Savannah River NUCLEAR SOLUTIONS℠

Remedial Investigation Report with Baseline Risk Assessment for the Automotive Repair Shop (716-A) Operable Unit (U)

SEMS Number: 62

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addressed under the Resource Conservation and Recovery Act corrective action program defined in the Savannah River Site Resource Conservation and Recovery Act Permit Renewal for the M Area and Metallurgical Laboratory Hazardous Waste Management Facilities.

As agreed to by the Core Team during the June 2025 scoping meeting, the deactivation and decommissioning final verification survey data was sufficient to support the update of the risk evaluation, and no additional data was needed. The investigative data collected beneath the Automotive Repair Shop (716-A) for subsurface soils (all depths) per the Work Plan characterization supports the contaminant migration and principal threat source material analyses.

This Remedial Investigation and Baseline Risk Assessment determined that there is no risk to human health and the environment at the Automotive Repair Shop (716-A) Operable Unit. There are no human health, ecological, principal threat source material, or contaminant migration constituents of concern, and the Automotive Repair Shop (716-A) supports unrestricted land use. According to United States Environmental Protection Agency guidance, if there is no current or potential threat to human health and the environment and no action is warranted, the Comprehensive Environmental Response, Compensation, and Liability Act §121 requirements are not triggered. If the requirements are not triggered, there is no need to evaluate other cleanup alternatives or to evaluate the No Action alternative against the nine remedy selection criteria in a Feasibility Study. Therefore, a Feasibility Study for the Automotive Repair Shop (716-A) Operable unit is not needed.

Upon United States Environmental Protection Agency and South Carolina Department of Environmental Services approval of this Remedial Investigation and Baseline Risk Assessment, a No Action Proposed Plan and No Action Record of Decision will be prepared for the Automotive Repair Shop (716-A).

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unit and is listed in Appendix C.4, Deactivation and Decommissioning (D&D) Facilities (or Remnants) That May Warrant Response Action of the FFA (FFA 1993).

The Core Team agreed in the post-RI Work Plan characterization scoping meeting held on June 11, 2025, that all data needs had been met and the existing data for the Automotive Repair Shop (716-A) OU was sufficient for performing the risk evaluation, PTSM evaluation, and the CM analysis. Preliminary evaluation of the data presented at the June 11, 2025, scoping meeting supported no problems warranting action for the Automotive Repair Shop (716-A) OU. Because no problems warranting action were identified, the Core Team agreed that a Feasibility Study (FS) was not needed, and the project team should proceed with preparation of a RI/BRA report for submittal by September 30, 2025. The proposed strategy also supports proceeding from the approved RI/BRA report to a No Action PP and No Action Record of Decision.

The *Savannah River Site Federal Facility Agreement Community Involvement Plan* (WSRC 1996) facilitates public participation in the decision-making processes. Public participation requirements (Section 113 and 117 of CERCLA) include the establishment of an Administrative Record File (ARF) that documents the selection of cleanup alternatives and provides for review and comment by the public on those alternatives. This RI/BRA is part of the ARF and will be available to the public at USDOE's Public Reading Rooms at the University of South Carolina-Aiken in Aiken, South Carolina, and the Thomas Cooper Library in Columbia South Carolina. A notice will be published in local newspapers when information is being compiled regarding the investigation and cleanup of the Automotive Repair Shop (716-A) OU. Additional repositories may be added and/or locations changed to better meet the needs of the public.

1.3 Operable Unit History

A Area, which is part of the larger A/M Area in the northwestern portion of SRS (Figure 1-1), previously served as the main administrative area for the SRS and includes several RCRA/ CERCLA units. Maintenance facilities, such as the Automotive Repair Shop (716-A), were also housed within A Area (Figure 1-2).

The Automotive Repair Shop (716-A) was a single-story structure constructed on a concrete slab and had an area of 3,903 square meters (m^2) (42,014 square feet [ft^2]) under roof. The structure

footprint is approximately 55 meters (m) by 110 m (180 feet (ft) by 360 ft). The structure was erected and occupied in 1953. The facility was constructed of a structural steel frame with the exterior walls enclosed in asbestos cement board (transite). The roof consisted of a single ply conventional membrane that was loose laid and covered with stone ballast. The building was used as an automotive repair shop containing service bays with offices, related storage areas, mechanical and electrical rooms. This facility also contained many vehicle lifting systems, battery charging and storage room, and brake repair area prior to decommissioning (Figure 1-3).

On the southeast side of Building 716-A, was the location of an outside underground waste oil storage tank, which was removed per underground storage tank regulations in the early 1990's. The waste oil storage tank was replaced by a new above ground system. An ancillary structure identified as the firewater valve house was located on the west side of Automotive Repair Shop (716-A). The area around the Automotive Repair Shop (716-A) is surrounded by asphalt and/or gravel pavement used for gas stations and parking spaces.

1.3.1 Previous Actions

The Facility Decommissioning Evaluation (FDE) for the Automotive Repair Shop (716-A) categorized the building as an "Other Industrial" Hazard Category facility and identified the Integrated Sampling Model (ISM) as the appropriate decommissioning model for this potentially contaminated facility (WSRC 2005b). As documented in the Decommissioning Project Final Report (DPFR) for the Automotive Repair Shop (716-A), fluid/oil stains in the maintenance areas, lubrication pit, side trench, hydraulic lifts, cylinders, and narrow trenches were cleaned and removed using strong surfactants and hydro/power washed (WSRC 2005a). The trenches and sumps were sampled following removal of the fluid/oil stains, and the sampling results were verified to be less than the applicable Savannah River National Laboratory (SRNL) Derived Concentration Guideline Levels (DCGLs) and CM thresholds. The DPFR concluded the building structure decommissioning activities had been completed and there were no contaminants of concern in these areas. The building structure was demolished to the foundation and penetrations greater than 5 centimeters (cm) (2 inches [in]) in diameter were grouted, including all pits associated with the automotive hydraulic lift systems. The clean concrete slab remains on its original footprint. ~~The Decommissioning Project Final Report (DPFR) for the Automotive Repair~~

~~Shop (716-A) concluded the building structure decommissioning activities had been completed using the ISM in 2005. The building structure was demolished to the foundation. The clean concrete slab remains on its original footprint and penetrations greater than 5 centimeters (cm) (2 inches [in]) in diameter were grouted, including all pits associated with the automotive hydraulic lift systems.~~

Because chemical operations only took place in the Spray Paint Room, the post-decommissioning final verification survey was restricted to the Spray Paint Room remnant concrete slab (WSRC ~~2005b~~2005c). Sixteen (16) sample locations composited in four sets of four samples were obtained for RCRA metals analysis (arsenic, barium, cadmium, chromium, lead, mercury [elemental], mercury [compounds], selenium, and silver) (Figure 1-5). Nine single samples were taken for volatile organic compounds (VOC) analysis (Figure 1-6). The DPFR documents the risk assessment that was conducted on the Spray Paint Room final verification sample results and a vadose zone contamination fate and transport model performed for the Automotive Repair Shop (716-A) OU concrete slab. As documented in the DPFR, there was no residual contamination at the Automotive Repair Shop (716-A) OU that exceeded the risk threshold and threshold levels that could impact the groundwater. The DPFR concluded that the remaining structure (i.e., remnant concrete slab) was free of hazards, both physical and chemical, and therefore warrants no further action (Figure 1-4).

Comments received by the USEPA and SCDES on the FDE and DPFR requested the SRS to conduct soil sampling for Target Analyte List/Target Compound List (TAL/TCL) constituents underneath the Automotive Repair Shop (716-A) OU remnant slab at the 103 Lubrication Pit area to determine whether there has been a release to the environment. Because the soil beneath the Automotive Repair Shop (716-A) Operable Unit remnant slab was outside of the scope (i.e., physical boundary) of the facility decommissioning project, the Automotive Repair Shop (716-A) Operable Unit was transferred to FFA Appendix C.4, *D&D Facilities (or Remnants) That May Warrant Response Action,* for further evaluation. In addition, a comment received from the USEPA on the FDE requested that all drain lines and/or sewer lines for the Automotive Repair Shop (716-A) OU be referred to, and further investigated by, the A-Area OU. Rather than deferring this scope to the A-Area OU, sampling beneath the remnant slab at the 103 Lubrication Pit and beneath the drain lines and/or sewer lines was performed in accordance with an approved RI Work

Plan for the Automotive Repair Shop (716-A) Operable Unit (SRNS 2024). Field work to support the RI Work Plan characterization was completed in December 2024. The RI discussed in this RI/BRA report is based on soil and concrete samples collected from the Automotive Repair Shop (716-A) OU.

1.4 Land Use

The Automotive Repair Shop (716-A) OU is located in an area designated for industrial use as defined by the *Land Use Control Assurance Plan for the Savannah River Site* (WSRC 1999). No current or projected future development of the OU is planned. Groundwater is not part of the OU and will be addressed under the RCRA corrective action program defined in the SRS RCRA Permit Renewal for the M-Area and Metallurgical Laboratory Hazardous Waste Management Facilities.

1.5 Natural Resource Trustees

The potential for natural resource injuries is documented by completing the NRIE Checklist (Appendix E). The purpose of the NRIE Checklist is to identify potential natural resource injuries associated with CERCLA remedial activities. If potential injuries are identified, consideration is given as to whether trustee involvement is needed. The checklist is a starting point in potential injury identification and is not intended to be all-inclusive. The checklist has been designed as a series of questions to help identify the potential for natural resource injuries and what resources may be affected. It is based on the pre-assessment screen in Title 43 Code of Federal Regulations (CFR) 11.13.

The USDOE, as a trustee of its land, is responsible for identifying resources of concern. SRS integrates components of the Natural Resource Damage Assessment and RI/FS processes to assess potential threats to natural resources during the remedial process. The intent is to prevent potential injuries to natural resources that can occur as the result of remediation activities and to mitigate, to the extent practical, any injuries that have already occurred. The list of trustees for the SRS is included in Table 1-1.

Based on the NRIE Checklist (Appendix E), natural resources have not been adversely affected by hazardous substances from the Automotive Repair Shop (716-A) OU. No irreversible or irretrievable resource losses are known to exist.

and extent (as well as fate and transport) of contamination, and developing preliminary remedial alternatives. In a complete pathway, exposure occurs at exposure points that may represent only a small portion of the entire exposure route. If there is no exposure point, then there is no exposure, and the pathway is considered incomplete.

2.3.1 Primary Sources of Contamination

The Automotive Repair Shop (716-A) contained service bays with offices, related storage areas, and mechanical and electrical rooms. A review of the Occurrence Reporting and Processing System (ORPS)/Site Item Reportability Issue Management (SIRIM) database from 1993 to 2005 indicated no evidence of any spills to the environment. However, motor oil stains were found in the maintenance areas, lubrication pit (Room 103), side trench, hydraulic lifts, cylinders, and narrow trenches. Based on process knowledge, chemical operations only took place in the Spray Paint Room. Routine operations within the Automotive Repair Shop (716-A) potentially contaminated portions of the facility.

2.3.2 Primary Sources Environmental Release Mechanism

The environmental release mechanism evaluated as a primary source of contamination to the Automotive Repair Shop (716-A) OU subunit are spills/leaks. Environmental release mechanisms for primary sources of contamination have been inactive since 2005.

2.3.3 Secondary Sources of Contamination

The secondary sources for the Automotive Repair Shop (716-A) are the concrete pad, under pad or building soil, and deep soil (all depths). The post-decommissioning final verification survey was restricted to the concrete slab in the Spray Paint Room. As previously described in Section 2.0, the preliminary HH risk evaluation concluded that there are no problems warranting action and the exposure pathway is considered incomplete for the concrete pad portion of the facility. In addition, there are no complete exposure pathways for wildlife receptors.

2.3.4 Secondary Sources Environmental Release Mechanism

Potential contaminants in the soil beneath the 103 Lubrication Pit Area and the drain/sewer lines may leach to groundwater above groundwater protection standards and additional sampling and

evaluation is needed for these soils beneath the remnant concrete slab to determine whether there has been a release to the environment.

2.3.5 Exposure Media

The Automotive Repair Shop (716-A) exposure media include air vapor/particulate, concrete, subsurface soil, deep soil to a depth of 51 m (167 ft) bgs, and groundwater (i.e. CM analysis).

2.3.6 Exposure Routes

The exposure routes for the Automotive Repair Shop (716-A) include inhalation, ingestion, and dermal contact. External radiation was not considered since this building was considered non-radiological.

2.3.7 Potential Receptors (Human Health)

The industrial worker is the most appropriate receptor scenario for assessing potential risks associated with the concrete and soil of the Automotive Repair Shop (716-A). The hypothetical resident scenario is protective of the industrial worker since the resident is a more conservative scenario to assess potential risk to human receptors. A comparison of exposure assumptions to potential human exposure scenarios at SRS is provided below:

Potential Receptor	Years	Days/Year	Hours/Day	Exposure Hours
Hypothetical Resident	26	350	24	218,400
Industrial Worker	25	250	8	50,000

Source: SRNS 2023~~a~~

Complete exposure pathways to potential human receptors for evaluation in this document are potentially industrial workers exposed to ~~deep~~ all soils should excavation activities occur. The PTSM evaluation addresses exposure to potentially highly toxic source material at all depths (Figure 2-8).

