Sanitary Trunk Sewer Pre-Design Study and Report

Greater Shediac Sewerage Commission
Pre-Design Study and Report
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Greater Shediac Sewerage Commission

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1 Introduction

1.1 Background

Upon Submission of the Sewer System Master Plan (Master Plan) (Englobe, March 13, 2023), Englobe identified capacity issues with the existing sewer system within the Town. These conditions along with future plans for large development within the Town of Shediac, Englobe recommended that an additional trunk sewer be constructed to alleviate current flows while also increasing the overall capacity of the existing system.

1.2 Objectives

The main objective of this project was to complete a preliminary design study on the installation of a new gravity trunk sewer extending from the Veterans Highway (south of the community garden) to the existing Wastewater Treatment Plant (WWTP). The primary trigger for a new trunk sewer is to accommodate the future development of residential and commercial land between Main St. and the Veterans Highway, including land south of the highway.

As a part of the pre-design, Englobe reviewed the catchment area overlap between the existing trunk sewer and the proposed trunk sewer. This was done to determine which sewer mains, currently connected to the existing trunk sewer, could be re-directed in the future to reduce flow into the existing trunk sewer, as it is nearing capacity.

1.3 Pre-Design Tasks

To complete the pre-design study, the general sequence of tasks are as follows:

- Review of Existing Information: Review of proposed development plans, LiDAR, As-builts, and past reports to understand the requirements of the new trunk sewer. Utility companies have also been contacted and provided with the preliminary alignment to identify the relevant utilities within the limits of the work.
- Topographic Survey and Data Collection: Englobe completed a detailed topographic and intrusive survey of all infrastructure relevant to the project, creating a base plan of the surrounding area's existing conditions.
- Geotechnical Investigation: Englobe completed borehole tests along the trunk sewer alignment to understand the current soil conditions, rock depth and water table of the project area.
- Preliminary Pipe Alignment: Using all collected data, Englobe selected two (2) alignments, each with horizontal and vertical profiles to be used to review alignment impacts.
- Sewershed Boundary Review: Englobe determined the preliminary sewershed boundaries of the preliminary alignments, reviewing proposed catchment area, its overlap with the existing trunk sewer, and land use requirements for both options.
- Hydraulic Modelling: Hydraulic modelling was completed using SewerCAD to confirm preliminary pipe sizing as well as peak design flows of the system.
- Preliminary Cost Estimate: Englobe completed a high-level cost estimate for the proposed alignments.

A detailed discussion of the study methodology, findings, and recommendations are presented in the following report.

2 Existing Conditions

2.1 Project Area

The conceptual alignment shown in the Master Plan was used as a baseline when evaluating preliminary alignment options for the pre-design. This area generally extends from the Veterans Highway south of the community garden and follows Shediac trail #5 up to Ohio Road. The trunk sewer then crosses through Main St. and connects north of main St. into the existing trunk sewer just before flowing into the WWTP. The figure 2-1 below shows the project area for the new trunk sewer.

Figure 2-1: Project Area

2.2 Review of Available Information and Data

2.2.1 Shediac Sewer Master Plan

In March of 2023 englobe completed a Master plan to review the GSSC sewer collection system and identify hydraulic risks and infrastructure deficiencies. The Commission is frequently asked about the capacity of its system for potential development and has primarily made infrastructure investments reactively.

By creating a hydraulic model of the collection system, the Commission will be able to respond to development requests and make informed infrastructure investment decisions. This Sewer System Master Plan report details the construction of the hydraulic model and provides findings and recommendations.

While the collection system was generally found to have a sufficient level of service, specific sections of the sewer system were identified as being at a heightened risk of surcharging. In cases where capacity constraints were identified, both under existing conditions and following additional development, one or more corresponding recommendations were made.

One of the key recommendations was a proposed secondary trunk sewer upgrade to by-pass both Lift Station 3 and Lift Station 4 to relieve capacity in the existing trunk sewer by re-routing a new forcemain to the south. This would reduce hydraulic surcharging and provide additional capacity for future development in the existingTrunk Sewer sewershed.

The master plan and model provided all the required existing and theoretical flows for this preliminary design for a new trunk sewer.

2.2.2 Record Drawings

Englobe reviewed the available records of the existing GSSC infrastructure in the Project Area. These record drawings were valuable in establishing a preliminary existing conditions plan used in early iterations of the proposed alignment. Existing conditions were subsequently updated with data gathered during the field investigation program.

2.3 Data Collection

As requested for the project's pre-design, Englobe completed an extensive field data collection program which included: Topographic survey, intrusive survey of underground infrastructure, and a geotechnical investigation of the soils within the proposed project area. These elements are described in further detail in the following sections.

2.3.1 Topographic Survey

A detailed topographic survey was completed for use within the pre-design of the project, collecting the following horizontal and vertical location of the following features for the proposed alignment:

- Roadway Centerline
- Edge of pave
- Curb
- Sidewalks
- Edge of trail
- Ditches
- Culverts
- Driveways
- Outfalls
- Hydrants
- Manholes/Catch basins
- Signs
- Overflows
- Valves
- Watercourse Banks
- Trees/Treeline
- Poles
- Other relevant features

In addition to the above noted features, locations of all underground utilities identified on site by utility companies will be requested and picked up during Detailed Design.

2.3.2 Intrusive Survey

On April 11, 2023, Englobe completed manhole intrusives for manholes along and connecting to the proposed alignment, along with previously completed manhole intrusives from the Master Plan for many sanitary manholes throughout Shediac. Water valve intrusives were also completed within the project area. The intrusive survey was used to determine the depths, sizes, materials, and potential conflicts of the underground infrastructure. A more detailed survey will be required during the detailed design.

2.3.3 Geotechnical Investigation (Pending Final Report)

Englobe completed a comprehensive geotechnical investigation as a part of the preliminary design study to complete preliminary estimates and understand the rock depth and soil conditions of the proposed alignment.

On May 3rd, 2023, Englobe completed these 5 boreholes along the proposed alignment, shown in Map 2-1 on the following page. A full report detailing the soil conditions and rock depth of the project area has been produced and can be found in Appendix A

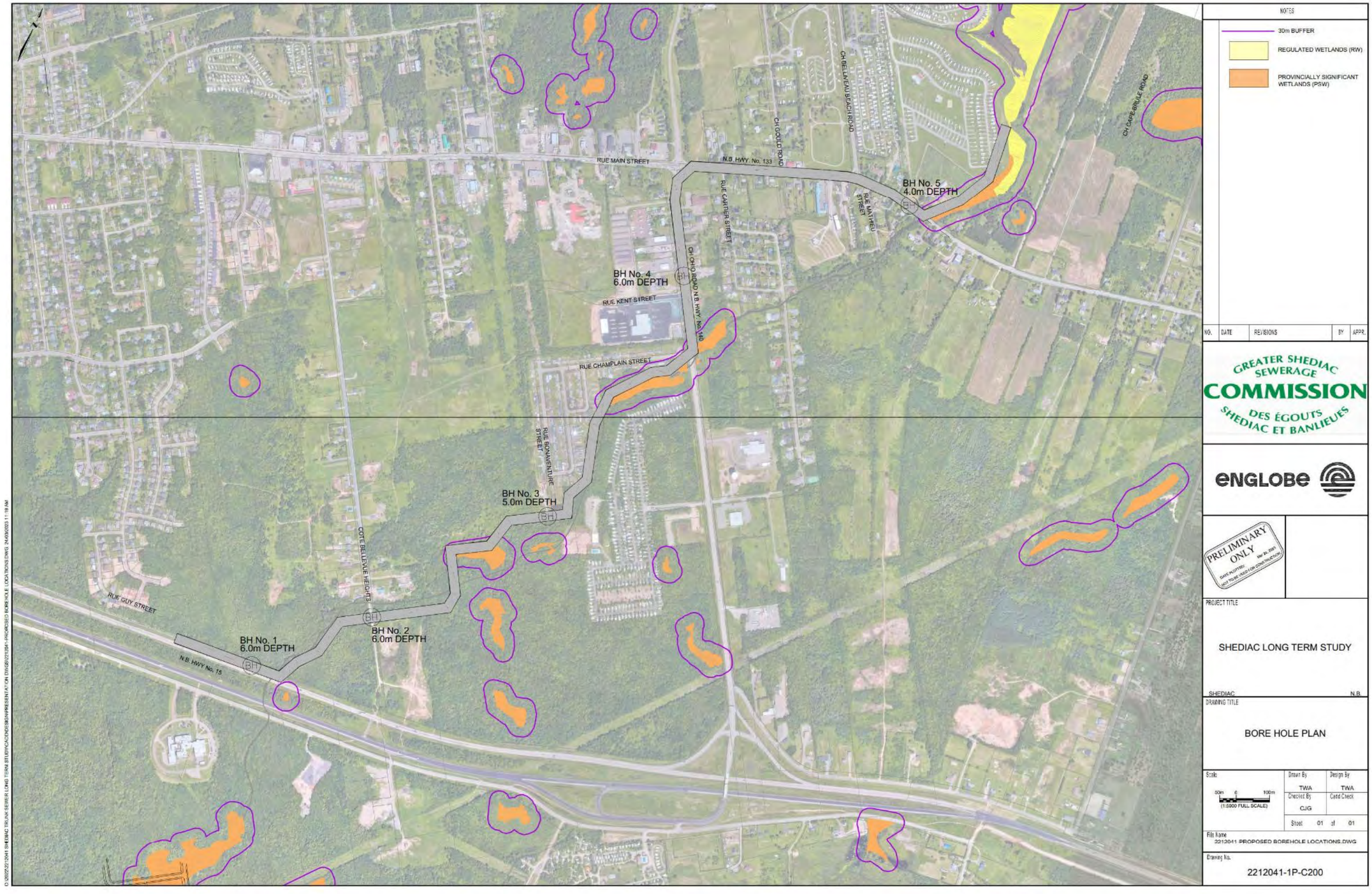
2.4 Existing Infrastructure

The existing infrastructure within the surrounding area of the proposed trunk sewer is described in the following section, and is shown in Appendix B - Prleliminary Trunk Sewer Design Drawings.

The new trunk sewer's proposed routing starts adjacent to Highway 15 south of Guy Street and runs along the existing Town of Shediac walking trail and adjoining water course. The new Trunk Sewer then ties into Ohio Rd. from Champlain St. to Main Street and east along Main St. to the existing trunk sewer as shown in Appendix B.

The existing infrastructure affected along this route is as follows:

- Culverts
- Hydro poles
- Underground electrical
- Sanitary, Water and Storm Infrastructure
- Road Structure
- Curb and sidewalk
- Walking Trail System



Map 2-1: Borehole Locations

2.4.1 Existing Forcemain

The existing forcemains within the Town of Shediac all currently discharges to the existing trunk sewer. The proposed new Trunk Sewer will allow the option to re-direct flows from Lift Station 3 and Lift Station 4, which captures all the flows west of Weldon and Victoria Street.

Presently a portion of Belleview Heights and the proposed development area is serviced by Lift Station 16.

2.4.2 Existing Gravity Sewer

The area near the proposed trunk sewershed discharges to the existing trunk sewer, located near Pascal Poirier.

The existing trunk sewer is 5200m long with pipe sizes ranging from 525mm to 900mm and comprises mostly concrete piping, constructed in 2008.

2.4.3 Existing Utilities

Englobe requested utility locates from all telecom companies through info-excavation, and NB Power to identify potential conflicts along the proposed alignment. The following infrastructure was noted:

- Power
- Communications
- Piping infrastrucure

2.4.4 LS-3 Dock Street

LS-3 is located at the northern end of Dock Street in West Shediac. This station receives flows LS-13, LS-2 and roughly 91.0 hectares of gravity piping. The existing station is equipped with duplex 20 hp self priming pumps with an estimated capacity of 32.9 L/s per pump and 47.5 L/s for both pumps. Flows are discharged to the existing trunk sewer near the intersection of Weldon and Main Street.

2.4.5 LS-4 Hamilton Street

LS-4 is located just west of the Hamilton Road and Shore Drive intersection. Currently, this station receives flows from LS-5 and about 48.7 hectares of gravity piping. The existing pumps are 20 hp with a capacity of 38.0 L/s for a single pump and two (2) pumps is estimated to about 71.50 L/s. Flows are discharged to the existing trunk sewer near the intersection of Weldon and Main Street.

3 Proposed New Trunk Sewer

The proposed new trunk sewer extension is intended to service all planned development of the surrounding area as well as receive the flows from the future forcemain pumped from LS-03. What has triggered this study is the recommendations from the previous study Master Plan. The previous study identified capacity issues in the existing system, particularly the existing trunk sewer, as shown in Figure 3-1 from the Master Plan.

Figure 3-1: Existing Trunk Sewer Capacity Limits

The red portions of the pipe network represent pipe sections that have a hydraulic grade line greater than 130% of the pipe's diameter, and are less than 2.2m from ground level. The Master Plan contains more information on the capacity issues of the existing trunk sewer. From the reviewed data, the existing trunk sewer running through Rue Pascal-Poirier and out to the WWTP east of Town is

reaching its maximum capacity and will require a second trunk sewer to provide sufficient capacity for new developments, as well as deviate some current flows.

3.1 Sewershed Boundary

The Master Plan provides a general overview of the catchment area of the existing trunk sewer. Currently, the existing trunk sewer services the whole Town of Shediac. With the addition of the new trunk sewer, a section of the catchment area for the existing trunk sewer will be directed into the new trunk sewer, along with a large section of currently undeveloped land.

3.1.1 Contributing Area

The total sewershed for the proposed trunk sewer includes three (3) primary components:

- Gravity Area – New Development
- Gravity Area – Existing Development
- Pumped Area

Each sewershed component is further defined in the following sections:

3.1.1.1 Gravity Area – New Development

To determine the servicing area of the proposed new trunk sewer, an area was modelled using the proposed alignment and extending a surface outward at a 1% grade until 2.5m below ground elevation was reached. This area mimics a sanitary service extending from the minimum basement elevation of a house, creating a theoretical service area of the proposed trunk sewer. The proposed serviceable area can be found in Map 3-1: Sewershed Servicing Area.

3.1.1.2 Gravity Area – Existing Development

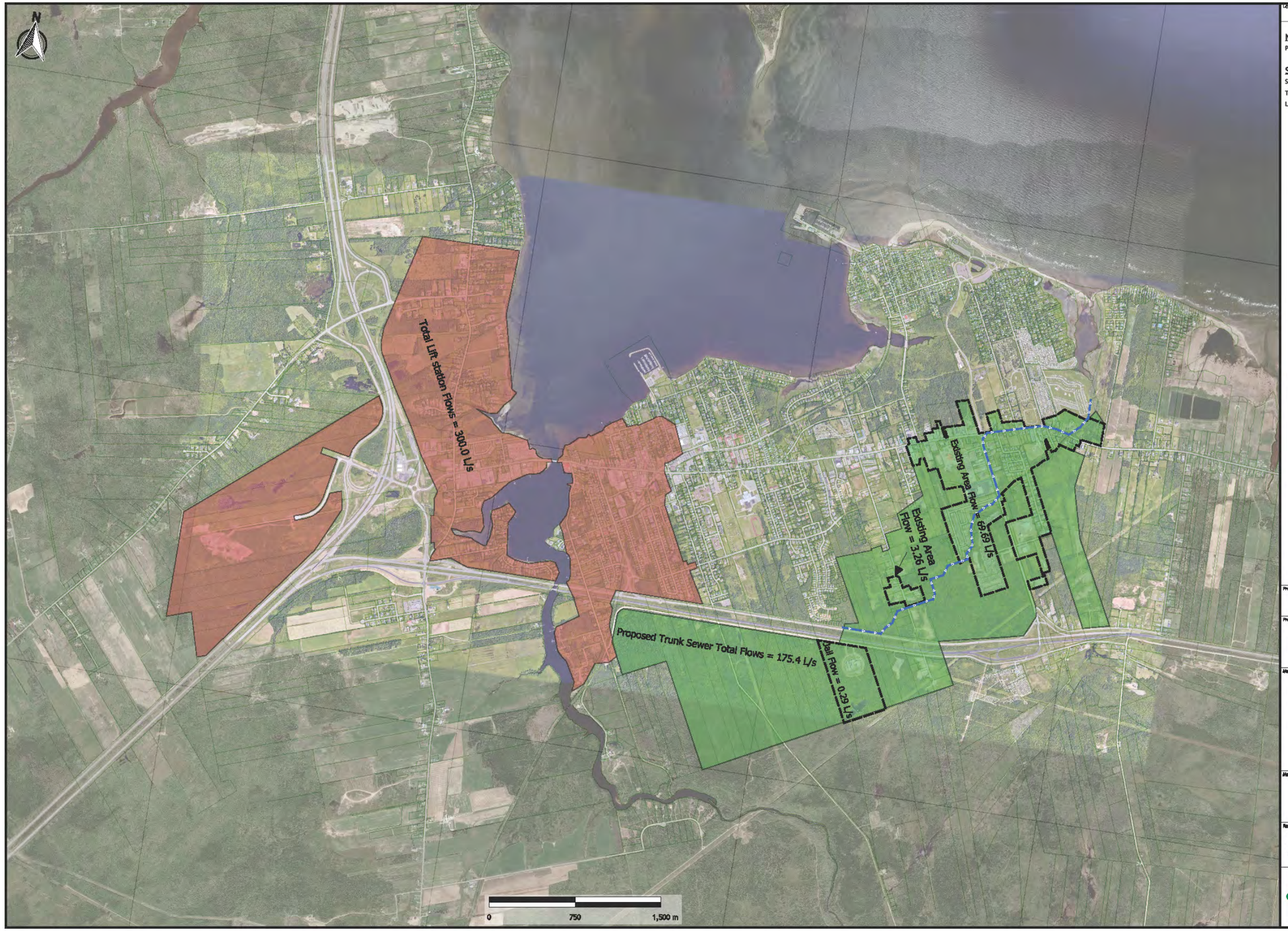
With the addition of the new trunk sewer, a portion of flows for the existing trunk sewer will also be directed into the new trunk sewer. This redirection of flow is intended to alleviate the flows of the existing trunk sewer, which is currently beyond theoretical capacity and is at risk of surcharging, as per the Master Plan.

3.1.1.3 Pumped Area

To further alleviate capacity on the existing trunk sewer, it is proposed to re-direct flows from LS 3 and LS 4 sewershed basins. These pumping stations currently discharge wastewater into the top of the trunk sewer near the intersection of Weldon St. and Main St.

The combined sewershed of these two pumping stations generally includes all areas to the west of Weldon and Victoria Street. In addition to representing a significant existing flow, the areas serviced by these pumping stations also include substantial future development areas.

Map 3-1 shows the full serviceable area of the above mentioned sewersheds.



Legend / Notes:

LEGEND

New Trunk Sewer Proposed Alignment
Proposed Trunk Sewer - Pipes

Servicing Area
Servicing Area Relieved From Existing Trunk Sewer
Trunk Sewer Servicing Area
Lift Station Servicing Area

Project Location:
SHEDIAC, N.B.

Project Title:
SHEDIAC TRINK SEWER PRE-DESIGN

Map Title:
SERVICING AREAS

Map ID:
MAP No: 3-1
PAGE No: 1 of 1
SCALE: 1:15000

Revisions:
DATE: 2023-04-12 BY: OFR
PROJ No: 2212041 APPR:

GREATER SHEDIAC SEWERAGE COMMISSION
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Map 3-1: Sewershed Servicing Area

3.1.1.4 Overall

The following table summarizes the catchment area changes with the proposed new trunk sewer:

Table 3-1: Existing and Proposed Trunk Sewer Catchment Areas

Trunk Sewer Catchment Areas	Catchment Area of Proposed New Trunk Sewer (ha)
Proposed Trunk Sewer Catchment Area (Gravity - Excluding Existing Development)	387.62
Proposed Trunk Sewer Catchment Area (Pumped)	588.21
Trunk Sewer Catchment Area (Existing Development - Gravity)	148.61
Total	**1124.44**

To gain an understanding of the future developments planned near the proposed trunk sewer, the Master Plan was reviewed and considered in the design, incorporating all future developments into the model. Once the future developments were added in, the vertical alignment was adjusted to provide service to the additional area.

3.1.2 Land-Use Distribution

To develop flow estimates for sizing the proposed new trunk sewer, the sewersheds of the proposed trunk sewer were overlaid on the Town's zoning map and the future development zoning to determine the distribution of land-use types. The distribution of land-use types for the proposed sewershed options were split up into residential and non-residential areas, and are summarized below:

Table 3-2: Land Use Type Distribution of Project Area

Land-Use Type	Area (ha)
Residential	519.54
Non-Residential	706.82

3.1.3 Equivalent Residential Units

When calculating future loads for undeveloped areas, an equivalent number of residential units was calculated and assigned to the area. This was done by dividng the estimated flow contribution from that area by an assumed flow rate of 798 L/day/residential unit, assuming 45 units per hectare of undeveloped land.

