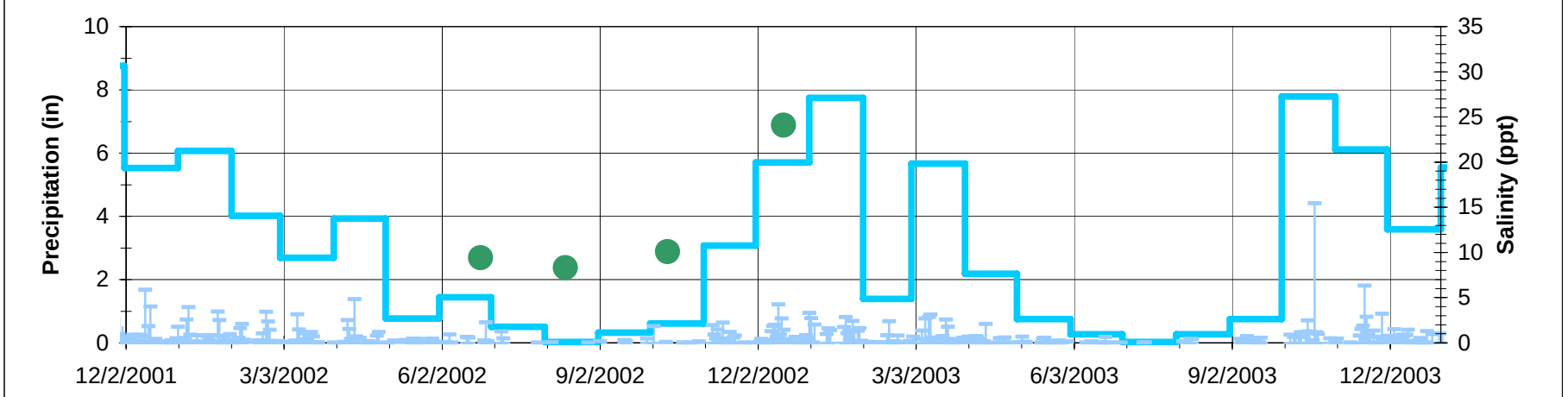

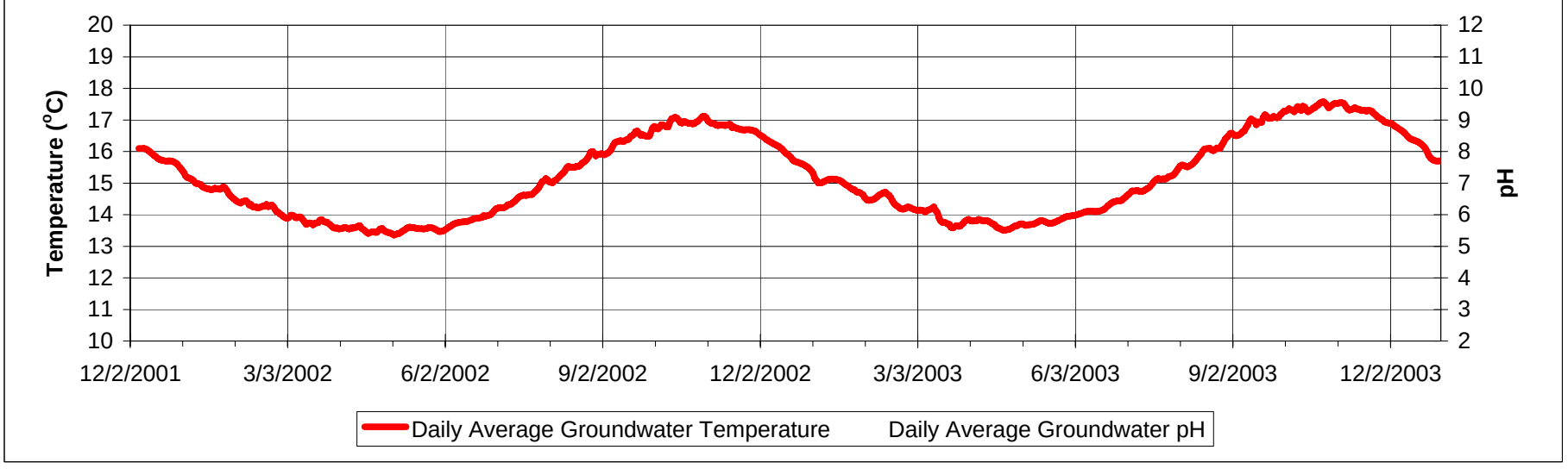

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-16
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Figure G-10

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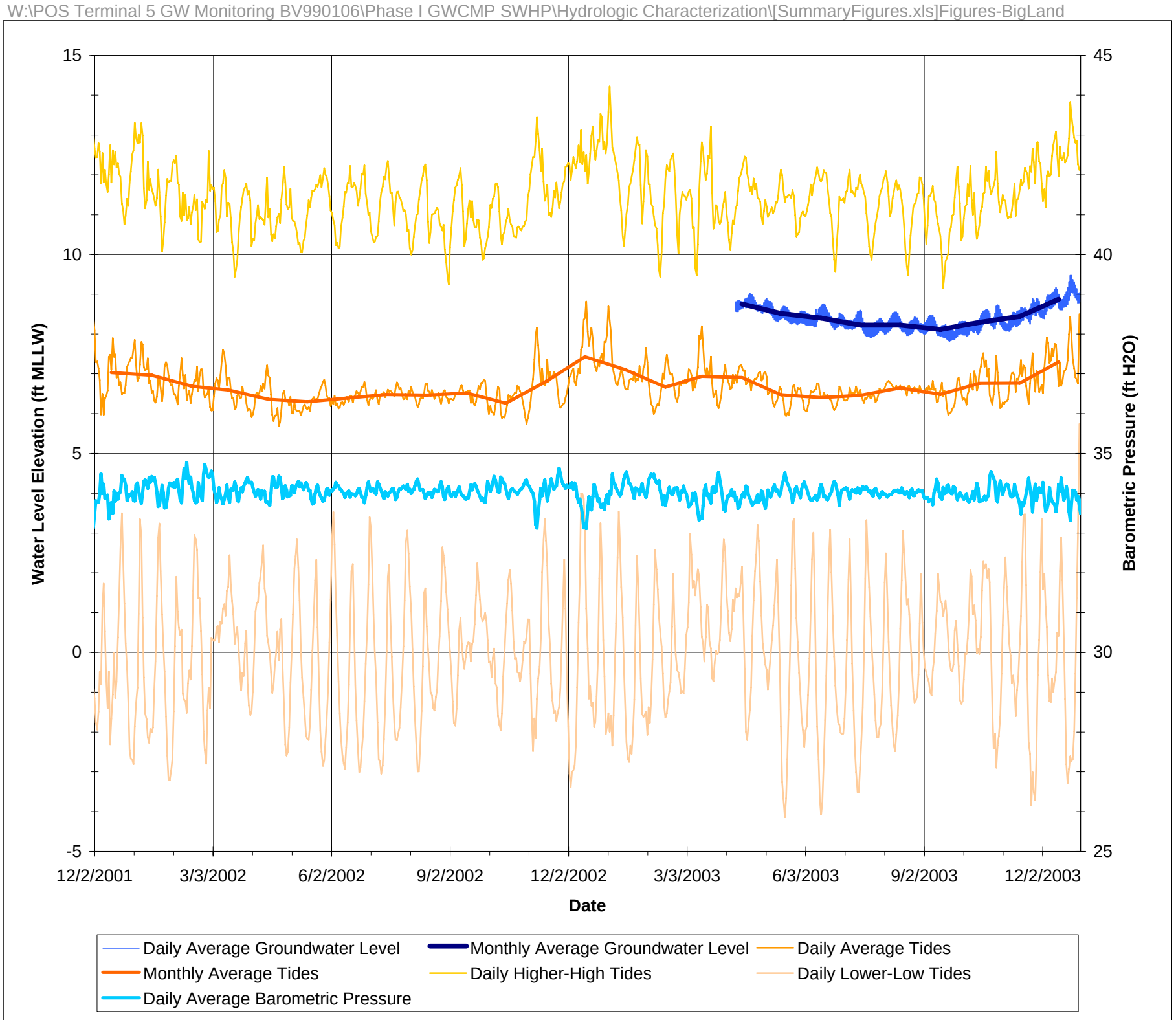

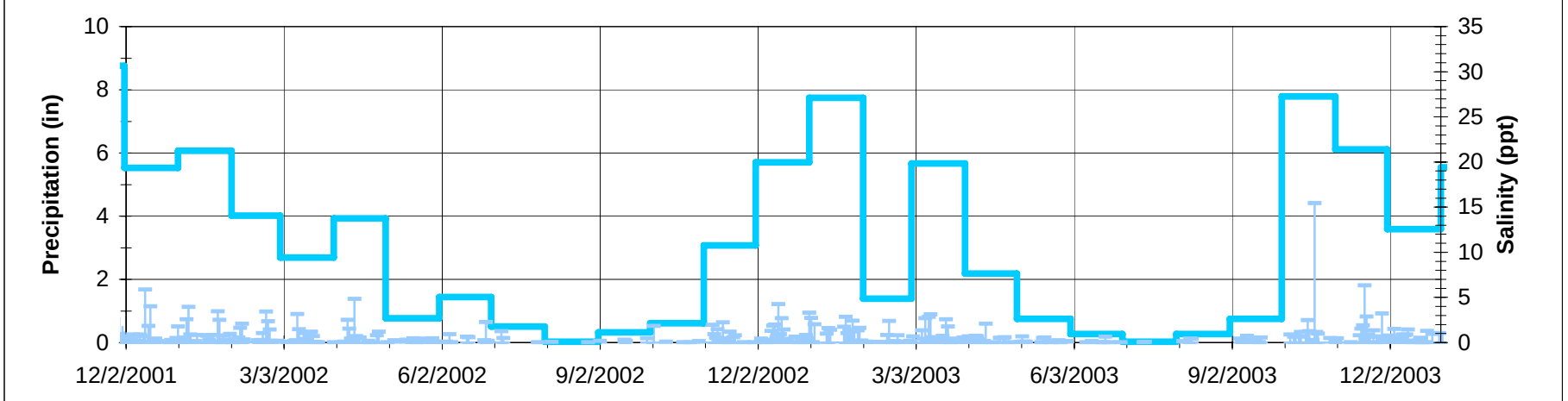

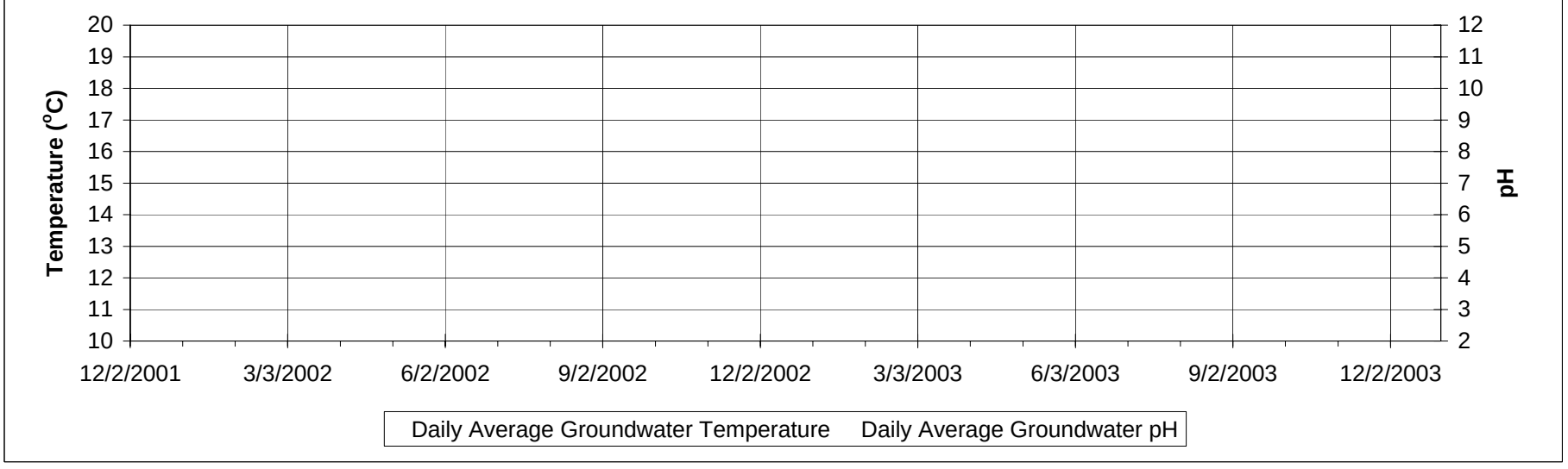

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-18
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-11

