Illicit Discharge Detection and Elimination (IDDE) Plan

Town of Sandown, New Hampshire

Prepared June 30, 2019
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Illicit Discharge Detection and Elimination (IDDE) Plan Revision Log

Revision Date	Section(s) Revised	Revisions Made	Revisions Made by
June 30, 2019	All	Original IDDE Plan prepared.	Comprehensive Environmental Inc.
June 30, 2021	Appendix H	Dry weather outfall screening data.	Comprehensive Environmental Inc.
June 30, 2022	1.4 and appendices	Impaired waterbodies in Table 1-1, appendices associated with mapping, outfall screening, and training.	Comprehensive Environmental Inc.

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1 Introduction

1.1 IDDE Regulatory Background

This Illicit Discharge Detection and Elimination (IDDE) Plan has been developed by the Town of Sandown to address the requirements of the United States Environmental Protection Agency's (USEPA's) 2017 National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in New Hampshire, hereafter referred to as the "2017 MS4 Permit." The 2017 New Hampshire MS4 Permit was signed on January 18, 2017 and has an effective date of July 1, 2018, and more recently updated on December 7, 2020 with an effective date of January 6, 2021. After several years of litigation, the permit was updated with a revised effective date of January 18, 2021. Authorization to discharge expires on July 1, 2023. The 2017 New Hampshire MS4 Permit requires that each permittee, or regulated community, address six Minimum Control Measures (MCMs). These measures include the following:

1. Public Education and Outreach;
2. Public Involvement and Participation;
3. Illicit Discharge Detection and Elimination Program;
4. Construction Site Stormwater Runoff Control;
5. Stormwater Management in New Development and Redevelopment (Post Construction Stormwater Management); and
6. Good Housekeeping and Pollution Prevention for Permittee Owned Operations.

Under MCM 3, the permittee is required to implement an IDDE program to systematically find and eliminate sources of non-stormwater discharges to its municipal separate storm sewer system and implement procedures to prevent such discharges. The IDDE program must be recorded in a written (hardcopy or electronic) document. This IDDE Plan has been prepared to address this requirement.

1.2 Illicit Discharges

An "illicit discharge" is any discharge to a municipal separate storm sewer that is not composed entirely of stormwater except non-stormwater discharges pursuant to a NPDES permit and discharges resulting from fire-fighting activities.

Illicit discharges may take a variety of forms. Illicit discharges may enter the drainage system through direct or indirect connections. Direct connections may be relatively obvious, such as cross-connections of a sewer service pipe to the storm drain system. Indirect illicit discharges may be more difficult to detect or address, such as a cracked pipe, leaking tank; failing septic systems that discharge untreated sewage to a ditch within the MS4, or a sump pump that discharges contaminated water on an intermittent basis.

Some illicit discharges are intentional, such as dumping used oil (or other pollutant material) into catch basins, a resident or contractor illegally tapping a sewer lateral into a storm drain pipe to avoid the costs of a sewer connection fee and service, and illegal dumping of yard

wastes into surface waters. Some illicit discharges are related to the unsuitability of original infrastructure to the modern regulatory environment. Examples of illicit discharges in this category include connected floor drains in old buildings, as well as sanitary sewer overflows that enter the drainage system. Sump pumps legally connected to the storm drain system can also be an illicit discharge if used inappropriately, such as for the disposal of floor wash water or old household products, in many cases due to a lack of understanding on the part of the homeowner.

Common illicit discharges can include the following:

- Sanitary wastewater from crushed, cracked, or collapsed pipes or from surcharges;
- Sewer lines from a house, basement, or individual bathroom to a storm drain;
- Overflow or seepage from septic tanks;
- Cross connections between a sewer or combined sewer line and the storm system;
- Commercial vehicle wash wastewater; and/or
- Improper disposal of automobile and household products.

Elimination of some discharges may require substantial costs and efforts, such as funding and designing a project to reconnect sanitary sewer laterals. Others, such as improving self-policing of dog waste management, can be accomplished by outreach in conjunction with the minimal additional cost of dog waste bins and the municipal commitment to dispose of collected materials on a regular basis. Regardless of the intention, when not addressed, illicit discharges can contribute high levels of pollutants, such as heavy metals, toxics, oil, grease, solvents, nutrients, and/or pathogens to surface waters. Thus, the 2017 MS4 Permit requires a program to identify, locate and remove illicit discharges.

1.3 Allowable Non-Stormwater Discharges

The following categories of non-storm water discharges are allowed under the MS4 Permit unless the permittee, USEPA identifies any category or individual discharge of non-stormwater discharge as a significant contributor of pollutants to the MS4:

- Water line flushing;
- Landscape irrigation;
- Diverted stream flows;
- Rising ground water;
- Uncontaminated pumped groundwater;
- Discharge from potable water sources;
- Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20));
- Foundation drains;
- Air conditioning condensation;
- Irrigation water, springs;
- Water from crawl space pumps;
- Footing drains;
- Lawn watering;
- Individual resident car washing
- Flows from riparian habitats and wetlands;
- De-chlorinated swimming pool discharges;
- Street wash waters; and
- Residential building wash waters without detergents.

If these discharges are identified as significant contributors to the MS4, they must be considered an "illicit discharge" and addressed under the IDDE Program (i.e., control these sources so they are no longer significant contributors of pollutants, and/or eliminate them entirely).

1.4 Receiving Waters and Impairments

As part of the 2017 MS4 Permit, communities must implement specific actions and BMPs to address waters with an approved Total Maximum Daily Load (TMDL) as of the issuance date of the permit (January 18, 2017) and to address water quality limited waters, including but not limited to waters listed in categories 5 or 4a on the most recent EPA-approved New Hampshire Clean Water Act section 303(d) list or New Hampshire Integrated Report of water under Clean Water Act section 305(b). IDDE requirements include consideration of these waters in the prioritization of IDDE activities and sampling programs.

Table 1-1 lists the "impaired waters" within the boundaries of Sandown's regulated area based on the Final New Hampshire Integrated List of Waters produced by the New Hampshire Department of Environmental Services (NHDES) every two years[1]. Impaired waters are water bodies that do not meet water quality standards for one or more designated use(s) such as recreation or aquatic habitat.

Table 1-1. Impaired Waters

Waterbody ID	Waterbody Name	Impairment(s)	Category
NHIMP600030802-01	Exeter River - Denson Pond	Mercury	4A-M
NHIMP600030802-08	Unnamed Brook - Atkins Dam	Mercury	4A-M
NHIMP600030802-09	Unnamed Brook - Fire Hole Pond Dam	Mercury	4A-M
NHLAK600030802-01	Hunt Pond	pH	4A-M
		Mercury	4A-M
NHLAK600030802-02	Lily Pond	pH	5-M
		Mercury	4A-M
		Cyanobacteria	5-P
NHLAK600030802-03-01	Phillips Pond	Chlorophyll-a	5-M
		Non-Native Aquatic Plants	4C-P
		Phosphorus (Total)	5-M
		pH	5-M
		Mercury	4A-M
		Cyanobacteria	5-M

[1]At the time of report preparation, the 2018 303d list is the most up to date 303d List as approved by USEPA.

Table 1-1 (continued). Impaired Waters

Waterbody ID	Waterbody Name	Impairment(s)	Category
NHLAK600030802-03-02	Phillips Pond - Seeley Town Beach	Non-Native Aquatic Plants	4C-P
		Mercury	4A-M
		Cyanobacteria	5-M
NHLAK600030802-04	Showell Pond	Chlorophyll-a	4A-P
		Phosphorus (Total)	4A-P
		pH	5-M
		Mercury	4A-M
		Chlorophyll-a	4A-P
		Cyanobacteria	4A-M
NHLAK700061403-01-01	Angle Pond	Chlorophyll-a	5-M
		Phosphorus (Total)	5-M
		pH	5-M
		Mercury	4A-M
		Cyanobacteria	5-M
NHLAK700061403-01-02	Angle Pond - Angle Pond Grove Beach	Mercury	4A-M
NHLAK700061403-04	Cub Pond	pH	5-M
		Mercury	4A-M
NHLAK700061403-14	Punch Pond	Mercury	4A-M
NHRIV600030802-02	Showell Pond Outlet Brook - to Phillips Pond	Mercury	4A-M
NHRIV600030802-03	Exeter River	pH	5-M
		Mercury	4A-M
		Escherichia coli	4A-P
NHRIV600030802-04	Exeter River - Unnamed Brook	Mercury	4A-M
NHRIV600030802-12	Unnamed Brook - to Exeter River	Mercury	4A-M
NHRIV600030802-15	Unnamed Brook	Mercury	4A-M
NHRIV600030802-17	Unnamed Brook	Mercury	4A-M
NHRIV600030802-19	Unnamed Brook	Mercury	4A-M
NHRIV600030802-20	Unnamed Brook	Mercury	4A-M
NHRIV600030802-21	Unnamed Brook	Mercury	4A-M
NHRIV600030802-26	Unnamed Brook	Mercury	4A-M
NHRIV600030802-27	Unnamed Brook	Mercury	4A-M
NHRIV600030802-29	Unnamed Brook	Mercury	4A-M
NHRIV600030802-31	Unnamed Brook	Mercury	4A-M
NHRIV600030802-32	Unnamed Brook	Mercury	4A-M
NHRIV600030802-35	Unnamed Brook	Mercury	4A-M
NHRIV600030802-36	Unnamed Brook	Mercury	4A-M
NHRIV600030802-37	Unnamed Brook	Mercury	4A-M

Table 1-1 (continued). Impaired Waters

Waterbody ID	Waterbody Name	Impairment(s)	Category
NHRIV700061403-01	Colby Brook	Mercury	4A-M
NHRIV700061403-21	Unnamed Brook - to Angel Pond through North Inlet	pH	5-M
		Mercury	4A-M
NHRIV700061403-22	Unnamed Brook - to Angel Pond through West Inlet	pH	5-M
		Mercury	4A-M
NHRIV700061403-25	Unnamed Brook	Mercury	4A-M
NHRIV700061403-26	Unnamed Brook	Mercury	4A-M
NHRIV700061403-36	Unnamed Brook	Mercury	4A-M

Category 4A-M –There is an impairment per the CALM by a parameter which is a pollutant and an EPA-approved TMDL has been completed. However, the impairment is relatively slight or marginal.
Category 4A-P – There is an impairment per the CALM by a parameter which is a pollutant and an EPA-approved TMDL has been completed. However, the impairment is more severe and causes poor water quality.
Category 4C-P – There is a parameter which is not considered a pollutant but is causing impairment per the CALM. The impairment is more severe and causes poor water quality defined in sub-category 4A-P above.
Category 5-M – There is an impairment per the CALM by a parameter which is a pollutant that requires a TMDL. The impairment is marginal as defined in DES sub-category 4A-M above.
Category 5-P Waters – There is an impairment per the CALM by a parameter which is a pollutant that requires a TMDL. The impairment is more severe and causes poor water quality conditions.

Sandown is also subject to the Great Bay nitrogen impairment, as the Town discharges to the Squamscott River (NHEST600030806) via the Exeter River and then onto Great Bay. Thus, Sandown is meeting sampling requirements in Part I of Appendix H for discharges to water quality limited waterbodies and their tributaries where nitrogen is the cause of impairment as outlined further below.

Note that although Sandown has a number of waterbodies listed as impaired, the 2017 MS4 Permit does not specific a wasteload allocation or other requirements for MS4 discharges for mercury, pH, non-native aquatic plants, chlorophyll-a, or cyanobacteria. Thus, there are no requirements for these pollutants under this Plan. Remaining sampling requirements for TMDL or water quality limited waterbodies related to nitrogen, phosphorus, and bacteria are outlined further below.

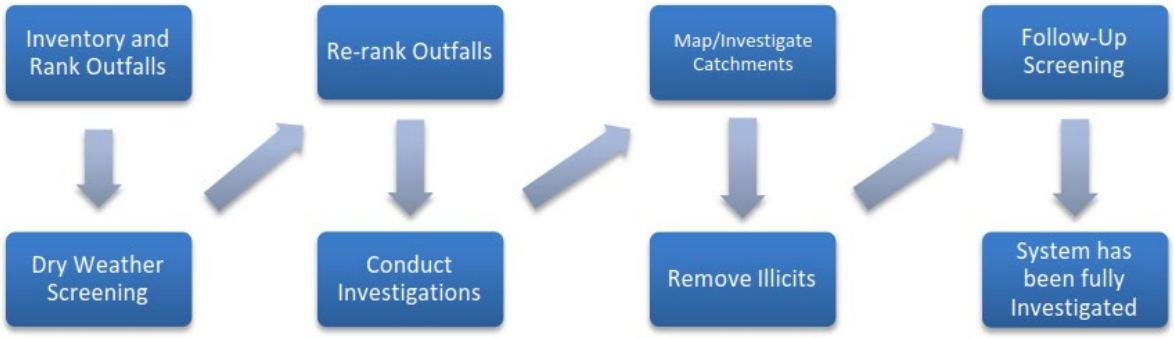
1.5 IDDE Program Purpose, Goals and Framework

The purpose of this plan is to document the Town's IDDE program and to assist field staff and program staff with the proper identification, reporting, and resolution of pollution problems. A locus map with the regulated Urbanized Area shown is provided as **Figure 1-1** at the end of this section.

The goals of the IDDE program are to find and eliminate illicit discharges to the municipal separate storm sewer system and to prevent illicit discharges from happening in the future. The program consists of the following major components as outlined in the MS4 Permit:

- Legal authority and regulatory mechanism to prohibit illicit discharges and enforce this prohibition;
- Storm system mapping;
- Inventory and ranking of outfalls;
- Dry weather outfall screening;
- Catchment investigations;
- Identification/confirmation of illicit sources;
- Illicit discharge removal;
- Follow-up screening; and
- Employee training.

The general IDDE investigation procedure framework is shown below:



1.6 How to Use this Plan

This plan is intended to be used by Town of Sandown staff whose job involves frequent field or site visits, as well as staff responsible for administering the MS4 permit. This includes staff from the Department of Public Works however may also involve staff from the Select Board. This plan is divided into several sections and includes the following components:

Section 2 **Authority and Statement of IDDE Responsibilities** – references the Town's legal authority to regulate illicit connections and discharges and identifies Town staff responsible for IDDE Program components.

Section 3 **Stormwater System Mapping** – outlines the procedures for completing required stormwater system mapping, as well as additional recommendations in the 2017 MS4 Permit.

Section 4 **Sanitary Sewer Overflows (SSOs)** – provides an inventory of known SSOs that have discharged to the MS4 and then to waterways within the five (5) years prior to the effective date of the 2017 MS4 Permit, and outlines the procedures for their elimination.

Section 5 **Assessment and Priority Ranking of Outfalls** – assesses and ranks each outfall catchment area for illicit discharge potential. The ranking is used to prioritize IDDE investigations.

Section 6 **Dry Weather Outfall Screening and Sampling** – outlines the procedures for performing outfall screening investigations during dry weather.

Section 7 **Catchment Investigations** – details various additional investigations used to locate evidence of illicit discharges or SSOs and to isolate and confirm the source of the potential discharge within the outfall catchment area.

Section 8 **Source Investigations** – describes methods for identifying the source of an illicit discharge.

Section 9 **Illicit Discharge Removal** – describes methods for illicit discharge removal, as well as subsequent confirmation screening and discharge prevention.

Section 10 **Training** – details the minimum IDDE training that is made available to all employees involved in the IDDE program.

Section 11 **Progress Reporting** – outlines the scope of annual progress reports which evaluates the progress and success of the IDDE program.

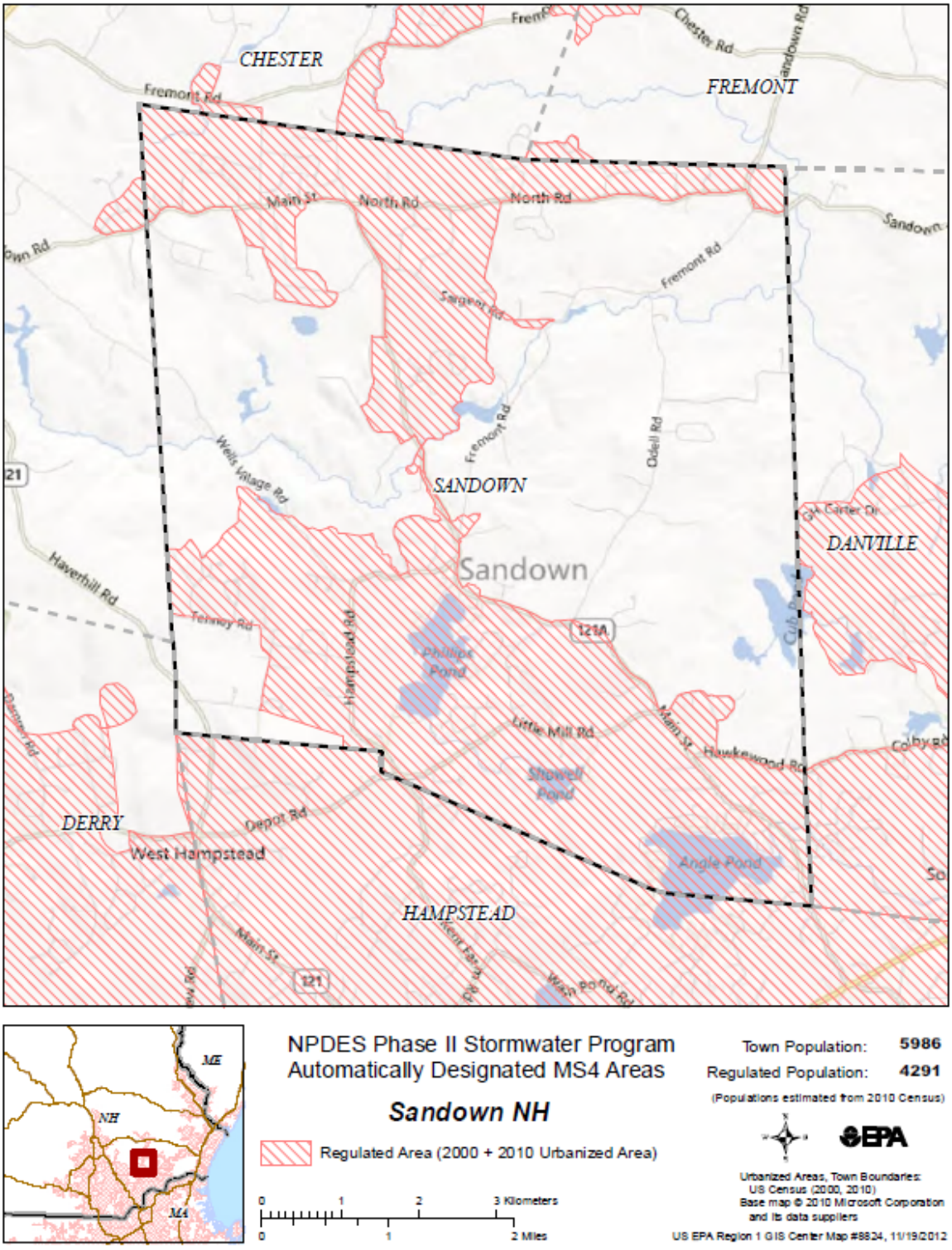


Figure 1-1. Urbanized Area

2 Authority and Statement of IDDE Responsibilities

2.1 Legal Authority

The Town of Sandown has adopted an "Illicit Discharge Detection and Elimination Ordinance" in the Zoning Ordinances, approved by voters on March 12, 2019 that addresses illicit discharges into the MS4 as required under the 2017 MS4 Permit. A copy of the bylaw is provided in the Stormwater Management Program (SWMP) Plan. This regulatory mechanism provides the Town of Sandown with adequate legal authority as required to comply with 2017 MS4 Permit requirements, including:

- Investigate suspected illicit discharges;
- Require the removal of all such illicit connections;
- Eliminate illicit discharges, including discharges from properties not owned by or controlled by the MS4 that discharge into the MS4 system; and
- Implement appropriate enforcement procedures and actions.

2.2 Statement of Responsibilities

The Department of Public Works (DPW) and Select Board (SB) are responsible for implementing the IDDE program. The Department of Public Works or his/her appointed designee has the authority to enforce Article I of the Stormwater Management Bylaw. IDDE Program Responsibilities include:

- Drainage system mapping (DPW, SB);
- Determining and inspecting key junction manholes (DPW, SB);
- Catchment delineation and prioritization for field screening (DPW, SB);
- Dry and wet weather outfall investigations where required (DPW, SB);
- Performing systematic catchment investigations (DPW, SB);
- Investigating and eliminating IDDE sources (DPW, SB);
- Enforcing IDDE ordinance requirements (DPW, SB);
- Tracking illicit discharge connections and removals for annual reporting (DPW, SB);
- Incorporating IDDE into public education efforts (DPW, SB); and
- Providing annual employee training (DPW, SB).

3 Stormwater System Mapping

The 2017 MS4 Permit requires a detailed storm system map to facilitate identification of key infrastructure, factors influencing proper system operation, and the potential for illicit discharges. The 2017 MS4 Permit requires the storm system map to be developed in two phases as outlined below. The Department of Public Works and Board of Selectmen are responsible for developing the stormwater system mapping pursuant to the 2017 MS4 Permit. The status of Sandown's stormwater infrastructure mapping is provided in **Appendix A** along with a copy of the map. The Town of Sandown reports on the progress towards completion of the storm system map in each annual report with updates to the stormwater mapping included in **Appendix A**.

3.1 Phase I Mapping

Phase I mapping must be completed within two (2) years of the effective date of the permit (July 1, 2020) and include the following information:

- Outfalls and receiving waters (previously required by the MS4-2003 permit);
- Open channel conveyances (swales, ditches, etc.);
- Interconnections with other MS4s and other storm sewer systems;
- Municipally owned stormwater treatment structures;
- Water bodies identified by name with a list of impairments as identified on the most recent EPA approved New Hampshire Integrated List of Waters report; and
- Initial catchment delineations. Topographic contours and drainage system information may be used to produce initial catchment delineations.

3.2 Phase II Mapping

Phase II mapping must be completed within ten (10) years of the effective date of the permit (July 1, 2028) and include the following information:

- Outfall locations (latitude and longitude with a minimum accuracy of +/-30 feet);
- Pipes;
- Manholes;
- Catch basins;
- Refined catchment delineations. Catchment delineations must be updated to reflect information collected during catchment investigations;
- Municipal sanitary sewer system; and
- Municipal combined sewer system.

Note that Sandown's population relies on septic systems for wastewater management, and thus sanitary system and combined sewer system mapping components do not apply to the Town's mapping program.

3.3 Additional Recommended Mapping Elements

Although not required, the 2017 MS4 Permit recommends mapping the following items as additional components to the Town of Sandown's storm system mapping:

- Storm sewer material, size (pipe diameter), age;
- Sanitary sewer system material, size (pipe diameter), age;
- Privately owned stormwater treatment structures;
- Where a municipal sanitary sewer system exists, properties known or suspected to be served by a septic system, especially in high density urban areas;
- Area where the permittee's MS4 has received or could receive flow from septic system discharges;
- Seasonal high-water table elevations impacting sanitary alignments;
- Topography;
- Orthophotography;
- Alignments, dates and representation of work completed of past investigations; and
- Locations of suspected, confirmed and corrected illicit discharges with dates and flow estimates.

As the Town of Sandown's IDDE program progresses through the mapping requirements of the next ten years, the Department of Public Works and/or Board of Selectmen will assess the feasibility, usefulness, and cost implications of including some or all of the above information into the GIS database. Maps are updated as additional information is obtained.

4 Sanitary Sewer Overflows (SSOs)

The 2017 MS4 Permit requires municipalities to prohibit illicit discharges, including sanitary sewer overflows (SSOs), to the separate storm sewer system. SSOs are discharges of untreated sanitary wastewater from a municipal sanitary sewer that can contaminate surface waters, cause serious water quality problems and property damage, and threaten public health.

Sandown's entire population relies on septic systems for wastewater management, and thus SSO considerations do not apply to the Town's program.

5 Assessment and Priority Ranking of Outfalls

The 2017 MS4 Permit requires an assessment and priority ranking of outfalls in terms of their potential to have illicit discharges and SSOs and the related public health significance. The ranking helps determine the priority order for performing IDDE investigations and meeting permit milestones.

5.1 Outfall Catchment Delineations

Catchments for each of the MS4 outfalls[2] and interconnections[3] have been delineated based on available topographic contours and mapped drainage infrastructure to define contributing areas for investigation of potential sources of illicit discharges. Initial catchment delineations are continually refined as additional mapping is completed and to reflect information collected during catchment investigations.

5.2 Outfall and Interconnection Inventory and Initial Ranking

The Department of Public Works and Board of Selectmen completed an initial outfall and interconnection inventory and priority ranking to assess illicit discharge potential based on existing information. The inventory is periodically updated to include data collected in connection with dry weather screening and other relevant inspections.

For the ranking, outfalls and interconnections have been classified into one of the following categories:

1. **Problem Outfalls**: Outfalls/interconnections with known or suspected contributions of illicit discharges based on existing information. This includes any outfalls/interconnections where previous screening indicates likely sewer input. Likely sewer input indicators are any of the following:
    - Olfactory or visual evidence of sewage;
    - Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water; or

[2] **Outfall** means a point source as defined by 40 CFR § 122.2 as the point where the municipal separate storm sewer discharges to waters of the United States. An outfall does not include open conveyances connecting two municipal separate storm sewers or pipes, tunnels or other conveyances that connect segments of the same stream or other waters of the United States and that are used to convey waters of the United States. Culverts longer than a simple road crossing shall be included in the inventory unless the permittee can confirm that they are free of any connections and simply convey waters of the United States.

[3] **Interconnection** means the point (excluding sheet flow over impervious surfaces) where the permittee's MS4 discharges to another MS4 or other storm sewer system, through which the discharge is conveyed to waters of the United States or to another storm sewer system and eventually to a water of the United States.

- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

Note that Problem Catchments are only identified during the initial round of catchment ranking, and no additional catchments should be added to this category. If future evidence indicates that the above pollutant levels may be present, catchments must be ranked at the top of the High Priority Catchments list. Dry weather screening and sampling is not required for Problem Outfalls.

2. **High Priority Outfalls**: Outfalls/interconnections that have not been classified as Problem Outfalls and that contain any of the following characteristics:
    - Discharging to an area of concern to public health due to proximity of public beaches, recreational areas, drinking water supplies or shellfish beds;
    - Past discharge complaints;
    - Discharges exceeding water quality standards for bacteria; ammonia levels ≥ 0.5 mg/l; surfactants greater ≥ 0.25 mg/l;
    - Sites that have a potential to generate pollutants that could contribute to illicit discharges. Examples of these sites include car dealers, car washes, gas stations, garden centers, industrial manufacturing, etc.;
    - Industrial areas >40 years old where the sanitary sewer system is >40 years old;
    - Areas that were once serviced by septic systems that have been converted to sewer;
    - Areas that were once served by a combined sewer system, but have been separated;
    - Septic systems > 30 years old in residential land use and prone to failure;
    - Any river or stream that is culverted for distances greater than a simple road crossing; and
    - Catchment areas draining to waterbody segments impaired for bacteria and pathogens.

3. **Low Priority Outfalls**: Outfalls/interconnections that do not meet any of the problem outfall, high priority outfall, or excluded (below) outfall criteria.

4. **Excluded outfalls**: Outfalls/interconnections with no potential for illicit discharges. This category is limited to roadway drainage in undeveloped areas with no dwellings and no sanitary sewers; drainage for athletic fields, parks or undeveloped green space and associated parking without services; cross-country drainage alignments (that neither cross nor are in proximity to sanitary sewer alignments) through undeveloped land.

The IDDE prioritization categories, from highest to lowest priority are Problem Outfalls, High Priority Outfalls and Low Priority Outfalls. Excluded Outfalls do not require any investigation. Outfalls that meet criteria in more than one category are automatically assigned the higher of the priority categories. Those within the Problem and High Priority Outfall category are further ranked based on the number of criteria each outfall meets in the

respective category. For example, the more criteria the outfall meets, the higher it is ranked in priority. Refer to **Appendix B** for a tabulated breakdown of the current prioritization (classification and ranking) for each outfall and a map identifying the prioritization by area. The map includes a grid overlay that breaks the Town into sections. The grid overlay is used to prioritize IDDE activities by section of Town (i.e., grid ID), rather than individual outfall, to more efficiently direct inspection activities by area. Classifications and rankings are updated as additional information is collected.

6 Dry Weather Outfall Screening and Sampling

Dry weather flow is a common indicator of potential illicit connections. The MS4 Permit requires all outfalls/interconnections (excluding Problem and excluded Outfalls) be inspected for the presence of dry weather flow. The first step for detecting illicit (non-stormwater) connections in MS4s is to physically observe all regulated outfall discharge points in the field during periods of dry weather. Outfall locations are shown on the Town Drainage System Maps provided in **Appendix A**.

Stormwater discharges to culverted streams that cannot be easily accessed (i.e., underground discharge locations) should be inspected at the nearest upstream location (e.g., manhole structure or the last "downstream" catch basin before the outfall pipe).A comprehensive SOP for Outfall Dry Weather Screening with checklist and forms is included in **Appendix C**. Screening procedures should be implemented starting with High Priority outfalls, followed by Low Priority outfalls, based on the initial priority rankings provided in **Appendix B**. Problem Outfalls do not require screening, rather proceed right to source investigations.

6.1 When to Inspect: Weather Conditions

Dry weather outfall screening and sampling may occur when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period and no significant snow melt is occurring. For purposes of determining dry weather conditions, program staff use precipitation data from sources that include the following:

> Weather Underground station in Sandown:
> https://www.wunderground.com/weather/us/nh/sandown

6.2 What to Look For: Physical Characteristics

Illicit discharges can be intermittent or continuous as defined below:

- **Intermittent** – Intermittent discharges are short in duration, lasting only a short time and then disappearing. Examples include:
  - Materials that have been dumped into a storm drain (catch basin) or drainage way, and
  - A floor drain that is connected to the storm sewer.

- **Continuous** – Continuous discharges continue without changing, stopping, or being interrupted. Examples include:
  - Sanitary wastewater piping that is cross-connected from a building or sanitary sewer line to the storm sewer, and
  - An industrial operational discharge that is not permitted.

Some intermittent illicit discharges may only occur in wet weather or when one part of the system overflows. These flows are generally associated with combined sewer and drainage systems that can back up or bypass diversion structures during heavy flows and discharge wastes to the storm drain system, but can also occur with failing septic systems that pond and discharge through the surface. Illicit discharges can be detected at the stormwater outfall, as evident from unusual debris (e.g. toilet paper), stressed vegetation, sheen, etc.

Physical inspections should include observations for flow, and when flow is not present, for potential signs of intermittent illicit discharges. When flow is present, observations on the presence and severity of odor, color, turbidity and floatables should be made and recorded in accordance with the SOP and checklist in **Appendix C**. Observations for other physical indicators should also be made, under flowing and non-flowing conditions, including the condition of the outfall pipe, deposits or stains in the vicinity of the outfall, abnormal vegetation growth, the quality of any pooled water at the outlet and any benthic growth on the pipe. **Table 6-1** describes various physical observation parameters and what they may indicate.