By representing development flows in this way, a cost breakdown and comparing existing conditions to new development is more straightforward.

A comparison of new units vs. the calculated equivalent residential units are shown in the table below:

Table 3-3: New Units vs. Equivalent Residential Units

Component	Gravity Area	LS 3 + LS 4	Total
Existing	282	1803	2085
New Units			
Planned Developments	3365	1261	4626
Future (Long-Term)	4935	4018	8953
Sub Total: New Units	**8300**	**5279**	**13,579**
Total	**8582**	**7082**	**15,664**

A full breakdown of units and development locations can be found in Appendix C.

3.2 Preliminary Pipe Alignment

The alignment is planned to start at the high point of the NB 15 Veterans Highway, and run for approximately 4.3 km, connecting to an upsized section of the existing trunk sewer, discharging into the WWTP. The proposed trunk sewer is intended to be designed to minimize installation depth, while also being able to accept any new development within the catchment area. To meet these design conditions, the following criteria were used:

— Maximum manhole spacing: 120m

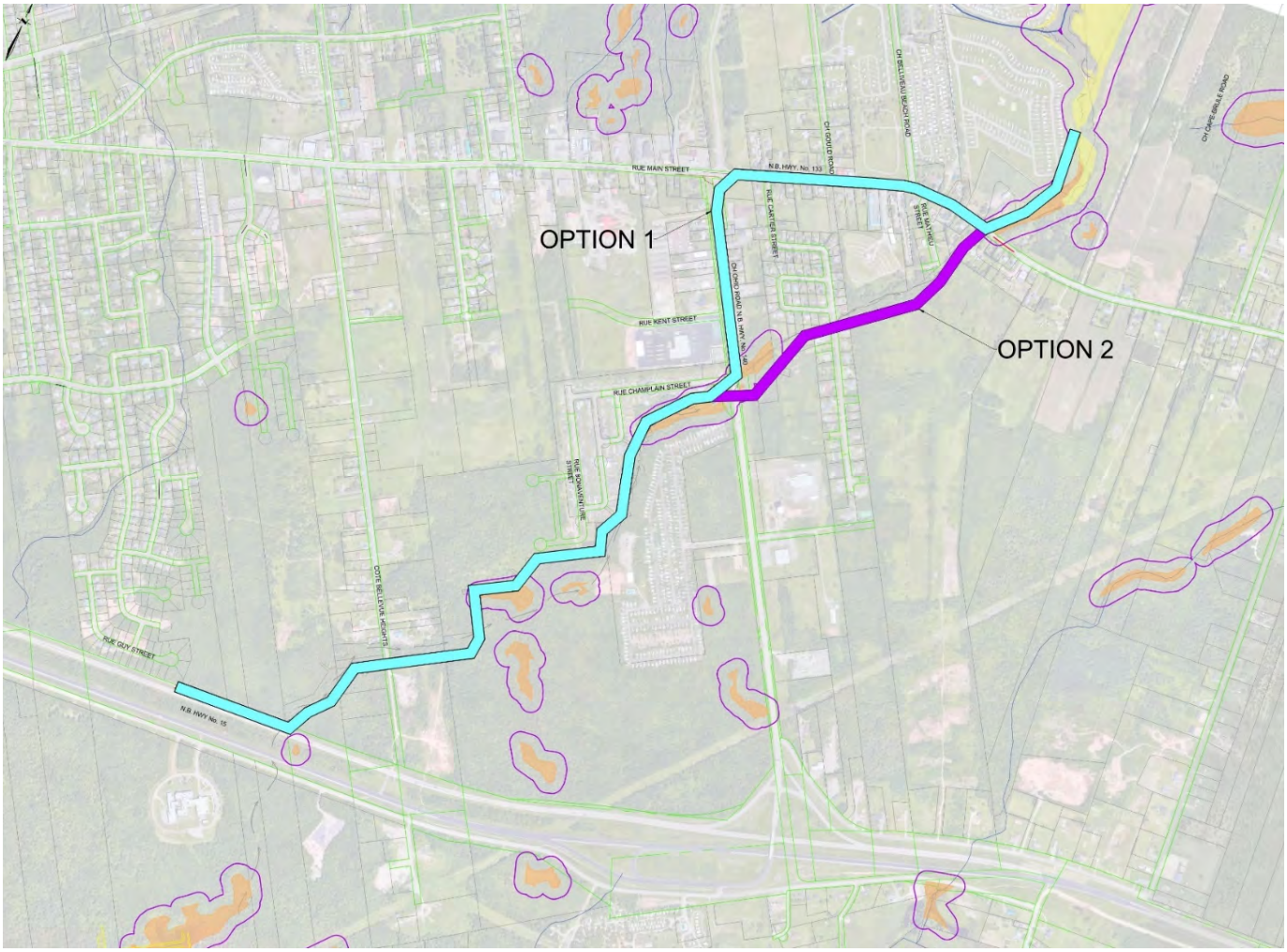
— Target minimum depth to crown: 1.8m

— Minimum pipe slope: 0.40%

3.2.1 Evaluated Options

The topography of the sewershed was reviewed to identify natural drainage patterns. A watercourse runs diagonally from the south-west to the north-east of the sewershed, providing a natural collection point for the sewershed. It was therefore decided to follow the existing watercourse while leveraging the existing trail for easements and access. Once the alignment along the trail was established as the best alignment option for the sewershed, two options for the northeastern half of the trunk sewer were investigated, with Option #1 following Ohio Road to the north, then following Main St. to the east, and Option #2 cutting through the private land following the watercourse up to Main St. south of Ocean Surf. From Main St., both options follow the watercourse to the north, connecting to the existing trunk sewer just before the WWTP. Both options can be seen in the figure 3-2 below.

Figure 3-2: Evaluated Options



The benefits and drawbacks of each option are summarized in the table below:

Option	Pros	Cons
Option #1	- More units serviced - Less land acquisition required	- Longer pipe length - More construction on Main St.
Option #2	- Shorter pipe length - Smaller pipe size	- More construction near watercourses & wetlands - More land acquisition required

Based on the above investigation, Option #1 was selected as the preferred option due to the greater units serviced, alleviating greater flows from the existing trunk sewer, and the minimal land acquisition and environmental requirements, minimizing potential issues during the design and construction phases.

3.2.2 Trunk Sewer Horizontal Alignment

Appendix B shows the preliminary trunk sewer alignment, which starts at the high point of the Veterans Highway, at STA 1+000. The trunk sewer then follows Shediac trail #5 through the forest crossing Bellevue Heights, running alongside the watercourse up to the intersection of Ohio Road and

Champlain Street, directing the flow down Ohio Road and along Main St., where it turns up north to the WWTP at STA 4+875.

This alignment was selected to leverage the existing trail alignment and to minimize the land acquisition requirements previously described in section 3.2.1.

3.2.3 Trunk Sewer Vertical Alignment

The preliminary trunk sewer alignment aims to stay at 1.8m of depth where possible, keeping a minimum grade of 0.4%. In certain cases, the trunk sewer must change in depth or grade to connect into existing infrastructure, service new or existing areas, or get under watercourses and other existing features. The resulting vertical pipe alignment has a maximum grade of 4.08% and a depth of 5.5m to accommodate these cases.

3.3 Land Acquisition

To be able to construct the proposed trunk sewer so that it will be able to service future developments within the area, large sections of the proposed trunk sewer are planned to be constructed outside of Town's Right of Way. To allow for construction and future maintenance of the proposed trunk sewer, the GSSC and Town of Shediac would need to negotiate easements through various properties before Detailed Design can begin.

3.3.1 Easement Width

Easement width required for the project must consider the area necessary to complete the installation and maintenance of the proposed underground infrastructure using conventional (open cut) methods. Therefore, the easement's required width depends on design aspects such as pipe depth and maintenance roads.

The proposed trunk sewer in the easements not owned by the Town of Shediac have a pipe depth range of 1.8m to 5.5m. To accommodate any maintenance required for the trunk sewer after construction and an access road for maintenance, it is proposed that a minimum maintenance easement of 10m in width be acquired. During the construction of the trunk sewer, it is proposed that a temporary easement 5m wider than the maintenance easement be obtained to accommodate the construction of the trunk sewer.

3.3.2 Required Easements

Table 3-5Table 3-4 presents the required easements to be acquired by the Town before constructing the proposed trunk sewer. Appendix B shows all areas where the alignment crosses private land.

Table 3-4: Easement Area and Owners

Land Owner	PID	Area (m^2)
Corporation of the Anglican Parish of Shediac	00882670	2511
Corporation of the Anglican Parish of Shediac	70459854	48
Killam Properties SGP	70387600	99
NLC Properties Ltd.	70677919	864
NLC Properties Ltd.	70677901	1077
Ocean Surf Ltd.	70086335	1844
Total		**6443**

3.4 Flow Estimation

Once the preliminary pipe alignments and sewershed delineations were established, theoretical flow estimates were completed at various points in the proposed trunk sewer. Englobe completed flow calculations for the Master Plan and used updated development units along with the proposed sewershed to develop preliminary flow values for the proposed trunk sewer.

3.4.1 Overall Approach

Development areas and associated flows for the various sewersheds were previously estimated in the Master Plan. Unless otherwise described below, the various flow components for the proposed trunk sewer were used directly from the SewerCAD model developed as part of that study.

A summary of the major inputs is provided below:

— Existing Flows

  — Residential: The model was populated with dry weather (sanitary) loading by utilizing aerial imagery (2022) to create a node for individual dwellings in GIS. These nodes were then imported directly into the model using SewerCAD's "load builder" function to assign the flows to the nearest manhole.

    Initial average loading for residential development was set at 340 l/person/day in accordance with the Atlantic Canada Wastewater Guidelines (2006). However, initial calculations necessitated an increase of this value to more closely represent the flows as provided in the GSSC SCADA. As a result, residential loading was adjusted to be **380L/person/day**, which aligns with the Atlantic Canada Wastewater Guidelines 2022 edition

    Non-residential: Non-residential areas were assigned loading using an initial load/area allowance of 35 m^3/ha (Atlantic Canada Wastewater Guidelines). This theoretical value was found to significantly over-represent the flows compared to recorded values. Therefore, to adjust the model to recorded values, the commercial and industrial loading rates were adjusted to 17 m^3/ha which is consistent with Englobe's experience with previously completed flow monitoring assignments in similar areas

    - Included in commercial areas are the following:
    - Restaurants, cafés, bars;
    - Shops, stores and boutiques;
    - Auto repair;
    - Office buildings and city hall ;
    - Hairdressers, nail salons, etc.

    The commercial loading rate might be higher for some of these types of loads, but it is important to consider that the property can be purchased and replaced by higher load types of businesses.

    For all other types of loading including churches, institutional flows, day-cares, gyms, etc. Please refer to the Master Plan.

  — I&I: The inflow and infiltration of the existing loading is based on applying an I&I rate to the length of pipe in km. Since future street configurations are unknown, pipe lengths/sizes are also unknown. Therefore, an area loading factor is applied to the development area to account for potential I&I.

    As found in the Atlantic Canada Wastewater Guidelines, the area allowance ranges from 0.14 to 0.28 L/sec per gross hectare. For the purpose of the future loading analysis, a factor of **0.21 L/sec** per gross hectare was used as it is the average value of the range.

— Future Flows

  — Planned developments: This area represents the known prospective developments in the Town of Shediac, meaning they have the potential to occur in a short-term planning horizon.

    All known developments from the shared map provided for the Master Plan were implemented into the model, as well as any changes to the map, which are mentioned in section 3.4.2.

  — Long-Term Future Growth areas: These areas represent a total planning horizon of 50 years (2072). Reflecting the uncertainty associated with Long Term Planning, no infrastructure recommendations were made to address any deficiencies that were identified through hydraulic modelling. However, those deficiencies are highlighted in this report and accompanying drawings to provide the Commission with a sense of where capacity could be constrained in the future.

    Long Term Planning development was assumed to occur in undeveloped areas that were not specifically identified in the Planned Development scenario. An annual growth rate was applied to estimate the growth that could occur between the end of the Planned Development scenario and the end of the 50-year planning horizon (2072).

    The following additional assumptions were made when estimating Long Term Planning growth:

    - Non-residential development (commercial/industrial) growth is equal to residential growth
    - Growth is based on the estimated seasonal population (# of dwellings at 2.1 people per dwelling)

3.4.2 Changes to Development Assumptions

Through discussions with the Town and the Commission, there were cases where the development assumptions originally used in the Master Plan were adjusted.

The following key adjustments to both Planned Development and Future Development areas were considered:

— Planned Developments

  — Planned Residential Development on PID 00882670 to have 1500 units rather than 300.

— Future Development (Long Term)

  — Additional area to the south of Highway 15 planned to be future commercial area.

3.4.3 Pumped Flows

One of the functions of the proposed trunk sewer is to allow bypass of flows from LS 3 and LS 4 to alleviate capacity in the existing trunk sewer. Therefore, the proposed trunk sewer was sized to accommodate the future projected flows for the pumped areas.

The projected future pumped capacity from this area was previously established in the Master Plan. A capacity allowance of 300 L/s was used for pipe sizing.

For more information, please see Section 4.3.

3.4.4 Selected Design Flows

The following table summarizes the flow components and total flow used when sizing the proposed trunk sewer. For further information on lift station flows, see section 4.3

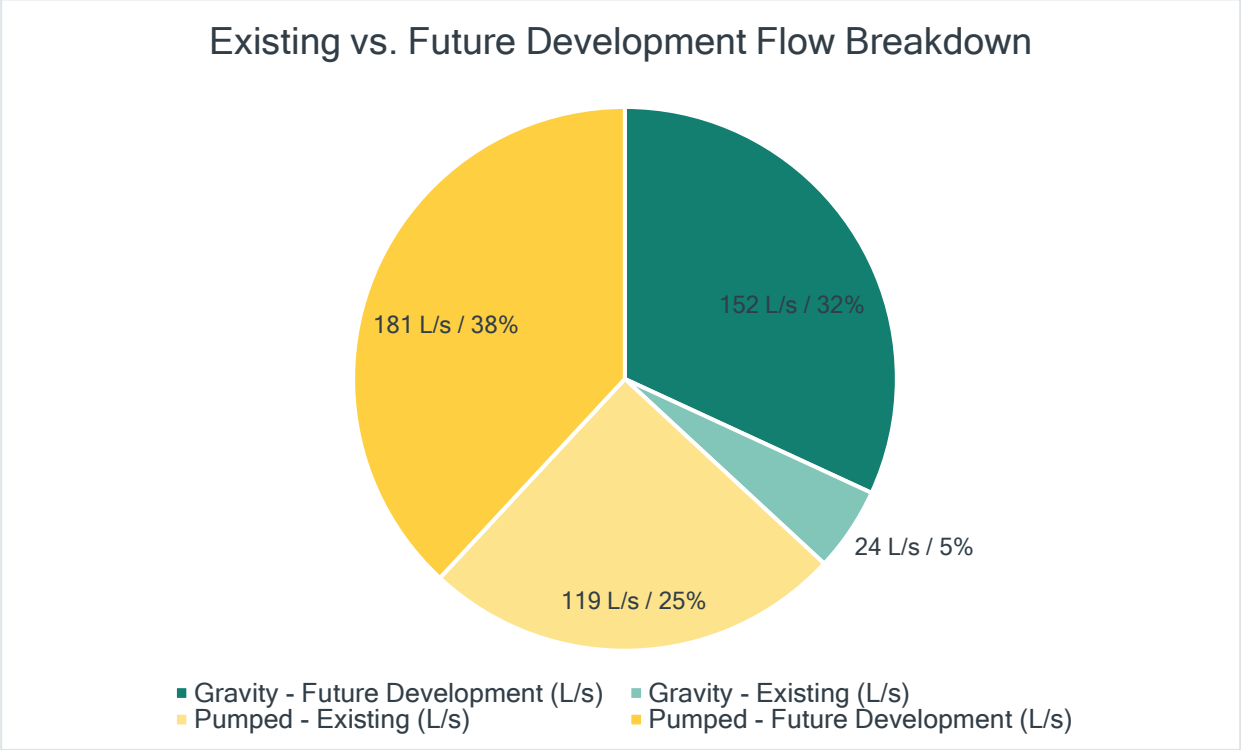
Table 3-5: Selected Design Flow - Breakdown of Components

Component	Gravity Area	LS 3 + LS 4	Total
Existing	23.80	119.00	142.80
Planned Developments	31.08	78.42	109.42
Future (Long-Term)	120.51	102.58	223.09
Total	**175.39**	**300**	**475.39**

Figure 3-3 shows a breakdown of existing vs. future flows to be conveyed by the proposed trunk sewer. This analysis shows that 70% of all projected flows for the trunk sewer are from presently undeveloped land within the sewersheds.

Where the proposed trunk sewer is intended to primarily service future development in the Town, it is expected the flows will increase to the noted levels as development occurs in the sewershed and lift station upgrades are completed. A full breakdown of the projected flows of the gravity and lift station sewersheds

Figure 3-3: Existing vs. Future Development Flow Breakdown



3.5 Hydraulic Analysis and Pipe sizing

Using the selected design flows from the Section above, preliminary pipe sizes for the proposed trunk sewer were selected and used for preliminary project cost estimates.

Preliminary pipe sizing was completed using SewerCAD to evaluate pipe capacity using Manning's formula and to evaluate the hydraulic grade line (HGL) for various sizing options. Structural head loss within the trunk sewer have not yet been considered as the use of tee base manholes has been considered. During detailed design, manhole type usage along the trunk sewer alignment will be better understood and head losses will be recalculated to determine changes within the design.

Pipe sizes were selected to target 80% of pipe capacity used by the design flows.In certain cases a higher percentage was accepted where there was found to be limited impact on the HGL for systems upstream.

The following table and figure summarize the preliminary pipe sizes for the proposed trunk sewer:

Table 3-6: Preliminary Pipe Sizing of Proposed Trunk Sewer (Including LS-03 Flows)

Station	Pipe size (mm)
1+000 to 4+490	750
4+490 to 4+875	900

The pipe sizing presented in the table above results in 15 – 78.7 percent full capacity, with hydraulic grade lines which do not exceed the top of pipe (no surcharging). Sections along Main St. were calculated to have greater percentage full due to a reduction in pipe slope in this section. However, the hydraulic grade was reviewed and deemed acceptable. The Hydraulic Grade line is shown below.

