Human Health Risk Assessment

Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

EPA ID #NCD980557805

Prepared for:

Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

Prepared By:

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List of Acronyms

ABS	Soil absorption value
ACS	American Cancer Society
ADAF	Age-Dependent Adjustment Factors
AECOM	AECOM Technical Services of North Carolina, Inc.
AF	Adherence Factor
AT	Averaging Time
Atm-m^3/mol	Atmosphere-cubic meter per mole
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below ground surface
BW	Body weight
C	Cancer
CA	Air Concentration
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CLP	USEPA Contract Laboratory Program
COC	Chemical of Concern
COPC	Chemicals of Potential Concern
CS	Soil Concentration
CSF	Cancer Slope Factor
CSEM	Conceptual Site Exposure Model
CW	Water Concentration
CF	Unit Conversion Factor
D_A	Diffusivity in air
DAD	Dermally Absorbed Dose
DA_{event}	Dermally Absorbed Dose per event
DAF	Dilution Attenuation Factor
DNAPL	Dense Non-Aqueous Phase Liquid
EarthCon	EarthCon Consultants of North Carolina, P.C.
EC	Exposure Concentration
ED	Exposure Duration
EF	Exposure Factor
ELCR	Excess Lifetime Cancer Risk
ENSR	ENSR Corporation of North Carolina
EPC	Exposure Point Concentration
ESI	Expanded Site Inspection
ET	Exposure Time
EV	Event Frequency
FFS	Focused Feasibility Study
FS	Feasibility Study
GI	Gastrointestinal Tract
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment

HI	Hazard Index
HMW	High molecular weight
HQ	Hazard Quotient
HRS	Hazard Ranking System
IR	Ingestion Rate
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
J&E Model	Johnson and Ettinger Model
Kg	Kilogram
KMCC	Kerr-McGee Chemical Corporation
LADI	Lifetime Average Daily Intake
LMW	Low molecular weight
MDL	Method Detection Limit
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
mg/L	Milligram per liter
mg/m^3	Milligram per cubic meter
MMOA	Mutagenic Mode of Action
MRL	Minimal Risk Level
Multistate Trust	Multistate Environmental Response Trust
NC	Non-cancer
NCDHHS	North Carolina Department of Health and Human Services
NC DEQ	North Carolina Department of Environmental Quality
NCEA	National Center for Environmental Assessment
OSWER	Office of Solid Waste and Emergency Response
PAH	Polycyclic Aromatic Hydrocarbon
PEF	Particulate Emission Factor
PHA	Public Health Assessment
PPRTV	Provisional Peer Reviewed Toxicity Value
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
RAGS	Risk Assessment Guidance for Superfund
RBA	Relative bioavailability factor
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
RSLs	USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites
SA	Surface Area
SIR	Soil Ingestion Rate
SRI	Supplemental Remedial Investigation
SVOC	Semi-volatile organic compound
SWQS	Surface water quality standard

TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Potential
TIC	Tentatively Identified Compound
Tronox	Tronox, LLC
UCL	Upper Confidence Limit
95UCL	95% Upper Confidence Limit on the Mean
URF	Unit Risk Factor
USEPA	United States Environmental Protection Agency
VF	Volatilization Factor
VI	Vapor Intrusion
VISL	Vapor Intrusion Screening Level
VOC	Volatile organic compounds
µg/L	Microgram per liter

Executive Summary

EarthCon Consultants of North Carolina, P.C. (EarthCon) has prepared this Human Health Risk Assessment (HHRA) for the Greenfield Environmental Multistate Trust, LLC, not individually but solely in its representative capacity as Trustee of the Multistate Environmental Response Trust (the Multistate Trust), as a component of the effort to complete the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) characterization of the Kerr-McGee Chemical Corp - Navassa Superfund Site [U.S. Environmental Protection Agency (USEPA) ID# NCD980557805], referred to herein as the Site, located in Navassa, North Carolina (**Figure 1-1**).

The Site operated as a creosote-based wood treating facility under three different owners from 1936 to 1974. Kerr-McGee Chemical Corp (KMCC) purchased the facility in 1965 and ceased operations in 1974. Dried lumber was pressure treated on site with a creosote solution and stored outside to dry. There are no records indicating that pentachlorophenol or chromated copper arsenate were used at the facility. Treated wood products included railroad ties, utility poles and pilings. Creosote storage and application and treated and untreated wood storage took place in a production area of approximately 62 acres in the western and southern portions of the property. Wastewater generated during the creosote treatment process was discharged into two on-site unlined wastewater ponds.

Between 1984 and 2004, multiple parties performed pre-CERCLA environmental investigations at the Site and surrounding areas, including KMCC, the North Carolina Department of Environment, Heath and Natural Resources [now known as the North Carolina Department of Environmental Quality (NC DEQ)], and the North Carolina Department of Transportation. CERCLA-related investigations, which were initiated in November 2004, included the Expanded Site Inspection (ESI) and pre-remedial investigation (pre-RI) soil sampling performed by ENSR Corporation of North Carolina (ENSR). These investigations indicated that soil, groundwater, surface water and sediment were impacted by Site operations.

Beginning in 2006, RI activities were performed by ENSR and AECOM Technical Services of North Carolina, Inc. (AECOM) under contract to Tronox, LLC (Tronox); USEPA; and CH2M Hill and EarthCon under contract to the Multistate Trust. The RI investigations include the ENSR/AECOM Phase 1 RI in 2006, the ENSR/AECOM Phase 2 RI in 2008, the USEPA Residential Sampling in 2010, the USEPA Marsh Edge Sampling in 2010, the USEPA Tissue Sampling in 2011, the AECOM Supplemental RI (SRI) in 2012, the CH2M Hill SRI conducted in

2015 and 2016, and the EarthCon SRI conducted in 2016 and 2017. The data and findings from these investigations were used in the HHRA to determine if remedial actions are needed to satisfy CERCLA cleanup requirements. According to USEPA, baseline risks are risks that might exist if no remediation or institutional controls were applied at a site. The primary purpose of the baseline risk assessment is to provide risk managers with an understanding of the actual and potential risks to human health and the environment. As a general policy, USEPA may use the results of the baseline risk assessment to determine whether a release or threatened release poses an unacceptable risk to human health or the environment that warrants remedial action and to determine if a site presents an imminent and substantial endangerment (USEPA, 1991).

These sampling investigations detected creosote-related semi-volatile organic compounds (SVOCs), metals, pesticides, and volatile organic compounds (VOCs) in Site soils, sediments, and groundwater. The Site was divided into eight areas and each area was evaluated separately in the HHRA for child and adult residents, outdoor workers, indoor workers, construction workers, and teenage trespassers. Because an individual may be exposed beginning as a child and extending into adulthood, exposure to an adult resident was calculated as the time-weighted average lifetime exposure assuming Reasonable Maximum Exposure (RME). The RME scenario is intended to assess exposures that are higher than average but are still within a realistic range of exposure. The areas evaluated are presented in **Figure 1-2** and include:

- Process Area
- Pond Area
- Treated Wood Storage Area
- Untreated Wood Storage Area
- Eastern Upland
- West of Navassa Road
- Southern Marsh
- Sturgeon Creek

Groundwater was evaluated by selecting 4 to 10 wells representing the ‘core of the plume’ or the highest concentrations for each constituent. Wells selected for use in the HHRA were approved by the USEPA and NC DEQ during a conference call on May 18, 2018. Impacts to groundwater were limited to the southern portion of the Site.

Constituents detected in each area for each medium were evaluated against USEPA's Regional Screening Levels (RSL) to determine the Chemicals of Potential Concern (COPCs). These COPCs were then further evaluated to determine the risk posed for each receptor scenario to identify the risk drivers or Chemicals of Concern (COCs) for the Site. In interpreting risk and hazard posed to current and future Site receptors, it is important to understand that the values are estimates, based on predictive intake equations and are subject to the uncertainties inherent in both the estimates of exposure and toxicity factors.

USEPA defines unacceptable risk as that exceeding the incremental or excess lifetime cancer risk (ELCR) of 1×10^{-6} (one incident per million) or a Hazard Index (HI) of 1. On a site-specific basis, a range of ELCR from 1×10^{-6} to 1×10^{-4} (one incident per million to one incident per 10,000) may be used to determine if remedial actions are required or not.

A summary of total ELCRs greater than 1×10^{-4} (1.0E-04) for carcinogenic COCs and a Hazard Index (HI) greater than 1 for non-carcinogenic COCs for each exposure area is provided below, by receptor. Mutagenic risks are included with the total risk for the lifetime resident. Mutagenic risk refers to excess cancer risk derived from COCs that interfere with the genetic material of the exposed receptor thus increasing the frequency of mutations above the natural background level.

Process Area

- The cancer risk from surface soil for the future lifetime resident in the Process Area is 4.5E-04, principally from the ingestion of benzo(b)fluoranthene, benzo(a)pyrene, and other polycyclic aromatic hydrocarbons (PAHs). Cancer risk from COCs in surface soil for the future child and adult residents in the Process Area are accounted for in the future lifetime resident.
- The HI from surface soil for the future child resident is 4. COCs include dibenzofuran and PAHs. The non-cancer risk is primarily driven by the ingestion of benzo(a)pyrene.
- The HIs from surface soil for the future adult resident, teenage trespasser, and future outdoor worker are 0.5, 0.1, and 0.3, respectively, which are below the threshold of 1.0.
- The cancer risk from surface soil for the future outdoor worker and teenage trespasser are 2.4E-05 and 1.5E-05, respectively, both below the threshold of 1.0E-04.
- The HI from combined surface and subsurface soil for the future on-Site construction worker is 18. The non-cancer risk is principally driven by the inhalation of naphthalene (HI

of 14) in subsurface soil. The cancer risk of 2.6E-05 for combined surface and subsurface soil is below the threshold of 1.0E-04.

- For the future child and adult resident, teenage trespasser, and future outdoor worker, exposure to subsurface soil is not considered to be a complete pathway because these potential receptors are not expected to encounter subsurface soil consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

Pond Area

- The cancer risk from surface soil for the future lifetime resident in the Pond Area is 1.1E-03, principally from the ingestion of benzo(a)pyrene and other PAHs.
- The HI from surface soil for the future child resident is 27 with dibenzofuran, benzo(a)pyrene and naphthalene contributing the most hazard. The non-cancer risk is driven by the ingestion of dibenzofuran and other PAHs.
- The HI from surface soil for the future adult resident is 9. The non-cancer risk is primarily from the inhalation of naphthalene and 1,1-biphenyl.
- The cancer risk of 9.3E-05 from surface soil for the future outdoor worker is below the threshold of 1E-04; however, the HI from surface soil of 3 exceeds the threshold of 1.0. The non-cancer risk is driven by the inhalation of naphthalene.
- The cancer risk of 3.0E-05 and HI of 0.7 from surface soil for the teenage trespasser are below the cancer and non-cancer thresholds of 1E-04 and 1.0, respectively.
- The cancer risk from combined surface and subsurface soil for the future on-Site construction worker is 2.8E-05, which is below the 1.0E-04 threshold. The HI from soil is 19 driven principally by the inhalation of naphthalene.
- For the future child and adult resident, teenage trespasser, and future outdoor worker, exposure to subsurface soil is not considered to be a complete pathway because these potential receptors are not expected to encounter subsurface soil consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

Treated Wood Storage Area

- The cancer risk of 4.1E-05 from surface soil for the future lifetime resident in the Treated Wood Storage Area is below the 1.0E-04 threshold.
- The non-cancer risk from surface soil of 0.2 for the future child resident and 0.02 for the adult resident are below the 1.0 threshold.
- The cancer risk of 2.2E-06 and HI of 0.01 from surface soil for the future outdoor worker are below the thresholds.
- No COCs in surface soil were retained for the teenage trespasser.
- The cancer risk of 1.5E-07 and HI of 0.06 for the future on-Site construction worker exposure to combined surface and subsurface soil are below the thresholds.
- For the future child and adult resident, teenage trespasser, and future outdoor worker, exposure to subsurface soil is not considered to be a complete pathway because these potential receptors are not expected to encounter subsurface soil consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

Untreated Wood Storage Area

- The cancer risk of 2.5E-05 from surface soil for the future lifetime resident in the Untreated Wood Storage Area is below the 1.0E-04 threshold.
- The non-cancer HI of 0.1 from surface soil for the future child resident is below the 1.0 threshold.
- No COCs in surface soil were retained for the future adult resident, teenage trespasser, future construction worker, and future outdoor worker.
- No COCs in subsurface soil were retained for the future on-Site construction worker.
- For the future child and adult resident, teenage trespasser, and future outdoor worker, exposure to subsurface soil is not considered to be a complete pathway because these potential receptors are not expected to encounter subsurface soil consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

Eastern Upland

- The cancer risk of 1.5E-05 from surface soil for the future lifetime resident in the Eastern Upland is below the 1.0E-04 threshold.

- The HIs from surface soil for the future child and adult residents are 0.3 and 0.08, respectively.
- The cancer risk of 2.3E-06 and HI of 0.02 from surface soil for the future outdoor worker are below the thresholds.
- The cancer risk is 1.7E-07 from soil for the future construction worker, and the HI is 0.1, both below the thresholds.
- No COCs in surface soil were retained for the teenage trespasser.
- For the future child and adult residents, teenage trespasser, and future outdoor worker, exposure to subsurface soil is not considered to be a complete pathway because these potential receptors are not expected to encounter subsurface soil consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

West of Navassa Road

- No constituents in soil exceeded the applicable screening criteria in the area West of Navassa Road.

Southern Marsh

- The cancer and non-cancer risks from the Southern Marsh sediment for the teenage trespasser (2.3E-05 and 0.4, respectively) and the future outdoor worker (3.7E-05 and 0.7, respectively) are below the thresholds. Exposures to the Southern Marsh sediment for the future child and adult residents are accounted for in the risk evaluations for the teenage trespasser.

Groundwater

- The cancer risk from groundwater, including vapor intrusion (VI) and potable use, for the future lifetime resident is 2.5E-03, principally from the inhalation of naphthalene and chloroform via VI and ingestion of arsenic, benzo(a)pyrene, and 1-methylnaphthalene.
- The cancer risk from groundwater based on potable use for a future child resident is 3.5E-04, and the HI is 49. Ingestion of arsenic, chloroform, and 1-methylnaphthalene contributed the most to the cancer risk. The non-cancer risk is primarily from ingestion of dibenzofuran, naphthalene, and 2-methylnaphthalene.

- The cancer risk from groundwater, including VI and potable use, for a future adult resident is 2.0E-03, and the HI is 79. The cancer risk is primarily from inhalation of chloroform and naphthalene and ingestion of arsenic, 1-methylnaphthalene, and chloroform. The non-cancer risk is primarily from direct exposure to dibenzofuran, 2-methylnaphthalene, and naphthalene as well as exposure to naphthalene via VI.
- The cancer risk from groundwater for a future outdoor worker via potable use is 2.9E-04, and the HI is 9. The cancer risk is primarily from ingestion of arsenic, 1-methylnaphthalene, and benzo(a)pyrene. The non-cancer risk is driven by the ingestion of dibenzofuran, naphthalene, arsenic, and 2-methylnaphthalene.
- The cancer risk from groundwater for a future indoor worker, including VI and potable use, is 5.6E-04, and the HI is 17. The cancer risk is primarily from the ingestion of arsenic, chloroform and naphthalene, and inhalation of naphthalene via VI.
- The cancer risk from groundwater for a future on-Site construction worker is 7.3E-07, and the HI is 0.8, both below the thresholds.
- Exposure to groundwater is not considered to be a complete pathway for the teenage trespasser because teenage trespassers are not expected to encounter groundwater consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

Sturgeon Creek

- No COCs were identified in Sturgeon Creek. Although arsenic was identified as a COPC, risk from exposure to arsenic was not quantified since arsenic is not a Site-related constituent. Additional information regarding elimination of arsenic in Sturgeon Creek from further evaluation in the HHRA is provided in Section 2.6.5.

Based on the results of the HHRA, the overall risk from soil is acceptable for the reasonably anticipated future land use (i.e., industrial/commercial and recreational), except for the Pond Area and Process Area. Based on current and future expected land use (i.e., non-residential), the Pond Area and Process Area require additional evaluation in the following step of the CERCLA process, the Feasibility Study. Uncertainties are associated with the COCs identified in the HHRA. For example, while arsenic and thallium were identified as COCs in soil, these constituents were qualitatively excluded as COCs for areas with arsenic soil concentrations less than the regional background value of 12.1 mg/kg or for thallium in areas with laboratory dilution-adjusted detection limits above the applicable screening level. Like arsenic, thallium in soil is not

associated with the creosote wood treating operation and was eliminated through use of a multiple lines of evidence approach provided in Section 2.6.5. Additional information regarding the basis for exclusion of other constituents as COCs can be found in **Appendices F through H**.

1.0 INTRODUCTION

The Kerr-McGee Chemical Corp - Navassa Superfund Site (the Site) (EPA ID# NCD980557805) is a former creosote-based wood treating facility located in Navassa, Brunswick County, North Carolina. Wood treating operations occurred at the facility from 1936 until 1974. The former Kerr-McGee Chemical Corp (KMCC) property has not been redeveloped or used for industrial activity since KMCC decommissioned the plant in 1980.

Between 1984 and 2017, environmental investigations were performed at the Site and surrounding areas. This Human Health Risk Assessment (HHRA) was prepared by EarthCon Consultants of North Carolina, P.C. (EarthCon) for the Greenfield Environmental Multistate Trust, LLC, not individually but solely in its representative capacity as Trustee of the Multistate Environmental Response Trust (the Multistate Trust) as part of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) characterization of the Site.

1.1 SITE DESCRIPTION AND BACKGROUND

The Site is a former creosote-based wood treating facility located on the former KMCC property (the property) in Navassa, North Carolina (**Figure 1-1**). The property is bounded to the north by Quality Drive and the former Rampage Boat Company, to the east by the Brunswick River, to the south by Sturgeon Creek, and to the west by Navassa Road.

The property consists of approximately 246 acres, 154 acres of upland areas and 92 acres of marsh. The upland areas are owned by the Multistate Trust. The marsh is owned by the State of North Carolina. **Figure 1-2** shows the property boundary on the 1969 historical aerial photograph. As indicated on **Figure 1-3**, the eastern two-thirds of the property (Eastern Upland) is undeveloped and wooded and bounded to the east by a marsh. Two one-acre former residential parcels (the Residential Parcels) are located within the east central portion of the property. The parcels are now owned by the Multistate Trust and are no longer occupied. Access to the residential parcels is via Canal Drive from Quality Drive. Canal Drive is an unpaved road approximately one half-mile long.

Historically, the western third of the property, consisting of approximately 62 acres, was used for the wood treating operations and is generally referred to as the Site. The northern and eastern portions of the Site were used primarily for storage of treated and untreated wood (Treated and Untreated Wood Storage Areas). The southern portion of the Site (Process Area and Pond Area)

was used in the wood treating process. Areas of the tidal marsh south of the former wood treating facility that have been impacted by wood treating process releases are also included in the Site.

Currently, most of the Site is overgrown with trees and underbrush with little evidence of the former structures. Vehicles can access the interior of the property at four locations: (1) the staging area on the west central side of the property, (2) an unpaved power line access road entering the north end of the property, (3) Canal Drive from the northern area of the property, and (4) an unpaved access road on the southern boundary of the property. There are locking gates at each of these access locations. A fence is located on the north and west boundaries of the Process Area (**Figure 1-3**).

1.2 NATURE AND EXTENT OF CONTAMINATION

This section summarizes the results of the Site investigations, including the Remedial Investigation (RI) and Supplemental RI (SRI), to determine the nature and extent of contamination at the Site. Details of sampling locations, media types, depths of borings and groundwater wells, types of analyses performed per medium and other information related to the determination of the nature and extent of contamination are presented in Section 2 of the RI Report (EarthCon, 2019). The nature and extent of the contamination is described in Section 4 of the RI Report, and is summarized in the following section.

The Site investigations have been developed to meet the following objectives:

- Delineate the nature and extent of contamination in soil, groundwater, and sediment and provide an appropriately comprehensive and current understanding of conditions at the Site.

- Identify remaining source(s) of the contamination of groundwater.

- Confirm the presence or absence of creosote and/or Site-related chemicals of concern (COCs) in areas surrounding the Site and further delineate the migration and contamination.

- Provide adequate information to assess potential risks to human health and the environment and complete an HHRA.

- Obtain adequate data from which to develop a Feasibility Study (FS), and ultimately select a remedy that will achieve protective conditions and facilitate future use of the property.

1.2.1 Results of Site Investigations

Creosote was released during the wood treating process in areas associated with process units, storage tanks and former surface water impoundments. The areas where residual creosote and soil impacts remain as a source of ongoing contamination to groundwater are referred to as source areas. Free-phase liquid creosote migrated from the source areas and remains within the subsurface soil as a continuing source of dissolved constituents in groundwater. The density of the free-phase creosote is slightly greater than water, classifying it as a dense non-aqueous phase liquid (DNAPL). Its migration through the subsurface is primarily controlled by gravity and capillary pressures and to a lesser extent by hydrodynamic pressure (i.e., viscous force) (Mercer and Cohen, 1993). Creosote can be found both in soil unsaturated by groundwater and in deeper saturated soil.

The constituents considered to be the primary indicators of creosote contamination include polycyclic aromatic hydrocarbons (PAHs), phenols, and three compounds closely associated with the PAHs (1,1-biphenyl, carbazole and dibenzofuran). The PAHs include 1-methylnaphthalene, 2-methylnaphthalane, acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. Volatile organic compounds (VOCs) are often present at creosote wood treating sites due to their presence in carrier oil, fuel for machinery and vehicles, and their associated use in equipment maintenance. Petroleum products were also sometimes added to dilute or “cut” the creosote (USEPA, 1992a).

Source areas identified during the RI include the Process Area, the Wastewater Ponds, the Boiler Ponds, the Operations Evaporation Pond and the Decommissioning Evaporation Pond. These source areas are clustered in the southwestern portion of the property, the most heavily impacted area (**Figure 1-2**).

1.2.2 Extent of Soil Impacts

Surface Soil and Terrestrial Sediments

Sample results from surface soil [0 to 1-foot below ground surface (bgs)] and terrestrial sediment (soil samples collected from drainage swales and surface depressions that are intermittently wet from rainfall) are presented in **Appendix A**. Surface soil and terrestrial sediment sample locations are shown on **Figure 1-4**.

Background soil sampling was conducted in January 2017 by collecting 15 surface soil samples from locations within the Town of Navassa as shown on **Figure 1-5**. Each soil sample was analyzed for PAHs, target analyte list (TAL) metals, and hexavalent chromium. Background values were derived by calculating the arithmetic mean and multiplying by two as described in the United States Environmental Protection Agency (USEPA) Region 4 Human Health Risk Assessment Supplemental Guidance (USEPA, 2018a). Analytical data used to derive site-wide background concentrations for metals in surface soils and sediment are provided in **Table 1-1**.

RI and SRI data have shown that surface soils and terrestrial sediments in the source areas are primarily impacted by creosote-related semi-volatile organic compounds (SVOCs). The highest concentrations in surface soils were encountered in the Process Area and Pond Area. SVOC concentrations greater than residential USEPA Regional Screening Levels (RSLs) are also present near the Wastewater Ponds and extend northward to the Treated Wood Storage Area. **Figure 1-6** shows the extent of creosote-related SVOCs above residential RSLs in surface soil and terrestrial sediments.

Several VOCs, including acrolein, benzene, ethylbenzene, and total xylenes, were also detected in surface soils. However, the detections were sporadic in nature. A pesticide, aldrin, was detected in a single terrestrial sediment sample. Although not considered to originate from the Site operations, multiple metals were detected in surface soils with arsenic being detected throughout the assessment areas at the Site. Several other inorganic constituents, including aluminum, cobalt, hexavalent chromium, iron, manganese, thallium and vanadium were detected throughout the assessment areas at the Site.

In general, surface soil in the Pond Area, Process Area, Treated Wood Storage Area, and Untreated Wood Storage Area showed impacts at levels above the residential RSLs, whereas the Eastern Upland surface soil displayed sporadic detections at lower concentrations. The

difference in SVOC contaminant levels in the Eastern Upland, compared to the other Site areas, ranged from one to four orders of magnitude less than those in the operational areas.

Subsurface Soil

Subsurface soil sample results are provided in **Appendix A**. USEPA Region 4 considers soil from the bottom of the defined depth of surface soil (i.e., 1-foot bgs) up to 10 feet bgs or to groundwater, whichever is shallower as subsurface soil (USEPA, 2018a). The subsurface soil sample locations are shown on **Figure 1-7**.

Ethylbenzene was the only VOC observed in subsurface soil at concentrations above residential RSLs. It was found in the Process Area and Pond Area, but not in the other areas.

Creosote-related SVOC constituents (PAHs, phenols, biphenyl, carbazole, and dibenzofuran) were detected above residential RSLs. These constituents were generally detected in subsurface soil in the Treated and Untreated Wood Storage Areas at lower levels than in surface soil. Since wood treating activities did not occur in the Eastern Upland Area, surface soil sample results exceeding the residential RSL are likely attributed to surface runoff and air deposition; therefore, subsurface soil samples were not collected in the Eastern Upland Area.

Much higher levels of creosote-related constituents, as well as DNAPL, were observed in subsurface soils at the Process Area and the Pond Area. Assessment of the vertical extent of contamination in the Process Area is limited as most of the soil samples were collected in the upper 5 feet with only a limited number of deeper samples, which were collected at depths below the water table, and therefore are not considered to be soil samples. However, the limited subsurface soil data combined with the DNAPL observations indicate that impacts in the unconsolidated zone at the Process Area extend from the ground surface to a depth of 25 feet bgs and in the Pond Area from ground surface to approximately 80 feet bgs. **Figure 1-8** shows sample locations and the extent of SVOCs above residential RSLs in subsurface soil.

Pesticides were not detected in subsurface soils. Aluminum and arsenic were the only metals detected above background and/or residential RSLs in subsurface soils.

1.2.3 Extent of Groundwater Impacts

As described in the RI (EarthCon, 2019), groundwater samples were collected from 19 temporary and 37 permanent monitoring wells installed in the Surficial Aquifer and 22 wells installed in the

underlying Peedee Formation. USEPA also collected groundwater samples from private irrigation wells located south of Sturgeon Creek. These data were used to delineate the groundwater plume. Data from background wells and the temporary groundwater wells located in the northern portion of the Site (Eastern Upland Area, Treated and Untreated Wood Storage Areas) indicated that constituents were not present above detection limits. Additionally, groundwater flow direction is to the south and east towards Sturgeon Creek and the Southern Marsh and away from the northern portion of the Site. Therefore, groundwater in this HHRA was only evaluated for the southern portion of the Site (Process and Pond Areas). A summary of background groundwater results is provided in **Table 1-2**. Groundwater sample results are provided in **Appendix A**.

VOC and SVOCs are present in groundwater at concentrations greater than tapwater RSLs in the Process Area, the Pond Area and the area west of Navassa Road. The locations and concentrations of these constituents indicate that the primary sources of groundwater contamination are the former creosote treating vessels, storage tanks, and associated ponds that were in place during facility operations.

Arsenic concentrations above tapwater RSLs correlate with high concentrations of PAHs in Surficial Aquifer groundwater and with low oxidation reduction potentials. Increased arsenic concentrations may result from dissolution of naturally occurring arsenic in the aquifer matrix due to reducing conditions in the presence of DNAPL or high concentrations of dissolved phase creosote constituents. Additional details of the groundwater investigation results are given below.

<u>VOCs</u>

VOCs detected above tapwater RSLs include petroleum constituents (1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, ethylbenzene and xylenes) which could be associated with materials used to “cut” the creosote. Drinking water disinfectants such as bromodichloromethane and chloroform, which are not related to wood treating operations, were also detected sporadically at concentrations above tapwater RSLs.

The extent of VOCs detected above tapwater RSLs in Surficial Aquifer groundwater during the March 2017 sampling is shown on **Figure 1-9**. The contamination extends from the Process Area, southwest across Navassa Road and southeast towards the Pond Area. Surficial groundwater in the Pond Area is also impacted and the impacts extend south toward the Southern Marsh.

As shown on **Figure 1-10**, VOCs were detected at concentrations above tapwater RSLs in Peedee Aquifer groundwater in four distinct locations, including West of Navassa Road, the Operations Evaporation Pond, south of the Fire Protection Pond and south of the Wastewater Ponds. The lateral extent of VOCs in Peedee Aquifer groundwater is less than the lateral extent in Surficial Aquifer groundwater.

SVOCs

SVOCs detected above tapwater RSLs include creosote-related PAHs, phenols, carbazole, and dibenzofuran. Additional SVOCs detected above tapwater RSLs include 4-nitroaniline, benzidine, bis(2-ethylhexyl)phthalate, and pyridine. Each of these constituents was detected only once above the RSL and was not detected consistently above the RSL in any monitoring well.

The extent of SVOCs detected in Surficial groundwater at concentrations above the tapwater RSLs in March 2017 is shown on **Figure 1-11**. The contamination extends from the Process Area, southwest across Navassa Road and southeast towards the Pond Area. Surficial groundwater in the Pond Area is also impacted and extends south toward the Southern Marsh.

Naphthalene was the only constituent detected above the tapwater RSL in monitoring wells located west of Navassa Road and in wells located along the northern and eastern edge of the plume in the Process Area and Pond Area. DNAPL was observed in shallow monitoring wells located in the Process Area and the Pond Area. Groundwater samples collect by USEPA from residential irrigation wells located south of Sturgeon Creek did not find groundwater contamination on the south side of Sturgeon Creek.

As shown on **Figure 1-12**, SVOCs were detected at concentrations above tapwater RSLs in the Peedee groundwater in the Process Area, West of Navassa Road, and in the Pond Area. Naphthalene was the only constituent detected above the tapwater RSL in monitoring wells located West of Navassa Road and in monitoring wells located along the northern plume edge (Process Area) and the eastern plume edge (Pond Area). The lateral extent of SVOCs in Peedee groundwater is less than the lateral extent in Surficial groundwater.

Pentachlorophenol

Pentachlorophenol was detected in groundwater samples collected from three monitoring wells (MW-06, MW-11S, and MW-25S) in 2016 and/or 2017. In February and June 2016, pentachlorophenol was analyzed as a pesticide using method SW8151A. In December 2016 and

March 2017, it was analyzed as an SVOC using method SW8270D due to the potential for interferences in the pesticide analysis from phenols. Each monitoring well contained measurable levels of DNAPL. Because pentachlorophenol was not detected in surface or subsurface soil, its presence is not anticipated to be due to wood treating activities. Therefore, additional sampling was conducted to evaluate the potential for the pentachlorophenol detections to be related to interference from DNAPL. While low concentrations of pentachlorophenol were reported in the samples, review of the mass spectra indicated that the ratios of the major ions associated with pentachlorophenol were not indicative of pentachlorophenol but could be associated with other phenolic compounds. Pentachlorophenol will be further evaluated during the FS for groundwater.

Metals

A summary of background concentrations in groundwater is provided in **Table 1-2**. Metals detected above tapwater RSLs and background concentrations include aluminum, arsenic, chromium, cobalt, iron, manganese, selenium, and thallium. None of these metals are related to creosote wood treating operations. Aluminum and iron were detected in the monitoring wells sampled at concentrations exceeding the background concentrations and the tapwater RSLs. The detections may be related to naturally occurring concentrations. Each of the other detected metals, are described below.

- Total chromium was detected above both the tapwater RSL for hexavalent chromium and the background value in the sample from MW-07 collected in October 2006. Dissolved chromium was detected in the sample from MW-25S collected in February 2016 at a concentration above the background value and above the tapwater RSL for hexavalent chromium. Both chromium detections are below the tapwater RSL for chromium (III). Hexavalent chromium was not detected in groundwater samples.

- Cobalt was detected in monitoring wells MW-07 in October 2006 and MW-11S in February 2016 at concentrations exceeding the background value and the tapwater RSL.

- Selenium was detected in monitoring well MW-25S in December 2016 at a concentration exceeding the tapwater RSL; however, the selenium concentration at this location in February 2016 was below the tapwater RSL.

- Thallium was detected in monitoring well MW-03 at a concentration exceeding the tapwater RSL and background value.

- Manganese was detected in each of the monitoring wells sampled at concentrations exceeding the tapwater RSL. Background values are not available for manganese. The detections may be related to naturally occurring concentrations of manganese.

Arsenic was detected in groundwater above the background value of 0.00225 milligrams per liter (mg/L) at concentrations ranging from 0.0023 to 0.068 mg/L. As shown on **Figure 1-13**, arsenic concentrations above background are present in the Surficial groundwater in the Process Area and the Untreated Wood Storage Area. Arsenic was detected in two distinct locations in the Pond Area, near the Evaporation Ponds and around the Wastewater Ponds. The arsenic detections in the Pond Area generally correlate with monitoring wells installed in the Surficial groundwater in areas with high concentrations of PAHs and low oxidation-reduction potentials.

1.2.4 Extent of Sediment and Surface Water Impacts

Marsh Sediment

The marsh sediment investigation included collection of 148 sediment samples as described in Section 2.4 of the RI Report (EarthCon, 2019). A summary of background marsh sediment results is provided in **Table 1-3**. **Figure 1-14** shows the marsh sediment sampling locations. The tabulated marsh sediment analytical results are provided in **Appendix A**.

Several VOCs were detected in the marsh sediment samples including acetone, fuel-related compounds (toluene, ethylbenzene, xylenes, trimethylbenzene, butylbenzenes, propylbenzene, isopropylbenzene, and isopropyltoluene), carbon disulfide, chlorobenzene, and methyl acetate. The concentrations of the detected VOCs are below residential RSLs.

The SVOCs exceeding residential RSLs and background values in the sediments from the Southern Marsh consisted of creosote-related compounds including PAHs, carbazole and dibenzofuran. Concentrations of PAHs for the marsh sediment background samples are provided in **Table 1-3**. The most frequently detected PAHs were benz(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, fluoranthene, and pyrene. As shown on **Figure 1-15**, the highest concentration of creosote-related SVOCs was detected in sample SD12 collected from the disturbed area in the Southern Marsh. Results from sediment location VC-H-M01 indicate that concentrations in this area generally decrease with increasing depth. Dibenzofuran was the only constituent detected above residential RSLs in the deepest sample collected from VC-H-M01 at a depth of 4.5 to 5.5 feet bgs. The lateral extent of contamination ranges from west of Navassa

Road (sample SD87) to southeast of the Pond Area (sample SD19) to approximately 500 feet south of the marsh edge (samples SD40 and SD48). USEPA sediment samples KM26 and KM35 located along the bank of Sturgeon Creek also contained low concentrations of PAHs with benzo(a)pyrene being the only constituent above the residential soil RSL in both samples. Sturgeon Creek sediments are submerged in water most of the year, and therefore, in accordance with USEPA guidance (USEPA, 2018a) were not assessed in the HHRA.

Background samples collected from the marsh were analyzed for arsenic, chromium, hexavalent chromium and thallium (**Table 1-3**). Metals detected above the residential RSLs and/or background values include aluminum, arsenic, hexavalent chromium, cobalt, iron, manganese, thallium, and vanadium. Arsenic was detected in each of the sediment samples collected, including the background samples. Arsenic concentrations in the samples from the marsh sediment appear to be indicative of anthropogenic impacts. Cobalt, manganese, and vanadium were detected in each of the marsh sediment samples.

Hexavalent chromium was detected once in Southern Marsh sediment sample SD-106 at a concentration of 44.2 milligrams per kilogram (mg/kg), which is higher than concentrations detected in background marsh sediment samples. This concentration is also higher than the total chromium concentration of 29.7 mg/kg detected in sample SD-106 which makes the hexavalent chromium result suspect. The data validation narrative in Appendix K of the RI report (EarthCon, 2019) indicated that the discrepancy could be due to sample heterogeneity or analytical interference. Thallium was detected in four of the ten Southern Marsh sediment samples analyzed. The metals detected in the Southern Marsh sediment are not associated with the creosote wood treating activities conducted at the property. These metals may be naturally occurring, or their presence may be due to deposition from upstream sources.

Surface Water

The RI surface water investigation included sampling at two background locations (SW-22 and SW-101) collected upstream in Sturgeon Creek, three background locations (SW-107, SW-108, and SW-109) collected from the Eastern Marsh, 13 surface water samples from the Southern Marsh, sample RISW01 from standing water in the Boiler Pond and sample RISW04 from standing water in a drainage swale in the Process Area. For the purposes of this HHRA, samples collected from standing water (basically, puddles) are not considered representative of surface

water quality at the Site. **Figure 1-14** shows the surface water sample locations. The tabulated surface water analytical results are provided in **Appendix A**.

Five surface water samples were collected from the Southern Marsh and Sturgeon Creek for SVOC analysis. SVOCs were not detected in these samples. Five additional surface water samples were collected from the Southern Marsh and Sturgeon Creek and analyzed for total and dissolved arsenic, chromium, and thallium. Arsenic and chromium results were generally consistent with the results from background surface water locations. Concentrations of detected constituents are below the applicable surface water quality standards (SWQS). The surface water system in the tidal marsh is dynamic with substantial tidal fluctuations averaging 4 to 5 feet per tidal cycle.

Based on these conditions and the surface water data collected to date from the tidal marsh and Sturgeon Creek, it appears that surface water quality in this area is not being influenced by discharge of groundwater or from the impacted sediments on the southern end of the property.

1.2.5 Land and Water Use Determination

Future uses of land and groundwater may affect the types and the frequency of potential contaminant exposures at the Site, which may affect the remedial actions considered and selected. Land use in the Navassa area of Brunswick County is both rural residential and industrial. The residential areas are west of the Site and Navassa Road. Most of the land area to the north of the Town and the property remains undeveloped and consists of industrial sites and undeveloped coastal forest or low-lying marsh.

As reported in the Expanded Site Inspection (ESI) (ENSR, 2005), there are no active groundwater supply wells in the Town of Navassa, which extends one mile north and west of Sturgeon Creek. The Hazard Ranking System (HRS) Documentation Record for the Site (USEPA, 2009a) states that residences along Navassa Road and in the Town limits are reportedly connected to public supply lines. The HRS Documentation Record also states that no supply wells are located down gradient from the Site. Public water for Brunswick County residents is reportedly obtained from intakes up the Cape Fear River outside of the study area. Access to supplied water is readily available, as supply line coverage is said to include most major and secondary roads throughout the county, including Canal Drive (USEPA, 2009a).

1.2.6 Risk Reduction Measures Implemented to Date

Other than the decommissioning of the Site completed in 1980, no risk reduction measures have taken place on Site aside from limited fence installation in 2015 that borders the most contaminated portions of the Site. However, the fence does not extend beyond these areas.

2.0 HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

The purpose of this HHRA is to evaluate the potential human health risks posed by Site-related contaminants under potential future residential or commercial/industrial land use conditions, assuming no additional remedial actions are taken. The specific goals of the HHRA are to:

- Determine whether releases of contaminants to environmental media may pose unacceptable risks to human health under specific exposure conditions.
- Provide information to support decisions concerning the need for further evaluation or corrective action based upon current and reasonably anticipated future residential or commercial/industrial land use.

The HHRA was conducted in accordance with USEPA guidance for conducting a risk assessment including, but not limited to, the following:

- *Risk Assessment Guidance for Superfund (RAGS): Volume 1 – Human Health Evaluation Manual* (Parts A, B, D, E, and F) (USEPA, 1989; USEPA 2001; USEPA, 2004a; USEPA, 2009b).
- *Guidance for Data Usability in Risk Assessment (Part A)*, Final, Office of Emergency and Remedial Response, Publication 9285.7-09A (USEPA, 1992b).
- *Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening*, EPA/903/R-93-001 (USEPA, 1993).
- *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA, 2002a).
- *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*, OSWER Directive 9355.4-24, USEPA 2002b)
- *Human Health Toxicity Values in Superfund Risk Assessments*, Office of Solid Waste and Emergency Response (OSWER) Directive 9285.7-53 (USEPA, 2003).
- *User's Guide to Evaluating Subsurface Vapor Intrusion into Buildings*. February 2004 (USEPA, 2004b).
- *Exposure Factors Handbook: 2011 Edition* (USEPA, 2011).
- *ProUCL Version 5.1 Statistical Software for Environmental Applications for Data Sets with and without Non-detect Observations* (USEPA, 2016a).
- *Region 4 TSS, Human Health Risk Assessment Supplemental Guidance* (USEPA, 2018a).
- *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors* (USEPA, 2014a).
- *Determining Groundwater Exposure Point Concentrations, Supplemental Guidance* (USEPA, 2014b).

- *Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites* (USEPA, 2018b).
- *RSL Calculator* (USEPA, 2018c)
- *Vapor Intrusion Screening Level (VISL) Calculator*, Version 3.3.1, OSWER Vapor Intrusion Assessment (USEPA, 2018d).

The HHRA has been conducted under the anticipated future residential use or continued industrial/commercial use scenarios. The future residential exposure assumes exposures based on child, adult and lifetime residents and the future industrial/commercial (outdoor and indoor workers) exposure scenario assume exposures based on adult workers, and construction workers. Teenage trespassers are also assessed in the HHRA.

In accordance with standard risk assessment practice, the results of the HHRA are presented in tabular format in accordance with the Risk Assessment Guidance for Superfund (RAGS) Part D (USEPA 2001). In general, the following elements are included in the HHRA:

- **Conceptual Site Exposure Model.** As defined in RAGS Part A (USEPA, 1989), the four elements necessary to form a complete exposure pathway include the contaminant source, transport mechanisms, points of receptor contact, and exposure routes. These four elements were discussed.

- **Data Collection and Evaluation.** The analytical data collected during the RI were used to calculated summary statistics and select chemicals of potential concern (COPCs) in environmental media by comparing maximum detected concentrations to health-protective, risk-based screening values and applicable background concentrations.

- **Exposure Assessment.** Current and reasonably anticipated future land use scenarios under which exposure to Site-related constituents may occur were qualitatively evaluated for each human health exposure area, and a set of exposure assumptions were developed to quantitatively evaluate such scenarios by calculating future risk. Medium-specific exposure point concentrations (EPC) were developed for each COPC per exposure area, and upper bound estimates of the intake of each COPC by each receptor through the selected pathways were calculated.

- **Toxicity Assessment.** A characterization of the toxicity and dose-response characteristics of each COPC regarding potential carcinogenic and non-carcinogenic effect has been completed.

- **Risk Characterization.** For each receptor and exposure scenario, the information provided by the exposure and toxicity assessments was combined to yield quantitative risk estimates that characterize the relationship between hypothetical exposures and potential toxicity.

2.1 CONCEPTUAL SITE EXPOSURE MODEL

To evaluate the significance of the impacted media at the Site, the potential pathways by which individuals may come into contact with these media must be determined. The combination of factors (chemical source, media of concern, release mechanisms, and potential receptors) that could produce a complete exposure pathway and lead to potential human uptake of chemicals at the Site is assessed in what is defined as the Conceptual Site Exposure Model (CSEM). The purpose of a CSEM is to provide an understanding of the potential for exposure, under current and future land use, to chemicals at a site based on the source(s) of contamination, the release mechanism(s), the exposure pathway(s), and the receptor(s). A source and complete pathway are required to potentially create an exposure to a receptor, and therefore possible risk. The objective of the HHRA was to evaluate potential risks to human health from exposure to COPCs via applicable exposure pathways identified in the RI.

Due to the multiple areas addressed by this HHRA, four CSEMs (**Figures 2-1 through 2-4**) have been created for the Site, each representing two of the areas (Process and Pond Areas; Treated and Untreated Wood Storage Areas; Eastern Upland and West of Navassa Road; and Southern Marsh and Sturgeon Creek, respectively). The Eastern Upland and West of Navassa Road areas were grouped together due to the limited impacts observed to environmental media from creosote related activities as wood treating operations were not conducted within these areas. Similar potential Site receptors and levels of contamination are also anticipated for these two areas. A fifth CSEM (**Figure 2-5**) was created for groundwater. The CSEMs illustrate the sources/release mechanisms, modes of transport, primary and secondary impacted media, exposure routes, and potentially exposed receptors for the Site.

This HHRA has been conducted assuming the future residential or commercial/industrial land use scenario. A future residential or commercial/industrial land use assumes residents, indoor/outdoor

workers, teenage trespassers, and construction workers will be the future receptors at the Site. These receptors would potentially be exposed to contaminants in soil or sediments for each of the areas evaluated; however, based on the limited extent of the groundwater plume located in the southern-most portion of the Site, future residents, indoor workers and construction workers were evaluated for exposure to groundwater in the Pond and Process Areas only.

2.2 DATA COLLECTION AND EVALUATION

The purpose of the problem formulation process is to summarize data and identify COPCs that were evaluated in the HHRA.

2.2.1 Sample Collection

The analytical data used for this HHRA include data collected during the ESI and RI activities; earlier data, which were not analyzed as per CERCLA protocol, were not incorporated. The investigations performed prior to the ESI were not included in the database but were used to describe the Site history. CERCLA-related investigative efforts were initiated in November 2004 with the ESI performed by ENSR Corporation of North Carolina (ENSR). Beginning in 2006, RI activities were performed by ENSR and AECOM Technical Services of North Carolina, Inc. (AECOM) under contract to Tronox, LLC (Tronox); USEPA; and CH2M Hill and EarthCon under contract to the Multistate Trust. The RI investigations include the ENSR/AECOM Phase 1 RI in 2006, the ENSR/AECOM Phase 2 RI in 2008, the USEPA Residential Sampling in 2010, the USEPA Marsh Edge Sampling in 2010, the USEPA Tissue Sampling in 2011, the AECOM Supplemental RI (SRI) in 2012, the CH2M Hill SRI conducted in 2015 and 2016, and the EarthCon SRI conducted in 2016 and 2017.

The ESI laboratory analyses were performed by Lancaster Laboratories located in Lancaster, Pennsylvania. The Phase 1 RI, Phase 2 RI, and AECOM SRI laboratory analyses were performed by Columbia Analytical Services of Jacksonville, Florida. The CH2M Hill SRI laboratory analyses were performed by GCAL Analytical Laboratories located in Baton Rouge, Louisiana. The EarthCon SRI laboratory analyses were performed by SGS Accutest of Orlando, Florida.

Data from the laboratories are assumed to be comparable because standard USEPA methods were used to analyze the samples, the method quality control (QC) criteria were generally met, and detection limits were calculated in accordance with USEPA methodology. In addition, data from each of these investigations were validated using USEPA guidelines for their Contract Laboratory Program (CLP). The laboratory analytical reports and the data validation reports with

the sample locations included are provided in Appendix J and Appendix K, respectively of the RI Report (EarthCon, 2019). Every analyte that was detected in at least one sample was included. Sample-specific quantitation limits were included for non-detects. The higher of the primary and duplicate/USEPA split sample results were used for screening.

The analytical test methods used by the laboratories were generally consistent between the investigations with consistent quality assurance/quality control (QA/QC) procedures. The analytical test methods used for the samples collected from various media in these studies are listed below:

ANALYSIS	METHOD
PAH	SW8270D SIM, SW8270
Pentachlorophenol	SW8270D SIM, SW8151A
VOC	TO15, SW8260B
SVOC	SW8270D, SW8270D SIM
Chloride	SW9056, EPA300
Total Solids, Total Dissolved Solids	SM2540, SM2540C, EPA 160.1
Metals and Mercury	SW6010B, 6020, 7470A, 7471
Hexavalent chromium	SW3060, SW7196, SW7199

Based on discussions with the USEPA and the North Carolina Department of Environmental Quality (NC DEQ), soil samples collected from below the water table were not considered in the HHRA. Subsurface soil is considered the portion of the vadose zone deeper than 1-ft bgs, but above the water table to a maximum depth of 10 ft bgs. The saturated soil samples were used in the characterization of the nature and extent of contamination but were not included in the risk calculations. Table 2-5 of the RI Report lists the soil samples that were collected from below the water table, and therefore, excluded from the HHRA. Due to no detections in groundwater wells installed in the northern portion of the Site and adequate plume delineation in the southern portion of the Site, only maximum groundwater data from within the defined plume was used for screening in the HHRA.

Data provided as “total PAHs” [including both low molecular weight (LMW) and high molecular weight (HMW)] were not used in this HHRA. These samples were collected for forensic analysis

and USEPA had previously discounted this data. Additionally, there were two sediment samples collected for Toxicity Characteristic Leaching Procedure (TCLP) analysis. These samples were only collected to evaluate leaching potential, and therefore, were excluded from the HHRA.

2.2.1.1 Quantitation Limits

A significant portion of soil and groundwater samples from the Process Area, Pond Area, and Treated Wood Storage Area contained elevated concentrations of contaminants, primarily PAHs. As a result, many of the associated sample results had elevated detection limits due to dilution, often above the screening criteria used for the constituent (typically RSLs). As per USEPA Region 4 policy, in cases where the detection limit for a constituent exceeded its RSL but was otherwise not detected, the constituent was eliminated from further evaluation in the risk assessment.

For several constituents, the RSL is lower than the detection limits achievable by standard USEPA analytical methods. An example is naphthalene with a tapwater RSL of 0.17 micrograms per liter (µg/L), which is used to screen groundwater samples. The detection limits for naphthalene in groundwater samples were typically two to three times higher than the tapwater RSL. However, naphthalene was retained as a COPC and further evaluated in the risk assessment due to its detection at concentrations greater than USEPA's tapwater RSL. These elevated detection limits were then used when computing the 95 percent upper confidence limit (95% UCL), or EPC, for naphthalene.

Hexavalent Chromium

Hexavalent chromium was not detected in background soil samples above reporting limits. However, the reporting limits were elevated, typically well above the residential RSL for hexavalent chromium. Rather than use the elevated reporting limits to derive a background value for hexavalent chromium, which would have resulted in the elimination of hexavalent chromium in soil, hexavalent chromium was retained for further evaluation in the HHRA.

Thallium

A similar situation occurred with thallium; however, although risk from thallium in soil in the Treated Wood Storage Area, Pond Area, Process Area, and Eastern Upland Area exceeded the non-cancer threshold, thallium was qualitatively eliminated as a COC. Per direction from NC DEQ, thallium will be addressed through a multiple lines of evidence approach presented in

Section 2.6.5. It should be noted, however, that these metals (as well as other metals) were not associated with historical site operations.

Many of the lowest target concentrations for soil were derived from soil concentrations protective of groundwater. Soil concentrations protective of groundwater were often well below the detection limits achievable using standard USEPA analytical methods. The uncertainty associated with the gap between RSLs and detection limits is discussed further in Section 2.6.

2.2.1.2 Qualified Data

The data collected for each phase of the RI were validated by a third-party validator using the USEPA's CLP National Functional Guidelines for Organic and Inorganic Review (Functional Guidelines) available at the time of the investigation (USEPA, 2008 and USEPA, 2010). The following qualifiers with their accompanying definitions were applied to the analytical data:

- U - The analyte was analyzed for but was not detected above the reported sample quantitation limit.
- J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample. Data qualified as estimated (J value) were treated as detected concentrations at the estimated concentration reported by the laboratory.
- NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents the approximate concentration.
- UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

For this HHRA, estimated (J-flagged) data were treated the same as unqualified data or detected concentrations at the estimated concentration reported by the laboratory. The UJ-flagged data were considered non-detects, and these data were retained only if the detection limit exceeded the screening criterion. No NJ- flagged data were encountered. The rejected (R- flagged) data were not used for the HHRA.

2.2.1.3 Blank Samples

Method and field blanks are analyzed to identify compounds that could be introduced during the sampling, laboratory extraction, or analysis phase (i.e., laboratory contaminants) and lead to inaccurate results. Laboratory method blanks were included with each sample batch as per CERCLA QA/QC protocols. A trip blank was submitted with VOC samples in each sample shipment and field blank samples were collected as required by the Quality Assurance Project Plan for each phase of the investigation. Associated data less than five times the blank value (10 times for common laboratory contaminants) were qualified as non-detect in accordance with Functional Guidelines criteria. The use of Functional Guidelines qualification reduces the impact of method blank contamination to the data by reducing the probability of reporting false positive or biased high data.

2.2.1.4 Tentatively Identified Compounds

The following criteria are used for the selection of tentatively identified compounds (TICs):

- Major ions (>10%) in reference must be present in sample;
- Intensities must agree within 20%; and
- If both criteria are met, then the identification of the TIC is to be confirmed.

No TICs were reported by the analytical laboratories.

2.2.2 Identification of COPCs

The concentrations of VOCs, PAHs/SVOCs, and inorganics detected in soil, groundwater, surface water, and sediment at the Site were screened to determine whether the levels warranted further risk evaluation, indicating that the constituents should be selected as COPCs. The chemicals were screened against the RSLs provided in **Table 2-1.** The COPCs are summarized in **Tables 2-2 to 2-6**. The COPC selection process has been presented in RAGS Part D format. The analytical results for these constituents are presented in **Appendix A** for surface soil and terrestrial sediment, subsurface soil, groundwater, surface water, and marsh sediment. The screening process and selection of the COPCs for soil, groundwater, surface water, and sediment are presented in the following sections.

Detected constituents were screened based on toxicity in accordance with USEPA Region 4 guidance (USEPA, 2018a). For each medium, chemicals with maximum concentrations less than

their respective screening value have not been identified as COPCs and were not retained in the HHRA quantitative process. The screening criteria are provided in **Table 2-1** and described below:

- Constituents in groundwater with maximum concentrations greater than the residential (tapwater) RSLs were initially included as COPCs. As discussed in Section 2.2.1, due to no positive detections in upgradient groundwater wells installed in the northern portion of the Site and adequate plume delineation confined to the southern portion of the Site, only maximum detected concentrations from within the defined plume were used for the selection of groundwater COPCs.

- Constituents in surface soil (0-1 ft bgs) and subsurface soil (>1 ft bgs to 10 ft bgs or to groundwater, whichever is shallower) or sediment with maximum concentrations greater than the residential soil RSLs were included as COPCs. Surface soil data were screened and evaluated separately from subsurface soil data to identify areas of localized contamination within each horizon and aid in risk management decision making.

- Constituents in surface water with maximum concentrations greater than the tapwater RSLs were included as COPCs.

The May 2018 USEPA residential RSLs (USEPA, 2018b) were used as appropriate screening values. The risk-based RSLs for non-carcinogenic chemicals based on a target hazard quotient (HQ) of 0.1 were used to account for potential additivity of constituents with the same toxic endpoint. The risk-based RSLs for carcinogenic chemicals are based on a target risk level of 1 x 10^{-6}, which is at the lower end of USEPA's target risk range of 1 x 10^{-6} to 1 x 10^{-4} (USEPA, 1991).

USEPA RAGS states, "Chemicals that are infrequently detected may be artifacts in the data due to sampling, analytical, or other problems, and therefore may not be related to site operations or disposal practices (USEPA, 1989). However, USEPA also cautions that an evaluation of a chemical's detection frequency in one medium must consider the following additional factors:

- A chemical's potential relationship to site operations;
- A chemical's detection in other media; and
- The concentration at which a chemical was detected in each medium.

Historically, a detection frequency of 5 percent has often been used as a basis for identifying COPCs (USEPA, 1989). However, the Site-related chemicals detected were retained as COPCs regardless of the frequency at which they were detected in a particular medium.

Three additional screens were initially employed to determine Site COPCs. In accordance with USEPA guidance, essential nutrients (principally metals) were eliminated as COPCs in the screening HHRA (USEPA, 1989). Constituents excluded from further consideration based on this criterion include:

- Calcium
- Chloride
- Magnesium
- Potassium
- Sodium

Other parameters that were excluded from further evaluation were physical characteristics of soils, groundwater or surface water. Parameters excluded from further consideration based on this criterion include:

- Percent Moisture
- Percent Solids
- pH
- Total Solids
- Total Dissolved Solids
- Hardness

Additionally, soil sample KM16 was initially included with samples from the area West of Navassa Road, but it was later removed from that data set when it was established that KM16 was collected from the ditch on the east side of Navassa Road.

As an initial step, detected constituents were compared to background values to evaluate whether more detailed evaluation of Site versus background attribution was warranted. Background values were derived by calculating the arithmetic mean and multiplying by two for each constituent as described in the USEPA Region 4 *HHRA Supplemental Guidance* (USEPA, 2018a). A summary of the background results is provided in **Tables 1-1, 1-2 and 1-3** for soil, groundwater and marsh sediment, respectively.

PAHs were detected in the background soil samples at concentrations below residential RSLs. Several naturally occurring metals were also detected in the background soil samples. Background concentrations of arsenic were compared to soil results. Because thallium and

hexavalent chromium were not detected in the background soil samples, the thallium and hexavalent chromium results were screened against their residential RSLs.

Future use of the Site is uncertain; therefore, detected constituents were screened using residential soil screening levels. Where no RSL is available for a constituent, an appropriate surrogate chemical was identified based on structural or toxicological similarities. The following table lists the surrogates used in this HHRA.

Constituent	Surrogate
4-Chlorophenyl phenyl ether	Pyrene
Acenaphthylene	
Benzo(g,h,i)perylene	
Carbazole	
Phenanthrene	
Dimethyl phthalate	Di-n-butylphthalate
Endosulfan II (beta)	Endrin
Endosulfan Sulfate	
Endrin aldehyde	
Methylcyclohexane	Cyclohexane
p-Isopropyltoluene	Toluene

In this HHRA, the USEPA's RSL Calculator (USEPA, 2018c) was used to determine soil concentrations protective of groundwater, using tapwater RSLs as the target groundwater standard. The site-specific input parameters of fraction organic carbon, soil density, water filled porosity, and hydraulic conductivity were used in the RSL Calculator. A dilution attenuation factor (DAF) of 1 was used, as is appropriate for sites with shallow groundwater. The model input parameters and results are discussed in Section 2.5.3.

2.2.2.1 COPCs in Soil

Table 2-2 presents a screening matrix for initial selection of surface soil COPCs. For the purposes of this HHRA, "surface soil" will include both soil from a depth of 0 to 1-foot bgs and terrestrial sediment. Terrestrial sediment is surface soil collected from drainage swales or ditches that contain water only intermittently. USEPA Region 4 guidance also states that sediments in an intermittent stream should be considered as surface soil for the portion of the year the stream is without water (USEPA, 2018a). The known detected VOCs, SVOCs, and inorganics are

presented in **Table 2-2** with the percent of detections observed at each area, the minimum and maximum concentrations of each detected constituent, and whether the constituent has been detected in surface soil. **Table 2-3** lists the same information for COPCs in subsurface soil. The on-Site subsurface soil data consist of soils greater than 1-foot bgs to 10 ft bgs or to groundwater, whichever is shallower. The COPCs for these media per area are given below.

Process Area

The following constituents were detected at concentrations greater than their screening criteria and were retained as COPCs for surface soil and subsurface soil in the Process Area:

Parameter	Surface Soil COPCs	Subsurface Soil COPCs
VOCs	None	Ethylbenzene
SVOCs	Carbazole Dibenzofuran	1,1-Biphenyl Carbazole Dibenzofuran
PAHs	2-Methylnaphthalene Anthracene Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene Dibenzo(a,h)anthracene Fluoranthene Fluorene Indeno(1,2,3-cd)pyrene Naphthalene Phenanthrene Pyrene	2-Methylnaphthalene Acenaphthene Anthracene Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene Dibenzo(a,h)anthracene Fluoranthene Fluorene Indeno(1,2,3-cd)pyrene Naphthalene Phenanthrene Pyrene
Inorganics	Aluminum Arsenic Hexavalent Chromium Thallium Vanadium	Aluminum

Pond Area

The following constituents were detected at concentrations greater than their screening criteria and were retained as COPCs for surface soil and subsurface soil in the Pond Area:

Parameter	Surface Soil COPCs	Subsurface Soil COPCs
VOCs	Benzene Ethylbenzene Xylenes	Ethylbenzene
SVOCs	1,1-Biphenyl Carbazole Dibenzofuran	1,1-Biphenyl Carbazole Dibenzofuran
PAHs	2-Methylnaphthalene Acenaphthene Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene Dibenzo(a,h)anthracene Fluoranthene Fluorene Indeno(1,2,3-cd)pyrene Naphthalene Phenanthrene Pyrene	2-Methylnaphthalene Acenaphthene Anthracene Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene Dibenzo(a,h)anthracene Fluoranthene Fluorene Indeno(1,2,3-cd)pyrene Naphthalene Phenanthrene Pyrene
Inorganics	Aluminum Arsenic Iron Thallium Vanadium	Aluminum Arsenic
Pesticides	Aldrin	None

Treated Wood Storage Area

The following constituents were detected at concentrations greater than their screening criteria and were retained as COPCs for surface soil and subsurface soil in the Treated Wood Storage Area:

Parameter	Surface Soil COPCs	Subsurface Soil COPCs
PAHs	Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenzo(a,h)anthracene Indeno(1,2,3-cd)pyrene	Benzo(a)pyrene
Inorganics	Aluminum Arsenic Thallium	None

Untreated Wood Storage Area

Concentrations of the following constituents exceeded their screening criteria and were retained as COPCs for surface soil and subsurface soil in the Untreated Wood Storage Area:

Parameter	Surface Soil COPCs	Subsurface Soil COPCs
PAHs	Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Dibenzo(a,h)anthracene Indeno(1,2,3-cd)pyrene	Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenzo(a,h)anthracene
SVOCs	None	2,6-Dinitrotoluene
Inorganics	Arsenic Hexavalent Chromium	None

Eastern Upland Area

The following constituents were detected at concentrations greater than their screening criteria and were retained as COPCs for surface soil in the Eastern Upland Area:

Parameter	Surface Soil COPCs	Subsurface Soil COPCs
VOCs	Acrolein	None
PAHs	Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Indeno(1,2,3-cd)pyrene	None
Inorganics	Aluminum Arsenic Cobalt Hexavalent Chromium Iron Manganese Thallium Vanadium	None

No subsurface soil samples were collected for the Eastern Upland Area.

West of Navassa Road

No constituents were detected above their screening criteria in surface soil west of Navassa Road. No subsurface soils were collected west of Navassa Road.

2.2.2.2 COPCs in Groundwater

Groundwater was evaluated for both direct contact exposure pathway for the resident and construction worker, as well as indirectly through inhalation of airborne vapors in indoor air originating from groundwater for the resident and indoor and outdoor workers.

For the direct contact exposure pathway, the maximum detected groundwater concentrations were compared to the USEPA Tapwater RSLs (USEPA, 2018b), based on a target cancer risk of 1×10^{-6} and a target hazard quotient of 0.1 to identify the groundwater COPCs. **Table 2-4** presents a screening matrix for initial selection of groundwater COPCs. The detected VOCs, SVOCs, PAHs, inorganics, and pesticides are presented in **Table 2-4**, including the ranges of reporting

limits, detection frequency at each area, the minimum and maximum concentrations of each detected constituent, and the locations of maximum values.

The following constituents were retained as COPCs for groundwater in the southern portion of the Site:

Parameter	Groundwater COPCs	
VOCs	Benzene Chloroform Ethylbenzene	Toluene 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene Xylenes
SVOCs	1,1-Biphenyl Bis(2-ethylhexyl)phthalate Carbazole Dibenzofuran 2,4-Dimethylphenol	2-Methylphenol (o-Cresol) 3-Methylphenol (m-Cresol) 4-methylphenol (p-Cresol) Pyridine
PAHs	1-Methylnaphthalene 2-Methylnaphthalene Acenaphthene Acenaphthylene Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene	Dibenzo(a,h)anthracene Fluorene Indeno(1,2,3-cd)pyrene Naphthalene Phenanthrene Pyrene
Inorganics	Aluminum Arsenic Cobalt	Iron Manganese Selenium
Pesticides	Pentachlorophenol	

2.2.2.3 COPCs in Sediment

Table 2-5 presents a screening matrix for initial selection of sediment COPCs. Sediment in Sturgeon Creek was not assessed in the HHRA because it is submerged in water most of the year. USEPA Region 4 guidance states that in most cases it is unnecessary to evaluate human exposures to sediments that are covered in water (USEPA, 2018a). However, bank sediments in the Southern Marsh were assessed due to the intermittent nature of water in this area. The following compounds were detected at levels greater than their screening criteria and were retained as COPCs for sediment in the Southern Marsh:

Parameter	Southern Marsh Sediment COPCs	
SVOCs	Carbazole Dibenzofuran	
PAHs	2-Methylnaphthalene Acenaphthene Anthracene Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene	Dibenzo(a,h)anthracene Fluoranthene Fluorene Indeno(1,2,3-cd)pyrene Naphthalene Phenanthrene Pyrene
Inorganics	Aluminum Arsenic Cobalt Hexavalent Chromium	Iron Manganese Thallium Vanadium

2.2.2.4 COPCs in Surface Water

Table 2-6 presents a screening matrix for selection of surface water COPCs. Arsenic was detected above the screening level in the Southern Marsh and Sturgeon Creek. No additional constituents were detected above their screening criteria in surface water. For Sturgeon Creek, risk to teenage trespassers from exposure to arsenic in surface water was not quantified in the HHRA since arsenic was not associated with the creosote wood treating process at the Site. Further explanation is presented in Section 2.6.5. Additionally, since surface water samples obtained from the Boiler Ponds and drainage swales are ponded water (i.e., ephemeral water only present after a precipitation event), no COPCs were selected from these samples.

2.2.3 Fate and Transport of COPCs

Some pathways through which exposure can occur currently, or in the future, require modeling to derive the EPCs. These pathways are primarily those where the transfer of contaminants across media occurs. Wind driven dust from impacted soil can be mobilized. Volatile constituents in soil partition to the vapor phase and can then migrate into indoor and ambient air. Contaminants can be leached from soil by infiltrating precipitation, which can impact groundwater if the leachate reaches the water table. For groundwater, these pathways include volatilization of VOCs in groundwater to soil vapor, which can then migrate to indoor and outdoor air. These various processes were quantified using the following methodologies:

- For soil, particulate emission factors (PEFs) and volatilization factors (VFs) were calculated for volatile organics using the approach described in *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, 2002b). The site-specific exposure variables used in the calculation of the PEF and VF were approved by USEPA and NC DEQ during a conference call on June 20, 2018. It should be noted that DNAPL has been observed in vadose zone and subsurface soils. The VF calculations, as well as other models of volatilization from soil, are not intended to calculate volatilization from pure product, and therefore, likely underestimate concentrations from volatilization.

- For groundwater, the Vapor Intrusion Screening Level (VISL) Calculator (USEPA, 2018d) was used to evaluate the volatilization from groundwater to indoor air pathway as shallow groundwater exist at the Site and can be up to 15 ft bgs in areas such as the Eastern Upland Area and the Treated and Untreated Wood Storage Areas. As VISL does not support route-to-route extrapolations, risk levels were calculated only for constituents for which inhalation toxicity factors are available. Both lifetime resident and indoor worker receptors were evaluated.

Based on guidance from USEPA, only chemicals that easily volatilize are included in the evaluation of indoor and ambient air (USEPA, 2017). The criteria established to gauge a constituent's tendency to volatilize include a Henry's Law constant of greater than 1×10^{-5} atmosphere-cubic meter per mole (atm-m^3/mol) or a vapor pressure great than or equal to 1 mm Hg. At the Site and surrounding areas, PAHs/SVOCs and metals are the principal COPCs, not VOCs. However, there are some PAHs/SVOCs observed in soil and groundwater at the Site that meet the volatility criteria including:

- Acenaphthene
- Acenaphthylene
- Anthracene
- Benz(a)anthracene
- 1,1-Biphenyl
- Dibenzofuran
- Fluorene
- 1-Methylnaphthalene
- 2-Methylnaphthalene
- Naphthalene
- Phenanthrene

- Pyrene

Additionally, the following VOCs were detected in groundwater and/or soil:

- Acrolein
- Benzene
- Chloroform
- Ethylbenzene
- n-Propylbenzene
- Toluene
- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- Xylenes

An attempt was made to collect soil gas samples during the RI, but shallow depths to groundwater inhibited sample collection. There are no structures on-site from which sub-slab vapor samples could be collected. Therefore, risk from volatilization of VOCs, naphthalene and the other more mobile PAHs/SVOCs from groundwater to indoor air was evaluated using the VISL Calculator version 3.5.1 (USEPA, 2018d).

The VISL Calculator will estimate risk levels only for constituents for which inhalation toxicity factors are available. Of the eleven PAHs/SVOCs detected in soil and groundwater at the Site which meet the vapor pressure and Henry's Law Constant criteria for volatility, inhalation toxicity factors are only available for 1,1-biphenyl and naphthalene. As other PAHs/SVOCs were observed at elevated levels in groundwater that can't be evaluated using the VISL Calculator, VI risks are likely underestimated in this risk assessment.

It should be noted that VISL is not an appropriate model to estimate vapor intrusion (VI) risks from very shallow groundwater sources. An example given in the VISL Calculator guidance describes depths to groundwater of less than five feet below foundation level (USEPA, 2018d). The VISL Calculator is not appropriate for quantifying VI risks from DNAPL in the vadose zone and in groundwater. As DNAPL is known to be present in the Process and Pond Areas, the confidence level in VI modeling results from those areas is low.

Additionally, VI risks from subsurface soil impacted with volatile constituents have not been quantified. As per discussions with USEPA during a May 31, 2018 HHRA conference call and according to recent USEPA guidance, results of volatilization calculations from bulk soil samples

are not considered to be reliable (USEPA, 2017). The September 2017 USEPA guidance document on use of the J&E model also states that volatilization from DNAPL cannot be reliably calculated. Therefore, J&E modeling of volatilization from subsurface soil and DNAPL has not been included in this HHRA. This issue is discussed further in Section 2.6.

For surface and subsurface soil, the RSL Calculator (USEPA, 2018c) was used to back-calculate soil concentrations of Site COPCs that would be protective of groundwater via leaching. A DAF of 1 was used in the model due to the shallow depth to groundwater (approximately five feet), particularly in the southern portion of the Site. A DAF of 20 may be more appropriate for the Eastern Upland Area, and the Treated and Untreated Wood Storage Areas, where depth to groundwater can be as deep as 15 feet. Site-specific input parameters were used where available (porosity, water-filled porosity, soil type, and fraction organic carbon). COPCs in soil that are supported by the RSL Calculator have been included in this evaluation, and are listed below:

- Acenaphthene
- Anthracene
- Benz(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(j)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- 1,1-Biphenyl
- Bis(2-chloroethyl)ether
- Carbazole
- Dibenz(a,h)anthracene
- Dibenzofuran
- Fluoranthene
- Fluorene
- Indeno(1,2,3-c,d)pyrene
- Naphthalene
- Phenanthrene
- Pyrene

2.3 EXPOSURE ASSESSMENT

The objective of the exposure assessment is to evaluate the magnitude, frequency, duration and routes of current and reasonably anticipated future chemical exposures that populations may receive from either direct or indirect contact with COPCs. The exposure assessment is based on the receptor scenarios for Site-related COPCs via Site-specific routes of exposure.

USEPA defines exposure as “the contact with a chemical or physical agent” and defines the magnitude of exposure as “the amount of an agent available at human exchange boundaries (i.e., lungs, gut, skin) during a specified time” (USEPA 1989). The exposure assessment yields upper-bound estimates of the theoretical intakes (or doses) of COPCs. Estimates of human intake are a function of exposure parameters, such as duration, frequency, and contact rates. This section describes the equations and assumptions used to develop exposure intakes.

The exposure assessment is a critical element of the HHRA because it identifies which potential human exposure pathways and receptors are potentially complete and included for further quantitative risk characterization; which pathways may be qualitatively evaluated; and which pathways are incomplete and not carried forward in the evaluation.

The key elements of this effort included:

1. developing the CSEMs (**Figures 2-1 to 2-5**) that identify receptor populations and possible future exposure pathways;

2. identifying and developing relevant exposure factors for each significant subpopulation and pathway to quantitatively estimate risks for potentially complete exposure pathways; and

3. calculating the magnitude of chemical concentrations (i.e., the chronic daily dose) in the relevant impacted media at the Site using the exposure factors identified.

The magnitude of exposure is calculated by determining the amount of a given chemical that enters the body (referred to as chemical intake or exposure dose). Chemical intakes were quantified using equations presented in relevant regulatory guidance (USEPA, 1989; USEPA, 2004a; and USEPA, 2009b).

For human exposures, a complete pathway is defined as those relevant and applicable exposure pathways that have been identified for quantitative risk analysis. However, while a pathway may be potentially complete for a receptor, the risk from such a pathway may be insignificant and therefore addressed only qualitatively in the risk assessment (e.g., future resident exposure to subsurface soil). Other pathways may not be potentially complete and also not relevant to a specific receptor (e.g., teenage trespasser exposure to groundwater). In such instances, the pathway was denoted as "NA" for not applicable.

For the exposure scenarios that were evaluated, reasonable maximum exposure (RME) assumptions were used. Default values for many parameters in the exposure scenarios have been proposed in USEPA guidance documents. Site-specific exposure factors were used when available, otherwise the default values were applied.

The Site is currently zoned for industrial use with residential areas to the west across Navassa Road, and south of the Site, across Sturgeon Creek. As previously discussed, the Treated and Untreated Wood Storage Areas, and the Pond and Process Areas were used for industrial purposes. However, the Eastern Upland Area and the West of Navassa Road Area were not used for industrial purposes. The Site presently has no office buildings or similar structures that would house commercial workers for extended periods of time.

It is assumed that a construction worker may conduct short-term digging or maintenance activities at the Site without following appropriate health and safety procedures. Therefore, construction worker exposures to Site-related contaminants during possible Site redevelopment activities are considered in this HHRA. It is also possible that new buildings will be constructed at the Site in the future and that indoor workers may occupy on-Site office buildings in the future. Thus, a future on-Site indoor worker is evaluated in this HHRA.

The following future on-Site receptors are evaluated in the HHRA: adult (lifetime) and child residents, indoor worker, outdoor worker, construction worker, and teenage trespasser.

2.3.1 Points of Exposure

An exposure point is a location where actual or potential human receptor contact with a contaminated medium may occur. Soil, groundwater, sediments, surface water, and indoor air are potential points of exposure at this Site.

2.3.2 Exposure Scenarios and Complete Exposure Pathways

Estimation of exposure involves the identification of exposure pathways, scenarios, and routes. An exposure pathway is the course a chemical or physical agent takes from a source to an exposed organism (USEPA, 1989). Exposure scenarios (designated “residential”, “industrial”, etc.) are comprised of one or more exposure routes appropriate to the potentially exposed population. An exposure route is the way a chemical or physical agent comes in contact with a receptor (i.e., by ingestion, inhalation, dermal contact, etc.). The residential and commercial/industrial exposure scenarios (USEPA 1997 and USEPA 2014a) are the focus of this HHRA. A teenage trespasser scenario was also evaluated based on the close proximity of the Site to residential areas and the attractiveness (marsh areas) of the Site to a trespasser (USEPA, 2018a). The exposure assumptions used to evaluate the trespasser are protective of a recreator; therefore, risk and hazard to a recreator were not quantified separately in this HHRA.

Potentially complete exposure pathways are identified to be considered for further evaluation in the risk assessment. For an exposure pathway to be complete, the following conditions must exist (USEPA, 1989):

- A source and mechanism of chemical release to the environment;
- An environmental transport medium (e.g., air, water, soil);
- A point of potential receptor contact with the medium; and,
- A human exposure route at the contact point (e.g., inhalation, ingestion, dermal contact).

Current and potential future site uses and potential receptors (i.e., people who may contact impacted environmental media of interest) have been identified, and potential exposure scenarios appropriate to current and potential future site uses and receptors have been developed (USEPA, 1989). The potential exposure pathways that are judged to be complete have been evaluated quantitatively in this HHRA.

Figures 2-1 through 2-5 present the human health CSEMs, considering current and reasonably foreseeable future conditions and land uses, for the areas of the Site. As shown in the CSEMs, the media relevant to evaluating potential human health exposures are:

- surface soil (0 to1 foot bgs) (includes terrestrial sediment),
- subsurface soil (1-foot bgs to the water table or 10 feet bgs, whichever is shallower),
- groundwater,
- soil gas,
- sediment in the Southern Marsh, and
- surface water.

The potentially exposed populations and the pathways by which exposure to site media and other site-impacted media are considered potentially complete are identified in the CSEMs. The potentially complete receptor/exposure pathway scenarios that are evaluated quantitatively in the HHRA are shown in **Figures 2-1 through 2-5** with a solid circle. Open circles indicate that the exposure route presented is complete, but risk and hazard posed to the receptor is insignificant, and therefore, not quantified in the HHRA. Exposure routes that are considered incomplete for a potential on-Site receptor are indicated by "NA" for not applicable. The potentially complete exposure scenarios and receptors are discussed below.

2.3.3 Exposure Routes

The route of exposure is the way in which a person may actually be exposed to a contaminant based on the media contaminated and the anticipated activities at the exposure points. The following primary exposure routes have been assessed for the potential to be complete based on the four conditions listed in the previous section.

<u>Ingestion</u>

- Incidental ingestion of contaminated soil or sediment
- Ingestion of groundwater as tapwater

<u>Dermal Contact</u>

- Dermal contact with contaminated groundwater
- Dermal contact with contaminated soil or sediment
- Dermal contact with groundwater as tapwater
- Dermal contact with surface water

Inhalation

- Inhalation of vapors volatilized from soil
- Inhalation of vapors volatilized from groundwater
    - Via VI into indoor air
    - From showering and other household use of water
- Inhalation of particulates (fugitive dust)

2.3.4 Potentially Exposed Populations

Potential receptors are assumed to be:

- A current/future on-Site teenage trespasser;
- A future on-Site resident (child and lifetime adult);
- A future on-Site indoor worker;
- A future on-Site outdoor worker; and,
- A future on-Site construction worker.

Most of the exposure factors applied in the HHRA are those recommended in USEPA guidance (USEPA, 2018b and USEPA, 2014a). The exposure factors represent upper bound or RME. RME refers to people who are at the high end of the exposure distribution (approximately the 95th percentile). The RME scenario is intended to assess exposures that are higher than average but are still within a realistic range of exposure. Some common parameters for the receptors evaluated include an 80-kilogram (kg) body weight for adults, a 15-kg body weight for children aged 0-6, and an assumed lifetime of 70 years (USEPA, 2014a). Brief descriptions of the receptors evaluated in the HHRA are provided below:

Teenage Trespasser

The teenage trespasser receptor would be an occasional trespasser aged 7 to 16 years, who would gain access to the Site via trespassing. As the exposure frequency for a teenage trespasser would be equal to or greater than an adult trespasser, only the teenage trespasser was evaluated in the HHRA. The trespasser is expected to conduct activities at or near the ground surface, and therefore, contact with groundwater will not occur. The potential exposure pathways for the trespasser are incidental ingestion, dermal contact (through exposed skin), and inhalation of air volatiles or particulates as contact is made with surface soil, marsh sediments, and surface water. An RME event duration of two hours is assumed for dermal contact with surface water

while wading and is based upon best professional judgment. Surface water and marsh sediment exposures to the teenage trespasser are protective of recreational users; therefore, the recreator exposure scenario was not quantified in this HHRA.

Future On-Site Resident (Child and Lifetime Adult)

The resident would be a child from 1 to 6 years of age and a child/adult from 7 to 26 years of age, who would reside on-Site and off-Site. The potential exposure pathways for the resident are dermal contact (through exposed skin), incidental ingestion, and inhalation of air volatiles as contact is made with surface soil and groundwater as a tapwater source in the household. In addition, the resident may be exposed to indoor air that may be impacted by volatile COPCs present in soil and groundwater through the inhalation pathway.

Future On-Site Worker (Indoor and Outdoor)

Although no workers are currently on-Site, it is assumed that indoor workers may occupy on-Site office buildings in the future. Indoor workers would be an adult working primarily indoors (and possibly a limited amount outdoors) in on-Site buildings. It is expected that the indoor worker would be exposed to indoor vapors that may be impacted by volatile COPCs present in the soil vadose zone and the use of groundwater as a potable source (drinking water, handwashing, toilet flushing, floor cleaning, etc.) while working indoors. Inhalation via VI was evaluated using groundwater-derived air concentrations.

Future on-Site outdoor workers are assumed to be involved in non-intrusive outdoor activities, such as landscape maintenance and Site operations. Outdoor workers are expected to be exposed via dermal contact (through exposed skin on the head, hands, and forearms), incidental ingestion, and inhalation of air particulates and volatiles as contact is made with surface soil and sediments along the Southern Marsh Area. For additional health protection, it was assumed that outdoor workers could become exposed to COPCs in groundwater via an on-Site potable well even though no potable wells currently exist on-Site. As a result, the dermal and ingestion pathways were evaluated to account for potential risk from use of groundwater as a potable source and dermal contact while performing certain work tasks such as handwashing and toilet flushing in a future on-Site building.

Future Construction Worker

This HHRA assumes that a construction worker may conduct short-term digging or maintenance activities at the Site without following appropriate health and safety procedures. Construction worker exposures to Site-related COPCs during possible Site redevelopment activities are also considered. It is possible that new buildings will be constructed at the Site in the future.

The construction worker is an adult that would be conducting ground intrusive activities (i.e., during maintenance of a subsurface utility for example) to a depth that would expose groundwater (0-10 ft). The base of the excavation could become flooded with impacted groundwater and potential incidental ingestion (hand-to-mouth contact), dermal contact, and inhalation of groundwater vapors accumulating within a trench could occur because of the shallow depth of groundwater (approximately 5 feet in the southern portion of the Site). The construction worker could also be potentially exposed to soil through incidental ingestion and dermal contact with exposed skin. In addition, inhalation of volatile COPCs in ambient air emitted from COPCs in surface and subsurface soil can occur. Windblown particulates could also occur during work completed in the immediate vicinity of the excavation. Thus, a construction worker direct exposure to on-Site soil and groundwater was evaluated in the HHRA. Construction activities are assumed to occur within a 1-year period. The default exposure assumptions provided by Virginia Department of Environmental Quality's Unified Risk Assessment Model were used to evaluate exposure to groundwater for this receptor (VADEQ, 2016).

When evaluating soil for the construction worker, surface and subsurface soil data sets were evaluated separately to determine risk from each soil increment (i.e., 0-1 and >1 ft bgs). Since construction workers would be expected to encounter both surface and subsurface soil while digging, risk was summed across these media. However, the fraction exposed to contaminated medium was halved [i.e., set equivalent to 0.5 (50%) instead of 1 (100%)] when calculating the chronic daily intakes to avoid 'double counting' risk for this receptor. This approach was applied to each of the soil exposure areas except for the Eastern Upland Area due to the absence of impacts to subsurface soil in this area.

Other Exposure Scenarios – Current/Future Anglers

Although current and future anglers (adult, teenage, and child) were identified as potential receptors in the CSEM for the Southern Marsh and Sturgeon Creek (**Figure 2-4**), risk to these

receptors were not quantified based on direction from NC DEQ. The potential exposure route that would be considered for anglers is ingestion of fish tissue. This pathway will be addressed through the North Carolina Department of Health and Human Services (NCDHHS) Public Health Assessment (PHA). The ingestion of wildlife tissue was deemed incomplete due to the nature and characteristics of the COPCs identified at the Site and their low potential for bioaccumulation in large and small wildlife game hunted on Site property (e.g., deer and rabbit).

In March 2012, the NCDHHS published a PHA of the Site which included an evaluation of health risks from the consumption of locally caught fish (NCDHHS, 2012). At that time, the PHA recommended that fish tissue samples be collected and analyzed for contaminants. The USEPA collected tissue samples from Sturgeon Creek in 2011 and the NC DEQ collected tissue samples in 2013 from Sturgeon Creek, the Brunswick River and the Cape Fear River. The samples included 10 different fish species and blue crabs. In July 2017, the NCDHHS issued a *Health Consultation for the Evaluation of Fish and Shellfish in Sturgeon Creek, Brunswick River and Cape Fear River* near the Site (NCDHHS, 2017). The analyses included detections of some SVOCs, principally phthalate esters but also PAHs. There currently is a fish advisory for the Brunswick River and Sturgeon Creek, but the advisory is for inorganic contaminants (arsenic, hexavalent chromium, and mercury) not associated with Site operations. The report recommended continued monitoring of fish contaminant levels on a five-year basis.

2.3.5 Exposure Point Concentrations

The EPC is defined as the upper confidence limit (UCL) on the arithmetic mean concentration, or the maximum concentration, whichever is lower (USEPA, 2002b). Summary statistics have been calculated for each chemical in each medium, as presented in **Tables 2-2 to 2-6**. Before summary statistics were calculated, duplicate sample analytical results were eliminated.

EPCs for groundwater, surface soil, subsurface soil, sediment and surface water (**Tables 2-7 to 2-11**) were generated following USEPA guidance (USEPA, 2002b; USEPA, 2014b; USEPA, 2016). USEPA's ProUCL Version 5.1 software (USEPA, 2016) was used to calculate UCLs using the Kaplan-Meier or Chebyshev methods where non-detects are present (using detection limits and appropriate substitution methods). The method detection limit was used for non-detects. **Appendix C** provides the output from ProUCL for COPCs meeting the minimum data requirements.

Groundwater was evaluated by selecting approximately 4-10 wells representing the 'core of the plume', or the highest concentrations for each constituent within a delineated groundwater plume (USEPA, 2014b). Wells selected for use in the groundwater EPC computations were approved by the USEPA and NC DEQ during a conference call on May 18, 2018. Below are the groundwater monitoring wells that were selected and used to calculate the EPCs for the various constituents:

- VOCs: MW-3, MW-4, MW-6, MW-8, MW-14S, MW-16, MW-25S and MW-32
- SVOCs: MW-3, MW-4, MW-6, MW-8, MW-14S, MW-16, MW-18, MW-25S, MW-26S and MW-32
- Aluminum, Cobalt, Iron, Manganese and Selenium: MW-6, MW-11, MW-11S, MW-25S
- Arsenic: MW-4, MW-6, MW-8, MW-16, MW-21 and MW-25S

Groundwater sampling data from February 2016 through March 2017 was used. The temporary monitoring wells installed in the northern portion of the Site were unimpacted (i.e., no positive detections above the detection limits were observed in temporary or upgradient background wells). The horizontal and vertical extent of the contaminant plume and the groundwater flow direction have been adequately delineated for the Site. Multiple rounds of monitoring have been conducted to characterize the dynamics and hydrogeologic properties of the plume over time. Based on data from these events, impacts to groundwater were confined to the southern portion of the Site and west of Navassa Road. No data from temporary wells (e.g., hydro-punch) were considered in this HHRA. Generally, data from these types of wells are not recommended for use in calculation of the groundwater EPC because the results are not reproducible (USEPA, 2014b).

The ProUCL-recommended UCL, 95%, was used as the EPC. Based on information presented in the ProUCL guidance (USEPA, 2016) regarding minimum sample size and frequency of detection, UCLs were calculated where at least 10 samples and at least four detected results are available. ProUCL recommends 10 to 15 or more distinct results for the most accurate and reliable UCL calculation. Where too few samples or detects are available, the maximum detected concentration is used as the EPC.

2.3.6 Current and Future Exposure Intakes

It is important to consider both current and potential future exposure when evaluating exposure routes. Presently, the property is fenced and gated along the perimeter that borders the more highly impacted areas of the Site. Trespassers may gain successful entry to the Site from the

Eastern Upland Area and northern portion of the Site that borders Navassa Road. Worker exposure is limited to field sampling teams conducting site investigation activities. Health and safety of these workers is provided through the OSHA Hazardous Waste Operations and Emergency Response standard and exposures are controlled through use of appropriate personal protective equipment, hygiene, and other procedures specified in the Health and Safety Plan. Potential residential exposure currently occurs only in the neighborhoods to the west of Navassa Road. However, no COPCs have been identified for this area. When screening detected chemicals as COPCs, default residential screening criteria (generally residential RSLs) were used, as future land use is uncertain, and each constituent that potentially presents significant risk should be considered in the analysis.

The magnitude of exposure is calculated by determining the amount of constituent that enters the body (referred to as constituent intake). Constituent intakes were quantified using equations presented in relevant regulatory guidance (USEPA, 1989; USEPA, 2004a; and USEPA, 2009b).

For the exposure scenarios that were evaluated, RME assumptions were used. Default values for many parameters in the exposure scenarios have been proposed in USEPA guidance documents (USEPA, 2014a). Site-specific exposure factors were used when available, otherwise the default values were applied.

The Site is currently zoned for commercial/industrial land use with residential areas to the west and south of the Site. As previously discussed, the Site was primarily used for industrial purposes. The Site presently has no office buildings or similar structures that commercial workers would occupy for extended periods of time.

In summary, the following receptors are evaluated in the HHRA: future adult and child resident; future indoor/outdoor worker; future construction worker; and, current/future teenage trespasser.

2.3.7 Exposure Intake Equations

This section presents the generic intake equations used to estimate chemical exposures or intakes for the various exposure pathways. The EPCs were used in combination with exposure factors to estimate chemical intake via each exposure pathway for each receptor. These

estimates of intake are later combined with toxicity values to calculate estimated cancer risks and the non-cancer Hazard Index (HI) for each population of potential concern.

Appendix B presents the daily intake equations used in this HHRA together with the appropriate exposure factors. The values used for each of the exposure factors are presented along with the source of that information and the abbreviation for the parameter that is found in the intake equations on **Tables B-1 through B-18** of **Appendix B**.

The chemical intake equations include variables that characterize the contact rate, exposure time, exposure frequency, exposure duration, body weight, and exposure averaging time. Chemical intake is expressed in terms of milligrams of chemical per kilogram of body weight per day (mg/kg-day), which is adjusted based on the exposure pathway and medium.

For dermal contact with soil:

$$DAD = \frac{DA_{event}\ x\ EF\ x\ ED\ x\ EV\ x\ FC\ x\ SA}{BW\ x\ AT}$$

$$DA_{event} = CS\ x\ CF\ x\ AF\ x\ ABS$$

where:

DAD	=	Dermally Absorbed Dose (mg/kg-day)
DA_{event}	=	Dermally Absorbed Dose per event (mg/cm^2-event)
EF	=	Exposure frequency (days)
ED	=	Exposure duration (year)
EV	=	Event frequency (events/day)
FC	=	Fraction dermally contacted (unitless)
SA	=	Exposed skin surface area (cm^2)
BW	=	Body weight (kg)
AT	=	Averaging time (years)
CS	=	Concentration of chemical in soil (mg/kg soil)
CF	=	Unit conversion factor (kg soil/10^6 mg soil)
AF	=	Soil-to-skin adherence factor (mg soil/cm^2)
ABS	=	Dermal absorption fraction (unitless)

For incidental soil ingestion:

$$CDI = \frac{CS\ x\ SIR\ x\ FI_{ing}\ x\ EF\ x\ ED\ x\ CF}{BW\ x\ AT}$$

where:

CDI = Chronic Daily Intake (mg/kg-day)
CS = Concentration of chemical in soil (or Sediment) (mg/kg soil)
SIR = Soil ingestion rate (mg soil/day)
FI_{ing} = Fraction ingested (unitless)
EF = Exposure frequency (days/year)
ED = Exposure duration (year)
CF = Unit conversion factor (kg soil/10^6 mg soil)
BW = Body weight (kg)
AT = Averaging time (years)

For ingestion of groundwater and surface water:

$$CDI = \frac{CW\ x\ IR\ x\ EF\ x\ ED}{BW\ x\ AT}$$

where:

CDI = Chronic Daily Intake (mg/kg-day)
CW = Water concentration (mg/L)
IR = Water ingestion rate (L/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (year)
BW = Body weight (kg)
AT = Averaging time (year)

Based on the direction of USEPA and NC DEQ provided in an email dated October 2, 2018, the USEPA RSL Calculator and User's Guide were used for dermal contact with groundwater and surface water calculations.

For air exposure:

$$EC = \frac{CA\ x\ FI_{inh}\ x\ ET\ x\ EF\ x\ ED}{AT}$$

where:

EC = Exposure Concentration (mg/m^3)
CA = Air concentration (mg/m^3)
FI_{inh} = Fraction inhaled (unitless)
ET = Exposure time (hours/day)

EF = Exposure frequency (days/year)
ED = Exposure duration (year)
AT = Averaging time (years)

For groundwater vapor inhalation exposure:

$$EC = \frac{CW\ x\ FT\ x\ EF\ x\ ED\ x\ (K\ or\ VF)}{AT}$$

where:

EC = Exposure concentration via groundwater vapor inhalation (mg/m^3)
CW = Chemical concentration in groundwater (e.g., mg/L)
FT = Fraction of time exposed (hours per 24 hours) (unitless)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
K = Volatilization factor (L/m^3) for residential scenario
VF = Volatilization factor (L/m^3) calculated for construction workers
AT = Averaging time (averaging period, days)

Mutagen Adjustments for Early Life Exposure

USEPA has identified several carcinogens that act via a mutagenic mode of action (MMOA). USEPA guidance for early life exposure to carcinogens (USEPA, 2005) requires that risks from chemicals that act by a mutagenic mode of action be calculated differently than chemicals that do not act via a mutagenic mode of action. Therefore, to account for their early life exposures, age-dependent adjustment factors (ADAFs) have been incorporated into the intake equations for carcinogenic PAHs that were selected as COPCs for various media at the Site. The intake equations for the mutagenic parameters were consistent with the equations used in the development of USEPA's RSLs (USEPA, 2018c).

$$IR_{adj} = \frac{\Sigma ED\ x\ IR}{BW}\ X\ ADAF$$

where:

ADAF = Age-dependent adjustment factors, where

- 0 - <2 years applied an ADAF of 10,
- 2 - <6 years applied an ADAF of 3,

- 6 - <16 years applied an ADAF of 3, and
- 16-26 years applied an ADAF of 1.

For the dermal exposure pathway, the adjusted surface area is a summation of the individual surface areas weighted by the body weights and exposure durations of the receptor from birth to 26 years. The resulting surface area is then multiplied by the ADAF similar to the equation above.

The MMOA age adjustment equations are presented in **Appendix B**.

Particulate Emissions Factor (PEF) and Volatilization Factor (VF)

To evaluate a receptor's exposure to soil particulates and vapors, a PEF and VF is calculated using the USEPA RSL Calculator and incorporating Site-specific characteristics as appropriate. The supporting information for the PEF and VF calculations is presented in **Tables B-21 and B-23** of **Appendix B**, respectively. **Table B-22** presents the calculations of the PEFs for the resident, teenage trespasser, indoor and outdoor workers. **Tables B-24** present calculations of apparent diffusivity (D_A) and VFs for residential and non-residential receptors. As discussed in Section 2.2.2, the site-specific values used in the calculation of the PEF and VF were selected in consultation with USEPA and NC DEQ.

In the calculation of the PEF for the indoor and outdoor workers, construction workers, future residents and teenage trespasser, the climate zone for Raleigh, North Carolina was applied per direction from NC DEQ provided in an email dated October 12, 2018. Default values are used for the remaining inputs and the calculated PEFs for each receptor are presented in **Tables B-21 and B-22** of **Appendix B**.

The calculated VFs are both receptor-specific and constituent-specific and are presented in **Appendix B**. Default values are used, except as follows:

- A climate zone for Raleigh, NC was applied for each receptor.
- For a teenage trespasser, the exposure frequency was modified to 45 days/year and exposure time to 2 hours per day, which is consistent with the exposure frequency and time noted above.
- For a construction worker, the "Construction Worker - Other Construction Activities" scenario in the RSL calculator is applied based on direction from NC DEQ. Also, it was

assumed that the Site will be bulldozed and graded once by the construction worker using a Caterpillar dozer blade and a grader blade of 157.48 inches (4 meters).

2.3.8 Exposure Factors

Table 2-12 presents a summary of the receptor exposure factor values used as input values for daily intake calculations. These represent the frequency, duration, intake rates and other factors associated with COPC exposure as they apply to the human receptors in the potentially completed exposure pathways. Exposure factors for the five potential receptors identified [resident (child and adult), construction worker, indoor worker, outdoor worker, and teenage trespasser] are given. Note that these exposure factors are protective default values principally from USEPA Supplemental Guidance (USEPA, 2014a) with several exposure factors taken from USEPA Region 4 guidance (2018a) and from the RSL User's Guide (USEPA, 2018c), except for the teenage trespasser. There are no defaults in the cited references for teenage trespasser scenarios. Therefore, professional judgement was used to select the following teenage trespasser exposure factors:

- An exposure frequency of 45 days per year, based on the distance of residential properties from the Site, and the lack of attractive nuisances at the Site;
- A soil ingestion rate of 150 mg/day, which is the average of the default values for the resident adult (100 mg/day) and child (200 mg/day);
- Skin surface area available for contact with soil/sediment of 4,203 cm^2, which is the average of the default values for the resident adult (6,032 cm^2) and child (2,373 cm^2), and;
- Exposure time to volatile emissions of 2 hours per trespassing event, which is an estimate of the amount of time spent on site during a trespassing event.

<u>Relative Bioavailability Factor for Arsenic in Soil</u>

The oral relative bioavailability factor (RBA) is incorporated in the ingestion pathway for soil and accounts for the differences in the bioavailability of a constituent between the medium of exposure (i.e., soil) and the media associated with the derivation of the toxicity value. An RBA of 0.6 was applied for arsenic in soil, which is based on an upper-bound estimate from several studies that evaluated the water-soluble form of arsenic, as identified in the USEPA *RSL User's Guide* (USEPA 2018c); an RBA of 1 was assumed for the remaining COPCs.

2.4 TOXICITY ASSESSMENT

The toxicity assessment identifies and qualifies the toxicity values that were used, in conjunction with the exposures described in the exposure assessment (Section 2.3) to evaluate potential human carcinogenic risks and non-carcinogenic health effects in the risk characterization (Section 2.5). Adverse effects are classified by USEPA as carcinogenic or non-carcinogenic The COPCs that have demonstrated evidence of carcinogenicity are referred to as carcinogens. The COPCs are evaluated for potential non-carcinogenic effects, while potential cancer effects are evaluated only for carcinogens. Carcinogens that are considered mutagenic are also evaluated for the future child resident, teenage trespasser, and lifetime resident receptors. Mutagenic risks were included with the total lifetime resident cancer risk.

The non-cancer toxicity values are termed reference doses (RfDs), and the cancer toxicity values are termed cancer slope factors (CSFs). **Tables 2-13a and 2-13b** present the chronic and sub-chronic non-cancer toxicity data for ingestion and dermal, respectively. **Tables 2-14a and 2-14b** present the chronic and sub-chronic non-cancer toxicity data for inhalation, respectively. **Table 2-15** presents the carcinogenic toxicity data for ingestion and dermal contact, and **Table 2-16** presents the carcinogenic toxicity data for inhalation.

Chronic dose-response values apply to exposures lasting greater than seven years, while sub-chronic dose-response values apply to exposures lasting fewer than seven years (USEPA, 1989). Future construction worker exposures were assumed to be less than one year. In accordance with USEPA's stance on sub-chronic durations for excavation or construction worker scenarios, sub-chronic toxicity values were used to derive the non-cancer hazard estimates for this receptor group only (USEPA, 2018a). When determining the risk level for inhalation pathways, inhalation unit risks (IURs) and reference concentrations (RfCs) were used when available. In the absence of a sub-chronic toxicity value, the chronic toxicity value was used in the risk calculations. Route-to-route extrapolations were not done for COPCs for which IURs are not available, as this is no longer the recommended methodology (USEPA, 2009b).

Route-to-Route Extrapolation for Dermal Toxicity Values

Dermal exposure is determined based on the amount of chemical that penetrates the skin and is absorbed into the blood stream. Consequently, toxicity values based on administered dose should

be adjusted to reflect the absorbed dose when evaluating the risks associated with dermal exposure.

For dermal exposure, oral CSFs and RfDs were used as surrogate values to estimate systemic toxicity due to dermal absorption of a COPC, because dermal toxicity values are currently not available for any chemicals. Use of the oral CSF or oral RfD directly does not correct for differences in absorption and metabolism between the oral and dermal routes. Where available, a GI absorption factor is used to adjust the oral CSF to a dermal CSF, and the oral RfD to a dermal RfD; however, GI absorption values are available only for a subset of Site COPCs. Additionally, direct toxic effects on the skin are not accounted for. Thus, the use of an oral CSF or oral RfD for the dermal route may lead to an underestimation or an overestimation of the risk or hazard, depending on the constituent. Therefore, the use of the oral toxicity value as a surrogate for a dermal value increases the uncertainty in the estimation of risk and hazard. However, this is not generally expected to significantly underestimate the risk or hazard relative to the other routes of exposure evaluated in this HHRA.

The current method recommended by the USEPA for converting toxicity values from administered to absorbed dose relies on the following assumptions:

- The health effects following exposure are not route specific.
- Portal-of-entry effects (e.g., dermatitis associated with dermal exposure) are not the principal effects of concern. For example, the USEPA recommends that the current default for evaluating dermal exposure is inappropriate for carcinogenic PAHs, because this group of chemicals cause skin cancer through direct action at the point of application (e.g., portal-of-entry effects) (USEPA, 1989 and 2004a). The USEPA further recommends that risks from dermal exposure to these chemicals be qualitatively evaluated.

