APEX SOUTH BUSINESS CENTRE
35 SAPPERS RIDGE
CITY OF OTTAWA

SERVICING AND STORMWATER MANAGEMENT REPORT

Prepared by:

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February 2014

Ref: R-2013-039
Novatech File No. 112034

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February 11, 2014

BY HAND

City of Ottawa
Planning and Growth Management Department
4th Floor
110 Laurier Avenue West
Ottawa, ON K1P 1J1

Attention: Mr. Jeff McEwen
Program Manager, Development Review Process (Rural)

Dear Mr. McEwen,

Re: Servicing and Stormwater Management Report
Apex South Business Centre
35 Sappers Ridge
Our File No.: 112034

Please find enclosed the 'Servicing and Stormwater Management Report' (February 2014) for the above noted project. This report addresses the approach to site servicing and stormwater management for the subject property and is submitted in support of an application for Site Plan approval.

Should you have any questions or require additional information, please contact the undersigned.

Yours truly,

NOVATECH ENGINEERING CONSULTANTS LTD.

L Bowley.

Lisa Bowley, P. Eng.
Project Engineer

cc: Michael Assal - Taplen Commercial Construction (1 copy)

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1.0 INTRODUCTION

Novatech Engineering Consultants Ltd. has been retained to complete the servicing, grading and stormwater management design for the proposed development of industrial condominiums at 35 Sapper Ridge located in the City of Ottawa. This report addresses the servicing aspects of the proposed development with respect to water supply, sanitary servicing, storm drainage, stormwater management and fire protection and is submitted in support of an application for Site Plan approval for the subject property.

1.1 Location and Site Description

The subject property is part of the Hawthorne Industrial Park located southeast of Hawthorne Road and Rideau Road. Refer to **Figure 1** - Key Plan for the subject property's location. The Hawthorne Industrial Park was developed in 2009 by R.W. Tomlinson Limited. The development included road works, stormwater management and utilities. The majority of the industrial park lands are currently vacant.

The subject property is approximately two acres (0.8ha) and is vacant. The legal description of the property is Part 3 and Part 4, Parts of Block 6, on the Registered Plan 4M-1388 and 4R-26208, in the City of Ottawa.

1.2 City of Ottawa Servicing Study Guidelines for Development Applications

Servicing Options

The City of Ottawa Servicing Study Guidelines for Development Applications (November 2009) requires a Servicing Options Report be completed in accordance with Bill 51 of the City of Ottawa Official Plan, in order to review the options for water supply and sanitary servicing. Servicing options are addressed in Section 4.0 of this report.

Servicing Study Guideline Checklist

The Servicing Study Guidelines require a Development Servicing Study Checklist to confirm that each applicable item is deemed complete and ready for review by City of Ottawa Infrastructure Approvals. A completed checklist is contained in **Appendix A.**

1.3 Planning Context

The subject property is designated General Rural Area (3.7.2) in the City of Ottawa Official Plan. The intent of the General Rural Area designation is to accommodate a variety of land uses, including industrial, that are appropriate for a rural location. Proposed developments should not preclude continued agricultural and non-residential uses, such as farms, rural housing, wood lots and forests, small industries, golf courses and small clusters of residential and commercial development. The proposed development conforms to these policies of the Official Plan.

The subject property is zoned RH – Rural Heavy Industrial in the City of Ottawa Zoning By-law 2008-250. The purpose of the RH Zone is to accommodate a range of heavy industrial uses and limited service commercial uses at locations which are neither environmentally sensitive nor in close proximity to incompatible land uses. The proposed development, as well as the surrounding industrial subdivision, has been prepared in accordance with the performance standards of the RH Zone and the intended uses are to conform to those uses permitted by the RH Zone.

1.4 Additional Information

This report should be read in conjunction with the following:

- Stormwater Management Report - Hawthorne Industrial Park prepared by JL Richards & Associates Ltd. (revised May 2009);
- Hydrogeological Evaluation - Proposed Commercial Development prepared by Houle Chevrier Engineering (dated August 2013);
- Geotechnical Investigation - Proposed Commercial Development prepared by Houle Chevrier Engineering (dated May 2013).

2.0 PROPOSED DEVELOPMENT

The site will be developed with three industrial condominium buildings and will have the following features:

- Buildings (total area 2,295 m^2)
- Asphalt parking lot with 61spaces (2 barrier free)
- Septic system
- Private well
- Fire protection network
- Surface drainage

The proposed development will have one access from Sapper Ridge, approximately 50-meters north of Somme Street.

Refer to the enclosed Grading Plan (112034-GR) for the proposed site layout.

All site works shown on the enclosed engineering plans listed below will be completed as a single phase.

- Grading Plan (112034-GR)
- General Plan of Services (112034-GP)
- Septic System Plan (112034-SEP)
- Erosion and Sediment Control (112034-ESC)
- Detail Sheets (112034-D1 and 112034-D2)

3.0 SITE GRADING

Existing Conditions

The existing property generally slopes in an easterly direction, down from an approximate elevation of 93.1m at the southwest corner at Sapper Ridge to an elevation of 92.0m at the northeast corner of the site. The roadside ditch along Sapper Ridge drains north to a stormwater management facility previously built to service the developed industrial park.

The site is vacant except for a small stockpile of material and a concrete foundation, both of which will be removed by the R.W. Tomlinson Limited prior to any site works.

The on-site soils are generally fill material. The native material is approximately 3.0-metres below the existing grade. Refer to the Geotechnical Investigation report for existing subsurface conditions.

Proposed Development

On-site drainage will be provided via a combination of sheet drainage and a shallow drainage ditch. The landscaped areas adjacent to the proposed buildings will be graded to provide providing positive drainage away from the buildings.

Under existing conditions the site drains to the back and there is no provision for rear yard drainage in the overall subdivision design. Drainage is therefore being redirected to the front requiring fill. Terracing down to original ground will be required around the perimeter of the site onto adjacent lands. The adjacent lands will have the same design constraints. As discussed with the developer it is understood that this temporary terracing of 3:1 (maximum) will be permitted. The terracing will no longer be required once the neighbouring lots are developed.

Refer to the Grading Plan for details.

4.0 SITE SERVICING

4.1 Servicing Options

Municipal services are not proposed or anticipated for the subject site. The development is well outside the urban boundary for the City of Ottawa and therefore the site will be serviced by private wells and wastewater systems (Official Plan - Section 4.4.2).

4.2 Water Supply

A new private water well has been drilled to service the proposed buildings and is located north of building A1 as shown on the General Plan of Services (112034-GP).

Refer to the Hydrogeological Evaluation report for water supply details.

4.3 Sanitary Servicing

The proposed building will be serviced by a new Class 4 absorption trench septic system that will be located within the grassed area west of the proposed buildings. The proposed septic system consists of a septic tank, three Clearstream pre-treatment units, a pump and an area bed type absorption system.

The septic system is designed to accommodate domestic flows, including employee washrooms and emergency washroom floor drains. In addition, floor drains in the rear of the buildings will be connected to oil and grit separators within the buildings and will outlet to the septic system.

A Septic System Design Brief has been prepared by Novatech Engineering summarizing the septic system design and is included in **Appendix B** for reference only as review will be the responsibility of the Ottawa Septic System Office (OSSO). A separate application will be made to the OSSO for a permit for the proposed septic system, as part of the building permit process.

Refer to the Septic System Plan (112034-SEP) for details.

5.0 STORMWATER MANAGEMENT

5.1 Design Criteria

Stormwater management criteria for the site are as described in the Stormwater Management Report – Hawthorne Industrial Park prepared by JL Richards & Associates Ltd. Refer to **Appendix C** for excerpts from the JL Richards Stormwater Management Report.

Quantity Control

- The release rate from the overall site shall be limited to a pre-development runoff coefficient of C=0.7 for both the 1:5 year and 1:100 year post-development design events.

Quality Control

- Provide an oil and grit separator on-site to achieve a *Normal level* of protection corresponding to a long-term 70% removal of total suspended solids (TSS).

Erosion and Sediment Control

- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

5.2 Quantity Control

Allowable Release Rate

The JL Richards Stormwater Management Report has specified that the allowable release rate from the site be limited to a pre-development runoff coefficient of C=0.7 for both the 1:5 year and 1:100 year post-development design events. Therefore the allowable release rates are as follows:

Design Storm	Runoff Coefficient	Allowable Release Rate (L/s)
1:5 year	0.7	164.0
1: 100 year	0.7	281.2

Refer to **Appendix D** for detailed calculations.

Post-Development Conditions

The development proposal includes the construction of three buildings with an asphalt parking lot and the overall runoff coefficient for the site will be 0.84, which is above the allowable runoff coefficient of 0.70 specified in the JL Richards Stormwater Management Report. To meet the quantity control criteria, under post-development conditions the flows will be controlled and stored on-site via surface storage prior to the runoff entering the existing roadside ditch on Sapper's Ridge.

The site has been subdivided into two catchment areas under post-development conditions.

Area A1 – Direct Runoff

The uncontrolled catchment (Area A1) will outlet uncontrolled to the Sapper's Ridge roadside ditch. The post-development runoff was calculated using the Rational Method to be 6.1 L/s and 13.2 L/s for the 1:5 year and 1:100 year design events respectively. Refer to **Appendix D** Rational Method calculations.

Area A2– Controlled Flow

Runoff from the proposed building roofs, parking lot, drive aisles and landscape buffer (Area A2) will sheet drain to a perimeter ditch on the south boundary and released at a controlled rate so that the overall post-development peak flows from the site do not exceed pre-development levels.

The Modified Rational Method was used to determine the storage volume required for this catchment area. Based on a release rate of 240 L/s, the required storage volume for the 1:100 year design event was calculated to be approximately 57 m^3. The proposed ditch provides an approximate storage volume of 63 m^3. The depth of water in the swale will have a maximum depth of 0.55m in the 1:100 year event. The flow will be controlled by a 500mm diameter culvert.

Table: Summary of Post-Development Flows

Area	**Description**	**Post - Development Controlled Flow (L/s)**		**Storage Required (m^3)**		**Provided**
		5 year	**100 year**	**5 year**	**100 year**	**(m^3)**
A1	Direct Runoff	6.1	13.2	-	-	-
A2	Buildings, Parking Lot, Landscape Buffer	160	240	19	57	63
	Total Flow (L/s) =	**166.1**	**253.2**			

As indicated in Table above, the total post-development flow from the sub-catchment areas will be released from the proposed development at a combined maximum rate of 253.2 L/s during the 1:100 year design event and 166.1 L/s during the 1:5 year design event; both of which are less than the allowable flow of 281.2 L/s for the site.

5.3 Quality Control

Quality Control

The direct runoff from Area A1 can be considered clean and will not require any additional treatment.

Area A2 will sheet drain to the grassed swale along the south boundary and then be directed to an Oil and Grit separator. The proposed oil and grit separator has been designed to provide a *Normal level* of water quality protection corresponding to a long-term average TSS removal rate of 70%. The outflow from the separator will be directed to the roadside ditch on Sapper Ridge. Refer to **Appendix E** for separator specifications.

6.0 EROSION AND SEDIMENT CONTROL

To mitigate erosion, temporary sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Silt fences installed around the site perimeter;
- Temporary rock flow check dams will be installed in the outlet ditch;
- Straw bales will be installed in the roadside ditch;
- A mud mat is to be installed at the site egress to minimize sediment transfer onto local roadways;
- Street sweeping and cleaning shall be performed on all roads adjacent to active construction on a regular basis.

The proposed erosion and sediment control measures will be implemented prior to construction and should remain in place during construction until vegetation is established. Regular inspection and maintenance of the erosion control measures, by the contractor, is required to ensure they are operational.

Refer to the Erosion and Sediment Control Plan (112034-ESC) for details.

7.0 FIRE PROTECTION NETWORK

On-site fire protection will be provided by underground storage tanks in accordance with the City's rural storage requirements and the requirements of section 3.2.5.7 of the Ontario Building Code. A dry hydrant will be provided to draw water from the tank, to which a pumper truck would connect. The pumper truck would then connect to a fire hydrant on site, thereby pressurizing the fire protection main and dry hydrants. A 150mm diameter pressure pipe network complete with remote hose connections will be provided in accordance with code requirements for the on-site fire route.

According to the mechanical consultant, a storage volume of about 270,000L is required for on-site fire protection, plus a recommended additional 15% of storage be provided for evaporation and safety margin. Refer to **Appendix F** for a record of the e-mail correspondence with the mechanical consultant. The area reserved for underground fire storage tanks is shown on the General Plan of Services.

Two options for underground water storage are being considered:

- Underground Storage Tanks manufactured by ZCL Composite Tanks
- Underground Chambers manufactured by Triton Stormwater Solutions

Reference material for each option is included in **Appendix G** and **Appendix H**, respectively.

8.0 SUMMARY AND CONCLUSIONS

Water Supply

- The site will be serviced by a private well located north of building A1.
- Details pertaining to the water supply are included in the Hydrogeological Investigation report.

Septic System

- The proposed building will be serviced by a new Class 4 absorption trench septic system that will be located within the grassed area west of the proposed buildings. The proposed septic system consists of a septic tank, three Clearstream pre-treatment units, a pump and an area bed type absorption system.
- A separate Septic System Design Brief has been prepared by Novatech Engineering summarizing the septic system design. A permit will be required from the Ottawa Septic System Office.

Stormwater Management

- The release rate from the overall site shall be limited to a pre-development runoff coefficient of C=0.7 for both the 1:5 year and 1:100 year post-development design events.
- The proposed oil and grit separator will provide a Normal level of water quality protection corresponding to a long-term average TSS removal rate of 70%.

Erosion and Sediment Control

- Temporary erosion and sediment control measures will be implemented during construction.

Fire Protection Network

- Underground water storage and a dry hydrant network will be provided for Ottawa Rural Fire Services.

NOVATECH ENGINEERING CONSULTANTS LTD.

Prepared by:

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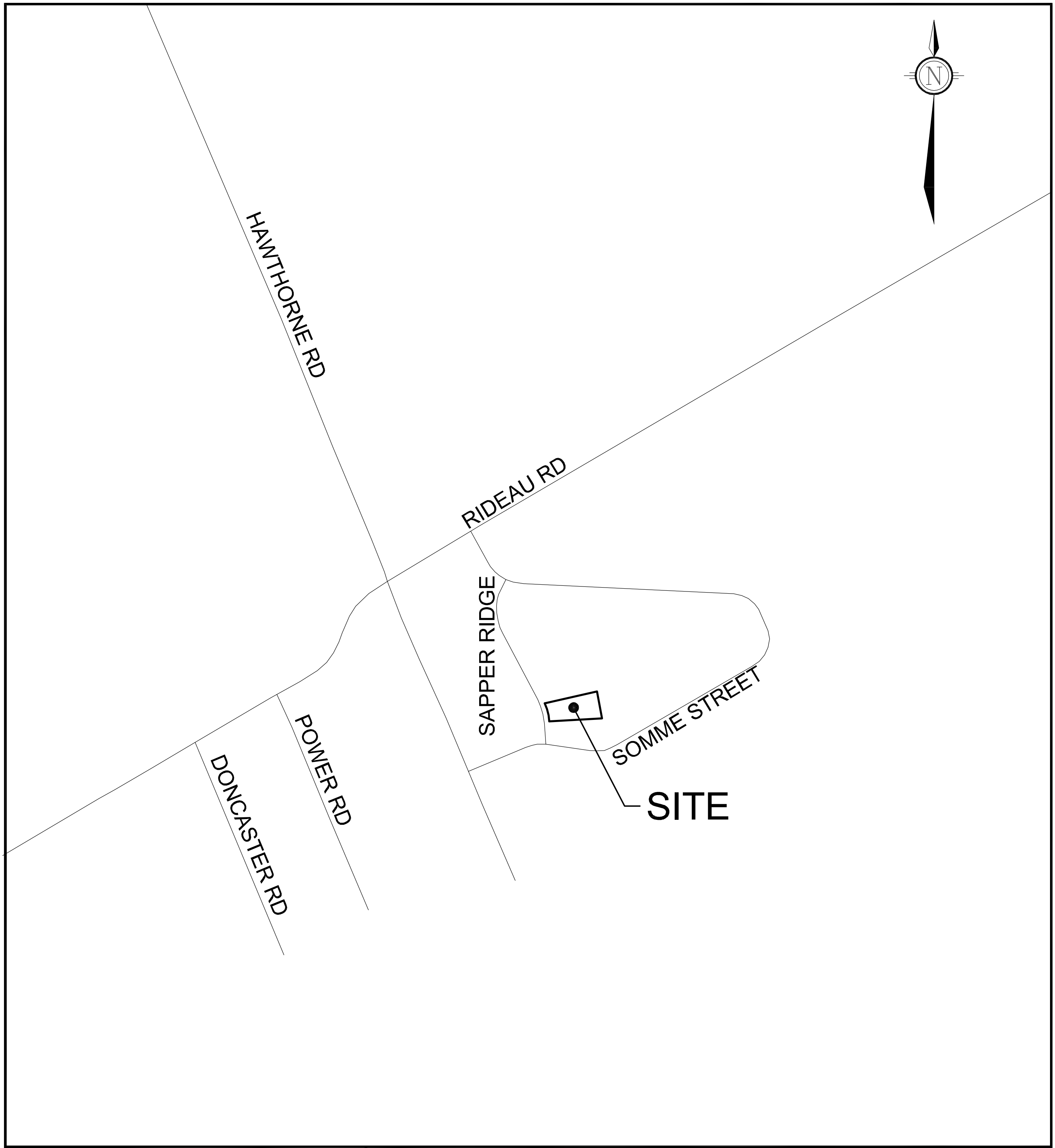

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N.T.S.

CITY OF OTTAWA

35 SAPPERS RIDGE -
APEX SOUTH BUSINESS
CENTRE

KEY PLAN

FEB 2014

112034

FIGURE 1

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APPENDIX A

DEVELOPMENT SERVICING STUDY CHECKLIST

Print Form

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

☐ Executive Summary (for larger reports only).

☑ Date and revision number of the report.

☑ Location map and plan showing municipal address, boundary, and layout of proposed development.

☑ Plan showing the site and location of all existing services.

☑ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.

☑ Summary of Pre-consultation Meetings with City and other approval agencies.

☐ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.

☑ Statement of objectives and servicing criteria.

☑ Identification of existing and proposed infrastructure available in the immediate area.

☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).

☑ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.

☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.

☑ Proposed phasing of the development, if applicable.

☑ Reference to geotechnical studies and recommendations concerning servicing.

☑ All preliminary and formal site plan submissions should have the following information:

- Metric scale
- North arrow (including construction North)
- Key plan
- Name and contact information of applicant and property owner
- Property limits including bearings and dimensions
- Existing and proposed structures and parking areas
- Easements, road widening and rights-of-way
- Adjacent street names

**Section Not Applicable

4.2 Development Servicing Report: Water

(Proposed private well)

☐ Confirm consistency with Master Servicing Study, if available

☐ Availability of public infrastructure to service proposed development

☐ Identification of system constraints

☐ Identify boundary conditions

☐ Confirmation of adequate domestic supply and pressure

☐ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.

☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.

☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design

☐ Address reliability requirements such as appropriate location of shut-off valves

☐ Check on the necessity of a pressure zone boundary modification.

☐ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

☐ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.

☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.

☐ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

**Section Not Applicable (Proposed private sewage system)

4.3 Development Servicing Report: Wastewater

☐ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).

☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.

☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.

☐ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

☐ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)

☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix ‘C’) format.

☐ Description of proposed sewer network including sewers, pumping stations, and forcemains.

☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).

☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.

☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.

☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.

☐ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

☑ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)

☐ Analysis of available capacity in existing public infrastructure.

☑ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

☑ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.

☑ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

☑ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

☑ Set-back from private sewage disposal systems.

☐ Watercourse and hazard lands setbacks.

☑ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.

☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

☐ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).

☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.

☑ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.

☐ Any proposed diversion of drainage catchment areas from one outlet to another.

☑ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.

☐ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.

☐ Identification of potential impacts to receiving watercourses

☐ Identification of municipal drains and related approval requirements.

☐ Descriptions of how the conveyance and storage capacity will be achieved for the development.

☐ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.

☑ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.

☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.

☐ Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

☑ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.

☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.

☐ Changes to Municipal Drains.

☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

☑ Clearly stated conclusions and recommendations

☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

☑ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

APPENDIX B

SEPTIC SYSTEM DESIGN BRIEF

NOVATECH
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February 10, 2014

Septic System Design Brief

35 Sappers Ridge – Apex South Business Centre
File No.: 112034

Proposed Development Scenario

The proposed development will have three commercial buildings with a total of 16 units, owned and maintained by a condominium corporation. The condo corporation will regulate the type of commercial use, number of employees and water demand.

The septic system design flow is based on the following assumption:

- Each condominium unit is in operation 8 hours per day, 7 days per week
- Number of Employees = 5/day/condominium unit
- Number of Condominium Units = 16
- Flow per Employee = 75L/8hr shift
- Total = 5 employees x 16 units x 75L/8hr shift = 6,000L/d

plus

- Rear Bay Floor Drains = 16 drains (internal oil & grit separator)
- Trap Size = 3inch, equivalent to 3 fixture units
- Fixture Unit = 50L/d
- Total = 16 drains x 3 fixture units x 50L/d = 2,400L/d

The total theoretical design flow for the development is 8,400 L/day.

