CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD April 18, 2009

*Revised 6/16/2009 to describe excluded material and 12/17/2009 to correct Table 10*

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM THE PUYALLUP TRIBAL TERMINAL PROJECT, BLAIR WATERWAY (Permit #NWF-2008-1083-SO), COMMENCEMENT BAY, TACOMA, WASHINGTON, EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR OPEN-WATER DISPOSAL AT THE COMMENCEMENT BAY OPEN WATER SITE OR FOR IN-WATER BENEFICIAL USE.

1. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Environmental Protection Agency, and Washington Departments of Ecology and Natural Resources) regarding the suitability of approximately 1.75 million cubic yards (cy) of dredged material from the Puyallup Tribal Terminal development project. The project area (Figure 1) is on the east side of the central portion of the Blair Waterway in Tacoma, Washington. Disposal of suitable material is anticipated for the Commencement Bay non-dispersive DMMP disposal site, in combination with approved upland sites and/or approved beneficial use sites. This determination of suitability for open-water disposal is based on the acceptability of the sampling conducted in July and August 2008. All relevant test data from this sampling event is contained in a reports submitted by Floyd-Snider (Floyd-Snider 2009). Collectively, these data were considered sufficient and acceptable for decision-making by the DMMP agencies.

2. Background. The Blair Waterway was created incrementally over much of the last century from tidal flats in the area of the Puyallup River where it meets Commencement Bay. As the waterway was extended inland, dredged material was used for fill in areas surrounding the waterway up through the 1970s. The waterway has also been dredged repeatedly in the last few years, beginning with the Sitcum Waterway Remediation Project completed in 1995. That project removed both contaminated and clean material from the waterway in a combined CERCLA cleanup and navigation deepening project. Since that time, Port of Tacoma development projects have led to further deepening of the Blair, expansion of the turning basin, and widening of some portions of the waterway.

The Puyallup Tribe and SSA Containers are presently planning the Puyallup Tribal Terminal development project. This project includes a proposed cutback of a portion of the eastern shoreline of the Blair Waterway to facilitate infrastructure improvement and increase safety and capacity for shipping. Widening of the Waterway would occur as a cutback of the eastern shoreline parallel to the existing shoreline for a distance of approximately 3,000 feet (see Figure 2). The dredging project is proposed to result in a ship berth of -51 ft. MLLW. Total proposed dredging volume is approximately 1,750,000 cubic yards.

Two portions of the proposed project area have not been included in this DMMP characterization, based on the known presence of contaminated sediment, concrete debris, and institutional control issues. These portions are 1) the area encompassing the Lincoln Avenue ditches (the former ditch and long segment) and 2) the Graving Dock. These areas, including a 10-foot buffer on either side of the ditches and the dock, are not considered in this suitability determination. They will be managed separately in accordance with the existing institutional controls specified in the Institutional Controls Addendum (Landau 1994c) and Puyallup Land Transfer Consent Decree (USEPA 1995). The material associated with the ditches and dock, approximately 214,600 cy, will be isolated from the rest of the cutback material for upland use and/or disposal.

Table 1. Regulatory Tracking Dates

| | |
|---|---|
| SAP received | June 30, 2008 |
| SAP review meeting | July 22, 2008 |
| SAP approved | July 29, 2008 |
| Sampling dates | July 31 – August 6, 2008 |
| Data report submitted | January 15, 2009 |
| DAIS Tracking | PTTCB-1-A-F-266 |
| Recency: M Concern (5-7 years) | August 2013 – 2015 |

Table 2. Project Synopsis

| | |
|---|---|
| Time of proposed dredging | 2011 in-water construction season |
| Proposed disposal sites | Commencement Bay open water non-dispersive site; and/or at permitted beneficial use site(s); and/or at approved upland locations |
| Sediment ranking | moderate; native |
| Predicted dredge volume | 1,750,000 cubic yards |
| Project last dredged | New work |

3. Project Ranking. Based on previous Blair cut-back projects and site specific sources, the characterized portion of the dredge prism was ranked "moderate." The Blair peninsula, formed by placement of previously dredged material, consists of a surface fill layer of variable depth over native material. The DMMP does not require characterization of deep native sediments to the limits of the depth prism in cases where there is a lack of sources (SMARM 1991). For this project, sampling of the native layer to eight feet below the fill layer, or to eight feet into the native layer below potential sources, was required. Further characterization was required if the deepest native layer showed any exceedances of DMMP screening levels.

4. Sampling. Sampling took place from July 31-August 6, 2008. Samples were collected from the upland with a direct push Geoprobe sampler. Samples were collected continuously in 4 or 5 foot intervals to a minimum of 8 feet below the native/fill interface and composited as described in the approved SAP. Sampling and testing took place on approximately 376,523 cy of the total proposed 1.75 million cy project area. The sampled portion of the dredge prism included all material previously placed as fill during formation of the Blair Waterway. As in previous cutback projects along the Blair, only the top eight feet of native sediments were sampled. The remaining 1,158,877 cy in the project area are deep native sediments that the DMMP determined, as part of its Tier 1 evaluation, were not necessary to characterize. This determination was supported by sampling results and no deeper sampling was required.

All samples were collected with an upland drill rig that took a total of 13 borings according to the approved Sampling and Analysis Plan, as modified in the field during the sampling and reported in the data report. Samples from all borings taken in a given DMMU were composited for analysis into 25 DMMU (Figure 3). Individual samples from smaller subunits were archived for follow-up analysis as necessary. Because depth contours were uncertain prior to sampling, DMMU designations were modified in the field to conform to DMMP sampling requirements. Table 3 summarizes borings, volumes and DMMU for this project.

Table 3. Project sampling summary

| | DMMU # | Approx. depth bgs | Volume (cy) |
|---|---|---|---|
| Surface Fill | 1 | 0 - 6 | 17,162 |
| | 2 | | 16,069 |
| | 3 | | 10,380 |
| | 4 | | 17,472 |
| Subsurface Native | 5 | 3 - 10 | 16,653 |
| | 6 | | 17,803 |
| | 7 | | 9,898 |
| | 8 | | 14,853 |
| | 9 | 7 - 16 | 18,616 |
| | 10 | | 16,764 |
| | 11 | | 11,308 |
| | 12 | | 19,191 |
| | 14 | 13 - 40 | 16,462 |
| | 14B | | 14,677 |
| | 15 | | 11,843 |
| | 16 | | 14,853 |
| | 17 | | 10,496 |
| | 17B | | 10,496 |
| | 17C | | 11,466 |
| | 17D | | 10,398 |
| | 18 | | 17,157 |
| | 19 | | 11,777 |
| | 20 | | 14,853 |
| | 21 | | 21,519 |
| | 22 | | 24,357 |
| Total Tested | | | 376,523 |
| Deep Native | not tested | 13 – 55 | 1,158,877 |
| Excluded Material | Not tested | LA/GD | 214,600 |
| Project Total | | | 1,750,000 |

5. Chemical Analysis. The Agencies' approved sampling and analysis plan was followed and quality assurance/quality control guidelines specified by PSEP and the DMMP were generally complied with. Chemical analyses were performed by Analytical Resources, Inc. (ARI) of Tukwila, Washington and Frontier Analytical Laboratory of El Dorado Hills, California. Conventional results from all sampling are found in Table 5.

Chemical analysis detected some of the standard chemicals of concern, especially metals and PAHs. All detections were well below the DMMP Screening Level. There was only one detection of PCBs, in DMMU

17C, but that detection (55 ppb dry wt.) was below the DMMP SL of 130 ppb. There were also no undetected chemicals for which the laboratory detection limit exceeded the SLs.

Dioxin (PCDD/F) testing was required due to proximity to potential sources and to exceedance of the interim guidelines in other cutback projects along the Blair Waterway. For dioxin analysis DMMUs were composited across depth horizons according to the following plan:

H1: DMMUs 1, 2, 3, and 4
H2: DMMUs 5, 6, 7, and 8
H3: DMMUs 9, 10, 11, and 12
H4: DMMUs 14, 15, and 16
H5: DMMUs 14B, 17, and 18
H6: DMMUs 17C, 17B, and 20
H7: DMMUs 17D, 19, and 21
H8: DMMU 22

PCDD/F data were reported as total equivalency quotients (TEQs) using World Health Organization (WHO 2005) toxic equivalency factors for human health/mammals. TEQs were calculated using a value of one half the reporting limit for non-detected values. Data collection, analysis and reporting generally followed guidelines put forth by the DMMP (SMARM 2007).

To evaluate the dioxin data, DMMP used the current interim guidelines in effect since February 2007. These interim guidelines are:

- Based on a comparison of dioxin in test sediments to disposal-site or reference area background.
- For non-dispersive sites, background is defined using disposal-site sediment dioxin data from the vicinity of the disposal site. This data has been collected as part of DMMP site monitoring.
- Disposal-site sediment dioxin concentrations are determined from perimeter, transect, and benchmark locations (e.g. not from any previously-disposed material).
- Dioxin concentrations in any given DMMU may not exceed site maximum.
- Average dioxin concentrations (weighted to the volume of each DMMU) cannot exceed mean disposal site concentration.
- Bioaccumulation testing for dioxin is currently not used to determine suitability for either dispersive or non-dispersive sites.

Monitoring in Commencement Bay found background levels in the area of the disposal site at a mean TEQ of 2.4 ng/kg, and a maximum TEQ of 5.2 ng/kg. The samples from H1 (all the surface DMMUs) and H6 (subsurface DMMUs) had levels of PCDD/F higher than the Commencement Bay site maximum. The rest of the material tested had levels lower than the site maximum and the volume-weighted mean.

Dioxin levels found in the surface horizon (H1) are consistent with those found in neighboring Blair Waterway cutback projects. The surface horizon was all fill material, deposited decades ago in the formation of the Blair. It appears to be relatively ubiquitous at the levels found throughout much of the fill material and does not appear to be associated with any localized sources.

