United States Environmental Protection Agency
Statement of Basis

for

Rolls-Royce Corporation
Plants 5 and 8
Indianapolis, Indiana

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INTRODUCTION

This Statement of Basis (SB) explains the proposed remedy for contaminated soil and groundwater at the Rolls-Royce Corporation (Rolls-Royce), Plants 5 and 8 Facility (the Facility) located in Indianapolis, Indiana. The U.S. Environmental Protection Agency (EPA) will select a final remedy for the Facility only after the public comment period has ended and any information provided by the public has been reviewed and considered.

EPA is issuing this SB as part of its public participation responsibilities under the Resource Conservation and Recovery Act (RCRA). The SB presents a summary of information that can be found in the Current Conditions Report of July 2001; the RCRA Facility Investigation (RFI) Report of July 2003; the Revised Corrective Measures Proposal (CMP) dated June 2015; and other pertinent documents contained in the Facility record. EPA encourages the public to review these documents to gain a more comprehensive understanding of the Facility and the RCRA corrective action activities that have occurred to date.

EPA may modify the proposed remedy or select another remedy based on new information or public comments. Therefore, the public is encouraged to participate in the remedy selection process by reviewing this document, as well as documents contained in the Facility record, and then providing comments to the EPA.

PROPOSED REMEDY

Remedial action objectives for the Facility seek to: further reduce the on-site mass of chlorinated volatile organic compounds (CVOCs) in the upper sand and gravel unit, support and validate the Groundwater Flow and Solute Transport Model upon which risk assessment decisions have been made, and ensure that groundwater usage assumptions in the CMP's Human Health Risk Assessment (HHRA) remain valid in perpetuity or until no longer needed. EPA is proposing the following remedy for the Rolls-Royce facility to address contaminated media at Plants 5 and 8 and achieve the remedial action objectives:

1) Previously completed interim measures addressing source removal/control included:

    a) Oil Stores and Southern Plant Boundary (Area of Interest (AOI) 5-2) - Two separate air sparging and soil vapor extraction (AS/SVE) systems were operated between 1997 - 2009 at the areas associated with AOI 5-2. The systems reduced CVOC mass in the vadose zone and groundwater within the upper sand and gravel unit and minimized contaminant migration.

    b) Former Plant 11 Silver Plating Area (AOI 5-9) - An AS/SVE remediation system was operated in this area between 2003 - 2009 and 2010 - 2015. The system reduced CVOC mass in the vadose zone and groundwater within the upper sand and gravel unit and minimized further migration of CVOCs from the area.

    c) Copper Cyanide Plating Area (AOI 5-10) - An AS/SVE remediation system operated in this area between 2003 - 2006. This system reduced CVOC mass in the vadose zone and groundwater within the upper sand and gravel unit and minimized further migration of CVOCs from this area.

d) Skim Basin Remediation System (AOI 5-11, AOI 5-21, and AOI 5-40) - An AS/SVE remediation system operated in these areas between 2003 - 2009 and 2010 - 2015. This system reduced CVOC mass in the vadose zone and groundwater within the upper sand and gravel unit, as well as minimized further migration of CVOCs from the Skim Basin area.

e) Chrome Plating Area (AOI 5-13) – An AS/SVE system was operated in this area between 2003 - 2006. This system reduced constituents of potential concern (COPC) mass in the vadose zone and groundwater within the upper sand and gravel unit, as well as minimized further migration of CVOCs from this area.

f) Former Underground Storage Tanks (AOI 8-31) - Soils from AOI 8-31 were excavated in two separate phases to address a potentially significant release of mercury. A total of approximately 135 tons of excavated soil was disposed at an off-site landfill. Confirmation samples collected after the second phase of excavation indicated acceptable levels of residual mercury in the soil.

2) Implementation of the following work plans, institutional controls, monitoring, and financial assurance requirements, including:

a) Complete proposed semi-annual soil gas monitoring for the 2020 calendar year as described in the December 18, 2019, *Soil Gas Assessment and Vapor Intrusion Evaluation* to evaluate soil vapor concentrations on-site and off-site and evaluate whether further courses of action are needed, which may include additional investigation or cleanup.

b) Complete a vapor intrusion investigation work plan in 2020 after sampling groundwater wells and creating isoconcentration maps and implement sampling to assess the potential for vapor intrusion risks to on-site buildings and determine whether further actions are warranted. Additional actions may include further investigation, cleanup, or use of a vapor intrusion institutional control that requires mitigation in the future if the current building use changes.

c) Complete sampling of groundwater for PFAS as described in the June 25, 2019 *PFAS Sampling Plan,* as amended by the October 1, 2019, *PFAS Sampling Plan, Response to EPA Comments,* in order to determine the extent of PFAS contaminated groundwater, if any. Sampling results from initial sampling may require additions to the groundwater monitoring network if impacts are identified that require delineation, and PFAS impacts may need to be addressed through additional sampling, modeling, expansion of institutional controls, or remediation, if warranted.

d) Impose institutional controls on the property to prohibit potable use of groundwater from the Facility. New non-potable groundwater use that is materially different from current uses, or non-potable groundwater use from new production wells must be evaluated to confirm that these new uses will not result in any significant exposure. This institutional control will provide notification to potential future owners and lessees that groundwater contamination is present and that use of groundwater is restricted as described above. In addition, impose institutional controls that prevent the excavation/extraction of contaminated soil or groundwater without implementing proper waste handling procedures, and that require vapor intrusion to be addressed in affected on-site buildings or new constructions in all contaminated areas, including areas where buildings currently do not exist, through testing/sampling of contaminants in the subsurface and indoor air, or installation of engineering controls to prevent vapor intrusion.

e) Maintain the existing No Well Zone (Area 11), established by the Marion County Health Department (MCHD), that does not allow a well permit to be issued for a potable water well at or downgradient of the Facility.

f) Maintain the existing deed restriction on the property to ensure land use remains industrial/commercial. Ensure that groundwater usage assumptions in the HHRA remain valid in perpetuity, or until no longer needed.

g) Perform groundwater monitoring under an approved Monitoring Plan and use the resultant data to verify/refine the Groundwater Flow and Solute Transport Model. Every 5 years, Rolls-Royce must verify the groundwater model predictions upon which risk assessment decisions have been made. Groundwater monitoring data will be used to update the model to further refine the model's predictive ability and assumptions, particularly related to estimates of remaining source mass and CVOC degradation rates. Should groundwater monitoring indicate increasing trends or impacts expanding to areas where risks are not currently identified, groundwater monitoring may need to be expanded to include further soil gas or indoor air sampling as part of the Monitoring Plan.

h) Provide adequate financial assurance to ensure funding will be available to complete the required remedy.

More details on EPA's proposed remedy are discussed later in this SB.

FACILITY BACKGROUND

Development and Ownership History

The Rolls-Royce facility is located on two industrial properties in the City of Indianapolis, Wayne Township, Marion County, Indiana. Plant 5 is located at 2355 South Tibbs Avenue and occupies approximately 1.70 million square feet of floor space on 207 acres. Plant 8 is located at 2001 South Tibbs Avenue and occupies approximately 0.76 million square feet of floor space on approximately 210 acres. Raymond Street runs east-west between the plants, with Plant 8 on the north and Plant 5 on the south side of the street. Figure 2, taken from the June 2015 CMP, shows the location of the plants in relation to one another and nearby landmarks.

Several light industrial and commercial establishments are located across from Plant 5 on Tibbs Avenue, which is the western boundary of the Facility. The Reilly Tar & Chemical Corporation Superfund Site is located directly west of Plant 8. Various commercial and industrial properties are east of Plant 5, between the eastern Facility boundary and Eagle Creek. These operations include Celadon Trucking Services, a Phillips 66 service station, the Kentucky Avenue Land Company, and a variety of other truck maintenance and/or equipment sales-type businesses. A residential area is adjacent to, and south of Plant 5. Another residential neighborhood borders the north side of the Plant 8 parking lot. Eagle Creek borders most of the Plant 8 eastern boundary. Taylors Truck and Trailer Service and a pallet company (formally known as Buckingham Pallets) are located east of the southern portion of Plant 8.

In 1942, the government-owned Defense Plant Corporation constructed and began operating Plant 5. A second plant, formerly referred to as Plant 11, was constructed in the southeastern portion of the Facility for the production of bearings in 1950. As production operations were expanded, Plant 11 operations

were incorporated into Plant 5 and designated as Building A. In 1966, Allison Gas Turbine Division of GM, which had previously leased and operated Plant 5 (and former Plant 11), purchased Plant 5 from the Defense Plant Corporation. GM constructed Plant 8 and began operations in 1953. In December 1993, GM sold both facilities to AEC Acquisition Corporation, which subsequently changed its name to Allison Engine Company. At the time of the sale, GM accepted responsibility for certain environmental issues and retained this responsibility until its bankruptcy in 2009. In March 1995, Allison Engine Company sold both plants to Rolls-Royce, which currently owns and operates the facilities for the production of turbine engines for commercial and military aircraft.

Processes have not changed significantly since operations began at the two plants. Manufacturing processes are performed at Plant 5. Plant 8 is used for research and development. Parts produced may require one or more manufacturing processes including machining, cleaning, plating, and/or painting. The assembly process may require that parts be cleaned with a variety of solvents and lubricated with oil. Following final assembly, each engine must be tested for quality control purposes, a step that requires the use of various fuels at the Facility. Numerous plating and machining lines have been located at the Facility over the years, along with approximately 57 vapor degreasers. Rolls-Royce is currently in the process of moving all plating operations to Plant 11 (Building A). All but three degreasers have been converted to water-based cleaning solutions. Prior to the conversion, the degreasers contained various chlorinated solvents.

The majority of Plant 5 is either occupied with buildings or paved. In the areas of Plant 5 where buildings have been removed, the ground cover consists of a concrete pad or grass. A portion of the former Plant 11 building was demolished in Spring 2003; the concrete slab and machinery pits were removed from this area. In 2014, the easternmost portion of the former Plant 11 building was removed and the slab remains in place. From 2016 to 2017, a new concrete dock was installed south of the remaining portion of the former Plant 11 building. The southern portion of the Plant 5 building was demolished in the summer and fall of 2006 (including the Oil Stores Building south of Plant 5 buildings), with some of the concrete slab in this area remaining. Several open grassy areas are present at the Plant 5 property surrounding the engineered retention basin.
Approximately two-thirds of Plant 8 is either occupied with buildings or paved. A pond and surrounding field occupy approximately one-third of the Plant 8 property.

Several portions of the Plant 5 and Plant 8 property were sold in 2016. Specifically, the wooded area and Ponds B and C located east of Plant 8, and a portion of the parking lot and grassy area north of Plant 8.

In 1999, GM obtained ownership of the closed hazardous waste surface impoundment AOI 5-31 from Rolls-Royce to facilitate post-closure care. The surface impoundment is classified as a landfill for permitting purposes. In 1999, GM submitted the post-closure permit application to the Indiana Department of Environmental Management (IDEM), and IDEM issued a post-closure permit for the Facility on June 29, 2001. In 2006, ARCADIS (GM's environmental contractor), on behalf of GM, submitted an application to renew the post-closure permit. IDEM issued a draft permit on October 27, 2006. Due to the GM bankruptcy on July 10, 2009, the Surface Impoundment became the property of MLC. On March 31, 2011, Revitalizing Auto Communities Environmental Response (RACER) Trust was formed to manage environmental assets from the GM bankruptcy. RACER Trust continues to be responsible for the post-closure maintenance of the Surface Impoundment.

Geologic Setting

The Facility is underlain by glacial sand and gravel outwash deposited along the White River and Eagle Creek. The outwash deposits consist predominantly of sand and/or gravel, but discontinuous interbedded layers of finer-grained silt and clay, and scattered cobbles and boulders, are also present. A thin alluvial layer ranging from 2 to 8 feet thick, consisting of sandy silts and clays, overlies the 50 to 100 feet of glacial outwash deposits. According to the United States Department of Agriculture (USDA) Soil Survey of Marion County, the soil type at the subject property is classified as Urban Land-Fox complex. The complex is described as well to poorly drained soils. Runoff is generally rapid from the Urban land, and slow on the Fox soils. The land surface at the subject property is described as having a 0 to 3 percent slope.

A silty clay unit (till), approximately 3 to 35 feet thick, has been encountered throughout the Facility at depths ranging from 22 to 63 feet below ground surface (bgs). Soil borings advanced to depths of up to 75 feet bgs during the RFI indicate that the till unit does not exist in the northeastern portion of Plant 5 and is relatively thin near the southwest portion of Plant 5, where it is immediately underlain by New Albany Shale. The surface of the till is relatively flat, except for a north-south trending ridge located near the southeastern corner of the closed surface impoundment and mounding near water supply well PW-5-4. The till acts as an aquitard and separates the sand and gravel layers into distinct water-bearing units (referenced as the upper and lower sand units), both of which include a few discontinuous interbedded layers of finer grained silts and clays.

The sand and gravel deposits are primarily light to dark brown, medium- to coarse-grained sands with rounded to sub-rounded gravel. Previous grain-size analyses indicate the presence of fine-grained materials in the upper sand and gravel unit ranging from 2 to 13 percent, but generally less than 5 percent. In general, the gravel content appears to increase with depth. The upper sand and gravel unit is generally approximately 22 to 63 feet thick. In the vicinity of production well PW-5-4, an intermediate sand and gravel unit is observed. This unit typically extends from 40 to 60 feet bgs and is classified as a silty clay and clayey silt layer of low plasticity. The lower sand and gravel unit ranges from 25 to 45 feet thick, overlies the New Albany Shale, and has a higher gravel content than the upper sand and gravel unit. Shallow sandy clay lenses, ranges from approximately 0.5 to 3 feet thick, have also been noted from boring logs in several areas beneath Plant 5. These sandy clay lenses do not act as a confining layer between the sand and gravel zones.

Based on a review of available boring logs and water supply well records, bedrock beneath the Facility consists of New Albany Shale. The shale layer is approximately 85 to 150 feet thick. Regionally, the New Albany Shale has a sharp basal contact with underlying limestone and dolomite (North Vernon Limestone and Jeffersonville Limestone of the Devonian System), which are roughly 100 feet thick. In the vicinity of the Facility, however, the contact is gradual and includes approximately 20 feet of dark calcareous, laminated shale and dark micritic limestone.

Hydrogeologic Setting

Regional groundwater flow (not influenced by withdrawals from water supply wells) in the upper sand and gravel unit is generally east-southeast toward Eagle Creek, located adjacent to the eastern boundary of Plant 8, and less than one-half mile east of the Plant 5 property. Locally, a significant portion of the groundwater in the upper sand and gravel unit at Plant 8 appears to discharge into Ponds A and B. The depth to groundwater in the upper sand and gravel unit generally ranges from 20 to 28 feet bgs.

However, because of variations in site topography, the depth to groundwater can be as shallow as 10 to 12 feet bgs in the eastern portion of Plant 8, near Ponds A and B. Seasonal variations in the groundwater table of more than 5 feet have also been observed. Groundwater in the upper sand and gravel unit is unconfined.

Regional groundwater flow in the lower sand and gravel unit is generally to the east-southeast toward the White River, located approximately 1.5 miles east of Plant 8 and roughly two-thirds of a mile southeast of the Plant 5 property. Observed water levels in the lower sand and gravel unit generally range from approximately 22 to 30 feet bgs. The lower sand and gravel unit behaves as a confined or semi-confined unit in the vicinity of the Facility because of the presence of the overlying clay till layer.

In 1983, the U.S. Geological Survey (USGS) estimated the hydraulic conductivity beneath the Facility would be between 50 and 200 feet/day, based on lithologic data. A 69-hour constant rate pumping test performed in 1989 at Well RW-3, located south of Plant 5 and screened near the base of the upper sand and gravel unit, indicated a hydraulic conductivity of 656 feet/day. A falling head slug test performed on March 22, 1993 indicated that the average hydraulic conductivity of the upper sand and gravel unit was 160 feet/day; however, slug tests tend to underestimate hydraulic conductivity because of well inefficiency. Based on the available data, ARCADIS estimates that the hydraulic conductivity of the upper sand and gravel unit beneath the Facility is approximately 300 feet/day. An 8-hour pumping test on PW-5-1B, screened in the lower sand and gravel unit, performed in 1998 calculated a hydraulic conductivity of 495 feet/day for the formation. Modelled simulations of the data using different hydraulic conductivities suggests that a hydraulic conductivity of 400 feet/day best represents the measured water levels in the lower sand and gravel unit.

Based on static water-level measurements recorded during 2012, the estimated hydraulic gradient for the upper sand and gravel unit was 0.0018 along the southern boundary of Plant 5, and 0.0020 along the northern Plant 5 boundary. The gradient along the northern boundary is slightly greater than that along the southern boundary because of pumping from water supply well PW-5-2 near the northeastern corner of Plant 5. Based on static water-level measurements recorded during 2012, the hydraulic gradient beneath Plant 8 is estimated to be 0.00186. Using these estimated gradients, an assumed effective porosity of 0.35, and a hydraulic conductivity of 300 feet/day, apparent groundwater velocities in the upper sand and gravel unit range from 1.54-1.73 feet/day at Plant 5 and 1.61 feet/day at Plant 8. The hydraulic gradient of the lower sand and gravel unit, based on data collected from monitoring wells installed in the lower sand and gravel unit, is estimated to be 0.0017.

Monitoring wells 5MW-0102, 5MW-0601-I, 5MW-0602-I and 5MW-0603-I are screened in the intermediate sand and gravel unit. Monitoring wells MW-200C, MW-202C, MW-203C, 5MW-0102, 5MW-0103B, 5MW-0201, 5MW-0202, 5MW-0601-D, 5MW-0602-D, and 8MW-0101 are screened in the lower sand and gravel unit. The remaining monitoring wells at the Facility are screened in the upper sand and gravel unit. The water supply wells at the plants are screened in the lower sand and gravel unit, except for water supply well, PW-5-2, located in the northeastern portion of the Plant 5 property, where the till unit is not present. Previous groundwater elevation data obtained from the monitoring well network at the Facility suggest that operation of PW-5-2 is impacting groundwater flow in the upper sand and gravel unit in this area, causing shallow groundwater to flow toward the well.

Aquitard Characteristics

The till layer that separates the upper and lower sand and gravel units behaves as an aquitard. Testing conducted by Rolls-Royce in 1991 showed a vertical hydraulic conductivity across the aquitard ranging from 5.5×10^{-7} cm/sec to 1.8×10^{-8} cm/sec, which indicates groundwater movement through the till layer would be minimal. Calculations based on static water-level measurements collected by Rolls-Royce during the RFI show that the vertical hydraulic gradient of groundwater flow is from the upper sand and gravel unit to the lower sand and gravel unit.