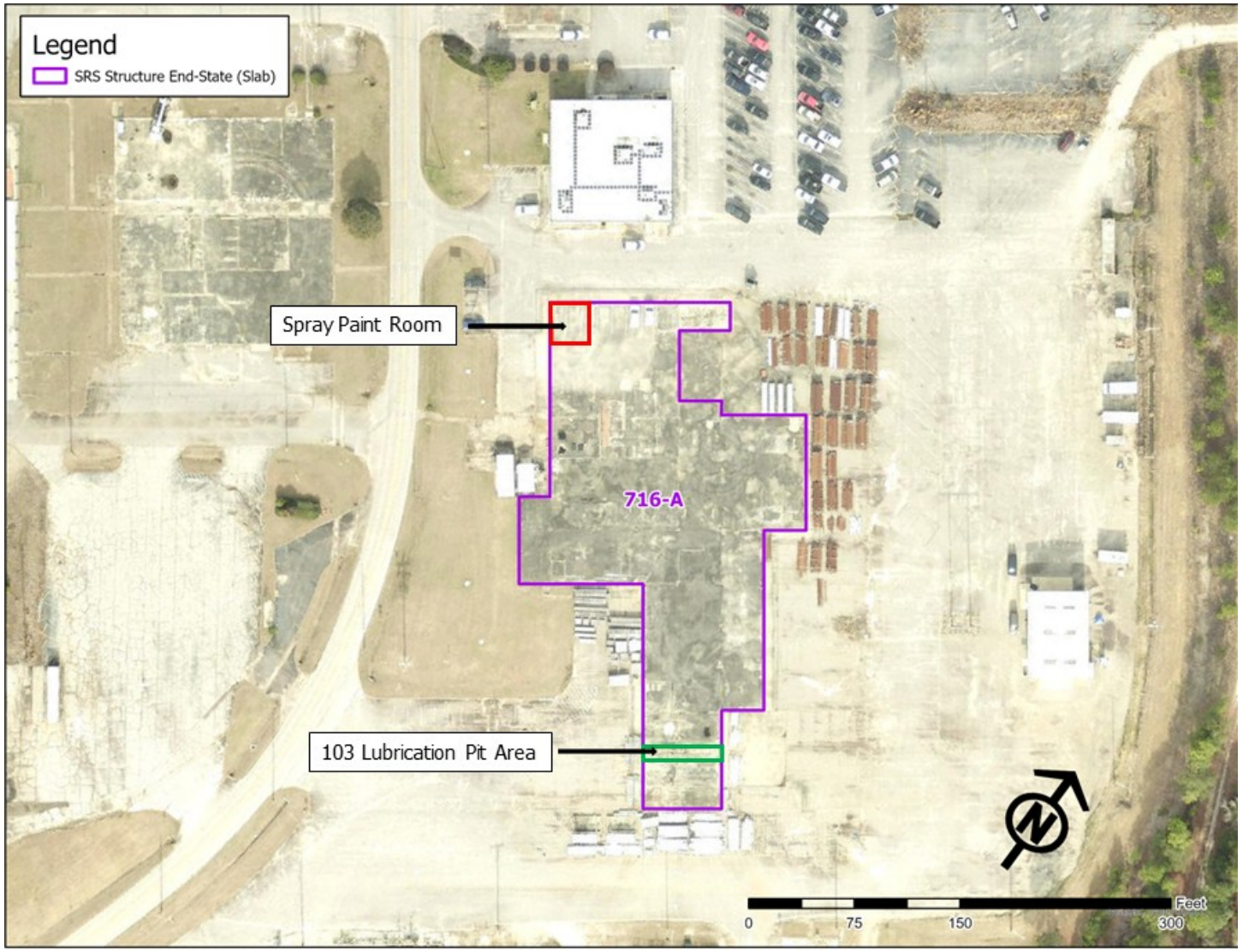


Figure 2-1. Location of Spray Paint Room and 103 Lubrication Pit Area within Building 716-A