Existing Soil Conditions

Houle Chevrier Engineering completed a Geotechnical Investigation (May 2013) for the subject property. Two test pits were advanced in the area of the proposed septic system (TP13-201, TP13-202). The investigation confirmed that the site was filled with over 3-metres of fill material. The fill material is unsuitable and will be removed, as there is a concern about potential settlement. The excavated material will be replaced with imported sand (T= 6 to 10min/cm).

Attached is an excerpt from the Houle Chevrier report and associated test pit logs.

Septic System Design

Details of the septic system design are indicated on the Septic System Plan (112034-SEP), attached. The proposed septic system consists of a septic tank, three Clearstream units, a lift pump and pump chamber and an area bed type absorption system.

The design flow used to size the septic system is 8,550L/day

Septic Tank

Septic tank size required (1x design flow): Q = 8,550L
Septic tank size provided Q = 9,000L (min)

Septic tank is to be fitted with an effluent filter.

Tertiary Pre-treatment

Clearstream Wastewater System: 3 x Model 750N which will provide a capacity of 2,850L each or a total of 8,550L/day.

Area Bed Design

Area of Stone layer:

$$\text{Area required} = \frac{Q}{50\text{L/m}^2} = \frac{8{,}550}{50} = 171\text{m}^2$$

Area provided = 175m^2

Area of Sand layer:

$$\text{Area required} = \frac{QT}{400} = \frac{(8{,}550)(10)}{400} = 214\text{m}^2$$

Area provided = 870m^2 (including the mantle)

Pump Calculations and Operations

Design flow = 8,400 L/day (average)

Pipe Volume for tile bed:

Length of Distribution Piping = 132m
75% of pipe volume = 132m x 0.0046m^2 x 0.75 = 0.455m^3

Required Flow Rate:

Dose the tile field with 455L per cycle in order to fill 75% of the pipe volume.

Therefore, 8,400L/day ÷ 455L = 18 cycles/day

The pump will operate at 2.7L/sec; (refer to Barnes EHV-412 Submersible Effluent Pump graph, attached)

Therefore, the pump will run for: 455L ÷ 2.7L/s = 2.8 minutes each cycle

Pump / Control Panel Operations

- The pump shall be equipped with a timer to control the discharge of effluent to the septic bed.
- The timer shall be set for the pump to run for a 2.8 minute interval at a flow rate of 2.70 L/s (+/-) and this cycle shall occur 18 times daily.
- Control panel must be equipped with data logging capabilities to record the inflow of effluent to the septic tank.
- Control panel is to be water proof and mounted on an exterior wall of the building (mounting location is to be verified with the architect prior to installation).
- A high float alarm must be installed a minimum of 0.3m below the inlet of the pump chamber.
- A low float shall be set to ensure the pump does not run dry for any period of time.
- If at any time during the 3 minute pumping cycle the water level in the tank reaches the low float level, the pump must turn off and remain off until the next scheduled pumping cycle begins.

Setbacks

The following minimum setbacks are required:

- Tile to any drilled well: 17.0m
- Tile to property line: 5.0m
- Septic tank to structure: 7.0m
- Septic tank to any drilled well: 15.0m

Septic System Installation

The septic system is to be installed in accordance with the following engineering drawings prepared by Novatech Engineering Consultants Ltd.

- Grading Plan (112034-GR)
- General Plan of Services (112034-GP)
- Septic System Plan (112034-SEP)

The area bed is to be constructed at the elevations shown on the Grading Plan and the Septic System Plan. The elevations are not to be revised without written permission from Novatech Engineering Consultants Ltd.

The proposed septic system consists of a septic tank, three Clearstream units, a lift pump and pump chamber and an area bed type absorption system.

Installation of the septic system and materials used to construct the septic system are to be in accordance with current Ontario Building Code requirements, and Building Materials Evaluation Commission (BMEC) Authorization.

The owner is required to enter into a service and maintenance agreement for the Clearstream units, in accordance with the Building Code requirements.

The septic system is to be installed by an installer authorized by the Clearstream manufacturer.

The imported sand, which is to be used to construct the septic system including the mantle, is to have a percolation rate of 6 to 8 min/cm, with less than 8% silt, tested and approved before placement.

The surface area of the septic system is to be graded to provide positive drainage, and treated with 100mm permeable topsoil and seed. No impermeable material is to be placed over or adjacent to the area bed.

This septic system has been designed to treat domestic waste. The following are not to be connected to the septic system.

- Water softener
- Sump pump
- Roof Drains
- Process Water

Rear Floor Drains: Additional effluent other than water, oil and grit in the rear bays must not be discharged to the septic system. This effluent is to captured and hauled offsite.

Construction traffic and materials are to be kept away from the septic system, including the mantle.

Installation of septic system is to be inspected by Ottawa Septic System Office and Novatech Engineering Consultants Ltd.

Novatech's design and inspection services do not relieve the septic system installer of the responsibility for guaranteeing workmanship and materials.

Reasonable Use

Reasonable use assessment is not required since design flow $\leq$ 10,000 L/day.

Prepared by:	Reviewed by:

NOVATECH ENGINEERING CONSULTANTS LTD.

LICENSED PROFESSIONAL ENGINEER L.A. BOWLEY 100081115 Feb 10 2014. PROVINCE OF ONTARIO	LICENSED PROFESSIONAL ENGINEER S.M. GORDON Feb 10/14 PROVINCE OF ONTARIO
Lisa Bowley, P.Eng Project Engineer	Susan M. Gordon, P.Eng Sr. Project Manager

Attached

1. Excerpt from Geotechnical Investigation (Houle Chevrier, May 2013)
2. Septic System Plan (112034-SEP, revision 1)
3. Barnes EHV-412 Submersible Effluent Pump graph

Houle Chevrier Engineering Ltd.
180 Wescar Lane
R.R. # 2
Carp, ON   K0A 1L0
Tel: (613) 836-1422
Fax: (613) 836-9731
www.hceng.ca

REPORT ON

GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
HAWTHORNE BUSINESS PARK (LOT H)
OTTAWA, ONTARIO

Submitted to:

Apex Developments Inc.
900 Morrison Drive
Ottawa, Ontario
K2H 8K7

DISTRIBUTION:

3 bound copies – Apex Developments Inc.
1 electronic copy – Apex Developments Inc.
1 bound copy – Houle Chevrier Engineering Ltd.

May 2013

Our ref: 13-106

the roadway subgrade surface and the granular subbase material, or a combination of both, to prevent pumping and disturbance to the subgrade material. The contractor should be responsible for construction access.

If the roadway subgrade surface becomes disturbed or wetted due to construction operations or precipitation, the Granular B Type II thickness given above may not be adequate and it may be necessary to increase the thickness of the Granular B Type II subbase and/or incorporate a woven geotextile separator between the roadway subgrade surface and the granular subbase material.

5.4 Septic System

5.4.1 Excavation

It is understood that a septic system is being proposed at the west end of the site, adjacent to Sappers Ridge. Based on the test pit information collected at TP 13-201 and 13-202 excavation of the septic system will be carried out through miscellaneous fill soils.

During construction, the sides of the excavation should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational Health and Safety Act. According to the act, soils at this site can be classified as Type 3. That is, open cut excavations within overburden deposits should be carried out with side slopes of 1 horizontal to 1 vertical, or flatter.

In general, the groundwater inflow from the overburden deposits could be controlled by pumping from sumps within the excavation. Significant groundwater inflow would be expected if excavation depths extend below the groundwater (i.e. 0.9 to 1.8 metres below surface grade). If groundwater pumping exceeds 50,000 litres per day (or 8 gallons per minute on a 24 hours basis) a Permit to Take Water will be required in advance of the construction. Based on our experience, it takes at least 3 months to obtain a permit from the time of application.

5.4.2 Infiltration Characteristics

The proposed septic area is covered with about 3 to 4 metres of miscellaneous fill. The composition of the fill is highly variable throughout the site; therefore the percolation rate and the compressibility of the fill cannot be accurately determined. As such, it is recommended that the fill be removed from the beneath the proposed septic system area, and the grade raised to the underside of the septic system level using suitable, compacted materials such as clean sand or earth borrow. The native silt/sand soils below the fill are located within the groundwater table, thus would not be relevant for the septic system design.

We recommend that the septic system be designed using imported fill. The infiltration rate of the proposed imported soil could be determined by Houle Chevrier Engineering once a material source is selected.

5.5 Effects of Construction Induced Vibration

Some of the construction operations (such as granular material compaction, excavation, hoe ramming, etc.) will cause ground vibration on and off of the site. The vibrations will attenuate with distance from the source, but may be felt at nearby structures. The magnitude of the vibrations will be much less than that required to cause damage to the nearby structures.

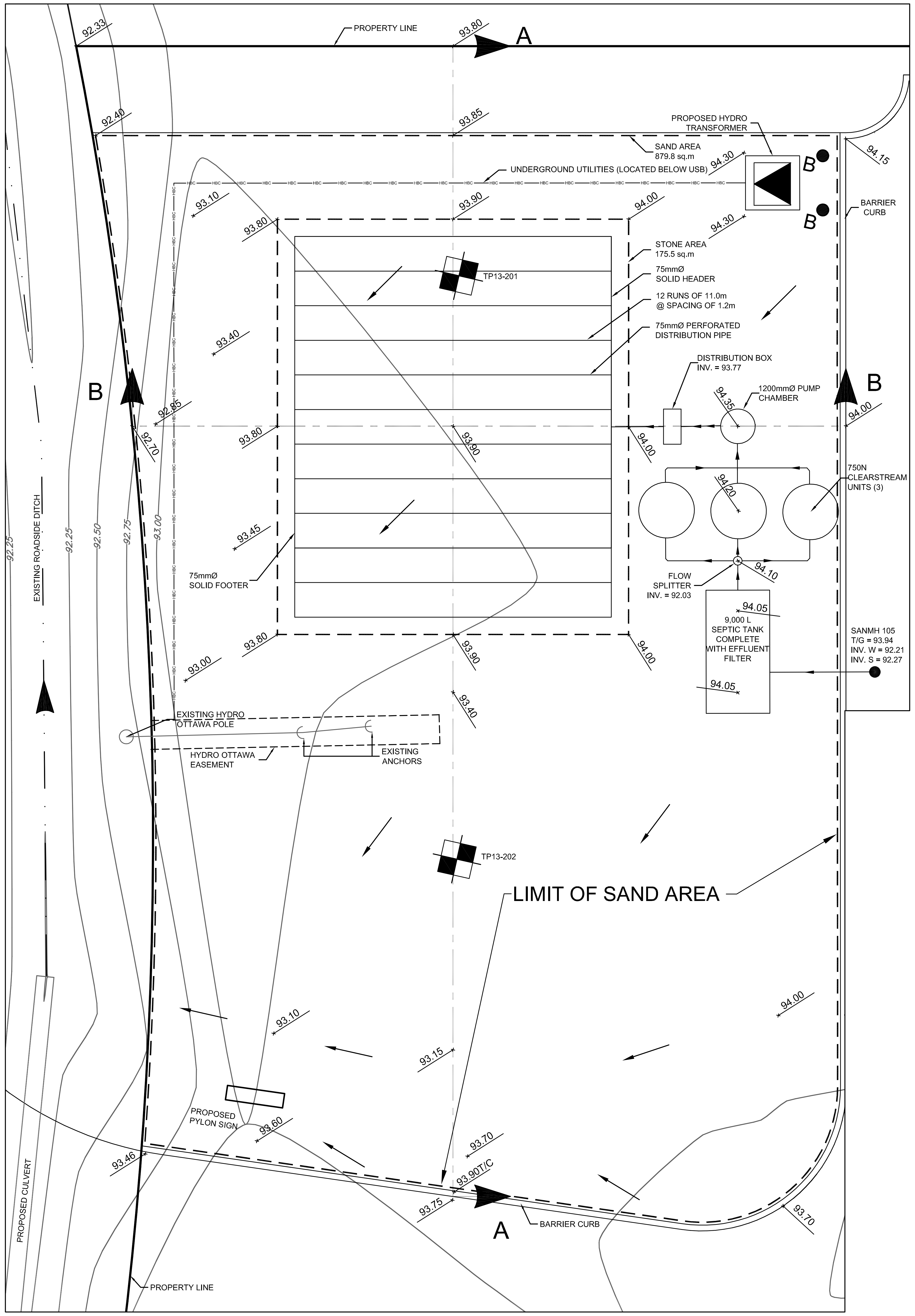
5.6 Winter Construction

In the event that construction is required during freezing temperatures, the soil subgrade below the footings and slabs should be protected immediately from freezing using straw, propane heaters, polystyrene insulation, insulated tarpaulins, or other suitable means.

5.7 Design Review and Construction Observation

The details for the proposed development were not available to us at the time of preparation of this report. It is recommended that the design drawings be reviewed by the geotechnical engineer as the design progresses to ensure that the guidelines provided in this report have been interpreted as intended.

The engagement of the services of the geotechnical consultant during construction is recommended to confirm that the subsurface conditions throughout the proposed excavations do not materially differ from those given in the report and that the construction activities do not adversely affect the intent of the design. The subgrade surfaces for the parking areas should be inspected by experienced geotechnical personnel to ensure that suitable materials have been reached and properly prepared. The placing and compaction of earth fill and imported granular



AREA BED PLAN VIEW

SCALE 1:100

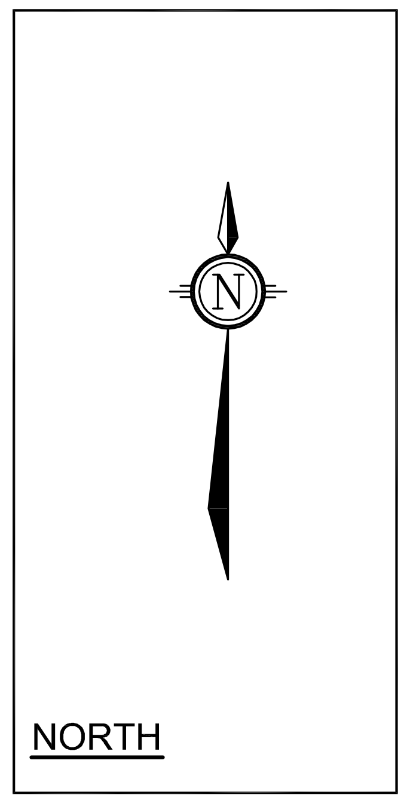
SEPTIC SYSTEM NOTES:

1. THE PROPOSED SEPTIC SYSTEM CONSISTS OF A SEPTIC TANK, THREE CLEARSTREAM PRE-TREATMENT UNITS, A LIFT PUMP AND AN AREA BED WHICH HAS BEEN DESIGNED BASED ON A SEWAGE FLOW OF 8,550 L/DAY.
2. INSTALLATION IS TO BE IN ACCORDANCE WITH CURRENT ONTARIO BUILDING CODE REQUIREMENTS, BUILDING MATERIALS EVALUATION COMMISSION AND THE ENGINEER'S BRIEF PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
3. THE OWNER IS REQUIRED TO ENTER INTO A SERVICE AND MAINTENANCE AGREEMENT FOR THE CLEARSTREAM UNITS, IN ACCORDANCE WITH ONTARIO BUILDING CODE REQUIREMENTS.
4. THE SEPTIC SYSTEM IS TO BE INSTALLED BY AN INSTALLER AUTHORIZED BY THE CLEARSTREAM MANUFACTURER.
5. THE FOLLOWING SETBACKS ARE REQUIRED:
   - TILE TO ANY DRILLED WELL = (17.0m) (min)
   - TILE TO PROPERTY LINE = (5.0m) (min)
   - STRUCTURE TO TILE = (7.0m) (min)
   - SEPTIC TANK TO ANY DRILLED WELL = 15.0m (min)
6. TANK SIZE - 9,000L (min)
7. THE SEPTIC TANK IS TO BE FITTED WITH AN EFFLUENT FILTER IN ACCORDANCE WITH MANUFACTURING SPECIFICATIONS.
8. TANK LIDS ARE TO BE LEFT ACCESSIBLE FOR PUMPING.
9. CLEARSTREAM MODEL 750N (3 UNITS REQUIRED)
10. ALL BENDS IN THE PIPE FROM THE BUILDING TO THE HEADER ARE TO BE 22.5 OR 45.0 DEGREES.
11. A MANTLE IS REQUIRED IN THE DIRECTION OF THE SURFACE DRAINAGE FLOW. IMPORTED SAND MATERIAL IS REQUIRED. IMPORTED SAND TO HAVE A PERCOLATION TIME OF 6 TO 10 MINUTES PER CENTIMETRE.
12. CONSTRUCTION TRAFFIC AND MATERIALS ARE TO BE KEPT AWAY FROM THE SEPTIC SYSTEM, INCLUDING THE MANTLE.
13. SEPTIC SYSTEM ELEVATIONS ARE NOT TO BE REVISED WITHOUT PERMISSION OF NOVATECH ENGINEERING CONSULTANTS LTD.
14. THE SEPTIC SYSTEM HAS BEEN DESIGNED TO TREAT DOMESTIC WASTE ONLY. THE FOLLOWING ARE NOT TO BE CONNECTED TO THE SEPTIC SYSTEM.
   - WATER SOFTENER
   - SUMP PUMP
   - ROOF DRAINS
   - PROCESS WATER
15. REAR FLOOR DRAINS:
   ADDITIONAL EFFLUENT OTHER THAN WATER, OIL AND GRIT IN THE REAR BAYS MUST NOT BE DISCHARGED TO THE SEPTIC SYSTEM. THIS EFFLUENT IS TO BE CAPTURED AND HAULED OFFSITE.
16. INSTALLATION OF SEPTIC SYSTEM TO BE INSPECTED BY OTTAWA SEPTIC SYSTEM OFFICE (OSSO) AND NOVATECH ENGINEERING CONSULTANTS LTD.
17. NOVATECH'S DESIGN AND INSPECTION SERVICES DO NOT RELIEVE THE SEPTIC SYSTEM INSTALLER OF THE RESPONSIBILITY FOR GUARANTEEING WORKMANSHIP AND MATERIALS.
18. THE CONTRACTOR IS RESPONSIBLE FOR SURVEYING AS-BUILT ELEVATIONS AND PROVIDING THE REQUIRED AS-BUILT INFORMATION AND DRAWINGS TO THE OSSO.

