November 26, 2008

Ms. Linda Holecek
King County Water/Land Resources Division
Department of Natural Resources and Parks
201 South Jackson Street, Suite 600
Seattle, Washington 98104

Mr. Ryan Larsen
City of Tukwila
6200 Southcenter Boulevard
Tukwila, Washington 98188

Subject: Evaluation of Soil Disposal Options and Estimated Costs
Carosino Property/Duwamish Gardens Project
11245/11269 East Marginal Way South
Tukwila, Washington
Work Order No. 14, Contract No. E00025E

Dear Ms. Holecek and Mr. Larsen:

This letter presents current disposal options and associated pricing for use in planning the appropriate disposal of "contaminated" soils to be excavated as a part of the City of Tukwila's Duwamish Garden Project. We understand the City plans to excavate an estimated 35,000 to 40,000 cubic yards of soil to create a tidal marshland adjacent to the Duwamish River. Camp Dresser & McKee Inc. (CDM) is providing environmental services related to this project for King County under Work Order No. 14, Contract No. E00025E.

Site Conditions

CDM reviewed a Phase II and Supplemental Phase II Environmental Site Assessment (ESA) completed for Sound Transit on the site by Gary Struthers Associates, Inc (GSA) in 2004. During these two assessments, GSA conducted surface and subsurface soil sampling and analyzed for dioxins and furans, organochlorine pesticides, petroleum hydrocarbons, semi-volatile and volatile organic compounds, and metals. CDM also conducted a supplemental Phase II ESA in October 2008. Detected contaminants in soil included: lube oil range petroleum, bromomethane, 2-butanone, benzene, ethylbenzene, xylenes, barium, chromium, lead, pesticides (DDT, dieldrin, chlordane), dioxins/furans, and carcinogenic polycyclic aromatic hydrocarbons (cPAH). Overall, the concentrations of all these compounds were relatively low and considered typical to what would be expected for a property that had a 100+ year history of agricultural and small business uses. There were no indications of

inappropriate chemical disposal practices or hazardous chemical releases (i.e., leaking underground storage tanks).

Of the compounds detected, one or more of the samples contained concentrations slightly or moderately exceeding the State of Washington Model Toxics Control Act (MTCA) Method A or B soil cleanup levels. These cleanup levels are conservatively-based standards for protection of human health. One or more compounds in these and other soil samples also exceeded one or more terrestrial ecological-based values established in Table 749-3 of MTCA. These are conservatively-based protection standards for plants, wildlife, and soil biota. These ecological-based values are not established cleanup levels. The compounds that exceeded one or more of the MTCA cleanup levels and terrestrial ecological standards included cPAHs, dioxins/furans, lead, benzene, dieldrin, and DDT.

Except for the benzene, which only slightly exceeded its Method A cleanup level, and for which its presence was not confirmed during CDM's subsequent Phase II ESA, all of these compounds are essentially nonvolatile, relatively immobile in the environment (i.e., affinity for organics in surface soils), and recalcitrant (i.e., do not readily break down). Therefore, when these compounds are present as a result of surficial deposition (such as through pesticide spraying, spreading ash over the ground surface, and airborne deposition) they are generally going to be limited to surficial soils. GSA's reports generally confirmed this, as the highest concentrations of these compounds occurred in samples collected from the top one foot of soil. However, low levels (i.e., not exceeding any standards) of pesticides, cPAHs, and dioxins/furans were detected in one or more deeper samples (5-10 ft samples).

Soil Disposal

Options

In general, there are four options for soil disposal: 1) at a dangerous waste facility, 2) at a Subtitle D landfill, 3) treatment followed by disposal as clean fill, and 4) at a clean fill site. Option 3, for example, may include thermal desorption of petroleum hydrocarbon contaminated soil to destroy the organic contaminants and then reuse as clean fill. The ultimate disposal for soils under Option 4 may include several scenarios. Clean soils may be used to fill quarry pits. Clean soils may also be segregated and sold as clean fill for sites under development or made into topsoil and distributed to the general public. Disposal costs for each of these options is generally in the order presented, with Option 1 being the highest and Option 4 being the lowest. Trucking fees can also influence this order of costs, depending upon the distance of the most local disposal facility.

Designating Wastes for Disposal

Disposal of soils that designate as dangerous waste are regulated under the Dangerous Waste Regulations (WAC 173-303). These regulations are very specific. Based on available analytical data and historic land use, there is no reason to believe that any of the site soils would classify as dangerous waste. Disposal of soil as a dangerous waste would be prohibitively expensive.

