ON-SITE SOILS

I. Summary:

Based on samples collected during both the FI and previous investigations, and as discussed in Section 5.0 and Appendix A, COCs are present in some on-site soils above risk-based screening levels for both the direct exposure and vapor intrusion pathways. Direct contact would include those exposures related to immediate or near contact with soils: inhalation of dust or vapors, absorption through the skin or mucous membranes, and ingestion of soils. Vapor intrusion exposures would result from the evaporation of volatile COCs from the soils, and the subsequent accumulation of vapors in indoor air spaces used by personnel. The COCs that are present in on-site soils at concentrations above direct contact RBCs are dieldrin, dinoseb, and aldrin; the COCs exceeding vapor intrusion RBCs are chloroform and 1,2-dichloroethane (1,2-DCA). Figure 3 (vapor intrusion) and 4 (direct contact) illustrate the locations where these exceedances are present.

Most of these soil exceedances underlie the Process Areas of the Facility, although there are a few in other areas. Within the Process Areas, these exceedances exhibit a generally scattered distribution. This distribution is consistent with these COCs having been sourced from multiple releases at different locations within the Facility.

Despite the generally scattered distribution of COCs at elevated concentrations, there is a significant locus of exceedances in the vicinity of the Former Dinoseb Disposal Ponds, near the Pump Shop. In addition, Perched Zone groundwater exhibits the highest observed concentrations of 1,2-DCA beneath the former Dichloroaniline Unit (Unit 6) (Figure 5), which indicates the likely presence of elevated 1,2-DCA in soils beneath this unit.

Given the suspected nature of Facility releases (i.e., multiple releases from varied source areas) it is likely that there are localized areas of elevated COCs in soils across the Facility, including areas not previously observed during historical or recent investigative work. The potential presence of such “pockets” of elevated COCs should be considered during the remedy evaluation and selection process.

II. Alternatives Considered:

The following remedy alternatives were evaluated for soils:

Soil Remedy Alternative S1—Exposure Control—Reducing the potential for workers and the public to be exposed to soils through a combination of institutional and engineering controls.

Soil Remedy Alternative S2—*In Situ* Stabilization—Reducing the potential leachability and mobility of soil constituents in selected geographic areas by mixing the soils in place with a stabilizing material.

Soil Remedy Alternative S3—Excavation with Off-Site Disposal as Solid Waste—Removing contaminated soils from the Facility, and replacing them with clean backfill.

Soil Remedy Alternative S4—Soil Vapor Extraction—removing VOCs from contaminated soils.

Soil Remedy Alternative S5—No Further Action

III. Evaluation of Alternatives:

Soil Remedy Alternative S1 – Exposure Controls

An exposure control approach is not intended to remove or destroy COCs in soils. Instead, it is intended to prevent current and future exposure pathways from becoming complete. Although the COCs would still be present, the public and site workers would not be exposed to harmful levels of these COCs. Exposure control would be achieved through a combination of engineering and institutional controls, as follows:

- A soil cover consisting primarily of asphalt pavement, which will be constructed across the Process Area. Following demolition of the above ground portions of site buildings and process units (see Section 7.0 of this FS), and the plugging of storm drains and other underground structures, the Process Area will be covered with a surface of asphalt pavement, including any needed base material. This pavement will be constructed in a manner that is suitable for normal commercial and industrial vehicle traffic, including semi-tractor trucks. The pavement will be continuous with foundations and related concrete structures that are left in place post-demolition. In addition, any significant breaches in the integrity of existing foundations, pads, or other concrete structures within the cover footprint will be repaired as a part of cover construction. The pavement and existing at-grade concrete structures together will comprise the soil cover in the Process Area. The anticipated footprint of this cover is shown on Figure 7.

- A soil cover consisting of geotextile overlain with approximately one foot of clean, low permeability soils, which will line the storm water collection ditch area on the southeast portion of the process areas (Figure 7). This geotextile/soil cover will be graded to maintain drainage to the south, and revegetated. Until revegetation is complete, the area will be monitored for excessive erosion, and repaired as needed.

