TIDAL MONITORING STUDY REPORT

Phase I Ground Water
Confirmation Monitoring Program
Southwest Harbor Project

Prepared for: Port of Seattle

Project No. 990106-004-12 • September 23, 2002

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1 Introduction

This report documents the tidal monitoring study completed as part of the Phase I Ground Water Confirmation Monitoring Program (GWCMP) for the Port of Seattle's (the Port's) Southwest Harbor Project (SWHP). The objectives of the tidal monitoring study are to evaluate potential changes in ground water flow conditions resulting from the SWHP remediation and redevelopment activities. A specific focus of the study is to determine whether filling and tightlining of the former equalization basins along the Longfellow Creek Overflow Line (LFOL) as part of SWHP redevelopment has significantly changed ground water flow conditions in the Fill Aquifer near the LFOL and, in turn, whether the retrofitted LFOL alignment is a significant route of ground water discharge from the Fill Aquifer, as it was prior to the SWHP redevelopment. The SWHP site vicinity is presented on Figure 1.1. Figure 1.2 is a plan map that shows the original Terminal 5 area in relation to the five redevelopment areas that comprise the SWHP.

Aspect Consulting completed the tidal monitoring study in accordance with the Associated Earth Sciences, Inc. (AESI) *Draft Monitoring Plan* (AESI, 2000) and *Addendum #1 to Monitoring Plan* (AESI, 2001). The Addendum was prepared to address comments raised by Ecology at a June 5, 2001 meeting to discuss the Draft Monitoring Plan. Ecology's comments were subsequently documented in a letter dated July 5, 2001 (Ecology, 2001), which confirmed Ecology's approval of the monitoring plan. The Addendum, together with the December 2000 Draft Monitoring Plan, constitute the final Monitoring Plan for the SWHP Phase I GWCMP. The Monitoring Plan meets the requirements of the consent decrees for redevelopment areas that were redeveloped as part of the SWHP, as well as the *Ground Water Conceptual Letter* submitted by the Port (dated March 1999) to the Washington State Department of Ecology (Ecology).

The data collection activities associated with the tidal monitoring study are documented in Section 2.0. Section 3.0 provides an evaluation of the tidal monitoring data, including pre-redevelopment and post-redevelopment ground water elevation contour maps for different tidal stages. Section 4.0 provides conclusions regarding post-redevelopment changes in ground water flow at the site, relative to the pre-redevelopment (1994) conditions. Appendix A presents plots of ground water elevations for two monitoring periods in December 2001 and April 2002 – the two post-redevelopment periods for which ground water elevation contour maps have been prepared for this tidal study. Appendix B provides water quality and water level data collected at the 12 Fill Aquifer wells for which water quality parameters have been monitored continuously since December 2001.

2 Data Collection Activities

This section summarizes the field data collection activities completed as part of the tidal monitoring study for the SWHP Phase I GWCMP. Data were collected from 18 monitoring wells completed in the Fill Aquifer and 5 wells completed in the underlying Estuarine Aquifer. Figure 2.1 depicts locations of the Fill Aquifer and Estuarine Aquifer monitoring well locations, and two LFOL surface water locations, monitored as part of the tidal study. The *Monitoring Network Construction Report* (Aspect Consulting, 2002) details completion of these ground water and surface water monitoring locations, as well as installation and initial calibration of the monitoring equipment.

2.1 Tidal Study Instrumentation

Automated In-Situ Troll® datalogging probes were installed to continuously record ground water levels in site monitoring wells for this tidal study prior to a period of large tidal exchange in early 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 water quality parameters including pH and conductivity. The conductivity and temperature data were used to calculate the salinity of the water. The dataloggers were programmed to record water level and water quality parameters on 10-minute intervals throughout the tidal study. Special care has been taken to place each probe's cable connector, at the end of the cable, in a relatively dry location within the monitoring well monuments to prevent water from entering the vent tubes. The vent tubes provide the pressure transducer compensation for changes in atmospheric pressure. The vent tubes open directly to the hardware of the probe without a desiccant pack or reservoir.

A total of 25 probes were active in wells from December 11 to December 17, 2001 – including 18 Fill Aquifer wells, five Estuarine Aquifer wells, and two (surface water) locations within the LFOL (MH-1 and MH-8) (Figure 2.1). Table 2.1 summarizes the information for the wells monitored for the tidal study and the instrumentation used in each. Manual static water level measurements were taken at the time of probe installation, and again during the tidal study on December 12 and 17, 2001. Rental probes, including five mini-Trolls and two T-8000s, were removed on December 17, 2001. The remaining probes, owned by the Port of Seattle, continued recording water levels and water quality parameters at 10-minute intervals until February 12-13, 2002. At this time, manual water level measurements in instrumented wells were taken, data from the previous 2 months were downloaded, the probes were re-calibrated for pH and conductivity and reinstalled, and the sampling interval was changed from 10 minutes to 1 hour. The 1 hour monitoring frequency will continue for the remainder of the Phase I GWCMP. On April 22-23, 2002, a second bimonthly field calibration and download took place, and water levels were measured manually in non-instrumented wells. In

addition, manual static water level measurements were taken in non-instrumented wells on February 8 and April 12, 2002.

2.2 Water Level Data Collection

Collection of water level elevations is a primary element of the Phase I GWCMP. The probes measure the height of the water column (pressure head) above the probe, and an accurate probe elevation is needed for conversion of the probe's pressure head reading to water level elevation. The elevation of the probes are 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 due to water above the probe. The equation for determining the elevation of the probe is:

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

where $Elev_{probe}$ is the elevation of the probe (ft MLLW);
$Elev_{TOC}$ is the elevation of the top of the casing (ft MLLW);
SWL_{TOC} is the measured depth to water below the top of the casing (ft); and
H_{probe} is the salinity-corrected freshwater equivalent head (see Section 2.5) due to water above the probe (ft) recorded by the datalogger.

When the probes were first installed, excess cable was kept inside the well casing so the well cap could be closed. However, this necessitated removing the probe before and after taking a manual static water level measurement. An alternative solution that has since been adopted is, with the well cap removed, to coil the cable around the casing within the monument. Note that the cable connector is draped inside the casing to avoid submergence of the vent tubes. This setup has been in use since reinstalling the probes after the February 2002 round of data downloads, and has greatly reduced the difference in transducer elevation between successive downloads.

Water level data have been corrected for any changes in transducer elevation by interpolating the transducer elevations between two data points. The average maximum transducer elevation change between the February and April 2002 downloads is 0.08 foot.

2.3 Water Quality Data Collection and Sensor Calibration

Collection of water quality data (pH and conductivity) is an additional element of the Phase I GWCMP. The T-8000 pH and conductivity sensors require regular calibration to maintain accuracy. The probes' water quality sensors (pH and conductivity) were calibrated in December 2001, before being installed for the tidal study. In February 2002, a calibration was performed on each instrument, including a one-point pH calibration and a one- or two-point conductivity calibration. In April 2002, a field check

of the calibration was made, and depending on the error of the measurement, a calibration was performed in the field. The field check/calibration procedures are conducted as follows:

1. Acquire a manual static water level and a manual reading of the pressure sensor on the probe.
2. Remove the probe from the well.
3. Rinse the probe in a bucket of deionized water and allow the probe temperature to equilibrate with ambient air temperature (temperature of the calibration solutions).
4. Insert the probe into a calibration solution with a known pH or conductivity.
5. Take a manual reading using the probe to check calibration.
    a. If the probe pH reading was off by more than 0.5 pH unit, a pH calibration was performed.
    b. If the probe conductivity reading was off by more than 10 percent, a conductivity calibration was performed.
6. Reinstall the probe in the well.
7. Obtain a manual static water level measurement and a water level reading from the probe.

2.4 Ground Water Sample Collection and Analysis

Ground water samples were collected from selected Fill and Estuarine Aquifer Wells for chloride analysis on December 12 and 17, 2001. The purpose of chloride data was to allow for salinity corrections for the water level data from the Estuarine Aquifer Wells, and to provide a check for salinities calculated from conductivity measurements in the Fill Aquifer Wells. Wells selected for chloride analyses were those exhibiting significantly elevated conductivity measurements during well development completed in late 2001.

Water samples were collected through 1/16" diameter dedicated polyethylene tubing installed in the wells. 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 Appendix C. Chloride results are also posted on the water quality plots in Appendix B.

2.5 Salinity Corrections to Water Level Data

Temperature and conductivity data have been collected at 12 Fill Aquifer monitoring wells (see Table 2.1). In addition, chloride analyses are available for selected Fill and Estuarine Aquifers wells. 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 ground water flow system. Consistent with findings from the Woodward Clyde (1994) tidal study, ground water salinity (thus density) was not found to alter the Fill Aquifer ground water level data significantly. Salinity correction factors were greater than 0.98 in all Fill Aquifer wells, resulting in water level differences 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) ($S_{0\text{-}40}$)), is 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 (°C),

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°C, p = 0 above one standard atmosphere. For our purposes, we use $k_{standard}$ = 42914 µS/cm.

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

$$r = r_0 + AS + BS^{3/2} + CS^2$$

$$r_0 = f_0 + f_1 t + f_2 t^2 + f_3 t^3 + f_4 t^4 + f_5 t$$
$$A = g_0 + g_1 t + g_2 t^2 + g_3 t^3 + g_4 t^4$$
$$B = h_0 + h_1 t + h_2 t^2$$
$$C = i_0$$

where f_n, g_n, h_n, i_0 are coefficients,

r_0 is the density of fresh water at the same temperature (kg/m^3),

S is salinity (PSS), and

t is temperature (°C)

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

$$CF = \frac{r_0}{r}$$

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
[C1] is chloride concentration in parts per thousand (ppt)

2.6 Probe Malfunction in Well MW-36

The cable connector for the T-4000 probe in Estuarine Aquifer monitoring well MW-36 was placed across the top of the casing due to the lack of a D-ring cable holder on this unit. After the monument was sealed in February 2002, the cable connector slipped slightly. When the monument was opened in April 2002, water was observed in the monument to the top of the casing, and the cable connector was under about ¼ inch of water, and water had entered the vent tube. Communication could not be re-established with the probe and it was removed and sent back to the manufacturer for inspection. Data from the probe was recovered by the manufacturer and sent to Aspect Consulting.

3 Data Evaluation

The tidal study data evaluation methods were generally consistent with those used for the Southwest Harbor Project tidal study completed in 1994, prior to the redevelopment (Woodward Clyde, 1994). The water level elevation data were corrected for salinity as described in the *Monitoring Plan* (Associated Earth Sciences, Inc., 2000; 2001), and in Section 2.5 of this report.

Water level elevations were calculated relative to mean lower low water (MLLW) datum (0.26 feet below Port of Seattle datum). The salinity-corrected water level elevation data were then used to calculate 72-hour mean ground water elevations using the method of Serfes (1991). This method cancels out the major lunar and solar frequencies that produce the tides, and provides a mean ground water elevation for the 72-hour time period. The mean (tidally averaged) potentiometric ground water surfaces for the Fill and Estuarine Aquifers were evaluated by contouring these mean ground water elevations from multiple site wells in the respective aquifers. From these contour maps, mean ground water flow directions and hydraulic gradients are determined, which represent the net ground water flow condition over the course of multiple tidal cycles. This mean ground water flow condition can be used to define appropriate points for monitoring ground water quality during the SWHP Phase II Water Quality Monitoring Program.

A substantial ground water recharge event occurred during the initial December 11 through 17, 2001, tidal monitoring period. Almost 3.6 inches of rain fell in Seattle during this period, including the two highest daily precipitation readings (1.68 and 1.14 inches on December 13 and December 16, respectively) recorded between December 2001 and April 2002. Figure 3.1 presents the daily precipitation data for this time period. Ground water levels in several site monitoring wells rose significantly during the course of this monitoring period in response to this large precipitation event. In light of concern over the relative effect of recharge versus tidal response on the observed December 2001 flow conditions, Aspect Consulting evaluated ground water elevation and tidal data from a second 72-hour period between April 10 through 12, 2002. This April 2002 period was chosen because the 72-hour mean ground water elevations in the majority of wells show a relatively stable trend, without major increasing or decreasing seasonal trends. Five wells monitored continuously during the December tidal monitoring period were not monitored during the April 2002 period: CMP-9 located east of RA-3; CMP-17 and MW-125 immediately north of RA-1; and wells CMP-15 and MW-5 on the northern edge of RA-5 (Figure 2.1). All of the monitoring wells located along the LFOL (a focus of the tidal study) were monitored continuously during the April 2002 period.

To provide consistency with the 1994 tidal study (Woodward Clyde, 1994), the December 2001 tidal monitoring period targeted a period of maximum tidal exchange to

evaluate ground water flow conditions in response to the large tidal fluctuations. During the December 2001 tidal monitoring period (additional site wells instrumented, as discussed in Section 2.1), the minimum low tide recorded at Coleman Dock in Elliot Bay was –2.32 feet MLLW at 22:40 on December 14, 2001 and the maximum high tide was 12.94 feet MLLW at 5:10 on December 14, 2001. This range is slightly greater than that from the 1994 site tidal study (–2.68 to 11.81 feet MLLW on April 28, 1994). The tidal exchange was smaller during the April 2002 tidal monitoring period (tidal range of 1.78 to 10.55 feet MLLW) than in the December 2001 period. However, the April 2002 is representative of a period of generally stable water level trends, which allows evaluation of ground water changes in response to tides. Tidal stage data for Coleman Dock are presented on the water elevation plots in Appendix A.

The post-redevelopment ground water elevation contour maps were developed to encompass the period of maximum tidal fluctuation in both the December and April tidal monitoring periods. For the December period, maps were developed for a 72-hour mean calculated between 0:00 December 13, 2001 and 23:50 on December 15, 2001 (centered about 12:00 December 14, 2001), and for the maximum high tide (5:10 December 14, 2001) and low tide (22:40 December 14, 2001). For the April period, maps were developed for a 72-hour mean calculated between 0:00 April 10, 2002 and 23:50 on April 12, 2002 (centered about 12:00 April 11, 2002), and for the maximum high tide (5:00 April 10, 2002) and low tide (12:00 April 12, 2002)

Figures A-1 through A-23 in Appendix A present the ground water elevation data, and the 72-hour mean elevations (running average by the Serfes [1991] method for both the December 2001 and April 2002 tidal monitoring periods. The corresponding tide elevation data, and the 72-hour period for which ground water elevation contour maps were developed, are also included on these figures for reference. The ground water recharge is evident in many wells by the rising trend in the 72-hour (Serfes) running averages over the course of the December 2001 monitoring period. Ground water elevation contour maps developed from these December 2001 data represent ground water flow conditions during a major short-term recharge event, and may not be representative of flow conditions during periods when less recharge is occurring.

Figure A-24 in Appendix A presents the surface water level elevation data collected during the December 2001 tidal monitoring period at two locations within the LFOL: in manhole MH-1 located near the south end of the LFOL within RA-2, and in manhole MH-8 located just north of South Florida Street near the LFOL outfall to Elliot Bay. Surface water levels were not measured in the LFOL after this monitoring period. The water level data from these two locations show a nearly perfect correlation, in both magnitude and timing, with the tidal stage at Coleman Dock, demonstrating that water levels in the LFOL respond to tidal changes without significant attenuation or time lag.

3.1 Ground Water Elevation Contour Maps

To assess ground water flow directions in the Fill and Estuarine Aquifers following redevelopment of the SWHP, post-redevelopment ground water elevation contour maps were developed for each aquifer at mean, high, and low tide stages, consistent with the maps generated for the 1994 tidal study (Woodward Clyde, 1994). Maps were developed for the December 2001 and April 2002 monitoring periods as discussed above.

In developing the ground water elevation contour maps, manual water level measurements from non-instrumented wells were used to supplement the water level data from the data logger probes. For both the December 2001 and April 2002 maps, these manual measurements were collected during the 72-hour window used in developing the contour maps. Only wells at distances roughly 500 feet or greater from the West Waterway or Elliot Bay were used since they have negligible tidal response. Manual measurements collected from wells CMP-15 and MW-5 during the April 2002 monitoring period (not instrumented at the time) were not used in developing the water level contour maps. The December 2001 data demonstrate that MW-5 has substantial tidal response (Figure A-14 in Appendix A). CMP-15 showed substantial recharge during that period that obscured potential tidal response (Figure A-11 in Appendix A); however, it is close enough to the shoreline that tidal response is probable. Additionally, the manual measurement times for these wells did not correspond to the high or low tide times contoured.

The ground water elevation contour maps for the Fill Aquifer are presented on Figures 3.2 through 3.10, and those for the Estuarine Aquifer on Figures 3.11 through 3.19. To facilitate comparison of pre- and post-redevelopment ground water flow conditions for each aquifer (Fill and Estuarine), the maps representing pre-redevelopment (1994) and post-redevelopment conditions (December 2001 and April 2002) are presented sequentially for each tidal stage (mean, high, and low tides). The current ground water flow conditions for each aquifer and comparison to pre-redevelopment conditions (1994) are described below.

3.1.1 Fill Aquifer

Mean Water Level Conditions. The December 2001 72-hour mean (tidally averaged) ground water elevation contour map for the Fill Aquifer is presented on Figure 3.3. The general ground water flow directions for this time period indicate recharge from the West Seattle uplands west of RA-3, and from the south of RA-1 and RA-2. Ground water in the Fill Aquifer across the site as a whole generally flows toward the northeast with discharge to the West Waterway and Elliot Bay. This contrasts with the pre-redevelopment (1994) ground water flow conditions (Figure 3.2), where flow throughout much of the Fill Aquifer at the site converged to discharge points at the LFOL equalization basins.

In the current study, a ground water high is apparent beneath a portion of RA-5 (centered on well MW-5) under mean flow conditions. Wells CMP-16 and MW-5 along the shoreline of RA-5 respond significantly to tidal fluctuations (see Figures A-4 and A-14, respectively, in Appendix A), whereas well MW-26R displayed a weak tidal response (see Figure A-15 in Appendix A). This tidal response difference, and the resulting ground water high in this area, could be the result of buried bulkheads or other structures generally known to exist in this area (Enviros, 1992). The presence of the ground water high, under mean water level conditions, was also observed in this general area during a 1992 tidal study of the Lockheed Property (Enviros, 1992). In the April 2002 monitoring period (Figure 3.4), the ground water high is not apparent under mean conditions; however, water level data were not collected from wells MW-5 or CMP-15 during this period.

The major change in Fill Aquifer ground water flow resulting from the SWHP redevelopment is the substantially dampened hydraulic influence of the LFOL. The pre-redevelopment data indicate that the LFOL's former southern and northern equalization basins acted as strong hydraulic sinks in the Fill Aquifer under mean water level conditions (Figure 3.2). As a result, the mean ground water 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 current tidal monitoring data (Figures 3.3 and 3.4) confirm that closure of the equalization basins and tightlining of the LFOL across the SWHP has substantially reduced the tidal influence within the Fill Aquifer along the LFOL. The December 2001 data suggest that the LFOL has negligible influence on ground water elevation contours, and thus ground water flow directions; the extensive ground water lows observed around the equalization basins in the 1994 tidal study (Figure 3.2) are absent.

In contrast to the December 2001 data, the April 2002 mean ground water elevation contours (see Figure 3.4) suggest a weak ground water low centered around the location of the former northern equalization basins, in the area of wells CMP-12 and CMP-13 (Figure 3.4). CMP-12, in the approximate location of a former northern equalization basin, shows greater tidal response than does CMP-13, located closer to Elliot Bay (compare Figures A-8 and A-9 in Appendix A). The April 2002 data suggest that the LFOL may still act as a weak hydraulic sink, with the mean ground water flow direction locally toward it in the area of CMP-12. In the localized area around CMP-12, the LFOL, or permeable backfill around it, may still act as a discharge pathway for some site ground water in the Fill Aquifer. However, from a site-wide perspective, the mean hydraulic gradient toward the LFOL has been greatly reduced relative to pre-redevelopment conditions. If Fill Aquifer ground water continues to discharge to the LFOL in the vicinity of the former northern equalization basins, the quantity of discharge is likely negligible relative to pre-development discharge volumes.

High Tide. Under pre-redevelopment conditions, ground water highs (mounds) developed around the south and north equalization basins (Figure 3.5) as the high tide propagated inland via the LFOL. As observed for mean water level conditions, this effect has been nearly eliminated under post-redevelopment conditions. For the post-redevelopment December 2001 data, the high tide ground water elevation contours (Figure 3.6) look similar to those for mean water level conditions, except along the shoreline where the hydraulic gradient is temporarily reversed – resulting in short-term marine water intrusion into the aquifer in these areas. The high tide ground water elevation contours from the April 2002 monitoring period (Figure 3.7) are similar to those for December 2001, except that a ground water low (sink) is observed around CMP-12. In the December 2001 high tide data, the ground water elevation at CMP-13 was higher than that at CMP-12, which was higher than that at CMP-11 located northeast of CMP-12 (Figure 3.6). In the April 2002 high tide data, the relationship changed such that CMP-13 was higher than CMP-11, which was higher than CMP-12 (Figure 3.7).

Low Tide. Under pre-redevelopment conditions, large ground water lows developed in the Fill Aquifer around the LFOL's former south and north equalization basins, resulting in substantial ground water discharge to the LFOL as the tides receded (Figure 3.8). Similar to that observed at mean and high tides, the effect of the LFOL on low tide ground water elevation contours is negligible during the December 2001 monitoring

period (Figure 3.9). During this low tide, the ground water elevation remains lower at CMP-12 than CMP-13, but is higher at CMP-12 than that at CMP-11; a significant ground water low is not apparent around CMP-12. During the April 2002 low tide monitoring event, the ground water elevation at CMP-12 was lower than that at both CMP-11 and CMP-13 (Figure 3.10), indicating the presence of a subtle ground water sink at low tide in the absence of a short-term recharge event.

The December 2001 low tide data also indicate a residual ground water high beneath the eastern portion of RA-5. A similar ground water high was also observed in this general area at low tide during the pre-redevelopment Enviros (1992) tidal study, suggesting that the Fill Aquifer in this area may drain more slowly as the tide drops than in adjacent areas, potentially as a result of bulkheads in the area. A ground water high was not apparent from the April 2002 data (Figure 3.10), but wells MW-5 and CMP-15 were not monitored during this period.

3.1.2 Estuarine Aquifer

As discussed in *Ground Water Conceptual Letter* (Ecology, 2001) and the *Monitoring Plan* (Associated Earth Sciences, 2000; 2001), the focus of the Phase I GWCMP is to evaluate potential changes in Fill Aquifer ground water conditions resulting from the SWHP redevelopment. The principal reason for monitoring water levels in the Estuarine Aquifer as part of the Phase I GWCMP is to evaluate vertical gradients between the Fill and Estuarine Aquifers (to be evaluated in the *Hydrologic Characterization Report* at the end of the Phase I GWCMP). As a result, only five Estuarine Aquifer wells are being monitored at locations where they are paired with Fill Aquifer wells. Regardless, for consistency with the data presentation in the pre-redevelopment tidal study (Woodward Clyde, 1994), post-redevelopment ground water elevation contour maps have been prepared for the Estuarine Aquifer at mean, high, and low tide conditions.

The data from the Estuarine Aquifer monitoring wells confirm that the pre-redevelopment ground water flow directions have not changed appreciably as a result of the SWHP redevelopment. Ground water in the Estuarine Aquifer continues to flow generally from the southwest toward the northeast, with discharge to Elliot Bay and the West Waterway. Figure 3.11 presents the pre-redevelopment (1994) Estuarine Aquifer 72-hour mean ground water elevation contours. Figures 3.12 and 3.13 present the corresponding post-redevelopment contour maps based on data collected in December 2001 and April 2002, respectively. Based on these data, the mean ground water flow directions are generally consistent between pre- and post-redevelopment conditions.

Figures 3.14 through 3.16 present the pre- and post-redevelopment ground water elevation contour maps for high tide conditions. Figures 3.17 through 3.19 present the same sets of contour maps for low tide. The pre- and post-redevelopment contours show the same general hydraulic gradient reversal along the shoreline, with marine water temporarily flowing into the aquifer at high tide, and discharging back at low tide.

3.2 Salinity Data

The post-redevelopment water quality and water level data collected to date (December 2001 through April 2002) for the 12 wells are presented graphically in Appendix B. Limited pre-redevelopment salinity data (single measurements) are available from the Woodward Clyde (1994) tidal study.

The available data indicate that ground water salinity (calculated from conductivity) varies significantly in some key Fill Aquifer monitoring wells (notably CMP-11 and CMP-12 near the LFOL; Figures B-6 and B-7 in Appendix B). Consequently, an evaluation of potential changes in post-redevelopment ground water salinity will be performed as part of the *Hydrologic Characterization Report*.

4 Conclusions

The December 2001 and April 2002 tidal monitoring data confirm that the SWHP redevelopment activities, including capping of a large portion of the site (and historical contaminant source areas) and change in the LFOL configuration, have had a significant effect on the Fill Aquifer flow regime. Prior to the SWHP redevelopment, ground water flow in the Fill Aquifer beneath the western and central portions of the SWHP was generally toward the LFOL, which served as a significant ground water discharge pathway to surface water. Now that the LFOL equalization basins have been filled in, and the LFOL has been tightlined across the locations of those former basins, there is substantially less tidal influence within the Fill Aquifer inland along the LFOL. Based on post-redevelopment data collected in April 2002, when negligible ground water recharge to the Fill Aquifer was occurring, some ground water may continue to discharge to the northern portion of the LFOL; however, the quantity of apparent discharge has been substantially reduced. Relative to pre-redevelopment conditions, a much greater percentage of Fill Aquifer beneath the western and central portions of the SWHP now flows toward the northeast with discharge to the West Waterway or Elliot Bay. Ground water flow directions in the Estuarine Aquifer do not appear to have changed appreciably relative to pre-development conditions.

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Serfes, M.E., 1991, *Determining the Mean Hydraulic Gradient of Ground Water Affected by Tidal Fluctuations.* Ground Water v. 29, no. 4, pp. 549-555.

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Woodward Clyde Consultants, 1994, *Tidal Study, Southwest Harbor Project*: prepared for Port of Seattle, dated July 1994.

Limitations

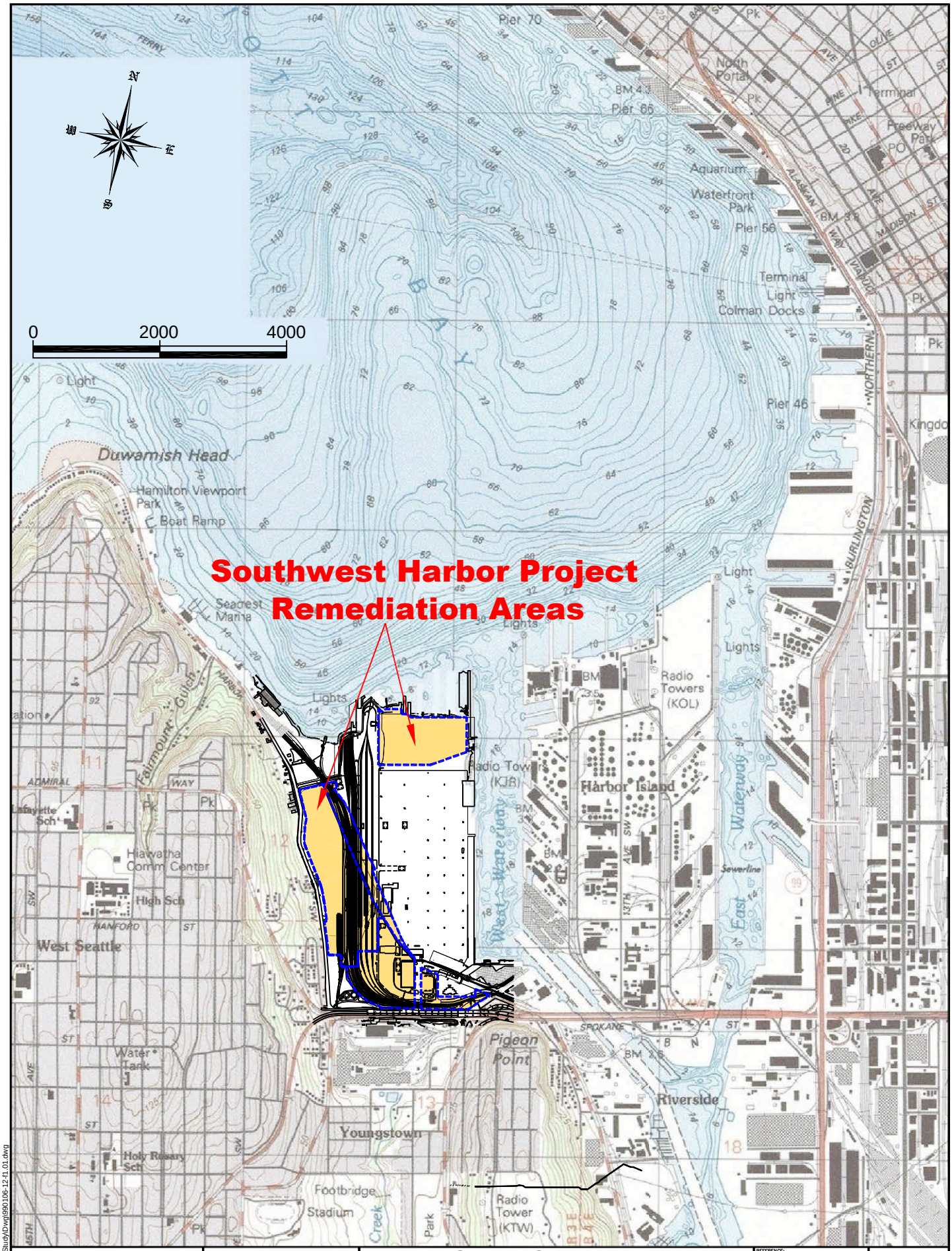
Work for this project was performed and this report prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Port of Seattle for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

Table 2.1
Ground Water Monitoring Well Data Summary
Phase 1 Ground Water Confirmation Monitoring Project
Southwest Harbor Project
Port of Seattle

Well ID	Installation Date	Well Location Coordinates[1] (feet)		Top of PVC Well Casing Elevation[2] (feet MLLW)	Well Depth[3] (feet bgs)	Screen Interval Depth (feet bgs)	Screen Interval Elevation (feet MLLW)	December 2001 Tidal Study Data Collection Method[5]	Long-term (including April 2002) Data Collection Method[5]
		Northing	Easting						
Fill Aquifer Wells									
CMP-1	9/19/2001	212355	1261812	22.71	17	7 to 17	16 to 6	Manual	Manual
CMP-2	9/18/2001	212702	1261309	22.67	17	7 to 17	16 to 6	8000	8000
CMP-3	9/19/2001	213309	1262165	17.40	16	6 to 16	11.8 to 1.8	8000	8000
CMP-4	9/18/2001	214292	1261638	19.92	17	7 to 17	13.2 to 3.2	8000	8000
CMP-5	10/29/2001	214209	1260800	23.80	15	5 to 15	19.1 to 9.1	Manual	Manual
CMP-6	9/18/2001	214819	1261538	20.04	17	7 to 17	13.3 to 3.3	8000	8000
CMP-8	9/18/2001	214249	1261789	18.40	17	7 to 17	11.6 to 1.6	8000	8000
CMP-9	9/18/2001	214476	1262081	17.87	17	7 to 17	11.1 to 1.1	Mini[4]	Manual
CMP-10	9/19/2001	215246	1261877	17.17	15	5 to 15	12.4 to 2.4	Manual	Manual
CMP-11	9/17/2001	215949	1261186	15.53	16	6 to 16	9.7 to -0.3	8000	8000
CMP-12	9/17/2001	215834	1261111	17.90	16	6 to 16	12 to 2	8000	8000
CMP-13	9/17/2001	215904	1261032	17.80	16	6 to 16	12 to 2	8000	8000
CMP-14	11/5/2001	216198	1261845	17.79	16.5	6.5 to 16.5	11.7 to 1.7	8000	8000
CMP-15	11/5/2001	216739	1261998	18.42	17	7 to 17	11.7 to 1.7	Mini[4]	Manual
CMP-16	11/5/2001	216882	1262452	18.48	16.2	6.2 to 16.2	12.6 to 2.6	4000	4000
CMP-17	11/6/2001	212793	1262710	18.43	16	6 to 16	12.3 to 2.3	Mini[4]	Manual
MW-5	8/3/1989	216853	1262825	18.53	25	5 to 25	13.8 to -6.2	8000 [4]	Manual
MW-26R	11/6/2001	216604	1262988	18.27	16.5	6.5 to 16.5	12.1 to 2.1	8000	8000
MW-125	5/13/1994	212542	1263034	15.90	15	5 to 15	12 to 2	8000 [4]	Manual
MW-307A	4/7/1994	216083	1260745	16.22	20	15 to 20	1.7 to -3.3	8000	8000
MW-308N (A)	4/5/1994	216143	1261040	14.69	17.5	12.5 to 17.5	2.5 to -2.5	8000	8000
FM-105	9/29/1992	212298	1263091	20.80	17	7 to 17	14.1 to 4.1	Manual	Manual
Estuarine Aquifer Wells									
CMP-7	11/7/2001	214830	1261539	19.92	47	37 to 47	-16.7 to -26.7	4000	4000
MW-36	7/8/1990	216248	1261886	17.60	73	58 to 73	-40.2 to -55.2	4000	4000
MW-44	6/23/1992	216613	1262994	18.38	74 [6]	59 to 74 6	-40.4 to -55.4 [6]	4000	4000
MW-307BR	11/9/2001	216095	1260732	16.64	39	29 to 39	-12 to -22	4000	4000
MW-308S (B)	4/6/1994	216136	1261041	14.42	40	35 to 40	-20 to -25	4000	4000

Notes:

1.) Well location coordinates accurate to within 1 foot using the Washington State Plane North (NAD 83
2.) Measured elevations accurate to within 0.01 foot using the Mean Lower-Low Water (MLLW) datum.
3.) Well depth taken from completion log.
4.) Rental units removed at the completion of the December, 2001 Tidal Study.
5.) Data collection methods:
8000 = Troll MP8000 Datalogger measures pressure, temperature, pH, and conductivity
4000 = Troll 4000 Datalogger measures pressure and temperature
Mini = Mini Troll Datalogger measures pressure and temperature
Manual = Manual measurements of water level



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Port of Seattle
Seattle, Washington

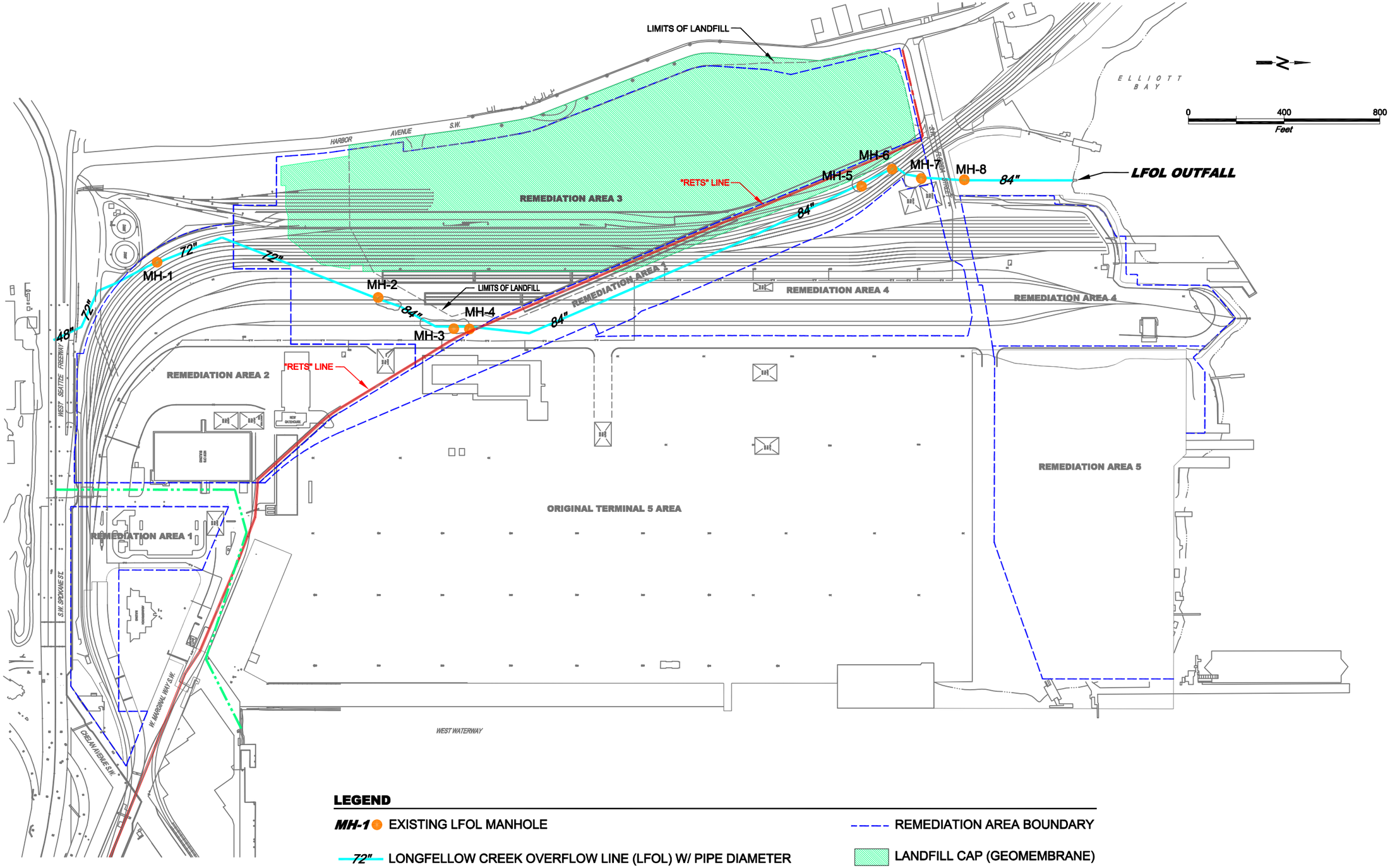
SITE VICINITY MAP
Southwest Harbor Project
Phase I Ground Water Confirmation Monitoring Program

REFERENCE:	Topo! 1997 Wildflower Productions
DATE:	05/23/02
SCALE:	1" = 2000'
DESIGNED BY:	WVG
REVISED:	
DRAWN BY:	JJR
ORIG. FILENAME:	BV99106-F1.dwg

PROJECT NO. 990106

FIGURE NO. 1.1

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-41.01.dwg



LEGEND

- MH-1 ● EXISTING LFOL MANHOLE
- 72" LONGFELLOW CREEK OVERFLOW LINE (LFOL) W/ PIPE DIAMETER
- LONGFELLOW CREEK MAIN LINE
- REMEDIATION AREA BOUNDARY
- LANDFILL CAP (GEOMEMBRANE)

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Seattle, Washington

PROJECT LOCATION MAP
Southwest Harbor Project
Phase I Ground Water Confirmation Monitoring Program

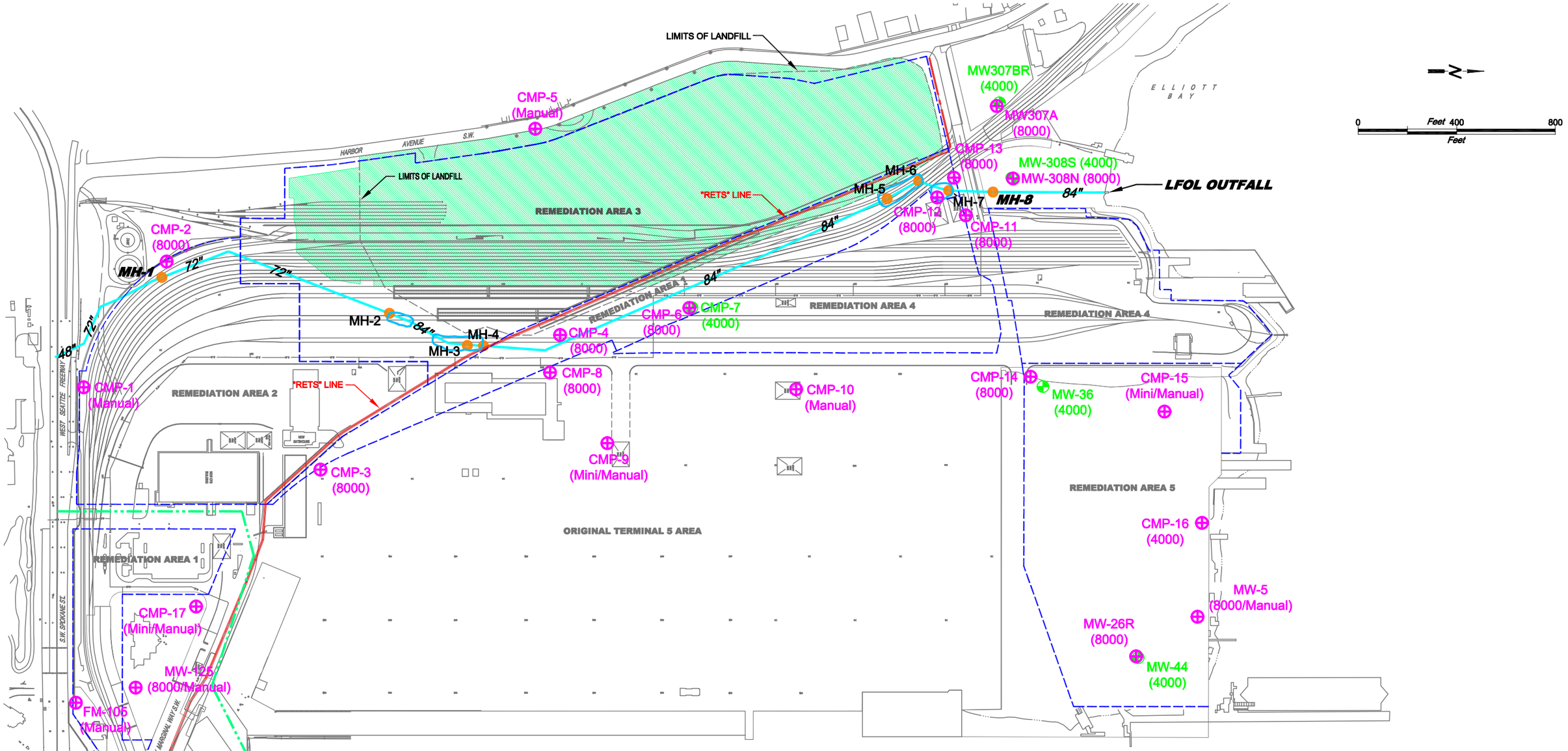
REFERENCE:	
DATE: 05/23/02	SCALE: 1" = 400'
DESIGNED BY: PSB, JJS	REVISED:
DRAWN BY: JJR	ORIG. FILENAME: BV99106-F2.dwg

PROJECT NO. 990106

FIGURE NO. 1.2

Survey Update 1/7/02

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f1.02.dwg



LEGEND

DATA COLLECTION METHOD

(8000) = Troll MP8000 Datalogger measures pressure, temperature, pH, and conductivity
(4000) = Troll 4000 Datalogger measures pressure and temperature
(Mini) = Mini Troll Datalogger measures pressure and temperature
(Manual) = Manual measurements of water level

NOTE: Where two methods are specified, the first applied to the December 2001 Tidal Monitoring Period, and the second applies thereafter.