Requirements and guidance for disposal of soils that contain contaminants, but do not designate as dangerous are far less specific. Solid Waste Handling Standards (WAC 173-350) which regulate the disposal of soils are vague. For example, "clean soils" are any soils that are not dangerous wastes or contaminated soils. The definition of "contaminated soils," as follows, is fairly vague and open ended:

> "Soils removed during the cleanup of a hazardous waste site, or a dangerous waste facility closure, corrective actions or other clean-up activities and which contain harmful substances but are not designated dangerous wastes. "

It is generally accepted that there is a low liability involved with the disposal of soils that contain contaminants, but are not designated as dangerous/hazardous, at RCRA Subtitle D landfill facilities. These facilities are managed to safely and appropriately handle such soils. Before accepting such soils the generator is required to provide appropriate analytical data and other information regarding the source of contaminants and the landfill reviews this internally before accepting the material. The generator must certify via a signature that the information provided to the landfill is accurate. Typically, soils exceeding MTCA Method A, B, or C cleanup levels are disposed of at landfills, unless of course, onsite or offsite treatment is a viable and economical alternative. However, contaminants in the subject property soils are not conducive for treatment, whether by thermal desorption, bioremediation, or other methods because of their recalcitrant nature.

Beyond WAC 173-350 there are no specific regulations or guidance documents that provide direction on the appropriate disposal methods for soils containing low level contaminant concentrations, specifically those containing less than MTCA Method A, B, or C cleanup levels. This became further complicated when MTCA adopted requirements for terrestrial ecological evaluations to ensure soil is protective of the environment (plants, animals, soil biota). Contaminant concentrations that are considered "safe" for various plants, animals, and soil biota may be much lower than what is considered "safe" for humans. Therefore, disposal options for soils containing any contaminants must consider the end use. For example, it may not be acceptable for soils containing detectable concentrations of contaminants to be made

into topsoil and marketed to the general public or to be used to fill a quarry pit located next to a salmon bearing river.

The Washington State Department of Ecology (Ecology) or the jurisdictional health department should be able to authorize disposal options for soils containing low level contaminants on a site by site basis; however, it has been the general experience by others that these entities are reluctant to make such determinations. The local disposal facility that accepts clean fill soils should also be capable of making such a determination. However, these facilities generally rely on the data and opinions provided by the generator. The disposal facility staff typically does not have the expertise to review and evaluate analytical data and sampling methods and then render an opinion as to the appropriateness of this fill for their site. In many instances no testing is required for soil disposed at these facilities. Typically, the facility only rejects reportedly clean soils when the delivered soil has an odor (i.e., hydrocarbons) or contains creosote treated timbers. In essence, it is incumbent upon the soil generator (i.e., the City) to establish the level of analytical testing (analytical methods, sample frequency, sample locations) and disposal method as the ultimate liability rests with the generator.

Contaminant Exceedances

Based on our review of the soil data collected by GSA there are areas of the site where surficial soils exceed one or more MTCA Method A or B soil cleanup levels. This appears to be the western end, northwest quadrant, and southeast quadrant (see attached Figure). In the southeast quadrant a composite surface soil sample contained 0.104 milligrams per kilogram (mg/kg) cPAH and 17.7 picograms per gram (pg/g) dioxins/furans, which slightly exceeded the Method A cleanup level for cPAHs (0.1 mg/kg) and the Method B cleanup level for dioxins/furans (11 pg/g). In the northwest quadrant a surface soil sample contained 0.7 mg/kg cPAHs and 40.3 pg/g dioxins/furans. In the western end, discrete soil samples contained dioxin/furan concentrations on the order of 12.8 and 50.8 pg/g. [1]

When the data are compared to the terrestrial ecological standards, there appear to be more widespread exceedances both in surficial and subsurface soils, as compared to the most stringent levels (i.e., 2 pg/g total dioxins and total dibenzofurans per Table 749-3 in MTCA).

[1] Dioxin/furan and cPAH concentrations are reported based on toxic equivalency methodology.