Surface Water

Eagle Creek is located adjacent to the eastern boundary of Plant 8, and roughly one-half mile east of the Plant 5 property. Eagle Creek flows in a south-southeast direction and is one of the principal streams flowing through the outwash aquifer in Marion County. Eagle Creek is also a major tributary of the White River, which is located approximately 1.5 miles east of the Facility and flows in a southerly direction. Two man-made water bodies (Ponds A and B) are present at Plant 8.

INVESTIGATION HISTORY

Rolls-Royce conducted an RFI at Plants 5 and 8 between October 2001 and April 2003. This investigation consisted of soil, sediment, groundwater, surface water, borehole water, and biota sampling. A total of 42 AOIs were investigated to determine whether any significant release of hazardous constituents to the environment had occurred. EPA had already determined that an additional 31 AOIs, identified during pre-RFI activities and listed in Attachment 1 to this SB, required no further action or investigation.

Based on the results of the initial phase of the RFI field effort, Rolls-Royce conducted three additional phases of field investigation to fully characterize the nature and extent of the releases identified. Findings from all four phases of RFI field investigation are discussed in Section 4 of the RFI Report. A hydrogeologic investigation was also completed as part of the RFI to assess groundwater flow and quality within the sand and gravel units.

Constituents detected above relevant soil and/or groundwater screening criteria included a variety of CVOCs including perchloroethylene (PCE); trichloroethene (TCE); 1,1,1-trichloroethane (TCA); 1,1,2-TCA; carbon tetrachloride; 1,2-dichloroethane (DCA); 1,1-dichloroethene (DCE); 1,2-DCE; 1,3-dichloropropene; methylene chloride; 1,1,2,2-tetrachloroethane; vinyl chloride; and 1,2,3-trichloropropane. Petroleum hydrocarbons (including benzene and various polynuclear aromatic hydrocarbons) and metals were also reported in Facility soil and groundwater (both the upper and lower sand and gravel units). Contamination was also found to be migrating off-site in groundwater from AOI 5-2. A summary of sampling results for each AOI can be found in Attachment 2.

In April 2019, soil gas sampling at AOI 5-2 and the adjacent residential neighborhood confirmed that current conditions were consistent with historical soil gas data collected from the Facility (in 2008-2009). TCE and PCE were present in soil gas in the residential neighborhood at levels below the risk-based screening criteria for those compounds, supporting a conclusion that there are no potentially significant vapor intrusion exposures to residents located off-site south of the Facility. The investigation confirmed the potential for vapor intrusion to pose a risk in on-site areas based on existing groundwater

sampling data. Additional investigation is planned for those on-site areas along with semiannual soil gas sampling from the residential area south of the site in 2020.

Several spills have occurred at the Facility subsequent to the RFI. As noted in Attachment 3, each of these incidents has been addressed, evaluated, and approved for No Further Action by IDEM at this time.

INTERIM MEASURES IMPLEMENTATION

Rolls-Royce conducted investigations at 42 AOIs, and implemented interim measures (IMs) for eight of the AOIs. The other AOIs were determined to be below risk-based criteria and required no further action. Each of these interim efforts is discussed below, along with its current operational status.

Oil Stores and Southern Plant Boundary (AOI 5-2)

Two separate AS/SVE systems were installed to address contamination associated with AOI 5-2: 1) the Oil Stores Area system and 2) the Southern Plant Boundary system which was later expanded to include the supplemental SPB system (collectively, the SPB system). The purpose of the Oil Stores Area system was to reduce CVOC mass in the vadose zone and upper sand and gravel unit groundwater, thereby minimizing contaminant migration. The SPB system was intended to minimize migration of CVOCs beyond the Oil Stores Area and beneath neighboring properties.

The AS/SVE systems removed a total of 3,774 pounds of PCE (2,438 pounds from the SPB and 1,336 pounds from the Oil Stores Area) and 5,541 pounds of total hydrocarbons (3,953 pounds from the SPB and 1,588 pounds from the Oil Stores Area) during the operation of the remediation systems from September 1997 through July 2007. The Remedial System Evaluation Report dated July 2014 indicated that concentrations of PCE, TCE, and cis-1,2-DCE decreased rapidly after system startup and reached asymptotic conditions, with less than 0.1% additional recovery of COPCs per day, as compared to the cumulative recovery totals of COPCs removed. Consequently, continued AS/SVE activity is unlikely to result in recovery of significant additional contaminant mass.

In July 2007, Rolls-Royce deactivated both the Oil Stores Area system and the SPB system due to adjacent demolition activities. In August 2009, Rolls-Royce dismantled the SPB system. CVOC concentrations continue to remain stable in and downgradient of the IM areas since the systems were deactivated. No rebound has been observed.

Former Plant 11 Silver Plating Area (AOI 5-9)

An AS/SVE remediation system was installed at AOI 5-9 in July 2003 to reduce CVOC mass in the vadose zone and upper sand and gravel unit groundwater. The system layout also served to minimize further migration of CVOCs from the area, as impacts were identified in the intermediate and lower sand and gravel units downgradient of AOI 5-9.
A total of 4,787 pounds of PCE and 5,001 pounds of total hydrocarbons was removed by this system between July 2003 and March 2014. PCE concentrations decreased rapidly immediately following system startup and then decreased more gradually. The system was idled during the GM bankruptcy, between August 2009 and April 2010, and restarted under Rolls-Royce's direction. From the PCE and TCE concentrations observed in well MW-106, it appears that groundwater containing higher concentrations of PCE may have migrated past the remediation system while the system was shut off

during the GM bankruptcy. The TCE concentrations observed downgradient of the IM area are believed to be due to the degradation of PCE.

As of July 2014, the system was removing less than 0.1% of additional COPCs per day. Between December 2014 and March 2015, the system was pulsed in an attempt to enhance contaminant recovery and evaluate the potential for contaminant rebound in soil gas. Due to continued low recovery levels, Rolls-Royce permanently shut down this system on April 24, 2015.

Copper Cyanide Plating Area (AOI 5-10)

An AS/SVE remediation system was installed at AOI 5-10 in November 2003 to reduce CVOC mass in the vadose zone and upper sand and gravel unit groundwater and to minimize further migration of CVOCs from this area.

The system removed a total of 2,855 pounds of PCE and 2,902 pounds of total hydrocarbons between November 2003 and August 2006. Again, PCE concentrations decreased rapidly immediately following system startup and then decreased more gradually. In August 2006, Rolls-Royce demolished the portion of the plant in which the system was located; therefore, the system was disconnected and removed. Prior to being decommissioned, this system was removing less than an estimated 0.1% of additional COPCs per day, relative to the cumulative COPC recovery totals from this area. No rebounding has been observed in groundwater contaminant concentrations since system shutdown.

Skim Basin Remediation System (AOI 5-11, AOI 5-21, and AOI 5-40)

An AS/SVE remediation system was installed in the Skim Basin area in July 2003 to address observed contamination at AOI 5-11, AOI 5-21, and AOI 5-40. Six AS/SVE wells addressed AOI 5-11, another six wells addressed AOI 5-21, and four AS/SVE wells targeted AOI 5-40. The purpose of this interim system was to reduce CVOC mass in the vadose zone and upper sand and gravel unit groundwater, as well as to minimize further migration of CVOCs from the Skim Basin area.

As with the other interim systems, PCE concentrations decreased rapidly immediately following system startup and then decreased more gradually. The system was idled during the GM bankruptcy (August 2009 through April 2010), and then restarted in April 2011 under the direction of Rolls-Royce. The combined system removed a total of 2,330 pounds of PCE and 2,411 pounds of total hydrocarbons between July 2003 and March 2014.
As of July 2014, the Skim Basin AS/SVE system was removing less than 0.1% of additional COPCs per day, relative to the cumulative recovery totals of COPCs removed. Between December 2014 and March 2015, the system was pulsed in an attempt to enhance contaminant recovery and evaluate the potential for contaminant rebound in soil gas. Due to continued low recovery levels, Rolls-Royce permanently shut down this system on April 24, 2015.

Chrome Plating Area (AOI 5-13)

The interim AS/SVE system constructed in November 2003 addressed one location at AOI 5-13. The purpose of the system was to reduce COPC mass in the vadose zone and upper sand and gravel unit groundwater, as well as to minimize further migration of CVOCs from this area.

The interim AS/SVE system removed a total of 993 pounds of PCE and 1,082 pounds of total hydrocarbons from the AOI between November 2003 and August 2006. In August 2006, Rolls-Royce demolished the portion of the plant in which the system was located; therefore, the system was disconnected and removed. The system wells remain in place, but the associated piping and power supply are no longer present. The system building has been relocated to a vacant portion of the Facility.

Prior to being decommissioned, this system was removing less than an estimated 0.1% of additional COPCs per day, relative to the cumulative COPC recovery totals from this area.

Former Underground Storage Tanks (AOI 8-31)

Soil from AOI 8-31 was excavated in two separate phases to address a potentially significant release of mercury in the vicinity of boring 8-31SB-0108. Approximately 100 tons of excavated soil were disposed at an off-site landfill. After the first phase of excavation was complete, confirmation samples were collected from the bottom and sidewalls of the excavation and analyzed for mercury and PCBs. Based on the residual mercury concentrations, a second phase of excavation was completed, concentrating on the western portion of the excavation. An additional 35 tons of excavated soil was likewise disposed at an off-site landfill. Confirmation samples collected after the second phase of excavation indicated acceptable levels of residual mercury in the soil. The RCRA Corrective Action IM Report on Excavation of Impacted Soil at AOI 8-31 summarized the excavation activities and analytical data.

INTERIM MEASURES EVALUATION

In 2007 and 2008, Rolls-Royce conducted additional soil and groundwater investigation at those AOIs at which IMs had been implemented. This investigation was intended to support an evaluation of IM performance. The Additional Investigation Data Report from June 2009 presented the results of this investigation. The highest detected post-IM concentrations in soil and groundwater were used to determine cumulative estimated lifetime cancer risks (ELCRs) and noncancer hazard index (HI) values. The July 2014 Remediation System Evaluation Report cited this data, showing that IM efforts had significantly reduced contaminant concentrations in the treatment zone.

SUMMARY OF FACILITY RISKS

The process for identifying human health risks posed by conditions at the Facility consisted of identifying site-specific COPCs, identifying potentially complete exposure pathways under current and planned future land uses, and assessing whether the complete exposure pathways are significant.

The RFI Report dated July 2003 included a baseline human health risk assessment showing no unacceptable risks from the Facility. In September 2010, this initial assessment was updated with regard to vapor intrusion concerns and showed no unacceptable risks from the Facility.

In November 2012, Environ completed an Updated Baseline Risk Assessment to Support the CMP showing no unacceptable risks at the Facility (submitted to EPA as Appendix A to the June 2015 CMP).

In 2019, the risk assessment was further updated due to changes in toxicity factors for some chemicals. The 2019 Soil Gas Assessment and Vapor Intrusion Evaluation identified the potential for risks of exposure via the vapor intrusion pathway in on-site areas only.

Environmental Indicators

The RCRA Corrective Action program uses Environmental Indicators (EIs) as interim measures of current Facility conditions to indicate the quality of the environment in relation to: (1) human exposures to contamination, and (2) migration of contaminated groundwater. Rolls-Royce achieved a "yes" determination in 2003 for the human health EI report, indicating there are no unacceptable human exposures to contamination that can reasonably be expected under the current land and groundwater use conditions at the Facility. Rolls-Royce also achieved a "yes" determination in 2003 for the migration of contaminated groundwater EI report, indicating that contaminated groundwater is not migrating beyond the current area of impact, nor is it discharging to a surface water body at levels of concern.

Human Health Risk Assessment Process and Scope

Complete exposure pathways identified in the EI reports represented potential future human health and environmental risks that warranted additional evaluation. Rolls-Royce conducted a HHRA to determine the risks posed by Facility conditions to current and future exposure pathways. Based on the conceptual site model (Table 1 in Attachment 4 to this SB), potential receptors for soil contamination at the Facility under current and future land use conditions included:

- Routine workers (on and off site) exposed while conducting outdoor activities;
- Routine workers (on site) exposed via vapor inhalation;
- Maintenance workers (on and off site) exposed while conducting outdoor activities;
- Construction workers (on and off site) exposed while conducting outdoor activities;
- Site trespassers exposed while conducting outdoor activities; and
- Off-site residents exposed via inhalation of vapors in outdoor air.

Rolls-Royce also used soil gas contaminant concentrations to assess risks to off-site residents exposed via vapor intrusion from contaminated groundwater into residential basements. Potential receptors for groundwater contamination at the Facility included:

- Routine workers (on and off site) exposed via vapor inhalation;
- Routine workers (on and off site) exposed via inhalation while conducting outdoor activities;
- Maintenance/construction workers (on site) exposed while conducting outdoor activities;
- Maintenance/construction workers (off site) exposed via inhalation while conducting outdoor activities;
- Residents and off-site workers exposed via vapor intrusion and inhalation of vapors in outdoor air; and
- Site trespassers exposed via inhalation of vapors in outdoor air.

Rolls-Royce also evaluated groundwater risks with regard to inhalation of vapors from open-top groundwater tanks near production wells at the Facility, non-potable usage for janitorial purposes, and exposure to off-site groundwater that could potentially be used in kiddie pools (Table 3a and 3b in Attachment 4 to this SB).

Potential exposures were first evaluated using upper-bound risk estimates. If an upper-bound cumulative risk estimate for an area was unacceptable (i.e., above EPA's standard risk management limits), refined risk estimates were calculated by replacing the maximum detected concentrations for the most significant contaminants (i.e., those that contributed most to the upper-bound estimates) with

concentrations that better represent exposure concentrations for reasonable maximum exposure estimation. The upper-bound and refined risk estimates for each medium were presented on Tables 2 through 4 of the December 2012 Updated Baseline Risk Assessment (and as provided in Attachment 4 to this SB).

As shown on Table 5 from the Updated Baseline Risk Assessment (also included in Attachment 4 to this SB), the cumulative ELCRs for exposure to Facility COPCs fall below the EPA risk management limit of $1x10^{-4}$. Cumulative HI values for lifetime noncancer risk are also lower than the limit of 1. Therefore, EPA concluded that contaminants in soil and groundwater at the Facility pose no significant human health risks under current or planned future land use scenarios (continued industrial use). Nevertheless, Rolls-Royce will continue groundwater monitoring at the Facility to ensure that such risks remain under control and implement institutional controls to address controls related to future use.

Ecological Risk Screening

Rolls-Royce followed the EPA Ecological Risk Assessment (ERA) Guidance to determine whether contaminants at the Facility pose a risk to ecological receptors. An ecological risk assessment is the process through which scientists evaluate the likelihood that adverse ecological effects might occur, or are occurring, due to exposure to contamination. The process begins with a Screening Level Ecological Risk Assessment (SLERA) which is an evaluation to determine whether a more comprehensive risk assessment is needed.

In 2001, an ecologist from Exponent (GM[1] environmental contractor) conducted a site visit to view the AOIs and undeveloped portions of the Facility and evaluate their suitability as wildlife habitat. The term "undeveloped" refers to areas not dedicated to industrial or administrative operations such as production and maintenance facilities, offices, and storage yards. The term excludes those areas in the immediate vicinity of operational facilities (i.e., roads, parking lots, graveled and landscaped areas). Exponent summarized its observations and conclusions from this site visit in a habitat characterization report (Exponent, 2002). Briefly, the site visit indicated that most of the AOIs have minimal value as wildlife habitat because they are developed (i.e., within operational areas, within buildings, having paved or graveled surfaces). Brief descriptions of each AOI and their associated habitat types are provided in Tables 6.1 and 6.2 of the CMP.

The habitat characterization suggested that exposure pathways for site-related COPCs to ecological receptors are potentially complete at three areas:

- Pond A at AOI 8-19;
- Pond B at AOI 8-20; and
- Stormwater Retention Basin and Lime Sludge Dewatering Basins at AOI 5-32.

On June 6, 2002, representatives of EPA and IDEM conducted a follow-up site visit. During that visit, EPA and IDEM expressed concern about the potential ecological significance of several other areas. Accordingly, GM agreed to evaluate the potential for ecological risk in three additional areas:

- A depression area north of Pond B in AOI 8-20 that contains standing water (hereafter referred to as Pond C);

[1] GM performed corrective action activities at the Facility until its bankruptcy in 2009.

- The Former Skim Basin and Retention Pond at Plant 8 (AOI 8-28); and
- Terrestrial habitats at AOI 8-19, AOI 8-20 (the construction debris landfill in the Pond B area), and AOI 8-28.

Rolls-Royce conducted the SLERA for these areas using data collected during the RFI. During this effort, Rolls-Royce determined that:

1. Sediment screening values were exceeded for several metals and semivolatile organic compounds (SVOCs) in the retention basin at AOI 5-32, and several metals at AOI 8-28. However, because these water bodies are man-made industrial structures, they do not provide an exposure pathway to natural populations of benthic macroinvertebrate communities. Consequently, exceedances of the sediment screening values are irrelevant in these areas and no further evaluation is necessary.

2. No COPC concentrations were detected above no-effect concentration screening criteria in sediments from Ponds A, B, and C. Therefore, no further investigation of potential risks to benthic organisms or corrective measures are warranted at these water bodies.

3. Food-web modeling using conservative assumptions for exposure parameters indicates a low likelihood of adverse effects to piscivorous wildlife from water bodies at the Facility and a low likelihood of adverse risk to vermivorous wildlife inhabiting terrestrial areas of the Facility.

Based on these findings, EPA believes that it is unlikely that the Facility poses any unacceptable ecological risks. Additionally, EPA determined that no further ecological risk assessment is necessary and no corrective measures are needed to address unacceptable ecological risks. Accordingly, EPA will not further consider ecological risks in this SB.

SCOPE OF CORRECTIVE ACTION

As stated previously, the updated Baseline HHRA of December 2012 concluded that post-IM contaminant concentrations in soil do not pose a current or potential future risk. Based on this conclusion, EPA believes that corrective measures are not necessary to address soil, with the exception of a restriction that requires the proper handling of contaminated soil during future excavation in areas of soil contamination.