The dioxin levels associated with H6 were a little more confusing. The DMMU comprising this sample were from a similar depth horizon but were separated by the former Graving Dock area that is not included in this DMMP evaluation (see Figure 3). Due to spatial separation, contractor reports of visually different material and the fact that 17C is directly below the Lincoln Ave. ditch clean-up area, the DMMP requested that

separate dioxin analyses of the H6 DMMUs be run. Due to the lack of archive material for DMMUs 17B and 17C, only DMMU 20 was analyzed separately. The two deepest subunits of DMMU 20 were analyzed to determine whether deeper sampling of a Z layer would be required. The analyses found TEQ levels much lower than in the composite (0.15 and 0.16 respectively in the two subunits) leading to the assumption that the dioxin exceedances were associated with DMMUs 17B and 17C, which are adjacent to the Lincoln Avenue ditch clean-up area. DMMU 14B was adjacent to the Lincoln Avenue ditch clean-up area, and analyzed as part of the H5 composite, which was below the Commencement Bay maximum TEQ (2.55 pptr), but elevated compared to the material above it (H4, 0.4 pptr TEQ). Since DMMU 14B represents the deepest DMMU for that section, analysis of the lowest archived subunit from the core closest to the ditches was requested. Again, data indicated that dioxin TEQs were low (0.13 pptr TEQ) and that the native material below DMMU 14B was not compromised by proximity to the Lincoln Avenue ditch clean-up.

Thus, due to exceedances of dioxin interim guidelines, DMMUs 1, 2, 3, 4, 17B and 17C were found unsuitable for open water disposal. DMMU 20, though part of the initial horizon composite that failed, was found suitable for open water disposal.

6. Suitability for Beneficial Use. All results of the chemical analyses were organic carbon normalized, if necessary, and compared to Washington State Sediment Management Standards. No exceedances of SMS standards were found in detected chemicals (Table 7). The one PCB detection, in DMMU 17C, was OC normalized to 8.5 ppm, below the 12.4 OC normalized SQS value. Some undetected chemicals exceeded SMS guidelines when their laboratory detection limits were OC normalized, but this appeared to be due to low TOC levels.

In order to evaluate the suitability of this material for beneficial use in terms of dioxin, data was compared against the 2008 Puget Sound Dioxin/PCB Survey's dioxin data for the main basin and reference bays for the Puget Sound region. None of the DMMUs that were found suitable for open water disposal were above the 4 pptr TEQ that represents the 90th percentile of the 2008 data, indicating that it should be suitable for beneficial use within the Puget Sound region.

This evaluation showed that all material suitable for open water disposal is also suitable for approved, in water beneficial uses under Washington State Sediment Management Standards and DMMP guidelines. As always, actual beneficial uses must be approved in other applicable permits and/or authorizations.

7. Suitability. This memo documents the suitability of proposed dredged sediments from the Puyallup Tribal Terminal area for open-water disposal. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program.

Based on the combined information from all chemistry testing results as evaluated by DMMP guidelines and best professional judgment, 1,452,355 cy of proposed dredge material is suitable for unconfined-open-water disposal. This suitable material includes all of DMMUs 5, 6, 7, 8, 9, 10, 11, 12, 14, 14B, 15, 16, 17, 17D, 18, 19, 20, 21 and 22 and all deep native material. A total of 83,045 cy is unsuitable for open water disposal at the Commencement Bay open-water disposal site or for in-water beneficial use. The unsuitable material includes all of DMMUs 1, 2, 3, 4, 17B and 17C. All suitable sediments are also suitable for any inwater beneficial use.

This memorandum determines the suitability of sediment proposed for dredging as part of the Puyallup Tribal Terminal for unconfined open-water disposal at an appropriate DMMP non-dispersive disposal site in Commencement Bay, or at an approved in-water beneficial use site. However, this suitability determination

does not constitute final agency approval of the project. Cleanup and dredging plans for this project must be completed as part of the final project approval process. 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.

Determination of suitability for this entire project is summarized in the following table.

Table 4. Summary of suitability with approximate volumes

| DMMU # | Approx. depth bgs | Volume (cy) | Suitability | Comments/Qualifiers |
|---|---|---|---|---|
| 1 | 0 – 6 Surface fill | 17,162 | No | Unsuitable due to dioxin levels > Commencement Bay interim guidelines |
| 2 | | 16,069 | No | |
| 3 | | 10,380 | No | |
| 4 | | 17,472 | No | |
| 5 | 3 – 10 Subsurface Native | 16,653 | Yes | |
| 6 | | 17,803 | Yes | |
| 7 | | 9,898 | Yes | |
| 8 | | 14,853 | Yes | |
| 9 | 7 – 16 Subsurface Native | 18,616 | Yes | |
| 10 | | 16,764 | Yes | |
| 11 | | 11,308 | Yes | |
| 12 | | 19,191 | Yes | |
| 14 | 13 – 40 Subsurface Native | 16,462 | Yes | |
| 14B | | 14,677 | Yes | |
| 15 | | 11,843 | Yes | |
| 16 | | 14,853 | Yes | |
| 17 | | 10,496 | Yes | |
| 17B | | 10,496 | No | Unsuitable due to dioxin levels > Commencement Bay interim guidelines |
| 17C | | 11,466 | No | |
| 17D | | 10,398 | Yes | |
| 18 | | 17,157 | Yes | |
| 19 | | 11,777 | Yes | |
| 20 | | 14,853 | Yes | |
| 21 | | 21,519 | Yes | |
| 22 | | 24,357 | Yes | |
| not tested | 13 – 55 Deep native | 1,158,877 | Yes | Suitable via Tier 1 determination |
| | LA/GD | 214,600 | No | Unsuitable via Tier 1 determination |
| Total Suitable | | 1,452,355 | | |
| Total Tested Unsuitable | | 83,045 | | |
| Total Untested Unsuitable | | 214,600 | | |
| Total Volume | | 1,750,000 | | |

## 8. References.


DMMP 2003. Determining when material above mean/ordinary high water will be characterized under the DMMP. DMMP Clarification Paper prepared by Tom Gries and Ted Benson for the DMMP agencies, November 17, 2003.

DMMP 2008. Dredged Material Evaluation and Disposal Procedures (Users' Manual), July 2008 edition. Prepared by the DMMP agencies.

Floyd-Snider 2009. Shoreline Cutback Characterization Report for the Puyallup Tribal Terminal, East Blair Waterway, Tacoma, Washington. Prepared by SSA Containers, Inc., January 2009.

PSDDA 1988. Evaluation Procedures Technical Appendix (EPTA) – Phase I (Central Puget Sound).

SMARM 1991. Modifications to Sampling Requirements For Deep Native Sediments. Clarification Paper prepared by David Fox (U.S. Army Corps of Engineers).

SMARM 2007. Polychlorinated Dioxins and Furans (PCDD/F): Clarification of Procedures for Acquiring Sediment Data. Prepared by Sandy Lemlich (U.S. Army Corps of Engineers); Erika Hoffman (U.S. Environmental Protection Agency); John Wakeman (U.S. Army Corps of Engineers).

World Health Organization (WHO) 2005. Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. ToxSci Advance Access published online July 7, 2006 at http://www.who.int/ipcs/assessment/tef_update/en/

## 9. Data Tables.

Table 5. Puyallup Tribal Terminal conventionals results.

| | DMMU | Volume (cubic yards) | Grain Size | | | | Total Fines (clay+silt) | Total Solids, % | Total Volatile Solids, % | Total Organic Carbon, % | Total Sulfides, mg/kg | Total Ammonia, mg/kg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | % Gravel | % Sand | % Silt | % Clay | | | | | | |
| *Surface Fill* | 1 | 17,162 | 14.5 | 65.5 | 15.4 | 4.6 | 20.0 | 93.8 | 2.02 | 0.889 | 1.13 U | 0.1 U |
| | 2 | 16,069 | 26.4 | 58.3 | 11.9 | 3.5 | 15.4 | 81.5 | 1.28 | 0.36 | 1.88 | 4.6 |
| | 3 | 10,380 | 28.7 | 57.3 | 11.7 | 2.1 | 13.8 | 95.2 | 1.65 | 1.47 | 0.97 U | 0.3 |
| | 4 | 17,472 | 20.6 | 44.8 | 26.1 | 8.7 | 34.8 | 85.9 | 9 | 0.645 | 23.5 | 5.4 |
| *Subsurface Native* | 5 | 16,653 | 2.2 | 80.4 | 13.5 | 3.9 | 17.4 | 82.6 | 1.24 | 0.429 | 1.2 U | 2.1 |
| | 6 | 17,803 | 0.2 | 59.5 | 32.5 | 7.7 | 40.2 | 82.5 | 1.95 | 0.38 | 56.4 | 6.22 |
| | 7 | 9,898 | 5.4 | 72.5 | 17.0 | 5.0 | 22.0 | 83 | 1.92 | 0.51 | 1.41 U | 0.78 |
| | 8 | 14,853 | 1.4 | 33.6 | 52.2 | 12.7 | 64.9 | 75.7 | 2.35 | 0.365 | 90.6 | 15.5 |
| | 9 | 18,616 | 2.4 | 69.2 | 19.1 | 9.3 | 28.4 | 63 | 5.69 | 2.9 | 5.85 | 29 |
| | 10 | 16,764 | 4.9 | 73.2 | 17.0 | 4.8 | 21.8 | 80.9 | 1.81 | 0.673 | 1.18 U | 6.7 |
| | 11 | 11,308 | 0.8 | 51.1 | 32.9 | 15.3 | 48.2 | 65.8 | 3.27 | 1.19 | 6.62 | 56.8 |
| | 12 | 19,191 | 9.1 | 17.3 | 45.8 | 27.8 | 73.6 | 65.6 | 4.04 | 1.63 | 349 | 67.7 |
| | 14[1] | 16,462 | 5.5 | 67.4 | 21.4 | 5.6 | 27.0 | 77.5 | 1.95 | 0.636 | 122 | 10.8 |
| | 14B | 14,677 | 3.4 | 75.0 | 16.9 | 4.7 | 21.6 | 79.6 | 1.6 | 0.336 | 3.9 | 9.32 |
| | 15 | 11,843 | 0.3 | 9.8 | 71.3 | 18.6 | 89.9 | 73.3 | 2.9 | 0.59 | 17.1 | 39.1 |
| | 16 | 14,853 | 0.1 | 27.5 | 51.3 | 21.2 | 72.5 | 73.1 | 2.28 | 0.555 | 25.4 | 33.6 |
| | 17 | 10,496 | NA[2] | NA | NA | NA | NA | 79.5 | 1.72 | 1.14 | 8.82 | 12.6 |
| | 17B | 10,496 | 21.6 | 55.7 | 14.9 | 7.9 | 22.8 | 75.3 | 1.99 | 0.972 | 15.8 | 27.9 |
| | 17C | 11,466 | 0.2 | 82.3 | 14.4 | 3.1 | 17.5 | 80.2 | 1.04 | 0.649 | 3.43 | 13 |
| | 17D | 10,398 | 0.1 | 92.5 | 6.2 | 1.2 | 7.4 | 84 | 0.82 | 0.111 | 4.9 | 3.99 |
| | 18 | 17,157 | 3.1 | 81.5 | 10.9 | 4.3 | 15.2 | 82.8 | 1.04 | 0.317 | 6.33 | 3.68 |
| | 19 | 11,777 | 0.6 | 62.2 | 28.3 | 9.0 | 37.3 | 77 | 1.61 | 0.788 | 1.22 U | 10.6 |
| | 20 | 14,853 | 0.1 U | 67.1 | 27.9 | 5.0 | 32.9 | 81.5 | 1.17 | 0.354 | 1.25 | 2.02 |
| | 21 | 21,519 | 0.3 | 44.5 | 41.5 | 13.8 | 55.3 | 73.7 | 3.46 | 0.779 | 2.04 | 14.7 |
| | 22 | 24,357 | 1.4 | 26.6 | 46.0 | 25.8 | 71.8 | 72.8 | 2.72 | 0.762 | 84.4 | 17.5 |