The USEPA recommends that oral toxicity values should only be adjusted from administered to absorbed dose when there is convincing empirical data that suggests that GI absorption is less than 50%. While this is less protective than assuming some default value, it does avoid the problem of incorporating overly-conservative values in the absence of good data. Due to the lack of empirical data on GI absorption for most chemicals, the USEPA's *Supplemental Guidance for Dermal Risk Assessment* (USEPA, 2004b) recommends that toxicity values only be adjusted for

select inorganic chemicals (i.e., antimony, barium, beryllium, cadmium, chromium III, chromium VI, manganese, mercuric chloride, nickel, silver, and vanadium).

2.4.1 Dose-Response Assessment

The toxicity assessment provides chemical-specific quantitative dose-response data for each COPC. The dose-response relationship is often determined from laboratory studies conducted under controlled conditions with laboratory animals. These laboratory studies are controlled to minimize confounding variables and are conducted at relatively high dose levels so that responses can be observed using as few animals as possible in the experiments. Humans are typically exposed to compounds in the environment at levels much lower than those tested in animals. Mathematical models or uncertainty factors are used to extrapolate the relatively high doses administered to animals to predict potential human responses at dose levels far below those tested in animals.

2.4.2 Sources of Dose-Response Values

The toxicity information for each COPC has been obtained from the hierarchy of sources recommended by EPA (USEPA, 2018b). Based on this guidance, the toxicity values have been selected from the following sources:

- Tier 1: Integrated Risk Information System (IRIS) database
- Tier 2: Provisional Peer-Reviewed Toxicity Values (PPRTV)
- Tier 3: Additional USEPA and non-USEPA sources of toxicity information including historical National Center for Environmental Assessment (NCEA) provisional values, Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk levels (MRLs), and the Health Effects Assessment Summary Tables (HEAST) as listed in the USEPA RSL table.

The toxicity values were selected based on chronic exposure of the type as follows:

Exposure Route(s)	Risk Category	Toxicity Value Type and Symbol
Inhalation	Non-Cancer (NC)	Chronic Reference Concentration (RfC), mg/m^3
	Cancer (C)	Inhalation Unit Risk (IUR), $(mg/m^3)^{-1}$
Ingestion/Oral	NC	Chronic Oral Reference Dose (RfD_O), mg/kg-day

Exposure Route(s)	Risk Category	Toxicity Value Type and Symbol
	C	Oral Slope Factor (CSF_O), (mg/kg-day) $^{-1}$
Dermal	NC	Dermal Chronic Reference Dose, (RfD_d), mg/kg-day
	C	Dermal Slope Factor, (CSF_d), (mg/kg-day)$^{-1}$

The USEPA provides the following definitions for the above toxicity value types:

Reference Concentration - An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime (chronic).

Reference Dose - An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime (chronic).

Slope Factor - An upper bound, approximating a 95 percent confidence limit, on the increased cancer risk from a lifetime exposure to an agent. CSF is expressed in units of proportion (of a population) affected per mg/kg-day for exposures corresponding to risks less than 1 in 100.

Inhalation Unit Risk - The upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 µg/m^3 in air. The interpretation of inhalation unit risk would be as follows: if unit risk equals 2 x 10^{-6} per µg/m^3, that means that 2 excess cancer cases (upper bound estimate) are expected to develop per 1,000,000 people, if exposed daily and for a lifetime to 1 microgram of the chemical per cubic meter of air.

2.4.3 Carcinogenic Dose-Response Values

A CSF is a numerical estimate of the potency of a chemical, which, when multiplied by the Lifetime Average Daily Intake (LADI), gives the probability of an individual developing cancer over a lifetime. CSFs are usually derived by the USEPA by means of a linear, multistage model and reflect the upper-bound limit of cancer potency of any chemical. As a result, the calculated

carcinogenic risk is likely to represent a plausible upper limit to the risk. The actual risk is unknown but is likely lower than the predicted risk, and may be as low as zero (USEPA, 1989).

Because USEPA has not developed CSFs for dermal exposure, oral CSFs are used to evaluate dermal exposures, with appropriate adjustments (as discussed in Section 2.4.5) and are also summarized in **Appendix B**.

2.4.4 Non-carcinogenic Dose-Response Values

Compounds with known or potential non-carcinogenic effects are assumed to have a dose below which no adverse effect occurs, or conversely, above which an adverse effect may be seen. This dose is called the threshold dose. Non-cancer oral dose-response values (RfDs)are defined as, "An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious [e.g., organ damage, biochemical alterations, birth defects] effects during a lifetime" (USEPA, 2007). RfDs have been developed by the USEPA for sub-chronic (short-term exposures), chronic (long-term exposures), and developmental exposures that may result in birth defects. Similarly, to assess non-carcinogenic effects from inhalation exposures, the USEPA derives reference concentrations (RfCs). RfCs are defined as, "An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime" (USEPA, 2007).

Estimation of Toxicity Values for Dermal Exposure

As there are no published dermal dose-response values, oral dose-response values are used to evaluate dermal exposures. The equation for calculating dermal absorption gives rise to an absorbed dose, making it necessary to adjust the oral toxicity factor to account for an absorbed rather than an administered dose. Consequently, toxicity values based on administered dose should be adjusted to reflect the absorbed dose when evaluating the risks associated with dermal exposure.

The approach developed by USEPA to derive dermal toxicity values from oral toxicity values adjusts the administered dose based on how much of the chemical was absorbed in the GI tract. This adjustment accounts for the absorption efficiency in the critical study, which forms the basis

of the RfD. Ideally the amount of GI absorption would be measured in the original oral toxicity study. However, this is rarely done.

The USEPA recommends that oral toxicity values should only be adjusted from administered to absorbed dose when there is convincing empirical data that suggests that GI absorption is less than 50 percent (i.e., if the adjustment factor is approximately 0.5 or less to yield at least a two-fold difference in the toxicity factor). While this is less protective than assuming some default value, it does avoid the problem of incorporating overly-conservative values in the absence of good data. Uncertainty is introduced for the COPCs with GI absorption less than 50 percent (primarily metals) and, therefore, do not need adjustment (USEPA, 2004a). Due to the lack of empirical data on GI absorption for most chemicals, the USEPA's *Supplemental Guidance for Dermal Risk Assessment* (USEPA, 2004a) recommends that toxicity values only be adjusted for select inorganic chemicals (i.e., antimony, barium, beryllium, cadmium, chromium III, chromium VI, manganese, mercuric chloride, nickel, silver, and vanadium).

USEPA-recommended adjustment factors for oral dose-response values (2004a, Exhibit 4-1) were used in the HHRA. A review of the USEPA recommended GI absorption values (USEPA 2004a) for the selected COPCs at the Site indicates that the oral absorption in the "critical study" for most inorganic chemicals (except for manganese) and all organic COPCs is essentially complete (i.e., 100%). Therefore, the absorbed dose is equivalent to the administered dose and it was not necessary to adjust the available RfD values in this HHRA to assess dermal exposures for these constituents. The dermal absorption factors used in the HHRA are presented on **Tables 2-13a and 2-13b**.

2.4.5 Toxicity of PAHs

PAHs are commonly associated with wood treating sites, and they have been observed at the Site at concentrations above residential RSLs. However, PAHs are also products of incomplete combustion of organic materials; sources are, thus, widespread, including cigarette smoke, municipal waste incineration, wood stove emissions, coal conversion, energy production from fossil fuels, and automobile and diesel exhaust. As PAHs are common environmental contaminants, USEPA has tried to produce a scientifically justified, consistent approach to the evaluation of human health risk from exposure to these compounds. However, for most PAHs classified as probable human carcinogens, data are insufficient for calculation of risk. Benzo(a)pyrene is the most completely studied of the PAHs, and data are adequate for calculation

of quantitative estimates of its carcinogenic potency. The cancer CSFs or RfDs for the other carcinogenic PAHs are expressed as ratios of benzo(a)pyrene's toxicity factors.

2.5 RISK CHARACTERIZATION

The risk to human health associated with exposure to COPCs in environmental media at and around the Site is summarized in this section of the HHRA. Risk characterization is the process in which the toxicity information is combined with quantitative estimates of human exposure derived in the exposure assessment. The result is a quantitative estimate of adverse health effects that humans may experience under the exposure assumptions made. Although some chemicals induce both cancer and non-cancer effects, the risks for each endpoint are calculated separately.

Carcinogenic risk and potential non-carcinogenic hazard are characterized for each potentially completed exposure pathway considered. Potential carcinogenic risk is evaluated by averaging exposure over a normal human lifetime, which, based on USEPA guidance, is assumed to be 70 years (USEPA, 1989). Potential non-carcinogenic hazard is evaluated by averaging exposure over the total exposure period (e.g. 26 years for lifetime adult resident, 10 years for teenage trespasser, and 25 years for on-Site workers). Risks and hazards were combined across the applicable pathways for a receptor group at a given exposure time for each COPC.

2.5.1 Carcinogenic Risk

The purpose of carcinogenic risk characterization is to estimate the upper-bound likelihood, over and above the background cancer rate, that a receptor will develop cancer in his or her lifetime as a result of exposure to a chemical in environmental media. This likelihood is a function of the dose or concentration of a chemical and the toxicity value for that chemical. The excess lifetime cancer risk is the likelihood of contracting cancer over and above the background cancer rate. The American Cancer Society (ACS) estimates that the lifetime probability of contracting cancer in the United States is 1 in 2 (5×10^{-1}) for men and 1 in 3 (3×10^{-1}) for women (ACS, 2013). The risk value is also expressed as a probability (e.g., 1 in 1 million or 10^{-6}).

Potential carcinogenic risks are calculated for each receptor by summing across multiple chemicals and pathways. In addition to calculating carcinogenic risks for each age group, the child and adult age group carcinogenic risks are summed to estimate potential cumulative risks to one individual who is assumed to be exposed over the full residential exposure period of 26

years (6 years as a young child and 20 years as an adult). Exposure durations for an indoor/outdoor worker and teenage trespasser are assumed to be 25 years and 10 years, respectively.

Exposure scenarios may involve potential exposure to more than one carcinogen. To represent the potential carcinogenic effects posed by exposure to multiple carcinogens, it is assumed, in the absence of information on synergistic or antagonistic effects, that these risks are additive. Cancer risks were calculated utilizing the following general equation:

For oral and dermal exposure:

$$ELCR = LADI \; x \; CSF$$

For inhalation exposure:

$$ELCR = EC \; x \; URF \; (or \; IUR)$$

where:

ELCR = Excess Lifetime Cancer Risk; estimated upper bound on additional risk of cancer over a lifetime in an individual exposed to the carcinogen for a specified exposure period (unitless).

LADI = Chronic Daily Intake due to exposure to the chemical; calculated using exposure scenario assumptions and is expressed as mg/kg-day for ingestion and dermal contact exposures. The chronic daily intake represents the total lifetime chemical dose averaged over an individual expected lifetime of 70 years.

EC = Exposure Concentration in air calculated by applying the exposure scenario assumptions and is expressed as mg/m^3 for inhalation exposure.

CSF = Cancer Slope Factor models the potential carcinogenic response and is expressed as $[mg/kg\text{-}d)]^{-1}$

URF (or IUR) = The inhalation Unit Risk Factor (or Inhalation Unit Risk) models the potential carcinogenic response and is expressed as $[mg/m^3]^{-1}$

Risk levels for carcinogens are derived, per RAGS Part F (USEPA, 2009b), by multiplying the air EC by the IUR values. An AT of 70 years was used for carcinogens to prorate the total cumulative intake (expressed as daily dose or exposure concentration) over a lifetime.

As a matter of policy, USEPA considers the cancer risk of simultaneous exposure to low dose rates of a chemical to be additive across exposure routes and across chemicals, regardless of the chemicals' mechanisms of toxicity or sites (organs of the body) of action (USEPA, 1989; 2005). Total cancer risk resulting from simultaneous exposure to a given carcinogen by multiple routes will be estimated from the following equation (USEPA, 1989):

$$ELCR_{Total} = ELCR_{R1} + ELCR_{R2} + \cdots ELCR_{Ri}$$

where:

ELCR(Total) = Total cancer risk for the given chemical in a given source medium summed across exposure routes (unitless, calculated)

ELCR(R*i*) = Cancer risk for the given chemical in a given source medium for exposure route *i* (unitless)

Cumulative risk summed across the chemicals and media was estimated for a given receptor as follows:

$$ELCR_{Cumulative} = ELCR_{T1} + ELCR_{T2} + \cdots ELCR_{Ti}$$

where:

$ELCR_{Cumulative}$ = Cumulative cancer risk for a given receptor summed across chemicals and source media (unitless, calculate)

$ELCR_{Ti}$ = Total cancer risk for chemical *i* in a given source medium summed across exposure routes (unitless)

The USEPA National Contingency Plan [(40 CFR 300.430(3)(B) and (C)] identifies 1.0E-06 as a level at or below which cancer risks may or may not be subjected to further action. Cancer risk levels above 1.0E-04 are generally considered to be unacceptable and require further action. USEPA Region 4 EPA considers a cancer risk of 1.0E-04 as the trigger level at which further action may be required (USEPA, 2018a).

2.5.2 Non-carcinogenic Risk

The potential for exposure to a chemical to result in adverse non-carcinogenic health effects is estimated for each receptor by comparing the chronic intake for each COPC over a specified time

period with the toxicity value (RfC or RfD) for that COPC for a similar time period. This ratio, termed the hazard quotient (HQ), is calculated according to the following general equation:

For oral and dermal exposure:

$$HQ = \frac{CDI}{RfD}$$

For inhalation exposure:

$$HQ = \frac{EC}{RfC}$$

where:

HQ = Hazard Quotient (unitless)

CDI = Average Chronic Daily Intake, or exposure level, is the chemical dose calculated by applying the exposure scenario assumptions and expressed as mg/kg-d. The intake represents the average daily chemical dose over the expected period of exposure.

EC = Exposure Concentration in air is calculated by applying the exposure scenario assumptions and is expressed as mg/m^3 for inhalation exposure.

RfD = Reference Dose is a daily dose assumed not to cause an adverse effect from even a lifetime exposure (mg/kg-d). The RfD is based on experimental data and/or epidemiological studies.

RfC = Reference Concentration is a daily concentration assumed not to cause an adverse effect from even a lifetime exposure (mg/m^3). The RfC is based on experimental data.

For non-carcinogens, the daily intake value is divided by the RfC. The chemical intake for non-carcinogens was estimated over the appropriate exposure period or averaging time. The averaging time selected depended on the toxic endpoint being assessed.

The approach for non-cancer hazard evaluation is different from the probabilistic approach used to evaluate carcinogenic risks. For example, an HQ of 0.01 does not imply a 1 in 100 chance of an adverse effect but indicates that the estimated intake rate is 100 times lower than the RfD. An HQ of 1.0 indicates that the estimated intake equals the RfD. In the case of simultaneous

exposure of a receptor to a given chemical by multiple exposure routes, a total HI for the chemical of interest was calculated as the sum of the route-specific HQs by:

$$HI = HQ_{R1} + HQ_{R2} + \cdots HQ_{Ri}$$

where:

HI = Hazard Index for a given chemical summed across exposure routes and source media (unitless, calculated)

HQ (R*i*) = Hazard Quotient for the given chemical for exposure route i (unitless)

HI values were summed across chemicals and media to estimate a cumulative HI for each receptor:

$$HI_{Cumulative} = HQ_1 + HQ_2 + \cdots HQ_i$$

where:

HI (Cumulative) = Cumulative Hazard Index summed across COPCs and source media (unitless, calculated)

HQ_i = Hazard Quotient for a given chemical summed across exposure routes and source media (unitless)

If the HI for a given receptor exceeds the threshold of 1.0, individual HI values were calculated, for each target organ (USEPA, 1989). This is called a 'target organ evaluation'. Total HI for a given target organ will be calculated for a given receptor as described in the following equation:

$$HI_{TO} = HQ_{COPC1} + HQ_{COPC2} + ... HQ_{COPCi}$$

where:

HI_{TO} = Total Hazard Index for a given target organ for a given receptor (unitless, calculated)

HQ_{COPCi} = Hazard Quotient for the target organ of interest estimated for the i^{th} COPC (unitless)

HI estimates below the threshold value of 1 are interpreted to mean that adverse non-cancer effects are unlikely (USEPA, 1989).

The HQ terms summed above include those associated with the target organ of interest, regardless of exposure routes for which they were calculated. It is possible that the same chemical

would occur multiple times in a given target organ HI calculation, particularly if it is relevant to more than one route of exposure. Furthermore, the target organ for dermal exposure is assumed to be the same as oral exposure, in which case the HI for a given target organ would include HQs calculated for oral and dermal exposure to the relevant chemicals.

HI Segregation for Specific Organ Effects

USEPA guidance recognizes that non-carcinogenic effects are exhibited in specific target organs and that certain chemicals can act in an additive fashion on the same target organ or body system. USEPA requires the summing of non-carcinogenic hazards for constituents that affect the same target organ or system to calculate a hazard index (USEPA, 1989). Therefore, potential non-carcinogenic effects were assessed using an HQ approach. Constituent and route-specific HQs were calculated for exposure to the non-carcinogenic COPCs for each receptor. As appropriate, HQs across target organs or systems were summed to calculate an HI for a given health effect to account for additivity of COPCs. An HI of less than one typically indicates it is unlikely for even sensitive populations to experience adverse health effects and is therefore not an exposure concern. Thus, if the cumulative HI exceeds the USEPA target HI of 1.0 (USEPA 2018a), the potential for non-cancer effects exists. In this case, it may be appropriate to reevaluate the toxicity of the individual COPCs to determine if individual chemicals have the same or differing toxicological endpoints that would support conclusions that the HQs should or should not be added.

Non-cancer hazard estimates have been established for each of the receptors for the RME scenarios based on the respective exposure durations. The total HI was segregated by target organ or body system for COCPs yielding an HI equal to or greater than one per receptor exposure scenario.

2.5.3 Identifying Chemicals of Concern

A given human population may be exposed to a chemical by several exposure routes and through more than one medium. The purpose of this section is to identify the risks associated with a population that may be exposed to Site COPCs through a combination of exposure pathways.

USEPA guidance states that risks should be combined across exposure pathways only where the following situation occurs:

a) Reasonable exposure pathway combinations are identified.
b) It appears likely that the same individuals would consistently face the RME through more than one pathway.

USEPA defines COCs as COPCs that contribute significantly to cumulative cancer risk that exceeds the trigger level of 1.0E-04, or that contribute significantly to total HI for a given target organ that exceeds the threshold of 1.0. Significant contribution to cancer risk means that the total excess lifetime cancer risk summed across relevant exposure pathways for a given COPC in a given source medium exceeds 1.0E-06. Significant contribution to non-cancer hazard means that the total HI summed across relevant exposure pathways for a given COPC in a given medium, or across relevant exposure pathways and source media for a given target organ, exceeds 0.1. In accordance with USEPA (2018), a cumulative excess lifetime cancer risk of 1.0E-04 and total HI of 1.0 was used as the trigger level for identifying cancer and non-cancer based COCs, respectively.

Tables 2-17a to 2-23f summarize the cumulative carcinogenic and non-carcinogenic risks from each area, segregated by exposure route for each medium (except soil gas) for the child resident, adult resident, lifetime resident, teenage trespasser, indoor worker, outdoor worker, and construction worker, respectively. The future hypothetical construction worker would be the most likely receptor exposed to subsurface soil and groundwater. Risks from groundwater vapors derived from the VISL Calculator (USEPA, 2018d) are summarized in **Table 2-24** for the hypothetical future resident and indoor worker. The VISL model runs are presented in **Appendix D**. Soil concentrations protective of groundwater are summarized in **Table 2-25** and calculations are provided in **Appendix E**.

The cumulative HIs and excess lifetime cancer risks across the applicable and relevant exposure routes and exposure areas are discussed by receptor in Section 3. These tables present RME risk estimates for receptor-specific exposure for the following Site receptors:

- ***Future Resident (Child, Adult, and Lifetime).*** Cumulative risk and hazard estimates are presented for exposure of future lifetime adult and child residents to surface soil and groundwater via potable use and indoor air VI.
- ***Teenage Trespasser.*** Cumulative risk and hazard estimates are presented for exposure of a youth trespasser to surface water and marsh sediments.

- ***Future Outdoor Worker.*** Cumulative risk and hazard estimates are presented for exposure of outdoor workers to groundwater used as a drinking water source and direct contact with surface soil for each of the exposure areas evaluated (Process Area, Pond Area, Treated Wood Storage Area, Untreated Wood Storage Area, and Eastern Upland Area) including marsh sediments. Surface soil risk from each of these areas were treated separately to account for the unlikelihood of the same outdoor worker to perform work throughout the entire Site in the event it undergoes redevelopment. In summary, cumulative risk and hazard estimates for an outdoor worker exposure to surface soil were separated consistent with the way in which the Site was divided for risk assessment purposes based on historical information regarding past use of the Site and contaminant source distribution.
- ***Future Indoor Worker.*** Cumulative risk and hazard estimates are presented for exposure of future indoor workers to groundwater used as a potable source and indoor air VI.
- ***Future Construction Worker.*** Cumulative risk and hazard estimates are presented for direct exposure of construction workers to groundwater (via incidental ingestion and dermal contact) while performing trench activities. Similar to the outdoor worker, cumulative cancer and non-cancer risks attributed to COPCs in soil were parsed consistent with the manner in which the Site was divided for risk assessment purposes based on past historical use and contaminant source distribution.

2.6 UNCERTAINTY ANALYSIS

An uncertainty analysis has been conducted, which has identified uncertainties associated with the site-specific risk assessment. The purpose of the uncertainty analysis is to present an evaluation of the uncertainties that enter the risk assessment at each step of the process for regulators, stakeholders, and risk managers to put the risks in proper context. The risks presented in HHRAs are conditional estimates, based on assumptions about exposure and toxicity given a specific land use scenario. Uncertainties are introduced to a risk assessment because a range of values could be used for each assumption, but only a few are used. Consistent with USEPA policy, upper bound values are generally chosen for each parameter, while other values (i.e., values closer to the central tendency) may be more representative of site-specific conditions (USEPA, 1989).

Major assumptions, scientific judgments, and to the extent possible, estimates of the uncertainties embodied in the assessment are discussed. The analysis is qualitative in nature and describes general methodologies and site-specific uncertainties in the risk assessment, and where possible, provides an indication as to whether these sources of uncertainty have resulted in an over- or under-estimation of the risk.

There is uncertainty inherent in the methods, inputs and conclusions of any HHRA. This level of uncertainty results from the fact that most every step in the risk assessment process involves assumptions contributing to the total uncertainty in the final conclusions. These include, but are not limited to:

- Knowledge of the Site, including its geology, hydrology, and past and current land use;
- Environmental parameters, chemistry and sampling analysis;
- Assumptions in the derivation of screening benchmarks that are used to identify Site-related COCs;
- The exposure factors used for quantifying exposure reflect upper bound assumptions; the resulting hazard and risk values may be overestimated;
- Maximum concentrations applied as a measure of exposure for each medium and receptor in the COPC screening, which is a conservative assumption intentionally used to focus the risk assessment on those pathways and receptors potentially at risk. This likely overestimates the risks and HQs;
- Bioavailability of 100% of a chemical is assumed for uptake by humans. This assumption is known to be invalid for most chemicals under varying environmental conditions and likely overestimates risks and HQs; and
- Summing non-cancer HQs across constituents and media may overestimate the non-cancer HI, as constituents may target different organs in the body and have varying non-cancer health effects.

Uncertainties specific to this HHRA are summarized in the following sections.

2.6.1 Uncertainty in the Conceptual Site Exposure Model

Uncertainties are presented in the CSEMs which incorporates multiple assumptions regarding the completeness and reasonableness of the presumed exposure scenarios. Some of the assumptions seem evidently valid. For example, it is not unrealistic to assume that portions of the

Site may be used for future residential and/or industrial/commercial purposes. However, the CSEMs also assumes exposure to trespassers on the Site. At the present, the property is vacant and heavily vegetated and the former production areas are fenced and gated. Although it is possible that trespassers may gain successful entry to the Site, the frequency and duration of their presence at the Site is uncertain.

In summary, the future land use exposure assumptions are subject to uncertainty. Some receptor-exposure pathway combinations are more or less likely than others.

2.6.2 Uncertainty in Analytical Data

Data Gaps

Uncertainty in the HHRA process begins with the site characterization. Historical data informed the choice of sampling locations, analytes, and media sampled. The medium-specific EPCs calculated in the HHRA are based entirely on data obtained during the RI. It is assumed that the Site has been thoroughly and accurately characterized. However, the following gaps in site characterization are known:

- No soil gas data could be effectively collected at the Site due to shallow depths to groundwater.
- The vertical extent of DNAPL and dissolved phase groundwater contamination has not been fully delineated in the Pond Area.

Detection Limits

Elevated detection limits were a source of uncertainty for this HHRA. Many soil and groundwater samples from the Process and Pond Areas contained elevated levels of contaminants, primarily PAHs. As a result, many of the sample results from the SVOC analysis had elevated detection limits due to dilution, often above the screening criteria used for the constituent (typically residential RSLs). In cases where the detection limit for a constituent exceeded its RSL, the constituent was retained for further evaluation in the risk assessment (USEPA 2018a).

Some constituents were retained because of a single detection in a medium, and they were not associated with the creosote wood treating process. Supplemental statistical analyses were

conducted to add another line of evidence; however, no COPCs were eliminated based on the supplemental screening.

Another source of uncertainty was the gap between screening criteria and achievable detection limits. For some constituents, the RSL is at such a low level that it can't be achieved by standard analytical methods. An example is naphthalene with a tapwater RSL of 0.17 µg/L, which is used to screen groundwater samples. The detection limits for naphthalene in groundwater were typically two to three times higher than the tapwater RSL. Many groundwater samples in the southern portion of the Site contained detectable levels of naphthalene, particularly those collected from the former Process Area and Pond Area, and naphthalene "screened in" for most media in many locations. The inclusion of elevated detection limits in the EPC calculation for COPCs likely results in overestimation of the cancer and non-cancer risks.

Other than the issue described above, the analytical data were of good quality with acceptable accuracy and precision. The data was validated in accordance with USEPA Functional guidelines.

Groundwater Risk to Receptors Upgradient of the "Core of the Plume"

The USEPA *Determining Groundwater Exposure Point Concentrations, Supplemental Guidance* (referred to herein as "core of the plume" guidance) (USEPA 2014b) provides a recommended approach to improve the quality and consistency in calculating groundwater EPCs. The approach involves evaluating data from the "core/center of the plume," which is defined as the three-dimensional core/center zone of highest concentrations of each constituent within a delineated groundwater plume. Cumulative risks and hazards from exposure to groundwater were determined using the groundwater EPCs. However, the groundwater EPCs were based on the evaluation of a subset of data for 4 to 10 monitoring wells with the highest maximum detected concentrations for Site-related COPCs identified in the RI. These wells were approved by the USEPA Region 4 and NC DEQ during a conference call on May 18, 2018.

2.6.3 Uncertainty in Exposure Estimates

Uncertainties are inherent in the calculations and assumptions used to estimate risk. The exposure scenarios are often not based on actual exposure data, but rather on assumptions about future exposure patterns requiring professional judgment. To compensate for these unavoidable uncertainties, this HHRA was developed using health protective methods and assumptions

compiled by USEPA (USEPA 2014a) as appropriate. Consequently, it overestimates exposures, resulting in risk estimates that are likely to be higher than actual risks. A discussion of the key uncertainties used in estimation of risks and hazards for this HHRA is presented below.

EPC Computation

If any sampling was intentionally biased toward areas of contamination, the resulting EPC (an attempted quantification of average concentrations across an area) could overestimate risks. When determining EPCs, UCLs were calculated where at least 10 samples were collected and at least four detected results are available. Based on information presented in the ProUCL guidance (USEPA, 2016) regarding minimum sample size and frequency of detection, ProUCL recommends 10 to 15 or more distinct results for the most accurate and reliable UCL calculation. Where too few samples or detects are available, the maximum detected concentration is used as the EPC. Use of maximum detected concentrations as EPCs likely overestimated risk, whereas use of a 95 percent UCL as the EPC could underestimate or overestimate risks. However, this parameter is designed to bias the risk high 95 percent of the time.

Assumptions about the distribution of the data affected calculation of a 95 percent UCL and, therefore, contributed to uncertainty in the calculation. Specifically, ProUCL developers have expressed some reservation regarding use of the lognormal distribution based on the observation that lognormal methods sometimes result in overly conservative estimates of the UCL. However, the lognormal distribution has a clear theoretical basis associated with the multiplicative process assumed with contaminant transport and dilution. Given that the simulations used to develop the ProUCL algorithm (resulting in nominal 95UCL coverage) included the lognormal theory (the appearance of lognormal theory methods in the UCL code is not a blatant error), use of the ProUCL-recommended UCL method is the most defensible and transparent approach.

Estimating Risk from Showering and Other Domestic Household Uses of Water

The approach for assessing inhalation and dermal exposure risk and hazard while showering is a factor that impacts the health evaluation for chemicals at the Site. The HHRA assumed that groundwater from the most contaminated portion of the plume at the Site is being supplied to households and used as a public water supply. The approach used in the HHRA was based on a simplistic methodology described by USEPA in the Region 4 Human Health Risk Assessment Supplemental Guidance (USEPA, 2018a). This approach involves equating the dermal and

inhalation risk from showering to that of risk from consumptive use of water. This approach is meant to account for risks from bathing/showering and other domestic household uses of water. This likely results in an over-estimation of Site risks due to the following:

- No considerations are made for ventilation of the showering area or the residential home when accounting for volatiles emanating from non-consumptive uses of water, which will increase the air exchange rate thus lowering the concentration of VOCs in air in a typical shower. The inhalation dose of VOCs from showering is estimated to be much lower in ventilated showers than non-ventilated showers.
- No considerations are made for water-to-air transfer rates, which involves the transfer of volatiles from water across the liquid and gas films and, finally, to air.
- No considerations for time spent while bathing/showering.

Volatilization of Organics from Soil Gas

Another source of uncertainty is the potential for volatilization of organics from subsurface soil gas, and subsequent VI into indoor spaces. The VISL Calculator (USEPA, 2018d) is recommended for quantifying VI risks from groundwater sources, but it does not support calculations of risks using bulk soil concentrations. Recent USEPA guidance on VI does not recommend any model for quantifying risks based on bulk soil concentrations due to the high heterogeneity of VOC concentrations in small-aliquot VOC soil samples.

In general, two types of uncertainties exist when modeling flow and transport processes: model uncertainty and parameter uncertainty. Model uncertainty relates to the simplifying assumptions and approximations present in any model of a physical system. The VISL calculator relates a chemical concentration in soil gas or groundwater to a concentration in air in the breathing zone of a potential receptor. The VISL calculator was run to calculate Site-specific groundwater VISLs for both residential and commercial scenarios. The calculator defaults were used. Parameter uncertainty includes uncertainty in the VISL calculator's input parameters due to measurement errors and incomplete knowledge of surface and subsurface conditions. Both model and parameter uncertainty reduce certainty in the model results (i.e., indoor and ambient air concentration levels present near potential receptors).

Based on guidance from USEPA, only chemicals that easily volatilize are included in the evaluation of indoor and ambient air (USEPA, 2018d). The criteria established to gauge a

constituent's tendency to volatilize include a Henry's Law constant of greater than 1 x 10^{-5} atm-m^3/mol or a vapor pressure great than or equal to 1 mm Hg. At the Site and surrounding areas, PAHs/SVOCs and metals are the principal COPCs, not VOCs. However, there are some PAHs/SVOCs observed in soil and groundwater at the Site that meet the volatility criteria including:

- Acenaphthene
- Acenaphthylene
- Anthracene
- Benz(a)anthracene
- 1,1-Biphenyl
- Dibenzofuran
- Fluorene
- 2-Methylnaphthalene
- Naphthalene
- Phenanthrene
- Pyrene

Additionally, the following VOCs were detected in groundwater and/or soil:

- Acrolein
- Benzene
- Chloroform
- Ethylbenzene
- n-Propylbenzene
- Toluene
- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- Xylenes

An attempt was made to collect soil gas samples during the RI, but shallow depths to groundwater inhibited sample collection. There are no structures on-site from which sub-slab vapor samples could be collected. Therefore, risk from volatilization of VOCs, naphthalene and the other more mobile PAHs/SVOCs from groundwater to indoor air was evaluated using the VISL Calculator (USEPA, 2018d).

The VISL Calculator will estimate risk levels only for constituents for which inhalation toxicity factors are available. Of the eleven PAHs/SVOCs detected in soil and groundwater at the Site which meet the vapor pressure and Henry's Law Constant criteria for volatility, inhalation toxicity factors are only available for 1,1-biphenyl and naphthalene. As other PAHs/SVOCs were

observed at elevated levels in groundwater that can't be evaluated using the VISL Calculator, VI risks are likely underestimated in this risk assessment.

Additionally, VI risks from subsurface soil impacted with volatile constituents have not been quantified. As discussed with USEPA and NC DEQ on May 31, 2018 and according to recent USEPA guidance, results of volatilization calculations from bulk soil samples are not considered to be reliable (USEPA, 2017). The September 2017 USEPA guidance document on use of the J&E model also states that volatilization from DNAPL cannot be reliably calculated. Therefore, J&E modeling of volatilization from subsurface soil and DNAPL has not been included in this HHRA.

The VISL calculator also is not appropriate to evaluate volatilization from DNAPL, which is known to be present in both the Pond and Process Areas. This introduces additional uncertainty for the VI evaluation, likely underestimating the risks from VI for the future child and adult resident, and future indoor worker should buildings be constructed in the Pond and Process Areas.

As per USEPA direction, the VISL calculator was used to quantify the future construction worker's exposure to volatilization from groundwater in the excavation scenario (USEPA, 2018e). However, after further consideration, this exposure pathway was removed (NC DEQ, 2018).

Site Trespassers (Teenage)

The HHRA assumed that teenage trespassers will have access to all areas of the Site. Currently, the Site is a heavily vegetated vacant property with fencing to control access to the former operational portion of the Site. This limits the ability for trespassers to be exposed to contamination. In addition, the Site is bordered to the east and south by marsh land with vegetation. Given the industrial nature of the Site and the surrounding land, it is likely this assumption introduces bias that may result in an overestimation of risk and hazards to this receptor.

2.6.4 Uncertainty in Toxicity Estimates

Chemical-Specific Assumptions

Uncertainty is inherent in the toxicity values used in evaluating carcinogenic and non-carcinogenic risks. Such uncertainty is chemical specific and is incorporated into the toxicity value during its development. For example, an uncertainty factor may be applied for interspecies and intra-human

variability, for extrapolation from sub-chronic to chronic exposures, or for epidemiological data limitations. Application of uncertainty factors is expected to overestimate risks.

Absence of toxicity values for some COPCs may lead to underestimation of risks and hazards. For example, surrogates were used for multiple constituents for which toxicological data were not available; four of these constituents screened in the HHRA. Each of the constituents was a PAH or SVOC:

- Acenaphthylene
- Benzo(g,h,i)perylene
- Carbazole
- Phenanthrene

Pyrene was the surrogate used for each of these constituents as approved by the USEPA and NC DEQ in the June 11, 2018 conference call.

Dermal Risk from Groundwater

For dermal exposure, oral CSFs and RfDs were adjusted using GI ABS where available, because dermal toxicity values are currently not available for any chemicals. However, GI ABS values are available only for a subset of site COPCs. Use of the oral CSF or oral RfD, directly, does not correct for differences in absorption and metabolism between the oral and dermal routes. Also, direct toxic effects on the skin are not accounted for. Thus, the use of an oral CSF or oral RfD for the dermal route may lead to an underestimation or an overestimation of the risk or hazard, depending on the compound.

For the reason described above, USEPA guidance RAGS Part E (USEPA, 2004a) recommends not quantifying dermal risk unless the dermal dose is at least 10% of the oral dose, as the dermal route usually contributes far less than other exposure routes, like the ingestion route, to overall risk. The RAGS Part E recommendation could lead to underestimation of risk for constituents for which the dermal dose is less than 10% of the oral dose, but dermal toxicity is greater than oral toxicity. Dermal risk was included in this HHRA where applicable. Additionally, PAHs are typically considered to be outside of the effective predictive domain, and therefore, are not recommended for risk quantification via the dermal contact exposure route. Rather USEPA recommends addressing dermal contact with PAHs in the uncertainty section of a HHRA (USEPA, 2004a).

2.6.5 Background Conditions

Concentrations of several of the constituents identified as COCs at the Site are commonly associated with natural and anthropogenic background conditions. Thus, the concentrations at the Site may not be entirely attributable to Site operations or releases. These are discussed in more detail below.

Hexavalent Chromium

To address the hexavalent chromium detections at the Site, a spatial analysis of the data was performed and is included in **Appendix F**. Review of the hexavalent chromium data across the Site indicates the following:

- The only detection of hexavalent chromium in groundwater was in an upgradient well at a concentration below the residential RSL.
- Hexavalent chromium was not detected in surface water.
- The detections of hexavalent chromium in surface soil and terrestrial sediment samples were in separate isolated areas. Hexavalent chromium was detected at low (<2 mg/kg) concentrations in samples collected outside of the Process Area as well as samples from the Process Area. Because the hexavalent chromium detections were not higher in the Process Area and hexavalent chromium is not associated with the creosote wood treating processes known to be used at the Site, the presence of hexavalent chromium does not appear to be Site related. Laboratory QC data suggest matrix interferences in the surface soil and terrestrial sediment samples.
- Hexavalent chromium was detected in the marsh sediment samples from both the Southern and Eastern marshes. Hexavalent chromium was detected at a higher frequency in marsh sediment samples from the Eastern Marsh, which has not shown impacts from the former wood treating operations on Site. Laboratory QC data also suggest matrix interferences with the marsh sediment data.

Based on these observations, hexavalent chromium does not appear to be Site related and may be related to interferences in the laboratory analyses and/or upstream sources in the marsh sediments. Therefore, hexavalent chromium was removed as a COC from the HHRA.

Non-Site Related Metals

A site-wide analysis of aluminum, iron, manganese, thallium and vanadium detections in surface soil and terrestrial sediment was performed for the Site and is included in **Appendix G**. Review of the select metals data across the Site indicates the following:

- Aluminum, iron, manganese and vanadium were detected throughout the Site both in areas used for wood treating and in areas where historical wood treating operations did not occur.

- Because aluminum, iron, manganese and vanadium are not associated with creosote wood treating activities, their presence is likely due to natural variation in background metals concentrations.

- The site-wide risks associated with aluminum, iron, manganese and vanadium are below the HQ of 0.1 for each pathway for each of the evaluated receptors. Therefore, aluminum, iron, manganese and vanadium will be eliminated as COCs and will not be considered further during the development of remedial alternatives for the Site.

- Thallium was detected in separate isolated areas, with the highest detected concentration in the Treated Wood Storage Area. Because the thallium detections were not higher in the Process Area and thallium is not associated with creosote wood treating activities, the presence of thallium does not appear to be Site related. Based on direction from NC DEQ via email correspondence and a conference call on March 19, 2019, thallium is qualitatively eliminated as a COC via the following lines of evidence examined:

Source Identification. Similar to arsenic, thallium is not associated with the creosote wood treating operations that were conducted at the Site.

Frequency of Detection in Surface Soil (by exposure area). Thallium has been identified as a COC in surface soil for the Process Area (child resident only), Pond Area (child and adult residents only), Treated Wood Storage Area (child resident only), and Eastern Upland Area (child resident only). Thallium was not detected in 75 of the 79 surface soil samples analyzed; however, each of the non-detect samples had detection limits that exceeded the residential RSL. The higher

detection limits for thallium lead to uncertainty in the analytical data. The detection summary for each area is summarized as follows:

- ***Process Area*****:** Of the 10 sample results, there was only one detected value reported below the RSL; however, thallium was selected as a COPC based on the dilution-adjusted detection limit being above the residential soil RSL (i.e., 0.96 vs 0.078 mg/kg).
- ***Pond Area*****:** Of the 10 sample results, there was only one detected value reported below the RSL; however, thallium was selected as a COPC based on the dilution-adjusted detection limit being above the residential soil RSL (i.e., 0.96 vs 0.078 mg/kg).
- ***Treated Wood Storage Area*****:** Of the 5 sample results, there was only one detected value reported below the RSL; however, thallium was selected as a COPC based on the dilution-adjusted detection limit being above the residential soil RSL (i.e., 0.941 vs 0.078 mg/kg).
- ***Eastern Upland Area*****:** Of the 34 sample results, there was only one detected value reported below the RSL; however, thallium was selected as a COPC based on the dilution-adjusted detection limit (0.96 mg/kg) being above the residential soil RSL.

Sample Co-location**.** The areal footprints identifying the sample locations of thallium where detection limits are elevated show overlap with other COCs identified in surface soil for the Site (PAHs in the Process Area and creosote-related SVOCs, benzene and ethylbenzene in the Pond Area). Therefore, any remedial action proposed for these other significant contributors to risk will also address thallium in soil.

Consistency in the Range of Detection Limits Across the Site. The detection limit range in the Eastern Upland Area where no creosote-related activities have occurred is consistent with the detection limit range observed in areas where there is known contamination (e.g., Pond Area and Process Area).

Low Hazard Potential. Overall, the hazard potential from thallium determined for each land use scenario is low with the child resident risk from thallium in surface soil yielding the highest HI of 1.2 in the Treated Wood Storage Area. The Site-wide risk associated with thallium for the dermal

contact and inhalation pathways are below the HQ of 0.1 for each evaluated receptor. Only the HQ for the incidental ingestion pathway exceeded the non-cancer threshold of 0.1.

Based on the information presented above, aluminum, iron, manganese, thallium, and vanadium were removed as COCs from the HHRA.

Arsenic

To address arsenic detections in surface soil and terrestrial sediment at the site, a spatial analysis of the arsenic data and a literature search for background concentrations of arsenic were performed and are included in **Appendix H**. Review of arsenic data across the Site indicates the following:

- Arsenic is not associated with creosote wood treating activities at the Site. While relatively elevated concentrations of arsenic were observed in the Pond Area, comparable concentrations were also observed in the Eastern Upland Area, where wood treating activities were not conducted. Furthermore, concentrations in the Process Area were lower than those observed in the Eastern Upland Area.

- The site-specific arsenic background concentration of 2.88 mg/kg is on the lower end of the naturally occurring and anthropogenic range of arsenic concentrations in North Carolina. Documented background concentrations of arsenic range from 0.42 mg/kg to 12.1 mg/kg for non-agricultural land and from 2.4 mg/kg to 32.9 mg/kg for agricultural land.

Based on the information presented above, a background arsenic concentration of 12.1 mg/kg was proposed for the Site. This value is within the literature values for arsenic background. Arsenic was removed as a COC from the HHRA in areas below the background concentration of 12.1 mg/kg.

2.6.6 Uncertainty in Leachability Evaluation

The RSL Calculator (USEPA, 2018c) was used to derive soil concentrations protective of groundwater. A DAF of 1 was used for this modeling due to the shallow depth to groundwater, particularly in the southern portion of the Site. However, a DAF of 20 may be more appropriate for the northern and western portions of the Site, specifically the Eastern Upland Area and the Treated and Untreated Wood Storage Areas. Groundwater is deeper in those areas (up to about

15 ft bgs). The most robust line of evidence to support a higher DAF for these areas is the lack of observed groundwater impacts, despite COPC concentrations which have been in soil for over 40 years that exceed the levels derived using the RSL Calculator. Further assessment of the soil concentrations protective of groundwater may be warranted.

3.0 SUMMARY AND CONCLUSIONS

The Site operated as a creosote-based wood treating facility under three different owners from 1936 to 1974, resulting in extensive releases of creosote in areas associated with wood treatment and storage and in former surface water impoundments. Sampling investigations, conducted from 1984 to 2017, have confirmed that areas of contaminated soil, sediments, and groundwater are present on the property. In addition, areas of residual creosote remain as sources of ongoing contamination to groundwater and the surrounding marsh areas, especially in the southwestern portion of the Site. Contamination of groundwater in neighboring commercial property west of the Site has also been confirmed.

This HHRA was prepared to evaluate potential baseline health risks for current and future receptor exposure to COPCs present in groundwater, soil, sediment, and surface water, in support of the Site's risk managers' decision-making process. Baseline risks are risks that might exist if no remediation or institutional controls were applied at a site. The primary purpose of the baseline risk assessment is to provide risk managers with an understanding of the actual and potential risks to human health and the environment. As a general policy, USEPA may use the results of the baseline risk assessment to determine whether a release or threatened release poses an unacceptable risk to human health or the environment that warrants remedial action and to determine if a site presents an imminent and substantial endangerment (USEPA, 1991). The potential exposure scenarios considered in this HHRA include inhalation of soil particulates and vapors; incidental ingestion of and dermal contact with soil particulates; drinking water ingestion, dermal contact and inhalation of groundwater; and incidental ingestion and dermal contact with sediment and surface water, as shown in the CSEMs provided in **Figures 2-1 through 2-5**. Cancer and non-cancer risks were estimated using standard RAGS methods. The estimated ELCR for each receptor was compared to USEPA acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$ while the total HI for each receptor was compared to the target HI of 1.0. Where the total HI exceeded 1.0, target organ specific HIs were calculated as recommended by USEPA.

The evaluation of potential cancer risks and non-cancer hazards to current/future receptors on-Site from exposure to COPCs in environmental media indicates that there are several primary COPCs, now identified as COCs, whose concentrations in environmental media contribute to the hazard and risk estimates, and exposure to these COCs may result in potential adverse health

effects. The cancer and non-cancer risk estimates for COPCs per receptor per land use scenario are presented in **Tables 3-1a through 3-1h**.

Seven Site areas with complete pathways were evaluated in this HHRA, including the Process Area, Pond Area, Treated Wood Storage Area, Untreated Wood Storage Area, Eastern Upland Area, the residential area West of Navassa Road, Sturgeon Creek, and the Southern Marsh. Additionally, groundwater was evaluated across the Site, though impacts to groundwater were limited to the southern portion of the property.

Each of these areas of the property has been assessed under both an industrial/commercial and residential land use scenario. Potentially exposed populations include future industrial/commercial workers, future construction workers, future on-Site adult and child residents, and the on-Site teenage trespasser. **Tables 3-1a to 3-1h** present summaries of risks and hazards for the COPCs for each of these receptors per medium. **Table 3-2** presents a summary of the risks and hazards for the COPCs for each receptor by exposure areas. COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (e.g., surface soil) exceeds the upper end of USEPA's acceptable cancer risk range of 1.0E-04 or the chemical-specific non-cancer HI exceeds 1.0. **Table 3-3** presents a summary of the COCs by exposure area.

As illustrated in the CSEMs provided as **Figures 2-1 to 2-5**, potentially complete exposure pathways include surface soil and soil gas (from soil and groundwater). Direct exposure to groundwater is not currently a potentially complete pathway for any receptors; however, hypothetical future adult and child residents, and a hypothetical future construction worker could potentially be exposed to groundwater, and therefore, risks were calculated for those hypothetical future scenarios. Additionally, direct contact with subsurface soil is anticipated to be a potentially complete pathway for construction workers only.

Each of the areas evaluated are impacted primarily with PAHs, but elevated levels of VOCs, SVOCs, metals, and to a lesser extent, pesticides, were observed in some locations. As anticipated, impacts are concentrated in the Process Area and Pond Area. Impacts are less in the Treated and Untreated Wood Storage Areas and are limited to surface soil in the Eastern Upland Area and to groundwater in areas west of Navassa Road.

As expected, groundwater in the former operational areas (Pond Area and Process Area) has been impacted, as has groundwater downgradient from those areas. Surface and subsurface soil appears to be an ongoing source of impacts to groundwater in the Pond and Process Areas. Elevated PAH levels were observed in Southern Marsh sediments.

A discussion of risks per applicable receptor per area is presented below. The carcinogenic and non-carcinogenic risks for these exposure scenarios are summarized in **Table 3-2**. For the lifetime resident, the cancer risk is the sum of non-mutagenic carcinogens and a weighted average of mutagenic risk for the 0-2, 2-6, 6-16, and 16-26 age ranges, using ADAFs of 10, 3, 3, and 1, respectively. This approach is consistent with USEPA guidance (USEPA, 2005).

Note that direct contact with subsurface soils is presumed to only occur for the construction worker (excavation scenario). For subsurface soil exposure, no other receptors were quantitatively evaluated.

Process Area

- The cancer risk from surface soil for the future lifetime resident in the Process Area is 4.5E-04, principally from the ingestion of benzo(b)fluoranthene, benzo(a)pyrene, and other polycyclic aromatic hydrocarbons (PAHs). Cancer risk from COCs in surface soil for the future child and adult residents in the Process Area are accounted for in the future lifetime resident.
- The HI from surface soil for the future child resident is 4. COCs include dibenzofuran and PAHs. The non-cancer risk is primarily driven by the ingestion of benzo(a)pyrene.
- The HIs from surface soil for the future adult resident, teenage trespasser, and future outdoor worker are 0.5, 0.1, and 0.3, respectively, which are below the threshold of 1.0.
- The cancer risk from surface soil for the future outdoor worker and teenage trespasser are 2.4E-05 and 1.5E-05, respectively, both below the threshold of 1.0E-04.
- The HI from combined surface and subsurface soil for the future on-Site construction worker is 18. The non-cancer risk is principally driven by the inhalation of naphthalene (HI of 14) in subsurface soil. The cancer risk of 2.6E-05 for combined surface and subsurface soil is below the threshold of 1.0E-04.
- For the future child and adult resident, teenage trespasser, and future outdoor worker, exposure to subsurface soil is not considered to be a complete pathway because these

potential receptors are not expected to encounter subsurface soil consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

Pond Area

- The cancer risk from surface soil for the future lifetime resident in the Pond Area is 1.1E-03, principally from the ingestion of benzo(a)pyrene and other PAHs.
- The HI from surface soil for the future child resident is 27 with dibenzofuran, benzo(a)pyrene and naphthalene contributing the most hazard. The non-cancer risk is driven by the ingestion of dibenzofuran and other PAHs.
- The HI from surface soil for the future adult resident is 9. The non-cancer risk is primarily from the inhalation of naphthalene and 1,1-biphenyl.
- The cancer risk of 9.3E-05 from surface soil for the future outdoor worker is below the threshold of 1E-04; however, the HI from surface soil of 3 exceeds the threshold of 1.0. The non-cancer risk is driven by the inhalation of naphthalene.
- The cancer risk of 3.0E-05 and HI of 0.7 from surface soil for the teenage trespasser are below the cancer and non-cancer thresholds of 1E-04 and 1.0, respectively.
- The cancer risk from combined surface and subsurface soil for the future on-Site construction worker is 2.8E-05, which is below the 1.0E-04 threshold. The HI from soil is 19 driven principally by the inhalation of naphthalene.
- For the future child and adult resident, teenage trespasser, and future outdoor worker, exposure to subsurface soil is not considered to be a complete pathway because these potential receptors are not expected to encounter subsurface soil consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

Treated Wood Storage Area

- The cancer risk of 4.1E-05 from surface soil for the future lifetime resident in the Treated Wood Storage Area is below the 1.0E-04 threshold.
- The non-cancer risk from surface soil of 0.2 for the future child resident and 0.02 for the adult resident are below the 1.0 threshold.
- No COCs in surface soil were retained for the teenage trespasser.
- The cancer risk of 2.2E-06 and HI of 0.01 from surface soil for the future outdoor worker are below the thresholds.

- The cancer risk of 1.5E-07 and HI of 0.06 for the future on-Site construction worker exposure to combined surface and subsurface soil are below the thresholds.
- For the future child and adult resident, teenage trespasser, and future outdoor worker, exposure to subsurface soil is not considered to be a complete pathway because these potential receptors are not expected to encounter subsurface soil consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

Untreated Wood Storage Area

- The cancer risk of 2.5E-05 from surface soil for the future lifetime resident in the Untreated Wood Storage Area is below the 1.0E-04 threshold.
- The non-cancer HI of 0.1 from surface soil for the future child resident is below the 1.0 threshold.
- No COCs in surface soil were retained for the future adult resident, teenage trespasser, future construction worker, and future outdoor worker.
- No COCs in subsurface soil were retained for the future on-Site construction worker.
- For the future child and adult resident, teenage trespasser, and future outdoor worker, exposure to subsurface soil is not considered to be a complete pathway because these potential receptors are not expected to encounter subsurface soil consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

Eastern Upland

- The cancer risk of 1.5E-05 from surface soil for the future lifetime resident in the Eastern Upland is below the 1.0E-04 threshold.
- The HIs from surface soil for the future child and adult residents are 0.3 and 0.08, respectively.
- The cancer risk of 2.3E-06 and HI of 0.02 from surface soil for the future outdoor worker are below the thresholds.
- The cancer risk is 1.7E-07 from soil for the future construction worker, and the HI is 0.1, both below the thresholds.
- No COCs in surface soil were retained for the teenage trespasser.
- For the future child and adult residents, teenage trespasser, and future outdoor worker, exposure to subsurface soil is not considered to be a complete pathway because these

potential receptors are not expected to encounter subsurface soil consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

West of Navassa Road

- No constituents in soil exceeded the applicable screening criteria in the area West of Navassa Road.

Southern Marsh

- The cancer and non-cancer risks from the Southern Marsh sediment for the teenage trespasser (2.3E-05 and 0.4, respectively) and the future outdoor worker (3.7E-05 and 0.7, respectively) are below the thresholds. Exposures to the Southern Marsh sediment for the future child and adult residents are accounted for in the risk evaluations for the teenage trespasser.

Groundwater

- The cancer risk from groundwater, including vapor intrusion (VI) and potable use, for the future lifetime resident is 2.5E-03, principally from the inhalation of naphthalene and chloroform via VI and ingestion of arsenic, benzo(a)pyrene, and 1-methylnaphthalene.
- The cancer risk from groundwater based on potable use for a future child resident is 3.5E-04, and the HI is 49. Ingestion of arsenic, chloroform, and 1-methylnaphthalene contributed the most to the cancer risk. The non-cancer risk is primarily from ingestion of dibenzofuran, naphthalene, and 2-methylnaphthalene.
- The cancer risk from groundwater, including VI and potable use, for a future adult resident is 2.0E-03, and the HI is 79. The cancer risk is primarily from inhalation of chloroform and naphthalene and ingestion of arsenic, 1-methylnaphthalene, and chloroform. The non-cancer risk is primarily from direct exposure to dibenzofuran, 2-methylnaphthalene, and naphthalene as well as exposure to naphthalene via VI.
- The cancer risk from groundwater for a future outdoor worker via potable use is 2.9E-04, and the HI is 9. The cancer risk is primarily from ingestion of arsenic, 1-methylnaphthalene, and benzo(a)pyrene. The non-cancer risk is driven by the ingestion of dibenzofuran, naphthalene, arsenic, and 2-methylnaphthalene.

- The cancer risk from groundwater for a future indoor worker, including VI and potable use, is 5.6E-04, and the HI is 17. The cancer risk is primarily from the ingestion of arsenic, chloroform and naphthalene, and inhalation of naphthalene via VI.
- The cancer risk from groundwater for a future on-Site construction worker is 7.3E-07, and the HI is 0.8, both below the thresholds.
- Exposure to groundwater is not considered to be a complete pathway for the teenage trespasser because teenage trespassers are not expected to encounter groundwater consistent with the Region 4 EPA HHRA Supplemental Guidance (USEPA, 2018a).

Sturgeon Creek

- No COCs were identified in Sturgeon Creek. Although arsenic was identified as a COPC, risk from exposure to arsenic was not quantified since arsenic is not a Site-related constituent. Additional information regarding elimination of arsenic in Sturgeon Creek from further evaluation in the HHRA is provided in Section 2.6.5.

Based on the results of the HHRA, the overall risk from soil is acceptable for the reasonably anticipated future land use (i.e., industrial/commercial and recreational), except for the Pond Area and Process Area. Based on current and future expected land use (i.e., non-residential), the Pond Area and Process Area require additional evaluation in the following step of the CERCLA process, the FS. Uncertainties are associated with the COCs identified in the HHRA. For example, while arsenic and thallium were identified as COCs in soil, these constituents were qualitatively excluded as COCs for areas with arsenic soil concentrations less than the regional background value of 12.1 mg/kg or for thallium in areas with laboratory dilution-adjusted detection limits above the applicable screening level. Like arsenic, thallium in soil is not associated with the creosote wood treating operation and was eliminated through use of a multiple lines of evidence approach provided in Section 2.6.5. Additional information regarding the basis for exclusion of other constituents as COCs can be found in **Appendices F through H**.

4.0 DEVELOPMENT OF REMEDIATION GOALS

Site-specific remediation goals for COCs identified in the HHRA will be evaluated and presented in the individual Focused FS for each exposure area. This will include further evaluation of the potential for contaminants to migrate to groundwater. Development of remediation goals in the Focused FS will allow the risk managers flexibility in establishing goals based upon the anticipated future use of the individual exposure areas evaluated.

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TABLES

Table 1-1
Background Soil Sampling Results
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Sample Location	BG-SO-01	BG-SO-02	BG-SO-03	BG-SO-04	BG-SO-05	BG-SO-06	BG-SO-07	BG-SO-08	BG-SO-09	BG-SO-10	BG-SO-11	BG-SO-12	BG-SO-13	BG-SO-14	BG-SO-15	Arithmetic Mean	Background Level (2x Mean)
Sample Date	01/23/17	01/24/17	01/24/17	01/24/17	01/24/17	01/24/17	01/24/17	01/24/17	01/24/17	01/24/17	01/24/17	01/24/17	01/24/17	01/24/17	01/24/17		
Sample Depth	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft		
Analyte																	
Inorganics (mg/kg)																	
Aluminum	1810	1370	1960	5470	4320	3060	2830	6250	4080	7450	9160	6060	2220	2040	5460	4236	8472
Antimony	<0.20 J	<0.22 J	<0.25 J	0.28	<0.19 J	<0.23 J	<0.25 J	<0.25 J	<0.27 J	<0.21 J	<0.26 J	<0.20 J	<0.22 J	<0.26 J	<0.21 J	0.2333	0.467
Arsenic	0.52	0.60	0.53	4.0	1.6	1.3	1.1	1.1	1.3	3.2	2.2	1.8	0.69	0.46	1.2	1.44	2.88
Barium	5.3	3.9	5.2	22.1	8.9	8.0	19.9	15.8	8.3	16.4	17.9	17.9	6.4	27.8	48.3	15.473	30.95
Beryllium	<0.20	<0.22	<0.25	<0.19	<0.19	<0.23	<0.25	<0.25	<0.27	<0.21	<0.26	<0.20	<0.22	<0.26	<0.21	0.2273	0.455
Cadmium	<0.20	<0.22	<0.25	<0.19	<0.19	<0.23	<0.25	<0.25	<0.27	<0.21	<0.26	<0.20	<0.22	<0.26	<0.21	0.2273	0.455
Calcium	2440	140	331	3020	656	952	1370	1320	277	3690	6030	877	445	1270	1830	1643.2	3286
Chromium	1.6	1.7	1.9	8.1	6.7	5.3	4.3	7.4	8.3	13	12.4	9.5	2.7	1.9	5.3	6.007	12.01
Chromium, Hexavalent	<2.2	<2.2	<2.3	<2.2	<2.3	<2.4	<2.3	<2.3	<2.3	<2.4	<2.3	<2.4	<2.4	<2.3	<2.6	2.327	4.65
Cobalt	<0.20	<0.22	<0.25	1.3	0.59	0.45	1.3	0.38	0.41	0.71	0.77	0.73	<0.22	1.4	2.5	0.762	1.52
Copper	0.72	1.2	1.1	9.6	2.9	2.3	5.1	3.0	2.0	4.4	3.6	3.7	2.9	3.5	10.7	3.781	7.56
Iron	1290	1340	1500	7860	3850	2290	4710	4500	3550	7190	8460	5120	1380	3630	7780	4296	8592
Lead	3.6	9.6	4.8	29	43.5	37.6	13.2	10.9	5.8	14.8	9.8	9.5	32.2	6.8	13.7	16.32	32.64
Magnesium	140	63.6	87.9	871	204	155	763	227	150	386	505	491	89.4	1010	1870	467.53	935.1
Manganese	4.3	2.8	20	45.8	10.2	9.9	52.3	10.4	6.3	18.2	25.2	29.6	9.7	61.7	114	28.03	56.06
Mercury	<0.041	<0.043	<0.046	<0.044	<0.045	<0.047	<0.044	<0.046	<0.046	<0.047	<0.045	<0.047	<0.047	<0.046	<0.051	0.04567	0.091
Nickel	0.70	0.47	1.1	2.7	1.6	1.6	2.5	1.3	0.97	2.4	2.6	1.7	0.99	1.5	3.8	1.729	3.46
Potassium	46.4	46.7	62.1	642	116	92	648	163	174	309	358	339	81.1	1120	1590	385.8	771.6
Selenium	0.61	0.59	0.60	2.8	1.8	1.3	1.9	1.8	2.4	1.9	2.5	2.6	1.1	1.6	3.1	1.773	3.55
Silver	<0.20	<0.22	<0.25	<0.19	<0.19	<0.23	<0.25	<0.25	<0.27	<0.21	<0.26	<0.20	<0.22	<0.26	<0.21	0.2273	0.455
Sodium	32.7	27.8	35.9	38.9	29.3	30.7	<25	37.4	44.7	45.2	54.6	29.9	32.9	42.4	68.3	38.38	76.76
Thallium	<0.20	<0.22	<0.25	<0.19	<0.19	<0.23	<0.25	<0.25	<0.27	<0.21	<0.26	<0.20	<0.22	<0.26	<0.21	0.2273	0.455
Vanadium	3.3	3.7	3.8	14.7	10.5	8.4	8.7	12.1	13.3	20.7	21	15.9	4.8	6.2	14.2	10.75	21.5
Zinc	3.8	5.1	103	29	20.4	20.5	18.9	11.3	7.6	22.7	14.3	18.1	9.9	14.1	49.8	23.23	46.46
PAHs (µg/kg)																	
1-Methylnaphthalene	<29 J	<30 J	<31 J	<30 J	<32 J	<31 J	<30 J	<31 J	<30 J	<31 J	<30 J	<33 J	<32 J	<32 J	<36 J	31.2	62.4
2-Methylnaphthalene	<29 J	<30 J	<31 J	<30 J	<32 J	<31 J	<30 J	<31 J	<30 J	<31 J	<30 J	<33 J	<32 J	<32 J	<36 J	31.2	62.4
Acenaphthene	<29 J	<30 J	<31 J	<30 J	<32 J	<31 J	<30 J	<31 J	<30 J	<31 J	<30 J	<33 J	<32 J	<32 J	<36 J	31.2	62.4
Acenaphthylene	<29 J	<30	<31	<30	<32	<31	<30 J	<31	<30 J	<31	<30	<33 J	<32 J	<32	<36	31.2	62.4
Anthracene	<18 J	<19 J	<19 J	26.7 J	<20 J	<19 J	<19 J	<19 J	<19 J	<20 J	<19 J	<20 J	<20 J	<20 J	<22 J	19.28	38.56
Benzo(a)anthracene	<3.6 J	<3.8	<3.8	25.9	<4.0	<3.9	9.0 J	<3.9	<3.8 J	15.3 J	7.6 J	<4.1 J	5.9 J	<4.0	<4.5	6.873	13.75
Benzo(a)pyrene	<3.6 J	<3.8	<3.8	35.9	<4.0	4.0 J	8.3 J	4.2 J	<3.8 J	18.1	10.3 J	<4.1 J	6.9 J	<4.0	<4.5	7.953	15.91
Benzo(b)fluoranthene	<3.6 J	<3.8 J	<3.8 J	50.7	5.4 J	9.6 J	13.1 J	6.4 J	<3.8 J	25.1	14.2 J	<4.1 J	11.4 J	6.4 J	8.8 J	11.35	22.7
Benzo(g,h,i)perylene	<3.6 J	<3.8	<3.8	38.8	<4.0	4.4 J	5.5 J	<3.9	<3.8 J	13.2 J	10.8 J	<4.1 J	5.4 J	<4.0	<4.5	7.573	15.15
Benzo(k)fluoranthene	<3.6 J	<3.8	<3.8	18.3	<4.0	<3.9	5.1 J	<3.9	<3.8 J	10.4 J	4.2 J	<4.1 J	<4.0 J	<4.0	<4.5	5.427	10.85
Chrysene	<3.6 J	<3.8	<3.8	38.3	<4.0	4.9 J	7.8 J	4.7 J	<3.8 J	18.1	10.9 J	<4.1 J	7.5 J	<4.0	5.0 J	8.287	16.57
Dibenzo(a,h)anthracene	<3.6 J	<3.8	<3.8	6.7 J	<4.0	<3.9	<3.8 J	<3.9	<3.8 J	<3.9	<3.8	<4.1 J	<4.0 J	<4.0	<4.5	4.107	8.21
Fluoranthene	<18 J	<19	<19	66.4 J	<20	<19	<19 J	<19	<19 J	32.3 J	<19	<20 J	<20 J	<20	<22	23.45	46.9
Fluorene	<29 J	<30 J	<31 J	<30 J	<32 J	<31 J	<30 J	<31 J	<30 J	<31 J	<30 J	<33 J	<32 J	<32 J	<36 J	31.2	62.4
Indeno (1,2,3-cd) pyrene	<3.6 J	<3.8	<3.8	34.9	<4.0	<3.9	5.8 J	<3.9	<3.8 J	16.1	7.5 J	<4.1 J	6.8 J	<4.0	<4.5	7.367	14.73
Naphthalene	<29 UJ	<30 UJ	<31 J	<30 J	<32 J	<31 J	<30 J	<31 J	<30 J	<31 J	<30 J	<33 J	<32 J	<32 J	<36 J	31.2	62.4
Phenanthrene	<18 J	<19	<19	19.4 J	<20	<19	<19 J	<19	<19 J	<20	<19	<20 J	<20 J	<20	<22	19.49	38.98
Pyrene	<18 J	<19 J	<19 J	72.7 J	<20 J	<19 J	<19 J	<19 J	<19 J	26.1 J	<19 J	<20 J	<20 J	<20 J	<22 J	23.45	46.9

Notes:
- Non detected results are reported as less than the Method Detection Limit (<MDL). The MDL values are used to calculate the mean for non-detect results.
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
ft - feet
J - estimated concentration
UJ - estimated concentration that indicates potential low bias
PAHs - polycyclic aromatic hydrocarbons

Prepared By: CDN 5/22/17
Checked By: MAB 6/6/17

Table 1-2
Background Groundwater Sampling Results
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Sample Location	MW-01		MW-01D		MW-22		MW-22D		MW-23		MW-23D		Arithmetic	Background
Screen Interval (ft bgs)	25 - 35		50 - 60		15 - 25		47 - 57		17 - 27		49 - 59		Mean	Level
Sample Date	02/24/16	12/13/16	02/24/16	12/13/16	02/24/16	12/13/16	02/24/16	12/13/16	02/24/16	12/12/16	02/24/16	12/12/16		
Analyte (mg/L)														
Chloride		9.60		9.10		4.90		13.6		8.70		10.2	NC	NC
Total Dissolved Solids		166		182		<100		184		110		216	NC	NC
Arsenic	<0.00025	<0.002	<0.00025	<0.002	<0.00025	<0.002	<0.00025	<0.002	<0.00025	<0.002	<0.00025	<0.002	0.001125	0.00225
Arsenic, dissolved	<0.00025	<0.002	<0.00025	<0.002	<0.00025	<0.002	<0.00025	<0.002	<0.00025	<0.002	<0.00025	<0.002	0.001125	0.00225
Chromium	0.00775		0.00067 J		0.00076 J		0.00102		0.00058 J		0.00053 J		0.001885	0.00377
Chromium, dissolved	0.00744		<0.00025		0.00059 J		<0.00025		0.0003 J		<0.00025		0.001513	0.00303
Chromium(III)	<0.00025		<0.00025		0.00076 J		0.00102		0.00058 J		0.00053 J		0.000565	0.00113
Chromium(III), dissolved	<0.00025		<0.00025		0.00059 J		<0.00025		0.0003 J		<0.00025		0.000315	0.00063
Chromium, Hexavalent	0.007 J		<0.005		<0.005		<0.005		<0.005		<0.005		0.005333	0.01067
Chromium, Hexavalent, dissolved	0.007 J		<0.005		<0.005		<0.005		<0.005		<0.005		0.005333	0.01067
Cobalt		<0.002		<0.002		<0.002		<0.002		<0.002		<0.002	0.002	0.004
Cobalt, dissolved		<0.002		<0.002		<0.002		<0.002		<0.002		<0.002	0.002	0.004
Thallium	<0.00025		<0.00025		<0.00025		<0.00025		<0.00025		<0.00025		0.00025	0.0005
Thallium, dissolved	<0.00025		<0.00025		<0.00025		<0.00025		<0.00025		<0.00025		0.00025	0.0005

Note:
- Non detected results are reported as less than the Method Detection Limit (<MDL)
NC - background value not calculated
mg/L - milligrams per liter
J - estimated concentration
ft bgs - feet below ground surface

Prepared By: CDN 5/22/17
Checked By: MAB 6/6/17

Table 1-3
Background Marsh Sediment Sampling Results
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Sample Location	BG-SD-01	BG-SD-02	BG-SD-03	BKSD1	KM24 [1]	KM30 [1]	SD22	SD71	SD72	SD73	SD74	SD101	SD107	SD108	SD109	Arithmetic	Background
Sample Date	12/12/16	12/12/16	12/12/16	06/25/12	11/02/10	11/02/10	11/03/04	06/26/12	06/27/12	06/27/12	06/27/12	06/02/16	06/06/16	06/06/16	06/06/16	Mean	Level
Sample Depth	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft		
Metals (mg/kg)																	
Arsenic												3.11	2.55	30.2	0.94	NC	NC
Chromium	18.3 J	28.8 J	42.5 J									27.1	4.23	5.84	2.5	18.47	36.93
Chromium, Hexavalent	6.80 J	29 J	7.30 J									<0.795 J	7.06 J	<1.48 J	1.49 J	7.7	15.41
Thallium												<0.21	<0.26	<0.40	<0.17	NC	NC
SVOCs (µg/kg)																	
(3-/ 4-)Methylphenol							<67									NC	NC
1,1-Biphenyl				<2200 J				<530 J	<520 J	<470 J	<310 J					806	1612
1-Methylnaphthalene	<130 J	<210 J	<150 J	<6.3 J				<7.4 J	<7.4 J	<5.7 J	<4.0					65.1	130.2
2,4-Dimethylphenol				<4300 J			<33	<1100 J	<1100 J	<940 J	<620 J					1349	2698
2,4-Dinitrotoluene				<2200 J			<67	<530 J	<520 J	<470 J	<310 J					682.8	1366
2-Methylnaphthalene	<130 J	<210 J	<150 J	<7.3 J	<8.7	<8.3	<33	<8.7 J	<8.6 J	<6.6 J	<4.7					52.35	104.7
3,3'-Dichlorobenzidine				<4400 J			<67	<1100 J	<1100 J	<960 J	<640 J					1361	2722
Acenaphthene	<130 J	<210 J	<150 J	<6.8 J	<8.7	<8.3	<33	<8.1 J	<8.0 J	<6.1 J	<4.3					52.12	104.2
Acenaphthylene	<130 J	<210 J	<150 J	<4.1 J	8.8 J	13	<33	<4.9 J	<4.9 J	<3.7 J	<2.7					51.37	102.7
Anthracene	112 J	<130 J	<96 J	<3.5 J	11	8.4	<33	<4.2 J	<4.1 J	<3.2 J	<2.3					37.06	74.13
Benzaldehyde				4600 J				1400 J	1100 J	1000 J	720 J					1764	3528
Benzo(a)anthracene	66 J	<26 J	<19 J	<2.2 J	41	26	<33	10 J	<2.6 J	2.9 J	2.8 J					21.05	42.09
Benzo(a)pyrene	55.5 J	<26 J	<19 J	<2.6 J	33 J	29 J	<33	8.1 J	<3.1 J	<2.4 J	3.0 J					19.52	39.04
Benzo(b)fluoranthene	149 J	26.5 J	40.6 J	<2.8 J	44	43	160 J	18 J	<3.4 J	5.2 J	5.7					45.29	90.58
Benzo(g,h,i)perylene	20.1 J	<26 J	<19 J	<3.1 J	11	<8.3	<33	<3.6 J	<3.6 J	<2.8 J	<2.0					12.05	24.09
Benzo(k)fluoranthene	90.3 J	<26 J	23.2 J	<3.5 J	16	15	<33	8.1 J	<4.1 J	<3.2 J	<2.3					20.43	40.85
Benzyl butyl phthalate				<2500 J			<67	<610 J	<600 J	<540 J	<350 J					777.8	1556
Bis(2-ethylhexyl) phthalate				<2300 J			420 J	<570 J	<560 J	<500 J	<330 J					780	1560
Carbazole				<3000 J	<8.7	<8.3	<33	<740 J	<730 J	<650 J	<430 J					700	1400
Chrysene	81.5 J	<26 J	23.6 J	<2.2 J	36	29	140 J	12 J	<2.6 J	3.1 J	3.1 J					32.65	65.29
Dibenzo(a,h)anthracene	<16 J	<26 J	<19 J	<2.8 J	<8.7	<8.3	<33	<3.4 J	<3.4 J	<2.6 J	<1.8					11.36	22.73
Dibenzofuran				<2400 J			<33	<600 J	<590 J	<520 J	<350 J					748.8	1498
Di-n-butylphthalate				<1800 J			<67	<440 J	<440 J	<390 J	<260 J					566.2	1132
Fluoranthene	257 J	<130 J	<96 J	<4.1 J	74	40	220 J	17 J	<4.9 J	5.2 J	6.2					77.67	155.3
Fluorene	<130 J	<210 J	<150 J	<5.2 J	<8.7	<8.3	<33	<6.2 J	<6.2 J	<4.7 J	<3.3					51.42	102.8
Indeno (1,2,3-cd) pyrene	27.8 J	<26 J	<19 J	<3.1 J	27	24	<33	<3.6 J	<3.6 J	<2.8 J	<2.0					15.63	31.25
Naphthalene	<130 J	<210 J	<150 J	<6.8 J	<14	<9.6	<33	<8.1 J	<8.0 J	<6.1 J	<4.3					52.72	105.4
Phenanthrene	<79 J	<130 J	<96 J	<5.0 J	18	15	<33	<6.0 J	<5.9 J	<4.5 J	<3.2					35.96	71.93
Phenol				<2400 J			<33	<600 J	<590 J	<520 J	<350 J					748.8	1498
Pyrene	191 J	<130 J	<96 J	<3.1 J	78	36	300 J	25 J	<3.6 J	6.6 J	6.6					86.93	173.9

Note:
- Non detected results are reported as less than the Method Detection Limit (<MDL), unless the MDL was not available
1 - Non detected results for the "KM" samples (collected by EPA) are reported as less than the Reporting Limit (<RL)
SVOCs - semi-volatile organic compounds
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
NC - background value not calculated
J - estimated concentration
ft - feet

Prepared By: BGM 5/19/17
Checked By: MAB 6/6/17

Table 2-1
Summary of RSLs and Surrogates
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Analytes	RSL THQ=0.1 from RSL Tables, November 2018	North Carolina PSRG from PSRG Tables, February 2018*	Tapwater RSL THQ=0.1 from RSL Tables, November 2018	15A NCAC 02.L0202 Groundwater (2L) Standards, Effective April 1, 2013*	Comments
VOCs	**Soil/Sediment (µg/kg)**	**Residential Health Based PSRG* (µg/kg)**	**Groundwater and Surface Water (µg/L)**	**Drinking Water Standard* (µg/L)**	
1,2,4-Trichlorobenzene	5,800	12,000	0.4	70	
1,2,4-Trimethylbenzene	30,000	63,000	5.6	400	
1,3,5-Trimethylbenzene	27,000**	56,000**	6	400	
Acetone	6,100,000	12,000,000	1,400	6,000	
Acrolein	14	31	0.0042**	4**	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Benzene	1,200	1,200	0.46	1	
Bromodichloromethane	290**	310**	0.13	0.6	
Bromomethane	680	1,400	0.75**	10**	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Carbon disulfide	77,000	160,000	81	700	
Chlorobenzene	28,000	58,000	7.8**	50**	
Chloroform	320	340	0.22	70	
Chloromethane	11,000**	23,000**	19	3	
Cyclohexane	650,000	1,400,000	1,300**	NA**	
Dibromochloromethane	8,300**	8,300**	0.87	0.4	
Ethylbenzene	5,800	6,100	1.5	600	
Isopropylbenzene	190,000	410,000	45	70	Synonym name is Cumene
m,p-Xylene	55,000	120,000	19	500	Value used is for m-Xylene
Methyl Acetate	7,800,000	16,000,000	2,000**	NA**	
Methyl Butyl Ketone	20,000	42,000	3.8**	40**	Synonym name is 2-hexanone. Drinking water standard is North Carolina's IMAC for 2-Hexanone
Methyl Ethyl Ketone	2,700,000	5,500,000	560	4,000	Synonym name is 2-Butanone
Methyl Isobutyl Ketone	3,300,000	7,000,000	630**	100**	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Methylcyclohexane	650,000	1,400,000	1,300**	NA**	Cyclohexane used as surrogate
Methylene Chloride	35,000	58,000	11	5	
n-Butylbenzene	390,000	780,000	100	70	
n-Propylbenzene	380,000	780,000	66	70	Propyl benzene
o-Chlorotoluene	160,000**	310,000**	24	100	
o-Xylene	65,000	140,000	19	500	
p-Isopropyltoluene	490,000	990,000	110	600	Toluene used as surrogate
sec-Butylbenzene	780,000	1,600,000	200	70	
Styrene	600,000	1,200,000	120	70	
Toluene	490,000	990,000	110	600	
Total Xylenes	58,000	120,000	19	500	
SVOCs					
(3-and/or 4-)Methylphenol	320,000	630,000	93	400	Value used is for 3-methylphenol (m-Cresol)
1,1-Biphenyl	4,700	10,000	0.083	400	
1-Methylnaphthalene	18,000	18,000	1.1	1	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
2,4-Dimethylphenol	130,000	250,000	36	100	
2,4-Dinitrotoluene	1,700	1,700	0.24**	0.1**	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
2,6-Dinitrotoluene	360	360	0.049**	NA**	
2-Methylnaphthalene	24,000	48,000	3.6	30	
2-Methylphenol	320,000	630,000	93	400	Synonym name is o-cresol. Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
3,3'-Dichlorobenzidine	1,200	1,200	0.13**	NA**	
4-Chloroaniline	2,700	2,700	0.37**	NA**	Synonym name is p-Chloroaniline
4-Chlorophenyl phenyl ether	180,000	360,000	12	200	Pyrene used as a surrogate
4-Methylphenol	630,000	1,300,000	190**	40**	Synonym name is p-Cresol
4-Nitroaniline	25,000**	27,000**	3.8	NA	
Acenaphthene	360,000	720,000	53	80	
Acenaphthylene	180,000	360,000	12	200	Pyrene used as a surrogate
Acetophenone	780,000	1,600,000	190	700	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Aniline	44,000	88,000	13	NA	
Anthracene	1,800,000	3,600,000	180	2,000	
Benzaldehyde	170,000	170,000	19	700	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Benzidine	0.53**	0.53**	0.00011	NA	
Benzo(a)anthracene	1,100	1,100	0.03	0.05	
Benzo(a)pyrene	110	110	0.025	0.005	
Benzo(b)fluoranthene	1,100	1,100	0.25	0.05	
Benzo(g,h,i)perylene	180,000	360,000	12	200	Pyrene used as a surrogate
Benzo(k)fluoranthene	11,000	11,000	2.5	0.5	
Benzoic acid	25,000,000	51,000,000	7,500	30,000	
Benzyl butyl phthalate	290,000	290,000	16	1,000	
Bis (2-Chloroethyl)Ether	230	240	0.014	0.03	
Bis(2-ethylhexyl) phthalate	39,000	39,000	5.6	3	
Caprolactam	3,100,000	6,300,000	990	4000	
Carbazole	180,000	360,000	12	2	Pyrene used as a surrogate. Drinking water standard is North Carolina's IMAC.
Chrysene	110,000	110,000	25	5	
Dibenzo(a,h)anthracene	110	110	0.025	0.005	
Dibenzofuran	7,300	15,000	0.79	28	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Diethyl phthalate	5,100,000**	10,000,000**	1,500	6,000	
Dimethyl phthalate	630,000	1,300,000	90	700	Di-n-butylphthalate used as a surrogate
Di-n-butylphthalate	630,000	1,300,000	90	700	Synonym name is Dibutyl Phthalate
Di-n-octylphthalate	63,00**	130,000**	20	100	
Fluoranthene	240,000	480,000	80	300	
Fluorene	240,000	480,000	29	300	
Indeno (1,2,3-cd) pyrene	1,100	1,100	0.25	0.05	
Naphthalene	3,800	4,100	0.17	6	
N-Nitrosodiphenylamine	110,000	110,000	12**	0.0007**	
Pentachlorophenol	1,000	1,000	0.041	0.3	
Phenanthrene	180,000	360,000	12	200	Pyrene used as a surrogate
Phenol	1,900,000	3,800,000	580	30	
Pyrene	180,000	360,000	12	200	
Pyridine	7,800	16,000	2	NA	
Pesticides					
4,4'-DDD	190	380	0.0063**	0.1**	Synonym name is p,p'-DDD
4,4'-DDE	2000	2000	0.046	0.1	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard; synonym name is p,p'-DDE
4,4'-DDT	1900	1900	0.23**	0.1**	Synonym name is p,p'-DDT
Aldrin	39	39	0.00092	0.002	Drinking water standard is North Carolina's IMAC
alpha-BHC	86	86	0.0072**	0.006**	Drinking water standard is North Carolina's IMAC for alpha-Hexachlorocyclohexane
beta-BHC	300	300	0.025**	0.02**	Drinking water standard is North Carolina's IMAC for beta-Hexachlorocyclohexane
Dieldrin	34	34	0.0018**	0.002**	
Endosulfan II (beta)	1900	3800	0.23**	2**	Endrin used as a surrogate
Endosulfan Sulfate	1900**	3800**	10**	40**	Endrin used as a surrogate
Endrin	1900	3800	0.23**	2**	
Endrin aldehyde	1900	3800	0.23**	2**	Endrin used as a surrogate
Heptachlor	130	140	0.0014**	0.008**	
Heptachlor epoxide	70	71	0.0014**	0.004**	
Pentachlorophenol	1000	1000	0.041	0.3	

Analytes	RSL THQ=0.1 from RSL Tables, November 2018	North Carolina PSRG from PSRG Tables, February 2018*	Tapwater RSL THQ=0.1 from RSL Tables, November 2018	15A NCAC 02.L0202 Groundwater (2L) Standards, Effective April 1, 2013*	Comments
	Soil/Sediment (mg/kg)	Residential Health Based PSRG* (mg/kg)	Groundwater and Surface Water (mg/L)	Drinking Water Standard* (mg/L)	
Inorganics					
Total Dissolved Solids	NA**	NA**	500	500	
Chloride	NA**	NA**	NA	250	
Cyanide	2.3	3.1	0.00015**	0.07**	
Aluminum	7,700	16,000	2	NA	
Antimony	3.1	6.3	0.00078	0.001	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Arsenic	0.68	0.68	0.000052**	0.01**	
Barium	1,500	3,100	0.38	0.700	
Beryllium	16	31	0.0025	0.004	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Boron	1600	3100	0.4**	0.7**	
Cadmium	7.1	14	0.00092	0.002	
Calcium	NA	NA	NA	NA	
Chromium	12,000	23,000	2.2	0.010	
Chromium, Hexavalent	0.3	0.31	0.000035	NA	
Cobalt	2.3	4.7	0.0006	NA	
Copper	310	630	0.08	0.001	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Iron	5,500	11,000	1.4	0.300	
Lead	400	400	0.015	0.015	
Magnesium	NA	NA	NA	NA	
Manganese	180	380	0.043	0.050	
Mercury	1.1	2.3	0.000063**	0.001**	
Nickel	150	310	0.039	0.100	
Potassium	NA	NA	NA	NA	
Selenium	39	78	0.01	0.020	
Silver	39**	78**	0.0094	0.020	
Sodium	NA	NA	NA	NA	
Thallium	0.078	0.16	0.00002**	0.0002**	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Vanadium	39	78	0.0086	0.0003	Drinking water standard is North Carolina's IMAC due to the absence of a 2L standard
Zinc	2300	4700	0.6	1	

Notes:
IMAC - Interim Maximum Allowable Concentration
RSL - Regional Screening Level
THQ - Total Hazard Quotient
PSRG - Preliminary Soil Remediation Goals
NA - Not Available
ug/kg - micrograms per kilogram
ug/L - micrograms per liter
mg/kg - milligrams per kilogram
mg/L - milligrams per liter
*North Carolina's PSRGs and IMACs are provided for reference only and are not used in the risk screening process.
**Indicates the constituent was not detected in that media or not site-related.
Total Dissolved Solids for groundwater and surface water was obtained from 15A NCAC 02L.0202 Groundwater Standards (effective April 1, 2013).

Prepared By: SMA 03/19/19
Checked By: JLF 03/21/19

References:
North Carolina Department of Environment and Natural Resources. Interim Maximum Allowable Concentrations (effective April 1, 2013)
North Carolina Department of Environmental Quality. Preliminary Soil Remediation Goals (February 2018)
United States Environmental Protection Agency. Regional Screening Level Summary Table (November 2018)

Table 2-2
Occurrence, Distribution and Selection of COPCs in Surface Soil
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current/Future
Medium: Surface Soil (0-1 foot bgs)

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Eastern Upland Area		***Inorganics***												
	E1644012	% Moisture	8.3	24.4	%	NA	24.4	SS10	7/7	0.5 - 0.5	NA	NA	N	PC
	E1642941	% Solids	74	93	%	NA	93	DU-1; DU-3	4/4	0.1 - 0.1	NA	171.5	N	PC
	E1640382	Total Solids	86	91	%	NA	91	DU-4	4/4	0.1 - 0.1	NA	171.5	N	PC
	7429-90-5	Aluminum	168	22800	mg/kg	NA	22,800	SD019	34/34	2.13 - 155	7,700	8,472	Y	ASL
	7440-36-0	Antimony	0.3	0.3	mg/kg	1	1	SD020	1/34	0.21 - 1	3.1	0.467	N	BSL
	7440-38-2	Arsenic	0.26	26.7	mg/kg	0.67	26.7	SD013	31/34	0.11 - 0.67	0.68	2.88	Y	ASL
	7440-39-3	Barium	1.63	101	mg/kg	NA	101	SD019	34/34	0.0854 - 0.5	1,500	30.95	N	BSL
	7440-41-7	Beryllium	0.0541	0.42	mg/kg	0.5	0.5	SD020	8/34	0.0417 - 0.5	16	0.455	N	BSL
	7440-42-8	Boron	1.97	1.97	mg/kg	5	5	SD020	1/31	0.53 - 5	1,600	NA	N	BSL
	7440-43-9	Cadmium	0.18	0.56	mg/kg	0.5	0.56	SO031	6/34	0.0835 - 0.5	7.1	0.455	N	BSL
	7440-70-2	Calcium	74	15000	mg/kg	74	15,000	SO031	29/34	6.47 - 250	NA	3,286	N	EN
	7440-47-3	Chromium	0.83	16.8	mg/kg	NA	16.8	SD006	34/34	0.11 - 0.53	12,000	12.01	N	BSL
	18540-29-9	Chromium, Hexavalent	0.912	0.912	mg/kg	0.498	0.912	SO024	1/3	0.333 - 0.498	0.3	4.65	Y	ASL
	7440-48-4	Cobalt	0.12	5.79	mg/kg	0.15	5.79	SD013	28/34	0.11 - 0.5	2.3	1.52	Y	ASL
	7440-50-8	Copper	0.81	24.1	mg/kg	NA	24.1	SD019	34/34	0.11 - 0.5	310	7.56	N	BSL
	7439-89-6	Iron	308	12100	mg/kg	NA	12,100	SS10	34/34	6.47 - 155	5,500	8,592	Y	ASL
	7439-92-1	Lead	2.97	125	mg/kg	NA	125	SD019	34/34	0.11 - 1.55	400	32.64	N	BSL
	7439-95-4	Magnesium	11.9	1230	mg/kg	NA	1,230	SO031	34/34	3.24 - 50	NA	935.1	N	EN
	7439-96-5	Manganese	1.42	428	mg/kg	1.11	428	SD010	29/34	0.035 - 8.13	180	56.06	Y	ASL
	7439-97-6	Mercury	0.006	0.35	mg/kg	0.0026	0.35	SD019	33/34	0.0026 - 0.023	1.1	0.091	N	BSL
	7440-02-0	Nickel	0.27	6.75	mg/kg	0.33	6.75	SD013	30/34	0.21 - 1	150	3.46	N	BSL
	7440-09-7	Potassium	17.6	378	mg/kg	NA	378	SD019	34/34	9.71 - 50	NA	771.6	N	EN
	7782-49-2	Selenium	0.14	1.41	mg/kg	0.96	1.41	SD019	19/34	0.11 - 0.96	39	3.55	N	BSL
	7440-23-5	Sodium	13.4	351	mg/kg	34.6	351	SD020	16/34	10.6 - 50	NA	76.76	N	EN
	7440-28-0	Thallium	0.17	0.17	mg/kg	0.96	0.96	SS11	1/34	0.11 - 0.96	0.078	0.455	Y	ASL
	7440-62-2	Vanadium	1.52	40.5	mg/kg	NA	40.5	SD019	34/34	0.0971 - 0.5	39	21.5	Y	ASL
	7440-66-6	Zinc	2.68	160	mg/kg	2.96	160	SD006	29/34	0.447 - 9.99	2,300	46.46	N	BSL
		Volatile organic compounds												
	95-63-6	1,2,4-Trimethylbenzene	1.98	1.98	ug/kg	29	29	SD013	1/31	0.267 - 29	30,000	NA	N	BSL
	67-64-1	Acetone	12	530	ug/kg	320	530	SD010	13/33	0.535 - 320	6,100,000	NA	N	BSL
	107-02-8	Acrolein	19	54	ug/kg	294	294	SD013	5/31	2.67 - 294	14	NA	Y	ASL
	71-43-2	Benzene	5.72	5.72	ug/kg	29	29	SD013	1/34	0.267 - 29	1,200	NA	N	BSL
	74-83-9	Bromomethane	1.76	1.76	ug/kg	93	93	SS09	1/34	0.535 - 93	680	NA	N	BSL
	75-15-0	Carbon disulfide	0.619	14	ug/kg	46	46	SS09	6/34	0.267 - 46	77,000	NA	N	BSL
	67-66-3	Chloroform	1.11	1.97	ug/kg	46	46	SS09	5/34	0.267 - 46	320	NA	N	BSL
	110-82-7	Cyclohexane	4	4	ug/kg	46	46	SS09	1/34	0.267 - 46	650,000	NA	N	BSL
	100-41-4	Ethylbenzene	1.07	2.12	ug/kg	46	46	SS09	2/34	0.267 - 46	5,800	NA	N	BSL
	79-20-9	Methyl Acetate	2.44	3130	ug/kg	93	3,130	SD013	21/34	0.535 - 93	7,800,000	NA	N	BSL
	78-93-3	Methyl Ethyl Ketone	1.82	59	ug/kg	190	190	SS09	21/34	0.535 - 190	2,700,000	NA	N	BSL
	108-10-1	Methyl Isobutyl Ketone	2.86	2.86	ug/kg	140	140	SS09	1/34	0.267 - 140	3,300,000	NA	N	BSL
	108-87-2	Methylcyclohexane	4.53	4.53	ug/kg	46	46	SS09	1/34	0.267 - 46	650,000	NA	N	BSL
	99-87-6	p-Isopropyltoluene	1.89	342	ug/kg	0.574	342	SD013	18/31	0.267 - 29	490,000	NA	N	BSL
	100-42-5	Styrene	2.41	2.41	ug/kg	46	46	SS09	1/34	0.267 - 46	600,000	NA	N	BSL
	108-88-3	Toluene	0.687	31	ug/kg	46	46	SS09	18/34	0.267 - 46	490,000	NA	N	BSL
	1330-20-7	Total Xylenes	0.963	4.26	ug/kg	59	59	SD013	4/34	0.535 - 59	58,000	NA	N	BSL

Table 2-2
Occurrence, Distribution and Selection of COPCs in Surface Soil
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Eastern Upland Area		***Semi-volatile organic compounds***												
	1319-77-3	(3-and/or 4-)Methylphenol	303	303	ug/kg	510	510	SD006	1/32	35 - 510	320,000	NA	N	BSL
	100-52-7	Benzaldehyde	118	190	ug/kg	1040	1,040	SD006	7/38	28 - 1040	170,000	NA	N	BSL
	65-85-0	Benzoic acid	45	6760	ug/kg	510	6,760	SD017	14/31	35 - 510	25,000,000	NA	N	BSL
	117-81-7	Bis(2-ethylhexyl) phthalate	12	3700	ug/kg	77	3,700	PRIVATE PROPERTY	4/39	5.36 - 100	39,000	NA	N	BSL
	86-74-8	Carbazole	9.2	686	ug/kg	87	686	SD013	16/39	5.36 - 87	180,000	NA	N	BSL
	132-64-9	Dibenzofuran	20	22	ug/kg	77	77	SD006; SD013	2/39	5.36 - 77	7,300	NA	N	BSL
	84-74-2	Di-n-butylphthalate	7.56	42	ug/kg	77	77	SD006; SD013	21/39	5.36 - 77	630,000	NA	N	BSL
	87-86-5	Pentachlorophenol	11	12	ug/kg	170	170	PRIVATE PROPERTY; SD09; SS10; SS11	4/8	0.96 - 170	1,000	NA	N	BSL
		PAHs												
	90-12-0	1-Methylnaphthalene	1.12	48	ug/kg	1.23	48	SD013	20/31	0.886 - 13	18,000	62.4	N	BSL
	91-57-6	2-Methylnaphthalene	1.03	54	ug/kg	90	90	DU-2	23/39	0.886 - 90	24,000	62.4	N	BSL
	83-32-9	Acenaphthene	2.91	49	ug/kg	81	81	DU-2	10/39	1.74 - 81	360,000	62.4	N	BSL
	208-96-8	Acenaphthylene	2.1	932	ug/kg	72	932	SD013	22/39	1.74 - 72	180,000	62.4	N	BSL
	120-12-7	Anthracene	0.461	1940	ug/kg	66	1,940	SD013	32/39	0.443 - 66	1,800,000	38.56	N	BSL
	56-55-3	Benzo(a)anthracene	1.1	2260	ug/kg	33	2,260	SD013	30/39	0.46 - 33	1,100	13.75	Y	ASL
	50-32-8	Benzo(a)pyrene	1	2570	ug/kg	33	2,570	SD013	25/39	0.443 - 33	110	15.91	Y	ASL
	205-99-2	Benzo(b)fluoranthene	1.9	6750	ug/kg	33	6,750	SD013	34/39	0.59 - 72	1,100	22.7	Y	ASL
	207-08-9	Benzo(k)fluoranthene	0.729	2340	ug/kg	90	2,340	SD013	26/39	0.443 - 90	11,000	10.85	N	BSL
	191-24-2	Benzo(g,h,i)perylene	3.76	1550	ug/kg	80	1,550	SD013	9/39	0.886 - 80	180,000	15.15	N	BSL
	218-01-9	Chrysene	1.4	3750	ug/kg	33	3,750	SD013	33/39	0.46 - 33	110,000	16.57	N	BSL
	53-70-3	Dibenzo(a,h)anthracene	7.8	86	ug/kg	72	86	SO031	4/39	0.59 - 72	110	8.21	N	BSL
	206-44-0	Fluoranthene	1.82	3000	ug/kg	74	3,000	SD013	33/39	0.443 - 74	240,000	46.9	N	BSL
	86-73-7	Fluorene	0.492	105	ug/kg	72	105	SD013	22/39	0.443 - 72	240,000	62.4	N	BSL
	193-39-5	Indeno (1,2,3-cd) pyrene	3.01	2110	ug/kg	63	2,110	SD013	15/39	0.443 - 63	1,100	14.73	Y	ASL
	85-01-8	Phenanthrene	0.899	435	ug/kg	65	435	SD013	33/39	0.886 - 65	180,000	38.98	N	BSL
	129-00-0	Pyrene	1.57	4370	ug/kg	71	4,370	SD013	33/39	0.886 - 71	180,000	46.9	N	BSL
		Pesticides												
	72-54-8	4,4'-DDD (p,p'-DDD)	2	2	ug/kg	7.87	7.87	SO031	1/14	0.33 - 7.87	190	NA	N	BSL
	72-55-9	4,4'-DDE (p,p'-DDE)	0.529	11	ug/kg	4.5	11	SO028	3/14	0.33 - 4.5	2,000	NA	N	BSL
	50-29-3	4,4'-DDT (p,p'-DDT)	2.7	6.43	ug/kg	11	11	SO031	3/14	0.33 - 11	1,900	NA	N	BSL
	60-57-1	Dieldrin	0.874	1.13	ug/kg	4.5	4.5	SO031	2/14	0.33 - 4.5	34	NA	N	BSL
	33213-65-9	Endosulfan II (beta)	3.97	3.97	ug/kg	4.5	4.5	SO031	1/14	0.33 - 4.5	1,900	NA	N	BSL
	7421-93-4	Endrin aldehyde	12	12	ug/kg	6.74	12	SO027	1/14	0.33 - 6.74	1,900	NA	N	BSL
West of Navassa Road		***Inorganics***												
		None												
		Volatile organic compounds												
		None												
		Semi-volatile organic compounds												
	100-52-7	Benzaldehyde	46	110	ug/kg	630	110	KM8	3/15	370 - 630	170,000	NA	N	BSL
		PAHs												
	56-55-3	Benzo(a)anthracene	51	110	ug/kg	63	110	KM11	4/15	37 - 63	1,100	13.75	N	BSL
	50-32-8	Benzo(a)pyrene	38	100	ug/kg	63	100	KM11	5/15	37 - 63	110	15.91	N	BSL
	205-99-2	Benzo(b)fluoranthene	76	180	ug/kg	63	180	KM9, KM11	7/15	37 - 63	1,100	22.7	N	BSL
	191-24-2	Benzo(g,h,i)perylene	47	49	ug/kg	63	63	KM2	2/15	37 - 63	180,000	15.15	N	BSL
	207-08-9	Benzo(k)fluoranthene	57	150	ug/kg	63	150	KM11	7/15	37 - 63	11,000	10.85	N	BSL
	218-01-9	Chrysene	43	180	ug/kg	63	180	KM11	7/15	37 - 63	110,000	16.57	N	BSL
	206-44-0	Fluoranthene	54	250	ug/kg	63	250	KM11	5/15	37 - 63	240,000	46.9	N	BSL
	193-39-5	Indeno (1,2,3-cd) pyrene	44	56	ug/kg	63	63	KM11	2/15	37 - 63	1,100	14.73	N	BSL
	85-01-8	Phenanthrene	51	51	ug/kg	63	63	KM11	1/15	37 - 63	180,000	38.98	N	BSL
	129-00-0	Pyrene	41	230	ug/kg	63	230	KM11	7/15	37 - 63	180,000	46.9	N	BSL
		Pesticides												
		None												