MW-149 Fill Aquifer Well
MW-36 Estuarine Aquifer Well
Longfellow Creek Main Line

MH-1 Existing LFOL Manhole
(***BOLD ITALICS*** = LFOL Surface Water Monitoring Station)
72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
Remediation Area Boundary
Landfill Cap (geomembrane)

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Fax: (206) 780-9438

Port of Seattle
Seattle, Washington

Fill and Estuarine Aquifer Tidal Monitoring Study Well Locations

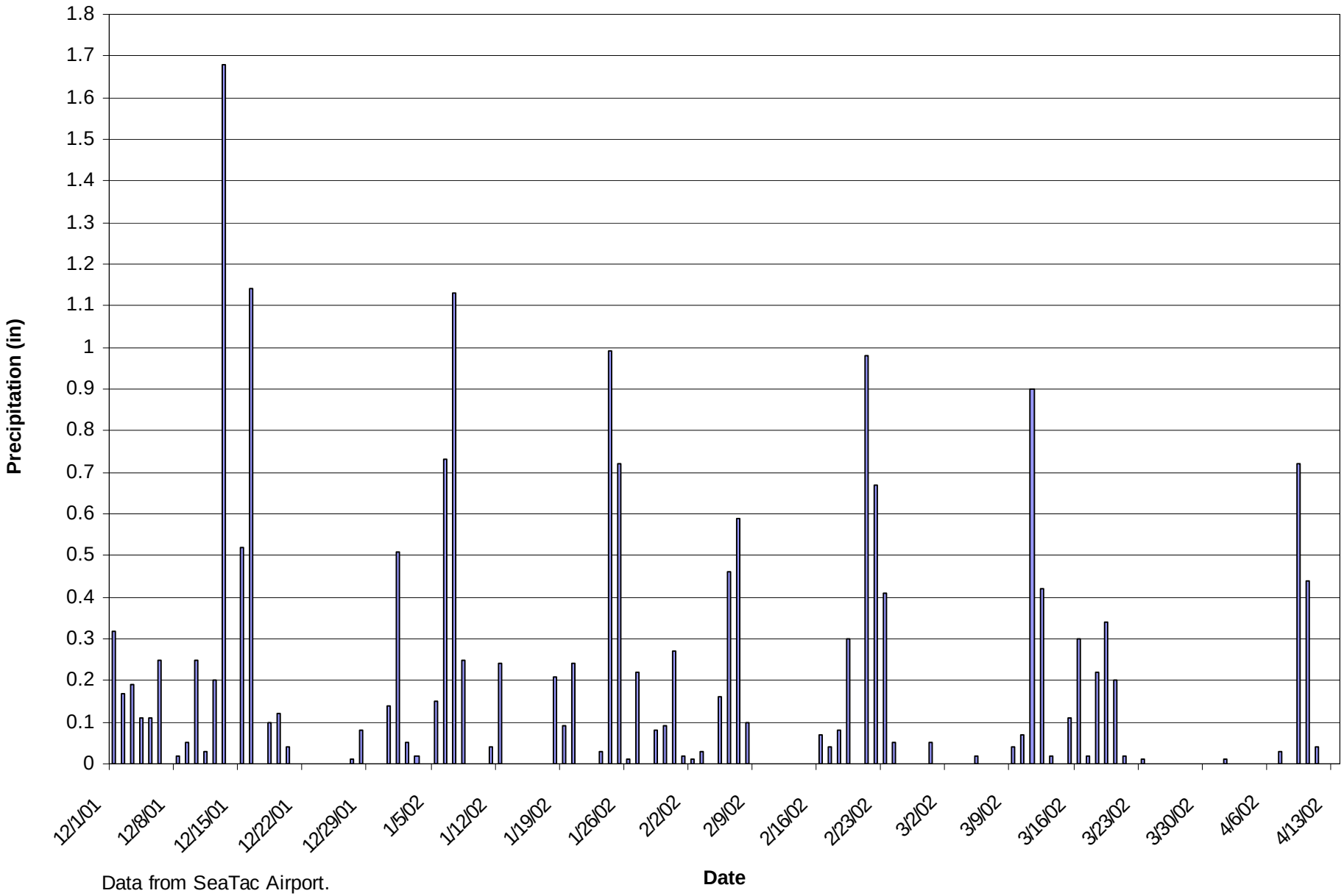
Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:	
DATE: 06/04/02	SCALE: 1" = 400'
DESIGNED BY: WVG, PSB	REVISED:
DRAWN BY: JJR	ORIG. FILENAME: BV99106D6.dwg

PROJECT NO. 990106-01
FIGURE NO. **2.1**

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f2.01.dwg

Survey Update 1/8/02



Data from SeaTac Airport.

Daily Precipitation Data
December 1, 2001 through April 13, 2002

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program
Figure 3.1

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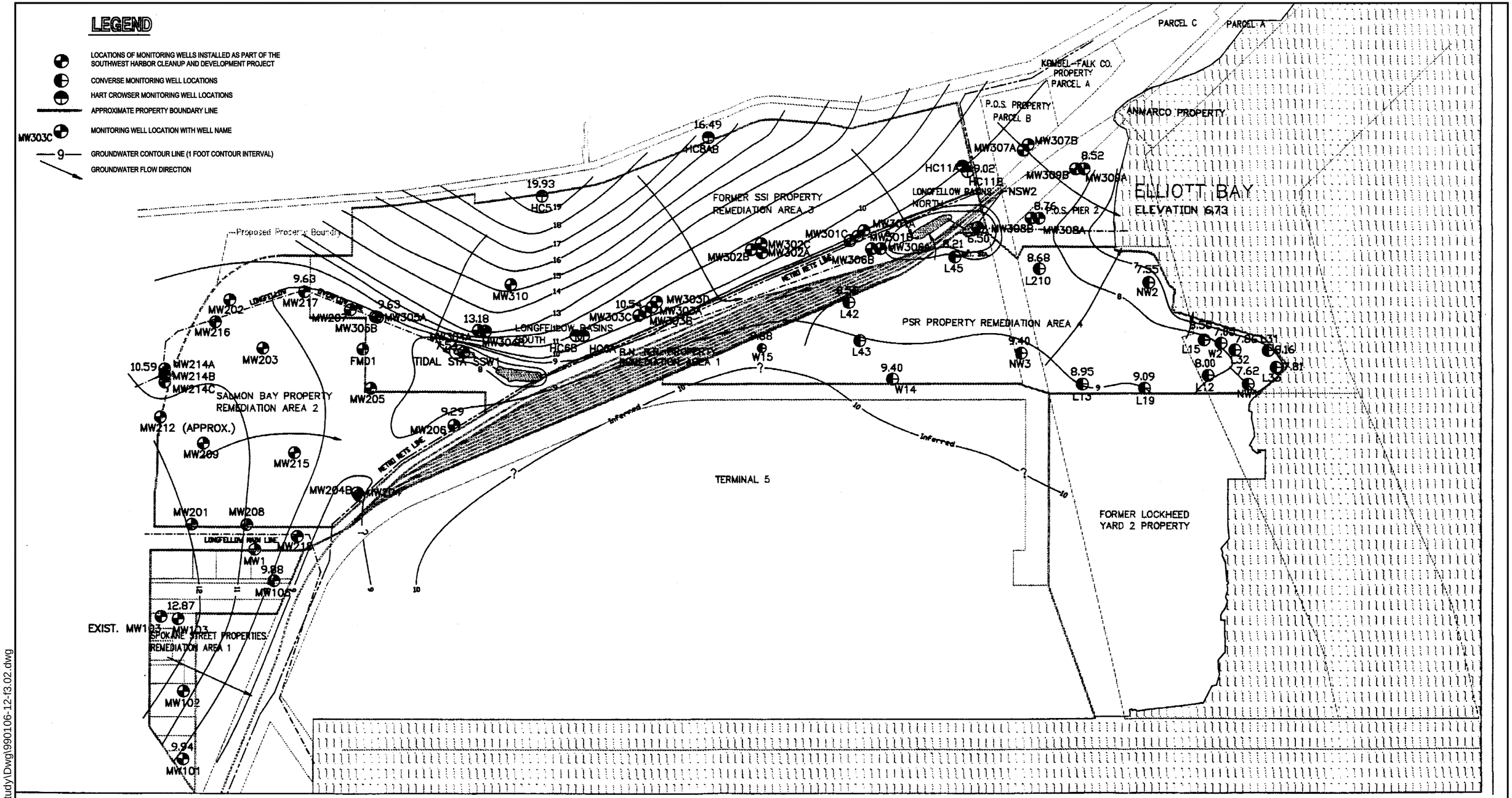
Fax: (206) 780-9438

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.01.dwg

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



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)

SCALE: 0 400 800 1600 FEET (N)

Reference:

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

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Port of Seattle
Seattle, Washington

Fill Aquifer Groundwater Elevation Contour Map (72-Hour Mean, 4/28-30/94)

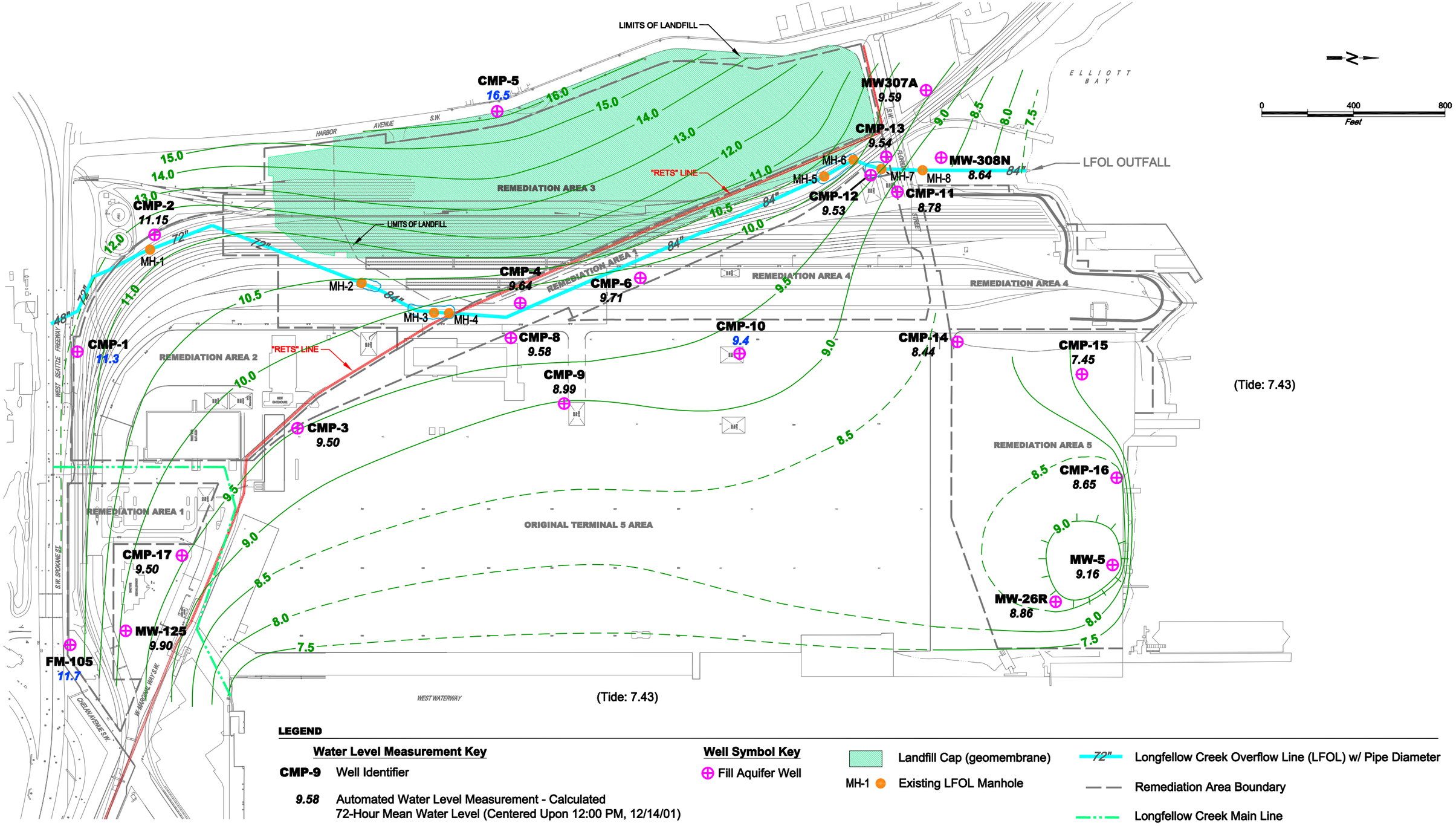
Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:	
DATE: 05/24/02	SCALE: 1" = 800'
DESIGNED BY: WVG, SJG	REVISED:
DRAWN BY: JJR	ORIG. FILENAME: Figure 3-2.dwg

PROJECT NO. 990106

FIGURE NO. 3.2

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.02.dwg



LEGEND

Water Level Measurement Key

- **CMP-9** Well Identifier
- ***9.58*** Automated Water Level Measurement - Calculated 72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)
- ***9.4*** Manual Water Level Measurement
- 8.5 Inferred Ground Water Elevation Contour *(dashed where uncertain)*

Well Symbol Key

- Fill Aquifer Well
- MH-1 Existing LFOL Manhole

- Landfill Cap (geomembrane)
- 72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
- Remediation Area Boundary
- Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

Survey Update 1/8/02

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Seattle, Washington

Fill Aquifer Groundwater Elevation Contour Map (72-Hour Mean, 12/13-15/2001)

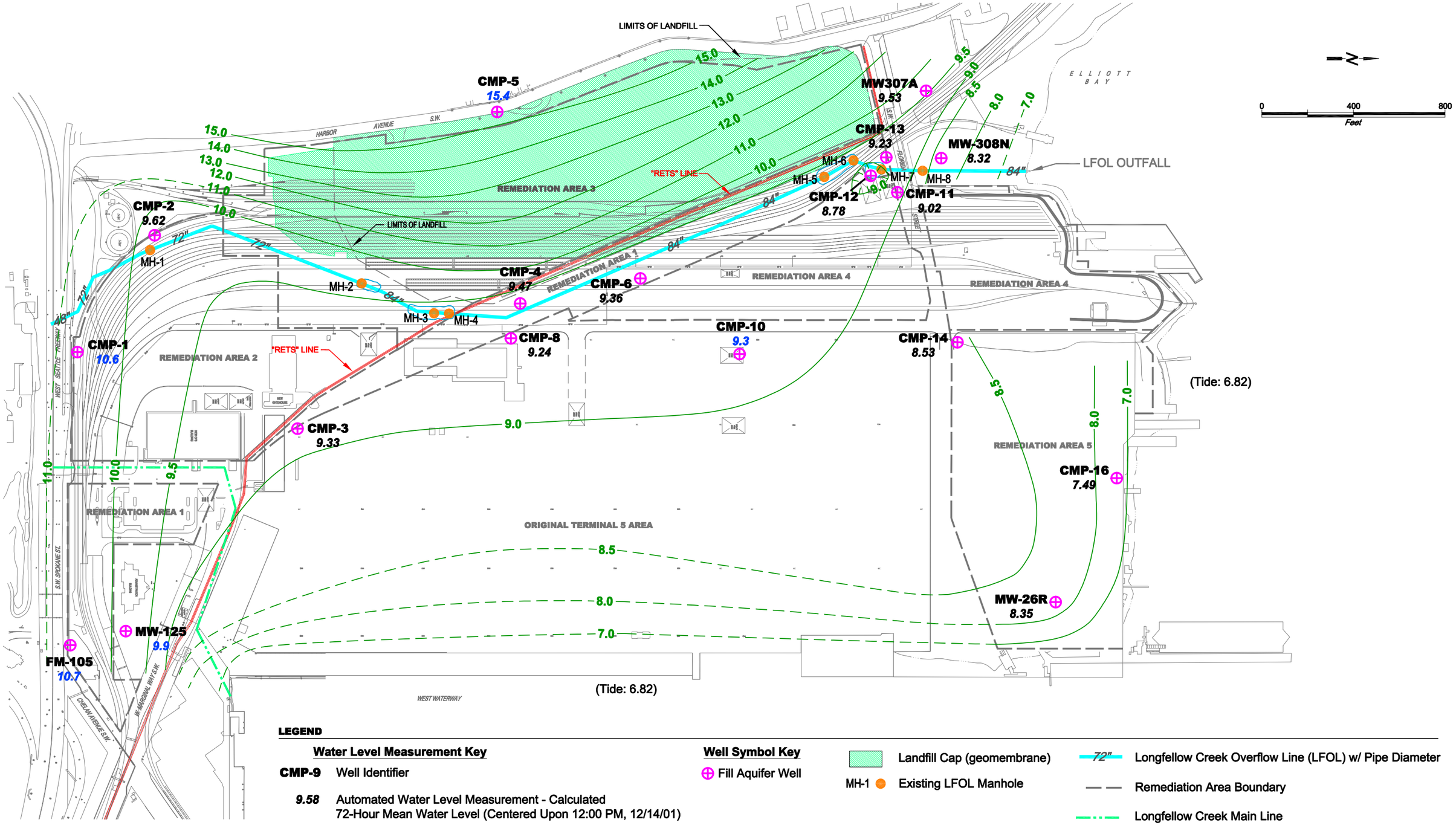
Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

DATE:	05/31/02
SCALE:	1" = 400'
DESIGNED BY:	WVG, SJG
REVISED:	
DRAWN BY:	JJR
FILENAME: (ORIG.)	990106GWFMTD.dwg

PROJECT NO. 990106

FIGURE NO. 3.3

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.03.dwg



LEGEND

Water Level Measurement Key

- **CMP-9** Well Identifier
- ***9.58*** Automated Water Level Measurement - Calculated 72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)
- ***9.4*** Manual Water Level Measurement
- 8.5 Inferred Ground Water Elevation Contour *(dashed where uncertain)*

Well Symbol Key

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- 72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
- Remediation Area Boundary
- Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

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Seattle, Washington

Fill Aquifer Groundwater Elevation Contour Map (72-Hour Mean, 4/10 - 12/2002)

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

DATE: 05/31/02	SCALE: 1" = 400'
DESIGNED BY: WVG, SJG	REVISED:
DRAWN BY: JJR	FILENAME: (ORIG.) 9901064-1202.dwg

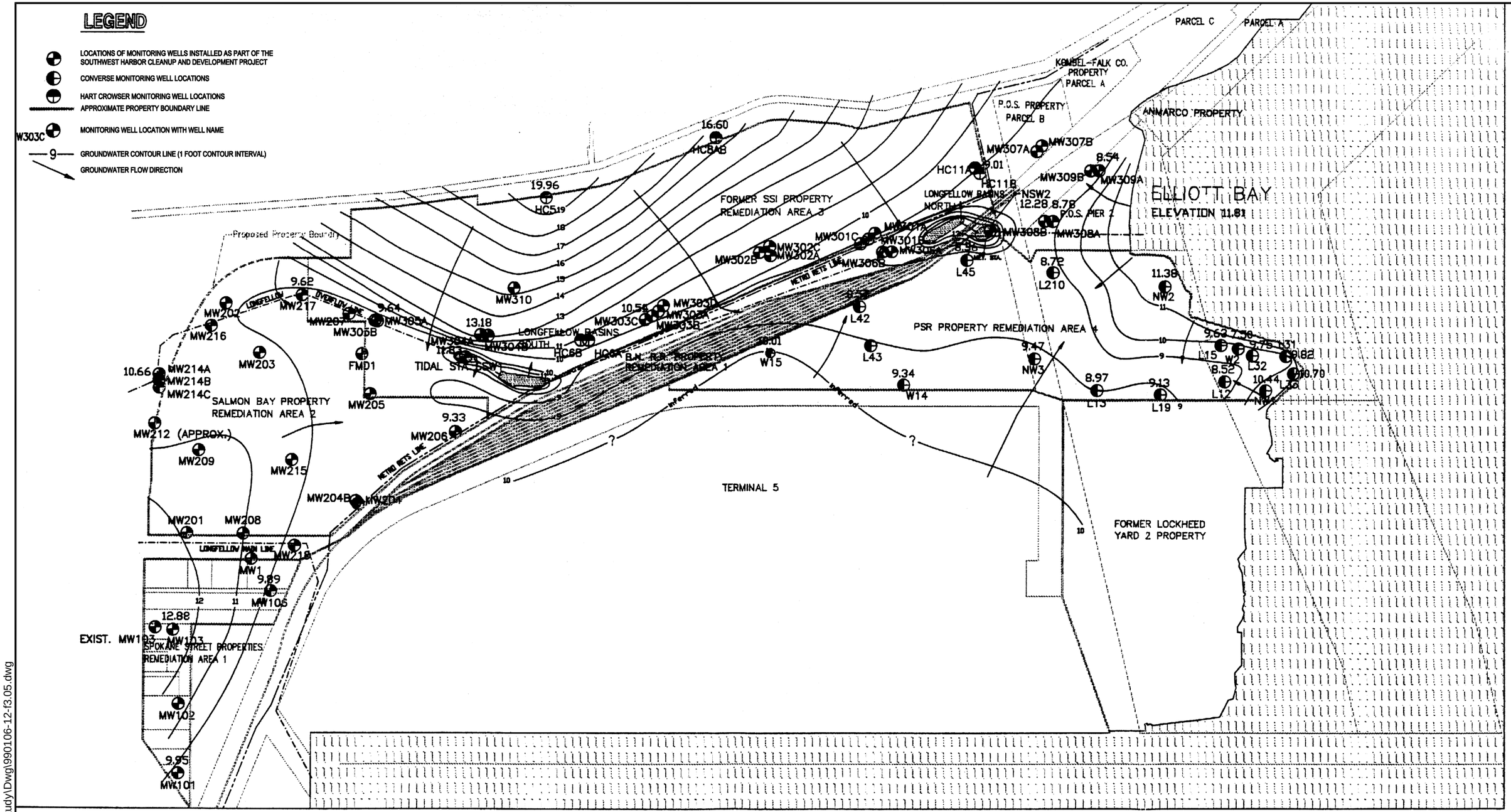
PROJECT NO. 990106

FIGURE NO. 3.4

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.04.dwg

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
- W303C — MONITORING WELL LOCATION WITH WELL NAME
- 9 — GROUNDWATER CONTOUR LINE (1 FOOT CONTOUR INTERVAL)
- GROUNDWATER FLOW DIRECTION



N

0 400 800 1600

SCALE 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 5
Southwest Harbor Project - July, 1994

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Fill Aquifer Groundwater Elevation Contour Map (High Tide, 21:00 4/28/94)

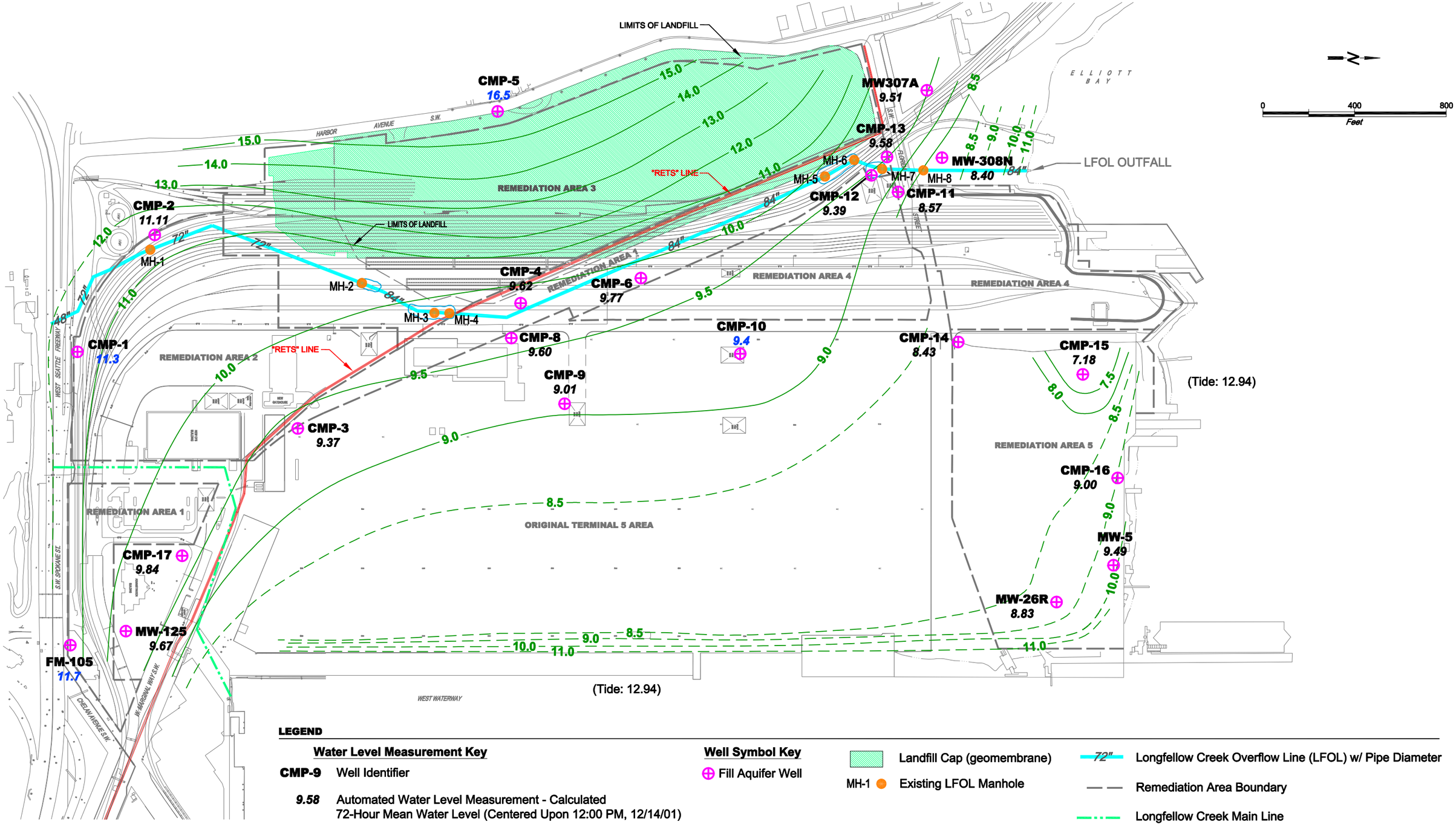
Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:	
DATE: 05/24/02	SCALE: 1" = 800'
DESIGNED BY: WVG, SJG	REVISED:
DRAWN BY: JJR	ORIG. FILENAME: Figure 3-5.dwg

PROJECT NO. 990106

FIGURE NO. 3.5

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.05.dwg



LEGEND

Water Level Measurement Key

- **CMP-9** Well Identifier
- ***9.58*** Automated Water Level Measurement - Calculated 72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)
- ***9.4*** Manual Water Level Measurement
- 8.5 Inferred Ground Water Elevation Contour *(dashed where uncertain)*

Well Symbol Key

- Fill Aquifer Well
- MH-1 Existing LFOL Manhole

- Landfill Cap (geomembrane)
- 72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
- Remediation Area Boundary
- Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

Survey Update 1/8/02

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Seattle, Washington

Fill Aquifer Groundwater Elevation Contour Map (High Tide, 5:10 12/14/01)
Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:	
DATE: 05/31/02	SCALE: 1" = 400'
DESIGNED BY: WVG, SJG	REVISED:
DRAWN BY: JJR	FILENAME: (ORIG.) 990106GWFHTD.dwg

PROJECT NO. 990106

FIGURE NO. 3.6

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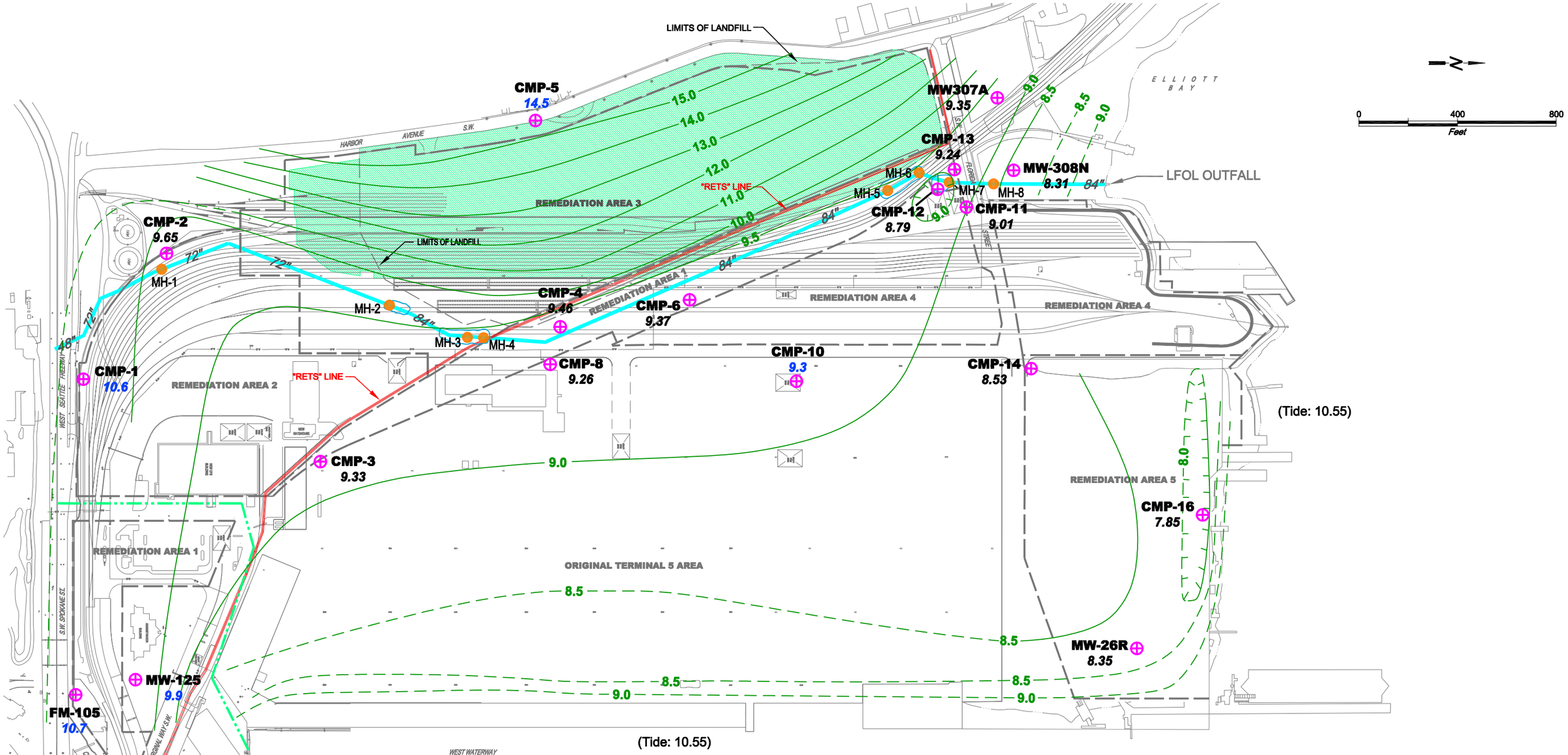

LEGEND

Water Level Measurement Key

- **CMP-9** Well Identifier
- ***9.58*** Automated Water Level Measurement - Calculated 72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)
- ***9.4*** Manual Water Level Measurement
- —8.5— Inferred Ground Water Elevation Contour *(dashed where uncertain)*

Well Symbol Key

- ⊕ Fill Aquifer Well

- Landfill Cap (geomembrane)
- MH-1 Existing LFOL Manhole
- 72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
- Remediation Area Boundary
- Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

Survey Update 1/8/02

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Fill Aquifer Groundwater Elevation Contour Map (High Tide, 5:00 4/10/02)

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

DATE:	05/31/02
SCALE:	1" = 400'
DESIGNED BY:	WVG, SJG
REVISED:	
DRAWN BY:	JJR
FILENAME: (ORIG.)	9901064-41002.dwg

PROJECT NO. 990106

FIGURE NO. 3.7

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.07.dwg

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
ANMARCO PROPERTY
ELLIOTT BAY
ELEVATION −21.68
FORMER SSI PROPERTY REMEDIATION AREA 3
LONGFELLOW BASINS NORTH
LONGFELLOW BASINS SOUTH
PSR PROPERTY REMEDIATION AREA 4
KETRU METS LINE
Proposed Property Boundary
TIDAL STUDY AREA
B.N. RR PROPERTY REMEDIATION AREA 1
SALMON BAY PROPERTY REMEDIATION AREA 2
TERMINAL 5
FORMER LOCKHEED YARD 2 PROPERTY
SPOKANE STREET PROPERTIES REMEDIATION AREA 1
EXIST. MW103
Inferred
?

