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US Army Corps of Engineers
Kansas City District

Final Screening Level Ecological Risk Assessment

Unimatic Manufacturing Corporation Superfund Site

Fairfield, New Jersey

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CDM Smith

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Acronyms and Abbreviations

CDM Smith	CDM Federal Programs Corporation
COPC	chemical of potential concern
CSM	conceptual site model
dichloroethene	DCE
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
ERAGS	Ecological Risk Assessment Guidance for Superfund
ESL	ecological screening level
FS	feasibility study
HQ	hazard quotient
JCMUA	Jersey City Municipal Utilities Authority
NJDEP	New Jersey Department of Environmental Protection
PCB	polychlorinated biphenyl
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RI	remedial investigation
SLERA	screening level ecological risk assessment
SVOC	semi-volatile organic compound
the Site	the Unimatic Manufacturing Corporation Superfund Site
Unimatic	Unimatic Manufacturing Corporation
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
mg/kg	milligram per kilogram
µg/kg	microgram per kilogram

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Executive Summary

Under the U.S. Army Corps of Engineers, Kansas City District, Contract No. W912DQ-11D-3004, Task Order No. 023, CDM Federal Programs Corporation (CDM Smith) has been directed to perform a remedial investigation/feasibility study (RI/FS) on behalf of the United States Environmental Protection Agency (EPA) Region 2 at the Unimatic Manufacturing Corporation (Unimatic) Superfund Site (the Site), located in Fairfield, New Jersey.

The overall purpose of the work assignment is to delineate the soil contamination for the RI/FS at the Site. This screening level ecological risk assessment (SLERA), as part of the RI/FS, provides a preliminary evaluation of ecological risks from contaminants in soil to terrestrial environments present at the Site.

The objective of this SLERA is to evaluate the potential for ecological receptors at the Site to be exposed to Site-related contaminants in surface soil (0 to 2 feet) and potentially suffer adverse effects from such exposures. Conservative assumptions are used to identify exposure pathways and, where possible, to quantify ecological risks. This report is prepared in accordance with the following documents:

- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final (EPA 1997)
- Guidelines for Ecological Risk Assessment (EPA 1998)

Site Description and History

Four properties form the Site including the Unimatic property, located at 25 Sherwood Lane, Fairfield, New Jersey and three adjacent properties: 30 Sherwood Lane to the east, 21 Sherwood Lane to the west, and a public water service delivery pipeline property for the Jersey City Municipal Utilities Authority (JCMUA) to the north. The Site is in a primarily industrial area with residential subdivisions located nearby to the northeast. The Unimatic property is approximately 1.23 acres and contains a centrally located, 22,000-square-foot building on a partially paved parking lot.

The original Unimatic building was constructed in 1955 and operated an aluminum die casting manufacturing process from 1955 until 2001. Lubricants used as part of the manufacturing processes contained polychlorinated biphenyls (PCBs) within naphtha or mineral spirits. The spraying of the lubricant resulted in the spillage of the lubricant on to the floor and walls. Unimatic washed the PCB oils from the floor and walls into floor trenches, which subsequently conveyed the PCB-contaminated wastewater to pipes that discharged outside the building. The wastewater pipes consisted of both cast concrete and corrugated steel that leaked contaminated wastewater into underlying soil and groundwater prior to the discharge point at the northeast corner of the Unimatic property. PCB use at the Site ended in 1979 when it was banned nationwide.

Ecological Investigations and Presence of Threatened and Endangered Species

An ecological reconnaissance was performed at the Site, focusing on areas that exhibited suitable/marginal habitat for ecological receptors. The property at 25 Sherwood Lane had limited habitat with a neglected landscaped patch containing ornamental trees by the front of the building and sparse vegetation growing out of the gravel lot and in the cracks of the driveway. In addition, trees and sparse patches of invasive vines, grasses and wildflowers grew around the fence lines in the area between the chain link fence line at the 25 Sherwood Lane and the wooden fence line at the 30 Sherwood Lane. No wildlife was observed, but three distinctly different types of animal droppings were observed; they may belong to deer or small mammals such as rabbits or rodents. The 21 Sherwood Lane property had well-manicured grass with ornamental landscape trees. Wildlife observed on the property included two northern mockingbirds (*Mimus polyglottos*). The JCMUA right of way consists of manicured fescue grasses intermixed with sparse patches of common weed species such as dandelion and crabgrass. Where the right of way transitions from the fescue grasses to an upgradient slope toward the Unimatic property, the vegetative cover became denser. Tree species include eastern cottonwood (*Populus* deltoids) and American sycamore (*Platanus occidentalis*), with the understory consisting of dense patches of Japanese knotwood (*Polygonum cuspidatum*). Evidence of wildlife at the right of way included animal droppings similar to those observed at the Unimatic property. The ecological reconnaissance conducted at the Site concluded that the Site has limited vegetation and wildlife and has little to no viable habitat to support ecological receptors at the Site.

In addition, information regarding threatened and endangered species that may exist at or in the vicinity of the study area was requested from the U.S. Fish and Wildlife Service (USFWS) via EPA and the New Jersey Department of Environmental Protection (NJDEP). The USFWS reported that there is one endangered species, Indiana bat (*Myotis sodalist*), one threatened species, northern long-eared bat (*Myotis septentrionalis*), and no critical habitats within the project area. The NJDEP Natural Heritage Program reported that their records indicate on or in the immediate vicinity (within ¼ mile) of the Site, no occurrence of any threatened or special concern species, except great blue heron (*Ardea Herodias*) which is a special concern species.. Indiana bat, northern long-eared bat and great blue heron were not observed during the ecological reconnaissance, and onsite habitat appeared unsuitable for these species.

Assessment and Measurement Endpoint

For this SLERA, the following assessment endpoint and measurement endpoint were selected to evaluate whether contaminants in surface soil (0 to 2 feet) pose a risk to ecological receptors:

- Assessment Endpoint 1: Viability (survival, growth, and reproduction) of terrestrial or soil-associated ecological receptors/communities
- Measurement Endpoint 1: Evaluate the toxicity of surface soil by comparing maximum-detected concentrations to chemical specific ecological screening levels (ESLs) for soil

Data Evaluated in the Screening Level Ecological Risk Assessment

The SLERA evaluated exposure to chemicals through direct contact with surface soil (0 to 2 feet). A total of 48 soil samples were collected and evaluated in this SLERA. All soil samples were analyzed for target compound list volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCBs, and target analyte list inorganics, including mercury. PCB congeners, dioxins, and furans were also analyzed but were not evaluated in this SLERA as they are collocated with the PCB Aroclors that will be remediated. Analytical results of PCB congeners and dioxins/furans are presented in Appendix I of the RI report (CDM Smith 2016).

The maximum detected concentration of each chemical serves as the exposure concentration for this SLERA. Maximum concentrations are compared to screening level ESLs to derive a screening level hazard quotient (HQ). If resultant HQs are greater than unity (1), risk is implied. An HQ less than 1 suggests there is a high degree of confidence that minimal risk exists and, therefore, are considered insignificant.

Summary and Conclusions

Based on a comparison of maximum detected concentrations of chemicals in Site surface soil (0 to 2 feet) to conservatively derived ESLs, the potential for ecological risk may occur. Specifically, HQs greater than 1 indicate potential risk from exposure to the following chemicals in soil:

- VOCs: acetone

  Acetone was detected in 11 of 48 samples with an HQ of 1.9. There is no historical information to indicate that acetone is a Site-related contaminant. Thus, acetone is not retained as a chemical of potential concern (COPC).

- SVOCs: benzo(a)anthracene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, chrysene, fluoranthene, and pyrene

  These 6 SVOCs were detected frequently (35 or more out of 48 samples). The maximum concentrations of all of these 6 SVOCs, except bis(2-ethylhexyl)phthalate, were qualified as "J+" indicating these concentrations are not only estimated but also biased high. HQs of these 6 SVOCs range from 2 (benzo[a]anthracene and chrysene) to 9 (pyrene). Similar to acetone, there is no historical information to indicate that SVOCs are Site related. Thus, these 6 SVOCs are not retained as COPCs.

- Pesticides: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, alpha-chlordane, gamma-chlordane, dieldrin, endosulfan I, endrin, endrin aldehyde, gamma-BHC, heptachlor, and heptachlor epoxide

  Thirteen out of 18 detected pesticides had HQs above 1. Aldrin, dieldrin, and heptachlor had highest HQs (6,325, 4,082 and 3,177, respectively); 4,4'-DDE, 4,4'-DDT, and endrin had HQs above 100, ranging from 198 (endrin) to 410 (4,4'-DDE). The remaining 7 pesticides had HQs below 100, ranging from 2 (4,4'-DDD) to 80 (gamma-BHC). There is no historical information to indicate that the pesticides are Site related, as well as no records to determine the sources of pesticides detected at the Site. However, pesticides detected are found to be co-located with PCBs at the Site (CDM Smith 2016).

- PCBs: Aroclor 1248 and Aroclor 1254

  Aroclor 1248 and Aroclor 1254 had HQs of 6,199 and 15, respectively. Aroclor 1248 was detected in 44 of 48 samples, with the maximum detected concentration of 2,300 milligrams per kilogram (mg/kg). Aroclor 1254 was detected in 11 of 48 samples, with the maximum detected concentration of 5.6 mg/kg. Both Aroclors are Site-related contaminants.

- Inorganics: antimony, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, vanadium, and zinc

  All of these 12 metals, except antimony and silver, were detected in more than 50 percent of the samples collected. HQs of these 12 metals ranged from 1.5 (cobalt) to 294 (mercury). There is no information to indicate that metals are Site related. Thus, these 12 metals are not retained as COPCs.

Chemicals detected with no corresponding ESLs are listed below:

- VOCs: cis-1,2-dichloroethene (cis-1,2-DCE), cyclohexane, and isopropylbenzene

  These three VOCs were detected in 1 (cis-1,2-DCE and cyclohexane) or 2 (isopropylbenzene) out of 48 samples. There is no information to indicate that VOCs are Site related. Thus, these three VOCs were not retained as COPCs.

- SVOCs: benzo(b)fluoranthene, caprolactam, carbazole, and dibenzofuran

  Benzo(b)fluoranthene was detected most frequently (42 out of 48 samples), having an estimated and biased high maximum concentration of 3,500 J+ micrograms per kilogram (µg/kg). The remaining 3 SVOCs were detected in 9 or fewer samples, with the maximum concentrations ranging from 180 (dibenzofuran) to 790 (carbazole) µg/kg. Again, there is no information to indicate that SVOCs are Site related.

- Pesticides: endrin ketone

  Endrin ketone was detected in 5 of 48 samples, with an estimated maximum concentration of 240 µg/kg. This pesticide is not a Site-related contaminant.

- Inorganics: aluminum, calcium, iron, magnesium, potassium, and sodium

  Aluminum and iron are commonly occurring elements and major components of almost all inorganic soil particles. The maximum concentrations of aluminum and iron in soil were well within the range of expected natural concentrations. Thus, iron and aluminum are not considered COPCs. The remaining four metals (calcium, magnesium, potassium, and sodium) are not retained as COPCs because they are ubiquitous, occur naturally in high concentrations, and are unlikely to pose risk. Additionally, they are not Site-related contaminants. Thus, these four metals are also not retained as COPCs.

In conclusion, the COPCs retained via a comparison of the maximum detected concentrations of chemicals to their respective soil ESLs include PCBs, SVOCs, pesticides, and metals. PCBs are Site related. There is no historical information to indicate that SVOCs, pesticides, and metals are Site related. However, pesticides detected are found to be co-located with PCBs. Thirteen detected pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aldrin, alpha-chlordane, gamma-chlordane, dieldrin, endosulfan I, endrin, endrin aldehyde, gamma-BHC, heptachlor, and heptachlor epoxide) had HQs

ranging from 2 to 6,325; and two PCBs (Aroclor 1248 and Aroclor 1254) had HQs ranging from 15 to 6,199.

The high HQs indicate potential risks exist at the Site to ecological receptors from exposure to contaminants in soil. However, the Site is an industrial site and based on observations made during the ecological reconnaissance, the Site has limited vegetation and wildlife, and little to no viable habitat to support ecological receptors. Furthermore, no threatened and endangered species were observed on site. All of these findings indicate that ecological threats at the Site are negligible. Thus, despite the high HQs from PCBs and pesticides, it is recommended that no further ecological investigation is warranted to evaluate the potential for risks to ecological receptors from exposure to contaminants at the Site.

