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Work Plan for 2018 Stormwater and Surface Water Investigation
Saint-Gobain Performance Plastics
701 Daniel Webster Highway
Merrimack, New Hampshire 03054
NHDES Site No.: 199712055
Project Number: 36430

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Date of Report: March 30, 2018

WORK PLAN FOR 2018 STORMWATER AND SURFACE WATER INVESTIGATION

SAINT-GOBAIN PERFORMANCE PLASTICS MERRIMACK, NEW HAMPSHIRE

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March 30, 2018 **Project No.: 166-8623**

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1.0 INTRODUCTION

Golder Associates Inc. (Golder), on behalf of Saint-Gobain Performance Plastics (SGPP), submitted a Stormwater and Surface Water Investigation Summary Report (StW-SW ISR; Golder, 2018) for the Merrimack, New Hampshire SGPP facility (the facility, see Figure 1) to the New Hampshire Department of Environmental Services (NHDES) on January 30, 2018. Representatives of SGPP, Golder and NHDES met on February 22, 2018 to discuss the findings of the StW-SW ISR and the scope of proposed additional stormwater and surface water investigation activities. NHDES issued written comments on the StW-SW ISR on March 14, 2018 (NHDES, 2018). A copy of NHDES comments and SGPP's responses are proved in Appendices A-1 and A-2, respectively.

This work plan outlines the objectives and proposed scope of work for additional investigation of stormwater at the facility as well as surface water in the Merrimack River located east and south of the facility, Dumpling Brook located south of the facility, and an unnamed brook located north of the facility.

The 2018 StW/SW investigation objectives do not include objectives to address the data gaps identified for dry-weather flow in the StW-SW ISR. SGPP will implement stormwater conveyance system maintenance (spot lining and grouting) of targeted potions of the stormwater conveyance system to reduce or eliminate dry weather flow. Additional dry-weather flow sampling will be implemented as part of performance monitoring if dry-weather flow is observed after implementation of stormwater conveyance system maintenance activities. Stormwater conveyance system maintenance activities, and post-maintenance monitoring relative to dry-weather flow are presented in Section 4.

This work plan includes the following:

- Background information on the facility, the facility's stormwater conveyance system, past stormwater and surface water investigations, and communications between SGPP and the NHDES
- Objectives and scope of work for investigation of stormwater and surface water
- Stormwater conveyance system maintenance activities to address dry-weather flow and post-maintenance monitoring activities
- A discussion of next-steps and schedule

2.0 BACKGROUND

This section describes the facility, its stormwater conveyance system, and past stormwater/surface water investigation activities. It also summarizes communications between SGPP and the NHDES regarding the StW-SW ISR's findings, and a preliminary conceptual model to inform data gaps, which provide the basis for the scope of work presented in this work plan.

2.1 Overview of Facility and Stormwater Conveyance System

The following description of the facility's stormwater conveyance system is based on a review of readily available historical documents, as-built plans and the results of the stormwater conveyance system camera survey as provided in the StW-SW ISR.

General Electric (GE) developed the facility property in 1971 and continued to operate at the location until approximately 1982. The GE-owned property consisted of approximately 170 acres located between Daniel Webster Highway and the Merrimack River, and included the existing 90,000-square-foot manufacturing building (referred to as the "Main Building"), several outbuildings, railway spurs, and a stormwater conveyance system, which collects runoff from the developed portion of the property. Historical drawings depicting the facility stormwater conveyance system, including as-builts from 1972, were provided in Appendix A of the StW-SW ISR.

In 1984, Chemical Fabrics Corporation (Chemfab) purchased the property from GE and in 1987, sub-divided and sold approximately 150 acres of the wooded/predominantly-undeveloped land surrounding the facility. As part of the sale, an easement was established for the portions of the stormwater conveyance system located between the eastern Chemfab property boundary and the Merrimack River. In the mid- to late-1990s, Chemfab constructed a 55,000-square foot addition (referred to as the "New Manufacturing Building") east of the facility's Main Building; a portion of the stormwater conveyance system appears to have been reconfigured to accommodate the new construction. At the current time, SGPP has not located the detailed drawings and plans for this stormwater reconfiguration. SGPP acquired Chemfab in 2000 and assumed ownership of the facility.

The facility stormwater conveyance system consists of two main "branches" that collect stormwater to the north and south of the Main Building/New Manufacturing Building (see Figure 2). The two branches join southeast of the Main Building at manhole MH-29, and the combined flow discharges to the Merrimack River at Outfall 001 under National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit (MSGP) number NHR053097 which expires on June 3, 2020. This outfall is the only outfall associated with the facility shown on historical facility drawings, and no other outfalls associated with the facility are known to exist.

The stormwater conveyance system generally follows the layout of the original stormwater system installed ca. 1971 and receives runoff from the ground and from facility-building roofs. Runoff from the roof of the Main Building flows to the stormwater conveyance system via roof drains plumbed inside the building. Runoff from the New Manufacturing Building flows to the stormwater conveyance system via roof drains that are plumbed directly to the stormwater conveyance system and from exterior downspouts that discharge to the paved ground surface to the east of the New Manufacturing Building, which flows to stormwater catch basins via surface flow. In addition, there are several swales west of the Main Building that direct over-land flow from off-facility areas and the western part of the property toward catch basins located north and south of the Main Building. The facility has a Stormwater Pollution Prevention Plan (SWPPP) that addresses stormwater discharges (SGPP, 2015) and maintains filter socks over catch basins as part of their stormwater Best Management Practice Plan.

2.2 NHDES Outfall Sample Collection and Request for Work Plan

2.2.1 Outfall Sample Collection and Request for Work Plan

On June 29, 2017 NHDES observed flow from Outfall 001 and collected a grab sample from the outfall, which was submitted to Aquarian Analytical Lab (Aquarian) of Canterbury, New Hampshire for analysis of per- and poly-fluoroalkyl substances (PFAS). NHDES indicated that the sample was collected "under dry conditions", suggesting that the source of the observed flow was not precipitation runoff. Twelve PFAS were detected in the sample at concentrations up to 1,820 nanograms per liter (ng/l) for perfluorooctanoic acid [PFOA]. New Hampshire currently has no regulatory standards for PFAS in stormwater.

NHDES requested a work plan to investigate dry weather flow via email on July 14, 2017. Golder submitted a stormwater and surface water investigation work plan on August 11, 2017 (Golder, 2017a) to address NHDES' requests. Revisions to the work plan were submitted on October 6, 2017 (Golder, 2017b) and an addendum was submitted on November 13, 2017 (Golder, 2017c) in response to comments issued by NHDES on September 21, 2017 and November 3, 2017.

2.2.2 Stormwater and Surface Water Investigation and Summary Report

The objectives presented in the StW-SW ISR included:

1. Identify the source of the dry-weather flow to the facility stormwater conveyance system that discharges at Outfall 001;
2. Identify measure(s) to eliminate the dry-weather source(s);
3. Assess water quality in the stormwater conveyance system under wet-weather conditions;
4. Assess water quality in Dumpling Brook between Daniel Webster Highway and the Merrimack River; and
5. Assess water quality in the Merrimack River in the vicinity of the SGPP stormwater outfall and the confluence of Dumpling Brook.

Golder completed the following activities to meet these objectives:

- Review of historical documentation relating to the facility's stormwater conveyance system
- Installation of a rain gauge at the facility to document precipitation events
- Installation of a flow meter at manhole MH-29 to document flow rates in the stormwater conveyance system
- Installation of pressure transducers in monitoring wells MW-03S and MW-03
- Documentation of observations of the facility's stormwater conveyance system under dry-weather conditions, with contemporaneous groundwater elevation measurements at the facility's eleven groundwater monitoring wells
- Camera-survey of the facility's stormwater conveyance system (including roof drains) to evaluate system integrity and identify potential sources of inflow to the system other than stormwater
- Survey of stormwater conveyance system structures
- Evaluation of off-facility dry-weather flow from the northern branch of the facility's stormwater conveyance system (i.e., downgradient of manhole MH-5)
- Surface water sampling of publicly-accessible portions of Dumpling Brook between Daniel Webster Highway and the Merrimack River under dry-weather conditions
- Surface water sampling of the Merrimack River under dry-weather conditions
- Collection of surface water samples from the Merrimack River under wet-weather conditions (concurrent with stormwater sampling under wet-weather conditions)
- Identification of potential measures to abate dry-weather flow discharges at Outfall 001

While conducting the work plan investigation activities outlined above, Golder also observed the clean-out of the roof-drain system, stormwater catch basins, and select sections of stormwater conveyance system pipeline[1].

Golder documented these activities in the January 30, 2018 StW-SW ISR, which included a listing of data gaps, discussed in Section 2.2.4.

2.2.3 NHDES Comments on the StW-SW ISR

NHDES issued comments on the StW-SW ISR on March 14, 2018 (NHDES, 2018). These comments and SGPP's responses are presented in Appendices A-1 and Appendix A-2, respectively.

2.2.4 Preliminary Conceptual Models

The following presents preliminary conceptual models for stormwater and surface water based on the findings and data gaps identified in the StW-SW ISR, as well as consideration of the requests in NHDES comments on the StW-SW ISR. The conceptual models presented below are preliminary and are presented

[1] Only sections of pipe identified as having an obstruction (e.g., sedimentation, root infiltration, etc.) were targeted for cleaning.

for developing a scope of work for further evaluation. Data generated during subsequent investigations will inform and modify these preliminary conceptual models.

Dry-weather flow:

- PFAS were detected in samples collected from the facility stormwater conveyance system under dry-weather conditions.
- No cross-connections between the facility's stormwater conveyance system and the facility's process and sanitary lines were observed during the camera survey
- The source of PFAS detected in dry-weather flow at Outfall 001 appears to be groundwater infiltration into the stormwater conveyance system where portions of the conveyance system piping are at least periodically partially beneath the water table[2].
- Outfall dry-weather flow does not result in a detectible increase in PFOA concentration in the Merrimack River
- Data gaps associated with the dry-weather flow conditions include temporal/seasonal trends in:
  - Groundwater elevations near the facility's stormwater conveyance system
  - Dry-weather flow volume in the facility's stormwater conveyance system
  - PFAS concentrations in dry-weather flow at Outfall 001 and in the Merrimack River

Wet-weather flow:

- PFAS were detected in samples collected from the facility stormwater conveyance system under wet-weather conditions.
- Potential sources of PFAS detected in wet-weather flow is unknown, but could include one or more of the following:
  - Roof runoff
  - Soils – leaching of PFAS to stormwater or erosion of soil and transport of PFAS associated with suspended solids
  - Sediments or solids within stormwater system[3]
  - Sediments entrained in the catch basin filter socks
  - Stormwater flow onto the property from off-property locations

[2] Some long-chain PFAS (perfluoroundecanoic acid [PFUnA], perfluorododecanoic acid [PFDoA], perfluorotridecanoic acid [PFTriA], and perfluorotetradecanoic acid [PFTA]) were detected in dry-weather flow at concentrations less than 5 ng/L and N-ethyl perfluorooctanesulfonamidoacetic Acid (NEtFOSAA) was detected at 15 ng/L. These compounds are not commonly detected in facility groundwater, therefor the source of these compounds in dry weather is uncertain. One potential source of these compounds in dry weather flow is back diffusion from sediments within the stormwater conveyance system and/or stormwater conveyance system materials.

[3] Materials identified in the stormwater conveyance system were observed through video reconnaissance only, and have been characterized based on these limited observations. However, based on the video reconnaissance, the sediments and materials observed in the sub-grade portions of the stormwater conveyance system appeared to be primarily soils with minor components of roofing-material granules. Localized areas of other materials, such as the deposits of light-colored material upstream of catch basin CB-9 (as noted on Figure 7 of the StW-SW ISR) could not be readily identified based on video observations. Likewise, the sediments observed in the roof drain headers were difficult to identify based on the quality of camera footage, but were potentially comprised of roofing-material granules (white granules), organic materials (e.g., decomposed leaves), and/or stack residues.

- No cross-connections between the facility's stormwater conveyance system and the facility's process and sanitary lines were observed during the camera survey
- Data gaps associated with the wet-weather flow conditions include:
  - Source(s) of PFAS detected in wet-weather flow
  - Temporal/seasonal trends in wet-weather flow volume, PFAS concentrations at Outfall 001, and PFAS concentrations in the Merrimack River
  - Nature of stormwater flow onto the property from the west and northwest

Dumpling Brook:

- PFAS were detected in samples collected from Dumpling Brook under dry-weather conditions. Measured PFAS concentrations increased between the upstream sampling location (Daniel Webster Highway) and the downstream sampling location at the confluence with the Merrimack River.
- Potential sources of PFAS detected in the upstream sampling location (Daniel Webster Highway) include aerially deposited PFAS from the facility (as described in the Preliminary Air, Soil, and Water Modeling Technical Memorandum: Merrimack, New Hampshire [Barr, 2017]) and/or other potential PFAS sources in the Dumpling Brook drainage basin upstream of Daniel Webster Highway.
- The potential cause of the observed increase in PFAS concentrations between Daniel Webster Highway and the confluence of Dumpling Brook and the Merrimack River include aerially deposited PFAS and/or the discharge of PFAS-impacted groundwater into the brook.
- Data gaps associated with Dumpling Brook include:
  - PFAS concentrations in Dumpling Brook surface water under wet-weather conditions
  - Temporal/seasonal trends in PFAS concentrations in Dumpling Brook at the monitoring location upgradient of Daniel Webster Highway, between Daniel Webster Highway and the confluence with the Merrimack River, and in the Merrimack River upgradient, downgradient and along the confluences with Dumpling Brook.
  - Dumpling Brook flow rates

3.0 INVESTIGATION OBJECTIVES AND SCOPE OF WORK

This section presents the objectives and scope of work for the proposed stormwater and surface water investigations.

For the purpose of this work plan:

- A "wet-weather" event is defined as greater than 0.25 inches of rainfall that occurs at least 72 hours (3 days) after a previous measurable storm event.
- "First flush" is defined as the first half-hour of discharge associated with a wet-weather event.
- "Dry-weather flow" is defined as flow following a period of more than 72 hours (3 days) without any measurable rain, based on data from the facility-specific rain gauge.

3.1 Investigation Objectives

The following investigation objectives have been developed for the StW/SW investigation activities based on the preliminary conceptual models and data gaps, identified above:

1. Identify the source of PFAS in wet-weather flow at the facility;
2. Evaluate temporal/seasonal trends in wet-weather flow volume, PFAS concentrations at Outfall 001, and PFAS concentrations in the Merrimack River
3. Investigate water quality and assess flow rates in Dumpling Brook between Daniel Webster Highway and the Merrimack River at locations that are accessible

In addition, the following objectives are related to requests from the NHDES March 14, 2018 comment letter (Appendix A):

4. Investigate sediment quality in publicly accessible areas in the vicinity of the northern confluence of Dumpling Brook and the Merrimack River
5. Investigate water quality in the unnamed brook identified by NHDES to the north of facility

3.2 Stormwater Conveyance System - Wet-Weather Flow

The following sections describe the scope of work to meet the investigation objectives 1 and 2 associated with wet-weather flow as described in Section 3.1.

3.2.1 Wet-Weather Flow Source Evaluation

To identify the source of PFAS in facility stormwater, sampling of wet-weather flow will be conducted in two phases at the locations listed in Table 1 and shown on Figure 3. Phase 1 sampling will focus on manholes MH-23 and MH-5 as follows:

- Catch-basin filter socks will be replaced prior to the anticipated storm event. Equipment blank samples will be collected from the new filter socks prior to installation.
- Grab samples will be collected from manholes MH-23 and MH-5 and Outfall 001 during a "first-flush" event (the first half-hour of the storm event).

- An additional round of grab samples will be collected from manholes MH-23 and MH-5 and Outfall 001 later in the storm event. During collection of these samples, extra sample volume will be collected from manholes MH-23 and MH-5 for lab centrifuging to remove suspended solids, to allow for reporting of "total" (uncentrifuged) and "dissolved" (centrifuged) PFAS concentrations and total suspended solids.

Following receipt of data from Phase 1 samples, SGPP will discuss the results with NHDES to determine whether additional "first flush" sampling is necessary during future sampling events.

Phase 2 sampling will focus on areas upstream of manhole MH-23 and MH-5 as follows:

- Grab samples will be collected during "first-flush" from the following locations (see Table 1 and Figure 3)
  - MH-23 and MH-5
  - Sample ports installed in the 5 roof drain vertical pipes
  - Drain inlets/catch basins DI-6A, DI-17, and CB-24 located upstream of input from the roof drains to the stormwater conveyance system (3 samples), and
  - Outfall 001
- Grab samples of stormwater flow entering drainage ditches 001 and 002 will be collected within the first 2 hours of the storm event, if flow is observed entering the ditches.

