CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD February 5, 2013

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF DREDGED MATERIAL FROM THE GRAYS HARBOR NAVIGATION IMPROVEMENT PROJECT, EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT, FOR OPEN-WATER DISPOSAL AT THE SOUTH JETTY OR POINT CHEHALIS DISPERSIVE SITES, OR FOR BENEFICIAL USE.

A. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) regarding the suitability of material from the Grays Harbor Navigation Improvement Project (GHNIP) for unconfined open-water disposal at the South Jetty or Point Chehalis estuarine sites, or for beneficial use. The requirements for determining the suitability of this material are documented in the "*Dredged Material Evaluation and Disposal Procedures – Users Manual*" (DMMP, 2008a), as amended by updates subsequently made through the Sediment Management Annual Review process.

B. Project Background. The Water Resources Development Act (WRDA) of 1986 authorized the deepening of portions of the Grays Harbor navigation channel to -38 feet mean lower low water (MLLW). However, a subsequent economic analysis could only justify deepening to -36 feet MLLW. The channel was deepened to this depth in 1990. Annual maintenance dredging since that time has included up to two feet of advanced maintenance and two feet of overdepth for a maximum dredging depth of -40 feet MLLW.

In 2005, the Port of Grays Harbor requested Seattle District to re-evaluate the deepening study to determine whether dredging to the authorized depth of -38 feet MLLW could now be justified (plus two feet of advanced maintenance and two feet of overdepth for a maximum dredging depth of -42 feet MLLW). The Corps completed a reconnaissance study in 2009 (USACE, 2009), which determined there was a federal interest in continuing the planning investigation.

A critical element in completing the economic evaluation of channel deepening is the characterization of sediment associated with deepening and determination of disposal options. Sediment sampling and testing were conducted for this purpose in 2012. This suitability determination memorandum summarizes the sediment characterization results and evaluates the suitability of the dredged material for in-water disposal and beneficial-use options.

The proposed deepening project includes dredging in South Reach, Crossover Reach, North Channel, Hoquiam Channel and Cow Point Reach (see Figure 1). Nearly 2 million cubic yards of material will need to be dredged to deepen the federal navigation channel by two feet. Approximately 1.7 million cubic yards of this material are in the inner reaches that require contaminant testing. The remainder is in South Reach, which would normally only require confirmation of its exclusionary status.

C. Project Summary. Table 1 includes project summary and tracking information.

Table 1. Project Summary

Project ranking	Low/Low-moderate
Proposed dredging volume	1,973,812 cubic yards
Proposed dredging depth	-42 feet MLLW (including 2 feet of overdepth and 2 feet of advanced maintenance)
Draft SAP received	February 13, 2012
Draft SAP returned for revisions	February 15, 2012
Revised SAP received	February 19, 2012
Revised SAP approved	February 21, 2012
Round 1 sampling dates	February 21 to April 11, 2012
Round 2 sampling dates	September 19 to 24, 2012
Draft data report received	January 14, 2013
Comments provided on draft report	January 29, 2013
Final data report received	February 1, 2013
DMMP tracking number	GHNIP-1-B-F-326
Recency Determination (7 years due to the generally nontoxic nature of the sediment and lack of active sources)	April 2019

D. Project Ranking and Sampling Requirements. The navigation channel has historically been divided into outer-harbor reaches (Entrance, Bar, and South Reach) and inner-harbor reaches (Crossover Reach, North Channel, Hoquiam Channel, Cow Point Reach, Aberdeen Reach and South Aberdeen Reach). The outer-harbor reaches have been found to meet the exclusionary criteria specified in Section 40 CFR 230.60 of the Clean Water Act, consisting mainly of coarse-grained material in a high-energy environment, geographically removed from sources of contamination. As such, these reaches are generally not subject to contaminant testing, but do require periodic confirmation of their exclusionary status. The inner-harbor reaches contain larger fractions of fine-grained sediment and are closer to historical sources of contamination. Contaminant testing is always required in these reaches. Table 2 includes the estimated dredging volume for each reach.

For DMMP characterization of annual maintenance dredging, the Grays Harbor federal navigation channel is normally ranked “low” regarding concern for potential contamination (DMMP, 2008a). For the GHNIP, the ranking and sampling requirements for the inner-harbor reaches were modified to reflect increasing concern for contamination in the upstream reaches, as will be explained later in this section.

South Reach is the only outer-harbor reach included in the GHNIP. As mentioned previously, it has been classified as "exclusionary" by the DMMP agencies for maintenance dredging, which means that the only testing required on a periodic basis for maintenance dredging is for grain size and total organic carbon. For the GHNIP, verification was required that the *deepening* material in South Reach also meets the exclusionary guidelines (less than 20% fines and less than 0.5% organic carbon). Therefore, the first tier of testing specified in the project sampling and analysis plan (SAP) for South Reach included only grain size and total organic carbon. However, the SAP indicated that should any portion of South Reach fail to meet the exclusionary guidelines, it would need to be fully characterized as non-exclusionary material. The DMMP agencies agreed to divide South Reach into dredged material management units (DMMUs) of approximately 72,000 cy (see Table 3). Three samples would be taken from each DMMU and composited for analysis. Initial analysis was to include grain size, sediment conventionals and mercury (due to holding-time constraints). The remaining sediment was to be archived for potential chemical and biological testing.

The remaining reaches – Crossover, North Channel, Hoquiam Channel and Cow Point – required full characterization. The DMMP agencies agreed that sediment in Crossover Reach and North Channel could be considered low-ranked and homogeneous. The DMMP Users Manual assigns a volume of 60,000 cubic yards per DMMU in such areas, with each field sample representing up to 8,000 cubic yards. However, based on past dioxin testing results, the DMMP agencies expressed increased concern for the deepening material in Hoquiam Channel and Cow Point Reach and classified this material as low-moderate and heterogeneous. This classification requires DMMUs of 48,000 cy and field samples representing up to 8,000 cy. Using these sampling requirements and the volumes included in Table 2, the inner-harbor reaches were divided into the DMMUs found in Table 3. The average volume of material in the DMMUs in Crossover Reach and North Channel is 57,704 cubic yards, while the average DMMU volume in Hoquiam Channel and Cow Point Reach is 47,702 cy. To better reflect the increasing concern for dioxin as one moves upstream, the size of DMMUs in Crossover Reach and North Channel were gradually decreased, rather than being assigned equal volumes. This strategy resulted in relatively large DMMUs near South Reach (exceeding the nominal volume of 60,000 cy), with DMMU volumes approaching 48,000 cubic yards in DMMUs near Hoquiam Channel.

The most recent site condition surveys were used to locate sampling stations within each DMMU. Core samples were to be collected from a total of 224 sampling locations, allocated to the DMMUs as indicated in Table 3.

E. <u>Sampling and Analysis.</u> Sampling and testing took place in two rounds. One DMMU (CO7) failed biological testing in Round 1 and was split into two subunits in Round 2. A second DMMU (CP32) had conflicting data from chemical and bioassay testing in Round 1, necessitating a second round of sampling and testing for that DMMU as well. The two rounds of sampling and testing are described in the following sections.

1. <u>Round 1 Sampling and Analysis.</u>

<u>Sampling</u>. Round 1 sampling and processing took place February 21 to April 11, 2012. Thirty-six DMMUs were sampled, all with a vibracore sampler. Three samples were taken from each of the South Reach DMMUs and composited, while 6-8 samples were taken from each of the inner-harbor

DMMUs and composited. Sectioned cores were kept on ice until they could be processed at a dock-side facility owned by the Port of Grays Harbor. Target and actual sampling locations are shown in Figures 2 through 10. Sampling station coordinates, mudline elevations and sampling depths can be found in Table 4.

Glacial till was encountered in four of the Cow Point DMMUs, resulting in limited penetration or outright refusal (see Figure 11). Two or more attempts were required at some sampling stations to achieve adequate penetration and, in some cases, the sampling stations needed to be moved. Despite these difficulties, sediment samples from the primary layer (i.e. representing the deepening material) were recovered at all stations but one (CP34-4). The glacial till did prevent penetration to the bottom of the z-sample (-44 feet MLLW) at numerous stations, but analysis of the z-samples was not required by the agencies for the Cow Point DMMUs in Round 1, so this had no repercussions on decision-making.

Physical and Chemical Analysis. Analysis of the inner-harbor reaches included sediment conventionals, grain size and the full suite of standard DMMP chemicals of concern. Table 5 includes the results. DMMUs CP32 and CP33 both exceeded the DMMP screening level (SL) for benzyl alcohol (SL = 57 ug/kg), with concentrations of 100 and 110 ug/kg respectively. None of the other DMMUs had any detected SL exceedances. However, the reporting limit of 3.4 ug/kg for total chlordane for DMMU CO7 exceeded the SL of 2.8 ug/kg. The two detected and one reporting-limit exceedances of SLs triggered bioassay testing for CO7, CP32 and CP33.

The South Reach DMMUs were anticipated to meet the DMMP exclusionary guidelines and were first analyzed for grain size, total organic carbon and mercury only (mercury was included due to holding time constraints). However, DMMUs SR1, SR3 and SR4 all had organic-carbon content that exceeded the exclusionary limit of 0.5%. Per the requirements in the sampling and analysis plan, these three DMMUs were then subjected to full chemical testing. While the chemical testing resulted in no SL exceedances, the holding time for the bioassays would have expired prior to receiving results from the full chemical testing, so a decision was made to conduct bioassays on these three DMMUs concurrently with the chemical testing.

In addition to the standard suite of DMMP chemicals of concern, dioxins/furans were analyzed for all DMMUs except SR2, which met the exclusionary guidelines for testing. Results for individual dioxin/furan congeners are included in Table 5. Toxic equivalents (TEQs, with u = ½ detection limit) were calculated for each DMMU using the congener concentrations and the toxic equivalency factors (TEFs) found in Table 6. The TEQs (see Table 7) ranged from 0.3 to 10.1 parts per trillion (pptr), with a mean of 3.3 pptr. Hoquiam Channel and Cow Point Reach had the highest concentrations with means of 4.8 and 4.6 pptr respectively. These concentrations are similar to what has been found historically in maintenance dredged material from the federal navigation channel.

Chemical Analysis QA/QC. Stage-4 data validation (EPA, 2009) was conducted for dioxins/furans, semivolatiles, PCBs and pesticides. Stage-3 data validation was conducted for sediment conventional and metals analyses. Data qualifiers assigned during validation have been incorporated into Table 5.

Bioassays. Biological testing was performed in two batches, with CP32 and CP33 tested in the first batch and CO7, SR1, SR3 and SR4 tested in the second batch. Two reference sediment samples were collected from North Bay on April 7, 2012 (see Figure 12). NB02 was run with the first batch and

NB01 was run with the second batch.

The standard suite of three bioassay tests (amphipod mortality, larval development, and polychaete growth) was performed. The DMMP interpretation guidelines for dispersive disposal sites in Table 8 were used to assess the bioassay results.

Amphipod Mortality. The 10-day amphipod bioassay was run using *Eohaustorius estuarius* as the test species. Test results are shown in Table 9. DMMUs CP32 and CP33 both scored hits under the 1-hit rule in batch 1. There were no hits in batch 2.

The negative control and reference sediments met the DMMP performance criteria. Water quality and positive control results were also within their acceptance ranges. However, an unforeseen variable was discovered for the first batch that could have resulted in nontreatment effects. The clay content of CP32 and CP33 was 24.2% and 30.6% respectively. This was much higher than the clay content of any dredged material tested in Grays Harbor in the past, and was therefore unanticipated. *Eohaustorius estuarius* has been documented to underperform in sediment with high clay content (DMMP, 2000). The DMMP Users Manual (DMMP, 2008a) indicates that for sediment with clay content higher than 20% the amphipod species of choice is *Ampelisca abdita*.

Due to the mix-up in species selection, the DMMP agencies allowed the amphipod bioassay to be rerun, using *Eohaustorius estuarius* and *Ampelisca abdita* in a side-by-side test. Because the holding time had expired for the test material, the agencies were concerned that the chemical nature of the dredged material might have changed during storage. Specifically, the concern was that benzyl alcohol, the chemical that triggered biological testing, could have been converted to benzoic acid, which is less toxic than benzyl alcohol. In order to address this problem the archived dredged material was tested again for semivolatile organics, including benzyl alcohol. The chemical testing indicated that there had not been a consistent shift in the benzyl alcohol concentrations to lower concentrations. The concentration detected in CP32 decreased, but the concentration in CP33 increased. These changes in concentration could easily be attributable to sampling and analytical variability.

DMMU	original benzyl alcohol concentration (ug/kg)	benzyl alcohol concentration after storage (ug/kg)
CP32	100	57
CP33	110	140

The amphipod retest was carried out on unfrozen archived sediment. It was anticipated that the *Eohaustorius* results would be similar to the first-round results due to the high clay content, with *Ampelisca* exhibiting less toxicity. However, the results (Table 10) indicated that there were no hits for either of the test species.

The negative control and reference sediment met the DMMP performance criteria for the amphipod retest. Water quality and positive control results were also within their acceptance ranges. Therefore, the amphipod retest was considered a valid test by the DMMP agencies.

Larval Development. The larval development bioassay - using *Mytilus galloprovincialis* - was run with two different termination protocols. The standard protocol involved carefully decanting the overlying water at the end of the test so as not to disturb the sediment, while for the resuspension protocol the sediment and overlying water were thoroughly mixed at the end of the test and allowed to settle for 24 hours prior to decanting.

The results are shown in Tables 11 and 12 for the standard and resuspension termination protocols respectively. In batch 1, CP32 scored a hit under the 2-hit rule using the standard protocol but no hit under the resuspension protocol. CP33 had no hit under either protocol. In batch 2, both SR4 and CO7 scored hits under the 1-hit rule for the standard protocol, but under the resuspension protocol, SR4 scored no hit at all, while CO7 again scored a hit under the 1-hit rule.

The negative control and reference sediments met the DMMP performance criteria for both termination protocols. Water quality and positive control results were also within their acceptance ranges. Therefore, the larval development bioassay was considered a valid test by the DMMP agencies.

Polychaete Growth. The 20-day juvenile polychaete growth test - using *Neanthes arenaceodentata* as the test species - was also run with two endpoints: dry-weight (DW) and ash-free dry-weight (AFDW). The AFDW endpoint was officially adopted over the DW endpoint in August of 2012 (DMMP, 2012). Therefore, only the AFDW endpoint was used for decision-making. Results for this endpoint are displayed in Table 13. There were no hits in either batch.

The negative control and reference sediments met the DMMP performance criteria. Water quality and positive control results were also within their acceptance ranges. Therefore, the polychaete growth bioassay was considered a valid test by the DMMP agencies.

Interpretation of Round 1 Bioassay Data. Tables 14 and 15 summarize the interpretation of bioassay data from batch 1 and batch 2 respectively, using the guidelines for dispersive sites provided in Table 8. Given the many bioassay endpoints, with sometimes conflicting outcomes, the DMMP agencies needed to use best professional judgment in determining the suitability of the dredged material for open-water disposal.

The results for DMMUs SR1 and SR3 were straightforward. These DMMUs had no exceedances of the DMMP SLs and scored no hits in any of the bioassays, so were clearly suitable for open-water disposal. For SR4, the agencies used a weight-of-evidence approach. There were no SL exceedances and it passed the amphipod and *Neanthes* tests. It barely scored a hit under the 1-hit rule in the larval development test using the standard termination protocol, with combined mortality and abnormality just 15.5% greater than reference. It scored no hit at all when the resuspension protocol was used. SR4 was also 85% sand, which has much less of a tendency to sorb organic contaminants than fine-grained sediment. On the basis of this combination of evidence, the agencies agreed that SR4 was suitable for open-water disposal.

The agencies also determined – using a weight-of-evidence approach – that CP33 was suitable for open-water disposal. There were no hits in either larval test or in the *Neanthes* bioassay. In the initial amphipod test, the wrong test species was used (based on clay content); the grain-size match with the reference was poor; and both control and reference performed extremely well. Despite these handicaps, CP33 barely failed the dispersive disposal guideline in the first round of testing. In the amphipod retest, CP33 passed using both test species.

Decision to Resample and Retest CO7 and CP32. Based solely on the results from the Round 1 larval tests, CO7 would have been found unsuitable for open-water disposal. Due to the size of CO7 (63,150 cubic yards), the Corps was concerned about the impact this volume of failed sediment could have on the viability of the project. Hence, the Corps petitioned the agencies to allow CO7 to be split into subunits for resampling in an effort to determine if the toxicity could, perhaps, be isolated to a smaller volume of material. The agencies agreed to this request, but only allowed CO7 to be split into two subunits so as to avoid a possible patchwork of suitable and unsuitable units.

While the weight-of-evidence approach worked well for CP33, the first-round results for CP32 were less amenable to interpretation. For example, the *Eohaustorius* mortality was 40% for CP32 in the initial amphipod test, but only 25% for CP33. In the *Ampelisca* test, while the CP32 mortality was not significant enough to score a hit, it *was* statistically different from reference; the mortality for CP33 was not statistically different from reference. Finally, CP32 scored a hit under the 2-hit rule in the larval test, while CP33 did not. Since the Corps was planning to resample and retest CO7 as two subunits, the DMMP agencies requested that the Corps also do the same for CP32, so as to gather more definitive data on which to base a decision for that DMMU.

A summary of the round-1 results can be found in Table 16, along with the overall interpretation for each DMMU.

For the resampling/retesting effort, DMMUs CO7 and CP32 were each divided into two subunits as shown in Figures 13 and 14. The volumes of CO7a and CO7b were 31,593 and 31,557 cubic yards respectively. DMMU CP32 was divided such that CP32a consisted of sediment within the 350-foot-wide navigation channel and CP32b consisted of material within the Cow Point turning basin. The volumes of CP32a and CP32b were 22,400 and 25,300 cubic yards respectively. An abbreviated sampling and analysis plan was developed, which included the following requirements:

- Six cores were to be taken from each subunit.
- Sampling locations were to provide a good spatial distribution within each subunit.
- First-round locations were to be used where possible.
- Testing was to include semivolatiles, pesticides, sediment conventionals and grain size. Semivolatiles and pesticides were chosen because it was chemicals in these analytical groups (benzyl alcohol and total chlordane) that had detected or reporting-limit exceedances of SL in the first round.
- Bioassays were to include the amphipod test, both the standard and resuspension protocols for the larval test, and the *Neanthes* AFDW endpoint.
- Due to the high-clay content found in CP32 during the first round of testing, *Ampelisca abdita* was to be used for all samples.
- Z-samples were to be analyzed concurrently with the primary dredged material samples (P-samples).

2. Round 2 Sampling and Analysis – CO7 and CP32.

Sampling. Sampling took place September 19-24, 2012 using a vibracore sampler. The 2nd round target and actual sampling stations can be seen in Figures 13 and 14. Table 17 includes the sampling coordinates, mudline elevations, sampling depths and compositing information. Z-samples were also collected and tested in Round 2.

Physical and Chemical Analysis. Analysis of the CO7 and CP32 subunits and their respective z-samples included semivolatiles, pesticides, sediment conventionals and grain size. Table 18 includes the results. There were no SL exceedances for any of the subunits or z-samples.

Chemical Analysis QA/QC. Stage-4 data validation was conducted for the semivolatile and pesticide analyses. Stage-3 data validation was conducted for the sediment conventionals. Data qualifiers assigned during validation are reflected in Table 18.

In the initial analysis of semivolatiles, the analytical lab reported diethyl phthalate concentrations of 360 and 510 ug/kg respectively for subunit CO7a and its corresponding z-sample. These results were unexpected, as diethyl phthalate had not been detected in any of the Round 1 samples. The lab subsequently reanalyzed these two samples to determine whether the initial results were valid. Rather than test aliquots from the same sample jars used for the initial test, the lab took aliquots from separate sample jars. Further, to increase the rigor of the retest, two independent aliquots were taken from two separate jars for each of the two samples, CO7a-P and CO7a-Z. Diethyl phthalate was undetected in both of the CO7a-P samples, with a reporting limit of 48 ug/kg for both samples. For CO7a-Z, one sample had a detected concentration of diethyl phthalate of 53 ug/kg, while in the second sample, diethyl phthalate was undetected at a reporting limit of 48 ug/kg.

The data validator reviewed the results from both the initial analysis and re-analysis. All semivolatile chemicals, with the exception of diethyl phthalate, showed consistent results between the initial analysis and re-analysis. In the best professional judgment of the validator, the initial diethyl phthalate detections were likely artifacts of the sampling/analytical process, and were not representative of CO7a-P and CO7a-Z. The DMMP agencies accepted this opinion. The results reported in Table 18 are the highest concentrations reported for the re-analysis, namely 48 ug/kg (undetected) for CO7a-P and 53 ug/kg (detected) for CO7a-Z.

Bioassays. Bioassays were run concurrently with the chemical analysis in Round 2. The four subunits and associated z-samples were subjected to the standard suite of three bioassay tests (amphipod mortality, larval development, and polychaete growth). The DMMP interpretation guidelines for dispersive disposal sites in Table 8 were used to assess the bioassay results.

Three reference sediment samples were collected from North Bay on September 26, 2012 (see Figure 12). Wet-sieving at the time of sampling indicated that the percentage of fines in NB13, NB14 and NB15 was 48%, 68% and 25% respectively. Due to contractual constraints, only two of these reference sediments could be used for bioassay testing. Therefore, the analytical lab archived these reference samples until the grain-size analysis could be completed for the eight test samples. When the grain-size results for the test samples became available, the DMMP agencies matched the wet-sieving results for the reference samples to the analytical grain-size results for the test samples and selected NB13 and NB15 for bioassay testing. These two reference samples were then analyzed by the testing lab for grain size and sediment conventionals at the same time the bioassays were under way. The laboratory grain-size results for NB13 and NB15 indicated that the actual fines content of these two reference samples was 28.2% and 11.1% respectively, much lower than that predicted by the wet-sieving results. The low fines content for NB15 eliminated this reference sediment as a match for any of the test sediments. Therefore, NB13 became the sole reference sediment used for test interpretation. The results for NB15 are provided in the tables of bioassay results, but were not used in test interpretation.

Amphipod Mortality. The 10-day amphipod bioassay was run using *Ampelisca abdita* as the test species. Unusually high mortality was encountered, as can be seen in the in Table 19. An evaluation of the water quality results indicated that ammonia was the likely cause. Table 20 includes the overlying and interstitial ammonia data from the test. Mortality is plotted against overlying ammonia in Figure 15. This figure shows that mortality was strongly correlated with ammonia. A review of the literature indicated that levels of ammonia such as these would be expected to result in toxicity (see Table 25). As a result of the ammonia toxicity, the DMMP agencies set aside the amphipod results for Round 2 and based their decision-making on the larval development and *Neanthes* growth tests.

Larval Development. The larval development bioassay - using *Mytilus galloprovincialis* - was run with two different termination protocols. The results are shown in Tables 21 and 22 for the standard and resuspension termination protocols respectively. All four subunits scored hits under the 2-hit rule using the standard protocol. For the resuspension protocol, CO7a, CO7b and CP32b did not score a hit of any kind, while CP32a scored a hit under the 1-hit rule.

As for the z-samples, CO7a-Z did not score a hit under either protocol. CO7b-Z scored a hit under the 2-hit rule for the standard protocol but no hit under the resuspension protocol. CP32a-Z and CP32b-Z both scored hits under the 1-hit rule for both protocols.

The negative control and reference sediments met the DMMP performance criteria for both termination protocols. The standard water quality parameters (temperature, pH, salinity and dissolved oxygen) and positive control results were also within their acceptance ranges. Therefore, the larval development bioassay was considered a valid test by the DMMP agencies. However, as in the amphipod test, ammonia was present at concentrations that would be expected to be toxic, at least for some of the test samples. The effects of ammonia will be discussed in the interpretation section below.

Polychaete Growth. Results from the 20-day *Neanthes* growth test are shown in Table 23. There were no hits for any of the samples. The negative control and reference sediments met the DMMP performance criteria. Water quality and positive control results were also within their acceptance ranges. Therefore, the polychaete growth bioassay was considered a valid test by the DMMP agencies.

Interpretation of Round 2 Bioassay Data. Table 24 summarizes the interpretation of bioassay data from Round 2, using the guidelines for dispersive sites provided in Table 8. Using only the Round 2 data, all of the samples associated with DMMU CO7 would be suitable for open-water disposal. The only hits were hits under the 2-hit rule in the larval test using the standard termination protocol. Because the amphipod results were rejected due to ammonia and there were no corroborating hits in the *Neanthes* growth test, both subunits and their respective z-samples would pass the dispersive interpretation for open-water disposal.

Subunit CP32b-P scored a hit under the 2-hit rule under the standard larval protocol, but no hit under the resuspension protocol. Again, because the amphipod results were set aside and there was no corroborating hit in the *Neanthes* growth test, this subunit would pass the dispersive interpretation for open-water disposal.

The results for CP32a-P, CP32a-Z and CP32b-Z were more complicated due to ammonia. Figure 16 shows seawater-normalized combined mortality and abnormality (NCMA) plotted against ammonia concentrations for all of the larval results from both rounds of testing. There is a strong statistical correlation between NCMA and ammonia. But correlation is insufficient to determine causality. The literature was reviewed for effects of ammonia on the test species *Mytilus galloprovincialis* and other mussel species. Table 25 provides the literature findings.

The ammonia concentrations associated with CP32a-P did not appear to be high enough to explain the mortality seen in this subunit. However, the ammonia concentrations associated with CP32a-Z and CP32b-Z did appear to be high enough to contribute to the toxicity seen in those two z-samples. On the basis of the strong correlation with ammonia and concentrations high enough in the z-samples to contribute to toxicity, the DMMP agencies determined that the sediment that would be exposed by dredging of CP32a and CP32b would not be considered degraded relative to the dredged material tested. Ammonia is a naturally occurring chemical in anoxic sediment and would be expected to quickly dissipate once exposed to more oxygenated conditions.

As for CP32a-P, the DMMP agencies reviewed other potential nontreatment effects, including fines content, clay content and depth of sampling. There was not a strong correlation with any of these variables. Given that there were no chemicals at concentrations of concern associated with CP32a-P and individual nontreatment factors did not appear to be responsible, the toxicity seen in the larval test cannot be easily explained by the data in hand. It is possible that a combination of nontreatment factors resulted in the toxicity manifested for this subunit, but without strong empirical evidence, the DMMP agencies made an environmentally-conservative call and found this subunit unsuitable for open-water disposal. However, the agencies also expressed their willingness to allow additional sampling and testing of CP32a-P prior to dredging to determine if it could be disposed at an open-water site.

F. Summary of Rounds 1 and 2. Results from the two rounds of chemical and biological testing can be summarized as follows:

- Dioxin concentrations were similar to what has been found historically in the federal navigation channel. The limits for disposal in Grays Harbor are 5 pptr for 2,3,7,8-TCDD and 15 pptr for TEQ (DMMP, 2008a). None of the DMMUs exceeded these limits. Therefore, with regard to dioxin, all the DMMUs are suitable for open-water disposal.
- Most DMMUs did not exceed any chemical screening levels and did not require biological testing. Therefore, the majority of DMMUs are suitable for open-water disposal on the basis of chemistry alone.
- DMMUs SR1, SR3, SR4 were subjected to bioassays due to holding-time constraints only, and were all found suitable for open-water disposal.

- CP33 was found suitable for open-water disposal based on the Round 1 results and a weight-of-evidence approach.
- A summary of first and second round results for CO7 and CP32 can be found in Table 26. The second round of sampling was more intensive than in the first round, thus providing a better spatial and volumetric representation of the dredged material in these DMMUs. Therefore, the DMMP agencies weighted the results from Round 2 more heavily than the results from Round 1.
- CO7 scored a hit under the 1-hit rule in the larval test in Round 1, but larval toxicity in Round 2 was low. There were no hits in the amphipod or *Neanthes* bioassays. The chemistry for this DMMU was benign, with only a detection-limit exceedance of the total chlordane SL in Round 1. The DMMP agencies used a weight-of-evidence approach and found CO7 suitable for open-water disposal.
- CP32 was more complicated. In Round 1, this DMMU scored a hit under the 1-hit rule in the amphipod test using *Eohaustorius estuarius*, but was retested with both *Eohaustorius estuarius* and *Ampelisca abdita* in an amphipod retest. There were no hits in the retest. In Round 2, subunit CP32a exhibited toxicity in the larval test that could not be explained by any single nontreatment effect. Therefore, the DMMP agencies found this subunit unsuitable for open-water disposal, but will allow the Corps to conduct additional sampling and testing of this subunit prior to dredging. Subunit CP32b only scored a hit under the 2-hit rule in the standard larval test in Round 2 and was found suitable for open-water disposal.

G. Sediment Exposed by Dredging. Sediment exposed by dredging must either meet the State of Washington Sediment Quality Standards (SQS) (Ecology, 1995) or the State's antidegradation standard (DMMP, 2008b). A direct evaluation can be made for those z-samples tested for the project. From a chemical perspective, all of these samples (CO7a-Z, CO7b-Z, CP32a-Z and CP32b-Z) were below SQS. With regard to the bioassay results, the z-samples for CO7a and CO7b met SQS, while the z-samples for CP32a and CP32b had higher combined mortality and abnormality in the larval test than exhibited by the dredged material samples. But, as indicated previously, there was evidence that this was due to ammonia. Because ammonia would be expected to dissipate quickly when exposed to more oxygenated conditions, the DMMP agencies determined that any detrimental effects from the exposure of sediment underlying CP32 would be short-lived.

In summary, the vast majority of dredged material had no SQS exceedances, and where exceedances did occur the biological testing data indicated that the z-layer was not degraded in any significant way compared to the dredged material. In addition, the limited chemical testing of z-samples that was done provided evidence that concentrations of chemicals of concern in the newly exposed sediment are generally lower than those in the dredged material. Therefore, the DMMP agencies determined that the sediment to be exposed by dredging is in compliance with the State of Washington anti-degradation policy.

H. Beneficial-Use Analysis. A portion of the material dredged for this project could be used for beneficial use. Examples include beach nourishment at Half Moon Bay/South Beach and Damon Point, and creation of shorebird habitat on low-relief islands such as Whitcomb Flats or Sand Island. Material for beneficial use would likely come from South Reach or Outer Crossover Reach. This material all met SQS and would be suitable for beneficial use from a sediment quality perspective.

I. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment proposed for the deepening of the Grays Harbor federal navigation channel for open-water disposal. The approved sampling and analysis plan was followed and the data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP.

Based on the results of the previously described testing, the DMMP agencies concluded that all of the material from this project, with the exception of subunit CP32a, is suitable for open-water disposal. The total volume of sediment suitable for open-water disposal is 1,951,412 cubic yards. The volume of unsuitable sediment is 22,400 cubic yards.

With regard to dioxin, all DMMUs had concentrations below the current guidelines for Grays Harbor of 5 pptr 2,3,7,8-TCDD and 15 pptr TEQ, and are therefore suitable for open-water disposal. However, during the planning phase for the dredged material characterization, the DMMP agencies agreed that should revised dioxin guidelines for Grays Harbor be adopted prior to dredging, that this suitability determination could be revisited.

This suitability determination does ***not*** constitute final agency approval of the project. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under section 404(b)(1) of the Clean Water Act.

J. References.

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SEE, 2013. *Sediment Characterization Report, Grays Harbor Federal Navigation Improvement Project – Sediment Sampling and Characterization, Grays Harbor, Washington.* Prepared for the US Army Corps of Engineers, Seattle District by Ahtna Facility Services, Inc and Science and Engineering for the Environment, Seattle, Washington. January 2013.

USACE, 2009. *Grays Harbor, Washington – Reconnaissance Report – Section 905(b) Analysis*. U.S. Army Corps of Engineers, Seattle District. March, 2009.

K. Agency Signatures.

Concur:

The signed document is on file in the Dredged Material Management Office.

Date David Fox, P.E. - Seattle District Corps of Engineers

Date Erika Hoffman - Environmental Protection Agency

Date Laura Inouye, Ph.D. - Washington Department of Ecology

Date Celia Barton - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
Marc Horton, Port of Grays Harbor
John Hicks, CENWS-OD-TS-NS
Josh Jackson, CENWS-PM-CP

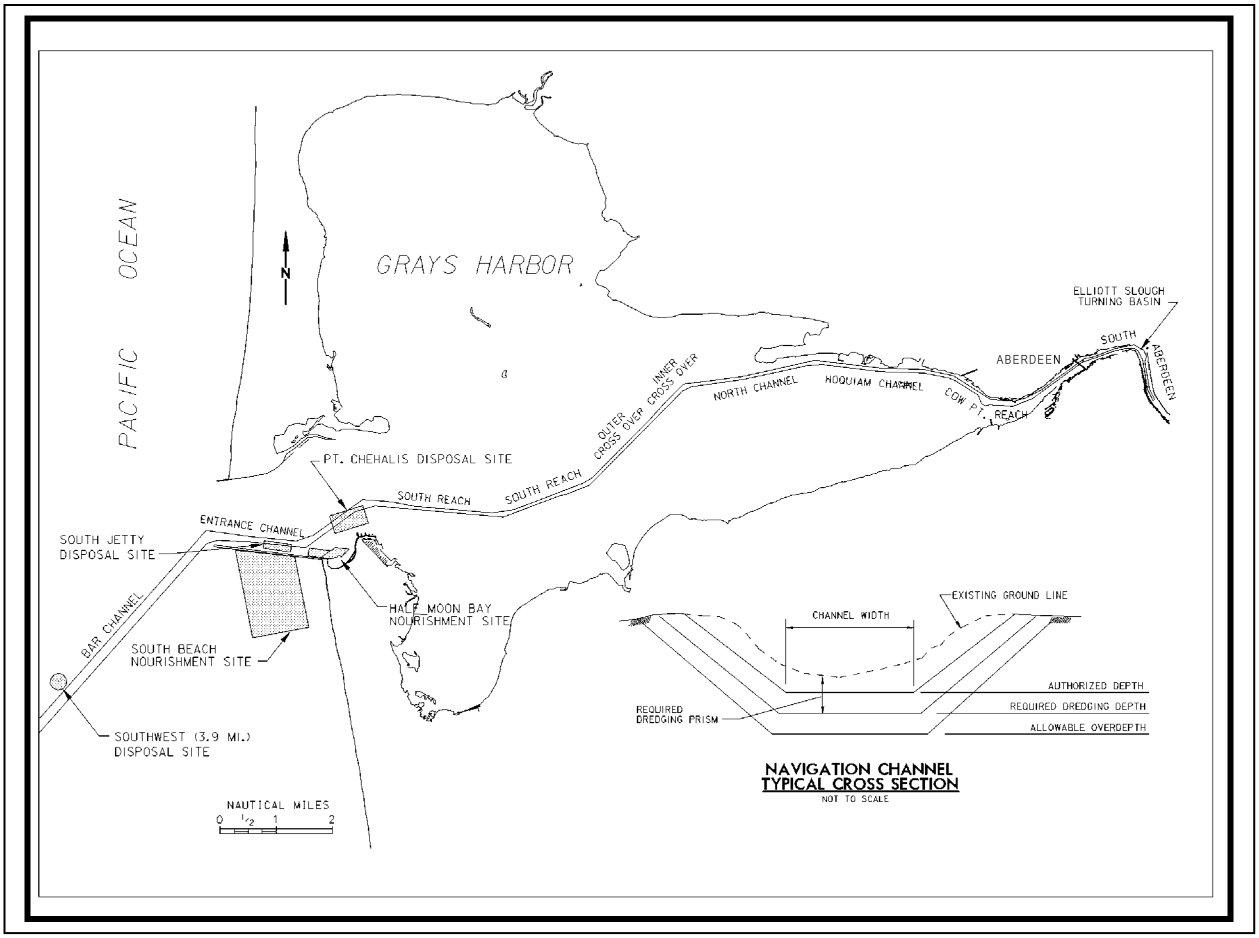


Figure 1. Grays Harbor Navigation Improvement Project. Samples taken for this characterization were from South Reach, Crossover Reach, North Channel, Hoquiam Channel and Cow Point Reach.

