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April 2, 2003
MFG Project No.: 060255

Ms. Sharon Bell
Tacoma Pierce County Health Department
3629 South D Street
Tacoma, WA 98418-6813

Subject: 2002 Year-End Report; Darling International, Inc. USTs Site;
Parcel No.: 0320031019

Dear Ms. Bell:

On behalf of Darling International, Inc. (DII), please find enclosed the 2002 Year-End Report for the DII facility (the "Site") located at 2041 Marc Avenue in Tacoma, Washington. The report presents data collected during 2002 for the months of February, June, September, and December. In addition, a site-specific risk assessment was performed to evaluate potential risks to human and ecological risks related to residual petroleum hydrocarbons at the Site and to evaluate the need to establish site-specific cleanup levels.

Please contact Natalie Morrow at (406) 728-4600 or Jerry Shuster (425) 921-4000 with questions or comments regarding the enclosed report.

Very truly yours,
MFG, INC.

Natalie J. Morrow, P.G., P.HG.
Senior Staff Hydrogeologist

FOR
Jerry Shuster, P.E.
Senior Engineer

NJM:bms
Enclosure
cc: Bill McMurtry – Darling International, Inc.
Carol Johnston – Southwest Department of Ecology
Pat Behling – Pastor, Behling, & Wheeler
Katherine Super – MFG, Inc.

2002 YEAR-END
GROUNDWATER MONITORING REPORT

DARLING INTERNATIONAL, INC.
LUSTs SITE

2041 MARC AVENUE
TACOMA, WASHINGTON

April 2, 2003

Prepared for:

Darling International, Inc.
Irving, Texas

Prepared by:

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MFG Project No. 060255

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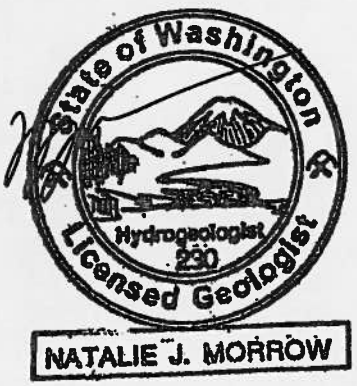
PROFESSIONAL CERTIFICATION

This report has been prepared by MFG, Inc. under the professional supervision of Natalie J. Morrow. The findings, recommendations, specifications and/or professional opinions presented in this report have been prepared in accordance with generally accepted professional hydrogeologic practice, and within the scope of the project. There is no other warranty, either express or implied.



Natalie J. Morrow
Washington P.G. No. 230
Senior Staff Hydrogeologist
MFG, Inc.

1.0 INTRODUCTION

MFG, Inc. performed quarterly groundwater monitoring at the Darling International, Inc. (DII) animal by-products recycling facility located at 2041 Marc Avenue in Tacoma, Washington during February, June, September, and December 2002. The results of the February 2002 monitoring event were presented in the site investigation report (MFG, 2002b). Quarterly groundwater monitoring was performed to address Tacoma Pierce County Health Department (TPCHD) concerns regarding possible petroleum hydrocarbons left in the subsurface after removal of two underground storage tanks (USTs) at the facility in May 1989. The purpose of site investigation and groundwater monitoring activities was to evaluate groundwater flow direction in the shallow groundwater zone at the facility and evaluate the nature and extent of petroleum hydrocarbons present in subsurface materials and groundwater.

This report is organized as follows. Section 1 provides an introduction including Site information and a summary of previous site investigation activities. Section 2 discusses the methods of investigation. Quarterly groundwater monitoring results are discussed in Section 3. Section 4 presents a summary and conclusions; recommendations are presented in Section 5, and references in Section 6. Appendix A contains investigation waste disposal documents, and Appendices B, C, and D contain the groundwater laboratory analytical data packages for June, September, and December 2002 groundwater monitoring events, respectively. The site-specific risk assessment performed for the facility is included in Appendix E.

1.1 Site Location And Background

DII owns and operates an animal by-products recycling facility (the "Site") located at 2041 Marc Avenue in Tacoma, Washington (Figure 1). The DII facility was previously known as Puget Sound By-Products. There are three buildings located at the Site (Figure 2), housing the office, the rendering plant, and a workshop. The Site is mostly asphalt paved with the exception of unpaved portions on the east and southeast areas of the Site where three wastewater treatment lagoons and a clarifier (now closed and backfilled) were formerly located.

The Site was constructed on the Tacoma Tideflats and within the boundaries of the Old Tacoma Tideflats Landfill (also known as the Lincoln Avenue Landfill; see Figure 1) and the Site and surrounding area is zoned M3 (heavy industrial) by the City of Tacoma. The Site is located

approximately 0.4 miles northeast of the Puyallup River. Commencement Bay of Puget Sound lies over 1.5 miles north to northwest of the Site.

The Old Tacoma Tideflats Landfill was constructed on top of dredged sediment fill material in a former tideflat area and was further filled with waste material so the land could be utilized for industrial and commercial development. The landfill was operated by the City of Tacoma from the 1940's through approximately 1964 and can generally be characterized as an unregulated dumping area for municipal waste for residents of Tacoma. In addition, it is believed that industries may have deposited solid and/or hazardous waste materials in the landfill (TPCHD, 2001). Burning of landfill materials was common practice to reduce the volume of the various materials present in the landfill.

This area of Tacoma, Washington contains numerous sites contaminated with a variety of constituents ranging from heavy metals, petroleum hydrocarbons, and a variety of other hazardous inorganic and organic compounds. Groundwater and subsurface soil/fill material at several other sites in the vicinity of the Site are known to be contaminated. For example, the Milwaukee Railyard, located north of the Site, has soil and groundwater contaminated with diesel, bunker fuels, lubricating oils, and arsenic, chromium, copper, pentachlorophenol, and naphthalene. Another example is the Cascade Pole and Lumber Company, also located north of the Site. Soil and groundwater at this facility contains pentachlorophenol, chromated copper arsenate, creosote, and PAHs. In addition, results from other sampling of landfill soil/fill material have indicated low levels of PAHs and groundwater results showed low levels of metals and total organic halogens (Pierce County, 1985).

One likely source of PAHs present is soil and groundwater at the Site and nearby sites is the Old Tacoma Tideflats Landfill. While some heavy range petroleum hydrocarbons may contain PAHs, it is also expected that the incomplete burning/combustion of organic matter (lawn cuttings, tree trimings, other wood and organic material, and other disposed waste items) may be an origin for PAHs found in the landfill debris material.

A discrepancy was observed between what had previously been noted as the north direction on maps obtained from the reports prepared by Rittenhouse-Zeman & Associates, Inc. (RZA, 1989) and Whitman Environmental Sciences (WES, 1998) and the north direction noted by APS Survey and Mapping (APS) during the February 2002 site investigation (MFG, 2002b). APS was

contacted regarding the discrepancy and, after review of their survey data, it was determined that the north direction at the Site is as APS located it and is as shown on Figure 2. All references to direction in the following text have been adjusted, where required, to reflect the correct direction as determined by the APS survey.

1.2 Underground Storage Tanks Removal

Two 10,000-gallon USTs were previously located at the Site. The tanks were located adjacent to the north-northeast side of the workshop (Figure 2). One tank contained diesel fuel for use by company trucks and the other tank contained Bunker C fuel oil for use in the facility boiler. The two USTs and associated piping were removed on May 11, 1989 (WES, 1998).

Approximately 112 cubic yards of soil were excavated during the removal of the USTs (WES, 1998). The soil was stockpiled and sampled. The samples were analyzed for total petroleum hydrocarbons (TPH) using EPA Method 418.1, and benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA Method 8020. EPA Method 418.1 does not differentiate TPH constituents; therefore, the results were presented as a total value for TPH. TPH results ranged from 4,672 milligram per kilogram (mg/kg) to 8,370 mg/kg; ethybenzene was detected at 0.41 mg/kg, and xylenes at 1.93 mg/kg. No benzene or toluene was detected in the stockpile soil. The soil contained in the stockpiles was removed from the Site for off-site disposal on May 23, 1989 (WES, 1998).

Soil samples were also collected from the walls of the UST excavation and a grab sample was collected from groundwater in the excavation (WES, 1998). The soil and groundwater samples were collected by the Washington Department of Ecology (Ecology). The soil samples were analyzed for TPH only and the groundwater sample was analyzed for TPH and BTEX. Soil TPH results ranged from 1,874 mg/kg to 2,854 mg/kg. TPH in the groundwater sample was 4,565 mg/L and ethylbenzene and xylenes were detected at 0.5 mg/L and 0.44 mg/L, respectively. Benzene and toluene were not detected in the groundwater sample. According to the WES (1998) report, the analytical results for soils and groundwater collected from the excavation indicated exceedances of the Washington MTCA Method A cleanup levels used at the time of the removal.

1.3 1989 Site Assessment

A subsurface investigation was performed at the Site in September 1989 by RZA and WES (1998). WES performed a UST closure review for the Site in 1998. Three borings were installed during the site assessment and completed as groundwater monitoring wells in the shallow groundwater zone at the Site. Total boring depths ranged from 14 to 16.5 feet below ground surface (bgs) and groundwater was encountered approximately 9 feet bgs (WES, 1998). One well was completed to the northwest of the former USTs location (MW-4), on the north side of the workshop (see Figure 2). A second was installed east of the former USTs location (MW-5) and a third well was installed southwest of the former USTs location, on the south side of the workshop (MW-6).

Fill material was encountered to depths of 12 to 16.5 feet bgs during drilling (RZA, 1989 and WES, 1998). The fill material consisted of medium dense, gray to brown silty sand with some gravel, followed by loose to medium dense black silty sand with wood chip waste, glass, metal, and organic matter. Soil material encountered below the fill material consisted of stiff to medium stiff gray silt. This soil material may be dredged fill material. The approximate groundwater flow direction in the upper groundwater zone at the Site, as inferred from these three wells, was to the north. All groundwater monitoring wells at the Site were abandoned in 1997 (RZA, 1989 and WES, 1998).

Soil samples were collected during drilling and analyzed for TPH using EPA Method 418.1. Results ranged from 141 mg/kg to 645 mg/kg TPH (RZA, 1989 and WES, 1998). Groundwater sampling was performed in September 1989 after completion of the wells. Initial results indicated no TPH above the 10 mg/L method detection limit. However, continued sampling from 1990 through 1993 showed that TPH concentrations in MW-4 ranged from less than 1.0 to 20 mg/L; concentrations in MW-5 ranged from less than 1.0 mg/L to 44 mg/L; and TPH concentrations in MW-6 ranged from 2.2 mg/L to 82 mg/L (WES, 1998).

Three other wells (MW-1, MW-2, and MW-3) were installed to monitor groundwater quality upgradient and downgradient of three wastewater treatment lagoons and one clarifier (Figure 2). The wells were completed at a depth of approximately 30 feet bgs. These three wells, completed in the lower groundwater zone beneath the Site, were also abandoned in 1997 by a licensed well driller (WES, 1998), and the lagoons and clarifier are no longer present at the Site. The

approximate groundwater flow direction of the lower groundwater zone at the Site, as previously inferred from these three wells, is to the east.

1.4 February 2002 Site Investigation

A subsurface site investigation was performed by MFG, Inc. during February 2002 (MFG, 2002b). The investigation was performed in accordance with the Site Investigation Work Plan developed for the Site (MFG, 2002a). Investigation activities included: 1) a document review for the Site and surrounding properties; 2) the completion of four groundwater monitoring wells (MFG-1, MFG-2, MFG-3, and MFG-4); 3) sampling and analysis of subsurface soil and groundwater to evaluate the extent and magnitude of petroleum hydrocarbons in subsurface materials and groundwater; 4) water level measurements to evaluate the direction of groundwater flow at the Site; 5) obtaining the horizontal and vertical coordinates for each monitoring well by a licensed surveyor; and 6) completion of a site investigation report. Well completion information is presented in Table 1.

The results of this investigation indicated that fill material and landfill debris are encountered at depths up to 13 to 15 feet bgs at the Site and the upper groundwater zone is located within the fill material and landfill debris. The fill material and landfill debris contain an abundance of wood, sticks, and other fine organic material. Metal, glass, and wire are also present. The water table was encountered at approximately seven feet bgs during drilling. However, soon after completion of each well, the water level was measured again and showed a rise in the water table of approximately one to two feet in each well, indicating the shallow groundwater zone may be semi-confined. Boring logs are provided in the February 2002 site investigation report (MFG, 2002b).

Soil samples collected during drilling indicated the presence of heavy oil range TPH and total carcinogenic polynuclear aromatic hydrocarbons (PAHs)at concentrations that exceeded MTCA Method A Soil Cleanup levels for both unrestricted and industrial properties. Heavy oil range TPH in the samples ranged from not detected (less than20 mg/kg) to 3,000 mg/kg and total PAHs ranged from not detected (less than 0.010 mg/kg) to 22.5 mg/kg. Table 2 and Figure 3 present the soil analytical data from the February 2002 site investigation.

Field parameters monitored during well development and groundwater sampling included specific conductance, pH, and temperature. Specific conductance in the upper groundwater zone at the Site ranged from 689 micro-Siemens (µS) to 1,043 µS, pH ranged from 6.1 to 6.6 standard units, and temperature ranged from 12.8 degrees Celsius (°C) to 15.5 °C. Oxidation-reduction potential, also monitored during well development and sampling, ranged from –322 millivolts (mV) to –363 mV; indicating the upper groundwater zone at the Site is strongly reducing. Groundwater analytical results indicated the presence of diesel range, heavy oil range, and mineral range TPH at concentrations that exceeded MTCA Method A Groundwater Cleanup Levels at the Site. Diesel range TPH in groundwater ranged from 2,300 micrograms per liter (µg/L) to 6,100 µg/L; heavy oil range TPH ranged from not detected to 1,100 µg/L; and mineral oil range TPH ranged from 2,500 µg/L to 7,300 µg/L. Table 3 presents the groundwater analytical data for the site.

Groundwater during February 2002 was encountered between four to six feet bgs; or approximately 11 feet above mean sea level (MSL). Table 4 presents water table elevation data for the Site. The groundwater gradient at the Site was calculated as 0.0002 ft/ft to 0.0005 ft/ft. Groundwater elevations at the Site vary by one to a few hundredths of a foot. In addition, the investigation area is relatively small.

2.0 METHODS OF INVESTIGATION

Quarterly groundwater monitoring was performed at the Site during June, September, and December 2002. The following sections discuss the quarterly groundwater monitoring.

2.1 Purpose of Investigation

The purpose of quarterly groundwater monitoring was to: 1) evaluate the direction of groundwater flow; and 2) evaluate the nature and extent of petroleum hydrocarbons in groundwater in the vicinity of the former USTs.

To meet these goals, the following activities were performed on a quarterly basis: 1) collection of water level measurements; and 2) sampling and analysis of groundwater.

2.2 Groundwater Sampling

Low-flow purging and sampling were performed at each well. Each well was purged at a rate of less than 0.5 to one liter per minute using a purger pump, with the pump intake placed approximately two feet below the top of the well screen. Specific conductance, pH, and temperature were continuously monitored during purging. Groundwater samples were collected after pH had stabilized to +/- 0.1 pH units, specific conductance to +/- 10 percent, and temperature to +/- 0.5 °C. Oxidation-reduction potential was also monitored during purging.

Samples were collected in laboratory-provided sample containers and preserved in the field as requested by the analytical laboratory. After samples were collected, they were immediately placed in a cooler containing doubled Ziploc™ bags filled with ice.

Samples were hand delivered to North Creek Analytical in Bothell, Washington the day following collection. Each groundwater sample was analyzed for BTEX, carcinogenic PAHs, naphthalene, Northwest Total Petroleum Hydrocarbon – Diesel Extended (NWTPH-Dx), and extractable petroleum hydrocarbons (EPH). Analytical methods included analysis of BTEX using EPA Method 8021B, PAHs and naphthalenes using GC/MS-SIM, EPH using modified WDOE Interim TPH Policy Method, and diesel range, heavy oil range, and mineral range hydrocarbons by NWTPH-Dx.

2.3 Water Level Measurements

Water levels were collected from each monitoring well upon arrival to the Site and prior to commencement of groundwater sampling. Water levels were collected using an electronic water level indicator and from the north side of the top of the PVC well casing. Depth to water was recorded to the nearest 0.01 foot.

2.4 Decontamination

All non-disposable equipment was decontaminated prior to use at the Site, between borings and wells, and after the collection of each sample. Decontamination consisted of an Alconox® and deionized water scrub and rinse followed by a double rinse of deionized water. Disposable equipment was placed in a DII waste receptacle for disposal in a sanitary landfill. Decontamination water, well development water, and purged groundwater was placed in 55-gallon drums pending off-site disposal. The disposal manifest for decontamination and purged groundwater is provided in Appendix A.

3.0 RESULTS

Quarterly groundwater monitoring events were performed during February, June, September, and December 2002. The following sections discuss the results of the groundwater monitoring activities.

3.1 Groundwater Monitoring Results

February monitoring results are discussed in detail in the Site Investigation Report (MFG, 2002b) and summarized above in Section 1.4. Results from the June, September, and December 2002 quarterly monitoring events are discussed below.

Table 3 presents the groundwater analytical data and Figure 4 summarizes the results for constituents exceeding MTCA Method A Groundwater Cleanup Levels at the Site. Appendix B, C, and D contain the groundwater laboratory analytical data packages for June, September, and December 2002, respectively.

3.1.1 June 2002 Quarterly Results

The June quarterly monitoring event was performed on June 19, 2002. Temperature in groundwater ranged from 18.7 °C to 23.9 °C; pH ranged from 6.0 to 6.4 standard units; specific conductance ranged from 879 µS to 1,362 µS; and oxidation reduction potential ranged from –87 mV to –159 mV.

The concentration of diesel range TPH, heavy oil range TPH, and mineral range TPH in groundwater at the Site were the constituents that exceeded MTCA Method A Groundwater Cleanup Levels in all the monitoring wells (MFG-1, MFG-2, MFG-3, and MFG-3) at the Site. Diesel range TPH ranged from 1,760 µg/L to 4,770 µg/L; heavy oil range TPH varied from 761 µg/L to 1,590 µg/L; and mineral range TPH ranged from 1,150 µg/L to 2,680 µg/L. Total naphthalenes were detected in all four monitoring wells at concentrations ranging from 0.218 µg/L to 4.36 µg/L. Benzene and toluene were detected in monitoring well MFG-4 at concentrations of 2.24 µg/L and 0.504 µg/L, respectively. No other analytes were detected in groundwater at the Site during June 2002.

3.1.2 September 2002 Quarterly Results

The September quarterly monitoring event was performed on September 26, 2002. Temperature in groundwater ranged from 19.4 °C to 21.6 °C; pH ranged from 5.9 to 6.1 standard units; specific conductance ranged from 777 µS to 1,235 µS; and oxidation reduction potential ranged from –83 mV to –122 mV.

The concentration of diesel range TPH, heavy oil range TPH, and mineral range TPH, in groundwater at the Site exceeded MTCA Method A Groundwater Cleanup Levels in the four monitoring wells (MFG-1, MFG-2, MFG-3, and MFG-3). Total carcinogenic PAHs were equivalent to or exceeded MTCA Method A Groundwater Cleanup Levels in MFG-2, MFG-3, and MFG-4. Diesel range TPH ranged from 1,270 µg/L to 4,480 µg/L; heavy oil range TPH varied from 612 µg/L to 1,420 µg/L; and mineral range TPH ranged from 904 µg/L to 2,970 µg/L. Total naphthalenes were present in all wells at concentrations ranging from 0.12 µg/L to 1.13 µg/L. C21-C34 aliphatics and benzene were detected in monitoring well MFG-4 at concentrations ranging from 95.9 µg/L and 0.598 µg/L, respectively. No other analytes were detected in groundwater at the Site during September 2002.

3.1.3 December 2002 Quarterly Results

The December monitoring event was performed on December 19, 2002. Temperature in groundwater ranged from 15.3 °C to 18.2 °C; pH ranged from 5.9 to 6.2 standard units; specific conductance ranged from 769 µS to 1,182 µS; and oxidation reduction potential ranged from –81 mV to –113 mV.

The concentration of diesel range TPH, heavy oil range TPH, and mineral range TPH, in groundwater at the Site exceeded MTCA Method A Groundwater Cleanup Levels in the four monitoring wells (MFG-1, MFG-2, MFG-3, and MFG-3) at the Site. Diesel range TPH ranged from 1,350 µg/L to 3,460 µg/L; heavy oil range TPH varied from 514 µg/L to 1,190 µg/L; and mineral range TPH ranged from 949 µg/L to 2,450 µg/L. Total naphthalenes were detected in MFG-1 and MFG-4 at concentrations of 0.738 µg/L to 1.81 µg/L, respectively. C12-C16 aromatics were detected in MFG-1 and MFG-2 at concentrations of 82.1 µg/L and 79.9 µg/L, respectively. C21-C34 aliphatics (91.4 µg/L), C10-C12 aromatics (50.6 µg/L), and benzene

(0.630 µg/L) were detected in MFG-4. No other analytes were detected in groundwater at the Site during December 2002.

3.2 Water Table Monitoring Results

Water levels were collected in the monitoring wells on six occasions during 2002 (see Table 4 and Figure 5), including one per each quarterly monitoring event and two additional dates in February 2002. June 2002 water table elevations ranged from 9.17 feet AMSL to 9.19 feet AMSL; September 2002 water table elevations ranged from 7.94 feet AMSL to 7.98 feet AMSL, and December 2002 water table elevations ranged from 8.80 feet AMSL to 8.81 feet AMSL. Total water table fluctuation at the Site during 2002 was 3.3 feet with the highest water table observed during February 2002 and the lowest water table in September 2002.

3.3 Groundwater Flow Direction

Potentiometric surface maps were created from data collected during each water level monitoring event to evaluate groundwater flow direction and gradient at the Site (see Figure 6).

Determination of the groundwater flow direction and gradient is difficult due to water table elevation differences of a few hundredths of a foot across the study area, the very shallow gradient present at the Site, and the uneven distribution/thickness of landfill materials in which the upper groundwater zone resides (see boring logs, MFG, 2002b). Potentiometric surface maps, created from the 2002 water elevation data, indicate that the gradient at the Site is relatively flat and the groundwater flow direction varies during the year (south to southeast during February and north to northwest during the remainder of the year).

3.4 Nature and Extent of Contamination

The analytical results indicate that the primary contaminants of concern (COCs) for the Site include diesel range TPH, heavy oil range TPH, and mineral oil range TPH. In addition, PAHs were detected during one monitoring event at levels at or above the MTCA Method A Groundwater Cleanup Level. Figure 4 presents a summary of COCs for each well for 2002. The results of the 2002 site investigation and monitoring activities indicate the COCs are primarily contained within the Site boundaries. The highest concentrations of COCs are consistently

present at well MFG-3, followed by well MFG-4. The lowest concentrations of COCs are consistently present in wells MFG-1 and MFG-2.

EPH results further suggest that the hydrocarbons present in soil and groundwater are predominantly the heavier petroleum hydrocarbon fractions. C16-C34 aliphatics and C16-C34 aromatics are the predominant hydrocarbon ranges present in soil; and C21-C34 aliphatics is the predominant hydrocarbon range present in groundwater. The heavier hydrocarbon ranges are likely to be relatively immobile in soil and groundwater.

COC concentrations also exhibited a declining trend in all monitoring wells during 2002. Diesel range, heavy oil range, and mineral oil range TPH concentrations decreased in all monitoring wells from February to December. These data suggest that the plume of hydrocarbon-impacted groundwater has stabilized and is being degraded through natural attenuation. The presence of strongly reducing groundwater conditions at the Site further suggest this conclusion.

4.0 SITE-SPECIFIC RISK ASSESSMENT

A site-specific risk assessment was performed for the Site to evaluate the potential impact of petroleum hydrocarbons present in subsurface soil and groundwater to human and ecological receptors and to evaluate the need for establishment of site-specific cleanup levels. MTCA regulations and guidelines were followed to complete the risk assessment. Appendix E presents the detailed site-specific risk assessment.

Both human and ecological receptors were evaluated during the site-specific risk assessement. The chemicals of potential concern (COPCs) identified for the site include BTEX, naphthalenes, TPH, and carcinogenic PAHs. BTEX and naphthalene concentrations were below MTCA Method A Cleanup Levels for both subsurface soil and groundwater. Therefore, these constituents were excluded from further consideration during the risk assessment. Carcinogenic PAH concentrations were also less than MTCA Method A Groundwater Cleanup Levels, except for the September 2002 monitoring event. Since carcinogenic PAHs have low solubility in water and high octanol-water partition coefficients, it is likely that the carcinogenic PAHs detected in groundwater during the September quarterly monitoring event were the result of very fine-grained landfill materials in the sample, rather than dissolved PAHs in groundwater. As a result, carcinogenic PAHs in groundwater were not evaluated further during the risk assessment. TPH (using EPH fractionation values) and carcinogenic PAHs in soil and TPH (EPHs) in groundwater were further evaluated during the risk assessement. The Cleanup Levels and Risk Calculations (CLARC) calculating spreadsheet, provided by Ecology, was used to evaluate these COPCs.