Samples will be submitted to ELLE under chain-of-custody protocols for analysis of the parameters summarized on Table 1, including:

- PFAS compounds by Modified Method 537.1 (see list of analytes in Table 2)
- Wet chemistry parameters including total suspended solids and principal ions (alkalinity as bicarbonate, ammonium, calcium, chloride, iron, magnesium, manganese, nitrate, nitrite, potassium, sodium, sulfate, and sulfite)

3.2.2 Triannual Wet-Weather Sampling

If wet-weather conditions meeting the criteria specified in Section 3.0 occur, SGPP will conduct three sampling events (spring, summer, and fall) in 2018. These sample events will be collected independent of the sampling described in Section 3.2.1. Samples will be collected from the stormwater conveyance system and the Merrimack River at the locations listed on Table 3 and shown Figure 4 using the procedures outlined in Section 5.0.

Samples from the Merrimack River will be collected from near shore (within 5 feet of the shore). At the "mixing zone location" (SW-MERR-201W) an "in-channel" sample (greater than 5 feet from the shore) will also be collected. Samples will be collected from the mid-point in the water column and not from stagnant or standing water.

The samples will be submitted to ELLE under chain-of-custody protocols for analysis of the parameters summarized on Table 3, including:

- PFAS compounds by Modified Method 537.1 (see list of analytes in Table 2) and
- Wet chemistry parameters.

The following additional analytes will be analyzed during the first wet-weather sampling event in a subset of samples (Outfall 001, SW-MERR-101W-NS, SW-MERR-201W-NS, and SW-MERR-201W-IC):

- Expanded PFAS list (see Table 2) by Method EPA 537 Version 1.1 Modified,
- Perfluoro(2-methyl-3-oxahexanoic) acid (HFPODA, “GenX”) by Method SW-846 8321B, and
- Modified target analyte list (MTAL)[4] metals (aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, vanadium, and zinc) by Methods 6010C and/or 6020A

SGPP will discuss the results of these additional analyses with NHDES after receipt of analytical data and determine if these compounds should be added to analyte list for additional locations or sampling events.

3.2.3 Stormwater Flow Rate and Rain Gauge Monitoring

Flow Assessment Services, LLC (FAS) installed a flow meter approximately 10 feet downstream of manhole MH-29 on November 9, 2017 as described in Appendix C of the StW-SW ISR. FAS calibrates the flow meter weekly. Golder observes the calibration and downloads, processes and reviews the flow meter data on a biweekly (twice per month) basis.

A rain gauge that was installed by SGPP at the facility in 2017 was removed for winter storage on January 3, 2018. The rain gauge will be redeployed in March or April 2018, pending weather conditions.

Stormwater flow meter and rain gauge data will be collected and evaluated during the 2018 field season.

3.2.4 Dye Testing

SGPP will conduct a dye test to qualitatively evaluate the extent of the outfall mixing zone in the Merrimack River under wet-weather conditions. SGPP will target a low-intensity, long-duration storm event for the dye test. Rhodamine WT, a fluorescent, water soluble, photodegradable and non-persistent dye that is generally considered safe to aquatic species at the expected concentrations in the river. Rhodamine will be injected into the outfall pipe at manhole MH-30 using a peristaltic pump. Rhodamine dye is typically visible in clear water at concentrations of 10 ppb or above. The rate of Rhodamine WT injection will target an outfall effluent concentration of between 100 ppb to 1,000 ppb to allow for visual observation of the mixing zone to an approximate 10x to 100x dilution factor. SGPP will visually observe the results of the dye test and record the observations with photographs and videos.

[4] The MTAL list represents the current USEPA Target Analyte List for metals modified to exclude the metals/ions already analyzed as part of the wet chemistry parameters.

SGPP will coordinate the field schedule for the dye test to allow NHDES the opportunity to be present during the test. SGPP will notify NHDES and the Town of Merrimack at least 24 hours prior to implementation of the test. SGPP will also coordinate with NHDES prior to the test to confirm that there are no drinking water intakes in the vicinity of the outfall.

Prior to use, a sample of the dye will be collected for analysis of the expanded PFAS list (see Table 2) by Method EPA 537 Version 1.1 Modified. Results of this analysis will be reviewed prior to use, and SGPP will suggest an alternative dye to NHDES prior to implementation if PFAS are detected in Rhodamine WT.

3.3 Dumpling Brook

The following sections describe the scope of work to meet the investigation objective 3 associated with Dumpling Brook as described in Section 3.1.

SGPP will installing a weir and data logger and investigate water quality and assess flow rates in Dumpling Brook by conducting tri-annual (spring, summer, and fall) wet-weather and dry-weather sampling events (six events) and as described below.

3.3.1 Weir and Data Logger Installation

SGPP will install a weir and data logger during the summer of 2018, weather and access permitting, to assess flow rates in Dumpling Brook. A location for the installation of the weir will be selected in field and subject to access.

3.3.2 Triannual Wet-Weather and Dry-Weather Sampling

Prior to sampling, SGPP will install up to five staff gauges in Dumpling Brook to establish surface water quality and elevation monitoring points between Daniel Webster Highway and the Merrimack River. The proposed staff gauge locations (SW-DB-104 through SW-DB-108) are shown on Figure 4. Installation of the staff gauges is dependent on access being granted by the current property owner. The staff gauge locations, and the staff gauges installed in 2017, will be surveyed by WSP of Nashua, New Hampshire following installation.

SGPP will conduct three rounds of wet-weather and three rounds of dry-weather sampling from Dumpling Brook and locations in the Merrimack River near potential Dumpling Brook discharge areas during the 2018 field season. The wet-weather and dry-weather flow samples for Dumpling Brook investigations will be collected from the locations listed on Table 4 and shown on Figure 4 using the procedures outlined in Section 5.0. As suggested by NHDES, SGPP will also document observations of recreational use in the vicinity of Dumpling Brook during the sampling events.

SGPP will conduct the wet-weather sampling events in Dumpling Brook concurrent with the stormwater conveyance system wet weather sampling events as described in Section 3.2.2. Samples from Dumpling

Brook vicinity will be collected after the stormwater conveyance system sampling and Merrimack River sampling. Therefore, sampling at Dumpling Brook will not be performed under “first-flush” conditions. If dry-weather flow is observed during post stormwater conveyance system maintenance monitoring, the dry-weather sampling from Dumpling Brook will occur concurrently with the stormwater conveyance system dry-weather flow sampling

Sampling at SW-MERR-301W, SW-MERR-302W, and SW-MERR-303W at the northern confluence of Dumpling Brook and the Merrimack River will only be performed if flow is observed through a breached portion of the beaver dam at the northern confluence of Dumpling Brook and the Merrimack River. Sampling at SW-MERR-401W, SW-MERR-402W, and SW-MERR-403W at the southern confluence of Dumpling Brook and the Merrimack River will only be performed if flow is observed through a breached portion of the beaver dam between Dumpling Brook and the southern confluence of Dumpling Brook and the Merrimack River. Samples will be collected at sample locations SW-DB-101 and SW-DB-102 at the northern and southern end of the meander, respectively, regardless of the condition of the beaver dams.

The samples will be submitted to ELLE under chain-of-custody protocols for analysis of the parameters summarized on Table 4, including:

- PFAS compounds by Modified Method 537.1 (see list of analytes in Table 2) and
- Wet chemistry parameters.

3.3.3 Sediment Sampling

In their comment letter, NHDES requested sampling of surface sediments from publicly accessible areas in the vicinity of Dumpling Brook and the Merrimack River. The following sections describe the scope of work to meet the investigation objective 4 associated with sediment as described in Section 3.1.

SGPP will collect grab samples of surface sediment to investigate sediment quality near the northern confluence of Dumpling Brook the Merrimack River. Samples will be collected from surface water sample locations SW-MERR-301W (SED-MERR-301W), SW-MERR-302W (SED-MERR-302W), SW-MERR-303W (SED-MERR-303W) and an upstream location from a beach downstream of the railroad bridge at the end of Moores Crossing Road in Bedford, NH (SED-MERR-US-2018A; see Figure 5). The sediment samples will be collected during the spring or summer dry-weather flow sampling event after collection of surface water samples at each location. The sediment samples will be collected using a stainless-steel scoop to place the samples directly into laboratory-supplied sample containers, following the standard operating procedures in Appendix E.

The samples will be submitted to ELLE under chain-of-custody protocols for analysis of PFAS compounds by Modified Method 537.1 (see list of analytes in Table 2), total organic carbon by Method SW-846 9060, and moisture content by Method SM 2540 G-1997. The samples will also be submitted to GeoTesting Express of Acton, Massachusetts for grain size analysis.

3.4 Unnamed Brook North of the Plant

In their comment letter, NHDES identified and requested sampling of an unnamed brook to the north of the facility hereafter referred to as Unnamed Brook A. The following sections describe the scope of work to meet the investigation objective 5 associated with Unnamed Brook A as described in Section 3.1.

SGPP will conduct one round of wet-weather and one round of dry-weather sampling from Unnamed Brook A during the 2018 field season. The wet-weather and dry-weather flow samples will be collected from two locations (SW-UBA-101 and SW-UBA-102) as listed on Table 5 and shown on Figure 4 using the procedures outlined in Section 5.0.

The samples will be submitted to ELLE under chain-of-custody protocols for analysis of the parameters summarized on Table 5, including:

- PFAS compounds by Modified Method 537.1 (see list of analytes in Table 2),
- Wet chemistry parameters, and
- MTAL metals.

4.0 STORMWATER CONVEYANCE SYSTEM - DRY-WEATHER FLOW

To reduce or eliminate the dry-weather flow in the stormwater conveyance system, SGPP proposes to implement a number of stormwater conveyance system maintenance activities. Following implementation of these maintenance activities, SGPP will implement a monitoring program to document the effect of the maintenance activities on reducing the volume of dry-weather flow. If dry weather flow persists, SGPP will implement additional dry-weather flow sampling/investigation. The following sections describe the proposed maintenance, and post-maintenance monitoring activities.

4.1.1 Stormwater Conveyance System Maintenance

Locations of groundwater infiltration into the stormwater conveyance system were identified during the 2017 camera survey and clean-out activities. Infiltration was primarily observed at defects in the northern branch of the stormwater conveyance system near manhole MH-5. Therefore, SGPP will spot-line approximately 700 feet of the north side of the conveyance system that is located below the water table and grout around manholes and catches basins. The approximate locations of spot lining and grouting are shown on Figure 6 and includes the following portions of the stormwater conveyance system:

- Between the trench drain at the loading dock and catch basin CB-9
- Between manhole MH-7 and catch basin CB-9
- Between catch basin CB-9 and catch basin CB-10
- Between drain inlet DI-34 and catch basin CB-10
- Between catch basin CB-10 and manhole MH-5
- Between manhole MH-5 and the property boundary toward manhole MH-11
- Approximately 20 feet upstream of MH-5
- Spot lining to address observations of infiltration in the vicinity of drain inlet DI-2
- Spot lining to address cracks observed approximately 8 feet downstream of catch basin CB-1

4.1.2 Post Stormwater Conveyance System Maintenance Monitoring

SGPP will conduct monthly dry-weather stormwater conveyance system flow observation events following completion of the maintenance described above. The observation events will include:

- Observations at stormwater catch basins, facility drainage swales, and Outfall 001 to document the presence or absence of dry weather flow (see Table 6).
- Measurement of the approximate dry weather flow rate at Outfall 001 with a bucket or graduated cylinder, if the outfall can be safely accessed.
- Groundwater elevation measurements at the eleven facility monitoring wells.

If dry-weather flow is observed, sampling and laboratory analysis of dry-weather flow will be conducted as described in Section 4.1.3.

4.1.3 Post-maintenance Dry-Weather Flow Sampling

If dry-weather flow is observed at the outfall during post stormwater conveyance system maintenance monitoring SGPP will conduct up to three rounds of tri-annual (spring, summer, and fall) dry-weather flow sampling from the stormwater conveyance system and the Merrimack River during the 2018 field season. The dry-weather flow samples will be collected at the locations listed on Table 7 and shown on Figure 4 using the procedures outlined in Section 5.0 and submitted to ELLE under chain-of-custody protocols for analysis of the parameters summarized on Table 7, including:

- PFAS compounds by Modified Method 537.1 (see list of analytes in Table 2) and
- Wet chemistry parameters.

At the request of NHDES, the following additional analytes will be analyzed during the first dry-weather sampling event in the subset of samples indicated on Table 7:

- Expanded PFAS list (see Table 2) by Method EPA 537 Version 1.1 Modified,
- HFPODA (“GenX”), and
- MTAL metals.

SGPP will discuss the results of these additional analyses with NHDES after receipt of analytical data and determine if these compounds should be added to analyte list for additional locations or sampling events.

4.2 Additional Maintenance Activities

The following additional stormwater conveyance system maintenance activities (not necessarily related to dry-weather flow) recommended in the StW-SW ISR will be completed during the 2018 field season:

- Plug and abandon the following unused components of the stormwater conveyance system:
  - Previously unmapped lateral between drain inlet DI-20 and the Hydro-test Building
  - Previously unmapped drain line connection to the stormwater conveyance system at manhole MH-32 located adjacent to the water tank building on the Flatley Property near the southwest corner of the SGPP property
- Decommission the stormwater infiltration catch basin located south of the facility building.
- Replace the damaged manhole cover at off-property manhole MH-13
- Grout and repair the hole observed in the discharge pipe at drain inlet DI-2, north of the Main Building
- Removal and off-facility disposal of encrustations/deposits observed in the discharge pipe between manhole MH-7 and catch basin CB-9
- Evaluate historical records regarding decommissioning of DI-6
- Evaluate historical records regarding the design and construction of the New Manufacturing Building to identify possible former connections into the patched hole in the vertical section of the roof drain

SGPP will also review the stormwater best management practices (BMPs) listed in the current SWPPP for the facility to identify potential measures for reduction of PFAS concentrations in wet-weather flow.

5.0 STORMWATER AND SURFACE WATER SAMPLING PROCEDURES

Stormwater and surface water samples will be collected in accordance with the standard operating procedures presented in Appendices A through C. Grab samples of stormwater or surface water will be collected using a stainless-steel dipper cup and pole. The dipper cup will be decanted into laboratory-supplied bottles (see sampling procedure included as Appendices B and C). Samples from the roof drain vertical piping will be collected directly from sample ports into the laboratory-supplied bottles. SGPP will record field parameters (temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, turbidity, and velocity[5]) and field observations (including but not limited to color, odor, clarity, foam, and sheen) at the time of sampling and the depth of the water column from which the sample is collected. Quality assurance/quality control samples will be collected in accordance with the sampling procedure included as Appendix D.

[5] Velocity may not be measureable at all sample locations.

6.0 NEXT STEPS AND SCHEDULE

The maintenance activities described in Section 4 will be implemented during the spring or summer of 2018, weather permitting. SGPP anticipates that the investigation and maintenance activities outlined in this work plan will be completed by November 31, 2018, pending weather conditions and NHDES' approval of the work plan by April 13, 2018 (two weeks after work plan submission). Within approximately 6 weeks of the receipt of analytical data from the fall (October-November) sampling, SGPP will provide a report summarizing the results of the activities. Assuming the fall (October-November) analytical data is available by December 19, 2018; it is anticipated that the report will be submitted to NHDES on or before January 30, 2019.

7.0 CLOSING

The undersigned are the principal authors of this work plan. Should you have any questions regarding this document, please contact Mr. Ross Bennett at (603) 668-0880.

GOLDER ASSOCIATES INC.

Ross W. Bennett, PE
Senior Engineer

Scott Drew, GIT
Staff Geologist

Alistair P.T. Macdonald, LSP, PG
Program Leader and Principal

rwb/std/aptm

8.0 REFERENCES

Barr, 2017. Preliminary Air, Soil, and Water Modeling Technical Memorandum: Merrimack, New Hampshire.

Golder, 2017a. Work Plan for Assessment of Facility Stormwater Conveyance System and Dumpling Brook Water Quality. August 2017.

Golder, 2017b. Work Plan for Assessment of Facility Stormwater Conveyance System and Dumpling Brook Water Quality – Revision 1. October 2017.

Golder, 2017c. Addendum to Work Plan for Assessment of Facility Stormwater Conveyance System and Dumpling Brook Water Quality – Revision 1. November 2017.

Golder, 2018. Stormwater and Surface Water Investigation Summary Report: Saint-Gobain Performance Plastics, Merrimack, New Hampshire. January 30, 2018.

NHDES, 2018. Letter Re: Stormwater and Surface Water Investigation Summary Report. March 14, 2018.

SGPP, 2015. Stormwater Pollution Prevention Plan, 2015 – 2019. August 26, 2015.