South Reach

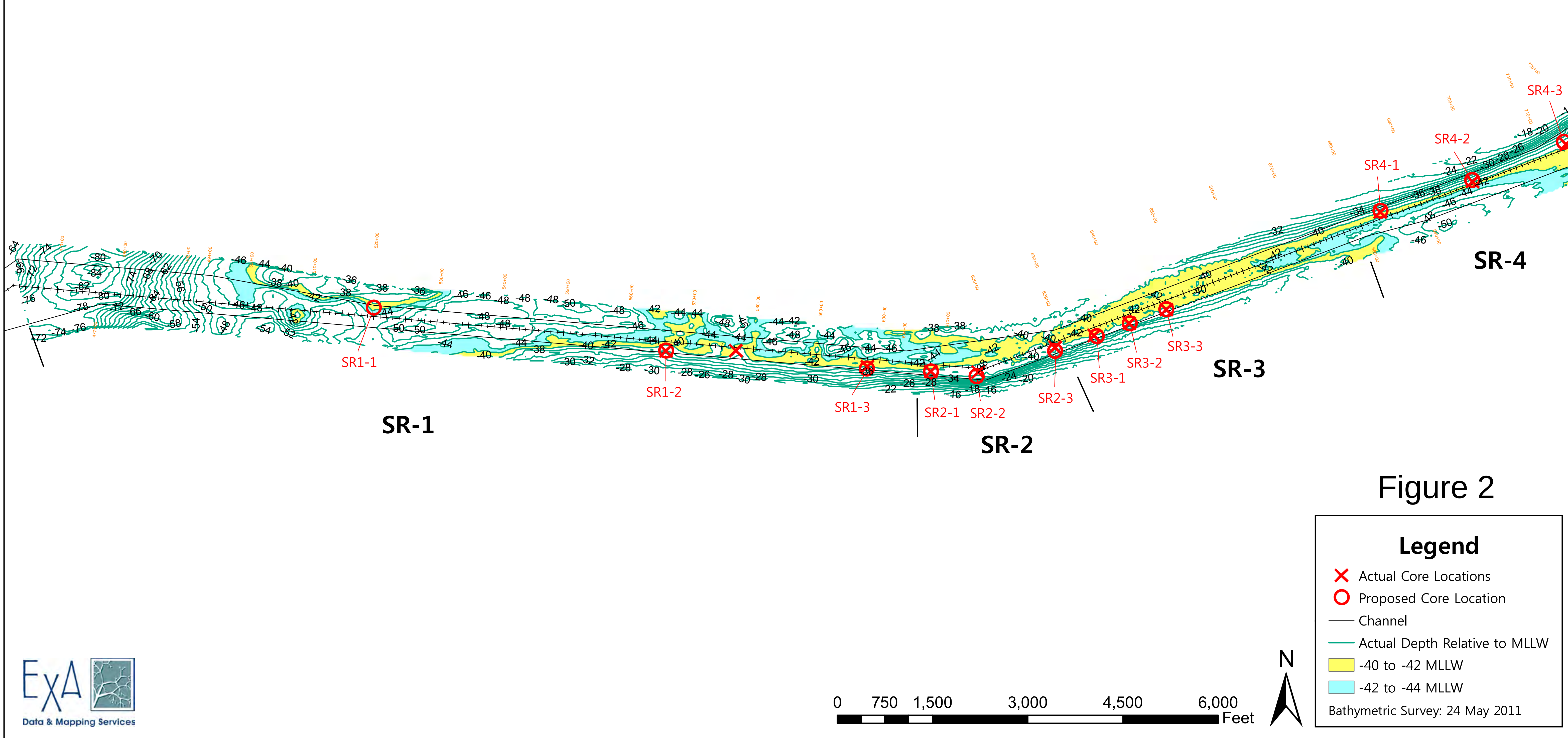
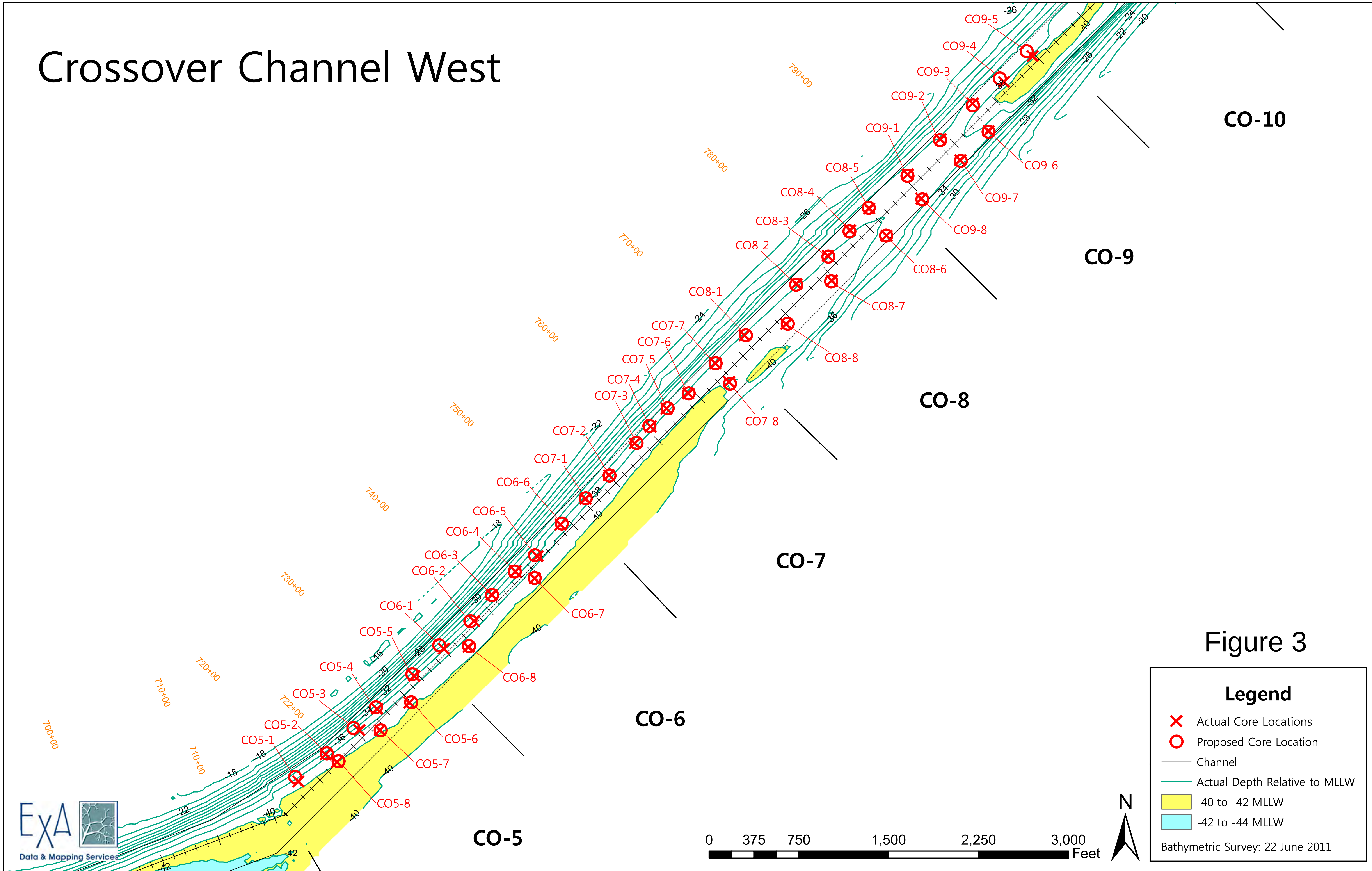
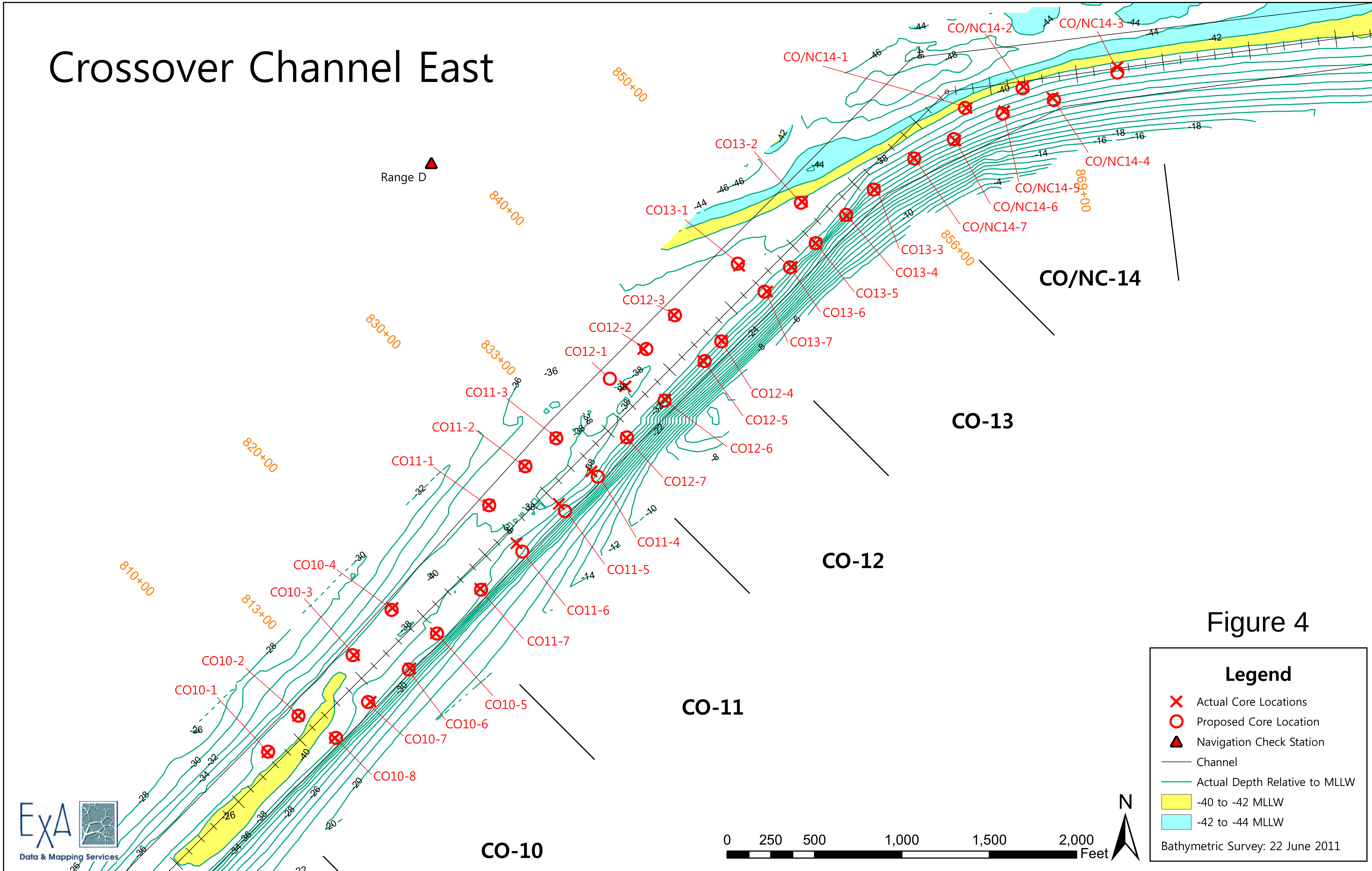


Figure 2


Crossover Channel West
CO-5
CO-6
CO-7
CO-8
CO-9
CO-10
CO5-1
CO5-2
CO5-3
CO5-4
CO5-5
CO5-6
CO5-7
CO5-8
CO6-1
CO6-2
CO6-3
CO6-4
CO6-5
CO6-6
CO6-7
CO6-8
CO7-1
CO7-2
CO7-3
CO7-4
CO7-5
CO7-6
CO7-7
CO7-8
CO8-1
CO8-2
CO8-3
CO8-4
CO8-5
CO8-6
CO8-7
CO8-8
CO9-1
CO9-2
CO9-3
CO9-4
CO9-5
CO9-6
CO9-7
CO9-8
700+00
710+00
720+00
722+00
730+00
740+00
750+00
760+00
770+00
780+00
790+00
Legend
Actual Core Locations
Proposed Core Location
Channel
Actual Depth Relative to MLLW
-40 to -42 MLLW
-42 to -44 MLLW
Bathymetric Survey: 22 June 2011
0
375
750
1,500
2,250
3,000
Feet
N
ExA
Data & Mapping Services
Figure 3


Crossover Channel East
Figure 4
Range D
810+00
813+00
820+00
830+00
833+00
840+00
850+00
856+00
869+00
CO-10
CO-11
CO-12
CO-13
CO/NC-14
CO10-1
CO10-2
CO10-3
CO10-4
CO10-5
CO10-6
CO10-7
CO10-8
CO11-1
CO11-2
CO11-3
CO11-4
CO11-5
CO11-6
CO11-7
CO12-1
CO12-2
CO12-3
CO12-4
CO12-5
CO12-6
CO12-7
CO13-1
CO13-2
CO13-3
CO13-4
CO13-5
CO13-6
CO13-7
CO/NC14-1
CO/NC14-2
CO/NC14-3
CO/NC14-4
CO/NC14-5
CO/NC14-6
CO/NC14-7
Legend
Actual Core Locations
Proposed Core Location
Navigation Check Station
Channel
Actual Depth Relative to MLLW
-40 to -42 MLLW
-42 to -44 MLLW
Bathymetric Survey: 22 June 2011
0
250
500
1,000
1,500
2,000
Feet
N
ExA
Data & Mapping Services

North Channel West

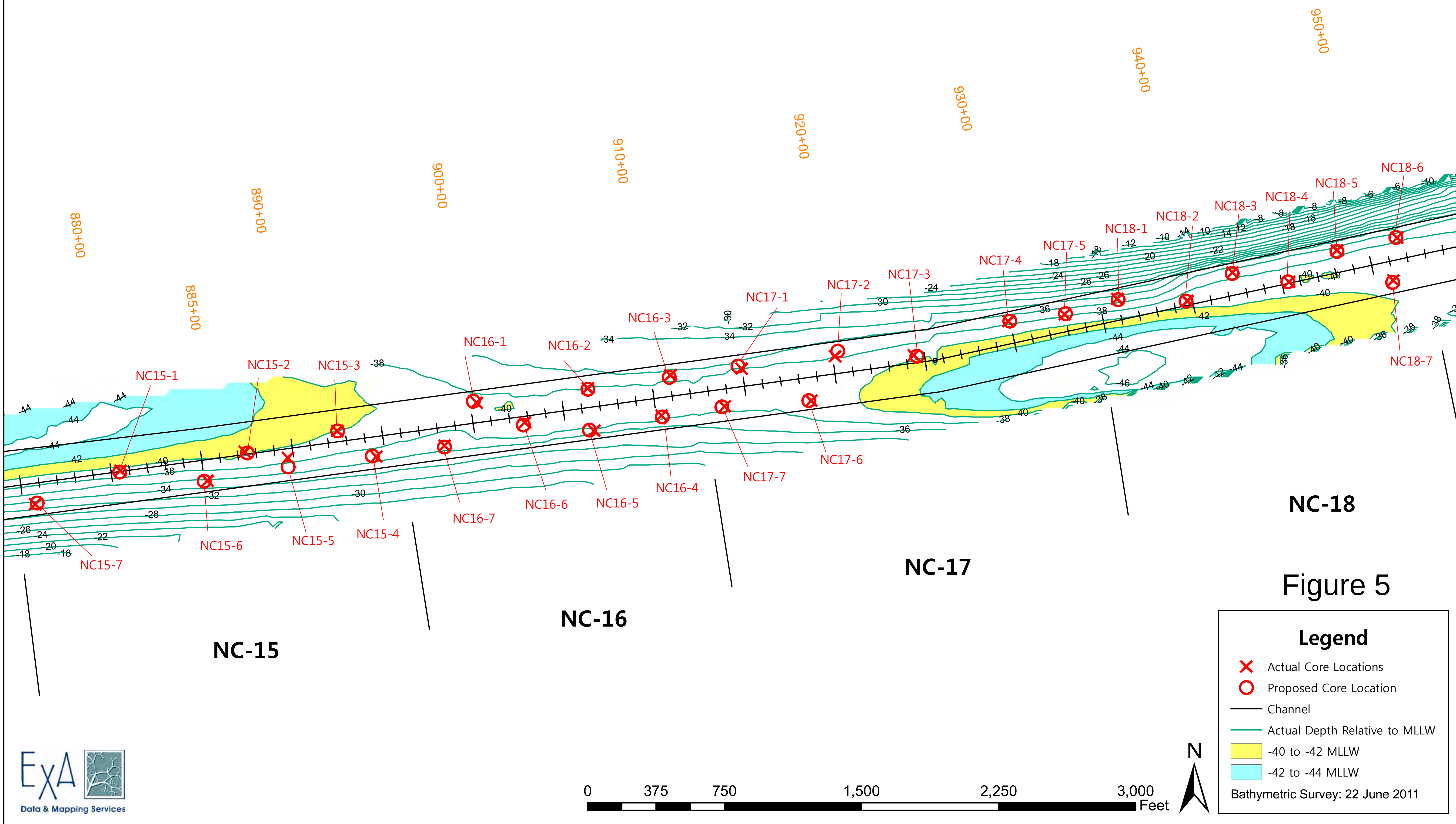


Figure 5

North Channel East

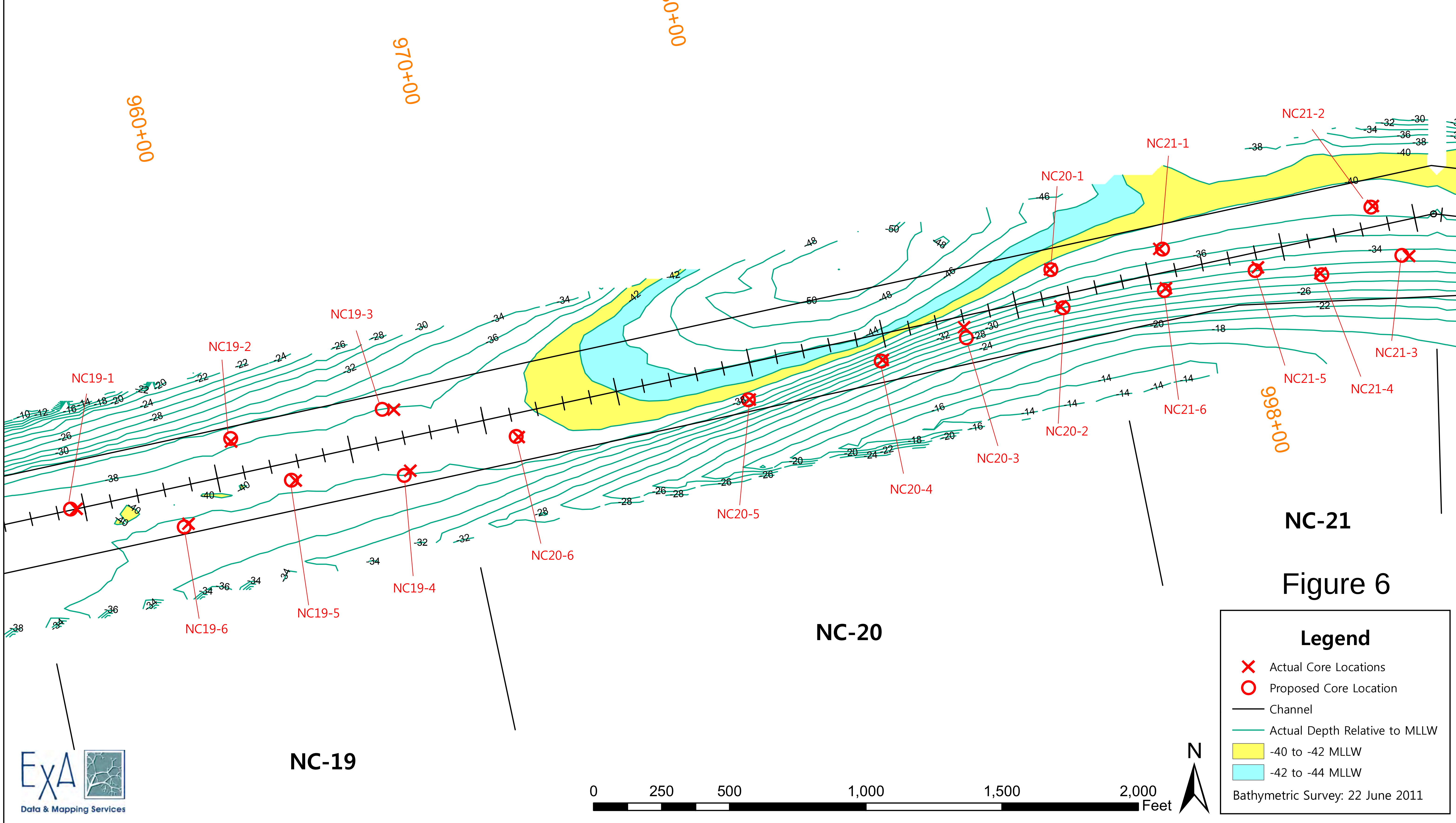


Figure 6

Hoquiam Reach West

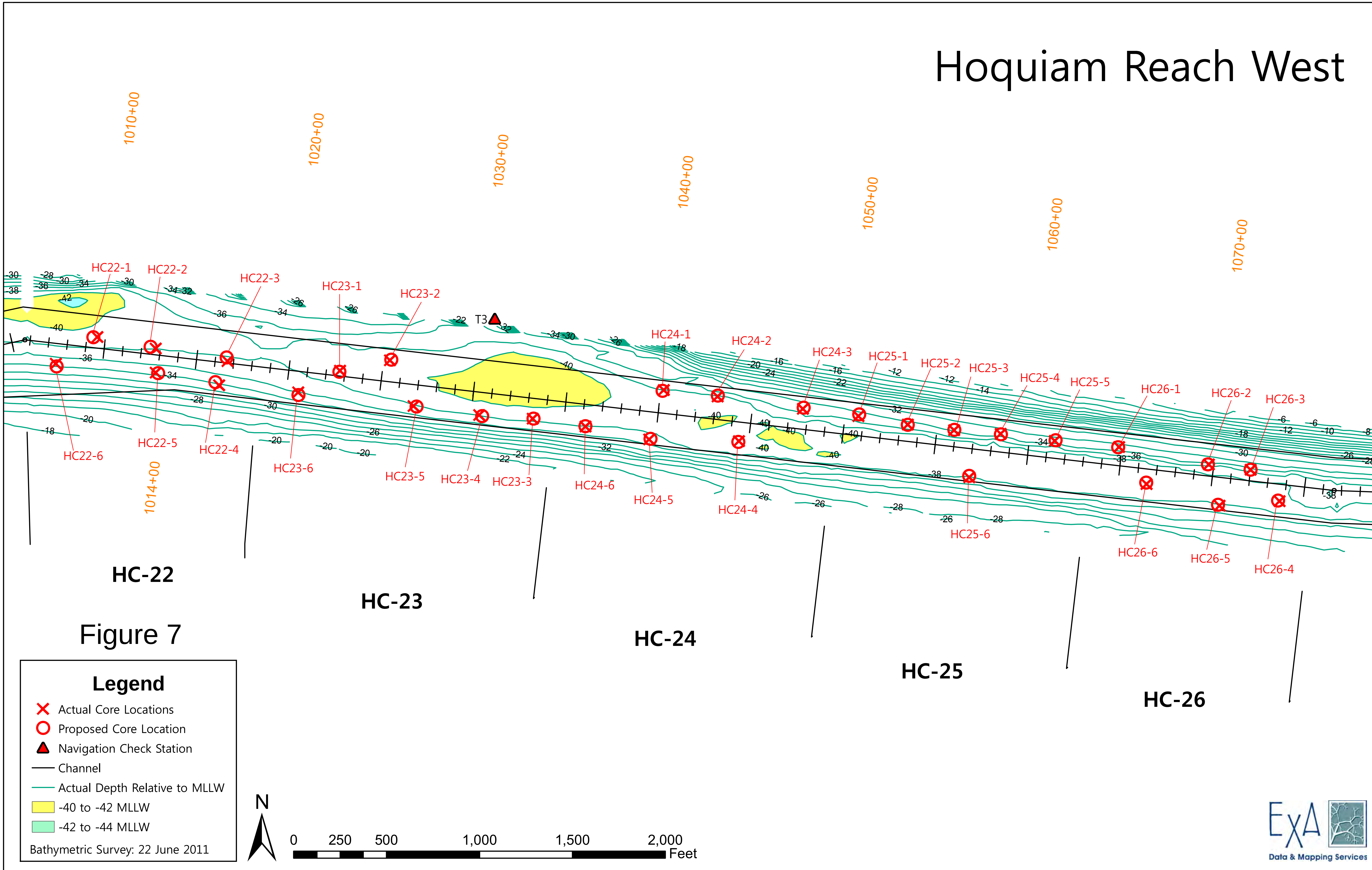


Figure 7

Hoquiam Reach East

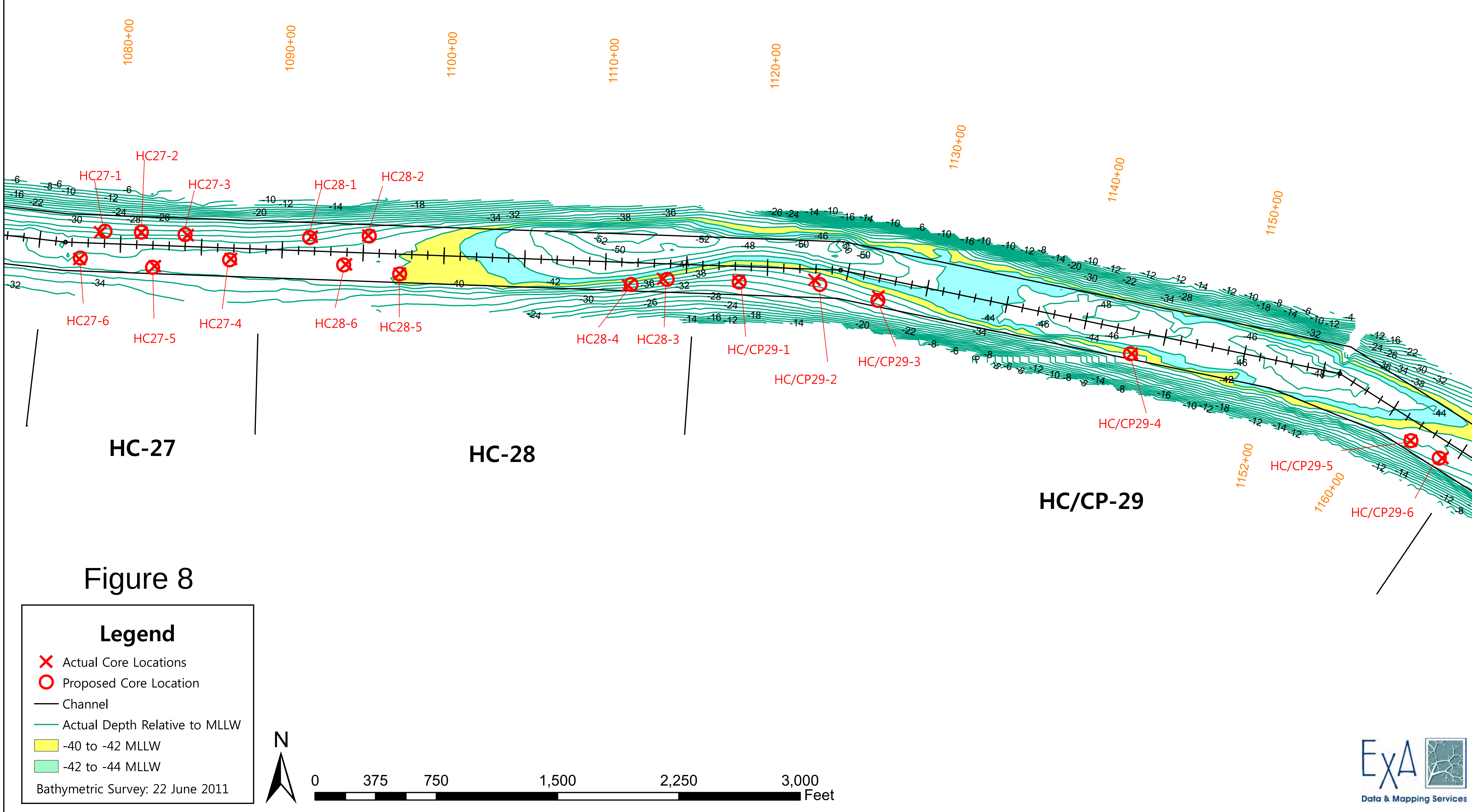
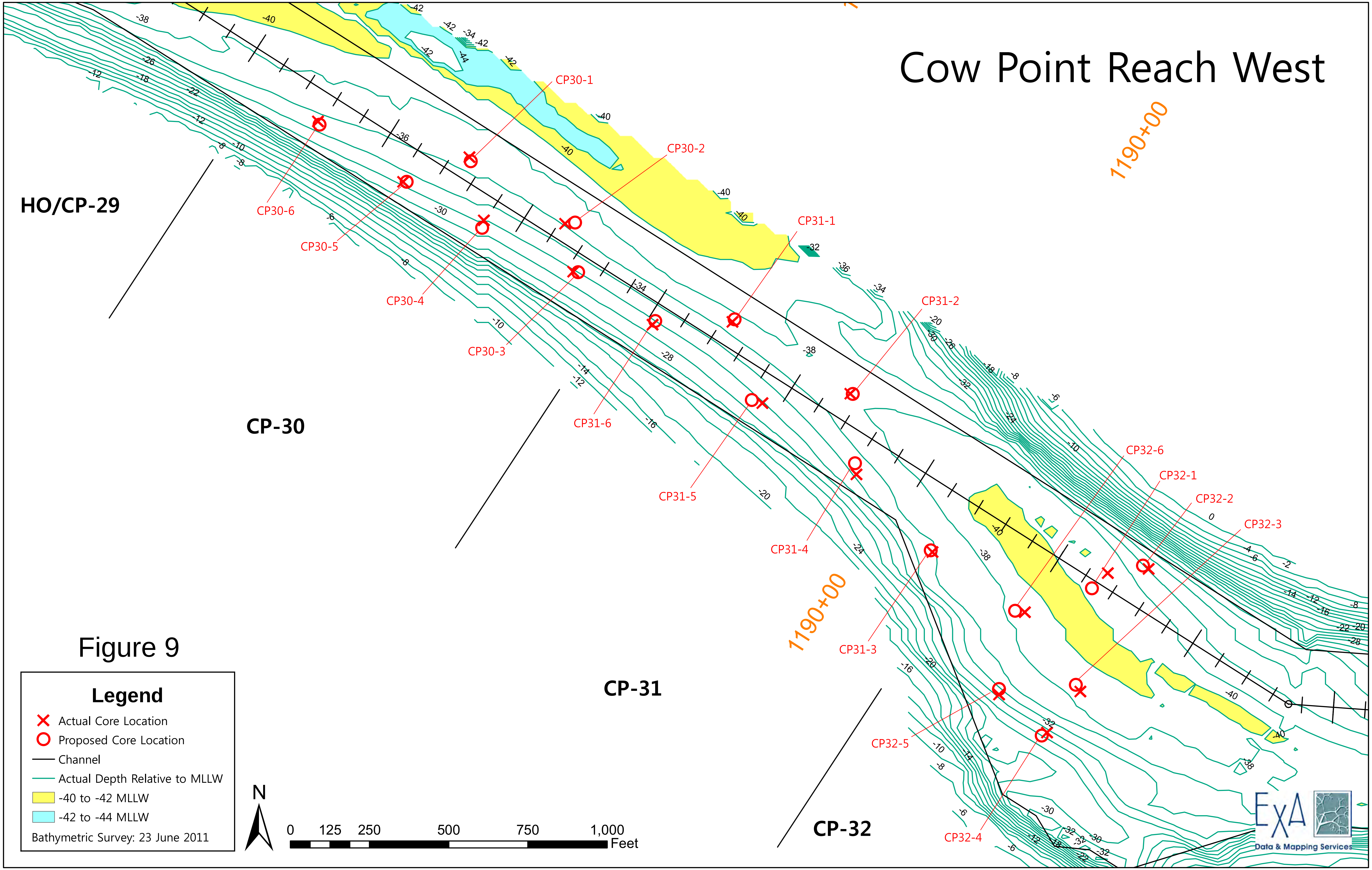
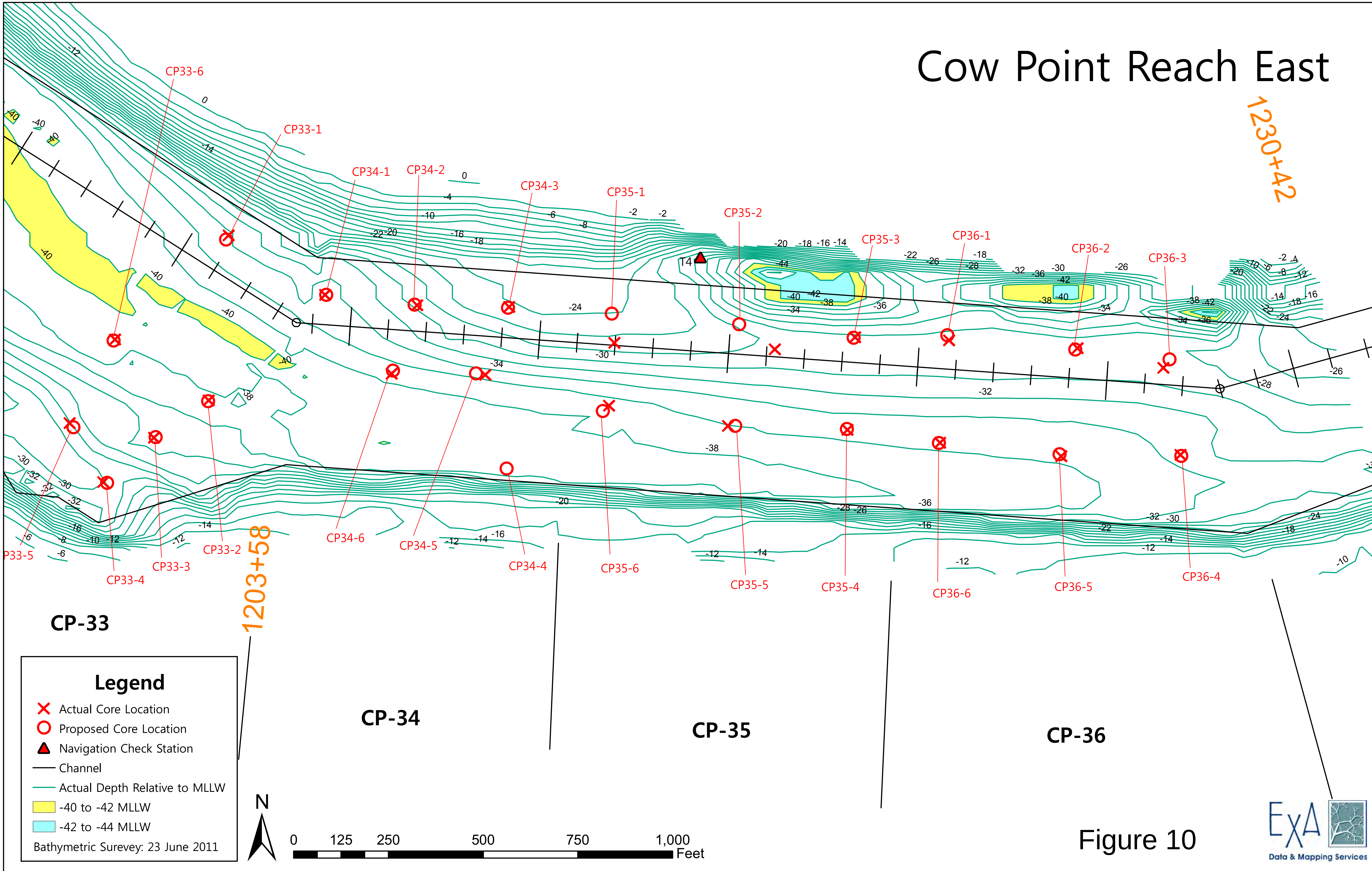