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
		Inorganics												
	E1644012	% Moisture	6.6	45.2	%	NA	45.2	BPSB11	27/27	0.5 - 0.5	NA	NA	N	PC
	E1642941	% Solids	51	75.2	%	NA	75.2	SB-139	3/3	0 - 0.1	NA	171.5	N	PC
	E701250	Carbon, Organic	29,000	35,000	mg/kg	NA	35,000	RISD01	2/2	35 - 35	NA	NA	N	PC
	E1640382	Total Solids	86	90	%	NA	90	RISB33; RISB34	5/5	0.1 - 0.1	NA	171.5	N	PC
	7429-90-5	Aluminum	3,160	19,000	mg/kg	NA	19,000	RISD02	7/7	2 - 6.67	7,700	8,472	Y	ASL
	7440-38-2	Arsenic	0.87	30.3	mg/kg	NA	30.3	SS03	9/9	0.12 - 0.78	0.68	2.88	Y	ASL
	7440-39-3	Barium	4.89	32	mg/kg	NA	32	RISD02	7/7	0.0846 - 0.68	1,500	30.95	N	BSL
	7440-41-7	Beryllium	0.0579	0.58	mg/kg	0.53	0.58	RISD01	3/7	0.0413 - 0.53	16	0.455	N	BSL
	7440-43-9	Cadmium	0.106	0.151	mg/kg	0.55	0.55	RISD02	3/7	0.0827 - 0.55	7.1	0.455	N	BSL
	7440-70-2	Calcium	80	6,230	mg/kg	NA	6230	SS03	7/7	6.41 - 11	NA	3,286	N	EN
	7440-47-3	Chromium	3.38	18	mg/kg	NA	18	RISD02	9/9	0.12 - 0.53	12,000	12.01	N	BSL
	7440-48-4	Cobalt	0.419	1.6	mg/kg	NA	1.6	RISD02	7/7	0.144 - 0.66	2.3	1.52	N	BSL
	7440-50-8	Copper	2.27	21	mg/kg	NA	21	RISD02	7/7	0.288 - 0.57	310	7.56	N	BSL
	7439-89-6	Iron	2,330	12,000	mg/kg	NA	12,000	RISD02	7/7	2.3 - 6.67	5,500	8,592	Y	ASL
	7439-92-1	Lead	5.89	29	mg/kg	NA	29	RISD02	7/7	0.23 - 0.78	400	32.64	N	BSL
	7439-95-4	Magnesium	103	790	mg/kg	NA	790	RISD02	7/7	3.2 - 4.2	NA	935.1	N	EN
	7439-96-5	Manganese	5.95	34.6	mg/kg	NA	34.6	SS03	7/7	0.0346 - 0.4	180	56.06	N	BSL
	7439-97-6	Mercury	0.021	0.51	mg/kg	NA	0.51	RISD02	7/7	0.0026 - 0.0081	1.1	0.091	N	BSL
	7440-02-0	Nickel	1.99	8.9	mg/kg	0.32	8.9	RISD02	6/7	0.29 - 0.33	150	3.46	N	BSL
	7440-09-7	Potassium	114	720	mg/kg	NA	720	RISD02	7/7	9.62 - 74	NA	771.6	N	EN
	7440-23-5	Sodium	44	49	mg/kg	34.6	49	RISD01	2/7	29 - 34.6	NA	76.76	N	EN
	7440-28-0	Thallium	0.15	0.15	mg/kg	0.96	0.96	RISD02; SS03; SS04; SS07	1/9	0.12 - 0.96	0.078	0.455	Y	ASL
	7440-62-2	Vanadium	8.82	78	mg/kg	NA	78	RISD02	7/7	0.0962 - 1.7	39	21.5	Y	ASL
	7440-66-6	Zinc	7.96	77	mg/kg	NA	77	RISD01	7/7	0.442 - 0.66	2,300	46.46	N	BSL
		Volatile organic compounds												
Pond Area	67-64-1	Acetone	38	310	ug/kg	300	310	RISD02	4/7	6 - 300	6,100,000	NA	N	BSL
	71-43-2	Benzene	250	1600	ug/kg	22	1,600	RISD01	2/7	0.4 - 54	1,200	NA	Y	ASL
	108-90-7	Chlorobenzene	4.4	4.4	ug/kg	43	43	SS04	1/7	0.8 - 43	28,000	NA	N	BSL
	100-41-4	Ethylbenzene	430	44,000	ug/kg	1	44,000	RISD02	3/9	0.48 - 86	5,800	NA	Y	ASL
	98-82-8	Isopropylbenzene	17,000	38,000	ug/kg	650	38,000	RISD02	2/9	0.52 - 650	190,000	NA	N	BSL
	78-93-3	Methyl Ethyl Ketone	57	57	ug/kg	170	170	SS04	1/7	2.8 - 170	2,700,000	NA	N	BSL
	108-10-1	Methyl Isobutyl Ketone	5.1	5.1	ug/kg	130	130	SS04	1/7	1.8 - 130	3,300,000	NA	N	BSL
	108-87-2	Methylcyclohexane	1.5	14	ug/kg	43	43	SS04	3/9	0.5 - 43	650,000	NA	N	BSL
	100-42-5	Styrene	54	280	ug/kg	43	280	RISD01	2/7	0.8 - 43	600,000	NA	N	BSL
	108-88-3	Toluene	250	12,000	ug/kg	1	12,000	RISD01; RISD02	3/9	0.48 - 89	490,000	NA	N	BSL
	1330-20-7	Total Xylenes	1,900	82,000	ug/kg	1	82,000	RISD02	3/7	0.8 - 310	58,000	NA	Y	ASL
		Semi-volatile organic compounds												
	1319-77-3	(3-and/or 4-)Methylphenol	190	220	ug/kg	3300	3,300	EPSB13	2/11	36 - 3300	320,000	NA	N	BSL
	92-52-4	1,1-Biphenyl	47,000	100,000	ug/kg	1700	100,000	TP01	3/13	22 - 1700	4,700	NA	Y	ASL
	105-67-9	2,4-Dimethylphenol	24	710	ug/kg	2200	2,200	RISB34	3/29	22 - 2200	130,000	NA	N	BSL
	121-14-2	2,4-Dinitrotoluene	300	300	ug/kg	3300	3,300	EPSB13; TP01	1/29	12 - 3300	1,700	NA	N	CBSL
	95-48-7	2-Methylphenol	59	59	ug/kg	1700	1,700	EPSB13; TP01	1/29	14 - 1700	320,000	NA	N	BSL
	91-94-1	3,3'-Dichlorobenzidine	370	370	ug/kg	3800	3,800	RISB34	1/29	39 - 3800	1,200	NA	N	CBSL
	98-86-2	Acetophenone	780	780	ug/kg	9300	9,300	RISB34	1/13	22 - 9300	780,000	NA	N	BSL
	65-85-0	Benzoic acid	445	445	ug/kg	NA	445	SB-139	1/1	220 - 220	25,000,000	NA	N	BSL
	117-81-7	Bis(2-ethylhexyl) phthalate	72	1,800	ug/kg	5000	5,000	EPSB13; TP01	7/29	18 - 5000	39,000	NA	N	BSL
	86-74-8	Carbazole	66	1,100,000	ug/kg	170	1,100,000	RISD01	25/31	18 - 48000	180,000	NA	Y	ASL
	132-64-9	Dibenzofuran	18	2,300,000	ug/kg	1700	2,300,000	RISD01; RISD02	21/31	15 - 39000	7,300	NA	Y	ASL
	84-74-2	Di-n-butylphthalate	220	220	ug/kg	6800	6,800	RISB34	1/29	67 - 6800	630,000	NA	N	BSL
	86-30-6	N-Nitrosodiphenylamine	15,000	15,000	ug/kg	1700	15,000	TP01	1/29	13 - 1700	110,000	NA	N	BSL
	106-44-5	p-Cresol (4-Methylphenol)	71	71	ug/kg	3300	3,300	TP01	1/19	30 - 3300	630,000	NA	N	BSL
	108-95-2	Phenol	150	270	ug/kg	1800	1,800	RISB34	2/29	18 - 1800	1,900,000	NA	N	BSL

Table 2-2
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Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Pond Area		***PAHs***												
	91-57-6	2-Methylnaphthalene	26	2,400,000	ug/kg	1700	2,400,000	RISD01	19/31	17 - 45000	24,000	62.4	Y	ASL
	208-96-8	Acenaphthylene	90	54,000	ug/kg	37	54,000	TP01	26/29	22 - 2200	180,000	62.4	N	BSL
	83-32-9	Acenaphthene	32	3,100,000	ug/kg	1700	3,100,000	RISD02	23/31	22 - 57000	360,000	62.4	Y	ASL
	120-12-7	Anthracene	69	820,000	ug/kg	25	820,000	TP01	27/29	13 - 17000	1,800,000	38.56	N	BSL
	56-55-3	Benzo(a)anthracene	18	520,000	ug/kg	33	520,000	TP01	29/31	13 - 33000	1,100	13.75	Y	ASL
	50-32-8	Benzo(a)pyrene	28	190,000	ug/kg	33	190,000	TP01	29/31	22 - 57000	110	15.91	Y	ASL
	205-99-2	Benzo(b)fluoranthene	31	330,000	ug/kg	NA	330,000	TP01	31/31	23 - 60000	1,100	22.7	Y	ASL
	191-24-2	Benzo(g,h,i)perylene	20	48,000	ug/kg	23	48,000	TP01	28/29	18 - 1800	180,000	15.15	N	BSL
	207-08-9	Benzo(k)fluoranthene	53	170,000	ug/kg	29	170,000	RISD01; RISD02	30/31	18 - 48000	11,000	10.85	Y	ASL
	218-01-9	Chrysene	29	530,000	ug/kg	NA	530,000	RISD02	31/31	23 - 65000	110,000	16.57	Y	ASL
	53-70-3	Dibenzo(a,h)anthracene	110	19,000	ug/kg	65000	65,000	RISD02	26/31	25 - 65000	110	8.21	Y	ASL
	206-44-0	Fluoranthene	21	3,800,000	ug/kg	NA	3,800,000	RISD02	31/31	14 - 83000	240,000	46.9	Y	ASL
	86-73-7	Fluorene	14	2,800,000	ug/kg	1700	2,800,000	RISD02	25/31	12 - 30000	240,000	62.4	Y	ASL
	193-39-5	Indeno (1,2,3-cd) pyrene	27	54,000	ug/kg	54000	54,000	TP01	28/31	21 - 54000	1,100	14.73	Y	ASL
	91-20-3	Naphthalene	23	3,400,000	ug/kg	1700	3,400,000	RISD01	21/31	15 - 39000	3,800	62.4	Y	ASL
	85-01-8	Phenanthrene	44	3,300,000	ug/kg	1700	3,300,000	TP01	24/29	15 - 83000	180,000	38.98	Y	ASL
	129-00-0	Pyrene	31	2,400,000	ug/kg	NA	2,400,000	RISD02	31/31	16 - 83000	180,000	46.9	Y	ASL
		Pesticides												
	72-54-8	4,4'-DDD (p,p'-DDD)	0.56	0.56	ug/kg	33	33	SS03; SS07	1/7	0.33 - 33	190	NA	N	BSL
	72-55-9	4,4'-DDE (p,p'-DDE)	0.62	0.62	ug/kg	33	33	SS03; SS07	1/7	0.33 - 33	2,000	NA	N	BSL
	50-29-3	4,4'-DDT (p,p'-DDT)	0.52	100	ug/kg	NA	100	RISD01; RISD02	7/7	0.33 - 33	1,900	NA	N	BSL
	309-00-2	Aldrin	150	150	ug/kg	17	150	RISD01	1/7	0.17 - 17	39	NA	Y	ASL
	319-84-6	alpha-BHC	56	56	ug/kg	17	56	SS03	1/7	0.17 - 17	86	NA	N	BSL
	33213-65-9	Endosulfan II (beta)	0.59	0.59	ug/kg	33	33	SS03; SS07	1/7	0.33 - 33	1,900	NA	N	BSL
	1031-07-8	Endosulfan Sulfate	0.48	9.8	ug/kg	33	33	SS03; SS07	2/7	0.33 - 33	1,900	NA	N	BSL
	72-20-8	Endrin	4.2	110	ug/kg	0.33	110	SS03	5/7	0.33 - 33	1,900	NA	N	BSL
	7421-93-4	Endrin aldehyde	3	150	ug/kg	3.3	150	SS03	5/7	0.33 - 33	1,900	NA	N	BSL
Process Area		***Inorganics***												
	E1644012	% Moisture	5.3	16.7	%	NA	16.7	SS02	10/10	0.5 - 0.5	NA	NA	N	PC
	E1642941	% Solids	51	89	%	NA	89	RISB12	6/6	0 - 0.1	NA	171.5	N	PC
	E701250	Carbon, Organic	40,400	48,000	mg/kg	NA	48,000	RISD03	2/2	35 - 35	NA	NA	N	PC
	57-12-5	Cyanide	0.36	0.36	mg/kg	0.17	0.36	SS02	1/2	0.17 - 0.18	2.3	NA	N	BSL
	E1640382	Total Solids	86	90	%	NA	90	RISB23	3/3	0.1 - 0.1	NA	171.5	N	PC
	7429-90-5	Aluminum	424	13,000	mg/kg	NA	13,000	RISD03	10/10	1.2 - 36	7,700	8,472	Y	ASL
	7440-36-0	Antimony	0.27	0.27	mg/kg	0.82	0.82	SS01	1/10	0.24 - 0.82	3.1	0.467	N	BSL
	7440-38-2	Arsenic	0.45	6.14	mg/kg	NA	6.14	SD112-T	10/10	0.12 - 0.76	0.68	2.88	Y	ASL
	7440-39-3	Barium	0.77	41.4	mg/kg	NA	41.4	SD111-T	10/10	0.0871 - 0.67	1,500	30.95	N	BSL
	7440-41-7	Beryllium	0.0563	0.28	mg/kg	0.52	0.52	RISD04	3/10	0.0426 - 0.52	16	0.455	N	BSL
	7440-43-9	Cadmium	0.115	0.115	mg/kg	0.54	0.54	RISD04	1/10	0.0851 - 0.54	7.1	0.455	N	BSL
	7440-70-2	Calcium	47	2,590	mg/kg	63.8	2,590	SD111-T	9/10	6.5 - 89.9	NA	3,286	N	EN
	7440-47-3	Chromium	0.76	14	mg/kg	NA	14	RISD03	10/10	0.1 - 0.53	12,000	12.01	N	BSL
	18540-29-9	Chromium, Hexavalent	0.836	0.836	mg/kg	0.669	0.836	SD110-T	1/5	0.453 - 0.669	0.3	4.65	Y	ASL
	7440-48-4	Cobalt	0.51	2.1	mg/kg	0.13	2.1	RISD03	8/10	0.12 - 0.65	2.3	1.52	N	BSL
	7440-50-8	Copper	0.72	15.3	mg/kg	NA	15.3	SD111-T	10/10	0.12 - 0.56	310	7.56	N	BSL
	7439-89-6	Iron	53.7	6,800	mg/kg	NA	6,800	RISD03	10/10	1.5 - 18	5,500	8,592	N	BKG
	7439-92-1	Lead	10.9	176	mg/kg	NA	176	SD110-T	10/10	0.12 - 1.8	400	32.64	N	BSL
	7439-95-4	Magnesium	18.6	426	mg/kg	12.8	426	SD111-T	9/10	2.5 - 18	NA	935.1	N	EN
	7439-96-5	Manganese	0.88	11.7	mg/kg	0.61	11.7	SD111-T	9/10	0.0356 - 0.9	180	56.06	N	BSL
	7439-97-6	Mercury	0.0097	0.31	mg/kg	0.0046	0.31	SD111-T	9/10	0.0025 - 0.0085	1.1	0.091	N	BSL
	7440-02-0	Nickel	0.26	6.1	mg/kg	0.26	6.1	RISD03	9/10	0.18 - 0.36	150	3.46	N	BSL
	7440-09-7	Potassium	14.1	400	mg/kg	12.8	400	RISD03	9/10	9.9 - 72	NA	771.6	N	EN
	7782-49-2	Selenium	0.68	0.96	mg/kg	1.6	1.6	RISD04	3/10	0.12 - 1.6	39	3.55	N	BSL
	7440-23-5	Sodium	28.4	55.6	mg/kg	34.6	55.6	SD111-T	4/10	12.2 - 34.6	NA	76.76	N	EN
	7440-28-0	Thallium	0.18	0.18	mg/kg	0.96	0.96	SS01	1/10	0.12 - 0.96	0.078	0.455	Y	ASL

Table 2-2
Occurrence, Distribution and Selection of COPCs in Surface Soil
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Process Area	7440-62-2	Vanadium	1.83	47	mg/kg	NA	47	RISD03	10/10	0.099 - 1.7	39	21.5	Y	ASL
	7440-66-6	Zinc	5.7	73	mg/kg	2.55	73	RISD03	8/10	0.39 - 3.6	2,300	46.46	N	BSL
		Volatile organic compounds												
	67-64-1	Acetone	170	560	ug/kg	350	560	SS02	2/9	0.55 - 350	6,100,000	NA	N	BSL
	100-41-4	Ethylbenzene	1.5	1.5	ug/kg	50	50	SS01	1/9	0.275 - 50	5,800	NA	N	BSL
	79-20-9	Methyl Acetate	453	453	ug/kg	100	453	SD111-T	1/9	0.25 - 100	7,800,000	NA	N	BSL
	78-93-3	Methyl Ethyl Ketone	5.62	15	ug/kg	200	200	SS01	3/9	0.55 - 200	2,700,000	NA	N	BSL
	108-87-2	Methylcyclohexane	66	66	ug/kg	23	66	SS01	1/9	0.275 - 50	650,000	NA	N	BSL
	99-87-6	p-Isopropyltoluene	0.958	176	ug/kg	NA	176	SD110-T	5/5	0.275 - 23	490,000	NA	N	BSL
	108-88-3	Toluene	2.3	478	ug/kg	50	478	SD111-T	5/9	0.275 - 50	490,000	NA	N	BSL
	1330-20-7	Total Xylenes	4.2	62	ug/kg	45	62	SS01	2/9	0.55 - 50	58,000	NA	N	BSL
		Semi-volatile organic compounds												
	1319-77-3	(3-and/or 4-)Methylphenol	910	910	ug/kg	2360	2,360	SD111-T	1/12	67 - 2360	320,000	NA	N	BSL
	92-52-4	1,1-Biphenyl	3,200	3,200	ug/kg	2360	3,200	SS02	1/11	170 - 2360	4,700	NA	N	BSL
	105-67-9	2,4-Dimethylphenol	1,400	1,400	ug/kg	2360	2,360	SD111-T	1/17	22 - 2360	130,000	NA	N	BSL
	95-48-7	2-Methylphenol	540	540	ug/kg	2360	2,360	SD111-T	1/17	14 - 2360	320,000	NA	N	BSL
	117-81-7	Bis(2-ethylhexyl) phthalate	23	570	ug/kg	2500	2,500	PASB20	3/17	18 - 2500	39,000	NA	N	BSL
	86-74-8	Carbazole	87	300,000	ug/kg	280	300,000	SS02	19/22	18 - 3300	180,000	NA	Y	ASL
	132-64-9	Dibenzofuran	26	230,000	ug/kg	358	230,000	PASB19	15/22	15 - 3300	7,300	NA	Y	ASL
	86-30-6	N-Nitrosodiphenylamine	720	720	ug/kg	830	830	PASB20	1/17	13 - 830	110,000	NA	N	BSL
		PAHs												
	90-12-0	1-Methylnaphthalene	16	16	ug/kg	327	327	SD114-T	1/6	10 - 327	18,000	62.4	N	BSL
	91-57-6	2-Methylnaphthalene	14	95,000	ug/kg	330	95,000	PASB19	18/22	10 - 3300	24,000	62.4	Y	ASL
	83-32-9	Acenaphthene	22	330,000	ug/kg	330	330,000	PASB19	19/22	20 - 3300	360,000	62.4	N	BSL
	208-96-8	Acenaphthylene	230	18,000	ug/kg	NA	18,000	PASB19	17/17	20 - 830	180,000	62.4	N	BSL
	120-12-7	Anthracene	530	2,100,000	ug/kg	NA	2,100,000	SS02	17/17	5.1 - 17000	1,800,000	38.56	Y	ASL
	56-55-3	Benzo(a)anthracene	660	220,000	ug/kg	NA	220,000	PASB19	22/22	13 - 3300	1,100	13.75	Y	ASL
	50-32-8	Benzo(a)pyrene	620	77,000	ug/kg	NA	77,000	PASB19	22/22	5.1 - 3300	110	15.91	Y	ASL
	205-99-2	Benzo(b)fluoranthene	1,600	170,000	ug/kg	NA	170,000	PASB19	22/22	20 - 3300	1,100	22.7	Y	ASL
	191-24-2	Benzo(g,h,i)perylene	552	32,000	ug/kg	11	32,000	PASB19	16/17	10 - 830	180,000	15.15	N	BSL
	207-08-9	Benzo(k)fluoranthene	730	70,000	ug/kg	NA	70,000	PASB19	22/22	5.1 - 3300	11,000	10.85	Y	ASL
	218-01-9	Chrysene	1,200	240,000	ug/kg	NA	240,000	PASB19	22/22	20 - 3300	110,000	16.57	Y	ASL
	53-70-3	Dibenzo(a,h)anthracene	90	13,000	ug/kg	589	13,000	PASB19	18/22	20 - 2100	110	8.21	Y	ASL
	206-44-0	Fluoranthene	1,200	1,200,000	ug/kg	NA	1,200,000	PASB19	22/22	5.1 - 67000	240,000	46.9	Y	ASL
	86-73-7	Fluorene	13	370,000	ug/kg	330	370,000	PASB19	20/22	5.1 - 3300	240,000	62.4	Y	ASL
	193-39-5	Indeno (1,2,3-cd) pyrene	230	42,000	ug/kg	5.35	42,000	PASB19	21/22	5.1 - 3300	1,100	14.73	Y	ASL
	91-20-3	Naphthalene	53	73,000	ug/kg	330	73,000	PASB19	13/22	5.1 - 3300	3,800	62.4	Y	ASL
	85-01-8	Phenanthrene	216	1,500,000	ug/kg	200	1,500,000	PASB19	16/17	10 - 67000	180,000	38.98	Y	ASL
	129-00-0	Pyrene	1,300	870,000	ug/kg	NA	870,000	PASB19	22/22	10 - 67000	180,000	46.9	Y	ASL
		Pesticides												
	72-55-9	4,4'-DDE (p,p'-DDE)	67	67	ug/kg	33	67	SS02	1/5	0.16 - 33	2,000	NA	N	BSL
	50-29-3	4,4'-DDT (p,p'-DDT)	4.1	130	ug/kg	NA	130	SS01	6/6	0.17 - 33	1,900	NA	N	BSL
	33213-65-9	Endosulfan II (beta)	44	56	ug/kg	0.39	56	SS01	2/5	0.24 - 33	1,900	NA	N	BSL
	1031-07-8	Endosulfan Sulfate	130	130	ug/kg	33	130	SS02	1/6	0.22 - 33	1,900	NA	N	BSL
	72-20-8	Endrin	61	130	ug/kg	0.38	130	SS01	2/6	0.23 - 33	1,900	NA	N	BSL
	7421-93-4	Endrin aldehyde	160	190	ug/kg	0.38	190	SS01	2/6	0.23 - 33	1,900	NA	N	BSL
	1024-57-3	Heptachlor epoxide	11	11	ug/kg	17	17	SS01; SS02	1/5	0.19 - 17	70	NA	N	BSL
	87-86-5	Pentachlorophenol	5.06	21	ug/kg	4200	4,200	PASB20	1/17	5.06 - 4200	1,000	NA	N	CBSL

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Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Treated Wood Storage Area		***Inorganics***												
	E1644012	% Moisture	8.5	17.8	%	NA	17.8	TWSB27	7/7	0.5 - 0.5	NA	NA	N	PC
	E1642941	% Solids	85	93	%	NA	93	SB-120	15/15	0 - 0.1	NA	171.5	N	PC
	7429-90-5	Aluminum	3,600	11,200	mg/kg	NA	11,200	SS12	4/4	1.2 - 6.54	7,700	8,472	Y	ASL
	7440-38-2	Arsenic	0.849	2.98	mg/kg	NA	2.98	SS12	4/4	0.44 - 0.657	0.68	2.88	Y	ASL
	7440-39-3	Barium	3.6	19.1	mg/kg	NA	19.1	SS12	4/4	0.0846 - 0.39	1,500	30.95	N	BSL
	7440-41-7	Beryllium	0.0631	0.0631	mg/kg	0.31	0.31	RISB09	1/4	0.0413 - 0.31	16	0.455	N	BSL
	7440-43-9	Cadmium	0.0964	0.0964	mg/kg	0.32	0.32	RISB09	1/4	0.0827 - 0.32	7.1	0.455	N	BSL
	7440-70-2	Calcium	12	1,110	mg/kg	6.54	1,110	SS12	3/4	6.2 - 6.54	NA	3,286	N	EN
	7440-47-3	Chromium	3.8	9.73	mg/kg	NA	9.73	SS12	4/4	0.1 - 0.52	12,000	12.01	N	BSL
	7440-48-4	Cobalt	0.546	1.07	mg/kg	0.38	1.07	SS12	2/4	0.144 - 0.38	2.3	1.52	N	BSL
	7440-50-8	Copper	2.78	5.41	mg/kg	NA	5.41	SS12	4/4	0.288 - 0.33	310	7.56	N	BSL
	7439-89-6	Iron	1700	3490	mg/kg	NA	3,490	SS12	4/4	1.4 - 6.54	5,500	8,592	N	BSL
	7439-92-1	Lead	6.44	15	mg/kg	NA	15	RISB09	4/4	0.14 - 0.765	400	32.64	N	BSL
	7439-95-4	Magnesium	82	471	mg/kg	NA	471	SS12	4/4	2.4 - 3.27	NA	935.1	N	EN
	7439-96-5	Manganese	1.7	28.5	mg/kg	NA	28.5	SS12	4/4	0.0346 - 0.23	180	56.06	N	BSL
	7439-97-6	Mercury	0.0202	0.033	mg/kg	0.0051	0.033	RISB03	3/4	0.0027 - 0.0051	1.1	0.091	N	BSL
	7440-02-0	Nickel	0.73	3.43	mg/kg	NA	3.43	SS12	4/4	0.17 - 0.324	150	3.46	N	BSL
	7440-09-7	Potassium	110	389	mg/kg	NA	389	SS12	4/4	9.62 - 43	NA	771.6	N	EN
	7440-28-0	Thallium	0.73	0.73	mg/kg	0.941	0.941	SS08	1/4	0.55 - 0.941	0.078	0.455	Y	ASL
	7440-62-2	Vanadium	5.9	11.8	mg/kg	NA	11.8	SS12	4/4	0.0962 - 0.99	39	21.5	N	BSL
	7440-66-6	Zinc	2.2	34.1	mg/kg	NA	34.1	SS12	4/4	0.38 - 0.451	2,300	46.46	N	BSL
		Volatile organic compounds												
	67-64-1	Acetone	19	75	ug/kg	3	75	SS12	2/4	2.8 - 7	6,100,000	NA	N	BSL
	75-09-2	Methylene Chloride	0.77	1.1	ug/kg	2	2	SS08; SS12	2/4	0.44 - 2	35,000	NA	N	BSL
		Semi-volatile organic compounds												
	62-53-3	Aniline	1,470	1,470	ug/kg	400	1,470	SB-134	1/10	38 - 400	44,000	NA	N	BSL
	65-85-0	Benzoic acid	209	237	ug/kg	1900	1,900	SB-133	2/10	180 - 1900	25,000,000	NA	N	BSL
	86-74-8	Carbazole	51	2,300	ug/kg	25	2,300	SB-125	18/20	18 - 330	180,000	NA	N	BSL
	132-64-9	Dibenzofuran	30	250	ug/kg	330	330	TWSB27	3/20	15 - 330	7,300	NA	N	BSL
		PAHs												
	91-57-6	2-Methylnaphthalene	19.9	130	ug/kg	330	330	TWSB27	3/20	17 - 330	24,000	62.4	N	BSL
	83-32-9	Acenaphthene	26	220	ug/kg	330	330	TWSB27	6/20	19 - 330	360,000	62.4	N	BSL
	208-96-8	Acenaphthylene	72	2,260	ug/kg	18	2,260	SB-125	14/15	18 - 330	180,000	62.4	N	BSL
	120-12-7	Anthracene	25.3	4,980	ug/kg	NA	4,980	SB-125	15/15	20 - 330	1,800,000	38.56	N	BSL
	56-55-3	Benzo(a)anthracene	48.1	7,900	ug/kg	13	7,900	RISB09	19/20	13 - 330	1,100	13.75	Y	ASL
	50-32-8	Benzo(a)pyrene	42.1	6,400	ug/kg	22	6,400	RISB09	19/20	21 - 330	110	15.91	Y	ASL
	205-99-2	Benzo(b)fluoranthene	76.6	12,900	ug/kg	23	12,900	SB-125	19/20	20 - 330	1,100	22.7	Y	ASL
	191-24-2	Benzo(g,h,i)perylene	24.6	3,520	ug/kg	NA	3,520	SB-125	15/15	19 - 330	180,000	15.15	N	BSL
	207-08-9	Benzo(k)fluoranthene	18	8,920	ug/kg	18	8,920	SB-125	19/20	18 - 330	11,000	10.85	N	BSL
	218-01-9	Chrysene	78.2	15,100	ug/kg	25	15,100	SB-125	19/20	18 - 330	110,000	16.57	N	BSL
	53-70-3	Dibenzo(a,h)anthracene	31	1,300	ug/kg	240	1,300	TWSB27	12/20	22 - 330	110	8.21	Y	ASL
	206-44-0	Fluoranthene	121	29,000	ug/kg	14	29,000	RISB09	19/20	14 - 330	240,000	46.9	N	BSL
	86-73-7	Fluorene	21	230	ug/kg	330	330	TWSB27	7/20	11 - 330	240,000	62.4	N	BSL
	193-39-5	Indeno (1,2,3-cd) pyrene	31.4	4,870	ug/kg	21	4,870	SB-125	19/20	20 - 330	1,100	14.73	Y	ASL
	91-20-3	Naphthalene	24.2	190	ug/kg	330	330	TWSB27	4/20	15 - 330	3,800	62.4	N	BSL
	85-01-8	Phenanthrene	32.5	2,810	ug/kg	33	2,810	SB-125	14/15	18 - 330	180,000	38.98	N	BSL
	129-00-0	Pyrene	159	23,000	ug/kg	16	23,000	RISB09	19/20	16 - 330	180,000	46.9	N	BSL
		Pesticides												
	72-55-9	4,4'-DDE (p,p'-DDE)	2.2	2.2	ug/kg	3.3	3.3	SS08	1/4	0.16 - 3.3	2,000	NA	N	BSL
	50-29-3	4,4'-DDT (p,p'-DDT)	3.6	58	ug/kg	0.17	58	RISB09	3/4	0.17 - 3.3	1,900	NA	N	BSL
	33213-65-9	Endosulfan II (beta)	0.55	0.55	ug/kg	3.3	3.3	SS08	1/4	0.24 - 3.3	1,900	NA	N	BSL
	72-20-8	Endrin	1.1	5.2	ug/kg	0.24	5.2	SS08	2/4	0.23 - 3.3	1,900	NA	N	BSL
	7421-93-4	Endrin aldehyde	1.9	8.7	ug/kg	0.24	8.7	SS08	2/4	0.23 - 3.3	1,900	NA	N	BSL
	76-44-8	Heptachlor	18	18	ug/kg	1.7	18	RISB09	1/4	0.17 - 1.7	130	NA	N	BSL

Table 2-2
Occurrence, Distribution and Selection of COPCs in Surface Soil
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Untreated Wood Storage Area		***Inorganics***												
	E1644012	% Moisture	2.5	8	%	NA	8	BKSB04	4/4	0.5 - 0.5	NA	NA	N	PC
	E1642941	% Solids	78.8	95.6	%	NA	95.6	SB-119R	17/17	0 - 0.1	NA	171.5	N	PC
	E17028275	pH	7.2	7.2	pH Units	NA	7.2	BRSB01	1/1	0.01 - 0.01	NA	N/A	N	PC
	E1640382	Total Solids	87	90	%	NA	90	RISB42	5/5	0.1 - 0.1	NA	171.5	N	PC
	7429-90-5	Aluminum	442	3,500	mg/kg	NA	3,500	RISB10	20/20	1.2 - 31.6	7,700	8,472	N	BSL
	7440-36-0	Antimony	0.55	0.55	mg/kg	0.37	0.55	SD021	1/19	0.24 - 0.37	3.1	0.467	N	BSL
	7440-38-2	Arsenic	0.24	10.8	mg/kg	0.663	10.8	SD021	22/23	0.12 - 0.663	0.68	2.88	Y	ASL
	7440-39-3	Barium	3.85	26	mg/kg	NA	26	RISB10	19/19	0.12 - 0.39	1,500	30.95	N	BSL
	7440-41-7	Beryllium	0.15	0.21	mg/kg	0.3	0.3	RISB10	4/19	0.12 - 0.3	16	0.455	N	BSL
	7440-42-8	Boron	1.38	3.13	mg/kg	1.58	3.13	SO041	6/18	0.59 - 1.58	1,600	NA	N	BSL
	7440-70-2	Calcium	179	182,000	mg/kg	NA	182,000	SO048	19/19	6.3 - 692	NA	3,286	N	EN
	7440-47-3	Chromium	0.97	7.25	mg/kg	NA	7.25	SO048	23/23	0.1 - 0.525	12,000	12.01	N	BSL
	18540-29-9	Chromium, Hexavalent	1.45	1.71	mg/kg	NA	1.71	SO059	2/2	0.391 - 0.407	0.3	4.65	Y	ASL
	7440-48-4	Cobalt	0.14	1.05	mg/kg	0.14	1.05	SD021	15/19	0.12 - 0.38	2.3	1.52	N	BSL
	7440-50-8	Copper	0.86	17.5	mg/kg	NA	17.5	SD021	19/19	0.12 - 0.32	310	7.56	N	BSL
	7439-89-6	Iron	336	3740	mg/kg	NA	3,740	SD021	20/20	1.4 - 15.8	5,500	8,592	N	BSL
	7439-92-1	Lead	3.32	36	mg/kg	NA	36	SD021	19/19	0.12 - 0.16	400	32.64	N	BSL
	7439-95-4	Magnesium	22	3270	mg/kg	NA	3,270	SO038	19/19	2.4 - 15.8	NA	935.1	N	EN
	7439-96-5	Manganese	0.93	59.8	mg/kg	0.79	59.8	SO048	18/19	0.23 - 0.79	180	56.06	N	BSL
	7439-97-6	Mercury	0.0078	0.27	mg/kg	0.0058	0.27	SD021	17/19	0.0043 - 0.0076	1.1	0.091	N	BSL
	7440-02-0	Nickel	0.3	2.8	mg/kg	0.26	2.8	RISB10	18/19	0.17 - 0.32	150	3.46	N	BSL
	7440-09-7	Potassium	22.9	140	mg/kg	12.9	140	RISB10; SD021; SO048	18/19	11.8 - 42	NA	771.6	N	EN
	7782-49-2	Selenium	0.14	0.68	mg/kg	0.91	0.91	RISB10	7/19	0.12 - 0.91	39	3.55	N	BSL
	7440-23-5	Sodium	17.5	1310	mg/kg	17	1,310	SO048	8/19	11.8 - 17	NA	76.76	N	EN
	7440-62-2	Vanadium	1.44	10.4	mg/kg	NA	10.4	SD021	20/20	0.099 - 0.97	39	21.5	N	BSL
	7440-66-6	Zinc	3.87	25.9	mg/kg	2.72	25.9	SO048	17/19	0.38 - 3.16	2,300	46.46	N	BSL
		Volatile organic compounds												
	67-64-1	Acetone	25	241	ug/kg	2.8	241	SO039	15/18	0.536 - 38	6,100,000	NA	N	BSL
	71-43-2	Benzene	0.66	1.61	ug/kg	0.44	1.61	SO046	6/18	0.268 - 0.744	1,200	NA	N	BSL
	74-83-9	Bromomethane	2.99	2.99	ug/kg	0.986	2.99	SO046	1/18	0.36 - 1.49	680	NA	N	BSL
	75-15-0	Carbon disulfide	7.56	7.56	ug/kg	1.8	7.56	SO046	1/18	0.268 - 1.8	77,000	NA	N	BSL
	67-66-3	Chloroform	0.892	0.892	ug/kg	0.744	0.892	SD021	1/18	0.268 - 0.744	320	NA	N	BSL
	100-41-4	Ethylbenzene	1.67	6.05	ug/kg	0.47	6.05	SO048	6/18	0.268 - 0.744	5,800	NA	N	BSL
	79-20-9	Methyl Acetate	4.81	6.9	ug/kg	0.986	6.9	SO046	3/18	0.22 - 1.49	7,800,000	NA	N	BSL
	591-78-6	Methyl Butyl Ketone	65	65	ug/kg	1.49	65	SD021	1/18	0.536 - 1.49	20,000	NA	N	BSL
	78-93-3	Methyl Ethyl Ketone	4.55	23	ug/kg	1.3	23	SO046	6/18	0.536 - 1.49	2,700,000	NA	N	BSL
	108-10-1	Methyl Isobutyl Ketone	3.37	4.66	ug/kg	0.8	4.66	SO046	2/18	0.268 - 0.8	3,300,000	NA	N	BSL
	75-09-2	Methylene Chloride	0.96	0.96	ug/kg	2.98	2.98	SO046	1/18	0.44 - 2.98	35,000	NA	N	BSL
	99-87-6	p-Isopropyltoluene	0.737	14	ug/kg	0.744	14	SD021	3/17	0.268 - 0.744	490,000	NA	N	BSL
	100-42-5	Styrene	0.953	0.953	ug/kg	0.744	0.953	SO038	1/18	0.268 - 0.744	600,000	NA	N	BSL
	108-88-3	Toluene	1.28	3.16	ug/kg	0.47	3.16	SO040	9/18	0.268 - 0.744	490,000	NA	N	BSL
		Semi-volatile organic compounds												
	1319-77-3	(3-and/or 4-)Methylphenol	116	176	ug/kg	2060	2,060	SD021	3/31	29 - 2060	320,000	NA	N	BSL
	65-85-0	Benzoic acid	55	2,090	ug/kg	2060	2,090	SO044	18/29	39 - 2060	25,000,000	NA	N	BSL
	117-81-7	Bis(2-ethylhexyl) phthalate	13	37	ug/kg	312	312	SD021	5/37	5.85 - 312	39,000	NA	N	BSL
	86-74-8	Carbazole	9.26	3870	ug/kg	29	3,870	SD021	28/43	5.85 - 312	180,000	NA	N	BSL
	132-64-9	Dibenzofuran	21	200	ug/kg	312	312	SD021	13/43	5.85 - 312	7,300	NA	N	BSL
	131-11-3	Dimethyl phthalate	280	280	ug/kg	498	498	SD021	1/37	9.35 - 498	630,000	NA	N	BSL
	84-74-2	Di-n-butylphthalate	11	11	ug/kg	312	312	SD021	1/37	5.85 - 312	630,000	NA	N	BSL
	108-95-2	Phenol	32.9	32.9	ug/kg	2060	2,060	SD021	1/37	17 - 2060	1,900,000	NA	N	BSL

Table 2-2
Occurrence, Distribution and Selection of COPCs in Surface Soil
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Untreated Wood Storage Area		***PAHs***												
	90-12-0	1-Methylnaphthalene	1.36	118	ug/kg	26	118	SD021	7/29	0.989 - 26	18,000	62.4	N	BSL
	91-57-6	2-Methylnaphthalene	1.19	190	ug/kg	33	190	RISB01; RISB10	18/43	0.989 - 33	24,000	62.4	N	BSL
	83-32-9	Acenaphthene	3.9	395	ug/kg	51	395	SD021	18/42	1.94 - 51	360,000	62.4	N	BSL
	208-96-8	Acenaphthylene	2.28	4,480	ug/kg	22	4,480	SD021	31/37	1.94 - 51	180,000	62.4	N	BSL
	120-12-7	Anthracene	1.36	12,100	ug/kg	21	12,100	SD021	37/38	0.494 - 33	1,800,000	38.56	N	BSL
	56-55-3	Benzo(a)anthracene	3.07	10,600	ug/kg	12	10,600	SD021	42/43	1.94 - 130	1,100	13.75	Y	ASL
	50-32-8	Benzo(a)pyrene	3.78	13,000	ug/kg	25	13,000	SD021	42/43	0.494 - 33	110	15.91	Y	ASL
	205-99-2	Benzo(b)fluoranthene	10	39,000	ug/kg	NA	39,000	SD021	43/43	1.94 - 128	1,100	22.7	Y	ASL
	191-24-2	Benzo(g,h,i)perylene	4.44	6,280	ug/kg	22	6,280	SD021	34/37	0.989 - 33	180,000	15.15	N	BSL
	207-08-9	Benzo(k)fluoranthene	3.27	11,100	ug/kg	NA	11,100	SD021	43/43	0.494 - 180	11,000	10.85	Y	ASL
	218-01-9	Chrysene	5.17	18,200	ug/kg	NA	18,200	SD021	43/43	1.94 - 250	110,000	16.57	N	BSL
	53-70-3	Dibenzo(a,h)anthracene	2.95	2,480	ug/kg	26	2,480	SD021	24/43	1.94 - 51	110	8.21	Y	ASL
	206-44-0	Fluoranthene	5.53	20,000	ug/kg	NA	20,000	RISB10	43/43	0.494 - 140	240,000	46.9	N	BSL
	86-73-7	Fluorene	0.591	548	ug/kg	33	548	SD021	31/43	0.494 - 33	240,000	62.4	N	BSL
	193-39-5	Indeno (1,2,3-cd) pyrene	6.66	10,500	ug/kg	26	10,500	SD021	39/43	0.494 - 33	1,100	14.73	Y	ASL
	91-20-3	Naphthalene	22	270	ug/kg	33	270	RISB10	11/43	0.494 - 33	3,800	62.4	N	BSL
	85-01-8	Phenanthrene	2.16	1,990	ug/kg	21	1,990	SD021	35/37	0.989 - 33	180,000	38.98	N	BSL
	129-00-0	Pyrene	5.75	20,000	ug/kg	NA	20,000	SD021	43/43	0.989 - 160	180,000	46.9	N	BSL
		Pesticides												
	50-29-3	4,4'-DDT (p,p'-DDT)	0.52	38	ug/kg	NA	38	RISB10	4/4	0.17 - 0.33	1,900	NA	N	BSL
	319-85-7	beta-BHC	0.63	0.63	ug/kg	0.31	0.63	BRSB01	1/4	0.17 - 0.31	300	NA	N	BSL
	1031-07-8	Endosulfan Sulfate	0.51	0.51	ug/kg	0.22	0.51	BRSB01	1/4	0.21 - 0.33	1,900	NA	N	BSL
	72-20-8	Endrin	0.46	0.46	ug/kg	0.23	0.46	BRSB01	1/4	0.22 - 0.33	1,900	NA	N	BSL
	7421-93-4	Endrin aldehyde	1.1	1.1	ug/kg	0.23	1.1	BRSB01	1/4	0.22 - 0.33	1,900	NA	N	BSL
	76-44-8	Heptachlor	13	13	ug/kg	0.17	13	RISB10	1/2	0.17 - 0.52	130	NA	N	BSL
	87-86-5	Pentachlorophenol	104	104	ug/kg	6.49	104	SD021	1/18	4.94 - 6.58	1,000	NA	N	BSL

Notes:

Prepared By: KH 7/10/2017
Reviewed By: MAB 7/12/2017
Checked By: RAH 7/20/2018

(1) Minimum/maximum detected concentration.
(2) Concentration used for screening is the higher of the maximum concentration or the maximum MDL for non-detected results.
(3) Screening value is the residential soil value from the USEPA Regional Screening Level (RSL) Table, based on risk of 10^{-6} for carcinogens and a hazard quotient (HQ) of 0.1 for noncarcinogens (USEPA, November 2018).
(4) Per Region 4 guidance (USEPA, 2014) background for naturally occuring metals is set to 2 times the average background concentration. See Tables 1-1 through 1-3 for derivation.
Consistent with the COPC Technical Memorandum for the site (ENSR, 2006), two times average background has also been used for semivolatiles.
(5) Rationale Codes:
Selection Reason: Above Screening Level (ASL)
Deletion Reason: Below Screening Level (BSL); Below Background Level (BKG); Essential Nutrient (EN); Physical Characteristic (PC); Maximum Concentration Below Screening Level (CBSL)
bgs - below ground surface
COPC - chemical of potential concern
MDL - method detection limit
NA - not available
PAHs - polycyclic aromatic hydrocarbons
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

Table 2-3
Occurrence, Distribution and Selection of COPCs in Subsurface Soil
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current/Future
Medium: Subsurface Soils (>1 foot bgs)

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
West of Navassa Road		***Inorganics***												
	E1644012	% Moisture	10.1	10.1	%	NA	10.1	PASB22	1/1	0.5 - 0.5	NA	NA	N	PC
		Volatile organic compounds												
		None												
		Semi-volatile organic compounds												
	86-74-8	Carbazole	170	170	ug/kg	NA	170	PASB22	1/1	33 - 33	180,000	NA	N	BSL
	132-64-9	Dibenzofuran	55	55	ug/kg	NA	55	PASB22	1/1	33 - 33	7,300	NA	N	BSL
		PAHs												
	120-12-7	Anthracene	480	480	ug/kg	NA	480	PASB22	1/1	33 - 33	1,800,000	38.56	N	BSL
	218-01-9	Chrysene	45	45	ug/kg	NA	45	PASB22	1/1	33 - 33	110,000	16.57	N	BSL
	206-44-0	Fluoranthene	130	130	ug/kg	NA	130	PASB22	1/1	33 - 33	240,000	46.9	N	BSL
	86-73-7	Fluorene	110	110	ug/kg	NA	110	PASB22	1/1	33 - 33	240,000	62.4	N	BSL
	85-01-8	Phenanthrene	290	290	ug/kg	NA	290	PASB22	1/1	33 - 33	180,000	38.98	N	BSL
	129-00-0	Pyrene	91	91	ug/kg	NA	91	PASB22	1/1	33 - 33	180,000	46.9	N	BSL
		Pesticides												
		None												
Pond Area		***Inorganics***												
	E1644012	% Moisture	5.1	18.3	%	NA	18.3	FWSB02	14/14	0.5 - 0.5	NA	NA	N	PC
	E1642941	% Solids	82	86	%	NA	86	RISB20	4/4	0 - 0.1	NA	171.5	N	PC
	E701250	Carbon, Organic	2,400	2,400	mg/kg	NA	2,400	RISB20	1/1	35 - 35	NA	NA	N	PC
	E1640382	Total Solids	79	97	%	NA	97	RISB33	8/8	0.1 - 0.1	NA	171.5	N	PC
	7429-90-5	Aluminum	7,900	9,400	mg/kg	NA	9,400	RISB20	2/2	1.2 - 1.3	7,700	8,472	Y	ASL
	7440-36-0	Antimony	0.4	0.4	mg/kg	0.39	0.4	RISB20	1/2	0.38 - 0.39	3.1	0.467	N	BSL
	7440-38-2	Arsenic	0.46	3.6	mg/kg	NA	3.6	RISB19	4/4	0.12 - 0.47	0.68	2.88	Y	ASL
	7440-39-3	Barium	7.5	7.6	mg/kg	NA	7.6	RISB19	2/2	0.4 - 0.41	1,500	30.95	N	BSL
	7440-70-2	Calcium	290	350	mg/kg	NA	350	RISB19	2/2	6.4 - 6.6	NA	3,286	N	EN
	7440-47-3	Chromium	4.69	14	mg/kg	NA	14	RISB20	4/4	0.1 - 0.13	12,000	12.01	N	BSL
	7440-48-4	Cobalt	0.55	0.55	mg/kg	0.39	0.55	RISB19	1/2	0.39 - 0.4	2.3	1.52	N	BSL
	7440-50-8	Copper	2.3	2.9	mg/kg	NA	2.9	RISB19	2/2	0.33 - 0.34	310	7.56	N	BSL
	7439-89-6	Iron	4,700	8,500	mg/kg	NA	8,500	RISB20	2/2	1.4 - 1.5	5,500	8,592	N	BKG
	7439-92-1	Lead	5.2	7.1	mg/kg	NA	7.1	RISB20	2/2	0.14 - 0.15	400	32.64	N	BSL
	7439-95-4	Magnesium	230	420	mg/kg	NA	420	RISB20	2/2	2.4 - 2.5	NA	935.1	N	EN
	7439-96-5	Manganese	8.1	11	mg/kg	NA	11	RISB20	2/2	0.23 - 0.24	180	56.06	N	BSL
	7440-02-0	Nickel	0.99	2	mg/kg	NA	2	RISB19	2/2	0.18 - 0.18	150	3.46	N	BSL
	7440-09-7	Potassium	300	300	mg/kg	NA	300	RISB19; RISB20	2/2	43 - 44	NA	771.6	N	EN
	7440-23-5	Sodium	24	24	mg/kg	18	24	RISB20	1/2	18 - 18	NA	76.76	N	EN
	7440-62-2	Vanadium	17	20	mg/kg	NA	20	RISB19	2/2	0.99 - 1	39	21.5	N	BSL
	7440-66-6	Zinc	4.1	8.4	mg/kg	NA	8.4	RISB19	2/2	0.39 - 0.4	2,300	46.46	N	BSL
		Volatile organic compounds												
	67-64-1	Acetone	17	84	ug/kg	3.1	84	RISB20	2/3	3 - 3.1	6,100,000	NA	N	BSL
	71-43-2	Benzene	3.8	4.4	ug/kg	0.48	4.4	RISB20	2/3	0.46 - 0.48	1,200	NA	N	BSL
	75-15-0	Carbon disulfide	2.2	2.2	ug/kg	570	570	RISB41	1/8	1.7 - 570	77,000	NA	N	BSL
	100-41-4	Ethylbenzene	360	30,000	ug/kg	0.48	30,000	RISB41	5/8	0.44 - 53	5,800	NA	Y	ASL
	98-82-8	Isopropylbenzene	65	26,000	ug/kg	0.54	26,000	RISB20	4/8	0.48 - 54	190,000	NA	N	BSL
	108-87-2	Methylcyclohexane	5.5	13	ug/kg	69	69	RISB41	2/8	0.46 - 69	650,000	NA	N	BSL
	75-09-2	Methylene Chloride	57	57	ug/kg	0.47	57	RISB20	1/3	0.46 - 0.48	35,000	NA	N	BSL
	100-42-5	Styrene	29	890	ug/kg	NA	890	RISB20	3/3	0.5 - 49	600,000	NA	N	BSL
	108-88-3	Toluene	40	32,000	ug/kg	0.48	32,000	RISB41	5/8	0.44 - 41	490,000	NA	N	BSL
	1330-20-7	Total Xylenes	1,100	11,000	ug/kg	NA	11,000	RISB20	3/3	90 - 190	58,000	NA	N	BSL
		Semi-volatile organic compounds												
	1319-77-3	(3-and/or 4-)Methylphenol	92	390	ug/kg	3300	3,300	EPSB13	3/12	33 - 3300	320,000	NA	N	BSL
	92-52-4	1,1-Biphenyl	59,000	720,000	ug/kg	1700	720,000	RISB41	4/11	20 - 38000	4,700	NA	Y	ASL
	105-67-9	2,4-Dimethylphenol	44	67,000	ug/kg	1700	67,000	RISB41	8/25	20 - 4900	130,000	NA	N	BSL
	121-14-2	2,4-Dinitrotoluene	110	310	ug/kg	3300	3,300	EPSB13	3/25	11 - 3300	1,700	NA	N	CBSL

Table 2-3
Occurrence, Distribution and Selection of COPCs in Subsurface Soil
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Pond Area	95-48-7	2-Methylphenol	58	42,000	ug/kg	1700	42,000	RISB41	5/25	13 - 3100	320,000	NA	N	BSL
	111-44-4	bis(2-Chloroethyl) Ether	41	41	ug/kg	3800	3,800	RISB41	1/25	16 - 3800	230	NA	N	CBSL
	117-81-7	Bis(2-ethylhexyl) phthalate	44	3,200	ug/kg	5000	5,000	EPSB13	5/25	17 - 5000	39,000	NA	N	BSL
	86-74-8	Carbazole	51	3,700,000	ug/kg	33	3,700,000	RISB41	24/31	17 - 21000	180,000	NA	Y	ASL
	132-64-9	Dibenzofuran	44	3,100,000	ug/kg	33	3,100,000	RISB41	18/28	14 - 17000	7,300	NA	Y	ASL
	106-44-5	p-Cresol (4-methylphenol)	7,200	86,000	ug/kg	330	86,000	RISB41	3/13	27 - 6600	630,000	NA	N	BSL
	108-95-2	Phenol	110	32,000	ug/kg	1900	32,000	RISB41	4/25	17 - 4100	1,900,000	NA	N	BSL
		PAHs												
	91-57-6	2-Methylnaphthalene	41	5,600,000	ug/kg	33	5,600,000	KM42	24/35	16 - 73000	24,000	62.4	Y	ASL
	83-32-9	Acenaphthene	91	7,100,000	ug/kg	33	7,100,000	KM42	25/35	20 - 73000	360,000	62.4	Y	ASL
	208-96-8	Acenaphthylene	34	71,000	ug/kg	33	71,000	RISB41	22/32	20 - 7300	180,000	62.4	N	BSL
	120-12-7	Anthracene	27	6,300,000	ug/kg	33	6,300,000	RISB41	26/32	12 - 73000	1,800,000	38.56	Y	ASL
	56-55-3	Benzo(a)anthracene	31	1,500,000	ug/kg	33	1,500,000	KM42	27/35	12 -36000	1,100	13.75	Y	ASL
	50-32-8	Benzo(a)pyrene	27	440,000	ug/kg	33	440,000	KM42	27/35	20 - 12000	110	15.91	Y	ASL
	205-99-2	Benzo(b)fluoranthene	42	600,000	ug/kg	33	600,000	KM42	27/35	21 - 13000	1,100	22.7	Y	ASL
	191-24-2	Benzo(g,h,i)perylene	44	34,000	ug/kg	33	34,000	KM42	22/35	17 - 7300	180,000	15.15	N	BSL
	207-08-9	Benzo(k)fluoranthene	42	440,000	ug/kg	33	440,000	KM42	27/35	17 - 9800	11,000	10.85	Y	ASL
	218-01-9	Chrysene	31	1,400,000	ug/kg	33	1,400,000	KM42	28/35	20 - 36000	110,000	16.57	Y	ASL
	53-70-3	Dibenzo(a,h)anthracene	54	44,000	ug/kg	14000	44,000	KM42	21/35	23 - 14000	110	8.21	Y	ASL
	206-44-0	Fluoranthene	52	11,000,000	ug/kg	33	11,000,000	KM42	29/35	13 - 360000	240,000	46.9	Y	ASL
	86-73-7	Fluorene	97	8,300,000	ug/kg	33	8,300,000	KM42	26/35	11 - 73000	240,000	62.4	Y	ASL
	193-39-5	Indeno (1,2,3-cd) pyrene	44	99,000	ug/kg	11000	99,000	KM42	25/35	19 - 11000	1,100	14.73	Y	ASL
	91-20-3	Naphthalene	49	4,100,000	ug/kg	33	4,100,000	RISB41	25/35	14 - 36000	3,800	62.4	Y	ASL
	85-01-8	Phenanthrene	42	21,000,000	ug/kg	33	21,000,000	KM42	26/32	14 - 360000	180,000	38.98	Y	ASL
	129-00-0	Pyrene	35	6,500,000	ug/kg	33	6,500,000	KM42	29/35	15 - 73000	180,000	46.9	Y	ASL
		Pesticides												
	72-54-8	4,4'-DDD (p,p'-DDD)	17	17	ug/kg	0.54	17	RISB19	1/2	0.54 - 0.56	190	NA	N	BSL
	50-29-3	4,4'-DDT (p,p'-DDT)	6.4	6.4	ug/kg	0.18	6.4	RISB19	1/2	0.18 - 0.19	1,900	NA	N	BSL
	72-20-8	Endrin	5.4	5.4	ug/kg	0.24	5.4	RISB19	1/2	0.24 - 0.25	1,900	NA	N	BSL
Process Area		***Inorganics***												
	E1644012	% Moisture	8.2	17.1	%	NA	17.1	SB28	8/8	0.5 - 0.5	NA	NA	N	PC
	E1642941	% Solids	83	87	%	NA	87	RISB12; RISB14	6/6	0 - 0.1	NA	171.5	N	PC
	E1640382	Total Solids	70	91	%	NA	91	RISB24	11/11	0.1 - 0.1	NA	171.5	N	PC
	7429-90-5	Aluminum	2,900	8,500	mg/kg	NA	8,500	RISB12	3/3	1.2 - 1.3	7,700	8,472	Y	ASL
	7440-38-2	Arsenic	0.61	0.95	mg/kg	0.48	0.95	RISB12	2/3	0.46 - 0.48	0.68	2.88	N	BKG
	7440-39-3	Barium	3.9	7.5	mg/kg	NA	7.5	RISB12	3/3	0.4 - 0.42	1,500	30.95	N	BSL
	7440-70-2	Calcium	16	150	mg/kg	6.8	150	RISB21	2/3	6.4 - 6.8	NA	3,286	N	EN
	7440-47-3	Chromium	3	6.6	mg/kg	NA	6.6	RISB12	3/3	0.1 - 0.11	12,000	12.01	N	BSL
	7440-48-4	Cobalt	0.42	0.42	mg/kg	0.41	0.42	RISB12	1/3	0.39 - 0.41	2.3	1.52	N	BSL
	7440-50-8	Copper	0.35	0.73	mg/kg	NA	0.73	RISB22	3/3	0.33 - 0.35	310	7.56	N	BSL
	7439-89-6	Iron	1,700	4,000	mg/kg	NA	4,000	RISB12	3/3	1.4 - 1.5	5,500	8,592	N	BSL
	7439-92-1	Lead	2.3	3.8	mg/kg	NA	3.8	RISB12	3/3	0.14 - 0.15	400	32.64	N	BSL
	7439-95-4	Magnesium	85	330	mg/kg	NA	330	RISB12	3/3	2.4 - 2.6	NA	935.1	N	EN
	7439-96-5	Manganese	3.5	6.1	mg/kg	NA	6.1	RISB12	3/3	0.23 - 0.25	180	56.06	N	BSL
	7440-02-0	Nickel	0.73	2.1	mg/kg	NA	2.1	RISB22	3/3	0.18 - 0.19	150	3.46	N	BSL
	7440-09-7	Potassium	95	270	mg/kg	NA	270	RISB12	3/3	43 - 46	NA	771.6	N	EN
	7440-62-2	Vanadium	7.5	14	mg/kg	NA	14	RISB12	3/3	1 - 1.1	39	21.5	N	BSL
	7440-66-6	Zinc	1.9	8.3	mg/kg	NA	8.3	RISB12	3/3	0.39 - 0.41	2,300	46.46	N	BSL
		Volatile organic compounds												
	120-82-1	1,2,4-Trichlorobenzene	0.37	0.37	ug/kg	0.19	0.37	RISB12	1/3	0.18 - 0.19	5,800	NA	N	BSL
	67-64-1	Acetone	10	91	ug/kg	3.1	91	RISB12	2/3	2.9 - 3.1	6,100,000	NA	N	BSL
	71-43-2	Benzene	4.4	790	ug/kg	0.45	790	RISB22	2/3	0.45 - 36	1,200	NA	N	BSL
	75-15-0	Carbon disulfide	8.5	8.5	ug/kg	440	440	RISB43	1/9	1.9 - 440	77,000	NA	N	BSL
	108-90-7	Chlorobenzene	0.5	0.5	ug/kg	0.48	0.5	RISB22	1/3	0.46 - 0.49	28,000	NA	N	BSL
	100-41-4	Ethylbenzene	0.62	7,700	ug/kg	0.61	7,700	RISB43	6/9	0.49 - 31	5,800	NA	Y	ASL
	98-82-8	Isopropylbenzene	0.64	1,900	ug/kg	0.66	1,900	RISB43	4/9	0.53 - 300	190,000	NA	N	BSL
	108-10-1	Methyl Isobutyl Ketone	4.4	4.4	ug/kg	0.85	4.4	RISB22	1/3	0.82 - 0.87	3,300,000	NA	N	BSL
	108-87-2	Methylcyclohexane	0.95	0.95	ug/kg	53	53	RISB43	1/9	0.51 - 53	650,000	NA	N	BSL

Table 2-3
Occurrence, Distribution and Selection of COPCs in Subsurface Soil
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Process Area	100-42-5	Styrene	2,600	2,600	ug/kg	0.52	2,600	RISB22	1/3	0.5 - 25	600,000	NA	N	BSL
	108-88-3	Toluene	0.64	9,300	ug/kg	0.54	9,300	RISB43	7/9	0.49 - 310	490,000	NA	N	BSL
	1330-20-7	Total Xylenes	10,000	10,000	ug/kg	1.6	10,000	RISB22	1/3	1.5 - 94	58,000	NA	N	BSL
		Semi-volatile organic compounds												
	1319-77-3	(3-and/or 4-)Methylphenol	65,000	65,000	ug/kg	670	65,000	PASB20	1/8	32 - 6700	320,000	NA	N	BSL
	92-52-4	1,1-Biphenyl	750	15,000	ug/kg	210	15,000	RISB43	3/13	20 - 2100	4,700	NA	Y	ASL
	105-67-9	2,4-Dimethylphenol	69	33,000	ug/kg	330	33,000	PASB20	5/20	21 - 3300	130,000	NA	N	BSL
	95-48-7	2-Methylphenol	150	37,000	ug/kg	330	37,000	PASB20	4/20	14 - 3300	320,000	NA	N	BSL
	98-86-2	Acetophenone	310	310	ug/kg	1200	1,200	RISB43	1/13	20 - 1200	780,000	NA	N	BSL
	100-52-7	Benzaldehyde	1,200	1,200	ug/kg	1600	1,600	RISB43	1/13	33 - 1600	170,000	NA	N	BSL
	117-81-7	Bis(2-ethylhexyl) phthalate	21	1,600	ug/kg	10000	10,000	PASB20	3/20	18 - 10000	39,000	NA	N	BSL
	86-74-8	Carbazole	31	7,100,000	ug/kg	330	7,100,000	PASB20	14/25	18 - 330000	180,000	NA	Y	ASL
	132-64-9	Dibenzofuran	20	3,400,000	ug/kg	330	3,400,000	PASB20	15/25	15 - 33000	7,300	NA	Y	ASL
	106-44-5	p-Cresol (4-methylphenol)	87	14,000	ug/kg	67	14,000	RISB26	3/12	29 - 380	630,000	NA	N	BSL
	108-95-2	Phenol	440	31,000	ug/kg	330	31,000	PASB20	3/20	18 - 3300	1,900,000	NA	N	BSL
	110-86-1	Pyridine	580	580	ug/kg	520	580	RISB26	1/12	41 - 520	7,800	NA	N	BSL
		PAHs												
	91-57-6	2-Methylnaphthalene	26	2,500,000	ug/kg	330	2,500,000	PASB20	14/25	17 - 33000	24,000	62.4	Y	ASL
	83-32-9	Acenaphthene	22	3,000,000	ug/kg	33	3,000,000	PASB20	15/25	21 - 33000	360,000	62.4	Y	ASL
	208-96-8	Acenaphthylene	26	74,000	ug/kg	33	74,000	PASB20	11/20	20 - 3300	180,000	62.4	N	BSL
	120-12-7	Anthracene	45	6,700,000	ug/kg	33	6,700,000	PASB20	14/20	13 - 330000	1,800,000	38.56	Y	ASL
	56-55-3	Benzo(a)anthracene	15	830,000	ug/kg	33	830,000	PASB20	19/25	13 - 33000	1,100	13.75	Y	ASL
	50-32-8	Benzo(a)pyrene	81	260,000	ug/kg	33	260,000	PASB20	16/25	21 - 3300	110	15.91	Y	ASL
	205-99-2	Benzo(b)fluoranthene	38	420,000	ug/kg	33	420,000	PASB20	17/25	21 - 3300	1,100	22.7	Y	ASL
	191-24-2	Benzo(g,h,i)perylene	38	92,000	ug/kg	33	92,000	PASB20	12/20	18 - 3300	180,000	15.15	N	BSL
	207-08-9	Benzo(k)fluoranthene	22	180,000	ug/kg	33	180,000	PASB20	18/25	18 - 3300	11,000	10.85	Y	ASL
	218-01-9	Chrysene	47	1,100,000	ug/kg	33	1,100,000	PASB20	17/25	20 - 33000	110,000	16.57	Y	ASL
	53-70-3	Dibenzo(a,h)anthracene	64	37,000	ug/kg	33	37,000	PASB20	13/25	25 - 3300	110	8.21	Y	ASL
	206-44-0	Fluoranthene	23	4,700,000	ug/kg	33	4,700,000	PASB20	19/25	14 - 33000	240,000	46.9	Y	ASL
	86-73-7	Fluorene	12	6,000,000	ug/kg	330	6,000,000	PASB20	14/25	11 - 330000	240,000	62.4	Y	ASL
	193-39-5	Indeno (1,2,3-cd) pyrene	50	120,000	ug/kg	33	120,000	PASB20	16/25	20 - 3300	1,100	14.73	Y	ASL
	91-20-3	Naphthalene	21	4,200,000	ug/kg	330	4,200,000	PASB20	16/25	15 - 33000	3,800	62.4	Y	ASL
	85-01-8	Phenanthrene	27	13,000,000	ug/kg	33	13,000,000	PASB20	15/20	15 - 330000	180,000	38.98	Y	ASL
	129-00-0	Pyrene	26	3,000,000	ug/kg	33	3,000,000	PASB20	19/25	16 - 33000	180,000	46.9	Y	ASL
		Pesticides												
	50-29-3	4,4'-DDT (p,p'-DDT)	16	16	ug/kg	0.18	16	RISB22	1/3	0.18 - 1.9	1,900	NA	N	BSL
	72-20-8	Endrin	62	62	ug/kg	0.24	62	RISB22	1/3	0.23 - 2.5	1,900	NA	N	BSL
	76-44-8	Heptachlor	66	66	ug/kg	0.57	66	RISB22	1/3	0.54 - 5.7	130	NA	N	BSL
Treated Wood Storage Area		***Inorganics***												
	E1644012	% Moisture	10.4	13.2	%	NA	13.2	TWSB27	3/3	0.5 - 0.5	NA	NA	N	PC
	E1642941	% Solids	79.6	99.9	%	NA	99.9	SB-131	15/15	0 - 0.1	NA	171.50	N	PC
	7429-90-5	Aluminum	3,300	4,800	mg/kg	NA	4,800	RISB03	2/2	1.2 - 1.3	7,700	8,472	N	EN
	7440-38-2	Arsenic	0.75	1.3	mg/kg	NA	1.3	RISB03	2/2	0.43 - 0.49	0.68	2.88	N	BKG
	7440-39-3	Barium	4.4	4.6	mg/kg	NA	4.6	RISB09	2/2	0.38 - 0.43	1,500	30.95	N	BSL
	7440-70-2	Calcium	14	14	mg/kg	7	14	RISB03	1/2	6.1 - 7	NA	3,286	N	EN
	7440-47-3	Chromium	4.2	4.9	mg/kg	NA	4.9	RISB03	2/2	0.099 - 0.11	12,000	12.01	N	BSL
	7440-50-8	Copper	1.1	3.2	mg/kg	NA	3.2	RISB03	2/2	0.32 - 0.36	310	7.56	N	BSL
	7439-89-6	Iron	570	2,400	mg/kg	NA	2,400	RISB03	2/2	1.4 - 1.6	5,500	8,592	N	EN
	7439-92-1	Lead	2.3	12	mg/kg	NA	12	RISB03	2/2	0.14 - 0.16	400	32.64	N	BSL
	7439-95-4	Magnesium	57	72	mg/kg	NA	72	RISB09	2/2	2.3 - 2.6	NA	935.1	N	EN
	7439-96-5	Manganese	2.6	2.6	mg/kg	NA	2.6	RISB03; RISB09	2/2	0.22 - 0.25	180	56.06	N	BSL
	7439-97-6	Mercury	0.028	0.028	mg/kg	0.0051	0.028	RISB03	1/2	0.0045 - 0.0051	1.1	0.091	N	BSL
	7440-02-0	Nickel	0.79	0.83	mg/kg	NA	0.83	RISB09	2/2	0.17 - 0.19	150	3.46	N	BSL
	7440-09-7	Potassium	73	110	mg/kg	NA	110	RISB09	2/2	41 - 47	NA	771.6	N	EN
	7782-49-2	Selenium	4	4	mg/kg	0.88	4	RISB09	1/2	0.88 - 1	39	3.55	N	BSL

Table 2-3
Occurrence, Distribution and Selection of COPCs in Subsurface Soil
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Treated Wood Storage Area	7440-62-2	Vanadium	4.5	8.1	mg/kg	NA	8.1	RISB03	2/2	0.95 - 1.1	39	21.5	N	BSL
	7440-66-6	Zinc	1.3	2.5	mg/kg	NA	2.5	RISB03	2/2	0.37 - 0.42	2,300	46.46	N	BSL
		Volatile organic compounds												
	75-09-2	Methylene Chloride	1.2	1.4	ug/kg	NA	1.4	RISB09	2/2	0.45 - 0.48	35,000	NA	N	BSL
		Semi-volatile organic compounds												
	105-60-2	Caprolactam	44	44	ug/kg	33	44	SB-128	1/10	26 - 33	3,100,000	NA	N	BSL
	86-74-8	Carbazole	25	55	ug/kg	33	55	TWSB25	3/18	18 - 33	180,000	NA	N	BSL
	132-64-9	Dibenzofuran	17	27	ug/kg	33	33	TWSB23; TWSB25; TWSB27	2/18	15 - 33	7,300	NA	N	BSL
		PAHs												
	91-57-6	2-Methylnaphthalene	26	26	ug/kg	33	33	TWSB23; TWSB25; TWSB27	1/18	17 - 33	24,000	62.4	N	BSL
	83-32-9	Acenaphthene	28	43	ug/kg	33	43	RISB03	2/18	18 - 33	360,000	62.4	N	BSL
	208-96-8	Acenaphthylene	22.7	52.2	ug/kg	33	52.2	SB-125	3/13	17 - 33	180,000	62.4	N	BSL
	120-12-7	Anthracene	23.2	94	ug/kg	33	94	TWSB25	2/13	19 - 33	1,800,000	38.56	N	BSL
	56-55-3	Benzo(a)anthracene	16	280	ug/kg	33	280	RISB09	5/18	13 - 33	1,100	13.75	N	BSL
	50-32-8	Benzo(a)pyrene	45	200	ug/kg	33	200	RISB02; RISB03; RISB09	4/18	19 - 33	110	15.91	Y	ASL
	205-99-2	Benzo(b)fluoranthene	33	580	ug/kg	24	580	TWSB25	6/18	18 - 33	1,100	22.7	N	BSL
	191-24-2	Benzo(g,h,i)perylene	78	78	ug/kg	33	78	TWSB25	1/13	17 - 33	180,000	15.15	N	BSL
	207-08-9	Benzo(k)fluoranthene	21	270	ug/kg	33	270	RISB09	5/18	18 - 33	11,000	10.85	N	BSL
	218-01-9	Chrysene	28	510	ug/kg	33	510	RISB09	5/18	17 - 33	110,000	16.57	N	BSL
	53-70-3	Dibenzo(a,h)anthracene	43	43	ug/kg	33	43	RISB09	1/18	21 - 33	110	8.21	N	BSL
	206-44-0	Fluoranthene	37	690	ug/kg	21	690	RISB09	6/18	14 - 33	240,000	46.9	N	BSL
	86-73-7	Fluorene	25	25	ug/kg	33	33	TWSB23; TWSB25; TWSB27	1/18	12 - 33	240,000	62.4	N	BSL
	193-39-5	Indeno (1,2,3-cd) pyrene	33	120	ug/kg	33	120	RISB09; TWSB25	3/18	20 - 33	1,100	14.73	N	BSL
	91-20-3	Naphthalene	16	19	ug/kg	33	33	TWSB23; TWSB25; TWSB27	2/18	15 - 33	3,800	62.4	N	BSL
	85-01-8	Phenanthrene	83	83	ug/kg	33	83	TWSB25	1/13	17 - 33	180,000	38.98	N	BSL
	129-00-0	Pyrene	42	710	ug/kg	24	710	RISB09; TWSB25	6/18	16 - 33	180,000	46.9	N	BSL
		Pesticides												
		None												
Untreated Wood Storage Area		***Inorganics***												
	E1644012	% Moisture	3.5	15.2	%	NA	15.2	BKSB04	3/3	0.5 - 0.5	NA	NA	N	PC
	E1642941	% Solids	81	95.1	%	NA	95.1	SB-119R	17/17	0 - 0.1	NA	171.50	N	PC
	E1640382	Total Solids	79	93	%	NA	93	RISB36	8/8	0.1 - 0.1	NA	171.50	N	PC
	7429-90-5	Aluminum	2,010	7,700	mg/kg	NA	7,700	RISB10	16/16	1.3 - 27.8	7,700	8,472	N	BKG
	7440-38-2	Arsenic	0.17	1.1	mg/kg	NA	1.1	RISB10	19/19	0.12 - 0.47	0.68	2.88	N	BKG
	7440-39-3	Barium	1.56	8.83	mg/kg	NA	8.83	SO038	16/16	0.12 - 0.41	1,500	30.95	N	BSL
	7440-70-2	Calcium	52	7,010	mg/kg	NA	7,010	SO047	16/16	6.7 - 69.5	NA	3,286	N	EN
	7440-47-3	Chromium	1.56	7.56	mg/kg	NA	7.56	SO057	19/19	0.11 - 0.14	12,000	12.01	N	BSL
	7440-48-4	Cobalt	0.13	0.41	mg/kg	0.14	0.41	RISB10	11/16	0.12 - 0.4	2.3	1.52	N	BSL
	7440-50-8	Copper	0.21	1.07	mg/kg	NA	1.07	SO036	16/16	0.12 - 0.34	310	7.56	N	BSL
	7439-89-6	Iron	279	3,080	mg/kg	NA	3,080	SO048	16/16	1.5 - 13.9	5,500	8,592	N	BSL
	7439-92-1	Lead	1.1	5.09	mg/kg	NA	5.09	SO047	16/16	0.12 - 0.15	400	32.64	N	BSL
	7439-95-4	Magnesium	14.1	194	mg/kg	NA	194	SO047	16/16	2.5 - 13.9	NA	935.1	N	EN
	7439-96-5	Manganese	0.91	5.3	mg/kg	NA	5.3	RISB10	16/16	0.24 - 0.69	180	56.06	N	BSL
	7439-97-6	Mercury	0.0069	0.036	mg/kg	NA	0.036	SO035	16/16	0.0047 - 0.0063	1.1	0.091	N	BSL
	7440-02-0	Nickel	0.3	2.7	mg/kg	0.28	2.7	RISB10	15/16	0.18 - 0.28	150	3.46	N	BSL
	7440-09-7	Potassium	17	180	mg/kg	13	180	RISB10	15/16	11.9 - 45	NA	771.6	N	EN
	7782-49-2	Selenium	0.16	0.27	mg/kg	0.96	0.96	RISB10	5/16	0.12 - 0.96	39	3.55	N	BSL
	7440-23-5	Sodium	30.6	56.1	mg/kg	18	56.1	SO047	2/16	11.9 - 18	NA	76.76	N	EN
	7440-62-2	Vanadium	1.46	13	mg/kg	NA	13	RISB10	16/16	0.12 - 1	39	21.5	N	BSL
	7440-66-6	Zinc	2.3	2.84	mg/kg	2.78	2.84	SO046	4/16	0.4 - 2.78	2,300	46.46	N	BSL
		Volatile organic compounds												
	67-64-1	Acetone	3.78	43	ug/kg	3	43	SO046	15/16	0.429 - 3	6,100,000	NA	N	BSL
	100-41-4	Ethylbenzene	0.75	2.3	ug/kg	0.5	2.3	RISB29	2/18	0.215 - 0.54	5,800	NA	N	BSL
	79-20-9	Methyl Acetate	2.22	2.22	ug/kg	0.785	2.22	SO045	1/18	0.23 - 0.785	7,800,000	NA	N	BSL
	78-93-3	Methyl Ethyl Ketone	2.25	2.25	ug/kg	1.4	2.25	SO047	1/16	0.429 - 1.4	2,700,000	NA	N	BSL
	75-09-2	Methylene Chloride	1.1	1.1	ug/kg	1.57	1.57	SO046	1/16	0.47 - 1.57	35,000	NA	N	BSL
	99-87-6	p-Isopropyltoluene	2.21	2.21	ug/kg	0.392	2.21	SO033	1/15	0.215 - 0.392	490,000	NA	N	BSL

Table 2-3
Occurrence, Distribution and Selection of COPCs in Subsurface Soil
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Untreated Wood Storage Area	108-88-3	Toluene	0.578	6.8	ug/kg	0.5	6.8	RISB29	4/18	0.215 - 0.54	490,000	NA	N	BSL
		Semi-volatile organic compounds												
	105-67-9	2,4-Dimethylphenol	200	200	ug/kg	54	200	RISB27; RISB28; RISB29	1/37	21 - 54	130,000	NA	N	BSL
	606-20-2	2,6-Dinitrotoluene	650	650	ug/kg	46	650	RISB28	1/37	23 - 46	360	NA	Y	ASL
	106-47-8	4-Chloroaniline	190	190	ug/kg	52	190	RISB28; RISB36; RISB42	1/37	28 - 52	2,700	NA	N	BSL
	65-85-0	Benzoic acid	47	104	ug/kg	200	200	SB-122; SB-127; SB-132; SB-136; SB-137; SB-138	5/26	39 - 200	25,000,000	NA	N	BSL
	117-81-7	Bis(2-ethylhexyl) phthalate	19	19	ug/kg	100	100	BKSB04; BRSB01; TWSB24	1/37	5.96 - 100	39,000	NA	N	BSL
	105-60-2	Caprolactam	99.4	99.4	ug/kg	94	99.4	SB-127	1/34	28 - 94	3,100,000	NA	N	BSL
	86-74-8	Carbazole	10	980	ug/kg	33	980	RISB28	7/43	5.96 - 33	180,000	NA	N	BSL
	132-64-9	Dibenzofuran	21	280	ug/kg	33	280	RISB28	7/43	5.96 - 33	7,300	NA	N	BSL
	131-11-3	Dimethyl phthalate	300	300	ug/kg	67	300	RISB28	1/37	9.54 - 67	630,000	NA	N	BSL
	84-74-2	Di-n-butylphthalate	11	11	ug/kg	82	82	SB-122; SB-132	2/37	5.96 - 82	630,000	NA	N	BSL
		PAHs												
	90-12-0	1-Methylnaphthalene	1.14	1.14	ug/kg	20	20	SB-122; SB-127; SB-132; SB-136; SB-137; SB-138	1/26	1.01 - 20	18,000	62.4	N	BSL
	91-57-6	2-Methylnaphthalene	1.4	320	ug/kg	33	320	RISB10	7/43	1.01 - 33	24,000	62.4	N	BSL
	83-32-9	Acenaphthene	35	190	ug/kg	33	190	RISB04; RISB28; RISB36; RISB42	6/43	1.99 - 33	360,000	62.4	N	BSL
	208-96-8	Acenaphthylene	2.85	40.2	ug/kg	33	40.2	SB-127	5/37	1.99 - 33	180,000	62.4	N	BSL
	120-12-7	Anthracene	0.655	2,300	ug/kg	33	2,300	RISB28	12/37	0.507 - 33	1,800,000	38.56	N	BSL
	56-55-3	Benzo(a)anthracene	3.22	1,600	ug/kg	33	1,600	RISB05	11/43	1.99 - 33	1,100	13.75	Y	ASL
	50-32-8	Benzo(a)pyrene	4.09	2,300	ug/kg	33	2,300	RISB05	11/43	0.507 - 33	110	15.91	Y	ASL
	205-99-2	Benzo(b)fluoranthene	4.09	5,600	ug/kg	33	5,600	RISB05	11/43	1.99 - 33	1,100	22.7	Y	ASL
	191-24-2	Benzo(g,h,i)perylene	4.09	67	ug/kg	33	67	RISB42	6/37	1.01 - 33	180,000	15.15	N	BSL
	207-08-9	Benzo(k)fluoranthene	0.54	2,300	ug/kg	33	2,300	RISB05	16/43	0.507 - 33	11,000	10.85	N	BSL
	218-01-9	Chrysene	3.32	2,800	ug/kg	33	2,800	RISB05	9/43	1.99 - 33	110,000	16.57	N	BSL
	53-70-3	Dibenzo(a,h)anthracene	2.86	370	ug/kg	33	370	RISB05	4/43	1.99 - 33	110	8.21	Y	ASL
	206-44-0	Fluoranthene	0.617	2,900	ug/kg	33	2,900	RISB05	20/43	0.507 - 33	240,000	46.9	N	BSL
	86-73-7	Fluorene	0.655	270	ug/kg	33	270	RISB28	11/43	0.507 - 33	240,000	62.4	N	BSL
	193-39-5	Indeno (1,2,3-cd) pyrene	4.09	910	ug/kg	33	910	RISB05	8/43	0.507 - 33	1,100	14.73	N	BSL
	91-20-3	Naphthalene	18	1,200	ug/kg	33	1,200	RISB29	10/43	0.507 - 33	3,800	62.4	N	BSL
	85-01-8	Phenanthrene	1.65	530	ug/kg	33	530	RISB28	12/37	1.01 - 33	180,000	38.98	N	BSL
	129-00-0	Pyrene	1.78	3,200	ug/kg	33	3,200	RISB05	17/43	1.01 - 33	180,000	46.9	N	BSL
		Pesticides												
		None												

Notes:
(1) Minimum/maximum detected concentration.
(2) Concentration used for screening is the higher of the maximum concentration or the maximum MDL for non-detected results.
(3) Screening value is the residential soil value from the USEPA Regional Screening Level (RSL) Table, based on risk of 10^{-6} for carcinogens and a hazard quotient (HQ) of 0.1 for noncarcinogens (USEPA, November 2018).
(4) Per Region 4 guidance (USEPA, 2014) background for naturally occuring metals is set to 2 times the average background concentration. See Tables 1-1 through 1-3 for derivation.
Consistent with the COPC Technical Memorandum for the site (ENSR, 2006), two times average background has also been used for semivolatiles.
(5) Rationale Codes:
Selection Reason: Above Screening Level (ASL)
Deletion Reason: Below Screening Level (BSL); Below Background Level (BKG); Essential Nutrient (EN); Physical Characteristic (PC); Maximum Concentration Below Screening Level (CBSL)
bgs - below ground surface
COPC - chemical of potential concern
MDL - method detection limit
NA - not available
PAHs - polycyclic aromatic hydrocarbons
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

Prepared By: KAH 7/11/2017
Reviewed By: MAB 7/15/2017
Checked By: RAH 7/19/2018

Table 2-4
Occurrence, Distribution and Selection of COPCs in Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current/Future
Medium: Groundwater

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
South		***Inorganics***												
	E1642222	Total Dissolved Solids	113	537	mg/L	100	537	MW25S	26/38	100 - 100	500	NA	N	PC
	16887-00-6	Chloride	6	124	mg/L	NA	124	MW04D	38/38	2 - 10	NA	NA	N	EN
	7429-90-5	Aluminum (dissolved)	0.495	1.97	mg/L	0.005	1.97	MW25S	2/5	0.005 - 0.05	2	NA	N	BSL
	7440-38-2	Arsenic (dissolved)	0.00043	0.0693	mg/L	0.002	0.0693	MW06	18/45	0.00025 - 0.002	0.000052	0.00225	Y	ASL
	7440-39-3	Barium (dissolved)	0.0112	0.065	mg/L	NA	0.065	MW25S	5/5	0.00025 - 0.00025	0.38	NA	N	BSL
	7440-41-7	Beryllium (dissolved)	0.00094	0.00094	mg/L	0.00025	0.00094	MW25S	1/5	0.00025 - 0.00025	0.0025	NA	N	BSL
	7440-70-2	Calcium (dissolved)	8.08	40.6	mg/L	1.25	40.6	MW25S	3/5	0.125 - 1.25	NA	NA	N	EN
	7440-47-3	Chromium (dissolved)	0.00026	0.00085	mg/L	0.00025	0.00085	MW25S	2/7	0.00025 - 0.00025	2.2	0.00303	N	BSL
	16065-83-1	Chromium(III), Insoluble Salts (dissolved)	0.00026	0.00085	mg/L	0.00025	0.00085	MW25S	2/7	0.00025 - 0.00025	NA	0.00063	N	BSL
	7440-48-4	Cobalt (dissolved)	0.00077	0.00416	mg/L	0.00025	0.00416	MW11S	4/5	0.00025 - 0.00025	0.0006	0.004	Y	ASL
	7439-89-6	Iron (dissolved)	0.0426	32.1	mg/L	NA	32.1	MW25S	5/5	0.025 - 0.25	1.4	NA	Y	ASL
	7439-92-1	Lead (dissolved)	0.00089	0.00089	mg/L	0.00025	0.00089	MW11S	1/5	0.00025 - 0.00025	0.015	NA	N	BSL
	7439-95-4	Magnesium (dissolved)	0.929	8.83	mg/L	NA	8.83	MW25S	5/5	0.025 - 0.25	NA	NA	N	EN
	7439-96-5	Manganese (dissolved)	0.0581	0.622	mg/L	NA	0.622	MW06	5/5	0.00125 - 0.0125	0.043	NA	Y	ASL
	7440-02-0	Nickel (dissolved)	0.00069	0.00558	mg/L	0.0005	0.00558	MW11S	3/5	0.0005 - 0.0005	0.039	NA	N	BSL
	7440-09-7	Potassium (dissolved)	2.02	3.82	mg/L	0.025	3.82	MW25S	2/5	0.025 - 0.025	NA	NA	N	EN
	7782-49-2	Selenium (dissolved)	0.00077	0.164	mg/L	0.00025	0.164	MW25S	3/6	0.00025 - 0.002	0.01	NA	Y	ASL
	7440-62-2	Vanadium (dissolved)	0.00047	0.00277	mg/L	0.00025	0.00277	MW25S	2/5	0.00025 - 0.00025	0.0086	NA	N	BSL
	7440-66-6	Zinc (dissolved)	0.00745	0.0173	mg/L	0.005	0.0173	MW11S	3/5	0.005 - 0.005	0.6	NA	N	BSL
	7429-90-5	Aluminum	1.96	3.24	mg/L	0.005	3.24	MW11S	2/5	0.005 - 0.05	2	NA	Y	ASL
	7440-38-2	Arsenic	0.00035	0.068	mg/L	0.002	0.068	MW06	20/45	0.00025 - 0.002	0.000052	0.00225	Y	ASL
	7440-39-3	Barium	0.0119	0.0613	mg/L	NA	0.0613	MW25S	5/5	0.00025 - 0.00025	0.38	NA	N	BSL
	7440-41-7	Beryllium	0.00071	0.00071	mg/L	0.00025	0.00071	MW25S	1/5	0.00025 - 0.00025	0.0025	NA	N	BSL
	7440-70-2	Calcium	7.66	47.1	mg/L	1.25	47.1	MW25D	4/5	0.125 - 1.25	NA	NA	N	EN
	7440-47-3	Chromium	0.00038	0.00348	mg/L	0.00025	0.00348	MW11S	6/7	0.00025 - 0.00025	2.2	0.00377	N	BSL
	16065-83-1	Chromium(III), Insoluble Salts	0.00038	0.00348	mg/L	0.00025	0.00348	MW11S	6/7	0.00025 - 0.00025	NA	0.00113	N	BSL
	7440-48-4	Cobalt	0.00068	0.00406	mg/L	0.00025	0.00406	MW11S	4/5	0.00025 - 0.00025	0.0006	0.004	Y	ASL
	7439-89-6	Iron	0.207	33	mg/L	NA	33	MW06	5/5	0.025 - 0.25	1.4	NA	Y	ASL
	7439-92-1	Lead	0.00135	0.00135	mg/L	0.00025	0.00135	MW11S	1/5	0.00025 - 0.00025	0.015	NA	N	BSL
	7439-95-4	Magnesium	0.889	8.75	mg/L	NA	8.75	MW25S	5/5	0.025 - 0.025	NA	NA	N	EN
	7439-96-5	Manganese	0.053	0.728	mg/L	NA	0.728	MW06	7/7	0.000066 - 0.0125	0.043	NA	Y	ASL
	7440-02-0	Nickel	0.00093	0.00566	mg/L	0.0005	0.00566	MW11S	3/5	0.0005 - 0.0005	0.039	NA	N	BSL
	7440-09-7	Potassium	3.16	3.16	mg/L	0.025	3.16	MW25S	1/5	0.025 - 0.025	NA	NA	N	EN
	7782-49-2	Selenium	0.00029	0.159	mg/L	0.001	0.159	MW25S	2/8	0.00025 - 0.002	0.01	NA	Y	ASL
	7440-62-2	Vanadium	0.00027	0.00405	mg/L	0.00025	0.00405	MW11S	4/5	0.00025 - 0.00025	0.0086	NA	N	BSL
		Volatile organic compounds												
	120-82-1	1,2,4-Trichlorobenzene	0.59	0.59	ug/L	20	20	MW10S	1/144	0.2 - 20	0.4	NA	N	CBSL*
	95-63-6	1,2,4-Trimethylbenzene	0.52	521	ug/L	20	521	MW06	42/136	0.2 - 65	5.6	NA	Y	ASL
	108-67-8	1,3,5-Trimethylbenzene	0.49	78.6	ug/L	40	78.6	MW06	27/136	0.2 - 40	6	NA	Y	ASL
	67-64-1	Acetone	8.28	15.9	ug/L	250	250	MW18; MW25S	4/140	0.5 - 250	1,400	NA	N	BSL
	71-43-2	Benzene	0.35	57	ug/L	40	57	MW06D	30/140	0.088 - 40	0.46	NA	Y	ASL
	75-27-4	Bromodichloromethane	0.62	0.62	ug/L	40	40	MW06	1/140	0.099 - 40	0.13	NA	N	CBSL**
	75-15-0	Carbon disulfide	0.61	64.7	ug/L	40	64.7	MW14S	7/142	0.2 - 40	81	NA	N	BSL
	67-66-3	Chloroform	0.38	86.6	ug/L	40	86.6	MW25S	9/140	0.12 - 40	0.22	NA	N	ASL
	124-48-1	Dibromochloromethane	0.44	0.44	ug/L	40	40	MW06	1/140	0.12 - 40	0.87	NA	N	CBSL
	100-41-4	Ethylbenzene	0.6	87.6	ug/L	40	87.6	MW32	40/142	0.12 - 40	1.5	NA	Y	ASL

Table 2-4
Occurrence, Distribution and Selection of COPCs in Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value [4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
South	98-82-8	Isopropylbenzene	0.73	15.9	ug/L	40	40	MW06	24/142	0.093 - 40	45	NA	N	BSL
	78-93-3	Methyl Ethyl Ketone	1.07	1.07	ug/L	64	64	MW18; MW25S	1/140	0.2 - 64	560	NA	N	BSL
	75-09-2	Methylene Chloride	0.39	0.39	ug/L	50	50	MW18; MW25S	1/140	0.2 - 50	11	NA	N	CBSL
	104-51-8	n-Butylbenzene	0.28	0.8	ug/L	40	40	MW06	7/137	0.2 - 40	100	NA	N	BSL
	103-65-1	n-Propylbenzene	0.39	3.3	ug/L	200	200	MW06	15/137	0.2 - 200	66	NA	N	CSBL
	95-49-8	o-Chlorotoluene	11	11	ug/L	40	40	MW06	1/137	0.2 - 40	24	NA	N	CBSL
	99-87-6	p-Isopropyltoluene	0.28	62.8	ug/L	40	62.8	MW14S	25/137	0.2 - 40	110	NA	N	BSL
	135-98-8	sec-Butylbenzene	0.34	2.3	ug/L	40	40	MW06	12/137	0.2 - 40	200	NA	N	BSL
	100-42-5	Styrene	0.96	77.8	ug/L	40	77.8	MW32	18/140	0.062 - 40	120	NA	N	BSL
	108-88-3	Toluene	0.47	110	ug/L	40	110	MW06D	32/142	0.13 - 40	110	NA	Y	ASL
	1330-20-7	Total Xylenes	1.2	268	ug/L	80	268	MW15	36/140	0.27 - 140	19	NA	Y	ASL
		Semi-volatile organic compounds												
	1319-77-3	(3-and/or 4-)Methylphenol	1.3	180	ug/L	9.8	180	MW06D	13/149	0.25 - 23	93	NA	Y	ASL
	92-52-4	1,1-Biphenyl	0.65	186	ug/L	5.3	186	MW15	48/147	0.5 - 14	0.083	NA	Y	ASL
	105-67-9	2,4-Dimethylphenol	1.2	610	ug/L	7.4	610	TMW10	25/149	0.5 - 35	36	NA	Y	ASL
	95-48-7	2-Methylphenol	0.94	320	ug/L	10	320	TMW10	15/149	0.46 - 11	93	NA	Y	ASL
	7005-72-3	4-Chlorophenyl phenyl ether	1.9	1.9	ug/L	10	10	MW25S	1/141	0.5 - 10	12	NA	N	BSL
	100-01-6	4-Nitroaniline	15.1	15.1	ug/L	30	30	MW25S	1/140	0.9 - 30	3.8	NA	N	CBSL*
	98-86-2	Acetophenone	12.8	90.3	ug/L	8.1	90.3	MW25S	6/137	0.5 - 10	190	NA	N	BSL
	62-53-3	Aniline	3.3	3.3	ug/L	15	15	MW25S	1/135	0.75 - 15	13	NA	N	CBSL
	100-52-7	Benzaldehyde	9.8	9.8	ug/L	50	50	MW06; MW25S	1/138	1 - 50	19	NA	N	CBSL
	92-87-5	Benzidine	6.24	6.24	ug/L	50	50	MW06; MW25S	1/135	2.5 - 50	0.00011	NA	N	CBSL*
	65-85-0	Benzoic acid	8.7	8.7	ug/L	100	100	MW06; MW25S	1/134	1.5 - 100	7,500	NA	N	BSL
	85-68-7	Benzyl butyl phthalate	4.8	4.8	ug/L	10	10	MW06; MW25S	1/139	0.25 - 10	16	NA	N	BSL
	117-81-7	Bis(2-ethylhexyl) phthalate	0.324	11.3	ug/L	10	11.3	MW11S	5/141	0.25 - 10	5.6	NA	Y	ASL
	86-74-8	Carbazole	0.511	877	ug/L	2.4	877	MW15	54/149	0.46 - 44	12	NA	Y	ASL
	132-64-9	Dibenzofuran	0.71	891	ug/L	2.7	891	MW15	56/149	0.46 - 92	0.79	NA	Y	ASL
	84-66-2	Diethyl phthalate	2.2	2.2	ug/L	10	10	MW06; MW25S	1/139	0.5 - 10	1,500	NA	N	BSL
	131-11-3	Dimethyl phthalate	1.7	1.7	ug/L	10	10	MW06; MW25S	1/139	0.5 - 10	90	NA	N	BSL
	84-74-2	Di-n-butylphthalate	4.4	4.4	ug/L	10	10	MW06; MW25S	1/141	0.5 - 10	90	NA	N	BSL
	117-84-0	Di-n-octylphthalate	6.4	12.3	ug/L	10	12.3	MW08	2/139	0.25 - 10	20	NA	N	BSL
	108-95-2	Phenol	3	29.7	ug/L	5	29.7	MW25S	8/148	0.46 - 10	580	NA	N	BSL
	110-86-1	Pyridine	2.03	2.03	ug/L	30	30	MW25S	1/135	1.5 - 30	2	NA	Y	ASL
		PAHs												
	90-12-0	1-Methylnaphthalene	0.048	1,210	ug/L	0.38	1210	MW04	73/135	0.04 - 67	1.1	NA	Y	ASL
	91-57-6	2-Methylnaphthalene	0.065	1,620	ug/L	0.5	1620	MW04	76/148	0.04 - 67	3.6	NA	Y	ASL
	83-32-9	Acenaphthene	0.014	711	ug/L	0.38	711	MW15	87/148	0.013 - 96	53	NA	Y	ASL
	208-96-8	Acenaphthylene	0.109	23	ug/L	64	64	MW15	27/140	0.04 - 64	12	NA	Y	ASL
	120-12-7	Anthracene	0.05	26	ug/L	40	40	MW15	41/136	0.033 - 40	180	NA	N	BSL
	56-55-3	Benzo(a)anthracene	0.027	18	ug/L	6.4	18	RIGW14	30/147	0.015 - 6.4	0.03	NA	Y	ASL
	50-32-8	Benzo(a)pyrene	0.015	6.2	ug/L	6.4	6.4	MW15	16/148	0.013 - 6.4	0.025	NA	Y	ASL
	205-99-2	Benzo(b)fluoranthene	0.015	7.5	ug/L	6.4	7.5	RIGW14	23/148	0.013 - 6.4	0.25	NA	Y	ASL
	191-24-2	Benzo(g,h,i)perylene	0.02	0.307	ug/L	6.4	6.4	MW15	8/140	0.013 - 6.4	12	NA	N	BSL
	207-08-9	Benzo(k)fluoranthene	0.03	6.5	ug/L	6.4	6.5	RIGW14	11/148	0.016 - 6.4	2.5	NA	Y	ASL
	218-01-9	Chrysene	0.03	4.3	ug/L	6.4	6.4	MW15	20/140	0.012 - 6.4	25	NA	N	BSL
	53-70-3	Dibenzo(a,h)anthracene	0.03	0.586	ug/L	6.4	6.4	MW15	5/140	0.016 - 6.4	0.025	NA	Y	ASL
	206-44-0	Fluoranthene	0.02	45	ug/L	40	45	TMW10	55/141	0.013 - 40	80	NA	N	BSL
	86-73-7	Fluorene	0.04	314	ug/L	0.43	314	MW15	84/148	0.04 - 40	29	NA	Y	ASL
	193-39-5	Indeno (1,2,3-cd) pyrene	0.015	0.4	ug/L	6.4	6.4	MW15	7/140	0.013 - 6.4	0.25	NA	Y	ASL
	91-20-3	Naphthalene	0.256	14,500	ug/L	3.3	14500	MW04	87/148	0.013 - 120	0.17	NA	Y	ASL

Table 2-4
Occurrence, Distribution and Selection of COPCs in Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum (1) Concentration	Maximum (1) Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening(2)	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value(3)	Background Value (4)	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
South	85-01-8	Phenanthrene	0.093	360	ug/L	0.625	360	RIGW18	79/148	0.013 - 40	12	NA	Y	ASL
	129-00-0	Pyrene	0.03	90	ug/L	40	90	RIGW14	53/147	0.023 - 40	12	NA	Y	ASL
		Pesticides												
	87-86-5	Pentachlorophenol	0.191	3.3	ug/L	40	40	MW15	5/140	0.1 - 40	0.041	NA	Y	ASL

Prepared by : KAH 8/17/2017
Reviewed by: DME 8/18/2017
Checked By: RAH 7/20/2018

Notes:
(1) Minimum/maximum detected concentration.
(2) Concentration used for screening is the higher of the maximum concentration or the maximum MDL for non-detected results.
(3) Screening value is the residential soil value from the USEPA Regional Screening Level (RSL) Table, based on risk of 10^{-6} for carcinogens and a hazard quotient (HQ) of 0.1 for noncarcinogens (USEPA, November 2018).
(4) Per Region 4 guidance (USEPA, 2014) background for naturally occuring metals is set to 2 times the average background concentration. See Tables 1-1 through 1-3 for derivation.
Consistent with the COPC Technical Memorandum for the site (ENSR, 2006), two times average background has also been used for semi-volatiles.
(5) Rationale Codes:
Selection Reason: Above Screening Level (ASL)
Deletion Reason: Below Screening Level (BSL); Below Background Level (BKG); Essential Nutrient (EN); Physical Characteristic (PC); Maximum Concentration Below Screening Level (CBSL)
CSBL* - Each of these constituents was detected only once above the RSL and was not detected consistently above the RSL in any monitoring well. Therefore, these constituents were not carried forward as COPCs.
CSBL** - Bromodichloromethane is a drinking water disinfectant which is not related to wood treating operations and was only detected once. Therefore, it was not carried forward as a COPC.
Based on USEPA Region 4 Human Health Risk Assessment (HHRA) Supplemental Guidance dated March 2018, the core of the plume was selected to calculate the groundwater (GW) exposure point concentrations (EPCs).
Also based on communication with USEPA dated May 11, 2018, the most recent groundwater sampling data was used to calculate the GW EPCs.
COPC - chemical of potential concern
MDL - method detection limit
NA - not available
PAHs - polycyclic aromatic hydrocarbons
mg/L - milligrams per liter
ug/L - micrograms per liter

Table 2-5
Occurrence, Distribution and Selection of COPCs in Sediment
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current/Future
Medium: Sediment