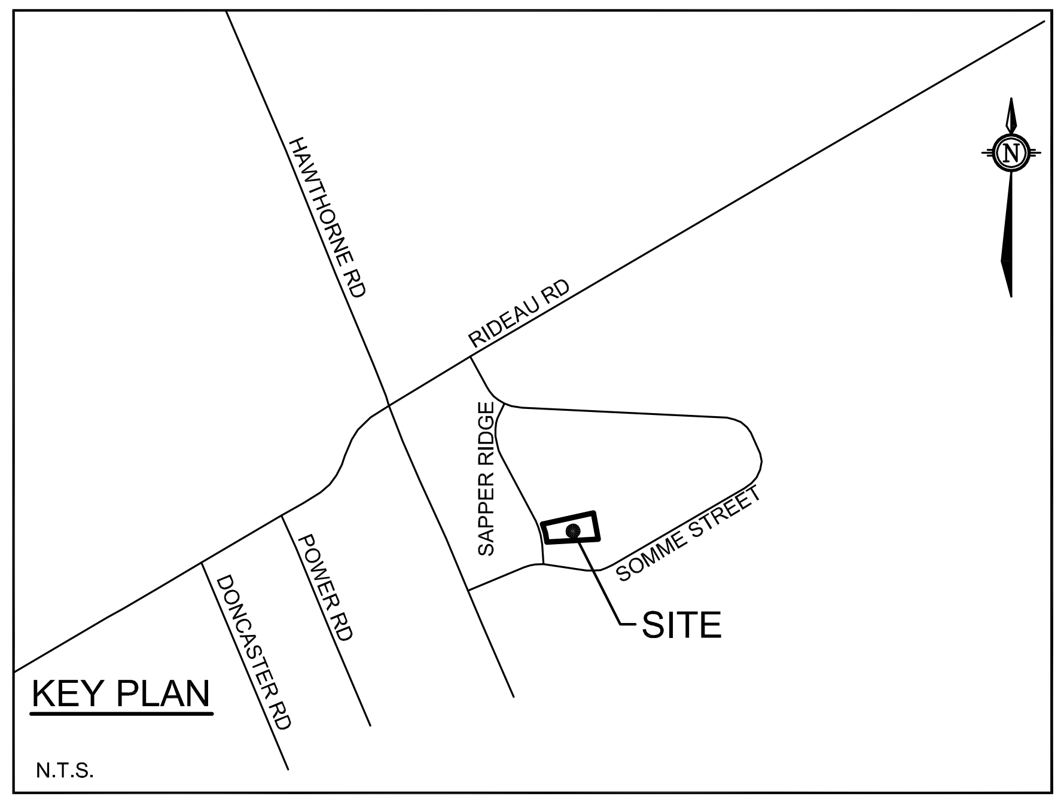
BENCHMARK

SITE BENCHMARK: NAIL IN EXISTING HYDRO OTTAWA POLE
ELEVATION = 92.45m

94.48 / 97.85	PROPOSED GRADE EXISTING GRADE
92.03(S)	PROPOSED SWALE INVERT
93.50INV	INVERT OF PROPOSED PIPE
TB	TOP OF SEPTIC BED
TM	TOP OF SEPTIC MANTLE
USB	UNDERSIDE OF SEPTIC BED
EP	EDGE OF PAVEMENT
TC	TOP OF CURB
FF	FINISHED FLOOR ELEVATION
Ⓦ	EXISITNG WELL ((APPROXIMATE LOCATION)
○	EXISTING HYDRO OTTAWA POLE
TP13-201	APPROXIMATE TEST PIT LOCATIONS (HOULE CHEVRIER 2013)

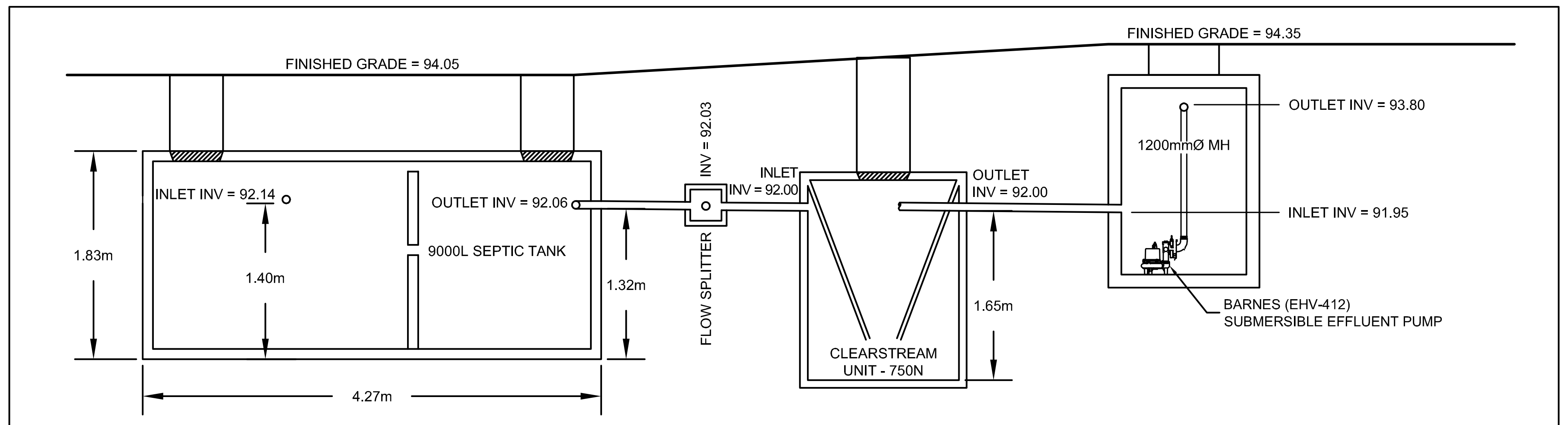


NORTH



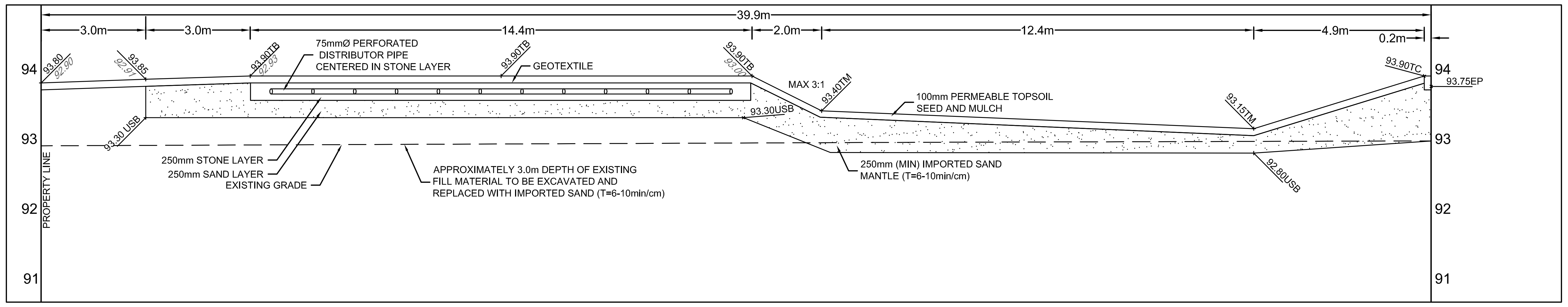
KEY PLAN

N.T.S.



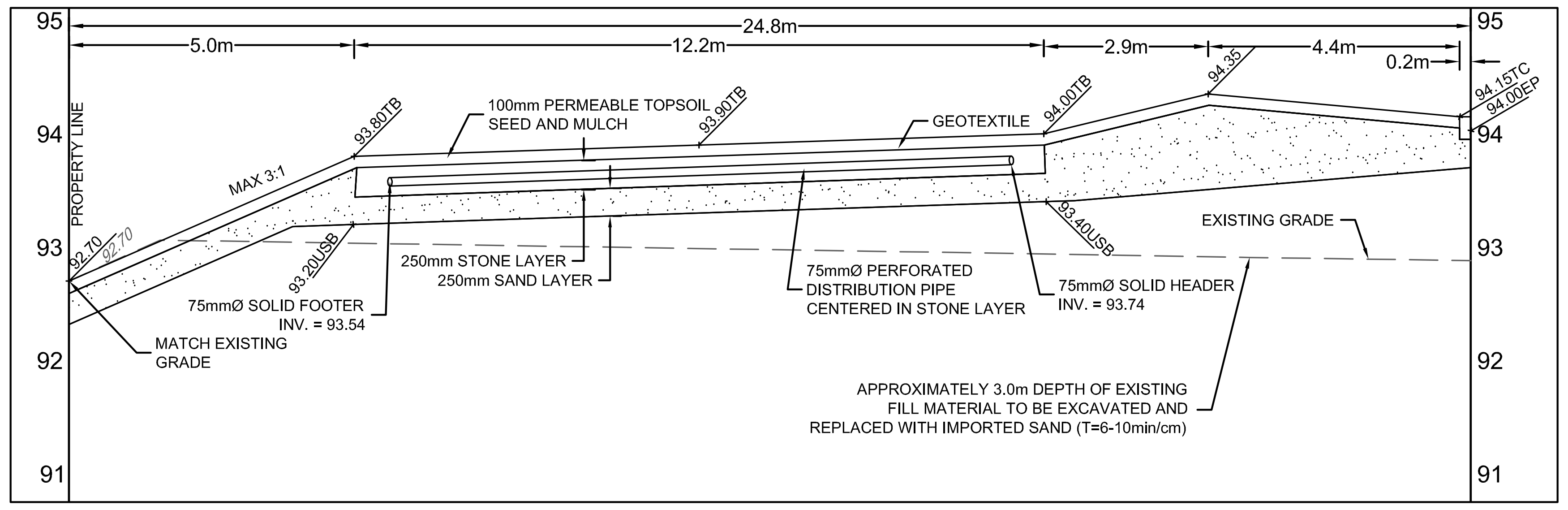
SEPTIC SYSTEM PROFILE

NTS



AREA BED CROSS SECTION A-A

H SCALE = 1:100
V SCALE = 1:50



AREA BED CROSS SECTION B-B

H SCALE = 1:100
V SCALE = 1:50

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
1.	ISSUED FOR SITE PLAN APPROVAL	FEB 10/14	LAB

SCALE
AS NOTED

DESIGN LAB
CHECKED SMG
DRAWN TGP
CHECKED LAB
APPROVED SMG

FOR REVIEW ONLY

L.A. BOWLEY
100081115
Feb 10 2014

S.M. GORDON
Feb 10/14

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CITY OF OTTAWA
35 SAPPERS RIDGE - APEX SOUTH BUSINESS CENTRE

SEPTIC SYSTEM PLAN

PROJECT No. 112034B-1
REV REV # 1
DRAWING No. 112034-SEP

PLANA1.DWG - 841mmx594mm

M:\2012\112034\CAD\Design\112034-SEP.dwg, SEP, Feb 10, 2014 - 3:46pm, mmckeough

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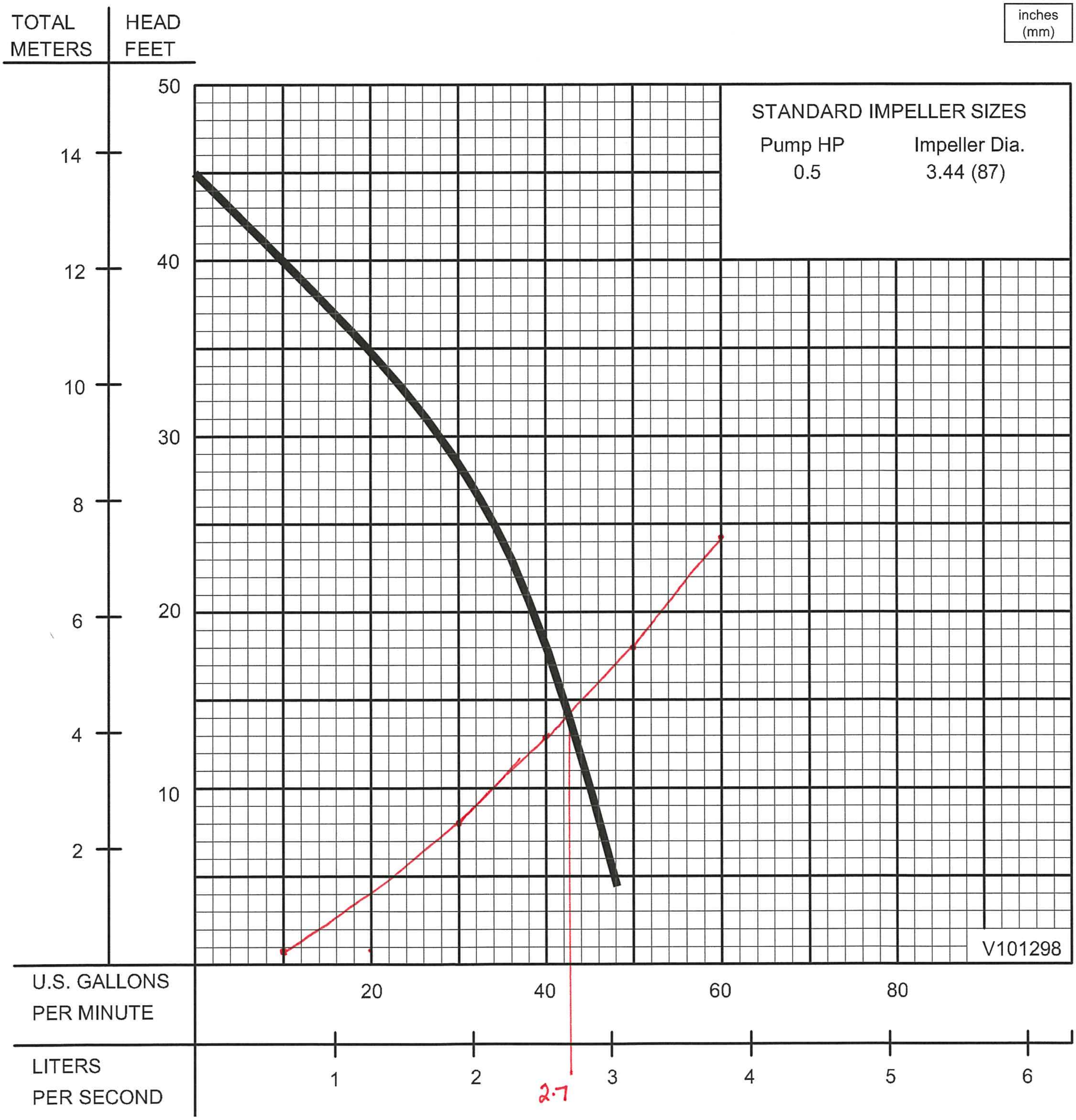


STANDARD IMPELLER SIZES

Pump HP	Impeller Dia.
0.5	3.44 (87)

Testing is performed with water, specific gravity 1.0 @ 68° F @ (20°C), other fluids may vary performance

APPENDIX C

EXCERPTS FROM STORMWATER MANAGEMENT REPORT
HAWTHORNE INDUSTRIAL PARK
PREPARED BY JL RICHARDS
REVISED MAY 2009

STORMWATER MANAGEMENT REPORT

HAWTHORNE INDUSTRIAL PARK

February 2009
(Revised April 2009)
(Revised May 2009)

Prepared for:

R.W. TOMLINSON LIMITED
5597 Power Road
Ottawa, Ontario
K1G 3N4

Prepared by:

J.L. RICHARDS & ASSOCIATES LIMITED
Consulting Engineers, Architects & Planners
864 Lady Ellen Place
Ottawa, Ontario
K1Z 5M2

JLR 20983

to provide aggregate wash water management to Tomlinson's existing quarry operations on the west side of Hawthorne Road (refer to Appendix 'I' for a copy of the Ministry of the Environment (MOE) Certificate of Approval (C of A) related to these works). In addition to the existing aggregate wash treatment facility, it is proposed to construct separate stormwater management facilities to service water quantity and quality requirements for the HIP.

1.3 Objectives

This Stormwater Managment Report (SWMR) was prepared to demonstrate that the subject lands can be developed as an Industrial Park Subdivision in compliance with the current surface water objectives of the watershed. Since the subject lands drain to Findlay Creek, which is tributary to the North Castor River, storm runoff criteria for this development must be in accordance with the recommendations of the document entitled "Shield's Creek Subwatershed Study, Totten Sims Hubicki Associates, June, 2004", referred throughout this Report as SCSS. More specifically, the above Report provided the following design criteria with regard to stormwater:

Water Quantity

Peak Flow	Post-development peak flows must be controlled to pre-development levels for storm events ranging from a 1:2 year to a 1:100 year recurrence.
Infiltration	Section 5.5 of the SCSS recommends that the quantity and quality of groundwater infiltration be maintained to pre-development rates.
Erosion	The stormwater management strategy for the proposed HIP must be developed to maintain the erosion potential to current levels.

Water Quality

The proposed stormwater management strategy for HIP must be developed to meet a Normal Level of Protection (as per the MOE's publication entitled "Stormwater Management Planning and Design Manual, March, 2003", referred throughout this Report as SWMPDM, which corresponds to a standard approach used in urban development to obtain a targeted total suspended solids (TSS) removal rate of 70%.

that there was a high groundwater table at the proposed pond location. In addition, in-situ soils in the area exhibited poor drainage properties which would have resulted in long retention times at the base of the pond, making it difficult to meet the water balance deficit requirements for the entire site while attempting to mimic the pre-development hydrological cycle.

Representatives from the City and SNC were consulted, and it was concluded that the SCSS groundwater balance targets for this site would be difficult to meet. It was also recognized that on-site infiltration strategies for this industrial subdivision could have a detrimental effect on groundwater quality and jeopardize the natural ecological integrity of receiving waters. In light of the above, it was decided by the approval authorities that the requirement for the water balance would be waived for the HIP development.

5.0 WATER QUALITY

5.1 General

Urbanization has been found to modify the hydrological regime of a receiving stream if inadequate stormwater management measures are implemented. The potential impacts associated with runoff arise primarily from the amount of urban area that is impervious to rain and snowmelt water. These impervious surfaces increase the amount of direct surface runoff that is generated and is conveyed more efficiently to the receiving stream. As part of the SCSS, fisheries resources have been inventoried along this watercourse, along with its associated tributaries. Given that the receiving watercourses were found to shelter fisheries, the approved document recommended that a "normal" level of protection be achieved. To fulfil this requirement, it is proposed that each individual site provide an oil/grit separator and infiltration storage be provided within the roadside open ditch system, as per the requirements presented in the SWMPDM.

5.2 Water Quality Requirement

Stormwater servicing for the HIP has been developed in accordance with the water quality recommendations of the SCSS (70% TSS removal). To fulfil this requirement, individual sites will be required to provide an oil/grit separator be installed to provide quality treatment (i.e., 70% TSS removal) of surface runoff before entering the roadside open ditch/culvert system. In addition, the oil/grit separator will be able to capture and contain hydrocarbons in the event of an on-site accidental spill.

To fulfill the water quality objectives for the paved portion of the HIP internal roads, it is proposed to provide infiltration within the open roadside ditch system to meet the storage volume requirements presented in Table 3.2 of the SWMPDM. Based on the normal level of service required and an imperviousness of 100% for the internal roads, Table 3.2 yields an extrapolated storage volume requirement of 35 m^3/ha. To achieve this storage volume, a clear stone envelope complete with a 200 mm diameter perforated pipe will be installed at the base of the roadside ditches to meet the required storage volume (Refer to Appendix C for calculations).

The following table presents the calculated infiltration volume required for water quality control and those provided by the roadside open ditch system to meet the recommended MOE Design Guidelines.

Table 3 - Water Quality Infiltration Requirements

Phase	Area (ha)	Infiltration Volume Requirement (m^3)	Infiltration Method	Length of 200 mm diameter Perf. Pipe (m)	Infiltration Volume Provided (m^3)
1	1.58	55.1	Open Ditch	1760	55.3
2	0.21	7.4	Open Ditch	240	7.5
Total	1.79	62.5	Open Ditch	2000	62.8

As shown in the above Table, the infiltration volume provided by the proposed open roadside ditch network (62.8 m^3) exceeds that obtained from Table 3.2 (62.5 m^3) of the SWMPDM. It should be noted that additional storage within the void space of the clear stone envelope was not accounted for and would increase the actual infiltration storage volume shown in Table 3.

6.0 HYDROLOGICAL ANALYSIS

6.1 General

To satisfy the surface water objectives presented in Subsections 1.3 and 2.2, a hydrological analysis was carried out to quantify peak flow rate variations resulting from the development of the proposed HIP. To quantify this variation, the SWMHYMO Stormwater Management Hydrological Model (Version 4.02, July, 1999) was utilized to calculate peak flows during severe storm events.

To carry out the hydrological analysis, three storm drainage plans were developed; one representing the pre-development drainage conditions, one representing the post-development conditions for the current study area, Phase 1, and the other for the post-development drainage conditions, including future development, Phase 2. For each of these plans, subwatershed boundaries were delineated based on existing topography of the site and the proposed overland flow direction following development of the site (refer to Figures 2, 3 and 4 for details).

6.2 Synthetic Design Storm Simulation and Hydrological Parameters

Peak runoff rates were calculated for both pre- and post-development conditions using synthetic design storm event modelling. Peak flow rates were estimated using the 3-hour Chicago Design Storm Event, as this synthetic storm event has been recognized as the most critical event for urban runoff applications (refer to Section 5.4.3.1 of the City of Ottawa's Sewer Design Guidelines). The design storm analysis was completed using volumes derived from the Intensity-Duration-Frequency (IDF) curve equation shown in Section 5.4.2 of the City of Ottawa Sewer Design Guidelines compiled using data from 1967 to 1997.

A SWMHYMO data file was developed to represent both pre- and post-development conditions of the subject area. Simulation of surficial runoff generated from undeveloped subwatersheds was carried out using the "DESIGN NASHYD" command along with the SCS procedure to compute rainfall losses. The SCS procedure uses the Curve Number (CN) method to compute rainfall losses and the Nash unit hydrograph to simulate the hydrological response from undeveloped watersheds. To simulate surface runoff from urban subwatersheds, the "CALIB STANDHYD" command was utilized. Hydrological parameter selection and methodology is described below:

Curve Number (CN)

In order to estimate a Curve Number that represents pre-development conditions, the geotechnical investigation completed by Inspec-Sol, entitled "Geotechnical Study Subdivision Plan, Hawthorne Industrial Park, Lots 26 and 27 Concession 6, Southeast of Hawthorne and Rideau Roads, Ottawa, Ontario" dated December 19, 2008 was used. At the time of this investigation, large amounts of fill material were encountered over the majority of the site, which does not reflect the pre-development conditions. As such, only native soils encountered below fill material were used to establish pre-development condition Curve Numbers. The review of the geotechnical investigation shows native soils ranging from silty sand in Blocks 4 and 5, to silty clay in Blocks 3, 5, 7 and 8, to sandstone and limestone in parts of Blocks 2 and 3. These soils have been classified by Inspec-Sol as being associated with hydrologic soil groups (HSG), ranging from "B" to "D" for silty sand to silty clay, respectively. Areas where rock was encountered (i.e., Sandstone and Limestone) were classified as "Rockland." Based on this information and current land usage, as interpreted from aerial photography, a pre-development Curve Number (CN) of 76 has been calculated using the Ministry of Transportation of Ontario (MTO) Chart H2-8. Detailed calculations for the HIP have been included in Appendix 'D'.

Under post-development conditions, it is proposed to provide sufficient grade differential to allow for positive drainage to meet City of Ottawa Design Standards. As the subject lands are to be developed as an Industrial Park with a significant increase in hard surfaces (i.e., buildings, asphalt and gravel), the post-development conditions were, therefore, analysed taking into consideration the low potential of these surfaces to infiltrate storm runoff.

Imperviousness

Surface runoff under post-development conditions is greatly impacted by the imperviousness of its tributary area. Since the final development of the HIP is unknown, a conservative assumption for typical surfaces encountered in similar industrial parks was developed, as illustrated in Table 2. To determine the imperviousness based on the assumed breakdown presented in Table 2, an imperviousness calculation was carried out and is presented in Appendix 'D'. The imperviousness calculation was based on the following assumptions:

- an imperviousness of 100% was assigned for building footprints;
- an imperviousness of 100% was assigned for all asphalt parking surfaces.
- an imperviousness of 70% was assigned for all gravel surfaces; and
- it was assumed that 50% of the total imperviousness (TIMP) 50 % was modelled as directly connected imperviousness (XIMP).