Figure 8



Cow Point Reach West
1190+00
HO/CP-29
CP-30
CP-31
CP-32
CP30-1
CP30-2
CP30-3
CP30-4
CP30-5
CP30-6
CP31-1
CP31-2
CP31-3
CP31-4
CP31-5
CP31-6
CP32-1
CP32-2
CP32-3
CP32-4
CP32-5
CP32-6
Figure 9
Legend
Actual Core Location
Proposed Core Location
Channel
Actual Depth Relative to MLLW
-40 to -42 MLLW
-42 to -44 MLLW
Bathymetric Survey: 23 June 2011
N
0 125 250 500 750 1,000
Feet
ExA
Data & Mapping Services



Cow Point Reach East
1230+42
1203+58
CP33-1
CP33-2
CP33-3
CP33-4
CP33-5
CP33-6
CP34-1
CP34-2
CP34-3
CP34-4
CP34-5
CP34-6
CP35-1
CP35-2
CP35-3
CP35-4
CP35-5
CP35-6
CP36-1
CP36-2
CP36-3
CP36-4
CP36-5
CP36-6
T4
CP-33
CP-34
CP-35
CP-36
Legend
Actual Core Location
Proposed Core Location
Navigation Check Station
Channel
Actual Depth Relative to MLLW
-40 to -42 MLLW
-42 to -44 MLLW
Bathymetric Surevey: 23 June 2011
N
0
125
250
500
750
1,000
Feet
Figure 10
ExA
Data & Mapping Services

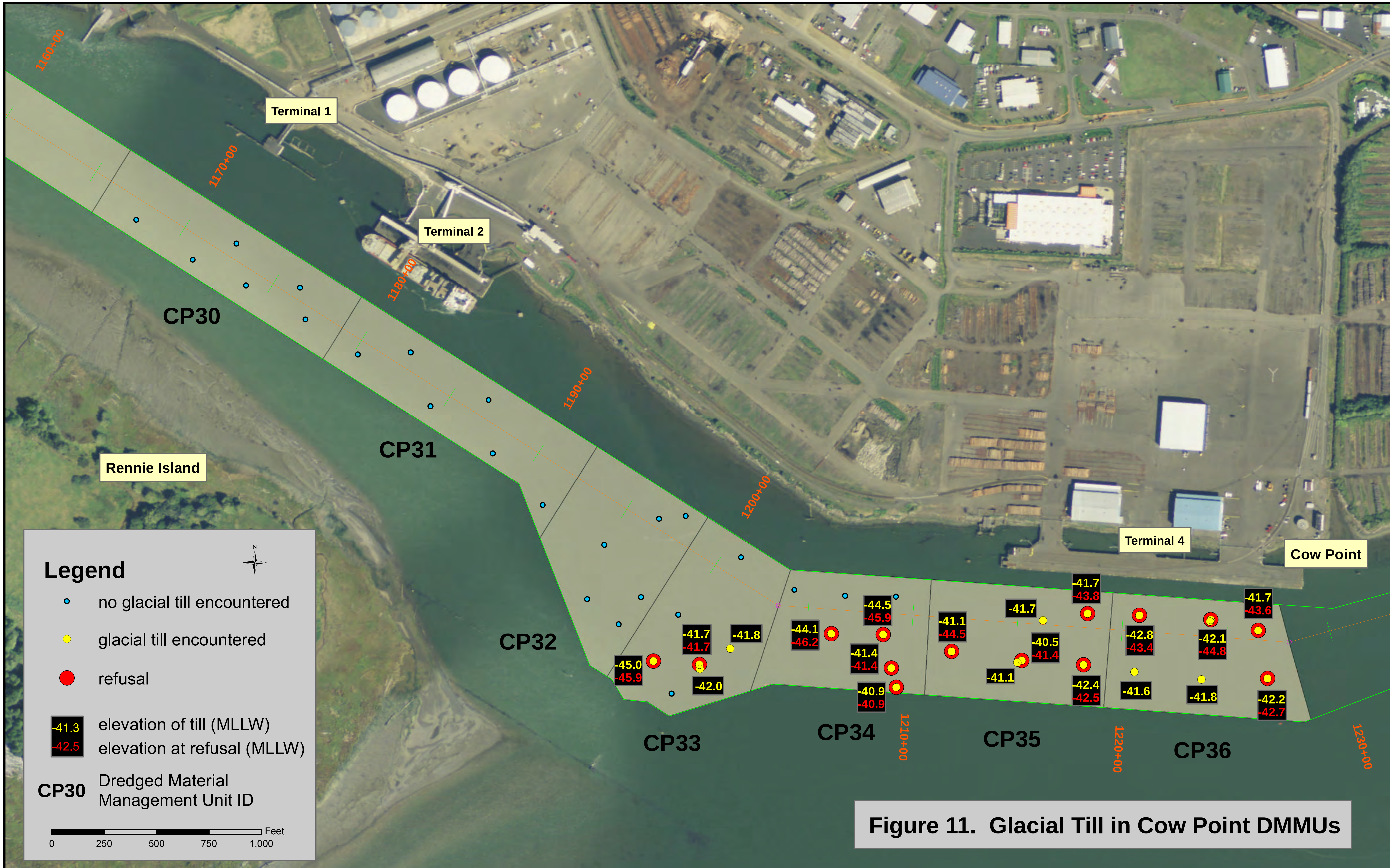
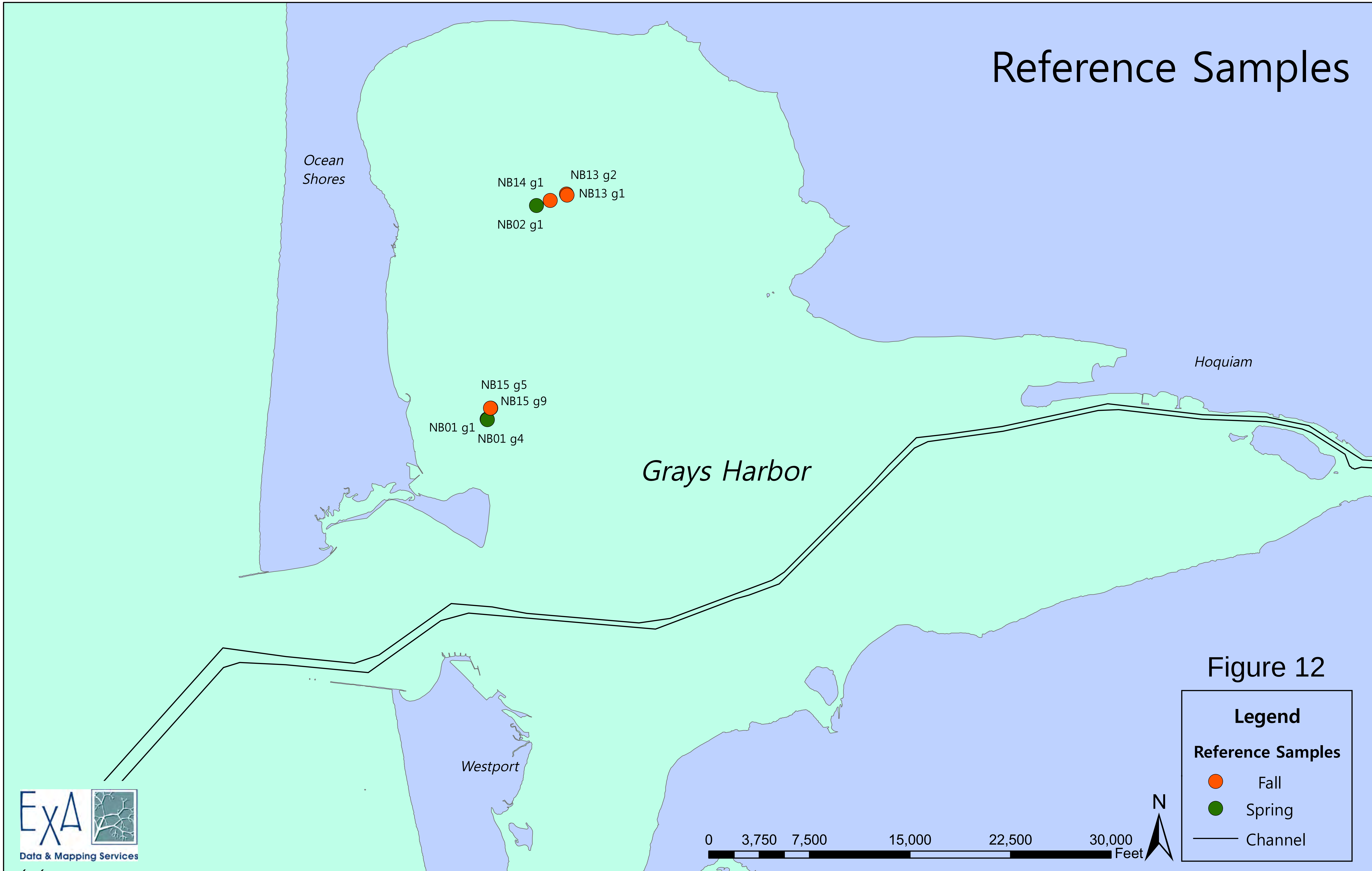


Figure 11. Glacial Till in Cow Point DMMUs


Reference Samples
Ocean Shores
NB14 g1
NB13 g2
NB13 g1
NB02 g1
NB15 g5
NB15 g9
NB01 g1
NB01 g4
Grays Harbor
Hoquiam
Westport
Figure 12
Legend
Reference Samples
Fall
Spring
Channel
0
3,750
7,500
15,000
22,500
30,000
Feet
N
ExA
Data & Mapping Services

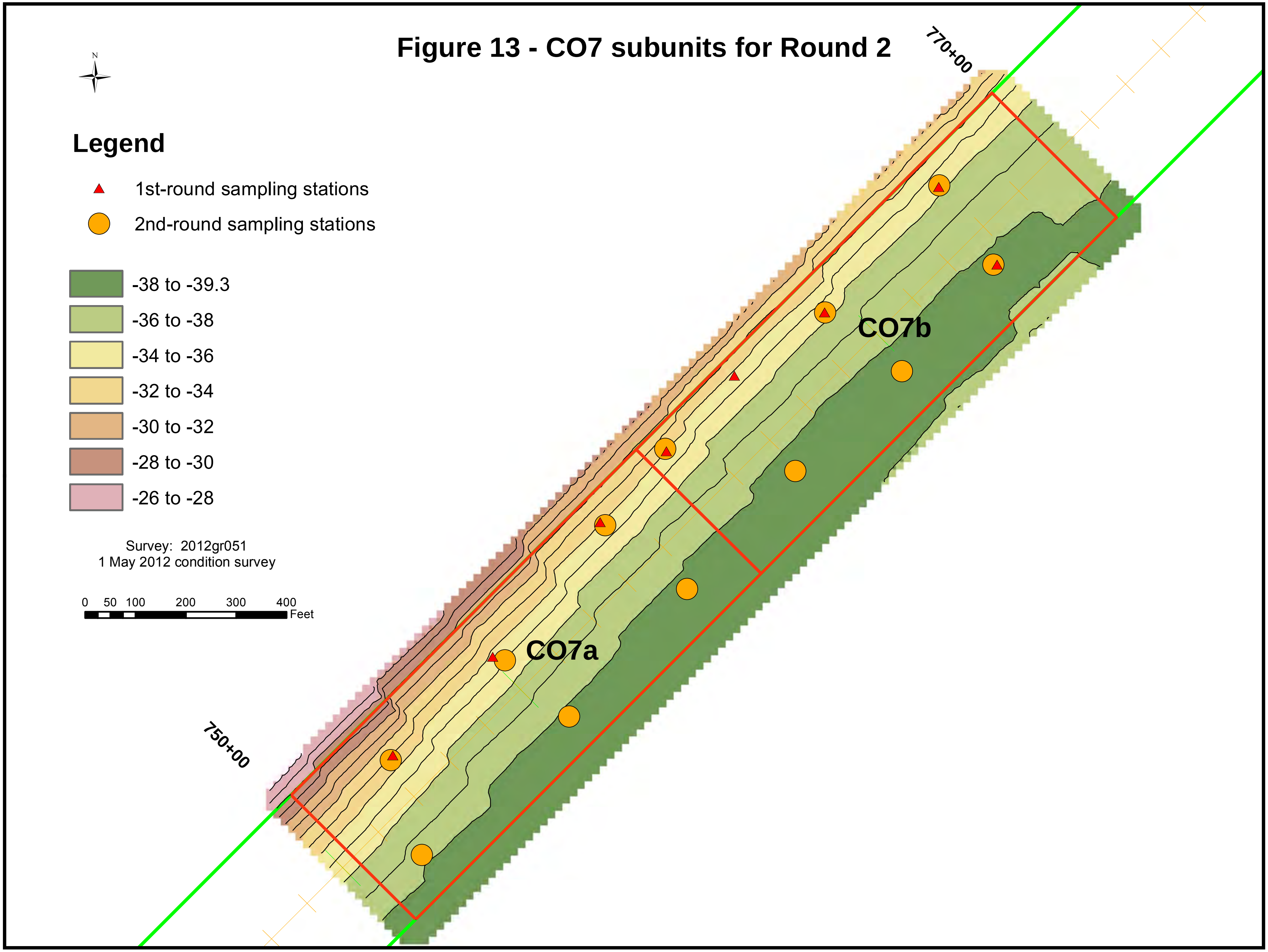


Figure 13 - CO7 subunits for Round 2
N
Legend
1st-round sampling stations
2nd-round sampling stations
-38 to -39.3
-36 to -38
-34 to -36
-32 to -34
-30 to -32
-28 to -30
-26 to -28
Survey: 2012gr051
1 May 2012 condition survey
0 50 100 200 300 400
Feet
770+00
750+00
CO7a
CO7b

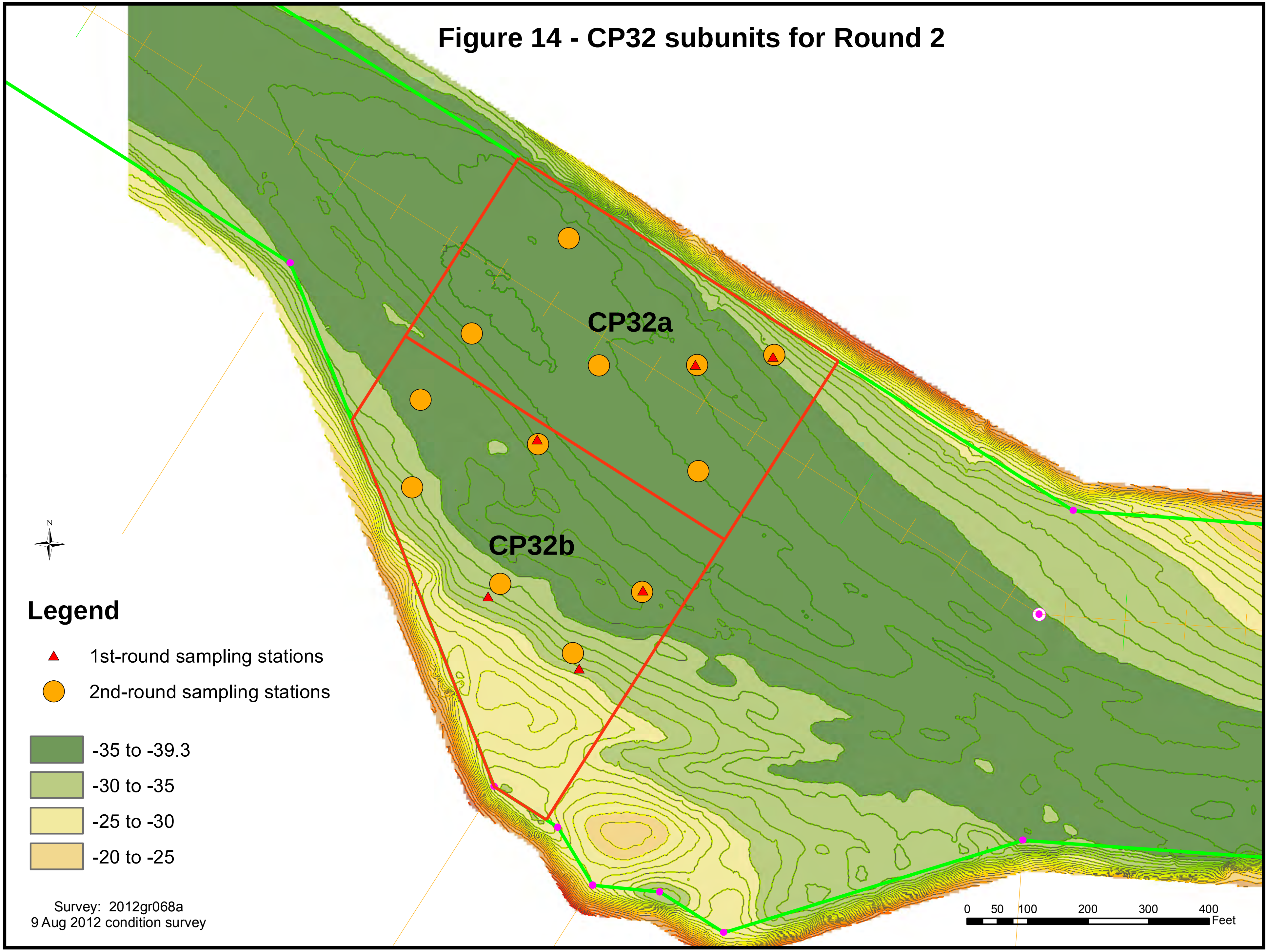


Figure 14 - CP32 subunits for Round 2
CP32a
CP32b
Legend
1st-round sampling stations
2nd-round sampling stations
-35 to -39.3
-30 to -35
-25 to -30
-20 to -25
N
Survey: 2012gr068a
9 Aug 2012 condition survey
0
50
100
200
300
400
Feet

Figure 15 - Round 2 Amphipod Mortality vs. Overlying Ammonia

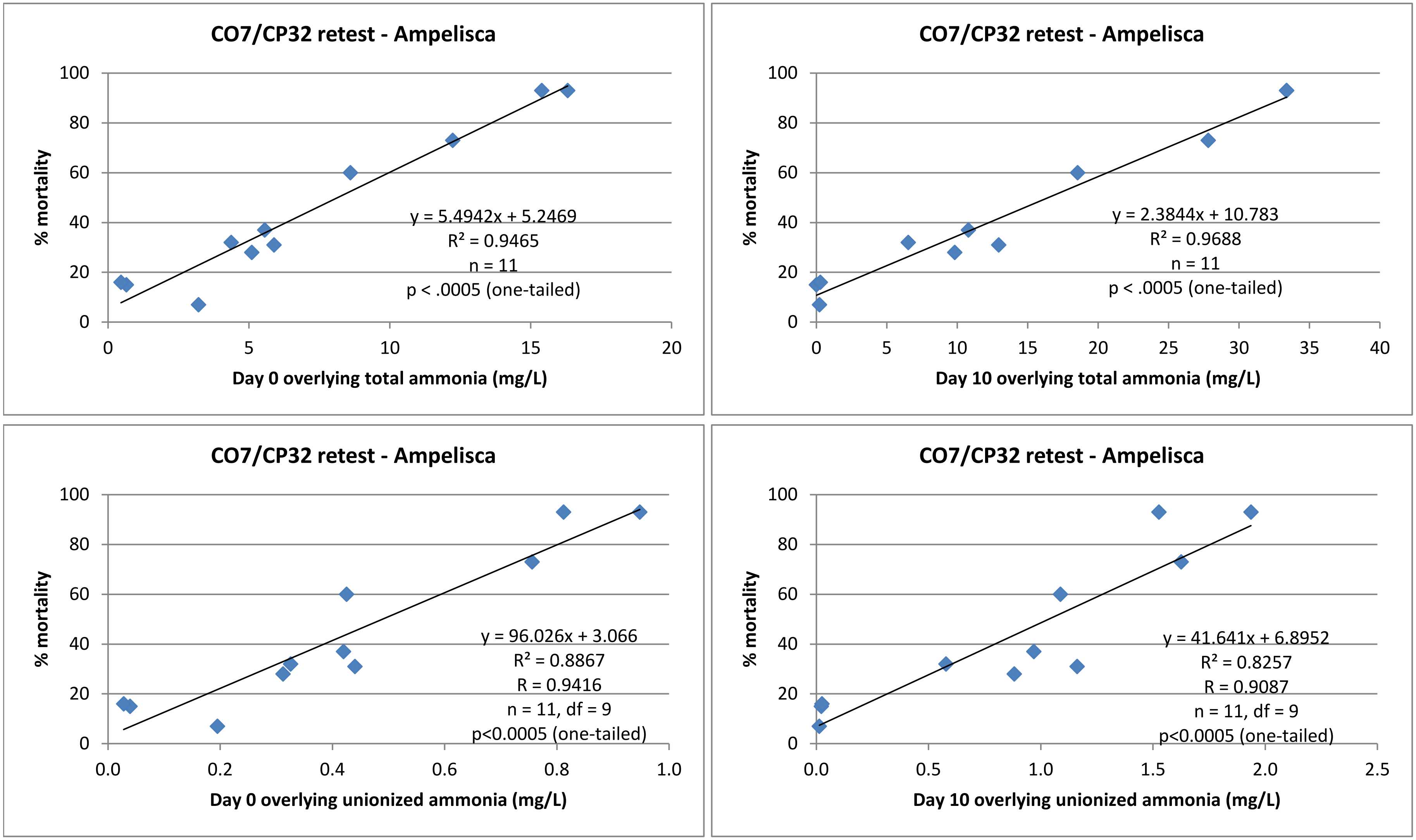


Figure 16-1. Round 2 Larval Bioassay - Normalized Combined Mortality and Abnormality vs. Overlying Total Ammonia

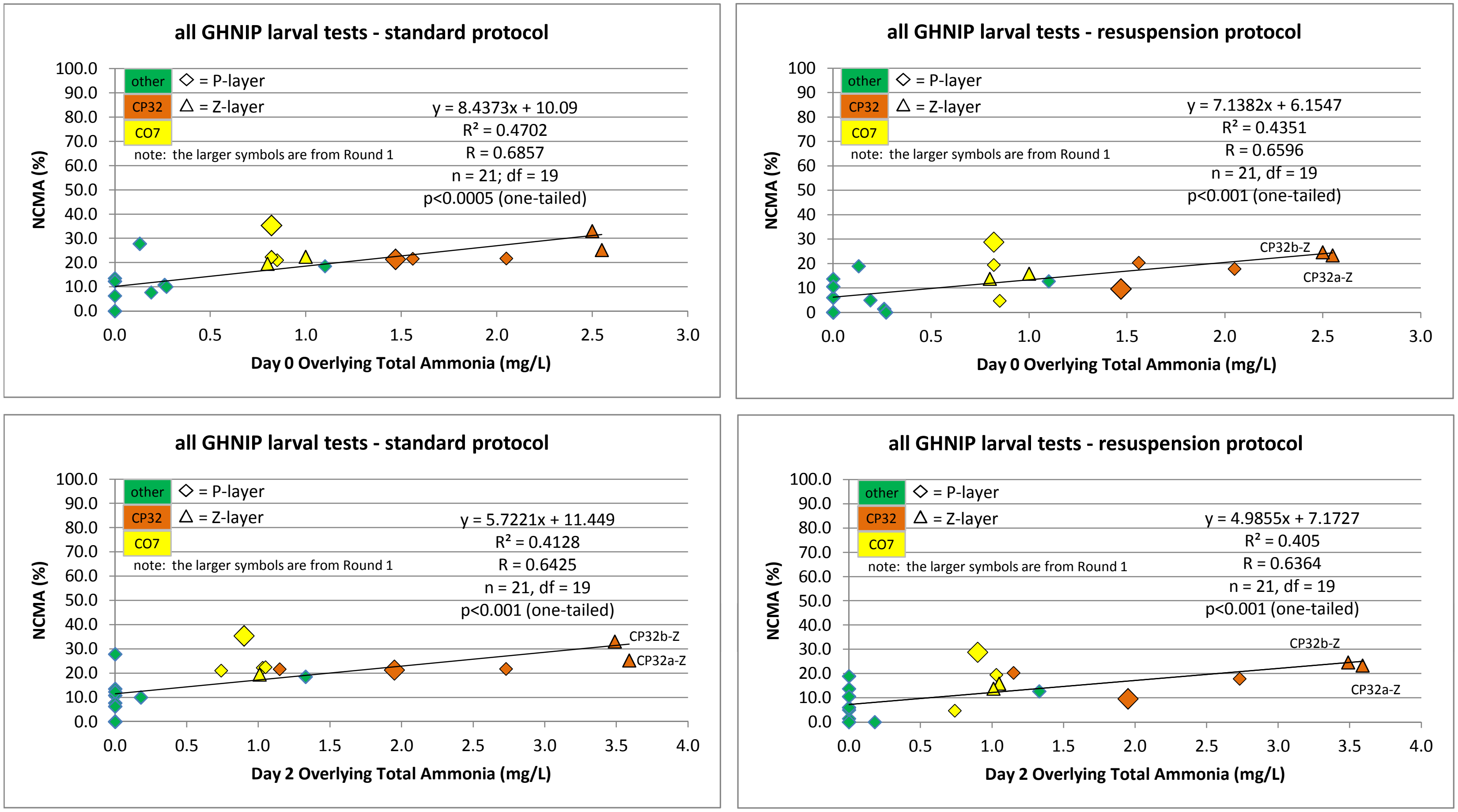


Figure 16-2. Round 2 Larval Bioassay - Normalized Combined Mortality and Abnormality vs. Overlying Unionized Ammonia

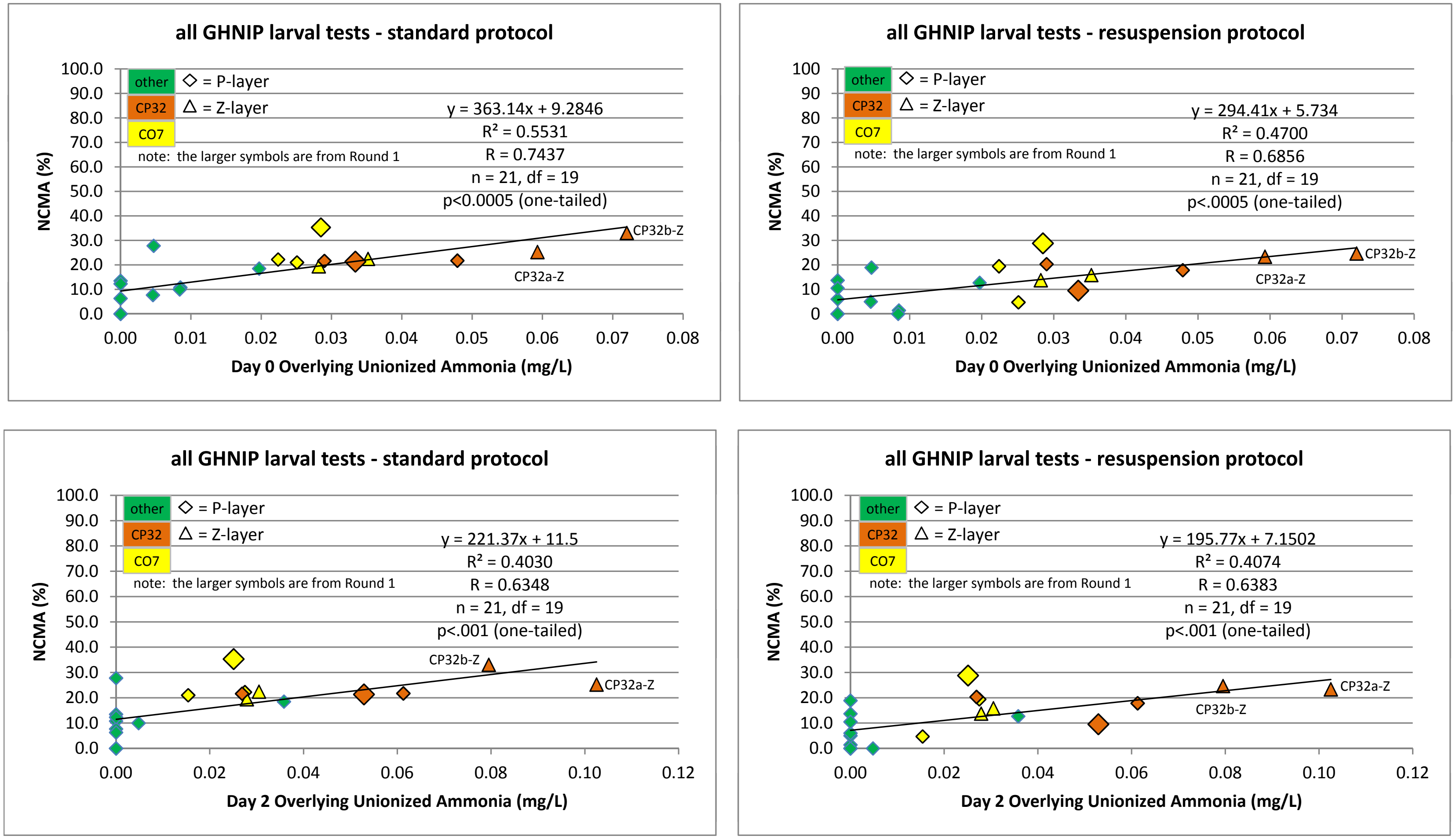


Table 2 – Calculated dredged material volumes from -40 to -42 feet MLLW

Reach	depth (ft, MLLW)	Stations	Side Slope	Volume (cy)	Volume (cy) w/ 15% Contingency
South	-40 to -42	463+00 to 715+93	1:5	250,454	288,022
Crossover	-40 to -42	715+93 to 869+00	1:5	516,782	594,299
North Channel	-40 to -42	869+00 to 1005+71	1:3	326,927	375,966
Hoquiam Channel	-40 to -42	1005+71 to 1156+02	1:3	317,484	365,106
Cow Point	-40 to -42	1156+02 to 1227+99	1:3	304,712	350,419
TOTAL				1,716,359	1,973,812

Table 3. DMMU stationing and volumes.