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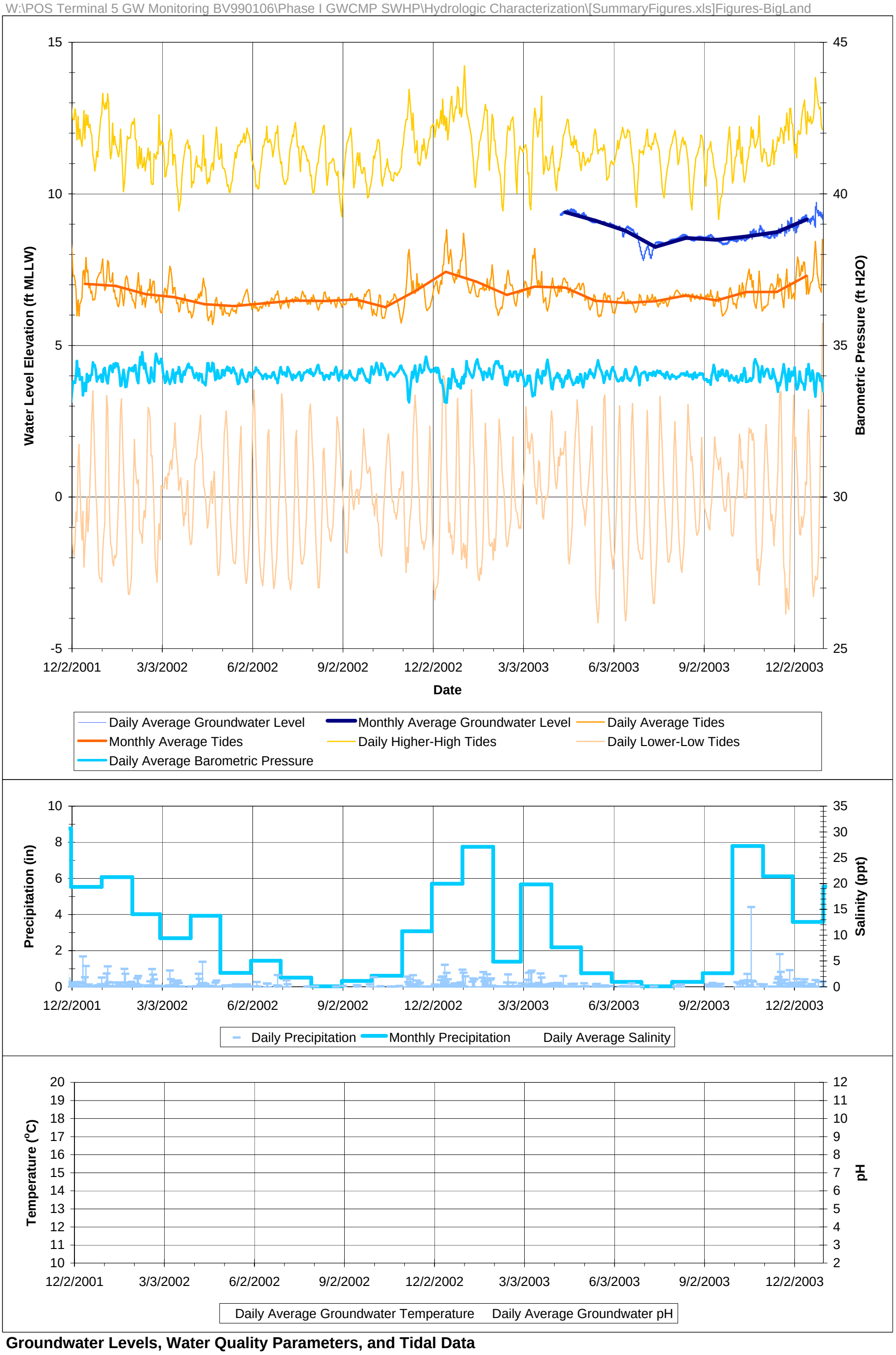

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-19
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Figure G-12

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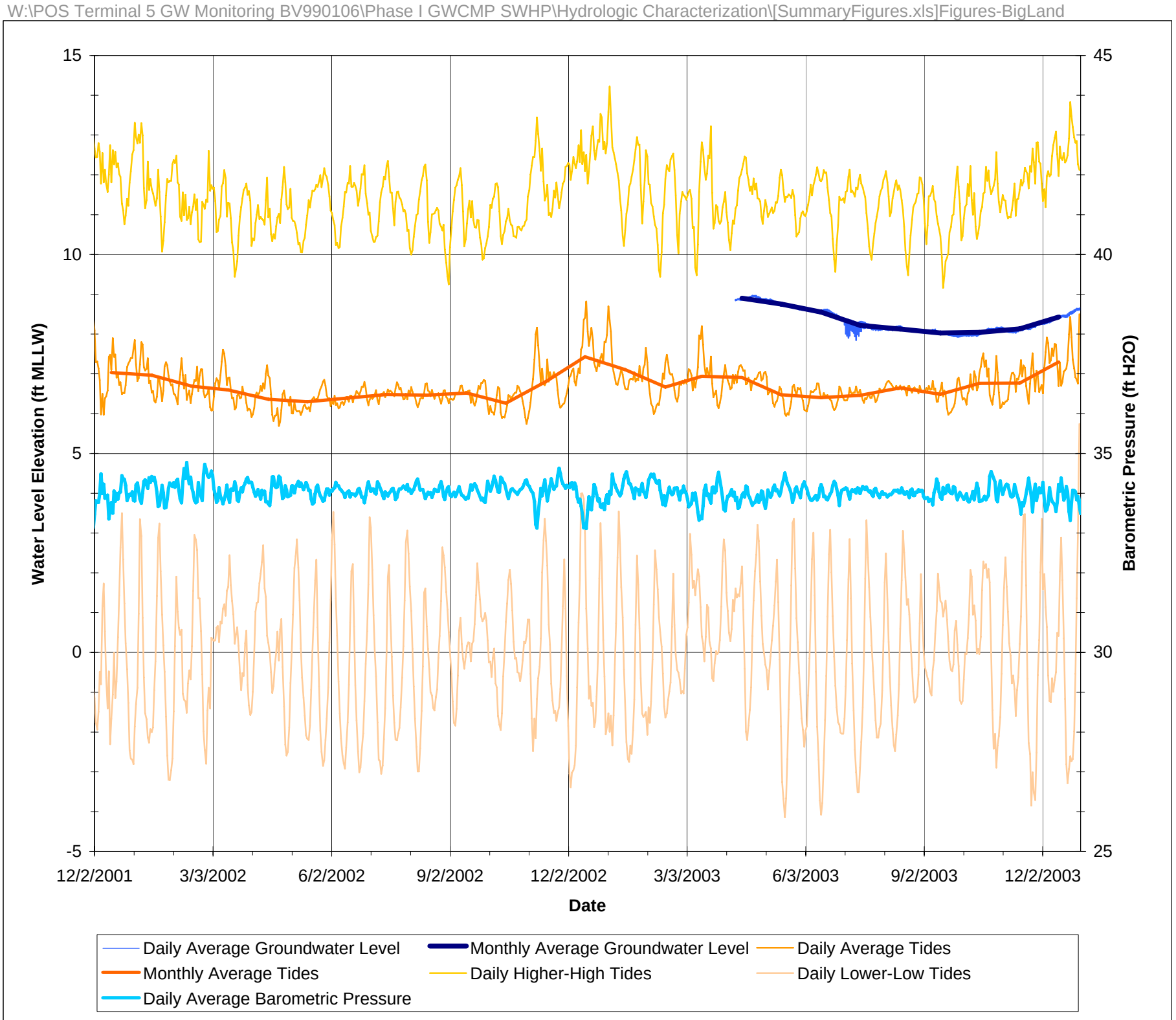