The updated Baseline HHRA also concluded that no current or potential future risks associated with groundwater contamination exist at the Facility. However, this HHRA determination was based on several assumptions:

- There will be no current or future potable uses of groundwater at the Facility;
- There will be no non-potable groundwater uses from existing production wells that are materially different than those evaluated in the risk assessment;
- There will be no current or future uses of groundwater downgradient of the Facility;
- New non-potable groundwater uses that are materially different from current uses, or non-potable groundwater use from new production wells, will be evaluated in advance to confirm that the new uses will not result in a significant exposure;
- Groundwater modeling results indicated that migration of residual contamination to potential receptors is unlikely;

- Concentrations of VOCs in indoor air that could be attributable to vapor intrusion are presumed to be below the levels prescribed by OSHA. If changes in building use occur that would preclude the use of OSHA workplace standards for indoor air, the risks from vapor intrusion will need to be addressed. In addition, construction of new buildings or changes in current building use will require Rolls-Royce to address risks from vapor intrusion; and
- There are no known surface water intakes between the Facility and the confluence of Eagle Creek and the White River in the area where groundwater has been impacted by historic Facility activities.

Remedial action objectives for the Facility seek to: (1) further reduce on-site mass of CVOCs in the upper sand and gravel unit, (2) support and validate the Groundwater Flow and Solute Transport Model upon which risk assessment decisions have been made, and (3) ensure that groundwater usage assumptions in the HHRA remain valid in perpetuity or until no longer needed.

SUMMARY OF ALTERNATIVES

As detailed in the July 2015 CMP, Rolls-Royce evaluated four alternatives for implementation at the Facility. These alternatives are described briefly below.

Alternative 1: No Action

Under this alternative, no groundwater sampling or gauging would be performed to confirm the Groundwater Flow and Solute Transport Model. No remediation systems would continue to operate on the property, and no institutional controls would be placed on the property. This alternative was retained only as a baseline for the assessment of other alternatives but, because it is not protective of human health and the environment, it is not considered further in this SB analysis.

Alternative 2: Monitoring Program and Additional Investigation

This option consists of a monitoring-only program to evaluate groundwater flow and quality conditions in the vicinity of Plants 5 and 8 and confirm the conclusions of the Groundwater Flow and Solute Transport Model approved by EPA on July 30, 2012. A Sampling Plan would be developed to specify the scope and frequency of groundwater monitoring for volatile organic compounds and PFAS, if continued sampling is necessary, along with additional soil gas and vapor intrusion monitoring in 2020. It is estimated that 85 monitoring wells would be gauged annually, 64 monitoring wells would be sampled annually, and 18 monitoring wells would be sampled semi-annually over a corrective action period of 30 years. The actual duration of the monitoring program would be reviewed with EPA during the execution of the corrective action effort. Additionally, a total of ten monitoring wells will initially be sampled for PFAS in the four areas (AOI 5-9, AOI 5-11, AOI 5-13, and AOI 8-2) where historical chrome plating operations were located. Soil gas and vapor intrusion monitoring will be evaluated to determine whether extended monitoring is warranted. Where practicable, monitoring wells at Plants 5 and 8 that are not planned for use in the monitoring program would be abandoned. Total costs associated with Alternative 2 (including a 3% yearly Consumer Price Index (CPI) increase) is estimated at $2,680,000 (refer to Table 5C in the June 2015 CMP for details), and cost estimates and financial assurance are updated annually.

Alternative 3: Air Sparge and Soil Vapor Extraction

As stated previously, active AS/SVE remediation of Facility contamination was implemented at multiple AOIs on an interim basis, pending formal determination of appropriate Facility remedies. This Corrective Measures alternative assumes that all six of these AS/SVE systems would resume operation for up to five years after EPA approval. Up to 30 years of groundwater monitoring would also be conducted under this option. Previously decommissioned AS/SVE systems would be reinstalled (i.e., trenching to lay piping for AS/SVE well connections, transport building to location) and connected/reconnected to a main power source. The cost associated with this alternative (including a 3% yearly CPI increase) is estimated at $4,600,700 (refer to Table 5D in the June 2015 CMP for detail).

Alternative 4: In-Situ Chemical Oxidation (ISCO)

ISCO was identified as a potentially feasible alternative to reduce groundwater source mass at the Facility. Under this option, injection wells would be installed within areas of groundwater containing PCE at concentrations above 1 milligram per liter (mg/l). A solution of sodium permanganate or similar oxidant (pending results of bench-scale testing) would be injected into the targeted treatment area through the newly-installed wells. The oxidant would react chemically with the contaminants, oxidizing them into innocuous byproducts such as carbon dioxide and water. This Corrective Measures alternative assumes that three injection events would be conducted at up to 369 wells, along with up to 30 years of groundwater monitoring. The cost associated with this alternative (including a 3% yearly CPI increase) is estimated at $10,029,000 (refer to Table 5E in the June 2015 CMP for detail).

Facility-Wide Controls

In addition to the targeted corrective measures alternatives outlined above, the final remedy for this Facility will include facility-wide management controls to ensure long-term protection of human health and the environment. These institutional controls consist of an Environmental Restrictive Covenant (ERC) that prevents the use of the property for residential purposes, prevents construction or reuse of portions of the property without first obtaining EPA approval to install vapor mitigation controls or obtaining EPA approval for additional vapor intrusion assessment, prevents improper handling of potentially contaminated soil or groundwater, and requires a No Well Zone. These restrictions in the ERC will be developed by Rolls-Royce for approval by EPA and IDEM.

Rolls-Royce will record an ERC in the Marion County Recorder's Office to notify potential future owners and lessees that groundwater contamination is present, and that use of groundwater is restricted. The ERC is a legally-enforceable document and a covenant that "runs with the land" and is binding on all future owners and lessees of the Facility. The ERC will prohibit any potable use of groundwater at the Facility. The ERC will also stipulate that on-site groundwater from existing production wells may continue to be used for non-potable purposes, so long as such uses are not materially different from those evaluated in the HHRA. The ERC will also require that materially different non-potable groundwater uses, or use of groundwater from new production wells, will be evaluated in advance to confirm that these uses will not result in a significant exposure. The ERC will also restrict future usage of the property to commercial and industrial purposes only. No future residential use of the property will be allowed. The proposed ERC for the Facility will thereby prevent exposures not considered in the risk evaluation. The one-time cost associated with establishing this facility-wide control is $9,000 (refer to Table 5B in the June 2015 CMP for detail). There is no long-term, recurring cost associated with the ERC.

The MCHD established a No Well Zone to restrict groundwater use on a regional basis. Installation of a water well in Marion County requires a licensed water well driller to obtain a well permit, which is signed by the Marion County Health Officer. The Marion County Health Officer will not sign water well permits for potable wells proposed for installation in a No Well Zone because groundwater in these areas is not considered suitable for use by humans for drinking, food preparation, washing, or other direct human contact. The site-related No Well Zone will be used to address groundwater contamination that has migrated beyond the Facility boundary. In December 2002, GM submitted a request to MCHD to create a No Well Zone to cover groundwater beneath the Facility and selected areas south and east of Plant 5. The No Well Zone was subsequently expanded to include additional properties southeast of Plant 5, north of Plant 8, and east of Plant 8 to Eagle Creek. The cost associated with this facility-wide control (including a 3% yearly CPI increase) is estimated at $142,000 over a period of 30 years (refer to Table 5A in the June 2015 CMP for detail).

SELECTION OF PROPOSED REMEDY

This section profiles the proposed remedy against the RCRA remedy selection criteria, including:

- Overall protection of human health and the environment;
- Attainment of media cleanup standards;
- Ability to control the source of releases;
- Compliance with applicable standards for waste management;
- Long-term reliability and effectiveness;
- Reduction of toxicity, mobility, or volumes of wastes;
- Short-term effectiveness;
- Community/state acceptance;
- Implementability; and
- Cost.

A brief summary of the alternatives evaluation is presented below with regard to each of the remedy selection criteria.

Overall Protection

As stated previously, the Updated Baseline Risk Assessment concluded that residual contamination in soil and groundwater at the Facility does not present significant exposure risks under current and reasonably expected future land use at and around the Facility. Thus, even the No Action alternative would be sufficiently protective, provided that the facility-wide institutional controls were implemented and maintained.

Attainment of Media Cleanup Standards

Costs associated with the proposed facility-wide controls account for groundwater monitoring to confirm that contaminant concentrations remain below relevant drinking water criteria at the boundary of the No Well Zone. Each of the alternatives, other than No Action, is capable of achieving CVOC concentrations that are equal to or less than those predicted by the groundwater model. Up to 30 years of groundwater monitoring is proposed as part of the three active alternatives to confirm that acceptable contaminant concentrations have been achieved in groundwater at and downgradient of the Facility.

Controlling the Sources of Releases

The facility-wide controls do not control contaminant sources. Because it includes monitoring only, Alternative 2 will not address source control either. Alternatives 3 and 4 are capable of addressing remaining contaminant source material to some degree. Pilot testing and system optimization would be used to maximize control of existing sources in groundwater.

Compliance with Applicable Standards for Waste Management

None of the facility-wide controls will result in generation of waste. Each of the active alternatives being considered would result in some waste generation (e.g., drilling or maintenance wastes). However, the CMP notes that procedures will be adopted to verify management of waste in accordance with applicable standards.

Long-Term Reliability and Effectiveness

Each of the institutional controls being considered would provide long-term reliability and effectiveness. With the exception of the No Action alternative, each of the groundwater options would provide long-term reliability and effectiveness and/or monitoring data for evaluation of the Groundwater Flow and Solute Transport Model.

Reduction of Toxicity, Mobility or Volumes of Wastes

None of the institutional controls described above on page 15 in the Facility-Wide Controls section, will reduce toxicity or volume of contamination at the Facility. However, implementation and maintenance of the No Well Zone may control migration from the Facility by eliminating potential migration induced by groundwater pumping.

The No Action and Monitoring Program alternatives would not provide a reduction in the toxicity, mobility, or volume of waste. The AS/SVE and ISCO alternatives would result in source mass reduction to some degree and would reduce mobility by reducing contaminant concentrations in the aquifer.

Short-Term Effectiveness

Each of the facility-wide controls being considered would be effective immediately upon implementation. Groundwater monitoring would be used to quickly and consistently provide data with which to evaluate the Groundwater Flow and Solute Transport Model. Among groundwater-based alternatives, ISCO could be implemented in the short term and would reduce the concentrations of CVOCs in the groundwater, but there may be migration of CVOCs into the groundwater from the soil. AS/SVE could also be implemented in the short term, however only limited additional recovery is expected.

Community/State Acceptance

EPA will evaluate community acceptance of the proposed remedy during the public comment period, and it will be described in the Final Decision and Response to Comments (FDRTC).

IDEM has reviewed and concurred with the proposed remedy for the Facility. IDEM will also have the opportunity to comment on this SB during the public comment period. EPA will respond to any comments received in the FDRTC.

Implementation

The facility-wide ERC is easy to implement. The No Well Zone has already been established and ongoing groundwater monitoring is readily implemented. Each of the groundwater-based alternatives can be easily implemented except for ISCO. Implementation of that alternative would require bench and pilot scale testing, as well as installation of wells to deliver the oxidant. Implementation of the AS/SVE alternative would require reinstallation of four of the six proposed systems.

Costs

Costs associated with the proposed institutional controls and groundwater alternatives were presented in the previous section of this SB. The two institutional control measures have relatively low costs over the long term. The Monitoring Program option is also relatively reasonable at approximately $2.7 million over 30 years. Implementation of the AS/SVE alternative is estimated to cost $4.6 million. The ISCO option is projected to cost $10.0 million.

Sustainability Evaluation

In addition to the evaluation described above, a qualitative sustainability assessment was performed to consider potential environmental, social, and economic impacts associated with the remedial alternatives. Sustainability criteria considered in this evaluation included energy usage, air emissions, water consumption, material consumption, waste generation, land and ecosystem impacts, and health and safety. Overall, Alternative 2 (Monitoring Program) presents the lowest environmental impacts because no additional infrastructure is required, and the alternative includes minimal water or material consumption. Although plume control is not provided under this alternative, groundwater monitoring and institutional controls will provide mechanisms to ensure protection of human health and the environment.

RECOMMENDED REMEDY

Based on information provided in the June 2015 CMP and other relevant documentation, EPA's proposed remedy for Plants 5 and 8 at the Rolls-Royce Facility in Indianapolis, Indiana, includes the previously completed interim measures addressing source removal/control, implementation of Alternative 2 (Monitoring Program and Additional Investigation)(estimated cost $2,680,000), establishment of appropriate ERCs (estimated cost $9,000), and maintenance of the existing No Well Zone (estimated cost $142,000). The combined cost for this remedy is estimated at $2,831,800.

As part of the recommended remedy, EPA proposes that Rolls-Royce provide a written report to the EPA Project Manager 180 days after the effective date of the Final Decision and by the same date every five years thereafter documenting the effectiveness of the corrective action activities related to the implementation of the Corrective Measures Implementation (CMI) Work Plan. The 5-year written report shall include but is not limited to:

1. Description of the activities taken toward achieving compliance with the CMI Work Plan during the prior reporting period.
2. Description of progress toward achieving the remedial action objectives for the Facility which seek to: (a) further reduce on-site mass of CVOCs in the upper sand and gravel unit, (b) support and validate the Groundwater Flow and Solute Transport Model upon which risk assessment decisions have been made, and (c) ensure that groundwater usage assumptions in the HHRA remain valid in perpetuity or until no longer needed. Data collected during long-term groundwater monitoring will be used to verify the groundwater model predictions. This data will be used to update the model to further refine the model's assumptions and predictive ability, particularly related to estimates of remaining source mass and CVOC degradation rates.
3. Report assessing whether Monitored Natural Attenuation (MNA) is progressing satisfactorily. In the CMI Work Plan, Rolls-Royce will propose the criteria for measuring satisfactory progress. If the comprehensive groundwater monitoring program does not demonstrate that MNA is progressing satisfactorily toward achieving the long-term cleanup goal, then Rolls-Royce must implement a contingent remedy to achieve the corrective action objectives for this project. The monitored natural attenuation can be terminated when the groundwater samples throughout the plume show that the long-term groundwater cleanup goals have been achieved consistently, in accordance with terms described in the approved CMI Work Plan.
4. List of activities scheduled to be completed during the next reporting period.
5. Verification of compliance with and maintenance of the ERC.
6. Description and results of groundwater monitoring performed during the previous reporting period.
7. Any other relevant information regarding other activities or matters at the Facility that affect or may affect implementation of the CMI Work Plan.
8. Statement that Rolls-Royce is in compliance with the implementation of the CMI Work Plan.
9. Description of any modifications to the CMI Work Plan that should be implemented to ensure the continued effectiveness and integrity of the corrective action.
10. Certification statement in accordance with 40 CFR, Section 270.11.

EPA did not select Alternative 1 (No Action) because it does not meet the minimum criteria for protection of human health and the environment. Under this scenario there would be nothing to prevent exposure to groundwater contamination or vapor intrusion in on-site buildings. The Facility could also be used for residential use.

EPA excluded Alternatives 3 and 4 because the additional capital costs will not provide commensurate human health or environmental benefits. It is important to note that data obtained during and subsequent to the RFI show that the previously implemented IMs achieved their outlined objective of reducing source mass in the upper sand and gravel unit. Moreover, the updated HHRA concluded that residual contamination in these areas no longer presents a potential exposure risk. Thus, additional active remediation is not a necessity for the Facility.

After consideration of the comments received, EPA will select a remedy and document the selection in the Final Decision and Response to Comments. The Final Decision and Response to Comments will be drafted at the conclusion of the public comment period and incorporated into the Administrative Record. After EPA issues the Final Decision, Rolls-Royce must submit a Corrective Measures Implementation (CMI) Work Plan detailing the implementation of the selected remedy to EPA for review and approval.

PUBLIC PARTICIPATION

EPA solicits input from the community on the corrective measures proposal for the Facility. The public is also invited to provide comment on corrective measure scenarios not addressed in this SB. EPA has set a public comment period from November 16th through December 31st, 2020. EPA recorded a Virtual Public Meeting that is available on the EPA RCRA Corrective Action website for the facility. Primary resources used in development of this SB include:

1. Current Conditions Report for Plant 5 and Plant 8. Prepared by ARCADIS Geraghty & Miller, Inc. (Arcadis). July 16, 2001.
2. RCRA Site Investigation Report. Prepared by Arcadis. July 2003.
3. Corrective Measures Proposal. Prepared by Arcadis. December 2006.
4. Additional Investigation Data Report. Prepared by Arcadis. June 2009.
5. Groundwater Flow and Solute Transport Model Report. Prepared by Arcadis. May 4, 2012.
6. Revised Draft Updated Baseline Risk Assessment to Support the Corrective Measures Proposal. Prepared by Environ. December 4, 2012.
7. Interim Measures Remediation System Evaluation Report. Prepared by Arcadis. July 14, 2014.
8. Third Quarter 2014 Progress Report for RCRA Corrective Action (July 1, 2014 through September 30, 2014). Prepared by Rolls-Royce. October 14, 2014.
9. Revised Corrective Measures Proposal for Plants 5 and 8. Prepared by Arcadis. June 2015.
10. Remediation Systems Status Update for RCRA Corrective Action. Prepared by Arcadis. June 3, 2015.
11. Alternate Nonresidential Soil Screening Levels for Lead CMP. Prepared by Arcadis. May 20, 2016.
12. PFAS Sampling Plan. Prepared by Arcadis. June 25, 2019.
13. PFAS Sampling Plan, Response to USEPA Comments. Prepared by Arcadis. October 1, 2019.
14. Soil Gas Assessment and Vapor Intrusion Evaluation. Prepared by Arcadis. December 18, 2019

These documents and other relevant resources are available in the Administrative Record for the Facility. The Administrative Record is available online and available for viewing at the following locations:

Indianapolis Public Library – West Branch
1216 S. Kappes Street
Indianapolis, Indiana 46221
(317) 275-4540

EPA, Region 5
Land, Chemicals and Redevelopment Division Records Center
77 West Jackson Boulevard, 7th Floor
Chicago, Illinois 60604-3590
(312) 886-0902
Hours: Mon-Fri, 8:00 a.m. - 4:00 p.m.

After consideration of the comments received, EPA will select the remedy and document the selection in the Final Decision and Response to Comments. EPA will summarize and respond to public comments. The Final Decision and Response to Comments will be drafted at the conclusion of the public comment period and incorporated into the Administrative Record.