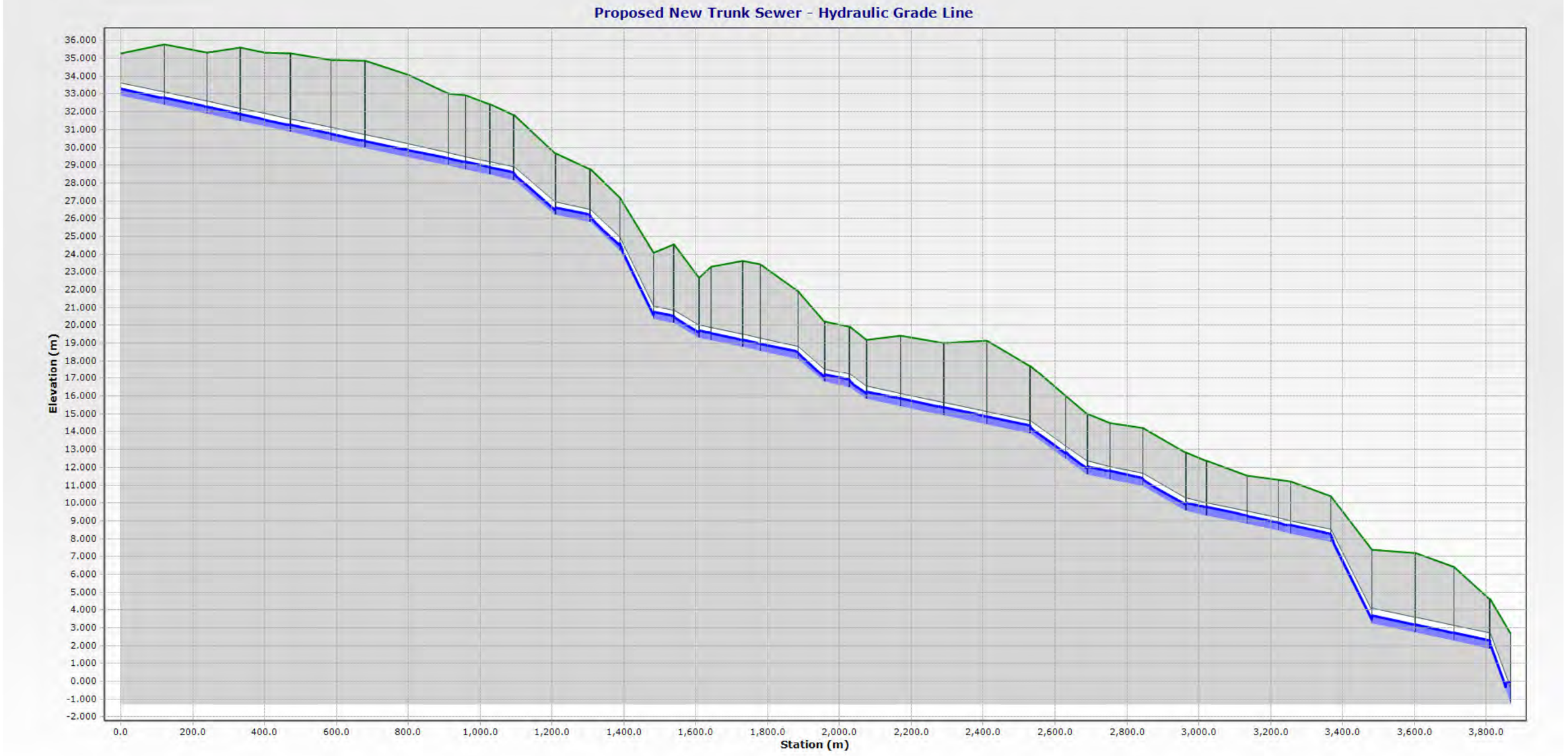
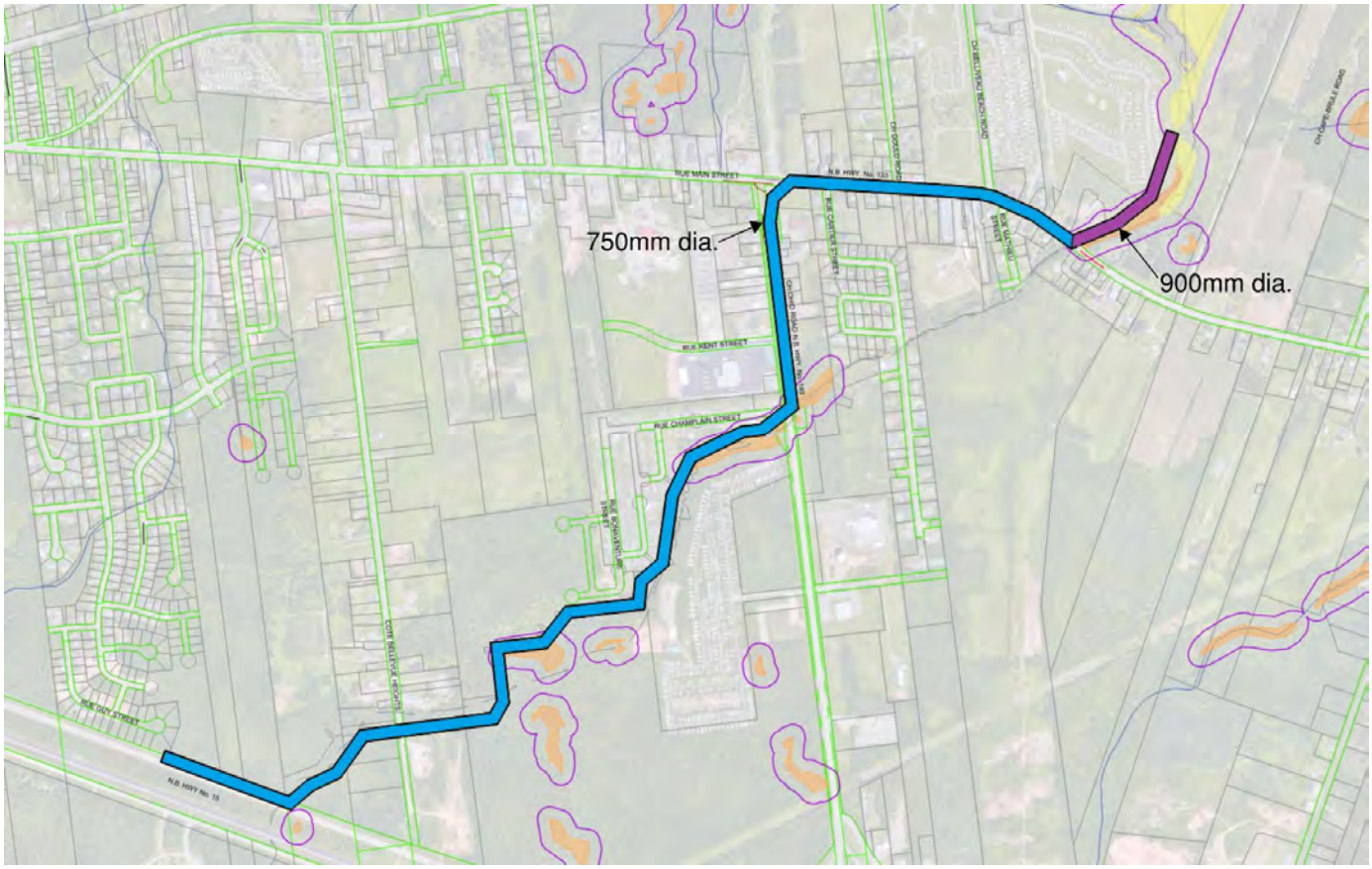


Figure 3-4: Hydraulic Grade Line of Proposed Alignment and Sizing

The significant uncertainty associated with future flow estimates at full-buildout conditions further influenced this sizing decision. Theoretical calculations of future flows are intentionally conservative, so increasing pipe sizes to achieve <80% full was not considered.

The following figure shows the alignment and associated pipe sizing.

Figure 3-5: Preliminary Pipe Sizing for Proposed Trunk Sewer



3.5.1 Alternative Sizing – Gravity Area Only

Should the trunk sewer be constructed without including the flows from the future LS-03 (See Section 4 - Lift Station Upgrades), the total design flow for the proposed trunk sewer would be reduced by approximately 300 l/s.

However, a change in pipe size results in a non-linear change in pipe capacity. In other words, reducing the flow by 50% does not generally result in an equivalent reduction in pipe diameter.

The following pipe sizes were determined for the reduced flow:

Table 3-7: Preliminary Pipe Sizing of Proposed Trunk Sewer (Excluding LS-03 Flows)

Station	Pipe size (mm)
1+000 to 1+912	450
1+912 to 3+763	525
3+763 to 4+875	600

3.5.2 Recommended Sizing

It is recommended to size the proposed trunk sewer to accept the full future estimated flow, including flow from the pumped area (future LS 3). A comparison was completed of infrastructure costs associated with the change to pipe diameter described in Section 3.5.1. The resulting difference of the reduced pipe sizing is approximately $865,750 in savings, a 9.6% reduction in the price of the trunk sewer project (Phase 1) and only a 2.5% reduction of the overall strategy (Phase 1 and Phase 2). For more information, see Sections 5 - Preliminary Cost Estimate and Section 6 - Conclusions and Recommendations.

3.6 Other Considerations

During the detailed design phase, many tasks require consideration prior to construction. The following sections provide insight on what would be required for construction to proceed:

3.6.1 Construction Permitting Requirements

For the trunk sewer to be constructed in the proposed location, the following permits and assessments must be completed and approved:

3.6.1.1 NBDELG Permits

Once detailed design of the project starts, the New Brunswick Department of Environment and Local Government (NBDELG) will be contacted to identify any conflicts and constraints of the proposed trunk sewer concerning wetlands and watercourses within the limits of work. The expected permits discussed with the department will be:

3.6.1.1.1 Wetland and Watercourse Alteration (WAWA) Permit

A wetland and Watercourse Alteration (WAWA) Permit is required whenever work is planned within 30m of a watercourse or wetland. Following review from the Province, a list of conditions is typically provided and must be followed for work to proceed. A WAWA permit may also identify triggers of additional permits, such as an Environmental Risk Assessment (EIA). Processing times can range from 10 days to 8 weeks, depending on the size and risk level of the project.

This project is expected to trigger the requirement for a WAWA at the following locations:

— Crossing the watercourse along the trail East of Bellevue Heights

— South of Champlain St. West of Ohio Rd.

— Through the Ocean Surf property, North of Main St.

3.6.1.1.2 Environmental Impact Assessment (EIA)

An Environmental Impact Assessment (EIA) is a process that allows the Province to evaluate the environmental impacts of a project that meets certain triggers. If a project triggers the requirement for an EIA, the proponent must submit the required information to allow for a Determination Review of the project by the Province. A Determination Review is an abbreviated assessment, whereby the Province determines whether a more comprehensive EIA is required, called a Comprehensive Review. Processing times can range from 8 weeks for a basic project, to multiple years for a Comprehensive Review of a major project.

Though this project falls within the 30m buffer of a regulated wetland, it is expected that this project would trigger an EIA. This is because the requirement under the EIA Registration Guideline distinguishes wetlands requiring an EIA by size. The following wording is presented in the Guideline:

v. all enterprises, activities, projects, structures, works or programs affecting two hectares or more of bog, marsh, swamp or other wetland;

Based on the mapping available through the Province's mapping service GeoNB, it appears the impacted wetland is larger than the trigger of 2.0 ha. Therefore, the Province must be consulted during detailed design to start the EIA process. Once the determination from the province has been recieved, the project team will need to determine whether the schedule implications outweigh the cost savings that result from an installation within the 30m buffer. Moving the trunk sewer outside of the buffer would simply result in increased excavation costs and land acquisition.

3.6.1.2 Highway Usage Permit (HUP)

A Highway Usage Permit (HUP) may be required for the work being done within the Right of way on any NBDTI Highway. Considering the proposed trunk sewer is planned to be constructed on the trail alongside the Veteran's Highway, NBDTI should be consulted early in the detailed design process to confirm the requirements of the permit.

3.6.2 Access Roads

With portions of the proposed trunk sewer being installed outside of the existing Town Right of Way, gravel access roads are proposed to be constructed to provide access for maintenance vehicles (flushing, inspection, repairs, etc.) in the future, but also for the construction of the proposed trunk sewer. It is recommended that the access roads be constructed as follows:

— Width of 4m

— Thickness of 300mm crushed rock on top of woven geotextile fabric

3.6.3 Maintenance of Existing Services During Construction

During construction of the trunk sewer, all existing sewermains along the alignment of the trunk sewer will remain in service, connecting into the trunk in certain locations as shown on the drawings in Appendix B. This means that sanitary services will only be disturbed when crossing the line, and will be reconnected to the existing sewermain when buried.

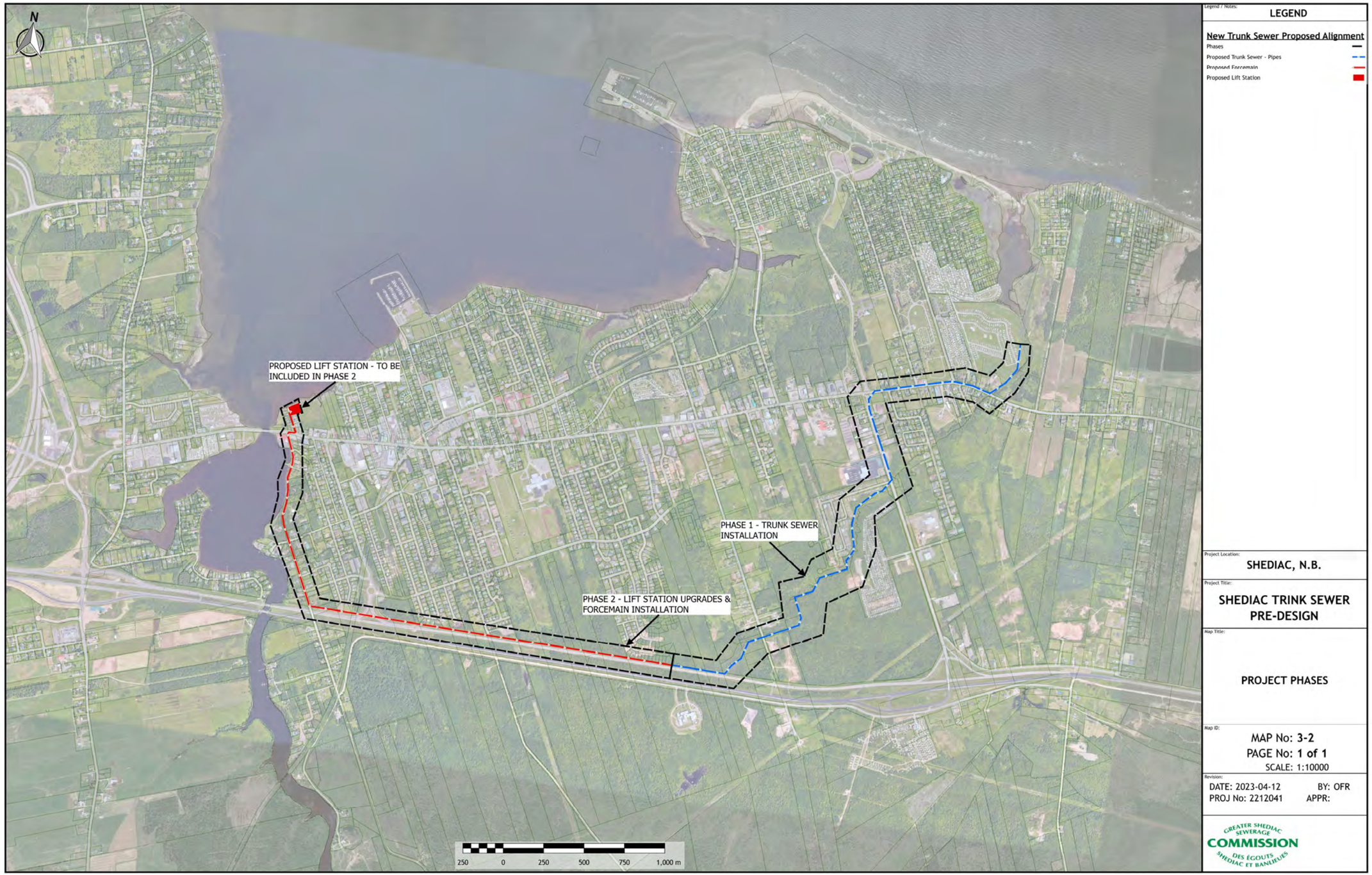
For constructability purposes, water services could be shut off, and the use of temporary water is recommended for the duration of the project along municipal roads.

3.6.4 Project Phasing

For the construction of the trunk sewer, it is recommended that the project be completed under a single contract taking place year round, until the completion of the trunk sewer.

Additionally, upgrades to LS-03 are also planned, which will be pumping sewage into the top of the new proposed gravity sewer system via. new force main. In order to complete these lift station upgrades, the proposed trunk sewer must be completed first.

The proposed new trunk sewer is designed to service new long-term (50+ years) development in the Town of Shediac and as a result, the proposed trunk sewer will not experience peak flows right away. The map below shows the proposed phasing of the project and what each phase encompasses.



Map 3-2: Proposed Project Phasing

3.6.5 Decommissioning LS 16

The preliminary verticle profile of the proposed trunk sewer was selected considering the potential decommissioning of LS 16 on Bellevue Heights. Once the trunk sewer is constructed, the existing sewershed basin for LS 16 could be re-directed to the new trunk sewer by gravity.

3.6.6 Pipe Material Options

There are various pipe material options available for the construction of a large diameter trunk sewer, each having their own benefits and drawbacks. Though it is expected that the acceptable material option(s) will be further refined at the detailed design stage, two (2) material options were explored in further detail. Those options were: Polypropylene and Concrete.

Table 3-8: Material Comparison – Polypropylene

Benefits	Drawbacks
Longer sections (6m) / faster install	Material Cost: Highest
	Relies heavily on good construction practice with regards to installation of bedding for structural support over time
Lower potential for infiltration (double gasket)	Price volatility
	Relatively new product
Higher service life claims (100 years)	Connections to manholes are non-standard
	Deep installations require special measures (fiberglass wrap)

Table 3-9: Material Comparison - Concrete

Benefits	Drawbacks
Material Cost: Lowest	Shorter sections (2.4m) / slower install
Locally sourced	Higher potential for infiltration (single gaskets)
Lower price volatility	
Strength is less installation-sensitive	Lower service life claims (75-100 years)
Potential for t-base manholes	

3.6.6.1 Pipe Material Recommendations

- It is recommended that both Concrete and Polypropylene be considered as approved products.
- To alleviate the main concern with concrete pipe of leaking joints, it is recommended that the specifications require that all joints be wrapped in a waterproofing membrane such as “Blue Skin” or equivalent. Manhole joints should also be wrapped.
- If additional material options become standard practice, they should be evaluated for inclusion as an approved alternative.
- Should concrete be selected as an option, bluskin product should be used on the trunk sewer to prevent leaks and infiltration.

3.6.7 Project Risk Matrix

The construction of a sanitary trunk sewer is a complex project that involves various stakeholders and is subject to a wide range of risks that could impact the project's success. To manage these risks effectively, it's important to identify and analyze potential risk events and develop a mitigation plan. Therefore, a project risk matrix was produced to evaluate the likelihood and consequences of different risks and prioritize them for further action. In the project risk matrix for a sanitary trunk sewer shown below, the key risk events that could impact the project and mitigation strategies to reduce their impact on the project's objectives were identified and evaluated.

Risk Event	Likelihood	Consequence	Risk Level	Mitigation
Delay in obtaining necessary permits	High	Moderate	High	Start permitting process as soon as the design has been approved.
Unforeseen site conditions (e.g. soil type, underground utilities)	High	High	Critical	Conduct a thorough site investigation and engage in contingency planning, to be done during detailed design.
Extreme weather events (e.g. heavy rain, flooding)	Medium	High	High	Develop a contingency plan with an emphasis on safety and environmental protection
Equipment failure	Medium	High	Medium	Implement a preventative maintenance program and have backup equipment available
Cost overruns	High	High	Critical	Develop a detailed budget and establish a contingency fund
Issues with project funding	Medium	High	High	Pursue funding early into deailed design to prevent holdups before construction starts
Inadequate project management	Medium	High	High	Assign an experienced project manager with a track record of successful sewer construction projects
Community opposition to project	Moderate	Moderate	Low	Engage with the community prior to construction and provide regular updates on the project's progress and benefits
Supply chain delays	High	High	High	Complete tender process early to allow contractors to order materials early to prevent delays

4 Lift Station Upgrades

As mentioned in previous sections, the intent is to divert the existing flows from LS-3 and LS-4 to the new proposed sanitary trunk sewer. The existing lift stations will need to be upgraded to accomplish pumping to a new location.

4.1 Overall Concept

As included in the Master Plan report, the existing sanitary trunk sewer was determined to have an elevated surcharge risk during peak flow scenario for existing conditions. Therefore, the existing trunk sewer would also be identified as a high risk to surcharge for the Planned Development and Long Term Planning scenarios.

When considering potential solutions that could reduce the overall sanitary loading on the existing sanitary trunk sewer, the preferred option determined in the Master Plan was to remove pumped flows from the western end of the community. Therefore, the following was proposed:

— LS-4 to be re-routed to discharge to LS-3;

— LS-3 to be re-routed to discharge into the new proposed sanitary trunk sewer.

4.1.1 Alternative Concept Considered

The concept initially highlighted in the Sewer Master Plan report involved leveraging the existing forcemains from both LS 3 and LS 4 and combining those forcemains near their common discharge at Weldon St. From this point, a new combined forcemain would be installed to discharge to the new proposed trunk sewer. In this scenario, both lift stations would require upgrades due to the additional hydraulic head on the lift station pumps.

This concept is not recommended due to the large difference in pumping capacity between LS-3 and LS-4. The new combined forcemain would have been sized for both lift stations pumping simultaneously. Since the flow from LS-4 is relatively less than LS-3, the minimum velocity in the forcemain may not be achieved when only LS-4 is operating. Also, the pumps at LS-4 would need to be upgraded to compensate for the additional head in the combined forcemain. It is expected that this would increase the pump horsepower (hp) relatively higher, which will impact other components such as the generator.

4.2 Service Area

The combined service areas for both LS-3 and LS-4 include the entire western portion of the Town. These areas include significant existing development and significant potential for future growth in the Town. The overall sewershed boundaries are summarized on Figure 3-2 in Section 3.1.1.3.

4.2.1 LS 3 – Dock Street

The existing LS-3 sewershed is approximately 90 hectares and consists of a majority of residential area with minor commercial developments. It also receives flows from LS-13, LS-17 and most importantly, LS-2 which services all of West Shediac (West of Foch Bridge).

4.2.2 LS 4 – Hamilton Road

LS-4 receives flows from approximately 50 hectares of a mix of residential and commercial developments. It currently receives flows from LS-5. However, as early as the fall of 2023, a new forcemain will be installed to re-route LS-5 flows directly to the existing trunk sewer near Weldon Street as a part of a 2023 reconsruction project for Pleasant Street.

4.3 Design Flows

The following table summarizes the existing and future flows for LS-3 and LS-4, which were initially evaluated as part of the Master Plan.

Station	Existing Pumping Capacity (L/s)	Projected Design Capacity (L/s)
LS #3	47.32	226.64
LS #4	71.50	71.50
Total	**118.8**	**298.14**

Therefore, approximately 119 L/s would be removed from the existing trunk sewer main to be discharged to the new proposed trunk sewer. The new trunk sewer was therefore sized to accommodate the future pumping capacity of station LS-3 and LS-4 for a total of approximately **300 L/s**, pumped from the proposed upgraded LS-3.