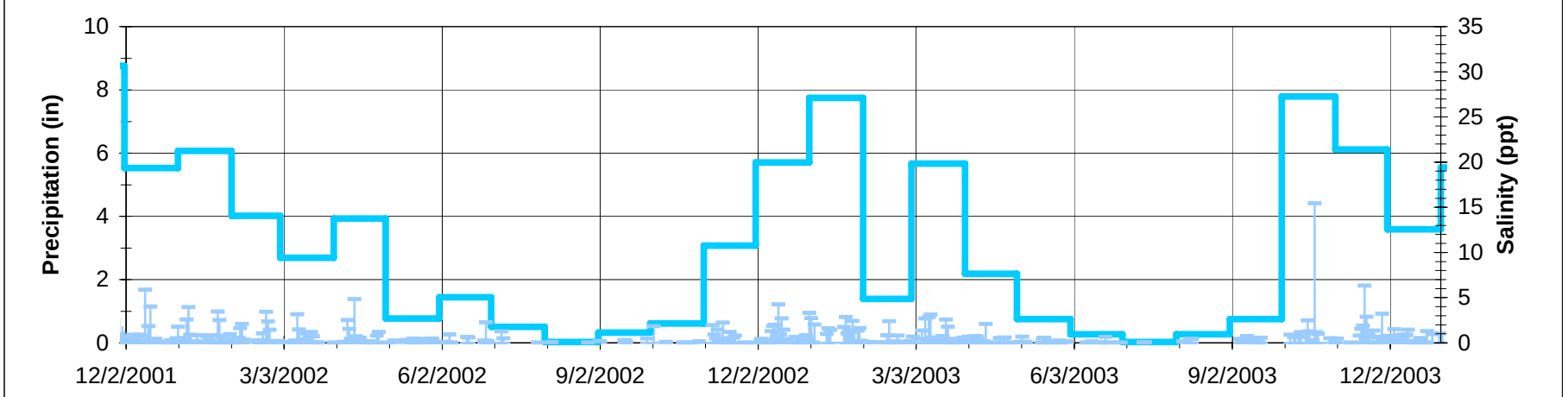

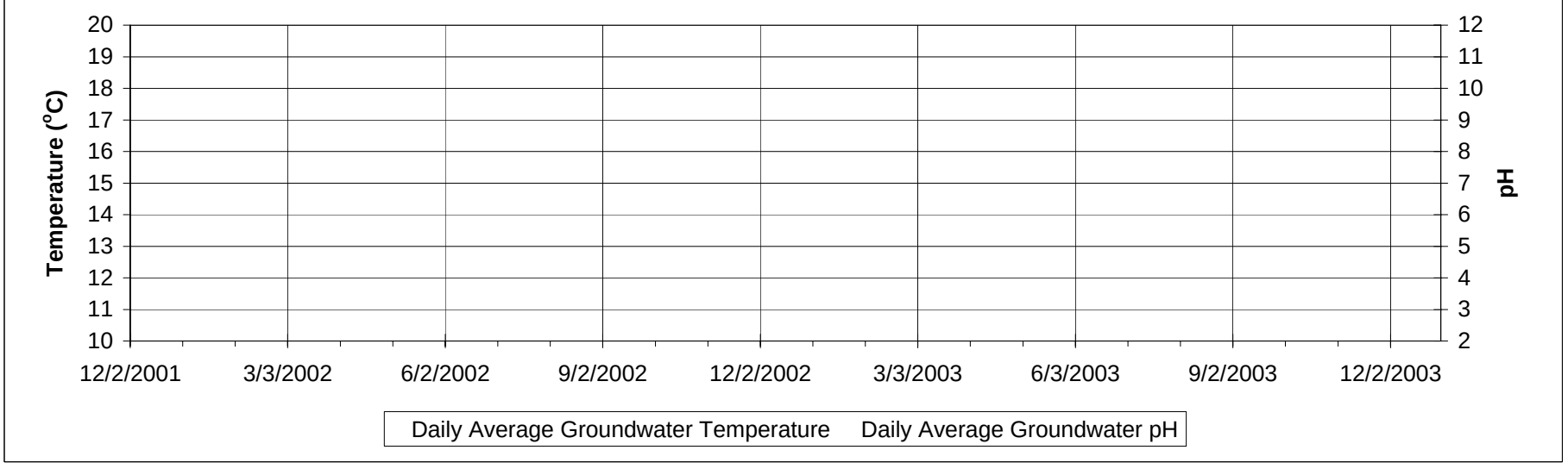

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well CMP-20
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-13

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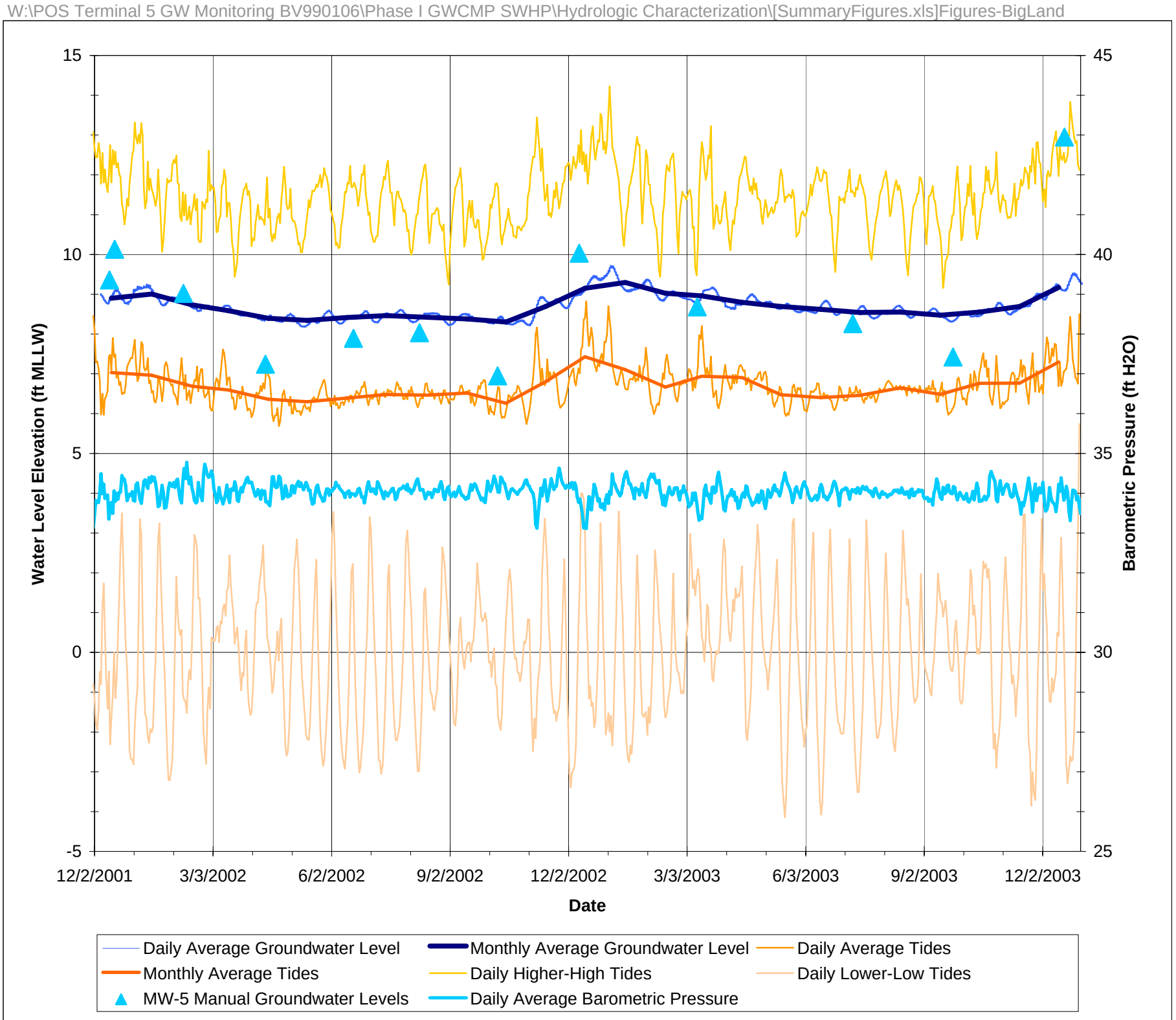

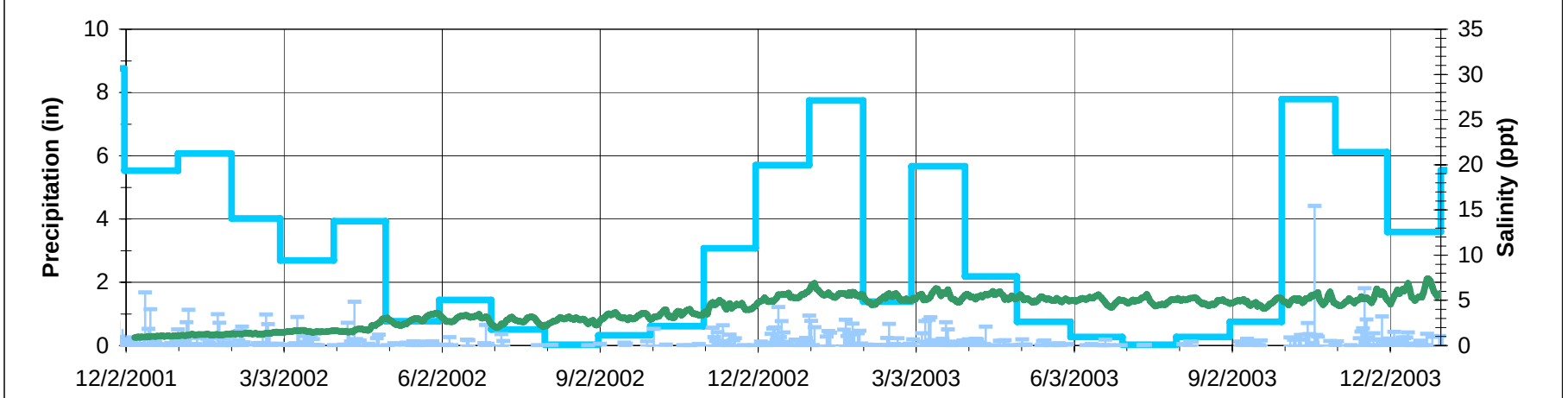

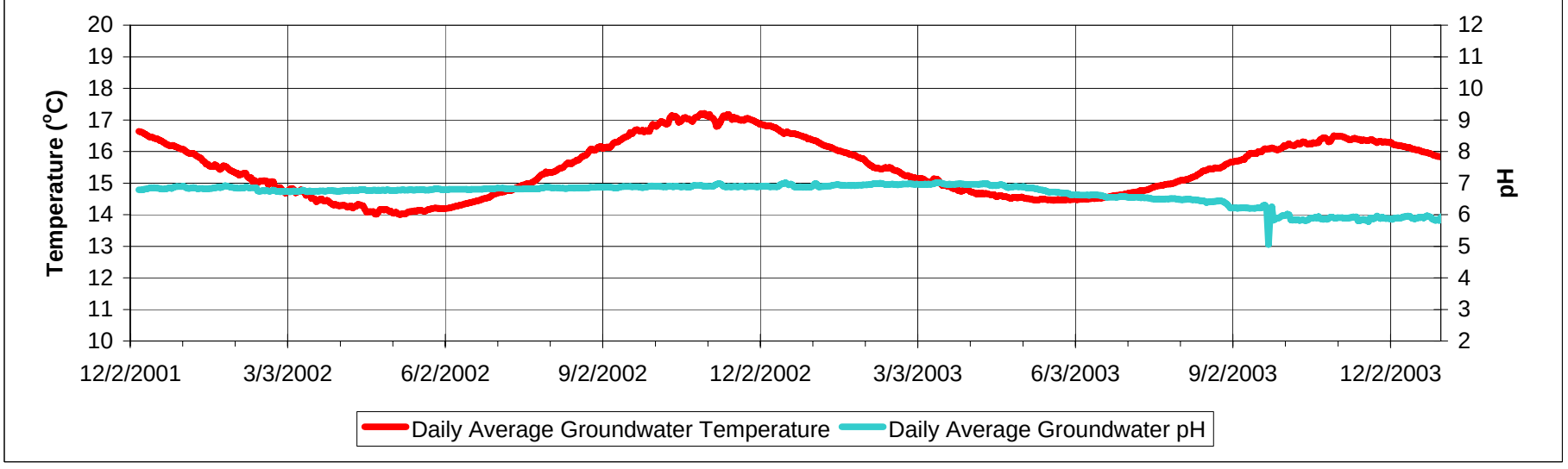

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well MW-26R
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-14