Using the CLARC spreadsheet and following MTCA regulations and guidelines, EPH in subsurface soil was shown to comply with Method B Soil Cleanup Levels for unrestricted land use. Carcinogenic PAHs in subsurface soil were evaluated under MTCA Method C, using a Modified Method C Industrial Soil Cleanup approach. The results indicate carcinogenic PAHs in subsurface soil had an acceptable lifetime cancer risk of $1x10^{-6}$. EPH in groundwater was shown to comply with the Method B Potable Groundwater Cleanup Levels.

The results of the site-specific risk assessment show the residual petroleum hydrocarbon constituents present in subsurface soil/landfill materials and groundwater at the Site do not pose an adverse human health or ecological risk. The remedial actions taken at the time of the tank

and soil removal in 1989 are believed to be protective of both human health and ecological receptors. Therefore, the calculation of site-specific cleanup goals for subsurface soil/landfill materials and groundwater are not necessary.

5.0 SUMMARY AND CONCLUSIONS

The Site and greater surrounding area is located in a heavy industrial area (zoned M3) in Tacoma, Washington. The Site is located approximately 0.4 miles northeast of the Puyallup River. Commencement Bay of the Puget Sound lies over 1.5 miles north to northwest of the Site. The majority of the Site is paved, including the area under investigation. Investigations at nearby sites within the Old Tacoma Tideflats Landfill have identified two groundwater zones. These same two groundwater zones, separated by a silt layer, have also been identified at the Site. The silt layer consists of dredged material from the Tacoma tideflats. This silt layer was encountered during the February 2002 site investigation at approximately 13 to 15 feet bgs (MFG, 2002b). Drilling did not extend deeper than the silt layer during the 2002 investigation and the upper groundwater zone is being monitored as part of this investigation.

During the February 2002 site investigation, fill material and landfill debris were encountered up to 13 to 15 feet bgs at the Site. The subsurface fill material and landfill debris contained an abundance of wood, sticks, and other fine organic material. Metal, glass, and wire are also present in the subsurface landfill debris and fill material. The upper groundwater zone at the Site is located within the fill material and landfill debris. Groundwater elevations at the Site during 2002 varied from a low of approximately 7.9 feet to a high of approximately 11.2 feet MSL (approximately 4.6 to 8.9 feet bgs). The potentiometric surface at the Site is relatively flat and the groundwater flow direction varies during the year.

Subsurface landfill debris and fill material samples collected during the February 2002 site investigation drilling indicated heavy oil range TPH (3,000 mg/kg) and total carcinogenic PAHs (22.5 mg/kg) above MTCA Method A Soil Cleanup Levels for unrestricted and industrial properties in boring MFG-B3 (well MFG-3; MFG, 2002). Total carcinogenic PAHs (2.3 mg/lkg) exceeded MTCA Method A Soil Cleanup Levels for unrestricted and industrial properties in boring MFG-B4 (well MFG-4) in the subsurface landfill debris and fill material sample.

Monitoring for oxdation-reduction potential during well purging indicated the upper groundwater zone at the Site is strongly reducing and varied from –81 mV to –363 mV. Groundwater analytical results indicate diesel range, heavy oil range, and mineral oil range TPH, and PAHs exceeded MTCA Method A Groundwater Cleanup Levels at the Site. The 2002 results indicate diesel range TPH varied from 1,270 µg/L to 6,100 µg/L; heavy oil range TPH varied from not

detected to 1,590 µg/L; and mineral oil range TPH varied from 904 µg/L to 7,300 µg/L. Total carcinogenic PAHs were not detected in groundwater at the Site for all monitoring events except the September 2002 quarterly event. Total carcinogenic PAHs ranged from not detected to 0.910 µg/L during the September 2002 monitoring.

The results indicate that petroleum hydrocarbons present in soil and groundwater at the Site in concentrations above MTCA Method A Cleanup Levels for soil and groundwater are primarily heavier carbon fractions (C21-C34 Aliphatics and C12-C16 Aromatics) and PAHs. The heavier TPH carbon fractions and PAHs found at the Site have lower solubilities and are relatively immobile in groundwater. Because of their low solubilities and octanol-water partition coefficients, the carcinogenic PAHs detected during the September monitoring event are believed to be a result of sedimentation/fine-grained landfill particles in the samples, rather than carcinogenic PAHs in groundwater. The carcinogenic PAHs were also detected in locations furthest from the location of the former USTs. A likely source of the PAHs detected in MFG-3 and MFG-4 is from the burning and incomplete combustion of organic landfill materials, rather than the former USTs. In addition, the primary constituents detected in soil and groundwater at the Site have relatively low volatilities (produce little to no vapor) and no free or product has been observed in any of the wells at the Site.

A site-specific risk assessment, was performed was to evaluate risks to human and ecological receptors associated with COPCs remaining in soil and groundwater at the Site. The risk assessment concluded that COPCs at the Site do not pose an adverse risk to human and ecological receptors and that further establishment of soil and groundwater cleanup levels is not warranted.

6.0 RECOMMENDATIONS

MFG recommends closure of the Site by TPCHD and/or Ecology for the following reasons:

1. The site-specific risk assessment showed that residual petroleum hydrocarbons present in subsurface fill/landfill materials and groundwater located near the former diesel and Bunker-C USTs do not pose an adverse risk to human and ecological receptors.

2. The diesel and Bunker-C USTs and associated piping were removed in 1989 along with approximately 112 cubic yards of soil/landfill materials surrounding the tanks, further reducing risk to human health and the environment.

3. There is no measurable petroleum hydrocarbons in the monitoring wells at the Site.

4. COCs detected in soil/groundwater samples from the Site consist of heavier carbon range TPH fractions and PAHs. These constituents are relatively immobile in groundwater and have limited volatility.

5. COC concentrations exhibited a declining trend in all monitoring wells during 2002, suggesting that the plume of hydrocarbon-impacted groundwater has stabilized and is being degraded through natural attenuation.

6. The Site is constructed on top of a former unregulated landfill operated by the City of Tacoma. Burning of landfill materials and dumping of household goods and chemicals have likely contaminated subsurface soil and landfill materials with carcinogenic PAHs and various other chemical constituents.

7. The area is zoned heavy industrial and will likely continue to be used for industrial purposes in the future. Because the Site and vicinity is located in a heavy industrial area and because it was construction on top of a landfill, it is unlikely that water at the Site and in the vicinity of the Site will be used as a source of potable water in the future.

6.0 REFERENCES

MFG, Inc., 2002a. Site Investigation Work Plan, Darling International, Inc. LUSTs Site, 2041 Marc Avenue, Tacoma, Washington. Prepared for Darling International, Inc. Dated January 2, 2002.

MFG, Inc., 2002b. Site Investigation Report, Darling International, Inc. LUSTs Site, 2041 Marc Avenue, Tacoma, Washington. Prepared for Darling International, Inc. Dated June 3, 2002.

Pierce County, 1985. Potential Hazardous Waste Site Preliminary Assessment, Summary Memorandum. City of Tacoma, Lincoln Avenue Landfill, Site No. WA D980511844. Prepared by Jon Hixon on September 28, 1985.

Rittenhouse-Zeman & Associates, Inc. (RZA), 1989. Subsurface Petroleum Hydrocarbon Evaluation, Puget Sound By Products Site, 2041 Marc Avenue, Tacoma, Washington. Dated September 27, 1989.

Tacoma-Pierce County Health Department (TPCHD), 2001. Memorandum to Tacoma Tideflats closed landfill site file, from John Wright. Subject: Correspondence with Fred Seavey, U.S. Fish & Wildlife. Dated February 13, 2001.

Whitman Environmental Sciences (WES), 1998. Underground Storage Tank Closure Review, Darling International, Inc. Facility, 2041 Marc Avenue, Tacoma, Washington. Dated April 17, 1998.

TABLES

TABLE 1
Well Completion Information
Darling International, Inc.
2041 Marc Avenue, Tacoma, Washington

Well Identification		Soil Boring Name	Date Well Completed	Well Construction	Well Dia. (inch.)	PVC Screen Slot Size	Total Depth of Borehole (ft bgs)	Total Depth of Well (ft bgs)	Screened Interval (ft bgs)	[1,2]Measuring Point Elevation (ft AMSL)	[3]Northing Coordinate	[3]Easting Coordinate	[2]Latitude	[2]Longitude
MFG Well#	WA State Unique Well#													
MFG-1	AGP054	MFG-B1	2/5/2002	Sch. 40 PVC	2	0.010	16.5	15.2	5.1 - 14.4	16.27	704986.37	1167047.48	47°15'02.9585	122°24'22.4035
MFG-2	AGP055	MFG-B2	2/5/2002	Sch. 40 PVC	2	0.010	14	10.13	4.97 - 9.3	15.80	705001.71	1167066.46	47°15'03.1144	122°24'22.1339
MFG-3	AGP056	MFG-B3	2/5/2002	Sch. 40 PVC	2	0.010	16.5	15.26	5.89 - 14.43	16.85	704924.7	1167130.23	47°15'02.3697	122°24'21.1828
MFG-4	AGP057	MFG-B4	2/6/2002	Sch. 40 PVC	2	0.010	14.5	15.4	5.24 - 14.57	15.67	704933.66	1167044.13	47°15'02.4376	122°24'22.4336

Sch. = Schedule
PVC = Polyvinylchloride
ft = feet
bgs = below ground surface

AMSL = Above Mean Sea Level (NAVD88 survey datum)
[1]Measuring Point = Top of PVC casing, north side
[2]Survey datum = NAVD88
[3]Washington State Plane Coordinate System - South Zone

TABLE 2
February 2002 Subsurface Boring Analytical Results
Darling International, Inc.
2041 Marc Avenue, Tacoma, Washington

Boring Location	MTCA Method A Soil Cleanup Levels	MFG-B2	MFG-B3		MFG-B4	
Sample Depth Interval (ft bgs)		10.5-11'	3-3.5'	7-8.5'	3-3.5'	8-8.5'
Date Sample Collected		2/5/2002	2/5/2002	2/5/2002	2/6/2002	2/6/2002
Dry weight (%)		49.4[3]	94.6	49.0[3]	91.9	49.5[3]
Total Petroleum Hydrocarbons (mg/kg)						
Diesel Range	2,000	37	<10	<820	17	650
Heavy Oil Range	2,000	120	<20	***3,000***[1]	43	1,300
Mineral Oil Range	4,000	180	<25	3,200	59	2,200
Extractable Petroleum Hydrocarbons (mg/kg)						
C8-C10 Aliphatics	—	<10.1	<5	<10.2	<5	<10.1
C10-C12 Aliphatics	—	<10.1	<5	<10.2	<5	23.2
C12-C16 Aliphatics	—	<10.1	<5	<10.2	<5	26.9
C16-C21 Aliphatics	—	<10.1	<5	22.9	<5	100
C21-C34 Aliphatics	—	40.3	<5	176	8.48	369
C10-C12 Aromatics	—	<10.1	<5	<10.2	<5	<10.1
C12-C16 Aromatics	—	<10.1	<5	<10.2	<5	<10.1
C16-C21 Aromatics	—	<10.1	<5	71.6	<5	39.6
C21-C34 Aromatics	—	<10.1	<5	207	<5	160
Total EPH	—	40.3	<5	477	8.48	718
Carcinogenic Polynuclear Aromatic Hydrocarbons (mg/kg)						
Benzo(a)anthracene	—	<0.020	<0.010	4.2	<0.010	0.27
Benzo(a)pyrene	0.1 ([2])	<0.020	<0.010	4.9	<0.010	0.51
Benzo(b)fluoranthene	—	<0.020	<0.010	4.4	0.01	0.64
Benzo(k)fluoranthene	—	<0.020	<0.010	1.3	<0.010	0.18
Chrysene	—	<0.020	<0.010	4.4	<0.010	0.34
Dibenz(a,h)anthracene	—	<0.020	<0.010	0.56	<0.010	<0.020
Ideno(1,2,3-cd)pyrene	—	<0.020	<0.010	2.7	<0.010	0.39
Total Carcinogenic PAHs	0.1 ([2])	NA	NA	***22.5***[1]	0.01	***2.3***[1]
Naphthalenes (mg/kg)						
1-Methylnaphthalene	—	<0.020	<0.010	0.17	<0.010	0.084
2-Methylnaphthalene	—	<0.020	<0.010	0.23	<0.010	0.08
Naphthalene	—	<0.020	<0.010	0.30	<0.010	0.047
Total Naphthalenes	5	NA	NA	0.70	NA	0.21
BTEX (mg/kg)						
Benzene	0.03	<0.0607	<0.0300	<0.0612	<0.0300	<0.0606
Toluene	7	<0.101	<0.0500	<0.102	<0.0500	<0.101
Ethylbenzene	6	<0.101	<0.0500	<0.102	<0.0500	<0.101
Xylenes (total)	9	<0.202	<0.100	<0.204	<0.100	<0.202

bgs = below ground surface
NA = Not Applicable.
Bold = Result is above method detection limit but not above MTCA Method A Soil Cleanup Levels
Bold[1] =Result is above MTCA Method A Soil Cleanup Level for unrestricted land use and industrial properties.
[2] MTCA Method A Soil Cleanup Level for Industrial Properties
[3] Low percent dry weight (high moisture content) may affect analytical results.

TABLE 3
2002 Groundwater Analytical Results
Darling International, Inc.
2041 Marc Avenue, Tacoma, Washington

Monitoring Well	MTCA Method A Groundwater Cleanup Levels	MFG-1				MFG-2				MFG-3				MFG-4			
Date Sample Collected		2/13/2002	6/19/2002	9/26/2002	12/19/2002	2/13/2002	6/19/2002	9/26/2002	12/19/2002	2/13/2002	6/19/2002	9/26/2002	12/19/2002	2/13/2002	6/19/2002	9/26/2002	12/19/2002
Water Table Elevation (ft amsl)		10.97	9.18	7.94	8.81	10.98	9.17	7.94	8.80	10.96	9.19	7.98	8.81	10.97	9.18	7.96	8.81
Field Parameters																	
Temperature (°C)	—	12.8	18.7	19.4	16.4	13.5	19.8	21.6	18.2	13.7	23.5	20.8	15.3	15.5	23.9	21.2	16.8
pH (standard units)	—	6.1	6.0	5.9	5.9	6.2	6.1	5.9	6.0	6.6	6.4	6.1	6.2	6.2	6.1	5.9	6.0
Specific Conductivity (uS)	—	1,043	1,311	1,133	1,081	992	1,181	982	1,111	689	879	777	769	1,026	1,362	1,235	1,182
Oxidation-Reduction Potential (mV)	—	-322	-87	-87	-81	-331	-93	-98	-96	-363	-159	-122	-113	-345	-115	-83	-94
Total Petroleum Hydrocarbons (ug/L)																	
Diesel Range	500	**3,100**	**4,160**	**3,130**	**1,350**	**2,300**	**2,920**	**1,710**	**1,630**	**6,100**	**1,760**	**1,270**	**1,670**	**4,700**	**4,770**	**4,480**	**3,460**
Heavy Oil Range	500	**730**	**763**	**612**	**514**	<500	**992**	**634**	**620**	**1,100**	**761**	**636**	**936**	**1,000**	**1,590**	**1,420**	**1,190**
Mineral Oil Range	500	**3,300**	**2,390**	**1,970**	**949**	**2,500**	**1,750**	**1,120**	**1,160**	**7,300**	**1,150**	**904**	**1,280**	**5,100**	**2,680**	**2,970**	**2,450**
Extractable Petroleum Hydrocarbons (ug/L)																	
C8-C10 Aliphatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
C10-C12 Aliphatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
C12-C16 Aliphatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
C16-C21 Aliphatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
C21-C34 Aliphatics	—	126	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	148	<100	95.9	91.4
C10-C12 Aromatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	50.6
C12-C16 Aromatics	—	<100	<100	<50	82.1	<100	<100	<50	79.9	<100	<100	<50	<50	<100	<100	<50	<50
C16-C21 Aromatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
C21-C34 Aromatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
Total EPH	—	126	NA	NA	82.1	NA	NA	<50	79.9	NA	NA	NA	NA	148	NA	NA	142
Carcinogenic Polynuclear Aromatic Hydrocarbons (ug/L)																	
Benzo(a)anthracene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.100	<0.10	<0.20	<0.10	0.182	<0.10	<0.10	<0.10	0.139	<0.10
Benzo(a)pyrene	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	**0.182**	<0.10	<0.10	<0.10	<0.10	<0.10
Benzo(b)fluoranthene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	0.121	<0.10	<0.10	<0.10	<0.10	<0.10
Benzo(k)fluoranthene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	0.162	<0.10	<0.10	<0.10	0.119	<0.10
Chrysene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	0.162	<0.10	<0.10	<0.10	<0.10	<0.10
Dibenz(a,h)anthracene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Ideno(1,2,3-cd)pyrene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	0.101	<0.10	<0.10	<0.10	<0.10	<0.10
Total Carcinogenic PAHs	0.1	NA	NA	NA	NA	NA	NA	**0.100**	NA	NA	NA	**0.910**	NA	NA	NA	**0.258**	NA
Naphthalenes (ug/L)																	
1-Methylnaphthalene	—	1.0	2.5	1.08	0.738	0.330	0.218	0.120	<0.10	0.39	0.24	<0.10	<0.10	2.5	3.27	0.97	1.47
2-Methylnaphthalene	—	<0.10	0.416	<0.10	<0.10	0.21	<0.10	<0.10	<0.10	<0.20	0.12	<0.10	<0.10	0.45	0.554	0.158	0.121
Naphthalene	—	<0.10	0.277	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	0.303	<0.10	0.41	0.535	<0.10	0.222
Total Naphthalenes	160	1.0	3.19	1.08	0.738	0.54	0.218	0.12	NA	0.39	0.36	0.303	NA	1.6	4.36	1.13	1.81
BTEX (ug/L)																	
Benzene	5	<0.5	<0.5	<0.500	<0.500	<0.5	<0.5	<0.5	<0.500	<0.5	<0.5	<0.5	<0.500	1.7	2.24	0.598	0.630
Toluene	1,000	<0.5	<0.5	<0.500	<2.00	<0.5	<0.5	<0.5	<2.00	0.513	<0.5	<0.5	<2.00	0.648	0.504	<0.5	<2.00
Ethylbenzene	700	<0.5	<0.5	<0.500	<1.00	<0.5	<0.5	<0.5	<1.00	<0.5	<0.5	<0.5	<1.00	<0.5	<0.5	<0.5	<1.00
Xylenes (total)	1,000	<1	<1	<1	<1.50	<1	<1	<1	<1.50	1.08	<1	<1	<1.50	1.38	<1	<1	<1.50

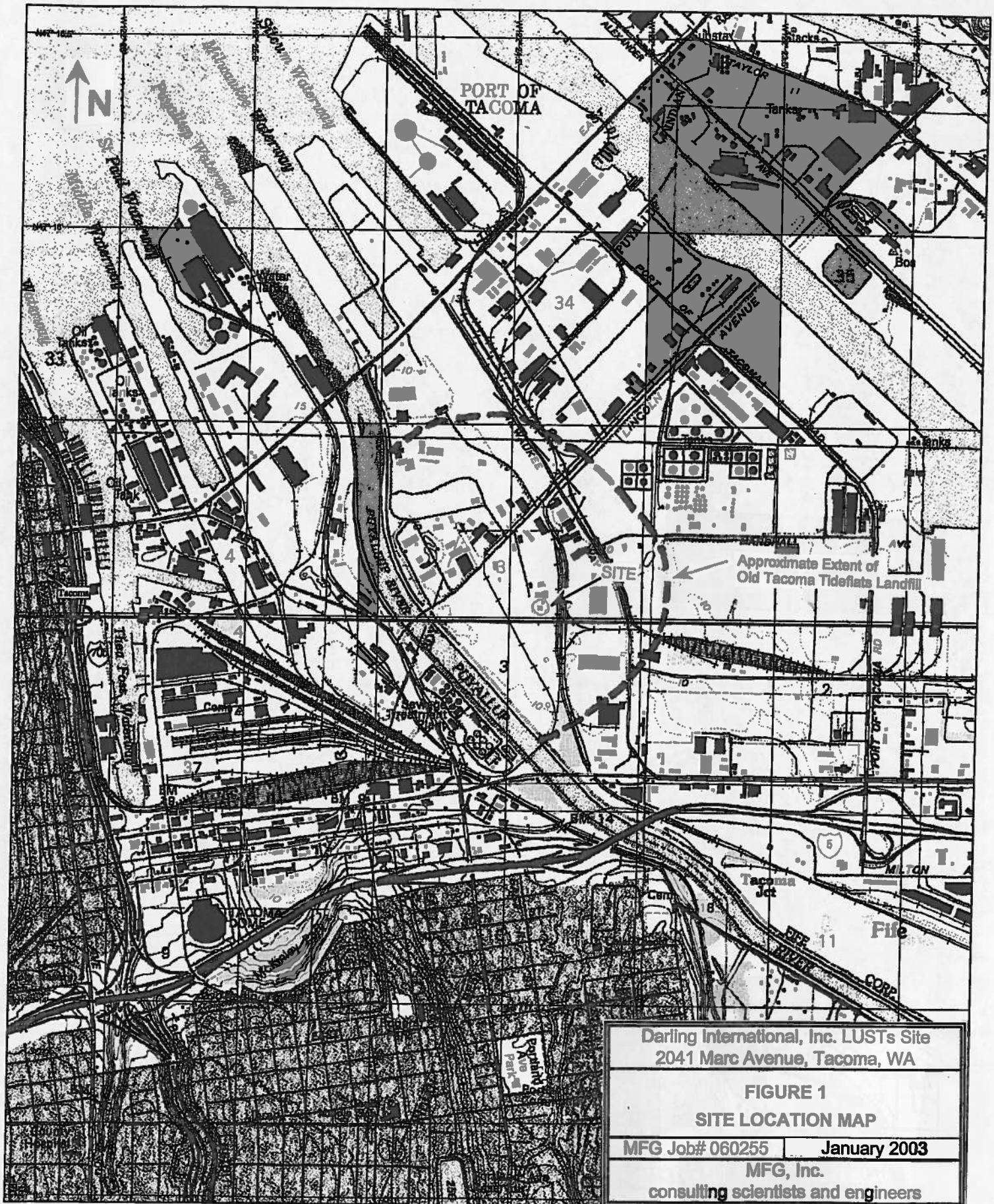
bgs = below ground surface NA = Not Applicable.
Bold=At or Above MTCA Method A Groundwater Cleanup Level

TABLE 4
Water Table Elevation Data
Darling International, Inc.
2041 Marc Avenue, Tacoma, Washington

Well	Date	Measuring Point Elevation (ft AMSL)	Depth to Water (top of PVC)	Potentiometric Surface Elevation (ft AMSL)
MFG-1	2/8/2002	16.27	5.06	11.21
	2/13/2002		5.30	10.97
	2/26/2002		5.20	11.07
	6/19/2002		7.09	9.18
	9/26/2002		8.33	7.94
	12/19/2002		7.46	8.81
MFG-2	2/8/2002	15.8	4.59	11.21
	2/13/2002		4.82	10.98
	2/26/2002		4.72	11.08
	6/19/2002		6.63	9.17
	9/26/2002		7.86	7.94
	12/19/2002		7.00	8.80
MFG-3	2/8/2002	16.85	5.69	11.16
	2/13/2002		5.89	10.96
	2/26/2002		5.77	11.08
	6/19/2002		7.66	9.19
	9/26/2002		8.87	7.98
	12/19/2002		8.04	8.81
MFG-4	2/8/2002	15.67	4.51	11.16
	2/13/2002		4.70	10.97
	2/26/2002		4.58	11.09
	6/19/2002		6.49	9.18
	9/26/2002		7.71	7.96
	12/19/2002		6.86	8.81