16.57 HC8AB
19.96 HC5
9.79 HC11A
HC11B
MW307A
MW307B
8.47
MW309B
MW309A
NSW2 −0.86
8.66
P.O.S. PIER 2
MW308B
MW308A
MW301C
MW302C
MW302A
MW302B
MW306B
8.58 L45
L210
MW310
9.62 MW217
MW202
MW216
MW207
9.65 MW305A
MW305B
13.15
MW304A
MW304B
10.40 MW303D
MW303C
MW303A
MW303B
HC6B
HC6A
L42
9.96 W15
L43
9.47 W14
9.49 MW3
8.96 L13
9.12 L19
L15
W2
7.67
L32
4.91
L12
10.53 MW214A
MW214B
MW214C
MW203
FMD1
MW205
9.42 MW206
MW212 (APPROX.)
MW209
MW215
MW204B
MW204A
MW201
MW208
MW218
MW1
9.90 MW105
12.86
MW103
MW102
9.95 MW101

0 400 800 1600 FEET
SCALE

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 6
Southwest Harbor Project - July, 1994

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Port of Seattle
Seattle, Washington

Fill Aquifer Groundwater Elevation Contour Map (Low Tide, 14:00 4/28/94)

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:	
DATE: 05/24/02	SCALE: 1" = 800'
DESIGNED BY: WVG, SJG	REVISED:
DRAWN BY: JJR	ORIG. FILENAME: Figure 3-8.dwg

PROJECT NO. 990106

FIGURE NO. **3.8**

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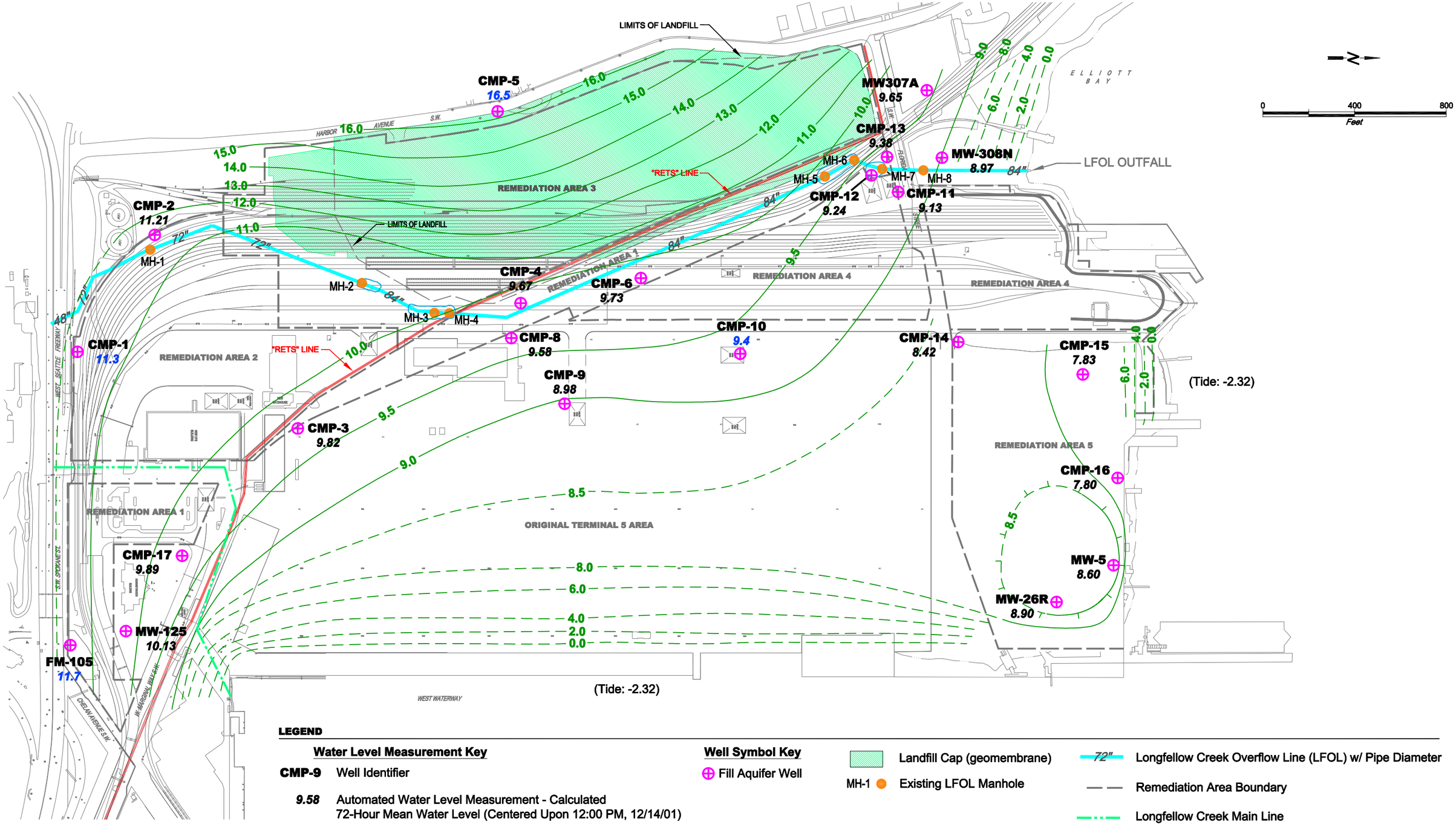

LEGEND

Water Level Measurement Key

- **CMP-9** Well Identifier
- ***9.58*** Automated Water Level Measurement - Calculated 72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)
- ***9.4*** Manual Water Level Measurement
- 8.5 Inferred Ground Water Elevation Contour *(dashed where uncertain)*

Well Symbol Key

- Fill Aquifer Well
- MH-1 Existing LFOL Manhole

- Landfill Cap (geomembrane)
- 72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
- Remediation Area Boundary
- Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

Survey Update 1/8/02

Aspect consulting
IN-DEPTH PERSPECTIVE
179 Madrone Lane North
Bainbridge Island, WA 98110
Tel: (206) 780-9370
Fax: (206) 780-9438

Port of Seattle
Seattle, Washington

Fill Aquifer Groundwater Elevation Contour Map (Low Tide, 22:40 12/14/01)

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

DATE:	05/31/02
SCALE:	1" = 400'
DESIGNED BY:	WVG, SJG
REVISED:	
DRAWN BY:	JJR
FILENAME: (ORIG.)	990106GWFLTD.dwg

PROJECT NO. 990106

FIGURE NO. 3.9

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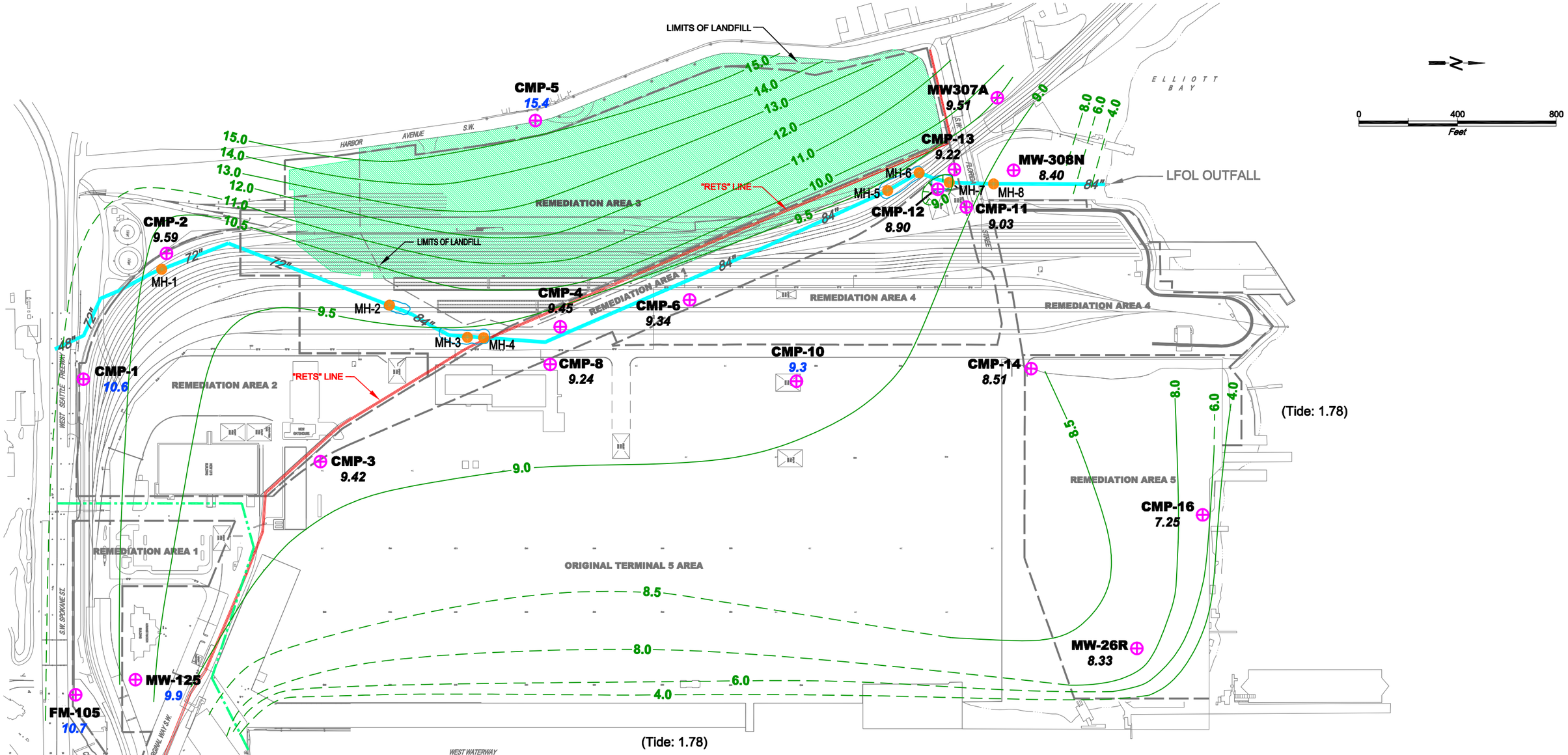

(Tide: 1.78)

LEGEND

Water Level Measurement Key

- **CMP-9** Well Identifier
- ***9.58*** Automated Water Level Measurement - Calculated 72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)
- ***9.4*** Manual Water Level Measurement
- 8.5 Inferred Ground Water Elevation Contour *(dashed where uncertain)*

Well Symbol Key

- Fill Aquifer Well
- MH-1 Existing LFOL Manhole

- Landfill Cap (geomembrane)
- 72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
- Remediation Area Boundary
- Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

Survey Update 1/8/02

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Bainbridge Island, WA 98110
Tel: (206) 780-9370
Fax: (206) 780-9438

Port of Seattle
Seattle, Washington

Fill Aquifer Groundwater Elevation Contour Map (Low Tide, 12:00 4/12/02)

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

DATE:	05/31/02
SCALE:	1" = 400'
DESIGNED BY:	WVG, SJG
REVISED:	
DRAWN BY:	JJR
FILENAME: (ORIG.)	9901064-LT41202.dwg

PROJECT NO. 990106

FIGURE NO. 3.10

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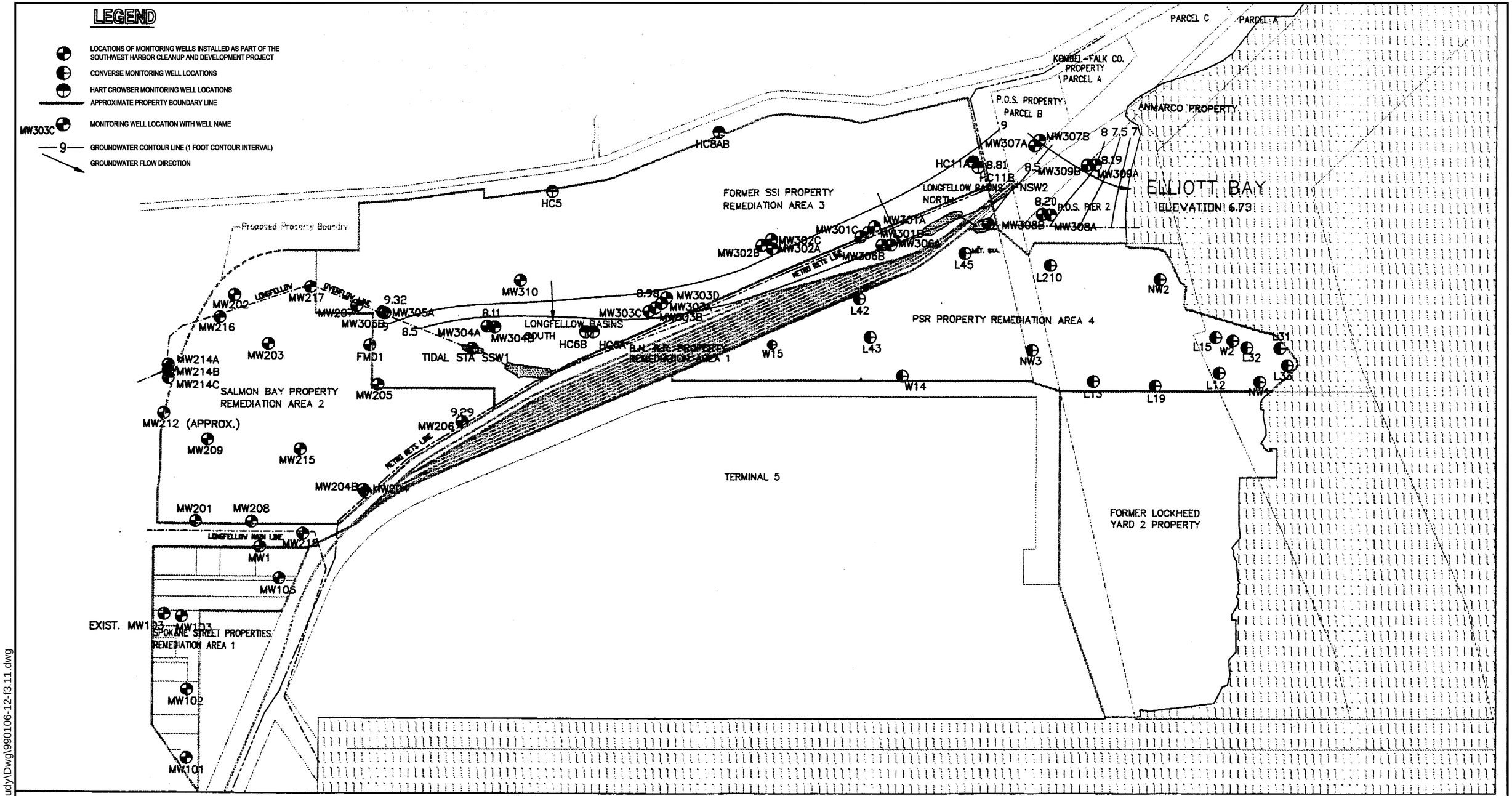

N

0 400 800 1600

SCALE 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

Aspect consulting
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Bainbridge Island, WA 98110
Tel: (206) 780-9370
Fax: (206) 780-9438

Port of Seattle
Seattle, Washington

Estuarine Aquifer Groundwater Elevation Contour Map (72-Hour Mean, 4/28-30/94)

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:	
DATE: 05/28/02	SCALE: 1" = 800'
DESIGNED BY: WVG, SJG	REVISED:
DRAWN BY: JJR	ORIG. FILENAME: Figure 3-11.dwg

PROJECT NO. 990106

FIGURE NO. **3.11**

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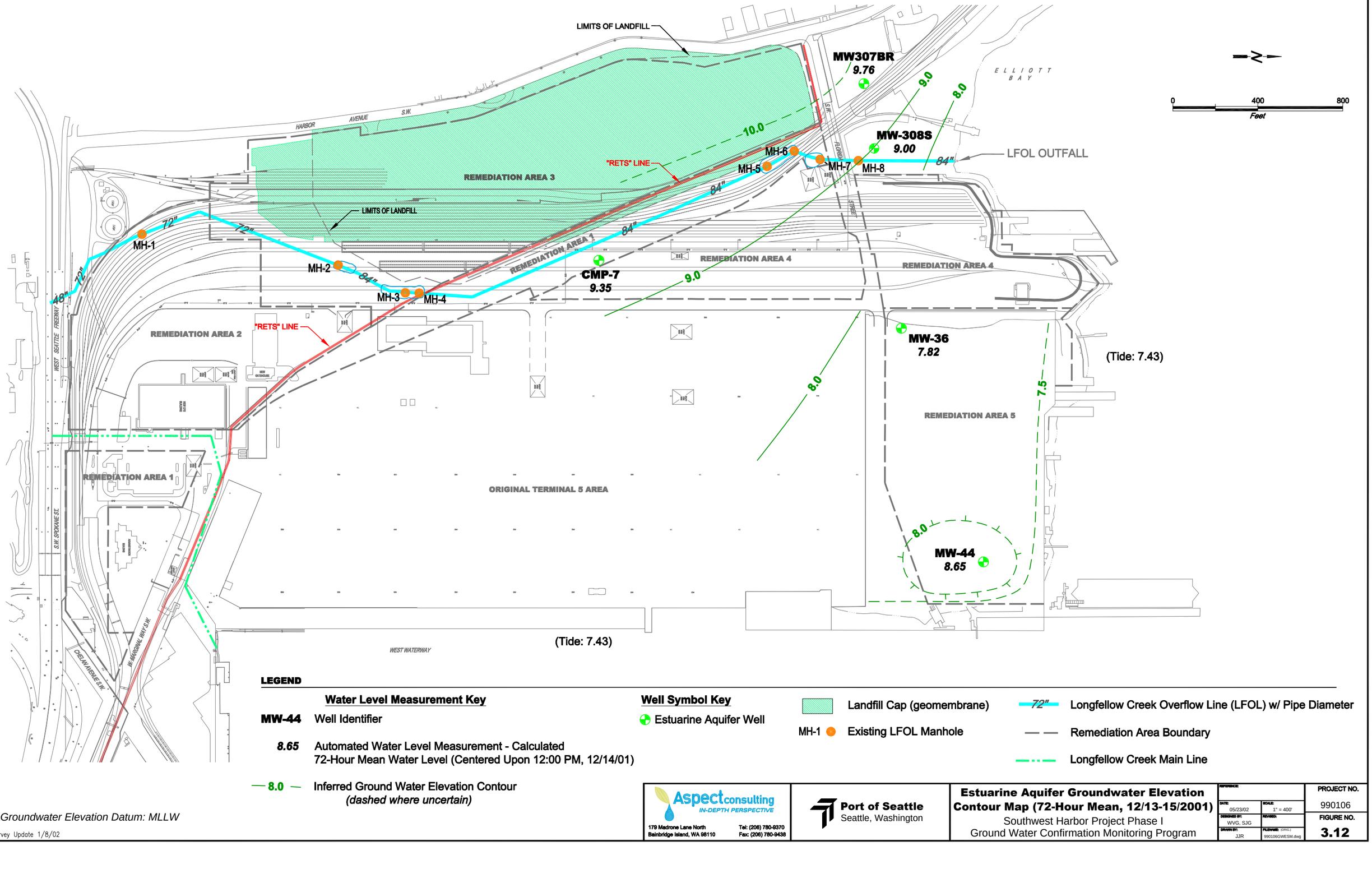

LEGEND

Water Level Measurement Key

MW-44 Well Identifier

8.65 Automated Water Level Measurement - Calculated
72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)

8.0 Inferred Ground Water Elevation Contour
(dashed where uncertain)

Well Symbol Key

Estuarine Aquifer Well

MH-1 Existing LFOL Manhole

Landfill Cap (geomembrane)

72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter

Remediation Area Boundary

Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

Survey Update 1/8/02

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Fax: (206) 780-9438

Port of Seattle
Seattle, Washington

Estuarine Aquifer Groundwater Elevation Contour Map (72-Hour Mean, 12/13-15/2001)
Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:	
DATE: 05/23/02	SCALE: 1" = 400'
DESIGNED BY: WVG, SJG	REVISED:
DRAWN BY: JJR	FILENAME: (ORIG.) 990106GWESM.dwg

PROJECT NO. 990106

FIGURE NO. **3.12**

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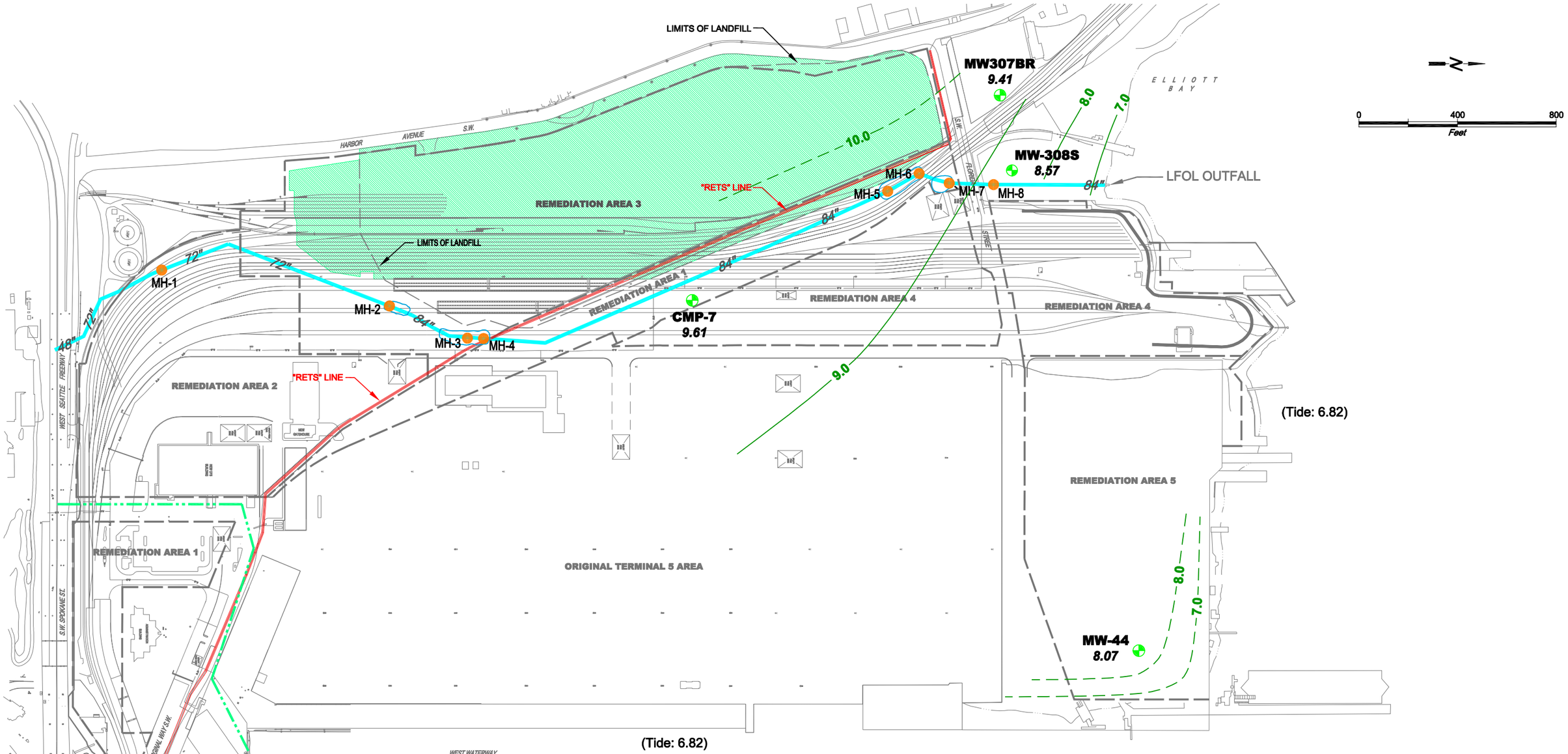

(Tide: 6.82)

LEGEND

Water Level Measurement Key

MW-44 Well Identifier

8.65 Automated Water Level Measurement - Calculated
72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)

8.0 Inferred Ground Water Elevation Contour
(dashed where uncertain)

Well Symbol Key

Estuarine Aquifer Well

MH-1 Existing LFOL Manhole

Landfill Cap (geomembrane)

72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter

Remediation Area Boundary

Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

Survey Update 1/8/02

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Fax: (206) 780-9438

Port of Seattle
Seattle, Washington

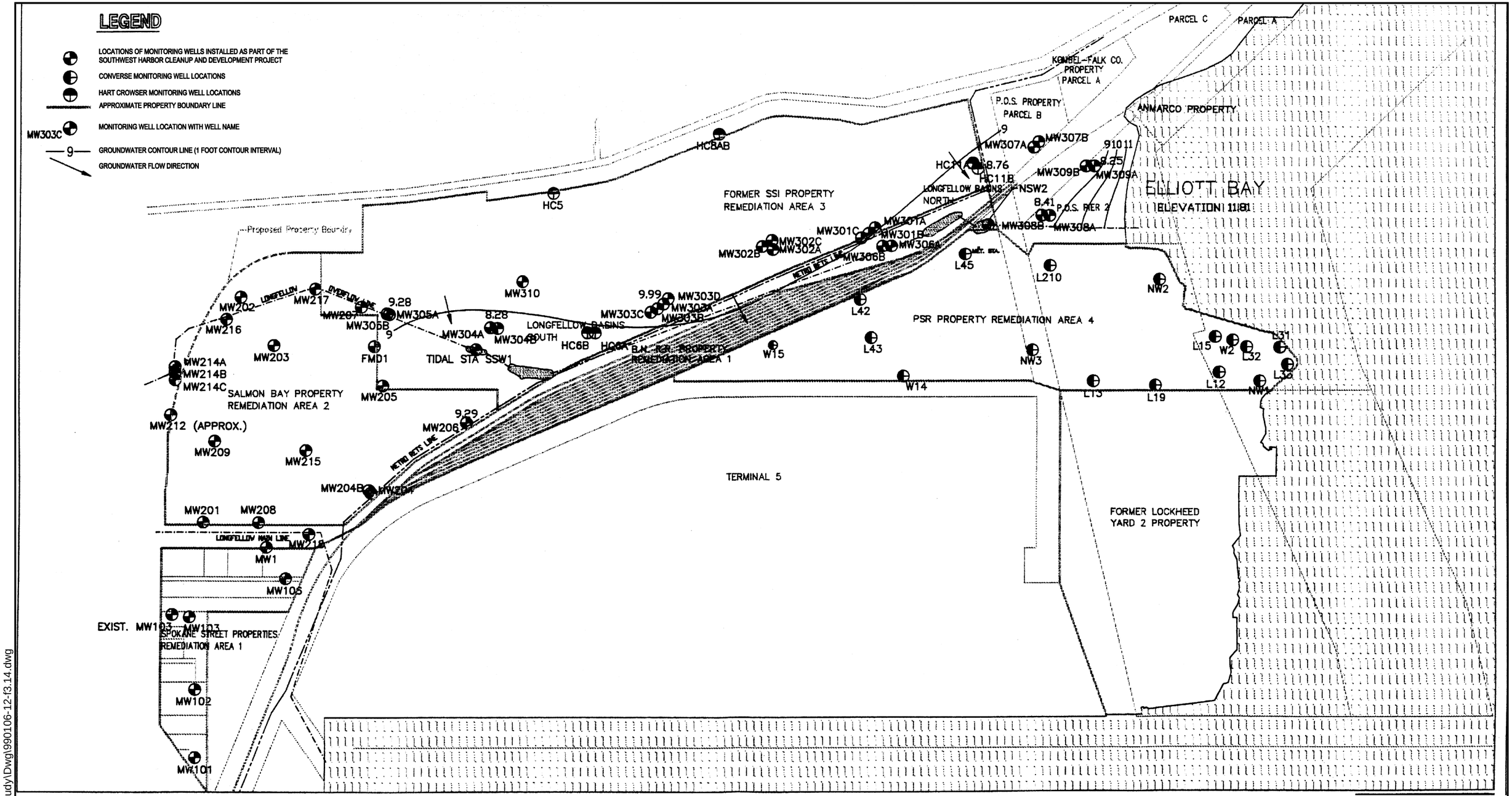
Estuarine Aquifer Groundwater Elevation Contour Map (72-Hour Mean, 4/10-12/2002)
Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:		PROJECT NO.
DATE: 05/23/02	SCALE: 1" = 400'	990106
DESIGNED BY: WVG, SJG	REVISED:	FIGURE NO.
DRAWN BY: JJR	FILENAME: (ORIG.) 990106GW3-13.dwg	3.13

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.13.dwg

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



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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Port of Seattle
Seattle, Washington

Estuarine Aquifer Groundwater Elevation Contour Map (High Tide, 21:00 4/28/94)

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:	
DATE: 05/28/02	SCALE: 1" = 800'
DESIGNED BY: WVG, SJG	REVISED:
DRAWN BY: JJR	ORIG. FILENAME: Figure 3-14.dwg

PROJECT NO. 990106

FIGURE NO. **3.14**

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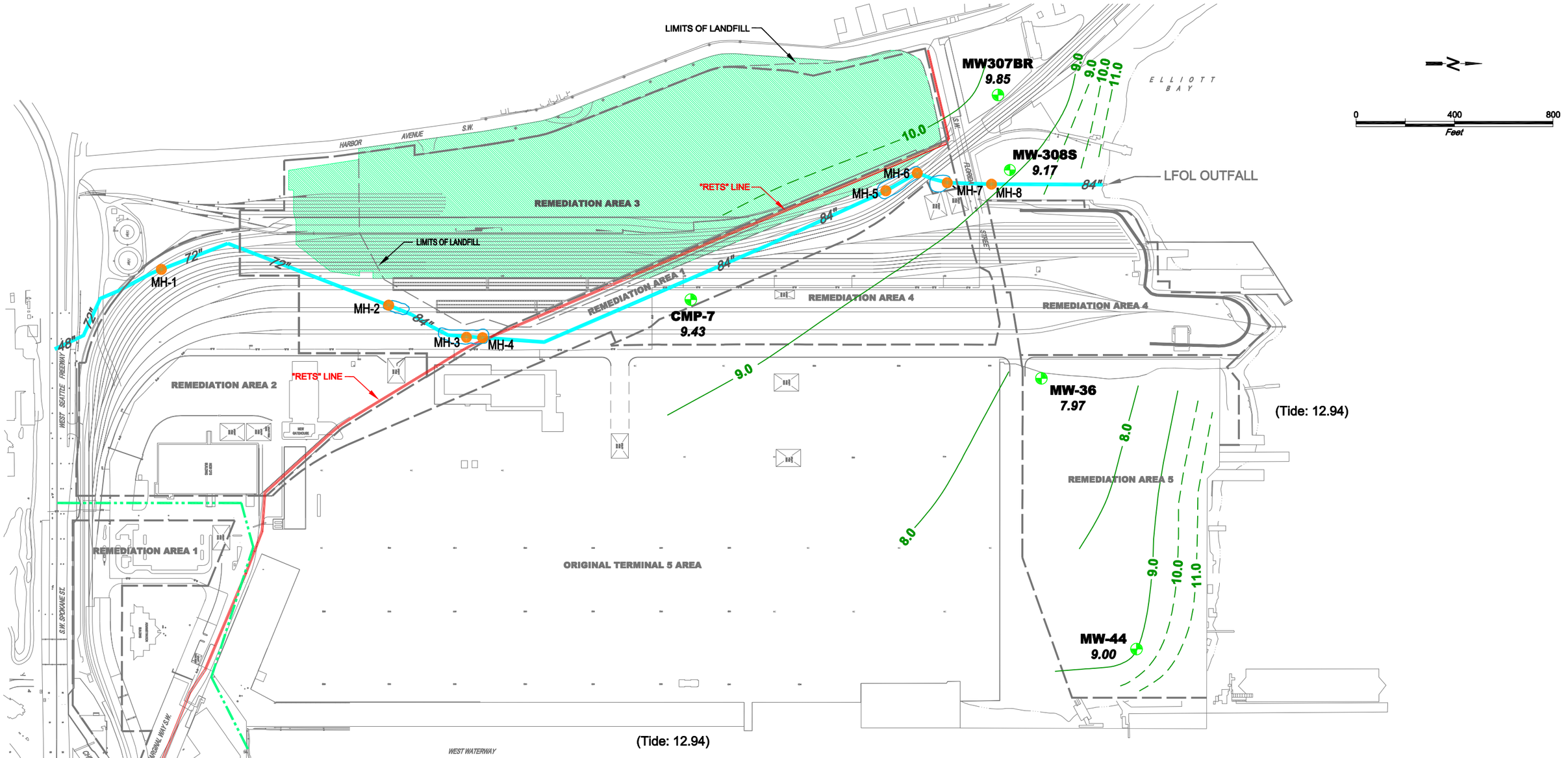

LEGEND

Water Level Measurement Key

MW-44 Well Identifier

9.00 Automated Water Level Measurement - Calculated
72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)

8.5 Inferred Ground Water Elevation Contour
(dashed where uncertain)

Well Symbol Key

Estuarine Aquifer Well

MH-1 Existing LFOL Manhole

Landfill Cap (geomembrane)

72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter

Remediation Area Boundary

Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

Survey Update 1/8/02

Aspect consulting
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179 Madrone Lane North
Bainbridge Island, WA 98110
Tel: (206) 780-8370
Fax: (206) 780-9438

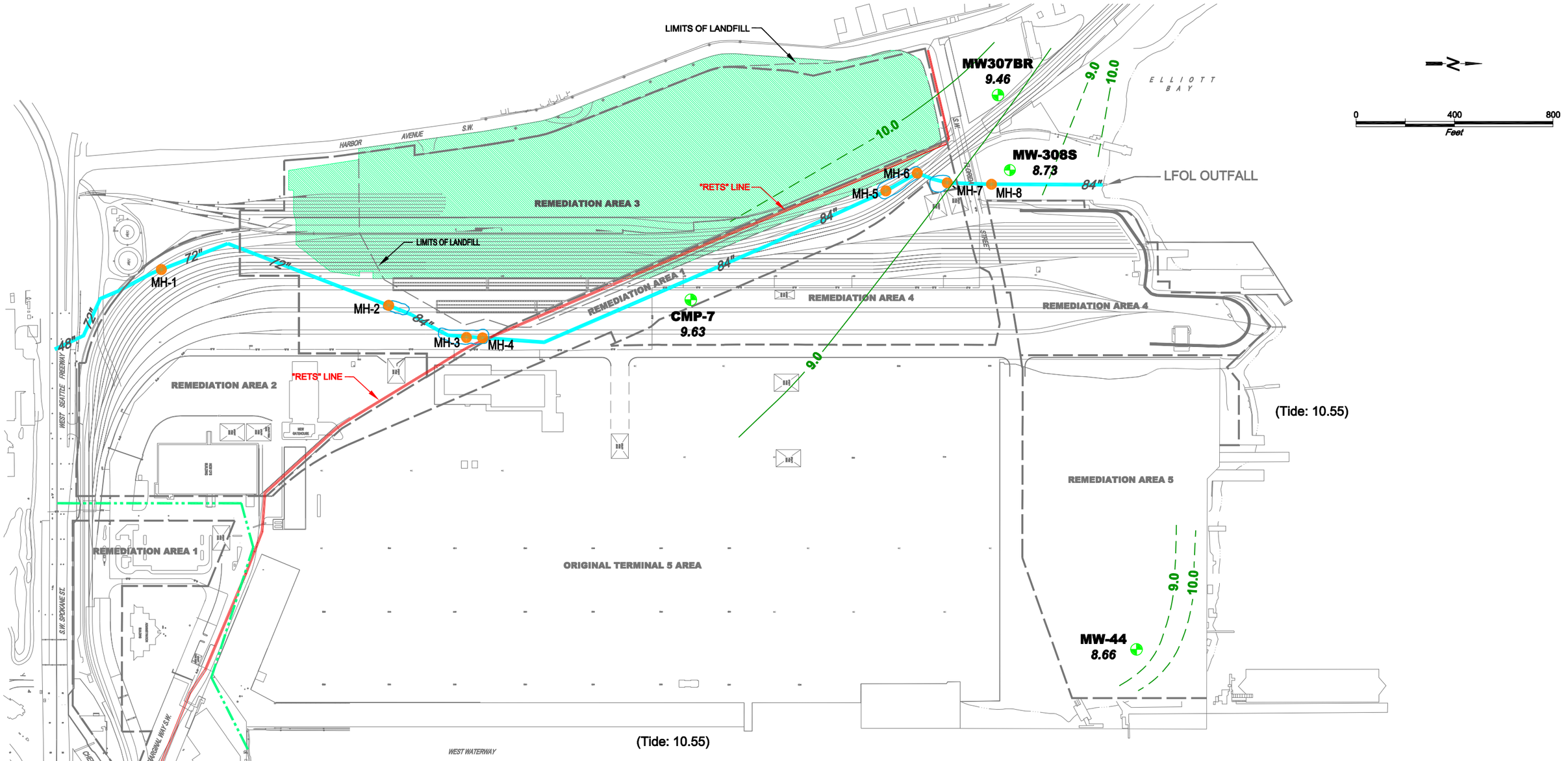
Port of Seattle
Seattle, Washington

Estuarine Aquifer Groundwater Elevation Contour Map (High Tide, 5:10 12/14/01)
Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:
DATE: 05/23/02
SCALE: 1" = 400'
DESIGNED BY: WVG, SJG
REVISED:
DRAWN BY: JJR
FILENAME (ORIG.): 990106GWESH.dwg

PROJECT NO. 990106
FIGURE NO. **3.15**

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.15.dwg



LEGEND

Water Level Measurement Key

MW-44 Well Identifier

8.65 Automated Water Level Measurement - Calculated
72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)

— 8.0 — Inferred Ground Water Elevation Contour
(dashed where uncertain)

Well Symbol Key

Estuarine Aquifer Well

MH-1 Existing LFOL Manhole

Landfill Cap (geomembrane)

72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter

Remediation Area Boundary

Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

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Seattle, Washington

Estuarine Aquifer Groundwater Elevation Contour Map (High Tide, 5:00 4/10/02)
Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:	
DATE: 05/23/02	SCALE: 1" = 400'
DESIGNED BY: WVG, SJG	REVISED:
DRAWN BY: JJR	FILENAME: (ORIG.) 990106GW3-16.dwg

PROJECT NO. 990106

FIGURE NO. 3.16

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.16.dwg

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
ANMARCO PROPERTY
ELLIOTT BAY
ELEVATION +2.68
FORMER SSI PROPERTY REMEDIATION AREA 3
LONGFELLOW BASINS NORTH
LONGFELLOW BASINS SOUTH
PSR PROPERTY REMEDIATION AREA 4
SALMON BAY PROPERTY REMEDIATION AREA 2
SPOKANE STREET PROPERTIES REMEDIATION AREA 1
TERMINAL 5
FORMER LOCKHEED YARD 2 PROPERTY
Proposed Property Boundary
METRO METS LINE
LONGFELLOW MAIN LINE
OVERFLOW LINE
TIDAL STA SSW1
MET. STA.
HC8AB
HC5
HC11A
HC11B
HC6B
HC6A
MW307A
MW307B
MW309B
MW309A
MW308B
MW308A
MW301C
MW301A
MW301B
MW306A
MW306B
MW302B
MW302C
MW302A
MW303D
MW303C
MW303A
MW303B
MW310
MW305A
MW305B
MW304A
MW304B
MW202
MW217
MW207
MW216
MW203
FMD1
MW214A
MW214B
MW214C
MW205
MW212 (APPROX.)
MW209
MW215
MW206
MW204B
MW204A
MW201
MW208
MW218
MW1
MW106
EXIST. MW103
MW103
MW102
MW101
L45
L42
L43
L210
NW2
NW3
W15
W14
L13
L19
L12
NW1
L15
W2
L32
L31
L30
NSW2
7 6543210-1-2
8.78
7.70
7.56
9.25
7.81
8.99
9.29

N

0 400 800 1600 SCALE 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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Fax: (206) 780-9438

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Seattle, Washington

Estuarine Aquifer Groundwater Elevation Contour Map (Low Tide, 14:00 4/28/94)

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:	
DATE: 05/28/02	SCALE: 1" = 800'
DESIGNED BY: WVG, SJG	REVISED:
DRAWN BY: JJR	ORG. FILENAME: Figure 3-17.dwg

PROJECT NO. 990106

FIGURE NO. **3.17**

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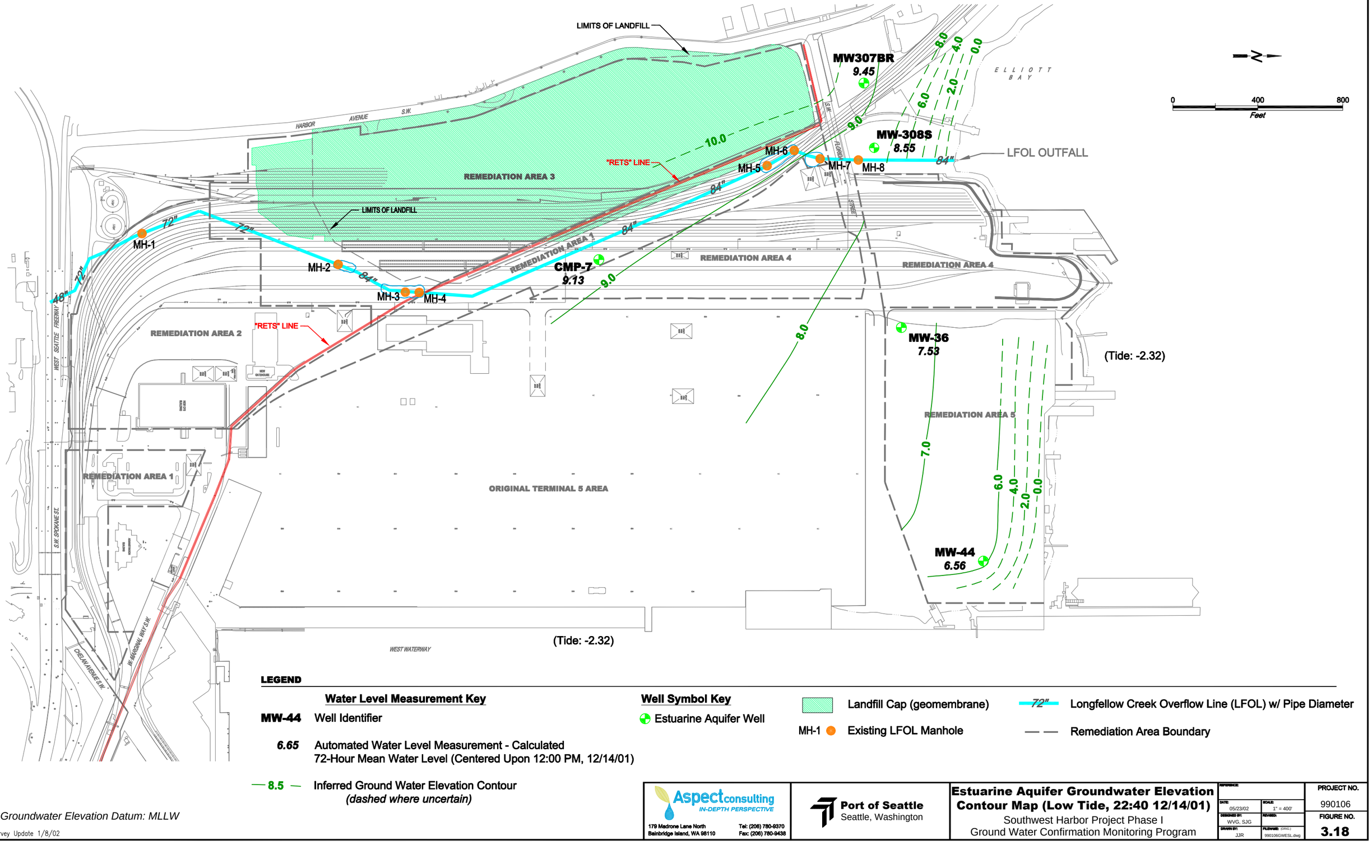

LEGEND

Water Level Measurement Key

MW-44 Well Identifier

6.65 Automated Water Level Measurement - Calculated
72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)

— 8.5 — Inferred Ground Water Elevation Contour
(dashed where uncertain)

Well Symbol Key

Estuarine Aquifer Well

Landfill Cap (geomembrane)