Table 6-1. Physical Observation Parameters and Likely Flow Sources

Parameter	Observations	Interpretation
Odor	Sewage	Stale sanitary wastewater, especially in pools near outfall
	Sulfur (rotten eggs)	Industries that discharge sulfide compounds or organics (meat packers, canneries, dairies, etc.). Also could be petroleum related "high – sulfur" fuels
	Rancid-sour	Food preparation facilities (restaurants, hotels, etc.)
	Oil and gas	Petroleum refineries or many facilities associated with vehicle maintenance or petroleum product storage
	Chlorine	Pool discharges, washing activities
	Sweet / Fruity	Washing activities
	Sharp, pungent (chemicals)	Hazardous waste
Color	Yellow	Chemical plants, textile and tanning plants
	Brown	Meat packers, printing plants, metal works, stone and concrete, fertilizers, petroleum refining facilities, construction sites, and glass cutting
	Green	Chemical plants, textile facilities, algae/plankton bloom, antifreeze (fluorescent green), fertilizer
	Red	Meat packers, metal works, iron floc (bacterium)
	Gray	Dairies, food processing, sewage, concrete wash-out
	Red, Purple, Blue, Black	Fabric dyes, inks from paper and cardboard manufacturers
Turbidity	Cloudy	Sanitary wastewater, concrete or stone operations, fertilizer facilities, automotive dealers
	Opaque	Food processors, lumber mills, metal operations, pigment plants

Table 6-1 (continued). Physical Observation Parameters and Likely Flow Sources

Parameter	Observations	Interpretation
Floatable Matter	Oil sheen, grease	Petroleum refineries or storage facilities and vehicle service facilities, restaurants
	Sewage	Sanitary wastewater
Deposits & Stains	Sediment	Construction site erosion
	Oily	Sanitary wastewater
Vegetation	Excessive growth	Food product facilities, fertilizers, farming agricultural use
	Inhibited growth, stressed vegetation	High stormwater flows, beverage facilities, printing plants, metal product facilities, drug manufacturing, petroleum facilities, vehicle service facilities and automobile dealers
Pipe Benthic Growth	Brown	Elevated nutrient level, possibly from sewage or fertilizers
	Orange/Red	High iron and manganese concentration, not typically associated with illicit discharges
	Green	Elevated nutrient level, possibly from sewage or fertilizers
Damage to Outfall Structures	Concrete cracking	Industrial flows, chemicals
	Concrete spalling[1]	
	Peeling paint	
	Metal corrosion	

[1]Concrete spalling: minor cracks and bulges in concrete caused by corrosion of the steel reinforcement inside the concrete.

6.3 What to Sample

If flow is present during a dry weather outfall inspection, a sample is collected and analyzed for the required permit parameters[4] listed in **Table 6-2**. Field test kits or field instrumentation can be used for all parameters except indicator bacteria and any pollutants of concern. Field kits need to have appropriate detection limits and ranges. **Table 6-2** lists various field test kits and field instruments that can be used for outfall sampling associated with the 2017 MS4 Permit parameters for all waterbodies, other than indicator bacteria and any pollutants of concern.

Table 6-3 lists additional analyses for pollutants of concern in Sandown based on the most recent Integrated List of Waters which must be sampled for select waterbodies. This list requires review and update each time a new list is finalized in New Hampshire. Updates are maintained in **Appendix C** with the comprehensive SOP for Outfall Dry Weather Screening. Analytic procedures and user's manuals for field test kits and field instrumentation are also provided in **Appendix C**. All results are documented in **Appendix G**.

[4] Other potentially useful parameters, although not required by the MS4 Permit, include **fluoride** (indicator of potable water sources in areas where water supplies are fluoridated), **potassium** (high levels may indicate the presence of sanitary wastewater), and **optical brighteners** (indicative of laundry detergents).

Table 6-2. Sampling Parameters and Analysis Methods for All Waterbodies

Analyte or Parameter	Instrumentation (Portable Meter)	Field Test Kit
Ammonia	CHEMetrics™ V-2000 Colorimeter Hach™ DR/890 Colorimeter Hach™ Pocket Colorimeter™ II	CHEMetrics™ K-1410 CHEMetrics™ K-1510 (series) Hach™ NI-SA Hach™ Ammonia Test Strips
Chlorine	CHEMetrics™ V-2000, K-2513 Hach™ Pocket Colorimeter™ II	NA
Conductivity	CHEMetrics™ I-1200 YSI Pro30 YSI EC300A Oakton 450	NA
Salinity	YSI Pro30 YSI EC300A Oakton 450	NA
Indicator Bacteria: *E. coli* (freshwater) or Enterococcus (saline water)	EPA certified laboratory Procedure (40 CFR § 136) Method 1103.1; 1603; Colilert 12 16, Colilert-18 12 15 16; mColiBlue-24 17	NA
Surfactants (Detergents)	CHEMetrics™ I-2017	CHEMetrics™ K-9400 and K-9404 Hach™ DE-2
Temperature	YSI Pro30 YSI EC300A Oakton 450	NA
Pollutants of Concern[5]: See Table 6-3	EPA certified laboratory procedure (40 CFR § 136) See Table 6-3	NA

Samples for laboratory analysis must also be stored and preserved in accordance with procedures found in 40 CFR § 136. The SOP in **Appendix C** lists analytical methods, detection limits, hold times, and preservatives for laboratory analysis of dry weather sampling parameters.

[5]Where the discharge is directly into a water quality limited water or a water subject to an approved TMDL, samples must be analyzed for the pollutants of concern identified as the cause of the water quality impairment

Table 6-3. Additional Sampling Parameters for Discharges to Impaired Waters

Sample Parameter	Impairment	Impaired Water	Method
Total Phosphorus	• Phosphorus • Cyanobacteria • Chlorophyll-a	• Lily Pond • Phillips Pond - Seeley Town Beach • Phillips Pond • Showell Pond • Angel Pond	Laboratory Analysis: 365.1, 365.2, 365.3, SM 4500-P-E
Total Nitrogen	• Nitrogen	• Exeter River	Test Kit (e.g., Hach Colorimeter Test Kit, total nitrogen (TNT)) or Laboratory Analysis: 351.1/351.2 + 353.2
pH	• pH	• Hunt Pond • Lily Pond • Phillips Pond • Showell Pond • Angle Pond • Cub Pond • Exeter River • Unnamed Brook - to Angel Pond through North Inlet • Unnamed Brook – to Angel Pond through West Inlet	Field Meter or Laboratory Analysis: 150.2

6.3.1 Field Equipment

Table 6-4 lists field equipment commonly used for dry weather screening and sampling.

Table 6-4. Field Equipment – Dry Weather Outfall Screening and Sampling

Equipment	Use/Notes
Clipboard	For organization of field sheets and writing surface
Field Sheets	Field sheets for both dry weather inspection and Dry weather sampling should be available with extras
Chain of Custody Forms	To ensure proper handling of all samples
Pens/Pencils/Permanent Markers	For proper labeling
Nitrile Gloves	To protect the sampler as well as the sample from contamination
Flashlight/headlamp w/batteries	For looking in outfalls or manholes, helpful in early mornings as well
Cooler with Ice	For transporting samples to the laboratory
Digital Camera	For documenting field conditions at time of inspection

Table 6-4 (continued). Field Equipment – Dry Weather Outfall Screening and Sampling

Equipment	Use/Notes
Personal Protective Equipment (PPE)	Reflective vest, Safety glasses and boots at a minimum
GPS Receiver	For taking spatial location data
Water Quality Sonde	If needed, for sampling conductivity, temperature, pH
Water Quality Meter	Hand held meter, if available, for testing for various water quality parameters such as ammonia, surfactants and chlorine
Test Kits	Have extra kits on hand to sample more outfalls than are anticipated to be screened in a single day
Label Tape	For labeling sample containers
Sample Containers	Make sure all sample containers are clean. Keep extra sample containers on hand at all times. Make sure there are proper sample containers for what is being sampled for (i.e., bacteria requires sterile containers).
Pry Bar or Pick	For opening catch basins and manholes when necessary
Sandbags	For damming low flows in order to take samples
Small Mallet or Hammer	Helping to free stuck manhole and catch basin covers
Utility Knife	Multiple uses
Measuring Tape	Measuring distances and depth of flow
Safety Cones	Safety
Hand Sanitizer	Disinfectant/decontaminant
Zip Ties/Duct Tape	For making field repairs
Rubber Boots/Waders	For accessing shallow streams/areas
Sampling Pole/Dipper/Sampling Cage	For accessing hard to reach outfalls and manholes

6.4 Interpreting Outfall Sampling Results

Outfall analytical data from dry weather sampling can be used to help identify the major type or source of discharge. **Table 6-5** shows values identified by the U.S. EPA and the Center for Watershed Protection as typical screening values for select parameters. These represent the typical concentration (or value) of each parameter expected to be found in stormwater. Screening values that exceed these benchmarks may indicate illicit discharges. All results are documented in **Appendix G**.

Table 6-5. Benchmark Field Measurements for Select Parameters

Parameter	Benchmark
Ammonia	>0.5 mg/L
Chlorine	>0.02 mg/L (detectable levels per the 2017 MS4 Permit)
Conductivity	>2,000 µS/cm
Salinity	Reference only, determine type of bacteria analysis

Table 6-5 (continued). Benchmark Field Measurements for Select Parameters

Parameter	Benchmark
Indicator Bacteria[6]: *E.coli* *Enterococcus*	The geometric mean of the five most recent samples taken during the same bathing season shall not exceed: *E.coli*: 126 colonies per 100 ml and no single sample taken during the bathing season shall exceed 235 colonies per 100 ml *Enterococcus:* 33 colonies per 100 ml and no single sample taken during the bathing season shall exceed 61 colonies per 100 ml
Surfactants	>0.25 mg/L
Temperature	>83°F
Pollutants of Concern	>Applicable water quality criteria

Table 6-6 provides a summary on the types of discharge that may be encountered and follow-up actions to be performed. Additional information on next step actions is included in the Illicit Discharge Source Investigation SOP in **Appendix C**.

Table 6-6. Outfall Discharge Designation and Follow-Up Action

Type	Description	Action
Obvious Discharge	Outfalls where there is an illicit discharge that do not require sample collection for confirmation (e.g., strong sewage odors, gray sewage water, toilet paper, etc.)	Full source investigation
Suspect Discharge	Flowing outfalls with: 1) high severity on one or more physical indicators and 2) ammonia >0.5 mg/L, surfactants >0.25 mg/L, bacteria >WQ criteria OR ammonia >0.5 mg/L, surfactants >0.25 mg/L, & detectable levels of chlorine	Full source investigation
Potential Discharge	Flowing or non-flowing outfalls with presence of two or more physical indicators	Intermittent flow source investigation
Unlikely Discharge	Non-flowing outfalls with no physical indicators of an illicit discharge	No further action

6.5 Follow-up Ranking of Outfalls and Interconnections

The Town of Sandown periodically updates and re-prioritizes the initial outfall and interconnection rankings based on information gathered during dry weather outfall screening as additional information becomes available. Outfalls/interconnections where relevant information was found indicating sewer input to the MS4 or sampling results indicating sewer input are highly likely to contain illicit discharges from sanitary sources are ranked at the top of the High Priority Outfalls category for investigation. Other outfalls and interconnections may be re-ranked based on any new information from the dry weather screening. All results are documented in **Appendix G**.

[6] New Hampshire Water Quality Standards: http://www.mass.gov/eea/docs/dep/service/regulations/314cmr04.pdf

7 Catchment Investigations

The 2017 MS4 Permit requires that investigations be performed for all MS4-owned outfall catchment areas regardless of whether flows are observed at the outfall. The catchment area represents the drainage area to the outfall. Catchment investigations must include: 1) a review of mapping and historic plans and records for each catchment to identify system vulnerability factors; 2) a manhole inspection methodology; and 3) procedures to isolate and confirm sources of illicit discharges.

This section outlines a systematic procedure to investigate outfall catchments. All data collected as part of the catchment investigations is recorded and reported in each annual report.

7.1 Dry Weather Key Junction Structure Inspections

In addition to the outfall screening discussed in Section 6, catchment investigations of key junction manholes must be performed during dry weather conditions. Several important terms related to the dry weather manhole inspection program are defined by the MS4 Permit as follows:

- **Junction Manhole** is a manhole or structure with two or more inlets accepting flow from two or more MS4 alignments. Manholes/structures with inlets solely from private storm drains, individual catch basins, or both are not considered junction manholes for these purposes.

- **Key Junction Manholes** are those junction manholes or structures that can represent one or more junction manholes/structures without compromising adequate implementation of the illicit discharge program. Adequate implementation of the illicit discharge program would not be compromised if the exclusion of a particular junction manhole/structure as a key junction manhole/structure would not affect the permittee's ability to determine the possible presence of an upstream illicit discharge. A permittee may exclude a junction manhole/structure located upstream from another located in the immediate vicinity or that is serving a drainage alignment with no potential for illicit connections.

Key junction manholes are inventoried by identifying all junction manholes/structures with two or more inlets and then eliminating those that were located in the immediate vicinity of the outfall, in the immediate vicinity of another key junction manhole and those that only received flow from one or two catch basins with no potential for illicit connections. For all catchments identified for investigation, field crews systematically inspect key junction manholes for evidence of illicit discharges during dry weather. A stormwater key junction manhole screening standard operating procedure (SOP) and checklist is included in **Appendix E**. Screening procedures should be implemented beginning with High Priority Outfalls and ending with Low Priority Outfalls. Problem Outfalls do not require screening, rather proceed right to source investigations (refer to Section 6.0).

7.1.1 When to Inspect

Visual inspections for illicit discharges must occur during dry weather conditions. Dry weather conditions are defined as a minimum of 24 consecutive hours with less than 0.10 inches of rainfall and no significant snow melt is occurring. MS4s are designed to only carry stormwater runoff. If a flow exists at a discharge point during the dry weather inspections, it is identified as a potential illicit discharge.

7.1.2 What to Look For: Physical Characteristics

Each identified key junction manhole must be opened and inspected systematically for visual and olfactory evidence of illicit connections (e.g., excrement, toilet paper, gray filamentous bacterial growth, or sanitary products present). The same observation made for outfalls can also be applied to key junction manhole investigations. Refer to **Table 6-1** in Section 6.0 for parameters and what they mean.

Key junction manholes within the same catchment area can be inspected working from the outfall upstream or working from the most upstream key junction manholes down towards the outfall.

7.1.3 What to Sample

If flow is observed in any manhole, a sample must be collected and analyzed for:

- Ammonia
- Chlorine
- Surfactants

Field kits or instrumentation can be used for these analyses. All results are documented in **Appendix G**.

7.1.4 Interpreting Key Junction Inspection Results

Where sampling results or visual or olfactory evidence indicate potential illicit discharges or SSOs (**Table 7-1**), the area draining to the junction manhole must be flagged for further upstream investigation to isolate and confirm sources of illicit discharges in accordance with Section 8.0. Key junction and subsequent manhole investigations proceed until the location of suspected illicit discharges or SSOs can be isolated to a pipe segment between two manholes.

Screening procedures should be implemented beginning with High Priority Catchments and ending with Low Priority Catchments. Problem Outfalls do not require screening and should instead proceed right to source investigations (refer to Section 8). A comprehensive SOP for Key Junction Manhole Dry Weather Screening with checklist and forms are included in **Appendix E**. All results are documented in **Appendix G**.

Table 7-1. Key Junction Discharge Designation and Follow-Up Action

Type	Description	Action
Obvious Discharge	Key junction manholes where there is an illicit discharge that do not require sample collection for confirmation (e.g., strong sewage odors, gray sewage water, toilet paper, etc.)	Full source investigation
Suspect Discharge	Flowing key junction manholes with: 1) high severity on one or more physical indicators and 2) ammonia >0.5 mg/L, surfactants >0.25 mg/L, & detectable levels of chlorine	Full source investigation
Potential Discharge	Flowing or non-flowing key junction manholes with presence of two or more physical indicators	Intermittent flow source investigation
Unlikely Discharge	Non-flowing key junction manholes with no physical indicators of an illicit discharge	No further action

7.2 System Vulnerability Factors and Wet Weather Sampling

Wet weather screening and sampling is required where System Vulnerability Factors (SVFs) exist within a catchment area, including:

- History of SSOs, including but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages;
- Common or twin-invert manholes serving storm and sanitary sewer alignments;
- Common trench construction serving both storm and sanitary sewer alignments;
- Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system;
- Sanitary sewer alignments known or suspected to have been constructed in regular surcharging, customer back-ups, or frequent customer complaints;
- Areas formerly served by combined sewer systems;
- Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations.

EPA recommends that the following SVFs also be considered:

- Sewer pump/lift stations, siphons, or known sanitary sewer restriction where power/equipment failures or blockages could readily result in SSOs;
- Any sanitary sewer and storm drain infrastructure greater than 40 years old;
- Widespread code-required septic system upgrades required at property transfers or history of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance).

Sandown has never had a sanitary sewer system and has not had any wide-spread code-required septic system upgrades required at property transfers or history of multiple Board

of Health actions addressing widespread septic system failures. Based on this information, no SVFs were identified and wet weather sampling is not currently required. Should SVFs be identified in the future, wet weather sampling will be performed in accordance with the SOP included in **Appendix F**.

The SVF inventory (**Appendix B**) will be updated as new information becomes available and included in the annual report.

7.2.1 When to Sample: Wet Weather Conditions

Where a minimum of one System Vulnerability Factor (SVF) is identified based on previous information or the catchment investigation, one wet weather screening and sampling event shall be performed at the outlet. A comprehensive SOP for Catchment Wet Weather Sampling with checklist and forms are included in **Appendix F**, however inspections will generally proceed as follows:

1. At least one wet weather sample will be collected at the outfall for the same parameters required during dry weather screening.

2. Wet weather sampling will occur during or after a storm event of sufficient depth or intensity to produce a stormwater discharge at the outfall. There is no specific rainfall amount that will trigger sampling, although minimum storm event intensities that are likely to trigger sanitary sewer interconnections are preferred. To the extent feasible, sampling should occur during the spring (March through June) when groundwater levels are relatively high.

3. If wet weather outfall sampling indicates a potential illicit discharge, then additional wet weather source sampling will be performed, as warranted, or source isolation and confirmation procedures will be followed as described in Section 8.

4. If wet weather outfall sampling does not identify evidence of illicit discharges, and no evidence of an illicit discharge is found during dry weather manhole inspections, catchment investigations will be considered complete.

7.2.2 What to Sample: Wet Weather Conditions

Samples collected during wet weather investigations should be analyzed for:

- Ammonia
- Chlorine
- Conductivity
- Salinity
- *E.coli* (freshwater receiving water) or enterococcus (saline or brackish receiving water)
- Surfactants (such as MBAS)
- Temperature

- Pollutants of concern – where the discharge is directly into a water quality limited water or a water subject to an approved TMDL, the sample shall be analyzed for the pollutant(s) of concern identified as the cause of the impairment

All analyses, with the exception of indicator bacteria can be performed with field test kits or field instrumentation. Refer to **Table 6-6** in Section 6.0 for additional details on acceptable concentrations that can be used to assess potential illicit discharges from Sandown's MS4. All results will be documented in **Appendix G**.

7.2.3 Interpreting Wet Weather Sampling Results

Wet weather sampling results can be compared to the benchmark values in **Table 6-5**. Screening values that exceed these benchmarks may be indicative of pollution and/or illicit discharges that warrant further investigation. In the case of wet weather sampling, low to moderate levels of bacteria may be associated with wildlife or domestic animal feces, rather than an illicit connection. Similarly, slight exceedances of ammonia benchmarks may also be caused by natural conditions. However, evidence of surfactants and/or chlorine are more likely to be attributed to man-made sources. All data collected during preparation of the IDDE Plan and throughout the catchment investigation process, including information on the surrounding land uses, visual and olfactory observations during dry and wet weather screening, age and history of surrounding septic tanks and/or sewer, storm characteristics, and water quality data should be considered in determining the potential presence of an illicit discharge and the steps for investigation.

Exceedances of one or more parameters by substantial amounts (e.g., an order of magnitude) may be indicative of an illicit discharge and a follow-up round of wet weather sampling should be performed. If additional samples deliver similar results, additional manhole sampling should be completed during wet weather in an attempt to "bracket" a potential source to confirm the presence or absence of an illicit discharge. All results will be documented in **Appendix G**.

8 Source Investigations

Once an illicit discharge is identified at an outfall or manhole, further investigation is necessary to identify the specific point where the illicit discharge comes from (source). The objective of a source investigation is to trace the path of an illicit discharge from the outfall or manhole to the upstream source.

The following methods may be used in isolating and confirming the source of illicit discharges

- Field Reviews;
- Sandbagging;
- Smoke Testing;
- Dye Testing;
- CCTV/Video Inspections;
- Optical Brightener Monitoring; and
- IDDE Canines.

Public notification is an important aspect of a detailed source investigation program. Prior to smoke testing, dye testing, or TV inspections, the Department of Public Works notifies property owners in the affected area. These methods are described in more detail below.

8.1 Field Reviews

Reviewing the drainage system and land uses within contributing catchment areas is the first and perhaps the most efficient method for identifying the source of an illicit discharge. It is important for field crews to observe the land use and activities around the upgradient drainage system to determine if there are any obvious sources of the illicit discharge, as a quick review of nearby land uses and activities may reveal the source immediately. In addition, field crews can simply follow the non-stormwater discharge if it is flowing by tracing the drainage system such as manholes and connecting drainage pipes (refer to SOP in **Appendix D**). Sampling these upgradient connections may also indicate where the source is located. However, some cases may require additional methods, such as sandbagging, dye testing, smoke testing, or television inspection as discussed below, if a flow cannot be traced due to blind connections or complicated drainage networks.

8.2 Sandbagging

This technique can be particularly useful when attempting to isolate intermittent illicit discharges or those with very little perceptible flow. The technique involves placing sandbags or similar barriers (e.g., caulking, weirs/plates, or other temporary barriers) within manholes to form a temporary dam that collects any intermittent flows that may occur. Sandbags are typically left in place for 48 hours, and should only be installed when dry weather is forecast. If flow has collected behind the sandbags/barriers after 48 hours it can be assessed using visual observations or by sampling. If no flow collects behind the sandbag, the upstream pipe network can be ruled out as a source of the intermittent discharge. Finding

appropriate durations of dry weather and the need for multiple trips to each manhole makes this method both time-consuming and somewhat limiting.

8.3 Smoke Testing

Smoke testing involves injecting non-toxic smoke into drain lines and noting the emergence of smoke from sanitary sewer vents in illegally connected buildings or from cracks and leaks in the system itself. Typically a smoke bomb or smoke generator is used to inject the smoke into the system at a catch basin or manhole and air is then forced through the system. Test personnel are placed in areas where there are suspected illegal connections or cracks/leaks, noting any escape of smoke (indicating an illicit connection or damaged storm drain infrastructure).

To be most effective, pipes may need to be plugged to prevent smoke from easily escaping through manholes, catch basins, or daylight areas. If a cross connection exists, smoke should appear from the building's sanitary sewer vent at the roof. The smoke should not affect residents since nearly all sanitary sewer systems have a trap to prevent odors from backing up into the house; however, residents with respiratory conditions may need to be monitored or evacuated from the area of testing to ensure safety during testing. In many cases, smoke testing should only be used once an unknown pipe is identified. The individual pipe can be plugged and filled with smoke while workers look for signs of smoke at nearby buildings or facilities.

It is important when using this technique to make proper notifications to area residents and business owners as well as local police and fire departments. This notification presents a good opportunity to involve the public as observers during the smoke test and to educate local residents about stormwater, allowable non-stormwater discharges and illicit discharges. Providing the public with an opportunity to participate in the illicit discharge source investigation promotes IDDE efforts and awareness throughout town.

If the initial test of the storm drain system is unsuccessful then a more thorough smoke-test of the sanitary sewer lines can also be performed. Note that buildings that do not emit smoke during sanitary sewer smoke tests may have problem connections and may also have sewer gas venting inside, which is hazardous.

8.4 Dye Testing

Dye testing involves flushing non-toxic dye into plumbing fixtures such as toilets, showers, and sinks and observing nearby storm drains and sewer manholes as well as stormwater outfalls for the presence of the dye. Similar to smoke testing, it is important to inform local residents and business owners. Police, fire, and local public health staff should also be notified prior to testing in preparation of responding to citizen phone calls concerning the dye and its presence in local surface waters.

A team of two or more people is needed to perform dye testing (ideally, all with two-way radios). One person is inside the building, while the others are stationed at the appropriate

storm sewer and sanitary sewer manholes (which should be opened) and/or outfalls. The person inside the building adds dye into a plumbing fixture (i.e., toilet or sink) and runs a sufficient amount of water to move the dye through the plumbing system. The person inside the building then radios to the outside crew that the dye has been dropped, and the outside crew watches for the dye in the storm sewer and sanitary sewer, recording the presence or absence of the dye.

The test can be relatively quick (about 30 minutes per test), effective (results are usually definitive), and inexpensive. Dye testing is best used when the likely source of an illicit discharge has been narrowed down to a few specific houses or businesses. Successful Tips for dye testing are provided in **Table 8-1**.

8.5 CCTV/Video Inspection

Another method of source isolation involves the use of mobile video cameras that are guided remotely through stormwater drain lines to observe possible illicit discharges. IDDE program staff can review the videos and note any visible illicit discharges. While this tool is both effective and usually definitive, it can be costly and time consuming when compared to other source isolation techniques.

8.6 Optical Brightener Monitoring

Optical brighteners are fluorescent dyes that are used in detergents and paper products to enhance their appearance. The presence of optical brighteners in surface waters or dry weather discharges suggests there is a possible illicit discharge or insufficient removal through adsorption in nearby septic systems or wastewater treatment. Optical brightener monitoring can be done in two ways. The most common, and least expensive, methodology involves placing a cotton pad in a wire cage and securing it in a pipe, manhole, catch basin, or inlet to capture intermittent dry weather flows. The pad is retrieved at a later date and placed under UV light to determine the presence/absence of brighteners during the monitoring period. A second methodology uses handheld fluorometers to detect optical brighteners in water samples collected from outfalls or ambient surface waters. Use of a fluorometer, while more quantitative, is typically more costly and is not as effective at isolating intermittent discharges as other source isolation techniques.

8.7 IDDE Canines

Dogs specifically trained to smell human related sewage are becoming a cost-effective way to isolate and identify sources of illicit discharges. While not widespread at the moment, the use of IDDE canines is growing as is their accuracy. The use of IDDE canines is not recommended as a standalone practice for source identification; rather it is recommended as a tool to supplement other conventional methods, such as dye testing, in order to fully verify sources of illicit discharges.

Table 8-1. Tips for Successful Dye Testing

Dye Selection

- Green and liquid dyes are the easiest to see.
- Dye test strips can be a good alternative for residential or some commercial applications. (Liquid can leave a permanent stain).
- Check the sanitary sewer before using dyes to get a "base color." In some cases, (e.g., a print shop with a permitted discharge to the sanitary sewer), the sewage may have an existing color that would mask a dye.
- Choose two dye colors, and alternate between them when testing multiple fixtures.

Selecting Fixtures to Test

- Check the plumbing plan for the site to isolate fixtures that are separately connected.
- For industrial facilities, check most floor drains (these are often misdirected).
- For plumbing fixtures, test a representative fixture (e.g., a bathroom sink).
- Test some locations separately (e.g., washing machines and floor drains), which may be misdirected.
- If conducting dye investigations on multiple floors, start from the basement and work your way up.
- At all fixtures, make sure to flush with plenty of water to ensure that the dye moves through the system.

Selecting a Sewer Manhole for Observations

- Pick the closest manhole possible to make observations (typically a sewer lateral).
- If this is not possible, choose the nearest downstream manhole.

Communications Between Crew Members

- The individual conducting the dye testing calls in to the field person to report the color dye used, and when it is dropped into the system.
- The field person then calls back when dye is observed in the manhole.
- If dye is not observed (e.g., after two separate flushes have occurred), dye testing is halted until the dye appears.

Locating Missing Dye

- The investigation is not complete until the dye is found. Some reasons for dye not appearing include:
- The building is actually hooked up to a septic system.
- The sewer line is clogged.
- There is a leak in the sewer line or lateral pipe.

Source: Center for Watershed Protection. Illicit Discharge Detection and Elimination, A Guidance Manual for Program Development and Technical Assessments. October 2004.

9 Illicit Discharge Removal

When the specific source of an illicit discharge is identified, the Town of Sandown exercises its authority as necessary to require its removal. The Department of Public Works and Board of Health collects relevant documentation and records to pursue illicit discharge removal through voluntary elimination or legal enforcement.

9.1 Removal Options

9.1.1 Voluntary Elimination

The voluntary elimination of illicit discharges is strongly encouraged. Through voluntary elimination, the responsible party of an illicit discharge can be contacted directly and informed about the incident. A responsible Town official should make this contact after an illicit discharge has been identified and verified. When a responsible party is contacted, the following information should be provided:

- Details on the identification and verification process;
- Information on the actions that should be implemented to correct the problem and the schedule for performing them; and
- Potential support and incentives that the Town can offer as a result of the voluntary approach.

This approach is the quickest and provides an opportunity for the responsible party to correct the problem in a cost-effective manner, versus a legal enforcement obligation, which is discussed below.

9.1.2 Legal Enforcement

Legal enforcement action may be necessary to completely eliminate illicit discharges in the Town, particularly those that have significant cost implications. Sandown has established legal authority for enforcement of IDDE requirements as outlined in the "Illicit Discharge Detection and Elimination Ordinance" in the Zoning Ordinances, approved by voters on March 12, 2019 and provided in the SWMP Plan. This regulatory mechanism in part allows for enforcement of the regulations, orders, violation notices, and enforcement orders, and may pursue civil and criminal remedies for such violations.

9.2 Reporting

All illicit discharge information should be recorded on the Illicit Discharge Tracking Form for each location, with overall actions recorded in the Illicit Discharge Log, both provided in **Appendix G**. The illicit discharge must be removed within sixty (60) days of its confirmation where possible, otherwise a schedule will be established for its elimination with dates and schedules identified in the MS4 annual report. The annual report will also include the status of IDDE investigation and removal activities including the following information for each confirmed source:

- The location of the discharge and its source(s);
- A description of the discharge;
- The method of discovery;
- Date of discovery;
- Date of elimination, mitigation or enforcement action OR planned corrective measures and a schedule for completing the illicit discharge removal; and
- Estimate of the volume of flow removed.

9.3 Confirmatory Outfall Screening

Confirmatory outfall screening will be completed within one year of removal of all identified illicit discharges within a catchment area and include confirmatory outfall or interconnection screening. The confirmatory screening will be conducted in dry weather unless System Vulnerability Factors have been identified, in which case both dry weather and wet weather confirmatory screening will be conducted. Procedures will follow those outlined earlier in this chapter and in the appendices of this IDDE Plan. If confirmatory screening indicates evidence of additional illicit discharges, the catchment will be scheduled for additional investigation.

9.4 Ongoing Screening

Upon completion of all catchment investigations and illicit discharge removal and confirmation (if necessary), each outfall or interconnection will be re-prioritized for screening, as needed, and scheduled for ongoing screening once every five years. Ongoing screening will consist of dry weather screening and sampling consistent with the procedures described in Section 6 of this plan. Ongoing wet weather screening and sampling will also be conducted at outfalls where wet weather screening was required due to System Vulnerability Factors and will be conducted in accordance with the procedures described in Section 7.2. All sampling results will be reported in the annual report.

9.5 IDDE Prevention

Preventing future illicit discharges is also critically important. Prevention of illicit discharges is achieved through education, outreach, and advocacy. Education and advocacy programs that identify where and when possible illicit discharges and connections occur are good long-term prevention activities. The following activities can be used to help prevent illicit discharges to the drainage system:

- Integrate IDDE information into public education and outreach components;
- Encourage awareness and promote stewardship of the storm drain system in neighborhoods, emphasizing the cause and effect relationship between non-stormwater inputs to the drainage system and water quality of receiving waters;
- Utilize the annual IDDE program evaluation results to promote and support the program throughout the Town; and
- Use the Town's website and provide a phone number for citizens to report suspected illicit discharges.