Survey datum = NAVD88

FIGURES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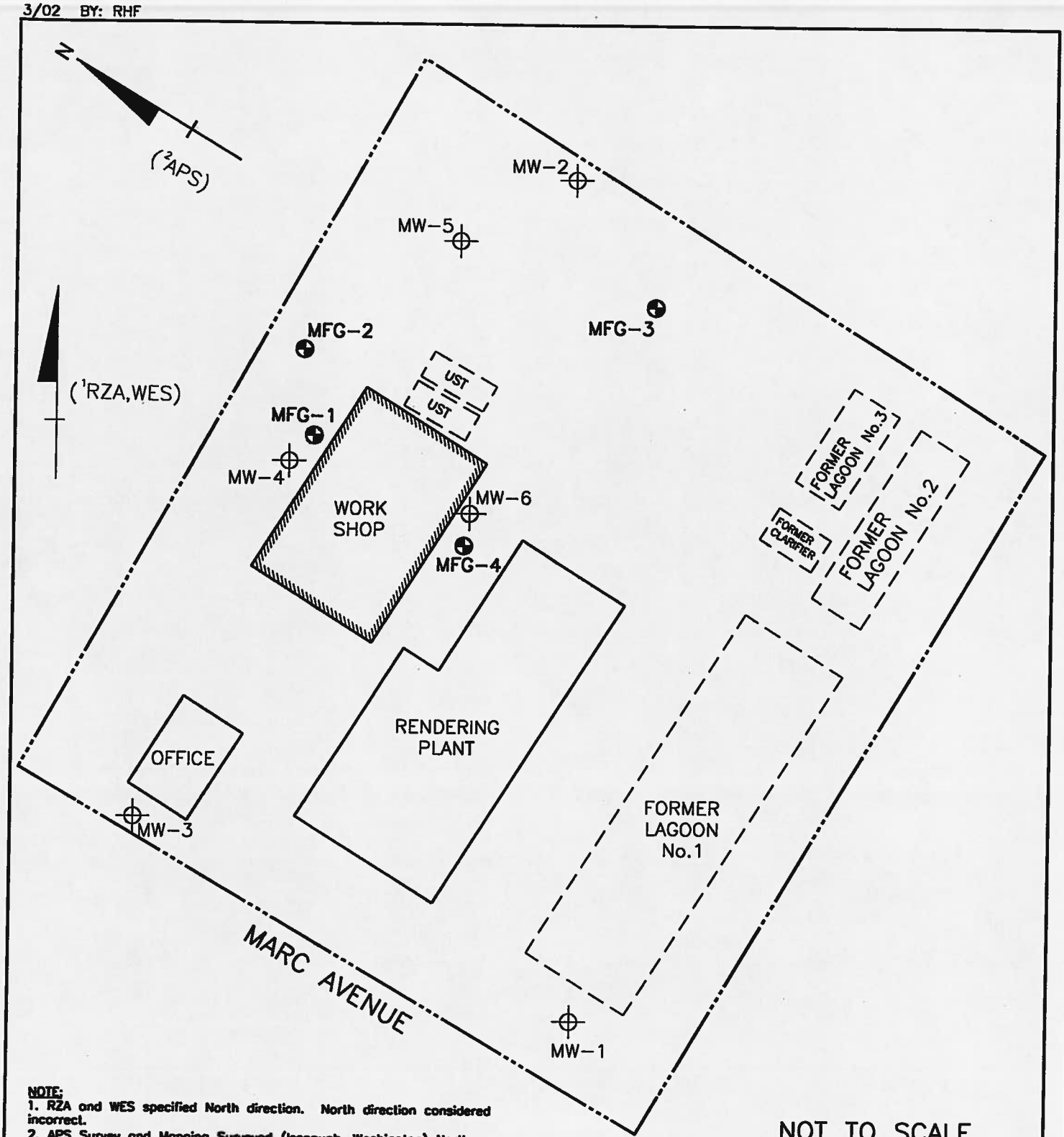
PORT OF TACOMA
Approximate Extent of Old Tacoma Tideflats Landfill
SITE
Tacoma
Fife
Tacoma Jct
Darling International, Inc. LUSTs Site
2041 Marc Avenue, Tacoma, WA
FIGURE 1
SITE LOCATION MAP
MFG Job# 060255
January 2003
MFG, Inc.
consulting scientists and engineers
3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS
950 ft Scale: 1 : 24,000 Detail: 13-3 Datum: WGS84

3/02 BY: RHF



NOT TO SCALE

NOTE:
1. RZA and WES specified North direction. North direction considered incorrect.
2. APS Survey and Mapping Surveyed (Issaquah, Washington) North direction. Survey datum: NAVD88 and Washington State Plane Coordinate System – South Zone. APS North direciton is considered correct.
3. Structure and well locations are approximate.

LEGEND:

- NEW MONITORING WELL
- PREVIOUSLY EXISTING MONITORING WELL
- FORMER STRUCTURES

DARLING INTERNATIONAL, INC. LUSTs SITE
2041 MARC AVENUE, TACOMA, WA

FIGURE 2

SITE MAP

PROJECT: 060255.	DATE: JANUARY 2003	
REV:	BY: ALJ	CHECKED: NM

MFG, Inc.
consulting scientists and engineers

RFIELD D:\MONTANA\0255\0255-Fig2.dwg ffff 12/13/02 3:30 pm
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Images: [none]
Plot time: 10:45 AM
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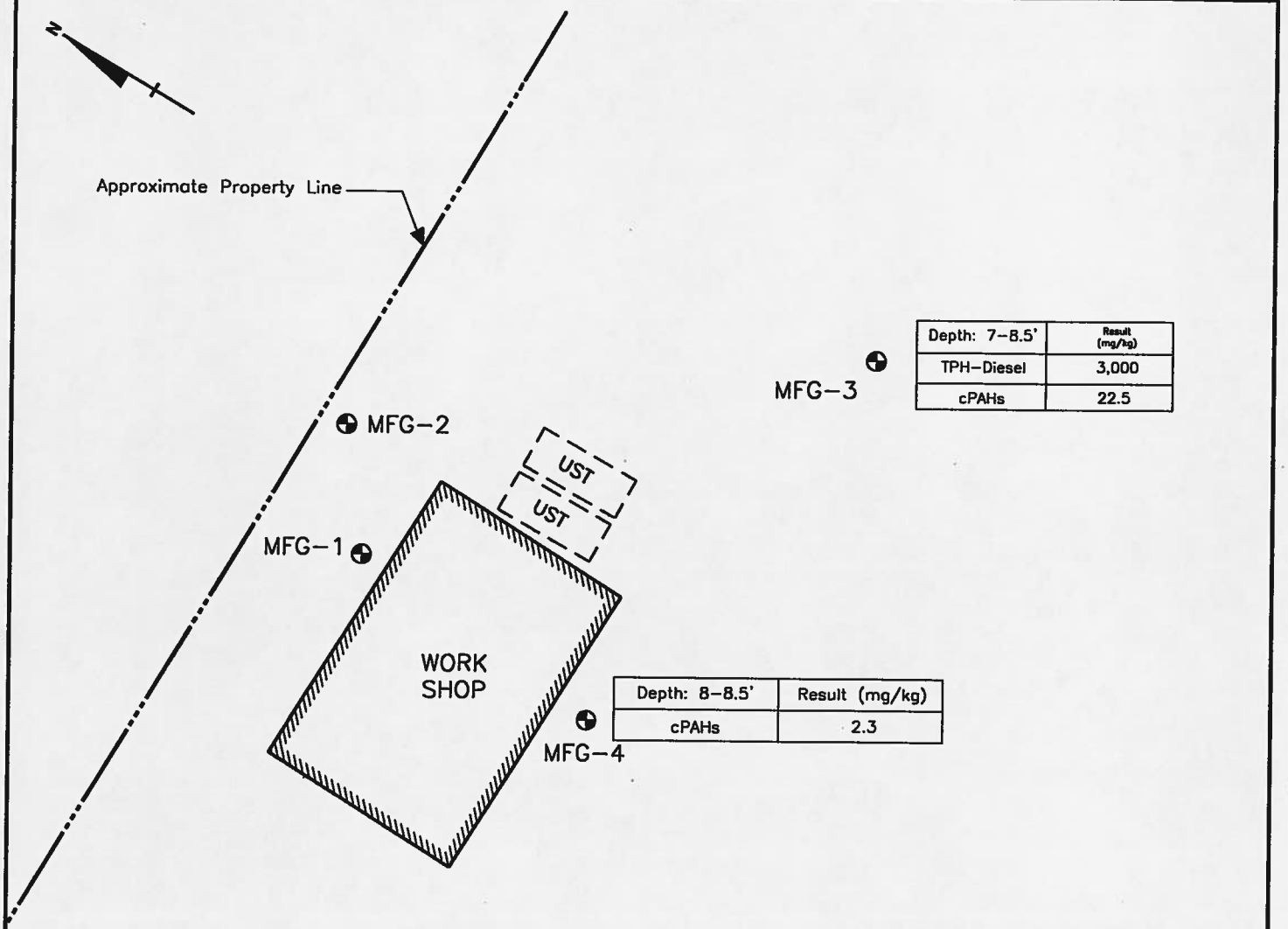
3/02 BY: RHF



Depth: 7–8.5'	Result (mg/kg)
TPH–Diesel	3,000
cPAHs	22.5

Depth: 8–8.5'	Result (mg/kg)
cPAHs	2.3

NOTE:

- Wells located according to survey datum NAVD88 and Washington State Plane Coordinate System – south zones (surveyed by APS Survey and Mapping of Issaquah, Washington)
- Results presented are those exceeding MTCA Method A Soil Cleanup levels for unrestricted land use and industrial properties.
- cPAHs = total carcinogenic PAHs.

LEGEND:

NEW MONITORING WELL

FORMER STRUCTURES (Approximate Sizes and Locations)

SCALE

30 15 0 30 FEET

DARLING INTERNATIONAL, INC. LUSTs SITE
2041 MARC AVENUE, TACOMA, WA

FIGURE 3

February 2002 Subsurface Soil Analytical Results

PROJECT: 060255.	DATE: JANUARY 2003	
REV:	BY: ALJ	CHECKED: NM

MFG, Inc.
consulting scientists and engineers

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Images: [none]
Plot time: 11:53 am
Plot date: 12/13/02

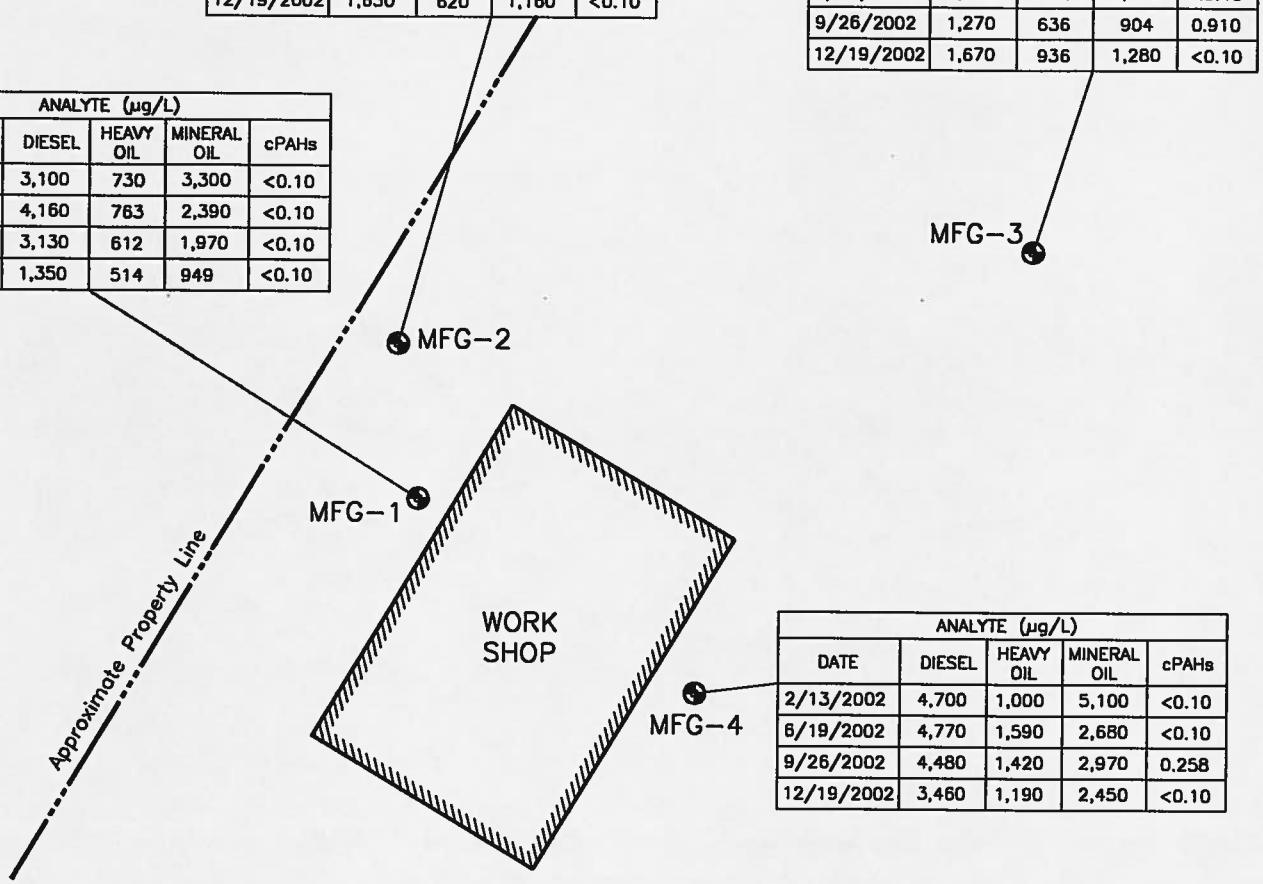
3/02 BY: RHF

ANALYTE (µg/L)				
DATE	DIESEL	HEAVY OIL	MINERAL OIL	cPAHs
2/13/2002	2,300	<500	2,500	<0.10
6/19/2002	2,920	992	1,750	<0.10
9/26/2002	1,710	634	1,120	1.0
12/19/2002	1,630	620	1,160	<0.10

ANALYTE (µg/L)				
DATE	DIESEL	HEAVY OIL	MINERAL OIL	cPAHs
2/13/2002	6,100	1,100	7,300	<0.20
6/19/2002	1,760	761	1,150	<0.10
9/26/2002	1,270	636	904	0.910
12/19/2002	1,670	936	1,280	<0.10

ANALYTE (µg/L)				
DATE	DIESEL	HEAVY OIL	MINERAL OIL	cPAHs
2/13/2002	3,100	730	3,300	<0.10
6/19/2002	4,160	763	2,390	<0.10
9/26/2002	3,130	612	1,970	<0.10
12/19/2002	1,350	514	949	<0.10

ANALYTE (µg/L)				
DATE	DIESEL	HEAVY OIL	MINERAL OIL	cPAHs
2/13/2002	4,700	1,000	5,100	<0.10
6/19/2002	4,770	1,590	2,680	<0.10
9/26/2002	4,480	1,420	2,970	0.258
12/19/2002	3,460	1,190	2,450	<0.10



SCALE

30 15 0 30 FEET

LEGEND:

MONITORING WELL

NOTES:

- Wells located according to survey datum NAVD88 and Washington State Plane Coordinate System – south zones (surveyed by APS Survey and Mapping of Issaquah, Washington)
- Analytes presented are those whose results exceed MTCA METHOD A Groundwater Cleanup Levels.
- cPAHs = Total carcinogenic PAHs.

DARLING INTERNATIONAL, INC. LUSTs SITE
2041 MARC AVENUE, TACOMA, WA

FIGURE 4

2002 Groundwater Analytical Results

PROJECT: 060255	DATE: JANUARY 2003	
REV:	BY: RHF	CHECKED: NM

MFG, Inc.
consulting scientists and engineers

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Xrefs [none]
Images: [none]
Plot time: 12:43 pm
Plot date: 1/15/03

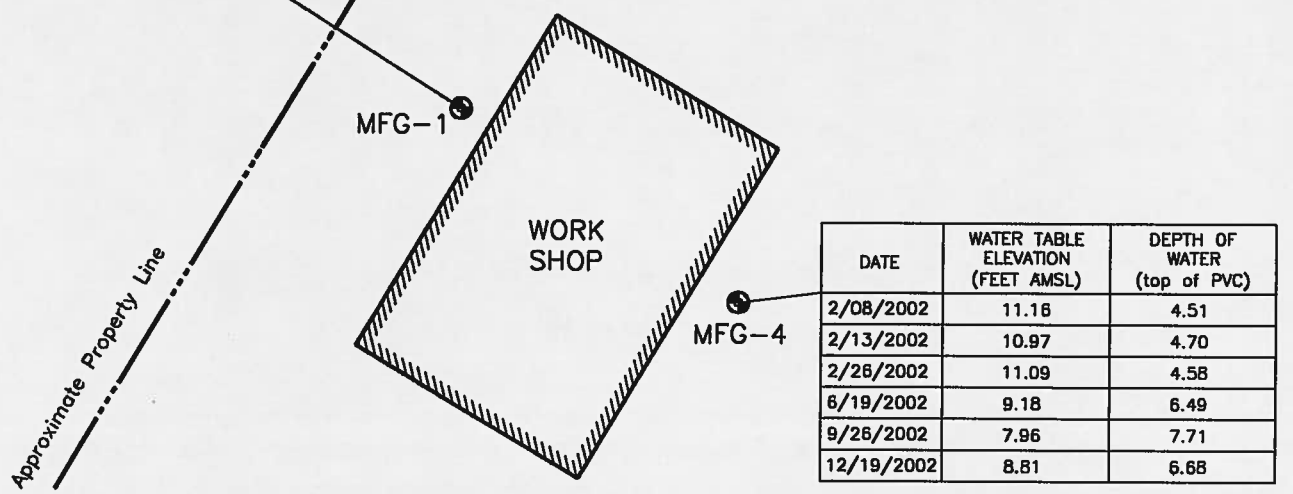
3/02 BY: RHF

DATE	WATER TABLE ELEVATION (FEET AMSL)	DEPTH OF WATER (top of PVC)
2/08/2002	11.21	4.59
2/13/2002	10.98	4.82
2/26/2002	11.08	4.72
6/19/2002	9.17	6.63
9/26/2002	7.94	7.86
12/19/2002	8.80	7.00

DATE	WATER TABLE ELEVATION (FEET AMSL)	DEPTH OF WATER (top of PVC)
2/08/2002	11.16	5.69
2/13/2002	10.96	5.89
2/26/20D2	11.08	5.77
6/19/20D2	9.19	7.66
9/26/2002	7.98	8.87
12/19/2002	8.81	8.04

DATE	WATER TABLE ELEVATION (FEET AMSL)	DEPTH OF WATER (top of PVC)
2/08/2002	11.21	5.06
2/13/2002	10.97	5.3D
2/26/2002	11.07	5.20
6/19/2002	9.18	7.09
9/26/2002	7.94	8.33
12/19/2002	8.81	7.46

DATE	WATER TABLE ELEVATION (FEET AMSL)	DEPTH OF WATER (top of PVC)
2/08/2002	11.16	4.51
2/13/2002	10.97	4.70
2/26/2002	11.09	4.58
6/19/2002	9.18	6.49
9/26/2002	7.96	7.71
12/19/2002	8.81	6.68



SCALE

30 15 0 30 FEET

LEGEND:

⊕ MONITORING WELL

NOTE:

- Wells located according to survey datum NAVD88 and Washington State Plane Coordinate System – south zones (surveyed by APS Survey and Mapping of Issaquah, Washington)

DARLING INTERNATIONAL, INC. LUSTs SITE
2041 MARC AVENUE, TACOMA, WA

FIGURE 5

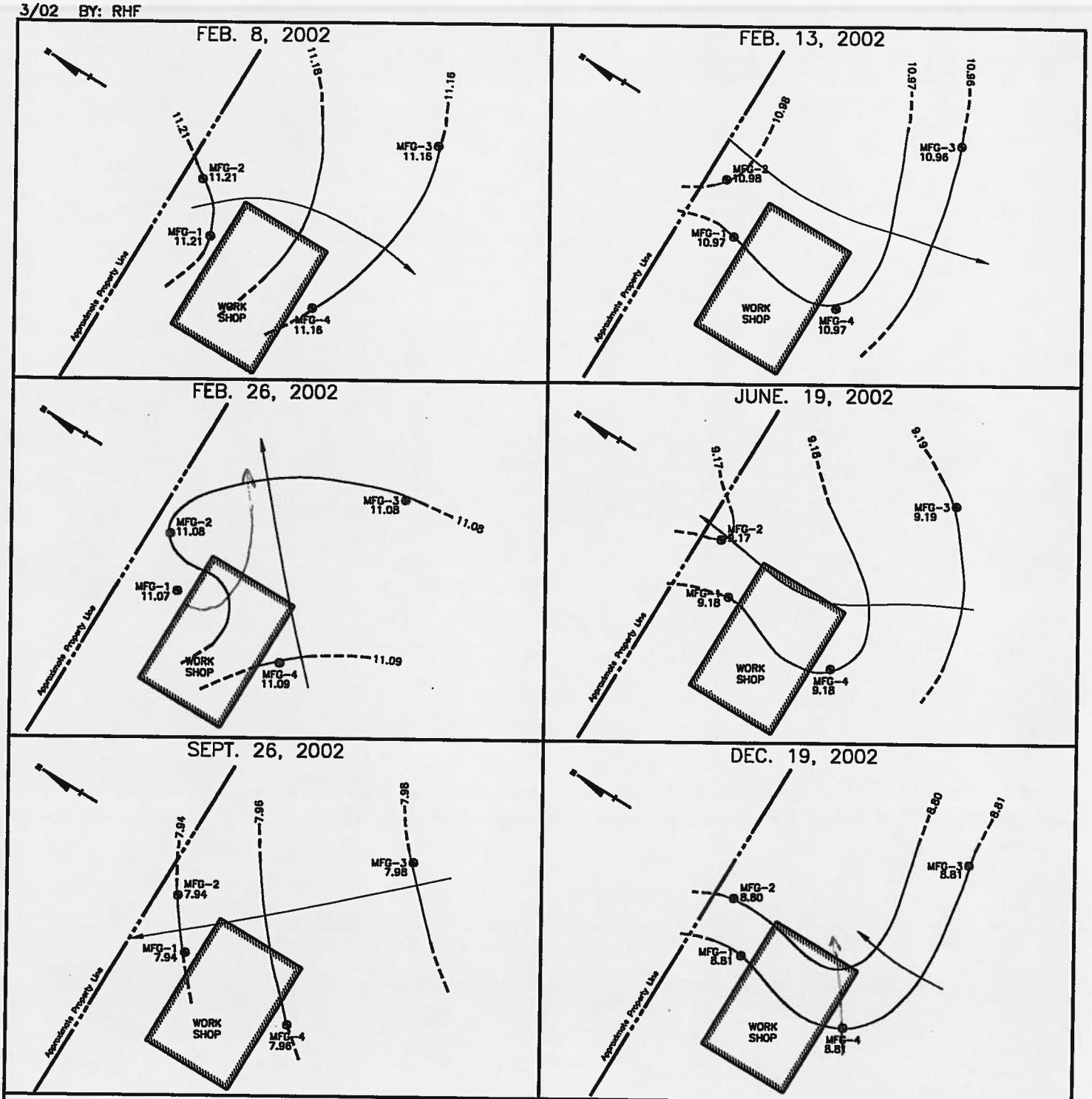
2002 Water Table Data

PROJECT: 060255	DATE: JANUARY 2003	
REV:	BY: RHF	CHECKED: NM

MFG, Inc.
consulting scientists and engineers

RFIELD D:\MONTANA\0255\0255-Fig5.dwg ???? 1/15/03 1:10 pm
Xrefs: [none]
Images: [none]
Plot time: 1:09 pm
Plot date: 1/15/03

3/02 BY: RHF



SCALE

60 0 60 FEET

LEGEND:

MW-1 ⊕ MONITORING WELL

CONTOUR LINE (DASHED INFERRED)

FLOW DIRECTION (APPROXIMATE)

NOTE:

- Wells located according to survey datum NAVD88 and Washington State Plane Coordinate System – south zones (surveyed by APS Survey and Mapping of Issaquah, Washington)

DARLING INTERNATIONAL, INC. LUSTs SITE
2041 MARC AVENUE, TACOMA, WA

FIGURE 6

Potentiometric Surface Maps

PROJECT: 060255	DATE: JANUARY 2003
REV:	BY: RHF | CHECKED: NM

MFG, Inc.
consulting scientists and engineers

RFIELD D:\MONTANA\060255\060255-Fig6.dwg ???? 1/15/03 1:15 pm
Xrefs: (none)
Images: (none)
Plot time: 1:13 PM
Plot date: 1/15/03

APPENDIX A
INVESTIGATION DERIVED WASTE DISPOSAL DOCUMENTS

BILL OF LADING
PRODUCT TRANSPORT MANIFEST
MARINE VACUUM SERVICE INC.
24 HOUR EMERGENCY PHONE NUMBER (206) 762-0240

TRUCK NUMBER 128 DATE 1-10-03

TO DESTINATION
NAME Marine Vacuum Service
STREET 1516 S. Graham St.
CITY / STATE Seattle wa

FROM SHIPPER
NAME MFG Job# 060255 Darling—Tacoma
STREET 2041 Meek Ave
CITY / STATE Tacoma wa

QUANTITY	PROPER SHIPPING NAME	UN (PLACARD) NUMBER
55 gal	waste water	n/a
	SLUDGE	

SHIPPER x [signature] DATE 1-10-03
DRIVER x [signature] DATE 1-10-03

NOTE:

2

PG 1 - M.V.S. PG 2 - DESTINATION PG 3 - SHIPPER

2

APPENDIX B

JUNE 2002 LABORATORY ANALYTICAL RESULTS

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541.383.9310 fax 541.382.7588

MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MFG-1	B2F0552-01	Water	06/19/02 12:47	06/20/02 15:30
MFG-2	B2F0552-02	Water	06/19/02 10:40	06/20/02 15:30
MFG-3	B2F0552-03	Water	06/19/02 16:08	06/20/02 15:30
MFG-4	B2F0552-04	Water	06/19/02 14:50	06/20/02 15:30

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

Semivolatile Petroleum Products by NWTPH-Dx (w/o Acid/Silica Gel Clean-up)

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2F0552-01) Water Sampled: 06/19/02 12:47 Received: 06/20/02 15:30									
Diesel Range Hydrocarbons	**4.16**	0.250	mg/l	1	2F25007	06/25/02	06/27/02	NWTPH-Dx	
Heavy Oil Range Hydrocarbons	**0.763**	0.500	"	"	"	"	"	"	
Mineral Oil Range Hydrocarbons	**2.39**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*90.2 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*81.4 %*	*56-123*			"	"	"	"	
MFG-2 (B2F0552-02) Water Sampled: 06/19/02 10:40 Received: 06/20/02 15:30									
Diesel Range Hydrocarbons	**2.92**	0.250	mg/l	1	2F25007	06/25/02	06/27/02	NWTPH-Dx	
Heavy Oil Range Hydrocarbons	**0.992**	0.500	"	"	"	"	"	"	
Mineral Oil Range Hydrocarbons	**1.75**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*88.8 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*81.6 %*	*56-123*			"	"	"	"	
MFG-3 (B2F0552-03) Water Sampled: 06/19/02 16:08 Received: 06/20/02 15:30									
Diesel Range Hydrocarbons	**1.76**	0.250	mg/l	1	2F25007	06/25/02	06/27/02	NWTPH-Dx	
Heavy Oil Range Hydrocarbons	**0.761**	0.500	"	"	"	"	"	"	
Mineral Oil Range Hydrocarbons	**1.15**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*92.8 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*82.8 %*	*56-123*			"	"	"	"	
MFG-4 (B2F0552-04) Water Sampled: 06/19/02 14:50 Received: 06/20/02 15:30									
Diesel Range Hydrocarbons	**4.77**	0.250	mg/l	1	2F25007	06/25/02	06/27/02	NWTPH-Dx	
Heavy Oil Range Hydrocarbons	**1.59**	0.500	"	"	"	"	"	"	
Mineral Oil Range Hydrocarbons	**2.68**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*97.2 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*83.0 %*	*56-123*			"	"	"	"	

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2F0552-01) Water Sampled: 06/19/02 12:47 Received: 06/20/02 15:30									
C8-C10 Aliphatics	ND	100	ug/l	1	2F24008	06/24/02	07/01/02	WA MTCA-EPH	
C10-C12 Aliphatics	ND	100	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	100	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	100	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	100	"	"	"	"	"	"	
C10-C12 Aromatics	ND	100	"	"	"	"	"	"	
C12-C16 Aromatics	ND	100	"	"	"	"	"	"	
C16-C21 Aromatics	ND	100	"	"	"	"	"	"	
C21-C34 Aromatics	ND	100	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	ND	100	"	"	"	"	"	"	
Surrogate: 2-FBP	*58.5 %*	*50-150*			"	"	"	"	
Surrogate: Octacosane	*82.0 %*	*50-150*			"	"	"	"	
Surrogate: Undecane	*54.7 %*	*30-150*			"	"	"	"	
MFG-2 (B2F0552-02) Water Sampled: 06/19/02 10:40 Received: 06/20/02 15:30									
C8-C10 Aliphatics	ND	100	ug/l	1	2F24008	06/24/02	07/01/02	WA MTCA-EPH	
C10-C12 Aliphatics	ND	100	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	100	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	100	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	100	"	"	"	"	"	"	
C10-C12 Aromatics	ND	100	"	"	"	"	"	"	
C12-C16 Aromatics	ND	100	"	"	"	"	"	"	
C16-C21 Aromatics	ND	100	"	"	"	"	"	"	
C21-C34 Aromatics	ND	100	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	ND	100	"	"	"	"	"	"	
Surrogate: 2-FBP	*67.4 %*	*50-150*			"	"	"	"	
Surrogate: Octacosane	*81.7 %*	*50-150*			"	"	"	"	
Surrogate: Undecane	*64.9 %*	*30-150*			"	"	"	"	

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-3 (B2F0552-03) Water Sampled: 06/19/02 16:08 Received: 06/20/02 15:30									
C8-C10 Aliphatics	ND	100	ug/l	1	2F24008	06/24/02	07/01/02	WA MTCA-EPH	
C10-C12 Aliphatics	ND	100	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	100	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	100	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	100	"	"	"	"	"	"	
C10-C12 Aromatics	ND	100	"	"	"	"	"	"	
C12-C16 Aromatics	ND	100	"	"	"	"	"	"	
C16-C21 Aromatics	ND	100	"	"	"	"	"	"	
C21-C34 Aromatics	ND	100	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	ND	100	"	"	"	"	"	"	
Surrogate: 2-FBP	*62.2 %*	*50-150*			"	"	"	"	
Surrogate: Octacosane	*75.6 %*	*50-150*			"	"	"	"	
Surrogate: Undecane	*57.6 %*	*30-150*			"	"	"	"	
MFG-4 (B2F0552-04) Water Sampled: 06/19/02 14:50 Received: 06/20/02 15:30									
C8-C10 Aliphatics	ND	100	ug/l	1	2F24008	06/24/02	07/01/02	WA MTCA-EPH	
C10-C12 Aliphatics	ND	100	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	100	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	100	"	"	"	"	"	"	
C21-C34 Aliphatics	**148**	100	"	"	"	"	"	"	
C10-C12 Aromatics	ND	100	"	"	"	"	"	"	
C12-C16 Aromatics	ND	100	"	"	"	"	"	"	
C16-C21 Aromatics	ND	100	"	"	"	"	"	"	
C21-C34 Aromatics	**105**	100	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	**253**	100	"	"	"	"	"	"	
Surrogate: 2-FBP	*64.4 %*	*50-150*			"	"	"	"	
Surrogate: Octacosane	*80.2 %*	*50-150*			"	"	"	"	
Surrogate: Undecane	*55.7 %*	*30-150*			"	"	"	"	

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	Reported: 07/03/02 11:47

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2F0552-01) Water Sampled: 06/19/02 12:47 Received: 06/20/02 15:30									
Benzo (a) anthracene	ND	0.100	ug/l	1	2F24008	06/24/02	07/01/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	2.51	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	0.416	0.100	"	"	"	"	"	"	
Naphthalene	0.277	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*104 %*	*30-150*			"	"	"	"	
MFG-2 (B2F0552-02) Water Sampled: 06/19/02 10:40 Received: 06/20/02 15:30									
Benzo (a) anthracene	ND	0.100	ug/l	1	2F24008	06/24/02	07/01/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	0.218	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
Naphthalene	ND	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*103 %*	*30-150*			"	"	"	"	

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-3 (B2F0552-03) Water Sampled: 06/19/02 16:08 Received: 06/20/02 15:30									
Benzo (a) anthracene	ND	0.100	ug/l	1	2F24008	06/24/02	06/30/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	**0.240**	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	**0.120**	0.100	"	"	"	"	"	"	
Naphthalene	ND	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*106 %*	*30-150*			"	"	"	"	
MFG-4 (B2F0552-04) Water Sampled: 06/19/02 14:50 Received: 06/20/02 15:30									
Benzo (a) anthracene	ND	0.100	ug/l	1	2F24008	06/24/02	06/30/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	**3.27**	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	**0.554**	0.100	"	"	"	"	"	"	
Naphthalene	**0.535**	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*103 %*	*30-150*			"	"	"	"	

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

BTEX by EPA Method 8021B

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2F0552-01) Water Sampled: 06/19/02 12:47 Received: 06/20/02 15:30									
Benzene	ND	0.500	ug/l	1	2F25002	06/25/02	06/25/02	EPA 8021B	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*89.2 %*	*62-120*				"	"	"	
MFG-2 (B2F0552-02) Water Sampled: 06/19/02 10:40 Received: 06/20/02 15:30									
Benzene	ND	0.500	ug/l	1	2F25002	06/25/02	06/25/02	EPA 8021B	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*87.3 %*	*62-120*				"	"	"	
MFG-3 (B2F0552-03) Water Sampled: 06/19/02 16:08 Received: 06/20/02 15:30									
Benzene	ND	0.500	ug/l	1	2F25002	06/25/02	06/25/02	EPA 8021B	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*87.7 %*	*62-120*				"	"	"	
MFG-4 (B2F0552-04) Water Sampled: 06/19/02 14:50 Received: 06/20/02 15:30									
Benzene	**2.24**	0.500	ug/l	1	2F25002	06/25/02	06/25/02	EPA 8021B	
Toluene	**0.504**	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*89.2 %*	*62-120*				"	"	"	

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541.383.9310 fax 541.382.7588

MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

Semivolatile Petroleum Products by NWTPH-Dx (w/o Acid/Silica Gel Clean-up) - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2F25007: Prepared 06/25/02 Using EPA 3520C										
Blank (2F25007-BLK1)										
Diesel Range Hydrocarbons	ND	0.250	mg/l							
Heavy Oil Range Hydrocarbons	ND	0.500	"							
Mineral Oil Range Hydrocarbons	ND	0.500	"							
Surrogate: 2-FBP	*0.287*		"	*0.320*		*89.7*	*50-121*			
Surrogate: Octacosane	*0.264*		"	*0.320*		*82.5*	*56-123*			
LCS (2F25007-BS1)										
Diesel Range Hydrocarbons	1.79	0.250	mg/l	2.00		89.5	62-122			
Surrogate: 2-FBP	*0.270*		"	*0.320*		*84.4*	*50-121*			
LCS Dup (2F25007-BSD1)										
Diesel Range Hydrocarbons	1.78	0.250	mg/l	2.00		89.0	62-122	0.560	40	
Surrogate: 2-FBP	*0.261*		"	*0.320*		*81.6*	*50-121*			
Matrix Spike (2F25007-MS1)					**Source: B2F0552-01**					
Diesel Range Hydrocarbons	5.50	0.250	mg/l	1.90	4.16	70.5	42-126			
Surrogate: 2-FBP	*0.293*		"	*0.305*		*96.1*	*50-121*			
Matrix Spike Dup (2F25007-MSD1)					**Source: B2F0552-01**					
Diesel Range Hydrocarbons	6.07	0.250	mg/l	1.90	4.16	101	42-126	9.85	40	
Surrogate: 2-FBP	*0.296*		"	*0.305*		*97.0*	*50-121*			

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541.383.9310 fax 541.382.7588

MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2F24008: Prepared 06/24/02 Using EPA 3520C										
Blank (2F24008-BLK1)										
C8-C10 Aliphatics	ND	100	ug/l							
C10-C12 Aliphatics	ND	100	"							
C12-C16 Aliphatics	ND	100	"							
C16-C21 Aliphatics	ND	100	"							
C21-C34 Aliphatics	ND	100	"							
C10-C12 Aromatics	ND	100	"							
C12-C16 Aromatics	ND	100	"							
C16-C21 Aromatics	ND	100	"							
C21-C34 Aromatics	ND	100	"							
Extractable Petroleum Hydrocarbons	ND	100	"							
Surrogate: 2-FBP	*266*		"	*394*		*67.5*	*50-150*			
Surrogate: Octacosane	*273*		"	*398*		*68.6*	*50-150*			
Surrogate: Undecane	*252*		"	*408*		*61.8*	*30-150*			
LCS (2F24008-BS1)										
Extractable Petroleum Hydrocarbons	3390	100	ug/l	5000		67.8	30-120			
Surrogate: 2-FBP	*296*		"	*394*		*75.1*	*50-150*			
Surrogate: Octacosane	*309*		"	*398*		*77.6*	*50-150*			
Surrogate: Undecane	*299*		"	*408*		*73.3*	*30-150*			
LCS Dup (2F24008-BSD1)										
Extractable Petroleum Hydrocarbons	3900	100	ug/l	5000		78.0	30-120	14.0	40	
Surrogate: 2-FBP	*292*		"	*394*		*74.1*	*50-150*			
Surrogate: Octacosane	*304*		"	*398*		*76.4*	*50-150*			
Surrogate: Undecane	*302*		"	*408*		*74.0*	*30-150*			
Matrix Spike (2F24008-MS1)					**Source: B2F0552-01**					
Extractable Petroleum Hydrocarbons	3770	100	ug/l	5000	ND	75.4	30-120			
Surrogate: 2-FBP	*267*		"	*394*		*67.8*	*50-150*			
Surrogate: Octacosane	*309*		"	*398*		*77.6*	*50-150*			
Surrogate: Undecane	*255*		"	*408*		*62.5*	*30-150*			

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2F24008: Prepared 06/24/02 Using EPA 3520C										
Matrix Spike Dup (2F24008-MSD1)					**Source: B2F0552-01**					
Extractable Petroleum Hydrocarbons	2850	100	ug/l	5000	ND	57.0	30-120	27.8	40	
Surrogate: 2-FBP	*198*		"	*394*		*50.3*	*50-150*			
Surrogate: Octacosane	*254*		"	*398*		*63.8*	*50-150*			
Surrogate: Undecane	*213*		"	*408*		*52.2*	*30-150*			

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2F24008: Prepared 06/24/02 Using EPA 3520C										
Blank (2F24008-BLK1)										
Benzo (a) anthracene	ND	0.100	ug/l							
Benzo (a) pyrene	ND	0.100	"							
Benzo (b) fluoranthene	ND	0.100	"							
Benzo (k) fluoranthene	ND	0.100	"							
Chrysene	ND	0.100	"							
Dibenz (a,h) anthracene	ND	0.100	"							
Indeno (1,2,3-cd) pyrene	ND	0.100	"							
1-Methylnaphthalene	ND	0.100	"							
2-Methylnaphthalene	ND	0.100	"							
Naphthalene	ND	0.100	"							
Surrogate: p-Terphenyl-d14	*10.2*		"	*8.00*		*128*	*30-150*			
LCS (2F24008-BS1)										
Chrysene	7.86	0.100	ug/l	10.0		78.6	50-150			
Indeno (1,2,3-cd) pyrene	6.20	0.100	"	10.0		62.0	50-150			
Surrogate: p-Terphenyl-d14	*8.76*		"	*8.00*		*110*	*30-150*			
LCS Dup (2F24008-BSD1)										
Chrysene	9.00	0.100	ug/l	10.0		90.0	50-150	13.5	25	
Indeno (1,2,3-cd) pyrene	7.28	0.100	"	10.0		72.8	50-150	16.0	25	
Surrogate: p-Terphenyl-d14	*9.62*		"	*8.00*		*120*	*30-150*			
Matrix Spike (2F24008-MS1)					**Source: B2F0552-01**					
Chrysene	7.06	0.100	ug/l	10.0	ND	70.6	50-150			
Indeno (1,2,3-cd) pyrene	5.20	0.100	"	10.0	ND	51.2	50-150			
Surrogate: p-Terphenyl-d14	*8.78*		"	*8.00*		*110*	*30-150*			
Matrix Spike Dup (2F24008-MSD1)					**Source: B2F0552-01**					
Chrysene	5.02	0.100	ug/l	10.0	ND	50.2	50-150	33.8	25	Q-07
Indeno (1,2,3-cd) pyrene	3.92	0.100	"	10.0	ND	38.4	50-150	28.1	25	Q-01
Surrogate: p-Terphenyl-d14	*6.40*		"	*8.00*		*80.0*	*30-150*			

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

BTEX by EPA Method 8021B - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2F25002: Prepared 06/25/02 Using EPA 5030B (P/T)										
Blank (2F25002-BLK1)										
Benzene	ND	0.500	ug/l							
Toluene	ND	0.500	"							
Ethylbenzene	ND	0.500	"							
Xylenes (total)	ND	1.00	"							
Surrogate: 4-BFB (PID)	*41.8*		"	*48.0*		*87.1*	*62-120*			
LCS (2F25002-BS1)										
Benzene	6.97	0.500	ug/l	6.20		112	80-120			
Toluene	35.9	0.500	"	37.4		96.0	80-120			
Ethylbenzene	9.24	0.500	"	8.94		103	80-120			
Xylenes (total)	43.9	1.00	"	43.7		100	80-120			
Surrogate: 4-BFB (PID)	*39.0*		"	*48.0*		*81.2*	*62-120*			
LCS Dup (2F25002-BSD1)										
Benzene	6.21	0.500	ug/l	6.20		100	80-120	11.5	40	
Toluene	32.0	0.500	"	37.4		85.6	80-120	11.5	40	
Ethylbenzene	8.18	0.500	"	8.94		91.5	80-120	12.2	40	
Xylenes (total)	39.0	1.00	"	43.7		89.2	80-120	11.8	40	
Surrogate: 4-BFB (PID)	*39.7*		"	*48.0*		*82.7*	*62-120*			
Matrix Spike (2F25002-MS1)					**Source: B2F0552-01**					
Benzene	6.46	0.500	ug/l	6.19	ND	100	80-120			
Toluene	32.1	0.500	"	37.6	ND	84.6	68-114			
Ethylbenzene	8.27	0.500	"	8.83	ND	90.2	80-120			
Xylenes (total)	38.9	1.00	"	44.5	ND	85.4	80-120			
Surrogate: 4-BFB (PID)	*40.2*		"	*48.0*		*83.8*	*62-120*			
Matrix Spike Dup (2F25002-MSD1)					**Source: B2F0552-01**					
Benzene	6.15	0.500	ug/l	6.19	ND	95.3	80-120	4.92	40	
Toluene	31.4	0.500	"	37.6	ND	82.8	68-114	2.20	40	
Ethylbenzene	8.09	0.500	"	8.83	ND	88.1	80-120	2.20	40	
Xylenes (total)	38.0	1.00	"	44.5	ND	83.4	80-120	2.34	40	
Surrogate: 4-BFB (PID)	*40.5*		"	*48.0*		*84.4*	*62-120*			

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 020255	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	07/03/02 11:47

Notes and Definitions

Q-01	The spike recovery for this QC sample is outside of established control limits. Review of associated batch QC indicates the recovery for this analyte does not represent an out-of-control condition for the batch.
Q-07	The RPD value for this QC sample is above the established control limit. Review of associated QC indicates the high RPD does not represent an out-of-control condition for the batch.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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CHAIN OF CUSTODY REPORT

Work Order #: B2F0552

CLIENT: MFG
REPORT TO: Natalie Morrow
ADDRESS: Po Box 7158
Missoula MT 59807
PHONE: 406-728-4600 FAX: 406-728-4698

INVOICE TO: (Same)
P.O. NUMBER: 060255

PROJECT NAME: Darling - Tacoma
PROJECT NUMBER: 060255
SAMPLED BY: Natalie Morrow

TURNAROUND REQUEST in Business Days*
Organic & Inorganic Analyses: ~~10~~ STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1
Petroleum Hydrocarbon Analyses: ~~X~~ STD. | 4 | 3 | 2 | 1 | <1
OTHER — Please Specify
*Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NWTPH-Dx	PAHs	Naphthalenes	EPH	BTEX	MS/MSD	MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1.	MFG-1	6/19/02 1247	X	X	X	X	X	X	W	14	Analyses must	01
2.	MFG-2	6/19/02 1040	X	X	X	X	X		W	7	meet MTCA and	02
3.	MFG-3	6/19/02 1608	X	X	X	X	X		W	7	need to be	03
4.	MFG-4	6/19/02 1450	X	X	X	X	X		W	7	consistent with	04
CW 5.	Trip Blank	6/19/02 1200							Hold		Feb 2002 sampling	05
6.											event	
7.											•	
8.											Contact Natalie	
9.											Morrow w/ questions	
10.											at 425-921-4000	
11.											until June 28th,	
12.											and at 406-728-4600	
13.											after June 28th	
14.												
15.												

Revised Chain of Custody

RELINQUISHED BY: PRINT NAME: Natalie Morrow FIRM: MFG DATE: 6/20/02 TIME: 14:20
RECEIVED BY: PRINT NAME: Aaron Dexter FIRM: NCA DATE: 6/20/02 TIME: 14:20
RELINQUISHED BY: PRINT NAME: Aaron Dexter FIRM: NCA DATE: 6/20/02 TIME: 15:30
RECEIVED BY: PRINT NAME: TONY FRANK FIRM: NCA DATE: 6-20-02 TIME: 1530

ADDITIONAL REMARKS:
Samples were not @2-6C Upon Receipt W/O TEMP: 8.0

COC REV 3/99

APPENDIX C

SEPTEMBER 2002 LABORATORY ANALYTICAL RESULTS

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CASE NARRATIVE for B2I0662

Client: MFG
Project Manager: Natalie Morrow
Project Name: Darling-Tacoma UST
Project Number: 060255-101-2

1.0 DESCRIPTION OF CASE

Four water samples were submitted for analysis of Semivolatile Petroleum Products by NWTPH-Dx without acid/silica gel clean up, Extractable Petroleum Hydrocarbons by modified WDOE TPH Policy Method, Polynuclear Aromatic Compounds by GC/MS with Selected Ion Monitoring, and BTEX by EPA Method 8021B.

2.0 COMMENTS ON SAMPLE RECEIPT

Samples were received September 27, 2002 and logged in September 30, 2002. The temperature of the samples at time of receipt was 8.6 degrees Celsius.

3.0 PREPARATION AND ANALYSIS

Semivolatile Petroleum Products by NWTPH-Dx (without Acid/Silica Gel Clean-up)

No additional anomalies or discrepancies were associated with sample preparation, analysis and quality control other than those already qualified in the data and described in the Notes and Definitions page at the end of this report.

Extractable Petroleum Hydrocarbons by modified WDOE TPH Policy Method

All criteria for acceptable QC measurements were met, with the following exceptions:

- The surrogate recovery of 2-FBP for laboratory sample B2I0662-04 below laboratory established control limits. The sample was re-extracted 6 days beyond method recommended holding time. Both results are reported.

No additional anomalies or discrepancies were associated with sample preparation, analysis and quality control other than those already qualified in the data and described in the Notes and Definitions page at the end of this report.

Polynuclear Aromatic Compounds with Selected Ion Monitoring

No anomalies were associated with sample preparation and analysis. All criteria for acceptable QC measurements were met

BTEX by EPA Method 8021B/8260B

One trip blank was received but not recorded on the original chain of custody. No analyses were performed on this trip blank due to inadvertent laboratory oversight.

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No anomalies were associated with sample preparation and analysis. All criteria for acceptable QC measurements were met

"I certify that this data package is in compliance with the Contract both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Director or his designee, as verified by the following signature."