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value[4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Sturgeon Creek		***Inorganics***												
	E1644012	% Moisture	17.8	61.2	%	NA	61.2	SD24	5/5	0.5 - 0.5	NA	NA	N	PC
	E701250	Carbon, Organic	3,600	69,000	mg/kg	NA	69,000	KM26	10/10	180 - 15000	NA	NA	N	PC
	R4-8000492	% Clay	1.99	8.83	%	NA	8.83	KM30	5/5	0.01 - 0.01	NA	NA	N	PC
	R4-8000490	% Sand	3.58	21.8	%	NA	21.8	KM28	5/5	0.01 - 0.01	NA	NA	N	PC
	R4-8000491	% Silt	8.57	23.2	%	NA	23.2	KM30	5/5	0.01 - 0.01	NA	NA	N	PC
		Volatile organic compounds												
		None												
		Semi-volatile organic compounds												
	86-74-8	Carbazole	180	180	ug/kg	33	180	KM26	1/14	8.3 - 89	180,000	1,400	N	BSL
		PAHs												
	91-57-6	2-Methylnaphthalene	19	160	ug/kg	33	160	KM27	4/14	8.3 - 89	24,000	104.7	N	BSL
	83-32-9	Acenaphthene	86	170	ug/kg	33	170	KM26	3/14	8.3 - 89	360,000	104.2	N	BSL
	208-96-8	Acenaphthylene	13	94	ug/kg	33	94	SD24	4/14	8.3 - 89	180,000	102.7	N	BSL
	120-12-7	Anthracene	8	370	ug/kg	33	370	KM35	4/14	8.3 - 89	1,800,000	74.13	N	BSL
	56-55-3	Benzo(a)anthracene	26	610	ug/kg	33	610	KM35	6/14	8.3 - 89	1,100	42.09	N	BSL
	50-32-8	Benzo(a)pyrene	29	230	ug/kg	33	230	KM35	5/14	8.3 - 89	110	39.04	Y	ASL*
	205-99-2	Benzo(b)fluoranthene	43	400	ug/kg	33	400	KM35	6/14	8.3 - 89	1,100	90.58	N	BSL
	191-24-2	Benzo(g,h,i)perylene	11	110	ug/kg	33	110	SD24	1/14	8.3 - 89	180,000	24.09	N	BSL
	207-08-9	Benzo(k)fluoranthene	15	140	ug/kg	33	140	KM35	4/14	8.3 - 89	11,000	40.85	N	BSL
	218-01-9	Chrysene	29	320	ug/kg	33	320	KM26	5/14	8.3 - 89	110,000	65.29	N	BSL
	53-70-3	Dibenzo(a,h)anthracene	11	12	ug/kg	33	33	SD24; SD25; SD26; SD27; SD28	2/14	8.3 - 89	110	22.73	N	BSL
	206-44-0	Fluoranthene	40	2,100	ug/kg	33	2,100	KM35	10/14	8.3 - 630	240,000	155.3	N	BSL
	86-73-7	Fluorene	15	380	ug/kg	33	380	KM26	4/14	8.3 - 89	240,000	102.8	N	BSL
	193-39-5	Indeno (1,2,3-cd) pyrene	24	120	ug/kg	33	120	SD24	5/14	8.3 - 89	1,100	31.25	N	BSL
	91-20-3	Naphthalene	56	260	ug/kg	33	260	KM26	6/14	9.2 - 89	3,800	105.4	N	BSL
	85-01-8	Phenanthrene	15	950	ug/kg	33	950	KM26	3/14	8.3 - 89	180,000	71.93	N	BSL
	129-00-0	Pyrene	36	1,400	ug/kg	33	1,400	KM35	10/14	8.3 - 630	180,000	173.9	N	BSL
		Pesticides												
		None												
Southern Marsh		***Inorganics***												
	E1644012	% Moisture	14.7	94	%	NA	94	SD16	78/78	0.5 - 0.5	NA	NA	N	PC
	E1642941	% Solids	11	69	%	NA	69	SD87	17/17	0.1 - 0.1	NA	NA	N	PC
	E701250	Carbon, Organic	49,000	410,000	mg/kg	NA	410,000	SD12	27/27	300 - 15000	NA	NA	N	PC
	E17028275	pH	6.47	6.67	pH Units	NA	6.67	VCHM01	2/2	1 - 1	NA	NA	N	PC
	E1640382	Total Solids	10	75	%	NA	75	SD87	30/30	0.1 - 0.1	NA	NA	N	PC
	R4-8000492	% Clay	3.09	3.09	%	NA	3.09	KM25	1/1	0.01 - 0.01	NA	NA	N	PC
	R4-8000490	% Sand	4.83	4.83	%	NA	4.83	KM25	1/1	0.01 - 0.01	NA	NA	N	PC
	R4-8000491	% Silt	17.8	17.8	%	NA	17.8	KM25	1/1	0.01 - 0.01	NA	NA	N	PC
	7429-90-5	Aluminum	14,700	31,800	mg/kg	NA	31,800	RISD63	5/5	3.3 - 11	7,700	NA	Y	ASL
	7440-36-0	Antimony	2.3	2.3	mg/kg	3.2	3.2	RISD58	1/5	0.96 - 3.2	3.1	NA	N	CBSL
	7440-38-2	Arsenic	4.07	25	mg/kg	NA	25	RISD62	10/10	0.19 - 1.6	0.68	NA	Y	ASL
	7440-39-3	Barium	32	76	mg/kg	NA	76	RISD61	5/5	0.42 - 1.4	1,500	NA	N	BSL
	7440-41-7	Beryllium	1.3	1.6	mg/kg	0.99	1.6	RISD62	4/5	0.3 - 0.99	16	NA	N	BSL
	7440-43-9	Cadmium	0.58	0.92	mg/kg	0.6	0.92	RISD62	4/5	0.18 - 0.6	7.1	NA	N	BSL
	7440-70-2	Calcium	2,600	4,790	mg/kg	NA	4,790	RISD58	5/5	17 - 57	NA	NA	N	EN
	7440-47-3	Chromium	21	61	mg/kg	NA	61	RISD62	10/10	0.15 - 0.57	12,000	36.93	N	BSL
	18540-29-9	Hexavalent Chromium	44.2	44.2	mg/kg	2.14	44.2	SD106	1/5	0.709 - 2.14	0.3	15.41	Y	ASL
	7440-48-4	Cobalt	9.8	30	mg/kg	NA	30	RISD66	5/5	0.2 - 0.65	2.3	NA	Y	ASL
	7440-50-8	Copper	21	57	mg/kg	NA	57	RISD62	5/5	0.51 - 1.7	310	NA	N	BSL
	7439-89-6	Iron	20,000	39,400	mg/kg	NA	39,400	RISD63	5/5	3.9 - 13	5,500	NA	Y	ASL
	7439-92-1	Lead	28	60	mg/kg	NA	60	RISD62	5/5	0.39 - 1.3	400	NA	N	BSL

Table 2-5
Occurrence, Distribution and Selection of COPCs in Sediment
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value[4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
	7439-95-4	Magnesium	5,120	5,370	mg/kg	NA	5,370	RISD66	5/5	6.6 - 22	NA	NA	N	EN
	7439-96-5	Manganese	106	397	mg/kg	NA	397	RISD66	5/5	0.36 - 1.2	180	NA	Y	ASL
	7439-97-6	Mercury	0.12	0.12	mg/kg	0.044	0.12	RISD61	1/5	0.013 - 0.044	1.1	NA	N	BSL
	7440-02-0	Nickel	15	28	mg/kg	NA	28	RISD62	5/5	0.48 - 1.6	150	NA	N	BSL
	7440-09-7	Potassium	1,520	2,260	mg/kg	NA	2,260	RISD62	5/5	117 - 386	NA	NA	N	EN
	7782-49-2	Selenium	0.42	3.3	mg/kg	NA	3.3	RISD58	5/5	0.1 - 0.33	39	NA	N	BSL
	7440-23-5	Sodium	4,860	13,500	mg/kg	NA	13,500	RISD58	5/5	48 - 158	NA	NA	N	EN
	7440-28-0	Thallium	0.22	3.4	mg/kg	0.85	3.4	RISD58	4/10	0.19 - 1.2	0.078	NA	Y	ASL
	7440-62-2	Vanadium	48	120	mg/kg	NA	120	RISD62	5/5	2.6 - 8.4	39	NA	Y	ASL
	7440-66-6	Zinc	79	223	mg/kg	NA	223	RISD62	5/5	0.84 - 2.8	2,300	NA	N	BSL
		Volatile organic compounds												
	95-63-6	1,2,4-Trimethylbenzene	11	11	ug/kg	6.96	11	VCHM01	1/5	1.47 - 6.96	30,000	NA	N	BSL
	67-64-1	Acetone	337	977	ug/kg	NA	977	VCHM01	5/5	2.93 - 14	6,100,000	NA	N	BSL
	75-15-0	Carbon disulfide	14	15	ug/kg	6.96	15	VCHM01	3/5	1.47 - 6.96	77,000	NA	N	BSL
	108-90-7	Chlorobenzene	11	138	ug/kg	NA	138	VCHM01	5/5	1.47 - 6.96	28,000	NA	N	BSL
	100-41-4	Ethylbenzene	6.69	7.33	ug/kg	6.96	7.33	VCHM01	2/5	1.47 - 6.96	5,800	NA	N	BSL
	98-82-8	Isopropylbenzene	22	46	ug/kg	2.51	46	VCHM01	3/5	1.47 - 6.96	190,000	NA	N	BSL
	179601-23-1	m,p-Xylene	12	15	ug/kg	6.96	15	VCHM01	2/5	1.47 - 6.96	55,000	NA	N	BSL
	79-20-9	Methyl Acetate	15	15	ug/kg	14	15	VCHM01	1/5	2.93 - 14	7,800,000	NA	N	BSL
	78-93-3	Methyl Ethyl Ketone	57	129	ug/kg	NA	129	VCHM01	5/5	2.93 - 14	2,700,000	NA	N	BSL
	104-51-8	n-Butylbenzene	35	78	ug/kg	2.51	78	VCHM01	3/5	1.47 - 6.96	390,000	NA	N	BSL
	103-65-1	n-Propylbenzene	7.8	29	ug/kg	2.51	29	VCHM01	3/5	1.47 - 6.96	380,000	NA	N	BSL
	95-47-6	o-Xylene	16	35	ug/kg	2.51	35	VCHM01	3/5	1.47 - 6.96	65,000	NA	N	BSL
	99-87-6	p-Isopropyltoluene	3.05	3.05	ug/kg	6.96	6.96	VCHM01	1/5	1.47 - 6.96	490,000	NA	N	BSL
	135-98-8	sec-Butylbenzene	43	66	ug/kg	2.51	66	VCHM01	3/5	1.47 - 6.96	780,000	NA	N	BSL
	108-88-3	Toluene	4.79	4.79	ug/kg	6.96	6.96	VCHM01	1/5	1.47 - 6.96	490,000	NA	N	BSL
	1330-20-7	Total Xylenes	28	35	ug/kg	5.01	35	VCHM01	3/5	2.93 - 14	58,000	NA	N	BSL
Southern Marsh		***Semi-volatile organic compounds***												
	92-52-4	1,1-Biphenyl	83	410	ug/kg	4,600	4,600	RISD58; RISD60	4/89	33 - 4600	4,700	1,612	N	BSL
	105-67-9	2,4-Dimethylphenol	49	1,100	ug/kg	3,600	3,600	SD86	5/113	33 - 3600	130,000	2,698	N	BSL
	121-14-2	2,4-Dinitrotoluene	890	890	ug/kg	3,300	3,300	SD12; SD13; SD14; SD15	1/113	67 - 3300	1,700	1,366	N	CBSL
	100-52-7	Benzaldehyde	4.5	4,600	ug/kg	5,310	5,310	VCHM03	40/89	1.9 - 5310	170,000	3,528	N	BSL
	65-85-0	Benzoic acid	766	2,350	ug/kg	2,620	2,620	VCHM03	3/5	375 - 2620	25,000,000	NA	N	BSL
	85-68-7	Benzyl butyl phthalate	420	1,100	ug/kg	3,300	3,300	SD12; SD13; SD14; SD15	4/100	57 - 3300	290,000	1,556	N	BSL
	117-81-7	Bis(2-ethylhexyl) phthalate	130	1,500	ug/kg	5,000	5,000	SD12; SD13; SD14; SD15	4/113	57 - 5000	39,000	1,560	N	BSL
	86-74-8	Carbazole	58	330,000	ug/kg	2,500	330,000	SD29	48/114	10 - 2500	180,000	1,400	Y	ASL
	132-64-9	Dibenzofuran	180	1,800,000	ug/kg	1,100	1,800,000	SD29	49/113	33 - 17000	7,300	1,498	Y	ASL
	84-74-2	Di-n-butylphthalate	167	538	ug/kg	3,300	3,300	SD12; SD13; SD14; SD15	2/113	57 - 3300	630,000	1,132	N	BSL
	86-30-6	N-Nitrosodiphenylamine	250	3,400	ug/kg	1,700	3,400	SD08; SD44	9/113	33 - 1700	110,000	N/A	N	BSL
	108-95-2	Phenol	51	51	ug/kg	2,620	2,620	VCHM03	1/113	33 - 2620	1,900,000	1,498	N	BSL
		PAHs												
	90-12-0	1-Methylnaphthalene	47	773	ug/kg	873	873	VCHM01	3/22	1.6 - 873	18,000	130.2	N	BSL
	91-57-6	2-Methylnaphthalene	13	3,000,000	ug/kg	1,700	3,000,000	SD29	33/114	1.9 - 17000	24,000	104.7	Y	ASL
	83-32-9	Acenaphthene	190	1,900,000	ug/kg	1,700	1,900,000	SD29	58/114	1.7 - 17000	360,000	104.2	Y	ASL
	208-96-8	Acenaphthylene	6.8	56,000	ug/kg	1,720	56,000	SD12	56/114	1.1 - 1720	180,000	102.7	N	BSL
	120-12-7	Anthracene	4.8	1,800,000	ug/kg	310	1,800,000	SD11	84/114	0.87 - 17000	1,800,000	74.13	Y	ASL
	56-55-3	Benzo(a)anthracene	1.8	1,500,000	ug/kg	1,720	1,500,000	SD12	85/114	1.3 - 2100	1,100	42.09	Y	ASL
	50-32-8	Benzo(a)pyrene	3.7	480,000	ug/kg	580	480,000	SD12	76/114	1.6 - 1700	110	39.04	Y	ASL
	205-99-2	Benzo(b)fluoranthene	2.9	720,000	ug/kg	1,720	720,000	SD12	89/114	1.7 - 1720	1,100	90.58	Y	ASL
	191-24-2	Benzo(g,h,i)perylene	13	130,000	ug/kg	873	130,000	SD12	56/114	1.8 - 2300	180,000	24.09	N	BSL
	207-08-9	Benzo(k)fluoranthene	5.1	330,000	ug/kg	490	330,000	SD12	75/114	2.1 - 2600	11,000	40.85	Y	ASL
	218-01-9	Chrysene	1.5	1,500,000	ug/kg	1,720	1,500,000	SD12	82/114	1.3 - 3300	110,000	65.29	Y	ASL
	53-70-3	Dibenzo(a,h)anthracene	23	48,000	ug/kg	1,720	48,000	SD12	46/114	0.7 - 2000	110	22.73	Y	ASL
	206-44-0	Fluoranthene	2.7	8,700,000	ug/kg	370	8,700,000	SD12	94/114	2.5 - 17000	240,000	155.3	Y	ASL
	86-73-7	Fluorene	3.9	2,100,000	ug/kg	310	2,100,000	SD29	61/114	1.3 - 17000	240,000	102.8	Y	ASL
	193-39-5	Indeno (1,2,3-cd) pyrene	14	160,000	ug/kg	550	160,000	SD12	61/114	1.8 - 1800	1,100	31.25	Y	ASL

Table 2-5
Occurrence, Distribution and Selection of COPCs in Sediment
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	CAS Number	Chemical	Minimum [1] Concentration	Maximum [1] Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening[2]	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value[3]	Background Value[4]	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
Southern Marsh	91-20-3	Naphthalene	28	3,500,000	ug/kg	1,700	3,500,000	SD29	47/114	1.7 - 17000	3,800	105.4	Y	ASL
	85-01-8	Phenanthrene	16	9,500,000	ug/kg	873	9,500,000	SD12	58/114	1.3 - 17000	180,000	71.93	Y	ASL
	129-00-0	Pyrene	2.9	5,600,000	ug/kg	873	5,600,000	SD12	93/114	1.8 - 17000	180,000	173.9	Y	ASL
		Pesticides												
		None												

Notes:
(1) Minimum/maximum detected concentration.
(2) Concentration used for screening is the higher of the maximum concentration or the maximum MDL for non-detected results.
(3) Screening value is the residential soil value from the USEPA Regional Screening Level (RSL) Table, based on risk of 10^{-6} for carcinogens and a hazard quotient (HQ) of 0.1 for noncarcinogens (USEPA, November 2018).
(4) Per Region 4 guidance (USEPA, 2014) background for naturally occuring metals is set to 2 times the average background concentration. See Tables 1-1 through 1-3 for derivation.
Consistent with the COPC Technical Memorandum for the site (ENSR, 2006), two times average background has also been used for semivolatiles.
(5) Rationale Codes:
Selection Reason: Above Screening Level (ASL)
Deletion Reason: Below Screening Level (BSL); Below Background Level (BKG); Essential Nutrient (EN); Physical Characteristic (PC); Maximum Concentration Below Screening Level (CBSL)
ASL* - Exposure route is complete but insignificant so it is not quantified in the Human Health Risk Assessment.
COPC - chemical of potential concern
MDL - method detection limit
NA - not available
PAHs - polycyclic aromatic hydrocarbons
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

Prepared by : KAH 7/11/2017
Reviewed by: MAB 7/13/2017
Checked By: RAH 7/20/2018

Table 2-6
Occurrence, Distribution and Selection of COPCs in Surface Water
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current/Future
Medium: Surface Water

Area	CAS Number	Chemical	Minimum (1) Concentration	Maximum (1) Concentration	Units	Max. MDL for Non-detected Results	Concentration Used for Screening(2)	Location of Maximum Value	Detection Frequency	Range of Reporting Limits	Screening Toxicity Value(3)	Background Value (4)	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Sturgeon Creek		***Inorganics***												
	7440-38-2	Arsenic (dissolved)	0.00038	0.00038	mg/L	NA	0.00038	SW101	1/1	0.00025 - 0.00025	0.000052	NA	Y	ASL*
	7440-47-3	Chromium (dissolved)	0.00026	0.00026	mg/L	NA	0.00026	SW101	1/1	0.00025 - 0.00025	2.2	NA	N	BSL
	16065-83-1	Chromium(III), Insoluble Salts (dissolved)	0.00026	0.00026	mg/L	NA	0.00026	SW101	1/1	0.00025 - 0.00025	NA	NA	N	BSL
	7440-38-2	Arsenic	0.00054	0.00054	mg/L	NA	0.00054	SW101	1/1	0.00025 - 0.00025	0.000052	NA	Y	ASL
	7440-47-3	Chromium	0.00072	0.00072	mg/L	NA	0.00072	SW101	1/1	0.00025 - 0.00025	2.2	NA	N	BSL
	16065-83-1	Chromium(III), Insoluble Salts	0.00072	0.00072	mg/L	NA	0.00072	SW101	1/1	0.00025 - 0.00025	NA	NA	N	BSL
		Volatile organic compounds												
		None												
		Semi-volatile organic compounds												
		None												
		PAHs												
		None												
		Pesticides												
		None												
Southern Marsh		***Inorganics***												
	E1642222	Total Dissolved Solids	110	434	mg/L	NA	434	SW112	3/3	100 - 100	500	NA	N	PC
	16887-00-6	Chloride	35.4	172	mg/L	NA	172	SW112	3/3	2 - 2	NA	NA	N	EN
	7440-38-2	Arsenic (dissolved)	0.00035	0.00079	mg/L	NA	0.00079	SW104	8/8	0.00025 - 0.00025	0.000052	NA	Y	ASL*
	7440-47-3	Chromium (dissolved)	0.00029	0.00189	mg/L	0.00025	0.00189	SW104	7/8	0.00025 - 0.00025	2.2	NA	N	BSL
	16065-83-1	Chromium(III), Insoluble Salts (dissolved)	0.00029	0.00189	mg/L	0.00025	0.00189	SW104	7/8	0.00025 - 0.00025	NA	NA	N	BSL
	7440-38-2	Arsenic	0.00059	0.00089	mg/L	NA	0.00089	SW105	8/8	0.00025 - 0.00025	0.000052	NA	Y	ASL
	7440-47-3	Chromium	0.00056	0.0009	mg/L	NA	0.0009	SW109	8/8	0.00025 - 0.00025	2.2	NA	N	BSL
	16065-83-1	Chromium(III), Insoluble Salts	0.00056	0.0009	mg/L	NA	0.0009	SW109	8/8	0.00025 - 0.00025	NA	NA	N	BSL
		Volatile organic compounds												
		None												
		Semi-volatile organic compounds												
		None												
		PAHs												
		None												
		Pesticides												
		None												

Notes:
(1) Minimum/maximum detected concentration.
(2) Maximum concentration used for screening is the higher of the maximum concentration or the maximum MDL for non-detected results.
(3) Screening value is the residential soil value from the USEPA Regional Screening Level (RSL) Table, based on risk of 10^{-6} for carcinogens and a hazard quotient (HQ) of 0.1 for noncarcinogens (USEPA, November 2018).
(4) Per Region 4 guidance (USEPA, 2014) background for naturally occuring metals is set to 2 times the average background concentration. See Tables 1-1 through 1-3 for derivation.
Consistent with the COPC Technical Memorandum for the site (ENSR, 2006), two times average background has also been used for semivolatiles.
(5) Rationale Codes:
Selection Reason: Above Screening Level (ASL)
Deletion Reason: Below Screening Level (BSL); Below Background Level (BKG); Essential Nutrient (EN); Physical Characteristic (PC)
ASL* - Per communication with USEPA and NCDEQ, total metals were used to calculate the exposure point concentrations.
COPC - chemical of potential concern
MDL - method detection limit
NA - not available
PAHs - polycyclic aromatic hydrocarbons
mg/L - milligrams per liter
ug/L - micrograms per liter

Prepared by : KAH 7/11/2017
Reviewed by: MAB 7/13/2017
Checked By: RAH 7/20/2018

Table 2-7
Surface Soil (0-1 foot) Exposure Point Concentrations
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Exposure Point											Exposure Point Concentration		
Area	Medium	Type	Chemical of Potential Concern (COPC)	Screening Toxicity Value[1]	Units	# of Detections	# of Samples	% of NDs	Arithmetic Mean	Maximum Concentration (Qualifier)	95% Upper Confidence Level (UCL)	Value	Units	Statistical Test
Pond Area	Surface Soils	Inorganic	Aluminum	7,700	mg/kg	7	7	0%	10,047.14	19,000	14,553	14,553	mg/kg	95 % Student's-t UCL
		Inorganic	Arsenic	0.68	mg/kg	9	9	0%	9.85	30.3	29.71	29.71	mg/kg	95% Adjusted Gamma UCL
		Inorganic	Iron	5,500	mg/kg	7	7	0%	6,587.14	12,000	9,297	9,297	mg/kg	95% Student's-t UCL
		Inorganic	Thallium	0.078	mg/kg	1	9	89%	0.77	*0.96 (ND)*	--	*0.96 (ND)*	mg/kg	--
		Inorganic	Vanadium	39	mg/kg	7	7	0%	29.60	78	48.92	48.92	mg/kg	95% Student's-t UCL
		VOC	Benzene	1,200	ug/kg	2	7	71%	267.70	1,600	--	1,600	ug/kg	--
		VOC	Ethylbenzene	5,800	ug/kg	3	9	67%	8,603.84	44,000	--	44,000	ug/kg	--
		VOC	Total Xylenes	58,000	ug/kg	3	7	57%	20,843.37	82,000	--	82,000	ug/kg	--
		PAH	2-Methylnaphthalene	24,000	ug/kg	19	30	37%	175,543.60	2,400,000	652,968	652,968	ug/kg	95% KM Chebyshev UCL
		PAH	Acenaphthene	360,000	ug/kg	23	30	23%	277,144.40	3,100,000	910,081	910,081	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)anthracene	1,100	ug/kg	28	30	7%	73,266.43	520,000	193,738	193,738	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)pyrene	110	ug/kg	28	30	7%	28,807.23	190,000	68,351	68,351	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(b)fluoranthene	1,100	ug/kg	29	30	3%	48,075.48	330,000	88,426	88,426	ug/kg	95% Adjusted Gamma UCL
		PAH	Benzo(k)fluoranthene	11,000	ug/kg	29	30	3%	28,016.77	170,000	66,720	66,720	ug/kg	95% KM Chebyshev UCL
		SVOC	Carbazole	180,000	ug/kg	25	30	17%	76,336.83	1,100,000	282,362	282,362	ug/kg	95% KM Chebyshev UCL
		PAH	Chrysene	110,000	ug/kg	30	30	0%	73,410.79	530,000	151,495	151,495	ug/kg	95% Adjusted Gamma UCL
		PAH	Dibenzo(a,h)anthracene	110	ug/kg	25	30	17%	6,908.87	*65,000*	6,547	6,547	ug/kg	95% KM Chebyshev UCL
		SVOC	Dibenzofuran	7,300	ug/kg	21	30	30%	191,445.27	2,300,000	661,734	661,734	ug/kg	95% KM Chebyshev UCL
		PAH	Fluoranthene	240,000	ug/kg	30	30	0%	432,140.94	3,800,000	1,045,304	1,045,304	ug/kg	95% Adjusted Gamma UCL
		PAH	Fluorene	240,000	ug/kg	25	30	17%	241,153.67	2,800,000	810,665	810,665	ug/kg	95% KM Chebyshev UCL
		PAH	Indeno(1,2,3-cd)pyrene	1,100	ug/kg	27	30	10%	11,515.27	54,000	19,010	19,010	ug/kg	95% KM Chebyshev UCL
		PAH	Naphthalene	3,800	ug/kg	20	30	33%	231,407.80	3,400,000	902,024	902,024	ug/kg	95% KM Chebyshev UCL
		PAH	Phenanthrene	180,000	ug/kg	23	28	18%	235,344.18	3,300,000	852,639	852,639	ug/kg	95% KM Chebyshev UCL
		PAH	Pyrene	180,000	ug/kg	30	30	0%	310,032.48	2,400,000	704,859	704,859	ug/kg	95% Adjusted Gamma UCL
		SVOC	1,1-Biphenyl	4,700	ug/kg	3	12	75%	19,933.42	100,000	--	100,000	ug/kg	--
		Pesticide	Aldrin	39	ug/kg	1	7	86%	27.48	150	--	150	ug/kg	--
Process Area	Surface Soils	Inorganic	Aluminum	7,700	mg/kg	10	10	0%	6,778.30	13,000	9,176	9,176	mg/kg	95% Student's-t UCL
		Inorganic	Arsenic	0.68	mg/kg	10	10	0%	2.97	6.14	4.112	4.112	mg/kg	95% Student's-t UCL
		Inorganic	Hexavalent Chromium	0.3	mg/kg	1	5	80%	0.6236	0.836	--	0.836	mg/kg	--
		Inorganic	Thallium	0.078	mg/kg	1	10	90%	0.50	*0.96 (ND)*	--	*0.96 (ND)*	mg/kg	--
		Inorganic	Vanadium	39	mg/kg	10	10	0%	19.52	47	27.58	27.58	mg/kg	95% Student's-t UCL

Table 2-7
Surface Soil (0-1 foot) Exposure Point Concentrations
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Exposure Point											Exposure Point Concentration		
Area	Medium	Type	Chemical of Potential Concern (COPC)	Screening Toxicity Value[1]	Units	# of Detections	# of Samples	% of NDs	Arithmetic Mean	Maximum Concentration (Qualifier)	95% Upper Confidence Level (UCL)	Value	Units	Statistical Test
Process Area	Surface Soils	PAH	2-Methylnaphthalene	24,000	ug/kg	18	22	18%	5,426.09	95,000	24,298	24,298	ug/kg	95% KM Chebyshev UCL
		PAH	Anthracene	1,800,000	ug/kg	17	17	0%	161,841.12	2,100,000	697,326	697,326	ug/kg	95% Chebyshev (Mean, SD) UCL
		PAH	Benzo(a)anthracene	1,100	ug/kg	22	22	0%	36,217.73	220,000	66,945	66,945	ug/kg	95% Adjusted Gamma UCL
		PAH	Benzo(a)pyrene	110	ug/kg	22	22	0%	20,282.14	77,000	34,924	34,924	ug/kg	95% Adjusted Gamma UCL
		PAH	Benzo(b)fluoranthene	1,100	ug/kg	22	22	0%	44,610.45	170,000	76,818	76,818	ug/kg	95% Adjusted Gamma UCL
		PAH	Benzo(k)fluoranthene	11,000	ug/kg	22	22	0%	19,705.91	70,000	32,929	32,929	ug/kg	95% Adjusted Gamma UCL
		SVOC	Carbazole	180,000	ug/kg	19	22	14%	22,413.18	300,000	83,492	83,492	ug/kg	95% KM Chebyshev UCL
		PAH	Chrysene	110,000	ug/kg	22	22	0%	49,625.91	240,000	90,582	90,582	ug/kg	95% Adjusted Gamma UCL
		PAH	Dibenzo(a,h)anthracene	110	ug/kg	18	22	18%	2,995.68	13,000	4,242	4,242	ug/kg	95% KM (t) UCL
		SVOC	Dibenzofuran	7,300	ug/kg	15	22	32%	12,401.14	230,000	58,211	58,211	ug/kg	95% KM Chebyshev UCL
		PAH	Fluoranthene	240,000	ug/kg	22	22	0%	114,670.00	1,200,000	236,305	236,305	ug/kg	95% Adjusted Gamma UCL
		PAH	Fluorene	240,000	ug/kg	20	22	9%	21,945.64	370,000	95,418	95,418	ug/kg	95% KM Chebyshev UCL
		PAH	Indeno (1,2,3-cd) pyrene	1,100	ug/kg	21	22	5%	10,860.11	42,000	15,075	15,075	ug/kg	95% KM (t) UCL
		PAH	Naphthalene	3,800	ug/kg	13	22	41%	4,212.25	73,000	18,813	18,813	ug/kg	95% KM Chebyshev UCL
		PAH	Phenanthrene	180,000	ug/kg	16	17	6%	98,333.53	1,500,000	481,578	481,578	ug/kg	95% KM Chebyshev UCL
		PAH	Pyrene	180,000	ug/kg	22	22	0%	114,819.10	870,000	220,686	220,686	ug/kg	95% Adjusted Gamma UCL
Treated Wood Storage Area	Surface Soils	Inorganic	Aluminum	7,700	mg/kg	4	4	0%	6,532.50	11,200	10,587	10,587	mg/kg	95% Student's-t UCL
		Inorganic	Arsenic	0.68	mg/kg	4	4	0%	2.11	2.98	2.98	2.98	mg/kg	95% Student's-t UCL
		Inorganic	Thallium	0.078	mg/kg	1	4	75%	0.79	*0.941*	--	*0.941*	mg/kg	--
		PAH	Benzo(a)anthracene	1,100	ug/kg	19	20	5%	1,914.21	7,900	4,444	4,444	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)pyrene	110	ug/kg	19	20	5%	1,452.46	6,400	3,289	3,289	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(b)fluoranthene	1,100	ug/kg	19	20	5%	2,846.43	12,900	6,356	6,356	ug/kg	95% KM Chebyshev UCL
		PAH	Dibenzo(a,h)anthracene	110	ug/kg	12	20	40%	226.66	1,300	551.8	551.8	ug/kg	95% KM Chebyshev UCL
		PAH	Indeno (1,2,3-cd) pyrene	1,100	ug/kg	19	20	5%	926.57	4,870	2,293	2,293	ug/kg	95% KM Chebyshev UCL
Untreated Wood Storage Area	Surface Soils	Inorganic	Arsenic	0.68	mg/kg	22	23	4%	2.19	10.8	4.44	4.44	mg/kg	95% KM Chebyshev UCL
		Inorganic	Hexavalent Chromium	0.3	mg/kg	2	2	0%	1.58	1.71	--	1.71	mg/kg	--
		PAH	Benzo(a)anthracene	1,100	ug/kg	42	43	2%	730.10	10,600	1,989	1,989	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)pyrene	110	ug/kg	42	43	2%	744.25	13,000	2,116	2,116	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(b)fluoranthene	1,100	ug/kg	43	43	0%	1,772.81	39,000	2,826	2,826	ug/kg	95% Adjusted Gamma UCL
		PAH	Benzo(k)fluoranthene	11,000	ug/kg	43	43	0%	784.40	11,100	1,223	1,223	ug/kg	95% Adjusted Gamma UCL
		PAH	Dibenzo(a,h)anthracene	110	ug/kg	24	43	44%	141.42	2,480	340	340	ug/kg	95% Adjusted Gamma UCL
		PAH	Indeno (1,2,3-cd) pyrene	1,100	ug/kg	39	43	9%	560.05	10,500	1,625	1,625	ug/kg	95% KM Chebyshev UCL

Table 2-7
Surface Soil (0-1 foot) Exposure Point Concentrations
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Exposure Point											Exposure Point Concentration		
Area	Medium	Type	Chemical of Potential Concern (COPC)	Screening Toxicity Value[1]	Units	# of Detections	# of Samples	% of NDs	Arithmetic Mean	Maximum Concentration (Qualifier)	95% Upper Confidence Level (UCL)	Value	Units	Statistical Test
Eastern Upland Area	Surface Soils	Inorganic	Aluminum	7,700	mg/kg	34	34	0%	4,507.41	22,800	6,295	6,295	mg/kg	95% Adjusted Gamma UCL
		Inorganic	Arsenic	0.68	mg/kg	31	34	9%	3.004	26.7	6.674	6.674	mg/kg	95% KM Chebyshev UCL
		Inorganic	Cobalt	2.3	mg/kg	28	34	18%	0.710	5.79	1.144	1.144	mg/kg	95% Adjusted Gamma UCL
		Inorganic	Hexavalent Chromium	0.3	mg/kg	1	3	67%	0.581	0.912	--	0.912	mg/kg	--
		Inorganic	Iron	5,500	mg/kg	34	34	0%	3,012.12	12,100	4,022	4,022	mg/kg	95% Adjusted Gamma UCL
		Inorganic	Manganese	180	mg/kg	29	34	15%	38.48	428	96.7	96.7	mg/kg	95% KM Chebyshev UCL
		Inorganic	Thallium	0.078	mg/kg	1	34	97%	0.226	*0.96 (ND)*	--	*0.96 (ND)*	mg/kg	--
		Inorganic	Vanadium	39	mg/kg	34	34	0%	8.45	40.5	11.02	11.02	mg/kg	95% Adjusted Gamma UCL
		VOC	Acrolein	14	ug/kg	5	31	84%	28.92	*294 (ND)*	10.99	10.99	ug/kg	95% KM (t) UCL
		PAH	Benzo(a)anthracene	1,100	ug/kg	30	39	23%	210.34	2,260	530.1	530.1	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)pyrene	110	ug/kg	25	39	36%	222.24	2,570	453.8	453.8	ug/kg	95% Adjusted Gamma UCL
		PAH	Benzo(b)fluoranthene	1,100	ug/kg	34	39	13%	612.23	6,750	1,511	1,511	ug/kg	95% KM Chebyshev UCL
		PAH	Indeno(1,2,3-cd)pyrene	1,100	ug/kg	15	39	62%	144.06	2,110	359.3	359.3	ug/kg	95% Adjusted Gamma UCL

Notes

Prepared By: SBH 6/22/2018
Reviewed By: RAH 7/20/2018

Surface soil samples collected 0-1 foot below ground surface (bgs)
[1] - Resident Soil RSL THQ=0.1 from RSL Tables, November 2018
RSL - Risk Screening Level
THQ - Total Hazard Quotient
ND - Not detected above the method detection limit
NL - Not Listed
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
PAH - Polycyclic Aromatic Hydrocarbon
VOC - Volatile Organic Compound
SVOC - Semi-Volatile Organic Compound
0.96 (ND) - Maximum concentration was non-detect due to elevated detection limits.
Duplicates were not included as individual samples. Instead, the average concentration was used.
Method Detection Limit (MDL) was used for non-detects.
-- Per the ProUCL Technical Guide, the maximum concentration was used in lieu of the 95% UCL if 1) greater than 90% of the samples were not detected or 2) there were less than four detections in the sample set.

Table 2-8
Subsurface Soil Exposure Point Concentrations
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Exposure Point											Exposure Point Concentration		
Area	Medium	Type	Chemical of Potential Concern (COPC)	Screening Toxicity Value[1]	Units	# of Detections	# of Samples	% of NDs	Arithmetic Mean	Maximum Concentration (Qualifier)	95% Upper Confidence Level (UCL)	Value	Units	Statistical Test
Pond Area	Subsurface Soils	Inorganic	Aluminum	7,700	mg/kg	2	2	0%	8,650	9,400	--	9,400	mg/kg	--
		Inorganic	Arsenic	0.68	mg/kg	4	4	0%	1.41	3.6	3.15	3.15	mg/kg	95% Student's-t UCL
		VOC	Ethylbenzene	5,800	ug/kg	5	8	38%	4,567.67	30,000	11,683	11,683	ug/kg	95% Adjusted Gamma KM-UCL
		SVOC	1,1-Biphenyl	4,700	ug/kg	4	11	64%	134,665.55	720,000	277,856	277,856	ug/kg	95% KM (t) UCL
		PAH	2-Methylnaphthalene	24,000	ug/kg	24	35	31%	408,370.37	5,600,000	1,165,467	1,165,467	ug/kg	95% Adjusted Gamma KM-UCL
		PAH	Acenaphthene	360,000	ug/kg	25	35	29%	450,042.11	7,100,000	1,434,867	1,434,867	ug/kg	95% KM Chebyshev UCL
		PAH	Anthracene	1,800,000	ug/kg	26	32	19%	514,199.53	6,300,000	1,621,575	1,621,575	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)anthracene	1,100	ug/kg	27	35	23%	91,483.46	1,500,000	289,625	289,625	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)pyrene	110	ug/kg	27	35	23%	29,808.60	440,000	88,592	88,592	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(b)fluoranthene	1,100	ug/kg	27	35	23%	41,461.17	600,000	120,348	120,348	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(k)fluoranthene	11,000	ug/kg	27	35	23%	29,446.29	440,000	88,758	88,758	ug/kg	95% KM Chebyshev UCL
		SVOC	Carbazole	180,000	ug/kg	24	31	23%	205,084.77	3,700,000	774,687	774,687	ug/kg	95% KM Chebyshev UCL
		PAH	Chrysene	110,000	ug/kg	28	35	20%	87,934.37	1,400,000	273,351	273,351	ug/kg	95% KM Chebyshev UCL
		PAH	Dibenzo(a,h)anthracene	110	ug/kg	21	35	40%	3,930.03	44,000	8,121	8,121	ug/kg	95% Adjusted Gamma KM-UCL
		SVOC	Dibenzofuran	7,300	ug/kg	18	28	36%	256,603.29	3,100,000	792,025	792,025	ug/kg	95% Adjusted Gamma KM-UCL
		PAH	Fluoranthene	240,000	ug/kg	29	35	17%	633,286.37	11,000,000	2,084,646	2,084,646	ug/kg	95% KM Chebyshev UCL
		PAH	Fluorene	240,000	ug/kg	26	35	26%	516,104.57	8,300,000	1,697,889	1,697,889	ug/kg	95% KM Chebyshev UCL
		PAH	Indeno(1,2,3-cd)pyrene	1,100	ug/kg	25	35	29%	8,772.63	99,000	22,617	22,617	ug/kg	95% KM Chebyshev UCL
		PAH	Naphthalene	3,800	ug/kg	25	35	29%	439,161.54	4,100,000	1,188,929	1,188,929	ug/kg	95% KM Chebyshev UCL
		PAH	Phenanthrene	180,000	ug/kg	26	32	19%	1,295,431.72	21,000,000	4,383,650	4,383,650	ug/kg	95% KM Chebyshev UCL
		PAH	Pyrene	180,000	ug/kg	29	35	17%	397,107.46	6,500,000	1,270,774	1,270,774	ug/kg	95% KM Chebyshev UCL
Process Area	Subsurface Soils	Inorganic	Aluminum	7,700	mg/kg	3	3	0%	5,466.67	8,500	--	8,500	mg/kg	--
		VOC	Ethylbenzene	5,800	ug/kg	6	9	33%	1,159.82	7,700	2,574	2,574	ug/kg	95% KM (BCA) UCL
		SVOC	1,1-Biphenyl	4,700	ug/kg	3	13	77%	1,451.00	15,000	--	15,000	ug/kg	--
		PAH	2-Methylnaphthalene	24,000	ug/kg	14	25	44%	113,449.92	2,500,000	1,230,873	1,230,873	ug/kg	95% Adjusted Gamma KM-UCL
		PAH	Acenaphthene	360,000	ug/kg	15	25	40%	160,723.44	3,000,000	1,128,576	1,128,576	ug/kg	95% Adjusted Gamma KM-UCL
		PAH	Anthracene	1,800,000	ug/kg	14	20	30%	351,041.50	6,700,000	1,825,241	1,825,241	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)anthracene	1,100	ug/kg	19	25	24%	47,043.52	830,000	194,611	194,611	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)pyrene	110	ug/kg	16	25	36%	14,636.16	260,000	60,859	60,859	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(b)fluoranthene	1,100	ug/kg	17	25	32%	23,988.36	420,000	98,819	98,819	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(k)fluoranthene	11,000	ug/kg	18	25	28%	10,713.72	180,000	42,573	42,573	ug/kg	95% KM Chebyshev UCL
		SVOC	Carbazole	180,000	ug/kg	14	25	44%	289,098.80	7,100,000	1,546,899	1,546,899	ug/kg	95% KM Chebyshev UCL
		PAH	Chrysene	110,000	ug/kg	17	25	32%	57,528.24	1,100,000	252,077	252,077	ug/kg	95% KM Chebyshev UCL
		PAH	Dibenzo(a,h)anthracene	110	ug/kg	13	25	48%	2,011.92	37,000	8,641	8,641	ug/kg	95% KM Chebyshev UCL

Table 2-8
Subsurface Soil Exposure Point Concentrations
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Exposure Point											Exposure Point Concentration		
Area	Medium	Type	Chemical of Potential Concern (COPC)	Screening Toxicity Value[1]	Units	# of Detections	# of Samples	% of NDs	Arithmetic Mean	Maximum Concentration (Qualifier)	95% Upper Confidence Level (UCL)	Value	Units	Statistical Test
Process Area	Subsurface Soils	SVOC	Dibenzofuran	7,300	ug/kg	15	25	40%	155,737.52	3,400,000	1,643,327	1,643,327	ug/kg	95% Adjusted Gamma KM-UCL
		PAH	Fluoranthene	240,000	ug/kg	19	25	24%	273,905.96	4,700,000	1,120,127	1,120,127	ug/kg	95% KM Chebyshev UCL
		PAH	Fluorene	240,000	ug/kg	14	25	44%	270,341.88	6,000,000	2,989,890	2,989,890	ug/kg	95% Adjusted Gamma KM-UCL
		PAH	Indeno(1,2,3-cd)pyrene	1,100	ug/kg	16	25	36%	6,460.04	120,000	27,831	27,831	ug/kg	95% KM Chebyshev UCL
		PAH	Naphthalene	3,800	ug/kg	16	25	36%	182,833.16	4,200,000	2,218,352	2,218,352	ug/kg	95% Adjusted Gamma KM-UCL
		PAH	Phenanthrene	180,000	ug/kg	15	20	25%	762,544.05	13,000,000	7,644,416	7,644,416	ug/kg	95% Adjusted Gamma KM-UCL
		PAH	Pyrene	180,000	ug/kg	19	25	24%	181,562.56	3,000,000	1,000,293	1,000,293	ug/kg	95% Adjusted Gamma KM-UCL
Treated Wood Storage Area	Subsurface Soils	PAH	Benzo(a)pyrene	110	ug/kg	4	18	78%	43.44	200	64.19	64.19	ug/kg	95% KM (t) UCL
Untreated Wood Storage Area	Subsurface Soils	SVOC	2,6-Dinitrotoluene	360	ug/kg	1	37	97%	52.46	650	--	650	ug/kg	--
		PAH	Benzo(a)anthracene	1,100	ug/kg	11	43	74%	53.82	1,600	214	214	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)pyrene	110	ug/kg	11	43	74%	72.36	2,300	302	302	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(b)fluoranthene	1,100	ug/kg	11	43	74%	153.59	5,600	730	730	ug/kg	95% KM Chebyshev UCL
		PAH	Dibenzo(a,h)anthracene	110	ug/kg	4	43	91%	25.73	370	--	370	ug/kg	--

Notes

Prepared By: RAH 12/27/2017
Reviewed By: SBH 1/5/2018

Subsurface soil collected at greater than 1-foot below ground surface (bgs)
[1] - Resident Soil RSL THQ=0.1 from RSL Tables, November 2018
RSL - Risk Screening Level
THQ - Total Hazard Quotient
ND - Not detected above the method detection limit
NL - Not Listed
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
PAH - Polycyclic Aromatic Hydrocarbon
VOC - Volatile Organic Compound
SVOC - Semi-Volatile Organic Compound
3300 - Maximum concentration was non-detect due to elevated detection limits.
Duplicates were not included as individual samples. Instead, the average concentration was used.
Method Detection Limit (MDL) was used for non-detects.
-- Per the ProUCL Technical Guide, the maximum concentration was used in lieu of the 95% UCL if 1) greater than 90% of the samples were not detected or 2) there were less than four detections in the sample set.

Table 2-9
Groundwater Exposure Point Concentrations
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Exposure Point											Exposure Point Concentration		
Area	Medium	Type	Chemical of Potential Concern (COPC)	Screening Toxicity Value[1]	Units	# of Detections	# of Samples	% of NDs	Arithmetic Mean	Maximum Concentration (Qualifier)	95% Upper Confidence Level (UCL)	Value	Units	Statistical Test
Groundwater	Groundwater	Inorganic	Aluminum	2	mg/L	2	4	50%	1.30	3.24	--	3.24	mg/L	--
		Inorganic	Arsenic	0.000052	mg/L	9	9	0%	0.027	0.068	0.0411	0.0411	mg/L	95% Student's-t UCL
		Inorganic	Cobalt	0.0006	mg/L	4	4	0%	0.0017	0.00406	--	0.00406	mg/L	--
		Inorganic	Iron	1.4	mg/L	4	4	0%	17.34	33	38.35	38.35	mg/L	95% Student's-t UCL
		Inorganic	Manganese	0.043	mg/L	4	4	0%	0.336	0.728	0.683	0.683	mg/L	95% Student's-t UCL
		Inorganic	Selenium	0.01	mg/L	2	5	60%	0.032	0.159	--	0.159	mg/L	--
		PAH	2-Methylnaphthalene	3.6	ug/L	28	30	7%	388.73	1,620	573.6	573.6	ug/L	95% Gamma Adjusted KM-UCL
		PAH	Acenaphthylene	12	ug/L	13	30	57%	11.79	*32 (ND)*	6.594	6.594	ug/L	95% KM (t) UCL
		PAH	Acenaphthene	53	ug/L	29	30	3%	283.04	524	326	326	ug/L	95% KM (t) UCL
		PAH	Benzo(a)anthracene	0.03	ug/L	5	30	83%	1.42	*5.1 (ND)*	0.382	0.382	ug/L	95% KM (t) UCL
		PAH	Benzo(a)pyrene	0.025	ug/L	3	34	91%	1.13	*3.2 (ND)*	--	*3.2 (ND)*	ug/L	--
		PAH	Benzo(b)fluoranthene	0.25	ug/L	2	30	93%	1.25	*3.2 (ND)*	--	*3.2 (ND)*	ug/L	--
		PAH	Benzo(k)fluoranthene	2.5	ug/L	1	30	97%	1.55	*5.1 (ND)*	--	*5.1 (ND)*	ug/L	--
		PAH	Dibenzo(a,h)anthracene	0.025	ug/L	5	15	67%	0.18	*1.25 (ND)*	0.179	0.179	ug/L	95% KM (t) UCL
		PAH	Fluorene	29	ug/L	30	30	0%	141.22	293	165.4	165.4	ug/L	95% Student's-t UCL
		PAH	Indeno(1,2,3-cd)pyrene	0.25	ug/L	7	19	63%	0.10	*0.625 (ND)*	0.105	0.105	ug/L	95% KM (t) UCL
		PAH	Naphthalene	0.17	ug/L	29	30	3%	2,922.06	14,500	4,220	4,220	ug/L	95% Gamma Adjusted KM-UCL
		PAH	1-Methylnaphthalene	1.1	ug/L	29	30	3%	338.38	1,210	487	487	ug/L	95% GROS Gamma Adjusted UCL
		PAH	Phenanthrene	12	ug/L	30	30	0%	115.00	244	137.1	137.1	ug/L	95% Student's-t UCL
		PAH	Pyrene	12	ug/L	15	30	50%	8.70	*20 (ND)*	6.306	6.306	ug/L	95% KM (t) UCL
		Pesticide/SVOC	Pentachlorophenol	0.041	ug/L	4	30	87%	5.45	*20 (ND)*	0.845	0.845	ug/L	95% KM (t) UCL
		SVOC	(3-and/or 4-)Methylphenol	93	ug/L	8	33	76%	15.13	123	25.03	25.03	ug/L	95% KM (t) UCL
		SVOC	1,1-Biphenyl	0.083	ug/L	28	30	7%	67.98	166	82.95	82.95	ug/L	95% KM (t) UCL
		SVOC	2,4-Dimethylphenol	36	ug/L	18	30	40%	77.93	458	189.2	189.2	ug/L	95% KM Chebyshev UCL
		SVOC	2-Methylphenol	93	ug/L	8	26	69%	13.23	83	21.55	21.55	ug/L	95% KM (t) UCL
		SVOC	Bis(2-ethylhexyl)phthalate	5.6	ug/L	1	30	97%	1.85	*10 (ND)*	--	*10 (ND)*	ug/L	--
		SVOC	Carbazole	12	ug/L	29	30	3%	175.7	454	213.9	213.9	ug/L	95% KM (t) UCL
		SVOC	Dibenzofuran	0.79	ug/L	29	30	3%	204.65	533	243.5	243.5	ug/L	95% GROS Gamma Adjusted UCL
		SVOC	Pyridine	2	ug/L	1	30	97%	4.05	*30 (ND)*	--	*30 (ND)*	ug/L	--
		VOC	1,2,4-Trimethylbenzene	5.6	ug/L	24	27	11%	88.96	521	181.3	181.3	ug/L	95% KM Chebyshev UCL
		VOC	1,3,5-Trimethylbenzene	6	ug/L	17	24	29%	24.53	78.6	37.78	37.78	ug/L	95% GROS Gamma Adjusted UCL
		VOC	Benzene	0.46	ug/L	14	24	42%	14.42	46.4	14.97	14.97	ug/L	95% KM (t) UCL
		VOC	Chloroform	0.22	ug/L	1	24	96%	9.01	86.6	--	86.6	ug/L	--

Table 2-9
Groundwater Exposure Point Concentrations
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Exposure Point											Exposure Point Concentration		
Area	Medium	Type	Chemical of Potential Concern (COPC)	Screening Toxicity Value[1]	Units	# of Detections	# of Samples	% of NDs	Arithmetic Mean	Maximum Concentration (Qualifier)	95% Upper Confidence Level (UCL)	Value	Units	Statistical Test
Groundwater	Groundwater	VOC	Ethylbenzene	1.5	ug/L	18	24	25%	31.63	87.6	36.88	36.88	ug/L	95% KM (t) UCL
		VOC	Toluene	110	ug/L	15	24	38%	25.06	94.5	31.2	31.2	ug/L	95% KM (t) UCL
		VOC	Total Xylenes	19	ug/L	18	24	25%	78.30	254	143.7	143.7	ug/L	95% GROS Gamma Adjusted UCL

Notes

Prepared By: SBH 5/31/2018
Reviewed By: RAH 7/20/2018

Based on USEPA Region 4 Human Health Risk Assessment (HHRA) Supplemental Guidance dated March 2018, the core of the plume was selected to calculate the groundwater (GW) exposure point concentrations (EPCs). Also based on communications with USEPA dated May 11, 2018, the most recent groundwater sampling data was used to calculate the GW EPCs.

[1] - Tapwater RSL THQ=0.1 from RSL Tables, November 2018

RSL - Risk Screening Level

THQ - Total Hazard Quotient

ND - Not detected above the method detection limit

mg/L - milligram per liter

ug/L - micrograms per liter

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

SVOC - Semi-Volatile Organic Compound

40 (ND) - Maximum concentration was non-detect due to elevated detection limits.

Duplicates were not included as individual samples. Instead, the average concentration was used.

Method Detection Limit (MDL) was used for non-detects.

-- Per the ProUCL Technical Guide, the maximum concentration was used in lieu of the 95% UCL if 1) greater than 90% of the samples were not detected or 2) there were less than four detections in the sample set.

Table 2-10
Sediment Exposure Point Concentrations
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	Medium	Type	Chemical of Potential Concern (COPC)	Screening Toxicity Value[1]	Units	# of Detections	# of Samples	% of NDs	Arithmetic Mean	Maximum Concentration (Qualifier)	95% Upper Confidence Level (UCL)	Exposure Point Concentration		
												Value	Units	Statistical Test
Southern Marsh	Sediment	Inorganic	Aluminum	7,700	mg/kg	5	5	0%	25,600	31,800	32,556	32,556	mg/kg	95% Student's-t UCL
		Inorganic	Arsenic	0.68	mg/kg	11	12	8.3%	9.89	25	13.71	13.71	mg/kg	95% KM (t) UCL
		Inorganic	Hexavalent Chromium	0.3	mg/kg	1	5	80%	10.10	44.2	--	44.2	mg/kg	--
		Inorganic	Cobalt	2.3	mg/kg	5	5	0.0%	20.96	30	28.77	28.77	mg/kg	95% Student's-t UCL
		Inorganic	Iron	5,500	mg/kg	5	5	0.0%	26,840	39,400	34,132	34,132	mg/kg	95% Student's-t UCL
		Inorganic	Manganese	180	mg/kg	5	5	0.0%	245.20	397	362.5	362.5	mg/kg	95% Student's-t UCL
		Inorganic	Thallium	0.078	mg/kg	4	10	60%	1.13	3.4	1.728	1.728	mg/kg	95% KM (t) UCL
		Inorganic	Vanadium	39	mg/kg	5	5	0.0%	92.00	120	120.5	120.5	mg/kg	95% Student's-t UCL
		PAH	2-Methylnaphthalene	24,000	ug/kg	33	114	71%	34,446.87	3,000,000	153,891	153,891	ug/kg	95% KM Chebyshev UCL
		PAH	Acenaphthene	360,000	ug/kg	58	114	49%	49,682.63	1,900,000	139,193	139,193	ug/kg	95% KM Chebyshev UCL
		PAH	Anthracene	1,800,000	ug/kg	84	114	26%	65,687.52	1,800,000	170,906	170,906	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)anthracene	1,100	ug/kg	85	114	25%	57,149.35	1,500,000	132,448	132,448	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(a)pyrene	110	ug/kg	76	114	33%	21,589.02	480,000	48,071	48,071	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(b)fluoranthene	1,100	ug/kg	89	114	22%	35,344.08	720,000	77,478	77,478	ug/kg	95% KM Chebyshev UCL
		PAH	Benzo(k)fluoranthene	11,000	ug/kg	75	114	34%	15,559.75	330,000	34,329	34,329	ug/kg	95% KM Chebyshev UCL
		SVOC	Carbazole	180,000	ug/kg	48	114	58%	7,797.66	330,000	22,086	22,086	ug/kg	95% KM Chebyshev UCL
		PAH	Chrysene	110,000	ug/kg	82	114	28%	56,607.47	1,500,000	132,140	132,140	ug/kg	95% KM Chebyshev UCL
		PAH	Dibenzo(a,h)anthracene	110	ug/kg	46	114	60%	2,474.75	48,000	5,278	5,278	ug/kg	95% KM Chebyshev UCL
		SVOC	Dibenzofuran	7,300	ug/kg	49	113	57%	44,798.65	1,800,000	131,169	131,169	ug/kg	95% KM Chebyshev UCL
		PAH	Fluoranthene	240,000	ug/kg	94	114	18%	279,775.55	8,700,000	696,292	696,292	ug/kg	95% KM Chebyshev UCL
		PAH	Fluorene	240,000	ug/kg	61	114	46%	66,191.06	2,100,000	186,284	186,284	ug/kg	95% KM Chebyshev UCL
		PAH	Indeno (1,2,3-cd) pyrene	1,100	ug/kg	61	114	46%	7,306.52	160,000	16,125	16,125	ug/kg	95% KM Chebyshev UCL
		PAH	Naphthalene	3,800	ug/kg	47	114	59%	41,823.35	3,500,000	180,925	180,925	ug/kg	95% KM Chebyshev UCL
		PAH	Phenanthrene	180,000	ug/kg	58	114	49%	235,882.25	9,500,000	747,034	747,034	ug/kg	95% KM Chebyshev UCL
		PAH	Pyrene	180,000	ug/kg	93	114	18%	192,511.90	5,600,000	468,240	468,240	ug/kg	95% KM Chebyshev UCL

Notes

Prepared By: SBH 12/27/2017
Reviewed By: RAH 7/20/2018

[1] - Resident Soil RSL THQ=0.1 from RSL Tables, November 2018
RSL - Risk Screening Level
THQ - Total Hazard Quotient
ND - Not detected above the method detection limit
mg/kg - milligram per kilogram
ug/kg - micrograms per kilogram
SVOC - Semi-Volatile Organic Compound
PAH - Polycyclic Aromatic Hydrocarbon
3300 - Maximum concentration was non-detect due to elevated detection limits.
Duplicates were not included as individual samples. Instead, the average concentration was used.
Method Detection Limit (MDL) was used for non-detects.
-- Per the ProUCL Technical Guide, the maximum concentration was used in lieu of the 95% UCL if 1) greater than 90% of the samples were not detected or 2) there were less than four detections in the sample set.

Table 2-11
Surface Water Exposure Point Concentrations
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Exposure Point		Type	Chemical of Potential Concern (COPC)	Screening Toxicity Value[1]	Units	# of Detections	# of Samples	% of NDs	Arithmetic Mean	Maximum Concentration (Qualifier)	95% Upper Confidence Level (UCL)	Exposure Point Concentration		
Area	Medium											Value	Units	Statistical Test
Marsh	Surface Water	Inorganic	Arsenic	0.000052	mg/L	8	8	0%	0.00074	0.00089	0.00082	0.00082	mg/L	95% Student's-t UCL

Notes

[1] - Tapwater RSL THQ=0.1 from RSL Tables, November 2018

RSL - Risk Screening Level

THQ - Total Hazard Quotient

ND - Not detected above the method detection limit

mg/L - milligram per liter

ug/L - micrograms per liter

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

SVOC - Semi-Volatile Organic Compound

40 (ND) - Maximum concentration was non-detect due to elevated detection limits.

Duplicates were not included as individual samples. Instead, the average concentration was used.

Method Detection Limit (MDL) was used for non-detects.

-- Per the ProUCL Technical Guide, the maximum concentration was used in lieu of the 95% UCL if 1) greater than 90% of the samples were not detected or 2) there were less than four detections in the sample set.

Prepared By: RAH 7/10/2018
Reviewed By: DME 7/10/2018

Table 2-12
Summary of Exposure Factors
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Parameter	Code	Units	Receptor	Exposure Factor	Comment
General					
Concentration in Soil	CS	mg/kg	All receptors	Chemical-specific	---
Concentration in Groundwater	CG	mg/L	All receptors	Chemical-specific	---
Exposure Frequency	EF_a	days/year	Resident Adult	350	USEPA, February 2014
	EF_c		Resident Child	350	USEPA, February 2014
	EF_{0-2}		Resident Age 0-2, Mutagenic	350	USEPA, February 2014
	EF_{2-6}		Resident Age 2-6, Mutagenic	350	USEPA, February 2014
	EF_{6-16}		Resident Age 6-16, Mutagenic	350	USEPA, February 2014
	EF_{16-26}		Resident Age 16-26, Mutagenic	350	USEPA, February 2014
	EF		Teenage Trespasser	45	USEPA RSL User's Guide and Region 4 EPA, March 2018 state that this parameter is site specific, based on proximity of residents and attractiveness of the site. This site has no improvements and is not considered attractive.
	EF		Outdoor Worker	225	USEPA, February 2014
	EF		Indoor Worker	250	USEPA, February 2014
	EF		Construction Worker	250 (soil); 125 (water)	Best professional judgement; Virginia DEQ default value for trench worker exposure to groundwater while digging.
Exposure Duration	ED_a	years	Resident Adult	20	USEPA, February 2014
	ED_c		Resident Child	6	USEPA RSL User's Guide, 2017/USEPA, February 2014
	ED_{0-2}		Resident Age 0-2, Mutagenic	2	USEPA RSL User's Guide, 2017/USEPA, February 2014
	ED_{2-6}		Resident Age 2-6, Mutagenic	4	USEPA RSL User's Guide, 2017/USEPA, February 2014
	ED_{6-16}		Resident Age 6-16, Mutagenic	10	No value provided in references; value based on email communication with Tim Frederick of USEPA dated 10/17/2017
	ED_{16-26}		Resident Age 16-26, Mutagenic	10	USEPA, February 2014
	ED		Teenage Trespasser	10	No value provided in references; value based on email communication with Tim Frederick of USEPA dated 10/17/2017
	ED		Outdoor Worker	25	USEPA, February 2014
	ED		Indoor Worker	25	USEPA, February 2014
	ED		Construction Worker	1	USEPA, RSL User's Guide
Body Weight	BW_a	kg	Resident Adult	80	USEPA, February 2014
	BW_c		Resident Child	15	USEPA RSL User's Guide, 2017/USEPA, February 2014
	BW_{0-2}		Resident Age 0-2, Mutagenic	15	USEPA RSL User's Guide, 2017/USEPA, February 2014
	BW_{2-6}		Resident Age 2-6, Mutagenic	15	USEPA RSL User's Guide, 2017/USEPA, February 2014
	BW_{6-16}		Resident Age 6-16, Mutagenic	45	No value provided in references; value based on email communication with Tim Frederick of USEPA dated 10/17/2017
	BW_{16-26}		Resident Age 16-26, Mutagenic	80	USEPA, February 2014
	BW		Teenage Trespasser	45	No value provided in references; value based on email communication with Tim Frederick of USEPA dated 10/17/2017
	BW		Outdoor Worker	80	USEPA, February 2014
	BW		Indoor Worker	80	USEPA, February 2014
	BW		Construction Worker	80	USEPA, February 2014
Averaging Time (Cancer)	AT-C	days	All receptors	25,550	USEPA, RSL User's Guide
		hrs	All receptors	613,200	

Table 2-12
Summary of Exposure Factors
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Parameter	Code	Units	Receptor	Exposure Factor	Comment
Averaging Time (Non-Cancer)	AT-NC	days	Resident Adult	7,300	USEPA, February 2014 and USEPA, RSL User's Guide. Teenage trespassor value obtained by multiplying 10-years by 365 days per year.
			Resident Child	2,190	
			Teenage Trespasser	3,650	
			Outdoor Worker	9,125	
			Indoor Worker	9,125	
			Construction Worker	365	
		hours	Resident Adult	175,200	USEPA, February 2014 and USEPA, RSL User's Guide. Teenage trespassor value obtained by multiplying 10-years by 365 days per year by 24 hours per day.
			Resident Child	52,560	
			Teenage Trespasser	87,600	
			Outdoor Worker	219,000	
			Indoor Worker	219,000	
			Construction Worker	8,760	
Age-Dependent Adjustment Factor	$ADAF_{0-2}$	unitless	Resident Age 0-2, Mutagenic	10	USEPA, March 2005
	$ADAF_{2-6}$		Resident Age 2-6, Mutagenic	3	
	$ADAF_{6-16}$		Resident Age 6-16, Mutagenic	3	
	$ADAF_{16-26}$		Resident Age 16-26, Mutagenic	1	
Ingestion					
Soil and Sediment					
Ingestion Rate of Soil	SIR_a	mg/day	Resident Adult	100	USEPA, February 2014
	SIR_c		Resident Child	200	USEPA RSL User's Guide, 2017/USEPA, February 2014
	SIR_{0-2}		Resident Age 0-2, Mutagenic	200	USEPA RSL User's Guide, 2017/USEPA, February 2014
	SIR_{2-6}		Resident Age 2-6, Mutagenic	200	USEPA RSL User's Guide, 2017/USEPA, February 2014
	SIR_{6-16}		Resident Age 6-16, Mutagenic	150	Average of Resident Adult and Child, based on email communication with Tim Frederick of USEPA dated 10/17/2017
	SIR_{16-26}		Resident Age 16-26, Mutagenic	100	USEPA, February 2014
	SIR		Teenage Trespasser	150	Average of Resident Adult and Child, based on email communication with Tim Frederick of USEPA dated 10/17/2017
	SIR		Outdoor Worker	100	USEPA, February 2014
	SIR		Indoor Worker	NA	NA
	SIR		Construction Worker	330	USEPA, RSL User's Guide
Conversion Factor	CF	kg/mg	All receptors	1.00E-06	---
Fraction Ingested	FI	unitless	All receptors (with exception of construction worker)	1	USEPA, February 2014
			Construction Worker	0.5	USEPA, March 2018; adjusts for exposure to both surface and subsurface soil while digging to avoid 'double counting'
Groundwater					
Ingestion Rate of Drinking Water (Groundwater)	IR_a	L/day	Resident Adult	2.5	USEPA, February 2014
	IR_c		Resident Child	0.78	USEPA, February 2014
	IR_{0-2}		Resident Age 0-2, Mutagenic	0.78	USEPA, February 2014
	IR_{2-6}		Resident Age 2-6, Mutagenic	0.78	USEPA, February 2014
	IR_{6-16}		Resident Age 6-16, Mutagenic	1.64	Average of Resident Adult and Child, based on email communication with Tim Frederick of USEPA dated 10/17/2017
	IR_{16-26}		Resident Age 16-26, Mutagenic	2.5	USEPA, February 2014
	IR		Teenage Trespasser	NA	NA
	IR		Outdoor Worker	1.25	Half the Resident Adult, based on personal communication with Tim Frederick of USEPA dated 6/20/2018
	IR		Indoor Worker	1.25	Half the Resident Adult, based on personal communication with Tim Frederick of USEPA dated 6/20/2018
	IR		Construction Worker	0.02	Virginia DEQ, 2016; Virginia Unified Risk Assessment Model (VURAM) default value for incidental ingestion of water in a trench.

Table 2-12
Summary of Exposure Factors
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Parameter	Code	Units	Receptor	Exposure Factor	Comment
Dermal Contact					
Soil and Sediment					
Surface Area available for contact	SA_a	cm^2	Resident Adult	6,032	USEPA, February 2014
	SA_c		Resident Child	2,373	USEPA RSL User's Guide, 2017/USEPA, February 2014
	SA_{0-2}		Resident Age 0-2, Mutagenic	2,373	USEPA RSL User's Guide, 2017/USEPA, February 2014
	SA_{2-6}		Resident Age 2-6, Mutagenic	2,373	USEPA RSL User's Guide, 2017/USEPA, February 2014
	SA_{6-16}		Resident Age 6-16, Mutagenic	4,203	Average of Resident Adult and Child, based on email communication with Tim Frederick of USEPA dated 10/17/2017
	SA_{16-26}		Resident Age 16-26, Mutagenic	6,032	USEPA, February 2014
	SA		Teenage Trespasser	4,203	Average of Resident Adult and Child, based on email communication with Tim Frederick of USEPA dated 10/17/2017
	SA		Outdoor Worker	3,527	USEPA, RSL User's Guide
	SA		Indoor Worker	NA	NA
	SA		Construction Worker	3,527	USEPA, RSL User's Guide
Soil to Skin Adherence Factor	AF_a	mg/cm^2	Resident Adult	0.07	USEPA, February 2014
	AF_c		Resident Child	0.2	USEPA RSL User's Guide, 2017/USEPA, February 2014
	AF_{0-2}		Resident Age 0-2, Mutagenic	0.2	USEPA RSL User's Guide, 2017/USEPA, February 2014
	AF_{2-6}		Resident Age 2-6, Mutagenic	0.2	USEPA RSL User's Guide, 2017/USEPA, February 2014
	AF_{6-16}		Resident Age 6-16, Mutagenic	0.135	Average of Resident Adult and Child, based on email communication with Tim Frederick of USEPA dated 10/17/2017
	AF_{16-26}		Resident Age 16-26, Mutagenic	0.07	USEPA, February 2014
	AF		Teenage Trespasser	0.135	Average of Resident Adult and Child, based on email communication with Tim Frederick of USEPA dated 10/17/2017
	AF		Outdoor Worker	0.12	USEPA, February 2014
	AF		Indoor Worker	NA	NA
	AF		Construction Worker	0.3	USEPA, RSL User's Guide
Conversion Factor	CF	kg/mg	All receptors	1.00E-06	---
Groundwater					
Skin Surface Area	SA_a	cm^2	Resident Adult	19,652	USEPA, February 2014
	SA_c		Resident Child	6,365	USEPA RSL User's Guide, 2017/USEPA, February 2014
	SA		Teenage Trespasser	NA	NA
	SA		Outdoor Worker	NA	NA
	SA		Indoor Worker	NA	NA
	SA		Construction Worker	3,527	USEPA, February 2014
Fraction of Skin Contacted	FC	unitless	All receptors (with exception of construction worker)	1	---
			Construction Worker	0.5	USEPA, March 2018; adjusts for exposure to both surface and subsurface soil increments while digging to avoid 'double counting'
Conversion Factor	CF-1	$liter/cm^3$	All receptors	1.00E-03	---
Dermal Factor	Z	cm/event	All receptors	Chemical-specific	---
Inhalation					
Soil and Sediment					
Chemical Concentration in Air	CA	mg/m^3	All receptors	Calculated	---
Exposure Time	ET_a	hours/day	Resident Adult	24	USEPA, February 2014
	ET_c		Resident Child	24	USEPA, February 2014
	ET		Teenage Trespasser	2	USEPA RSL User's Guide indicates this parameter is site specific. Estimate is based on site-specific information and professional judgement.
	ET		Outdoor Worker	8	USEPA, February 2014
	ET		Indoor Worker	NA	NA
	ET		Construction Worker	8	USEPA, February 2014 for soil; Virginia DEQ Unified Risk Assessment Model (VURAM) default value for time spent in a trench
Fraction Inhaled	FI_{inh}	unitless	All receptors (with exception of construction worker)	1	USEPA, February 2014
			Construction Worker	0.5	USEPA, March 2018; adjusts for exposure to both surface and subsurface soil while digging to avoid 'double counting'
Volatilization Factor	VF	m^3/kg	All receptors	Chemical-specific	USEPA, December 2002, Appendix E
Particulate Emission Factor	PEF	m^3/kg	All receptors	Scenario-specific	USEPA, December 2002, Appendix D

Table 2-12
Summary of Exposure Factors
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Parameter	Code	Units	Receptor	Exposure Factor	Comment
Groundwater					
Chemical Concentration in Air	CA	mg/m^3	All receptors	Calculated	---
Exposure Time	ET_a	hours/day	Resident Adult	24	USEPA, February 2014
	ET_c		Resident Child	24	USEPA, February 2014
	ET		Teenage Trespasser	NA	NA
	ET		Outdoor Worker	NA	NA
	ET		Indoor Worker	NA	NA
	ET		Construction Worker	4	USEPA, February 2014 for soil; Virginia DEQ Unified Risk Assessment Model (VURAM) default value for time spent in a trench
Groundwater via Showering Scenario					
Per the USEPA Region 4 Human Health Risk Assessment Supplemental Guidance, March 2018 Update, Section 4.9 Exposure to Volatile Organic Chemicals (VOCs) During Showering, inhalation and dermal exposure to volatile organic chemicals from bathing/showering is conservatively assumed to be equivalent to exposure from the daily ingestion of contaminated water per day. If ingestion risk is non-calculable, risk from this exposure route is based on dermal risk. The pathway is considered incomplete (not applicable) if both ingestion and dermal risk are non-calculable.					

Notes:
NA - Pathway was not evaluated as part of the HHRA and an exposure factor for this parameter is not needed.
--- Parameter is chemical-specific or standard (no reference needed).
mg/kg - milligrams per kilogram
mg/L - milligrams per liter
kg - kilogram
hrs - hours
mg/day - milligrams per day
kg/mg - kilograms per milligram
L/day - liters per day
cm^2 - square centimeters
mg/cm^2 - milligrams per square centimeter
$liter/cm^3$ - liters per cubic centimeter
cm/event - centimeters per event
mg/m^3 - milligrams per cubic meter
m^3/kg - cubic meters per kilogram

Prepared By: SMA 3/28/2019
Checked By: RAH 3/29/2019

References:
USEPA, *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors* , February 2014
USEPA, *Regional Screening Levels (RSLs) - User's Guide, November 2018*
USEPA Region 4, *Human Health Risk Assessment Supplemental Guidance* , March 2018
USEPA, *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* , March 2005
VADEQ, Virginia Unified Risk Assessment Model, 2016

Table 2-13a
Chronic Non-Cancer Toxicity Data - Oral/Dermal
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Chemicals of Potential Concern	Oral RfD		Oral Absorption Efficiency for Dermal	Absorped RfD for Dermal[1]		Primary Target Organ(s)	RfD and Target Organ Source(s)
	Value	Units		Value	Units		
Inorganics							
Antimony	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Hematologic, Other	IRIS
Aluminum	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Nervous	PPRTV
Arsenic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Cardiovascular, Dermal	IRIS
Cobalt	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Thyroid	PPRTV
Hexavalent Chromium	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	No Observed Effects	IRIS
Iron	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal	PPRTV
Manganese	2.4E-02	mg/kg-day	0.04	9.6E-04	mg/kg-day	Nervous	S
Selenium	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Nervous, Hematologic, Dermal	IRIS
Thallium	1.0E-05	mg/kg-day	1	1.0E-05	mg/kg-day	Skin Histopathology	Appendix PPRTV Screen
Vanadium	5.0E-03	mg/kg-day	0.026	1.3E-04	mg/kg-day	Dermal	S
VOCs							
1,2,4-Trimethylbenzene	1.0E-02	mg/kg-day	1	1.0E-02	mg/kg-day	Nervous	IRIS
1,3,5-Trimethylbenzene	1.0E-02	mg/kg-day	1	1.0E-02	mg/kg-day	Nervous	IRIS
Acrolein	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Other	IRIS
Benzene	4.0E-03	mg/kg-day	1	4.0E-03	mg/kg-day	Immune	IRIS
Chloroform	1.0E-02	mg/kg-day	1	1.0E-02	mg/kg-day	Hepatic	IRIS
Ethylbenzene	1.0E-01	mg/kg-day	1	1.0E-01	mg/kg-day	Hepatic, Renal	IRIS
n-Propylbenzene	1.0E-01	mg/kg-day	1	1.0E-01	mg/kg-day	Hepatic, Renal	Appendix PPRTV Screen
Toluene	8.0E-02	mg/kg-day	1	8.0E-02	mg/kg-day	Urinary	IRIS
Total Xylenes	2.0E-01	mg/kg-day	1	2.0E-01	mg/kg-day	Other	IRIS
SVOCs							
(3-and/or 4-)Methylphenol	5.0E-02	mg/kg-day	1	5.0E-02	mg/kg-day	Nervous	IRIS
1,1-Biphenyl	5.0E-01	mg/kg-day	1	5.0E-01	mg/kg-day	Renal	IRIS
2,4-Dimethylphenol	2.0E-02	mg/kg-day	1	2.0E-02	mg/kg-day	Nervous, Hematologic	IRIS
2,6-Dinitrotoluene	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Hematologic, Renal, Nervous	Appendix PPRTV Screen
2-Methylphenol	5.0E-02	mg/kg-day	1	5.0E-02	mg/kg-day	Nervous, Other	IRIS
Bis(2-ethylhexyl)phthalate	2.0E-02	mg/kg-day	1	2.0E-02	mg/kg-day	Hepatic	IRIS
Carbazole	3.0E-02	mg/kg-day	1	3.0E-02	mg/kg-day	Renal	IRIS
Dibenzofuran	1.0E-03	mg/kg-day	1	1.0E-03	mg/kg-day	Hepatic	Appendix PPRTV Screen
Pyridine	1.0E-03	mg/kg-day	1	1.0E-03	mg/kg-day	Hepatic	IRIS
PAHs							
1-Methylnaphthalene	7.0E-02	mg/kg-day	1	7.0E-02	mg/kg-day	Dermal, Nervous and Respiratory	ATSDR
2-Methylnaphthalene	4.0E-03	mg/kg-day	1	4.0E-03	mg/kg-day	Respiratory	IRIS
Acenaphthylene	3.0E-02	mg/kg-day	1	3.0E-02	mg/kg-day	Renal	IRIS
Acenaphthene	6.0E-02	mg/kg-day	1	6.0E-02	mg/kg-day	Hepatic	IRIS
Anthracene	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	No Observed Effects	IRIS
Benzo(a)anthracene	NA	NA	1	NA	NA	NA	NA
Benzo(a)pyrene	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Developmental	IRIS
Benzo(b)fluoranthene	NA	NA	1	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	1	NA	NA	NA	NA
Chrysene	NA	NA	1	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	1	NA	NA	NA	NA
Fluoranthene	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Hepatic, Renal	IRIS
Fluorene	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Hematologic	IRIS
Indeno(1,2,3-cd)pyrene	NA	NA	1	NA	NA	NA	NA
Naphthalene	2.0E-02	mg/kg-day	1	2.0E-02	mg/kg-day	Other	IRIS
Phenanthrene	3.0E-02	mg/kg-day	1	3.0E-02	mg/kg-day	Renal	IRIS
Pyrene	3.0E-02	mg/kg-day	1	3.0E-02	mg/kg-day	Renal	IRIS
Pesticides							
Pentachlorophenol	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hepatic	IRIS
Aldrin	3.0E-05	mg/kg-day	1	3.0E-05	mg/kg-day	Hepatic	IRIS

Notes:

Prepared by: RAH 3/29/2019
Checked by: SMA 3/29/2019

RfD - Reference Dose
NA - Not Applicable
mg/kg-day - milligrams per kilogram-day
PPRTV - Provisional Peer Reviewed Toxicity Values for Superfund
IRIS - Integrated Risk Information System
ATSDR - Agency for Toxic Substances and Disease Registry
S - Per U.S. EPA Regional Screening Level (RSL) Summary Table (TR=1E-06, HQ=0.1) November 2018, See User Guide Section 5
[1]Absorbed RfD for Dermal = (Oral RfD) x (Oral Absorption Efficiency)
Pyrene used as a surrogate for acenaphthylene, carbazole and phenanthrene.
VOCs - Volatile Organic Compounds
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons

Table 2-13b
Sub-chronic Non-Cancer Toxicity Data - Oral/Dermal
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Chemicals of Potential Concern	Oral RfD		Oral Absorption Efficiency for Dermal	Absorped RfD for Dermal[1]		Primary Target Organ(s)	RfD and Target Organ Source(s)
	Value	Units		Value	Units		
Inorganics							
Antimony	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Hematologic, Other	PPRTV
Aluminum	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Nervous	ATSDR
Arsenic	NA	NA	1	NA	NA	NA	NA
Cobalt	3.0E-03	mg/kg-day	1	3.0E-03	mg/kg-day	Thyroid	PPRTV
Hexavalent Chromium	5.0E-03	mg/kg-day	0.025	1.3E-04	mg/kg-day	No Observed Effects	ATSDR
Iron	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal	PPRTV
Manganese	NA	NA	1	NA	NA	NA	NA
Selenium	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Nervous, Hematologic, Dermal	HEAST
Thallium	4.0E-05	mg/kg-day	1	4.0E-05	mg/kg-day	Skin Histopathology	Appendix PPRTV Screen
Vanadium	1.0E-02	mg/kg-day	0.026	2.6E-04	mg/kg-day	Dermal	ATSDR
VOCs							
1,2,4-Trimethylbenzene	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Nervous	IRIS
1,3,5-Trimethylbenzene	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Nervous	IRIS
Acrolein	4.0E-03	mg/kg-day	1	4.0E-03	mg/kg-day	Other	ATSDR
Benzene	1.0E-02	mg/kg-day	1	1.0E-02	mg/kg-day	Immune	PPRTV
Chloroform	1.0E-01	mg/kg-day	1	1.0E-01	mg/kg-day	Hepatic	ATSDR
Ethylbenzene	5.0E-02	mg/kg-day	1	5.0E-02	mg/kg-day	Hepatic, Renal	PPRTV
n-Propylbenzene	1.0E-01	mg/kg-day	1	1.0E-01	mg/kg-day	Hepatic, Renal	Appendix PPRTV Screen
Toluene	8.0E-01	mg/kg-day	1	8.0E-01	mg/kg-day	Urinary	PPRTV
Total Xylenes	4.0E-01	mg/kg-day	1	4.0E-01	mg/kg-day	Other	PPRTV
SVOCs							
(3-and/or 4-)Methylphenol	4.0E-01	mg/kg-day	1	4.0E-01	mg/kg-day	Nervous	PPRTV
1,1-Biphenyl	1.0E-01	mg/kg-day	1	1.0E-01	mg/kg-day	Renal	PPRTV
2,4-Dimethylphenol	5.0E-02	mg/kg-day	1	5.0E-02	mg/kg-day	Nervous, Hematologic	PPRTV
2,6-Dinitrotoluene	4.0E-03	mg/kg-day	1	4.0E-03	mg/kg-day	Hematologic, Renal, Nervous	ATSDR
2-Methylphenol	2.0E-01	mg/kg-day	1	2.0E-01	mg/kg-day	Nervous, Other	PPRTV
Bis(2-ethylhexyl)phthalate	1.0E-01	mg/kg-day	1	1.0E-01	mg/kg-day	Hepatic	ATSDR
Carbazole	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Renal	PPRTV
Dibenzofuran	4.0E-03	mg/kg-day	1	4.0E-03	mg/kg-day	Hepatic	PPRTV
Pyridine	1.0E-02	mg/kg-day	1	1.0E-02	mg/kg-day	Hepatic	HEAST
PAHs							
1-Methylnaphthalene	NA	NA	1	NA	NA	NA	NA
2-Methylnaphthalene	4.0E-03	mg/kg-day	1	4.0E-03	mg/kg-day	Respiratory	PPRTV
Acenaphthylene	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Renal	PPRTV
Acenaphthene	2.0E-01	mg/kg-day	1	2.0E-01	mg/kg-day	Hepatic	PPRTV
Anthracene	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	No Observed Effects	PPRTV
Benzo(a)anthracene	NA	NA	1	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	1	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	1	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	1	NA	NA	NA	NA
Chrysene	NA	NA	1	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	1	NA	NA	NA	NA
Fluoranthene	1.0E-01	mg/kg-day	1	1.0E-01	mg/kg-day	Hepatic, Renal	PPRTV
Fluorene	4.0E-01	mg/kg-day	1	4.0E-01	mg/kg-day	Hematologic	ATSDR
Indeno(1,2,3-cd)pyrene	NA	NA	1	NA	NA	NA	NA
Naphthalene	6.0E-01	mg/kg-day	1	6.0E-01	mg/kg-day	Other	ATSDR
Phenanthrene	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Renal	PPRTV
Pyrene	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Renal	PPRTV
Pesticides							
Pentachlorophenol	1.0E-03	mg/kg-day	1	1.0E-03	mg/kg-day	Hepatic	ATSDR
Aldrin	4.0E-05	mg/kg-day	1	4.0E-05	mg/kg-day	Hepatic	PPRTV

Notes:
RfD - Reference Dose
NA - Not Applicable
mg/kg-day - milligrams per kilogram-day
PPRTV - Provisional Peer Reviewed Toxicity Values for Superfund
IRIS - Integrated Risk Information System
ATSDR - Agency for Toxic Substances and Disease Registry
HEAST - Health Effects Assessment Summary Table
[1]Absorbed RfD for Dermal = (Oral RfD) x (Oral Absorption Efficiency)
Pyrene used as a surrogate for acenaphthylene, carbazole and phenanthrene.
Sub-chronic RfD values apply to construction/utility workers only. All other receptors are assessed using chronic RfDs (see Table 2-13a).
VOCs - Volatile Organic Compounds
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons

Prepared by: SMA 1/22/2019
Checked by: RAH 1/22/2019

Table 2-14a
Chronic Non-Cancer Toxicity Data - Inhalation
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Chemicals of Potential Concern	Inhalation RfC		Primary Target Organ(s)	RfC and Target Organ Source(s)
	Value	Units		
Inorganics				
Antimony	NA	NA	NA	NA
Aluminum	5.0E-03	mg/m^3	Nervous	PPRTV
Arsenic	1.5E-05	mg/m^3	Developmental	Cal EPA
Cobalt	6.0E-06	mg/m^3	Respiratory	PPRTV
Hexavalent Chromium	1.0E-04	mg/m^3	Respiratory	IRIS
Iron	NA	NA	NA	NA
Manganese	5.0E-05	mg/m^3	Nervous	IRIS
Selenium	2.0E-02	mg/m^3	Hepatic	Cal EPA
Thallium	NA	NA	NA	NA
Vanadium	1.0E-04	mg/m^3	Respiratory	ATSDR
VOCs				
1,2,4-Trimethylbenzene	6.0E-02	mg/m^3	Nervous	IRIS
1,3,5-Trimethylbenzene	6.0E-02	mg/m^3	Nervous	IRIS
Acrolein	2.0E-05	mg/m^3	Respiratory	IRIS
Benzene	3.0E-02	mg/m^3	Immune	IRIS
Chloroform	9.8E-02	mg/m^3	Hepatic	ATSDR
Ethylbenzene	1.0E+00	mg/m^3	Developmental	IRIS
n-Propylbenzene	1.0E+00	mg/m^3	Developmental	Appendix PPRTV Screen
Toluene	5.0E+00	mg/m^3	Nervous	IRIS
Total Xylenes	1.0E-01	mg/m^3	Nervous	IRIS
SVOCs				
(3-and/or 4-)Methylphenol	6.0E-01	mg/m^3	Nervous	Cal EPA
1,1-Biphenyl	4.0E-04	mg/m^3	Hepatic, Renal	Appendix PPRTV Screen
2,4-Dimethylphenol	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA
2-Methylphenol	6.0E-01	mg/m^3	Nervous	Cal EPA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA
PAHs				
1-Methylnaphthalene	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA
Benzo(a)pyrene	2.0E-06	mg/m^3	Developmental	IRIS
Benzo(b)fluoranthene	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA
Naphthalene	3.0E-03	mg/m^3	Nervous, Respiratory	IRIS
Phenanthrene	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA
Pesticides				
Pentachlorophenol	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA

Notes:
RfC - Reference Concentration
NA - Not Applicable
mg/m^3 - milligrams per cubic meter
PPRTV - Provisional Peer Reviewed Toxicity Values for Superfund
Cal EPA - California Environmental Protection Agency
IRIS - Integrated Risk Information System
ATSDR - Agency for Toxic Substances and Disease Registry
Pyrene used as a surrogate for acenaphthylene, carbazole and phenanthrene.
VOCs - Volatile Organic Compounds
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons

Prepared by: DME 5/18/2018
Checked by: DAR 5/18/2018

Table 2-14b
Sub-chronic Non-Cancer Toxicity Data - Inhalation
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Chemicals of Potential Concern	Inhalation RfC		Primary Target Organ(s)	RfC and Target Organ Source(s)
	Value	Units		
Inorganics				
Antimony	NA	NA	NA	NA
Aluminum	NA	NA	NA	NA
Arsenic	NA	mg/m^3	Developmental	Cal EPA
Cobalt	2.0E-05	mg/m^3	Respiratory	PPRTV
Hexavalent Chromium	3.0E-04	mg/m^3	Respiratory	ATSDR
Iron	NA	NA	NA	NA
Manganese	NA	NA	NA	NA
Selenium	NA	NA	NA	NA
Thallium	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA
VOCs				
1,2,4-Trimethylbenzene	2.0E-01	mg/m^3	Nervous	IRIS
1,3,5-Trimethylbenzene	2.0E-01	mg/m^3	Nervous	IRIS
Acrolein	9.2E-05	mg/m^3	Respiratory	ATSDR
Benzene	8.0E-02	mg/m^3	Immune	PPRTV
Chloroform	2.4E-01	mg/m^3	Hepatic	ATSDR
Ethylbenzene	9.0E+00	mg/m^3	Developmental	PPRTV
n-Propylbenzene	1.0E+00	mg/m^3	Developmental	Appendix PPRTV Screen
Toluene	5.0E+00	mg/m^3	Nervous	PPRTV
Total Xylenes	4.0E-01	mg/m^3	Nervous	PPRTV
SVOCs				
(3-and/or 4-)Methylphenol	NA	NA	NA	NA
1,1-Biphenyl	4.0E-03	mg/m^3	Hepatic, Renal	Appendix PPRTV Screen
2,4-Dimethylphenol	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA
PAHs				
1-Methylnaphthalene	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA
Pesticides				
Pentachlorophenol	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA

Prepared by: SMA 1/22/2019
Checked by: RAH 1/22/2019

Notes:
RfC - Reference Concentration
NA - Not Applicable
mg/m^3 - milligrams per cubic meter
PPRTV - Provisional Peer Reviewed Toxicity Values for Superfund
Cal EPA - California Environmental Protection Agency
IRIS - Integrated Risk Information System
ATSDR - Agency for Toxic Substances and Disease Registry
Pyrene used as a surrogate for acenaphthylene, carbazole and phenanthrene.
Sub-chronic RfD values apply to construction/utility workers only. All other receptors are assessed using chronic RfDs (see Table 2-14a).
VOCs - Volatile Organic Compounds
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons

Table 2-15
Cancer Toxicity Data - Oral/Dermal
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Chemicals of Potential Concern	Oral CSF		Oral Absorption Efficiency for Dermal[1]	Absorbed CSF for Dermal		Weight of Evidence (WOE) / Cancer Guideline Description[2]	CSF and WOE Source(s)
	Value	Units		Value	Units		
Inorganics							
Antimony	NA	NA	0.15	NA	NA	NA	NA
Aluminum	NA	NA	1	NA	NA	NA	NA
Arsenic	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS
Cobalt	NA	NA	1	NA	NA	NA	NA
Hexavalent Chromium	5.0E-01	$(mg/kg\text{-}day)^{-1}$	0.025	1.3E-02	$(mg/kg\text{-}day)^{-1}$	CH	Cal EPA and IRIS
Iron	NA	NA	1	NA	NA	NA	NA
Manganese	NA	NA	0.04	NA	NA	D	IRIS
Selenium	NA	NA	1	NA	NA	D	IRIS
Thallium	NA	NA	1	NA	NA	Inl	IRIS
Vanadium	NA	NA	0.026	NA	NA	NA	NA
VOCs							
1,2,4-Trimethylbenzene	NA	NA	1	NA	NA	Inl	IRIS
1,3,5-Trimethylbenzene	NA	NA	1	NA	NA	Inl	IRIS
Acrolein	NA	NA	1	NA	NA	NA	NA
Benzene	5.5E-02	$(mg/kg\text{-}day)^{-1}$	1	5.5E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS
Chloroform	3.1E-02	$(mg/kg\text{-}day)^{-1}$	1	3.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS
Ethylbenzene	1.1E-02	$(mg/kg\text{-}day)^{-1}$	1	1.1E-02	$(mg/kg\text{-}day)^{-1}$	D	Cal EPA and IRIS
n-Propylbenzene	NA	NA	1	NA	NA	NA	NA
Toluene	NA	NA	1	NA	NA	Inl	IRIS
Total Xylenes	NA	NA	1	NA	NA	NA	NA
SVOCs							
(3-and/or 4-)Methylphenol	NA	NA	1	NA	NA	C	IRIS
1,1-Biphenyl	8.0E-03	$(mg/kg\text{-}day)^{-1}$	1	8.0E-03	$(mg/kg\text{-}day)^{-1}$	SE	IRIS
2,4-Dimethylphenol	NA	NA	1	NA	NA	NA	NA
2,6-Dinitrotoluene	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1	NA	NA	B2	PPRTV and IRIS
2-Methylphenol	NA	NA	1	NA	NA	C	IRIS
Bis(2-ethylhexyl)phthalate	1.4E-02	$(mg/kg\text{-}day)^{-1}$	1	1.4E-02	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA and IRIS
Carbazole	NA	NA	1	NA	NA	NA	NA
Dibenzofuran	NA	NA	1	NA	NA	NA	NA
Pyridine	NA	NA	1	NA	NA	NA	NA
PAHs							
1-Methylnaphthalene	2.9E-02	$(mg/kg\text{-}day)^{-1}$	1	2.9E-02	$(mg/kg\text{-}day)^{-1}$	NA	PPRTV and IRIS
2-Methylnaphthalene	NA	NA	1	NA	NA	NA	NA
Acenaphthylene	NA	NA	1	NA	NA	NA	NA
Acenaphthene	NA	NA	1	NA	NA	NA	NA
Anthracene	NA	NA	1	NA	NA	D	IRIS
Benzo(a)anthracene	1.0E-01	$(mg/kg\text{-}day)^{-1}$	1	1.0E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS
Benzo(a)pyrene	1.0E+00	$(mg/kg\text{-}day)^{-1}$	1	1.0E+00	$(mg/kg\text{-}day)^{-1}$	CH	IRIS
Benzo(b)fluoranthene	1.0E-01	$(mg/kg\text{-}day)^{-1}$	1	1.0E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS
Benzo(k)fluoranthene	1.0E-02	$(mg/kg\text{-}day)^{-1}$	1	1.0E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS
Chrysene	1.0E-03	$(mg/kg\text{-}day)^{-1}$	1	1.0E-03	$(mg/kg\text{-}day)^{-1}$	B2	IRIS
Dibenzo(a,h)anthracene	1.0E+00	$(mg/kg\text{-}day)^{-1}$	1	1.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS
Fluoranthene	NA	NA	1	NA	NA	D	IRIS
Fluorene	NA	NA	1	NA	NA	D	IRIS
Indeno(1,2,3-cd)pyrene	1.0E-01	$(mg/kg\text{-}day)^{-1}$	1	1.0E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS
Naphthalene	NA	NA	1	NA	NA	C	Cal EPA and IRIS
Phenanthrene	NA	NA	1	NA	NA	NA	NA
Pyrene	NA	NA	1	NA	NA	D	IRIS
Pesticides							
Pentachlorophenol	4.0E-01	$(mg/kg\text{-}day)^{-1}$	1	4.0E-01	$(mg/kg\text{-}day)^{-1}$	LH	IRIS
Aldrin	1.7E+01	$(mg/kg\text{-}day)^{-1}$	1	1.7E+01	$(mg/kg\text{-}day)^{-1}$	NA	NA

Notes:
Prepared by: DME 5/18/2018
Checked by: DAR 5/18/2018

CSF - Cancer Slope Factor
NA - Not Applicable
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
PPRTV - Provisional Peer Reviewed Toxicity Values for Superfund
Cal EPA - California Environmental Protection Agency
IRIS - Integrated Risk Information System

[1] Source: Risk Assessment Guidance for Superfund. Volume 1: Human Helath Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Section 4.2 and Exhibit 4-1.

[2] EPA WOE (2005 Guidelines) = weight of evidence for carcinogenicity under 2005 EPA cancer guidelines: CH - carcinogenic to humans; LH - likely to be carcinogenic; SE - suggestive evidence of carcinogenic potential; InI - inadequate information to assess carcinogenic potential; NH - not likely to be carcinogenic). EPA WOE (1986 Guidelines) = weight-of-evidence for carcinogenicity under the 1986 EPA cancer guidelines: A - human carcinogen; B1 - probable carcinogen, limited human evidence; B2 - probable carcinogen, sufficient evidence in animals; C - possible human carcinogen; D - not classifiable E - evidence of noncarcinogenicity.