To send written comments or request information on the public participation process, please contact:

Ruth Muhtsun, EPA Community Involvement Coordinator
U.S. Environmental Protection Agency, Region 5
77 West Jackson Boulevard, RE-19J
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(312) 886-6596
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For additional information or questions regarding the details of this Statement of Basis, please contact:

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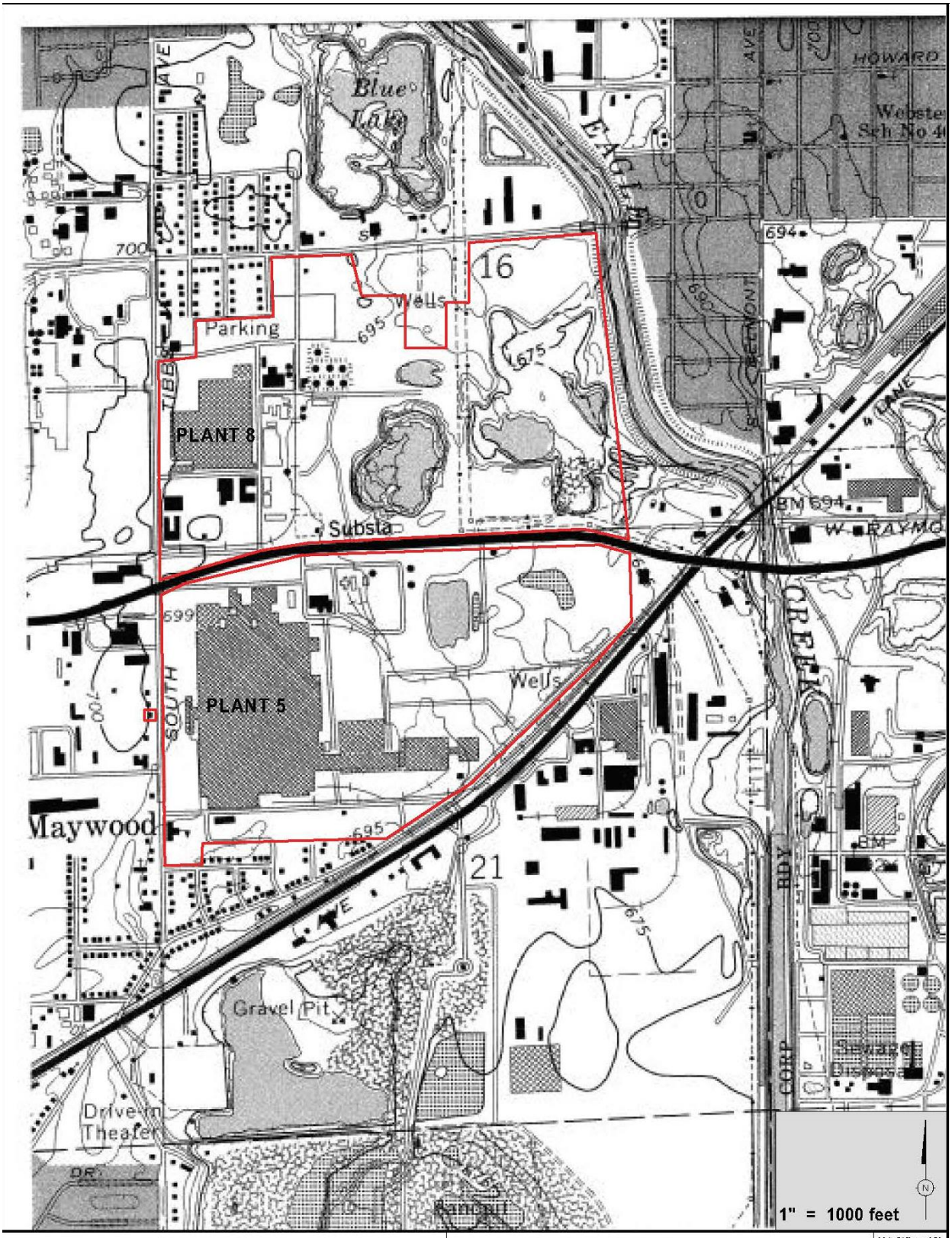
Facility Location Map

Rolls-Royce Corporation
Plants 5 and 8
Indianapolis, Indiana

EPA ID: IND 000 806 836
IND 094 469 913



ARCADIS

ROLLS-ROYCE CORPORATION
INDIANAPOLIS, INDIANA
CORRECTIVE MEASURES PROPOSAL
VICINITY MAP

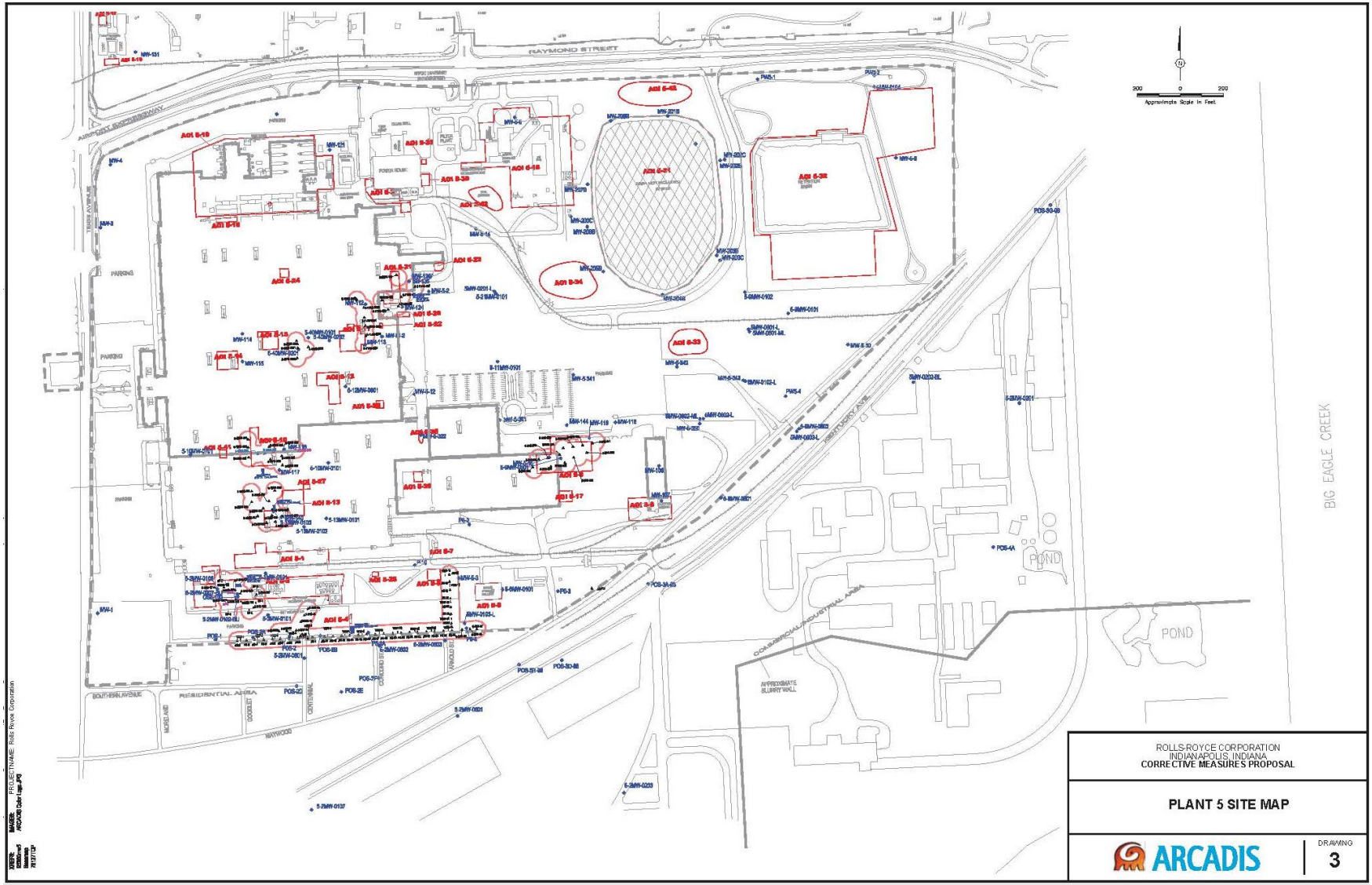
PROJECT NUMBER
IN000848.
2013

DRAWING NUMBER
2

Plant 5 Map

Rolls-Royce Corporation
Plants 5 and 8
Indianapolis, Indiana

EPA ID: IND 000 806 836
IND 094 469 913



ROLLS-ROYCE CORPORATION
INDIANAPOLIS, INDIANA
CORRECTIVE MEASURES PROPOSAL

PLANT 5 SITE MAP

ARCADIS

DRAWING
3

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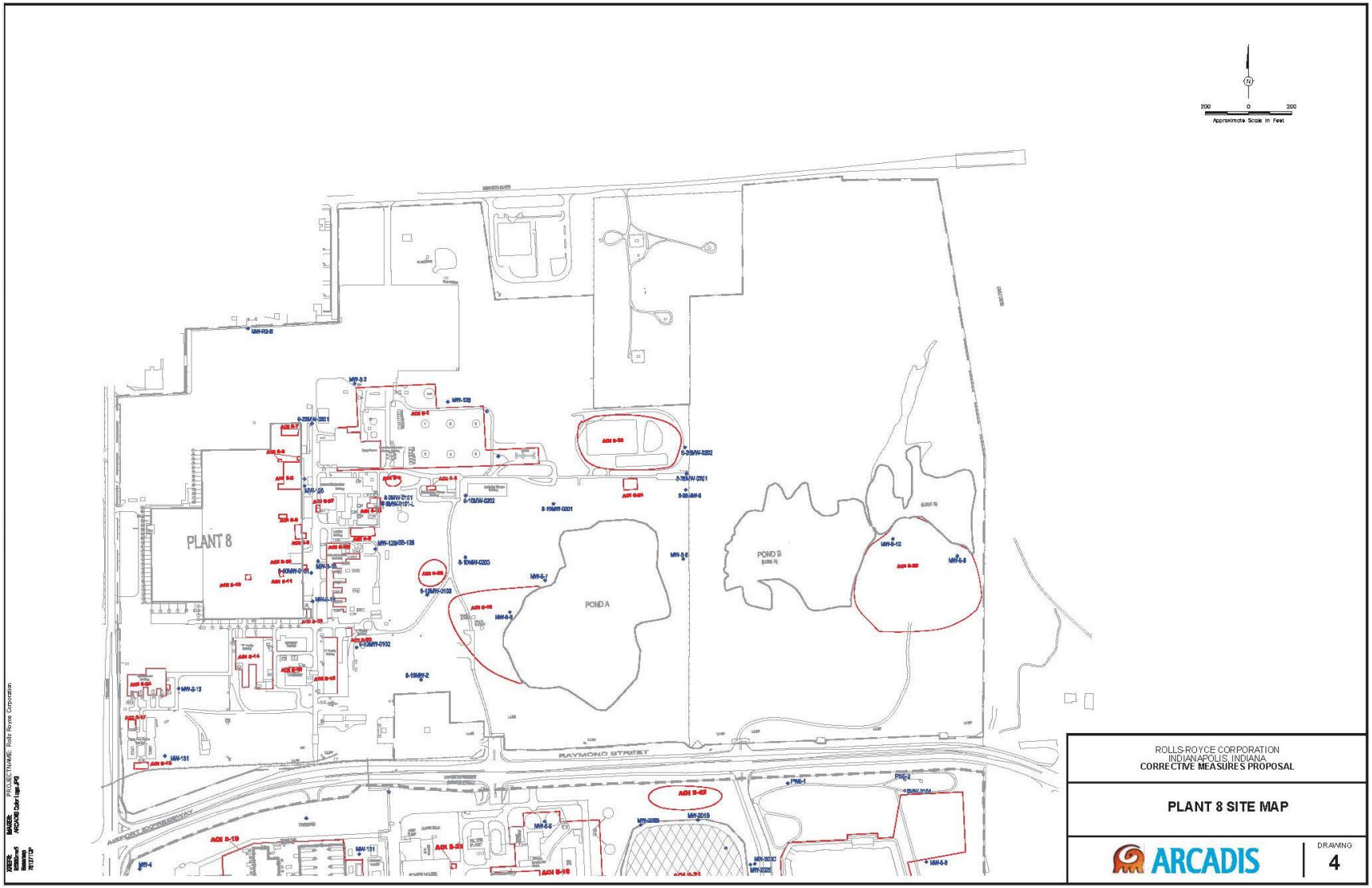
IMAGE: PROJECTNAME: Rolls Royce Corporation
ARCADIS Color Logo.JPG

Plant 8 Map

Figure 4 from the Revised CMP

Rolls-Royce Corporation
Plants 5 and 8
Indianapolis, Indiana

EPA ID: IND 000 806 836
IND 094 469 913



ROLLS-ROYCE CORPORATION
INDIANAPOLIS, INDIANA
CORRECTIVE MEASURES PROPOSAL

PLANT 8 SITE MAP

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4

XREFs: PROJECTNAME: Rolls Royce Corporation
IMAGES: ARCADIS Color Logo.JPG

Attachment 1

No Further Action Determinations
By Area of Interest

Rolls-Royce Corporation
Plants 5 and 8
Indianapolis, Indiana

EPA ID: IND 000 806 836
IND 094 469 913

Rolls-Royce Corporation
Plants 5 and 8
Indianapolis, Indiana

EPA ID: IND 000 806 836
IND 094 469 913

The following AOIs were identified in the Current Conditions Report (ARCADIS, 2001a) as requiring no further action or investigation:

Plant 5

- AOI 5-4 (AS/SVE System)
- AOI 5-5 (Trash Incinerator)
- AOI 5-6 (Barrel Storage Area)
- AOI 5-7 (Less than 90-Day Storage Area)
- AOI 5-15 (Former Plating and Paint Room Area)
- AOI 5-16 (Test Cell 108 Plating Area)
- AOI 5-22 (Maintenance Paint Room WCAs)
- AOI 5-23 (Blasting Dust Dumpsters)
- AOI 5-24 (Turbine Vanes WCAs)
- AOI 5-25 (QA Laboratory WCAs)
- AOI 5-26 (Sludge Swarf Room)
- AOI 5-27 (Turbine Blades WCA)
- AOI 5-28 (Waste Collection Drum)
- AOI 5-29 (Asbestos Storage Building)
- AOI 5-35 (Process Sewer Line)
- AOI 5-36 (PCB Transformers)
- AOI 5-37 (Blasting Dust Collection Units)
- AOI 5-38 (Scrap Metal Hoppers)
- AOI 5-39 (Mop Water Stations)

Plant 8

- AOI 8-6 (Etching and X-Ray Department WCAs)
- AOI 8-7 (Foundry WCAs)
- AOI 8-8 (Document Incinerator)
- AOI 8-9 (Metallurgical Materials Area)
- AOI 8-11 (Maintenance Paint Show WCA)
- AOI 8-12 (Floor Spray Booth WCA)
- AOI 8-13 (Vibration Laboratory WCA)
- AOI 8-17 (Turbo Prop WCAs)
- AOI 8-21 (Trash Incinerator)
- AOI 8-22 (Blasting Dust Collection Units)
- AOI 8-23 (Scrap Metal Hoppers)
- AOI 8-26 (PCB Transformers)

Attachment 2

AOI Summary Table

Rolls-Royce Corporation
Plants 5 and 8
Indianapolis, Indiana

EPA ID: IND 000 806 836
IND 094 469 913

AOI Summary Table, Rolls-Royce Corporation, Plants 5 and 8, Indianapolis, Indiana

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
5-1	Byproducts Area	Liquid Waste Collection Trucks, Byproducts Storage Areas, Former Magnesium Chip Storage Shed, Runoff from SWMU 4	Soil: N/A (2003) PCE (2009)	0.12 – 9.85	• Soil excavation • Drainage system installed • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: N/A (2003) PCBs (2009)	6.47	
5-2	Oil Stores Area Southern Plant Boundary	Soil Vapor Extraction System, Former Oil Stores Skim Basin, Oil Stores Waste Recovery System, Oil Stores above ground storage tanks (ASTs), 1,1,1 TCA Waste Collection Area (WCA), Former USTs, Former Plant 5 USTs, Equipment Cleaning Area	Soil: 1,2,3-trichloropropane (2003) N/A (2009)	0.17	• Underground storage tank (UST) removal and soil excavation • Groundwater pump and treat operations (1991-1995) • Air Sparging/Soil Vapor Extraction (AS/SVE) (1997-2009) - Discontinued due to limited removal. • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: Benzene (2003) CVOCs (2003) Iron (2003)	0.014 – 0.029 0.0032 – 7.5 6.19 – 42.6	

AOI Summary Table, Rolls-Royce Corporation, Plants 5 and 8, Indianapolis, Indiana

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
5-3	Powerhouse Area	Potential Soil Impacts Due to Releases	Soil: N/A (2003)		• Minor soil excavation (spill response) • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: PAHs (2003)	0.0099 – 0.021	
5-8	Clarifier Building Area	Central Soluble Oil Recovery System	Soil: N/A (2003)		• Soil excavation • Additional corrective measures are not warranted based on risk assessment.
			No groundwater investigation		
5-9	Former Plant 11 Silver Plating Area	Silver Plating Line WCAs, Silver Reclamation Storage and Treatment, Former Silver Waste Incinerator, Former Waste Acid Tank, Plant 5 Plating Tanks, Degreaser near well MW 5-15	Soil: PCE (2003) Cyanide, total (2003) PCE (2009)	0.006 – 200 0.0317 – 290 0.0025 – 4.16	• Incinerator decommissioned • Soil excavation • AS/SVE (2003-2013) - Discontinued due to limited removal. • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: CVOCs (2003) Cyanide, total (2003) N/A (2009)	0.0016 – 16 0.526 -- 34	

AOI Summary Table, Rolls-Royce Corporation, Plants 5 and 8, Indianapolis, Indiana

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
5-10	Copper Cyanide Plating Area	Copper Cyanide Plating Line WCAs, Plant 5 Plating Tanks, Copper Cyanide Plating Degreasers	Soil: N/A (2003) PCE (2009)	0.005 – 9.44	• AS/SVE (2003-2006) - Discontinued due to limited removal. • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: CVOCs (2003) Cyanide, total (2003) N/A (2009)	0.0064 – 17 0.417 – 5.4	
5-11	Nickel, Copper and Silver Plating Area	Nickel, Copper, and Bronze Plating Line WCAs; Nickel, Copper, and Bronze Plating Tanks	Soil: N/A (2003) PCE (2009)	0.0049 – 3.44	• AS/SVE (2003-2013) - Discontinued due to limited removal. • Additional corrective measures are not warranted based on risk assessment
			Groundwater: CVOCs (2003) Metals (2003) N/A (2009)	0.0054 – 0.85 0.00938 – 3.96	