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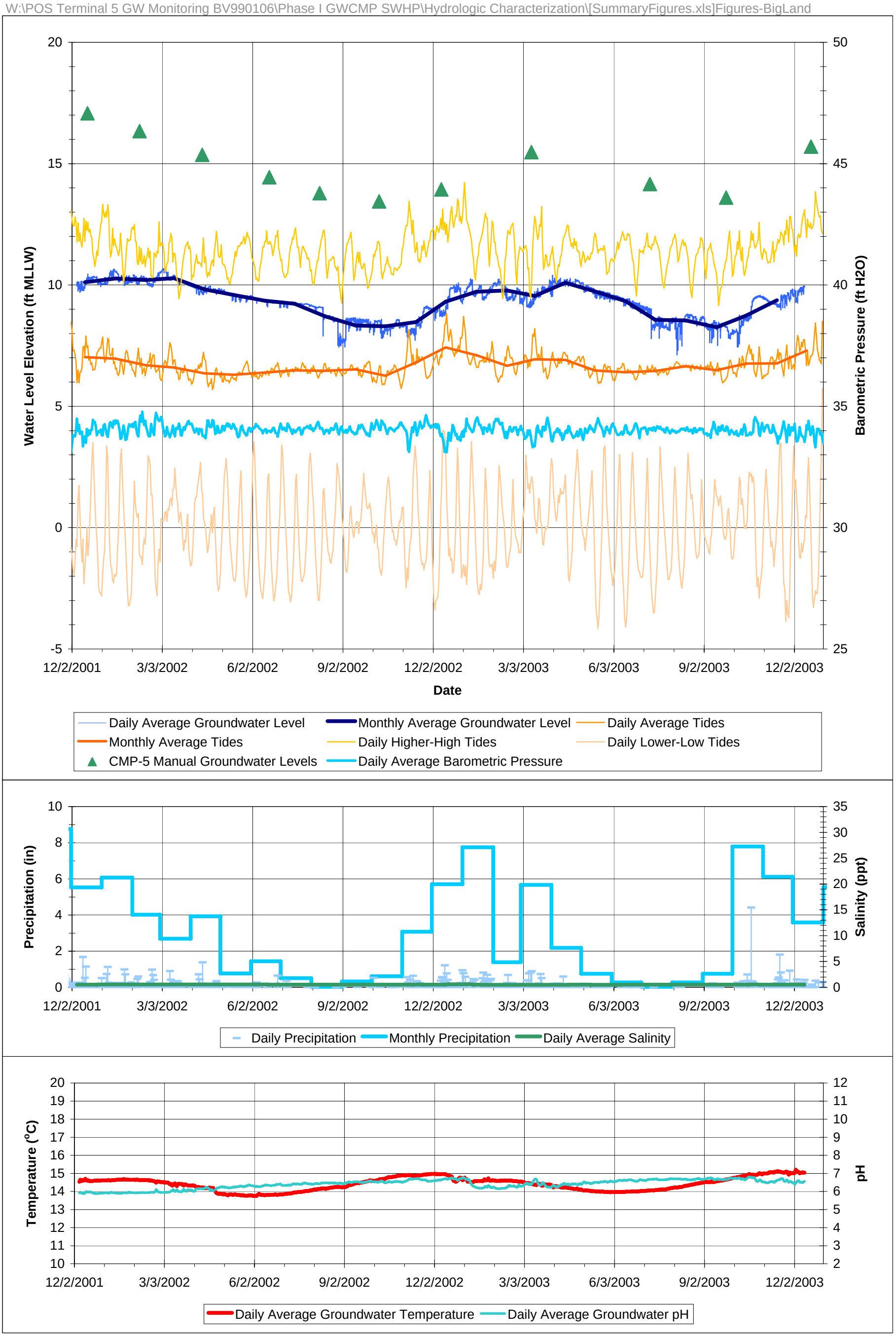

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well MW-307A
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-15

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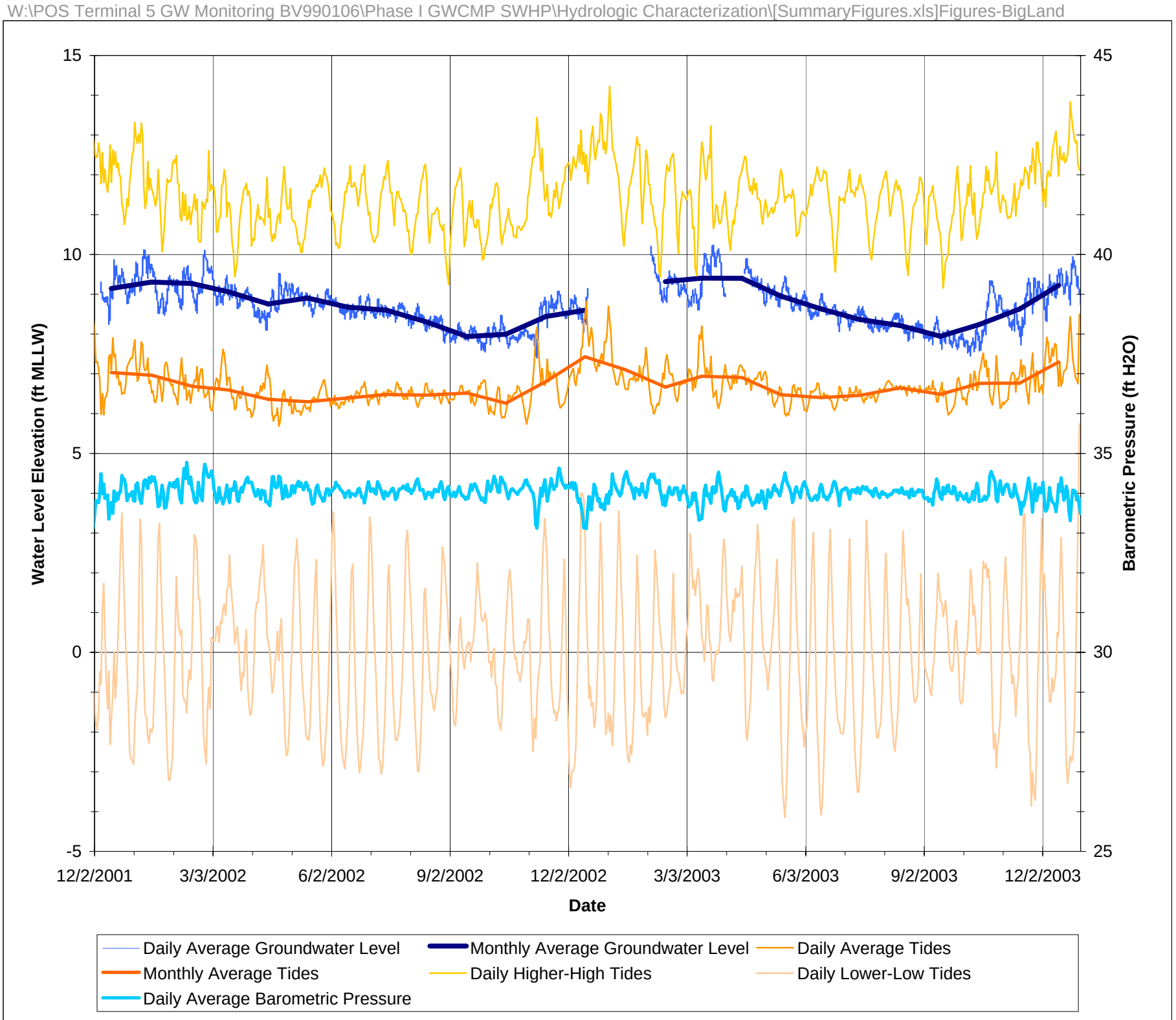

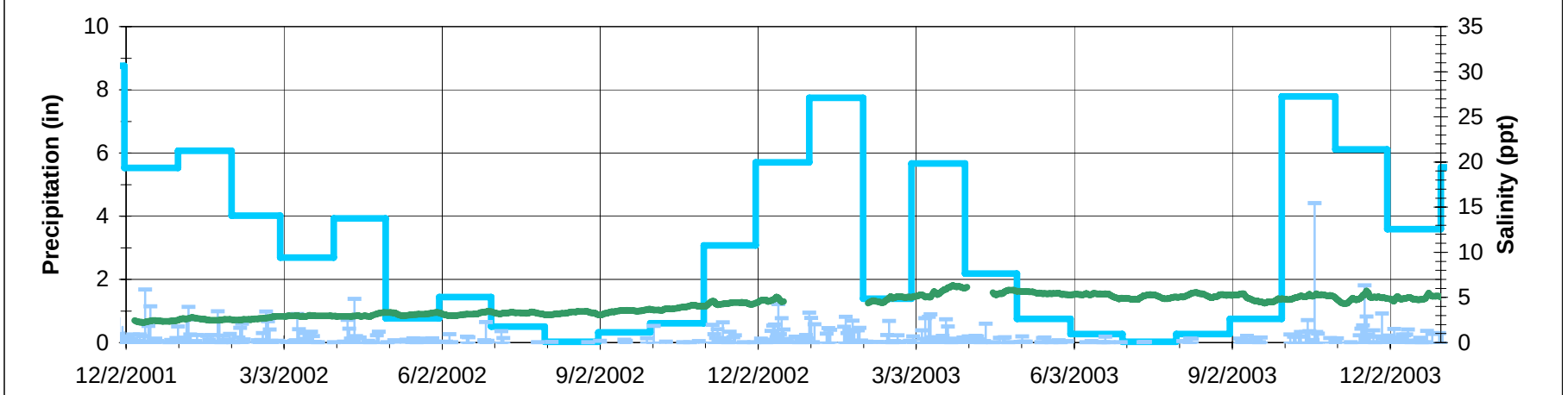

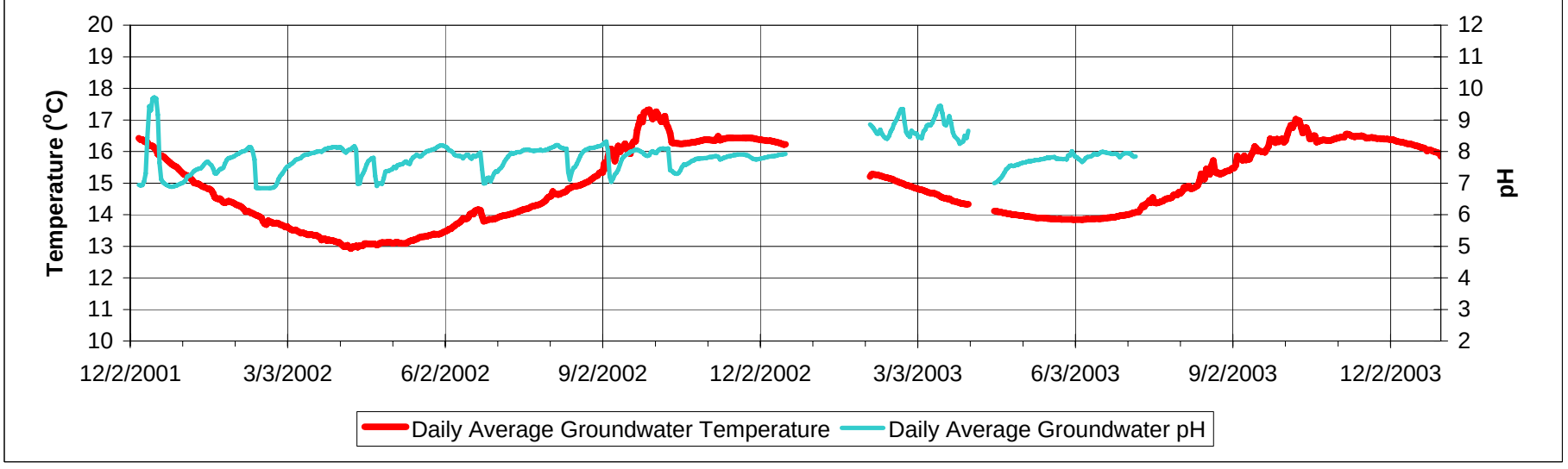

Groundwater Levels, Water Quality Parameters, and Tidal Data
Fill Aquifer Well MW-308N
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-16