MH-1 Existing LFOL Manhole

72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter

Remediation Area Boundary

Groundwater Elevation Datum: MLLW

Survey Update 1/8/02

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.18.dwg

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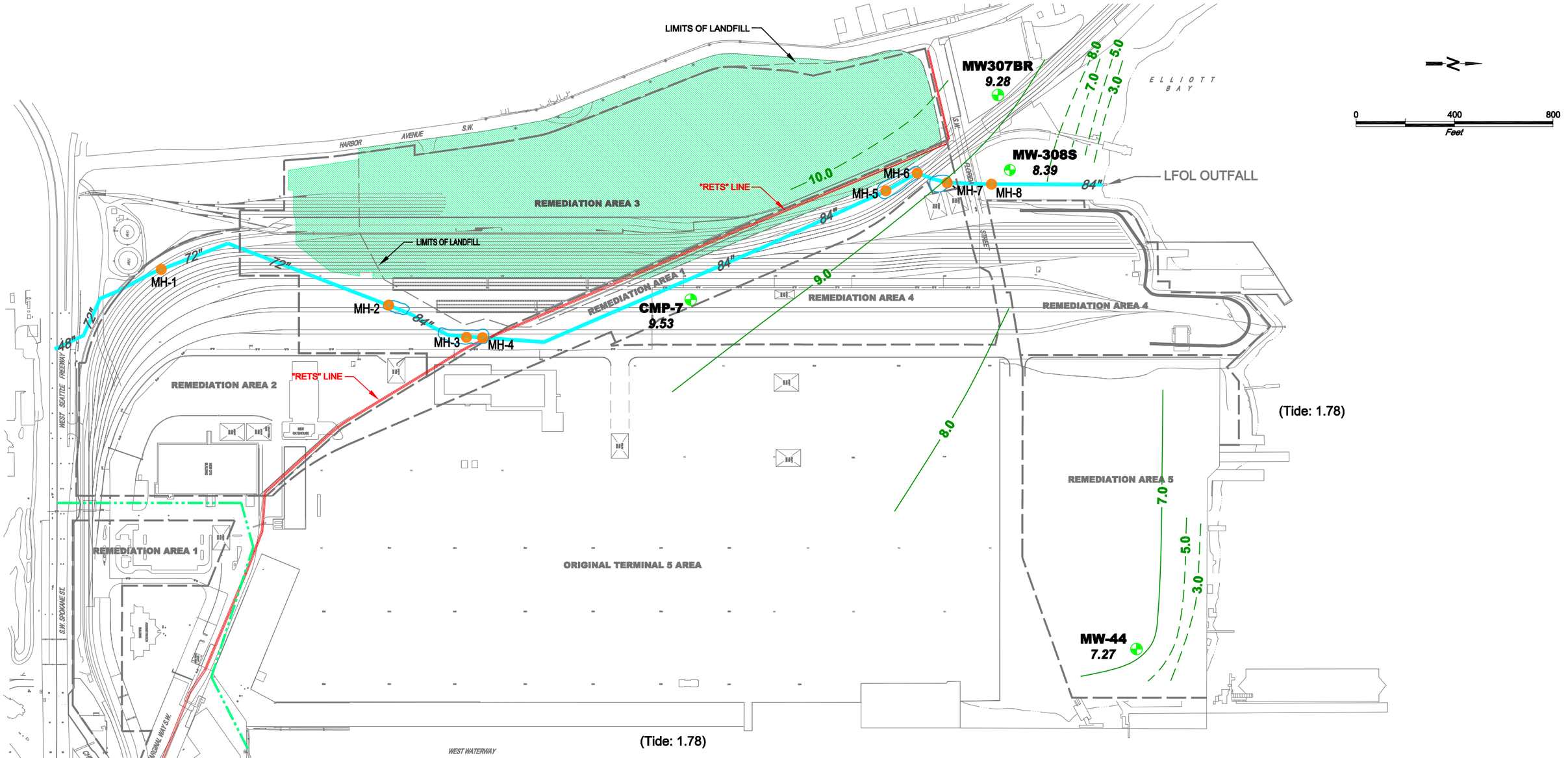
Port of Seattle
Seattle, Washington

Estuarine Aquifer Groundwater Elevation Contour Map (Low Tide, 22:40 12/14/01)

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

REFERENCE:
DATE: 05/23/02
SCALE: 1" = 400'
DESIGNED BY: WVG, SJG
REVISED:
DRAWN BY: JJR
FILENAME: (ORIG.) 990106GWESL.dwg

PROJECT NO. 990106
FIGURE NO. **3.18**



LEGEND

Water Level Measurement Key

MW-44 Well Identifier

6.65 Automated Water Level Measurement - Calculated
72-Hour Mean Water Level (Centered Upon 12:00 PM, 12/14/01)

8.5 Inferred Ground Water Elevation Contour
(dashed where uncertain)

Well Symbol Key

Estuarine Aquifer Well

MH-1 Existing LFOL Manhole

Landfill Cap (geomembrane)

72" Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter

Remediation Area Boundary

Longfellow Creek Main Line

Groundwater Elevation Datum: MLLW

Survey Update 1/8/02

P:\POS Terminal 5\TidalStudy\Dwg\990106-12-f3.19.dwg

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Fax: (206) 780-9438

Port of Seattle
Seattle, Washington

Estuarine Aquifer Groundwater Elevation Contour Map (Low Tide, 12:00 4/12/02)

Southwest Harbor Project Phase I
Ground Water Confirmation Monitoring Program

DATE:	05/23/02
SCALE:	1" = 400'
DESIGNED BY:	WVG, SJG
REVISED:	
DRAWN BY:	JJR
FILENAME: (ORIG.)	990106GW3-19.dwg

PROJECT NO. 990106

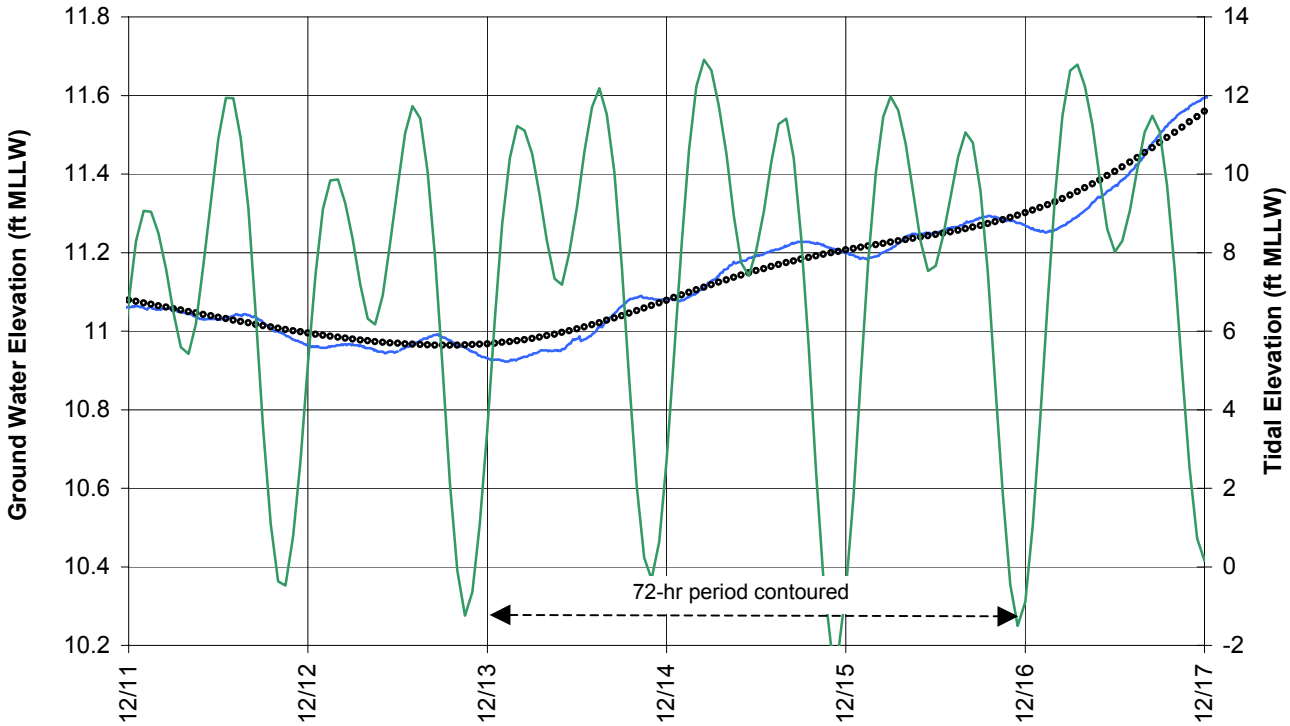
FIGURE NO. **3.19**

APPENDIX A

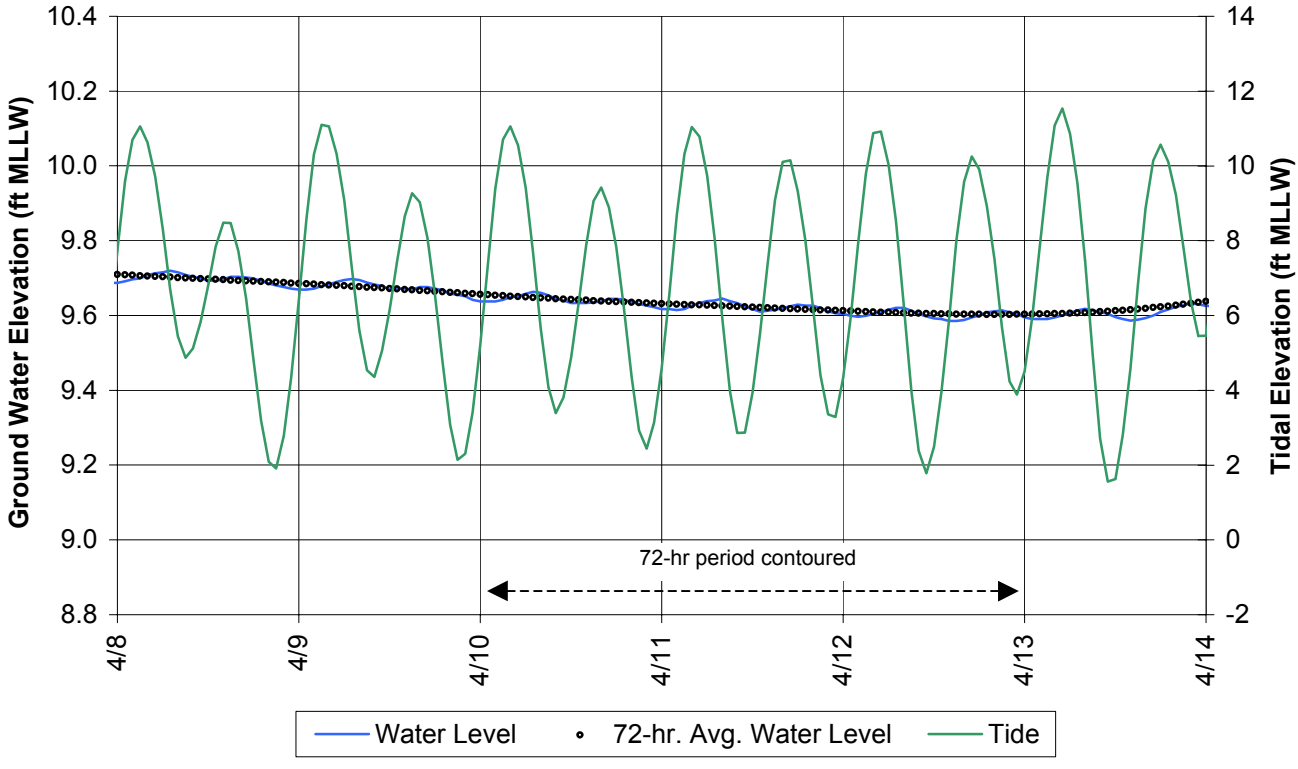
Ground Water Elevation Versus Time Plots

CMP-2 (Fill Aquifer)

December 2001



April 2002



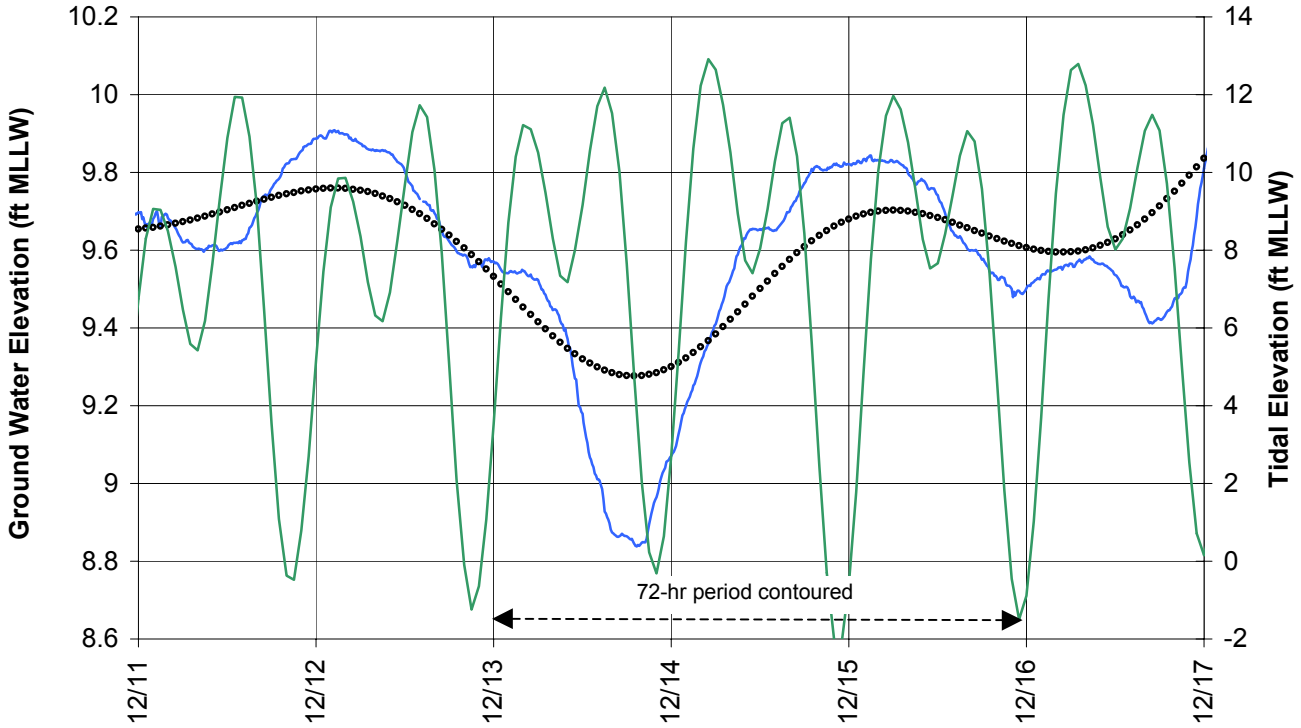
Aspect consulting
IN-DEPTH PERSPECTIVE

CMP-2 Ground Water Elevation during Tidal Study **Figure A-1**

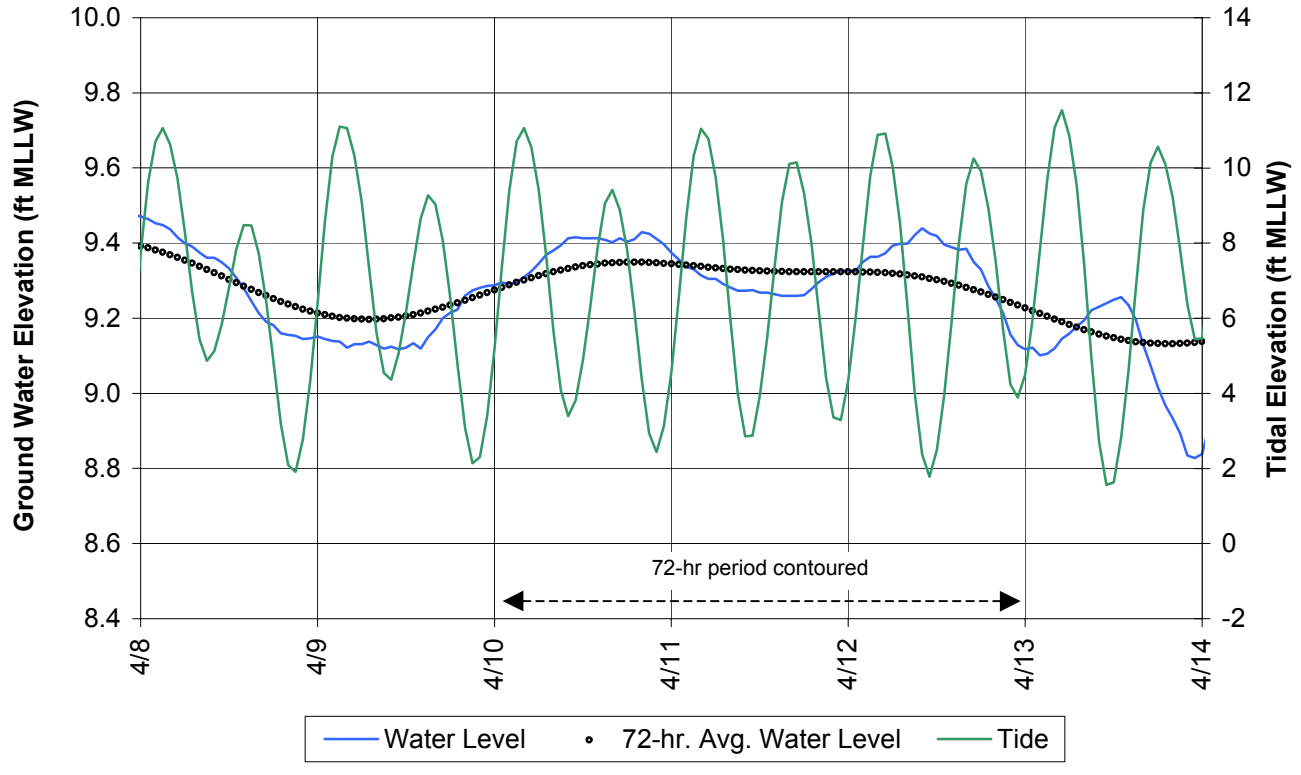
SWHP Phase I, GWCMP

CMP-3 (Fill Aquifer)

December 2001



April 2002

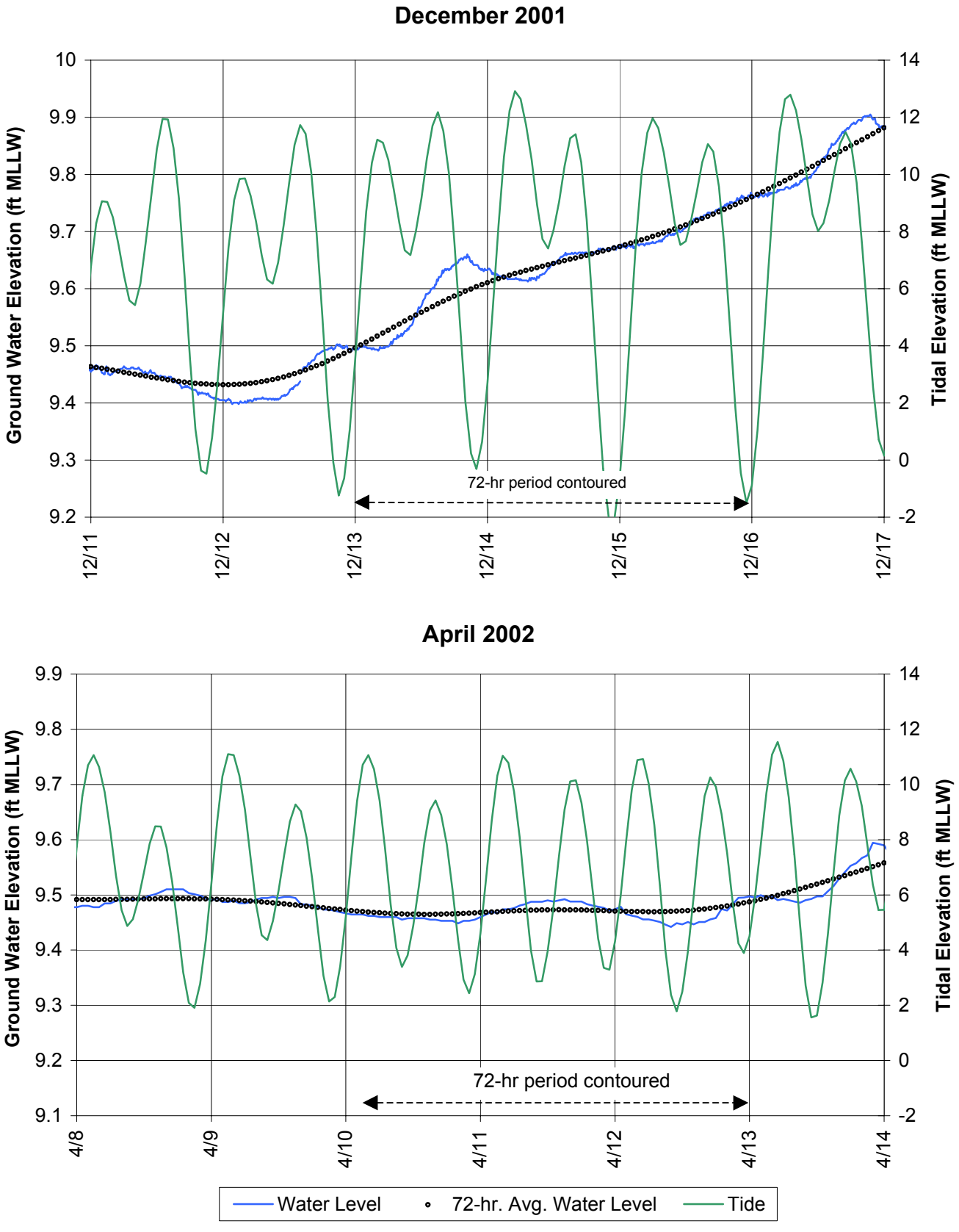


Aspect consulting
IN-DEPTH PERSPECTIVE

CMP-3 Ground Water Elevation during Tidal Study **Figure A-2**

SWHP Phase I, GWCMP

CMP-4 (Fill Aquifer)

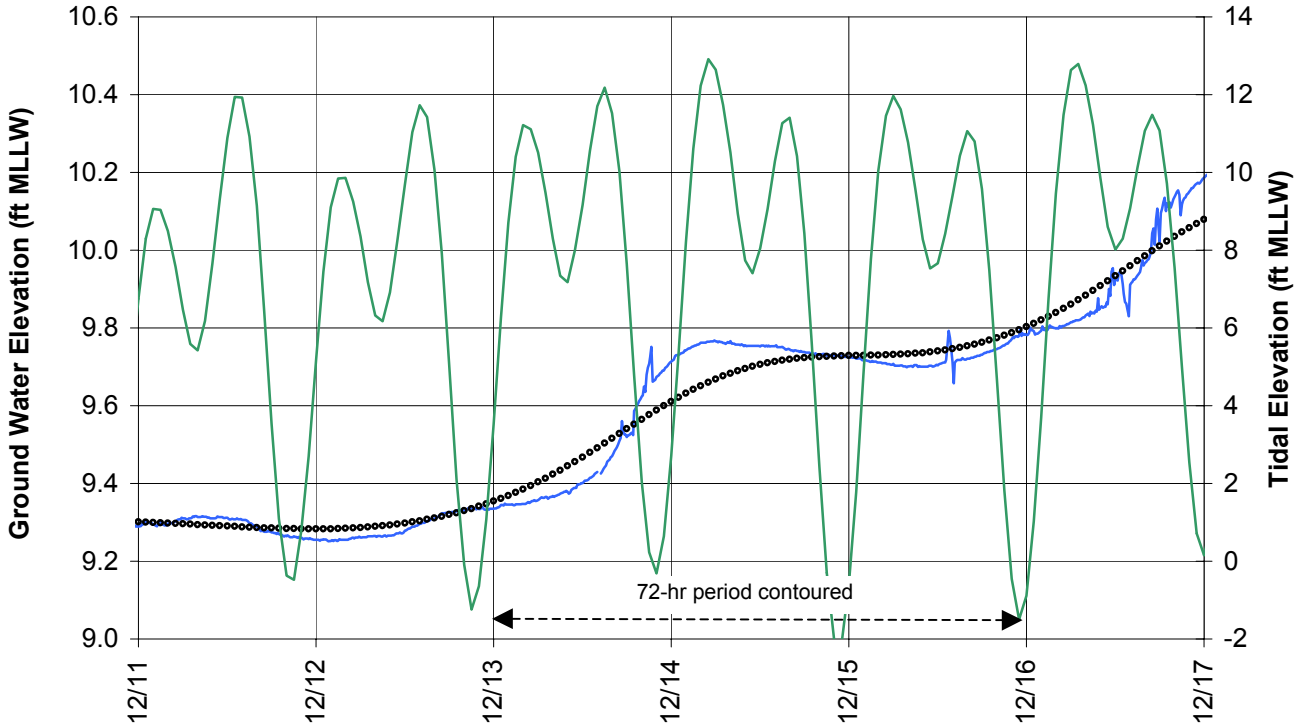


CMP-4 Ground Water Elevation during Tidal Study **Figure A-3**

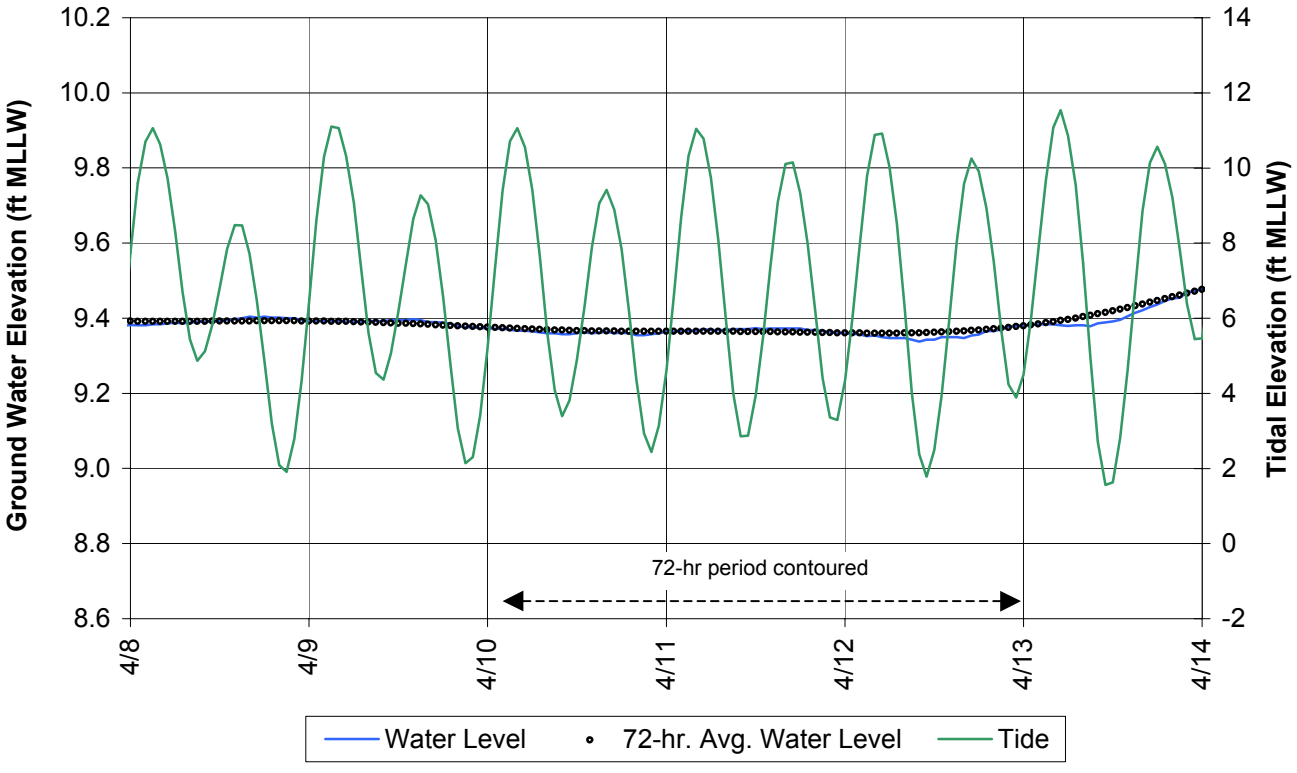
SWHP Phase I, GWCMP

CMP-6 (Fill Aquifer)

December 2001



April 2002

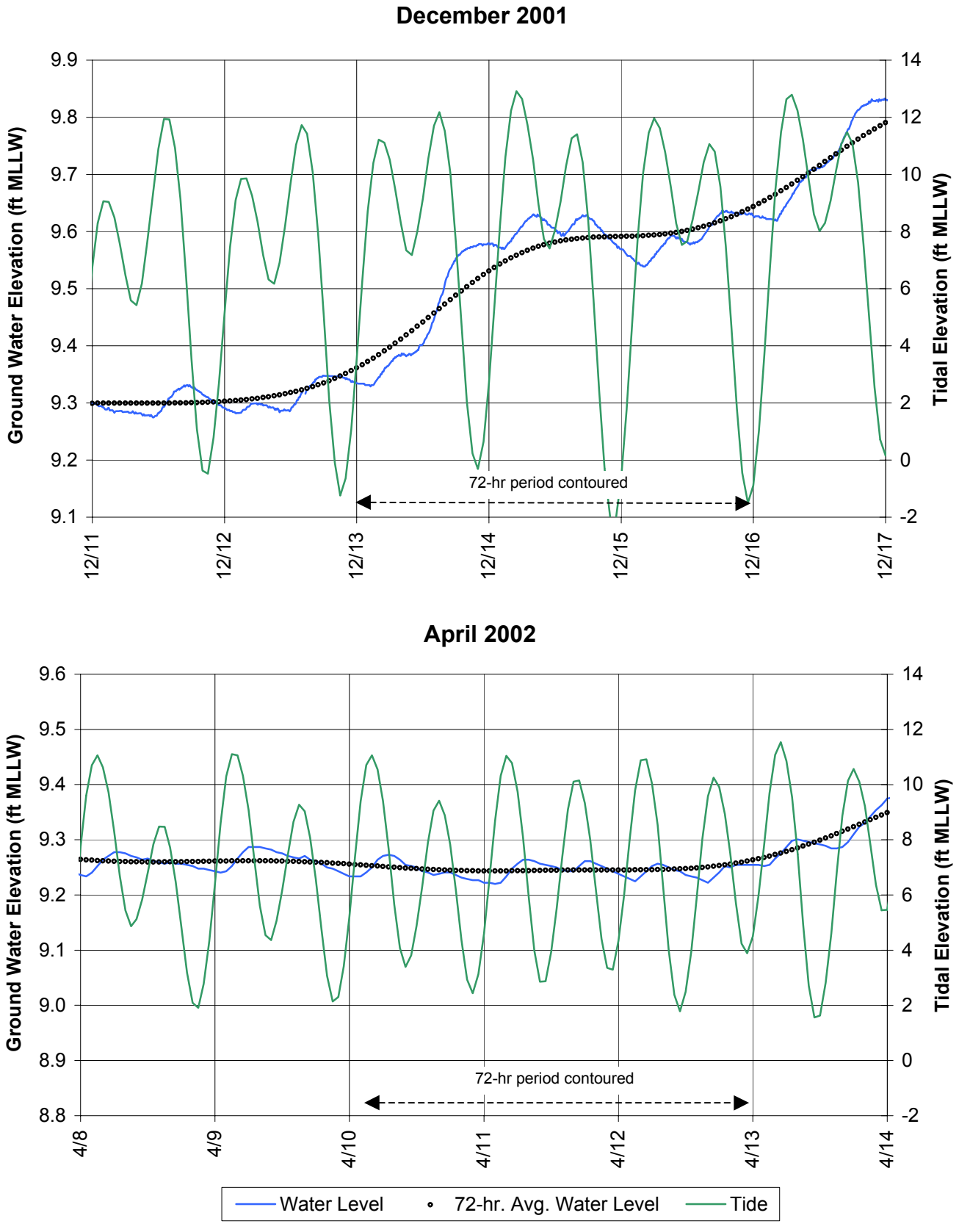


Aspect consulting
IN-DEPTH PERSPECTIVE

CMP-6 Ground Water Elevation during Tidal Study **Figure A-4**

SWHP Phase I, GWCMP

CMP-8 (Fill Aquifer)



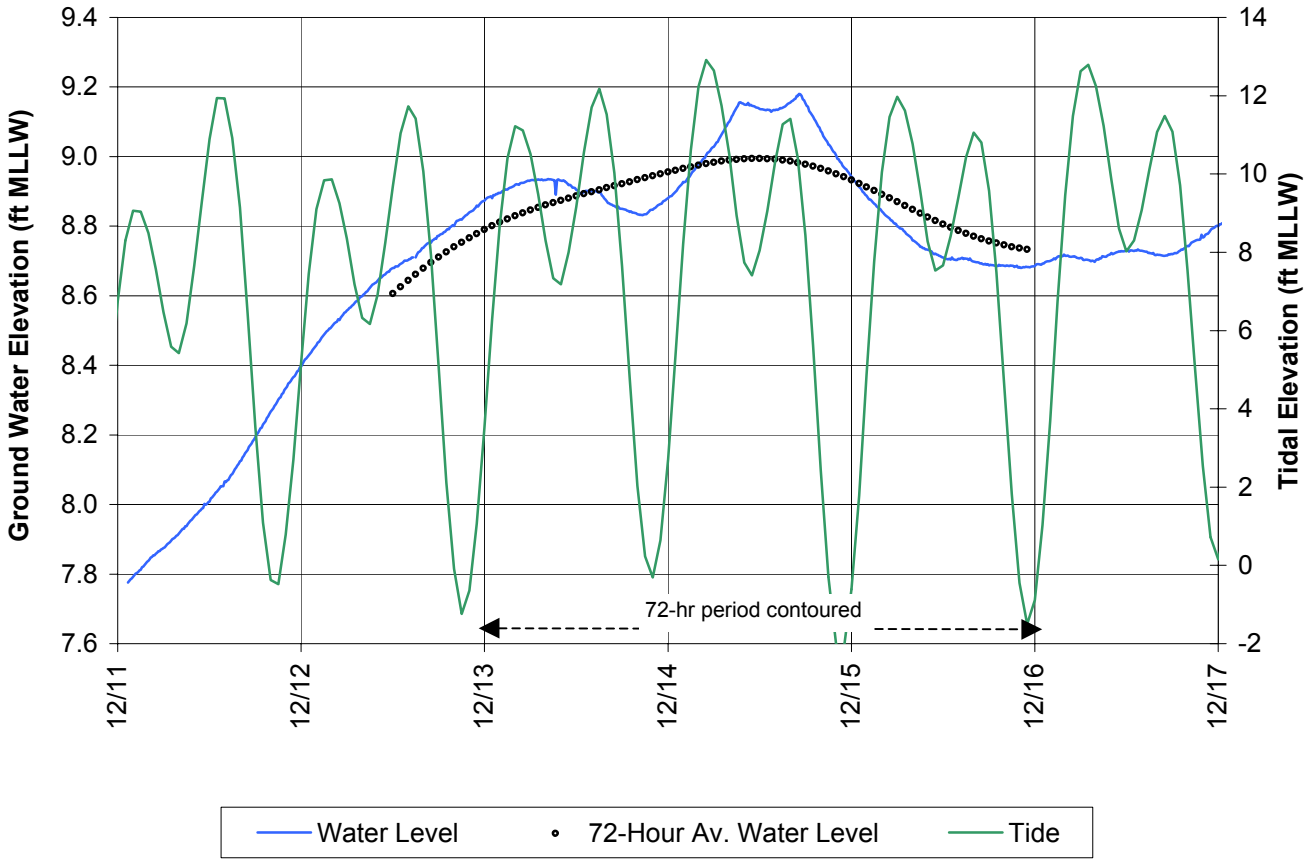
Aspect consulting
IN-DEPTH PERSPECTIVE

CMP-8 Ground Water Elevation during Tidal Study **Figure A-5**

SWHP Phase I, GWCMP

CMP-9 (Fill Aquifer)

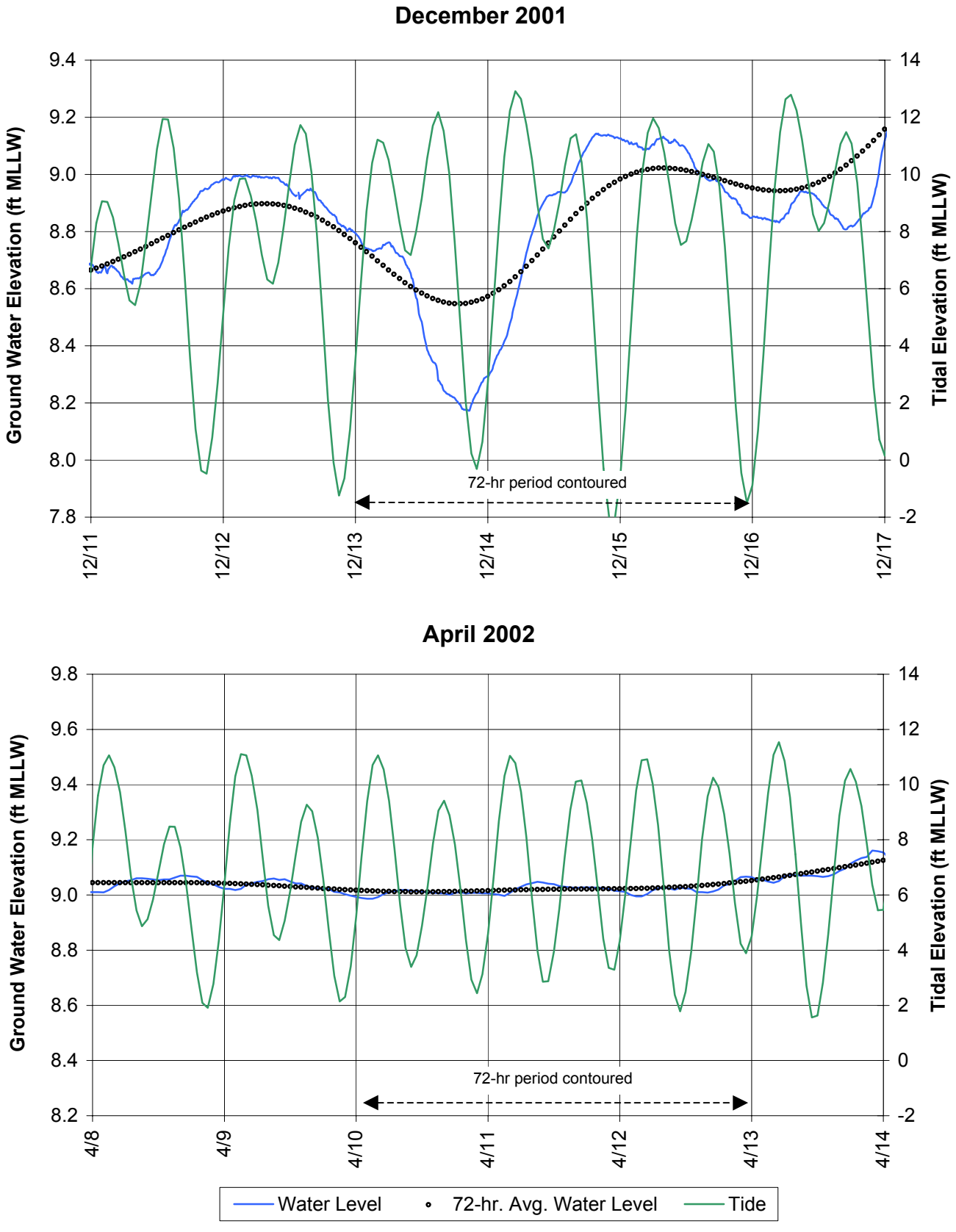
December 2001



CMP-9 Ground Water Elevation during Tidal Study **Figure A-6**

SWHP Phase I, GWCMP

CMP-11 (Fill Aquifer)