TABLES

Table 1: Stormwater Conveyance System Source Evaluation Sample Locations
Saint-Gobain Performance Plastics
Merrimack, New Hampshire

		Analytical Parameters		
Sample ID	**Location**	**PFAS**	**Wet Chemistry**	**Note**
SGPP-MH-23	A manhole in the southern branch of the SGPP stormwater system	**3x**	**3x**	Sample will only be collected if wet-weather flow is observed in the manhole and sufficient depth of water is present
SGPP-MH-5	A manhole in the northern branch of the SGPP stormwater system	**3x**	**3x**	
SGPP-RD-MB-NW	Roof drain located in the northwest corner of the main building	**1x**	**1x**	Sample will only be collected if wet-weather flow is observed in the roof drain and sufficient flow of water is present
SGPP-RD-MB-NE	Roof drain located in the northeast corner of the main building	**1x**	**1x**	
SGPP-RD-MB-SW	Roof drain located in the southwest corner of the main building	**1x**	**1x**	
SGPP-RD-MB-SE	Roof drain located in the southeast corner of the main building	**1x**	**1x**	
SGPP-RD-NMB	Roof drain located in the new manufacturing building	**1x**	**1x**	
SGPP-DI-6A	Drain inlet upstream of CB-9 and roof input to the northern branch of the stormwater system	**1x**	**1x**	Sample will only be collected if wet-weather flow is observed in the drain inlet and sufficient depth of water is present
SGPP-DI-17	Drain inlet upstream of MH-18 and roof input to the southern branch of the stormwater system	**1x**	**1x**	
SGPP-CB-24	Catch basin upstream of CB-22 and roof input to the southern branch of the stormwater system	**1x**	**1x**	Sample will only be collected if wet-weather flow is observed in the catch basin and sufficient depth of water is present
SGPP-OUTFALL-001	Outfall 001	**3x**	**3x**	Sample will only be collected if the sample location can be safely accessed during the storm event
SGPP-DRAINAGE-001	Drainage west of the main SGPP parking lot	**1x**	**1x**	Sample will only be collected if wet-weather flow is observed in the drainage and sufficient flow of water is present
SGPP-DRAINAGE-002	Drainage upstream of CB-1	**1x**	**1x**	

Notes
3x indicates up to 3 samples collected during the stormwater conveyance system source evaluation
1x indicates 1 sample collected during the stormwater conveyance system source evaluation
Wet chemistry parameters include total suspended solids, and principal ions including: alkalinity as bicarbonate, ammonium, chloride, nitrate, nitrite, sulfate, sulfite, Ca, Fe, K, Mg, Mn, and Na

Prepared by: STD
Checked by: RWB
Reviewed by: APTM

Table 2: PFAS Analyte List

PFAS Analytes	Abbreviation	CAS Id.	Target List	Expanded List
10:2 Fluorotelomer sulfonic acid	10:2 FTSA	120226-60-0		x
4:2 Fluorotelomer sulfonic acid	4:2 FTSA	757124-72-4		x
6:2 Fluorotelomer sulfonic acid	6:2 FTSA	27619-97-2		x
8:2 Fluorotelomer sulfonic acid	8:2 FTSA	39108-34-4		x
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	x	
N-ethyl perfluorooctylsulfonamide	NEtPFOSA	4151-50-2		x
N-ethyl perfluorooctanesulfonamideoethanol	NEtPFOSAE	1691-99-2		x
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	x	
N-methyl perfluorooctanesulfonamide	NMePFOSA	31506-32-8		x
N-methyl perfluorooctanesulfonamidoethanol	NMePFOSAE	24448-09-7		x
Perfluorooctanesulfonic acid	PFOS	1763-23-1	x	
Perfluorobutanesulfonic acid	PFBS	375-73-5	x	
Perfluorobutanoic acid	PFBA	375-22-4	x	
Perfluorodecanesulfonic acid	PFDS	335-77-3		x
Perfluorodecanoic acid	PFDA	335-76-2	x	
Perfluorododecanesulfonic acid	PFDoS	79780-39-5		x
Perfluorododecanoic acid	PFDoA	307-55-1	x	
Perfluoroheptanesulfonic acid	PFHpS	375-92-8		x
Perfluoroheptanoic acid	PFHpA	375-85-9	x	
Perfluorohexadecanoic acid	PFHxdA	67905-19-5		x
Perfluorohexanesulfonic acid	PFHxS	355-46-4	x	
Perfluorohexanoic acid	PFHxA	307-24-4	x	
Perfluorononanesulfonate	PFNS	68259-12-1		x
Perfluorononanoic acid	PFNA	375-95-1	x	
Perfluorooctadecanoic acid	PFOdA	16517-11-6		x
Perfluorooctanesulfonamide	PFOSA	754-91-6		x
Perfluorooctanoic acid	PFOA	335-67-1	x	
Perfluoropentanesulfonic acid	PFPeS	2706-91-4		x
Perfluoropentanoic acid	PFPeA	2706-90-3	x	
Perfluorotetradecanoic acid	PFTA	376-06-7	x	
Perfluorotridecanoic acid	PFTrDA	72629-94-8	x	
Perfluoroundecanoic acid	PFUnA	2058-94-8	x	
Perfluoro(2-methyl-3-oxahexanoic) acid	HFPODA	13252-13-6		x

Prepared by: STD
Checked by: RWB
Reviewed by APTM

Table 3: Stormwater Conveyance System and Merrimack River Wet-Weather Sample Locations
Saint-Gobain Performance Plastics
Merrimack, New Hampshire

Sample ID	Location	Analytical Parameters: PFAS	Wet Chemistry	Expanded PFAS List	GenX	MTAL Metals	Note
SGPP-MH-23	A manhole in the southern branch of the SGPP stormwater system	3x	3x				Sample will only be collected if wet-weather flow is observed in the manhole and sufficient depth of water is present
SGPP-MH-5	A manhole in the northern branch of the SGPP stormwater system	3x	3x				
SGPP-OUTFALL-001	Outfall 001	3x	3x	1x	1x	1x	Sample will only be collected if the sample location can be safely accessed during the storm event
SW-MERR-101W-NS	Upstream of outfall, along western bank within 5 feet of shore	3x	3x	1x	1x	1x	
SW-MERR-201W-NS	River water at Outfall 001	3x	3x	1x	1x	1x	
SW-MERR-201W-IC	River water at Outfall 001	3x	3x				
SW-MERR-202W-NS	Approximately 1000 feet downstream of Outfall 001, along western shore	3x	3x				

Notes

3x indicates sampling at up to 3 tri-annual events

1x indicates one-time sampling event

Wet chemistry parameters include total suspended solids, and principal ions including: alkalinity as bicarbonate, ammonium, chloride, nitrate, nitrite, sulfate, sulfite, Ca, Fe, K, Mg, Mn, and Na

GenX analysis includes HFPODA by Method SW-846 8321B

Modified Target Analyte List (MTAL) metals include Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, V, Zn

NS - Near Shore (within 5 feet of shore)

IC - In Channel (greater than 10 feet from shore)

Prepared by: STD
Checked by: RWB
Reviewed by: APTM

Table 4: Dumpling Brook Dry- And Wet-Weather Sample Locations
Saint-Gobain Performance Plastics
Merrimack, New Hampshire

Sample ID	Location	Analytical Parameters: PFAS	Analytical Parameters: Wet Chemistry	Notes
SW-MERR-301W-NS	Approximately 200 feet upstream of northern Dumpling Brook confluence with the Merrimack River, along western shore	3x/3x	3x/3x	A wet-weather sample will only be collected if flow is observed through a breached portion of the beaver dam located at the northern confluence of Dumpling Brook and the Merrimack River
SW-MERR-302W-NS	At northern Dumpling Brook confluence with the Merrimack River, along western shore	3x/3x	3x/3x	
SW-MERR-303W-NS	Approximately 200 feet downstream of northern Dumpling Brook confluence with the Merrimack River, along western shore	3x/3x	3x/3x	
SW-MERR-401W-NS	Approximately 200 feet upstream of southern Dumpling Brook confluence with the Merrimack River, along western shore	3x/3x	3x/3x	A wet-weather sample will only be collected if flow is observed through a breached portion of the beaver dam located at the southern confluence of Dumpling Brook and the Merrimack River
SW-MERR-402W-NS	At southern Dumpling Brook confluence with the Merrimack River, along western shore	3x/3x	3x/3x	
SW-MERR-403W-NS	Approximately 200 feet downstream of southern Dumpling Brook confluence with the Merrimack River, along western shore	3x/3x	3x/3x	
SW-DB-101	At northern Dumpling Brook confluence with the Merrimack River, in the meander	3x/3x	3x/3x	
SW-DB-102	At southern Dumpling Brook confluence with the Merrimack River, in the meander	3x/3x	3x/3x	
SW-DB-103	At Dumpling Brook confluence with the meander, in the brook	3x/3x	3x/3x	
SW-DB-104	Approximately 500 feet upstream of the Dumpling Brook confluence with the meander, in the brook	3x/3x	3x/3x	
SW-DB-105	Approximately 1,000 feet upstream of the Dumpling Brook confluence with the meander, in the brook	3x/3x	3x/3x	
SW-DB-106	Approximately 500 feet downstream of the culvert where Dumpling Brook reemerges as surface water, in the brook	3x/3x	3x/3x	
SW-DB-107	At the culvert where Dumpling Brook reemerges as surface water, in the brook	3x/3x	3x/3x	
SW-DB-108	Along the shore of the former fish hatchery ponds	3x/3x	3x/3x	
SW-DB-109	Immediately west of Daniel Webster Highway prior to Dumpling Brook flowing under the highway, in the brook	3x/3x	3x/3x	

Notes

3x/3x indicates sampling at up to 3 tri-annual events for both dry-weather and wet-weather

Wet chemistry parameters include total suspended solids, and principal ions including: alkalinity as bicarbonate, ammonium, calcium, chloride, iron, magnesium, manganese, nitrate, nitrite, potassium, sodium, sulfate, and sulfite

NS - Near Shore (within 5 feet of shore)

IC - In Channel (greater than 10 feet from shore)

For all sample locations, a wet-weather sample will only be collected if the sample location can be safely accessed during the storm event

Prepared by: STD
Checked by: RWB
Reviewed by: APTM

Table 5: Unnamed Brook Dry- And Wet-Weather Sample Locations
Saint-Gobain Performance Plastics
Merrimack, New Hampshire

		Analytical Parameters			
Sample ID	**Location**	**PFAS**	**Wet Chemistry**	**MTAL Metals**	**Notes**
SW-UBA-101	At the Unnamed Brook confluence with the Merrimack River	1x/1x	1x/1x	1x/1x	Sample will only be collected if flow is observed and sufficient depth of water is present
SW-UBA-102	Where the Unnamed Brook flows beneath Daniel Webster Highway	1x/1x	1x/1x	1x/1x	

Notes

1x/1x indicates one round of sampling for both dry-weather and wet-weather

Wet chemistry parameters include total suspended solids, and principal ions including: alkalinity as bicarbonate, ammonium, calcium, chloride, iron, magnesium, manganese, nitrate, nitrite, potassium, sodium, sulfate, and sulfite

Modified Target Analyte List (MTAL) metals include Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, V, Zn

For both sample locations, a wet-weather sample will only be collected if the sample location can be safely accessed during the storm event

Prepared by: STD
Checked by: RWB
Reviewed by: APTM

Table 6: Stormwater Conveyance System Observation Locations

ID	Location
Drainage Swale upstream of MH-15	Upstream flow onto the property from the west
MH-23	Manhole on the southern branch of the stormwater conveyance system
MH-28	Manhole on the southern branch of the stormwater conveyance system
Drainage Swale upstream of CB-1	Upstream flow onto the property from the north/northwest
MH-5	Manhole on the northern branch of the stormwater conveyance system
MH-13	Manhole on the northern branch of the stormwater conveyance system
Outfall 001	Downgradient discharge point at Merrimack River

Prepared by: STD
Checked by: RWB
Reviewed by: APTM

Table 7: Stormwater Conveyance System Dry-Weather Flow Sample Locations
Saint-Gobain Performance Plastics
Merrimack, New Hampshire

		Analytical Parameters					
Sample ID	**Location**	**PFAS**	**Wet Chemistry**	**Expanded PFAS List**	**GenX**	**MTAL Metals**	**Note**
SGPP-MH-23	A manhole in the southern branch of the SGPP stormwater system	**3x**	**3x**				Sample will only be collected if dry weather flow is observed in the manhole and sufficient depth of water is present
SGPP-MH-5	A manhole in the northern branch of the SGPP stormwater system	**3x**	**3x**				
SGPP-OUTFALL-001	At Outfall 001	**3x**	**3x**	**1x**	**1x**	**1x**	
SW-MERR-101W-NS	Upstream of outfall, along western bank within 5 feet of shore	**3x**	**3x**	**1x**	**1x**	**1x**	
SW-MERR-201W-NS	River water at Outfall 001	**3x**	**3x**	**1x**	**1x**	**1x**	
SW-MERR-201W-IC	River water at Outfall 001	**3x**	**3x**				
SW-MERR-202W-NS	Approximately 1000 feet downstream of Outfall 001, along western shore	**3x**	**3x**				

Notes

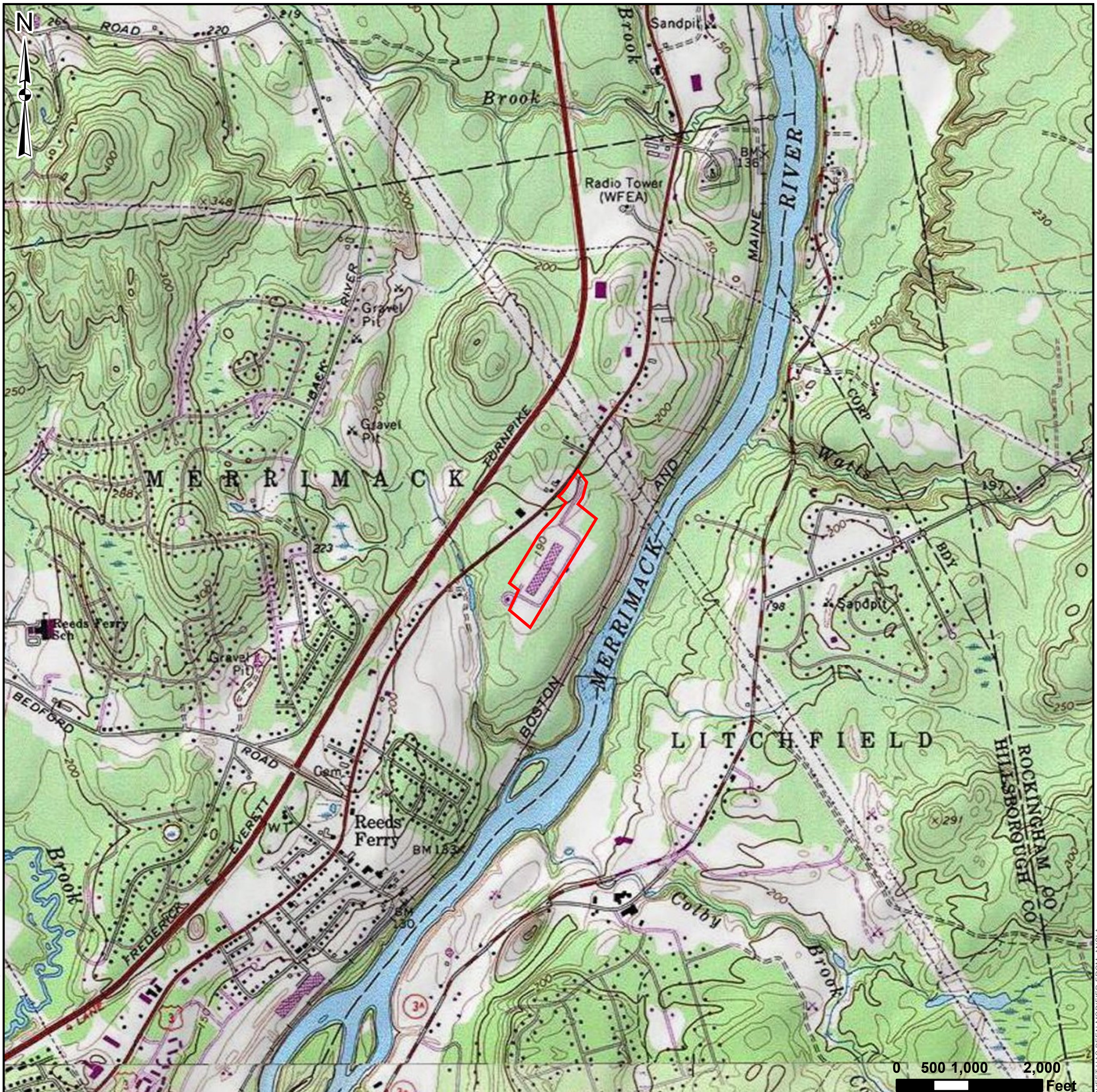
3x indicates sampling at up to 3 tri-annual events, assuming dry-weather flow is observed
1x indicates one-time sampling event