[1] DMMU numbering changed from initial plan due to field conditions.
[2] There was insufficient material from DMMU 17 due to field adjustment of DMMUs to perform grain size analyses.

Table 6. PTT results of chemical analysis compared to DMMP criteria.

| | DMMP Criteria | | | DMMU ID | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | SL | BT | ML | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | |
| Metals (mg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 150 | -- | 200 | 7 | U | 5 | U | 5 | U | 5 | U | 6 | U | 6 | U | 5 | U | 6 | U | 7 | U | 6 | U | 6 | U | 8 | U |
| Arsenic | 57 | 507.1 | 700 | 11 | | 5 | U | 6 | | 14 | | 6 | U | 6 | U | 5 | U | 8 | | 7 | U | 6 | U | 6 | U | 10 | |
| Cadmium | 5.1 | 11.3 | 14 | 0.3 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.3 | U | 0.3 | U | 0.3 | U | 0.3 | U | 0.3 | U |
| Chromium | -- | 267 | -- | 16 | | 43.8 | | 19 | | 15 | | 13 | | 15 | | 13 | | 17 | | 15 | | 16 | | 16 | | 19 | |
| Copper | 390 | 1,027 | 1,300 | 26 | | 30.1 | | 49 | | 24 | | 13 | | 17 | | 16 | | 40 | | 15 | | 16 | | 24 | | 39 | |
| Lead | 450 | 975 | 1,200 | 10 | | 37 | | 10 | | 11 | | 2 | U | 2 | U | 4 | | 5 | | 4 | | 3 | | 5 | | 14 | |
| Mercury | 0.41 | 1.5 | 2.3 | 0.05 | U | 0.05 | U | 0.05 | U | 0.05 | U | 0.05 | U | 0.05 | U | 0.04 | U | 0.05 | U | 0.06 | U | 0.06 | U | 0.05 | U | 0.07 | U |
| Nickel | 140 | 370 | 370 | 11 | | 72 | | 18 | | 10 | | 10 | | 11 | | 9 | | 12 | | 9 | | 12 | | 12 | | 16 | |
| Selenium | -- | 3 | -- | 0.7 | U | 0.5 | U | 0.5 | U | 0.5 | U | 0.6 | U | 0.6 | U | 0.6 | U | 0.6 | U | 0.6 | U | 0.7 | U | 0.7 | U | 0.8 | U |
| Silver | 6.1 | 6.1 | 8.4 | 0.4 | U | 0.3 | U | 0.3 | U | 0.3 | U | 0.4 | U | 0.3 | U | 0.3 | U | 0.4 | U | 0.4 | U | 0.4 | U | 0.4 | U | 0.5 | U |
| Zinc | 410 | 2,783 | 3800 | 39 | | 56 | | 49 | | 41 | | 23 | | 25 | | 24 | | 32 | | 22 | | 25 | | 30 | | 42 | |
| LPAHs (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | 560 | -- | 1,300 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Acenaphthene | 500 | -- | 2,000 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Anthracene | 960 | -- | 13,000 | 20 | U | 21 | | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Fluorene | 540 | -- | 3,600 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Naphthalene | 2,100 | -- | 2,400 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 11 | J | 20 | U | 20 | U | 19 | U |
| Phenanthrene | 1,500 | -- | 21,000 | 9.8 | J | 47 | | 20 | U | 10 | J | 19 | U | 20 | U | 20 | U | 20 | U | 21 | | 23 | | 20 | U | 13 | J |
| 2-Methylnaphthalene | 670 | -- | 1,900 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Total LPAH[1] | 5,200 | -- | 29,000 | 9.8 | J | 68 | | 20 | U | 10 | J | 19 | U | 20 | U | 20 | U | 20 | U | 32 | | 23 | | 20 | U | 13 | J |
| HPAHs (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | 1,300 | -- | 5,100 | 20 | U | 130 | | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 38 | | 20 | U | 19 | U |
| Benzo(a)pyrene | 1,600 | -- | 3,600 | 20 | U | 88 | | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 30 | | 20 | U | 19 | U |
| Total Benzofluoranthenes[4] | 3,200 | -- | 9,900 | 15 | J | 170 | | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 10 | J | 58 | | 20 | U | 19 | U |
| Benzo(g,h,i)perylene | 670 | -- | 3,200 | 11 | J | 36 | | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 13 | J | 20 | U | 19 | U |
| Chrysene | 1,400 | -- | 21,000 | 16 | J | 160 | | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 16 | J | 52 | | 20 | U | 19 | U |
| Dibenzo(a,h)anthracene | 230 | -- | 1,900 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Fluoranthene | 1,700 | 4,600 | 30,000 | 14 | J | 230 | | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 22 | | 66 | | 20 | U | 9.9 | J |
| Indeno(1,2,3-c,d)pyrene | 600 | -- | 4,400 | 20 | U | 39 | | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 13 | J | 20 | U | 19 | U |
| Pyrene | 2,600 | 11,980 | 16,000 | 16 | J | 290 | | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 22 | | 79 | | 20 | U | 19 | U |

| | DMMP Criteria | | | DMMU ID | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | SL | BT | ML | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | |
| Total HPAHs[2] | 12,000 | -- | 69,000 | 72 | J | 1,143 | | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 70 | J | 349 | J | 20 | U | 9.9 | J |
| Chlorinated Hydrocarbons (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hexachlorobenzene | 22 | 168 | 230 | 20 | U | 20 | U | 20 | U | 1 | U | 19 | U | 20 | U | 20 | U | 1 | U | 20 | U | 20 | U | 20 | U | 1 | U |
| Hexachlorobutadiene | 29 | -- | 270 | 20 | U | 20 | U | 20 | U | 1 | U | 19 | U | 20 | U | 20 | U | 1 | U | 20 | U | 20 | U | 20 | U | 1 | U |
| 1,2-Dichlorobenzene | 35 | -- | 110 | 0.8 | U | 0.8 | U | 0.8 | U | 0.8 | U | 1 | U | 1 | U | 1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.2 | U | 1.2 | U |
| 1,3-Dichlorobenzene | 170 | -- | -- | 0.8 | U | 0.8 | U | 0.8 | U | 0.8 | U | 1 | U | 1 | U | 1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.2 | U | 1.2 | U |
| 1,4-Dichlorobenzene | 110 | -- | 120 | 0.8 | U | 0.8 | U | 0.8 | U | 0.8 | U | 1 | U | 1 | U | 1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.2 | U | 1.2 | U |
| 1,2,4-Trichlorobenzene | 31 | -- | 64 | 4.2 | U | 3.9 | U | 4.1 | U | 4.1 | U | 4.9 | U | 4.9 | U | 4.8 | U | 5.4 | U | 5.4 | U | 5.4 | U | 6 | U | 5.7 | U |
| Phthalates (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Diethyl phthalate | 200 | -- | 1,200 | 19 | J | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Dimethyl phthalate | 71 | -- | 1,400 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Di-n-butyl phthalate | 1,400 | -- | 5,100 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Di-n-octyl phthalate | 6,200 | -- | 6,200 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Bis (2-ethylhexyl) phthalate | 1,300 | -- | 8,300 | 22 | | 17 | J | 20 | U | 40 | | 11 | J | 16 | J | 20 | U | 25 | | 17 | J | 12 | J | 20 | U | 37 | |
| Butyl benzyl phthalate | 63 | -- | 970 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Phenols (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pentachlorophenol | 400 | 504 | 690 | 98 | U | 99 | U | 98 | U | 97 | U | 97 | U | 97 | U | 99 | U | 99 | U | 98 | U | 99 | U | 99 | U | 97 | U |
| Phenol | 420 | -- | 1,200 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| 2 Methylphenol | 63 | -- | 77 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| 4 Methylphenol | 670 | -- | 3,600 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| 2,4-Dimethylphenol | 29 | -- | 210 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Miscellaneous Compounds (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzoic acid | 650 | -- | 760 | 200 | U | 200 | U | 200 | U | 190 | U | 190 | U | 200 | U | 200 | U | 200 | U | 200 | U | 200 | U | 200 | U | 190 | U |
| Benzyl alcohol | 57 | -- | 870 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Dibenzofuran | 540 | -- | 1,700 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Hexachloroethane | 1,400 | -- | 14,000 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| N-Nitrosodiphenylamine | 28 | -- | 130 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Volatile Organics (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 10 | -- | 50 | 0.8 | U | 0.8 | U | 0.8 | U | 0.8 | U | 1 | U | 1 | U | 1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.2 | U | 1.2 | U |
| Tetrachloroethene | 57 | -- | 210 | 0.8 | U | 0.8 | U | 0.8 | U | 0.8 | U | 1 | U | 1 | U | 1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.2 | U | 1.2 | U |
| Trichloroethene | 160 | -- | 1,600 | 0.8 | U | 0.8 | U | 0.8 | U | 0.8 | U | 1 | U | 1 | U | 1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.2 | U | 1.2 | U |
| Xylene (s) (sum of o-, m-, p-) | 40 | -- | 160 | 0.8 | U | 0.8 | U | 0.8 | U | 0.8 | U | 1 | U | 1 | U | 1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.2 | U | 1.2 | U |
| Pesticides (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aldrin | 10 | -- | -- | 1 | U | 0.99 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |

| | DMMP Criteria | | | DMMU ID | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | SL | BT | ML | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | |
| Total Chlordane[4] | 10 | 37 | -- | 1.9 | U | 2 | U | 2 | U | 1.9 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U |
| Total DDT | 6.9 | 50 | 69 | 1.9 | U | 2 | U | 2 | U | 1.9 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U |
| Dieldrin | 10 | -- | -- | 1.9 | U | 2 | U | 2 | U | 1.9 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U |
| Heptachlor | 10 | -- | -- | 1 | U | 0.99 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Lindane | 10 | -- | -- | 1 | U | 0.99 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| PCBs (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total PCBs | 130 | 38[5] | 3,100 | 19 | U | 20 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U |

Notes:
Bold Indicates detected concentrations.
1 Total LPAH = the sum of acenaphthylene, acenaphthene, anthracene, fluorene, naphthalene, and phenanthrene.
2 Total HPAH = the sum of benzo(a)anthracene, benzo(a)pyrene, total benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, and pyrene.
3 Total benzofluoranthenes = the sum of the "b," "j" and "k" isomers. The "j" isomer co-elutes with the "k" isomer, thus the concentration of the "j" isomer is included in the "k" isomer concentration.
4 Total chlordane = the sum of alpha-chlordane, gamma-chlordane, oxy-chlordane, cis-nonachlor, and trans-nonachlor.
5 This value is normalized to total organic carbon and is expressed in mg/kg carbon (mg/kg-OC).

Table 6, cont. PTT chemical analysis results compared to DMMP guidelines.

| | DMMP Criteria | | | DMMP ID | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | SL | BT | ML | 12 | | 14[1] | | 14B | | 15 | | 16 | | 17 | | 17B | | 17C | | 17D | | 18 | | 19 | | 20 | | 21 | | 22 | |
| Metals (mg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 150 | -- | 200 | 8 | U | 8 | U | 6 | U | 7 | U | 6 | U | 6 | U | 6 | U | 6 | U | 6 | U | 6 | U | 6 | U | 6 | U | 6 | U | 7 | U |
| Arsenic | 57 | 507.1 | 700 | 10 | | 8 | U | 6 | U | 7 | U | 7 | | 6 | U | 6 | U | 6 | U | 6 | U | 8 | | 6 | U | 7 | | 6 | U | 7 | U |
| Cadmium | 5.1 | 11.3 | 14 | 0.3 | U | 0.3 | U | 0.2 | U | 0.3 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.3 | U | 0.3 | U |
| Chromium | -- | 267 | -- | 19 | | 19 | | 15 | | 19 | | 17 | | 15 | | 14 | | 13.2 | | 13 | | 13 | | 14 | | 15 | | 18 | | 19 | |
| Copper | 390 | 1,027 | 1,300 | 39 | | 29 | | 14 | | 34 | | 27 | | 18 | | 17 | | 12.3 | | 10 | | 14 | | 15 | | 17 | | 23 | | 27 | |
| Lead | 450 | 975 | 1,200 | 14 | | 5 | | 2 | U | 3 | | 3 | | 4 | | 5 | | 4 | | 2 | U | 2 | U | 2 | U | 2 | U | 3 | | 3 | |
| Mercury | 0.41 | 1.5 | 2.3 | 0.07 | U | 0.07 | U | 0.06 | U | 0.06 | U | 0.05 | U | 0.06 | U | 0.05 | U | 0.05 | U | 0.04 | U | 0.05 | U | 0.05 | U | 0.05 | U | 0.05 | U | 0.06 | U |
| Nickel | 140 | 370 | 370 | 16 | | 15 | | 11 | | 15 | | 12 | | 9 | | 9 | | 8 | | 8 | | 9 | | 9 | | 9 | | 11 | | 14 | |
| Selenium | -- | 3 | -- | 0.8 | U | 0.8 | U | 0.6 | U | 0.7 | U | 0.6 | U | 0.6 | U | 0.6 | U | 0.6 | U | 0.6 | U | 0.6 | U | 0.6 | U | 0.6 | U | 0.7 | U | 0.7 | U |
| Silver | 6.1 | 6.1 | 8.4 | 0.5 | U | 0.5 | U | 0.4 | U | 0.4 | U | 0.4 | U | 0.3 | U | 0.4 | U | 0.3 | U | 0.3 | U | 0.4 | U | 0.4 | U | 0.4 | U | 0.4 | U | 0.4 | U |
| Zinc | 410 | 2,783 | 3800 | 42 | | 36 | | 20 | | 37 | | 30 | | 26 | | 24 | | 23 | | 21 | | 23 | | 21 | | 22 | | 27 | | 31 | |
| LPAHs (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | 560 | -- | 1,300 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Acenaphthene | 500 | -- | 2,000 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Anthracene | 960 | -- | 13,000 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Fluorene | 540 | -- | 3,600 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |

| | DMMP Criteria | | | DMMP ID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | SL | BT | ML | 12 | | 14[1] | | 14B | | 15 | | 16 | | 17 | | 17B | | 17C | | 17D | | 18 | | 19 | | 20 | | 21 | | 22 | |
| Naphthalene | 2,100 | -- | 2,400 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Phenanthrene | 1,500 | -- | 21,000 | 13 | J | 29 | | 20 | U | 19 | U | 20 | U | 19 | U | 18 | J | 24 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| 2-Methylnaphthalene | 670 | -- | 1,900 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Total LPAH[3] | 5,200 | -- | 29,000 | 13 | J | 29 | | 20 | U | 19 | U | 20 | U | 19 | U | 18 | J | 24 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| HPAHs (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | 1,300 | -- | 5,100 | 19 | U | 12 | J | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 150 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Benzo(a)pyrene | 1,600 | -- | 3,600 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 110 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Total Benzofluoranthenes[4] | 3,200 | -- | 9,900 | 19 | U | 11 | J | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 280 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Benzo(g,h,i)perylene | 670 | -- | 3,200 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 52 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Chrysene | 1,400 | -- | 21,000 | 19 | U | 17 | J | 20 | U | 19 | U | 20 | U | 19 | U | 13 | J | 140 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Dibenzo(a,h)anthracene | 230 | -- | 1,900 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 28 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Fluoranthene | 1,700 | 4,600 | 30,000 | 9.9 | J | 26 | | 20 | U | 19 | U | 20 | U | 19 | U | 23 | | 150 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Indeno(1,2,3-c,d)pyrene | 600 | -- | 4,400 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 85 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Pyrene | 2,600 | 11,980 | 16,000 | 19 | U | 30 | | 20 | U | 19 | U | 20 | U | 19 | U | 21 | | 100 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Total HPAHs[5] | 12,000 | -- | 69,000 | 9.9 | J | 96 | J | 20 | U | 19 | U | 20 | U | 19 | U | 57 | J | 1095 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Chlorinated Hydrocarbons (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hexachlorobenzene | 22 | 168 | 230 | 1 | U | 19 | U | 20 | U | 19 | U | 1 | U | 1 | U | 1 | U | 0.97 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Hexachlorobutadiene | 29 | -- | 270 | 1 | U | 19 | U | 20 | U | 19 | U | 1 | U | 1 | U | 1 | U | 0.97 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,2-Dichlorobenzene | 35 | -- | 110 | 1.2 | U | 1 | U | 0.9 | U | 1.1 | U | 1 | U | 1 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1.1 | U |
| 1,3-Dichlorobenzene | 170 | -- | -- | 1.2 | U | 1 | U | 0.9 | U | 1.1 | U | 1 | U | 1 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1.1 | U |
| 1,4-Dichlorobenzene | 110 | -- | 120 | 1.2 | U | 1 | U | 0.9 | U | 1.1 | U | 1 | U | 1 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1.1 | U |
| 1,2,4-Trichlorobenzene | 31 | -- | 64 | 5.7 | U | 4.9 | U | 4.6 | U | 5.7 | U | 4.9 | U | 4.9 | U | 4.4 | U | 4.8 | U | 4.6 | U | 4.4 | U | 5 | U | 4.6 | U | 4.6 | U | 5.7 | U |
| Phthalates (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Diethyl phthalate | 200 | -- | 1,200 | 19 | U | 16 | J | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Dimethyl phthalate | 71 | -- | 1,400 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Di-n-butyl phthalate | 1,400 | -- | 5,100 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Di-n-octyl phthalate | 6,200 | -- | 6,200 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Bis (2-ethylhexyl) phthalate | 1,300 | -- | 8,300 | 37 | | 12 | J | 20 | U | 19 | U | 13 | J | 19 | U | 12 | J | 30 | | 20 | U | 16 | J | 20 | U | 16 | J | 24 | | 13 | J |
| Butyl benzyl phthalate | 63 | -- | 970 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |

| | DMMP Criteria | | | DMMP ID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | SL | BT | ML | 12 | | 14[1] | | 14B | | 15 | | 16 | | 17 | | 17B | | 17C | | 17D | | 18 | | 19 | | 20 | | 21 | | 22 | |
| Phenols (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pentachlorophenol | 400 | 504 | 690 | 97 | U | 96 | U | 99 | U | 96 | U | 99 | U | 96 | U | 96 | U | 95 | U | 98 | U | 81 | J | 98 | U | 85 | J | 98 | U | 98 | U |
| Phenol | 420 | -- | 1,200 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| 2 Methylphenol | 63 | -- | 77 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| 4 Methylphenol | 670 | -- | 3,600 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| 2,4-Dimethylphenol | 29 | -- | 210 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Miscellaneous Compounds (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzoic acid | 650 | -- | 760 | 190 | U | 190 | U | 200 | U | 190 | U | 200 | U | 190 | U | 190 | U | 190 | U | 200 | U | 190 | U | 200 | U | 200 | U | 200 | U | 200 | U |
| Benzyl alcohol | 57 | -- | 870 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Dibenzofuran | 540 | -- | 1,700 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Hexachloroethane | 1,400 | -- | 14,000 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| N-Nitrosodiphenylamine | 28 | -- | 130 | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Volatile Organics (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 10 | -- | 50 | 1.2 | U | 1 | U | 0.9 | U | 1.1 | U | 1 | U | 1 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1.1 | U |
| Tetrachloroethene | 57 | -- | 210 | 1.2 | U | 1 | U | 0.9 | U | 1.1 | U | 1 | U | 1 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1.1 | U |
| Trichloroethene | 160 | -- | 1,600 | 1.2 | U | 1 | U | 0.9 | U | 1.1 | U | 1 | U | 1 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1.1 | U |
| Xylene (s) (sum of o-, m-, p-) | 40 | -- | 160 | 1.2 | U | 1 | U | 0.9 | U | 1.1 | U | 1 | U | 1 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1 | U | 0.9 | U | 0.9 | U | 1.1 | U |
| Pesticides (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aldrin | 10 | -- | -- | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 0.97 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Total Chlordane | 10 | 37 | -- | 2 | U | 1.9 | U | 2 | U | 1.9 | U | 2 | U | 2 | U | 2 | U | 1.9 | U | 2 | U | 1.9 | U | 2 | U | 2 | U | 2 | U | 2 | U |
| Total DDT | 6.9 | 50 | 69 | 2 | U | 1.9 | U | 2 | U | 1.9 | U | 2 | U | 2 | U | 2 | U | 1.9 | U | 2 | U | 1.9 | U | 2 | U | 2 | U | 2 | U | 2 | U |
| Dieldrin | 10 | -- | -- | 2 | U | 1.9 | U | 2 | U | 1.9 | U | 2 | U | 2 | U | 2 | U | 1.9 | U | 2 | U | 1.9 | U | 2 | U | 2 | U | 2 | U | 2 | U |
| Heptachlor | 10 | -- | -- | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1.2 | UY | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Lindane | 10 | -- | -- | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 0.97 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| PCBs (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total PCBs | 130 | 38[6] | 3,100 | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 55 | | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 19 | U |

Notes:
Bold Indicates detected concentrations.
1 DMMU numbering was altered during sampling due to field conditions differing slightly from SAP assumptions.

Table 7. PTT chemical analysis results compared to SMS guidelines.

| Chemical | SMS Guidelines | | DMMP ID | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SQS | CSL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Total Organic Carbon (%) | -- | -- | 0.89 | 0.36 | 1.47 | 0.65 | 0.43 | 0.38 | 0.51 | 0.37 | 2.9 | 0.67 | 1.19 | 1.63 |
| Metals (mg/kg dry weight) | | | | | | | | | | | | | | |
| Arsenic | 57 | 93 | 11 | 5 U | 6 | 14 | 6 U | 6 U | 5 U | 8 | 7 U | 6 U | 6 U | 10 |
| Cadmium | 5.1 | 6.7 | 0.3 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.3 U | 0.3 U | 0.3 U | 0.3 U | 0.3 U |
| Chromium | 260 | 270 | 16 | 43.8 | 19 | 15 | 13 | 15 | 13 | 17 | 15 | 16 | 16 | 19 |
| Copper | 390 | 390 | 26 | 30.1 | 49 | 24 | 13 | 17 | 16 | 40 | 15 | 16 | 24 | 39 |
| Lead | 450 | 530 | 10 | 37 | 10 | 11 | 2 U | 2 U | 4 | 5 | 4 | 3 | 5 | 14 |
| Mercury | 0.41 | 0.59 | 0.05 U | 0.05 U | 0.05 U | 0.05 U | 0.05 U | 0.05 U | 0.04 U | 0.05 U | 0.06 U | 0.06 U | 0.05 U | 0.07 U |
| Silver | 6.1 | 6.1 | 0.4 U | 0.3 U | 0.3 U | 0.3 U | 0.4 U | 0.3 U | 0.3 U | 0.4 U | 0.4 U | 0.4 U | 0.4 U | 0.5 U |
| Zinc | 410 | 960 | 39 | 56 | 49 | 41 | 23 | 25 | 24 | 32 | 22 | 25 | 30 | 42 |
| LPAHs (µg/kg OC) | | | | | | | | | | | | | | |
| Acenaphthylene | 66 | 66 | 2.2 U | 5.6 U | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 U | 3.0 U | 1.7 U | 1.2 U |
| Acenaphthene | 16 | 57 | 2.2 U | 5.6 U | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 U | 3.0 U | 1.7 U | 1.2 U |
| Anthracene | 220 | 1,200 | 2.2 U | 5.8 | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 U | 3.0 U | 1.7 U | 1.2 U |
| Fluorene | 23 | 79 | 2.2 U | 5.6 U | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 U | 3.0 U | 1.7 U | 1.2 U |
| Naphthalene | 99 | 170 | 2.2 U | 5.6 U | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.4 J | 3.0 U | 1.7 U | 1.2 U |
| Phenanthrene | 100 | 480 | 1.1 J | 13.1 | 1.4 U | 1.6 J | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 | 3.4 | 1.7 U | 0.8 J |
| 2-Methylnaphthalene | 38 | 64 | 2.2 U | 5.6 U | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 U | 3.0 U | 1.7 U | 1.2 U |
| Total LPAH | 370 | 780 | 1.1 J | 18.9 | 1.4 U | 1.6 J | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 1.1 | 3.4 | 1.7 U | 0.8 J |
| HPAHs (µg/kg OC) | | | | | | | | | | | | | | |
| Benzo(a)anthracene | 110 | 270 | 2.2 U | 36.1 | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 U | 5.6 | 1.7 U | 1.2 U |
| Benzo(a)pyrene | 99 | 210 | 2.2 U | 24.4 | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 U | 4.5 | 1.7 U | 1.2 U |
| Total Benzofluoranthenes | 230 | 450 | 1.7 J | 47.2 | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.3 J | 8.6 | 1.7 U | 1.2 U |
| Benzo(g,h,i)perylene | 31 | 78 | 1.2 J | 10.0 | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 U | 1.9 J | 1.7 U | 1.2 U |
| Chrysene | 110 | 460 | 1.8 J | 44.4 | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.6 J | 7.7 | 1.7 U | 1.2 U |
| Dibenzo(a,h)anthracene | 12 | 33 | 2.2 U | 5.6 U | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 U | 3.0 U | 1.7 U | 1.2 U |
| Fluoranthene | 160 | 1,200 | 1.6 J | 63.9 | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.8 | 9.8 | 1.7 U | 0.6 J |
| Indeno(1,2,3-cd)pyrene | 34 | 88 | 2.2 U | 10.8 | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.7 U | 1.9 J | 1.7 U | 1.2 U |
| Pyrene | 1,000 | 1,400 | 1.8 J | 80.6 | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 0.8 | 11.7 | 1.7 U | 1.2 U |
| Total HPAHs | 960 | 5,300 | 8.1 J | 318 | 1.4 U | 2.9 U | 4.4 U | 5.3 U | 3.9 U | 5.5 U | 2.4 J | 52 J | 1.7 U | 0.6 J |

| Chemical | SMS Guidelines | | DMMP ID | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SQS | CSL | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | |
| Chlorinated Hydrocarbons (µg/kg OC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hexachlorobenzene | 0.38 | 2.3 | 2.2 | U | 5.6 | U | 1.4 | U | 0.2 | U | 4.4 | U | 5.3 | U | 3.9 | U | 0.3 | U | 0.7 | U | 3.0 | U | 1.7 | U | 0.1 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | 2.2 | U | 5.6 | U | 1.4 | U | 0.2 | U | 4.4 | U | 5.3 | U | 3.9 | U | 0.3 | U | 0.7 | U | 3.0 | U | 1.7 | U | 0.1 | U |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.1 | U | 0.2 | U | 0.1 | U | 0.1 | U | 0.2 | U | 0.3 | U | 0.2 | U | 0.3 | U | 0.04 | U | 0.2 | U | 0.1 | U | 0.1 | U |
| 1,4-Dichlorobenzene | 3.1 | 9 | 0.1 | U | 0.2 | U | 0.1 | U | 0.1 | U | 0.2 | U | 0.3 | U | 0.2 | U | 0.3 | U | 0.04 | U | 0.2 | U | 0.1 | U | 0.1 | U |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | 0.5 | U | 1.1 | U | 0.3 | U | 0.6 | U | 1.1 | U | 1.3 | U | 0.9 | U | 1.5 | U | 0.2 | U | 0.80 | U | 0.5 | U | 0.3 | U |
| Phthalates (µg/kg OC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Diethyl phthalate | 61 | 110 | 2.1 | J | 5.6 | U | 1.4 | U | 2.9 | U | 4.4 | U | 5.3 | U | 3.9 | U | 5.5 | U | 0.7 | U | 3.0 | U | 1.7 | U | 1.2 | U |
| Dimethyl phthalate | 53 | 53 | 2.2 | U | 5.6 | U | 1.4 | U | 2.9 | U | 4.4 | U | 5.3 | U | 3.9 | U | 5.5 | U | 0.7 | U | 3.0 | U | 1.7 | U | 1.2 | U |
| Di-n-butyl phthalate | 220 | 1,700 | 2.2 | U | 5.6 | U | 1.4 | U | 2.9 | U | 4.4 | U | 5.3 | U | 3.9 | U | 5.5 | U | 0.7 | U | 3.0 | U | 1.7 | U | 1.2 | U |
| Di-n-octyl phthalate | 58 | 4,500 | 2.2 | U | 5.6 | U | 1.4 | U | 2.9 | U | 4.4 | U | 5.3 | U | 3.9 | U | 5.5 | U | 0.7 | U | 3.0 | U | 1.7 | U | 1.2 | U |
| Bis (2-ethylhexyl) phthalate | 47 | 78 | 2.5 | | 4.7 | J | 1.4 | U | 6.2 | | 2.6 | J | 4.2 | J | 3.9 | U | 6.8 | | 0.6 | J | 1.8 | J | 1.7 | U | 2.3 | |
| Butyl benzyl phthalate | 4.9 | 64 | 2.2 | U | 5.6 | U | 1.4 | U | 2.9 | U | 4.4 | U | 5.3 | U | 3.9 | U | 5.5 | U | 0.7 | U | 3.0 | U | 1.7 | U | 1.2 | U |
| Phenols (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pentachlorophenol | 360 | 690 | 98 | U | 99 | U | 98 | U | 97 | U | 97 | U | 97 | U | 99 | U | 99 | U | 98 | U | 99 | U | 99 | U | 97 | U |
| Phenol | 420 | 1,200 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| 2 Methylphenol | 63 | 63 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| 4 Methylphenol | 670 | 670 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| 2,4-Dimethylphenol | 29 | 29 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Miscellaneous Compounds | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzoic acid (µg/kg dry weight) | 650 | -- | 200 | U | 200 | U | 200 | U | 190 | U | 190 | U | 200 | U | 200 | U | 200 | U | 200 | U | 200 | U | 200 | U | 190 | U |
| Benzyl alcohol (µg/kg dry weight) | 57 | 73 | 20 | U | 20 | U | 20 | U | 19 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 20 | U | 19 | U |
| Dibenzofuran (µg/kg OC) | 15 | 58 | 2.2 | U | 5.6 | U | 1.4 | U | 2.9 | U | 4.4 | U | 5.3 | U | 3.9 | U | 5.5 | U | 0.7 | U | 3.0 | U | 1.7 | U | 1.2 | U |
| N-Nitrosodiphenylamine (µg/kg OC) | 11 | 11 | 2.2 | U | 5.6 | U | 1.4 | U | 2.9 | U | 4.4 | U | 5.3 | U | 3.9 | U | 5.5 | U | 0.7 | U | 3.0 | U | 1.7 | U | 1.2 | U |
| PCBs (mg/kg OC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total PCBs | 12 | 65 | 2.1 | U | 5.6 | U | 1.4 | U | 2.9 | U | 4.4 | U | 5.0 | U | 3.9 | U | 5.5 | U | 0.7 | U | 3.0 | U | 1.7 | U | 1.2 | U |

Notes:
Bold Indicates detected concentrations.
Shading indicates nondetect exceedance of SQS after carbon normalization.

Table 7, cont. PTT chemical analysis results compared to SMS guidelines.

| Chemical | SMS Guidelines | | DMMP ID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SQS | CSL | 14[1] | | 14B | | 15 | | 16 | | 17 | | 17B | | 17C | | 17D | | 18 | | 19 | | 20 | | 21 | | 22 | |
| Total Organic Carbon (%) | -- | -- | 0.64 | | 0.34 | | 0.59 | | 0.56 | | 1.14 | | 0.97 | | 0.65 | | 0.11 | | 0.32 | | 0.79 | | 0.35 | | 0.78 | | 0.76 | |
| Metals (mg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | 57 | 93 | 8 | U | 6 | U | 7 | U | 7 | | 6 | U | 6 | U | 6 | U | 6 | U | 8 | | 6 | U | 7 | | 6 | U | 7 | U |
| Cadmium | 5.1 | 6.7 | 0.3 | U | 0.2 | U | 0.3 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.2 | U | 0.3 | U | 0.3 | U |
| Chromium | 260 | 270 | 19 | | 15 | | 19 | | 17 | | 15 | | 14 | | 13 | | 13 | | 13 | | 14 | | 14.5 | | 17.7 | | 19.3 | |
| Copper | 390 | 390 | 29 | | 14 | | 34 | | 27 | | 18 | | 17 | | 12 | | 10 | | 14 | | 15 | | 17.1 | | 23.3 | | 27.1 | |
| Lead | 450 | 530 | 5 | | 2 | U | 3 | | 3 | | 4 | | 5 | | 4 | | 2 | U | 2 | U | 2 | U | 2 | U | 3 | | 3 | |
| Mercury | 0.41 | 0.59 | 0.07 | U | 0.06 | U | 0.06 | U | 0.05 | U | 0.06 | U | 0.05 | U | 0.05 | U | 0.04 | U | 0.05 | U | 0.05 | U | 0.05 | U | 0.05 | U | 0.06 | U |
| Silver | 6.1 | 6.1 | 0.5 | U | 0.4 | U | 0.4 | U | 0.4 | U | 0.3 | U | 0.4 | U | 0.3 | U | 0.3 | U | 0.4 | U | 0.4 | U | 0.4 | U | 0.4 | U | 0.4 | U |
| Zinc | 410 | 960 | 36 | | 20 | | 37 | | 30 | | 26 | | 24 | | 23 | | 21 | | 23 | | 21 | | 22 | | 27 | | 31 | |
| LPAHs (µg/kg OC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | 66 | 66 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Acenaphthene | 16 | 57 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Anthracene | 220 | 1,200 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Fluorene | 23 | 79 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Naphthalene | 99 | 170 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Phenanthrene | 100 | 480 | 4.6 | | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 1.9 | J | 3.7 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| 2-Methylnaphthalene | 38 | 64 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Total LPAH | 370 | 780 | 4.6 | | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 1.9 | J | 3.7 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| HPAHs (µg/kg OC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | 110 | 270 | 1.9 | J | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 23.1 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Benzo(a)pyrene | 99 | 210 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 16.9 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Total Benzofluoranthenes[6] | 230 | 450 | 1.7 | J | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 43.1 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Benzo(g,h,i)perylene | 31 | 78 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 8.0 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Chrysene | 110 | 460 | 2.7 | J | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 1.3 | J | 21.6 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Dibenzo(a,h)anthracene | 12 | 33 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 4.3 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Fluoranthene | 160 | 1,200 | 4.1 | | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.4 | | 23.1 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Indeno(1,2,3-cd)pyrene | 34 | 88 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 13.1 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Pyrene | 1,000 | 1,400 | 4.7 | | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.2 | | 15.4 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Total HPAHs | 960 | 5,300 | 15.1 | J | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 5.9 | J | 169 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |

| Chemical | SMS Guidelines | | DMMP ID | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SQS | CSL | 14[1] | | 14B | | 15 | | 16 | | 17 | | 17B | | 17C | | 17D | | 18 | | 19 | | 20 | | 21 | | 22 | |
| Chlorinated Hydrocarbons (µg/kg OC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hexachlorobenzene | 0.38 | 2.3 | 3.0 | U | 6.0 | U | 3.2 | U | 0.2 | U | 0.1 | U | 0.1 | U | 0.1 | U | 0.9 | U | 0.3 | U | 0.1 | U | 0.3 | U | 0.1 | U | 0.1 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | 3.0 | U | 6.0 | U | 3.2 | U | 0.2 | U | 0.1 | U | 0.1 | U | 0.1 | U | 0.9 | U | 0.3 | U | 0.1 | U | 0.3 | U | 0.1 | U | 0.1 | U |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.2 | U | 0.3 | U | 0.2 | U | 0.2 | U | 0.1 | U | 0.1 | U | 0.2 | U | 0.8 | U | 0.3 | U | 0.1 | U | 0.3 | U | 0.1 | U | 0.1 | U |
| 1,4-Dichlorobenzene | 3.1 | 9 | 0.2 | U | 0.3 | U | 0.2 | U | 0.2 | U | 0.1 | U | 0.1 | U | 0.2 | U | 0.8 | U | 0.3 | U | 0.1 | U | 0.3 | U | 0.1 | U | 0.1 | U |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | 0.77 | U | 1.4 | U | 1.0 | U | 0.9 | U | 0.4 | U | 0.5 | U | 0.7 | U | 4.1 | U | 1.4 | U | 0.6 | U | 1.3 | U | 0.6 | U | 0.7 | U |
| Phthalates (µg/kg OC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Diethyl phthalate | 61 | 110 | 2.5 | J | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Dimethyl phthalate | 53 | 53 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Di-n-butyl phthalate | 220 | 1,700 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Di-n-octyl phthalate | 58 | 4,500 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Bis (2-ethylhexyl) phthalate | 47 | 78 | 1.9 | J | 6.0 | U | 3.2 | U | 2.3 | J | 1.7 | U | 1.2 | J | 4.6 | | 18.0 | U | 5.0 | J | 2.5 | U | 4.5 | J | 3.1 | | 1.7 | J |
| Butyl benzyl phthalate | 4.9 | 64 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| Phenols (µg/kg dry weight) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pentachlorophenol | 360 | 690 | 96 | U | 99 | U | 96 | U | 99 | U | 96 | U | 96 | U | 95 | U | 98 | U | 81 | J | 98 | U | 85 | J | 98 | U | 98 | U |
| Phenol | 420 | 1,200 | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| 2 Methylphenol | 63 | 63 | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| 4 Methylphenol | 670 | 670 | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| 2,4-Dimethylphenol | 29 | 29 | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Miscellaneous Compounds | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzoic acid (µg/kg dry weight) | 650 | -- | 190 | U | 200 | U | 190 | U | 200 | U | 190 | U | 190 | U | 190 | U | 200 | U | 190 | U | 200 | U | 200 | U | 200 | U | 200 | U |
| Benzyl alcohol (µg/kg dry weight) | 57 | 73 | 19 | U | 20 | U | 19 | U | 20 | U | 19 | U | 19 | U | 19 | U | 20 | U | 19 | U | 20 | U | 20 | U | 20 | U | 20 | U |
| Dibenzofuran (µg/kg OC) | 15 | 58 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| N-Nitrosodiphenylamine (µg/kg OC) | 11 | 11 | 3.0 | U | 6.0 | U | 3.2 | U | 3.6 | U | 1.7 | U | 2.0 | U | 2.9 | U | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.6 | U |
| PCBs (mg/kg OC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total PCBs | 12 | 65 | 3.0 | U | 6.0 | U | 3.4 | U | 3.6 | U | 1.8 | U | 2.1 | U | 8.5 | | 18.0 | U | 6.0 | U | 2.5 | U | 5.6 | U | 2.6 | U | 2.5 | U |

Bold Indicates detected concentrations.
Shading indicates nondetect exceedance of SQS after carbon normalization.
1 DMMU numbering was altered during sampling due to field conditions differing slightly from SAP assumptions.

Table 8. PTT Project Dioxins/Furans Total Equivalents (TEQs).

| | TEF WHO 2005 | ND=1/2 RL TEQ | | | | | | | | ND=0 TEQ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | H1 | H2 | H3 | H4 | H5 | H6 | H7 | H8 | H1 | H2 | H3 | H4 | H5 | H6 | H7 | H8 |
| Dioxins | | | | | | | | | | | | | | | | | |
| 2,3,7,8-TCDD | 1 | 0.31 | 0.05 | 0.08 | 0.08 | 0.06 | 0.40 | 0.06 | 0.04 | 0.31 | 0 | 0 | 0 | 0 | 0.40 | 0 | 0 |
| 1,2,3,7,8-PeCDD | 1 | 1.03 | 0.39 | 0.12 | 0.08 | 0.66 | 1.30 | 0.06 | 0.04 | 1.03 | 0.39 | 0 | 0 | 0.66 | 1.30 | 0 | 0 |
| 1,2,3,4,7,8-HxCDD | 0.1 | 0.25 | 0.08 | 0.09 | 0.02 | 0.19 | 0.27 | 0.01 | 0.01 | 0.25 | 0.08 | 0.09 | 0 | 0.19 | 0.27 | 0 | 0 |
| 1,2,3,6,7,8-HxCDD | 0.1 | 1.00 | 0.21 | 0.15 | 0.02 | 0.30 | 0.84 | 0.07 | 0.01 | 1.00 | 0.21 | 0.15 | 0 | 0.30 | 0.84 | 0.07 | 0 |
| 1,2,3,7,8,9-HxCDD | 0.1 | 0.50 | 0.15 | 0.13 | 0.02 | 0.27 | 0.54 | 0.01 | 0.01 | 0.50 | 0.15 | 0.13 | 0 | 0.27 | 0.54 | 0 | 0 |
| 1,2,3,4,6,7,8-HpCDD | 0.01 | 2.03 | 0.32 | 0.21 | 0.05 | 0.53 | 1.48 | 0.11 | 0.001 | 2.03 | 0.32 | 0.21 | 0.05 | 0.53 | 1.48 | 0.11 | 0 |
| OCDD | 0.0003 | 0.81 | 0.09 | 0.04 | 0.01 | 0.12 | 0.51 | 0.03 | 0.0001 | 0.81 | 0.09 | 0.04 | 0.01 | 0.12 | 0.51 | 0.03 | 0 |
| Furans | | | | | | | | | | | | | | | | | |
| 2,3,7,8-TCDF | 0.1 | 0.08 | 0.04 | 0.07 | 0.01 | 0.01 | 0.10 | 0.01 | 0.005 | 0.08 | 0.04 | 0.07 | 0 | 0 | 0.10 | 0 | 0 |
| 1,2,3,7,8-PeCDF | 0.03 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.05 | 0.004 | 0.002 | 0.03 | 0.01 | 0.01 | 0 | 0 | 0.047 | 0 | 0 |
| 2,3,4,7,8-PeCDF | 0.3 | 0.52 | 0.22 | 0.15 | 0.06 | 0.06 | 0.32 | 0.04 | 0.022 | 0.52 | 0.22 | 0.15 | 0 | 0 | 0.324 | 0 | 0 |
| 1,2,3,4,7,8-HxCDF | 0.1 | 0.54 | 0.13 | 0.06 | 0.01 | 0.10 | 0.47 | 0.005 | 0.003 | 0.54 | 0.13 | 0.06 | 0 | 0.10 | 0.467 | 0 | 0 |
| 1,2,3,6,7,8-HxCDF | 0.1 | 0.20 | 0.07 | 0.04 | 0.01 | 0.06 | 0.21 | 0.004 | 0.003 | 0.20 | 0.07 | 0.04 | 0 | 0.06 | 0.214 | 0 | 0 |
| 1,2,3,7,8,9-HxCDF | 0.1 | 0.18 | 0.01 | 0.01 | 0.01 | 0.04 | 0.15 | 0.01 | 0.004 | 0.18 | 0 | 0.01 | 0 | 0.04 | 0.154 | 0 | 0 |
| 2,3,4,6,7,8-HxCDF | 0.1 | 0.28 | 0.08 | 0.05 | 0.01 | 0.07 | 0.30 | 0.005 | 0.003 | 0.28 | 0.08 | 0.05 | 0 | 0.07 | 0.30 | 0 | 0 |
| 1,2,3,4,6,7,8-HpCDF | 0.01 | 0.33 | 0.04 | 0.03 | 0.01 | 0.06 | 0.24 | 0.02 | 0.001 | 0.33 | 0.04 | 0.03 | 0.01 | 0.06 | 0.238 | 0.021 | 0 |
| 1,2,3,4,7,8,9-HpCDF | 0.01 | 0.03 | 0.01 | 0.001 | 0.001 | 0.01 | 0.02 | 0.001 | 0.001 | 0.03 | 0.01 | 0 | 0 | 0.01 | 0.024 | 0 | 0 |
| OCDF | 0.0003 | 0.02 | 0.002 | 0.002 | 0.0001 | 0.004 | 0.02 | 0.003 | 0.000 | 0.02 | 0.002 | 0.002 | 0 | 0.004 | 0.015 | 0.00 | 0 |
| Totals | | 8.16 | 1.90 | 1.23 | 0.40 | 2.55 | 7.22 | 0.45 | 0.16 | 8.16 | 1.84 | 1.03 | 0.07 | 2.41 | 7.22 | 0.23 | 0.00 |

Notes:
- Bolded values are based on detected concentrations.

Table 9. Additional dioxin results from follow-up analyses.

| Dioxins/Furans | | DMMP Interim Approach | | Sample ID | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Max | 14 B[1] | | 20 A | | 20B | |
| 2,3,7,8-TCDD | pg/g | NA | NA | 0.0811 | U | 0.133 | U | 0.119 | U |
| 1,2,3,7,8-PeCDD | pg/g | NA | NA | 0.0903 | U | 0.0693 | U | 0.0785 | U |
| 1,2,3,4,7,8-HxCDD | pg/g | NA | NA | 0.0767 | U | 0.104 | U | 0.124 | U |
| 1,2,3,6,7,8-HxCDD | pg/g | NA | NA | 0.103 | U | 0.139 | U | 0.174 | U |
| 1,2,3,7,8,9-HxCDD | pg/g | NA | NA | 0.104 | U | 0.138 | U | 0.174 | U |
| 1,2,3,4,6,7,8-HpCDD | pg/g | NA | NA | 0.258 | J | 0.314 | J | 0.211 | J |
| OCDD | pg/g | NA | NA | 3.36 | J | 2.18 | J | 0.723 | J |
| 2,3,7,8-TCDF | pg/g | NA | NA | 0.0375 | U | 0.0647 | U | 0.107 | U |
| 1,2,3,7,8-PeCDF | pg/g | NA | NA | 0.0856 | U | 0.0907 | U | 0.116 | U |
| 2,3,4,7,8-PeCDF | pg/g | NA | NA | 0.106 | U | 0.116 | U | 0.151 | U |
| 1,2,3,4,7,8-HxCDF | pg/g | NA | NA | 0.0257 | U | 0.0254 | U | 0.0288 | U |
| 1,2,3,6,7,8-HxCDF | pg/g | NA | NA | 0.0263 | U | 0.0261 | U | 0.0307 | U |
| 2,3,4,6,7,8-HxCDF | pg/g | NA | NA | 0.023 | U | 0.0229 | U | 0.0276 | U |
| 1,2,3,7,8,9-HxCDF | pg/g | NA | NA | 0.0372 | U | 0.0393 | U | 0.0434 | U |
| 1,2,3,4,6,7,8-HpCDF | pg/g | NA | NA | 0.0497 | U | 0.0669 | U | 0.0982 | U |
| 1,2,3,4,7,8,9-HpCDF | pg/g | NA | NA | 0.0522 | U | 0.0759 | U | 0.113 | U |
| OCDF | pg/g | NA | NA | 0.166 | U | 0.218 | U | 0.177 | U |
| Summed Dioxin/Furan TEQ [2,3] | pg/g | 2.1 | 4.1 | 0.004 | J | 0.004 | J | 0.002 | J |
| Summed Dioxin/Furan TEQ with One-Half of the Detection Limits [2,4] | pg/g | 2.1 | 4.1 | 0.13 | J | 0.15 | J | 0.16 | J |

Notes:

**Bolded** values are based on detected concentrations.

[1] Samples are composited material from the following Dredged Material Management Units (DMMUs):

DMMU 14B = Sample from B-04-14D

DMMU 20A = Composite of B-12-20A and B-13-20A

DMMU 20B = Composite of B-12-20B and B-13-20B

[2] World Health Organization 2005 Toxic Equivalency Factors used for calculation of dioxin/furan TEQ (Van den Berg et al. 2006).

[3] Calculated using detected dioxin/furan concentrations.

[4] Calculated using detected dioxin/furan concentrations plus one-half the detection limit for dioxins/furans that were not detected.

Table 10. PTT project volume weighted averages for Dioxins and Furans (PCDD/F).

| Composite (DMMUs included) | Volume (CY) | PCDD/F TEQ (ND=1/2 RL) ng/kg dry wt. | Product (Vol x TEQ) | Product/total (ng/kg/volume) | Comments |
|---|---|---|---|---|---|
| H1—DMMUs 1, 2, 3, and 4. | 61,083 | 8.16 | 498,159 | | unsuitable - greater than CB max TEQ 5.2 |
| H2—DMMUs 5, 6, 7, and 8. | 59,207 | 1.90 | 112,204 | | |
| H3—DMMUs 9, 10, 11, and 12. | 65,879 | 1.23 | 81,140 | | |
| H4—DMMUs 14, 15, and 16. | 43,158 | 0.40 | 17,401 | | |
| H5—DMMUs 14B, 17, and 18. | 42,330 | 2.55 | 107,875 | | |
| H6—DMMUs 17C & 17B | 21,962 | 7.22 | 158,603 | | unsuitable - greater than CB max TEQ 5.2 |
| H6—DMMU 20 | 14,853 | 0.16 | 2,376 | | |
| H7—DMMUs 17D, 19, and 21. | 43,694 | 0.45 | 19,657 | | |
| H8—DMMU 22. | 24,357 | 0.16 | 3,800 | | |
| *No-test Native | 1,158,877 | 0.16 | 185,420 | | vol weighted conc. for untested native |
| Totals (Suitable): Tested Only | 293,478 | | 342,078 | 1.17 | vol weighted conc. for total suitable characterized |
| Totals (Suitable): Tested + no-test Native | 1,452,355 | | 527,498 | 0.36 | volume weighted concentration for all suitable project material |

Notes:
*For no-test native material: PCDD/F TEQ for H8 used to estimate volume weighted concentrations

**SUBJECT**: DETERMINATION ON THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM THE PUYALLUP TRIBAL TERMINAL, BLAIR WATERWAY (**Permit #NWF-2008-1083-SO**) COMMENCEMENT BAY, TACOMA, WASHINGTON, EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR OPEN-WATER DISPOSAL AT THE COMMENCEMENT BAY OPEN WATER SITE OR FOR IN-WATER BENEFICIAL USE.