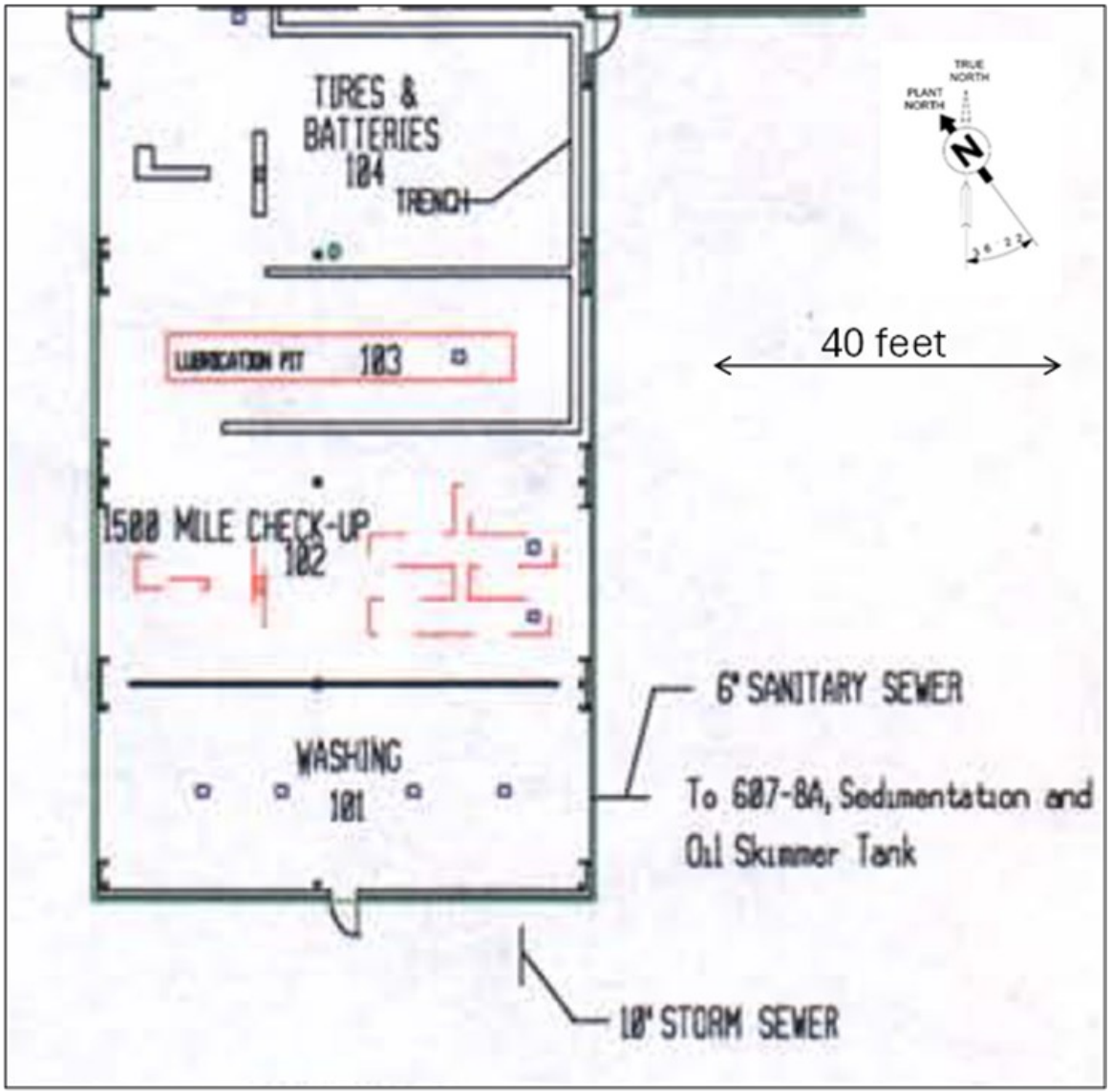


Figure 2-2. South End Floor Plan of Building 716-A

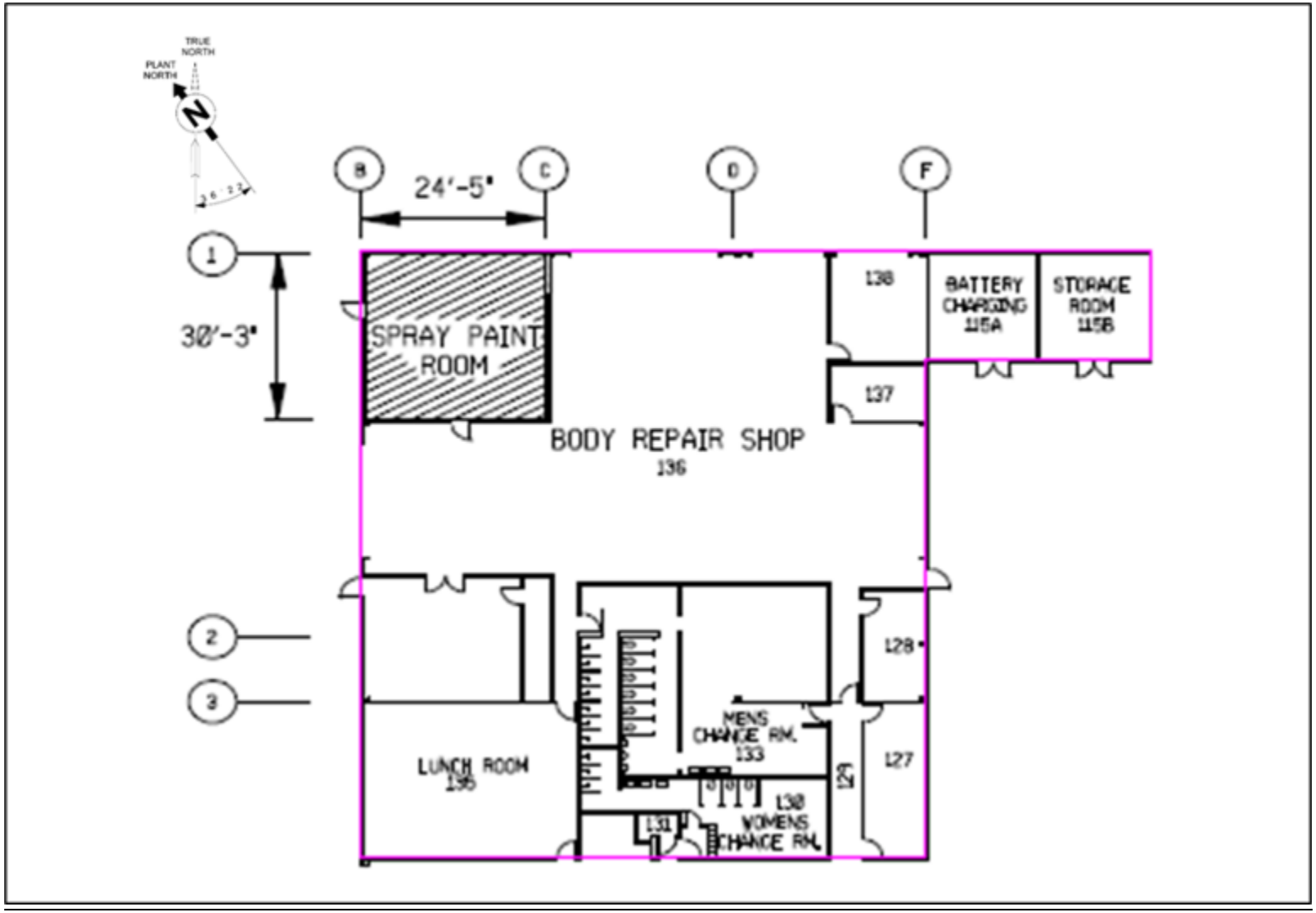


Figure 2-3. Northwest Corner Floorplan of Building 716-A



Figure 2-4. Overhead View of the 716-A Building Slab and Surrounding Areas

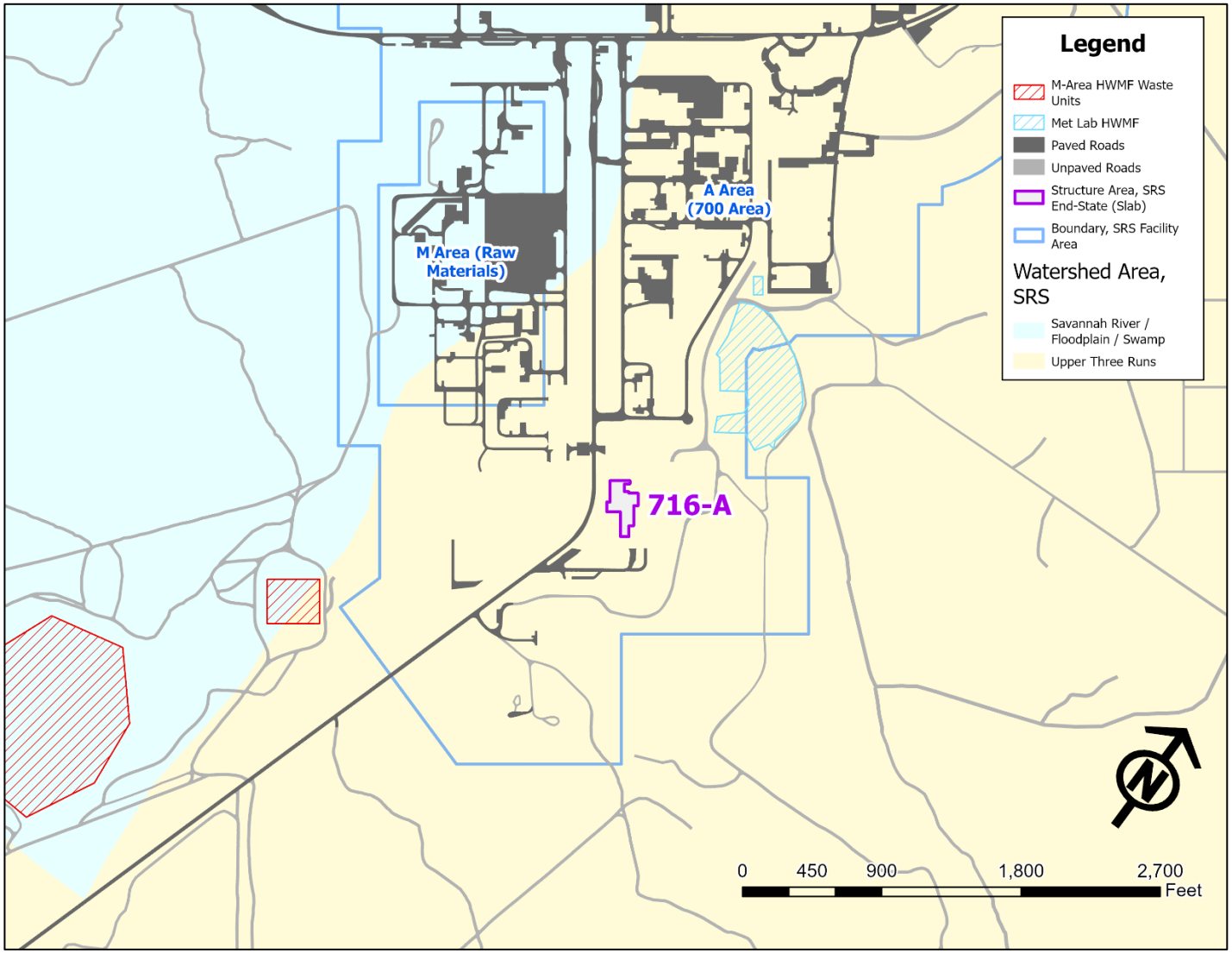


Figure 2-7. Watershed Map of Area Surrounding Building 716-A

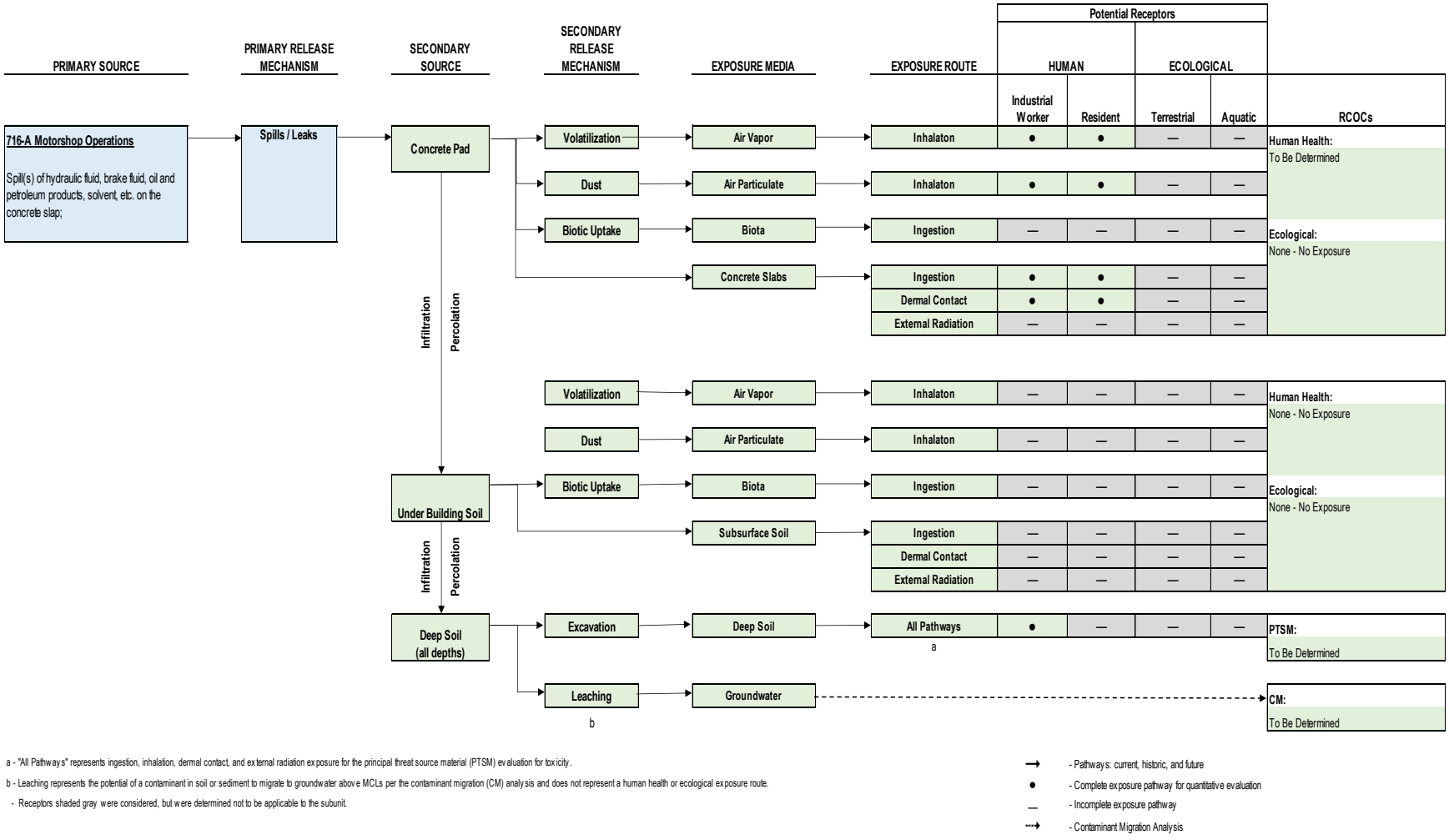


Figure 2-8. Preliminary Conceptual Site Model for the 716-A Automotive Repair Shop

3.0 REMEDIAL INVESTIGATION

This section described the collection, assessment, and evaluation of the data that identify the problem(s) warranting action from the investigation.

3.1 Operable Unit Investigation Overview

As previously discussed, the DPFR for the Automotive Repair Shop (716-A) concluded that the remnant concrete slab was free of hazards, both physical and chemical, and therefore warrants no further action. Comments received by the USEPA and SCDES on the FDE and DPFR requested the SRS to conduct soil sampling for TAL/TCL constituents underneath the remnant slab at the 103 Lubrication Pit area to determine whether there has been a release to the environment. In addition, a comment received from the USEPA on the FDE requested that all drain lines and/or sewer lines for the Automotive Repair Shop (716-A) OU be investigated.

A comprehensive approach was implemented to address potential impact to human health and the environment at the Automotive Repair Shop (716-A) OU. Characterization through soil sampling was conducted as proposed in the approved RI Work Plan (SRNS ~~2023b~~2024). Soil sampling was conducted beneath the Automotive Repair Shop (716-A) remnant concrete slab at the 103 Lubrication Pit and beneath the drain lines and/or sewer lines. Sample locations are presented in Figure 3-1.

3.2 Site Characterization and Data Usability

Characterization activities for soil media were conducted in 2024 for the Automotive Repair Shop (716-A) OU. No groundwater or surface water samples were collected.

Samples were collected from continuous soil cores from each boring, and lithologic descriptions were recorded. Rotosonic drilling and soil coring were utilized for sample collection at all six locations. The five locations (ARS-001-SB, ARS-002-SB, ARS-003-SB, ARS-004-SB, and ARS-006-SB) beneath the drain lines and/or sewer lines were continuously cored to a total depth of 17 m (57 ft) bgs, and samples were collected every 2 m (5 ft) through 15 m (50 ft). Additionally, the 103 Lubrication Pit location (ARS-005-SB) was continuously cored to a total depth of 51 m (167 ft) bgs, and samples were collected every 2 m (5 ft) through 15 m (50 ft) and every 3 m (10 ft)

thereafter to total depth. The total number of samples collected was 78. All samples were analyzed for all TAL/TCL constituents (excluding herbicides and pesticides). Appendix A provides the Investigation Data/Data Summary Tables.

The one deviation from the RI Work Plan was due to poor recovery of soil core in the first 6 m (21 ft) at location ARS-006-SB and no samples were collected in this interval. It is uncertain what caused the poor recovery in the first 6 m (21 ft) ft of core at ARS-006-SB. Its likely due to loosely compacted soil beneath the concrete slab being pushed away from the core barrel during drilling activities. Recovered material consisted of a water/soil slurry that contained a large amount of drilling fluids and was not able to be sampled as soil media. The loosely compacted soil could be explained by poor compaction during building construction activities. ARS-006-SB was located on the edge of the building footprint in close proximity to underground sewer lines. It is possible that water infiltrated through the transition between the concrete slab and the surrounding asphalt or that the sewer line had previously leaked. Either loosely compacted soil or excess water in the subsurface could have resulted in conditions causing poor recovery during drilling activities. The four samples that could not be collected from the first 6 m (21 ft) of core were distributed throughout the remaining core. Soil core and samples were successfully collected from 6 to 17 m (21 to 57 ft) at ARS-006-SB. Any contaminants present at this location would be expected to migrate through the loosely compacted soil into the deeper soil. The lack of contamination present in the soil samples collected from 6 to 17 m (21 to 57 ft) below grade at ARS-006-SB supports the conclusion that contamination is not present in this area. In addition ~~S~~soil core and soil samples were collected from approximately 0 to 6 m (0 to 21 ft) at ARS-005-SB (i.e., nearest soil boring located 12 m (40 ft) to the north) and the other four soil borings (i.e., ARS-001-SB through ARS-004-SB) with no results exceeding limits. SRS believes that the soil samples collected from 6 to 17 m (21 to 57 ft) at ARS-006-SB and the soil samples from the other five soil borings provide adequate coverage to eliminate any perceived data gap. Figure 3-2 presents a cross-section of the Automotive Repair Shop (716-A) OU soil beneath the remnant concrete slab. All of the soil results were utilized to assess the CM and PTSM constituents of concern (COCs). There were no Tier 1 CM COCs (Appendix B) or PTSM COCs (Appendix D) identified. Therefore, the contaminants at the Automotive Repair Shop (716-A) are not a potential source for groundwater contamination.

The risk evaluation process presented in historical D&D documentation do not align with the current methodology for evaluating human health risk in the Environmental Compliance and Area Completion Projects (EC&ACP) Regulatory Document Handbook (SRNS 2023~~a~~). To verify that the risk assessment conclusions of the DPFR for the Automotive Repair Shop (716-A) risk evaluation are still valid, the Core Team agreed to reevaluate the results of the D&D risk assessment using current EC&ACP risk evaluation protocols and threshold values (SRNS 2023~~b~~).

Risk-based threshold levels used in the reevaluation were obtained from the USEPA Regional Screening Levels (RSLs) website (USEPA 2024). Per SRS protocols, RSLs for soil media are multiplied by ten (10x) to obtain thresholds for concrete media (SRNS 2023~~a~~). This conversion acknowledges that the exposure assumptions for competent, hardened concrete are different from (i.e., less than) the exposure assumptions for more friable soil media.

Risk and hazard estimate calculations for the reevaluation of the Spray Paint Room remnant concrete slab were based on the maximum detected concentration of each analyte to provide the most conservative risk/hazard result compared to the RSL values. HH COCs for the residential and industrial worker risk scenarios are identified when both the HI and individual constituent hazard quotients exceed 1 for noncarcinogens and constituent-specific risk exceeds 1E-06 for carcinogens.

Any individual constituent that is identified as a COC is further evaluated in a refinement step. The refinement step is an uncertainty evaluation that includes an interpretive discussion of the applicable uncertainty factors (line of evidence) and a recommendation whether the constituent should or should not be identified as a RCOC. The results of this process determine if remedial actions need to be evaluated to protect HH receptors.

3.6 Ecological Risk Assessment Methodology

A quantitative ecological risk assessment for the Automotive Repair Shop (716-A) is not warranted. The remnant concrete slab does not provide any appreciable habitat, and a survey of the surrounding area indicates the physical setting does not provide adequate habitat for population level impacts to wildlife receptors since it is very small in size and located in an industrial setting. There are no problems warranting action from an ecological risk perspective.

3.7 Principle Threat Source Material Evaluation Methodology

The PTSM evaluation for the Automotive Repair Shop (716-A) OU is presented in Appendix D. The concept of principal threat waste and low-level threat waste, as developed by the USEPA in the National Oil Hazardous Substances Contingency Plan (NCP) (40 CFR 300.430[a][1][iii]), is to be applied on a site-specific basis when characterizing source material. Source materials include or contain hazardous substances, pollutants, or contaminants that act as a reservoir for migration to surface water, or air, or act as a source for direct exposure. The determination of whether the source materials present at a waste unit would be classified as PTSM is based principally on the USEPA guidance (USEPA 1991).

In determining whether the source should be preliminarily considered PTSM, the evaluation considers the cumulative effects of both the potential risk from carcinogenic constituents and the adverse health effects from noncarcinogens to human receptors. The toxicity assessment of the source material is based on the potential exposure of an industrial worker, which is the most appropriate receptor scenario at the Automotive Repair Shop (716-A) OU.

The source material (i.e., in soil) from all depth intervals is preliminarily considered to be PTSM if the cumulative risk exceeds one of the following toxicity threshold criteria:

- Carcinogens: greater than 1E-03 industrial worker risk
- Noncarcinogens: industrial worker HI greater than 10

If the threshold criteria for PTSM is not exceeded based on a maximum concentration, then PTSM is not present, and it is not necessary to carry the assessment into an uncertainty evaluation. An uncertainty evaluation is performed on potential PTSM constituents using similar criteria as that used for the identification of HH RCOCs. This evaluation includes, but is not limited to, assessing the potential for natural degradation, or lack thereof, that would reduce concentrations over time, as applicable.

3.8 Operable Unit

3.8.1 Automotive Repair Shop (716-A) Description

The Automotive Repair Shop (716-A) was decommissioned using the D&D ISM. Fluid/oil stains were removed during decommissioning, and the trenches and sumps were sampled to verify contaminants were less than DCGLs and CM threshold levels~~the applicable threshold levels~~. As documented in the DPFR, the post-decommissioning final verification survey of the Spray Paint Room remnant concrete slab concluded there was no residual contamination that exceeded the risk threshold or threshold levels that could impact groundwater. Therefore, the DPFR for the Automotive Repair Shop (716-A) concluded the building structure decommissioning activities had been completed, including waste disposal in accordance with federal and state regulations. The building structure was demolished to the foundation. The DPFR documented that the remnant concrete slab was free of hazards and warranted no further action. ~~The DPFR for the Automative Repair Shop (716-A) concluded the building structure decommissioning activities had been completed, including waste disposal in accordance with federal and state regulations. The building structure was demolished to the foundation.~~ The clean concrete slab remains on its original 55 m by 110 m (180 ft by 360 ft) footprint.