Kortland Orr
Project Manager
North Creek Analytical

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16 October 2002

Natalie Morrow
MFG-Missoula
P.O. Box 7158
Missoula, MT/USA 59807

RE: Darling-Tacoma UST

Enclosed are the results of analyses for samples received by the laboratory on 09/27/02 17:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kortland Orr
PM

www.ncalabs.com

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MFG-1	B2I0662-01	Water	09/26/02 14:16	09/27/02 17:30
MFG-2	B2I0662-02	Water	09/26/02 12:40	09/27/02 17:30
MFG-3	B2I0662-03	Water	09/26/02 16:53	09/27/02 17:30
MFG-4	B2I0662-04	Water	09/26/02 15:42	09/27/02 17:30

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Semivolatile Petroleum Products by NWTPH-Dx (w/o Acid/Silica Gel Clean-up)

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2I0662-01) Water Sampled: 09/26/02 14:16 Received: 09/27/02 17:30									
Diesel Range Hydrocarbons	**3.13**	0.250	mg/l	1	2J01009	10/01/02	10/04/02	NWTPH-Dx	D-06
Heavy Oil Range Hydrocarbons	**0.612**	0.500	"	"	"	"	"	"	D-06
Mineral Oil Range Hydrocarbons	**1.97**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*98.5 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*101 %*	*56-123*			"	"	"	"	
MFG-2 (B2I0662-02) Water Sampled: 09/26/02 12:40 Received: 09/27/02 17:30									
Diesel Range Hydrocarbons	**1.71**	0.250	mg/l	1	2J01009	10/01/02	10/04/02	NWTPH-Dx	D-06
Heavy Oil Range Hydrocarbons	**0.634**	0.500	"	"	"	"	"	"	D-06
Mineral Oil Range Hydrocarbons	**1.12**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*87.6 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*95.9 %*	*56-123*			"	"	"	"	
MFG-3 (B2I0662-03) Water Sampled: 09/26/02 16:53 Received: 09/27/02 17:30									
Diesel Range Hydrocarbons	**1.27**	0.250	mg/l	1	2J01009	10/01/02	10/04/02	NWTPH-Dx	D-06
Heavy Oil Range Hydrocarbons	**0.636**	0.500	"	"	"	"	"	"	D-06
Mineral Oil Range Hydrocarbons	**0.904**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*83.8 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*97.4 %*	*56-123*			"	"	"	"	
MFG-4 (B2I0662-04) Water Sampled: 09/26/02 15:42 Received: 09/27/02 17:30									
Diesel Range Hydrocarbons	**4.48**	0.250	mg/l	1	2J01009	10/01/02	10/04/02	NWTPH-Dx	D-06
Heavy Oil Range Hydrocarbons	**1.42**	0.500	"	"	"	"	"	"	D-06
Mineral Oil Range Hydrocarbons	**2.97**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*89.4 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*97.5 %*	*56-123*			"	"	"	"	

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2I0662-01) Water Sampled: 09/26/02 14:16 Received: 09/27/02 17:30									
C8-C10 Aliphatics	ND	50.0	ug/l	1	2J03005	10/03/02	10/07/02	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	10/07/02	"	
C12-C16 Aromatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	ND	50.0	"	"	"	"	10/07/02	"	
Surrogate: 2-FBP	*55.2 %*	*50-150*			"	"	*10/07/02*	"	
Surrogate: Octacosane	*76.9 %*	*50-150*			"	"	*10/07/02*	"	
Surrogate: Undecane	*52.8 %*	*30-150*			"	"	"	"	
MFG-2 (B2I0662-02) Water Sampled: 09/26/02 12:40 Received: 09/27/02 17:30									
C8-C10 Aliphatics	ND	50.0	ug/l	1	2J03005	10/03/02	10/07/02	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	10/07/02	"	
C12-C16 Aromatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	ND	50.0	"	"	"	"	10/07/02	"	
Surrogate: 2-FBP	*60.7 %*	*50-150*			"	"	*10/07/02*	"	
Surrogate: Octacosane	*71.9 %*	*50-150*			"	"	*10/07/02*	"	
Surrogate: Undecane	*33.6 %*	*30-150*			"	"	"	"	

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-3 (B2I0662-03) Water Sampled: 09/26/02 16:53 Received: 09/27/02 17:30									
C8-C10 Aliphatics	ND	50.0	ug/l	1	2J03005	10/03/02	10/07/02	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	10/07/02	"	
C12-C16 Aromatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	ND	50.0	"	"	"	"	10/07/02	"	
Surrogate: 2-FBP	*70.6 %*	*50-150*			"	"	*10/07/02*	"	
Surrogate: Octacosane	*71.4 %*	*50-150*			"	"	*10/07/02*	"	
Surrogate: Undecane	*55.3 %*	*30-150*			"	"	"	"	
MFG-4 (B2I0662-04) Water Sampled: 09/26/02 15:42 Received: 09/27/02 17:30									
C8-C10 Aliphatics	ND	50.0	ug/l	1	2J03005	10/03/02	10/08/02	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	10/08/02	"	
C12-C16 Aromatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	ND	50.0	"	"	"	"	10/08/02	"	
Surrogate: 2-FBP	*45.6 %*	*50-150*			"	"	*10/08/02*	"	*X*
Surrogate: Octacosane	*51.5 %*	*50-150*			"	"	*10/08/02*	"	
Surrogate: Undecane	*37.4 %*	*30-150*			"	"	"	"	

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-4 (B2I0662-04RE1) Water Sampled: 09/26/02 15:42 Received: 09/27/02 17:30									Q-29
C8-C10 Aliphatics	ND	50.0	ug/l	1	2J09006	10/09/02	10/15/02	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	**95.9**	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	10/15/02	"	
C12-C16 Aromatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	**95.9**	50.0	"	"	"	"	10/15/02	"	
Surrogate: 2-FBP	*70.0 %*	*50-150*			"	"	*10/15/02*	"	
Surrogate: Octacosane	*73.8 %*	*50-150*			"	"	*10/15/02*	"	
Surrogate: Undecane	*61.1 %*	*30-150*			"	"	"	"	

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2I0662-01) Water Sampled: 09/26/02 14:16 Received: 09/27/02 17:30									
Benzo (a) anthracene	ND	0.100	ug/l	1	2J03005	10/03/02	10/05/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	**1.08**	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
Naphthalene	ND	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*65.6 %*	*30-150*			"	"	"	"	
MFG-2 (B2I0662-02) Water Sampled: 09/26/02 12:40 Received: 09/27/02 17:30									
Benzo (a) anthracene	**0.100**	0.100	ug/l	1	2J03005	10/03/02	10/08/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	**0.120**	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
Naphthalene	ND	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*62.8 %*	*30-150*			"	"	"	"	

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-3 (B2I0662-03) Water	**Sampled: 09/26/02 16:53**	**Received: 09/27/02 17:30**							
Benzo (a) anthracene	**0.182**	0.100	ug/l	1	2J03005	10/03/02	10/05/02	8270-SIM	
Benzo (a) pyrene	**0.182**	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	**0.121**	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	**0.162**	0.100	"	"	"	"	"	"	
Chrysene	**0.162**	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	**0.101**	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
Naphthalene	**0.303**	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*58.8 %*	*30-150*			"	"	"	"	
MFG-4 (B2I0662-04) Water	**Sampled: 09/26/02 15:42**	**Received: 09/27/02 17:30**							
Benzo (a) anthracene	**0.139**	0.100	ug/l	1	2J03005	10/03/02	10/05/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	**0.119**	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	**0.970**	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	**0.158**	0.100	"	"	"	"	"	"	
Naphthalene	ND	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*41.5 %*	*30-150*			"	"	"	"	

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

BTEX by EPA Method 8021B

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2I0662-01) Water	**Sampled: 09/26/02 14:16**	**Received: 09/27/02 17:30**							
Benzene	ND	0.500	ug/l	1	2J05011	10/05/02	10/06/02	EPA 8021B	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*102 %*	*62-120*			"	"	"	"	
MFG-2 (B2I0662-02) Water	**Sampled: 09/26/02 12:40**	**Received: 09/27/02 17:30**							
Benzene	ND	0.500	ug/l	1	2J05011	10/05/02	10/06/02	EPA 8021B	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*101 %*	*62-120*			"	"	"	"	
MFG-3 (B2I0662-03) Water	**Sampled: 09/26/02 16:53**	**Received: 09/27/02 17:30**							
Benzene	ND	0.500	ug/l	1	2J05011	10/05/02	10/06/02	EPA 8021B	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*101 %*	*62-120*			"	"	"	"	
MFG-4 (B2I0662-04) Water	**Sampled: 09/26/02 15:42**	**Received: 09/27/02 17:30**							
Benzene	0.598	0.500	ug/l	1	2J05011	10/05/02	10/06/02	EPA 8021B	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*107 %*	*62-120*			"	"	"	"	

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Semivolatile Petroleum Products by NWTPH-Dx (w/o Acid/Silica Gel Clean-up) - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2J01009: Prepared 10/01/02 Using EPA 3520C										
Blank (2J01009-BLK1)										
Diesel Range Hydrocarbons	ND	0.250	mg/l							
Heavy Oil Range Hydrocarbons	ND	0.500	"							
Mineral Oil Range Hydrocarbons	ND	0.500	"							
Surrogate: 2-FBP	*0.253*		"	*0.320*		*79.1*	*50-121*			
Surrogate: Octacosane	*0.266*		"	*0.320*		*83.1*	*56-123*			
LCS (2J01009-BS1)										
Diesel Range Hydrocarbons	1.79	0.250	mg/l	2.00		89.5	62-122			
Surrogate: 2-FBP	*0.285*		"	*0.320*		*89.1*	*50-121*			
LCS Dup (2J01009-BSD1)										
Diesel Range Hydrocarbons	1.76	0.250	mg/l	2.00		88.0	62-122	1.69	40	
Surrogate: 2-FBP	*0.279*		"	*0.320*		*87.2*	*50-121*			
Matrix Spike (2J01009-MS1)					**Source: B2I0662-02**					
Diesel Range Hydrocarbons	1.72	0.250	mg/l	1.96	1.71	0.510	42-126			Q-01
Surrogate: 2-FBP	*0.209*		"	*0.314*		*66.6*	*50-121*			
Matrix Spike Dup (2J01009-MSD1)					**Source: B2I0662-02**					
Diesel Range Hydrocarbons	2.56	0.250	mg/l	1.98	1.71	42.9	42-126	39.3	40	
Surrogate: 2-FBP	*0.283*		"	*0.317*		*89.3*	*50-121*			

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2J03005: Prepared 10/03/02 Using EPA 3520C										
Blank (2J03005-BLK1)										
C8-C10 Aliphatics	ND	50.0	ug/l							
C10-C12 Aliphatics	ND	50.0	"							
C12-C16 Aliphatics	ND	50.0	"							
C16-C21 Aliphatics	ND	50.0	"							
C21-C34 Aliphatics	ND	50.0	"							
C10-C12 Aromatics	ND	50.0	"							
C12-C16 Aromatics	ND	50.0	"							
C16-C21 Aromatics	ND	50.0	"							
C21-C34 Aromatics	ND	50.0	"							
Extractable Petroleum Hydrocarbons	ND	50.0	"							
Surrogate: 2-FBP	*205*		"	*394*		*52.0*	*50-150*			
Surrogate: Octacosane	*234*		"	*398*		*58.8*	*50-150*			
Surrogate: Undecane	*210*		"	*408*		*51.5*	*30-150*			
LCS (2J03005-BS1)										
Extractable Petroleum Hydrocarbons	3370	50.0	ug/l	5000		67.4	30-120			
Surrogate: 2-FBP	*291*		"	*394*		*73.9*	*50-150*			
Surrogate: Octacosane	*321*		"	*398*		*80.7*	*50-150*			
Surrogate: Undecane	*225*		"	*408*		*55.1*	*30-150*			
LCS Dup (2J03005-BSD1)										
Extractable Petroleum Hydrocarbons	2940	50.0	ug/l	5000		58.8	30-120	13.6	40	
Surrogate: 2-FBP	*261*		"	*394*		*66.2*	*50-150*			
Surrogate: Octacosane	*271*		"	*398*		*68.1*	*50-150*			
Surrogate: Undecane	*263*		"	*408*		*64.5*	*30-150*			
Matrix Spike (2J03005-MS1)					**Source: B2I0662-02**					
Extractable Petroleum Hydrocarbons	3130	50.0	ug/l	5000	ND	62.6	30-120			
Surrogate: 2-FBP	*293*		"	*394*		*74.4*	*50-150*			
Surrogate: Octacosane	*303*		"	*398*		*76.1*	*50-150*			
Surrogate: Undecane	*276*		"	*408*		*67.6*	*30-150*			

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2J03005: Prepared 10/03/02 Using EPA 3520C										
Matrix Spike Dup (2J03005-MSD1)					**Source: B2I0662-02**					
Extractable Petroleum Hydrocarbons	2640	50.0	ug/l	5000	ND	52.8	30-120	17.0	40	
Surrogate: 2-FBP	*220*		"	*394*		*55.8*	*50-150*			
Surrogate: Octacosane	*271*		"	*398*		*68.1*	*50-150*			
Surrogate: Undecane	*183*		"	*408*		*44.9*	*30-150*			
Batch 2J09006: Prepared 10/09/02 Using EPA 3520C										
Blank (2J09006-BLK1)										
C8-C10 Aliphatics	ND	50.0	ug/l							
C10-C12 Aliphatics	ND	50.0	"							
C12-C16 Aliphatics	ND	50.0	"							
C16-C21 Aliphatics	ND	50.0	"							
C21-C34 Aliphatics	ND	50.0	"							
C10-C12 Aromatics	ND	50.0	"							
C12-C16 Aromatics	ND	50.0	"							
C16-C21 Aromatics	ND	50.0	"							
C21-C34 Aromatics	ND	50.0	"							
Extractable Petroleum Hydrocarbons	ND	50.0	"							
Surrogate: 2-FBP	*287*		"	*394*		*72.8*	*50-150*			
Surrogate: Octacosane	*301*		"	*398*		*75.6*	*50-150*			
Surrogate: Undecane	*264*		"	*408*		*64.7*	*30-150*			
LCS (2J09006-BS1)										
Extractable Petroleum Hydrocarbons	4030	50.0	ug/l	5000		80.6	30-120			
Surrogate: 2-FBP	*358*		"	*394*		*90.9*	*50-150*			
Surrogate: Octacosane	*370*		"	*398*		*93.0*	*50-150*			
Surrogate: Undecane	*358*		"	*408*		*87.7*	*30-150*			

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2J09006: Prepared 10/09/02 Using EPA 3520C										
LCS Dup (2J09006-BSD1)										
Extractable Petroleum Hydrocarbons	3820	50.0	ug/l	5000		76.4	30-120	5.35	40	
Surrogate: 2-FBP	*316*		"	*394*		*80.2*	*50-150*			
Surrogate: Octacosane	*339*		"	*398*		*85.2*	*50-150*			
Surrogate: Undecane	*342*		"	*408*		*83.8*	*30-150*			

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2J03005: Prepared 10/03/02 Using EPA 3520C										
Blank (2J03005-BLK1)										
Benzo (a) anthracene	ND	0.100	ug/l							
Benzo (a) pyrene	ND	0.100	"							
Benzo (b) fluoranthene	ND	0.100	"							
Benzo (k) fluoranthene	ND	0.100	"							
Chrysene	ND	0.100	"							
Dibenz (a,h) anthracene	ND	0.100	"							
Indeno (1,2,3-cd) pyrene	ND	0.100	"							
1-Methylnaphthalene	ND	0.100	"							
2-Methylnaphthalene	ND	0.100	"							
Naphthalene	ND	0.100	"							
Surrogate: p-Terphenyl-d14	*4.14*		"	*8.00*		*51.8*	*30-150*			
LCS (2J03005-BS1)										
Benzo (a) anthracene	6.78	0.100	ug/l	10.0		67.8	50-150			
Benzo (a) pyrene	6.54	0.100	"	10.0		65.4	50-150			
Benzo (b) fluoranthene	5.98	0.100	"	10.0		59.8	50-150			
Benzo (k) fluoranthene	6.70	0.100	"	10.0		67.0	50-150			
Chrysene	6.74	0.100	"	10.0		67.4	50-150			
Dibenz (a,h) anthracene	6.72	0.100	"	10.0		67.2	50-150			
Indeno (1,2,3-cd) pyrene	6.84	0.100	"	10.0		68.4	50-150			
Naphthalene	7.12	0.100	"	10.0		71.2	50-150			
Surrogate: p-Terphenyl-d14	*6.56*		"	*8.00*		*82.0*	*30-150*			
LCS Dup (2J03005-BSD1)										
Benzo (a) anthracene	6.40	0.100	ug/l	10.0		64.0	50-150	5.77	25	
Benzo (a) pyrene	5.64	0.100	"	10.0		56.4	50-150	14.8	25	
Benzo (b) fluoranthene	5.92	0.100	"	10.0		59.2	50-150	1.01	25	
Benzo (k) fluoranthene	6.48	0.100	"	10.0		64.8	50-150	3.34	25	
Chrysene	6.24	0.100	"	10.0		62.4	50-150	7.70	25	
Dibenz (a,h) anthracene	6.24	0.100	"	10.0		62.4	50-150	7.41	25	
Indeno (1,2,3-cd) pyrene	6.08	0.100	"	10.0		60.8	50-150	11.8	25	
Naphthalene	7.20	0.100	"	10.0		72.0	50-150	1.12	25	
Surrogate: p-Terphenyl-d14	*5.82*		"	*8.00*		*72.8*	*30-150*			

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2J03005: Prepared 10/03/02 Using EPA 3520C										
Matrix Spike (2J03005-MS1)					Source: B2I0662-02					
Benzo (a) anthracene	5.42	0.100	ug/l	10.0	0.100	53.2	50-150			
Benzo (a) pyrene	4.48	0.100	"	10.0	ND	44.0	50-150			
Benzo (b) fluoranthene	4.50	0.100	"	10.0	ND	44.2	50-150			
Benzo (k) fluoranthene	4.72	0.100	"	10.0	ND	46.4	50-150			
Chrysene	5.44	0.100	"	10.0	ND	53.6	50-150			
Dibenz (a,h) anthracene	3.62	0.100	"	10.0	ND	35.4	50-150			
Indeno (1,2,3-cd) pyrene	4.14	0.100	"	10.0	ND	40.6	50-150			
Naphthalene	6.28	0.100	"	10.0	ND	62.2	50-150			
Surrogate: p-Terphenyl-d14	*6.12*		"	*8.00*		*76.5*	*30-150*			
Matrix Spike Dup (2J03005-MSD1)					Source: B2I0662-02					
Benzo (a) anthracene	4.14	0.100	ug/l	10.0	0.100	40.4	50-150	26.8	25	
Benzo (a) pyrene	3.48	0.100	"	10.0	ND	34.0	50-150	25.1	25	
Benzo (b) fluoranthene	3.62	0.100	"	10.0	ND	35.4	50-150	21.7	25	
Benzo (k) fluoranthene	3.66	0.100	"	10.0	ND	35.8	50-150	25.3	25	
Chrysene	4.06	0.100	"	10.0	ND	39.8	50-150	29.1	25	
Dibenz (a,h) anthracene	2.56	0.100	"	10.0	ND	24.8	50-150	34.3	25	
Indeno (1,2,3-cd) pyrene	3.04	0.100	"	10.0	ND	29.6	50-150	30.6	25	
Naphthalene	4.80	0.100	"	10.0	ND	47.4	50-150	26.7	25	
Surrogate: p-Terphenyl-d14	*4.62*		"	*8.00*		*57.8*	*30-150*			

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

BTEX by EPA Method 8021B - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2J05011: Prepared 10/05/02 Using EPA 5030B (P/T)										
Blank (2J05011-BLK1)										
Benzene	ND	0.500	ug/l							
Toluene	ND	0.500	"							
Ethylbenzene	ND	0.500	"							
Xylenes (total)	ND	1.00	"							
Surrogate: 4-BFB (PID)	*48.7*		"	*48.0*		*101*	*62-120*			
LCS (2J05011-BS1)										
Benzene	6.34	0.500	ug/l	6.19		102	80-120			
Toluene	31.7	0.500	"	37.3		85.0	80-120			
Ethylbenzene	8.56	0.500	"	8.92		96.0	80-120			
Xylenes (total)	40.1	1.00	"	43.6		92.0	80-120			
Surrogate: 4-BFB (PID)	*46.5*		"	*48.0*		*96.9*	*62-120*			
LCS Dup (2J05011-BSD1)										
Benzene	6.28	0.500	ug/l	6.19		101	80-120	0.951	40	
Toluene	31.2	0.500	"	37.3		83.6	80-120	1.59	40	
Ethylbenzene	8.45	0.500	"	8.92		94.7	80-120	1.29	40	
Xylenes (total)	39.3	1.00	"	43.6		90.1	80-120	2.02	40	
Surrogate: 4-BFB (PID)	*45.8*		"	*48.0*		*95.4*	*62-120*			
Matrix Spike (2J05011-MS1)					**Source: B2I0662-02**					
Benzene	6.35	0.500	ug/l	6.19	ND	99.2	80-120			
Toluene	31.4	0.500	"	37.3	ND	83.1	68-114			
Ethylbenzene	8.59	0.500	"	8.92	ND	94.9	80-120			
Xylenes (total)	39.9	1.00	"	43.6	ND	90.2	80-120			
Surrogate: 4-BFB (PID)	*47.2*		"	*48.0*		*98.3*	*62-120*			
Matrix Spike Dup (2J05011-MSD1)					**Source: B2I0662-02**					
Benzene	6.33	0.500	ug/l	6.19	ND	98.9	80-120	0.315	40	
Toluene	31.4	0.500	"	37.3	ND	83.1	68-114	0.00	40	
Ethylbenzene	8.49	0.500	"	8.92	ND	93.7	80-120	1.17	40	
Xylenes (total)	39.8	1.00	"	43.6	ND	89.9	80-120	0.251	40	
Surrogate: 4-BFB (PID)	*47.2*		"	*48.0*		*98.3*	*62-120*			

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	10/16/02 19:13

Notes and Definitions

D-06	The sample chromatographic pattern does not resemble the fuel standard used for quantitation.
Q-01	The spike recovery for this QC sample is outside of established control limits. Review of associated batch QC indicates the recovery for this analyte does not represent an out-of-control condition for the batch.
Q-29	This sample was prepared outside of the method established holding time.
X	See case narrative.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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CHAIN OF CUSTODY REPORT

Work Order #: B2I0602

CLIENT: MFG

REPORT TO: Natalie Morrow

ADDRESS: P.O. Box 7158
Missoula, MT 59807

PHONE: 406-728-4600 FAX: 406-728-4698

INVOICE TO: Same

P.O. NUMBER: 060255-101-2

PROJECT NAME: Darling-Tacoma

PROJECT NUMBER: 060255-101-2

SAMPLED BY: Sean Williams

TURNAROUND REQUEST in Business Days*

Organic & Inorganic Analyses: [X] STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1

Petroleum Hydrocarbon Analyses: [X] STD. | 4 | 3 | 2 | 1 | <1

OTHER _____ Please Specify

*Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NWTPH-Dx	PAH's	Naphthalenes	EDB	BTEX	MTBE/MS(I)	MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1.	*See note MFG-1	9/26/02 1116	X	X	X	X	X		W	7	Analyses must meet	01
2.	MFG-2	9/26/02 1240	X	X	X	X	X	X	W	7	MTCA and need	02
3.	MFG-3	9/26/02 1653	X	X	X	X	X		W	7	to be consistent	03
4.	MFG-4	9/26/02 1542	X	X	X	X	X		W	7	with Feb 2002	04
5.	TripBlank	9/26/02 1200								4	sampling event	05
6.												
7.											Contact Natalie	
8.											Morrow w/ questions	
9.											at 406-728-4600	
10.												
11.											*Sample MFG-1-A (a 40ml VOA) might	
12.											have been contaminated,	
13.											Please use the other	
14.											VOA first if and	
15.											only if possible.	

Revised Chain of Custody

RELINQUISHED BY: Sean Williams
PRINT NAME: Sean Williams FIRM: MFG DATE: 9-27-02 TIME: 1612

RECEIVED BY: Aaron Dockter
PRINT NAME: Aaron Dockter FIRM: NCA DATE: 9/27/02 TIME: 16:12

RELINQUISHED BY: Aaron Dockter
PRINT NAME: Aaron Dockter FIRM: NCA DATE: 9/27/02 TIME: 17:30

RECEIVED BY: [illegible]
PRINT NAME: [illegible] FIRM: NCA DATE: 9/27/02 TIME: 1730

ADDITIONAL REMARKS:

TEMP: [illegible]

COC REV 3.00

APPENDIX D

DECEMBER 2002 LABORATORY ANALYTICAL RESULTS

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907.334.9338 fax 907.334.9339

CASE NARRATIVE for B2L0545

Client: MFG
Project Manager: Natalie Morrow
Project Name: Darling-Tacoma UST
Project Number: 060255-101-2

1.0 DESCRIPTION OF CASE

Four water samples and one trip blank were submitted for analysis of Semivolatile Petroleum Products by NWTPH-Dx without acid/silica gel clean up, Extractable Petroleum Hydrocarbons by modified WDOE TPH Policy Method, Polynuclear Aromatic Compounds by GC/MS with Selected Ion Monitoring, and BTEX by EPA Method 8021B.

2.0 COMMENTS ON SAMPLE RECEIPT

Samples were received December 20, 2002 and logged in December 21, 2002. The temperature of the samples at time of receipt was 8.6 degrees Celsius.

3.0 PREPARATION AND ANALYSIS

Semivolatile Petroleum Products by NWTPH-Dx (without Acid/Silica Gel Clean-up)

No additional anomalies or discrepancies were associated with sample preparation, analysis and quality control other than those already qualified in the data and described in the Notes and Definitions page at the end of this report.

Extractable Petroleum Hydrocarbons by modified WDOE TPH Policy Method

No anomalies were associated with sample preparation and analysis. All criteria for acceptable QC measurements were met.

Polynuclear Aromatic Compounds with Selected Ion Monitoring

No additional anomalies or discrepancies were associated with sample preparation, analysis and quality control other than those already qualified in the data and described in the Notes and Definitions page at the end of this report.

BTEX by EPA Method 8021B/8260B

No anomalies were associated with sample preparation and analysis. All criteria for acceptable QC measurements were met.

"I certify that this data package is in compliance with the Contract both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Director or his designee, as verified by the following signature."