Reach	DMMU #	begin station	end station	volume	# of field samples
SR	1	463+00	605+16	72,002	3
SR	2	605+16	628+97	72,014	3
SR	3	628+97	679+12	72,003	3
SR	4	679+12	715+93	72,003	3
CO	5	715+93	733+62	65,163	8
CO	6	733+62	750+28	64,162	8
CO	7	750+28	769+71	63,150	8
CO	8	769+71	788+39	62,143	8
CO	9	788+39	806+07	61,124	8
CO	10	806+07	821+53	60,128	8
CO	11	821+53	834+07	59,106	7
CO	12	834+07	844+65	58,089	7
CO	13	844+65	856+41	57,093	7
CO/NC	14	856+41	874+10	56,063	7
NC	15	874+10	895+90	55,073	7
NC	16	895+90	912+50	54,045	7
NC	17	912+50	934+26	53,037	7
NC	18	934+26	952+71	52,033	7
NC	19	952+71	968+20	51,022	6
NC	20	968+20	993+07	50,019	6
NC	21	993+07	1005+71	48,815	6
HC	22	1005+71	1018+51	47,692	6
HC	23	1018+51	1034+38	47,702	6
HC	24	1034+38	1049+44	47,715	6
HC	25	1049+44	1063+01	47,704	6
HC	26	1063+01	1075+80	47,701	6
HC	27	1075+80	1088+30	47,701	6
HC	28	1088+30	1115+43	47,696	6
HC/CP	29	1115+43	1165+85	47,689	6
CP	30	1165+85	1178+91	47,693	6
CP	31	1178+91	1192+22	47,687	6
CP	32	1192+22	1198+47	47,700	6
CP	33	1198+47	1203+58	47,812	6
CP	34	1203+58	1210+78	47,695	6
CP	35	1210+78	1219+42	47,669	6
CP	36	1219+42	1227+99	47,669	6
			total:	1,973,812	224

CO = Crossover Reach
CP = Cow Point Reach
HC = Hoquiam Channel
NC = North Channel
SR = South Reach

Table 4. Sampling Data

DMMU	Station	Latitude	Longitude	Mudline Elevation (ft, MLLW)	Acquisition Depth (ft, MLLW)	Sample Length Acquired (ft)	Z-sample Length Acquired (ft)
SR1	SR1-1	46.92063	-124.07107	-39.9	-44.0	2.0	2.0
	SR1-2	46.92049	-124.07546	-39.8	-43.6	2.0	1.6
	SR1-3	46.92019	-124.06274	-38.4	-44.0	2.0	2.0
SR2	SR2-1	46.92011	-124.05874	-38.7	-44.0	2.0	2.0
	SR2-2	46.92018	-124.05574	-37.4	-44.0	2.0	2.0
	SR2-3	46.92139	-124.05098	-39.4	-44.0	2.0	2.0
SR3	SR3-1	46.92198	-124.04854	-38.8	-44.0	2.0	2.0
	SR3-2	46.92257	-124.04638	-38.4	-44.0	2.0	2.0
	SR3-3	46.92324	-124.04408	-39.6	-44.0	2.0	2.0
SR4	SR4-1	46.92786	-124.03089	-39.6	-44.0	2.0	2.0
	SR4-2	46.92934	-124.02516	-39.9	-44.0	2.0	2.0
	SR4-3	46.93113	-124.01937	-39.3	-44.0	2.0	2.0
CO5	CO5-1	46.93187	-124.01843	-36.4	-44.0	2.0	2.0
	C05-2	46.93252	-124.01756	-32.6	-44.0	2.0	2.0
	C05-3	46.93311	-124.01647	-34.0	-44.0	2.0	2.0
	CO5-4	46.93361	-124.01591	-32.6	-44.0	2.0	2.0
	CO5-5	46.93440	-124.01471	-33.0	-44.0	2.0	2.0
	CO5-6	46.93379	-124.01484	-36.9	-44.0	2.0	2.0
	CO5-7	46.93313	-124.01578	-37.2	-44.0	2.0	2.0
	CO5-8	46.93235	-124.01716	-37.3	-44.0	2.0	2.0
CO6	CO6-1	46.93506	-124.01377	-33.6	-44.0	2.0	2.0
	CO6-2	46.93571	-124.01280	-33.7	-44.0	2.0	2.0
	CO6-3	46.93634	-124.01224	-32.5	-44.0	2.0	2.0
	CO6-4	46.93689	-124.01150	-33.4	-44.0	2.0	2.0
	CO6-5	46.93726	-124.01078	-34.9	-44.0	2.0	2.0
	CO6-6	46.93800	-124.01006	-33.3	-44.0	2.0	2.0
	CO6-7	46.93676	-124.01084	-36.9	-44.0	2.0	2.0
	CO6-8	46.93512	-124.01294	-37.2	-44.0	2.0	2.0
CO7	CO7-1	46.93862	-124.00927	-33.8	-44.0	2.0	2.0
	CO7-2	46.93919	-124.00851	-35.7	-44.0	2.0	2.0
	CO7-3	46.93994	-124.00770	-34.8	-44.0	2.0	2.0
	CO7-4	46.94035	-124.00720	-34.9	-44.0	2.0	2.0
	CO7-5	46.94077	-124.00669	-35.1	-44.0	2.0	2.0
	CO7-6	46.94114	-124.00599	-36.9	-44.0	2.0	2.0
	CO7-7	46.94185	-124.00513	-36.7	-44.0	2.0	2.0
	CO7-8	46.94144	-124.00464	-39.7	-44.0	2.0	2.0
CO8	CO8-1	46.94252	-124.00419	-37.2	-44.0	2.0	2.0
	CO8-2	46.94375	-124.00254	-36.5	-44.0	2.0	2.0
	CO8-3	46.94443	-124.00154	-36.6	-44.0	2.0	2.0
	CO8-4	46.94503	-124.00083	-36.4	-44.0	2.0	2.0
	CO8-5	46.94555	-124.00023	-35.2	-44.0	2.0	2.0
	CO8-6	46.94495	-123.99961	-36.7	-44.0	2.0	2.0
	CO8-7	46.94386	-124.00136	-38.3	-44.0	2.0	2.0
	CO8-8	46.94282	-124.00281	-38.8	-44.0	2.0	2.0

Table 4. Sampling Data

DMMU	Station	Latitude	Longitude	Mudline Elevation (ft, MLLW)	Acquisition Depth (ft, MLLW)	Sample Length Acquired (ft)	Z-sample Length Acquired (ft)
CO9	CO9-1	46.94637	-123.99899	-35.3	-44.0	2.0	2.0
	CO9-2	46.94720	-123.99795	-35.6	-44.0	2.0	2.0
	CO9-3	46.94805	-123.99692	-36.3	-44.0	2.0	2.0
	CO9-4	46.94858	-123.99591	-37.6	-43.3	2.0	1.3
	CO9-5	46.94920	-123.99499	-38.4	-44.0	2.0	2.0
	CO9-6	46.94744	-123.99635	-38.7	-44.0	2.0	2.0
	CO9-7	46.94675	-123.99726	-36.3	-44.0	2.0	2.0
	CO9-8	46.94583	-123.99849	-36.9	-44.0	2.0	2.0
CO10	CO10-1	46.94993	-123.99416	-37.5	-44.0	2.0	2.0
	CO10-2	46.95053	-123.99349	-36.8	-44.0	2.0	2.0
	CO10-3	46.95152	-123.99227	-38.0	-44.0	2.0	2.0
	CO10-4	46.95228	-123.99143	-37.6	-44.0	2.0	2.0
	CO10-5	46.95192	-123.99041	-36.0	-44.0	2.0	2.0
	CO10-6	46.95135	-123.99097	-33.3	-44.0	2.0	2.0
	CO10-7	46.95080	-123.99184	-36.1	-44.0	2.0	2.0
	CO10-8	46.95020	-123.99262	-37.0	-44.0	2.0	2.0
CO11	CO11-1	46.95397	-123.98933	-38.0	-44.0	2.0	2.0
	CO11-2	46.95461	-123.98854	-37.5	-43.8	2.0	1.8
	CO11-3	46.95507	-123.98786	-37.1	-43.1	2.0	1.1
	CO11-4	46.95457	-123.98701	-35.8	-44.0	2.0	2.0
	CO11-5	46.95404	-123.98772	-36.3	-44.0	2.0	2.0
	CO11-6	46.95339	-123.98865	-34.1	-44.0	2.0	2.0
	CO11-7	46.95265	-123.98944	-35.1	-44.0	2.0	2.0
CO12	CO12-1	46.95593	-123.98632	-36.9	-44.0	2.0	2.0
	CO12-2	46.95652	-123.98594	-36.5	-41.9	1.9	none
	CO12-3	46.95708	-123.98527	-35.9	-44.0	2.0	2.0
	CO12-4	46.95671	-123.98415	-31.3	-44.0	2.0	2.0
	CO12-5	46.95638	-123.98455	-31.1	-43.8	2.0	1.8
	CO12-6	46.95575	-123.98539	-32.8	-43.9	2.0	1.9
	CO12-7	46.95512	-123.98624	-33.9	-44.0	2.0	2.0
CO13	CO13-1	46.95790	-123.98383	-36.9	-44.0	2.0	2.0
	CO13-2	46.95895	-123.98245	-39.9	-44.0	2.0	2.0
	CO13-3	46.95919	-123.98081	-32.1	-44.0	2.0	2.0
	CO13-4	46.95876	-123.98142	-33.0	-44.0	2.0	2.0
	CO13-5	46.95830	-123.98209	-33.8	-44.0	2.0	2.0
	CO13-6	46.95792	-123.98263	-33.0	-44.0	2.0	2.0
	CO13-7	46.95752	-123.98316	-32.8	-44.0	2.0	2.0
CO/NC14	CO/NC14-1	46.96053	-123.97877	-38.7	-44.0	2.0	2.0
	CO/NC14-2	46.96091	-123.97749	-38.6	-44.0	2.0	2.0
	CO/NC14-3	46.96128	-123.97535	-38.2	-44.0	2.0	2.0
	CO/NC14-4	46.96075	-123.97681	-34.5	-44.0	2.0	2.0
	CO/NC14-5	46.96051	-123.97791	-35.3	-44.0	2.0	2.0
	CO/NC14-6	46.96002	-123.97900	-32.1	-44.0	2.0	2.0
	CO/NC14-7	46.95971	-123.97993	-33.1	-44.0	2.0	2.0

Table 4. Sampling Data

DMMU	Station	Latitude	Longitude	Mudline Elevation (ft, MLLW)	Acquisition Depth (ft, MLLW)	Sample Length Acquired (ft)	Z-sample Length Acquired (ft)
NC15	NC15-1	46.96167	-123.97214	-39.2	-43.7	2.0	1.7
	NC15-2	46.96204	-123.96944	-40.6	-44.0	2.0	2.0
	NC15-3	46.96241	-123.96743	-39.9	-44.0	2.0	2.0
	NC15-4	46.96205	-123.96655	-36.6	-44.0	2.0	2.0
	NC15-5	46.96197	-123.96848	-38.8	-44.0	2.0	2.0
	NC15-6	46.96158	-123.97023	-34.5	-44.0	2.0	2.0
	NC15-7	46.96111	-123.97398	-32.5	-44.0	2.0	2.0
NC16	NC16-1	46.96292	-123.96440	-38.9	-44.0	2.0	2.0
	NC16-2	46.96321	-123.96199	-38.4	-44.0	2.0	2.0
	NC16-3	46.96347	-123.96018	-37.6	-43.6	2.0	1.6
	NC16-4	46.96285	-123.96034	-38.0	-44.0	2.0	2.0
	NC16-5	46.96258	-123.96180	-35.7	-44.0	2.0	2.0
	NC16-6	46.96266	-123.96333	-37.5	-44.0	2.0	2.0
	NC16-7	46.96226	-123.96506	-36.0	-44.0	2.0	2.0
NC17	NC17-1	46.96361	-123.95863	-38.3	-44.0	2.0	2.0
	NC17-2	46.96385	-123.95659	-38.0	-44.0	2.0	2.0
	NC17-3	46.96393	-123.95487	-39.7	-44.0	2.0	2.0
	NC17-4	46.96450	-123.95283	-37.5	-43.7	2.0	1.7
	NC17-5	46.96464	-123.95160	-37.6	-44.0	2.0	2.0
	NC17-6	46.96317	-123.95707	-39.1	-44.0	2.0	2.0
	NC17-7	46.96303	-123.95896	-39.1	-44.0	2.0	2.0
NC18	NC18-1	46.96490	-123.95046	-34.6	-43.0	2.0	1.0
	NC18-2	46.96492	-123.94892	-38.8	-44.0	2.0	2.0
	NC18-3	46.96538	-123.94796	-35.9	-44.0	2.0	2.0
	NC18-4	46.96527	-123.94672	-38.9	-44.0	2.0	2.0
	NC18-5	46.96578	-123.94570	-34.5	-44.0	2.0	2.0
	NC18-6	46.96600	-123.94439	-35.2	-44.0	2.0	2.0
	NC18-7	46.96536	-123.94443	-39.0	-44.0	2.0	2.0
NC19	NC19-1	46.96590	-123.94310	-38.7	-44.0	2.0	2.0
	NC19-2	46.96665	-123.94087	-36.2	-44.0	2.0	2.0
	NC19-3	46.96704	-123.93850	-38.2	-44.0	2.0	2.0
	NC19-4	46.96644	-123.93822	-38.8	-44.0	2.0	2.0
	NC19-5	46.96629	-123.93990	-39.4	-44.0	2.0	2.0
	NC19-6	46.96580	-123.94145	-38.3	-44.0	2.0	2.0
NC20	NC20-1	46.96874	-123.92895	-39.1	-44.0	2.0	2.0
	NC20-2	46.96837	-123.92877	-38.3	-44.0	2.0	2.0
	NC20-3	46.96812	-123.93018	-32.0	-44.0	2.0	2.0
	NC20-4	46.96775	-123.93135	-31.2	-43.9	2.0	1.9
	NC20-5	46.96730	-123.93328	-37.2	-44.0	2.0	2.0
	NC20-6	46.96682	-123.93665	-38.9	-44.0	2.0	2.0
NC21	NC21-1	46.96899	-123.92736	-37.7	-44.0	2.0	2.0
	NC21-2	46.96952	-123.92425	-38.2	-44.0	2.0	2.0
	NC21-3	46.96903	-123.92368	-38.1	-44.0	2.0	2.0
	NC21-4	46.96882	-123.92498	-39.1	-44.0	2.0	2.0
	NC21-5	46.96885	-123.92590	-39.3	-44.0	2.0	2.0
	NC21-6	46.96860	-123.92723	-38.5	-44.7	2.0	2.0

Table 4. Sampling Data

DMMU	Station	Latitude	Longitude	Mudline Elevation (ft, MLLW)	Acquisition Depth (ft, MLLW)	Sample Length Acquired (ft)	Z-sample Length Acquired (ft)
NC22	NC22-1	46.96955	-123.92179	-39.8	-44.0	2.0	2.0
	HC22-2	46.96942	-123.92052	-38.5	-44.0	2.0	2.0
	HC22-3	46.96928	-123.91896	-37.8	-44.0	2.0	2.0
	HC22-4	46.96892	-123.91912	-33.8	-44.0	2.0	2.0
	HC22-5	46.96907	-123.92050	-34.1	-44.0	2.0	2.0
	HC22-6	46.96914	-123.92266	-34.4	-44.0	2.0	2.0
HC23	HC23-1	46.96921	-123.91653	-38.1	-44.0	2.0	2.0
	HC23-2	46.96940	-123.91547	-39.2	-44.0	2.0	2.0
	HC23-3	46.96863	-123.91234	-38.8	-44.0	2.0	2.0
	HC23-4	46.96865	-123.91350	-38.5	-44.0	2.0	2.0
	HC23-5	46.96874	-123.91492	-38.0	-44.0	2.0	2.0
	HC23-6	46.96887	-123.91742	-36.1	-44.0	2.0	2.0
HC24	HC24-1	46.96914	-123.90955	-38.4	-44.0	2.0	2.0
	HC24-2	46.96907	-123.90838	-38.3	-44.0	2.0	2.0
	HC24-3	46.96895	-123.90653	-35.2	-44.0	2.0	2.0
	HC24-4	46.96843	-123.90788	-39.2	-44.0	2.0	2.0
	HC24-5	46.96840	-123.90981	-37.4	-44.0	2.0	2.0
	HC24-6	46.96855	-123.91120	-38.0	-44.0	2.0	2.0
HC25	HC25-1	46.96888	-123.90533	-33.8	-44.0	2.0	2.0
	HC25-2	46.96878	-123.90426	-34.5	-44.0	2.0	2.0
	HC25-3	46.96873	-123.90326	-34.1	-44.0	2.0	2.0
	HC25-4	46.96870	-123.90225	-32.4	-44.0	2.0	2.0
	HC25-5	46.96864	-123.90108	-32.1	-44.0	2.0	2.0
	HC25-6	46.96805	-123.90289	-38.0	-44.0	2.0	2.0
HC26	HC26-1	46.96859	-123.89969	-31.6	-44.0	2.0	2.0
	HC26-2	46.96838	-123.89775	-34.1	-44.0	2.0	2.0
	HC26-3	46.96833	-123.89684	-34.3	-44.0	2.0	2.0
	HC26-4	46.96789	-123.89619	-38.3	-43.3	2.0	1.3
	HC26-5	46.96779	-123.89748	-38.2	-43.4	2.0	1.4
	HC26-6	46.96806	-123.89907	-37.8	-44.0	2.0	2.0
HC27	HC27-1	46.96827	-123.89418	-38.5	-44.0	2.0	2.0
	HC27-2	46.96830	-123.89315	-38.9	-44.0	2.0	2.0
	HC27-3	46.96829	-123.89201	-38.6	-44.0	2.0	2.0
	HC27-4	46.96792	-123.89092	-38.9	-44.0	2.0	2.0
	HC27-5	46.96774	-123.89280	-39.0	-44.0	2.0	2.0
	HC27-6	46.96781	-123.89466	-38.3	-44.0	2.0	2.0
HC28	HC28-1	46.96835	-123.88894	-38.1	-44.0	2.0	2.0
	HC28-2	46.96841	-123.88754	-38.0	-44.0	2.0	2.0
	HC28-3	46.96789	-123.88021	-41.0	-44.0	2.0	2.0
	HC28-4	46.96776	-123.88107	-39.6	-44.0	2.0	2.0
	HC28-5	46.96779	-123.88673	-40.4	-44.0	2.0	2.0
	HC28-6	46.96791	-123.88807	-39.6	-44.0	2.0	2.0
HC/CP29	HC/CP29-1	46.96791	-123.87834	-35.3	-44.0	2.0	2.0
	HC/CP29-2	46.96799	-123.87647	-38.6	-44.0	2.0	2.0
	HC/CP29-3	46.96775	-123.87487	-39.0	-44.0	2.0	2.0
	HC/CP29-4	46.96696	-123.86855	-40.6	-44.0	2.0	2.0
	HC/CP29-5	46.96570	-123.86155	-38.0	-44.0	2.0	2.0
	HC/CP29-6	46.96542	-123.86075	-38.6	-44.0	2.0	2.0

Table 4. Sampling Data

DMMU	Station	Latitude	Longitude	Mudline Elevation (ft, MLLW)	Acquisition Depth (ft, MLLW)	Sample Length Acquired (ft)	Z-sample Length Acquired (ft)
CP30	CP30-1	46.96468	-123.85753	-36.7	-44.0	2.0	2.0
	CP30-2	46.96414	-123.85628	-39.1	-44.0	2.0	2.0
	CP30-3	46.96373	-123.85615	-38.1	-43.9	2.0	1.9
	CP30-4	46.96414	-123.85731	-37.0	-44.0	2.0	2.0
	CP30-5	46.96445	-123.85835	-37.7	-44.0	2.0	2.0
	CP30-6	46.96494	-123.85946	-39.1	-44.0	2.0	2.0
CP31	CP31-1	46.96336	-123.85411	-37.5	-43.8	2.0	1.8
	CP31-2	46.96278	-123.85259	-37.8	-44.0	2.0	2.0
	CP31-3	46.96144	-123.85147	-38.9	-44.0	2.0	2.0
	CP31-4	46.96208	-123.85247	-39.2	-44.0	2.0	2.0
	CP31-5	46.96266	-123.85369	-37.2	-44.0	2.0	2.0
	CP31-6	46.96330	-123.85512	-37.5	-44.0	2.0	2.0
CP32	CP32-1	46.96132	-123.84924	-38.6	-44.0	2.0	2.0
	CP32-2	46.96137	-123.84873	-39.7	-44.0	2.0	2.0
	CP32-3	46.96029	-123.84952	-39.2	-44.0	2.0	2.0
	CP32-4	46.95992	-123.84992	-35.7	-44.0	2.0	2.0
	CP32-5	46.96023	-123.85055	-37.6	-44.0	2.0	2.0
	CP32-6	46.96095	-123.85027	-39.7	-44.0	2.0	2.0
CP33	CP33-1	46.96086	-123.84764	-37.6	-44.0	2.0	2.0
	CP33-2	46.95967	-123.84778	-38.8	-43.8	2.0	1.8
	CP33-3	46.95938	-123.84834	-39.7	-44.0	2.0	2.0
	CP33-4	46.95904	-123.84886	-38.6	-44.0	2.0	2.0
	CP33-5	46.95946	-123.84924	-37.4	-44.0	2.0	2.0
	CP33-6	46.96008	-123.84879	-38.5	-44.0	2.0	2.0
CP34	CP34-1	46.96046	-123.84660	-37.8	-44.0	2.0	2.0
	CP34-2	46.96042	-123.84562	-35.2	-44.0	2.0	2.0
	CP34-3	46.96043	-123.84465	-32.4	-42.6	2.0	0.6
	CP34-4	---	---	---	---	---	---
	CP34-5	46.95993	-123.84487	-38.9	-44.0	2.0	2.0
	CP34-6	46.95992	-123.84586	-40.2	-44.0	2.0	2.0
CP35	CP35-1	46.96021	-123.84353	-32.1	-43.1	2.0	1.1
	CP35-2	46.96021	-123.84183	-31.6	-44.0	2.0	2.0
	CP35-3	46.96032	-123.84099	-32.8	-42.2	2.0	0.2
	CP35-4	46.95965	-123.84103	-36.5	-42.5	2.0	0.5
	CP35-5	46.95964	-123.84229	-37.1	-41.7	1.7	none
	CP35-6	46.95975	-123.84355	-37.5	-43.5	2.0	1.5
CP36	CP36-1	46.96033	-123.84000	-32.2	-42.2	2.0	0.2
	CP36-2	46.96031	-123.83864	-33.3	-44.0	2.0	2.0
	CP36-3	46.96019	-123.83772	-32.2	-41.6	1.6	none
	CP36-4	46.95957	-123.83750	-35.9	-42.1	2.0	0.1
	CP36-5	46.95952	-123.83876	-37.2	-44.0	2.0	2.0
	CP36-6	46.95958	-123.84005	-36.3	-42.8	2.0	0.8

Table 5-1. Analytical Results for South Reach: DMMUs 1 - 4 (from SEE, 2013)

Compound	SL	BT	ML	SR-1		SR-2		SR-3		SR-4	
				Value	Q	Value	Q	Value	Q	Value	Q
Conventionals											
Total Solids (%)	—	—	—	89.00		85.20		90.20		74.90	
Total Volatile Solids (%)	—	—	—	1.51		1.35		1.33		2.37	
N-Ammonia (mg-N/kg)	—	—	—	6.73		11.60		3.90		19.80	
Sulfide (mg/kg)	—	—	—	71.00		135.00		2.49	J	51.10	J
Total Organic Carbon (%)	—	—	—	2.68		0.31		0.98		1.17	
Gravel (%)	—	—	—	0.60		0.20		0.20		0.10	
Sand (%)	—	—	—	97.30		97.30		99.50		85.10	
Silt (%)	—	—	—	2.00	U	2.50	U	0.30		9.70	
Clay (%)	—	—	—	0.00		0.00		0.00		5.10	
Fines (%)	—	—	—	2.00	U	2.50	U	0.30		14.80	
Metals (mg/kg dw)											
Antimony	150	—	200	6.00	U	n.a.	n.a.	5.00	U	7.00	U
Arsenic	57	507.1	700	6.00	U	n.a.	n.a.	5.00	U	7.00	U
Cadmium	5.1	11.3	14	0.20	U	n.a.	n.a.	0.20	U	0.30	U
Chromium	260	260	—	17.40		n.a.	n.a.	17.50		23.80	
Copper	390	1,027	1,300	7.00		n.a.	n.a.	7.30		15.70	
Lead	450	975	1,200	2.00	U	n.a.	n.a.	2.00	U	3.00	
Mercury	0.41	1.5	2.3	0.02	U	0.02	U	0.02	U	0.03	U
Selenium	—	3	—	0.60	U	n.a.	n.a.	0.50	U	0.60	U
Silver	6.1	6.1	8.4	0.40	U	n.a.	n.a.	0.30	U	0.40	U
Zinc	410	2,783	3,800	33.00		n.a.	n.a.	34.00		46.00	
PAHs (µg/kg dw)											
Naphthalene	2,100	—	2,400	18.00	U	n.a.	n.a.	20.00	U	19.00	U
2-Methylnaphthalene [1]	670	—	1,900	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Acenaphthylene	560	—	1,300	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Acenaphthene	500	—	2,000	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Fluorene	540	—	3,600	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Phenanthrene	1,500	—	21,000	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Anthracene	960	—	13,000	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Total LPAH	5,200	—	29,000	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Fluoranthene	1,700	4,600	30,000	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Pyrene	2,600	11,980	16,000	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Benzo(a)anthracene	1,300	—	5,100	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Chrysene	1,400	—	21,000	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Benzo(a)pyrene	1,600	—	3,600	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Indeno(1,2,3-cd)pyrene	600	—	4,400	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Dibenz(a,h)anthracene	230	—	1,900	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Benzo(g,h,i)perylene	670	—	3,200	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Total Benzofluoranthenes	3,200	—	9,900	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Total HPAH	12,000	—	69,000	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Chlorinated Hydrocarbons (µg/kg dw)											
1,4-Dichlorobenzene	110	—	120	18.00	U	n.a.	n.a.	20.00	U	19.00	U
1,2-Dichlorobenzene	35	—	110	18.00	U	n.a.	n.a.	20.00	U	19.00	U
1,2,4-Trichlorobenzene	31	—	64	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Hexachlorobenzene	22	168	230	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Phthalates (µg/kg dw)											
Dimethylphthalate	71	—	1,400	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Diethylphthalate	200	—	1,200	46.00	U	n.a.	n.a.	49.00	U	47.00	U
Di-n-Butylphthalate	1,400	—	5,100	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Butylbenzylphthalate	63	—	970	18.00	U	n.a.	n.a.	20.00	U	19.00	U
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	23.00	U	n.a.	n.a.	25.00	U	24.00	U
Di-n-Octyl phthalate	6,200	—	6,200	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Phenols (µg/kg dw)											
Phenol	420	—	1,200	18.00	U	n.a.	n.a.	20.00	U	41.00	
2-Methylphenol	63	—	77	18.00	U	n.a.	n.a.	20.00	U	19.00	U
4-Methylphenol	670	—	3,600	37.00	U	n.a.	n.a.	39.00	U	38.00	U
2,4-Dimethylphenol	29	—	210	17.00	U	n.a.	n.a.	20.00	U	19.00	U
Pentachlorophenol	400	504	690	180.00	U	n.a.	n.a.	200.00	U	190.00	U

Table 5-1. Analytical Results for South Reach: DMMUs 1 - 4 (from SEE, 2013)

Compound	SL	BT	ML	SR-1		SR-2		SR-3		SR-4	
				Value	Q	Value	Q	Value	Q	Value	Q
Miscellaneous Extractables (µg/kg dw)											
Benzyl Alcohol	57	—	870	18.00	U	n.a.	n.a.	20.00	UJ	19.00	U
Benzoic Acid	650	—	760	370.00	U	n.a.	n.a.	390.00	U	380.00	U
Dibenzofuran	540	—	1,700	18.00	U	n.a.	n.a.	20.00	U	19.00	U
N-Nitrosodiphenylamine	28	—	130	18.00	U	n.a.	n.a.	20.00	U	19.00	U
Heptachlor	1.5	—	—	0.46	U	n.a.	n.a.	0.48	U	1.80	U
Hexachlorobutadiene	11	—	270	0.46	U	n.a.	n.a.	0.48	U	0.48	U
Pesticides and PCBs (µg/kg dw)											
Aldrin	9.5	—	—	0.46	U	n.a.	n.a.	0.48	U	3.10	U
Dieldrin	1.9	—	—	0.92	U	n.a.	n.a.	0.96	U	0.96	U
4,4 -DDE	16	—	—	0.92	U	n.a.	n.a.	0.96	U	0.96	U
4,4 -DDD	9	—	—	0.92	U	n.a.	n.a.	0.96	U	0.96	U
4,4 -DDT	12	—	—	0.92	U	n.a.	n.a.	0.96	U	0.96	U
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.92	U	n.a.	n.a.	0.96	U	0.96	U
trans-Chlordane	—	—	—	0.46	U	n.a.	n.a.	0.48	U	1.80	U
cis-Chlordane	—	—	—	0.46	U	n.a.	n.a.	0.48	U	2.00	U
oxy Chlordane	—	—	—	1.80	U	n.a.	n.a.	1.90	U	2.60	U
cis-Nonachlor	—	—	—	1.80	U	n.a.	n.a.	1.90	U	1.90	U
trans-Nonachlor	—	—	—	1.80	U	n.a.	n.a.	1.90	U	1.90	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	1.80	U	n.a.	n.a.	1.90	U	2.60	U
Aroclor 1016	—	—	—	9.10	U	n.a.	n.a.	9.00	U	9.20	U
Aroclor 1242	—	—	—	9.10	U	n.a.	n.a.	9.00	U	9.20	U
Aroclor 1248	—	—	—	9.10	U	n.a.	n.a.	9.00	U	9.20	U
Aroclor 1254	—	—	—	9.10	U	n.a.	n.a.	9.00	U	9.20	U
Aroclor 1260	—	—	—	9.10	U	n.a.	n.a.	9.00	U	9.20	U
Aroclor 1221	—	—	—	9.10	U	n.a.	n.a.	9.00	U	9.20	U
Aroclor 1232	—	—	—	9.10	U	n.a.	n.a.	9.00	U	9.20	U
Aroclor 1262	—	—	—	9.10	U	n.a.	n.a.	9.00	U	9.20	U
Aroclor 1268	—	—	—	9.10	U	n.a.	n.a.	9.00	U	9.20	U
Total PCBs	130	38 [2]	3,100	9.10	U	n.a.	n.a.	9.00	U	9.20	U
Dioxins and Furans (ng/kg) [3]											
2,3,7,8-TCDD	—	—	—	0.138	U	n.a.	n.a.	0.197	U	0.436	U
1,2,3,7,8-PeCDD	—	—	—	0.153	U	n.a.	n.a.	0.189	J	0.523	J
1,2,3,4,7,8-HxCDD	—	—	—	0.192	U	n.a.	n.a.	0.272	U	0.601	U
1,2,3,6,7,8-HxCDD	—	—	—	0.099	J	n.a.	n.a.	0.059	U	0.305	U
1,2,3,7,8,9-HxCDD	—	—	—	0.214	U	n.a.	n.a.	0.253	J	1.150	J
1,2,3,4,6,7,8-HpCDD	—	—	—	1.510	J	n.a.	n.a.	0.804	U	4.860	
OCDD	—	—	—	8.980		n.a.	n.a.	7.010		25.700	
2,3,7,8-TCDF	—	—	—	0.195	J	n.a.	n.a.	0.081	J	0.163	J
1,2,3,7,8-PeCDF	—	—	—	0.212	U	n.a.	n.a.	0.055	U	0.069	J
2,3,4,7,8-PeCDF	—	—	—	0.150	U	n.a.	n.a.	0.048	J	0.131	U
1,2,3,4,7,8-HxCDF	—	—	—	0.182	U	n.a.	n.a.	0.167	U	0.058	U
1,2,3,6,7,8-HxCDF	—	—	—	0.027	J	n.a.	n.a.	0.154	U	0.044	U
2,3,4,6,7,8-HxCDF	—	—	—	0.191	U	n.a.	n.a.	0.020	U	0.072	U
1,2,3,7,8,9-HxCDF	—	—	—	0.121	U	n.a.	n.a.	0.095	U	0.134	U
1,2,3,4,6,7,8-HpCDF	—	—	—	0.291	U	n.a.	n.a.	0.208	J	1.280	U
1,2,3,4,7,8,9-HpCDF	—	—	—	0.236	U	n.a.	n.a.	0.119	U	0.385	U
OCDF	—	—	—	0.541	U	n.a.	n.a.	0.145	U	1.680	U

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.

n.a. - not analyzed

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

3. *Value exceeds the DMMP screening level*

Table 5-2. Analytical Results for Crossover Reach: DMMUs 5 - 13 (from SEE, 2013)

Compound	SL	BT	ML	CO-5		CO-55 (CO5 Dup)		CO-6		CO-7		CO-8	
				Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
Conventionals													
Total Solids (%)	—	—	—	68.90		68.4		68.10		65.70		72.40	
Total Volatile Solids (%)	—	—	—	3.55		3.62		4.15		4.65		3.18	
N-Ammonia (mg-N/kg)	—	—	—	75.50		84.7		89.50		102.00		33.50	
Sulfide (mg/kg)	—	—	—	840.00	J	23.9		557.00	J	638.00	J	455.00	
Total Organic Carbon (%)	—	—	—	1.30		0.729		1.20		1.30		1.06	
Gravel (%)	—	—	—	0.20		0.3		0.20		0.10	U	0.60	
Sand (%)	—	—	—	73.40		73		73.60		64.90		78.50	
Silt (%)	—	—	—	18.50		18.2		17.60		24.90		14.40	
Clay (%)	—	—	—	7.80		8.3		8.60		10.50		6.40	
Fines (%)	—	—	—	26.30		26.50		26.20		35.40		20.80	
Metals (mg/kg dw)													
Antimony	150	—	200	7.00	UJ	7.00	UJ	7.00	UJ	7.00	UJ	7.00	UJ
Arsenic	57	507.1	700	7.00	U	7.00	U	7.00	U	7.00	U	7.00	U
Cadmium	5.1	11.3	14	0.30	U	0.30	U	0.30	U	0.30	U	0.30	U
Chromium	260	260	—	25.40		23.90		26.00		29.40		26.10	
Copper	390	1,027	1,300	20.60		20.70		21.90		25.70		21.30	
Lead	450	975	1,200	4.00		3.00		4.00		4.00		3.00	U
Mercury	0.41	1.5	2.3	0.03		0.03	U	0.03	U	0.04		0.03	U
Selenium	—	3	—	0.70	U	0.70	U	0.70	U	0.70	U	0.60	U
Silver	6.1	6.1	8.4	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Zinc	410	2,783	3,800	50.00		46.00		52.00		58.00		49.00	
PAHs (µg/kg dw)													
Naphthalene	2,100	—	2,400	26.00		19.00	U	12.00	J	18.00	J	19.00	U
2-Methylnaphthalene [1]	670	—	1,900	24.00		19.00	U	19.00	U	19.00	U	19.00	U
Acenaphthylene	560	—	1,300	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Acenaphthene	500	—	2,000	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Fluorene	540	—	3,600	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Phenanthrene	1,500	—	21,000	12.00	J	19.00	U	17.00	J	16.00	J	10.00	J
Anthracene	960	—	13,000	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Total LPAH	5,200	—	29,000	38.00		19.00	U	29.00		34.00		10.00	
Fluoranthene	1,700	4,600	30,000	19.00	U	19.00	U	13.00	J	13.00	J	10.00	J
Pyrene	2,600	11,980	16,000	11.00	J	19.00	U	13.00	J	14.00	J	12.00	J
Benzo(a)anthracene	1,300	—	5,100	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Chrysene	1,400	—	21,000	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Benzo(a)pyrene	1,600	—	3,600	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Indeno(1,2,3-cd)pyrene	600	—	4,400	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Dibenz(a,h)anthracene	230	—	1,900	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Benzo(g,h,i)perylene	670	—	3,200	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Total Benzofluoranthenes	3,200	—	9,900	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Total HPAH	12,000	—	69,000	11.00		19.00	U	26.00		27.00		22.00	
Chlorinated Hydrocarbons (µg/kg dw)													
1,4-Dichlorobenzene	110	—	120	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
1,2-Dichlorobenzene	35	—	110	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
1,2,4-Trichlorobenzene	31	—	64	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Hexachlorobenzene	22	168	230	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Phthalates (µg/kg dw)													
Dimethylphthalate	71	—	1,400	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Diethylphthalate	200	—	1,200	48.00	U	48.00	U	48.00	U	47.00	U	48.00	U
Di-n-Butylphthalate	1,400	—	5,100	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Butylbenzylphthalate	63	—	970	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	24.00	U	15.00	J	15.00	J	23.00	U	24.00	U
Di-n-Octyl phthalate	6,200	—	6,200	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Phenols (µg/kg dw)													
Phenol	420	—	1,200	17.00	J	16.00	J	19.00	U	19.00		24.00	
2-Methylphenol	63	—	77	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
4-Methylphenol	670	—	3,600	33.00	J	18.00	J	20.00	J	48.00		38.00	U
2,4-Dimethylphenol	29	—	210	19.00	UJ	19.00	UJ	19.00	UJ	19.00	UJ	19.00	UJ
Pentachlorophenol	400	504	690	190.00	UJ	190.00	UJ	190.00	UJ	190.00	UJ	190.00	UJ

Table 5-2. Analytical Results for Crossover Reach: DMMUs 5 - 13 (from SEE, 2013)