Comments received by the USEPA and SCDES on the FDE and DPFR requested the SRS to conduct soil sampling for TAL/TCL constituents underneath the remnant slab at the 103 Lubrication Pit area and beneath drain lines and/or sewer lines to determine whether there has been a release to the environment.

3.8.2 Automotive Repair Shop (716-A) Characterization and Data Summary

In accordance with the approved RI Work Plan (SRNS 2024), subsurface soils at six locations were collected in December 2024 (Figure 3-1). Five soil borings were continuously cored to a total depth of 17 m (57 ft) bgs, and one location was cored to a depth of 51 m (167 ft) bgs. A cross-section with sample depths is provided in Figure 3-2. From the six soil borings, a total of 70 regular samples, four split samples, and four field duplicate samples were collected. Samples were collected from continuous soil cores from each boring, and lithologic descriptions were recorded. The one exception was at location ARS-006-SB, where no samples were collected from the first 6 m (21 ft) of the boring due to poor soil recovery. Rotosonic sample collection was used

for all six locations. The five locations (ARS-001-SB, ARS-002-SB, ARS-003-SB, ARS-004-SB, and ARS-006-SB) beneath the drain lines and/or sewer lines were continuously cored to a total depth of 17 m (57 ft) bgs, and samples were collected every 2 m (5 ft) through 17 m (57 ft). Additionally, the 103 Lubrication Pit location (ARS-005-SB) was continuously cored to a total depth of 51 m (167 ft) bgs, and samples were collected every 2 m (5 ft) through 15 m (50 ft) and every 3 m (10 ft) thereafter to total depth. The total number of samples collected was 78.

3.8.3 Automotive Repair Shop (716-A) Nature and Extent of Contamination

Constituents identified as USCs for the Automotive Repair Shop (716-A) OU are shown in Appendix A. There were 33 constituents that were detected from all the soil results collected at the six soil borings. Maximum soil concentrations from those 33 detected constituents were compared against two-times (2X) the SRS mean background concentrations (WSRC 2006), if applicable, to determine if the constituent was a USC. Constituents above detection limits and without an SRS mean background were considered USCs. Thirty-one constituents were identified as USCs (i.e., acetone; aluminum; arsenic; barium; benzo(b)fluoranthene; beryllium; bis(2-ethylhexyl)phthalate (DEHP); butyl ~~(2-ehtylhexyl)~~benzyl phthalate; calcium; chromium; cobalt; copper; dichloromethane (methylene chloride); diethyl phthalate; di-n-butyl phthalate; iron; lead; magnesium; manganese; mercury; nickel; n-dioctyl phthalate; potassium; selenium; silver; sodium; thallium; toluene; trichloroethylene; vanadium; and zinc). The primary contaminants at the Automotive Repair Shop (716-A) OU are inorganics (metals) and VOCs. Soil sampling at the Automotive Repair Shop (716-A) OU is sufficient to determine the nature and extent of contamination and the presence or absence of problems warranting response action.

3.8.4 Automotive Repair Shop (716-A) Contamination Fate and Transport Evaluation Results

A contaminant migration analysis using VZCOMML® was performed for the subsurface soil data collected at the six locations in accordance with the approved RI Work Plan (SRNS 2024). The complete analysis is detailed in Appendix B. None of the 31 USCs failed the Tier I screen. Therefore, no Tier II simulations were conducted.

Results of the CM analysis confirm that the contaminants at the Automotive Repair Shop (716-A) OU are not a potential source for groundwater contamination.

3.8.5 Automotive Repair Shop (716-A) Human Health Risk Assessment Results

The risk information presented in the DPFR is based on the final verification survey data from concrete samples collected from the Spray Paint Room and evaluated using protocols that were developed by the SRNL (i.e., comparison to SRNL DCGLs) in the 2004-2005 timeframe. The DPFR concluded that there were no problems warranting action for human receptors at the Automotive Repair Shop (716-A) OU remnant concrete slab. To verify that the risk assessment conclusions of the DPFR for the Automotive Repair Shop (716-A) risk evaluation were still valid, the Core Team agreed to reevaluate the results of the DPFR risk assessment using current EC&ACP risk evaluation protocols and threshold values (SRNS 2023~~a~~).

The reevaluation of the original data set from concrete samples collected in the Spray Paint Room using current protocols is provided in Appendix C. The updated residential scenario had a noncarcinogenic HI = 0.~~021~~ 9 and cancer TCR = 4.~~1~~E-07. The updated industrial worker scenario had an HI = 0.~~003~~ 05 and cancer TCR = 9.~~4~~E-08. Because no HH COCs were identified, no uncertainty evaluation was needed. The updated risk evaluation confirmed the conclusions of the DPFR that there are no problems warranting action for human receptors at the Automotive Repair Shop (716-A).

3.8.6 Automotive Repair Shop (716-A) Ecological Risk Assessment Results

A quantitative ecological risk assessment for the Automotive Repair Shop (716-A) OU is not warranted. The remnant concrete slab does not provide any appreciable habitat, and a survey of the surrounding area indicates the physical setting does not provide adequate habitat for population level impacts to wildlife receptors since it is very small in size and located in an industrial setting.

There are no problems warranting action from an ecological risk perspective.

3.8.7 Automotive Repair Shop (716-A) Principal Threat Source Material Evaluation Results

A PTSM evaluation was performed for the subsurface soil data collected at six locations in accordance with the approved RI Work Plan (SRNS 2024). Source material is considered PTSM if the cumulative risk is greater than 1E-03 or the HI is greater than 10 for the industrial worker. Results of the PTSM evaluation presented in Appendix D show that the HI is 6.57E-01 and the

cumulative risk is 1.09E-05 (Appendix D). No PTSM RCOCs are identified for the Automotive Repair Shop (716-A) OU soil media.

3.8.8 Automotive Repair Shop (716-A) Summary of Problems Warranting Action

No CM, HH, ecological, or PTSM RCOCs were identified for the Automotive Repair Shop (716-A) OU. There are no problems warranting action for the Automotive Repair Shop (716-A) OU.

3.9 Summary of Refined Constituents of Concern and Refined Conceptual Site Model

Figure 3-3 presents the refined CSM for the Automotive Repair Shop (716-A) OU. The CSM presents that no further evaluation of concrete and subsurface soils is required based on the results of the HH risk assessment, CM, and PTSM evaluations. A quantitative ecological risk assessment for the Automotive Repair Shop (716-A) OU is not warranted.

3.10 Applicable or Relevant and Appropriate Requirements Evaluation

There is no current or potential threat to public health, welfare, or the environment from the Automotive Repair Shop (716-A) OU. There are no potential ARARs for this OU.

3.11 Nature Resource Injury Evaluation

The NRIE Checklist and supporting descriptions are provided in Appendix E. Based on the NRIE Checklist, natural resources in the locale have not been impacted by hazardous substances from the Automotive Repair Shop (716-A) OU. No irreversible resource losses are known to exist.

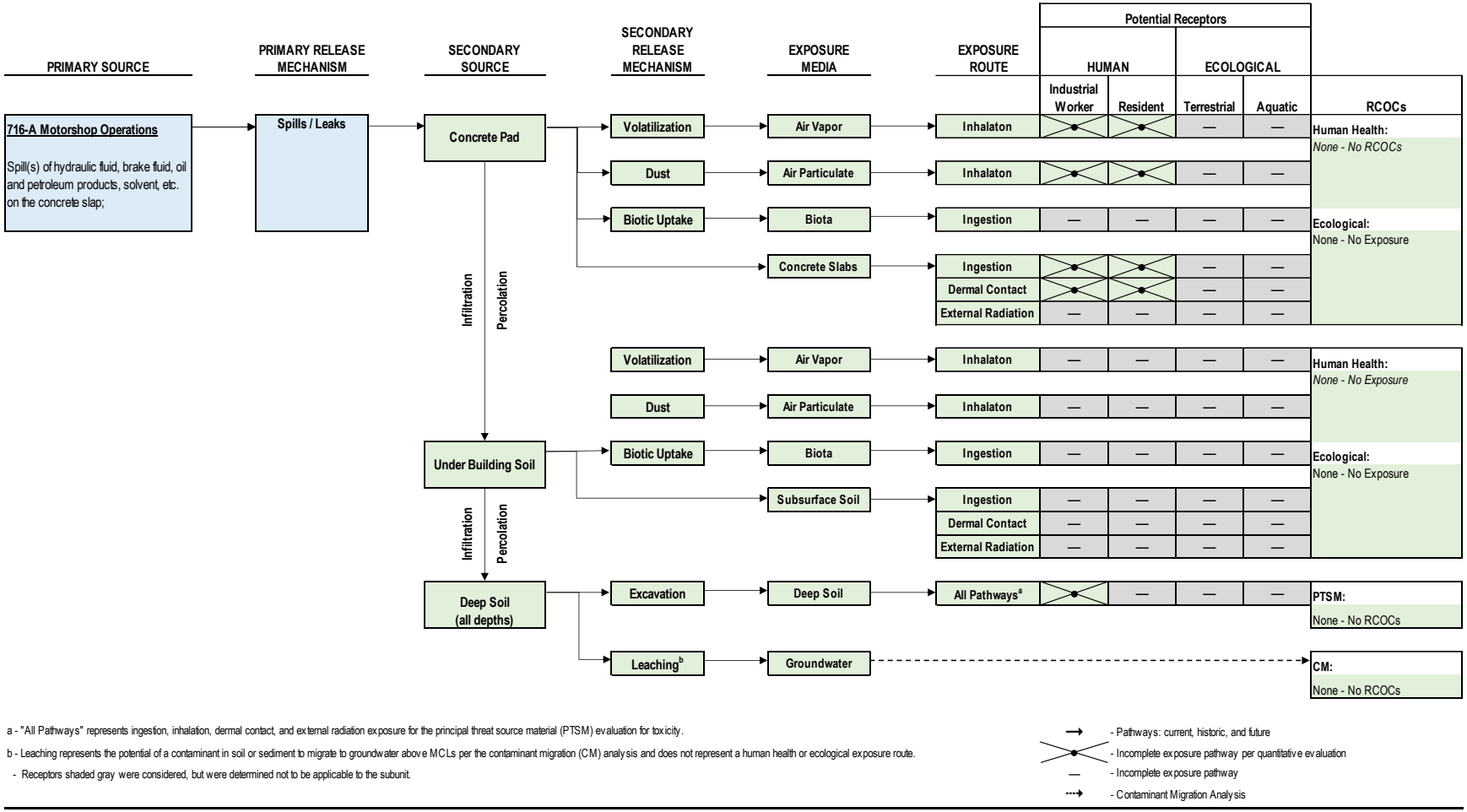


Figure 3-3. Refined Conceptual Site Model for the 716-A Automotive Repair Shop

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5.0 SUMMARY / CONCLUSION

The Automotive Repair Shop (716-A) OU was evaluated per the approved EC&ACP Regulatory Handbook protocols (SRNS 2023~~a~~). Based on the characterization results, human health risk assessment, PTSM evaluation, and CM analysis, the Automotive Repair Shop (716-A) OU poses no risk to human health and the environment. No constituents were identified as HH RCOCs, CM RCOCs, or PTSM RCOCs. A quantitative ecological risk assessment for the Automotive Repair Shop (716-A) OU was not warranted since the concrete slab does not provide any appreciable habitat and a survey of the surrounding area indicates the physical setting does not provide adequate habitat for community-level impacts to wildlife receptors.

This RI/BRA determined that there was no risk to human health and the environment, and the Automotive Repair Shop (716-A) supports unrestricted land use. According to USEPA guidance, if there is no current or potential threat to human health and the environment and no action is warranted. The CERCLA §121 requirements are not triggered; therefore, there is no need to evaluate other cleanup alternatives or to evaluate the No Action alternative against the nine remedy selection criteria in a FS. Since no RCOCs were identified for the Automotive Repair Shop (716-A) OU, no RAOs were developed, and no cleanup levels were established. Therefore, a FS for the Automotive Repair Shop (716-A) OU is not warranted.

Upon USEPA and SCDES approval of this RI/BRA, a No Action PP and No Action ROD will be prepared for the Automotive Repair Shop (716-A) OU.

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6.0 IMPLEMENTATION SCHEDULE

A summary of the key deliverables and submittal dates for the Automotive Repair Shop (716-A) is shown below. These dates are listed in the USEPA and SCDES approved OU implementation schedule and are included in the FFA (FFA 1993).