4.4 Lift Station Upgrades

As mentioned above, the existing pumps at each station are not sized and designed to pump to the location of the new proposed trunk sewer main. LS-3 was identified as requiring full upgrades to accommodate future flows. However, no upgrades to the pumping capacity was recommended for LS-

4 because the existing capacity was determined to be adequate for the existing and future flows. To avoid requiring a costly upgrade to pump to the new trunk sewer, it is proposed to re-route the flows from LS-4 to LS-3.

One option that needs to be further developed is to possibly utilize the existing 250mm Ø forcemain for LS-3 which could be connected to the existing forcemain for LS-4. If possible, this would allow LS-4 to be re-routed to LS-3 without requiring any construction projects along Main Street. The existing pumps might require some upgrades to accomodate the additional headlosses from the extended forcemain. This will be further evaluated during preliminary design.

To accommodate the increased flow, forcemain length and elevation gain, a complete replacement of LS 3 is required.

The new station for LS-3 will take the flows from LS-2 and LS-4 and will pump in a new forcemain to the new proposed trunk sewer. Two (2) options were considered for the upgrades of the lift station The following considerations were accounted for in each of the options:

— Due to the depth of the wet well and the pumping capacity required for the future flows, it is proposed that the future station have a wet well and dry well configuration. This type of configuration allows for relatively easier operation and maintenance of the pumps when compared to a submersible installation.

— To be able to pump a wider range of flows, the station will likely operate as a triplex pumping system (2 duty and 1 standby).

— The new station is proposed to be located close to the existing station to avoid having to re-route the existing gravity piping.

— The discharge location is at the top of the new proposed trunk sewer main.

The following upgrade options were considered:

4.4.1 Option 1 – Eliminate LS-2

This option would require installing a new sanitary gravity main by horizontal directional drilling (HDD) to connect the LS-2 gravity piping to a deeper wet well at LS-3. This would allow LS-2 to be decommissioned and removed. This option would also accommodate the future upgrades in West Shediac that would otherwise overload LS-2.

We evaluated Option 1 further to see if it was feasible regarding cost and construction. We found some challenges with this option:

— The gravity main across the Scoudouc River would need to be installed by HDD, which is expensive and complex for large pipes. Assuming a slope of 1%, the pipe size was estimated to be 600mmØ.

— The horizontal alignment would require expropriating a residential property to make room for the gravity main to reach the new wet well.

— The wet well for LS-3 would be about 15.0m deep, which is 7.0m deeper than Option 2. This would increase the difficulty and cost of sheet piling and dewatering at the coastal site, as well as significantly increase capital costs of the project when compared to Option 2.

4.4.2 Option 2 – Upgrades to LS-2

LS-2 and LS-3 are upgraded to accommodate future flows, and LS-3 pumps to the new discharge location. In this scenario, LS-2 continues to pump flows directly to LS-3.

— Significant upgrades would be required to increase the station capacity from 32.81 L/s to 182.34 L/s;

— The forcemain from LS-2 would likely need to be upgraded to convey future flows to LS-3 along with the gravity section from the forcemain discharge to LS-3;

— Although the wet well would be relatively less deep than the depth of Option 1, the installation of the wet well will likely still have some complexity due to the close proximity to the coast.

4.5 New Proposed Forcemain

4.5.1 Forcemain Alignment

To handle the flows that will be produced by the proposed lift station, a new forcemain is required. This forcemain will connect the upgraded lift station to the trunk sewer at the high point along the Veterans Highway. Upon review of the existing conditions of the roads connecting Main St. to the Veterans Highway, It was concluded that Riverside Dr. was the best option for the forcemain. Constructing the forcemain along Riverside Dr. will not only avoid recentlty reconstructed streets, but also minimizes the construction of the forcemain along Main St. which minimizes existing pipe conflicts and reduces traffic impact. The map below shows a preliminary alignment of the proposed forcemain.

NOTES

LEGEND:

PROPOSED NEW FORCEMAIN PIPE

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

ENGLOBE

PRELIMINARY ONLY

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

PROPOSED FORCEMAIN LOCATION PLAN

Scale	Drawn By	Design By
50m 0 100m (1:5000 FULL SCALE)	TWA	TWA
	Checked By: OR	Cadd Check
	Sheet 1 of 2	

File Name: 2212041-1P-RIVERSIDE DRIVE.DWG

Drawing No.: 2212041-1P-C100

Map 4-1: Proposed Forcemain Alignment

4.5.1.1 Alternative Alignments Considered

Other potential alignments such as Chesley St. and Sackville St. were initially discussed as options for the forcemain, but were dismissed due to recent reconstruction of the roadways.

4.5.2 Forcemain Sizing

Typically, forcemains are sized to have a minimum velocity of at least 0.6 m/s to meet minimum scour velocity and a maximum of 1.5 m/s to avoid having too much hydraulic headloss which increases the pump sizing.

The sizing of the new forcemain was completed in accordance with ACWWA guidelines. The following forcemain sizes were evaluated at a flow of 300 L/s:

Forcemain Diameter (mm)	Flow to Achieve Min. Velocity of 0.6 m/s (L/s)	Flow to Achieve Max. Velocity of 1.5 m/s (L/s)	Velocity at 300 L/s (m/s)
450	85	225	2.17
500	110	280	1.63
600	155	390	1.12

Based on this analysis, it is expected that the velocity in a 500mm Ø forcemain will be above 1.5 m/s, which is outside of the recommended velocity range from ACWWA. In addition, a high velocity will increase the friction loss, which could impact the size of the pumps and related equipment. For the purpose of this report, a 600mm Ø forcemain is recommended.

4.6 Selected Concept and Next Steps

Based on the preliminary analysis of both options, it is our opinion that option No. 2 would be the recommended option. As presented in this section, the feasibility and constructability of No.1 is a concern. Although, option No.1 would remove a lift station from the sanitary system, the operating cost of LS-2 over a 25-year span would still be below the additional construction cost required at LS-3 for option No.1.

Further evaluation is recommended during preliminary design of LS-3 and the proposed new forcemain.

5 Preliminary Cost Estimate

To assist the GSSC in budgeting future projects, a preliminary cost estimate was completed for the proposed trunk sewer alignment. The completed cost estimate includes pipe installation, trench reinstatement, access road construction, and rock excavation where appropriate. The total preliminary cost estimate for the proposed new trunk sewer, forcemain and Lift Station 3 upgrades is **$45,640,290.00**. A detailed breakdown has been included in Appendix D.

Please note that the estimate does not include land acquisition costs or the cost for any other renewals that the GSSC may want to complete as a part of the same contracts such as water main renewal, or storm and sanitary sewer renewal. Cost estimates were completed in 2023 and will need to be adjusted to reflect future material cost increases. Cost estimates include a contingency of 20%, an engineering allowance of 15%, and HST at the current rate of 15%.

5.1 Cost Sharing

When determining a payment method for the trunk sewer that includes the undeveloped land, a cost per undeveloped unit should be considered to help pay for construction costs. The table below is a preliminary cost breakdown of the undeveloped units. These prices are subject to change as unit counts change with the undeveloped land.

Table 5-1: Cost Sharing of Undeveloped Units

Scenario	Est. Cost *	No. of Units**	Cost/Unit
Phase 1: Gravity Only	$ 11,262,620	8300	$1357
Phase 1: Gravity + Pumped	$ 12,281,250	8300	$1480
Phase 2	$ 33,484,040	5279	$6319
Phase 1 + Phase 2	**$45,640,290**	**13,579**	**$3361**

* Including Contingency, Engineering and Environmental in each phase
** Excluding Existing Units

5.2 Cost Reduction Measures

The following recommendations should be given further consideration during detailed design:

— To promote competitive pricing, it is recommended the GSSC phase out the piping work from the mechanical Lift Station No. 3 work and allow both concrete and various polypropylene pipe when tendering the project.

— T- base manholes may be considere to reduce cost of large drop manholes in many locations.

— The use of a trench box throughout construction to reduce restoration and traffic impacts as much as possible.

— Apply for available funding programs to reduce capital cost to the GSSC and Town of Shediac.

6 Conclusions and Recommendations

The following conclusions and recommendations were generated through the course of the study:

- The proposed trunk sewer is not required, based on present capacity, it would only be required if the developments proposed are to proceed.
- The New Trunk Sewer will also alleviate existing infrastructure capacity issues as well as Lift Station No. 16 completely.
- Option 1 for the pipe alignment of the proposed trunk sewer is recommended due to the greater units serviced, alleviating greater flows from the existing trunk sewer, and the minimal land acquisition and environmental requirements, minimizing potential issues during the design and construction phases.
- Due to the significant wetlands along the alignment the Province should be consulted during the early stages of design to provide a determination on the EIA requirement as portions of the new sewer will be constructed within wetlands.
- Pipe sizing of the proposed trunk sewer is recommended to be 750mm from NB Highway No. 15 to the corner of Main St. and the Ocean Surf RV Park. The remaining section of the trunk sewer heading north is recommended to be 900mm to accommodate the flows of the entire trunk sewer.
- Based on the preliminary analysis of both of the lift station options, it is recommended that option No. 2 would be constructed, largely due to constructability concerns of Option No.1, and that the operating cost of LS-2 over a 25-year span would still be below the additional construction cost required at LS-3 for option No.1.
- It is recommended GSSC begin land acquisition during the early stages of design due to the amount of private land required for easements. Land acquisition is required to be purchased for the proposed Lift Station No.3.

- Based on the cost and capacity analysis, it is recommended, should the project proceed, sizing the trunk sewer for the full future development of Phase 1 and Phase 2 (West Shediac).
- Where manholes are located adjacent to the water course at flood level, it is recommended to seal covers with watertight lock down covers.
- NB Power to be consulted on Hydro pole relocations.

Appendix A Geotechnical Report

ENGLOBE

Appendix B Preliminary Trunk Sewer Design Drawings

ENGLOBE

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

SIGNED FOR IDENTIFICATION:

OWNER: _____

CONTRACTOR: _____

DATE: _____

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

ISSUED FOR REVIEW

SHEDIAC LONG TERM STUDY

SHEDIAC, N.B.

PROJECT No. 2212041-1D

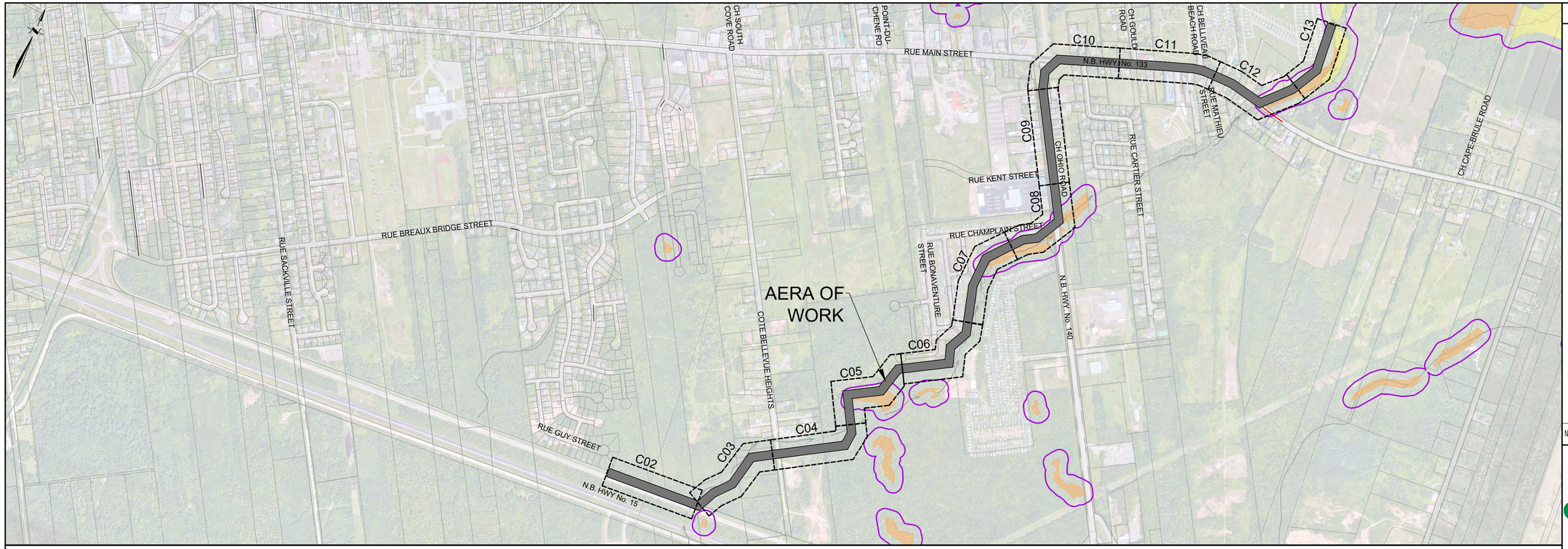
LIST OF DRAWINGS

ENGLOBE

Client:
GSSC

Project:
SHEDIAC LONG TERM STUDY

PROJECT No. 2212041-1D



GENERAL NOTES

1. EXACT LOCATION OF EXISTING INFRASTRUCTURE AND SERVICE PIPES TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR.
2. REPAIR OF EXISTING WATER, STORM AND SEWER MAINS AND SERVICE PIPES IS INCIDENTAL TO THE WORK.
3. ENVIRONMENTAL EROSION CONTROL MEASURES TO BE INSTALLED PRIOR TO THE START OF THE WORK, INCIDENTAL TO THE WORK.
4. SAFETY SIGNS TO BE INSTALLED PRIOR TO THE START OF CONSTRUCTION AND IN ACCORDANCE WITH THE NBDTI WORK AREA TRAFFIC CONTROL MANUAL.
5. ALL HYDRO POLES TO BE SUPPORTED DURING THE CONSTRUCTION, INCIDENTAL TO THE WORK.
6. ALL SEWER MAINS TO BE INSTALLED USING TRENCH BOX.
7. EXISTING SIGNS AND MAIL BOXES TO BE REMOVED, RE-INSTALLED IN A TEMPORARY MANNER ACCEPTABLE TO THE ENGINEER AND THEN RE-INSTALLED PERMANENTLY FOLLOWING THE WORK, INCIDENTAL TO THE WORK.
8. DRIVEWAYS ARE TO BE ACCESSIBLE AT THE END OF EACH WORKING DAY.
9. CLEAN-UP, INCLUDING DITCHING ARE TO BE DONE ON A DAILY BASIS. DUST TO BE CONTROLLED WITH WATER AS REQUIRED, AS DIRECTED BY THE ENGINEER, MINIMUM ONCE PER DAY, AND USING CALCIUM CHLORIDE FOR NON WORKING HOURS INCLUDING WEEKENDS.
10. RECONNECTION OF EXISTING SEWER MAIN AND SERVICE PIPE TO BE DONE AT THE END OF EACH DAY.
11. NO WORK PERMITTED WITHIN WETLAND AREA UNLESS AUTHORIZED BY ENGINEER.
12. ALL LABOR, MATERIAL, AND EQUIPMENT REQUIRED TO BY-PASS SEWER FLOWS ARE INCIDENTAL TO THE WORK. THE CONTRACTOR IS TO ENSURE THAT THERE IS NO SEWER OVERFLOW ON BACK-UPS OF SEWER AS A RESULT OF THIS WORK. STAND-BY / DUPLEX PUMPS ARE TO BE PROVIDED AS PER DRAWINGS AND SPECIFICATIONS.
13. THE REMOVAL AND DISPOSAL OF PIPES, MANHOLES AND OTHER RELATED ITEMS AS IDENTIFIED ON THE PLANS ARE CONSIDERED INCIDENTAL TO THE WORK. THE CONTRACTOR WILL BE RESPONSIBLE TO REMOVE THESE ITEMS FROM THE COMMON EXCAVATION OR BACKFILL MATERIAL AND DISPOSE OF THEM PROPERLY OFF SITE.
14. CONTRACTOR TO MINIMIZE THE SIZE OF EQUIPMENT WHEN WORKING ON PRIVATE PROPERTY TO ENSURE MINIMAL DISTURBANCE TO THE LAND.
15. CONTRACTOR TO IMPORT CLEAN TOPSOIL. All STRIPPED TOPSOIL FROM SITE SHALL NOT RE REUSED AND IS TO BE DISPOSED OF OFF SITE.
16. CONTRACTOR WILL BE PROVIDED WITH A COPY OF THE WAWA PERMIT AND MUST ADHERE TO ALL NOTED REQUIRMENTS.
17. CONTRACTOR TO KEEP NBDNR TRAIL SAFE FOR THE DURATION OF THE PROJECTAND LIMIT CLOSURE PERIODS TO WHEN REQUIRED ONLY. PROPER TEMPORARY CLOSURE SIGNS AND BARRICADES TO BE INSTALLED AT EVERY ENTRY POINTS (INCIDENTAL TO THE WORK).

CONTROL POINT (m)				
POINT No.	LOCATION	NORTHING	EASTING	ELEV.
NBMON 5534	HWY. NO. 15	7469642.371	2654563.596	44.870

* COORDINATES IN NEW BRUNSWICK STEREOGRAPHIC PROJECTION, NAD 83 (CSRS) CGVD28 DATUM.

GENERAL LEGEND

ITEM	EXISTING	NEW
R.O.W.		
WATER MAIN	W	W
SANITARY SEWER	S	S
SEWER PRESSURE PIPE	FM	FM
STORM SEWER	ST	ST
SANITARY MANHOLE		
STORM MANHOLE		
CATCH BASIN		
SLUICE BOX		
VALVE		
FIRE HYDRANT		
CURB STOP		
BENDS		
TEE		
CAP OR PLUG		
REDUCER		
SLEEVE OR COUPLING		
UTILITY POLE		
TREE		
WELL		
BOREHOLE		
ASPHALT DRIVEWAY	A	
GRAVEL DRIVEWAY	G	
FENCE		
CULVERT		
TREE LINE		
GUIDE RAIL		
RAILROAD		
EROSION CONTROL STRUCTURE		TYPE "A" TYPE "B" TYPE "C"
WATERCOURSE		
LEFT DITCH		
RIGHT DITCH		
WETLAND		
SILT FENCING		
LIMIT OF CONTRACT		L.O.C.
LIMIT OF GRADING		L.O.G.
LIMIT OF PAVING		L.O.P.
LIMIT OF WORK		L.O.W.
NOT IN CONTRACT		N.I.C.