10 Training

Annual IDDE training is made available to all employees involved in the IDDE program. This training at a minimum includes information on how to identify illicit discharges and may also include additional training specific to the functions of particular personnel and their function within the framework of the IDDE program. Training records are maintained in the IDDE Employee Training Record provided in **Appendix H**. The frequency and type of training are included in the annual report.

11 Progress Reporting

11.1 Program Activity and Timeline

A summary of the required IDDE activities and timelines are provided below:

Activity	Timeline
Sanitary Sewer Overflow Inventory	Complete by June 30, 2019 (N/A – no sewer)
Initial Catchment Ranking	Complete by June 30, 2019
Mapping:	
• Outfalls and Interconnections	Complete by June 30, 2020
• Initial Catchment Delineation	Complete by June 30, 2020
• Remaining Mapping	Complete by June 30, 2028
Dry Weather Outfall Inspections	Complete by June 30, 2021
Catchment Investigations:	
• Problem Catchments	Begin by July 1, 2020 Complete by June 30, 2025
• All w/Potential Illicit Discharges	Complete by June 30, 2025
• All Outfalls Complete	Complete by June 30, 2028
Source Investigation	As soon as sampling results indicating an illicit discharge are obtained and evaluated
Source Elimination	Within 60 days of its identification or, if not possible, in accordance with schedule established by the Town (refer to Section 9)
Confirmatory Samples	Within 1 year of illicit discharge elimination
Follow-Up Screening	Reprioritize and resample all outfalls for weather conditions as per the first round within 5 years
Employee Training	Perform annually
Recordkeeping	At all times for all activities

11.2 Annual Recordkeeping

The progress and success of the IDDE program is evaluated on an annual basis. The evaluation is documented in the annual report and includes the following indicators of program progress:

- Number of illicit discharges identified and removed;
- Number and percent of total outfall catchments served by the MS4 evaluated using the catchment investigation procedure;
- Number of dry weather outfall inspections/screenings;
- Number of wet weather outfall inspections/sampling event;
- Number of enforcement notices issued;
- All dry weather and wet weather screening and sampling results;
- Estimate of the volume of sewage removed, as applicable; and
- Number of employees trained annually.

The success of the IDDE program is measured by the IDDE activities completed within the required permit timeline.

Appendix A

Stormwater System Mapping

Status of Stormwater System Mapping

Requirement Summary	Status
Phase I – Must be Complete by July 1, 2020	
1. Outfalls and receiving waters	Complete
2. Open channel conveyances	Complete (updates ongoing)
3. Interconnections with other MS4s	Complete
4. Municipally owned structural BMPs	Complete
5. Waterbody names and impairments	Complete
6. Initial catchment delineations by topography	Complete
Phase II – Must be Complete by July 1, 2028	
1. Outfalls with spatial accuracy +/-30 feet	Complete
2. Pipe connectivity	Complete, updates ongoing
3. Manholes	Complete
4. Catch basins	Complete
5. Refined catchment delineations	Not started
6. Municipal sanitary system	N/A
7. Municipal combined sewer system	N/A

FREMONT

CHESTER

DANVILLE

DERRY

HAMPSTEAD

Celeste Ter
Allen St
Reed Rd
Elizabeth Rd
Hale True Rd
Dee Dee Dr
Brian St
Lilac Ln
Lexington Dr
Woodbury Ln
Compromise Ln
North Rd
Waterford Dr
Country Acres Rd
Stagecoach Dr
Holmeswood Dr
Highland Ave
Cricket Ln
Cross Rd
Hollow Oak Dr
Fremont Rd
Royal Range Rd
Rangeway Ave
Hunt Pond Rd
Sargent Rd
Exeter River
Hunt Pond
Penacook Rd
Pheasant Run Dr
Meghan Dr
Mallard Ln
Eastfield Loop
Phillips Rd
Twitchells Way
Ferguson Ln
David Ln
Lily Pond
Montana Dr
Pine Ridge Cir
Riverbend Dr
Wells Village Rd
Main St
Glastonbury Dr
Depot Rd
Granberry Meadow Rd
Meadow Brook Xing
Odell Rd
Hersey Rd
Candlestick Ln
Kenneth Rd
Lantern Dr
School House Rd
Tacoma Dr
North Shore Rd
Brown Ave
Chestnut Hill Dr
Snow Ln
Cub Pond Rd
Cub Pond
Colby Brook
Punch Pond
Tenney Rd
Woodland Dr
Rowell Rd
Hampstead Rd
Chase Rd
Phillips Pond
Phillipswood Rd
Beechwood Rd
Stevens Rd
Walnut Hill Rd
Phillips Pond Dr
Metacomet Dr
Hemlock Cir
Oak Ridge Rd
Little Mill Rd
Showell Pond Rd
Showell Pond
Michael Cir
Giordani Ln
Pinewood Loop
Hawkewood Rd
Higgins Ave
Jeannies Way
Birch Dr
Holts Point Rd
Lakeside Dr
Bartlett Brook
Truex Pkwy
Round Hill Rd
Angle Pond
Christopher Dr

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OF-3
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OF-45
OF-46
OF-47

Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

N
W E
S

0 0.25 0.5 1
Miles

Stormwater Infrastructure Map
Sandown, NH

Comprehensive Environmental Incorporated

Data Sources: CEI, GRANIT, Town of Sandown

10/24/2022

FREMONT

CHESTER

DANVILLE

DERRY

HAMPSTEAD

A1 A2 A3 A4 A5 A6 A7 A8

B2 B3 B4 B5

C3 C4

D2 D3 D4

E1 E2 E3 E4

F1 F2 F3 F4 F5 F6 F7

G3 G4 G5 G6 G7 G8

H6 H7 H8

OF-1 OF-2 OF-3 OF-4 OF-7 OF-8 OF-10 OF-11 OF-12 OF-13 OF-14 OF-15 OF-16 OF-17 OF-18 OF-19 OF-20 OF-21 OF-22 OF-23 OF-24 OF-25 OF-26 OF-27 OF-28 OF-29 OF-30 OF-31 OF-32 OF-33 OF-34 OF-35 OF-36 OF-37 OF-38 OF-39 OF-40 OF-41 OF-42 OF-43 OF-44 OF-45 OF-46 OF-47

Allen St
Brian St
Reed Rd
Elizabeth Rd
Dee Dee Dr
Celeste Ter
Hale True Rd
Lilac Ln
Lexington Dr
Woodbury Ln
North Rd
Compromise Ln
Waterford Dr
Country Acres Rd
Hollow Oak Dr
Stagecoach Dr
Holmeswood Dr
Highland Ave
Cricket Ln
Cross Rd
Fremont Rd
Royal Range Rd
Rangeway Ave
Hunt Pond Rd
Sargent Rd
Exeter Ridge
Hunt Pond
Pheasant Run Dr
Penacook Rd
Meghan Dr
Mallard Ln
Eastford Loop
Phillips Rd
Twitchells Way
Lily Pond
Montana Dr
Riverbend Dr
Exeter River
Wellsville Rd
Main St
Glastonbury Dr
Depot Rd
Cranberry Meadow Rd
Ferguson Ln
David Ln
Pine Ridge Cir
Odell Rd
Meadow Brook Xing
Hersey Rd
Colby Brook
Cub Pond
Cub Pond Rd
Punch Pond
Candlestick Ln
Lantern Dr
Kenneth Rd
School House Rd
Tacoma Dr
Tenney Rd
Chase Rd
Woodland Dr
Rowell Rd
Hampstead Rd
North Shore Rd
Brown Ave
Phillips Pond
Phillips Pond Dr
Beechwood Rd
Phillipswood Rd
Snow Ln
Chestnut Hill Dr
Stevens Rd
Walnut Hill Rd
Hemlock Cir
Oak Ridge Rd
Little Mill Rd
Metacomet Dr
Showell Pond Rd
Showell Pond
Christopher Dr
Michael Cir
Giordani Ln
Pinewood Loop
Hawkewood Rd
Higgins Ave
Jeannies Way
Holts Point Rd
Birch Dr
Lakeside Dr
Bartlett Brook
Truex Pkwy
Round Hill Rd
Angle Pond

Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

N W E S

0 0.25 0.5 1
Miles

Stormwater Master Tile Map
Sandown, NH

Comprehensive Environmental Incorporated

Data Sources: CEI, GRANIT, Town of Sandown

10/24/2022

CHESTER

FREMONT

DERRY

HAMPSTEAD

A1 A2 A3 A4 A5 A6 A7 A8

B2 B3 B4 B5

C3 C4

D2 D3 D4

E1 E2 E3 E4

F1 F2 F3 F4 F5 F6 F7

G3 G4 G5 G6 G7 G8

H6 H7 H8

OF-1 OF-2 OF-3 OF-4 OF-5 OF-7 OF-12 OF-13 OF-14 OF-15 OF-17 OF-18 OF-19 OF-20 OF-21 OF-22 OF-23 OF-24 OF-25 OF-26 OF-27 OF-28 OF-29 OF-30 OF-31 OF-32 OF-33 OF-34 OF-35 OF-36 OF-37 OF-38 OF-39 OF-40 OF-41 OF-42 OF-43 OF-44 OF-45 OF-46 OF-47