Based on the above, a total imperviousness of 70% was calculated, which is equivalent to a runoff coefficient of 0.7. The hydrological analysis was, therefore, carried out using a total imperviousness of 70%, consistent with the runoff coefficient used for sizing the open ditch/culvert system.

Time to Peak (T_p)

Time to peak calculations were carried out under pre-development conditions. Time of concentration was first estimated using the Uplands Method Chart based on the various flow paths. Once calculated, the times to peak were set to 67% (i.e., 2/3) of the time of concentration (T_c). Under pre-development conditions, a 90 minute time to peak was calculated (refer to Appendix 'D' for calculations). When modelling post-development conditions, the "CALIB STANDHYD" command was used to calculate the time to peak associated with the proposed site surfaces and grades (refer to Appendix 'E' for SWMHYMO outputs).

6.3 Simulation of Pre- and Post-Development (Uncontrolled) Conditions

The hydrological analysis was carried over the entire HIP under both the pre- and post-development conditions. As stated in Section 6.1, two post-development conditions were investigated, namely, Phase 1 and Phase 2. Phase 1 evaluates servicing for the current Study area, while Phase 2 includes the current Study area along with servicing of an additional 11.2 ha of land to the north east, shown on drawings as "Future Development Block."

Peak flow rates were computed with SWMHYMO using the procedure and parameters described in Subsection 6.2. Table 4 presents the simulated peak runoff rates under a 3 hour Chicago design storm event for both the pre- and post- (uncontrolled) development conditions for the HIP (refer to Appendix 'E' for SWMHYMO data input and output files), along with those under a 4 hour - 25 mm storm.

APPENDIX D

STORMWATER QUANTITY

- **RATIONAL METHOD CALCULATIONS**
- **IDF CURVES**
- **MODIFIED RATIONAL METHOD**

RATIONAL METHOD

The Rational Method was used to determine both the allowable runoff as well as the theoretical post-development runoff for the proposed site. The equation is as follows:

$Q=2.78\ CIA$

Where:
Q is the runoff in L/s
C is the weighted runoff coefficient*
I is the rainfall intensity in mm/hr**
A is the area in hectares

*The weighted runoff coefficient is determined for each of the catchment areas as follows:

$$C = \frac{(A_{perv} \times C_{perv}) + (A_{imp} \times C_{imp}) + (A_{grav} \times C_{grav})}{A_{tot}}$$

Where:
A_{perv} is the pervious area in hectares
C_{perv} is the pervious area runoff coefficient (C_{perv}=0.20)
A_{imp} is the impervious area in hectares
C_{imp} is the impervious area runoff coefficient (C_{imp}=0.90)
A_{grav} is the gravel area in hectares
C_{grav} is the gravel area runoff coefficient (C_{imp}=0.70)
A_{tot} is the catchment area ($A_{perv} + A_{imp} + A_{grav}$) in hectares

Note: The 100-year runoff coefficients were increased by 25% to account for saturated soils conditions. (max. C_{imp}=1.0).

**The rainfall intensities used in the calculations were taken from the City of Ottawa IDF curves.

Design Storm	Time of Concentration (min)	Rainfall Intensity (mm/hr)
1:5 year	10	104.2
1: 100 year	10	178.6

ALLOWABLE RELEASE RATE

The stormwater management criteria states that an allowable runoff coefficient of 0.7 was used to size the stormwater management facilities in the Hawthorne Industrial Park. This is equivalent to the following calculated flow rates:

Drainage Area (A) = 0.809 ha
Runoff Coefficient (C) = 0.70

Q_{5A}= 2.78 CIA
Q_{5A}= 2.78 x 0.7 x 104.2 x 0.809
Q_{5A}= 164.0 L/s

Q_{100A}= 2.78 CIA
Q_{100A}= 2.78 x 0.7 x 178.6 x 0.809
Q_{100A}= 281.2 L/s

POST-DEVELOPMENT RUNOFF

The developed site will ultimately drain to the roadside ditch on Sapper Ridge. The grassed septic bed will drain to the roadside ditch uncontrolled. The remainder of the site will drain controlled to the south limit of the property and be directed into a grassed swale, through an oil and grit separator and finally to the roadside ditch.

Area A1

Drainage Area (A) = 0.106 ha
Pervious Area = 0.106 ha
Impervious Area = NA
Gravel Area = NA
Runoff Coefficient (C_{5yr}) = 0.20
Runoff Coefficient (C_{100yr}) = 0.25

Q_{5U}= 2.78 CIA
Q_{5U}= 2.78 x 0.20 x 104.2 x 0.106
Q_{5U}= 6.1 L/s

Q_{100U}= 2.78 CIA
Q_{100U}= 2.78 x 0.25 x 178.6 x 0.106
Q_{100U}= 13.2 L/s

Area A2

Drainage Area (A) = 0.703ha
Pervious Area = 0.088 ha
Impervious Area = 0.615
Gravel Area = NA
Runoff Coefficient (C_{5yr}) = 0.81
Runoff Coefficient (C_{100yr}) = 0.91

Q_5= 2.78 CIA
Q_5= 2.78 x 0.81 x 104.2 x 0.703
Q_5= 165.0 L/s

$$C_{5yr} = \frac{(0.088x0.2) + (0.615 \times 0.9)}{0.703} = 0.81$$

Q_{100}= 2.78 CIA
Q_{100}= 2.78 x 0.91 x 178.6 x 0.703
Q_{100}= 317.6 L/s

$$C_{100yr} = \frac{(0.088x0.25) + (0.615 \times 1.0)}{0.703} = 0.91$$

CONTROLLED FLOW (AREA A2)

- Note Area A1 is direct runoff (uncontrolled)
- Subtract uncontrolled post-development flow (Area A1) from total allowable release rate

Q_5 (A2)= Q_{5A} - Q_{5C} = 164.0 L/s – 6.1 L/s = 157.9L/s

Q_{100} (A2)= Q_{100A} - Q_{100C} = 281.2 L/s – 13.2 L/s = 268.0L/s

Therefore the maximum allowable release rates for Area A2 are calculated to be:

$Q_{(5)}$ = 157.9L/s

$Q_{(100)}$ = 268.0L/s

Storage Calculations

- Using the Modified Rational Method calculate the storage required in Area A2 to achieve the allowable release rate
- Storage Calculated for 1:5 year and 1:100 year event

APEX SOUTH BUSINESS PARK
35 SAPPER RIDGE
PROJECT NO. 112034
REQUIRED STORAGE - 1:5 YEAR EVENT

CITY OF OTTAWA IDF CURVE

Area = 0.703 ha
C = 0.81
Qallow = 160.0 L/s
Vol(max) = **19** m^3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	223.49	63.49	19.05
10	104.19	164.94	4.94	2.96
15	83.56	132.27	-27.73	-24.95
20	70.25	111.21	-48.79	-58.55
25	60.90	96.40	-63.60	-95.40
30	53.93	85.37	-74.63	-134.34
35	48.52	76.80	-83.20	-174.71
40	44.18	69.94	-90.06	-216.13
45	40.63	64.32	-95.68	-258.35
50	37.65	59.61	-100.39	-301.18
55	35.12	55.60	-104.40	-344.52
60	32.94	52.15	-107.85	-388.26

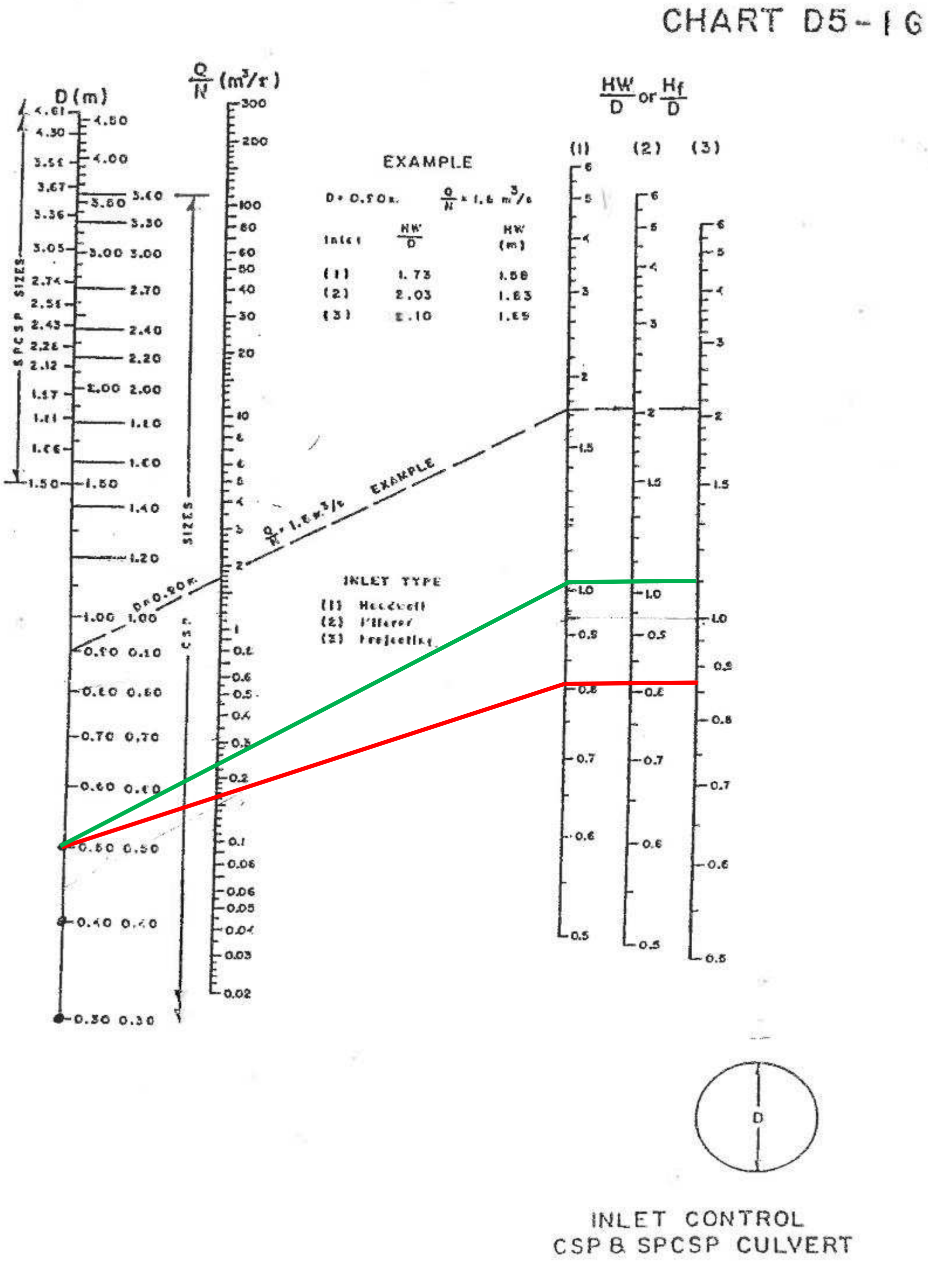
APEX SOUTH BUSINESS PARK
35 SAPPER RIDGE
PROJECT NO. 112034
REQUIRED STORAGE - 1:100 YEAR EVENT

CITY OF OTTAWA IDF CURVE

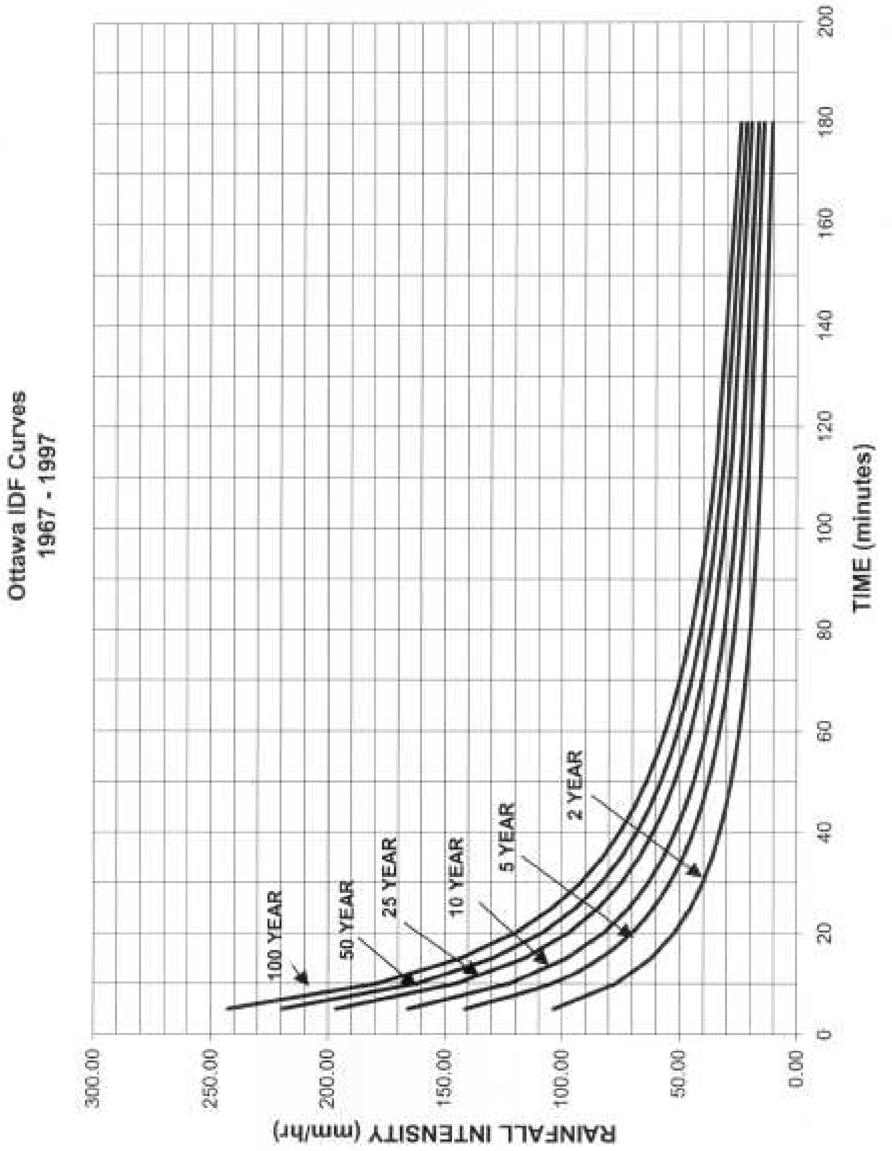
Area = 0.703 ha
C = 0.91
Qallow = 240.0 L/s
Vol(max) = **57** m^3

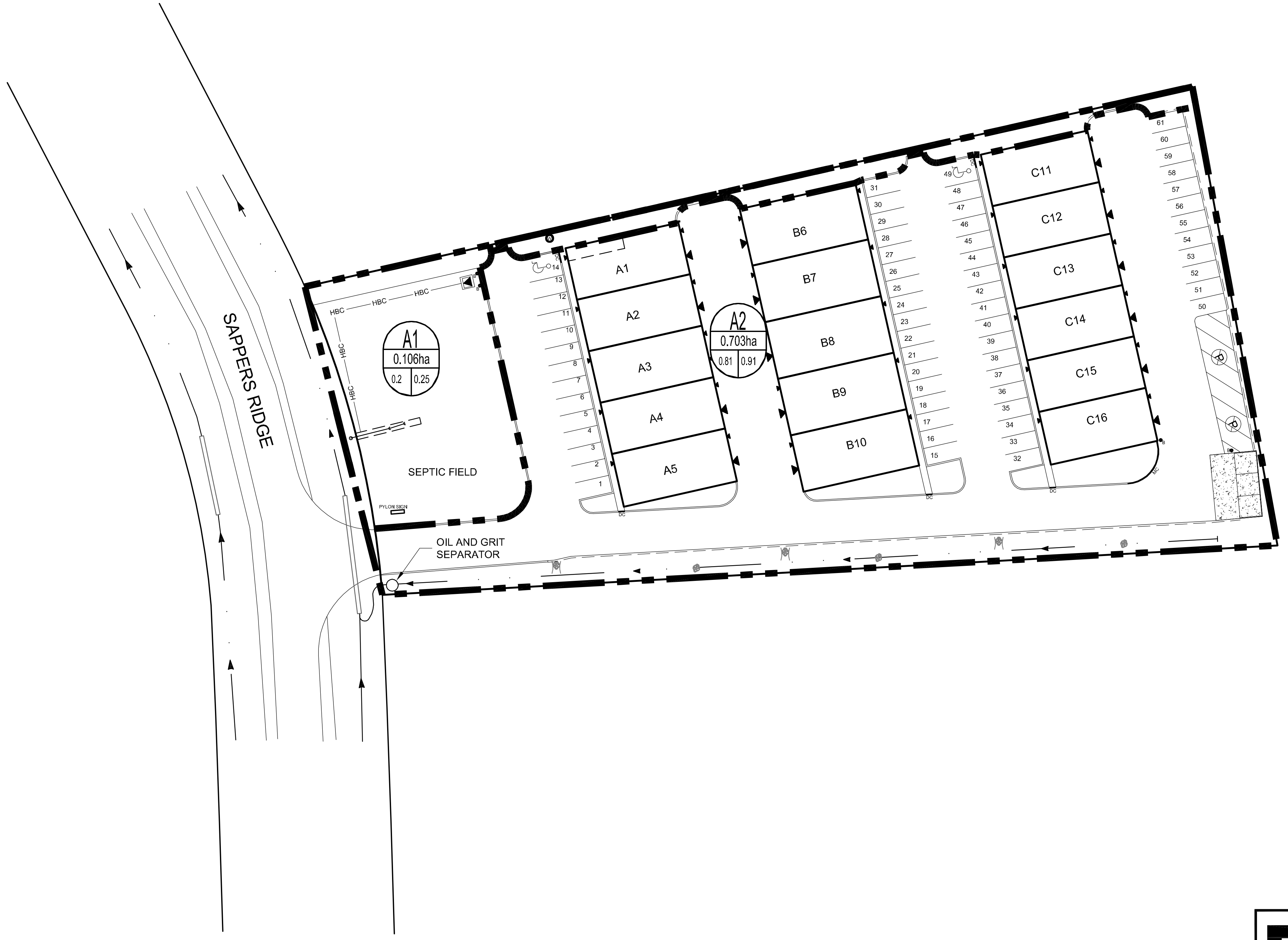
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	431.64	191.64	57.49
10	178.56	317.56	77.56	46.53
15	142.89	254.13	14.13	12.72
20	119.95	213.33	-26.67	-32.01
25	103.85	184.69	-55.31	-82.97
30	91.87	163.38	-76.62	-137.91
35	82.58	146.86	-93.14	-195.59
40	75.15	133.64	-106.36	-255.26
45	69.05	122.80	-117.20	-316.43
50	63.95	113.74	-126.26	-378.78
55	59.62	106.04	-133.96	-442.08
60	55.89	99.41	-140.59	-506.14

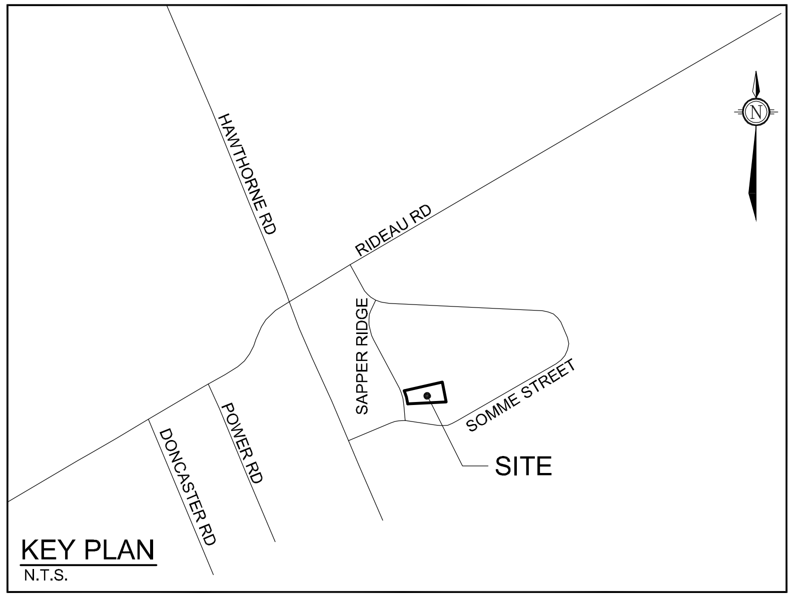
Culvert				
Storm Event	Depth (m)	Culvert Dia. (mm)	HW/D	Culvert Flow Rate (L/s)
5-year	0.43	500	0.86	**160**
100-year	0.55	500	1.10	**240**



APPENDIX 5-A OTTAWA INTENSITY DURATION FREQUENCY (IDF) CURVE







KEY PLAN
N.T.S.