Prepared by: STD
Checked by: RWB
Reviewed by: APTM

Wet chemistry parameters include total suspended solids, and principal ions including: alkalinity as bicarbonate, ammonium, chloride, nitrate, nitrite, sulfate, sulfite, Ca, Fe, K, Mg, Mn, and Na
GenX analysis includes HFPODA by Method SW-846 8321B
Modified Target Analyte List (MTAL) metals include Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, V, Zn
NS - Near Shore (within 5 feet of shore)
IC - In Channel (greater than 10 feet from shore)

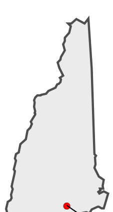
Golder Associates

FIGURES



LEGEND

Approximate SGPP Facility Property Boundary



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CLIENT

SAINT-GOBAIN PERFORMANCE PLASTICS

PROJECT

SAINT-GOBAIN PERFORMANCE PLASTICS
701 DANIEL WEBSTER HIGHWAY
MERRIMACK, NH

TITLE

FACILITY LOCATION MAP

CONSULTANT

GOLDER

YYYY-MM-DD	2018-03-29
PREPARED	SHL
DESIGN	HDE
REVIEW	RWB
APPROVED	APTM

PROJECT No.	CONTROL	Rev.	FIGURE
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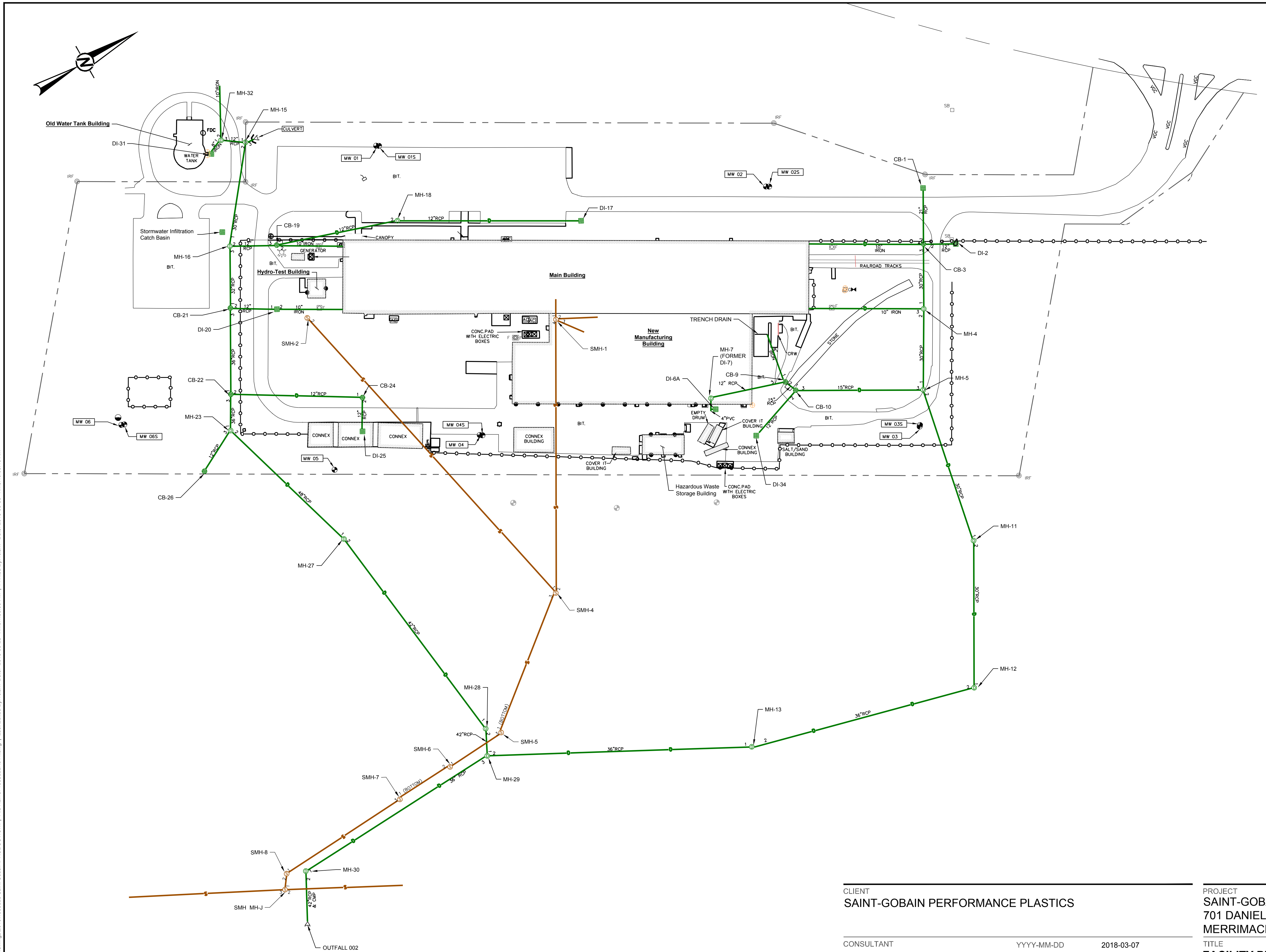

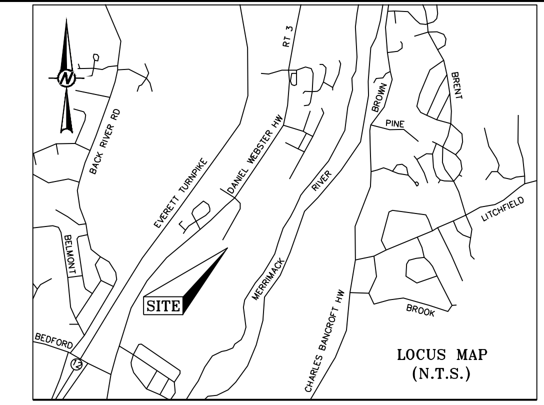

LEGEND

IRF	IRON ROD FOUND	SB	STONE BOUND FOUND
F	FIRE VALVE		ELECTRIC BOX
	CULVERT	AC	AC UNIT
G	GAS HANDHOLE		CATCH BASIN
	GAS GATE		ROUND CATCH BASIN
	BORING	FDC	FIRE DEPARTMENT CONNECTION
	POST		UNKNOWN MANHOLE
TBM	TEMPORARY BENCHMARK		DRAIN MANHOLE
VGC	VERTICAL GRANITE CURB		EXTERIOR ROOF DRAIN DOWNSPOUT
CNO	COULD NOT OBSERVE		SEWER MANHOLE
NPV	NO PIPES VISIBLE		BOLLARD
CMP	CORRUGATED METAL PIPE		FIRE HYDRANT
RCP	REINFORCED CONCRETE PIPE		MONITORING WELL
			UNKNOWN MONITORING WELL

CHAIN LINK FENCE
PROPERTY LINE
RIGHT OF WAY
STORMWATER DRAIN LINE
SANITARY SEWER LINE

NOTES

1. THIS PLAN WAS PREPARED FROM FIELD SURVEY CONDUCTED BY WSP IN APRIL OF 2016, AUGUST OF 2017 AND OCTOBER OF 2017.

2. THE HORIZONTAL DATUM SHOWN HEREON REFERENCES THE NEW HAMPSHIRE STATE PLANE COORDINATE SYSTEM NAD83.

3. THE VERTICAL DATUM SHOWN HEREON REFERENCES NAVD88.

4. THIS PLAN ONLY REFERENCES THE BENCHMARK SET BY WSP AND IS LABELED AS 'TBM A'. ANY OTHER BENCHMARKS FOUND ON SITE WERE NOT SET OR VERIFIED BY WSP.

5. THE SURVEYED PROPERTY IS SUBJECT BUT NOT LIMITED TO THE INFORMATION SHOWN HEREON. ALL INFORMATION THAT MAY AFFECT THE QUALITY OF THE TITLE TO BOTH THE SUBJECT AND ADJOINING PARCELS SHOULD BE VERIFIED BY AN ACCURATE AND CURRENT TITLE REPORT. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT.

PLAN REFERENCES

1. PLAN ENTITLED "SUBDIVISION PLAN (MAP 6E, LOT 3-4), MERRIMACK COMMERCE PARK, DANIEL WEBSTER HIGHWAY, MERRIMACK, NEW HAMPSHIRE, PREPARED FOR JOHN J. FLATELY COMPANY." DATED NOVEMBER 3, 2012. PREPARED BY HAYNER/ SWANSON, INC. PLAN ON RECORD AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS AS PLAN No. 37652.

2. PLAN ENTITLED "LOT LINE RELOCATION PLAN (LOTS 3-2 & 3-4, MAP 6E), BALLYGOWAN PARK, D.W. HIGHWAY, MERRIMACK, NEW HAMPSHIRE. PREPARED FOR THE FLATLEY COMPANY." DATED APRIL 6, 1990. PREPARED BY ALLAN H. SWANSON, INC. PLAN ON RECORD AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS AS PLAN No. 24540.

3. PLAN ENTITLED "PLAN OF LOTS PREPARED FOR CHEMICAL FABRICS CORPORATION, DANIEL WEBSTER HIGHWAY, MERRIMACK, N.H." DATED MARCH 9, 1987. PREPARED BY T.F. MORAN, INC. PLAN ON RECORD AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS AS PLAN No. 20689.

4. PLAN ENTITLED "SUBDIVISION PLAN PREPARED FOR CHEMICAL FABRICS CORPORATION, DANIEL WEBSTER HIGHWAY, MERRIMACK, N.H." DATED MARCH 9, 1987. PREPARED BY T.F. MORAN, INC. PLAN ON RECORD AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS AS PLAN No. 20582.

5. PLAN ENTITLED "LOT LINE REVISION PLAN, LAND OF CHEMICAL FABRICS CORPORATION, DANIEL WEBSTER HIGHWAY, MERRIMACK, N.H." DATED AUGUST 7, 1986. PREPARED BY GEORGE F. KELLER, INC. PLAN ON RECORD AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS AS PLAN No. 19804.

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CLIENT
SAINT-GOBAIN PERFORMANCE PLASTICS

CONSULTANT
GOLDER

YYYY-MM-DD	2018-03-07
DESIGNED	SD
PREPARED	RWC
REVIEWED	RWB
APPROVED	APTM

PROJECT
SAINT-GOBAIN PERFORMANCE PLASTICS
701 DANIEL WEBSTER HIGHWAY
MERRIMACK, NEW HAMPSHIRE

TITLE
FACILITY PLAN AND STORMWATER CONVEYANCE SYSTEM LAYOUT

PROJECT NO.	SUBTITLE	REV.	FIGURE
166-8623	A	0	2

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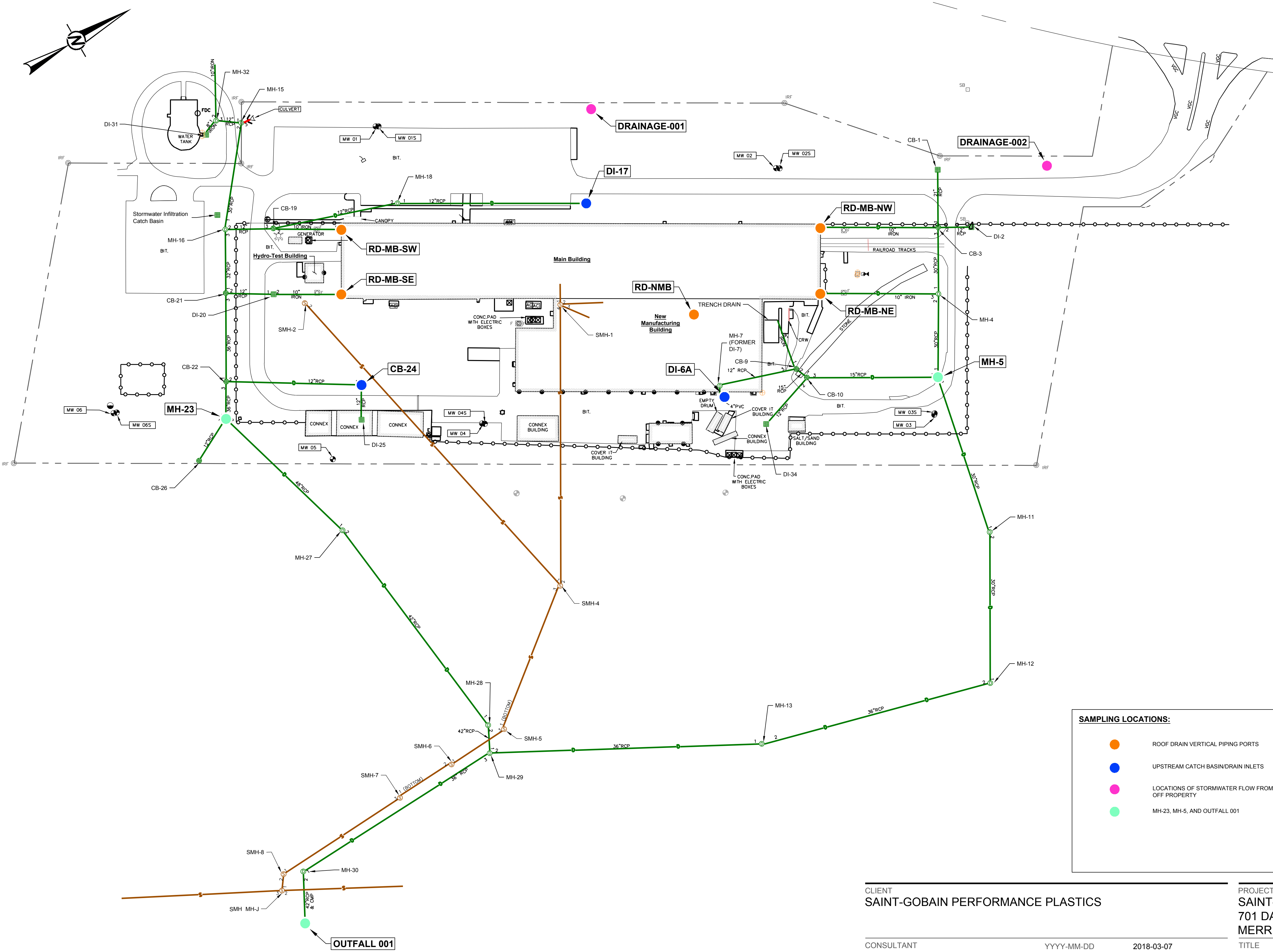
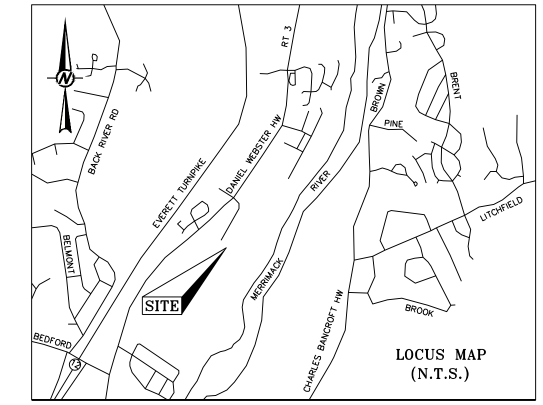


SAMPLING LOCATIONS:

- ROOF DRAIN VERTICAL PIPING PORTS
- UPSTREAM CATCH BASIN/DRAIN INLETS
- LOCATIONS OF STORMWATER FLOW FROM OFF PROPERTY
- MH-23, MH-5, AND OUTFALL 001



LEGEND

- IRF — IRON ROD FOUND
- SB — STONE BOUND FOUND
- F — FIRE VALVE
- ELECTRIC BOX
- CULVERT
- AC UNIT
- G — GAS HANDHOLE
- CATCH BASIN
- GAS GATE
- ROUND CATCH BASIN
- BORING
- FDC — FIRE DEPARTMENT CONNECTION
- POST
- UNKNOWN MANHOLE
- TBM — TEMPORARY BENCHMARK
- DRAIN MANHOLE
- VGC — VERTICAL GRANITE CURB
- ROOF DRAIN
- CNO — COULD NOT OBSERVE
- SEWER MANHOLE
- NPV — NO PIPES VISIBLE
- BOLLARD
- CMP — CORRUGATED METAL PIPE
- FIRE HYDRANT
- RCP — REINFORCED CONCRETE PIPE
- MONITORING WELL
- UNKNOWN MONITORING WELL
- CHAIN LINK FENCE
- PROPERTY LINE
- RIGHT OF WAY
- DRAIN LINE
- SEWER LINE

NOTES

1. THIS PLAN WAS PREPARED FROM AN ACTUAL ON THE GROUND FIELD SURVEY CONDUCTED BY WSP IN APRIL OF 2016, AUGUST OF 2017 AND OCTOBER OF 2017.