North Rd

Royal Range Rd

Sargent Rd

Wells Village Rd

Main St

Fremont Rd

Odell Rd

Cranberry Meadow Rd

Hampstead Rd

Phillips Pond Dr

Chase Rd

Little Mill Rd

Hunt Pond

Exeter River

Lily Pond

Phillips Pond

Showell Pond

Angle Pond

Punch Pond

Colby Brook

Bartlett Brook

Legend

Prioritized Outfalls:
- 2
- 1
- Low Priority

Prioritized Tiles:
- High
- Medium
- Low

- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

N W E S

0 1

Miles

Stormwater Map with Prioritized Outfalls and Areas

Sandown, NH

Comprehensive Environmental Incorporated

Note: Higher priority outfalls are ranked 1-2 with 2 being the highest priority

Data Sources: MassGIS, Town of Sandown, CEI

10/24/2022

Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

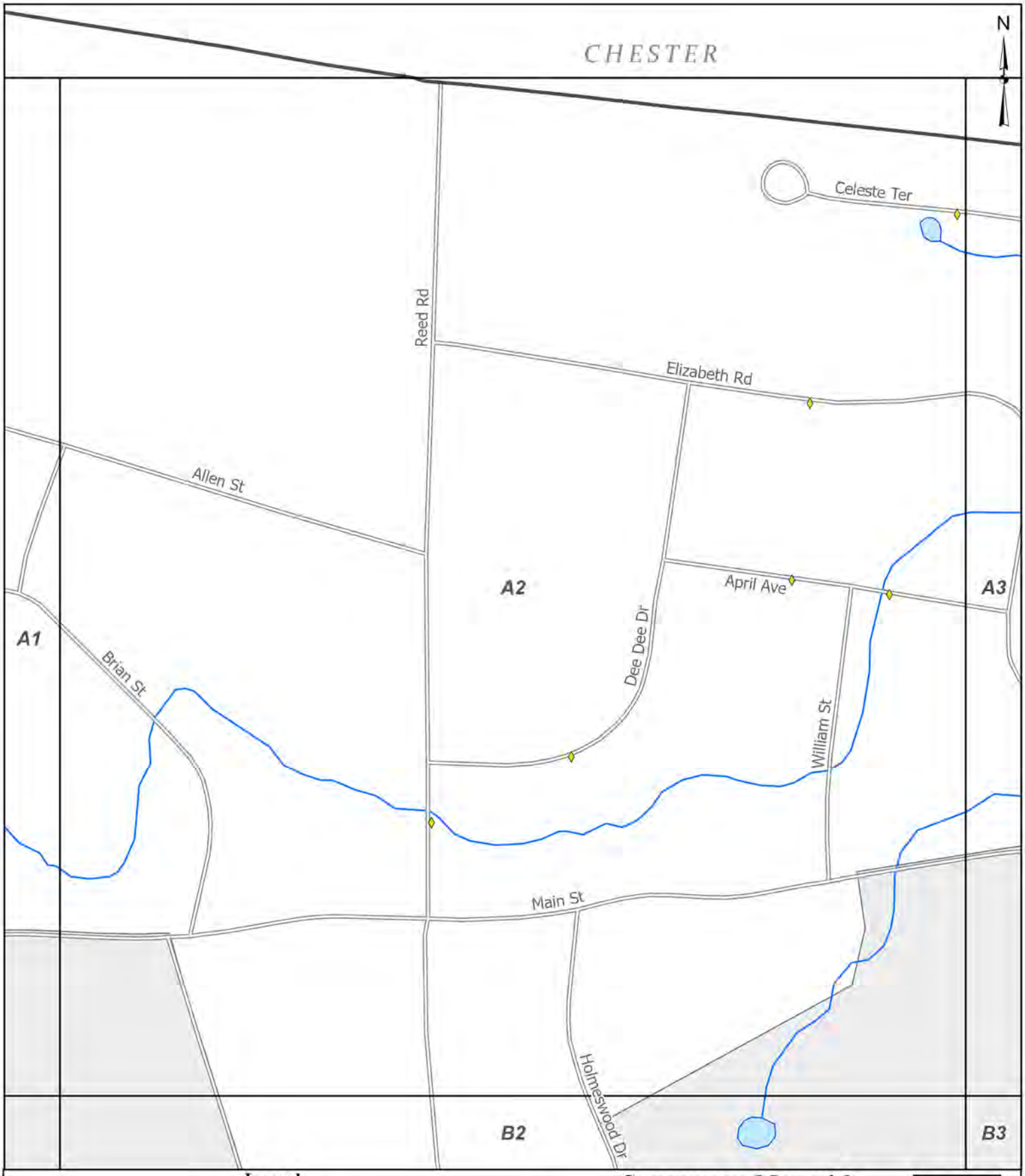
SHEET A1

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

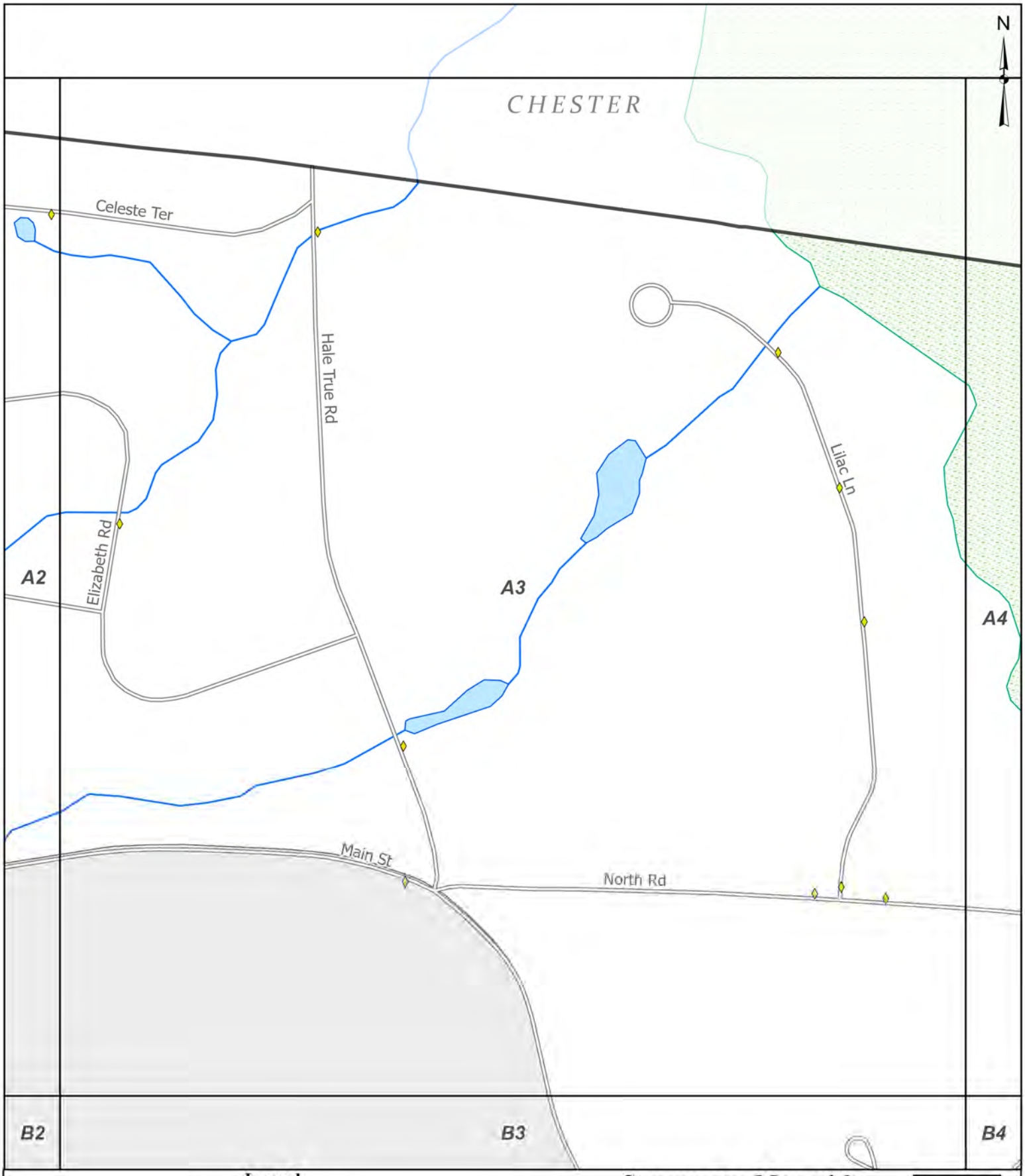
SHEET A2

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

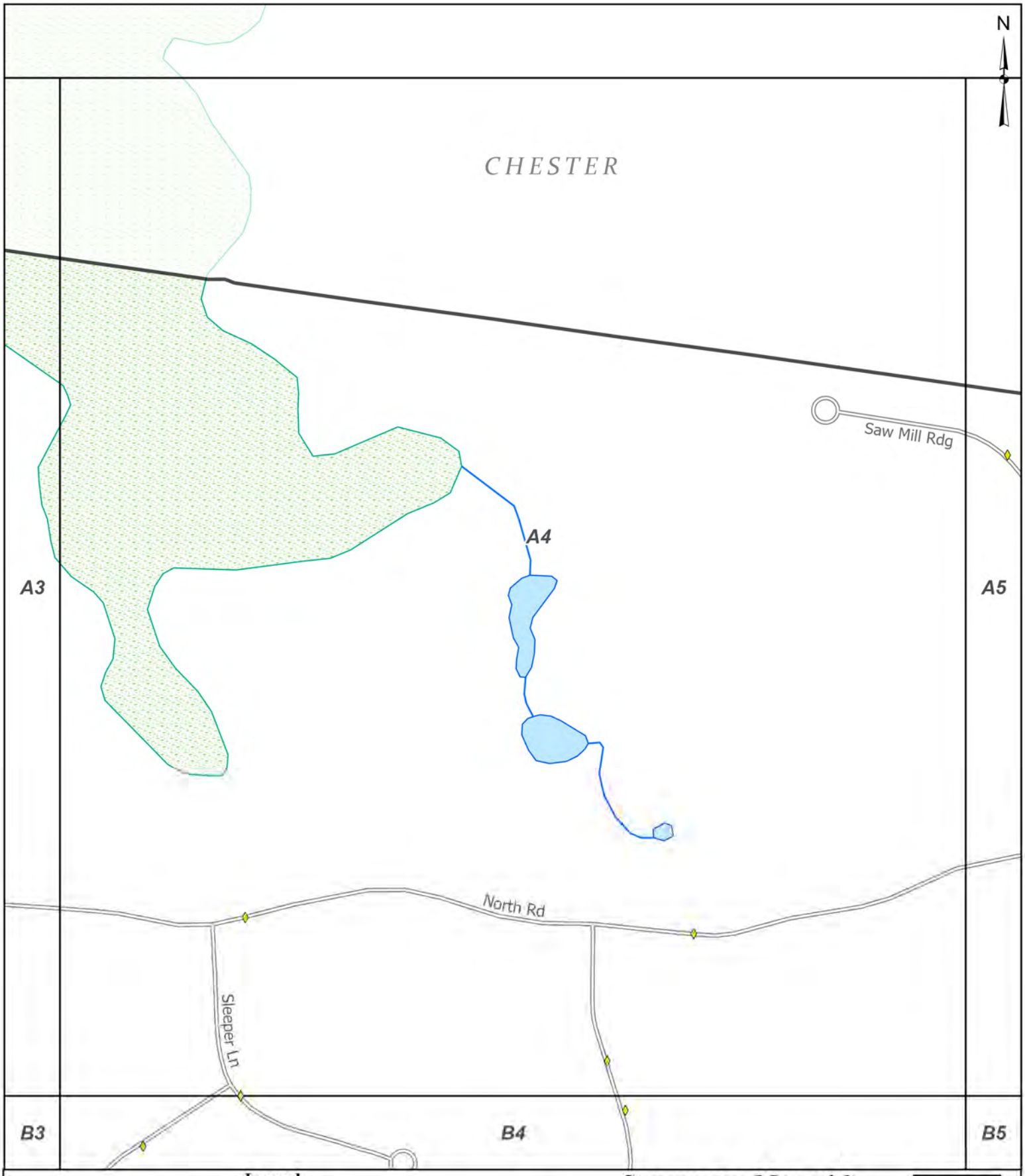
SHEET A3

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

SHEET A4

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI

Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

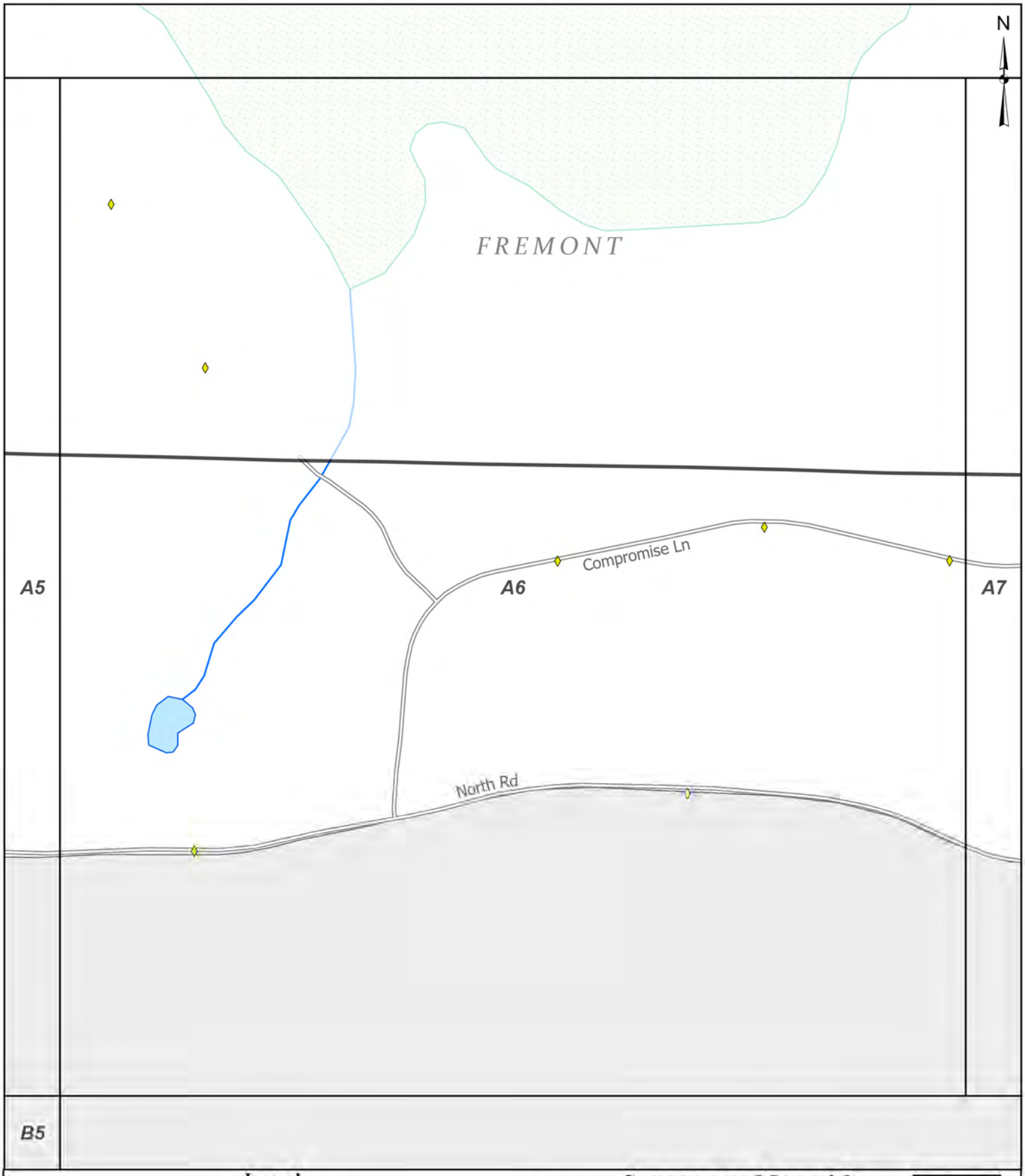
SHEET A5

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

SHEET A6

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI

Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

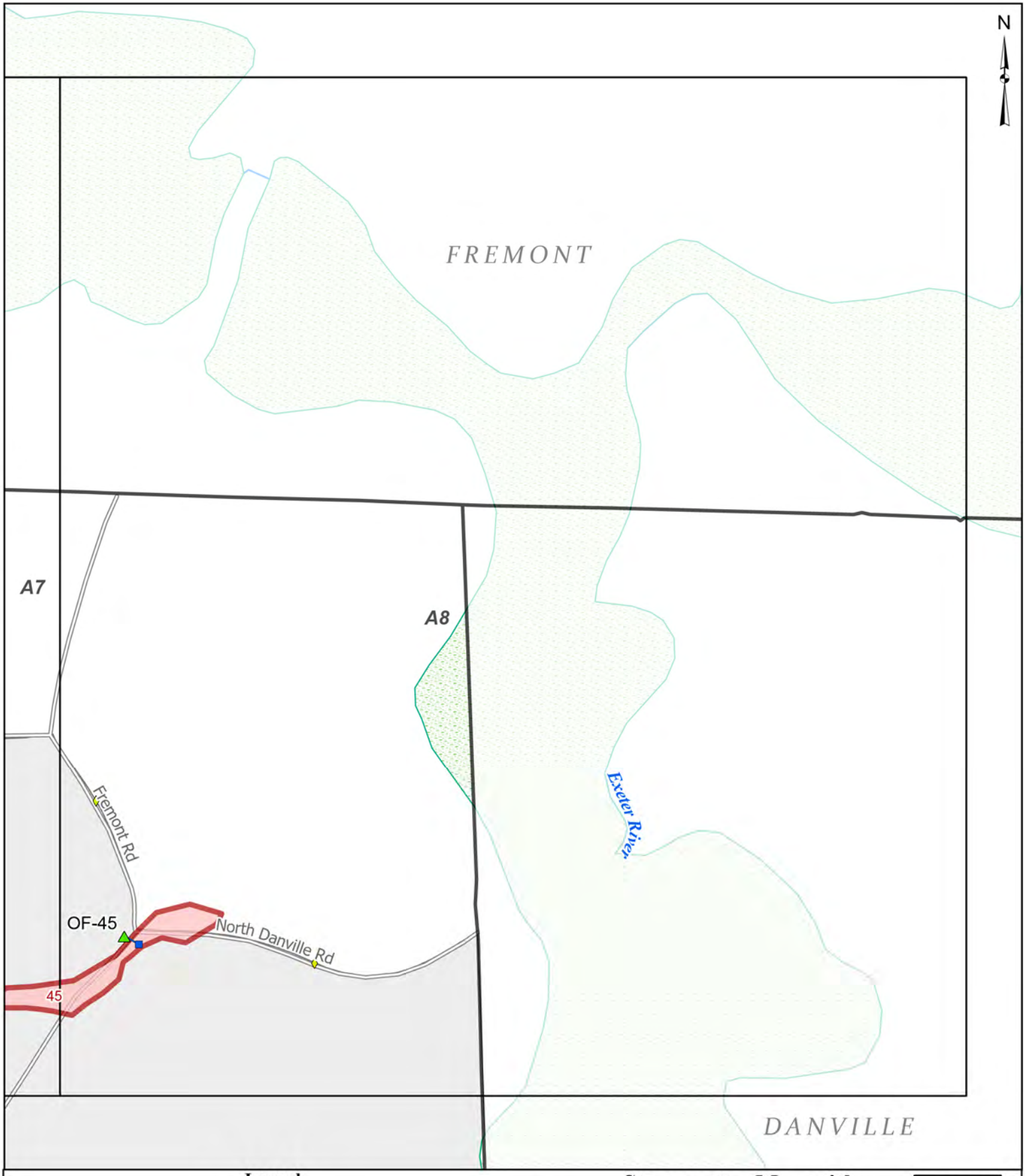
SHEET A7

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

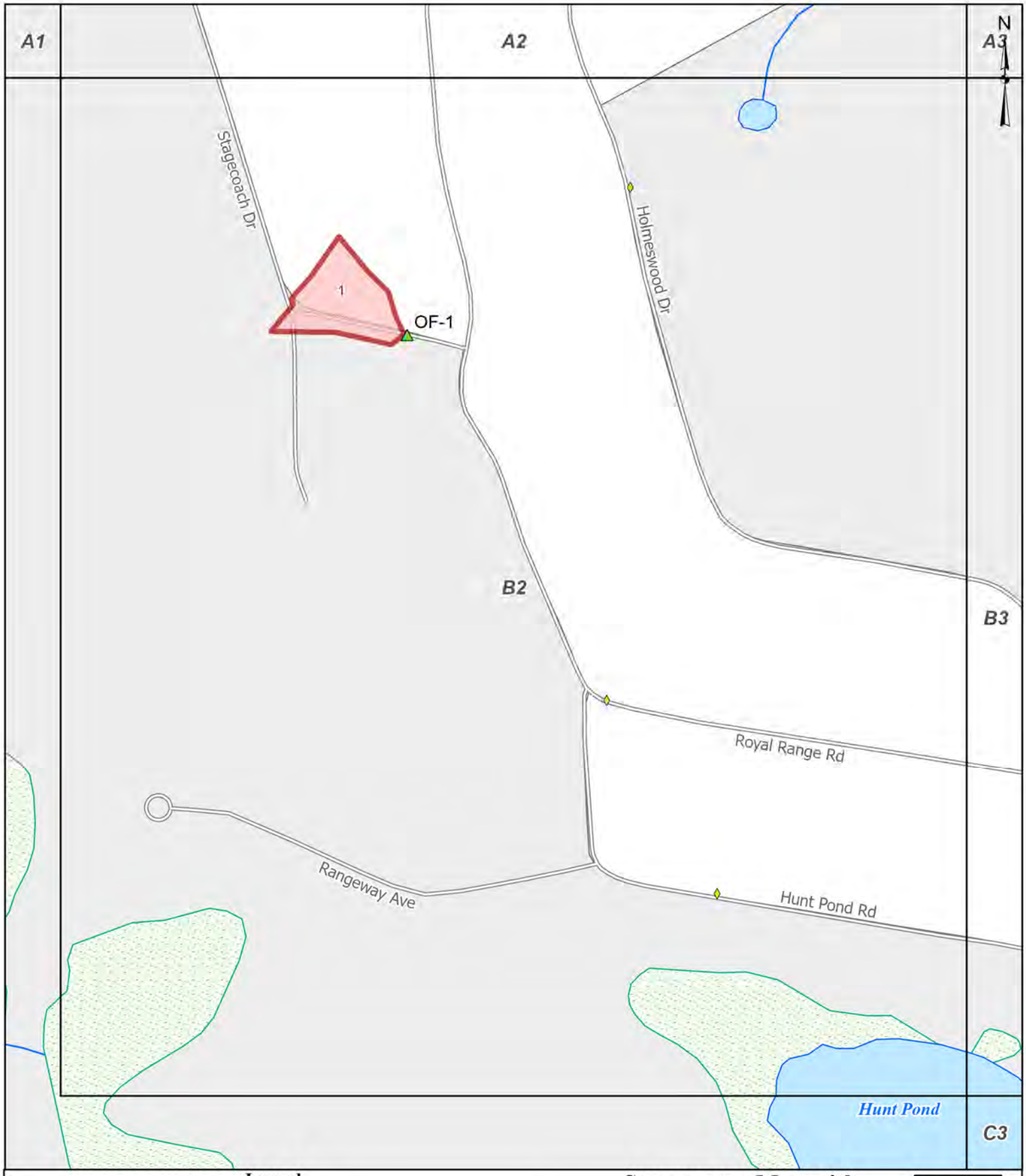
SHEET A8

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

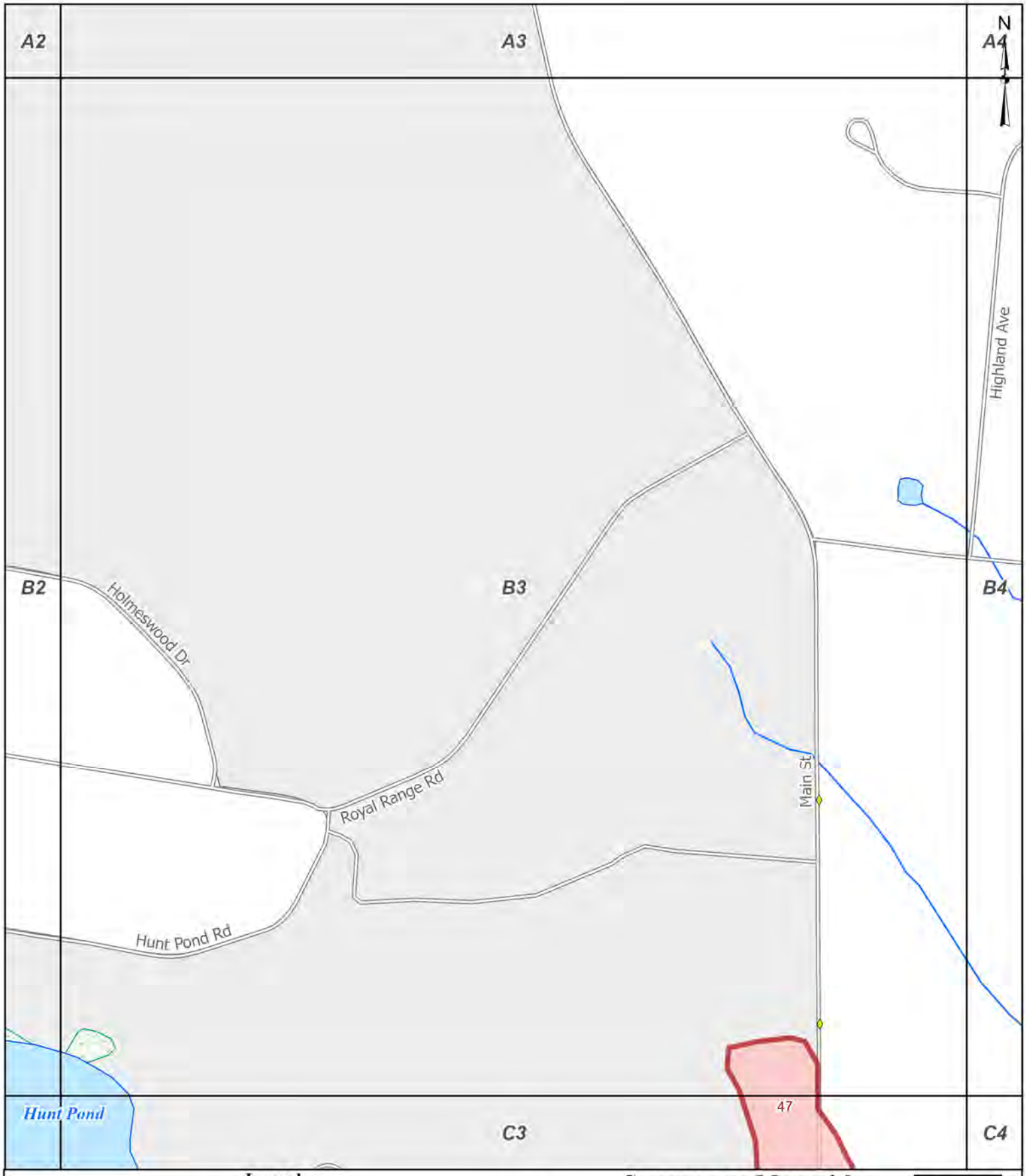
SHEET B2

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