AOI Summary Table, Rolls-Royce Corporation, Plants 5 and 8, Indianapolis, Indiana

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
5-12	Paint Room and HAE Plating Area	Nonhazardous Waste Drum Paint Room WCAs, HAE Plating Tanks, PCE Degreaser	Soil: N/A (2003) PCE (2009)	 0.012 - 6.54	• Corrective measures are not warranted based on risk assessment
			Groundwater: CVOCs (2003) N/A (2009)	 0.041 – 0.79	
5-13	Chrome Plating	Plant 5 Plating Tanks, Former Degreaser near K-24	Soil: N/A (2003) PCE (2009)	 0.007 – 5.53	• AS/SVE (2003-2006) - Discontinued due to limited removal. • Additional corrective measures are not warranted based on risk assessment
			Groundwater: CVOCs (2003) Cyanide, total (2003) N/A (2009)	 0.0069 – 2.7 19.2	
5-14	Former Plant 5 Silver Plating Area	Plant 5 Plating Tanks	Soil: N/A (2003) PCE (2009)	 0.006 – 17.1	• Corrective measures are not warranted based on risk assessment

AOI Summary Table, Rolls-Royce Corporation, Plants 5 and 8, Indianapolis, Indiana

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
			Groundwater: CVOCs (2003) N/A (2009)	0.0053 – 0.16	
5-17	Lead Plating Area	Plant 5 Plating Tanks	Soil: N/A (2003) PCE (2009)	0.0031 – 6.9	• Corrective measures are not warranted based on risk assessment
			Groundwater: N/A (2003 and 2009)		
5-18	Fuel Farm Area	Plant 5 Waste Storage Area, Wastewater Treatment Facility, Tank Farm Waste Jet Fuel WCA, Former Underground Waste Storage Tanks 5 and 36, Waste Cyanide AST, Former Plant 5 UST Locations	Soil: N/A (2003) PCE (2009)	0.002 – 2.0	• Container storage area closure (1994) • SVE (1998) • Soil excavation (2012) • Additional corrective measures are not warranted based on risk assessment and IDEM's Compliance Confirmation letter indicating no further action is necessary.
			Groundwater: VOCs (2003) N/A (2009)	0.01 – 0.093	

AOI Summary Table, Rolls-Royce Corporation, Plants 5 and 8, Indianapolis, Indiana

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
5-19	Test Cells Area	Testing Area Waste Fuel and Waste Oil, ASTs, Former Testing Area Skim Basin, New Testing Area Oil-Water Separator, Testing Area Waste Fuel and Waste Oil WCAs, Oil Test Laboratory WCAs, Former USTs 60, 61 and 63, Former Plant 5 UST Locations	Soil: PAHs (2003) CVOCs (2009) 2-hexanone (2009) Xylenes, total (2009)	 0.35 – 41 0.866 – 3.11 30.3 0.0015 – 45	• Soil excavation • Groundwater pump and treat operations (1993-1994) • SVE (1993-1996) • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: VOCs (2003) Iron (2003) N/A (2009)	 0.0016 – 0.12 0.914 – 19	
5-20	USTs 55 and 56	Former Plant 5 UST Locations	Soil: N/A (2003)		• Corrective measures are not warranted based on risk assessment.
			Groundwater: CVOCs (2003)	 0.059 – 0.89	

AOI Summary Table, Rolls-Royce Corporation, Plants 5 and 8, Indianapolis, Indiana

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
5-21	Skim Basin Area	Maintenance Department Skim, Basin Degreaser Near MW-136	Soil: N/A (2003) PCE (2009)	0.003 – 89.6	• AS/SVE (2003-2013) - Discontinued due to limited removal. • Additional corrective measures are not warranted based on risk assessment
			Groundwater: CVOCs Metals N/A (2009)	0.0021 – 2.4 0.167 – 50.9	
5-30	Coal Slurry Drum Area	Coal Slurry Sludge Drum Storage Area	Soil: PAHs (2003)	0.82 – 44	• Corrective measures are not warranted based on risk assessment.
			No groundwater investigation		
5-32	Retention Basin Area	Groundwater Treatment Dewatering Lagoons, New Non-Contact Water & Stormwater Collection Basin, Calcium Carbonate Waste Pile, Former Lime Sludge Dewatering Area	Soil: N/A (2003)		• Periodic removal of calcium carbonate waste • Corrective measures are not warranted based on risk assessment.
			Groundwater: PCE (2003)	0.011	
			Surface water: Metals (2003)	0.0104 – 0.111	

AOI Summary Table, Rolls-Royce Corporation, Plants 5 and 8, Indianapolis, Indiana

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
			Sediment: Benzo(b)fluoranthene (2003)	200	
5-33	Cinder Pile	New Cinder Pile	Soil: N/A (2003)		• Corrective measures are not warranted based on risk assessment.
			No groundwater investigation		
5-34	Coal Cinder Storage	Coal Cinder Storage	Soil: N/A (2003)		• Corrective measures are not warranted based on risk assessment.
			No groundwater investigation		
5-36	PCB Transformers	PCB Transformers	PCB wipe samples (prior to 2013 coating effort)	≥10 µg/cm^2	• PCB equipment removal (1994-1998) • Triple wash and sealing of floor (1998) • Application of two epoxy coatings (2013)
			No soil or groundwater investigation conducted		
5-40	Degreasers	Former Degreaser Locations	Soil: N/A (2003) PCE (2009)	0.002 – 6.69	• Recovery of spilled material • AS/SVE (2003-2013) - Discontinued due to limited removal.

AOI Summary Table, Rolls-Royce Corporation, Plants 5 and 8, Indianapolis, Indiana

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
			Groundwater: CVOCs (2003) N/A (2009)	0.0062 – 1.4	• Additional corrective measures are not warranted based on risk assessment
5-41	Cutting Oil Release (Bay F-19)	Cutting Oil Release at Bay F-19	Soil: N/A (2003)		• Soil excavation • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: Bis (2-ethylhexyl) phthalate, (2003)	0.0075	
5-42	Former Coal Storage	Former Coal Storage Area	Soil and coal: N/A (2003)		• Corrective measures are not warranted based on risk assessment.
			No groundwater investigation		
8-1	Fuel Farm Area	Plant 8 Waste Storage Area, USTs located in the Tank Farm Area	Soil: Benzo(a)pyrene (2003) Arsenic (2003)	0.62 – 14 1.9 – 112	• UST removal (1989) • SVE and free-phase product recovery (multiple phases) • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: CVOCs (2003)	0.0055 – 0.024	
8-2	Plating Area	Plating Tanks	Soil: N/A (2003)		

AOI Summary Table, Rolls-Royce Corporation, Plants 5 and 8, Indianapolis, Indiana

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
			Groundwater: CVOCs (2003)	0.0087 – 0.011	• Corrective measures are not warranted based on risk assessment.
8-3	Process Water Release Area	Identified Release Area South of Waste Storage	Soil: Benzo(a)pyrene (2003)	8.9	• Soil excavation (spill response) • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: TCE (2003)	0.0115 – 0.016	
8-5	Skim Basin Area	Plant 8 Waste Oil Skim Basin	Soil: N/A (2003)		• Soil excavation • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: PCE (2003)	0.082	

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
8-10	Mop Water Station	Mop Water Disposal Station	Soil: N/A (2003) PCE (2009)	 0.019 – 4.3	• Corrective measures are not warranted based on risk assessment.
			Groundwater: CVOCs (2003) Arsenic (2003) N/A (2009)	 0.0058 – 0.95 0.0087 – 0.062	
8-14	D Facility	Facility D Waste Oil WCAs	Soil: Arsenic (2003)	 4.06 – 160	• UST removal and soil excavation (1989). • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: N/A (2003)		
8-15	C Facility	Facility C WCAs	Soil and bore water: N/A (2003)		• Soil excavation • Additional corrective measures are not warranted based on risk assessment.
8-16	Compressor Turbine WCAs	Compressor Turbine Building WCAs	Soil and bore water: N/A (2003)		• Soil and gravel excavation • Additional corrective measures are not warranted based on risk assessment.
8-18	Turbo Test Cells Release	Identified Release Area South of Turbo Test Cells	Soil and bore water: N/A (2003)		• Soil excavation • Corrective measures are not warranted based on risk assessment.
8-19	Pond A Area	Historical Releases Near Pond A	Soil: N/A (2003)		

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
			Groundwater: VOCs (2003) PAHs (2003)	 0.009 – 0.053 0.023 – 1.1	• Corrective measures are not warranted based on risk assessment.
			Surface water: N/A (2003)		
			Sediment: N/A (2003)		
8-20	Pond B Area	Construction Debris Landfill	Soil: Benzo(a)pyrene (2003)	0.36 – 26	• Corrective measures are not warranted based on risk assessment.
			Groundwater: N/A (2003)		
			Surface water: Manganese (2003)	 0.0537 – 0.54	
			Sediment: N/A (2003)		
8-24	Dynamometer Building Area	Dynamometer Building Waste Oil WCAs	Soil: Arsenic (2003)	1.89 - 64	• Soil excavation • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: N/A (2003)		
8-25	Former Test Cells Area	Former Test Cells East of Turbo-Jet Test Cells	Soil: N/A (2003)		• Additional corrective measures are not warranted based on risk assessment.
			Groundwater: 1,1,2-TCA (2003) Manganese (2003)	 0.0063 0.30 – 0.927	

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
8-27	Radiochemical Vault	Radiochemical Vault	N/A (2003)		• Corrective measures are not warranted based on risk assessment.
8-28	Retention Basin	Former Skim Basin and Retention Pond	Soil: N/A (2003)		• Excavation of settled material • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: TCE (2003) Bis (2-ethylhexyl) phthalate, (2003) Iron (2003) Manganese (2003)	0.012 – 0.013 0.011 15.5 0.443 – 1.3	
			Surface water: N/A (2003)		
			Sediment: N/A (2003)		
8-29	Turbo-Jet Test Cells Area	Turbo-Jet Ambient Test Cells WCA	Soil: Benzo(a)pyrene (2003) Arsenic (2003) Lead (2003)	2.8 – 5.5 1.83 – 602 2.69 – 2,670	• Recovery of released material • Soil excavation • Additional corrective measures are not warranted based on risk assessment.
			No groundwater investigation		
8-30	F Facility	Releases from F Facility	Soil: N/A (2001)		• Soil excavation

AOI	Name	Description	Contaminants	Range (ppm)	Corrective Action
			No groundwater investigation		• Corrective measures are not warranted based on risk assessment.
8-31	Underground Storage Tanks	Former Underground Waste Storage Tank 38, Former USTs	Soil: N/A (2003)		• UST removal • Soil Excavation • Additional corrective measures are not warranted based on risk assessment.
			Groundwater: CVOCs (2003)	0.0094 – 0.034	
8-32	Degreasers	Former Degreaser Locations	Soil: N/A (2003)		
			Groundwater: PCE (2003)	0.0083– 0.059	• Corrective measures are not warranted based on risk assessment.
8-33	Fuel Release Area	Historic Release East of Research Building	Soil: N/A (2003)		• Corrective measures are not warranted based on risk assessment.
			No groundwater investigation		

This table includes only the most recent data for each Area of Interest (AOI). Historical contaminants are not included if subsequent cleanup and/or investigation indicates environmental conditions have changed. For example, the 2003 RCRA Facility Investigation included assessment of soil and groundwater concentrations against industrial direct contact and inhalation screening criteria. However, with respect to certain AOIs, the 2009 data repeated the contaminant comparison against industrial volatilization to indoor air criteria. In that case, the 2003 data is superseded by the 2009 data for vapor intrusion considerations.

N/A – Indicates that no contaminants were detected above screening levels.

Groundwater data may also reflect observed chemical concentrations in bore water.

Proposed Corrective Actions may change and/or affect the proposed restrictions of an Environmental Restrictive Covenant, depending upon results of future PFAS sampling and vapor intrusion assessment activities proposed for 2020

Attachment 3

Post-RFI Spill Response Actions

Rolls-Royce Corporation
Plants 5 and 8
Indianapolis, Indiana

EPA ID: IND 000 806 836
IND 094 469 913

POST-RFI SPILL RESPONSE ACTIONS

As noted in the June 2015 CMP, several spill incidents occurred at the Facility subsequent to the RFI and follow-on investigations. The discussion below describes the releases and provides an evaluation as to the current status of those releases.

Pipe repair and removal of soil/concrete at AOI 5-18 (incident #31818)

On October 17, 2012, Rolls-Royce attempted to clear a blocked storm water drain line at the Waste Treatment Facility at Plant 5 (AOI 5-18) with high pressure water and a subsequent soil excavation was started. During the excavation, the drain line was observed to be rusted and broken, and there was the possibility that all rinse water and storm water from this area were draining into the ground. On October 17, 2012, Rolls-Royce reported this spill incident to IDEM, the National Response Center (NRC), and the Marion County Public Health Department. Soil samples collected during the excavation indicated no toxicity characteristic leaching procedure exceedances for metals or volatile organic compounds (VOCs). Pipe repair of the drain line was completed by December 14, 2012. Further removal of soil and concrete was completed during the repair process, and all wastes were appropriately shipped off-site. On September 24, 2014, the Emergency Response Branch of IDEM issued a Compliance Confirmation letter indicating that no further action is necessary regarding incident #31818.

Repair of the process sewer line for the skim basin at AOI 5-21 (incident #2007-11-132)

On November 26, 2007, Rolls-Royce notified IDEM of a release from a process sewer line in the vicinity of the Skim Basin (AOI 5-21). Rolls-Royce repaired the process sewer line and started an environmental investigation. A select group of monitoring wells was sampled and results indicated no residual contamination at levels of concern. A No Further Action request letter was submitted to IDEM in November 2011. In response to a query from EPA, ARCADIS contacted IDEM in October 2014 for an update on the review of this request. According to the Emergency Response Branch of IDEM, Incident 2007-11-132 is marked with the following note: “incident is in regards to a spill for industrial wastewater, refer to the Industrial Wastewater Section.” However, the incident had not been transferred to the Industrial Wastewater Section. On October 10, 2014, IDEM Section Chiefs from the Hazardous Waste Compliance and RCRA Sections began review of the incident to determine an appropriate lead program for this review. It has been determined that EPA will evaluate the No Further Action request as part of the Statement of Basis.

The environmental investigation conducted by Rolls-Royce included an evaluation of eight quarters of groundwater monitoring data collected from August 2008 to February 2011 for monitoring wells MW-124, MW-136 and MW-5-2 using the Mann-Kendal Trend Test function in EPA ProUCL 4.1. Monitoring wells MW-124, MW-136 and MW-5-2 all showed a no trend or decreasing trend for total and dissolved arsenic, chromium, and lead. No evaluation of the data could be conducted for some constituents (barium, cadmium, nickel, selenium, silver, and mercury) because the analytical results for all samples were lower than the detection limits. While the most current trend test evaluation showed a no trend or decreasing trend for total and dissolved arsenic, it should be noted that a Mann-Kendall evaluation in 2010, identified that the total and dissolved arsenic concentrations in monitoring well MW-124 were increasing. However, based on the historical concentrations of arsenic at the Facility, the arsenic is most likely naturally-occurring and leaching out from sulfide minerals within the glacial sand and gravel deposits into the groundwater. Based on the information above, and the risk assessment

conducted by Rolls-Royce as part of the CMS, EPA believes that additional corrective measures are not warranted for AOI 5-21.

Repair of skim basin at AOI 5-21 (incident #26127)

On December 14, 2011, a second release occurred at the Skim Basin and was reported to IDEM and the NRC. Rolls-Royce completed an appropriate repair and started an environmental investigation that is summarized in the Skim Basin Investigation Data Report from 2012. On September 5, 2013, a No Further Action request letter was subsequently submitted to IDEM. In response to an EPA query, ARCADIS contacted IDEM in September and October 2014 for an update on the status of this request. According to the IDEM Emergency Response Branch, this incident was closed, but no closure letter can be issued because the incident was reported as a historical release. No further action appears to be necessary with regard to this spill incident.

PCB release response and sealing at AOI 5-36

In December 2012, during the removal process of all PCB transformers at Plant 5, a historical release was observed from a transformer located on an overhead metal platform at bay N15, located north-northeast of AOI 5-10 and due west of AOI 5-12. Wipe samples were collected on the floor and metal platform in January and February 2013 and analyzed for PCBs. The historical release could not be remediated to the required level (<10 microgram/square centimeter) and, therefore, was sealed in 2013 by F.E. Gates Company, with two coatings of epoxy. Sealed material remains in place at AOI 5-36. IDEM and the U.S. Occupational Safety and Health Administration (OSHA) performed facility inspections of potential PCB exposure after Rolls-Royce completed removal of the transformer. Neither IDEM nor OSHA identified any objections to how Rolls-Royce was managing the sampling and cleanup of PCBs, and the effort was conducted in accordance with relevant Toxic Substances Control Act (TSCA) regulations. In May 2013, Rolls-Royce requested a No Further Action determination from IDEM and OSHA regarding the release. In response to a query from EPA, ARCADIS contacted IDEM in September and October 2014 for a status update on this request. On October 7, 2014, the IDEM Emergency Response Project Manager, George Ritchotte, stated that he planned to review the information and response effort. As part of ongoing corrective actions for the Facility, this incident will be carefully tracked, evaluated, investigated, cleaned up, and closed out as deemed appropriate by IDEM and EPA.

Recovery of released jet fuel at AOI 8-1 (incident #2007-02-080)

On February 12, 2007, Rolls-Royce notified IDEM and the NRC of a previous release of jet fuel at Plant 8 Fuel Farm (AOI 8-1). The release resulted from a flange gasket failure at the Plant 8 Fuel Farm line #3 releasing 4,672 gallons of Jet A Fuel into the environment. Approximately 1,000 gallons of fuel were recovered, and an existing SVE system in the spill area was restarted. Rolls-Royce conducted an environmental investigation and submitted a No Further Action request letter to IDEM on November 11, 2011. ARCADIS followed up with IDEM in 2014 regarding the status of this incident. According to the Emergency Response Section of IDEM, this incident was referred to the MCHD when first reported on February 12, 2007. According to the MCHD, this incident has been closed. However, MCHD does not issue closure letters or any type of No Further Action document. ARCADIS has confirmed that this incident is not enrolled in any other section of the agency. Thus, no further action appears to be necessary with regard to this spill incident.