Kortland Orr
Project Manager
North Creek Analytical

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07 January 2003

Natalie Morrow
MFG-Missoula
P.O. Box 7158
Missoula, MT/USA 59807

RE: Darling-Tacoma UST

Enclosed are the results of analyses for samples received by the laboratory on 12/20/02 16:20. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kortland Orr
PM

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907.334.9338 fax 907.334.9339

MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MFG-1	B2L0545-01	Water	12/19/02 12:09	12/20/02 16:20
MFG-2	B2L0545-02	Water	12/19/02 10:56	12/20/02 16:20
MFG-3	B2L0545-03	Water	12/19/02 15:22	12/20/02 16:20
MFG-4	B2L0545-04	Water	12/19/02 13:40	12/20/02 16:20
Trip Blank	B2L0545-05	Water	12/19/02 12:00	12/20/02 16:20

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Semivolatile Petroleum Products by NWTPH-Dx (w/o Acid/Silica Gel Clean-up)

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2L0545-01) Water Sampled: 12/19/02 12:09 Received: 12/20/02 16:20									
Diesel Range Hydrocarbons	**1.35**	0.250	mg/l	1	2L24024	12/24/02	12/29/02	NWTPH-Dx	D-06
Heavy Oil Range Hydrocarbons	**0.514**	0.500	"	"	"	"	"	"	
Mineral Oil Range Hydrocarbons	**0.949**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*94.9 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*98.1 %*	*56-123*			"	"	"	"	
MFG-2 (B2L0545-02) Water Sampled: 12/19/02 10:56 Received: 12/20/02 16:20									
Diesel Range Hydrocarbons	**1.63**	0.250	mg/l	1	2L24024	12/24/02	12/29/02	NWTPH-Dx	D-06
Heavy Oil Range Hydrocarbons	**0.620**	0.500	"	"	"	"	"	"	
Mineral Oil Range Hydrocarbons	**1.16**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*96.8 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*99.7 %*	*56-123*			"	"	"	"	
MFG-3 (B2L0545-03) Water Sampled: 12/19/02 15:22 Received: 12/20/02 16:20									
Diesel Range Hydrocarbons	**1.67**	0.250	mg/l	1	2L24024	12/24/02	12/29/02	NWTPH-Dx	D-06
Heavy Oil Range Hydrocarbons	**0.936**	0.500	"	"	"	"	"	"	
Mineral Oil Range Hydrocarbons	**1.28**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*104 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*108 %*	*56-123*			"	"	"	"	
MFG-4 (B2L0545-04) Water Sampled: 12/19/02 13:40 Received: 12/20/02 16:20									
Diesel Range Hydrocarbons	**3.46**	0.250	mg/l	1	2L24024	12/24/02	12/29/02	NWTPH-Dx	D-06
Heavy Oil Range Hydrocarbons	**1.19**	0.500	"	"	"	"	"	"	
Mineral Oil Range Hydrocarbons	**2.45**	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*108 %*	*50-121*			"	"	"	"	
Surrogate: Octacosane	*99.4 %*	*56-123*			"	"	"	"	

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2L0545-01) Water Sampled: 12/19/02 12:09 Received: 12/20/02 16:20									
C8-C10 Aliphatics	ND	50.0	ug/l	1	2L24015	12/24/02	01/02/03	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	01/03/03	"	
C12-C16 Aromatics	**82.1**	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	**82.1**	50.0	"	"	"	"	01/02/03	"	
Surrogate: 2-FBP	*567 %*	*50-150*			"	"	*01/03/03*	"	
Surrogate: Octacosane	*85.4 %*	*50-150*			"	"	*01/02/03*	"	
Surrogate: Undecane	*66.9 %*	*30-150*			"	"	"	"	
MFG-2 (B2L0545-02) Water Sampled: 12/19/02 10:56 Received: 12/20/02 16:20									
C8-C10 Aliphatics	ND	50.0	ug/l	1	2L24015	12/24/02	01/02/03	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	01/03/03	"	
C12-C16 Aromatics	**79.9**	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	**79.9**	50.0	"	"	"	"	01/02/03	"	
Surrogate: 2-FBP	*479 %*	*50-150*			"	"	*01/03/03*	"	
Surrogate: Octacosane	*73.4 %*	*50-150*			"	"	*01/02/03*	"	
Surrogate: Undecane	*54.9 %*	*30-150*			"	"	"	"	

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-3 (B2L0545-03) Water Sampled: 12/19/02 15:22 Received: 12/20/02 16:20									
C8-C10 Aliphatics	ND	50.0	ug/l	1	2L24015	12/24/02	01/02/03	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	01/03/03	"	
C12-C16 Aromatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	ND	50.0	"	"	"	"	01/02/03	"	
Surrogate: 2-FBP	*641 %*	*50-150*			"	"	*01/03/03*	"	
Surrogate: Octacosane	*72.3 %*	*50-150*			"	"	*01/02/03*	"	
Surrogate: Undecane	*58.1 %*	*30-150*			"	"	"	"	
MFG-4 (B2L0545-04) Water Sampled: 12/19/02 13:40 Received: 12/20/02 16:20									
C8-C10 Aliphatics	ND	50.0	ug/l	1	2L24015	12/24/02	01/02/03	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	**91.4**	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	**50.6**	50.0	"	"	"	"	01/03/03	"	
C12-C16 Aromatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	**142**	50.0	"	"	"	"	01/02/03	"	
Surrogate: 2-FBP	*556 %*	*50-150*			"	"	*01/03/03*	"	
Surrogate: Octacosane	*72.7 %*	*50-150*			"	"	*01/02/03*	"	
Surrogate: Undecane	*50.7 %*	*30-150*			"	"	"	"	

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2L0545-01) Water Sampled: 12/19/02 12:09 Received: 12/20/02 16:20									
Benzo (a) anthracene	ND	0.100	ug/l	1	2L24015	12/24/02	12/31/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	0.738	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
Naphthalene	ND	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*79.0 %*	*30-150*			"	"	"	"	
MFG-2 (B2L0545-02) Water Sampled: 12/19/02 10:56 Received: 12/20/02 16:20									
Benzo (a) anthracene	ND	0.100	ug/l	1	2L24015	12/24/02	12/31/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
Naphthalene	ND	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*86.5 %*	*30-150*			"	"	"	"	

Kortland Orr, PM

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-3 (B2L0545-03) Water Sampled: 12/19/02 15:22 Received: 12/20/02 16:20									
Benzo (a) anthracene	ND	0.100	ug/l	1	2L24015	12/24/02	12/31/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
Naphthalene	ND	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*70.8 %*	*30-150*			"	"	"	"	
MFG-4 (B2L0545-04) Water Sampled: 12/19/02 13:40 Received: 12/20/02 16:20									
Benzo (a) anthracene	ND	0.100	ug/l	1	2L24015	12/24/02	12/31/02	8270-SIM	
Benzo (a) pyrene	ND	0.100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.100	"	"	"	"	"	"	
Chrysene	ND	0.100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.100	"	"	"	"	"	"	
1-Methylnaphthalene	**1.47**	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	**0.121**	0.100	"	"	"	"	"	"	
Naphthalene	**0.222**	0.100	"	"	"	"	"	"	
Surrogate: p-Terphenyl-d14	*53.5 %*	*30-150*			"	"	"	"	

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

BTEX by EPA Method 8021B

North Creek Analytical - Spokane

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MFG-1 (B2L0545-01) Water Sampled: 12/19/02 12:09 Received: 12/20/02 16:20									
Benzene	ND	0.500	ug/l	1	3010004	01/02/03	01/02/03	EPA 8021B	
Toluene	ND	2.00	"	"	"	"	"	"	
Ethylbenzene	ND	1.00	"	"	"	"	"	"	
Xylenes (total)	ND	1.50	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*120 %*	*56-142*			"	"	"	"	
MFG-2 (B2L0545-02) Water Sampled: 12/19/02 10:56 Received: 12/20/02 16:20									
Benzene	ND	0.500	ug/l	1	3010004	01/02/03	01/02/03	EPA 8021B	
Toluene	ND	2.00	"	"	"	"	"	"	
Ethylbenzene	ND	1.00	"	"	"	"	"	"	
Xylenes (total)	ND	1.50	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*102 %*	*56-142*			"	"	"	"	
MFG-3 (B2L0545-03) Water Sampled: 12/19/02 15:22 Received: 12/20/02 16:20									
Benzene	ND	0.500	ug/l	1	3010004	01/02/03	01/02/03	EPA 8021B	
Toluene	ND	2.00	"	"	"	"	"	"	
Ethylbenzene	ND	1.00	"	"	"	"	"	"	
Xylenes (total)	ND	1.50	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*102 %*	*56-142*			"	"	"	"	
MFG-4 (B2L0545-04) Water Sampled: 12/19/02 13:40 Received: 12/20/02 16:20									
Benzene	**0.630**	0.500	ug/l	1	3010004	01/02/03	01/02/03	EPA 8021B	
Toluene	ND	2.00	"	"	"	"	"	"	
Ethylbenzene	ND	1.00	"	"	"	"	"	"	
Xylenes (total)	ND	1.50	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*117 %*	*56-142*			"	"	"	"	

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

BTEX by EPA Method 8021B

North Creek Analytical - Spokane

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (B2L0545-05) Water Sampled: 12/19/02 12:00 Received: 12/20/02 16:20									
Benzene	ND	0.500	ug/l	1	3010004	01/02/03	01/02/03	EPA 8021B	
Toluene	ND	2.00	"	"	"	"	"	"	
Ethylbenzene	ND	1.00	"	"	"	"	"	"	
Xylenes (total)	ND	1.50	"	"	"	"	"	"	
Surrogate: 4-BFB (PID)	*110 %*	*56-142*			"	"	"	"	

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Semivolatile Petroleum Products by NWTPH-Dx (w/o Acid/Silica Gel Clean-up) - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2L24024: Prepared 12/24/02 Using EPA 3520C										
Blank (2L24024-BLK1)										
Diesel Range Hydrocarbons	ND	0.250	mg/l							
Heavy Oil Range Hydrocarbons	ND	0.500	"							
Mineral Oil Range Hydrocarbons	ND	0.500	"							
Surrogate: 2-FBP	*0.312*		"	*0.320*		*97.5*	*50-121*			
Surrogate: Octacosane	*0.317*		"	*0.320*		*99.1*	*56-123*			
LCS (2L24024-BS1)										
Diesel Range Hydrocarbons	1.80	0.250	mg/l	2.00		90.0	62-122			
Surrogate: 2-FBP	*0.320*		"	*0.320*		*100*	*50-121*			
LCS Dup (2L24024-BSD1)										
Diesel Range Hydrocarbons	1.94	0.250	mg/l	2.00		97.0	62-122	7.49	40	
Surrogate: 2-FBP	*0.362*		"	*0.320*		*113*	*50-121*			
Matrix Spike (2L24024-MS1)					**Source: B2L0545-04**					
Diesel Range Hydrocarbons	5.20	0.250	mg/l	1.98	3.46	87.9	42-126			
Surrogate: 2-FBP	*0.379*		"	*0.317*		*120*	*50-121*			
Matrix Spike Dup (2L24024-MSD1)					**Source: B2L0545-04**					
Diesel Range Hydrocarbons	4.82	0.250	mg/l	2.00	3.46	68.0	42-126	7.58	40	
Surrogate: 2-FBP	*0.285*		"	*0.320*		*89.1*	*50-121*			

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2L24015: Prepared 12/24/02 Using EPA 3520C										
Blank (2L24015-BLK1)										
C8-C10 Aliphatics	ND	50.0	ug/l							
C10-C12 Aliphatics	ND	50.0	"							
C12-C16 Aliphatics	ND	50.0	"							
C16-C21 Aliphatics	ND	50.0	"							
C21-C34 Aliphatics	ND	50.0	"							
C10-C12 Aromatics	ND	50.0	"							
C12-C16 Aromatics	ND	50.0	"							
C16-C21 Aromatics	ND	50.0	"							
C21-C34 Aromatics	ND	50.0	"							
Extractable Petroleum Hydrocarbons	ND	50.0	"							
Surrogate: 2-FBP	*329*		"	*50.0*		*658*	*50-150*			
Surrogate: Octacosane	*351*		"	*0.00*			*50-150*			
Surrogate: Undecane	*321*		"	*0.00*			*30-150*			
LCS (2L24015-BS1)										
Extractable Petroleum Hydrocarbons	2570	50.0	ug/l	5000		51.4	30-120			
Surrogate: 2-FBP	*297*		"	*50.0*		*594*	*50-150*			
Surrogate: Octacosane	*264*		"	*0.00*			*50-150*			
Surrogate: Undecane	*238*		"	*0.00*			*30-150*			
LCS Dup (2L24015-BSD1)										
Extractable Petroleum Hydrocarbons	3100	50.0	ug/l	5000		62.0	30-120	18.7	40	
Surrogate: 2-FBP	*374*		"	*50.0*		*748*	*50-150*			
Surrogate: Octacosane	*301*		"	*0.00*			*50-150*			
Surrogate: Undecane	*289*		"	*0.00*			*30-150*			
Matrix Spike (2L24015-MS1)					**Source: B2L0545-04**					
Extractable Petroleum Hydrocarbons	2900	50.0	ug/l	4900	142	56.3	30-120			
Surrogate: 2-FBP	*281*		"	*49.0*		*573*	*50-150*			
Surrogate: Octacosane	*338*		"	*0.00*			*50-150*			
Surrogate: Undecane	*254*		"	*0.00*			*30-150*			

North Creek Analytical - Bothell

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2L24015: Prepared 12/24/02 Using EPA 3520C										
Matrix Spike Dup (2L24015-MSD1)					**Source: B2L0545-04**					
Extractable Petroleum Hydrocarbons	2900	50.0	ug/l	4900	142	56.3	30-120	0.00	40	
Surrogate: 2-FBP	*341*		"	*49.0*		*696*	*50-150*			
Surrogate: Octacosane	*332*		"	*0.00*			*50-150*			
Surrogate: Undecane	*259*		"	*0.00*			*30-150*			

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2L24015: Prepared 12/24/02 Using EPA 3520C										
Blank (2L24015-BLK1)										
Benzo (a) anthracene	ND	0.100	ug/l							
Benzo (a) pyrene	ND	0.100	"							
Benzo (b) fluoranthene	ND	0.100	"							
Benzo (k) fluoranthene	ND	0.100	"							
Chrysene	ND	0.100	"							
Dibenz (a,h) anthracene	ND	0.100	"							
Indeno (1,2,3-cd) pyrene	ND	0.100	"							
1-Methylnaphthalene	ND	0.100	"							
2-Methylnaphthalene	ND	0.100	"							
Naphthalene	ND	0.100	"							
Surrogate: p-Terphenyl-d14	*65.7*		"	*50.0*		*131*	*30-150*			
LCS (2L24015-BS1)										
Benzo (a) anthracene	6.50	0.100	ug/l	10.0		65.0	50-150			
Benzo (a) pyrene	6.42	0.100	"	10.0		64.2	50-150			
Benzo (b) fluoranthene	7.02	0.100	"	10.0		70.2	50-150			
Benzo (k) fluoranthene	6.22	0.100	"	10.0		62.2	50-150			
Chrysene	6.30	0.100	"	10.0		63.0	50-150			
Dibenz (a,h) anthracene	5.06	0.100	"	10.0		50.6	50-150			
Indeno (1,2,3-cd) pyrene	5.18	0.100	"	10.0		51.8	50-150			
Naphthalene	6.70	0.100	"	10.0		67.0	50-150			
Surrogate: p-Terphenyl-d14	*49.7*		"	*50.0*		*99.4*	*30-150*			
LCS Dup (2L24015-BSD1)										
Benzo (a) anthracene	7.78	0.100	ug/l	10.0		77.8	50-150	17.9	25	
Benzo (a) pyrene	7.76	0.100	"	10.0		77.6	50-150	18.9	25	
Benzo (b) fluoranthene	8.46	0.100	"	10.0		84.6	50-150	18.6	25	
Benzo (k) fluoranthene	7.62	0.100	"	10.0		76.2	50-150	20.2	25	
Chrysene	7.54	0.100	"	10.0		75.4	50-150	17.9	25	
Dibenz (a,h) anthracene	6.42	0.100	"	10.0		64.2	50-150	23.7	25	
Indeno (1,2,3-cd) pyrene	6.52	0.100	"	10.0		65.2	50-150	22.9	25	
Naphthalene	7.50	0.100	"	10.0		75.0	50-150	11.3	25	
Surrogate: p-Terphenyl-d14	*59.0*		"	*50.0*		*118*	*30-150*			

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2L24015: Prepared 12/24/02 Using EPA 3520C										
Matrix Spike (2L24015-MS1)					**Source: B2L0545-04**					
Benzo (a) anthracene	3.80	0.100	ug/l	9.80	0.0606	38.2	50-150			Q-02
Benzo (a) pyrene	2.90	0.100	"	9.80	ND	29.6	50-150			Q-02
Benzo (b) fluoranthene	3.61	0.100	"	9.80	ND	36.8	50-150			Q-02
Benzo (k) fluoranthene	3.00	0.100	"	9.80	ND	30.6	50-150			Q-02
Chrysene	3.75	0.100	"	9.80	0.0404	37.9	50-150			Q-02
Dibenz (a,h) anthracene	1.84	0.100	"	9.80	ND	18.8	50-150			Q-02
Indeno (1,2,3-cd) pyrene	2.08	0.100	"	9.80	ND	21.2	50-150			Q-02
Naphthalene	5.96	0.100	"	9.80	0.222	58.6	50-150			
Surrogate: p-Terphenyl-d14	*38.0*		"	*49.0*		*77.6*	*30-150*			
Matrix Spike Dup (2L24015-MSD1)					**Source: B2L0545-04**					
Benzo (a) anthracene	5.22	0.100	ug/l	9.80	0.0606	52.6	50-150	31.5	25	Q-02
Benzo (a) pyrene	4.27	0.100	"	9.80	ND	43.6	50-150	38.2	25	Q-02
Benzo (b) fluoranthene	5.14	0.100	"	9.80	ND	52.4	50-150	35.0	25	Q-02
Benzo (k) fluoranthene	4.45	0.100	"	9.80	ND	45.4	50-150	38.9	25	Q-02
Chrysene	5.06	0.100	"	9.80	0.0404	51.2	50-150	29.7	25	Q-02
Dibenz (a,h) anthracene	3.12	0.100	"	9.80	ND	31.8	50-150	51.6	25	Q-02
Indeno (1,2,3-cd) pyrene	3.25	0.100	"	9.80	ND	33.2	50-150	43.9	25	Q-02
Naphthalene	7.61	0.100	"	9.80	0.222	75.4	50-150	24.3	25	
Surrogate: p-Terphenyl-d14	*45.9*		"	*49.0*		*93.7*	*30-150*			

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

BTEX by EPA Method 8021B - Quality Control
North Creek Analytical - Spokane

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3010004: Prepared 01/02/03 Using GC Volatiles										
Blank (3010004-BLK1)										
Benzene	ND	0.500	ug/l							
Toluene	ND	2.00	"							
Ethylbenzene	ND	1.00	"							
Xylenes (total)	ND	1.50	"							
Surrogate: 4-BFB (PID)	*26.4*		"	*25.0*		*106*	*56-142*			
LCS (3010004-BS1)										
Benzene	22.6	0.500	ug/l	20.0		113	85-115			
Toluene	21.4	2.00	"	20.0		107	85-115			
Ethylbenzene	21.2	1.00	"	20.0		106	85-115			
Xylenes (total)	64.3	1.50	"	60.0		107	85-115			
Surrogate: 4-BFB (PID)	*25.5*		"	*25.0*		*102*	*56-142*			
Duplicate (3010004-DUP1)					**Source: S212134-04**					
Benzene	ND	0.500	ug/l		0.551				50	
Toluene	ND	2.00	"		0.728				50	
Ethylbenzene	ND	1.00	"		ND			NA	50	
Xylenes (total)	ND	1.50	"		ND			NA	50	
Surrogate: 4-BFB (PID)	*27.2*		"	*25.0*		*109*	*56-142*			
Duplicate (3010004-DUP2)					**Source: B2L0545-02**					
Benzene	ND	0.500	ug/l		ND			NA	50	
Toluene	ND	2.00	"		ND			NA	50	
Ethylbenzene	ND	1.00	"		ND			NA	50	
Xylenes (total)	ND	1.50	"		ND			NA	50	
Surrogate: 4-BFB (PID)	*28.8*		"	*25.0*		*115*	*56-142*			
Matrix Spike (3010004-MS1)					**Source: S212134-04**					
Benzene	23.8	0.500	ug/l	20.0	0.551	116	54-143			
Toluene	21.9	2.00	"	20.0	0.728	106	48-145			
Ethylbenzene	20.1	1.00	"	20.0	ND	100	49-142			
Xylenes (total)	59.6	1.50	"	60.0	ND	99.3	55-140			
Surrogate: 4-BFB (PID)	*26.8*		"	*25.0*		*107*	*56-142*			

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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MFG-Missoula	Project: Darling-Tacoma UST	
P.O. Box 7158	Project Number: 060255-101-2	Reported:
Missoula MT/USA, 59807	Project Manager: Natalie Morrow	01/07/03 15:56

Notes and Definitions

D-06	The sample chromatographic pattern does not resemble the fuel standard used for quantitation.
Q-02	The spike recovery for this QC sample is outside of NCA established control limits due to sample matrix interference.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

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CHAIN OF CUSTODY REPORT

Work Order #: B2L0545

CLIENT: MFG
REPORT TO: Natalie Morrow
ADDRESS: P.O. Box 7158
Missoula, MT 59807
PHONE: 406-728-4600 FAX: 406-728-4698

INVOICE TO: Same
P.O. NUMBER: 060255-101-2

PROJECT NAME: Darling-Tacoma
PROJECT NUMBER: 060255-101-2
SAMPLED BY: Sean Williams

TURNAROUND REQUEST in Business Days*
Organic & Inorganic Analyses: [X] 10 STD. [ ] 7 [ ] 5 [ ] 4 [ ] 3 [ ] 2 [ ] 1 [ ] <1
Petroleum Hydrocarbon Analyses: [X] STD. [ ] 4 [ ] 3 [ ] 2 [ ] 1 [ ] <1
[ ] OTHER Please Specify
*Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NWTPH-Dx	PAHs	Naphthalenes	EPH	BTEX	ms/msd	MATRIX (W, S, O)	# OF CONT.	B2L0545 COMMENTS	NCA WO ID
1.	MFG-1	12-19-02	X	X	X	X	X		W	7	Analyses must meet	01
2.	MFG-2	12-19-02	X	X	X	X	X		W	7	MTCA and need to	02
3.	MFG-3	12-19-02	X	X	X	X	X		W	7	be consistent with	03
4.	MFG-4	12-19-02	X	X	X	X	X	X	W	17	Feb 2002 sampling	04
5.											event.	
6.												
7.											Contact Natalie	
8.											Morrow w/	
9.											questions @	
10.											406-728-4600	
11.												
12.												
13.												
14.												
15.												

RELINQUISHED BY: Sean Williams
PRINT NAME: Sean Williams FIRM: MFG, inc. DATE: 12-20-02 TIME: 1240
RECEIVED BY: Aaron Dorbter
PRINT NAME: Aaron Dorbter FIRM: NCA DATE: 12/20/02 TIME: 12:40

RELINQUISHED BY: Aaron Dorbter
PRINT NAME: Aaron Dorbter FIRM: NCA DATE: 12/20/02 TIME: 16:20
RECEIVED BY: Cathy Gamble
PRINT NAME: Cathy Gamble FIRM: NCA DATE: 12/20/02 TIME: 16:20

ADDITIONAL REMARKS:

COC REV 3/99

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20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711 (541) 383-9310 FAX 382-7588

CHAIN OF CUSTODY REPORT

Work Order #: B2L0545

CLIENT: MFG
REPORT TO: Natalie Morrow
ADDRESS: P.O. Box 7158
Missoula, MT 59807
PHONE: 406-728-4600 FAX: 406-728-4698

INVOICE TO: Same

P.O. NUMBER: 060255-101-2

PROJECT NAME: Darling-Tacoma
PROJECT NUMBER: 060255-101-2
SAMPLED BY: Sean Williams

TURNAROUND REQUEST in Business Days*
Organic & Inorganic Analyses: [X] 10 STD. [ ] 7 [ ] 5 [ ] 4 [ ] 3 [ ] 2 [ ] 1 [ ] <1
Petroleum Hydrocarbon Analyses: [X] STD. [ ] 4 [ ] 3 [ ] 2 [ ] 1 [ ] <1
[ ] OTHER Please Specify
*Turnaround Requests less than standard may incur Rush Charges.