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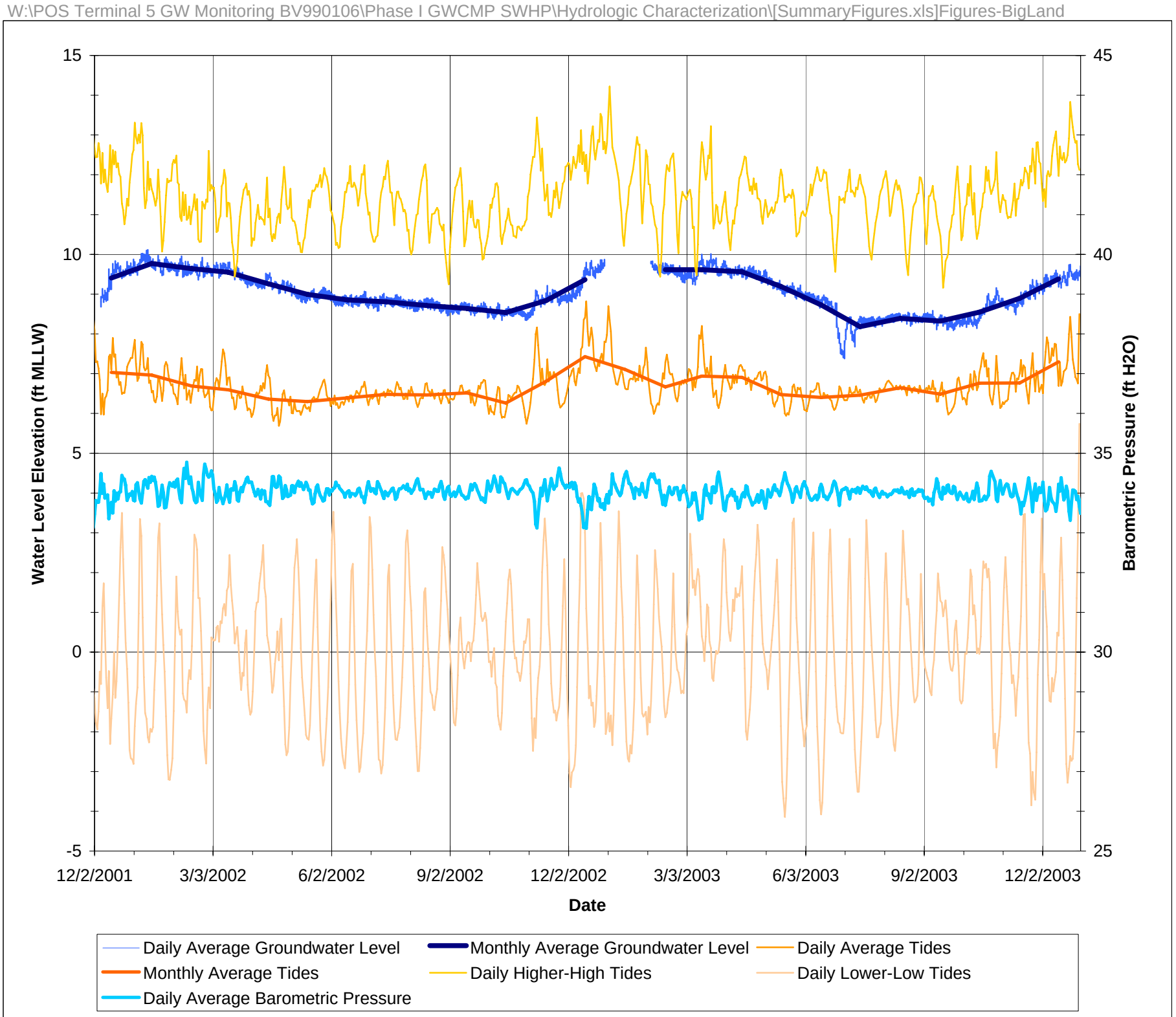

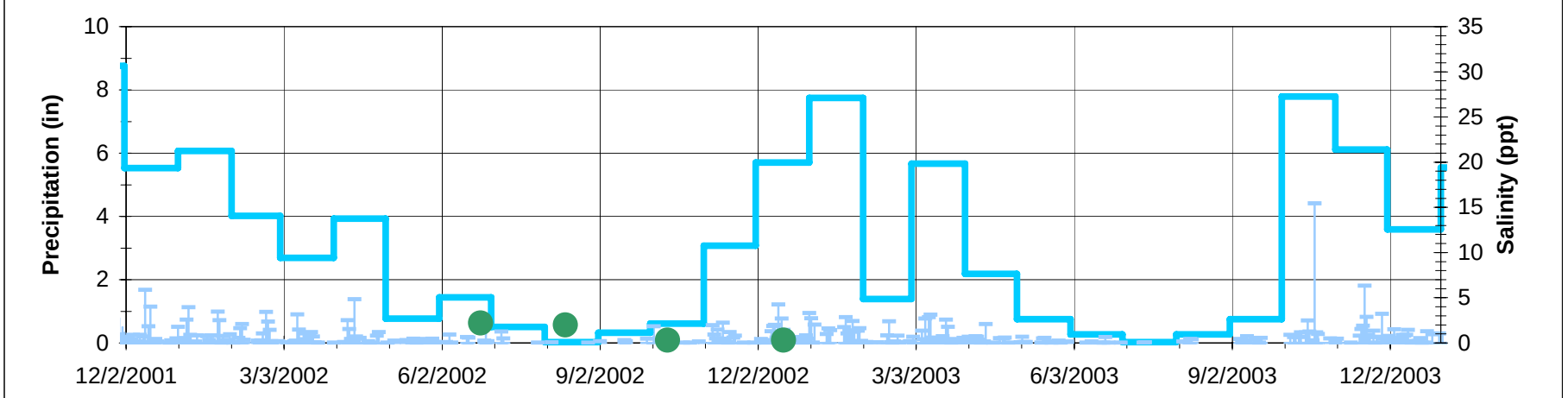

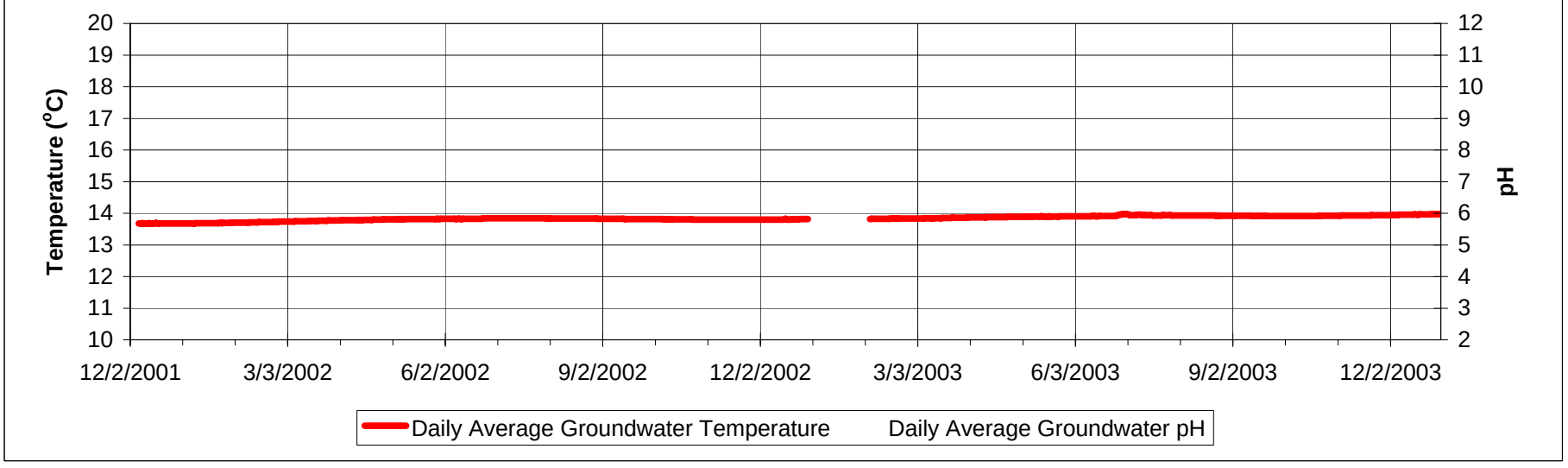

Groundwater Levels, Water Quality Parameters, and Tidal Data
Estuarine Aquifer Well CMP-7
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-17

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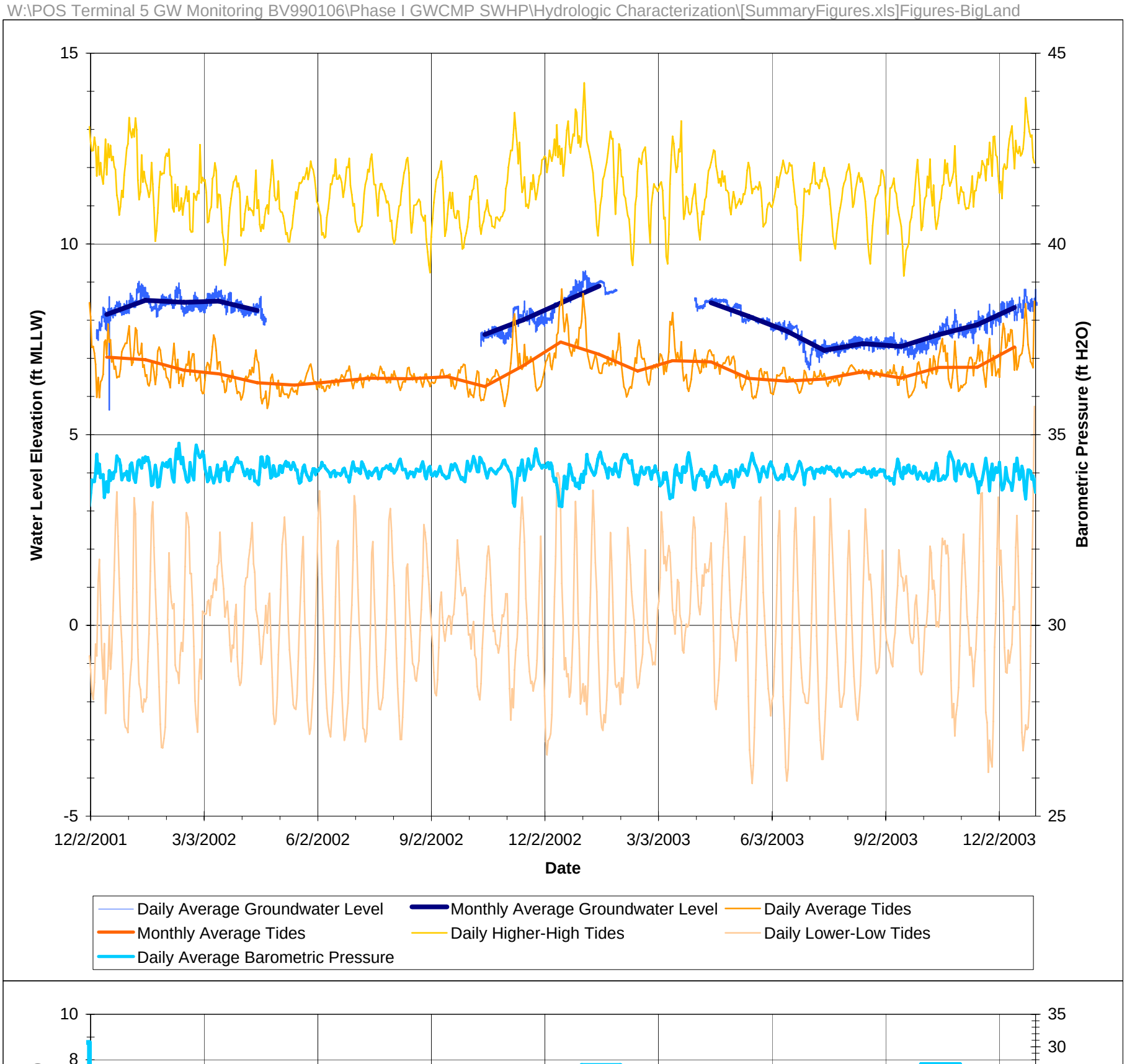

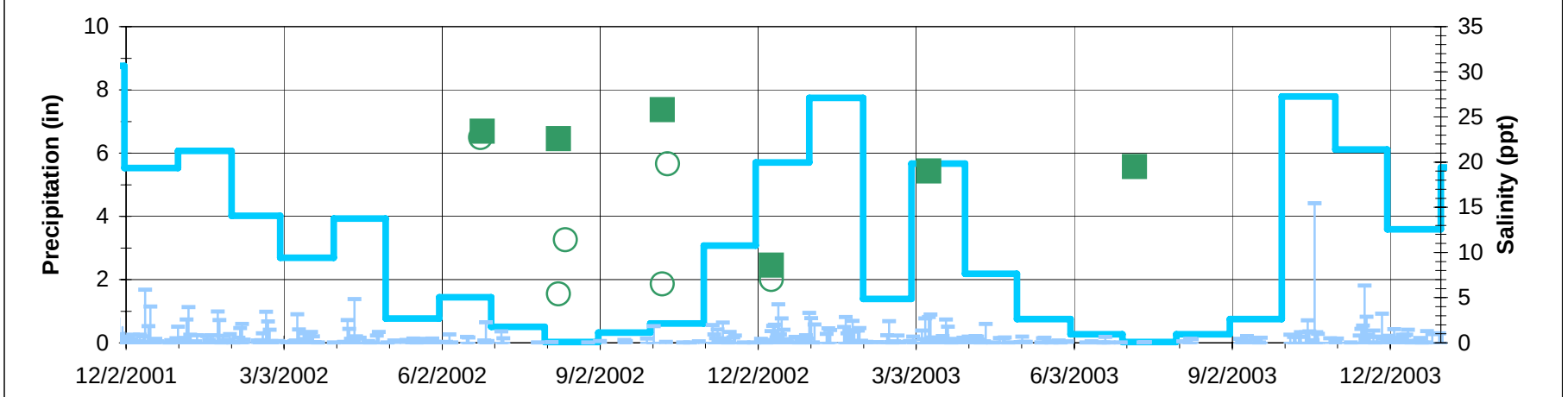

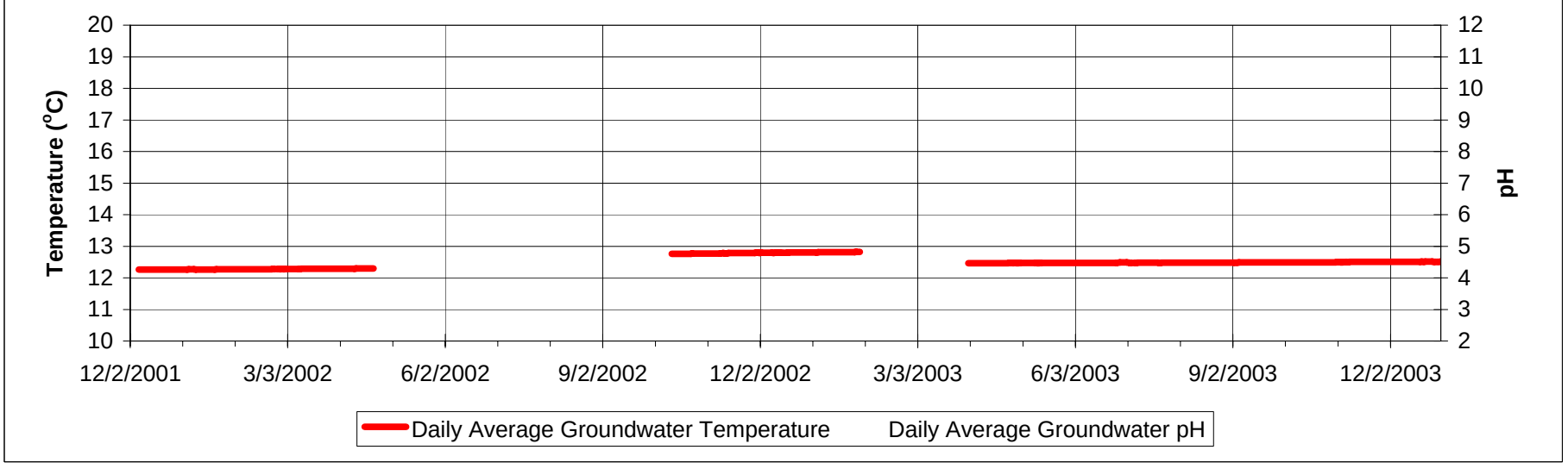

Groundwater Levels, Water Quality Parameters, and Tidal Data
Estuarine Aquifer Well MW-36
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Figure G-18

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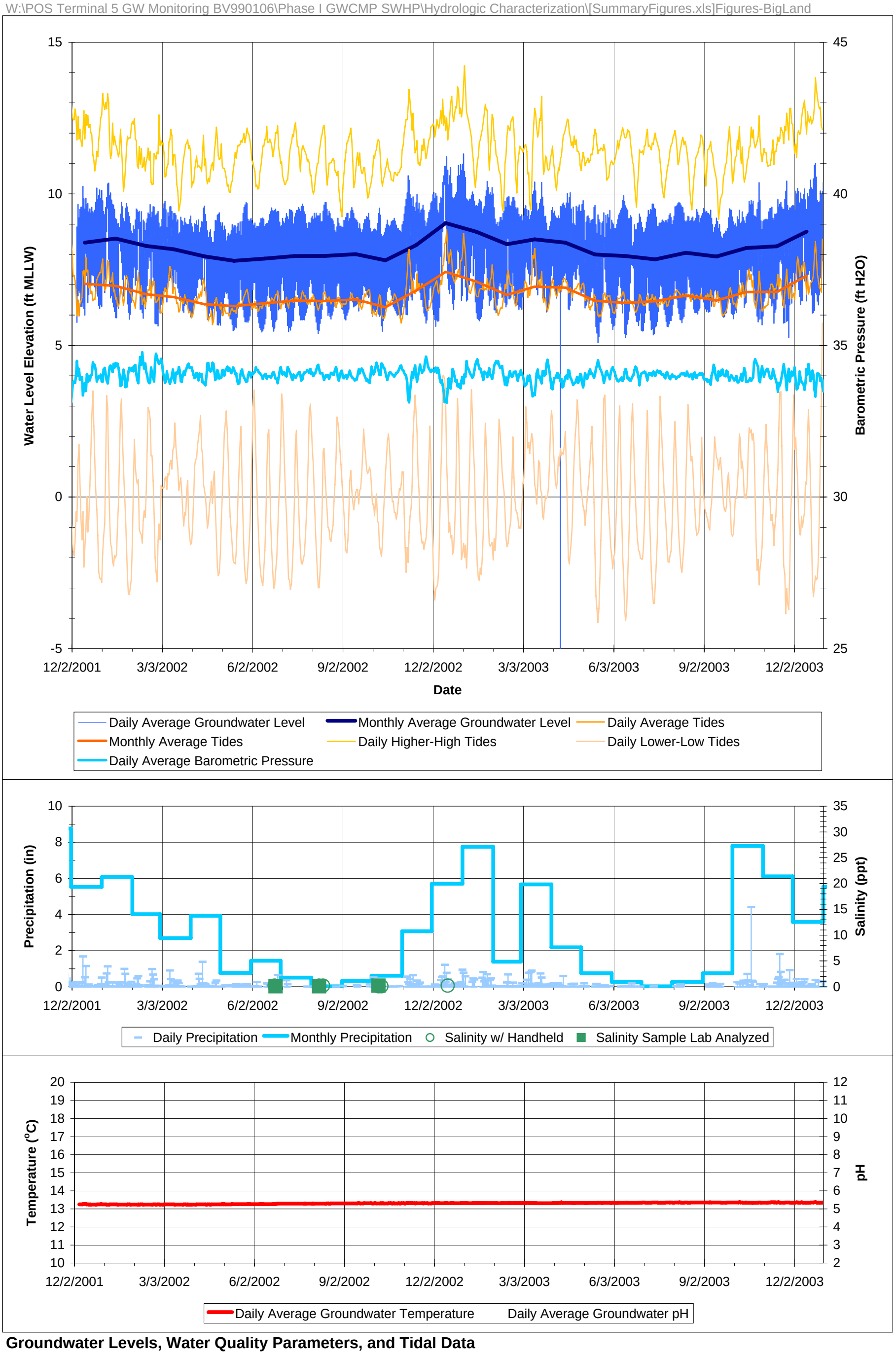

Groundwater Levels, Water Quality Parameters, and Tidal Data
Estuarine Aquifer Well MW-44
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-19

