



DNREC Brownfield Investigation Report/ Remedial Investigation Report Template September 2026

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Ensure table of contents is accurate and navigable, including figures, tables, and appendices. Contents including figures, tables, and appendices will be bookmarked in the PDF for efficient navigation of the document.

For consistency of reporting all figures, tables and other documents should be included at the end of the report under Tables, Figures and Appendices sections and not in the body of the report.

Please remember to cite all sources in the text and provide a citation in the reference section of the report.

EXECUTIVE SUMMARY

An executive summary should include a brief (max. 2 pages) plain language description of the following items:

- Purpose of the BFI/RI
- Site location and current site layout and current use(s)
- Potential future use(s) of the site
- Contaminants of concern (COCs) detected in environmental media (soil, groundwater, soil gas, indoor air, surface water and sediment)
- Conclusion of risk posed by the release to human health and the environment
- Recommendations for future action(s) (e.g., necessity of remedial actions based on investigation and risk assessment, perform feasibility study **but no discussion of remedial alternatives**).

INTRODUCTION

1.1 Purpose of the Investigation

The purpose of this Brownfield Investigation (BFI)/Remedial Investigation (RI) [7 DE Admin. Code 1375 §9.4 and §9.5] is to characterize the nature and extent (vertical and horizontal) of the release or potential release of hazardous substances in all applicable environmental media (soil, soil-gas,

groundwater, surface water and sediment); to collect data to assess the risk to human health and the environment as a result of a release; and to identify the specific conditions that require potential remediation. The BFI/RI was performed to comply with the Delaware Regulations Governing Hazardous Substance Cleanup (DNREC, 2019) and DNREC's Hazardous Substance Cleanup Act (HSCA). The investigation and reporting followed DNREC's Guidance, Policies, standard operating procedures (SOPs), or alternatives pre-approved by DNREC.

1.2 Site Description

- Site Address and Tax parcel ID(s)
- A description of the site layout (e.g. acreage, topography, roads, structures on-site)
- Site current land use(s), including zoning
- Existing utilities (e.g., electric, sanitary, water, stormwater, communication) and their locations and connections.
- Any existing wells and any information regarding their locations, purposes, depths
- Any applicable site features including underground tunnels, roadways, bulkheads, and other rights-of-way (transportation, pipeline, railroad, dredged waterways.)
- Identified Environmental Justice (EJ) communities, sensitive human population (e.g., schools, day cares, hospitals, adult care) at and surrounding properties to the site. Provide distances and directions from the site.
- Description of adjacent properties including land use, and any off-site Ecologically Sensitive Natural Resources (ESNR) possibly impacted by the site or site systems (e.g. USTs, streams, ponds)

1.3 Operational History

- Describe the operational history of the site and include approximate dates or periods. Use of standard historical sources, such as aerial imagery, fire insurance maps, city directories, are encouraged.
- Describe changes in site layout/infrastructure (e.g. from historic aerial photographs)
- Identify and describe potential/known sources of contamination on-site and the surrounding properties including the potential/known

hazardous substances from past operations history and use (e.g., previous tannery and potential metals contamination) including a summary of any investigation and cleanup.

1.4 Regulatory History

- Identify any historical Federal, State, or Tribal permits or records of the Site and adjacent sites. Permits include, but are not limited, storage tanks, Resource Conservation and Recovery Act (RCRA) Hazardous Waste Generators, landfills, waste manifests, emergency response, etc.
 - If records or permits were identified,
 - Dates of permits or records
 - Dates of investigations or inspections,
 - Dates of notice of violations (NOVs) and corrections, or
 - Other activities that would suggest potential for a release of hazardous substances.
- Identify and describe all past and present local, state and federal environmental regulatory activities that have been completed or are currently ongoing at the site and surrounding areas. Include a brief description of any investigations, cleanup activities, and remedies.

1.5 Previous Investigations

- Identify all previous investigations that have been completed on the site. Please provide a brief summary of the purpose and findings of each investigation performed at the site. Investigation activities include but are not limited to Phase I and Phase II Environmental Site Assessment (ESAs), EPA-funded Preliminary Assessments (PAs) and/or Site Inspections (SIs), Facility Evaluations (FEs), Limited Subsurface Investigations, etc.
- Any previous investigation reports referenced should be provided as a copy (if available) to DNREC. Copies of these reports do not have to be included in the RI/BFI report.

1.6 Proposed Site Development Plan/Usage, if applicable

- Describe the proposed development plan(s) and use(s) of the site in detail and include the plan submitted to the county or other local agencies, if available.

- If plan is not available include the conceptual development plan and the intended site use(s) (i.e., commercial, residential, mixed use, etc.).
- Describe any environmental and socio-economic benefit related to this development.
- Discussion of economic benefits resulting from site redevelopment including creation of jobs.

2.0 SITE PHYSICAL CHARACTERISTICS

2.1 Geology

2.1.1 Regional Geology

- Identify and describe the underlying geology (bedrock Formations, unconsolidated Formations, or both) of the area and reference the latest geologic map of the area.
 - Approximate lithologic thicknesses in the area as well as estimated depths to bedrock, if applicable.
- Include a copy of the portion of the geologic map showing the site location and a regional cross-section, as needed.
- Identify the surface soil type for the site and discuss the hydraulic nature, permeability, and erodibility of the soil. Include approximate soil horizon thicknesses.

2.1.2 Site-Specific Geology

- Interpret site-specific geology based on soil boring logs, monitoring well logs, test pit logs and other approved subsurface investigation methods (such as high-resolution characterization tools and geophysical/geotechnical investigations). All logs used for the evaluation should be included in the appendices.
 - For all logs, identify the classification system (e.g., USCS, USDA) used to identify geologic materials. Please try to keep the classification system used uniform throughout the investigation process, if possible.
 - Describe any odors, sheens, etc. in the logs.
 - Identify the depth(s) of all geologic materials including fill, Geologic Formations, and provenance (e.g. fill, alluvial, saprolite).

- Describe the contents of the fill.
- Include a narrative about how regional geology relates to site-specific geology.
 - (In the Piedmont) Discuss the potential of contaminant migration to bedrock.
- Create site-specific cross sections of the subsurface stratigraphy and include as a figure (s). The cross sections should include investigation points and identify the source areas of the release and all receptors (e.g. drinking wells, basements, etc.)

2.2 Hydrogeology

2.2.1 Regional Hydrogeology

- Identify the regional aquifers (both shallow and deep),
 - Identify whether the aquifers are confining, semi-confining, or perched.
 - Identify and describe any low transmissive layers,
 - Identify the distance, direction, and classification of all recharge areas
 - Identify aquifer uses (e.g., drinking water, irrigation, etc.) in the area.
- Identify and describe any effect of seasonal fluctuations, saltwater intrusion, or tidal fluctuations on groundwater in the area.
- Discuss presumed or published groundwater flow direction of the underlying aquifer(s).
 - Include regional aquifer and flow maps as necessary.
 - Note any specific aquifer conditions, for example yield or water quality conditions.

2.2.2 Site Specific Hydrogeology

- Identify the aquifers beneath the site.
- Report depth to groundwater, groundwater elevations and groundwater flow direction.
- Include groundwater elevation contour map(s) and indicate flow directions for the site as applicable.
- Include site-specific cross section(s) showing the aquifers

- A single cross-section may show both geology and hydrogeology, as well as contaminant distribution.
- Identify all potential groundwater receptors at and near the site.

2.3 Surface Water Hydrology

- Describe site topography and precipitation, effects on drainage.
- Identify any surface water bodies at and near the site, include information such as
 - approximate distance and direction from the site
 - Water salinity type (freshwater, brackish, or saltwater)
 - Water flow direction, if applicable.
 - If there's a tidal influence on the water body.
- Current storm water features (e.g., inlets, swales, ditches, management ponds, etc.) at the site and overland flow direction(s)
 - Identify the connectivity of any stormwater infrastructure on or adjacent to the site.
- Identify the usage of surface water (drinking water, recreational, or other use).
- Identify the designated uses of stream basins and water bodies as listed in Section 3.0 of the Delaware Surface Water Quality Standards [7 DE Admin. Code 7401¹].
- Identify whether the surface water body is listed in the Combined Watershed Assessment Report (305(b)) and Determination for the Clean Water Act Section 303(d) List of Waters Needing TMDLs, also known as the "Integrated Report"².
 - If so, identify the parameter(s) for which the water body is listed.
 - Identify whether there are total maximum daily loads (TMDLs) developed for the impaired waterway. Identify the impairment and the developed TMDL.
 - Identify whether there is a fish consumption advisory for the impaired waterway.
- Identify any hazards associated with surface water hydrology at and near the site including:
 - FEMA Special Flood Hazard Areas,

<https://regulations.delaware.gov/AdminCode/title7/7401>

<https://dnrec.delaware.gov/watershed-stewardship/assessment/reports/>

- Climate Change Vulnerability Assessment³ (such as sea level rise, susceptible to storm surges, erosion, flooding, etc.).

3.0 REMEDIAL/BROWNFIELD INVESTIGATION METHODS AND RESULTS

This section should include the investigation methods and results for all environmental media investigated in their respective sections below. All sample procedures should follow their DNREC-approved Sampling and Analysis Plans (SAPs) as well as respective DNREC SOPs. Please note under certain site-specific conditions deviations from the SAPs or SOPs are allowed by communicating with DNREC-RS. Please discuss these deviations in their respective sections.

If an environmental media was not sampled, please include why the media was not sampled.

All laboratory, field data, well construction, soil boring logs, electronic data deliverables (EDDs) shall be submitted to the DNREC EQuISTM System data manager⁴.

3.1 Soil Investigation Methods and Results

3.1.1 Surface Soil (0-6 inches below ground surface (bgs))

3.1.1.1 Methods

- Describe the objective of surface soil collection
- Briefly describe how and when sampling was performed and refer to the DNREC-approved Sampling Analysis Plan (SAP) and the respective DNREC Standard Operating Procedures (SOPs) used

Discuss any deviations from the SAP and SOPs

- Describe the analyses performed on the samples with the EPA analytical method and revision, if applicable
- Describe the screening analyses performed
- Identify the HSCA approved laboratory/laboratories that performed the analyses
- Describe QA/QC samples

<https://dnrec.delaware.gov/climate-coastal-energy/climate-change/>
<https://dnrec.delaware.gov/waste-hazardous/equis/>

- The number of QC samples collected
 - The frequency per analysis, per number of samples, per day
- Indicate that all analyses were performed in accordance with SOPCAP

3.1.1.2 Results

- Describe the results and identify the Contaminants of Potential Concern (COPCs) and the Contaminants of Potential Ecological Concern (COPECs) detected and the concentrations, include maximum observed concentrations (MOCs) and locations.
- Reference the table showing the COPC concentrations
- Reference the map showing the results associated with the sample location(s).

3.1.2 Shallow Soils (0-2 feet bgs)

3.1.2.1. Methods

- Briefly describe how and when sampling was performed and refer to the DNREC-approved SAP and the respective DNREC SOPs used
- Discuss any deviations from the SAP and SOPs
- Describe the analyses performed on the samples with the EPA analytical method and revision, if applicable
- Describe the screening analyses performed
- Identify the HSCA approved laboratory/laboratories that performed the analyses
- Describe QA/QC samples
 - The number of QC samples collected
 - The frequency per analysis, per number of samples, per day
- Indicate that all analyses were performed in accordance with SOPCAP

3.1.2.2 Results

- Describe the results and identify the COPCs and COPECs detected and the concentration range. Include MOCs and their respective locations
- Reference the table showing the COPC and COPEC concentrations
- Reference the map showing the results associated with the sample location(s).

3.1.3. Deep Soil (>2 feet bgs)

3.1.3.1 Methods

- Briefly describe how and when sampling was performed and refer to the DNREC-approved SAP and the respective DNREC SOPs used
- Discuss any deviations from the SAP and SOPs
- Describe the analyses performed on the samples with the EPA analytical method and revision, if applicable
- Describe the screening analyses performed
- Identify the HSCA approved laboratory/laboratories that performed the analyses
- Describe QA/QC samples
 - The number of QC samples collected
 - The frequency per analysis, per number of samples, per day
- Indicate that all analyses were performed in accordance with SOPCAP

3.1.3.2 Results

- Describe the results and identify the COPCs and COPECs detected and the concentration range. Include maximum observed concentrations and locations
- Reference the table showing the COPC and COPEC concentrations
- Reference the map showing the results associated with the sample location(s).

3.1.4 Soil to Groundwater

Refer to the *Technical Guidance for Evaluating the Soil to Groundwater Pathway under the Hazardous Substances Cleanup Act* (Soil to GW Guidance)

3.1.4.1 Methods

- Identify the soil samples used to make an evaluation of the soil to groundwater (StGW) pathway.

3.1.4.2 Results

- Identify all data used in the evaluation as outlined in Section 4.4 of the Soil to GW Guidance.

- Describe the results and identify contaminants exceeding Soil to Groundwater Generic Value (SOIL_{GW}GV), calculated Soil to Groundwater Site Specific Value (SOIL_{GW}SS) or other approved values.
- If a SOIL_{GW}SS is calculated, identify site specific values used in the calculation and associated rationale for using such values.
- Include an analytical table showing the number of soil borings, sample IDs, and all sample results. A Table including non-detects. may be requested by DNREC on a site-specific basis.
- Include a map showing the exceedances of SOIL_{GW}GV, SOIL_{GW}SS, or other approved values and delineated soil areas
- Discuss any changes made to the SAP and how they affected the delineation effort

3.2. Groundwater Investigation Methods and Results

3.2.1 Methods

- Describe the construction and installation detail of the monitoring well installation.
 - Identify when monitoring wells were installed and refer to the DNREC-approved SAP and respective DNREC SOPs,
 - include the well construction logs, well completion reports, and all well permit information which shall be provided in the Appendix.
 - Include in the section text well screen depth placement, well diameters, and other notable construction details.
- For monitoring wells provide information regarding DE licensed surveyor and the DE licensed well driller
- All monitoring wells should be surveyed by a Delaware-licensed land surveyor to the nearest North American Datum (NAD) and the coordinates of the sampling points (X, Y) should be in State Plane Coordinate System in meters. Vertical elevations (Z) should be in North American Vertical Datum (NAVD) in feet. Included this information in a table
- Describe the analyses performed on the samples with the EPA analytical method and revision, if applicable
- Describe the screening analyses performed

- Identify the HSCA approved laboratory/laboratories that performed the analyses
- Describe QA/QC samples
 - The number of QC samples collected
 - The frequency per analysis, per number of samples, per day
- Indicate that all analyses were performed in accordance with SOPCAP
- Briefly describe how and when groundwater sampling was performed and identify what DNREC SOPs were applied.
 - Detail the development, purging, and sample collection procedures.
 - Copies of the groundwater quality sheets shall be provided in the appendices.
 - Note in the text
 - Depths to water/groundwater elevation in each well.
 - If near a tidal waterbody,
 - note the time and where the tide height was during sample collection.
 - Note if a transducer was deployed for a tidal influence study.
 - any irregularities in the sample collection, including well recharge issues, sheens, odors, etc.
- Discuss any deviations from the SAP and SOPs.

3.2.2 Results

- Describe the results and identify the COPCs detected and the concentrations. Include MOCs and locations.
- Reference the table showing the COPC concentrations.
- Reference the map showing the results.
- Discuss the results of the tidal influence study (if applicable).
- If possible, complete a contaminant concentration interpolation map.

3.3 Surface water Investigation Methods and Results

3.3.1 Methods

- Briefly describe how and when sampling was performed and refer to the DNREC-approved SAP and the respective DNREC SOPs
- The coordinates of the sampling points (X, Y) should be included in a table
- Discuss any deviations from the SAP and SOPs.
- Describe the analyses performed on the samples with the EPA analytical method and revision, if applicable
- Describe the screening analyses performed
- Identify the HSCA approved laboratory/laboratories that performed the analyses
- Describe QA/QC samples
 - The number of QC samples collected
 - The frequency per analysis, per number of samples, per day
- Indicate that all analyses were performed in accordance with SOPCAP

3.3.2 Results

- Describe the results and identify the COPCs detected and the concentrations. include maximum observed concentrations and locations
- Reference the table showing the COPC concentrations
- Reference the map showing the results

3.4 Sediments Investigation Methods and Results

3.4.1 Methods

- Briefly describe how and when sampling was performed and refer to the work plan and SOPs
- Discuss any deviations from the SAP and SOPs
- The coordinates of the sampling points (X, Y) in a table
- Describe the analyses performed on the samples with the EPA analytical method and revision, if applicable
- Describe the screening analyses performed
- Identify the HSCA approved laboratory/laboratories that performed the analyses
- Describe QA/QC samples

- The number of QC samples collected
 - The frequency per analysis, per number of samples, per day
- Indicate that all analyses were performed in accordance with SOPCAP

3.4.2 Results

- Describe the results and identify the COPCs detected, and the concentrations include maximum observed concentrations and locations
- Reference the table showing the COPC concentrations
- Reference the map showing the results

3.5 Vapor Intrusion Investigation Methods and Results (soil gas, indoor and outdoor air, etc.)

3.5.1 Methods

- Briefly describe how and when sampling was performed and refer to the DNREC-approved SAP and respective DNREC SOPs.
- Confirm whether all field QA/QC tests passed per the SOPs prior to the sampling. If not, indicate the reasons why sampling proceeded and provide DNREC's approval documentation.
- Describe the analyses performed on the samples with the EPA analytical method and revision, if applicable
- Describe the screening analyses performed
- Identify the HSCA approved laboratory/laboratories that performed the analyses
- Describe QA/QC samples
 - The number of QC samples collected
 - The frequency per analysis, per number of samples, per day
- Indicate that all analyses were performed in accordance with SOPCAP

3.5.2 Results

- Describe the results and identify the COPCs detected and the concentrations with location
- Reference the table showing the COPC concentrations
- Reference the map showing the results
- Evaluate vapor intrusion to indoor air from subsurface.
- Describe other air pollution issues related to the site, if applicable.

3.6 Other Investigations Methods and Results

3.6.1 Methods

Please describe the methods and results of the following investigations and include copies of the reports in the appendices. This section is intended for environmental data or investigations in addition to the environmental media sampled and described in the sections above.

- Asbestos and Lead-Based Paint (LBP) Surveys
- Geophysical surveys
- Other
- Include the SOPs followed

3.6.2 Results

Describe results of geophysical surveys such as GPR, magnetic survey, lead based paint, asbestos, or any other survey performed at the site such as potable well search. Include site coverage and findings. A copy of these reports should be included in the Appendix.

3.7 Environmental Media/Investigation-derived Waste (IDW) Management

- Include a description of media-specific IDW generated and how the waste was treated, stored, labeled, and/or disposed of, ensuring consistency with the SAP
- Include photography and disposal documentation in Appendix (such as, waste manifests, etc.)
- Reference the Environmental Media and IDW guidance

3.8 Data Quality Assessment (DQA)

Describe the quality of data used and indicate if the data is usable per the Guidance for Analytical Data Usability Assessment⁵. The DQA should include a discussion of the items below and their impact on data usability:

- Sample preservation and receipt
 - Indicate whether samples were properly preserved and received within the appropriate temperature range.
 - Analyte matches the appropriate sample bottle ware
 - Include any chain of custody nonconformances

<https://documents.dnrec.delaware.gov/dwhs/remediation/Guidance-for-Analytical-Data-Usability-Assessments.pdf>

- Hold times
 - Indicate whether all analyses were performed within applicable hold times.
- Method blanks
 - Indicate whether method blanks met SOPCAP requirements.
- Field Quality Control (QC) samples including field blanks, trip blanks, field duplicates, field spikes (if applicable)
 - Indicate whether field QC samples met SOPCAP requirements.
- Evaluate the analytical data in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS)
- Nonconformances reported by the laboratory
 - The information should be summarized in a table format consistent with the example below and placed in the Tables section at the end of the document.
 - Include separate tables for each type of sample matrix analyzed in the Table section of the report
 - Provide supporting documentation if available (e.g. corrective action records, email, or other correspondence).

4.0 NATURE AND EXTENT OF CONTAMINATION

This section should describe the nature and extent of the release of the hazardous substance in all applicable media based on the results described in Section 3.0. Include any data gaps and how they were addressed in their respective sections below.

4.1 Nature and Extent of Contamination in Soil

- Identify and describe the nature and extent of contamination in soil, which includes the following:
 - Hotspot-areas of high contaminant concentration(s) and
 - Areas of soil with concentration(s) that can migrate to groundwater and may cause vapor intrusion.

- An evaluation of soil to groundwater pathway as outlined in the Soil to GW Guidance.
 - Include a narrative of the soil findings, calculation of approximately soil volume exceeding $SOIL_{GWGV}$ or $SOIL_{GWSS}$ or other approved values.
- Discussion and explanation of the next steps in the evaluation.
- Include maps and cross sections showing the extent of contamination

4.2 Nature and Extent of Contamination in Groundwater

- Identify and describe the extent of contamination in groundwater including the following:
 - Flow direction and fluctuations (tidal, seasonal or other)
 - All Identified Receptors
 - Preferential pathways that may impact groundwater movement
 - Fate and Transport of the contaminants
 - NAPL
- Reference the maps showing the extent of contamination. Include a cross-section as applicable.

4.3 Nature and Extent of Contamination in Surface Water

- Brief description of the extent of contamination in surface water including the following:
 - Fate and transport of contamination
 - Location of seeps
 - Include whether the surface water contamination potentially be attributed to groundwater or soil contamination at the site
- Reference the maps and cross sections showing the extent of contamination

4.4 Nature and Extent of Contamination in Sediments

- Brief description of the extent of contamination in sediment including the following:
 - Fate and Transport of contamination
- Include maps and cross sections showing the extent of contamination

4.5 Nature and Extent of Vapor/Air Contamination (soil gas, sub-slab, indoor and outdoor air, as applicable)

- Brief description of the extent of contamination in Vapor Including the following:
 - Source of the vapor
 - Fate and transport of contamination
- Include maps and cross sections showing the extent of contamination

5.0 HUMAN HEALTH RISK ASSESSMENT

For more information on the procedure to conduct a Human Health Risk Assessment (HHRA), please refer to the *HSCA Human Health Risk Assessment Guidance*⁶.

5.1 Human Health Risk Assessment Approach

- Describe the risk assessment approach that was used for the site and explain why.
- Include input parameters in a table.

5.2 Identification of Onsite Contaminants of Potential Concern

Include the following items:

- Describe how the Contaminants of Potential Concern (COPCs) were identified (for example, by comparing to HSCA Screening levels) for each media (soil, groundwater, soil-gas, etc.).
- Provide a table with COPCs. Include a brief description of the toxicity of the COPCs.
- Use the templates for the tables that are available in the Human Health Risk Assessment Guidance

5.3 Exposure Pathway Assessment

5.3.1 Conceptual Site Exposure Model

Include the following items:

- Describe the sources and fate and transport of contamination in each medium and the exposure routes and the receptors based on the investigation results and observations

- Reference the table(s) showing the exposure route and receptors
- Reference the map (s) as figures at the figure showing the receptors at and near the site (such as drinking water wells, basements for vapor intrusion, daycare, etc.)

5.3.2 Exposure Assessment – Human Health

- Describe the assumptions of the established pathways as per DERAC.
- What are the exposure point concentrations (EPCs) for each media and how the EPCs were determined using DNREC’s HHRA guidance including the tables.

5.4 Risk Characterization

5.4.1 Human Health Risk Characterization

- Describe the results of the human health risk assessment (including estimation of non-cancer hazards and cancer risk), which must evaluate current and future land use and exposure scenarios as noted within the HHRA Guidance for the following exposure scenarios. Provide a summary of the human health risk and perform an uncertainty analysis of the human health risk

5.4.1.1 Residential User Exposure Scenario

- Describe potential risks to the resident from exposure to the applicable contaminated environmental media (surface soil, shallow soil, combined shallow and deep soil, groundwater as tap water, vapor intrusion and air).

5.4.1.2 Indoor Commercial Worker User Exposure Scenario

- Describe potential risks to the indoor commercial worker from exposure to the applicable contaminated environmental media (surface soil, shallow soil, combined shallow and deep soil, groundwater as tap water, vapor intrusion and air).

5.4.1.3 Outdoor Commercial Worker User Exposure Scenario

- Describe potential risks to the outdoor commercial worker from exposure to the applicable contaminated environmental media (surface soil, shallow soil, combined shallow and deep soil, and air).

5.4.1.4 Composite Worker User Exposure Scenario

- Describe potential risks to the composite worker from exposure to the applicable contaminated environmental media (surface soil, shallow soil, combined shallow and deep soil, vapor intrusion and air).

5.4.1.5 Excavation Worker User Exposure Scenario

- Describe potential risks to the excavation worker from exposure to the applicable contaminated environmental media (surface soil, shallow soil, combined shallow and deep soil, and air).

5.4.1.6 Recreational User Exposure Scenario

- Describe potential risks to the recreational user from exposure to the applicable contaminated environmental media (surface soil, shallow soil, combined shallow and deep soil, sediment, and surface water).

5.4.1.7 Trespasser Exposure Scenario

- Describe potential risks to the trespasser from exposure to the applicable contaminated environmental media (surface soil, shallow soil, combined shallow and deep soil, sediment and surface water).

5.4.1.8 Summary of Risk Calculations

- Please summarize the cancer and non-cancer human health risk under the various exposure scenarios and applicable environmental media as an in-text table shown below:

Exposure Scenario	Environmental Media	Cancer Risk	Hazard Index
Resident			
	Shallow Soil	4E-04	2E+02
	Combined Soil		
	Groundwater		
	Vapor/Air		
Indoor commercial worker			
	Shallow Soil		
	Combined Soil		
	Groundwater		
	Vapor/Air		

Exposure Scenario	Environmental Media	Cancer Risk	Hazard Index
Composite Worker			
	Shallow Soil		
	Combined Soil		
	Vapor/Air		
Excavation Worker			
	Shallow Soil		
	Combined Soil		
	Vapor/Air		
Recreator			
	Shallow Soil		
	Combined Soil		
	Sediment		
	Surface Water		
Trespasser			
	Shallow Soil		
	Combined Soil		
	Sediment		
	Surface Water		

5.4.1.9 Human Health Uncertainty Analysis

- Discuss any sources of uncertainties and biases in the estimation of the risk to human health

6.0 SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT (SLERA)

SLERA should be performed for all sites being addressed under HSCA. Any deviation from DNREC's SLERA guidance should be preapproved by DNREC.

If SLERA shows an impact, as outlined within the guidance, a Baseline Ecological Risk Assessment (BERA) may need to be performed. Please contact DNREC for further instructions.

6.1 Ecological Screening Risk Assessment Approach

The SLERA is evaluated through a multistage step process. Please refer to the *Guidance for Screening Level Ecological Risk Assessments (SLERA) under HSCA*⁷ for more detailed information.

- Step 1: Site Visit, Problem Formulation, and Toxicity Evaluation.
- Step 2: Ecological Effects Evaluation, Exposure Assessment, and Risk Calculation

The following steps for the SLERA are presented below:

6.2 SLERA Step 1

- 6.2.1 Site Visit
- 6.2.2 Problem Formulation/CSM
- 6.2.3 Ecological Toxicity Evaluation
- 6.2.4 Determination of Marine or Freshwater System

6.3 SLERA Step 2

- 6.3.1 Ecological Effects Evaluation and Exposure Assessment
- 6.3.2 Determination of COPECs for Media
- 6.3.3 Screening Level Ecological Non-Cancer Risk Evaluation
- 6.3.4 Further Site-Specific Refinement of COPECs

6.4 Summary of SLERA and Recommendations

7.0 REMOVAL ACTIONS

- Describe any removal actions, such as hot spot removal, that were performed at the site.

Include:

- Map(s) and figure(s) showing location and the extent action efforts
- Data tables of pre- and post-IRA sampling results.
- Waste and disposal manifests

8.0 SUMMARY/CONCLUSIONS/RECOMMENDATIONS

8.1 Summary of Findings

- 8.1.1 Nature and Extent of Contamination
- 8.1.2 Human Health Risk Assessment
- 8.1.3 Screening Level Ecological Risk Assessment

8.2 Conclusions/Recommendations (This should include only the conclusions of the investigation and risk assessments)

9.0 REFERENCES

Cite all referenced documents, reports, and any other supporting documents used in drafting the BFI/RI. Please be consistent with reference citation formats. Please alphabetize the sources.

10.0 TABLES (use table format provided by DNREC SOPs)

- Sample Locations: Sample Names/Types with X/Y coordinates
- Well Construction Data
- Water Gauging Data
- Tidal Gauging Data (If applicable)
- Analytical Results – Soil (Analytical Results should include screening results and CAS numbers)
- Analytical Results – Groundwater (Analytical Results should include screening results and CAS numbers)
- Analytical Results – Surface Water (Analytical Results should include screening results and CAS numbers)
- Analytical Results – Sediments - Analytical Results should include screening results and CAS numbers
- Analytical Results – Air (Analytical Results should include screening results and CAS numbers)
- Analytical Results – Other (Analytical Results should include screening results and CAS numbers)
- Data Quality Evaluation-Nonconformances (The data usability table may be attached as an appendix if longer than 5 pages)
- Human Health Risk Assessment Results – HHRA Table A-Selection of Exposure Pathways
- Human Health Risk Assessment Results - Table B - Selection of Contaminants of Potential Concern
- Human health Risk Assessment Results - Table C - Selection of Exposure Point Concentrations

- Human Health Risk Assessment Results - Table D - Risk Summary for Receptors
- Ecological Risk Assessment Table 1: Selection of Contaminants of Potential Ecological Concern- Soil
- Ecological Risk Assessment- Table 2: Selection of Contaminants of Potential Ecological Concern- Sediment (Fresh/Marine)
- Ecological Risk Assessment- Table 3: Selection of Contaminants of Potential Ecological Concern- Surface Water (Fresh/Marine)

11.0 FIGURES (as applicable)

- Site Location Map
- Site Vicinity Map, depicting neighboring site uses
- Site Features Map
- Site Photos can be included as figures or in an appendix
- Site Soil Map
- Site Topographic Map shows surface water drainage
- Wetland Maps with Jurisdiction(s) noted
- Site Aerial Photograph most recent, identify ecologically sensitive areas
- Site Development Plan if available
- Sample Location Map
- Regional geological maps and cross-sections as necessary
- Site Cross Section(s): show geology, hydrogeology and/or contaminant distribution
- Groundwater Elevation Contour Map
- Maps Showing Concentrations of COCs for human health risk - primary risk drivers in different media including ground water plume maps
- Maps Showing Concentrations of COCs for ecological risks -
- Contaminant Isoconcentration Maps
- Site Conceptual Exposure Model graphical representation

12.0 APPENDICES (as applicable)

- Historic Use Information (Sanborn Maps, Aerial Photographs, etc.)
- Previous Reports Excerpt if necessary (Phase I ESA, Phase II ESA, etc.) and provide a copy of the report for DNREC's files/admin records separately but don't include the full report in the appendix.

- Soil Boring/Monitoring Well Construction Logs including well development and well sampling documentation
- Field Sampling Sheets groundwater sampling field sheets (temp, pH, well volumes purged, etc.)
 - Air sampling field sheets to document the sampling passed all 3 field QA/QC tests. Include any building survey forms for air sampling conducted
- Investigation-derived Waste Management Documentation of waste disposal (Waste manifests, etc.)
- Monitoring Well Completion Reports (mandatory)
- Monitoring Well Survey
- Laboratory Analytical Reports
- Risk Assessment Calculations - DERAC input and output
- ProUCL Documentation -ProUCL input and output
- Vapor Intrusion Evaluation Spreadsheets (e.g. Johnson and Ettinger and Vapor Intrusion Screening Level Calculator as necessary)
- Mass loading calculations including groundwater and overland flow to surface water loading calculations
- Removal Action documents (Removal Action Completion Report)
- Asbestos Survey Report and Lead-Based Paint Survey
- GPR Report
- Species Conservation and Research Program Letter-Outline rare, threatened and endangered species, unique natural communities, and other significant natural resources
- iPac Results from risk assessment
- Other relevant ecological documentations