Pyrene used as a surrogate for acenaphthylene, carbazole and phenanthrene.
VOCs - Volatile Organic Compounds
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons

Table 2-16
Cancer Toxicity Data - Inhalation
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Chemicals of Potential Concern	Inhalation Unit Risk		Weight of Evidence (WOE)[1] / Cancer Guideline Description	Inhalation Unit Risk and WOE
	Value	Units		Source(s)
Inorganics				
Antimony	NA	NA	NA	NA
Aluminum	NA	NA	NA	NA
Arsenic	4.3E-03	$(\mu g/m^3)^{-1}$	A	IRIS
Cobalt	9.0E-03	$(\mu g/m^3)^{-1}$	NA	NA
Hexavalent Chromium	8.4E-02	$(\mu g/m^3)^{-1}$	CH	Cal EPA and IRIS
Iron	NA	NA	NA	NA
Manganese	NA	NA	D	IRIS
Selenium	NA	NA	D	IRIS
Thallium	NA	NA	Inl	IRIS
Vanadium	NA	NA	NA	NA
VOCs				
1,2,4-Trimethylbenzene	NA	NA	Inl	IRIS
1,3,5-Trimethylbenzene	NA	NA	Inl	IRIS
Acrolein	NA	NA	NA	NA
Benzene	7.8E-06	$(\mu g/m^3)^{-1}$	A	IRIS
Chloroform	2.3E-05	$(\mu g/m^3)^{-1}$	B2	IRIS
Ethylbenzene	2.5E-06	$(\mu g/m^3)^{-1}$	D	Cal EPA and IRIS
n-Propylbenzene	NA	NA	NA	NA
Toluene	NA	NA	Inl	IRIS
Total Xylenes	NA	NA	NA	NA
SVOCs				
(3-and/or 4-)Methylphenol	NA	NA	C	IRIS
1,1-Biphenyl	NA	NA	SE	IRIS
2,4-Dimethylphenol	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	B2	PPRTV and IRIS
2-Methylphenol	NA	NA	C	IRIS
Bis(2-ethylhexyl)phthalate	2.4E-06	$(\mu g/m^3)^{-1}$	B2	Cal EPA and IRIS
Carbazole	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA
PAHs				
1-Methylnaphthalene	NA	NA	NA	PPRTV and IRIS
2-Methylnaphthalene	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA
Anthracene	NA	NA	D	IRIS
Benzo(a)anthracene	6.0E-05	$(\mu g/m^3)^{-1}$	B2	IRIS
Benzo(a)pyrene	6.0E-04	$(\mu g/m^3)^{-1}$	CH	IRIS
Benzo(b)fluoranthene	6.0E-05	$(\mu g/m^3)^{-1}$	B2	IRIS
Benzo(k)fluoranthene	6.0E-06	$(\mu g/m^3)^{-1}$	B2	IRIS
Chrysene	6.0E-07	$(\mu g/m^3)^{-1}$	B2	IRIS
Dibenzo(a,h)anthracene	6.0E-04	$(\mu g/m^3)^{-1}$	B2	IRIS
Fluoranthene	NA	NA	D	IRIS
Fluorene	NA	NA	D	IRIS
Indeno(1,2,3-cd)pyrene	6.0E-05	$(\mu g/m^3)^{-1}$	B2	IRIS
Naphthalene	3.4E-05	$(\mu g/m^3)^{-1}$	C	Cal EPA and IRIS
Phenanthrene	NA	NA	NA	NA
Pyrene	NA	NA	D	IRIS
Pesticides				
Pentachlorophenol	5.1E-06	$(\mu g/m^3)^{-1}$	LH	IRIS
Aldrin	4.9E-03	$(\mu g/m^3)^{-1}$	NA	NA

Notes:
IUR - Inhalation Unit Risk
NA - Not Applicable
$(\mu g/m^3)^{-1}$ - 1/micrograms per cubic meter
PPRTV - Provisional Peer Reviewed Toxicity Values for Superfund
Cal EPA - California Environmental Protection Agency
IRIS - Integrated Risk Information System
[1] EPA WOE (2005 Guidelines) = weight of evidence for carcinogenicity under 2005 EPA cancer guidelines: CH - carcinogenic to humans; LH - likely to be carcinogenic; SE - suggestive evidence of carcinogenic potential; InI - inadequate information to assess carcinogenic potential; NH - not likely to be carcinogenic). EPA WOE (1986 Guidelines) = weight-of-evidence for carcinogenicity under the 1986 EPA cancer guidelines: A - human carcinogen; B1 - probable carcinogen, limited human evidence; B2 - probable carcinogen, sufficient evidence in animals; C - possible human carcinogen; D - not classifiable E - evidence of noncarcinogenicity.
Pyrene used as a surrogate for acenaphthylene, carbazole and phenanthrene.
VOCs - Volatile Organic Compounds
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons

Prepared by: DME 5/18/2018
Checked by: DAR 5/18/2018

Table 2-17a
Risk Calculations for Child Resident - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Groundwater	Groundwater	Ingestion	***Inorganics***														
			Aluminum	3.24	mg/L	1.38E-02	mg/kg-day	NA	NA	NA	NA	1.62E-01	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.2
			Arsenic	0.0411	mg/L	1.76E-04	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.6E-04	2.05E-03	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	7
			Cobalt	0.00406	mg/L	1.74E-05	mg/kg-day	NA	NA	9.0E-03	NA	2.02E-04	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.7
			Iron	38.35	mg/L	1.64E-01	mg/kg-day	NA	NA	NA	NA	1.91E+00	mg/kg-day	7.0E-01	7.0E-01	NA	3
			Manganese	0.683	mg/L	2.92E-03	mg/kg-day	NA	NA	NA	NA	3.41E-02	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	1
			Selenium	0.159	mg/L	6.80E-04	mg/kg-day	NA	NA	NA	NA	7.93E-03	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	2
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	7.75E-04	mg/kg-day	NA	NA	NA	NA	9.04E-03	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.9
			1,3,5-Trimethylbenzene	0.0378	mg/L	1.61E-04	mg/kg-day	NA	NA	NA	NA	1.88E-03	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.2
			Benzene	0.0150	mg/L	6.40E-05	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	3.5E-06	7.46E-04	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.2
			Chloroform	0.0866	mg/L	3.70E-04	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	1.1E-05	4.32E-03	mg/kg-day	1.0E-02	1.0E-02	9.8E-02	0.4
			Ethylbenzene	0.0369	mg/L	1.58E-04	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1.7E-06	1.84E-03	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.02
			Toluene	0.0312	mg/L	1.33E-04	mg/kg-day	NA	NA	NA	NA	1.56E-03	mg/kg-day	8.0E-02	8.0E-02	5.0E+00	0.02
			Total Xylenes	0.144	mg/L	6.14E-04	mg/kg-day	NA	NA	NA	NA	7.17E-03	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.04
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	1.07E-04	mg/kg-day	NA	NA	NA	NA	1.25E-03	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	0.02
			1,1-Biphenyl	0.0830	mg/L	3.55E-04	mg/kg-day	8.0E-03	8.0E-03	NA	2.8E-06	4.14E-03	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.008
			2,4-Dimethylphenol	0.189	mg/L	8.09E-04	mg/kg-day	NA	NA	NA	NA	9.43E-03	mg/kg-day	2.0E-02	2.0E-02	NA	0.5
			2-Methylphenol	0.0216	mg/L	9.21E-05	mg/kg-day	NA	NA	NA	NA	1.07E-03	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	0.02
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	4.27E-05	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	6.0E-07	4.99E-04	mg/kg-day	2.0E-02	2.0E-02	NA	0.02
			Carbazole	0.214	mg/L	9.14E-04	mg/kg-day	NA	NA	NA	NA	1.07E-02	mg/kg-day	3.0E-02	3.0E-02	NA	0.4
			Dibenzofuran	0.244	mg/L	1.04E-03	mg/kg-day	NA	NA	NA	NA	1.21E-02	mg/kg-day	1.0E-03	1.0E-03	NA	12
			Pyridine	0.0300	mg/L	1.28E-04	mg/kg-day	NA	NA	NA	NA	1.50E-03	mg/kg-day	1.0E-03	1.0E-03	NA	1
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	2.45E-03	mg/kg-day	NA	NA	NA	NA	2.86E-02	mg/kg-day	4.0E-03	4.0E-03	NA	7
			Acenaphthylene	0.00659	mg/L	2.82E-05	mg/kg-day	NA	NA	NA	NA	3.29E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
			Acenaphthene	0.326	mg/L	1.39E-03	mg/kg-day	NA	NA	NA	NA	1.63E-02	mg/kg-day	6.0E-02	6.0E-02	NA	0.3
			Benzo(a)anthracene	0.000382	mg/L	1.63E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.90E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	1.37E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	1.60E-04	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.5
			Benzo(b)fluoranthene	0.00320	mg/L	1.37E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.60E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	2.18E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	2.54E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	7.65E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	8.93E-06	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	7.07E-04	mg/kg-day	NA	NA	NA	NA	8.25E-03	mg/kg-day	4.0E-02	4.0E-02	NA	0.2
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	4.49E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	5.24E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.22	mg/L	1.80E-02	mg/kg-day	NA	NA	3.4E-05	NA	2.10E-01	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	11
			1-Methylnaphthalene	0.487	mg/L	2.08E-03	mg/kg-day	2.9E-02	2.9E-02	NA	6.0E-05	2.43E-02	mg/kg-day	7.0E-02	7.0E-02	NA	0.3
			Phenanthrene	0.137	mg/L	5.86E-04	mg/kg-day	NA	NA	NA	NA	6.84E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.2
			Pyrene	0.00631	mg/L	2.70E-05	mg/kg-day	NA	NA	NA	NA	3.14E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01

Table 2-17a
Risk Calculations for Child Resident - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral (mg/kg-day)$^{-1}$	Abs. Dermal (mg/kg-day)$^{-1}$	Inhalation (ug/m^3)$^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Groundwater	Groundwater	Ingestion	***Pesticides***														
			Pentachlorophenol	0.000845	mg/L	3.61E-06	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	1.4E-06	4.21E-05	mg/kg-day	5.0E-03	5.0E-03	NA	0.008
		Exposure Route Total									**3.5E-04**						**49**
		Dermal & Inhalation (via Bathing)	***Inorganics***														
			Aluminum	3.24	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NC
			Arsenic	0.041	mg/L	NC	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	NC	NC	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	NC
			Cobalt	0.00406	mg/L	NC	mg/kg-day	NA	NA	9.0E-03	NC	NC	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	NC
			Iron	38.35	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	7.0E-01	7.0E-01	NA	NC
			Manganese	0.683	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NC
			Selenium	0.159	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	NC
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	NC
			1,3,5-Trimethylbenzene	0.0378	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	NC
			Benzene	0.0150	mg/L	NC	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	NC	NC	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	NC
			Chloroform	0.0866	mg/L	NC	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	NC	NC	mg/kg-day	1.0E-02	1.0E-02	9.8E-02	NC
			Ethylbenzene	0.0369	mg/L	NC	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	NC	NC	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	NC
			Toluene	0.0312	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	8.0E-02	8.0E-02	5.0E+00	NC
			Total Xylenes	0.144	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	NC
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	NC
			1,1-Biphenyl	0.0830	mg/L	NC	mg/kg-day	8.0E-03	8.0E-03	NA	NC	NC	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	NC
			2,4-Dimethylphenol	0.189	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	2.0E-02	2.0E-02	NA	NC
			2-Methylphenol	0.0216	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	NC
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	NC	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	NC	NA	mg/kg-day	2.0E-02	2.0E-02	NA	NA
			Carbazole	0.214	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Dibenzofuran	0.244	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			Pyridine	0.0300	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	4.0E-03	4.0E-03	NA	NC
			Acenaphthylene	0.00659	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	3.0E-02	3.0E-02	NA	NC
			Acenaphthene	0.326	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	6.0E-02	6.0E-02	NA	NC
			Benzo(a)anthracene	0.000382	mg/L	NC	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NC	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	NC	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NC	NC	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	NC
			Benzo(b)fluoranthene	0.00320	mg/L	NC	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NC	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	NC	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NC	NA	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	NC	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NC	NA	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	4.0E-02	4.0E-02	NA	NC
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	NC	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NC	NA	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.22	mg/L	NC	mg/kg-day	NA	NA	3.4E-05	NC	NC	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	NC
			1-Methylnaphthalene	0.487	mg/L	NC	mg/kg-day	2.9E-02	2.9E-02	NA	NC	NC	mg/kg-day	7.0E-02	7.0E-02	NA	NC
			Phenanthrene	0.137	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	3.0E-02	3.0E-02	NA	NC

Table 2-17a
Risk Calculations for Child Resident - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Groundwater	Groundwater	Dermal & Inhalation (via Bathing)	Pyrene	0.00631	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	3.0E-02	3.0E-02	NA	NC
			Pesticides/SVOC														
			Pentachlorophenol	0.000845	mg/L	NC	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	NC	NC	mg/kg-day	5.0E-03	5.0E-03	NA	NC
		Exposure Route Total									**NA**						**NA**
		Inhalation (via Vapor Intrusion)	***Inorganics***														
			Aluminum	3.24	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	0.0411	mg/L	NA	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	NA
			Cobalt	0.00406	mg/L	NA	mg/kg-day	NA	NA	9.0E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	NA
			Iron	38.35	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese	0.683	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NA
			Selenium	0.159	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	NA
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	NC
			1,3,5-Trimethylbenzene	0.0378	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	NC
			Benzene	0.0150	mg/L	NC	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	NC	NC	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	NC
			Chloroform	0.0866	mg/L	NC	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	NC	NC	mg/kg-day	1.0E-02	1.0E-02	9.8E-02	NC
			Ethylbenzene	0.0369	mg/L	NC	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	NC	NC	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	NC
			Toluene	0.0312	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	8.0E-02	8.0E-02	5.0E+00	NC
			Total Xylenes	0.144	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NC	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	NC
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	NA
			1,1-Biphenyl	0.0830	mg/L	NA	mg/kg-day	8.0E-03	8.0E-03	NA	NA	NC	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	NC
			2,4-Dimethylphenol	0.189	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-02	2.0E-02	NA	NA
			2-Methylphenol	0.0216	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	NA
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	NA	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	NA	NA	mg/kg-day	2.0E-02	2.0E-02	NA	NA
			Carbazole	0.214	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Dibenzofuran	0.244	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			Pyridine	0.0300	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Acenaphthylene	0.00659	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Acenaphthene	0.326	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	6.0E-02	6.0E-02	NA	NA
			Benzo(a)anthracene	0.000382	mg/L	NC	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NC	NC	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	NA	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	NA
			Benzo(b)fluoranthene	0.00320	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	NA	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	NA	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.22	mg/L	NC	mg/kg-day	NA	NA	3.4E-05	NC	NC	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	NC

Table 2-17a
Risk Calculations for Child Resident - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral (mg/kg-day)$^{-1}$	Abs. Dermal (mg/kg-day)$^{-1}$	Inhalation (ug/m^3)$^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Groundwater	Groundwater	Inhalation (via Vapor Intrusion)	1-Methylnaphthalene	0.487	mg/L	NA	mg/kg-day	2.9E-02	2.9E-02	NA	NA	NA	mg/kg-day	7.0E-02	7.0E-02	NA	NA
			Phenanthrene	0.137	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pyrene	0.00631	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pesticides/SVOC														
			Pentachlorophenol	0.000845	mg/L	NA	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	NA	NA	mg/kg-day	5.0E-03	5.0E-03	NA	NA
		Exposure Route Total									**NA**						**NA**
	Exposure Medium Total										**3.5E-04**						**49**
Groundwater Total											**3.5E-04**					**Groundwater HI**	**49**
Total Groundwater Receptor Risk											**3.5E-04**						**49**

Prepared By: RAH 4/2/2019
Checked By: SMA 4/2/2019

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
CSF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
NC - Not Calculated; the risk to a Child Resident is accounted for in the assessment of the Adult Resident.
mg/L - milligrams per liter
mg/kg-day - milligrams per kilogram-day
(mg/kg-day)$^{-1}$ - 1/milligrams per kilogram-day
(ug/m^3)$^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Chemical not sufficiently volatile to pose a significant risk via bathing. Therefore, risk is based on dermal route of exposure only
Per the USEPA Region 4 Human Health Risk Assessment Supplemental Guidance dated March 2018, inhalation and dermal exposure to volatile organic chemicals from bathing/showering is conservatively assumed to be equivalent to exposure from the daily ingestion of contaminated water per day. If ingestion risk is non-calculable, risk from this exposure route is based on dermal risk. The pathway is considered incomplete (not applicable) if both ingestion and dermal risk are non-calculable.
Groundwater-to-indoor air inhalation risk was calculated using the U.S. EPA Vapor Intrusion Screening Levels (VISL) online Calculator (see Appendix D).

Table 2-17b
Risk Calculations for Child Resident - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	9,176	mg/kg	1.01E-02	mg/kg-day	NA	NA	NA	NA	1.2E-01	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.1
			Arsenic*	4.112	mg/kg	2.70E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	4.1E-06	3.2E-05	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.1
			Hexavalent Chromium*	0.836	mg/kg	9.16E-07	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	1.1E-05	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.004
			Thallium*	0.96	mg/kg	1.05E-06	mg/kg-day	NA	NA	NA	NA	1.2E-05	mg/kg-day	1.0E-05	1.0E-05	NA	1
			Vanadium*	27.58	mg/kg	3.02E-05	mg/kg-day	NA	NA	NA	NA	3.5E-04	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.07
			SVOCs														
			Carbazole	83.49	mg/kg	9.15E-05	mg/kg-day	NA	NA	NA	NA	1.1E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.04
			Dibenzofuran	58.21	mg/kg	6.38E-05	mg/kg-day	NA	NA	NA	NA	7.4E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.7
			PAHs														
			2-Methylnaphthalene	24.30	mg/kg	2.66E-05	mg/kg-day	NA	NA	NA	NA	3.1E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.08
			Anthracene	697.3	mg/kg	7.64E-04	mg/kg-day	NA	NA	NA	NA	8.9E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.03
			Benzo(a)anthracene	66.95	mg/kg	7.34E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	8.6E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	34.92	mg/kg	3.83E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	4.5E-04	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	1
			Benzo(b)fluoranthene	76.82	mg/kg	8.42E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	9.8E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	32.93	mg/kg	3.61E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	4.2E-04	mg/kg-day	NA	NA	NA	NA
			Chrysene	90.58	mg/kg	9.93E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	1.2E-03	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4.242	mg/kg	4.65E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.4E-05	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	236.3	mg/kg	2.59E-04	mg/kg-day	NA	NA	NA	NA	3.0E-03	mg/kg-day	4.0E-02	4.0E-02	NA	0.08
			Fluorene	95.42	mg/kg	1.05E-04	mg/kg-day	NA	NA	NA	NA	1.2E-03	mg/kg-day	4.0E-02	4.0E-02	NA	0.03
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	1.65E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.9E-04	mg/kg-day	NA	NA	NA	NA
			Naphthalene	18.81	mg/kg	2.06E-05	mg/kg-day	NA	NA	3.4E-05	NA	2.4E-04	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.01
			Phenanthrene	481.6	mg/kg	5.28E-04	mg/kg-day	NA	NA	NA	NA	6.2E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.2
			Pyrene	220.7	mg/kg	2.42E-04	mg/kg-day	NA	NA	NA	NA	2.8E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.09
		Exposure Route Total*									**NA**						**3**
		Dermal Contact	***Inorganics***														
			Aluminum*	9,176	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	4.112	mg/kg	3.21E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	4.8E-07	3.74E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.01
			Hexavalent Chromium*	0.836	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	27.58	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			SVOCs														
			Carbazole	83.49	mg/kg	2.17E-05	mg/kg-day	NA	NA	NA	NA	2.53E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.008
			Dibenzofuran	58.21	mg/kg	1.51E-05	mg/kg-day	NA	NA	NA	NA	1.77E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.2

Table 2-17b
Risk Calculations for Child Resident - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 feet bgs)	Surface Soil (0-1 feet bgs)	Dermal Contact	***PAHs***														
			2-Methylnaphthalene	24.30	mg/kg	8.21E-06	mg/kg-day	NA	NA	NA	NA	9.58E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.02
			Anthracene	697.3	mg/kg	2.36E-04	mg/kg-day	NA	NA	NA	NA	2.75E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.009
			Benzo(a)anthracene	66.95	mg/kg	2.26E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.64E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	34.92	mg/kg	1.18E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	1.38E-04	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.5
			Benzo(b)fluoranthene	76.82	mg/kg	2.60E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.03E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	32.93	mg/kg	1.11E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	1.30E-04	mg/kg-day	NA	NA	NA	NA
			Chrysene	90.58	mg/kg	3.06E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	3.57E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4.242	mg/kg	1.43E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	1.67E-05	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	236.3	mg/kg	7.99E-05	mg/kg-day	NA	NA	NA	NA	9.32E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.02
			Fluorene	95.42	mg/kg	3.23E-05	mg/kg-day	NA	NA	NA	NA	3.76E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.009
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	5.10E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	5.95E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	18.81	mg/kg	6.36E-06	mg/kg-day	NA	NA	3.4E-05	NA	7.42E-05	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.004
			Phenanthrene	481.6	mg/kg	1.63E-04	mg/kg-day	NA	NA	NA	NA	1.90E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.06
			Pyrene	220.7	mg/kg	7.46E-05	mg/kg-day	NA	NA	NA	NA	8.70E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.03
		Exposure Route Total *									**NA**						**0.8**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Aluminum*	1.46E-05	mg/m^3	1.20E-06	mg/kg-day	NA	NA	NA	NA	1.40E-05	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.003
			Arsenic*	6.55E-09	mg/m^3	5.38E-10	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.3E-09	6.28E-09	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0004
			Hexavalent Chromium*	1.33E-09	mg/m^3	1.09E-10	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	1.28E-09	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.00001
			Thallium*	1.53E-09	mg/m^3	1.26E-10	mg/kg-day	NA	NA	NA	NA	1.47E-09	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	4.39E-08	mg/m^3	3.61E-09	mg/kg-day	NA	NA	NA	NA	4.21E-08	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.0004
			SVOCs														
			Carbazole	7.46E-06	mg/m^3	6.13E-07	mg/kg-day	NA	NA	NA	NA	7.15E-06	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Dibenzofuran	2.78E-04	mg/m^3	2.29E-05	mg/kg-day	NA	NA	NA	NA	2.67E-04	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			PAHs														
			2-Methylnaphthalene	3.12E-04	mg/m^3	2.56E-05	mg/kg-day	NA	NA	NA	NA	2.99E-04	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Anthracene	9.87E-04	mg/m^3	8.11E-05	mg/kg-day	NA	NA	NA	NA	9.46E-04	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Benzo(a)anthracene	1.10E-05	mg/m^3	9.01E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.05E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	5.56E-08	mg/m^3	4.57E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.33E-08	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.03
			Benzo(b)fluoranthene	1.22E-07	mg/m^3	1.01E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.17E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	5.24E-08	mg/m^3	4.31E-09	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	5.03E-08	mg/kg-day	NA	NA	NA	NA
			Chrysene	1.44E-07	mg/m^3	1.19E-08	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	1.38E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.75E-09	mg/m^3	5.55E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	6.48E-09	mg/kg-day	NA	NA	NA	NA

Table 2-17b
Risk Calculations for Child Resident - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 feet bgs)	Surface Soil (0-1 feet bgs)	Inhalation (via Particulate and Vapor Emissions)	Fluoranthene	3.76E-07	mg/m^3	3.09E-08	mg/kg-day	NA	NA	NA	NA	3.61E-07	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Fluorene	2.52E-04	mg/m^3	2.07E-05	mg/kg-day	NA	NA	NA	NA	2.42E-04	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Indeno(1,2,3-cd)pyrene	2.40E-08	mg/m^3	1.97E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.30E-08	mg/kg-day	NA	NA	NA	NA
			Naphthalene	3.02E-04	mg/m^3	2.48E-05	mg/kg-day	NA	NA	3.4E-05	8.4E-07	2.90E-04	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.1
			Phenanthrene	5.53E-04	mg/m^3	4.55E-05	mg/kg-day	NA	NA	NA	NA	5.31E-04	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pyrene	1.67E-05	mg/m^3	1.37E-06	mg/kg-day	NA	NA	NA	NA	1.60E-05	mg/kg-day	3.0E-02	3.0E-02	NA	NA
		Exposure Route Total*									**8.4E-07**						**0.1**
	Exposure Medium Total*										**8.4E-07**						**4**
Surface Soil (0 to 1 foot bgs) Total*											**8.4E-07**					**Surface Soil HI**	**4**
Total Process Area Receptor Risk*											**8.4E-07**						**4**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA- Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-17c
Risk Calculations for Child Resident - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	14,553	mg/kg	1.59E-02	mg/kg-day	NA	NA	NA	NA	1.9E-01	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.2
			Arsenic	29.71	mg/kg	1.95E-05	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.9E-05	2.3E-04	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.8
			Iron*	9,297	mg/kg	1.02E-02	mg/kg-day	NA	NA	NA	NA	1.2E-01	mg/kg-day	7.0E-01	7.0E-01	NA	0.2
			Thallium*	0.96	mg/kg	1.05E-06	mg/kg-day	NA	NA	NA	NA	1.2E-05	mg/kg-day	1.0E-05	1.0E-05	NA	1
			Vanadium*	48.92	mg/kg	5.36E-05	mg/kg-day	NA	NA	NA	NA	6.3E-04	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.1
			VOCs														
			Benzene	1.6	mg/kg	1.75E-06	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	9.6E-08	2.0E-05	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.005
			Ethylbenzene	44	mg/kg	4.82E-05	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	5.3E-07	5.6E-04	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.006
			Total Xylenes	82	mg/kg	8.99E-05	mg/kg-day	NA	NA	NA	NA	1.0E-03	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.005
			SVOCs														
			Carbazole	282.4	mg/kg	3.09E-04	mg/kg-day	NA	NA	NA	NA	3.6E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.1
			Dibenzofuran	661.7	mg/kg	7.25E-04	mg/kg-day	NA	NA	NA	NA	8.5E-03	mg/kg-day	1.0E-03	1.0E-03	NA	8
			1,1-Biphenyl	100	mg/kg	1.10E-04	mg/kg-day	8.0E-03	8.0E-03	NA	8.8E-07	1.3E-03	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.003
			PAHs														
			2-Methylnaphthalene	653.0	mg/kg	7.16E-04	mg/kg-day	NA	NA	NA	NA	8.3E-03	mg/kg-day	4.0E-03	4.0E-03	NA	2
			Acenaphthene	910.1	mg/kg	9.97E-04	mg/kg-day	NA	NA	NA	NA	1.2E-02	mg/kg-day	6.0E-02	6.0E-02	NA	0.2
			Benzo(a)anthracene	193.7	mg/kg	2.12E-04	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.5E-03	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	68.35	mg/kg	7.49E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	8.7E-04	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	3
			Benzo(b)fluoranthene	88.43	mg/kg	9.69E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.1E-03	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	66.72	mg/kg	7.31E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	8.5E-04	mg/kg-day	NA	NA	NA	NA
			Chrysene	151.5	mg/kg	1.66E-04	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	1.9E-03	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.547	mg/kg	7.17E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	8.4E-05	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,045	mg/kg	1.15E-03	mg/kg-day	NA	NA	NA	NA	1.3E-02	mg/kg-day	4.0E-02	4.0E-02	NA	0.3
			Fluorene	810.7	mg/kg	8.88E-04	mg/kg-day	NA	NA	NA	NA	1.0E-02	mg/kg-day	4.0E-02	4.0E-02	NA	0.3
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	2.08E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.4E-04	mg/kg-day	NA	NA	NA	NA
			Naphthalene	902.0	mg/kg	9.89E-04	mg/kg-day	NA	NA	3.4E-05	NA	1.2E-02	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.6
			Phenanthrene	852.6	mg/kg	9.34E-04	mg/kg-day	NA	NA	NA	NA	1.1E-02	mg/kg-day	3.0E-02	3.0E-02	NA	0.4
			Pyrene	704.9	mg/kg	7.72E-04	mg/kg-day	NA	NA	NA	NA	9.0E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.3
			Pesticides														
			Aldrin	0.150	mg/kg	1.64E-07	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	2.8E-06	1.9E-06	mg/kg-day	3.0E-05	3.0E-05	NA	0.06
		Exposure Route Total*									**3.4E-05**						**16**
		Dermal Contact	***Inorganics***														
			Aluminum*	14,553	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	29.71	mg/kg	2.32E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	3.5E-06	2.70E-05	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.09
			Iron*	9,297	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	48.92	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA

Table 2-17c
Risk Calculations for Child Resident - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Dermal Contact	***VOCs***														
			Benzene	1.6	mg/kg	NA	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	NA	NA	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	NA
			Ethylbenzene	44	mg/kg	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	NA	NA	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	NA
			Total Xylenes	82	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	NA
			SVOCs														
			Carbazole	282.4	mg/kg	7.34E-05	mg/kg-day	NA	NA	NA	NA	8.57E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.03
			Dibenzofuran	661.7	mg/kg	1.72E-04	mg/kg-day	NA	NA	NA	NA	2.01E-03	mg/kg-day	1.0E-03	1.0E-03	NA	2
			1,1-Biphenyl	100	mg/kg	2.60E-05	mg/kg-day	8.0E-03	8.0E-03	NA	2.1E-07	3.03E-04	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.0006
			PAHs														
			2-Methylnaphthalene	653.0	mg/kg	2.21E-04	mg/kg-day	NA	NA	NA	NA	2.58E-03	mg/kg-day	4.0E-03	4.0E-03	NA	0.6
			Acenaphthene	910.1	mg/kg	3.08E-04	mg/kg-day	NA	NA	NA	NA	3.59E-03	mg/kg-day	6.0E-02	6.0E-02	NA	0.06
			Benzo(a)anthracene	193.7	mg/kg	6.55E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	7.64E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	68.35	mg/kg	2.31E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	2.70E-04	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.9
			Benzo(b)fluoranthene	88.43	mg/kg	2.99E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.49E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	66.72	mg/kg	2.26E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	2.63E-04	mg/kg-day	NA	NA	NA	NA
			Chrysene	151.5	mg/kg	5.12E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	5.98E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.547	mg/kg	2.21E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	2.58E-05	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,045	mg/kg	3.53E-04	mg/kg-day	NA	NA	NA	NA	4.12E-03	mg/kg-day	4.0E-02	4.0E-02	NA	0.1
			Fluorene	810.7	mg/kg	2.74E-04	mg/kg-day	NA	NA	NA	NA	3.20E-03	mg/kg-day	4.0E-02	4.0E-02	NA	0.08
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	6.43E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	7.50E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	902.0	mg/kg	3.05E-04	mg/kg-day	NA	NA	3.4E-05	NA	3.56E-03	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.2
			Phenanthrene	852.6	mg/kg	2.88E-04	mg/kg-day	NA	NA	NA	NA	3.36E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.1
			Pyrene	704.9	mg/kg	2.38E-04	mg/kg-day	NA	NA	NA	NA	2.78E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.09
			Pesticides														
			Aldrin	0.150	mg/kg	NA	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	NA	NA	mg/kg-day	3.0E-05	3.0E-05	NA	NA
		Exposure Route Total*									**3.7E-06**						**4**
		Inhalation	***Inorganics***														
		(via Particulate	Aluminum*	2.32E-05	mg/m^3	1.90E-06	mg/kg-day	NA	NA	NA	NA	2.22E-05	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.004
		and Vapor Emissions)	Arsenic	4.73E-08	mg/m^3	3.89E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.7E-08	4.54E-08	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.003
			Iron*	1.48E-05	mg/m^3	1.22E-06	mg/kg-day	NA	NA	NA	NA	1.42E-05	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Thallium*	1.53E-09	mg/m^3	1.26E-10	mg/kg-day	NA	NA	NA	NA	1.47E-09	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	7.79E-08	mg/m^3	6.40E-09	mg/kg-day	NA	NA	NA	NA	7.47E-08	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.0007
			VOCs														
			Benzene	3.39E-04	mg/m^3	2.78E-05	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	2.2E-07	3.25E-04	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.01
			Ethylbenzene	5.80E-03	mg/m^3	4.76E-04	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1.2E-06	5.56E-03	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.006
			Total Xylenes	1.07E-02	mg/m^3	8.77E-04	mg/kg-day	NA	NA	NA	NA	1.02E-02	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.1
			SVOCs														
			Carbazole	2.52E-05	mg/m^3	2.07E-06	mg/kg-day	NA	NA	NA	NA	2.42E-05	mg/kg-day	3.0E-02	3.0E-02	NA	NA

Table 2-17c
Risk Calculations for Child Resident - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Dibenzofuran	3.16E-03	mg/m^3	2.60E-04	mg/kg-day	NA	NA	NA	NA	3.03E-03	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			1,1-Biphenyl	6.53E-04	mg/m^3	5.37E-05	mg/kg-day	8.0E-03	8.0E-03	NA	NA	6.26E-04	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	2
			PAHs														
			2-Methylnaphthalene	8.38E-03	mg/m^3	6.89E-04	mg/kg-day	NA	NA	NA	NA	8.04E-03	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Acenaphthene	4.81E-03	mg/m^3	3.95E-04	mg/kg-day	NA	NA	NA	NA	4.61E-03	mg/kg-day	6.0E-02	6.0E-02	NA	NA
			Benzo(a)anthracene	3.17E-05	mg/m^3	2.61E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.04E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	1.09E-07	mg/m^3	8.94E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	1.04E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.05
			Benzo(b)fluoranthene	1.41E-07	mg/m^3	1.16E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.35E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.06E-07	mg/m^3	8.73E-09	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	1.02E-07	mg/kg-day	NA	NA	NA	NA
			Chrysene	2.41E-07	mg/m^3	1.98E-08	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	2.31E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.04E-08	mg/m^3	8.57E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	9.99E-09	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1.66E-06	mg/m^3	1.37E-07	mg/kg-day	NA	NA	NA	NA	1.60E-06	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Fluorene	2.14E-03	mg/m^3	1.76E-04	mg/kg-day	NA	NA	NA	NA	2.05E-03	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Indeno(1,2,3-cd)pyrene	3.03E-08	mg/m^3	2.49E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.90E-08	mg/kg-day	NA	NA	NA	NA
			Naphthalene	1.45E-02	mg/m^3	1.19E-03	mg/kg-day	NA	NA	3.4E-05	4.0E-05	1.39E-02	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	5
			Phenanthrene	9.80E-04	mg/m^3	8.05E-05	mg/kg-day	NA	NA	NA	NA	9.40E-04	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pyrene	5.33E-05	mg/m^3	4.38E-06	mg/kg-day	NA	NA	NA	NA	5.11E-05	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pesticides														
			Aldrin	0.150	mg/kg	1.23E-02	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	6.0E-05	1.44E-01	mg/kg-day	3.0E-05	3.0E-05	NA	NA
		Exposure Route Total*									**1.0E-04**						**6**
	Exposure Medium Total*										**1.4E-04**						**27**
Surface Soil (0 to 1 foot bgs) Total*											**1.4E-04**					**Surface Soil HI**	**27**
Total Pond Area Receptor Risk*											**1.4E-04**						**27**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-17d
Risk Calculations for Child Resident - Treated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	10,587	mg/kg	1.16E-02	mg/kg-day	NA	NA	NA	NA	1.4E-01	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.1
			Arsenic*	2.98	mg/kg	1.96E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.9E-06	2.3E-05	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.08
			Thallium*	0.941	mg/kg	1.03E-06	mg/kg-day	NA	NA	NA	NA	1.2E-05	mg/kg-day	1.0E-05	1.0E-05	NA	1
			PAHs														
			Benzo(a)anthracene	4.444	mg/kg	4.87E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	5.7E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.289	mg/kg	3.60E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	4.2E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.1
			Benzo(b)fluoranthene	6.356	mg/kg	6.97E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	8.1E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.5518	mg/kg	6.05E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	7.1E-06	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	2.51E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.9E-05	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.1**
		Dermal Contact	***Inorganics***														
			Aluminum*	10,587	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	2.98	mg/kg	2.32E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	3.5E-07	2.71E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.009
			Thallium*	0.941	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			PAHs														
			Benzo(a)anthracene	4.444	mg/kg	1.50E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.75E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.289	mg/kg	1.11E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	1.30E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.04
			Benzo(b)fluoranthene	6.356	mg/kg	2.15E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.51E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.5518	mg/kg	1.87E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	2.18E-06	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	7.75E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	9.04E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.04**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Aluminum*	1.69E-05	mg/m^3	1.39E-06	mg/kg-day	NA	NA	NA	NA	1.62E-05	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.003
			Arsenic*	4.74E-09	mg/m^3	3.90E-10	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.7E-09	4.55E-09	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0003
			Thallium*	1.50E-09	mg/m^3	1.23E-10	mg/kg-day	NA	NA	NA	NA	1.44E-09	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			PAHs														
			Benzo(a)anthracene	7.28E-07	mg/m^3	5.98E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	6.98E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	5.24E-09	mg/m^3	4.30E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.02E-09	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.003

Table 2-17d
Risk Calculations for Child Resident - Treated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Benzo(b)fluoranthene	1.01E-08	mg/m^3	8.32E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	9.70E-09	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	8.79E-10	mg/m^3	7.22E-11	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	8.42E-10	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	3.65E-09	mg/m^3	3.00E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.50E-09	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.003**
	Exposure Medium Total*										**NA**						**0.2**
Surface Soil (0 to 1 foot bgs) Total*											**NA**					**Surface Soil HI**	**0.2**
Total Treated Wood Storage Area Receptor Risk*											**NA**						**0.2**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-17e
Risk Calculations for Child Resident - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Arsenic*	4.44	mg/kg	2.92E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	4.4E-06	3.4E-05	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.1
			Hexavalent Chromium*	1.71	mg/kg	1.87E-06	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	2.2E-05	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.007
			PAHs														
			Benzo(a)anthracene	1.989	mg/kg	2.18E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.5E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	2.116	mg/kg	2.32E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	2.7E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.09
			Benzo(b)fluoranthene	2.826	mg/kg	3.10E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.6E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.223	mg/kg	1.34E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	1.6E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.340	mg/kg	3.73E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	4.3E-06	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	1.78E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.1E-05	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.09**
		Dermal Contact	***Inorganics***														
			Arsenic*	4.44	mg/kg	3.46E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	5.2E-07	4.04E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.01
			Hexavalent Chromium*	1.71	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			PAHs														
			Benzo(a)anthracene	1.989	mg/kg	6.72E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	7.85E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	2.116	mg/kg	7.15E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	8.35E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.03
			Benzo(b)fluoranthene	2.826	mg/kg	9.55E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.11E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.223	mg/kg	4.13E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	4.82E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.340	mg/kg	1.15E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	1.34E-06	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	5.49E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	6.41E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.03**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Arsenic*	7.07E-09	mg/m^3	5.81E-10	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.5E-09	6.78E-09	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0005
			Hexavalent Chromium*	2.72E-09	mg/m^3	2.24E-10	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	2.61E-09	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.00003
			PAHs														
			Benzo(a)anthracene	3.26E-07	mg/m^3	2.68E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.12E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.37E-09	mg/m^3	2.77E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	3.23E-09	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.002
			Benzo(b)fluoranthene	4.50E-09	mg/m^3	3.70E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	4.31E-09	mg/kg-day	NA	NA	NA	NA

Table 2-17e
Risk Calculations for Child Resident - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Benzo(k)fluoranthene	1.95E-09	mg/m^3	1.60E-10	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	1.87E-09	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	5.41E-10	mg/m^3	4.45E-11	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.19E-10	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.59E-09	mg/m^3	2.13E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.48E-09	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.002**
	Exposure Medium Total*										**NA**						**0.1**
Surface Soil (0 to 1 foot bgs) Total*											**NA**					**Surface Soil HI**	**0.1**
Total Untreated Wood Storage Area Receptor Risk*											**NA**						**0.1**

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Table 2-17f
Risk Calculations for Child Resident - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	6,295	mg/kg	6.90E-03	mg/kg-day	NA	NA	NA	NA	8.0E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.08
			Arsenic	6.674	mg/kg	4.39E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	6.6E-06	5.1E-05	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.2
			Cobalt	1.144	mg/kg	1.25E-06	mg/kg-day	NA	NA	9.0E-03	NA	1.5E-05	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.05
			Hexavalent Chromium*	0.912	mg/kg	9.99E-07	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	1.2E-05	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.004
			Iron*	4,022	mg/kg	4.41E-03	mg/kg-day	NA	NA	NA	NA	5.1E-02	mg/kg-day	7.0E-01	7.0E-01	NA	0.07
			Manganese*	96.7	mg/kg	1.06E-04	mg/kg-day	NA	NA	NA	NA	1.2E-03	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.05
			Thallium*	0.96	mg/kg	1.05E-06	mg/kg-day	NA	NA	NA	NA	1.2E-05	mg/kg-day	1.0E-05	1.0E-05	NA	1
			Vanadium*	11.02	mg/kg	1.21E-05	mg/kg-day	NA	NA	NA	NA	1.4E-04	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.03
			VOCs														
			Acrolein	0.011	mg/kg	1.20E-08	mg/kg-day	NA	NA	NA	NA	1.4E-07	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	0.0003
			PAHs														
			Benzo(a)anthracene	0.530	mg/kg	5.81E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	6.8E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.454	mg/kg	4.97E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.8E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.02
			Benzo(b)fluoranthene	1.511	mg/kg	1.66E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.9E-05	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	3.94E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	4.6E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**6.6E-06**						**0.2**
		Dermal Contact	***Inorganics***														
			Aluminum*	6,295	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	6.674	mg/kg	5.21E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	7.8E-07	6.07E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.02
			Cobalt	1.144	mg/kg	NA	mg/kg-day	NA	NA	9.0E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	NA
			Hexavalent Chromium*	0.912	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			Iron*	4,022	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese*	96.7	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	11.02	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			VOCs														
			Acrolein	0.011	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	NA
			PAHs														
			Benzo(a)anthracene	0.530	mg/kg	1.79E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.09E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.454	mg/kg	1.53E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	1.79E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.006
			Benzo(b)fluoranthene	1.511	mg/kg	5.11E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	5.96E-06	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	1.21E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.42E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**7.8E-07**						**0.03**
		Inhalation	***Inorganics***														
		(via Particulate	Aluminum*	1.00E-05	mg/m^3	8.24E-07	mg/kg-day	NA	NA	NA	NA	9.61E-06	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.002
		and Vapor Emissions)	Arsenic	1.06E-08	mg/m^3	8.73E-10	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	3.8E-09	1.02E-08	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0007
			Cobalt	1.82E-09	mg/m^3	1.50E-10	mg/kg-day	NA	NA	9.0E-03	1.3E-09	1.75E-09	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.0003

Table 2-17f
Risk Calculations for Child Resident - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Hexavalent Chromium*	1.45E-09	mg/m^3	1.19E-10	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	1.39E-09	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.00001
			Iron*	6.40E-06	mg/m^3	5.26E-07	mg/kg-day	NA	NA	NA	NA	6.14E-06	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese*	1.54E-07	mg/m^3	1.27E-08	mg/kg-day	NA	NA	NA	NA	1.48E-07	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.003
			Thallium*	1.53E-09	mg/m^3	1.26E-10	mg/kg-day	NA	NA	NA	NA	1.47E-09	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	1.75E-08	mg/m^3	1.44E-09	mg/kg-day	NA	NA	NA	NA	1.68E-08	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.0002
			VOCs														
			Acrolein	1.18E-06	mg/m^3	9.73E-08	mg/kg-day	NA	NA	NA	NA	1.13E-06	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	0.06
			PAHs														
			Benzo(a)anthracene	8.68E-08	mg/m^3	7.13E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	8.32E-08	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	7.22E-10	mg/m^3	5.94E-11	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	6.93E-10	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0003
			Benzo(b)fluoranthene	2.41E-09	mg/m^3	1.98E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.31E-09	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	5.72E-10	mg/m^3	4.70E-11	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	5.49E-10	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**5.1E-09**						**0.06**
	Exposure Medium Total*										**7.4E-06**						**0.3**
Surface Soil (0 to 1 foot bgs) Total*											**7.4E-06**					**Surface Soil HI**	**0.3**
Total Eastern Upland Area Receptor Risk*											**7.4E-06**						**0.3**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-18a
Risk Calculations for Adult Resident - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Groundwater	Groundwater	Ingestion	***Inorganics***														
			Aluminum	3.24	mg/L	2.77E-02	mg/kg-day	NA	NA	NA	NA	9.71E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.1
			Arsenic	0.0411	mg/L	3.52E-04	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	5.3E-04	1.23E-03	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	4
			Cobalt	0.00406	mg/L	3.48E-05	mg/kg-day	NA	NA	9.0E-03	NA	1.22E-04	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.4
			Iron	38.35	mg/L	3.28E-01	mg/kg-day	NA	NA	NA	NA	1.15E+00	mg/kg-day	7.0E-01	7.0E-01	NA	2
			Manganese	0.683	mg/L	5.85E-03	mg/kg-day	NA	NA	NA	NA	2.05E-02	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.9
			Selenium	0.159	mg/L	1.36E-03	mg/kg-day	NA	NA	NA	NA	4.76E-03	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	1
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	1.55E-03	mg/kg-day	NA	NA	NA	NA	5.43E-03	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.5
			1,3,5-Trimethylbenzene	0.0378	mg/L	3.23E-04	mg/kg-day	NA	NA	NA	NA	1.13E-03	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.1
			Benzene	0.0150	mg/L	1.28E-04	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	7.0E-06	4.49E-04	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.1
			Chloroform	0.0866	mg/L	7.41E-04	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	2.3E-05	2.60E-03	mg/kg-day	1.0E-02	1.0E-02	9.8E-02	0.3
			Ethylbenzene	0.0369	mg/L	3.16E-04	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	3.5E-06	1.11E-03	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.01
			Toluene	0.0312	mg/L	2.67E-04	mg/kg-day	NA	NA	NA	NA	9.35E-04	mg/kg-day	8.0E-02	8.0E-02	5.0E+00	0.01
			Total Xylenes	0.144	mg/L	1.23E-03	mg/kg-day	NA	NA	NA	NA	4.31E-03	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.02
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	2.14E-04	mg/kg-day	NA	NA	NA	NA	7.50E-04	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	0.02
			1,1-Biphenyl	0.0830	mg/L	7.10E-04	mg/kg-day	8.0E-03	8.0E-03	NA	5.7E-06	2.49E-03	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.005
			2,4-Dimethylphenol	0.189	mg/L	1.62E-03	mg/kg-day	NA	NA	NA	NA	5.67E-03	mg/kg-day	2.0E-02	2.0E-02	NA	0.3
			2-Methylphenol	0.0216	mg/L	1.85E-04	mg/kg-day	NA	NA	NA	NA	6.46E-04	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	0.01
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	8.56E-05	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	1.2E-06	3.00E-04	mg/kg-day	2.0E-02	2.0E-02	NA	0.01
			Carbazole	0.214	mg/L	1.83E-03	mg/kg-day	NA	NA	NA	NA	6.41E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.2
			Dibenzofuran	0.244	mg/L	2.08E-03	mg/kg-day	NA	NA	NA	NA	7.30E-03	mg/kg-day	1.0E-03	1.0E-03	NA	7
			Pyridine	0.0300	mg/L	2.57E-04	mg/kg-day	NA	NA	NA	NA	8.99E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.9
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	4.91E-03	mg/kg-day	NA	NA	NA	NA	1.72E-02	mg/kg-day	4.0E-03	4.0E-03	NA	4
			Acenaphthylene	0.00659	mg/L	5.65E-05	mg/kg-day	NA	NA	NA	NA	1.98E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.007
			Acenaphthene	0.326	mg/L	2.79E-03	mg/kg-day	NA	NA	NA	NA	9.77E-03	mg/kg-day	6.0E-02	6.0E-02	NA	0.2
			Benzo(a)anthracene	0.000382	mg/L	3.27E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.14E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	2.74E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	9.59E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.3
			Benzo(b)fluoranthene	0.00320	mg/L	2.74E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	9.59E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	4.37E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	1.53E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	1.53E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.36E-06	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	1.42E-03	mg/kg-day	NA	NA	NA	NA	4.96E-03	mg/kg-day	4.0E-02	4.0E-02	NA	0.1
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	8.99E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.15E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.220	mg/L	3.61E-02	mg/kg-day	NA	NA	3.4E-05	NA	1.26E-01	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	6
			1-Methylnaphthalene	0.487	mg/L	4.17E-03	mg/kg-day	2.9E-02	2.9E-02	NA	1.2E-04	1.46E-02	mg/kg-day	7.0E-02	7.0E-02	NA	0.2
			Phenanthrene	0.137	mg/L	1.17E-03	mg/kg-day	NA	NA	NA	NA	4.11E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.1
			Pyrene	0.00631	mg/L	5.40E-05	mg/kg-day	NA	NA	NA	NA	1.89E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.006

Table 2-18a
Risk Calculations for Adult Resident - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Groundwater	Groundwater	Ingestion	***Pesticides***														
			Pentachlorophenol	0.000845	mg/L	7.23E-06	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	2.9E-06	2.53E-05	mg/kg-day	5.0E-03	5.0E-03	NA	0.005
		Exposure Route Total									**6.9E-04**						**29**
		Dermal & Inhalation	***Inorganics***														
		(via Showering)	Aluminum	3.24	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.0005 *
			Arsenic	0.0411	mg/L	NA	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	4.2E-06 *	NA	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.02 *
			Cobalt	0.00406	mg/L	NA	mg/kg-day	NA	NA	9.0E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.0009 *
			Iron	38.35	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	0.009 *
			Manganese	0.683	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.1 *
			Selenium	0.159	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	0.005 *
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.5
			1,3,5-Trimethylbenzene	0.0378	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.1
			Benzene	0.0150	mg/L	NA	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	1.1E-05	NA	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.1
			Chloroform	0.0866	mg/L	NA	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	3.4E-05	NA	mg/kg-day	1.0E-02	1.0E-02	9.8E-02	0.3
			Ethylbenzene	0.0369	mg/L	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	5.2E-06	NA	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.01
			Toluene	0.0312	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	8.0E-02	8.0E-02	5.0E+00	0.01
			Total Xylenes	0.144	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.02
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	0.001 *
			1,1-Biphenyl	0.0830	mg/L	NA	mg/kg-day	8.0E-03	8.0E-03	NA	8.5E-06	NA	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.005
			2,4-Dimethylphenol	0.189	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-02	2.0E-02	NA	0.04 *
			2-Methylphenol	0.0216	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	0.001 *
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	NA	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	1.8E-06	NA	mg/kg-day	2.0E-02	2.0E-02	NA	0.01
			Carbazole	0.214	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	0.2
			Dibenzofuran	0.244	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-03	1.0E-03	NA	7
			Pyridine	0.0300	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-03	1.0E-03	NA	0.9
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-03	4.0E-03	NA	4
			Acenaphthylene	0.00659	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	0.007
			Acenaphthene	0.326	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	6.0E-02	6.0E-02	NA	0.2
			Benzo(a)anthracene	0.000382	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	NA	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	NA
			Benzo(b)fluoranthene	0.00320	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	NA	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	NA	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-02	4.0E-02	NA	0.1
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.220	mg/L	NA	mg/kg-day	NA	NA	3.4E-05	NA	NA	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	6
			1-Methylnaphthalene	0.487	mg/L	NA	mg/kg-day	2.9E-02	2.9E-02	NA	1.8E-04	NA	mg/kg-day	7.0E-02	7.0E-02	NA	0.2
			Phenanthrene	0.137	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	0.1

Table 2-18a
Risk Calculations for Adult Resident - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral (mg/kg-day)$^{-1}$	Abs. Dermal (mg/kg-day)$^{-1}$	Inhalation (ug/m^3)$^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Groundwater	Groundwater	Dermal & Inhalation (via Showering)	Pyrene	0.00631	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	0.006
			Pesticides/SVOC														
			Pentachlorophenol	0.000845	mg/L	NA	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	1.6E-05 *	NA	mg/kg-day	5.0E-03	5.0E-03	NA	0.02 *
		Exposure Route Total									**2.6E-04**						**21**
		Inhalation (via Vapor Intrusion)	***Inorganics***														
			Aluminum	3.24	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	0.0411	mg/L	NA	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	NA
			Cobalt	0.00406	mg/L	NA	mg/kg-day	NA	NA	9.0E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	NA
			Iron	38.35	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese	0.683	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NA
			Selenium	0.159	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	NA
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.7
			1,3,5-Trimethylbenzene	0.0378	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.2
			Benzene	0.0150	mg/L	NA	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	9.4E-06	NA	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.1
			Chloroform	0.0866	mg/L	NA	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	1.1E-04	NA	mg/kg-day	1.0E-02	1.0E-02	9.8E-02	0.1
			Ethylbenzene	0.0369	mg/L	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1.1E-05	NA	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.01
			Toluene	0.0312	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	8.0E-02	8.0E-02	5.0E+00	0.002
			Total Xylenes	0.144	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.4
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	NA
			1,1-Biphenyl	0.0830	mg/L	NA	mg/kg-day	8.0E-03	8.0E-03	NA	NA	NA	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	3
			2,4-Dimethylphenol	0.189	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-02	2.0E-02	NA	NA
			2-Methylphenol	0.0216	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	NA
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	NA	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	NA	NA	mg/kg-day	2.0E-02	2.0E-02	NA	NA
			Carbazole	0.214	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Dibenzofuran	0.244	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			Pyridine	0.0300	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Acenaphthylene	0.00659	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Acenaphthene	0.326	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	6.0E-02	6.0E-02	NA	NA
			Benzo(a)anthracene	0.000382	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	NA	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	NA
			Benzo(b)fluoranthene	0.00320	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	NA	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	NA	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.220	mg/L	NA	mg/kg-day	NA	NA	3.4E-05	9.2E-04	NA	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	24

Table 2-18a
Risk Calculations for Adult Resident - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Groundwater	Groundwater	Inhalation (via Vapor Intrusion)	1-Methylnaphthalene	0.487	mg/L	NA	mg/kg-day	2.9E-02	2.9E-02	NA	NA	NA	mg/kg-day	7.0E-02	7.0E-02	NA	NA
			Phenanthrene	0.137	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pyrene	0.00631	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pesticides/SVOC														
			Pentachlorophenol	0.000845	mg/L	NA	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	NA	NA	mg/kg-day	5.0E-03	5.0E-03	NA	NA
		Exposure Route Total									**1.0E-03**						**28**
	Exposure Medium Total										**2.0E-03**						**79**
Groundwater Total											**2.0E-03**					**Groundwater HI**	**79**
Total Groundwater Receptor Risk											**2.0E-03**						**79**

Prepared By: RAH 4/2/2019
Checked By: SMA 4/2/2019

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
CSF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/L - milligrams per liter
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
Per the U.S. EPA and NCDEQ, the RSL Calculator (see Appendix B) was used to determine the dermal risk from groundwater.
* Chemical not sufficiently volatile to pose a significant risk via showering. Therefore, risk is based on dermal route of exposure only.
Per the USEPA Region 4 Human Health Risk Assessment Supplemental Guidance dated March 2018, inhalation and dermal exposure to volatile organic chemicals from bathing/showering is conservatively assumed to be equivalent to exposure from the daily ingestion of contaminated water per day. If ingestion risk is non-calculable, risk from this exposure route is based on dermal risk. The pathway is considered incomplete (not applicable) if both ingestion and dermal risk are non-calculable.
Groundwater-to-indoor air inhalation risk was calculated using the U.S. EPA Vapor Intrusion Screening Levels (VISL) online Calculator (see Appendix D).

Table 2-18b
Risk Calculations for Adult Resident - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	9,176	mg/kg	3.14E-03	mg/kg-day	NA	NA	NA	NA	1.1E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.01
			Arsenic*	4.112	mg/kg	8.45E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.3E-06	3.0E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.01
			Hexavalent Chromium*	0.836	mg/kg	2.86E-07	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	1.0E-06	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.0003
			Thallium*	0.96	mg/kg	3.29E-07	mg/kg-day	NA	NA	NA	NA	1.2E-06	mg/kg-day	1.0E-05	1.0E-05	NA	0.1
			Vanadium*	27.58	mg/kg	9.45E-06	mg/kg-day	NA	NA	NA	NA	3.3E-05	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.007
			SVOCs														
			Carbazole	83.49	mg/kg	2.86E-05	mg/kg-day	NA	NA	NA	NA	1.0E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.003
			Dibenzofuran	58.21	mg/kg	1.99E-05	mg/kg-day	NA	NA	NA	NA	7.0E-05	mg/kg-day	1.0E-03	1.0E-03	NA	0.07
			PAHs														
			2-Methylnaphthalene	24.30	mg/kg	8.32E-06	mg/kg-day	NA	NA	NA	NA	2.9E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.007
			Anthracene	697.3	mg/kg	2.39E-04	mg/kg-day	NA	NA	NA	NA	8.4E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.003
			Benzo(a)anthracene	66.95	mg/kg	2.29E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	8.0E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	34.92	mg/kg	1.20E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	4.2E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.1
			Benzo(b)fluoranthene	76.82	mg/kg	2.63E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	9.2E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	32.93	mg/kg	1.13E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	3.9E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	90.58	mg/kg	3.10E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	1.1E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4.242	mg/kg	1.45E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.1E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	236.3	mg/kg	8.09E-05	mg/kg-day	NA	NA	NA	NA	2.8E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.007
			Fluorene	95.42	mg/kg	3.27E-05	mg/kg-day	NA	NA	NA	NA	1.1E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.003
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	5.16E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.8E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	18.81	mg/kg	6.44E-06	mg/kg-day	NA	NA	3.4E-05	NA	2.3E-05	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.001
			Phenanthrene	481.6	mg/kg	1.65E-04	mg/kg-day	NA	NA	NA	NA	5.8E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.02
			Pyrene	220.7	mg/kg	7.56E-05	mg/kg-day	NA	NA	NA	NA	2.6E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.009
		Exposure Route Total*									**NA**						**0.3**
		Dermal Contact	***Inorganics***														
			Aluminum*	9,176	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	4.112	mg/kg	1.78E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.7E-07	6.24E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.002
			Hexavalent Chromium*	0.836	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	27.58	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			SVOCs														
			Carbazole	83.49	mg/kg	1.21E-05	mg/kg-day	NA	NA	NA	NA	4.23E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.001
			Dibenzofuran	58.21	mg/kg	8.42E-06	mg/kg-day	NA	NA	NA	NA	2.95E-05	mg/kg-day	1.0E-03	1.0E-03	NA	0.03

Table 2-18b
Risk Calculations for Adult Resident - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Dermal Contact	***PAHs***														
			2-Methylnaphthalene	24.30	mg/kg	4.57E-06	mg/kg-day	NA	NA	NA	NA	1.60E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.004
			Anthracene	697.3	mg/kg	1.31E-04	mg/kg-day	NA	NA	NA	NA	4.59E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.002
			Benzo(a)anthracene	66.95	mg/kg	1.26E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	4.40E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	34.92	mg/kg	6.57E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	2.30E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.08
			Benzo(b)fluoranthene	76.82	mg/kg	1.44E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	5.05E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	32.93	mg/kg	6.19E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	2.17E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	90.58	mg/kg	1.70E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	5.96E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4.242	mg/kg	7.97E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	2.79E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	236.3	mg/kg	4.44E-05	mg/kg-day	NA	NA	NA	NA	1.55E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.004
			Fluorene	95.42	mg/kg	1.79E-05	mg/kg-day	NA	NA	NA	NA	6.28E-05	mg/kg-day	4.0E-02	4.0E-02	NA	0.002
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	2.83E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	9.92E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	18.81	mg/kg	3.54E-06	mg/kg-day	NA	NA	3.4E-05	NA	1.24E-05	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.0006
			Phenanthrene	481.6	mg/kg	9.05E-05	mg/kg-day	NA	NA	NA	NA	3.17E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
			Pyrene	220.7	mg/kg	4.15E-05	mg/kg-day	NA	NA	NA	NA	1.45E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.005
		Exposure Route Total*									**NA**						**0.1**
		Inhalation	***Inorganics***														
		(via Particulate	Aluminum*	1.46E-05	mg/m^3	4.00E-06	mg/kg-day	NA	NA	NA	NA	1.40E-05	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.003
		and Vapor Emissions)	Arsenic*	6.55E-09	mg/m^3	1.79E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	7.7E-09	6.28E-09	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0004
			Hexavalent Chromium*	1.33E-09	mg/m^3	3.65E-10	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	1.28E-09	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.00001
			Thallium*	1.53E-09	mg/m^3	4.19E-10	mg/kg-day	NA	NA	NA	NA	1.47E-09	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	4.39E-08	mg/m^3	1.20E-08	mg/kg-day	NA	NA	NA	NA	4.21E-08	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.0004
			SVOCs														
			Carbazole	7.46E-06	mg/m^3	2.04E-06	mg/kg-day	NA	NA	NA	NA	7.15E-06	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Dibenzofuran	2.78E-04	mg/m^3	7.62E-05	mg/kg-day	NA	NA	NA	NA	2.67E-04	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			PAHs														
			2-Methylnaphthalene	3.12E-04	mg/m^3	8.54E-05	mg/kg-day	NA	NA	NA	NA	2.99E-04	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Anthracene	9.87E-04	mg/m^3	2.70E-04	mg/kg-day	NA	NA	NA	NA	9.46E-04	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Benzo(a)anthracene	1.10E-05	mg/m^3	3.00E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.05E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	5.56E-08	mg/m^3	1.52E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.33E-08	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.03
			Benzo(b)fluoranthene	1.22E-07	mg/m^3	3.35E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.17E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	5.24E-08	mg/m^3	1.44E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	5.03E-08	mg/kg-day	NA	NA	NA	NA
			Chrysene	1.44E-07	mg/m^3	3.95E-08	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	1.38E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.75E-09	mg/m^3	1.85E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	6.48E-09	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	3.76E-07	mg/m^3	1.03E-07	mg/kg-day	NA	NA	NA	NA	3.61E-07	mg/kg-day	4.0E-02	4.0E-02	NA	NA

Table 2-18b
Risk Calculations for Adult Resident - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral (mg/kg-day)$^{-1}$	Abs. Dermal (mg/kg-day)$^{-1}$	Inhalation (ug/m^3)$^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Fluorene	2.52E-04	mg/m^3	6.90E-05	mg/kg-day	NA	NA	NA	NA	2.42E-04	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Indeno(1,2,3-cd)pyrene	2.40E-08	mg/m^3	6.58E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.30E-08	mg/kg-day	NA	NA	NA	NA
			Naphthalene	3.02E-04	mg/m^3	8.28E-05	mg/kg-day	NA	NA	3.4E-05	2.8E-06	2.90E-04	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.1
			Phenanthrene	5.53E-04	mg/m^3	1.52E-04	mg/kg-day	NA	NA	NA	NA	5.31E-04	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pyrene	1.67E-05	mg/m^3	4.58E-06	mg/kg-day	NA	NA	NA	NA	1.60E-05	mg/kg-day	3.0E-02	3.0E-02	NA	NA
		Exposure Route Total*									**2.8E-06**						**0.1**
	Exposure Medium Total*										**2.8E-06**						**0.5**
Surface Soil (0 to 1 foot bgs) Total*											**2.8E-06**					**Surface Soil HI**	**0.5**
Total Process Area Receptor Risk*											**2.8E-06**						**0.5**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
(mg/kg-day)$^{-1}$ - 1/milligrams per kilogram-day
(ug/m^3)$^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-18c
Risk Calculations for Adult Resident - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	14,553	mg/kg	4.98E-03	mg/kg-day	NA	NA	NA	NA	1.7E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.02
			Arsenic	29.71	mg/kg	6.10E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	9.2E-06	2.1E-05	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.07
			Iron*	9,297	mg/kg	3.18E-03	mg/kg-day	NA	NA	NA	NA	1.1E-02	mg/kg-day	7.0E-01	7.0E-01	NA	0.02
			Thallium*	0.96	mg/kg	3.29E-07	mg/kg-day	NA	NA	NA	NA	1.2E-06	mg/kg-day	1.0E-05	1.0E-05	NA	0.1
			Vanadium*	48.92	mg/kg	1.68E-05	mg/kg-day	NA	NA	NA	NA	5.9E-05	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.01
			VOCs														
			Benzene	1.600	mg/kg	5.48E-07	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	3.0E-08	1.9E-06	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.0005
			Ethylbenzene	44.00	mg/kg	1.51E-05	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1.7E-07	5.3E-05	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.0005
			Total Xylenes	82.00	mg/kg	2.81E-05	mg/kg-day	NA	NA	NA	NA	9.8E-05	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.0005
			SVOCs														
			Carbazole	282.4	mg/kg	9.67E-05	mg/kg-day	NA	NA	NA	NA	3.4E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
			Dibenzofuran	661.7	mg/kg	2.27E-04	mg/kg-day	NA	NA	NA	NA	7.9E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.8
			1,1-Biphenyl	100.0	mg/kg	3.42E-05	mg/kg-day	8.0E-03	8.0E-03	NA	2.7E-07	1.2E-04	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.0002
			PAHs														
			2-Methylnaphthalene	653.0	mg/kg	2.24E-04	mg/kg-day	NA	NA	NA	NA	7.8E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.2
			Acenaphthene	910.1	mg/kg	3.12E-04	mg/kg-day	NA	NA	NA	NA	1.1E-03	mg/kg-day	6.0E-02	6.0E-02	NA	0.02
			Benzo(a)anthracene	193.7	mg/kg	6.63E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.3E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	68.35	mg/kg	2.34E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	8.2E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.3
			Benzo(b)fluoranthene	88.43	mg/kg	3.03E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.1E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	66.72	mg/kg	2.28E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	8.0E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	151.5	mg/kg	5.19E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	1.8E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.547	mg/kg	2.24E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	7.8E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,045	mg/kg	3.58E-04	mg/kg-day	NA	NA	NA	NA	1.3E-03	mg/kg-day	4.0E-02	4.0E-02	NA	0.03
			Fluorene	810.7	mg/kg	2.78E-04	mg/kg-day	NA	NA	NA	NA	9.7E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.02
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	6.51E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.3E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	902.0	mg/kg	3.09E-04	mg/kg-day	NA	NA	3.4E-05	NA	1.1E-03	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.05
			Phenanthrene	852.6	mg/kg	2.92E-04	mg/kg-day	NA	NA	NA	NA	1.0E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.03
			Pyrene	704.9	mg/kg	2.41E-04	mg/kg-day	NA	NA	NA	NA	8.4E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.03
			Pesticides														
			Aldrin	0.150	mg/kg	5.14E-08	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	8.7E-07	1.8E-07	mg/kg-day	3.0E-05	3.0E-05	NA	0.006
		Exposure Route Total*									**1.1E-05**						**2**

Table 2-18c
Risk Calculations for Adult Resident - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Dermal Contact	***Inorganics***														
			Aluminum*	14,553	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	29.71	mg/kg	1.29E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.9E-06	4.51E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.02
			Iron*	9,297	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	48.92	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			VOCs														
			Benzene	1.600	mg/kg	NA	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	NA	NA	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	NA
			Ethylbenzene	44.00	mg/kg	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	NA	NA	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	NA
			Total Xylenes	82.00	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	NA
			SVOCs														
			Carbazole	282.4	mg/kg	4.08E-05	mg/kg-day	NA	NA	NA	NA	1.43E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.005
			Dibenzofuran	661.7	mg/kg	9.57E-05	mg/kg-day	NA	NA	NA	NA	3.35E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.3
			1,1-Biphenyl	100.0	mg/kg	1.45E-05	mg/kg-day	8.0E-03	8.0E-03	NA	1.2E-07	5.06E-05	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.0001
			PAHs														
			2-Methylnaphthalene	653.0	mg/kg	1.23E-04	mg/kg-day	NA	NA	NA	NA	4.30E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.1
			Acenaphthene	910.1	mg/kg	1.71E-04	mg/kg-day	NA	NA	NA	NA	5.99E-04	mg/kg-day	6.0E-02	6.0E-02	NA	0.01
			Benzo(a)anthracene	193.7	mg/kg	3.64E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.27E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	68.35	mg/kg	1.28E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	4.50E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.1
			Benzo(b)fluoranthene	88.43	mg/kg	1.66E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	5.82E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	66.72	mg/kg	1.25E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	4.39E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	151.5	mg/kg	2.85E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	9.97E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.547	mg/kg	1.23E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	4.31E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,045	mg/kg	1.96E-04	mg/kg-day	NA	NA	NA	NA	6.88E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.02
			Fluorene	810.7	mg/kg	1.52E-04	mg/kg-day	NA	NA	NA	NA	5.33E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.01
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	3.57E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.25E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	902.0	mg/kg	1.70E-04	mg/kg-day	NA	NA	3.4E-05	NA	5.93E-04	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.03
			Phenanthrene	852.6	mg/kg	1.60E-04	mg/kg-day	NA	NA	NA	NA	5.61E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.02
			Pyrene	704.9	mg/kg	1.33E-04	mg/kg-day	NA	NA	NA	NA	4.64E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.02
			Pesticides														
			Aldrin	0.150	mg/kg	NA	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	NA	NA	mg/kg-day	3.00E-05	3.00E-05	NA	NA
		Exposure Route Total*									**2.0E-06**						**0.7**

Table 2-18c
Risk Calculations for Adult Resident - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Aluminum*	2.32E-05	mg/m^3	6.35E-06	mg/kg-day	NA	NA	NA	NA	2.22E-05	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.004
			Arsenic	4.73E-08	mg/m^3	1.30E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	5.6E-08	4.54E-08	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.003
			Iron*	1.48E-05	mg/m^3	4.06E-06	mg/kg-day	NA	NA	NA	NA	1.42E-05	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Thallium*	1.53E-09	mg/m^3	4.19E-10	mg/kg-day	NA	NA	NA	NA	1.47E-09	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	7.79E-08	mg/m^3	2.13E-08	mg/kg-day	NA	NA	NA	NA	7.47E-08	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.0007
			VOCs														
			Benzene	3.39E-04	mg/m^3	9.28E-05	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	7.2E-07	3.25E-04	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.01
			Ethylbenzene	5.80E-03	mg/m^3	1.59E-03	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	4.0E-06	5.56E-03	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.006
			Total Xylenes	1.07E-02	mg/m^3	2.92E-03	mg/kg-day	NA	NA	NA	NA	1.02E-02	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.1
			SVOCs														
			Carbazole	2.52E-05	mg/m^3	6.91E-06	mg/kg-day	NA	NA	NA	NA	2.42E-05	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Dibenzofuran	3.16E-03	mg/m^3	8.67E-04	mg/kg-day	NA	NA	NA	NA	3.03E-03	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			1,1-Biphenyl	6.53E-04	mg/m^3	1.79E-04	mg/kg-day	8.0E-03	8.0E-03	NA	NA	6.26E-04	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	2
			PAHs														
			2-Methylnaphthalene	8.38E-03	mg/m^3	2.30E-03	mg/kg-day	NA	NA	NA	NA	8.04E-03	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Acenaphthene	4.81E-03	mg/m^3	1.32E-03	mg/kg-day	NA	NA	NA	NA	4.61E-03	mg/kg-day	6.0E-02	6.0E-02	NA	NA
			Benzo(a)anthracene	3.17E-05	mg/m^3	8.69E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.04E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	1.09E-07	mg/m^3	2.98E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	1.04E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.05
			Benzo(b)fluoranthene	1.41E-07	mg/m^3	3.86E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.35E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.06E-07	mg/m^3	2.91E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	1.02E-07	mg/kg-day	NA	NA	NA	NA
			Chrysene	2.41E-07	mg/m^3	6.61E-08	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	NA	2.31E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.04E-08	mg/m^3	2.86E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	9.99E-09	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1.66E-06	mg/m^3	4.56E-07	mg/kg-day	NA	NA	NA	NA	1.60E-06	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Fluorene	2.14E-03	mg/m^3	5.87E-04	mg/kg-day	NA	NA	NA	NA	2.05E-03	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Indeno(1,2,3-cd)pyrene	3.03E-08	mg/m^3	8.29E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.90E-08	mg/kg-day	NA	NA	NA	NA
			Naphthalene	1.45E-02	mg/m^3	3.97E-03	mg/kg-day	NA	NA	3.4E-05	1.3E-04	1.39E-02	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	5
			Phenanthrene	9.80E-04	mg/m^3	2.68E-04	mg/kg-day	NA	NA	NA	NA	9.40E-04	mg/kg-day	3.0E-02	3.0E-02	NA	NA

Table 2-18c
Risk Calculations for Adult Resident - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Pyrene	5.33E-05	mg/m^3	1.46E-05	mg/kg-day	NA	NA	NA	NA	5.11E-05	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pesticides														
			Aldrin	2.39E-10	mg/kg	6.54E-11	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	3.2E-10	2.29E-10	mg/kg-day	3.00E-05	3.00E-05	NA	NA
		Exposure Route Total*									**1.4E-04**						**6**
	Exposure Medium Total*										**1.5E-04**						**9**
Surface Soil (0 to 1 foot bgs) Total*											**1.5E-04**					**Surface Soil HI**	**9**
Total Pond Area Receptor Risk*											**1.5E-04**						**9**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-18d
Risk Calculations for Adult Resident - Treated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	10,587	mg/kg	3.63E-03	mg/kg-day	NA	NA	NA	NA	1.3E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.01
			Arsenic*	2.98	mg/kg	6.12E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	9.2E-07	2.1E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.007
			Thallium*	0.941	mg/kg	3.22E-07	mg/kg-day	NA	NA	NA	NA	1.1E-06	mg/kg-day	1.0E-05	1.0E-05	NA	0.1
			PAHs														
			Benzo(a)anthracene	4.444	mg/kg	1.52E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	5.3E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.289	mg/kg	1.13E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	3.9E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.01
			Benzo(b)fluoranthene	6.356	mg/kg	2.18E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	7.6E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.5518	mg/kg	1.89E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	6.6E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	7.85E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.7E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.01**
		Dermal Contact	***Inorganics***														
			Aluminum*	10,587	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	2.98	mg/kg	1.29E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.9E-07	4.52E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.002
			Thallium*	0.941	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			PAHs														
			Benzo(a)anthracene	4.444	mg/kg	8.35E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.92E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.289	mg/kg	6.18E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	2.16E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.007
			Benzo(b)fluoranthene	6.356	mg/kg	1.19E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	4.18E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.5518	mg/kg	1.04E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	3.63E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	4.31E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.51E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.007**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Aluminum*	1.69E-05	mg/m^3	4.62E-06	mg/kg-day	NA	NA	NA	NA	1.62E-05	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.003
			Arsenic*	4.74E-09	mg/m^3	1.30E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	5.6E-09	4.55E-09	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0003
			Thallium*	1.50E-09	mg/m^3	4.10E-10	mg/kg-day	NA	NA	NA	NA	1.44E-09	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			PAHs														
			Benzo(a)anthracene	7.28E-07	mg/m^3	1.99E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	6.98E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	5.24E-09	mg/m^3	1.43E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.02E-09	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.003

Table 2-18d
Risk Calculations for Adult Resident - Treated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Benzo(b)fluoranthene	1.01E-08	mg/m^3	2.77E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	9.70E-09	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	8.79E-10	mg/m^3	2.41E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	8.42E-10	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	3.65E-09	mg/m^3	1.00E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.50E-09	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.003**
	Exposure Medium Total*										**NA**						**0.02**
Surface Soil (0 to 1 foot bgs) Total*											**NA**					**Surface Soil HI**	**0.02**
Total Treated Wood Storage Area Receptor Risk*											**NA**						**0.02**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-18e
Risk Calculations for Adult Resident - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Arsenic*	4.440	mg/kg	9.12E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.4E-06	3.2E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.01
			Hexavalent Chromium*	1.710	mg/kg	5.86E-07	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	2.0E-06	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.0007
			PAHs														
			Benzo(a)anthracene	1.989	mg/kg	6.81E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.4E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	2.116	mg/kg	7.25E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	2.5E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.008
			Benzo(b)fluoranthene	2.826	mg/kg	9.68E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.4E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.223	mg/kg	4.19E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	1.5E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.340	mg/kg	1.16E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	4.1E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	5.57E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.9E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.008**
		Dermal Contact	***Inorganics***														
			Arsenic*	4.440	mg/kg	1.93E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.9E-07	6.74E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.002
			Hexavalent Chromium*	1.710	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			PAHs														
			Benzo(a)anthracene	1.989	mg/kg	3.74E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.31E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	2.116	mg/kg	3.98E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	1.39E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.005
			Benzo(b)fluoranthene	2.826	mg/kg	5.31E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.86E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.223	mg/kg	2.30E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	8.05E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.340	mg/kg	6.39E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	2.24E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	3.05E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.07E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.005**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Arsenic*	7.07E-09	mg/m^3	1.94E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	8.3E-09	6.78E-09	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0005
			Hexavalent Chromium*	2.72E-09	mg/m^3	7.46E-10	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	2.61E-09	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.00003
			PAHs														
			Benzo(a)anthracene	3.26E-07	mg/m^3	8.92E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.12E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.37E-09	mg/m^3	9.23E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	3.23E-09	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.002
			Benzo(b)fluoranthene	4.50E-09	mg/m^3	1.23E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	4.31E-09	mg/kg-day	NA	NA	NA	NA

Table 2-18e
Risk Calculations for Adult Resident - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Benzo(k)fluoranthene	1.95E-09	mg/m^3	5.33E-10	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	1.87E-09	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	5.41E-10	mg/m^3	1.48E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.19E-10	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.59E-09	mg/m^3	7.09E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.48E-09	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**NA**						**0.002**
	Exposure Medium Total*										**NA**						**0.01**
Surface Soil (0 to 1 foot bgs) Total*											**NA**					**Surface Soil HI**	**0.01**
Total Untreated Wood Storage Area Receptor Risk*											**NA**						**0.01**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-18f
Risk Calculations for Adult Resident - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	6,295	mg/kg	2.16E-03	mg/kg-day	NA	NA	NA	NA	7.5E-03	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.008
			Arsenic	6.674	mg/kg	1.37E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.1E-06	4.8E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.02
			Cobalt	1.144	mg/kg	3.92E-07	mg/kg-day	NA	NA	9.0E-03	NA	1.4E-06	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.005
			Hexavalent Chromium*	0.912	mg/kg	3.12E-07	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	1.1E-06	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.0004
			Iron*	4,022	mg/kg	1.38E-03	mg/kg-day	NA	NA	NA	NA	4.8E-03	mg/kg-day	7.0E-01	7.0E-01	NA	0.007
			Manganese*	96.7	mg/kg	3.31E-05	mg/kg-day	NA	NA	NA	NA	1.2E-04	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.005
			Thallium*	0.96	mg/kg	3.29E-07	mg/kg-day	NA	NA	NA	NA	1.2E-06	mg/kg-day	1.0E-05	1.0E-05	NA	0.1
			Vanadium*	11.02	mg/kg	3.77E-06	mg/kg-day	NA	NA	NA	NA	1.3E-05	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.003
			VOCs														
			Acrolein	0.011	mg/kg	3.76E-09	mg/kg-day	NA	NA	NA	NA	1.3E-08	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	0.00003
			PAHs														
			Benzo(a)anthracene	0.530	mg/kg	1.82E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	6.4E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.454	mg/kg	1.55E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	5.4E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.002
			Benzo(b)fluoranthene	1.511	mg/kg	5.17E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	1.8E-06	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	1.23E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	4.3E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**2.1E-06**						**0.02**
		Dermal Contact	***Inorganics***														
			Aluminum*	6,295	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	6.674	mg/kg	2.90E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	4.3E-07	1.01E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.003
			Cobalt	1.144	mg/kg	NA	mg/kg-day	NA	NA	9.0E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	NA
			Hexavalent Chromium*	0.912	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			Iron*	4,022	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese*	96.7	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	11.02	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			VOCs														
			Acrolein	0.011	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	NA
			PAHs														
			Benzo(a)anthracene	0.530	mg/kg	9.97E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	3.49E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.454	mg/kg	8.53E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	2.99E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.001
			Benzo(b)fluoranthene	1.511	mg/kg	2.84E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	9.94E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	6.75E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.36E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**4.3E-07**						**0.004**

Table 2-18f
Risk Calculations for Adult Resident - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Aluminum*	1.00E-05	mg/m^3	2.75E-06	mg/kg-day	NA	NA	NA	NA	9.61E-06	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.002
			Arsenic	1.06E-08	mg/m^3	2.91E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.3E-08	1.02E-08	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0007
			Cobalt	1.82E-09	mg/m^3	4.99E-10	mg/kg-day	NA	NA	9.0E-03	4.5E-09	1.75E-09	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.0003
			Hexavalent Chromium*	1.45E-09	mg/m^3	3.98E-10	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	1.39E-09	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.00001
			Iron*	6.40E-06	mg/m^3	1.75E-06	mg/kg-day	NA	NA	NA	NA	6.14E-06	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese*	1.54E-07	mg/m^3	4.22E-08	mg/kg-day	NA	NA	NA	NA	1.48E-07	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.003
			Thallium*	1.53E-09	mg/m^3	4.19E-10	mg/kg-day	NA	NA	NA	NA	1.47E-09	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	1.75E-08	mg/m^3	4.81E-09	mg/kg-day	NA	NA	NA	NA	1.68E-08	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.0002
			VOCs														
			Acrolein	1.18E-06	mg/m^3	3.24E-07	mg/kg-day	NA	NA	NA	NA	1.13E-06	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	0.06
			PAHs														
			Benzo(a)anthracene	8.68E-08	mg/m^3	2.38E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	8.32E-08	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	7.22E-10	mg/m^3	1.98E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	6.93E-10	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0003
			Benzo(b)fluoranthene	2.41E-09	mg/m^3	6.59E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	2.31E-09	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	5.72E-10	mg/m^3	1.57E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	5.49E-10	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**1.7E-08**						**0.06**
	Exposure Medium Total*										**2.5E-06**						**0.08**
Surface Soil (0 to 1 foot bgs) Total*											**2.5E-06**					**Surface Soil HI**	**0.08**
Total Eastern Upland Area Receptor Risk*											**2.5E-06**						**0.08**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
Carcinogenic risk for mutagenic carcinogens is included on Tables 2-19a through 2-19f.
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-19a
Risk Calculations for Lifetime Resident, Mutagenic Carcinogens - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk
Groundwater	Groundwater	Ingestion	***PAHs***								
			Benzo(a)anthracene	0.000382	mg/L	1.61E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.6E-06
			Benzo(a)pyrene	0.00320	mg/L	1.35E-04	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.3E-04
			Benzo(b)fluoranthene	0.00320	mg/L	1.35E-04	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.3E-05
			Benzo(k)fluoranthene	0.00510	mg/L	2.14E-04	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	2.1E-06
			Dibenzo(a,h)anthracene	0.000179	mg/L	7.53E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	7.5E-06
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	4.42E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.4E-07
		Exposure Route Total									**1.6E-04**
		Dermal & Inhalation (via Showering)	***PAHs***								
			Benzo(a)anthracene	0.000382	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.6E-06
			Benzo(a)pyrene	0.00320	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA
			Benzo(b)fluoranthene	0.00320	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA
			Benzo(k)fluoranthene	0.00510	mg/L	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA
		Exposure Route Total									**1.6E-06**
		Inhalation (via Vapor Intrusion)	***PAHs***								
			Benzo(a)anthracene	0.000382	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.1E-08
			Benzo(a)pyrene	0.00320	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA
			Benzo(b)fluoranthene	0.00320	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA
			Benzo(k)fluoranthene	0.00510	mg/L	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA
		Exposure Route Total									**1.1E-08**
	Exposure Medium Total										**1.6E-04**
Groundwater Total											**1.6E-04**
Total Groundwater Receptor Risk											**1.6E-04**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
CSF - Carcinogenic Slope Factor
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/L - milligrams per liter
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
Per the U.S. EPA and NCDEQ, the RSL Calculator (see Appendix B) was used to determine the dermal risk from groundwater.
Per the USEPA Region 4 Human Health Risk Assessment Supplemental Guidance dated March 2018, inhalation and dermal exposure to volatile organic chemicals from bathing/showering is conservatively assumed to be equivalent to exposure from the daily ingestion of contaminated water per day. If ingestion risk is non-calculable, risk from this exposure route is based on dermal risk. The pathway is considered incomplete (not applicable) if both ingestion and dermal risk are non-calculable.
Groundwater-to-indoor air inhalation risk was calculated using the U.S. EPA Vapor Intrusion Screening Levels (VISL) online Calculator (see Appendix D).

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-19b
Risk Calculations for Lifetime Resident, Mutagenic Carcinogens - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***								
			Hexavalent Chromium*	0.836	mg/kg	6.17E-06	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	3.1E-06
			PAHs								
			Benzo(a)anthracene	66.95	mg/kg	4.94E-04	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.9E-05
			Benzo(a)pyrene	34.92	mg/kg	2.58E-04	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.6E-04
			Benzo(b)fluoranthene	76.82	mg/kg	5.67E-04	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.7E-05
			Benzo(k)fluoranthene	32.93	mg/kg	2.43E-04	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	2.4E-06
			Chrysene	90.58	mg/kg	6.69E-04	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	6.7E-07
			Dibenzo(a,h)anthracene	4.242	mg/kg	3.13E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.1E-05
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	1.11E-04	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.1E-05
		Exposure Route Total*									**4.1E-04**
		Dermal Contact	***Inorganics***								
			Hexavalent Chromium*	0.836	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA
			PAHs								
			Benzo(a)anthracene	66.95	mg/kg	4.40E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.4E-06
			Benzo(a)pyrene	34.92	mg/kg	2.29E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.3E-05
			Benzo(b)fluoranthene	76.82	mg/kg	5.04E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.0E-06
			Benzo(k)fluoranthene	32.93	mg/kg	2.16E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	2.2E-07
			Chrysene	90.58	mg/kg	5.95E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	5.9E-08
			Dibenzo(a,h)anthracene	4.242	mg/kg	2.79E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.8E-06
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	9.90E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	9.9E-07
		Exposure Route Total*									**3.6E-05**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***								
			Hexavalent Chromium*	1.33E-09	mg/m^3	1.31E-09	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	1.1E-07
			PAHs								
			Benzo(a)anthracene	1.10E-05	mg/m^3	1.08E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	6.5E-07
			Benzo(a)pyrene	5.56E-08	mg/m^3	5.48E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.3E-08
			Benzo(b)fluoranthene	1.22E-07	mg/m^3	1.21E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	7.2E-09
			Benzo(k)fluoranthene	5.24E-08	mg/m^3	5.17E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3.1E-10

Table 2-19b
Risk Calculations for Lifetime Resident, Mutagenic Carcinogens - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Chrysene	1.44E-07	mg/m^3	1.42E-07	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	8.5E-11
			Dibenzo(a,h)anthracene	6.75E-09	mg/m^3	6.66E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.0E-09
			Indeno(1,2,3-cd)pyrene	2.40E-08	mg/m^3	2.37E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.4E-09
		Exposure Route Total*									**6.9E-07**
	Exposure Medium Total*										**4.5E-04**
Surface Soil (0 to 1 feet bgs) Total*											**4.5E-04**
Total Process Area Receptor Risk*											**4.5E-04**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendix F for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-19c
Risk Calculations for Lifetime Resident, Mutagenic Carcinogens - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***PAHs***								
			Benzo(a)anthracene	193.7	mg/kg	1.43E-03	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.4E-04
			Benzo(a)pyrene	68.35	mg/kg	5.05E-04	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	5.0E-04
			Benzo(b)fluoranthene	88.43	mg/kg	6.53E-04	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	6.5E-05
			Benzo(k)fluoranthene	66.72	mg/kg	4.93E-04	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	4.9E-06
			Chrysene	151.5	mg/kg	1.12E-03	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	1.1E-06
			Dibenzo(a,h)anthracene	6.547	mg/kg	4.84E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.8E-05
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	1.40E-04	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.4E-05
		Exposure Route Total									**7.8E-04**
		Dermal Contact	***PAHs***								
			Benzo(a)anthracene	193.7	mg/kg	1.27E-04	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.3E-05
			Benzo(a)pyrene	68.35	mg/kg	4.49E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.5E-05
			Benzo(b)fluoranthene	88.43	mg/kg	5.81E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.8E-06
			Benzo(k)fluoranthene	66.72	mg/kg	4.38E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	4.4E-07
			Chrysene	151.5	mg/kg	9.95E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	9.9E-08
			Dibenzo(a,h)anthracene	6.547	mg/kg	4.30E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.3E-06
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	1.25E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.2E-06
		Exposure Route Total									**6.9E-05**
		Inhalation (via Particulate and Vapor Emissions)	***PAHs***								
			Benzo(a)anthracene	3.17E-05	mg/m^3	3.13E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.9E-06
			Benzo(a)pyrene	1.09E-07	mg/m^3	1.07E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.4E-08
			Benzo(b)fluoranthene	1.41E-07	mg/m^3	1.39E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	8.3E-09
			Benzo(k)fluoranthene	1.06E-07	mg/m^3	1.05E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	6.3E-10
			Chrysene	2.41E-07	mg/m^3	2.38E-07	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	1.4E-10
			Dibenzo(a,h)anthracene	1.04E-08	mg/m^3	1.03E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.2E-09
			Indeno(1,2,3-cd)pyrene	3.03E-08	mg/m^3	2.99E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.8E-09
		Exposure Route Total									**2.0E-06**
	Exposure Medium Total										**8.5E-04**
Surface Soil (0 to 1 foot bgs) Total											**8.5E-04**
Total Pond Area Receptor Risk											**8.5E-04**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
PAHs - Polycyclic Aromatic Hydrocarbons
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface

Prepared By: DME 7/30/2018
Checked By: DAR 8/03/2018

Table 2-19d
Risk Calculations for Lifetime Resident, Mutagenic Carcinogens - Treated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***PAHs***								
			Benzo(a)anthracene	4.444	mg/kg	3.28E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.3E-06
			Benzo(a)pyrene	3.289	mg/kg	2.43E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.4E-05
			Benzo(b)fluoranthene	6.356	mg/kg	4.69E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.7E-06
			Dibenzo(a,h)anthracene	0.5518	mg/kg	4.08E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.1E-06
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	1.69E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.7E-06
		Exposure Route Total									**3.8E-05**
		Dermal Contact	***PAHs***								
			Benzo(a)anthracene	4.444	mg/kg	2.92E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.9E-07
			Benzo(a)pyrene	3.289	mg/kg	2.16E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.2E-06
			Benzo(b)fluoranthene	6.356	mg/kg	4.17E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.2E-07
			Dibenzo(a,h)anthracene	0.5518	mg/kg	3.62E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.6E-07
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	1.51E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.5E-07
		Exposure Route Total									**3.4E-06**
		Inhalation (via Particulate and Vapor Emissions)	***PAHs***								
			Benzo(a)anthracene	7.28E-07	mg/m^3	7.18E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.3E-08
			Benzo(a)pyrene	5.24E-09	mg/m^3	5.16E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.1E-09
			Benzo(b)fluoranthene	1.01E-08	mg/m^3	9.98E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	6.0E-10
			Dibenzo(a,h)anthracene	8.79E-10	mg/m^3	8.66E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	5.2E-10
			Indeno(1,2,3-cd)pyrene	3.65E-09	mg/m^3	3.60E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.2E-10
		Exposure Route Total									**4.7E-08**
	Exposure Medium Total										**4.1E-05**
Surface Soil (0 to 1 foot bgs) Total											**4.1E-05**
Total Treated Wood Storage Area Receptor Risk											**4.1E-05**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
PAHs - Polycyclic Aromatic Hydrocarbons
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface

Prepared By: DME 7/30/2018
Checked By: DAR 8/03/2018

Table 2-19e
Risk Calculations for Lifetime Resident, Mutagenic Carcinogens - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***								
			Hexavalent Chromium*	1.710	mg/kg	1.26E-05	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	6.3E-06
			PAHs								
			Benzo(a)anthracene	1.989	mg/kg	1.47E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.5E-06
			Benzo(a)pyrene	2.116	mg/kg	1.56E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.6E-05
			Benzo(b)fluoranthene	2.826	mg/kg	2.09E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.1E-06
			Benzo(k)fluoranthene	1.223	mg/kg	9.03E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	9.0E-08
			Dibenzo(a,h)anthracene	0.340	mg/kg	2.51E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.5E-06
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	1.20E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.2E-06
		Exposure Route Total*									**2.3E-05**
		Dermal Contact	***Inorganics***								
			Hexavalent Chromium*	1.710	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA
			PAHs								
			Benzo(a)anthracene	1.989	mg/kg	1.31E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.3E-07
			Benzo(a)pyrene	2.116	mg/kg	1.39E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.4E-06
			Benzo(b)fluoranthene	2.826	mg/kg	1.86E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.9E-07
			Benzo(k)fluoranthene	1.223	mg/kg	8.03E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	8.0E-09
			Dibenzo(a,h)anthracene	0.340	mg/kg	2.23E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.2E-07
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	1.07E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.1E-07
		Exposure Route Total*									**2.0E-06**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***								
			Hexavalent Chromium*	2.72E-09	mg/m^3	2.69E-09	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	2.3E-07
			PAHs								
			Benzo(a)anthracene	3.26E-07	mg/m^3	3.21E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.9E-08
			Benzo(a)pyrene	3.37E-09	mg/m^3	3.32E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.0E-09
			Benzo(b)fluoranthene	4.50E-09	mg/m^3	4.44E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.7E-10

Table 2-19e
Risk Calculations for Lifetime Resident, Mutagenic Carcinogens - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Benzo(k)fluoranthene	1.95E-09	mg/m^3	1.92E-09	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.2E-11
			Dibenzo(a,h)anthracene	5.41E-10	mg/m^3	5.34E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.2E-10
			Indeno(1,2,3-cd)pyrene	2.59E-09	mg/m^3	2.55E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.5E-10
		Exposure Route Total*									**2.2E-08**
	Exposure Medium Total*										**2.5E-05**
Surface Soil (0 to 1 foot bgs) Total*											**2.5E-05**
Total Untreated Wood Storage Area Receptor Risk*											**2.5E-05**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendix F for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-19f
Risk Calculations for Lifetime Resident, Mutagenic Carcinogens - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***								
			Hexavalent Chromium*	0.912	mg/kg	6.74E-06	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	3.4E-06
			PAHs								
			Benzo(a)anthracene	0.530	mg/kg	3.92E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.9E-07
			Benzo(a)pyrene	0.454	mg/kg	3.35E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.4E-06
			Benzo(b)fluoranthene	1.511	mg/kg	1.12E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.1E-06
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	2.65E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.7E-07
		Exposure Route Total*									**5.1E-06**
		Dermal Contact	***Inorganics***								
			Hexavalent Chromium*	0.912	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA
			PAHs								
			Benzo(a)anthracene	0.530	mg/kg	3.48E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.5E-08
			Benzo(a)pyrene	0.454	mg/kg	2.98E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.0E-07
			Benzo(b)fluoranthene	1.511	mg/kg	9.92E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	9.9E-08
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	2.36E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.4E-08
		Exposure Route Total*									**4.6E-07**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***								
			Hexavalent Chromium*	1.45E-09	mg/m^3	1.43E-09	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	1.2E-07
			PAHs								
			Benzo(a)anthracene	8.68E-08	mg/m^3	8.56E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.1E-09
			Benzo(a)pyrene	7.22E-10	mg/m^3	7.13E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.3E-10
			Benzo(b)fluoranthene	2.41E-09	mg/m^3	2.37E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.4E-10
			Indeno(1,2,3-cd)pyrene	5.72E-10	mg/m^3	5.64E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.4E-11
		Exposure Route Total*									**5.7E-09**
	Exposure Medium Total*										**5.6E-06**
Surface Soil (0 to 1 foot bgs) Total*											**5.6E-06**
Total Eastern Upland Area Receptor Risk*											**5.6E-06**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendix F for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-20a
Risk Calculations for Teenage Trespasser - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***															
			Aluminum*	9,176	mg/kg	5.39E-04	mg/kg-day	NA	NA	NA	1	NA	3.8E-03	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.004
			Arsenic*	4.112	mg/kg	1.45E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	2.2E-07	1.0E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.003
			Hexavalent Chromium*	0.836	mg/kg	4.91E-08	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	3	7.4E-08	3.4E-07	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.0001
			Thallium*	0.960	mg/kg	5.64E-08	mg/kg-day	NA	NA	NA	1	NA	3.9E-07	mg/kg-day	1.0E-05	1.0E-05	NA	0.04
			Vanadium*	27.58	mg/kg	1.62E-06	mg/kg-day	NA	NA	NA	1	NA	1.1E-05	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.002
			SVOCs															
			Carbazole	83.49	mg/kg	4.90E-06	mg/kg-day	NA	NA	NA	1	NA	3.4E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.001
			Dibenzofuran	58.21	mg/kg	3.42E-06	mg/kg-day	NA	NA	NA	1	NA	2.4E-05	mg/kg-day	1.0E-03	1.0E-03	NA	0.02
			PAHs															
			2-Methylnaphthalene	24.30	mg/kg	1.43E-06	mg/kg-day	NA	NA	NA	1	NA	1.0E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.002
			Anthracene	697.3	mg/kg	4.09E-05	mg/kg-day	NA	NA	NA	1	NA	2.9E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.001
			Benzo(a)anthracene	66.95	mg/kg	3.93E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.2E-06	2.8E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	34.92	mg/kg	2.05E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	6.2E-06	1.4E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.05
			Benzo(b)fluoranthene	76.82	mg/kg	4.51E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.4E-06	3.2E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	32.93	mg/kg	1.93E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3	5.8E-08	1.4E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	90.58	mg/kg	5.32E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	3	1.6E-08	3.7E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4.242	mg/kg	2.49E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	7.5E-07	1.7E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	236.3	mg/kg	1.39E-05	mg/kg-day	NA	NA	NA	1	NA	9.7E-05	mg/kg-day	4.0E-02	4.0E-02	NA	0.002
			Fluorene	95.42	mg/kg	5.60E-06	mg/kg-day	NA	NA	NA	1	NA	3.9E-05	mg/kg-day	4.0E-02	4.0E-02	NA	0.001
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	8.85E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	2.7E-07	6.2E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	18.81	mg/kg	1.10E-06	mg/kg-day	NA	NA	3.40E-05	1	NA	7.7E-06	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.0004
			Phenanthrene	481.6	mg/kg	2.83E-05	mg/kg-day	NA	NA	NA	1	NA	2.0E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.007
			Pyrene	220.7	mg/kg	1.30E-05	mg/kg-day	NA	NA	NA	1	NA	9.1E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.003
		Exposure Route Total*										**9.8E-06**						**0.09**
		Dermal Contact	***Inorganics***															
			Aluminum*	9,176	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	4.112	mg/kg	2.74E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	4.1E-08	1.92E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0006
			Hexavalent Chromium*	0.836	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	3	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			Thallium*	0.960	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	1.00E-05	1.00E-05	NA	NA
			Vanadium*	27.58	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			SVOCs															
			Carbazole	83.49	mg/kg	1.85E-06	mg/kg-day	NA	NA	NA	1	NA	1.30E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.0004
			Dibenzofuran	58.21	mg/kg	1.29E-06	mg/kg-day	NA	NA	NA	1	NA	9.05E-06	mg/kg-day	1.0E-03	1.0E-03	NA	0.009

Table 2-20a
Risk Calculations for Teenage Trespasser - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Dermal Contact	***PAHs***															
			2-Methylnaphthalene	24.30	mg/kg	7.01E-07	mg/kg-day	NA	NA	NA	1	NA	4.91E-06	mg/kg-day	4.0E-03	4.0E-03	NA	0.001
			Anthracene	697.3	mg/kg	2.01E-05	mg/kg-day	NA	NA	NA	1	NA	1.41E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.0005
			Benzo(a)anthracene	66.95	mg/kg	1.93E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	5.8E-07	1.35E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	34.92	mg/kg	1.01E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	3.0E-06	7.06E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.02
			Benzo(b)fluoranthene	76.82	mg/kg	2.22E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	6.7E-07	1.55E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	32.93	mg/kg	9.51E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3	2.9E-08	6.65E-06	mg/kg-day	NA	NA	NA	NA
			Chrysene	90.58	mg/kg	2.61E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	3	7.8E-09	1.83E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4.242	mg/kg	1.22E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	3.7E-07	8.57E-07	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	236.3	mg/kg	6.82E-06	mg/kg-day	NA	NA	NA	1	NA	4.77E-05	mg/kg-day	4.0E-02	4.0E-02	NA	0.001
			Fluorene	95.42	mg/kg	2.75E-06	mg/kg-day	NA	NA	NA	1	NA	1.93E-05	mg/kg-day	4.0E-02	4.0E-02	NA	0.0005
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	4.35E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.3E-07	3.05E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	18.81	mg/kg	5.43E-07	mg/kg-day	NA	NA	3.4E-05	1	NA	3.80E-06	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.0002
			Phenanthrene	481.6	mg/kg	1.39E-05	mg/kg-day	NA	NA	NA	1	NA	9.73E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.003
			Pyrene	220.7	mg/kg	6.37E-06	mg/kg-day	NA	NA	NA	1	NA	4.46E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.001
		Exposure Route Total*										**4.8E-06**						**0.04**
	Exposure Medium Total*											**1.5E-05**						**0.1**
Surface Soil (0 to 1 foot bgs) Total*												**1.5E-05**					**Surface Soil HI**	**0.1**
Total Process Area Receptor Risk*												**1.5E-05**						**0.1**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
[1] Age-Dependent Adjustment Factor (ADAF) is used for chemicals with a mutagenic mode of action for carcinogenesis. The cancer risk is adjusted by multiplying the calculated risk by the ADAF. See Text for explanation.
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-20b
Risk Calculations for Teenage Trespasser - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil	Surface Soil	Incidental Ingestion	***Inorganics***															
(0-1 foot bgs)	(0-1 foot bgs)		Aluminum*	14,553	mg/kg	8.54E-04	mg/kg-day	NA	NA	NA	1	NA	6.0E-03	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.006
			Arsenic	29.71	mg/kg	1.05E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	1.6E-06	7.3E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.02
			Iron*	9,297	mg/kg	5.46E-04	mg/kg-day	NA	NA	NA	1	NA	3.8E-03	mg/kg-day	7.0E-01	7.0E-01	NA	0.005
			Thallium*	0.960	mg/kg	5.64E-08	mg/kg-day	NA	NA	NA	1	NA	3.9E-07	mg/kg-day	1.0E-05	1.0E-05	NA	0.04
			Vanadium*	48.92	mg/kg	2.87E-06	mg/kg-day	NA	NA	NA	1	NA	2.0E-05	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.004
			VOCs															
			Benzene	1.600	mg/kg	9.39E-08	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	1	5.2E-09	6.6E-07	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.0002
			Ethylbenzene	44.00	mg/kg	2.58E-06	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1	2.8E-08	1.8E-05	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.0002
			Total Xylenes	82.00	mg/kg	4.81E-06	mg/kg-day	NA	NA	NA	1	NA	3.4E-05	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.0002
			SVOCs															
			Carbazole	282.4	mg/kg	1.66E-05	mg/kg-day	NA	NA	NA	1	NA	1.2E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.004
			Dibenzofuran	661.7	mg/kg	3.88E-05	mg/kg-day	NA	NA	NA	1	NA	2.7E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.3
			1,1-Biphenyl	100.0	mg/kg	5.87E-06	mg/kg-day	8.0E-03	8.0E-03	NA	1	4.7E-08	4.1E-05	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.00008
			PAHs															
			2-Methylnaphthalene	653.0	mg/kg	3.83E-05	mg/kg-day	NA	NA	NA	1	NA	2.7E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.07
			Acenaphthene	910.1	mg/kg	5.34E-05	mg/kg-day	NA	NA	NA	1	NA	3.7E-04	mg/kg-day	6.0E-02	6.0E-02	NA	0.006
			Benzo(a)anthracene	193.7	mg/kg	1.14E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	3.4E-06	8.0E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	68.35	mg/kg	4.01E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	1.2E-05	2.8E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.09
			Benzo(b)fluoranthene	88.43	mg/kg	5.19E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.6E-06	3.6E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	66.72	mg/kg	3.92E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3	1.2E-07	2.7E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	151.5	mg/kg	8.89E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	3	2.7E-08	6.2E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.547	mg/kg	3.84E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	1.2E-06	2.7E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,045	mg/kg	6.14E-05	mg/kg-day	NA	NA	NA	1	NA	4.3E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.01
			Fluorene	810.7	mg/kg	4.76E-05	mg/kg-day	NA	NA	NA	1	NA	3.3E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.008
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	1.12E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	3.3E-07	7.8E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	902.0	mg/kg	5.30E-05	mg/kg-day	NA	NA	3.4E-05	1	NA	3.7E-04	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.02
			Phenanthrene	852.6	mg/kg	5.01E-05	mg/kg-day	NA	NA	NA	1	NA	3.5E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
			Pyrene	704.9	mg/kg	4.14E-05	mg/kg-day	NA	NA	NA	1	NA	2.9E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
			Pesticides															
			Aldrin	0.150	mg/kg	8.81E-09	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	1	1.5E-07	6.2E-08	mg/kg-day	3.0E-05	3.0E-05	NA	0.002
		Exposure Route Total										**2.0E-05**						**0.5**