2. THE HORIZONTAL DATUM SHOWN HEREON REFERENCES THE NEW HAMPSHIRE STATE PLANE COORDINATE SYSTEM NAD83.

3. THE VERTICAL DATUM SHOWN HEREON REFERENCES NAVD88.

4. THIS PLAN ONLY REFERENCES THE BENCHMARK SET BY WSP AND IS LABELED AS 'TBM A'. ANY OTHER BENCHMARKS FOUND ON SITE WERE NOT SET OR VERIFIED BY WSP.

5. THE PURPOSE OF THIS PLAN WAS TO LOCATE ALL THE IMPERVIOUS SURFACES ON THE LOCUS PARCEL. THAT INCLUDED PAVEMENT, WALKWAYS, PADS AND BUILDINGS. ALSO, WSP WAS TO LOCATE ALL DRAINAGE AND SEWER STRUCTURES AND THEIR INVERTS, ON SITE AND OFF SITE, AND CLEANOUTS WITHIN THE BUILDING ITSELF.

6. THE SURVEYED PROPERTY IS SUBJECT BUT NOT LIMITED TO THE INFORMATION SHOWN HEREON. ALL INFORMATION THAT MAY AFFECT THE QUALITY OF THE TITLE TO BOTH THE SUBJECT AND ADJOINING PARCELS SHOULD BE VERIFIED BY AN ACCURATE AND CURRENT TITLE REPORT. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT.

PLAN REFERENCES

1. PLAN ENTITLED "SUBDIVISION PLAN (MAP 6E, LOT 3-4), MERRIMACK COMMERCE PARK, DANIEL WEBSTER HIGHWAY, MERRIMACK, NEW HAMPSHIRE, PREPARED FOR JOHN J. FLATELY COMPANY." DATED NOVEMBER 3, 2012. PREPARED BY HAYNER/ SWANSON, INC. PLAN ON RECORD AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS AS PLAN No. 37652.

2. PLAN ENTITLED "LOT LINE RELOCATION PLAN (LOTS 3-2 & 3-4, MAP 6E), BALLYGOWAN PARK, D.W. HIGHWAY, MERRIMACK, NEW HAMPSHIRE. PREPARED FOR THE FLATLEY COMPANY." DATED APRIL 6, 1990. PREPARED BY ALLAN H. SWANSON, INC. PLAN ON RECORD AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS AS PLAN No. 24540.

3. PLAN ENTITLED "PLAN OF LOTS PREPARED FOR CHEMICAL FABRICS CORPORATION, DANIEL WEBSTER HIGHWAY, MERRIMACK, N.H." DATED MARCH 9, 1987. PREPARED BY T.F. MORAN, INC. PLAN ON RECORD AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS AS PLAN No. 20689.

4. PLAN ENTITLED "SUBDIVISION PLAN PREPARED FOR CHEMICAL FABRICS CORPORATION, DANIEL WEBSTER HIGHWAY, MERRIMACK, N.H." DATED MARCH 9, 1987. PREPARED BY T.F. MORAN, INC. PLAN ON RECORD AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS AS PLAN No. 20582.

5. PLAN ENTITLED "LOT LINE REVISION PLAN, LAND OF CHEMICAL FABRICS CORPORATION, DANIEL WEBSTER HIGHWAY, MERRIMACK, N.H." DATED AUGUST 7, 1986. PREPARED BY GEORGE F. KELLER, INC. PLAN ON RECORD AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS AS PLAN No. 19804.

0 80 160
1" = 80' FEET

CLIENT
SAINT-GOBAIN PERFORMANCE PLASTICS

CONSULTANT
GOLDER

YYYY-MM-DD	2018-03-07
DESIGNED	SD
PREPARED	RWC
REVIEWED	RWB
APPROVED	APTM

PROJECT
SAINT-GOBAIN PERFORMANCE PLASTICS
701 DANIEL WEBSTER HIGHWAY
MERRIMACK, NEW HAMPSHIRE

TITLE
STORMWATER CONVEYANCE SYSTEM SAMPLING LOCATIONS

PROJECT NO.	SUBTITLE	REV.	FIGURE
166-8623	A	0	3

Path: \\manchester\cadd\Drawings\2016\1668623 Saint Gobain\PRODUCTION\ | File Name: 1668623A011.dwg | Last Edited By: rclark Date: 2018-03-28 Time:1:56:06 PM | Printed By: rclark Date: 2018-03-30 Time:10:10:17 AM

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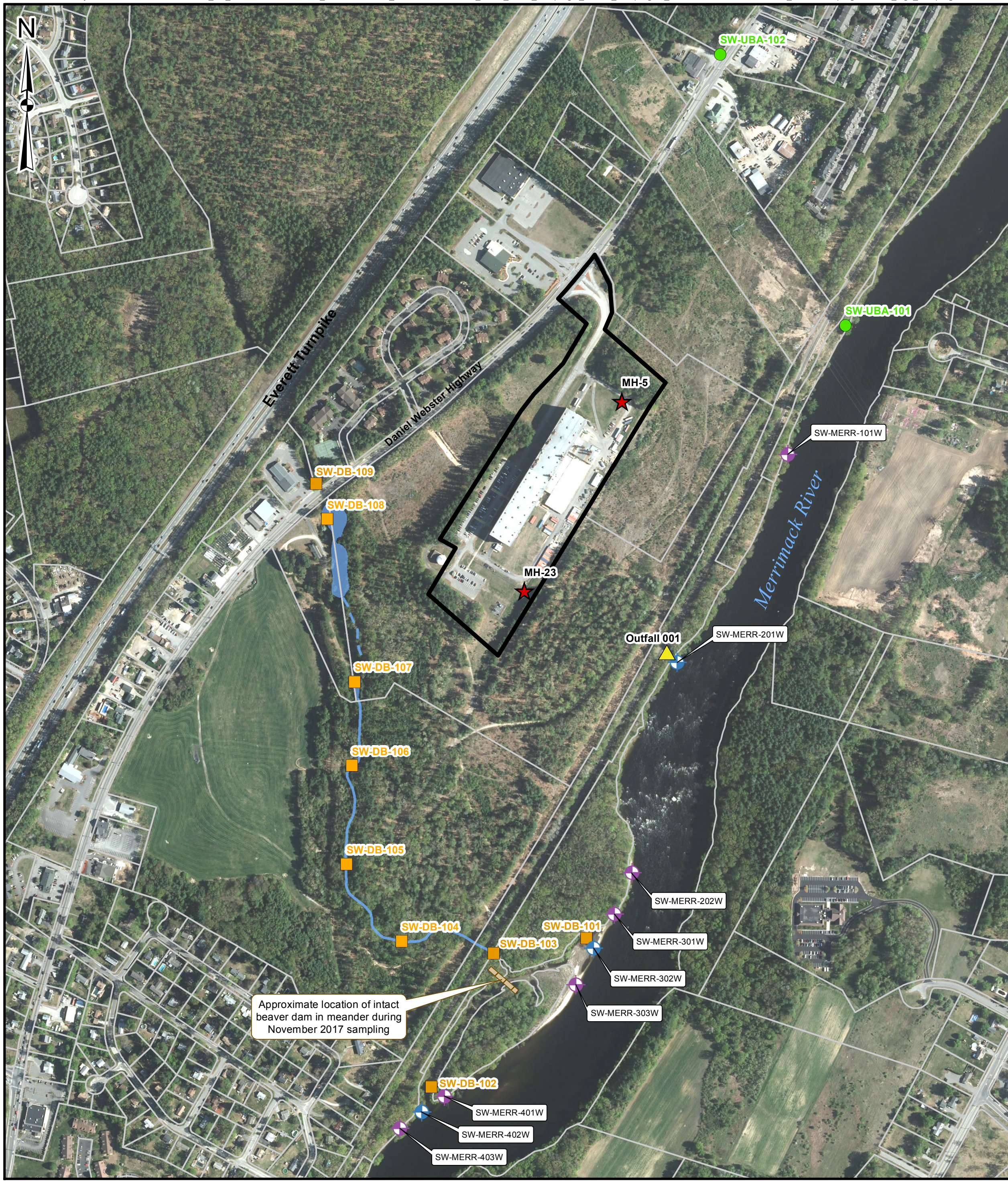

LEGEND

- Manhole Sampling Location
- Outfall Sampling Location
- Proposed Sample Location - Unnamed Brook North of Plant
- Merrimack River Near Shore (<5 ft from shore) and Channel (~10 - 15 ft from shore) Sampling Location
- Merrimack River Near Shore Sampling Location
- Dumpling Brook and River Meander Sampling Location
- Dumpling Brook
- Dumpling Brook - Underground
- Approximate SGPP Facility Boundary
- Beaver Dam

1 inch = 800 feet

0 400 800 Feet

REFERENCE

2015 IMAGERY DOWNLOADED FROM NH GRANIT WEBSITE

CLIENT
SAINT-GOBAIN PERFORMANCE PLASTICS

PROJECT
SAINT-GOBAIN PERFORMANCE PLASTICS
701 DANIEL WEBSTER HIGHWAY
MERRIMACK, NH

TITLE
FACILITY, MERRIMACK RIVER, DUMPLING BROOK, AND UNNAMED BROOK SAMPLING LOCATIONS

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-03-08
PREPARED	SHL
DESIGN	STD
REVIEW	RWB
APPROVED	APTM

PROJECT No.	CONTROL	Rev.	FIGURE
166-8623	-	0	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI A

0 1 in

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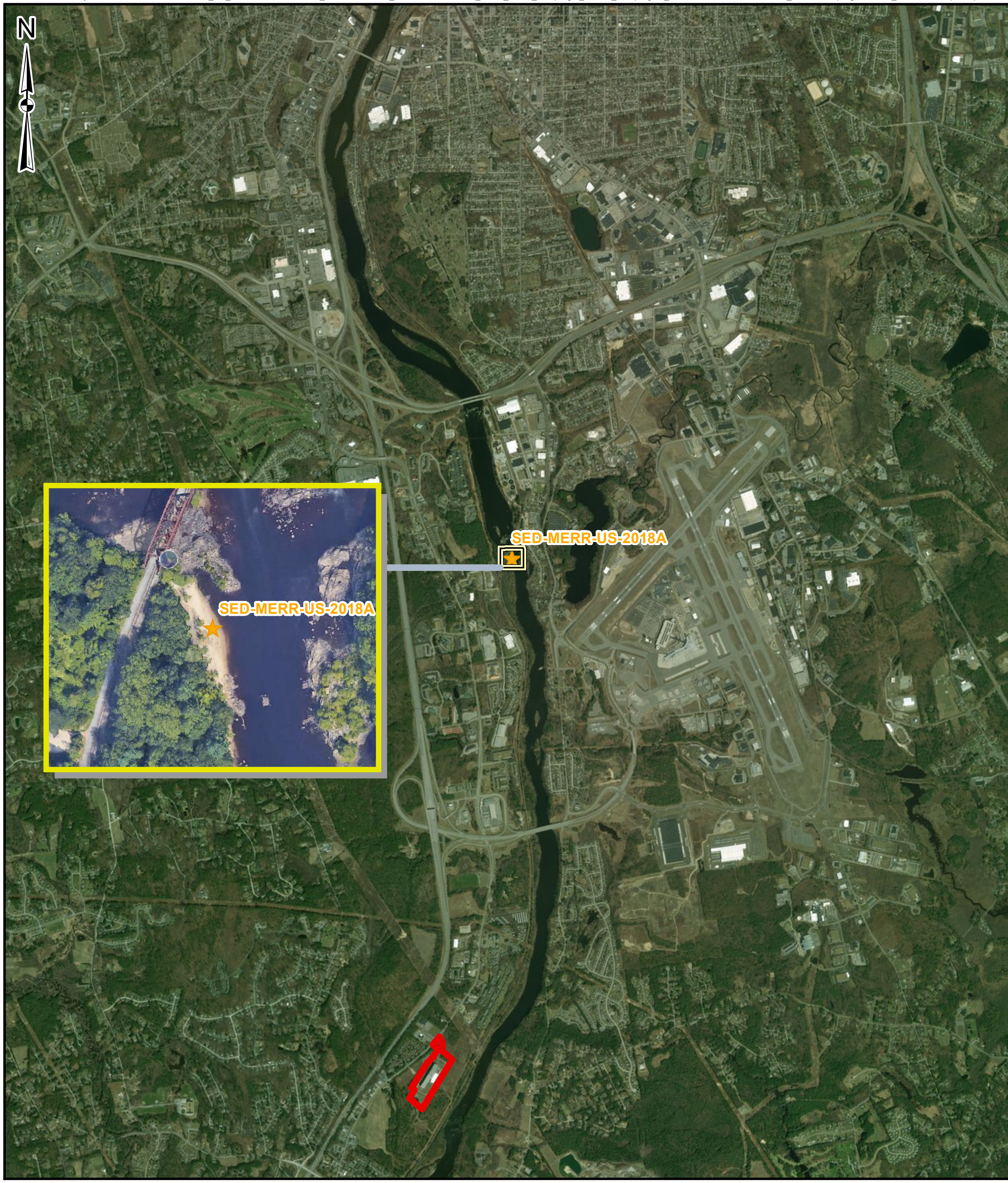


LEGEND

Approximate SGPP Facility Boundary

Upstream Sediment Sample

0 2,200 4,400
Feet

REFERENCE

SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

CLIENT
SAINT-GOBAIN PERFORMANCE PLASTICS

PROJECT
SAINT-GOBAIN PERFORMANCE PLASTICS
701 DANIEL WEBSTER HIGHWAY
MERRIMACK, NH

TITLE
LOCATION OF UPSTREAM SEDIMENT SAMPLE

CONSULTANT

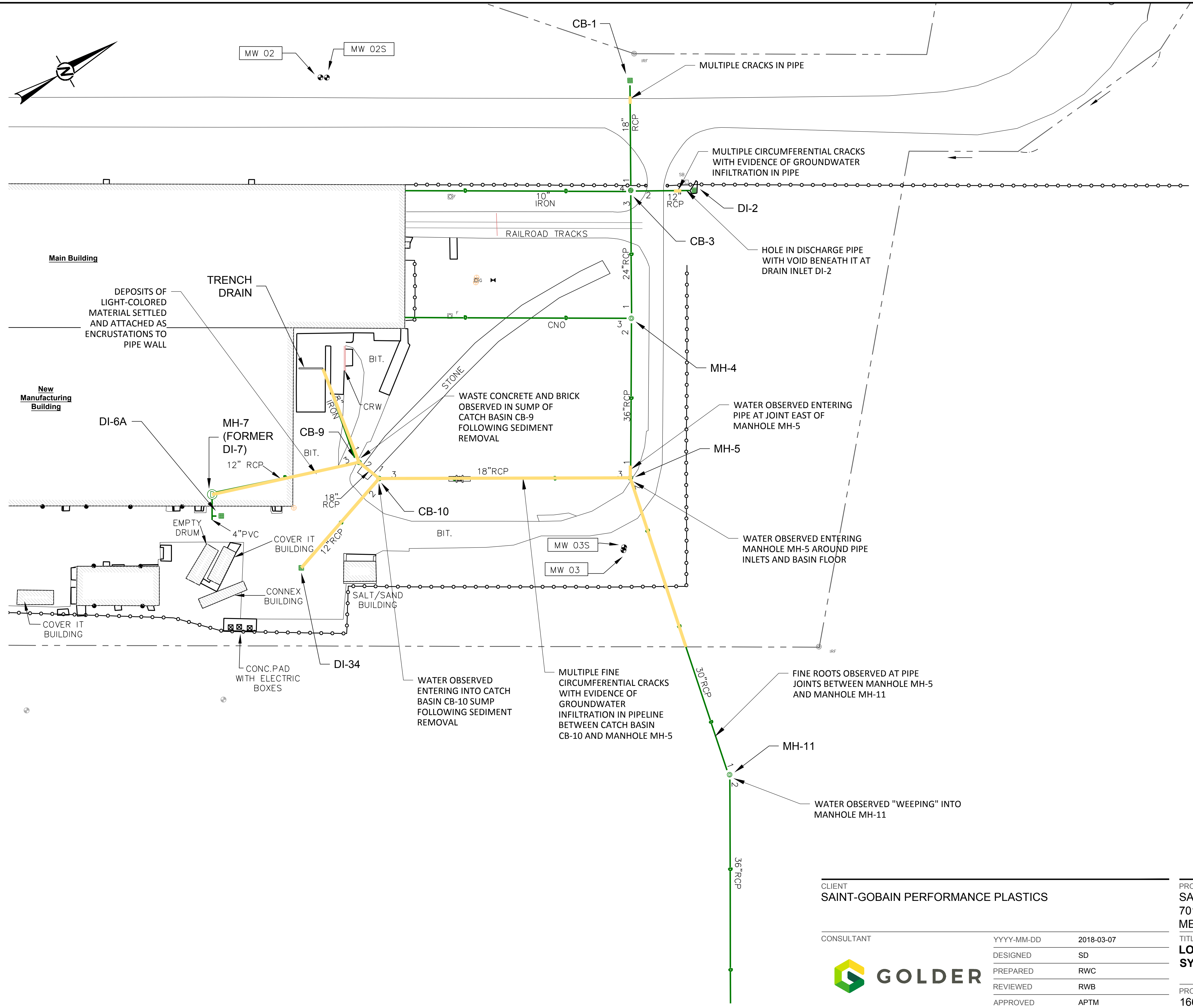
Golder Associates

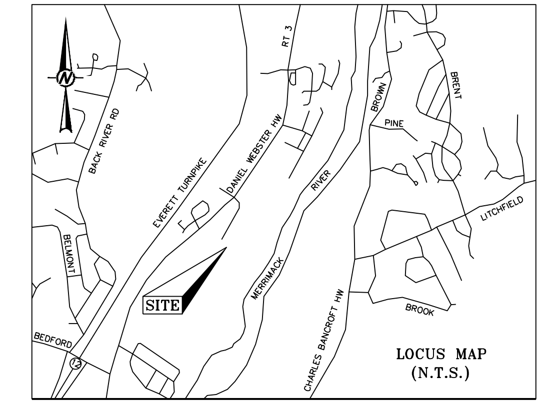
YYYY-MM-DD	2018-03-29
PREPARED	SHL
DESIGN	STD
REVIEW	RWB
APPROVED	APTM

PROJECT No.	CONTROL	Rev.	FIGURE
166-8623	-	0	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI A