Attachment 4

Risk Assessment Tables (Not Including On-Site Vapor Intrusion Risks)
(Tables 1 through 5 from the Updated Baseline Risk Assessment)

Rolls-Royce Corporation
Plants 5 and 8
Indianapolis, Indiana

EPA ID: IND 000 806 836
IND 094 469 913

Table 1: Scenarios for Potential Human Exposure
Rolls-Royce Corporation Facility, Indianapolis, Indiana

Receptor Population	Exposure Medium	Exposure Route	Possible Currently	Possible in Future	Type of Analysis	Comments
On-Site						
Routine Workers	surface soil	incidental ingestion of and dermal contact	Yes	Yes	Quantitative	Potential exposure of routine workers to soil is possible in unpaved areas. Potential indoor exposure is also possible if soil-derived vapors migrate through building foundations.
		inhalation of soil-derived vapors and airborne particulates (wind erosion) in outdoor air	Yes	Yes		
	subsurface soil	incidental ingestion of and dermal contact	No	No	Not Applicable	
		inhalation of soil-derived vapors in outdoor air	Yes	Yes	Quantitative	
		inhalation of soil-derived vapors that migrate through building foundations into indoor air	Yes	Yes		
	shallow and deep groundwater	ingestion of and dermal contact with groundwater and inhalation of groundwater-derived vapors during use of groundwater for drinking water	No	No	Not Applicable	Groundwater is not used at the site for drinking water purposes. Potable water is obtained from the municipal drinking water system.
		incidental ingestion of and dermal contact with groundwater and inhalation of groundwater-derived vapors during use of groundwater for purposes other than drinking water	Yes	Yes	Quantitative	Dermal contact is evaluated for industrial maintenance activities (e.g., janitorial); inhalation of vapors during industrial process use of groundwater from production wells is evaluated.
		inhalation of groundwater-derived vapors in outdoor air	Yes	Yes	Quantitative	Potential exposure of routine workers to groundwater vapors in outdoor air is possible.
		inhalation of groundwater-derived vapors that migrate through building foundations into indoor air	Yes	Yes		Potential indoor exposure is possible, if groundwater-derived vapors migrate through building foundations.
	sediment	incidental ingestion and dermal contact	No	No	Not Applicable	Activities performed by routine workers do not require access to areas where sediments or surface water are present.
	surface water	incidental ingestion, dermal contact and inhalation	No	No		
Maintenance Workers	surface and subsurface soil	incidental ingestion of and dermal contact with soil; inhalation of soil derived vapors and airborne particulate in work-space air	Yes	Yes	Quantitative	Exposure of maintenance workers to soil is possible where soil is exposed during utility maintenance activities.
	shallow groundwater	incidental ingestion of and dermal contact with exposed groundwater; inhalation of vapors from exposed groundwater	Yes	Yes		The depth to water in the upper aquifer below the Site generally ranges from approximately 20 to 28 ft bsg. Because of variations in topography, the depth to water is as shallow as 10 to 12 ft bsg in the eastern portion of Plant 8, near Ponds A and B. Therefore, maintenance workers may contact groundwater if the building or pavement were removed.
	sediment	incidental ingestion and dermal contact	Yes	Yes	Quantitative	Potential exposures during occasional maintenance of surface impoundments and ponds (AOIs 5-32, 8-19, 8-20, and 8-28) are
	surface water	incidental ingestion, dermal contact and inhalation	Yes	Yes		
Construction Workers	surface and subsurface soil	incidental ingestion of and dermal contact with soil; inhalation of soil derived vapors and airborne particulate in work-space air	Yes	Yes	Quantitative	Exposure of construction workers to soil is possible where soil is exposed during construction-related utility maintenance activities.
	shallow groundwater	incidental ingestion of and dermal contact with exposed groundwater; inhalation of vapors from exposed groundwater	Yes	Yes		The depth to water in the upper aquifer below the Site generally ranges from approximately 20 to 28 ft bsg. Because of variations in topography, the depth to water is as shallow as 10 to 12 ft bsg in the eastern portion of Plant 8, near Ponds A and B. Therefore, maintenance workers may contact groundwater if the building or pavement were removed.
Trespassers	surface soil	incidental ingestion of and dermal contact	Yes	Yes	Inferred from Routine Workers	Potential exposure of trespassers on-site is possible, although fencing and security personnel control access to the Site. These controls make trespassing unlikely, and would limit the duration of any unauthorized access as well as the types of activities while on-site. While trespassing, they could come into contact with surface soil in unpaved areas.
		inhalation of soil-derived vapors and airborne particulates (wind erosion) in outdoor air	Yes	Yes		
	subsurface soil	inhalation of soil-derived vapors in outdoor air	Yes	Yes		
	shallow groundwater	inhalation of groundwater-derived vapors in outdoor air	Yes	Yes		

Table 1: Scenarios for Potential Human Exposure
Rolls-Royce Corporation Facility, Indianapolis, Indiana

Receptor Population	Exposure Medium	Exposure Route	Possible Currently	Possible in Future	Type of Analysis	Comments
Off-Site						
Routine Workers	surface soil	incidental ingestion of and dermal contact	No	No	Inferred from On-Site Routine Workers	Airborne exposures off-site are possible via windblown dust and vapors from exposed soil or excavation activities at the site.
		inhalation of soil-derived vapors and airborne particulates (wind erosion) in outdoor air	Yes	Yes		
	subsurface soil	incidental ingestion of and dermal contact	No	No		
		inhalation of soil-derived vapors in outdoor air	Yes	Yes		
		inhalation of soil-derived vapors that migrate through building foundations into indoor air	No	No		
	shallow and deep groundwater	ingestion of and dermal contact with groundwater and inhalation of groundwater-derived vapors during use of groundwater for drinking water	No	No	Not Applicable	Potable water is obtained from the municipal drinking water system.
		incidental ingestion of and dermal contact with groundwater and inhalation of groundwater-derived vapors during use of groundwater for purposes other than drinking water	Yes	Yes	Inferred from On-Site Routine Workers	Dermal contact is evaluated for industrial maintenance activities (e.g., janitorial); inhalation of vapors during industrial process use of groundwater from production wells is evaluated.
		inhalation of groundwater-derived vapors in outdoor air	Yes	Yes	Quantitative	Potential exposure of routine workers to groundwater vapors in outdoor air is possible.
		inhalation of groundwater-derived vapors that migrate through building foundations into indoor air	Yes	Yes		Potential indoor exposure is possible, if groundwater-derived vapors migrate through building foundations.
Maintenance Workers	surface and subsurface soil	incidental ingestion of and dermal contact	No	No	Inferred from On-Site Maintenance Workers	Airborne exposures off-site to vapors derived from on-site and off-site soil are possible.
	sediment	incidental ingestion and dermal contact	Yes	Yes		Potential exposures during occasional maintenance of off-site surface water bodies are evaluated.
	surface water	incidental ingestion, dermal contact and inhalation	Yes	Yes		
	shallow groundwater	incidental ingestion of and dermal contact with exposed groundwater; inhalation of vapors from exposed groundwater	Yes	Yes		Potential exposures during construction where groundwater is shallow will be evaluated.
Construction Workers	surface and subsurface soil	incidental ingestion of and dermal contact	Yes	Yes	Inferred from On-Site Construction Workers	Airborne exposures off-site to vapors derived from on-site and off-site soil are possible.
	shallow groundwater	incidental ingestion of and dermal contact with exposed groundwater; inhalation of vapors from exposed groundwater	Yes	Yes		Potential exposures during maintenance of off-site production wells where groundwater is shallow will be evaluated.
Residents	surface soil	incidental ingestion and dermal contact	No	No	Quantitative	Airborne exposures off-site to vapors derived from on-site and off-site soil are possible.
		inhalation of soil-derived vapors and airborne particulates (wind erosion) in outdoor air	Yes	Yes		
	subsurface soil	incidental ingestion of and dermal contact	No	No		
		inhalation of soil-derived vapors in outdoor air	Yes	Yes		
		inhalation of soil-derived vapors that migrate through building foundations into indoor air	No	No		
	shallow and deep groundwater	ingestion of and dermal contact with groundwater and inhalation of groundwater-derived vapors during use of groundwater for drinking water	No	No	Not Applicable	All households in the neighborhood currently use municipal water supplies for potable and nonpotable purposes. Future potable use is not reasonably expected.
		incidental ingestion of and dermal contact with groundwater and inhalation of groundwater-derived vapors during use of groundwater for purposes other than drinking water	No	Yes	Quantitative	
		inhalation of groundwater-derived vapors in outdoor air	Yes	Yes	Inferred from On-Site Routine Workers	Dermal contact during industrial maintenance activities (e.g., janitorial) and inhalation of vapors during industrial process use of groundwater from production wells are evaluated.
		inhalation of groundwater-derived vapors that migrate through building foundations into indoor air	Yes	Yes		
Recreators	sediment	incidental ingestion and dermal contact	Yes	Yes	Quantitative	Potential exposures during occasional recreation in Eagle Creek are evaluated.
	surface water	incidental ingestion, dermal contact and inhalation	Yes	Yes		
	fish	ingestion	Yes	Yes		

Table 2a: Upper-Bound Cumulative Cancer Risk and HIs for Soil
Rolls-Royce Corporation Facility, Indianapolis, Indiana

	Routine Worker					Maintenance Worker		Construction Worker		Off-Site Resident	
	Outdoor Activities		Vapor Intrusion			Outdoor Activities		Outdoor Activities		Outdoor Air Inhalation	
Area	Risk	HI	Risk	HI	Occ	Risk	HI	Risk	HI	Risk	HI
5-1	5E-05	3E-01	2E-06	6E-01	1E-04	6E-06	7E-02	1E-05	6E-01	1E-06	5E-02
5-2	2E-06	5E-02	3E-07	**2E+00**	3E-04	2E-07	1E-02	4E-07	3E-01	4E-08	2E-01
5-3	1E-11	3E-06	2E-10	7E-05	2E-06	1E-12	9E-07	4E-12	2E-05	4E-11	6E-06
5-5	ND	3E-05	ND	ND	ND	ND	7E-06	ND	1E-04	ND	ND
5-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-8	8E-06	3E-02	2E-07	8E-02	5E-04	1E-06	8E-03	1E-06	4E-02	1E-07	7E-03
5-9	1E-05	**2E+00**	1E-06	1E+00	1E-03	1E-06	4E-01	2E-06	**8E+00**	3E-07	**5E+00**
5-10	2E-05	2E-01	3E-06	8E-01	2E-04	2E-06	6E-02	3E-06	6E-01	9E-07	7E-02
5-11	3E-06	6E-02	8E-07	2E-01	6E-05	3E-07	4E-02	5E-07	4E-01	1E-07	2E-02
5-12	3E-06	3E-02	2E-06	6E-01	9E-05	3E-07	8E-03	5E-07	1E-01	2E-07	5E-02
5-13	5E-06	4E-02	2E-06	5E-01	9E-05	4E-07	1E-02	6E-07	1E-01	2E-07	3E-02
5-14	2E-06	3E-02	3E-06	9E-01	2E-04	2E-07	9E-03	3E-07	4E-01	3E-07	7E-02
5-15	1E-06	7E-03	5E-08	2E-02	7E-06	2E-07	2E-03	2E-07	1E-02	2E-08	3E-03
5-17	2E-06	1E-01	3E-06	1E+00	1E-04	2E-07	5E-02	3E-07	5E-01	5E-07	9E-02
5-18	3E-05	1E-01	2E-06	3E-01	2E-03	3E-06	6E-02	4E-06	5E-01	8E-07	4E-02
5-19	**2E-04**	5E-01	9E-06	**1E+01**	2E-02	1E-05	1E-01	2E-05	1E+00	1E-05	**2E+00**
5-20	3E-09	8E-04	1E-07	4E-02	7E-06	3E-10	2E-04	2E-09	1E-02	1E-08	3E-03
5-21	**3E-04**	1E+00	2E-05	**5E+00**	3E-03	4E-05	4E-01	5E-05	**5E+00**	6E-06	8E-01
5-26	9E-10	2E-04	4E-08	1E-02	3E-06	1E-10	7E-05	6E-10	4E-03	3E-09	8E-04
5-30	**2E-04**	4E-02	9E-09	ND	9E-04	1E-05	2E-02	1E-05	1E-01	3E-06	2E-03
5-32	9E-06	2E-02	4E-09	1E-03	4E-07	1E-06	7E-03	2E-06	5E-02	1E-07	4E-04
5-33	2E-06	6E-02	2E-07	8E-02	2E-06	2E-07	4E-02	4E-07	3E-01	5E-08	1E-02
5-34	1E-06	4E-02	ND	ND	ND	1E-07	3E-02	2E-07	3E-01	2E-08	4E-03
5-35	2E-06	3E-02	2E-07	3E-01	4E-04	2E-07	9E-03	3E-07	8E-02	2E-08	3E-02
5-40	2E-06	8E-02	2E-06	4E-01	1E-04	2E-07	2E-02	3E-07	2E-01	4E-07	3E-02
5-41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-42	6E-06	7E-02	ND	ND	ND	5E-07	5E-02	8E-07	4E-01	2E-08	6E-03
8-1	1E-04	4E-01	1E-05	7E-01	2E-02	7E-06	1E-01	1E-05	7E-01	1E-05	3E-01
8-2	9E-07	3E-02	3E-08	2E-02	6E-06	1E-07	2E-02	1E-07	2E-01	2E-08	4E-02
8-3	4E-05	4E-02	3E-07	8E-03	5E-04	3E-06	2E-02	4E-06	2E-01	9E-07	1E-02
8-5	4E-07	4E-02	ND	6E-03	4E-06	4E-08	2E-02	6E-08	2E-01	6E-09	4E-02
8-9	3E-10	1E-04	1E-08	4E-03	2E-06	3E-11	3E-05	2E-10	1E-03	1E-09	4E-04
8-10	7E-06	9E-02	3E-06	9E-01	7E-05	6E-07	4E-02	9E-07	3E-01	3E-07	7E-02
8-14	6E-05	4E-01	5E-09	2E-03	2E-06	5E-06	1E-01	7E-06	6E-01	9E-08	8E-03
8-15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8-17	6E-13	2E-04	9E-12	4E-06	1E-07	7E-14	4E-05	2E-13	6E-04	2E-12	4E-07
8-18	4E-12	3E-06	6E-11	9E-05	9E-07	4E-13	7E-07	1E-12	1E-05	1E-11	7E-06
8-19	5E-06	1E-01	1E-07	4E-02	2E-05	4E-07	4E-02	6E-07	3E-01	3E-07	4E-02
8-20	1E-04	2E-01	3E-06	9E-02	3E-03	8E-06	4E-02	1E-05	4E-01	5E-06	1E-01
8-21	9E-09	8E-05	ND	ND	ND	1E-09	2E-05	2E-09	3E-04	1E-10	2E-07
8-24	2E-05	2E-01	2E-08	5E-03	2E-06	2E-06	5E-02	3E-06	2E-01	3E-08	4E-03
8-25	1E-06	5E-02	ND	ND	ND	1E-07	4E-02	2E-07	3E-01	2E-08	5E-03
8-26	1E-05	7E-01	3E-07	ND	1E-05	7E-07	1E-01	9E-07	6E-01	3E-06	ND
8-27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8-28	2E-06	8E-02	2E-09	7E-06	3E-07	2E-07	5E-02	3E-07	4E-01	4E-08	5E-03
8-29	**2E-04**	1E+00	9E-07	8E-02	4E-03	2E-05	4E-01	3E-05	1E+00	2E-06	1E-01
8-30	1E-09	4E-05	2E-12	ND	3E-07	8E-11	7E-06	1E-10	8E-06	2E-10	ND
8-31	9E-06	6E-02	3E-07	9E-02	4E-03	6E-07	1E-02	7E-07	2E-01	4E-07	2E-01
8-32	2E-06	1E-02	3E-08	7E-03	2E-06	2E-07	3E-03	3E-07	9E-03	5E-09	6E-04
8-33	5E-11	1E-05	2E-09	6E-04	3E-07	5E-12	4E-06	3E-11	2E-04	2E-10	4E-05

Notes:

Media-specific upper-bound cumulative cancer risk and HI estimates in excess of USEPA's risk limits (1E-4 and 1, respectively) are shaded in bold.

Media-specific upper-bound cumulative cancer risk and HI estimates are calculated using the maximum detected site-related concentrations (i.e., those in excess of background) from each area from any depth.

ND = No constituents contributing to cancer or noncancer risk were detected, as appropriate.

Toxicity values are current as of March 15, 2012. Constituent concentrations are current as of June 11, 2012.

Table 2b: Refined Cumulative Cancer Risks and HIs for Soil
Rolls-Royce Corporation Facility, Indianapolis, Indiana

Area	Routine Worker				Construction Worker		Off-Site Resident	
	Outdoor Activities		Vapor Intrusion		Outdoor Activities		Outdoor Air Inhalation	
	Risk	HI	Risk	HI	Risk	HI	Risk	HI
5-2	NR	NR	NR	1E+00	NR	NR	NR	NR
5-9	NR	6E-01	NR	NR	NR	1E+00	NR	5E-01
5-19	6E-05	NR	NR	1E+00	NR	NR	NR	1E+00
5-21	1E-04	NR	NR	1E+00	NR	1E+00	NR	NR
5-30	7E-05	NR	NR	NR	NR	NR	NR	NR
8-29	1E-04	NR	NR	NR	NR	NR	NR	NR
Notes:								

AOIs with upper-bound cumulative cancer risk or HI estimates in excess of USEPA's risk limits (1E-4 and 1, respectively) on Table 2a are shown.

NR = No refinements were necessary based on the upper-bound risk estimates in Table 2a.

None of the refined cumulative cancer risk and HI estimates exceed USEPA's risk limits (1E-4 and 1, respectively).

Refined risk estimates for routine workers, construction workers and off-site residents involved in outdoor activities are calculated using 95% UCLs for the constituent(s) contributing most significantly to the risk estimate and maximum concentrations for the remaining constituents. The 95% UCLs are calculated using the maximum detected concentration from each location within an AOI. The 95% UCLs were calculated for the following AOIs and constituents:

- AOI 5-9: tetrachloroethene, arsenic, cadmium, chromium (total), copper, cyanide (total), nickel, and silver.
- AOI 5-19: 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and naphthalene
- AOI 5-21: tetrachloroethene, antimony, arsenic, cadmium, chromium (total), copper, cyanide (total), mercury, nickel, selenium, and silver
- AOI 5-30: benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene
- AOI 8-29: benzo(a)pyrene and arsenic

For AOI 5-21, using the 95% UCLs listed above, the refined HI estimate for construction workers during outdoor activities is largely the result of tetrachloroethene, nickel and chromium (total). After segregating the refined HI for these constituents by target organ, the highest construction worker HI is 1, as shown in Appendix Table D5.