Alternatives for Site Soil Disposal

Invariably, if surficial soils were to be excavated concurrently with the remainder of the soils that are to be excavated from the site, dilution alone would reduce these contaminant concentrations to at least below Method A/B cleanup levels; however, WAC 173-350-200 specifically disallows this. Terrestrial ecological standards may also be exceeded in much of the excavated surficial soils. It is not expected that the subsurface soils would exceed terrestrial ecological standards, but that some soils may contain low contaminant concentrations. For these reasons, CDM recommends the following alternatives for site soil excavation and disposal:

Alternative 1 – Excavation and Disposal of Soil at a Subtitle D Landfill

a) Excavate the top one foot of soils throughout northwest quadrant, southeast quadrant and west end of the site as shown on the attached figure and dispose of these materials at a Subtitle D landfill.

b) Conduct confirmation soil testing at the base of the excavated areas. If any of the confirmation soil samples exceed Method A or B cleanup levels additional soil would be removed and landfill disposed. Continue to test the soil and excavate as necessary until applicable Method A or B cleanup levels are achieved.

c) Dispose of all remaining soils to be excavated for the project at a clean fill site with the stipulation that the material may only be used to fill a quarry pit or as fill soil on a commercial or industrial site. The material may not be used as topsoil, as fill on residential property, or on any site that would not meet the exclusion criteria for the terrestrial ecological evaluation (WAC 173-340-7491(1)(a through c)).

Alternative 2 – Excavation and Profiling of Topsoil Prior to Transport

a) Excavate the top foot of soils throughout the northwest quadrant, southeast quadrant and west end of the site as shown on the attached figure, stockpile this material on site and conduct further characterization sampling and analysis. If the stockpile samples do not exceed Method A/B cleanup levels the soil could be disposed of at a clean fill site as outlined in Alternative 1(c). Otherwise the soil would be disposed of at a Subtitle D landfill.

b) Conduct confirmation testing at the base of these excavated areas. If any of the samples exceed Method A/B cleanup levels, repeat step (a) for the area of concern.

c) Dispose of remaining excavated soils the same as described in Alternative 1(c).

Cleanup Cost Estimate and Assumptions

Table 1 outlines the estimated additional costs associated with the two alternatives. That is, we are not estimating the total cost of soil removal, but only the added cost to designate and remove potentially contaminated soil. The cost estimate includes the additional effort on the part of the consultant for planning and coordination, soil testing that would be required for each Alternative (as opposed to not having to conduct any additional soil testing) and the estimated costs for disposal.

Either alternative will require an added degree of planning and coordination over simply excavating and disposing of all soils as clean fill without further testing. Without proper planning and coordination, the overall costs could be increased greatly, particularly if the soil is rejected at the last minute, or if the contractor has to schedule a large downtime between phases. Pre-planning efforts must include identifying and working with the disposal facility, determining contingencies, and coordinating the work. Further assumptions are outlined below.

- The contractor is 40 hour Haz Mat health and safety trained.
- Mobilization and demobilization costs are not included. They are a part of the overall excavation for the property. However, and additional $5,000 was added to each cost estimate in an effort to cover either down time or remobilization.
- Samples collected from the stockpile and excavation will be analyzed on a standard 3 week turnaround.
- The contractor will coordinate other work to occur while waiting on analytical results.
- There will be no additional sampling or contaminated soil disposal beyond the first round.
- The cost is based on price information obtained during October 2008.
- A brief summary report will be prepared at the end of the work, which transmits the analytical data and contains documentation regarding the final disposition of the soil. The report is not intended to be submitted to Ecology.
- For Alternative 2, none of the soil will require disposal at a Subtitle D facility.

- Trucking fees are not included as it is assumed that the trucking will be approximately the same however the soil is disposed of.

The estimated costs are $93,300 for Alternative 2 and $206,600 for Alternative 1. The estimate for Alternative 2 does not include a cost for soil disposal because it would not be an additional cost to the project. Therefore, it is unrealistic to compare the costs of the two alternatives against each other, unless soil disposal at a clean fill site can be obtained for free. The cost for soil disposal at a Subtitle D landfill is fairly well established. However, the cost to dispose of clean fill varies substantially, from essentially free to as much as $25 per ton. To provide a more conservative cost comparison for the two alternatives, CDM backed out the cost for soil disposal at a clean fill site from Alternative 1, assuming a tipping fee of $18/ton ($56,400). Taking this into account results in an *additional* project cost for Alternative 1 of $150,200.

Recommendations

We have outlined what we believe are conservatively protective, yet realistic alternatives that comply with the intent of the solid waste regulations as they relate to the appropriate disposal of soils containing low concentrations of contaminants. However, CDM recommends consulting with an environmental attorney to help guide the final decision regarding soil disposal.

We appreciate the opportunity to prepare this evaluation of disposal options and planning cost estimate. If you have any questions, please call us at (425) 453-8383.

Very truly yours,

Pamela J. Morrill, LHG
Senior Scientist
Camp Dresser & McKee Inc.

Lance E. Peterson, LHG
Senior Hydrogeologist
Camp Dresser & McKee Inc.

Attachments

cc: Mr. James Neely, King County