- Institutional controls, including deed notices, ordinances, restrictive covenants, and other applicable measures, that would:

  i. Provide information to potential future buyers of the Facility property of the presence and location of soil COCs.
  ii. Limit the use of the Facility property to commercial/industrial activities, and prohibit certain non-industrial commercial uses (e.g., health care or children's day care) that would create an unacceptable risk scenario.
  iii. Require the installation and maintenance of site control and security measures, such as fencing, to limit public access to the Facility property. These institutional controls would also limit activities that could disturb either the soils or the cover described above. Require the prompt and complete repair of any disturbance of the soil cover
  iv. For any activity that would involve soil disturbance, require:

— Characterization of the levels of COCs in soil or water that would be contacted during the disturbance activity.

— The utilization of personnel, equipment, and methods appropriate for work with soils containing those COCs.

— The management of soils, waters, or similar wastes generated from such activities in a manner that complied with state and federal regulations.

v. Impose requirements for any new construction where there is the potential for unacceptable vapor intrusion risks. Within these areas, the design and construction of any new buildings or similar enclosed structures would have to include controls to limit the intrusion and accumulation of VOC vapors from underlying soils. The controls could include, but would not be limited to:

— An assessment of soil vapor levels at the specific location of the planned structure,

— The construction of passive venting systems for crawlspaces, the exclusion of basements, and/or

— The use of vapor barriers and VOC sensor/alarm systems.

As depicted in Figure 7, these institutional controls would be implemented across the entirety of the Facility property, with the exception of the wooded area west of the Wastewater Treatment Ponds.

Soil Remedy Alternative S2 –*In Situ* Stabilization

The *in situ* stabilization (ISS) approach is not intended to remove or destroy COCs in soils, although some loss of VOCs from evaporation during soil mixing is a common ancillary effect of this remedy. Instead, ISS is intended to reduce the leachability and mobility of COCs in soil. With their mobility reduced, COCs are less likely to migrate from soils to groundwater, effectively reducing the source of groundwater impact. Stabilized soils also typically pose a lower risk than unstabilized soils with respect to both vapor intrusion and direct exposure.

ISS would require the removal of all surface improvements (including foundations), pavements, utilities, and other infrastructure in the areas to be treated. Once this removal is completed, soils would be excavated and mixed with a stabilizing material (the stabilant) using specially-equipped augers, trackhoes, or other equipment. This mixing would be performed primarily within the boundaries of the soil excavation. The stabilant may be fly ash, Portland cement, or another pozzolanic material. The preferred stabilant and mix ratios to meet remedial goals would be determined as a part of the Remedial Design process (see Section 10.0). Excavation and mixing would extend to approximately the top of the Perched Zone, at a typical depth of 17 feet.

At the conclusion of ISS, soils would be graded for desired drainage and remain in place within the excavation. Note that ISS often results in a slight volumetric increase in soil volume, so there may be a slight increase in the ground surface elevation within the ISS area.

At the Facility, ISS could be performed as either an area-wide or a focused approach. These differ as follows:

- Area-wide approach – This approach would address the entire Process Area portion of the Facility, as shown on Figure 8A.
- Focused approach – This approach would target specific areas ("hot spots") known to represent areas of waste disposal or elevated COCs, and stabilize those areas. For example, as shown on Figure 8B, ISS would target the Former Dinoseb Disposal Pond area. This approach would not attempt to address all areas of soil contamination at the Facility, but to immobilize a large fraction of the soil COCs through the stabilization of a geographically defined source area.
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Soil Remedy Alternative S3—Excavation with Off-Site Disposal as Solid Waste

Excavation with off-site disposal permanently removes soil COCs from the Facility, through bulk removal of contaminated soils and their permanent placement in an off-site disposal facility. Excavation with off-site disposal would require the removal of all surface improvements (including foundations), pavements, utilities, and other infrastructure. Once this removal is completed, soils would be excavated and segregated by waste classification (i.e., hazardous vs. non-hazardous). Hazardous and non-hazardous waste soils would remain segregated through the remainder of the remedy process. Soils would be transferred to container trucks and transported from the site to licensed hazardous and non-hazardous solid waste disposal facilities. Excavation would extend to approximately the top of the Perched Zone, at a typical depth of 17 feet.