Deliverable	Submittal Date
Submit Rev. 0, PP	July 14, 2026
Submit Rev. 0, ROD	January 10, 2027
Issuance of the ROD	September 21, 2027
~~Submit Rev. 0, Land Use Control Implementation Plan~~	~~June 22, 2028~~
~~Remedial Action Start~~	~~December 28, 2028~~

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Table A.2-1. Data Summary Table Automotive Repair Shop (716-A) OU Soil (All Depths)

Analyte Name	Units	Sample #	Detects	Non-Detects	J-Detects	Distr. Code	UCL Method	Mean	95%UCL	Max Result	Min	RME	Max Location	Qualifier of Max	Max Sample Date
Inorganics															
ALUMINUM	mg/kg	70	70	--	--	N	1	4.08E+03	4.82E+03	1.59E+04	4.78E+02	4.82E+03	ARS-005-SB		12/10/24
ANTIMONY	mg/kg	70	20	50	20	N	2	8.26E-01	5.20E-01	1.70E+00	3.47E-01	5.20E-01	ARS-004-SB	J	12/03/24
ARSENIC	mg/kg	70	60	10	20	N	2	6.40E+00	6.52E+00	2.30E+01	6.37E-01	6.52E+00	ARS-005-SB	J	12/10/24
BARIUM	mg/kg	70	70	--	7	N	1	1.14E+01	2.15E+01	4.16E+02	4.12E-01	2.15E+01	ARS-005-SB		12/09/24
BERYLLIUM	mg/kg	70	36	34	31	N	2	3.20E-01	2.62E-01	1.50E+00	1.05E-01	2.62E-01	ARS-005-SB		12/09/24
CADMIUM	mg/kg	70	4	66	4	N	2	1.19E-01	9.37E-02	1.47E-01	1.03E-01	9.37E-02	ARS-005-SB	J	12/09/24
CALCIUM	mg/kg	70	69	1	14	N	2	1.37E+02	2.03E+02	2.50E+03	1.04E+01	2.03E+02	ARS-006-SB		12/04/24
CHROMIUM	mg/kg	70	70	--	1	G	4	1.56E+01	1.87E+01	6.51E+01	7.78E-01	1.87E+01	ARS-004-SB		12/02/24
COBALT	mg/kg	70	36	34	28	N	2	8.12E-01	8.18E-01	1.40E+01	1.62E-01	8.18E-01	ARS-005-SB		12/09/24
COPPER	mg/kg	70	68	2	41	N	2	2.05E+00	2.26E+00	7.61E+00	3.43E-01	2.26E+00	ARS-005-SB		12/09/24
IRON	mg/kg	70	70	--	--	N	1	1.45E+04	1.65E+04	3.79E+04	1.01E+03	1.65E+04	ARS-003-SB		11/20/24
LEAD	mg/kg	70	69	1	11	N	2	4.98E+00	5.53E+00	1.66E+01	9.16E-01	5.53E+00	ARS-005-SB		12/09/24
MAGNESIUM	mg/kg	70	62	8	30	G	4	5.48E+01	6.60E+01	6.69E+02	8.95E+00	6.60E+01	ARS-005-SB		12/10/24
MANGANESE	mg/kg	70	70	--	2	G	8	2.22E+01	2.69E+01	7.53E+01	7.06E-01	2.69E+01	ARS-005-SB		12/09/24
MERCURY	mg/kg	70	29	41	25	N	2	2.23E-01	1.60E-01	9.77E-02	1.02E-02	9.77E-02	ARS-001-SB		11/21/24
NICKEL	mg/kg	70	60	10	28	N	2	9.31E-01	1.02E+00	6.40E+00	1.70E-01	1.02E+00	ARS-005-SB		12/09/24
POTASSIUM	mg/kg	70	55	15	24	G	8	4.63E+01	5.24E+01	3.82E+02	7.56E+00	5.24E+01	ARS-005-SB		12/10/24
SELENIUM	mg/kg	70	35	35	32	L	9	1.42E+00	1.24E+00	7.37E+00	5.17E-01	1.24E+00	ARS-005-SB	J	12/10/24
SILVER	mg/kg	70	27	43	23	L	9	2.91E-01	2.16E-01	1.11E+00	1.05E-01	2.16E-01	ARS-003-SB		11/20/24
SODIUM	mg/kg	70	21	49	19	N	2	1.67E+01	1.14E+01	7.42E+01	7.66E+00	1.14E+01	ARS-006-SB		12/04/24
THALLIUM	mg/kg	70	50	20	28	N	2	2.27E+00	2.06E+00	4.72E+00	6.42E-01	2.06E+00	ARS-004-SB		12/02/24
VANADIUM	mg/kg	70	70	--	--	G	8	3.59E+01	4.20E+01	1.06E+02	4.53E+00	4.20E+01	ARS-003-SB		11/20/24
ZINC	mg/kg	70	56	14	36	N	4	1.90E+00	2.00E+00	7.97E+00	3.89E-01	2.00E+00	ARS-005-SB	J	12/10/24
Organics															
ACETONE	mg/kg	70	23	47	15	N	4	4.04E-03	2.48E-03	8.76E-03	1.50E-03	2.48E-03	ARS-003-SB		11/20/24
BENZO[B]FLUORANTHENE	mg/kg	70	1	69	1	--	--	5.59E+00	--	1.17E-02	1.17E-02	1.17E-02	ARS-005-SB	J	12/09/24
BIS(2-ETHYLHEXYL)PHTHALATE (DEHP)	mg/kg	70	3	67	3	N	4	2.02E-02	1.13E-02	2.67E-02	1.66E-02	1.13E-02	ARS-005-SB	J	12/09/24
BUTYL BENZYL PHTHALATE	mg/kg	70	1	69	1	--	--	5.59E+00	--	1.46E-02	1.46E-02	1.46E-02	ARS-005-SB	J	12/09/24
DICHLOROMETHANE (METHYLENE CHLORIDE)	mg/kg	70	1	69	1	--	--	6.71E-01	--	1.89E-03	1.89E-03	1.89E-03	ARS-002-SB	J	11/19/24
DIETHYL PHTHALATE	mg/kg	70	1	69	1	--	--	5.59E+00	--	1.33E-02	1.33E-02	1.33E-02	ARS-005-SB	J	12/05/24
DI-N-BUTYL PHTHALATE	mg/kg	70	2	68	2	N	2	1.34E-02	1.05E-02	1.35E-02	1.32E-02	1.05E-02	ARS-005-SB	J	12/09/24
N-DIOCTYL PHTHALATE	mg/kg	70	1	69	1	--	--	5.59E+00	--	1.54E-02	1.54E-02	1.54E-02	ARS-005-SB	J	12/09/24
TOLUENE	mg/kg	70	1	69	1	--	--	1.34E-01	--	5.35E-04	5.35E-04	5.35E-04	ARS-002-SB	J	11/19/24
TRICHLOROETHYLENE (TCE)	mg/kg	70	1	69	--	--	--	1.34E-01	--	1.20E-03	1.20E-03	1.20E-03	ARS-005-SB		12/10/24

Distribution Code:
N - Normal Distribution G - Gamma Distribution
L - Lognormal Distribution X - Non-Parameric

UCL Method Code: (as determined by ProUCL)
1) Student's t UCL 2) Kaplan-Meier (KM) t UCL 3) Adjusted Gamma UCL
4) KM Approximate Gamma UCL 5) Hall's Bootstrap UCL 6) Land's H-Statistic (H) UCL
7) KM Adjusted Gamma UCL 8) 95% Approximate Gamma UCL 9) 95% H-UCL (KM-log)

ND: Non-Detect
RME: Reasonable Maximum Exposure
UCL: Upper Confidence Limit

Table A.2-2. Unit Specific Constituent Screening Table Automotive Repair Shop (716-A) OU Soil (All Depths)

ANALYTE NAME	Units	95% UCL	Max Result[1]	Qualifier of Max	Max Location	Sample Depth (ft)	SRS 2X Mean Background[2]	Is Max Detect>2X SRS Mean Bkg?[3]
Inorganics								
ALUMINUM	mg/kg	4.82E+03	1.59E+04		ARS-005-SB	144.5	1.34E+04	Yes
ANTIMONY	mg/kg	5.20E-01	1.70E+00	J	ARS-004-SB	23.5	2.65E+00	No
ARSENIC	mg/kg	6.52E+00	2.30E+01	J	ARS-005-SB	144.5	4.45E+00	Yes
BARIUM	mg/kg	2.15E+01	4.16E+02		ARS-005-SB	115.5	3.31E+01	Yes
BERYLLIUM	mg/kg	2.62E-01	1.50E+00		ARS-005-SB	115.5	3.05E-01	Yes
CADMIUM	mg/kg	9.37E-02	1.47E-01	J	ARS-005-SB	85.0	4.44E-01	No
CALCIUM	mg/kg	2.03E+02	2.50E+03		ARS-006-SB	22.0	3.34E+02	Yes
CHROMIUM	mg/kg	1.87E+01	6.51E+01		ARS-004-SB	19.5	2.29E+01	Yes
COBALT	mg/kg	8.18E-01	1.40E+01		ARS-005-SB	115.5	1.40E+00	Yes
COPPER	mg/kg	2.26E+00	7.61E+00		ARS-005-SB	76.0	6.35E+00	Yes
IRON	mg/kg	1.65E+04	3.79E+04		ARS-003-SB	16.5	2.20E+04	Yes
LEAD	mg/kg	5.53E+00	1.66E+01		ARS-005-SB	85.0	1.08E+01	Yes
MAGNESIUM	mg/kg	6.60E+00	6.69E+02		ARS-005-SB	144.5	2.46E+02	Yes
MANGANESE	mg/kg	2.69E+01	7.53E+01		ARS-005-SB	115.5	6.33E+01	Yes
MERCURY	mg/kg	1.60E-01	9.77E-02		ARS-001-SB	5.5	6.68E-02	Yes
NICKEL	mg/kg	1.02E+00	6.40E+00		ARS-005-SB	115.5	4.15E+00	Yes
POTASSIUM	mg/kg	5.24E+01	3.82E+02		ARS-005-SB	144.5	2.13E+02	Yes
SELENIUM	mg/kg	1.24E+00	7.37E+00	J	ARS-005-SB	144.5	3.71E+00	Yes
SILVER	mg/kg	2.16E-01	1.11E+00		ARS-003-SB	16.5	6.37E-01	Yes
SODIUM	mg/kg	1.14E+00	7.42E+01		ARS-006-SB	22.0	4.36E+01	Yes
THALLIUM	mg/kg	2.60E+00	4.72E+00		ARS-004-SB	19.5	2.94E+00	Yes
VANADIUM	mg/kg	4.20E+01	1.06E+02		ARS-003-SB	16.5	5.81E+01	Yes
ZINC	mg/kg	2.00E+00	7.97E+00	J	ARS-005-SB	144.5	7.44E+00	Yes
Organics								
ACETONE	mg/kg	2.48E-03	8.76E-03		ARS-003-SB	25.5	--	Yes
BENZO[B]FLUORANTHENE	mg/kg	--	1.17E-02	J	ARS-005-SB	135.5	--	Yes
BIS(2-ETHYLHEXYL)PHTHALATE (DEHP)	mg/kg	1.13E-02	2.67E-02	J	ARS-005-SB	135.5	--	Yes
BUTYL BENZYL PHTHALATE	mg/kg	--	1.46E-02	J	ARS-005-SB	135.5	--	Yes
DICHLOROMETHANE (METHYLENE CHLORIDE)	mg/kg	--	1.89E-03	J	ARS-002-SB	29.5	--	Yes
DIETHYL PHTHALATE	mg/kg	--	1.33E-02	J	ARS-005-SB	21.5	--	Yes
DI-N-BUTYL PHTHALATE	mg/kg	1.05E-02	1.35E-02	J	ARS-005-SB	135.5	--	Yes
N-DIOCTYL PHTHALATE	mg/kg	--	1.54E-02	J	ARS-005-SB	135.5	--	Yes
TOLUENE	mg/kg	--	5.35E-04	J	ARS-002-SB	29.5	--	Yes
TRICHLOROETHYLENE (TCE)	mg/kg	--	1.20E-03		ARS-005-SB	161.5	--	Yes

Table Notes:
UCL = upper confidence level
J = estimated value
NA = not available
1 = Max = maximum detected concentration from all depth intervals
2 = Background Soils Statistical Summary report for the Savannah River Site, ERD-EN-2005-0223, Appendix B-2 (All Depth Intervals) (WSRC 2006)
3 = Constituents identified as an USC if maximum detected concentration is greater than 2X SRS Mean Concentration. Organics are not considered naturally occurring and therefore identified as USCs.

B.1 INTRODUCTION

The purpose of this appendix is to determine the fate and transport of contaminants associated with the Automotive Repair Shop (716-A) Operable Unit (OU). This determination will support Core Team (i.e., representatives from the United States Department of Energy [USDOE], United States Environmental Protection Agency [USEPA], and South Carolina Department of Environmental Services [SCDES][a]) remedial decisions for the Automotive Repair Shop (716-A) OU. The Automotive Repair Shop (716-A) OU is listed in Appendix C.4, D&D Facilities (or remnants) That May Warrant Response Action of the Federal Facility Agreement (FFA) (FFA 1993).

The organic and inorganic unit-specific constituents (USC) listed in Appendix A were evaluated in the CM analysis. The Automotive Repair Shop (716-A) was a nonradiological building; therefore, radiological constituents were not considered. The CM analysis was performed using the spreadsheet model VZCOMML© (V.4.0~~)[b],—~~) (WSRC 2007) which accounts for decay processes, infiltration rate, soil properties, vadose zone thickness, and chemical behavior. Soil screening limits (SSLs) were calculated by the model, and an exceedance of a SSL by a vadose zone constituent indicates that the resultant maximum groundwater concentration has the potential to exceed the regulatory limits (e.g., maximum contaminant levels [MCLs]) within the compliance period of 1,000 years (yr). Interpretation of the results and discussion of exceeding constituents are provided in the following sections of this appendix, as appropriate.

B.2 CONTAMINANT MIGRATION MODEL

B.2.1 Background

The Automotive Repair Shop (716-A) OU was used as an automotive repair facility containing service bays with offices, related storage areas, mechanical, and electrical rooms. The building was erected on top of a concrete slab and occupied in 1953. Fluid/oil stains were found in the maintenance areas, lubrication pit (Room 103), side trench, hydraulic lifts, cylinders, and narrow

a _South Carolina Department of Environmental Services (SCDES) was known as South Carolina Department of Health and Environmental Control (SCDHEC) prior to July 1, 2024.
~~b _ Vadose Zone Contaminant Migration Multi-Layered Model (VZCOMML©) Version 4.0, Copyright TXu 1-663-361, 2009, Savannah River Nuclear Services, LLC. (WSRC 2007)~~

trenches. Based on process knowledge, chemical operations only took place in the Spray Paint Room.