Compound	SL	BT	ML	CO-5		CO-55 (CO5 Dup)		CO-6		CO-7		CO-8	
				Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
Miscellaneous Extractables (µg/kg dw)													
Benzyl Alcohol	57	—	870	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Benzoic Acid	650	—	760	390.00	U	380.00	U	380.00	U	370.00	U	380.00	U
Dibenzofuran	540	—	1,700	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
N-Nitrosodiphenylamine	28	—	130	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Heptachlor	1.5	—	—	0.47	UJ	0.47	UJ	0.48	UJ	0.49	UJ	0.46	UJ
Hexachlorobutadiene	11	—	270	0.47	U	0.47	U	0.48	U	0.49	U	0.46	U
Pesticides and PCBs (µg/kg dw)													
Aldrin	9.5	—	—	0.47	U	0.47	UJ	0.48	U	0.49	U	0.46	U
Dieldrin	1.9	—	—	0.95	U	0.95	U	0.97	U	0.98	U	0.93	U
4,4 -DDE	16	—	—	0.95	U	0.95	U	0.97	U	0.98	J	0.93	U
4,4 -DDD	9	—	—	0.95	U	0.95	U	0.97	U	0.98	U	0.93	U
4,4 -DDT	12	—	—	0.95	U	0.95	U	0.97	U	7.40	J	0.93	U
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.95	U	0.95	U	0.97	U	7.40		0.93	U
trans-Chlordane	—	—	—	0.47	U	0.47	U	0.48	U	0.49	U	0.46	U
cis-Chlordane	—	—	—	0.47	U	0.47	U	0.48	U	0.49	U	0.46	U
oxy Chlordane	—	—	—	1.90	U	1.90	U	1.90	U	2.00	U	1.80	U
cis-Nonachlor	—	—	—	1.90	U	1.90	U	1.90	U	3.40	U	1.80	U
trans-Nonachlor	—	—	—	1.90	U	1.90	U	1.90	U	2.00	U	1.80	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	1.90	U	1.90	U	1.90	U	*3.40*	*U*	1.80	U
Aroclor 1016	—	—	—	9.50	U	9.40	U	9.70	U	9.90	U	9.30	U
Aroclor 1242	—	—	—	9.50	U	9.40	U	9.70	U	9.90	U	9.30	U
Aroclor 1248	—	—	—	9.50	U	9.40	U	9.70	U	9.90	U	9.30	U
Aroclor 1254	—	—	—	9.50	U	9.40	U	9.70	U	9.90	U	9.30	U
Aroclor 1260	—	—	—	9.50	U	9.40	U	9.70	U	9.90	U	9.30	U
Aroclor 1221	—	—	—	9.50	U	9.40	U	9.70	U	9.90	U	9.30	U
Aroclor 1232	—	—	—	9.50	U	9.40	U	9.70	U	9.90	U	9.30	U
Aroclor 1262	—	—	—	9.50	U	9.40	U	9.70	U	9.90	U	9.30	U
Aroclor 1268	—	—	—	9.50	U	9.40	U	9.70	U	9.90	U	9.30	U
Total PCBs	130	38 (2)	3,100	9.50	U	9.40	U	9.70	U	9.90	U	9.30	U
Dioxins and Furans (pg/g) 3													
2,3,7,8-TCDD	—	—	—	0.689	U	0.642	U	0.588	U	0.853	U	0.521	U
1,2,3,7,8-PeCDD	—	—	—	0.931	J	0.961	J	0.944	J	1.150	J	0.600	U
1,2,3,4,7,8-HxCDD	—	—	—	2.100		2.070		1.820	J	2.900		1.650	J
1,2,3,6,7,8-HxCDD	—	—	—	1.000	J	1.100	J	0.818	J	1.100	J	0.604	J
1,2,3,7,8,9-HxCDD	—	—	—	0.302	J	0.303	J	0.242	J	0.315	J	0.206	J
1,2,3,4,6,7,8-HpCDD	—	—	—	14.000		14.000		10.200		14.500		7.640	
OCDD	—	—	—	75.900		84.600		59.100		84.200		45.100	
2,3,7,8-TCDF	—	—	—	0.839	J	0.794	J	0.521	J	0.774	J	0.350	J
1,2,3,7,8-PeCDF	—	—	—	0.168	J	0.135	U	0.132	J	0.186	J	0.085	J
2,3,4,7,8-PeCDF	—	—	—	0.219	U	0.308	J	0.248	U	0.291	J	0.152	J
1,2,3,4,7,8-HxCDF	—	—	—	0.037	U	0.143	U	0.079	U	0.139	U	0.077	U
1,2,3,6,7,8-HxCDF	—	—	—	0.042	U	0.046	U	0.029	U	0.047	U	0.024	U
2,3,4,6,7,8-HxCDF	—	—	—	0.154	J	0.168	J	0.146	J	0.257	J	0.108	U
1,2,3,7,8,9-HxCDF	—	—	—	0.265	J	0.220	U	0.230	U	0.268	J	0.121	U
1,2,3,4,6,7,8-HpCDF	—	—	—	0.117	U	0.177	U	0.134	U	0.129	U	0.059	U
1,2,3,4,7,8,9-HpCDF	—	—	—	4.860		4.820		4.150		5.520		2.600	
OCDF	—	—	—	5.810		5.980		4.720	J	6.610		2.600	U

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

3. *Value exceeds the DMMP screening level*

Table 5-2. Analytical Results for Crossover Reach: DMMUs 5 - 13 (from SEE, 2013)

Compound	SL	BT	ML	CO-9		CO-10		CO-11		CO-12		CO-13	
				Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
Conventionals													
Total Solids (%)	—	—	—	71.70		71.8		62.9		70.3		65.1	
Total Volatile Solids (%)	—	—	—	3.28		3.7		5.0		3.3		5.0	
N-Ammonia (mg-N/kg)	—	—	—	54.60		58.0		113.0		91.3		68.2	
Sulfide (mg/kg)	—	—	—	398.00		4.6		791.0		23.9		238.0	J
Total Organic Carbon (%)	—	—	—	0.56		1.1		1.6		1.1		1.6	
Gravel (%)	—	—	—	4.80		0.2		0.1		0.1	U	0.1	
Sand (%)	—	—	—	68.70		71.0		63.0		70.3		65.2	
Silt (%)	—	—	—	19.00		18.8		24.5		19.8		23.7	
Clay (%)	—	—	—	7.40		10.1		12.3		9.8		11.0	
Fines (%)	—	—	—	26.40		28.90		36.80		29.60		34.70	
Metals (mg/kg dw)													
Antimony	150	—	200	6.00	UJ	7.00	UJ	7.00	UJ	7.00	UJ	7.00	UJ
Arsenic	57	507.1	700	6.00		7.00	U	7.00	U	7.00	U	8.00	
Cadmium	5.1	11.3	14	0.30	U	0.30	U	0.30	U	0.30	U	0.30	U
Chromium	260	260	—	28.70		25.40		30.00		26.80		30.40	
Copper	390	1,027	1,300	24.90		22.60		28.70		24.30		30.00	
Lead	450	975	1,200	3.00	U	3.00		4.00		3.00		4.00	
Mercury	0.41	1.5	2.3	0.03	U	0.03		0.04		0.03		0.04	
Selenium	—	3	—	0.60	U	0.70	U	0.80	U	0.70	U	0.70	U
Silver	6.1	6.1	8.4	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Zinc	410	2,783	3,800	52.00		50.00		58.00		53.00		60.00	
PAHs (µg/kg dw)													
Naphthalene	2,100	—	2,400	20.00	U	11.00	J	16.00	J	18.00	U	27.00	
2-Methylnaphthalene [1]	670	—	1,900	20.00	U	19.00	U	11.00	J	18.00	U	14.00	J
Acenaphthylene	560	—	1,300	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Acenaphthene	500	—	2,000	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Fluorene	540	—	3,600	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Phenanthrene	1,500	—	21,000	20.00	U	19.00	U	15.00	J	18.00	U	20.00	
Anthracene	960	—	13,000	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Total LPAH	5,200	—	29,000	20.00	U	11.00		31.00		18.00	U	47.00	
Fluoranthene	1,700	4,600	30,000	11.00	J	19.00	U	12.00	J	18.00	U	18.00	J
Pyrene	2,600	11,980	16,000	9.80	J	19.00	U	14.00	J	18.00	U	19.00	
Benzo(a)anthracene	1,300	—	5,100	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Chrysene	1,400	—	21,000	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Benzo(a)pyrene	1,600	—	3,600	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Indeno(1,2,3-cd)pyrene	600	—	4,400	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Dibenz(a,h)anthracene	230	—	1,900	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Benzo(g,h,i)perylene	670	—	3,200	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Total Benzofluoranthenes	3,200	—	9,900	20.00	U	19.00	U	19.00	U	18.00	U	11.00	J
Total HPAH	12,000	—	69,000	20.80		19.00	U	26.00		18.00	U	48.00	
Chlorinated Hydrocarbons (µg/kg dw)													
1,4-Dichlorobenzene	110	—	120	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
1,2-Dichlorobenzene	35	—	110	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
1,2,4-Trichlorobenzene	31	—	64	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Hexachlorobenzene	22	168	230	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Phthalates (µg/kg dw)													
Dimethylphthalate	71	—	1,400	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Diethylphthalate	200	—	1,200	49.00	U	48.00	U	48.00	U	46.00	U	47.00	U
Di-n-Butylphthalate	1,400	—	5,100	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Butylbenzylphthalate	63	—	970	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	24.00	U	24.00	U	24.00	U	23.00	U	23.00	U
Di-n-Octyl phthalate	6,200	—	6,200	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Phenols (µg/kg dw)													
Phenol	420	—	1,200	20.00	U	19.00	U	47.00		18.00	U	23.00	
2-Methylphenol	63	—	77	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
4-Methylphenol	670	—	3,600	39.00	U	39.00	U	41.00		37.00	U	80.00	
2,4-Dimethylphenol	29	—	210	20.00	UJ	19.00	UJ	19.00	UJ	18.00	UJ	19.00	UJ
Pentachlorophenol	400	504	690	200.00	UJ	190.00	UJ	190.00	UJ	180.00	UJ	190.00	U

Table 5-2. Analytical Results for Crossover Reach: DMMUs 5 - 13 (from SEE, 2013)

Compound	SL	BT	ML	CO-9		CO-10		CO-11		CO-12		CO-13	
				Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
Miscellaneous Extractables (µg/kg dw)													
Benzyl Alcohol	57	—	870	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Benzoic Acid	650	—	760	390.00	U	390.00	U	380.00	U	370.00	U	380.00	U
Dibenzofuran	540	—	1,700	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
N-Nitrosodiphenylamine	28	—	130	20.00	U	19.00	U	19.00	U	18.00	U	19.00	U
Heptachlor	1.5	—	—	0.48	UJ	0.48	UJ	0.48	UJ	0.48	UJ	0.50	UJ
Hexachlorobutadiene	11	—	270	0.48	U	0.48	U	0.48	U	0.48	U	0.50	U
Pesticides and PCBs (µg/kg dw)													
Aldrin	9.5	—	—	0.48	U	0.48	U	0.48	U	0.48	U	0.50	U
Dieldrin	1.9	—	—	0.95	U	0.96	U	0.96	U	0.96	U	1.00	U
4,4 -DDE	16	—	—	0.95	U	0.96	U	0.96	U	0.96	U	1.00	U
4,4 -DDD	9	—	—	0.95	U	0.96	U	0.96	U	0.96	U	1.00	U
4,4 -DDT	12	—	—	0.95	U	0.96	U	0.96	U	0.96	U	1.00	UJ
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.95	U	0.96	U	0.96	U	0.96	U	1.00	UJ
trans-Chlordane	—	—	—	0.48	U	0.48	U	0.48	U	0.48	U	0.70	U
cis-Chlordane	—	—	—	0.48	U	0.48	U	0.48	U	0.48	U	0.50	U
oxy Chlordane	—	—	—	1.90	U	1.90	U	1.90	U	1.90	U	2.00	U
cis-Nonachlor	—	—	—	1.90	U	1.90	U	1.90	U	1.90	U	2.00	U
trans-Nonachlor	—	—	—	1.90	U	1.90	U	1.90	U	1.90	U	2.00	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	1.90	U	1.90	U	1.90	U	1.90	U	2.00	U
Aroclor 1016	—	—	—	9.50	U	9.50	U	9.60	U	9.70	U	9.70	U
Aroclor 1242	—	—	—	9.50	U	9.50	U	9.60	U	9.70	U	9.70	U
Aroclor 1248	—	—	—	9.50	U	9.50	U	9.60	U	9.70	U	9.70	U
Aroclor 1254	—	—	—	9.50	U	9.50	U	9.60	U	9.70	U	9.70	U
Aroclor 1260	—	—	—	9.50	U	9.50	U	9.60	U	9.70	U	9.70	U
Aroclor 1221	—	—	—	9.50	U	9.50	U	9.60	U	9.70	U	9.70	U
Aroclor 1232	—	—	—	9.50	U	9.50	U	9.60	U	9.70	U	9.70	U
Aroclor 1262	—	—	—	9.50	U	9.50	U	9.60	U	9.70	U	9.70	U
Aroclor 1268	—	—	—	9.50	U	9.50	U	9.60	U	9.70	U	9.70	U
Total PCBs	130	38 (2)	3,100	9.50	U	9.50	U	9.60	U	9.70	U		
Dioxins and Furans (pg/g) 3													
2,3,7,8-TCDD	—	—	—	0.611	J	0.790	J	0.896	U	0.857	J	0.983	U
1,2,3,7,8-PeCDD	—	—	—	0.742	J	0.941	J	1.280	J	1.080	J	1.470	
1,2,3,4,7,8-HxCDD	—	—	—	1.690	J	2.150		3.010		2.200		0.356	J
1,2,3,6,7,8-HxCDD	—	—	—	0.631	J	0.886	J	1.260	J	0.974	J	1.320	J
1,2,3,7,8,9-HxCDD	—	—	—	0.205	J	0.291	J	0.340	J	0.258	J	3.740	
1,2,3,4,6,7,8-HpCDD	—	—	—	7.550		12.000		14.000		10.500		15.100	J
OCDD	—	—	—	43.300		78.000		80.400		63.600		89.100	J
2,3,7,8-TCDF	—	—	—	0.295	J	0.464	J	0.658	J	0.475	J	0.542	J
1,2,3,7,8-PeCDF	—	—	—	0.065	J	0.119	J	0.147	J	0.117	U	0.069	U
2,3,4,7,8-PeCDF	—	—	—	0.084	U	0.243	J	0.123	U	0.139	J	0.115	U
1,2,3,4,7,8-HxCDF	—	—	—	0.051	U	0.109	U	0.140	U	0.081	U	0.275	J
1,2,3,6,7,8-HxCDF	—	—	—	0.025	U	0.060	U	0.047	U	0.028	U	0.192	U
2,3,4,6,7,8-HxCDF	—	—	—	0.084	U	0.151	U	0.200	U	0.168	J	0.170	U
1,2,3,7,8,9-HxCDF	—	—	—	0.143	U	0.197	U	0.251	U	0.200	J	0.050	U
1,2,3,4,6,7,8-HpCDF	—	—	—	0.052	U	0.056	U	0.181	J	0.143	U	5.330	
1,2,3,4,7,8,9-HpCDF	—	—	—	2.150		3.860		5.000		3.910		0.138	U
OCDF	—	—	—	2.540	J	5.980		5.960		3.790	U	7.230	

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

3. *Value exceeds the DMMP screening level*

Table 5-3. Analytical Results for North Channel: DMMUs 14 - 21 (from SEE, 2013)

Compound	SL	BT	ML	CO/NC-14		NC-15		NC-16		NC-17	
				Value	Q	Value	Q	Value	Q	Value	Q
Conventionals											
Total Solids (%)	—	—	—	60.60		62.80		60.10		68.70	
Total Volatile Solids (%)	—	—	—	4.77		5.16		4.99		3.26	
N-Ammonia (mg-N/kg)	—	—	—	81.00		120.00		117.00		58.40	
Sulfide (mg/kg)	—	—	—	262.00		220.00		572.00		32.90	
Total Organic Carbon (%)	—	—	—	1.20		2.24		1.65		1.18	
Gravel (%)	—	—	—	0.10		0.10		0.70		0.50	
Sand (%)	—	—	—	62.30		46.50		53.90		72.60	
Silt (%)	—	—	—	25.80		37.50		31.70		18.60	
Clay (%)	—	—	—	11.80		15.90		13.60		8.30	
Fines (%)	—	—	—	37.60		53.40		45.30		26.90	
Metals (mg/kg dw)											
Antimony	150	—	200	8.00	UJ	8.00	UJ	8.00	UJ	7.00	UJ
Arsenic	57	507.1	700	8.00	U	8.00	U	8.00	U	7.00	U
Cadmium	5.1	11.3	14	0.30	U	0.30	U	0.30	U	0.30	U
Chromium	260	260	—	31.80		33.50		31.50		27.20	
Copper	390	1,027	1,300	34.70		38.40		36.70		27.30	
Lead	450	975	1,200	4.00		4.00		4.00		3.00	
Mercury	0.41	1.5	2.3	0.04		0.04		0.04		0.03	U
Selenium	—	3	—	0.80	U	0.80	U	0.80	U	0.70	U
Silver	6.1	6.1	8.4	0.50	U	0.50	U	0.50	U	0.40	U
Zinc	410	2,783	3,800	63.00		64.00		62.00		55.00	
PAHs (µg/kg dw)											
Naphthalene	2,100	—	2,400	12.00	J	15.00	J	17.00	J	19.00	U
2-Methylnaphthalene [1]	670	—	1,900	20.00	U	18.00	U	10.00	J	19.00	U
Acenaphthylene	560	—	1,300	20.00	U	18.00	U	19.00	U	19.00	U
Acenaphthene	500	—	2,000	20.00	U	18.00	U	19.00	U	19.00	U
Fluorene	540	—	3,600	20.00	U	18.00	U	19.00	U	19.00	U
Phenanthrene	1,500	—	21,000	12.00	J	15.00	J	26.00		19.00	U
Anthracene	960	—	13,000	20.00	U	18.00	U	19.00	U	19.00	U
Total LPAH	5,200	—	29,000	24.00		30.00		43.00		19.00	U
Fluoranthene	1,700	4,600	30,000	11.00	J	14.00	J	20.00		19.00	U
Pyrene	2,600	11,980	16,000	11.00	J	15.00	J	19.00		19.00	U
Benzo(a)anthracene	1,300	—	5,100	20.00	U	18.00	U	19.00	U	19.00	U
Chrysene	1,400	—	21,000	20.00	U	18.00	U	19.00	U	19.00	U
Benzo(a)pyrene	1,600	—	3,600	20.00	U	18.00	U	19.00	U	19.00	U
Indeno(1,2,3-cd)pyrene	600	—	4,400	20.00	U	18.00	U	19.00	U	19.00	U
Dibenz(a,h)anthracene	230	—	1,900	20.00	U	18.00	U	19.00	U	19.00	U
Benzo(g,h,i)perylene	670	—	3,200	20.00	U	18.00	U	19.00	U	19.00	U
Total Benzofluoranthenes	3,200	—	9,900	20.00	U	18.00	U	19.00	U	19.00	U
Total HPAH	12,000	—	69,000	22.00		29.00		39.00		19.00	U
Chlorinated Hydrocarbons (µg/kg dw)											
1,4-Dichlorobenzene	110	—	120	20.00	U	18.00	U	19.00	U	19.00	U
1,2-Dichlorobenzene	35	—	110	20.00	U	18.00	U	19.00	U	19.00	U
1,2,4-Trichlorobenzene	31	—	64	20.00	U	18.00	U	19.00	U	19.00	U
Hexachlorobenzene	22	168	230	20.00	U	18.00	U	19.00	U	19.00	U
Phthalates (µg/kg dw)											
Dimethylphthalate	71	—	1,400	20.00	U	18.00	U	19.00	U	19.00	U
Diethylphthalate	200	—	1,200	50.00	U	46.00	U	47.00	U	47.00	U
Di-n-Butylphthalate	1,400	—	5,100	20.00	U	18.00	U	19.00	U	19.00	U
Butylbenzylphthalate	63	—	970	20.00	U	18.00	U	19.00	U	19.00	U
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	25.00	U	23.00	U	24.00	U	24.00	U
Di-n-Octyl phthalate	6,200	—	6,200	20.00	U	18.00	U	19.00	U	19.00	U
Phenols (µg/kg dw)											
Phenol	420	—	1,200	20.00	U	38.00		19.00		20.00	
2-Methylphenol	63	—	77	20.00	U	18.00	U	19.00	U	19.00	U
4-Methylphenol	670	—	3,600	79.00		16.00	J	36.00	J	38.00	U
2,4-Dimethylphenol	29	—	210	20.00	UJ	18.00	UJ	18.00	UJ	19.00	UJ
Pentachlorophenol	400	504	690	200.00	U	180.00	U	190.00	U	190.00	UJ

Table 5-3. Analytical Results for North Channel: DMMUs 14 - 21 (from SEE, 2013)

Compound	SL	BT	ML	CO/NC-14		NC-15		NC-16		NC-17	
				Value	Q	Value	Q	Value	Q	Value	Q
Miscellaneous Extractables (µg/kg dw)											
Benzyl Alcohol	57	—	870	20.00	U	18.00	U	19.00	U	19.00	U
Benzoic Acid	650	—	760	400.00	U	370.00	U	380.00	U	380.00	U
Dibenzofuran	540	—	1,700	20.00	U	18.00	U	19.00	U	19.00	U
N-Nitrosodiphenylamine	28	—	130	20.00	U	18.00	U	19.00	U	19.00	U
Heptachlor	1.5	—	—	0.49	UJ	0.46	UJ	0.47	UJ	0.48	UJ
Hexachlorobutadiene	11	—	270	0.49	U	0.46	U	0.47	U	0.48	U
Pesticides and PCBs (µg/kg dw)											
Aldrin	9.5	—	—	0.49	U	0.46	U	0.47	U	0.48	U
Dieldrin	1.9	—	—	0.99	U	0.93	U	0.93	U	0.97	U
4,4 -DDE	16	—	—	0.99	U	0.93	U	0.93	U	0.97	U
4,4 -DDD	9	—	—	0.99	U	0.93	U	0.93	U	0.97	U
4,4 -DDT	12	—	—	0.99	UJ	0.93	UJ	0.93	UJ	0.97	U
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.99	U	0.93	U	0.93	U	0.97	U
trans-Chlordane	—	—	—	1.40	U	0.46	U	0.83	U	0.48	U
cis-Chlordane	—	—	—	0.49	U	0.46	U	0.47	U	0.48	U
oxy Chlordane	—	—	—	2.00	U	1.80	U	1.90	U	1.90	U
cis-Nonachlor	—	—	—	2.00	U	1.80	U	1.90	U	1.90	U
trans-Nonachlor	—	—	—	2.00	U	1.80	U	1.90	U	1.90	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	2.00	U	1.80	U	1.90	U	1.90	U
Aroclor 1016	—	—	—	9.80	U	9.20	U	9.40	U	9.80	U
Aroclor 1242	—	—	—	9.80	U	9.20	U	9.40	U	9.80	U
Aroclor 1248	—	—	—	9.80	U	9.20	U	9.40	U	9.80	U
Aroclor 1254	—	—	—	9.80	U	9.20	U	9.40	U	9.80	U
Aroclor 1260	—	—	—	9.80	U	9.20	U	9.40	U	9.80	U
Aroclor 1221	—	—	—	9.80	U	9.20	U	9.40	U	9.80	U
Aroclor 1232	—	—	—	9.80	U	9.20	U	9.40	U	9.80	U
Aroclor 1262	—	—	—	9.80	U	9.20	U	9.40	U	9.80	U
Aroclor 1268	—	—	—	9.80	U	9.20	U	9.40	U	9.80	U
Total PCBs	130	38 (2)	3,100	9.80	U	9.20	U	9.40	U	9.80	U
Dioxins and Furans (pg/g) [3]											
2,3,7,8-TCDD	—	—	—	1.540		1.230	U	1.680		0.947	J
1,2,3,7,8-PeCDD	—	—	—	1.970		1.660		2.140		1.080	J
1,2,3,4,7,8-HxCDD	—	—	—	0.404	J	0.332	J	0.484	J	2.620	
1,2,3,6,7,8-HxCDD	—	—	—	1.480	J	1.280	J	1.620	J	0.882	J
1,2,3,7,8,9-HxCDD	—	—	—	4.610		4.840		5.420		0.280	J
1,2,3,4,6,7,8-HpCDD	—	—	—	15.900	J	12.300	J	16.400	J	10.300	
OCDD	—	—	—	86.400	J	64.500	J	84.700	J	60.400	
2,3,7,8-TCDF	—	—	—	0.533	J	0.318	J	0.440	J	0.407	J
1,2,3,7,8-PeCDF	—	—	—	0.109	J	0.017	U	0.132	U	0.113	J
2,3,4,7,8-PeCDF	—	—	—	0.193	J	0.068	U	0.140	U	0.156	J
1,2,3,4,7,8-HxCDF	—	—	—	0.305	J	0.152	J	0.310	J	0.088	U
1,2,3,6,7,8-HxCDF	—	—	—	0.219	J	0.023	U	0.138	U	0.048	U
2,3,4,6,7,8-HxCDF	—	—	—	0.176	J	0.190	J	0.152	J	0.148	U
1,2,3,7,8,9-HxCDF	—	—	—	0.066	U	0.010	U	0.090	U	0.194	J
1,2,3,4,6,7,8-HpCDF	—	—	—	4.980		3.330		7.320		0.125	U
1,2,3,4,7,8,9-HpCDF	—	—	—	0.260	J	0.106	U	0.168	U	3.540	
OCDF	—	—	—	6.900		4.080	J	7.510		4.270	J

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

3. *Value exceeds the DMMP screening level*

Table 5-3. Analytical Results for North Channel: DMMUs 14 - 21 (from SEE, 2013)

Compound	SL	BT	ML	NC-18		NC-19		NC-20		NC-21	
				Value	Q	Value	Q	Value	Q	Value	Q
Conventionals											
Total Solids (%)	—	—	—	70.00		57.20		64.80		58.40	
Total Volatile Solids (%)	—	—	—	3.30		5.53		4.22		6.10	
N-Ammonia (mg-N/kg)	—	—	—	96.80		153.00		137.00		171.00	
Sulfide (mg/kg)	—	—	—	73.40		927.00		166.00		512.00	
Total Organic Carbon (%)	—	—	—	0.84		1.26		1.09		1.61	
Gravel (%)	—	—	—	0.10		0.10		0.10		0.10	
Sand (%)	—	—	—	66.80		37.80		58.00		36.20	
Silt (%)	—	—	—	23.70		44.40		30.70		46.40	
Clay (%)	—	—	—	9.40		17.90		11.20		17.20	
Fines (%)	—	—	—	33.10		62.30		41.90		63.60	
Metals (mg/kg dw)											
Antimony	150	—	200	7.00	UJ	8.00	UJ	7.00	UJ	8.00	UJ
Arsenic	57	507.1	700	7.00	U	8.00	U	7.00	U	8.00	U
Cadmium	5.1	11.3	14	0.30	U	0.30	U	0.30	U	0.30	U
Chromium	260	260	—	28.40		36.10		32.20		36.90	
Copper	390	1,027	1,300	28.70		53.90		40.10		50.00	
Lead	450	975	1,200	3.00		5.00		4.00		5.00	
Mercury	0.41	1.5	2.3	0.03	U	0.04		0.03		0.05	
Selenium	—	3	—	0.60	U	0.90	U	0.70	U	0.80	U
Silver	6.1	6.1	8.4	0.40	U	0.50	U	0.40	U	0.50	U
Zinc	410	2,783	3,800	54.00		73.00		63.00		74.00	
PAHs (µg/kg dw)											
Naphthalene	2,100	—	2,400	19.00	U	23.00		20.00	U	70.00	
2-Methylnaphthalene [1]	670	—	1,900	19.00	U	19.00	U	20.00	U	15.00	J
Acenaphthylene	560	—	1,300	19.00	U	19.00	U	20.00	U	18.00	U
Acenaphthene	500	—	2,000	19.00	U	19.00	U	20.00	U	18.00	U
Fluorene	540	—	3,600	19.00	U	19.00	U	20.00	U	18.00	U
Phenanthrene	1,500	—	21,000	19.00	U	23.00		20.00	U	28.00	
Anthracene	960	—	13,000	19.00	U	19.00	U	20.00	U	18.00	U
Total LPAH	5,200	—	29,000	19.00	U	46.00		20.00	U	98.00	
Fluoranthene	1,700	4,600	30,000	19.00	U	26.00		9.90	J	33.00	
Pyrene	2,600	11,980	16,000	19.00	U	22.00		9.90	J	30.00	
Benzo(a)anthracene	1,300	—	5,100	19.00	U	19.00	U	20.00	U	18.00	U
Chrysene	1,400	—	21,000	19.00	U	19.00	U	20.00	U	12.00	J
Benzo(a)pyrene	1,600	—	3,600	19.00	U	19.00	U	20.00	U	18.00	U
Indeno(1,2,3-cd)pyrene	600	—	4,400	19.00	U	19.00	U	20.00	U	18.00	U
Dibenz(a,h)anthracene	230	—	1,900	19.00	U	19.00	U	20.00	U	18.00	U
Benzo(g,h,i)perylene	670	—	3,200	19.00	U	19.00	U	20.00	U	18.00	U
Total Benzofluoranthenes	3,200	—	9,900	19.00	U	12.00	J	20.00	U	18.00	U
Total HPAH	12,000	—	69,000	19.00	U	60.00		19.80		75.00	
Chlorinated Hydrocarbons (µg/kg dw)											
1,4-Dichlorobenzene	110	—	120	19.00	U	19.00	U	20.00	U	18.00	U
1,2-Dichlorobenzene	35	—	110	19.00	U	19.00	U	20.00	U	18.00	U
1,2,4-Trichlorobenzene	31	—	64	19.00	U	19.00	U	20.00	U	18.00	U
Hexachlorobenzene	22	168	230	19.00	U	19.00	U	20.00	U	18.00	U
Phthalates (µg/kg dw)											
Dimethylphthalate	71	—	1,400	19.00	U	19.00	U	20.00	U	18.00	U
Diethylphthalate	200	—	1,200	47.00	U	48.00	U	50.00	U	46.00	U
Di-n-Butylphthalate	1,400	—	5,100	19.00	U	19.00	U	20.00	U	18.00	U
Butylbenzylphthalate	63	—	970	19.00	U	19.00	U	20.00	U	18.00	U
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	24.00	U	24.00	U	25.00	U	23.00	U
Di-n-Octyl phthalate	6,200	—	6,200	19.00	U	19.00	U	20.00	U	18.00	U
Phenols (µg/kg dw)											
Phenol	420	—	1,200	19.00	U	25.00		20.00	U	80.00	
2-Methylphenol	63	—	77	19.00	U	19.00	U	20.00	U	18.00	U
4-Methylphenol	670	—	3,600	38.00	U	20.00	J	13.00	J	28.00	J
2,4-Dimethylphenol	29	—	210	19.00	UJ	18.00	UJ	20.00	UJ	18.00	UJ
Pentachlorophenol	400	504	690	190.00	UJ	190.00	U	200.00	U	180.00	U

Table 5-3. Analytical Results for North Channel: DMMUs 14 - 21 (from SEE, 2013)

Compound	SL	BT	ML	NC-18		NC-19		NC-20		NC-21	
				Value	Q	Value	Q	Value	Q	Value	Q
Miscellaneous Extractables (µg/kg dw)											
Benzyl Alcohol	57	—	870	19.00	U	15.00	J	20.00	U	18.00	U
Benzoic Acid	650	—	760	380.00	U	380.00	U	400.00	U	110.00	J
Dibenzofuran	540	—	1,700	19.00	U	19.00	U	20.00	U	9.20	J
N-Nitrosodiphenylamine	28	—	130	19.00	U	19.00	U	20.00	U	18.00	U
Heptachlor	1.5	—	—	0.49	UJ	0.49	UJ	0.48	UJ	0.48	UJ
Hexachlorobutadiene	11	—	270	0.49	U	0.49	U	0.48	U	0.48	U
Pesticides and PCBs (µg/kg dw)											
Aldrin	9.5	—	—	0.49	U	0.49	U	0.48	U	0.48	U
Dieldrin	1.9	—	—	0.98	U	0.98	U	0.96	U	0.96	U
4,4 -DDE	16	—	—	0.98	U	0.98	U	0.96	U	0.96	U
4,4 -DDD	9	—	—	0.98	U	0.98	U	0.96	U	0.96	U
4,4 -DDT	12	—	—	0.98	U	0.98	U	0.96	UJ	0.96	UJ
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.98	U	0.98	U	0.96	U	0.96	U
trans-Chlordane	—	—	—	0.49	U	0.49	U	0.48	U	1.20	U
cis-Chlordane	—	—	—	0.49	U	0.49	U	0.48	U	0.48	U
oxy Chlordane	—	—	—	2.00	U	2.00	U	1.90	U	1.90	U
cis-Nonachlor	—	—	—	2.00	U	2.00	U	1.90	U	1.90	U
trans-Nonachlor	—	—	—	2.00	U	2.00	U	1.90	U	1.90	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	2.00	U	2.00	U	1.90	U	1.90	U
Aroclor 1016	—	—	—	9.70	U	9.80	U	9.50	U	9.50	U
Aroclor 1242	—	—	—	9.70	U	9.80	U	9.50	U	9.50	U
Aroclor 1248	—	—	—	9.70	U	9.80	U	9.50	U	9.50	U
Aroclor 1254	—	—	—	9.70	U	9.80	U	9.50	U	9.50	U
Aroclor 1260	—	—	—	9.70	U	9.80	U	9.50	U	9.50	U
Aroclor 1221	—	—	—	9.70	U	9.80	U	9.50	U	9.50	U
Aroclor 1232	—	—	—	9.70	U	9.80	U	9.50	U	9.50	U
Aroclor 1262	—	—	—	9.70	U	9.80	U	9.50	U	9.50	U
Aroclor 1268	—	—	—	9.70	U	9.80	U	9.50	U	9.50	U
Total PCBs	130	38 (2)	3,100	9.70	U	9.80	U	9.50	U	9.50	U
Dioxins and Furans (pg/g) [3]											
2,3,7,8-TCDD	—	—	—	0.892	U	0.404	U	1.360		0.274	U
1,2,3,7,8-PeCDD	—	—	—	1.050	U	0.557	J	1.450		0.364	J
1,2,3,4,7,8-HxCDD	—	—	—	2.740		0.109	U	0.298	J	0.051	U
1,2,3,6,7,8-HxCDD	—	—	—	0.883	J	0.443	J	0.945	J	0.233	U
1,2,3,7,8,9-HxCDD	—	—	—	0.250	J	1.500	J	3.930		0.757	J
1,2,3,4,6,7,8-HpCDD	—	—	—	10.700		5.350	J	10.800	J	2.490	J
OCDD	—	—	—	62.200		30.500	J	56.000	J	14.200	J
2,3,7,8-TCDF	—	—	—	0.263	J	0.189	J	0.312	J	0.088	U
1,2,3,7,8-PeCDF	—	—	—	0.078	U	0.024	U	0.041	U	0.016	U
2,3,4,7,8-PeCDF	—	—	—	0.130	J	0.044	U	0.079	J	0.039	U
1,2,3,4,7,8-HxCDF	—	—	—	0.083	U	0.078	U	0.124	J	0.037	U
1,2,3,6,7,8-HxCDF	—	—	—	0.021	U	0.030	U	0.089	J	0.027	J
2,3,4,6,7,8-HxCDF	—	—	—	0.100	U	0.070	U	0.043	U	0.049	J
1,2,3,7,8,9-HxCDF	—	—	—	0.137	U	0.020	U	0.032	U	0.006	U
1,2,3,4,6,7,8-HpCDF	—	—	—	0.093	U	1.300	J	2.150		0.815	J
1,2,3,4,7,8,9-HpCDF	—	—	—	2.620		0.052	U	0.089	J	0.008	U
OCDF	—	—	—	3.760	J	1.990	J	3.180	J	1.090	J

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

3. *Value exceeds the DMMP screening level*

Table 5-4. Analytical Results for Hoquiam Reach: DMMUs 22-29 (from SEE, 2013)