SHEET B3

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI

Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

SHEET B4

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI

Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

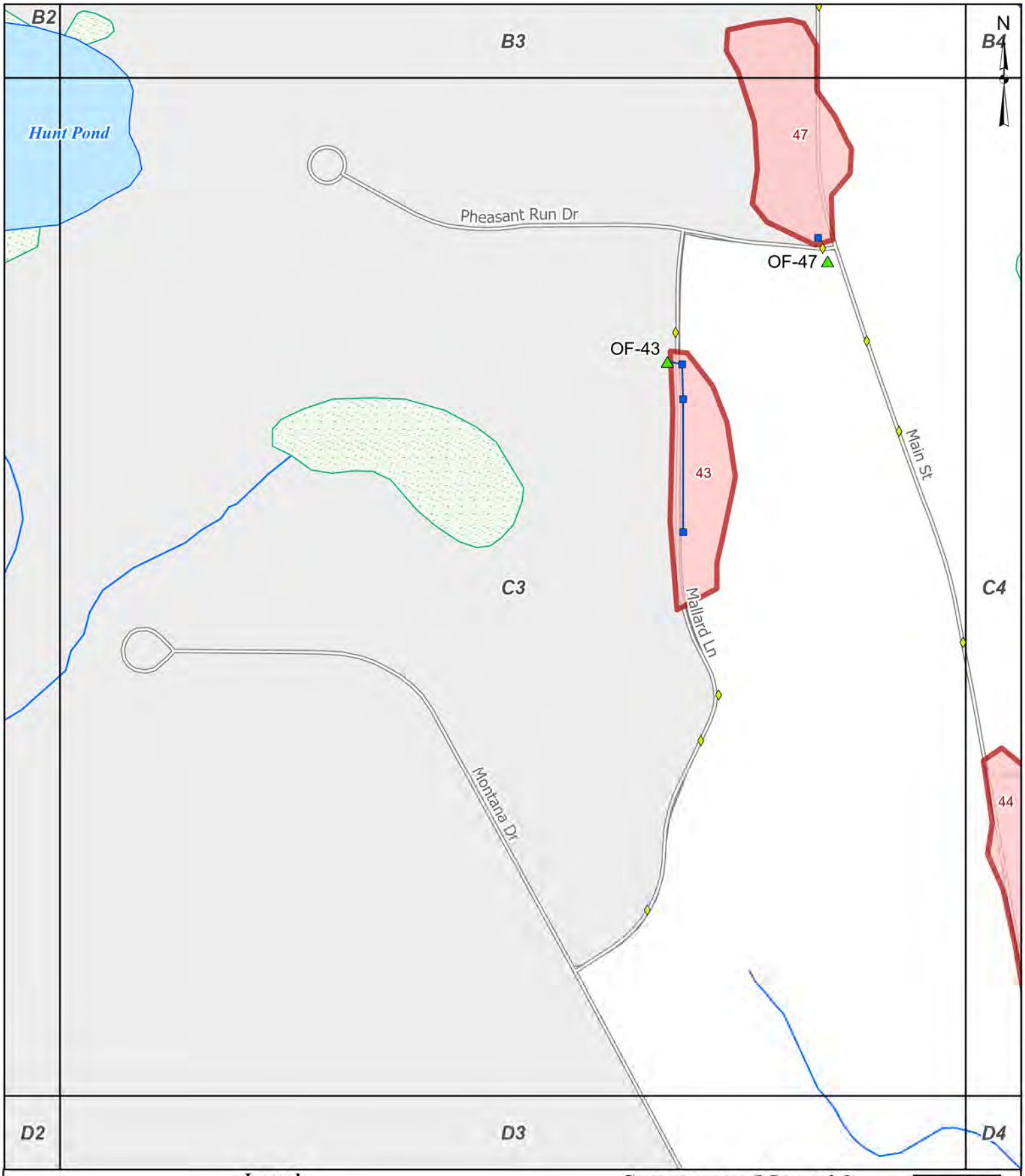
SHEET B5

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

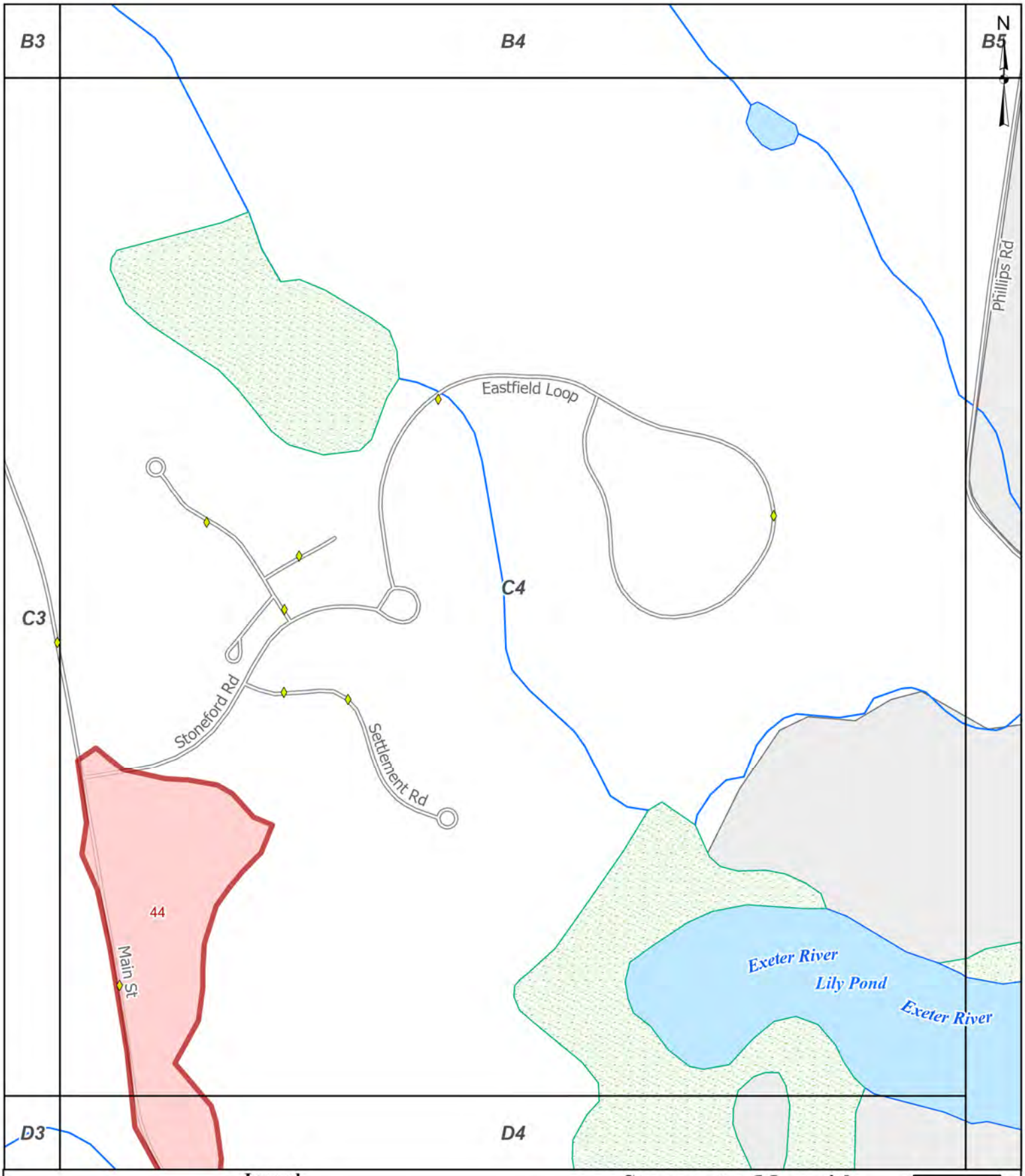
SHEET C3

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

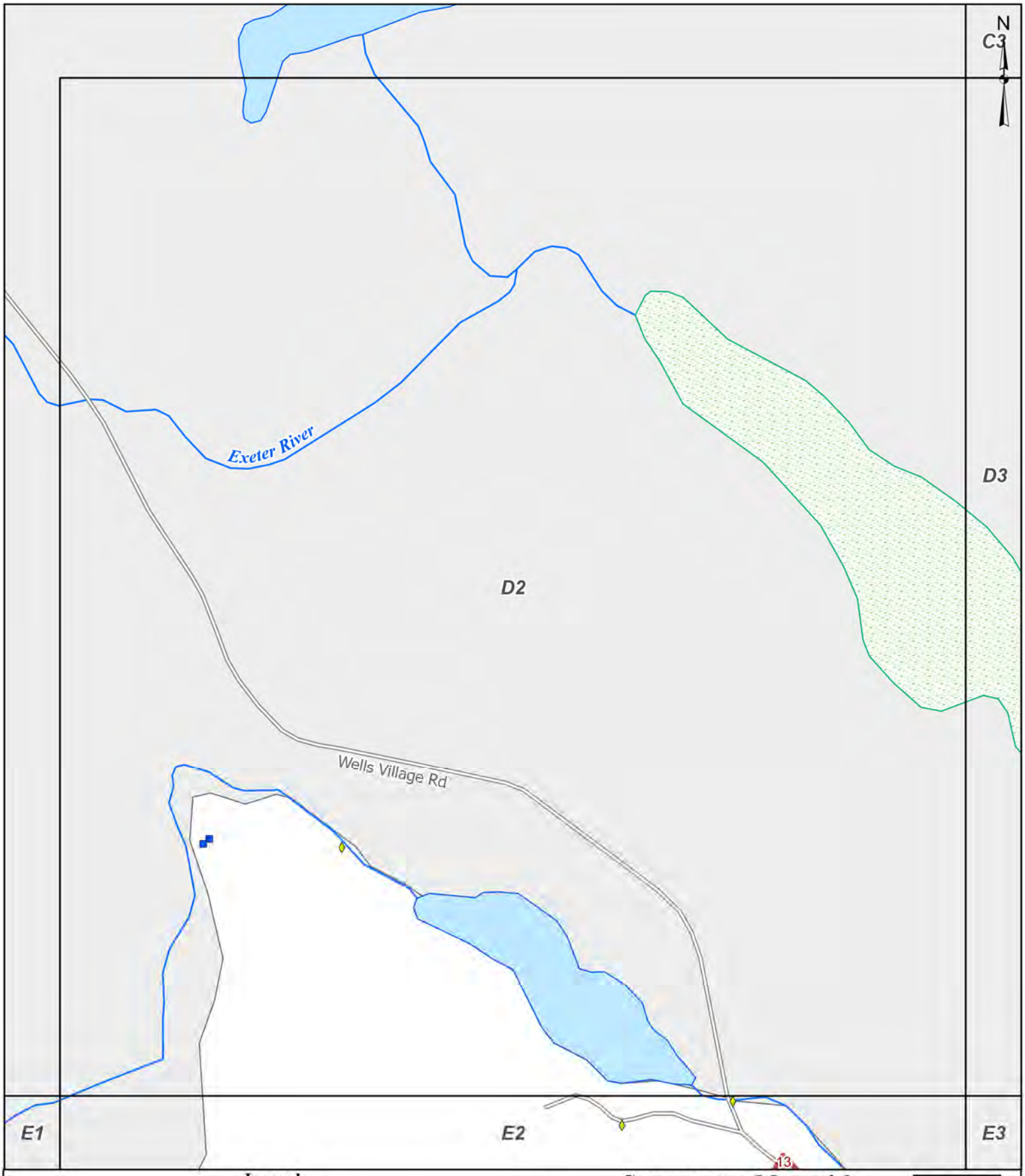
SHEET C4

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

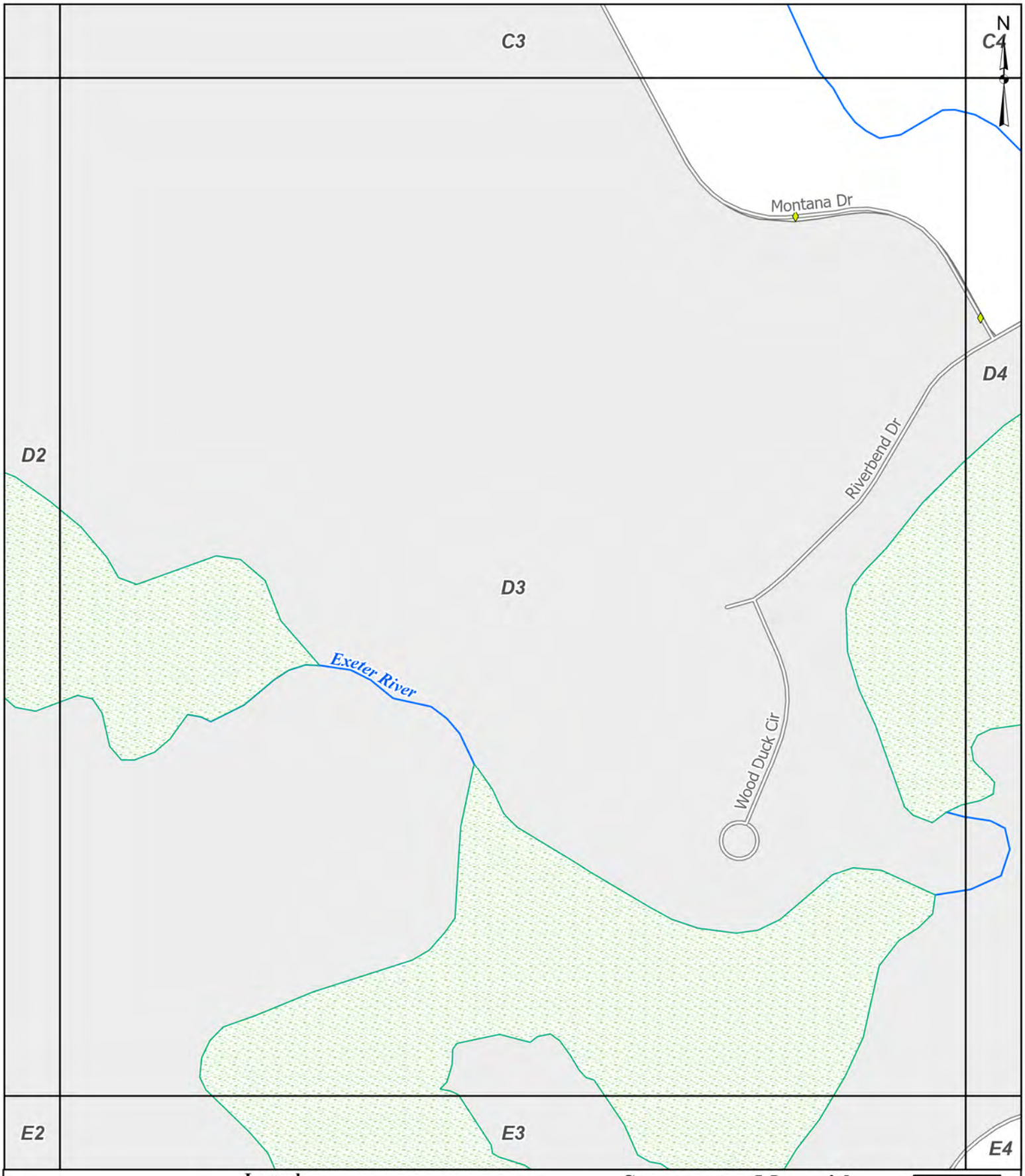
SHEET D2

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

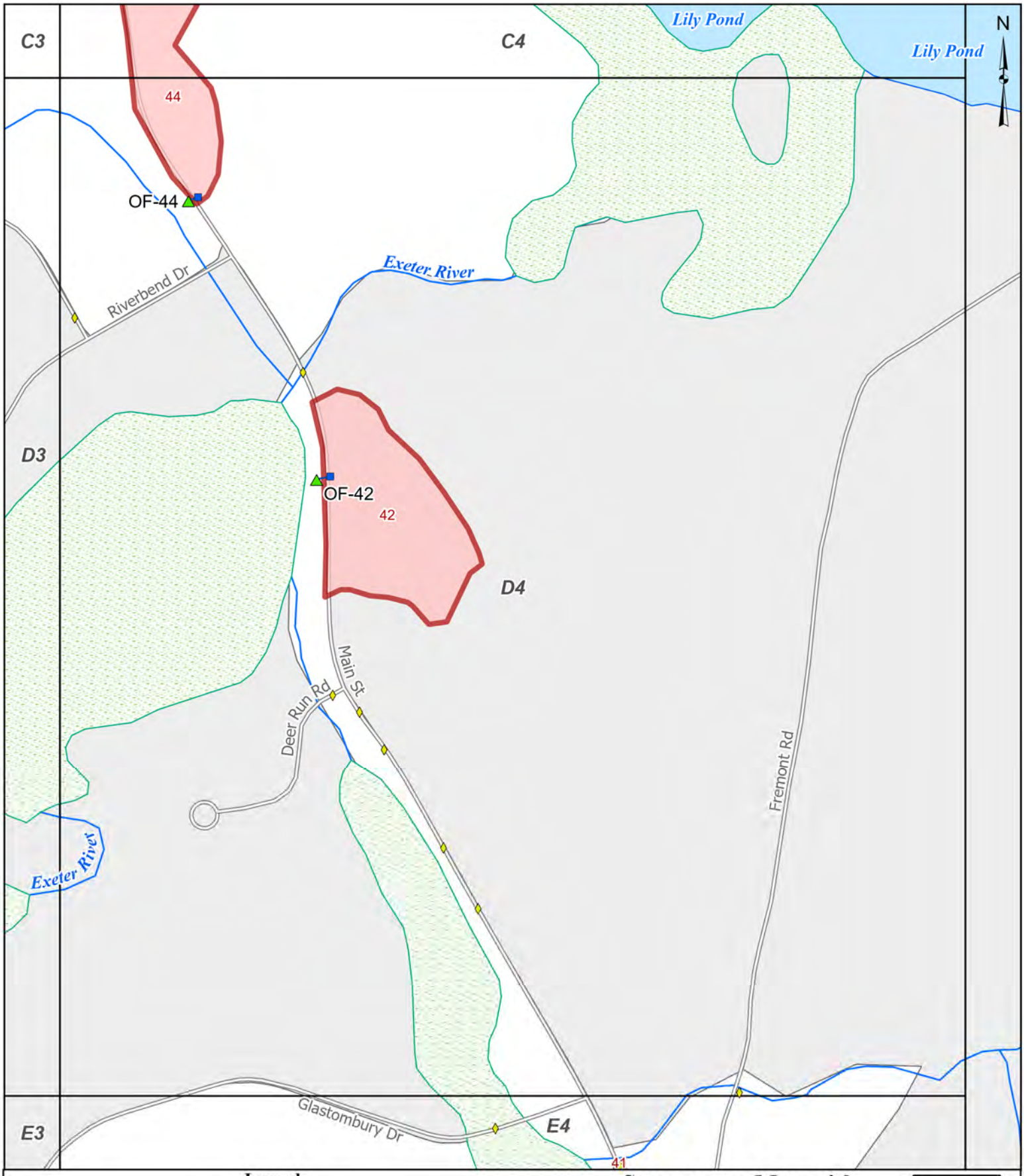
SHEET D3

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

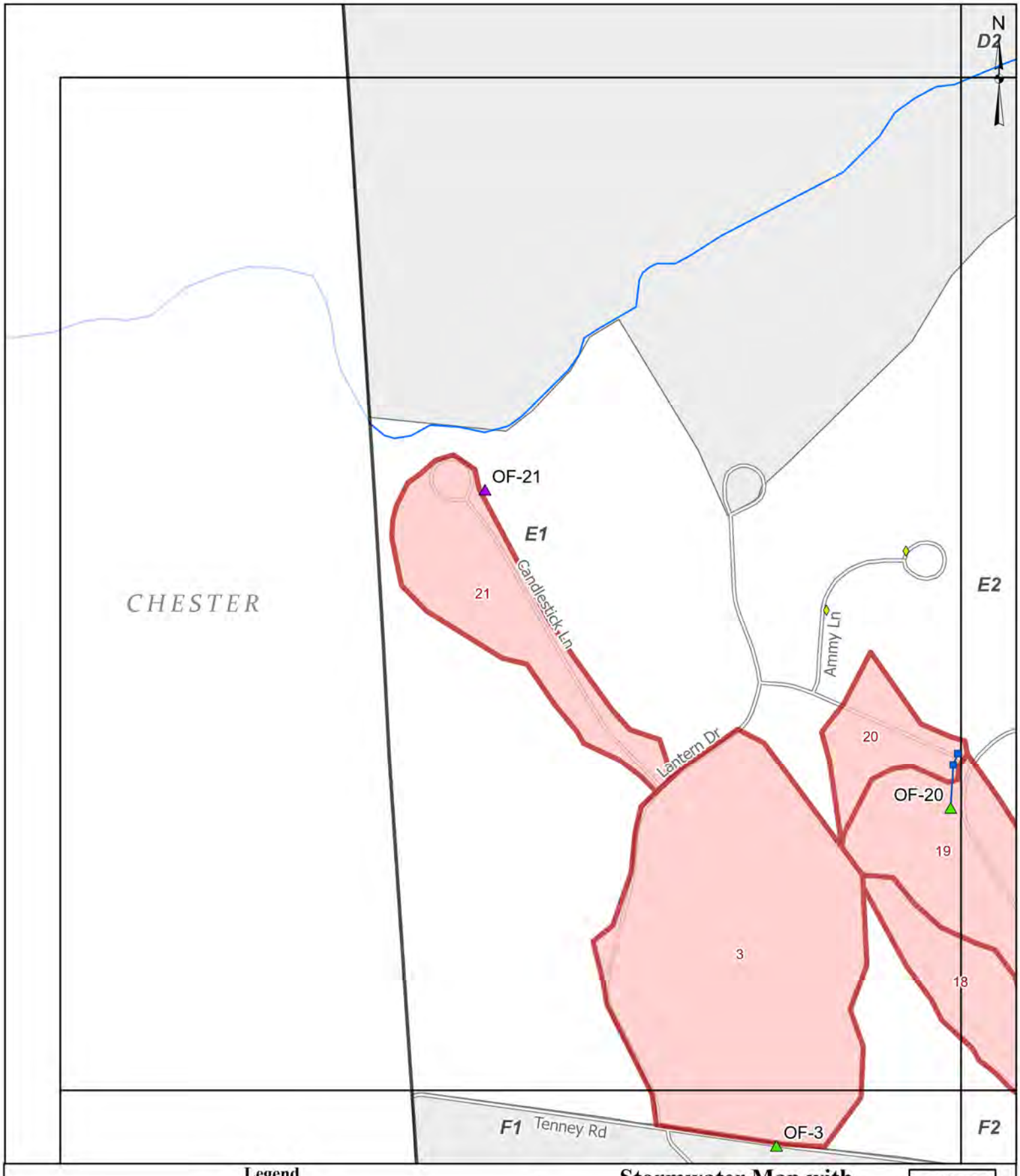
SHEET D4

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

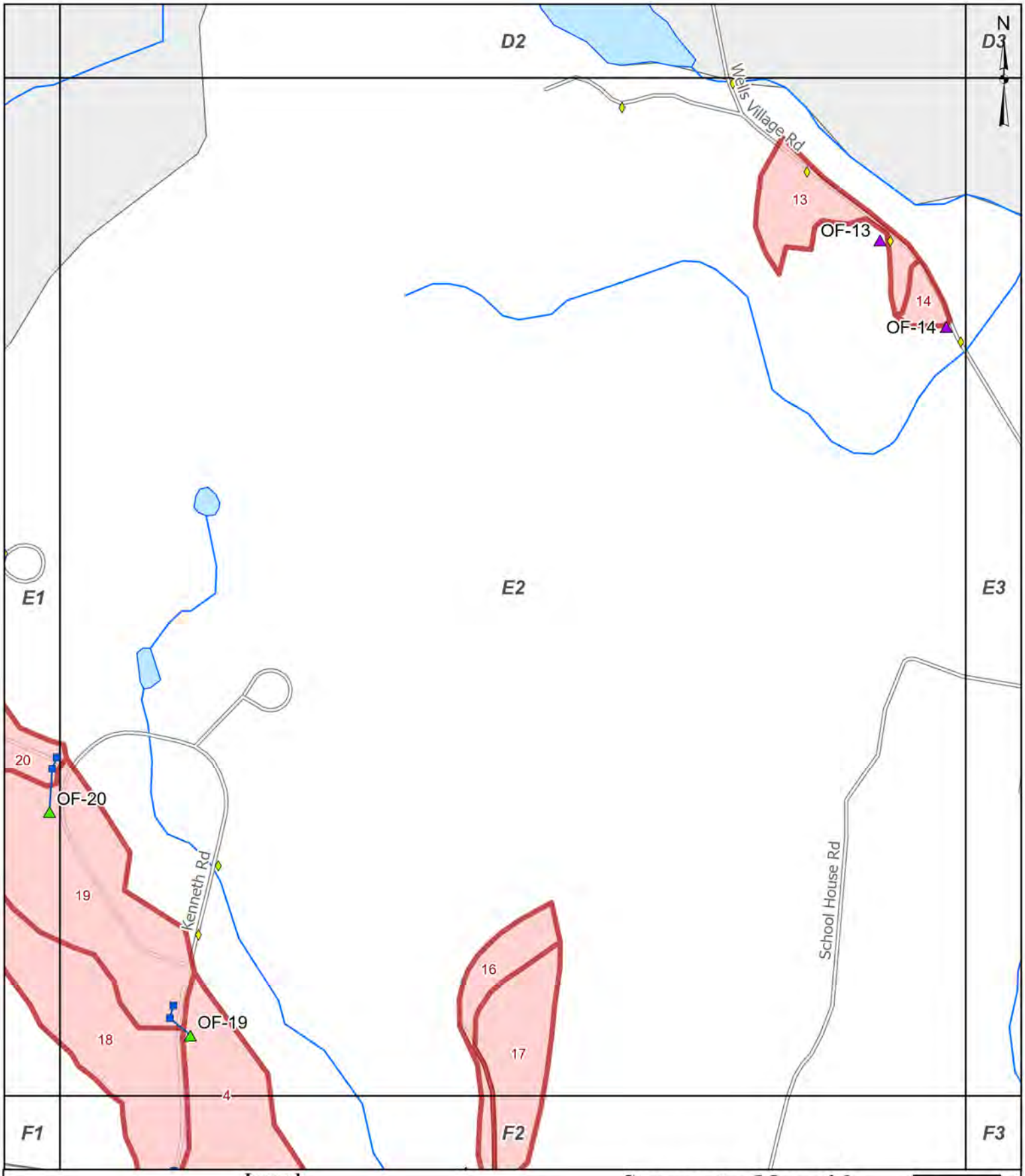
SHEET E1

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

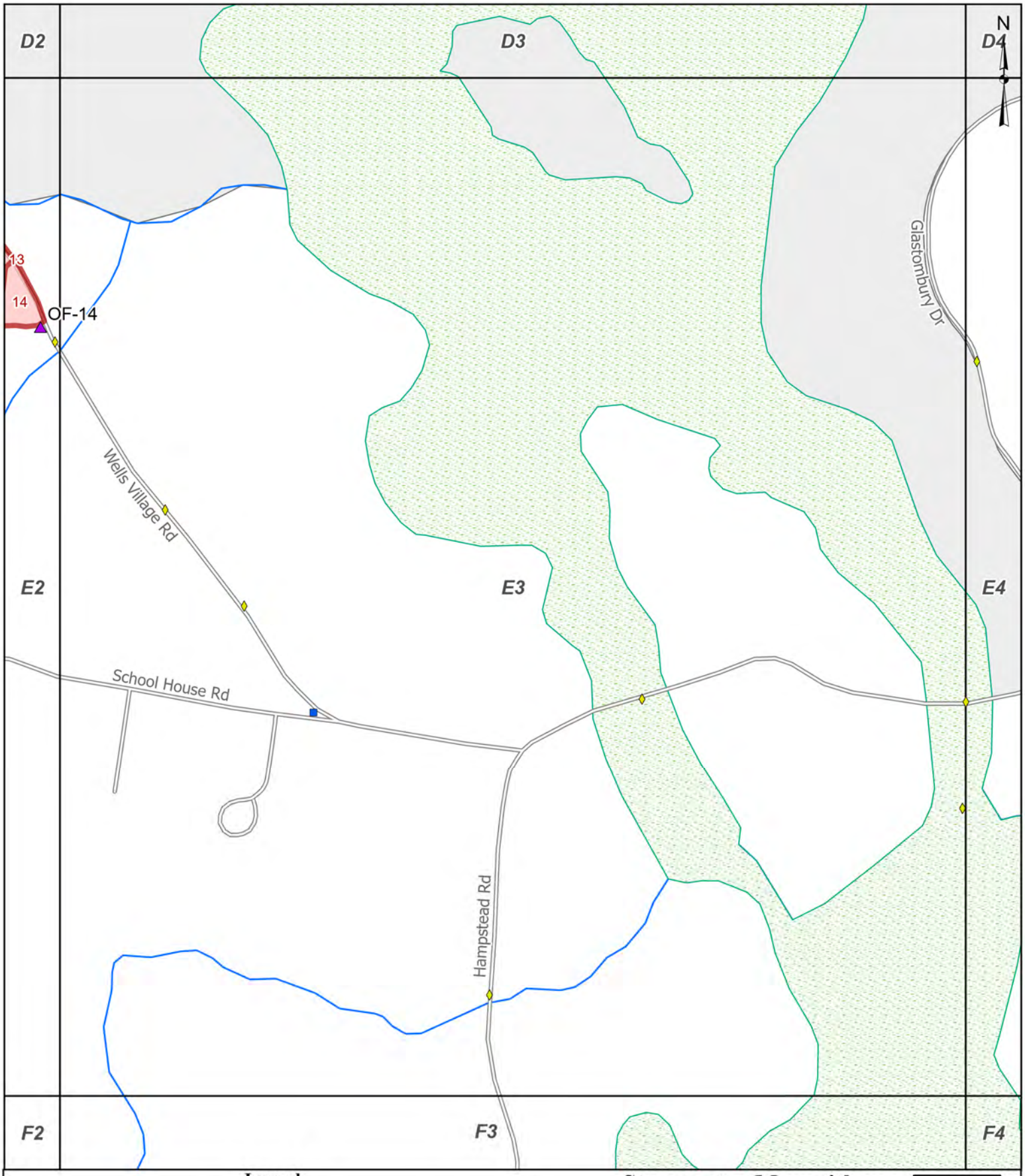
SHEET E2

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

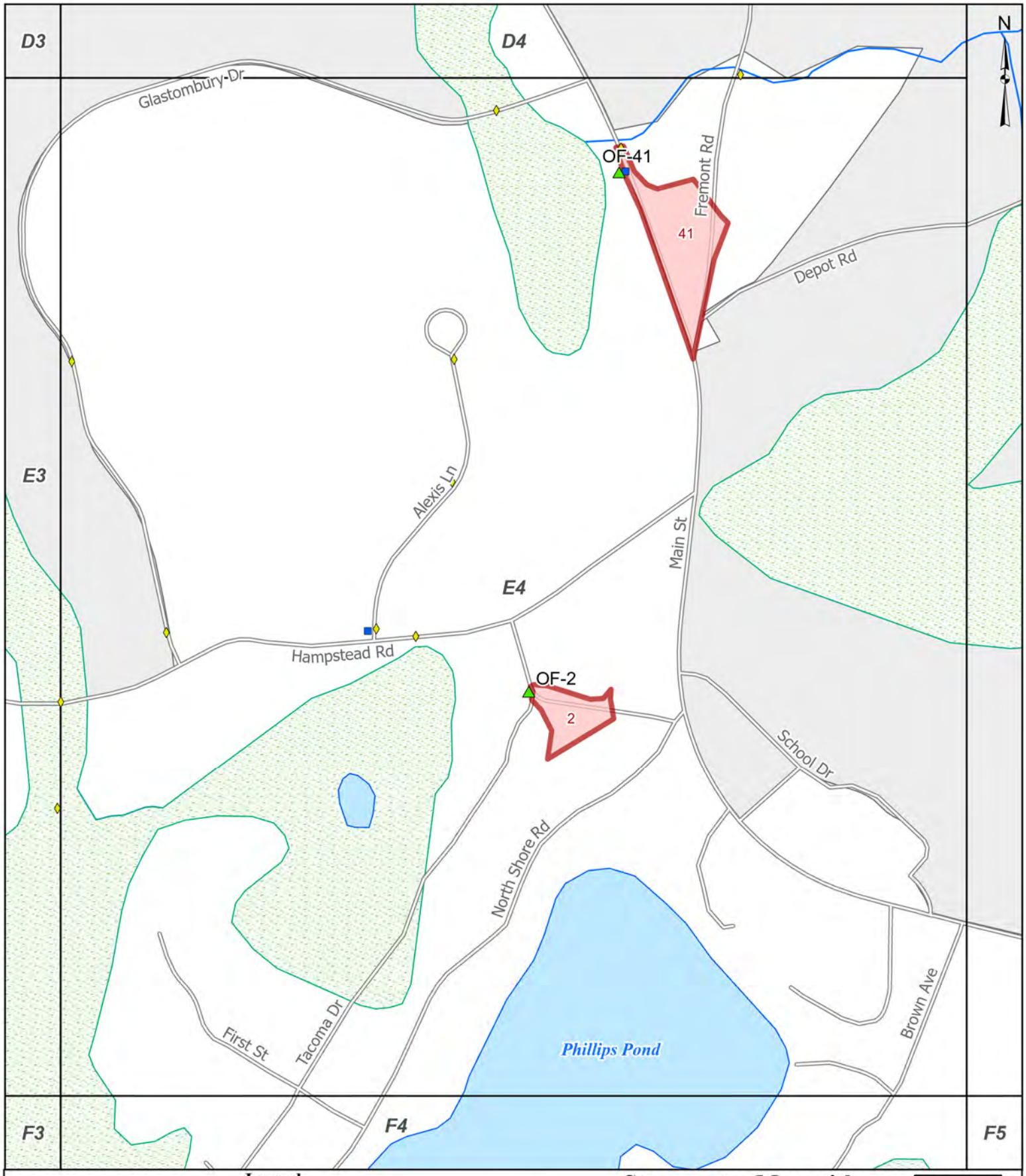
SHEET E3

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

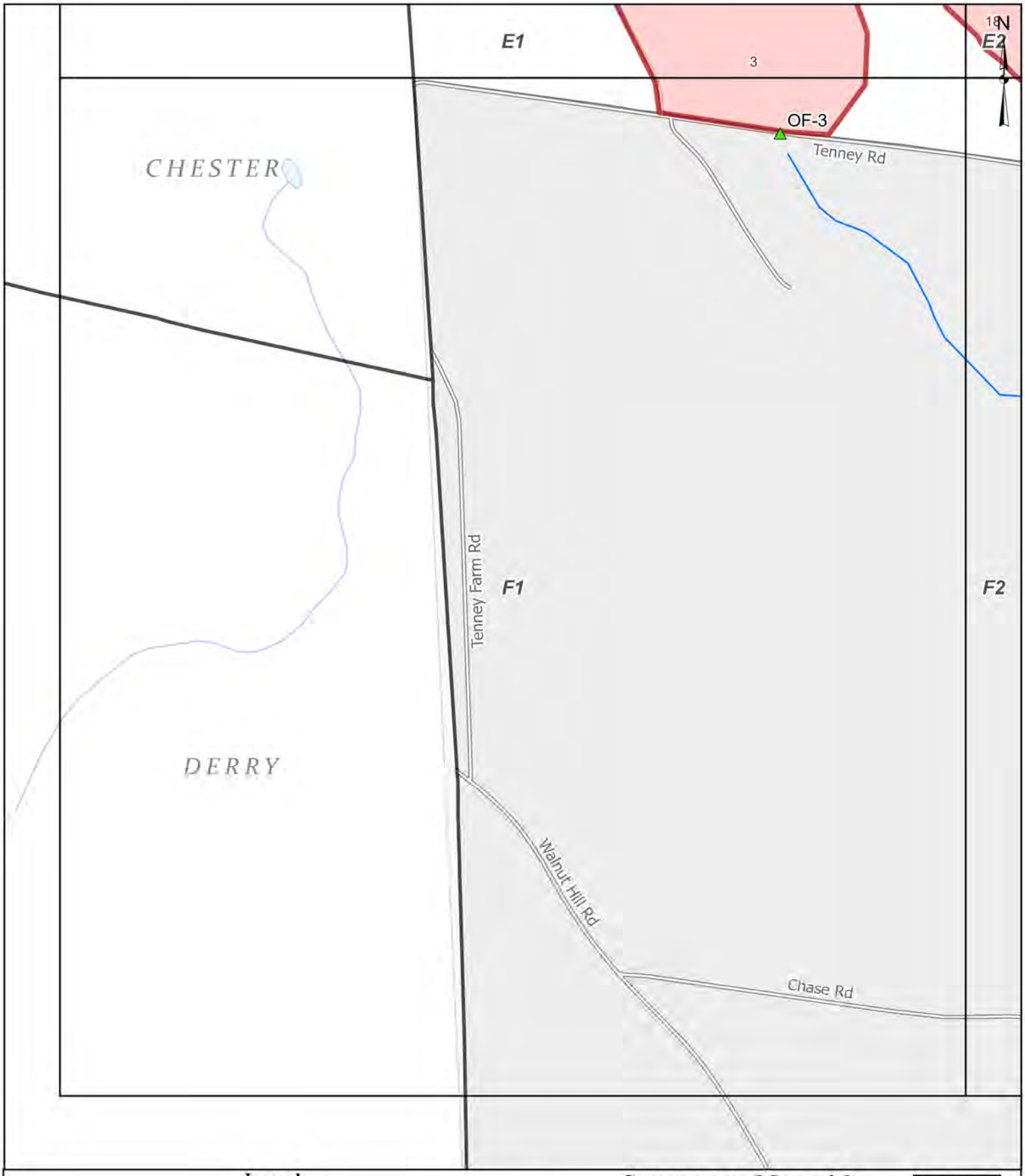
SHEET E4

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

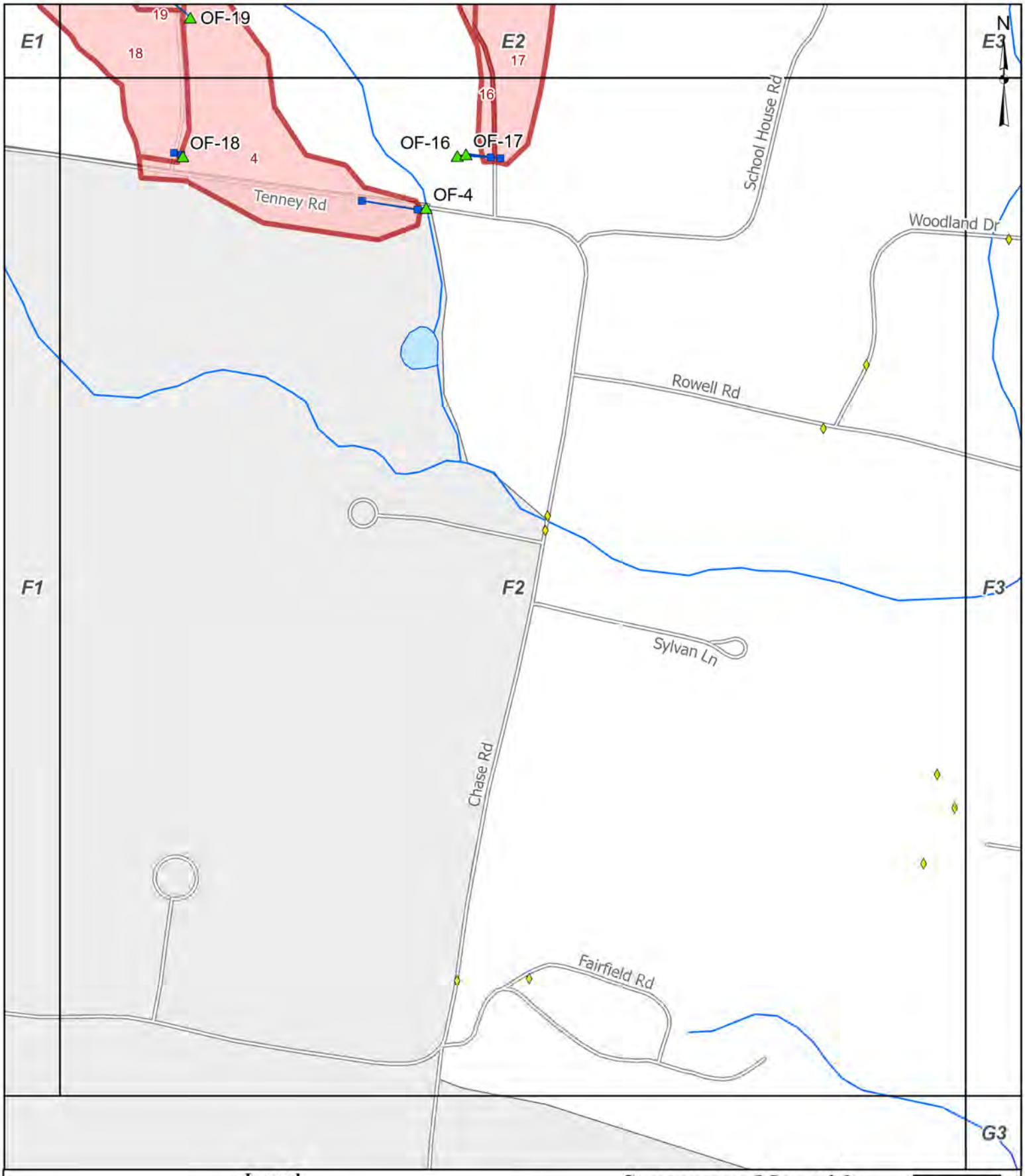
SHEET F1

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

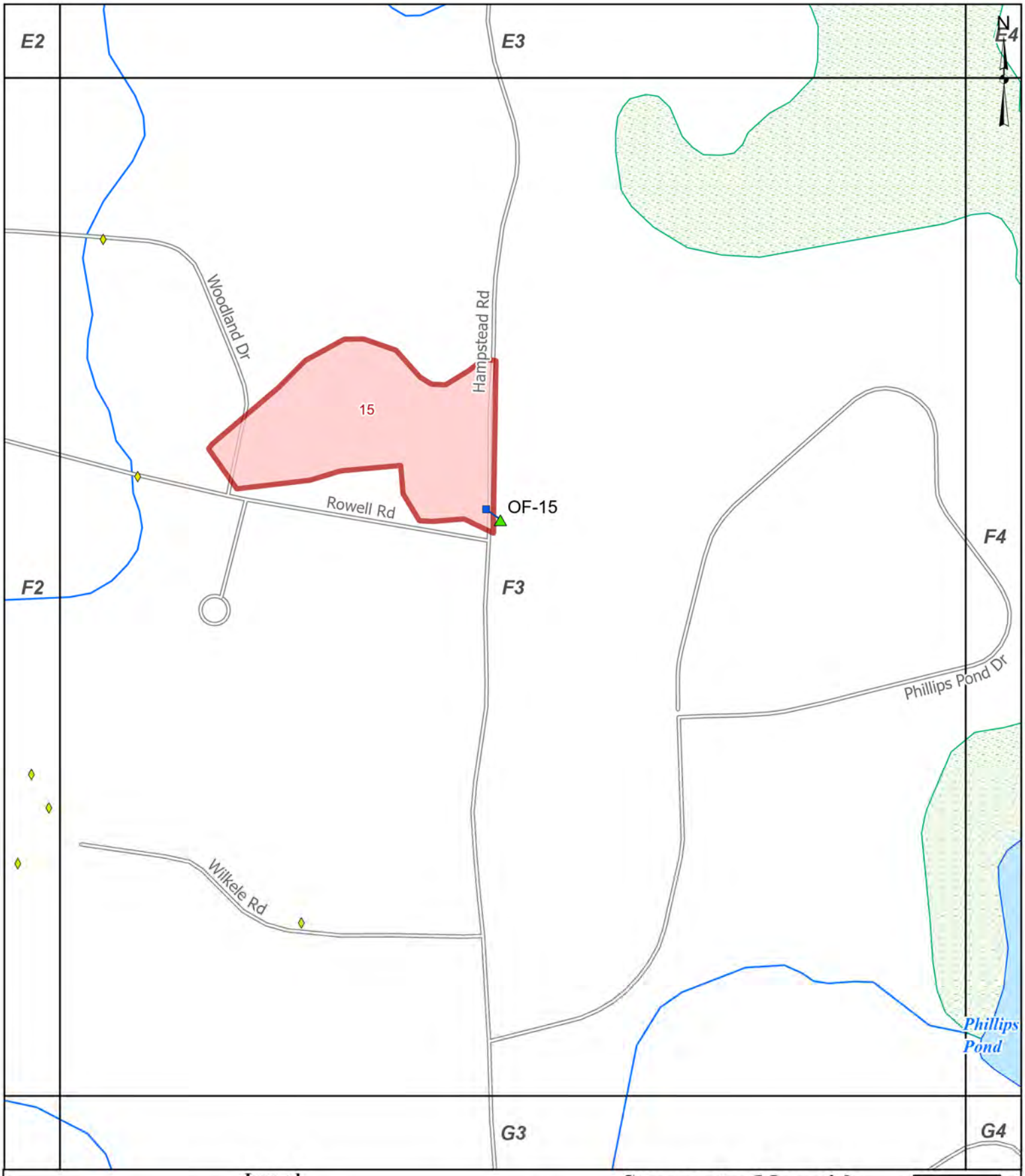
SHEET F2

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

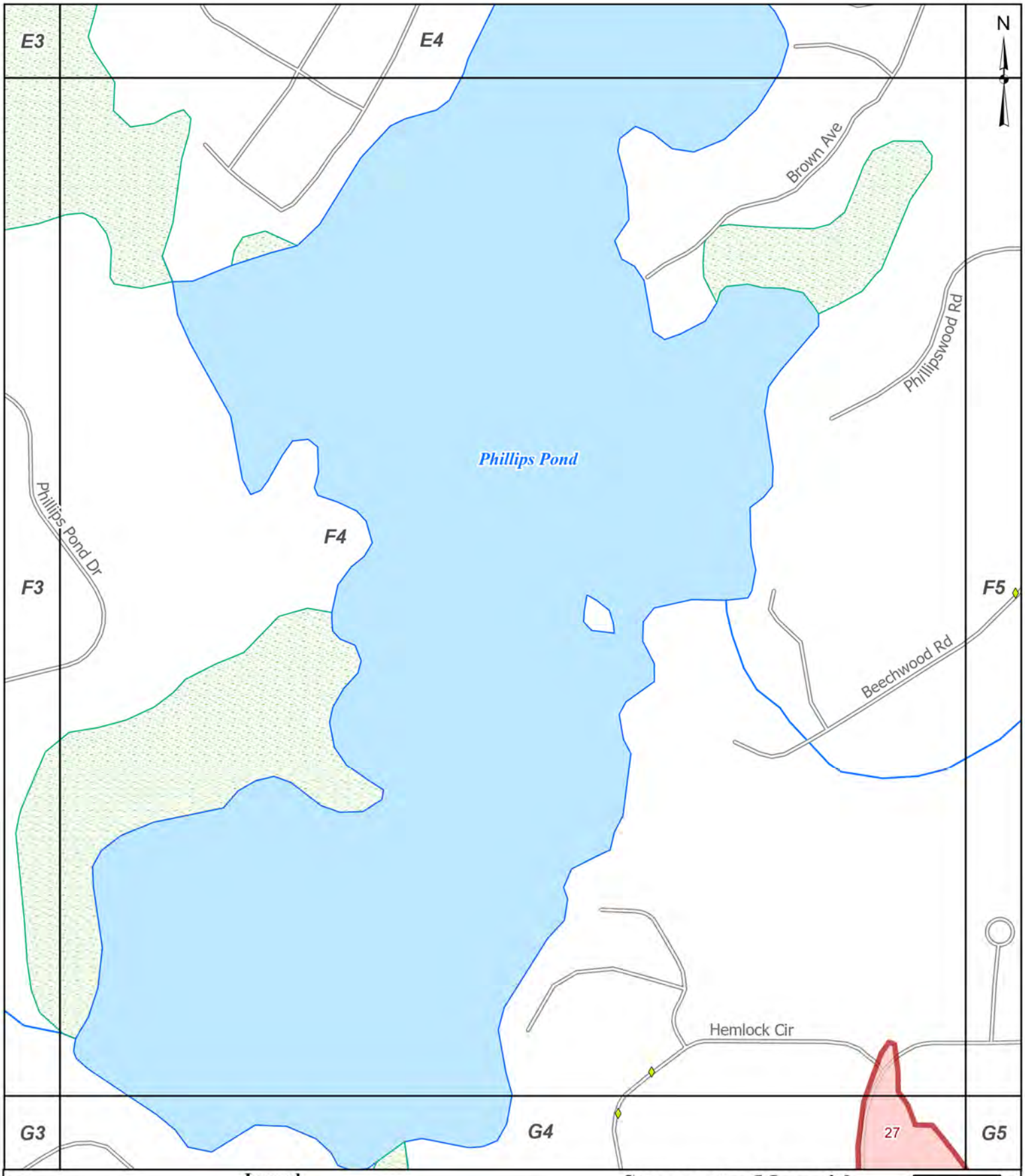
SHEET F3

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

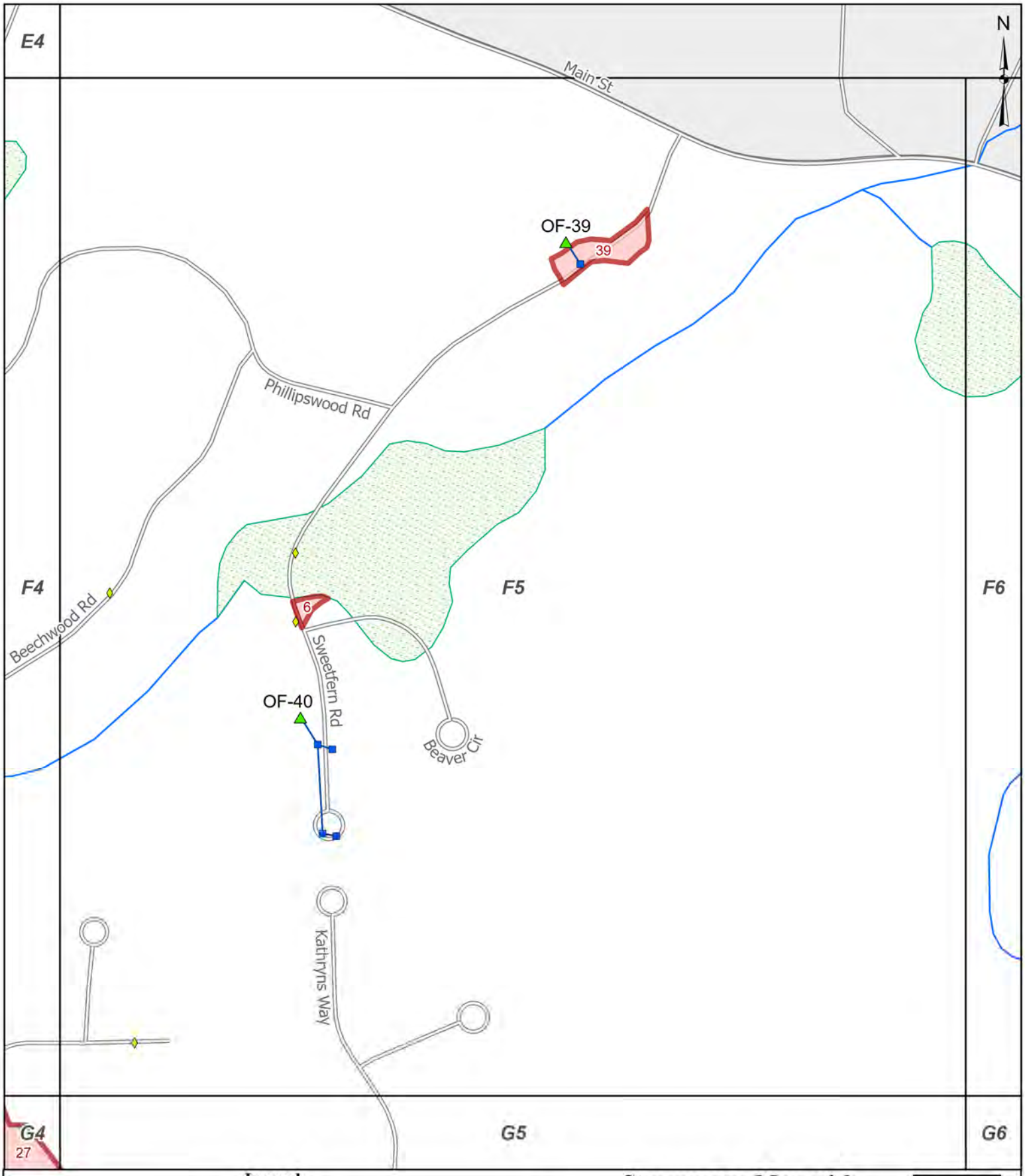
SHEET F4

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