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Section 1
Introduction

Under the United States Army Corps of Engineers, Kansas City District, Contract No. W912DQ-11D-3004, Task Order No. 023, CDM Federal Programs Corporation (CDM Smith) has been directed to perform a remedial investigation/feasibility study (RI/FS) on behalf of the United States Environmental Protection Agency (EPA) Region 2 at the Unimatic Manufacturing Corporation (Unimatic) Superfund Site (the Site), located in Fairfield, New Jersey (Figure 1-1).

The overall purpose of the work assignment is to delineate soil contamination for RI/FS at the Site. This screening level ecological risk assessment (SLERA), as part of the RI/FS, provides a preliminary evaluation of ecological risks from potential exposure to chemicals in Site soil.

1.1 Objectives

The objective of this SLERA is to evaluate ecological risks at the Site. Conservative assumptions and approaches are used to identify exposure pathways and risks to ecological receptors that may be exposed to Site surface soil (0 to 2 feet). This report is prepared in accordance with the following documents:

- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final (EPA 1997)
- Guidelines for Ecological Risk Assessment (EPA 1998)

The SLERA consists of Steps 1 and 2 of a recommended eight-step process for conducting ecological risk assessments at Superfund sites (EPA 1997). Step 1 of the Ecological Risk Assessment Guidance (ERAGS) includes a screening level problem formulation and ecological effects evaluation. Descriptions are developed of:

- Environmental setting
- Chemicals known or suspected to exist at the Site and the maximum concentrations present in surface soil
- Contaminant fate and transport mechanisms that might exist
- Mechanisms of ecotoxicity associated with chemicals and categories of receptors that may be affected
- Potentially complete exposure pathways

In Step 2 of the ERAGS, the preliminary exposure estimate and risk calculations, risk is estimated by comparing maximum detected exposure concentrations with the ecological screening levels (ESL) identified in Step 1. The process concludes with a scientific management decision point, which determines that:

- Ecological threats are negligible.

- Ecological risk assessment should continue to determine whether a risk exists as the information is not adequate to make a decision at this point.
- There is a potential for adverse ecological effects, and a baseline ecological risk assessment, incorporating more site-specific information, is needed.

Per EPA's ERAGS (1997, 1998), a scientific management decision will be made by risk managers.

1.2 Report Organization

This SLERA is composed of eight sections and two appendices, including:

Section 1 Introduction – provides an overview of the objectives and organization of the report.

Section 2 Problem Formulation – presents the environmental setting, conceptual site model (CSM), assessment and measurement endpoints, risk questions, and overview of data evaluated in the SLERA.

Section 3 Exposure Assessment – presents the pathways and media through which receptors may be exposed to Site chemicals.

Section 4 Effects Assessment – presents the literature based- and chemical-specific ESLs for detected chemicals.

Section 5 Risk Characterization – presents the process for selecting chemicals of potential concern (COPCs) and integrates information from the exposure and effects assessments.

Section 6 Uncertainty Assessment – discusses the uncertainties associated with the assumptions used in this SLERA.

Section 7 Summary and Conclusions – summarizes the significant findings of the SLERA and presents conclusions based on the results.

Section 8 References – provides a list of references cited.

Tables and figures are presented at the end of the text. In addition, three appendices are included in this report. Appendix A presents photo log of ecological reconnaissance. Appendix B includes letters received from the U.S. Fish and Wildlife Service (USFWS) and from the New Jersey Department of Environmental Protection (NJDEP) regarding federally and state-listed threatened and endangered species at or in the vicinity of the Site. Appendix C presents a list of soil samples evaluated in this SLERA.

Section 2
Problem Formulation

The problem formulation contains a description of the environmental setting, CSM, assessment and measurement endpoints, risk questions, and an overview of data evaluated.

2.1 Environmental Setting

This subsection describes the Site location and description, Site history, Site geology and hydrogeology, ecological habitat and biota, and threatened and endangered species that may occur at or in the vicinity of the Site.

2.1.1 Site Location and Description

The Unimatic facility is located at 25 Sherwood Lane, Fairfield, New Jersey (the Unimatic property). In addition to the Unimatic property, the Site also encompasses three adjacent properties: 30 Sherwood Lane to the east, 21 Sherwood Lane to the west, and a public water service delivery pipeline property for the Jersey City Municipal Utilities Authority (JCMUA) water system to the north. These four properties together form the Site. The Site is in a primarily industrial area, with residential subdivisions located approximately 800 feet to the northeast. The Unimatic property is approximately 1.23 acres and contains a centrally located 22,000-square foot building on a partially paved parking lot. Figure 1-1 shows the property boundaries and the neighboring properties.

2.1.2 Site History and Previous Investigations

The Unimatic operated an aluminum die-casting manufacturing process from 1955 until 2001. The original building was constructed at the center of property in 1955 and was expanded twice by 1970. This expansion coincided with an increase in production from the mid-1960s to the mid-1970s. The lubricating oil used in the die-casting process contained polychlorinated biphenyls (PCBs) within naphtha or mineral spirits. The lubricating oil was sprayed throughout the shop area and covered the floor and walls to a height of approximately 8 feet. Unimatic washed the PCB oils from the floor and walls into floor trenches, which subsequently conveyed the PCB-contaminated wastewater to pipes that discharged outside the building. The wastewater pipes consisted of both cast concrete and corrugated steel that leaked contaminated wastewater into underlying soil and groundwater prior to the discharge point at the northeast corner of the Unimatic property. PCB use at the Site ended in 1979 when it was banned nationwide.

EPA and NJDEP issued numerous non-compliance and violation notices to Unimatic beginning in 1982; however, Unimatic continued to discharge large volumes of contaminated water through more than 200 feet of leaking wastewater pipes until 1988. In 1988, Unimatic installed a recirculating cooling system that reportedly eliminated discharges to the environment. Unimatic ceased all operations in 2001 and sold the property to Cardean, LLC which leased the building to Frameware, Inc. in 2002.

Numerous investigations and removal actions have been conducted at the Site since 2001. Tanks and 4,800 tons of contaminated soil were excavated and removed. However, high levels of PCB contamination in soil and groundwater remained throughout the Unimatic property and beyond the property boundaries. In response to a May 9, 2012 request from NJDEP, EPA initiated a removal site evaluation to determine if a removal action was warranted. Results from EPA samples collected from the interior of the building and from surface soil outside of the building in September and October of 2012 indicated a release of PCBs to the environment, and that, at a minimum, surficial PCB Contamination was still present at the Site. Based on the results, EPA concluded that the Site did not meet the statutory requirements for taking an emergency removal action at the Site.

Based on the results of EPA's 2012 sampling, the New Jersey Department of Health, in consultation with the federal Agency for Toxic Substances and Disease Registry, issued a letter to NJDEP categorizing the current and future use of the Site as a public health hazard and recommended the relocation of workers. In response, Frameware, Inc. moved its operations and workers, and decontaminated equipment and materials were removed from the Site. In April 2015, NJDEP installed a chain link fence to secure the Unimatic property, and in June 2015, the current RI was initiated. The Site was added to the National Priorities List on May 8, 2014. A detailed description of Site history can be found in the RI report (CDM Smith 2016).

2.1.3 Habitat and Biota

Characterization of the study area and identification of habitats and biota at the study area are based on observations made during the ecological reconnaissance conducted by CDM Smith on August 6, 2015. The area subject to ecological reconnaissance included the Unimatic property, the area between the chain link fence at the Unimatic property and the wooden fence at 30 Sherwood Lane, 21 Sherwood Land, and JCMUA right of way. Observations made at these areas are presented below and pictures taken during the ecological reconnaissance are presented in Appendix A.

Unimatic Manufacturing Company, Incorporated Site at 25 Sherwood Lane including the area between the chain link fence at 25 Sherwood Lane and the wooden fence at 30 Sherwood Lane: There is limited habitat at the property, which consists of a building, two driveways, and a gravel lot. With the exception of a small area of the gravel lot in the northern corner of the property, sparse vegetation is present, growing in the cracks of the driveways, along the edge of the fence lines, and along the sides of the building.

The southwest side of the property (front of the building) is a formerly landscaped plot of grass with two ornamental bushes located along the edge of Sherwood Lane and a black oak (*Quercus velutina*) at the southeastern corner of the property. During the time of the ecological reconnaissance, the majority of the grass was stressed. A small landscaped patch containing ornamental trees was present along the front of the building near the front door. The neglected landscaped patch, gravel lot, and the cracks of the driveways were now overgrown with invasive vines, grasses, and wildflowers, including porcelain berry (*Ampelopsis brevipedunculata*), bull thistle (*Cirsium vulgare*), American pokeweed (*Phytolacca americana*), common mugwort (*Artemisia vulgaris*), Queen Anne's lace (*Daucus carota*), and foxtail (*Setaria* spp.).

Trees and sparse patches of invasive vines, grasses, and wildflowers were observed around the fence lines at 25 Sherwood Land and 30 Sherwood Lane. Tree species included northern red oak (*Quercus rubra*), black cherry (*Prunus serotina*), Norway maple (*Acer platanoides*), eastern cottonwood (*Populus deltoides*), American basswood (*Tilia americana*), silver maple (*Acer saccharinum*), black walnut (*Juglans nigra*), northern catalpa (*Catalpa speciosa*), and black oak. Invasive vines and wildflowers observed by the driveway and gravel lot were also observed along the fence line. While most of the vegetation was sparse around the fence line, a section of fence line in the northwestern corner of the property had heavy porcelain berry and poison ivy (*Toxicodendron radicans*) growth climbing the fence and trees.

No wildlife was observed on the property; however, three distinctly different types of animal droppings were observed on the patch of grass in the front of the building. It is likely they belong to white tailed deer (*Odocoileus virginianus*) and other small mammals such as raccoons, groundhogs, or rabbits. Several songbirds were heard in the vicinity.

21 Sherwood Lane: The majority of the lot, which includes a small commercial building, is landscaped with well-manicured grass and ornamental trees on the southwestern side (front of building) that include the American holly (*Ilex opaca*) and Japanese maple (*Acer palmatum*). Due to the well-manicured nature of the lot, there is very limited viable habitat. Trees, including silver maple, pin oak (*Quercus palustris*), eastern cottonwood, and northern red oak (*Quercus rubra*), can be found at the northeastern extent of the property, which borders the JCMUA right of way. In addition to the trees, heavy patches of Japanese knotwood (*Polygonum cuspidatum*) are present at the northeastern extent of the property. Wildlife observed on the property were two northern mockingbirds (*Mimus polyglottos*).

JCMUA Right of Way: The right of way consists of manicured fescue grasses intermixed with sparse patches of common weed species such as dandelion and crabgrass. Where the right of way transitions from the fescue grasses to an upgradient slope toward the Unimatic property, the vegetative cover becomes denser. Tree species on the upgradient portion of the right of way adjacent to the Unimatic property include eastern cottonwood and American sycamore (*Platanus occidentalis*), with the understory consisting of dense patches of Japanese knotwood. Continuing east on the upgradient slope along the border of the Unimatic property, the Japanese knotwood transitions into very dense vine cover of porcelain berry, which in most parts has completely engulfed the trees. Other vegetation found includes poison ivy, Devil's walking stick (*Aralia spinoss*), and hemp dogbane (*Apocynum cannabinum*).

Other than an unidentified hawk observed in the distance, the only evidence of wildlife observed on the JCMUA right of way included a few animal burrows, multiple animal droppings similar to the droppings found at the Unimatic property, and a blue jay (*Cyanocitta cristata*) feather found on the ground.

The ecological reconnaissance conducted at the Site concluded that the Site has limited vegetation and wildlife and little to no viable habitat to support ecological receptors.

2.1.4 Federally and State-Listed Threatened and Endangered Species

Information regarding federally listed and state-list threatened and endangered species and ecologically sensitive environments that may exist at or in the vicinity of the Site study area was

requested from the USFWS through EPA and NJDEP. Letters received from both agencies are summarized below and presented in Appendix B.