The Automotive Repair Shop (716-A) OU was decommissioned using the Deactivation and Decommissioning Integrated Sampling Model (ISM) in the 2004-2005 timeframe. Fluid/oil stains that were part of routine operation of Automotive Repair Shop (716-A) were removed, and the building structure was demolished to the remnant concrete slab foundation. The Decommissioning Project Final Report (DPFR) (WSRC 2005a) concluded the building structure decommissioning activities have been completed, including waste disposal in accordance with federal and state regulations. The building structure was demolished to the foundation, and the clean remnant concrete slab remains on its original footprint.

A vadose zone contamination fate and transport model (Vadose Zone Contaminant Migration Model – Multi-Layered [VZCOMML] [WSRC 2007]) was performed for the Automotive Repair Shop (716-A) OU concrete slab and documented *Decommissioning Project Final Report 716-A, Automotive Repair Shop* (WSRC 2005a). The DPFR concluded that residual contamination on the Automotive Repair Shop (716-A) OU concrete slab were below threshold levels that could impact the groundwater. The VZCOMML© software and the underlying physical and mathematical basis are documented in a technical report ~~(WSRC, 2007)~~.

Comments received by the USEPA and the SCDES on the Automotive Repair Shop (716-A) OU Facility Decommissioning Evaluation (FDE) (WSRC 2005b)and DPFR (WSRC 2005a) requested SRS to conduct soils samples beneath the Automotive Repair Shop (716-A) OU remnant slab at the 103 Lubrication Pit area and beneath drain lines and/or storm sewer lines to confirm that there has not been a release to the environment. In accordance with the approved Remedial Investigation (RI) Work Plan (SRNS 2024), subsurface soils at six locations were collected in December 2024 to support the CM analysis and the principle threat source material (PTSM) evaluation.at five additional locations The PTSM evaluation is presented in Appendix D. Five soil borings were continuously cored to a total depth of 57 feet below ground surface, and one location was cored to a depth of 167 feet bgs. A cross-section with sample depths is provided in Figure B-1. From the six soil borings, a total of 70 regular (REG) samples, four split samples, and four field duplicate samples were collected.

All samples were analyzed for Target Analyte List (TAL) and Target Compound List (TCL) constituents (excluding herbicides and pesticides). From the 70 REG samples, 33 constituents were detected in at least one sample. Appendix A presents a summary of the detected results from the Work Plan characterization, and the 31 constituents that exceeded two times (2X) SRS background concentrations (WSRC 2006) and identified as USCs.

The 31 USCs identified from the collected soil samples were included in the CM analysis evaluation using the calculated 95% upper confidence levels (UCL) in accordance with data processing protocols in the *Environmental Compliance and Area Completion Regulatory Document Handbook* (SRNS 2023). The maximum detected concentrations were used when the 95% UCL could not be estimated for certain constituents. The CM analysis screening was completed using VZCOMML© (Table B-1).

B.2.2 Screening Methods

This section describes screening methods used for identifying CM constituents of potential concern (COPCs) and CM constituents of concern (COCs) for Savannah River Site (SRS) OUs. The identification of CM COPCs and CM COCs is facilitated by the VZCOMML© V.4.0 program (WSRC 2007).

The CM analysis follows the protocols and guidelines established in the *Environmental Compliance and Area Completion Projects Regulatory Document Handbook* (SRNS 2023). For the Tier I screen, the most conservative assumptions for source thickness, depth to groundwater, and subsurface properties are used. USEPA default SSLs are calculated for the Tier I screen, which are then compared to the maximum concentrations of all detected constituents. Constituents with concentrations that are greater than the calculated Tier I SSLs have the potential to impact groundwater at levels exceeding action levels and therefore are retained as Tier I CM COPCs. A less conservative set of assumptions are used for the Tier II analyses to assess impact to groundwater at concentrations exceeding action levels within the evaluation time (T_e) of 1,000 yrs. The Tier II screen accounts for physical and chemical complexities associated with vadose zone transport and more accurately predicts risks of exposure via the CM pathway. Constituents with maximum source zone concentrations that exceed the Tier II SSLs within the T_e are retained as Tier II CM COCs.

Both the Tier I and Tier II screens include infinite source mass and limited source mass calculations. In reality, the consideration of an infinite source mass is not reasonable, so the mass-limited calculations (default mass-limited SSLs and SRS site-specific mass-limited SSLs [MLSSL]) consider the entire release of the source mass within a 70-yr exposure period. This prevents a source mass balance error (i.e., releasing more contaminant mass than is actually contained in the source) in the calculation, which is likely with the infinite source scenario. Equations used to calculate Tier I and Tier II SSLs and MLSSLs are provided below in the Section B.2.3.

The spreadsheet model VZCOMML© was developed at SRS to facilitate SSL calculations and Tier I/Tier II soil data CM screening. VZCOMML© simultaneously calculates SSLs for TAL/TCL constituents and for specified radionuclides (a total of 219 constituents). VZCOMML© compares user-entered soil concentrations (i.e., maximum values, 95% UCLs) to calculate SSLs and identifies constituents that are Tier I CM COPCs and Tier II CM COCs. Chemical properties of analytes used by VZCOMML© (e.g., soil/water distribution coefficient [K_d], Henry's Law constant [H', H], etc.) for the 31 USCs identified for the Automotive Repair Shop (716-A) OU are listed in Table B-1. VZCOMML© also contains assigned hydraulic functions for different types of soil layers (e.g., source layer, soil layer, or engineered barrier layer) and texture classifications (e.g., sand, loamy sand, clay, concrete) within the soil column. The Tier II screen completed by VZCOMML© also uses soil concentrations input by the user to calculate maximum groundwater concentrations and migration times.

If Tier II CM COCs are identified, it is up to the user to evaluate results and apply professional judgment, other modeling approaches, and/or knowledge of site conditions and geochemistry to further refine the list of CM COCs in an uncertainty discussion (Section B.2.6). Constituents that are retained following the uncertainty discussion are CM refined COCs (RCOCs), which are constituents that are mobile at that waste unit, can leach to the aquifer within a 1,000-yr travel time (SRNS 2023), and are predicted to exceed drinking water standards at a receptor well located adjacent to the edge of the waste unit within the T_e.

B.2.3 Soil Screening Equations

Equations used by VZCOMML© (WSRC 2007) are consistent with USEPA Soil Screening Guidance (USEPA 1996, 2000). A conceptual framework of the model and vadose zone and screening parameters for VZCOMML© is provided in Figure B-1. Model assumptions include:

- A receptor drinking water well at the downgradient edge of the source zone with the well screen located in the plume.
- Linear equilibrium isotherms were used rather than exponential isotherms (this is typically a conservative estimate [i.e., likely transports more contaminant to water table] of partitioning into the aqueous phase of a moving front).
- Uniformly distributed contamination in the subsurface (this is also typically a conservative estimate using the input concentration across the entire unit for each constituent).
- Instantaneous equilibrium partitioning within soil, vapor, and liquid phases (this is typically a conservative estimate [i.e., likely transports more contaminant to water table] of partitioning into the aqueous phase of a moving front for compounds that have lower Henry's Law constants).

In the VZCOMML© model construction, the source zone layer thickness represents the vertical extent of contamination. Generally, Layer 1 is the source zone and Layers 2 through 5 (if applicable) are the vadose zone layers beneath the source zone and are used to simulate soil heterogeneity in the soil column. These layers can accommodate different hydraulic functions, soil textures, properties, and layer thicknesses for up to five total soil layers (including source layer). The aquifer layer represents the shallowest water table aquifer. Following is a discussion of the equations used by VZCOMML© for the soil screening process.

B.2.3.1 Dilution Attenuation Factor

The dilution attenuation factor (*DAF*) represents leachate dilution in the water table aquifer. The *DAF* calculation assumes that the aquifer is unconfined, unconsolidated, isotropic, and homogeneous. The minimum *DAF* is one, which indicates no dilution occurs in the aquifer. The USEPA recommends a default *DAF* of 20 for sites up to 0.2 hectare (ha) (0.5 acre [ac]) whenever

site-specific data are not available (USEPA 1996). It should be noted that the footprint of the building remnant concrete slab is 1.5 acres or three times the size used for USEPA estimation. Therefore, the DAF is anticipated to be much larger than the recommended value of 20 for sites up to 0.5 acres. The *DAF* (dimensionless) is calculated as follows:

$$DAF = 1 + \frac{K_a \cdot i \cdot d}{I \cdot L}$$

where;

K_a = saturated zone (aquifer) hydraulic conductivity (feet per year [ft/yr])

i = saturated zone (aquifer) hydraulic gradient (feet/feet [ft/ft])

I = infiltration rate through vadose zone (ft/yr)

L = length of the source (parallel to groundwater flow) (ft)

d_a = measured saturated zone (aquifer) thickness (ft)

d_i = calculated mixing zone depth (ft)

d = mixing zone depth (minimum of d_i and d_a) (ft)

If the input infiltration rate through the vadose zone is greater than any of the individual vadose zone layer saturated hydraulic conductivities, then the infiltration rate is adjusted to the maximum of the individual vadose zone layer saturated hydraulic conductivities. The calculated mixing zone depth (d_i) is defined as follows:

$$d_i = \sqrt{0.0112 \cdot L^2} + d_a\left(1 - e^{\left(-L \cdot I/(K_a \cdot i \cdot d_a)\right)}\right)$$

The actual mixing zone depth (d) value cannot exceed the actual aquifer thickness (d_a). Therefore, the mixing zone depth is the minimum of d_i or d_a. This can tend to underpredict localized contaminant concentrations in groundwater by immediately diluting the concentrations over the full aquifer extent when the contaminant reaches groundwater but is adjustable to accommodate mixing or lack thereof.

B.2.3.4 Incorporating Decay

To account for chemical degradation, hydrolysis, or biodegradation of constituents and for redistribution of mass in the vadose zone, the Tier I SSLs and Tier I MLSSLs are adjusted using first-order equations in the Tier II $SSL_{T1/2}$ (*TierII_SSL*$_{T1/2}$) and Tier II $MLSSL_{T1/2}$ (*TierII_MLSSL*$_{T1/2}$) as follows:

$$TierII_SSL_{T1/2} = \left(\frac{TierI_SSL}{e^{(-\lambda T_{Mean})}}\right) \cdot \left(\frac{T_c}{d_s}\right)$$

$$TierII_MLSSL_{T1/2} = \frac{TierI_MLSSL}{e^{(-\lambda ED)}}$$

where;

T_{Mean} = the mean travel time (yr)

A half-life ($T_{1/2}$, $t_{1/2}$) for a chemical compound is largely determined from literature sources. Because there is usually variability of the reported half-life of a chemical compound (e.g., aerobic and anaerobic rates), the most conservative (longest) half-life is selected as the rate constant in the equations. The rate constants used in the VZCOMML© model are primarily derived from the publications of P. H. Howard, et al (1991) and Looney et. Al (1987), but other references were also used such as USEPA's Estimation Program Interface Suite software (USEPA, 2012) and USEPA's Human Health Risk Assessment Parameters database.

VZCOMML© assumes equilibration, mass redistribution, and conservation of mass in the source zone between phases (i.e., volatilized, dissolved, or sorbed) and throughout the entire vadose zone volume. This results in more realistic SSLs, which accounts for vadose zone thickness, travel time, and chemical behavior in the subsurface.

The VZCOMML© Tier II screening decision logic for a constituent 'fails' if: 1) the mean travel time (T_{Mean}) through the vadose zone is less than 1,000 yrs, and 2) the source concentration exceeds the Tier II $MLSSL_{T1/2}$, and 3) the groundwater concentration exceeds an action level (i.e., the calculated concentration in groundwater would exceed the regulatory limit, such as MCLs or

RSLs). In this case, the constituent would be retained as a CM COC and subject to further CM COC refinement steps.

B.2.3.5 Saturation Concentration

For organic (non-radioactive) constituents, the saturation concentration (C_{sat}) (mg/kg) is calculated from the solubility constant in water (S) (milligrams per liter [mg/L]) as follows:

$$C_{sat=}\frac{S}{\rho_b}\cdot(K_d+\rho_b+\theta_w+H\cdot\theta_a)$$

The C_{sat} is a theoretical concentration that represents a pure non-aqueous phase liquid (NAPL) or solid threshold concentration in soil. The C_{sat} is compared to the detected concentration to predict if a NAPL phase compound is present in the soil.

B.2.3.6 Groundwater Concentration

The concentration of constituents in groundwater in the water table aquifer is directly calculated by VZCOMML© for comparison to groundwater regulatory limits. The groundwater concentration (C_{gw} [µg/L]) is calculated as follows (SRNS_2011):

For organic contaminants (including mercury with vapor phase);

$$C_{gw}=\frac{\left(\frac{C_t\cdot 1000}{DAF}\right)\times e^{(-\lambda T_{mean})}}{\left(K_d+\frac{(\theta_w+H\cdot\theta_a)}{\rho_b}\right)\times\left(\frac{\lambda t}{1-e^{(-\lambda t)}}\right)}\cdot\left(\frac{d_s}{T_c}\right)$$

where;

C_t = input contaminant soil concentration (mg/kg)

For inorganic contaminants (including metals [note: metals use an infinite half-life] and excluding mercury with vapor phase):

$$C_{gw}=\frac{\left(\frac{C_t\cdot 1000}{DAF}\right)\cdot e^{(-\lambda T_{mean})}}{\left(K_d+\frac{\theta_w}{\rho_b}\right)\cdot\left(\frac{\lambda t}{1-e^{(-\lambda t)}}\right)}\cdot\left(\frac{d_s}{T_c}\right)$$

VZCOMML© assumes equilibration, redistribution, and conservation of mass of the source between phases (i.e., volatilized, dissolved, or sorbed) and distribution throughout the entire vadose zone volume. The concentration of constituents in groundwater in the water table aquifer is directly calculated by VZCOMML© for comparison to groundwater regulatory limits or standards.