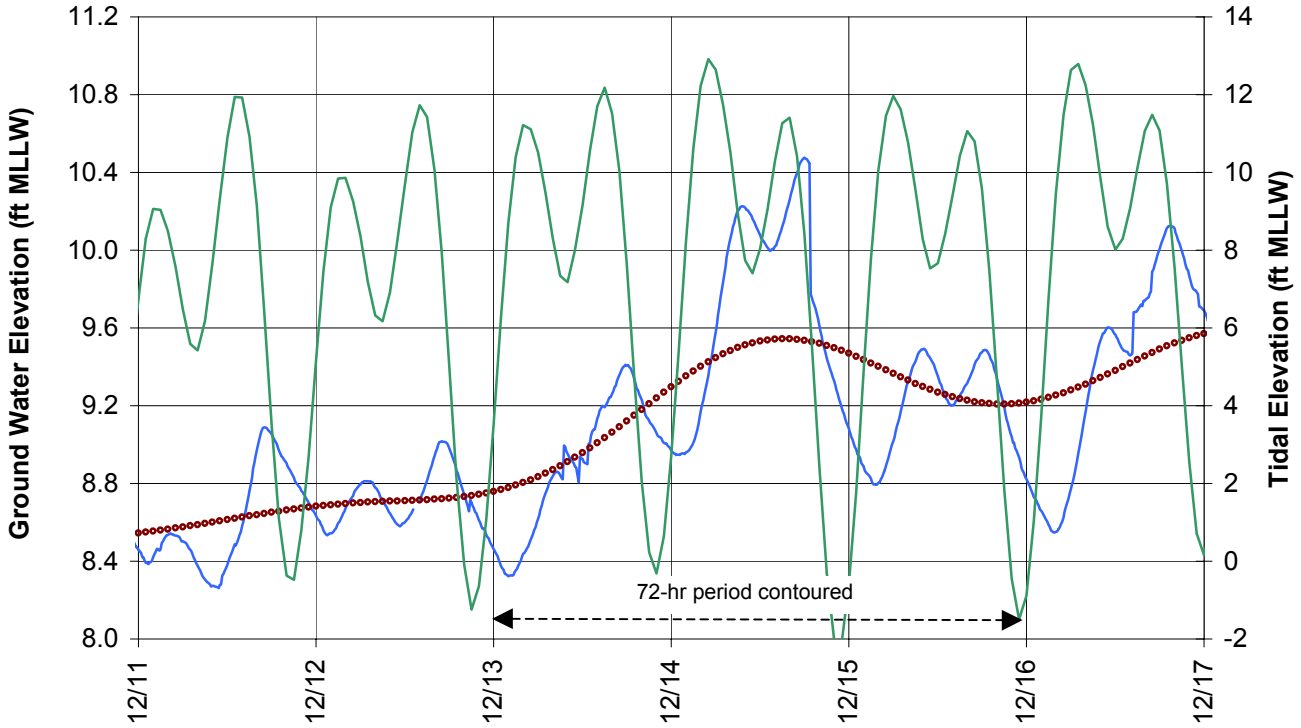
Aspect consulting
IN-DEPTH PERSPECTIVE

CMP-11 Ground Water Elevation during Tidal Study **Figure A-7**

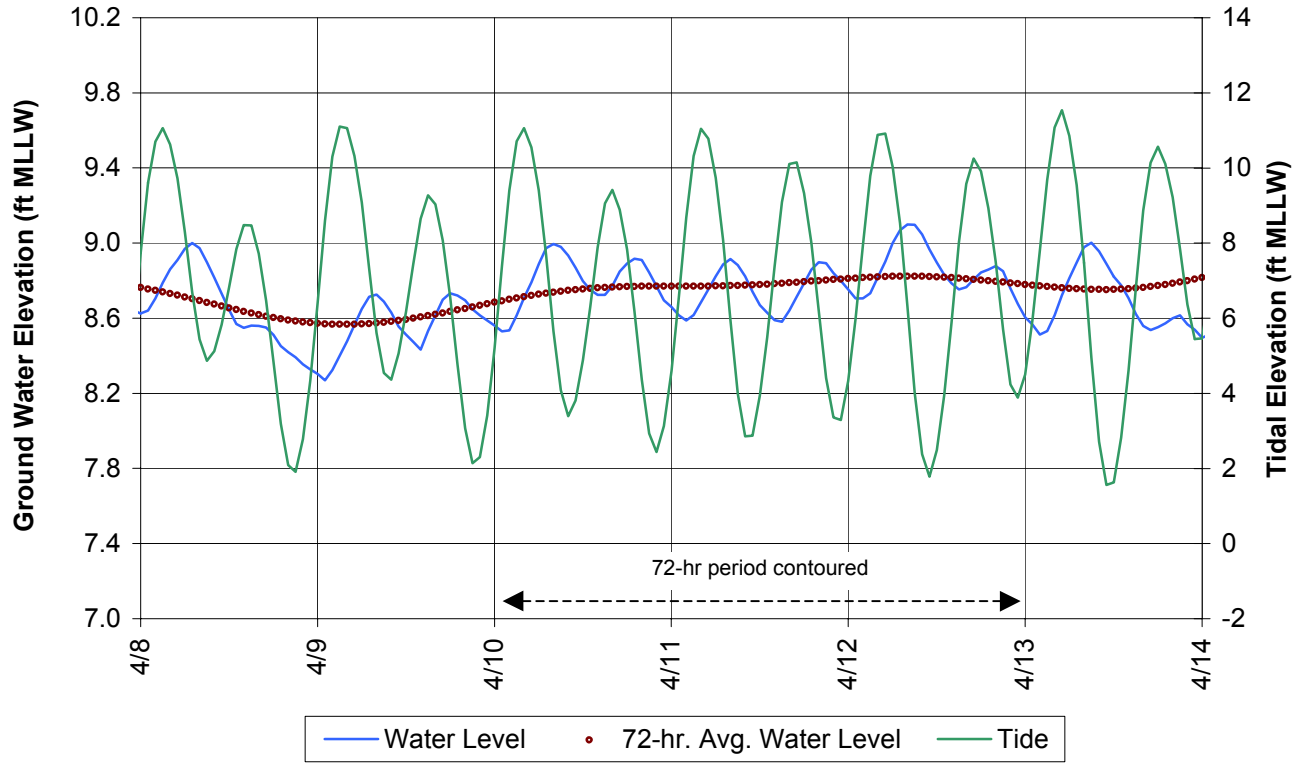
SWHP Phase I, GWCMP

CMP-12 (Fill Aquifer)

December 2001



April 2002

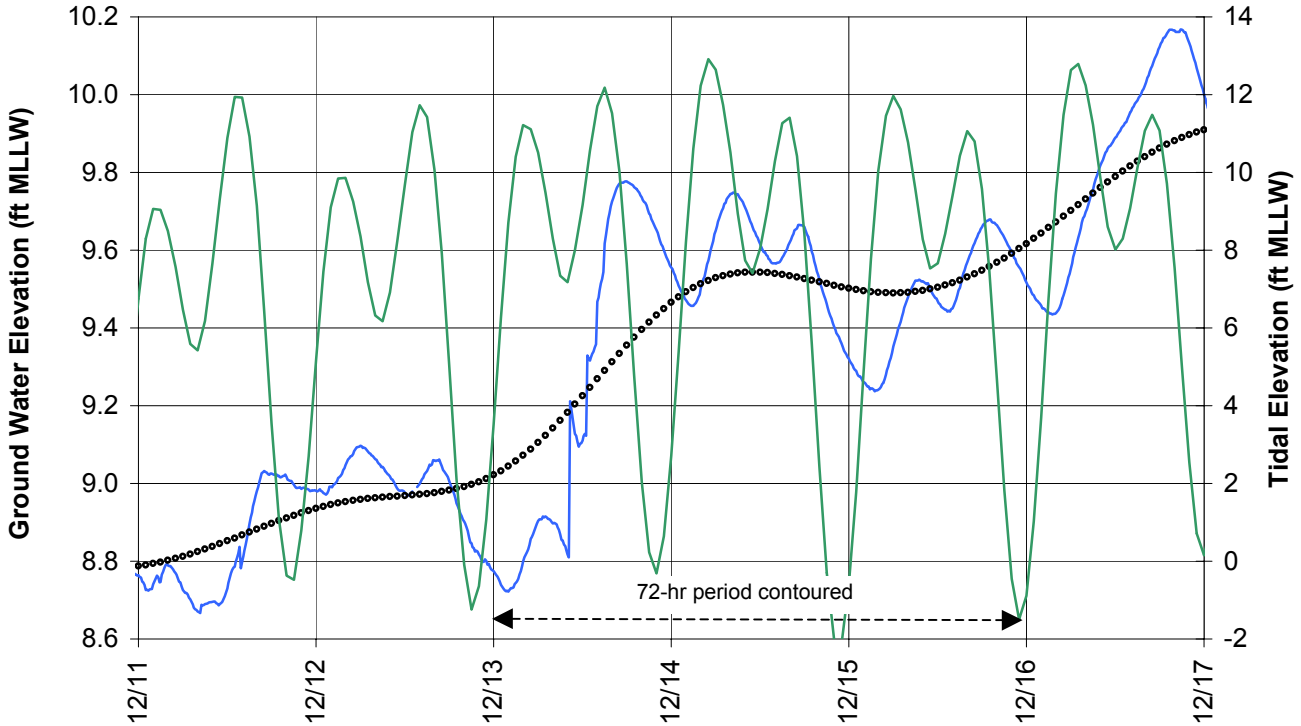


CMP-12 Ground Water Elevation during Tidal Study **Figure A-8**

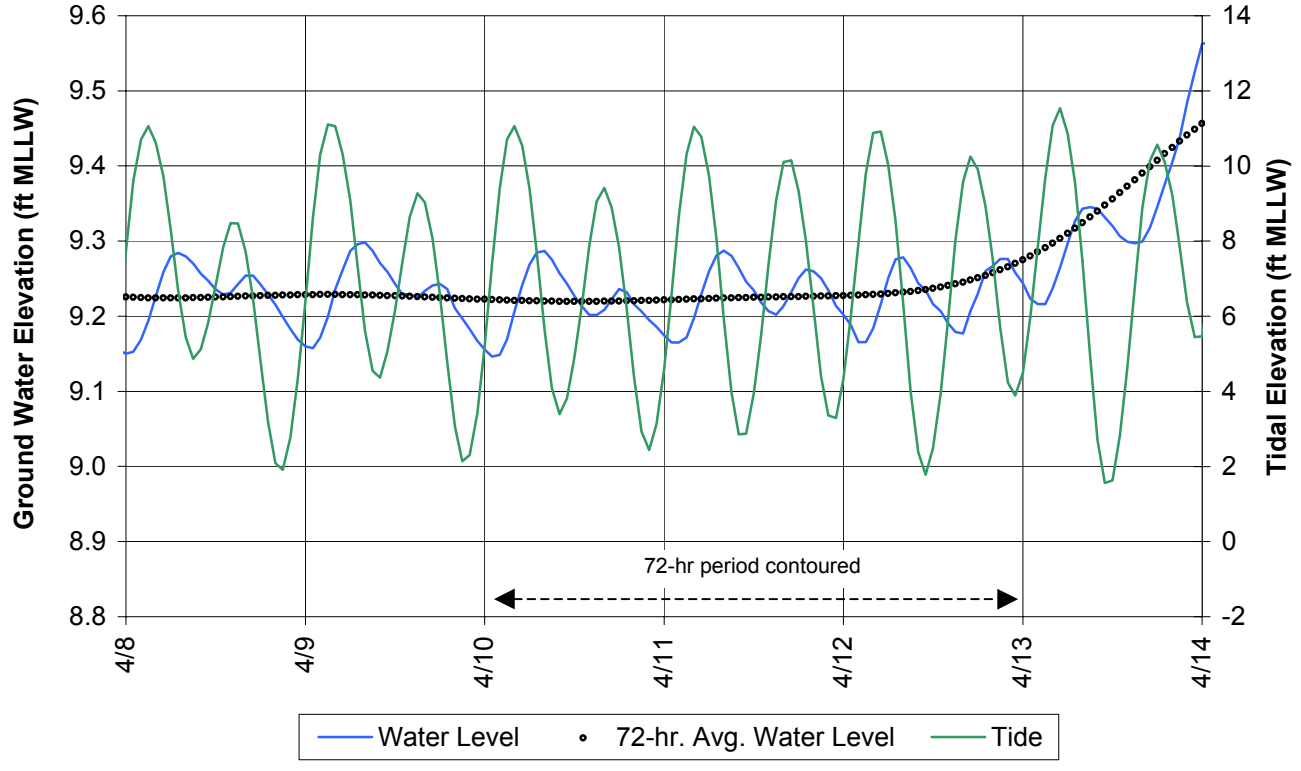
SWHP Phase I, GWCMP

CMP-13 (Fill Aquifer)

December 2001



April 2002

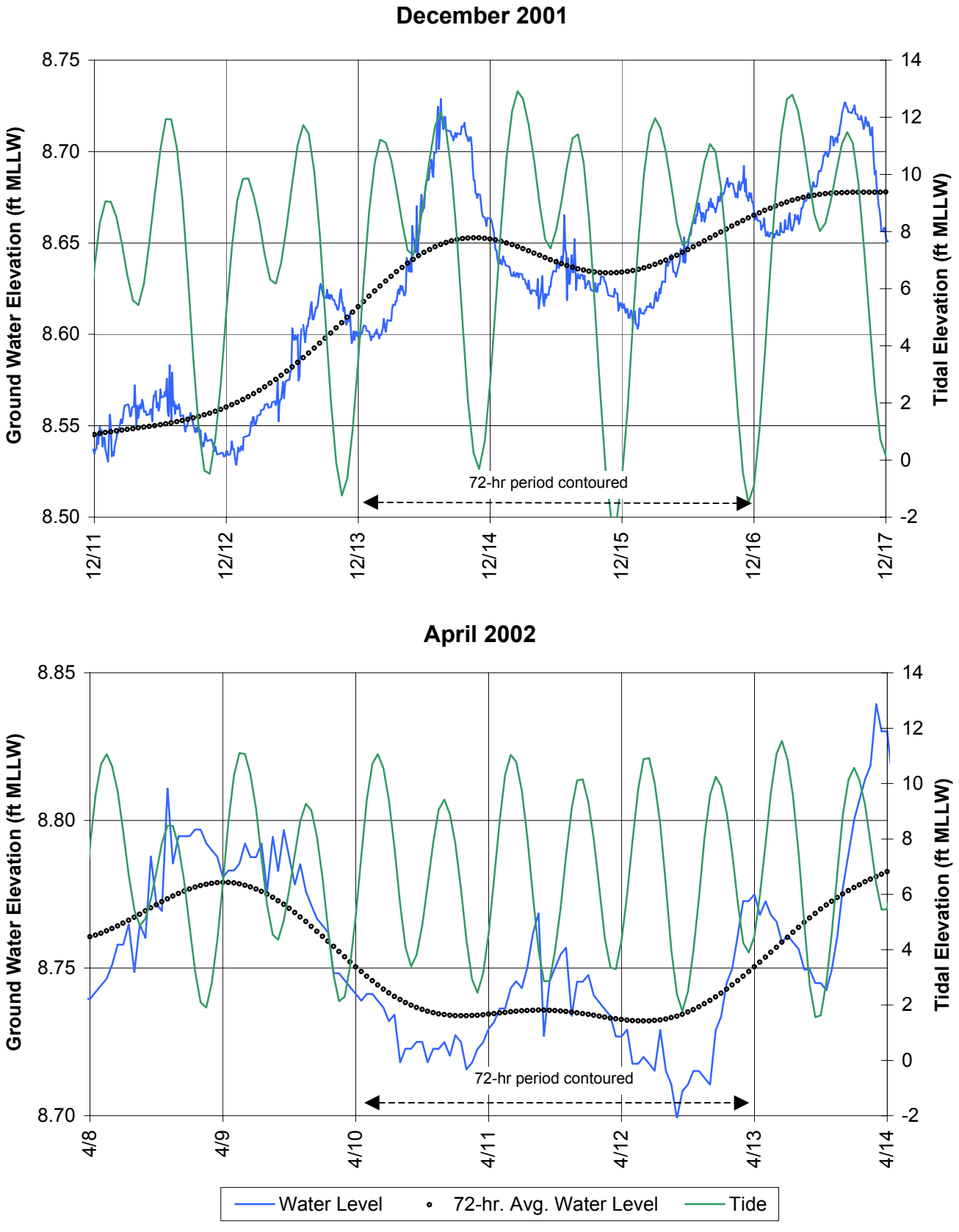


Aspect consulting
IN-DEPTH PERSPECTIVE

CMP-13 Ground Water Elevation during Tidal Study **Figure A-9**

SWHP Phase I, GWCMP

CMP-14 (Fill Aquifer)



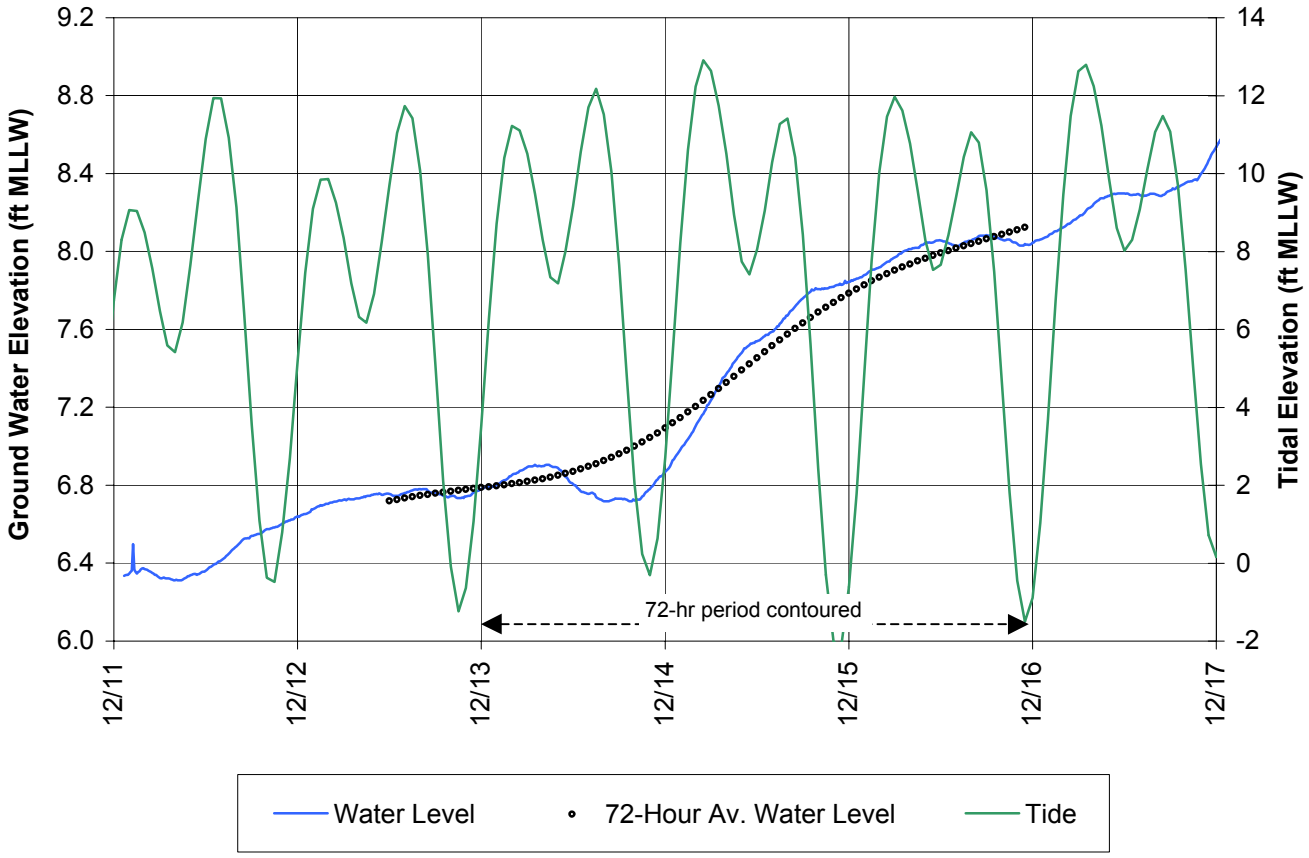
Aspect consulting IN-DEPTH PERSPECTIVE

CMP-14 Ground Water Elevation during Tidal Study **Figure A-10**

SWHP Phase I, GWCMP

CMP-15 (Fill Aquifer)

December 2001

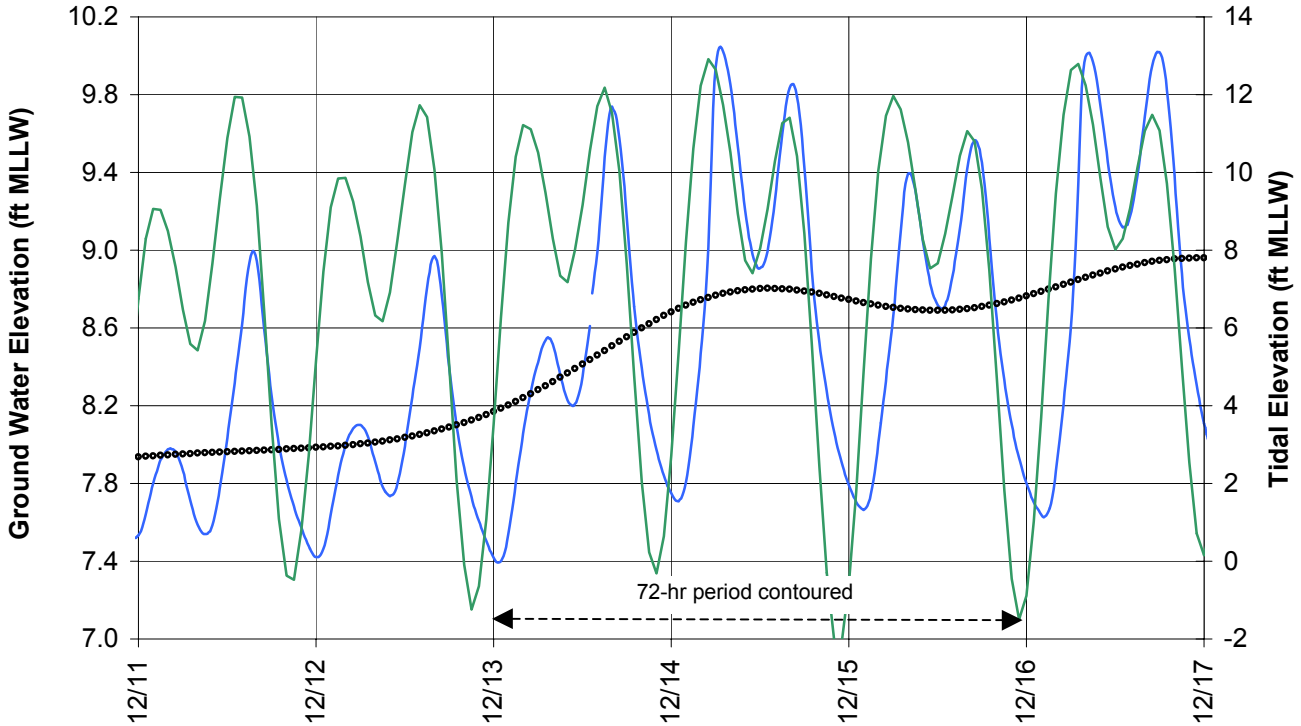


CMP-15 Ground Water Elevation during Tidal Study **Figure A-11**

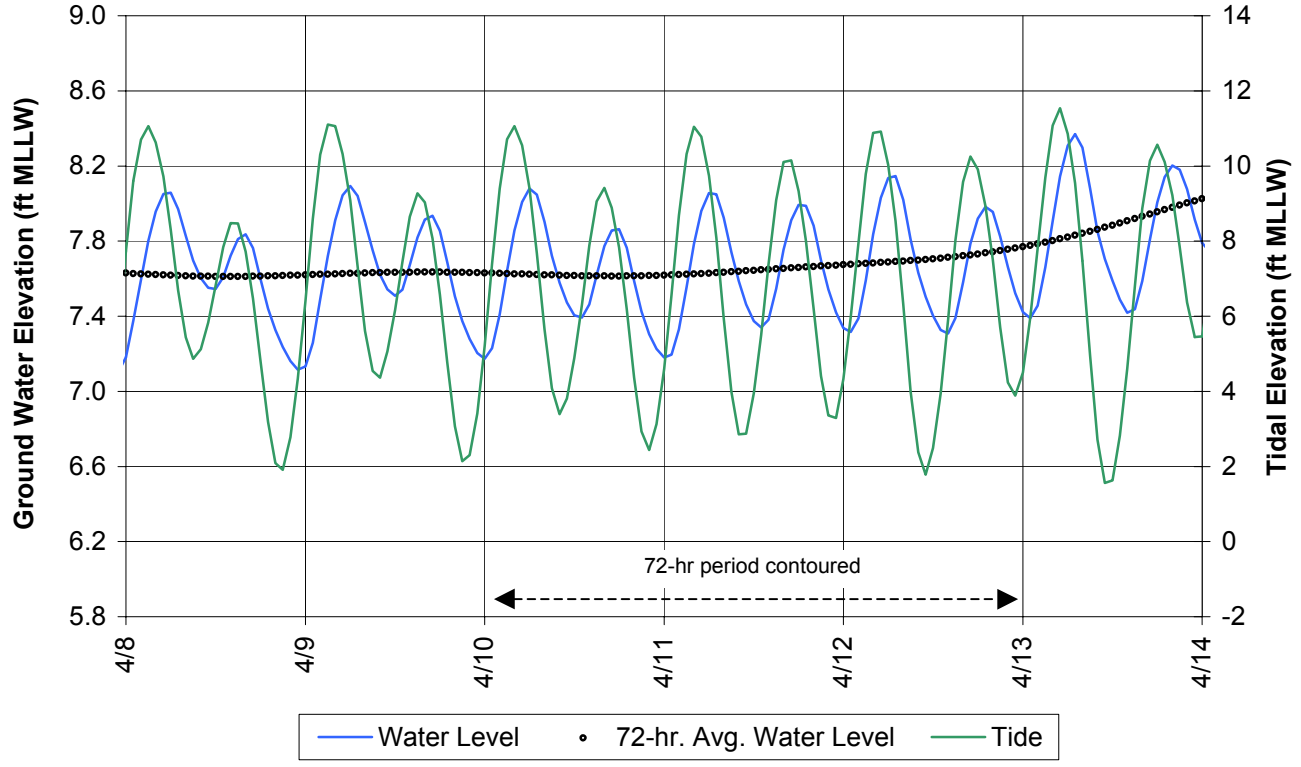
SWHP Phase I, GWCMP

CMP-16 (Fill Aquifer)

December 2001



April 2002

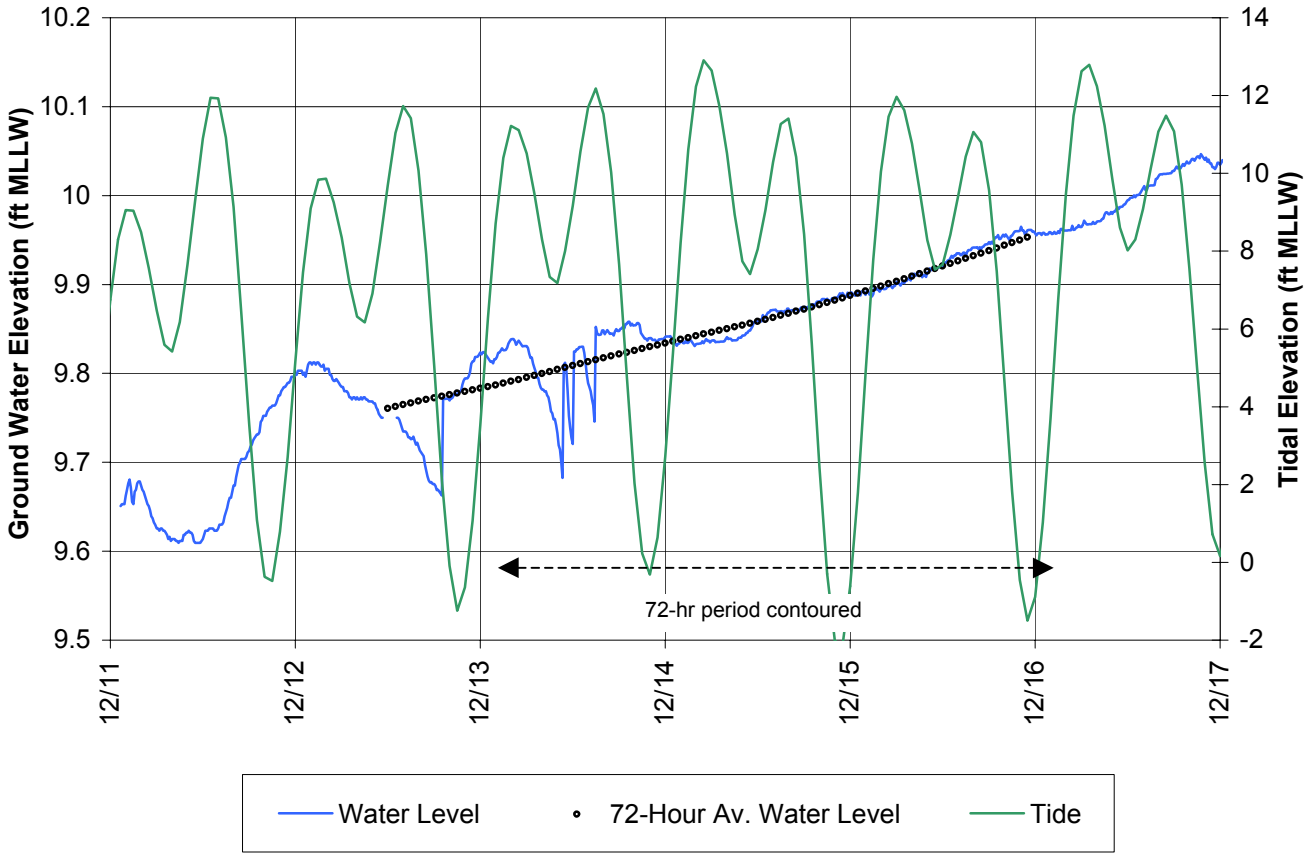


CMP-16 Ground Water Elevation during Tidal Study **Figure A-12**

SWHP Phase I, GWCMP

CMP-17 (Fill Aquifer)

December 2001

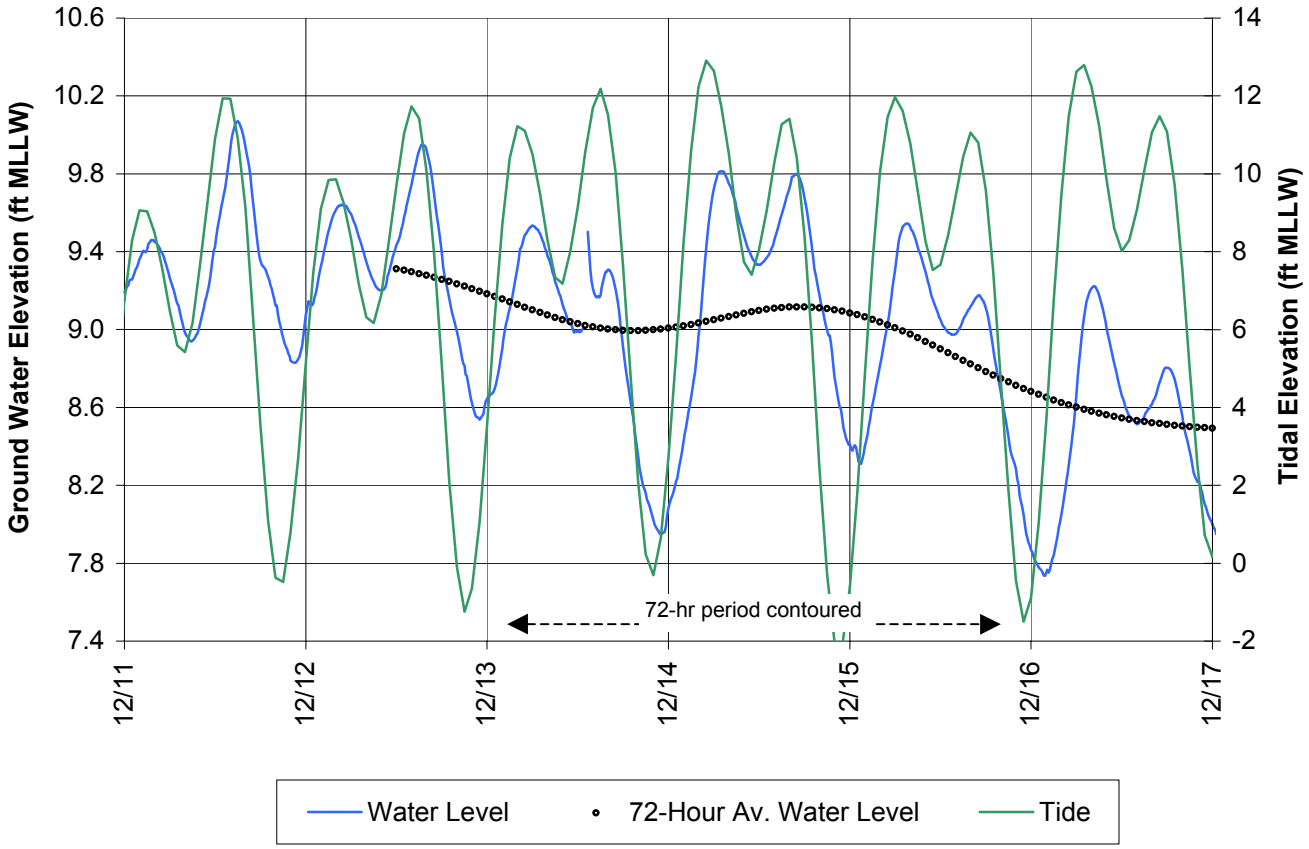


CMP-17 Ground Water Elevation during Tidal Study **Figure A-13**

SWHP Phase I, GWCMP

MW-5 (Fill Aquifer)

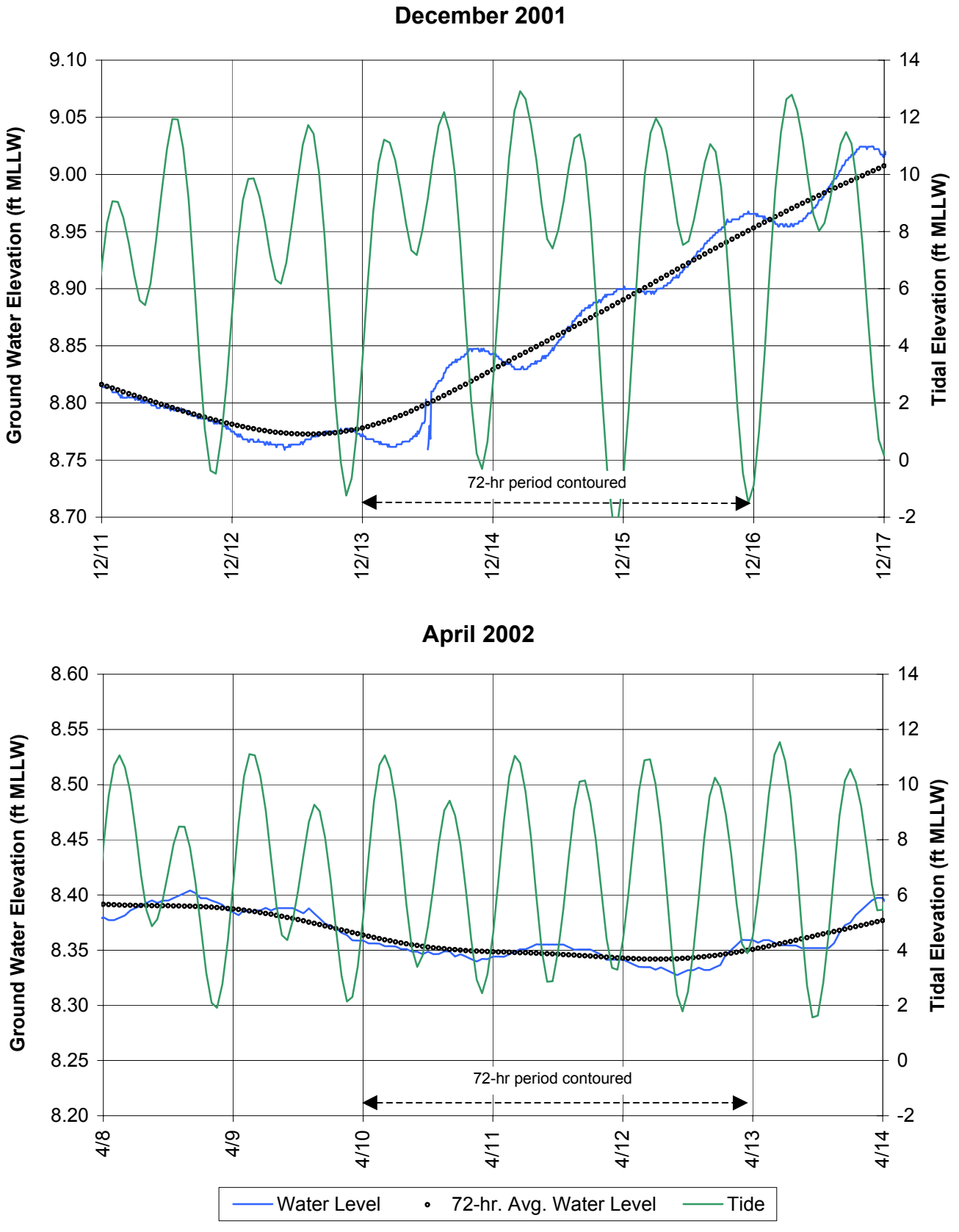
December 2001



MW-5 Ground Water Elevation during Tidal Study **Figure A-14**

SWHP Phase I, GWCMP

MW-26R (Fill Aquifer)

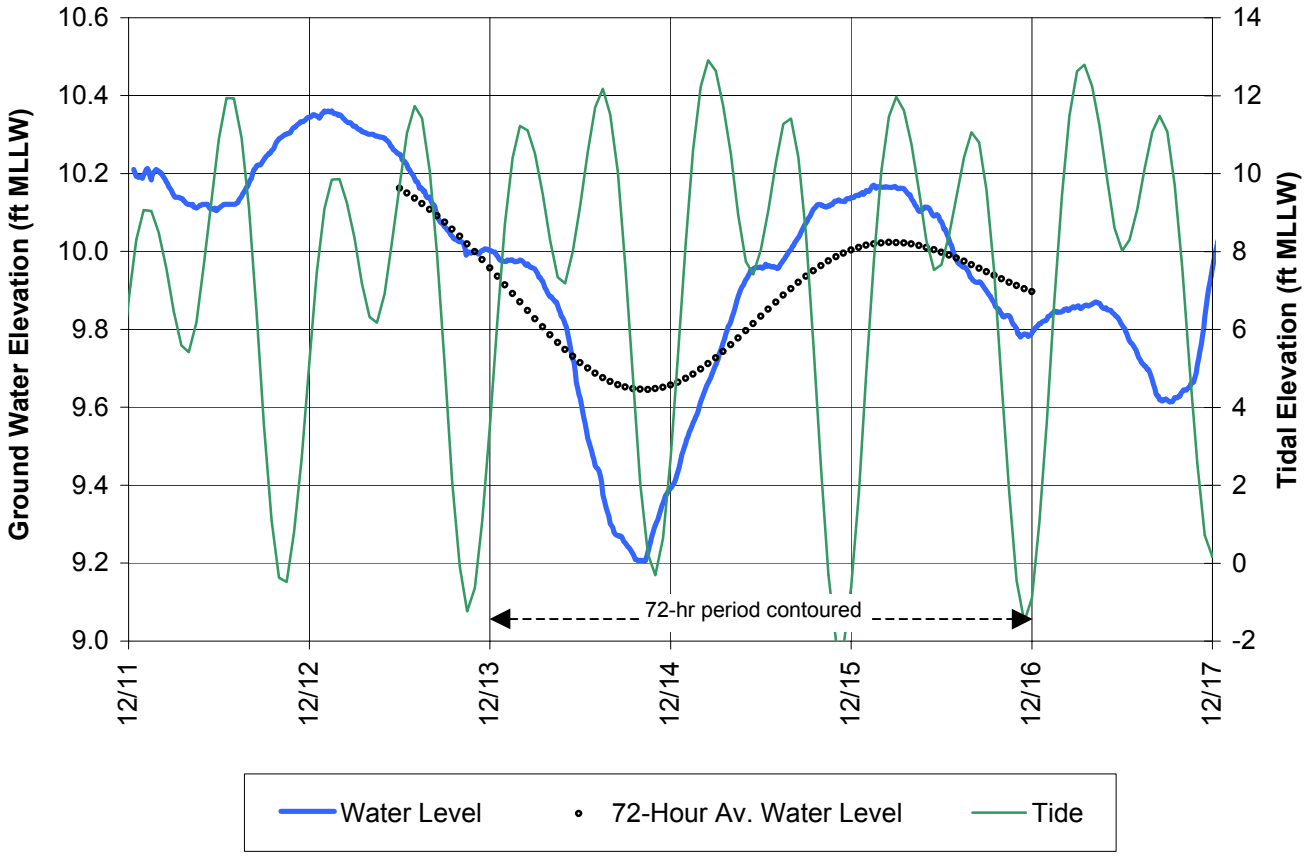


MW-26R Ground Water Elevation during Tidal Study **Figure A-15**

SWHP Phase I, GWCMP

MW-125 (Fill Aquifer)