2.1.4.1 Federally Listed Species

USFWS reported one endangered species, Indiana bat (*Myotis sodalist*), one threatened species, northern long-eared bat (*Myotis septentrionalis*), and no critical habitats within the project area. Indiana bat and northern long-eared bat were not observed and no viable habitat for these species was identified during the ecological reconnaissance conducted on August 6, 2015.

2.1.4.2 State-Listed Species

The records of NJDEP Natural Heritage Program indicate no occurrence of any threatened or special concern species except great blue heron (*Ardea Herodias*), a special concern species, on or in the immediate vicinity (within ¼ mile) of the Site. Great blue heron was not observed, and no viable habitat for great blue heron was identified during the ecological reconnaissance conducted on August 6, 2015.

2.2 Conceptual Site Model

The CSM depicts the fate and transport of chemicals from source(s) to exposure media (e.g., soil, food) and illustrates the exposure routes for ecological receptors. Development of the CSM includes identification of the sources of contamination and potential exposure pathways (Figure 2-1).

2.2.1 Sources of Contamination

For this SLERA, sources of contamination consist of chemicals present in surface soil (0 to 2 feet), the result of historical spills, and releases associated with past Site operation. Chemicals in soil have potential to migrate to surrounding areas via erosion and overland flow during rain events.

2.2.2 Exposure Pathways

An exposure pathway is the means by which chemicals are transported from a source to ecological receptors. For this SLERA, contaminated surface soil represents the source of contaminants (Section 2.1.2). Any soil transport that occurs may result in the migration of contaminants to surrounding areas. The potential exposure pathways are depicted on the CSM (Figure 2-1).

Within portions of the Site and surrounding areas, habitats, although limited, have some potential to support terrestrial biota that may include invertebrates, amphibians, reptiles, birds, and mammals. Ecological receptors utilizing the Site may be exposed to chemicals present in soil via direct contact or incidental ingestion. Exposure of higher trophic-level receptors can also occur through food chain exposure (via ingestion of prey that may have become contaminated through exposure to Site-related chemicals). The completeness and significance of these exposure pathways depends on the frequency and duration of exposure, both of which are expected to be low given the poor quality habitats observed.

2.3 Assessment Endpoint

Assessment endpoints are explicit expressions of an environmental resource that is considered of value, operationally defined by an ecological entity and its attributes (EPA 1997). In SLERAs,

assessment endpoints are usually linked to any adverse effects from Site contaminants to any ecological receptors that may occur at the Site. It is not practical or possible to directly evaluate risks to all the individual components of the ecosystem on site, so assessment endpoints are used to focus on particular components that could be adversely affected by the chemicals associated with the Site.

Assessment endpoint evaluated in this SLERA includes:

- Assessment Endpoint 1: Viability (survival, growth, and reproduction) of terrestrial ecological receptors/communities

2.4 Risk Questions

Risk questions summarize important components of the problem formulation phase of the SLERA and are based on the assessment endpoints. Risk questions are directly related to the testable hypotheses that can be accepted or rejected using the results of the SLERA. Selected risk questions to be answered in this SLERA include:

- Are ecological receptors likely to be exposed to contaminants in surface soil?
- Where present, are concentrations of contaminants in surface soil sufficient to cause adverse effects on the survival, growth, and /or reproduction of terrestrial receptors/communities?

2.5 Measurement Endpoint

Measurement endpoints are chosen to link the existing Site conditions to the goals established by the assessment endpoints and are useful for assessment endpoint evaluation. Measurement endpoints are quantitative expressions of observed or measured biological responses to contamination relevant to selected assessment endpoints. For a SLERA, ESLs are commonly used as measurement endpoints. For this SLERA, measurement endpoints are based on conservative ESLs from sources discussed in Section 4.

For this SLERA, the assessment endpoint and associated measurement endpoint presented below are selected to evaluate whether contaminants in surface soil (0 to 2 feet) pose a risk to ecological receptors:

- Assessment Endpoint 1: Viability (survival, growth, and reproduction) of terrestrial ecological receptor/communities
- Measurement Endpoint 1: Chemical-specific ESLs for surface soil (used to evaluate the toxicity of contaminants in soil by comparing to maximum concentrations of potentially hazardous chemicals detected in Site surface soils)

2.6 Data Evaluated in the Screening Level Ecological Risk Assessment

This SLERA evaluates exposure to chemicals through direct contact with Site surface soil (0 to 2 feet). All data evaluated in the SLERA were collected in support of the RI/FS. For this SLERA, the

maximum concentration of chemicals detected in surface soil was selected as the exposure point concentration (EPC). Sample locations are shown on Figure 2-2, and the list of samples evaluated in this SLERA is presented in Appendix C.

2.6.1 Exposed Medium

A total of 75 surface soil samples were collected from the Unimatic property, 21 Sherwood Lane, and the JCMUA utility during the field investigation from June 8 to July 29, 2015. Twenty-seven of the 75 samples were under the building or asphalt. Thus, only 48 of 75 samples were evaluated in this SLERA (Figure 2-2). Samples were analyzed for target compound list volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCBs, and target analyte list inorganics, including mercury. PCB congeners, dioxins, and furans were also analyzed but not evaluated in this SLERA as they are collocated with the PCB Aroclors that will be remediated. Analytical results of PCB congeners and dioxins/furans are presented in Appendix I of the RI report (CDM Smith 2016). Minimum and maximum concentrations of contaminants detected, their frequency of detection, and location of the maximum detected concentrations are presented in Table 2-1.

Among 15 VOCs detected in surface soil, the most frequently detected VOCs were acetone (11 of 48 samples) and trichloroethene (8 of 48 samples). 1,2,4-Trichlorobenzene and 2-butanone were detected in four samples. The remaining 11 VOCs were detected in either 1 or 2 of 48 samples. The maximum detected concentrations of the most detected VOCs were qualified as estimated.

Twenty-four SVOCs were detected in soil. The most frequently detected SVOCs were bis(2-ethylhexyl) phthalate (46), pyrene (43), and benzo(b)fluoranthene (42). Six SVOCs detected in 31 to 37 samples included benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, fluoranthene, and phenanthrene. Almost all of the remaining 15 chemicals were detected in less than 10 out of 48 samples. The maximum detected concentrations of all detected SVOCs were qualified as estimated.

Eighteen pesticides were detected in soil. Nine pesticides were detected in more than 20 of 48 samples, with 4,4'-DDE, gamma-chlordane and dieldrin having the highest frequency of detection (42 out of 48 samples). The maximum detected concentrations of most pesticides were from sample locations E-10 and E-11, which are located directly southeast from the Receiving Room of the Unimatic property building. In addition, the maximum detected concentrations of all pesticides, except endrin ketone, were qualified as estimated.

Aroclor 1248 and Aroclor 1254 were the two PCBs detected in soil. Aroclor 1248 was detected in 44 of 48 samples, with the maximum detected concentration of 2,300 milligrams per kilogram (mg/kg) at sample location E-10. Aroclor 1254 was detected in 11 samples, with the maximum detected concentration of 5.6 mg/kg at sample location D-15.

Twenty-two metals were detected in soil. Fifteen metals (aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, vanadium, and zinc) were detected in at least 45 of 48 samples. Antimony was the least detected metal, found in only three samples.

2.6.2 Data Quality Assessment

Data quality assessment was performed for the RI/FS to evaluate the usability of the data collected and determine whether they meet the quality objectives and user requirements outlined in the Revised Final Quality Assurance Project Plan (QAPP) (CDM Smith 2015). Usability related to data evaluated in this report is summarized in this section, and Data Usability Report is presented in the RI report (CDM Smith 2016).

All analytical data were reviewed to ensure that project requirements for representativeness, completeness, precision, and accuracy were met. Data Usability Report, which include summaries of data quality assurance/quality control (QA/QC) measures, were prepared for all samples collected during the field investigation for the RI. Based on the results of the data usability assessment, the data are suitable for use in the RI, FS, and risk assessments. Data quality objective goals for completeness, comparability, and representativeness established during project planning were achieved. Data that did not meet QC criteria were appropriately qualified during data validation as "J" estimated and usable, "UJ" usable but non-detect, or "R" rejected and not usable. All data reported and evaluated in this report are usable as reported with the data validation qualifiers added except for rejected data, which were not used for project decisions. The final percentage of valid data for soil is 98.1 percent. The 90 percent completeness goal for usable data evaluated in this SLERA has been met.

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Section 3
Exposure Assessment

A primary objective of the exposure assessment is to determine the pathways and media through which ecological receptors may be exposed to chemicals. Exposure scenarios are simplified descriptions of how potential receptors may come in contact with contaminants. Potential exposure pathways are dependent on habitats and receptors present on site, the extent and magnitude of contamination (i.e., the magnitude of EPCs), and environmental fate and transport of contaminants.

During the ecological reconnaissance, observations indicated that the Site provides limited habitat or foraging areas for several species, including birds and mammals (e.g., deer, small mammals). Ecological receptors can be exposed to contaminants by direct contact and/or ingestion of contaminated soil and/or prey.

Some components of the soil macroinvertebrate community are in constant association with soil and are, therefore, highly exposed to contaminants through direct contact with, and in some cases (e.g., earthworms) ingestion of, soil and soil interstitial water. Additional exposure may result from the ingestion of contaminated food items. Macroinvertebrates may also be indirectly affected by a reduction in ecosystem functions such as nutrient cycling and energy transfer that are critical to growth and reproduction.

Plant communities potentially may be exposed to contaminants through direct contact with soil and uptake of contaminants via root contact. Vegetation may also be indirectly affected by a reduction in ecosystem functions such as nutrient cycling and energy transfer, which are critical to growth and reproduction. The presence of contaminated vegetation not only places plants at risk but also affects organisms that utilize vegetation for food and cover.

Mammals and other terrestrial invertebrates may utilize the Site for foraging and cover and may feed on a variety of prey items such as plants, insects, and soil invertebrates. Therefore, terrestrial vertebrates may be exposed to contaminants through ingestion of contaminated food items. They may also be exposed through incidental ingestion and/or direct contact with contaminated soil.

Other organisms that inhabit the study area include a variety of birds, some of which may be invertivorous and feed on soil macroinvertebrates or other insects. Others may be omnivorous or herbivorous and feed on seeds or other plant tissues. Therefore, birds may be potentially exposed to contaminants through ingestion of contaminated food items. They may also be exposed through incidental ingestion and/or direct contact with contaminated soil.

Organisms or representative groups of organisms can be exposed to contaminants by direct contact and/or ingestion of contaminated media and/or prey. Although several potential exposure scenarios can be identified for ecological receptors, it is most appropriate to focus the assessment of critical exposure scenarios or those most likely to contribute to risk. This SLERA focuses on the direct contact exposure scenario identified in the CSM.

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Section 4
Effects Assessment

An effects assessment includes an evaluation of the available types and sources of effects data and presents media- and chemical-specific ESLs that serve as conservative effects concentrations for the SLERA.

This section of the SLERA describes and provides the sources of effects data selected for use in this evaluation. As appropriate for a SLERA, effects data are limited to ESLs. Screening values from the following references were applied in a hierarchical fashion to the maximum Site-specific chemical concentrations detected in surface soil:

1. EPA ecological soil screening levels; lowest value used (2008, 2007a through 2007h, 2006, 2005a through 2005h, 2003a, and 2003b)
2. Oak Ridge National Laboratory, Preliminary Remediation Goals for Ecological Endpoints (1997)
3. NJDEP Soil Ecological Screening Levels (2009)
4. EPA Region 5 Resource Conservation and Recovery Act Ecological Screening Levels (2003c)

The first source of soil ESLs presented above was examined to determine if an ESL was available for a particular chemical. If a value was available, it was selected and utilized. If not, values from secondary sources (in order of preference as noted above) were selected and used. If a selected screening level was exceeded by the maximum detected concentration, or if no screening level was found available, chemicals were retained as COPCs.

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Section 5
Risk Characterization

The risk characterization integrates information from the exposure and effects assessments and estimates risk to representative ecological receptors. This SLERA relies on the hazard quotient (HQ) approach, supplemented by site observations to assess ecological risks at the Site.

5.1 Hazard Quotient Approach

Potential risks to ecological receptors are evaluated using the HQ approach. This process involves comparing chemical concentrations measured in Site media to their respective ESLs. These values are intentionally conservative, and their use reduces the potential for underestimating risk. For this SLERA, the maximum exposure concentration for a specific chemical is compared to its respective ESL counterpart and is expressed as a ratio per the following formula:

$$Hazard\ Quotient = \frac{Maximum\ Detected\ Concentration\ of\ a\ Chemical}{ESL}$$

If resultant HQs are greater than unity (1), risk is implied. An HQ less than 1 suggests there is a high degree of confidence that minimal risk exists and, therefore, is considered insignificant. Higher HQs are not necessarily indicative of more severe effects because of varying degrees of uncertainty in the ESLs used to calculate HQs. Instead, higher HQs suggest a greater probability that exposure will result in ecologically adverse effects.

5.2 Identification of Chemicals of Potential Concern

Chemicals with maximum detected concentrations exceeding their respective ESLs are identified as COPCs. COPCs also include detected chemicals for which ESLs could not be identified. The HQs and identified COPCs, and the rationale for their selection, are summarized below and presented in Table 2-1.

Chemicals detected with maximum concentrations exceeding ESLs (HQs >1.0) in surface soil are listed below:

- VOCs: Acetone

  Acetone is the only VOC out of 15 detected VOCs having an HQ above 1 (1.9). There is no historical information to indicate that acetone is a Site related contaminant; additionally acetone is considered a common laboratory contaminant. Thus, acetone is not retained as a COPC.

- SVOCs: benzo(a)anthracene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, chrysene, fluoranthene, and pyrene.

These 6 SVOCs were detected frequently (35 or more out of 48 samples). The maximum concentrations of all of these 6 SVOCs, except bis(2-ethylhexyl)phthalate, were qualified as "J+" indicating these concentrations are not only estimated but also biased high. HQs of these 6 SVOCs ranged from 2 (benzo[a]anthracene, bis[2-ethylhexyl]phthalate, benzo[a]pyrene, and chrysene) to 9 (pyrene). Similar to acetone, there is no historical information to indicate that SVOCs are Site related. Thus, these 6 SVOCs are not retained as COPCs.

- Pesticides: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aldrin, alpha-chlordane, gamma-chlordane, dieldrin, endosulfan I, endrin, endrin aldehyde, gamma-BHC, heptachlor, and heptachlor epoxide

  Thirteen out of 18 detected pesticides had HQs above 1. Aldrin, dieldrin, and heptachlor had the highest HQs (6,325, 4,082, and 3,177, respectively); 4,4'-DDE, 4,4'-DDT, and endrin had HQs above 100, ranging from 198 (endrin) to 410 (4,4'-DDE). The remaining 7 pesticides had HQs below 100, ranging from 2 (4,4'-DDD) to 80 (gamma-BHC).

  There is no historical information to indicate that pesticides are Site related, as well as no records to determine the sources of pesticides at the Site. However, the detected pesticides are found to be co-located with detected PCBs (CDM Smith 2016).

- PCBs: Aroclor 1248 and Aroclor 1254

  Aroclor 1248 and Aroclor 1254 had HQs of 6,199 and 15, respectively. Aroclor 1248 was detected almost in all samples (44 of 48 sample), with the maximum concentration of 2,300 mg/kg from location E-10. Aroclor 1254 was detected in 11 of 48 samples, with the maximum concentration of 5.6 mg/kg from location D-15. Both Aroclors are Site-related contaminants.

- Inorganics: antimony, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, vanadium, and zinc

  All of these 12 metals, except antimony and silver, were detected in more than 50 percent of the samples collected; antimony and silver were detected in 14 or fewer of 48 samples. HQs of these 12 metals ranged from 1.5 (cobalt) to 294 (mercury). Similar to pesticides, metals are not Site related.

Chemicals detected with no corresponding ESLs are listed below:

- VOCs: cis-1,2-dichlorethene (cis-1,2-DCE), cyclohexane, and isopropylbenzene

  These 3 VOCs were detected in 1 or 2 of 48 samples and none of these three VOCs is a Site-related contaminant.

- SVOCs: benzo(b)fluoranthene, caprolactam, carbazole, and dibenzofuran

  Benzo(b)fluoranthene was detected most frequently (42 of 48 samples), having an estimated and biased high maximum concentration of 3,500 J+ micrograms per kilogram (µg/kg). The remaining 3 SVOCs were detected in 9 or fewer samples, with the maximum concentrations ranging from 180 (dibenzofuran) to 790 (carbazole) µg/kg. None of these SVOCs is a Site-related contaminant.

- Pesticides: endrin ketone

  Endrin ketone was detected in 5 of 48 samples, with an estimated maximum concentration of 240 µg/kg. Most likely, this pesticide is not a Site-related contaminant.

- Inorganics: aluminum, calcium, iron, magnesium, potassium, and sodium

  No soil ESLs for aluminum and iron were located. Both metals are commonly occurring elements and are major components of almost all inorganic soil particles. Concentrations of aluminum and iron typically range in surface soil from 10,000 to 300,000 mg/kg (i.e., 1 to 30 percent) and 2,000 to 550,000 mg/kg (i.e., 0.2 to 55 percent), respectively (EPA 2003a; 2003b). The maximum concentrations of aluminum and lead (26,500 and 57,100 mg/kg, respectively) in surface soil were well within the range of expected natural occurring concentrations. Thus, iron and aluminum are not considered COPCs.

  The remaining four metals (calcium, magnesium, potassium, and sodium) are ubiquitous, occur naturally in high concentrations, only toxic at very high concentrations; thus, unlikely to pose risk. Additionally tissue concentrations of these chemicals are regulated by living organisms even at relatively high levels of exposure, internal concentrations generally do not become sufficiently high to cause toxic effects. Furthermore, these four metals are not Site related; thus, they are also not retained as COPCs.

5.3 Risk Summary

This section of the SLERA discusses the potential ecological significance of the estimated risks and provides answers to risk questions identified in Section 2. Ecological significance considers the limitations and uncertainties (see Section 6) with the quantitative HQ risk estimates. An important first step to understanding the results of this SLERA is to answer the risk questions initially presented in Section 2 Problem Formulation.

The following risk questions were identified as important to the SLERA. The results of the SLERA are used to respond to these questions and help form conclusions. The risk questions and associated responses are presented below.

- May ecological receptors be exposed to contaminants present in surface soil?

  Response: Yes. Fifteen VOCs, 24 SVOCs, 18 pesticides, 2 PCBs, and 22 metals were detected in surface soil (Table 2-1).

- Where present, are concentrations of contaminants in surface soil sufficient to cause adverse effects on the survival, growth, and /or reproduction of terrestrial ecological receptors/communities?

  Response: Yes. Six SVOCs, 13 pesticides, 2 PCBs, and 12 metals had HQs above 1 and retained as COPCs (Table 2-1). Although SVOCs, pesticides, and metals are not Site-related contaminants, PCBs, the Site-related contaminants, had high HQs indicating adverse effects on survival, growth, and/or reproduction of terrestrial ecological receptors/communities.

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Section 6
Uncertainty Assessment

Ecological risks due to exposure to contaminants in surface soil at the Site were evaluated by comparing maximum detected concentrations to ESLs, an approach that provides the lowest level at which harmful effects would be predicted to occur. Some degree of uncertainty inherent in these comparisons is introduced during various steps in the evaluation. The sources of uncertainty are discussed below as well as whether the assumptions used are likely to over- or under-represent ecological risks from contaminants at the study area. In general, because this SLERA uses conservative assumptions, risks are likely overestimated rather than underestimated.

The main sources of uncertainty include natural variability, error, and insufficient knowledge. Natural variability is an inherent characteristic of ecological systems, their stressors, and their combined behavior in the environment. Biotic and abiotic parameters in these systems may vary to such a degree that the exposure and response of similar assessment endpoints in the same system may differ temporally and spatially. Factors that contribute to temporal and spatial variability include differences in individual organism behavior (within and between species), changes in the weather or ambient temperature, known and unanticipated interference from other stressors, interactions with other species in the community, differences between microenvironments, and numerous other factors.

6.1 Problem Formulation

Sources of uncertainty within the problem formulation phase of the SLERA relate to the selection of assessment endpoints and assumptions within the CSM.

The selection of appropriate assessment endpoints to characterize risk is a critical step within the problem formulation of an ecological risk assessment. If an assessment endpoint is overlooked or not identified, environmental risk at the Site will be underestimated. Within this SLERA, the selection of assessment endpoints was performed with the intent of being inclusive. However, given the complexity of the environment and the state of knowledge of organism interactions, it is possible that unique exposure pathways or assessment endpoints exist that were not acknowledged within the problem formulation. If additional pathways or assessment endpoints exist, risk may be underestimated.

The CSM presents the pathways by which contaminants are released from source areas to potentially exposed receptors. However, some exposure pathways are difficult to evaluate or cannot be quantitatively evaluated based on available information. Within this SLERA, only the direct contact pathway, which includes direct contact and ingestion of contaminants in soil, was evaluated. Use of such a conservative endpoint may result in overestimating potential risk.

Soil samples were taken from 0 to 2 feet in this SLERA. The majority of ecological receptors would receive their exposure to soil contamination at 0 to 1 foot. Soil samples taken from 0-2 feet including additional depth in the samples may dilute the contaminants; thus, underestimates the

risk. Or including subsurface contamination would be unavailable to ecological receptors; thus overestimate the risk.

Potential receptors represent a variety of organisms with different feeding and behavioral strategies. For this SLERA, the evaluation assumes a significant portion of their life cycles is restricted to areas of contamination. For example, the assumption that ecological receptors spend a significant portion of their life cycles at the Site or a particular area may be conservative for highly mobile animals or those with large foraging ranges but may be appropriate for plants and relatively immobile animals such as earthworms.

6.2 Exposure Assessment

All exposure assessments have a degree of uncertainty due to necessary simplifications and assumptions, which must be made as part of the evaluation. Major sources of uncertainty in the exposure assessment are discussed below.

Concentrations used to represent EPCs and characterizations of the distributions of COPCs can be a source of uncertainty. These issues relate to the adequate characterization of the nature and extent of chemical contamination. For example, it is unknown if the maximum detected concentration selected as the EPC accurately represents the true maximum to which receptors may be exposed. It is assumed, however, that sufficient samples have been collected from Site media and appropriately analyzed to adequately describe the nature and extent of chemical contamination resulting from the release of contaminants.

When potential levels of uncertainty could adversely affect the results of the assessment, conservative approaches are taken that likely result in over-protection of sensitive receptors. Such an approach is prudent where uncertainties are high and is in line with regulatory guidance for conducting SLERAs. For example, maximum detected concentrations of COPCs are used to assess risk at the SLERA stage, and this approach likely overestimated the average concentrations to which receptors would be exposed.

In this SLERA, it was assumed that COPCs in soil were 100 percent bioavailable. This is a conservative assumption that most often will overestimate risk. Bioavailability can be affected by factors, including chemical speciation, complexation, aging, competition with environmental ligands, or precipitation in anoxic environments in the presence of sulfides (Chapman et al. 2003). In addition, this SLERA only evaluated direct contact exposure. The exposure to upper trophic level receptors through food chain model was not evaluated, due to limited habitat on site to support ecological receptors; however, evaluating the direct exposure only in this SLERA may result is underestimating potential risk.

6.3 Effects Assessment

Uncertainties associated with the effects assessment relate to selected ESLs, the use of conservative assumptions, and the degree of interaction between Site contaminants.

Not all ESLs have the same degree of confidence. For some COPCs, information on toxicity is limited or not available. Additionally, many ESLs were derived from laboratory animal studies that evaluated exposure to a single chemical under controlled conditions. Ecological receptors using

the Site are likely exposed to a mixture of Site-related and non-Site-related contaminants, which may reduce or potentiate the toxicity of individual contaminants. Additionally, extrapolation of an ESL derived from populations or species different from those at the Site may introduce error because of differences in pharmacokinetics or population and species variability. Further, where ESLs are statistically determined or where they are based on co-occurrence rather than measured toxicity, they do not represent absolute thresholds. Finally, ESLs incorporate error contributed by studies underlying the numeric value selected as the ESL. These factors may result in over- or underestimating ecological risk.

Uncertainties can also be introduced by use of unrealistic assumptions in SLERAs. In SLERAs, conservative assumptions are generally made to ensure risk is not underestimated. This minimizes the possibility of concluding that no risk is present when a threat actually does exist (e.g., minimizes false negatives). The use of conservative assumptions likely overestimates potential risk.

There is also the potential of cumulative stress from exposure to additional stressors (e.g., habitat degradation); however, this was not evaluated in this SLERA. If other stressors exist at the Site, and if the effects of those stressors and the effects of exposure to contaminants are cumulative, ecological risks at the Site may be underestimated.

For this SLERA, maximum concentrations of contaminants detected in soil served as EPCs and are evaluated by comparison to ESLs based on direct exposure. The risk estimates resulting from these comparisons do not consider food web transfer and risks to upper trophic level receptors that may be exposed via dietary intake. Thus, without evaluating dietary exposure, ecological risks at the Site may be underestimated.

6.4 Risk Characterization

By definition, uncertainties in risk characterization are influenced by uncertainties in the exposure assessment and effects assessment. The adequate sampling and analysis of study area soil minimize the uncertainties in the exposure assessment of this medium. Descriptions of the magnitude and distribution of COPCs at the Site are considered to be generally representative of current conditions. Since only the maximum detected concentrations are used at this stage of the ecological risk assessment, the range of exposure concentrations is less critical to the results of the SLERA.

Effects data can also contribute to overall uncertainty in risk characterization. Science and scientific investigations cannot prove any hypothesis beyond doubt. The scientific method is instead based on stating the hypotheses, testing the hypotheses, and either accepting or rejecting the hypotheses based on the weight-of-evidence provided by test data. Confidence in the ability of selected ESLs to assess ecological risks varies for each data value selected. While all ESLs used in this SLERA are associated with some degree of uncertainty, it is the general trend described by the comparisons between exposure concentrations and effects concentrations, and the overall confidence in such comparisons, that are most important. Available information suggests the ESLs selected for use in this SLERA are generally similar to other ESLs, commonly accepted for screening, and adequate for estimating risk using conservative assumptions.

Detected concentrations of COPCs may not be indicative of bioavailable concentrations. All contaminant data used in the assessment were based upon the total concentration of the chemical present, as opposed to the bioavailable fraction. Both metals and organic compounds may bind to soil, making them less available to ecological receptors, particularly higher trophic level receptors. Thus, risk may be overestimated in some cases.

Another potential source of uncertainty is the small amount of biological or ecological survey data to support this SLERA. The types of surveys needed to aid in the determination of cause and effect relationships, especially at the community or population level, are highly dependent on data quality and quantity. Such data, however, are not typically included in a SLERA. Observations based on a more general site visit/survey are used to qualitatively evaluate habitat quality, habitat use, presence of receptors, and observations of adverse impacts.

Finally, the risk characterization method itself can contribute to uncertainty. Hazard quotients depend on a single value for both exposure concentration and effects concentration. Selecting a single ESL, only after consulting multiple sources to ensure some degree of consistency, minimizes the uncertainty associated with any single value. Incorporating Site observations into final conclusions also reduces the dependence on strict quantitative risk estimates that, in some cases, can be highly uncertain.

Section 7
Summary and Conclusions

Comparisons of maximum detected concentrations of chemicals in surface soil to conservative ESLs result in some degree of unacceptable risk. Specifically, HQs greater than unity (1) were calculated to the following contaminants, and these contaminants are identified as COPCs:

- VOCs: Acetone

  Acetone is the only VOC detected with an HQ above 1 (1.9). However, there is no information to indicate that acetone is a Site-related contaminant; thus, acetone is not retained as a COPC.

- SVOCs: benzo(a)anthracene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, chrysene, fluoranthene, and pyrene

  These 6 SVOCs were detected frequently (35 or more out of 48 samples). The maximum concentrations of all of these 6 SVOCs, except bis(2-ethylhexyl)phthalate, were qualified as "J+" indicating these concentrations are not only estimated but also biased high. HQs of these 6 SVOCs ranged from 2 (benzo[a]anthracene and chrysene) to 9 (pyrene). Similar to acetone, there is no information to indicate SVOCs are Site related. Thus, these 6 SVOCs are not retained as COPCs.

- Pesticides: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aldrin, alpha-chlordane, gamma-chlordane, dieldrin, endosulfan I, endrin, endrin aldehyde, gamma-BHC, heptachlor, and heptachlor epoxide

  Thirteen out of 18 detected pesticides had HQs above 1. Aldrin, dieldrin, and heptachlor had the highest HQs (6,325, 4,082, and 3,177, respectively); 4,4'-DDE, 4,4'-DDT, and endrin had HQs above 100, ranging from 198 (endrin) to 410 (4,4'-DDE). The remaining 7 pesticides had HQs below 100, ranging from 2 (4,4'-DDD) to 80 (gamma-BHC). There is no historical information to indicate that pesticides are related, as well as no records to determine the sources of the detected pesticides at the Site. However, the detected pesticides are found to be co-located with detected PCBs at the Site (CDM Smith 2016).

- PCBs: Aroclor 1248 and Aroclor 1254

  Aroclor 1248 and Aroclor 1254 had HQs of 6,199 and 15, respectively. Aroclor 1248 was detected in 44 of 48 samples, with the maximum detected concentration of 2,300 mg/kg. Both Aroclors are Site-related contaminants.

- Inorganics: antimony, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, vanadium, and zinc

  All of these 12 metals, except antimony and silver, were detected in more than 50 percent of the samples collected. HQs of these 12 metals ranged from 1.5 (cobalt) to 294 (mercury). There is no information to indicate that metals are Site related. Thus, all of these metals are retained as COPCs.

Chemicals detected with no corresponding ESLs are listed below:

- VOCs: cis-1,2-DCE, cyclohexane, and isopropylbenzene

  These 3 VOCs were detected in 1 or 2 out of 48 samples. These three VOCs are not considered Site related. Thus, they are not considered COPCs.

- SVOCs: benzo(b)fluoranthene, caprolactam, carbazole, and dibenzofuran

  Benzo(b)fluoranthene was detected most frequently (42 of 48 samples), having an estimated and biased high maximum concentration of 3,500 J+ µg/kg. The remaining 3 SVOCs were detected in 9 or fewer samples, with the maximum concentrations ranging from 180 (dibenzofuran) to 790 (carbazole) µg/kg. SVOCs are not considered Site related.

- Pesticides: endrin ketone

  Endrin ketone was detected in 5 of 48 samples, with an estimated maximum concentration of 240 µg/kg. Most likely this pesticide is not a Site-related contaminant.

- Inorganics: aluminum, calcium, iron, magnesium, potassium, and sodium

  Aluminum and iron are commonly occurring elements and are major components of almost all inorganic soil particles. Concentrations of aluminum and iron typically range in soil from 10,000 to 300,000 mg/kg (i.e., 1 to 30 percent) and 2,000 to 550,000 mg/kg (i.e., 0.2 to 55 percent), respectively (EPA 2003a; 2003b). The maximum concentrations of aluminum and lead (26,500 and 57,100 mg/kg, respectively) in soil were well within the range of expected natural concentrations. Thus, iron and aluminum are not considered COPCs.

  The remaining four metals (calcium, magnesium, potassium, and sodium) are ubiquitous, occur naturally in high concentrations, only toxic at very high concentrations; thus, unlikely to pose risk. Additionally tissue concentrations of these chemicals are regulated by living organisms even at relatively high levels of exposure, internal concentrations generally do not become sufficiently high to cause toxic effects. Furthermore, these four metals are not Site related; thus, they are also not retained as COPCs.

In conclusion, the COPCs identified via a comparison of the maximum detected concentrations of chemicals to their respective soil ESLs include PCBs, SVOCs, pesticides, and metals. SVOCs and metals are not Site-related contaminants. Two detected PCBs (Aroclor 1248 and Aroclor 1254) had high HQs (15 and 6,199), and 13 pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aldrin, alpha-chlordane, gamma-chlordane, dieldrin, endosulfan I, endrin, endrin aldehyde, gamma-BHC, heptachlor, and heptachlor epoxide) had HQs ranging from 2 to 6,325. Although there is no information to indicate that pesticides are Site related, as well as no records to determine the sources of the detected pesticides, the detected pesticides are found to be co-located with detected PCBs at the Site.

The high HQs indicate potential risks exist at the Site to ecological receptors from exposure to contaminants. However, the Site is an industrial site, and based on observations made during the ecological reconnaissance, the Site has limited vegetation and wildlife and has little to no viable habitat to support ecological receptors. Furthermore, no threatened and endangered species were observed on site. All of these findings indicate ecological threats are negligible at the Site.

Thus, despite the high HQs from PCBs and pesticides, it is recommended that no further ecological investigation is warranted to evaluate the potential for risks to ecological receptors from exposure to contaminants at the Site.

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EPA. 2007a. Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs), Interim Final, OSWER Directive 9285.7-78, Office of Solid Waste and Emergency Response. Washington, DC 20460. June.

EPA. 2007b. Ecological Soil Screening Levels for Copper, Revised Interim Final, OSWER Directive 9285.7-68, Office of Solid Waste and Emergency Response. Washington, DC 20460. February.

EPA. 2007c. Ecological Soil Screening Levels for Manganese, Interim Final, OSWER Directive 9285.7-71, Office of Solid Waste and Emergency Response. Washington, DC 20460. April.

EPA. 2007d. Ecological Soil Screening Levels for Nickel, Interim Final, OSWER Directive 9285.7-76, Office of Solid Waste and Emergency Response. Washington, DC 20460. March.

EPA. 2007e. Ecological Soil Screening Levels for Zinc, Interim Final, OSWER Directive 9285.7-73, Office of Solid Waste and Emergency Response. Washington, DC 20460. June.

EPA. 2007f. Ecological Soil Screening Levels for DDT and Metabolites, Interim Final, OSWER Directive 9285.7-57, Office of Solid Waste and Emergency Response. Washington, DC 20460. April.

EPA. 2007g. Ecological Soil Screening Levels for Dieldrin, Revised Interim Final, OSWER Directive 9285.7-56, Office of Solid Waste and Emergency Response. Washington, DC 20460. April.

EPA. 2007h. Ecological Soil Screening Levels for Dieldrin, Revised Interim Final, OSWER Directive 9285.7-58, Office of Solid Waste and Emergency Response. Washington, DC 20460. April.

EPA. 2008. Ecological Soil Screening Levels for Chromium, Revised Interim Final, OSWER Directive 9285.7-66, Office of Solid Waste and Emergency Response. Washington, DC 20460. April.

New Jersey Department of Environmental Protection (NJDEP). 2009. Ecological Screening Levels. http://www.nj.gov/dep/srp/guidance/ecoscreening

Figures

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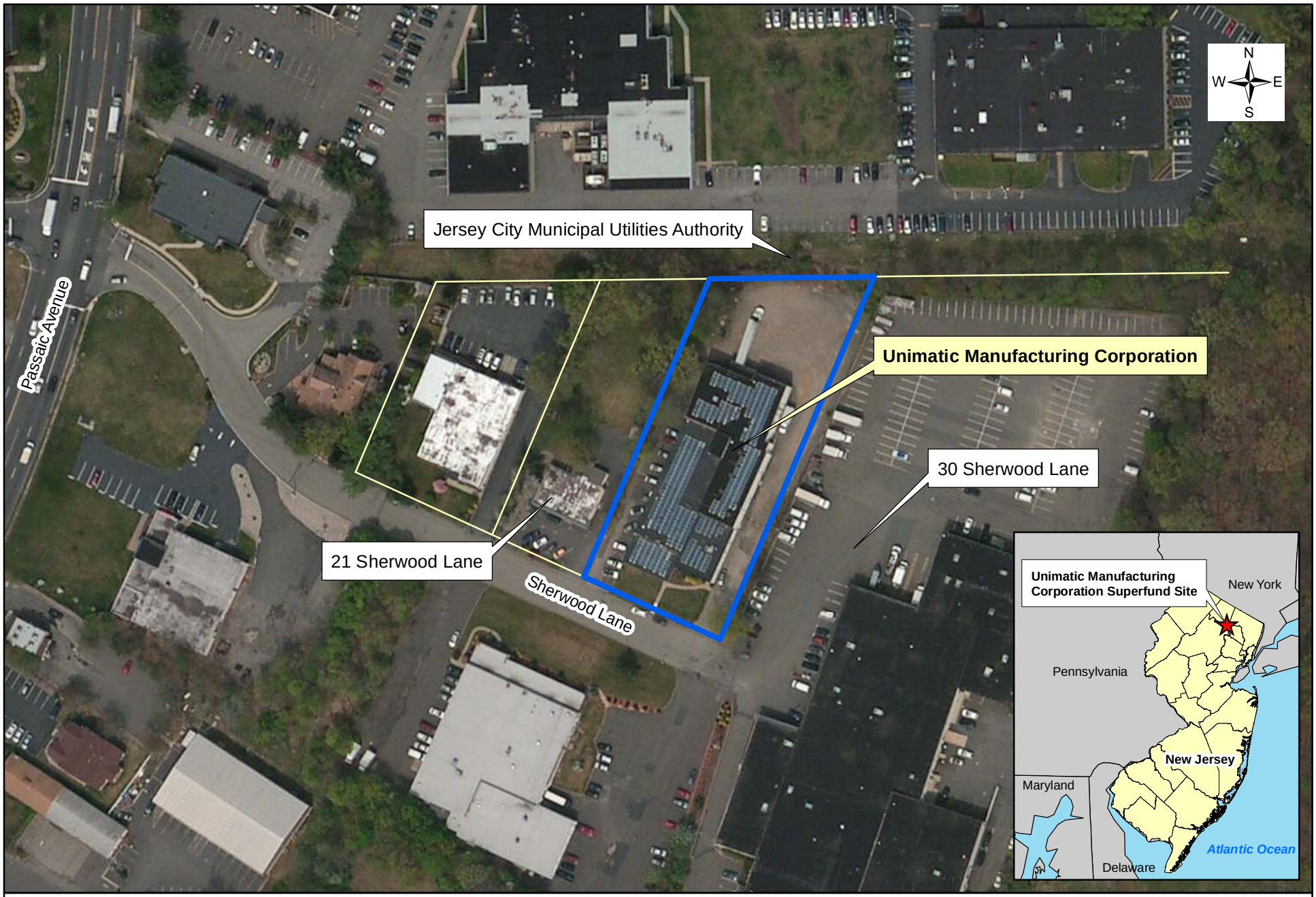

Legend

Property Boundary

0 75 150 300 Feet

CDM Smith

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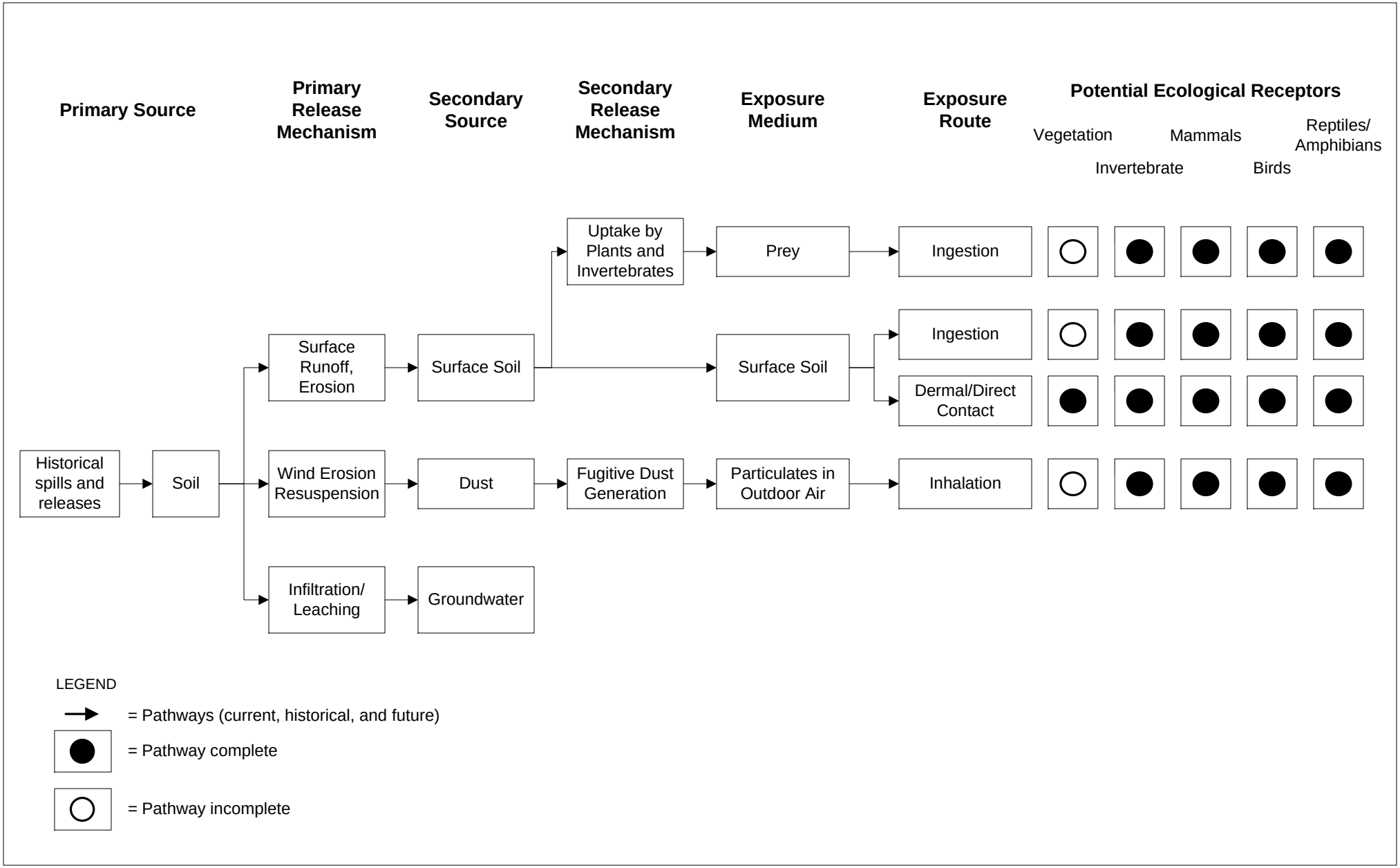
Figure 1-1
Site Location Map
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

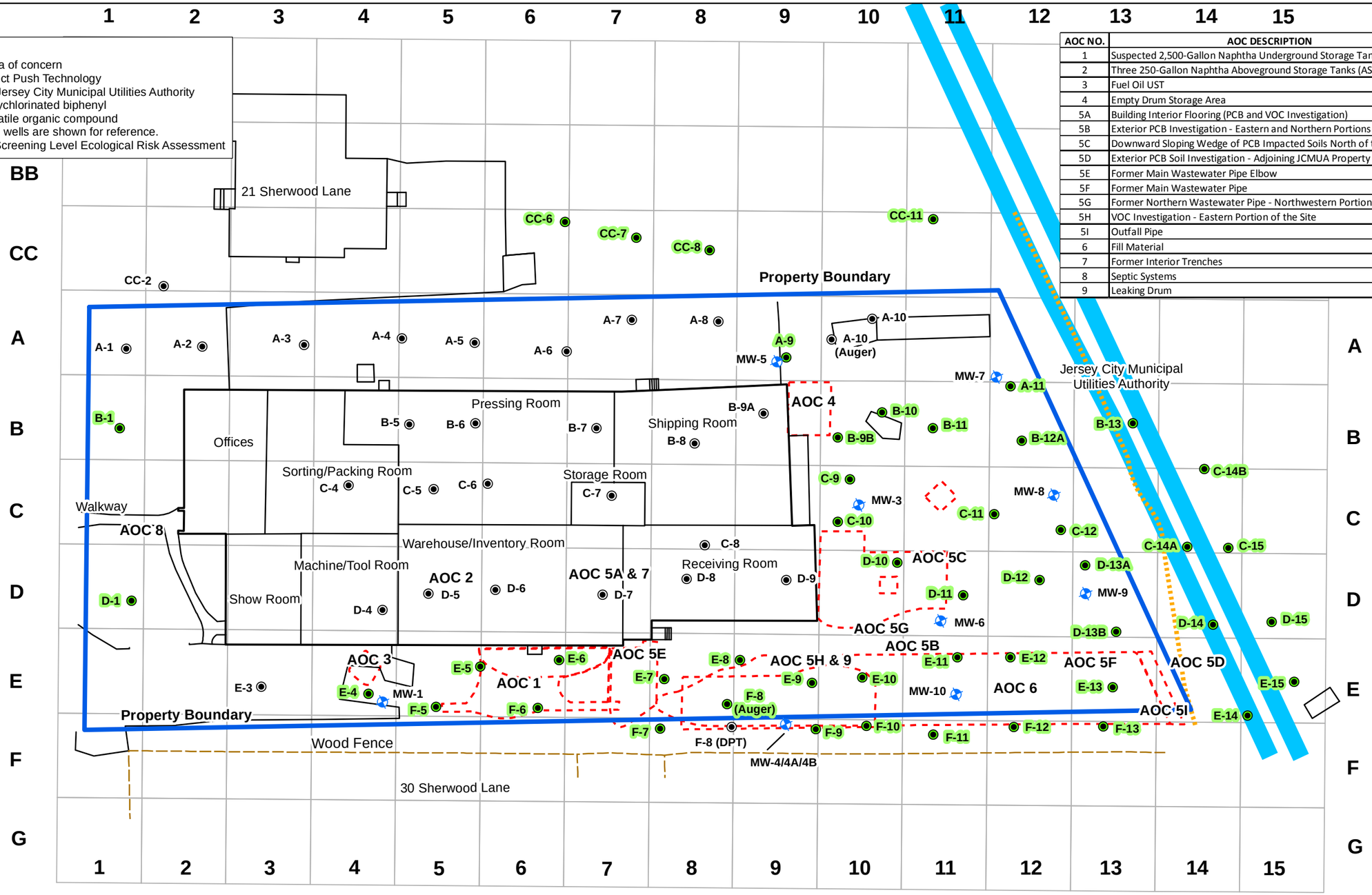


CDM Smith

Figure 2-1
Conceptual Site Model
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Notes:
1. AOC - Area of concern
2. DPT - Direct Push Technology
3. JCMUA - Jersey City Municipal Utilities Authority
4. PCB - Polychlorinated biphenyl
5. VOC - Volatile organic compound
6. Monitoring wells are shown for reference.
7. SLERA - Screening Level Ecological Risk Assessment

AOC NO.	AOC DESCRIPTION
1	Suspected 2,500-Gallon Naphtha Underground Storage Tank (UST)
2	Three 250-Gallon Naphtha Aboveground Storage Tanks (ASTs)
3	Fuel Oil UST
4	Empty Drum Storage Area
5A	Building Interior Flooring (PCB and VOC Investigation)
5B	Exterior PCB Investigation - Eastern and Northern Portions of the Site
5C	Downward Sloping Wedge of PCB Impacted Soils North of the Building
5D	Exterior PCB Soil Investigation - Adjoining JCMUA Property
5E	Former Main Wastewater Pipe Elbow
5F	Former Main Wastewater Pipe
5G	Former Northern Wastewater Pipe - Northwestern Portion
5H	VOC Investigation - Eastern Portion of the Site
5I	Outfall Pipe
6	Fill Material
7	Former Interior Trenches
8	Septic Systems
9	Leaking Drum



Legend

- Monitoring Well
- Soil Boring
- Soil Boring (Evaluated in SLERA)
- Approximate Toe of Slope
- Property Boundary
- JCMUA Pipeline
- Excavation Area

0 25 50 100 Feet

CDM Smith

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Figure 2-2
Soil Sample Locations
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Tables

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Table 2-1
Summary of Statisticas and Comparison of Chemicals Detected in Soil to Ecological Screening Levels
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Chemicals	CAS No	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Frequency of Detection	Screening Level	Hazard Quotient	Chemical of Potential Concern	Rationale
Volatile Organic Compounds (µg/kg)									
1,2,3-Trichlorobenzene	87-61-6	1.5 J	3.1 J	E-10	2 / 48	20,000 B	0.0002	No	BSL
1,2,4-Trichlorobenzene	120-82-1	3.2 J+	9.3	E-6	4 / 48	20,000 B	0.0005	No	BSL
1,3-Dichlorobenzene	541-73-1	3.6 J+	3.6 J+	E-11	1 / 48	37,700 C	0.0001	No	BSL
1,4-Dichlorobenzene	106-46-7	9.2 J+	9.2 J+	E-11	1 / 48	20,000 B	0.0005	No	BSL
2-Butanone	78-93-3	6.7 J	24	E-14	4 / 48	89,600 D	0.0003	No	BSL
2-Hexanone	591-78-6	9.1 J	9.1 J	F-12	1 / 48	12,600 D	0.0007	No	BSL
Acetone	67-64-1	13	4,700	E-13	11 / 48	2,500 D	1.9	No	LC
Carbon Disulfide	75-15-0	1 J	1.7 J	E-11	2 / 48	94.1 D	0.02	No	BSL
cis-1,2-Dichloroethene	156-59-2	4.4 J	4.4 J	F-10	1 / 48	NL	NC	Yes	NV
Cyclohexane	110-82-7	0.52 J	0.52 J	B-10	1 / 48	NL	NC	Yes	NV
Isopropylbenzene	98-82-8	0.67	0.94 J	E-6	2 / 48	NL	NC	Yes	NV
Styrene	100-42-5	2.2 J	2.2 J	E-5	1 / 48	300,000 B	0.00001	No	BSL
Tetrachloroethene	127-18-4	6.6 J	6.6 J	B-9B	1 / 48	9,920 C	0.001	No	BSL
Toluene	108-88-3	1.2 J	7.9	E-12	2 / 48	200,000 B	0.00004	No	BSL
Trichloroethene	79-01-6	0.71 J	3.3 J	B-11	8 / 48	12,400 C	0.0003	No	BSL
Semivolatile Organic Compounds (µg/kg)									
1,1'-Biphenyl	92-52-4	26 J	26 J	F-13	1 / 48	60,000 C	0.0004	No	BSL
1,2,4,5-Tetrachlorobenzene	95-94-3	16 J	16 J	E-10	1 / 48	2,020 C	0.008	No	BSL
2,4-Dinitrophenol	51-28-5	390 J	390 J	D-1	1 / 48	20,000 B	0.02	No	BSL
2-Methylnaphthalene	91-57-6	13 J	47 J	F-13	3 / 48	3,240 D	0.01	No	BSL
Acenaphthene	83-32-9	12 J	290	F-13	9 / 48	29,000 A, a	0.01	No	BSL
Acenaphthylene	208-96-8	37 J	96 J	CC-7	4 / 48	29,000 A, a	0.003	No	BSL
Anthracene	120-12-7	9.4 J	710	E-15	15 / 48	29,000 A, a	0.024	No	BSL
Benzo(a)anthracene	56-55-3	12 J-	2,200 J+	CC-7	35 / 48	1,100 A, b	2.00	Yes	ASL
Benzo(a)pyrene	50-32-8	9.3 J+	2,400 J+	CC-7	36 / 48	1,100 A, b	2.18	Yes	ASL
Benzo(b)fluoranthene	205-99-2	17 J	3,500 J+	CC-7	42 / 48	59,800 B	0.06	No	BSL
Benzo(k)fluoranthene	207-08-9	8.3 J+	1,200 J+	CC-7	35 / 48	148,000 C	0.008	No	BSL
Benzylbutylphthalate	85-68-7	15 J	42 J	CC-11	3 / 48	239 D	0.2	No	BSL
Bis(2-ethylhexyl)phthalate	117-81-7	31 J	1,900 J	D-13A	46 / 48	925 C	2.1	Yes	ASL
Caprolactam	105-60-2	27 J	600 J	E-15	6 / 48	NL	NC	Yes	NV
Carbazole	86-74-8	23 J	790	E-15	9 / 48	NL	NC	Yes	NV
Chrysene	218-01-9	9.2 J	2,200 J+	CC-7/E-15	37 / 48	1,100 A, b	2.0	Yes	ASL

Table 2-1
Summary of Statisticas and Comparison of Chemicals Detected in Soil to Ecological Screening Levels
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Chemicals	CAS No	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Frequency of Detection	Screening Level	Hazard Quotient	Chemical of Potential Concern	Rationale
Dibenzofuran	132-64-9	25 J	180	F-13	5 / 48	NL	NC	Yes	NV
Di-n-Butylphthalate	84-74-2	13 J	13 J	CC-11/B-13	2 / 48	200,000 B	0.00007	No	BSL
Di-n-Octylphthalate	117-84-0	42 J	42 J	A-11	1 / 48	709,000 D	0.00006	No	BSL
Fluoranthene	206-44-0	16 J+	5,600 J+	E-15	35 / 48	1,100 A, b	5	Yes	ASL
Fluorene	86-73-7	16 J	390	E-13/F-13	8 / 48	29,000 A, a	0.01	No	BSL
Naphthalene	91-20-3	11 J	29 J	F-13	4 / 48	29,000 A, a	0.001	No	BSL
Phenanthrene	85-01-8	11 J	5,200 J	E-15	31 / 48	29,000 A, a	0.2	No	BSL
Pyrene	129-00-0	9.1 J	9,800 J+	E-15	43 / 48	1,100 A, b	9	Yes	ASL
Pesticides (µg/kg)									
4,4'-DDD	72-54-8	3.7 J+	47 JN	D-15	8 / 48	21 A, c	2	Yes	ASL
4,4'-DDE	72-55-9	2.1 J	8,600 J	E-10	42 / 48	21 A, c	410	Yes	ASL
4,4'-DDT	50-29-3	2.2 J	7,200	E-10	28 / 48	21 A, c	343	Yes	ASL
Aldrin	309-00-2	1.1 J	21,000 J	E-10	30 / 48	3.32 C	6,325	Yes	ASL
Alpha-Chlordane	319-84-6	0.81 J+	4,200 J	E-8	9 / 48	224 C, d	19	Yes	ASL
Gamma-Chlordane	1024-57-3	0.82 J	9,300 J	E-10	42 / 48	224 C, d	42	Yes	ASL
Delta-BHC	5103-71-9	2 J	1,200 J	E-11	22 / 48	9,940 D	0.12	No	BSL
Dieldrin	319-86-8	5.4 J	20,000	E-10	42 / 48	4.9 A	4,082	Yes	ASL
Endosulfan I	60-57-1	0.51 J	1,500 J	E-10	21 / 48	119 D	13	Yes	ASL
Endosulfan II	959-98-8	0.57 J	25 JN	D-13B	11 / 48	119 D	0.2	No	BSL
Endosulfan Sulfate	33213-65-9	0.28 J	0.28 J	D-1	1 / 48	35.8 C	0.01	No	BSL
Endrin	1031-07-8	0.62 J	2,000 J	E-10	35 / 48	10.1 C	198	Yes	ASL
Endrin Aldehyde	72-20-8	1.8 J	790 JN	E-10	14 / 48	10.5 C	75	Yes	ASL
Endrin Ketone	7421-93-4	10 NJ	240 J	E-8	5 / 48	NL	NC	Yes	NV
Gamma-BHC (Lindane)	53494-70-5	0.31 J	400 JN	E-11	27 / 48	5 C	80	Yes	ASL
Heptachlor	58-89-9	16 J	19,000 JN	E-10	19 / 48	5.98 C	3,177	Yes	ASL
Heptachlor Epoxide	5103-74-2	0.73 J	2,900	E-5	11 / 48	152 C	19	Yes	ASL
Methoxychlor	76-44-8	1.1 J	5 J	C-9	2 / 48	19.9 C	0.3	No	BSL
Polychlorinated Biphenyls (µg/kg)									
Aroclor 1248	12672-29-6	110	2,300,000	E-10	44 / 48	371 B, e	6,199	Yes	ASL
Aroclor 1254	11097-69-1	36 J	5,600	D-15	11 / 48	371 B, e	15	Yes	ASL

Table 2-1
Summary of Statisticas and Comparison of Chemicals Detected in Soil to Ecological Screening Levels
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Chemicals	CAS No	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Frequency of Detection	Screening Level	Hazard Quotient	Chemical of Potential Concern	Rationale
Metals (mg/kg)									
Aluminum	7429-90-5	5,540 J	26,500	D-13B	48 / 48	NL	NC	Yes	NV
Antimony	7440-36-0	0.38	0.71	D-13B	3 / 48	0.27 A	3	Yes	ASL
Arsenic	7440-38-2	0.73	11.4	F-11	46 / 48	18 A	0.6	No	BSL
Barium	7440-39-3	15.6 J	101	C-14A	48 / 48	330 A	0.3	No	BSL
Beryllium	7440-41-7	0.18 J	0.93 J	C-14A	34 / 48	21 A	0.04	No	BSL
Cadmium	7440-43-9	0.051 J	4.1	B-9B	25 / 48	0.36 A	11	Yes	ASL
Calcium	7440-70-2	1,200	28,700	F-9	48 / 48	NL	NC	No	NV
Chromium	7440-47-3	8.6	690	D-13A	48 / 48	26 A	27	Yes	ASL
Cobalt	7440-48-4	3.5	19	E-13	48 / 48	13 A	1.5	Yes	ASL
Copper	7440-50-8	2.3	1,100	D-13B	48 / 48	28 A	39	Yes	ASL
Iron	7439-89-6	13,900	57,100	F-9	48 / 48	NL	NC	No	NV
Lead	7439-92-1	3.2	130	C-9	48 / 48	11 A	12	Yes	ASL
Magnesium	7439-95-4	1,040	12,200	E-13	48 / 48	NL	NC	No	NV
Manganese	7439-96-5	94.5	24,800	E-5	47 / 48	220 A	113	Yes	ASL
Mercury	7439-97-6	0.0026 J	0.15	CC-8/C-15	39 / 48	0.00051 B	294	Yes	ASL
Nickel	7440-02-0	5.2	70.7	D-13A	48 / 48	38 A	2	Yes	ASL
Potassium	7440-09-7	567	3,130	C-14A	45 / 48	NL	NC	No	NV
Selenium	7782-49-2	0.21 J	1.5	F-6/F-12	35 / 48	0.52 A	3	Yes	ASL
Silver	7440-22-4	0.0057 J	0.64	D-13B	13 / 48	4.2 A	0.2	No	BSL
Sodium	7440-23-5	577	1,850	F-13	14 / 48	NL	NC	No	NV
Vanadium	7440-62-2	13.5	149	D-13A	47 / 48	7.8 A	19	Yes	ASL
Zinc	7440-66-6	5.4	721	D-13B	46 / 48	46 A	16	Yes	ASL

Notes:

ASL - above screening level
BSL - below screening level
J - estimated
J+ - estimated, biased high
J- - estimated, biased low
NJ - estimated, tentively identified
LC - a common laboratory contaminant
NC - no hazard quotient calculated
NL - not listed
mg/kg - millligram per kilogram
NV - no screening value
µg/kg - microgram per kilogram

A - EPA Ecological Soil Screening Levels (EcoSSLs). http://www.epa.gov/ecotox/ecossl/
B - Efroymson, R.A., et al., 1997. Preliminary Remediation Goals for Ecological Endpoints. Prepared for US Department of Energy, Office of Environmental Management Contract No. DE-AC05-84OR21401.
C - NJDEP. 2009. Ecological Screening Levels. http://www.nj.gov/dep/srp/guidance/ecoscreening
D - EPA.2003. EPA Region 5 Resource Conservation and Recovery Act Ecological Screening Levels.
a - value for low moliecular weight PAHs
b - value for high moliecular weight PAHs
c - value for DDT and metabolites
d - value for chlordane
e - value for PCBs

Appendix A

Ecological Reconnaissance Photo log

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Ecological Reconnaissance Photographic Documentation
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essdex County, New Jersey

Former Unimatic Manufacturing Company
Picture Date: August 6, 2015
Picture taken Sherwood Lane looking northeast.
Perspective view of the Former Unimatic Manufacturing building, note un-kept lawn and landscaping.

Former Unimatic Manufacturing Company
Picture Date: August 6, 2015
Picture taken from westside driveway looking northeast.
Westiside driveway of the site, note sparse vegetation along edge of building and site fence.

Ecological Reconnaissance Photographic Documentation
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essdex County, New Jersey

Former Unimatic Manufacturing Company
Picture Date: August 6, 2015
Picture taken from westside driveway looking north.
Northwestern corner of the site with dense patch of vegetation consisting of porcelain berry.

Former Unimatic Manufacturing Company
Picture Date: August 6, 2015
Picture taken from westside of site facing southeast.
Northside of site building, note the gravel lot and sparse vegetation along building edge.

Former Unimatic Manufacturing Company
Picture Date: August 6, 2015
Picture taken from westside driveway facing northeast.
Perspective view of gravel lot and northeastern corner of the site property.

Former Unimatic Manufacturing Company
Picture Date: August 6, 2015
Picture taken from gravel lot looking southwest.
Perspective view of eastside gravel driveway, note the sparse vegetation along the edge of the building.

Ecological Reconnaissance Photographic Documentation
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essdex County, New Jersey

Former Unimatic Manufacturing Company
Picture Date: August 6, 2015
Picture taken from east side driveway facing northeast.
View of drainage right-of-way between the former General Hose Site and the site.

21 Sherwood Lane
Picture Date: August 6, 2015
Picture taken Sherwood Lane looking northeast.
Perspective view of 21 Sherwood Lane, note the manicured lawn and landscaping.

21 Sherwood Lane
Picture Date: August 6, 2015
Picture taken Sherwood Lane looking northeast.
View of westside of 21 Sherwood Lane's manicured lawn.

21 Sherwood Lane
Picture Date: August 6, 2015
Picture taken from eastside driveway looking northeast.
View of 21 Sherwood Lane eastside driveway, note sparse vegetation along eastern fence shared with the Unimatic Site. Trees can be seen bordering the northern extent of the property.

21 Sherwood Lane
Picture Date: August 6, 2015
Picture taken in backyard facing northwest.
View of 21 Sherwood Lane backyard.

21 Sherwood Lane
Picture Date: August 6, 2015
Picture taken in backyard facing southeast.
View of 21 Sherwood Lane backyard and eastern fence that borders the Unimatic Site. Note the trees on the property and vegetation growing along fence.

JCUMA Right of Way
Picture Date: August 6, 2015
Picture taken from JCUMA right of way looking west.
View of JCUMA right of way that borders the northern extent of the 21 Sherwood Lane property.

JCUMA Right of Way
Picture Date: August 6, 2015
Picture taken from JCUMA right of way looking east.
View of JCUMA right of way that borders the northern extent of the Unimatic Site. Note the dense vegetation on the JCUMA right of way that borders the Unimatic Site northern border.

JCUMA Right of Way
Picture Date: August 6, 2015
Picture taken from JCUMA right of way looking northeast.
View of the sewer opening on the JCUMA right of way where water run-off from the Unimatic Site and the Former General Hose Site drain.

JCUMA Right of Way
Picture Date: August 6, 2015
Picture taken from area around sewer opening looking south.
Area where water from the Former General Hose Site and the Unimatic Site drain. Note the phragmites growing in the area.

Forested Plot of Land
Picture Date: August 6, 2015
Picture taken from the JCUMA right of way looking southwest.
View of dry creek bordering the Former General Hose Site locate in the forested plot of land.

Forested Plot of Land
Picture Date: August 6, 2015
Picture taken from forested plot of land looking west.
Perspective view of forested plot of land and the fence bordering the eastside of the Former General Hose Site.

21 Sherwood Lane
Picture Date: August 6, 2015
Animal burrow located at northern extent of 21 Sherwood Lane property.

JCUMA Right of Way
Picture Date: August 6, 2015
Animal burrow located on JCUMA right of way near the 21 Sherwood Lane.
and Unimatic Site property boundary.

Forested Plot of Land
Picture Date: August 6, 2015
Blue Jay feather found on the JCUMA right of way.

Appendix B

Letters from the U.S. Fish and Wildlife Service and New Jersey Department of Environmental Protection on Federally and State-Listed Threatened and Endangered Species

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Jersey Ecological Services Field Office
927 NORTH MAIN STREET, BUILDING D
PLEASANTVILLE, NJ 08232
PHONE: (609)646-9310 FAX: (609)646-0352
URL: www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

Consultation Code: 05E2NJ00-2016-SLI-0067 October 29, 2015
Event Code: 05E2NJ00-2016-E-00056
Project Name: Unimatic Manufacturing Corporation Superfund Site

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species that may occur in your proposed action area and/or may be affected by your proposed project. This species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*)

If the enclosed list indicates that any listed species may be present in your action area, please visit the New Jersey Field Office consultation web page as the next step in evaluating potential project impacts: http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

On the New Jersey Field Office consultation web page you will find:

- habitat descriptions, survey protocols, and recommended best management practices for listed species;
- recommended procedures for submitting information to this office; and
- links to other Federal and State agencies, the Section 7 Consultation Handbook, the Service's wind energy guidelines, communication tower recommendations, the National Bald Eagle Management Guidelines, and other resources and recommendations for protecting wildlife resources.

The enclosed list may change as new information about listed species becomes available. As per Federal regulations at 50 CFR 402.12(e), the enclosed list is only valid for 90 days. Please return to the ECOS-IPaC website at regular intervals during project planning and implementation to obtain an updated species list. When using ECOS-IPaC, be careful about drawing the boundary of your Project Location. Remember that your action area under the ESA

is not limited to just the footprint of the project. The action area also includes all areas that may be indirectly affected through impacts such as noise, visual disturbance, erosion, sedimentation, hydrologic change, chemical exposure, reduced availability or access to food resources, barriers to movement, increased human intrusions or access, and all areas affected by reasonably forseeable future that would not occur without ("but for") the project that is currently being proposed.

We appreciate your concern for threatened and endangered species. The Service encourages Federal and non-Federal project proponents to consider listed, proposed, and candidate species early in the planning process. Feel free to contact this office if you would like more information or assistance evaluating potential project impacts to federally listed species or other wildlife resources. Please include the Consultation Tracking Number in the header of this letter with any correspondence about your project.

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: Unimatic Manufacturing Corporation Superfund Site

Official Species List

Provided by:

New Jersey Ecological Services Field Office
927 NORTH MAIN STREET, BUILDING D
PLEASANTVILLE, NJ 08232
(609) 646-9310
http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

Consultation Code: 05E2NJ00-2016-SLI-0067
Event Code: 05E2NJ00-2016-E-00056

Project Type: Superfund Site Remediation

Project Name: Unimatic Manufacturing Corporation Superfund Site

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

Project Location Map:

Project Coordinates: MULTIPOLYGON (((-74.27158534526825 40.878278981752665, -74.27114278078079 40.878850881657044, -74.27061438560486 40.87865416487153, -74.27109450101851 40.878110655662326, -74.27158534526825 40.878278981752665)))

Project Counties: Essex, NJ

Endangered Species Act Species List

There are a total of 2 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Mammals	Status	Has Critical Habitat	Condition(s)
Indiana bat *(Myotis sodalis)* Population: Entire	Endangered		
Northern long-eared Bat *(Myotis septentrionalis)*	Threatened		

Critical habitats that lie within your project area

There are no critical habitats within your project area.

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
State Forestry Services
Mail Code 501-04
ONLM -Natural Heritage Program
P.O. Box 420
Trenton, NJ 08625-0420
Tel. #609-984-1339
Fax. #609-984-1427

BOB MARTIN
Commissioner

August 21, 2015

Nai-chia Luke
CDM Smith
110 Fieldcrest Avenue, #8, 6th Floor
Edison, NJ 08837

Re: Unimatic Manufacturing Corporation Remedial Investigation/Feasibility Study
Block(s) - 2301, Lot(s) - 8
Fairfield Township, Essex County

Dear Nai-chia Luke:

Thank you for your data request regarding rare species information for the above referenced project site in Fairfield Township, Essex County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.1) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the vicinity of the site.

A list of rare plant species and ecological communities that have been documented from the project site, referenced above, can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf.

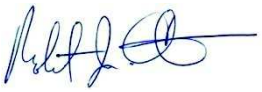
NHP File No. 15-4007483-8183

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive NJ-GeoWeb website at the following URL, http://www.state.nj.us/dep/gis/geowebsplash.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,



Robert J. Cartica
Administrator

c: NHP File No. 15-4007483-8183

Table 1: On Site Data Request Search Results (7 Possible Reports)

Report Name	**Included**	**Number of Pages**
1. Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
2. On or In the Immediate Vicinity of the Project Site Based on Search of the Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
3. Natural Heritage Priority Sites On Site	No	0 pages included
4. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches	No	0 pages included
5. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.1	No	0 pages included
6. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File	No	0 pages included
7. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	No	0 pages included

Table 2: Vicinity Data Request Search Results (6 possible reports)

Report Name	**Included**	**Number of Pages**
1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
2. Natural Heritage Priority Sites within the Vicinity	No	0 pages included
3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches	Yes	1 page(s) included
4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.1	No	0 pages included
5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File	No	0 pages included
6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	No	0 pages included

Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
Aves								
	Great Blue Heron	Ardea herodias	Foraging	2	NA	Special Concern	G5	S3B,S4N

Appendix C

List of Samples Evaluated in SLERA

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Table C-1
List of Samples Evaluated in the SLERA
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Location	Sample ID	Sample Depth (feet)	Sample Date
A-11	SB-A-11-A	0 / 2	6/19/2015
A-9	SB-A-9-A	0 / 2	6/19/2015
B-1	SB-B-1-A	0 / 2	6/24/2015
B-10	SB-B-10-A	0 / 2	6/16/2015
B-11	SB-B-11-A	0 / 2	6/17/2015
B-12A	SB-B-12A-A	0 / 2	6/17/2015
B-13	SB-B-13-A	0 / 2	7/8/2015
B-9B	SB-B-9B-A	0 / 2	6/16/2015
C-10	SB-C-10-A	0 / 2	6/15/2015
C-11	SB-C-11-A	0 / 2	6/15/2015
C-12	SB-C-12-A	0 / 2	6/26/2015
C-14A	SB-C-14A-A	0 / 2	7/8/2015
C-14B	SB-C-14B-A	0 / 2	7/8/2015
C-15	SB-C-15-A	0 / 2	7/7/2015
C-9	SB-C-9-A	0 / 2	7/7/2015
C-9	SB-C-9-A-R	0 / 2	7/9/2015
CC-11	SB-CC-11-A	0 / 2	6/25/2015
CC-6	SB-CC-6-A	0 / 2	6/24/2015
CC-7	SB-CC-7-A	0 / 2	6/24/2015
CC-8	SB-CC-8-A	0 / 2	6/25/2015
D-1	SB-D-1-A	0 / 2	6/30/2015
D-10	SB-D-10-A	0 / 2	6/15/2015
D-11	SB-D-11-A	0 / 2	6/15/2015
D-12	SB-D-12-A	0 / 2	6/25/2015
D-13A	SB-D-13A-A	0 / 2	6/29/2015
D-13B	SB-D-13B-A	0 / 2	7/7/2015
D-14	SB-D-14-A	0 / 2	7/8/2015
D-15	SB-D-15-A	0 / 2	7/7/2015
E-10	SB-E-10-A	0 / 2	6/16/2015
E-11	SB-E-11-A	0 / 2	6/26/2015
E-12	SB-E-12-A	0 / 2	6/29/2015
E-13	SB-E-13-A	0 / 2	6/29/2015
E-14	SB-E-14-A	0 / 2	7/7/2015
E-15	SB-E-15-A	0 / 2	7/7/2015
E-4	SB-E-4-A	0 / 2	6/30/2015
E-5	SB-E-5-A	0 / 2	6/30/2015
E-6	SB-E-6-A	0 / 2	6/18/2015
E-7	SB-E-7-A	0 / 2	6/17/2015
E-8	SB-E-8-A	0 / 2	6/17/2015
E-9	SB-E-9-A	0 / 2	6/17/2015
F-10	SB-F-10-A	0 / 2	6/19/2015
F-11	SB-F-11-A	0 / 2	7/1/2015
F-12	SB-F-12-A	0 / 2	7/1/2015
F-13	SB-F-13-A	0 / 2	7/6/2015
F-5	SB-F-5-A	0 / 2	7/6/2015
F-6	SB-F-6-A	0 / 2	7/6/2015
F-7	SB-F-7-A	0 / 2	6/19/2015
F-8	SB-F-8-A	0 / 2	6/18/2015
F-9	SB-F-9-A	0 / 2	6/18/2015