#	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NWTPH-Dx	PAHs	Naphthalenes	EPH	BTEX	ms/msd	MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1	MFG-1	12-19-02 1209	X	X	X	X	X		W	7	Analyses must meet	01
2	MFG-2	12-19-02 1056	X	X	X	X	X		W	7	MTCA and need to	02
3	MFG-3	12-19-02 1522	X	X	X	X	X		W	7	be consistent with	03
4	MFG-4	12-19-02 1340	X	X	X	X	X	X	W	17	Feb 2002 sampling	04
5	TB (cw)	12/19/02 1200									event.	05
6												
7											Contact Natalie	
8											Morrow w/	
9											questions @	
10											406-728-4600	
11												
12												
13												
14												
15												

REQUESTED ANALYSES

Revised Chain of Custody

RELINQUISHED BY: Sean Williams
PRINT NAME: Sean Williams FIRM: MFG, Inc. DATE: 12-20-02 TIME: 1240
RECEIVED BY: Aaron Dachter
PRINT NAME: Aaron Dachter FIRM: NCA DATE: 12/20/02 TIME: 12:40

RELINQUISHED BY: Aaron Dachter
PRINT NAME: Aaron Dachter FIRM: NCA DATE: 12/20/02 TIME: 16:20
RECEIVED BY: Cathy Gamble
PRINT NAME: Cathy Gamble FIRM: NCA DATE: 12/20/02 TIME: 16:20

ADDITIONAL REMARKS:

CDC REV 3/99

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APPENDIX E

SITE-SPECIFIC RISK ASSESSMENT

Appendix E: Site Specific Risk Assessment

The former Darling International, Inc. (DII) facility at 2041 E. Marc Street, Tacoma, WA is the Site of two former underground storage tanks (USTs) for petroleum products. The USTs and 112 cubic yards of surrounding soil were removed in 1989. In order to obtain closure for the removal of the two USTs in compliance with the State of Washington's Model Toxics Control Act (MTCA; as defined under Washington Administrative Code (WAC) 173-340), MFG completed an investigation of soil and groundwater in the vicinity of the former USTs, and prepared this Site-specific risk assessment. The purpose of this risk assessment is to demonstrate whether detected petroleum-related analytes in soil and groundwater meet Method A Cleanup Levels and, if necessary, to identify those constituents that require further Site-specific risk evaluation (i.e., chemicals of potential concern – COPCs). The WAC allows flexibility for site specific conditions to be applied under WAC 173-340-708 to support closure and focus additional remedy efforts, if necessary. The Site-specific risk assessment indicates whether potential risks associated with residual levels of COPCs in soil are protective of human health and the environment. The tasks that were performed to complete this risk assessment follow WAC guidelines and are based on Site-specific conditions. This section presents separate evaluations of human health and ecological risks.

1.0 HUMAN HEALTH RISK EVALUATION

The objective of a human health risk assessment is to evaluate the potential impacts of chemicals of potential concern (COPCs) in environmental media to human receptors. Specifically, human health risk assessment addresses the nature of constituents associated with a site and released to environmental media, the pathways of human exposure, and the degree to which the releases may pose a potential for adverse health effects.

An evaluation of potential risks to human health should consider several key elements, including:

- Hazard Assessment (i.e., Identifying Chemicals of Potential Concern (COPCs),
- Exposure Assessment,
- Toxicity Assessment, and
- Risk Characterization.

The risk assessment of the former USTs uses a tiered approach consistent with the MTCA Cleanup Level hierarchy. In the first step ("hazard assessment"), the Method A Cleanup Levels are used to show if any detected constituents in environmental media meet these most conservative, screening-level concentrations, and thus can be concluded to pose acceptable risk for human receptors without further evaluation. Constituents whose concentrations are greater than Method A Cleanup Levels, are identified as COPCs for further evaluation at the next MTCA tiers (i.e., Method B for unrestricted use; Method C for soil – Site-specific risk assessment).

For the Method B for unrestricted use evaluation, Washington State Department of Ecology (Ecology) has developed a spreadsheet tool, Cleanup Level and Risk Calculations (CLARC). The CLARC spreadsheet (Ecology, 2001) was used for the risk evaluation of TPH components.

The Site-specific risk assessment to support a Method C Cleanup Level follows the risk assessment methodologies presented in WAC 173-340-708 (Human Health Risk Assessment Procedures). The Site-specific risk assessment also relies on approaches described by the USEPA in *Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation*

Manual, Part A (USEPA, 1989). For a Method C risk assessment, the additional elements of exposure assessment, toxicity assessment, and risk characterization are conducted.

The human health risk evaluation begins with a conceptual site model that identifies potential environmental media of interest. This is followed by a Method A screening to identify COPCs, a Method B evaluation for COPCs that can meet the unrestricted use criteria, and Method C Site-specific risk assessment for COPCs in soil, as appropriate.

1.1 Conceptual Site Model

A brief conceptual site model of the area of interest in the investigation was developed. The original sources being evaluated are former petroleum-product USTs. Petroleum products may have been released to subsurface soil (approximately 8 feet below ground surface (bgs)) from these USTs. Therefore, shallow soils would not have been impacted in the UST area. From subsurface soil, released petroleum products could have migrated to shallow groundwater. From shallow groundwater, petroleum products could migrate in a hydrogeologically downgradient direction.

Based on the conceptual site model, environmental media of interest are subsurface soil and groundwater. Current and future land use is and will be industrial. The Site fits the MTCA definition of "industrial properties" under WAC 173-340-200. The Site is located in an area of heavy industry in the City of Tacoma, and zoned industrial. Since the historical release of petroleum product was to subsurface soil, residual non-volatile constituents in soil would not be accessible without excavation activities. It is possible that under future conditions a construction worker could come in contact with subsurface soil. There is also the potential for volatile constituents in soil to migrate through the soil column to the surface and possibly to indoor air; however,this pathway would be relevant only if volatile COPCs are identified in soil.

Groundwater is not currently used as drinking water, and is unlikely to be used as drinking water in the future since the site is constructed on a former landfill. The Washington Department of Health was contacted to inquire about wells within the surrounding area, and there were no wells nor wellhead protection areas found within a 1-mile radius of the property. However, the contaminated groundwater zone (i.e., shallow zone) does not meet the rigorous criteria for exclusion as potable water in the future (i.e., per WAC 173-340-720(2)(b), yield is

<0.5 gallons/minute, TDS >10,000 mg/L, or aquifer is too deep to make "recovery of water for drinking water purposes technically impossible"). Therefore, appropriate MTCA methods for potable groundwater will be conservatively employed in this risk assessment.

Analytical data from subsurface soil and groundwater sampling were evaluated as follows.

1.2 Method A Screening: Selection of Chemicals of Potential Concern (COPCs)

1.2.1 Soils

As discussed in the 2002 Year-End Report, five subsurface soil samples were collected during the installation of MFG monitoring wells in February 2002. These samples were analyzed for the following petroleum-related constituents: benzene, toluene, ethylbenzene, xylenes (BTEX); naphthalenes, carcinogenic polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH), and extractable petroleum hydrocarbon (EPH) fraction analysis per WAC 173-340-830 (3)(a)(vi)).

The analytical results for soil samples are presented in Table E-1. These are first compared with MTCA Method A unrestricted soil cleanup values as defined under WAC 173-340-740 and presented in WAC 173-340-900 (Table 740-1), to identify any constituents that meet the Method A soil values.

BTEX, naphthalenes

Benzene, toluene, ethylbenzene, and xylenes were not detected in any of the soil samples. Naphthalenes were detected in two of the five samples, but concentrations of total naphthalenes for the samples with detectable naphthalenes were well-below the Method A soil cleanup value of 5 mg/kg. Therefore, these constituents meet the unrestricted soil cleanup standards and are not evaluated further in this risk assessment.

Carcinogenic PAHs

The carcinogenic PAHs were not detected in two of five soil samples, but exceeded the Method A soil cleanup levels in two samples. Based on this comparison, the following constituents exceeded the unrestricted cleanup standards and are identified as COPCs for further evaluation in the risk assessment: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Both benzo(a)pyrene and the sum of the carcinogenic PAHs are also greater than the Method A industrial soil values (Table 745-1 from WAC 173-340-900). The property is zoned for industrial land use; therefore, carcinogenic PAHs are identified as COPCs for a Modified Method C Site-specific risk assessment (Section 1.4).

TPH, EPH

The TPH results were compared with the Method A soil cleanup values, and the diesel range concentrations in the five soil samples were below the unrestricted cleanup standard of 2,000 mg/kg. The maximum detected concentrations of heavy oil and mineral oil range total petroleum hydrocarbons (TPH) in soil exceed the Method A unrestricted use values, which are the same as Method A industrial values for these constituents. As recommended in MTCA, extractable petroleum hydrocarbon (EPH) fraction analysis was also conducted on these samples to provide a better characterization of the types of constituents making up the TPH. There are no Method A values for the EPH fractions, but these data can be evaluated within the procedures of Method B of MTCA. Therefore, the TPH was identified as a COPC for further evaluation using the detected EPH fractions for a quantitative Method B evaluation.

1.2.2 Groundwater

Four quarterly rounds of groundwater samples were collected from monitoring wells MFG-1, MFG-2, MFG-3, and MFG-4 in February, June, September, and December 2002. These samples were analyzed for the following types of petroleum constituents: BTEX; naphthalenes, PAHs, TPH, and EPH fraction analysis. Table E-2 presents the analytical results for these sampling rounds.

The analytical results were compared with MTCA Method A Groundwater Cleanup Levels as defined in WAC 173-430-720 and presented in WAC 173-340-900 (Table 720-1).

BTEX, naphthalenes

Benzene, toluene, ethylbenzene, xylenes and naphthalenes were detected at concentrations that are lower than the Method A Groundwater Cleanup values for these constituents. Therefore, these constituents are not evaluated further in the risk assessment.

Carcinogenic PAHs

Carcinogenic PAHs were not detected in three of the four monitoring rounds in any well. In one monitoring event, the third round collected on September 26, 2002, carcinogenic PAHs were detected at concentrations exceeding the Method A Groundwater Cleanup values in two of the wells during this single sampling event. PAHs have high octanol/water coefficients, and are unlikely to partition significantly into water. Given that groundwater concentrations of carcinogenic PAHs met the Method A Groundwater Cleanup Levels in three of the four sampling rounds, it is likely that the PAH analytical results from the third quarter are artifacts of soil particulate from historic landfill materials in those groundwater samples. The third quarterly sampling occurred during a time of low groundwater elevations, and the water table at that time approximately coincided with the soil zone containing elevated levels of carcinogenic PAHs from SB-3 (7.5-8 feet bgs). Furthermore, given the distance of MFG-3 from the former UST location, it is likely that the carcinogenic PAHs in this location are associated with the former landfill activities at the property, and not the former USTs. Since the overall groundwater monitoring data support that carcinogenic PAHs are not likely dissolved in and therefore not migrating with groundwater, these constituents in groundwater are not identified as COPCs for further evaluation in the risk assessment.

TPH, EPH

The groundwater samples were analyzed for diesel range, heavy oil range, and mineral oil range TPH. These were detected in nearly every sample from each well during each sampling round, and detected concentrations exceeded the general MTCA Method A values for these constituent mixtures. EPH analyses were also conducted on these groundwater samples. As shown in Table E-2, most of the samples had no detectable concentrations of the EPH fractions specified in the WAC 173-340 rule. There were sporadic detections of the following EPH fractions: C21-C34 aliphatics, C10-C12 aromatics, and C12-C16 aromatics. Since there are no

Method A values for specific EPH fractions, these EPH fractions are identified as COPCs for further evaluation in the risk assessment. These were evaluated for a Method B Potable Ground Water Cleanup Level in section 1.3, below.

1.2.3 Constituents that Meet the Method A Cleanup Levels

In soil, BTEX and total naphthalenes concentrations were lower than the Method A Unrestricted Soil Cleanup Levels, and therefore these constituents meet the unrestricted land use criteria.

In groundwater, BTEX and total naphthalenes concentrations also were lower than the Method A Groundwater Cleanup Levels. Therefore, these constituents meet the potable water standard (although it should be emphasized that the impacted zone on Site – a shallow zone in a former landfill located in a heavily industrialized area – is not being used for drinking water nor will it likely be used in the future). Carcinogenic PAH results were generally shown to meet Method A Groundwater Cleanup Levels.

1.2.4 Summary of COPCs for Further Risk Evaluation

For soil, carcinogenic PAHs and EPH fractions were identified as COPCs for further evaluation in the risk assessment based on comparison with MTCA Method A Soil Unrestricted Cleanup Levels.

For groundwater, EPH fractions were identified as COPCs for further evaluation in the risk assessment based on comparison with MTCA Method A Groundwater Cleanup Levels.

1.3 Method B Determinations for EPH

For both soil and groundwater, TPH results exceeded the Method A values, but EPH data were also collected for these samples. The EPH results for a sample provide a more precise evaluation of the types of hydrocarbons that contribute to the TPH result, and the potential toxicity of the components of the TPH. There are no Method A Cleanup Levels for EPH, but a Method B cleanup for unrestricted use can be conducted per MTCA guidance with Site EPH concentrations and toxicity criteria for the EPH fractions. Ecology provides a spreadsheet tool, the Cleanup Levels and Risk Calculations under the MTCA Cleanup Regulation (CLARC,

version 3.0, 2001), and this was used to assess whether the EPH results in soil and groundwater meet the Method B Cleanup Levels.

For soil, the maximum concentrations of detected EPH fractions were conservatively selected as exposure point concentrations for input into the CLARC spreadsheet for Method B soil. The detected EPH fractions were aliphatic carbon chain lengths: C10-C12, C12-C16, C16-C21, C21-C34, and aromatic carbon chains lengths: C16-C21 and C21-C34. The CLARC spreadsheet contains Ecology's recommended toxicity criteria, dermal absorbance factors, gastrointestinal absorbance factors for adjusting oral toxicity criteria for the dermal pathway, assumptions of contact rate, exposure duration, exposure frequency for unrestricted land use (i.e., residential). EPH fractions are not considered to be carcinogenic, and therefore, only a noncarcinogenic hazard evaluation is included in the CLARC worksheet for calculating Method B Cleanup Levels for these constituents. It should be noted that the Site is located over a former landfill in a long-term, heavily industrialized area that is zoned industrial. Therefore, the Method B unrestricted cleanup level is very conservative for this Site, but was conducted to show that meeting an unrestricted use standard is possible for these constituents.

Table E-3 is the output from the CLARC spreadsheet for soil, showing the Site-specific EPH concentrations that were included. The results show that the maximum detected concentrations of EPH yield a hazard index of 0.2 (i.e., <1) and therefore EPH in soil passes the Method B Cleanup evaluation.

For groundwater, the maximum detected concentrations of EPH fractions in any well and any sampling round were conservatively incorporated into the Method B Potable Ground Water Cleanup Level calculation. Table E-4 is the output of the CLARC worksheet for Method B Potable Ground Water. This shows that the maximum detected concentrations of EPH in groundwater yield a Hazard Index of 0.2 (i.e., HI<1), and therefore these concentrations of EPH are acceptable for the Method B Potable Ground Water Cleanup evaluation.

1.4 Method C Cleanup Level for Soil

Carcinogenic PAHs were detected in soil samples at concentrations exceeding the Method A Cleanup Levels for unrestricted use as well as for industrial land use. These detections were from subsurface soil samples collected at 7-8.5 feet bgs from SB-3 and at 8-8.5 feet bgs

from SB-4. A Modified Method C Industrial Soil Cleanup evaluation is appropriate for addressing these COPCs in subsurface soil on an industrial property, and this section presents the Site-specific risk assessment to support the Modified Method C evaluation for soil. This includes an exposure assessment, toxicity assessment, and risk characterization for these COPCs in soil.

1.4.1 Exposure Assessment

The purpose of an exposure assessment is to estimate the type of exposure to COPCs that is likely to occur due to site-related activities. The exposure assessment consists of characterizing the potentially exposed receptors, identifying exposure pathways (i.e., exposure points, and exposure routes), and quantifying exposure (i.e., combining the exposure concentrations with assumed intake variables).

1.4.1.1 Land Use Assumptions

The current and future land use of the former DII site is and will be industrial. The Site fits the MTCA definition of "industrial properties" under WAC 173-340-200, and is located over a former landfill in an area of heavy industry in the City of Tacoma that is zoned industrial.

1.4.1.2 Identification of Potentially Exposed Receptors

The human receptors who may be exposed to COPCs on Site were identified based on current and assumed future land use at the Site and surrounding properties. There are workers that work at the current facility, but these people would not have an opportunity to directly contact subsurface soil. There is the possibility of volatile COPCs migrating from soil through the soil column to the surface, and to indoor air if there is a structure at the surface. However, given the nature of COPCs detected in soil, the soil to vapor pathway does not need to be evaluated (i.e., per WAC 173-340-745(5)(b)(iii)(C), the maximum detection of diesel range TPH is well-below 10,000 mg/kg).

As noted in the conceptual site model (section 1.1), it is possible that excavation activities, such as for construction, could provide an opportunity for contact with subsurface soil and COPCs in this medium. Therefore, a construction worker scenario will be evaluated as part of this risk assessment for a Method C Site-specific Cleanup Level.

1.4.1.3 Identification of Potentially Complete Exposure Pathways

An exposure pathway typically consists of the following elements:

- A source and mechanism of contaminant release;
- An exposure medium (e.g., soil);
- A point of contact with the medium (i.e., receptor); and
- A human intake route (e.g., inhalation, ingestion, etc.).

In general, each of these elements must be present for an exposure pathway to be complete.

Construction Workers

Construction activities involving digging into the subsurface soils may occur at the Site in the future. Such a receptor could be exposed to COPCs in soil through incidental ingestion, dermal contact, and inhalation of fugitive dusts from subsurface soils. Therefore, these exposure pathways are considered in this risk assessment.

1.4.1.4 Estimation of Exposure Point Concentrations

The exposure point concentration (EPC) is the concentration of a COPC in an exposure medium that may be contacted by a potential receptor. EPCs were calculated to be consistent with MTCA and Ecology's Statistical Guidance. This is a reasonable maximum exposure (RME) assessment; therefore, the 95% UCL of the mean concentration is appropriate for inclusion as the EPC per MTCA and USEPA risk assessment guidance (1989). However, the soil dataset is rather small for calculating meaningful statistics. The distributions of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene were determined to fit a lognormal distribution. The 95% UCLs when calculated by the method prescribed in Ecology's Statistical Guidance for such small datasets are much higher than the maximum detected concentrations. Therefore, the maximum detected concentrations (as shown in Table E-1) were conservatively used as the EPCs for these COPCs. The distribution of

dibenzo(a)anthracene was neither normal nor lognormal; however, for consistency, the maximum detected concentration was also used as the EPC for this constituent.

To calculate an air concentration associated with soil particles released to air, USEPA guidance provides a simple Particulate Emission Factor (PEF) by which the soil EPC is divided. In this risk assessment, a PEF was calculated from USEPA's Soil Screening Guidance: Technical Background Document (EPA, 1996) and its default assumptions. This value of 6.6 E+08 m^3/kg soil was applied in this risk assessment to estimate COPC concentrations in air for the inhalation pathway.

1.4.1.5 Estimation of Intake

The EPC is combined with exposure factors to estimate intake for the receptors. Exposure is defined as the contact rate of an organism with a chemical or physical agent. Intake is exposure normalized for time and body weight and is expressed in units of mg chemical per kg body weight per day, which is an average daily dose (EPA, 1989).

For carcinogenic effects, the relevant intake is the total cumulative intake averaged over a lifetime because the quantitative dose-response function for carcinogens is based on the assumption that cancer results from chronic, lifetime exposures to carcinogenic agents. This intake or dose is then averaged over a lifetime to provide an estimate of intake or dose to carcinogens as (mg/kg-day), which is expressed as a lifetime average daily dose (LADD). Thus, for potentially carcinogenic compounds, the averaging time (AT) is equal to 75 years (WAC 173-340).

Noncarcinogenic effects are evaluated for chronic, subchronic, or acute exposures by receptors to systemic or reproductive toxicants. For noncarcinogenic effects, the relevant intake or dose is based on the daily intake averaged over the exposure period of concern (average daily dose or ADD). However, the COPCs for the Method C Cleanup evaluation are considered to be carcinogenic, and noncarcinogenic toxicity criteria are not available from USEPA or Ecology for any of these constituents. Therefore, ADDs were not calculated in this Site-specific risk assessment.

Using the EPCs for soil, a daily dose was calculated following Ecology and EPA guidance (WAC 173-340-708, 740, and 745, and EPA, 1989 and 1997) for estimating intake of

soil through dermal, incidental ingestion, and inhalation pathways. Ecology does not provide default assumptions for a construction scenario, and applicable site-specific data were used in risk assessment. Site-specific assumptions that were made included that the future construction scenario is a one-time event of 3 months' duration. This is a conservative assumption given the limited area of the investigation and former UST location. Therefore, the exposure frequency for the construction worker is conservatively assumed to be 90 days (or events for dermal exposure) per year.

The exposure factors used, references, and equations used to calculate intake for these values are presented in Table E-5.

1.4.2 Toxicity Assessment

A toxicity assessment was performed for the COPCs to provide a basis for the risk characterization as part of the Method C Cleanup evaluation for carcinogenic PAHs in soil. The toxicological assessment involves a critical review and interpretation of toxicity data from epidemiological, clinical, animal, and in vitro studies. The carcinogenic PAHs are evaluated only for potential carcinogenic effects, because noncarcinogenic toxicity criteria are not available for these constituents from USEPA or Ecology.

Potential carcinogenic effects resulting from human exposure to constituents are estimated quantitatively using cancer slope factors (CSFs), which represent the theoretical increased risk per milligram of constituent intake per kilogram body weight per day $(mg/kg\text{-}day)^{-1}$ or unit risks, which are the theoretical increased risk per exposure concentration. CSFs or unit risks are used to estimate a theoretical upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular lifetime daily dose of a potential carcinogen.

In general, USEPA has developed CSFs for the oral route of exposure and unit risks for oral and inhalation routes of exposure for a number of potentially carcinogenic compounds. In the absence of values specific to the dermal route, the oral factors are typically used with absorption adjustment factors to account for differences in absorption between the two routes. USEPA has derived an oral CSF for benzo(a)pyrene, but not specifically for the other carcinogenic PAHs, and has provisional oral CSFs for the other carcinogenic PAHs based on assumptions of relative potency to benzo(a)pyrene. However, California Environmental

Protection Agency (CalEPA) has derived somewhat different CSFs for the carcinogenic PAHs than USEPA's values, and Ecology has adopted the CalEPA CSFs in MTCA (173-340-708). Table E-6 presents the Ecology-recommended oral and inhalation slope factors, gastrointestinal absorption factors used to adjust the oral to a dermal slope factor, and the adjusted slope factor for the dermal risk evaluation. The source of these values is the database of the CLARC tool (CLARC VER 3.0 2001).

1.4.3 Risk Characterization

Risk characterization combines the data from the exposure and toxicity assessments to develop quantitative estimates of risks associated with assumed exposures to COPCs at the Site. Characterization for carcinogenic effects is presented below.

1.4.3.1 Carcinogenic Risks

Potential carcinogenic effects are characterized in terms of the excess probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. For chemicals that exhibit carcinogenic effects, EPA has developed a non-threshold model of carcinogenesis. To characterize the potential for carcinogenic effects, an LADD is combined with a CSF to calculate a probability that an individual would develop cancer over a lifetime of exposure to the COPC, with the following equation:

$$Risk = LADD \times CSF_{oral}$$

These probabilities or theoretical excess lifetime cancer risks are combined across pathways and COPCs. The summed theoretical excess lifetime cancer risk for future construction worker to carcinogenic PAHs in soil is 1×10^{-6}. Furthermore, no individual COPC contributed a risk of $>1 \times 10^{-6}$ (e.g., the highest risk contributed by an individual COPC was 7×10^{-7} from the summed exposure pathways for benzo(a)pyrene). The cancer risk estimates for individual COPCs and pathways are presented in Table E-7.

Based on guidance found in WAC 173-340-708, a level of 1×10^{-5} is the target acceptable risk in this assessment, and no individual carcinogenic COPC may contribute a risk in excess of 1×10^{-6}. Typically, cancer risks less than 1×10^{-6} are considered *de minimis*, and USEPA

(1991) considers risks between the range of 1×10^{-6} to 1×10^{-4} and below to be acceptable. Therefore, the calculated risk estimate is acceptable by both Ecology and USEPA criteria.

2.0 ECOLOGICAL ASSESSMENT

Under MTCA regulations (WAC 173-340-7490), a terrestrial ecological risk evaluation is necessary at the DII facility. The goal of the ecological risk evaluation is the protection of terrestrial ecological receptors from exposure to contaminated soil with the potential to cause significant adverse effects. Since the site does not meet any of the exclusions from ecological risk evaluation under WAC 173-340-7491, a simplified terrestrial ecological risk evaluation was conducted using MTCA guidance (WAC 173-340-7492).

Simplified terrestrial ecological evaluations are intended to identify those sites which do not have a substantial potential for posing a threat of significant adverse effects to terrestrial ecological receptors. Since the DII site is an industrial area, terrestrial wildlife are the only receptors that must be considered under the simplified risk evaluation procedures.

The site cannot be eliminated from further evaluation since the area of contamination may be greater than 350 square feet in total area and the large areas of contiguous ecological habitat (i.e., open, non-industrial) located to the east and south of the DII site (Figure 1).