Table 2-20b
Risk Calculations for Teenage Trespasser - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Dermal Contact	***Inorganics***															
			Aluminum*	14,553	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	29.71	mg/kg	1.98E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	3.0E-07	1.39E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.005
			Iron*	9,297	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Thallium*	0.960	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	48.92	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			VOCs															
			Benzene	1.600	mg/kg	NA	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	1	NA	NA	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	NA
			Ethylbenzene	44.00	mg/kg	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1	NA	NA	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	NA
			Total Xylenes	82.00	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	NA
			SVOCs															
			Carbazole	282.4	mg/kg	6.27E-06	mg/kg-day	NA	NA	NA	1	NA	4.39E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.001
			Dibenzofuran	661.7	mg/kg	1.47E-05	mg/kg-day	NA	NA	NA	1	NA	1.03E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.1
			1,1-Biphenyl	100.0	mg/kg	2.22E-06	mg/kg-day	8.0E-03	8.0E-03	NA	1	1.8E-08	1.55E-05	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.00003
			PAHs															
			2-Methylnaphthalene	653.0	mg/kg	1.88E-05	mg/kg-day	NA	NA	NA	1	NA	1.32E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.03
			Acenaphthene	910.1	mg/kg	2.63E-05	mg/kg-day	NA	NA	NA	1	NA	1.84E-04	mg/kg-day	6.0E-02	6.0E-02	NA	0.003
			Benzo(a)anthracene	193.7	mg/kg	5.59E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.7E-06	3.91E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	68.35	mg/kg	1.97E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	5.9E-06	1.38E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.05
			Benzo(b)fluoranthene	88.43	mg/kg	2.55E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	7.7E-07	1.79E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	66.72	mg/kg	1.93E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3	5.8E-08	1.35E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	151.5	mg/kg	4.37E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	3	1.3E-08	3.06E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.547	mg/kg	1.89E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	5.7E-07	1.32E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,045	mg/kg	3.02E-05	mg/kg-day	NA	NA	NA	1	NA	2.11E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.005
			Fluorene	810.7	mg/kg	2.34E-05	mg/kg-day	NA	NA	NA	1	NA	1.64E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.004
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	5.49E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.6E-07	3.84E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	902.0	mg/kg	2.60E-05	mg/kg-day	NA	NA	3.4E-05	1	NA	1.82E-04	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.009
			Phenanthrene	852.6	mg/kg	2.46E-05	mg/kg-day	NA	NA	NA	1	NA	1.72E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.006
			Pyrene	704.9	mg/kg	2.03E-05	mg/kg-day	NA	NA	NA	1	NA	1.42E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.005

Table 2-20b
Risk Calculations for Teenage Trespasser - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral (mg/kg-day)$^{-1}$	Abs. Dermal (mg/kg-day)$^{-1}$	Inhalation (ug/m^3)$^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Dermal Contact	***Pesticides*** Aldrin	0.150	mg/kg	NA	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	1	NA	NA	mg/kg-day	3.0E-05	3.0E-05	NA	NA
		Exposure Route Total										**9.5E-06**						**0.2**
	Exposure Medium Total											**3.0E-05**						**0.7**
Surface Soil (0 to 1 foot bgs) Total												**3.0E-05**					**Surface Soil HI**	**0.7**
Total Pond Area Receptor Risk												**3.0E-05**						**0.7**

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
[1] Age-Dependent Adjustment Factor (ADAF) is used for chemicals with a mutagenic mode of action for carcinogenesis. The cancer risk is adjusted by multiplying the calculated risk by the ADAF. See Text for explanation.
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
(mg/kg-day)$^{-1}$ - 1/milligrams per kilogram-day
(ug/m^3)$^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Table 2-20c
Risk Calculations for Teenage Trespasser - Treated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***															
			Aluminum*	10,587	mg/kg	6.22E-04	mg/kg-day	NA	NA	NA	1	NA	4.4E-03	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.004
			Arsenic*	2.98	mg/kg	1.05E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	1.6E-07	7.3E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.002
			Thallium*	0.941	mg/kg	5.52E-08	mg/kg-day	NA	NA	NA	1	NA	3.9E-07	mg/kg-day	1.0E-05	1.0E-05	NA	0.04
			PAHs															
			Benzo(a)anthracene	4.444	mg/kg	2.61E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	7.8E-08	1.8E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.289	mg/kg	1.93E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	5.8E-07	1.4E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.005
			Benzo(b)fluoranthene	6.356	mg/kg	3.73E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.1E-07	2.6E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.5518	mg/kg	3.24E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	9.7E-08	2.3E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	1.35E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	4.0E-08	9.4E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*										**9.1E-07**						**0.005**
		Dermal Contact	***Inorganics***															
			Aluminum*	10,587	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	2.98	mg/kg	1.99E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	3.0E-08	1.39E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0005
			Thallium*	0.941	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			PAHs															
			Benzo(a)anthracene	4.444	mg/kg	1.28E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	3.8E-08	8.98E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.289	mg/kg	9.49E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	2.8E-07	6.65E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.002
			Benzo(b)fluoranthene	6.356	mg/kg	1.83E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	5.5E-08	1.28E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.5518	mg/kg	1.59E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	4.8E-08	1.11E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	6.62E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	2.0E-08	4.63E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*										**4.5E-07**						**0.002**
	Exposure Medium Total*											**1.4E-06**						**0.007**
Surface Soil (0 to 1 foot bgs) Total*												**1.4E-06**					**Surface Soil HI**	**0.007**
Total Treated Wood Storage Area Receptor Risk*												**1.4E-06**						**0.007**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
[1] Age-Dependent Adjustment Factor (ADAF) is used for chemicals with a mutagenic mode of action for carcinogenesis. The cancer risk is adjusted by multiplying the calculated risk by the ADAF. See Text for explanation.
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-20d
Risk Calculations for Teenage Trespasser - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***															
			Arsenic*	4.440	mg/kg	1.56E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	2.3E-07	1.1E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.004
			Hexavalent Chromium*	1.710	mg/kg	1.00E-07	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	3	1.5E-07	7.0E-07	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.0002
			PAHs															
			Benzo(a)anthracene	1.989	mg/kg	1.17E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	3.5E-08	8.2E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	2.116	mg/kg	1.24E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	3.7E-07	8.7E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.003
			Benzo(b)fluoranthene	2.826	mg/kg	1.66E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	5.0E-08	1.2E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.223	mg/kg	7.18E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3	2.2E-09	5.0E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.340	mg/kg	2.00E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	6.0E-08	1.4E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	9.54E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	2.9E-08	6.7E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*										**5.5E-07**						**0.003**
		Dermal Contact	***Inorganics***															
			Arsenic*	4.440	mg/kg	2.96E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	4.4E-08	2.07E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0007
			Hexavalent Chromium*	1.710	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	3	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			PAHs															
			Benzo(a)anthracene	1.989	mg/kg	5.74E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.7E-08	4.02E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	2.116	mg/kg	6.11E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	1.8E-07	4.28E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.001
			Benzo(b)fluoranthene	2.826	mg/kg	8.16E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	2.4E-08	5.71E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.223	mg/kg	3.53E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3	1.1E-09	2.47E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.340	mg/kg	9.81E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	2.9E-08	6.87E-08	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	4.69E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.4E-08	3.28E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*										**2.7E-07**						**0.001**
	Exposure Medium Total*											**8.2E-07**						**0.004**
Surface Soil (0 to 1 foot bgs) Total*												**8.2E-07**					**Surface Soil HI**	**0.004**
Total Untreated Wood Storage Area Receptor Risk												**8.2E-07**						**0.004**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
[1] Age-Dependent Adjustment Factor (ADAF) is used for chemicals with a mutagenic mode of action for carcinogenesis. The cancer risk is adjusted by multiplying the calculated risk by the ADAF. See Text for explanation.
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-20e
Risk Calculations for Teenage Trespasser - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***															
			Aluminum*	6,295	mg/kg	3.70E-04	mg/kg-day	NA	NA	NA	1	NA	2.6E-03	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.003
			Arsenic	6.674	mg/kg	2.35E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	3.5E-07	1.6E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.005
			Cobalt	1.144	mg/kg	6.72E-08	mg/kg-day	NA	NA	9.0E-03	1	NA	4.7E-07	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.002
			Hexavalent Chromium*	0.912	mg/kg	5.35E-08	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	3	8.0E-08	3.7E-07	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.0001
			Iron*	4,022	mg/kg	2.36E-04	mg/kg-day	NA	NA	NA	1	NA	1.7E-03	mg/kg-day	7.0E-01	7.0E-01	NA	0.002
			Manganese*	96.7	mg/kg	5.68E-06	mg/kg-day	NA	NA	NA	1	NA	4.0E-05	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.002
			Thallium*	0.96	mg/kg	5.64E-08	mg/kg-day	NA	NA	NA	1	NA	3.9E-07	mg/kg-day	1.0E-05	1.0E-05	NA	0.04
			Vanadium*	11.02	mg/kg	6.47E-07	mg/kg-day	NA	NA	NA	1	NA	4.5E-06	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.0009
			VOCs															
			Acrolein	0.011	mg/kg	6.45E-10	mg/kg-day	NA	NA	NA	1	NA	4.5E-09	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	0.000009
			PAHs															
			Benzo(a)anthracene	0.530	mg/kg	3.11E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	9.3E-09	2.2E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.454	mg/kg	2.66E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	8.0E-08	1.9E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0006
			Benzo(b)fluoranthene	1.511	mg/kg	8.87E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	2.7E-08	6.2E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	2.11E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	6.3E-09	1.5E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*										**4.7E-07**						**0.008**
		Dermal Contact	***Inorganics***															
			Aluminum*	6,295	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	6.674	mg/kg	4.45E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	6.7E-08	3.11E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.001
			Cobalt	1.144	mg/kg	NA	mg/kg-day	NA	NA	9.0E-03	1	NA	NA	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	NA
			Hexavalent Chromium*	0.912	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	3	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			Iron*	4,022	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese*	96.7	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	11.02	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			VOCs															
			Acrolein	0.011	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	NA
			PAHs															
			Benzo(a)anthracene	0.530	mg/kg	1.53E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	4.6E-09	1.07E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.454	mg/kg	1.31E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	3.9E-08	9.17E-08	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0003

Table 2-20e
Risk Calculations for Teenage Trespasser - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral (mg/kg-day)$^{-1}$	Abs. Dermal (mg/kg-day)$^{-1}$	Inhalation (ug/m^3)$^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Dermal Contact	Benzo(b)fluoranthene	1.511	mg/kg	4.36E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.3E-08	3.05E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	1.04E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	3.1E-09	7.26E-08	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*										**1.3E-07**						**0.001**
	Exposure Medium Total*											**6.0E-07**						**0.009**
Surface Soil (0 to 1 foot bgs) Total*												**6.0E-07**					**Surface Soil HI**	**0.009**
Total Eastern Upland Area Receptor Risk*												**6.0E-07**						**0.009**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
[1] Age-Dependent Adjustment Factor (ADAF) is used for chemicals with a mutagenic mode of action for carcinogenesis. The cancer risk is adjusted by multiplying the calculated risk by the ADAF. See Text for explanation.
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
(mg/kg-day)$^{-1}$ - 1/milligrams per kilogram-day
(ug/m^3)$^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-20f
Risk Calculations for Teenage Trespasser - Southern Marsh
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Sediment	Sediment	Incidental Ingestion	***Inorganics***															
			Aluminum	32,556	mg/kg	1.91E-03	mg/kg-day	NA	NA	NA	1	NA	1.3E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.01
			Arsenic	44.20	mg/kg	1.56E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	2.3E-06	1.1E-05	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.04
			Hexavalent Chromium*	13.71	mg/kg	8.05E-07	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	3	1.2E-06	5.6E-06	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.002
			Cobalt	28.77	mg/kg	1.69E-06	mg/kg-day	NA	NA	9.0E-03	1	NA	1.2E-05	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.04
			Iron	34,132	mg/kg	2.00E-03	mg/kg-day	NA	NA	NA	1	NA	1.4E-02	mg/kg-day	7.0E-01	7.0E-01	NA	0.02
			Manganese	362.5	mg/kg	2.13E-05	mg/kg-day	NA	NA	NA	1	NA	1.5E-04	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.006
			Thallium*	1.728	mg/kg	1.01E-07	mg/kg-day	NA	NA	NA	1	NA	7.1E-07	mg/kg-day	1.0E-05	1.0E-05	NA	0.07
			Vanadium	120.5	mg/kg	7.07E-06	mg/kg-day	NA	NA	NA	1	NA	5.0E-05	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.01
			SVOCs															
			Carbazole	22.09	mg/kg	1.30E-06	mg/kg-day	NA	NA	NA	1	NA	9.1E-06	mg/kg-day	3.0E-02	3.0E-02	NA	0.0003
			Dibenzofuran	131.2	mg/kg	7.70E-06	mg/kg-day	NA	NA	NA	1	NA	5.4E-05	mg/kg-day	1.0E-03	1.0E-03	NA	0.05
			PAHs															
			2-Methylnaphthalene	153.9	mg/kg	9.03E-06	mg/kg-day	NA	NA	NA	1	NA	6.3E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.02
			Acenaphthene	139.2	mg/kg	8.17E-06	mg/kg-day	NA	NA	NA	1	NA	5.7E-05	mg/kg-day	6.0E-02	6.0E-02	NA	0.001
			Anthracene	170.9	mg/kg	1.00E-05	mg/kg-day	NA	NA	NA	1	NA	7.0E-05	mg/kg-day	3.0E-01	3.0E-01	NA	0.0002
			Benzo(a)anthracene	132.4	mg/kg	7.78E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	2.3E-06	5.4E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	48.07	mg/kg	2.82E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	8.5E-06	2.0E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.07
			Benzo(b)fluoranthene	77.48	mg/kg	4.55E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.4E-06	3.2E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	34.33	mg/kg	2.02E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3	6.0E-08	1.4E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	132.1	mg/kg	7.76E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	3	2.3E-08	5.4E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	5.278	mg/kg	3.10E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	9.3E-07	2.2E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	696.3	mg/kg	4.09E-05	mg/kg-day	NA	NA	NA	1	NA	2.9E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.007
			Fluorene	186.3	mg/kg	1.09E-05	mg/kg-day	NA	NA	NA	1	NA	7.7E-05	mg/kg-day	4.0E-02	4.0E-02	NA	0.002
			Indeno(1,2,3-cd)pyrene	16.13	mg/kg	9.47E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	2.8E-07	6.6E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	180.9	mg/kg	1.06E-05	mg/kg-day	NA	NA	3.4E-05	1	NA	7.4E-05	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.004
			Phenanthrene	747.0	mg/kg	4.39E-05	mg/kg-day	NA	NA	NA	1	NA	3.1E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
			Pyrene	468.2	mg/kg	2.75E-05	mg/kg-day	NA	NA	NA	1	NA	1.9E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.006
		Exposure Route Total*										**1.6E-05**						**0.3**
		Dermal Contact	***Inorganics***															
			Aluminum	32,556	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	44.20	mg/kg	2.94E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	4.4E-07	2.06E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.007
			Hexavalent Chromium*	13.71	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	3	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			Cobalt	28.77	mg/kg	NA	mg/kg-day	NA	NA	9.0E-03	1	NA	NA	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	NA
			Iron	34,132	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese	362.5	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NA
			Thallium*	1.728	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium	120.5	mg/kg	NA	mg/kg-day	NA	NA	NA	1	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA

Table 2-20f
Risk Calculations for Teenage Trespasser - Southern Marsh
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	ADAF [1]	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$			Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Sediment	Sediment	Dermal Contact	***SVOCs***															
			Carbazole	22.09	mg/kg	4.90E-07	mg/kg-day	NA	NA	NA	1	NA	3.43E-06	mg/kg-day	3.0E-02	3.0E-02	NA	0.0001
			Dibenzofuran	131.2	mg/kg	2.91E-06	mg/kg-day	NA	NA	NA	1	NA	2.04E-05	mg/kg-day	1.0E-03	1.0E-03	NA	0.02
			PAHs															
			2-Methylnaphthalene	153.9	mg/kg	4.44E-06	mg/kg-day	NA	NA	NA	1	NA	3.11E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.008
			Acenaphthene	139.2	mg/kg	4.02E-06	mg/kg-day	NA	NA	NA	1	NA	2.81E-05	mg/kg-day	6.0E-02	6.0E-02	NA	0.0005
			Anthracene	170.9	mg/kg	4.93E-06	mg/kg-day	NA	NA	NA	1	NA	3.45E-05	mg/kg-day	3.0E-01	3.0E-01	NA	0.0001
			Benzo(a)anthracene	132.4	mg/kg	3.82E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.1E-06	2.68E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	48.07	mg/kg	1.39E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	4.2E-06	9.71E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.03
			Benzo(b)fluoranthene	77.48	mg/kg	2.24E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	6.7E-07	1.57E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	34.33	mg/kg	9.91E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3	3.0E-08	6.94E-06	mg/kg-day	NA	NA	NA	NA
			Chrysene	132.1	mg/kg	3.81E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	3	1.1E-08	2.67E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	5.278	mg/kg	1.52E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3	4.6E-07	1.07E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	696.3	mg/kg	2.01E-05	mg/kg-day	NA	NA	NA	1	NA	1.41E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.004
			Fluorene	186.3	mg/kg	5.38E-06	mg/kg-day	NA	NA	NA	1	NA	3.76E-05	mg/kg-day	4.0E-02	4.0E-02	NA	0.0009
			Indeno(1,2,3-cd)pyrene	16.13	mg/kg	4.65E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3	1.4E-07	3.26E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	180.9	mg/kg	5.22E-06	mg/kg-day	NA	NA	3.4E-05	1	NA	3.66E-05	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.002
			Phenanthrene	747.0	mg/kg	2.16E-05	mg/kg-day	NA	NA	NA	1	NA	1.51E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.005
			Pyrene	468.2	mg/kg	1.35E-05	mg/kg-day	NA	NA	NA	1	NA	9.46E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.003
		Exposure Route Total*										**7.1E-06**						**0.08**
	Exposure Medium Total*											**2.3E-05**						**0.4**
Sediment Total*												**2.3E-05**					**Sediment HI**	**0.4**
Surface Water	Surface Water	Dermal Contact	***Inorganics***															
			Arsenic *	0.00082	mg/L	NA	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1	NA	NA	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	NA
		Exposure Route Total*										**NA**						**NA**
	Exposure Medium Total*											**NA**						**NA**
Surface Water Total*												**NA**					**Surface Water HI**	**NA**
Total Southern Marsh Area Receptor Risk*												**2.3E-05**						**0.4**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
[1] Age-Dependent Adjustment Factor (ADAF) is used for chemicals with a mutagenic mode of action for carcinogenesis. The cancer risk is adjusted by multiplying the calculated risk by the ADAF. See Text for explanation.
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendix F for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-21a
Risk Calculations for Outdoor Worker - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Groundwater	Groundwater	Ingestion	***Inorganics***														
			Aluminum	3.24	mg/L	1.11E-02	mg/kg-day	NA	NA	NA	NA	3.12E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.03
			Arsenic	0.0411	mg/L	1.41E-04	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.1E-04	3.96E-04	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	1
			Cobalt	0.00406	mg/L	1.40E-05	mg/kg-day	NA	NA	9.0E-03	NA	3.91E-05	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.1
			Iron	38.35	mg/L	1.32E-01	mg/kg-day	NA	NA	NA	NA	3.69E-01	mg/kg-day	7.0E-01	7.0E-01	NA	0.5
			Manganese	0.683	mg/L	2.35E-03	mg/kg-day	NA	NA	NA	NA	6.58E-03	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.3
			Selenium	0.159	mg/L	5.47E-04	mg/kg-day	NA	NA	NA	NA	1.53E-03	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	0.3
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	6.24E-04	mg/kg-day	NA	NA	NA	NA	1.75E-03	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.2
			1,3,5-Trimethylbenzene	0.0378	mg/L	1.30E-04	mg/kg-day	NA	NA	NA	NA	3.64E-04	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.04
			Benzene	0.0150	mg/L	5.15E-05	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	2.8E-06	1.44E-04	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.04
			Chloroform	0.0866	mg/L	2.98E-04	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	9.2E-06	8.34E-04	mg/kg-day	1.0E-02	1.0E-02	9.8E-02	0.08
			Ethylbenzene	0.0369	mg/L	1.27E-04	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1.4E-06	3.55E-04	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.004
			Toluene	0.0312	mg/L	1.07E-04	mg/kg-day	NA	NA	NA	NA	3.01E-04	mg/kg-day	8.0E-02	8.0E-02	5.0E+00	0.004
			Total Xylenes	0.144	mg/L	4.94E-04	mg/kg-day	NA	NA	NA	NA	1.38E-03	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.007
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	8.61E-05	mg/kg-day	NA	NA	NA	NA	2.41E-04	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	0.005
			1,1-Biphenyl	0.0830	mg/L	2.85E-04	mg/kg-day	8.0E-03	8.0E-03	NA	2.3E-06	7.99E-04	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.002
			2,4-Dimethylphenol	0.189	mg/L	6.51E-04	mg/kg-day	NA	NA	NA	NA	1.82E-03	mg/kg-day	2.0E-02	2.0E-02	NA	0.09
			2-Methylphenol	0.0216	mg/L	7.41E-05	mg/kg-day	NA	NA	NA	NA	2.08E-04	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	0.004
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	3.44E-05	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	4.8E-07	9.63E-05	mg/kg-day	2.0E-02	2.0E-02	NA	0.005
			Carbazole	0.214	mg/L	7.36E-04	mg/kg-day	NA	NA	NA	NA	2.06E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.07
			Dibenzofuran	0.244	mg/L	8.38E-04	mg/kg-day	NA	NA	NA	NA	2.35E-03	mg/kg-day	1.0E-03	1.0E-03	NA	2
			Pyridine	0.0300	mg/L	1.03E-04	mg/kg-day	NA	NA	NA	NA	2.89E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.3
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	1.97E-03	mg/kg-day	NA	NA	NA	NA	5.52E-03	mg/kg-day	4.0E-03	4.0E-03	NA	1
			Acenaphthylene	0.00659	mg/L	2.27E-05	mg/kg-day	NA	NA	NA	NA	6.35E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.002
			Acenaphthene	0.326	mg/L	1.12E-03	mg/kg-day	NA	NA	NA	NA	3.14E-03	mg/kg-day	6.0E-02	6.0E-02	NA	0.05
			Benzo(a)anthracene	0.000382	mg/L	1.31E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.3E-07	3.68E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	1.10E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.1E-05	3.08E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.1
			Benzo(b)fluoranthene	0.00320	mg/L	1.10E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.1E-06	3.08E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	1.75E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.8E-07	4.91E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	6.16E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.2E-07	1.72E-06	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	5.69E-04	mg/kg-day	NA	NA	NA	NA	1.59E-03	mg/kg-day	4.0E-02	4.0E-02	NA	0.04
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	3.61E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.6E-08	1.01E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.22	mg/L	1.45E-02	mg/kg-day	NA	NA	3.4E-05	NA	4.06E-02	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	2
			1-Methylnaphthalene	0.487	mg/L	1.68E-03	mg/kg-day	2.9E-02	2.9E-02	NA	4.9E-05	4.69E-03	mg/kg-day	7.0E-02	7.0E-02	NA	0.07
			Phenanthrene	0.137	mg/L	4.72E-04	mg/kg-day	NA	NA	NA	NA	1.32E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.04
			Pyrene	0.00631	mg/L	2.17E-05	mg/kg-day	NA	NA	NA	NA	6.07E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.002

Table 2-21a
Risk Calculations for Outdoor Worker - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Groundwater	Groundwater	Ingestion	***Pesticides***														
			Pentachlorophenol	0.000845	mg/L	2.91E-06	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	1.2E-06	8.14E-06	mg/kg-day	5.0E-03	5.0E-03	NA	0.002
		Exposure Route Total									**2.9E-04**						**9**
	Exposure Medium Total										**2.9E-04**						**9**
Groundwater Total											**2.9E-04**					**Groundwater HI**	**9**
Total Groundwater Receptor Risk											**2.9E-04**						**9**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
CSF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/L - milligrams per liter
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-21b
Risk Calculations for Outdoor Worker - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	9,176	mg/kg	2.53E-03	mg/kg-day	NA	NA	NA	NA	7.1E-03	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.007
			Arsenic*	4.112	mg/kg	6.79E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.0E-06	1.9E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.006
			Hexavalent Chromium*	0.836	mg/kg	2.30E-07	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	1.2E-07	6.4E-07	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.0002
			Thallium*	0.96	mg/kg	2.64E-07	mg/kg-day	NA	NA	NA	NA	7.4E-07	mg/kg-day	1.0E-05	1.0E-05	NA	0.07
			Vanadium*	27.58	mg/kg	7.59E-06	mg/kg-day	NA	NA	NA	NA	2.1E-05	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.004
			SVOCs														
			Carbazole	83.49	mg/kg	2.30E-05	mg/kg-day	NA	NA	NA	NA	6.4E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.002
			Dibenzofuran	58.21	mg/kg	1.60E-05	mg/kg-day	NA	NA	NA	NA	4.5E-05	mg/kg-day	1.0E-03	1.0E-03	NA	0.04
			PAHs														
			2-Methylnaphthalene	24.30	mg/kg	6.69E-06	mg/kg-day	NA	NA	NA	NA	1.9E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.005
			Anthracene	697.3	mg/kg	1.92E-04	mg/kg-day	NA	NA	NA	NA	5.4E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.002
			Benzo(a)anthracene	66.95	mg/kg	1.84E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.8E-06	5.2E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	34.92	mg/kg	9.61E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	9.6E-06	2.7E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.09
			Benzo(b)fluoranthene	76.82	mg/kg	2.11E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.1E-06	5.9E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	32.93	mg/kg	9.06E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	9.1E-08	2.5E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	90.58	mg/kg	2.49E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	2.5E-08	7.0E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4.242	mg/kg	1.17E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.2E-06	3.3E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	236.3	mg/kg	6.50E-05	mg/kg-day	NA	NA	NA	NA	1.8E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.005
			Fluorene	95.42	mg/kg	2.63E-05	mg/kg-day	NA	NA	NA	NA	7.4E-05	mg/kg-day	4.0E-02	4.0E-02	NA	0.002
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	4.15E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.1E-07	1.2E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	18.81	mg/kg	5.18E-06	mg/kg-day	NA	NA	3.4E-05	NA	1.4E-05	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.0007
			Phenanthrene	481.6	mg/kg	1.33E-04	mg/kg-day	NA	NA	NA	NA	3.7E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
			Pyrene	220.7	mg/kg	6.07E-05	mg/kg-day	NA	NA	NA	NA	1.7E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.006
		Exposure Route Total*									**1.5E-05**						**0.2**
		Dermal Contact	***Inorganics***														
			Aluminum*	9,176	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	4.112	mg/kg	1.44E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.2E-07	4.02E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.001
			Hexavalent Chromium*	0.836	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	27.58	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			SVOCs														
			Carbazole	83.49	mg/kg	9.72E-06	mg/kg-day	NA	NA	NA	NA	2.72E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.0009
			Dibenzofuran	58.21	mg/kg	6.78E-06	mg/kg-day	NA	NA	NA	NA	1.90E-05	mg/kg-day	1.0E-03	1.0E-03	NA	0.02

Table 2-21b
Risk Calculations for Outdoor Worker - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Dermal Contact	***PAHs***														
			2-Methylnaphthalene	24.30	mg/kg	3.68E-06	mg/kg-day	NA	NA	NA	NA	1.03E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.003
			Anthracene	697.3	mg/kg	1.06E-04	mg/kg-day	NA	NA	NA	NA	2.96E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.001
			Benzo(a)anthracene	66.95	mg/kg	1.01E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.0E-06	2.84E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	34.92	mg/kg	5.29E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	5.3E-06	1.48E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.05
			Benzo(b)fluoranthene	76.82	mg/kg	1.16E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.2E-06	3.26E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	32.93	mg/kg	4.99E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	5.0E-08	1.40E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	90.58	mg/kg	1.37E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	1.4E-08	3.84E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4.242	mg/kg	6.42E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.4E-07	1.80E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	236.3	mg/kg	3.58E-05	mg/kg-day	NA	NA	NA	NA	1.00E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.003
			Fluorene	95.42	mg/kg	1.44E-05	mg/kg-day	NA	NA	NA	NA	4.05E-05	mg/kg-day	4.0E-02	4.0E-02	NA	0.001
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	2.28E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.3E-07	6.39E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	18.81	mg/kg	2.85E-06	mg/kg-day	NA	NA	3.4E-05	NA	7.98E-06	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.0004
			Phenanthrene	481.6	mg/kg	7.29E-05	mg/kg-day	NA	NA	NA	NA	2.04E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.007
			Pyrene	220.7	mg/kg	3.34E-05	mg/kg-day	NA	NA	NA	NA	9.36E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.003
		Exposure Route Total*									**8.4E-06**						**0.09**
		Inhalation	***Inorganics***														
		(via Particulate and	Aluminum*	1.46E-05	mg/m^3	1.07E-06	mg/kg-day	NA	NA	NA	NA	3.00E-06	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.0006
		Volatile Emissions)	Arsenic*	6.55E-09	mg/m^3	4.80E-10	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.1E-09	1.35E-09	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.00009
			Hexavalent Chromium*	1.33E-09	mg/m^3	9.77E-11	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	8.2E-09	2.73E-10	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.000003
			Thallium*	1.53E-09	mg/m^3	1.12E-10	mg/kg-day	NA	NA	NA	NA	3.14E-10	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	4.39E-08	mg/m^3	3.22E-09	mg/kg-day	NA	NA	NA	NA	9.02E-09	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.00009
			SVOCs														
			Carbazole	7.46E-06	mg/m^3	5.47E-07	mg/kg-day	NA	NA	NA	NA	1.53E-06	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Dibenzofuran	2.78E-04	mg/m^3	2.04E-05	mg/kg-day	NA	NA	NA	NA	5.72E-05	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			PAHs														
			2-Methylnaphthalene	3.12E-04	mg/m^3	2.29E-05	mg/kg-day	NA	NA	NA	NA	6.41E-05	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Anthracene	9.87E-04	mg/m^3	7.24E-05	mg/kg-day	NA	NA	NA	NA	2.03E-04	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Benzo(a)anthracene	1.10E-05	mg/m^3	8.04E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.8E-08	2.25E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	5.56E-08	mg/m^3	4.08E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.4E-09	1.14E-08	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.006
			Benzo(b)fluoranthene	1.22E-07	mg/m^3	8.98E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.4E-10	2.51E-08	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	5.24E-08	mg/m^3	3.85E-09	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	2.3E-11	1.08E-08	mg/kg-day	NA	NA	NA	NA
			Chrysene	1.44E-07	mg/m^3	1.06E-08	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	6.3E-12	2.96E-08	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.75E-09	mg/m^3	4.96E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.0E-10	1.39E-09	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	3.76E-07	mg/m^3	2.76E-08	mg/kg-day	NA	NA	NA	NA	7.73E-08	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Fluorene	2.52E-04	mg/m^3	1.85E-05	mg/kg-day	NA	NA	NA	NA	5.18E-05	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Indeno(1,2,3-cd)pyrene	2.40E-08	mg/m^3	1.76E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.1E-10	4.93E-09	mg/kg-day	NA	NA	NA	NA

Table 2-21b
Risk Calculations for Outdoor Worker - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral (mg/kg-day)$^{-1}$	Abs. Dermal (mg/kg-day)$^{-1}$	Inhalation (ug/m^3)$^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Volatile Emissions)	Naphthalene	3.02E-04	mg/m^3	2.22E-05	mg/kg-day	NA	NA	3.4E-05	7.5E-07	6.21E-05	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.02
			Phenanthrene	5.53E-04	mg/m^3	4.06E-05	mg/kg-day	NA	NA	NA	NA	1.14E-04	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pyrene	1.67E-05	mg/m^3	1.23E-06	mg/kg-day	NA	NA	NA	NA	3.43E-06	mg/kg-day	3.0E-02	3.0E-02	NA	NA
		Exposure Route Total*									**8.1E-07**						**0.03**
	Exposure Medium Total*										**2.4E-05**						**0.3**
Soil (0 to 1 foot bgs) Total*											**2.4E-05**					**Surface Soil HI**	**0.3**
Total Process Area Receptor Risk*											**2.4E-05**						**0.3**

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
(mg/kg-day)$^{-1}$ - 1/milligrams per kilogram-day
(ug/m^3)$^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Table 2-21c
Risk Calculations for Outdoor Worker - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	14,553	mg/kg	4.00E-03	mg/kg-day	NA	NA	NA	NA	1.1E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.01
			Arsenic	29.71	mg/kg	4.91E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	7.4E-06	1.4E-05	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.05
			Iron*	9,297	mg/kg	2.56E-03	mg/kg-day	NA	NA	NA	NA	7.2E-03	mg/kg-day	7.0E-01	7.0E-01	NA	0.01
			Thallium*	0.96	mg/kg	2.64E-07	mg/kg-day	NA	NA	NA	NA	7.4E-07	mg/kg-day	1.0E-05	1.0E-05	NA	0.07
			Vanadium*	48.92	mg/kg	1.35E-05	mg/kg-day	NA	NA	NA	NA	3.8E-05	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.008
			VOCs														
			Benzene	1.6	mg/kg	4.40E-07	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	2.4E-08	1.2E-06	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.0003
			Ethylbenzene	44	mg/kg	1.21E-05	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1.3E-07	3.4E-05	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.0003
			Total Xylenes	82	mg/kg	2.26E-05	mg/kg-day	NA	NA	NA	NA	6.3E-05	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.0003
			SVOCs														
			Carbazole	282.4	mg/kg	7.77E-05	mg/kg-day	NA	NA	NA	NA	2.2E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.007
			Dibenzofuran	661.7	mg/kg	1.82E-04	mg/kg-day	NA	NA	NA	NA	5.1E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.5
			1,1-Biphenyl	100	mg/kg	2.75E-05	mg/kg-day	8.0E-03	8.0E-03	NA	2.2E-07	7.7E-05	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.0002
			PAHs														
			2-Methylnaphthalene	653.0	mg/kg	1.80E-04	mg/kg-day	NA	NA	NA	NA	5.0E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.1
			Acenaphthene	910.1	mg/kg	2.50E-04	mg/kg-day	NA	NA	NA	NA	7.0E-04	mg/kg-day	6.0E-02	6.0E-02	NA	0.01
			Benzo(a)anthracene	193.7	mg/kg	5.33E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.3E-06	1.5E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	68.35	mg/kg	1.88E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.9E-05	5.3E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.2
			Benzo(b)fluoranthene	88.43	mg/kg	2.43E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.4E-06	6.8E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	66.72	mg/kg	1.84E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.8E-07	5.1E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	151.5	mg/kg	4.17E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	4.2E-08	1.2E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.547	mg/kg	1.80E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.8E-06	5.0E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,045	mg/kg	2.88E-04	mg/kg-day	NA	NA	NA	NA	8.1E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.02
			Fluorene	810.7	mg/kg	2.23E-04	mg/kg-day	NA	NA	NA	NA	6.2E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.02
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	5.23E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.2E-07	1.5E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	902.0	mg/kg	2.48E-04	mg/kg-day	NA	NA	3.4E-05	NA	7.0E-04	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.03
			Phenanthrene	852.6	mg/kg	2.35E-04	mg/kg-day	NA	NA	NA	NA	6.6E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.02
			Pyrene	704.9	mg/kg	1.94E-04	mg/kg-day	NA	NA	NA	NA	5.4E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.02
			Pesticides														
			Aldrin	0.150	mg/kg	4.13E-08	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	7.0E-07	1.2E-07	mg/kg-day	3.0E-05	3.0E-05	NA	0.004
Exposure Route Total*											**3.8E-05**						**1**
		Dermal Contact	***Inorganics***														
			Aluminum*	14,553	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	29.71	mg/kg	1.04E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.6E-06	2.91E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.01
			Iron*	9,297	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	48.92	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA

Table 2-21c
Risk Calculations for Outdoor Worker - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Dermal Contact	***VOCs***														
			Benzene	1.6	mg/kg	NA	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	NA	NA	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	NA
			Ethylbenzene	44	mg/kg	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	NA	NA	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	NA
			Total Xylenes	82	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	NA
			SVOCs														
			Carbazole	282.4	mg/kg	3.29E-05	mg/kg-day	NA	NA	NA	NA	9.21E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.003
			Dibenzofuran	661.7	mg/kg	7.71E-05	mg/kg-day	NA	NA	NA	NA	2.16E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.2
			1,1-Biphenyl	100	mg/kg	1.16E-05	mg/kg-day	8.0E-03	8.0E-03	NA	9.3E-08	3.26E-05	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.00007
			PAHs														
			2-Methylnaphthalene	653.0	mg/kg	9.89E-05	mg/kg-day	NA	NA	NA	NA	2.77E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.07
			Acenaphthene	910.1	mg/kg	1.38E-04	mg/kg-day	NA	NA	NA	NA	3.86E-04	mg/kg-day	6.0E-02	6.0E-02	NA	0.006
			Benzo(a)anthracene	193.7	mg/kg	2.93E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.9E-06	8.21E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	68.35	mg/kg	1.03E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.0E-05	2.90E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.1
			Benzo(b)fluoranthene	88.43	mg/kg	1.34E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.3E-06	3.75E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	66.72	mg/kg	1.01E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.0E-07	2.83E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	151.5	mg/kg	2.29E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	2.3E-08	6.42E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.547	mg/kg	9.91E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	9.9E-07	2.78E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,045	mg/kg	1.58E-04	mg/kg-day	NA	NA	NA	NA	4.43E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.01
			Fluorene	810.7	mg/kg	1.23E-04	mg/kg-day	NA	NA	NA	NA	3.44E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.009
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	2.88E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.9E-07	8.06E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	902.0	mg/kg	1.37E-04	mg/kg-day	NA	NA	3.4E-05	NA	3.82E-04	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.02
			Phenanthrene	852.6	mg/kg	1.29E-04	mg/kg-day	NA	NA	NA	NA	3.61E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
			Pyrene	704.9	mg/kg	1.07E-04	mg/kg-day	NA	NA	NA	NA	2.99E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
			Pesticides														
			Aldrin	0.150	mg/kg	NA	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	NA	NA	mg/kg-day	3.0E-05	3.0E-05	NA	NA
		Exposure Route Total*									**1.8E-05**						**0.5**
		Inhalation	***Inorganics***														
		(via Particulate	Aluminum*	2.32E-05	mg/m^3	1.70E-06	mg/kg-day	NA	NA	NA	NA	4.76E-06	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.001
		and Vapor Emissions)	Arsenic	4.73E-08	mg/m^3	3.47E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.5E-08	9.72E-09	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0006
			Iron*	1.48E-05	mg/m^3	1.09E-06	mg/kg-day	NA	NA	NA	NA	3.04E-06	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Thallium*	1.53E-09	mg/m^3	1.12E-10	mg/kg-day	NA	NA	NA	NA	3.14E-10	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	7.79E-08	mg/m^3	5.72E-09	mg/kg-day	NA	NA	NA	NA	1.60E-08	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.0002
			VOCs														
			Benzene	3.39E-04	mg/m^3	2.49E-05	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	1.9E-07	6.96E-05	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.002
			Ethylbenzene	5.80E-03	mg/m^3	4.25E-04	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1.1E-06	1.19E-03	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.001
			Total Xylenes	1.07E-02	mg/m^3	7.83E-04	mg/kg-day	NA	NA	NA	NA	2.19E-03	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.02

Table 2-21c
Risk Calculations for Outdoor Worker - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	***SVOCs***														
			Carbazole	2.52E-05	mg/m^3	1.85E-06	mg/kg-day	NA	NA	NA	NA	5.18E-06	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Dibenzofuran	3.16E-03	mg/m^3	2.32E-04	mg/kg-day	NA	NA	NA	NA	6.50E-04	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			1,1-Biphenyl	6.53E-04	mg/m^3	4.79E-05	mg/kg-day	8.0E-03	8.0E-03	NA	NA	1.34E-04	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.3
			PAHs														
			2-Methylnaphthalene	8.38E-03	mg/m^3	6.15E-04	mg/kg-day	NA	NA	NA	NA	1.72E-03	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Acenaphthene	4.81E-03	mg/m^3	3.53E-04	mg/kg-day	NA	NA	NA	NA	9.88E-04	mg/kg-day	6.0E-02	6.0E-02	NA	NA
			Benzo(a)anthracene	3.17E-05	mg/m^3	2.33E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.4E-07	6.52E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	1.09E-07	mg/m^3	7.99E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.8E-09	2.24E-08	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.01
			Benzo(b)fluoranthene	1.41E-07	mg/m^3	1.03E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	6.2E-10	2.89E-08	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.06E-07	mg/m^3	7.80E-09	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	4.7E-11	2.18E-08	mg/kg-day	NA	NA	NA	NA
			Chrysene	2.41E-07	mg/m^3	1.77E-08	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	1.1E-11	4.96E-08	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.04E-08	mg/m^3	7.65E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.6E-10	2.14E-09	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1.66E-06	mg/m^3	1.22E-07	mg/kg-day	NA	NA	NA	NA	3.42E-07	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Fluorene	2.14E-03	mg/m^3	1.57E-04	mg/kg-day	NA	NA	NA	NA	4.40E-04	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Indeno(1,2,3-cd)pyrene	3.03E-08	mg/m^3	2.22E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.3E-10	6.22E-09	mg/kg-day	NA	NA	NA	NA
			Naphthalene	1.45E-02	mg/m^3	1.06E-03	mg/kg-day	NA	NA	3.4E-05	3.6E-05	2.98E-03	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	1
			Phenanthrene	9.80E-04	mg/m^3	7.19E-05	mg/kg-day	NA	NA	NA	NA	2.01E-04	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pyrene	5.33E-05	mg/m^3	3.91E-06	mg/kg-day	NA	NA	NA	NA	1.10E-05	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pesticides														
			Aldrin	2.39E-10	mg/m^3	1.75E-11	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	8.6E-11	4.91E-11	mg/kg-day	3.0E-05	3.0E-05	NA	NA
		Exposure Route Total*									**3.8E-05**						**1**
	Exposure Medium Total*										**9.3E-05**						**3**
Soil (0 to 1 foot bgs) Total*											**9.3E-05**					**Surface Soil HI**	**3**
Total Pond Area Receptor Risk*											**9.3E-05**						**3**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
VOCs - Volatile Organic Compounds
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-21d
Risk Calculations for Outdoor Worker - Treated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	10,587	mg/kg	2.91E-03	mg/kg-day	NA	NA	NA	NA	8.2E-03	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.008
			Arsenic*	2.98	mg/kg	4.92E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	7.4E-07	1.4E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.005
			Thallium*	0.941	mg/kg	2.59E-07	mg/kg-day	NA	NA	NA	NA	7.3E-07	mg/kg-day	1.0E-05	1.0E-05	NA	0.07
			PAHs														
			Benzo(a)anthracene	4.444	mg/kg	1.22E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.2E-07	3.4E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.289	mg/kg	9.05E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	9.1E-07	2.5E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.008
			Benzo(b)fluoranthene	6.356	mg/kg	1.75E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.7E-07	4.9E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.5518	mg/kg	1.52E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.5E-07	4.3E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	6.31E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	6.3E-08	1.8E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**1.4E-06**						**0.008**
		Dermal Contact	***Inorganics***														
			Aluminum*	10,587	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	2.98	mg/kg	1.04E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.6E-07	2.92E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.001
			Thallium*	0.941	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			PAHs														
			Benzo(a)anthracene	4.444	mg/kg	6.73E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	6.7E-08	1.88E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.289	mg/kg	4.98E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	5.0E-07	1.39E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.005
			Benzo(b)fluoranthene	6.356	mg/kg	9.62E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	9.6E-08	2.69E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.5518	mg/kg	8.36E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	8.4E-08	2.34E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	3.47E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.5E-08	9.72E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**7.8E-07**						**0.005**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Aluminum*	1.69E-05	mg/m^3	1.24E-06	mg/kg-day	NA	NA	NA	NA	3.46E-06	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.0007
			Arsenic*	4.74E-09	mg/m^3	3.48E-10	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.5E-09	9.75E-10	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.00006
			Thallium*	1.50E-09	mg/m^3	1.10E-10	mg/kg-day	NA	NA	NA	NA	3.08E-10	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			PAHs														
			Benzo(a)anthracene	7.28E-07	mg/m^3	5.34E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.2E-09	1.49E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	5.24E-09	mg/m^3	3.84E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.3E-10	1.08E-09	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0005

Table 2-21d
Risk Calculations for Outdoor Worker - Treated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Benzo(b)fluoranthene	1.01E-08	mg/m^3	7.43E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.5E-11	2.08E-09	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	8.79E-10	mg/m^3	6.45E-11	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.9E-11	1.81E-10	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	3.65E-09	mg/m^3	2.68E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.6E-11	7.50E-10	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**3.5E-09**						**0.0005**
	Exposure Medium Total*										**2.2E-06**						**0.01**
Surface Soil (0 to 1 foot bgs) Total*											**2.2E-06**					**Surface Soil HI**	**0.01**
Total Treated Wood Storage Area Receptor Risk*											**2.2E-06**						**0.01**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-21e
Risk Calculations for Outdoor Worker - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Arsenic*	4.44	mg/kg	7.33E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.1E-06	2.1E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.007
			Hexavalent Chromium*	1.71	mg/kg	4.71E-07	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	2.4E-07	1.3E-06	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.0004
			PAHs														
			Benzo(a)anthracene	1.989	mg/kg	5.47E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.5E-08	1.5E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	2.116	mg/kg	5.82E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	5.8E-07	1.6E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.005
			Benzo(b)fluoranthene	2.826	mg/kg	7.78E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	7.8E-08	2.2E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.223	mg/kg	3.37E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3.4E-09	9.4E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.340	mg/kg	9.36E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	9.4E-08	2.6E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	4.47E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.5E-08	1.3E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**8.6E-07**						**0.005**
		Dermal Contact	***Inorganics***														
			Arsenic*	4.44	mg/kg	1.55E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.3E-07	4.34E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.001
			Hexavalent Chromium*	1.71	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			PAHs														
			Benzo(a)anthracene	1.989	mg/kg	3.01E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.0E-08	8.43E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	2.116	mg/kg	3.20E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.2E-07	8.97E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.003
			Benzo(b)fluoranthene	2.826	mg/kg	4.28E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.3E-08	1.20E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.223	mg/kg	1.85E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.9E-09	5.19E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.340	mg/kg	5.15E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	5.1E-08	1.44E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	2.46E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.5E-08	6.89E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**4.7E-07**						**0.003**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Arsenic*	7.07E-09	mg/m^3	5.19E-10	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.2E-09	1.45E-09	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0001
			Hexavalent Chromium*	2.72E-09	mg/m^3	2.00E-10	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	1.7E-08	5.59E-10	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.000006
			PAHs														
			Benzo(a)anthracene	3.26E-07	mg/m^3	2.39E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.4E-09	6.69E-08	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.37E-09	mg/m^3	2.47E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.5E-10	6.92E-10	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0003
			Benzo(b)fluoranthene	4.50E-09	mg/m^3	3.30E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.0E-11	9.24E-10	mg/kg-day	NA	NA	NA	NA

Table 2-21e
Risk Calculations for Outdoor Worker - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Benzo(k)fluoranthene	1.95E-09	mg/m^3	1.43E-10	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	8.6E-13	4.00E-10	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	5.41E-10	mg/m^3	3.97E-11	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.4E-11	1.11E-10	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.59E-09	mg/m^3	1.90E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.1E-11	5.32E-10	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**1.6E-09**						**0.0003**
	Exposure Medium Total*										**1.3E-06**						**0.009**
Surface Soil (0 to 1 foot bgs) Total*											**1.3E-06**					**Surface Soil HI**	**0.009**
Total Untreated Wood Storage Area Receptor Risk*											**1.3E-06**						**0.009**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-21f
Risk Calculations for Outdoor Worker - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	6,295	mg/kg	1.73E-03	mg/kg-day	NA	NA	NA	NA	4.9E-03	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.005
			Arsenic	6.674	mg/kg	1.10E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.7E-06	3.1E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.01
			Cobalt	1.144	mg/kg	3.15E-07	mg/kg-day	NA	NA	9.0E-03	NA	8.8E-07	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.003
			Hexavalent Chromium*	0.912	mg/kg	2.51E-07	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	1.3E-07	7.0E-07	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.0002
			Iron*	4,022	mg/kg	1.11E-03	mg/kg-day	NA	NA	NA	NA	3.1E-03	mg/kg-day	7.0E-01	7.0E-01	NA	0.004
			Manganese*	96.7	mg/kg	2.66E-05	mg/kg-day	NA	NA	NA	NA	7.5E-05	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.003
			Thallium*	0.96	mg/kg	2.64E-07	mg/kg-day	NA	NA	NA	NA	7.4E-07	mg/kg-day	1.0E-05	1.0E-05	NA	0.07
			Vanadium*	11.02	mg/kg	3.03E-06	mg/kg-day	NA	NA	NA	NA	8.5E-06	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.002
			VOCs														
			Acrolein	0.011	mg/kg	3.02E-09	mg/kg-day	NA	NA	NA	NA	8.5E-09	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	0.00002
			PAHs														
			Benzo(a)anthracene	0.530	mg/kg	1.46E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.5E-08	4.1E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.454	mg/kg	1.25E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.2E-07	3.5E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.001
			Benzo(b)fluoranthene	1.511	mg/kg	4.16E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.2E-08	1.2E-06	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	9.89E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	9.9E-09	2.8E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**1.8E-06**						**0.01**
		Dermal Contact	***Inorganics***														
			Aluminum*	6,295	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	6.674	mg/kg	2.33E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	3.5E-07	6.53E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.002
			Cobalt	1.144	mg/kg	NA	mg/kg-day	NA	NA	9.0E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	NA
			Hexavalent Chromium*	0.912	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			Iron*	4,022	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese*	96.7	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	11.02	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			VOCs														
			Acrolein	0.011	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	NA
			PAHs														
			Benzo(a)anthracene	0.530	mg/kg	8.03E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	8.0E-09	2.25E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.454	mg/kg	6.87E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.9E-08	1.92E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0006
			Benzo(b)fluoranthene	1.511	mg/kg	2.29E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.3E-08	6.41E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	5.44E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.4E-09	1.52E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**4.5E-07**						**0.003**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Aluminum*	1.00E-05	mg/m^3	7.35E-07	mg/kg-day	NA	NA	NA	NA	2.06E-06	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.0004
			Arsenic	1.06E-08	mg/m^3	7.80E-10	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	3.4E-09	2.18E-09	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.0001
			Cobalt	1.82E-09	mg/m^3	1.34E-10	mg/kg-day	NA	NA	9.0E-03	1.2E-09	3.74E-10	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.00006
			Hexavalent Chromium*	1.45E-09	mg/m^3	1.07E-10	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	9.0E-09	2.98E-10	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.000003

Table 2-21f
Risk Calculations for Outdoor Worker - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Iron*	6.40E-06	mg/m^3	4.70E-07	mg/kg-day	NA	NA	NA	NA	1.32E-06	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese*	1.54E-07	mg/m^3	1.13E-08	mg/kg-day	NA	NA	NA	NA	3.16E-08	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.0006
			Thallium*	1.53E-09	mg/m^3	1.12E-10	mg/kg-day	NA	NA	NA	NA	3.14E-10	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium*	1.75E-08	mg/m^3	1.29E-09	mg/kg-day	NA	NA	NA	NA	3.61E-09	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.00004
			VOCs														
			Acrolein	1.18E-06	mg/m^3	8.68E-08	mg/kg-day	NA	NA	NA	NA	8.5E-09	mg/kg-day	5.0E-04	5.0E-04	2.0E-05	0.0004
			PAHs														
			Benzo(a)anthracene	8.68E-08	mg/m^3	6.37E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.8E-10	1.78E-08	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	7.22E-10	mg/m^3	5.30E-11	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.2E-11	1.48E-10	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.00007
			Benzo(b)fluoranthene	2.41E-09	mg/m^3	1.77E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.1E-11	4.94E-10	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	5.72E-10	mg/m^3	4.20E-11	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.5E-12	1.18E-10	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**5.0E-09**						**0.0007**
	Exposure Medium Total*										**2.3E-06**						**0.02**
Surface Soil (0 to 1 foot bgs) Total*											**2.3E-06**					**Surface Soil HI**	**0.02**
Total Eastern Upland Area Receptor Risk*											**2.3E-06**						**0.02**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

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Checked By: SMA 3/28/2019

Table 2-21g
Risk Calculations for Outdoor Worker - Southern Marsh
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Sediment	Sediment	Incidental Ingestion	***Inorganics***														
			Aluminum	32,556	mg/kg	8.96E-03	mg/kg-day	NA	NA	NA	NA	2.5E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.03
			Arsenic	13.71	mg/kg	2.26E-06	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	3.4E-06	6.3E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.02
			Hexavalent Chromium*	44.2	mg/kg	1.22E-05	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	1.8E-05	3.4E-05	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	0.01
			Cobalt	28.77	mg/kg	7.92E-06	mg/kg-day	NA	NA	9.0E-03	NA	2.2E-05	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.07
			Iron	34,132	mg/kg	9.39E-03	mg/kg-day	NA	NA	NA	NA	2.6E-02	mg/kg-day	7.0E-01	7.0E-01	NA	0.04
			Manganese	362.5	mg/kg	9.98E-05	mg/kg-day	NA	NA	NA	NA	2.8E-04	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.01
			Thallium*	1.728	mg/kg	4.76E-07	mg/kg-day	NA	NA	NA	NA	1.3E-06	mg/kg-day	1.0E-05	1.0E-05	NA	0.1
			Vanadium	120.5	mg/kg	3.32E-05	mg/kg-day	NA	NA	NA	NA	9.3E-05	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	0.02
			SVOCs														
			Carbazole	22.09	mg/kg	6.08E-06	mg/kg-day	NA	NA	NA	NA	1.7E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.0006
			Dibenzofuran	131.2	mg/kg	3.61E-05	mg/kg-day	NA	NA	NA	NA	1.0E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.1
			PAHs														
			2-Methylnaphthalene	153.9	mg/kg	4.24E-05	mg/kg-day	NA	NA	NA	NA	1.2E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.03
			Acenaphthene	139.2	mg/kg	3.83E-05	mg/kg-day	NA	NA	NA	NA	1.1E-04	mg/kg-day	6.0E-02	6.0E-02	NA	0.002
			Anthracene	170.9	mg/kg	4.70E-05	mg/kg-day	NA	NA	NA	NA	1.3E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.0004
			Benzo(a)anthracene	132.4	mg/kg	3.64E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.6E-06	1.0E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	48.07	mg/kg	1.32E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.3E-05	3.7E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.1
			Benzo(b)fluoranthene	77.48	mg/kg	2.13E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.1E-06	6.0E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	34.33	mg/kg	9.45E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	9.4E-08	2.6E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	132.1	mg/kg	3.64E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	3.6E-08	1.0E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	5.278	mg/kg	1.45E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.5E-06	4.1E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	696.3	mg/kg	1.92E-04	mg/kg-day	NA	NA	NA	NA	5.4E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.01
			Fluorene	186.3	mg/kg	5.13E-05	mg/kg-day	NA	NA	NA	NA	1.4E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.004
			Indeno(1,2,3-cd)pyrene	16.13	mg/kg	4.44E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.4E-07	1.2E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	180.9	mg/kg	4.98E-05	mg/kg-day	NA	NA	3.4E-05	NA	1.4E-04	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.007
			Phenanthrene	747.0	mg/kg	2.06E-04	mg/kg-day	NA	NA	NA	NA	5.8E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.02
			Pyrene	468.2	mg/kg	1.29E-04	mg/kg-day	NA	NA	NA	NA	3.6E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
		Exposure Route Total*									**2.4E-05**						**0.5**
		Dermal Contact	***Inorganics***														
			Aluminum	32,556	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	13.71	mg/kg	4.79E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	7.2E-07	1.34E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.004
			Hexavalent Chromium*	44.2	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	3.0E-03	7.5E-05	1.0E-04	NA
			Cobalt	28.77	mg/kg	NA	mg/kg-day	NA	NA	9.0E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	NA
			Iron	34,132	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.00E-01	7.00E-01	NA	NA
			Manganese	362.5	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NA

Table 2-21g
Risk Calculations for Outdoor Worker - Southern Marsh
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Sediment	Sediment	Dermal Contact	Thallium*	1.728	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-05	1.0E-05	NA	NA
			Vanadium	120.5	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	1.3E-04	1.0E-04	NA
			SVOCs														
			Carbazole	22.09	mg/kg	2.57E-06	mg/kg-day	NA	NA	NA	NA	7.20E-06	mg/kg-day	3.0E-02	3.0E-02	NA	0.0002
			Dibenzofuran	131.2	mg/kg	1.53E-05	mg/kg-day	NA	NA	NA	NA	4.28E-05	mg/kg-day	1.0E-03	1.0E-03	NA	0.04
			PAHs														
			2-Methylnaphthalene	153.9	mg/kg	2.33E-05	mg/kg-day	NA	NA	NA	NA	6.52E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.02
			Acenaphthene	139.2	mg/kg	2.11E-05	mg/kg-day	NA	NA	NA	NA	5.90E-05	mg/kg-day	6.0E-02	6.0E-02	NA	0.001
			Anthracene	170.9	mg/kg	2.59E-05	mg/kg-day	NA	NA	NA	NA	7.25E-05	mg/kg-day	3.0E-01	3.0E-01	NA	0.0002
			Benzo(a)anthracene	132.4	mg/kg	2.01E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.0E-06	5.62E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	48.07	mg/kg	7.28E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	7.3E-06	2.04E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.07
			Benzo(b)fluoranthene	77.48	mg/kg	1.17E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.2E-06	3.28E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	34.33	mg/kg	5.20E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	5.2E-08	1.46E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	132.1	mg/kg	2.00E-05	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	2.0E-08	5.60E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	5.278	mg/kg	7.99E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	8.0E-07	2.24E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	696.3	mg/kg	1.05E-04	mg/kg-day	NA	NA	NA	NA	2.95E-04	mg/kg-day	4.0E-02	4.0E-02	NA	0.007
			Fluorene	186.3	mg/kg	2.82E-05	mg/kg-day	NA	NA	NA	NA	7.90E-05	mg/kg-day	4.0E-02	4.0E-02	NA	0.002
			Indeno(1,2,3-cd)pyrene	16.13	mg/kg	2.44E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.4E-07	6.84E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	180.9	mg/kg	2.74E-05	mg/kg-day	NA	NA	3.4E-05	NA	7.67E-05	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	0.004
			Phenanthrene	747.0	mg/kg	1.13E-04	mg/kg-day	NA	NA	NA	NA	3.17E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.01
			Pyrene	468.2	mg/kg	7.09E-05	mg/kg-day	NA	NA	NA	NA	1.99E-04	mg/kg-day	3.0E-02	3.0E-02	NA	0.007
		Exposure Route Total*									**1.2E-05**						**0.2**
	Exposure Medium Total*										**3.7E-05**						**0.7**
Sediment Total*											**3.7E-05**					**Sediment HI**	**0.7**
Total Southern Marsh Area Receptor Risk*											**3.7E-05**						**0.7**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
mg/m^3 - milligrams per meter cubed
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

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Checked By: SMA 3/28/2019

Table 2-22
Risk Calculations for Indoor Worker - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Indoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Groundwater	Groundwater	Ingestion	***Inorganics***														
			Aluminum	3.24	mg/L	1.24E-02	mg/kg-day	NA	NA	NA	NA	3.47E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.03
			Arsenic	0.0411	mg/L	1.57E-04	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	2.4E-04	4.40E-04	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	1.5
			Cobalt	0.00406	mg/L	1.55E-05	mg/kg-day	NA	NA	9.0E-03	NA	4.35E-05	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	0.1
			Iron	38.35	mg/L	1.47E-01	mg/kg-day	NA	NA	NA	NA	4.10E-01	mg/kg-day	7.0E-01	7.0E-01	NA	0.6
			Manganese	0.683	mg/L	2.61E-03	mg/kg-day	NA	NA	NA	NA	7.31E-03	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.3
			Selenium	0.159	mg/L	6.08E-04	mg/kg-day	NA	NA	NA	NA	1.70E-03	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	0.3
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	6.93E-04	mg/kg-day	NA	NA	NA	NA	1.94E-03	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.2
			1,3,5-Trimethylbenzene	0.0378	mg/L	1.44E-04	mg/kg-day	NA	NA	NA	NA	4.04E-04	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.04
			Benzene	0.0150	mg/L	5.72E-05	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	3.1E-06	1.60E-04	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.04
			Chloroform	0.0866	mg/L	3.31E-04	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	1.0E-05	9.27E-04	mg/kg-day	1.0E-02	1.0E-02	9.8E-02	0.09
			Ethylbenzene	0.0369	mg/L	1.41E-04	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1.6E-06	3.95E-04	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.004
			Toluene	0.0312	mg/L	1.19E-04	mg/kg-day	NA	NA	NA	NA	3.34E-04	mg/kg-day	8.0E-02	8.0E-02	5.0E+00	0.004
			Total Xylenes	0.144	mg/L	5.49E-04	mg/kg-day	NA	NA	NA	NA	1.54E-03	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.008
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	9.57E-05	mg/kg-day	NA	NA	NA	NA	2.68E-04	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	0.005
			1,1-Biphenyl	0.0830	mg/L	3.17E-04	mg/kg-day	8.0E-03	8.0E-03	NA	2.5E-06	8.88E-04	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.002
			2,4-Dimethylphenol	0.189	mg/L	7.23E-04	mg/kg-day	NA	NA	NA	NA	2.02E-03	mg/kg-day	2.0E-02	2.0E-02	NA	0.1
			2-Methylphenol	0.0216	mg/L	8.24E-05	mg/kg-day	NA	NA	NA	NA	2.31E-04	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	0.005
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	3.82E-05	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	5.4E-07	1.07E-04	mg/kg-day	2.0E-02	2.0E-02	NA	0.005
			Carbazole	0.214	mg/L	8.18E-04	mg/kg-day	NA	NA	NA	NA	2.29E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.08
			Dibenzofuran	0.244	mg/L	9.31E-04	mg/kg-day	NA	NA	NA	NA	2.61E-03	mg/kg-day	1.0E-03	1.0E-03	NA	3
			Pyridine	0.0300	mg/L	1.15E-04	mg/kg-day	NA	NA	NA	NA	3.21E-04	mg/kg-day	1.0E-03	1.0E-03	NA	0.3
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	2.19E-03	mg/kg-day	NA	NA	NA	NA	6.14E-03	mg/kg-day	4.0E-03	4.0E-03	NA	2
			Acenaphthylene	0.00659	mg/L	2.52E-05	mg/kg-day	NA	NA	NA	NA	7.06E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.002
			Acenaphthene	0.326	mg/L	1.25E-03	mg/kg-day	NA	NA	NA	NA	3.49E-03	mg/kg-day	6.0E-02	6.0E-02	NA	0.06
			Benzo(a)anthracene	0.000382	mg/L	1.46E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.5E-07	4.09E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	1.22E-05	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.2E-05	3.42E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.1
			Benzo(b)fluoranthene	0.00320	mg/L	1.22E-05	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.2E-06	3.42E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	1.95E-05	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.9E-07	5.46E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	6.84E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.8E-07	1.92E-06	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	6.32E-04	mg/kg-day	NA	NA	NA	NA	1.77E-03	mg/kg-day	4.0E-02	4.0E-02	NA	0.04
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	4.01E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.0E-08	1.12E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.22	mg/L	1.61E-02	mg/kg-day	NA	NA	3.4E-05	NA	4.52E-02	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	2
			1-Methylnaphthalene	0.487	mg/L	1.86E-03	mg/kg-day	2.9E-02	2.9E-02	NA	5.4E-05	5.21E-03	mg/kg-day	7.0E-02	7.0E-02	NA	0.07
			Phenanthrene	0.137	mg/L	5.24E-04	mg/kg-day	NA	NA	NA	NA	1.47E-03	mg/kg-day	3.0E-02	3.0E-02	NA	0.05
			Pyrene	0.00631	mg/L	2.41E-05	mg/kg-day	NA	NA	NA	NA	6.75E-05	mg/kg-day	3.0E-02	3.0E-02	NA	0.002
			Pesticides														
			Pentachlorophenol	0.000845	mg/L	3.23E-06	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	1.3E-06	9.04E-06	mg/kg-day	5.00E-03	5.00E-03	NA	0.002
		Exposure Route Total									**3.2E-04**						**11**

Table 2-22
Risk Calculations for Indoor Worker - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Indoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral (mg/kg-day)$^{-1}$	Abs. Dermal (mg/kg-day)$^{-1}$	Inhalation (ug/m^3)$^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Groundwater	Groundwater	Inhalation (via Vapor Intrusion)	***Inorganics***														
			Aluminum	3.24	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	0.041	mg/L	NA	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	NA
			Cobalt	0.00406	mg/L	NA	mg/kg-day	NA	NA	9.0E-03	NA	NA	mg/kg-day	3.0E-04	3.0E-04	6.0E-06	NA
			Iron	38.35	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese	0.683	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NA
			Selenium	0.159	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	NA
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.2
			1,3,5-Trimethylbenzene	0.0378	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-02	0.05
			Benzene	0.0150	mg/L	NA	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	2.2E-06	NA	mg/kg-day	4.0E-03	4.0E-03	3.0E-02	0.03
			Chloroform	0.0866	mg/L	NA	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	2.4E-05	NA	mg/kg-day	1.0E-02	1.0E-02	9.8E-02	0.03
			Ethylbenzene	0.0369	mg/L	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	2.4E-06	NA	mg/kg-day	1.0E-01	1.0E-01	1.0E+00	0.003
			Toluene	0.0312	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	8.0E-02	8.0E-02	5.0E+00	0.0004
			Total Xylenes	0.144	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-01	2.0E-01	1.0E-01	0.09
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	NA
			1,1-Biphenyl	0.0830	mg/L	NA	mg/kg-day	8.0E-03	8.0E-03	NA	NA	NA	mg/kg-day	5.0E-01	5.0E-01	4.0E-04	0.6
			2,4-Dimethylphenol	0.189	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-02	2.0E-02	NA	NA
			2-Methylphenol	0.0216	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-02	5.0E-02	6.0E-01	NA
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	NA	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	NA	NA	mg/kg-day	2.0E-02	2.0E-02	NA	NA
			Carbazole	0.214	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Dibenzofuran	0.244	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			Pyridine	0.0300	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-03	1.0E-03	NA	NA
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Acenaphthylene	0.00659	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Acenaphthene	0.326	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	6.0E-02	6.0E-02	NA	NA
			Benzo(a)anthracene	0.000382	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	9.2E-10	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	NA	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	NA
			Benzo(b)fluoranthene	0.00320	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	NA	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	NA	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-02	4.0E-02	NA	NA
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.22	mg/L	NA	mg/kg-day	NA	NA	3.4E-05	2.1E-04	NA	mg/kg-day	2.0E-02	2.0E-02	3.0E-03	6
			1-Methylnaphthalene	0.487	mg/L	NA	mg/kg-day	2.9E-02	2.9E-02	NA	NA	NA	mg/kg-day	7.0E-02	7.0E-02	NA	NA
			Phenanthrene	0.137	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA
			Pyrene	0.00631	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-02	3.0E-02	NA	NA

Table 2-22
Risk Calculations for Indoor Worker - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Indoor Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		CSF		Unit Risk	Cancer Risk	Intake/Exposure Concentration		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Groundwater	Groundwater	Inhalation (via Vapor Intrusion)	***Pesticides/SVOC*** Pentachlorophenol	0.000845	mg/L	NA	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	NA	NA	mg/kg-day	5.0E-03	5.0E-03	NA	NA
		Exposure Route Total									**2.4E-04**						**7**
	Exposure Medium Total										**5.6E-04**						**17**
Groundwater Total											**5.6E-04**					**Groundwater HI**	**17**
Total Groundwater Receptor Risk											**5.6E-04**						**17**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
CSF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/L - milligrams per liter
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
Per the U.S. EPA Risk Assessment Guidance for Superfund (RAGS): Part E, dermal exposure risk from PAHs is not included in the total Receptor Risk. The screening tables in Exhibit B-3 and B-4 were used to determine the organic and inorganic chemicals to assess dermal risk.
Groundwater-to-indoor air inhalation risk was calculated using the U.S. EPA Vapor Intrusion Screening Levels (VISL) online Calculator (see Appendix D).

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-23a
Risk Calculations for Construction Worker - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake*		CSF		Unit Risk	Cancer Risk	Intake		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Groundwater	Groundwater	Ingestion	***Inorganics***														
			Aluminum	3.24	mg/L	3.96E-06	mg/kg-day	NA	NA	NA	NA	2.77E-04	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.0003
			Arsenic	0.0411	mg/L	5.03E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	7.5E-08	3.52E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.012
			Cobalt	0.00406	mg/L	4.97E-09	mg/kg-day	NA	NA	9.0E-03	NA	3.48E-07	mg/kg-day	3.0E-03	3.0E-03	2.0E-05	0.0001
			Iron	38.35	mg/L	4.69E-05	mg/kg-day	NA	NA	NA	NA	3.28E-03	mg/kg-day	7.0E-01	7.0E-01	NA	0.005
			Manganese	0.683	mg/L	8.35E-07	mg/kg-day	NA	NA	NA	NA	5.85E-05	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.002
			Selenium	0.159	mg/L	1.94E-07	mg/kg-day	NA	NA	NA	NA	1.36E-05	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	0.003
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	2.22E-07	mg/kg-day	NA	NA	NA	NA	1.55E-05	mg/kg-day	4.0E-02	4.0E-02	2.0E-01	0.0004
			1,3,5-Trimethylbenzene	0.0378	mg/L	4.62E-08	mg/kg-day	NA	NA	NA	NA	3.23E-06	mg/kg-day	4.0E-02	4.0E-02	2.0E-01	0.00008
			Benzene	0.0150	mg/L	1.83E-08	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	1.0E-09	1.28E-06	mg/kg-day	1.0E-02	1.0E-02	8.0E-02	0.0001
			Chloroform	0.0866	mg/L	1.06E-07	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	3.3E-09	7.41E-06	mg/kg-day	1.0E-01	1.0E-01	2.4E-01	0.00007
			Ethylbenzene	0.0369	mg/L	4.51E-08	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	5.0E-10	3.16E-06	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	0.00006
			Toluene	0.0312	mg/L	3.82E-08	mg/kg-day	NA	NA	NA	NA	2.67E-06	mg/kg-day	8.0E-01	8.0E-01	5.0E+00	0.000003
			Total Xylenes	0.144	mg/L	1.76E-07	mg/kg-day	NA	NA	NA	NA	1.23E-05	mg/kg-day	4.0E-01	4.0E-01	4.0E-01	0.00003
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	3.06E-08	mg/kg-day	NA	NA	NA	NA	2.14E-06	mg/kg-day	4.0E-01	4.0E-01	6.0E-01	0.000005
			1,1-Biphenyl	0.0830	mg/L	1.01E-07	mg/kg-day	8.0E-03	8.0E-03	NA	8.1E-10	7.10E-06	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.00007
			2,4-Dimethylphenol	0.189	mg/L	2.31E-07	mg/kg-day	NA	NA	NA	NA	1.62E-05	mg/kg-day	5.0E-02	5.0E-02	NA	0.0003
			2-Methylphenol	0.0216	mg/L	2.64E-08	mg/kg-day	NA	NA	NA	NA	1.85E-06	mg/kg-day	2.0E-01	2.0E-01	6.0E-01	0.000009
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	1.22E-08	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	1.7E-10	8.56E-07	mg/kg-day	1.0E-01	1.0E-01	NA	0.000009
			Carbazole	0.214	mg/L	2.62E-07	mg/kg-day	NA	NA	NA	NA	1.83E-05	mg/kg-day	3.0E-01	3.0E-01	NA	0.00006
			Dibenzofuran	0.244	mg/L	2.98E-07	mg/kg-day	NA	NA	NA	NA	2.08E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.005
			Pyridine	0.0300	mg/L	3.67E-08	mg/kg-day	NA	NA	NA	NA	2.57E-06	mg/kg-day	1.0E-02	1.0E-02	NA	0.0003
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	7.02E-07	mg/kg-day	NA	NA	NA	NA	4.91E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.01
			Acenaphthylene	0.00659	mg/L	8.07E-09	mg/kg-day	NA	NA	NA	NA	5.65E-07	mg/kg-day	3.0E-01	3.0E-01	NA	0.000002
			Acenaphthene	0.326	mg/L	3.99E-07	mg/kg-day	NA	NA	NA	NA	2.79E-05	mg/kg-day	3.0E-01	3.0E-01	NA	0.00009
			Benzo(a)anthracene	0.000382	mg/L	4.67E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.7E-11	3.27E-08	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	3.91E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.9E-09	2.74E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0009
			Benzo(b)fluoranthene	0.00320	mg/L	3.91E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.9E-10	2.74E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	6.24E-09	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	6.2E-11	4.37E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	2.19E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.2E-10	1.53E-08	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	2.02E-07	mg/kg-day	NA	NA	NA	NA	1.42E-05	mg/kg-day	4.0E-01	4.0E-01	NA	0.00004
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	1.28E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.3E-11	8.99E-09	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.220	mg/L	5.16E-06	mg/kg-day	NA	NA	3.4E-05	NA	3.61E-04	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.0006
			1-Methylnaphthalene	0.487	mg/L	5.96E-07	mg/kg-day	2.9E-02	2.9E-02	NA	1.7E-08	4.17E-05	mg/kg-day	7.0E-02	7.0E-02	NA	0.0006
			Phenanthrene	0.137	mg/L	1.68E-07	mg/kg-day	NA	NA	NA	NA	1.17E-05	mg/kg-day	3.0E-01	3.0E-01	NA	0.00004
			Pyrene	0.00631	mg/L	7.71E-09	mg/kg-day	NA	NA	NA	NA	5.40E-07	mg/kg-day	3.0E-01	3.0E-01	NA	0.000002

Table 2-23a
Risk Calculations for Construction Worker - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake*		CSF		Unit Risk	Cancer Risk	Intake		RfD		RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Groundwater	Groundwater	Ingestion	***Pesticides***														
			Pentachlorophenol	0.000845	mg/L	1.03E-09	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	4.1E-10	7.23E-08	mg/kg-day	1.0E-03	1.0E-03	NA	0.00007
		Exposure Route Total									**1.0E-07**						**0.04**
		Dermal Contact	***Inorganics***														
			Aluminum	3.24	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.00003
			Arsenic	0.041	mg/L	NA	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	9.4E-09	NA	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.001
			Cobalt	0.00406	mg/L	NA	mg/kg-day	NA	NA	9.0E-03	NA	NA	mg/kg-day	3.0E-03	3.0E-03	2.0E-05	0.000006
			Iron	38.35	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	0.0006
			Manganese	0.683	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.008
			Selenium	0.159	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-03	5.0E-03	2.0E-02	0.0003
			VOCs														
			1,2,4-Trimethylbenzene	0.181	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-02	4.0E-02	2.0E-01	0.01
			1,3,5-Trimethylbenzene	0.0378	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-02	4.0E-02	2.0E-01	0.001
			Benzene	0.0150	mg/L	NA	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	3.4E-09	NA	mg/kg-day	1.0E-02	1.0E-02	8.0E-02	0.0004
			Chloroform	0.0866	mg/L	NA	mg/kg-day	3.1E-02	3.1E-02	2.3E-05	6.5E-09	NA	mg/kg-day	1.0E-01	1.0E-01	2.4E-01	0.0001
			Ethylbenzene	0.0369	mg/L	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	6.5E-09	NA	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	0.0008
			Toluene	0.0312	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	8.0E-01	8.0E-01	5.0E+00	0.00003
			Total Xylenes	0.144	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-01	4.0E-01	4.0E-01	0.0004
			SVOCs														
			(3-and/or 4-)Methylphenol	0.0250	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-01	4.0E-01	6.0E-01	0.00001
			1,1'-Biphenyl	0.0830	mg/L	NA	mg/kg-day	8.0E-03	8.0E-03	NA	2.8E-08	NA	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.002
			2,4-Dimethylphenol	0.189	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	5.0E-02	5.0E-02	NA	0.001
			2-Methylphenol	0.0216	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.0E-01	2.0E-01	6.0E-01	0.00002
			Bis(2-ethylhexyl)phthalate	0.0100	mg/L	NA	mg/kg-day	1.4E-02	1.4E-02	2.4E-06	NA	NA	mg/kg-day	1.0E-01	1.0E-01	NA	NA
			Carbazole	0.214	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-01	3.0E-01	NA	0.1
			Dibenzofuran	0.244	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-03	4.0E-03	NA	0.2
			Pyridine	0.0300	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-02	1.0E-02	NA	0.00009
			PAHs														
			2-Methylnaphthalene	0.574	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-03	4.0E-03	NA	0.4
			Acenaphthylene	0.00659	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-01	3.0E-01	NA	0.0002
			Acenaphthene	0.326	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-01	3.0E-01	NA	0.004
			Benzo(a)anthracene	0.000382	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.00320	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	NA	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	NA
			Benzo(b)fluoranthene	0.00320	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	0.00510	mg/L	NA	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	NA	NA	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.000179	mg/L	NA	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	NA	NA	mg/kg-day	NA	NA	NA	NA
			Fluorene	0.165	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-01	4.0E-01	NA	0.002
			Indeno(1,2,3-cd)pyrene	0.000105	mg/L	NA	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	NA	NA	mg/kg-day	NA	NA	NA	NA
			Naphthalene	4.220	mg/L	NA	mg/kg-day	NA	NA	3.4E-05	NA	NA	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.009
			1-Methylnaphthalene	0.487	mg/L	NA	mg/kg-day	2.9E-02	2.9E-02	NA	5.4E-07	NA	mg/kg-day	7.0E-02	7.0E-02	NA	0.02
			Phenanthrene	0.137	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-01	3.0E-01	NA	0.0002
			Pyrene	0.00631	mg/L	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	3.0E-01	3.0E-01	NA	0.0002

Table 2-23a
Risk Calculations for Construction Worker - Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake*		CSF		Unit Risk		Intake		RfD		RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Groundwater	Groundwater	Dermal Contact	*Pesticides*														
			Pentachlorophenol	0.000845	mg/L	NA	mg/kg-day	4.0E-01	4.0E-01	5.1E-06	3.5E-08	NA	mg/kg-day	1.0E-03	1.0E-03	NA	0.006
		Exposure Route Total									**6.2E-07**						**0.8**
	Exposure Medium Total										**7.3E-07**						**0.8**
Groundwater Total											**7.3E-07**					**Groundwater HI**	**0.8**
Total Groundwater Receptor Risk											**7.3E-07**						**0.8**

Notes:
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
*Intakes not shown for dermal exposure route because risk/hazard calculations based on results from RSL Calculator (see Appendix B) per direction from USEPA and NCDEQ via email dated 10/2/18.
CSF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/L - milligrams per liter
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-23b
Risk Calculations for Construction Worker - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	9,176	mg/kg	1.85E-04	mg/kg-day	NA	NA	NA	NA	1.3E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.01
			Arsenic*	4.112	mg/kg	4.98E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	7.5E-08	3.5E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.01
			Hexavalent Chromium*	0.836	mg/kg	1.69E-08	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	8.4E-09	1.2E-06	mg/kg-day	5.0E-03	1.3E-04	3.0E-04	0.0002
			Thallium*	0.96	mg/kg	1.94E-08	mg/kg-day	NA	NA	NA	NA	1.4E-06	mg/kg-day	4.0E-05	4.0E-05	NA	0.03
			Vanadium*	27.58	mg/kg	5.57E-07	mg/kg-day	NA	NA	NA	NA	3.9E-05	mg/kg-day	1.0E-02	2.6E-04	1.0E-04	0.004
			SVOCs														
			Carbazole	83.49	mg/kg	1.68E-06	mg/kg-day	NA	NA	NA	NA	1.2E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.0004
			Dibenzofuran	58.21	mg/kg	1.17E-06	mg/kg-day	NA	NA	NA	NA	8.2E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.02
			PAHs														
			2-Methylnaphthalene	24.30	mg/kg	4.90E-07	mg/kg-day	NA	NA	NA	NA	3.4E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.009
			Anthracene	697.3	mg/kg	1.41E-05	mg/kg-day	NA	NA	NA	NA	9.9E-04	mg/kg-day	1.0E+00	1.0E+00	NA	0.001
			Benzo(a)anthracene	66.95	mg/kg	1.35E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.4E-07	9.5E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	34.92	mg/kg	7.05E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	7.0E-07	4.9E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.2
			Benzo(b)fluoranthene	76.82	mg/kg	1.55E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.6E-07	1.1E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	32.93	mg/kg	6.65E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	6.6E-09	4.7E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	90.58	mg/kg	1.83E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	1.8E-09	1.3E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4.242	mg/kg	8.56E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	8.6E-08	6.0E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	236.3	mg/kg	4.77E-06	mg/kg-day	NA	NA	NA	NA	3.3E-04	mg/kg-day	1.0E-01	1.0E-01	NA	0.003
			Fluorene	95.42	mg/kg	1.93E-06	mg/kg-day	NA	NA	NA	NA	1.3E-04	mg/kg-day	4.0E-01	4.0E-01	NA	0.0003
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	3.04E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.0E-08	2.1E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	18.81	mg/kg	3.80E-07	mg/kg-day	NA	NA	3.4E-05	NA	2.7E-05	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.00004
			Phenanthrene	481.6	mg/kg	9.72E-06	mg/kg-day	NA	NA	NA	NA	6.8E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.002
			Pyrene	220.7	mg/kg	4.45E-06	mg/kg-day	NA	NA	NA	NA	3.1E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.001
		Exposure Route Total*									**1.1E-06**						**0.2**
		Dermal Contact	***Inorganics***														
			Aluminum*	9,176	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	4.112	mg/kg	7.98E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.2E-08	5.59E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.002
			Hexavalent Chromium*	0.836	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	5.0E-03	1.3E-04	3.0E-04	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-05	4.0E-05	NA	NA
			Vanadium*	27.58	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-02	2.6E-04	1.0E-04	NA
			SVOCs														
			Carbazole	83.49	mg/kg	5.40E-07	mg/kg-day	NA	NA	NA	NA	3.78E-05	mg/kg-day	3.0E-01	3.0E-01	NA	0.0001
			Dibenzofuran	58.21	mg/kg	3.77E-07	mg/kg-day	NA	NA	NA	NA	2.64E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.007
			PAHs														
			2-Methylnaphthalene	24.30	mg/kg	2.04E-07	mg/kg-day	NA	NA	NA	NA	1.43E-05	mg/kg-day	4.0E-03	4.0E-03	NA	0.004
			Anthracene	697.3	mg/kg	5.87E-06	mg/kg-day	NA	NA	NA	NA	4.11E-04	mg/kg-day	1.0E+00	1.0E+00	NA	0.0004

Table 2-23b
Risk Calculations for Construction Worker - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Dermal Contact	Benzo(a)anthracene	66.95	mg/kg	5.63E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.6E-08	3.94E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	34.92	mg/kg	2.94E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.9E-07	2.06E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.07
			Benzo(b)fluoranthene	76.82	mg/kg	6.46E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	6.5E-08	4.52E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	32.93	mg/kg	2.77E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	2.8E-09	1.94E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	90.58	mg/kg	7.62E-07	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	7.6E-10	5.33E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4.242	mg/kg	3.57E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.6E-08	2.50E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	236.3	mg/kg	1.99E-06	mg/kg-day	NA	NA	NA	NA	1.39E-04	mg/kg-day	1.0E-01	1.0E-01	NA	0.001
			Fluorene	95.42	mg/kg	8.03E-07	mg/kg-day	NA	NA	NA	NA	5.62E-05	mg/kg-day	4.0E-01	4.0E-01	NA	0.0001
			Indeno(1,2,3-cd)pyrene	15.08	mg/kg	1.27E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.3E-08	8.88E-06	mg/kg-day	NA	NA	NA	NA
			Naphthalene	18.81	mg/kg	1.58E-07	mg/kg-day	NA	NA	3.4E-05	NA	1.11E-05	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.00002
			Phenanthrene	481.6	mg/kg	4.05E-06	mg/kg-day	NA	NA	NA	NA	2.84E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.0009
			Pyrene	220.7	mg/kg	1.86E-06	mg/kg-day	NA	NA	NA	NA	1.30E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.0004
		Exposure Route Total*									**4.7E-07**						**0.08**
		Inhalation	***Inorganics***														
		(via Particulate and	Aluminum*	2.00E-03	mg/m^3	3.27E-06	mg/kg-day	NA	NA	NA	NA	2.29E-04	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.05
		Vapor Emissions)	Arsenic*	8.97E-07	mg/m^3	1.46E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	6.3E-09	1.02E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.007
			Hexavalent Chromium*	1.82E-07	mg/m^3	2.98E-10	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	2.5E-08	2.08E-08	mg/kg-day	5.0E-03	1.3E-04	3.0E-04	0.00007
			Thallium*	2.10E-07	mg/m^3	3.42E-10	mg/kg-day	NA	NA	NA	NA	2.39E-08	mg/kg-day	4.0E-05	4.0E-05	NA	NA
			Vanadium*	6.02E-06	mg/m^3	9.82E-09	mg/kg-day	NA	NA	NA	NA	6.87E-07	mg/kg-day	1.0E-02	2.6E-04	1.0E-04	0.007
			SVOCs														
			Carbazole	7.79E-05	mg/m^3	1.27E-07	mg/kg-day	NA	NA	NA	NA	8.90E-06	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Dibenzofuran	2.91E-03	mg/m^3	4.74E-06	mg/kg-day	NA	NA	NA	NA	3.32E-04	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			PAHs														
			2-Methylnaphthalene	3.26E-03	mg/m^3	5.31E-06	mg/kg-day	NA	NA	NA	NA	3.72E-04	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Anthracene	1.03E-02	mg/m^3	1.68E-05	mg/kg-day	NA	NA	NA	NA	1.18E-03	mg/kg-day	1.0E+00	1.0E+00	NA	NA
			Benzo(a)anthracene	1.15E-04	mg/m^3	1.87E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.1E-08	1.31E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	7.62E-06	mg/m^3	1.24E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	7.5E-09	8.70E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.4
			Benzo(b)fluoranthene	1.68E-05	mg/m^3	2.73E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.6E-09	1.91E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	7.19E-06	mg/m^3	1.17E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	7.0E-11	8.20E-07	mg/kg-day	NA	NA	NA	NA
			Chrysene	1.98E-05	mg/m^3	3.22E-08	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	1.9E-11	2.26E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	9.26E-07	mg/m^3	1.51E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	9.1E-10	1.06E-07	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	5.16E-05	mg/m^3	8.41E-08	mg/kg-day	NA	NA	NA	NA	5.89E-06	mg/kg-day	1.0E-01	1.0E-01	NA	NA
			Fluorene	2.63E-03	mg/m^3	4.29E-06	mg/kg-day	NA	NA	NA	NA	3.01E-04	mg/kg-day	4.0E-01	4.0E-01	NA	NA
			Indeno(1,2,3-cd)pyrene	3.29E-06	mg/m^3	5.37E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.2E-10	3.76E-07	mg/kg-day	NA	NA	NA	NA
			Naphthalene	3.16E-03	mg/m^3	5.15E-06	mg/kg-day	NA	NA	3.4E-05	1.8E-07	3.60E-04	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.1
			Phenanthrene	5.78E-03	mg/m^3	9.43E-06	mg/kg-day	NA	NA	NA	NA	6.60E-04	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Pyrene	1.75E-04	mg/m^3	2.85E-07	mg/kg-day	NA	NA	NA	NA	1.99E-05	mg/kg-day	3.0E-01	3.0E-01	NA	NA
		Exposure Route Total*									**2.0E-07**						**0.6**
	Exposure Medium Total*										**1.8E-06**						**0.8**
Surface Soil (0 to 1 foot bgs) Total*											**1.8E-06**					**Surface Soil HI**	**0.8**

Table 2-23b
Risk Calculations for Construction Worker - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk	Cancer Risk	Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	Hazard Quotient
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$		Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	
Subsurface Soil	Subsurface Soil	Incidental Ingestion	***Inorganics***														
			Aluminum	8,500	mg/kg	1.72E-04	mg/kg-day	NA	NA	NA	NA	1.20E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.01
			VOCs														
			Ethylbenzene	2.574	mg/kg	5.19E-08	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	5.7E-10	3.64E-06	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	0.00007
			SVOCs														
			1,1-Biphenyl	15.00	mg/kg	3.03E-07	mg/kg-day	8.0E-03	8.0E-03	NA	2.4E-09	2.12E-05	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.0002
			Carbazole	1,547	mg/kg	3.12E-05	mg/kg-day	NA	NA	NA	NA	2.19E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.007
			Dibenzofuran	1,643	mg/kg	3.32E-05	mg/kg-day	NA	NA	NA	NA	2.32E-03	mg/kg-day	4.0E-03	4.0E-03	NA	0.6
			PAHs														
			2-Methylnapthalene	1,231	mg/kg	2.48E-05	mg/kg-day	NA	NA	NA	NA	1.74E-03	mg/kg-day	4.0E-03	4.0E-03	NA	0.4
			Acenaphthene	1,129	mg/kg	2.28E-05	mg/kg-day	NA	NA	NA	NA	1.59E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.005
			Anthracene	1,825	mg/kg	3.68E-05	mg/kg-day	NA	NA	NA	NA	2.58E-03	mg/kg-day	1.0E+00	1.0E+00	NA	0.003
			Benzo(a)anthracene	194.6	mg/kg	3.93E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.9E-07	2.75E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	60.86	mg/kg	1.23E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.2E-06	8.60E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.3
			Benzo(b)fluoranthene	98.82	mg/kg	1.99E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.0E-07	1.40E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	42.57	mg/kg	8.59E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	8.6E-09	6.01E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	252.1	mg/kg	5.09E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	5.1E-09	3.56E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	8.641	mg/kg	1.74E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.7E-07	1.22E-05	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,120	mg/kg	2.26E-05	mg/kg-day	NA	NA	NA	NA	1.58E-03	mg/kg-day	1.0E-01	1.0E-01	NA	0.02
			Fluorene	2,990	mg/kg	6.03E-05	mg/kg-day	NA	NA	NA	NA	4.22E-03	mg/kg-day	4.0E-01	4.0E-01	NA	0.01
			Indeno(1,2,3-cd)pyrene	27.83	mg/kg	5.62E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.6E-08	3.93E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	2,218	mg/kg	4.48E-05	mg/kg-day	NA	NA	3.4E-05	NA	3.13E-03	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.005
			Phenanthrene	7,644	mg/kg	1.54E-04	mg/kg-day	NA	NA	NA	NA	1.08E-02	mg/kg-day	3.0E-01	3.0E-01	NA	0.04
			Pyrene	1,000	mg/kg	2.02E-05	mg/kg-day	NA	NA	NA	NA	1.41E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.005
		Exposure Route Total									**2.1E-06**						**1**
		Dermal Contact	***Inorganics***														
			Aluminum	8,500	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			VOCs														
			Ethylbenzene	2.574	mg/kg	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	NA	NA	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	NA
			SVOCs														
			1,1-Biphenyl	15.00	mg/kg	9.71E-08	mg/kg-day	8.0E-03	8.0E-03	NA	7.8E-10	6.79E-06	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.00007
			Carbazole	1,547	mg/kg	1.00E-05	mg/kg-day	NA	NA	NA	NA	7.01E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.002
			Dibenzofuran	1,643	mg/kg	1.06E-05	mg/kg-day	NA	NA	NA	NA	7.44E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.2
			PAHs														
			2-Methylnapthalene	1,231	mg/kg	1.04E-05	mg/kg-day	NA	NA	NA	NA	7.25E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.2
			Acenaphthene	1,129	mg/kg	9.49E-06	mg/kg-day	NA	NA	NA	NA	6.65E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.002
			Anthracene	1,825	mg/kg	1.54E-05	mg/kg-day	NA	NA	NA	NA	1.07E-03	mg/kg-day	1.0E+00	1.0E+00	NA	0.001

Table 2-23b
Risk Calculations for Construction Worker - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Subsurface Soil	Subsurface Soil	Dermal Contact	Benzo(a)anthracene	194.6	mg/kg	1.64E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.6E-07	1.15E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	60.86	mg/kg	5.12E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	5.1E-07	3.58E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.1
			Benzo(b)fluoranthene	98.82	mg/kg	8.31E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	8.3E-08	5.82E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	42.57	mg/kg	3.58E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	3.6E-09	2.51E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	252.1	mg/kg	2.12E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	2.1E-09	1.48E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	8.641	mg/kg	7.27E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	7.3E-08	5.09E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,120	mg/kg	9.42E-06	mg/kg-day	NA	NA	NA	NA	6.60E-04	mg/kg-day	1.0E-01	1.0E-01	NA	0.007
			Fluorene	2,990	mg/kg	2.52E-05	mg/kg-day	NA	NA	NA	NA	1.76E-03	mg/kg-day	4.0E-01	4.0E-01	NA	0.004
			Indeno(1,2,3-cd)pyrene	27.83	mg/kg	2.34E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.3E-08	1.64E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	2,218	mg/kg	1.87E-05	mg/kg-day	NA	NA	3.4E-05	NA	1.31E-03	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.002
			Phenanthrene	7,644	mg/kg	6.43E-05	mg/kg-day	NA	NA	NA	NA	4.50E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.02
			Pyrene	1,000	mg/kg	8.41E-06	mg/kg-day	NA	NA	NA	NA	5.89E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.002
		Exposure Route Total									**8.6E-07**						**0.5**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Aluminum	1.86E-03	mg/m^3	3.03E-06	mg/kg-day	NA	NA	NA	NA	2.12E-04	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.04
			VOCs														
			Ethylbenzene	3.54E-03	mg/m^3	5.78E-06	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	1.4E-08	4.05E-04	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	0.00004
			SVOCs														
			1,1-Biphenyl	1.02E-03	mg/m^3	1.67E-06	mg/kg-day	8.0E-03	8.0E-03	NA	NA	1.17E-04	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.03
			Carbazole	1.44E-03	mg/m^3	2.36E-06	mg/kg-day	NA	NA	NA	NA	1.65E-04	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Dibenzofuran	8.21E-02	mg/m^3	1.34E-04	mg/kg-day	NA	NA	NA	NA	9.37E-03	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			PAHs														
			2-Methylnapthalene	1.65E-01	mg/m^3	2.69E-04	mg/kg-day	NA	NA	NA	NA	1.88E-02	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Acenaphthene	6.23E-02	mg/m^3	1.02E-04	mg/kg-day	NA	NA	NA	NA	7.12E-03	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Anthracene	2.70E-02	mg/m^3	4.40E-05	mg/kg-day	NA	NA	NA	NA	3.08E-03	mg/kg-day	1.0E+00	1.0E+00	NA	NA
			Benzo(a)anthracene	3.33E-04	mg/m^3	5.43E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.3E-08	3.80E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	1.33E-05	mg/m^3	2.17E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.3E-08	1.52E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.8
			Benzo(b)fluoranthene	2.16E-05	mg/m^3	3.52E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.1E-09	2.46E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	9.29E-06	mg/m^3	1.52E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	9.1E-11	1.06E-06	mg/kg-day	NA	NA	NA	NA
			Chrysene	5.50E-05	mg/m^3	8.97E-08	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	5.4E-11	6.28E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.89E-06	mg/m^3	3.08E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.8E-09	2.15E-07	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	2.44E-04	mg/m^3	3.99E-07	mg/kg-day	NA	NA	NA	NA	2.79E-05	mg/kg-day	1.0E-01	1.0E-01	NA	NA
			Fluorene	8.25E-02	mg/m^3	1.35E-04	mg/kg-day	NA	NA	NA	NA	9.42E-03	mg/kg-day	4.0E-01	4.0E-01	NA	NA
			Indeno(1,2,3-cd)pyrene	6.07E-06	mg/m^3	9.91E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.9E-10	6.93E-07	mg/kg-day	NA	NA	NA	NA
			Naphthalene	3.72E-01	mg/m^3	6.07E-04	mg/kg-day	NA	NA	3.4E-05	2.1E-05	4.25E-02	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	14
			Phenanthrene	9.18E-02	mg/m^3	1.50E-04	mg/kg-day	NA	NA	NA	NA	1.05E-02	mg/kg-day	3.0E-01	3.0E-01	NA	NA

Table 2-23b
Risk Calculations for Construction Worker - Process Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Subsurface Soil	Subsurface Soil	Inhalation (via Particulate and Vapor Emissions)	Pyrene	7.91E-04	mg/m^3	1.29E-06	mg/kg-day	NA	NA	NA	NA	9.03E-05	mg/kg-day	3.0E-01	3.0E-01	NA	NA
		Exposure Route Total									**2.1E-05**						**15**
	Exposure Medium Total										**2.4E-05**						**17**
Subsurface Soil Total											**2.4E-05**					**Subsurface Soil HI**	**17**
Total Process Area Receptor Risk*											**2.5E-05**						**18**

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Notes:
(1) A relative bioavailability factor (RBA) of 0.6 for arsenic is included in the calculation of the ingestion dose, consistent with USEPA methodology in the USEPA RSL tables. The default value is one.
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Table 2-23c
Risk Calculations for Construction Worker - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration (1)		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil	Surface Soil	Incidental Ingestion	***Inorganics***														
(0-1 foot bgs)	(0-1 foot bgs)		Aluminum*	14,553	mg/kg	2.94E-04	mg/kg-day	NA	NA	NA	NA	2.1E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.02
			Arsenic	29.71	mg/kg	3.60E-07	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	5.4E-07	2.5E-05	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.08
			Iron*	9,297	mg/kg	1.88E-04	mg/kg-day	NA	NA	NA	NA	1.3E-02	mg/kg-day	7.0E-01	7.0E-01	NA	0.02
			Thallium*	0.96	mg/kg	1.94E-08	mg/kg-day	NA	NA	NA	NA	1.4E-06	mg/kg-day	4.0E-05	4.0E-05	NA	0.03
			Vanadium*	48.92	mg/kg	9.87E-07	mg/kg-day	NA	NA	NA	NA	6.9E-05	mg/kg-day	1.0E-02	2.6E-04	1.0E-04	0.007
			VOCs														
			Benzene	1.6	mg/kg	3.23E-08	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	1.8E-09	2.3E-06	mg/kg-day	1.0E-02	1.0E-02	8.0E-02	0.0002
			Ethylbenzene	44	mg/kg	8.88E-07	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	9.8E-09	6.2E-05	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	0.001
			Total Xylenes	82	mg/kg	1.65E-06	mg/kg-day	NA	NA	NA	NA	1.2E-04	mg/kg-day	4.0E-01	4.0E-01	4.0E-01	0.0003
			SVOCs														
			Carbazole	282.4	mg/kg	5.70E-06	mg/kg-day	NA	NA	NA	NA	4.0E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.001
			Dibenzofuran	661.7	mg/kg	1.34E-05	mg/kg-day	NA	NA	NA	NA	9.3E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.2
			1,1-Biphenyl	100	mg/kg	2.02E-06	mg/kg-day	8.0E-03	8.0E-03	NA	1.6E-08	1.4E-04	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.001
			PAHs														
			2-Methylnaphthalene	653.0	mg/kg	1.32E-05	mg/kg-day	NA	NA	NA	NA	9.2E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.2
			Acenaphthene	910.1	mg/kg	1.84E-05	mg/kg-day	NA	NA	NA	NA	1.3E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.004
			Benzo(a)anthracene	193.7	mg/kg	3.91E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.9E-07	2.7E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	68.35	mg/kg	1.38E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.4E-06	9.7E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.3
			Benzo(b)fluoranthene	88.43	mg/kg	1.78E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.8E-07	1.2E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	66.72	mg/kg	1.35E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.3E-08	9.4E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	151.5	mg/kg	3.06E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	3.1E-09	2.1E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.547	mg/kg	1.32E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.3E-07	9.2E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,045	mg/kg	2.11E-05	mg/kg-day	NA	NA	NA	NA	1.5E-03	mg/kg-day	1.0E-01	1.0E-01	NA	0.01
			Fluorene	810.7	mg/kg	1.64E-05	mg/kg-day	NA	NA	NA	NA	1.1E-03	mg/kg-day	4.0E-01	4.0E-01	NA	0.003
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	3.84E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.8E-08	2.7E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	902.0	mg/kg	1.82E-05	mg/kg-day	NA	NA	3.4E-05	NA	1.3E-03	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.002
			Phenanthrene	852.6	mg/kg	1.72E-05	mg/kg-day	NA	NA	NA	NA	1.2E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.004
			Pyrene	704.9	mg/kg	1.42E-05	mg/kg-day	NA	NA	NA	NA	1.0E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.003
			Pesticides														
			Aldrin	0.150	mg/kg	3.03E-09	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	5.1E-08	2.1E-07	mg/kg-day	4.0E-05	4.0E-05	NA	0.005
		Exposure Route Total*									**2.8E-06**						**0.9**
		Dermal Contact	***Inorganics***														
			Aluminum*	14,553	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	29.71	mg/kg	5.77E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	8.7E-08	4.04E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.01
			Iron*	9,297	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-05	4.0E-05	NA	NA
			Vanadium*	48.92	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-02	2.6E-04	1.0E-04	NA