Soils from the sidewalls of the resulting excavation would be analyzed at completion to confirm that cleanup objectives had been met, with additional excavation as necessary to address any locations identified to still have elevated COCs. As soil removal was completed, the excavation would be backfilled with clean fill. This fill would have to be purchased and imported from a local supplier, since there is no on-site source of backfill. Backfill would be graded for desired drainage.

Like ISS, excavation could be performed in either an area-wide or a focused "hot spot" approach. These differ as follows:

- Area-wide approach – This approach would address the entire Process Area portion of the Facility, as shown on Figure 9A.
- Focused approach – This approach would target specific areas ("hot spots") known to represent areas of waste disposal or elevated COCs, and remove soils from those areas. For example, as shown on Figure 9B, excavation would target the Former Dinoseb Disposal Pond area. This approach would not attempt to address all areas of soil contamination at the Facility, but to remove a large fraction of the soil COCs through the excavation of a geographically defined source area.

Soil Remedy Alternative S4—Soil Vapor Extraction

Soil vapor extraction, or SVE, utilizes wells or trenches to extract the air that fills much of the pore space in soils above the water table. As this air is withdrawn, vapor-phase COCs contained in the air are also removed. This removal will continue as evaporation of COCs in the subsurface transfers more chemical mass into the air being removed. SVE is most effective in relatively permeable material, and on volatile chemicals. Ancillary reductions of semi-volatile organics are sometime observed due to biologic action, however, in cases where SVE increases the oxygen content in soil gas.

The primary objective of SVE would be to improve groundwater quality by reducing the mass of VOCs that could ultimately reach Perched Zone and Alluvial Aquifer groundwater. SVE would also reduce vapor intrusion risks at the Facility, by reducing the mass of VOCs that behave as a source of organic vapors.

Given the primary objective cited above, SVE would be performed at locations with elevated VOCs either in soils or in the underlying Perched Zone groundwater (we are assuming that areas with elevated VOCs in Perched Zone groundwater are likely to be overlain by elevated VOCs in soils). The SVE system configuration under this area-wide approach is shown on Figure 10A. Alternatively, Figure 10B depicts how SVE could be focused on areas of elevated 1,2-DCA, in particular, rather than on volatile COCs in general. Under this focused approach, the SVE work would be concentrated in two areas based on Perched Zone groundwater levels of 1,2-DCA: at the former Unit 6, and at the former Unit 4 and 5 area.

Based on the shallow depth to water and high clay content of soils at this location, SVE will utilize a close extraction well spacing and relatively low vacuum pressures. For the purposes of this FS, a well spacing of approximately 20 feet and vacuums of approximately 40 inches of water are assumed. The extraction wells will be manifolded to the suction side of an extraction/treatment unit. Water condensing from the extracted vapor will be routed via a moisture knockout system to an aboveground tank. This water will be periodically collected for discharge to the Publicly Owned Treatment Works (POTW) intake at the Facility, subject to approval by the POTW operator.

Depending on the mass and character of VOCs removed and emitted to the atmosphere, it may be necessary to obtain an air emissions permit and/or perform emissions treatment in order to operate an SVE system. Emissions treatment options include activated carbon or thermal oxidation with scrubbing. The need for permitting and emissions treatment is more likely with larger systems (i.e., with the area-wide approach), since most emissions criteria are mass-based, with thresholds set in terms of tons of pollutant per year or pounds of pollutant per day.

The actual system specifications and operating parameters will be developed as a part of Remedial Design (discussed in Section 10.0). This will include any pilot testing and other activities needed to develop a final system design, as well as operating protocols.

Soil Remedy Alternative S5—No Further Action

Under a No Further Action (NFA) approach, no remedy would be implemented to address COCs in soils. Soils would be left in their existing condition, with no additional

measures taken to reduce COC concentrations, and no controls implemented to limit potential public exposure to the soils, or to vapor intrusion risks associated with the soils.

IV. Justification for Selection:

V. Selected Remedy/Site Plan: