



DELAWARE DEPARTMENT OF
**NATURAL RESOURCES AND
ENVIRONMENTAL CONTROL**

APPLICATION FOR A COASTAL ZONE ACT STATUS DECISION

**State of Delaware
Department of Natural Resources and Environmental Control
Division of Climate, Coastal, and Energy**

**March 30, 2026
(Revised September
2, 2026)
750 Governor Lea Road
Governor Lea Road LLC**

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CZA Status Decision Application Instructions

1. Complete all parts of the application. For questions which are not applicable to your project, do not leave blank; present a statement that clearly states why the section is not applicable to your project.
2. Because all applicants' projects are different, this word document template will provide you flexibility for needed space to answer the questions. Please insert additional lines for text where needed for your application. If appropriate, attach extra pages referencing each answer by the corresponding question number.
3. Include all attachments **required** by this application at the end of this application in an Appendix, labeling it "Appendix 1" Please provide these attachments in the order that they appear in this application.
4. Submit one electronic copy to CZA_Program@delaware.gov. If you are unable to submit electronically, send a hard copy, CD, or USB to:

Coastal Zone Act Program
Department of Natural Resources and Environmental Control
Division of Climate, Coastal and Energy
100 W Water Street, Suite 7B
Dover, DE 19904

5. Comply, if required, or as requested by the DNREC Secretary, with [7 Delaware Code, Chapter 79, Section 7902](#). If requested, but not completed, your application will not be considered administratively complete until this form is reviewed.
6. Be sure to include your permit application fee of \$3,000 with the mailed permit application. The application will not be considered administratively complete before payment is received. Make checks payable to the "State of Delaware."
7. Be advised that the application for a Delaware Coastal Zone Act Status Decision is a public document, which may be displayed at DNREC offices, public libraries, and the web, among others. If this application requires you to place confidential information or data in the application to make it administratively complete, note the Delaware Freedom of Information Act ([29 Delaware Code, Chapter 100](#)) and [DNREC's Freedom of Information Act Regulation](#), Section 6 (Requests for Confidentiality), for the proper procedure in requesting confidentiality.

PART 1

CERTIFICATION BY APPLICANT

Under the penalty of perjury pursuant to 11 Delaware Code §1221-1235, I hereby certify that all the information contained in this Delaware Coastal Zone Act Status Decision Application and in any attachments is true and complete to the best of my belief.

I hereby acknowledge that all information in this application will be public information subject to the Delaware Freedom of Information Act, except for clearly identified proprietary information agreed to by the Secretary of the Department of Natural Resources & Environmental Control.

E. Thomas Harvey, IV for Governor Lea Road LLC

Print Name of Applicant

E. Thomas Harvey

Signature of Applicant

Authorized Member

Title

3/30/2026 (Rev 9/2/2026)

Date

PART 2

APPLICANT INFORMATION AND SITE IDENTIFICATION

2.1 Identification of the applicant:

Company Name: **Governor Lea Road LLC (The Developer)**
Address: **405 East Marsh Lane, Suite 1 Newport, DE 19804**
Telephone: **(302) 218-1277**
Fax: **(302) 683-9306**

2.2 Primary contact: Please list the name, phone number and email of a preferred contact within your company in case the DNREC needs to contact you regarding this status decision.

Name: **E. Thomas Harvey, IV**
Phone Number: **(302) 218-1277**
Email: **ETHarvey@harveyhanna.com**

2.3 Site of proposed project (if different than above):

2.4 Authorized agent/consultant (if any):

Name: **Stephen G. Davies, P.E. for Apex Engineering Incorporated**
Address: **27 W. Market Street Newport, DE 19804**
Telephone: **(302) 994-1900 ext. 2**
Fax: **(302) 994-9099**
Email: **sdavies@apexengineeringinc.com**

If you have an authorized agent for this status decision process, provide written authorization from client for being the authorized agent.

2.5 Is the applicant claiming confidentiality in any section of their application?

Yes ☐

No ☒

If yes, see instructions on page 3.

PART 3

PROJECT SUMMARY

Provide a one-page summary describing the proposed project or use. Include a brief quantitative description of any anticipated environmental impacts.

The project consists of the construction of a 353,500sf warehouse building with loading docks. The intended building use is for those general warehouse uses allowed under the New Castle County Unified Development Code.

There currently is no tenant designated to lease this building. The owner intends to construct this building while looking for an end user.

The site is a Brownfield site that has completed DNREC's process and has an approved Certification of Completion of Remedy (COCR). Although site soil conditions were found acceptable for non-residential uses consistent with the application, surface soils with moderate contamination remain in place subject to Environmental Covenant restrictions. The redevelopment will pave over these moderately contaminated surface soils, thereby further minimizing direct contact with hazardous substances. The paving and new building will also intercept stormwater that would otherwise infiltrate through contaminated surface soils and instead direct it to infiltrate through cleaner subsurface soils.

The project developer has completed an Environmental Impact Assessment (EIA) in accordance with New Castle County requirements, received EIA Report unanimous approval from the Resource Protection Area Technical Advisory Committee (RPATAC) and Board of Adjustment. The EIA Report and associated RPATAC recommendation are attached. The associated stormwater management design is intended to use infiltration methods that will improve stormwater runoff and groundwater recharge quality, as well as increasing the quantity of clean stormwater recharge. The EIA Report includes a Groundwater Monitoring Plan to confirm the stormwater infiltration systems do not negatively impact the groundwater.

There are minimal anticipated negative environmental effects from this redevelopment. Rather, the stormwater infiltration systems are designed to improve the quantity and quality of groundwater recharge and may serve to limit existing stress on the nearby Metachem remediation caused by existing uncontrolled infiltration and associated groundwater flow / mounding.

PART 4

PROJECT INFORMATION

- 4.1 Is the proposed project entirely or partly a new, or improved, or extended pier or other ship docking facility?

Yes ☐

No ☒

If yes, will it be used at least in part for bulk cargo transfers by the applicant?

Yes ☐

No ☐

N/A ☒

If no, please explain what it will handle:

- 4.2 Is this project entirely for pollution control purposes?

Yes ☐

No ☒

- 4.3 Is this project a new research and development facility?

Yes ☐

No ☒

- 4.4 Is this project a new or expanding (flow rate) public sewage wastewater treatment plant?

Yes ☐

No ☒

- 4.5 Will the proposed project meet the following definition of "Manufacturing" as found in the [Coastal Zone Act](#): "Manufacturing means the mechanical or chemical transformation of organic or inorganic substances into new products, characteristically using power driven machines and materials handling equipment, and including establishments engaged in assembling component parts of manufactured products, provided the new product is not a structure or other fixed improvement."

Yes ☐

No ☒

If no, explain what kind of activity will be carried out at this project site:

The primary use of the proposed warehousing facility is to provide for the storage and transfer of goods by tenant operators. Tenant activity may include other 'Uses Not Regulated' explicitly listed in Section 5.0 of the 'Regulations Governing Delaware's Coastal Zone' (The Regulations). As such, the facility will include office uses and/or maintenance operations in support of such facilities. There are multiple references to light manufacturing in the EIA report, which was initially developed in 2023 based on generic development potential provided by the site zoning and New Castle County Comprehensive Plan prior to the developer's confirmed plans for development of a distribution and logistics facility. However, no manufacturing is proposed or contemplated.

4.6 Will the project have the following equipment or facilities?

- | | | |
|-------------------------------------|------------------------------|--|
| a. Smoke stacks | Yes ☐ | No ☒ |
| b. Tanks | Yes ☐ | No ☒ |
| c. Distillation or reaction columns | Yes ☐ | No ☒ |
| d. Chemical processing equipment | Yes ☐ | No ☒ |
| e. Scrubbing towers | Yes ☐ | No ☒ |
| f. Pickling equipment | Yes ☐ | No ☒ |
| g. Waste treatment lagoons | Yes ☐ | No ☒ |
| h. Smelters | Yes ☐ | No ☒ |
| i. Incinerators | Yes ☐ | No ☒ |

4.7 Will the project use 20 acres or more?

Yes ☐

No ☒

How many acres will it use? **18.5 acres**

4.8 Does this facility appear in Appendix B of the Coastal Zone Act Regulations (the list of the nonconforming uses)?

Yes ☐

No ☒

If no, proceed to question 4.11

4.9 Will the proposed activity described in this application occur entirely within the lines delineating the area of nonconformity for this site, as seen in the Appendices of the Regulations?

Yes ☐

No ☐

N/A ☒

4.10 Will the proposed activity or use straddle this line?

Yes ☐

No ☐

N/A ☒

If yes, describe what equipment, facilities, or machinery will be within the delineated area of nonconformity AND what will be outside of this area of nonconformity:

4.11 Is the proposed project or use part of a manufacturing use that was in operation prior to and on June 28, 1971?

Yes ☐

No ☒

4.12 Has this facility ever been granted a Coastal Zone Act Permit?

Yes ☐

No ☒

If yes, please provide the following information:

Applicant Name	Permit Number	Date Issued

4.13 Does the new or expanded use involve any change in existing:

- a. processes? Yes ☐ No ☒
- b. facilities? Yes ☐ No ☒
- c. buildings? Yes ☒ No ☐
- d. emissions discharge? Yes ☐ No ☒

If yes, please explain each in detail. Use the following tables to help describe any new, or changes to, air emission or water discharge:

The Developer plans to demolish the two existing buildings at the site and construct a 353,500sf logistics and distribution facility. The Developer has completed building surveys for asbestos and is in the process of identifying an asbestos abatement contractor to remove the limited quantities of non-friable asbestos identified.

The new building will not include manufacturing process-related discharges. Potential air discharges are limited to construction-related dust and minor emissions from HVAC systems whose design is pending. Building surveys for asbestos were conducted and the Developer is in the process of identifying an asbestos abatement contractor to remove the limited quantities of non-friable asbestos prior to demolition. Water discharges are limited to the stormwater runoff controls described in the EIA and stormwater plans approved by New Castle County. Wastewater discharges are limited to domestic sewage, the pending septic system for which will be designed in accordance with New Castle County requirements. The Developer is working with EPA and DNREC to provide for preservation of their existing monitoring well network and ongoing access.

Air Emissions

Pollutant	Existing Emissions		Net Increase/Decrease		New Total Emissions	
	Lbs/day	Tons/year	Lbs/day	Tons/year	Lbs/day	Tons/year

Water Discharge

Pollutant	Load					
	Current Discharge		Net Increase/Decrease		New Total Discharge	
	Lbs/day	Tons/year	Lbs/day	Tons/year	Lbs/day	Tons/year

Pollutant	Concentration					
	Current Discharge (mg/L)		Net Increase/Decrease (mg/L)		New Total Discharge (mg/L)	
	Daily	Yearly	Daily	Yearly	Daily	Yearly

4.14 Will this project directly or indirectly increase plant production over present capacity?

Yes ☐

No ☒

If yes, explain in what way and by how much:

- 4.15 Will this project result in the production of any new products, either directly or indirectly, at this facility?

Yes ☐

No ☒

If yes, list each new product:

- 4.16 List materials and/or ingredients to be utilized by this proposed project and how they will be transported to the site.

PART 5

PROJECT SITE AND ZONING

- 5.1 In a separate attachment, provide a map of appropriate scale to clearly show the site. Mark important natural features and project buildings and processing equipment of the proposed project such as roads, wetlands, railway sidings, drainage ways, tanks, sewer systems, water mains, wells, etc.

See attachment

- 5.2 What is the current SIC code for the proposed use?

4225 - General Warehousing and Storage

- 5.3 What is the current zoning and planned land use of the proposed project site?

The subject site is zoned 'HI – Heavy Industrial' and the proposed land use is classified as 'Light Industry – Warehousing Storage Facility' per the New Castle County Unified Development Code. Further, the site is located along the Route 9 corridor identified in the New Castle County 2050 Comprehensive Plan as the ideal setting for warehousing, distribution and logistics facilities.

- 5.4 Will the proposed project require a zoning change?

Yes ☐

No ☒

If yes:

A. To what classification will it be changed?

B. What zoning authority is responsible for reviewing and approving the change?

- 5.5 Will this project require new supporting facilities?

Yes ☐

No ☒

If yes, describe each facility, and how it will be used:

PART 6

PROJECT DESCRIPTION AND PROJECT IMPACTS

- 6.1 On a separate attachment labeled “**Project Description**,” provide a concise but complete description of the proposed project or use. Be sure to answer the following questions:
- How does the project relate to any existing manufacturing operations and facilities (if this is not for an entirely new manufacturing plant)?
 - What effects will there be, if any, on land use acreage, manufacturing production capacity, modification of current product line(s), and safety risks to the public and to company employees?
 - Is this project or use a complete, single project, or is it part of a long-term, large-scale project that has other components to it that may need approval under the Coastal Zone Act at a later date?
 - If it is part of a larger project, describe the entire project in detail and mention ALL major machinery, facilities, land, products, and processes involved.
- 6.2 On a separate attachment labeled “**Environmental Impacts**,” provide a detailed and accurate impact analysis that describes the proposed project’s impacts on:
- air quality
 - local surface and ground water quality
 - surface and groundwater withdrawals
 - habitat loss
 - solid and hazardous waste generation
 - noise
 - odors
 - local aesthetic quality
 - any other notable factors not listed above
 - Provide a detailed statement describing the proposed project’s potential to pollute should equipment malfunction or human error occur, including a description of backup controls, backup power, and safety provisions.
- 6.3 On a separate attachment labeled “**Other Project Impacts**,” provide a detailed and accurate analysis on how the proposed project will impact each of the following (include both positive and negative impacts):
- the economy (corporate, state, county)
 - county and municipal comprehensive plans/ zoning
 - effect upon neighboring land uses
 - the impacts, if any, that *supporting facilities* will have on: the environment; economics of the area; zoning; neighboring land uses; and aesthetic quality.

END OF APPLICATION

ATTACHMENTS TO FOLLOW

APPENDIX 1

Project Description
(Refer to Question 6.1)

The project consists of the construction of a 353,500sf warehouse building with loading docks. The intended building use is general warehouse as allowed under the New Castle County Unified Development Code. The project does not relate to any existing manufacturing operations or facilities. The project will redevelop an 18-acre Brownfield site that currently consists of a vacant office building and parking lot, surrounded by maintained lawn with few scattered trees and shrubs. The project is standalone and not related to any other projects.

The owner intends to lease all or portions of the facility to one or multiple tenants for the purpose of general warehousing and associated office support and/or maintenance facilities.

Environmental Impacts

(Refer to Question 6.2)

The project was designed to satisfy New Castle County's Environmental Impact Assessment (EIA) and mitigation requirements associated with the mapped Water Resource Protection Area (WRPA) covering 8 acres of the site, as unanimously approved by the Resource Protection Area Technical Advisory Committee (RPATAC) and Board of Adjustment (BoA). As such, there are minimal anticipated environmental impacts and several net environmental improvements.

Specific measures to limit and/or mitigate environmental impacts are outlined below:

- a) air quality – the project is anticipated to have normal construction- and transportation-related air quality impacts for projects of similar character.
- b) Surface and groundwater quality – the EIA includes design provisions to maintain post-development runoff and recharge quality consistent or improved from pre-development conditions. The design will intercept stormwater that currently infiltrates through contaminated surface soils and route it to cleaner subsurface soils to replenish the aquifer. The project is expected to improve upon the existing groundwater condition by routing stormwater infiltration away from site areas directly upgradient of the Metachem property across the street on Governor Lea Road. By infiltrating captured stormwater in areas not direction upgradient of Metachem, it is projected that contaminant mass loading to Red Lion Creek as well as pressure against the Metachem subsurface containment wall will be reduced while improving supplemental recharge of the aquifer.
- c) Surface and groundwater withdrawals – no withdrawals planned. Stormwater infiltration will increase the volume and quality of groundwater recharge over pre-development conditions.
- d) Habitat loss – minimal. Site is developed with a small building and parking area surrounded by primarily maintained lawn with existing contaminated surface soils. The development will cover the majority of existing soils, and include significant reforestation as part of the project landscape plan.
- e) Solid and hazardous waste generation – tenants are responsible for proper handling and disposal of solid and hazardous wastes. No storage of hazardous substances above reportable quantities is allowed within the 8-acre WRPA.
- f) Noise – normal construction and transportation noise is anticipated.
- g) Odors – minimal to no unpleasant odors are anticipated.
- h) Local aesthetic quality - The project building will adhere to the setback requirements of the applicable New Castle County Zoning Code and the Route 9 scenic corridor. The reforestation and other extensive plantings included in the landscaping plan will provide an attractive streetscape.
- i) No other notable factors

- j) No anticipated pollution potential requiring backup controls or other specialized safety provisions.

Other Project Impacts (Refer to Question 6.3)

- a) The economy (corporate, state, county) - Construction expenditures are projected to be \$36.6 million, all to occur in a single year of construction. Construction spending will support the creation of 380 temporary jobs in New Castle County, 72 percent of which will be in the construction industry. The remaining 28 percent represents indirect or induced employment distributed across different sectors outside of the construction industry, such as in healthcare, transportation, and retail. Construction is projected to generate \$1.7 million to the State of Delaware in personal income and business tax revenues.

At full occupancy, the planned facility will produce \$27.0 million annually in economic impact for the county and support more than 180 permanent jobs in logistics, distribution, engineering, technology, transportation, and an array of support industries and services.

The economic impact estimates were developed by an economic consultant using standard input-output modeling techniques and conservative assumptions about economic activity levels to estimate total jobs, employee compensation earnings, and overall economic impact from the redevelopment. For the economic footprint following construction, the estimates were based on industry-standard assumptions for square feet per employee and the scale of the building, as well as estimated salaries and wages for typical tenants. These values were used to calculate the 180 permanent jobs and \$27 million-dollar economic impact.

Tax revenue attendant with full occupancy is projected to be \$761,000 annually in State personal income and business taxes. Additionally, the redevelopment is expected to generate \$289,000 in new property taxes to the Colonial School District and New Castle County.

- b) County and municipal comprehensive plans / zoning – The subject site is zoned ‘HI – Heavy Industrial’ and the proposed land use is classified as ‘Light Industry – Warehousing Storage Facility’ per the New Castle County Unified Development Code. As such, the proposed use is consistent with the County zoning. Further, the site is located along the Route 9 corridor identified in the New Castle County Comprehensive Plan as the ideal setting for warehousing, distribution, and logistics facilities.
- c) The effect upon neighboring land uses - The neighboring land uses consist of Heavy Industrial uses including the Delaware City Refinery to the south, the Standard Chlorine / Metachem Superfund site to the north, former Kaneka Delaware industrial plant to the east, and an access strip for the refinery to the west. There are no other neighboring uses including residential or commercial. As such, there are no anticipated negative impacts on neighboring land uses.
- d) Impacts of supporting facilities on the area – Not applicable.

EIA REPORT

ENVIRONMENTAL IMPACT ASSESSMENT

750 GOVERNOR LEA ROAD DELAWARE CITY, NEW CASTLE COUNTY, DELAWARE



January 26, 2023 (*Revised July 1, 2024*)

Prepared for:
New Castle County Department of Land Use
87 Reads Way
New Castle, Delaware 19720

On behalf of:
Governor Lea Road, LLC
405 E. Marsh Lane, Suite 1
Newport, Delaware 19804

Prepared by:
Ten Bears Environmental Associates Company
1080 South Chapel Street
Suite 200
Newark, Delaware 19702

P.N. 22-231.B

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I. INTRODUCTION

Ten Bears Environmental Associates Company (TBE) has prepared this Environmental Impact Assessment (EIA) Report on behalf of the current owner and developer, Governor Lea Road, LLC (the “Owner”), for review by the New Castle County Resource Protection Area Technical Advisory Committee (RPATAC). The project site is 750 Governor Lea Road in Delaware City, Delaware (Figure 1) (the “Property” or “Site”), most recently used for laboratory research and offices by Ion Power, which has vacated the property. The owner proposes to redevelop the Property for light manufacturing and/or other code-compliant industrial uses consistent with New Castle County’s Comprehensive Plan (the “Project”). The Apex Engineering, Inc. plan titled “Application No. 2023-0190: Revised Exploratory Major Land Development Plan for 750 Governor Lea Road” (Appendix A, the ‘Exploratory Plan’) depicts the proposed development. As shown on Figure 2, a mapped Water Resource Protection Area (WRPA) covers nearly half (approximately 8.01 acres) of the 18.5-acre Property on the central-western portion, prompting an EIA to comply with New Castle County through the Unified Development Code (UDC).

The purpose of the EIA report is to identify potential environmental impacts to the protected WRPA associated with the Project, and to assess potential avoidance, as well as minimization and mitigation, of such impacts. The EIA report was prepared in pursuit of variance requests to permit impervious surfacing beyond the protection levels permitted by the UDC in accordance with sections 40.10.160, 40.10.163, 40.10.165, and 40.31.440 of the UDC. Requested variances include:

- Variance from the resource protection level of 50% in Table 40.10.010 (Section 40.10.110) of the UDC to disturb up to 100% of the Recharge WRPA Area;
- Variance from the provisions of Section 40.10.160.B of the UDC to permit up to 86% impervious surfacing in the WRPA (Exploratory Plan shows 84%, plus cushion for future design changes) and impervious surfacing in the WRPA (20% permitted); and
- Department and Recharge Design Manual recommendation for siting supplemental stormwater recharge within the WRPA boundary.

The Property consists of two New Castle County tax parcels (tax parcel #s12-008.00-004 and 12-008.00-006), totaling approximately 18.5 acres. The Site is currently underutilized, with a small office / research lab and vacant locker room / shower facility formerly used for a nearby industrial plant. The Owner proposes to construct an approximately 353,500 square-foot light manufacturing facility (approximately 304,690 sf footprint with 48,810 sf mezzanine) at the Site consistent with infill Brownfields redevelopment. As shown on the Exploratory Plan, the parcels include a mapped Recharge WRPA covering approximately 8.01 acres of the Site.

Pursuant to Section 40.10.110 and Table 40.10.010 of the UDC, the requirements for Recharge WRPAs specify:

“...open space shall remain undisturbed. Resource Protection levels are specified in Table 40.10.010 and must be met within any development.” Table 40.10.010 indicates resource protection levels for Recharge WRPA in all districts are 0.50.”

Sections 40.10.160.A and .B of the UDC states:

- A. *“...These areas shall be protected as required by the following Sections to protect the County’s water resources from contamination and pollution and to insure adequate water quantity for future needs.”*
- B. *“No development shall be permitted to have more than twenty (20) percent impervious surface ratio without an environmental impact assessment report and a recommendation from RPATAC supporting a greater than twenty (20) percent impervious surface ratio. The environmental impact assessment report shall be certified by a State-registered professional geologist or professional engineer with technical expertise in hydrogeology. The impervious surface ratio and open space ratio operate independently and are based on the base site area.”*

Section 40.10.163 of the UDC states:

- A. *“When impervious cover is proposed by the applicant at a rate greater than twenty (20) percent of the site, the applicant shall be required to demonstrate that the quality of storm water runoff is equal to or greater than predevelopment conditions and the quantity of stormwater runoff is equal to or less than predevelopment conditions.”*
- B. *“Those areas of open space not currently forested, shall have a minimum of twenty-five (25) percent of their area reforested pursuant to Section 40.10.351....”*

Applicable excerpts of Section 40.10.165 of the UDC – “Uniform Standards and Criteria” include:

- 1. *“Stormwater management facilities shall be designed and constructed in accordance with DNREC “Delaware Sediment and Stormwater Regulations,” effective November 11, 2014 or as later revised.*
- 2. *“...stormwater management and recharge facilities shall be designed with the goal of maintaining the quantity and quality of groundwater recharge at predevelopment levels.”*
- 3. *“...a study shall be prepared under the supervision of a State-registered professional geologist or professional engineer with a background in hydrogeology...”*
- 5. *“When facilities are proposed to augment groundwater recharge, to ensure that the quality of groundwater recharge shall be maintained, a groundwater quality monitoring program shall be established...”*

As such, this EIA report includes a Climatic Water Balance to confirm post-development recharge, equal to or greater than pre-development and a groundwater monitoring plan, as well as an environmental impact assessment. The following Sections summarize the site character (especially pertaining to protected resources), resource protection (avoidance, minimization, mitigation, conservation design) pursuant to the requirements of Section 10.701 of the UDC, as well as our conclusions and recommendations. However, before getting to those provisions, we believe it is important for the reader of this EIA to have an understanding of the environmental conditions impacting the Property.

II. ENVIRONMENTAL CONSIDERATIONS

The Site is the former Ion Power Brownfields site (DE-1322), a completed Delaware Hazardous Substance Cleanup Act (HSCA) site which adjoins the southern (upgradient) side of the former Standard Chlorine (a.k.a., Metachem) Federal Superfund site, as well as the northern border of the Delaware City Industries refinery. The Brownfield Investigation results indicated the Ion

Power Brownfield Site (which constitutes the Property) environmental conditions were generally acceptable, except for site groundwater, the use of which was restricted through the Environmental Covenant. However, the downgradient Metachem Superfund Site required extensive remediation to control and treat chlorobenzene impacts to the site, including a 1986 release of 569,000 gallons of di- and tri-chlorobenzenes (EPA 2021, 5-Year Review). The remedy included a vertical containment wall surrounding the property, using low-permeability slurry extending to an average depth of 65 feet, along with a surface cap (Note: within mapped Recharge WRPA) and a pump-and-treat groundwater remedy. Prior to these remedial actions, DNREC and the EPA removed a large quantity of waste chemicals and demolished former plant facilities. EPA constructed these remedy elements in 2000 and 2007. The EPA remedy is ongoing with additional remedial actions planned.

The Owner proposes to construct a light manufacturing facility at the Site with a large building footprint consistent with infill Brownfields redevelopment that readily lends itself to collection and supplemental infiltration of stormwater runoff. However, in our opinion, preservation of stormwater recharge to shallow groundwater within the WRPA at the Site is not desirable or warranted. Rather, such infiltration furthers the migration of contaminated groundwater from the adjoining Metachem site to Red Lion Creek and then the Delaware River, thereby exacerbating ongoing environmental impacts.

The entire Site, including the mapped Recharge WRPA extending through the Site, is in a Groundwater Management Zone (GMZ) placed by DNREC over most of the Delaware City area that prohibits future installation of potable groundwater wells (subject site is in GMZ 'Area A') – (see Memorandum of Agreement in Appendix B). The Property has received a Certification of Completion of Remedy (Appendix C) conditioned on Environmental Covenant restrictions against installing potable water wells. Based on the 2004 Brownfields Investigation of the Ion Power site and review of materials from the Delaware City Industrial Area, groundwater in the vicinity of the Site prior to the Metachem remedy flowed north to the nearby Red Lion Creek. Figure 3A shows the groundwater drainage area for the Metachem Site, as estimated from New Castle County mapped topography. As indicated on Figure 3B, the groundwater drainage area corresponds roughly with the northern portion of the Recharge WRPA, with groundwater flow generally northward toward the Metachem Site. Therefore, prior to manmade controls, the Property received groundwater from the Delaware City Industries Site, which passed through the Property to the Metachem site, then to Red Lion Creek to the North.

Based on the EPA 5-Year Review, after the 2007 remedial actions, groundwater in the vicinity of Metachem mounds to the south of the containment wall and flows around the wall to the northwest and northeast. This pattern likely extends onto the Property as shown on Figure 4, though direct measurements were limited to the immediate vicinity of the wall. Although the vertical containment wall surrounds the site, contamination extended beyond and remains in place outside the wall. As such, current infiltration within the WRPA on the site flows towards the wall and diverts around it, with associated contamination, which is then carried to the Red Lion Creek, which flows east to the Delaware River. As further indicated by the EPA 5-Year Review, the current groundwater mounding outside the south side of the wall increases the pressure differential across the wall that has contributed to a compromised portion of the wall requiring repair and potentially also to flow through or under the wall to the pump and treat remediation system.

In summary, the WRPA zone on the Property is directly upgradient of the Metachem site and associated groundwater contamination, with stormwater infiltration contributing to groundwater flow-driven migration of contaminants at the downgradient site. Further, the Property and surrounding areas are zoned Heavy Industry, indicating similar development is likely to continue in the future. Multi-layered restrictions prohibit the use of the groundwater for future potable water wells at the Property and the larger Delaware City Industrial Area, which the Recharge WRPA is intended to protect. As such, although well intended, this particular Recharge WRPA does not appear to further the objectives of Source Water Protection regulations to protect future use of potable water.

Therefore, to better secure the objectives of the WRPA, the Owner proposes to place additional impervious surfacing in the WRPA zone, upgradient of the contaminated site, while redirecting the associated runoff for infiltration elsewhere on the Property, as shown on Figure 5. This approach will reduce the mounding of groundwater behind the wall, thereby decreasing contaminant mass loading to the creek and pressure differential across the wall, while maintaining or increasing infiltration to the subsurface in keeping with the general intent of the WRPA resource protections. While the Final Plan of Remedial Action for the Ion Power Brownfield site did not require impervious cover, Ten Bears has consulted with DNREC Remediation Section regarding the Project and the approach to demonstrating beneficial impacts to the adjoining site contamination outlined in the Mass Loading Calculations in Appendix D.

III. SITE CHARACTERISTICS

To evaluate environmental site characteristics pertinent to the EIA, Ten Bears reviewed available property information provided by the Owner's Civil Site Design Engineer, Apex Engineering, Inc., reviewed available resource mapping, visually reviewed the Site, and contacted regulatory agencies for information within their purview regarding the Site and vicinity. The following summarizes our findings regarding pre- and post-development Site conditions, including surface topography, wetlands, floodplains, Water Resource Protection Areas, historical conditions, soils, and endangered species / historical resources.

A. SITE DESCRIPTION

The Site currently consists of approximately 18.5 acres of partially developed industrial land north of Delaware City. Existing development at the Site is limited, with an approximately 9,000 sf research / office building most recently used by Ion Power for offices and laboratory research and an approximately 3,200 square-foot building formerly used as shower / locker room facilities for the former Standard Chlorine / Metachem site across Governor Lea Road. The larger building and associated parking facilities are entirely within the mapped WRPA boundary, while the shower facility is outside the WRPA to the west.

B. SURFACE TOPOGRAPHY

The Exploratory Plan includes surface elevations of the land surface at the Property at 1-foot contour intervals. The contours indicate ground surface sloping in all directions from an elevated area in the south-central portion of the Property at approximately 63 feet. General topographic trends are away from this plateau to the west on the western half of the Property and to the southeast on the eastern portion of the Property. Surrounding area topography slopes to the north towards Red Lion Creek in areas to the west and north of the Property and to the east towards the Delaware River in areas to the south and east of the Site. As indicated above, general groundwater flow at the Site was to the north prior to the Metachem remedy. Post-remedy groundwater flow mounds behind the south side of the wall and around to the northeast and northwest.

The mapped topography indicates that current (i.e., pre-development) stormwater runoff is primarily collected by two subtle swales. On the western portion of the Site, runoff leads to a swale along the western boundary of the Site then flows north to an unnamed tributary to Red Lion Creek. On the eastern portion of the Site, runoff leads to a swale along the southeastern portion of the Site, flowing east towards Delaware Route 9 (River Road), then towards the Delaware River. A narrow band along the northern border of the Site drains toward Governor Lea Road.

C. FLOOD ZONES

According to the applicable Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for New Castle County and Incorporated Areas (Map Panel Number 1003C0436K), no flood-prone areas are mapped on the Site. This mapping is consistent with the elevated topography of the Site relative to surrounding areas. As such, flooding is unlikely to affect stormwater recharge at the Site.

D. WETLANDS

Similarly, the applicable U. S. Department of the Interior “National Wetlands Inventory” Online Wetlands Mapper indicates no mapped federal wetland areas on the Property. Site observations were consistent with this mapping.

E. WATER RESOURCE PROTECTION AREAS

As shown on the Exploratory Plan, the parcels include a mapped Recharge WRPA covering approximately 8.01 acres of the Site. The area covers nearly half the Property, extended through the west-central portion from the southern boundary to the northern boundary. Off site, the WRPA extends to the north across Governor Lea Road onto a cluster of parcels currently owned by ‘COP Acquisition Co’ that were formerly operated as ‘Metachem Industries’ and ‘Standard Chlorine.’ The WRPA extends to the south well into the adjoining Delaware City Industries refinery.

Figure 2 includes the WRPA mapping as shown on the New Castle County internet site. The Water Resource Protection Area (WRPA) Map of Central New Castle County (Water

Resources Agency, University of Delaware, sheet 2 of 3, revised March 2022) depicts the area as a “Recharge WRPA.” Neither resource depicts protected water supply wells in the vicinity of the Property.

F. HISTORICAL CONDITIONS

Historical aerial photographs available on the New Castle County parcel information and DEMAC (Delaware Environmental Monitoring and Analysis Center) internet sites indicate the Site as undeveloped / agricultural land until the 1982 NCC photo, when a small apparent dirt parking lot appears in the northwest corner of the Site. The 1992 DEMAC photo first shows the current development, along with an area of land disturbance / fill south of the locker room facility. The field appears maintained in this photograph, but gradually overgrows with time. Five rows of solar panels are visible south of the larger building on the 2017 DEMAC photograph.

The Site is surrounded by apparent agricultural lands in the early (1926 through 1954) aerial imagery. In 1961, the refinery facility is largely completed to the south and southeast of the Property, with density added progressively over time. Construction of Metachem to the north begins to show on the 1968 photograph, with the facility largely completed by 1992. By the 2007 photograph, the Metachem facility is no longer present.

G. MAPPED SOILS

The U.S. Department of Agriculture, Natural Resources Conservation Service’s Web Soil Survey internet tool was reviewed for mapped soils at the site. Mapped soils were reviewed for information relevant to the performance of the Climatic Water Balance, particularly the Hydrologic Soil Group (HSG) classification for each series. Full soil series descriptions are also found in Appendix E.

As shown in Appendix E, Site soils are mapped as primarily Reybold silt loam, with 0 to 2 percent slopes on the north-central and 2 to 5 percent slopes on the majority of the remainder. The Reybold series soils are described as well-drained, high-silt loamy eolian (windblown) deposits on flats and interfluves. The small area of Hambrook-Urban land complex soils along Route 9 are described as sandy loam, loam and sandy clay loam soils. The small area of Sassafras soils in the southwestern portion of the Site are described as sandy loam soils on low hills and hillslopes. All four soil series are HSG B.

Soils in the WRPA area are mapped as Reybold series, with the exception of a narrow strip of Urban land along Governor Lea Road in the northwestern corner. The typical profile of Reybold soils is silt loam to 30 inches underlain by gravelly coarse sand. Urban land is typically disturbed by filling or cutting that obscures the original soil profile.

H. COASTAL ZONE

As indicated on the New Castle County internet site, the Property is mapped within the Delaware Coastal Zone. While the Owner does not propose prohibited uses, the proposed light manufacturing use will require a status decision from DNREC, which is pending.

IV. POTENTIAL IMPACTS

Apparent potential impacts to the protected resources involve the disturbance of approximately 8.01 acres of mapped Recharge WRPA, with impervious surfacing up to eighty-four percent (84%) of that area (as shown on the Exploratory Plan). The following sections summarize efforts toward avoidance, minimization, mitigation, and conservation design, as well as potential for endangered species and historical resources associated with the affected resource and / or the overall project.

A. AVOIDANCE

The mapped WRPA occupies nearly half of the Property and extends through the central portion of the site. As such, it is impracticable and financially infeasible to avoid the WRPA while redeveloping the Site for its highest and best use. Also, as presented above, placing impervious surfacing in the WRPA on the Site serves to lessen groundwater contaminant migration associated with the Metachem site. Conversely, avoiding impervious surfacing in the WRPA or infiltrating excess stormwater within the WRPA promotes the migration of existing documented contamination. Selection of this Brownfield site in the larger Delaware City Industrial Area for a redevelopment project is in keeping with the surrounding area and the intent of Coastal Zone regulations, as well as the goals of the New Castle County 2050 Comprehensive Development Plan to avoid placing development in Greenfields and encouraging development within infill areas.

B. MINIMIZATION

As with avoidance, the existing environmental site conditions suggest that minimizing impacts to the protected resource as defined in the UDC serves little purpose. As such, the proposed project focuses on mitigation specifically directed to limit migration of contaminants from the adjoining site into the Red Clay Creek.

C. MITIGATION

The Project as designed provides substantial mitigation for the recharge of groundwater and assists with controlling the migration of existing groundwater contamination on the adjoining property. The collection and infiltration of groundwater from the WRPA area upgradient of the Metachem site will be redirected outside the areas upgradient of the Metachem site. As outlined in the following sections, the Project will enhance the overall recharge volume while capturing untreated runoff and reducing contaminant migration to the nearby Red Lion Creek. The Owner also plans landscaping improvements including substantial afforestation (see draft concept for landscape plan in Appendix F - final plan to be prepared by Designs, Etc.). The plan includes a continuous screen of trees from the adjoining roadways with a total of 220 trees and covering 1.8 acres of the Site, covering half the available open space. This greatly exceeds the UDC requirement of 25 percent reforestation of remaining open space.

Apex Engineering, Inc. reviewed 49 other parcels owned by the developer and related entities for potential areas in WRPA zones for consideration of transferring development rights. However, no mapped WRPAs were identified.

D. CONSERVATION DESIGN

Conservation design principles are included in the proposed construction. Standard Best Management Practices (BMPs) will be employed to limit potential erosion and sedimentation of soils exposed by construction. The BMPs will filter sediments, vegetative debris, and excess nutrients from stormwater runoff from the Site and upgradient areas during construction-related soil disturbance.

E. ENDANGERED SPECIES

On December 16, 2022, Ten Bears submitted notification letters to selected agencies informing them of the proposed construction and requesting a formal determination of any potential conflicts with protected resources on the Property or within 500 feet, including threatened and endangered species and wetlands. Notified agencies included the State of Delaware Department of Natural Resources and Environmental Control (DNREC) Wetlands and Subaqueous Lands Section, DNREC Division of Fish and Wildlife (DFW), Delaware State Historic Preservation Office, U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service.

Agency responses, including DNREC DFW, indicated no conflicts with protected resources. While the IPaC (U.S. Fish and Wildlife Service, Information for Planning and Consultation map resource) output (see Appendix G) indicated the potential for the bog turtle, a threatened species, and the monarch butterfly, a candidate, in the area of the Property, it identified no critical habitats for any species at this location.

F. HISTORICAL RESOURCES

A similar conflict determination letter was sent to the Delaware State Historic Preservation Office (SHPO). As is typical for projects that are not Federally funded, Ten Bears has received no responses as of this writing. The State of Delaware's CHRIS (Cultural and Historical Response Information System) web application indicated no mapped historical resources at or within 500' of the Site (see map printouts in Appendix G).

V. SUBSURFACE EXPLORATION AND INFILTRATION TESTING

In their June 3, 2024, report, Geo-Technology Associates, Inc. (GTA) summarizes their soil investigation specific to the proposed stormwater management (SWM) facilities proposed for the Property. The purpose was to evaluate soil characteristics pertinent to recharge of stormwater, including soil texture, infiltration rate, and estimated seasonal-high water level (SHWL). Appendix H attaches the GTA report, which includes a figure depicting soil boring locations. The soil investigation consisted of 8 borings: 4 in the southwestern SWM facility and 4 in the southeastern SWM facility.

The soil borings encountered conditions generally consistent with the soils mapping, with a thin layer of topsoil, followed by silty soils with varying amounts of sand (silt loam) soils to depths ranging from 2 to 7 feet bgs. Underlying soils consisted of granular sandy soils with varying amounts of silt to the termination depths of the borings. The borings did not encounter groundwater; therefore, the Seasonal-

High Water Level (SHWL) was presumed to occur at depths greater than 20 feet bgs. This is consistent with Ten Bears' 2004/5 BFI, which indicated groundwater depths ranging from 30 to 40 feet bgs in the SWM areas.

Borehole infiltration tests were conducted in each test boring at depths selected by Apex to represent the proposed bottom depths (8 and 12 feet) of infiltration systems proposed at each location. The tests were run to equilibrium in accordance with the procedures outlined in ASTM D5126-16 "Standard Guide for Comparison of Field Methods for Determining Hydraulic Conductivity in Vadose Zone." Equilibrium infiltration rates for all 4 southwestern SWM area borehole tests were '10+' inches per hour. Three of the 4 test results for the southeastern SWM were '10+' inches per hour, with 8 inches per hour for the remainder. These test rates are consistent with the sandy soils first encountered at depths ranging from 2 to 7 feet bgs in the GTA borings and soils encountered throughout the Site in the 60 soil borings completed for the BFI.

VI. CLIMATIC WATER BALANCE

To comply with the requirements of Section 40.10.165 Parts 1. and 2. of the UDC, a Climatic Water Balance analysis was performed to quantify (approximately, within the limitations of the methodology) potential changes from the proposed development to the quantity of water available on an annual basis for recharge to groundwater within the WRPA areas. Methods and findings are described in the following.

A. METHODOLOGY

In accordance with New Castle County guidance, potential infiltration loss in the WRPA zone was estimated following the Climatic Water Balance procedures found in the "***Delaware Ground-Water Recharge Design Manual, Supplement 1 to the Source Water Protection Guidance Manual for the Local Governments of Delaware***" (DNREC/WRA, revised June 2017), hereafter the "Recharge Design Manual." In accordance with the Recharge Design Manual, existing (Pre-development) hydrologic site conditions were modelled using "Thornthwaite & Mather" Water Balance methodology originally described in *Publications in Climatology, Volume X, Number 3, "Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance"* (C.W. Thornthwaite and J.R. Mather, 1957). Input values for the variables of mean monthly precipitation for the nearest weather station (Wilmington Airport) were obtained from Table 1 in the 2017 Recharge Design Manual, as revised for the period 2010-2020 in a revised Table provided by New Castle County. Runoff Coefficients were found in Table 2 of the Recharge Design Manual, using soil and Hydrologic Soil Group HSG classifications from the USDA Web Soil Survey mapping tool (HSG B and 'meadow'). Values for monthly Potential Evapotranspiration (PE) came from Table 5 of the Recharge Design Manual. The Soil Moisture Storage Capacity, i.e., water storage depth in the soil root zone for the 'meadow' land cover in HSG B were obtained from Table 6. Overgrown grass and scattered clusters of shrubs and small trees consistent with the meadow land cover predominate on the Site based on visual observations and recent aerial photographs.

B. CLIMATIC WATER BALANCE FINDINGS

Existing (Pre-development) recharge conditions were evaluated on a month-to-month basis as shown on Table 1 of this report for 'Meadow' soils in HSG B. The result of the calculations is the "Percolation" value, which is an estimated quantity of the amount of water available for groundwater recharge each month. Percolation is determined using the Precipitation less the Runoff (called Infiltration) minus the Actual Evapotranspiration (AET) for months with no deficit in which precipitation (inflow) exceeds that needed by Potential Evapotranspiration (PET). The total yearly Percolation value of 14.4 inches is the estimated quantity of groundwater table recharge under pre-development conditions. A similar water budget referenced in the 2007 RI report for the adjoining Metachem site estimated annual infiltration at Metachem as 12.5 in/yr, which comports with our findings.

The post-development recharge deficit was estimated using the unit area recharge deficit and proposed impervious area within the WRPA, assuming all the pre-development recharge is lost to runoff absent supplemental recharge facilities. Recharge facility design recommendations are then based on capture of 86 percent of the available 45.33 inches of annual precipitation (Wilmington Airport station) as runoff. Table 2 summarizes the annual recharge deficit calculations, along with supplemental stormwater recharge facility design considerations outlined in the Delaware Groundwater Recharge Design Manual.

As indicated on Table 1, we estimated approximately 14.4 inches of pre-development annual recharge per unit area. Based on 86 percent impervious surfacing of the 8.01-acre WRPA area (the proposed 84% impervious surfacing proposed in the WRPA zone as shown on the Exploratory Plan plus a cushion for future design changes during the approval process), the resulting impervious area is 6.9 acres. As indicated in Table 2, we estimate that 6.9 acres of impervious surfacing in the WRPA would yield an annual recharge deficit of approximately 2.7 million gallons (360,000 cubic feet [cf]) to the protected resource, absent supplemental stormwater recharge systems.

Per the Recharge Design Manual for a rooftop collection and recharge system to offset the estimated recharge deficit volume of approximately 360,000 cf would require a building rooftop footprint of approximately 106,000 square feet (sf). This is based on capture of 86 percent of the annual precipitation as runoff. The proposed rooftop area shown on the Exploratory Plan is 304,690 sf. As such, the proposed rooftop area alone is more than sufficient to collect enough stormwater to offset the recharge deficit to the WRPA, by approximately 200,000 sf. However, to meet standard State of Delaware Sediment and Stormwater design requirements for total runoff volume control, the Exploratory Plan includes collecting runoff from all impervious surfacing for infiltration on Site. The calculations in Table 2 indicate this will result in capture and infiltration of approximately 2.14 million cf/yr, well beyond the estimated total recharge deficit of 360,000 cf/yr.

According to the Recharge Design Manual, capturing 86 percent of the annual runoff requires recharge basins to accommodate the 2-year frequency storm (3.2-in depth) volume and drain within 48 hours. At $\frac{1}{2}$ the average 10-inch measured infiltration rate from the soil investigation, a SWM basin would drain a 20-foot depth of water in 48 hours, conservatively assuming instantaneous runoff. Therefore, to capture the 2-year storm with a maximum 20-foot depth of water, an open-air SWM facility at that depth designed to offset the WRPA area annual deficit should have a

minimum 8,400 sf total basin area designed to store and infiltrate stormwater (i.e., below the lowest outlet pipe invert). However, the Recharge Design Manual recommends a maximum depth of 4-feet for open-air basins, resulting in a minimum area of approximately 42,000 sf. Although SWM control designs have not been finalized and are subject to further design and review to meet current Delaware SWM requirements, the current Exploratory Plan depicts underground SWM facilities with a total bottom area of approximately 1.0 acre (43,560 sf). With this footprint, an underground facility designed to capture the 2-year storm from all impervious surfaces would have a minimum depth of 9.6 feet and will drain in 23 hours, which is well below the 48-hour requirement. A facility capturing the 2-year storm from the rooftop only would require a minimum depth of 4.7 feet and drain in 11 hours. While the Recharge Design Manual indicates recharge basins ‘should’ be located within the protected WRPAs, there are environmental considerations for an alternate approach as outlined herein.

VII. PROPOSED GROUNDWATER RECHARGE FACILITIES

A. DESIGN

Based on the above, the proposed SWM structures as shown on the Exploratory Plan are sufficiently sized to facilitate stormwater infiltration to more than balance pre- and post-development groundwater recharge. The final SWM designs and associated structures are also required to meet current Delaware Sediment and Stormwater Regulations with prior approval by DNREC. The underground recharge systems include geotextile-wrapped ‘isolator rows’ that serve to deposit / filter sediments and debris, similar to forebays and bioswales, designed to treat stormwater for quality as well as quantity. As such, the controls will result in improved post-development runoff as well as groundwater recharge quality and quantity. These controls will also require review to meet current DNREC requirements.

B. CONSTRUCTION AND MAINTENANCE

Per the “Delaware Post-Construction Stormwater BMP Standards and Specifications,” Appendix 1, effective February 2019, DNREC will require additional testing to confirm the prior investigation of stormwater infiltration rates. Ten Bears or other qualified soils professionals will be required to complete additional soils investigation and infiltration testing at the final SWM facility locations, at specified frequencies based on the size of the structure. Additional testing at similar frequencies is required upon excavation for the facilities to confirm the infiltration rates used in the design.

Construction of stormwater infiltration facilities requires controlled sequencing to limit the potential for erosion and sedimentation during construction to interfere with the infiltration capacity of the facility. As such, Appendix I includes construction recommendations for use in conjunction with DNREC Stormwater Facility Construction Checklists. The Groundwater Monitoring Plan outlined below includes provisions for visual review of facilities following construction. Where recommended maintenance includes removal of accumulated sediment and replacement of bottom treatments, these activities should follow the construction recommendations.

C. GROUNDWATER MONITORING PLAN

The proposed SWM controls include measures to treat runoff for quality as well as quantity. Further, the infiltration systems will be placed outside the WRPA Area. As such, there is limited potential for groundwater impacts. However, a Groundwater Monitoring Plan and associated monitoring are included as a conservative measure. Please see Appendix J for the Groundwater Monitoring Plan.

VIII. CONCLUSIONS AND RECOMMENDATIONS

Ten Bears has completed an Environmental Impact Assessment (EIA) for the Project on behalf of the Owner. Because the proposed redevelopment within a WRPA mapped on the central portion of the Site will exceed the 20% impervious cover allowed by right, the UDC requires an EIA Report documenting that the project will balance pre- and post-development annual groundwater recharge volumes, as well as protect the potential drinking water source aquifer from contamination. Because the proposed impervious surfacing will cause recharge deficit, supplemental infiltration systems are required to mitigate the reduced infiltration potential by directing stormwater runoff into the ground within the Recharge WRPAs. As documented above, the proposed stormwater management facilities are more than adequate to balance pre- and post-development groundwater recharge, resulting in surplus water input to the protected resource.

However, the use of the groundwater on the Site or the downstream adjoining Metachem Federal Superfund site for drinking water is not reasonably likely. Also, the groundwater contamination at the adjoining site causes ongoing contaminant loading to the adjoining Red Lion Creek under existing conditions, that is subject to an EPA remedy to limit migration to the creek. Therefore, the project design includes measures to redirect stormwater infiltration outside the areas likely to contribute to contaminant migration, which will serve to mitigate the rate of contaminant mass loading to the creek. In short, the project will reduce off-site contaminant travel to Red Lion Creek and the Delaware River.

The final SWM structures will be designed to meet current Delaware Sediment and Stormwater Regulations for quality as well as quantity and require prior approval by DNREC. As indicated above, these requirements include additional testing to confirm infiltration rates adequate for stormwater recharge design and/or develop recommendations to confirm adequate infiltration. Additional controls for recharge facility construction are recommended per Appendix I. We also recommend routing roof drains directly to infiltration practices to the extent practicable. These controls and their placement outside the WRPA suggest minimal potential to impact the groundwater resource; however, a Groundwater Monitoring Plan is included in Appendix J as a conservative measure.

Based on these considerations, Ten Bears Environmental Associates Co. recommends development of the Site in general accordance with the Exploratory Plan, incorporating the recommendations provided herein and recommending in favor of the requested variances for disturbance of 100 percent of the WRPA and impervious surfacing over up to 86 percent.

IX. SIGNATURE OF THE ENVIRONMENTAL PROFESSIONAL

I, the undersigned, hereby certify that I am a qualified professional with a background in the applicable environmental discipline and registered in the State of Delaware and it is my opinion that, to the best of my knowledge, each element *New Castle County Code* chapter 40 (the UDC), article 10, was considered and addressed in accordance with all applicable regulations, codes, standards, guidelines, and policies.



R. Clayton Greer, P.E.

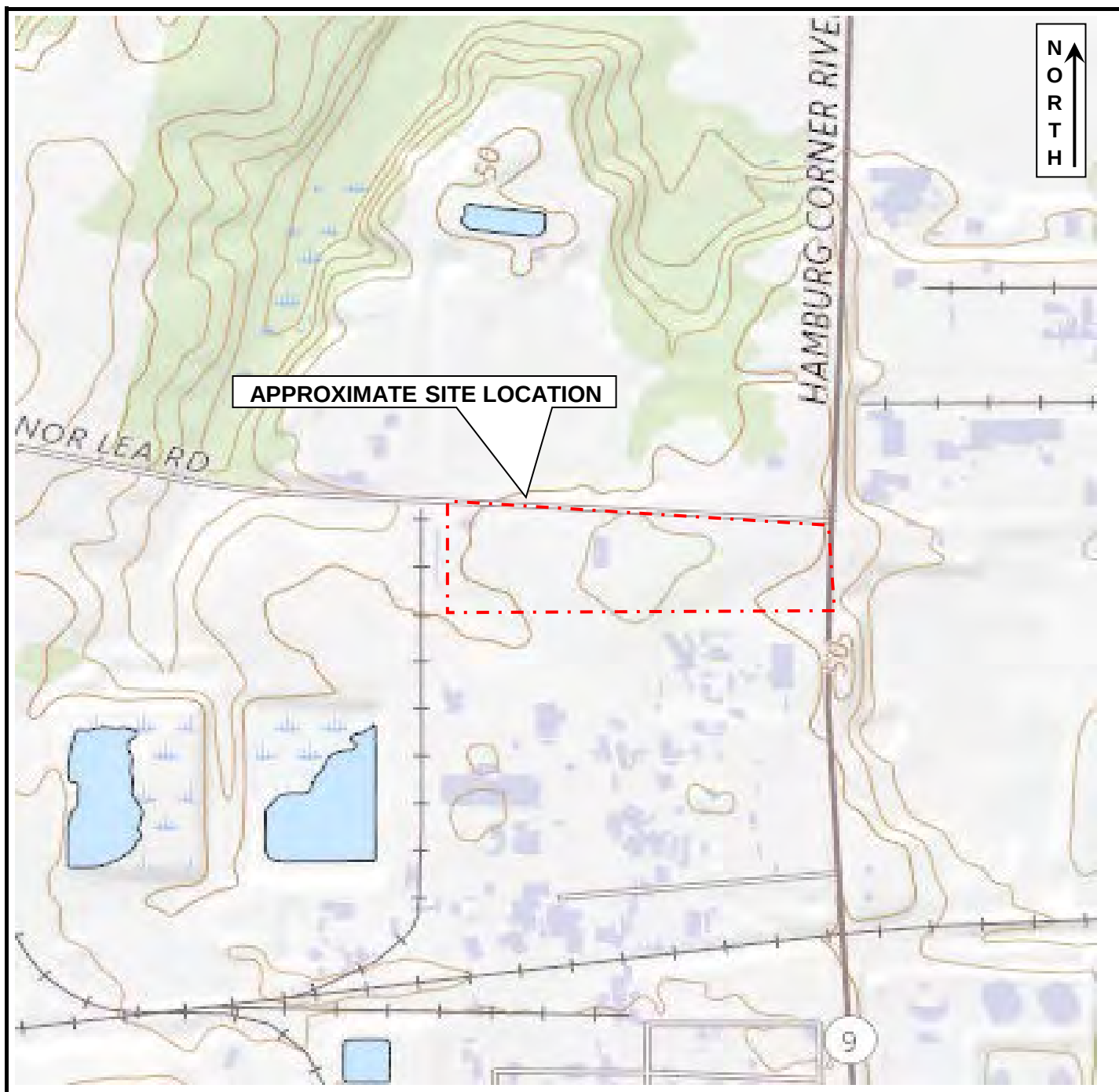
7-1-24

Date

X. REFERENCES

1. U.S. Department of the Interior, Geological Survey, 2019. Topographic Map, St. Georges, Delaware.
2. Federal Emergency Management Agency (FEMA), January 22, 2020. Flood Insurance Rate Map (FIRM), New Castle County, Delaware, Map Number 10003C0232L.
3. "*Delaware Ground-Water Recharge Design Manual, Supplement 1 to the Source Water Protection Guidance Manual for the Local Governments of Delaware*" (Prepared for Delaware Department of Natural Resources and Environmental Control by University of Delaware - Water Resources Agency, revised June 2017).
4. *Publications in Climatology, Volume X, Number 3, "Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance"* (C.W. Thornthwaite and J.R. Mather, 1957).

FIGURES



NOTE:
THIS LOCATION SKETCH WAS ADOPTED FROM THE USGS TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, FOR ST GEORGES, DELAWARE (2022)



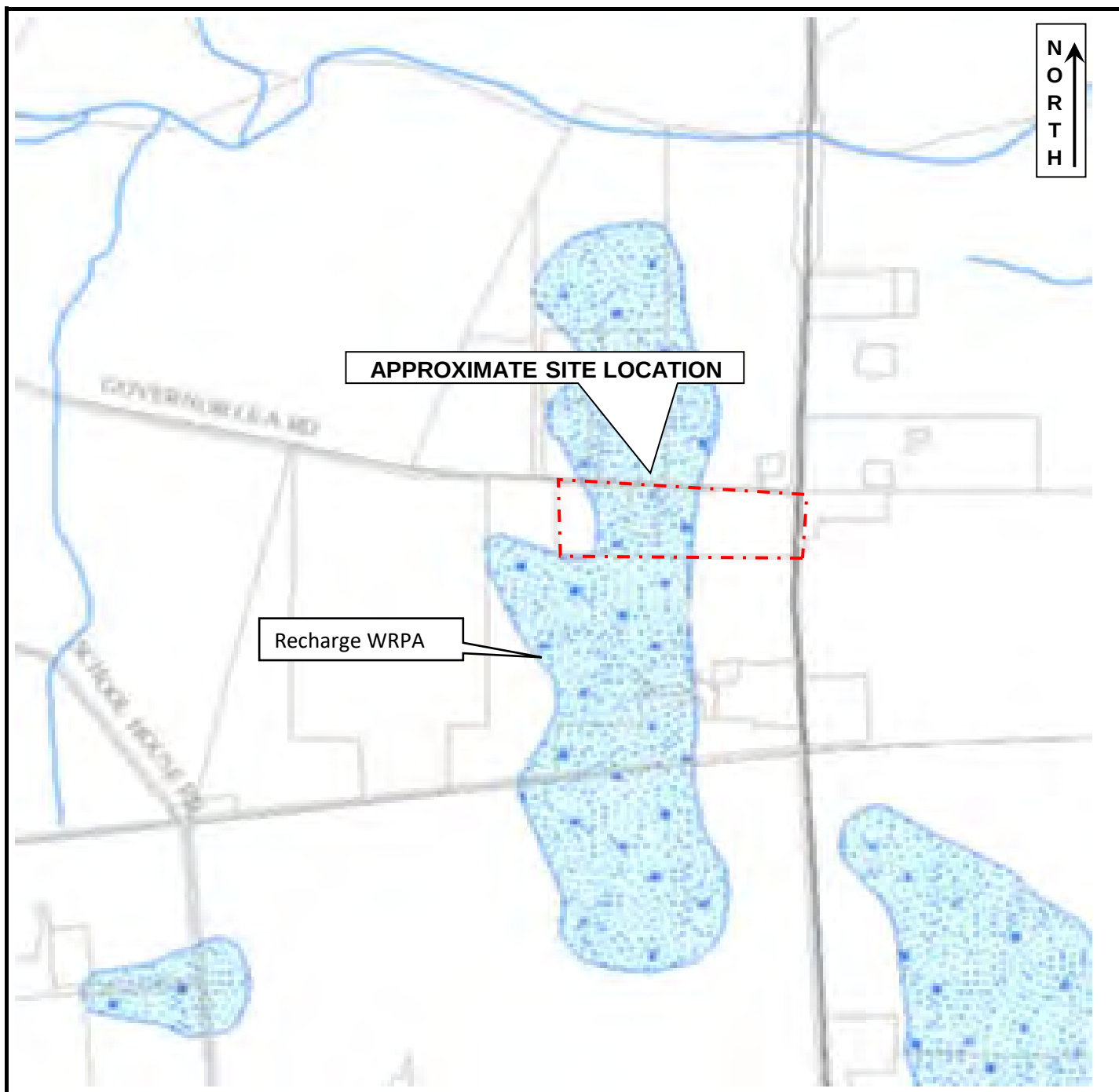
Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

FIGURE 1 - SITE LOCATION SKETCH

750 GOVERNOR LEA ROAD

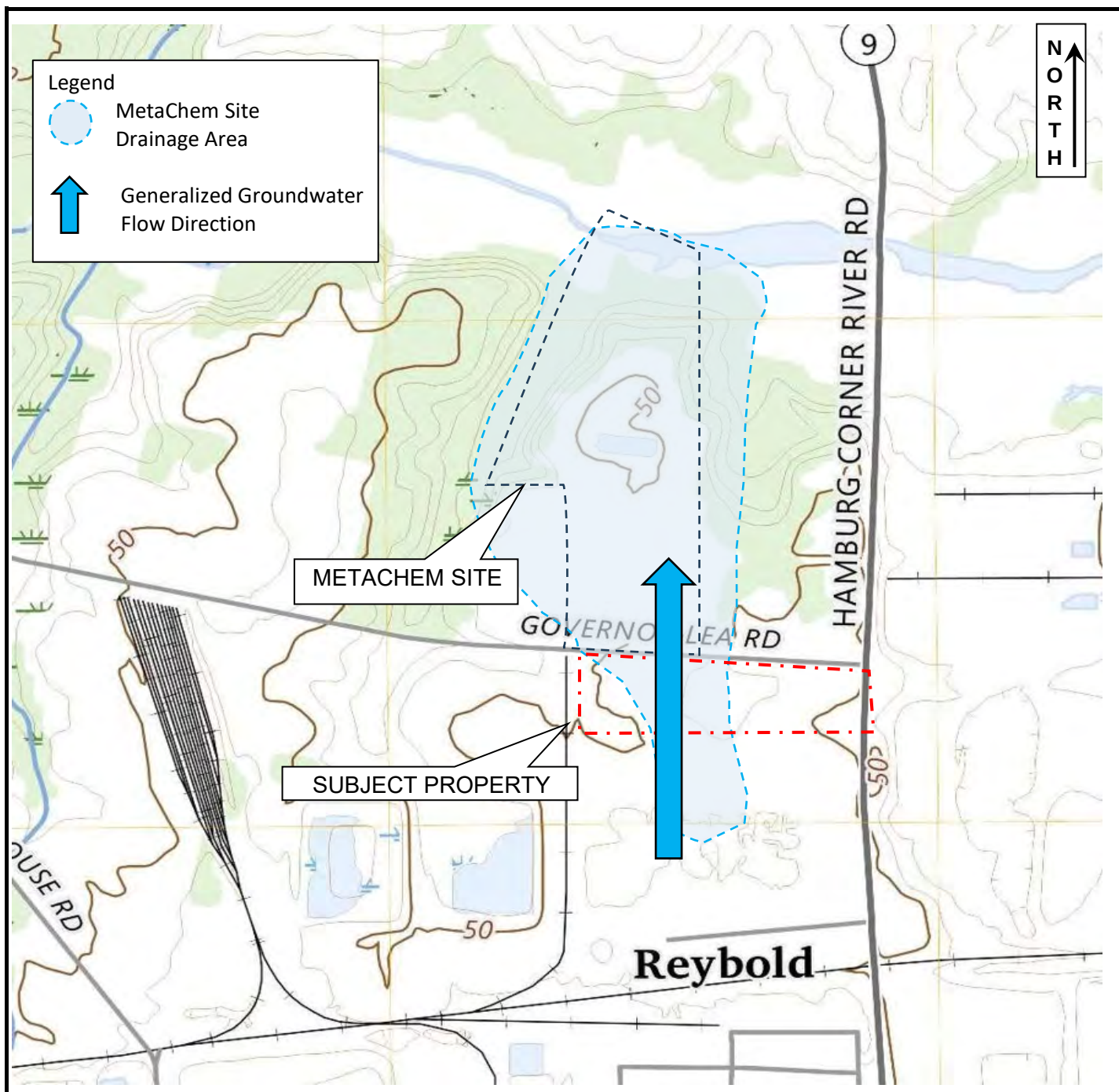
DELAWARE CITY, DELAWARE

DATE: 6/20/2022	JOB NUMBER: 22-231.B
DRAWN BY: ASK	SCALE: N.T.S.
CHECKED BY: RCG	FIGURE NO: 1
FILE NO: 22-231.B	SHEET 1 OF 1



NOTE:
THIS LOCATION SKETCH WAS ADOPTED FROM THE USGS TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, FOR ST GEORGES, DELAWARE (2022)

 Ten Bears Environmental Ten Bears Environmental Associates Co., 1080 South Chapel Street, Suite 200 Newark, DE 19702 Phone: (302) 731-8633	FIGURE 2 - MAPPED RECHARGE WRPA	
	750 GOVERNOR LEA ROAD	
	DELAWARE CITY, DELAWARE	
	DATE: 6/20/2022	JOB NUMBER: 22-231.B
	DRAWN BY: ASK	SCALE: N.T.S.
	CHECKED BY: RCG	FIGURE NO: 2
FILE NO: 22-231.B		SHEET 1 OF 1



NOTE:
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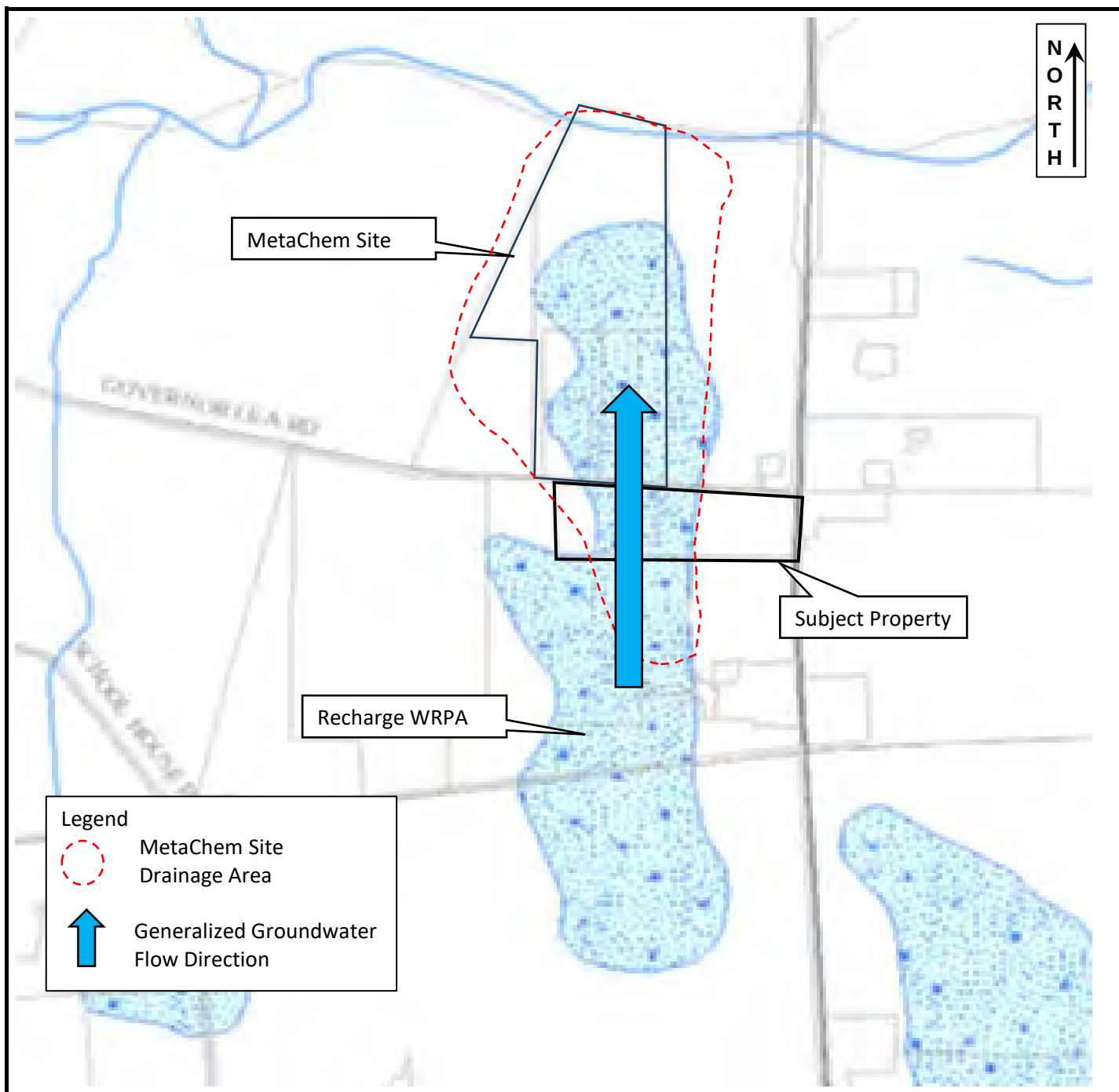
Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

**FIGURE 3A - Estimated Drainage Area of Groundwater Flow
to MetaChem Site, with Conceptual Pre-Remedy
Groundwater Flow**

750 GOVERNOR LEA ROAD

DELAWARE CITY, DELAWARE

DATE: 5/30/2024	JOB NUMBER: 22-231.B
DRAWN BY: MBK	SCALE: N.T.S.
CHECKED BY: RCG	FIGURE NO: 3A
FILE NO: 22-231.B	SHEET 1 OF 1



NOTE:
THIS LOCATION SKETCH WAS ADOPTED FROM THE USGS TOPOGRAPHIC MAP,
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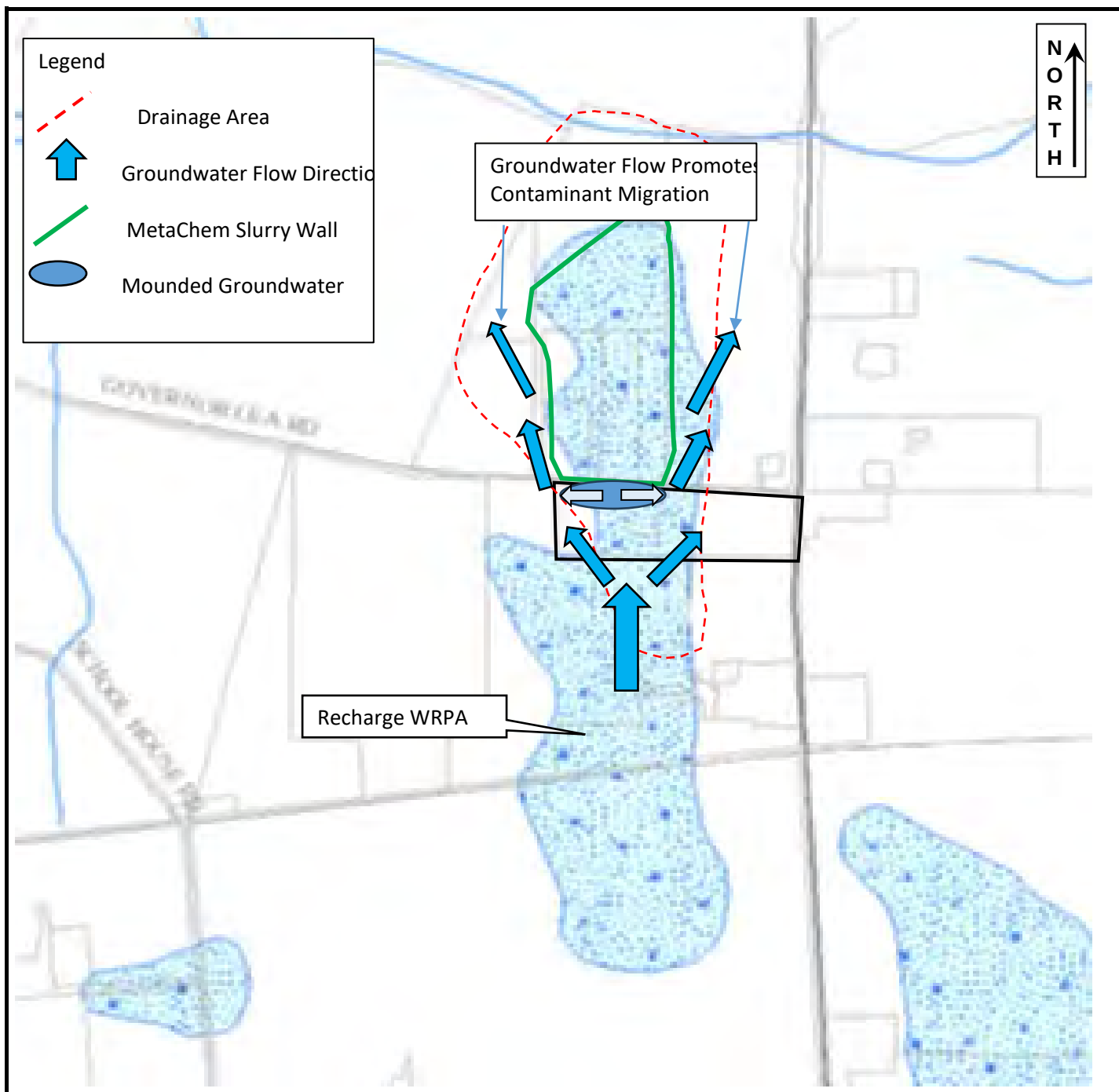
Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

**FIGURE 3B - Estimated Drainage Area of Groundwater Flow to
MetaChem Site, with Recharge WRPA**

750 GOVERNOR LEA ROAD

DELAWARE CITY, DELAWARE

DATE: 5/30/2024	JOB NUMBER: 22-231.B
DRAWN BY: MBK	SCALE: N.T.S.
CHECKED BY: RCG	FIGURE NO: 3B
FILE NO: 22-231.B	SHEET 1 OF 1



NOTE:
THIS LOCATION SKETCH WAS ADOPTED FROM THE USGS TOPOGRAPHIC MAP,
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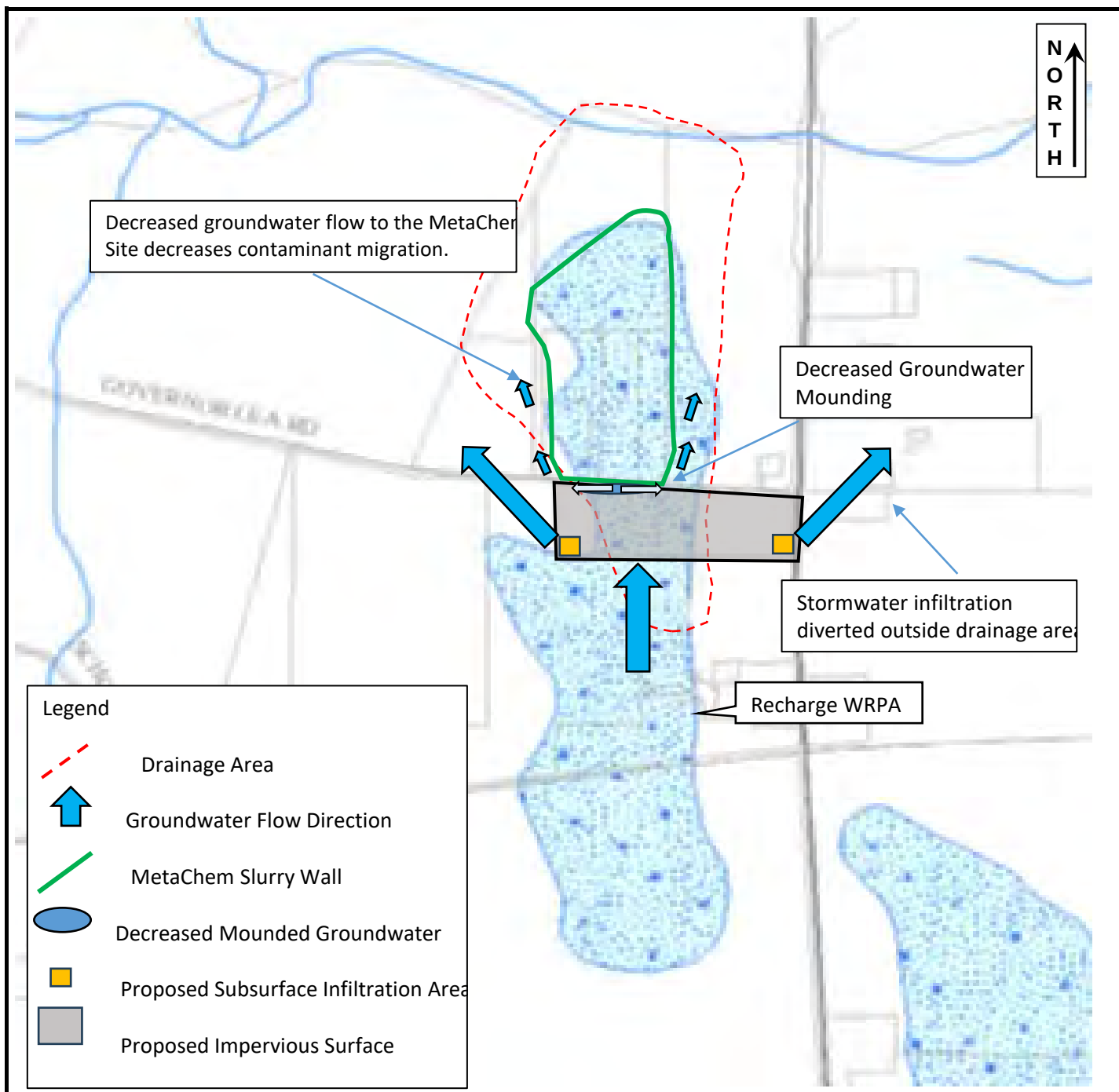
Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

FIGURE 4 - CONCEPTUAL POST-REMEDY GROUNDWATER FLOW

750 GOVERNOR LEA ROAD

DELAWARE CITY, DELAWARE

DATE: 5/30/2024	JOB NUMBER: 22-231.B
DRAWN BY: MBK	SCALE: N.T.S.
CHECKED BY: RCG	FIGURE NO: 4
FILE NO: 22-231.B	SHEET 1 OF 1



NOTE:
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7.5 MINUTE SERIES, FOR ST GEORGES, DELAWARE (2022)



Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

FIGURE 5 - CONCEPTUAL POST-DEVELOPMENT GROUNDWATER FLOW

750 GOVERNOR LEA ROAD

DELAWARE CITY, DELAWARE

DATE: 5/30/2024	JOB NUMBER: 22-231.B
DRAWN BY: MBK	SCALE: N.T.S.
CHECKED BY: RCG	FIGURE NO: 5
FILE NO: 22-231.B	SHEET 1 OF 1

TABLES

TABLE 1
CLIMATIC WATER BALANCE
PRE-DEVELOPMENT CONDITONS
750 Governor Lea Road
Delaware City, New Castle County, Delaware

Pre-development Climatic Water Budget Analysis (inches)													
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly (in.)
Precipitation *	3.23	2.83	4.16	3.51	3.57	4.67	4.41	3.98	4.38	3.68	3.06	3.85	45.33
Runoff Coeff (RC) **	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	
Runoff (RO = RC X P)	0.06	0.06	0.08	0.07	0.07	0.09	0.09	0.08	0.09	0.07	0.06	0.08	0.91
Infiltration (I = P - RO)	3.17	2.77	4.08	3.44	3.50	4.58	4.32	3.90	4.29	3.61	3.00	3.77	44.42
Pot. Evapotranspiration	0.00	0.00	0.62	2.00	3.72	5.25	6.10	5.31	3.74	2.02	0.75	0.00	29.51
I-PE	3.17	2.77	3.46	1.44	-0.22	-0.67	-1.78	-1.41	0.55	1.59	2.25	3.77	14.91
Cum Water Loss	0.00	0.00	0.00	0.00	-0.22	-0.89	-2.67	-4.08	0.00	0.00	0.00	0.00	
Soil Moist Storage Capacity **	12.00	12.00	12.00	12.00	11.78	11.14	9.60	8.53	9.08	10.67	12.00	12.00	
Storage Change (dS) ***	0.00	0.00	0.00	0.00	-0.22	-0.64	-1.54	-1.07	0.55	1.59	1.33	1.09	
Actual Evapotranspiration	0.00	0.00	0.62	2.00	3.72	5.22	5.86	4.97	3.74	2.02	0.75	0.00	28.90
Percolation	3.17	2.77	3.46	1.44	0.00	0.00	0.00	0.00	0.00	0.00	0.92	2.68	14.43

* From Delaware Groundwater Recharge Design Manual, WRA, rev.2017), Table 1, revised for 1990-2020 as provided by New Castle County, for the Wilmington Airport Station

** From Delaware Groundwater Recharge Design Manual, WRA, rev.2017), Table 2 and Table 6

*** from Table 20, Soil Moisture Retention Table - 12 inches, Thornthwaite & Mather, Publications in Climatology, 1957

TABLE 2

Recharge Deficit Calculations

750 Governor Lea Road
Delaware City, New Castle County, Delaware

Proposed development of 6.73 ac impervious (84% total WRPA Area) - calculations for 6.89 ac (86%)

Pre-Development Recharge = 14.43 inch 1.2 ft
 Total Impervious = 6.89 ac (86% of 8.01-ac WRPA)
 Total Recharge Deficit = 8.3 ac-ft
 Recharge Deficit Vol = 2,693,405 gals or 360,081 cf
 i.e., design recharge facility to infiltrate approximately 2.7 million gallons annually (outside WRPA)

Rooftop (or impervious) area required for stormwater collection to offset recharge deficit

Recharge Deficit Vol (cf) = 360,081 cf
 Annual precipitation 45.33 in
 Runoff (RO = .90 * P) 41 in
 Runoff depth (ft/unit area) = 3.40 ft
 rooftop area required = 105,914 sf
 proposed rooftop area = 304,690 sf
 excess rooftop area = 198,776 sf
 total impervious area = 629,930 sf
 excess impervious area = 524,016 sf
 Proposed to Stormtech = 629,930 sf
 excess impervious area = 524,016 sf

Recharge Basin Volume requirements (open-air basin - not proposed)

	all impervious	Min Rooftop Only
impervious area	629,930 sf	304,690 sf
total annual runoff	2,141,604 cf	1,035,870 cf
2-yr storm depth (3.2 in)	0.27 ft	0.27 ft
2-yr runoff vol.	167,981 cf	81,251 cf
infiltration rate (in/hr)	5 in/hr	5 in/hr
infiltration rate (ft/d)	10 ft/d	10 ft/d
max fac. Depth (from Recharge Design Manua	4 ft	4 ft
min total facility area	41,995 sf	20,313 sf

Proposed Subsurface Basin Drainage Time (neglecting pipe storage)

	All Impervious	Min Rooftop Only
2-yr runoff vol.	167981.3 cf	81,251 cf
Required stone vol (porosity = 0.4)	419953.25 cf	203126.67 cf
Underground Basin Area	43560 sf	43560 sf
min depth of recharge facility	9.64 ft	4.66 ft
infiltration rate (in/hr)	5 in/hr	5 in/hr
infiltration rate (ft/d)	10 ft/d	10 ft/d
basin drainage time (max 48 hr required)	23 hr	11 hr

APPENDIX A

APEX Exploratory Plan

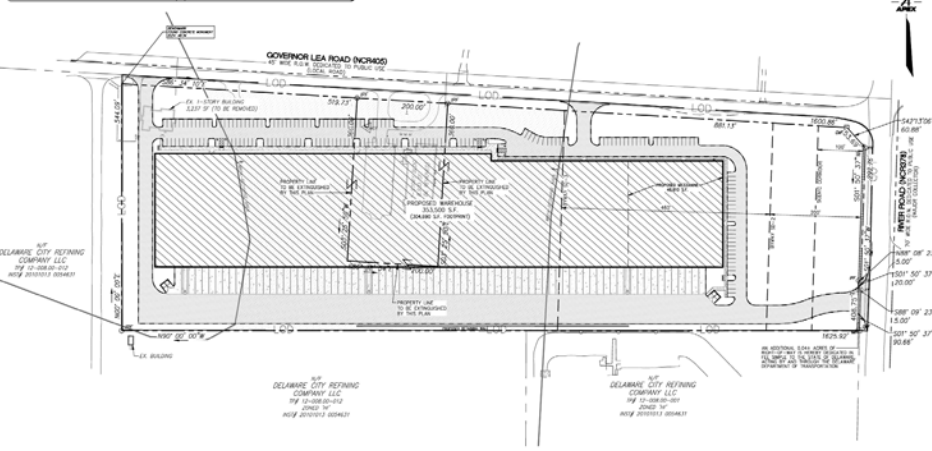
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EXISTING		PROPOSED		EXISTING		PROPOSED	
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3	CONCRETE	3	CONCRETE	3	DATE WEST	3	DATE WEST
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56	CONCRETE	56	CONCRETE	56	DATE WEST</		



1. PURPOSE OF PLANS: DEVELOPMENT OF A SHOWFIELD SITE BY CONVEYING TWO PARCELS INTO ONE AND CONSTRUCT A 203,500 S.F. GFA WAREHOUSE (WITH MILLIARDE) AND ASSOCIATED SITE IMPROVEMENTS.

- [illegible]



J. EMMETT D. BAUER, *CHIEF, DESIGN GROUP* • 100 • 1990

STATE OF TEXAS
COUNTY OF DALLAS
I, STEPHEN G. DAVIES, A PROFESSIONAL ENGINEER WITH A BACKGROUND IN CIVIL ENGINEERING IN THE STATE OF DELAWARE AND THAT ALL OF THE INFORMATION ON THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY ACCEPTED SURVEYING STANDARDS AND PRACTICES AND BY THE NEW CASTLE COUNTY UNIFIED DEVELOPMENT CODE.

STEPHEN G. DAVIES
REGISTRATION #7890

DATE _____

CONCENTRATION OF OWNERSHIP

THOMAS HARVEY IV HEREBY CERTIFY THAT GOVERNOR LISA M. BROWN IS THE OWNER OF THE PROPERTIES WHICH ARE SUBJECT OF THIS PLAN AND THAT THE LAND USE ACTION PROPOSED BY THIS PLAN IS IN ACCORDANCE WITH THE REGULATIONS OF THE NEW CASTLE COUNTY DEVELOPMENT CODE.

THOMAS HARVEY IV _____ DATE _____

IDENTIFICATION OF TESTS/TOTALS

APPROVED _____ BY _____
DATE _____ GENERAL MANAGER
FOR DEPARTMENT OF LAND USE
OF NEW CASTLE COUNTY

APPROVED _____ BY _____
DATE _____ COUNCIL PRESIDENT
FOR COUNTY COUNCIL

 APEX ENGINEERING INCORPORATED	
114 S. MOORE STREET CHICAGO, ILL. 60606 CDED 994-0000 CDED 994-9000 FAX	
100 200 300 400 500 600 700 800 900 1000	
SCALE 1" = 100'	DATE 3/28/2023
DRAWN BY J.A.V.	CHECKED BY S.G.D.
PROJECT / FILE NUMBER 21100000EXPLOT-EXPLOR-REV	
REVISION 2	

The contractual agreement of this drawing is between the undersigned and the client. It is intended that the client will be responsible for the accuracy of the information provided. The undersigned is not responsible for the accuracy of the information provided. The undersigned is not responsible for the accuracy of the information provided. The undersigned is not responsible for the accuracy of the information provided.

APPENDIX B

DNREC Groundwater Management Zone MOA

Memorandum of Agreement

Department of Natural Resources and Environmental Control

Between:
Division of Air and Waste Management
and
Division of Water Resources



For:
Delaware City Industrial Area
New Castle County, Delaware

April 2008

WHEREAS, the Delaware Department of Natural Resources and Environmental Control (DNREC) has investigated numerous environmental releases in the Delaware City industrial area of northern New Castle County, Delaware (Attachments 1, 2, and 3); and

WHEREAS, the Standard Chlorine of Delaware (Metachem) (DE-0053, DE-1279), Delaware City PVC (DE-0007), Ion Power (DE-1322), Kaneka Corporation (DE-1292) sites (the “sites”) outlined in green in Attachment 1 have been investigated by the DNREC Site Investigation and Restoration Branch (“DNREC-SIRB”); and

WHEREAS, the OxyChem (DED003913266), Motiva (DED002329738), VPI Mirrex (DED075511154) and, AKZO (DED980551667) sites (the “sites”) outlined in orange shown in Attachment 2 have been investigated by the DNREC Solid and Hazardous Waste Management Branch (“DNREC-SHWMB”); and

WHEREAS, the Stapleford Chevrolet (3-000042) Standard Chlorine (3-000091), Star Enterprises Refinery (3-000092), Motiva Enterprises (3-001104), Liquid Air/Cardox (3-000096), Getty Foraker (3-000408), Diamond State Telephone (3-000480), Oriole Chemical Carriers (3-000545), Chloramon (3-000619), Keysor Century (7-000038) sites (the “sites”) outlined in yellow shown in Attachment 3 have been investigated by the DNREC Tank Management Branch (“DNREC-TMB”); and

WHEREAS, the findings of these investigations are available in the remedial investigation (“RI”) reports (or similar), and subsequent reports, which are contained within each site’s administrative record; and those reports document the extent of detected (or potential sources of) groundwater contamination in the area of the sites; and

WHEREAS, proposed or enacted remedies are or will be outlined in each site’s or project’s SIRB-Proposed or Final Plan of Remedial Action; SHWMB- Permits, Interim Measures Plan or Corrective Measures Implementation Plan; or TMB Plan of Remedial Action; and

WHEREAS, the DNREC Division of Air and Waste Management (“DAWM”) is responsible for the investigation and cleanup of hazardous substance releases in the State of Delaware; and

WHEREAS, the DNREC Division of Water Resources (“DWR”) is responsible for management of the withdrawal of waters in the State of Delaware; and

WHEREAS, DNREC’s intent is to formally establish a groundwater management zone (“GMZ”) for the sites that is consistent with Subsections 2.2, 3.2, 3.6, 4.2, and 4.4 of Delaware’s Comprehensive State Ground Water Protection Program (“CSGWPP”); and

WHEREAS, significant water bearing units in the vicinity of the sites include the Columbia and Potomac aquifers (McKenna et al., 2004; Ramsey, 2005; and Benson, 2006) and

WHEREAS, the Columbia aquifer and, in some areas, the Potomac aquifer have been or have the potential for being impacted by contaminants from the sites; and

WHEREAS, DNREC has determined that a GMZ for the Columbia aquifer, Potomac aquifer units, and other aquifer units underlying the sites and surrounding areas is appropriate to protect exposure of the public by way of known and/or potential groundwater contamination and for

management of known and/or potential releases at the aforementioned sites and surrounding areas; and

WHEREAS, the intent of this GMZ agreement is to provide administrative control aimed at minimizing the risks posed by contaminated groundwater beneath and in the vicinity of the listed sites and is only part of the approved final remedial actions; and

WHEREAS, DNREC determined that two GMZ Areas (Attachment 4) are appropriate for management of releases at the listed sites, and to protect exposure of the public by way of potential groundwater contamination; the GMZ Areas consist of the following:

- **GMZ Area A:** start at the intersection of the eastern edge of Route 1 (Korean War Veterans Memorial Highway) and the crossing point of disconnected Governor Lea Road follow east along Governor Lea Road; north at the intersection of the “unnamed tributary” along the western edge of Air Products and Chemicals; east at the intersection of this property line and the center line of Red Lion Creek; east along the approximate center line of Red Lion Creek to the Delaware River at Hamburg Cove; south along the Delaware River line to Dragon Creek inlet; southwest along the approximate center line of Dragon Creek; follow Dragon Creek west along the main stem to Clark’s Corner Road; follow Clark’s Corner Road north to the intersection with Route 72; west along Route 72 to the junction with Route 1. North along the eastern edge of Route 1 to the point of beginning; and
- **GMZ Area B:** start at the intersection of Route 72 (Wrangle Hill Road) and Route 1 (Korean War Veterans Memorial Highway) follow east along Route 72 to the intersection with Clarks Corner Road; follow Clark’s Corner Road to the south to the northern tributary of Dragon Creek; follow Dragon Creek to the west then to the north to the intersection with Delaware Route 1; follow Delaware Route 1 north to the point of beginning; and

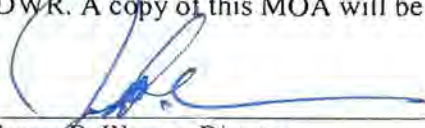
WHEREAS, Attachment 5 lists the tax parcel numbers of the properties within the GMZ Area A; and Attachment 6 lists the tax parcel numbers of the properties within the GMZ Area B.

NOW, THEREFORE, IT IS AGREED BY DAWM AND DWR AS FOLLOWS:

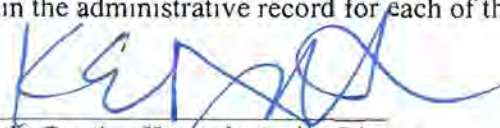
1. A GMZ shall be established to include the listed sites and surrounding areas as defined both in the text and on the attached maps (Attachments 1, 2, 3, and 4).
2. No new public or domestic (potable) water supply wells will be allowed or permitted within the GMZ Area A (Attachment 4).
3. No new public or domestic (potable) water supply wells will be allowed in the unconfined Columbia aquifer and any underlying aquifer unit hydraulically connected to the Columbia aquifer within the GMZ Area B (Attachment 4). Potable wells in the GMZ Area B may be allowed or permitted provided: (i) they are drilled into a confined aquifer (ii) they are constructed to prevent the vertical movement of potential contaminants, (iii) that contaminated groundwater, if encountered, will be sufficiently treated to applicable potable use standards; and (iv) a joint review and approval is completed by both DWR and DAWM .

4. Non-potable wells, such as, but not limited to, industrial, monitoring, observation, and contaminant recovery wells, may be installed in GMZ areas A and B following joint review and approval by DWR and DAWM.
5. Permits for wells in GMZ Area B may only be issued by DWR following joint reviews and approvals by both DWR and DAWM.

This MOA may be modified or terminated only upon the agreement of both parties. Any modifications must be made in writing and signed by the Director of DAWM and the Director of DWR. A copy of this MOA will be placed within the administrative record for each of the sites.


James D. Werner, Director
Division of Air and Waste Management

Date: 3 April 2008


Kathy Bunting-Howarth, Acting Director
Division of Water Resources

Date: 4/10/08

TAK: ebg
TAK08007.doc
DE -Various Sites, II B 8

- | | |
|---------------|--|
| Attachment 1: | Site Investigation and Restoration Branch Sites within GMZ for Delaware City Industrial Area |
| Attachment 2: | Solid and Hazardous Waste Management Branch Sites within GMZ for Delaware City Industrial Area |
| Attachment 3: | Tank Management Branch Sites within the GMZ for Delaware City Industrial Area |
| Attachment 4: | GMZ Areas (A+B) with adjacent GMZ (Red Lion and Route 13 – Tybouts Corner) |
| Attachment 5: | List of Tax Parcel Numbers of Properties included in GMZ Area A |
| Attachment 6: | List of Tax Parcel Numbers of Properties included in GMZ Area B |

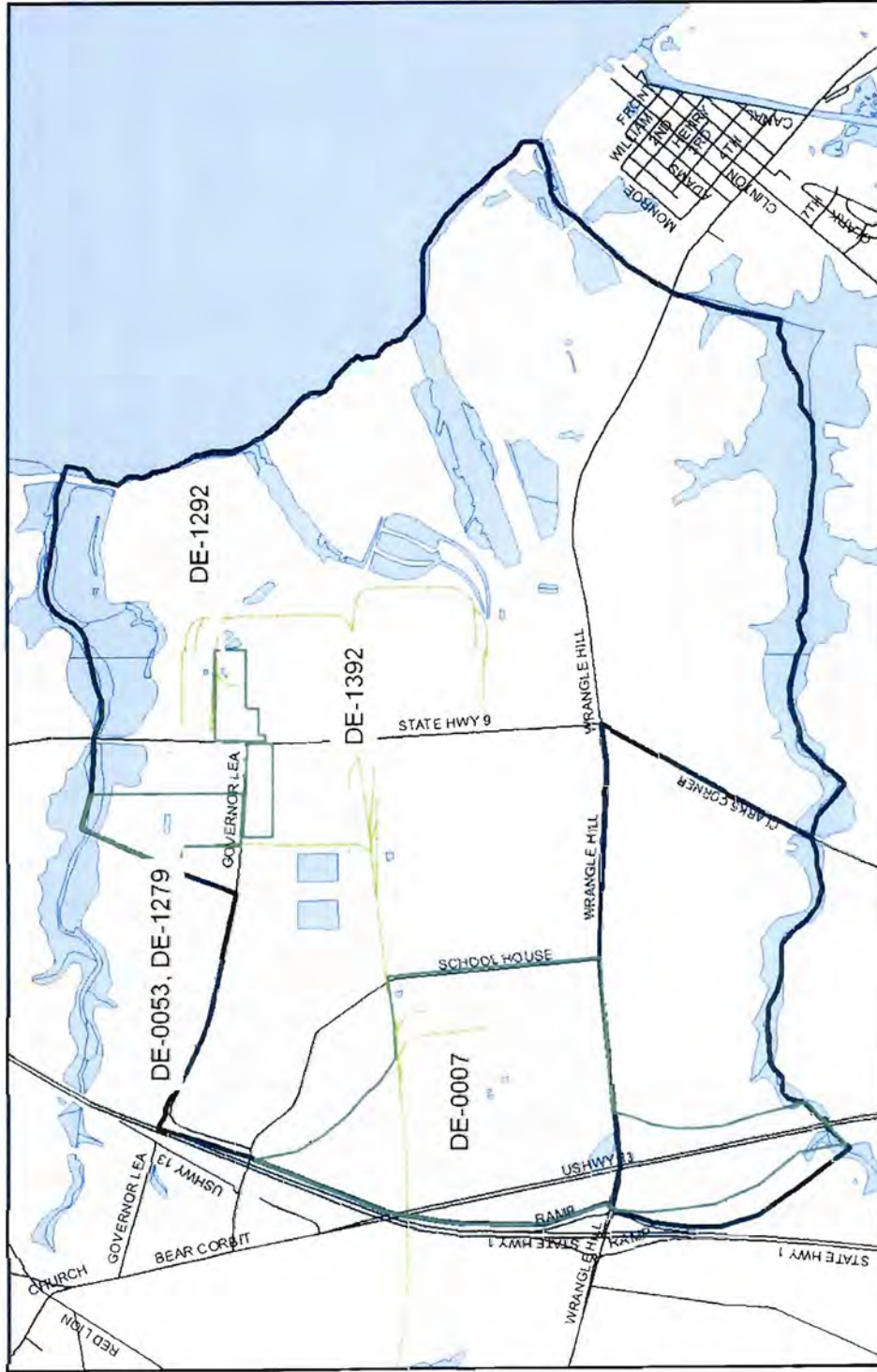
pc: Kathy Stiller Banning, DNREC DAWM-SIRB with Attachments
Paul Will, DNREC DAWM-SIRB with Attachments
Timothy Ratsep, DNREC DAWM-SIRB with Attachments
Qazi Salahuddin, DNREC DAWM-SIRB with Attachments
Nancy Marker, DNREC DAWM-SHWMB with Attachments
Bryan Ashby, DNREC DAWM-SHWMB with Attachments
Karen J'Anthony, DNREC DAWM-SHWMB with Attachments
Alex Rittberg, DNREC-DAWM-TMB with Attachments
Jennifer Roushey, DNREC-DAWM-TMB with Attachments
Stewart Lovell, DNREC DWR-GPB with Attachments
John Barndt, DNREC DWR-GPB with Attachments

REFERENCES

McKenna, T. E., McLaughlin, P. P., and Benson, R. N., 2004, Characterization of the Potomac Aquifer, an extremely heterogeneous fluvial system in the Atlantic Coastal Plain of Delaware: Delaware Geological Survey Open File Report No. 45, 4 p.

Ramsey, K.W., 2005, Geologic Map of New Castle County, Delaware: Delaware Geological Survey Geologic Map Series No. 13, Scale: 1:100,000.

Benson, R.N., 2006, Internal stratigraphic correlation of the subsurface Potomac Formation, New Castle County, Delaware, and adjacent areas in Maryland and New Jersey. Delaware Geological Survey Report of Investigations No. 71, 15 p., 3 plates

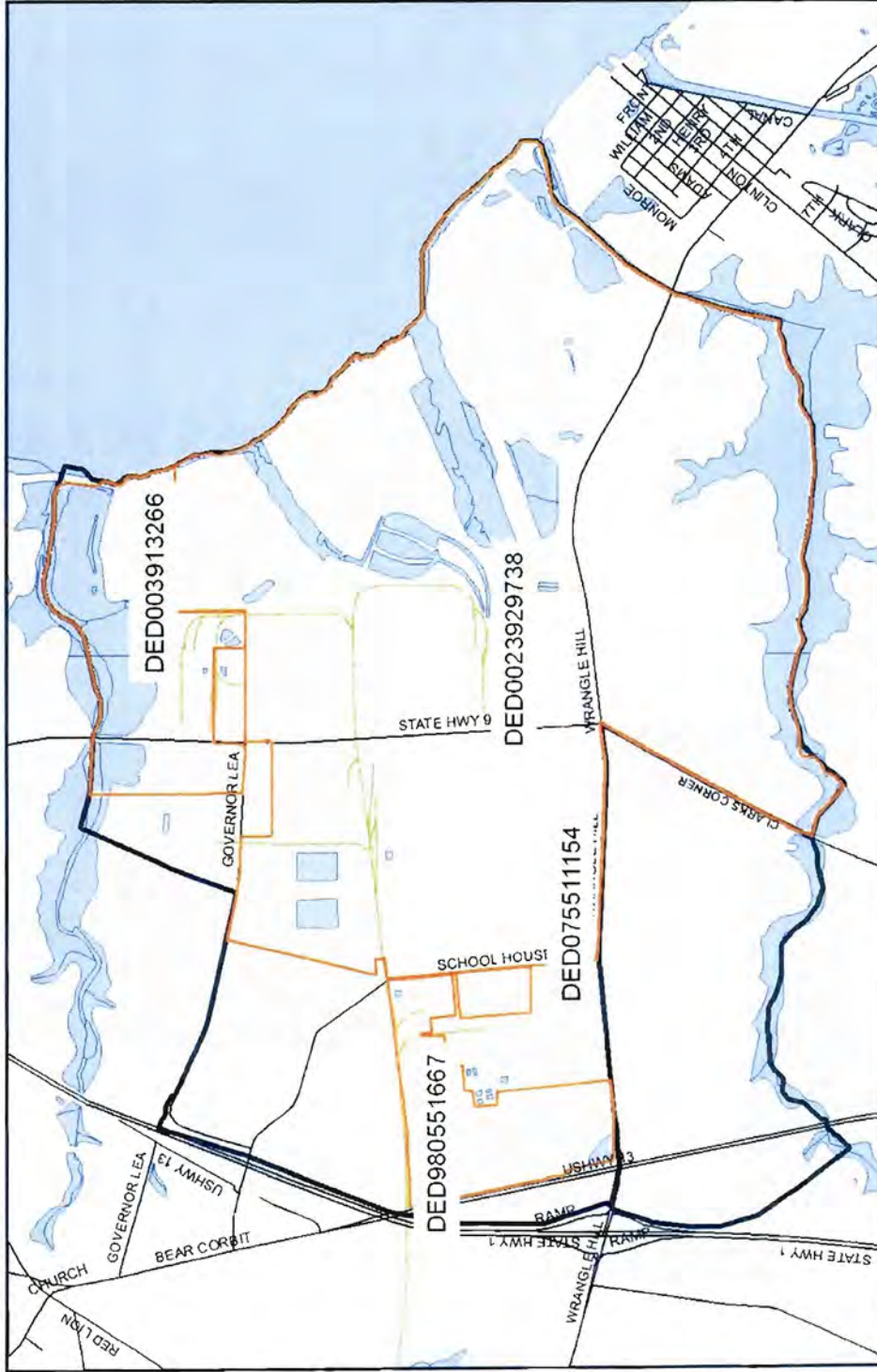


ATTACHMENT 1 SITE INVESTIGATION AND RESTORATION BRANCH SITES WITHIN GMZ FOR DELAWARE CITY INDUSTRIAL AREA NEW CASTLE COUNTY, DELAWARE

This map is provided by the
DNREC-SIRB solely for display and
reference purposes and is subject
to change without notice. DNREC-
SIRB will not be held responsible
for the assumed accuracy contained
in the map or for use other than its
intended purposes.

SITE INVESTIGATION &
RESTORATION BRANCH
391 LUKENS DR
NEW CASTLE, DE 19720-2714
302.385.2600





ATTACHMENT 2 SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH SITES WITHIN GMZ FOR DELAWARE CITY INDUSTRIAL AREA NEW CASTLE COUNTY, DELAWARE

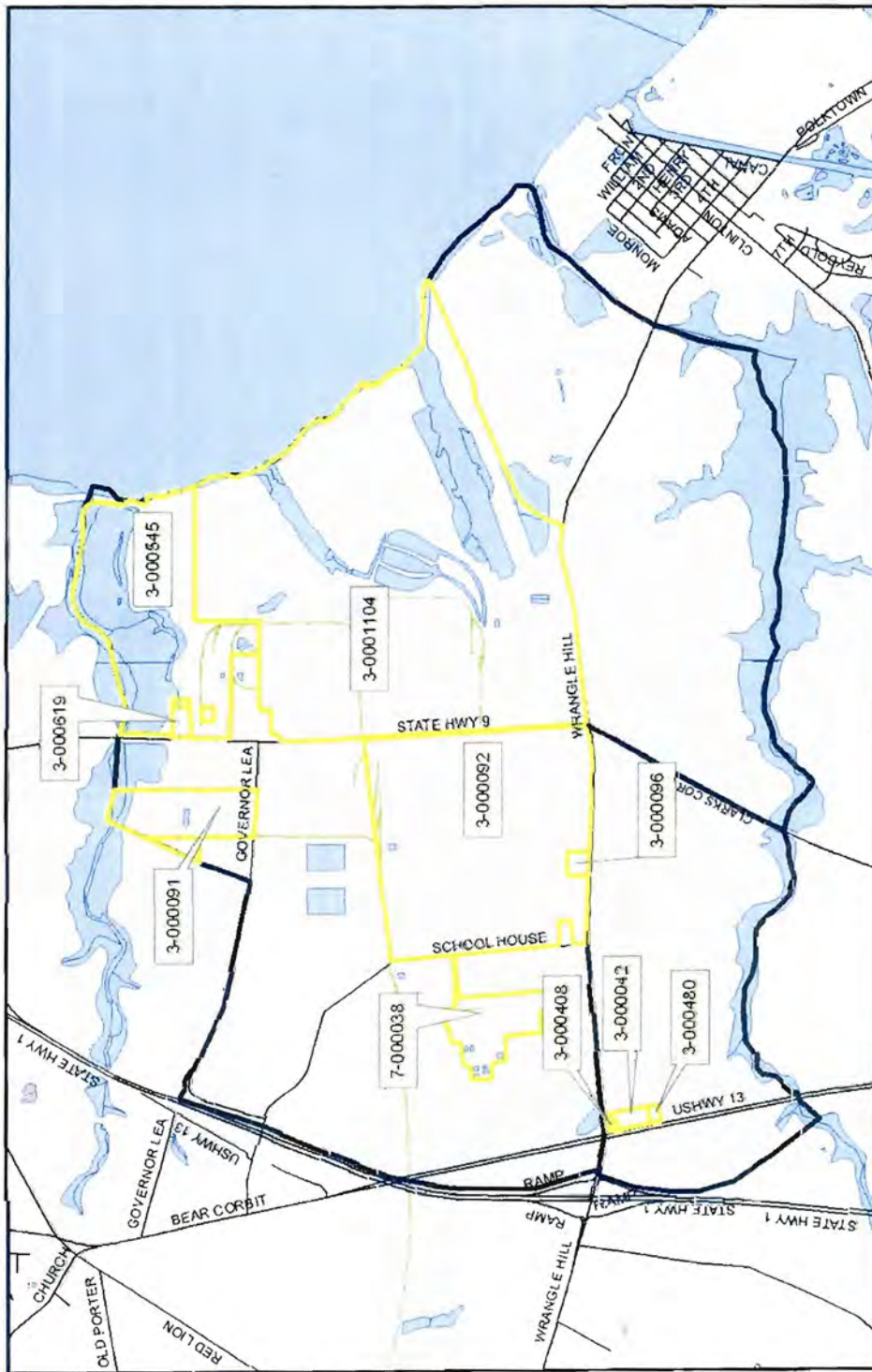
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DNREC-SIRB solely for display and
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to change without notice. DNREC-
SIRB will not be held responsible
for the assumed accuracy contained
in the map or for use other than its
intended purposes.

SITE INVESTIGATION &
RESTORATION BRANCH
391 LUKENS DR
NEW CASTLE DE 19720-2774
302.555.2600

Legend

Solid Sites

0.5 0.25 0 0.5 Miles



ATTACHMENT 3 TANK MANAGEMENT BRANCH SITES WITHIN GMZ FOR DELAWARE CITY INDUSTRIAL AREA NEW CASTLE COUNTY, DELAWARE

This map is provided by the Delaware-SIRB solely for display and reference purposes and is subject to change without notice. DNRREC-SIRB will not be held responsible for the assumed accuracy contained in the map or for use other than its intended purpose.

SITE INVESTIGATION & RESTORATION BRANCH
381 LUKENS DR
NEW CASTLE, DE 19720-2774
302.336.2600



Attachment 5

List of Tax Parcel Numbers of Properties included in the Delaware City Industrial GMZ Area A

1200300004
1200300013
1200300014
1200300017
1200300016
1200300005
1200300012
1200300011
1200300010
1200300001
1200200025
1200800015
1200300007
1200300002
1200300015
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1200300003
1200300009
1200200025
1200800004
1200800006
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1200800009
1200800003
1200800010
1200800011
1200800014
1200700010
1200700008
1201300007
1200200025
1201300026
2200300001
1200700011

Subject Site Parcels

1201300008
1201300028
1201300013
1201300035
1201400001
2200600056
1200800012

Attachment 6

List of Tax Parcel Numbers of Properties included in the Delaware City Industrial GMZ Area B

1201300005
1201300012
1202000005
1201300006
1202000012
1202000011
1202000004
1202000013
1202000006
1202000014
1202000007
1202000016
1202000017
1202000021
1200200025
1202000003
1202000091
1202000008
1202000106
1202000090
1200200025
1202000105
1200200025

APPENDIX C

Ion Power COCR

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FEB 08 2013

DNREC - SIRS



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T20130002868

Michael E. Kozikowski
New Castle Recorder MISC

Tax Parcel Number: 12-008-00-004
12-008-00-006

Prepared By: Department of Natural Resources
and Environmental Control

Return To: Program Administrator
DNREC-SIRS
391 Lukens Drive
New Castle, DE 19720

CERTIFICATION OF COMPLETION OF REMEDY

The Department of Natural Resources and Environmental Control (DNREC) has reviewed the request made by Dr. Stephen Grot on June 14, 2012 for a Certification of Completion of Remedy (COCR) for the Ion Power Site (Site) (DE-1322) located at 720 and 750 Governor Lea Road in New Castle, Delaware. DNREC reviewed all of the relevant documents necessary to make a determination.

The approximately 13.2 acre Site is located on the west side of Route 9, approximately 1.5 miles east of the Delaware River and is known by New Castle County as tax parcel numbers 12-008-00-004 and 12-008-00-006. The Site was utilized as agricultural land until the 1980s when the two buildings and parking lots were constructed on the property for use as administrative offices for the former Metachem Site located across Governor Lea Road to the north. Currently owned by IPI Ventures, L.L.C., the Site has remained mostly undeveloped with the exception of two one-story concrete-block commercial buildings along the northern border with Governor Lea Road.

Ten Bears Environmental, Inc. completed a comprehensive Remedial Investigation (RI) of the Site on behalf of IPI Ventures, L.L.C to assess potential contamination to soil and groundwater. The RI was completed in June 2005 and DNREC approved the final RI report dated December 27, 2005.

Based upon the RI for the Site, a potentially unacceptable risk to human health existed due to exposure to surface soil through excavation at the Site, assuming a commercial/industrial (i.e. restricted) setting. The exposure to groundwater was also unacceptable.

On June 7, 2006, DNREC issued a Proposed Plan of Remedial Action (Proposed Plan), based on the results of the Remedial Investigation/Feasibility Study (RI/FS), which described the remedial actions DNREC had proposed to clean up contamination at the Site. The Proposed Plan called for an environmental covenant be placed on the Property, as described below, and required future groundwater monitoring. DNREC advertised the

EML12085

DE 1322-I-4

Proposed Plan for public comment in the News Journal and Delaware State News from June 7, 2006 through June 27, 2006. DNREC did not receive any public comments regarding the Proposed Plan.

On June 29, 2006, DNREC issued the Final Plan of Remedial Action (Final Plan) for the Ion Power Site. The Final Plan contained DNREC's final determination of the remedial action required to be taken at the Site which was identical to the remedial action contained in the Proposed Plan. All of the remedial actions required by the Final Plan have been completed as follows:

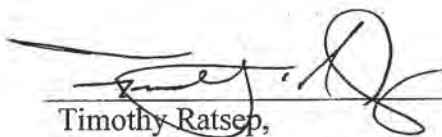
- An Environmental Covenant consistent with the requirements of the Uniform Environmental Covenants Act (UECA), 7 Del. C. Chapter 79, Subchapter II be placed on the property that: (a) prohibits current and future residential use of the Property; (b) prohibits any digging, drilling, excavating, grading, constructing, earth moving, or any other land disturbing activities on the Property without the prior written approval of DNREC; and (c) prohibits the installation of any water well on or use of groundwater at the Site without the prior written approval of DNREC, as well as noting the Site's location within a (proposed) GMZ. *The Environmental Covenant with the activities and use restrictions as stated above was recorded in the Office of the New Castle County Recorder of Deeds on January 14, 2009 at Instrument number 20090114-002162.*
- The Site owner will continue to maintain access for both the United States Environmental Protection Agency and DNREC personnel to sample existing monitoring wells or install additional monitoring wells on the Property, as required. The location of any new monitoring wells will be discussed with the Site owner prior to installation.
- Existing monitoring wells must be maintained in their current locations and disposition. This requirement will apply to any subsequently installed wells.

Based upon its review, DNREC certifies that a remedy consistent with the Delaware Hazardous Substance Cleanup Act and the Regulations Governing Hazardous Substance Cleanup has been completed at the Site, and the Site may be used in any manner consistent with the requirements of the Environmental Covenant as set forth herein. Non-compliance with the Environmental Covenant, which may result in a potential risk to public health, welfare or the environment shall, at DNREC's discretion, render this Certification of Completion of Remedy null and void and may require that additional remedies be performed at the Site.

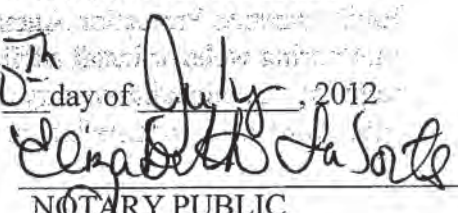
Pursuant to 7 Del. C. Section 9105(e), any person who owns, operates or otherwise controls activities at the Site after the date of issuance of this COCR shall not, by virtue of that later ownership, operation or control, be liable for the release or imminent threat of release addressed in this COCR, or for any future release or imminent threat of release attributable to conditions existing prior to the issuance of this COCR. If circumstances change, or any new information becomes available that relates to the release of a hazardous substance at the Site, DNREC reserves the right to require additional measures to be taken in order to ensure that the remedy is protective of both human health and the environment.

Pursuant to 7 Del. C. § 9115(b), the Owner is required to promptly record this Certification of Completion of Remedy with the Office of the New Castle County Recorder of Deeds.

7/10/2012
Date of Issuance


Timothy Ratsep,
Environmental Program
Administrator
DNREC, Site Investigation
and Restoration Section

SWORN TO AND SUBSCRIBED before me this 10th day of July, 2012


NOTARY PUBLIC

Commission Expires
Upon Office.

ELIZABETH M. LASORTE
NOTARY PUBLIC
STATE OF DELAWARE
My commission expires
upon office

APPENDIX D

Summary of Mass Loading Calculations

MASS LOADING CALCULATION SUMMARY

The following mass loading calculations estimate the effects on the transfer of contaminants in groundwater at Metachem to the Red Lion Creek associated with the proposed development at 750 Governor Lea Road (**Figure 1**). Loading to the creek under existing conditions was estimated based on the formula: Contaminant Mass = Groundwater Concentration * Groundwater Flow. A similar estimate was made using reduced groundwater flow following development that intercepts and redirects stormwater to infiltration systems outside the WRPA area upgradient of Metachem (see **Figure 2** – Mapped Recharge WRPA). The post-development estimate incorporates the estimated loss of infiltration / recharge to the area upgradient of Metachem associated with the development, calculated following the ‘Climatic Water Balance’ procedures outlined in the Delaware Recharge Design Manual, as adopted by New Castle County for the purpose of WRPA supplemental recharge design. The following describes the calculations and assumptions used and summarizes the results of the creek loading calculations.

GROUNDWATER DISCHARGE

Estimating potential contaminant loading to the Red Lion Creek included calculating the volume of groundwater discharge to the creek. The discharge estimates were based on the hydraulic conductivity of the soil, the cross-sectional area of the aquifer discharge boundary with the creek, and the gradient.

Groundwater discharge was calculated using the general form of the Darcy equation:

$$Q = K * i * A$$

where: Q = groundwater discharge
 K = hydraulic conductivity
 i = hydraulic gradient
 A = area through which flow occurs

PRE-DEVELOPMENT DISCHARGE

Based on review of Metachem file documents, including the U.S. EPA’s June 2021 “3rd Five-Year Review Report for Standard Chlorine of Delaware, Inc. Superfund Site” (the 2021 5-YR Report) and August 2007 Final Remedial Investigation Report (2007 RI), shallow groundwater flow would primarily occur in the water table Columbia aquifer sands. Hydraulic conductivity values reported in the RI for Columbia aquifer was typically 70 feet/day (ft/d), ranging from as low as 5 ft/d to as high as 441 ft/d (report excerpt in **Attachment 1**). Ten Bears used a value of 12 ft/d in the loading calculations, on the lower end of the aquifer range for the RI wells, presuming lesser conductivity for the fine-grained bedding of the creek. Based on groundwater elevation mapping in the 2021 5-YR Report, the hydraulic gradient is towards the north at a slope of approximately 0.0067 ft/ft.

According to the 5-YR Report, the slurry containment wall is socketed in a clay confining layer (upper Potomac) at an average depth of 65 feet (average elevation of approximately -25 feet). Based on a mean creek elevation close to 0 feet, the saturated aquifer thickness would be 25 feet. The lineal outcrop (flow-through cross-section) of the downgradient contaminated groundwater at the Metachem site is approximately 1,800 linear feet, as shown on **Figure 3**. Using the resulting area of 45,000 square feet and the above hydraulic conductivity and gradient values, the daily groundwater flux from the site would be approximately 3,600 cubic feet per day (approximately 1,320,000 cubic feet per year). **Table 1** summarizes the discharge calculations.

POST-DEVELOPMENT DISCHARGE

To estimate reduced groundwater flow / discharge associated with the proposed development, Ten Bears calculated the infiltration loss as a result of impervious surfacing. Infiltration loss was estimated following the Climatic Water Balance procedures found in the “**Delaware Ground-Water Recharge Design Manual, Supplement 1 to the Source Water Protection Guidance Manual for the Local Governments of Delaware**” (DNREC/WRA, revised June 2017), hereafter the “Recharge Design Manual.” In accordance with the Recharge Design Manual, existing (Pre-development) hydrologic site conditions were modelled using “Thornthwaite & Mather” Water Balance methodology originally described in Publications in Climatology, Volume X, Number 3, “Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance” (C.W. Thornthwaite and J.R. Mather, 1957). Input values for the variables of mean monthly precipitation for the nearest weather station (Wilmington Airport) were obtained from Table 1 in the 2017 Recharge Design Manual. Runoff Coefficients were found in Table 2 of the Recharge Design Manual, using soil and Hydrologic Soil Group HSG classifications from the USDA Web Soil Survey mapping tool. Values for monthly Potential Evapotranspiration (PE) came from Table 5 of the Recharge Design Manual. The Soil Moisture Storage Capacity, i.e., water storage depth in the soil root zone for the ‘meadow’ land cover in HSG B were obtained from Table 6. Overgrown grass and small trees consistent with the meadow land cover predominates on the site based on visual site observations and recent aerial photographs.

Existing (Pre-development) recharge conditions were evaluated on a month-to-month basis as shown on **Table 2** for meadow vegetation and soils in HSG B. The result of the calculations is the “Percolation” value, which is an estimated quantity of the amount of water available for groundwater recharge each month. Percolation is determined using the Precipitation less the Runoff (called Infiltration) minus the Actual Evapotranspiration (AET) for months with no deficit in which precipitation (inflow) exceeds Potential Evapotranspiration (PET). The total yearly Percolation value of 14.4 inches is the quantity of groundwater recharge per unit of area. A similar water budget referenced in the 2007 RI report estimated annual infiltration at Metachem as 12.5 in/yr, which comports with our findings. Based on 86 percent impervious surfacing (the proposed 84 percent impervious surfacing proposed in the WRPAs zone as shown on the attached Apex Engineering, Inc. plan titled “Application No. 2023-0190: Revised Exploratory Major Land Development Plan for 750 Governor Lea Road” (the ‘Exploratory Plan’) plus a cushion for future design changes during the approval process), roughly equivalent to the on-site area upgradient of the Metachem site, we estimate an annual recharge deficit of 360,000 cubic feet (see **Table 3**).

GROUNDWATER CONTAMINANT CONCENTRATIONS

Total contaminant concentrations in Metachem groundwater samples were obtained from the 2020 sampling event as presented in the 2021 5-YR Report. The average total contaminant concentration of 5.7 milligrams per Liter (mg/L) estimated from data for 17 wells was used in the loading calculations. See **Attachment 2** for contaminant concentrations for individual wells.

LOADING ESTIMATES

Pre- and post-development contaminant loading was estimated using calculated flow and average groundwater concentrations. Results, provided on **Table 1**, indicate pre-development loading of 483 pounds per year and post-development loading at 352 pounds per year, an approximate 27 percent reduction associated with the proposed development project. This total reduction aligns with the proportion of the proposed impervious surfacing of 7.2 acres to the overall Metachem Site drainage area of approximately 27 acres (50 acres total less 23-acre Metachem cap area).

As requested by DNREC, we also evaluated the anticipated timeframe of the loading reductions, using similar methodology. The Darcy equation was used to estimate flow volume changes over time with initial equilibrium outflow, as reduced infiltration lessens volume input and lowers the water table elevation. The resulting calculations (**Table 4** and associated Chart) indicate nearly half the mass loading reduction (13 of 27 percent) occurs in the first year, over 2/3 of the reduction after 2 years (20 of 27 percent), and near-equilibrium (24 of 27 percent) approximately 4 years following construction.

CONCLUSIONS

The results of our mass loading estimates associated with the proposed redevelopment project indicate an approximate 27 percent reduction in mass loading of Metachem groundwater contamination to the Red Lion Creek. The reduction is based on placing impervious surfacing in the WRPA zone of the property, thereby limiting stormwater infiltration upgradient of the Metachem site and associated groundwater flow through the site. This outcome presumes the capture of stormwater runoff from the pavement for redirect to stormwater controls on the eastern and southwestern portions of the property, where infiltration would have minimal affect on groundwater flow through the Metachem Site.

Figure 1 – Site Location Sketch

Figure 2 – Mapped Recharge WRPA

Figure 3 – Mass Loading Flow Section

Attachment 1 - Excerpt from 2007 Standard Chlorine / Metachem Remedial Investigation Report

Attachment 2 – Figure from 2021 FYR Showing Contamination in Individual Wells

Table 1 - Discharge and Loading Estimates

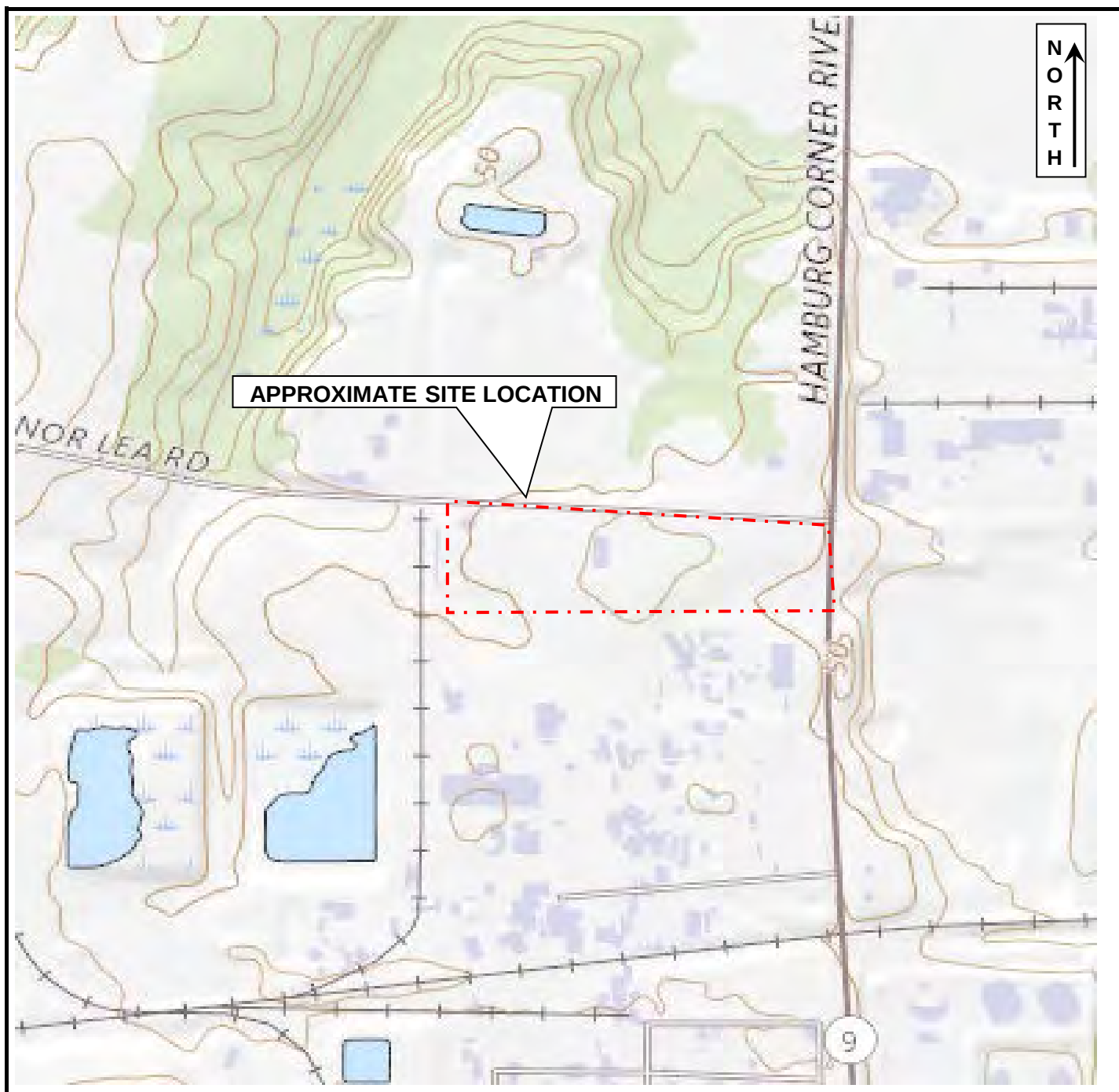
Table 2 - Climatic Water Balance, Pre-development Conditions

Table 3 – Recharge Deficit Calculations

Table 4 – Calculations Summary for Discharge Reduction Over Time

Chart - Discharge (and associated mass) Reduction over Time

FIGURES



NOTE:
THIS LOCATION SKETCH WAS ADOPTED FROM THE USGS TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, FOR ST GEORGES, DELAWARE (2022)



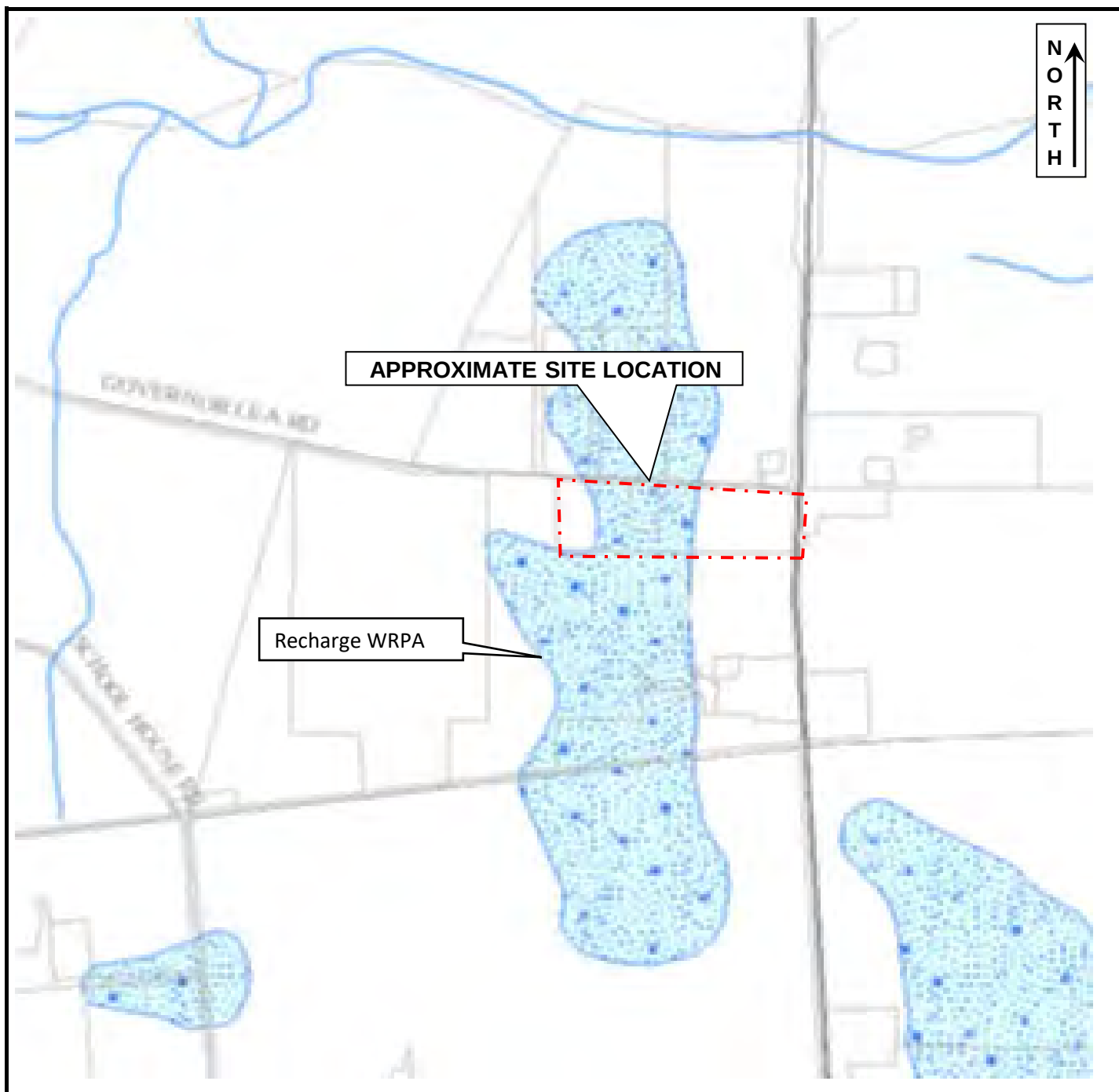
Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

FIGURE 1 - SITE LOCATION SKETCH

750 GOVERNOR LEA ROAD

DELAWARE CITY, DELAWARE

DATE: 6/20/2022	JOB NUMBER: 22-231.B
DRAWN BY: ASK	SCALE: N.T.S.
CHECKED BY: RCG	FIGURE NO: 1
FILE NO: 22-231.B	SHEET 1 OF 1



NOTE:
THIS LOCATION SKETCH WAS ADOPTED FROM THE USGS TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, FOR ST GEORGES, DELAWARE (2022)



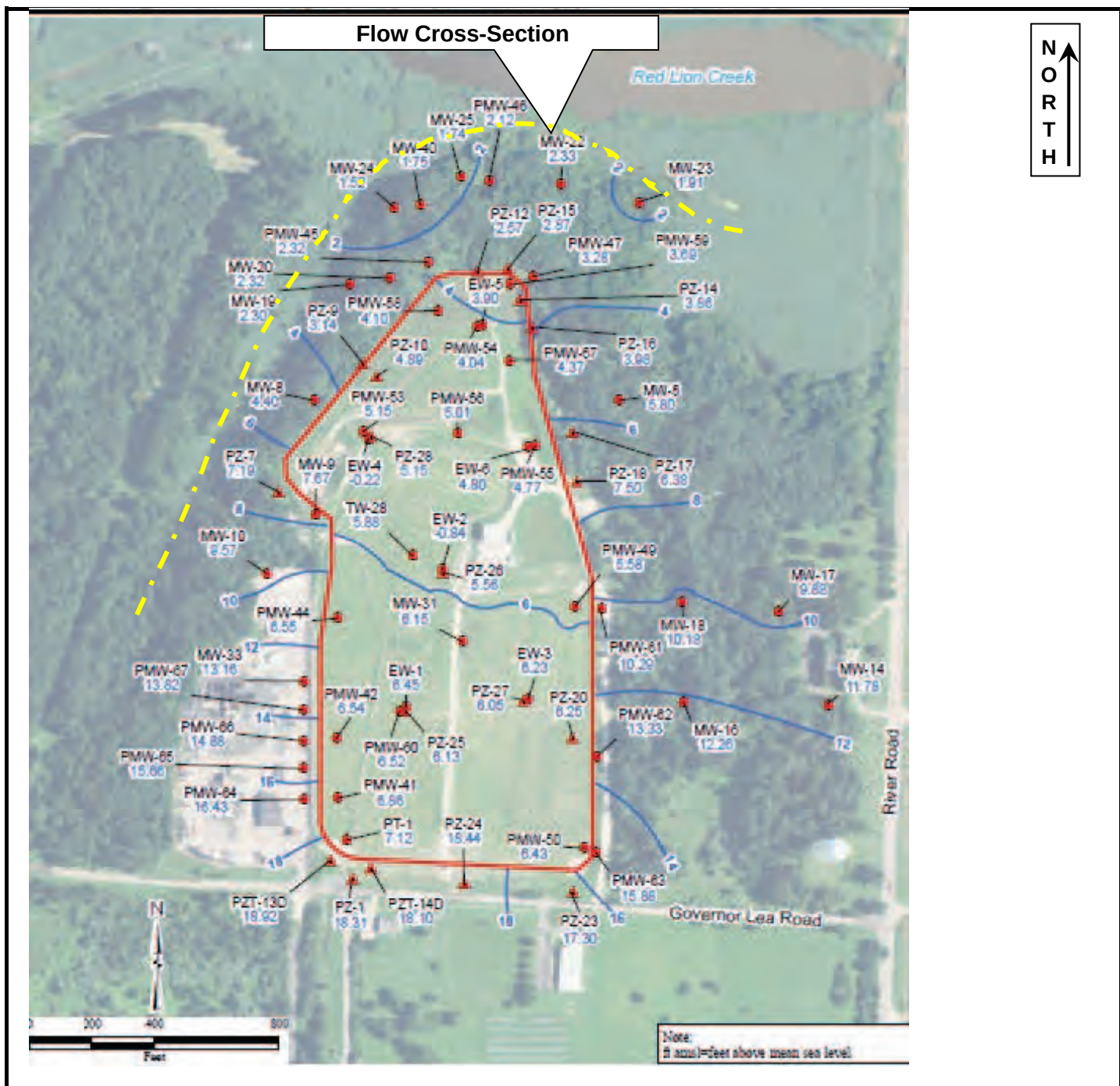
Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

FIGURE 2 - MAPPED RECHARGE WRPA

750 GOVERNOR LEA ROAD

DELAWARE CITY, DELAWARE

DATE: 6/20/2022	JOB NUMBER: 22-231.B
DRAWN BY: ASK	SCALE: N.T.S.
CHECKED BY: RCG	FIGURE NO: 2
FILE NO: 22-231.B	SHEET 1 OF 1



NOTE:
THIS LOCATION SKETCH WAS ADAPTED FROM 2020 GROUNDWATER CONTOUR MAP
FROM EPA 2021 FIVE YEAR REVIEW REPORT FOR STANDARD CHLORINE SITE



Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

FIGURE 3 - Mass-Loading Flow Section

750 GOVERNOR LEA ROAD

DELAWARE CITY, DELAWARE

DATE:	10/1/2022	JOB NUMBER:	22-231.B
DRAWN BY:	RCG	SCALE:	AS SHOWN
CHECKED BY:	RCG	FIGURE NO:	3
FILE NO:	22-231.B	SHEET	1 OF 1

Attachment 1

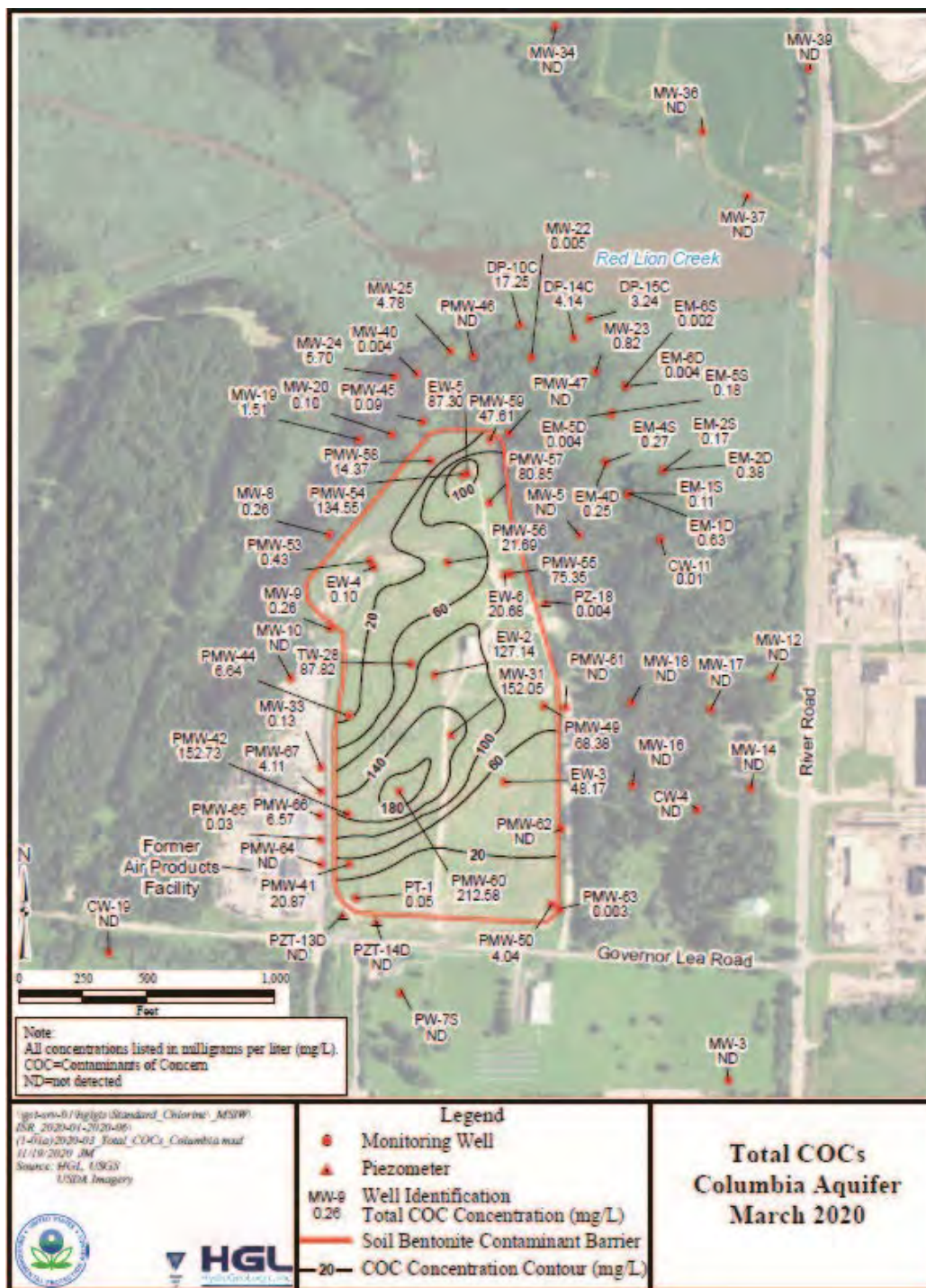
The surface of the groundwater table forms the upper boundary of the Columbia Aquifer and generally occurs at depths ranging from at the ground surface (near the wetlands at Red Lion Creek) to 14 feet MSL at the upland area near the facility. Additionally, the site water level may slightly fluctuate due to seasonal precipitation changes. Groundwater flow in the Columbia Aquifer is towards Red Lion Creek, an unnamed tributary, and the surrounding marsh area. Due to the tide gates, no tidal influence is expected. The average hydraulic gradient of groundwater has ranged from 0.003 feet/foot (CRA, 2000) to 0.007 feet/foot (Weston, 1992) to the north-northeast. The aquifer hydraulic conductivity is estimated to range from 5 to 134 feet per day, but has been observed as high as 184 to 441 feet per day at TW-6 (CRA, 2000). CPT data recently collected as part of the Remedial Design indicated that the Columbia Aquifer has a high conductivity (up to 10^{-6} cm/second) mostly based on the presence of silts and sands (Appendix A). The water level in Red Lion Creek is lower than the adjacent groundwater table in the Columbia Aquifer (4 feet MSL) indicating that there is flow from the Columbia Aquifer into Red Lion Creek and the unnamed tributary.

Groundwater level measurements collected in 2001 during the operation of recovery wells at the site indicated an induced depression that extended along the line of the RW wells at an elevation of 0 feet MSL (CRA 2001). However, since the RW wells are currently inactive, it is assumed that this depression is no longer present. Production flow rates of 10 and 21 gpm were measured in recovery wells RW-1 and RW-4 during the operation of the groundwater collection system (CRA, 2001).

In 2002, DNREC performed an investigation of groundwater levels in 48 wells screened in the Columbia aquifer at the site and adjacent properties. Data from this investigation indicated that Columbia Aquifer groundwater levels were highest (approximately 12 to 15 feet above MSL) at the southern and western portions of the facility and decreased to between 2.5 and 3.5 feet above MSL near Red Lion Creek (Figure 5-2).

2.4.2.2 Merchantville-Upper Potomac Aquitard. The presence of what may be a continuous clay/silty-clay layer associated with the Merchantville and/or the Upper Potomac Formations restricts groundwater flow between the Columbia and Potomac Aquifers at the SCD Site. The Merchantville Formation consists of dark gray to black micaceous clays and silty-clays. Figure 2-2 presents a model of the bottom of the Columbia Formation using the existing boring and well log data. The top of the lower hydraulic conductivity beds of the Merchantville and/or the Upper Potomac Formations range in elevation from 10 feet above MSL to 32 feet below MSL. The top of the lower hydraulic conductivity bed is not planar and is likely unevenly eroded, exposing direct contact between the Columbia and Potomac

Attachment 2



TABLES

TABLE 1 - DISCHARGE AND LOADING ESTIMATES

750 GOVERNOR LEA ROAD
DELAWARE CITY, NEW CASTLE COUNTY, DELAWARE

Calculate Mass Loading from mean concentration and volumetric flow rate, Q

$$Q=kiA$$

where k is hydraulic conductivity

i=hydraulic gradient

A = cross-sectional area of aquifer

k = 12 ft/d (Range for columbia wells at site (range 5 to 441 ft/d) per 2007 Standard Chlorine RI, assumed near bottom of range for interface with fine-grained sediments of creek bottom)

i= 4'/600' 0.007 ft/ft

A = 1800' length x 25' depth (25' depth of water at interface with Creek)

45000 ft² (cross-sectional area of flow through contaminated aquifer outside containment wall - estimated)

$$Q=(12\text{ft/d})*(.0067\text{ft/ft})*(45,000\text{ft}^2)$$

Pre-Development Flow / Loading

3618 ft³/day
365 d/yr
1320570 ft³/yr
64 lb water / ft³
84516480 lb water / yr
5.72 mg/L avg conc.
483 lb. COCs / yr

Post-Development Flow / Loading

3618 ft³/day
365 d/yr
1320570 ft³/yr
(less annual recharge deficit - from Table 3)
360,081 cf/yr
960,489 cf/yr Net 18470.94 cf/wk 80040.75 cf/mo
64 lb water / ft³
61471296 lb water / yr
5.72 mg/L avg conc.
352 lb. COCs / yr

Check vs. Area Reduction

50 acre tot Metachem drainage area
23 ac metachem cap
27 ac Net Drain area with infiltration
7.2 ac development in WRPA
27 % of drainage area

0.27
27 % reduction

TABLE 2
CLIMATIC WATER BALANCE
PRE-DEVELOPMENT CONDITONS
750 Governor Lea Road
Delaware City, New Castle County, Delaware

Pre-development Climatic Water Budget Analysis (inches)													
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly (in.)
Precipitation *	3.23	2.83	4.16	3.51	3.57	4.67	4.41	3.98	4.38	3.68	3.06	3.85	45.33
Runoff Coeff (RC) **	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	
Runoff (RO = RC X P)	0.06	0.06	0.08	0.07	0.07	0.09	0.09	0.08	0.09	0.07	0.06	0.08	0.91
Infiltration (I = P - RO)	3.17	2.77	4.08	3.44	3.50	4.58	4.32	3.90	4.29	3.61	3.00	3.77	44.42
Pot. Evapotranspiration	0.00	0.00	0.62	2.00	3.72	5.25	6.10	5.31	3.74	2.02	0.75	0.00	29.51
I-PE	3.17	2.77	3.46	1.44	-0.22	-0.67	-1.78	-1.41	0.55	1.59	2.25	3.77	14.91
Cum Water Loss	0.00	0.00	0.00	0.00	-0.22	-0.89	-2.67	-4.08	0.00	0.00	0.00	0.00	
Soil Moist Storage Capacity **	12.00	12.00	12.00	12.00	11.78	11.14	9.60	8.53	9.08	10.67	12.00	12.00	
Storage Change (dS) ***	0.00	0.00	0.00	0.00	-0.22	-0.64	-1.54	-1.07	0.55	1.59	1.33	1.09	
Actual Evapotranspiration	0.00	0.00	0.62	2.00	3.72	5.22	5.86	4.97	3.74	2.02	0.75	0.00	28.90
Percolation	3.17	2.77	3.46	1.44	0.00	0.00	0.00	0.00	0.00	0.00	0.92	2.68	14.43

* From Delaware Groundwater Recharge Design Manual, WRA, rev.2017), Table 1, revised for 1990-2020 as provided by New Castle County, for the Wilmington Airport Station

** From Delaware Groundwater Recharge Design Manual, WRA, rev.2017), Table 2 and Table 6

*** from Table 20, Soil Moisture Retention Table - 12 inches, Thornthwaite & Mather, Publications in Climatology, 1957

TABLE 3

Recharge Deficit Calculations

750 Governor Lea Road
Delaware City, New Castle County, Delaware

Request approval for development of up to 6.89 ac impervious (86% total WRPA Area)

(Current Proposed development of 6.73 ac impervious (84% total WRPA Area))

Pre-Development Recharge = 14.43 inch 1.2 ft

WRPA Impervious = 6.89 ac (86% of 8.01-ac WRPA)

WRPA Recharge Deficit = 8.3 ac-ft

Recharge Deficit Vol = 2,693,405 gals or 360,081 cf

i.e., design recharge facility to infiltrate approximately **2.7 million** gallons annually

Total Impervious Recharge Deficit = 758,717 cf (for overall project)

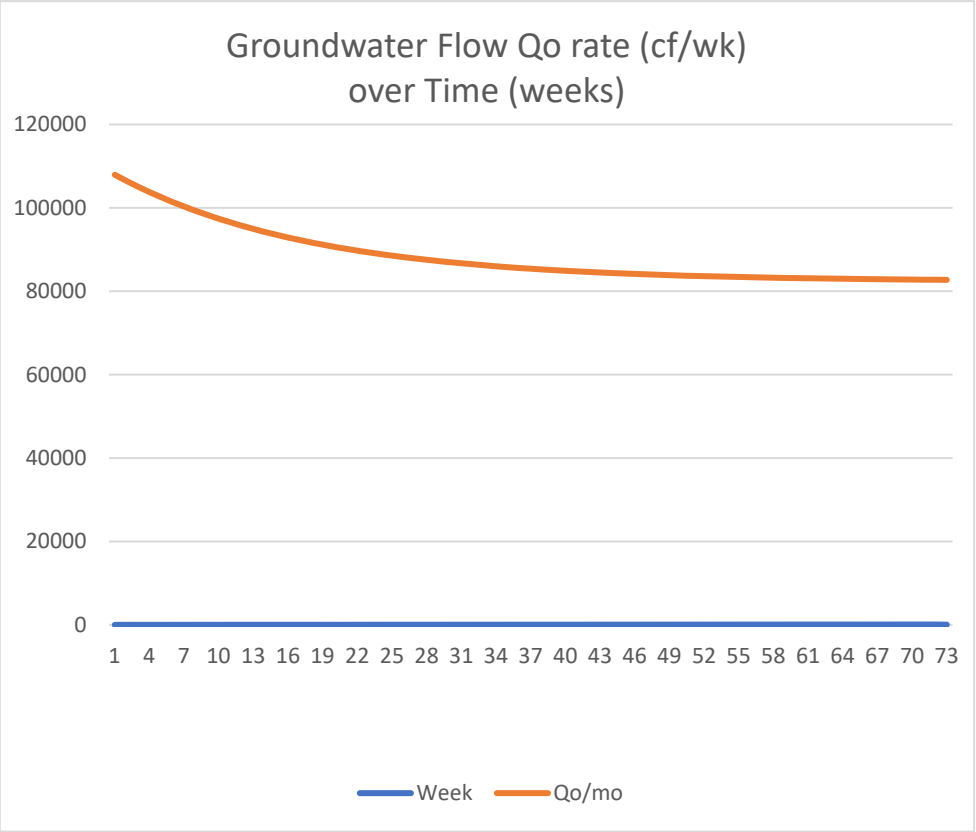
Table 4
Time to Equilibrium Calculations

Week	initial Aq Vol	inflow	outflow	Aq Vol	Aq Ht	i	Qo/mo	
22	4357482.033	80000	88085.06	4349396.976	9.245224	0.005409	87621.04	
23	4349396.976	80000	87621.04	4341775.938	9.229024	0.005382	87183.65	
24	4341775.938	80000	87183.65	4334592.287	9.213754	0.005356	86771.37	0.803644 20% reduction after 24 months
25	4334592.287	80000	86771.37	4327820.92	9.199361	0.005332	86382.74	
26	4327820.92	80000	86382.74	4321438.177	9.185793	0.00531	86016.42	
27	4321438.177	80000	86016.42	4315421.753	9.173005	0.005288	85671.13	
28	4315421.753	80000	85671.13	4309750.624	9.16095	0.005268	85345.65	
29	4309750.624	80000	85345.65	4304404.973	9.149587	0.005249	85038.85	
30	4304404.973	80000	85038.85	4299366.12	9.138876	0.005231	84749.66	
31	4299366.12	80000	84749.66	4294616.457	9.12878	0.005215	84477.07	
32	4294616.457	80000	84477.07	4290139.388	9.119264	0.005199	84220.12	
33	4290139.388	80000	84220.12	4285919.267	9.110293	0.005184	83977.92	
34	4285919.267	80000	83977.92	4281941.347	9.101838	0.00517	83749.62	
35	4281941.347	80000	83749.62	4278191.729	9.093867	0.005156	83534.42	
36	4278191.729	80000	83534.42	4274657.31	9.086355	0.005144	83331.57	0.771785 23% reduction after 36 months
37	4274657.31	80000	83331.57	4271325.738	9.079273	0.005132	83140.37	
38	4271325.738	80000	83140.37	4268185.372	9.072598	0.005121	82960.13	
39	4268185.372	80000	82960.13	4265225.238	9.066305	0.005111	82790.25	
40	4265225.238	80000	82790.25	4262434.992	9.060374	0.005101	82630.11	
41	4262434.992	80000	82630.11	4259804.885	9.054784	0.005091	82479.16	
42	4259804.885	80000	82479.16	4257325.725	9.049514	0.005083	82336.88	
43	4257325.725	80000	82336.88	4254988.849	9.044547	0.005074	82202.76	
44	4254988.849	80000	82202.76	4252786.091	9.039864	0.005066	82076.34	
45	4252786.091	80000	82076.34	4250709.755	9.035451	0.005059	81957.17	
46	4250709.755	80000	81957.17	4248752.583	9.031291	0.005052	81844.85	
47	4248752.583	80000	81844.85	4246907.738	9.027369	0.005046	81738.97	
48	4246907.738	80000	81738.97	4245168.772	9.023673	0.005039	81639.16	0.756111 24% reduction after 48 months
49	4245168.772	80000	81639.16	4243529.609	9.020188	0.005034	81545.09	(effective equilibrium)
50	4243529.609	80000	81545.09	4241984.522	9.016904	0.005028	81456.41	
51	4241984.522	80000	81456.41	4240528.11	9.013808	0.005023	81372.83	
52	4240528.11	80000	81372.83	4239155.284	9.01089	0.005018	81294.04	
53	4239155.284	80000	81294.04	4237861.248	9.00814	0.005014	81219.77	

Table 4
Time to Equilibrium Calculations

Week	initial Aq Vol	inflow	outflow	Aq Vol	Aq Ht	i	Qo/mo	
54	4237861.248	80000	81219.77	4236641.48	9.005547	0.005009	81149.76	
55	4236641.48	80000	81149.76	4235491.716	9.003103	0.005005	81083.78	
56	4235491.716	80000	81083.78	4234407.94	9.000799	0.005001	81021.58	
57	4234407.94	80000	81021.58	4233386.364	8.998628	0.004998	80962.95	
58	4233386.364	80000	80962.95	4232423.418	8.996581	0.004994	80907.68	
59	4232423.418	80000	80907.68	4231515.738	8.994651	0.004991	80855.59	
60	4231515.738	80000	80855.59	4230660.152	8.992833	0.004988	80806.48	0.748399 25% reduction after 60 months
61	4230660.152	80000	80806.48	4229853.669	8.991118	0.004985	80760.2	
62	4229853.669	80000	80760.2	4229093.472	8.989503	0.004983	80716.57	
63	4229093.472	80000	80716.57	4228376.905	8.987979	0.00498	80675.44	
64	4228376.905	80000	80675.44	4227701.463	8.986544	0.004978	80636.68	
65	4227701.463	80000	80636.68	4227064.786	8.98519	0.004975	80600.14	
66	4227064.786	80000	80600.14	4226464.649	8.983915	0.004973	80565.69	
67	4226464.649	80000	80565.69	4225898.955	8.982712	0.004971	80533.23	
68	4225898.955	80000	80533.23	4225365.727	8.981579	0.004969	80502.62	
69	4225365.727	80000	80502.62	4224863.103	8.98051	0.004968	80473.78	
70	4224863.103	80000	80473.78	4224389.325	8.979503	0.004966	80446.59	
71	4224389.325	80000	80446.59	4223942.739	8.978554	0.004964	80420.96	
72	4223942.739	80000	80420.96	4223521.783	8.977659	0.004963	80396.8	0.744605 26% reduction after 72 months

CHART



APPENDIX E

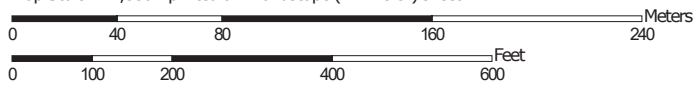
Soils Map and Descriptions

Soil Map—New Castle County, Delaware



Soil Map may not be valid at this scale.

Map Scale: 1:2,880 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

5/9/2024
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: New Castle County, Delaware

Survey Area Data: Version 18, Sep 12, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 5, 2022—Jul 4, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HkB	Hanbrook-Urban land complex, 0 to 5 percent slopes	1.5	7.2%
ReA	Reybold silt loam, 0 to 2 percent slopes	3.9	19.3%
ReB	Reybold silt loam, 2 to 5 percent slopes	14.1	69.2%
SaD	Sassafras sandy loam, 10 to 15 percent slopes	0.5	2.6%
Up	Urban land	0.3	1.7%
Totals for Area of Interest		20.4	100.0%



New Castle County, Delaware

HkB—Hambrook-Urban land complex, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2p7fj

Elevation: 0 to 260 feet

Mean annual precipitation: 40 to 48 inches

Mean annual air temperature: 52 to 58 degrees F

Frost-free period: 180 to 250 days

Farmland classification: Not prime farmland

Map Unit Composition

Hambrook and similar soils: 45 percent

Urban land: 35 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hambrook

Setting

Landform: Depressions, knolls, fluviomarine terraces, flats

Landform position (three-dimensional): Rise

Down-slope shape: Concave, convex, linear

Across-slope shape: Concave, convex, linear

Typical profile

Ap - 0 to 10 inches: sandy loam

BE - 10 to 14 inches: loam

Bt - 14 to 28 inches: sandy clay loam

BC - 28 to 65 inches: loamy sand

2Cg - 65 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to high (0.20 to 1.98 in/hr)

Depth to water table: About 40 to 72 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: B

Ecological site: F149AY170MD - Well Drained Fine-Loamy Upland

Hydric soil rating: No

Description of Urban Land

Setting

Landform: Flats

Down-slope shape: Linear

Across-slope shape: Linear

Minor Components

Udorthents

Percent of map unit: 10 percent

Hydric soil rating: No

Hammonton

Percent of map unit: 5 percent

Landform: Flats

Ecological site: F149AY130NJ - Moist Loamy Upland

Hydric soil rating: No

Sassafras

Percent of map unit: 3 percent

Landform: Knolls, flats

Ecological site: F149AY170MD - Well Drained Fine-Loamy Upland

Hydric soil rating: No

Woodstown

Percent of map unit: 2 percent

Landform: Flats

Ecological site: F149AY130NJ - Moist Loamy Upland

Hydric soil rating: No

Data Source Information

Soil Survey Area: New Castle County, Delaware

Survey Area Data: Version 18, Sep 12, 2023

New Castle County, Delaware

ReA—Reybold silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2p7g6

Elevation: 10 to 120 feet

Mean annual precipitation: 42 to 48 inches

Mean annual air temperature: 52 to 59 degrees F

Frost-free period: 180 to 220 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Reybold and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Reybold

Setting

Landform: Flats, interfluves

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: High silt loamy eolian deposits over fluviomarine deposits

Typical profile

Ap - 0 to 10 inches: silt loam

Bt - 10 to 30 inches: silt loam

2BC - 30 to 39 inches: gravelly coarse sandy loam

2C - 39 to 80 inches: gravelly coarse sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to high (0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 1

Hydrologic Soil Group: B

Ecological site: F149AY170MD - Well Drained Fine-Loamy Upland

Hydric soil rating: No

Minor Components

Sassafras

Percent of map unit: 10 percent

Landform: Knolls, flats

Ecological site: F149AY170MD - Well Drained Fine-Loamy Upland

Hydric soil rating: No

Matapeake

Percent of map unit: 5 percent

Landform: Flats

Ecological site: F153CY030MD - Well Drained Loess Upland

Hydric soil rating: No

Unicorn

Percent of map unit: 5 percent

Landform: Swales, flats

Ecological site: F153DY160NJ - Well Drained Coarse-Loamy Upland

Hydric soil rating: No

Queponco

Percent of map unit: 5 percent

Landform: Swales, flats

Ecological site: F149AY170MD - Well Drained Fine-Loamy Upland

Hydric soil rating: No

Data Source Information

Soil Survey Area: New Castle County, Delaware

Survey Area Data: Version 18, Sep 12, 2023

New Castle County, Delaware

ReB—Reybold silt loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2p7g7

Elevation: 10 to 120 feet

Mean annual precipitation: 42 to 48 inches

Mean annual air temperature: 52 to 59 degrees F

Frost-free period: 180 to 220 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Reybold and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Reybold

Setting

Landform: Interfluves, flats

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: High silt loamy eolian deposits over fluviomarine deposits

Typical profile

Ap - 0 to 10 inches: silt loam

Bt - 10 to 30 inches: silt loam

2BC - 30 to 39 inches: gravelly coarse sandy loam

2C - 39 to 80 inches: gravelly coarse sandy loam

Properties and qualities

Slope: 2 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to high (0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: B

Ecological site: F149AY170MD - Well Drained Fine-Loamy Upland

Hydric soil rating: No

Minor Components

Sassafras

Percent of map unit: 10 percent

Landform: Knolls, flats

Ecological site: F149AY170MD - Well Drained Fine-Loamy Upland

Hydric soil rating: No

Unicorn

Percent of map unit: 5 percent

Landform: Swales, flats

Ecological site: F153DY160NJ - Well Drained Coarse-Loamy Upland

Hydric soil rating: No

Queponco

Percent of map unit: 5 percent

Landform: Swales, flats

Ecological site: F149AY170MD - Well Drained Fine-Loamy Upland

Hydric soil rating: No

Matapeake

Percent of map unit: 5 percent

Landform: Flats

Ecological site: F153CY030MD - Well Drained Loess Upland

Hydric soil rating: No

Data Source Information

Soil Survey Area: New Castle County, Delaware

Survey Area Data: Version 18, Sep 12, 2023

New Castle County, Delaware

SaD—Sassafras sandy loam, 10 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2p7fd

Elevation: 0 to 330 feet

Mean annual precipitation: 42 to 48 inches

Mean annual air temperature: 52 to 58 degrees F

Frost-free period: 180 to 220 days

Farmland classification: Not prime farmland

Map Unit Composition

Sassafras and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sassafras

Setting

Landform: Fluviomarine terraces, knolls, low hills, hillslopes

Landform position (three-dimensional): Riser, dip

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Typical profile

Ap - 0 to 9 inches: sandy loam

E - 9 to 15 inches: sandy loam

Bt - 15 to 30 inches: loam

BC - 30 to 37 inches: sandy loam

C - 37 to 80 inches: loamy sand

Properties and qualities

Slope: 10 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: F149AY170MD - Well Drained Fine-Loamy Upland

Hydric soil rating: No

Minor Components

Downer

Percent of map unit: 10 percent

Landform: Fluvio-marine terraces, knolls, flats

Ecological site: F153DY160NJ - Well Drained Coarse-Loamy
Upland

Hydric soil rating: No

Evesboro

Percent of map unit: 5 percent

Landform: Flats, dunes, fluvio-marine terraces, knolls

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Ecological site: F153DY170NJ - Sandy, Excessively Drained
Upland

Hydric soil rating: No

Ingleside

Percent of map unit: 5 percent

Landform: Depressions, flats, fluvio-marine terraces

Landform position (three-dimensional): Talf

Down-slope shape: Concave, linear

Across-slope shape: Concave, linear

Ecological site: F153DY160NJ - Well Drained Coarse-Loamy
Upland

Hydric soil rating: No

Zekiah

Percent of map unit: 5 percent

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R149AY060DE - Wet Alluvial Floodplain

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: New Castle County, Delaware

Survey Area Data: Version 18, Sep 12, 2023

New Castle County, Delaware

Up—Urban land

Map Unit Setting

National map unit symbol: 2p7dx

Elevation: 0 to 300 feet

Mean annual precipitation: 42 to 48 inches

Mean annual air temperature: 52 to 58 degrees F

Frost-free period: 180 to 220 days

Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Flats

Down-slope shape: Linear

Across-slope shape: Linear

Minor Components

Udorthents, loamy

Percent of map unit: 10 percent

Landform: Broad interstream divides

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

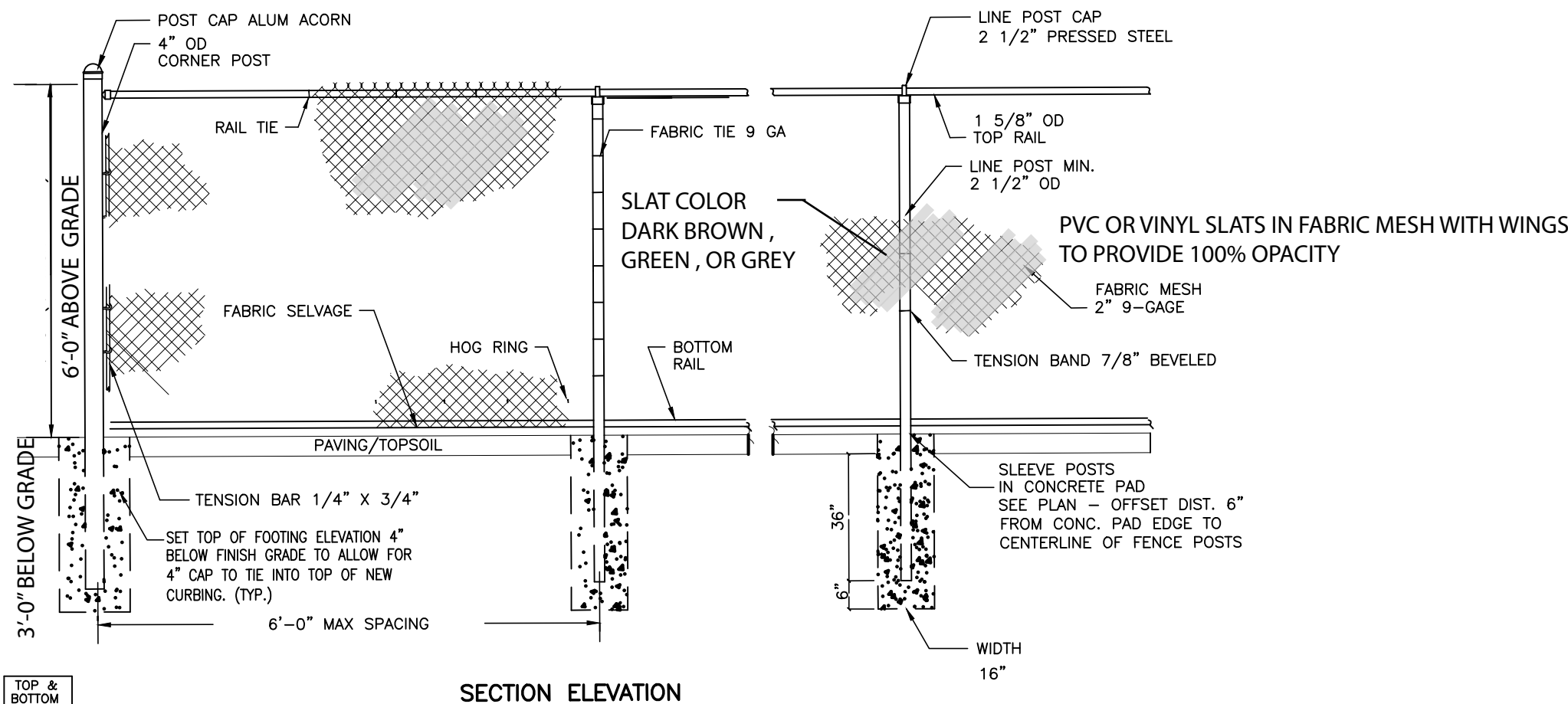
Data Source Information

Soil Survey Area: New Castle County, Delaware

Survey Area Data: Version 18, Sep 12, 2023

APPENDIX F

Draft Concept – Landscape Plan



- NOTES:
- FENCE SPECS: CONTRACTOR MUST SUBMIT SHOP DRAWINGS AND SPECS FOR ALL PROPOSED FENCING AND GATES
 - FENCE COLOR: CHAINLINK FENCING SHALL BE PVC COATED, COLOR BLACK.

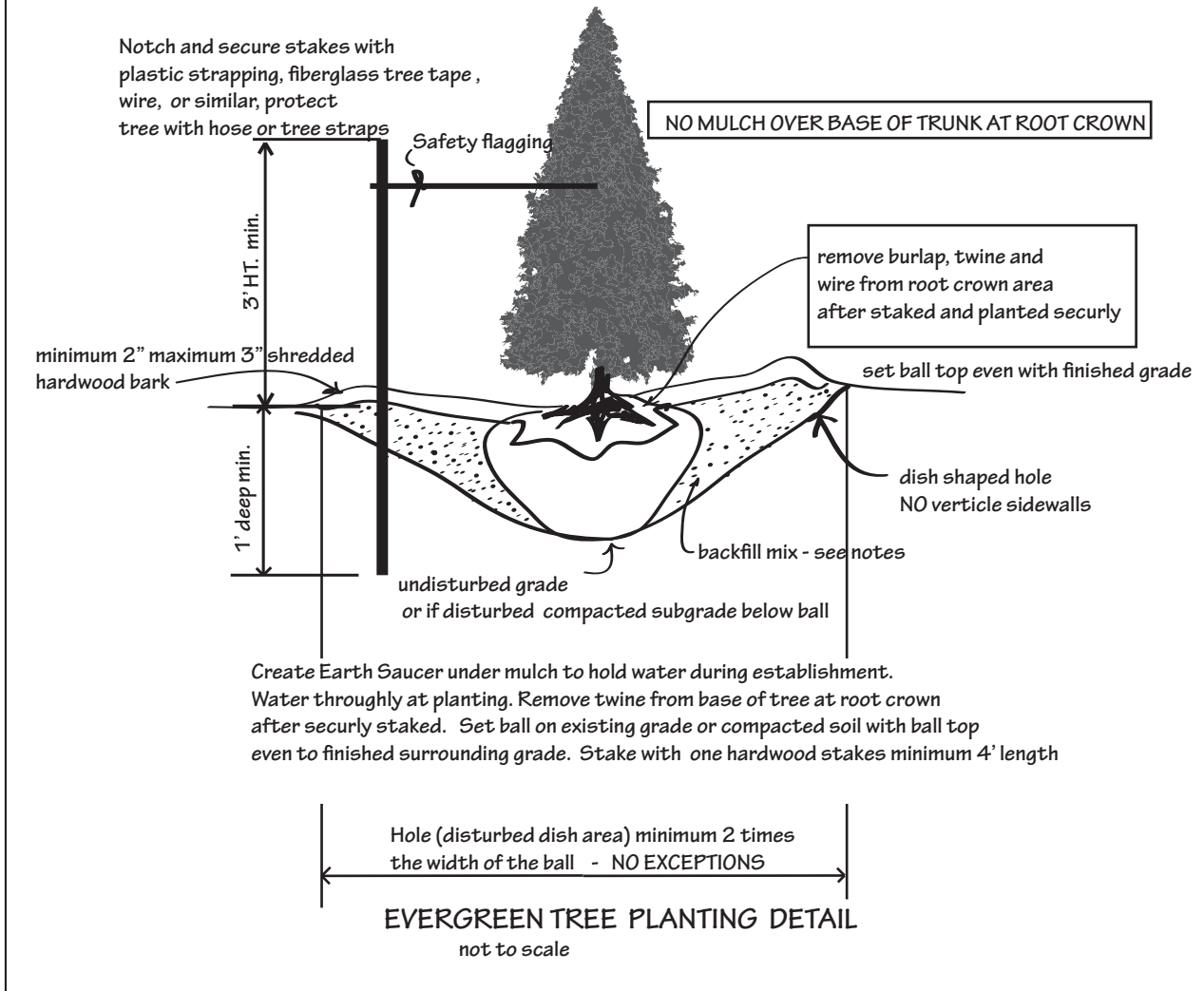
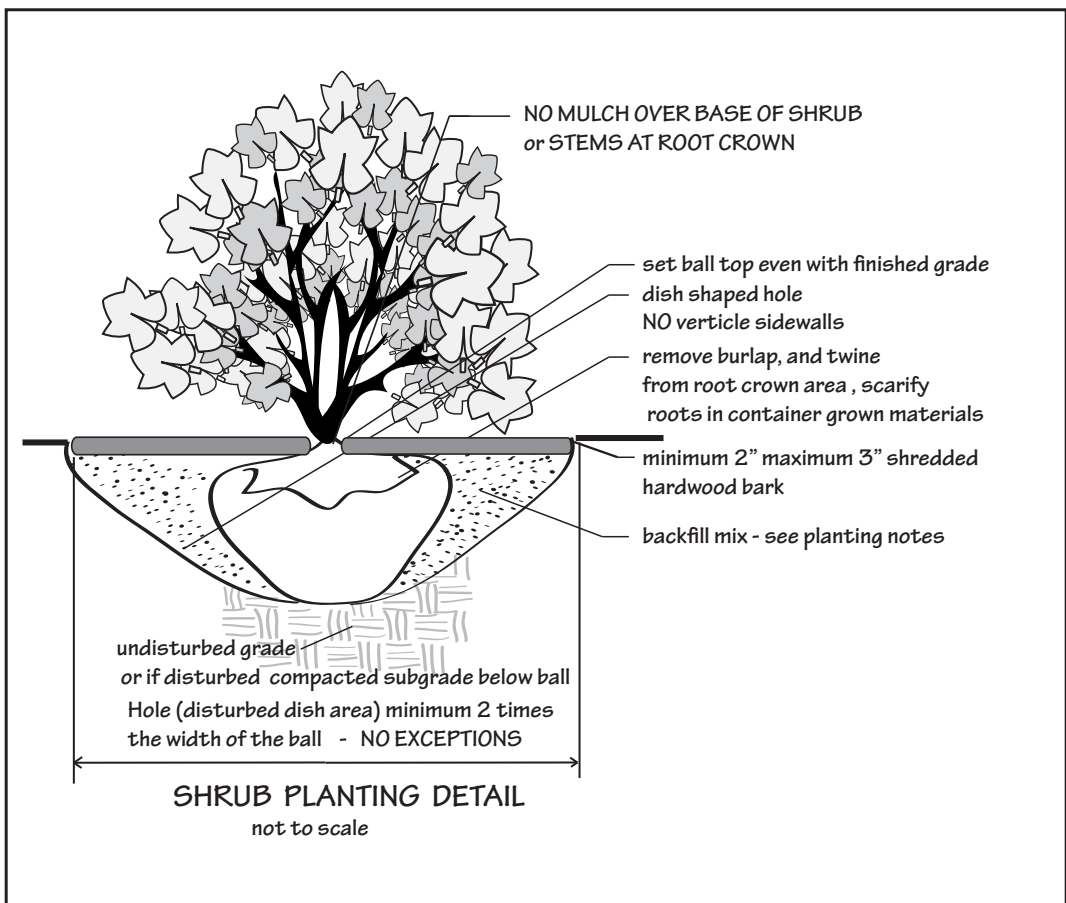
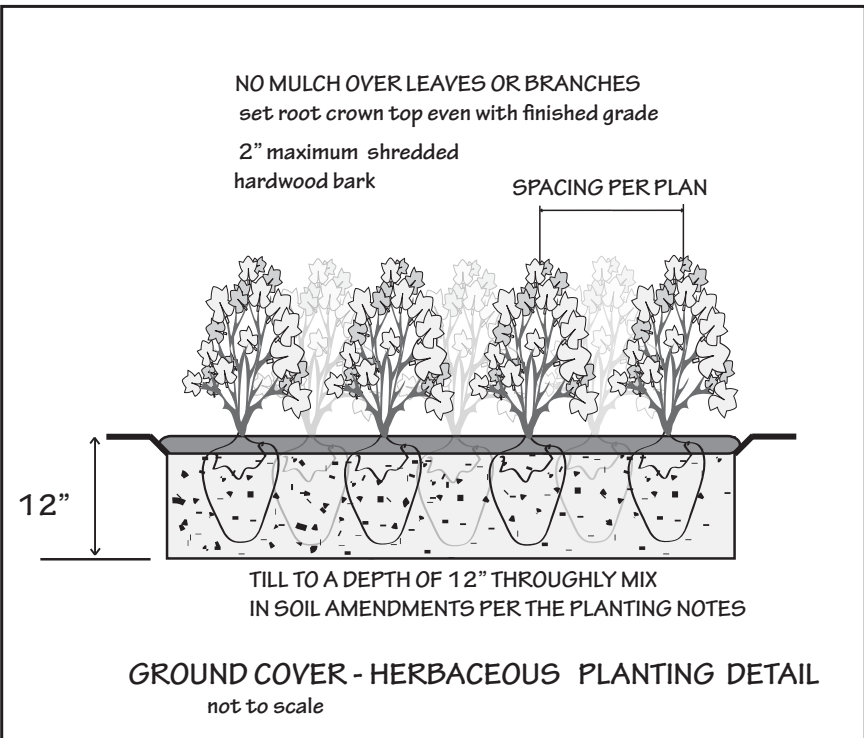
CHAIN LINK FENCE 6' HEIGHT WITH WINGED SLATS - 100% OPAQUE

FIELD LOCATE ALL UTILITIES PRIOR TO DIGGING
ADJUST LOCATIONS OF PLANTINGS TO AVOID CONFLICTS WITH
DRAINAGE, UTILITIES, STRUCTURES, AND VEGETATION TO REMAIN.
IF SOILS UNSUITABLE FOR PLANTING AND PROPER PLANT ESTABLISHMENT
ARE ENCOUNTERED, STOP PLANTING AND NOTIFY THE OWNER AND LANDSCAPE ARCHITECT.

PLANTING AND CONSTRUCTION OPERATIONS SHALL CONFORM TO
ALL LOCAL STATE AND FEDERAL SAFETY, ENVIRONMENTAL LAWS. CONTRACTORS ARE
RESPONSIBLE FOR ALL PERMITS AND SUBMISSIONS REQUIRED FOR THE WORK.



NO MULCH MOUNDS
OVER TREE OR SHRUB
TRUNKS OR STEMS



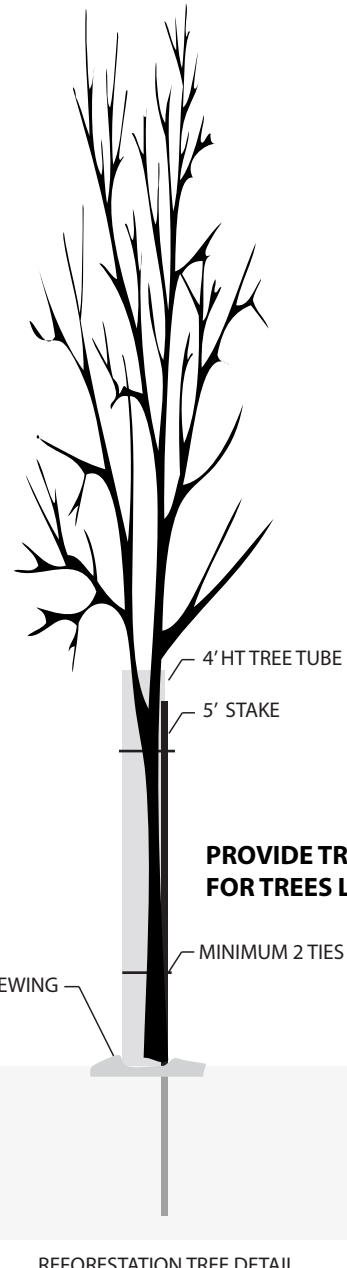
- PLANTING NOTES:
- PLANT IN ACCORDANCE WITH THE STANDARDS AS SET FORTH BY THE AMERICAN ASSOCIATION OF NURSERYMEN, AND THE AMERICAN STANDARD FOR NURSERY STOCK.
 - LOCATE OVERHEAD AND UNDERGROUND UTILITIES PRIOR TO PLANTING. FIELD ADJUST PLANT LOCATIONS AS NEEDED TO AVOID CONFLICT WITH SWALES, PIPES, DRAINAGE STRUCTURES, WIRES, UTILITY BOXES TRANSFORMERS, EXISTING VEGETATION THAT REMAINS, ETC. STOP PLANTING AND CONTACT THE LANDSCAPE ARCHITECT AND OWNER IF SOIL CONDITIONS ARE ENCOUNTERED THAT ARE UNSUITABLE FOR PROPER PLANT GROWTH.
 - FIELD LOCATION PLANTS TO AVOID CONFLICT WITH SWALES, DRAINAGE AND UTILITIES ABOVE AND BELOW GROUND, EXISTING VEGETATION ETC.
 - PLANTING BACKFILL MIX: ONE PART PEAT HUMUS, TO ONE PART TOPSOIL TO ONE PART EXISTING SOIL. AMENDMENTS: MIX INTO SOIL PRIOR TO BACKFILLING, .25 LBS ORGANIC FERTILIZER 5-10-5 ORGANIC FERTILIZER .75 LBS OF BONE MEAL, AND 1 LB OF ORGANIC DECOMPOSED COW MANURE PER CUBIC FOOT OF BACKFILL. SET BALL OR CONTAINER SOIL TOP EVEN WITH FINISHED GRADE.
 - THE QUANTITIES OF PLANTS ON THE PLAN DRAWING FOR CODE REQUIRED AREAS SHALL REMAIN WITH THE SPECIFIC AREA (IE: BUFFERYARDS, PARKING AREAS ETC) BUT SHALL BE FIELD LOCATED TO AVOID UTILITIES OR OBSTRUCTIONS AND SHALL GOVERN OVER THE SCHEDULE TO MEET MINIMUM CODE REQUIREMENTS.

REFORESTATION

The area around each tree shall be mulched. The entire area may be mulched or seeded in a perennial grass mix with a minimum thirty (30) percent indigenous herbaceous forest, or grassland species - see specified seed mix.
Trees shall be selected to provide a diversity of native plants.
All plants and trees used for reforestation must consist only of species native and indigenous to Delaware. Selected plants and trees may not include cultivars or hybrids of species or State rare or endangered species.
Plants and trees shall be selected and arranged within the reforestation area in accordance with site conditions.
Reforestation plantings shall include a minimum of six (6) species.
Where more than two hundred (200) trees are provided, a minimum of eight (8) species shall be used; no one (1) species shall have less than five (5) or more than twenty (20) percent of the total trees.
All trees shall be staked and or flagged for visibility to discourage being mowed over as follows:
trees 3.4\" - 1.5\" cal. one six foot stake with flag each - whips - one 3\" stake with flag - seedlings one 2\" stake with flag
Provide deer protection in areas of heavy deer browse.

Perpetual Maintenance
Remove invasive plants while protecting reforestation plantings - see note this sheet for invasive removals and native grass establishment.
Facilitate the establishment of a leaf-litter layer on the ground within the reforestation area
- when the tree canopies shade out the grass and the opportunity to allow invasive plants to germinate
no not mow the area and utilize the leaf layer for ground coverage.

The survival rate for reforestation areas shall be a minimum of one hundred (100) trees per acre or at least seventy-five (75) percent of the total number of trees planted per acre under the approved plan, whichever is greater.
Replanting shall be required to meet this minimum standard for sites where the survival threshold is not met.
Infill planting also may be required where planting fails in large contiguous areas, resulting in tree spacing greater than twenty five (25) feet.



PROVIDE TRUNK PROTECTION FROM DEER
FOR TREES LESS THAN 2\" CAL.

TREES SELECT 278 TREES FROM THIS LIST WITH
NO MORE THAN 20 OF ANY ONE SPECIES .
MINIMUM SIZE 1.5\" CAL. (184)
INCREASE TO 2\" CAL. FOR BUFFER TREES (63) KEY -RFB
INCREASE TO 3\" CAL. FOR STREET TREES (31) KEY -RFB (SEE PLAN FOR LOCATIONS)

NATIVE TREES - SELECTION LIST

Hophornbeam - Ostrya virginiana
Ironwood - Carpinus caroliniana
Red Maple - Acer rubrum
Sweet Birch Betula lenta
River Birch- Betula nigra
Willow Oak - Quercus phellos
Black gum - Nyssa sylvatica
Sweetgum- Liquidambar styraciflua
Yellowwood - Cladrastis kentukea
Honeylocust - Gleditsia triacanthos
Bald Cypress - Taxodium distichum
Tuliptree - Liriodendron tulipifera
Sycamore - Platanus occidentalis
Bur Oak - Quercus macrocarpa
White Oak - Quercus alba
American Beech - Fagus grandifolia
Virginia Pine - Pinus virginiana
Red cedar - Juniperus virginiana
Eastern Arborvitae - Thuja occidentalis
American Holly -Ilex opaca
Southern Magnolia- Magnolia grandiflora

PLANTING SCHEDULE

TYPE KEY # BOTANICAL AND COMMON NAME MINIMUM SIZE
Note: Substitutions or variations of any kind from the materials specified requires Landscape Architect's written approval prior to installation

ST	CCA	10	CARPINUS CAROLINIANA PALISADE- PALISADE AMERICAN HORNBEAM	3.0\" CAL. BB
T	ARC	4	ACER RUBRUM 'ARMSTRONG'- COLUMNAR RED MAPLE	2.0\" CAL. BB
T	AR	10	ACER RUBRUM RED SUNSET - RED SUNSET MAPLE	2.0\" CAL. BB
T	CK	4	CLEDRASTIS KENTUCKEA - YELLOW WOOD	2.0\" CAL. BB
T	GT	5	GLEDITSIA TRIACANTHOS INERMIS SHADEMASTER- HONEY LOCUST	2.0\" CAL. BB
T	NS	7	NYSSA SYLVATICA 'GREEN GABLE'- GREEN GABLE BLACK TUPELO	2.0\" CAL. BB
T	UA	3	ULMUS AMERICANA 'PRINCETON'- PRINCETON AMERICAN ELM	2.0\" CAL. BB
ALTERNATE CLTVRS. AMERICAN LIBERTY DELAWARE INDEPENDENCE NEW HARMONY VALLEY FORGE				

O	BN	4	BETULA NIGRA 'HERITAGE' - HERITAGE RIVER BIRCH	8'-10' 1.5\" CAL. MULTI STEM BB
O	MV	2	MAGNOLIA VIRGINIANA 'MOONGLOW'- JIM WILSON'-MOONGLOW MAGNOLIA	8'-10' 1.5\" CAL. MULTI STEM BB
O	MG	3	MAGNOLIA GRANDIFLORA BRACKENS BROWN BEAUTY - MAGNOLIA	8'-10' 1.5\" CAL. MULTI STEM BB

E	IO*	4	ILEX OPACA 'JERSEY PRINCESS'- FEMALE AMERICAN HOLLY (1- ILEX OPACA 'JERSEY KNIGHT'- MALE AMERICAN HOLLY)	5'-6' BB
E	JV	7	JUNIPERUS VIRGINIANA EMERALD SENTINEL - E.S. JUNIPER	5'-6' BB
E	TO	3	THUJA OCCIDENTALIS 'EMERALD'- NARROW ARBORVITAE	5'-6' BB

S	AM	41	ARONIA MELANOCARPA LOWSCAPE 'SNOWFIRE'- SNOWFIRE DWARF CHOKE BERRY	18\" - 24\" CONT.
S	DV	33	DIERVIELLA X KODIAK ORANGE- BUSH HONEY SUCKLE	18\" - 36\" CONT.
S	DVB	20	DIERVIELLA X KODIAK BLACK- BUSH HONEY SUCKLE	18\" - 36\" CONT.
S	IG	20	ILEX GLABRA COMPACTA - INKBERRY	18\" - 36\" CONT.
S	IVG*	20	ILEX VERTICILLATA WINTER GOLD - GOLD WINTER BERRY	18\" - 36\" CONT.
S	IVB*	20	ILEX VERTICILLATABERRY POPPINS - BERRY POPPINS WINTER BERRY	18\" - 36\" CONT.

* HOLLY POLLINATORS - PROVIDE 10% MALE POLLINATOR PLANTS OF THE SAME SPECIES IN SHRUB GROUPS

S	ITM	49	ITEA VIRGINICUS 'MERLOT'- MERLOT VIRGINIA SWEETSPIRE	18\" - 36\" CONT.
S	LF	21	LEUCOTHOE FONTAINIASIANA 'RAINBOW'- RAINBOW DROOPING FETTERBUSH	18\" - 24\" CONT.
S	PHY	47	PHYSOCARPIS OPULIFOLIUS 'TINY WINE'- DWARF NINEBARK	18\" - 36\" CONT.
S	VDC	34	VIBURNUM DENTATUM 'CHICAGO LUSTRE (R)' - ARROW WOOD	18\" - 36\" CONT.
S	VO	30	VIBURNUM OPULUS NANUM - DWARF CRANBERRY VIBURNUM	18\" - 24\" CONT.
X	XX	-	NOTE PLAN DRAWING FOR PLANT MATERIAL QUANTITIES IN REQUIREMENT AREAS SHALL SUPERSEDE THE SCHEDULE	

KEY - T = TREE, E = EVERGREEN TREE ST = STREET TREE O = UNDERSTORY TREE S = SHRUB P = PERENNIAL
G = GRASSES, GC = GROUND COVER H = HERBACEOUS RF = REFORESTATION B = BULBS V = VINES

The source of all plant material for the site shall be from within one whole number hardiness zone as defined by the United States Department of Agriculture (USDA) of the zone that covers the majority of New Castle County.
The handling, planting and perpetual maintenance of all tree and plant material shall conform to Tree Care Industry Association ANSI A300-2011 standards.
ALL TREES MUST BE PLANTED PER THE DETAIL INCULDING SOIL AMENDMENTS - MULCHED - STAKED - GUYED AND WATERED WHEN INSTALLED

Designs
1901 Hickory Hill Road
Chadds Ford PA 19317
610-348-7786

ellentrayceDESIGNSetc@gmail.com

LOCATE OVERHEAD AND UNDERGROUND UTILITIES PRIOR TO PLANTING.
FIELD ADJUST PLANT LOCATIONS AS NEEDED TO AVOID CONFLICT WITH
SWALES, PIPES, DRAINAGE STRUCTURES, WIRES, UTILITY BOXES,
TRANSFORMERS, EXISTING VEGETATION THAT REMAIN, ETC. STOP PLANTING
AND CONTACT THE LANDSCAPE ARCHITECT AND OWNER IF SOIL CONDITIONS
ARE ENCOUNTERED THAT ARE UNSUITABLE FOR PROPER PLANT GROWTH.
PLANT QUANTITIES ON THE PLAN DRAWING SHALL SUPERSEDE THE
SCHEDULE WHERE NEEDED TO MEET MINIMUM CODE REQUIREMENTS.

REV.	DATE	COMMENT	CHECKED

REFERENCE LIST - INVASIVE PLANTS

INVASIVE WOODY SHRUBS & VINES

Buddleia davidii Butterflybush
Celastrus orbiculatus Oriental Bittersweet
Clematis terniflora Sweet Autumn Clematis
Elaeagnus angustifolia Russian Olive
Elaeagnus umbellata Autumn Olive
Euonymus alata Winged Euonymus
Euonymus fortunei Wintercreeper
Hedera helix English Ivy
Hedera hibernica Atlantic Ivy
Ilex crenata Japanese Holly
Leucothoe axillaris Coastal Doghobble
Ligustrum japonicum Japanese Privet
Ligustrum obtusifolium Border Privet
Ligustrum ovalifolium California Privet
Ligustrum sinense Chinese Privet
Ligustrum vulgare Common Privet
Loniceria fragrantissima Chinese Honeysuckle
Loniceria japonica Japanese Honeysuckle
Loniceria maackii Amur Honeysuckle
Loniceria morrowii Morrow's Honeysuckle
Loniceria tatarica Tatarian Honeysuckle
Mahonia bealei Beales Barberry
Mahonia repens Creeping Mahonia
Philadelphus coronarius European Mock-orange
Pueraria montana Kudzu
Rhamnus cathartica Common Buckthorn
Rhamnus frangula Alder Buckthorn
Rhodotypos scandens Jetbead
Robinia hispida Bristly locust
Rosa multiflora Multiflora Rose
Rubus laciniatus Evergreen Blackberry
Rubus parvifolius Australian Raspberry
Rubus phoenicolasus Wineberry
Viburnum dilatatum Linden Viburnum
Viburnum lantanoides Hobblebush
Viburnum seditoides Sedit Viburnum
Viburnum setigerum Tea Viburnum
Wisteria sinensis Chinese Wisteria

INVASIVE TREES

Acer platanoides Norway Maple
Acer saccharinum Silver Maple
Ailanthus altissima Tree of Heaven
Albizia julibrissin Mimosa Trees
Aralia elata Korean Angelica-tree
Betula papyrifera Paper/White Birch
Cupressus x leylandii Leyland Cypress
Evodia danthelii Korean Evodia
Fraxinus spp. Ash Trees
Maclura pomifera Osage Orange
Magnolia kobus Kobus Magnolia
Malus baccata Siberian Crabapple
Mimosa spp. Mimosa Trees
Morus alba White Mulberry
Morus rubra Red Mulberry
Paulownia tomentosa Empress Tree
Phellodendron amurense Amur Cork Tree
Photinia villosa Christmas Berry
Pinus nigra Austrian Pine
Pinus parviflora Japanese White Pine
Pinus thunbergiana Japanese Black Pine
Populus alba White Poplar
Pyrus calleryana Callery Pear
Robinia pseudoacacia Black Locust
Quercus palustris Pin Oak
Syraus japonica Japanese Snowbell
Tsuga spp. Hemlock Trees
Ulmus pumila Siberian Elm

INVASIVE PLANT REMOVALS - MAINTENANCE - REFORESTATION AREAS

Growing season May - September
Remove and eliminate invasive plants with cutting and spraying operations.
If the contractor is unfamiliar with invasive plant removals consult professional
invasive plant removal specialists. Select herbicides, applications, and cutting
procedures according to the species infestation. Use hand tools and minimize
disturbance in sensitive areas. Spray foliar glyphosate type herbicides for herbaceous plants,
annual grasses, biennial and perennial forbs. Use aquatic labeled herbicide in wetland areas.
For woody shrubs and vines, cut to ground level and immediately paint stems with systemic
herbicide. Cut hanging vines that remain to a height of 10' above grade to allow to die in the tree
canopy. Large invasive tree species may be treated with basal bark oil herbicides such as triclopyr and imazapyr.
once dead cut with chain saw. Repeat operation if needed for seasonal regrowth from any remaining
root stock.

INVASIVE HERBACEOUS GRASSES, GROUND COVERS AND VINES

Acorus calamus European Sweetflag
Ageratina altissima White Snakeroot
Alliaria petiolata Garlic Mustard
Allium vineale Field Garlic
Ampelopsis glandulosa Porcelain-berry
Arthraxon hispidus Joint-head Arthraxon
Bambusa spp. Bamboo
Bidens polycephala Tickseed Sunflower
Bromus inermis Awmless Brome
Bromus japonicus Japanese Brome
Bromus stertilis Poverty Brome
Bromus tectorum Cheat-grass Brome
Cabomba caroliniana Carolina Fanwort
Centauria maculosa Spotted Knapweed
Cicuta maculata Water Hemlock
Cirsium arvense Creeping Thistle
Commelina communis Asiatic Dayflower
Conium maculatum Poison Hemlock
Coronilla varia Crownvetch
Cynanchum louiseae Black Swallow-wort
Datura stramonium Jimsonweed
Dioscorea polystachya Chinese Yam
Egeria densa Brazilian Waterweed
Eichhornia crassipes Water Hyacinth
Endodaea serpentaria Virginia Snakeroot
Eragrostis curvula Weeping Lovegrass
Fallopia japonica Japanese Knotweed
Ficaria verna Lesser Celandine
Galanthus nivalis Common Snowdrop
Glechoma hederacea Ground Ivy
Hemerocallis spp. Daylilies
Hesperis matronalis Dame's Rocket
Hordeum jubatum Foxtail Barley
Humulus japonicus (scandens) Japanese Hop
Hydrilla verticillata Hydrilla
Iris pseudacorus Yellow Flag Iris
Chinese Bushclover
Lespedeza cuneata
Leucocium aestivum Summer Snowflake
Ludwigia peploides Creeping Primrose
Lysichiton nummularia Creeping Jenny
Lythrum salicaria Purple Loosestrife
Matteuccia struthiopteris Ostrich Fern
Microstegium vimineum Japanese Stiltgrass
Miscanthus sinensis Chinese Silvergrass
Murdannia keiskei Marsh Dayflower
Myriophyllum aquaticum Parrot Feather
Myriophyllum spicatum Eurasian Watermilfoil
Narcissus pseudonarcissus Daffodil
Ornithogalum nutans Drooping Star-of-Bethlehem
Ornithogalum umbellatum Star-of-Bethlehem
Oxipolis rigidior Cowbane
Pachysandra terminalis Japanese Pachysandra
Pennisetum orientale Oriental Fountain Grass
Perilla frutescens Beefsteak Plant
Persicaria longistea Oriental Lady's Thumb
Mile-a-minute Weed
Phalaris arundinacea Reed Canary Grass
Phyllostachys spp. Bamboo
Phragmites australis Common Reed
Pistia stratiotes Water Lettuce
Pseudorasia spp. Bamboo
Saponaria officinalis Bouncing Bet
Carolina Horse-nettle
Sorghum halepense Johnson Grass
Urtica dioica Stinging Nettle
Tapa natans Water Chestnut
Vicia minor Periwinkle

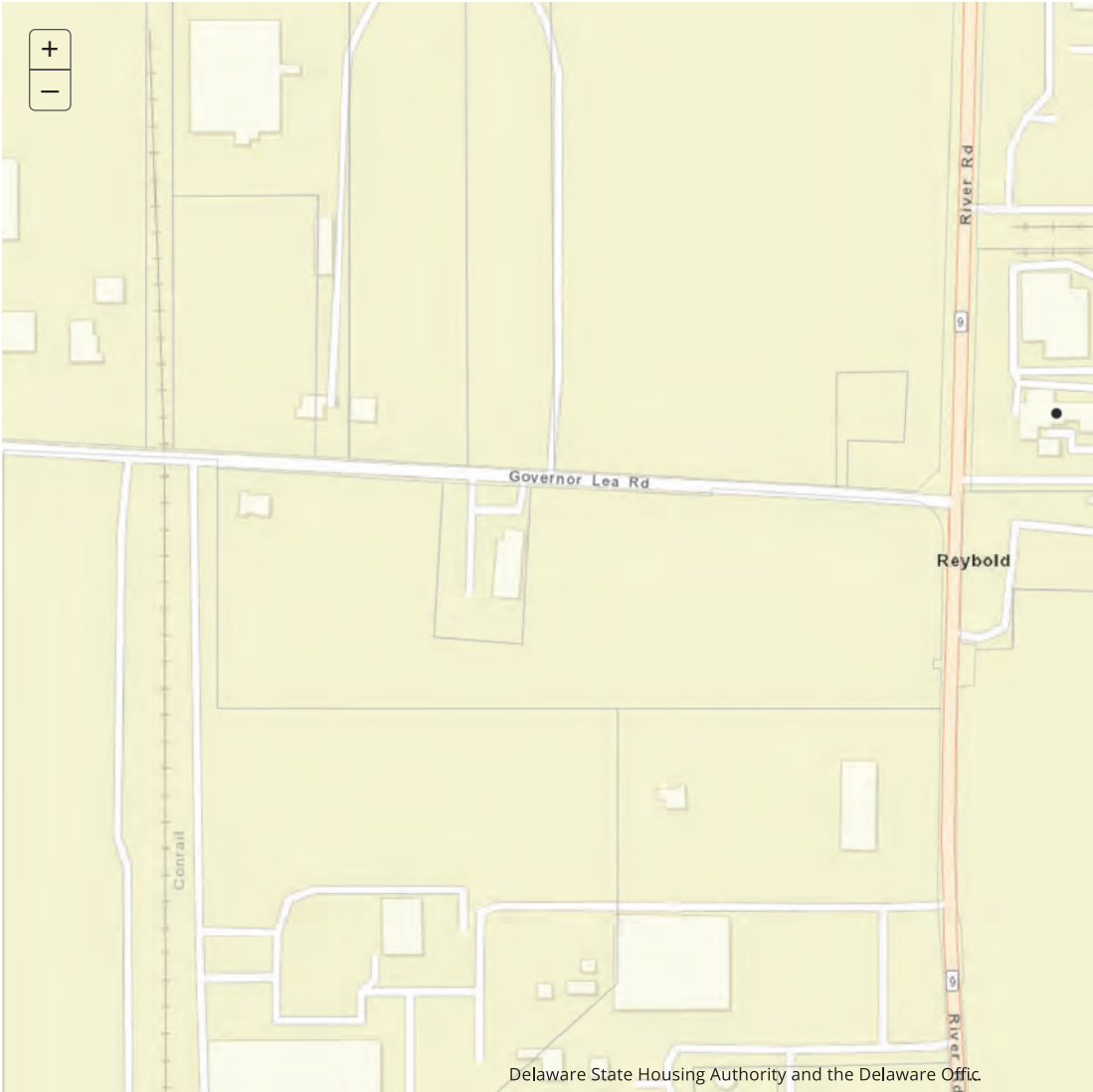
APPLICATION NO. 2023-0190
RECORD LANDSCAPE PLAN
FOR
750 GOVERNOR LEA ROAD

RED LION HUNDRED NEW CASTLE COUNTY DELAWARE

APEX ENGINEERING INCORPORATED 27 W. MARKET STREET NEWPORT, DELAWARE 19004 (302) 994-1900 (302) 994-9089 FAX		
SCALE AS NOTED	DATE 2/03/2024	SHEET NO. 2 of 2
SURVEYED BY: JAV/ET	DRAWN BY: JAV/ET	OF
MICROFILM NO.	CHECKED BY:	REVISION
PROJECT / FILE NUMBER 21100000PLOT-LANDSCAPE		
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APPENDIX G

Historical Resources and Endangered Species



Find an Address ()

Print Tool ()

Measure Tool ()

Basemaps ()

Map Layers ()

☒ DE_StateParcels

☒ State Parcels

☐ Parcel Centroids

☐ DE_Imagery_1926

☐ DE_Imagery_1937

☐ DE_Imagery_1954

☒ DE_Planning_Development

☐ Downtown Development District Boundary

☐ Downtown Development Projects

☐ Development Applications

☐ Building Permits

☐ PLUS Project Areas

☒ DE_Boundaries - Municipalities

☐ DE_Boundaries - State and County Boundaries

☐ DE_Boundaries - Communities

☐ DE_Political_Boundaries - Senate Districts

☐ DE_Political_Boundaries - House of Representatives

☐ Captain John Smith Trail Delaware

☐ First State National Historic Park, Delaware

☐ Survey Boundary 2

☐ Survey Boundary 1

☐ Demolished

☐ Other Historic Properties Secondary

☐ USGS map index

☐ SPO

☐ Hundreds

☐ DE_Water - MajorRivers

☐ DE_Water - FlowLine

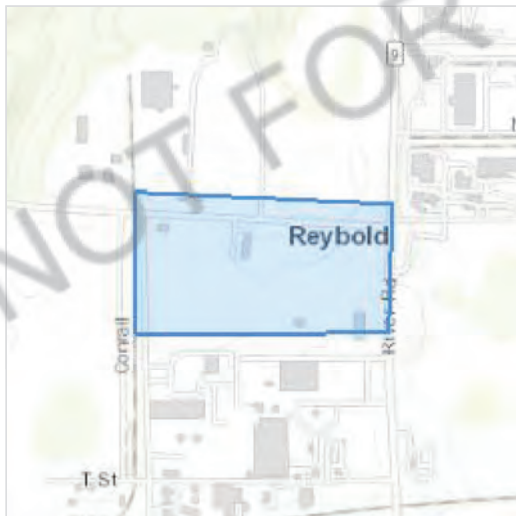
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

New Castle County, Delaware



Local office

Chesapeake Bay Ecological Services Field Office

☎ (410) 573-4599

📅 (410) 266-9127

177 Admiral Cochrane Drive

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement **can only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries)².

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

-
1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Reptiles

NAME	STATUS
Bog Turtle <i>Glyptemys muhlenbergii</i> This species only needs to be considered if the following condition applies: For bog turtle projects in DE, email dnrec_envreview@delaware.gov for review. No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6962	Threatened

Insects

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> Wherever found This species only needs to be considered if the following condition applies: The monarch is a candidate species and not yet listed or proposed for listing. There are generally no section 7 requirements for candidate species (FAQ found here: https://www.fws.gov/savethemonarch/FAQ-Section7.html). No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <https://www.fws.gov/program/migratory-birds/species>
- Measures for avoiding and minimizing impacts to birds
<https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds>
- Nationwide conservation measures for birds
<https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Oystercatcher <i>Haematopus palliatus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31

Bald Eagle *Haliaeetus leucocephalus*

Breeds Oct 15 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Black Skimmer *Rynchops niger*

Breeds May 20 to Sep 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/5234>

Blue-winged Warbler *Vermivora pinus*

Breeds May 1 to Jun 30

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Bobolink *Dolichonyx oryzivorus*

Breeds May 20 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Chimney Swift *Chaetura pelagica*

Breeds Mar 15 to Aug 25

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

King Rail *Rallus elegans*

Breeds May 1 to Sep 5

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/8936>

Lesser Yellowlegs *Tringa flavipes*

Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9679>

Prairie Warbler *Dendroica discolor*

Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prothonotary Warbler *Protonotaria citrea*

Breeds Apr 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Rusty Blackbird *Euphagus carolinus*

Breeds elsewhere

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Short-billed Dowitcher *Limnodromus griseus*

Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9480>

Wood Thrush *Hylocichla mustelina*

Breeds May 10 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence(■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the

probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season 🟡

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

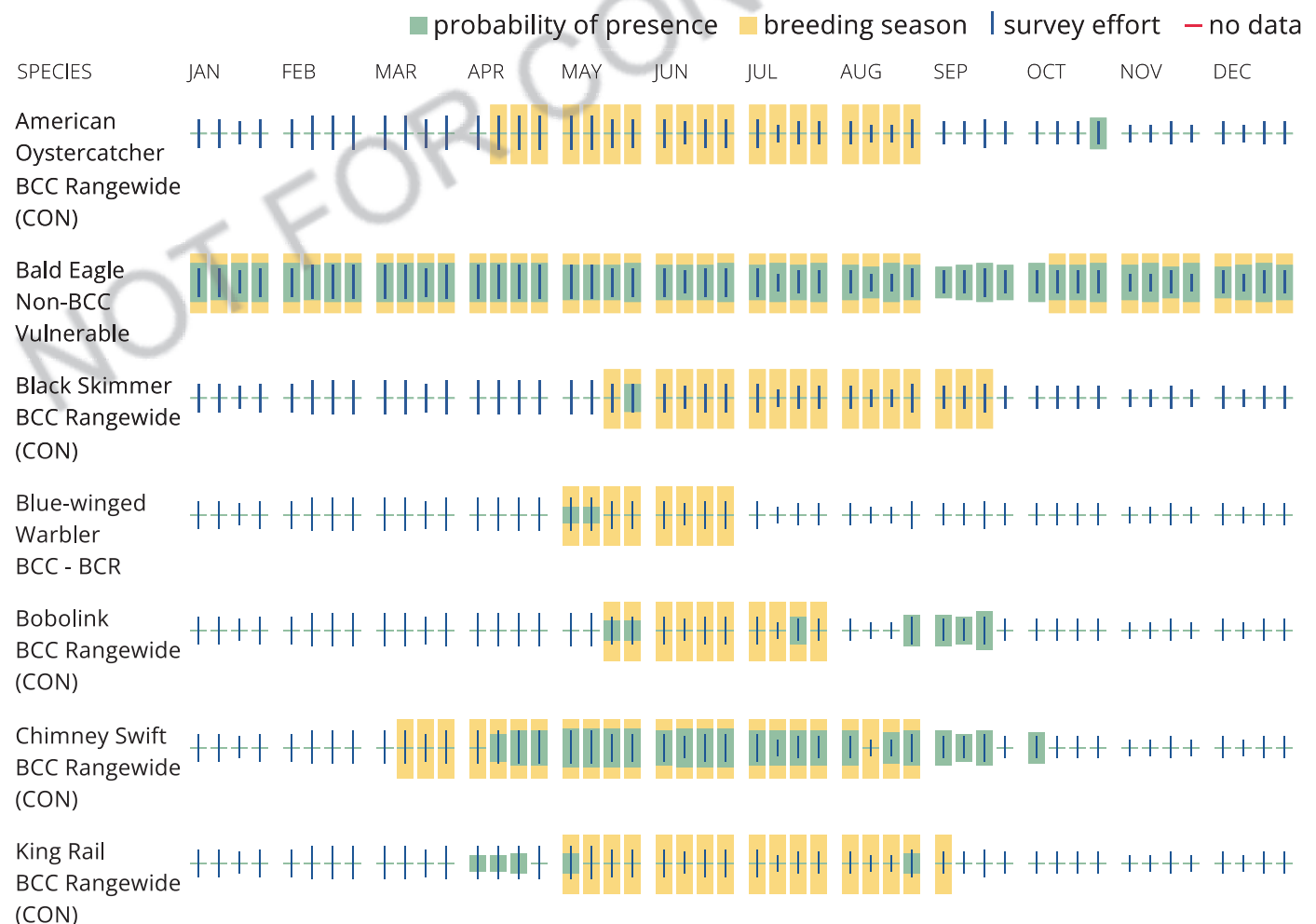
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

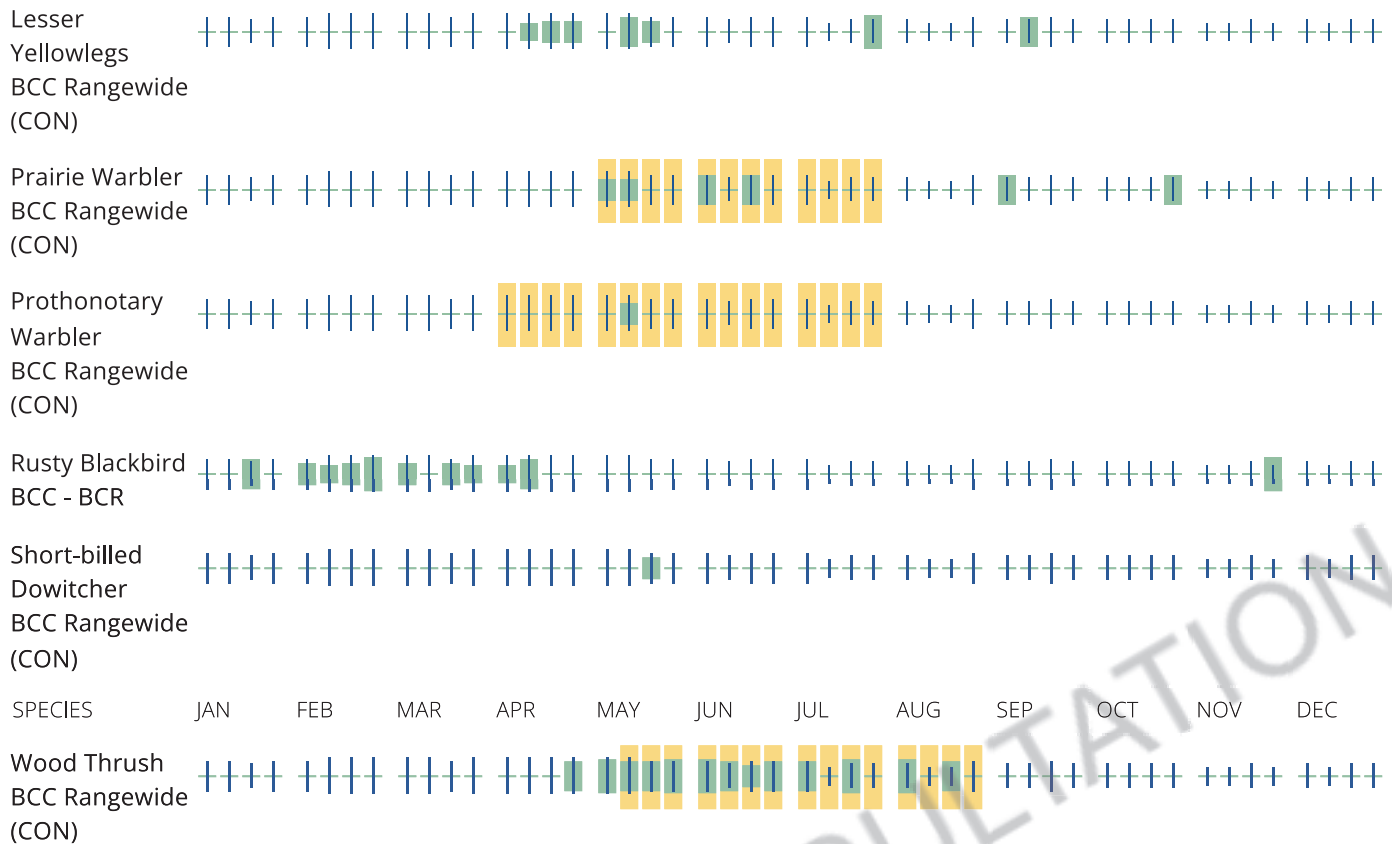
No Data (-)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle [Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#)

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go to the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the [BAIL Tool](#) and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact

[Caleb Spiegel](#) or [Pam Loring](#)

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need [to obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Coastal Barrier Resources System

Projects within the [John H. Chafee Coastal Barrier Resources System](#) (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local [Ecological Services Field Office](#) or visit the [CBRA Consultations website](#). The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

There are no known coastal barriers at this location.

Data limitations

The CBRS boundaries used in IPaC are representations of the controlling boundaries, which are depicted on the [official CBRS maps](#). The boundaries depicted in this layer are not to be considered authoritative for in/out determinations close to a CBRS boundary (i.e., within the "CBRS Buffer Zone" that appears as a

hatched area on either side of the boundary). For projects that are very close to a CBRS boundary but do not clearly intersect a unit, you may contact the Service for an official determination by following the instructions here: <https://www.fws.gov/service/coastal-barrier-resources-system-property-documentation>

Data exclusions

CBRS units extend seaward out to either the 20- or 30-foot bathymetric contour (depending on the location of the unit). The true seaward extent of the units is not shown in the CBRS data, therefore projects in the offshore areas of units (e.g., dredging, breakwaters, offshore wind energy or oil and gas projects) may be subject to CBRA even if they do not intersect the CBRS data. For additional information, please contact CBRA@fws.gov.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

This location did not intersect any wetlands mapped by NWI.

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX H

Soils and Infiltration Testing Report

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm



June 3, 2024

Apex Engineering, Inc.
27 West Market Street
Newport, Delaware 19804

Attn: Mr. Steve Woodin, P.E.

Re: Report of Geotechnical Services
750 Governor Lea Road
New Castle County, Delaware

Dear Steve:

In accordance with our agreement dated March 11, 2022, Geo-Technology Associates, Inc. (GTA) has performed a geotechnical exploration for proposed stormwater management (SWM) facilities to be constructed as part of the warehouse development at 750 Governor Lea Road in New Castle County, Delaware. Provided herein are the results of the subsurface exploration, infiltration testing, and recommendations for design and construction of the proposed improvements at this site. GTA performed 8 Standard Penetration Test (SPT) borings and borehole infiltration tests at the site in locations indicated by Apex Engineering. To assist with our evaluation, GTA was provided with a drawing titled *Revised Exploratory Major Land Development Plan for Governor Lea Road*, prepared by Apex Engineering, dated March 28, 2023, last revised May 6, 2024. No other civil drawings were available for our review at the time this report was prepared.

Site Description

The project site is located at along Governor Lea Road southwest of its intersection with River Road in New Castle County, Delaware, as shown on the *Site Location Map, Figure 1*. The majority of the site is currently a grass field with two existing buildings and associates parking lot areas located in the northwest corner of the site and in the approximate middle. The building located in the northwest corner of the site is a one-story, approximately 3,600 square-foot structure and the building in the middle of the site is a one-story warehouse with a footprint of approximately 10,000 square feet. Solar panel arrays are located along the south middle area of the site. The site generally grades downward from the middle of the site to the east and west with elevations ranging between elevation (EL) 62 to EL 46 and EL 48 in the southeast and southwest corners of the site, respectfully. The existing grades in the proposed SWM facilities range from EL 52 to EL 47 in the southeast facility and EL 51 to EL 48 in the southwest facility.

18 Boulden Circle, Suite 36, New Castle, Delaware 19720

(302) 326-2100

◆ Abingdon, MD ◆ Baltimore, MD ◆ Laurel, MD ◆ Frederick, MD ◆ Waldorf, MD ◆ New Castle, DE ◆ Georgetown, DE
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◆ Northeastern, OH ◆ Sterling, VA ◆ Nashville, TN ◆ Charlotte, NC ◆ Raleigh, NC ◆ Orlando, FL

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Proposed Construction

We understand that proposed site development includes a new single-story, slab-on-grade warehouse with a footprint gross square footage of 353,500 square feet. Development of the new warehouse will require demolition of the existing buildings and solar panel arrays at the site. Surrounding the building will be parking lot, loading docks, and access drives. Two below-grade SWM facilities are to be located in the southwest and southeast corners of the site.

Geology

According to the *Geologic Map of The Cecilton and Middletown Quadrangle*, prepared by the Delaware Geological Survey (DGS) in 2020, the site is situated within the Coastal Plain Physiographic Province. The Coastal Plain is characterized by undifferentiated and interlayered sedimentary deposits derived from eroded and transported rock formations to the north and west. Specifically, the map indicated that the site is underlain by the middle Pleistocene Age Columbia Formation. The Columbia Formation typically consists of yellow to reddish brown, fine to coarse, feldspathic quartz sand with varying amounts of gravel. Beds of pebbles to cobble size gravel are common at the base of the unit. The formation is typically less than 20 feet thick outside of channels. Refer to the publication for more detailed information.

Based on the U.S. Department of Agriculture (USDA), *Natural Resources Conservation Service (NRCS) Web Soils Survey*, the soils underlying the site are predominantly mapped as Reybold silt loam with some areas of Hambrook-Urban land complex, Sassafras sandy loam, and Urban land. These units are described as being well drained with a depth to restrictive layer greater than 80 inches. The typical profile of the Reybold silt loam area units consist of silt loam to 30 inches underlain by gravelly coarse sandy loam. The typical profile for the Hambrook-Urban land complex consists of sandy loam to 10 inches, loam to 14 inches, sandy clay loam to 28 inches, loamy sand to 65 inches, and silt loam beneath. The Sassafras sandy loam unit has a typical soil profile of sandy loam to 15 inches, loam to 30 inches, sandy loam to 37 inches, and loamy sand beneath.

Subsurface Exploration and Subsurface Conditions

The subsurface exploration included 8 SPT borings and borehole infiltration tests within the proposed SWM areas, designated as B-1 through B-8. Test depths were preselected by Apex Engineering. The locations were staked in the field by Apex Engineering. The approximate locations are indicated on the enclosed *Revised Exploratory Major Land Development Plan, Sheer 2 of 2*, titled Figure 2 herein.

The subsurface exploration was performed on April 5 and 6, 2022. The test borings were drilled to depths of 12 to 16 feet below the existing ground surface using an ATV-mounted drill rig equipped with hollow stem augers and an automatic drop hammer. SPT was performed beginning at 4 feet, with soil samples obtained at continuous intervals until termination depths. SPT involves driving a 2-inch O.D., 1 $\frac{3}{8}$ -inch I.D. split-spoon sampler with a 140-pound hammer free falling 30 inches. The number of blows required to drive the sampler was recorded in intervals of 6 inches. The total number of hammer blows required to drive the sampler from the 6- to 18-inch interval is the SPT N-value.

Beneath a surficial layer of topsoil, the subsurface conditions observed in the borings consisted of a layer of fine-grained soil underlain by granular materials to the extent of the borings. Topsoil thicknesses ranged between approximately 5 and 7 inches. The fine-grained soils consisted of silt with varying amounts of sand to depths of approximately 2 to 7 feet below existing grade. The underlying granular soils consisted of silty sand and poorly-graded sand with silt to the extent of the borings.

Groundwater was not encountered during performance of the borings. Based on regional groundwater mapping provided by The Delaware Geologic Information Resource (DGIR), groundwater at the site is anticipated to be greater than 20 feet in dry through wet seasonal periods.

Logs of the borings are attached to this letter. Descriptions provided on the field logs are based on visual classifications by GTA personnel in accordance with ASTM D2488 (Unified Soil Classification System). The classification system is summarized in Notes for Explorations Logs.

Infiltration Testing

After observing the soil conditions to evaluate any limiting zones within the soil profile, 8 infiltration tests were conducted in offset auger probes from the exploratory borings in the proposed stormwater management areas. Borehole infiltration testing was performed in general accordance with the procedures outlined in ASTM D5126 to estimate hydraulic conductivity in the unsaturated zone. The test consisted of seating an open bottom 4-inch diameter casing 2 to 4 inches into the subgrade soils followed by a minimum one-hour presoak period or a 12-inch drop of water. After the presoak period, water level measurements were recorded over two 30-minute or 60- minute intervals. Solinst® level loggers (pressure transducers) were used to collect water level drop in the tests. The unfactored field infiltration rates at each location are provided in the table below.

UNFACTORED FIELD INFILTRATION RATES

Location	Depth	Unfactored Field Infiltration Rate	USCS Soil Classification
B-1	8.0 feet	10+ inches per hour	Poorly-graded SAND with Silt (SP-SM)
B-2	8.0 feet	10+ inches per hour	Poorly-graded SAND with Silt (SP-SM)
B-3	12.0 feet	10+ inches per hour	Poorly-graded SAND with Silt (SP-SM)
B-4	12.0 feet	10+ inches per hour	Poorly-graded SAND with Silt (SP-SM)

Location	Depth	Unfactored Field Infiltration Rate	USCS Soil Classification
B-5	12.0 feet	10+ inches per hour	Silty SAND (SM)
B-6	12.0 feet	8 inches per hour	Poorly-graded SAND with Silt (SP-SM)
B-7	8.0 feet	10+ inches per hour	Poorly-graded SAND with Silt (SP-SM)
B-8	8.0 feet	10+ inches per hour	Silty SAND (SM)

It should be noted that infiltration rates can vary widely with variations in soil texture and gradation. The density and plasticity of the soils affected the infiltration potential.

Conclusions and Recommendations

The guidelines established in the Delaware Sediment and Stormwater program technical Document Article 3.06, Appendix 3.06.2. A-1 Soil Investigation Procedures indicate that the minimum infiltration rate for all runoff reduction and infiltration practices is 1-inch per hour. Also, a vertical separation of two (2) feet from the seasonal high groundwater elevation is required for all infiltration practices unless an underdrain is provided.

Areas where infiltration rates exceed 2 inches per hour are generally considered suitable for infiltration practices. Although infiltration testing was performed, infiltration potential will be limited given the surficial fine-grained nature of the soils in the upper 6 feet of the ground surface at TP-3. However, infiltration practices in these soils or at these depths may be feasible in these areas by over-excavation to more granular soils and replacement with concrete sand, open-graded aggregate or additional bio-media, depending on final design and a review of the site conditions.

We recommend that a design infiltration rate of no more than 4-inches per hour for the silty sand and poorly-graded sand with silt materials. The rate is applicable for the test depths noted above and should not be set deeper than 4 feet below the test depths without additional review or testing. A blended or average rate should not be used for the site. Since groundwater was not encountered during excavation, we recommend a seasonal high water table (SHWT) of EL 26, based on a review of the groundwater level records maintained by Delaware Geological Survey. Therefore, inverts can not be lower than EL 28 for the infiltration facilities in the areas tested.

General Construction Recommendations

To preserve the infiltration capability, GTA recommends that the facilities be excavated using a track-mounted excavator, which will generally eliminate the need to operate equipment directly on the subgrade. This recommendation is based on the inherent problems associated with these systems as they become less permeable due to densification during construction and partial

clogging or siltation occurring over time. The inverts of the facilities subgrade should be in natural granular soils, and should be hand cleaned to remove any disturbed soil prior to placing the fabric and/or stone.

Once the design of the facilities has been completed, GTA should be provided the opportunity to review the plans to evaluate if the geotechnical issues have been addressed. At that time, GTA will provide the DNREC Checklist and Infiltration Test Logs for the Final Design, provided supplemental field testing is not required.

Also, GTA should be provided the opportunity to review the facility subgrade during construction and perform additional field-testing. This is to observe compliance with the design concepts, specifications, or recommendations, and to allow for field changes in the event that the soils conditions differ from that anticipated prior to that start of construction.

Limitations

This report, including all supporting logs, field data, field notes, calculations, estimates and other documents prepared by GTA in connection with this Project have been prepared in accordance with generally accepted engineering practice. All terms and conditions set forth in the Agreement and the General Provisions attached thereto are incorporated herein by reference. No warranty, express or implied, is made herein. Use and reproduction of this report by any other person without the expressed written permission of GTA is unauthorized and such use is at the sole risk of the user.

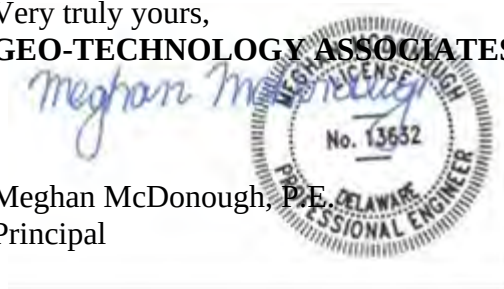
The analysis and recommendations contained in this report are based on the data obtained from limited observation and testing of the encountered materials. Infiltration tests indicate soil conditions only at specific locations and times and only at the depths excavated. They do not necessarily reflect strata or variations that may exist between exploration locations. Consequently, the analysis and recommendations must be considered preliminary until the subsurface conditions can be verified by direct observation at the time of construction. If variations of subsurface conditions from those described in this report are noted during construction, recommendations in this report may need to be re-evaluated.

In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report are verified in writing. Geo-Technology Associates, Inc. is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of Geo-Technology Associates, Inc.

We appreciate the opportunity to be of assistance on this project. Should you have questions, please contact our office at (302) 326-2100.

Very truly yours,
GEO-TECHNOLOGY ASSOCIATES, INC.

Meghan McDonough, P.E.
Principal



ARS/ML/mt
220646

Attachments:

GBA Important Information Regarding Your Geotechnical Engineering Report
Figure 1: Site Location Map
Figure 2: Exploration Location Plan
Boring Logs (B-1 through B-8)
USDA Soil Mapping

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual site-wide subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



GEOPROFESSIONAL
BUSINESS
ASSOCIATION

Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org



Notes:

- 1) Base map obtained from Google Earth Imagery, Inc. from September 20, 2020.
- 2) Site Location Map should be reviewed in conjunction with GTA Report 750 Governor Lea Road, Job No. 220646.



GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
 18 Boulden Circle, Suite 36
 New Castle, Delaware 19720
 (302) 326-2100

SITE LOCATION MAP

750 GOVERNOR LEA ROAD
 NEW CASTLE COUNTY, DELAWARE

SCALE
 NTS

DATE
 APR 2022

DRAWN BY

REVIEW BY
 MM

JOB NO.
 220646

FIGURE NO.
 1

LOG OF BORING NO. B-1

Sheet 1 of 1

PROJECT: **750 Governor Lea Road**
 PROJECT NO.: **220646**
 PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft): **Dry** **Dry** **Dry**
 DATE: **4/5/22** **4/5/22** **4/5/22**
 CAVED (ft): **In Augers** **10.8** **10.8**

DATE STARTED: **4/5/22**
 DATE COMPLETED: **4/5/22**
 DRILLING CONTRACTOR: **GTA**
 DRILLER: **D. Hans, Jr.**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **Dry**
 GROUND SURFACE ELEVATION: **46.0**
 DATUM: **Survey**
 EQUIPMENT: **Diedrich D50**
 LOGGED BY: **M. Day**
 CHECKED BY: **M.McDonough**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
S-1	0.0	6	1-2-2-2	4	46.0 45.5	0	ML		Topsoil +/- 6 Inches Brown, moist, soft, SILT		
S-2	2.0	13	1-2-1-2	3					Same		
S-3	4.0	12	1-1-2-2	3		5			Brown, moist, soft, Sandy SILT		
S-4	6.0	16	4-8-9-13	17	39.0 38.0		SM		Same, very stiff		
S-5	8.0	2	9-12-10-12	22		10	SP-SM		Orange-brown, moist, medium dense, Silty SAND, contains gravel Tan, moist, medium dense, Poorly-graded SAND with SILT, contains gravel		
S-6	10.0	1	9-10-9-9	19					Same, orange		
					34.0				Boring terminated at 12.0 feet.		
						15					
						20					
						25					

NOTES: **Elevation and location should be considered approximate.**



**GEO-TECHNOLOGY
ASSOCIATES, INC.**

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New Castle, DE 19720

LOG OF BORING NO. B-1

Sheet 1 of 1

LOG OF BORING NO. B-2

Sheet 1 of 1

PROJECT: **750 Governor Lea Road**
 PROJECT NO.: **220646**
 PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):  **Dry**  **Dry** 
 DATE: **4/5/22** **4/5/22**
 CAVED (ft): **In Augers** **7.6**

DATE STARTED: **4/5/22**
 DATE COMPLETED: **4/5/22**
 DRILLING CONTRACTOR: **GTA**
 DRILLER: **D. Hans, Jr.**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **Dry**
 GROUND SURFACE ELEVATION: **48.0**
 DATUM: **Survey**
 EQUIPMENT: **Diedrich D50**
 LOGGED BY: **M. Day**
 CHECKED BY: **M.McDonough**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
									DESCRIPTION	REMARKS
S-1	0.0	8	1-1-2-2	3	48.0 47.6	0	ML		Topsoil +/- 5 Inches Brown, moist, soft, SILT Brown, moist, soft, Sandy SILT, contains gravel	
S-2	2.0	9	2-2-2-2	4						
S-3	4.0	10	1-1-1-1	2	44.0	5	SM		Orange-brown, moist, very loose, Silty SAND Same, loose	
S-4	6.0	15	2-3-5-5	8						
S-5	8.0	13	3-4-5-6	9	40.0	10	SP-SM		Tan, moist, loose, Poorly-graded SAND with SILT, contains gravel Same, medium dense	
S-6	10.0	17	5-7-7-6	14						
					36.0				Boring terminated at 12.0 feet.	
						15				
						20				
						25				

NOTES: **Elevation and location should be considered approximate.**



**GEO-TECHNOLOGY
ASSOCIATES, INC.**

18 Boulden Circle, Suite 36
New Castle, DE 19720

LOG OF BORING NO. B-2

Sheet 1 of 1

LOG OF BORING NO. B-3

Sheet 1 of 1

PROJECT: **750 Governor Lea Road**
 PROJECT NO.: **220646**
 PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):  **Dry**  **Dry** 
 DATE: **4/5/22** **4/5/22**
 CAVED (ft): **In Augers** **10.5**

DATE STARTED: **4/5/22**
 DATE COMPLETED: **4/5/22**
 DRILLING CONTRACTOR: **GTA**
 DRILLER: **D. Hans, Jr.**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **Dry**
 GROUND SURFACE ELEVATION: **50.0**
 DATUM: **Survey**
 EQUIPMENT: **Diedrich D50**
 LOGGED BY: **M. Day**
 CHECKED BY: **M.McDonough**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
S-1	0.0	8	1-1-2-2	3	50.0 49.5	0	ML		Topsoil +/- 6 Inches Brown, moist, soft, SILT Same, medium stiff		
S-2	2.0	16	2-3-4-5	7							
S-3	4.0	12	3-7-7-7	14	46.0	5	SM		Orange-brown, moist, medium dense, Silty SAND, contains gravel Same Same, loose		
S-4	6.0	13	5-7-7-7	14							
S-5	8.0	6	5-4-4-6	8							
S-6	10.0	15	5-6-4-5	10	40.0	10	SP-SM		Tan, moist, loose, Poorly-graded SAND with Silt Same, tan-orange Same		
S-7	12.0	13	3-4-4-5	8							
S-8	14.0	18	4-5-5-5	10		15					
					34.0				Boring terminated at 16.0 feet.		
						20					
						25					

NOTES: **Elevation and location should be considered approximate.**



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LOG OF BORING NO. B-3

Sheet 1 of 1

LOG OF BORING NO. B-4

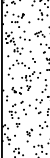
Sheet 1 of 1

PROJECT: **750 Governor Lea Road**
 PROJECT NO.: **220646**
 PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):  **Dry**  **Dry** 
 DATE: **4/5/22** **4/5/22**
 CAVED (ft): **In Augers** **11.4**

DATE STARTED: **4/5/22**
 DATE COMPLETED: **4/5/22**
 DRILLING CONTRACTOR: **GTA**
 DRILLER: **D. Hans, Jr.**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **Dry**
 GROUND SURFACE ELEVATION: **48.7**
 DATUM: **Survey**
 EQUIPMENT: **Diedrich D50**
 LOGGED BY: **M. Day**
 CHECKED BY: **M.McDonough**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
									DESCRIPTION	REMARKS
						0				
S-1	0.0	12	1-1-2-3	3	48.7	48.1	ML		Topsoil +/- 7 Inches	
					Brown, moist, soft, Sandy SILT					
S-2	2.0	14	2-3-5-6	8	46.7	SM		Orange-brown, moist, loose, Silty SAND, contains gravel		
S-3	4.0	13	2-4-7-7	11	42.7	SP-SM		Same, medium dense		
S-4	6.0	12	5-6-6-5	12				Tan, moist, medium dense, Poorly-graded SAND with Silt, contains gravel		
S-5	8.0	12	2-3-4-4	7		SP-SM		Same, loose		
S-6	10.0	17	4-4-4-4	8	10			Orange-tan, moist, loose, Poorly-graded SAND with Silt, contains gravel		
S-7	12.0	13	3-4-5-5	9				Same		
S-8	14.0	17	4-5-6-6	11		15		Same, medium dense, mottled		
					32.7				Boring terminated at 16.0 feet.	
						20				
						25				

NOTES: **Elevation and location should be considered approximate.**



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LOG OF BORING NO. B-4

Sheet 1 of 1

LOG OF BORING NO. B-5

Sheet 1 of 1

PROJECT: **750 Governor Lea Road**
 PROJECT NO.: **220646**
 PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft): ▼ Dry ▼ Dry ▼ BOC
 DATE: 4/6/22 4/6/22
 CAVED (ft): In Augers 11.4

DATE STARTED: **4/6/22**
 DATE COMPLETED: **4/6/22**
 DRILLING CONTRACTOR: **GTA**
 DRILLER: **D. Hans, Jr.**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **Dry**
 GROUND SURFACE ELEVATION: **50.3**
 DATUM: **Survey**
 EQUIPMENT: **Diedrich D50**
 LOGGED BY: **A. Carta**
 CHECKED BY: **M.McDonough**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
									DESCRIPTION	REMARKS
S-1	0.0	11	1-1-2-4	3	50.3	0	ML		Topsoil +/- 5 Inches	
					49.9				Brown, moist, soft, SILT	
S-2	2.0	10	3-6-7-10	13	48.3		SM		Brown, moist, medium dense, Silty SAND, contains gravel	
S-3	4.0	12	3-6-7-7	13		5			Orange, moist, medium dense, Silty SAND	
S-4	6.0	17	7-7-7-7	14					Same, tan	
S-5	8.0	17	3-3-3-3	6					Tan, moist, loose, Silty SAND, contains gravel	
S-6	10.0	16	25-5-4-6	9		10			Same	
S-7	12.0	17	4-5-5-5	10					Same, light orange	
S-8	14.0	17	5-5-5-6	10		15			Same, light tan	
					34.3				Boring terminated at 16.0 feet.	
						20				
						25				

NOTES: **Elevation and location should be considered approximate.**



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LOG OF BORING NO. B-5

Sheet 1 of 1

LOG OF BORING NO. B-6

Sheet 1 of 1

PROJECT: **750 Governor Lea Road**
 PROJECT NO.: **220646**
 PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft): ▼ Dry ▼ Dry ▼ BOC
 DATE: 4/6/22 4/6/22
 CAVED (ft): In Augers 11.0

DATE STARTED: **4/6/22**
 DATE COMPLETED: **4/6/22**
 DRILLING CONTRACTOR: **GTA**
 DRILLER: **D. Hans, Jr.**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **Dry**
 GROUND SURFACE ELEVATION: **51.2**
 DATUM: **Survey**
 EQUIPMENT: **Diedrich D50**
 LOGGED BY: **A. Carta**
 CHECKED BY: **M.McDonough**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
									DESCRIPTION	REMARKS
					51.2	0				
S-1	0.0	18	1-3-6-7	9	50.7		SM		Topsoil +/- 6 Inches	
									Brown, moist, loose, Silty SAND, contains gravel	
S-2	2.0	13	3-7-10-10	17					Light brown, moist, medium dense, Silty SAND	
S-3	4.0	1	6-6-7-7	13		5			Same, contains gravel	
S-4	6.0	16	5-4-4-4	8					Same, loose	
					43.2		SP-SM		Light tan, moist, loose, Poorly-graded SAND with Silt, contains gravel	
S-5	8.0	10	1-3-4-4	7		10			Same	
S-6	10.0	18	3-4-4-4	8					Same	
S-7	12.0	15	2-3-3-4	6					Same	
S-8	14.0	19	4-4-5-6	9		15			Same	
					35.2				Boring terminated at 16.0 feet.	
						20				
						25				

NOTES: **Elevation and location should be considered approximate.**



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LOG OF BORING NO. B-6

Sheet 1 of 1

LOG OF BORING NO. B-7

Sheet 1 of 1

PROJECT: **750 Governor Lea Road**
 PROJECT NO.: **220646**
 PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft): **Dry** **Dry** **BOC**
 DATE: **4/5/22** **4/5/22**
 CAVED (ft): **In Augers** **7.1**

DATE STARTED: **4/5/22**
 DATE COMPLETED: **4/5/22**
 DRILLING CONTRACTOR: **GTA**
 DRILLER: **D. Hans, Jr.**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **Dry**
 GROUND SURFACE ELEVATION: **47.4**
 DATUM: **Survey**
 EQUIPMENT: **Diedrich D50**
 LOGGED BY: **A. Carta**
 CHECKED BY: **M.McDonough**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
									DESCRIPTION	REMARKS
S-1	0.0	17	2-11-14-13	25	47.4 47.0	0	ML		Topsoil +/- 5 Inches Brown, moist, very stiff, SILT, contains gravel	
S-2	2.0	10	6-8-8-7	16					Same	
S-3	4.0	2	2-3-3-3	6		5			Brown, moist, medium stiff, Sandy SILT	
S-4	6.0	12	3-3-3-3	6	41.4		SP-SM		Light brown, moist, medium stiff, Sandy SILT	
S-5	8.0	5	3-3-4-3	7		10			Same, contains gravel	
S-6	10.0	14	2-2-3-3	5					Same	
					35.4				Boring terminated at 12.0 feet.	
						15				
						20				
						25				

NOTES: **Elevation and location should be considered approximate.**



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18 Boulden Circle, Suite 36
 New Castle, DE 19720

LOG OF BORING NO. B-7

Sheet 1 of 1

LOG OF BORING NO. B-8

Sheet 1 of 1

PROJECT: **750 Governor Lea Road**
 PROJECT NO.: **220646**
 PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft): **Dry** **Dry** **BOC**
 DATE: **4/6/22** **4/6/22**
 CAVED (ft): **In Augers** **8.8**

DATE STARTED: **4/6/22**
 DATE COMPLETED: **4/6/22**
 DRILLING CONTRACTOR: **GTA**
 DRILLER: **D. Hans, Jr.**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **Dry**
 GROUND SURFACE ELEVATION: **47.3**
 DATUM: **Survey**
 EQUIPMENT: **Diedrich D50**
 LOGGED BY: **A. Carta**
 CHECKED BY: **M.McDonough**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
									DESCRIPTION	REMARKS
S-1	0.0	12	1-2-4-4	6	47.3 46.8	0	ML		Topsoil +/- 6 Inches Brown, moist, medium stiff, Sandy SILT Same, contains gravel	
S-2	2.0	1	2-2-4-4	6						
S-3	4.0	14	2-1-2-3	3	43.3	5	SM		Light brown, moist, very loose, Silty SAND	
S-4	6.0	15	4-1-4-5	5	41.3		SP-SM		Light orange, moist, loose, Poorly-graded SAND with Silt, contains gravel Same	
S-5	8.0	15	3-3-4-5	7		10			Same, medium dense	
S-6	10.0	14	4-7-6-5	13	35.3				Boring terminated at 12.0 feet.	
						15				
						20				
						25				

NOTES: **Elevation and location should be considered approximate.**



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LOG OF BORING NO. B-8

Sheet 1 of 1

Soil Map—New Castle County, Delaware
(750 Governor Lea Road)



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

5/2/2022
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: New Castle County, Delaware

Survey Area Data: Version 16, Aug 26, 2021

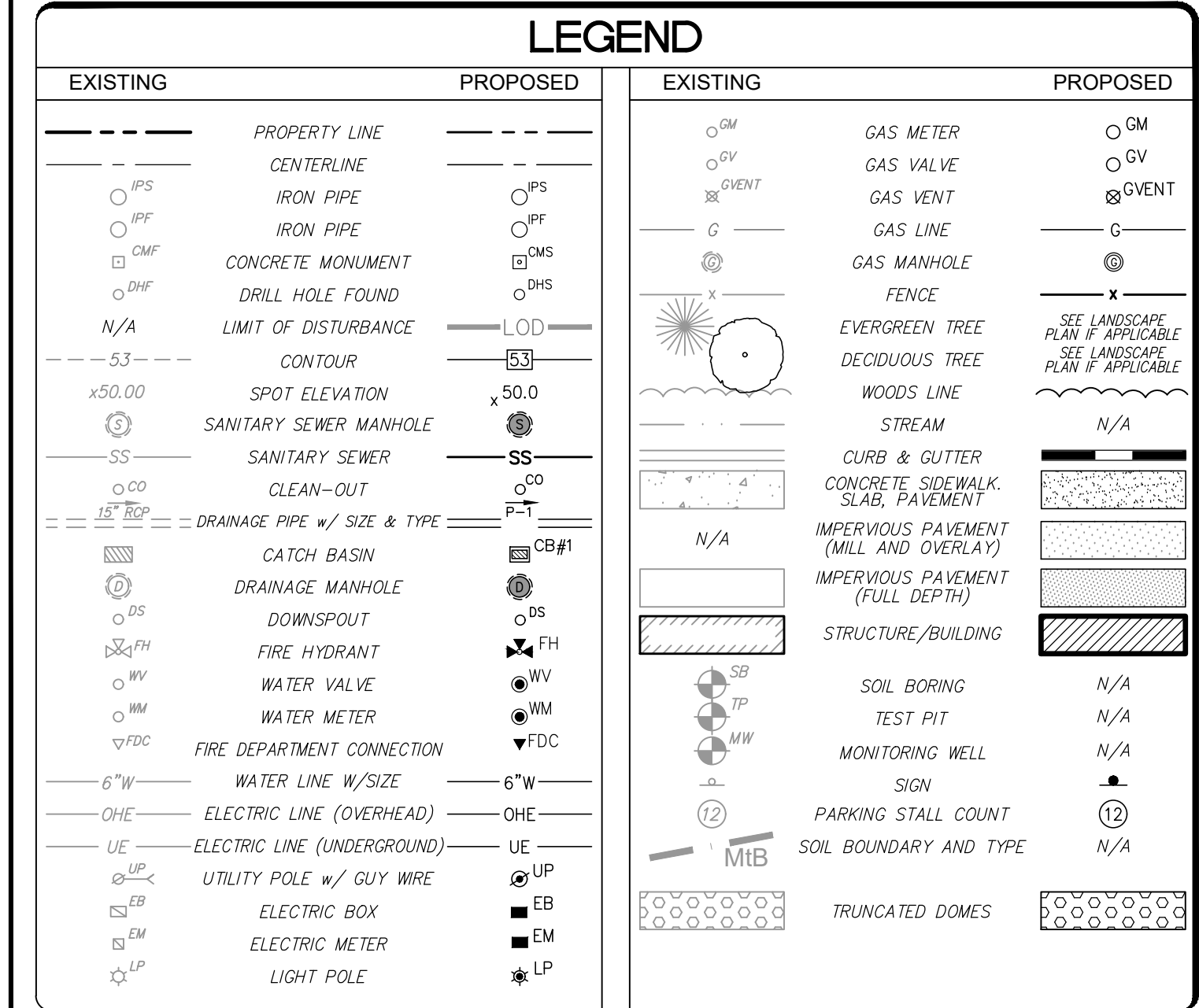
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 25, 2020—Sep 5, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HkB	Hambrook-Urban land complex, 0 to 5 percent slopes	1.6	7.4%
ReA	Reybold silt loam, 0 to 2 percent slopes	4.3	19.9%
ReB	Reybold silt loam, 2 to 5 percent slopes	14.4	66.2%
SaD	Sassafras sandy loam, 10 to 15 percent slopes	0.6	2.7%
Up	Urban land	0.8	3.7%
Totals for Area of Interest		21.7	100.0%



RED LION HUNDRED NEW CASTLE COUNTY DELAWARE

60 30 0 60 200

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APPENDIX I

Construction and Maintenance Recommendations

CONSTRUCTION RECOMMENDATIONS

(Following establishment of erosion and sediment perimeter controls)

- Construct a runoff diversion berm around the perimeter of the recharge basin area. The berm shall be compacted to at least 90% of the maximum dry density as determined by the Standard Proctor Test (ASTM: D698). Stabilize the berm with seed and mulch. Mulch on top and interior berm slopes shall be excelsior blankets. Mulch on exterior berm slope may be straw. This work shall be completed prior to the start of basin excavation.
- Strip topsoil from recharge basin area.

The following work items (as listed below) shall not be performed when wet weather or wet subgrade conditions exist at the site, or if groundwater is present within the excavation.

- Excavate recharge basin area, using a low ground pressure, tracked excavator or hoe, to a depth approximately one (1) foot above the design bottom / subgrade elevation.
- Construct any above-grade berms, required by the recharge basin design, using soils placed in lifts (as specified in design plans) and compacted to at least 90% of the maximum dry density as determined by the Standard Proctor Test (ASTM: D698).
- Excavation of bottom 1 foot should not occur until runoff diversion and slope stabilization are in place and established. Excavate the basin area to the design bottom / subgrade elevation, using a low ground pressure, tracked excavation or hoe.
- The recharge basin subgrade shall be reviewed by a qualified engineer for conformance with the design conditions, prior to backfilling. Areas with indications of potentially impeded drainage (e.g., finer grained soils, mottles) shall be undercut as directed by the engineer and backfilled with washed concrete sand or gravel as indicated below.
- Remove loose and disturbed soils, remove all eroded soils, and scarify by hand raking the bottom of the basin and side slopes to the height of the scour protection or bottom treatments. After scarifying, no equipment shall be allowed to run on the exposed bottom / subgrade prior to placement of the backfill or subsequent bottom treatments.
- Backfill with clean, washed sand. Do not compact.

- Place washed gravel for subgrade protection prior to placement of any stone erosion and scour protection material.
- Wash gravel and riprap, to be placed in the recharge basin, with clean water until free of fines. The washing operation shall be located so as to prevent wash water runoff from entering the recharge basin area. Runoff from the washing operation shall be managed in accordance with applicable regulations.
- Washed gravel and stone bottom treatments shall be stockpiled outside the limits of the excavation for the recharge basin and associated diversion features, and shall be placed in the basin with a hoe bucket, dozer, or loader. If necessary, equipment used on bottom of basin shall be low pressure, tracked equipment and shall run on top of the placed material, not on the exposed basin bottom / subgrade. The equipment shall be operated in a manner to limit tracking of dirt onto the placed material, and disturbance and compaction of the subgrade soils. Under no circumstances shall trucks be driven onto the excavated bottom area to dump bottom materials.
- Remove diversion berm only when vegetation in all areas upslope from the recharge basin has become well established and / or the area otherwise stabilized with respect to erosion.

APPENDIX J

Groundwater Monitoring Plan

GROUNDWATER MONITORING PLAN

750 GOVERNOR LEA ROAD
DELAWARE CITY, NEW CASTLE COUNTY, DELAWARE

May 28, 2024

Prepared for:
New Castle County Department of Land Use
87 Reads Way
New Castle, Delaware 19720

On behalf of:
Governor Lea Road, LLC
405 E. Marsh Lane, Suite 1
Newport, Delaware 19804

Prepared by:

Ten Bears Environmental Associates Company
1080 South Chapel Street
Suite 200
Newark, Delaware 19702

P.N. 22-231.B

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I.	INTRODUCTION	1
II.	SITE DESCRIPTION	1
III.	ASSESSMENT OF CONTAMINATION RISKS	2
IV.	GROUNDWATER MONITORING SCOPE	2
V.	SCHEDULE AND REPORTING.....	4

FIGURES

Figure 1	Site Location Sketch
Figure 2	WRPA Map
Figure 3	EPA Groundwater Monitoring Well Locations
Figure 4	Proposed Groundwater Monitoring Well Locations

APPENDICES

Appendix A	Laboratory Parameters Excerpt from Recharge Design Manual
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I. INTRODUCTION

Ten Bears Environmental Associates Company (TBE) has prepared this Groundwater Monitoring Plan (GWMP) on behalf of the developer, Governor Lea Road, LLC, for review by the New Castle County Resource Protection Area Technical Advisory Committee (RPATAC), to assess pre- and post-development conditions of groundwater at the 750 Governor Lea Road Site (hereinafter referred to as the “Property” or the “Site”) in Delaware City, New Castle County, Delaware. This GWMP was prepared, in conjunction with an Environmental Impact Assessment (EIA), to assess pre- and post-development conditions of groundwater at the referenced Site.

The following sections present the Site description, our assessment of contamination risks, the scope of well construction, scope and frequency of monitoring, implementation schedule, and data assessment / reporting.

II. SITE DESCRIPTION

The Site currently consists of approximately 18.5 acres of partially developed industrial land north of Delaware City (Figure 1). Existing development at the site is limited, with an approximately 9,000 sf research / office building most recently used by Ion Power for offices and laboratory research and an approximately 3,200 square-foot building formerly used as shower / locker room facilities for the former Standard Chlorine / Metachem Site across Governor Lea Road. The mapped WRPA covers nearly half the Property in the central portion (Figure 2). The larger building and associated parking facilities are entirely within the mapped WRPA boundary, while the shower facility is outside the WRPA to the west.

The Site is the former Ion Power Brownfields site (DE-1322), a completed Delaware Hazardous Substance Cleanup Act (HSCA) site which adjoins the southern (upgradient) side of the former Standard Chlorine (a.k.a., Metachem) Federal Superfund site, as well as the northern border of the Delaware City Industries refinery. The Brownfield Investigation results indicated the Ion Power Brownfield Site (Subject Property) environmental conditions were generally acceptable, except for site groundwater, the use of which was restricted through the Environmental Covenant.

Additionally, the Environmental Covenant for the Property includes a requirement that all wells present and used for United States Environmental Protection Agency (EPA) or DNREC monitoring of groundwater shall be preserved in the current state. Based on our review of the most recent (2021) EPA 5-Year Review Report, there are three wells currently on the 750 Governor Lea Road Site: PW-7S, MW-3, and C-31 (see Figure 3). Currently, MW-3 and C-31 are in areas slated for pavement, and can be sleeved and / or protected during construction and rebuilt at the new grade. PW-7S is located in the footprint of the proposed building; Ten Bears proposes to petition the EPA to relocate it outside the building. If constructed at suitable intervals, as confirmed by field measurements, and acceptable to the EPA, TBE proposes to utilize PW-7S and MW-3 as part of this GWMP. Otherwise, we will construct new wells at similar locations. Should the EPA determine that the wells are unnecessary, they will be abandoned in-place by a Delaware-licensed driller.

III. ASSESSMENT OF CONTAMINATION RISKS

Likely contaminants associated with post-development commercial warehouse / light industrial use include petroleum residuals associated with roadway / parking runoff and lawn maintenance equipment, nutrients from lawn fertilizers, and road salt. Trace amounts of motor oil from vehicle leaks and asphalt-laden sediments are anticipated to enter the subsurface stormwater management (SWM) controls proposed for the site. However, these contaminants are heavy-weight hydrocarbons with low solubility in water and strong molecular attractions to soil mineral and organic particulates. As such, these contaminants are removed / treated with standard pre-treatment Best Management Practices (BMPs) designed to remove soil particulates. Road salt and other de-icing chemicals can also enter the groundwater through runoff, though more widespread environmental impact is likely through direct runoff to waterways, as under existing conditions. The proposed storm water controls will serve to contain and control that runoff, thereby limiting impact to surrounding soils and groundwater. Also, we anticipate significant separation between the Ion Power facility and the water table at the proposed SWM locations as outlined below.

Groundwater movement generally follows surface topography, absent manmade controls or other influences. The topography of the Site indicates ground surface sloping in all directions from an elevated area in the south-central portion of the Property at approximately 63 feet. General topographic trends are away from this plateau to the west on the western half of the Property and to the southeast on the eastern portion of the Property. Surrounding area topography is similar, sloping to the north towards Red Lion Creek in areas to the west and north of the Property and to the east towards the Delaware River in areas to the south and east of the Site. Based on previous exploratory drilling for TBE's 2004/5 Brownfield Investigation, groundwater flow followed the general area topographic trend to the north-northeast and was encountered at depths ranging from 30 to 40 feet below ground surface (bgs).

We anticipate the subsurface basins will cause localized mounding of shallow groundwater, but otherwise, shallow groundwater is expected to flow either northwest or northeast based on surficial topography and the presence of the nearby Metachem slurry wall. The proposed stormwater control structures and associated grading are designed to capture the majority of post-development site runoff and, as such, represent the most likely route for contamination to enter the environment and impact protected groundwater resources.

IV. GROUNDWATER MONITORING SCOPE

Given the two separate SWM areas, Ten Bears proposes constructing two sets of upgradient and downgradient wells for a total of 4 monitoring wells. Proposed locations are shown on Figure 4. If acceptable to EPA, TBE proposes to incorporate existing wells into the GWMP. Based on the anticipated 30- to 40-foot depth to water, we propose constructing the wells using hollow-stem auger drilling methods. A Delaware-licensed well driller will construct the wells and obtain the necessary well construction permits from the DNREC Division of Watershed Stewardship, Water Supply Section in advance of the work.

The wells will be constructed using 2-inch nominal diameter polyvinyl chloride well casing set in boreholes advanced with hollow-stem auger (HSA) equipment. The driller will advance 4 ¼-inch HSAs to the anticipated depths for well construction, approximately 40 to 55 feet. The soil

borings will be advanced using Standard Penetration Test (SPT) drilling procedure, with split-spoon soil samples collected at 1.5-foot intervals every 5 feet of borehole.

Ten Bears will review soil samples collected from the borings using visual-manual procedures to describe soil texture. Based on observed soil texture, we will work with the well driller to attempt to place a 10-foot length of 2-inch nominal diameter, No. 10-slot PVC well screen approximately 7 feet into the water table, in sandy soils within the proposed depth intervals, with solid PVC extending up to grade. Well construction depth intervals may vary from that planned for borings that encounter fine-grained units within the proposed interval. The annular borehole space surrounding the well casings will be filled with #2 filter sand to a minimum of 1 foot above the top of screen, then a minimum of 2 feet of bentonite 'hole plug,' followed by bentonite-amended cement grout to grade. The wells will be finished approximately 2 feet above grade with protective steel standpipes set in concrete. Immediately following construction, the wells will be developed using an alternate surge and pump technique to obtain visually clear water.

The first groundwater sampling event will occur a minimum of one week following well construction and development and prior to site development. Subsequent events are proposed semi-annually for a period of 2 years following construction. For each groundwater sampling event, sampling personnel will measure depth to groundwater prior to sample collection. The groundwater samples will be collected following well purging in accordance with EPA's low flow protocol. Due to the likely depth of groundwater, we anticipate using a submersible or bladder pump to purge the well at a relatively low flow rate from 300 to 500 milliliters per minute (mL/min) until the field parameters of pH, temperature, conductivity, dissolved oxygen, and visual clarity stabilize. The purge rate will be reduced to a maximum of 100 mL/min during sampling of volatile compounds.

We will pump the groundwater samples directly into laboratory-prepared bottleware with the appropriate field preservatives for the proposed analyses. We anticipate submitting the samples for analysis by a Delaware-certified laboratory for the contaminants listed in the Delaware Ground-Water Recharge Design Manual (University of Delaware Water Resources Agency, Revised June 2017).

During the first, baseline sampling event, the analysis will include all of the listed parameters (see attached excerpt), which include parameters regulated by the Delaware Drinking Water Standards. A few of those parameters will be excluded due to their insolubility in water (asbestos, PCBs, benzo(a)pyrene) or because they are drinking water treatment by-products (trihalomethanes). The first annual sampling event following construction will again include all of the listed parameters from the Ground-Water Recharge Design Manual. The subsequent, second post-construction annual event will include the semi-annual parameters, microbiological contaminants (turbidity by field instrument), and any contaminants detected in the prior annual event. Each subsequent semi-annual event will be limited to nitrate nitrogen; Chemical Oxygen Demand; the metals copper, zinc, and lead; chlorides; Total Dissolved Solids; phosphorous; and Total Carbon. The pH and specific conductance will be measured in the field during sampling as described above.

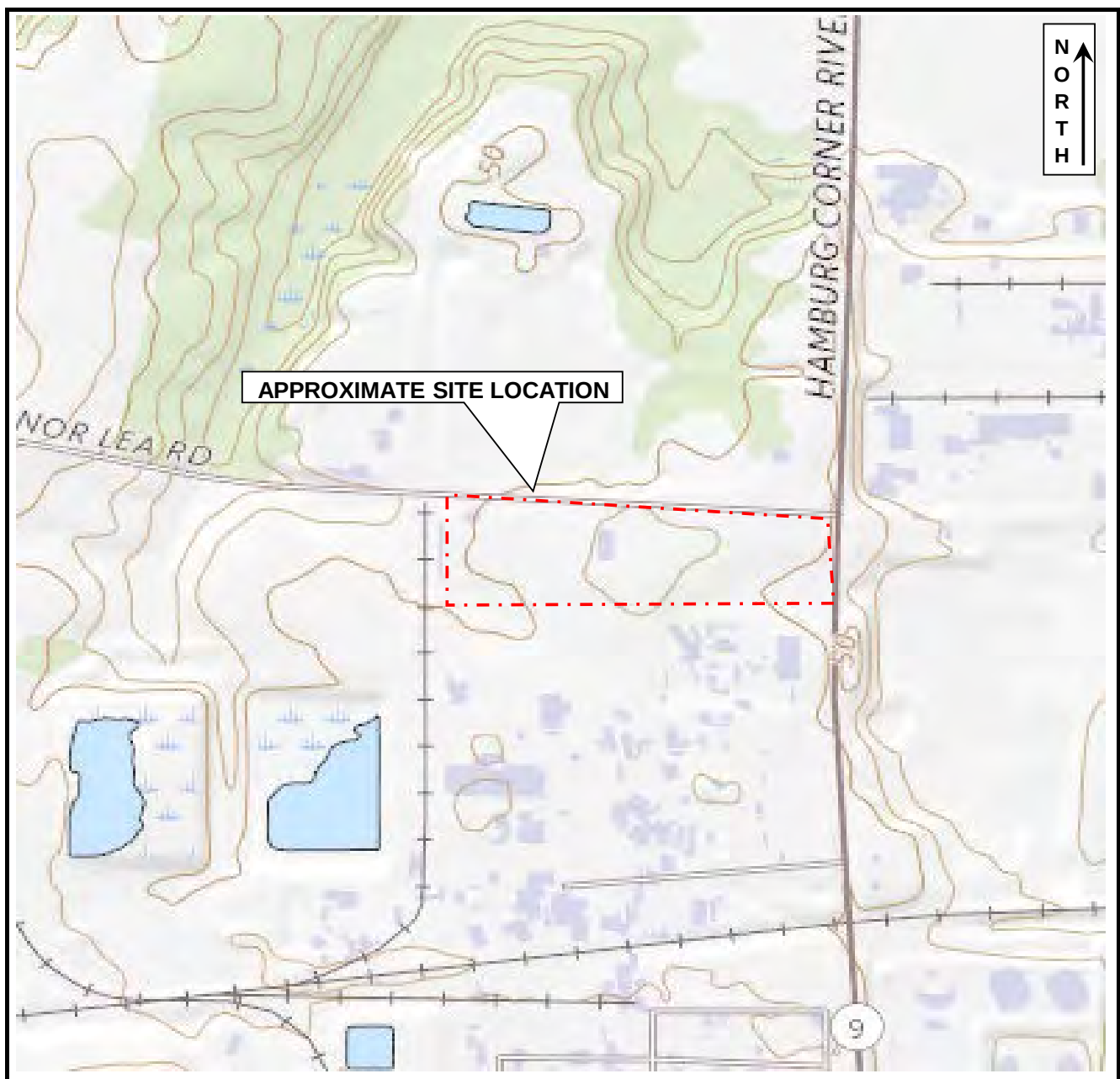
Laboratory testing will follow EPA standard methods and SW-846 methodology, including Method 353.2 for nitrate and nitrite, EPA Method 365.3 for phosphorous, EPA Method 524.2 for volatile organics, Method 515.1 for chlorinated herbicides, Method 507 for organophosphate pesticides,

Method 508 for chlorinated pesticides, Method 531.1 for carbamate pesticides, and Method 525.2 or semi-volatile organics, and SW-846 6020 for inorganics. For evaluation of potential risk to the aquifer, the results will be compared with the State of Delaware Maximum Contaminant Levels (MCLs) for Drinking Water or DNREC's Screening Levels (Screening Level Table, Updated November 2023), whichever is lower (more conservative). These levels are for screening of risk associated with hypothetical drinking water use for the location of the sample. Further evaluation may be warranted in the event that sampling results exceed these levels. As indicated above, the baseline event will be treated as site-specific background for use in evaluating potential impacts from the stormwater recharge facility.

V. SCHEDULE AND REPORTING

Groundwater sampling will be performed once prior to development on the Site, and semi-annually for two years after construction. We anticipate that potential contaminant discharges associated with the development would reach the proposed downgradient well location within 60 days. As such, after a year of semi-annual groundwater sampling, the groundwater data will be compiled and submitted to the County in an Annual Report. At that time, the frequency and scope of further groundwater sampling efforts will be re-evaluated. Tentatively, we anticipate recommending limiting the laboratory analysis for the second annual event to the contaminants detected in the prior event, as described above. The findings will be compiled in a second annual report. This plan does not contemplate ongoing monitoring after the 2-year post-construction period.

FIGURES



NOTE:
THIS LOCATION SKETCH WAS ADOPTED FROM THE USGS TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, FOR ST GEORGES, DELAWARE (2022)



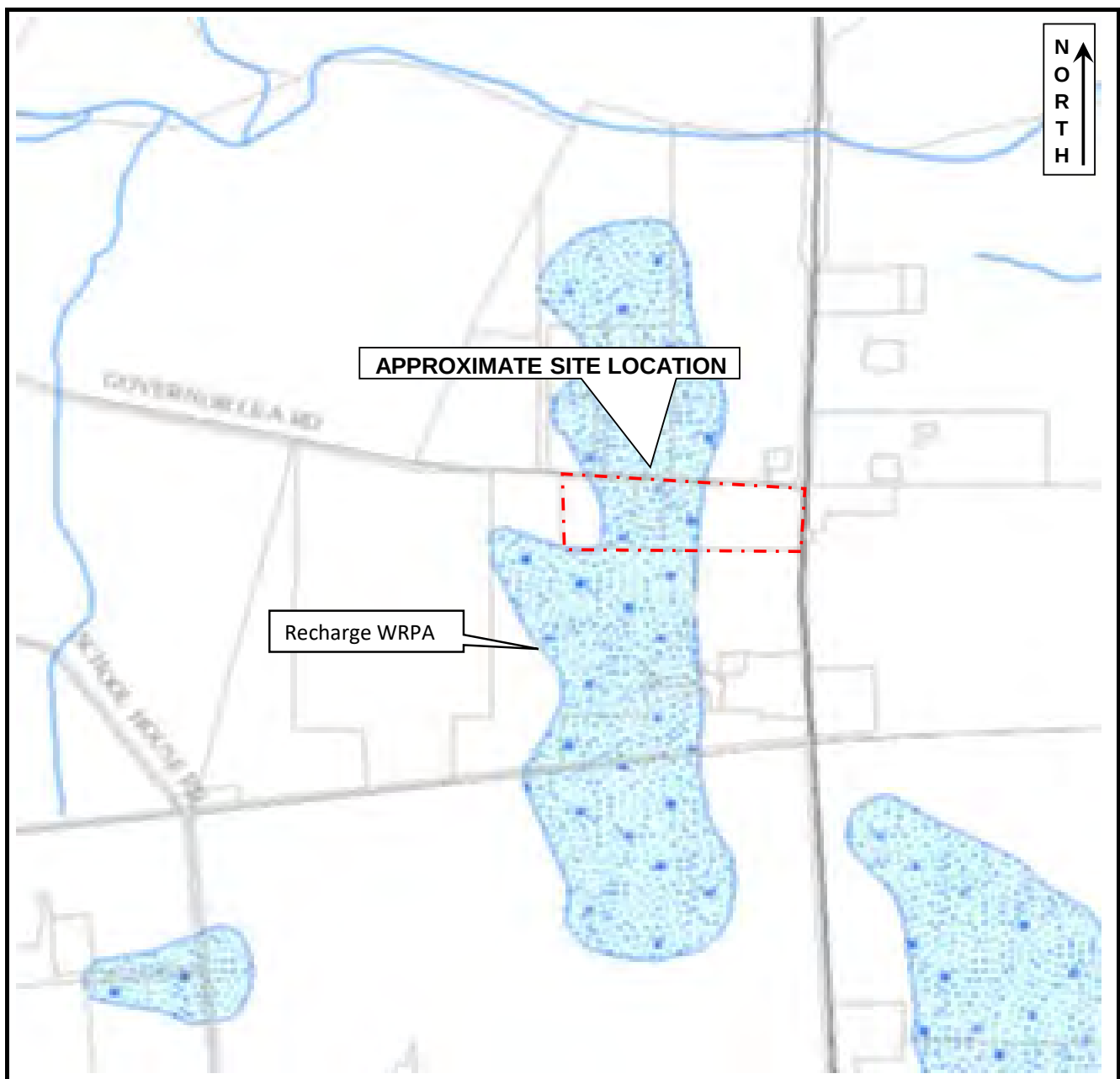
Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

FIGURE 1 - SITE LOCATION SKETCH

750 GOVERNOR LEA ROAD

DELAWARE CITY, DELAWARE

DATE: 6/20/2022	JOB NUMBER: 22-231.B
DRAWN BY: ASK	SCALE: N.T.S.
CHECKED BY: RCG	FIGURE NO: 1
FILE NO: 22-231.B	SHEET 1 OF 1



NOTE:
THIS LOCATION SKETCH WAS ADOPTED FROM THE USGS TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, FOR ST GEORGES, DELAWARE (2022)



Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

FIGURE 2 - MAPPED RECHARGE WRPA

750 GOVERNOR LEA ROAD

DELAWARE CITY, DELAWARE

DATE: 6/20/2022	JOB NUMBER: 22-231.B
DRAWN BY: ASK	SCALE: N.T.S.
CHECKED BY: RCG	FIGURE NO: 2
FILE NO: 22-231.B	SHEET 1 OF 1



NOTE: THIS LOCATION SKETCH WAS ADOPTED FROM A GOOGLE EARTH AERIAL IMAGE (2023)



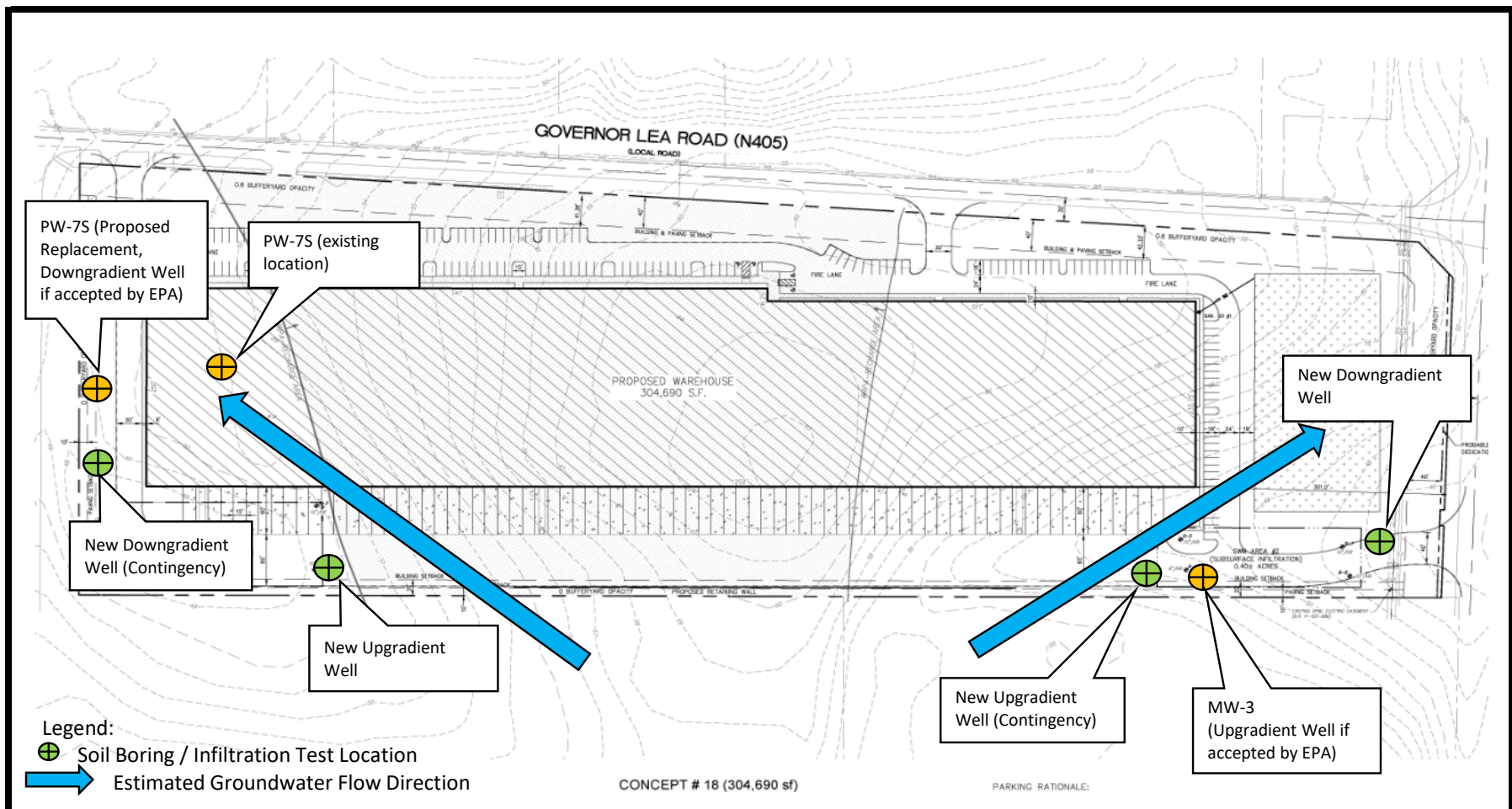
Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

FIGURE 3 - EPA GROUNDWATER MONITORING WELL LOCATIONS

750 GOVERNOR LEA ROAD

WILMINGTON, NEW CASTLE COUNTY, DELAWARE

DATE:	5/2/2024	JOB NO:	22-231.B
DRAWN BY:	MBK	SCALE:	As Shown
CHECKED BY:	RCG	FIGURE NO:	3
FILE NO:	22-231.B	SHEET:	1 of 1



NOTE: THIS LOCATION SKETCH WAS ADOPTED FROM A DRAFT LANDSCAPE PLAN
PROVIDED BY APEX ENGINEERING (2023)

FIGURE 4 - PROPOSED MONITORING WELL LOCATIONS

750 GOVERNOR LEA ROAD

WILMINGTON, NEW CASTLE COUNTY, DELAWARE



Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633

DATE: 5/2/2024
DRAWN BY: MBK
CHECKED BY: RCG
FILE NO: 22-231.B

JOB NO: 22-231.B
SCALE: 1" : 200'
FIGURE NO: 4
SHEET: 1 of 1

APPENDIX A

LABORATORY PARAMETERS EXCERPT FROM RECHARGE DESIGN MANUAL

1) *Frequency*: The quality of surface runoff entering the recharge facility and ground water and shall be sampled (a) before site development to determine baseline conditions and (b) twice annually after construction for at least 2 years. Depth to ground-water levels should be measured semiannually.

2) *Quality*: The following parameters shall be sampled semiannually:

pH	Chlorides	Specific Conductance
Nitrate Nitrogen	Total Dissolved Solids	Total Phosphorus
Chemical Oxygen Demand	Lead	Total Carbon
Copper	Zinc	

The following full suite of substances, those regulated by the Delaware Drinking Water Standards, shall be sampled and analyzed one per year. For further information:

<http://www.state.de.us/research/register/july2003/waterregs.pdf>.

Microbiological Contaminants

Total Coliform	Fecal coliform and E. coli
Turbidity	

Inorganic Contaminants

Antimony	Arsenic
Asbestos	Barium
Beryllium	Cadmium
Chromium	Copper
Cyanide	Fluoride
Lead	Mercury
Nitrate	Nitrite
Nitrate/nitrite (as Nitrogen)	Selenium
Thallium	

Synthetic Organic Contaminants (including Pesticides and Herbicides)

2,4-D	2,4,5-TP [Silvex]
Acrylamide	Alachlor
Atrazine	Benzo(a)pyrene
Carbofuran	Chlordane
Dalapon	Di(2-ethylhexyl)adipate
Di(2-ethylhexyl) phthalate	Dibromochloropropane
Dinoseb	Diquat
Dioxin [2,3,7,8-TCDD]	Endothall
Endrin	Epichlorohydrin
Ethylene dibromide	Glyphosate
Heptachlor	Heptachlor epoxide

Hexachlorobenzene
Lindane
Oxamyl [Vydate]
Pentachlorophenol
Simazine
Aldicarb
Aldicarb sulfoxide

Hexachlorocyclopentadiene
Methoxychlor
PCBs
Picloram
Toxaphene
Aldicarb sulfone

Volatile Organic Contaminants

Benzene
Carbon tetrachloride
Chlorine
Chlorine dioxide
o-Dichlorobenzene
1,2-Dichloroethane
cis-1,2-Dichloroethylene
Dichloromethane
Ethylbenzene
Methyl Tert Butyl Ether
Tetrachloroethylene
1,1,1-Trichloroethane
Trichloroethylene
Toluene
Xylenes

Bromate
Chloramines
Chlorite
Chlorobenzene
p-Dichlorobenzene
1,1-Dichloroethylene
trans-1,2-Dichloroethylene
1,2-Dichloropropane
Haloacetic acids
Styrene
1,2,4-Trichlorobenzene
1,1,2-Trichloroethane
TTHMs [Total trihalomethanes]
Vinyl Chloride
Control of DBP Precursors (TOC)

RPATAC RECOMMENDATION



Department of Land Use

Resource Protection Area Technical Advisory Committee

**RECOMMENDATION TO THE NEW CASTLE COUNTY
DEPARTMENT OF LAND USE AND BOARD OF ADJUSTMENT**

APPLICATION #: 2024-0336 (750 Governor Lea)
HEARING DATE: July 24, 2024
APPLICANT: Governor Lea Road LLC
720 and 750 Governor Lea Road
New Castle, Delaware
Council District: 12

VARIANCE REQUEST:

Governor Lea Road LLC requests a recommendation from the Resource Protection Area Technical Advisory Committee to the Department of Land Use and the Board of Adjustment for a variance from the Water Resources Protection Area (WRPA) standards outlined in Table 40.10.010 of the Unified Development Code to disturb up to 100% of the WRPA (50% protection level) and from Section 40.10.160.B to permit up to 86% impervious cover in the WRPA and variance from the Department's Recharge Design Manual recommendations for siting supplemental stormwater recharge within a WRPA boundary in order to build a 353,500-sf light manufacturing facility and associated site improvements. The application proposes groundwater recharge and afforestation.

PROJECT DESCRIPTION:

Site Description

The Property consists of two New Castle County tax parcels (12-008.00-004 and 12-008.00-006), totaling approximately 18.5 acres. The Property currently has a small office / research lab and vacant locker room / shower facility formerly used for a nearby industrial plant. The Owner proposes to construct an approximately 353,500 square-foot light manufacturing facility (approximately 304,690 sf footprint with 48,810 sf mezzanine) at the Property consistent with infill Brownfields redevelopment. The parcels include a mapped Recharge WRPA covering approximately 8.01 acres of the Property.

STANDARDS FOR AN ENVIRONMENTAL IMPACT ASSESSMENT

The proposed use requires an environmental impact assessment report and has addressed the criteria set forth in the Unified Development Code Sections 40.10.701, as follows:

Site Character

The Site currently consists of approximately 18.5 acres of partially developed industrial land north of Delaware City. Existing development at the Site is limited, with an approximately 9,000 sf research / office building most recently used by Ion Power for offices and laboratory research and an approximately 3,200 square-foot building formerly used as shower / locker room facilities for the former Standard Chlorine / Metachem site across Governor Lea Road. The larger building and associated parking facilities are entirely within the mapped WRPA boundary, while the shower facility is outside the WRPA to the west.

General topographic trends are from the western half of the Property and to the southeast on the eastern portion of the Property. Surrounding area topography slopes to the north towards Red Lion Creek in areas to the west and north of the Property and to the east towards the Delaware River in areas to the south and east of the Site. General groundwater flow at the Site was to the north prior to the Metachem remedy. Post-remedy groundwater flow mounds behind the south side of the wall and around to the northeast and northwest.

The mapped topography indicates that current (i.e., pre-development) stormwater runoff is primarily collected by two subtle swales. On the western portion of the Site, runoff leads to a swale along the western boundary of the Site then flows north to an unnamed tributary to Red Lion Creek. On the eastern portion of the Site, runoff leads to a swale along the southeastern portion of the Site, flowing east towards Delaware Route 9 (River Road), then towards the Delaware River. A narrow band along the northern border of the Site drains toward Governor Lea Road.

According to the applicable Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for New Castle County and Incorporated Areas (Map Panel Number 1003C0436K), no flood-prone areas are mapped on the Site. This mapping is consistent with the elevated topography of the Site relative to surrounding areas. As such, flooding is unlikely to affect stormwater recharge at the Site.

Similarly, the applicable U. S. Department of the Interior “National Wetlands Inventory” Online Wetlands Mapper indicates no mapped federal wetland areas on the Property. Site observations were consistent with this mapping.

The parcels include a mapped Recharge WRPA covering approximately 8.01 acres of the Site. The Water Resource Protection Area (WRPA) Map of Central New Castle County (Water Resources Agency, University of Delaware, sheet 2 of 3, revised March 2022) depicts the area as a “Recharge WRPA.” The area covers nearly half the Property, extended through the west-central portion from the southern boundary to the northern boundary. Off site, the WRPA extends to the north across Governor Lea Road onto a cluster of parcels currently owned by ‘COP Acquisition Co’ that were formerly operated as ‘Metachem Industries’ and ‘Standard Chlorine.’ The WRPA extends to the south well into the adjoining Delaware City Industries refinery. No protected water supply wells are depicted in the vicinity of the Property.

Historical aerial photographs available on the New Castle County parcel information and DEMAC (Delaware Environmental Monitoring and Analysis Center) indicate the Site as undeveloped / agricultural land until the 1982 NCC photo, when a small apparent dirt parking lot appears in the northwest corner of the Site. The 1992 DEMAC photo first shows the current development, along with an area of land disturbance / fill south of the locker room facility. The field appears maintained in this photograph, but gradually overgrows with time. Five rows of solar panels are visible south of the larger building on the 2017 DEMAC photograph.

The Site is surrounded by apparent agricultural lands in the early (1926 through 1954) aerial imagery. In 1961, the refinery facility is largely completed to the south and southeast of the Property, with density added progressively over time. Construction of Metachem to the north begins to show on the 1968 photograph, with the facility largely completed by 1992. By the 2007 photograph, the Metachem facility is no longer present.

The U.S. Department of Agriculture, Natural Resources Conservation Service’s Web Soil Survey maps the Site soils as primarily Reybold silt loam, with 0 to 2 percent slopes on the north-central and 2 to 5 percent slopes on the majority of the remainder. The Reybold series soils are described as well-drained, high-silt loamy eolian (windblown) deposits on flats and interfluvies. The small area of Hambrook-Urban land complex soils along Route 9 are described as sandy loam, loam and sandy clay loam soils. The small area of Sassafra soils in the southwestern portion of the Site are described as sandy loam soils on low hills and hillslopes. All four soil series are hydrologic soil group (HSG) B.

Soils in the WRPA area are mapped as Reybold series, with the exception of a narrow strip of Urban land along Governor Lea Road in the northwestern corner. The typical profile of Reybold soils is silt loam to 30 inches underlain by gravelly coarse sand. Urban land is typically disturbed by filling or cutting that obscures the original soil profile.

The Property is mapped within the Delaware Coastal Zone. While the Owner does not propose prohibited uses, the proposed light manufacturing use will require a status decision from DNREC, which is pending.

Avoidance

The mapped WRPA occupies nearly half of the Property and extends through the central portion of the site. As such, it is impracticable and financially infeasible to avoid the WRPA while redeveloping the Site for its highest and best use. Also, placing impervious surfacing in the WRPA on the Site serves to lessen groundwater contaminant migration associated with the Metachem site. Conversely, avoiding impervious surfacing in the WRPA or infiltrating excess stormwater within the WRPA promotes the migration of existing documented contamination. Selection of this Brownfield site in the larger Delaware City Industrial Area for a redevelopment project is in keeping with the surrounding area and the intent of Coastal Zone regulations, as well as the goals of the New Castle County 2050 Comprehensive Development Plan to avoid placing development in Greenfields and encouraging development within infill areas.

Minimization

As with avoidance, the existing environmental site conditions suggest that minimizing impacts to the protected resource as defined in the UDC serves little purpose. As such, the proposed project focuses on mitigation specifically directed to limit migration of contaminants from the adjoining site into the Red Clay Creek.

Mitigation

The Project as designed provides substantial mitigation for the recharge of groundwater and assists with controlling the migration of existing groundwater contamination on the adjoining property. The collection and infiltration of groundwater from the WRPA area upgradient of the Metachem site will be redirected outside the areas upgradient of the Metachem site. The Project proposes to enhance the overall recharge volume while capturing untreated runoff and reducing contaminant migration to the nearby Red Lion Creek. The Owner also plans landscaping improvements including substantial afforestation. The plan includes a continuous screen of trees from the adjoining roadways with a total of 220 trees and covering 1.8 acres of the Site, covering half the available open space.

Apex Engineering, Inc. reviewed 49 other parcels owned by the developer and related entities for potential areas in WRPA zones for consideration of transferring development rights. However, no mapped WRPAs were identified.

Conservation Design

Conservation design principles are included in the proposed construction. Standard Best Management Practices (BMPs) will be employed to limit potential erosion and sedimentation of soils exposed by construction. The BMPs will filter sediments, vegetative debris, and excess nutrients from stormwater runoff from the Site and upgradient areas during construction-related soil disturbance.

Endangered Species

On December 16, 2022, Ten Bears submitted notification letters to selected agencies informing them of the proposed construction and requesting a formal determination of any potential conflicts with protected resources on the Property or within 500 feet, including threatened and endangered species and wetlands. Notified agencies included the State of Delaware Department of Natural Resources and Environmental Control (DNREC) Wetlands and Subaqueous Lands Section, DNREC Division of Fish and Wildlife (DFW), Delaware State Historic Preservation Office, U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service.

Agency responses, including DNREC DFW, indicated no conflicts with protected resources. While the IPaC (U.S. Fish and Wildlife Service, Information for Planning and Consultation map resource) output indicated the potential for the bog turtle, a threatened species, and the monarch butterfly, a candidate, in the area of the Property, it identified no critical habitats for any species at this location.

Resources

A similar conflict determination letter was sent to the Delaware State Historic Preservation Office (SHPO). As is typical for projects that are not Federally funded, Ten Bears has received no responses. The State of Delaware's CHRIS (Cultural and Historical Response Information System) web application indicated no mapped historical resources at or within 500' of the Site.

RESOURCE PROTECTION AREA TECHNICAL ADVISORY COMMITTEE HEARING

July 24, 2024

Synopsis:

The New Castle County Resource Protection Area Technical Advisory Committee held a public hearing on July 24, 2024, to review Application 20240-336 for 750 Governor Lea Rd.

On behalf of the Owner, Pam Scott, Esq. of Saul Ewing, LLP presented a PowerPoint for this application describing the details of the plan, including on-site mitigation as outlined in the Environmental Impact Assessment report. Also, in attendance were Clay Greer, PE of Ten Bears Environmental Associates Co., Steve Davies, PE of Apex Engineering, Inc., Ellen Tracey, RLA of Designs Etc., and William and Thomas Harvey as owner representatives.

Following the presentation, several questions were posed by the RPATAC:

1. **The EIA states that the proposed development will infiltrate four times more than the pre-developed condition, how might this additional recharge impact the slurry wall for the adjacent Metachem site?**
The applicant responded that the additional infiltration will be directed to the east and west, away from the slurry wall and lessen the impacts currently experienced in the pre-developed condition.
2. **The EIA states that this Project will results in a mass-loading decrease for the Metachem site, how will this be achieved?**
The applicant responded that the impervious cover proposed over the Recharge WRPA within their site would act as cap reducing the rate of groundwater flow from this site to the Metachem property.
3. **As it is preferred that infiltration be encouraged on the east side of the site, could the currently proposed septic system in this location be moved to the west side?**
The applicant stated that this application is also subject to the Rt. 9 Scenic By-way provisions, which require additional buffering along the east property edge, the septic system in this location allows both needs of the site, septic and buffering, to be accomplished in the same space.
4. **Could the future EPA remedy be impacted by the development of this property?**
The applicant responded that this project would not impact any future EPA remedy.

There was one letter received from the public, neighbor Michael Cirillo of 755 Governor Lea Rd., who wrote in support of the variance request.

RECOMMENDATION

After reviewing the Environmental Impact Assessment report, prepared by the applicant's consultant, as well as the testimony provided by the applicant's representatives during the hearing, a motion was made by Stefanie Baxter, which was seconded by Ping Wang, to Recommend in favor of the variance as requested by the applicant.

Eleven (11) members were present for this meeting. The Committee voted to support a Recommendation in favor of the application (11-0) as summarized in the table below.

Resource Protection Area Technical Advisory Committee



Marian Young
Chairperson

Signed September 17, 2024

Member - Representation	In Attendance	For	Against	Recuse	Present	Abstain
Michael Ellis – Consulting Engineer’s Council						
Ping Wang – DNREC	x	x				
Stephanie Baxter – Delaware Geologic Survey	x	x				
Marian Young – Chair – Chamber of Commerce	x	x				
Doug Hokuf – Department of Land Use	x	x				
Ellie Mortazavi – Department of Public Works	x	x				
Jonathan Hawkes – Water Company	x	x				
Andrew Homsey – University of Delaware Water Resources Agency	x	x				
Kristen Travers – Environmental Advocacy Group	x	x				
Andrew Hayes – Private Sector	x	x				
Kevin Donnelly – New Castle Conservation District	x	x				
Scott Hoffman – Private Sector Environmental Professional	x	x				
Vacant – Chemical Industry						