Concur:

4/24/09
Date

Lauran Cole Warner, Seattle District Corps of Engineers

4/23/09
Date

Erika Hoffman, Environmental Protection Agency

04/02/09
Date

Laura Inouye, Washington Department of Ecology

April 2, 2009
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**Sampling and Analysis Plan**
**Puyallup Tribal Terminal**
**Tacoma, Washington**

Figure 1.1
Vicinity Map

File: F:\projects\SSA-RHOLD\GIS\MXD_Figures\Task 6300\MXD\Figure 1.1 (Streetmap USA Vicinity Map).mxd
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Figure 1. Vicinity Map.

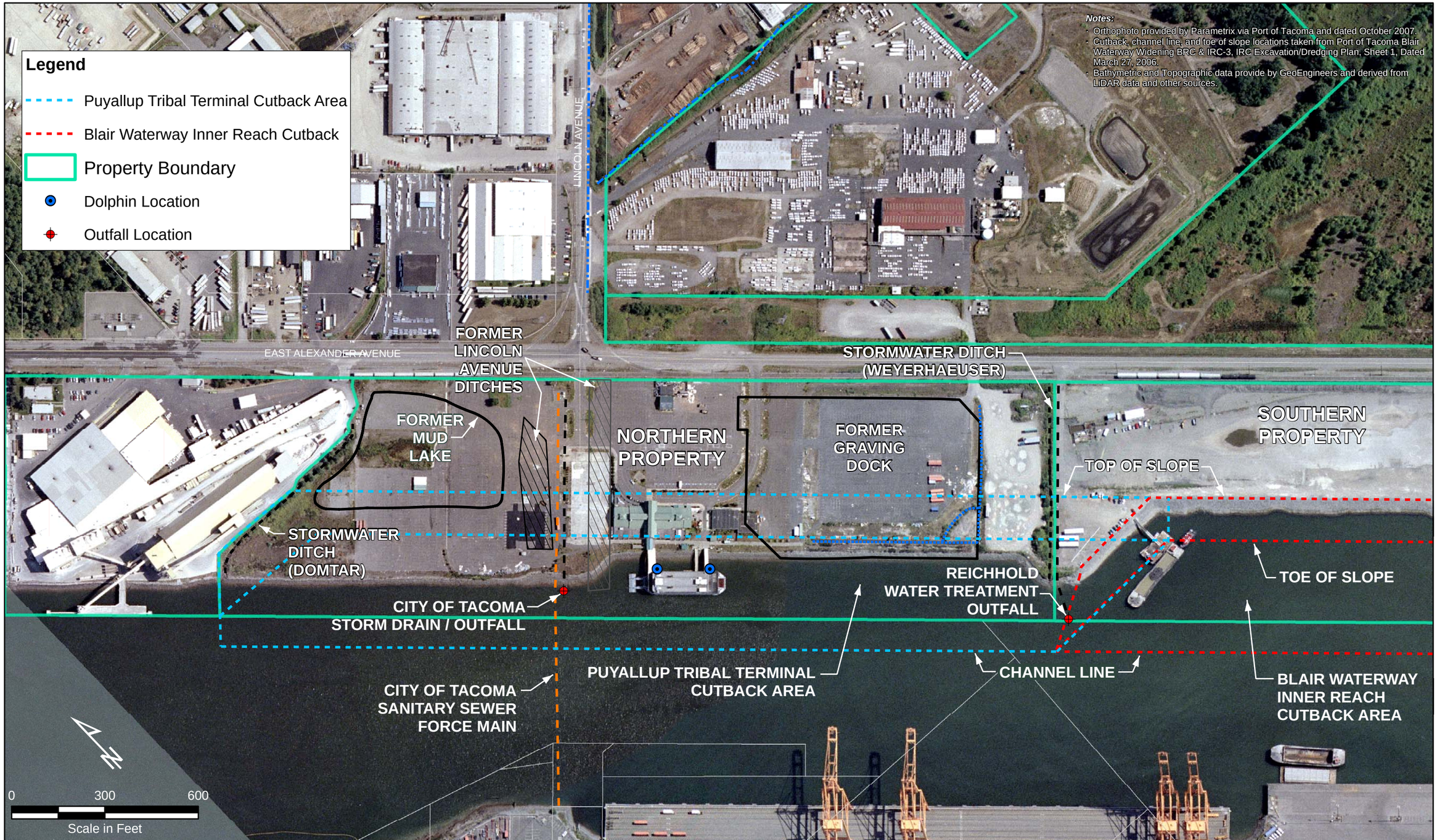


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Figure 2. Proposed project area.

File: F:\projects\SSA-RHOLD\GIS\MXD_Figures\Task 6300\MXD\Figure 1.3 (Study Area).mxd
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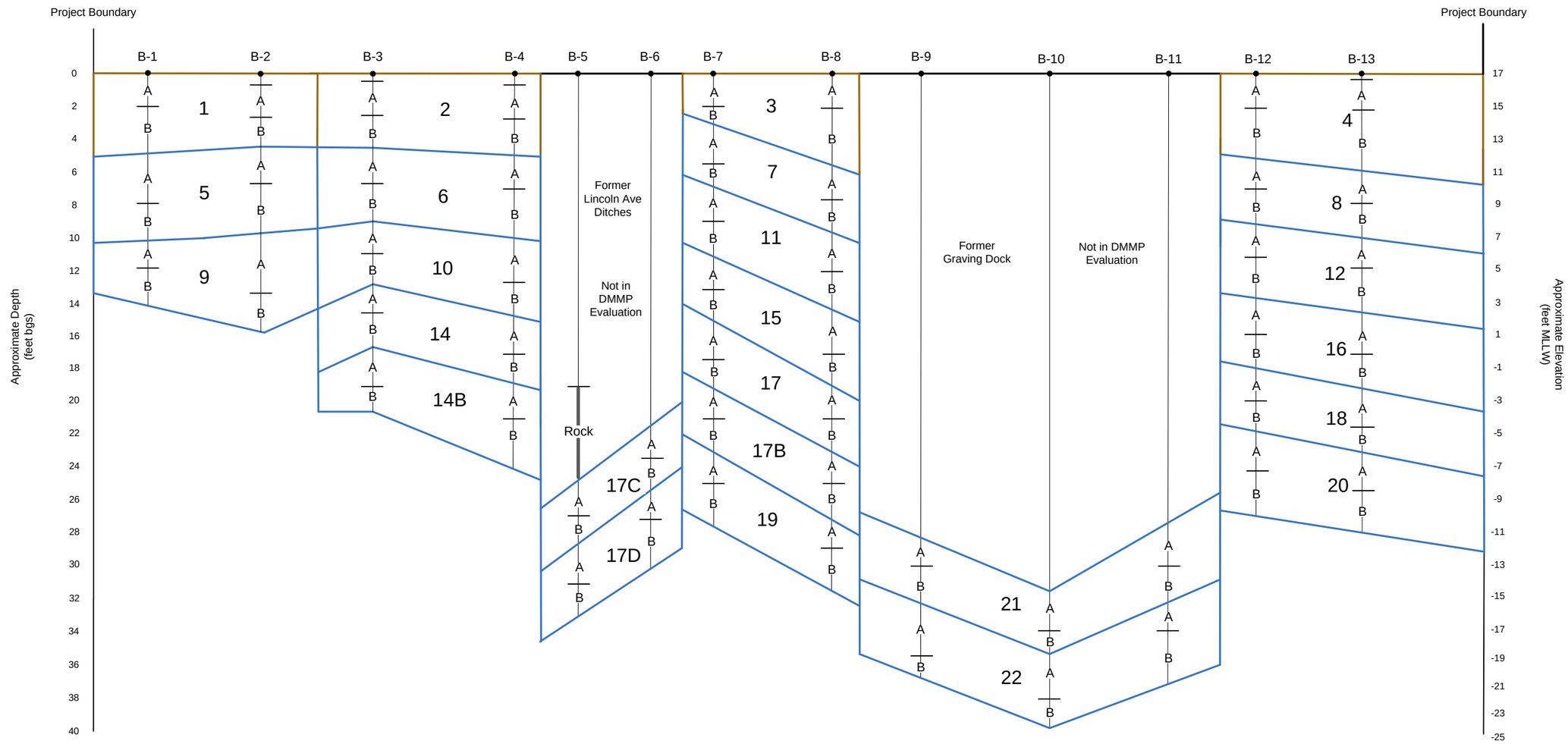


Notes:

Approximate Horizontal Scale 1 inch = 240 feet

| | |
|---|---|
| B-1 | Boring location and designation |
| Bgs | Below ground surface |
| DMMP | Dredge Material Management Program |
| DMMU | Dredge Material Management Unit |
| MLLW | Mean Lower Low Water |
| 1 | Fill DMMU and DMMU designation |
| 1 | Native DMMU and DMMU designation |
| A/B | Subunit sample interval and designation |

**Dioxin Samples**

H1: DMMUs 1, 2, 3, and 4
H2: DMMUs 5, 6, 7, and 8
H3: DMMUs 9, 10, 11, and 12
H4: DMMUs 14, 15, and 16
H5: DMMUs 14B, 17, and 18
H6: DMMUs 17C, 17B, and 20
H7: DMMUs 17D, 19, and 21
H8: DMMU 22

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**Shoreline Cutback Characterization**
**Puyallup Tribal Terminal**
**Tacoma, Washington**

Figure 3. Sampling Strategy.

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