B.2.4 Modeling Parameters

Vadose zone CM simulation using the VZCOMML© spreadsheet is presented in this section for the Automotive Repair Shop (716-A) OU. The vadose zone soil layers for the Automotive Repair Shop (716-A) OU were modeled based on the best available data from previous soil boring activities, as well as recent soil core descriptions (Appendix G). The layers were modeled as shown in Table B-2.

These steps were used to perform the CM analysis:

1. Analytical soil data were compiled and evaluated. The data were processed to purge all quality assurance data and rejected (R qualified) data. The data were further processed to select the maximum detected concentration and the 95% upper confidence limit (UCL) for each analyte (Appendix A). The 95% UCL was determined by ProUCL (USEPA 2022).

2. A conceptual site model was developed, which includes a soil layer above the contamination, a source zone (ending at the depth of contamination), a vadose zone below the contamination up to the estimated water table and assigned values for several hydrogeological parameters, presented in Table B-3 and B-4.

3. VZCOMML© Tier I screen was performed, using two conservative assumptions: a) for each analyte, the 95% UCL soil concentration was used to represent the soil concentration (C_t), and b) the thickness of the source zone was assumed to be equal to the depth of the deepest available soil sample with maximum detected concentration. An analyte was retained as a Tier I CM COPC if the source zone concentration was greater than both the Tier I Source-Specific SSL and the Tier I MLSSL. No Tier I CM COPCs were identified in the analysis.

4. VZCOMML© Tier II Simulation was planned to be run, using two conservative assumptions: (a) for each analyte, the 95% UCL soil concentration was used to represent the soil concentration (C_t), and (b) the thickness of the source zone was assumed to be equal to the depth of the deepest available soil sample. Analytes predicted to impact groundwater at concentrations exceeding action levels within the evaluation time of 1,000 yrs, under the conservative conditions simulated, were retained as Tier II CM COPCs. Action levels refer to the Tier II $SSL_{T1/2}$, the Tier II $MLSSL_{T1/2}$, and either the November 2024 USEPA MCL or RSL. For an analyte to be retained as a Tier II CM COPC in VZCOMML©, the "predicted concentration in aquifer" must be greater than all three action levels, and the analyte must have a mean travel time of less than 1,000 yrs. No Tier II simulations were required since no Tier I CM COPCs were identified.

5. CM COCs were not evaluated further using additional lines of inquiry since there were no exceedances in the Tier I analysis. However, an Uncertainty Discussion (Section B.2.6) is included to summarize the limitations of the analysis.

6. No Screening-level CM remedial goal options (RGOs) were identified since no COCs exceeded the SSL in Tier I analysis.

Table B-1 presents chemical and physical property parameters for each evaluated analyte. These parameters include organic carbon partitioning coefficient (K_{oc}), soil-water partitioning coefficient (K_d), half-life (biological degradation for organics), Henry's Law constant (H', H), solubility (S), and regulatory action level (USEPA MCL or RSL). The RSLs used were for resident tap water with a target hazard quotient (THQ) of 1.0. In addition to chemical parameters, several physical parameters are also employed in CM simulations. The physical parameters are presented in Table B-3. Other hydrogeologic physical parameters related to the location of contamination and flow parameters are presented in Table B-4.

B.2.5 Results of the Tier I and Tier II Analyses

In this section, results of the Tier I and Tier II screening are presented for the Automotive Repair Shop (716-A) OU. Constituents that did not undergo SSL calculations include those compounds which lack both MCLs and RSLs (e.g., Di-n-octyl phthalate), and constituents that are essential

WSRC, 2005b. *Facility Decommissioning Evaluation Automotive Repair Shop, 716-A*, G-FDE-A-00039, Revision 1, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2005c. *Final Verification Survey for 716-A*, SDD-SAP-2005-00004, Revision 0, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2006. *Background Soils Statistical Summary Report for the Savannah River Site*, ERD-EN-2005-0223, Revision 1.0, Washington Savannah River Company LLC, Savannah River Site, Aiken, SC

WSRC, 2007. *Vadose Zone Contaminant Migration Model- Multi-Layered Software© (VZCOMML©) Calculation Note and Documentation*, Q-CLC-G-00068, Washington Savannah River Company LLC, Savannah River Site, Aiken, SC

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Table B-1. Chemical Parameters Used for Screening

Analyte	K_{OC} *[L/kg]*	K_d *[L/kg]*	$T_{1/2}$ *[yr]*	H' *[-]*	S *[mg/L]*	Action Level[A] *[µg/L or pCi/L]*
Volatile Organic Analytes						
Acetone	2.20E+00	4.40E-03	1.90E-02	1.59E-03	1.00E+06	1.80E+04
Dichloromethane (Methylene chloride)	1.00E+01	2.00E-02	3.07E-01	8.98E-02	1.30E+04	5.00E+00
Toluene	1.40E+02	2.80E-01	6.00E-02	2.72E-01	5.26E+02	1.00E+03
Trichloroethylene	1.66E+02	3.32E-01	1.00E+01	4.22E-01	1.10E+03	5.00E+00
Semivolatile Analytes						
Benzo(b)fluoranthene	1.23E+06	2.46E+03	1.67E+00	4.55E-03	1.50E-03	2.50E-01
Bis(2-ethylhexyl) phthalate	1.11E+05	2.22E+02	6.30E-02	4.18E-06	3.40E-01	6.00E+00
Butylbenzyl phthalate	1.37E+04	2.74E+01	1.90E-02	5.17E-05	2.69E+00	~~3.5~~1.60E+01
Diethyl phthalate	8.22E+01	1.64E-01	1.54E-01	1.85E-05	6.80E+02	~~2.90~~1.5E+04
Di-n-butyl phthalate	1.57E+03	3.14E+00	6.30E-02	3.85E-08	1.12E+01	9.00E+02
Di-n-octyl phthalate	8.32E+07	1.66E+05	7.70E-02	2.74E-03	3.40E-01	2.0E+02~~NA~~
Metal Analytes						
Aluminum	NA	1.00E+03	Infinite	NA	NA	2.00E+04
~~Antimony (metallic)~~	~~NA~~	~~3.00E+03~~	~~Infinite~~	~~NA~~	~~NA~~	~~6.00E+00~~
Arsenic, Inorganic	NA	1.50E+02	Infinite	NA	NA	1.00E+01
Barium	NA	1.90E+01	Infinite	NA	NA	2.00E+03
Beryllium and compounds	NA	7.90E+02	Infinite	NA	NA	4.00E+00
~~Cadmium~~	~~NA~~	~~2.50E+01~~	~~Infinite~~	~~NA~~	~~NA~~	~~5.00E+00~~
Calcium	NA	1.25E+01	Infinite	NA	NA	NA
Chromium, Total	NA	7.00E+02	Infinite	NA	NA	1.00E+02
Cobalt	NA	7.00E+01	Infinite	NA	NA	6.00E+00
Copper, Total	NA	6.00E+01	Infinite	NA	NA	1.30E+03
Iron	NA	3.00E+02	Infinite	NA	NA	1.40E+04
Lead and compounds	NA	3.50E+03	Infinite	NA	NA	1.0~~5~~0E+01
Magnesium	NA	No Kd available	Infinite	NA	NA	NA
Manganese	NA	1.10E+02	Infinite	NA	NA	4.30E+02
Mercury (elemental)	NA	9.00E+02	Infinite	NA	NA	2.00E+00
Nickel Soluble Salts	NA	1.85E+01	Infinite	NA	NA	3.90E+02

Table B-1. Chemical Parameters Used for Screening *(continued/end)*

Analyte	K_{OC} *[L/kg]*	K_d *[L/kg]*	$T_{1/2}$ *[yr]*	H' *[-]*	S *[mg/L]*	Action Level[A] *[µg/L or pCi/L]*
Metal Analytes (continued/end)						
Potassium	NA	1.75E+01	Infinite	NA	NA	NA
Selenium	NA	1.00E+03	Infinite	NA	NA	5.00E+01
Silver	NA	2.00E+01	Infinite	NA	NA	9.40E+01
Sodium, total recoverable	NA	1.75E+01	Infinite	NA	NA	NA
Thallium Soluble Salts	NA	5.00E+01	Infinite	NA	NA	2.00E+00
Vanadium, total recoverable	NA	1.00E+03	Infinite	NA	NA	8.60E+01
Zinc (metallic)	NA	2.50E+01	Infinite	NA	NA	6.00E+03

A Action Level – The USEPA Regional Screening Level (RSL) was used when a MCL was not available. The RSLs used were for the resident tap water with a THQ of 1.0.
NA = Not Available; Red = MCL; Black = RSL Table on **www.epa.gov** website (November 2024 revision; accessed February 2025)

Table B-5. Tier I Screening Results for the Automotive Repair Shop (716-A) OU

Analyte	Source Zone Concentration[1]	Tier I Source-Specific SSL	Tier I Mass Limit SSL	Failing Analytes
	[mg/kg]			
Acetone	2.48E-03	5.90E+01	3.30E+01	
Dichloromethane (Methylene chloride)	1.89E-03	1.88E-02	9.15E-03	
Toluene	5.35E-04	9.19E+00	1.83E+00	
Trichloroethylene	1.20E-03	5.25E-02	9.15E-03	
Benzo(b)fluoranthene	1.17E-02	1.20E+01	4.58E-04	
Bis(2-ethylhexyl) phthalate	1.13E-02	2.60E+01	1.10E-02	
Butylbenzyl phthalate	1.46E-02	8.61E+00~~1.88E+01~~	3.27E-02~~6.41E-02~~	
Diethyl phthalate	1.33E-02	9.60E+01~~1.86E+02~~	3.06E+01~~5.31E+01~~	
Di-n-butyl phthalate	1.05E-02	5.81E+01	1.65E+00	
Di-n-octyl phthalate	1.54E-02	NA	NA	NA
Aluminum	4.82E+03	3.91E+05	3.66E+01	
~~Antimony (metallic)~~	~~5.20E-01~~	~~4.69E+02~~	~~1.10E-02~~	
Arsenic, Inorganic	6.52E+00	2.93E+01	1.83E-02	
Barium	2.15E+01	7.49E+02	3.66E+00	
Beryllium and compounds	2.62E-01	6.17E+01	7.32E-03	
~~Cadmium~~	~~9.37E-02~~	~~7.34E+00~~	~~9.15E-03~~	
Calcium	2.03E+02	NA	NA	NA
Chromium, Total	1.87E+01	1.37E+03	1.83E-01	
Cobalt	8.18E-01	8.22E+00	1.10E-02	

Table B-5. Tier I Screening Results for the 716-A OU *(continued/end)*

Analyte	Source Zone Concentration[1]	Tier I Source-Specific SSL	Tier I Mass Limit SSL	Failing Analytes
	[mg/kg]			
Copper, Total	2.26E+00	1.53E+03	2.38E+00	
Iron	1.65E+04	8.21E+04	2.56E+01	
Lead and compounds	5.53E+00	1.03E+03	2.75E-02	
Magnesium	6.60E+00	NA	NA	NA
Manganese	2.69E+01	9.25E+02	7.87E-01	
Mercury (elemental)	1.60E-01	3.52E+01	3.66E-03	
Nickel Soluble Salts	1.02E+00	1.42E+02	7.14E-01	
Potassium	5.24E+01	NA	NA	NA
Selenium	1.24E+00	9.77E+02	9.15E-02	
Silver	2.16E-01	1.66E+02	1.72E-01	
Sodium, total recoverable	1.14E+00	NA	NA	NA
Thallium Soluble Salts	2.60E+00	2.78E+00	3.66E-03	
Vanadium, total recoverable	4.20E+01	1.68E+03	1.57E-01	
Zinc (metallic)	2.00E+00	2.95E+03	1.10E+01	

1 - The maximum detected concentrations were used when the 95% UCL could not be estimated for certain constituents.

NA – Not Available, due to absence of Action Level as noted in Table B-1

C-1. INTRODUCTION

The human health risk assessment (HHRA) in support of the Remedial Investigation Report with Baseline Risk Assessment (BRA) for the Automotive Repair Shop (716-A) Operable Unit (OU) ~~is~~ presented in this appendix~~. The evaluation contained herein assesses~~ is not the initial baseline risk assessment for the Spray Paint Room remnant concrete slab. Rather, this evaluation provides an update to the human health risk assessment reported in the *Decommissioning Project Final Report 716-A, Automotive Repair Shop* (WSRC 2005a) to assess the risks of contamination to human receptors to identify the problems warranting action from a human health standpoint to support subsequent remediation as deemed necessary.

The Automotive Repair Shop (716-A) OU is located in A Area in an area currently designated for industrial use as defined by the SRS Land Use Control Assurance Plan (WSRC 1999). The Automotive Repair Shop (716-A) OU is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-only unit and is listed in Appendix C.4, D&D Facilities (or Remnants) That May Warrant Response Action of the Federal Facility Agreement (FFA) (FFA 1993). No current or projected future development of the OU is planned, nor is the current land use expected to change. Nevertheless, to support the risk management decision-making, both the residential (unrestricted) and industrial worker scenarios are evaluated.