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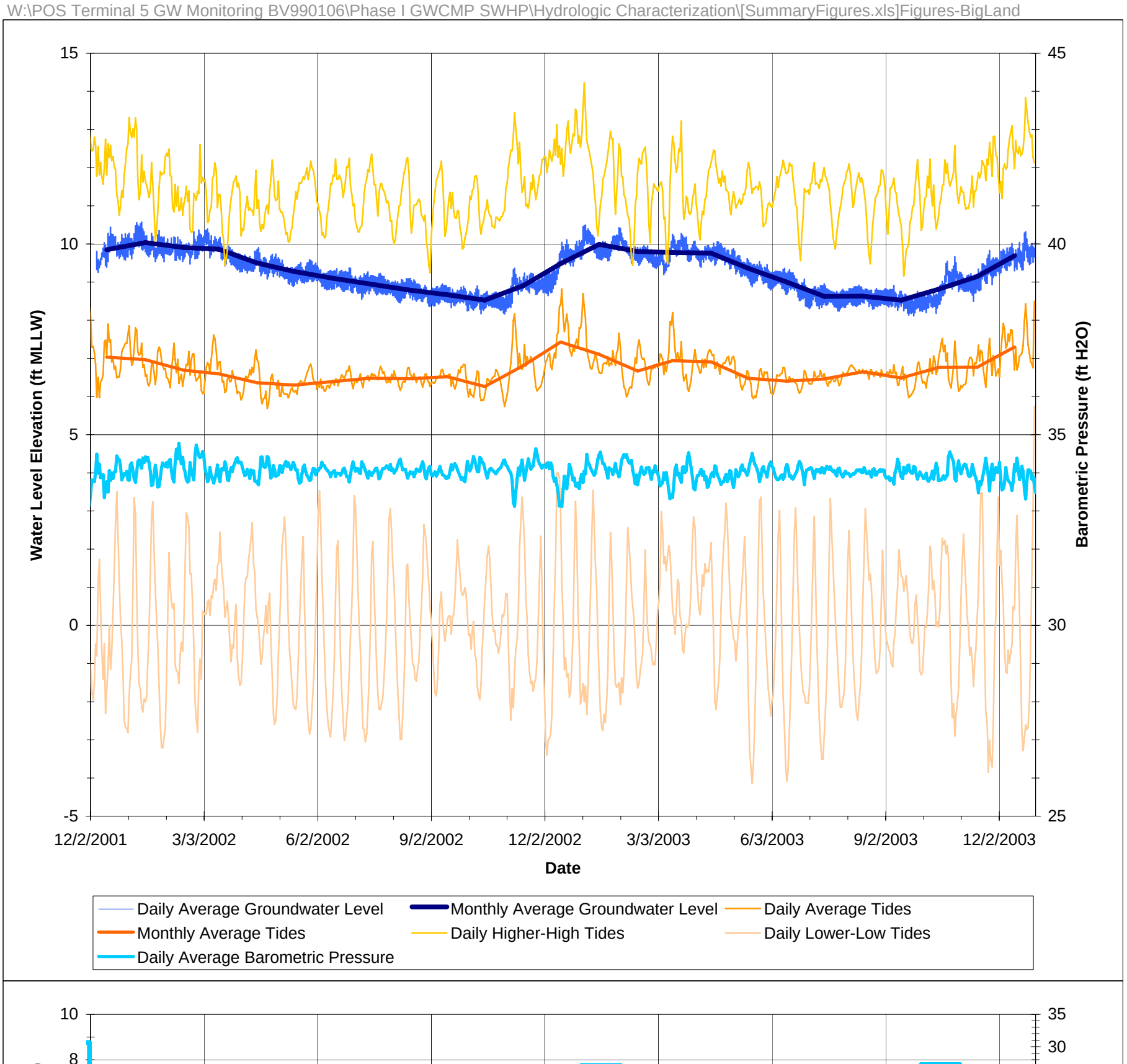

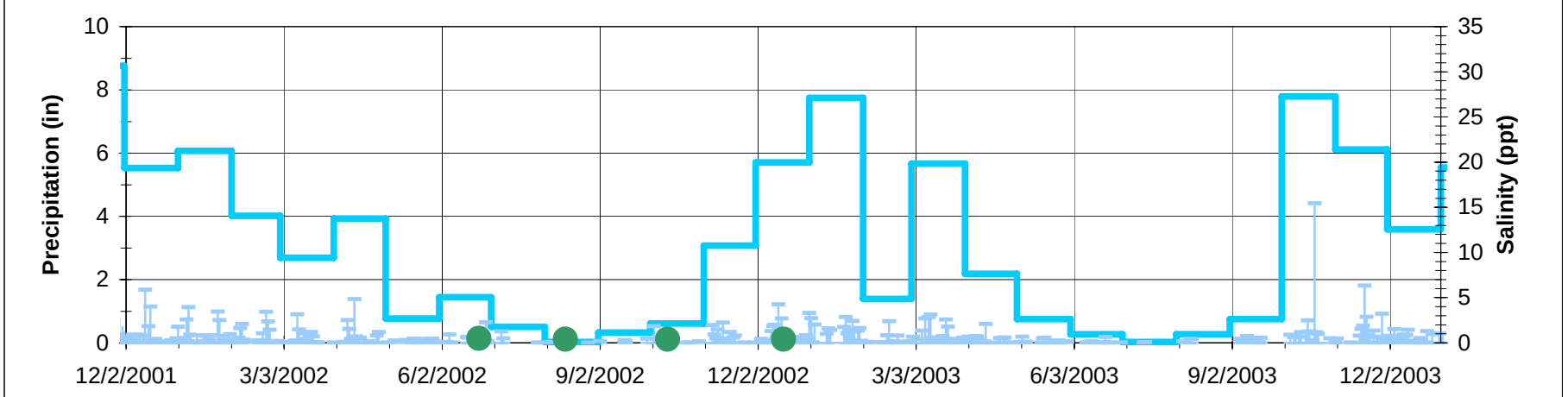

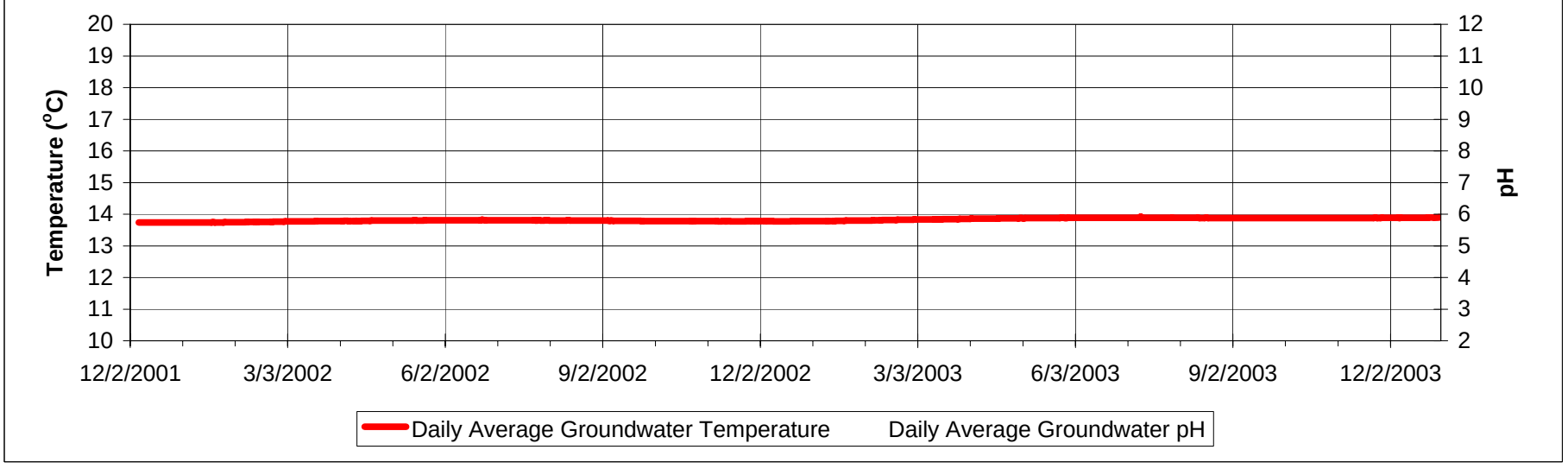

Groundwater Levels, Water Quality Parameters, and Tidal Data
Estuarine Aquifer Well MW-307BR
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Figure G-20

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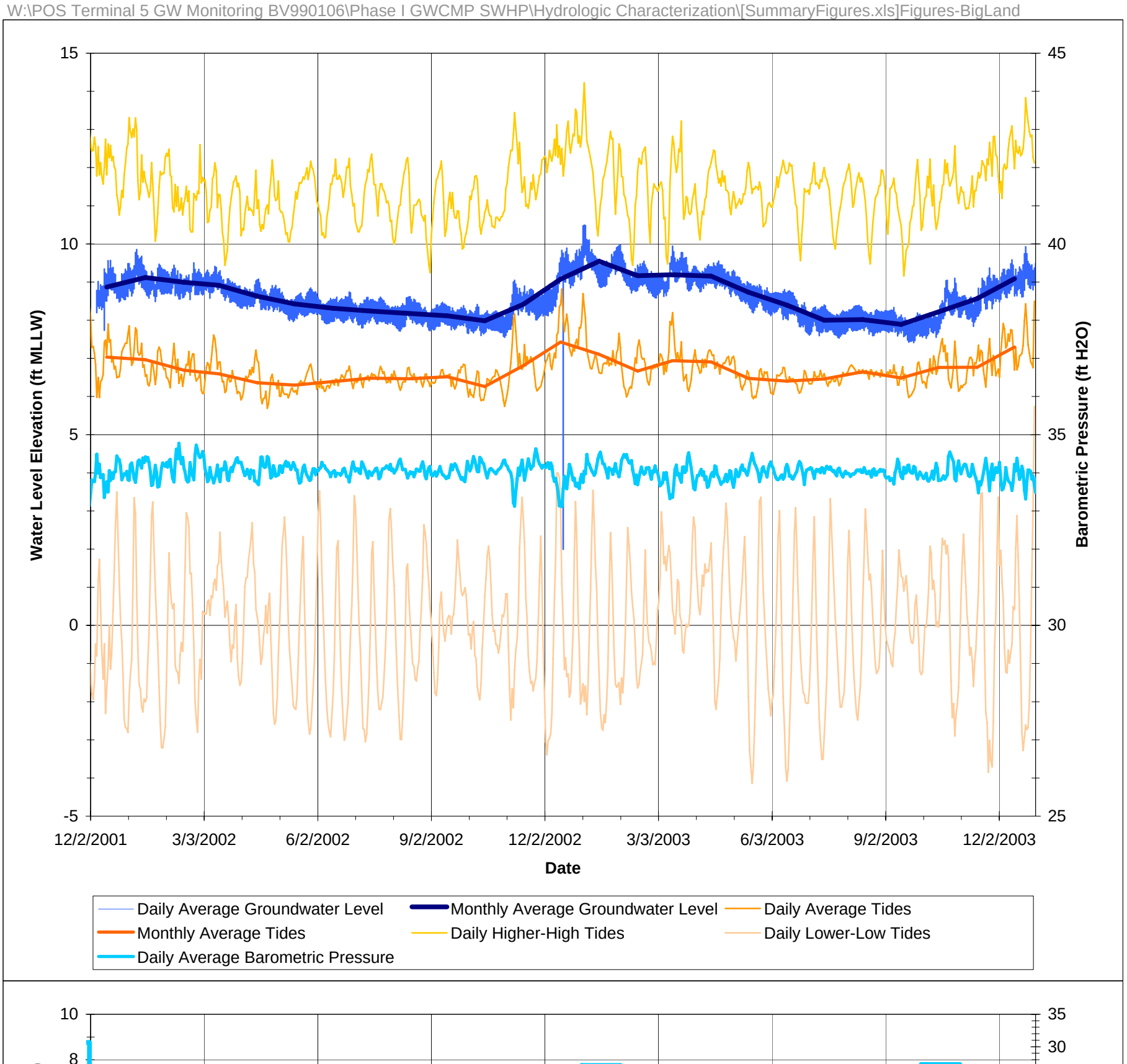