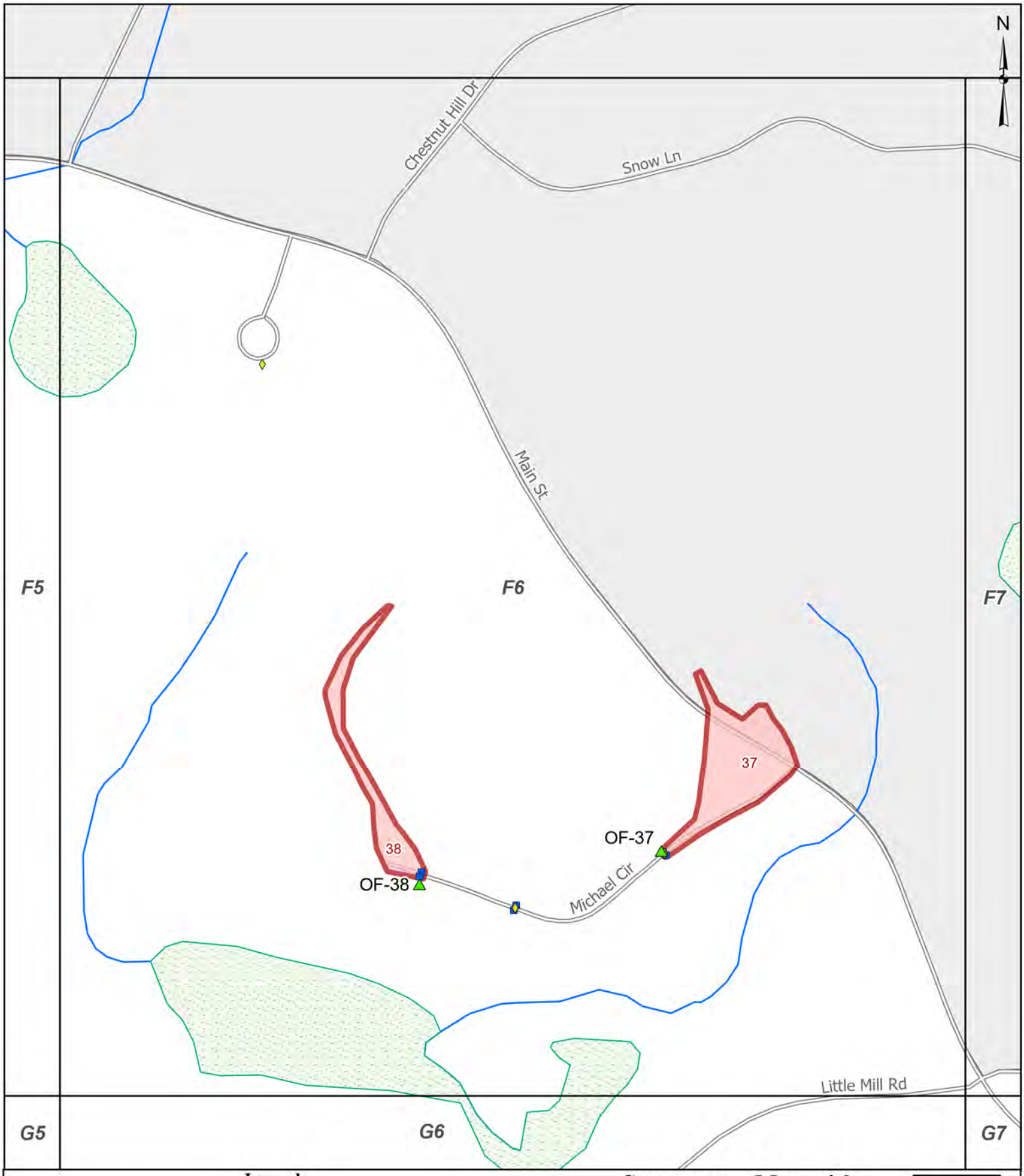
SHEET F5

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

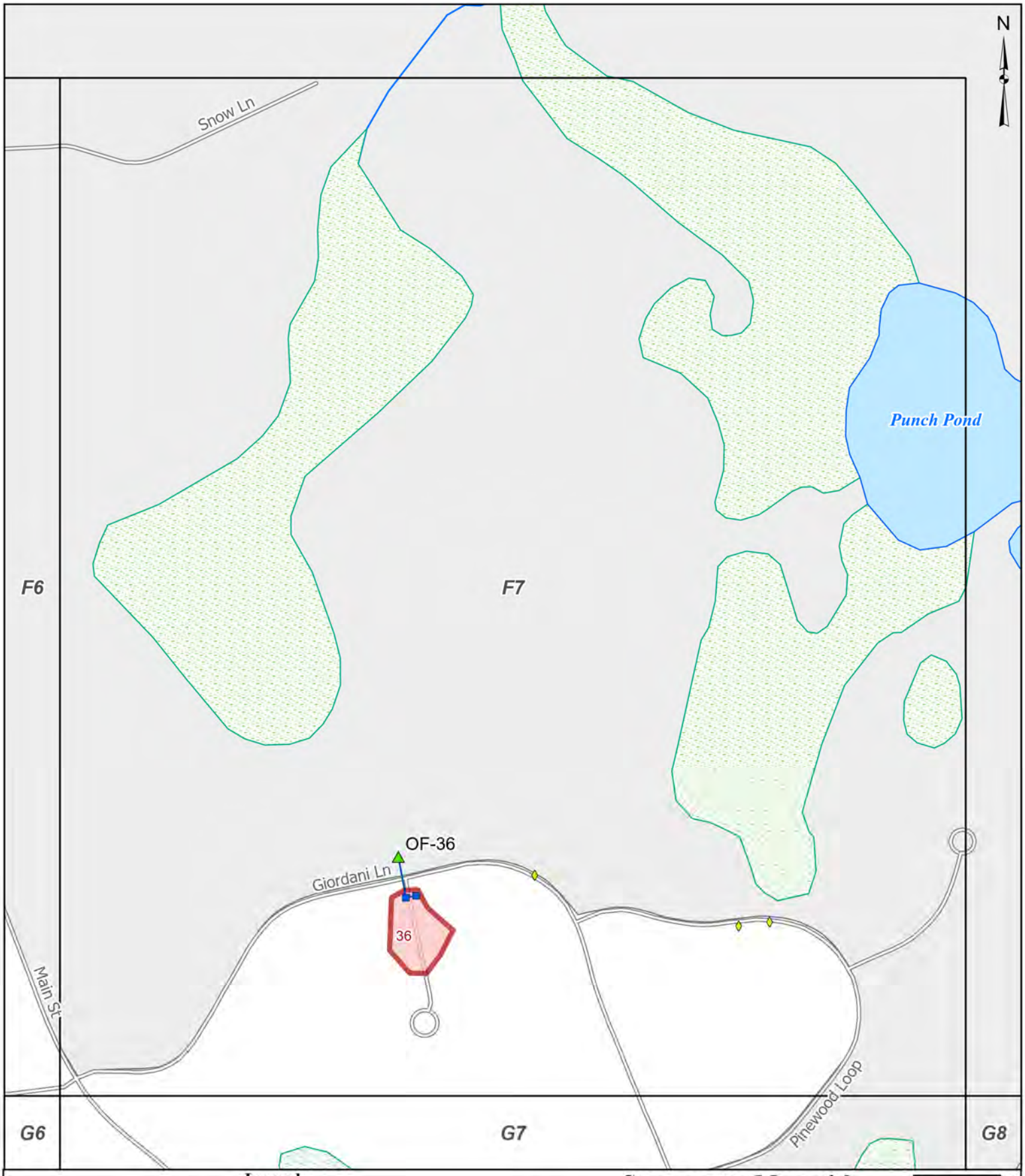
SHEET F6

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

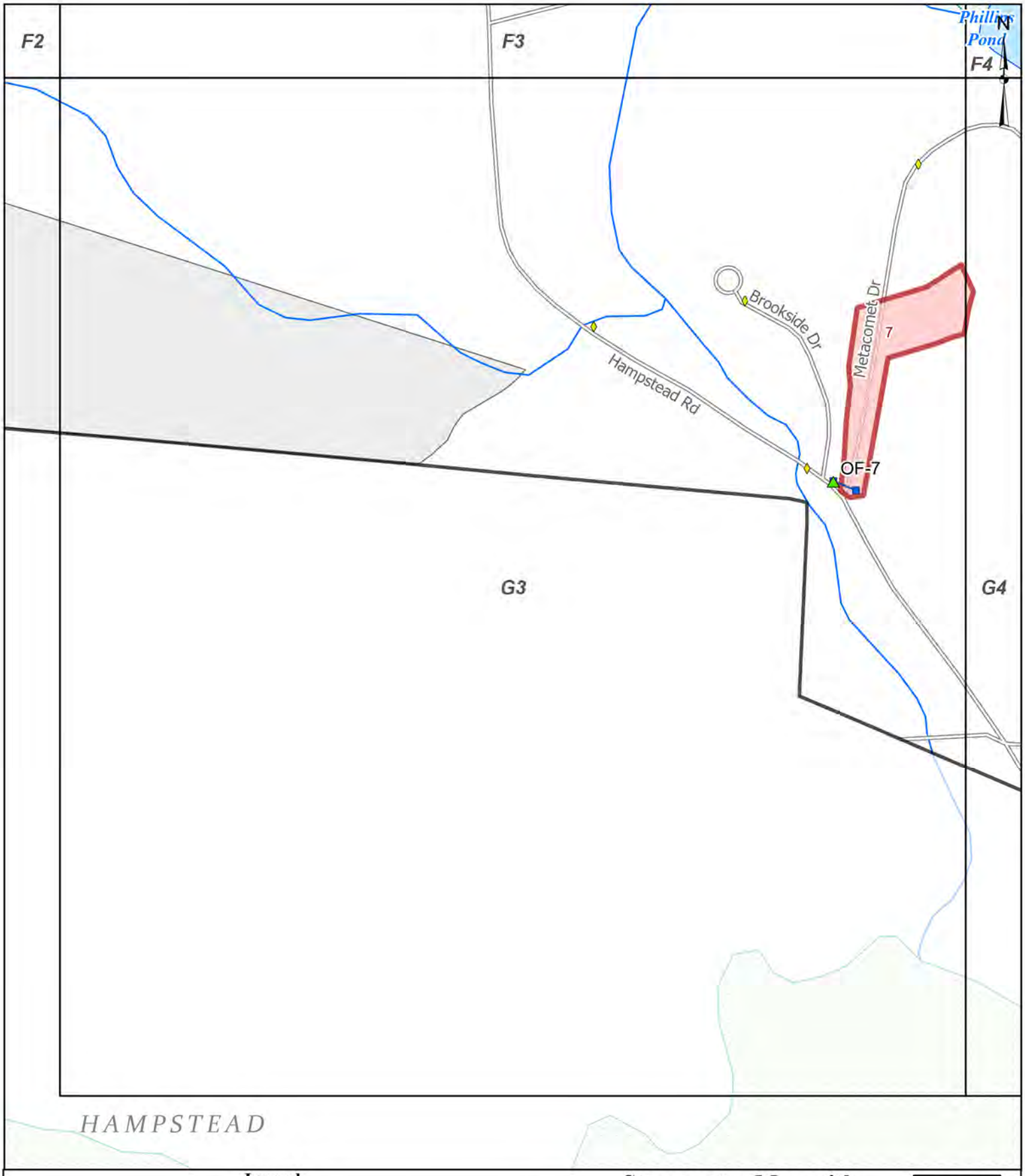
SHEET F7

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

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- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
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- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

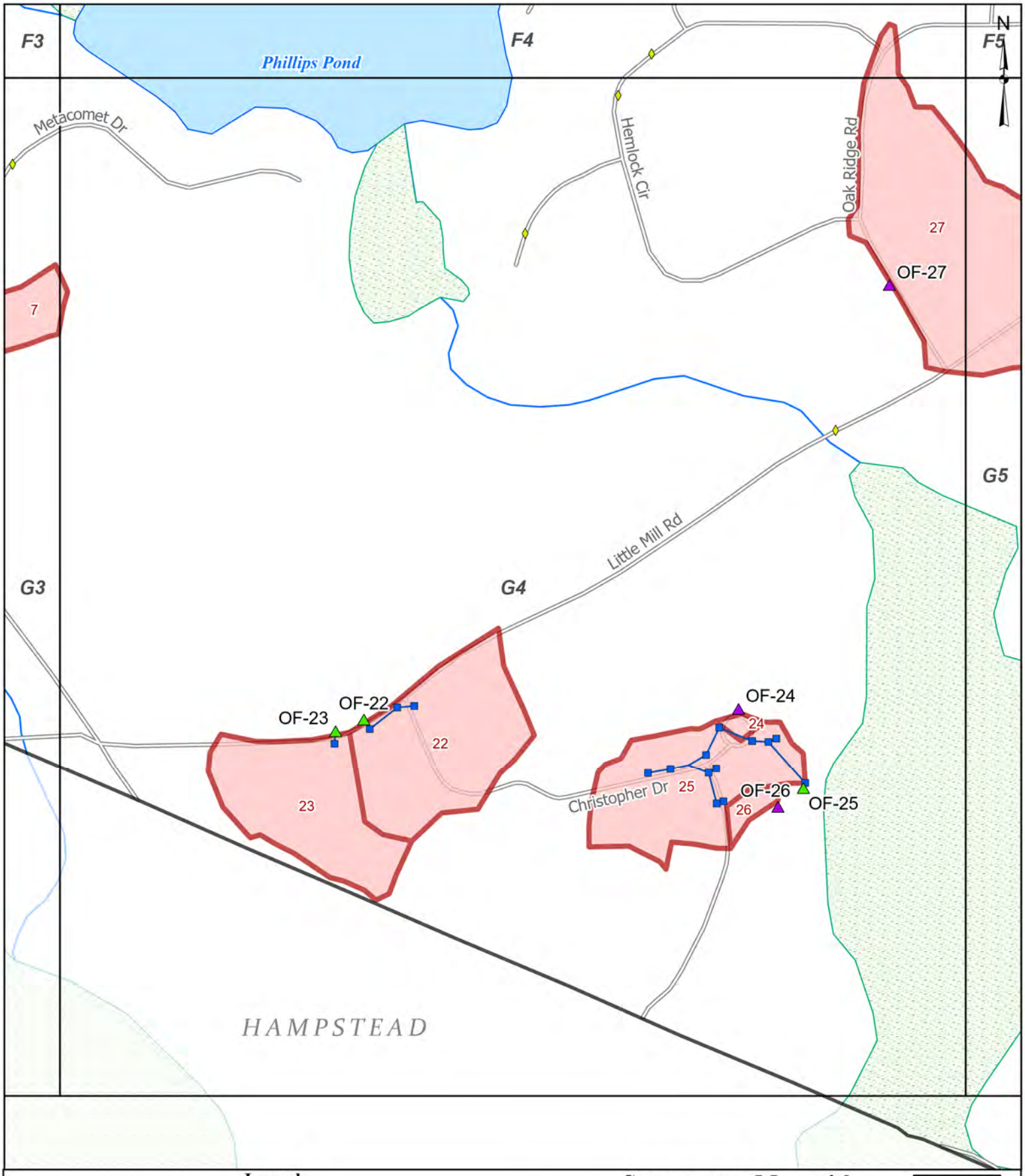
SHEET G3

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

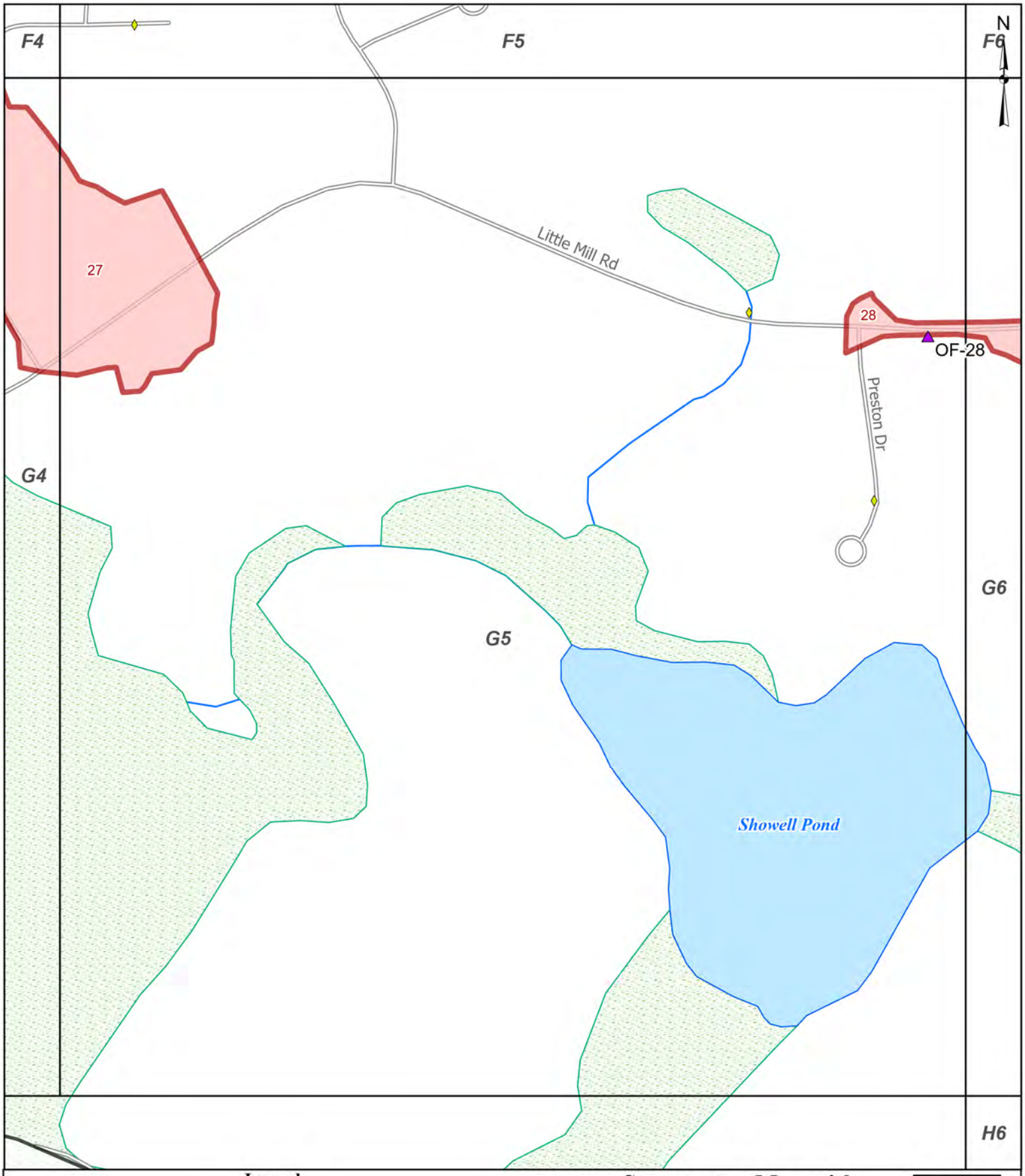
SHEET G4

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
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- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

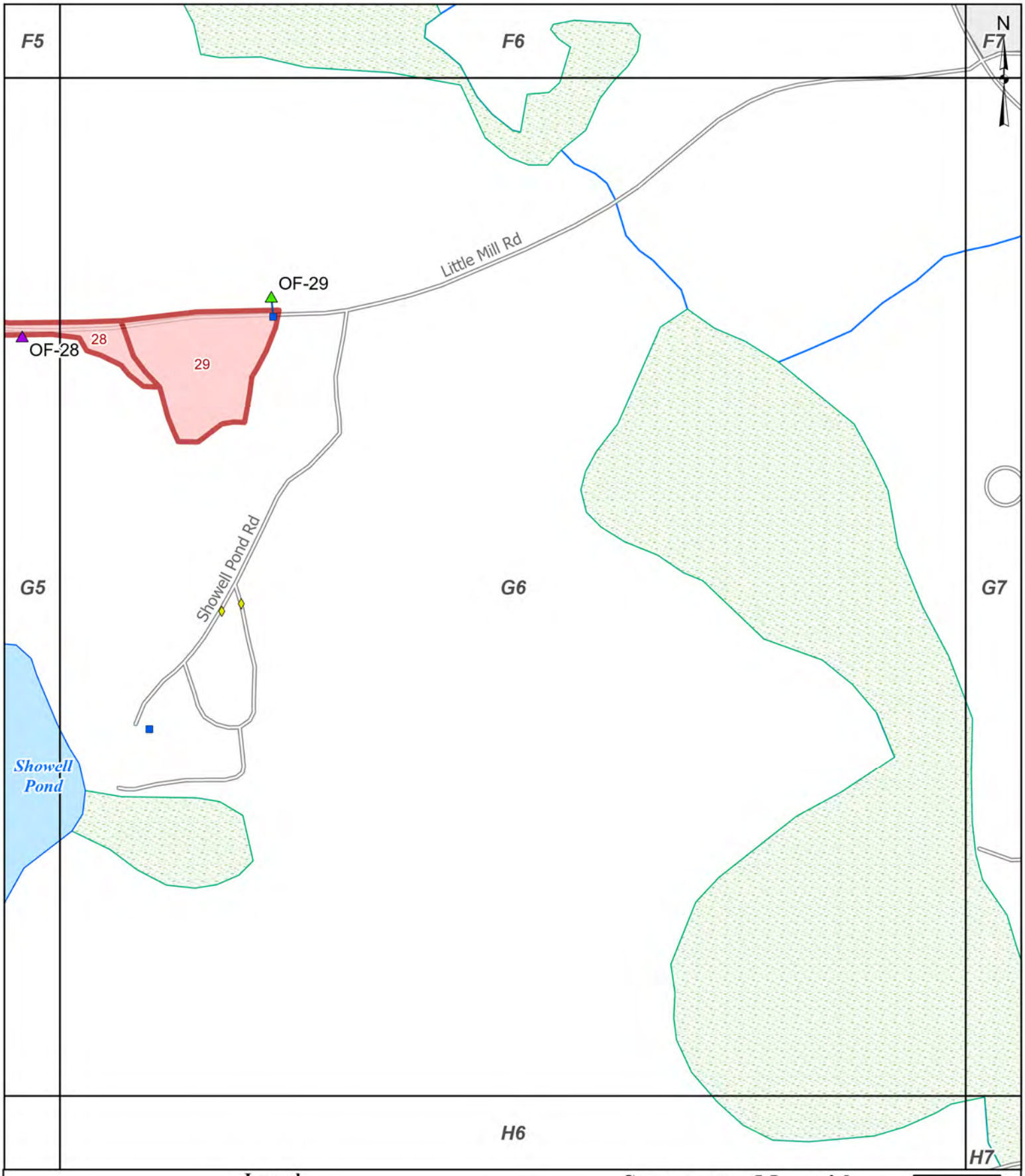
SHEET G5

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

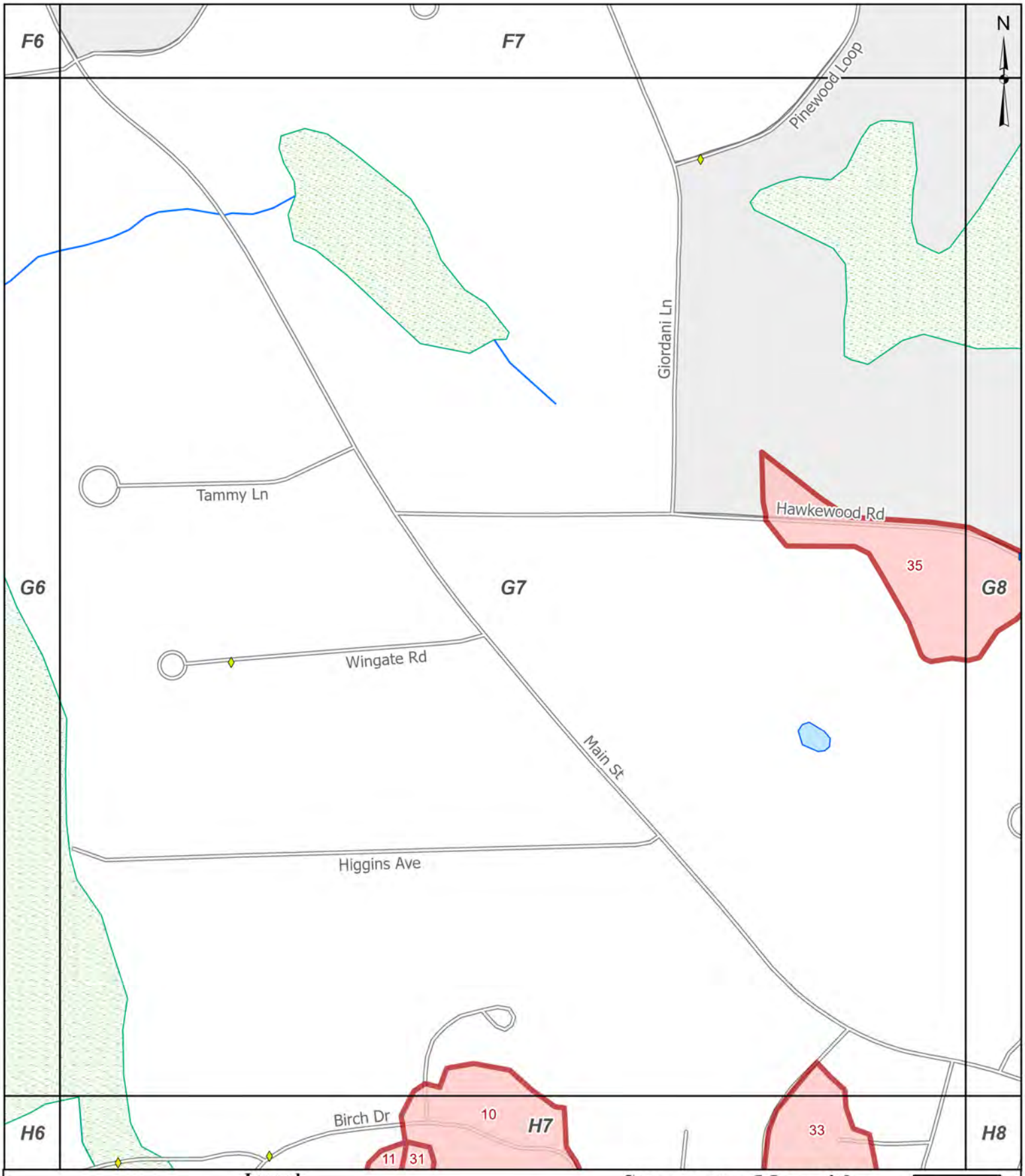
SHEET G6

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
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- Swamp, Marsh
- Stream, Brook
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Stormwater Map with Catchment Delineations Sandown, NH

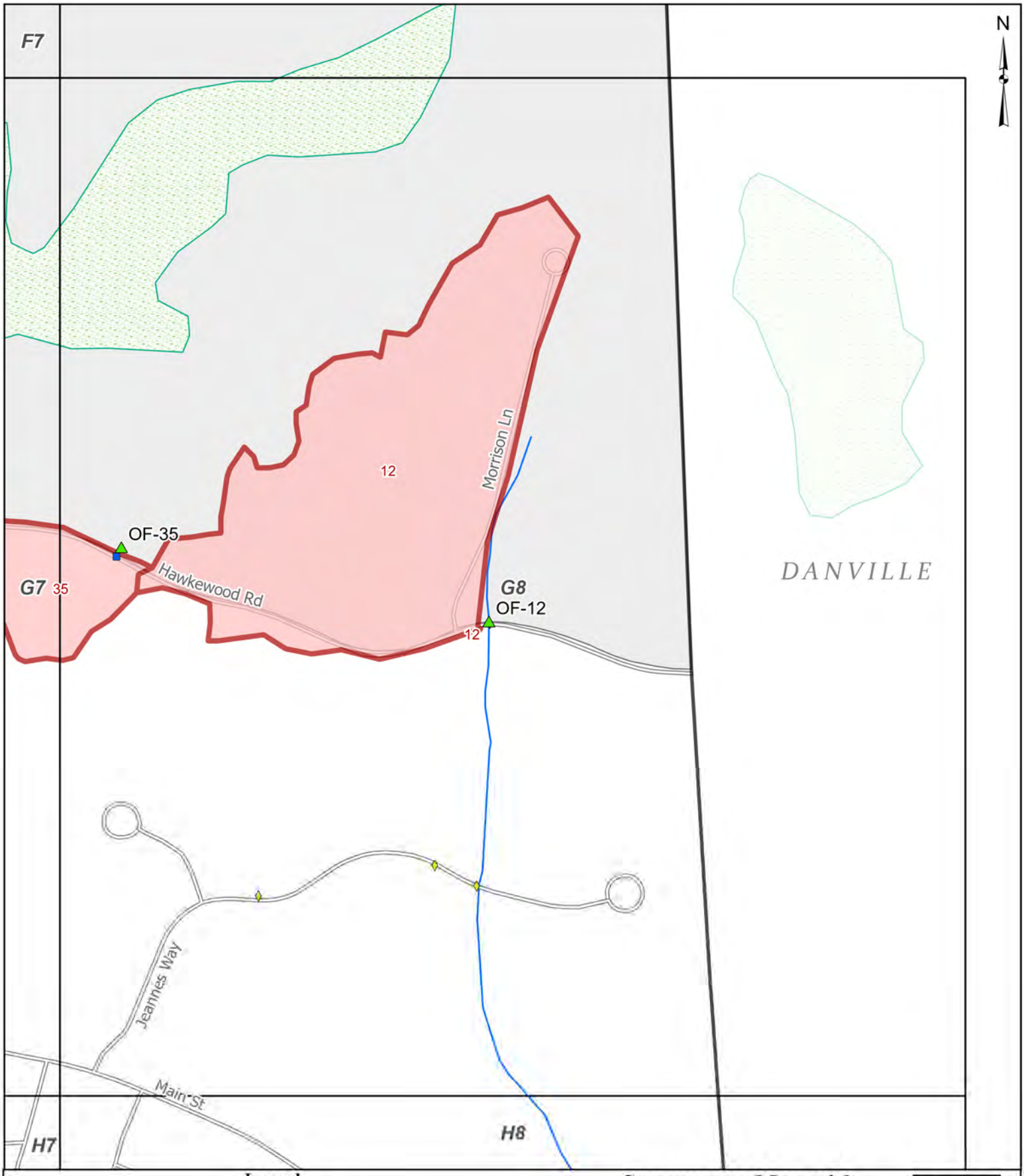
SHEET G7

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

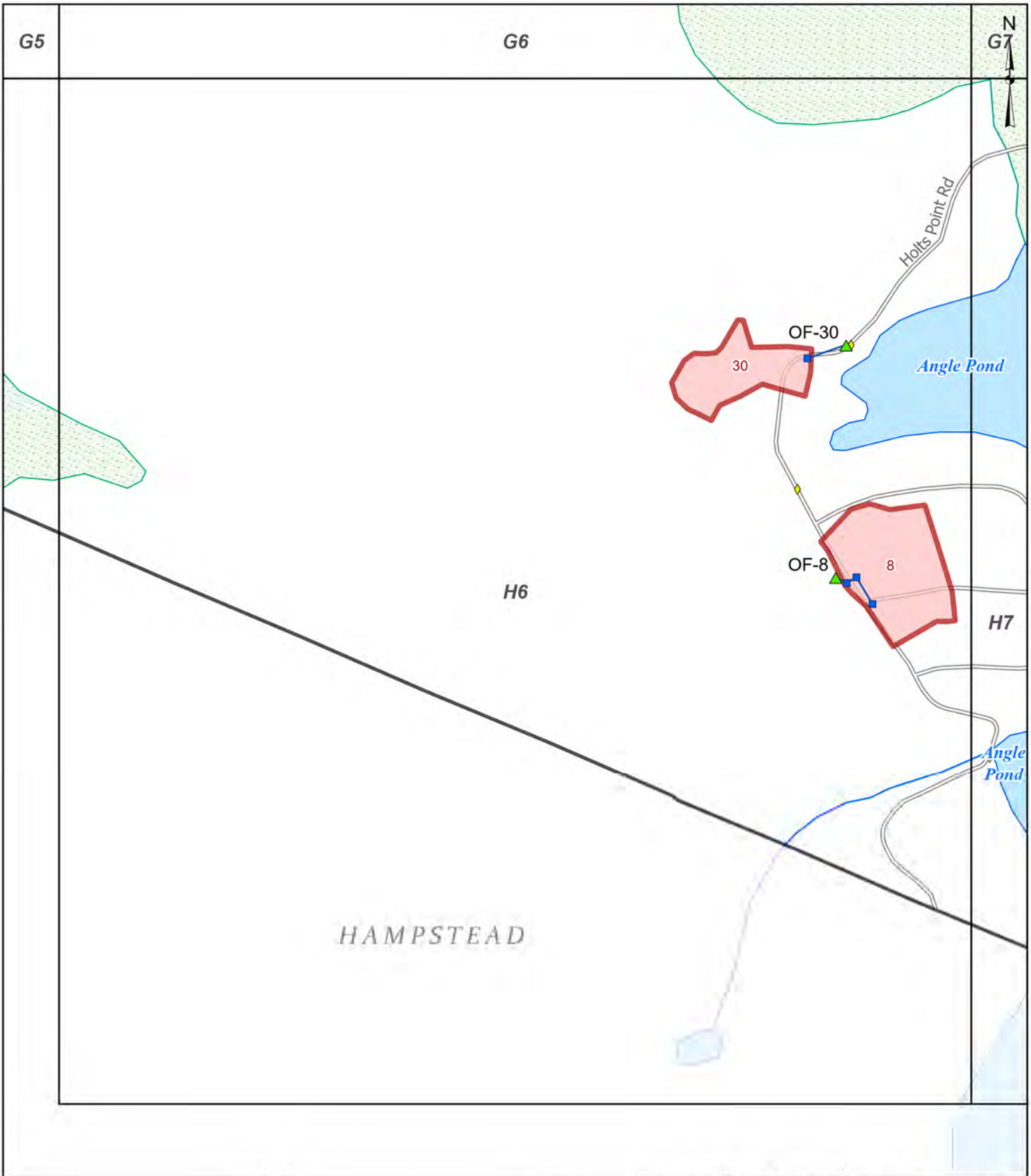
SHEET G8

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

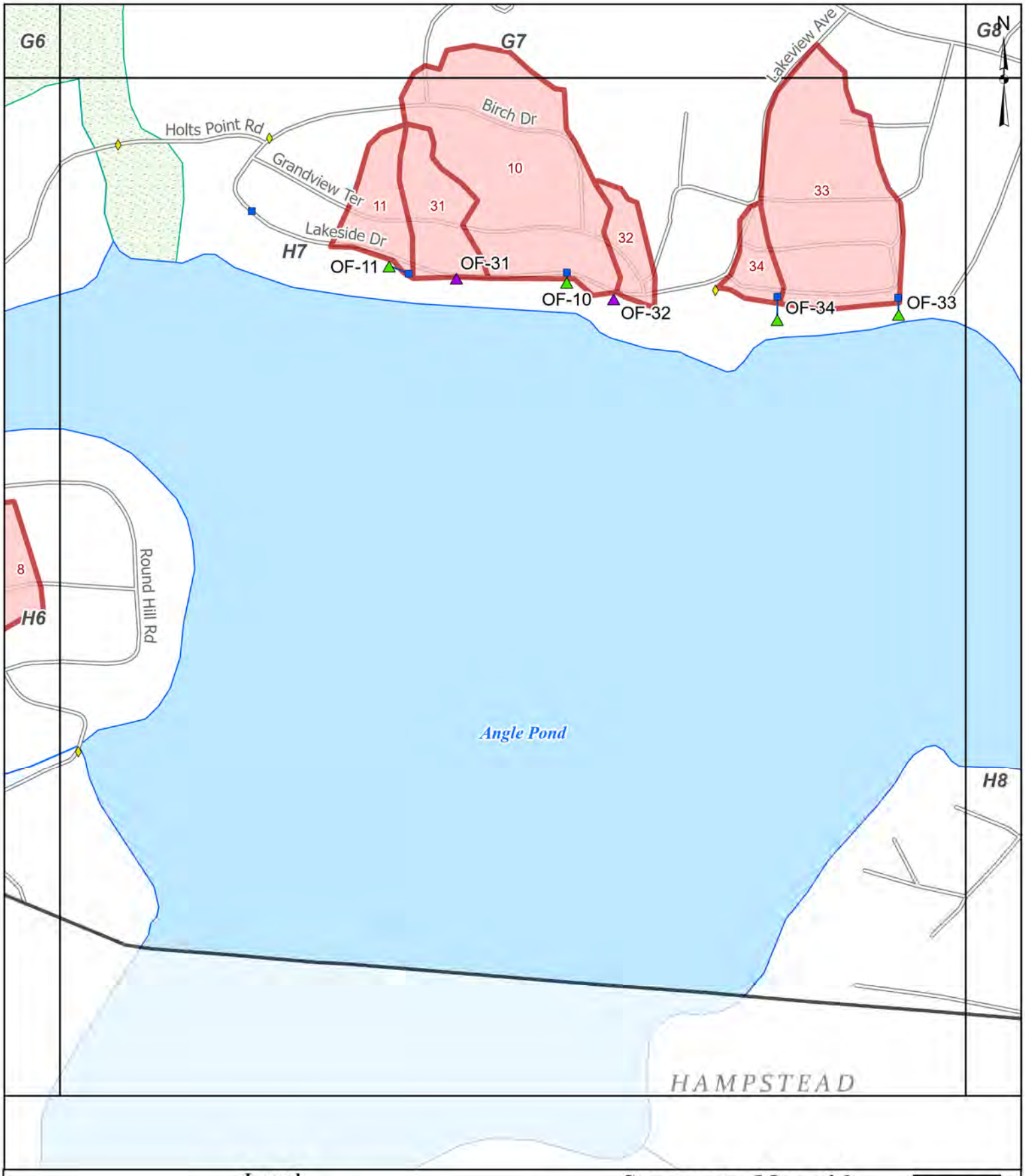
SHEET H6

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
- Culvert
- Catch Basin
- Drainage Manhole
- Drainage Pipes
- Catchments
- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