NOTES

30m BUFFER

REGULATED WETLANDS (RW)

PROVINCIALLY SIGNIFICANT WETLANDS (PSW)

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

eNGLOBe

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

LOCATION PLAN, GENERAL NOTES AND LEGEND

Scale: 75m 0 150m (1:7500 FULL SCALE)

Drawn By: TWA | Design By: - - -

Checked By: CJG | Cadd Check: TWA

Sheet 01 of 13

File Name: 2212041-1D-CVR-C01.DWG

Drawing No.: 2212041-1D-C01

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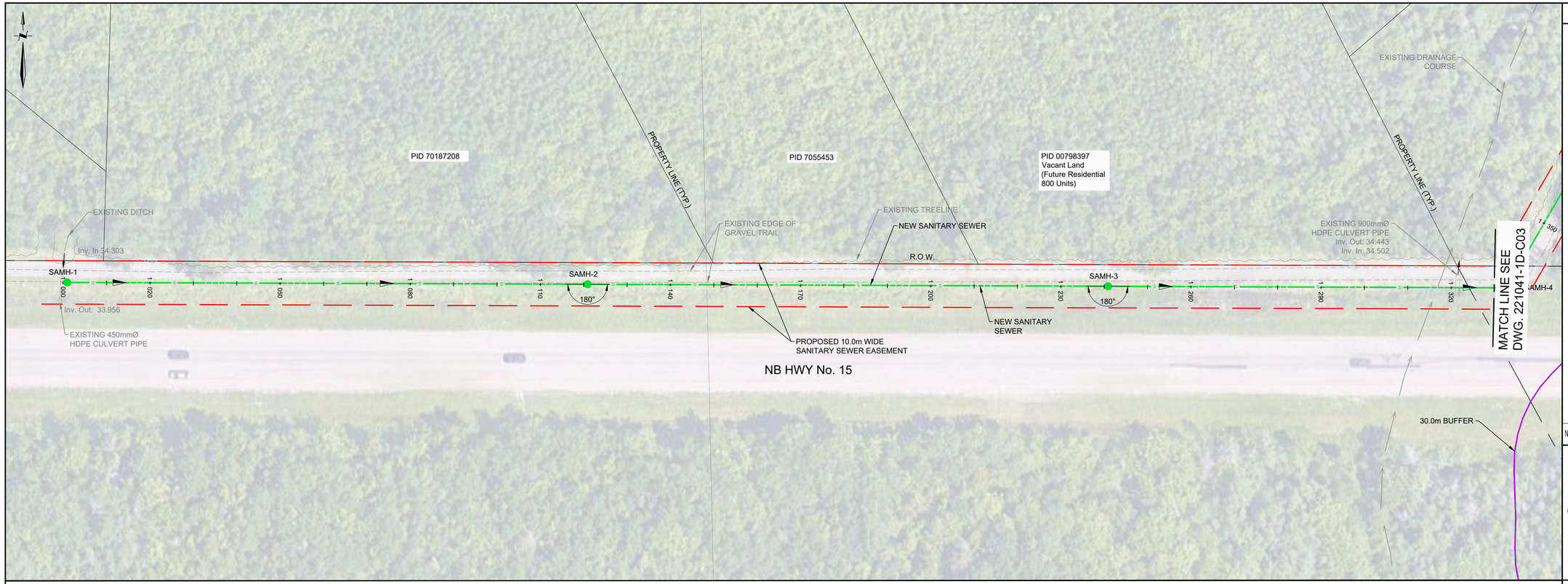

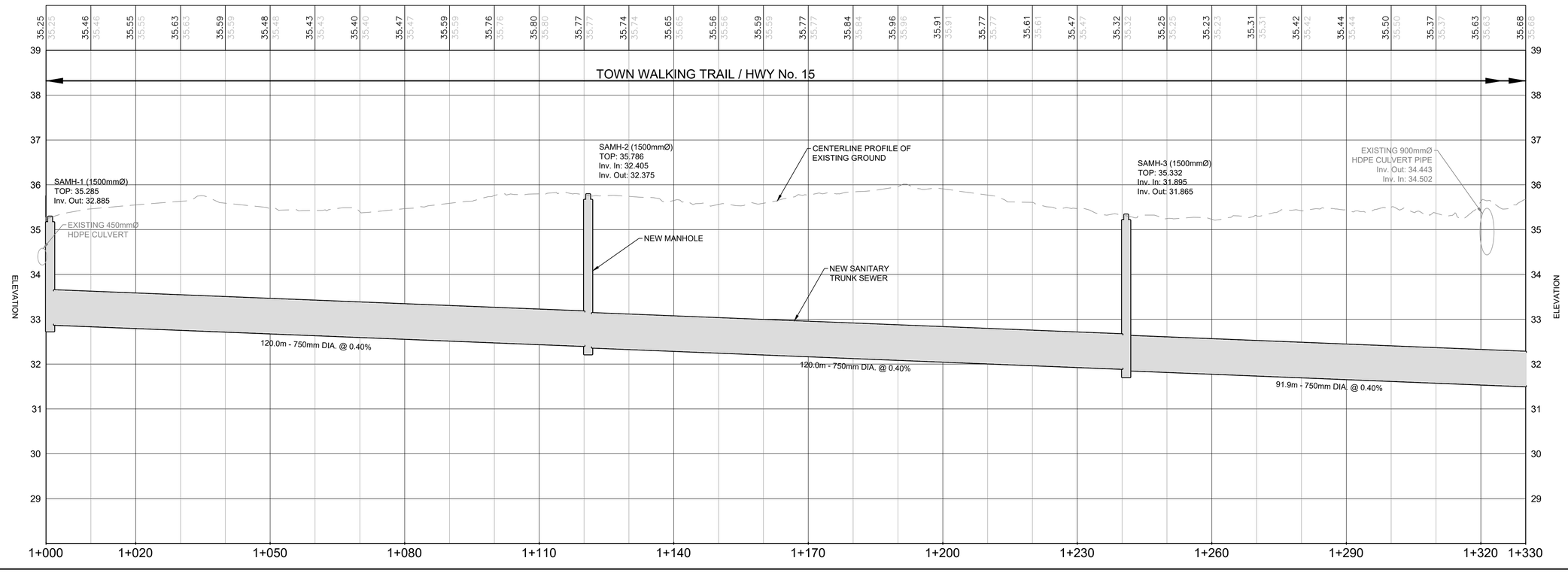

NOTES

LEGEND:

1. REFER TO GEOTECHNICAL REPORT FOR BOREHOLE INFORMATION.

- NEW SANITARY MANHOLE
- NEW SANITARY SEWER
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN
- PROPOSED 10.0m WIDE EASEMENT
- PROV. SIGNIFICANT WETLAND
- PSW 30m BUFFER
- BOREHOLE LOCATION
- BH / TOP OF BEDROCK

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 1+000 TO 1+330

Scale	Drawn By	Design By
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	Checked By: CJG	Cadd Check: TWA
	Sheet 02 of 13	

File Name: 2212041-1D-C02-C06.DWG

Drawing No.: 2212041-1D-C02

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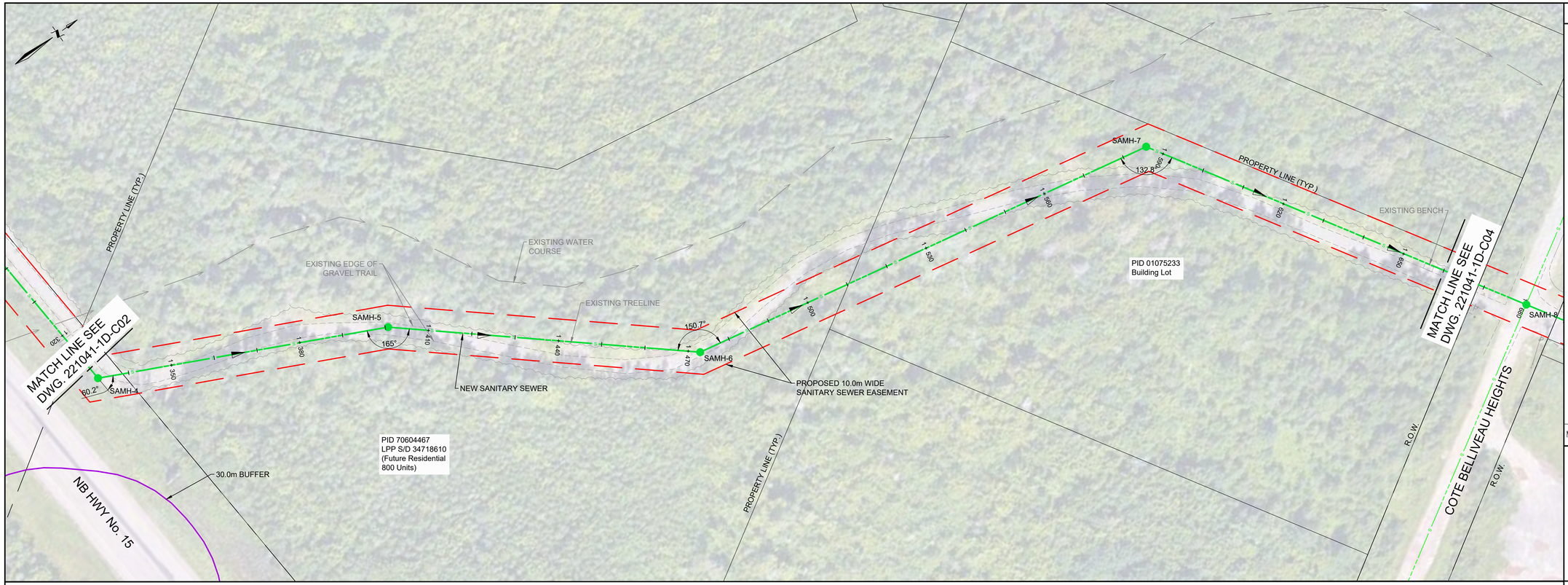

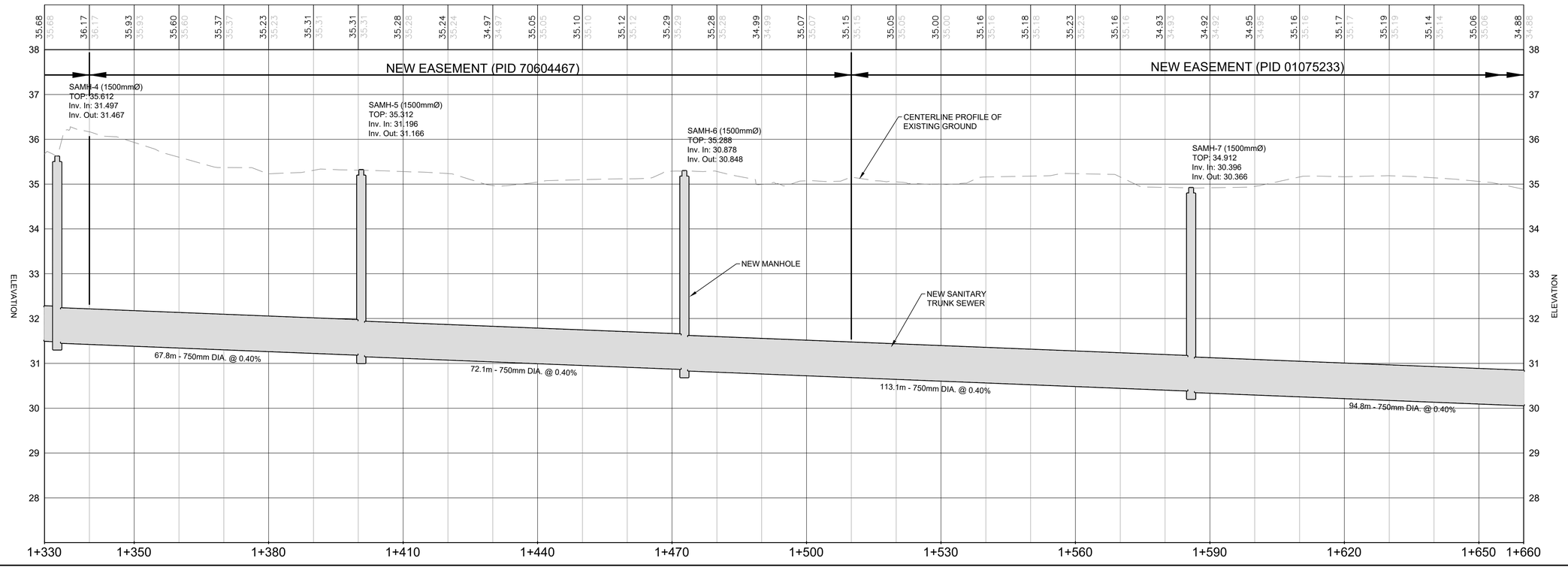

NOTES

LEGEND:

1. REFER TO GEOTECHNICAL REPORT FOR BOREHOLE INFORMATION.

NEW SANITARY MANH
NEW SANITARY SEWE
EXISTING SANITARY SEWER
EXISTING STORM SEV
EXISTING WATERMAIN
PROPOSED 10.0m WID EASEMENT
PROV. SIGNIFICANT WETLA
PSW 30m BUFFER
BH
BOREHOLE LOCATION
TOP OF BEDROCK

NO.	DATE	REVISIONS	BY	A

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 1+330 TO 1+660

Scale	Drawn By	Design By
1:500 Horizontal (Full Scale)	TWA	AC
1:50 Vertical (Full Scale)	Checked By: CJG	Cadd Check: TWA
	Sheet 03 of 13	

File Name: 2212041-1D-C02-C06.DWG

Drawing No.: 2212041-1D-C03

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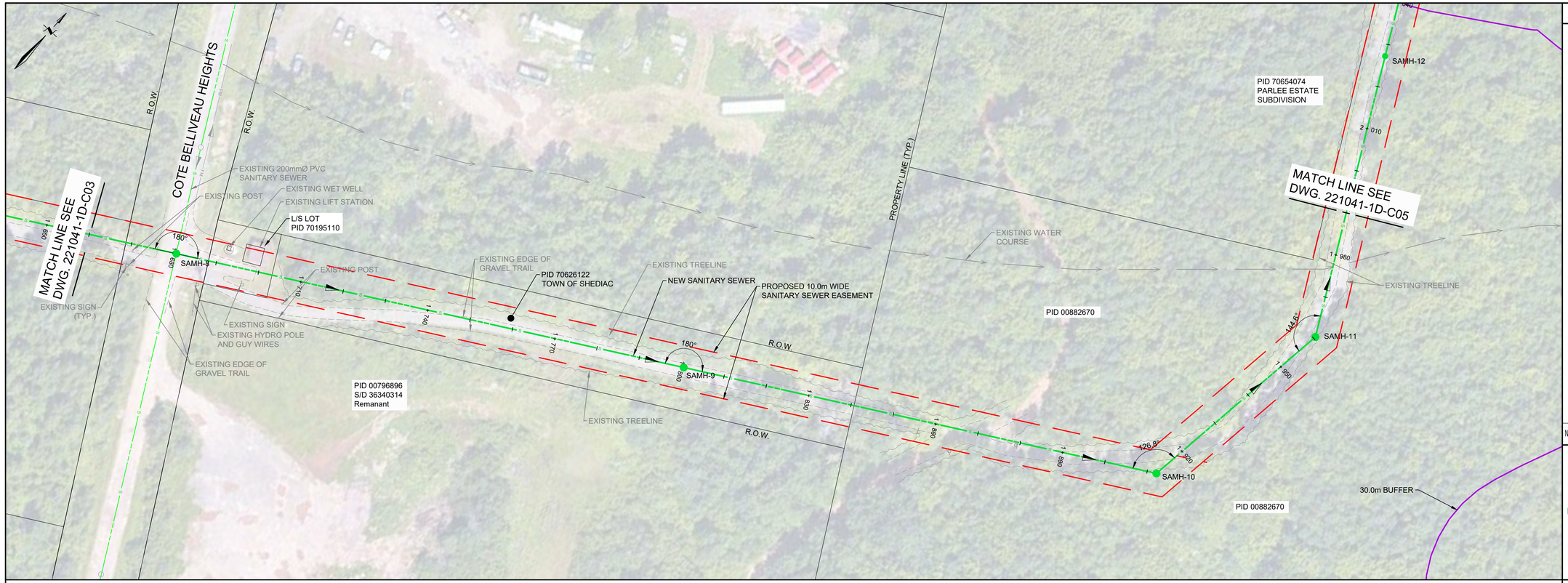

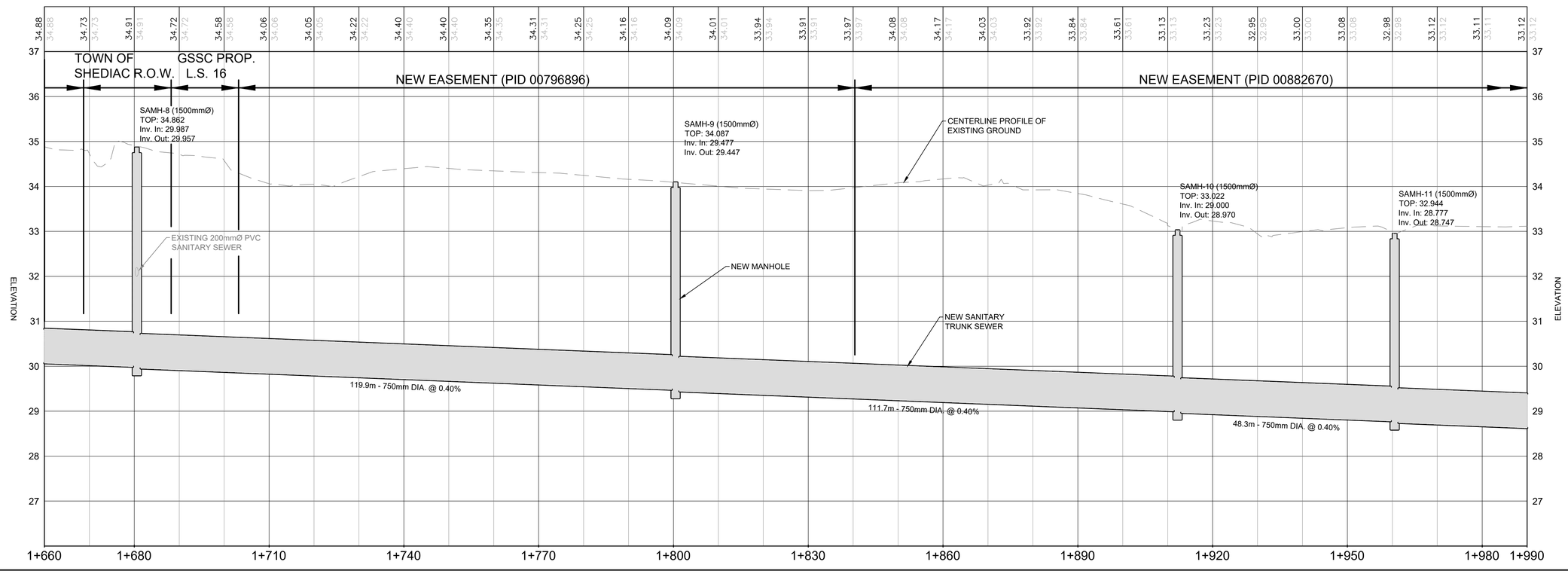

NOTES

LEGEND:

1. REFER TO GEOTECHNICAL REPORT FO BOREHOLE INFORMATION.

NEW SANITA
NEW SANITA
EXISTING SA SEWER
EXISTING ST
EXISTING WA
PROPOSED EASEMENT
PROV. SIGNIFICA
PSW 30m BUFFER
BOREHOLE LO
BH
TOP OF BEDROCK

NO.	DATE	REVISIONS

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIE

eNGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM ST

SHEDIAC

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 1+660 TO 1+990

Scale
5m 0 10m
1:500 Horizontal (Full Scale)
.5m 0 1m
1:50 Vertical (Full Scale)

Drawn By: TWA
Checked By: CJG
Sheet: 04

File Name: 2212041-1D-C02-C06.DWG

Drawing No.: 2212041-1D-C04

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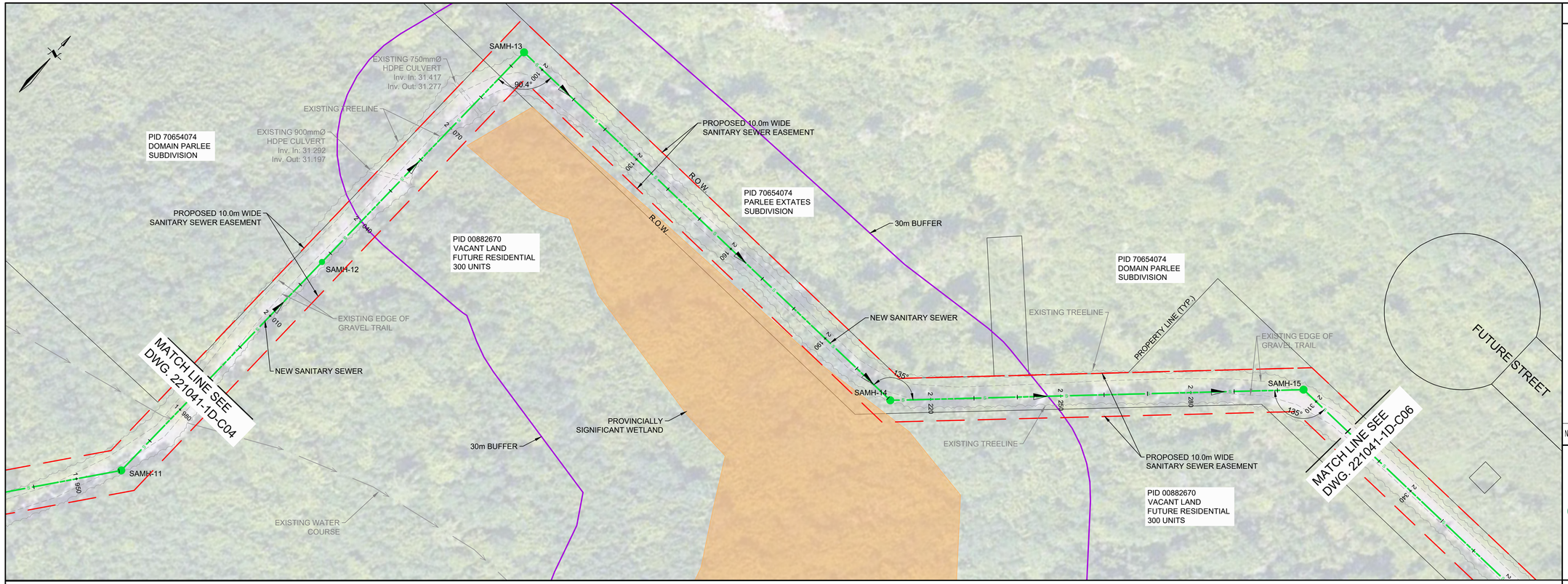