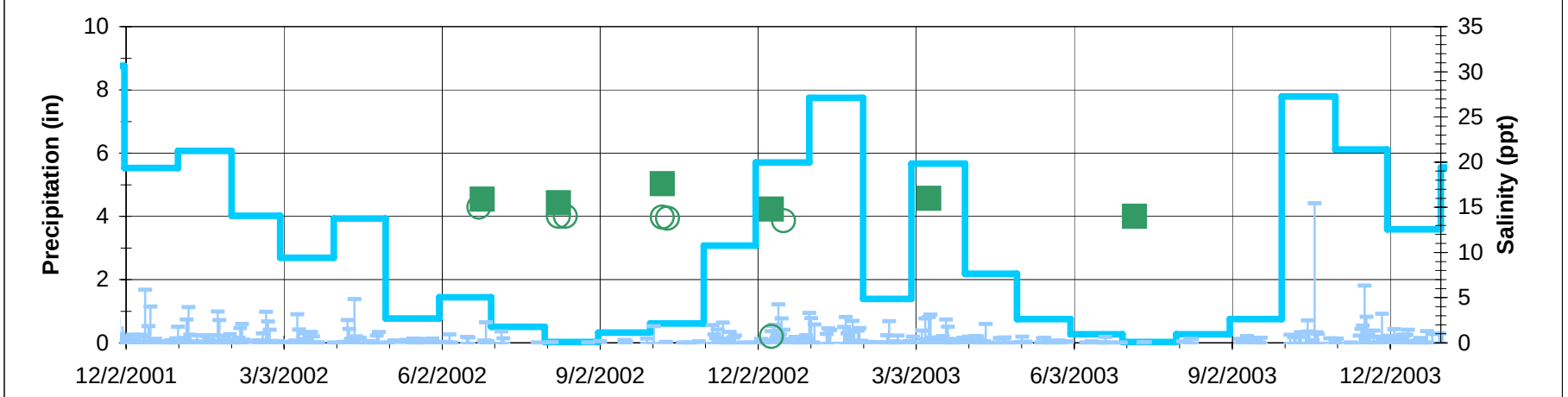

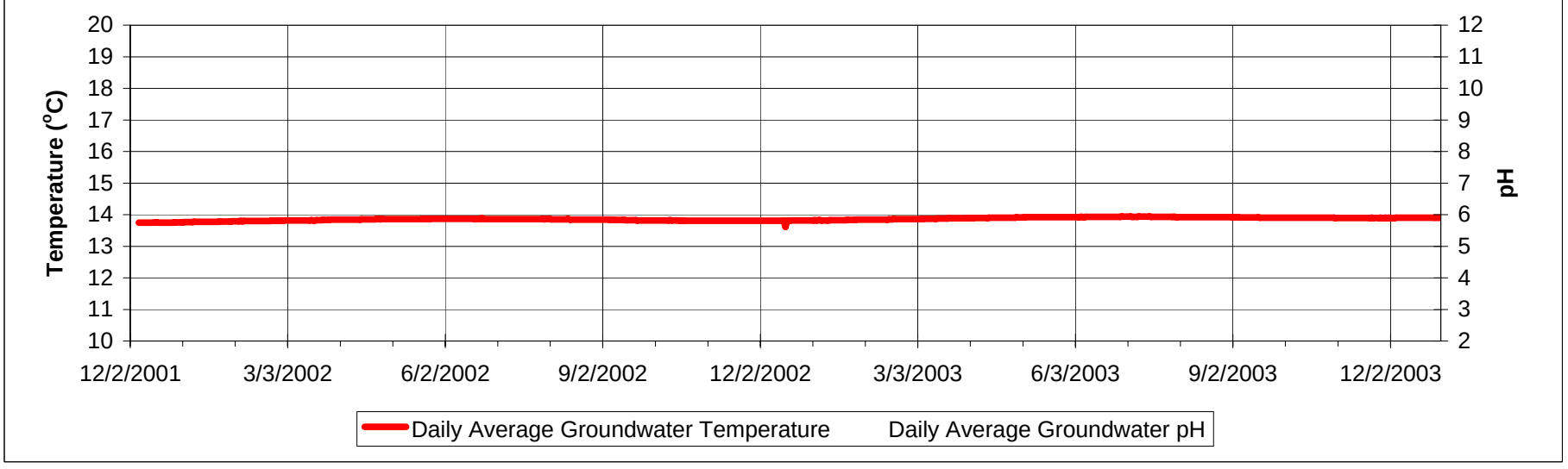

Groundwater Levels, Water Quality Parameters, and Tidal Data
Estuarine Aquifer Well MW-308S
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Figure G-21

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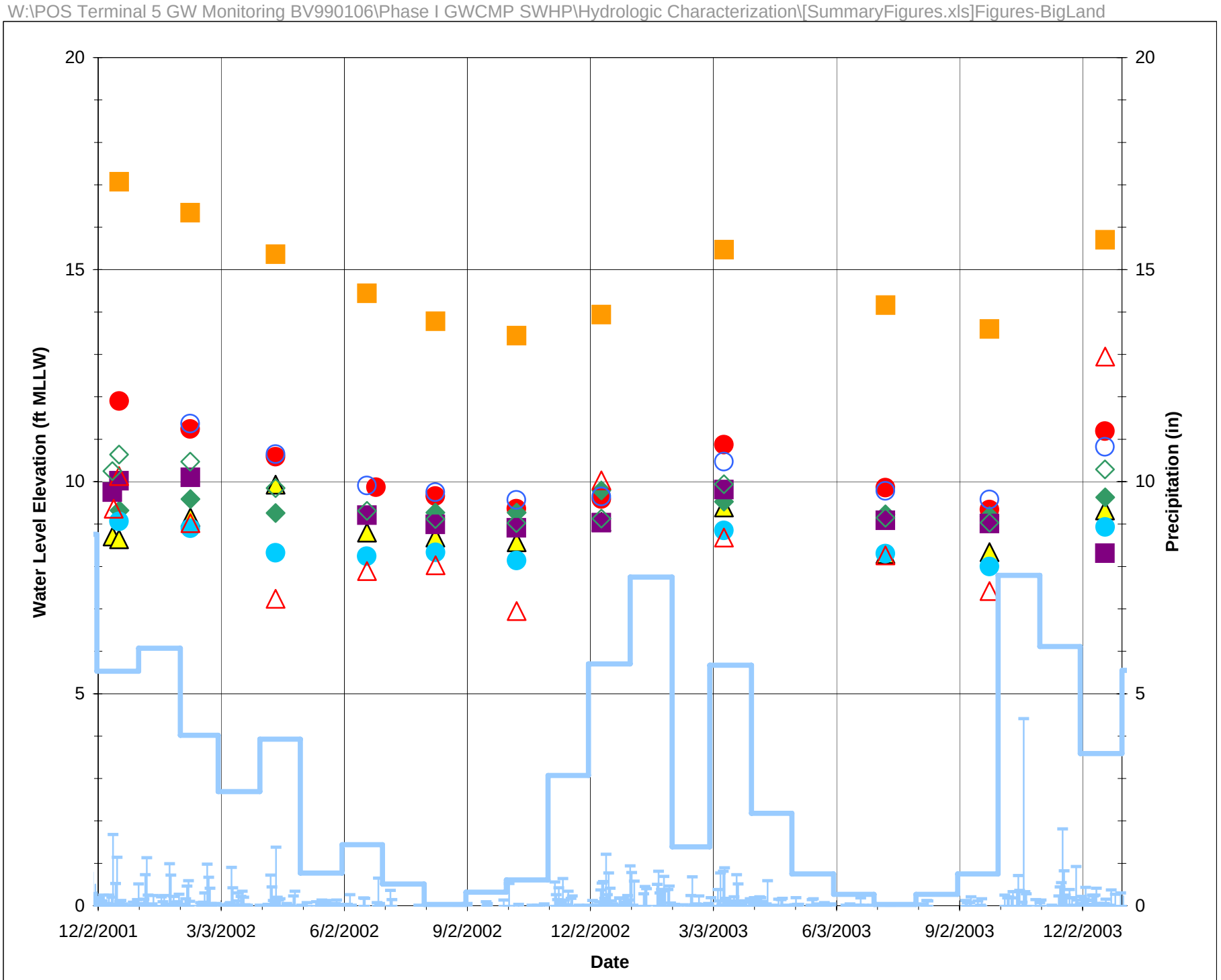

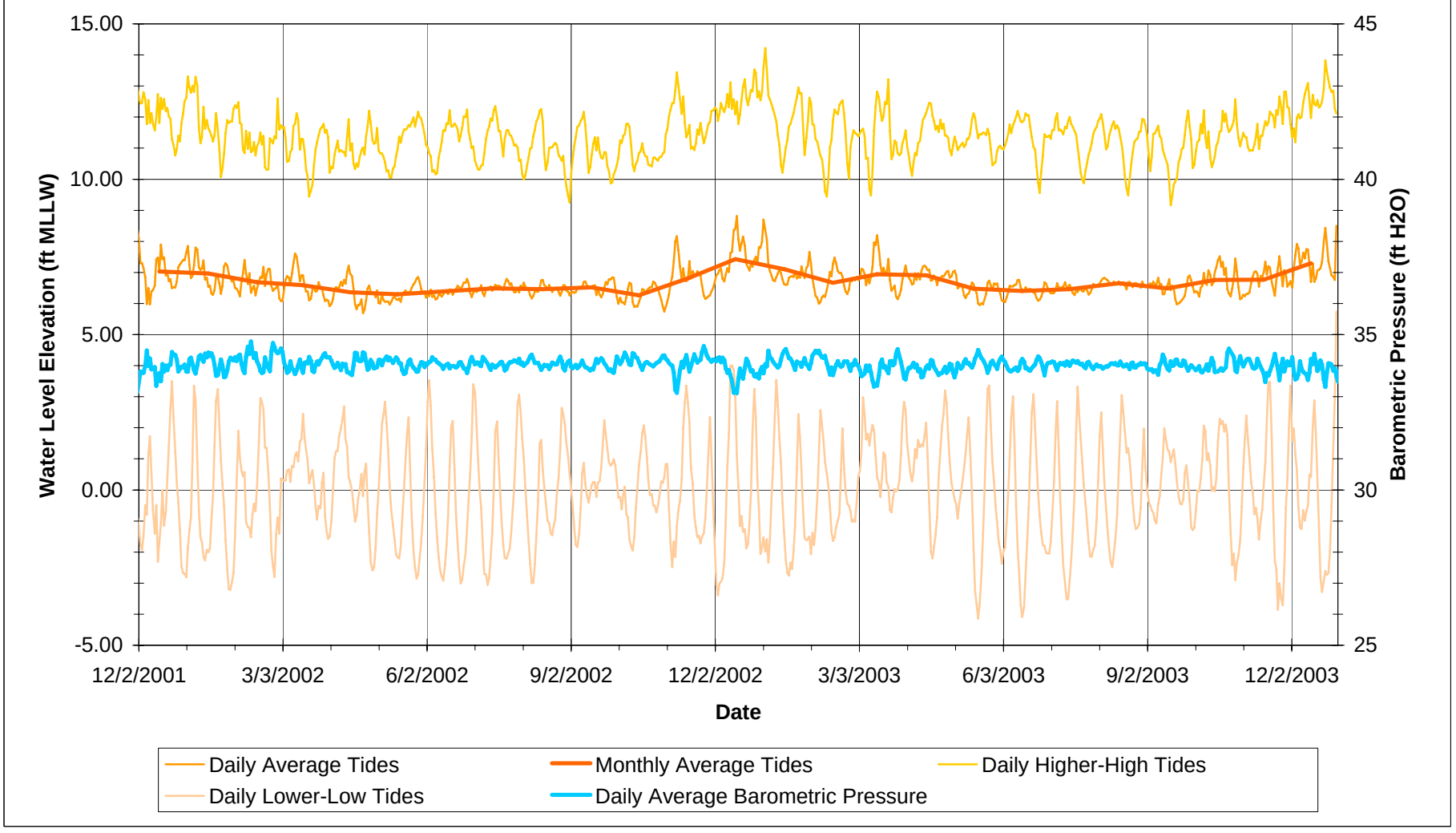

Groundwater Levels and Tidal Data
Manual Measurements
SWHP Phase I Groundwater Confimation Monitoring Program
Hydrologic Characterization Report

Figure G-22