For AOI 5-9, the refined risk estimates for construction worker and off-site resident vapor inhalation exposure during outdoor activities were calculated with a 95% UCL for cyanide using soil data from each sample. Additionally, cyanide (amenable) data was used for samples where both cyanide (total) and cyanide (amenable) data exist.

Refined risk estimates for routine worker vapor intrusion exposure were calculated using depth-weighted average concentrations for the constituent(s) contributing most significantly to the risk estimate and maximum concentrations for the remaining constituents, and by segregating the HI by target organ, as listed below:

- For AOI 5-2, the upper-bound HI estimate is largely the result of detected concentrations of 1,2,3-trichloropropane, 1,2,4-trimethylbenzene, and 1,3,5 trimethylbenzene. After segregating the upper-bound HI for these constituents by target organ, the highest routine worker vapor intrusion HI is 1, as shown on Appendix Table D2.
- For AOI 5-19, depth-weighted average concentrations were calculated for the following constituents: benzene, ethyl benzene, 4-methyl-2-pentanone, n-propylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, xylenes (total), and cumene. Using these depth-weighted average concentrations, the refined HI estimate is largely the result of 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and naphthalene. After segregating the refined HI for these constituents by target organ, the highest routine worker vapor intrusion HI is 1, as shown on Appendix Table D3.
- For AOI 5-21, a depth-weighted average concentration was calculated for tetrachloroethene. Using this depth-weighted average concentration, the refined HI estimate is largely the result of tetrachloroethene and 1,1,2-trichloroethane. After segregating the refined HI for these constituents by target organ, the highest routine worker vapor intrusion HI is 1, as shown on Appendix Table D4.

Table 3a: Upper-Bound Cumulative Cancer Risks and HIs for Groundwater
Rolls-Royce Corporation Facility, Indianapolis, Indiana

			Routine Worker					Maintenance Worker		Construction Worker		Resident			
			Vapor Intrusion			Outdoor Air Inhalation		Groundwater Contact		Groundwater Contact		Vapor Intrusion		Outdoor Air Inhalation	
On/Off-site	Area	Well Zone	Risk	HI	Occ Ratio	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk	HI
On-Site	5-1	ShallowT	2E-07	7E-03	2E-05	7E-09	2E-04	8E-06	1E+00	8E-07	5E-01	2E-06	5E-02	4E-08	1E-03
On-Site	5-2	Deep	4E-08	1E-02	8E-06	2E-09	5E-04	8E-08	4E-02	8E-09	9E-03	6E-07	9E-02	1E-08	2E-03
On-Site	5-2	ShallowB	5E-08	2E-02	1E-06	2E-09	6E-04	7E-08	4E-02	7E-09	1E-02	5E-07	1E-01	1E-08	2E-03
On-Site	5-2	ShallowT	2E-07	4E-02	7E-05	6E-09	1E-03	3E-07	1E-01	3E-08	4E-02	3E-06	3E-01	6E-08	6E-03
On-Site	5-6	ShallowT	2E-08	7E-03	4E-07	8E-10	3E-04	3E-08	2E-02	3E-09	6E-03	3E-07	5E-02	5E-09	1E-03
On-Site	5-9	Deep	3E-08	5E-03	2E-05	1E-09	2E-04	7E-08	2E-02	7E-09	4E-03	6E-07	4E-02	1E-08	8E-04
On-Site	5-9	ShallowT	7E-08	2E-02	3E-06	2E-09	9E-04	1E-07	8E-02	1E-08	4E-02	7E-07	2E-01	2E-08	4E-03
On-Site	5-10	ShallowT	6E-08	9E-03	3E-05	2E-09	3E-04	2E-06	4E-02	2E-07	2E-02	1E-06	7E-02	2E-08	1E-03
On-Site	5-11	ShallowB	1E-08	3E-03	9E-07	4E-10	1E-04	1E-08	9E-03	1E-09	4E-03	1E-07	2E-02	2E-09	5E-04
On-Site	5-11	ShallowT	3E-08	4E-03	1E-05	1E-09	2E-04	1E-05	7E-02	1E-06	4E-02	5E-07	3E-02	1E-08	7E-04
On-Site	5-12	ShallowT	1E-07	3E-02	4E-06	4E-09	1E-03	1E-07	8E-02	1E-08	4E-02	1E-06	2E-01	2E-08	4E-03
On-Site	5-13	ShallowB	2E-10	5E-05	1E-08	7E-12	2E-06	2E-10	1E-04	2E-11	1E-04	2E-09	4E-04	4E-11	8E-06
On-Site	5-13	ShallowT	9E-09	3E-03	7E-07	3E-10	9E-05	2E-06	2E-02	2E-07	1E-02	8E-08	2E-02	2E-09	4E-04
On-Site	5-14	ShallowT	8E-09	2E-03	3E-07	3E-10	9E-05	3E-08	7E-03	3E-09	3E-03	8E-08	2E-02	2E-09	4E-04
On-Site	5-15	ShallowT	3E-09	1E-03	2E-08	1E-10	3E-05	9E-09	3E-03	9E-10	7E-04	3E-08	7E-03	7E-10	1E-04
On-Site	5-17	ShallowT	2E-07	5E-02	7E-06	6E-09	2E-03	7E-06	2E-01	7E-07	8E-02	2E-06	4E-01	3E-08	7E-03
On-Site	5-18	ShallowT	8E-07	1E-02	2E-03	3E-08	7E-04	1E-06	1E-01	1E-07	1E-01	7E-06	1E-01	1E-07	3E-03
On-Site	5-19	ShallowT	7E-08	2E-03	2E-04	4E-09	1E-04	3E-07	3E-02	3E-08	2E-02	6E-07	1E-02	2E-08	4E-04
On-Site	5-21	Deep	ND	ND	ND	ND	ND	ND	2E-05	ND	2E-05	ND	ND	ND	ND
On-Site	5-21	ShallowB	2E-07	4E-02	8E-05	7E-09	2E-03	4E-07	1E-01	4E-08	4E-02	4E-06	3E-01	7E-08	7E-03
On-Site	5-21	ShallowT	8E-08	2E-02	1E-05	3E-09	8E-04	3E-07	7E-02	3E-08	4E-02	9E-07	2E-01	2E-08	3E-03
On-Site	5-31	Deep	1E-08	9E-05	1E-05	5E-10	3E-06	4E-08	5E-04	4E-09	3E-04	4E-07	6E-04	8E-09	1E-05
On-Site	5-31	ShallowT	1E-06	8E-03	3E-04	7E-08	4E-04	3E-06	4E-02	3E-07	7E-03	2E-05	6E-02	9E-07	2E-03
On-Site	5-32	ShallowT	ND	ND	ND	ND	ND	6E-09	1E-04	6E-10	4E-05	ND	ND	ND	ND
On-Site	5-35	ShallowT	5E-10	1E-04	4E-08	2E-11	5E-06	6E-10	4E-04	6E-11	3E-04	4E-09	1E-03	9E-11	2E-05
On-Site	5-40	ShallowB	9E-09	3E-03	2E-06	3E-10	9E-05	1E-08	7E-03	1E-09	5E-03	8E-08	2E-02	2E-09	4E-04
On-Site	5-40	ShallowT	1E-08	4E-03	6E-07	5E-10	2E-04	5E-08	1E-02	5E-09	5E-03	2E-07	3E-02	3E-09	7E-04
On-Site	5-42	ShallowT	ND	ND	ND	ND	ND	8E-09	1E-04	8E-10	4E-05	ND	ND	ND	ND
On-Site	8-1	ShallowT	6E-09	2E-03	7E-06	2E-10	7E-05	3E-08	6E-03	3E-09	2E-03	7E-08	1E-02	1E-09	3E-04
On-Site	8-2	ShallowB	3E-09	1E-03	3E-08	1E-10	4E-05	5E-09	3E-03	5E-10	8E-04	4E-08	8E-03	8E-10	2E-04
On-Site	8-2	ShallowT	1E-08	4E-03	9E-08	5E-10	2E-04	3E-08	1E-02	3E-09	3E-03	1E-07	3E-02	3E-09	6E-04
On-Site	8-3	ShallowT	5E-09	2E-03	3E-08	2E-10	6E-05	1E-08	5E-03	1E-09	1E-03	6E-08	1E-02	1E-09	3E-04
On-Site	8-5	ShallowT	2E-09	5E-04	1E-07	6E-11	2E-05	3E-08	2E-03	3E-09	9E-04	2E-08	3E-03	3E-10	7E-05
On-Site	8-10	Deep	3E-09	2E-05	4E-06	1E-10	8E-07	1E-08	3E-04	1E-09	9E-05	1E-07	2E-04	2E-09	3E-06
On-Site	8-10	ShallowT	2E-08	1E-02	6E-07	8E-10	5E-04	4E-08	5E-02	4E-09	7E-03	2E-07	8E-02	4E-09	2E-03
On-Site	8-18	ShallowT	9E-10	3E-04	5E-09	3E-11	1E-05	7E-09	9E-04	7E-10	2E-04	1E-08	2E-03	2E-10	4E-05
On-Site	8-19	ShallowT	3E-09	8E-04	4E-05	1E-10	3E-05	1E-08	4E-03	1E-09	2E-03	5E-08	6E-03	1E-09	1E-04
On-Site	8-20	ShallowT	ND	ND	ND	ND	ND	1E-07	7E-04	1E-08	2E-04	ND	ND	ND	ND
On-Site	8-24	ShallowT	ND	ND	ND	ND	ND	5E-09	8E-05	5E-10	1E-05	ND	ND	ND	ND
On-Site	8-27	ShallowT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
On-Site	8-28	ShallowT	7E-09	2E-03	4E-08	3E-10	9E-05	4E-08	7E-03	4E-09	2E-03	8E-08	2E-02	2E-09	4E-04
On-Site	8-32	ShallowT	1E-09	3E-04	9E-08	4E-11	1E-05	6E-09	1E-03	6E-10	6E-04	1E-08	2E-03	2E-10	5E-05
On-Site	8-33	ShallowT	4E-09	1E-03	1E-07	1E-10	4E-05	5E-09	3E-03	5E-10	1E-03	4E-08	8E-03	8E-10	2E-04
On-Site	Perimeter	ShallowT	7E-09	8E-04	5E-06	3E-10	3E-05	3E-08	3E-03	3E-09	8E-04	2E-07	6E-03	4E-09	1E-04
On-Site	Production Well	Deep	6E-09	6E-05	6E-06	2E-10	2E-06	2E-07	2E-03	2E-08	9E-04	2E-07	5E-04	4E-09	9E-06

Table 3a: Upper-Bound Cumulative Cancer Risks and HIs for Groundwater
Rolls-Royce Corporation Facility, Indianapolis, Indiana

			Routine Worker					Maintenance Worker		Construction Worker		Resident			
			Vapor Intrusion			Outdoor Air Inhalation		Groundwater Contact		Groundwater Contact		Vapor Intrusion		Outdoor Air Inhalation	
On/Off-site	Area	Well Zone	Risk	HI	Occ Ratio	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk	HI
On-Site	Production Well	ShallowT	2E-09	ND	5E-09	7E-11	ND	3E-09	1E-04	3E-10	9E-05	1E-08	ND	4E-10	ND
On-Site	Production Well	Unassigned	1E-09	1E-05	2E-06	5E-11	3E-07	4E-09	3E-05	4E-10	3E-05	5E-08	7E-05	9E-10	1E-06
On-Site	unknown	ShallowT	ND	ND	3E-08	ND	ND	ND	2E-04	ND	2E-05	ND	ND	ND	ND
Off-Site	5-2	ShallowT	7E-08	2E-02	3E-06	2E-09	8E-04	1E-07	7E-02	1E-08	2E-02	8E-07	2E-01	2E-08	3E-03
Off-Site	5-9	ShallowT	7E-08	2E-02	5E-07	3E-09	9E-04	1E-07	7E-02	1E-08	2E-02	9E-07	2E-01	2E-08	4E-03
Off-Site	8-20	ShallowT	ND	ND	ND	ND	ND	9E-09	2E-04	9E-10	3E-05	ND	ND	ND	ND
Off-Site	Offsite	Deep	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Off-Site	Perimeter	ShallowT	2E-08	6E-03	2E-07	7E-10	2E-04	3E-08	2E-02	3E-09	4E-03	2E-07	5E-02	5E-09	1E-03
	Notes:														
	No media-specific upper-bound cumulative cancer risk and HI estimates are in excess of USEPA's risk limits (1E-4 and 1, respectively).														
	Media-specific upper-bound cancer risk and HI estimates are calculated using the maximum detected constituent concentrations from each area based on the most recent analysis of the constituent at each location.														
	The PCBs (total) concentration of 6.465 mg/L at AOI 5-1 was capped at the solubility for PCBs (total) of 0.012 mg/L.														
	ND = No constituents contributing to cancer or noncancer risk were detected, as appropriate.														

Table 3b: Summary of Current and Potential Future Groundwater Exposures - Non-Potable Use Rolls-Royce Corporation Facility, Indianapolis, Indiana

			Scenario 5-C-1 (Inhalation of Vapors from Open Tanks)		
Chem Group	Chemical	CASRN	Receptor Point Conc (mg/m^3)	Occupational Inhalation Limit (mg/m^3)	Ratio of Receptor Point Conc to Limit
VOC	Benzene	71-43-2	4.2E-02	3.2E+00	1.3E-02
VOC	Carbon Tetrachloride	56-23-5	3.0E-05	1.0E+01	3.0E-06
VOC	1,2-Dichloroethane	107-06-2	3.1E-05	4.0E+01	7.7E-07
VOC	1,1-Dichloroethene	75-35-4	5.7E-04	2.0E+01	2.9E-05
VOC	cis-1,2-Dichloroethene	156-59-2	4.2E-01	7.9E+02	5.4E-04
VOC	Methylene Chloride	75-09-2	3.2E-03	8.7E+01	3.7E-05
VOC	Tetrachloroethene	127-18-4	1.0E+00	6.8E+02	1.5E-03
VOC	1,1,1-Trichloroethane	71-55-6	2.1E-02	1.9E+03	1.1E-05
VOC	1,1,2-Trichloroethane	79-00-5	4.9E-04	4.5E+01	1.1E-05
VOC	Trichloroethene	79-01-6	1.2E-01	5.4E+02	2.2E-04
VOC	Vinyl Chloride	75-01-4	7.2E-01	2.6E+00	2.8E-01
				Sum:	3.0E-01
Notes:					
Assuming complete transformation of PCE, TCE, and cis-1,2-DCE concentrations to vinyl chloride.					
Scenario 5-C-1 (inhalation of vapors from open tanks) was originally discussed and evaluated in the RFI Report (ARCADIS 2003).					
Occupational inhalation limits were selected based on the following hierarchy: (1) Occupational Safety and Health Standards (OSHA) Permissible Exposure Limits (PEL) and (2) American Conference of Government Industrial Hygienists (ACGIH) Threshold Limit Value (TLV).					

Table 3c: Upper-Bound Cumulative Cancer Risk and HI for Groundwater - Non-Potable Use
Rolls-Royce Corporation Facility, Indianapolis, Indiana

			Scenario 5-C-2 (Janitor Use)			Scenario 5-D (Kiddie Pool)		
Chem Group	Chemical	CASRN	Max Detected Conc (mg/L)	Cancer Risk	HQ	Max Detected Conc (mg/L)	Cancer Risk	HQ
VOC	Benzene	71-43-2	8.0E-02	4.0E-07	5.1E-03	1.2E-01	1.1E-05	
VOC	Carbon Tetrachloride	56-23-5	6.1E-05	3.8E-10	3.8E-06	9.4E-05	7.5E-09	1.5E-05
VOC	1,2-Dichloroethane	107-06-2	6.1E-05	1.5E-10	7.6E-07	9.4E-05	2.6E-08	
VOC	1,1-Dichloroethene	75-35-4	1.0E-03		4.2E-06	1.6E-03		1.6E-05
VOC	cis-1,2-Dichloroethene	156-59-2	7.4E-01		5.0E-02	7.5E-01		1.3E-01
VOC	Methylene Chloride	75-09-2	5.5E-03	2.5E-10	5.8E-05	8.5E-03	2.5E-09	3.2E-04
VOC	Tetrachloroethene	127-18-4	2.2E+00	3.2E-07	7.1E-02	1.0E+00	3.8E-06	2.0E-01
VOC	1,1,1-Trichloroethane	71-55-6	4.2E-02		4.5E-06	6.4E-02		1.7E-05
VOC	1,1,2-Trichloroethane	79-00-5	1.0E-03	2.4E-09	2.9E-05	1.6E-03	2.7E-07	1.3E-04
VOC	Trichloroethene	79-01-6	2.3E-01	1.2E-06	1.5E-01	3.0E-01	3.8E-05	
VOC	Vinyl Chloride	75-01-4	1.4E+00	4.5E-05	5.9E-02	1.0E+00	1.4E-04	1.0E-01
			Sum:	**2E-06**	**3E-01**	**Sum:**	**5E-05**	**3E-01**
Note:								
The cancer risk and HQ for vinyl chloride are not included in the cumulative risk calculations, as this would lead to a "double-counting" of risks, as discussed in Section 5 of the RFI Report.								
Scenarios 5-C-2 (Janitor Use) and 5-D (Kiddie Pool) were originally discussed and evaluated in the RFI Report (ARCADIS 2003).								