LEGEND

A2 — AREA ID

0.703ha — DRAINAGE AREA

0.81 — RUNOFF COEFFICIENT (1:100 YEAR)

0.91 — RUNOFF COEFFICIENT (1:5 YEAR)

▬ ▬ ▬ — STORM DRAINAGE AREA

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ENGINEERING
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CITY OF OTTAWA
35 SAPPERS RIDGE - APEX SOUTH BUSINESS CENTRE

STORMWATER MANAGEMENT PLAN
POST DEVELOPMENT

SCALE 1 : 750		
DATE FEB 2014	JOB 112034	FIGURE SDA

M:\2012\112034\CAD\Design\112034-SWM2.dwg, 11x17 landscape, Feb 11, 2014 - 2:41pm, mmckeough

SHT11X17.DWG - 279mmX432mm

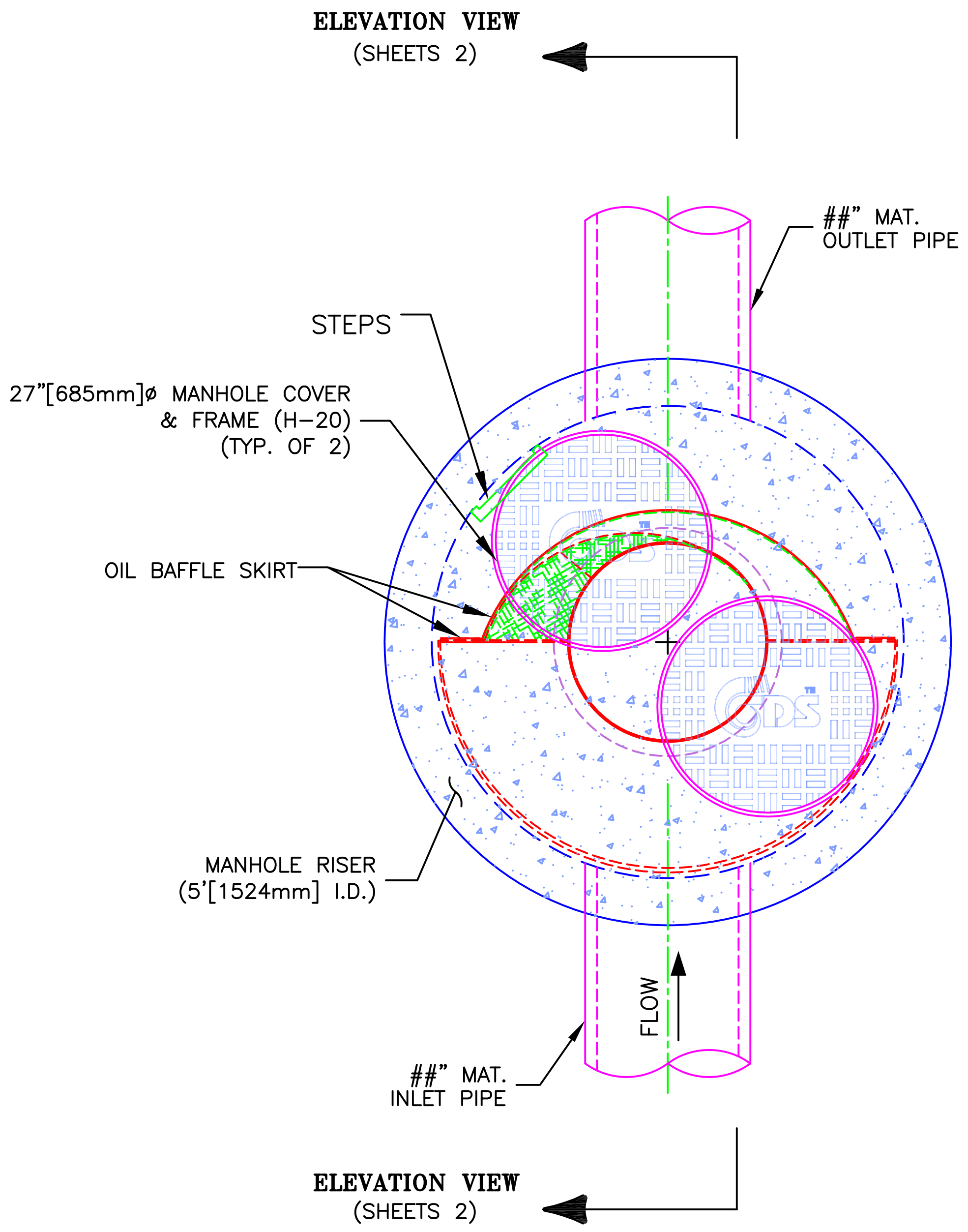
APPENDIX E

STORMWATER QUALITY

- OIL & GRIT SEPARATOR INFORMATION

CDS TECHNOLOGIES

PLAN VIEW



CDS MODEL PMSU20_15m, 0.7 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT

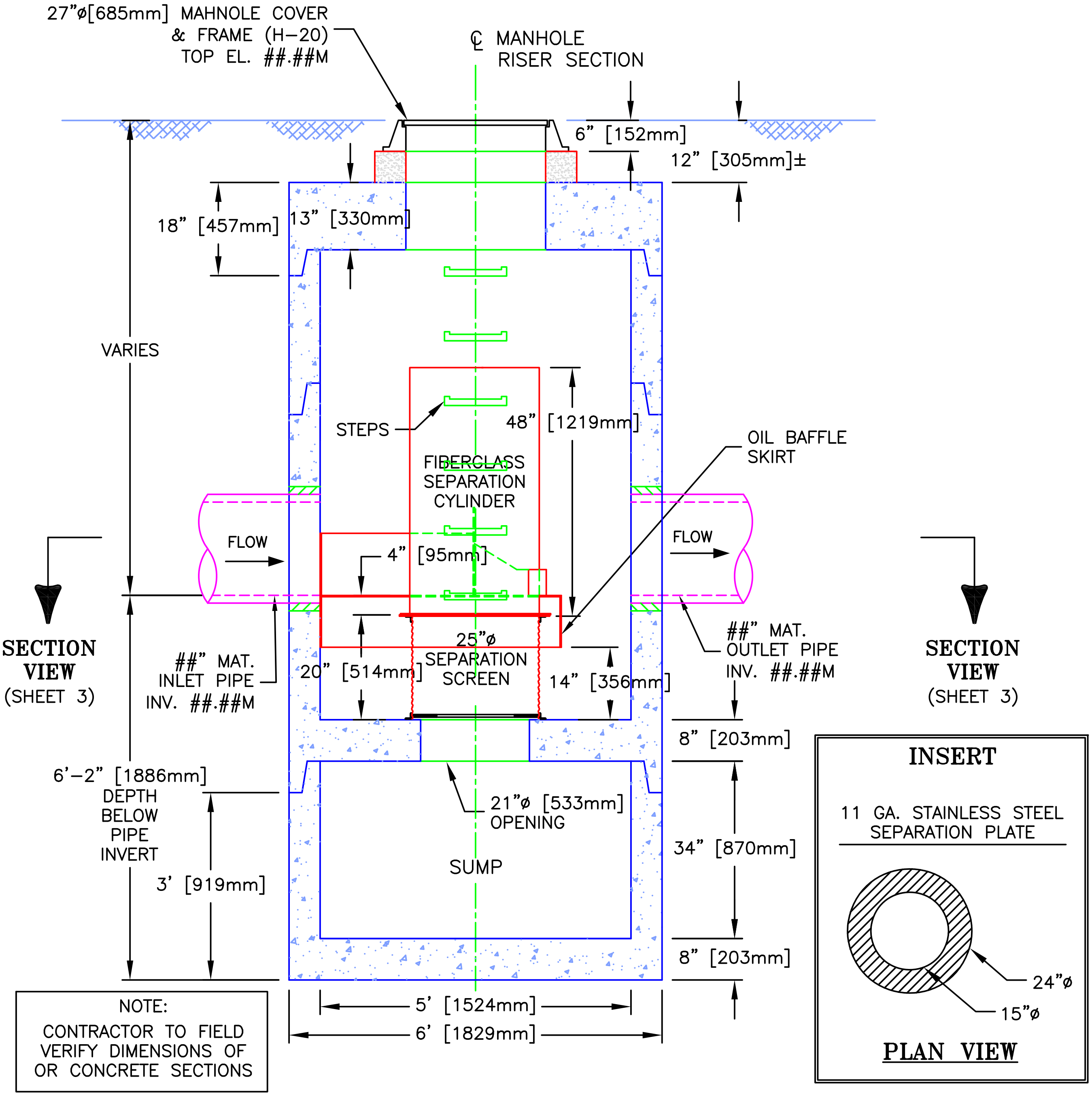
CONTECH STORMWATER SOLUTIONS INC

PROJECT NAME
CITY, STATE

JOB#	XX-##-###	SCALE 1" = 2'	
DATE	##/##/##	SHEET	
DRAWN	INITIALS	1	
APPROV.			

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 200 Enterprise Drive, Scarborough, Maine 04074 Tel: (877) 907-8676 Fax: (207) 885-9825

ELEVATION VIEW



NOTE:
CONTRACTOR TO FIELD
VERIFY DIMENSIONS OF
OR CONCRETE SECTIONS

CDS MODEL PMSU20_15m, 0.7 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH® STORMWATER SOLUTIONS INC.

PROJECT NAME
CITY, STATE

JOB#	XX–##–###	SCALE 1" = 2.5'	
DATE	##/##/##	SHEET	
DRAWN	INITIALS	2	
APPROV.			

CDS Average Annual Efficiency For TSS Removal

Modified: FK, 09/15/03 Orlando

Project: Hawthorne Industrial - Apex Gardens **Area:** 0.701
Date: May 3, 2013 **Runoff Coeff:** 0.80
By: KR **Tc:** 10 min

CDS Model: CDS20_15_5 **Rainfall Data:** IDF Curves - Ottawa Nepean
CDS Design Flow: 20 l/s

Return	Period	Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Frequency of Occurrence	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1m	0.08	6.20	91.1	9930	9930	91.70	6.20	6	0.00	100.00
2m	0.17	10.22	90.0	16375	16375	83.33	10.22	10	0.00	100.00
3m	0.25	13.61	88.0	21809	21809	75.00	13.61	14	0.00	100.00
4m	0.33	16.72	85.4	26804	26804	66.70	16.72	17	0.00	100.00
5m	0.42	19.39	82.3	30392	30721	58.30	19.39	19	0.00	99.05
6m	0.50	21.61	79.3	33979	34638	50.00	21.61	20	1.79	98.10
7m	0.58	23.67	76.4	35586	37626	41.70	23.67	20	3.85	95.06
8m	0.67	25.56	73.5	37194	40614	33.30	25.56	20	5.73	92.03
9m	0.75	27.20	70.7	38801	43602	25.00	27.20	20	7.38	88.99
10m	0.83	28.79	68.7	39774	45995	16.70	28.79	20	8.97	86.71
11m	0.92	30.29	66.7	40747	48389	8.30	30.29	20	10.47	84.43
1y	1	31.68	64.8	41721	50782	1.00	31.68	20	11.86	82.16
2y	2	44.36	52.7	48104	71104	0.50	44.36	20	24.54	67.65
5y	5	70.63	38.6	56689	113208	0.20	70.63	20	50.81	50.07
10y	10	89.44	32.5	60711	143346	0.10	89.44	20	69.61	42.35
25y	25	113.05	27.3	64695	181190	0.04	113.05	20	93.23	35.71
50y	50	139.33	23.3	68244	223310	0.02	139.33	20	119.51	30.56
100y	100	159.49	21.0	70377	255620	0.01	159.49	20	139.66	27.53
Q-ave		**21.25**	l/s	741932.5	1395061.5					

Average Annual TSS Removal Efficiency [%]: **81.5** Ave. Ann. T. Volume [%]: **92.5%**

Notes

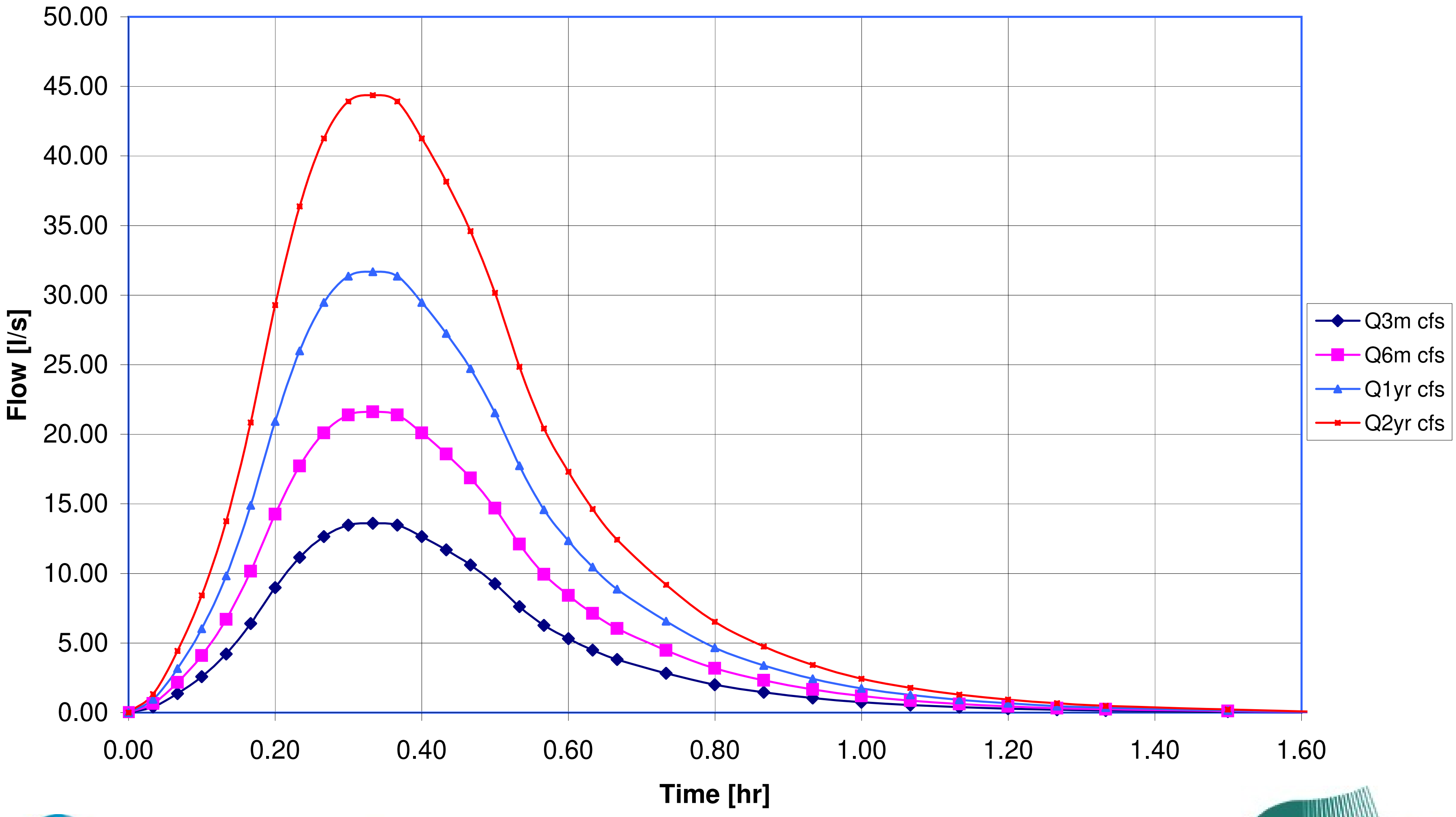
ECHELON ENVIRONMENTAL

CDS

Hydrographs

Project: Hawthorne Industrial - Apex Gardens

A = 0.701ha, C= 0.80



ECHELON
ENVIRONMENTAL

CDS

CONTECH®
CONSTRUCTION PRODUCTS INC.

CDS Guide
Operation, Design, Performance and Maintenance

CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs. Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs. The pollutant removal capacity of the CDS system has been proven in lab and field testing.

Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.

Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall MethodTM and Probabalistic Method are used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125-microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75-microns (μm).

Water Quality Flow Rate Method

In many cases, regulations require that a specific flow rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval (i.e. the six-month storm) or a water quality depth (i.e. 1/2-inch of rainfall).

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the treatment flow rate around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and reduces the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore they are variable based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabalistic Rational Method

The Probabalistic Rational Method is a sizing program CONTECH developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic rational method is an extension of the rational method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (i.e.: 2-year storm event). Under this method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus helping to prevent re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

CDS hydraulic capacity is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. As needed, the crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulics.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS unit (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This full-scale CDS unit was evaluated under controlled laboratory conditions of pumped influent and the controlled addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSD) of the test materials were analyzed using standard method "Gradation ASTM D-422 with Hydrometer" by a certified laboratory. UF Sediment is a mixture of three different U.S. Silica Sand products referred as: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (uniform coefficient Cu averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003). The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

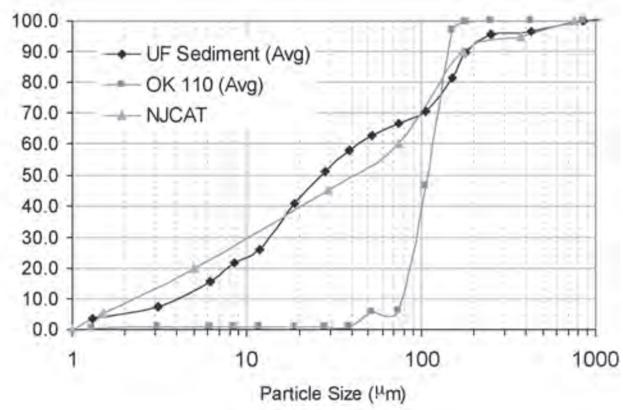


Figure 1. Particle size distributions for the test materials, as compared to the NJCAT/NJDEP theoretical distribution.

Tests were conducted to quantify the CDS unit (1.1 cfs (31.3-L/s) design capacity) performance at various flow rates, ranging from 1% up to 125% of the design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC – ASTM Standard Method D3977-97) and particle size distribution analysis.

Results and Modeling

Based on the testing data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve for the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect to SSC removal for any particle size gradation assuming sandy-silt type of inorganic components of SSC. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand).

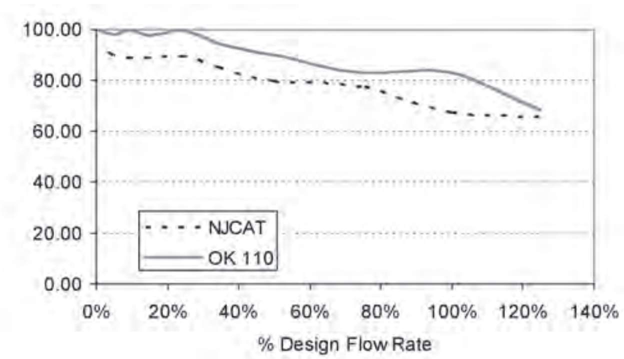


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (WADOE, 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). Supported by the laboratory data, the model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at 100% of design flow rate, for this particle size distribution (d50 = 125 μm).

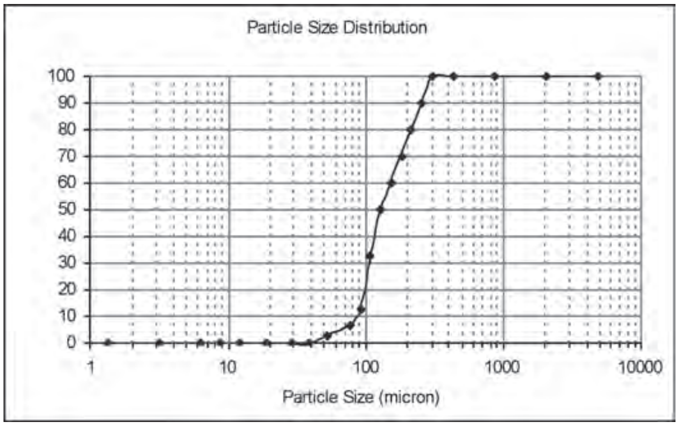


Figure 3. PSD with d50 = 125 microns, used to model performance for Ecology submittal.

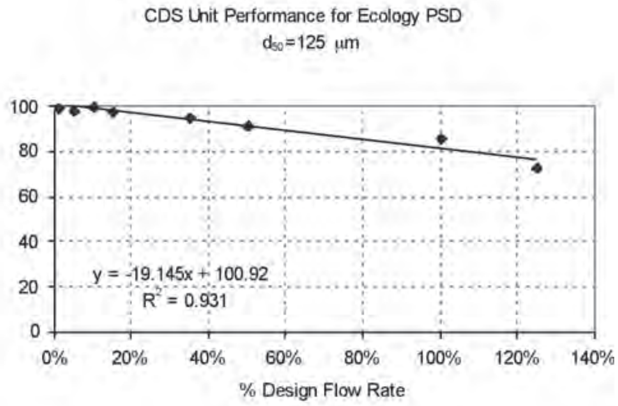


Figure 4. Modeled performance for CDS unit with 2400 microns screen, using Ecology PSD.