Table 2-23c
Risk Calculations for Construction Worker - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration (1)		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil	Surface Soil	Dermal Contact	***VOCs***														
(0-1 foot bgs)	(0-1 foot bgs)		Benzene	1.6	mg/kg	NA	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	NA	NA	mg/kg-day	1.0E-02	1.0E-02	8.0E-02	NA
			Ethylbenzene	44	mg/kg	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	NA	NA	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	NA
			Total Xylenes	82	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-01	4.0E-01	4.0E-01	NA
			SVOCs														
			Carbazole	282.4	mg/kg	1.83E-06	mg/kg-day	NA	NA	NA	NA	1.28E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.0004
			Dibenzofuran	661.7	mg/kg	4.28E-06	mg/kg-day	NA	NA	NA	NA	3.00E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.07
			1,1-Biphenyl	100	mg/kg	6.47E-07	mg/kg-day	8.0E-03	8.0E-03	NA	5.2E-09	4.53E-05	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.0005
			PAHs														
			2-Methylnaphthalene	653.0	mg/kg	5.49E-06	mg/kg-day	NA	NA	NA	NA	3.84E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.1
			Acenaphthene	910.1	mg/kg	7.66E-06	mg/kg-day	NA	NA	NA	NA	5.36E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.002
			Benzo(a)anthracene	193.7	mg/kg	1.63E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.6E-07	1.14E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	68.35	mg/kg	5.75E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	5.7E-07	4.02E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.1
			Benzo(b)fluoranthene	88.43	mg/kg	7.44E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	7.4E-08	5.21E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	66.72	mg/kg	5.61E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	5.6E-09	3.93E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	151.5	mg/kg	1.27E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	1.3E-09	8.92E-05	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.547	mg/kg	5.51E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	5.5E-08	3.86E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	1,045	mg/kg	8.79E-06	mg/kg-day	NA	NA	NA	NA	6.16E-04	mg/kg-day	1.0E-01	1.0E-01	NA	0.006
			Fluorene	810.7	mg/kg	6.82E-06	mg/kg-day	NA	NA	NA	NA	4.77E-04	mg/kg-day	4.0E-01	4.0E-01	NA	0.001
			Indeno(1,2,3-cd)pyrene	19.01	mg/kg	1.60E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.6E-08	1.12E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	902.0	mg/kg	7.59E-06	mg/kg-day	NA	NA	3.4E-05	NA	5.31E-04	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.0009
			Phenanthrene	852.6	mg/kg	7.17E-06	mg/kg-day	NA	NA	NA	NA	5.02E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.002
			Pyrene	704.9	mg/kg	5.93E-06	mg/kg-day	NA	NA	NA	NA	4.15E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.001
			Pesticides														
			Aldrin	0.150	mg/kg	NA	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	NA	NA	mg/kg-day	4.0E-05	4.0E-05	NA	NA
		Exposure Route Total*									**9.8E-07**						**0.3**
		Inhalation	***Inorganics***														
		(via Particulate	Aluminum*	3.18E-03	mg/m^3	5.18E-06	mg/kg-day	NA	NA	NA	NA	3.63E-04	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.07
		and Vapor Emissions)	Arsenic	6.48E-06	mg/m^3	1.06E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	4.5E-08	7.40E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.05
			Iron*	2.03E-03	mg/m^3	3.31E-06	mg/kg-day	NA	NA	NA	NA	2.32E-04	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Thallium*	2.10E-07	mg/m^3	3.42E-10	mg/kg-day	NA	NA	NA	NA	2.39E-08	mg/kg-day	4.0E-05	4.0E-05	NA	NA
			Vanadium*	1.07E-05	mg/m^3	1.74E-08	mg/kg-day	NA	NA	NA	NA	1.22E-06	mg/kg-day	1.0E-02	2.6E-04	1.0E-04	0.01
			VOCs														
			Benzene	3.54E-03	mg/m^3	5.77E-06	mg/kg-day	5.5E-02	5.5E-02	7.8E-06	4.5E-08	4.04E-04	mg/kg-day	1.0E-02	1.0E-02	8.0E-02	0.005
			Ethylbenzene	6.06E-02	mg/m^3	9.88E-05	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	2.5E-07	6.92E-03	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	0.0008
			Total Xylenes	1.12E-01	mg/m^3	1.82E-04	mg/kg-day	NA	NA	NA	NA	1.27E-02	mg/kg-day	4.0E-01	4.0E-01	4.0E-01	0.03

Table 2-23c
Risk Calculations for Construction Worker - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration (1)		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	***SVOCs***														
			Carbazole	2.64E-04	mg/m^3	4.30E-07	mg/kg-day	NA	NA	NA	NA	3.01E-05	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Dibenzofuran	3.31E-02	mg/m^3	5.39E-05	mg/kg-day	NA	NA	NA	NA	3.77E-03	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			1,1-Biphenyl	6.82E-03	mg/m^3	1.11E-05	mg/kg-day	8.0E-03	8.0E-03	NA	NA	7.79E-04	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.2
			PAHs														
			2-Methylnaphthalene	8.76E-02	mg/m^3	1.43E-04	mg/kg-day	NA	NA	NA	NA	1.00E-02	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Acenaphthene	1.35E-02	mg/m^3	2.19E-05	mg/kg-day	NA	NA	NA	NA	1.54E-03	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Benzo(a)anthracene	3.31E-04	mg/m^3	5.41E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.2E-08	3.78E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	1.49E-05	mg/m^3	2.43E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.5E-08	1.70E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.9
			Benzo(b)fluoranthene	1.93E-05	mg/m^3	3.15E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.9E-09	2.20E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.46E-05	mg/m^3	2.37E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.4E-10	1.66E-06	mg/kg-day	NA	NA	NA	NA
			Chrysene	3.31E-05	mg/m^3	5.39E-08	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	3.2E-11	3.77E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.43E-06	mg/m^3	2.33E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.4E-09	1.63E-07	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	2.28E-04	mg/m^3	3.72E-07	mg/kg-day	NA	NA	NA	NA	2.60E-05	mg/kg-day	1.0E-01	1.0E-01	NA	NA
			Fluorene	2.24E-02	mg/m^3	3.65E-05	mg/kg-day	NA	NA	NA	NA	2.55E-03	mg/kg-day	4.0E-01	4.0E-01	NA	NA
			Indeno(1,2,3-cd)pyrene	4.15E-06	mg/m^3	6.77E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.1E-10	4.74E-07	mg/kg-day	NA	NA	NA	NA
			Naphthalene	1.51E-01	mg/m^3	2.47E-04	mg/kg-day	NA	NA	3.4E-05	8.4E-06	1.73E-02	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	6
			Phenanthrene	1.02E-02	mg/m^3	1.67E-05	mg/kg-day	NA	NA	NA	NA	1.17E-03	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Pyrene	5.57E-04	mg/m^3	9.09E-07	mg/kg-day	NA	NA	NA	NA	6.36E-05	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Pesticides														
			Aldrin	3.27E-08	mg/m^3	5.34E-11	mg/kg-day	1.7E+01	1.7E+01	4.9E-03	2.6E-10	3.74E-09	mg/kg-day	4.0E-05	4.0E-05	NA	NA
		Exposure Route Total*									**8.8E-06**						**7**
	Exposure Medium Total*										**1.3E-05**						**8**
Surface Soil (0 to 1 foot bgs) Total*											**1.3E-05**					**Surface Soil HI**	**8**
Subsurface Soil	Subsurface Soil	Incidental Ingestion	***Inorganics***														
			Aluminum	9,400	mg/kg	1.90E-04	mg/kg-day	NA	NA	NA	NA	1.33E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.01
			Arsenic*	3.150	mg/kg	3.81E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	5.7E-08	2.67E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.009
			VOCs														
			Ethylbenzene	11.68	mg/kg	2.36E-07	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	2.6E-09	1.65E-05	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	0.0003
			SVOCs														
			1,1-Biphenyl	277.9	mg/kg	5.61E-06	mg/kg-day	8.0E-03	8.0E-03	NA	4.5E-08	3.93E-04	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.004
			Carbazole	774.7	mg/kg	1.56E-05	mg/kg-day	NA	NA	NA	NA	1.09E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.004
			Dibenzofuran	792.0	mg/kg	1.60E-05	mg/kg-day	NA	NA	NA	NA	1.12E-03	mg/kg-day	4.0E-03	4.0E-03	NA	0.3
			PAHs														
			2-Methylnapthalene	1,165	mg/kg	2.35E-05	mg/kg-day	NA	NA	NA	NA	1.65E-03	mg/kg-day	4.0E-03	4.0E-03	NA	0.4
			Acenaphthene	1,435	mg/kg	2.90E-05	mg/kg-day	NA	NA	NA	NA	2.03E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.007
			Anthracene	1,622	mg/kg	3.27E-05	mg/kg-day	NA	NA	NA	NA	2.29E-03	mg/kg-day	1.0E+00	1.0E+00	NA	0.002
			Benzo(a)anthracene	289.6	mg/kg	5.84E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.8E-07	4.09E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	88.59	mg/kg	1.79E-06	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.8E-06	1.25E-04	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.4
			Benzo(b)fluoranthene	120.3	mg/kg	2.43E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.4E-07	1.70E-04	mg/kg-day	NA	NA	NA	NA

Table 2-23c
Risk Calculations for Construction Worker - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration (1)		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Subsurface Soil	Subsurface Soil	Incidental Ingestion	Benzo(k)fluoranthene	88.76	mg/kg	1.79E-06	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.8E-08	1.25E-04	mg/kg-day	NA	NA	NA	NA
			Chrysene	273.4	mg/kg	5.52E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	5.5E-09	3.86E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	8.121	mg/kg	1.64E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.6E-07	1.15E-05	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	2,085	mg/kg	4.21E-05	mg/kg-day	NA	NA	NA	NA	2.94E-03	mg/kg-day	1.0E-01	1.0E-01	NA	0.03
			Fluorene	1,698	mg/kg	3.43E-05	mg/kg-day	NA	NA	NA	NA	2.40E-03	mg/kg-day	4.0E-01	4.0E-01	NA	0.006
			Indeno(1,2,3-cd)pyrene	22.62	mg/kg	4.56E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.6E-08	3.20E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	1,189	mg/kg	2.40E-05	mg/kg-day	NA	NA	3.4E-05	NA	1.68E-03	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.003
			Phenanthrene	4,384	mg/kg	8.85E-05	mg/kg-day	NA	NA	NA	NA	6.19E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.02
			Pyrene	1,271	mg/kg	2.56E-05	mg/kg-day	NA	NA	NA	NA	1.80E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.006
		Exposure Route Total*									**2.9E-06**						**1**
		Dermal Contact	***Inorganics***														
			Aluminum	9,400	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	3.150	mg/kg	6.11E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	9.2E-09	4.28E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.001
			VOCs														
			Ethylbenzene	11.68	mg/kg	NA	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	NA	NA	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	NA
			SVOCs														
			1,1-Biphenyl	277.9	mg/kg	1.80E-06	mg/kg-day	8.0E-03	8.0E-03	NA	1.4E-08	1.26E-04	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.001
			Carbazole	774.7	mg/kg	5.01E-06	mg/kg-day	NA	NA	NA	NA	3.51E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.001
			Dibenzofuran	792.0	mg/kg	5.13E-06	mg/kg-day	NA	NA	NA	NA	3.59E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.09
			PAHs														
			2-Methylnapthalene	1,165	mg/kg	9.80E-06	mg/kg-day	NA	NA	NA	NA	6.86E-04	mg/kg-day	4.0E-03	4.0E-03	NA	0.2
			Acenaphthene	1,435	mg/kg	1.21E-05	mg/kg-day	NA	NA	NA	NA	8.45E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.003
			Anthracene	1,622	mg/kg	1.36E-05	mg/kg-day	NA	NA	NA	NA	9.55E-04	mg/kg-day	1.0E+00	1.0E+00	NA	0.001
			Benzo(a)anthracene	289.6	mg/kg	2.44E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.4E-07	1.71E-04	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	88.59	mg/kg	7.45E-07	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	7.5E-07	5.22E-05	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.2
			Benzo(b)fluoranthene	120.3	mg/kg	1.01E-06	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.0E-07	7.09E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	88.76	mg/kg	7.47E-07	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	7.5E-09	5.23E-05	mg/kg-day	NA	NA	NA	NA
			Chrysene	273.4	mg/kg	2.30E-06	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	2.3E-09	1.61E-04	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	8.121	mg/kg	6.83E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.8E-08	4.78E-06	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	2,085	mg/kg	1.75E-05	mg/kg-day	NA	NA	NA	NA	1.23E-03	mg/kg-day	1.0E-01	1.0E-01	NA	0.01
			Fluorene	1,698	mg/kg	1.43E-05	mg/kg-day	NA	NA	NA	NA	1.00E-03	mg/kg-day	4.0E-01	4.0E-01	NA	0.002
			Indeno(1,2,3-cd)pyrene	22.62	mg/kg	1.90E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.9E-08	1.33E-05	mg/kg-day	NA	NA	NA	NA
			Naphthalene	1,189	mg/kg	1.00E-05	mg/kg-day	NA	NA	3.4E-05	NA	7.00E-04	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	0.001
			Phenanthrene	4,384	mg/kg	3.69E-05	mg/kg-day	NA	NA	NA	NA	2.58E-03	mg/kg-day	3.0E-01	3.0E-01	NA	0.009
			Pyrene	1,271	mg/kg	1.07E-05	mg/kg-day	NA	NA	NA	NA	7.48E-04	mg/kg-day	3.0E-01	3.0E-01	NA	0.002
		Exposure Route Total*									**1.2E-06**						**0.5**
		Inhalation	***Inorganics***														
		(via Particulate	Aluminum	2.05E-03	mg/m^3	3.35E-06	mg/kg-day	NA	NA	NA	NA	2.34E-04	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.05
		and Vapor Emissions)	Arsenic*	6.87E-07	mg/m^3	1.12E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	4.8E-09	7.85E-08	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.005

Table 2-23c
Risk Calculations for Construction Worker - Pond Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration (1)		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Subsurface Soil	Subsurface Soil	Inhalation (via Particulate and Vapor Emissions)	***VOCs***														
			Ethylbenzene	1.61E-02	mg/m^3	2.62E-05	mg/kg-day	1.1E-02	1.1E-02	2.5E-06	6.6E-08	1.84E-03	mg/kg-day	5.0E-02	5.0E-02	9.0E+00	0.0002
			SVOCs														
			1,1-Biphenyl	1.90E-02	mg/m^3	3.09E-05	mg/kg-day	8.0E-03	8.0E-03	NA	NA	2.16E-03	mg/kg-day	1.0E-01	1.0E-01	4.0E-03	0.5
			Carbazole	7.23E-04	mg/m^3	1.18E-06	mg/kg-day	NA	NA	NA	NA	8.26E-05	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Dibenzofuran	3.96E-02	mg/m^3	6.45E-05	mg/kg-day	NA	NA	NA	NA	4.52E-03	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			PAHs														
			2-Methylnapthalene	1.56E-01	mg/m^3	2.55E-04	mg/kg-day	NA	NA	NA	NA	1.78E-02	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			Acenaphthene	7.93E-02	mg/m^3	1.29E-04	mg/kg-day	NA	NA	NA	NA	9.05E-03	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Anthracene	2.40E-02	mg/m^3	3.91E-05	mg/kg-day	NA	NA	NA	NA	2.74E-03	mg/kg-day	1.0E+00	1.0E+00	NA	NA
			Benzo(a)anthracene	4.95E-04	mg/m^3	8.08E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.8E-08	5.66E-05	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	1.93E-05	mg/m^3	3.15E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.9E-08	2.21E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	1
			Benzo(b)fluoranthene	2.63E-05	mg/m^3	4.28E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.6E-09	3.00E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.94E-05	mg/m^3	3.16E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.9E-10	2.21E-06	mg/kg-day	NA	NA	NA	NA
			Chrysene	5.97E-05	mg/m^3	9.73E-08	mg/kg-day	1.0E-03	1.0E-03	6.0E-07	5.8E-11	6.81E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.77E-06	mg/m^3	2.89E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.7E-09	2.02E-07	mg/kg-day	NA	NA	NA	NA
			Fluoranthene	4.55E-04	mg/m^3	7.42E-07	mg/kg-day	NA	NA	NA	NA	5.19E-05	mg/kg-day	1.0E-01	1.0E-01	NA	NA
			Fluorene	4.69E-02	mg/m^3	7.64E-05	mg/kg-day	NA	NA	NA	NA	5.35E-03	mg/kg-day	4.0E-01	4.0E-01	NA	NA
			Indeno(1,2,3-cd)pyrene	4.94E-06	mg/m^3	8.05E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.8E-10	5.63E-07	mg/kg-day	NA	NA	NA	NA
			Naphthalene	2.00E-01	mg/m^3	3.25E-04	mg/kg-day	NA	NA	3.4E-05	1.1E-05	2.28E-02	mg/kg-day	6.0E-01	6.0E-01	3.0E-03	8
			Phenanthrene	5.26E-02	mg/m^3	8.59E-05	mg/kg-day	NA	NA	NA	NA	6.01E-03	mg/kg-day	3.0E-01	3.0E-01	NA	NA
			Pyrene	1.00E-03	mg/m^3	1.64E-06	mg/kg-day	NA	NA	NA	NA	1.15E-04	mg/kg-day	3.0E-01	3.0E-01	NA	NA
		Exposure Route Total*									**1.1E-05**						**9**
	Exposure Medium Total*										**1.5E-05**						**11**
Subsurface Soil Total*											**1.5E-05**					**Subsurface Soil HI**	**11**
Total Pond Area Receptor Risk*											**2.8E-05**						**19**

Notes:
(1) A relative bioavailability factor (RBA) of 0.6 for arsenic is included in the calculation of the ingestion dose, consistent with USEPA methodology in the USEPA RSL tables. The default value is one.
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-23d
Risk Calculations for Construction Worker - Treated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration (1)		SF		Unit Risk		Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	10,587	mg/kg	2.14E-04	mg/kg-day	NA	NA	NA	NA	1.5E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.01
			Arsenic*	2.98	mg/kg	3.61E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	5.4E-08	2.5E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.008
			Thallium*	0.941	mg/kg	1.90E-08	mg/kg-day	NA	NA	NA	NA	1.3E-06	mg/kg-day	4.0E-05	4.0E-05	NA	0.03
			PAHs														
			Benzo(a)anthracene	4.444	mg/kg	8.97E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	9.0E-09	6.3E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.289	mg/kg	6.64E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.6E-08	4.6E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.02
			Benzo(b)fluoranthene	6.356	mg/kg	1.28E-07	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.3E-08	9.0E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.5518	mg/kg	1.11E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.1E-08	7.8E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	4.63E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.6E-09	3.2E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**1.0E-07**						**0.02**
		Dermal Contact	***Inorganics***														
			Aluminum*	10,587	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic*	2.98	mg/kg	5.78E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	8.7E-09	4.05E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.001
			Thallium*	0.941	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-05	4.0E-05	NA	NA
			PAHs														
			Benzo(a)anthracene	4.444	mg/kg	3.74E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.7E-09	2.62E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	3.289	mg/kg	2.77E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.8E-08	1.94E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.006
			Benzo(b)fluoranthene	6.356	mg/kg	5.35E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.3E-09	3.74E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.5518	mg/kg	4.64E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.6E-09	3.25E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.293	mg/kg	1.93E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.9E-09	1.35E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**4.3E-08**						**0.006**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Aluminum*	2.31E-03	mg/m^3	3.77E-06	mg/kg-day	NA	NA	NA	NA	2.64E-04	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.05
			Arsenic*	6.50E-07	mg/m^3	1.06E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	4.6E-09	7.42E-08	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.005
			Thallium*	2.05E-07	mg/m^3	3.35E-10	mg/kg-day	NA	NA	NA	NA	2.34E-08	mg/kg-day	4.0E-05	4.0E-05	NA	NA
			PAHs														
			Benzo(a)anthracene	7.60E-06	mg/m^3	1.24E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	7.4E-10	8.68E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	7.18E-07	mg/m^3	1.17E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	7.0E-10	8.19E-08	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.04
			Benzo(b)fluoranthene	1.39E-06	mg/m^3	2.26E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.4E-10	1.58E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.20E-07	mg/m^3	1.96E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.2E-10	1.37E-08	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	5.00E-07	mg/m^3	8.16E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.9E-11	5.71E-08	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**1.7E-09**						**0.04**
	Exposure Medium Total*										**1.5E-07**						**0.06**
Surface Soil (0 to 1 foot bgs) Total*											**1.5E-07**					**Surface Soil HI**	**0.06**

Table 2-23d
Risk Calculations for Construction Worker - Treated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration (1)		SF		Unit Risk		Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Subsurface Soil	Subsurface Soil	Incidental Ingestion	***PAHs***														
			Benzo(a)pyrene	0.0642	mg/kg	1.30E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.3E-09	9.07E-08	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0003
		Exposure Route Total									**1.3E-09**						**0.0003**
		Dermal Contact	***PAHs***														
			Benzo(a)pyrene	0.0642	mg/kg	5.40E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	5.4E-10	3.78E-08	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0001
		Exposure Route Total									**5.4E-10**						**0.0001**
		Inhalation (via Particulate and Vapor Emissions)	***PAHs***														
			Benzo(a)pyrene	1.40E-08	mg/m^3	2.28E-11	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.4E-11	1.60E-09	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0008
		Exposure Route Total									**1.4E-11**						**0.0008**
	Exposure Medium Total										**1.8E-09**						**0.001**
Subsurface Soil Total											**1.8E-09**					**Subsurface Soil HI**	**0.001**
Total Treated Wood Storage Area Receptor Risk*											**1.5E-07**						**0.06**

Notes:
(1) A relative bioavailability factor (RBA) of 0.6 for arsenic is included in the calculation of the ingestion dose, consistent with USEPA methodology in the USEPA RSL tables. The default value is one.
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
PAHs - Polycyclic Aromatic Hydrocarbons
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-23e
Risk Calculations for Construction Worker - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Arsenic*	4.440	mg/kg	5.38E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	8.1E-08	3.8E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.01
			Hexavalent Chromium*	1.710	mg/kg	3.45E-08	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	1.7E-08	2.4E-06	mg/kg-day	5.0E-03	1.3E-04	3.0E-04	0.0005
			PAHs														
			Benzo(a)anthracene	1.989	mg/kg	4.01E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.0E-09	2.8E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	2.116	mg/kg	4.27E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.3E-08	3.0E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.01
			Benzo(b)fluoranthene	2.826	mg/kg	5.70E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	5.7E-09	4.0E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.223	mg/kg	2.47E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	2.5E-10	1.7E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.340	mg/kg	6.86E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.9E-09	4.8E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	3.28E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.3E-09	2.3E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**6.3E-08**						**0.01**
		Dermal Contact	***Inorganics***														
			Arsenic*	4.440	mg/kg	8.62E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.3E-08	6.03E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.002
			Hexavalent Chromium*	1.710	mg/kg	NA	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	NA	NA	mg/kg-day	5.0E-03	1.3E-04	3.0E-04	NA
			PAHs														
			Benzo(a)anthracene	1.989	mg/kg	1.67E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.7E-09	1.17E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	2.116	mg/kg	1.78E-08	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	1.8E-08	1.25E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.004
			Benzo(b)fluoranthene	2.826	mg/kg	2.38E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	2.4E-09	1.66E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.223	mg/kg	1.03E-08	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	1.0E-10	7.20E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.340	mg/kg	2.86E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.9E-09	2.00E-07	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.625	mg/kg	1.37E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.4E-09	9.57E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**2.6E-08**						**0.004**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Arsenic*	9.69E-07	mg/m^3	1.58E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	6.8E-09	1.11E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.007
			Hexavalent Chromium*	3.73E-07	mg/m^3	6.09E-10	mg/kg-day	5.0E-01	1.3E-02	8.4E-02	5.1E-08	4.26E-08	mg/kg-day	5.0E-03	1.3E-04	3.0E-04	0.0001
			PAHs														
			Benzo(a)anthracene	3.40E-06	mg/m^3	5.55E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.3E-10	3.88E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	4.62E-07	mg/m^3	7.53E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	4.5E-10	5.27E-08	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.03
			Benzo(b)fluoranthene	6.17E-07	mg/m^3	1.01E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	6.0E-11	7.04E-08	mg/kg-day	NA	NA	NA	NA
			Benzo(k)fluoranthene	2.67E-07	mg/m^3	4.35E-10	mg/kg-day	1.0E-02	1.0E-02	6.0E-06	2.6E-12	3.05E-08	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	7.42E-08	mg/m^3	1.21E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	7.3E-11	8.47E-09	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	3.55E-07	mg/m^3	5.78E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.5E-11	4.05E-08	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**9.6E-10**						**0.03**
	Exposure Medium Total*										**9.0E-08**						**0.04**
Surface Soil (0 to 1 foot bgs) Total*											**9.0E-08**					**Surface Soil HI**	**0.04**

Table 2-23e
Risk Calculations for Construction Worker - Untreated Wood Storage Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration		SF		Unit Risk		Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral $(mg/kg\text{-}day)^{-1}$	Abs. Dermal $(mg/kg\text{-}day)^{-1}$	Inhalation $(ug/m^3)^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Subsurface Soil	Subsurface Soil	Incidental Ingestion	***SVOCs***														
			2,6-Dinitrotoluene	0.650	mg/kg	1.31E-08	mg/kg-day	1.5E+00	NA	NA	2.0E-08	9.18E-07	mg/kg-day	4.0E-03	4.0E-03	NA	0.0002
			PAHs														
			Benzo(a)anthracene	0.214	mg/kg	4.33E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.3E-10	3.03E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.302	mg/kg	6.10E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.1E-09	4.27E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.001
			Benzo(b)fluoranthene	0.730	mg/kg	1.47E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.5E-09	1.03E-06	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.370	mg/kg	7.47E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	7.5E-09	5.23E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total									**3.5E-08**						**0.002**
		Dermal Contact	***SVOCs***														
			2,6-Dinitrotoluene	0.650	mg/kg	4.21E-09	mg/kg-day	1.5E+00	NA	NA	NA	2.94E-07	mg/kg-day	4.0E-03	4.0E-03	NA	0.00007
			PAHs														
			Benzo(a)anthracene	0.214	mg/kg	1.80E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.8E-10	1.26E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.302	mg/kg	2.54E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	2.5E-09	1.78E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.0006
			Benzo(b)fluoranthene	0.730	mg/kg	6.14E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	6.1E-10	4.30E-07	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	0.370	mg/kg	3.11E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.1E-09	2.18E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total									**6.5E-09**						**0.0007**
		Inhalation (via Particulate and Vapor Emissions)	***SVOCs***														
			2,6-Dinitrotoluene	1.42E-07	mg/m^3	2.31E-10	mg/kg-day	1.5E+00	NA	NA	NA	1.62E-08	mg/kg-day	4.0E-03	4.0E-03	NA	NA
			PAHs														
			Benzo(a)anthracene	3.67E-07	mg/m^3	5.98E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.6E-11	4.19E-08	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	6.60E-08	mg/m^3	1.08E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	6.5E-11	7.53E-09	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.004
			Benzo(b)fluoranthene	1.59E-07	mg/m^3	2.60E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.6E-11	1.82E-08	mg/kg-day	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	8.08E-08	mg/m^3	1.32E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	7.9E-11	9.22E-09	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total									**2.0E-10**						**0.004**
	Exposure Medium Total										**4.2E-08**						**0.006**
Subsurface Soil Total											**4.2E-08**					**Subsurface Soil HI**	**0.006**
Total Untreated Wood Storage Area Receptor Risk*											**1.3E-07**						**0.05**

Notes:
(1) A relative bioavailability factor (RBA) of 0.6 for arsenic is included in the calculation of the ingestion dose, consistent with USEPA methodology in the USEPA RSL tables. The default value is one.
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$ - 1/milligrams per kilogram-day
$(ug/m^3)^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-23f
Risk Calculations for Construction Worker - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration (1)		Chronic SF		Unit Risk		Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral (mg/kg-day)$^{-1}$	Abs. Dermal (mg/kg-day)$^{-1}$	Inhalation (ug/m^3)$^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Incidental Ingestion	***Inorganics***														
			Aluminum*	6,295	mg/kg	1.27E-04	mg/kg-day	NA	NA	NA	NA	1.8E-02	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.02
			Arsenic	6.674	mg/kg	8.08E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.2E-07	1.1E-05	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.04
			Cobalt	1.144	mg/kg	2.31E-08	mg/kg-day	NA	NA	9.0E-03	NA	3.2E-06	mg/kg-day	3.0E-03	3.0E-03	2.0E-05	0.001
			Hexavalent Chromium*	0.912	mg/kg	1.84E-08	mg/kg-day	5.0E-01	2.0E+01	8.4E-02	9.2E-09	2.6E-06	mg/kg-day	5.0E-03	1.3E-04	3.0E-04	0.0005
			Iron*	4,022	mg/kg	8.12E-05	mg/kg-day	NA	NA	NA	NA	1.1E-02	mg/kg-day	7.0E-01	7.0E-01	NA	0.02
			Manganese*	96.7	mg/kg	1.95E-06	mg/kg-day	NA	NA	NA	NA	2.7E-04	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.01
			Thallium*	0.96	mg/kg	1.94E-08	mg/kg-day	NA	NA	NA	NA	2.7E-06	mg/kg-day	4.0E-05	4.0E-05	NA	0.07
			Vanadium*	11.02	mg/kg	2.22E-07	mg/kg-day	NA	NA	NA	NA	3.1E-05	mg/kg-day	1.0E-02	2.6E-04	1.0E-04	0.003
			VOCs														
			Acrolein	0.011	mg/kg	2.22E-10	mg/kg-day	NA	NA	NA	NA	3.1E-08	mg/kg-day	4.0E-03	4.0E-03	9.2E-05	0.000008
			PAHs														
			Benzo(a)anthracene	0.530	mg/kg	1.07E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.1E-09	1.5E-06	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.454	mg/kg	9.16E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	9.2E-09	1.3E-06	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.004
			Benzo(b)fluoranthene	1.511	mg/kg	3.05E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.0E-09	4.3E-06	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	7.25E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	7.3E-10	1.0E-06	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**1.4E-07**						**0.04**
		Dermal Contact	***Inorganics***														
			Aluminum*	6,295	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	NA
			Arsenic	6.674	mg/kg	1.30E-08	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.9E-08	1.81E-06	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.006
			Cobalt	1.144	mg/kg	NA	mg/kg-day	NA	NA	9.0E-03	NA	NA	mg/kg-day	3.0E-03	3.0E-03	2.0E-05	NA
			Hexavalent Chromium*	0.912	mg/kg	NA	mg/kg-day	5.0E-01	2.0E+01	8.4E-02	NA	NA	mg/kg-day	5.0E-03	1.3E-04	3.0E-04	NA
			Iron*	4,022	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese*	96.7	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	NA
			Thallium*	0.96	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-05	4.0E-05	NA	NA
			Vanadium*	11.02	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	1.0E-02	2.6E-04	1.0E-04	NA
			VOCs														
			Acrolein	0.011	mg/kg	NA	mg/kg-day	NA	NA	NA	NA	NA	mg/kg-day	4.0E-03	4.0E-03	9.2E-05	NA
			PAHs														
			Benzo(a)anthracene	0.530	mg/kg	4.46E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	4.5E-10	6.24E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	0.454	mg/kg	3.82E-09	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	3.8E-09	5.34E-07	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.002
			Benzo(b)fluoranthene	1.511	mg/kg	1.27E-08	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	1.3E-09	1.78E-06	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	0.359	mg/kg	3.02E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.0E-10	4.23E-07	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**2.5E-08**						**0.008**
		Inhalation (via Particulate and Vapor Emissions)	***Inorganics***														
			Aluminum*	1.37E-03	mg/m^3	2.24E-06	mg/kg-day	NA	NA	NA	NA	3.14E-04	mg/kg-day	1.0E+00	1.0E+00	5.0E-03	0.06
			Arsenic	1.46E-06	mg/m^3	2.38E-09	mg/kg-day	1.5E+00	1.5E+00	4.3E-03	1.0E-08	3.33E-07	mg/kg-day	3.0E-04	3.0E-04	1.5E-05	0.02
			Cobalt	2.50E-07	mg/m^3	4.07E-10	mg/kg-day	NA	NA	9.0E-03	3.7E-09	5.70E-08	mg/kg-day	3.0E-03	3.0E-03	2.0E-05	0.003
			Hexavalent Chromium*	1.99E-07	mg/m^3	3.25E-10	mg/kg-day	5.0E-01	2.0E+01	8.4E-02	2.7E-08	4.54E-08	mg/kg-day	5.0E-03	1.3E-04	3.0E-04	0.0002

Table 2-23f
Risk Calculations for Construction Worker - Eastern Upland Area
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Noncancer Hazard Calculations					
						Intake/Exposure Concentration (1)		Chronic SF		Unit Risk		Intake/Exposure Concentration		Subchronic RfD		Subchronic RfC	
				Value	Units	Value	Units	Oral (mg/kg-day)$^{-1}$	Abs. Dermal (mg/kg-day)$^{-1}$	Inhalation (ug/m^3)$^{-1}$	Cancer Risk	Value	Units	Oral mg/kg-day	Abs. Dermal mg/kg-day	Inhalation mg/m^3	Hazard Quotient
Surface Soil (0-1 foot bgs)	Surface Soil (0-1 foot bgs)	Inhalation (via Particulate and Vapor Emissions)	Iron*	8.78E-04	mg/m^3	1.43E-06	mg/kg-day	NA	NA	NA	NA	2.00E-04	mg/kg-day	7.0E-01	7.0E-01	NA	NA
			Manganese*	2.11E-05	mg/m^3	3.44E-08	mg/kg-day	NA	NA	NA	NA	4.82E-06	mg/kg-day	2.4E-02	9.6E-04	5.0E-05	0.1
			Thallium*	2.10E-07	mg/m^3	3.42E-10	mg/kg-day	NA	NA	NA	NA	4.78E-08	mg/kg-day	4.0E-05	4.0E-05	NA	NA
			Vanadium*	2.41E-06	mg/m^3	3.92E-09	mg/kg-day	NA	NA	NA	NA	5.49E-07	mg/kg-day	1.0E-02	2.6E-04	1.0E-04	0.005
			VOCs														
			Acrolein	1.24E-05	mg/kg	2.02E-08	mg/kg-day	NA	NA	NA	NA	2.82E-06	mg/kg-day	4.0E-03	4.0E-03	9.2E-05	0.03
			PAHs														
			Benzo(a)anthracene	9.07E-07	mg/m^3	1.48E-09	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	8.9E-11	2.07E-07	mg/kg-day	NA	NA	NA	NA
			Benzo(a)pyrene	9.90E-08	mg/m^3	1.62E-10	mg/kg-day	1.0E+00	1.0E+00	6.0E-04	9.7E-11	2.26E-08	mg/kg-day	3.0E-04	3.0E-04	2.0E-06	0.01
			Benzo(b)fluoranthene	3.30E-07	mg/m^3	5.38E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	3.2E-11	7.53E-08	mg/kg-day	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	7.84E-08	mg/m^3	1.28E-10	mg/kg-day	1.0E-01	1.0E-01	6.0E-05	7.7E-12	1.79E-08	mg/kg-day	NA	NA	NA	NA
		Exposure Route Total*									**1.4E-08**						**0.07**
	Exposure Medium Total*										**1.7E-07**						**0.1**
Surface Soil (0 to 1 foot bgs) Total*											**1.7E-07**					**Surface Soil HI**	**0.1**
Total Eastern Upland Area Receptor Risk*											**1.7E-07**						**0.1**

Notes:
(1) A relative bioavailability factor (RBA) of 0.6 for arsenic is included in the calculation of the ingestion dose, consistent with USEPA methodology in the USEPA RSL tables. The default value is one.
EPC - Exposure Point Concentration. Concentrations obtained from Tables 2-7 through 2-11.
SF - Carcinogenic Slope Factor
RfD - Reference Dose (Non-Carcinogenic)
RfC - Reference Concentration (Non-Carcinogenic)
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
mg/kg- milligrams per kilogram
mg/kg-day - milligrams per kilogram-day
(mg/kg-day)$^{-1}$ - 1/milligrams per kilogram-day
(ug/m^3)$^{-1}$ - 1/micrograms per meter cubed
mg/m^3 - milligrams per meter cubed
bgs - below ground surface
* Indicates constituent is not site-related and, therefore, the calculated risk is not included in the route-specific and total receptor risk. See Section 2.6.5 and Appendices F through H for further explanation.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 2-24
Model Summary VISL Calculator
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Constituent	Site Groundwater Concentration (ug/L)	Indoor Air Concentration (ug/m^3)	Resident		Indoor Worker	
			VI Carcinogenic Risk	VI Hazard	VI Carcinogenic Risk	VI Hazard
Benz(a)anthracene	3.8E-01	1.9E-04	1.1E-08	No RfC	9.2E-10	No RfC
Benzene	1.5E+01	3.4E+00	9.4E-06	1.1E-01	2.2E-06	2.6E-02
1,1-Biphenyl	8.3E+01	1.0E+00	No IUR	2.6E+00	No IUR	6.0E-01
Chloroform	8.7E+01	1.3E+01	1.1E-04	1.3E-01	2.4E-05	3.0E-02
Ethylbenzene	3.7E+01	1.2E+01	1.1E-05	1.1E-02	2.4E-06	2.7E-03
Naphthalene	4.2E+03	7.6E+01	9.2E-04	2.4E+01	2.1E-04	5.8E+00
Toluene	3.1E+01	8.5E+00	No IUR	1.6E-03	No IUR	3.9E-04
1,2,4-Trimethylbenzene	1.8E+02	4.6E+01	No IUR	7.2E-01	No IUR	1.7E-01
1,3,5-Trimethylbenzene	3.8E+01	1.4E+01	No IUR	2.2E-01	No IUR	5.2E-02
Total Xylenes	1.4E+02	3.9E+01	No IUR	3.7E-01	No IUR	8.9E-02
Total Risk/Hazard =			**1.0E-03**	**2.8E+01**	**2.4E-04**	**6.7E+00**

Notes:
VI - Vapor Intrusion
RfC - Reference Concentration
IUR - Inhalation Unit Risk
Highlight indicates VI carcinogenic risk greater than the target risk for carcinogens (10^{-6}) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (10^{-1}).
Shallow groundwater exist at the Site and can be up to 15 feet below ground surface.
ug/L - micrograms per liter
ug/m^3 - micrograms per cubic meter
VISL - Vapor Intrusion Screening Level

Prepared By: RAH 12/16/2018
Checked By: SMA 12/26/2018

Table 2-25
Soil Concentrations Protective of Groundwater
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Chemical	MCL-based SL (mg/kg)	Noncarcinogenic Adult SL THQ=1 (mg/kg)	Noncarcinogenic Child SL THQ=1 (mg/kg)	Carcinogenic SL (mg/kg)	Risk-Based SL (mg/kg)
Acenaphthene	--	8.63E+00	5.49E+00	--	5.49E+00
Anthracene	--	9.00E+01	5.81E+01	--	5.81E+01
Benz[a]anthracene	--	--	--	1.05E-02	1.05E-02
Benzo(j)fluoranthene	--	--	--	7.78E-02	7.78E-02
Benzo[a]pyrene	2.35E-01	1.18E+01	7.07E+00	2.94E-02	2.94E-02
Benzo[b]fluoranthene	--	--	--	3.00E-01	3.00E-01
Benzo[g,h,i]perylene	--	--	--	--	--
Benzo[k]fluoranthene	--	--	--	2.94E+00	2.94E+00
Biphenyl, 1,1'-	--	8.72E-03	8.72E-03	4.09E-02	8.72E-03
Bis(2-chloroethyl)ether	--	--	--	3.61E-06	3.61E-06
Carbazole	--	--	--	--	--
Dibenz[a,h]anthracene	--	--	--	9.58E-02	9.58E-02
Dibenzofuran	--	2.28E-01	1.46E-01	--	1.46E-01
Fluoranthene	--	1.48E+02	8.91E+01	--	8.91E+01
Fluorene	--	8.50E+00	5.45E+00	--	5.45E+00
Indeno[1,2,3-cd]pyrene	--	--	--	9.78E-01	9.78E-01
Naphthalene	--	2.03E-02	2.01E-02	5.43E-04	5.43E-04
Phenanthrene	--	--	--	--	--
Pyrene	--	2.02E+01	1.32E+01	--	1.32E+01

Notes:
mg/kg - milligrams per kilogram
MCL - Maximum Contaminant Level
SL - Screening Level
THQ - Target Harzard Quotient
-- - Not applicable

Prepared By: DME 1/4/2018
Checked By: DAR 1/5/2018

Table 3-1a
Summary of Receptor Risks and Hazards for COPCs - Child Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Groundwater	Groundwater	Groundwater	***Inorganics***									
			Aluminum	NA	NA	NA	NA	Nervous	0.2	NC	NA	0.2
			Arsenic	2.6E-04	NC	NA	2.6E-04	Cardiovascular, Dermal	7	NC	NA	7
			Cobalt	NA	NC	NA	NA	Thyroid	0.7	NC	NA	0.7
			Iron	NA	NA	NA	NA	Gastrointestinal	3	NC	NA	3
			Manganese	NA	NA	NA	NA	Nervous	1	NC	NA	1
			Selenium	NA	NA	NA	NA	Nervous, Hematologic, Dermal	2	NC	NA	2
			VOCs									
			1,2,4-Trimethylbenzene	NA	NA	NA	NA	Nervous	0.9	NC	NC	0.9
			1,3,5-Trimethylbenzene	NA	NA	NA	NA	Nervous	0.2	NC	NC	0.2
			Benzene	3.5E-06	NC	NC	3.5E-06	Immune	0.2	NC	NC	0.2
			Chloroform	1.1E-05	NC	NC	1.1E-05	Hepatic	0.4	NC	NC	0.4
			Ethylbenzene	1.7E-06	NC	NC	1.7E-06	Developmental	0.02	NC	NC	0.02
			Toluene	NA	NA	NA	NA	Urinary	0.02	NC	NC	0.02
			Total Xylenes	NA	NA	NA	NA	Nervous	0.04	NC	NC	0.04
			SVOCs									
			(3-and/or 4-)Methylphenol	NA	NA	NA	NA	Nervous	0.02	NC	NA	0.02
			1,1-Biphenyl	2.8E-06	NC	NA	2.8E-06	Hepatic, Renal	0.008	NC	NC	0.008
			2,4-Dimethylphenol	NA	NA	NA	NA	Nervous, Hematologic	0.5	NC	NA	0.5
			2-Methylphenol	NA	NA	NA	NA	Nervous, Other	0.02	NC	NA	0.02
			Bis(2-ethylhexyl)phthalate	6.0E-07	NC	NA	6.0E-07	Hepatic	0.02	NA	NA	0.02
			Carbazole	NA	NA	NA	NA	Renal	0.4	NA	NA	0.4
			Dibenzofuran	NA	NA	NA	NA	Hepatic	12	NA	NA	12
			Pyridine	NA	NA	NA	NA	Hepatic	1	NA	NA	1
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	7	NC	NA	7
			Acenaphthylene	NA	NA	NA	NA	Renal	0.01	NC	NA	0.01
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.3	NC	NA	0.3
			Benzo(a)anthracene	NA	NC	NC	NC	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NC	NA	NA	Developmental	0.5	NC	NA	0.5
			Benzo(b)fluoranthene	NA	NC	NA	NA	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	NA	NC	NA	NA	NA	NA	NA	NA	NA

Table 3-1a
Summary of Receptor Risks and Hazards for COPCs - Child Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Groundwater	Groundwater	Groundwater	Dibenzo(a,h)anthracene	NA	NC	NA	NA	NA	NA	NA	NA	NA
			Fluorene	NA	NA	NA	NA	Hematologic	0.2	NC	NA	0.2
			Indeno(1,2,3-cd)pyrene	NA	NC	NA	NA	NA	NA	NA	NA	NA
			Naphthalene	NA	NC	NC	NA	Nervous, Respiratory	11	NC	NC	11
			1-Methylnaphthalene	6.0E-05	NC	NA	6.0E-05	Dermal, Nervous and Respiratory	0.3	NC	NA	0.3
			Phenanthrene	NA	NA	NA	NA	Renal	0.2	NC	NA	0.2
			Pyrene	NA	NA	NA	NA	Renal	0.01	NC	NA	0.01
			Pesticides									
			Pentachlorophenol	1.4E-06	NC	NA	1.4E-06	Hepatic	0.008	NC	NA	0.008
			Chemical Total	**3.5E-04**	**NA**	**NA**	**3.5E-04**		**49**	**NA**	**NA**	**49**
		Exposure Point Total					**3.5E-04**					**49**
	Exposure Medium Total						**3.5E-04**					**49**
Groundwater Total							**3.5E-04**					**49**
Soil	Surface Soil (0 -1 foot bgs)	Process Area	***SVOCs***									
			Carbazole	NA	NA	NA	NA	Renal	0.04	0.008	NA	0.04
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.7	0.2	NA	0.9
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.08	0.02	NA	0.1
			Anthracene	NA	NA	NA	NA	No Observed Effects	0.03	0.009	NA	0.04
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	1	0.5	0.03	2
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.08	0.02	NA	0.1
			Fluorene	NA	NA	NA	NA	Hematologic	0.03	0.009	NA	0.04
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	8.4E-07	8.4E-07	Nervous, Respiratory	0.01	0.004	0.1	0.1
			Phenanthrene	NA	NA	NA	NA	Renal	0.2	0.06	NA	0.3
			Pyrene	NA	NA	NA	NA	Renal	0.09	0.03	NA	0.1
			Chemical Total	**NA**	**NA**	**8.4E-07**	**8.4E-07**		**3**	**0.8**	**0.1**	**4**
		Exposure Point Total					**8.4E-07**					**4**
	Receptor Total - Process Area (includes groundwater; see footnote [1])						**3.5E-04**					**53**

Table 3-1a
Summary of Receptor Risks and Hazards for COPCs - Child Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Pond Area	***Inorganics***									
			Arsenic	2.9E-05	3.5E-06	1.7E-08	3.3E-05	Cardiovascular, Dermal	0.8	0.09	0.003	0.9
			VOCs									
			Benzene	9.6E-08	NA	2.2E-07	3.1E-07	Immune	0.005	NA	0.01	0.02
			Ethylbenzene	5.3E-07	NA	1.2E-06	1.7E-06	Hepatic, Renal	0.006	NA	0.006	0.01
			Total Xylenes	NA	NA	NA	NA	Other	0.005	NA	0.1	0.1
			SVOCs									
			Carbazole	NA	NA	NA	NA	Renal	0.1	0.03	NA	0.1
			Dibenzofuran	NA	NA	NA	NA	Hepatic	8	2	NA	10
			1,1-Biphenyl	8.8E-07	2.1E-07	NA	1.1E-06	Renal	0.003	0.0006	2	2
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	2	0.6	NA	3
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.2	0.06	NA	0.3
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	3	0.9	0.05	4
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.3	0.1	NA	0.4
			Fluorene	NA	NA	NA	NA	Hematologic	0.3	0.08	NA	0.3
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	4.0E-05	4.0E-05	Nervous, Respiratory	0.6	0.2	5	5
			Phenanthrene	NA	NA	NA	NA	Renal	0.4	0.1	NA	0.5
			Pyrene	NA	NA	NA	NA	Renal	0.3	0.09	NA	0.4
			Pesticides									
			Aldrin	2.8E-06	NA	6.0E-05	6.3E-05	Hepatic	0.06	NA	NA	0.06
			Chemical Total	**3.4E-05**	**3.7E-06**	**1.0E-04**	**1.4E-04**		**16**	**4**	**6**	**27**
		Exposure Point Total					**1.4E-04**					**27**
	Receptor Total - Pond Area (includes groundwater; see footnote [1])						**4.9E-04**					**76**
Soil	Surface Soil	Treated Wood Storage	***PAHs***									
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	0.1	0.04	0.003	0.2
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	**NA**	**NA**	**NA**	**NA**		**0.1**	**0.04**	**0.003**	**0.2**
		Exposure Point Total					**NA**					**0.2**
	Receptor Total - Treated Wood Storage Area						**NA**					**0.2**

Table 3-1a
Summary of Receptor Risks and Hazards for COPCs - Child Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Child Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Untreated Wood Storage	***PAHs***									
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	0.09	0.03	0.002	0.1
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	**NA**	**NA**	**NA**	**NA**		**0.09**	**0.03**	**0.002**	**0.1**
		Exposure Point Total					**NA**					**0.1**
	Receptor Total - Untreated Wood Storage Area						**NA**					**0.1**
Soil	Surface Soil (0 -1 foot bgs)	Eastern Upland Area	***Inorganics***									
			Arsenic	6.6E-06	7.8E-07	3.8E-09	7.4E-06	Cardiovascular, Dermal	0.2	0.02	0.0007	0.2
			Cobalt	NA	NA	1.3E-09	1.3E-09	Thyroid	0.05	NA	0.0003	0.05
			VOCs									
			Acrolein	NA	NA	NA	NA	Other	0.0003	NA	0.06	0.06
			PAHs									
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	0.02	0.006	0.0003	0.03
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	**6.6E-06**	**7.8E-07**	**5.1E-09**	**7.4E-06**		**0.2**	**0.03**	**0.06**	**0.3**
		Exposure Point Total					**7.4E-06**					**0.3**
	Receptor Total - Eastern Upland Area						**7.4E-06**					**0.3**

Notes:
COPCs - Chemicals of Potential Concern
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
NC - Not Calculated; the risk to a Child Resident is accounted for in the assessment of the Adult Resident.
bgs - below ground surface
BOLD highlighted cells - Target organ HI exceeds threshold of 1.0.
[1] Future child resident's exposure to 'core of the plume' groundwater is limited to the Process and Pond Areas.
[2] Target organ HI segregation is presented for exposure scenarios that present a cumulative HI greater than 1.0. Per the USEPA Region 4 Human Health Risk Assessment Supplemental Guidance dated March 2018, inhalation and dermal exposure to VOCs from bathing/showering is conservatively assumed to be equivalent to exposure from the daily ingestion of contaminated water per day. If ingestion risk is non-calculable, risk from this exposure route is based on dermal risk. The pathway is considered incomplete (NA) if both ingestion and dermal risk are non-calculable.
*Value shown for **groundwater** dermal risk represents combined dermal and inhalation risks from showering in accordance with the simplistic approach from Region 4 EPA's HHRA Supplemental Guidance (USEPA, 2018).
Value shown for the **groundwater inhalation pathway represents risk from the inhalation of volatiles in indoor air only.

Target Organ Effects/Exposure Area [1,2]	Process Area (soil and groundwater)	Pond Area (soil and groundwater)	Treated Wood Storage Area	Eastern Upland Area
Cardiovascular HI Across All Media	**7**	**8**	NA	0.2
Dermal/Skin HI Across All Media	**9**	**10**	NA	0.2
Developmental HI Across All Media	**3**	**4**	0.2	0.03
Gastrointestinal HI Across All Media	**3**	**3**	NA	NA
Hepatic HI Across All Media	**15**	**26**	NA	NA
Hematologic HI Across All Media	**2**	**3**	NA	NA
Immune HI Across All Media	0.2	0.2	NA	NA
Nervous HI Across All Media	**16**	**21**	NA	NA
No Observed Effects HI Across All Media	0.04	NA	NA	NA
Other HI Across All Media	0.02	0.1	NA	0.06
Renal HI Across All Media	**1**	**4**	NA	NA
Respiratory HI Across All Media	**18**	**26**	NA	NA
Thyroid HI Across All Media	0.7	0.7	NA	0.05
Urinary Across All Media	0.02	0.02	NA	NA

Prepared By: SMA 3/28/2019
Checked By: RAH 3/28/2019

Table 3-1b
Summary of Receptor Risks and Hazards for COPCs - Adult Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Groundwater	Groundwater	Groundwater	***Inorganics***									
			Aluminum	NA	NA	NA	NA	Nervous	0.1	0.0005	NA	0.1
			Arsenic	5.3E-04	4.2E-06	NA	5.3E-04	Cardiovascular, Dermal	4	0.02	NA	4
			Cobalt	NA	NA	NA	NA	Thyroid	0.4	0.0009	NA	0.4
			Iron	NA	NA	NA	NA	Gastrointestinal	2	0.009	NA	2
			Manganese	NA	NA	NA	NA	Nervous	0.9	0.1	NA	1
			Selenium	NA	NA	NA	NA	Nervous, Hematologic, Dermal	1	0.005	NA	1
			VOCs									
			1,2,4-Trimethylbenzene	NA	NA	NA	NA	Nervous	0.5	0.5	0.7	2
			1,3,5-Trimethylbenzene	NA	NA	NA	NA	Nervous	0.1	0.1	0.2	0.4
			Benzene	7.0E-06	1.1E-05	9.4E-06	2.7E-05	Immune	0.1	0.1	0.1	0.3
			Chloroform	2.3E-05	3.4E-05	1.1E-04	1.6E-04	Hepatic	0.3	0.3	0.1	0.6
			Ethylbenzene	3.5E-06	5.2E-06	1.1E-05	1.9E-05	Developmental	0.01	0.01	0.01	0.03
			Toluene	NA	NA	NA	NA	Urinary	0.01	0.01	0.002	0.02
			Total Xylenes	NA	NA	NA	NA	Nervous	0.02	0.02	0.4	0.4
			SVOCs									
			(3-and/or 4-)Methylphenol	NA	NA	NA	NA	Nervous	0.02	0.001	NA	0.02
			1,1-Biphenyl	5.7E-06	8.5E-06	NA	1.4E-05	Hepatic, Renal	0.005	0.005	3	3
			2,4-Dimethylphenol	NA	NA	NA	NA	Nervous, Hematologic	0.3	0.04	NA	0.3
			2-Methylphenol	NA	NA	NA	NA	Nervous, Other	0.01	0.001	NA	0.01
			Bis(2-ethylhexyl)phthalate	1.2E-06	1.8E-06	NA	3.0E-06	Hepatic	0.01	0.01	NA	0.03
			Carbazole	NA	NA	NA	NA	Renal	0.2	0.2	NA	0.4
			Dibenzofuran	NA	NA	NA	NA	Hepatic	7	7	NA	15
			Pyridine	NA	NA	NA	NA	Hepatic	0.9	0.9	NA	2
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	4	4	NA	9
			Acenaphthylene	NA	NA	NA	NA	Renal	0.007	0.007	NA	0.01
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.2	0.2	NA	0.3
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	0.3	NA	NA	0.3
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Fluorene	NA	NA	NA	NA	Hematologic	0.1	0.1	NA	0.2
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 3-1b
Summary of Receptor Risks and Hazards for COPCs - Adult Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Groundwater	Groundwater	Groundwater	Naphthalene	NA	NA	9.2E-04	9.2E-04	Nervous, Respiratory	6	6	24	37
			1-Methylnaphthalene	1.2E-04	1.8E-04	NA	3.0E-04	Dermal, Nervous and Respiratory	0.2	0.2	NA	0.4
			Phenanthrene	NA	NA	NA	NA	Renal	0.1	0.1	NA	0.3
			Pyrene	NA	NA	NA	NA	Renal	0.006	0.006	NA	0.01
			Pesticides									
			Pentachlorophenol	2.9E-06	1.6E-05	NA	1.9E-05	Hepatic	0.005	0.02	NA	0.02
			Chemical Total	**6.9E-04**	**2.6E-04**	**1.0E-03**	**2.0E-03**		**29**	**21**	**28**	**79**
		Exposure Point Total					**2.0E-03**					**79**
	Exposure Medium Total						**2.0E-03**					**79**
Groundwater Total							**2.0E-03**					**79**
Soil	Surface Soil (0 -1 foot bgs)	Process Area	***SVOCs***									
			Carbazole	NA	NA	NA	NA	Renal	0.003	0.001	NA	0.005
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.07	0.03	NA	0.1
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.007	0.004	NA	0.01
			Anthracene	NA	NA	NA	NA	No Observed Effects	0.003	0.002	NA	0.004
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	0.1	0.08	0.03	0.2
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.007	0.004	NA	0.01
			Fluorene	NA	NA	NA	NA	Hematologic	0.003	0.002	NA	0.004
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	2.8E-06	2.8E-06	Nervous, Respiratory	0.001	0.0006	0.1	0.1
			Phenanthrene	NA	NA	NA	NA	Renal	0.02	0.01	NA	0.03
			Pyrene	NA	NA	NA	NA	Renal	0.009	0.005	NA	0.01
			Chemical Total	**NA**	**NA**	**2.8E-06**	**2.8E-06**		**0.3**	**0.1**	**0.1**	**0.5**
		Exposure Point Total					**2.8E-06**					**0.5**
	Receptor Total - Process Area (includes groundwater; see footnote [1])						**2.0E-03**					**79**

Table 3-1b
Summary of Receptor Risks and Hazards for COPCs - Adult Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Pond Area	***Inorganics***									
			Arsenic	9.2E-06	1.9E-06	5.6E-08	1.1E-05	Cardiovascular, Dermal	0.07	0.02	0.003	0.09
			VOCs									
			Benzene	3.0E-08	NA	7.2E-07	7.5E-07	Immune	0.0005	NA	0.01	0.01
			Ethylbenzene	1.7E-07	NA	4.0E-06	4.1E-06	Hepatic, Renal	0.0005	NA	0.006	0.006
			Total Xylenes	NA	NA	NA	NA	Other	0.0005	NA	0.1	0.1
			SVOCs									
			Carbazole	NA	NA	NA	NA	Renal	0.01	0.005	NA	0.02
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.8	0.3	NA	1
			1,1-Biphenyl	2.7E-07	1.2E-07	NA	3.9E-07	Renal	0.0002	0.0001	2	2
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.2	0.1	NA	0.3
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.02	0.01	NA	0.03
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	0.3	0.1	0.05	0.5
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.03	0.02	NA	0.05
			Fluorene	NA	NA	NA	NA	Hematologic	0.02	0.01	NA	0.04
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	1.3E-04	1.3E-04	Nervous, Respiratory	0.05	0.03	5	5
			Phenanthrene	NA	NA	NA	NA	Renal	0.03	0.02	NA	0.05
			Pyrene	NA	NA	NA	NA	Renal	0.03	0.02	NA	0.04
			Pesticides									
			Aldrin	8.7E-07	NA	3.2E-10	8.7E-07	Hepatic	0.006	NA	NA	0.006
			Chemical Total	**1.1E-05**	**2.0E-06**	**1.4E-04**	**1.5E-04**		**2**	**0.7**	**6**	**9**
		Exposure Point Total					**1.5E-04**					**9**
	Receptor Total - Pond Area (includes groundwater; see footnote [1])						**2.2E-03**					**87**
Soil	Surface Soil (0 -1 foot bgs)	Treated Wood Storage	***PAHs***									
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	0.01	0.007	0.003	0.02
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	**NA**	**NA**	**NA**	**NA**		**0.01**	**0.007**	**0.003**	**0.02**
		Exposure Point Total					**NA**					**0.02**
	Receptor Total - Treated Wood Storage Area						**NA**					**0.02**

Table 3-1b
Summary of Receptor Risks and Hazards for COPCs - Adult Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Adult Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Untreated Wood Storage	***PAHs***									
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	0.008	0.005	0.002	0.01
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	**NA**	**NA**	**NA**	**NA**		**0.008**	**0.005**	**0.002**	**0.01**
		Exposure Point Total					**NA**					**0.01**
	Receptor Total - Untreated Wood Storage Area						**NA**					**0.01**
Soil	Surface Soil (0 -1 foot bgs)	Eastern Upland Area	***Inorganics***									
			Arsenic	2.1E-06	4.3E-07	1.3E-08	2.5E-06	Cardiovascular, Dermal	0.02	0.003	0.0007	0.02
			Cobalt	NA	NA	4.5E-09	4.5E-09	Thyroid	0.005	NA	0.0003	0.005
			VOCs									
			Acrolein	NA	NA	NA	NA	Other	0.00003	NA	0.06	0.06
			PAHs									
			Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Benzo(a)pyrene	NA	NA	NA	NA	Developmental	0.002	0.001	0.0003	0.003
			Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	**2.1E-06**	**4.3E-07**	**1.7E-08**	**2.5E-06**		**0.02**	**0.004**	**0.06**	**0.08**
		Exposure Point Total					**2.5E-06**					**0.08**
	Receptor Total - Eastern Upland Area						**2.5E-06**					**0.08**

Target Organ Effects/Exposure Area [1,2]	Process Area (soil and groundwater)	Pond Area (soil and groundwater)
Cardiovascular HI Across All Media	**4**	**4**
Dermal/Skin Histopathology HI Across All Media	**6**	**6**
Developmental HI Across All Media	0.6	**1**
Gastrointestinal HI Across All Media	**2**	**2**
Hepatic HI Across All Media	**20**	**21**
Hematologic HI Across All Media	**2**	**2**
Immune HI Across All Media	0.3	0.3
Nervous HI Across All Media	**43**	**47**
No Observed Effects HI Across All Media	0.004	NA
Other HI Across All Media	0.01	0.1
Renal HI Across All Media	**3**	**5**
Respiratory HI Across All Media	**46**	**51**
Thyroid HI Across All Media	0.4	0.4
Urinary Across All Media	0.02	0.02

Notes:
COPCs - Chemicals of Potential Concern
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
NC - Not Calculated, Included in the Lifetime Resident
bgs - below ground surface
BOLD highlighted cells - Target organ HI exceeds threshold of 1.0.
[1] Future adult resident's exposure to 'core of the plume' groundwater is limited to the Process and Pond Areas.
[2] Target organ HI segregation is presented for exposure scenarios that present a cumulative HI greater than 1.0.
Per the USEPA Region 4 Human Health Risk Assessment Supplemental Guidance dated March 2018, inhalation and dermal exposure to VOCs from bathing/showering is conservatively assumed to be equivalent to exposure from the daily ingestion of contaminated water per day. If ingestion risk is non-calculable, risk from this exposure route is based on dermal risk. The pathway is considered incomplete (not applicable) if both ingestion and dermal risk are non-calculable.
*Value shown for **groundwater** dermal risk represents combined dermal and inhalation risks from showering in accordance with the simplistic approach from Region 4 EPA's HHRA Supplemental Guidance (USEPA 2018).
Value shown for the **groundwater inhalation pathway represents risk from the inhalation of volatiles in indoor air only.

Prepared By: SMA 3/28/2019
Checked By: RAH 3/28/2019

Table 3-1c
Summary of Receptor Risks and Hazards for COPCs - Mutagenic Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident - Mutagenic

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Groundwater	Groundwater	Groundwater	***PAHs***				
			Benzo(a)anthracene	1.6E-06	1.6E-06	1.1E-08	3.2E-06
			Benzo(a)pyrene	1.3E-04	NA	NA	1.3E-04
			Benzo(b)fluoranthene	1.3E-05	NA	NA	1.3E-05
			Benzo(k)fluoranthene	2.1E-06	NA	NA	2.1E-06
			Dibenzo(a,h)anthracene	7.5E-06	NA	NA	7.5E-06
			Indeno(1,2,3-cd)pyrene	4.4E-07	NA	NA	4.4E-07
			Chemical Total	**1.6E-04**	**1.6E-06**	**1.1E-08**	**1.6E-04**
		Exposure Point Total					**1.6E-04**
	Exposure Medium Total						**1.6E-04**
Groundwater Total							**1.6E-04**
Soil	Surface Soil (0 -1 foot bgs)	Process Area	***PAHs***				
			Benzo(a)anthracene	4.9E-05	4.4E-06	6.5E-07	5.4E-05
			Benzo(a)pyrene	2.6E-04	2.3E-05	3.3E-08	2.8E-04
			Benzo(b)fluoranthene	5.7E-05	5.0E-06	7.2E-09	6.2E-05
			Benzo(k)fluoranthene	2.4E-06	2.2E-07	3.1E-10	2.6E-06
			Chrysene	6.7E-07	5.9E-08	8.5E-11	7.3E-07
			Dibenzo(a,h)anthracene	3.1E-05	2.8E-06	4.0E-09	3.4E-05
			Indeno(1,2,3-cd)pyrene	1.1E-05	9.9E-07	1.4E-09	1.2E-05
			Chemical Total	**4.1E-04**	**3.6E-05**	**6.9E-07**	**4.5E-04**
		Exposure Point Total					**4.5E-04**
	Receptor Total - Process Area (includes groundwater; see footnote [1])						**6.1E-04**

Table 3-1c
Summary of Receptor Risks and Hazards for COPCs - Mutagenic Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident - Mutagenic

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Pond Area	***PAHs***				
			Benzo(a)anthracene	1.4E-04	1.3E-05	1.9E-06	1.6E-04
			Benzo(a)pyrene	5.0E-04	4.5E-05	6.4E-08	5.5E-04
			Benzo(b)fluoranthene	6.5E-05	5.8E-06	8.3E-09	7.1E-05
			Benzo(k)fluoranthene	4.9E-06	4.4E-07	6.3E-10	5.4E-06
			Chrysene	1.1E-06	9.9E-08	1.4E-10	1.2E-06
			Dibenzo(a,h)anthracene	4.8E-05	4.3E-06	6.2E-09	5.3E-05
			Indeno(1,2,3-cd)pyrene	1.4E-05	1.2E-06	1.8E-09	1.5E-05
			Chemical Total	**7.8E-04**	**6.9E-05**	**2.0E-06**	**8.5E-04**
		Exposure Point Total					**8.5E-04**
	Receptor Total - Pond Area (includes groundwater; see footnote [1])						**1.0E-03**
Soil	Surface Soil (0 -1 foot bgs)	Treated Wood Storage	***PAHs***				
			Benzo(a)anthracene	3.3E-06	2.9E-07	4.3E-08	3.6E-06
			Benzo(a)pyrene	2.4E-05	2.2E-06	3.1E-09	2.6E-05
			Benzo(b)fluoranthene	4.7E-06	4.2E-07	6.0E-10	5.1E-06
			Dibenzo(a,h)anthracene	4.1E-06	3.6E-07	5.2E-10	4.4E-06
			Indeno(1,2,3-cd)pyrene	1.7E-06	1.5E-07	2.2E-10	1.8E-06
			Chemical Total	**3.8E-05**	**3.4E-06**	**4.7E-08**	**4.1E-05**
		Exposure Point Total					**4.1E-05**
	Receptor Total - Treated Wood Storage Area						**4.1E-05**

Table 3-1c
Summary of Receptor Risks and Hazards for COPCs - Mutagenic Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Resident - Mutagenic

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Untreated Wood Storage	***PAHs***				
			Benzo(a)anthracene	1.5E-06	1.3E-07	1.9E-08	1.6E-06
			Benzo(a)pyrene	1.6E-05	1.4E-06	2.0E-09	1.7E-05
			Benzo(b)fluoranthene	2.1E-06	1.9E-07	2.7E-10	2.3E-06
			Benzo(k)fluoranthene	9.0E-08	8.0E-09	1.2E-11	9.8E-08
			Dibenzo(a,h)anthracene	2.5E-06	2.2E-07	3.2E-10	2.7E-06
			Indeno(1,2,3-cd)pyrene	1.2E-06	1.1E-07	1.5E-10	1.3E-06
			Chemical Total	**2.3E-05**	**2.0E-06**	**2.2E-08**	**2.5E-05**
		Exposure Point Total					**2.5E-05**
	Receptor Total - Untreated Wood Storage Area						**2.5E-05**
Soil	Surface Soil (0 -1 foot bgs)	Eastern Upland Area	***PAHs***				
			Benzo(a)anthracene	3.9E-07	3.5E-08	5.1E-09	4.3E-07
			Benzo(a)pyrene	3.4E-06	3.0E-07	4.3E-10	3.7E-06
			Benzo(b)fluoranthene	1.1E-06	9.9E-08	1.4E-10	1.2E-06
			Indeno(1,2,3-cd)pyrene	2.7E-07	2.4E-08	3.4E-11	2.9E-07
			Chemical Total	**5.1E-06**	**4.6E-07**	**5.7E-09**	**5.6E-06**
		Exposure Point Total					**5.6E-06**
	Receptor Total - Eastern Upland Area						**5.6E-06**

Notes:
COPCs - Chemicals of Potential Concern
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
bgs - below ground surface
[1] Future resident's exposure to 'core of the plume' groundwater is limited to the Process and Pond Areas.
*Value shown for **groundwater** dermal risk represents combined dermal and inhalation risks from showering in accordance with the simplistic approach from Region 4 EPA's HHRA Supplemental Guidance (USEPA 2018).
Value shown for the **groundwater inhalation pathway represents risk from the inhalation of volatiles in indoor air only.

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 3-1d
Summary of Receptor Risks and Hazards for COPCs - Lifetime Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Aggregate Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Groundwater	Groundwater	Groundwater	***Inorganics***				
			Aluminum	NA	NA	NA	NA
			Arsenic	7.9E-04	4.2E-06	NA	8.0E-04
			Cobalt	NA	NA	NA	NA
			Iron	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA
			Selenium	NA	NA	NA	NA
			VOCs				
			1,2,4-Trimethylbenzene	NA	NA	NA	NA
			1,3,5-Trimethylbenzene	NA	NA	NA	NA
			Benzene	1.1E-05	1.1E-05	9.4E-06	3.1E-05
			Chloroform	3.4E-05	3.4E-05	1.1E-04	1.7E-04
			Ethylbenzene	5.2E-06	5.2E-06	1.1E-05	2.1E-05
			Toluene	NA	NA	NA	NA
			Total Xylenes	NA	NA	NA	NA
			SVOCs				
			(3-and/or 4-)Methylphenol	NA	NA	NA	NA
			1,1-Biphenyl	8.5E-06	8.5E-06	NA	1.7E-05
			2,4-Dimethylphenol	NA	NA	NA	NA
			2-Methylphenol	NA	NA	NA	NA
			Bis(2-ethylhexyl)phthalate	1.8E-06	1.8E-06	NA	3.6E-06
			Carbazole	NA	NA	NA	NA
			Dibenzofuran	NA	NA	NA	NA
			Pyridine	NA	NA	NA	NA

Table 3-1d
Summary of Receptor Risks and Hazards for COPCs - Lifetime Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Aggregate Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Groundwater	Groundwater	Groundwater	***PAHs***				
			2-Methylnaphthalene	NA	NA	NA	NA
			Acenaphthylene	NA	NA	NA	NA
			Acenapthene	NA	NA	NA	NA
			Benzo(a)anthracene	1.6E-06	1.6E-06	1.1E-08	3.2E-06
			Benzo(a)pyrene	1.3E-04	NA	NA	1.3E-04
			Benzo(b)fluoranthene	1.3E-05	NA	NA	1.3E-05
			Benzo(k)fluoranthene	2.1E-06	NA	NA	2.1E-06
			Dibenzo(a,h)anthracene	7.5E-06	NA	NA	7.5E-06
			Fluorene	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	4.4E-07	NA	NA	4.4E-07
			Naphthalene	NA	NA	9.2E-04	9.2E-04
			1-Methylnaphthalene	1.8E-04	1.8E-04	NA	3.6E-04
			Phenanthrene	NA	NA	NA	NA
			Pyrene	NA	NA	NA	NA
			Pesticides				
			Pentachlorophenol	4.3E-06	4.3E-06	NA	8.7E-06
			Chemical Total	**1.2E-03**	**2.5E-04**	**1.0E-03**	**2.5E-03**
		Exposure Point Total					**2.5E-03**
	Exposure Medium Total						**2.5E-03**
Groundwater Total							**2.5E-03**
Soil	Surface Soil (0 -1 foot bgs)	Process Area	***SVOCs***				
			Carbazole	NA	NA	NA	NA
			Dibenzofuran	NA	NA	NA	NA

Table 3-1d
Summary of Receptor Risks and Hazards for COPCs - Lifetime Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Aggregate Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Process Area	***PAHs***				
			2-Methylnaphthalene	NA	NA	NA	NA
			Anthracene	NA	NA	NA	NA
			Benzo(a)anthracene	4.9E-05	4.4E-06	6.5E-07	5.4E-05
			Benzo(a)pyrene	2.6E-04	2.3E-05	3.3E-08	2.8E-04
			Benzo(b)fluoranthene	5.7E-05	5.0E-06	7.2E-09	6.2E-05
			Benzo(k)fluoranthene	2.4E-06	2.2E-07	3.1E-10	2.6E-06
			Chrysene	6.7E-07	5.9E-08	8.5E-11	7.3E-07
			Dibenzo(a,h)anthracene	3.1E-05	2.8E-06	4.0E-09	3.4E-05
			Fluoranthene	NA	NA	NA	NA
			Fluorene	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.1E-05	9.9E-07	1.4E-09	1.2E-05
			Naphthalene	NA	NA	3.7E-06	3.7E-06
			Phenanthrene	NA	NA	NA	NA
			Pyrene	NA	NA	NA	NA
			Chemical Total	**4.1E-04**	**3.6E-05**	**4.4E-06**	**4.5E-04**
		Exposure Point Total					**4.5E-04**
	Receptor Total - Process Area (includes groundwater; see footnote [1])						**2.9E-03**
Soil	Surface Soil (0 -1 foot bgs)	Pond Area	***Inorganics***				
			Arsenic	3.8E-05	5.4E-06	7.2E-08	4.4E-05
			VOCs				
			Benzene	1.3E-07	NA	9.4E-07	1.1E-06
			Ethylbenzene	7.0E-07	NA	5.2E-06	5.9E-06
			Total Xylenes	NA	NA	NA	NA

Table 3-1d
Summary of Receptor Risks and Hazards for COPCs - Lifetime Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Aggregate Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Pond Area	***SVOCs***				
			Carbazole	NA	NA	NA	NA
			Dibenzofuran	NA	NA	NA	NA
			1,1-Biphenyl	1.2E-06	3.2E-07	NA	1.5E-06
			PAHs				
			2-Methylnaphthalene	NA	NA	NA	NA
			Acenaphthene	NA	NA	NA	NA
			Benzo(a)anthracene	1.4E-04	1.3E-05	1.9E-06	1.6E-04
			Benzo(a)pyrene	5.0E-04	4.5E-05	6.4E-08	5.5E-04
			Benzo(b)fluoranthene	6.5E-05	5.8E-06	8.3E-09	7.1E-05
			Benzo(k)fluoranthene	4.9E-06	4.4E-07	6.3E-10	5.4E-06
			Chrysene	1.1E-06	9.9E-08	1.4E-10	1.2E-06
			Dibenzo(a,h)anthracene	4.8E-05	4.3E-06	6.2E-09	5.3E-05
			Fluoranthene	NA	NA	NA	NA
			Fluorene	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1.4E-05	1.2E-06	1.8E-09	1.5E-05
			Naphthalene	NA	NA	1.8E-04	1.8E-04
			Phenanthrene	NA	NA	NA	NA
			Pyrene	NA	NA	NA	NA
			Pesticides				
			Aldrin	3.7E-06	NA	6.0E-05	6.4E-05
			Chemical Total	**8.3E-04**	**7.5E-05**	**2.4E-04**	**1.1E-03**
		Exposure Point Total					**1.1E-03**
	Receptor Total - Pond Area (includes groundwater; see footnote [1])						**3.6E-03**

Table 3-1d
Summary of Receptor Risks and Hazards for COPCs - Lifetime Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Aggregate Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Treated Wood Storage	***PAHs***				
			Benzo(a)anthracene	3.3E-06	2.9E-07	4.3E-08	3.6E-06
			Benzo(a)pyrene	2.4E-05	2.2E-06	3.1E-09	2.6E-05
			Benzo(b)fluoranthene	4.7E-06	4.2E-07	6.0E-10	5.1E-06
			Dibenzo(a,h)anthracene	4.1E-06	3.6E-07	5.2E-10	4.4E-06
			Indeno(1,2,3-cd)pyrene	1.7E-06	1.5E-07	2.2E-10	1.8E-06
			Chemical Total	**3.8E-05**	**3.4E-06**	**4.7E-08**	**4.1E-05**
		Exposure Point Total					**4.1E-05**
	Receptor Total - Treated Wood Storage Area						**4.1E-05**
Soil	Surface Soil (0 -1 foot bgs)	Untreated Wood Storage	***PAHs***				
			Benzo(a)anthracene	1.5E-06	1.3E-07	1.9E-08	1.6E-06
			Benzo(a)pyrene	1.6E-05	1.4E-06	2.0E-09	1.7E-05
			Benzo(b)fluoranthene	2.1E-06	1.9E-07	2.7E-10	2.3E-06
			Benzo(k)fluoranthene	9.0E-08	8.0E-09	1.2E-11	9.8E-08
			Dibenzo(a,h)anthracene	2.5E-06	2.2E-07	3.2E-10	2.7E-06
			Indeno(1,2,3-cd)pyrene	1.2E-06	1.1E-07	1.5E-10	1.3E-06
			Chemical Total	**2.3E-05**	**2.0E-06**	**2.2E-08**	**2.5E-05**
		Exposure Point Total					**2.5E-05**
	Receptor Total - Untreated Wood Storage Area						**2.5E-05**
Soil	Surface Soil (0 -1 foot bgs)	Eastern Upland Area	***Inorganics***				
			Arsenic	8.6E-06	1.2E-06	1.6E-08	9.9E-06
			Cobalt	NA	NA	5.8E-09	5.8E-09
			VOCs				
			Acrolein	NA	NA	NA	NA

Table 3-1d
Summary of Receptor Risks and Hazards for COPCs - Lifetime Resident
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Aggregate Resident

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Dermal*	Inhalation**	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Eastern Upland Area	***PAHs***				
			Benzo(a)anthracene	3.9E-07	3.5E-08	5.1E-09	4.3E-07
			Benzo(a)pyrene	3.4E-06	3.0E-07	4.3E-10	3.7E-06
			Benzo(b)fluoranthene	1.1E-06	9.9E-08	1.4E-10	1.2E-06
			Indeno(1,2,3-cd)pyrene	2.7E-07	2.4E-08	3.4E-11	2.9E-07
			Chemical Total	**1.4E-05**	**1.7E-06**	**2.8E-08**	**1.5E-05**
		Exposure Point Total					**1.5E-05**
	Receptor Total - Eastern Upland Area						**1.5E-05**

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Notes:
COPCs - Chemicals of Potential Concern
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
bgs - below ground surface
[1] Future resident's exposure to 'core of the plume' groundwater is limited to the Process and Pond Areas.
*Value shown for **groundwater** dermal risk represents combined dermal and inhalation risks from showering in accordance with the simplistic approach from Region 4 EPA's HHRA Supplemental Guidance (USEPA, 2018).
Value shown for the **groundwater inhalation pathway represents risk from the inhalation of volatiles in indoor air only.

Table 3-1e
Summary of Receptor Risks and Hazards for COPCs - Teenage Trespasser
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Process Area	***SVOCs***									
			Carbazole	NA	NA	NA	NA	Renal	0.001	0.0004	NA	0.002
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.02	0.009	NA	0.03
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.002	0.001	NA	0.004
			Anthracene	NA	NA	NA	NA	No Observed Effects	0.001	0.0005	NA	0.001
			Benzo(a)anthracene	1.2E-06	5.8E-07	NA	1.8E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	6.2E-06	3.0E-06	NA	9.2E-06	Developmental	0.05	0.02	NA	0.07
			Benzo(b)fluoranthene	1.4E-06	6.7E-07	NA	2.0E-06	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	5.8E-08	2.9E-08	NA	8.7E-08	NA	NA	NA	NA	NA
			Chrysene	1.6E-08	7.8E-09	NA	2.4E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	7.5E-07	3.7E-07	NA	1.1E-06	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.002	0.001	NA	0.004
			Fluorene	NA	NA	NA	NA	Hematologic	0.001	0.0005	NA	0.001
			Indeno(1,2,3-cd)pyrene	2.7E-07	1.3E-07	NA	4.0E-07	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	NA	NA	Other	0.0004	0.0002	NA	0.0006
			Phenanthrene	NA	NA	NA	NA	Renal	0.007	0.003	NA	0.01
			Pyrene	NA	NA	NA	NA	Renal	0.003	0.001	NA	0.005
			Chemical Total	**9.8E-06**	**4.8E-06**	**NA**	**1.5E-05**		**0.09**	**0.04**	**NA**	**0.1**
		Exposure Point Total					**1.5E-05**					**0.1**
	Receptor Total - Process Area						**1.5E-05**					**0.1**
Soil	Surface Soil (0 -1 foot bgs)	Pond Area	***Inorganics***									
			Arsenic	1.6E-06	3.0E-07	NA	1.9E-06	Cardiovascular, Dermal	0.02	0.005	NA	0.03
			VOCs									
			Benzene	5.2E-09	NA	NA	5.2E-09	Immune	0.0002	NA	NA	0.0002
			Ethylbenzene	2.8E-08	NA	NA	2.8E-08	Hepatic, Renal	0.0002	NA	NA	0.0002
			Total Xylenes	NA	NA	NA	NA	Other	0.0002	NA	NA	0.0002
			SVOCs									
			Carbazole	NA	NA	NA	NA	Renal	0.004	0.001	NA	0.005
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.3	0.1	NA	0.4
			1,1-Biphenyl	4.7E-08	1.8E-08	NA	6.5E-08	Renal	0.00008	0.00003	NA	0.0001

Table 3-1e
Summary of Receptor Risks and Hazards for COPCs - Teenage Trespasser
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Pond Area	***PAHs***									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.07	0.03	NA	0.1
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.006	0.003	NA	0.009
			Benzo(a)anthracene	3.4E-06	1.7E-06	NA	5.1E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1.2E-05	5.9E-06	NA	1.8E-05	Developmental	0.09	0.05	NA	0.1
			Benzo(b)fluoranthene	1.6E-06	7.7E-07	NA	2.3E-06	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.2E-07	5.8E-08	NA	1.8E-07	NA	NA	NA	NA	NA
			Chrysene	2.7E-08	1.3E-08	NA	4.0E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.2E-06	5.7E-07	NA	1.7E-06	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.01	0.005	NA	0.02
			Fluorene	NA	NA	NA	NA	Hematologic	0.008	0.004	NA	0.01
			Indeno(1,2,3-cd)pyrene	3.3E-07	1.6E-07	NA	5.0E-07	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	NA	NA	Other	0.02	0.009	NA	0.03
			Phenanthrene	NA	NA	NA	NA	Renal	0.01	0.006	NA	0.02
			Pyrene	NA	NA	NA	NA	Renal	0.01	0.005	NA	0.01
			Pesticides									
			Aldrin	1.5E-07	NA	NA	1.5E-07	Hepatic	0.002	NA	NA	0.002
			Chemical Total	**2.0E-05**	**9.5E-06**	**NA**	**3.0E-05**		**0.5**	**0.2**	**NA**	**0.7**
		Exposure Point Total					**3.0E-05**					**0.7**
	Receptor Total - Pond Area						**3.0E-05**					**0.7**
Soil	Surface Soil (0 -1 foot bgs)	Treated Wood Storage	***PAHs***									
			Benzo(a)anthracene	7.8E-08	3.8E-08	NA	1.2E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	5.8E-07	2.8E-07	NA	8.6E-07	Developmental	0.005	0.002	NA	0.007
			Benzo(b)fluoranthene	1.1E-07	5.5E-08	NA	1.7E-07	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	9.7E-08	4.8E-08	NA	1.4E-07	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	4.0E-08	2.0E-08	NA	6.0E-08	NA	NA	NA	NA	NA
			Chemical Total	**9.1E-07**	**4.5E-07**	**NA**	**1.4E-06**		**0.005**	**0.002**	**NA**	**0.007**
		Exposure Point Total					**1.4E-06**					**0.007**
	Receptor Total - Treated Wood Storage Area						**1.4E-06**					**0.007**

Table 3-1e
Summary of Receptor Risks and Hazards for COPCs - Teenage Trespasser
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Untreated Wood Storage	***PAHs***									
			Benzo(a)anthracene	3.5E-08	1.7E-08	NA	5.2E-08	NA	NA	NA	NA	NA
			Benzo(a)pyrene	3.7E-07	1.8E-07	NA	5.6E-07	Developmental	0.003	0.001	NA	0.004
			Benzo(b)fluoranthene	5.0E-08	2.4E-08	NA	7.4E-08	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	2.2E-09	1.1E-09	NA	3.2E-09	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.0E-08	2.9E-08	NA	8.9E-08	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2.9E-08	1.4E-08	NA	4.3E-08	NA	NA	NA	NA	NA
			Chemical Total	**5.5E-07**	**2.7E-07**	**NA**	**8.2E-07**		**0.003**	**0.001**	**NA**	**0.004**
		Exposure Point Total					**8.2E-07**					**0.004**
	Receptor Total - Untreated Wood Storage Area						**8.2E-07**					**0.004**
Soil	Surface Soil (0 -1 foot bgs)	Eastern Upland Area	***Inorganics***									
			Arsenic	3.5E-07	6.7E-08	NA	4.2E-07	Cardiovascular, Dermal	0.005	0.001	NA	0.007
			Cobalt	NA	NA	NA	NA	Thyroid	0.002	NA	NA	0.002
			VOCs									
			Acrolein	NA	NA	NA	NA	Other	0.000009	NA	NA	0.000009
			PAHs									
			Benzo(a)anthracene	9.3E-09	4.6E-09	NA	1.4E-08	NA	NA	NA	NA	NA
			Benzo(a)pyrene	8.0E-08	3.9E-08	NA	1.2E-07	Developmental	0.0006	0.0003	NA	0.0009
			Benzo(b)fluoranthene	2.7E-08	1.3E-08	NA	4.0E-08	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	6.3E-09	3.1E-09	NA	9.4E-09	NA	NA	NA	NA	NA
			Chemical Total	**4.7E-07**	**1.3E-07**	**NA**	**6.0E-07**		**0.008**	**0.001**	**NA**	**0.009**
		Exposure Point Total					**6.0E-07**					**0.009**
	Receptor Total - Eastern Upland Area						**6.0E-07**					**0.009**
Sediment	Sediment	Southern Marsh	***Inorganics***									
			Aluminum	NA	NA	NA	NA	Nervous	0.01	NA	NA	0.01
			Arsenic	2.3E-06	4.4E-07	NA	2.8E-06	Cardiovascular, Dermal	0.04	0.007	NA	0.04
			Cobalt	NA	NA	NA	NA	Thyroid	0.04	NA	NA	0.04
			Iron	NA	NA	NA	NA	Gastrointestinal	0.02	NA	NA	0.02
			Manganese	NA	NA	NA	NA	Nervous	0.006	NA	NA	0.006
			Vanadium	NA	NA	NA	NA	Dermal	0.01	NA	NA	0.01
			SVOCs									
			Carbazole	NA	NA	NA	NA	Renal	0.0003	0.0001	NA	0.0004
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.05	0.02	NA	0.07

Table 3-1e
Summary of Receptor Risks and Hazards for COPCs - Teenage Trespasser
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Current and Future
Receptor Population: Teenage Trespasser

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Southern Marsh	***PAHs***									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.02	0.008	NA	0.02
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.001	0.0005	NA	0.001
			Anthracene	NA	NA	NA	NA	No Observed Effects	0.0002	0.0001	NA	0.0003
			Benzo(a)anthracene	2.3E-06	1.1E-06	NA	3.5E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	8.5E-06	4.2E-06	NA	1.3E-05	Developmental	0.07	0.03	NA	0.1
			Benzo(b)fluoranthene	1.4E-06	6.7E-07	NA	2.0E-06	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	6.0E-08	3.0E-08	NA	9.0E-08	NA	NA	NA	NA	NA
			Chrysene	2.3E-08	1.1E-08	NA	3.5E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	9.3E-07	4.6E-07	NA	1.4E-06	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.007	0.004	NA	0.01
			Fluorene	NA	NA	NA	NA	Hematologic	0.002	0.0009	NA	0.003
			Indeno(1,2,3-cd)pyrene	2.8E-07	1.4E-07	NA	4.2E-07	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	NA	NA	Other	0.004	0.002	NA	0.006
			Phenanthrene	NA	NA	NA	NA	Renal	0.01	0.005	NA	0.02
			Pyrene	NA	NA	NA	NA	Renal	0.006	0.003	NA	0.01
			Chemical Total	**1.6E-05**	**7.1E-06**	**NA**	**2.3E-05**		**0.3**	**0.08**	**NA**	**0.4**
		Exposure Point Total					**2.3E-05**					**0.4**
	Receptor Total - Southern Marsh						**2.3E-05**					**0.4**

Notes:
COPCs - Chemicals of Potential Concern
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
bgs - below ground surface

Prepared By: RAH 3/28/2019
Checked By: SMA 3/28/2019

Table 3-1f
Summary of Receptor Risks and Hazards for COPCs - Outdoor Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Groundwater	***Inorganics***									
			Aluminum	NA	NA	NA	NA	Nervous	0.03	NA	NA	0.03
			Arsenic	2.1E-04	NA	NA	2.1E-04	Cardiovascular, Dermal	1	NA	NA	1
			Cobalt	NA	NA	NA	NA	Thyroid	0.1	NA	NA	0.1
			Iron	NA	NA	NA	NA	Gastrointestinal	0.5	NA	NA	0.5
			Manganese	NA	NA	NA	NA	Nervous	0.3	NA	NA	0.3
			Selenium	NA	NA	NA	NA	Nervous, Hematologic, Dermal	0.3	NA	NA	0.3
			VOCs									
			1,2,4-Trimethylbenzene	NA	NA	NA	NA	Nervous	0.2	NA	NA	0.2
			1,3,5-Trimethylbenzene	NA	NA	NA	NA	Nervous	0.04	NA	NA	0.04
			Benzene	2.8E-06	NA	NA	2.8E-06	Immune	0.04	NA	NA	0.04
			Chloroform	9.2E-06	NA	NA	9.2E-06	Hepatic	0.08	NA	NA	0.08
			Ethylbenzene	1.4E-06	NA	NA	1.4E-06	Developmental	0.004	NA	NA	0.004
			Toluene	NA	NA	NA	NA	Urinary	0.004	NA	NA	0.004
			Total Xylenes	NA	NA	NA	NA	Nervous	0.007	NA	NA	0.007
			SVOCs									
			(3-and/or 4-)Methylphenol	NA	NA	NA	NA	Nervous	0.005	NA	NA	0.005
			1,1-Biphenyl	2.3E-06	NA	NA	2.3E-06	Hepatic, Renal	0.002	NA	NA	0.002
			2,4-Dimethylphenol	NA	NA	NA	NA	Nervous, Hematologic	0.09	NA	NA	0.09
			2-Methylphenol	NA	NA	NA	NA	Nervous, Other	0.004	NA	NA	0.004
			Bis(2-ethylhexyl)phthalate	4.8E-07	NA	NA	4.8E-07	Hepatic	0.005	NA	NA	0.005
			Carbazole	NA	NA	NA	NA	Renal	0.07	NA	NA	0.07
			Dibenzofuran	NA	NA	NA	NA	Hepatic	2	NA	NA	2
			Pyridine	NA	NA	NA	NA	Hepatic	0.3	NA	NA	0.3
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	1	NA	NA	1
			Acenaphthylene	NA	NA	NA	NA	Renal	0.002	NA	NA	0.002
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.05	NA	NA	0.05
			Benzo(a)anthracene	1.3E-07	NA	NA	1.3E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1.1E-05	NA	NA	1.1E-05	Developmental	0.1	NA	NA	0.1
			Benzo(b)fluoranthene	1.1E-06	NA	NA	1.1E-06	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.8E-07	NA	NA	1.8E-07	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.2E-07	NA	NA	6.2E-07	NA	NA	NA	NA	NA
			Fluorene	NA	NA	NA	NA	Hematologic	0.04	NA	NA	0.04
			Indeno(1,2,3-cd)pyrene	3.6E-08	NA	NA	3.6E-08	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	NA	NA	Nervous, Respiratory	2	NA	NA	2
			1-Methylnaphthalene	4.9E-05	NA	NA	4.9E-05	Dermal, Nervous and Respiratory	0.07	NA	NA	0.07

Table 3-1f
Summary of Receptor Risks and Hazards for COPCs - Outdoor Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Groundwater	Phenanthrene	NA	NA	NA	NA	Renal	0.04	NA	NA	0.04
			Pyrene	NA	NA	NA	NA	Renal	0.002	NA	NA	0.002
			Pesticides									
			Pentachlorophenol	1.2E-06	NA	NA	1.2E-06	Hepatic	0.002	NA	NA	0.002
			Chemical Total	**2.9E-04**	**NA**	**NA**	**2.9E-04**		**9**	**NA**	**NA**	**9**
		Exposure Point Total					**2.9E-04**					**9**
	Exposure Medium Total						**2.9E-04**					**9**
Groundwater Total							**2.9E-04**					**9**
Soil	Surface Soil (0 -1 foot bgs)	Process Area	***SVOCs***									
			Carbazole	NA	NA	NA	NA	Renal	0.002	0.0009	NA	0.003
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.04	0.02	NA	0.06
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.005	0.003	NA	0.007
			Anthracene	NA	NA	NA	NA	No Observed Effects	0.002	0.001	NA	0.003
			Benzo(a)anthracene	1.8E-06	1.0E-06	4.8E-08	2.9E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	9.6E-06	5.3E-06	2.4E-09	1.5E-05	Developmental	0.09	0.05	0.006	0.1
			Benzo(b)fluoranthene	2.1E-06	1.2E-06	5.4E-10	3.3E-06	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	9.1E-08	5.0E-08	2.3E-11	1.4E-07	NA	NA	NA	NA	NA
			Chrysene	2.5E-08	1.4E-08	6.3E-12	3.9E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.2E-06	6.4E-07	3.0E-10	1.8E-06	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.005	0.003	NA	0.007
			Fluorene	NA	NA	NA	NA	Hematologic	0.002	0.001	NA	0.003
			Indeno(1,2,3-cd)pyrene	4.1E-07	2.3E-07	1.1E-10	6.4E-07	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	7.5E-07	7.5E-07	Nervous, Respiratory	0.0007	0.0004	0.02	0.02
			Phenanthrene	NA	NA	NA	NA	Renal	0.01	0.007	NA	0.02
			Pyrene	NA	NA	NA	NA	Renal	0.006	0.003	NA	0.009
			Chemical Total	**1.5E-05**	**8.4E-06**	**8.1E-07**	**2.4E-05**		**0.2**	**0.09**	**0.03**	**0.3**
		Exposure Point Total					**2.4E-05**					**0.3**
	Receptor Total - Process Area (includes groundwater; see footnote [1])						**3.2E-04**					**10**
Soil	Surface Soil (0 -1 foot bgs)	Pond Area	***Inorganics***									
			Arsenic	7.4E-06	1.6E-06	1.5E-08	8.9E-06	Cardiovascular, Dermal	0.05	0.01	0.0006	0.06
			VOCs									
			Benzene	2.4E-08	NA	1.9E-07	2.2E-07	Immune	0.0003	NA	0.002	0.003
			Ethylbenzene	1.3E-07	NA	1.1E-06	1.2E-06	Hepatic, Renal	0.0003	NA	0.001	0.002
			Total Xylenes	NA	NA	NA	NA	Other	0.0003	NA	0.02	0.02

Table 3-1f
Summary of Receptor Risks and Hazards for COPCs - Outdoor Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Pond Area	***SVOCs***									
			Carbazole	NA	NA	NA	NA	Renal	0.007	0.003	NA	0.01
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.5	0.2	NA	0.7
			1,1-Biphenyl	2.2E-07	9.3E-08	NA	3.1E-07	Renal	0.0002	0.00007	0.3	0.3
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.1	0.07	NA	0.2
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.01	0.006	NA	0.02
			Benzo(a)anthracene	5.3E-06	2.9E-06	1.4E-07	8.4E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1.9E-05	1.0E-05	4.8E-09	2.9E-05	Developmental	0.2	0.1	0.01	0.3
			Benzo(b)fluoranthene	2.4E-06	1.3E-06	6.2E-10	3.8E-06	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.8E-07	1.0E-07	4.7E-11	2.8E-07	NA	NA	NA	NA	NA
			Chrysene	4.2E-08	2.3E-08	1.1E-11	6.5E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.8E-06	9.9E-07	4.6E-10	2.8E-06	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.02	0.01	NA	0.03
			Fluorene	NA	NA	NA	NA	Hematologic	0.02	0.009	NA	0.02
			Indeno(1,2,3-cd)pyrene	5.2E-07	2.9E-07	1.3E-10	8.1E-07	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	3.6E-05	3.6E-05	Nervous, Respiratory	0.03	0.02	1	1
			Phenanthrene	NA	NA	NA	NA	Renal	0.02	0.01	NA	0.03
			Pyrene	NA	NA	NA	NA	Renal	0.02	0.01	NA	0.03
			Pesticides									
			Aldrin	7.0E-07	NA	8.6E-11	7.0E-07	Hepatic	0.004	NA	NA	0.004
			Chemical Total	**3.8E-05**	**1.8E-05**	**3.8E-05**	**9.3E-05**		**1**	**0.5**	**1**	**3**
		Exposure Point Total					**9.3E-05**					**3**
	Receptor Total - Pond Area (includes groundwater; see footnote [1])						**3.8E-04**					**12**
Soil	Surface Soil (0 -1 foot bgs)	Treated Wood Storage	***PAHs***									
			Benzo(a)anthracene	1.2E-07	6.7E-08	3.2E-09	1.9E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	9.1E-07	5.0E-07	2.3E-10	1.4E-06	Developmental	0.008	0.005	0.0005	0.01
			Benzo(b)fluoranthene	1.7E-07	9.6E-08	4.5E-11	2.7E-07	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.5E-07	8.4E-08	3.9E-11	2.4E-07	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	6.3E-08	3.5E-08	1.6E-11	9.8E-08	NA	NA	NA	NA	NA
			Chemical Total	**1.4E-06**	**7.8E-07**	**3.5E-09**	**2.2E-06**		**0.008**	**0.005**	**0.0005**	**0.01**
		Exposure Point Total					**2.2E-06**					**0.01**
	Receptor Total - Treated Wood Storage Area						**2.2E-06**					**0.01**

Table 3-1f
Summary of Receptor Risks and Hazards for COPCs - Outdoor Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Untreated Wood Storage	***PAHs***									
			Benzo(a)anthracene	5.5E-08	3.0E-08	1.4E-09	8.6E-08	NA	NA	NA	NA	NA
			Benzo(a)pyrene	5.8E-07	3.2E-07	1.5E-10	9.0E-07	Developmental	0.005	0.003	0.0003	0.009
			Benzo(b)fluoranthene	7.8E-08	4.3E-08	2.0E-11	1.2E-07	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	3.4E-09	1.9E-09	8.6E-13	5.2E-09	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	9.4E-08	5.1E-08	2.4E-11	1.5E-07	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	4.5E-08	2.5E-08	1.1E-11	6.9E-08	NA	NA	NA	NA	NA
			Chemical Total	**8.6E-07**	**4.7E-07**	**1.6E-09**	**1.3E-06**		**0.005**	**0.003**	**0.0003**	**0.009**
		Exposure Point Total					**1.3E-06**					**0.009**
	Receptor Total - Untreated Wood Storage Area						**1.3E-06**					**0.009**
Soil	Surface Soil (0 -1 foot bgs)	Eastern Upland Area	***Inorganics***									
			Arsenic	1.7E-06	3.5E-07	3.4E-09	2.0E-06	Cardiovascular, Dermal	0.01	0.002	0.0001	0.01
			Cobalt	NA	NA	1.2E-09	1.2E-09	Thyroid	0.003	NA	0.00006	0.003
			VOCs									
			Acrolein	NA	NA	NA	NA	Other	0.00002	NA	0.0004	0.0004
			PAHs									
			Benzo(a)anthracene	1.5E-08	8.0E-09	3.8E-10	2.3E-08	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1.2E-07	6.9E-08	3.2E-11	1.9E-07	Developmental	0.001	0.0006	0.00007	0.002
			Benzo(b)fluoranthene	4.2E-08	2.3E-08	1.1E-11	6.4E-08	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	9.9E-09	5.4E-09	2.5E-12	1.5E-08	NA	NA	NA	NA	NA
			Chemical Total	**1.8E-06**	**4.5E-07**	**5.0E-09**	**2.3E-06**		**0.01**	**0.003**	**0.0007**	**0.02**
		Exposure Point Total					**2.3E-06**					**0.02**
	Receptor Total - Eastern Upland Area						**2.3E-06**					**0.02**
Sediment	Sediment	Southern Marsh	***Inorganics***									
			Aluminum	NA	NA	NA	NA	Nervous	0.03	NA	NA	0.03
			Arsenic	3.4E-06	7.2E-07	NA	4.1E-06	Cardiovascular, Dermal	0.02	0.004	NA	0.03
			Cobalt	NA	NA	NA	NA	Thyroid	0.07	NA	NA	0.07
			Iron	NA	NA	NA	NA	Gastrointestinal	0.04	NA	NA	0.04
			Manganese	NA	NA	NA	NA	Nervous	0.01	NA	NA	0.01
			Vanadium	NA	NA	NA	NA	Dermal	0.02	NA	NA	0.02
			SVOCs									
			Carbazole	NA	NA	NA	NA	Renal	0.0006	0.0002	NA	0.0008
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.1	0.04	NA	0.1
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.03	0.02	NA	0.05
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.002	0.001	NA	0.003

Table 3-1f
Summary of Receptor Risks and Hazards for COPCs - Outdoor Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Outdoor Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Southern Marsh	Anthracene	NA	NA	NA	NA	No Observed Effects	0.0004	0.0002	NA	0.0007
			Benzo(a)anthracene	3.6E-06	2.0E-06	NA	5.7E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1.3E-05	7.3E-06	NA	2.1E-05	Developmental	0.1	0.07	NA	0.2
			Benzo(b)fluoranthene	2.1E-06	1.2E-06	NA	3.3E-06	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	9.4E-08	5.2E-08	NA	1.5E-07	NA	NA	NA	NA	NA
			Chrysene	3.6E-08	2.0E-08	NA	5.6E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.5E-06	8.0E-07	NA	2.3E-06	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.01	0.007	NA	0.02
			Fluorene	NA	NA	NA	NA	Hematologic	0.004	0.002	NA	0.006
			Indeno(1,2,3-cd)pyrene	4.4E-07	2.4E-07	NA	6.9E-07	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	NA	NA	Nervous, Respiratory	0.007	0.004	NA	0.01
			Phenanthrene	NA	NA	NA	NA	Renal	0.02	0.01	NA	0.03
			Pyrene	NA	NA	NA	NA	Renal	0.01	0.007	NA	0.02
			Chemical Total	**2.4E-05**	**1.2E-05**	**NA**	**3.7E-05**		**0.5**	**0.2**	**NA**	**0.7**
		Exposure Point Total					**3.7E-05**					**0.7**
	Receptor Total -Southern Marsh						**3.7E-05**					**0.7**
		Exposure Point Total					**3.7E-05**					**0.7**
	Receptor Total -Southern Marsh						**3.7E-05**					**0.7**

Notes:
COPCs - Chemicals of Potential Concern
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
bgs - below ground surface
BOLD highlighted cells - Target organ HI exceeds threshold of 1.0
[1] Outdoor worker's exposure to 'core of the plume' groundwater is limited to the Pond and Process Areas.
[2] Target organ HI segregation is presented for exposure scenarios that present a cumulative HI greater than 1.0.