December 2001

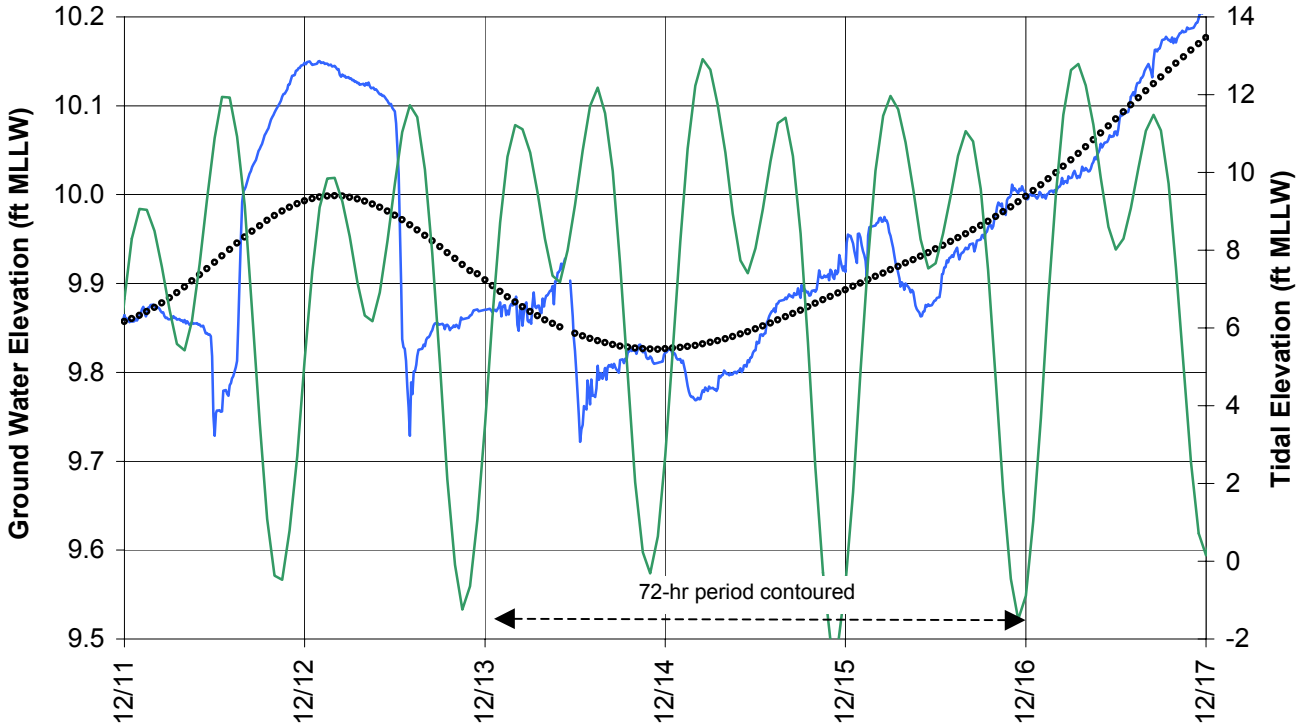


MW-125 Ground Water Elevation during Tidal Study **Figure A-16**

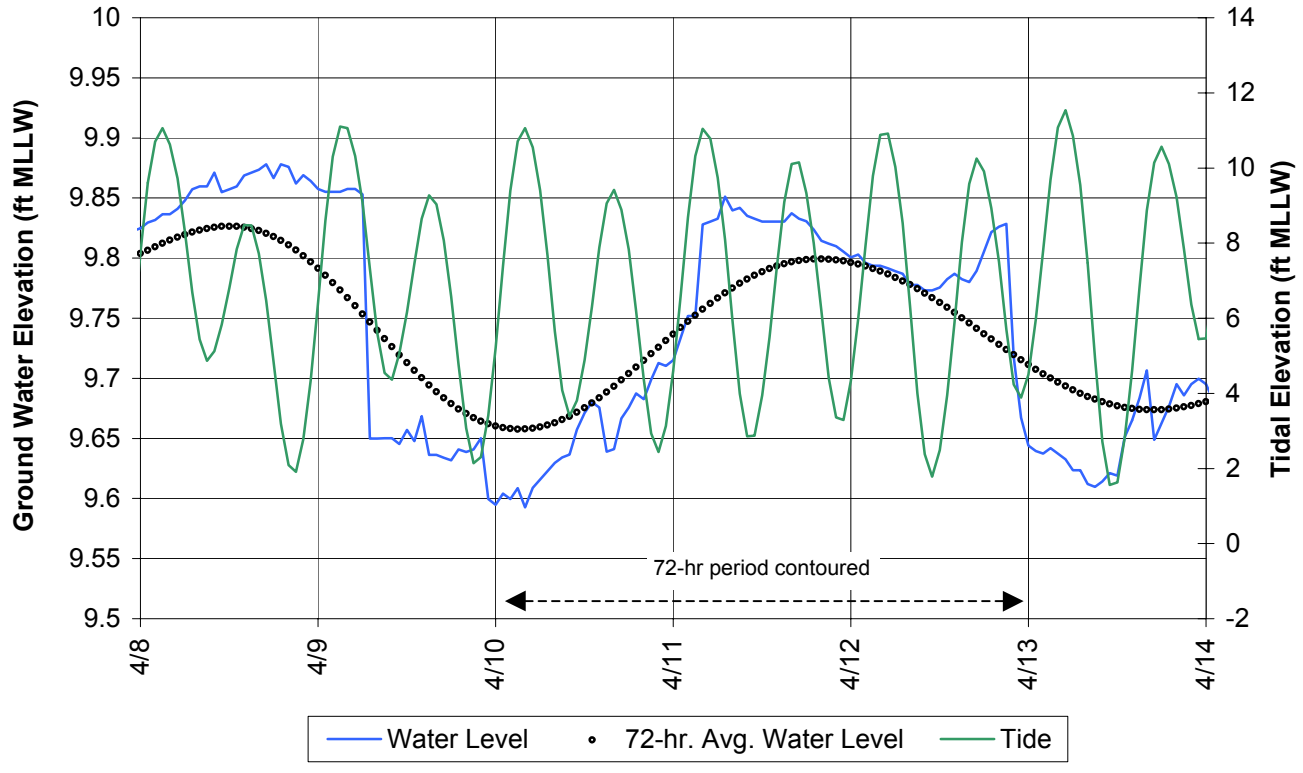
SWHP Phase I, GWCMP

MW-307A (Fill Aquifer)

December 2001



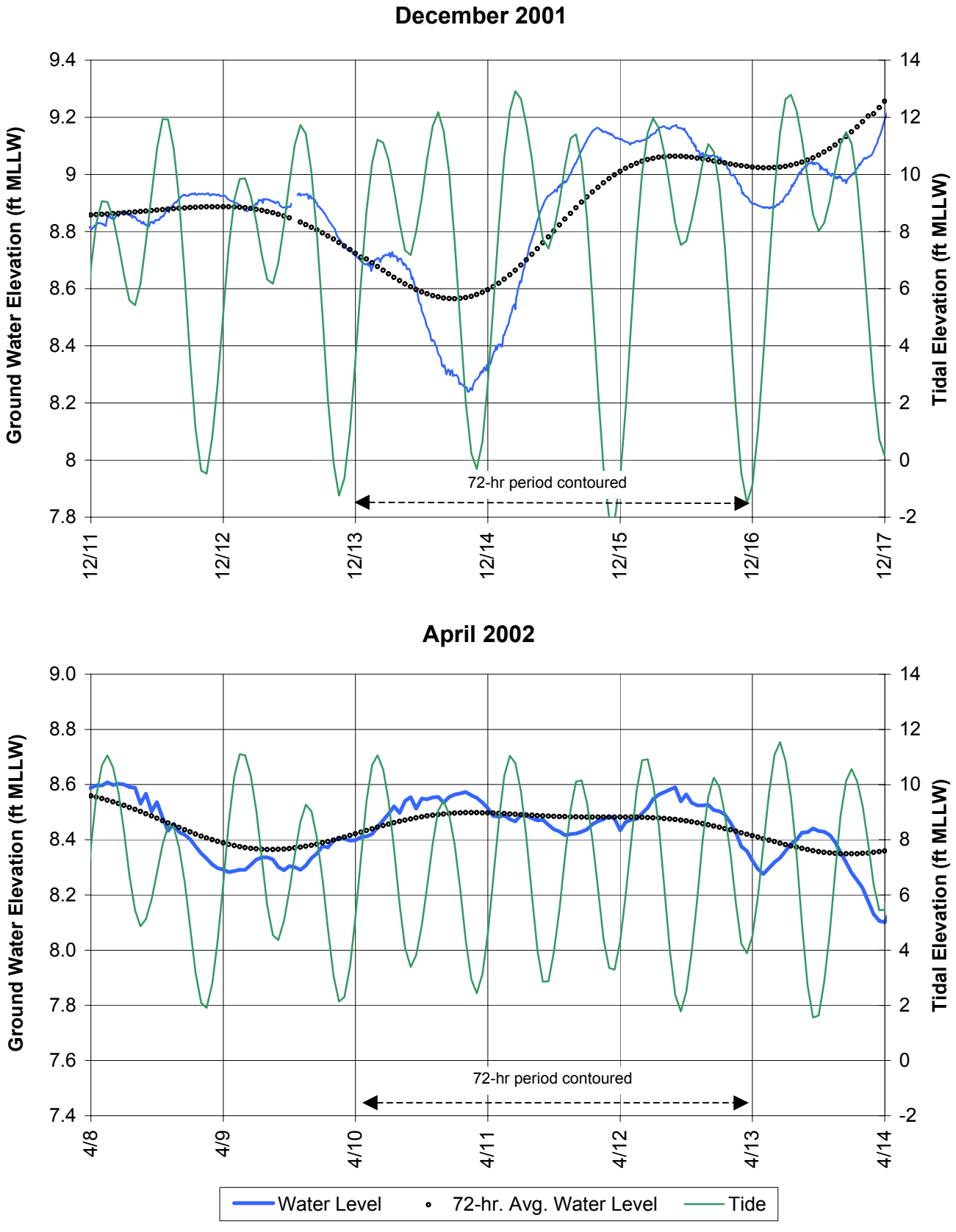
April 2002



MW-307A Ground Water Elevation during Tidal Study **Figure A-17**

SWHP Phase I, GWCMP

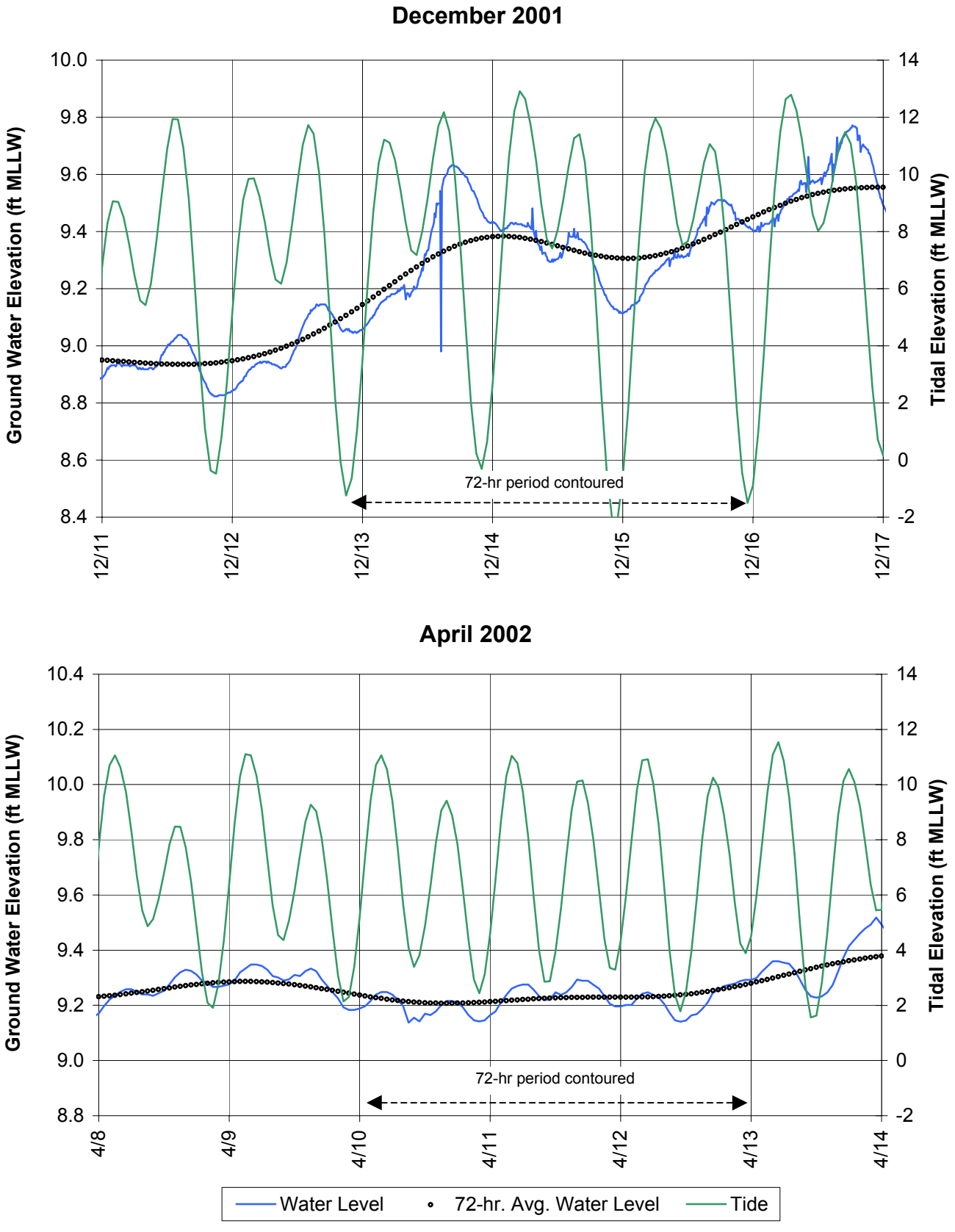
MW-308N (Fill Aquifer)



MW-308N Ground Water Elevation during Tidal Study **Figure A-18**

SWHP Phase I, GWCMP

CMP-7 (Estuarine Aquifer)

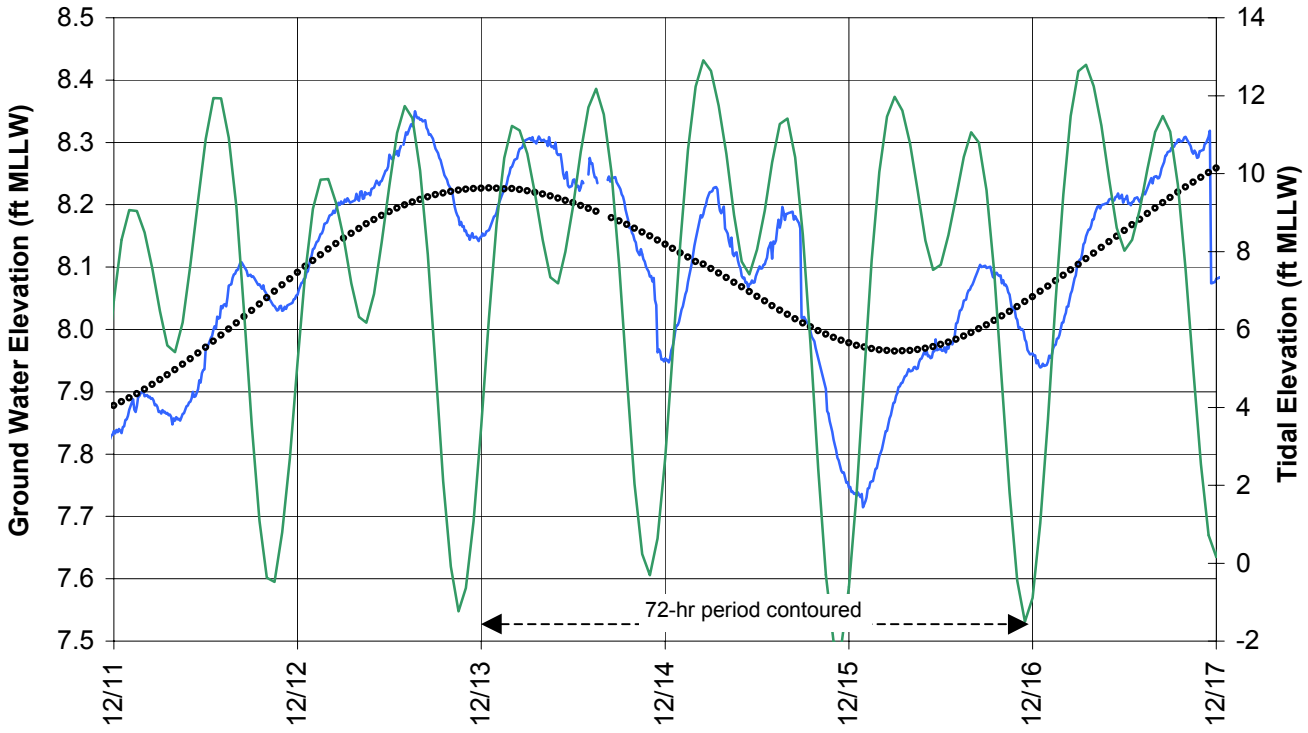


CMP-7 Ground Water Elevation during Tidal Study **Figure A-19**

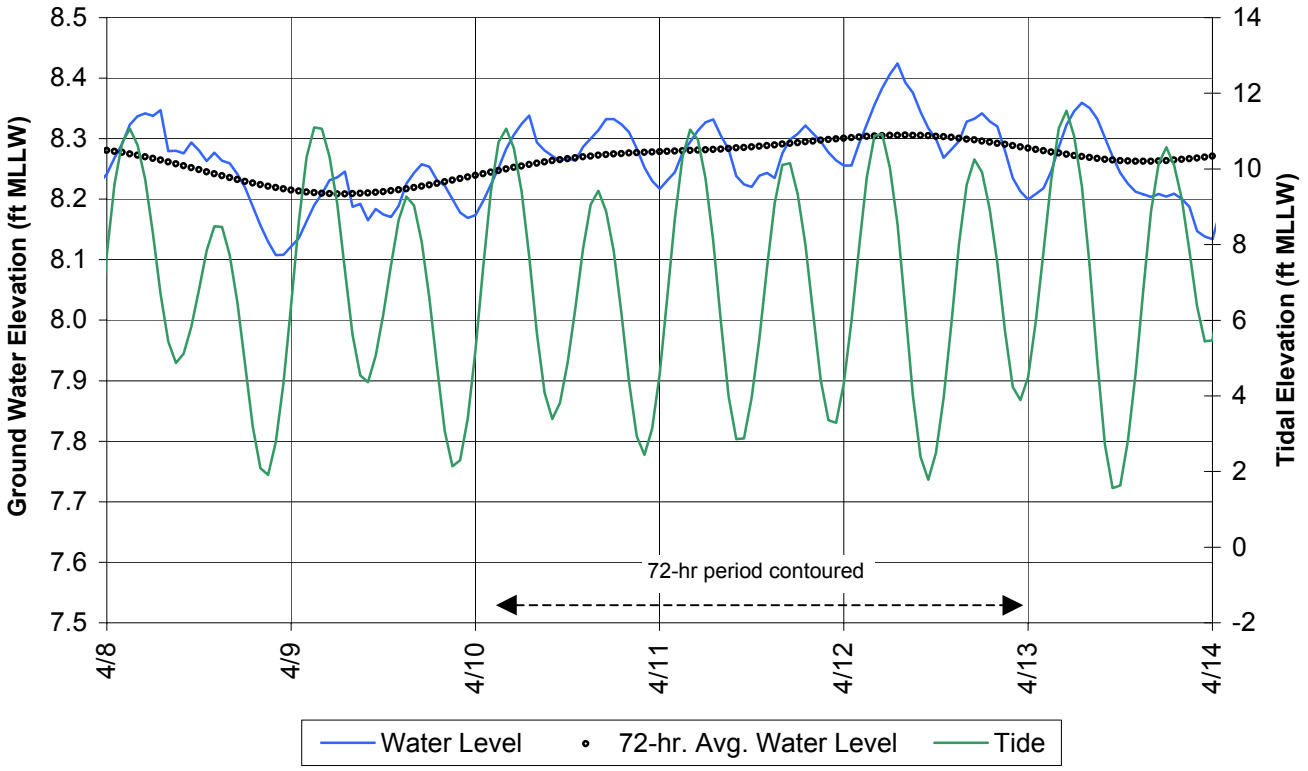
SWHP Phase I, GWCMP

MW-36 (Estuarine Aquifer)

December 2001



April 2002

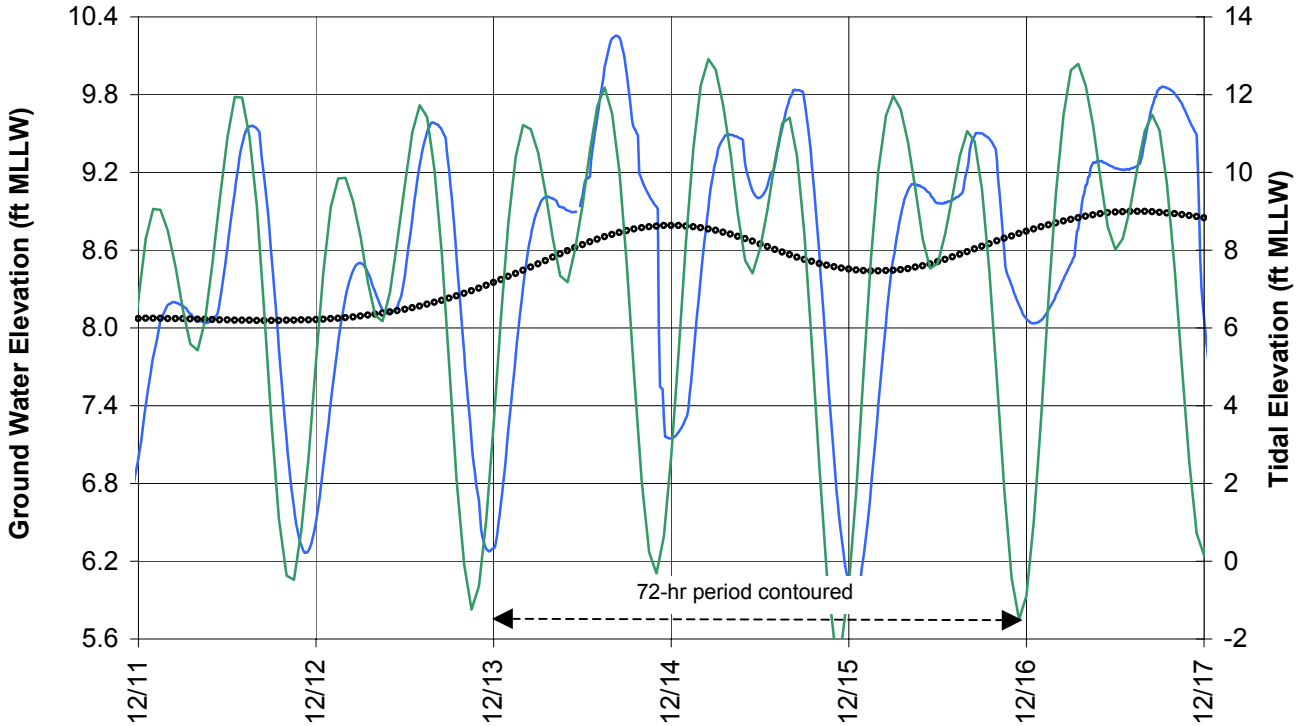


MW-36 Ground Water Elevation during Tidal Study **Figure A-20**

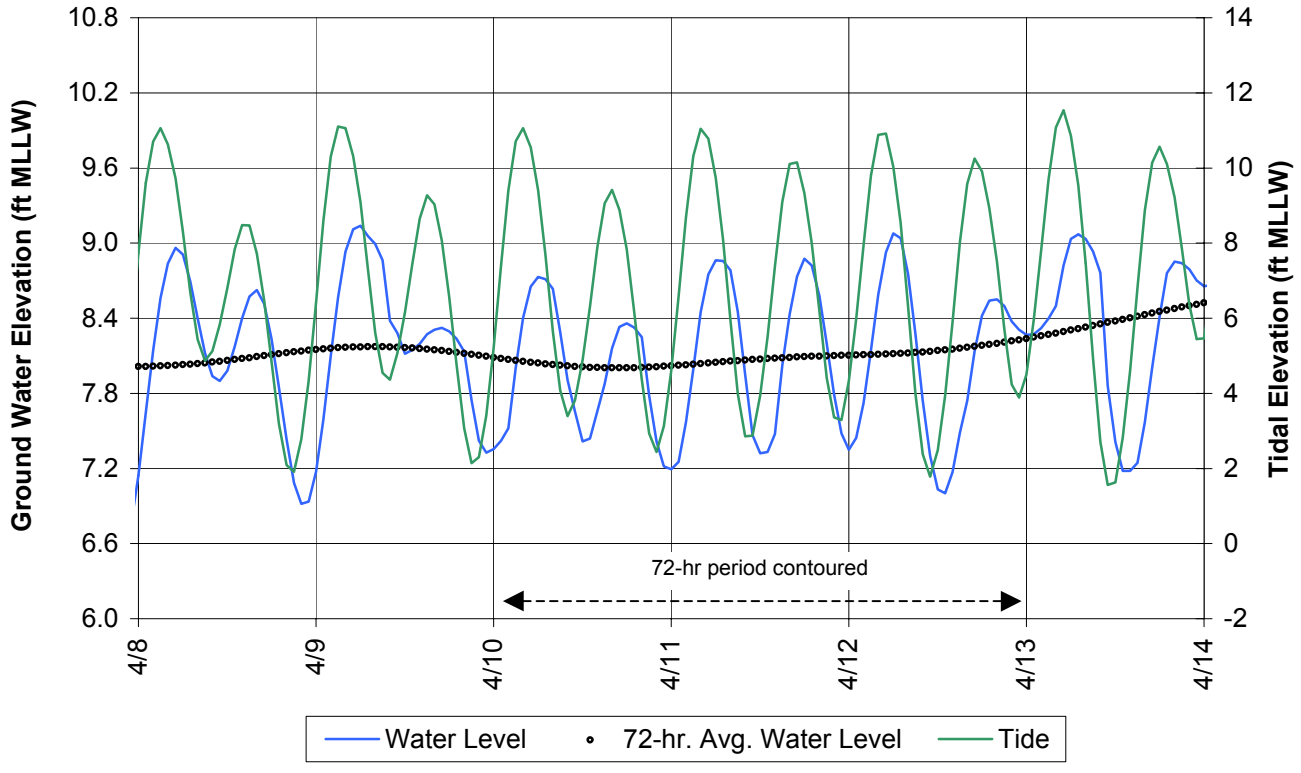
SWHP Phase I, GWCMP

MW-44 (Estuarine Aquifer)

December 2001



April 2002



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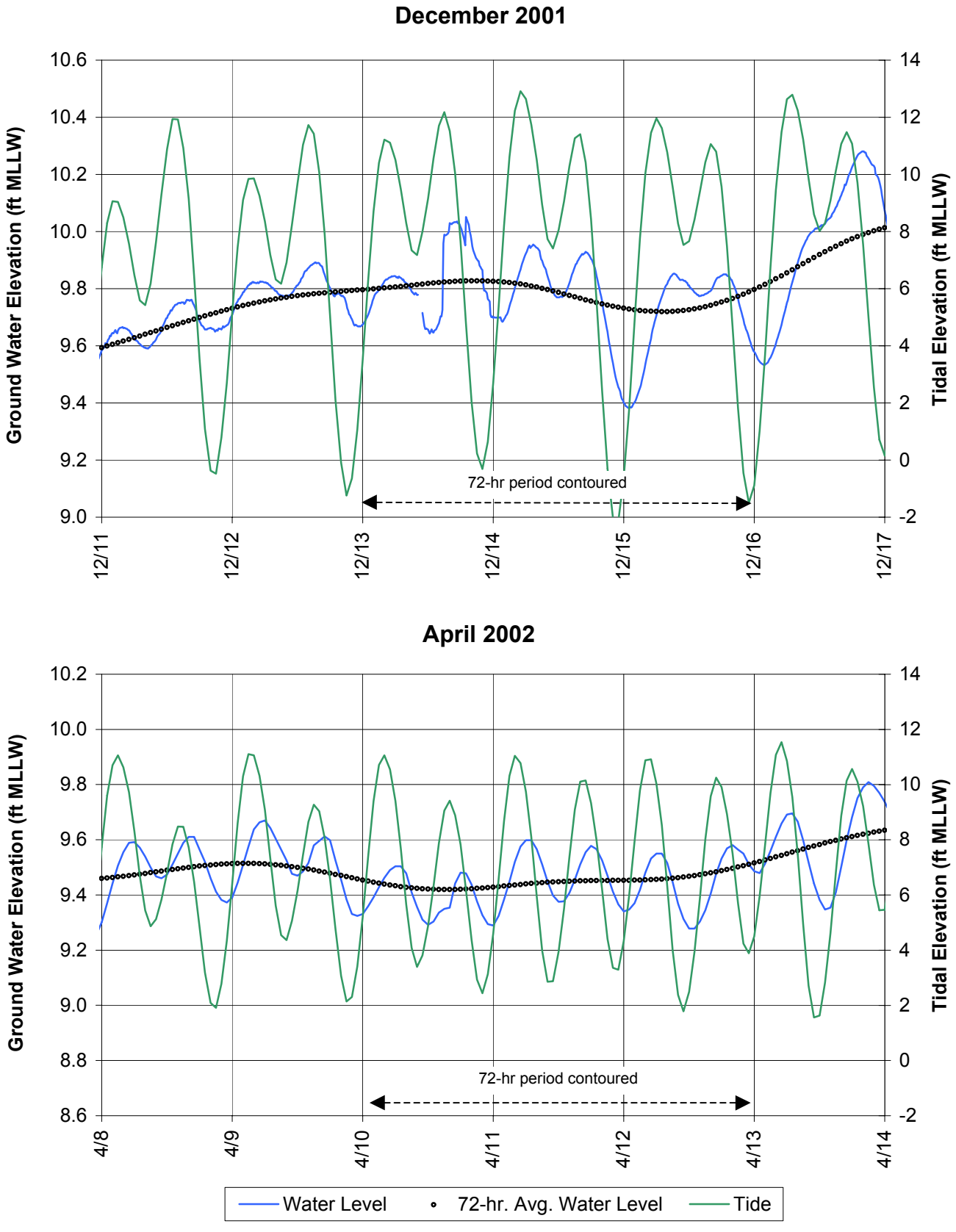
MW-44 Ground Water Elevation during Tidal Study **Figure A-21**

SWHP Phase I, GWCMP

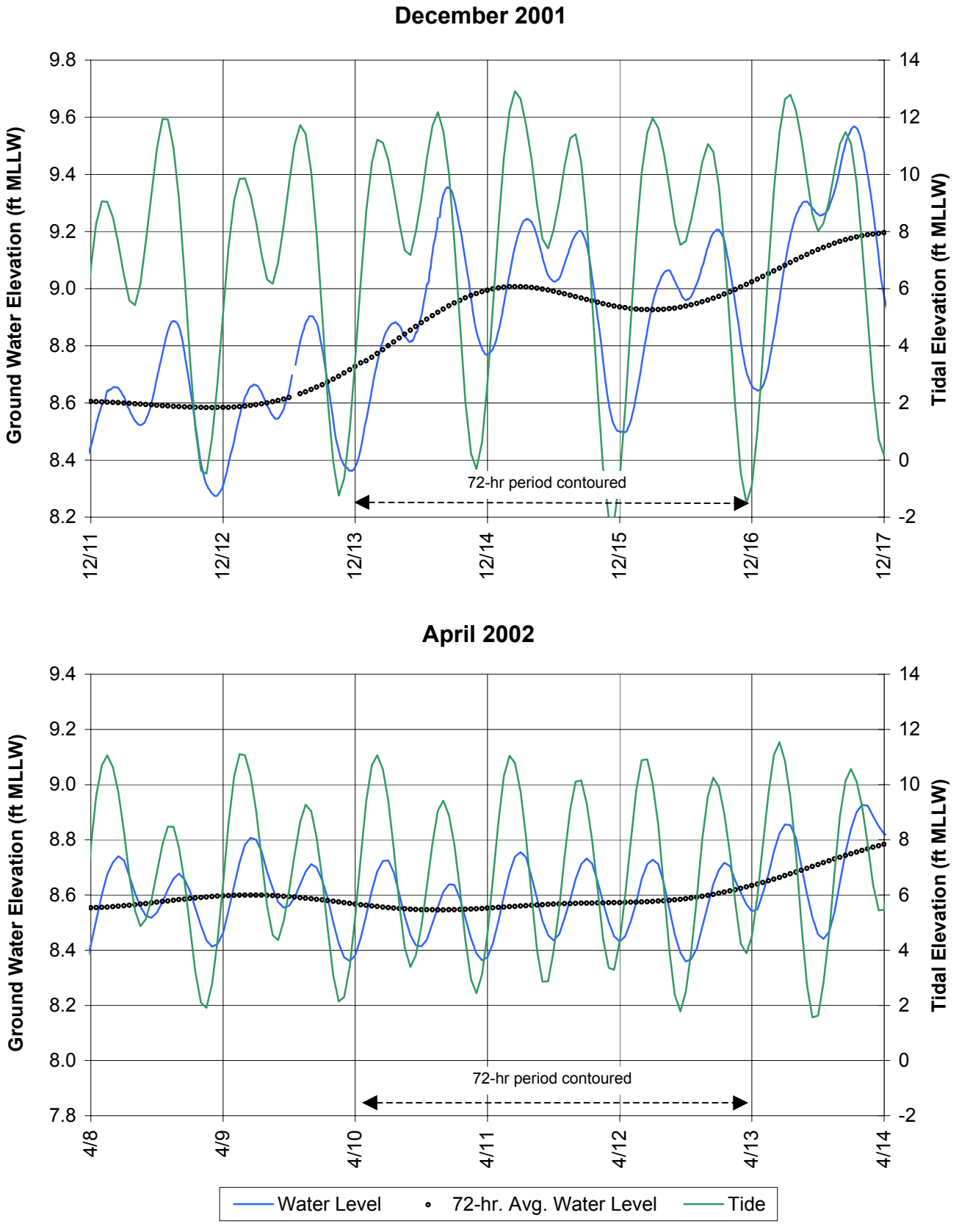
MW-307BR (Estuarine Aquifer)



MW-307BR Ground Water Elevation during Tidal Study **Figure A-22**

SWHP Phase I, GWCMP

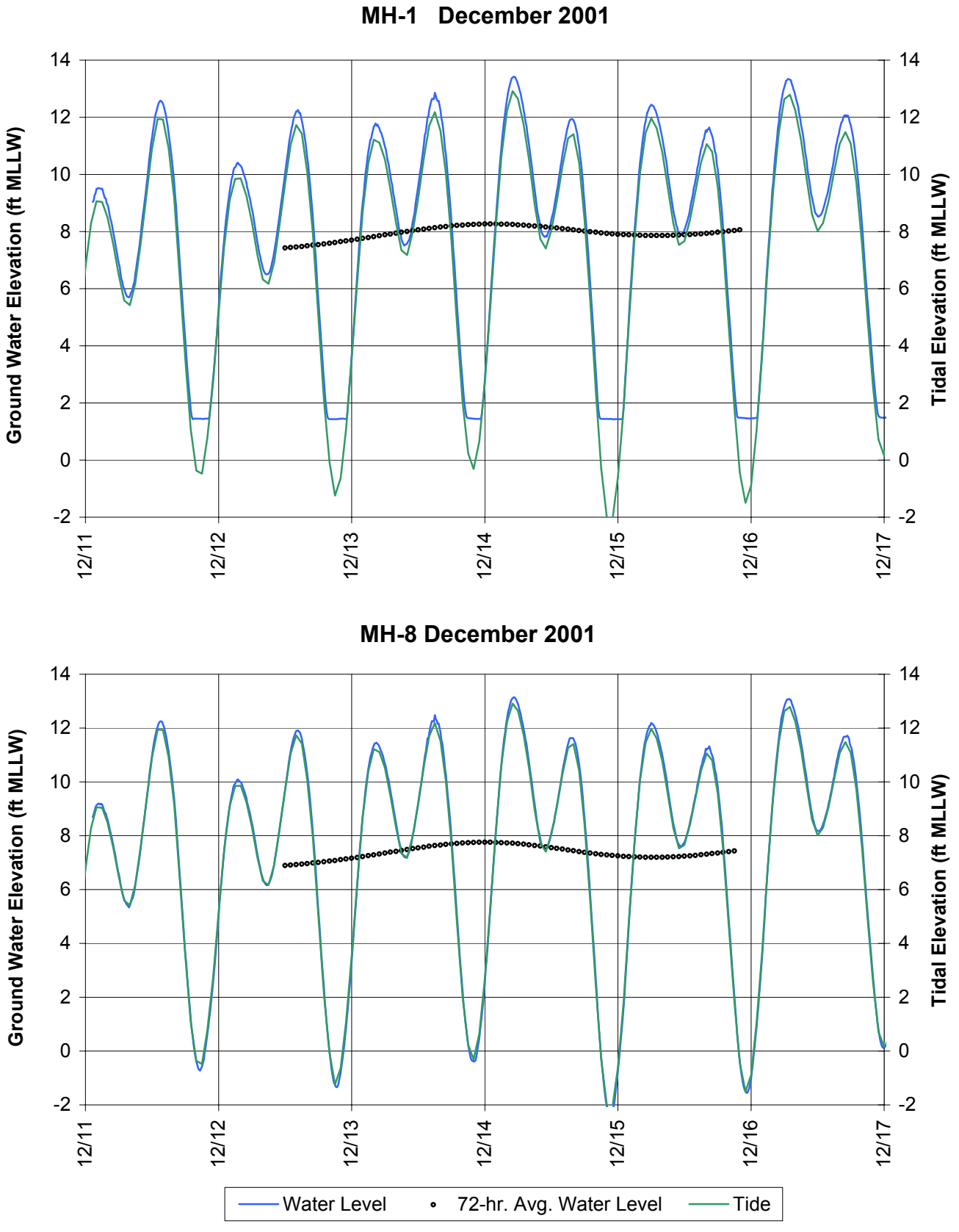
MW-308S (Estuarine Aquifer)



MW-308S Ground Water Elevation during Tidal Study **Figure A-23**

SWHP Phase I, GWCMP

MH-1 & MH-8 (LFOL)