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, e.g., unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant deposition and transport may vary from year to year and regular inspections will help insure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (i.e. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Additionally, installations should be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions to inlet and/or separation screen. The inspection should also identify evidence of vector infestation and accumulations of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If sorbent material is used for enhanced removal of hydrocarbons then the level of discoloration of the sorbent material should also

be identified during inspection. It is useful and often required as part of a permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (screen/cylinder) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained behind the screen. For units possessing a sizable depth below grade (depth to pipe), a single manhole access point would allow both sump cleanout and access behind the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump and/or when an appreciable level of hydrocarbons and trash has accumulated. If sorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Finer, silty particles at the top of the pile typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine if the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of the CDS systems should be done during dry weather conditions when no flow is entering the system. Cleanout of the CDS with a vacuum truck is generally the most effective and convenient method of excavating pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should be pumped out also if pollutant build-up exists in this area.

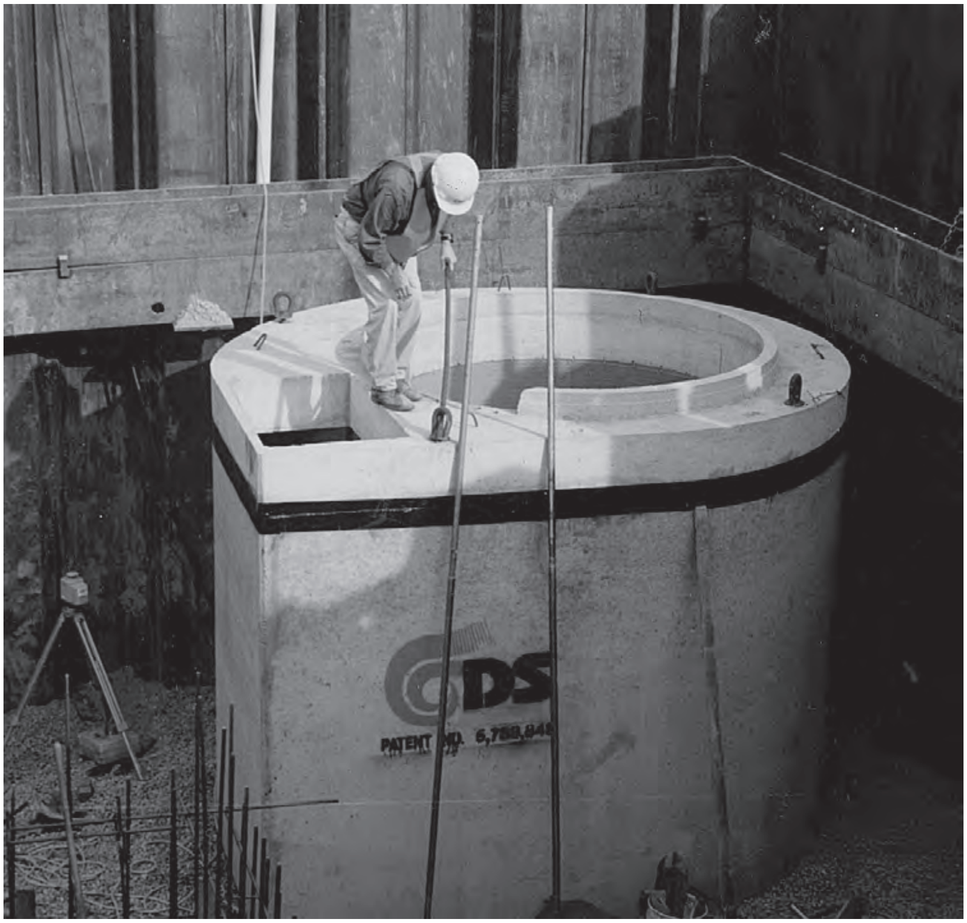
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use adsorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash can be netted out if you wish to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure proper safety precautions. Confined Space Entry procedures need to be followed. Disposal of all material removed from the CDS system should be done is accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	yd3	m3
CDS2015-4	4	1.2	3.0	0.9	0.5	0.4
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

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The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

cds_manual 10/08 3M

APPENDIX F

CORRESPONDENCE

Lisa Bowley

From: Marc Carriere [mcarriere@gwal.com]
Sent: April-05-13 8:24 AM
To: Susan Gordon
Cc: Darryl Hood (hood@csv.ca); Michael Assal (MAssal@taplenconstruction.com); Adam Thompson
Subject: Hawthorne Project - Water Supply for Fire-fighting - OBC A-3.2.5.7
Attachments: Scanned from a Xerox multifunction device.pdf

Susan,
As requested, please find hereafter analysis for on-site water supply for fire-fighting based on OBC 3.2.5.7 – Water Supply for Fire Fighting. The storage tank sizing is based on an open (single tenant), 800sqm building, 9m high, non-combustible construction, Group F Division 1 occupancy. The water storage is based on minimum 30 minutes water flow rate duration. Since the OBC formula is based spatial separation between buildings, we are assuming storage for only one of three buildings in a fire condition. If further water storage is needed, then the storage volume would increase. I would suggest a discussion with the Fire Marshal to determine the minimum acceptable volume.

Based on the above analysis, the minimum water storage would be 270,000L or 59,400impGal. I would recommend adding 15% capacity for evaporation and safety margin in the event tank isn't full.

Please review OBC Appendix A-3.2.5.7 for details relating to access and maintenance. I've included a copy for reference.

Regards,

Marc Carriere CET, Principal
Goodkey Weedmark and Associates Limited
Consulting Engineers
1688 Woodward Drive, Ottawa, Ontario, K2C 3R8
Voice: 613-727-5111, ext 237
Fax: 613-727-5115
Email: mcarriere@gwal.com
Web: www.gwal.com

A-3.2.4.20.(1) Visual Alarm Pattern.

CAN/ULC S526-M, "Standard for Visual Signal Appliances", published by Underwriters' Laboratories of Canada, applies to visual signalling units. This document is referenced by the most recent standard for the installation of fire alarm systems and would automatically apply. Visual signalling devices with the same temporal pattern as required for audible devices are available from some sources and they should become available in Canada. Not all units that comply with the ULC standard will have sufficient power to adequately cover large areas; care will have to be taken to specify units with adequate power when large spaces are being designed.

A-3.2.4.20.(2) Visual Signal.

If staff located in each zone or compartment can see each sleeping room door, visual signals could be located above each door. If staff cannot see every door, it is intended that the visual signals be provided at the location where the staff are normally in attendance.

A-3.2.4.21.(5) Smoke Alarm Installation.

The Electrical Code permits a smoke alarm to be installed on most residential circuits that carry lighting outlets and receptacles. It is the intent of this Code that any other item on a circuit with a smoke alarm should be unlikely to be overloaded and trip the breaker with a resultant loss of power that is not sufficiently annoying for the breaker to be restored to the on position. It is considered that an interior bathroom light or a kitchen light fulfills this intent, but that circuits restricted to receptacles do not fulfill this intent.

A-3.2.4.22.(1)(b) Voice Messages.

The concept of intelligibility expressed in Clause 3.2.4.22.(1)(b) is intended to mean that a person with average hearing and cognitive abilities is able to understand the messages that are transmitted into the space occupied by the person. The intelligibility of the message depends on the speech level, the background level, and the reverberation time of the space. ISO 7731, "Danger signals for workplaces - Auditory danger signals", addresses audibility. The standard suggests that an A-weighted sound level at least 15 dB above the ambient is required for audibility, but allows for more precise calculations using octave or ⅓ octave band frequencies to tailor the alarm signal for particular ambient noise conditions. Design of the alarm system is limited to ensuring that all areas receive an adequately loud alarm signal. If a public address system is to be used to convey instructions during an emergency, then the requirements of the system are less straightforward.

A-3.2.5.4.(1) Fire Department Access for Detention Buildings.

Buildings of Group B, Division 1 used for housing persons who are under restraint include security measures that would prevent normal access by local fire departments. These security measures include fencing around the building site, exterior walls without openings or openings which are either very small or fitted with bars, and doors that are equipped with security hardware that would prevent easy entry. These buildings would have fire fighting equipment installed and the staff would be trained to handle any small incipient fires. It is expected that appropriate fire safety planning would be undertaken in conjunction with local fire departments in order that special emergencies could be handled in a cooperative manner.

A-3.2.5.6.(1) Fire Department Access Route.

The design and construction of fire department access routes involves the consideration of many variables, some of which are specified in the requirements in the Code. All these variables should be considered in relation to the type and size of fire department vehicles available in the municipality or area where the building will be constructed. It is appropriate, therefore, that the local fire department be consulted prior to the design and construction of access routes.

A-3.2.5.7. Water Supply for Fire-Fighting.

This Article requires that an adequate water supply for fire fighting is to be provided for every building. However, farm buildings of low human occupancy under the National Farm Building Code of Canada 1995 are exempted. The water supply requirements for interior fire suppression systems such as sprinkler systems and standpipe and hose systems are contained in other standards, for example, NFPA Standard 13, "Installation of Sprinkler Systems", and NFPA Standard 14, "Installation of Standpipe and Hose Systems". This Appendix note focuses only on water supplies that are considered essential to fire fighting by fire department or other trained personnel using fire hoses.

Minimum requirements for water supply for fire fighting are relevant mainly to building sites not serviced by municipal water supply systems. For building sites serviced by municipal water supply systems where the water supply duration is not a concern, water supply flow rates at minimum pressures would be the main focus of this Appendix note. However, where municipal water supply capacities are limited, it would be necessary for buildings to have on-site supplemental water supply.

An adequate water supply for fire fighting should be an immediately available and accessible water supply with sufficient volume and/or flow to enable fire department personnel using fire hoses to control fire growth until the building is safely evacuated, prevent the fire from spreading to adjacent buildings, limit environmental impact of the fire, and provide a limited measure of property protection.

The sources of water supply for fire fighting purposes may be natural or man-made. Natural sources may include ponds, lakes, rivers, streams, bays, creeks, springs, artesian wells, and irrigation canals. Man-made sources may include aboveground tanks, elevated gravity tanks, cisterns, swimming pools, wells, reservoirs, aqueducts, tankers, and hydrants served by a public or private water system. It is imperative that such sources of water be accessible to fire department equipment under all climate conditions.

The available water supply would allow arriving fire department personnel to use the water at their discretion when entering a burning building with hose lines. During the search and evacuation operation, hose streams may be needed for fire suppression to limit fire spread. The duration of the water supply should be sufficient to allow complete search and evacuation of the building. Once the search and rescue operations are complete, additional water may be required for exposure protection or fire suppression to limit property damage.

Fire departments serving remote or rural areas often have to respond to a fire with a transportable water supply of sufficient volume for approximately 5 to 10 minutes when using one or two 38 mm hose lines. This would provide minimal hose streams allowing immediate search and rescue operations in small buildings with simple layouts but limited fire suppression capabilities, especially if a fire is already well-established.

For larger more complex buildings, an on-site water supply for fire fighting would be needed to provide an extended duration of hose stream use by the fire department to allow search and evacuation of the building, exposure protection and fire suppression. The volume of this on-site water supply would be dependent on the building size, construction, occupancy, exposure and environmental impact potential, and should be sufficient to allow at least 30 minutes of fire department hose stream use.

The recommendations of this Appendix note are predicated on prompt response by a well equipped fire department using modern fire fighting techniques, and buildings being evacuated in accordance with established building fire safety plans and fire department pre-fire plans. For buildings constructed in areas where fire department response is not expected at all or in a reasonable time, sprinkler protection should be considered to ensure safe evacuation.

Elementary and secondary schools usually have a record of well established and practiced fire safety plans which would allow complete evacuations within 4 minutes. Because of this and the inherent high level of supervision in these buildings, a reduction of the water supply for fire fighting may be considered. It is suggested that the level of reduction should be determined by the local jurisdictional authority based on the resources and response time of the fire department, and the size and complexity of the buildings.

When designing open, unheated reservoirs as sources of fire protection water, a 600 mm ice depth allowance should be included in the water volume calculations, except where local winter temperature conditions result in a greater ice depth (as typically found on local lakes or ponds). As well, make-up water supplies should be provided to maintain the design volumes, taking into account volume loss due to evaporation during drought periods.

1. Buildings not Requiring an On-Site Water Supply
   (a) A building would not require an on-site water supply for fire fighting if the building satisfies the criteria set out in Item 1(b) or Item 1(c) provided that:
      (i) the building is serviced by a municipal water supply system that satisfies Item 3(b), or
      (ii) the fire department can respond with a transportable water supply of sufficient quantity to allow them to

conduct an effective search and evacuation of the building, determined on the basis of other guidelines or standards (such as, NFPA 1231, "Standard on Water Supplies for Suburban and Rural Fire Fighting").

(b) A building would not require an on-site water supply for fire fighting where all of the following criteria are met:
  (i) the building area is 200 m^2 or less,
  (ii) the building height is 2 storeys or less,
  (iii) the building does not contain a care or detention occupancy,
  (iv) the building does not require a sprinkler system or a standpipe and hose system,
  (v) the limiting distance from the property line is at least 13 m if the building contains a high hazard industrial occupancy, and
  (vi) the building constitutes no significant environmental contamination potential due to fire.

(c) A building that exceeds 200 m^2 in building area or 2 storeys in building height and that contains a low hazard industrial occupancy may not require an on-site water supply for fire fighting if the combustible loading in the building is insignificant (such as that found in cement plants, steel stock storage sheds, etc.), as determined by the Chief Building Official.

2. Sprinklered Buildings

For sprinklered buildings, water supply additional to that required by the sprinkler systems should be provided for fire fighting using fire hoses in accordance with the hose stream demands and water supply durations for different hazard classifications as specified in NFPA 13, "Standard for the Installation of Sprinkler Systems".

3. Buildings Requiring On-Site Water Supply

(a) Except for sprinklered buildings and as required by Items 3(c) and 3(e), buildings should have a supply of water available for fire fighting purposes not less than the quantity derived from the following formula:

$$Q = K \cdot V \cdot S_{Tot}$$

where

Q = minimum supply of water in litres
K = water supply coefficient from Table 1
V = total building volume in cubic metres
S_{tot} = total of spatial coefficient values from property line exposures on all sides as obtained from the formula:

$$S_{tot} = 1.0 + [S_{side1} + S_{side2} + S_{side3} + \ldots \text{ etc.})]$$

where
S_{side} values are established from Figure 1, as modified by Items 3(d) and 3(f), and
S_{tot} need not exceed 2.0.

(b) Water supply flow rates should not be less than that specified in Table 2. Where the water supply is from a municipal or industrial water supply system, the required flow rate should be available at a minimum pressure of 140 kPa.

(c) The water supply as required in Item 3(a) should not be less than that needed to provide the minimum flow rate specified in Table 2 for a minimum duration of 30 minutes.

(d) Where a masonry wall with a minimum fire-resistance rating of 2 h, and no unprotected openings is provided as an exterior wall, the spatial coefficient (S_{side}) for this side of the building may be considered equal to 0. This masonry wall should be provided with a minimum 150 mm parapet. Firewalls that divide a structure into two or more buildings may be given similar consideration when evaluating the exposure of the buildings to each other.

(e) In elementary or secondary schools, the water supply determined in accordance with Items 3(a) and 3(b) may be reduced. The level of reduction to be applied would be at the discretion of the local jurisdictional authority, and should not exceed 30 per cent.

(f) The spatial coefficient S_{side} may be considered equal to 0 when the exposed building is on the same property and is less than 10 m^2 in building area.

4. Additions to Existing Buildings
   (a) Except as permitted in Items 4(b) and 4(c), additions to existing buildings should be provided with a water supply for fire fighting as required in Items 3(a) to 3(e). Although under Part 11, Renovation, the required water supply is to be based only on the building volume of the addition, it is recommended that the entire building volume of the expanded facility be used to ensure complete evacuation and safety of all the occupants.
   (b) Buildings with new additions falling within any one of the following criteria would not require an additional water supply for fire fighting where:
      (i) the expanded building complies with all the requirements of Item 1(a),
      (ii) the new addition does not exceed 100 m^2 in building area, or
      (iii) the new addition exceeds 100 m^2 but does not exceed 400 m^2 in building area, contains an assembly, business and personal services, mercantile or low hazard industrial occupancy, is of noncombustible construction, does not result in a significant increase in exposure to other existing buildings, has no combustible storage or process, and is separated from the existing building by a fire separation with a fire-resistance rating of at least 1 h.
   (c) Where a firewall is provided between the new addition and the existing building, the water supply for fire fighting may be determined in accordance with Items 1(a) and 3(a), using only the building volume of the new addition.

Table 1

WATER SUPPLY COEFFICIENT - K

TYPE OF CONSTRUCTION	Classification by Group or Division in Accordance with Table 3.1.2.1. of the Building Code				
	A-2 B-1 B-2 B-3 C D	A-4 F-3	A-1 A-3	E F-2	F-1
Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches.	10	12	14	17	23
Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	16	19	22	27	37
Building is of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2.	18	22	25	31	41
Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	23	28	32	39	53
Column 1	2	3	4	5	6

Table 2	
OBC Part 3 Buildings	Required Minimum Water Supply Flow Rate (L/min)
One-storey building with building area not exceeding 600 m²	1800
All other buildings	2700 (if $Q \leq 108,000$ L)(1) 3600 (if $Q > 108,000$ L and $\leq 135,000$ L)(1) 4500 (if $Q > 135,000$ L and $\leq 162,000$ L)(1) 5400 (if $Q > 162,000$ L and $\leq 190,000$ L)(1) 6300 (if $Q > 190,000$ L and $\leq 270,000$ L)(1) 9000 (if $Q > 270,000$ L)(1)

Note to Table 2:

(1) $Q = KVS_{Tot}$ as referenced in Paragraph 3(a)

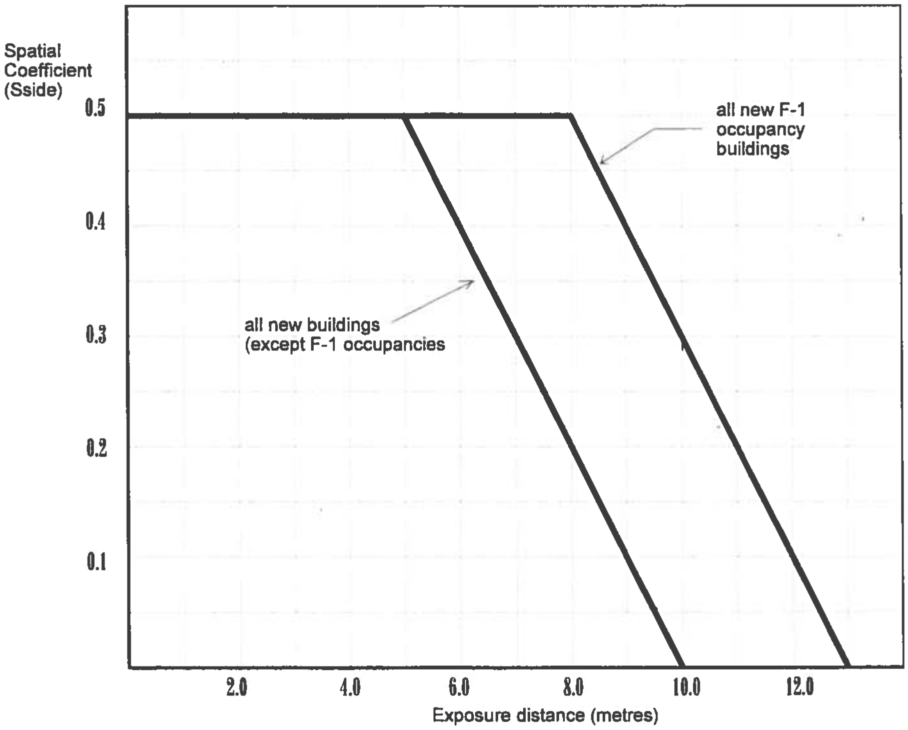


Figure 1
Spatial Coefficient vs Exposure Distance

Further clarification of intent and sample problems and solutions are contained in the "Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code". Copies of this guideline may be obtained by contacting the Research and Standards Section of the Office of the Fire Marshal, Ministry of the Solicitor General and Correctional Services at the following address:

Place Nouveau Building, 7th Floor
5775 Yonge Street
North York, Ontario
M2M 4J1
Tel. (416) 325-3201
Fax. (416) 325-3213

APPENDIX G

UNDERGROUND STORAGE TANKS MANUFACTURED BY ZCL COMPOSITE TANKS (REFERENCE MATERIAL)

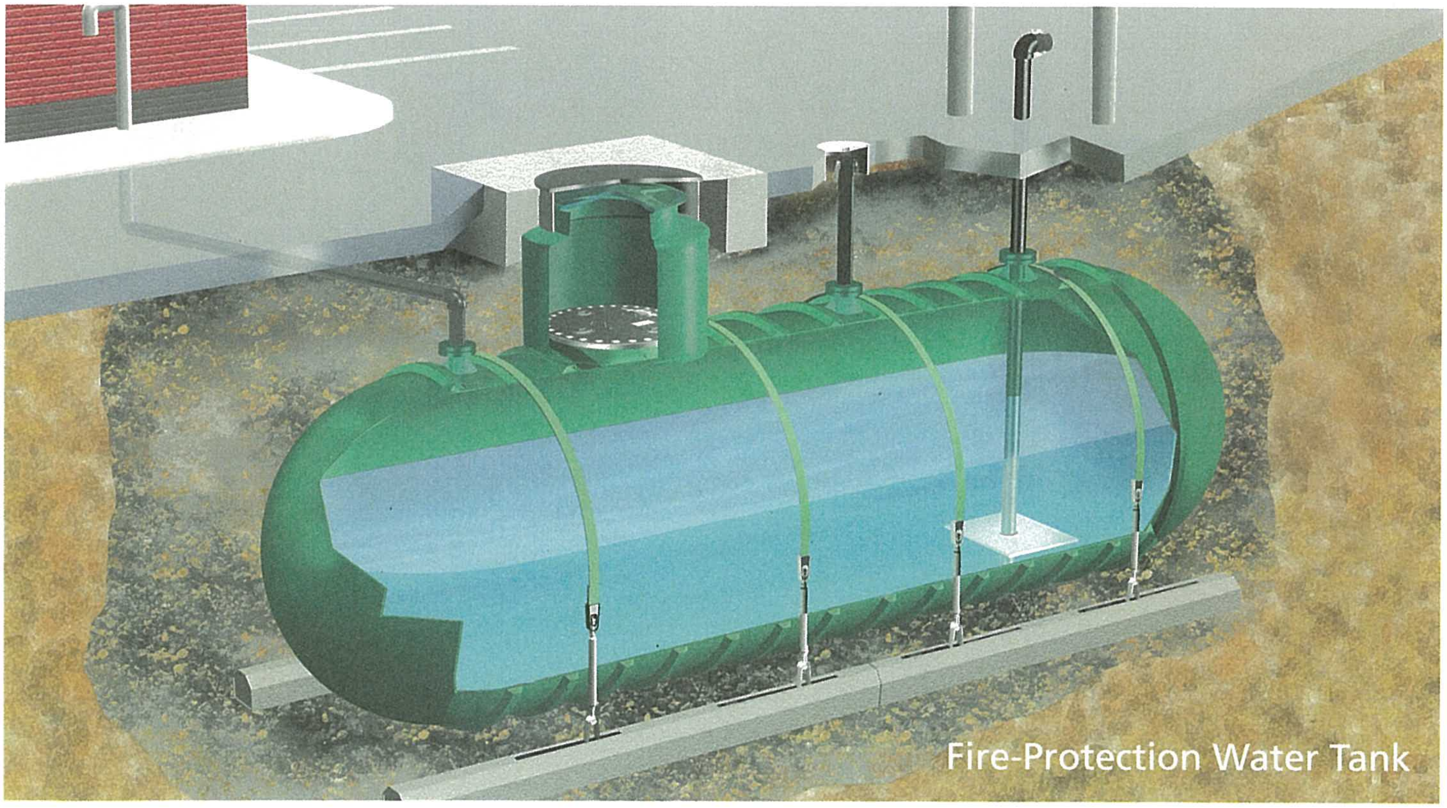
Fibreglass Water Tanks for Fire-Protection Water Applications

Growing concerns about fire safety and increased use of sprinkler systems in building construction have resulted in a new demand for underground tanks for the storage of fire-protection water. Because of this, residential and commercial building designers need to find safe, reliable and cost-effective systems for the storage of fire-protection water in their projects. Often, new regulatory codes and insurance requirements are calling for stand-alone, standby water supplies. The latest edition of NFPA 22 Standard for Water Tanks for Private Fire Protection, includes a chapter on the use of FRP underground tanks.