The Automotive Repair Shop (716-A) OU was decommissioned using the Deactivation and Decommissioning (D&D) Integrated Sampling Model (ISM) in the 2004-2005 timeframe. Because chemical operations at the Automotive Repair Shop (716-A) only took place in the Spray Paint Room, the post-decommissioning final verification survey was restricted to the Spray Paint Room remnant concrete slab. The *Decommissioning Project Final Report 716-A, Automotive Repair Shop* (WSRC 2005a) documents the risk assessment that was conducted on the remnant concrete slab, concluding that there were no problems warranting remedial action to human receptors. As agreed to by the Core Team (i.e., United States Department of Energy, U.S. Environmental Protection Agency [USEPA] and the South Carolina Department of Environmental Services [SCDES]) at the June 2025 scoping meeting, the strategy for the Automotive Repair Shop (716-A) OU is to use the information and conclusions of the Decommissioning Project Final Report (DPFR) and provide an update of the risk assessment using current SRS Environmental

Compliance & Area Completion Projects (EC&ACP) risk evaluation protocols and methodology (SRNS 2023) to verify that the conclusions of the DPFR risk evaluation.

C-1.1 Background

The Automotive Repair Shop (716-A) OU was used as an automotive repair facility containing service bays with offices, related storage areas, mechanical, and electrical rooms. The building was erected on top of a concrete slab and occupied in 1953. Fluid/oil stains were found in the maintenance areas, lubrication pit (Room 103), side trench, hydraulic lifts, cylinders, and narrow trenches. Based on process knowledge, chemical operations only took place in the approximately 738 square feet Spray Paint Room.

The Automotive Repair Shop (716-A) OU was decommissioned using the D&D ISM in the 2004-2005 timeframe. Fluid/oil stains that were part of routine operation of Automotive Repair Shop (716-A) were removed, and the building structure was demolished to the remnant concrete slab foundation. The DPFR (WSRC 2005a) concluded the building structure decommissioning activities have been completed, including waste disposal in accordance with federal and state regulations. The clean remnant concrete slab remains on its original footprint (Figure 1-2).

Because chemical operations only took place in the Spray Paint Room, the post-decommissioning final verification survey was restricted to the Spray Paint Room remnant concrete slab. The DPFR (WSRC 2005a) documents the assessment that was conducted on the Spray Paint Room remnant concrete slab following protocols that were developed by the Savannah River National Laboratory (SRNL) (i.e., comparison to SRNL Derived Concentration Guideline Levels [DCGLs]). The total cumulative risk (TCR) risk to an industrial worker exposed to the remnant concrete slab was estimated to be 4.36E-07. The non-cancer hazard index (HI) for the remnant concrete slab was estimated to be 0.049.

The risk information presented in the DPFR followed protocols that were developed by the SRNL (i.e., comparison to SRNL DCGLs) in the 2004-2005 timeframe. It was uncertain if the conclusion of the DPFR risk evaluation were still valid since the risk evaluation process presented in historical D&D documents do not align with the current SRS EC&ACP methodology for evaluating human health risk. To address this uncertainty, updating the D&D risk assessment using current EC&ACP

risk evaluation protocols and threshold values (SRNS 2023) is the subject of the HHRA presented in this appendix.

A quantitative ecological risk assessment for the Automotive Repair Shop (716-A) is not warranted. The remnant concrete slab does not provide any appreciable habitat, and a survey of the surrounding area indicates the physical setting does not provide adequate habitat for population level impacts to wildlife receptors since it is very small in size and located in an industrial setting. There are no problems warranting action from an ecological risk perspective.

C-1.2 Data

The dataset used for the HHRA risk/hazard calculations were concrete samples collected in the Spray Paint Room for the D&D final verification survey (WSRC 2005b). Sixteen (16) sample locations composited in four sets of four samples were obtained for Resource Conservation and Recovery Act (RCRA) metals analysis (arsenic, barium, cadmium, chromium, lead, mercury [elemental], mercury [compounds], selenium, and silver) (Figure 1-~~3~~5). Nine single samples were taken for volatile organic compounds (VOC) analysis (Figures 1-~~4~~6) . As agreed by the Core Team during the June 2025 scoping meeting, the D&D final verification survey data was sufficient to support the update of the risk evaluation, and no additional data needs were identified.

The investigative data reported in Appendix A for subsurface soils (all depths) collected beneath the Automotive Repair Shop (716-A) storm sewer lines and the 103 Lubrication Pit are not part of the HHRA update. This data supports the contaminant migration analysis in Appendix B and the PTSM evaluation presented in Appendix D. In addition, groundwater is not part of this OU. Groundwater will be investigated and remediated, as applicable, under the RCRA corrective action program defined in the SRS RCRA Permit Renewal for the M-Area and Metallurgical Laboratory Hazardous Waste Management Facilities.

C-1.3 Receptors

The receptors evaluated in the updated HHRA include the future resident (unrestricted use) and future industrial worker. A description of each is presented below.

The future resident receptor scenario evaluates long-term risks to individuals assumed to have unrestricted use of the Spray Paint Room remnant concrete slab area. This scenario considers residents (adults and children) that hypothetically live on the Automotive Repair Shop (716-A) OU and are exposed chronically to OU contaminants. The standard exposure assumptions are 26 years, 350 days per year, and 24 hours per day. Exposure routes associated with the concrete media include inhalation of particulates and vapors, external exposure to radiation, dermal absorption, and incidental ingestion.

The future industrial worker scenario is a standard USEPA exposure scenario that addresses long-term risks to workers who are exposed to OU contaminants within an industrial setting. The standard exposure assumptions are 25 years, 250 days per year, and 8 hours per day. This receptor is referred to as "composite worker" by USEPA and is analogous to the term "industrial worker" used herein. The future industrial worker scenario considers an adult who hypothetically works on-unit in an outdoor setting for the majority of time. Exposure routes include inhalation, external exposure to radiation, dermal absorption, and incidental ingestion.

C-1.4 Sources of Risk-Based Threshold Values

The USEPA publishes regional screening levels (RSLs) for nonradiological constituents and preliminary remediation goals (PRGs) for radiological constituents that are risk-based concentrations (or activity concentrations) that can be used to evaluate potentially contaminated waste sites. Both RSLs and PRGs combine current USEPA toxicity values with standard exposure factors that represent reasonable maximum exposure (RME) conditions to estimate contaminant concentrations in exposure media that the agency considers protective of humans over a lifetime. The concentrations are based on direct exposure pathways for which generally accepted methods, models, and assumptions have been developed for specific land use conditions.

The USEPA RSLs website (USEPA 2024) is the source of the November 2024 USEPA RSLs for nonradiological constituents used in this evaluation. The website was accessed in April 2025. The default resident and industrial worker RSLs are provided in Attachment C-1.

The Automotive Repair Shop (716-A) was a nonradiological building. Therefore, radiological risks for the Spray Paint Room remnant concrete slab were not considered.

C-2. HUMAN HEALTH RISK ASSESSMENT PROCESS

The strategy for the HHRA for this RI/BRA is to update the risk evaluation reported in the DPFR for the Spray Paint Room remnant concrete slab by applying the approved EC&ACP protocols for the human health risk assessment (SRNS 2023) and November 2024 USEPA RSLs. The maximum detected concentration of each analyte in the Spray Paint Room is used to provide the most conservative risk/hazard result.

Per SRS protocols, RSLs for soil media are multiplied by ten (10x) to obtain thresholds for concrete media. This conversion acknowledges that the exposure assumptions for competent, hardened concrete are different from (i.e., less than) the exposure assumptions for more friable soil media. As defined by CERCLA, a risk of less than 1.0E-06 and a hazard quotient (HQ) of less than 1 were used as the maximum acceptable risk thresholds for the residential and industrial worker risk scenarios.

C-2.1 Risk/Hazard Calculation

Risk and hazard estimate calculations for the reevaluation of the Spray Paint Room remnant concrete slab are based on the maximum detected concentration.

The risk estimates for constituents are calculated using the following equation:

$$risk\ estimate = \left(\frac{[Maximum\ Concentration]}{[RSL\ or\ PRG]}\right) \times 1E\text{-}06$$

The risk estimates are then summed to provide the total risk by grouping. The total media risk is the sum of the total groupings. Constituents with an individual cancer risk greater than 1E-06 are identified as constituents of concern (COCs) and are further evaluated in the refinement of COCs step (i.e., uncertainty evaluation).

For noncarcinogens, hazard estimates (or HQs) are calculated individually for each nonradiological constituent using the following equation:

$$hazard\ estimate\ (HQ) = \frac{[Maximum\ Concentration]}{[RSL]}$$

Individual constituent HQs are summed to provide the total HI. If the total HI is less than 1, then no COCs are identified. If the total HI is greater than 1, then the constituents are segregated based on relevant target organ or system toxicity, and the grouped constituent HQs are summed. Constituents are identified as COCs if the constituent organ/system HQ is greater than 0.1 and the total organ HI is greater than 1. Constituents identified as COCs are further evaluated in the refinement of COCs step (i.e., uncertainty evaluation).

C-2.2 Risk/Hazard Evaluation Results

Table C-1 presents the updated risk evaluation for the Automotive Repair Shop (716-A OU) Spray Paint Room remnant concrete slab. The updated residential scenario had a noncarcinogenic HI=0.~~021~~ 9 and cancer TCR=~~4.1~~E-07. The updated industrial worker scenario had an HI=0.~~003~~ 05 and TCR=~~9.4~~E-08. Because no COCs were identified, no uncertainty evaluation was needed.

C-3. SUMMARY/CONCLUSION OF THE HUMAN HEALTH RISK ASSESSMENT

The updated risk evaluation confirmed the conclusions of the DPFR that there are no problems warranting action for human receptors at the Automotive Repair Shop (716-A) Spray Paint Room remnant concrete slab. The risk from the updated HHRA are within acceptable limits and did not exceed the risk management range of 1E-06 to 1E-04 from the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300.430(3)(2)(i)(A)(*2*)) (USEPA 1990). As previously stated, the remnant concrete slab and surrounding area does not provide any appreciable habitat for ecological receptors and a quantitative ecological risk assessment is not warranted. The refined conceptual site model based on the results of the HHRA are presented in Section 3.9.

C-4. REFERENCES

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Table C-1. Preliminary Human Health Risk/Hazard Calculation for Spray Paint Room Remnant Concrete Slab

Analyte	Maximum Concentration[1]	Residential Scenario					Industrial Worker Scenario				
		Residential Soil RSL[2]	Noncarcinogenic Hazard Estimate		Carcinogenic Risk Estimate		Industrial Soil RSL[2]	Noncarcinogenic Hazard Estimate		Carcinogenic Risk Estimate	
			Residential Concrete RSL[3]	Residential HQ Estimate[4]	Residential Concrete RSL[3]	Residential Risk Estimate[5]		Industrial Concrete RSL[3]	Industrial HQ Estimate[4]	Industrial Concrete RSL[3]	Industrial Risk Estimate[5]
Arsenic	2.82E+00	6.80E-01	--	--	6.80E+00	4.1E-07	3.00E+00	--	--	3.00E+01	9.4E-08
Barium	4.87E+01	1.50E+04	1.5E+05	3.2E-04	--	--	2.20E+05	2.2E+06	2.2E-05	--	--
Cadmium	8.47E-01	7.10E+00	7.1E+01	1.2E-02	--	--	1.00E+02	1.0E+03	8.5E-04	--	--
Chromium	8.78E+00	9.50E-01	**9.5E+00**	**9.2E-01**	--	--	2.00E+01	**2.0E+02**	**4.4E-02**	--	--
Lead	1.54E+01	2.00E+02	2.0E+03	7.7E-03	--	--	8.00E+02	8.0E+03	1.9E-03	--	--
Mercury	1.73E-02	7.10E+00	7.1E+01	2.4E-04	--	--	3.00E+01	3.0E+02	5.8E-05	--	--
Selenium	4.21E+00	3.90E+02	3.9E+03	1.1E-03	--	--	5.80E+03	5.8E+04	7.3E-05	--	--
Silver	5.20E-02	3.90E+02	3.9E+03	1.3E-05	--	--	5.80E+03	5.8E+04	9.0E-07	--	--
2-Hexanone	1.64E-02	2.00E+02	2.0E+03	8.2E-06	--	--	1.30E+03	1.3E+04	1.3E-06	--	--
Acetone	7.03E-02	7.00E+04	7.0E+05	1.0E-07	--	--	1.10E+06	1.1E+07	6.4E-09	--	--
Benzene	6.81E-04	1.20E+00	--	--	1.20E+01	5.7E-11	5.10E+00	--	--	5.10E+01	1.3E-11
Ethylbenzene	3.03E-03	5.80E+00	--	--	5.80E+01	5.2E-11	2.50E+01	--	--	2.50E+02	1.2E-11
Methyl ethyl ketone	2.88E-02	2.70E+04	2.7E+05	1.1E-07	--	--	1.90E+05	1.9E+06	1.5E-08	--	--
Methyl isobutyl ketone	1.10E-02	3.30E+04	3.3E+05	3.3E-08	--	--	1.40E+05	1.4E+06	7.9E-09	--	--
Styrene	2.57E-03	6.00E+03	6.0E+04	4.3E-08	--	--	3.50E+04	3.5E+05	7.3E-09	--	--
Toluene	4.49E+00	4.90E+03	4.9E+04	9.2E-05	--	--	4.70E+04	4.7E+05	9.6E-06	--	--
Xylenes	8.67E-03	5.80E+02	5.8E+03	1.5E-06	--	--	2.50E+03	2.5E+04	3.5E-07	--	--
			Hazard Index (HI)	**9E-01**	Cumulative Risk	**4E-07**		Hazard Index (HI)	**5E-02**	Cumulative Risk	**9E-08**

1 – Maximum detected concentration from DPFR 716-A, Automotive Repair Shop, V=PCOR-A-00043, Appendix B (WSRC 2005).
2 – RSLs are default resident or industrial worker soil values from the *EPA Regional Screening Levels Table*, dated November 2024.
3 – RSLs for concrete media are ten time (10x) the soil RSLs.
4 – Hazard Estimate (HQ) = maximum concentration / concrete RSL concentration.
5 – Risk Estimate = (maximum concentration / concrete RSL concentration) x 1E-06.
6 – RSL for Chromium VI was used.

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