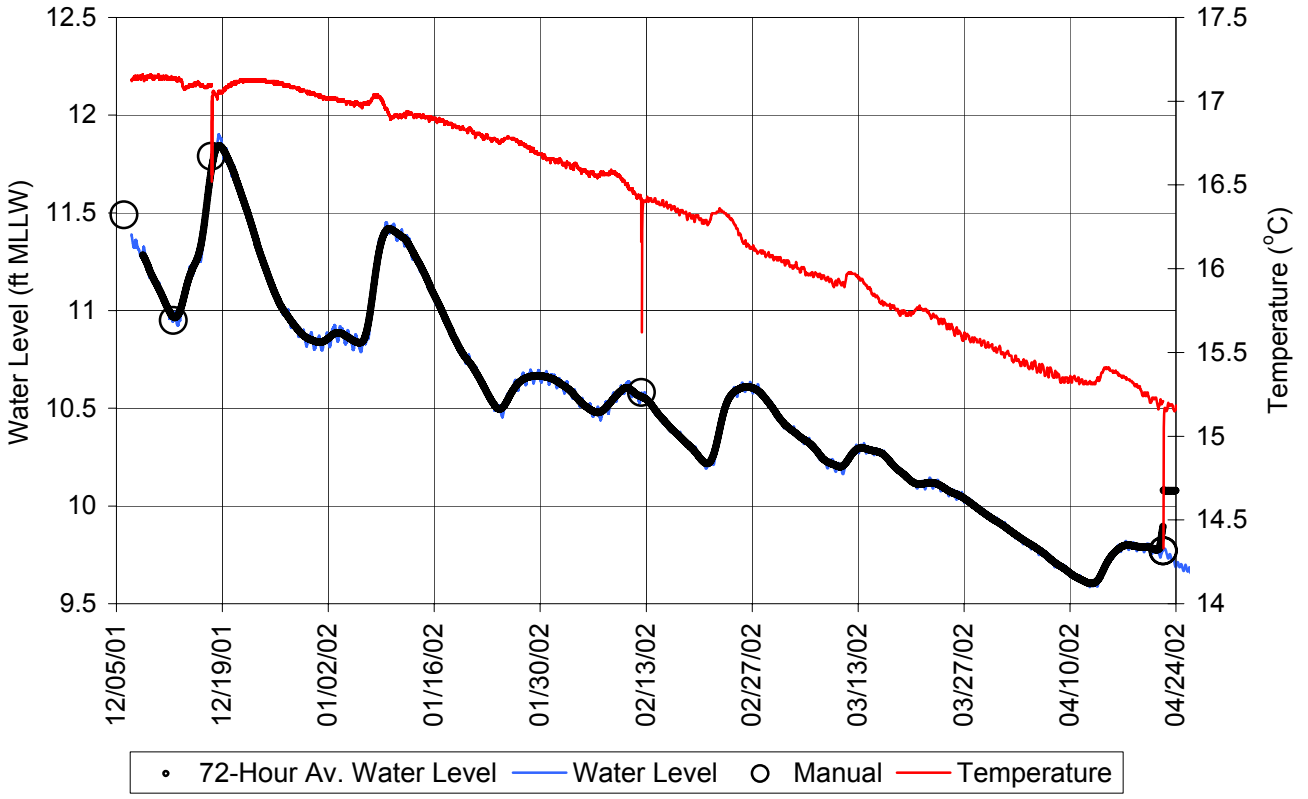
MH-1 & MH-8 Water Level Elevation during Tidal Study **Figure A-24**