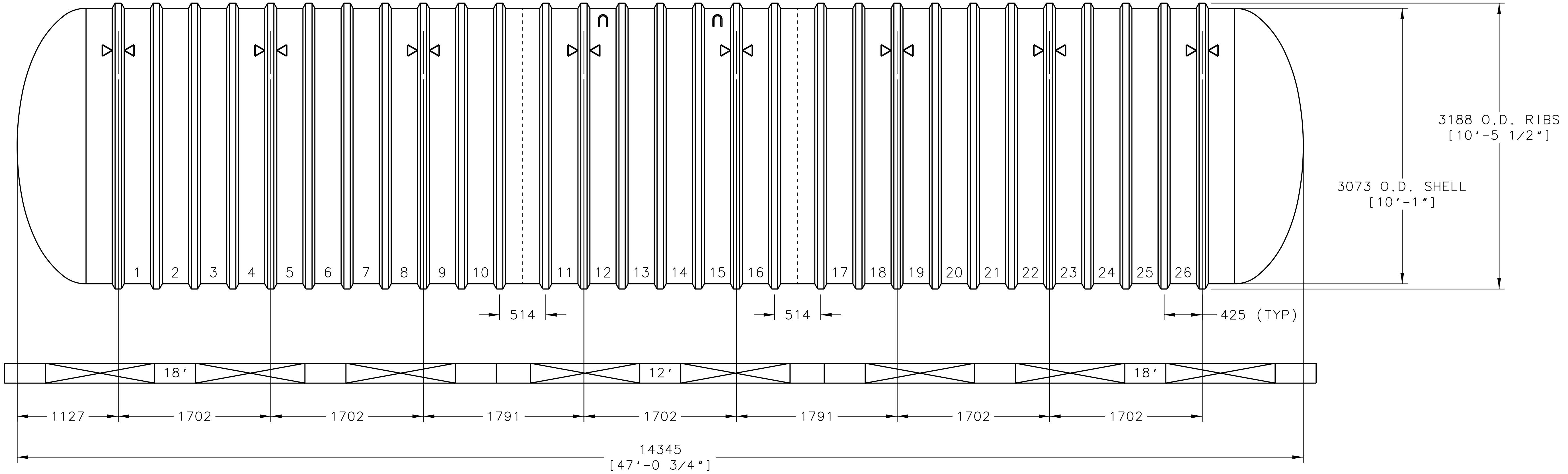
ZCL fibreglass water tanks are becoming an especially popular choice for all types of water applications in rural, suburban and urban facilities. Whether the need is as a sole source water cistern in rural areas or as a standby water reservoir to supplement a pressurized municipal water system, a ZCL tank provides maintenance-free underground storage of water. The most recent edition of NFPA 1142 Standard on Water Supplies for Suburban and Rural Fire Fighting illustrates a fibreglass underground storage tank as a sole-source water cistern.

Recent changes in fire codes require design alternatives, such as standby water tanks when the existing pressurized water supply is inadequate or when pressure levels are not dependable and fire pumps may need to draw from a break tank, as described in NFPA 20.

A ZCL underground tank used as a water reservoir has many advantages over an aboveground tank used for the same purpose. For instance, it doesn't occupy valuable property that could be used for parking or other needs, and it makes the property aesthetically pleasing. Also, since the tank is buried, it does not require the expensive protection against water freezing that might be necessary with an aboveground tank.



Fire-Protection Water Tank

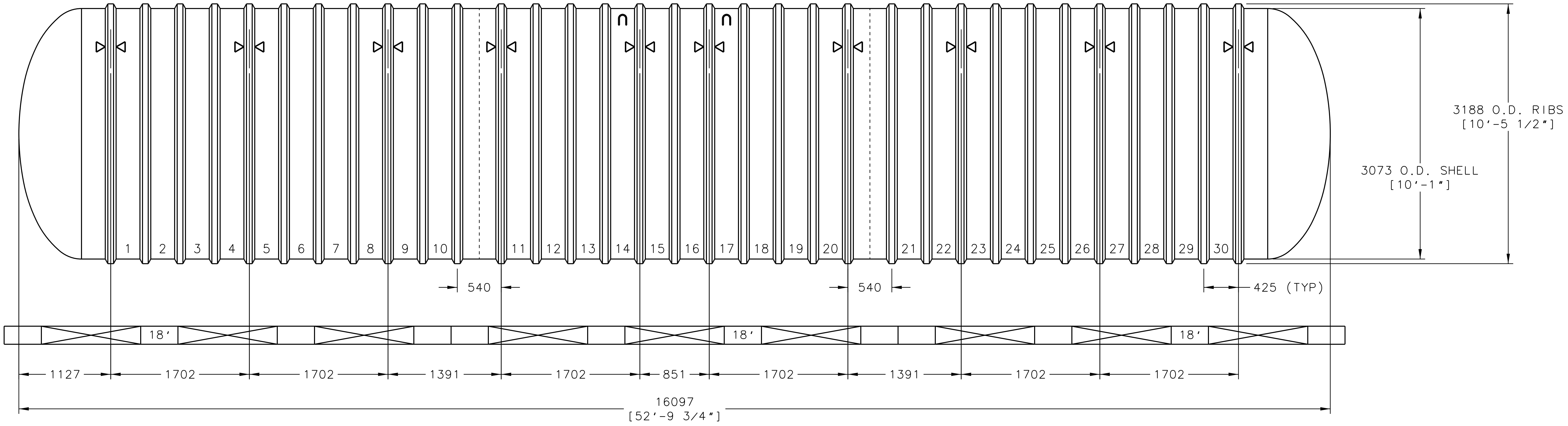


Optional prefabricated engineered concrete deadmen shown.

ZCL
COMPOSITES INC.

TITLE Z100SW
CAP. 100,000 LITRES
27,000 U.S. GALLONS

DATE 6-12 DR. NO. Z10-034.01



Optional prefabricated engineered concrete deadmen shown.

ZCL
COMPOSITES INC.

TITLE Z100SW
CAP. 115,000 LITRES
30,000 U.S. GALLONS

DATE 6-12 DR. NO. Z10-035.01

APPENDIX H

UNDERGROUND CHAMBERS
MANUFACTURED BY TRITON STORMWATER SOLUTIONS
(REFERENCE MATERIAL)

From: JJ Breede [jjbreede@terrafixgeo.com]
Sent: June-27-13 3:27 PM
To: Lisa Bowley
Subject: RE: Hawthorne: Triton System

Attachments: Sizing Report - 311m3 (2013_05_23).pdf

Hi Lisa,

The storage volume (311m3) for the attached sizing report is from the bottom of the trench to the top of the stone cover.

If the pipe outlet is at the bottom of the chamber, there would be 300mm of water sitting within the bedding that would not leave. Storage volume would in fact be 311m3 – (38.77m x 8.865m x 0.3m x 0.4void) = 269m3. Should we add more stone above the chambers to make up for the difference?

Regards,

J.J. Breede, P.Eng.
Technical Specialist
Stormwater Management and Erosion & Sediment Control Solutions
Terrafix Geosynthetics Inc.
455 Horner Avenue
Toronto, ON
M8W 4W9
Office: 416-674-0363 x241
Cell: 416-659-0363
Fax: 416-674-1159
jjbreede@terrafixgeo.com
www.terrafixgeo.com

From: JJ Breede [mailto:jjbreede@terrafixgeo.com]
Sent: June-25-13 5:24 PM
To: 'Lisa Bowley'; 'Graham Brown'
Cc: 'Susan Gordon'
Subject: RE: Hawthorne: Triton System

Hi Lisa, Susan,

It was a pleasure meeting and speaking with you yesterday. Thanks again for setting up the L&L for us.

Here is the contact information for Chris Denich at Aquafor Beech as you requested:

Chris Denich
Aquafor Beech
denich.c@aquaforbeech.com
519-224-3740 x1236

In the meantime, we'll start working on a set of shop drawings for your review.

Regards,

J.J. Breede, P.Eng.
Technical Specialist
Stormwater Management and Erosion & Sediment Control Solutions
Terrafix Geosynthetics Inc.
455 Horner Avenue
Toronto, ON
M8W 4W9
Office: 416-674-0363 x241
Cell: 416-659-0363
Fax: 416-674-1159
jjbreede@terrafixgeo.com
www.terrafixgeo.com

From: Lisa Bowley [mailto:l.bowley@novatech-eng.com]
Sent: June-25-13 12:00 PM
To: JJ Breede; 'Graham Brown'
Cc: Susan Gordon
Subject: Hawthorne: Triton System

JJ, Graham,

As discussed yesterday, please find enclosed the Preliminary Grading & Servicing Plan (112034-PGS, revision 1) for the Hawthorne site. We are providing the plan in AutoCAD (2007) and PDF for your use.
The area reserved for the Triton system is located west of Building A.

Thank you very much for your help on this project.

Lisa Bowley, P.Eng.
****
Novatech Engineering Consultants Ltd.
Suite 200, 240 Michael Cowpland Drive
Kanata . Ontario . Canada . K2M 1P6
Tel: (613) 254-9643 x246
Fax: (613) 254-5867
Email: l.bowley@novatech-eng.com
Web: http://www.novatech-eng.com

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Site Calculator

- System Builder
- Field Diagram
- Summary

Parameters

Units: Metric
Storage Volume: 311 Cu. M
Chamber Selection: S-29 [+]
Header Row Position: Double
Fill Over Embedment Stone: 120 cm

Embedment Stone:

Over: 30
Under: 30
Porosity: 0.4

Controlled By (in M):

Width
10

Accessories:

Dumpsters: 0
Bins: 0
Floors: ☐

Double Stacked

Double Stacked?: ☐
Lower Chamber: S-29
Stone Between: 15

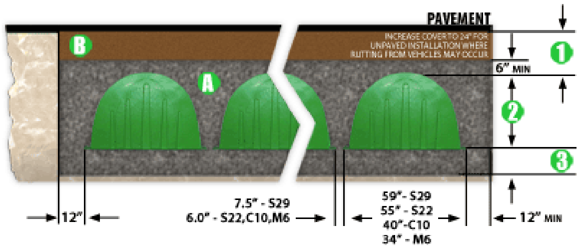
Note: After making an input change you must hit recalculate to update the Field Diagram and Project Results. RECALCULATE

SAVE

HydroCAD® Stormwater Modeling

NOTICE: This calculator is provided for your convenience only and is not meant for final quotation and/or engineering purposes. Please contact Triton for more information.

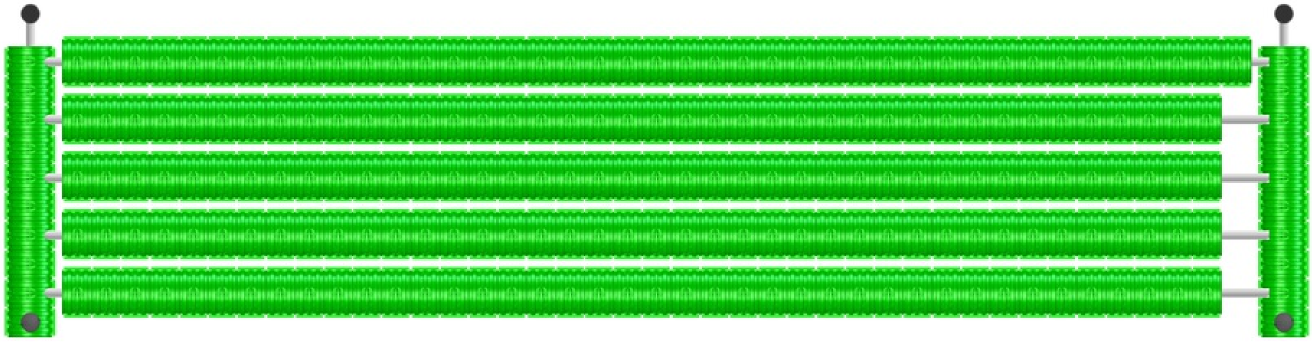
Project Results



- ① Total Cover Over Chambers: 150.00 cm
- ② Height of Chamber: 91.44 cm
- ③ Embedment Stone Under Chambers: 30.00 cm
- Ⓐ Volume of Embedment Stone Required: 349 Cu. M
- Ⓑ Volume of Fill Material Required: 412 Cu. M

Total Storage Provided:	311.0 Cu. M
Type of Distribution Chambers:	S-29
# of Distribution Chambers Required:	201
# of end caps required:	14
Type of header row chambers required:	S-29
# of header row chambers required:	20
Floors:	0
Bins:	0
Dumpsters:	0
Required Bed Size:	343.68 Sq. M
Volume of Embedment Stone Required:	349.03 Cu. M
Volume of Fill Material Required:	412.41 Cu. M
Volume of Excavation:	932.88 Cu. M
Area of Filter Fabric:	487.95 Sq. M
# of Chambers long:	41
# of rows:	5
Actual Trench Length:	38.77 M
Actual Trench Width:	8.865 M

Field Diagram

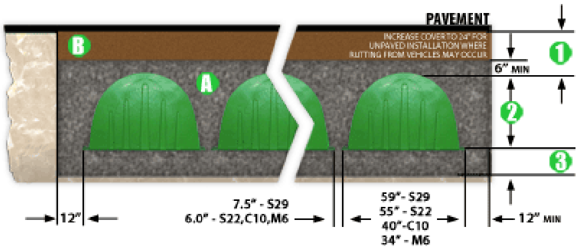


WIRE DIAGRAM

Chamber Type

Dimensions 59" x 36" x 35" (WxHxL)
1498.6mm x 914.4mm x 889mm
Weight 32 lbs / 14.5 kg
Bare Chamber Storage 29 ft³ / 0.82 m³

Project Results



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# of header row chambers required:	20
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Bins:	0
Dumpsters:	0

Required Bed Size:	343.68 Sq. M
Volume of Embedment Stone Required:	349.03 Cu. M
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Area of Filter Fabric:	487.95 Sq. M
# of Chambers long:	41
# of rows:	5
Actual Trench Length:	38.77 M
Actual Trench Width:	8.865 M

Triton Stormwater Solutions™, LLC
9864 E. Grand River, Suite 110 #176
Brighton, Michigan 48116
Phone: (810) 222-7652 - Fax: (810) 222-1769

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CONSTRUCTION DRAWINGS
Prepared For:

NOVATECH ENGINEERING

HAWTHORNE INDUSTRIAL PARK

OTTAWA, ONTARIO

311 m3 STORAGE

INDEX

terrafix
geosynthetics inc.

455 Horner Avenue
Toronto, Ontario
M8W 4W9
Tel:(416) 674–0363

REVISIONS \ ISSUE

Project Number

Date Drawn
06/27/13

Scale
N.T.S.

Designed by

Drawn by

Checked by

HAWTHORNE INDUSTRIAL PARK
OTTAWA, ONTARIO

TITLE SHEET

Sheet Number
1 OF 9

NOTES

1. ALL DIMENSIONS ARE IN METERS OR
UNLESS OTHERWISE SHOWN.
2. NOT TO SCALE

CHAMBER WEIGHT: 14.51 kg (32 lbs)

CHAMBER LAYUP LENGTH: 0.847 m (33.35")

INSTALLED BARE CHAMBER STORAGE: 0.775 m3 (27.36 cu ft)

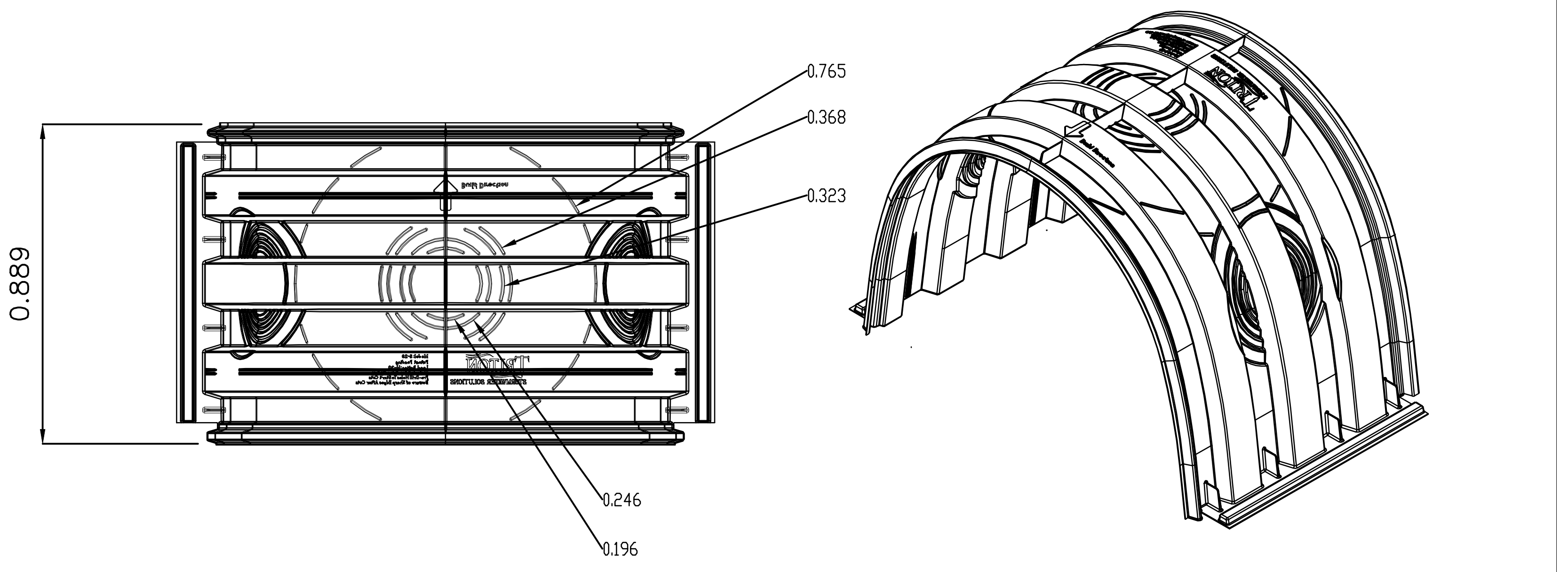
MIN. INSTALLED STORAGE: 1.165 m3 (41.15 cu ft)*