Therefore, the first step in the simplified terrestrial ecological risk evaluation includes an analysis of potential exposure pathways. An exposure pathway is defined as a pathway through which an ecological receptor may contact Site-related constituents. Currently, there are no potential exposure pathways for terrestrial ecological receptors at the DII site. Exposure is precluded by the depth of the potential contamination in the subsurface soils (> 6 feet bgs). Of the chemicals listed in MTCA Table 749-2, only diesel range organics (DRO) are detected at depths less than the six foot bgs point of compliance (Table E-1). That detection is considerably less than the industrial/commercial land use value for chemicals of ecological concern listed in Table 749-2 of the MTCA regulations (i.e., detection of 17 mg/kg compared with MTCA ecological value of 12,000 mg/kg). The detected DRO concentration is also less than the MTCA value for DRO for unrestricted land use (460 mg/kg).

However, since there are chemicals of potential ecological significance detected in the soil samples less than 15 feet in depth, the detected concentrations of each of those chemicals were compared to the soil concentrations presented in the industrial or commercial site column of MTCA Table 749-2 in a contaminants analysis (WAC 173-340-7492 2(c)).

Of the COPCs detected at the DII site, only benzo(a)pyrene and DRO are listed as priority contaminants of ecological concern for sites that qualify for the simplified terrestrial ecological evaluation procedure (Table 749-2). The maximum detected concentration of benzo(a)pyrene was 4.9 mg/kg at sample location MFG-B3 at 7.5 to 8 feet bgs. The maximum detected concentration is considerably less than the value listed in MTCA Table 749-2 (300 mg/kg). Likewise, the maximum detected concentration of DRO, detected at sample location MFG-B4 at 8 to 8.5 feet bgs (650 mg/kg) is also considerably less than the MTCA industrial site value (12,000 mg/kg).

Since no hazardous substance listed in MTCA Table 749-2 is detected at concentrations greater than their respective screening value at any depth less than 15 feet bgs, the simplified terrestrial ecological risk evaluation may be ended. No further action is required to attenuate any potential risk to ecological receptors at the DII site.

3.0 CONCLUSIONS AND RECOMMENDATIONS

The remedial actions taken at the time of UST and soil removal are believed to have been protective of both human health and ecological receptors, based on the tiered risk evaluation presented herein. A number of detected petroleum constituents were shown to be present at concentrations lower than the MTCA Method A Cleanup Levels for soil and groundwater. These include BTEX and naphthalenes in soil and groundwater. Carcinogenic PAHs also generally met the MTCA Method A Cleanup Level in groundwater. TPH in soil and groundwater, and carcinogenic PAHs in soil were identified as COPCs for further risk evaluation.

The TPH results were augmented by more refined EPH results, and EPH was evaluated for Method B Cleanup Levels for soil and groundwater using the CLARC calculating tool (CLARC VER 3.0 2001) from Ecology. EPH in soil was shown to meet the Method B Soil Cleanup Levels for unrestricted use. EPH in groundwater was shown to meet the Method B Potable Groundwater Cleanup Levels.

Carcinogenic PAHs in soil were identified as COPCs, and these were further evaluated under Method C Soil Cleanup procedures using Site-specific risk assessment. The results of the Site-specific risk assessment show that the cumulative risk for the carcinogenic PAHs for the construction worker is 1×10^{-6} and none of the individual PAHs contributed greater than 1×10^{-6} to the summed risk. Therefore, the estimated risks for the future construction worker scenario is below the criteria for acceptable levels (i.e., Risk $< 1 \times 10^{-5}$) as set forth by the WAC 173-340-708.

In addition, based on the discussion above in Section 2 of this appendix, no adverse ecological impacts are believed to exist with respect to the site and residual petroleum constituents. As a result, since the remedial actions taken at the time of UST and soil removal are believed to have been protective of both human health and ecological receptors, the calculation of site-specific clean-up goals is not necessary.

4.0 REFERENCES

United States Environmental Protection Agency (USEPA), 1989. *Risk Assessment Guidance for Superfund, Human Health Evaluation Manual Part A*. Office of Solid Waste and Emergency Response. 9285.701A. December.

USEPA, 1996. *Soil Screening Guidance: Technical Background Document.* Office of Solid Waste and Emergency Response. 9355/4-17A; EPA/540/R-95/128. May.

USEPA, 1997. *Exposure Factors Handbook.* Office of Research and Development. EPA/600/P-95/002F. August.

Washington Administrative Code (WAC). Model Toxics Control Act (MTCA). Chapter 173-340.

Washington State Department of Ecology (Ecology). 2001. *Cleanup Levels and Risk Calculations (CLARC)*, Version 3.0, Publication No. 94-145, August 2001.

TABLE E-1
February 2002 Subsurface Boring Analytical Results - Method A Screening
Darling International, Inc.
2041 Marc Avenue, Tacoma, WA

Boring Location	MTCA Method A Soil Cleanup Levels	MFG-B2	MFG-B3		MFG-B4	
Sample Depth Interval (ft bgs)		10.5-11'	3-3.5'	7-8.5'	3-3.5'	8-8.5'
Date Sample Collected		2/5/2002	2/5/2002	2/5/2002	2/6/2002	2/6/2002
Dry weight (%)		49.4[3]	94.6	49.0[3]	91.9	49.5[3]
Total Petroleum Hydrocarbons (mg/kg)						
Diesel Range	2,000	37	<10	<820	17	650
Heavy Oil Range	2,000	120	<20	***3,000***	43	1,300
Mineral Oil Range	4,000	180	<25	3,200	59	2,200
Extractable Petroleum Hydrocarbons (mg/kg)						
C8-C10 Aliphatics	---	<10.1	<5	<10.2	<5	<10.1
C10-C12 Aliphatics	---	<10.1	<5	<10.2	<5	23.2
C12-C16 Aliphatics	---	<10.1	<5	<10.2	<5	26.9
C16-C21 Aliphatics	---	<10.1	<5	22.9	<5	100
C21-C34 Aliphatics	---	40.3	<5	176	8.48	369
C10-C12 Aromatics	---	<10.1	<5	<10.2	<5	<10.1
C12-C16 Aromatics	---	<10.1	<5	<10.2	<5	<10.1
C16-C21 Aromatics	---	<10.1	<5	71.6	<5	39.6
C21-C34 Aromatics	---	<10.1	<5	207	<5	160
Total EPH	---	40.3	<5	477	8.48	718
Carcinogenic Polynuclear Aromatic Hydrocarbons (mg/kg)						
Benzo(a)anthracene	---	<0.020	<0.010	4.2	<0.010	0.27
Benzo(a)pyrene	0.1 ([2])	<0.020	<0.010	4.9	<0.010	0.51
Benzo(b)fluoranthene	---	<0.020	<0.010	4.4	0.01	0.64
Benzo(k)fluoranthene	---	<0.020	<0.010	1.3	<0.010	0.18
Chrysene	---	<0.020	<0.010	4.4	<0.010	0.34
Dibenz(a,h)anthracene	---	<0.020	<0.010	0.56	<0.010	<0.020
Ideno(1,2,3-cd)pyrene	---	<0.020	<0.010	2.7	<0.010	0.39
Total Carcinogenic PAHs	0.1 ([2])	NA	NA	22.5	0.01	2.3
Naphthalenes (mg/kg)						
1-Methylnaphthalene	---	<0.020	<0.010	0.17	<0.010	0.084
2-Methylnaphthalene	---	<0.020	<0.010	0.23	<0.010	0.08
Naphthalene	---	<0.020	<0.010	0.3	<0.010	0.047
Total Naphthalenes	5	NA	NA	0.7	NA	0.21
BTEX (mg/kg)						
Benzene	0.03	<0.0607	<0.0300	<0.0612	<0.0300	<0.0606
Toluene	7	<0.101	<0.0500	<0.102	<0.0500	<0.101
Ethylbenzene	6	<0.101	<0.0500	<0.102	<0.0500	<0.101
Xylenes (total)	9	<0.202	<0.100	<0.204	<0.100	<0.202

bgs = below ground surface
NA = Not Applicable.
Bold = Result is above MTCA Method A Soil Cleanup Levels
[1] =MTCA Method A Soil Cleanup Level for Industrial Properties

TABLE E-2
2002 Groundwater Analytical Results - Method A Screening
Darling International, Inc.
2041 Marc Avenue, Tacoma, WA

Monitoring Well	MTCA Method A Groundwater Cleanup Levels	MFG-1				MFG-2				MFG-3				MFG-4			
Date Sample Collected		2/13/2002	6/19/2002	9/26/2002	12/19/2002	2/13/2002	6/19/2002	9/26/2002	12/19/2002	2/13/2002	6/19/2002	9/26/2002	12/19/2002	2/13/2002	6/19/2002	9/26/2002	12/19/2002
Total Petroleum Hydrocarbons (ug/L)																	
Diesel Range	500	**3,100**	**4,160**	**3,130**	**1,350**	**2,300**	**2,920**	**1,710**	**1,630**	**6,100**	**1,760**	**1,270**	**1,670**	**4,700**	**4,770**	**4,480**	**3,460**
Heavy Oil Range	500	**730**	**763**	**612**	**514**	<500	**992**	**634**	**620**	**1,100**	**761**	**636**	**936**	**1,000**	**1,590**	**1,420**	**1,190**
Mineral Oil Range	500	**3,300**	**2,390**	**1,970**	**949**	**2,500**	**1,750**	**1,120**	**1,160**	**7,300**	**1,150**	**904**	**1,280**	**5,100**	**2,680**	**2,970**	**2,450**
Extractable Petroleum Hydrocarbons (ug/L)																	
C8-C10 Aliphatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
C10-C12 Aliphatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
C12-C16 Aliphatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
C16-C21 Aliphatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
C21-C34 Aliphatics	—	126	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	148	<100	95.9	91.4
C10-C12 Aromatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	50.6
C12-C16 Aromatics	—	<100	<100	<50	82.1	<100	<100	<50	79.9	<100	<100	<50	<50	<100	<100	<50	<50
C16-C21 Aromatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
C21-C34 Aromatics	—	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50	<100	<100	<50	<50
Total EPH	—	126	NA	NA	82.1	NA	NA	<50	79.9	NA	NA	NA	NA	148	NA	NA	142
Carcinogenic Polynuclear Aromatic Hydrocarbons (ug/L)																	
Benzo(a)anthracene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.100	<0.10	<0.20	<0.10	0.182	<0.10	<0.10	<0.10	0.139	<0.10
Benzo(a)pyrene	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	**0.182**	<0.10	<0.10	<0.10	<0.10	<0.10
Benzo(b)fluoranthene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	0.121	<0.10	<0.10	<0.10	<0.10	<0.10
Benzo(k)fluoranthene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	0.182	<0.10	<0.10	<0.10	0.119	<0.10
Chrysene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	0.182	<0.10	<0.10	<0.10	<0.10	<0.10
Dibenz(a,h)anthracene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Ideno(1,2,3-cd)pyrene	—	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	0.101	<0.10	<0.10	<0.10	<0.10	<0.10
Total Carcinogenic PAHs	0.1	NA	NA	NA	NA	NA	NA	0.100	NA	NA	NA	**0.910**	NA	NA	NA	**0.258**	NA
Naphthalenes (ug/L)																	
1-Methylnaphthalene	—	1.0	2.5	1.08	0.738	0.330	0.218	0.120	<0.10	0.39	0.24	<0.10	<0.10	2.5	3.27	0.97	1.47
2-Methylnaphthalene	—	<0.10	0.416	<0.10	<0.10	0.21	<0.10	<0.10	<0.10	<0.20	0.12	<0.10	<0.10	0.45	0.554	0.158	0.121
Naphthalene	—	<0.10	0.277	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	0.303	<0.10	0.41	0.535	<0.10	0.222
Total Naphthalenes	160	1.0	3.19	1.08	0.738	0.54	0.216	0.12	NA	0.39	0.36	0.303	NA	1.6	4.36	1.13	1.81
BTEX (ug/L)																	
Benzene	5	<0.5	<0.5	<0.500	<0.500	<0.5	<0.5	<0.5	<0.500	<0.5	<0.5	<0.5	<0.500	1.7	2.24	0.598	0.630
Toluene	1,000	<0.5	<0.5	<0.500	<2.00	<0.5	<0.5	<0.5	<2.00	0.513	<0.5	<0.5	<2.00	0.648	0.504	<0.5	<2.00
Ethylbenzene	700	<0.5	<0.5	<0.500	<1.00	<0.5	<0.5	<0.5	<1.00	<0.5	<0.5	<0.5	<1.00	<0.5	<0.5	<0.5	<1.00
Xylenes (total)	1,000	<1	<1	<1	<1.50	<1	<1	<1	<1.50	1.06	<1	<1	<1.50	1.39	<1	<1	<1.50

bgs = below ground surface NA = Not Applicable.
Bold=Above MTCA Method A Groundwater Cleanup Level

TABLE E-3

Worksheet for Calculating Soil Cleanup Level for Soil Direct Contact pathway: Method B-Unrestricted Land use (Refer to WAC 173-340-740)

Date: 4/2/2003
Site Name: Darling International, Inc.
Sample Name: 2041 Marc Avenue, Tacoma, WA

Chemical of Concern or EC Group	Measured Soil Conc dry basis	Exposure Parameters				Toxicity Parameters		Current Condition			Adjusted Condition			
		AB1	AF	ABS_d	GI	RfD_o	CPF_o	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	mg/cm²-day	unitless	unitless	mg/kg-day	kg-day/mg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction														
AL_EC >5-6	0	1	0.2	0.03	0.8	5.7					0.00E+00			
AL_EC >6-8	0	1	0.2	0.03	0.8	5.7					0.00E+00			
AL_EC >8-10	0	1	0.2	0.03	0.8	0.03					0.00E+00			
AL_EC >10-12	23.2	1	0.2	0.03	0.8	0.03		1.05E-02			3.49E+00	1.57E-03		
AL_EC >12-16	26.9	1	0.2	0.1	0.5	0.03		1.61E-02			4.05E+00	2.43E-03		
AL_EC >16-21	100	1	0.2	0.1	0.5	2		9.00E-04			1.50E+01	1.35E-04		
AL_EC >21-34	369	1	0.2	0.1	0.5	2		3.32E-03			5.55E+01	5.00E-04		
AR_EC >8-10	0	1	0.2	0.03	0.8	0.05					0.00E+00			
AR_EC >10-12	0	1	0.2	0.03	0.8	0.05					0.00E+00			
AR_EC >12-16	0	1	0.2	0.1	0.5	0.05					0.00E+00			
AR_EC >16-21	71.6	1	0.2	0.1	0.5	0.03		4.30E-02			1.08E+01	6.46E-03		
AR_EC >21-34	207	1	0.2	0.1	0.5	0.03		1.24E-01			3.11E+01	1.87E-02		
Benzene	0	1	0.2	0.0005	0.95	0.003	0.055		0.00E+00		0.00E+00		0.00E+00	
Toluene	0	1	0.2	0.03	1	0.2					0.00E+00			
Ethylbenzene	0	1	0.2	0.03	0.92	0.1					0.00E+00			
Total Xylenes	0	1	0.2	0.03	0.9	2					0.00E+00			
Total Naphthalenes	0	1	0.2	0.13	0.89	0.02					0.00E+00	0.00E+00		
n-Hexane	0	1	0.2	0.03	0.8	0.06					0.00E+00	0.00E+00		
MTBE	0										0.00E+00			
Ethylene Dibromide (EDB)	0	1	0.2	0.03	0.8	0.000057	85		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0	1	0.2	0.03	0.8	0.03	0.091		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	0	1	0.2	0.13	0.89		0.73		0.00E+00	*for*	0.00E+00		0.00E+00	*for*
Benzo(b)fluoranthene	0	1	0.2	0.13	0.89		0.73		0.00E+00	*all*	0.00E+00		0.00E+00	*all*
Benzo(k)fluoranthene	0	1	0.2	0.13	0.89		0.73		0.00E+00	*cPAHs*	0.00E+00		0.00E+00	*cPAHs*
Benzo(a)pyrene	0	1	0.2	0.13	0.89		7.3		0.00E+00		0.00E+00		0.00E+00	
Chrysene	0	1	0.2	0.13	0.89		0.073		0.00E+00		0.00E+00		0.00E+00	
Dibenzo(a,h)anthracene	0	1	0.2	0.13	0.89		2.92		0.00E+00		0.00E+00		0.00E+00	
Indeno(1,2,3-cd)pyrene	0	1	0.2	0.13	0.89		0.73		0.00E+00		0.00E+00		0.00E+00	
Sum	797.7							1.98E-01	0.00E+00		1.20E+02	2.98E-02	0.00E+00	

a. "TPH Test" button below is for testing adjusted condition at a specified TPH concentration.
b. Check columns at left for Pass/Fail detail.

Current Condition

TPH, mg/kg= 797.700
HI= 1.980E-01
Cancer RISK= 0.000E+00
Pass or Fail? Pass

Adjusted Condition

TPH, mg/kg= 120.000
HI= 2.978E-02
Cancer RISK= 0.000E+00
Pass or Fail? Pass

Exposure Parameters		
for Non-carcinogens		Units
Average Body Weight, ABW	16	kg
Averaging Time, AT	6	yr
Exposure Frequency, EF	1	unitless
Exposure Duration, ED	6	yr
Soil Ingestion Rate, SIR	200	mg/day
Dermal Surface Area, SA	2200	cm^2
for Carcinogens		
Averaging time, AT_C	75	yr

TABLE E-4

Worksheet for Calculating Method B Potable Ground Water Cleanup Levels

Refer to MTCA WAC 173-340-720

Date: 4/2/2003
Site Name: Darling International, Inc.
Sample info: 2041 Marc Avenue, Tacoma, WA

Enter Ground Water Concentration Measured			Current Condition			Adjusted Condition			
Chemical of Concern or EC Group	Measured Ground Water Conc	Ground Water Cleanup Level	HQ	RISK	Pass or Fail?	Ground Water Conc being tested	HQ	RISK	Pass or Fail?
	ug/l	ug/l	unitless	unitless		ug/l	unitless	unitless	
Petroleum EC Fraction									
AL_EC >5-6						0.00E+00	0.00E+00		
AL_EC >6-8						0.00E+00	0.00E+00		
AL_EC >8-10						0.00E+00	0.00E+00		
AL_EC >10-12						0.00E+00	0.00E+00		
AL_EC >12-16						0.00E+00	0.00E+00		
AL_EC >16-21						0.00E+00	0.00E+00		
AL_EC >21-34	148		4.63E-03			5.02E+02	1.57E-02		
AR_EC >8-10						0.00E+00	0.00E+00		
AR_EC >10-12	50.6		1.27E-01			1.71E+02	4.29E-01		
AR_EC >12-16	82.1		1.03E-01			2.78E+02	3.48E-01		
AR_EC >16-21						0.00E+00	0.00E+00		
AR_EC >21-34						0.00E+00	0.00E+00		
Benzene		5		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Toluene		1000				0.00E+00	0.00E+00		
Ethylbenzene		700				0.00E+00	0.00E+00		
Total Xylenes		1000				0.00E+00	0.00E+00		
Total Naphthalenes		160				0.00E+00	0.00E+00		
n-Hexane						0.00E+00	0.00E+00		
MTBE		20				0.00E+00			
Ethylene Dibromide (EDB)	0	0.01		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0	5		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene				0.00E+00	*for*	0.00E+00		0.00E+00	*for*
Benzo(b)fluoranthene				0.00E+00	*all*	0.00E+00		0.00E+00	*all*
Benzo(k)fluoranthene				0.00E+00	*cPAHs*	0.00E+00		0.00E+00	*cPAHs*
Benzo(a)pyrene				0.00E+00		0.00E+00		0.00E+00	
Chrysene				0.00E+00		0.00E+00		0.00E+00	
Dibenzo(a,h)anthracene				0.00E+00		0.00E+00		0.00E+00	
Indeno(1,2,3-cd)pyrene				0.00E+00		0.00E+00		0.00E+00	
Sum	**280.7**		2.34E-01	0.00E+00		9.51E+02	7.92E-01	0.00E+00	

1. All data must be numeric values. Use of alphabetical characters (i.e., "ND", "NA", "<", ">", or "=") will cause an error.
2. Try to avoid double counting: When entering the concentration of petroleum EC fraction into the data entry cell make sure you subtract the concentration of individual substances from the appropriate EC fraction. (See User's Guide)

Current Condition

TPH, ug/l= 280.7
HI= 2.34E-01
Cancer RISK= 0.00E+00
Pass or Fail?

Adjusted Condition

TPH, ug/l= 951.364
HI= 7.92E-01
Cancer RISK= 0.00E+00
Pass or Fail? Pass

Please check WAC 246-290-310!

Exposure Parameters for Non-carcinogens		Units
Average Body Weight, ABW	16	kg
Unit Conversion Factor, UCF	1000	ug/mg
Drinking Water Ingestion Rate, DWIR	1	l/day
Drinking Water Fraction, DWF	1	unitless
for Carcinogens		**Units**
Average Body Weight, ABW	70	kg
Unit Conversion Factor, UCF	1000	ug/mg
Averaging time, AT	75	yr
Drinking Water Ingestion Rate, DWIR	2	l/day
Exposure Duration, ED	30	yr
Drinking Water Fraction, DWF	1	unitless

TABLE E-5
EXPOSURE ASSUMPTIONS FOR FUTURE ON-SITE CONSTRUCTION WORKERS - SUBSURFACE SOIL
Darling International, Inc.
2041 Marc Avenue, Tacoma, WA

Scenario Timeframe:	Future
Medium:	Subsurface Soil
Exposure Medium:	On-site Subsurface Soil
Receptor Population:	Construction Worker
Receptor Age:	Adults

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation
All	Cs	EPC in Subsurface Soil	mg/kg	Chemical Spec.	Max Detect (table D-1)	
	EF	Exposure Frequency	days/year	90	(1)	
	ED	Exposure Duration	years	1	(1)	
	BW	Body Weight	kg	70	EPA 1989	
	ATc	Averaging Time (Cancer)	days	27,375	EPA 1997	
Incidental Ingestion	IR	Ingestion Rate of Soil	mg/day	330	EPA 2001	LADD (mg/kg-day) =
	FI	Fraction Ingested from Contaminated Source	unitless	1	(1)	Cs x IR x FI x EF x ED x CF x 1/BW x 1/ATc
	CF	Conversion Factor	kg/mg	1.00E-06	--	
Dermal Contact COPCs in soil	CF	Conversion Factor	kg/mg	1.00E-06	--	LADD (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2/day	2,500	WAC 173-340-745	Cs x SA x AF x CF x EF x ABS x
	AF	Adherence Factor	mg/cm^2	0.3	EPA 1997	ED x 1/BW x 1/ATc
	ABS-PAHs	Dermal Absorption Factor - PAHs	%	0.13	WAC 173-340	
Inhalation of COPCs in Dust	Ca	EPC in Air	mg/m^3	Chem Spec.	EPA 1996	Ca = Cs x 1/PEF
	PEF	Particulate Emission Factor (Ambient Air)	kg/m^3	6.6 E+08	EPA 1996	LADD (mg/kg-day) =
	IRH	Inhalation Rate	m^3/hr	1.5	EPA 1997	Ca x IRH x ET x EF x ED x 1/BW x 1/ATc
	ET	Exposure Time	hr	8	(1)	

(1) Professional Judgment

Sources:
EPA 1989. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EPA 1996. Soil Screening Guidance: Users's Guide Publication 9355.4-23.
EPA 1997. Exposure Factors Handbook. EPA /600/P-95/002 Fa.
EPA 2001. Draft Supplemental Soil Screening Level Guidance. OSWER 9355.4-24. March.

TABLE E-6

TOXICITY CRITERIA FOR COPCs[1]

Darling International, Inc

2041 Marc Avenue, Tacoma, WA

Constituent	Cancer Slope Factors (mg/kg-day)$^{-1}$			Reference Doses (mg/kg-day)		
	Oral	Inhalation	Dermal[2]	Oral	Inhalation	Dermal
Benzo(a)anthracene	0.73	NA	0.82	NA	NA	NA
Benzo(a)anthracene	0.73	0.61	0.82	NA	NA	NA
Benzo(a)pyrene	7.3	6.1	8.2	NA	NA	NA
Benzo(b)fluoranthene	0.73	0.61	0.82	NA	NA	NA
Benzo(k)fluoranthene	0.73	0.61	0.82	NA	NA	NA
Chrysene	0.073	0.061	0.082	NA	NA	NA
Dibenz(a,h)anthracene	2.92	2.44	3.3	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.73	0.61	0.82	NA	NA	NA

Gastrointestinal Absorbance Factor (GE abs)[3] - PAHs 0.89

[1] WA Ecology-recommended toxicity criteria for carcinogenic PAHs, (CalEPA, 1994 per CLARC VER 3.0 2001).

[2] Dermal Adjusted CSF=oral CSF/GE abs

[3] WA Ecology-recommended GE abs (CLARC VER 3.0 2001).

NA = Not available