0 1 in





LEGEND

IRF	IRON ROD FOUND	SB	STONE BOUND FOUND
F	FIRE VALVE		ELECTRIC BOX
	CULVERT	AC	AC UNIT
G	GAS HANDHOLE		CATCH BASIN
	GAS GATE		ROUND CATCH BASIN
	BORING	FDC	FIRE DEPARTMENT CONNECTION
	POST	U	UNKNOWN MANHOLE
TBM	TEMPORARY BENCHMARK	D	DRAIN MANHOLE
VGC	VERTICAL GRANITE CURB		EXTERIOR ROOF DRAIN DOWNSPOUT
CNO	COULD NOT OBSERVE	S	SEWER MANHOLE
NPV	NO PIPES VISIBLE		BOLLARD
CMP	CORRUGATED METAL PIPE		FIRE HYDRANT
RCP	REINFORCED CONCRETE PIPE		MONITORING WELL
	GATE VALVE		UNKNOWN MONITORING WELL

CHAIN LINK FENCE
PROPERTY LINE
RIGHT OF WAY
STORMWATER DRAIN LINE
SANITARY SEWER LINE
PORTION OF STORMWATER DRAIN LINE TO BE LINED

NOTES

1. THIS PLAN WAS PREPARED FROM FIELD SURVEY CONDUCTED BY WSP IN APRIL OF 2016, AUGUST OF 2017 AND OCTOBER OF 2017.

2. THE HORIZONTAL DATUM SHOWN HEREON REFERENCES THE NEW HAMPSHIRE STATE PLANE COORDINATE SYSTEM NAD83.

3. THE VERTICAL DATUM SHOWN HEREON REFERENCES NAVD88.

4. THIS PLAN ONLY REFERENCES THE BENCHMARK SET BY WSP AND IS LABELED AS 'TBM A'. ANY OTHER BENCHMARKS FOUND ON SITE WERE NOT SET OR VERIFIED BY WSP.

5. THE SURVEYED PROPERTY IS SUBJECT BUT NOT LIMITED TO THE INFORMATION SHOWN HEREON. ALL INFORMATION THAT MAY AFFECT THE QUALITY OF THE TITLE TO BOTH THE SUBJECT AND ADJOINING PARCELS SHOULD BE VERIFIED BY AN ACCURATE AND CURRENT TITLE REPORT. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT.

PLAN REFERENCES

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CLIENT
SAINT-GOBAIN PERFORMANCE PLASTICS

CONSULTANT
GOLDER

YYYY-MM-DD	2018-03-07
DESIGNED	SD
PREPARED	RWC
REVIEWED	RWB
APPROVED	APTM

PROJECT
SAINT-GOBAIN PERFORMANCE PLASTICS
701 DANIEL WEBSTER HIGHWAY
MERRIMACK, NEW HAMPSHIRE

TITLE
LOCATIONS OF PROPOSED STORMWATER CONVEYANCE SYSTEM SPOT LINING AND GROUTING

PROJECT NO.	SUBTITLE	REV.	FIGURE
166-8623	A	0	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

APPENDIX A-1

NHDES COMMENTS DATED MARCH 14, 2018

The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Robert R. Scott, Commissioner

EMAIL ONLY

March 14, 2018

Christopher S. Angier
Senior Environmental Project Manager
Saint-Gobain Performance Plastics
14 McCaffrey Street
Hoosick Falls, NY 12090

Subject: **Merrimack** – Saint-Gobain Performance Plastics, 701 Daniel Webster Highway
DES Site #**199712055**, Project #36430

Stormwater and Surface Water Investigation Summary Report, prepared by Golder Associates, dated January 30, 2018

Dear Mr. Angier:

The New Hampshire Department of Environmental Services (NHDES) has reviewed the above-referenced submittal prepared on behalf of Saint-Gobain Performance Plastics (Saint-Gobain) by Golder Associates, Inc. (Golder) for Saint-Gobain's facility at 701 Daniel Webster Highway in Merrimack ("facility"). The report documents SGPP's extensive evaluation of the integrity of the facility stormwater utility system, and evaluation of water quality impacts associated with dry weather and wet weather flow through the system and the adjacent surface water bodies related to releases of per- and polyfluorinated alkyl substances (PFAS) at the facility. In summary:

- The study confirmed the presence of PFAS in dry weather flow at the stormwater outfall, as well as in surface water samples from Dumping Brook and the Merrimack River during dry weather conditions. The most significant surface water quality impacts during dry weather flow were observed at Dumpling Brook near the confluence of the brook and the Merrimack River. The study concluded that the source of dry weather flow in the stormwater system is likely attributed to groundwater infiltration to the stormwater system, and that mitigation measures appear warranted.

- Sampling of wet weather flow (i.e., stormwater) shows PFAS impacts at concentrations greater than those detected in dry weather flow, with a slightly different composition of PFAS analytes. Sampling of surface water quality in the Merrimack River during a storm event also indicated PFAS impacts. The report concludes that additional assessment of the potential source of impacts to wet weather flow and surface water is warranted.

Please see the following summary of comments related to the submittal and SGPP's proposed response, based on discussions between NHDES, SGPP, and Golder during a telephone call on February 13, 2018, and during meetings at NHDES on January 18 and February 22, 2018.

1. Further details and clarifications to the report are needed. **Please address the following comments in a technical addendum to the report, and submit to NHDES via upload to the NHDES OneStop system no later than March 30, 2018.**

    - NHDES briefly reviewed portions of the roof drain camera survey video, and there were images that appeared to look different than the photograph of accumulated material provided for Roof Drain #6. As such, please update Appendix D to summarize and document the results of the camera survey of the roof drain system. Please update Figures 2, 4, and/or 7 (at a minimum) to depict the roof drain locations and piping system that includes the connection to manhole DMH-7. Additionally, please show on Figure 7 the results of the camera survey of the roof drain system (e.g., documentation of areas with accumulated solids and debris). Please include a description of the maintenance activities that collect, remove, and dispose of the char and other solids from the roof.

    - Please document whether the manholes and catchbasins have solid, intact bases and note the construction material, or whether the structures have open bases that allow infiltration.

    - The report states that sediment and debris removed from the system was containerized for disposal by Clean Harbors. Please provide characterization and profile data for the wastes generated by cleaning the system, as well as disposal documentation.

    - Please clarify whether stormwater can exfiltrate from the subsurface stormwater system. Please describe what concerns, if any, there are with the holes, voids, and/or penetrations in the system related to mobilization of facility-related contamination.

    - We understand that the wastewater conveyance system was mapped and its integrity evaluated with a camera survey. To aid in evaluation of the potential for releases to the environment from the wastewater system, and the potential for cross-connections or overflow between the wastewater and stormwater systems, please provide the survey, a summary of key findings from the camera survey, and elevation survey data (including, but not limited to invert and rim elevations, pipe diameters and materials, and structure materials and construction information). Please incorporate the Town of Merrimack sewer locations on the adjacent property to the east of the facility. If requested by SGPP, this submittal can be provided under separate cover. The report states that no cross connections between the stormwater conveyance system and the wastewater sewer were observed during the camera survey; please confirm whether there are or have been other indications of any cross connections or overflow between the wastewater and storm sewer systems.

    - The report documents the lateral locations of the surface water samples. Please provide a vertical reference for the samples (e.g., collected at the surface, collected six inches below the surface, etc.). Also, please update the figure(s) to show the location of the "two roadway/parking lot drains that flow into Dumpling Brook…" presented in the text.

- For the PFAS analytes, please add the Chemical Abstract Service (CAS) Nos. to the summary table. Please confirm whether the PFAS laboratory reported sulfonic acids or sulfonates (e.g., for PFOS), and clarify in the text and tables as appropriate. Please also incorporate the results of the stormwater sampling completed by NHDES on July 20, 2017 for perfluoro-2-propoxypropanoaic acid (HFPO-DA/"GenX") and dodecafluoro-3H-4,8-dioxanonanoic acid (ADONA).

- The report discusses general PFAS findings, with a focus on perfluorooctanoic acid (PFOA) impacts. An evaluation of perfluorooctane sulfonic acid (PFOS) impacts through text and figures is also required, given that the USEPA Lifetime Health Advisory (LHA) and NHDES Ambient Groundwater Quality Standard (AGQS) include both PFOA and PFOS.

- Please clarify the flow measurements in manhole MH-29 versus those measured at the outfall during the dry weather sampling events.

- Please provide photographs of each sampling location, if available.

- Please confirm if the USEPA NPDES Multi-Sector General Permit (MSGP) permit reference is correct. Have there been or are there any deviations, repairs, and/or corrective actions taken during the past reporting year? Please provide copy of the last annual report with any Discharge Monitoring Reports (DMR) prepared for 2017.

2. NHDES appreciates SGPP's initiative to design a work scope to address data gaps identified during the initial investigation, and to evaluate potential sources of impacts to stormwater, dry weather flow, and surface water quality. As presented by SGPP, **please provide a Work Plan to NHDES via upload to the NHDES OneStop system no later than March 30, 2018. The Work Plan should encompass the scope discussed with NHDES, including, but not limited to, the following:**

   - The stormwater report introduced a preliminary conceptual site model (CSM) for the source of impacts to dry weather flow (potential groundwater infiltration). The preamble to the Work Plan should include a preliminary CSM that also discusses potential source(s) of PFAS-related impacts to stormwater and surface water, similar to the presentation provided to NHDES on February 22, 2018. Please also include a discussion of:

     - Why long chain perfluorocarboxylic acids (PFCAs) and perfluoroalkane sulfonamido substances were observed in the dry weather flow but not in facility groundwater, and what PFAS are detected in wet weather but not in dry weather flows;

     - Why elevated concentrations are found in the upstream Dumpling Brook sample, and why concentrations at the downgradient Dumpling Brook sampling location were the highest observed in surface water sampled during this effort;

  - Whether a relationship, if any, was observed between the ions detected in the stormwater samples with presence in groundwater, wastewater, and raw materials;

  - The potential source of precursor compounds that could form PFOA and PFOS (as well as any other perfluoroalkyl acids [PFAAs]), with a discussion of relevant fate and transport;

  - What the potential source(s) may be for the solids and debris in the stormwater system (e.g., the black and white materials in the roof drains, the "encrustation/deposits of a hardened, light colored material" between MH-7 and CB-9, and the fine sediments not described as sand or gravel in the conveyance piping), and whether these materials are observed elsewhere at the facility (e.g., on rooftops, on the lawn, in sediment traps or catchbasin inserts, associated with process materials).

- The Work Plan tasks should include, but not be limited to:

  - Mapping of all facility utilities, including an evaluation of: (i) the lateral connection near DI-20 (possiby into the Hydro-test building); (ii) the inlet to MH-32 (possibly from the former water tank/fire builidng); (iii) the existence of DI-6; and (iv) possible former connections into the patched hole in the vertical section of the roof drain in the New Manufacturing Building. Please plan to documet any repairs or system modifications to eliminate any non-stormwater sources from the stormwater system.

  - Reinstalling the rain gauge, installing and surveying permanent staff gauge elevations, and measuring dry and wet weather flow rates.

  - Collecting surface water samples from near shore locations and the in channel location of the Merrimack River near the outfall, as well as the same locations in Dumpling Brook sampled during the initial investigation. Please consider completing a dye test to evaluate the presence and location of a mixing zone of the stormwater discharge into the River, and collecting surface water samples from the midpoint and downstream limits of the mixing zone as part of this effort. The evaluation could be used to support the conclusion in the stormwater report indicates that PFAS "concentrations attenuate rapidly with distance into the Merrimack River."

  - Collecting three sets of wet and dry weather sampling data from each of the sampling locations so that the wet and dry weather sampling results can be compared at each sampling locaiton. At a minimum, wet weather sampling should be completed during the first flush of a measurable storm event. Please provide pphotographs and a figure documenting all sampling locations.

  - Documenting uses observed in publically accessible areas of Dumpling Brook and the Merrimack River that are evaluated during this study.

- Collecting sediment sample(s) from in publically accessible areas of Dumpling Brook and the Merrimack River, consistent with previous dicussions with NHDES. Please note that at this time, additional media samples are not required; however, in the future, evaluation of impacts to other media (e.g., fish tissue) may be required, as discussed with NHDES.

- Collecting a surface water sample from the small, unnamed brook north of the facility that discharges to the Merrimack River.

- Analyzing each sample for at least the same list of compounds included in the initial evaluation. Please expand the PFAS list to include the full suite of PFAS compounds available from the analytical laboratory, including long chain PFAAs, HPFO-DA/GenX, and other polyfluorinated compounds. If metals or other analytes have been detected in other facility media samples (e.g., char from the roof stacks, dispersions, wastewater, groundwater), please also include those analytes in this scope of work. The laboratory should report the PFAAs as sulfonic acids and not sulfonates as applicable, and provide CAS Numbers on the laboratory reports for all PFAS data. Please be sure that pH data is collected at the time of sampling for all sampling locations, regardless of sampling conditions.

- Providing a final report that summarizes the findings of the study, and includes a detailed analysis of the data collected, supported by figures and graphics to illustrate conditions. The report should also summarize the recommendations for improvements to the facility's stormwater Best Management Practices (BMPs) that will be implemented as a result of this effort to reduce PFAS impacs to wet weather flow.

3. NHDES understands that SGPP is evaluating options to mitigate dry weather flow and eliminate non-stormwater discharges (e.g., contaminated groundwater, connection from the HydroTest building) to the storm sewer system, and that SGPP plans to implement select activities in the 2018 construction season, such as plugging, abandoning, and/or decommissioning portions of the system, and repairing and/or replacing some components (e.g., lengths of piping, or installing bases in manholes or catchbasins if solid sumps are not found). NHDES also acknowledges that the findings of some of the work proposed in the Work Plan due on March 30, 2018 may also inform the mitigation approach.

   At least three days prior to implementation of these tasks, NHDES requests that SGPP notify NHDES of the schedule so that NHDES may observe the work. Documentation of the work completed should be provided to NHDES. NHDES expect that SGPP will appropriately manage any wastes that may be generated from any cleaning or removal of material in the system (e.g., "encrustation/deposits of a hardened, light colored material" between MH-7 and CB-9). Please provide waste disposal documentation, including waste characterization data, to NHDES.

NHDES appreciates the work completed to date by SGPP related to stormwater and surface water quality, and we look forward to receipt of the submittals requested herein. Should you have questions or wish to further discuss these comments, please contact Lea Anne Atwell (LeaAnne.Atwell@des.nh.gov) or Kate Emma Schlosser (KateEmma.Schlosser@des.nh.gov) at NHDES' Waste Management Division.