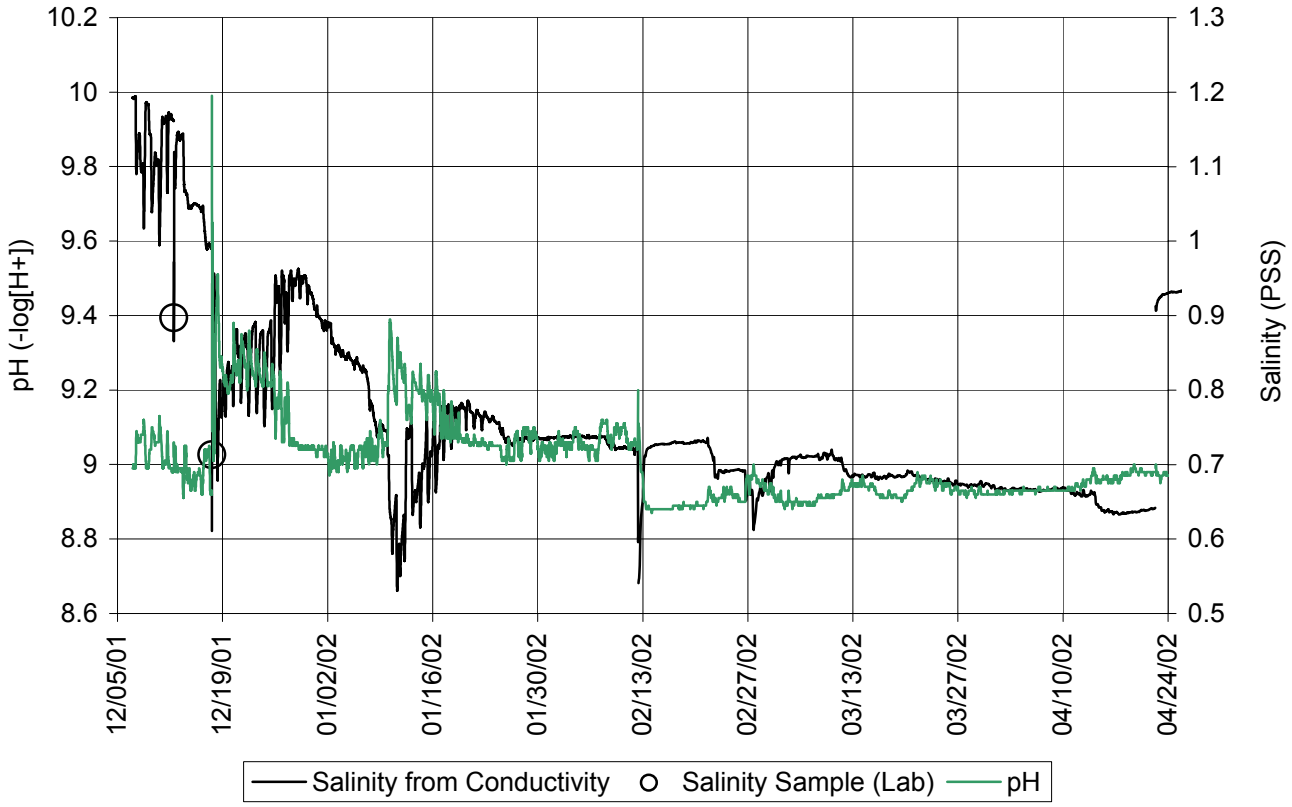
SWHP Phase I, GWCMP

APPENDIX B

Water Quality and Water Level Data Plots for Selected Wells

CMP-2

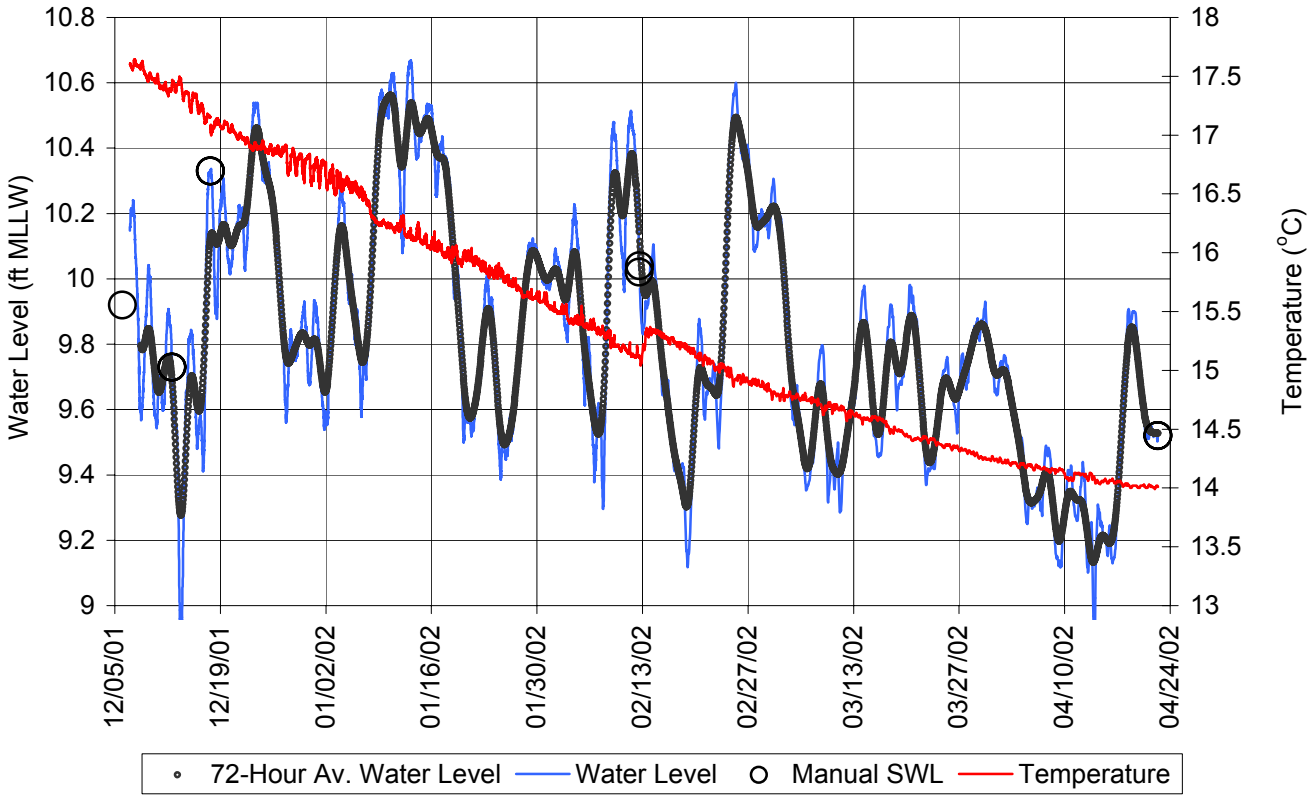


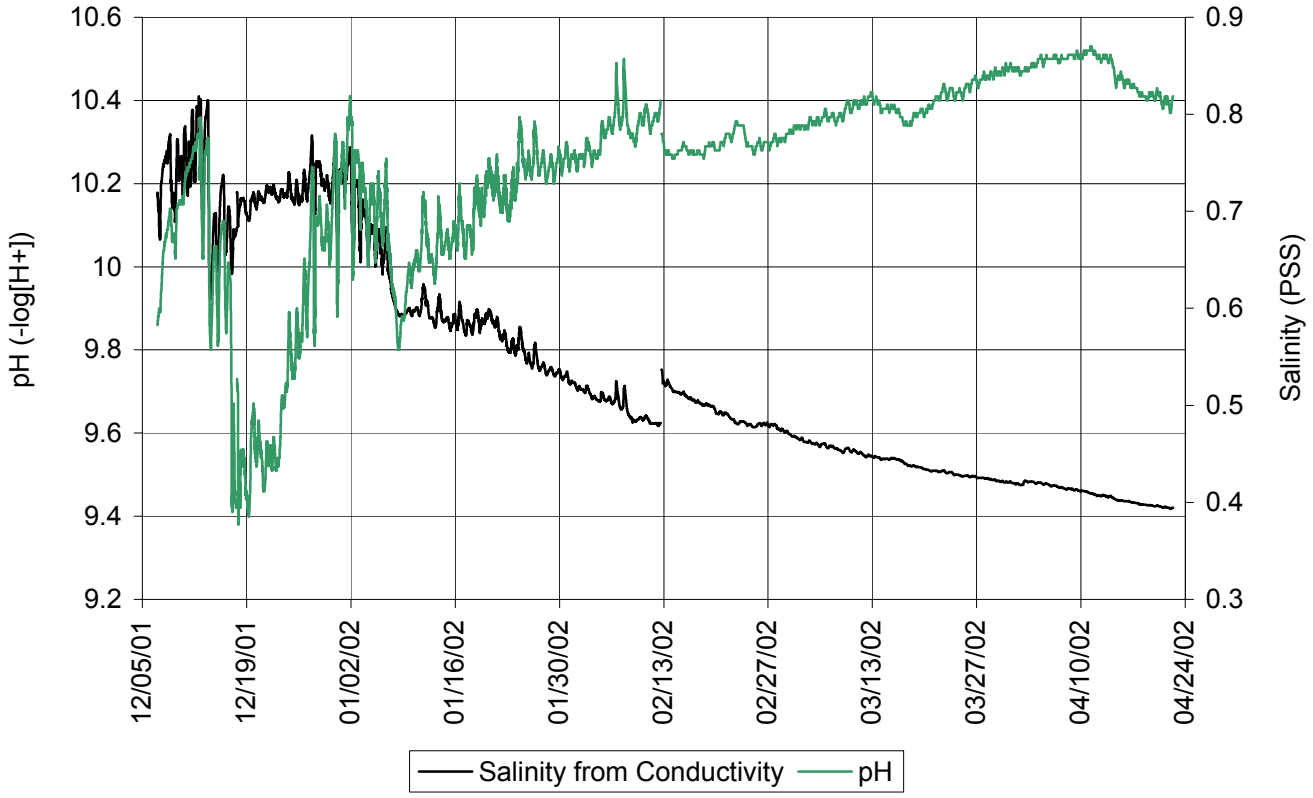


CMP-2 Water Level and Water Quality Data to Date **Figure B-1**

SWHP Phase I, GWCMP

CMP-3

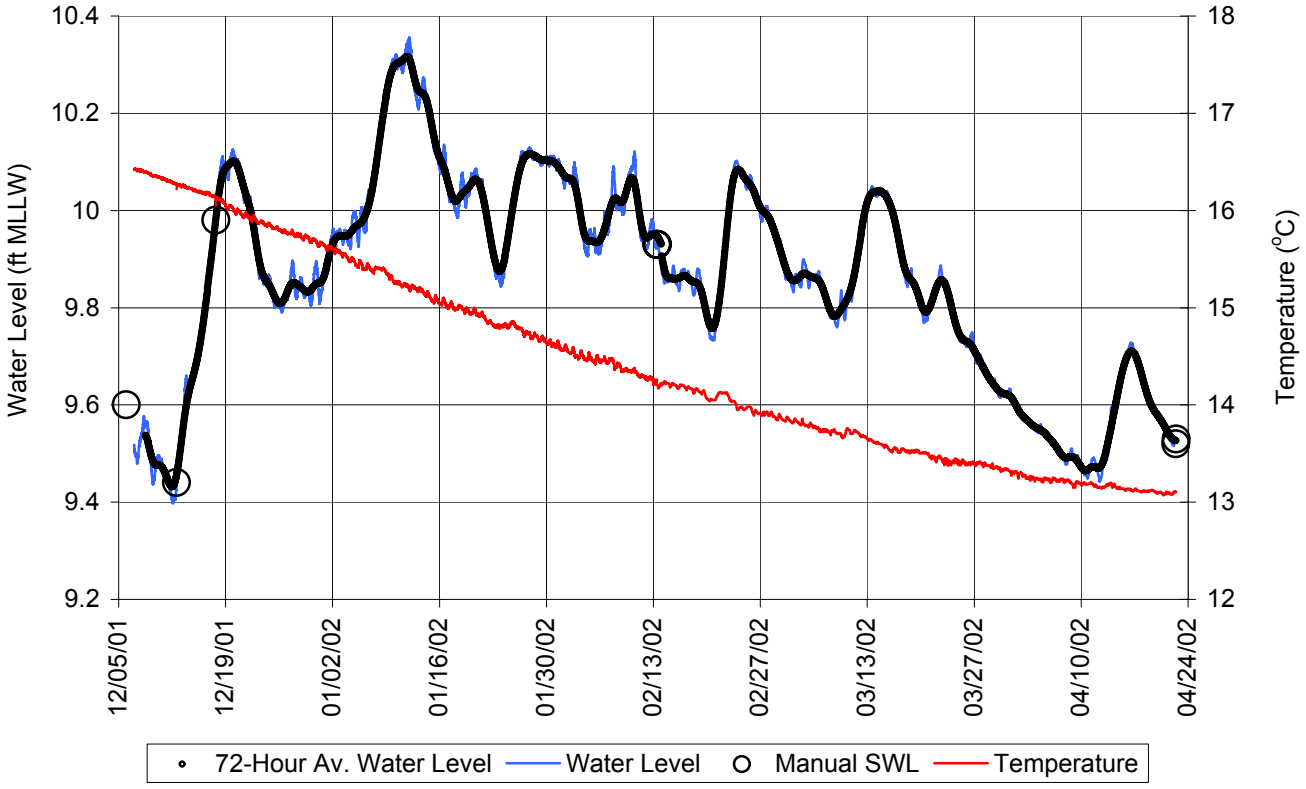


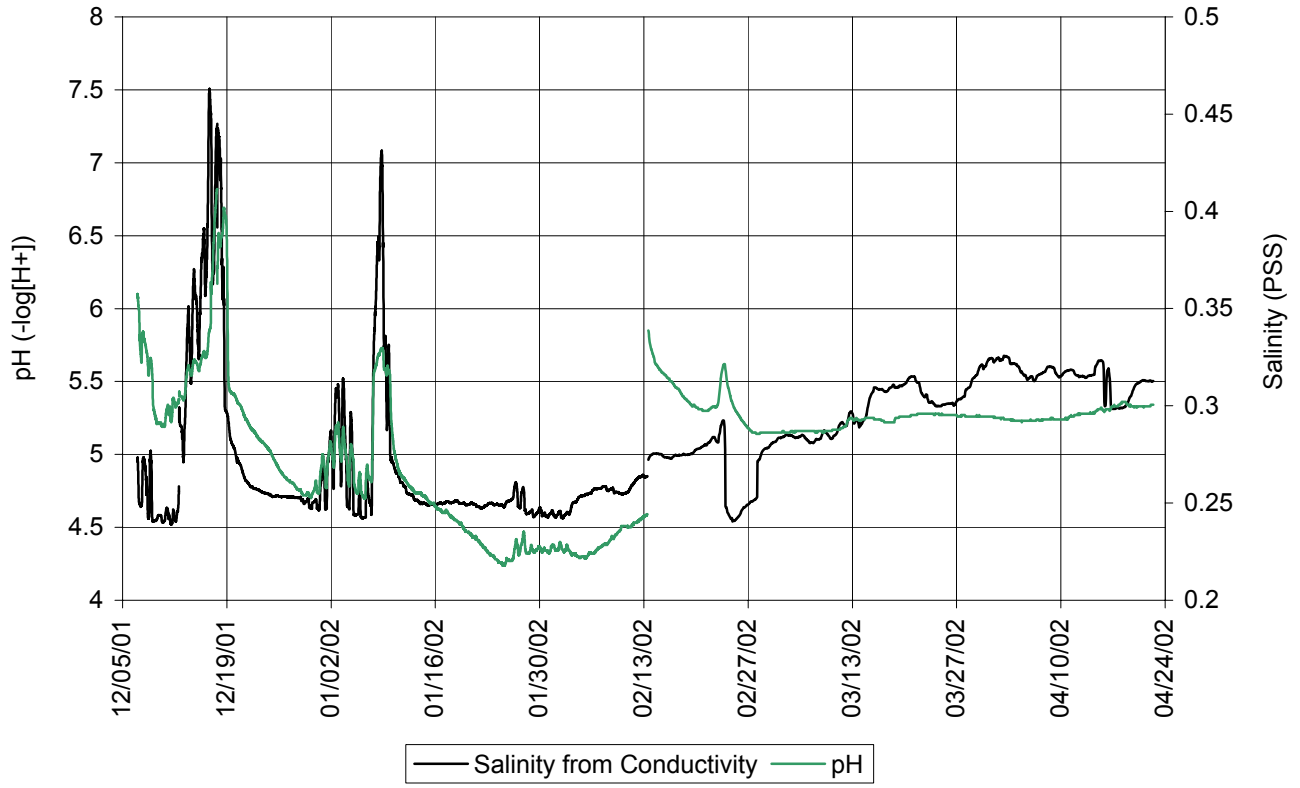


CMP-3 Water Level and Water Quality Data to Date **Figure B-2**

SWHP Phase I, GWCMP

CMP-4

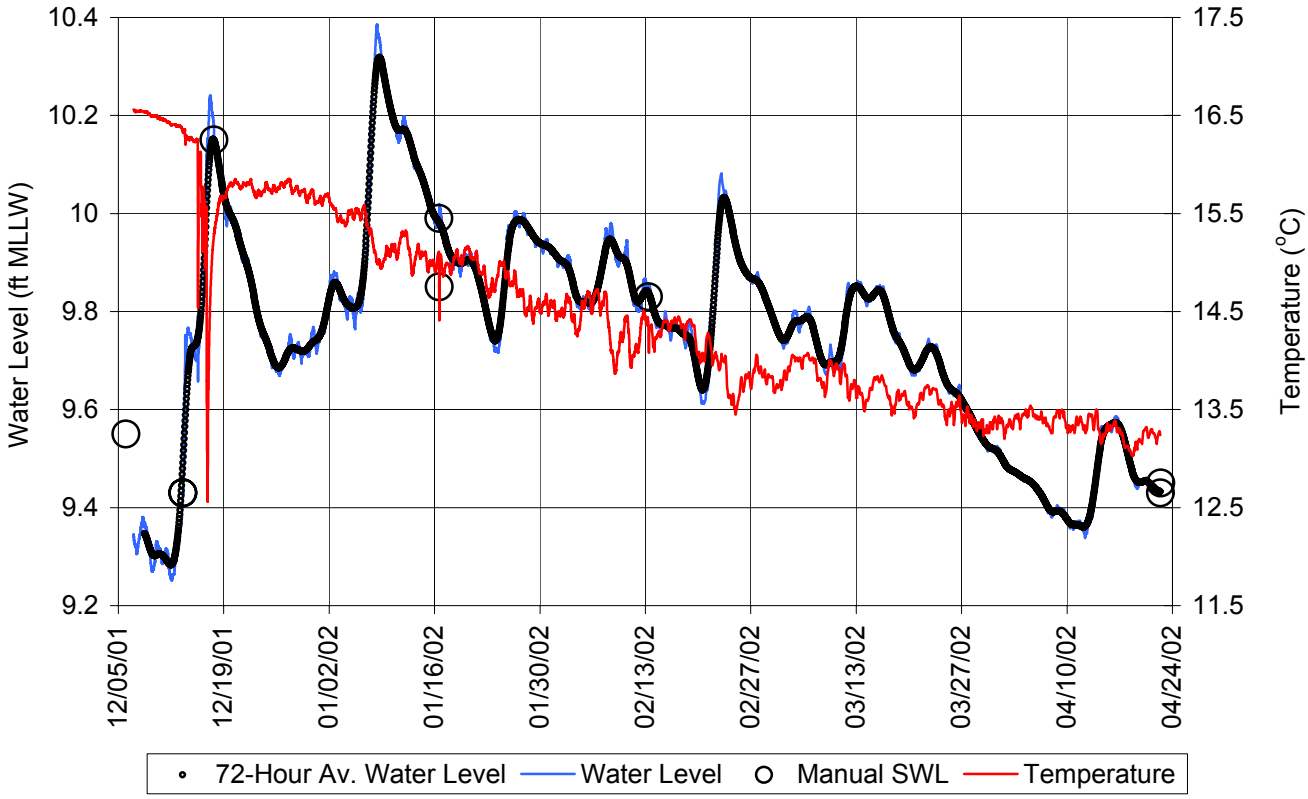


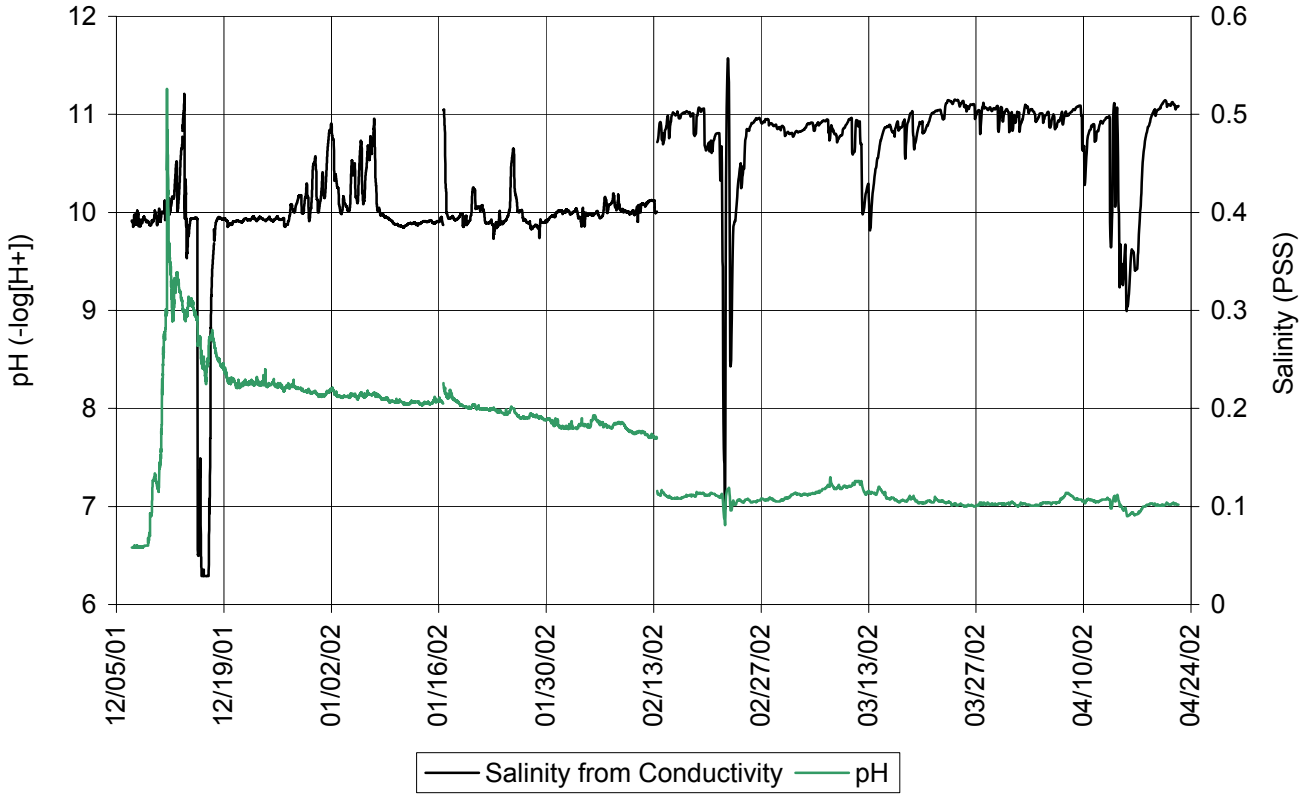


CMP-4 Water Level and Water Quality Data to Date **Figure B-3**

SWHP Phase I, GWCMP

CMP-6

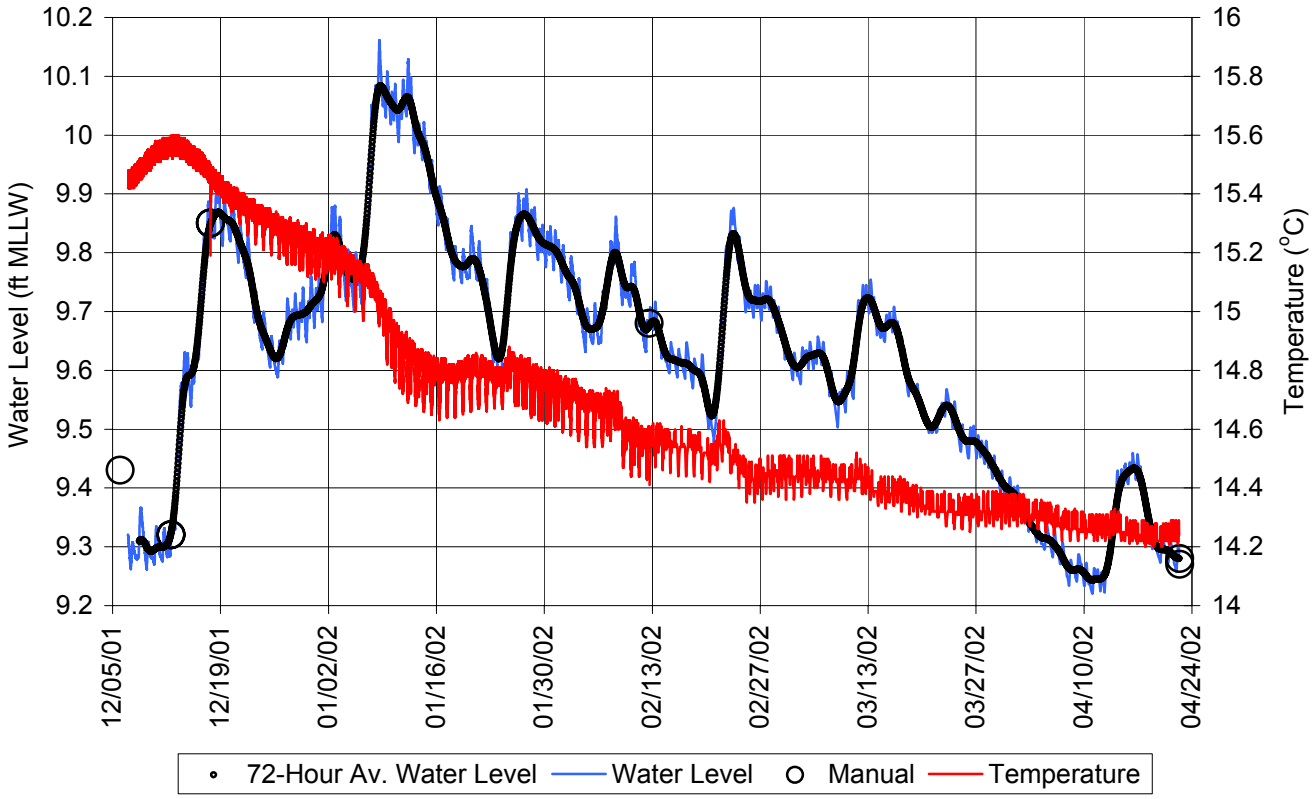


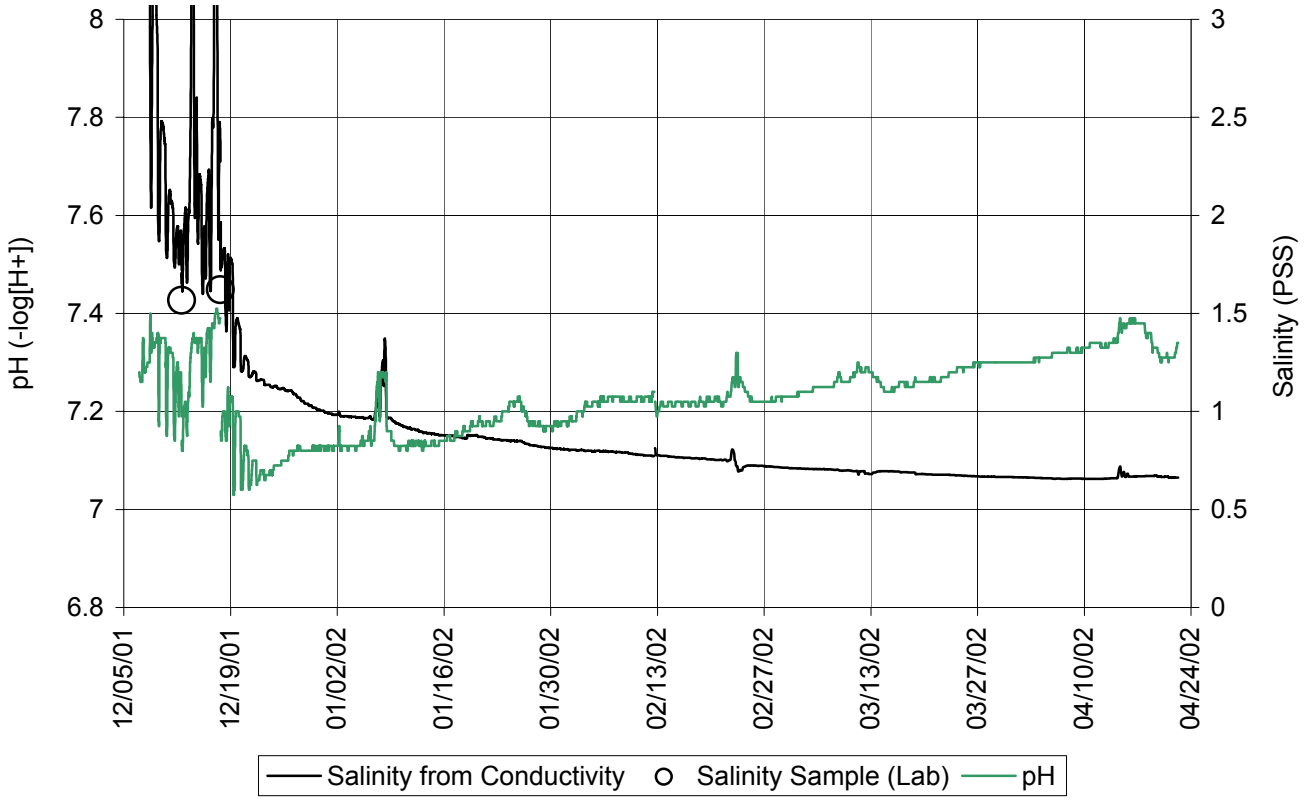


CMP-6 Water Level and Water Quality Data to Date **Figure B-4**

SWHP Phase I, GWCMP

CMP-8

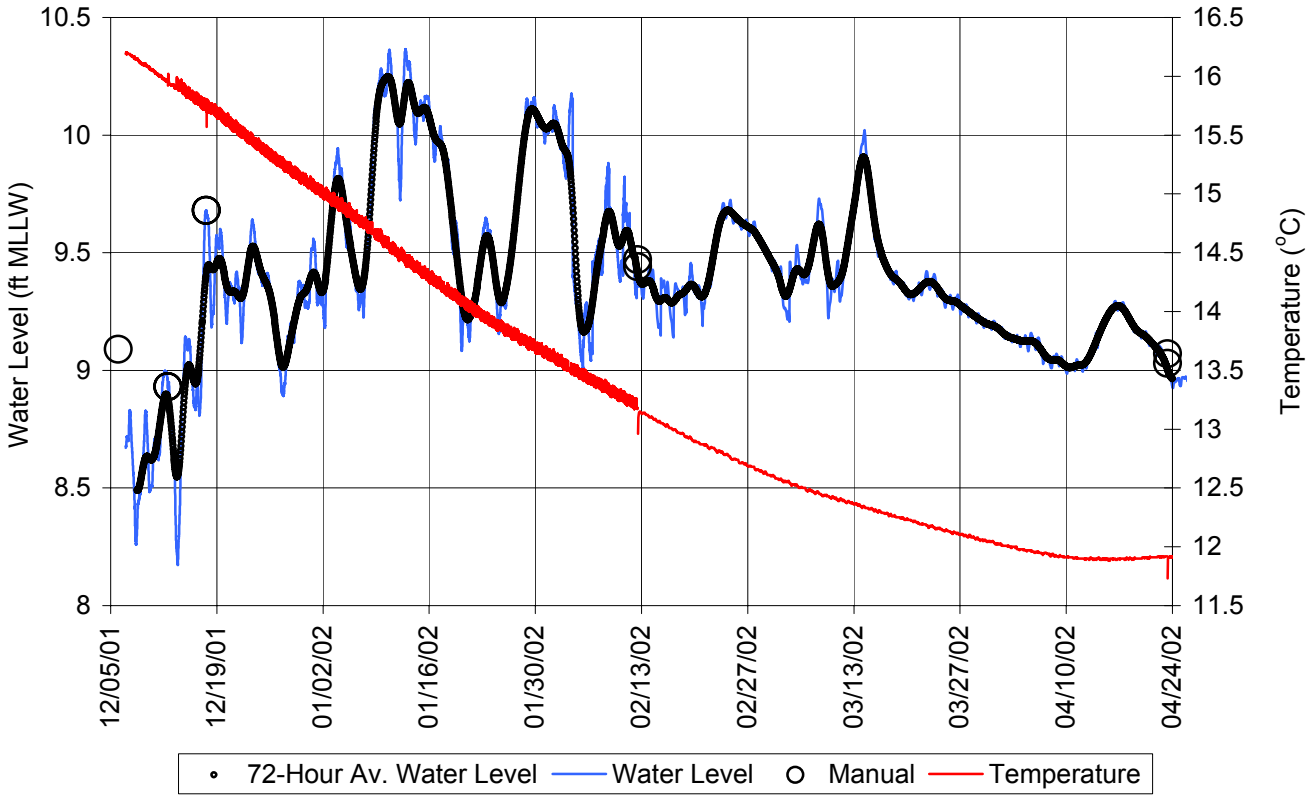


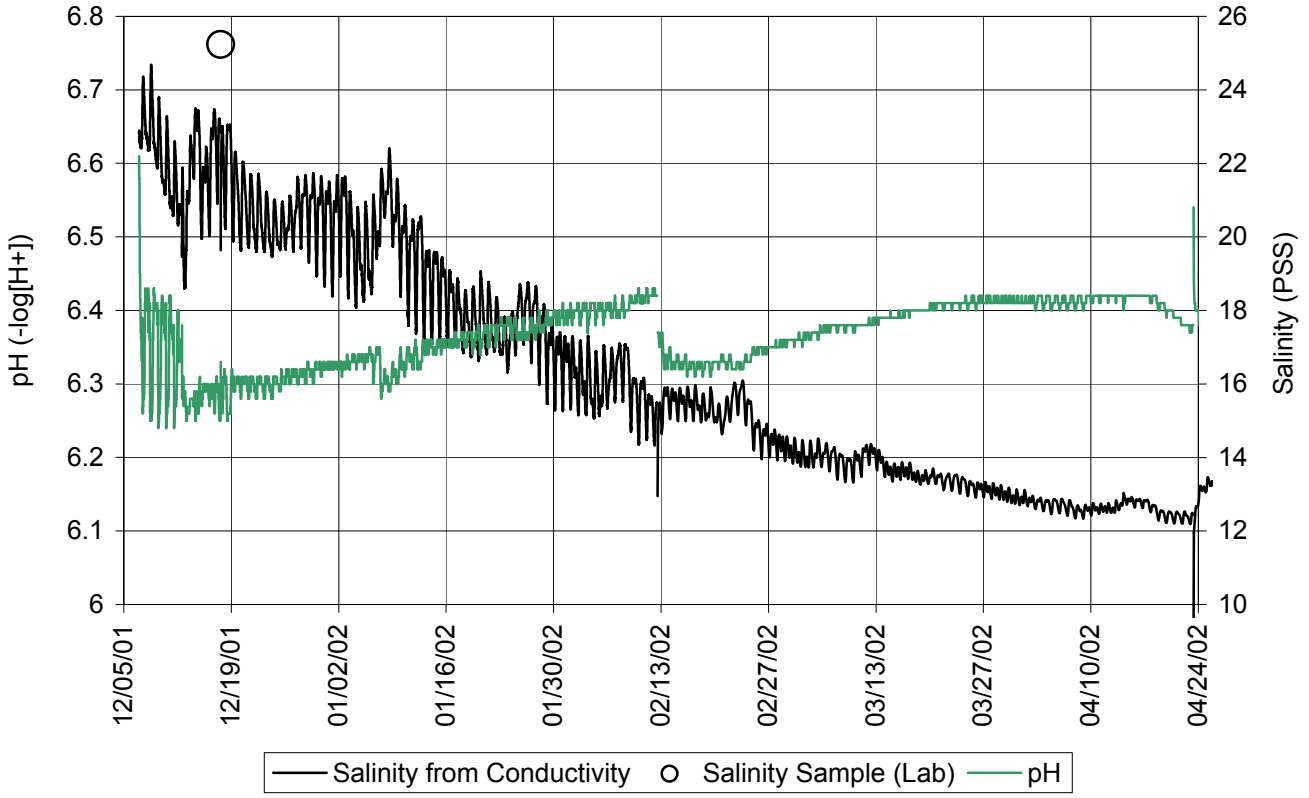


CMP-8 Water Level and Water Quality Data to Date **Figure B-5**

SWHP Phase I, GWCMP

CMP-11

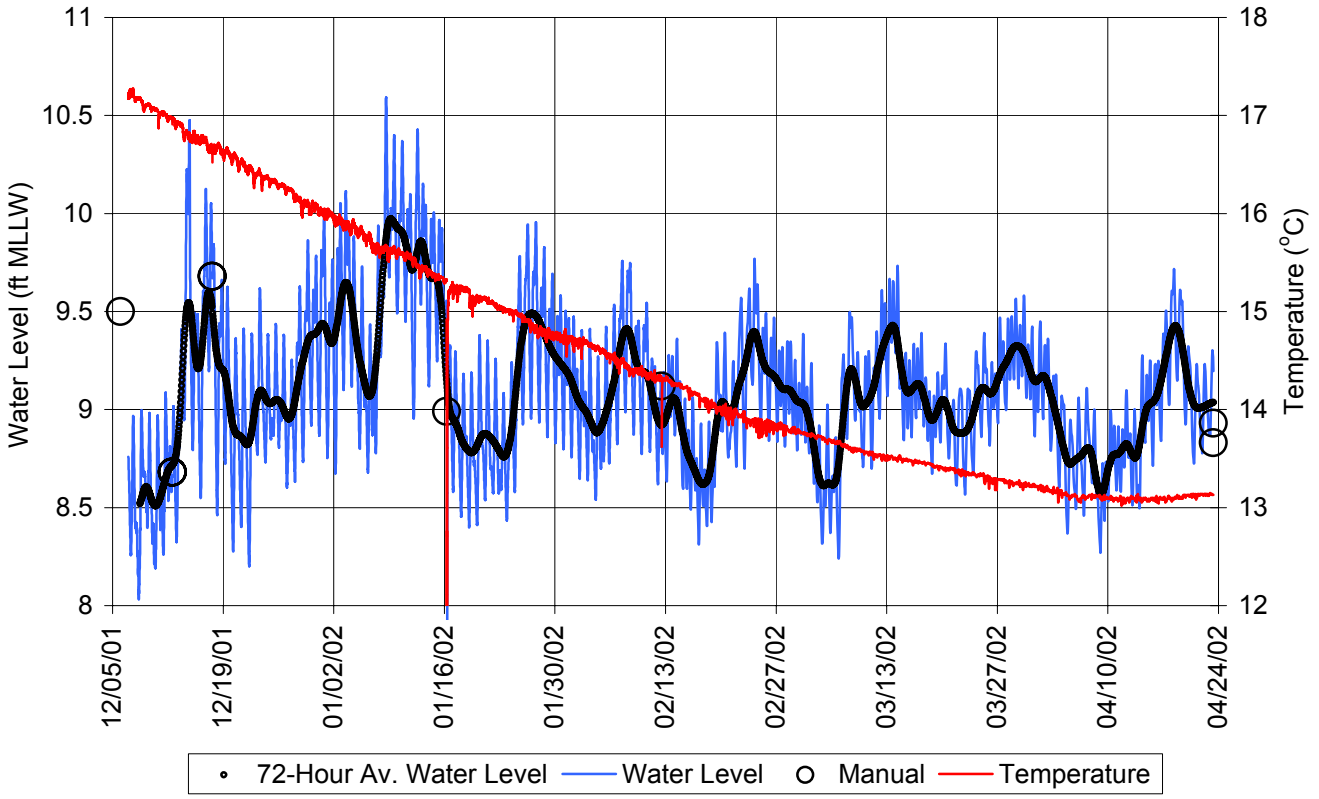


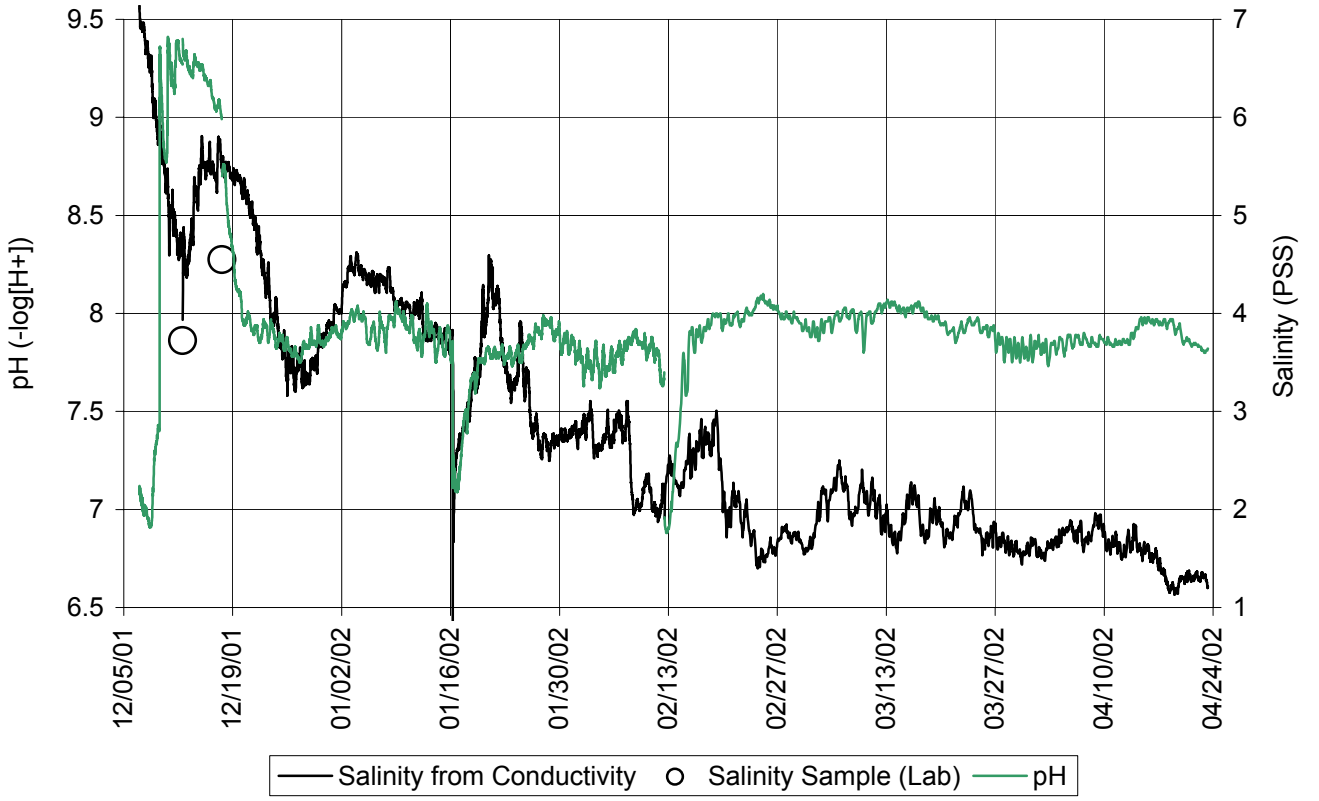


Well CMP-11 Water Level and Water Quality Data to Date **Figure B-6**

SWHP Phase I, GWCMP

CMP-12





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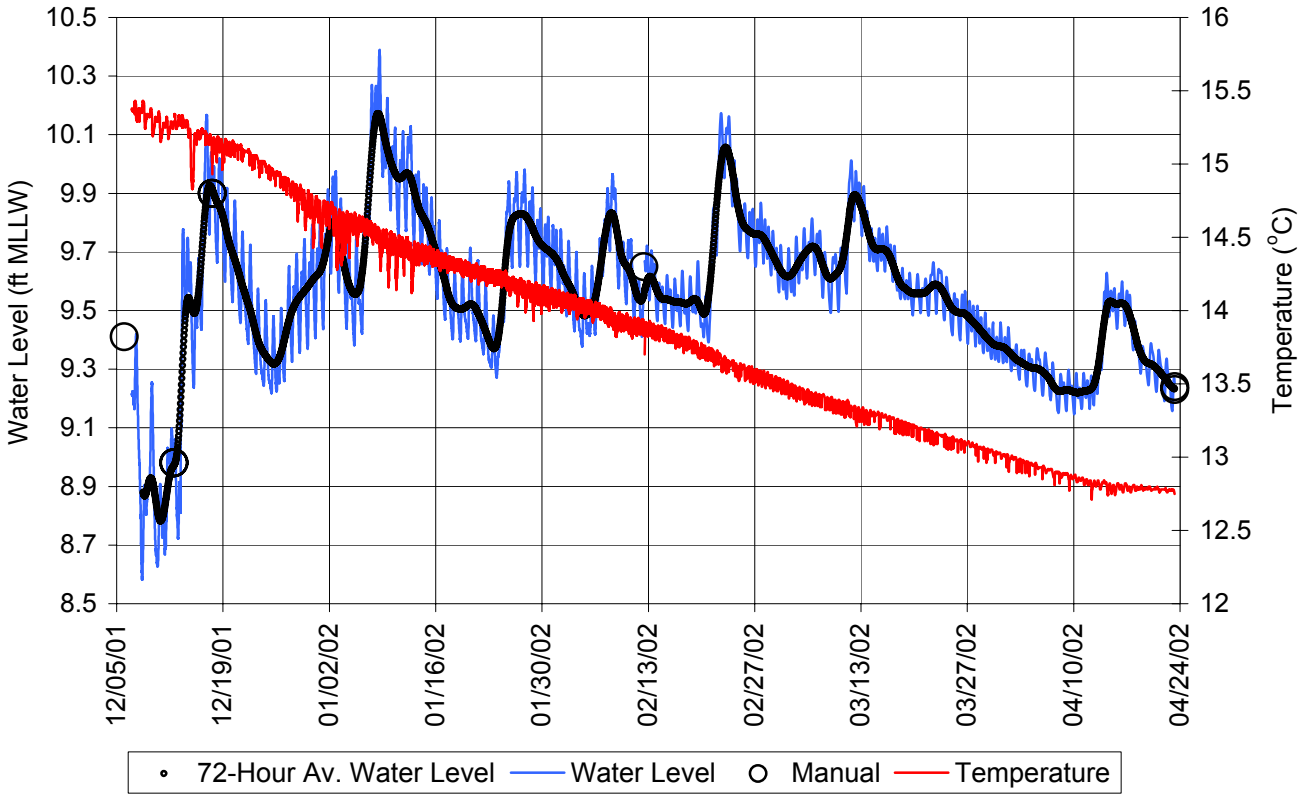
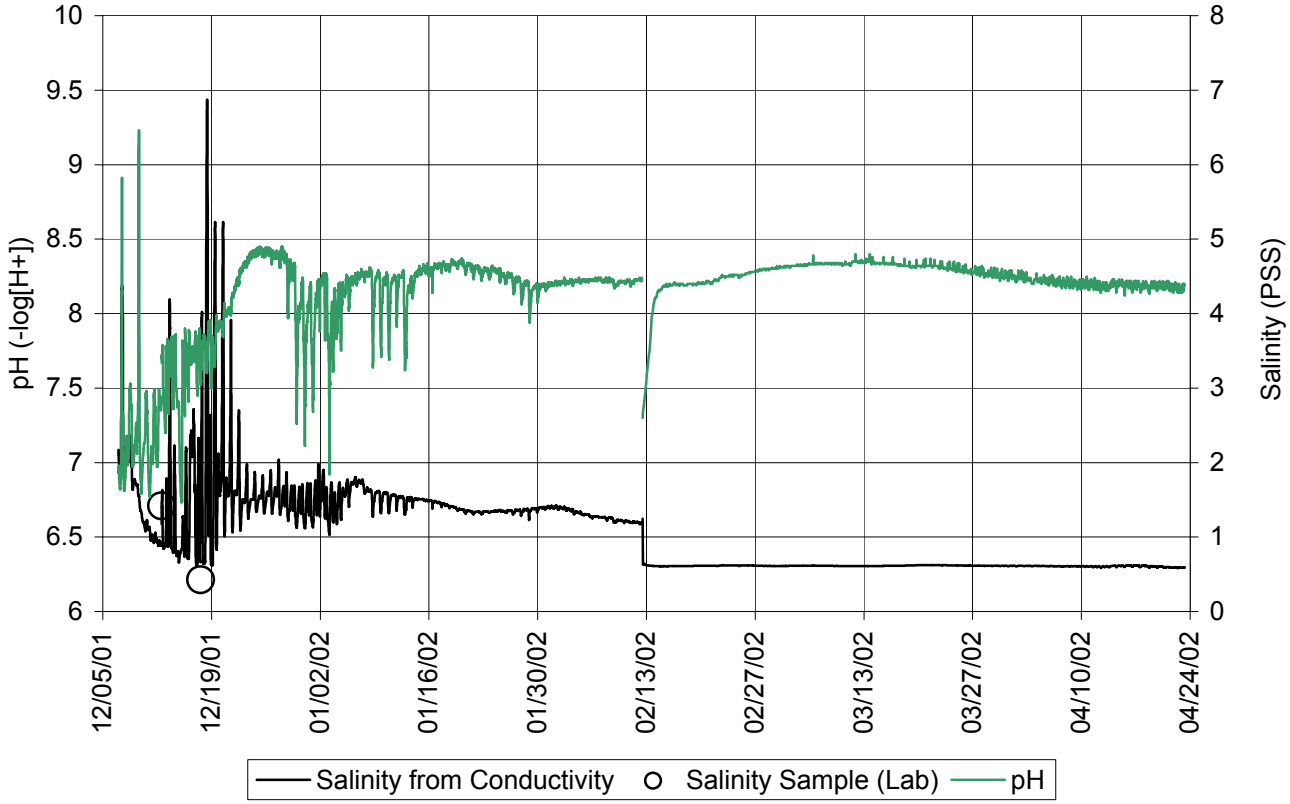
CMP-12 Water Level and Water Quality Data to Date **Figure B-7**

SWHP Phase I, GWCMP

CMP-13

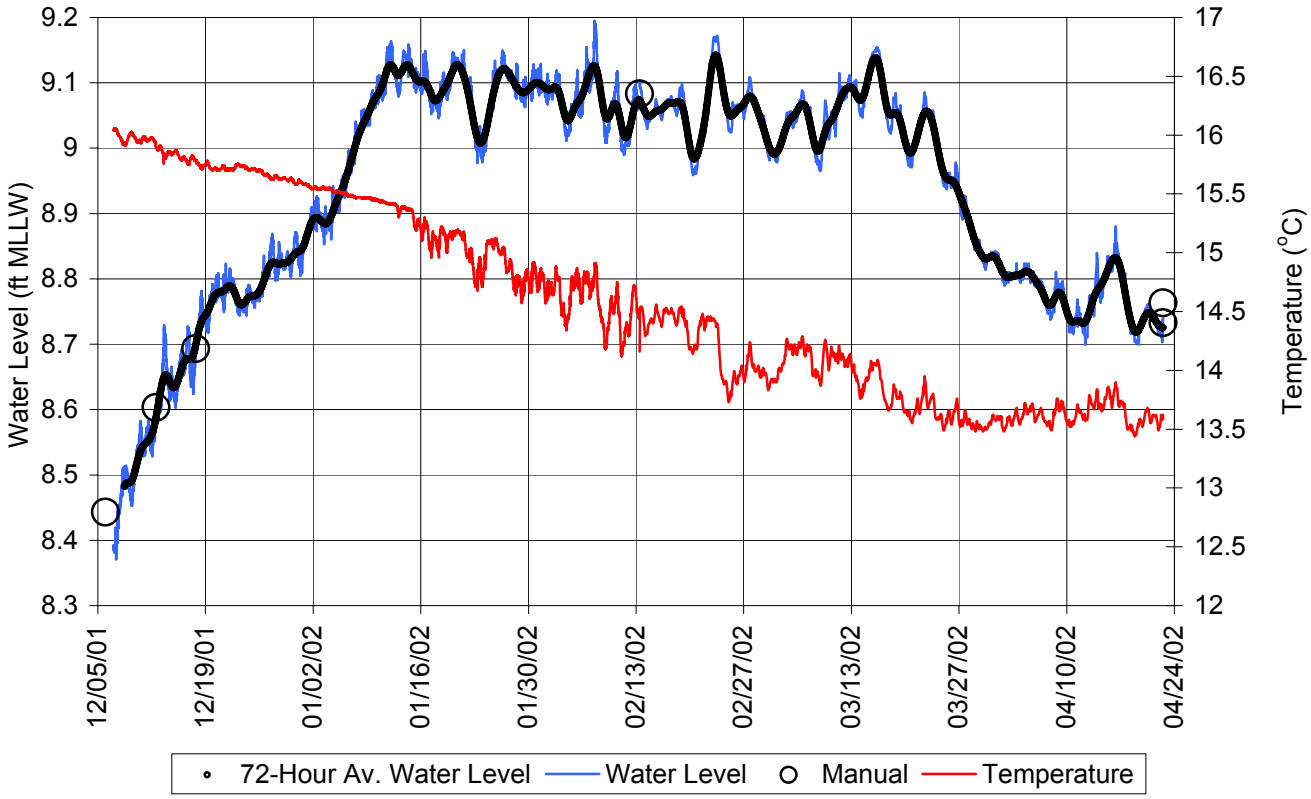


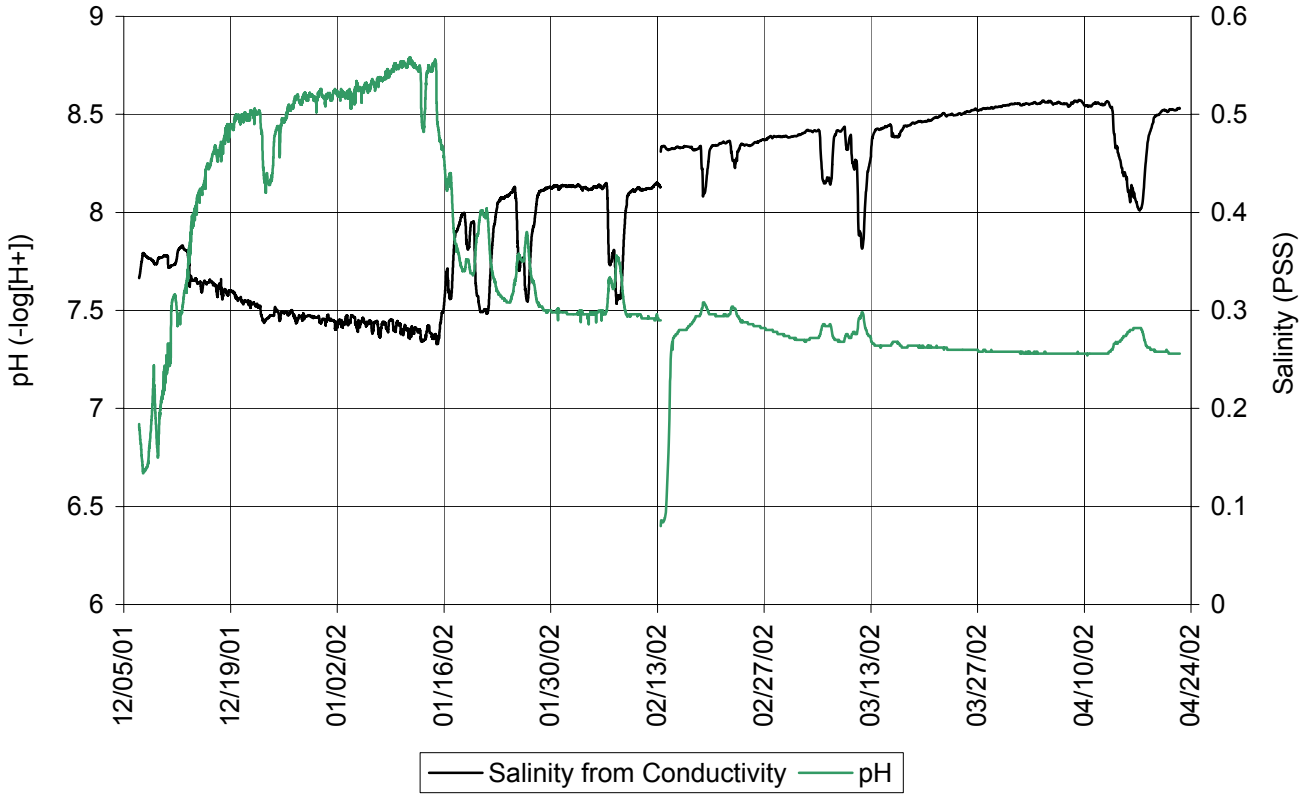


CMP-13 Water Level and Water Quality Data to Date **Figure B-8**

SWHP Phase I, GWCMP

CMP-14

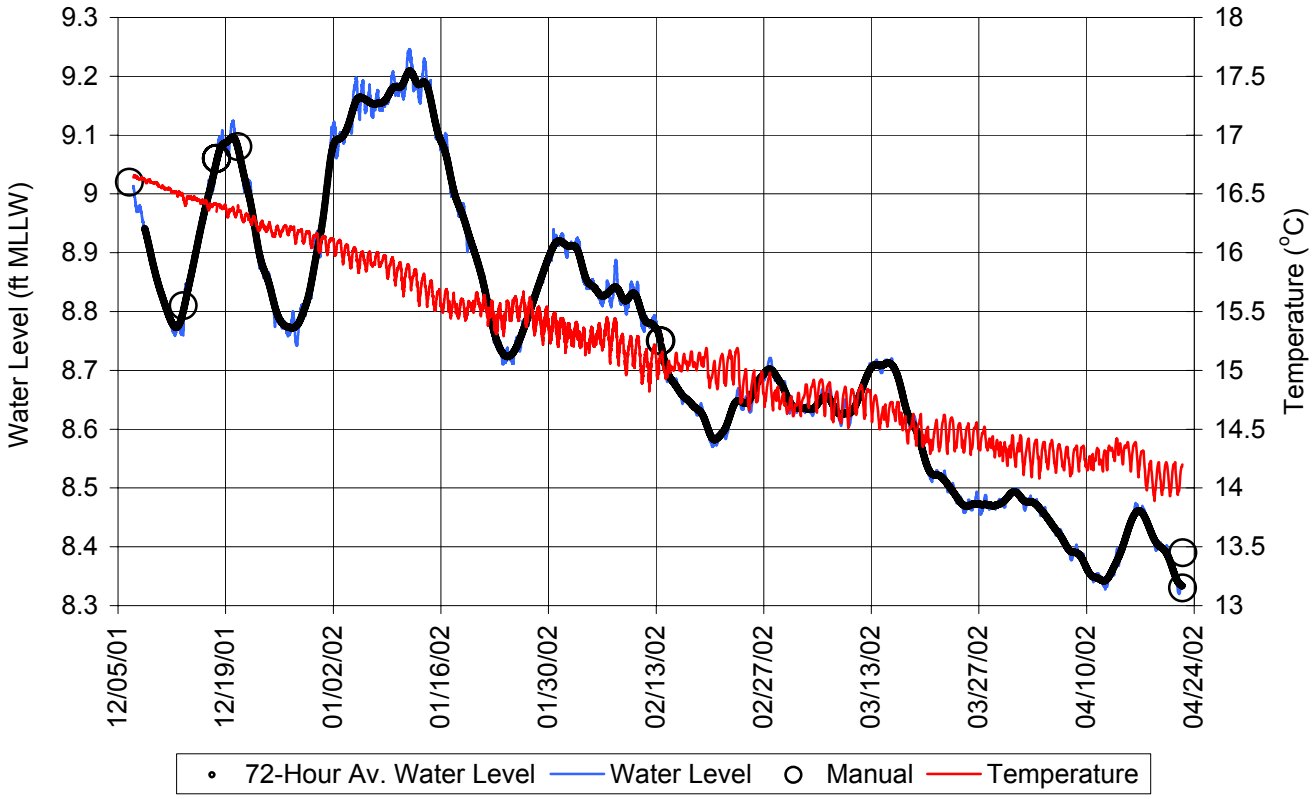


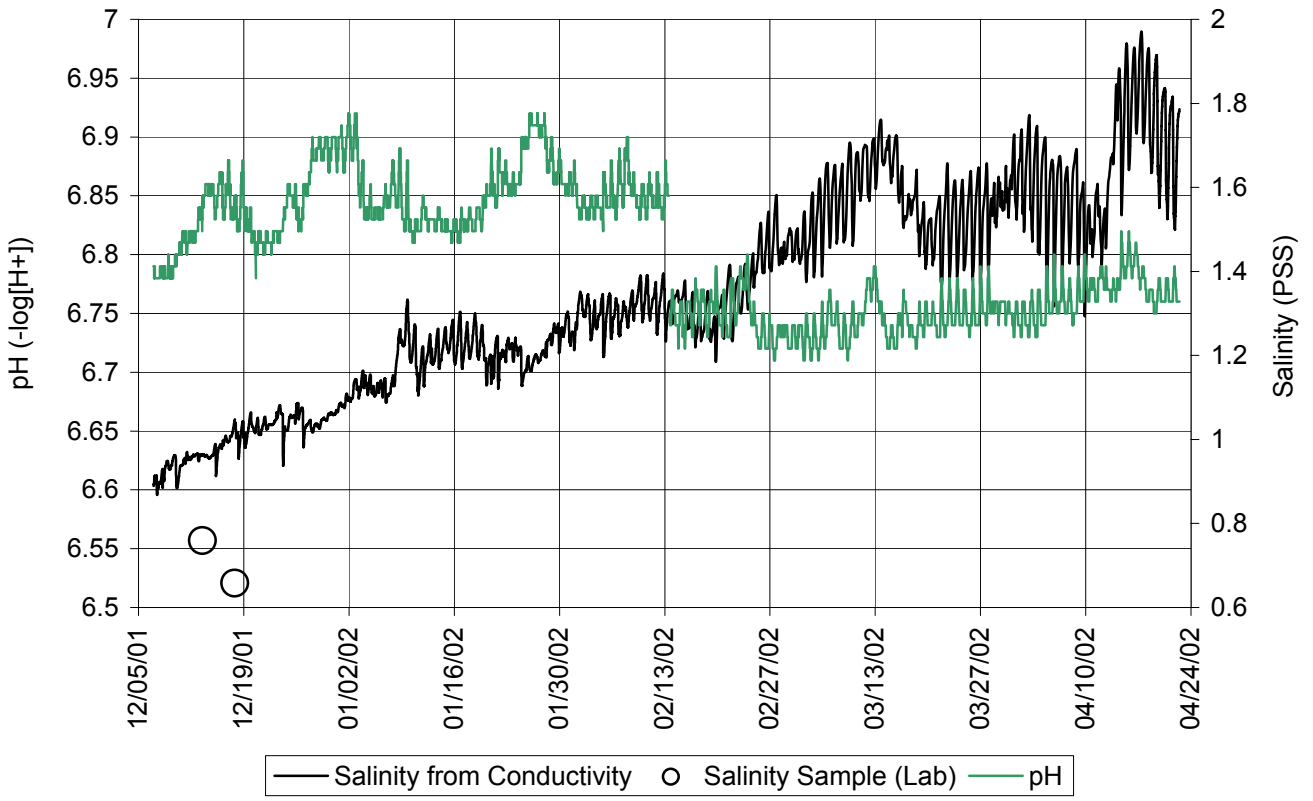


CMP-14 Water Level and Water Quality Data to Date **Figure B-9**

SWHP Phase I, GWCMP

MW-26R

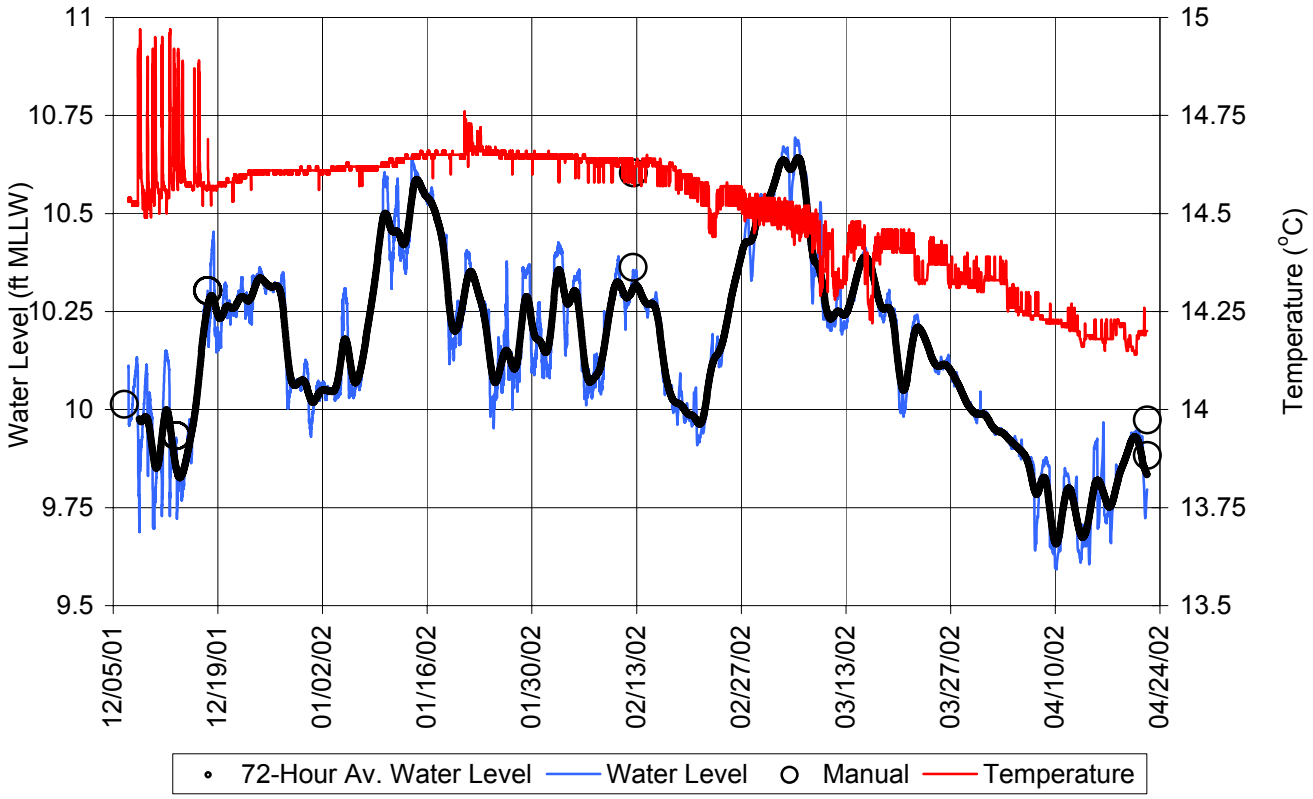


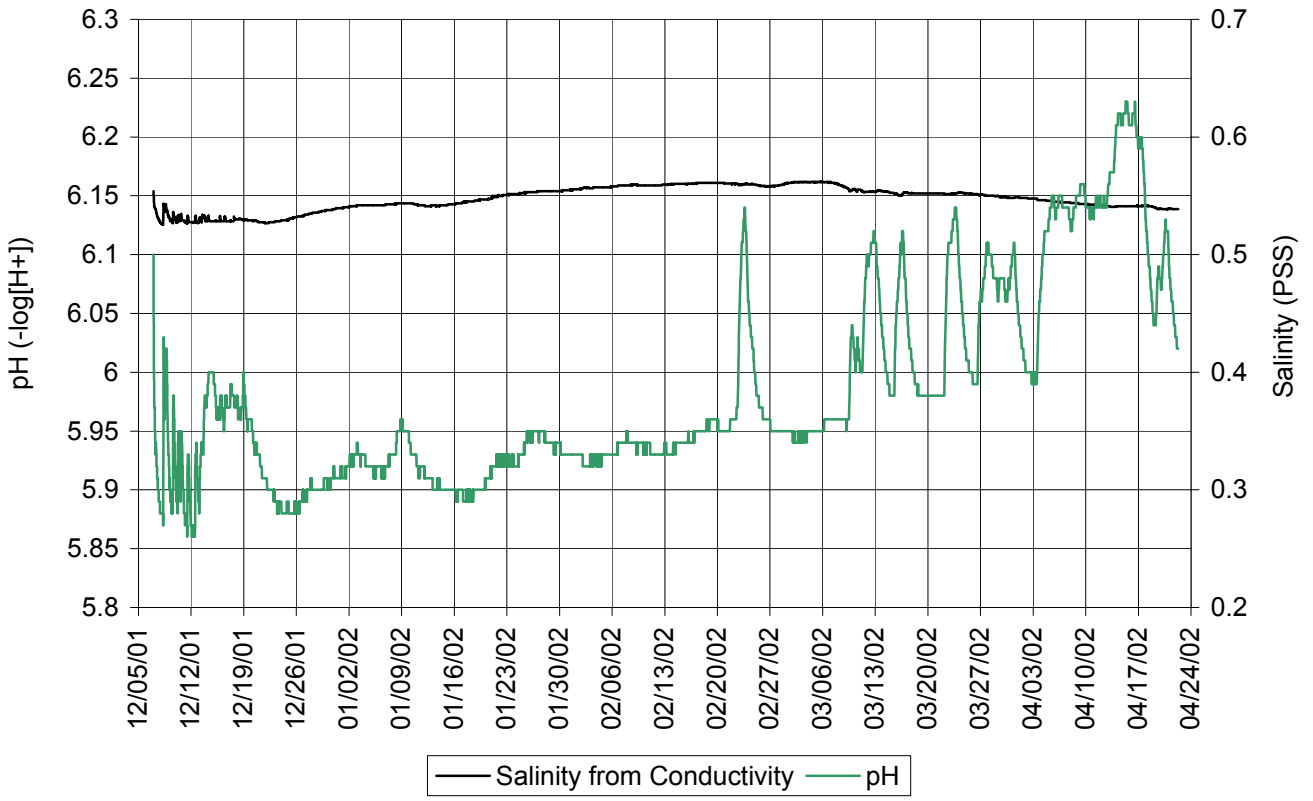


MW-26R Water Level and Water Quality Data to Date **Figure B-10**

SWHP Phase I, GWCMP

MW-307A

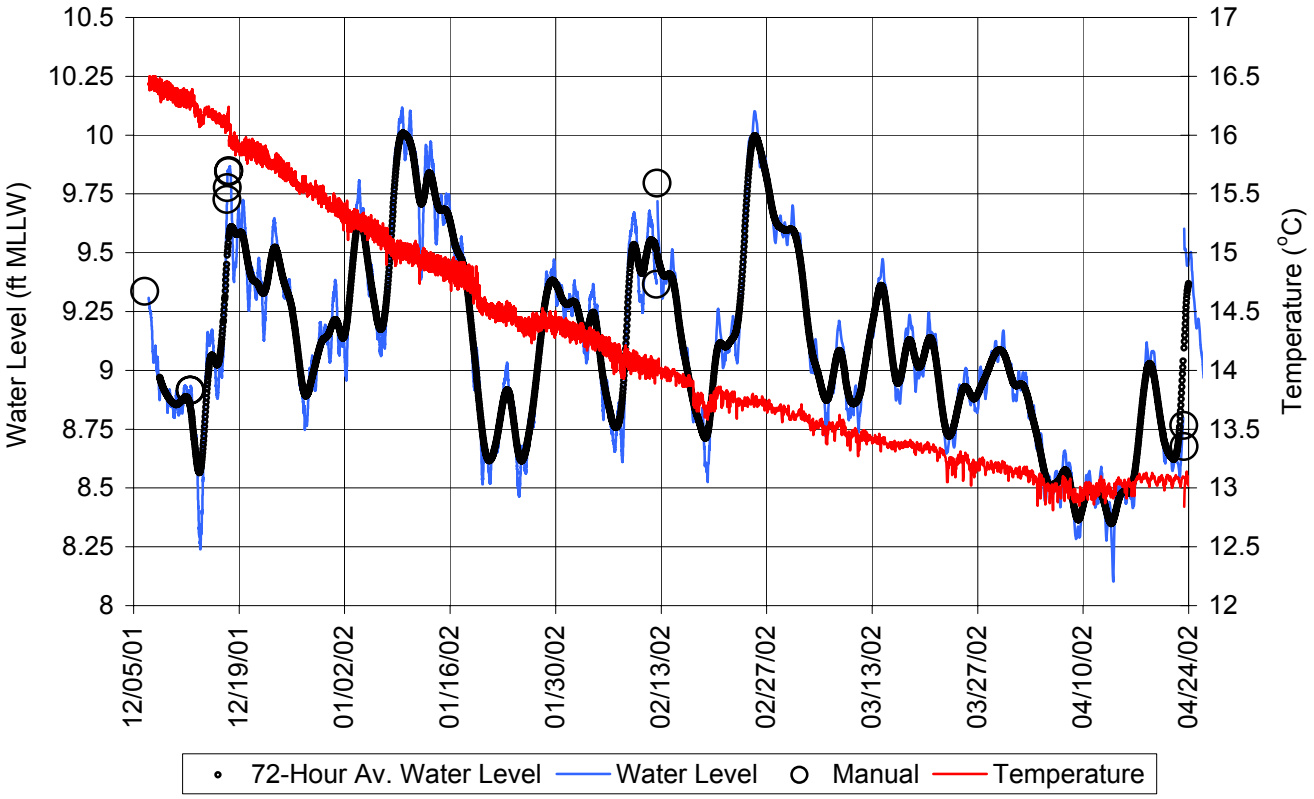


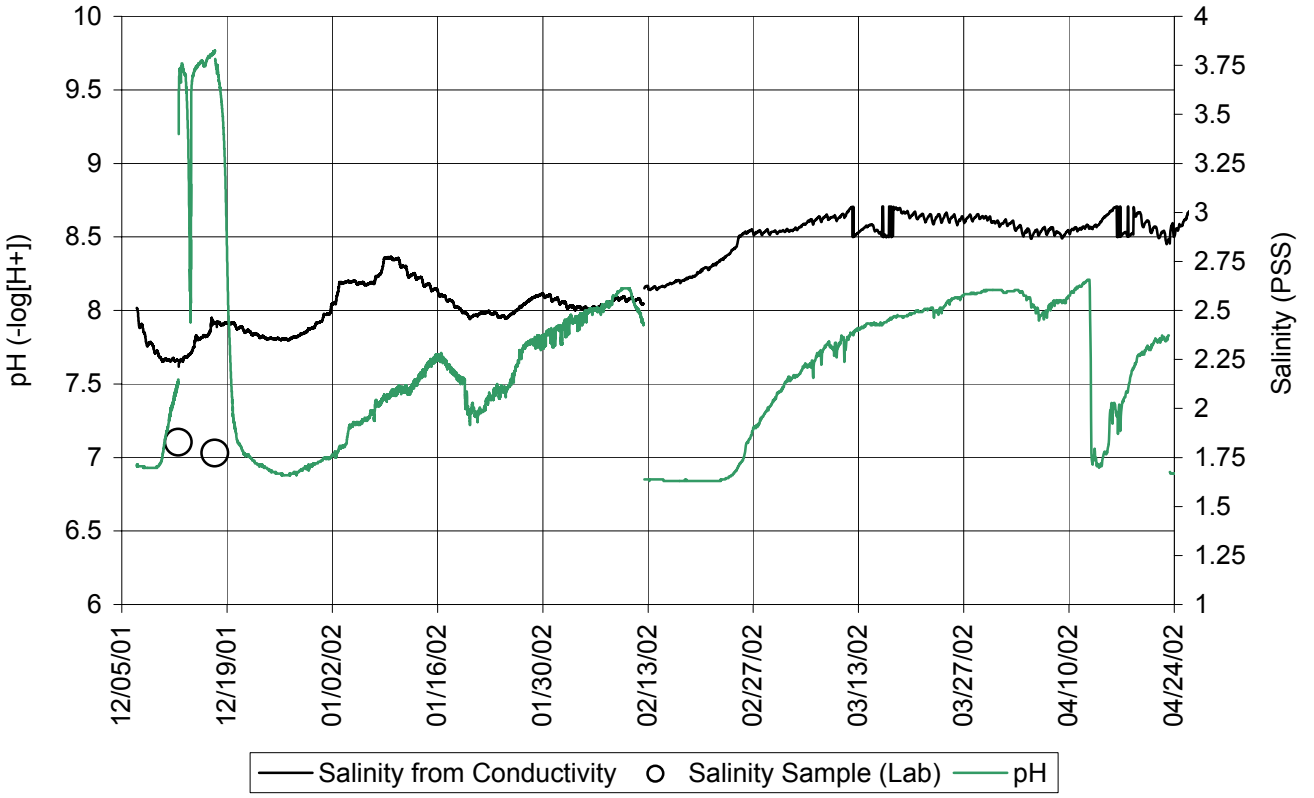


MW-307A Water Level and Water Quality Data to Date **Figure B-11**

SWHP Phase I, GWCMP

MW-308N





MW-308N Water Level and Water Quality Data to Date **Figure B-12**

SWHP Phase I, GWCMP

APPENDIX C

Laboratory Results – Chloride Analyses

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509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

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

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
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503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

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,

Scott A. Woerman
Project Manager

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
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509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

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

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

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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-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

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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-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	

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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	

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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	

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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	

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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 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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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			

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	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: ~~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: Cl ETA 300

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	Cl ETA 300	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 — DATE: 12-18-01 — TIME: 1000
PRINT NAME: Peter Bannister — FIRM: Aspect
RECEIVED BY: — DATE: 12/19/01 — TIME: 0930
PRINT NAME: BRANT TONTZ — FIRM: NCA

RELINQUISHED BY: — DATE: — TIME:
PRINT NAME: — FIRM:
RECEIVED BY: — DATE: — TIME:
PRINT NAME: — FIRM:

ADDITIONAL REMARKS:
WSCS
TEMP: 4.6

COC REV 3/99 — PAGE OF

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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 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: 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-808N 121201	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-308S 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: W/C3

TEMP: 4.6

COC REV 3/99

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