Target Organ Effects/Exposure Area [1,2]	Process Area (soil and groundwater)	Pond Area (soil and groundwater)
Cardiovascular HI Across All Media	1	1
Dermal/Skin Histopathology HI Across All Media	**2**	**2**
Developmental HI Across All Media	0.3	0.4
Gastrointestinal HI Across All Media	0.5	0.5
Hepatic HI Across All Media	**3**	**4**
Hematologic HI Across All Media	0.4	0.5
Immune HI Across All Media	0.04	0.04
Nervous HI Across All Media	**3**	**4**
No Observed Effects HI Across All Media	0.003	NA
Other HI Across All Media	0.004	0.03
Renal HI Across All Media	0.2	0.6
Respiratory HI Across All Media	**4**	**5**
Thyroid HI Across All Media	0.1	0.1
Urinary Across All Media	0.004	0.004

Prepared By: SMA 3/28/2019
Checked By: RAH 3/28/2019

Table 3-1g
Summary of Receptor Risks and Hazards for COPCs - Indoor Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Indoor Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Groundwater	***Inorganics***									
			Aluminum	NA	NA	NA	NA	Nervous	0.03	NA	NA	0.03
			Arsenic	2.4E-04	NA	NA	2.4E-04	Cardiovascular, Dermal	1	NA	NA	1
			Cobalt	NA	NA	NA	NA	Thyroid	0.1	NA	NA	0.1
			Iron	NA	NA	NA	NA	Gastrointestinal	0.6	NA	NA	0.6
			Manganese	NA	NA	NA	NA	Nervous	0.3	NA	NA	0.3
			Selenium	NA	NA	NA	NA	Nervous, Hematologic, Dermal	0.3	NA	NA	0.3
			VOCs									
			1,2,4-Trimethylbenzene	NA	NA	NA	NA	Nervous	0.2	NA	0.2	0.4
			1,3,5-Trimethylbenzene	NA	NA	NA	NA	Nervous	0.04	NA	0.05	0.09
			Benzene	3.1E-06	NA	2.2E-06	5.3E-06	Immune	0.04	NA	0.03	0.07
			Chloroform	1.0E-05	NA	2.4E-05	3.5E-05	Hepatic	0.09	NA	0.03	0.1
			Ethylbenzene	1.6E-06	NA	2.4E-06	4.0E-06	Developmental	0.004	NA	0.003	0.007
			Toluene	NA	NA	NA	NA	Urinary	0.004	NA	0.0004	0.005
			Total Xylenes	NA	NA	NA	NA	Nervous	0.008	NA	0.09	0.1
			SVOCs									
			(3-and/or 4-)Methylphenol	NA	NA	NA	NA	Nervous	0.005	NA	NA	0.005
			1,1-Biphenyl	2.5E-06	NA	NA	2.5E-06	Hepatic, Renal	0.002	NA	0.6	0.6
			2,4-Dimethylphenol	NA	NA	NA	NA	Nervous, Hematologic	0.1	NA	NA	0.1
			2-Methylphenol	NA	NA	NA	NA	Nervous, Other	0.005	NA	NA	0.005
			Bis(2-ethylhexyl)phthalate	5.4E-07	NA	NA	5.4E-07	Hepatic	0.005	NA	NA	0.005
			Carbazole	NA	NA	NA	NA	Renal	0.08	NA	NA	0.08
			Dibenzofuran	NA	NA	NA	NA	Hepatic	3	NA	NA	3
			Pyridine	NA	NA	NA	NA	Hepatic	0.3	NA	NA	0.3
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	2	NA	NA	2
			Acenaphthylene	NA	NA	NA	NA	Renal	0.002	NA	NA	0.002
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.06	NA	NA	0.06
			Benzo(a)anthracene	1.5E-07	NA	9.2E-10	1.5E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1.2E-05	NA	NA	1.2E-05	Developmental	0.1	NA	NA	0.1
			Benzo(b)fluoranthene	1.2E-06	NA	NA	1.2E-06	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.9E-07	NA	NA	1.9E-07	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.8E-07	NA	NA	6.8E-07	NA	NA	NA	NA	NA
			Fluorene	NA	NA	NA	NA	Hematologic	0.04	NA	NA	0.04

Table 3-1g
Summary of Receptor Risks and Hazards for COPCs - Indoor Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Indoor Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Groundwater	Indeno(1,2,3-cd)pyrene	4.0E-08	NA	NA	4.0E-08	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	2.1E-04	2.1E-04	Nervous, Respiratory	2	NA	6	8
			1-Methylnaphthalene	5.4E-05	NA	NA	5.4E-05	Dermal, Nervous and Respiratory	0.07	NA	NA	0.07
			Phenanthrene	NA	NA	NA	NA	Renal	0.05	NA	NA	0.05
			Pyrene	NA	NA	NA	NA	Renal	0.002	NA	NA	0.002
			Pesticides									
			Pentachlorophenol	1.3E-06	NA	NA	1.3E-06	Hepatic	0.002	NA	NA	0.002
			Chemical Total	**3.2E-04**	**NA**	**2.4E-04**	**5.6E-04**		**11**	**NA**	**7**	**17**
		Exposure Point Total					**5.6E-04**					**17**
	Exposure Medium Total						**5.6E-04**					**17**
Groundwater Total							**5.6E-04**					**17**

Target Organ Effects*	HI
Cardiovascular HI Across All Media	**1**
Dermal/Skin Histopathology HI Across All Media	**2**
Developmental HI Across All Media	0.1
Gastrointestinal HI Across All Media	0.6
Hepatic HI Across All Media	**4**
Hematologic HI Across All Media	0.5
Immune HI Across All Media	0.07
Nervous HI Across All Media	**9**
No Observed Effects HI Across All Media	NA
Other HI Across All Media	0.005
Renal HI Across All Media	0.7
Respiratory HI Across All Media	**10**
Thyroid HI Across All Media	0.1
Urinary Across All Media	0.005

Notes:
COPCs - Chemicals of Potential Concern
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
BOLD highlighted cells - Target organ HI exceeds threshold of 1.0
*Target organ HI segregation is presented for exposure scenarios that present a cumulative HI greater than 1.0.

Prepared By: RAH 1/18/2019
Checked By: SMA 1/21/2019

Table 3-1h
Summary of Receptor Risks and Hazards for COPCs - Construction Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Groundwater	***Inorganics***									
			Aluminum	NA	NA	NA	NA	Nervous	0.0003	0.00003	NA	0.0003
			Arsenic	7.5E-08	9.4E-09	NA	8.5E-08	Cardiovascular, Dermal	0.01	0.001	NA	0.01
			Cobalt	NA	NA	NA	NA	Thyroid	0.0001	0.000006	NA	0.0001
			Iron	NA	NA	NA	NA	Gastrointestinal	0.005	0.0006	NA	0.005
			Manganese	NA	NA	NA	NA	Nervous	0.002	0.008	NA	0.01
			Selenium	NA	NA	NA	NA	Nervous, Hematologic, Dermal	0.003	0.0003	NA	0.003
			VOCs									
			1,2,4-Trimethylbenzene	NA	NA	NA	NA	Nervous	0.0004	0.01	NA	0.01
			1,3,5-Trimethylbenzene	NA	NA	NA	NA	Nervous	0.00008	0.001	NA	0.002
			Benzene	1.0E-09	3.4E-09	NA	4.4E-09	Immune	0.0001	0.0004	NA	0.0006
			Chloroform	3.3E-09	6.5E-09	NA	9.7E-09	Hepatic	0.00007	0.0001	NA	0.0002
			Ethylbenzene	5.0E-10	6.5E-09	NA	7.0E-09	Developmental	0.00006	0.0008	NA	0.0009
			Toluene	NA	NA	NA	NA	Urinary	0.000003	0.00003	NA	0.00003
			Total Xylenes	NA	NA	NA	NA	Nervous	0.00003	0.0004	NA	0.0004
			SVOCs									
			(3-and/or 4-)Methylphenol	NA	NA	NA	NA	Nervous	0.000005	0.00001	NA	0.00002
			1,1-Biphenyl	8.1E-10	2.8E-08	NA	2.8E-08	Hepatic, Renal	0.00007	0.002	NA	0.002
			2,4-Dimethylphenol	NA	NA	NA	NA	Nervous, Hematologic	0.0003	0.001	NA	0.001
			2-Methylphenol	NA	NA	NA	NA	Nervous, Other	0.000009	0.00002	NA	0.00003
			Bis(2-ethylhexyl)phthalate	1.7E-10	NA	NA	1.7E-10	Hepatic	0.000009	NA	NA	0.000009
			Carbazole	NA	NA	NA	NA	Renal	0.00006	0.1	NA	0.1
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.005	0.2	NA	0.2
			Pyridine	NA	NA	NA	NA	Hepatic	0.0003	0.00009	NA	0.0003
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.01	0.4	NA	0.4
			Acenaphthylene	NA	NA	NA	NA	Renal	0.000002	0.0002	NA	0.0002
			Acenapthene	NA	NA	NA	NA	Hepatic	0.00009	0.004	NA	0.004
			Benzo(a)anthracene	4.7E-11	NA	NA	4.7E-11	NA	NA	NA	NA	NA
			Benzo(a)pyrene	3.9E-09	NA	NA	3.9E-09	Developmental	0.0009	NA	NA	0.0009
			Benzo(b)fluoranthene	3.9E-10	NA	NA	3.9E-10	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	6.2E-11	NA	NA	6.2E-11	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	2.2E-10	NA	NA	2.2E-10	NA	NA	NA	NA	NA
			Fluorene	NA	NA	NA	NA	Hematologic	0.00004	0.002	NA	0.002

Table 3-1h
Summary of Receptor Risks and Hazards for COPCs - Construction Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Groundwater	Indeno(1,2,3-cd)pyrene	1.3E-11	NA	NA	1.3E-11	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	NA	NA	Nervous, Respiratory	0.0006	0.009	NA	0.009
			1-Methylnaphthalene	1.7E-08	5.4E-07	NA	5.5E-07	Dermal, Nervous and Respiratory	0.0006	0.02	NA	0.02
			Phenanthrene	NA	NA	NA	NA	Renal	0.00004	0.0002	NA	0.0002
			Pyrene	NA	NA	NA	NA	Renal	0.000002	0.0002	NA	0.0002
			Pesticides									
			Pentachlorophenol	4.1E-10	3.5E-08	NA	3.5E-08	Hepatic	0.00007	0.006	NA	0.006
			Chemical Total	**1.0E-07**	**6.2E-07**	**NA**	**7.3E-07**		**0.04**	**0.8**	**NA**	**0.8**
		Exposure Point Total					**7.3E-07**					**0.8**
	Exposure Medium Total						**7.3E-07**					**0.8**
Groundwater Total							**7.3E-07**					**0.8**
Soil	Surface Soil	Process Area	***SVOCs***									
	(0 -1 foot bgs)		Carbazole	NA	NA	NA	NA	Renal	0.0004	0.0001	NA	0.0005
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.02	0.007	NA	0.03
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.009	0.004	NA	0.01
			Anthracene	NA	NA	NA	NA	No Observed Effects	0.001	0.0004	NA	0.001
			Benzo(a)anthracene	1.4E-07	5.6E-08	1.1E-08	2.0E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	7.0E-07	2.9E-07	7.5E-09	1.0E-06	Developmental	0.2	0.07	0.4	0.7
			Benzo(b)fluoranthene	1.6E-07	6.5E-08	1.6E-09	2.2E-07	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	6.6E-09	2.8E-09	7.0E-11	9.5E-09	NA	NA	NA	NA	NA
			Chrysene	1.8E-09	7.6E-10	1.9E-11	2.6E-09	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	8.6E-08	3.6E-08	9.1E-10	1.2E-07	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.003	0.001	NA	0.005
			Fluorene	NA	NA	NA	NA	Hematologic	0.0003	0.0001	NA	0.0005
			Indeno(1,2,3-cd)pyrene	3.0E-08	1.3E-08	3.2E-10	4.3E-08	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	1.8E-07	1.8E-07	Nervous, Respiratory	0.00004	0.00002	0.1	0.1
			Phenanthrene	NA	NA	NA	NA	Renal	0.002	0.0009	NA	0.003
			Pyrene	NA	NA	NA	NA	Renal	0.001	0.0004	NA	0.001
			Chemical Total	**1.1E-06**	**4.7E-07**	**2.0E-07**	**1.8E-06**		**0.2**	**0.08**	**0.6**	**0.8**
		Exposure Point Total					**1.8E-06**					**0.8**

Table 3-1h
Summary of Receptor Risks and Hazards for COPCs - Construction Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Subsurface Soil (greater than 1 foot bgs)	Process Area	***Inorganics***									
			Aluminum	NA	NA	NA	NA	Nervous	0.01	NA	0.04	0.05
			VOCs									
			Ethylbenzene	5.7E-10	NA	1.4E-08	1.5E-08	Developmental	0.00007	NA	0.00004	0.0001
			SVOCs									
			1,1-Biphenyl	2.4E-09	7.8E-10	NA	3.2E-09	Renal	0.0002	0.00007	0.03	0.03
			Carbazole	NA	NA	NA	NA	Renal	0.007	0.002	NA	0.01
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.6	0.2	NA	0.8
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.4	0.2	NA	0.6
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.008	0.003	NA	0.01
			Anthracene	NA	NA	NA	NA	No Observed Effects	0.003	0.001	NA	0.004
			Benzo(a)anthracene	3.9E-07	1.6E-07	3.3E-08	5.9E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1.2E-06	5.1E-07	1.3E-08	1.8E-06	Developmental	0.3	0.1	0.8	1
			Benzo(b)fluoranthene	2.0E-07	8.3E-08	2.1E-09	2.8E-07	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	8.6E-09	3.6E-09	9.1E-11	1.2E-08	NA	NA	NA	NA	NA
			Chrysene	5.1E-09	2.1E-09	5.4E-11	7.3E-09	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.7E-07	7.3E-08	1.8E-09	2.5E-07	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.02	0.007	NA	0.02
			Fluorene	NA	NA	NA	NA	Hematologic	0.01	0.004	NA	0.01
			Indeno(1,2,3-cd)pyrene	5.6E-08	2.3E-08	5.9E-10	8.0E-08	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	2.1E-05	2.1E-05	Nervous, Respiratory	0.005	0.002	14	14
			Phenanthrene	NA	NA	NA	NA	Renal	0.04	0.02	NA	0.05
			Pyrene	NA	NA	NA	NA	Renal	0.005	0.002	NA	0.007
			Chemical Total	**2.1E-06**	**8.6E-07**	**2.1E-05**	**2.4E-05**		**1**	**0.5**	**15**	**17**
		Exposure Point Total					**2.4E-05**					**17**
	Receptor Total - Process Area (includes groundwater; see footnote [1])						**2.6E-05**					**19**

Table 3-1h
Summary of Receptor Risks and Hazards for COPCs - Construction Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Pond Area	***Inorganics***									
			Arsenic	5.4E-07	8.7E-08	4.5E-08	6.7E-07	Cardiovascular, Dermal	0.08	0.01	0.05	0.1
			VOCs									
			Benzene	1.8E-09	NA	4.5E-08	4.7E-08	Immune	0.0002	NA	0.005	0.005
			Ethylbenzene	9.8E-09	NA	2.5E-07	2.6E-07	Hepatic, Renal	0.001	NA	0.0008	0.002
			Total Xylenes	NA	NA	NA	NA	Other	0.0003	NA	0.03	0.03
			SVOCs									
			Carbazole	NA	NA	NA	NA	Renal	0.001	0.0004	NA	0.002
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.2	0.07	NA	0.3
			1,1-Biphenyl	1.6E-08	5.2E-09	NA	2.1E-08	Renal	0.001	0.0005	0.2	0.2
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.2	0.1	NA	0.3
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.006	0.003	NA	0.009
			Benzo(a)anthracene	3.9E-07	1.6E-07	3.2E-08	5.9E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1.4E-06	5.7E-07	1.5E-08	2.0E-06	Developmental	0.3	0.1	0.9	1
			Benzo(b)fluoranthene	1.8E-07	7.4E-08	1.9E-09	2.5E-07	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.3E-08	5.6E-09	1.4E-10	1.9E-08	NA	NA	NA	NA	NA
			Chrysene	3.1E-09	1.3E-09	3.2E-11	4.4E-09	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.3E-07	5.5E-08	1.4E-09	1.9E-07	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.01	0.006	NA	0.02
			Fluorene	NA	NA	NA	NA	Hematologic	0.003	0.001	NA	0.004
			Indeno(1,2,3-cd)pyrene	3.8E-08	1.6E-08	4.1E-10	5.5E-08	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	8.4E-06	8.4E-06	Nervous, Respiratory	0.002	0.0009	6	6
			Phenanthrene	NA	NA	NA	NA	Renal	0.004	0.002	NA	0.006
			Pyrene	NA	NA	NA	NA	Renal	0.003	0.001	NA	0.005
			Pesticides									
			Aldrin	5.1E-08	NA	2.6E-10	5.2E-08	Hepatic	0.005	NA	NA	0.005
			Chemical Total	**2.8E-06**	**9.8E-07**	**8.8E-06**	**1.3E-05**		**0.9**	**0.3**	**7**	**8**
		Exposure Point Total					**1.3E-05**					**8**

Table 3-1h
Summary of Receptor Risks and Hazards for COPCs - Construction Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Subsurface Soil (greater than 1 foot bgs)	Pond Area	***Inorganics***									
			Aluminum	NA	NA	NA	NA	Nervous	0.01	NA	0.05	0.06
			VOCs									
			Ethylbenzene	2.6E-09	NA	6.6E-08	6.8E-08	Hepatic, Renal	0.0003	NA	0.0002	0.0005
			SVOCs									
			1,1-Biphenyl	4.5E-08	1.4E-08	NA	5.9E-08	Renal	0.004	0.001	0.5	0.5
			Carbazole	NA	NA	NA	NA	Renal	0.004	0.001	NA	0.005
			Dibenzofuran	NA	NA	NA	NA	Hepatic	0.3	0.09	NA	0.4
			PAHs									
			2-Methylnaphthalene	NA	NA	NA	NA	Respiratory	0.4	0.2	NA	0.6
			Acenaphthene	NA	NA	NA	NA	Hepatic	0.01	0.004	NA	0.01
			Anthracene	NA	NA	NA	NA	No Observed Effects	0.002	0.001	NA	0.003
			Benzo(a)anthracene	5.8E-07	2.4E-07	4.8E-08	8.8E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1.8E-06	7.5E-07	1.9E-08	2.6E-06	Developmental	0.4	0.2	1	2
			Benzo(b)fluoranthene	2.4E-07	1.0E-07	2.6E-09	3.5E-07	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	1.8E-08	7.5E-09	1.9E-10	2.6E-08	NA	NA	NA	NA	NA
			Chrysene	5.5E-09	2.3E-09	5.8E-11	7.9E-09	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.6E-07	6.8E-08	1.7E-09	2.3E-07	NA	NA	NA	NA	NA
			Fluoranthene	NA	NA	NA	NA	Hepatic, Renal	0.03	0.01	NA	0.04
			Fluorene	NA	NA	NA	NA	Hematologic	0.006	0.002	NA	0.008
			Indeno(1,2,3-cd)pyrene	4.6E-08	1.9E-08	4.8E-10	6.5E-08	NA	NA	NA	NA	NA
			Naphthalene	NA	NA	1.1E-05	1.1E-05	Nervous, Respiratory	0.003	0.001	8	8
			Phenanthrene	NA	NA	NA	NA	Renal	0.02	0.009	NA	0.03
			Pyrene	NA	NA	NA	NA	Renal	0.006	0.002	NA	0.008
			Chemical Total	**2.9E-06**	**1.2E-06**	**1.1E-05**	**1.5E-05**		**1**	**0.5**	**9**	**11**
		Exposure Point Total					**1.5E-05**					**11**
	Receptor Total - Pond Area (includes groundwater; see footnote [1])						**2.9E-05**					**20**
Soil	Surface Soil (0 -1 foot bgs)	Treated Wood Storage	***PAHs***									
			Benzo(a)anthracene	9.0E-09	3.7E-09	7.4E-10	1.3E-08	NA	NA	NA	NA	NA
			Benzo(a)pyrene	6.6E-08	2.8E-08	7.0E-10	9.5E-08	Developmental	0.02	0.006	0.04	0.06
			Benzo(b)fluoranthene	1.3E-08	5.3E-09	1.4E-10	1.8E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1.1E-08	4.6E-09	1.2E-10	1.6E-08	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	4.6E-09	1.9E-09	4.9E-11	6.6E-09	NA	NA	NA	NA	NA
			Chemical Total	**1.0E-07**	**4.3E-08**	**1.7E-09**	**1.5E-07**		**0.02**	**0.006**	**0.04**	**0.06**
		Exposure Point Total					**1.5E-07**					**0.06**
Soil	Subsurface Soil (greater than 1 foot bgs)	Treated Wood Storage	***PAHs***									
			Benzo(a)pyrene	1.3E-09	5.4E-10	1.4E-11	1.8E-09	Developmental	0.0003	0.0001	0.0008	0.001
			Chemical Total	**1.3E-09**	**5.4E-10**	**1.4E-11**	**1.8E-09**		**0.0003**	**0.0001**	**0.0008**	**0.001**
		Exposure Point Total					**1.8E-09**					**0.001**
	Receptor Total - Treated Wood Storage Area						**1.5E-07**					**0.06**

Table 3-1h
Summary of Receptor Risks and Hazards for COPCs - Construction Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Untreated Wood Storage	***PAHs***									
			Benzo(a)anthracene	4.0E-09	1.7E-09	3.3E-10	6.0E-09	NA	NA	NA	NA	NA
			Benzo(a)pyrene	4.3E-08	1.8E-08	4.5E-10	6.1E-08	Developmental	0.01	0.004	0.03	0.04
			Benzo(b)fluoranthene	5.7E-09	2.4E-09	6.0E-11	8.1E-09	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	2.5E-10	1.0E-10	2.6E-12	3.5E-10	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	6.9E-09	2.9E-09	7.3E-11	9.8E-09	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	3.3E-09	1.4E-09	3.5E-11	4.7E-09	NA	NA	NA	NA	NA
			Chemical Total	**6.3E-08**	**2.6E-08**	**9.6E-10**	**9.0E-08**		**0.01**	**0.004**	**0.03**	**0.04**
		Exposure Point Total					**9.0E-08**					**0.04**
Soil	Subsurface Soil (greater than 1 foot bgs)	Untreated Wood Storage	***SVOCs***									
			2,6-Dinitrotoluene	2.0E-08	NA	NA	2.0E-08	Hematologic, Renal, Nervous	0.0002	0.00007	NA	0.0003
			PAHs									
			Benzo(a)anthracene	4.3E-10	1.8E-10	3.6E-11	6.5E-10	NA	NA	NA	NA	NA
			Benzo(a)pyrene	6.1E-09	2.5E-09	6.5E-11	8.7E-09	Developmental	0.001	0.0006	0.004	0.006
			Benzo(b)fluoranthene	1.5E-09	6.1E-10	1.6E-11	2.1E-09	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	7.5E-09	3.1E-09	7.9E-11	1.1E-08	NA	NA	NA	NA	NA
			Chemical Total	**3.5E-08**	**6.5E-09**	**2.0E-10**	**4.2E-08**		**0.002**	**0.0007**	**0.004**	**0.006**
		Exposure Point Total					**4.2E-08**					**0.006**
	Receptor Total - Untreated Wood Storage Area						**1.3E-07**					**0.05**

Table 3-1h
Summary of Receptor Risks and Hazards for COPCs - Construction Worker
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Scenario Timeframe: Future
Receptor Population: Construction Worker

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil (0 -1 foot bgs)	Eastern Upland Area	***Inorganics***									
			Arsenic	1.2E-07	1.9E-08	1.0E-08	1.5E-07	Cardiovascular, Dermal	0.04	0.006	0.02	0.07
			Cobalt	NA	NA	3.7E-09	3.7E-09	Thyroid	0.001	NA	0.003	0.004
			VOCs									
			Acrolein	NA	NA	NA	NA	Other	0.000008	NA	0.03	0.03
			PAHs									
			Benzo(a)anthracene	1.1E-09	4.5E-10	8.9E-11	1.6E-09	NA	NA	NA	NA	NA
			Benzo(a)pyrene	9.2E-09	3.8E-09	9.7E-11	1.3E-08	Developmental	0.004	0.002	0.01	0.02
			Benzo(b)fluoranthene	3.0E-09	1.3E-09	3.2E-11	4.4E-09	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	7.3E-10	3.0E-10	7.7E-12	1.0E-09	NA	NA	NA	NA	NA
			Chemical Total	**1.4E-07**	**2.5E-08**	**1.4E-08**	**1.7E-07**		**0.04**	**0.008**	**0.07**	**0.1**
		Exposure Point Total					**1.7E-07**					**0.1**
	Receptor Total - Eastern Upland Area						**1.7E-07**					**0.1**

Notes:
COPCs - Chemicals of Potential Concern
SVOCs - Semi-Volatile Organic Compounds
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
NA - Not Applicable
bgs - below ground surface
BOLD highlighted cells - Target organ HI exceeds threshold of 1.0
[1] Construction/utility worker's exposure to 'core of the plume' groundwater is limited to the Process and Pond Areas.
[2] Target organ HI segregation is presented for exposure scenarios that present a cumulative HI greater than 1.0.

Target Organ Effects/Exposure Area [1,2]	Process Area (soil and groundwater)	Pond Area (soil and groundwater)
Cardiovascular HI Across All Media	0.013	0.2
Dermal/Skin Histopathology HI Across All Media	0.04	0.2
Developmental HI Across All Media	**2**	**3**
Gastrointestinal HI Across All Media	0.005	0.005
Hepatic HI Across All Media	**1**	**1**
Hematologic HI Across All Media	0.02	0.02
Immune HI Across All Media	0.0006	0.006
Nervous HI Across All Media	**14**	**13**
No Observed Effects HI Across All Media	0.005	0.003
Other HI Across All Media	0.00003	0.03
Renal HI Across All Media	0.3	**1**
Respiratory HI Across All Media	**15**	**15**
Thyroid HI Across All Media	0.0001	0.0001
Urinary Across All Media	0.00003	0.00003

Prepared By: SMA 3/28/2019
Checked By: RAH 3/28/2019

Table 3-2
Summary of Exposure Area Risks and Hazards for COPCs
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Receptor	Exposure Area	Carcinogenic Risk					Non-Carcinogenic Risk				
		Exposure Medium				Total Carcinogenic Risk	Exposure Medium				Total Non-Carcinogenic Risk
		Soil	Sediment	Groundwater - Direct Exposure	Groundwater - Vapor Intrusion		Soil	Sediment	Groundwater - Direct Exposure	Groundwater - Vapor Intrusion	
Child Resident	Process Area	8.4E-07	--	3.5E-04	--	3.5E-04	4	--	49	--	53
	Pond Area	1.4E-04	--	3.5E-04	--	4.9E-04	27	--	49	--	76
	Treated Wood Storage Area	--	--	[1]	[1]	--	0.2	--	[1]	[1]	0.2
	Untreated Wood Storage Area	--	--	[1]	[1]	--	0.1	--	[1]	[1]	0.1
	Eastern Upland Area	7.4E-06	--	[1]	[1]	7.4E-06	0.3	--	[1]	[1]	0.3
Adult Resident	Process Area	2.8E-06	--	9.5E-04	1.0E-03	2.0E-03	0.5	--	50	28	79
	Pond Area	1.5E-04	--	9.5E-04	1.0E-03	2.2E-03	9	--	50	28	88
	Treated Wood Storage Area	--	--	[1]	[1]	--	0.02	--	[1]	[1]	0.02
	Untreated Wood Storage Area	--	--	[1]	[1]	--	0.01	--	[1]	[1]	0.01
	Eastern Upland Area	2.5E-06	--	[1]	[1]	2.5E-06	0.08	--	[1]	[1]	0.08
Lifetime Resident	Process Area	4.5E-04	--	1.4E-03	1.0E-03	2.9E-03	--	--	--	--	--
	Pond Area	1.1E-03	--	1.4E-03	1.0E-03	3.6E-03	--	--	--	--	--
	Treated Wood Storage Area	4.1E-05	--	[1]	[1]	4.1E-05	--	--	[1]	[1]	--
	Untreated Wood Storage Area	2.5E-05	--	[1]	[1]	2.5E-05	--	--	[1]	[1]	--
	Eastern Upland Area	1.5E-05	--	[1]	[1]	1.5E-05	--	--	[1]	[1]	--
Teenage Trespasser	Process Area	1.5E-05	--	--	--	1.5E-05	0.1	--	--	--	0.1
	Pond Area	3.0E-05	--	--	--	3.0E-05	0.7	--	--	--	0.7
	Treated Wood Storage Area	1.4E-06	--	--	--	1.4E-06	0.007	--	--	--	0.007
	Untreated Wood Storage Area	8.2E-07	--	--	--	8.2E-07	0.004	--	--	--	0.004
	Eastern Upland Area	6.0E-07	--	--	--	6.0E-07	0.009	--	--	--	0.009
	Southern Marsh	--	2.3E-05	--	--	2.3E-05	--	0.4	--	--	0.4
Outdoor Worker	Process Area	2.4E-05	--	2.9E-04	--	3.2E-04	0.3	--	9	--	10
	Pond Area	9.3E-05	--	2.9E-04	--	3.8E-04	3	--	9	--	12
	Treated Wood Storage Area	2.2E-06	--	[1]	[1]	2.2E-06	0.01	--	[1]	[1]	0.01
	Untreated Wood Storage Area	1.3E-06	--	[1]	[1]	1.3E-06	0.009	--	[1]	[1]	0.009
	Eastern Upland Area	2.3E-06	--	[1]	[1]	2.3E-06	0.02	--	[1]	[1]	0.02
	Southern Marsh	--	3.7E-05	--	--	3.7E-05	--	0.7	--	--	0.7
Indoor Worker	Groundwater	--	--	3.2E-04	2.4E-04	5.6E-04	--	--	11	7	17
Construction Worker	Process Area	2.5E-05	--	7.3E-07	--	2.6E-05	18	--	0.8	--	19
	Pond Area	2.8E-05	--	7.3E-07	--	2.9E-05	19	--	0.8	--	20
	Treated Wood Storage Area	1.5E-07	--	[1]	[1]	1.5E-07	0.06	--	[1]	[1]	0.06
	Untreated Wood Storage Area	1.3E-07	--	[1]	[1]	1.3E-07	0.05	--	[1]	[1]	0.05
	Eastern Upland Area	1.7E-07	--	[1]	[1]	1.7E-07	0.1	--	[1]	[1]	0.1

Notes:
COPCs - Chemicals of Potential Concern
-- - Not Applicable. Exposure pathway is incomplete or risk not calculable.
Shading indicates excess lifetime cancer risk greater than 1E-4 or a total hazard index greater than 1.0.
[1] Based on data collected prior to the Remedial Investigation, groundwater impacts are limited to areas in the southern-most portion of the Untreated Wood Storage Area adjacent to the Pond and Process Areas (see Figures 1-9 and 1-10). Consequently, groundwater risk was not included in the total exposure area risk for the Eastern Upland Area, Treated Wood Storage Area, and Untreated Wood Storage Area. See text for further explanation.

Prepared By: RAH 3/28/2019
Reviewed By: SMA 3/28/2019

Table 3-3
Summary of COCs
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	Medium	COCs	Receptors						
			Child Resident	Adult Resident	Lifetime Resident	Teenage Trespasser	Outdoor Worker	Indoor Worker	Construction Worker
Groundwater	Groundwater	***Inorganics***							
		Aluminum	✓	✓	X	NA	X	X	X
		Arsenic	✓	✓	✓	NA	✓	✓	X
		Cobalt	✓	✓	X	NA	✓	✓	X
		Iron	✓	✓	X	NA	✓	✓	X
		Manganese	✓	✓	X	NA	✓	✓	X
		Selenium	✓	✓	X	NA	✓	✓	X
		VOCs							
		1,2,4-Trimethylbenzene	✓	✓	X	NA	✓	✓	X
		1,3,5-Trimethylbenzene	✓	✓	X	NA	X	X	X
		Benzene	✓	✓	✓	NA	✓	✓	X
		Chloroform	✓	✓	✓	NA	✓	✓	X
		Ethylbenzene	✓	✓	✓	NA	✓	✓	X
		Total Xylenes	X	✓	X	NA	X	✓	X
		SVOCs							
		1,1-Biphenyl	✓	✓	✓	NA	✓	✓	X
		2,4-Dimethylphenol	✓	✓	X	NA	X	✓	X
		Bis(2-ethylhexyl)phthalate	X	✓	✓	NA	X	X	X
		Carbazole	✓	✓	X	NA	X	X	X
		Dibenzofuran	✓	✓	X	NA	✓	✓	X
		Pyridine	✓	✓	X	NA	✓	✓	X
		PAHs							
		2-Methylnaphthalene	✓	✓	X	NA	✓	✓	X
		Acenaphthene	✓	✓	X	NA	X	X	X
		Benzo(a)anthracene	X	X	✓	NA	X	X	X
		Benzo(a)pyrene	✓	✓	✓	NA	✓	✓	X
		Benzo(b)fluoranthene	X	X	✓	NA	✓	✓	X
		Benzo(k)fluoranthene	X	X	✓	NA	X	X	X
		Dibenzo(a,h)anthracene	X	X	✓	NA	X	X	X
		Fluorene	✓	✓	X	NA	X	X	X
		Naphthalene	✓	✓	✓	NA	✓	✓	X
		1-Methylnaphthalene	✓	✓	✓	NA	✓	✓	X
		Phenanthrene	✓	✓	X	NA	X	X	X
		Pesticides							
		Pentachlorophenol	✓	✓	✓	NA	✓	✓	X
Process Area	Surface Soil and Terrestrial Sediment	***SVOCs***							
		Dibenzofuran	✓	X	X	X	X	NA	X
		PAHs							
		2-Methylnaphthalene	✓	X	X	X	X	NA	X
		Benzo(a)anthracene	X	X	✓	X	X	NA	X
		Benzo(a)pyrene	✓	X	✓	X	X	NA	X
		Benzo(b)fluoranthene	X	X	✓	X	X	NA	X
		Benzo(k)fluoranthene	X	X	✓	X	X	NA	X
		Dibenzo(a,h)anthracene	X	X	✓	X	X	NA	X
		Fluoranthene	✓	X	X	X	X	NA	X
		Indeno(1,2,3-cd)pyrene	X	X	✓	X	X	NA	X
		Naphthalene	✓	X	✓	X	X	NA	X
		Phenanthrene	✓	X	X	X	X	NA	X
		Pyrene	✓	X	X	X	X	NA	X
	Subsurface Soil	***SVOCs***							
		Dibenzofuran	NA	NA	NA	NA	NA	NA	✓
		PAHs							
		2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	✓
		Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	✓
		Naphthalene	NA	NA	NA	NA	NA	NA	✓

Table 3-3
Summary of COCs
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

Area	Medium	COCs	Receptors						
			Child Resident	Adult Resident	Lifetime Resident	Teenage Trespasser	Outdoor Worker	Indoor Worker	Construction Worker
Pond Area	Surface Soil and Terrestrial Sediment	***Inorganics***							
		Arsenic	✓	✓	✓	X	✓	NA	✓
		VOCs							
		Benzene	X	X	✓	X	X	NA	X
		Ethylbenzene	✓	✓	✓	X	✓	NA	X
		Total Xylenes	✓	✓	X	X	X	NA	X
		SVOCs							
		1,1-Biphenyl	✓	✓	✓	X	✓	NA	✓
		Carbazole	✓	X	X	X	X	NA	X
		Dibenzofuran	✓	✓	X	X	✓	NA	✓
		PAHs							
		2-Methylnaphthalene	✓	✓	X	X	✓	NA	✓
		Acenaphthene	✓	X	X	X	X	NA	X
		Benzo(a)anthracene	X	X	✓	X	✓	NA	X
		Benzo(a)pyrene	✓	✓	✓	X	✓	NA	✓
		Benzo(b)fluoranthene	X	X	✓	X	✓	NA	X
		Benzo(k)fluoranthene	X	X	✓	X	X	NA	X
		Chrysene	X	X	✓	X	X	NA	X
		Dibenzo(a,h)anthracene	X	X	✓	X	✓	NA	X
		Fluoranthene	✓	X	X	X	X	NA	X
		Fluorene	✓	X	X	X	X	NA	X
		Indeno(1,2,3-cd)pyrene	X	X	✓	X	X	NA	X
		Naphthalene	✓	✓	✓	X	✓	NA	✓
		Phenanthrene	✓	X	X	X	X	NA	X
		Pyrene	✓	X	X	X	X	NA	X
		Pesticides							
		Aldrin	✓	X	✓	X	X	NA	X
	Subsurface Soil	***SVOCs***							
		1,1-Biphenyl	NA	NA	NA	NA	NA	NA	✓
		Dibenzofuran	NA	NA	NA	NA	NA	NA	✓
		PAHs							
		2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	✓
		Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	✓
		Naphthalene	NA	NA	NA	NA	NA	NA	✓
Treated Wood Storage Area	Surface Soil and Terrestrial Sediment	**No COCs**							
	Subsurface Soil	**No COCs**							
Untreated Wood Storage Area	Surface Soil and Terrestrial Sediment	**No COCs**							
	Subsurface Soil	**No COCs**							
Eastern Upland Area	Surface Soil and Terrestrial Sediment	**No COCs**							
Southern Marsh	Sediment	**No COCs**							

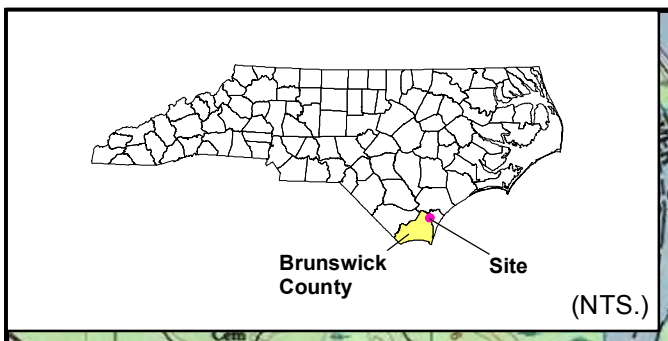
Notes:
COCs - Chemicals of Concern
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs - Volatile Organic Compounds
SVOCs - Semi-Volatile Organic Compounds
ELCR - Excess Lifetime Cancer Risk
HQ - Hazard Quotient
NA - Not Applicable

✓	ELCR exceeds 1E-06 and/or HQ exceeds 0.1
X	ELCR is less than 1E-06 and HQ is less than 0.1

Prepared By: RAH 4/1/2019
Reviewed By: SMA 4/1/2019

No constituents were detected above the USEPA residential soil screening values in surface soil and subsurface soil West of Navassa Road.

FIGURES



(NTS.)

N

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Legend

PROPERTY BOUNDARY

0 1,000 2,000

Scale in Feet

Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

PREPARED BY:

EARTHCON

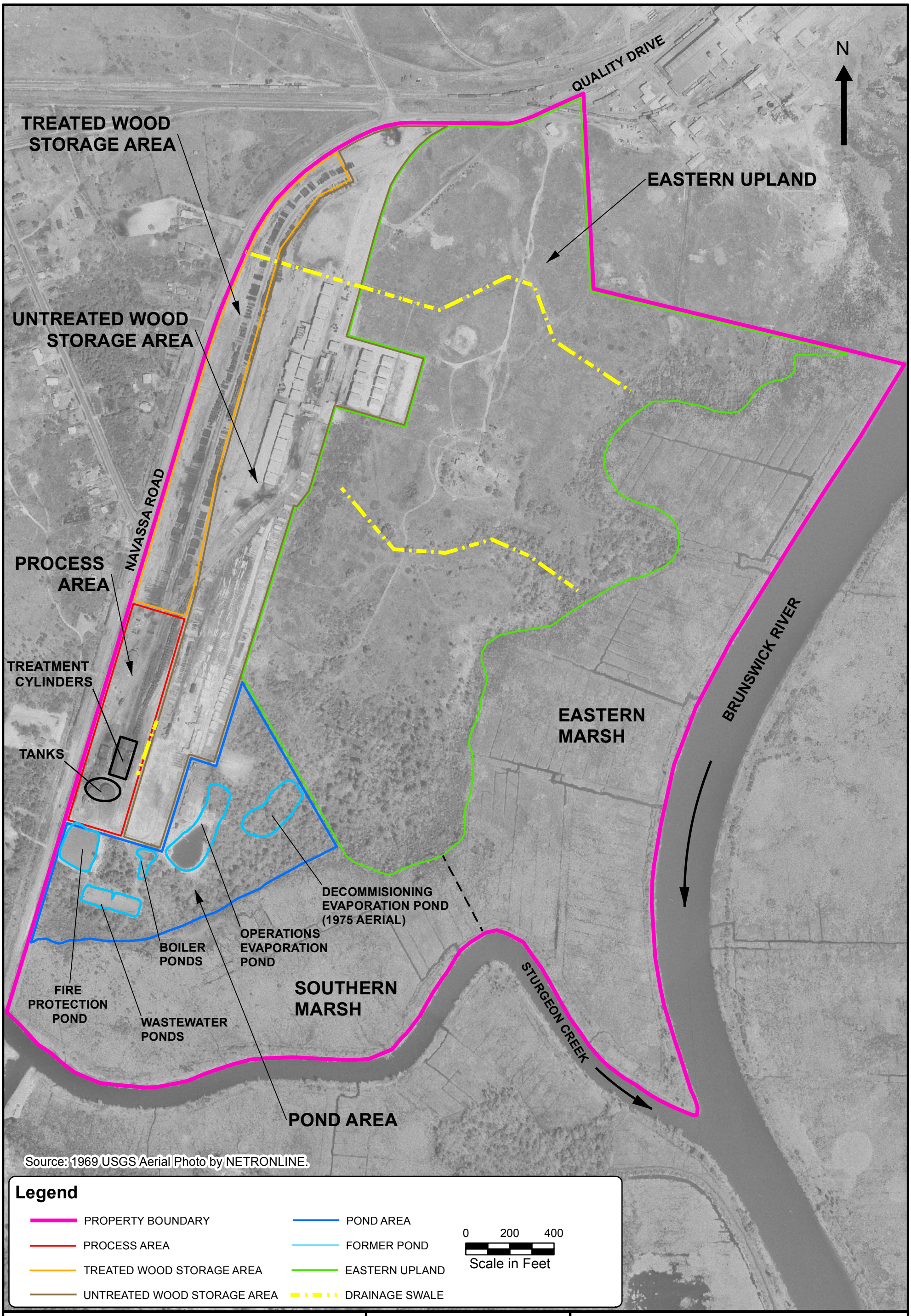
EARTHCON CONSULTANTS OF NORTH CAROLINA, P.C.

SITE LOCATION
Human Health Risk Assessment

Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-1

S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 1-1 Navassa Site Location_HHRA.mxd



S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 1-2 Navassa Historical Site Plan_HHRA.mxd

Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

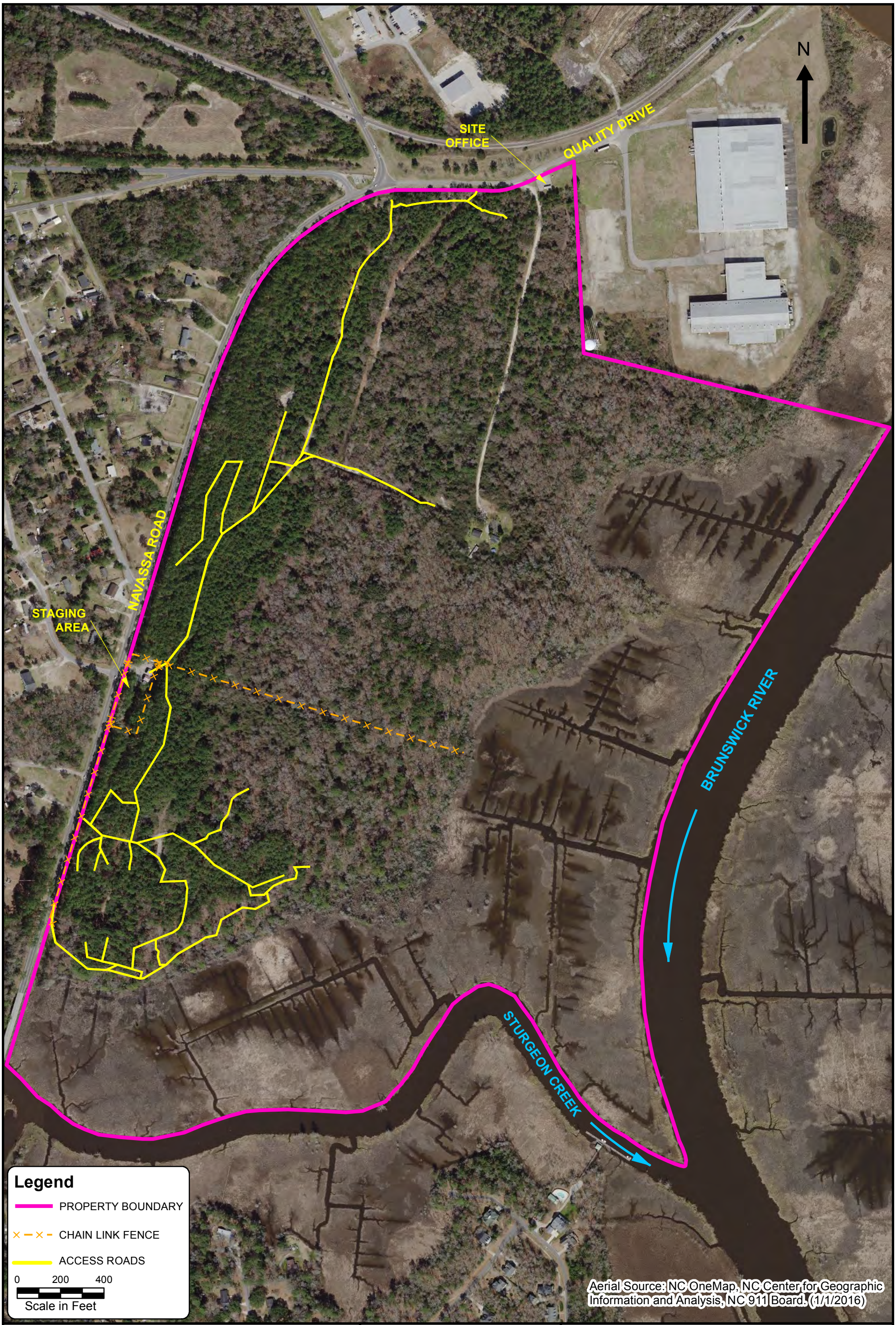
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HISTORICAL SITE PLAN
Human Health Risk Assessment

Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-2



S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 1-3 Current Property Condition_HHRA.mxd

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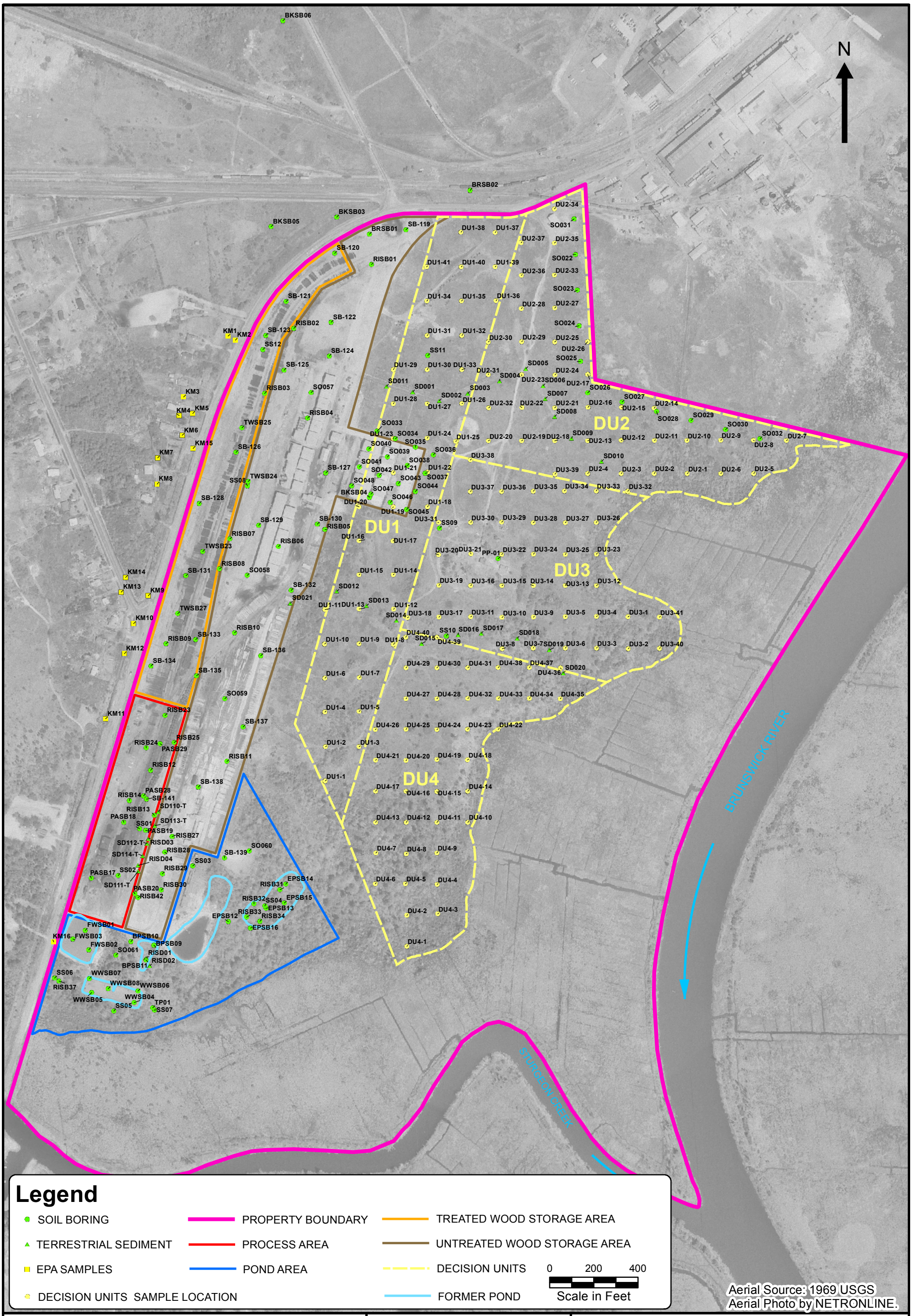
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CURRENT PROPERTY CONDITIONS
Human Health Risk Assessment

Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-3



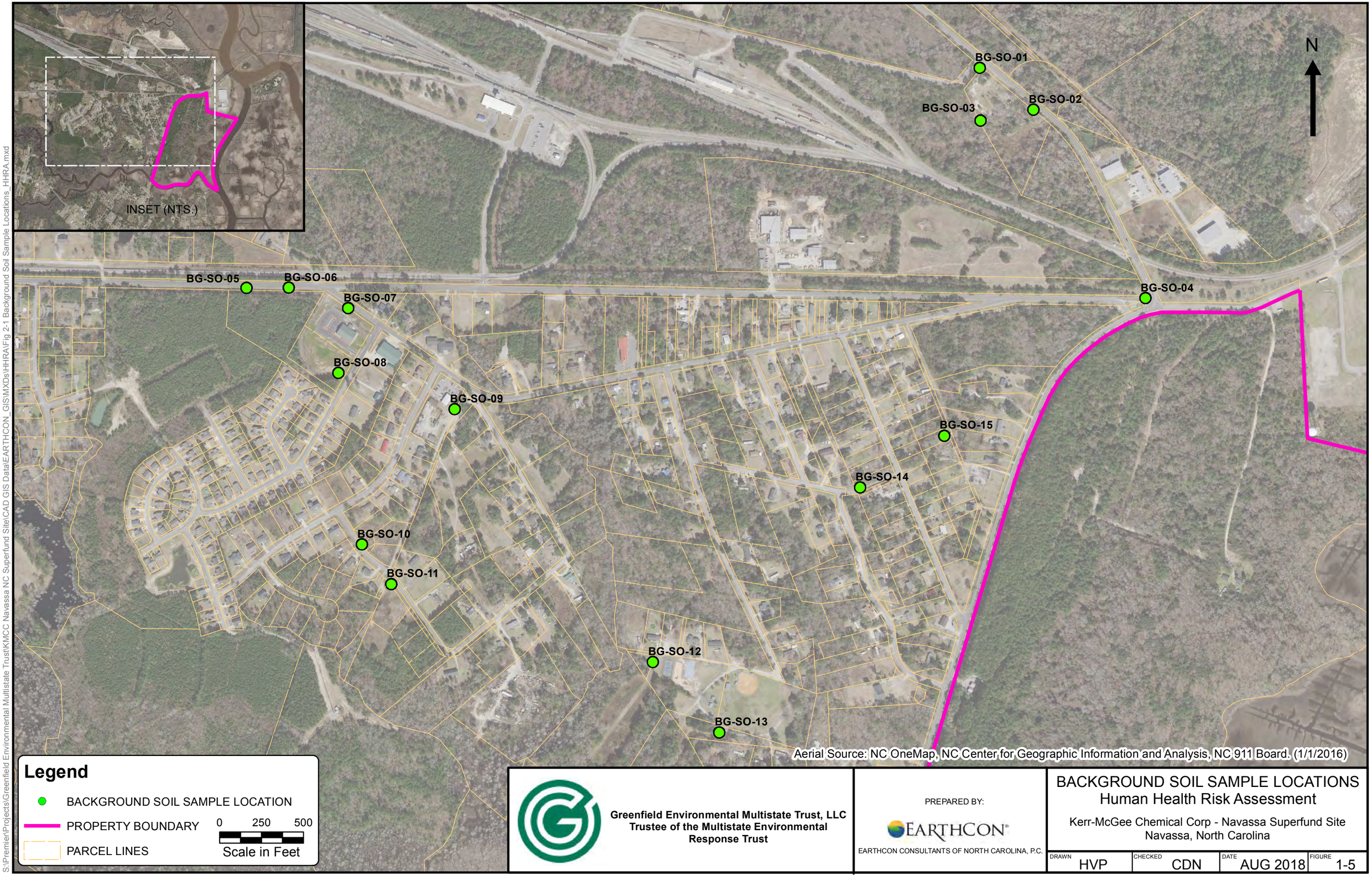
S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-2a Surface Soil and Terrestrial Sediment Sample Location_HHRA.mxd

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SURFACE SOIL and TERRESTRIAL SEDIMENT SAMPLING LOCATIONS
Human Health Risk Assessment
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-4



S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-1 Background Soil Sample Locations_HHRA.mxd

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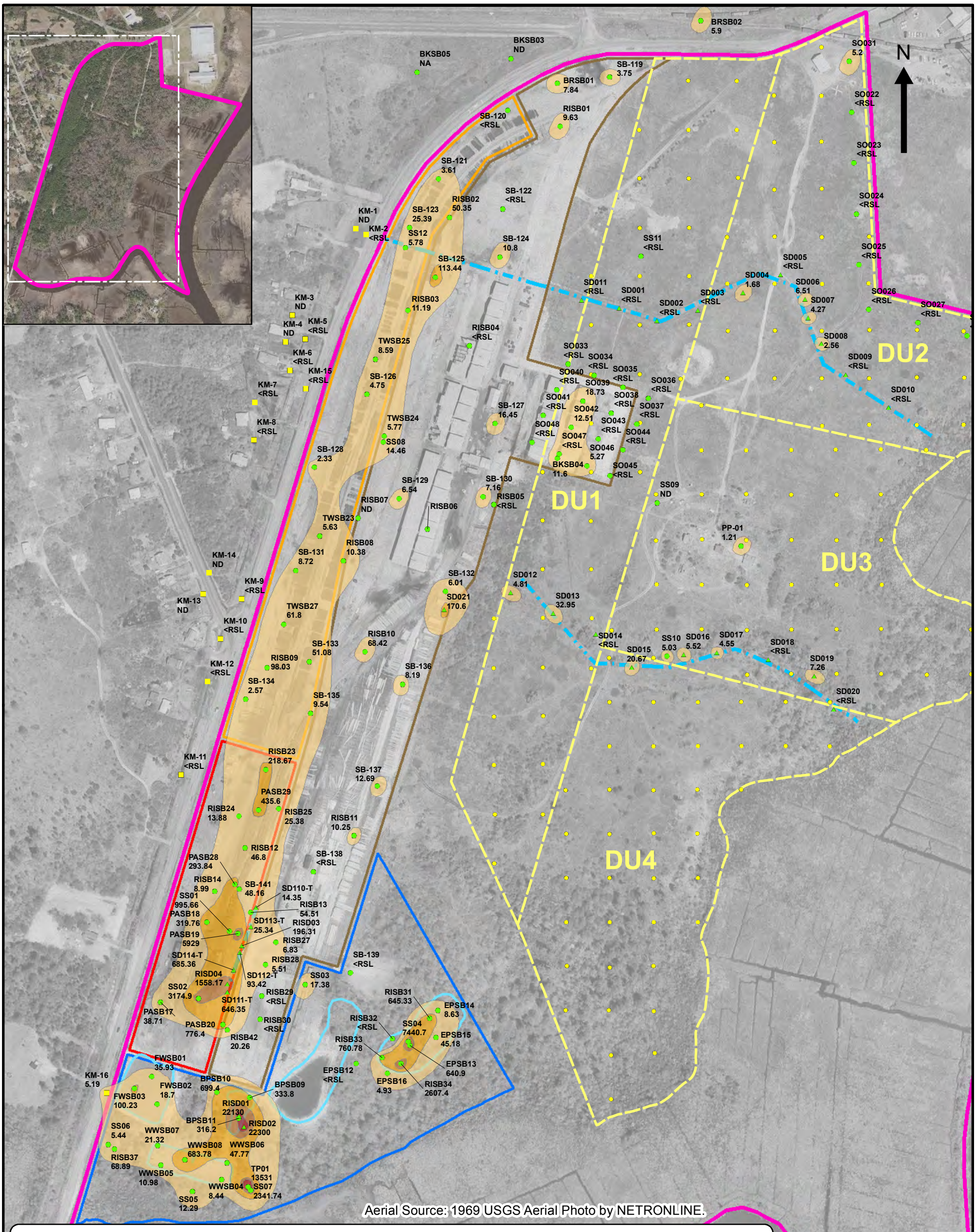
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BACKGROUND SOIL SAMPLE LOCATIONS
Human Health Risk Assessment

Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-5



Aerial Source: 1969 USGS Aerial Photo by NETRONLINE.

Legend

NOTE: CREOSOTE-RELATED SVOCs INCLUDE 1,1-BIPHENYL, CARBAZOLE, DIBENZOFURAN AND PAHS

- SOIL BORING
- TERRESTRIAL SEDIMENT
- EPA SAMPLES
- DECISION UNITS SAMPLE LOCATION
- PROPERTY BOUNDARY
- PROCESS AREA
- POND AREA
- DRAINAGE SWALE
- TREATED WOOD STORAGE AREA
- UNTREATED WOOD STORAGE AREA
- DECISION UNITS
- FORMER POND

0 150 300
Scale in Feet

<RSL - LESS THAN RESIDENTIAL REGIONAL SCREENING LEVEL (RSL) mg/kg - MILLIGRAMS PER KILOGRAM ND - NOT DETECTED

CREOSOTE-RELATED SVOC CONCENTRATIONS (mg/kg)

- 0 - 100
- 100 - 1000
- 1000 - 10000
- > 10000

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DISTRIBUTION OF CREOSOTE-RELATED SVOCs in SURFACE SOIL and TERRESTRIAL SEDIMENT
Human Health Risk Assessment

Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-6

S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-2b SVOC Concentrations in Surface Soil and Terr Sediment_HHRA.mxd



S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-3a Subsurface Soil Sampling Locations_HHRA.mxd

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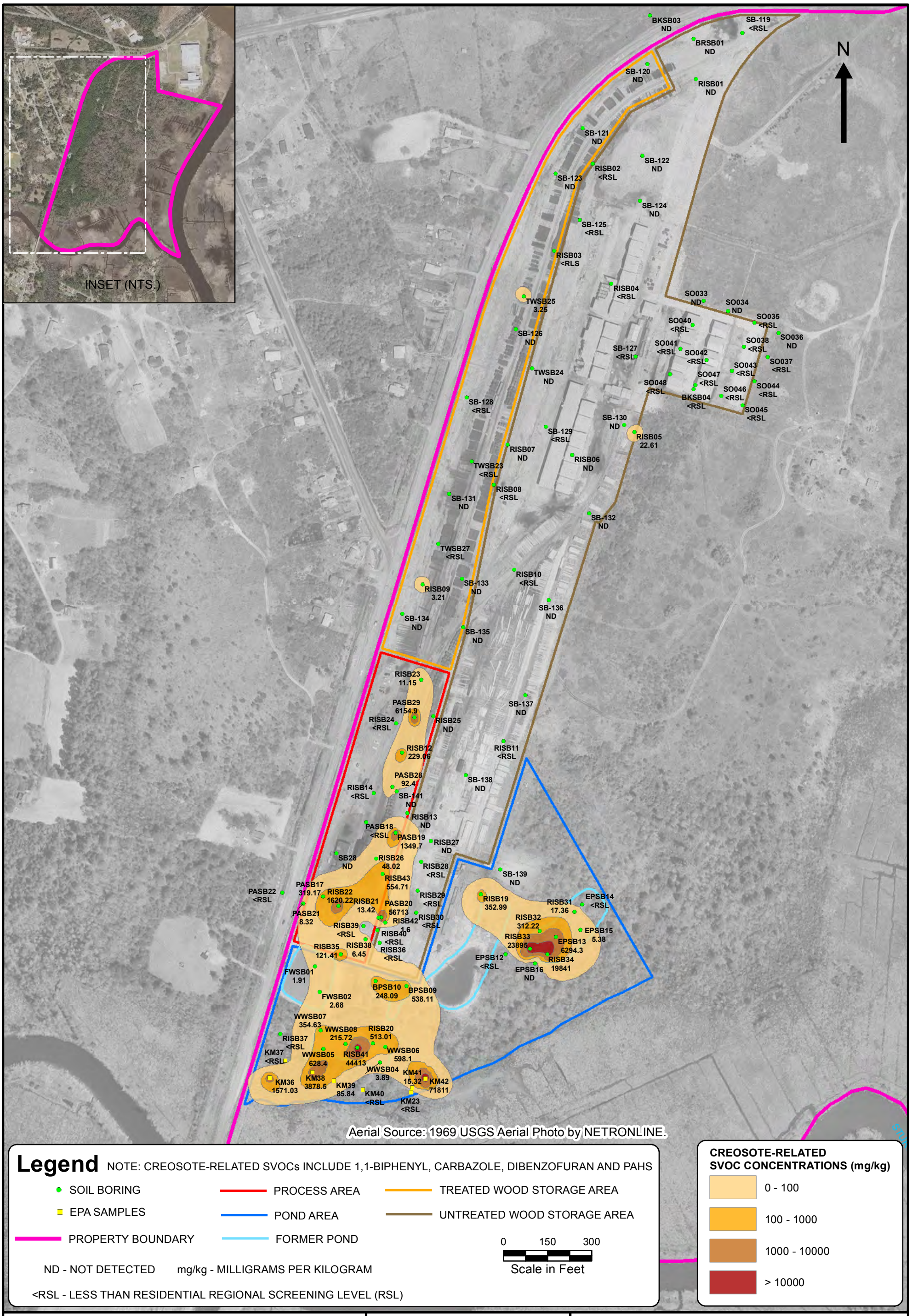
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SUBSURFACE SOIL SAMPLING LOCATIONS
Human Health Risk Assessment

Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-7



Aerial Source: 1969 USGS Aerial Photo by NETRONLINE.

Legend

NOTE: CREOSOTE-RELATED SVOCs INCLUDE 1,1-BIPHENYL, CARBAZOLE, DIBENZOFURAN AND PAHS

- SOIL BORING
- EPA SAMPLES
- PROPERTY BOUNDARY
- PROCESS AREA
- POND AREA
- FORMER POND
- TREATED WOOD STORAGE AREA
- UNTREATED WOOD STORAGE AREA

0 150 300
Scale in Feet

ND - NOT DETECTED mg/kg - MILLIGRAMS PER KILOGRAM

<RSL - LESS THAN RESIDENTIAL REGIONAL SCREENING LEVEL (RSL)

CREOSOTE-RELATED SVOC CONCENTRATIONS (mg/kg)

- 0 - 100
- 100 - 1000
- 1000 - 10000
- > 10000

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DISTRIBUTION OF CREOSOTE-RELATED SVOCs in SUBSURFACE SOIL

Human Health Risk Assessment

Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-8

S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-3b SVOC Concentrations in Subsurface Soil_HHRA.mxd



N

MW-30
ND

MW-10S
FP

MW-10
ND

MW-12
ND

MW-12S
ND

MW-20
ND

MW-03
188.7

MW-17
ND

MW-24S
ND

MW-25S
261.3

MW-19
ND

MW-02
FP

MW-28S
ND

MW-13
ND

MW-11S
14.18

MW-11
ND

MW-21
ND

MW-08
118.5

MW-08S
<RSL

MW-29
ND

MW-18
98.5

MW-27S
FP

MW-31
ND

MW-07
ND

MW-16
137

MW-26S
80.1

MW-04
258.9

MW-14S
373.8

MW-14
32.8

MW-05
FP

MW-06
711.2

MW-15
FP

MW-32
524.8

Aerial Source: 1969 USGS Aerial Photo by NETRONLINE.

VOC CONCENTRATION (ug/L)

- 0-10
- 10-100
- 100-500
- >500

Legend

NOTE: VOCs INCLUDE BENZENE, ETHYLBENZENE, XYLENE, AND TRIMETHYLBENZENES

- SHALLOW MONITORING WELL
- PROPERTY BOUNDARY
- UNTREATED WOOD STORAGE AREA
- PROCESS AREA
- POND AREA
- FORMER POND

FP - FREE PRODUCT

<RSL - LESS THAN RESIDENTIAL REGIONAL SCREENING LEVEL (RSL)

ND - NOT DETECTED

ug/L - MICROGRAMS PER LITER

0 75 150

Scale in Feet

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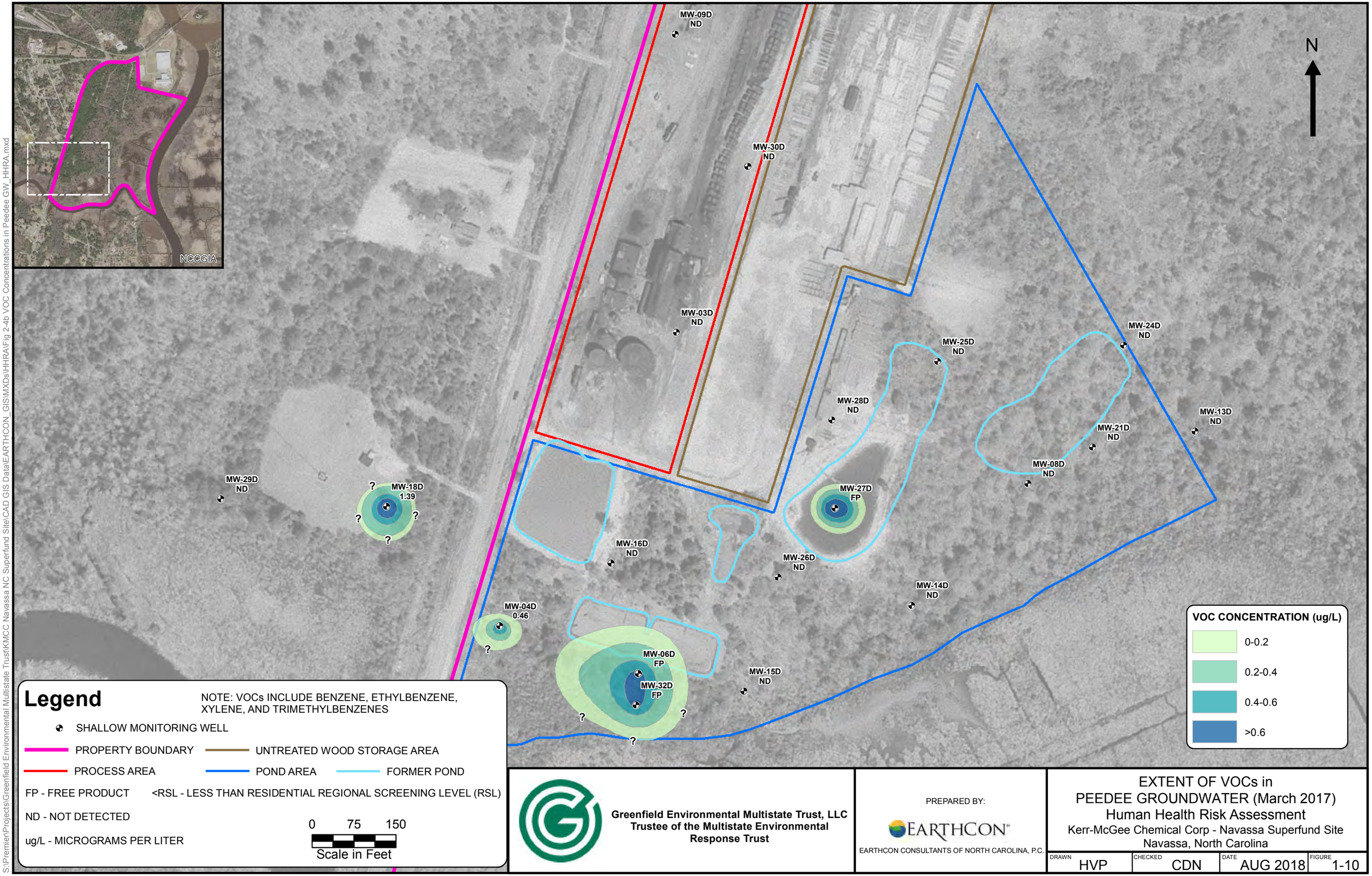
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EXTENT OF VOCs in SURFICIAL GROUNDWATER (March 2017)
Human Health Risk Assessment
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-9

S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-4a VOC Concentrations in Shallow GW_HHRA.mxd



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EXTENT OF VOCs in PEEDEE GROUNDWATER (March 2017) Human Health Risk Assessment

Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-10

S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-4b VOC Concentrations in Peedee GW_HHRA.mxd



N

MW-30 0.46
MW-10S FP
MW-10 ND
MW-12 1.34
MW-12S ND
MW-20 7.46
MW-03 4224.3
MW-17 43.21
MW-24S 1.67
MW-25S 3863
MW-02 FP
MW-19 12.57
MW-28S 0.42
MW-13 ND
MW-11S 148.47
MW-11 ND
MW-21 ND
MW-08 3195.6
MW-08S 30.5
MW-29 12.93
MW-18 2405.3
MW-27S FP
MW-31 3.21
MW-07 1.3
MW-16 1765
MW-26S 2883.5
MW-04 5954.3
MW-14S 3021.8
MW-14 755.36
MW-05 FP
MW-06 8669.3
MW-15 FP
MW-32 8290.8

Aerial Source: 1969 USGS Aerial Photo by NETRONLINE.

CREOSOTE-RELATED SVOC CONCENTRATIONS (ug/L)

- 0-10
- 10-100
- 100-1000
- 1000-10000
- >10000

Legend

NOTE: CREOSOTE-RELATED SVOCs INCLUDE 1,1-BIPHENYL, CARBAZOLE, DIBENZOFURAN AND PAHS

- SHALLOW MONITORING WELL
- PROPERTY BOUNDARY
- UNTREATED WOOD STORAGE AREA
- PROCESS AREA
- POND AREA
- FORMER POND

RSL - REGIONAL SCREENING LEVEL

ug/L - MICROGRAMS PER LITER

FP - FREE PRODUCT

ND - NOT DETECTED

0 75 150
Scale in Feet

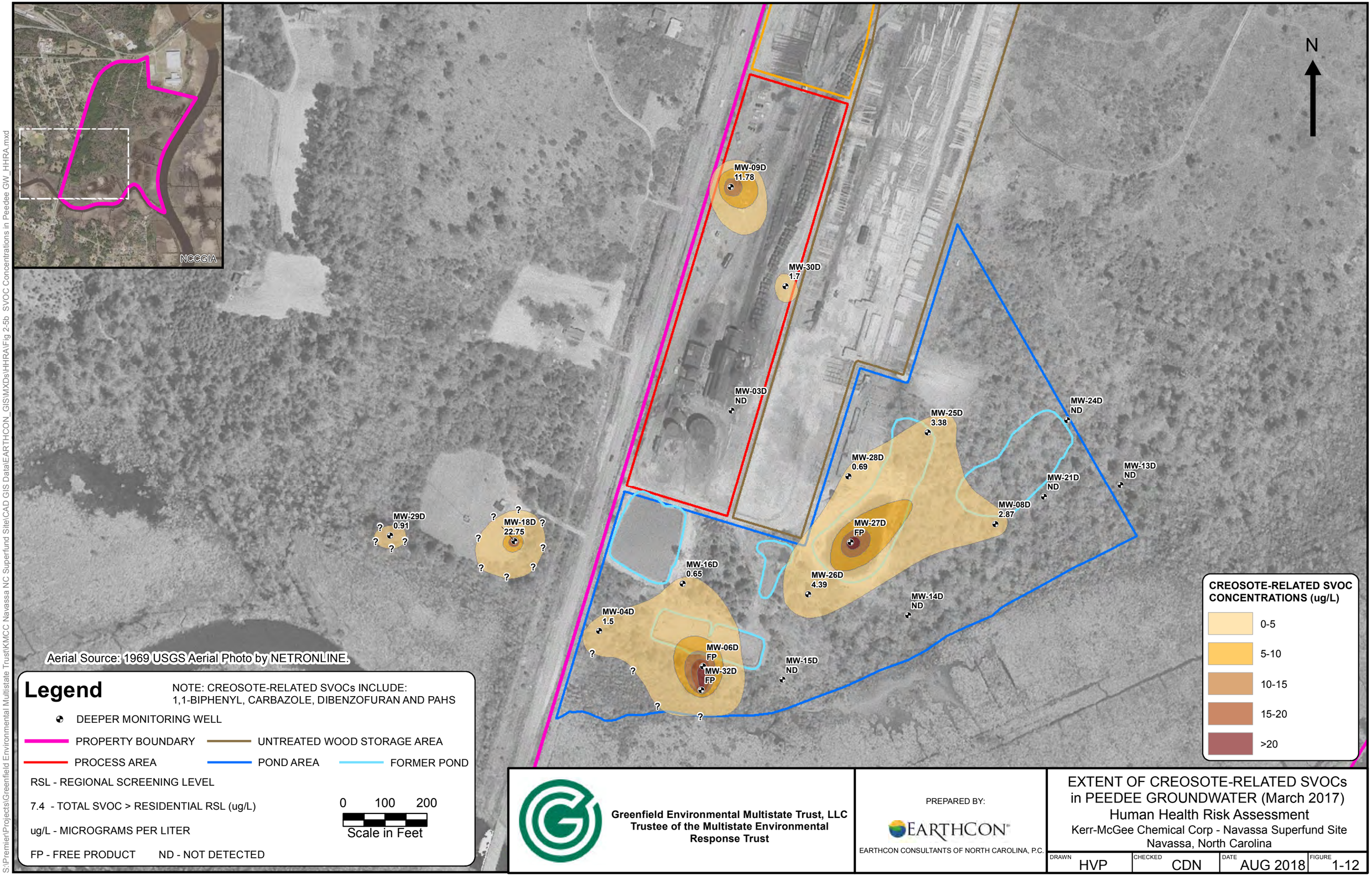
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EXTENT OF CREOSOTE-RELATED SVOCs in SURFICIAL GROUNDWATER (March 2017)
Human Health Risk Assessment
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-11

S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-5a SVOC Concentrations in Shallow GW_HHRA.mxd



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EXTENT OF CREOSOTE-RELATED SVOCs in PEEDEE GROUNDWATER (March 2017)
Human Health Risk Assessment
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-12

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EXTENT OF ARSENIC in SURFICIAL GROUNDWATER (Dec. 2016)
Human Health Risk Assessment
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-13

S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-6 Arsenic Concentrations in Shallow GW_HHRA.mxd

N

BKSD1

SD109 SW109

BG-SD-03
SW108
SD108

BRUNSWICK RIVER

SD107 SW107

RISW04

RISW01

SW-110

SD71

BG-SD-01

BG-SD-02

SD22 SW22
SD101 SW101

KM24

SD87

Collector 1 (C1)
Collector 2 (C2)
Collector 3 (C3)

SW-112
SW-111
SD-M2
SD-M1
SD-M3
SD-M4
SD-M5
SD-M6
SD-M7
VC-H-M01
VC-H-M03

SD01 SD02 SD03 SD04 SD05 SD06 SD07 SD08 SD09 SD10 SD11 SD12 SD13 SD14 SD15 SD16 SD17 SD18 SD19 SD20 SD21 SD22 SD27 SD28 SD29 SD30 SD31 SD32 SD33 SD34 SD35 SD36 SD37 SD38 SD39 SD40 SD41 SD42 SD43 SD44 SD45 SD46 SD47 SD48 SD49 SD50 SD51 SD52 SD53 SD54 SD55 SD56 SD57 SD68 SD69 SD70 SD71 SD72 SD73 SD74 SD75 SD76 SD79 SD80 SD81 SD82 SD83 SD84 SD85 SD86 SD87 SD88 SD89 SD90 SD101 SD102 SD103 SD104 SD105 SD106 SD107 SD108 SD109

RISD58 RISD59 RISD60 RISD61 RISD62 RISD63 RISD64 RISD65 RISD66 RISD67

SW101 SW102 SW103 SW104 SW105 SW106 SW107 SW108 SW109

SW20 SW23 SW24 SW26 SW28

KM25 KM26 KM27 KM28 KM29 KM30 KM31 KM32 KM33 KM34 KM35

STURGEON CREEK

Legend

- MARSH SEDIMENT
- SURFACE WATER
- EPA SAMPLES
- SURFACE WATER & SEDIMENT
- PROPERTY BOUNDARY
- PROCESS AREA
- TREATED WOOD STORAGE AREA
- UNTREATED WOOD STORAGE AREA
- POND AREA
- FORMER POND

0 250 500
Scale in Feet

Aerial Source: 1969 USGS Aerial Photo by NETRONLINE.

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SURFACE WATER and MARSH SEDIMENT SAMPLING LOCATIONS
Human Health Risk Assessment
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-14

S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-7 Surface Water and Marsh Sediment Sampling Locations_HHRA.mxd



N

SD87 3.97
SD88 <RSL
SD89 <RSL
SD86 287.4
SD03 159.01
SD05 69.12
SD39 NS
SD01 10.98
SD02 55.44
SD04 176.98
SD06 53.77
SD07 244.03
SD08 881.5
SD09 1135.99
SD43 NS
SD29 24668*
SD35 14.93
SD33 9.18
SD34 <RSL
SD36 17.84
RISD58 15.52
SD42 420.24
SD10 3404.9
SD11 22923
SD12 34170
VC-H-M01 483.07
SD13 5201
SD14 7754
SD46 NS
SD15 7607
SD53 1884.16
SD52 574.45
SD44 2157.7
SD21 1590.07
RISD62 527.99
SD41 818.06
RISD61 <RSL
VC-H-M03 147.49
SD49 304.19
RISD59 ND
SD45 321.6
RISD60 <RSL
SD47 52.02
RISD64 <RSL
SD51 29.95
SD16 199.1
SD17 24.47
SD18 43.37
SD19 13.9
SD56 11.41
RISD66 <RSL
RISD67 <RSL
SD69 <RSL
SD68 <RSL
SD20 5.77
SD57 <RSL
RISD65 <RSL
SD54 455.69
RISD63 59.76
SD81 <RSL
SD80 <RSL
SD82 <RSL
SD83 <RSL
SD55 ND
SD90 <RSL
SD70 <RSL
SD79 <RSL
KM31 <RSL
KM32 <RSL
SD30 <RSL
SD32 <RSL
SD38 <RSL
KM25 <RSL
SD24 1.57
SD31 <RSL
SD48 3.8
SD40 2.28
SD50 NS
SD85 <RSL
SD84 <RSL
KM35 6.11
KM27 <RSL
KM28 <RSL
SD37 <RSL
SD26 ND
KM33 <RSL
KM26 5.51
SD25 <RSL
KM34 <RSL

Aerial Source: 1969 USGS Aerial Photo by NETRONLINE.

CREOSOTE-RELATED SVOC CONCENTRATION (mg/kg)

- 0.1 - 100
- 100 - 1000
- 1000 - 10000
- > 10000

Legend

NOTE: CREOSOTE-RELATED SVOCs INCLUDE 1,1-BIPHENYL, CARBAZOLE, DIBENZOFURAN AND PAHS

- MARSH SEDIMENT
- EPA SAMPLES
- PROPERTY BOUNDARY
- PROCESS AREA
- POND AREA
- FORMER POND
- UNTREATED WOOD STORAGE AREA

ND - NOT DETECTED

NS - NOT SAMPLED

<RSL - LESS THAN RESIDENTIAL REGIONAL SCREENING LEVEL (RSL)

mg/kg - MILLIGRAMS PER KILOGRAM

* - CONCENTRATION FROM 0.3 TO 0.65 FT HORIZON

0 75 150 Feet

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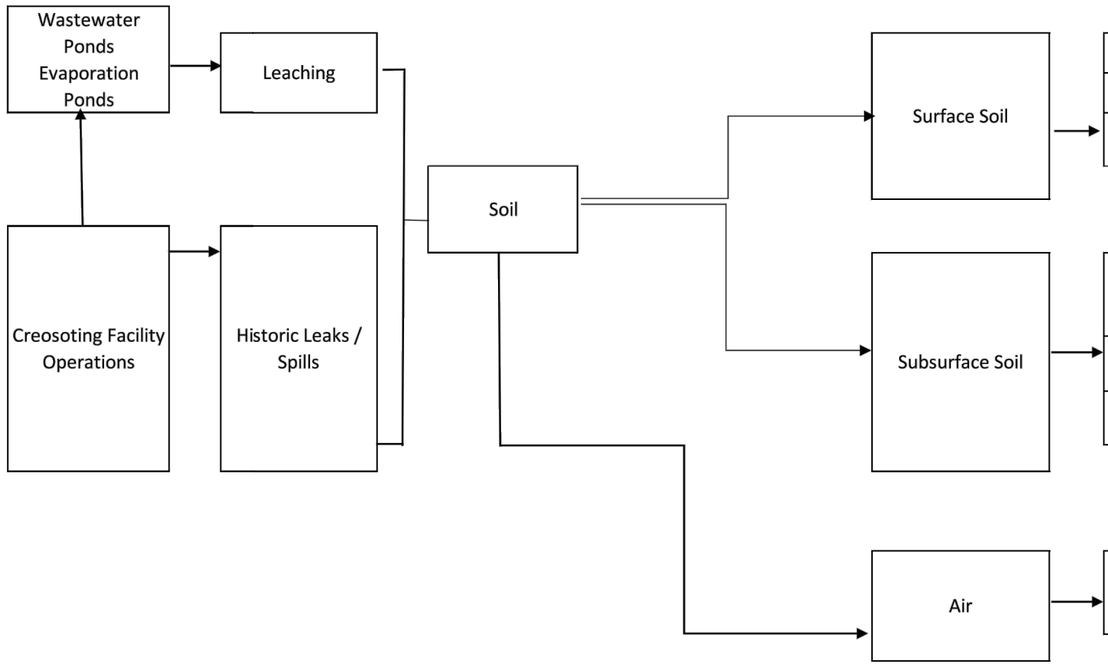
DISTRIBUTION OF CREOSOTE-RELATED SVOCs in MARSH SEDIMENT
Human Health Risk Assessment

Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

DRAWN	CHECKED	DATE	FIGURE
HVP	CDN	AUG 2018	1-15

S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\CAD GIS Data\EARTHCON_GIS\MXDs\HHRA\Fig 2-8 SVOC Concentrations in Marsh Sediment_HHRA.mxd

POND AND PROCESS AREAS



Potential Primary Sources	Primary Release Mechanisms	Secondary Source	Transport and Migration Mechanisms	Exposure Media	Exposure Route	Potentially Exposed Receptors: Future Resident	Current/Future Trespasser	Future Outdoor Worker	Future Indoor Worker	Future Construction Worker
				Surface Soil	Ingestion	●	●	●	o	●
					Dermal Contact	●	●	●	o	●
					Inhalation (via Particulate and Vapor Emissions)	●	o	●	NA	●
				Subsurface Soil	Incidential Ingestion	NA	NA	o	NA	●
					Dermal Contact	NA	NA	o	NA	●
					Inhalation (via Particulate and Vapor Emissions)	NA	NA	o	NA	●
				Air	Inhalation (via Vapor Intrusion) [1]	o	NA	NA	o	NA

Notes:

● Complete Exposure Route, Quantified in the Human Health Risk Assessment (HHRA)

o Exposure Route Complete but Insignificant - Not Quantified in the HHRA

NA Not Applicable - receptor is not potentially exposed via this pathway

Dermal contact is considered insignificant for future indoor worker. Dermal contact risk for the resident and outdoor worker is quantified and will be greater than the future indoor worker.

Teenage trespasser inhalation via particulate emissions of surface soil would be less than the resident and is therefore considered insignificant.

Teenage trespasser and outdoor worker exposure to subsurface soil via vapor emissions is considered insignificant.

[1]Given the technical difficulty in collecting representative soil gas samples due to the presence of shallow groundwater, soil gas vapor intrusion was not assessed. Instead, the potential for vapor intrusion is assessed via the groundwater-to-indoor air pathway. See Fig. 2-5 Groundwater CSEM.

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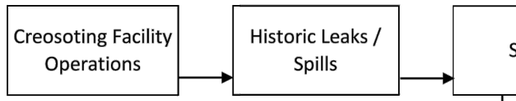
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Environmental Challenges ***BUSINESS SOLUTIONS®***
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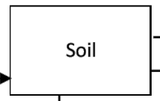
HUMAN HEALTH CONCEPTUAL SITE EXPOSURE MODEL
POND AND PROCESS AREAS
HUMAN HEALTH RISK ASSESSMENT
Kerr-McGee Chemical Corporation Superfund Site
Navassa, North Carolina

DRAWN:	CHECKED:	DATE:	FIGURE:
HVP	CDN	JANUARY 2019	2-1

S:\Premier\Projects\Greenfield Environmental Multistate Trust\KMCC Navassa NC Superfund Site\Drawings & Figures\Drawings\Cross Sections CAD\2-1 TO 6-1 HHRA_RV8.dwg (2-1) 01/30/19 12:58 - hpham

TREATED AND UNTREATED WOOD STORAGE AREAS





Potential Primary Sources	Primary Release Mechanisms	Secondary Source	Transport and Migration Mechanisms	Exposure Media	Potentially Exposed Receptors					
					Exposure Route	Future Resident	Current/Future Trespasser	Future Outdoor Worker	Future Indoor Worker	Future Construction Worker
				Surface Soil	Incidential Ingestion	●	●	●	o	●
					Dermal Contact	●	●	●	o	●
					Inhalation (via Particulate and Vapor Emissions)	●	o	●	NA	●
				Subsurface Soil	Incidential Ingestion	NA	NA	o	NA	●
					Dermal Contact	NA	NA	o	NA	●
					Inhalation (via Particulate and Vapor Emissions)	NA	NA	o	NA	●
				Air	Inhalation (via Vapor Intrusion) [1]	o	NA	NA	o	NA

Notes:

- ● Complete Exposure Route, Evaluated and quantified in the Human Health Risk Assessment (HHRA)
- o Exposure Route Complete but Insignificant - Not Evaluated or quantified in the HHRA
- NA Not Applicable - receptor is not potentially exposed via this pathway

Dermal contact is considered insignificant for future indoor worker. Dermal contact risk for the resident and outdoor worker is quantified and will be greater than the future indoor worker.
Teenage trespasser inhalation via particulate emissions of surface soil would be less than the resident and is therefore considered insignificant.
Teenage trespasser and outdoor worker exposure to subsurface soil via vapor emissions is considered insignificant.
[1]Given the technical difficulty in collecting representative soil gas samples due to the presence of shallow groundwater, soil gas vapor intrusion was not assessed. Instead, the potential for vapor intrusion is assessed via the groundwater-to-indoor air pathway. See Fig. 2-5 Groundwater CSEM.

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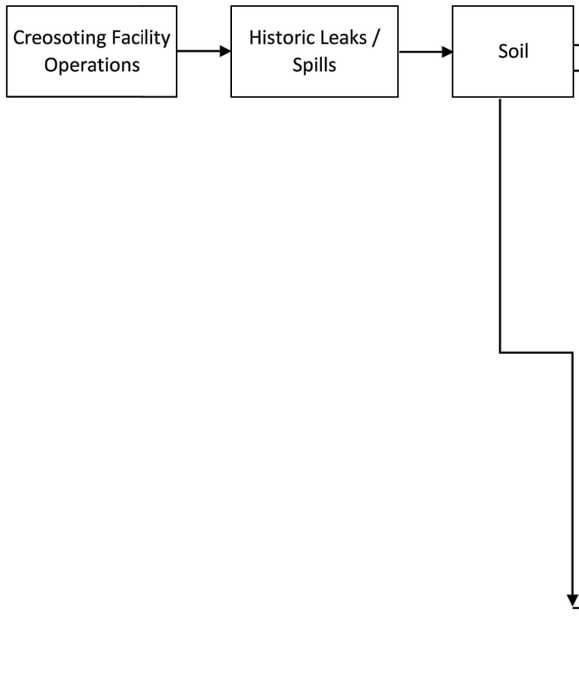
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HUMAN HEALTH CONCEPTUAL SITE EXPOSURE MODEL
TREATED AND UNTREATED WOOD STORAGE AREAS
HUMAN HEALTH RISK ASSESSMENT
Kerr-McGee Chemical Corporation Superfund Site
Navassa, North Carolina

DRAWN:	CHECKED:	DATE:	FIGURE:
HVP	CDN	JANUARY 2019	2-2

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EASTERN UPLAND AND WEST OF NAVASSA ROAD



Potential Primary Sources	Primary Release Mechanisms	Secondary Source	Transport and Migration Mechanisms	Exposure Media	Potentially Exposed Receptors					
					Exposure Route	Future Resident	Current/Future Trespasser	Future Outdoor Worker	Future Indoor Worker	Future Construction Worker
				Surface Soil	Incidential Ingestion	●	●	●	o	●
					Dermal Contact	●	●	●	o	●
					Inhalation (via Particulate and Vapor Emissions)	●	o	●	NA	●
				Subsurface Soil	Incidential Ingestion	NA	NA	o	NA	●
					Dermal Contact	NA	NA	o	NA	●
					Inhalation (via Particulate and Vapor Emissions)	NA	NA	o	NA	●
				Air	Inhalation (via Vapor Intrusion) [1]	o	NA	NA	o	NA

Notes:

● Complete Exposure Route, Evaluated and quantified in the Human Health Risk Assessment (HHRA)

o Exposure Route Complete but Insignificant - Not Evaluated or quantified in the HHRA

NA Not Applicable - receptor is not potentially exposed via this pathway

Dermal contact is considered insignificant for future indoor worker. Dermal contact risk for the resident and outdoor worker is quantified and will be greater than the future indoor worker.

Constituents were detected in subsurface soil samples collected West of Navassa Road. The samples were below the screening levels and therefore, pathways are considered insignificant.

Constituents were not detected in subsurface soil samples collected from the Eastern Uplands and all pathways are considered NA.

[1]Given the technical difficulty in collecting representative soil gas samples due to the presence of shallow groundwater, soil gas vapor intrusion was not assessed. Instead, the potential for vapor intrusion is assessed via the groundwater-to-indoor air pathway. See Fig. 2-5 Groundwater CSEM.

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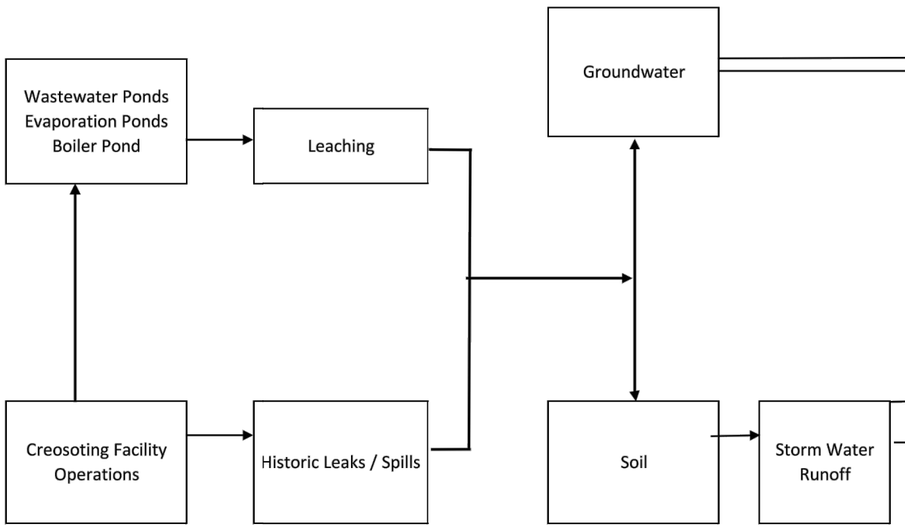
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HUMAN HEALTH CONCEPTUAL SITE EXPOSURE MODEL
EASTERN UPLAND AND WEST OF NAVASSA ROAD
HUMAN HEALTH RISK ASSESSMENT
Kerr-McGee Chemical Corporation Superfund Site
Navassa, North Carolina

DRAWN:	CHECKED:	DATE:	FIGURE:
HVP	CDN	JANUARY 2019	2-3

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SOUTHERN MARSH AND STURGEON CREEK



Potential Primary Sources	Primary Release Mechanisms	Secondary Source	Transport and Migration Mechanisms	Exposure Media	Exposure Route	Potentially Exposed Receptors: Future Resident	Current/Future Trespasser [1]	Future Outdoor Worker	Future Indoor Worker	Future Construction Worker	Current/ Future Angler
				Sturgeon Creek Sediment	Incidential Ingestion	o	o [1]	NA	NA	NA	NA
					Dermal Contact	o	o [1]	NA	NA	NA	NA
				Sturgeon Creek Surface Water	Fish Ingestion [2]	NA	NA	NA	NA	NA	o
					Incidential Ingestion	o	●	NA	NA	NA	o
					Dermal Contact	o	●	NA	NA	NA	o
				Southern Marsh Sediment	Incidential Ingestion	o	● [1]	●	NA	NA	NA
					Dermal Contact	o	● [1]	●	NA	NA	NA
					Inhalation (via Particulate Emissions/Dust)	NA	NA	NA	NA	NA	NA
				Southern Marsh Surface Water	Fish Ingestion [2]	NA	NA	NA	NA	NA	o
					Incidential Ingestion	o	●	NA	NA	NA	o
					Dermal Contact	o	●	NA	NA	NA	o

Notes:

● Complete Exposure Route, Evaluated and quantified in the Human Health Risk Assessment (HHRA)

o Exposure Route Complete but Insignificant - Not Evaluated or quantified in the HHRA

NA Not Applicable - receptor is not potentially exposed via this pathway

[1] In accordance with USEPA Region 4 Human Health Risk Assessment Supplemental Guidance (2018), for Sturgeon Creek, risk to a current/future trespasser from direct exposure to sediments fully submerged (or covered) in surface water is not quantified since expected to wash off skin upon exit from the surface water; however, due to uncovered bank sediments in the Southern Marsh, direct exposure to sediments are quantitatively assessed.

[2] See North Carolina Department of Health and Human Services Public Health Assessment for additional information on how this pathway is being addressed.

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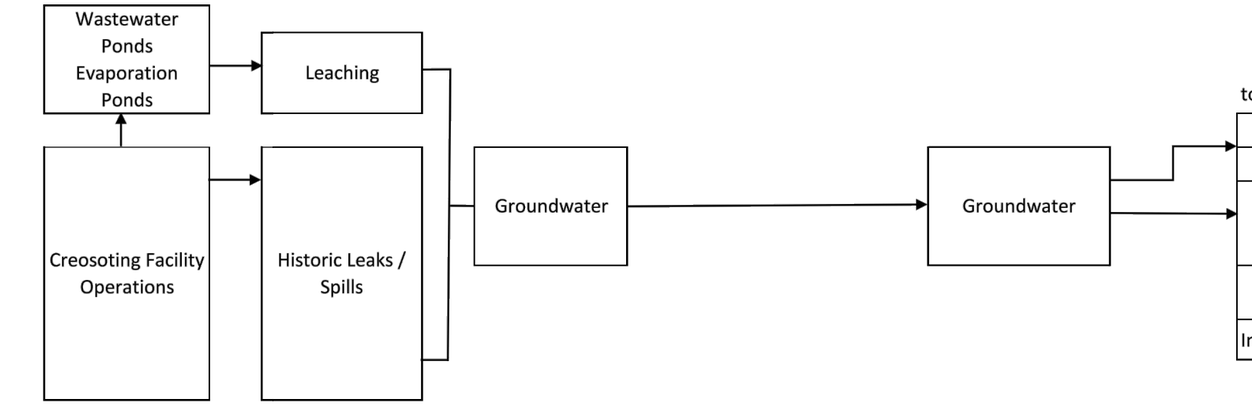
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HUMAN HEALTH CONCEPTUAL SITE EXPOSURE MODEL
SOUTHERN MARSH AND STURGEON CREEK
HUMAN HEALTH RISK ASSESSMENT
Kerr-McGee Chemical Corporation Superfund Site
Navassa, North Carolina

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HVP	CDN	JANUARY 2019	2-4

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GROUNDWATER [1,2]



Potential Primary Sources	Primary Release Mechanisms	Secondary Source	Transport and Migration Mechanisms	Exposure Media	Potentially Exposed Receptors					
					Exposure Route	Future Resident	Current/Future Trespasser	Future Outdoor Worker	Future Indoor Worker	Future Construction Worker
					to Sturgeon Creek, Southern Marsh, Figure 2-4					
					Ingestion	●	NA	●	●	●
					Dermal Contact	●	NA	NA	o	●
					Inhalation (via Volatile Emissions)	NA	NA	NA	NA	o
					Inhalation (via Showering Scenario)	●	NA	NA	NA	NA
					Inhalation (Vapor Intrusion)	●	NA	NA	●	NA

Notes:

- ● Complete Exposure Route, Evaluated and quantified in the Human Health Risk Assessment (HHRA)
- o Exposure Route Complete but Insignificant - Not Evaluated or quantified in the HHRA

NA Not Applicable - receptor is not potentially exposed via this pathway

[1] Groundwater exposure for the construction worker is direct contact. Groundwater exposure for other receptors is via tapwater. Ingestion of groundwater for construction worker is assumed to be incidental.

[2] Based on the extent of the groundwater plume and information pertaining to groundwater flow direction, which is to the south towards Sturgeon Creek and the Southern Marsh, current/future receptors indicated as having potentially complete exposure route(s) to groundater are limited to the Pond and Process Areas only. No impacts to groundwater have been observed in the northern portion of the Site (i.e., Eastern Upland Area, Treated Wood Storage Area, and Untreated Wood Storage Area).

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HUMAN HEALTH CONCEPTUAL SITE EXPOSURE MODEL
GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT
Kerr-McGee Chemical Corp - Navassa Superfund Site
Navassa, North Carolina

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HVP	CDN	JANUARY 2019	2-5