Sincerely,

Kate Emma Schlosser

Kate Emma Schlosser, PE, Project Manager
Hazardous Waste Remediation Bureau
Tel: (603) 271-2910
Fax: (603) 271-2181
Email: KateEmma.Schlosser@des.nh.gov

ec: Edward J. Canning, Saint-Gobain
Ross W. Bennett, PE, Golder Associates
Theresa Miller, PG, LSP, Golder Associates
Clark Freise, Assistant Commissioner, NHDES
Michael J. Wimsatt, PG, Director, NHDES WMD
Karlee Kenison, PG, Administrator, NHDES HWRB
Lea Anne Atwell, PG, NHDES HWRB
Ted Walsh, NHDES Watershed Management Bureau
Eileen Cabanel, Town Manager, Merrimack
Attention Health Officer, Town of Merrimack

APPENDIX A-2

SGPP RESPONSE TO NHDES COMMENTS DATED MARCH 14, 2018

Comment #	Comment	SGPP Response to Comment
1	Further details and clarifications to the report are needed. Please address the following comments in a technical addendum to the report, and submit to NHDES via upload to the NHDES OneStop system no later than March 30, 2018.	SGPP requested an extension for the submittal of the technical addendum until April 21, 2018 to compile/review the information requested.
1.1	NHDES briefly reviewed portions of the roof drain camera survey video, and there were images that appeared to look different than the photograph of accumulated material provided for Roof Drain #6. As such, please update Appendix D to summarize and document the results of the camera survey of the roof drain system. Please update Figures 2, 4, and/or 7 (at a minimum) to depict the roof drain locations and piping system that includes the connection to manhole DMH-7. Additionally, please show on Figure 7 the results of the camera survey of the roof drain system (e.g., documentation of areas with accumulated solids and debris). Please include a description of the maintenance activities that collect, remove, and dispose of the char and other solids from the roof.	Because these lines were investigated with a push camera, EcoClean did not provide camera survey summaries for the roof drain work, so we cannot include those reports in Appendix D. Golder will provide a more detailed summary of the roof drain camera survey and roof maintenance activities in the Technical Addendum. To inform NHDES' review of the Stormwater Work Plan, Golder will provide additional details on the roof drain camera survey and roof maintenance activities prior to submittal of the Technical Addendum.
1.2	Please document whether the manholes and catchbasins have solid, intact bases and note the construction material, or whether the structures have open bases that allow infiltration.	This information will be provided in the Technical Addendum.
1.3	The report states that sediment and debris removed from the system was containerized for disposal by Clean Harbors. Please provide characterization and profile data for the wastes generated by cleaning the system, as well as disposal documentation.	This information will be provided in the Technical Addendum.
1.4	Please clarify whether stormwater can exfiltrate from the subsurface stormwater system. Please describe what concerns, if any, there are with the holes, voids, and/or penetrations in the system related to mobilization of facility-related contamination.	Golder acknowledged the potential for exfiltration in footnote 14 of the 2017 StW Investigation Report. Golder met with NHDES on February 22, 2018 to discuss a scope of work to evaluate the potential for exfiltration from the stormwater system. This information will be provided in the Technical Addendum.
1.5	We understand that the wastewater conveyance system was mapped and its integrity evaluated with a camera survey. To aid in evaluation of the potential for releases to the environment from the wastewater system, and the potential for cross-connections or overflow between the wastewater and stormwater systems, please provide the survey, a summary of key findings from the camera survey, and elevation survey data (including, but not limited to invert and rim elevations, pipe diameters and materials, and structure materials and construction information). Please incorporate the Town of Merrimack sewer locations on the adjacent property to the east of the facility. If requested by SGPP, this submittal can be provided under separate cover. The report states that no cross connections between the stormwater conveyance system and the wastewater sewer were observed during the camera survey; please confirm whether there are or have been other indications of any cross connections or overflow between the wastewater and storm sewer systems.	This information will be provided under a separate submittal, concurrent with the Technical Addendum.
1.6	The report documents the lateral locations of the surface water samples. Please provide a vertical reference for the samples (e.g., collected at the surface, collected six inches below the surface, etc.). Also, please update the figure(s) to show the location of the “two roadway/parking lot drains that flow into Dumpling Brook…” presented in the text.	This information will be provided in the Technical Addendum.
1.7	For the PFAS analytes, please add the Chemical Abstract Service (CAS) Nos. to the summary table. Please confirm whether the PFAS laboratory reported sulfonic acids or sulfonates (e.g., for PFOS), and clarify in the text and tables as appropriate. Please also incorporate the results of the stormwater sampling completed by NHDES on July 20, 2017 for perfluoro-2-propoxypropanoaic acid (HFPO-DA/”GenX”) and dodecafluoro-3H-4,8-dioxanonanoic acid (ADONA).	This information will be provided in or incorporated into the Technical Addendum.
1.8	The report discusses general PFAS findings, with a focus on perfluorooctanoic acid (PFOA) impacts. An evaluation of perfluorooctane sulfonic acid (PFOS) impacts through text and figures is also required, given that the USEPA Lifetime Health Advisory (LHA) and NHDES Ambient Groundwater Quality Standard (AGQS) include both PFOA and PFOS.	This information will be provided in the Technical Addendum.
1.9	Please clarify the flow measurements in manhole MH-29 versus those measured at the outfall during the dry weather sampling events.	This clarification will be provided in the Technical Addendum.
1.10	Please provide photographs of each sampling location, if available.	Available sample location photographs will be provided. Due to the prohibitions on use of cell phones during PFAS sampling, some sampling locations were inadvertently not photographed. Golder will photograph these locations in the Spring of 2018, and provide the photos to NHDES. Due to snow and ice, some of the sample locations cannot currently be accessed safely. If these photographs can be safely obtained prior to April 14, 2018; Golder will include this information in the Addendum.
1.11	Please confirm if the USEPA NPDES Multi-Sector General Permit (MSGP) permit reference is correct. Have there been or are there any deviations, repairs, and/or corrective actions taken during the past reporting year? Please provide copy of the last annual report with any Discharge Monitoring Reports (DMR) prepared for 2017.	The requested clarification and information will be provided in the Technical Addendum.

Comment #	Comment	SGPP Response to Comment
2	NHDES appreciates SGPP's initiative to design a work scope to address data gaps identified during the initial investigation, and to evaluate potential sources of impacts to stormwater, dry weather flow, and surface water quality. As presented by SGPP, please provide a Work Plan to NHDES via upload to the NHDES OneStop system no later than March 30, 2018. The Work Plan should encompass the scope discussed with NHDES, including, but not limited to, the following	SGPP agrees to submit the requested work plan by March 30, 2018.
2.10	The stormwater report introduced a preliminary conceptual site model (CSM) for the source of impacts to dry weather flow (potential groundwater infiltration). The preamble to the Work Plan should include a preliminary CSM that also discusses potential source(s) of PFAS-related impacts to stormwater and surface water, similar to the presentation provided to NHDES on February 22, 2018. Please also include a discussion of:	A preliminary CSM has been included in the work plan.
2.11	Why long chain perfluorocarboxylic acids (PFCAs) and perfluoroalkane sulfonamido substances were observed in the dry weather flow but not in facility groundwater, and what PFAS are detected in wet weather but not in dry weather flows	A footnote regarding detections of these compounds in dry-weather flow has been added to the preliminary CSM.
2.12	Why elevated concentrations are found in the upstream Dumpling Brook sample, and why concentrations at the downgradient Dumpling Brook sampling location were the highest observed in surface water sampled during this effort	Text regarding PFAS detections in Dumpling Brook has been added to the preliminary CSM.
2.13	Whether a relationship, if any, was observed between the ions detected in the stormwater samples with presence in groundwater, wastewater, and raw materials	In general, the principal ion data is consistent with the preliminary CSM. SGPP will provide an evaluation of principal ion data in the 2018 summary report.
2.14	The potential source of precursor compounds that could form PFOA and PFOS (as well as any other perfluoroalkyl acids [PFAAs]), with a discussion of relevant fate and transport	Available data does not suggest that PFAS precursors are significant with regard to fate and transport within the stormwater conveyance system, or in the receiving water. However, this does represent a data gap. SGPP recommends that this data gap be addressed during pre-design investigation for remedial measures, if needed.
2.15	What the potential source(s) may be for the solids and debris in the stormwater system (e.g., the black and white materials in the roof drains, the "encrustation/deposits of a hardened, light colored material" between MH-7 and CB-9, and the fine sediments not described as sand or gravel in the conveyance piping), and whether these materials are observed elsewhere at the facility (e.g., on rooftops, on the lawn, in sediment traps or catchbasin inserts, associated with process materials)	A footnote to the preliminary CSM has been added discussing the solids and debris observed in the stormwater system.
2.2	Mapping of all facility utilities, including an evaluation of: (i) the lateral connection near DI-20 (possiby [sic] into the Hydro-test building); (ii) the inlet to MH-32 (possibly from the former water tank/fire builidng [sic]); (iii) the existence of DI-6; and (iv) possible former connections into the patched hole in the vertical section of the roof drain in the New Manufacturing Building. Please plan to documet [sic] any repairs or system modifications to eliminate any non-stormwater sources from the stormwater system.	SGPP has added evaluation of these utility lines to the work plan. Where appropriate, SGPP will abandon/decommission these utilities, if they are no longer needed.
2.3	Reinstalling the rain gauge, installing and surveying permanent staff gauge elevations, and measuring dry and wet weather flow rates.	SGPP has incorporated the requested items into the proposed scope in the work plan.
2.4	Collecting surface water samples from near shore locations and the in channel location of the Merrimack River near the outfall, as well as the same locations in Dumpling Brook sampled during the initial investigation.	SGPP has incorporated the requested sampling into the proposed scope in the work plan.
2.5	Please consider completing a dye test to evaluate the presence and location of a mixing zone of the stormwater discharge into the River, and collecting surface water samples from the midpoint and downstream limits of the mixing zone as part of this effort. The evaluation could be used to support the conclusion in the stormwater report indicates that PFAS "concentrations attenuate rapidly with distance into the Merrimack River."	SGPP has incorporated the suggested dye testing into the proposed scope in the work plan.
2.6	Collecting three sets of wet and dry weather sampling data from each of the sampling locations so that the wet and dry weather sampling results can be compared at each sampling locaiton [sic]. At a minimum, wet weather sampling should be completed during the first flush of a measurable storm event. Please provide pphotographs [sic] and a figure documenting all sampling locations.	SGPP has added the requested sampling to the proposed scope in the work plan. The work plan specifies that samples associated with the stormwater conveyance system will be collected under first-flush conditions. Because of the number of samples, Merrimack River and Dumpling Brook samples may not be collected under first-flush conditions, but will be sampled during the same storm event.
2.7	Documenting uses observed in publically accessible areas of Dumpling Brook and the Merrimack River that are evaluated during this study.	SGPP has incorporated the requested documentation into the proposed scope in the work plan.
2.8	Collecting sediment sample(s) from in publically accessible areas of Dumpling Brook and the Merrimack River, consistent with previous dicussions [sic] with NHDES. Please note that at this time, additional media samples are not required; however, in the future, evaluation of impacts to other media (e.g., fish tissue) may be required, as discussed with NHDES.	SGPP has included the requested sediment sampling from the vicinity of the northern confluence of Dumpling Brook and the Merrimack River to the proposed scope in the work plan.
2.9	Collecting a surface water sample from the small, unnamed brook north of the facility that discharges to the Merrimack River.	SGPP has added the requested surface water sampling from the unnamed brook to the proposed scope in the work plan.

Comment #	Comment	SGPP Response to Comment
2.10	Analyzing each sample for at least the same list of compounds included in the initial evaluation. Please expand the PFAS list to include the full suite of PFAS compounds available from the analytical laboratory, including long chain PFAAs, HPFO-DA/GenX, and other polyfluorinated compounds. If metals or other analytes have been detected in other facility media samples (e.g., char from the roof stacks, dispersions, wastewater, groundwater), please also include those analytes in this scope of work. The laboratory should report the PFAAs as sulfonic acids and not sulfonates as applicable, and provide CAS Numbers on the laboratory reports for all PFAS data. Please be sure that pH data is collected at the time of sampling for all sampling locations, regardless of sampling conditions.	SGPP has added a larger PFAS target analyte list, HPFO-DA/GenX, TAL metals to the analyte list for a subset of samples in the work plan scope. The lab provides chemical abstracts service (CAS) numbers in the electronic data files. SGPP will include CAS numbers in future analytical summary tables. pH is listed as a field parameter that will be measured at the time of sample collection.
2.11	Providing a final report that summarizes the findings of the study, and includes a detailed analysis of the data collected, supported by figures and graphics to illustrate conditions. The report should also summarize the recommendations for improvements to the facility's stormwater Best Management Practices (BMPs) that will be implemented as a result of this effort to reduce PFAS impacs [sic] to wet weather flow.	The work plan specifies the need to prepare and submit a final report including the items requested.
3.1	NHDES understands that SGPP is evaluating options to mitigate dry weather flow and eliminate non-stormwater discharges (e.g., contaminated groundwater, connection from the HydroTest building) to the storm sewer system, and that SGPP plans to implement select activities in the 2018 construction season, such as plugging, abandoning, and/or decommissioning portions of the system, and repairing and/or replacing some components (e.g., lengths of piping, or installing bases in manholes or catchbasins if solid sumps are not found). NHDES also acknowledges that the findings of some of the work proposed in the Work Plan due on March 30, 2018 may also inform the mitigation approach.	The work plan identifies the stormwater conveyance system maintenance activities that will be completed in 2018, including post-maintenance monitoring.
3.2	At least three days prior to implementation of these tasks, NHDES requests that SGPP notify NHDES of the schedule so that NHDES may observe the work. Documentation of the work completed should be provided to NHDES. NHDES expect that SGPP will appropriately manage any wastes that may be generated from any cleaning or removal of material in the system (e.g., "encrustation/deposits of a hardened, light colored material" between MH-7 and CB-9). Please provide waste disposal documentation, including waste characterization data, to NHDES.	SGPP acknowledges and agrees to provide the notifications and documentation requested and to meet NHDES' expectations regarding waste management.

APPENDIX B

SOP-1: GENERAL FIELD METHODS FOR PFAS SAMPLING PROGRAMS

1.0 GENERAL APPLICABILITY

The purpose of this Standard Operating Procedure (SOP) is to describe the procedures that shall be used during implementation of this perfluorinated compound (PFAS) sampling program.

Due to the extremely low method detection limits associated with PFAS analysis (i.e., nanograms per liter [ng/l]) and the many potential sources of trace levels of PFASs, field personnel shall employ the greatest caution by strictly following the protocols described herein. Frequent replacement of nitrile gloves and decontamination of non-dedicated sampling equipment in accordance with the appropriate procedures will reduce the potential for false detections of PFASs.

This SOP includes the following:

- Considerations regarding food packaging and food consumption during PFAS sampling programs
- Field gear and clothing restrictions
- Personal hygiene requirements
- Sample area access restrictions
- Field equipment decontamination

Some of the provisions of the PFAS sampling program requirements described herein may conflict with standard health and safety procedures (e.g., use of insect repellant or sunscreen). Therefore, prior to implementation of a field program subject to these General Provisions, an Addendum to the site-specific Health and Safety Plan (HASP) shall be prepared to address any potential conflicts between the requirements described herein and standard health and safety procedures.

2.0 RESPONSIBILITIES

The Field Team Leader and field personnel have the shared responsibility to oversee and ensure that the PFAS sampling program is performed in accordance with the program-specific protocols described in this SOP. The Field Team Leader shall ensure that on-site personnel, including subcontractors and third parties that may have direct access to the sampling area, understand and comply with this SOP. Field personnel shall be notified of these requirements a minimum of three days prior to the start of field work in order to have the time to appropriately comply with many of the food and clothing requirements prior to arriving at the site.

3.0 GENERAL FIELD METHODS

3.1 Food Consumption

Components of some food packages have been treated to resist wetting. Historically, this was achieved through the use of PFASs. Accordingly, field personnel shall avoid the use of paper bags and other paper packaging to transport food to the site, including pre-wrapped foods and snacks (e.g., chocolate bars, energy bars, granola bars, potato chips, etc.). Field personnel shall not bring any fast food to the site that uses any form of paper wrapping such as sandwiches or paper drinking cups. If possible, field personnel shall use hard plastic or stainless steel food containers. Field personnel shall not use aluminum foil, wax paper, or coated textiles to transport food to the site.

The Teflon® coating on some frying pans contains fluorinated compounds and as such represents a potential source of PFASs. Field personnel shall not transport to or consume food at the site that has been prepared using a Teflon® coated cooking utensil.

Field personnel shall not consume food or beverages in the field vehicle or in the immediate vicinity of the sample location. Prior to consuming food or beverages, field personnel shall remove their nitrile gloves and coveralls and move to a location a minimum distance of 35 feet away from the sample location, preferably in the downwind direction. When finished eating or drinking, field personnel shall wash their hands, put their coveralls back on and put on a new pair of nitrile gloves prior to returning to the work area.

3.2 Field Gear and Clothing Restrictions

Because treatments to provide water resistant, water proof, or stain-resistant clothing include the use of PFASs, field personnel shall not wear any water resistant, water proof, stain-resistant treated clothing or Tyvek clothing during the field program. Permissible outer field clothing for PFAS sampling programs includes clothing made from natural fibers, preferably cotton, and rain gear made of polyethylene, vinyl or PVC. Clothing made of synthetic fibers shall be avoided (i.e., reflective vests); however, during cold-weather field events, it shall be allowable to wear synthetic under-layers, provided that they be completely covered by clothing made of natural fibers.

Field clothing shall be laundered with a minimal amount of detergent and no fabric softener or scented products shall be used. Once field clothing has been washed appropriately, field clothing shall be washed a second time on a rinse-only cycle, using only water, prior to drying. Anti-static dryer sheets shall not be used when drying field clothing. Field clothing shall preferably be old cotton clothing that has been laundered many times, as new clothing may contain PFAS related treatments. Clothing containing Gore-Tex™ shall not be worn during the sampling program, as Gore-Tex™ clothing contains a PFAS membrane.