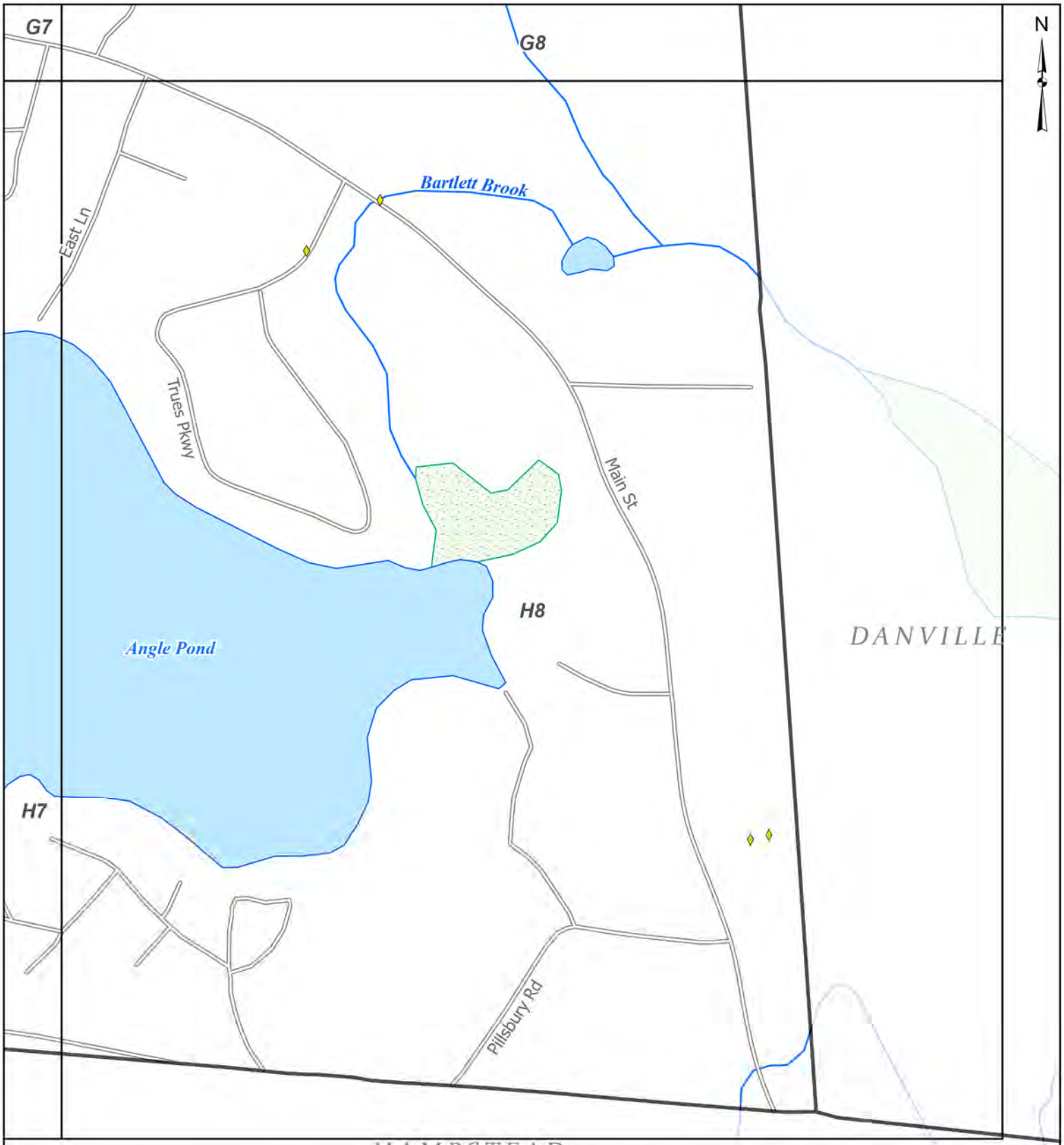
SHEET H7

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI



Legend

- Outfall
- Open Drainage
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- Catch Basin
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- Drainage Pipes
- Catchments
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- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

Stormwater Map with Catchment Delineations Sandown, NH

SHEET H8

0 100 Yards

Comprehensive Environmental Incorporated

10/24/2022

Data Sources: GRANIT, Town of Sandown, CEI

Appendix B

IDDE Outfall Classification/Ranking & Vulnerability Assessment

Sandown, NH IDDE Outfall Classification and Ranking, By Outfall ID

Outfall Data			Sampling Data							Problem Outfalls		High Priority Outfalls																			Excluded			Ranking		
																Density of Generating Sites[2]						Age of development																
Outfall ID	Receiving Water	Receiving Water Impairment[1]	Ammonia > 0.5 mg/L	Surfactants > 0.25 mg/L	Chlorine > 0 mg/L	Bacteria > WQ criteria	Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria > WQ criteria	Ammonia ≥ 0.5 mg/L, surfactants > 0.25 mg/L, and detectable levels of chlorine	Sewer odor detected during inspection	Known or suspected contributions of illicit discharges	Olfactory or visual evidence of sewage	Discharge to/near public beach	Discharge to/near recreational area	Discharge to/near drinking water supply	Discharge to/near shellfish beds	Past Discharge Complaints	Car dealers	Car washes	Gas stations	Garden centers	Industrial manufacturing	Other	Industrial areas >40 years old	Sewer areas >40 years old	Catchment areas serviced by septic systems converted to sewer	Historic combined sewer system that has been separated	Density of septic systems ≥30 years old in residential land use	Culverted stream lengths greater than a simple roadway crossing	Discharge to impaired water & potential to carry that pollutant	Presence of older industrial operations	Roadway drainage in undeveloped areas with no dwellings and no sanitary sewers	Outfall is drainage for athletic fields, parks or undeveloped green space & associated parking without services	Cross-country drainage alignments through undeveloped land	Overall Ranking (Problem, High, Low, Excluded)	Ranking Score (Number of Boxes Checked)	Notes
1														x																				High	1	WPA for Sandown North Elementary School
2														x																				High	1	WPA for Sandown Central School
3	Unnamed tributary to Exeter River																																	Low	0	
4	Unnamed tributary to Exeter River																																	Low	0	
5	Unnamed tributary to Exeter River																																	Low	0	
7	Unnamed brook - to southwest inlet of Phillips Pond	pH																												x				High	1	
8														x																				High	1	WPA for Hampstead Area Water
10	Angle Pond	Chlorophyll-a, P, pH, Cyanobacteria hepatotoxic microcystins												x																x				High	2	WPA for Hampstead Area Water
11	Angle Pond	Chlorophyll-a, P, pH, Cyanobacteria hepatotoxic microcystins																												x				High	1	
12	Bartlett Brook - Colby Brook - Unnamed Brook	DO, pH																												x				High	1	
13	Unnamed tributary to Exeter River																																	Low	0	
14	Unnamed tributary to Exeter River																																	Low	0	
15																																		Low	0	
16	Unnamed tributary to Exeter River																																	Low	0	
17	Unnamed tributary to Exeter River																																	Low	0	
18																																		Low	0	
19																																		Low	0	
20														x																				High	1	WPA for Townhouses at Wells Village
21														x																				High	1	WPA for Townhouses at Wells Village
22														x																				High	1	WPA for Little Mill Woods
23														x																				High	1	WPA for Little Mill Woods
24														x																				High	1	WPAs for Hampstead Area Water and Little Mill Woods
25														x																				High	1	WPAs for Hampstead Area Water and Little Mill Woods
26														x																				High	1	WPAs for Hampstead Area Water and Little Mill Woods
27														x																				High	1	WPA for Little Mill Woods
28														x																				High	1	WPA for Hampstead Area Water
29														x																				High	1	WPA for Hampstead Area Water
30	Angle Pond	Chlorophyll-a, P, pH, Cyanobacteria hepatotoxic microcystins												x																x				High	2	WPA for Hampstead Area Water
31	Angle Pond	Chlorophyll-a, P, pH, Cyanobacteria hepatotoxic microcystins																												x				High	1	
32	Angle Pond	Chlorophyll-a, P, pH, Cyanobacteria hepatotoxic microcystins												x																x				High	2	WPA for Hampstead Area Water
33	Angle Pond	Chlorophyll-a, P, pH, Cyanobacteria hepatotoxic microcystins												x																x				High	2	WPA for Hampstead Area Water
34	Angle Pond	Chlorophyll-a, P, pH, Cyanobacteria hepatotoxic microcystins												x																x				High	2	WPA for Hampstead Area Water
35																																		Low	0	
36																																		Low	0	
37																																		Low	0	
38																																		Low	0	
39														x																				High	1	WPA for PEU?Beaver Hollow
40														x																				High	1	WPA for PEU?Beaver Hollow
41																																		Low	0	
42	Unnamed wetland adjacent to Exeter River on Main St													x																				High	1	WPA for Stoneford
43														x																				High	1	WPA for Stoneford
44														x																				High	1	WPA for Stoneford
45																																		Low	0	
46														x																				High	1	WPAs for Cornerstone Estates and Waterford Village Estates
47																																		Low	0	

1. DO = Dissolved oxygen, P = Phosphorus (Total)

2. Locations of gas stations, car dealerships, car washes and garden centers obtained from Google in April 2019.

Sandown NH Vulnerability Assessment

	Required SVFs									Recommended SVFs			
Outfall ID	History of SSOs	Common or twin-invert manholes serving storm & sanitary sewer alignments	Common trench construction serving storm & sanitary sewer alignments	Crossings of storm & sanitary sewer alignments where the sanitary system is shallower than the storm drain system	Sanitary sewer alignments known or suspected to have been constructed with an underdrain system	Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints	Areas formerly served by combined sewers systems	Sanitary sewer infrastructure defects (e.g., leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through I/I, etc.)	Sewer pump/lift stations, siphons, sewer restrictions where power/equipment failures or blockages could result in SSOs	Sanitary sewer & storm drain infrastructure >40 years old	Widespread code-required septic system upgrades required at property transfers due to inadequate soils, water table separation or other physical constraints rather than poor owner maintenance	History of multiple BOH actions addressing widespread septic system failures due to inadequate soils, water table separation, or other physical constraints, rather than poor owner maintenance	Wet Weather Sampling Required? (Y or N)
1													No
2													No
3													No
4													No
5													No
7													No
8													No
10													No
11													No
12													No
13													No
14													No
15													No
16													No
17													No
18													No
19													No
20													No
21													No
22													No
23													No
24													No
25													No
26													No
27													No
28													No
29													No
30													No
31													No
32													No
33													No
34													No
35													No
36													No
37													No
38													No
39													No
40													No
41													No
42													No
43													No
44													No
45													No
46													No
47													No

Appendix C

SOP for Dry Weather Outfall Inspection/Sampling

Dry Weather Outfall Inspection/Sampling SOP

Purpose of SOP

1. The inspection of stormwater drainage outfalls and interconnections to assess the **condition of the structure;**
2. The inspection of stormwater drainage outfalls and interconnections to assess the **possibility of illicit discharges**; and
3. The **collection of samples** during dry weather conditions.

Prior to the Leaving the Facility

1. **Check the weather**: Dry weather screening and sampling shall proceed only when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period and no significant snow melt is occurring.
2. **Gather** all required equipment and materials:
    - Necessary Forms:
        - Form 1: Outfall Description and Condition Inventory and Inspection
        - Form 2: Illicit Discharge Detection Inspection
        - Form 3: Dry Weather Water Quality Sampling Form
    - Multi-meters for chlorine, conductivity, salinity, and temperature
    - Sample kits ammonia and surfactants
    - Sampling bottles for *E. coli* analysis
    - Multi meters for pH (*for discharges to impaired and TMDL waters only*)
    - Sampling bottles for total phosphorus analysis (*for discharges to impaired and TMDL waters only*)
    - Dipper with extension rod
    - Tape measure
    - Pen
    - Cooler with ice or ice packs to transport samples
3. **Calibrate** meters following methods in the instruction manuals.

In Field

1. **Observe** each outfall under dry weather conditions. If an outfall/interconnection is inaccessible or submerged, proceed to the first accessible upstream manhole or structure for the observation and sampling.
2. **Record observations** about the condition of the outfall and interconnection on **Form 1**: **Outfall Description and Condition Inventory and Inspection**. Take photos and document on form.
3. **Record observations** about the possibility of an illicit discharge on **Form 2**: **Illicit Discharge Detection Inspectio**n. Take photos and document on form.
4. If flow is present, **collect samples** for analysis following procedures in **Table 1**. Follow hold times and instructions in **Table 2.** Record information in **Form 3.**
5. **Report** any signs of illicit discharges to your supervisor.

Dry Weather Outfall Inspection/Sampling SOP

Form 1: Outfall Description and Condition Inventory and Inspection

Inspection Information					
Outfall ID					
Outfall Location					
Inspector's Name					
Date of Inspection					
Rainfall (in)	Last 24 hours:		Last 48 hours:		
Outfall Description					
Type of Outfall (circle)	**Material**	**Shape**	**Dimensions**	**Submerged**	
Closed Pipe	☐ RCP ☐ CMP ☐ HDPE ☐ Aluminum Other:_____	☐ Circular ☐ Elliptical ☐ Box Other:_____	Diameter/ Dimensions:	<u>In water</u>: ☐ No ☐ Partially ☐ Fully	<u>With sediment</u>: ☐ No ☐ Partially ☐ Fully
Open Drainage	☐ Paved ☐ Grass ☐ Rip-rap Other:_____	☐ Trapezoid ☐ Parabolic Other:_____	Depth:_____ Top Width: _____ Bottom Width:_____		

Condition Assessment	
Outfall Damage: No Yes	Damage Type: Spalling Cracking/Chipping Corrosion Other:
Deposits: No Yes	None Grease/Oil Trash Foam Sediment Other:
Sediment: No Yes, Depth:	None Minor Moderate High Other:
Vegetation Distress: No Yes	Little or No Moderate High N/A Other:
Erosion Damage: No Yes	Little or No Moderate High N/A Other:
Comments or any other non-illicit discharge concerns (e.g. trash or needed infrastructure repairs?):	

Dry Weather Outfall Inspection/Sampling SOP

Form 2: Illicit Discharge Detection Inspection

Outfall ID:	**Date:**
Outfall Location:	**Inspector's Name:**

Indicators (*all outfalls with indicators*)	
Indicator	**Description (circle all that apply)**
☐ Deposits and Stains	Oily Flow Line Paint Other:
☐ Poor Pool Quality (circle)	Odors Colors Oil Sheen Suds Algae Floatables Other:
☐ Pipe Benthic Growth (circle)	Brown Orange Green Other:

Flow Description	
Flow Present: Yes No	Notes:
Flow Description: Trickle Moderate Substantial	Flow Depth:

Physical Indicators (*flowing outfalls*)			
Indicator	**Description**	**Severity Indicators**	**Notes**
Odor	☐ Sewage ☐ Petroleum/Gas ☐ Sulfide ☐ Rancid/Sour ☐ Other:_____	☐ 1 – Faint (unclear source) ☐ 2 – Easily detected ☐ 3 – Noticeable from a distance	*Confirm the odor is coming from the discharge location and water and not the surrounding area. Avoid deeply inhaling odors as they may potentially be harmful vapors.*
Color	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other: _____	☐ 1 – Faint colors in sample bottle ☐ 2 – Clearly visible in sample bottle ☐ 3 – Clearly visible in the flow	*Color is defined by the tint or intensity of color observed.*
Turbidity/ Cloudiness		☐ 1 – Slight ☐ 2 – Cloudy ☐ 3 – Opaque	*Turbidity or cloudiness is a measure of how easily light can penetrate through the sample.*
Floatables *(other than trash)*	☐ Sewage (toilet paper, etc.) ☐ Suds ☐ Petroleum/oil sheen ☐ Other:_____	☐ 1 – Few/slight; origin not obvious ☐ 2 – Some; indications of origin ☐ 3 – Some; origin clear	*- In some cases, surface sheens may be created by in-stream processes. A thick or swirling sheen with a gas-like odor may indicate an oil discharge.* *- Suds that break up quickly may simply indicate water turbulence. Suds with a strong organic/sewage odor may indicate sewage. Suds with a fragrant odor may indicate laundry water.*

Possibility of Illicit Discharge			**Sum of Severity Indicators: _____**
☐ Unlikely	☐ Potential *(two or more indicators)*	☐ Suspect *(one or more indicators at severity 3)*	☐ Obvious
Comments/Possible Sources:			

Table 1: Sampling Protocol

General Sampling Protocols

1) Do not eat, drink or smoke during sample collection and processing.
2) Do not collect or process samples near a running vehicle.
3) Do not park vehicles in the immediate sample collection area, including both running and non-running vehicles.

Sample Collection Protocols

1) Bring all materials and equipment including all forms, the cooler containing the sample bottles, and multi-meters to the site where the sample is going to be taken.
2) For any sample to be collected with a **multi-meter**, follow this protocol:
    a. Turn on multi-meters and place the probe in the flow being careful not to let it rest on the bottom or become encased in sediment.
    b. Once the numbers on the probe have stopped changing, record data from the multi-meters onto **Form 3: Dry Weather Water Quality Sampling Form**.
3) For any sample that must be collected by **bottle**, follow this protocol:
    a. Put on clean, powder-free nitrile gloves and be careful not to touch anything other than the dippers or the sampling containers.
    b. The second sampler should be prepared to open bottles and hand them to the first sampler when needed. The bottle caps should be left in the bags and not placed on the ground or other surface.
    c. Keep hands away from the bottle opening to prevent contamination.
    d. Collect the sample by placing the bottle in the main stream of flow, being careful not to allow the water to flow over your hands or the outside of the bottle first.
    e. Do not overfill the bottle (only fill to about ½ inch from the top of the bottle) and do not dump any liquid from them as some of the bottles supplied by the lab have preservatives.
    f. Once the sample bottle is filled, immediately hand the bottle to the second sampler to place and tighten the cap on the bottle.
    g. Label sample bottle with location, date, and time.
    h. Place the bottle in the plastic bag and immediately store it in the cooler before taking the next sample.
    i. If the flow cannot be reached by the sampler, remove the dipper and extension rod from the sealed bag. Fill and rinse the dipper in the flow three times being careful not to disturb the sediment. Collect the sample in the dipper and carefully pour into the bottle following the protocol listed above.
4) Complete **Form 3: Dry Weather Water Quality Sampling Form** if analytical samples were collected, specify parameters, and note the sample time on the form. This creates a reference point for samples.
5) Complete the Chain of Custody for any samples delivered to a laboratory for analytical analysis.
6) Clean and maintain all equipment according to user manual.

Table 2: Analytical Methods, Detection Limits, Hold Times, and Preservatives

Analyte or Parameter	Analytical Method[1]	Detection Limit	Max. Hold Time	Preservative/Cooling
Ammonia	**EPA**: 350.2 **SM**: 4500-NH3C	0.05 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2, none if analyzed immediately
Chlorine	**SM**: 4500-Cl G	0.02 mg/L	15 minutes	None
Conductivity	**EPA**: 120.1 **SM**: 2510B	0.2 µs/cm	28 days	Cool ≤6°C
Indicator Bacteria: *E.coli*	**EPA**: 1603 **SM**: 9221B, 9221F, 9223 B **Other**: Colilert, Colilert-18	**EPA**: 1 cfu/100mL **SM**: 2 MPN/100mL **Other**: 1 MPN/100mL	6 hours	Cool ≤10°C, 0.0008% $Na_2S_2O_3$
Indicator Bacteria: Enterococcus	**EPA**: 1600 **SM**: 9230 C **Other**: Enterolert	**EPA**: 1 cfu/100mL **SM**: 1 MPN/100mL **Other**: 1 MPN/100mL	6 hours	Cool ≤10°C, 0.0008% $Na_2S_2O_3$
Indicator Bacteria: Fecal coliform	**SM:** 9221E, 9222D	**SM**: 1.8 org/100mL	6 hours	Cool 4°C, 0.0008% $Na_2S_2O_3$
Salinity	**SM**: 2520		28 days	Cool ≤6°C
Surfactants	**SM**: 5540-C	0.01 mg/L	48 hours	Cool ≤6°C
Temperature	**SM**: 2550B	Not applicable	Immediate	None
Total Phosphorus	**EPA**: Manual-365.3, Automated Ascorbic acid digestion-365.1 Rev. 2, ICP/AES4 200.7 Rev. 4.4 **SM**: 4500-P E-F	**EPA**: 0.01 mg/L **SM** : 0.01 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2

Notes:
Select meters/test kits that can read below the detection limit provided in the table.
Follow the instrumentation/test kit instructions for sampling.
[1]SM = Standard Methods

Form 3: Dry Weather Water Quality Sampling Form

Outfall ID:		**Date:**	
Outfall Location:		**Inspector's Name:**	
FOR ALL OUTFALLS			
Sample Parameter	**Field Meter/Test Kit Name**		**Field Screening Result**
Uses a Field Meter			
Temperature			
Salinity			
Specific Conductance			
Chlorine			
Uses a Test Kit			
Surfactant as MBAS			
Ammonia (NH_3)			
Uses bottles to be sent to lab (*see Table 2 for method, transport, and hold times)*			
Sample Parameter	**Time/Date**	**Laboratory**	**Result**
E.coli			
FOR DISCHARGES TO IMPAIRED WATERS ONLY			
Sample Parameter	**Field Meter/Test Kit Name**		**Field Screening Result**
Uses a Field Meter			
pH (*discharges to pH impaired waters)*			
Uses bottles to be sent to lab *(see Table 2 for method, transport, and hold times)*			
Sample Parameter	**Time/Date**	**Laboratory**	**Result**
Total Phosphorus (*discharges to phosphorus impaired waters)*			
Total Nitrogen (*discharges to nitrogen impaired waters)*			

Appendix D

SOP for Illicit Discharge Source Investigation

Illicit Discharge Source Investigation SOP

Purpose of SOP

1. Once a potential illicit discharge has been identified during routine dry weather sampling or inspection, an investigation to **identify the source** of the illicit discharge must be conducted.
2. **Observations of flow** during dry weather conditions will assist with identifying the source of an illicit discharge.

Prior to the Leaving the Facility

1. **Check the weather**: The illicit discharge source investigation shall proceed only when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period and no significant snow melt is occurring.
2. **Gather** all required equipment and materials:
   - Necessary Forms:
     - Form 1: Illicit Discharge Source Investigation (at outfall)
     - Form 2: Illicit Discharge Source Investigation (for each structure upstream from outfall)
   - Detailed map of stormwater drainage infrastructure
   - Pen

Illicit Discharge Source Investigation

1. Once a potential illicit discharge has been identified during routine dry weather sampling or inspection**, observe the outfall** under dry weather conditions.
2. **Record observations** about the possibility of an illicit discharge on **Form 1**: **Illicit Discharge Source Investigation (at outfall)**. Take photos and document on form.
3. If flow is present, **proceed to the first accessible upstream manhole or structure** to continue the investigation to the source of the flow.
4. At each structure, **record observations about all flow** from inlet pipes on **Form 2: Illicit Discharge Source Investigation** (for each structure upstream from outfall). Take photos and document on form. Note flow on stormwater map.
5. If an illicit discharge is identified and sampling and flow observations do not identify the source**, use alternative investigation techniques** (additional sampling, dye or smoke testing, television inspection, etc.) as needed to identify the source.
6. Once the source is identified, **notify the responsible entity** of the illicit discharge and encourage voluntary removal.
7. **Use existing regulations** to enforce the removal of the illicit discharge. Impose a compliance schedule and fees (if allowed).

Form 1: Illicit Discharge Source Investigation (at outfall)

Outfall ID:	**Date:**
Inspector's Name:	
Flow Present: Yes No	
Flow Description (circle): Trickle Moderate Substantial	
Notes (color, odor, trash, etc.):	
Possibility of Illicit Discharge? Yes No	Possible Sources:

Form 2: Illicit Discharge Source Investigation

(for each structure upstream from outfall or key junction structure)

Structure ID:		**Date:**	
Inspector's Name:			
Flow in Inlet Pipes? Yes No		Notes:	
List all inlet pipes with flow (if more space is required, use back of form)			
Pipe ID		Flow Description (circle): Trickle Moderate Substantial	
		Notes (color, odor, trash, etc.):	
		Possibility of Illicit Discharge? Yes No	Possible Sources:
Pipe ID		Flow Description (circle): Trickle Moderate Substantial	
		Notes (color, odor, trash, etc.):	
		Possibility of Illicit Discharge? Yes No	Possible Sources:
Pipe ID		Flow Description (circle): Trickle Moderate Substantial	
		Notes (color, odor, trash, etc.):	
		Possibility of Illicit Discharge? Yes No	Possible Sources:
Pipe ID		Flow Description (circle): Trickle Moderate Substantial	
		Notes (color, odor, trash, etc.):	
		Possibility of Illicit Discharge? Yes No	Possible Sources:

Appendix E

SOP for Dry Weather Key Junction Inspection/Sampling

Dry Weather Key Junction Screening SOP

Purpose of SOP

1. The inspection of key junction structures to assess the **condition of the structure;**
2. The inspection of key junction structures to assess the **possibility of illicit discharges**; and
3. The **collection of samples** during dry weather conditions.

Prior to the Leaving the Facility

1. **Check the weather**: Dry weather screening and sampling shall proceed only when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period and no significant snow melt is occurring.
2. **Gather** all required equipment and materials:
   - ☐ Necessary Forms:
     - Form 1: Key Junction Structure Description and Condition Inventory
     - Form 2: Illicit Discharge Detection Inspection
     - Form 3: Dry Weather Water Quality Sampling Form
   - ☐ Multi-meter for chlorine
   - ☐ Sample kits for ammonia and surfactants
   - ☐ Dipper with extension rod
   - ☐ Tape measure
   - ☐ Pen
   - ☐ Cooler with ice or ice packs to transport samples
3. **Calibrate** meters following methods in the instruction manuals.

In Field

1. **Observe** each key junction structure under dry weather conditions.
2. **Record observations** about the condition of the key junction structure on **Form 1**: **Key Junction Structure Description and Condition Inventory and Inspection**. Take photos and document on form.
3. **Record observations** about the possibility of an illicit discharge on **Form 2**: **Illicit Discharge Detection Inspectio**n. Take photos and document on form.
4. If flow is present, assign an ID to the flowing pipes on the site map. **collect samples** for analysis following procedures in **Table 1**. Follow hold times and instructions in **Table 2.** Record information in **Form 3.**
5. **Report** any signs of illicit discharges to your supervisor.

Table 2: Analytical Methods, Detection Limits, Hold Times, and Preservatives

Analyte or Parameter	Analytical Method[1]	Detection Limit	Max. Hold Time	Preservative/Cooling
Ammonia	**EPA**: 350.2 **SM**: 4500-NH3C	0.05 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2
Chlorine	**SM**: 4500-Cl G	0.02 mg/L	15 minutes	None
Surfactants	**SM**: 5540-C	0.01 mg/L	48 hours	Cool ≤6°C

Dry Weather Key Junction Screening SOP

Analyte or Parameter	Analytical Method[1]	Detection Limit	Max. Hold Time	Preservative/Cooling

Dry Weather Key Junction Screening SOP

Analyte or Parameter	Analytical Method[1]	Detection Limit	Max. Hold Time	Preservative/Cooling

Form 1: Key Junction Structure Description and Condition Inventory

Inspection Information					
Junction ID					
Associated Outfall ID					
Inspector's Name					
Date of Inspection					
Rainfall (in)	Last 24 hours:		Last 48 hours:		
Description of Key Junction Structure					
Type of Structure	Manhole	Catch Basin	Other: _____		
Condition of Structure	**Good**	**Fair**	**Poor**	**Comments**	**Construction Material**
Cover					
Frame					
Corbel					
Walls					
Floor					
Key Junction Damage	Spalling Cracking/Chipping Corrosion Other: _____				

(circle)	
Comments or any other non-illicit discharge concerns (e.g., trash or needed infrastructure repairs?):	

Dry Weather Key Junction Screening SOP

Form 2: Illicit Discharge Detection Inspection

Junction ID:			**Date:**	
Associated Outfall ID:			**Inspector's Name:**	
Flow Description				
Flow in Inlet Pipes? Yes No		Notes:		
List all inlet pipes with flow (if more space is required, use back of form)				
Pipe ID		Flow Description (circle): Trickle Moderate Substantial		
		Depth in Center of Flow (in.)	Width (in.)	
Pipe ID		Flow Description (circle): Trickle Moderate Substantial		
		Depth in Center of Flow (in.)	Width (in.)	

Physical Indicators (*all key structures*)				
Indicator	**Description**			
☐ Deposits and Stains (circle)	Oily	Flow Line	Paint	Other:
☐ Pipe Benthic Growth (circle)	Brown	Orange	Green	Other:

Physical Indicators (*flowing structures/pipes only*)			
Indicator	**Description**	**Severity**	**Notes**
Odor	☐ Sewage ☐ Petroleum/Gas ☐ Sulfide ☐ Rancid/Sour Other:_____	☐ 1 – Faint ☐ 2 – Easily detected ☐ 3 – Noticeable from a distance	*Confirm the odor is coming from the discharge location and water and not the surrounding area. Avoid deeply inhaling odors as they may potentially be harmful vapors.*
Color	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other: _____	☐ 1 – Faint colors in sample bottle ☐ 2 – Clearly visible in sample bottle ☐ 3 – Clearly visible in the flow	*Color is defined by the tint or intensity of color observed*
Turbidity/ Cloudiness		☐ 1 – Slight ☐ 2 – Cloudy ☐ 3 – Opaque	*Turbidity or cloudiness is a measure of how easily light can penetrate through the sample.*
Floatables (*other than trash)*	☐ Sewage (toilet paper, etc.) ☐ Suds ☐ Petroleum/oil sheen Other:_____	☐ 1 – Few/slight; origin not obvious ☐ 2 – Some; indications of origin ☐ 3 – Some; origin clear	*- In some cases, surface sheens may be created by in-stream processes. A thick or swirling sheen with a gas-like odor may indicate an oil discharge.* *- Suds that break up quickly may simply indicate water turbulence. Suds with a strong organic/sewage odor may indicate sewage. Suds with a fragrant odor may indicate laundry water.*

Possibility of Illicit Discharge		**Sum of Severity Indicators: _____**	
☐ Unlikely	☐ Potential *(two or more indicators)*	☐ Suspect *(one or more indicators with severity 3)*	☐ Obvious
Comments/Possible Sources:			

Table 1: Sampling Protocol

General Sampling Protocols

1) Do not eat, drink or smoke during sample collection and processing.
2) Do not collect or process samples near a running vehicle.
3) Do not park vehicles in the immediate sample collection area, including both running and non-running vehicles.