Compound	SL	BT	ML	HC-22		HC-23		HC-73 (HC23 Dup)		HC-24		HC-25	
				Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
Conventionals													
Total Solids (%)	—	—	—	64.20		65.00		64.90		69.50		58.70	
Total Volatile Solids (%)	—	—	—	4.44		4.31		4.46		3.51		7.39	
N-Ammonia (mg-N/kg)	—	—	—	127.00		95.70		111.00		81.80		165.00	
Sulfide (mg/kg)	—	—	—	585.00		478.00		n.v. [5]		107.00	J	656.00	
Total Organic Carbon (%)	—	—	—	1.29		1.21		1.09		1.09		1.72	
Gravel (%)	—	—	—	0.10		0.10	U	0.10		0.10		0.10	U
Sand (%)	—	—	—	58.60		57.50		57.30		74.40		42.90	
Silt (%)	—	—	—	29.50		30.20		30.60		18.20		42.50	
Clay (%)	—	—	—	12.00		12.40		12.00		7.30		14.70	
Fines (%)	—	—	—	41.50		42.60		42.60		25.50		57.20	
Metals (mg/kg dw)													
Antimony	150	—	200	8.00	UJ	8.00	UJ	7.00	UJ	20.00	UJ	8.00	UJ
Arsenic	57	507.1	700	8.00	U	8.00	U	7.00	U	20.00	U	8.00	U
Cadmium	5.1	11.3	14	0.30	U	0.30	U	0.30	U	0.70	U	0.30	U
Chromium	260	260	—	33.00		30.60		30.80		37.00		40.00	
Copper	390	1,027	1,300	40.30		38.00		38.50		46.40		57.30	
Lead	450	975	1,200	4.00		4.00		4.00		7.00	U	5.00	
Mercury	0.41	1.5	2.3	0.04		0.04		0.03		0.03	U	0.05	
Selenium	—	3	—	0.70	U	0.70	U	0.80	U	0.70	U	0.80	U
Silver	6.1	6.1	8.4	0.50	U	0.50	U	0.40	U	1.00	U	0.50	U
Zinc	410	2,783	3,800	67.00		63.00		63.00		72.00		76.00	
PAHs (µg/kg dw)													
Naphthalene	2,100	—	2,400	18.00	J	19.00	U	19.00	U	19.00	U	18.00	J
2-Methylnaphthalene [1]	670	—	1,900	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Acenaphthylene	560	—	1,300	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Acenaphthene	500	—	2,000	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Fluorene	540	—	3,600	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Phenanthrene	1,500	—	21,000	20.00		19.00	U	19.00	U	19.00	U	16.00	J
Anthracene	960	—	13,000	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Total LPAH	5,200	—	29,000	38.00		19.00	U	19.00	U	19.00	U	34.00	
Fluoranthene	1,700	4,600	30,000	25.00		13.00	J	11.00	J	19.00	U	26.00	
Pyrene	2,600	11,980	16,000	22.00		12.00	J	11.00	J	19.00	U	21.00	
Benzo(a)anthracene	1,300	—	5,100	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Chrysene	1,400	—	21,000	10.00	J	19.00	U	19.00	U	19.00	U	10.00	J
Benzo(a)pyrene	1,600	—	3,600	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Indeno(1,2,3-cd)pyrene	600	—	4,400	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Dibenz(a,h)anthracene	230	—	1,900	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Benzo(g,h,i)perylene	670	—	3,200	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Total Benzofluoranthenes	3,200	—	9,900	15.00	J	19.00	U	19.00	U	19.00	U	17.00	J
Total HPAH	12,000	—	69,000	72.00		25.00		22.00		19.00	U	74.00	
Chlorinated Hydrocarbons (µg/kg dw)													
1,4-Dichlorobenzene	110	—	120	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
1,2-Dichlorobenzene	35	—	110	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
1,2,4-Trichlorobenzene	31	—	64	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Hexachlorobenzene	22	168	230	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Phthalates (µg/kg dw)													
Dimethylphthalate	71	—	1,400	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Diethylphthalate	200	—	1,200	48.00	U	47.00	U	48.00	U	47.00	U	48.00	U
Di-n-Butylphthalate	1,400	—	5,100	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Butylbenzylphthalate	63	—	970	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	24.00	U	23.00	U	24.00	U	15.00	J	15.00	J
Di-n-Octyl phthalate	6,200	—	6,200	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Phenols (µg/kg dw)													
Phenol	420.00	—	1200.00	48.00		13.00	J	30.00		19.00	U	20.00	
2-Methylphenol	63.00	—	77.00	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
4-Methylphenol	670.00	—	3600.00	19.00	J	16.00	J	13.00	J	38.00	U	30.00	J
2,4-Dimethylphenol	29.00	—	210.00	19.00	UJ	19.00	UJ	19.00	UJ	19.00	UJ	19.00	UJ
Pentachlorophenol	400.00	504.00	690.00	190.00	U	190.00	UJ	190.00	UJ	190.00	UJ	190.00	UJ

Table 5-4. Analytical Results for Hoquiam Reach: DMMUs 22-29 (from SEE, 2013)

Compound	SL	BT	ML	HC-22		HC-23		HC-73 (HC23 Dup)		HC-24		HC-25	
				Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
Miscellaneous Extractables (µg/kg dw)													
Benzyl Alcohol	57	—	870	19.00	U	19.00	U	19.00	U	19.00	U	16.00	J
Benzoic Acid	650	—	760	380.00	U	380.00	U	390.00	U	380.00	U	380.00	U
Dibenzofuran	540	—	1,700	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
N-Nitrosodiphenylamine	28	—	130	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Heptachlor	1.5	—	—	0.49	UJ	0.50	UJ	0.49	UJ	0.49	UJ	0.48	UJ
Hexachlorobutadiene	11	—	270	0.49	U	0.50	U	0.49	U	0.49	U	0.48	U
Pesticides and PCBs (µg/kg dw)													
Aldrin	9.5	—	—	0.49	U	0.50	U	0.49	U	0.49	U	0.48	U
Dieldrin	1.9	—	—	0.98	U	0.99	U	0.98	U	0.98	U	0.96	U
4,4 -DDE	16	—	—	0.98	U	0.99	U	0.98	U	0.98	U	0.96	U
4,4 -DDD	9	—	—	0.98	U	0.99	U	0.98	U	0.98	U	0.96	U
4,4 -DDT	12	—	—	0.98	UJ	0.99	U	0.98	U	0.98	U	0.96	UJ
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.98	UJ	0.99	U	0.98	U	0.98	U	0.96	UJ
trans-Chlordane	—	—	—	1.10	U	0.50	U	0.49	U	0.49	U	0.86	U
cis-Chlordane	—	—	—	0.49	U	0.50	U	0.49	U	0.49	U	0.48	U
oxy Chlordane	—	—	—	2.00	U	2.00	U	2.00	U	2.00	U	1.90	U
cis-Nonachlor	—	—	—	2.00	U	2.00	U	2.00	U	2.00	U	1.90	U
trans-Nonachlor	—	—	—	2.00	U	2.00	U	2.00	U	2.00	U	1.90	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	2.00	U	2.00	U	2.00	U	2.00	U	1.90	U
Aroclor 1016	—	—	—	9.50	U	9.90	U	9.90	U	9.80	U	9.60	U
Aroclor 1242	—	—	—	9.50	U	9.90	U	9.90	U	9.80	U	9.60	U
Aroclor 1248	—	—	—	9.50	U	9.90	U	9.90	U	9.80	U	9.60	U
Aroclor 1254	—	—	—	9.50	U	9.90	U	9.90	U	9.80	U	9.60	U
Aroclor 1260	—	—	—	9.50	U	9.90	U	9.90	U	9.80	U	9.60	U
Aroclor 1221	—	—	—	9.50	U	9.90	U	9.90	U	9.80	U	9.60	U
Aroclor 1232	—	—	—	9.50	U	9.90	U	9.90	U	9.80	U	9.60	U
Aroclor 1262	—	—	—	9.50	U	9.90	U	9.90	U	9.80	U	9.60	U
Aroclor 1268	—	—	—	9.50	U	9.90	U	9.90	U	9.80	U	9.60	U
Total PCBs	130	38 (2)	3,100	9.50	U	9.90	U	9.90	U	9.80	U	9.6	U
Dioxins and Furans (pg/g) [3]													
2,3,7,8-TCDD	—	—	—	1.710		1.300	U	1.540		1.000		2.000	
1,2,3,7,8-PeCDD	—	—	—	2.130		1.840	J	1.930	J	1.210	J	2.900	J
1,2,3,4,7,8-HxCDD	—	—	—	0.492	J	4.560		4.560		2.960		7.400	
1,2,3,6,7,8-HxCDD	—	—	—	1.840	J	1.310	U	1.530	J	0.913	J	2.290	
1,2,3,7,8,9-HxCDD	—	—	—	5.200		0.305	U	0.317	U	0.300	J	0.747	J
1,2,3,4,6,7,8-HpCDD	—	—	—	20.800	J	17.100		18.000		11.200		27.400	
OCDD	—	—	—	121.000	J	97.800		105.000		62.000		154.000	
2,3,7,8-TCDF	—	—	—	0.766	J	0.592	U	0.665	J	0.211	U	0.599	J
1,2,3,7,8-PeCDF	—	—	—	0.163	U	0.144	U	0.179	U	0.082	U	0.180	U
2,3,4,7,8-PeCDF	—	—	—	0.238	J	0.292	J	0.325	J	0.172	U	0.255	U
1,2,3,4,7,8-HxCDF	—	—	—	0.335	J	0.149	U	0.153	U	0.085	U	0.163	U
1,2,3,6,7,8-HxCDF	—	—	—	0.226	U	0.051	J	0.049	U	0.041	U	0.142	J
2,3,4,6,7,8-HxCDF	—	—	—	0.232	U	0.211	J	0.205	J	0.085	U	0.234	J
1,2,3,7,8,9-HxCDF	—	—	—	0.081	J	0.267	J	0.291	J	0.111	U	0.360	J
1,2,3,4,6,7,8-HpCDF	—	—	—	5.880		0.161	U	0.232	J	0.100	U	0.252	U
1,2,3,4,7,8,9-HpCDF	—	—	—	0.278	J	5.280		5.700		2.760		6.790	
OCDF	—	—	—	8.630		6.820		7.220		3.300	U	12.200	

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

3. *Value exceeds the DMMP screening level*

4. nv = no value. Sulfides were not taken for blind field replicates

Table 5-4. Analytical Results for Hoquiam Reach: DMMUs 22-29 (from SEE, 2013)

Compound	SL	BT	ML	HC-26		HC-27		HC-57 (HC27 Dup)		HC-28		HC/CP-29	
				Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
Conventionals													
Total Solids (%)	—	—	—	59.80		61.90		60.00		60.70		56.90	
Total Volatile Solids (%)	—	—	—	5.14		5.76		6.63		4.75		5.90	
N-Ammonia (mg-N/kg)	—	—	—	148.00		74.90		74.70		82.40		113.00	
Sulfide (mg/kg)	—	—	—	441.00		874.00		n.v. [5]		735.00		1390.00	
Total Organic Carbon (%)	—	—	—	1.81		1.51		1.59		1.53		1.68	
Gravel (%)	—	—	—	0.20		0.40		0.40		0.30		0.60	
Sand (%)	—	—	—	49.90		60.30		59.30		59.40		43.40	
Silt (%)	—	—	—	36.80		27.20		27.60		29.10		40.00	
Clay (%)	—	—	—	13.00		12.30		12.80		11.10		16.10	
Fines (%)	—	—	—	49.80		39.50		40.40		40.20		56.10	
Metals (mg/kg dw)													
Antimony	150	—	200	8.00	UJ	8.00	UJ	8.00	UJ	20.00	UJ	8.00	UJ
Arsenic	57	507.1	700	8.00	U	8.00	U	8.00	U	20.00	U	8.00	U
Cadmium	5.1	11.3	14	0.30	U	0.30	U	0.30	U	0.80	U	0.30	U
Chromium	260	260	—	36.70		37.10		36.40		38.00		33.00	
Copper	390	1,027	1,300	51.60		49.00		51.20		51.60		40.30	
Lead	450	975	1,200	5.00		5.00		5.00		8.00	U	4.00	
Mercury	0.41	1.5	2.3	0.05		0.04		0.03	U	0.04		0.04	
Selenium	—	3	—	0.80	U	0.80	U	0.80	U	0.80	U	0.70	U
Silver	6.1	6.1	8.4	0.50	U	0.50	U	0.50	U	1.00	U	0.50	U
Zinc	410	2,783	3,800	76.00		72.00		75.00		79.00		67.00	
PAHs (µg/kg dw)													
Naphthalene	2,100	—	2,400	15.00	J	30.00		22.00		15.00	J	22.00	
2-Methylnaphthalene [1]	670	—	1,900	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Acenaphthylene	560	—	1,300	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Acenaphthene	500	—	2,000	19.00	U	19.00	U	12.00	J	19.00	U	19.00	U
Fluorene	540	—	3,600	19.00	U	19.00	U	9.40	J	19.00	U	19.00	U
Phenanthrene	1,500	—	21,000	12.00	J	49.00		20.00		17.00	J	16.00	J
Anthracene	960	—	13,000	19.00	U	19.00	U	13.00	J	19.00	U	19.00	U
Total LPAH	5,200	—	29,000	27.00		79.00		76.40		32.00		38.00	
Fluoranthene	1,700	4,600	30,000	18.00	J	76.00	J	23.00	J	23.00		24.00	
Pyrene	2,600	11,980	16,000	15.00	J	63.00	J	22.00	J	22.00		23.00	
Benzo(a)anthracene	1,300	—	5,100	19.00	U	41.00	J	19.00	UJ	19.00	U	19.00	U
Chrysene	1,400	—	21,000	19.00	U	41.00	J	19.00	UJ	19.00	U	19.00	U
Benzo(a)pyrene	1,600	—	3,600	19.00	U	34.00		19.00	U	19.00	U	19.00	U
Indeno(1,2,3-cd)pyrene	600	—	4,400	19.00	U	16.00	J	19.00	U	19.00	U	19.00	U
Dibenz(a,h)anthracene	230	—	1,900	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Benzo(g,h,i)perylene	670	—	3,200	19.00	U	16.00	J	19.00	U	19.00	U	19.00	U
Total Benzofluoranthenes	3,200	—	9,900	19.00	U	72.00	J	10.00	J	19.00	U	12.00	J
Total HPAH	12,000	—	69,000	33.00		359.00		55.00		45.00		59.00	
Chlorinated Hydrocarbons (µg/kg dw)													
1,4-Dichlorobenzene	110	—	120	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
1,2-Dichlorobenzene	35	—	110	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
1,2,4-Trichlorobenzene	31	—	64	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Hexachlorobenzene	22	168	230	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Phthalates (µg/kg dw)													
Dimethylphthalate	71	—	1,400	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Diethylphthalate	200	—	1,200	47.00	U	48.00	U	47.00	U	47.00	U	48.00	U
Di-n-Butylphthalate	1,400	—	5,100	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Butylbenzylphthalate	63	—	970	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	17.00	J	24.00	U	24.00	U	23.00	U	24.00	U
Di-n-Octyl phthalate	6,200	—	6,200	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Phenols (µg/kg dw)													
Phenol	420.00	—	1200.00	18.00	J	24.00		33.00		52.00		36.00	
2-Methylphenol	63.00	—	77.00	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
4-Methylphenol	670.00	—	3600.00	15.00	J	39.00		67.00		37.00		18.00	J
2,4-Dimethylphenol	29.00	—	210.00	19.00	UJ	19.00	UJ	19.00	UJ	19.00	UJ	19.00	UJ
Pentachlorophenol	400.00	504.00	690.00	190.00	UJ	190.00	U	190.00	U	190.00	U	190.00	U

Table 5-4. Analytical Results for Hoquiam Reach: DMMUs 22-29 (from SEE, 2013)

Compound	SL	BT	ML	HC-26		HC-27		HC-57 (HC27 Dup)		HC-28		HC/CP-29	
				Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
Miscellaneous Extractables (µg/kg dw)													
Benzyl Alcohol	57	—	870	14.00	J	19.00	U	24.00		12.00	J	11.00	J
Benzoic Acid	650	—	760	380.00	U	390.00	U	380.00	U	370.00	U	380.00	U
Dibenzofuran	540	—	1,700	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
N-Nitrosodiphenylamine	28	—	130	19.00	U	19.00	U	19.00	U	19.00	U	19.00	U
Heptachlor	1.5	—	—	0.48	UJ	0.50	UJ	0.49	UJ	0.46	UJ	0.48	UJ
Hexachlorobutadiene	11	—	270	0.48	U	0.50	U	0.49	U	0.46	U	0.48	U
Pesticides and PCBs (µg/kg dw)													
Aldrin	9.5	—	—	0.48	U	0.50	U	0.49	U	0.46	U	0.48	U
Dieldrin	1.9	—	—	0.97	U	0.99	U	0.98	U	0.92	U	0.96	U
4,4 -DDE	16	—	—	0.97	U	0.99	U	0.98	U	0.92	U	0.96	U
4,4 -DDD	9	—	—	0.97	U	0.99	U	0.98	U	0.92	U	0.96	U
4,4 -DDT	12	—	—	0.97	U	1.50	UJ	0.98	UJ	0.92	UJ	0.96	UJ
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.97	U	1.50	UJ	0.98	UJ	0.92	UJ	0.96	UJ
trans-Chlordane	—	—	—	0.90	U	0.50	U	0.49	U	0.99	U	1.50	U
cis-Chlordane	—	—	—	0.48	U	0.50	U	0.49	U	0.46	U	0.48	U
oxy Chlordane	—	—	—	1.90	U	2.00	U	2.00	U	1.80	U	1.90	U
cis-Nonachlor	—	—	—	1.90	U	2.00	U	2.00	U	1.80	U	1.90	U
trans-Nonachlor	—	—	—	1.90	U	2.00	U	2.00	U	1.80	U	1.90	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	1.90	U	2.00	U	2.00	U	1.80	U	1.90	U
Aroclor 1016	—	—	—	9.60	U	9.60	U	9.60	U	9.50	U	9.90	U
Aroclor 1242	—	—	—	9.60	U	9.60	U	9.60	U	9.50	U	9.90	U
Aroclor 1248	—	—	—	9.60	U	9.60	U	9.60	U	9.50	U	9.90	U
Aroclor 1254	—	—	—	9.60	U	9.60	U	9.60	U	9.50	U	9.90	U
Aroclor 1260	—	—	—	9.60	U	9.60	U	9.60	U	9.50	U	9.90	U
Aroclor 1221	—	—	—	9.60	U	9.60	U	9.60	U	9.50	U	9.90	U
Aroclor 1232	—	—	—	9.60	U	9.60	U	9.60	U	9.50	U	9.90	U
Aroclor 1262	—	—	—	9.60	U	9.60	U	9.60	U	9.50	U	9.90	U
Aroclor 1268	—	—	—	9.60	U	9.60	U	9.60	U	9.50	U	9.90	U
Total PCBs	130	38 (2)	3,100	9.6	U	9.6	U	9.6	U	9.5	U	9.9	U
Dioxins and Furans (pg/g) 3													
2,3,7,8-TCDD	—	—	—	1.210	U	3.240		1.370		1.770		0.993	U
1,2,3,7,8-PeCDD	—	—	—	1.730	J	4.440		1.690		2.220		1.280	
1,2,3,4,7,8-HxCDD	—	—	—	3.760		0.866	J	0.287	U	0.548	U	0.264	U
1,2,3,6,7,8-HxCDD	—	—	—	1.280	J	3.370		1.380	J	1.940	J	1.120	J
1,2,3,7,8,9-HxCDD	—	—	—	0.407	J	11.300	J	3.970	J	5.270		3.120	
1,2,3,4,6,7,8-HpCDD	—	—	—	15.700		40.000	J	16.900	J	19.400	J	10.800	J
OCDD	—	—	—	102.000		233.000	J	111.000	J	108.000	J	63.100	J
2,3,7,8-TCDF	—	—	—	0.368	J	0.800	J	0.547	J	0.508	J	0.260	J
1,2,3,7,8-PeCDF	—	—	—	0.131	U	0.199	U	0.020	U	0.125	J	0.097	U
2,3,4,7,8-PeCDF	—	—	—	0.228	U	0.270	J	0.157	J	0.155	U	0.107	U
1,2,3,4,7,8-HxCDF	—	—	—	0.091	U	0.495	J	0.270	U	0.225	U	0.311	J
1,2,3,6,7,8-HxCDF	—	—	—	0.084	J	0.371	J	0.215	J	0.191	J	0.180	J
2,3,4,6,7,8-HxCDF	—	—	—	0.211	J	0.232	U	0.276	J	0.247	U	0.111	U
1,2,3,7,8,9-HxCDF	—	—	—	0.261	J	0.099	U	0.022	U	0.036	U	0.083	J
1,2,3,4,6,7,8-HpCDF	—	—	—	0.201	U	9.210		7.050		4.520		3.370	
1,2,3,4,7,8,9-HpCDF	—	—	—	4.680		0.411	J	0.138	U	0.233	J	0.155	U
OCDF	—	—	—	7.980		16.700		8.700		7.580		5.930	

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

3. *Value exceeds the DMMP screening level*

4. nv = no value. Sulfides were not taken for blind field replicates

Table 5-5. Analytical Results for Cow Point: DMMUs 30 - 36 (from SEE, 2013)

Compound	SL	BT	ML	CP-30		CP-31		CP-32		CP-33	
				Value	Q	Value	Q	Value	Q	Value	Q
Conventionals											
Total Solids (%)	—	—	—	57.6		54.4		52.2		47.8	
Total Volatile Solids (%)	—	—	—	6.9		7.0		7.9		8.4	
N-Ammonia (mg-N/kg)	—	—	—	179.0		157.0		210.0		115.0	
Sulfide (mg/kg)	—	—	—	501.0		920.0		509.0		70.2	
Total Organic Carbon (%)	—	—	—	1.6		1.9		2.0		2.4	
Gravel (%)	—	—	—	0.1		0.1		0.6		5.9	
Sand (%)	—	—	—	23.8		19.7		25.5		15.3	
Silt (%)	—	—	—	51.7		57.0		49.6		48.2	
Clay (%)	—	—	—	24.5		23.4		24.2		30.6	
Fines (%)	—	—	—	76.2		80.4		73.8		78.8	
Metals (mg/kg dw)											
Antimony	150	—	200	8.00	UJ	9.00	UJ	10.00	UJ	10.00	UJ
Arsenic	57	507.1	700	8.00	U	9.00	U	10.00	U	10.00	U
Cadmium	5.1	11.3	14	0.30	U	0.30	U	0.40	U	0.40	U
Chromium	260	260	—	38.40		40.10		44.00		48.00	
Copper	390	1,027	1,300	61.90		65.00		71.60		82.80	
Lead	450	975	1,200	6.00		6.00		6.00		7.00	
Mercury	0.41	1.5	2.3	0.05		0.06		0.05		0.06	
Selenium	—	3	—	0.80	U	0.90	U	0.90	U	1.00	U
Silver	6.1	6.1	8.4	0.50	U	0.50	U	0.60	U	0.60	U
Zinc	410	2,783	3,800	77.00		83.00		86.00		93.00	
PAHs (µg/kg dw)											
Naphthalene	2,100	—	2,400	19.00		32.00		30.00		49.00	
2-Methylnaphthalene [1]	670	—	1,900	19.00	U	10.00	J	12.00	J	13.00	J
Acenaphthylene	560	—	1,300	19.00	U	19.00	U	19.00	U	18.00	U
Acenaphthene	500	—	2,000	19.00	U	19.00	U	19.00	U	18.00	U
Fluorene	540	—	3,600	19.00	U	9.40	J	14.00	J	18.00	U
Phenanthrene	1,500	—	21,000	23.00		28.00		30.00		27.00	
Anthracene	960	—	13,000	19.00	U	19.00	U	19.00	U	18.00	U
Total LPAH	5,200	—	29,000	42.00		60.00		60.00		76.00	
Fluoranthene	1,700	4,600	30,000	32.00		35.00		33.00		30.00	
Pyrene	2,600	11,980	16,000	28.00		33.00		27.00		28.00	
Benzo(a)anthracene	1,300	—	5,100	10.00	J	19.00	U	19.00	U	18.00	U
Chrysene	1,400	—	21,000	12.00	J	13.00	J	13.00	J	13.00	J
Benzo(a)pyrene	1,600	—	3,600	19.00	U	19.00	U	19.00	U	18.00	U
Indeno(1,2,3-cd)pyrene	600	—	4,400	19.00	U	19.00	U	19.00	U	18.00	U
Dibenz(a,h)anthracene	230	—	1,900	19.00	U	19.00	U	19.00	U	18.00	U
Benzo(g,h,i)perylene	670	—	3,200	19.00	U	19.00	U	11.00	J	18.00	U
Total Benzofluoranthenes	3,200	—	9,900	20.00		24.00		20.00		21.00	
Total HPAH	12,000	—	69,000	122.00		105.00		104.00		92.00	
Chlorinated Hydrocarbons (µg/kg dw)											
1,4-Dichlorobenzene	110	—	120	19.00	U	19.00	U	16.00	J	18.00	U
1,2-Dichlorobenzene	35	—	110	19.00	U	19.00	U	19.00	U	18.00	U
1,2,4-Trichlorobenzene	31	—	64	19.00	U	19.00	U	19.00	U	18.00	U
Hexachlorobenzene	22	168	230	19.00	U	19.00	U	19.00	U	18.00	U
Phthalates (µg/kg dw)											
Dimethylphthalate	71	—	1,400	19.00	U	19.00	U	19.00	U	18.00	U
Diethylphthalate	200	—	1,200	47.00	U	47.00	U	47.00	U	46.00	U
Di-n-Butylphthalate	1,400	—	5,100	19.00	U	19.00	U	19.00	U	18.00	U
Butylbenzylphthalate	63	—	970	19.00	U	19.00	U	19.00	U	10.00	J
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	24.00	U	24.00	U	24.00	U	23.00	U
Di-n-Octyl phthalate	6,200	—	6,200	19.00	U	19.00	U	19.00	U	18.00	U
Phenols (µg/kg dw)											
Phenol	420	—	1,200	130.00		120.00		56.00		100.00	
2-Methylphenol	63	—	77	19.00	U	19.00	U	11.00	J	18.00	U
4-Methylphenol	670	—	3,600	26.00	J	30.00	J	42.00		66.00	
2,4-Dimethylphenol	29	—	210	19.00	UJ	19.00	UJ	19.00	UJ	18.00	UJ
Pentachlorophenol	400	504	690	190.00	U	190.00	U	190.00	U	180.00	U

Table 5-5. Analytical Results for Cow Point: DMMUs 30 - 36 (from SEE, 2013)

Compound	SL	BT	ML	CP-30		CP-31		CP-32		CP-33	
				Value	Q	Value	Q	Value	Q	Value	Q
Miscellaneous Extractables (µg/kg dw)											
Benzyl Alcohol	57	—	870	26.00		35.00		*100.00*		*110.00*	
Benzoic Acid	650	—	760	110.00	J	150.00	J	210.00	J	380.00	
Dibenzofuran	540	—	1,700	19.00	U	19.00	U	19.00	U	18.00	U
N-Nitrosodiphenylamine	28	—	130	19.00	U	19.00	U	19.00	U	18.00	U
Heptachlor	1.5	—	—	0.47	UJ	0.48	UJ	0.47	UJ	0.49	UJ
Hexachlorobutadiene	11	—	270	0.47	U	0.48	U	0.47	U	0.49	U
Pesticides and PCBs (µg/kg dw)											
Aldrin	9.5	—	—	0.47	U	0.48	U	0.47	U	0.49	U
Dieldrin	1.9	—	—	0.95	U	0.97	U	0.94	U	0.97	U
4,4 -DDE	16	—	—	0.95	U	0.97	U	0.94	U	0.97	U
4,4 -DDD	9	—	—	0.95	U	0.97	U	0.94	U	0.97	U
4,4 -DDT	12	—	—	0.95	UJ	0.97	UJ	0.94	UJ	0.97	UJ
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.95	UJ	0.97	UJ	0.94	UJ	0.97	UJ
trans-Chlordane	—	—	—	1.60	U	1.20	U	1.50	U	1.90	U
cis-Chlordane	—	—	—	0.47	U	0.48	U	0.47	U	0.49	U
oxy Chlordane	—	—	—	1.90	U	1.90	U	1.90	U	1.90	U
cis-Nonachlor	—	—	—	1.90	U	1.90	U	1.90	U	1.90	U
trans-Nonachlor	—	—	—	1.90	U	1.90	U	1.90	U	1.90	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	1.90	U	1.90	U	1.90	U	1.90	U
Aroclor 1016	—	—	—	9.40	U	9.90	U	9.30	U	9.60	U
Aroclor 1242	—	—	—	9.40	U	9.90	U	9.30	U	9.60	U
Aroclor 1248	—	—	—	9.40	U	9.90	U	9.30	U	9.60	U
Aroclor 1254	—	—	—	9.40	U	9.90	U	9.30	U	9.60	U
Aroclor 1260	—	—	—	9.40	U	9.90	U	9.30	U	9.60	U
Aroclor 1221	—	—	—	9.40	U	9.90	U	9.30	U	9.60	U
Aroclor 1232	—	—	—	9.40	U	9.90	U	9.30	U	9.60	U
Aroclor 1262	—	—	—	9.40	U	9.90	U	9.30	U	9.60	U
Aroclor 1268	—	—	—	9.40	U	9.90	U	9.30	U	9.60	U
Total PCBs	130	38 (2)	3,100	9.40	U	9.90	U	9.30	U	9.60	U
Dioxins and Furans (pg/g) [3]											
2,3,7,8-TCDD	—	—	—	0.321	U	2.710		2.680		0.415	U
1,2,3,7,8-PeCDD	—	—	—	0.376	U	3.930		3.560		0.532	U
1,2,3,4,7,8-HxCDD	—	—	—	0.016	U	0.655	U	0.707	J	0.140	J
1,2,3,6,7,8-HxCDD	—	—	—	0.422	J	2.950		2.520		0.463	J
1,2,3,7,8,9-HxCDD	—	—	—	1.010	J	9.830		7.890		1.240	J
1,2,3,4,6,7,8-HpCDD	—	—	—	7.490	J	35.000	J	25.500	J	5.760	J
OCDD	—	—	—	55.800	J	210.000	J	129.000	J	34.600	J
2,3,7,8-TCDF	—	—	—	0.111	U	0.804	J	0.839	J	0.158	J
1,2,3,7,8-PeCDF	—	—	—	0.011	U	0.166	J	0.221	U	0.011	U
2,3,4,7,8-PeCDF	—	—	—	0.018	U	0.267	U	0.301	J	0.066	J
1,2,3,4,7,8-HxCDF	—	—	—	0.109	J	0.507	J	0.476	J	0.050	U
1,2,3,6,7,8-HxCDF	—	—	—	0.059	U	0.370	U	0.353	J	0.050	J
2,3,4,6,7,8-HxCDF	—	—	—	0.052	U	0.529	J	0.287	J	0.040	U
1,2,3,7,8,9-HxCDF	—	—	—	0.018	U	0.105	J	0.127	J	0.017	U
1,2,3,4,6,7,8-HpCDF	—	—	—	2.650		9.610		6.920		1.740	J
1,2,3,4,7,8,9-HpCDF	—	—	—	0.020	U	0.396	J	0.285	U	0.064	U
OCDF	—	—	—	4.940		18.000		11.900		3.220	J

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

3. *Value exceeds the DMMP screening level*

Table 5-5. Analytical Results for Cow Point: DMMUs 30 - 36 (from SEE, 2013)

Compound	SL	BT	ML	CP-34		CP-35		CP-36	
				Value	Q	Value	Q	Value	Q
Conventionals									
Total Solids (%)	—	—	—	53.9		56.1		54.4	
Total Volatile Solids (%)	—	—	—	7.3		7.1		7.8	
N-Ammonia (mg-N/kg)	—	—	—	102.0		150.0		82.2	
Sulfide (mg/kg)	—	—	—	247.0		879.0		797.0	
Total Organic Carbon (%)	—	—	—	2.0		1.5		2.2	
Gravel (%)	—	—	—	5.1		32.5		42.5	
Sand (%)	—	—	—	32.2		20.9		16.5	
Silt (%)	—	—	—	46.0		31.2		27.4	
Clay (%)	—	—	—	16.8		15.3		13.6	
Fines (%)	—	—	—	62.8		46.5		41.0	
Metals (mg/kg dw)									
Antimony	150	—	200	9.00	UJ	20.00	UJ	9.00	UJ
Arsenic	57	507.1	700	9.00	U	20.00	U	9.00	U
Cadmium	5.1	11.3	14	0.40	U	0.90	U	0.30	U
Chromium	260	260	—	41.80		42.00		39.90	
Copper	390	1,027	1,300	66.90		61.90		62.40	
Lead	450	975	1,200	6.00		9.00	U	6.00	
Mercury	0.41	1.5	2.3	0.06		0.06		0.06	
Selenium	—	3	—	0.90	U	0.90	U	0.90	U
Silver	6.1	6.1	8.4	0.60	U	1.00	U	0.50	U
Zinc	410	2,783	3,800	82.00		83.00		80.00	
PAHs (µg/kg dw)									
Naphthalene	2,100	—	2,400	23.00		17.00	J	20.00	
2-Methylnaphthalene [1]	670	—	1,900	9.60	J	19.00	U	19.00	U
Acenaphthylene	560	—	1,300	19.00	U	19.00	U	19.00	U
Acenaphthene	500	—	2,000	19.00	U	19.00	U	19.00	U
Fluorene	540	—	3,600	19.00	U	19.00	U	19.00	U
Phenanthrene	1,500	—	21,000	25.00		22.00		50.00	
Anthracene	960	—	13,000	19.00	U	19.00	U	9.60	J
Total LPAH	5,200	—	29,000	48.00		39.00		79.60	
Fluoranthene	1,700	4,600	30,000	31.00		30.00		58.00	
Pyrene	2,600	11,980	16,000	26.00		26.00		63.00	
Benzo(a)anthracene	1,300	—	5,100	19.00	U	19.00	U	24.00	
Chrysene	1,400	—	21,000	12.00	J	19.00	U	24.00	
Benzo(a)pyrene	1,600	—	3,600	19.00	U	19.00	U	23.00	
Indeno(1,2,3-cd)pyrene	600	—	4,400	19.00	U	19.00	U	9.60	J
Dibenz(a,h)anthracene	230	—	1,900	19.00	U	19.00	U	19.00	U
Benzo(g,h,i)perylene	670	—	3,200	19.00	U	19.00	U	13.00	J
Total Benzofluoranthenes	3,200	—	9,900	18.00	J	13.00	J	30.00	
Total HPAH	12,000	—	69,000	87.00		69.00		244.60	
Chlorinated Hydrocarbons (µg/kg dw)									
1,4-Dichlorobenzene	110	—	120	19.00	U	19.00	U	19.00	U
1,2-Dichlorobenzene	35	—	110	19.00	U	19.00	U	19.00	U
1,2,4-Trichlorobenzene	31	—	64	19.00	U	19.00	U	19.00	U
Hexachlorobenzene	22	168	230	19.00	U	19.00	U	19.00	U
Phthalates (µg/kg dw)									
Dimethylphthalate	71	—	1,400	19.00	U	19.00	U	19.00	U
Diethylphthalate	200	—	1,200	48.00	U	47.00	U	48.00	U
Di-n-Butylphthalate	1,400	—	5,100	19.00	U	19.00	U	19.00	U
Butylbenzylphthalate	63	—	970	19.00	U	19.00	U	19.00	U
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	24.00	U	19.00	J	16.00	J
Di-n-Octyl phthalate	6,200	—	6,200	19.00	U	19.00	U	19.00	U
Phenols (µg/kg dw)									
Phenol	420	—	1,200	40.00		22.00		23.00	
2-Methylphenol	63	—	77	19.00	U	19.00	U	19.00	U
4-Methylphenol	670	—	3,600	110.00		20.00	J	24.00	J
2,4-Dimethylphenol	29	—	210	19.00	UJ	19.00	UJ	19.00	UJ
Pentachlorophenol	400	504	690	190.00	U	190.00	UJ	190.00	UJ

Table 5-5. Analytical Results for Cow Point: DMMUs 30 - 36 (from SEE, 2013)

Compound	SL	BT	ML	CP-34		CP-35		CP-36	
				Value	Q	Value	Q	Value	Q
Miscellaneous Extractables (µg/kg dw)									
Benzyl Alcohol	57	—	870	53.00		24.00		32.00	
Benzoic Acid	650	—	760	280.00	J	380.00	U	150.00	J
Dibenzofuran	540	—	1,700	19.00	U	19.00	U	19.00	U
N-Nitrosodiphenylamine	28	—	130	19.00	U	19.00	U	19.00	U
Heptachlor	1.5	—	—	0.47	UJ	0.49	UJ	*3.80*	*UJ*
Hexachlorobutadiene	11	—	270	0.47	U	0.49	U	0.48	U
Pesticides and PCBs (µg/kg dw)									
Aldrin	9.5	—	—	0.47	U	0.49	U	0.48	U
Dieldrin	1.9	—	—	0.93	U	0.98	U	0.95	U
4,4 -DDE	16	—	—	0.93	U	0.98	U	1.40	U
4,4 -DDD	9	—	—	0.93	U	0.98	U	0.95	U
4,4 -DDT	12	—	—	0.93	UJ	0.98	U	0.95	UJ
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.93	UJ	0.98	U	0.95	UJ
trans-Chlordane	—	—	—	1.10	U	1.00	U	0.99	U
cis-Chlordane	—	—	—	0.47	U	0.49	U	0.48	U
oxy Chlordane	—	—	—	1.90	U	2.00	U	1.90	U
cis-Nonachlor	—	—	—	1.90	U	2.00	U	1.90	U
trans-Nonachlor	—	—	—	1.90	U	2.00	U	1.90	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	1.90	U	2.00	U	1.90	U
Aroclor 1016	—	—	—	9.40	U	9.70	U	9.60	U
Aroclor 1242	—	—	—	9.40	U	9.70	U	9.60	U
Aroclor 1248	—	—	—	9.40	U	9.70	U	9.60	U
Aroclor 1254	—	—	—	9.40	U	9.70	U	9.60	U
Aroclor 1260	—	—	—	9.40	U	9.70	U	9.60	U
Aroclor 1221	—	—	—	9.40	U	9.70	U	9.60	U
Aroclor 1232	—	—	—	9.40	U	9.70	U	9.60	U
Aroclor 1262	—	—	—	9.40	U	9.70	U	9.60	U
Aroclor 1268	—	—	—	9.40	U	9.70	U	9.60	U
Total PCBs	130	38 (2)	3,100	9.40	U	9.70	U	9.60	U
Dioxins and Furans (pg/g) 3									
2,3,7,8-TCDD	—	—	—	0.859	U	1.960		2.450	
1,2,3,7,8-PeCDD	—	—	—	1.030		2.710	J	3.430	J
1,2,3,4,7,8-HxCDD	—	—	—	0.165	U	6.830		7.760	
1,2,3,6,7,8-HxCDD	—	—	—	0.784	J	2.500		2.760	
1,2,3,7,8,9-HxCDD	—	—	—	2.430		0.664	J	0.827	J
1,2,3,4,6,7,8-HpCDD	—	—	—	9.570	J	31.900		36.800	
OCDD	—	—	—	58.000	J	197.000		227.000	
2,3,7,8-TCDF	—	—	—	0.177	U	0.709	J	0.728	J
1,2,3,7,8-PeCDF	—	—	—	0.031	U	0.202	U	0.262	J
2,3,4,7,8-PeCDF	—	—	—	0.058	U	0.461	U	0.565	U
1,2,3,4,7,8-HxCDF	—	—	—	0.147	J	0.208	J	0.180	U
1,2,3,6,7,8-HxCDF	—	—	—	0.089	U	0.136	U	0.087	U
2,3,4,6,7,8-HxCDF	—	—	—	0.068	U	0.289	U	0.345	U
1,2,3,7,8,9-HxCDF	—	—	—	0.009	U	0.456	J	0.436	U
1,2,3,4,6,7,8-HpCDF	—	—	—	2.660		0.372	U	0.411	U
1,2,3,4,7,8,9-HpCDF	—	—	—	0.082	U	10.700		11.500	
OCDF	—	—	—	4.920		16.900		21.500	

see note below

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

3. *Value exceeds the DMMP screening level*

Due to miscommunication between the Corps of Engineers and the data validator, this SL exceedance was not discovered until the DMMP suitability determination had been finalized. After reviewing the laboratory documentation, it was determined that the correct value for heptachlor is 2.4 U. Had this mistake been discovered during testing, the laboratory would have been instructed to reanalyze this sample in order to bring the detection limit down below the SL.