Because field vehicle seats may have been treated with PFAS-containing products for stain resistance, the seats of field vehicles shall be covered with a well laundered cotton sheet or blanket for the duration of the field program in order to avoid direct contact between field personnel clothing and vehicle seat fabric. Measures taken to mitigate field personnel contact with field vehicle seat fabric shall not in any way interfere with the functionality or impede the use of vehicle safety belts.

Waterproof field books shall not be used; field notes shall be recorded on loose paper using aluminum clip boards. Plastic clip boards, self-sticking notes, binders or spiral hard cover notebooks shall not be used. Field notes shall be recorded in pen or pencil. Markers shall not be used.

Most safety footwear is constructed of leather and synthetic materials that have been treated to provide some degree of waterproofing and/or increased durability. Therefore, footwear materials represent a potential source of trace PFASs. Field personnel contact with safety footwear including donning footwear or tying laces shall not occur within 35-feet of the sampling area. If footwear must be adjusted, field personnel shall re-locate to an area a minimum of 35-feet from the sampling area, preferably in a downwind direction, and make the necessary adjustments. Nitrile gloves shall be worn when contacting footwear. The nitrile gloves worn while contacting footwear shall be removed and new nitrile gloves shall be put on prior to re-entering the sampling area.

Disposable nitrile gloves shall be worn at all times. A new pair of nitrile gloves shall be donned prior to the following activities at each sample location:

- Contact with laboratory-suppled sample containers or PFAS-free water containers
- Decontamination of sampling equipment
- Insertion of anything into the well (e.g., HDPE tubing, HydraSleeve, bailer, etc.)
- Insertion of silicon tubing into the peristaltic pump
- Completion of monitoring well purging
- Sample collection
- Handling of QA/QC samples including field blanks and equipment blanks
- After the handling of any non-dedicated sampling equipment or contact with non-decontaminated surfaces

3.3 Personal Hygiene

Field personnel shall not use shampoo, conditioner, body gel, cosmetic cream, or hand cream as part of their personal showering routine on the day of a sampling event, as these products may contain surfactants and represent a potential source of PFASs. Field personnel shall follow their normal hygiene routine the night before a sampling event and then rinse with water only the morning before a sampling event. The use of bar soap is acceptable; however, bar soap including moisturizers shall be avoided.

Field personnel shall not use moisturizers, cosmetics, dental floss, sunscreen, and/or insect repellent for the duration of the field program (unless they are made with natural ingredients or DEET in the case of insect repellent), either on-site or off-site, as these products may contain trace PFASs. Appropriate accommodation to address the prohibition of the use of these substances must be incorporated into a site-specific HASP.

3.4 Sample Area Access

Visitors, including contractors or site personnel, who are not following these general PFAS sampling program protocols shall not be allowed to approach within 35 feet of the sample area until PFAS sample collection activities are complete and the PFAS sample container has been enclosed in a Ziploc® storage bag and placed in the sample cooler.

3.5 Field Equipment Decontamination

Use the procedures in this section to decontaminate all non-dedicated sampling equipment (e.g., submersible pumps, bladder pump components, tubing shears, etc.) used to collect samples:

- Rinse thoroughly with Alconox, Liquinox, or Citranox solution
- Rinse thoroughly with de-ionized (DI) water
- Rinse with methanol
- Rinse with DI water

- Allow to air dry
- Store equipment in clean Ziploc® storage bag until needed for sampling

Decontamination fluids used to clean equipment including Alconox/Liquinox/Citranox, DI water, and methanol shall not be reused during field decontamination and shall be collected and discharged to the publicly-owned treatment works at the on-site treatment building.

APPENDIX C

SOP-2: PFAS PROGRAM SAMPLING PROTOCOLS

APPENDIX C
STANDARD OPERATING PROCEDURE
SOP-2

Title: PFAS Program Sampling Protocols

1.0 GENERAL APPLICABILITY

The purpose of this Standard Operating Procedure (SOP) is to describe the procedures that shall be followed during sample collection for analysis of perfluoroalkyl substances (PFAS).

This SOP includes the following:

- Sample Container Considerations
- Sample Collection
- Sample Shipping Requirements

2.0 RESPONSIBILITIES

The Field Team Leader and field personnel have the shared responsibility to oversee and ensure that the monitoring well purge and PFAS groundwater sampling program is performed in accordance with the program-specific protocols described in this SOP. The Field Team Leader shall ensure that field personnel understand and comply with this SOP.

3.0 SAMPLING PROCEDURES

3.1 Sample Containers

Water samples shall be collected in HDPE sample containers provided by the laboratory specifically for use in the collection samples for analysis of PFAS (i.e., HDPE without a Teflon® liner). Glass containers shall not be used due to the potential for loss of PFAS through adsorption.

Sample container lids shall remain on the sample container until immediately prior to sample collection and lids shall be resealed immediately following sample collection. Field personnel shall hold the sample container lid in their hand until the lid is replaced on the sample container. Field personnel shall not rinse sample container bottles during sample collection. Sample container labels shall be completed using a pen or a pencil after the lid has been re-secured on the sample container. Field personnel shall not use markers to complete sample container labels.

3.2 Sample Collection

Field personnel shall wash their hands and put on a new pair of nitrile gloves prior to sample collection. Once the nitrile gloves are put on, field personnel shall not handle papers, pens, clothes, etc. prior to the collection of groundwater samples. If field personnel need to take notes or handle anything other than the sample container prior to collecting the sample, the old nitrile gloves with which contact was made shall be removed and new nitrile gloves put on.

Field personnel shall hold the sample container in such a manner that the sample container does not come in direct contact with the sampling equipment. The sampling container shall be filled completely. If field personnel observe suspended solids in the collected sample, a new sample shall be collected, if possible. If it is not possible to collect a sample with minimal suspended solids (i.e., no evidence of solids settling at the bottom of the sampling container), field personnel shall contact the project manager and, if the sample is submitted for analysis, indicate the presence of suspended solids as a note on the chain-of-custody.

Samples shall be placed directly into the laboratory-supplied HDPE containers. Once the sample container lid has been resealed, groundwater sample containers are to be placed into individual new Ziploc® (or equivalent) storage bags. Following sample collection, sample containers enclosed within their Ziploc® (or equivalent) storage bags shall be placed on ice in the laboratory-provided sample cooler. Field personnel shall minimize sample exposure to sunlight during sample handling and storage.

All sampling materials shall be treated as single use and disposed of following completion of sampling at each location.

3.3 Sample Shipping

Groundwater sample containers shall be stored on ice and maintained at approximately 4 degrees Celsius (ºC) and transported by overnight courier to the laboratory. Field personnel shall only use new, fresh ice. Reusable chemical or gel ice packs shall not be used as these may contain PFAS. Tracking numbers for all shipments shall be provided once the sample coolers have been shipped to ensure their timely delivery.

APPENDIX D

SOP-3: QA/QC SAMPLING PROGRAM PROTOCOLS

1.0 GENERAL APPLICABILITY

The purpose of this Standard Operating Procedure (SOP) is to describe the Quality Assurance / Quality Control (QA/QC) samples that shall be collected during a perfluoroalkyl substances (PFAS) sampling program.

This SOP includes protocols for the collection of the following QA/QC samples:

- Equipment Blanks
- De-ionized Water Blanks
- Field Duplicates
- Field Blanks
- Trip Blanks
- Analytical QA/QC

2.0 RESPONSIBILITIES

The Field Team Leader and field personnel have the shared responsibility to oversee and ensure that the PFAS QA/QC sampling program is performed in accordance with the program-specific protocols described in this SOP. The Field Team Leader shall ensure that field personnel understand and comply with this SOP.

Field personnel shall inquire of the submersible pump manufacturer and identify a pump model whose construction does not include any Teflon® components (e.g., check balls, O-rings, compression fittings, etc.).

3.0 QA/QC PROTOCOLS

3.1 Equipment Blanks

Equipment blanks shall be collected at a rate of one per setup per event for non-dedicated sampling equipment (i.e., submersible pumps). Equipment blanks shall be collected using laboratory-supplied PFAS-free water and shall be collected in laboratory-supplied high-density polyethylene (HDPE) containers.

After decontamination of the submersible pump in accordance with the procedure described in SOP-1, equipment blanks will be collected by pouring the laboratory supplied PFAS-free water into a new and unused HDPE sample bottle and then pumping the PFAS-free water through new HDPE tubing and new silicon tubing with the submersible pump into the sample container. When the sample container is full, replace the sample container lid and re-seal. Equipment blank container lids shall remain in the hand of field personnel until replaced on the sample container. Sample container labels shall be completed using a pen or pencil after the sample container lid has been resealed. Field personnel shall not use markers to complete sample container labels.

3.2 Field Duplicates

Field personnel shall collect one blind field duplicate for every 20 primary field samples collected. Field personnel shall collected field duplicates immediately after collection of the primary field samples. Field duplicates shall be collected in the laboratory-supplied PFAS-free HDPE sample containers. Field duplicate container lids shall remain in the hand of field personnel until replaced on the sample container. Sample container labels shall be completed as described above.

Field personnel shall collect groundwater field duplicates for analysis of PFAS using the following procedures:

- Following collection of the primary sample, change gloves and prepare to collect the field duplicate.
- Field duplicates shall be collected immediately following collection of the primary sample.
- Completely fill the laboratory-provided HDPE groundwater sample container.
- Replace and re-seal the lid on the groundwater sample containers and then complete the sample container label as described above.

3.3 Field Blanks

Field personnel shall submit of one field blank per day of sampling. Field blanks shall consist of PFAS-free water containerized in an HDPE sample container filled at the laboratory prior to beginning the field program. Field blank sample containers shall be opened during the collection of a sample and the laboratory-supplied PFAS-free water contained therein shall be poured directly into a laboratory-supplied HDPE sample container and then resealed. Field blank container lids shall remain in the hand of field personnel until replaced on the sample container. Sample container labels shall be completed as described above.

3.4 Trip Blanks

Field personnel shall submit one laboratory-supplied trip blank per day of sampling. Trip blanks shall consist of PFAS-free water containerized in an HDPE sample container filled at the laboratory prior to the beginning of the field program. Field personnel shall place one trip blank container in the sample cooler at the beginning of the day and the trip blank shall remain in the cooler for the duration of sampling activities conducted on that day. Trip blank containers shall be submitted to the laboratory with the daily field sample shipment.

3.5 Analytical QA/QC

Internal laboratory QA/QC shall consist of one laboratory blank and one matrix spike / matrix spike duplicate (MS/MSD) for every 20 primary field samples collected for analysis. Field personnel shall collected MS/MSDs immediately after collection of the primary field samples as described above for field duplicates.

As part of the internal QA/QC, relative percent difference (RPD) shall be calculated between samples and corresponding field or laboratory duplicates. The laboratory quality assurance portion of the laboratory certificates shall be reviewed to verify that all calculations/recoveries were within acceptable limits as established by the laboratory method.

3.6 Sample Shipping

QA/QC samples shall be maintained at a temperature between 0 and 4º C during shipping. Only new, fresh ice may be used in sample coolers. Field personnel shall not use reusable chemical or gel ice packs, as these may contain PFAS. Samples shall be shipped via courier service with priority overnight delivery. Tracking numbers for all shipments shall be provided once they have been sent out so to ensure their timely delivery.

APPENDIX E

SOP-4: PFAS SEDIMENT SAMPLING PROTOCOLS

APPENDIX E
STANDARD OPERATING PROCEDURE
SOP-4

1.0 GENERAL APPLICABILITY

The purpose of this Standard Operating Procedure (SOP) is to describe the procedures that shall be followed during the collection of sediment samples for analysis of per- and polyfluoroalkyl substances (PFAS).

This SOP includes the following:

- Equipment;
- Sample Container and Handling Considerations;
- Sample Collection Procedures;
- Sample Shipping Requirements; and
- Field Equipment Decontamination Procedures.

Refer to SOP-1 “General Field Methods for PFAS Sampling”, SOP-2 “PFAS Sampling Protocols”, and SOP-3 “Quality Assurance / Quality Control Protocols for PFAS Sampling” for general PFAS sampling considerations and QA/QC protocols.

With the exceptions provided in these SOPs, field personnel shall follow the sediment sampling protocols according to the standard Golder SOPs or project specific Sampling and Analysis Plan (SAP).

2.0 RESPONSIBILITIES

The Field Team Leader and field personnel have the shared responsibility to oversee and ensure that the PFAS sediment sampling program is performed in accordance with the program-specific protocols described in this SOP. The Field Team Leader shall ensure that field personnel understand and comply with this SOP.

3.0 SEDIMENT SAMPLING PROCEDURES

3.1 Equipment

Field personnel shall not use equipment made of Teflon®, other PFAS-containing materials or materials coated with waterproofing agents including sampling tools, tape, strings/cables, boat components and waders among others. Written details on the equipment construction materials and/or Safety Data Sheets (SDS) shall be requested and reviewed as applicable before commencement of the field program so that alternative arrangements can be made if needed. Field personnel shall not re-use materials between sample locations whenever possible. Following completion of sediment sampling at a given location, field personnel shall place all disposable materials in heavy-duty (i.e., lawn waste) garbage bags for disposal. Field personnel shall wear nitrile gloves at all times.

3.2 Sample Containers and Handling

Sediment sample containers shall not be handled without first donning a new, clean pair of nitrile gloves. Sediment samples shall only be collected in high density polyethylene (HDPE) or polypropylene containers provided by the laboratory for specific PFAS use (no Teflon liner). Glass containers shall not be used due to the potential for loss of PFAS through adsorption. Sediment sample container labels shall be completed after collection of the sediment using a non-gel pen or a pencil. The sediment sample shall be collected first and the lid to the sample container shall be re-sealed before the sample container label is completed. If a marker must be used, nitrile gloves shall be removed after use of the marker and replaced with new ones.

3.3 Sample Collection

A new pair of nitrile gloves shall be worn prior to the handling and recovery of the sampling equipment and the collection of each sample. Sediment samples collected for analysis of PFAS shall be obtained using clean, decontaminated grab or core samplers.

Sediment samples are to be placed directly into the laboratory-supplied HDPE or polypropylene containers. The containers shall be filled completely to minimize surface-to-volume ratio and therefore the likelihood of PFAS loss via sorption. No subsampling or sample transfer shall occur in the field. Once the sediment sample container lid has been resealed, sample containers are to be placed into individual new Ziploc® storage bags. Following sample collection, sediment sample containers enclosed within their Ziploc® storage bags will be placed on ice in the laboratory-provided sample cooler. During sample processing and storage, minimize the exposure of the sample to light.

Samples shall be collected from the most downstream to the most upstream location, but, whenever possible, background samples interpreted to be less impacted shall be collected first. Where surface water samples and sediment samples are collected at the same location, surface water samples shall be collected first to minimize the presence of sediment in the water column.

If sampling requires physical entry by field staff into the water body, field staff should stand at the downstream side of the sample location to minimize disturbance of the sample location.

Field personnel shall decontaminate non-dedicated tools and sampling equipment as indicated below in this SOP. Equipment blanks must be collected using PFAS free water poured over appropriate equipment as per SOP-2.

3.4 Sample Shipping

Sediment sample containers shall be stored on ice and maintained at approximately 4 degrees Celsius (ºC) and transported by overnight courier to the laboratory. Field personnel shall only use new, fresh ice. Reusable chemical or gel ice packs shall not be used, as these may contain PFAS. Tracking numbers for all shipments shall be provided once the sample coolers have been shipped to ensure their timely delivery.

3.5 Field Equipment Decontamination

Use the procedures in this section to decontaminate all non-dedicated sampling equipment (e.g., grab or core sampler) used to collect sediment samples:

- Clean with a brush to remove particulate matter and surface films;
- Rinse thoroughly with Alconox or Citranox solution;

- Rinse thoroughly with de-ionized (DI) PFAS-free laboratory-supplied water;
- Rinse with methanol;
- Rinse with de-ionized (DI) PFAS-free laboratory-supplied water;
- Allow to air dry; and
- Store equipment in clean Ziploc® storage bag until needed for sampling.

Decontamination fluids used to clean equipment including Alconox, Citranox, PFAS-free water, and methanol shall not be reused during field decontamination and shall be containerized and disposed of in accordance with local regulations or protocols.

Use of PFAS pre-tested tap or tanker water is acceptable for decontaminating large field equipment that require a significant amount of water such as grab and core samplers. However, pre-testing the water for PFAS and other potential contaminants of concern must be carried out before the field program begins and included in the site-specific field protocol. Pre-testing shall occur at least 3 weeks before the field work starts to receive the results and make any necessary alternative plans in time. Re-tested shall be conducted in case potential changes to the quality of the source water are expected over the duration of the field program.

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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