Sample Collection Protocols

1) Bring all materials and equipment including all forms, the cooler containing the sample bottles, and multi-meters to the site where the sample is going to be taken.
2) For any sample to be collected with a **multi-meter**, follow this protocol:
    a. Turn on multi-meters and place the probe in the flow being careful not to let it rest on the bottom or become encased in sediment.
    b. Once the numbers on the probe have stopped changing, record data from the multi-meters onto **Form 3: Dry Weather Water Quality Sampling Form**.
3) For any sample that must be collected by **bottle**, follow this protocol:
    a. Put on clean, powder-free nitrile gloves and be careful not to touch anything other than the dippers or the sampling containers.
    b. The second sampler should be prepared to open bottles and hand them to the first sampler when needed. The bottle caps should be left in the bags and not placed on the ground or other surface.
    c. Keep hands away from the bottle opening to prevent contamination.
    d. Collect the sample by placing the bottle in the main stream of flow, being careful not to allow the water to flow over your hands or the outside of the bottle first.
    e. Do not overfill the bottle (only fill to about ½ inch from the top of the bottle) and do not dump any liquid from them as some of the bottles supplied by the lab have preservatives.
    f. Once the sample bottle is filled, immediately hand the bottle to the second sampler to place and tighten the cap on the bottle.
    g. Label sample bottle with location, date, and time.
    h. Place the bottle in the plastic bag and immediately store it in the cooler before taking the next sample.
    i. If the flow cannot be reached by the sampler, remove the dipper and extension rod from the sealed bag. Fill and rinse the dipper in the flow three times being careful not to disturb the sediment. Collect the sample in the dipper and carefully pour into the bottle following the protocol listed above.
4) Complete **Form 3: Dry Weather Water Quality Sampling Form** if analytical samples were collected, specify parameters, and note the sample time on the form. This creates a reference point for samples.
5) Complete the Chain of Custody for any samples delivered to a laboratory for analytical analysis.
6) Clean and maintain all equipment according to the user manual.

Form 3: Dry Weather Water Quality Sampling Form

Junction ID:	**Date and Time:**			
Associated Outfall ID:		**Inspector's Name:**		
Sample Parameter	**Field Meter/Test Kit Name**	**Field Screening Result**		
		Pipe ID	**Pipe ID**	**Pipe**
	Units:			
Uses a Field Meter				
Chlorine				
Uses a Test Kit				
Surfactant as MBAS				
Ammonia (NH_3)				

Junction ID:	**Date and Time:**			
Associated Outfall ID:		**Inspector's Name:**		
Sample Parameter	**Field Meter/Test Kit Name**	**Field Screening Result**		
		Pipe ID	**Pipe ID**	**Pipe**
	Units:			
Uses a Field Meter				
Chlorine				
Uses a Test Kit				
Surfactant as MBAS				
Ammonia (NH_3)				

Appendix F

SOP for Wet Weather Outfall Sampling

Wet Weather Outfall Sampling SOP

Purpose of SOP

- A **wet weather investigation** will be conducted for outfalls that have been identified by the Town of Abington as having a higher potential for illicit connections; and
- The investigation will include an **inspection** of stormwater drainage outfalls and the **collection of samples** during wet-weather induced flows to determine the presence of illicit discharges to the MS4.

Prior to the Leaving the Facility

1. **Check the weather**:
    - The storm event should be large enough to produce stormwater discharge.
    - Wet weather screening and sampling shall proceed when more than 0.1 inches of rainfall has occurred in the previous 24-hour period.
    - Sampling is recommended in the spring when groundwater levels are high.
2. **Gather** all required equipment and materials:
    - Necessary Forms:
        - Form 1: Wet Weather Illicit Discharge Detection Inspection
        - Form 2: Wet Weather Water Quality Sampling Form
    - Multi-meters for chlorine, conductivity, salinity, and temperature
    - Sample kits for ammonia and surfactants
    - Sampling bottles for *E. coli* analysis
    - Multi meters for pH (*for discharges to impaired and TMDL waters only*)
    - Sampling bottles for total phosphorus analysis (*for discharges to impaired and TMDL waters only*)
    - Dipper with extension rod
    - Tape measure
    - Pen
    - Cooler with ice or ice packs to transport samples
3. **Calibrate** meters following methods in the instruction manuals.

In Field

1. **Observe** each outfall under wet weather conditions. If an outfall is inaccessible or submerged, proceed to the first accessible upstream manhole or structure.
2. **Record observations** about the general condition of the structure and the possibility of an illicit discharge on **Form 1**: **Wet Weather Illicit Discharge Detection Inspectio**n. Take photos and document on form.
3. **Collect samples** for analysis following procedures in **Table 1**. Follow hold times and instructions in **Table 2.** Record information in **Form 2: Wet Weather Water Quality Sampling Form.**
4. **Report** any signs of illicit discharges to your supervisor.

Form 1: Illicit Discharge Detection Inspection

Outfall ID:	**Date:**
Outfall Location:	**Inspector's Name:**

Indicators (*all outfalls with indicators*)	
Indicator	**Description (circle all that apply)**
☐ Deposits and Stains	Oily Flow Line Paint Other:
☐ Poor Pool Quality (circle)	Odors Colors Oil Sheen Suds Algae Floatables Other:
☐ Pipe Benthic Growth (circle)	Brown Orange Green Other:

Flow Description	
Flow Present: Yes No	Notes:
Flow Description: Trickle Moderate Substantial	Flow Depth:

Physical Indicators (*flowing outfalls*)			
Indicator	**Description**	**Severity Indicators**	**Notes**
Odor	☐ Sewage ☐ Petroleum/Gas ☐ Sulfide ☐ Rancid/Sour ☐ Other:_____	☐ 1 – Faint (unclear source) ☐ 2 – Easily detected ☐ 3 – Noticeable from a distance	*Confirm the odor is coming from the discharge location and water and not the surrounding area. Avoid deeply inhaling odors as they may potentially be harmful vapors.*
Color	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other: _____	☐ 1 – Faint colors in sample bottle ☐ 2 – Clearly visible in sample bottle ☐ 3 – Clearly visible in the flow	*Color is defined by the tint or intensity of color observed.*
Turbidity/ Cloudiness		☐ 1 – Slight ☐ 2 – Cloudy ☐ 3 – Opaque	*Turbidity or cloudiness is a measure of how easily light can penetrate through the sample.*
Floatables *(other than trash)*	☐ Sewage (toilet paper, etc.) ☐ Suds ☐ Petroleum/oil sheen ☐ Other:_____	☐ 1 – Few/slight; origin not obvious ☐ 2 – Some; indications of origin ☐ 3 – Some; origin clear	*- In some cases, surface sheens may be created by in-stream processes. A thick or swirling sheen with a gas-like odor may indicate an oil discharge.* *- Suds that break up quickly may simply indicate water turbulence. Suds with a strong organic/sewage odor may indicate sewage. Suds with a fragrant odor may indicate laundry water.*

Possibility of Illicit Discharge			**Sum of Severity Indicators: _____**
☐ Unlikely	☐ Potential *(two or more indicators)*	☐ Suspect *(one or more indicators at severity 3)*	☐ Obvious
Comments/Possible Sources:			

Table 1: Sampling Protocol

General Sampling Protocols

1) Do not eat, drink or smoke during sample collection and processing.
2) Do not collect or process samples near a running vehicle.
3) Do not park vehicles in the immediate sample collection area, including both running and non-running vehicles.

Sample Collection Protocols

1) Bring all materials and equipment including all forms, the cooler containing the sample bottles, and multi-meters to the site where the sample is going to be taken.
2) For any sample to be collected with a **multi-meter**, follow this protocol:
    a. Turn on multi-meters and place the probe in the flow being careful not to let it rest on the bottom or become encased in sediment.
    b. Once the numbers on the probe have stopped changing, record data from the multi-meters onto **Form 2: Wet Weather Water Quality Sampling Form**.
3) For any sample that must be collected by **bottle**, follow this protocol:
    a. Put on clean, powder-free nitrile gloves and be careful not to touch anything other than the dippers or the sampling containers.
    b. The second sampler should be prepared to open bottles and hand them to the first sampler when needed. The bottle caps should be left in the bags and not placed on the ground or other surface.
    c. Keep hands away from the bottle opening to prevent contamination.
    d. Collect the sample by placing the bottle in the main stream of flow, being careful not to allow the water to flow over your hands or the outside of the bottle first.
    e. Do not overfill the bottle (only fill to about ½ inch from the top of the bottle) and do not dump any liquid from them as some of the bottles supplied by the lab have preservatives.
    f. Once the sample bottle is filled, immediately hand the bottle to the second sampler to place and tighten the cap on the bottle.
    g. Label sample bottle with location, date, and time.
    h. Place the bottle in the plastic bag and immediately store it in the cooler before taking the next sample.
    i. If the flow cannot be reached by the sampler, remove the dipper and extension rod from the sealed bag. Fill and rinse the dipper in the flow three times being careful not to disturb the sediment. Collect the sample in the dipper and carefully pour into the bottle following the protocol listed above.
4) Complete **Form 2: Wet Weather Water Quality Sampling Form** if analytical samples were collected, specify parameters, and note the sample time on the form. This creates a reference point for samples.
5) Complete the Chain of Custody for any samples delivered to a laboratory for analytical analysis.
6) Clean and maintain all equipment according to user manual.

Table 2: Analytical Methods, Detection Limits, Hold Times, and Preservatives

Analyte or Parameter	Analytical Method[1]	Detection Limit	Max. Hold Time	Preservative/Cooling
Ammonia	**EPA**: 350.2 **SM**: 4500-NH3C	0.05 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2, none if analyzed immediately
Chlorine	**SM**: 4500-Cl G	0.02 mg/L	15 minutes	None
Conductivity	**EPA**: 120.1 **SM**: 2510B	0.2 µs/cm	28 days	Cool ≤6°C
Indicator Bacteria: *E.coli*	**EPA**: 1603 **SM**: 9221B, 9221F, 9223 B **Other**: Colilert, Colilert-18	**EPA**: 1 cfu/100mL **SM**: 2 MPN/100mL **Other**: 1 MPN/100mL	6 hours	Cool ≤10°C, 0.0008% $Na_2S_2O_3$
Indicator Bacteria: Enterococcus	**EPA**: 1600 **SM**: 9230 C **Other**: Enterolert	**EPA**: 1 cfu/100mL **SM**: 1 MPN/100mL **Other**: 1 MPN/100mL	6 hours	Cool ≤10°C, 0.0008% $Na_2S_2O_3$
Indicator Bacteria: Fecal coliform	**SM:** 9221E, 9222D	**SM**: 1.8 org/100mL	6 hours	Cool 4°C, 0.0008% $Na_2S_2O_3$
Salinity	**SM**: 2520		28 days	Cool ≤6°C
Surfactants	**SM**: 5540-C	0.01 mg/L	48 hours	Cool ≤6°C
Temperature	**SM**: 2550B	Not applicable	Immediate	None
Total Phosphorus	**EPA**: Manual-365.3, Automated Ascorbic acid digestion-365.1 Rev. 2, ICP/AES4 200.7 Rev. 4.4 **SM**: 4500-P E-F	**EPA**: 0.01 mg/L **SM** : 0.01 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2

Notes:
Select meters/test kits that can read below the detection limit provided in the table.
Follow the instrumentation/test kit instructions for sampling.
[1]SM = Standard Methods

Form 2: Wet Weather Water Quality Sampling Form

Outfall ID:		**Date:**	
Outfall Location:		**Inspector's Name:**	
FOR ALL OUTFALLS			
Sample Parameter	**Field Meter/Test Kit Name**		**Field Screening Result**
Uses a Field Meter			
Temperature			
Salinity			
Specific Conductance			
Chlorine			
Uses a Test Kit			
Surfactant as MBAS			
Ammonia (NH_3)			
Uses bottles to be sent to lab (*see Table 2 for method, transport, and hold times)*			
Sample Parameter	**Time/Date**	**Laboratory**	**Result**
E.coli			
FOR DISCHARGES TO IMPAIRED WATERS ONLY			
Sample Parameter	**Field Meter/Test Kit Name**		**Field Screening Result**
Uses a Field Meter			
pH (*discharges to pH impaired waters)*			
Uses bottles to be sent to lab *(see Table 2 for method, transport, and hold times)*			
Sample Parameter	**Time/Date**	**Laboratory**	**Result**
Total Phosphorus (*discharges to phosphorus impaired waters)*			
Total Nitrogen (*discharges to nitrogen impaired waters)*			

Appendix G

Field Evaluation Records

DRY WEATHER OUTFALL INSPECTION REPORT

To:	Ms. Lynne Blaisdell, Town Administrator
From:	Nick Cristofori, P.E., Comprehensive Environmental Inc.
Date:	June 15, 2021
Town:	Sandown, NH
Subject:	Dry Weather Outfall Inspection and Screening

Under the Environmental Protection Agency's (EPA's) 2017 National Pollutant Discharge and Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit, regulated communities such as Sandown are required to inspect all known outfalls and interconnections for the presence of dry weather flow (no more than 0.1-inches of rainfall has occurred during the previous 24-hour period and no significant snow melt is occurring) within three years of the permit effective date, or by June 30, 2021. CEI performed initial field work on twelve previously known outfalls to screen for dry weather flows on November 3, 2020. CEI then completed additional stormwater system mapping in November and December 2020 during which an additional 34 outfalls and open drainage points were mapped. These additional 34 structures were revisited on June 11, 2021 to screen for dry weather flows. The following conditions represent the results of all dry weather screening completed as of June 11, 2021:

Table 1 – Dry Weather Flow Screening Results

Parameter	Number
Known Outfalls within the Urbanized Area	46
Outfalls that were Attempted to Visit	46
Outfalls that Could Not be Located	6
Outfalls that Could Not be Accessed	1
Structures Identified as an Outfall that Likely Do Not Exist	1
Structures Identified as an Outfall Found that were a Culvert	2
Actual Outfalls Found	36
Outfalls Found	36
Outfalls Found Not Flowing	36
Outfalls Found with Evidence of Flow	0
Found with Illicit Discharge Potential	0
Total Not Yet Attempted to Visit	0

No outfalls were flowing or observed to have evidence of flow, or to have indicators of an illicit discharge.

Recommendations and Next Steps

The following items are recommended as follow-up actions:

- As noted above, there was no evidence of flows or illicit discharges noted at any of the inspected outfalls and no further action is needed at those outfalls.
- Outfalls OF-5, OF-19, OF-20, OF-37, OF-40, OF-41, and OF-42 are showing some evidence of deterioration and should be monitored during future years and/or repaired as soon as practical.
- Outfalls OF-36, OF-38, and OF-41 were observed to be at least half buried in sediment and should be cleaned out to preserve flow capacity.
- Outfalls OF-21, OF-29, and OF-44 exhibited evidence of downstream erosion which should be monitored during future years and/or repaired as soon as practical.
- Outfalls OF-20 and OF-41 exhibited headwall deterioration which should be monitored during future years and/or repaired as soon as practical.
- One outfall could not be accessed due to fencing around the property, however, the immediate upgradient catch basin did not exhibit evidence of flow. Thus, dry weather illicit discharges are unlikely at this location. If a structural inspection is desired, access to this location should be obtained so that an inspection can occur.
- Six outfalls could not be found and should be field-located so that dry weather inspections and screening can occur or determined not to exist and removed from mapping. Outfalls that have not yet been visited or located should be inspected for dry weather flows by the end of Year 3 (June 30, 2021).
- Outfall condition should be monitored during future years for sediment accumulation, structural deterioration, evidence of erosion, and other adverse impacts and maintained as needed.

If you have any further questions or would like additional information, please feel free to contact me at 800.725.2550 x303 or ncristofori@ceiengineers.com. Thank you.

Nick Cristofori, P.E.
Principal, Project Manager

Attachments:
- Dry Weather Outfall Sampling Results map
- Table of Results

CHESTER

FREMONT

DANVILLE

DERRY

HAMPSTEAD

North Rd

Royal Range Rd

Sargent Rd

Fremont Rd

Wells Village Rd

Exeter River

Main St

Odell Rd

Cranberry Meadow Rd

Hampstead Rd

Chase Rd

Phillips Pond Dr

Little Mill Rd

Burdett Brook

Colby Brook

OF-1
OF-2
OF-3
OF-4
OF-5
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OF-43
OF-44
OF-45
OF-46

Hunt Pond
Lily Pond
Phillips Pond
Showell Pond
Punch Pond
Angle Pond

Legend

Outfall Inspection Result:

- Not Flowing
- Not Found
- Could Not Access
- May Not Exist
- Culvert

- Roads
- Lake, Pond, Reservoir
- Swamp, Marsh
- Stream, Brook
- Non-Urban Area

N W E S

0 1

Miles

Dry Weather Outfall Screening Results Map

Sandown, NH

Comprehensive Environmental Incorporated

Data Sources: MassGIS, Town of Sandown, CEI

2.3.2021

Sandown New Hampshire Dry Weather Outfall Screening

Outfall Characteristics												Pipe Ends and Headwall Conditions				
Outfall ID	Lat.	Lon.	Date of Inspection	Outfall Located?	Receiving Waterbody (if any)	Outfall Type	Pipe Material	Outfall Shape	Outfall Diameter (inches)	Outfall Damage	Outfall Condition Comment	Pipe End Treatment	Pipe End Treatment Condition	Headwall Material	Headwall Condition	Headwall Condition Comment
1	42.95315	-71.2101	11/3/2020 13:50	Found		Outfall	CMP	Round	12	Dented	Slightly dented on right side	Projecting	Good	N/A	N/A	
2	42.92547	-71.1889	11/3/2020 14:43	Not Found												
3	42.92182	-71.2159	11/3/2020 14:09	Found		Outfall	CMP	Round	12	None		Flush with Headwall	Good	Stone	Good	
4	42.92121	-71.2099	11/3/2020 14:18	Found	Unnamed Stream	Outfall	CMP	Round	18	None		Flush with Headwall	Good	Stone	Good	
5	42.91869	-71.2085	11/3/2020 14:23	Found	Unnamed Stream	Outfall	CMP	Round	36	Corrosion	Invert corrosion	Flush with Headwall	Good	Stone	Good	
6	42.91817	-71.1817	11/3/2020 14:50	Found, not an Outfall			RCP	Round	36	None		Flush with Headwall	Good	Reinforced Concrete	Good	
7	42.91069	-71.1956	11/3/2020 14:32	Found	Unnamed Stream	Outfall	HDPE	Round	12	None		Flush with Headwall	Good	Stone	Good	
8	42.90145	-71.1655	11/3/2020 15:32	Found		Outfall	RCP	Round	12	None		Flush with Headwall	Good	Precast Concrete	Good	
9	42.904	-71.1573	11/3/2020 15:13	Found, not an Outfall												
10	42.90416	-71.1585	11/3/2020 15:17	Could not Access												
11	42.90403	-71.1599	11/3/2020 15:24	Found	Angle Pond	Open Drainage	Rip rap		24	None	Gravel open drainage outfall in good condition	N/A	N/A	N/A	N/A	
12	42.90937	-71.1499	11/3/2020 15:05	Found		Outfall	RCP	Round	12	None		Flush with Headwall	Good	Precast Concrete	Good	
OF-13	42.92926	-71.2046	6/11/2021 13:07	Found		Outfall	HDPE	Round	15	None		Flush with Headwall	Good	Stone	Good	Stone headwall and HDPE flared end section
OF-14	42.92841	-71.204	6/11/2021 13:00	Found		Outfall	HDPE	Round	15	None	Riprap swale is in good condition. Catch basin is covered in leaves. Some leaf buildup in pipe but in overall good condition	Projecting	Good	N/A	N/A	
OF-15	42.91871	-71.1991	6/11/2021 14:11	Found		Outfall	RCP	Round	12	None	Pipe is in good condition	Flared End	Good	N/A	N/A	
OF-16	42.92173	-71.2096	6/11/2021 14:03	Not Found												
OF-17	42.92174	-71.2096	6/11/2021 14:05	May Not Exist												
OF-18	42.9217	-71.2126	6/11/2021 13:53	Not Found												
OF-19	42.92282	-71.2125	6/11/2021 13:45	Found		Outfall	RCP	Round	12	Spalling	Generalized spalling	Flush with Headwall	Fair	Reinforced Concrete	Good	
OF-20	42.92459	-71.214	6/11/2021 13:36	Found		Outfall	RCP	Round	15	Cracking, spalling	Pipe end cracked, rebar exposed and rusting	Flush with Headwall	Poor	Stone	Good	
OF-21	42.92706	-71.2191	6/11/2021 13:28	Found		Open Drainage	Rip rap			None	Vegetation growing in portions of riprap swale	N/A	N/A	N/A	N/A	
OF-22	42.90879	-71.1906	6/11/2021 14:22	Not Found												
OF-23	42.90882	-71.191	6/11/2021 14:18	Found		Outfall	HDPE	Round	15	None		Flush with Headwall	Good	Reinforced Concrete	Good	
OF-24	42.90892	-71.1866	6/11/2021 14:27	Found		Open Drainage	Rip rap			None		N/A	N/A	N/A	N/A	
OF-25	42.90828	-71.1859	6/11/2021 14:32	Found		Outfall	HDPE	Round	15	None		Flared End	Good	N/A	N/A	
OF-26	42.90813	-71.1862	6/11/2021 14:35	Found		Open Drainage	Rip rap			None		N/A	N/A	N/A	N/A	
OF-27	42.91239	-71.1849	6/11/2021 14:43	Found		Open Drainage	paved			None		N/A	N/A	N/A	N/A	
OF-28	42.91192	-71.1746	6/11/2021 14:49	Found		Outfall	HDPE	Round	12	None		Flared End	Good	N/A	N/A	
OF-29	42.91225	-71.1718	6/11/2021 14:55	Found		Outfall	RCP	Round	12	None		Flared End	Good	N/A	N/A	
OF-30	42.90349	-71.1655	6/11/2021 16:53	Found		Outfall	HDPE	Round	12	None		Flared End	Good	N/A	N/A	
OF-31	42.90415	-71.16	6/11/2021 16:48	Found		Open Drainage	Rip rap			None		N/A	N/A	N/A	N/A	
OF-32	42.90394	-71.1581	6/11/2021 16:44	Found	Angle Pond	Open Drainage	paved			None		N/A	N/A	N/A	N/A	
OF-33	42.90376	-71.155	6/11/2021 16:32	Not Found												
OF-34	42.90399	-71.1562	6/11/2021 16:39	Not Found												
OF-35	42.91011	-71.1535	6/11/2021 16:18	Found		Outfall	RCP	Round	12	None		Flared End	Good	N/A	N/A	
OF-36	42.91572	-71.1607	6/11/2021 15:42	Found		Outfall	RCP	Round	12	None	Mostly buried	Projecting	Fair	N/A	N/A	
OF-37	42.91602	-71.1675	6/11/2021 15:02	Found		Outfall	RCP	Round	15	Cracking, spalling	Flared end section has some chipping around edges and a piece has cracked off	Flared End	Fair	N/A	N/A	
OF-38	42.91564	-71.1702	6/11/2021 15:08	Found		Outfall	RCP	Round	12	None	Partially buried	Projecting	Fair	N/A	N/A	
OF-39	42.92047	-71.1779	6/11/2021 15:16	Found		Outfall	HDPE	Round	12	None	In almost new condition	Flared End	Good	N/A	N/A	
OF-40	42.91709	-71.1814	6/11/2021 15:23	Found		Outfall	RCP	Round	12	Spalling	Spalling along end section of pipe	Flush with Headwall	Fair	Reinforced Concrete	Good	Shares headwall with culvert
OF-41	42.92971	-71.1878	6/11/2021 12:51	Found		Outfall	CMP	Round	10	Cracking, corrosion	Pipe is severely corroded and deteriorating	Projecting	Poor	N/A	N/A	
OF-42	42.93552	-71.1911	6/11/2021 12:45	Found		Outfall	RCP	Round	12	Cracking	Top piece of pipe outlet has cracked off	Projecting	Fair	N/A	N/A	
OF-43	42.94467	-71.1972	6/11/2021 12:29	Found		Outfall	HDPE	Round	12	None	Pipe is in good condition	Flared End	Good	N/A	N/A	
OF-44	42.93771	-71.1926	6/11/2021 12:39	Found		Outfall	RCP	Round	15	None	Some sediment buildup	Projecting	Good	N/A	N/A	
OF-45	42.95643	-71.1533	6/11/2021 12:16	Found		Outfall	HDPE	Round	15	None		Flared End	Good	N/A	N/A	
OF-46	42.95748	-71.1819	6/11/2021 12:07	Found		Outfall	HDPE	Round	15	None		Flared End	Good	N/A	N/A	

Notes

1. Outfall Material: RCP = Reinforced Concrete Pipe; CMP = Corrugated Metal Pipe; HDPE = High Density Polyethylene; CI = Cast Iron; PVC = Polyvinyl Chloride

	Erosion and Sedimentation				Illicit Discharge Potential & Flow Characteristics				Overall Comments
Outfall ID	Downstream Erosion	Downstream Erosion Comment	Vegetation Distress	Sedimentation Level	Any Illicit Discharge Indicators?	Is Dry Weather Flow Present?	Flow Description	Is a Sample Required?	Overall Comments
1	Moderate	Some channelization	None	<25%	None	No		No	
2									Outfall not found, mapped location is halfway up a hill and on a street with no visible drainage infrastructure
3	None		None	None	None	No		No	
4	None		None	None	None	No		No	
5	None		None	None	None	No		No	Culvert with drainage connection
6	None		None	<25%	None	No		No	Culvert with no apparent drainage connection
7	None		None	<25%	None	No		No	
8	None		None	<25%	None	No		No	
9									Stone drainage culvert in good condition
10									Could not access due to fencing around property. Upstream catch basin did not have any flow
11	None		None	None	None	No		No	Gravel open drainage outfall. No pipe could be found along shoreline
12	None		None	<25%	None	No		No	
OF-13	None		None	<25%	No	No		No	Riprap open drainage directs flow to pipe that carries flow across the road. Leaf litter buildup in swale. Water appears to sit in swale not reaching pipe due to improper grading.
OF-14	None		None	<25%	No	No		No	Riprap swale directs flow into a catch basin that outlet to a 15" HDPE pipe across the road. Pipe conveyance is also riprap
OF-15	None		None	None	No	No		No	Outfall located on side of road and is connected to a single catch basin. Some leaf litter buildup in pipe and flared end section.
OF-16									Signs of a flow channel but pipe end appears to be covered by rocks and sediment. No flow in upgradient catch basin
OF-17									Outfall most likely doesn't not exist. Upgradient catch basins flow into the outfall OF-16 drainage network
OF-18									Standing water and sediment buildup in upgradient catch basin. Could not find outfall in overgrown vegetation so upgradient catch basin inspected as proxy. There is a 15" RCP outlet in direction of outfall. No dry weather flow present
OF-19	None		None	<25%	No	No		No	Some spalling on pipe end. Leaves and some displaced riprap at pipe opening. Discharges to grass channel with berm.
OF-20	None		None	25%-50%	No	No		No	Limited access due to overgrown vegetation. Pipe end is chipped with exposed rebar and partially submerged in standing water. No flow in upgradient catch basins
OF-21	Moderate	Some bank erosion observed along road shoulder	None	<25%	No	No		No	Roadside riprap swale on both sides of Candlestick Lane. Riprap runs the length of the road before diverting into wooded areas.
OF-22									Could not located outfall due to overgrown vegetation. Upgradient catch basin contained stagnant water.
OF-23	None		None	None	No	No		No	Some leaf litter buildup in pipe
OF-24	None		None	<25%	No	No		No	Sediment buildup in riprap swale. Generally in good condition.
OF-25	Moderate	Appears to be a designed channel	None	None	No	No		No	Some minor riprap displacement from slope above outfall. Eroded channel appears to be by design.
OF-26				None	No	No		No	Overgrown vegetation in riprap.
OF-27	None		None	None	No	No		No	Paved open drainage on edge of road to wooded area.
OF-28	None		None	<25%	No	No		No	Open drainage rip rap on edge of road flows into 12" HDPE pipe, is piped across the street and discharges through flared end section into wooded area. Some leaf buildup in rip rap channel.
OF-29	Moderate	Channelization	None	None	No	No		No	Concrete flared end is in good condition but outfall has an erosion channel
OF-30	None		None	<25%	No	No		No	Outfall found next to culvert. Some debris buildup in flared end.
OF-31	Moderate		None	<25%	No	No		No	Open drainage rip rap off the edge of the road. Minor displacement of riprap in channel where water flows.
OF-32	None		None	<25%	No	No		No	Some sediment and organic debris present in paved roadside swale
OF-33									Standing water in upgradient catch basin. Outfall not located. May be buried or submerged in lake.
OF-34									Outfall not located. May be buried or submerged in lake. Stagnant water in upgradient catch basin. Could not see outlet to confirm pipe direction
OF-35	None		None	None	No	No		No	Some leaf buildup in flared end section. Stagnant water in upgradient catch basin
OF-36	None		None	>75%	No	No		No	Pipe mostly buried and full of leaves and sediment. Standing water in upstream manhole.
OF-37	None		None	<25%	No	No		No	Standing water present in upgradient catch basin
OF-38	None		None	>75%	No	No		No	Pipe is full of sediment and covered in debris. Not flow present and standing water in upstream catch basin.
OF-39	None		None	None	No	No		No	Outfall is in good condition and no flow observed.
OF-40	None		None	25%-50%	No	No		No	No flow from outfall, only the culvert. Standing water in upstream catch basins
OF-41	None		None	50%-75%	No	No		No	Pipe about 50-75% full of sediment and upstream catch basin is full of sediment. Pipe is heavily corroded and cracked.
OF-42	Moderate	Minor channelization	None	<25%	No	No		No	Outfall found across from catch basin. Piece of pipe end has cracked off and minor erosion downstream.
OF-43	Moderate	Minor plunge pool after flared end section	None	25%-50%	No	No		No	Outfall located adjacent to roadway. Sediment present in pipe end and flared end section. Outfall generally in good condition, no flow present.
OF-44	Moderate	Deep channel present after pipe end, directing flow to nearby wetland area. Channel necessary to prevent flooding of residential backyard.	None	25%-50%	No	No		No	Outfall found projecting from roadway embankment. Minor sediment buildup in pipe end.
OF-45	None		None	<25%	No	No		No	Outfall found across from catch basin. Some leaf litter build up in flared end section. No flow and standing water in catch basin. Defined channel downstream.
OF-46	None		None	<25%	No	No		No	Outfall found across from catch basin. Some leaf litter build up in flared end section. No flow and standing water in catch basin.

Illicit Discharge Log

Date	Outfall ID	Outfall Location	Description of Discharge	Description of Discovery	Source of Discharge	Date of Mitigation	Planned Corrective Actions	Estimated volume of Flow Removed

Illicit Discharge Tracking Form

Outfall ID:	
Outfall Location:	
Description of Discharge:	
Description of Discovery (Methods used):	
Source of Discharge:	
Date of Discovery:	**Date of Mitigation (if corrected):**
Planned Corrective Actions (with schedule):	
Estimated Volume of Flow Removed:	

Appendix H

IDDE Employee Training Records

Training Topics:		
Date:	**Hours:**	
Employee Name	**Department / Position**	**Contact Info**

Town of Sandown, NH

Training Topics: IDDE		
Date: 10/1/2020	Hours: 9:30-10:30	
Employee Name	**Department / Position**	**Contact Info**
Mark Tolman	Health officer	Town Hall
Arthur Gennaldo	Public works Dir.	Highway 603-300-6452 my cell

Training Topics: MS4 Training - IDDE, Sandown NH		
Date: 12/13/2021	Hours: 9 - 10 AM	
Employee Name	**Department / Position**	**Contact Info**
Rich O'Hanley	Highway foreman	603-231-9212
Alex Brooks	~~[illegible]~~ Highway laborer	
JOHN RUNCE	HWY	
Arthur Genvuldo	Public Works Dir	603-300-6452