Table 5-6. Analytical Results for North Bay Reference Sediments (from SEE, 2013)

Compound	SL	BT	ML	NB 040712 01		NB 040712 02	
				Value	Q	Value	Q
Conventionals							
Total Solids (%)	—	—	—	73		58.70	
Total Volatile Solids (%)	—	—	—	2.36		4.14	
N-Ammonia (mg-N/kg)	—	—	—	11.4		9.56	
Sulfide (mg/kg)	—	—	—	10.7	J	112.00	J
Total Organic Carbon (%)	—	—	—	1.15		0.79	
Gravel (%)	—	—	—	0.1	U	0.20	
Sand (%)	—	—	—	91.3		60.00	
Silt (%)	—	—	—	5.5		28.20	
Clay (%)	—	—	—	3.1		11.60	
Fines (%)	—	—	—	8.6		39.80	
Dioxins and Furans (ng/kg)							
2,3,7,8-TCDD	—	—	—	0.146	U	0.415	U
1,2,3,7,8-PeCDD	—	—	—	0.236	U	0.702	J
1,2,3,4,7,8-HxCDD	—	—	—	0.111	J	1.230	U
1,2,3,6,7,8-HxCDD	—	—	—	0.201	U	0.722	J
1,2,3,7,8,9-HxCDD	—	—	—	0.449	U	0.214	U
1,2,3,4,6,7,8-HpCDD	—	—	—	3.510		9.470	
OCDD	—	—	—	22.100		54.600	
2,3,7,8-TCDF	—	—	—	0.195	J	0.380	J
1,2,3,7,8-PeCDF	—	—	—	0.054	U	0.110	U
2,3,4,7,8-PeCDF	—	—	—	0.042	U	0.244	J
1,2,3,4,7,8-HxCDF	—	—	—	0.065	U	0.087	U
1,2,3,6,7,8-HxCDF	—	—	—	0.044	U	0.023	U
2,3,4,6,7,8-HxCDF	—	—	—	0.043	U	0.136	J
1,2,3,7,8,9-HxCDF	—	—	—	0.129	U	0.171	J
1,2,3,4,6,7,8-HpCDF	—	—	—	0.971	U	0.104	J
1,2,3,4,7,8,9-HpCDF	—	—	—	0.303	U	3.250	
OCDF	—	—	—	1.340	J	3.500	U

J - The analyte was detected above the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

Table 6. Toxic Equivalency Factors (TEFs) for PCDDs and PCDFs[1]

	CONGENERS	TOXIC EQUIVALENCY FACTOR (TEF)
Dioxins	2,3,7,8-TCDD	1
	1,2,3,7,8-PeCDD	1
	1,2,3,4,7,8-HxCDD	0.1
	1,2,3,6,7,8-HxCCD	0.1
	1,2,3,7,8,9-HxCDD	0.1
	1,2,3,4,6,7,8-HpCDD	0.01
	OCDD	0.0003
Furans	2,3,7,8-TCDF	0.1
	1,2,3,7,8-PeCDF	0.03
	2,3,4,7,8-PeCDF	0.3
	1,2,3,4,7,8-HxCDF	0.1
	1,2,3,6,7,8-HxCDF	0.1
	2,3,4,6,7,8-HxCDF	0.1
	1,2,3.7,8,9-HxCDF	0.1
	1,2,3,4,6,7,8-HpCDF	0.01
	1,2,3,4,7,8,9-HpCDF	0.01
	OCDF	0.0003

[1] World Health Organization Human and Mammalian TEFs, from van den Berg et al. (2006)

PCDD = polychlorinated dibenzo-p-dioxins
PCDF = polychlorinated dibenzofurans
T = tetra
Pe = penta
Hx = hexa
Hp = hepta
O = octa

Table 7. Dioxin/Furan Toxic Equivalents (TEQs)

Reach	DMMU	Sample ID	TEQ[1]	Units
South Reach	1	GHNIP SR1-P	0.3	ng/kg
South Reach	3	GHNIP SR3-P	0.4	ng/kg
South Reach	4	GHNIP SR4-P	1.0	ng/kg
Crossover	5	GHNIP CO5-P	2.0	ng/kg
Crossover	6	GHNIP CO6-P	1.8	ng/kg
Crossover	7	GHNIP CO7-P	2.5	ng/kg
Crossover	8	GHNIP C08-P	1.0	ng/kg
Crossover	9	GHNIP C09-P	1.8	ng/kg
Crossover	10	GHNIP CO10-P	2.4	ng/kg
Crossover	11	GHNIP CO11-P	2.5	ng/kg
Crossover	12	GHNIP CO12P	2.6	ng/kg
Crossover	13	GHNIP CO13P	2.9	ng/kg
CO/NC	14	GHNIP CO/NC14P	4.6	ng/kg
North Channel	15	GHNIP NC15-P	3.2	ng/kg
North Channel	16	GHNIP NC16P	5.0	ng/kg
North Channel	17	GHNIP NC17P	2.7	ng/kg
North Channel	18	GHNIP NC18P	1.6	ng/kg
North Channel	19	GHNIP NC19-P	1.1	ng/kg
North Channel	20	GHNIP NC20 P	3.6	ng/kg
North Channel	21	GHNIP NC21 P	0.6	ng/kg
Hoquiam Channel	22	GHNIP HC22 P	5.1	ng/kg
Hoquiam Channel	23	GHNIP HC23 P	3.5	ng/kg
Hoquiam Channel	24	GHNIP HC24 P	2.8	ng/kg
Hoquiam Channel	25	GHNIP HC25 P	6.5	ng/kg
Hoquiam Channel	26	GHNIP HC26 P	3.3	ng/kg
Hoquiam Channel	27	GHNIP HC27-P	10.1	ng/kg
Hoquiam Channel	28	GHNIP HC28-P	5.1	ng/kg
HC/CP	29	GHNIP HC/CP29-P	2.5	ng/kg
Cow Point	30	GHNIP CP30-P	0.6	ng/kg
Cow Point	31	GHNIP CP31-P	8.7	ng/kg
Cow Point	32	GHNIP CP32-P	8.0	ng/kg
Cow Point	33	GHNIP CP33P	0.8	ng/kg
Cow Point	34	GHNIP CP34P	2.0	ng/kg
Cow Point	35	GHNIP CP35P	6.4	ng/kg
Cow Point	36	GHNIP CP36P	7.8	ng/kg
North Bay Ref 1	---	GHNIP NB 040712 01	0.3	ng/kg
North Bay Ref 2	---	GHNIP NB 040712 02	1.3	ng/kg

Blind Field Splits

Reach	DMMU	Sample_ID	TEQ[1]	Units
Crossover	5	GHNIP CO5-P	2.0	ng/kg
Crossover	5	GHNIP CO55-P	2.0	ng/kg
Hoquiam Channel	23	GHNIP HC23 P	3.4	ng/kg
Hoquiam Channel	23	GHNIP HC73 P	4.6	ng/kg
Hoquiam Channel	27	GHNIP HC27-P	10.1	ng/kg
Hoquiam Channel	27	GHNIP HC57-P	4.1	ng/kg

ng/kg = nanograms/kilograms (parts per trillion)

[1]TEQs calculated with u = 1/2 detection limit

Table 8. DMMP Solid Phase Bioassay Performance Standards and Evaluation Guidelines.

Bioassay	Negative Control Performance Standard	Reference Sediment Performance Standard	Dispersive Disposal Site Interpretation Guidelines		Nondispersive Disposal Site Interpretation Guidelines	
			1-hit rule	2-hit rule	1-hit rule	2-hit rule
Amphipod	$M_C \leq 10\%$	$M_R - M_C \leq 20\%$	$M_T - M_C > 20\%$ and M_T vs. M_R SS (p=.05) and		$M_T - M_C > 20\%$ and M_T vs. M_R SS (p=.05) and	
			$M_T - M_R > 10\%$	NOCN	$M_T - M_R > 30\%$	NOCN
Larval	$N_C \div I \geq 0.70$	$N_R \div N_C \geq 0.65$	$N_T \div N_C < 0.80$ and N_T/N_C vs. N_R/N_C SS (p=.10) and		$N_T \div N_C < 0.80$ and N_T/N_C vs. N_R/N_C SS (p=.10) and	
			$N_R/N_C - N_T/N_C > 0.15$	NOCN	$N_R/N_C - N_T/N_C > 0.30$	NOCN
Neanthes growth	$M_C \leq 10\%$ and $MIG_C \geq 0.38$	$M_R \leq 20\%$ and $MIG_R \div MIG_C \geq 0.80$	$MIG_T \div MIG_C < 0.80$ and MIG_T vs. MIG_R SS (p=.05) and		$MIG_T \div MIG_C < 0.80$ and MIG_T vs. MIG_R SS (p=.05) and	
			$MIG_T/MIG_R < 0.70$	NOCN	$MIG_T/MIG_R < 0.50$	$MIG_T/MIG_R < 0.70$

M = mortality, N = normal larvae, I = initial count, MIG = mean individual growth rate mg/individual/day)
SS = statistically significant, NOCN = no other conditions necessary, N/A = not applicable
Subscripts: R = reference sediment, C = negative control, T = test sediment

Table 9. Round 1 Amphipod Results - Original

	Sample ID	Replicate	Initial Count	Survivors	Percent Survival	Percent Mortality	Mean Percent Mortality	Hit/No Hit
Batch 1	CP32	1	20	9	45	55	40	XX
	CP32	2	20	10	50	50		
	CP32	3	20	11	55	45		
	CP32	4	20	13	65	35		
	CP32	5	20	17	85	15		
	CP33	1	20	18	90	10	25	XX
	CP33	2	20	11	55	45		
	CP33	3	20	13	65	35		
	CP33	4	20	18	90	10		
	CP33	5	20	15	75	25		
	NB 02	1	20	20	100	0	8	---
	NB 02	2	20	19	95	5		
	NB 02	3	20	18	90	10		
	NB 02	4	20	20	100	0		
	NB 02	5	20	15	75	25		
	control	1	20	19	95	5	1	---
	control	2	20	20	100	0		
	control	3	20	20	100	0		
	control	4	20	20	100	0		
	control	5	20	20	100	0		
Batch 2	SR1	1	20	20	100	0	1	No Hit
	SR1	2	20	20	100	0		
	SR1	3	20	20	100	0		
	SR1	4	20	19	95	5		
	SR1	5	20	20	100	0		
	SR3	1	20	19	95	5	4	No Hit
	SR3	2	20	19	95	5		
	SR3	3	20	18	90	10		
	SR3	4	20	20	100	0		
	SR3	5	20	20	100	0		
	SR4	1	20	19	95	5	3	No Hit
	SR4	2	20	20	100	0		
	SR4	3	20	20	100	0		
	SR4	4	20	19	95	5		
	SR4	5	20	19	95	5		
	CO7	1	20	20	100	0	14	No Hit
	CO7	2	20	14	70	30		
	CO7	3	20	17	85	15		
	CO7	4	20	15	75	25		
	CO7	5	20	20	100	0		
	NB 01	1	20	19	95	5	2	---
	NB 01	2	20	20	100	0		
	NB 01	3	20	19	95	5		
	NB 01	4	20	20	100	0		
	NB 01	5	20	20	100	0		
	control	1	20	20	100	0	1	---
	control	2	20	20	100	0		
	control	3	20	20	100	0		
	control	4	20	19	95	5		
	control	5	20	20	100	0		

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)

Table 10. Round 1 Amphipod Results - Retest of CP32/CP33

	Sample ID	Replicate	Initial Count	Survivors	Percent Survival	Percent Mortality	Mean Percent Mortality	Hit/No Hit
Eohaustorius estuarius	CP32	1	20	15	75	25	15	No Hit
	CP32	2	20	19	95	5		
	CP32	3	20	18	90	10		
	CP32	4	20	16	80	20		
	CP32	5	20	17	85	15		
	CP33	1	20	19	95	5	21	No Hit
	CP33	2	20	14	70	30		
	CP33	3	20	14	70	30		
	CP33	4	20	17	85	15		
	CP33	5	20	15	75	25		
	NB 02	1	20	19	95	5	12	---
	NB 02	2	20	16	80	20		
	NB 02	3	20	19	95	5		
	NB 02	4	20	16	80	20		
	NB 02	5	20	18	90	10		
	control	1	20	18	90	10	6	---
	control	2	20	18	90	10		
	control	3	20	19	95	5		
	control	4	20	20	100	0		
	control	5	20	19	95	5		
Ampelisca abdita	CP32	1	20	16	80	20	23	No Hit
	CP32	2	20	12	60	40		
	CP32	3	20	18	90	10		
	CP32	4	20	17	85	15		
	CP32	5	20	14	70	30		
	CP33	1	20	18	90	10	7	No Hit
	CP33	2	20	17	85	15		
	CP33	3	20	20	100	0		
	CP33	4	20	20	100	0		
	CP33	5	20	18	90	10		
	NB 02	1	20	19	95	5	2	---
	NB 02	2	20	19	95	5		
	NB 02	3	20	20	100	0		
	NB 02	4	20	20	100	0		
	NB 02	5	20	20	100	0		
	control	1	20	20	100	0	4	---
	control	2	20	19	95	5		
	control	3	20	19	95	5		
	control	4	20	18	90	10		
	control	5	20	20	100	0		

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)

Table 11. Round 1 Larval Results - Standard Termination Protocol

	Sample ID	Replicate	Initial Count	Normal Survivors	Combined Mortality and Abnormality	NMCA	Mean NCMA	Hit/No Hit
Batch 1	CP32	1	265	198	67	21.1	21.3	X
	CP32	2	265	195	70	22.2		
	CP32	3	265	200	65	20.3		
	CP32	4	265	214	51	14.7		
	CP32	5	265	180	85	28.2		
	CP33	1	265	195	70	22.2	18.5	No Hit
	CP33	2	265	204	61	18.7		
	CP33	3	265	201	64	19.9		
	CP33	4	265	216	49	13.9		
	CP33	5	265	206	59	17.9		
	NB 02	1	265	244	21	2.7	10.0	---
	NB 02	2	265	235	30	6.3		
	NB 02	3	265	188	77	25.0		
	NB 02	4	265	244	21	2.7		
	NB 02	5	265	217	48	13.5		
	swcontrol	1	265	248	17	1.1	0.0	---
	swcontrol	2	265	256	9	-2.1		
	swcontrol	3	265	249	16	0.7		
	swcontrol	4	265	255	10	-1.7		
	swcontrol	5	265	246	19	1.9		
Batch 2	SR1	1	245	196	49	13.7	13.5	No Hit
	SR1	2	245	190	55	16.4		
	SR1	3	245	173	72	23.9		
	SR1	4	245	228	17	-0.4		
	SR1	5	245	196	49	13.7		
	SR3	1	245	221	24	2.7	6.3	No Hit
	SR3	2	245	249	-4	-9.6		
	SR3	3	245	212	33	6.7		
	SR3	4	245	196	49	13.7		
	SR3	5	245	186	59	18.1		
	SR4	1	245	160	85	29.6	27.8	XX
	SR4	2	245	174	71	23.4		
	SR4	3	245	159	86	30.0		
	SR4	4	245	168	77	26.1		
	SR4	5	245	159	86	30.0		
	CO7	1	245	157	88	30.9	35.3	XX
	CO7	2	245	135	110	40.6		
	CO7	3	245	157	88	30.9		
	CO7	4	245	148	97	34.9		
	CO7	5	245	138	107	39.3		
	NB 01	1	245	204	41	10.2	12.3	---
	NB 01	2	245	189	56	16.8		
	NB 01	3	245	191	54	15.9		
	NB 01	4	245	218	27	4.0		
	NB 01	5	245	194	51	14.6		
	swcontrol	1	245	200	45	12.0	0.0	---
	swcontrol	2	245	220	25	3.2		
	swcontrol	3	245	233	12	-2.6		
	swcontrol	4	245	242	3	-6.5		
	swcontrol	5	245	241	4	-6.1		

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)
NCMA=normalized combined percent mortality and abnormality=100(1-(# of normals/NS))
where NS=average of normal larvae counted in seawater controls

Table 12. Round 1 Larval Results - Resuspension Protocol

	Sample ID	Replicate	Initial Count	Normal Survivors	Combined Mortality and Abnormality	NMCA	Mean NCMA	Hit/No Hit
Batch 1	CP32	1	265	238	27	2.1	9.5	No Hit
	CP32	2	265	212	53	12.8		
	CP32	3	265	240	25	1.3		
	CP32	4	265	203	62	16.5		
	CP32	5	265	208	57	14.5		
	CP33	1	265	189	76	22.3	12.7	No Hit
	CP33	2	265	228	37	6.3		
	CP33	3	265	226	39	7.1		
	CP33	4	265	215	50	11.6		
	CP33	5	265	204	61	16.1		
	NB 02	1	265	236	29	3.0	-0.7	---
	NB 02	2	265	229	36	5.8		
	NB 02	3	265	232	33	4.6		
	NB 02	4	265	281	-16	-15.5		
	NB 02	5	265	247	18	-1.6		
	swcontrol	1	265	259	6	-6.5	0.0	---
	swcontrol	2	265	243	22	0.1		
	swcontrol	3	265	238	27	2.1		
	swcontrol	4	265	239	26	1.7		
	swcontrol	5	265	237	28	2.5		
Batch 2	SR1	1	245	242	3	-8.0	13.7	No Hit
	SR1	2	245	201	44	10.3		
	SR1	3	245	165	80	26.3		
	SR1	4	245	206	39	8.0		
	SR1	5	245	153	92	31.7		
	SR3	1	245	177	68	21.0	10.5	No Hit
	SR3	2	245	224	21	0.0		
	SR3	3	245	206	39	8.0		
	SR3	4	245	212	33	5.4		
	SR3	5	245	183	62	18.3		
	SR4	1	245	183	62	18.3	18.9	No Hit
	SR4	2	245	210	35	6.3		
	SR4	3	245	147	98	34.4		
	SR4	4	245	185	60	17.4		
	SR4	5	245	183	62	18.3		
	CO7	1	245	150	95	33.0	28.8	XX
	CO7	2	245	190	55	15.2		
	CO7	3	245	146	99	34.8		
	CO7	4	245	169	76	24.6		
	CO7	5	245	142	103	36.6		
	NB 01	1	245	197	48	12.1	6.0	---
	NB 01	2	245	198	47	11.6		
	NB 01	3	245	222	23	0.9		
	NB 01	4	245	221	24	1.3		
	NB 01	5	245	215	30	4.0		
	swcontrol	1	245	245	0	-9.4	0.0	---
	swcontrol	2	245	220	25	1.8		
	swcontrol	3	245	238	7	-6.3		
	swcontrol	4	245	228	17	-1.8		
	swcontrol	5	245	189	56	15.6		

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)
NCMA=normalized combined percent mortality and abnormality=100(1-(# of normals/NS))
where NS=average of normal larvae counted in seawater controls

Table 13. Round 1 Neanthes Results - Ash-Free Dry-Weight Endpoint

	Sample ID	Replicate	Initial Count	Survivors	Growth Rate (mg/individual/day)	Mean Growth Rate	Hit/No Hit
Batch 1	CP32	1	5	5	0.59	0.62	No Hit
	CP32	2	5	5	0.71		
	CP32	3	5	5	0.61		
	CP32	4	5	5	0.62		
	CP32	5	5	5	0.56		
	CP33	1	5	5	0.58	0.61	No Hit
	CP33	2	5	5	0.62		
	CP33	3	5	5	0.56		
	CP33	4	5	5	0.66		
	CP33	5	5	5	0.63		
	NB 02	1	5	5	0.79	0.80	---
	NB 02	2	5	5	0.88		
	NB 02	3	5	5	0.76		
	NB 02	4	5	5	0.88		
	NB 02	5	5	5	0.70		
	control	1	5	5	0.69	0.69	---
	control	2	5	5	0.71		
	control	3	5	5	0.76		
	control	4	5	5	0.75		
	control	5	5	5	0.53		
Batch 2	SR1	1	5	5	0.88	0.84	No Hit
	SR1	2	5	5	0.96		
	SR1	3	5	5	0.80		
	SR1	4	5	5	0.74		
	SR1	5	5	5	0.81		
	SR3	1	5	5	0.84	0.76	No Hit
	SR3	2	5	5	0.67		
	SR3	3	5	5	0.88		
	SR3	4	5	5	0.77		
	SR3	5	5	5	0.65		
	SR4	1	5	5	0.60	0.79	No Hit
	SR4	2	5	5	0.56		
	SR4	3	5	5	0.86		
	SR4	4	5	3	1.26		
	SR4	5	5	5	0.65		
	CO7	1	5	5	0.41	0.68	No Hit
	CO7	2	5	5	0.68		
	CO7	3	5	5	0.76		
	CO7	4	5	5	0.77		
	CO7	5	5	5	0.76		
	NB 01	1	5	5	0.97	0.84	---
	NB 01	2	5	5	0.84		
	NB 01	3	5	5	0.72		
	NB 01	4	5	5	0.80		
	NB 01	5	5	5	0.86		
	swcontrol	1	5	5	0.58	0.70	---
	swcontrol	2	5	5	0.62		
	swcontrol	3	5	5	0.76		
	swcontrol	4	5	5	0.79		
	swcontrol	5	5	5	0.74		

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)

Table 14. Interpretation of Bioassay Results - Round 1, Batch 1

original amphipod (Eohaustorius estuarius):

	mean % mortality	$M_T - M_C$	$M_T - M_C > 20$?	transformation	statistically greater than reference?	$M_T - M_R$	$M_T - M_R > 15$?	interpretation
CP32	40	39	yes	arcsin sq root	yes	32	yes	XX
CP33	25	24	yes	arcsin sq root	yes	17	yes	XX
NB02	8	---	---	---	---	---	---	---
Control	1	---	---	---	---	---	---	---

amphipod retest (Eohaustorius estuarius):

	mean % mortality	$M_T - M_C$	$M_T - M_C > 20$?	transformation	statistically greater than reference?	$M_T - M_R$	$M_T - M_R > 15$?	interpretation
CP32	15	9	no	NA	NA	NA	NA	no hit
CP33	21	15	no	NA	NA	NA	NA	no hit
NB02	12	---	---	---	---	---	---	---
Control	6	---	---	---	---	---	---	---

amphipod retest (Ampelisca abdita):

	mean % mortality	$M_T - M_C$	$M_T - M_C > 20$?	transformation	statistically greater than reference?	$M_T - M_R$	$M_T - M_R > 15$?	interpretation
CP32	23	19	no	NA	NA	NA	NA	no hit
CP33	7	3	no	NA	NA	NA	NA	no hit
NB02	2	---	---	---	---	---	---	---
Control	4	---	---	---	---	---	---	---

standard larval protocol (Mytilus galloprovincialis):

	mean normal count	N_T/N_C	$N_T/N_C < 0.80$?	transformation	statistically less than reference?	$N_R/N_C - N_T/N_C$	$N_R/N_C - N_T/N_C > 0.15$?	interpretation
CP32	197.4	0.785	yes	none needed	yes	0.115	no	X
CP33	204.4	0.813	no	NA	NA	NA	NA	no hit
NB02	226.0	---	---	---	---	---	---	---
Control	251.0	---	---	---	---	---	---	---

resuspension larval protocol (Mytilus galloprovincialis):

	mean normal count	N_T/N_C	$N_T/N_C < 0.80$?	transformation	statistically less than reference?	$N_R/N_C - N_T/N_C$	$N_R/N_C - N_T/N_C > 0.15$?	interpretation
CP32	220.2	0.905	no	NA	NA	NA	NA	no hit
CP33	212.4	0.872	no	NA	NA	NA	NA	no hit
NB02	245.0	---	---	---	---	---	---	---
Control	243.2	---	---	---	---	---	---	---

Neanthes growth - AFDW endpoint:

	mean individual growth rate	MIG_T/MIG_C	$MIG_T/MIG_C < 0.80$?	transformation	statistically less than reference?	MIG_T/MIG_R	$MIG_T/MIG_R < 0.70$?	interpretation
CP32	0.620	0.904	no	NA	NA	NA	NA	no hit
CP33	0.610	0.889	no	NA	NA	NA	NA	no hit
NB02	0.800	---	---	---	---	---	---	---
Control	0.686	---	---	---	---	---	---	---

M = mortality, N = normal larvae, MIG = mean individual growth rate mg/individual/day)
Subscripts: R = reference sediment, C = negative control, T = test sediment
NA = not applicable

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)

Table 15. Interpretation of Bioassay Results - Round 1, Batch 2

amphipod (Eohaustorius estuarius):

	mean % mortality	M_T - M_C	M_T - M_C > 20?	transformation	statistically greater than reference?	M_T - M_R	M_T - M_R > 15?	interpretation
SR1-P	1	0	no	NA	NA	NA	NA	no hit
SR3-P	4	3	no	NA	NA	NA	NA	no hit
SR4-P	3	2	no	NA	NA	NA	NA	no hit
CO7-P	14	13	no	NA	NA	NA	NA	no hit
NB01	2	---	---	---	---	---	---	---
Control	1	---	---	---	---	---	---	---

standard larval protocol (Mytilus galloprovincialis):

	mean normal count	N_T/N_C	N_T/N_C < 0.80?	transformation	statistically less than reference?	N_R/N_C - N_T/N_C	N_R/N_C - N_T/N_C > 0.15?	interpretation
SR1-P	196.6	0.865	no	NA	NA	NA	NA	no hit
SR3-P	212.8	0.937	no	NA	NA	NA	NA	no hit
SR4-P	164.0	0.722	yes	log 10	yes	0.155	yes	XX
CO7-P	147.0	0.647	yes	log 10	yes	0.230	yes	XX
NB01	199.2	---	---	---	---	---	---	---
Control	227.2	---	---	---	---	---	---	---

resuspension larval protocol (Mytilus galloprovincialis):

	mean normal count	N_T/N_C	N_T/N_C < 0.80?	transformation	statistically less than reference?	N_R/N_C - N_T/N_C	N_R/N_C - N_T/N_C > 0.15?	interpretation
SR1-P	193.4	0.863	no	NA	NA	NA	NA	no hit
SR3-P	200.4	0.895	no	NA	NA	NA	NA	no hit
SR4-P	181.6	0.811	no	NA	NA	NA	NA	no hit
CO7-P	159.4	0.712	yes	none needed	yes	0.229	yes	XX
NB01	210.6	---	---	---	---	---	---	---
Control	224.0	---	---	---	---	---	---	---

Neanthes growth - AFDW endpoint:

	mean individual growth rate	MIG_T/MIG_C	MIG_T/MIG_C < 0.80?	transformation	statistically less than reference?	MIG_T/MIG_R	MIG_T/MIG_R < 0.70?	interpretation
SR1-P	0.840	1.200	no	NA	NA	NA	NA	no hit
SR3-P	0.760	1.086	no	NA	NA	NA	NA	no hit
SR4-P	0.790	1.129	no	NA	NA	NA	NA	no hit
CO7-P	0.680	0.971	no	NA	NA	NA	NA	no hit
NB01	0.840	---	---	---	---	---	---	---
Control	0.700	---	---	---	---	---	---	---

M = mortality, N = normal larvae, MIG = mean individual growth rate mg/individual/day)
Subscripts: R = reference sediment, C = negative control, T = test sediment
NA = not applicable

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)

Table 16-1. Summary of data for Round 1/Batch 1: CP32 and CP33

Parameter/Bioassay	CP32	CP33	NB02	
% clay	24.2	30.6	11.6	initial results
% fines	74.0	78.8	38.7	
bulk ammonia (mg/kg)	210	115	9.6	
bulk sulfides (mg/kg)	509	70.2	10.7	
benzyl alcohol (ug/kg) (SL = 57)	100	110	---	
amphipod (*E. estuarius*)	XX	XX	NA	
larval - standard protocol	X	no hit	NA	
larval - resuspension protocol	no hit	no hit	NA	
Neanthes - AFDW endpoint	no hit	no hit	NA	
% clay	28.5	32.2	13.8	amphipod retest
% fines	77.8	85.4	42.9	
bulk ammonia (mg/kg)	151	93	7.6	
bulk sulfides (mg/kg)	233	377	348	
benzyl alcohol (ug/kg)	57	140	---	
amphipod (*E. estuarius*)	no hit	no hit	NA	
amphipod (*A. abdita*)	no hit	no hit	NA	
overall interpretation/outcome	**split and resample**	**pass**	NA	

Table 16-2. Summary of data for Round 1/Batch 2: SR1, SR3, SR4 and CO7

Parameter/Bioassay	SR-1	SR-3	SR-4	CO-7	NB01
% clay	2	0.3	2.2	4.5	1.5
% fines	2.0	0.3	14.7	35.2	9.5
% TOC	2.3	1.0	1.2	1.3	1.2
bulk ammonia (mg/kg)	6.7	3.9	19.8	102	11.4
bulk sulfides (mg/kg)	71	2.49	51.1	638	0.7
number of SL exceedances:	0	0	0	1[1]	---
cis-nonachlor (ug/kg); SL = 2.8	---	---	---	3.4 U	---
dioxin TEQ (ng/kg)	0.3	0.4	1.0	2.5	0.3
amphipod	no hit	no hit	no hit	no hit	---
larval - standard protocol	no hit	no hit	XX	XX	---
larval - resuspension protocol	no hit	no hit	no hit	XX	---
Neanthes - AFDW endpoint	no hit	no hit	no hit	no hit	---
overall interpretation/outcome	**pass**	**pass**	**pass**	**split and resample**	**---**

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)
NA = not applicable

[1]Cis-nonachlor was originally reported as a probable detect, hence the decision to conduct bioassays. After reviewing the data in more depth and doing some follow-up analysis, the analytical laboratory didn't think this was an actual hit, but there was not enough evidence to bring the reporting limit down below the SL.