NOTES

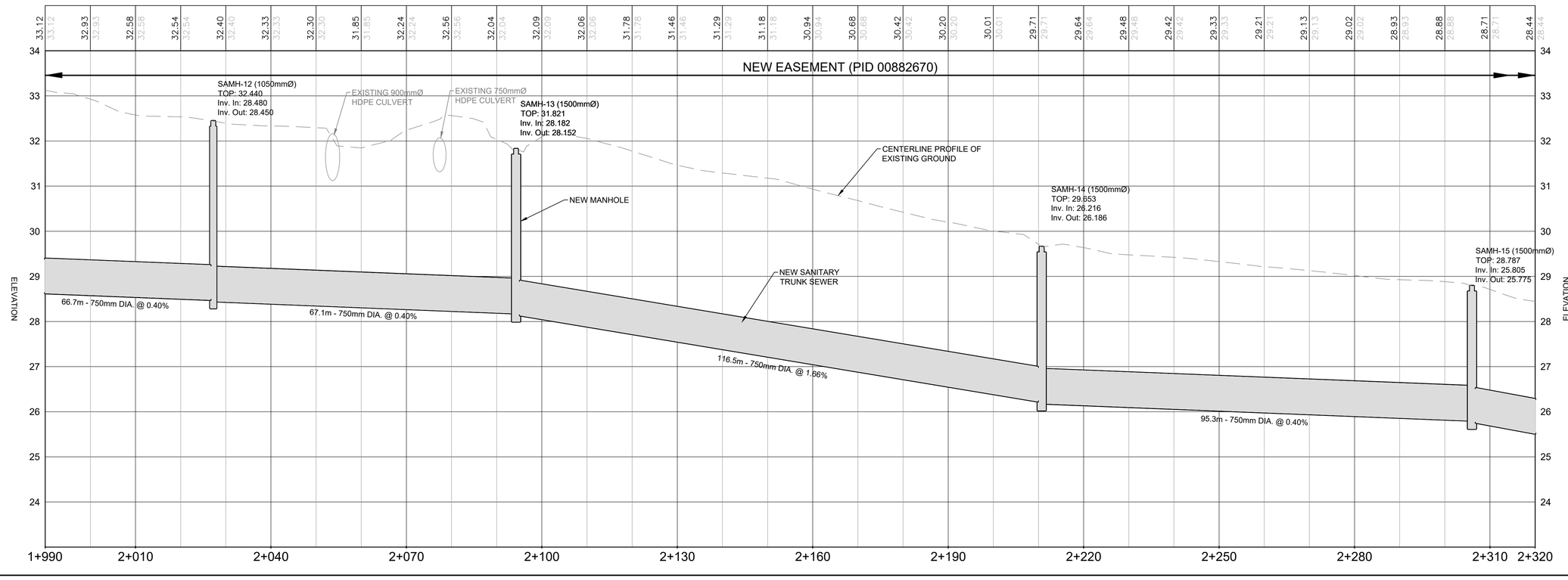
LEGEND:

1. REFER TO GEOTECHNICAL REPORT FOR BOREHOLE INFORMATION.

- NEW SANITARY MANHOLE
- NEW SANITARY SEWER
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN
- PROPOSED 10.0m WIDE EASEMENT
- PROV. SIGNIFICANT WETLAND
- PSW 30m BUFFER
- BOREHOLE LOCATION
- TOP OF BEDROCK

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES



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PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 1+990 TO 2+320

Scale	Drawn By	Design By
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	Checked By	Cadd Check
	CJG	TWA
	Sheet 05 of 13	

File Name
2212041-1D-C02-C06.DWG

Drawing No.
2212041-1D-C05

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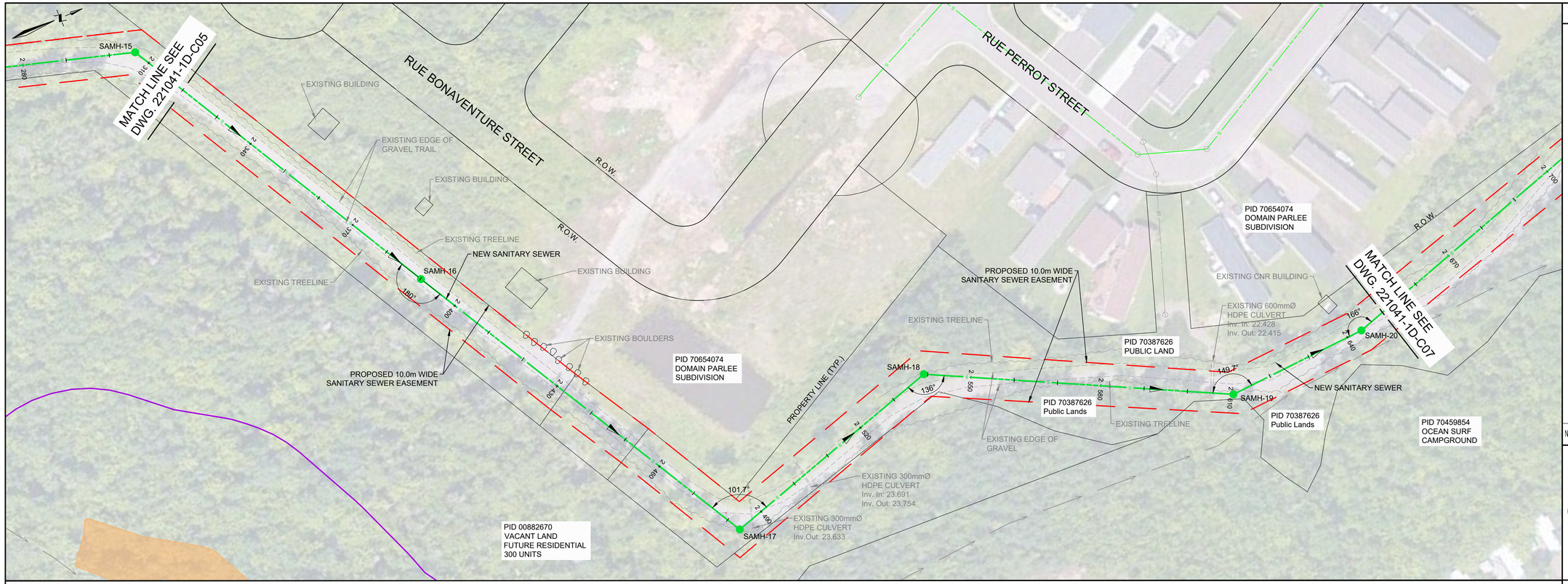

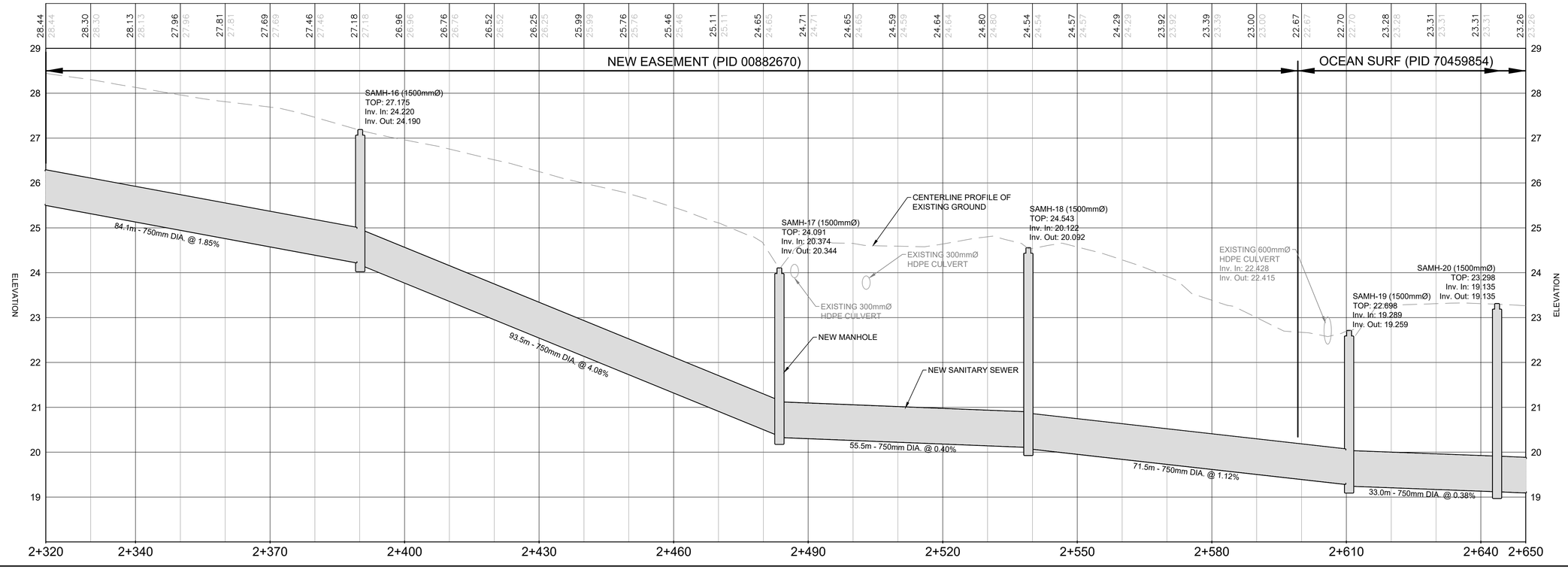

NOTES

LEGEND:

1. REFER TO GEOTECHNICAL REPORT FOR BOREHOLE INFORMATION.

- NEW SANITARY MANHOLE
- NEW SANITARY SEWER
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN
- PROPOSED 10.0m WIDE EASEMENT
- PROV. SIGNIFICANT WETLAND
- PSW 30m BUFFER
- BOREHOLE LOCATION
- BH
- TOP OF BEDROCK

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 2+320 TO 2+650

Scale	Drawn By	Design By
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	Checked By	Cadd Check
	CJG	TWA
	Sheet 06 of 13	

File Name
2212041-1D-C02-C06.DWG

Drawing No.
2212041-1D-C06

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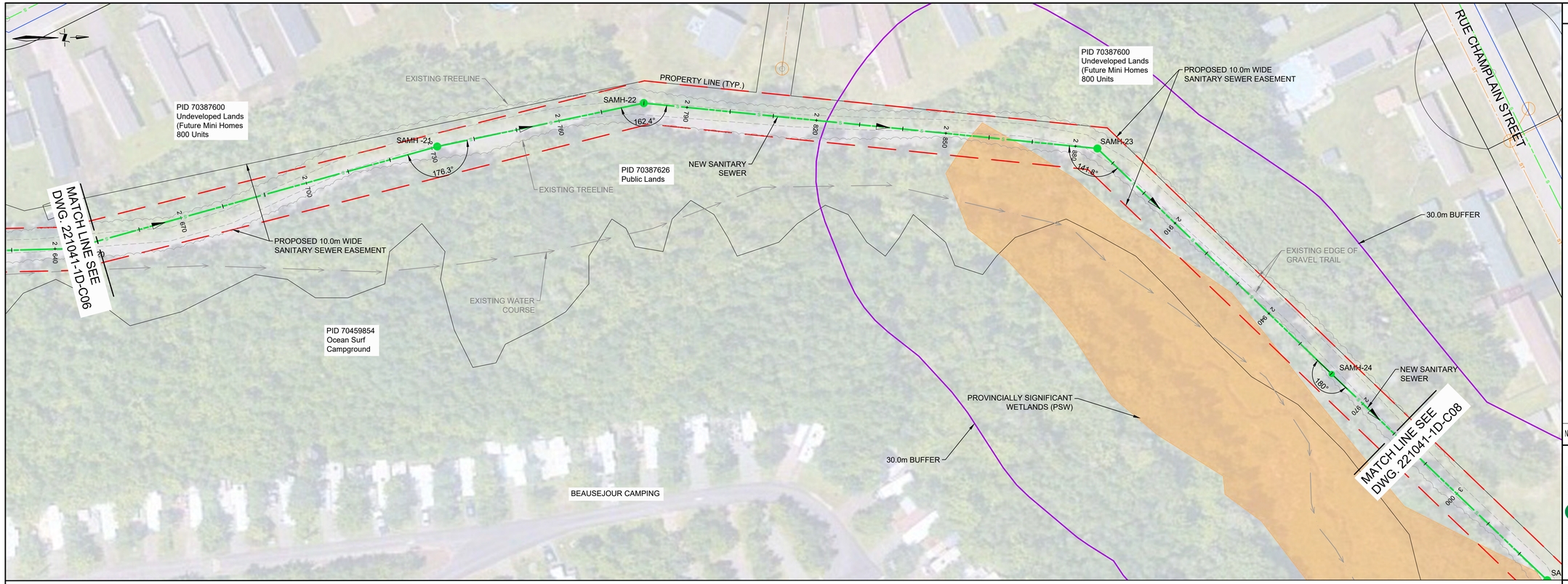

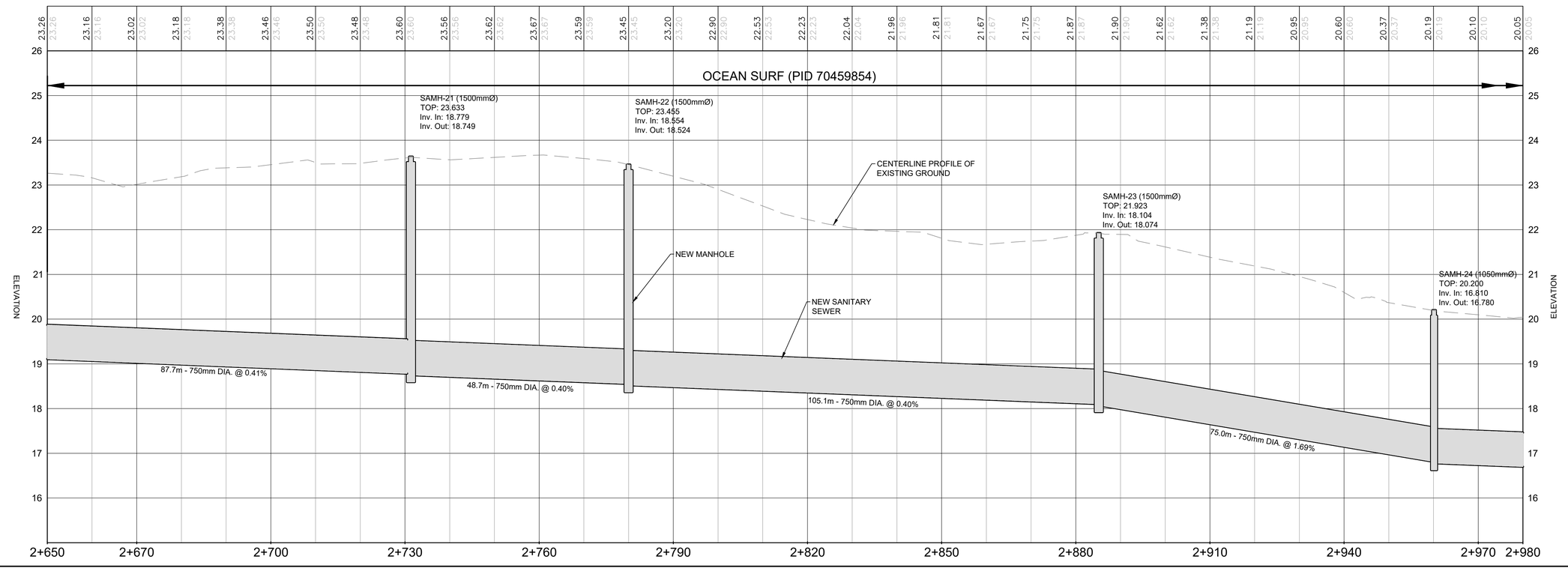

NOTES

LEGEND:

1. REFER TO GEOTECHNICAL REPORT FOR BOREHOLE INFORMATION.

NEW SANITARY MANHOLE
NEW SANITARY SEWER
EXISTING SANITARY SEWER
EXISTING STORM SEWER
EXISTING WATERMAIN
PROPOSED 10.0m WIDE EASEMENT
PROV. SIGNIFICANT WETLAND
PSW 30m BUFFER
BOREHOLE LOCATION
BH
TOP OF BEDROCK

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 2+650 TO 2+980

Scale	Drawn By	Design By
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	Sheet 07 of 13	

File Name: 2212041-1D-C07-C11.DWG

Drawing No.: 2212041-1D-C07

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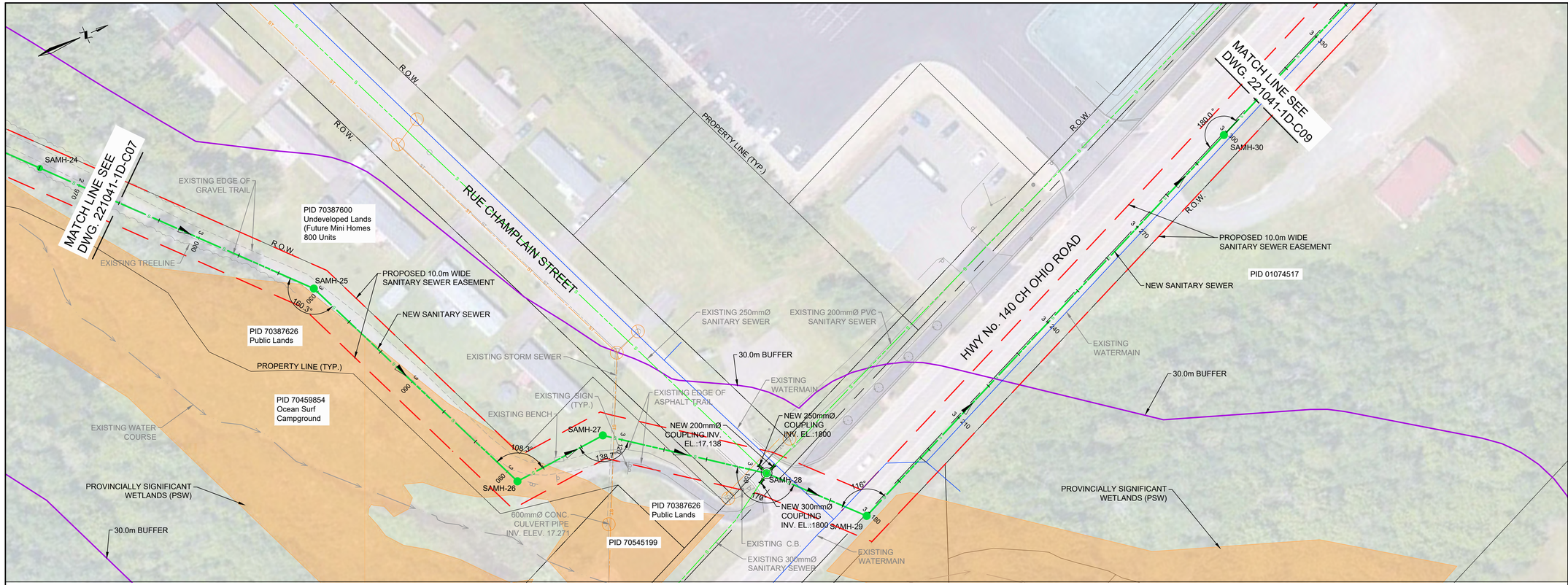

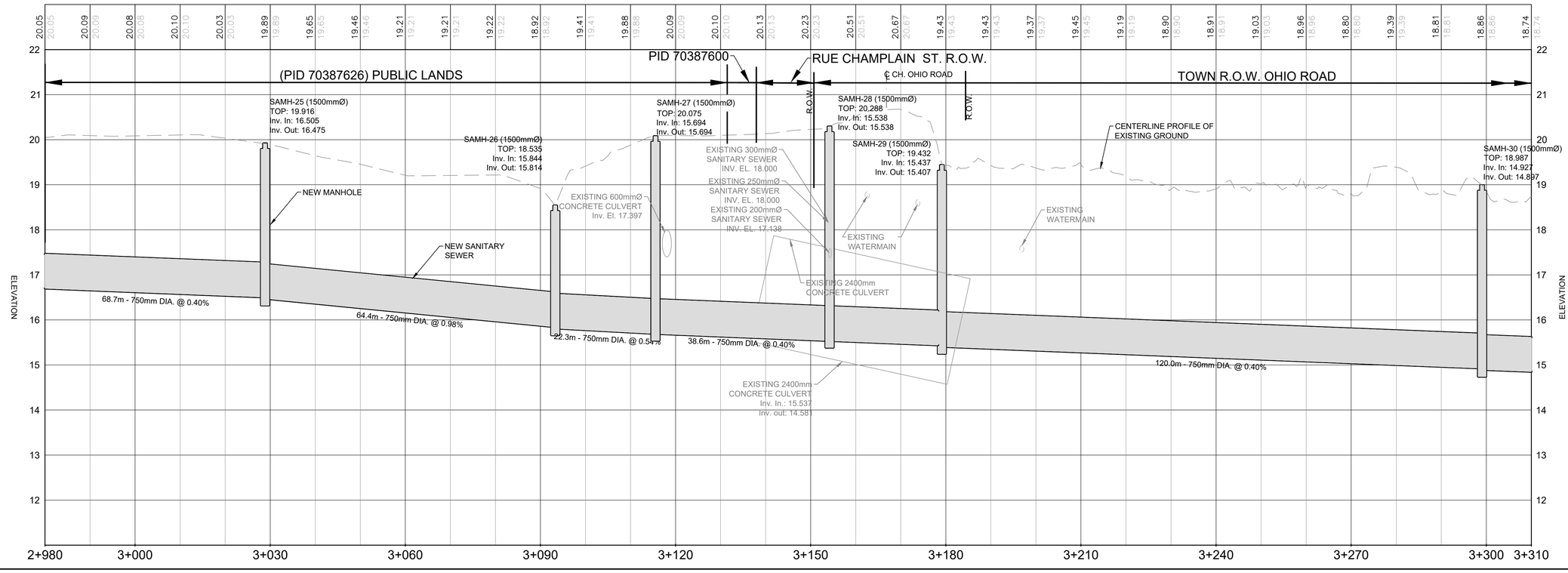

NOTES

LEGEND:

1. REFER TO GEOTECHNICAL REPORT FOR BOREHOLE INFORMATION.

NEW SANITARY MANHOLE
NEW SANITARY SEWER
EXISTING SANITARY SEWER
EXISTING STORM SEWER
EXISTING WATERMAIN
PROPOSED 10.0m WIDE EASEMENT
PROV. SIGNIFICANT WETLAND
PSW 30m BUFFER
BOREHOLE LOCATION
TOP OF BEDROCK

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 2+980 TO 3+310

Scale	Drawn By	Design By
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	Checked By: CJG	Cadd Check: TWA
	Sheet 08 of 13	

File Name: 2212041-1D-C07-C11.DWG

Drawing No.: 2212041-1D-C08

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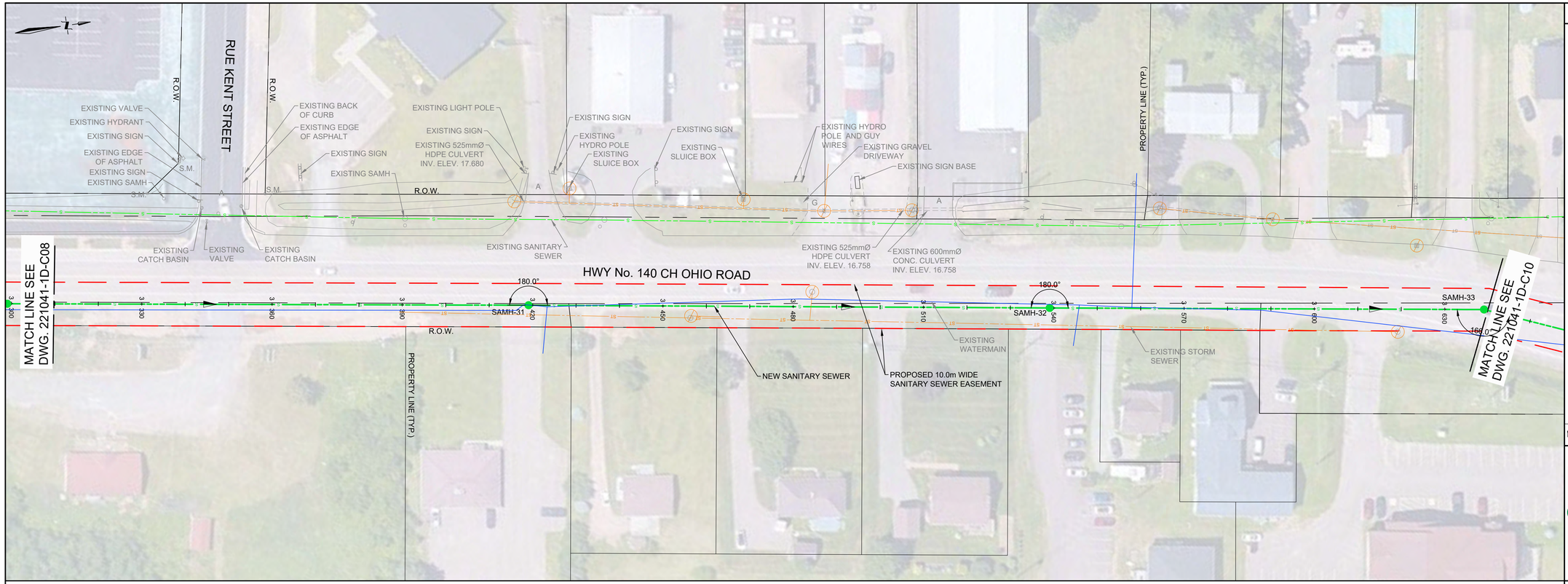

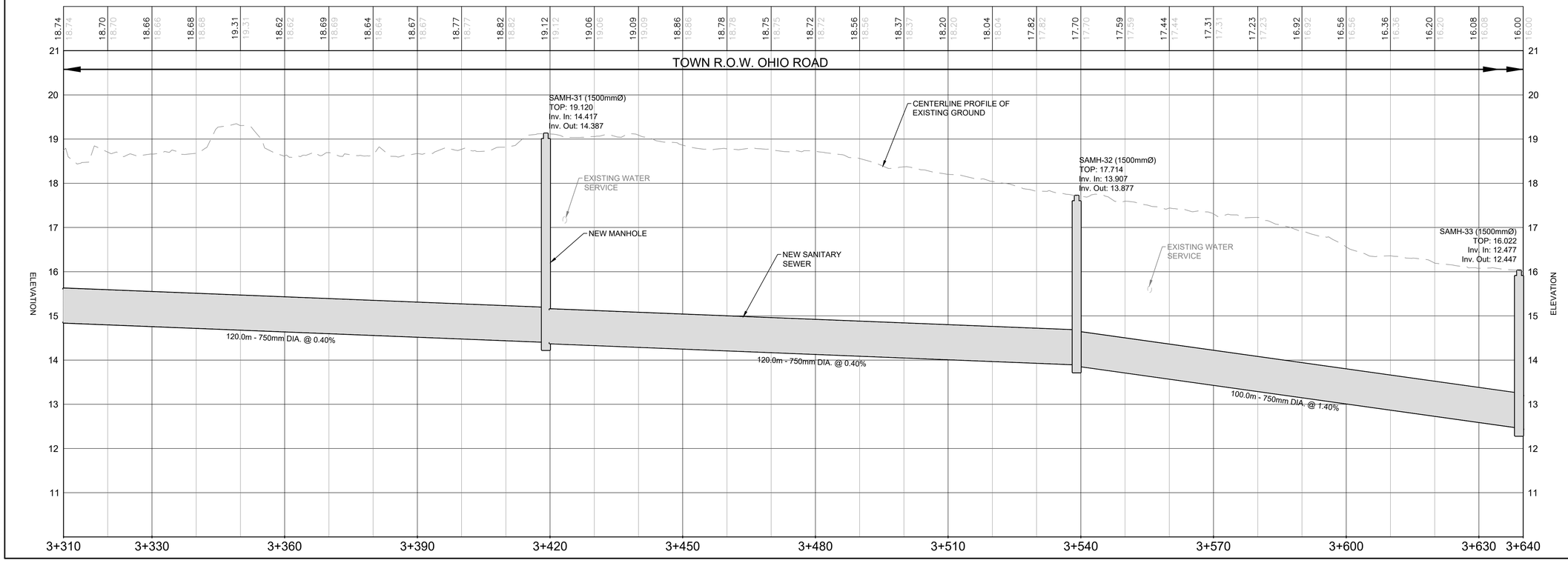

NOTES

LEGEND:

1. REFER TO GEOTECHNICAL REPORT FOR BOREHOLE INFORMATION.

NEW SANITARY MANHOLE
NEW SANITARY SEWER
EXISTING SANITARY SEWER
EXISTING STORM SEWER
EXISTING WATERMAIN
PROPOSED 10.0m WIDE EASEMENT
PROV. SIGNIFICANT WETLAND
PSW 30m BUFFER
BOREHOLE LOCATION
TOP OF BEDROCK

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 3+310 TO 3+640

Scale	Drawn By	Design By
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	Checked By: CJG	Cadd Check: TWA
	Sheet 09 of 13	

File Name: 2212041-1D-C07-C11.DWG

Drawing No.: 2212041-1D-C09

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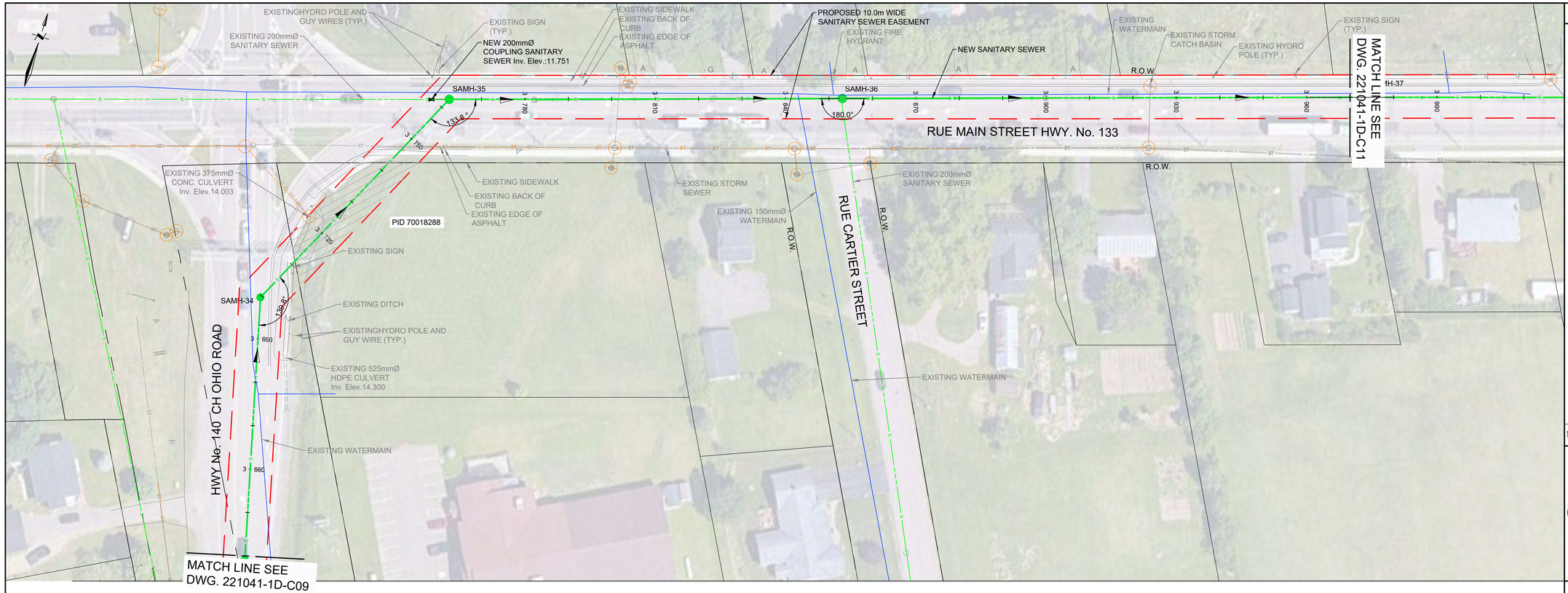

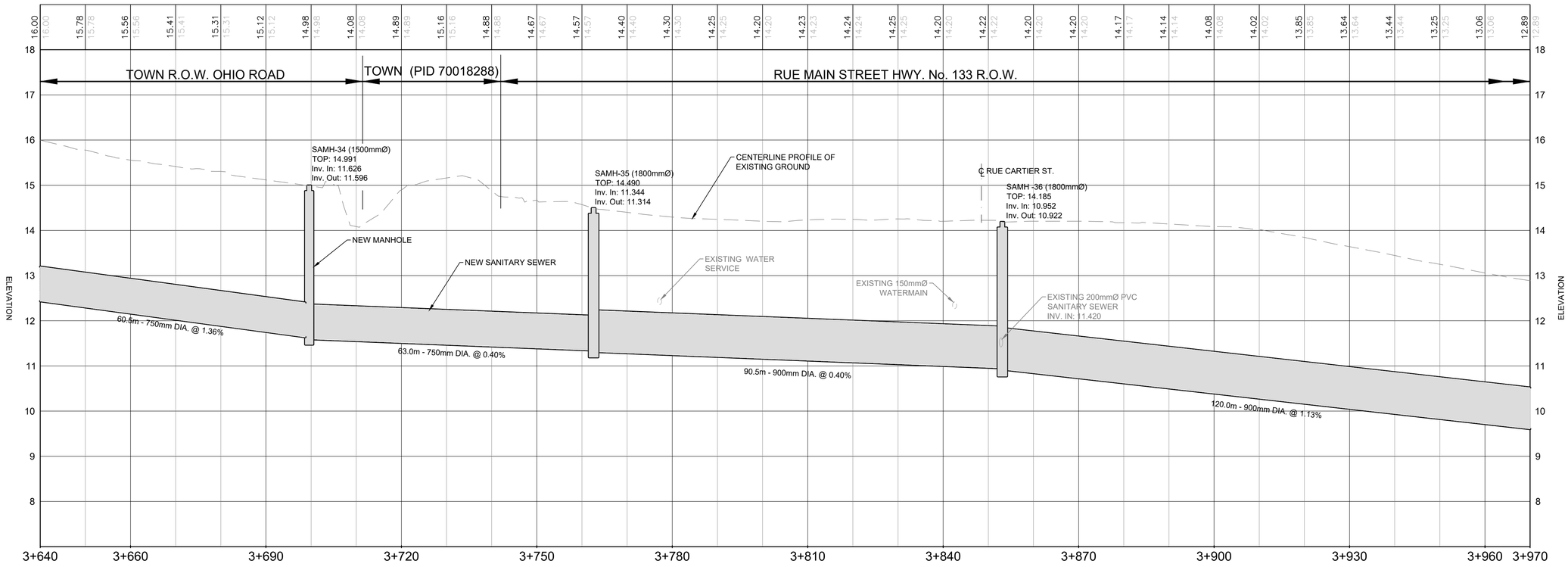

NOTES

LEGEND:

1. REFER TO GEOTECHNICAL REPORT FOR BOREHOLE INFORMATION.

NEW SANITARY MANHOLE
NEW SANITARY SEWER
EXISTING SANITARY SEWER
EXISTING STORM SEWER
EXISTING WATERMAIN
PROPOSED 10.0m WIDE EASEMENT
PROV. SIGNIFICANT WETLAND
PSW 30m BUFFER
BOREHOLE LOCATION
BH
TOP OF BEDROCK

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

eNGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 3+640 TO 3+970

Scale	Drawn By	Design By
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	Checked By: CJG	Cadd Check: TWA
	Sheet 10 of 13	

File Name: 2212041-1D-C07-C11.DWG

Drawing No.: 2212041-1D-C10

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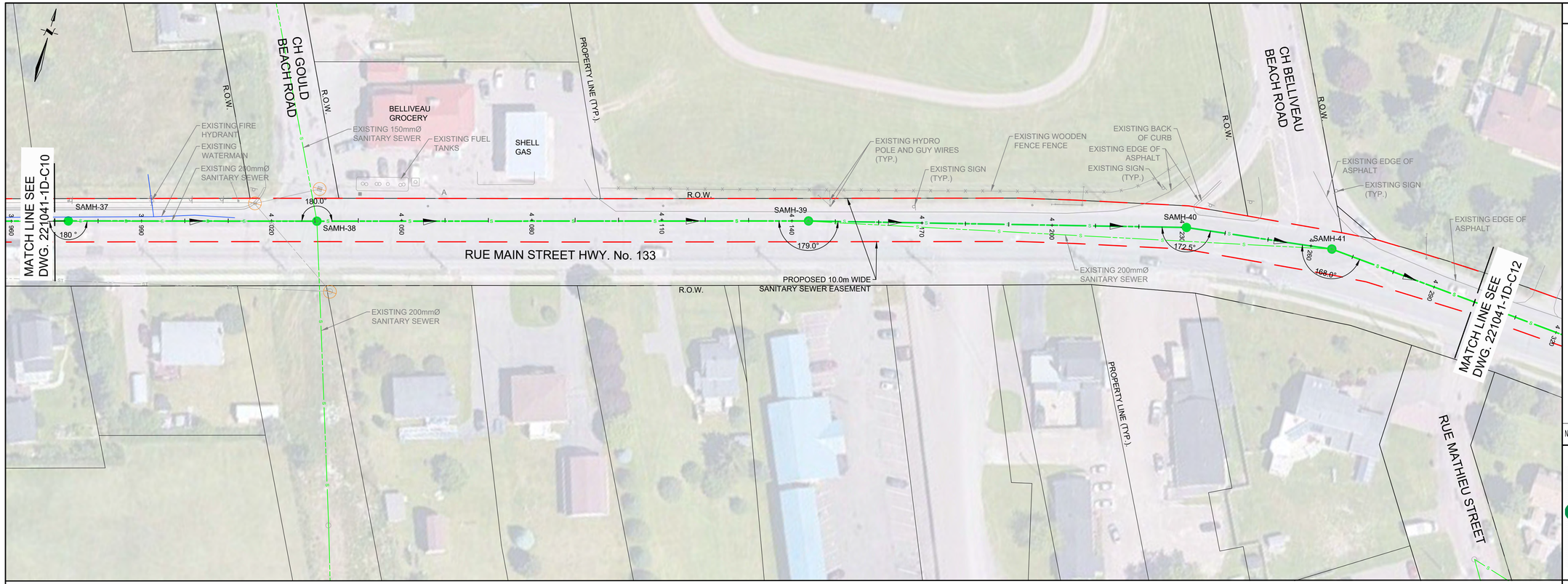

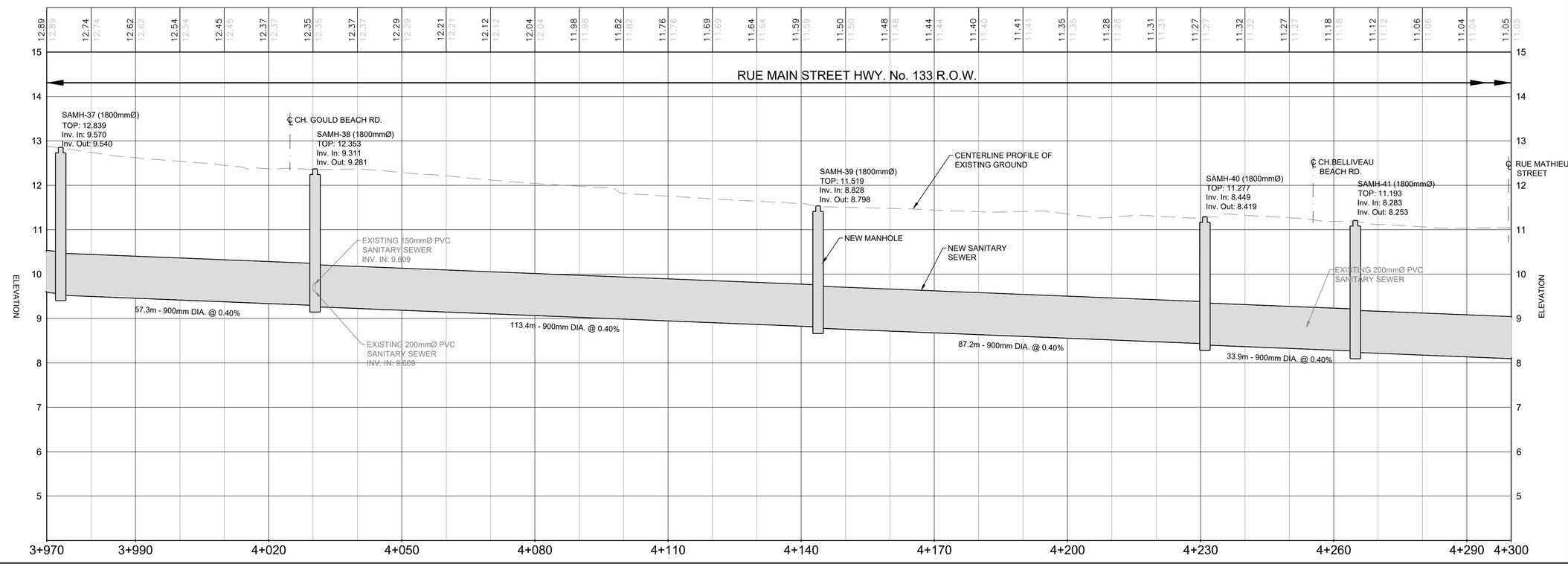

NOTES

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 3+970 TO 4+300

Scale	Drawn By	Design By
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.5m 0 1m 1:50 Vertical (Full Scale)	Checked By: CJG	Cadd Check: TWA
	Sheet 11 of 13	