Table 4: Estimated High-End Potential Cumulative Cancer Risk and Hazard Index for Vapor Intrusion from Soil Gas into a Residential Building from Data for Off-Site Soil Gas Monitoring Wells (Soil Gas Data from 2008 and 2019)

Soil Gas Well (Year)	Constituent	Risk	Hazard Quotient
5-2SVP-0801 (2008)	Tetrachloroethene	3.1E-07	0.1
	Trichloroethene	1.8E-06	0.4
	SUM:	**2.1E-06**	**0.5**
5-2SVP-0801 (2019)	Tetrachloroethene	3.8E-07	0.1
	Trichloroethene	1.8E-07	0.04
	SUM:	**5.6E-07**	**0.1**
5-2SVP-0802 (2008)	Tetrachloroethene	2.4E-06	0.6
	Trichloroethene	1.2E-05	2.7
	SUM:	**2.4E-05**	**3.3**
5-2SVP-0802 (2019)	Tetrachloroethene	2.8E-06	0.7
	Trichloroethene	3.9E-06	0.9
	SUM:	**6.7E-06**	**1.6**
NOTES:			

Soil gas concentrations used to calculate these estimated risks are based on the maximum concentrations of Tetrachloroethene and Trichloroethene detected from locations 5-2SVP-0801 and 5-2SVP-0802. The soil gas data are presented in the Report: *Soil Gas Assessment and Vapor Intrusion Evaluation; Rolls Royce Corporation* submitted by ARCADIS, Inc. (December 18, 2019). The calculations were performed using the EPA *Vapor Intrusion Screening Level Calculator* (https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator)

Table 5: Summary of Media-Specific Cumulative Cancer Risk and Hazard Index (HI)
Rolls-Royce Corporation Facility, Indianapolis, Indiana

Medium	Exposure Scenario	On-Site Routine Workers					On-Site Maintenance Workers				On-Site Construction Workers				On-Site Trespassers[9]				Off-Site Routine Workers[10]				Off-Site Residents				Off-Site Maintenance Workers[11]				Off-Site Construction Workers[12]			
		Exposure Possible Currently?	Exposure Possible in Future?	Cancer Risk	HI	Occ Risks	Exposure Possible Currently?	Exposure Possible in Future?	Cancer Risk	HI	Exposure Possible Currently?	Exposure Possible in Future?	Cancer Risk	HI	Exposure Possible Currently?	Exposure Possible in Future?	Cancer Risk	HI	Exposure Possible Currently?	Exposure Possible in Future?	Cancer Risk	HI	Exposure Possible Currently?	Exposure Possible in Future?	Cancer Risk	HI	Exposure Possible Currently?	Exposure Possible in Future?	Cancer Risk	HI	Exposure Possible Currently?	Exposure Possible in Future?	Cancer Risk	HI
On-Site Soil[8]	Outdoor	Yes	Yes	$< 1 \times 10^{-4}$	< 1	-	Yes	Yes	$< 4 \times 10^{-6}$	< 0.4	Yes	Yes	$< 8 \times 10^{-5}$	≤ 1	Yes	Yes	$<< 1 \times 10^{-4}$	<< 1	Yes (Inh only)	Yes (Inh only)	$<< 1 \times 10^{-4}$	<< 0.7	Yes (Inh only)	Yes (Inh only)	$< 1 \times 10^{-5}$	≤ 0.8	Yes (Inh only)	Yes (Inh only)	$<< 4 \times 10^{-6}$	<< 0.4	Yes (Inh only)	Yes (Inh only)	$<< 5 \times 10^{-6}$	<< 1
	Vapor Intrusion	Yes	Yes	$< 2 \times 10^{-5}$	≤ 1	$< 2 \times 10^{-5}$	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-
On-Site Groundwater	Outdoor	Yes (Inh only)	Yes (Inh only)	$< 7 \times 10^{-6}$	$< 2 \times 10^{-2}$	-	Yes	Yes	$<< 1 \times 10^{-5}$	<< 1	Yes	Yes	$<< 1 \times 10^{-6}$	<< 0.5	Yes (Inh only)	Yes (Inh only)	$<< 7 \times 10^{-6}$	$<< 2 \times 10^{-3}$	Yes (Inh only)	Yes (Inh only)	$<< 7 \times 10^{-6}$	$<< 2 \times 10^{-3}$	Yes (Inh only)	Yes (Inh only)	$< 9 \times 10^{-7}$	$< 7 \times 10^{-3}$	Yes (Inh only)	Yes (Inh only)	$<< 1 \times 10^{-5}$	<< 1	Yes (Inh only)	Yes (Inh only)	$<< 3 \times 10^{-6}$	<< 0.7
	Vapor Intrusion	Yes	Yes	$< 1 \times 10^{-6}$	$< 5 \times 10^{-2}$	$< 2 \times 10^{-5}$	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	Yes	$<< 1 \times 10^{-6}$	$<< 5 \times 10^{-2}$	NA	Yes	$< 2 \times 10^{-5}$	< 0.4	NA	NA	-	-	NA	NA	-	-
	Potable	No	No	-	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	No	-	-	NA	No	-	-	NA	NA	-	-	NA	NA	-	-
	Nonpotable	Yes	Yes	$< 2 \times 10^{-6}$	< 0.3	< 0.3	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	No	-	-	NA	No	-	-	NA	NA	-	-	NA	NA	-	-
Off-Site Groundwater	Outdoor	NA	NA	-	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	Yes (Inh only)	Yes (Inh only)	$<< 3 \times 10^{-6}$	$<< 9 \times 10^{-4}$	Yes (Inh only)	Yes (Inh only)	$< 2 \times 10^{-6}$	$< 4 \times 10^{-3}$	Yes	Yes	$< 1 \times 10^{-7}$	$< 7 \times 10^{-4}$	Yes	Yes	$< 1 \times 10^{-6}$	$< 2 \times 10^{-2}$
	Vapor Intrusion	NA	NA	-	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	Yes	Yes	$<< 7 \times 10^{-6}$	$<< 2 \times 10^{-2}$	Yes	Yes	$< 9 \times 10^{-7}$	< 0.2	NA	NA	-	-	NA	NA	-	-
	Potable	NA	NA	-	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	No	No	-	-	No	No	-	-	NA	NA	-	-	NA	NA	-	-
	Nonpotable	NA	NA	-	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	Yes	Yes	$<< 2 \times 10^{-6}$	<< 0.3	No	Yes	$< 5 \times 10^{-6}$	< 0.3	NA	NA	-	-	NA	NA	-	-
Soil Gas	Vapor Intrusion	NA	NA	-	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	Yes	Yes	$< 1 \times 10^{-6}$	< 0.4	NA	NA	-	-	NA	NA	-	-

Notes:

1 For each receptor population, the cumulative cancer risk and HI estimates summarized above are documented in Tables 2a through 4.
2 The maximum of the upper-bound risk estimates or refined upper-bound risk estimates, if calculated, are presented for each receptor/medium combination.
3 No estimates are provided (designated with "-") for exposures that are not reasonably expected under current or future conditions (designated with "No") or for exposures that are not relevant for the indicated receptor/medium exposure combination (designated with an "NA").
4 The significance of these potential exposures is evaluated by comparing these estimates to USEPA-established cancer and HQ limits (10^{-4} and 1, respectively) in order to determine whether they warrant corrective measures under RCRA corrective action (USEPA 1991).
5 Cancer risk and HI estimates presented as less-than ("<") values indicate estimates that are based on the highest upper-bound estimate for the medium/receptor combination and highly conservative exposure assumptions.
6 Cancer risk and HI estimates presented as less-than or equal to ("≤") value indicate estimates that represent refined upper-bound estimates and are the highest estimates (upper-bound or refined upper-bound if calculated) for the receptor/medium combination.
7 Cancer risk and HI estimates presented as much less than ("<<") values indicate estimates that are based on inference from more conservative receptor/medium exposure combinations.
8 Soil data are from on-site locations only. The on-site soil samples are used to assess both on-site and off-site exposures.
9 On-site trespasser exposure is assessed using on-site routine worker risk estimates.
10 Off-site routine worker exposure to on-site media is assessed using on-site routine worker risk estimates.
11 Off-site maintenance worker exposure to on-site media is assessed using on-site maintenance worker risk estimates.
12 Off-site construction worker exposure to on-site media is assessed using on-site construction worker risk estimates.

Attachment 5

Administrative Record Index

Rolls-Royce Corporation
Plants 5 and 8
Indianapolis, Indiana

EPA ID: IND 000 806 836
IND 094 469 913

U.S. ENVIRONMENTAL PROTECTION AGENCY

PENDING ADMINISTRATIVE RECORD
FOR THE
ROLLS-ROYCE CORPORATION SITE
INDIANAPOLIS, MARION COUNTY, INDIANA
FORMERLY KNOWN AS GMC ALLISON GAS TURBINE DIV. PLANTS 5 & 8

ORIGINAL
STATEMENT OF BASIS
NOVEMBER 16, 2020
SEMS ID: 962010

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	1003170	8/31/00	Morris, L., Redhorse, LLC	U.S. EPA	Preliminary Assessment/Visual Site Inspection	724
2	956062	3/27/02	Favero, D., Favero Geosciences	Rudloff, G., U.S.EPA	Exponent - Technical Memorandum - Habit Characterization and Ecological Screening Report	33
3	956076	7/31/03	Arcadis	General Motors Corporation	RCRA Facility Investigation Report	1082
4	956056	8/27/03	Rudloff, G., U.S.EPA	_ _ _ _ _	Documentation of Environmental Indicator Determination - CA 725 - Current Human Exposures	6
5	956055	8/27/03	Rudloff, G., U.S.EPA	_ _ _ _ _	Documentation of Environmental Indicator Determination - CA 750 - Migration of Contaminated Groundwater	8
6	1003169	4/27/04	Favero, D., Favero Geosciences	Rudloff, G., U.S.EPA	Supplement No. 2 to the RCRA Facility Investigation Report	407
7	956106	12/1/06	Rolls-Royce Corporation	General Motors Corporation	Corrective Measures Proposal (Redacted)	737
8	956074	6/17/09	Arcadis	Rolls-Royce Corporation	Additional Investigation Data Report	170

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9	956059	9/14/12	Patel, P., Rolls-Royce Corporation	Rudloff, G., U.S.EPA	Quarterly Status Letter - Skim Basin Groundwater Monitoring Report - Second Quarter 2012	34
10	956064	11/6/12	Ramacciotti, F., and Song, S., Environ	Patel, P., Rolls-Royce Corporation	Revised Draft Updated Baseline Risk Assessment to Support Corrective Measures Proposal	78
11	956072	1/29/13	Guerriero, M., U.S. EPA	Becker, D. Rolls-Royce Corporation	Administrative Order on Consent	20
12	956065	7/11/13	Porter, T., Gastineau-Lyons, H. and Fisher, S., Arcadis	Rolls-Royce Corporation	Semi-Annual Status and Groundwater Monitoring Report - First Half 2013	21
13	956060	9/5/13	Porter, T. and Gastineau-Lyons, H., Arcadis	Indiana Department of Environmental Management - Office of Land Quality	Skim Basin Status Letter - Groundwater Monitoring Summary Report and No Further Action Request	31
14	1003178	7/14/14	Moosbrugger, E., Gastineau-Lyons, H. and Fisher, S., Arcadis	Rolls-Royce Corporation	RCRA Corrective Action Interim Measures - Remediation System Evaluation Report	195
15	956073	7/25/14	Guerriero, M., U.S. EPA	Kent, D. Rolls-Royce Corporation	First Amended Administrative Order on Consent - Docket No. RCRA-05-2013-0004	20
16	956057	10/14/14	Patel, P., Rolls-Royce Corporation	Rudloff, G., U.S.EPA	Third Quarter 2014 Progress Report	3
17	956089	6/3/15	Gastineau-Lyons, H., Arcadis	Rudloff, G., U.S.EPA	Memo - Remediation Systems Status Update	29
18	956092	6/30/15	Patel, P., Rolls-Royce Corporation	Rudloff, G., U.S.EPA	Letter - Corrective Measures Proposal	1
19	956093	6/30/15	Moosbrugger, E., Gastineau-Lyons, H. and Fisher, S., Arcadis	Rolls-Royce Corporation	RCRA Corrective Action Corrective Measures Proposal (Redacted)	321

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***THE FOLLOWING 31 DOCUMENTS ARE PART OF APPENDIX B FOR THE ABOVE LISTED CORRECTIVE MEASURES PROPOSAL**						
20*	956069	7/16/01	Arcadis	General Motors Corporation	Current Conditions Report (Redacted)	207
21*	956107	11/19/01	Arcadis	General Motors Corporation	RCRA Facility Investigation Work Plan	79
22*	956119	9/30/02	Fisher, S., Walker, R. and Banaszak, K., Arcadis	General Motors Corporation	Interim Measures Report - Excavation of Impacted Soil at AOI 8-31	1945
23*	962009	10/19/06	Arcadis	General Motors Corporation	Interim Measures Work Plan to Enhance Hydraulic Control of Groundwater at Plant 5	49
24*	962004	12/21/07	Arcadis	Remediation and Liability Management Company, Inc.	Proposed Additional Investigation to Support Evaluation of Interim Measures Performance	86
25*	962005	3/28/08	Arcadis	General Motors Corporation	Soil Vapor Sampling Work Plan	51
26*	956124	9/1/08	Arcadis	General Motors Corporation	Soil Vapor Data Report	19
27*	956102	7/14/08	Gastineau-Lyons, H., Fisher, S. and Cosgrove, J., Arcadis	Rolls-Royce Corporation	Interim Measures Semi-Annual Status and Groundwater Monitoring Report - First Half 2008	2431
28*	956117	1/14/09	Gastineau-Lyons, H., Fisher, S. and Cosgrove, J., Arcadis	Rolls-Royce Corporation	Interim Measures Semi-Annual Status and Groundwater Monitoring Report - Second Half 2008	3128
29*	956116	7/14/09	Gastineau-Lyons, H., Fisher, S. and Cosgrove, J., Arcadis	Rolls-Royce Corporation	Semi-Annual Status and Groundwater Monitoring Report - First Half 2009	1529
30*	956054	9/1/10	Arcadis	_ _ _ _ _	Proposed Stage II Additional Investigation	6

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31*	956098	7/15/10	Gastineau-Lyons, H. and Copeland, P., Arcadis	Jones, M., Rolls-Royce Corporation	Quarterly Status Letter - Skim Basin Groundwater Monitoring Report - Second Quarter 2010	26
32*	956099	10/29/10	Gastineau-Lyons, H. and Kolb, T., Arcadis	Jones, M., Rolls-Royce Corporation	Quarterly Status Letter - Skim Basin Groundwater Monitoring Report - Third Quarter 2010	57
33*	956110	7/15/10	Gastineau-Lyons, H. and Copeland, P., Arcadis	Jones, M., Rolls-Royce Corporation	Quarterly Status Letter - Fuel Farm Groundwater Monitoring Report - Second Quarter 2010	24
34*	956111	10/29/10	Gastineau-Lyons, H. and Kolb, T., Arcadis	Jones, M., Rolls-Royce Corporation	Quarterly Status Letter - Plant 8 Fuel Farm Groundwater Monitoring Report - Third Quarter 2010	21
35*	956108	10/14/10	Gastineau-Lyons, H., Fisher, S. and Kolb, T., Arcadis	Rolls-Royce Corporation	Semi-Annual Status and Groundwater Monitoring Report - First Half 2010	2570
36*	956095	1/31/10	Gastineau-Lyons, H. and Kolb, T., Arcadis	Jones, M., Rolls-Royce Corporation	Quarterly Status Letter - Skim Basin Groundwater Monitoring Report - Fourth Quarter 2010	55
37*	956100	5/9/11	Gastineau-Lyons, H. and Kolb, T., Arcadis	Jones, M., Rolls-Royce Corporation	Quarterly Status Letter - Skim Basin Groundwater Monitoring Report - First Quarter 2011	33
38*	956096	7/13/11	Fisher, S., Arcadis	Rolls-Royce Corporation	Drawing - Proposed Soil Borings Test Cells Area Locations	1
39*	956114	5/9/11	Gastineau-Lyons, H. and Kolb, T., Arcadis	Jones, M., Rolls-Royce Corporation	Quarterly Status Letter - Plant 8 Fuel Farm Groundwater Monitoring Report - First Quarter 2011	18
40*	956113	1/31/11	Gastineau-Lyons, H. and Kolb, T., Arcadis	Jones, M., Rolls-Royce Corporation	Quarterly Status Letter - Plant 8 Fuel Farm Groundwater Monitoring Report - Fourth Quarter 2010	18

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42*	956112	10/14/11	Gastineau-Lyons, H., Fisher, S. and Kolb, T., Arcadis	Rolls-Royce Corporation	Semi-Annual Status and Groundwater Monitoring Report - First Half 2011	2256
43*	956097	11/11/11	Gastineau-Lyons, H. and Kolb, T., Arcadis	Indiana Department of Environmental Management - Office of Land Quality	Groundwater Monitoring Summary Report and No Further Action Request	16
44*	956109	9/13/12	Gastineau-Lyons, H. and Fisher, S., Arcadis	Rolls-Royce Corporation	Stage III Additional Investigation Data Report	430
45*	956063	5/4/12	Kladias, M. and Roller, J., Arcadis	Rolls-Royce Corporation	Groundwater Flow and Solute Transport Model	131
46*	962006	10/12/12	Porter, T., Gastineau-Lyons, H. and Fisher, S., Arcadis	Rolls-Royce Corporation	Semi-Annual Status and Groundwater Monitoring Report - First Half 2012	1678
47*	962001	12/5/12	Gastineau-Lyons, H. and Fisher, S., Arcadis	Patel, P., Rolls-Royce Corporation	Quarterly Status Letter - Skim Basin Groundwater Monitoring Report - Third Quarter 2012	232
48*	962002	1/14/13	Gastineau-Lyons, H. and Fisher, S., Arcadis	Patel, P., Rolls-Royce Corporation	Quarterly Status Letter - Skim Basin Groundwater Monitoring Report - Fourth Quarter 2012	288
49*	962007	1/14/13	Porter, T., Gastineau-Lyons, H. and Fisher, S., Arcadis	Rolls-Royce Corporation	Semi-Annual Status and Groundwater Monitoring Report - Second Half 2012	673
50*	962003	5/30/13	Gastineau-Lyons, H. and Fisher, S., Arcadis	Patel, P., Rolls-Royce Corporation	Quarterly Status Letter - Skim Basin Groundwater Monitoring Report - First Quarter 2013	222

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53	956075	12/21/17	Kladias, M. and Roller, J., Arcadis	Patel, P., Rolls-Royce Corporation	Update to Groundwater Flow and Solute Transport Model	23
54	956090	6/25/19	Gastineau-Lyons, H., Arcadis	Rudloff, G., U.S.EPA	Memo - PFAS Sampling Plan	34
55	956120	10/1/19	Gastineau-Lyons, H., Arcadis	Rudloff, G., U.S.EPA	PFAS Sampling Plan - Response to U.S. EPA Comments (Redacted)	231
56	956061	12/18/19	Gastineau-Lyons, H., Arcadis	Rudloff, G., U.S.EPA	Memo - Soil Gas Assessment and Vapor Intrusion Evaluation	118
57	956094	9/4/20	Gastineau-Lyons, H., Arcadis	Stanhope, J. and Kelly, J., U.S.EPA	Memo - Soil Gas Monitoring Summary - First Half 2020	74
58	956115	9/23/20	Gastineau-Lyons, H., Fisher, S. and Woodruff, R., Arcadis	Rolls-Royce Corporation	Poly-and Perfluorinated Alkyl Substances (PFAS) Summary Report	3062
59	956121	11/16/20	U.S. EPA	Rolls-Royce Corporation	Statement of Basis	66