Table 17. Round 2 Sampling Data

DMMU	Station	Latitude	Longitude	Mudline Elevation (ft, MLLW)	Acquisition Depth (ft, MLLW)	Sample Length Acquired (ft)	Z-sample Length Acquired (ft)
C07a	CO7a-1	46.93860	-124.00928	-34.3	-44.0	2.0	2.0
	CO7a-2	46.93917	-124.00841	-35.4	-44.0	2.0	2.0
	CO7a-3	46.93993	-124.00766	-35.2	-44.0	2.0	2.0
	CO7a-4	46.93809	-124.00900	-38.2	-44.0	2.0	2.0
	CO7a-5	46.93888	-124.00788	-38.4	-44.0	2.0	2.0
	CO7a-6	46.93960	-124.00699	-38.4	-44.0	2.0	2.0
CO7b	CO7b-1	46.94036	-124.00721	-34.0	-44.0	2.0	2.0
	CO7b-2	46.94114	-124.00599	-35.9	-44.0	2.0	2.0
	CO7b-3	46.94186	-124.00513	-35.8	-44.0	2.0	2.0
	CO7b-4	46.94144	-124.00467	-38.2	-44.0	2.0	2.0
	CO7b-5	46.94084	-124.00536	-38.5	-44.0	2.0	2.0
	CO7b-6	46.94027	-124.00617	-38.4	-44.0	2.0	2.0
CP32a	CP32a-1	46.96138	-123.84872	-35.6	-44.0	2.0	2.0
	CP32a-2	46.96132	-123.84923	-38.5	-44.0	2.0	2.0
	CP32a-3	46.96084	-123.84919	-38.7	-44.0	2.0	2.0
	CP32a-4	46.96130	-123.84988	-39.1	-44.0	2.0	2.0
	CP32a-5	46.96142	-123.85073	-39.2	-44.0	2.0	2.0
	CP32a-6	46.96142	-123.85073	-39.1	-44.0	2.0	2.0
CP32b	CP32b-1	46.95999	-123.84997	-33.0	-44.0	2.0	2.0
	CP32b-2	46.96028	-123.84953	-36.6	-44.0	2.0	2.0
	CP32b-3	46.96029	-123.85047	-33.9	-44.0	2.0	2.0
	CP32b-4	46.96093	-123.85026	-38.3	-44.0	2.0	2.0
	CP32b-5	46.96111	-123.85105	-35.7	-44.0	2.0	2.0
	CP32b-6	46.96071	-123.85108	-34.1	-44.0	2.0	2.0

Table 18-1. Analytical Results for Round 2 (from SEE, 2013)

Compound	SL	BT	ML	CO7a-P		CO7a-Z		CO7b-P		CO7b-Z	
				Value	Q	Value	Q	Value	Q	Value	Q
Conventionals											
Total Solids (%)	—	—	—	68.4		68.4		69.5		73.7	
Total Volatile Solids (%)	—	—	—	3.6		3.8		3.7		2.3	
N-Ammonia (mg-N/kg)	—	—	—	60.4		55.5		76.2		90.0	
Sulfide (mg/kg)	—	—	—	268.0		262.0		208.0		41.0	
Total Organic Carbon (%)	—	—	—	1.3		1.4		1.0		0.7	
Gravel (%)	—	—	—	0.4		0.1		1.0		0.1	
Sand (%)	—	—	—	65.9		52.7		57.5		75.0	
Silt (%)	—	—	—	23.7		33.4		31.0		17.8	
Clay (%)	—	—	—	10.0		13.8		10.6		7.3	
Fines (%)	—	—	—	33.7		47.2		41.6		25.1	
PAHs (µg/kg dw)											
Naphthalene	2,100	—	2,400	19.00	J	20.00	U	15.00	J	19.00	U
2-Methylnaphthalene [1]	670	—	1,900	20.00	U	20.00	U	19.00	U	19.00	U
Acenaphthylene	560	—	1,300	20.00	U	20.00	U	19.00	U	19.00	U
Acenaphthene	500	—	2,000	20.00	U	20.00	U	19.00	U	19.00	U
Fluorene	540	—	3,600	20.00	U	20.00	U	19.00	U	19.00	U
Phenanthrene	1,500	—	21,000	19.00	U	13.00	J	17.00	J	19.00	U
Anthracene	960	—	13,000	20.00	U	20.00	U	19.00	U	19.00	U
Total LPAH	5,200	—	29,000	19.00		13.00		15.00		19.00	
Benzo(a)anthracene	1,300	—	5,100	20.00	U	20.00	U	19.00	U	19.00	U
Benzo(a)pyrene	1,600	—	3,600	20.00	U	20.00	U	19.00	U	19.00	U
Benzo(g,h,i)perylene	670	—	3,200	20.00	U	20.00	U	19.00	U	19.00	U
Chrysene	1,400	—	21,000	20.00	U	20.00	U	19.00	U	19.00	U
Dibenz(a,h)anthracene	230	—	1,900	20.00	U	20.00	U	19.00	U	19.00	U
Fluoranthene	1,700	4,600	30,000	13.00	J	20.00	U	11.00	J	19.00	U
Indeno(1,2,3-cd)pyrene	600	—	4,400	20.00	U	20.00	U	19.00	U	19.00	U
Pyrene	2,600	11,980	16,000	14.00	J	20.00	U	15.00	J	19.00	U
Total Benzofluoranthenes	3,200	—	9,900	39.00	U	40.00	U	37.00	U	38.00	U
Total HPAH	12,000	—	69,000	27.00		40.00		26.00		38.00	U
Chlorinated Hydrocarbons (µg/kg dw)											
1,4-Dichlorobenzene	110	—	120	20.00	U	20.00	U	19.00	U	19.00	U
1,2-Dichlorobenzene	35	—	110	20.00	U	20.00	U	19.00	U	19.00	U
1,2,4-Trichlorobenzene	31	—	64	20.00	U	20.00	U	19.00	U	19.00	U
Hexachlorobenzene	22	168	230	20.00	UJ	20.00	UJ	19.00	UJ	19.00	UJ
Phthalates (µg/kg dw)											
Dimethylphthalate	71	—	1,400	20.00	U	20.00	U	19.00	U	19.00	U
Diethylphthalate	200	—	1,200	48	U	53		46.00	U	48.00	U
Di-n-Butylphthalate	1,400	—	5,100	20.00	U	20.00	U	19.00	U	19.00	U
Butylbenzylphthalate	63	—	970	20.00	U	20.00	U	19.00	U	19.00	U
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	29.00	U	25.00	U	23.00	U	24.00	U
Di-n-Octyl phthalate	6,200	—	6,200	20.00	U	20.00	U	19.00	U	19.00	U
Phenols (µg/kg dw)											
Phenol	420	—	1,200	24.00		26.00		10.00	J	19.00	U
2-Methylphenol	63	—	77	20.00	U	20.00	U	19.00	U	19.00	U
4-Methylphenol	670	—	3,600	16.00	J	40.00	U	25.00	J	38.00	U
2,4-Dimethylphenol	29	—	210	20.00	UJ	20.00	UJ	19.00	UJ	19.00	UJ
Pentachlorophenol	400	504	690	200.00	UJ	200.00	UJ	190.00	UJ	190.00	UJ
Miscellaneous Extractables (µg/kg dw)											
Benzyl Alcohol	57	—	870	20.00	UJ	20.00	UJ	19.00	UJ	19.00	UJ
Benzoic Acid	650	—	760	390.00	U	400.00	U	370.00	U	380.00	U
Dibenzofuran	540	—	1,700	20.00	U	20.00	U	19.00	U	19.00	U
N-Nitrosodiphenylamine	28	—	130	20.00	U	20.00	U	19.00	U	19.00	U
Heptachlor	1.5	—	—	0.48	U	0.47	U	0.46	U	0.48	UJ
Hexachlorobutadiene	11	—	270	0.96	UJ	0.94	UJ	0.93	UJ	0.97	UJ

Table 18-1. Analytical Results for Round 2 (from SEE, 2013)

Compound	SL	BT	ML	CO7a-P		CO7a-Z		CO7b-P		CO7b-Z	
				Value	Q	Value	Q	Value	Q	Value	Q
Pesticides and PCBs (µg/kg dw)											
Aldrin	9.5	—	—	0.48	U	0.47	U	0.46	U	0.48	U
Dieldrin	1.9	—	—	0.96	U	0.94	U	0.93	U	0.97	U
4,4 -DDE	16	—	—	0.96	U	0.94	U	0.93	U	0.97	U
4,4 -DDD	9	—	—	0.96	U	0.94	U	0.93	U	0.97	U
4,4 -DDT	12	—	—	0.96	U	0.94	U	0.93	U	0.97	UJ
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.96	U	0.94	U	0.93	U	0.97	UJ
trans-Chlordane	—	—	—	0.48	U	0.47	U	0.46	U	0.48	U
cis-Chlordane	—	—	—	0.48	U	0.47	U	0.46	U	0.48	U
oxy Chlordane	—	—	—	0.96	U	0.94	U	0.93	U	0.97	U
cis-Nonachlor	—	—	—	0.96	U	0.94	U	0.93	U	0.97	U
trans-Nonachlor	—	—	—	0.96	U	0.94	U	0.93	U	0.97	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	0.96	U	0.94	U	0.93	U	0.97	U

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

Table 18-1. Analytical Results for Round 2 (from SEE, 2013)

Compound	SL	BT	ML	CP32a-P		CP32a-Z		CP32b-P		CP32b-Z	
				Value	Q	Value	Q	Value	Q	Value	Q
Conventionals											
Total Solids (%)	—	—	—	57.2		63.8		65.7		67.6	
Total Volatile Solids (%)	—	—	—	6.1		4.4		4.3		3.8	
N-Ammonia (mg-N/kg)	—	—	—	174.0		283.0		184.0		188.0	
Sulfide (mg/kg)	—	—	—	579.0		290.0		364.0		142.0	
Total Organic Carbon (%)	—	—	—	1.6		1.0		1.7		1.1	
Gravel (%)	—	—	—	0.4		0.1		0.1	U	0.1	U
Sand (%)	—	—	—	38.1		31.9		47.8		42.3	
Silt (%)	—	—	—	42.8		58.1		36.5		43.0	
Clay (%)	—	—	—	18.7		9.9		15.9		14.7	
Fines (%)	—	—	—	61.5		68.0		52.4		57.7	
PAHs (µg/kg dw)											
Naphthalene	2,100	—	2,400	22.00		19.00	U	18.00	U	19.00	U
2-Methylnaphthalene [1]	670	—	1,900	18.00	J	19.00	U	18.00	U	19.00	U
Acenaphthylene	560	—	1,300	19.00	U	19.00	U	18.00	U	19.00	U
Acenaphthene	500	—	2,000	19.00	U	19.00	U	18.00	U	19.00	U
Fluorene	540	—	3,600	12.00	J	19.00	U	18.00	U	19.00	U
Phenanthrene	1,500	—	21,000	27.00		11.00	J	14.00	J	12.00	J
Anthracene	960	—	13,000	19.00	U	19.00	U	18.00	U	19.00	U
Total LPAH	5,200	—	29,000	49.00		11.00		14.00		12.00	
Benzo(a)anthracene	1,300	—	5,100	19.00	U	19.00	U	18.00	U	19.00	U
Benzo(a)pyrene	1,600	—	3,600	19.00	U	19.00	U	18.00	U	19.00	U
Benzo(g,h,i)perylene	670	—	3,200	14.00	J	19.00	U	18.00	U	19.00	U
Chrysene	1,400	—	21,000	10.00	J	19.00	U	18.00	U	19.00	U
Dibenz(a,h)anthracene	230	—	1,900	19.00	U	19.00	U	18.00	U	19.00	U
Fluoranthene	1,700	4,600	30,000	23.00		19.00	U	11.00	J	19.00	U
Indeno(1,2,3-cd)pyrene	600	—	4,400	19.00	U	19.00	U	18.00	U	19.00	U
Pyrene	2,600	11,980	16,000	22.00		19.00	U	11.00	J	19.00	U
Total Benzofluoranthenes	3,200	—	9,900	15.00	J	38.00	U	36.00	U	38.00	U
Total HPAH	12,000	—	69,000	84.00		38.00		22.00		38.00	
Chlorinated Hydrocarbons (µg/kg dw)											
1,4-Dichlorobenzene	110	—	120	19.00	U	19.00	U	18.00	U	19.00	U
1,2-Dichlorobenzene	35	—	110	19.00	U	19.00	U	18.00	U	19.00	U
1,2,4-Trichlorobenzene	31	—	64	19.00	U	19.00	U	18.00	U	19.00	U
Hexachlorobenzene	22	168	230	19.00	UJ	19.00	UJ	18.00	UJ	19.00	UJ
Phthalates (µg/kg dw)											
Dimethylphthalate	71	—	1,400	19.00	U	19.00	U	18.00	U	19.00	U
Diethylphthalate	200	—	1,200	48.00	U	47.00	U	45.00	U	48.00	U
Di-n-Butylphthalate	1,400	—	5,100	19.00	U	19.00	U	18.00	U	19.00	U
Butylbenzylphthalate	63	—	970	19.00	U	19.00	U	18.00	U	19.00	U
bis(2-Ethylhexyl)phthalate	1,300	—	8,300	24.00	U	24.00	U	22.00	U	24.00	U
Di-n-Octyl phthalate	6,200	—	6,200	19.00	U	19.00	U	18.00	U	19.00	U
Phenols (µg/kg dw)											
Phenol	420	—	1,200	32.00		12.00	J	36.00		9.50	J
2-Methylphenol	63	—	77	19.00	U	19.00	U	18.00	U	19.00	U
4-Methylphenol	670	—	3,600	24.00	J	38.00	U	36.00	U	38.00	U
2,4-Dimethylphenol	29	—	210	19.00	UJ	19.00	UJ	18.00	UJ	19.00	UJ
Pentachlorophenol	400	504	690	190.00	UJ	190.00	UJ	180.00	UJ	190.00	UJ
Miscellaneous Extractables (µg/kg dw)											
Benzyl Alcohol	57	—	870	19.00	UJ	19.00	UJ	18.00	UJ	19.00	UJ
Benzoic Acid	650	—	760	140.00	J	380.00	U	360.00	U	380.00	U
Dibenzofuran	540	—	1,700	14.00	J	19.00	U	18.00	U	19.00	U
N-Nitrosodiphenylamine	28	—	130	19.00	U	19.00	U	18.00	U	19.00	U
Heptachlor	1.5	—	—	0.49	U	0.48	U	0.49	U	0.48	U
Hexachlorobutadiene	11	—	270	0.98	UJ	0.96	UJ	0.98	UJ	0.95	UJ

Table 18-1. Analytical Results for Round 2 (from SEE, 2013)

Compound	SL	BT	ML	CP32a-P		CP32a-Z		CP32b-P		CP32b-Z	
				Value	Q	Value	Q	Value	Q	Value	Q
Pesticides and PCBs (µg/kg dw)											
Aldrin	9.5	—	—	0.49	U	0.48	U	0.49	U	0.48	U
Dieldrin	1.9	—	—	0.98	U	0.96	U	0.98	U	0.95	U
4,4 -DDE	16	—	—	0.98	U	0.96	U	0.98	U	0.95	U
4,4 -DDD	9	—	—	0.98	U	0.96	U	0.98	U	0.95	U
4,4 -DDT	12	—	—	0.98	U	0.96	U	0.98	U	0.95	U
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT	—	50	69	0.98	U	0.96	U	0.98	U	0.95	U
trans-Chlordane	—	—	—	0.49	U	0.48	U	0.49	U	0.48	U
cis-Chlordane	—	—	—	0.49	U	0.48	U	0.49	U	0.48	U
oxy Chlordane	—	—	—	0.98	U	0.96	U	0.98	U	0.95	U
cis-Nonachlor	—	—	—	0.98	U	0.96	U	0.98	U	0.95	U
trans-Nonachlor	—	—	—	0.98	U	0.96	U	0.98	U	0.95	U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	—	0.98	U	0.96	U	0.98	U	0.95	U

J - The analyte was detected below the reported quantitation limit, and the reported concentration was an estimated value.

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.

Notes:

1. 2-Methylnaphthalene is not included in the summation for total LPAH.

2. This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

Table 18-2. Analytical Results for North Bay Reference Sediments - Round 2 (from SEE, 2013)

Compound	SL	BT	ML	NB13		NB15	
				Value	Q	Value	Q
Conventionals							
Total Solids (%)	—	—	—	67.7		71.4	
Total Volatile Solids (%)	—	—	—	3.4		2.2	
N-Ammonia (mg-N/kg)	—	—	—	5.1		6.9	
Sulfide (mg/kg)	—	—	—	169.0		359.0	
Total Organic Carbon (%)	—	—	—	1.1		1.1	
Gravel (%)	—	—	—	0.1	U	0.1	U
Sand (%)	—	—	—	71.7		88.8	
Silt (%)	—	—	—	19.3		5.9	
Clay (%)	—	—	—	8.9		5.2	
Fines (%)	—	—	—	28.2		11.1	

U - The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.

Table 19. Round 2 Amphipod Results

Sample ID	Replicate	Initial Count	Survivors	Percent Survival	Percent Mortality	Mean Percent Mortality	Hit/No Hit[1]
CO7a-P	1	20	13	65	35	32	---
CO7a-P	2	20	12	60	40		
CO7a-P	3	20	12	60	40		
CO7a-P	4	20	16	80	20		
CO7a-P	5	20	15	75	25		
CO7a-Z	1	20	14	70	30	28	---
CO7a-Z	2	20	18	90	10		
CO7a-Z	3	20	11	55	45		
CO7a-Z	4	20	16	80	20		
CO7a-Z	5	20	13	65	35		
CO7b-P	1	20	17	85	15	37	---
CO7b-P	2	20	15	75	25		
CO7b-P	3	20	13	65	35		
CO7b-P	4	20	8	40	60		
CO7b-P	5	20	10	50	50		
CO7b-Z	1	20	16	80	20	31	---
CO7b-Z	2	20	12	60	40		
CO7b-Z	3	20	7	35	65		
CO7b-Z	4	20	15	75	25		
CO7b-Z	5	20	19	95	5		
CP32a-P	1	20	9	45	55	60	---
CP32a-P	2	20	7	35	65		
CP32a-P	3	20	9	45	55		
CP32a-P	4	20	7	35	65		
CP32a-P	5	20	8	40	60		
CP32a-Z	1	20	3	15	85	93	---
CP32a-Z	2	20	0	0	100		
CP32a-Z	3	20	1	5	95		
CP32a-Z	4	20	2	10	90		
CP32a-Z	5	20	1	5	95		
CP32b-P	1	20	5	25	75	73	---
CP32b-P	2	20	2	10	90		
CP32b-P	3	20	9	45	55		
CP32b-P	4	20	8	40	60		
CP32b-P	5	20	3	15	85		
CP32b-Z	1	20	2	10	90	93	---
CP32b-Z	2	20	1	5	95		
CP32b-Z	3	20	2	10	90		
CP32b-Z	4	20	2	10	90		
CP32b-Z	5	20	0	0	100		
NB 13	1	20	18	90	10	16	---
NB 13	2	20	15	75	25		
NB 13	3	20	20	100	0		
NB 13	4	20	14	70	30		
NB 13	5	20	17	85	15		
NB 15	1	20	18	90	10	15	---
NB 15	2	20	16	80	20		
NB 15	3	20	18	90	10		
NB 15	4	20	15	75	25		
NB 15	5	20	18	90	10		
control	1	20	19	95	5	7	---
control	2	20	19	95	5		
control	3	20	18	90	10		
control	4	20	17	85	15		
control	5	20	20	100	0		

[1]High ammonia concentrations resulted in the data being rejected by the DMMP agencies

Table 20. Ammonia Concentrations in Round 2 Amphipod Bioassay

Compound	CO7a-P	CO7a-Z	CO7b-P	CO7b-Z	CP32a-P	CP32a-Z	CP32b-P	CP32b-Z	NB13	NB15	control
	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
Bulk sediment ammonia (mg-N/kg)	60.4	55.5	76.2	90.0	174.0	283.0	184.0	188.0	5.1	6.9	---
Day 0 overlying total ammonia (mg-N/L)	4.37	5.10	5.56	5.89	8.60	15.39	12.23	16.31	0.46	0.65	3.21
Day 10 overlying total ammonia (mg-N/L)	6.52	9.82	10.79	12.94	18.54	33.37	27.81	33.37	0.28	0.00	0.22
Day 0 interstitial total ammonia (mg-N/L)	*27.01*	*28.73*	*30.64*	*44.38*	*40.32*	*76.35*	*66.81*	*71.58*	3.87	4.72	14.13
Day 10 interstitial total ammonia (mg-N/L)	12.03	*17.34*	*18.97*	*20.09*	*26.81*	*60.61*	*44.06*	*51.28*	2.42	2.10	3.26
Day 0 overlying unionized ammonia (mg-NH3/L)	0.325	0.312	0.420	0.440	0.425	0.948	0.756	0.812	0.028	0.039	0.195
Day 10 overlying unionized ammonia (mg-NH3/L)	0.578	0.882	0.969	1.162	1.087	1.937	1.625	1.526	0.025	0.000	0.013
Day 0 interstitial unionized ammonia (mg-NH3/L)	*0.334*	*0.446*	*0.475*	*1.720*	0.166	*0.632*	*0.695*	*0.756*	0.024	0.029	0.109
Day 10 interstitial unionized ammonia (mg-NH3/L)	0.188	*0.340*	*0.463*	*0.773*	0.135	*0.481*	*0.347*	*0.638*	0.030	0.041	0.032
Amphipod Mortality	32	28	37	31	60	93	73	93	16	15	7

Bold italized text: Exceeds DMMP interstitial threshold (DMMP, 2002 - Table 1) for total ammonia (mg/L N) for *Ampelisca abdita* = 15 mg/L.

Bold italized and shaded text: Exceeds DMMP interstitial threshold (DMMP, 2002 - Table 1) for unionized ammonia (mg/L N) for *Ampelisca abdita* = 0.2 mg/L.

Table 21. Round 2 Larval Results - Standard Termination Protocol

Sample ID	Replicate	Initial Count	Normal Survivors	Combined Mortality and Abnormality	NMCA	Mean NCMA	Hit/No Hit
CO7a-P	1	269	197	72	23.5		
CO7a-P	2	269	211	58	18.1		
CO7a-P	3	269	190	79	26.2	21.0	X
CO7a-P	4	269	215	54	16.5		
CO7a-P	5	269	204	65	20.8		
CO7a-Z	1	269	210	59	18.5		
CO7a-Z	2	269	187	82	27.4		
CO7a-Z	3	269	224	45	13.0	19.4	No Hit
CO7a-Z	4	269	206	63	20.0		
CO7a-Z	5	269	211	58	18.1		
CO7b-P	1	269	221	48	14.2		
CO7b-P	2	269	185	84	28.2		
CO7b-P	3	269	220	49	14.6	22.2	X
CO7b-P	4	269	224	45	13.0		
CO7b-P	5	269	152	117	41.0		
CO7b-Z	1	269	205	64	20.4		
CO7b-Z	2	269	211	58	18.1		
CO7b-Z	3	269	194	75	24.7	22.4	X
CO7b-Z	4	269	192	77	25.5		
CO7b-Z	5	269	198	71	23.1		
CP32a-P	1	269	200	69	22.4		
CP32a-P	2	269	226	43	12.3		
CP32a-P	3	269	214	55	16.9	21.6	X
CP32a-P	4	269	170	99	34.0		
CP32a-P	5	269	200	69	22.4		
CP32a-Z	1	269	195	74	24.3		
CP32a-Z	2	269	183	86	29.0		
CP32a-Z	3	269	193	76	25.1	25.2	XX
CP32a-Z	4	269	189	80	26.6		
CP32a-Z	5	269	204	65	20.8		
CP32b-P	1	269	205	64	20.4		
CP32b-P	2	269	204	65	20.8		
CP32b-P	3	269	182	87	29.3	21.7	X
CP32b-P	4	269	209	60	18.9		
CP32b-P	5	269	209	60	18.9		
CP32b-Z	1	269	147	122	42.9		
CP32b-Z	2	269	205	64	20.4		
CP32b-Z	3	269	176	93	31.7	33.0	XX
CP32b-Z	4	269	159	110	38.3		
CP32b-Z	5	269	176	93	31.7		
NB 13	1	269	237	32	8.0		
NB 13	2	269	232	37	9.9		
NB 13	3	269	257	12	0.2	7.7	---
NB 13	4	269	243	26	5.7		
NB 13	5	269	220	49	14.6		
NB 15	1	269	243	26	5.7		
NB 15	2	269	238	31	7.6		
NB 15	3	269	238	31	7.6	10.8	---
NB 15	4	269	230	39	10.7		
NB 15	5	269	200	69	22.4		
swcontrol	1	269	288	-19	-11.8		
swcontrol	2	269	253	16	1.8		
swcontrol	3	269	271	-2	-5.2	0.0	---
swcontrol	4	269	234	35	9.2		
swcontrol	5	269	242	27	6.1		

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)
NCMA=normalized combined percent mortality and abnormality=100(1-(# of normals/NS))
where NS=average of normal larvae counted in seawater controls

Table 22. Round 2 Larval Results - Resuspension Termination Protocol

Sample ID	Replicate	Initial Count	Normal Survivors	Combined Mortality and Abnormality	NMCA	Mean NCMA	Hit/No Hit
CO7a-P	1	269	224	45	8.9		
CO7a-P	2	269	225	44	8.5		
CO7a-P	3	269	233	36	5.3	4.7	No Hit
CO7a-P	4	269	258	11	-4.9		
CO7a-P	5	269	232	37	5.7		
CO7a-Z	1	269	179	90	27.2		
CO7a-Z	2	269	222	47	9.8		
CO7a-Z	3	269	218	51	11.4	13.7	No Hit
CO7a-Z	4	269	238	31	3.3		
CO7a-Z	5	269	205	64	16.7		
CO7b-P	1	269	215	54	12.6		
CO7b-P	2	269	175	94	28.9		
CO7b-P	3	269	203	66	17.5	19.4	No Hit
CO7b-P	4	269	221	48	10.2		
CO7b-P	5	269	177	92	28.0		
CO7b-Z	1	269	179	90	27.2		
CO7b-Z	2	269	202	67	17.9		
CO7b-Z	3	269	225	44	8.5	15.8	No Hit
CO7b-Z	4	269	207	62	15.9		
CO7b-Z	5	269	223	46	9.3		
CP32a-P	1	269	205	64	16.7		
CP32a-P	2	269	165	104	32.9		
CP32a-P	3	269	198	71	19.5	20.3	XX
CP32a-P	4	269	201	68	18.3		
CP32a-P	5	269	211	58	14.2		
CP32a-Z	1	269	202	67	17.9		
CP32a-Z	2	269	204	65	17.1		
CP32a-Z	3	269	146	123	40.7	23.3	XX
CP32a-Z	4	269	207	62	15.9		
CP32a-Z	5	269	185	84	24.8		
CP32b-P	1	269	194	75	21.1		
CP32b-P	2	269	196	73	20.3		
CP32b-P	3	269	192	77	22.0	17.8	X
CP32b-P	4	269	196	73	20.3		
CP32b-P	5	269	233	36	5.3		
CP32b-Z	1	269	125	144	49.2		
CP32b-Z	2	269	196	73	20.3		
CP32b-Z	3	269	207	62	15.9	24.6	XX
CP32b-Z	4	269	196	73	20.3		
CP32b-Z	5	269	204	65	17.1		
NB 13	1	269	253	16	-2.8		
NB 13	2	269	229	40	6.9		
NB 13	3	269	240	29	2.4	5.0	---
NB 13	4	269	237	32	3.7		
NB 13	5	269	209	60	15.0		
NB 15	1	269	252	17	-2.4		
NB 15	2	269	248	21	-0.8		
NB 15	3	269	256	13	-4.1	1.4	---
NB 15	4	269	218	51	11.4		
NB 15	5	269	239	30	2.8		
swcontrol	1	269	237	32	3.7		
swcontrol	2	269	262	7	-6.5		
swcontrol	3	269	238	31	3.3	0.0	---
swcontrol	4	269	241	28	2.0		
swcontrol	5	269	252	17	-2.4		

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)
NCMA=normalized combined percent mortality and abnormality=100(1-(# of normals/NS))
where NS=average of normal larvae counted in seawater controls

Table 23. Round 2 Neanthes Results - Ash-Free Dry-Weight Endpoint

Sample ID	Replicate	Initial Count	Survivors	Growth Rate (mg/individual/day)	Mean Growth Rate	Hit/No Hit
CO7a-P	1	5	5	0.64	0.71	No Hit
CO7a-P	2	5	5	0.74		
CO7a-P	3	5	5	0.66		
CO7a-P	4	5	5	0.63		
CO7a-P	5	5	5	0.89		
CO7a-Z	1	5	5	0.57	0.65	No Hit
CO7a-Z	2	5	5	0.63		
CO7a-Z	3	5	5	0.63		
CO7a-Z	4	5	5	0.63		
CO7a-Z	5	5	5	0.78		
CO7b-P	1	5	5	0.68	0.70	No Hit
CO7b-P	2	5	5	0.87		
CO7b-P	3	5	5	0.68		
CO7b-P	4	5	5	0.64		
CO7b-P	5	5	4	0.64		
CO7b-Z	1	5	5	0.76	0.64	No Hit
CO7b-Z	2	5	5	0.55		
CO7b-Z	3	5	5	0.58		
CO7b-Z	4	5	5	0.67		
CO7b-Z	5	5	5	0.65		
CP32a-P	1	5	5	0.64	0.62	No Hit
CP32a-P	2	5	5	0.57		
CP32a-P	3	5	5	0.58		
CP32a-P	4	5	5	0.76		
CP32a-P	5	5	5	0.58		
CP32a-Z	1	5	5	0.65	0.62	No Hit
CP32a-Z	2	5	5	0.63		
CP32a-Z	3	5	5	0.53		
CP32a-Z	4	5	5	0.68		
CP32a-Z	5	5	5	0.60		
CP32b-P	1	5	5	0.67	0.67	No Hit
CP32b-P	2	5	5	0.64		
CP32b-P	3	5	5	0.65		
CP32b-P	4	5	5	0.63		
CP32b-P	5	5	5	0.79		
CP32b-Z	1	5	5	0.85	0.72	No Hit
CP32b-Z	2	5	5	0.57		
CP32b-Z	3	5	5	0.63		
CP32b-Z	4	5	5	0.68		
CP32b-Z	5	5	5	0.86		
NB 13	1	5	5	0.68	0.70	---
NB 13	2	5	5	0.72		
NB 13	3	5	5	0.74		
NB 13	4	5	5	0.65		
NB 13	5	5	5	0.72		
NB 15	1	5	5	0.77	0.72	---
NB 15	2	5	5	0.71		
NB 15	3	5	5	0.69		
NB 15	4	5	4	0.81		
NB 15	5	5	5	0.63		
swcontrol	1	5	5	0.39	0.60	---
swcontrol	2	5	5	0.64		
swcontrol	3	5	5	0.62		
swcontrol	4	5	5	0.69		
swcontrol	5	5	5	0.63		

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)

Table 24. Interpretation of Bioassay Results - Round 2

amphipod (Ampelisca abdita):

data rejected due to high concentrations of ammonia

standard larval protocol (Mytilus galloprovincialis):

	mean normal count	N_T/N_C	N_T/N_C < 0.80?	transformation	statistically less than reference?	$N_R/N_C - N_T/N_C$	$N_R/N_C - N_T/N_C$ > 0.15?	interpretation
CO7a-P	203.4	0.790	yes	none needed	yes	0.134	no	X
CO7a-Z	207.6	0.806	no	NA	NA	NA	NA	no hit
CO7b-P	200.4	0.778	yes	none needed	yes	0.145	no	X
CO7b-Z	200.0	0.776	yes	none needed	yes	0.147	no	X
CP32a-P	202.0	0.784	yes	none needed	yes	0.139	no	X
CP32a-Z	192.8	0.748	yes	none needed	yes	0.175	yes	XX
CP32b-P	201.8	0.783	yes	none needed	yes	0.140	no	X
CP32b-Z	172.6	0.670	yes	none needed	yes	0.253	yes	XX
NB13	237.8	---	---	---	---	---	---	---
NB15	229.8	---	---	---	---	---	---	---
Control	257.6	---	---	---	---	---	---	---

resuspension larval protocol (Mytilus galloprovincialis):

	mean normal count	N_T/N_C	N_T/N_C < 0.80?	transformation	statistically less than reference?	$N_R/N_C - N_T/N_C$	$N_R/N_C - N_T/N_C$ > 0.15?	interpretation
CO7a-P	234.4	0.953	no	NA	NA	NA	NA	no hit
CO7a-Z	212.4	0.863	no	NA	NA	NA	NA	no hit
CO7b-P	198.2	0.806	no	NA	NA	NA	NA	no hit
CO7b-Z	207.2	0.842	no	NA	NA	NA	NA	no hit
CP32a-P	196.0	0.797	yes	none needed	yes	0.153	yes	XX
CP32a-Z	188.8	0.767	yes	none needed	yes	0.182	yes	XX
CP32b-P	202.2	0.822	no	NA	NA	NA	NA	no hit
CP32b-Z	185.6	0.754	yes	none needed	yes	0.195	yes	XX
NB13	233.6	---	---	---	---	---	---	---
NB15	242.6	---	---	---	---	---	---	---
Control	246.0	---	---	---	---	---	---	---

Neanthes growth - AFDW endpoint:

	mean individual growth rate	MIG_T/MIG_C	MIG_T/MIG_C < 0.80?	transformation	statistically less than reference?	MIG_T/MIG_R	MIG_T/MIG_R < 0.70?	interpretation
CO7a-P	0.712	1.197	no	NA	NA	NA	NA	no hit
CO7a-Z	0.646	1.085	no	NA	NA	NA	NA	no hit
CO7b-P	0.699	1.175	no	NA	NA	NA	NA	no hit
CO7b-Z	0.641	1.077	no	NA	NA	NA	NA	no hit
CP32a-P	0.625	1.050	no	NA	NA	NA	NA	no hit
CP32a-Z	0.620	1.041	no	NA	NA	NA	NA	no hit
CP32b-P	0.675	1.134	no	NA	NA	NA	NA	no hit
CP32b-Z	0.717	1.204	no	NA	NA	NA	NA	no hit
NB13	0.704	---	---	---	---	---	---	---
NB15	0.721	---	---	---	---	---	---	---
Control	0.595	---	---	---	---	---	---	---

M = mortality, N = normal larvae, MIG = mean individual growth rate mg/individual/day)
Subscripts: R = reference sediment, C = negative control, T = test sediment
NA = not applicable

X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)

Table 25. Literature Values for the Effects of Ammonia on Amphipods and Mussels

	Reference	NOEC	EC50/LC50	Species
Mussels	Phillips, 2005	0.09 mg/L unionized	EC50 = 0.120 to 0.231 mg/L unionized	Mytilus galloprovincialis
	Batley, 2009	0.044 mg/l unionized	---	Mytilus galloprovincialis
		2.190 mg/l total		
	Gardiner, 1996	---	~~EC50 = 0.7 mg/L unionized~~ [2]	Mytilus galloprovincialis
	Batley, 2009	---	LC50 = 0.156 mg/L unionized	Lampsilis cardium
			LC50 = 3.050 mg/L total	
Amphipods	Kohn, 1994	---	LC50 = 0.83 mg/L unionized	Ampelisca abdita
			LC50 = 49.8 mg/L total	
	Burgess, 2003	---	LC50[1]= 0.60 to 1.90 mg/L unionized	Ampelisca abdita
			LC50[1] = 59.9 to 164 mg/L total	

[1]95% confidence interval

[2]The EC50 concentration of 0.7 mg/L for unionized ammonia provided in the original suitability determination was incorrect. The correct EC50 is 0.07 mg/L unionized ammonia (David Fox, 20 May 2013).

Table 26-1. Summary of chemistry and bioassay data for CO7

	Round 1	Round 2			
	CO7	CO7a-P	CO7a-Z	CO7b-P	CO7b-Z
COCs > SL	chlordane DL	none[1]	none[1]	none	none
amphipod (E. estuarius)	no hit	---	---	---	---
amphipod (*A. abdita*)	---	ammonia[2]	ammonia[2]	ammonia[2]	ammonia[2]
larval - standard protocol	XX	X	no hit	X	X
larval - resuspension protocol	XX	no hit	no hit	no hit	no hit
Neanthes - AFDW endpoint	no hit	no hit	no hit	no hit	no hit

P = primary sample (i.e. the -40 to -42 foot dredged material sample)
Z = z-sample (i.e. the -42 to -44 foot sample from the material that will be exposed by dredging)
X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)
NA = not applicable

[1]Diethyl phthalate was detected at concentrations above the screening level, but not detected in a subsequent retest. The data validator determined that the initial detection was likely an artifact and not an actual screening level exceedance.

[2]Results from this bioassay were set aside due to nontreatment effects from high ammonia concentrations.

Table 26-2. Summary of chemistry and bioassay data for CP32

	Round 1		Round 2			
	CP32	amphipod retest	CP32a-P	CP32a-Z	CP32b-P	CP32b-Z
COCs > SL	benzyl alcohol	none[1]	none	none	none	none
amphipod (E. estuarius)	XX	no hit	NT	NT	NT	NT
amphipod (*A. abdita*)	NT	no hit	ammonia[2]	ammonia[2]	ammonia[2]	ammonia[2]
larval - standard protocol	X	NT	X	XX	X	XX
larval - resuspension protocol	no hit	NT	XX	XX	no hit	XX
Neanthes - AFDW endpoint	no hit	NT	no hit	no hit	no hit	no hit

P = primary sample (i.e. the -40 to -42 foot dredged material sample)
Z = z-sample (i.e. the -42 to -44 foot sample from the material that will be exposed by dredging)
X = hit under the 2-hit rule (minor hit)
XX = hit under the 1-hit rule (major hit)
NT = no test; this test was not run

[1]CP33 was also subjected to the amphipod retest. Despite having a higher concentration of benzyl alcohol than in the original test (both concentrations were > SL), it too had no hits in the retest.

[2]Results from this bioassay were set aside due to nontreatment effects from high ammonia concentrations.