File Name: 2212041-1D-C07-C11.DWG

Drawing No.: 2212041-1D-C11

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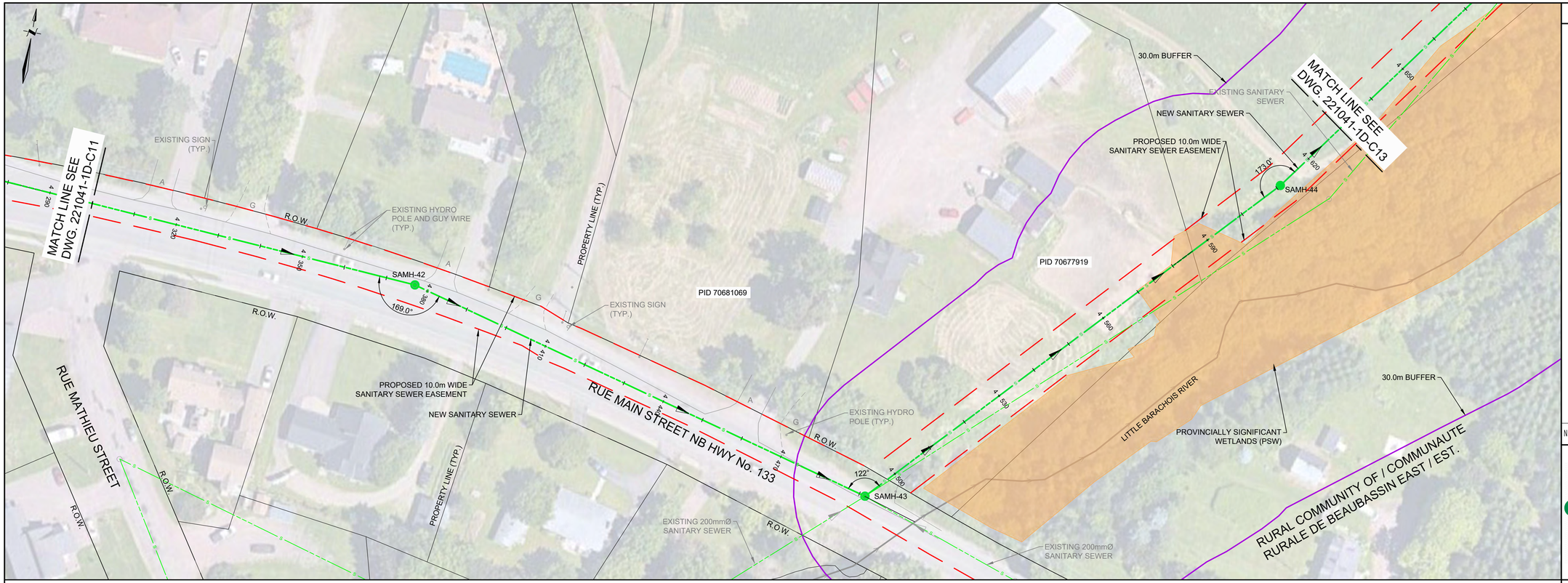

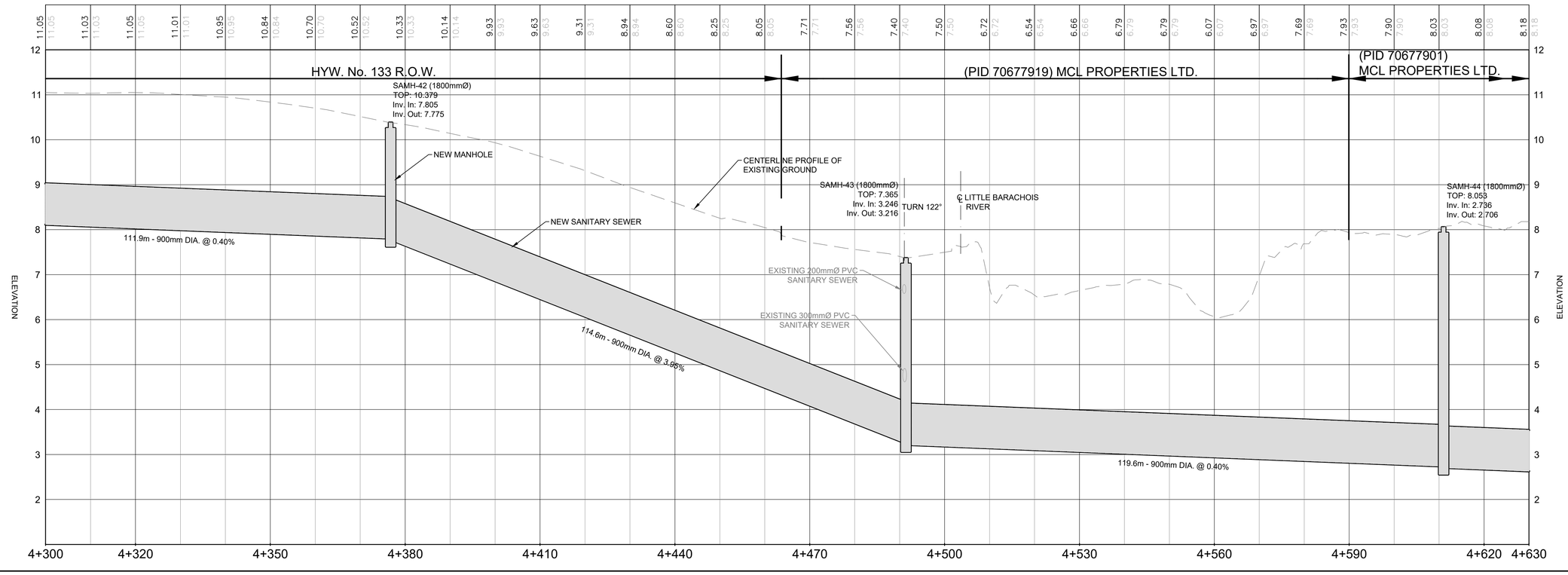

NOTES

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

eNGLOBe

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 4+430 TO 4+630

Scale	Drawn By	Design By
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	Checked By: CJG	Cadd Check: TWA
	Sheet 12 of 13	

File Name: 2212041-1D-C12-C13.DWG

Drawing No.: 2212041-1D-C12

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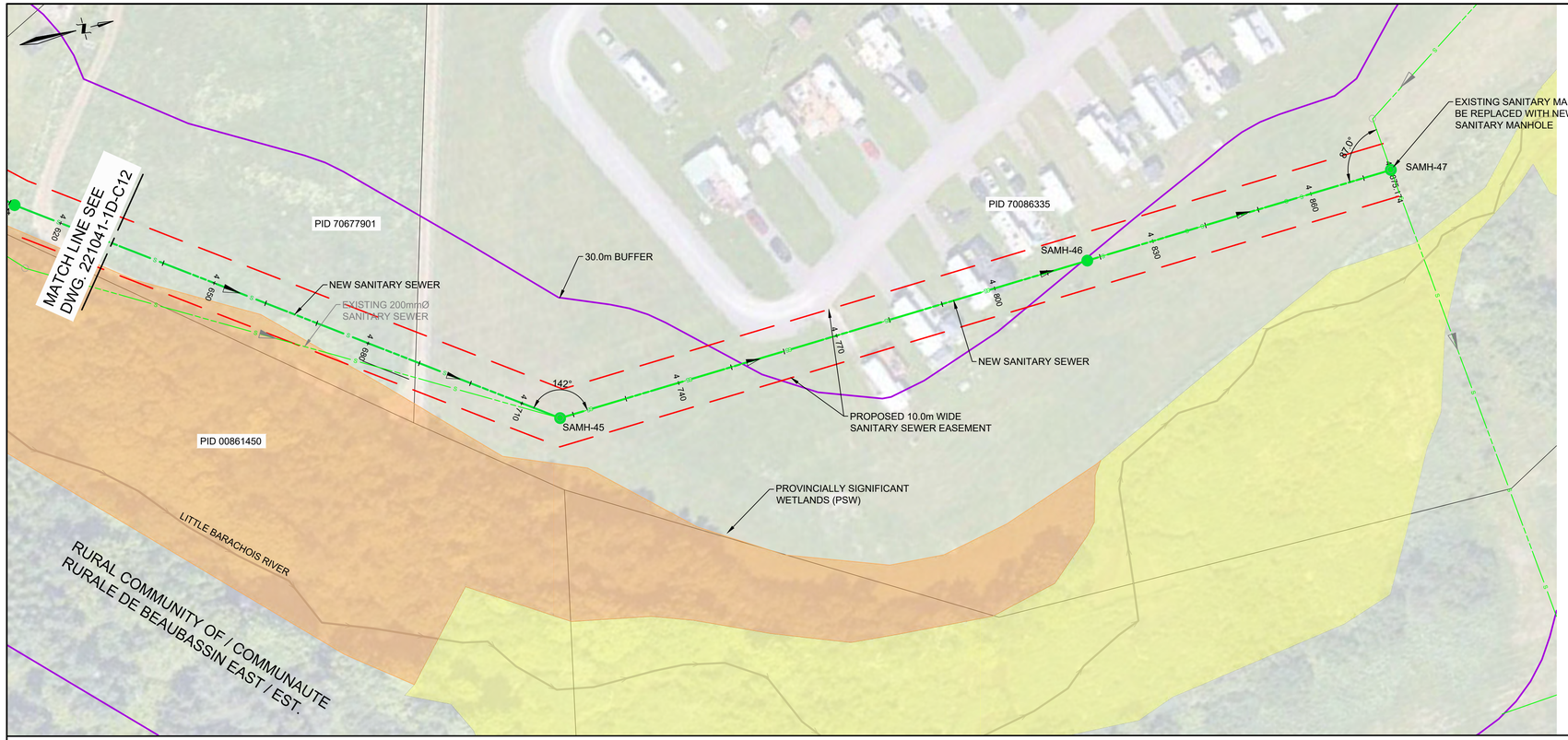

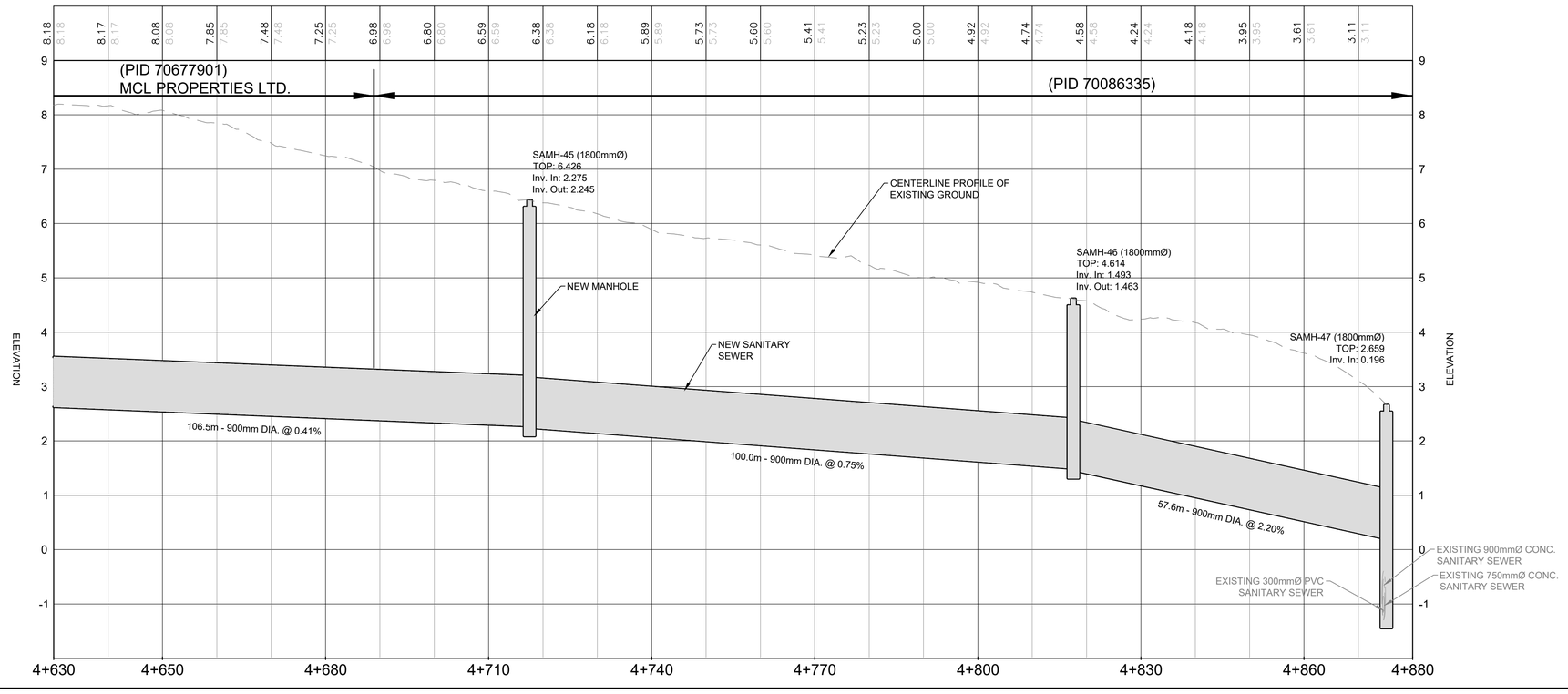

NOTES

LEGEND:

1. REFER TO GEOTECHNICAL REPORT FOR BOREHOLE INFORMATION.

NEW SANITARY MANHOLE
NEW SANITARY SEWER
EXISTING SANITARY SEWER
EXISTING STORM SEWER
EXISTING WATERMAIN
PROPOSED 10.0m WIDE EASEMENT
PROV. SIGNIFICANT WETLAND
PSW 30m BUFFER
BOREHOLE LOCATION
BH
TOP OF BEDROCK

NO.	DATE	REVISIONS	BY	APPR.

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Apr 13, 2023
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

SHEDIAC LONG TERM STUDY

SHEDIAC N.B.

DRAWING TITLE

TRUNK SEWER
PLAN AND PROFILE
STA. 4+630 TO 4+880

Scale	Drawn By	Design By
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.5m 0 1m 1:50 Vertical (Full Scale)	Checked By: CJG	Cadd Check: TWA
	Sheet 13 of 13	

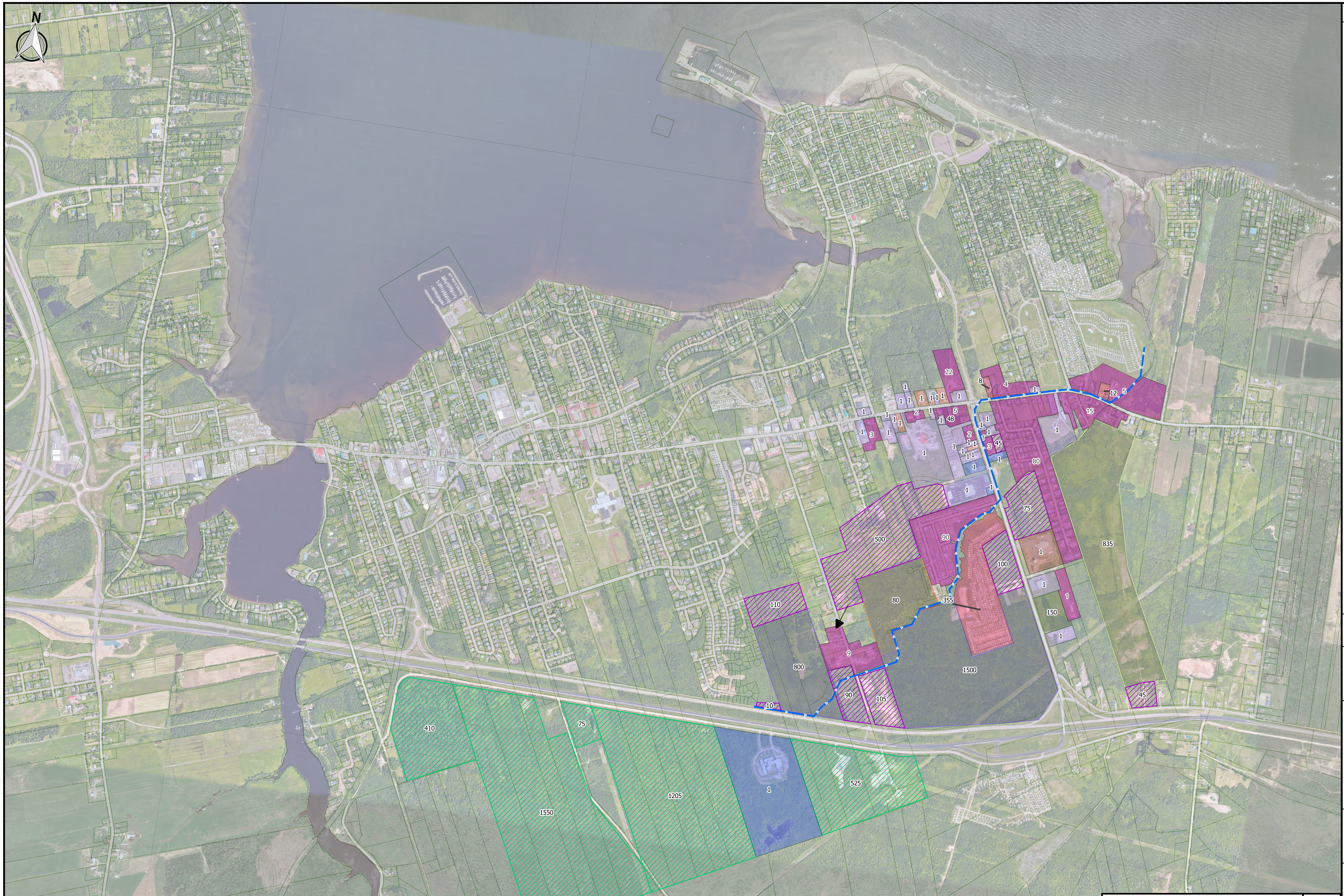
File Name: 2212041-1D-C12-C13.DWG

Drawing No.: 2212041-1D-C13

O:\2022\221204\1 SHEDIAC TRUNK SEWER LONG TERM STUDY\CADD\DESIGN\CURRENT SHEETS\2212041-1D-C12-C13.DWG, 13/04/2023 3:12 PM

Appendix C Development and Existing Area Unit Counts of Trunk Sewer

ENGLOBE



Area	Units
Existing Units	282
Future Developments	4935
Long Term Future Developments	3365

Legend / Notes:

LEGEND

New Trunk Sewer Proposed Alignment

Proposed Trunk Sewer - Pipes

Servicing Area

Loading

Existing

Sanitary Loading - Area Loading

- Commercial
- Restaurants
- Muncipal
- Goverment Bldg
- Existing Residential
- Maps - Motor Home Loads

Future

Large Scale Future Development

- Residential
- Commercial

Long Term Future Development

- Commercial
- Residential - High Density
- Mini Home
- Institutional

Project Location:

SHEDIAC, N.B.

Project Title:

SHEDIAC TRINK SEWER PRE-DESIGN

Map Title:

TRUNK SEWER UNITS SERVICED

Map ID:

MAP No: 2-2

PAGE No: 1 of 1

SCALE: 1:10000

Revision:

DATE: 2023-04-12 BY: OFR

PROJ No: 2212041 APPR:

GREATER SHEDIAC SEWERAGE COMMISSION DES ÉGOUTS SHEDIAC ET BANLIEUES

Appendix D Class ‘D’ Cost Estimate

ENGLOBE

ENGLOBE

PRELIMINARY COST ESTIMATE - CLASS 'D'

Project:	**Shediac Trunk Sewer Pre-Design**
No.	**2212041.000**
Client:	**Greater Shediac Sewerage Commisssion**
Date:	**May 15, 2023**

Item		Subtotal Cost
New Trunk Sewer		
Environmental Protection	$	100,000.00
Decommissioning of Existing Infrastructure	$	100,000.00
Earthworks	$	2,310,500.00
Sanitary Sewer System	$	3,813,250.00
Stormwater Management Restoration	$	149,800.00
Roadway / Trail Reconstruction & Restoration	$	2,545,700.00
CONSTRUCTION SUBTOTAL:	$	9,019,250.00
Construction Contingency (20%):	$	1,804,000.00
Engineering Environmental Services:	$	375,000.00
Engineering Management & Design Services:	$	1,083,000.00
PHASE 1 TOTAL:	**$**	**12,281,250.00**
Lift Station Upgrades		
Forcemain Environmental Protection	$	150,000.00
Forcemain Earthworks	$	1,775,500.00
Sanitary Forcemain	$	4,870,000.00
Forcemain Roadway Reconstruction & Restoration	$	1,524,040.00
Decommissioning of Existing Infrastructure	$	100,000.00
Lift Station 03 Upgrades (Lift Station 02 still pumping to 03)	$	15,900,000.00
Connection from Lift Station 02 to 03	$	400,000.00
Connection from Lift Station 04 to 03	$	456,500.00
CONSTRUCTION SUBTOTAL:	$	25,176,040.00
Construction Contingency (20%):	$	5,036,000.00
Engineering Environmental Services:	$	125,000.00
Engineering Management & Design Services:	$	3,022,000.00
PHASE 2 TOTAL:	**$**	**33,359,040.00**
GRAND TOTAL:	**$**	**45,640,290.00**