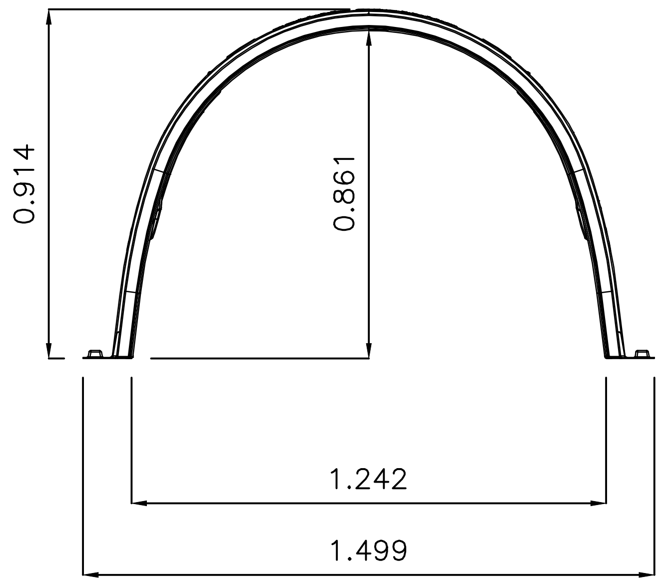
0.91m3 OF STORAGE PER LINEAR METRE WITHOUT STONE

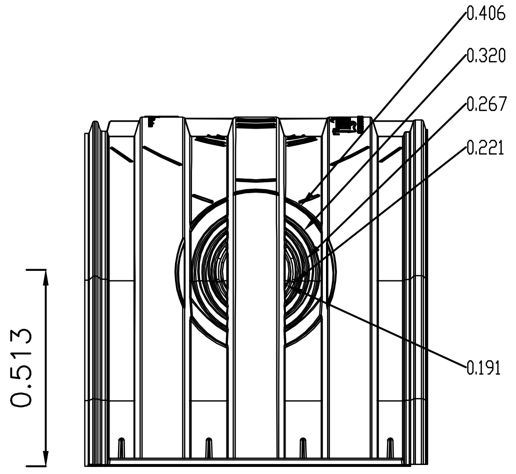
1.37m3 OF STORAGE PER LINEAR METRE WITH STONE*

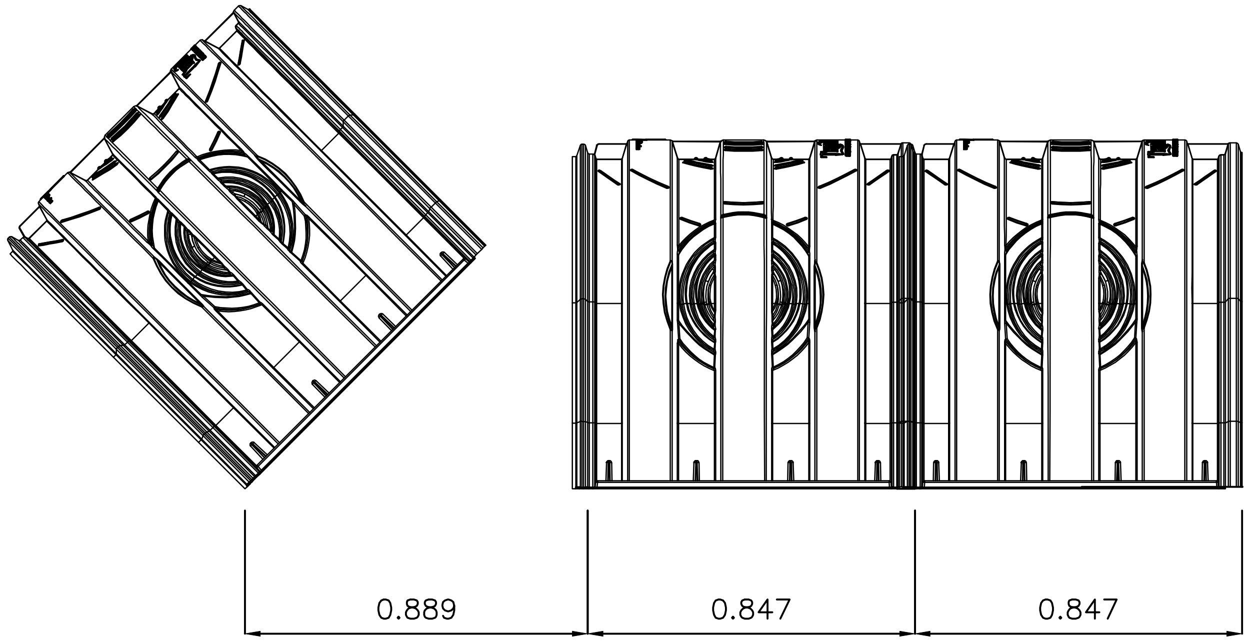
*ASSUMIMG A MIN. OF 150 mm (6") OF STONE ABOVE AND BELOW AND 191 mm (7.5") BETWEEN ROWS WITH 40% STONE POROSITY

S-29 CHAMBER DETAILS TESTED AND RATED FOR H-30 LOAD CONDITIONS









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TYPICAL CHAMBER DETAIL

Sheet Number
2 OF 9

INSTALLATION OF TRITON CHAMBERS (TO BE READ IN CONJUNCTION WITH TRITON INSTALLATION MANUAL)

Required Materials and Equipment List

? Acceptable 0.75" – 2" (19.05mm – 50.8mm) washed, crushed, angular stone per Tables 4 & 5.
? Acceptable fill materials per Table 5.
? Terrafix 360R Filter Fabric
? Triton end caps
? Triton chambers
? Reciprocating saw with a tapered blade, router, jig saw or an air saw (to custom cut end cap, side and top holes)
? Air saw works the best (Portable air compressor and power source if using an air saw)
? PVC distribution pipe
? Self–Expanding closed cell foams (i.e. Great Stuff? insulating foam, yellow cap)
? OHSA compliance
? Stone bucket
? Tracked excavator
? Transit or laser
? Vibratory roller with maximum gross vehicle weight of 12,000 lbs. (5443kg) and a maximum dynamic force of 20,000 lbs. (9071 kg)
? Installer(s) should wear gloves and proper eye protection, proper clothing and dust mask when cutting
? Review directions on all products to ensure proper installation
? 60? (1524mm) forks to unload pallets
? Fork pallet only. Do not lift stack by placing forks under product
? Remove all packaging, i.e. bands, stretch wrap, labels, and protective film from product before installing them.

Requirements for System Installation

1. Triton LLC requires installing contractors to use and understand Triton's most current installation instructions prior to beginning system installation. All illustrations and photographs are examples of typical situations. Actual designs may vary. Be sure to follow the drawings.
2. Triton offers installation consultations to installing contractors. Contact Terrafix or Triton 10 days prior to system installation to arrange a pre–installation consultation. Our representatives can answer questions, address comments and provide information about the Triton chamber system's installation requirements. Call Terrafix or Triton to receive the most current version of our installation instructions.
3. Contact local underground utility companies or locating agency at least 3 days prior to construction.
4. Triton's requirements for systems with a pavement design (asphalt, concrete pavers, etc.): Minimum cover is 18" not including pavement; maximum cover is 600" (15,240mm) including pavement design. For installations that do not include pavement, where rutting from vehicles may occur, minimum required cover is 24" (609.6mm) , maximum cover is 600" (15,240mm).
5. The contractor must report any discrepancies with the system subgrade soil's bearing capacity to the engineer.
6. Check chambers for shipping damage prior to installation. Units that have been damaged must not be installed. Contact Terrafix or Triton immediately upon discovery of any damage.
7. Filter fabric must be used as indicated in the drawings.
8. To maintain row separation distances and prevent chamber displacement, place stone between chamber rows and around perimeter as required by the most current version of Triton's Installation Instructions.
9. Backfilling of the chamber system must be in accordance with the most current version of Triton's Installation Instructions.
10. The contractor must refer to Triton's Installation Instructions for Tables of Acceptable Vehicle Loads at various depths of cover. The contractor is responsible for preventing vehicles that exceed Triton's requirements from traveling across or parking over the stormwater system. Temporary fencing, warning tape and appropriately located signs are commonly used to prevent unauthorized vehicles from entering sensitive construction areas.
11. The contractor must apply erosion and sediment control measures to protect the stormwater system during all phases of site construction per local codes and engineer's specifications.
12. Remove all packaging, i.e. bands, stretch wrap, labels, and protective film from product before installing them.
13. Triton systems must be installed in accordance with Triton's minimum requirements. Failure to do so will void the limited warranty.
14. Triton product warranty is limited. See current product warranty for details. To acquire a copy call Terrafix at 416–674–0363 or Triton at 1–810–222–7652 or visit www.tritonsws.com.
15. For installation instructions for any additional structures or fittings not covered in these instructions, contact Terrafix at 416–674–0363 or Triton at 1–810–222–7652.
16. Supply Triton and its distributor with the vehicle specifications that will be used during the installation of the system 10 business days prior to start of installation approval.

Requirements for Excavating and Preparing the Site

1. Excavate and level the designated area. Be sure to excavate at least one extra foot (0.305m) around the chamber perimeter to allow for proper fit and adequate compaction. (Bed dimensions are specified on the drawings.)
2. Excavation must be free of standing water. Dewatering measures must be taken if required. Positive drainage of the excavation must be maintained.
3. Prepare the chamber bed's subgrade soil as outlined in the engineer's drawings.

4–A. Base of Excavation: Shall be smooth soil, level and free of lumps or debris. Compact to at least 95% or as required by Engineer. Materials that can not be stabilized by compaction, such as sand and/or drainage rock, should be avoided.

4–B. Place the first layer of geotextile fabric on the bottom of the trench extending the excess portion of the rolls up sides of the excavated area. Overlap the geotextile joints 12? or per manufacturer's recommendations.

4–C. Place the geomembrane liner extending the excess portion of the rolls up the sides of the excavated area. The excess liner will later be brought up and around to encompass the sides of the 12" (min.) clear stone perimeter and above the 6" (min.) clear stone layer over the top row of Triton chambers. Seams should overlap a minimum of 12 inches or per manufacture's recommendations. The seams of the geomembrane liner shall be sealed, per manufacturer specifications, to ensure impermeability.

4–D. Place a second layer of geotextile fabric over the geomembrane prior to placement of the clear stone bedding also extending the excess portion of the rolls up the sides of the excavated area.

5. Perforated pipe outlet underdrains may be designed within the one foot stone perimeter. Install perforated pipe outlet underdrains as required on the drawings.
6. Place acceptable 0.75"– 2" (19.05mm – 50.8mm) –washed, crushed, angular stone foundation material over the entire bottom surface of the bed (see Tables 4 & 5 for stone requirements). Refer to the engineer's drawings for subgrade soil preparation and required stone foundation thickness.
7. Compact the stone using a vibratory roller with its full dynamic force applied to achieve a flat surface.

Requirements for Assembling Inlet Pipes

NOTE Depending on the system's design, it may be advantageous to lay out the inlet and outlet pipe systems prior to forming the bed of chambers.

1. Temporarily layout the main header system according to the drawings.
2. Stone foundation scour control measures such as splash pads, riprap, or geotextiles may be required by the design engineer. Locate and install scour control measures if required.
3. Set first chamber of each row aligned with their inlet pipes if applicable or with the main header row. A minimum *7.5" (190.5mm) clear spacing, measured between feet, is required between adjacent rows. Separate chambers and inlet fittings as necessary to maintain 7.5" (190.5mm) clear space between chamber rows.
4. Pre–drill a hole large enough to use a saw. Cut an opening for the inlet piping in the applicable end caps at the specified invert height.

NOTE: Inlet pipe openings may be cut anywhere on an end cap. To do this, take a short length of pipe and use a marker to draw an outline of the pipe on the end cap at the correct height or use the proper diameter guides on the face of the end cap to cut required hole.

5. Insert the distribution pipes into the end caps.
6. Once chamber spacing requirements are met, the header row system may be permanently assembled.

* 7.5" (190.5mm) is the minimum recommended spacing. A wider spacing may be required as indicated on the drawings.

Requirements for Installing the Chambers

To begin building the chamber bed, orient the chambers so the end labeled with the build direction arrow is pointed in the direction of the build.

Maintain a minimum 7.5" (190.5mm) separation between chamber rows (measurement taken from the foot of chambers).

With the Build Direction Arrow nearest you, lower Chamber B over the last rib on Chamber A.

Requirements for Joining the Chambers

Although not visible to the eye, a chamber's end corrugations are sized differently to allow for an overlapping joint.

To ensure proper joint fit, orient all chambers in the bed with their arrows pointing in the direction of the build.

Construct the chamber bed by joining the chambers lengthwise in rows. Attach chambers by overlapping the end corrugation of one chamber onto the end corrugation of the last chamber in the row. Be sure that chamber placement does not exceed the reach of the construction equipment used to place the stone.

Make sure that the chamber and end cap flanges are sitting on the base stone. Base stone must provide support under the products.

NOTE: Do not overlap more than one corrugation.

Requirements for Attaching the End Caps

Slide the end cap over the end of the last Chamber. The end caps sits on the outside of the Chamber rib and not on the inside.

Make sure that the end cap is properly seated onto the chamber and that the flange of the end cap is not overlapping or resting on the side flange of the chamber. The end cap should not sit higher than the first full corrugation.

4 self tapping screws can be used to screw the end cap in place to keep it from shifting during the backfill process. The 4 screws can be equally spaced and drilled through the face of the end cap an 1.5?(38.1mm) from the outer edge. Ensure that all the screws penetrate the end cap and the last chamber rib.

NOTE: End caps are required only at the beginning and the end of each row of chambers.

Requirements for Placing Stone Over the Chambers

Angular stone meeting the specifications in Tables 4 & 5 and cross–section drawings may be placed over the chambers with an excavator, pushed with a dozer or walked in with a stone conveyer boom. Each method has benefits and limitations. These three processes will be explained separately, however there are some common requirements for each:

The 7.5" (190.5mm) minimum clear spacing must always be maintained between adjacent Triton's chamber rows; and, construction vehicle loads must not exceed the requirements of Tables1 & 2.

Ensure that the stone is of mixed size consisting of 0.75? to 2? (19.05mm to 50.8mm) and meets the requirements listed in Tables 4 & 5 and cross–section drawings.

Requirements for Placing Stone with an Excavator

Placing stone with an excavator is currently the most common method of placing stone over Triton's chambers. Its biggest limitation is the reach of the excavator arm. For larger beds it is common practice to work across a bed by joining only a few rows of chambers and placing their angular stone embedment, the filter fabric and soil fill before moving onto the next few rows.

A bed may be built either parallel to or perpendicular to the chamber row's direction with this process. The excavator typically works inside the excavation, leading the way across the bed. It is also possible for the excavator to work at grade over the recently placed chambers following the build across. If this process is done it is required that the depth of cover between tops of chambers and the excavator's tracks be the minimum required by Tables 1 & 2.

1. Anchor chambers by ladling angular stone directly over the centerline of the chambers. Evenly distribute stone to minimize chamber movement while maintaining row separation distances.
2. After chambers are anchored, continue to place the stone, surrounding the chambers and filling the perimeter areas to required cover over the top of chambers. Do not drive equipment over the chambers without minimum cover required by Tables 1 & 2.
3. Repeat steps 1 & 2 until all the chambers are laid to the dimensions of the drawing.

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INSTALLATION GUIDELINES PT.1

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Requirements for Pushing Stone with a Dozer

A dozer may be used to push the angular stone embedment into place over the chambers. There are some strict requirements for this process.

1. All embedment stone must be pushed in a direction parallel with the rows of chambers. Pushing stone perpendicular across chamber rows may cause the chambers to move, possibly reducing the required 7.5"(190.5mm) minimum spacing between rows. The stone around and between the chambers is a critical component to the strength of the overall system so when pushing stone make sure that the amount of stone is evenly distributed and not pushed on one side of the chamber and not the other.
2. Always maintain the required cover between the tops of chambers and the dozer tracks, per Table 2. The contractor must check Table 2 to determine if their construction vehicles can be used over the chamber bed.
3. Supply Triton or Terrafix with the vehicle specifications that will be used during the installation of the system.
4. Push stone in the opposite directions of the ?Build Direction? arrows that are on top of each chamber. Push stone in small piles and spread evenly. Evenly distribute stone to minimize chamber movement while maintaining the proper row separation distances.
5. NEVER push embedment stone perpendicular to the chamber row including the Main Header Row. Evenly distribute embedment stone to minimize chamber movement while maintaining row separation distances.
6. When entering onto the chamber bed make sure that there is a flat as possible transition from the existing grade to the stone cover. Push in small piles as to not side load the chamber rows. Ensure that the stone fill in between the chamber row is equalized. Contact Terrafix or Triton for further details.
7. The angular stone cover height should never differ by more than 12" (304.8mm) over adjacent chambers unless there is a minimum cover of 24" (609.6mm) over the chambers. Stone should be pushed in small piles and spread evenly to prevent movement of chamber rows.
8. Full dump trucks must not drive over or dump stone over Triton chambers unless there is a minimum of 24" (610mm) of cover over the chambers. It is convenient for truckers to dump stone as close to the dozer as practical, however a full truck is often the heaviest load on a construction site. Raising the body to dump stone significantly increases the rear wheel loads. 24" (610mm) of cover is the minimum requirement for dumping stone over Triton chambers. The dump truck must be on level ground with adequate soil cover under all tires. Make sure that all tire pressure is to the tire manufacturers' recommendations. Lower pressure tires must be inflated to the proper pressure before driving over the chamber bed.

Requirements for Placing Stone with a Telescoping Conveyer Boom

Telescoping aggregate conveyer trucks are becoming increasingly popular at construction sites. Their use can save a significant amount of time, money and free up other heavy equipment for other uses. They are only limited by the range of the boom. Typical trucks have a boom range between 50' (15.24m) to 130' (39.624m). Booms can convey up to 360 cu ft (10.194m3) of stone per hour.

1. Anchor chambers by ladling angular stone directly over the centerline of the chambers. Evenly distribute stone to minimize chamber movement while maintaining row separation distances.
2. After chambers are anchored, continue to place the stone, surrounding the chambers and filling the perimeter areas to a minimum of 6" (152.4mm) over the top of chambers. Do not drive equipment over the chambers without minimum cover required by Tables 1 & 2.
3. Repeat steps 1 & 2 above until all the chambers are laid to the dimensions of the approved drawings.

Requirements for Backfilling the System

1. Place the required angular stone over the entire bed area as described in previous sections.
2. After placement of 6" (min.) over the top row of Triton chambers, bring fabric material up the sides and over the top of the structure, overlapping at least 2' (0.610m)
3. The first 12" (304.8mm) of fill material must meet the requirements of Table 5. Backfill over the top of the fabric material in lifts that do not exceed 6" (152.4mm). Distribute the fill with a construction vehicle that meets the maximum wheel loads or ground pressure limits specified in Tables 1 & 2.
4. Compact each lift of backfill as specified in the drawings. Triton requires compacting to a minimum of 95% of the Standard Proctor density. Use a walk–behind or vibratory roller not to exceed a maximum gross vehicle weight of 12,000 lbs (5443.108 kg) and a maximum dynamic force of 20,000 lbs (9071.847 kg).
5. Continue to backfill over the chamber bed in 6" (152.4mm) maximum lifts until the specified grade is achieved. Triton's cover requirements are 24" (609.6mm) minimum and 600" (15,240mm) maximum over the top of the chambers. For pavement sub–base or special fill requirements, see drawings.The backfill height differential should never differ by more than 12" (304.8mm) over adjacent chambers. Minimum cover heights must be met before vehicles are allowed on top of the system. Large rocks and organic matter such as roots, stumps, etc. must not be part of the backfill material. Refer to Table 5 for Acceptable Cover Materials or contact the design engineer for approved fill types.

Requirements for Assembling the Triton Main Header Row System

1. Locate installed catch basin or mechanical filter.
2. Determine length of main inlet pipe from catch basin or mechanical filter to feed the main header row.
3. Temporarily lay out Triton sediment floor according to the drawings to determine installation location of the dumpster and/or sump bin assembly (if required).
4. Once dumpster and/or sump bin location has been determined, contractor can then excavate and install dumpster and/or sump bin assembly (if required).
5. InstallPERMANENT Triton sediment floor according to engineer's drawings. The sediment floor sections should be installed in the build direction indicated by the arrows on the surface of the floor sections. When a dumpster assembly is present, it is recommended to start from the dumpster assembly and build the main Header Row toward the inlet structure. Otherwise the build direction can start from inlet structure.
6. Install first chamber section and end cap in main header row in the build direction indicated by the arrows on the top surface of each chamber.
7. Install main inlet pipe(s) from catch basin or mechanical filter into the end cap of the first chamber section of the main header row.

   NOTE: If main inlet pipe does not fit tightly into end cap, then wrap end of distribution pipe with geo–fabric to remove any slack to get a secure fit. Wrap geo–fabric ONLY on the outer wall of the distribution pipe, making sure not to obstruct any end of distribution pipes. You may also use self–expanding closed cell foam (i.e. Great Stuff? insulating foam, yellow cap) to seal around the opening.

   NOTE: If the end caps and main header rows chambers have not been cut at the factory, then cut end caps and chambers that will receive the distribution pipes BEFORE building into rows. This will assure proper fit and correct cutting locations and will also give adequate room to cut openings before the system is built.

   NOTE: If any hole is cut 2? (50.8mm) larger than pipe O.D. then that product (I.E. chamber, end cap) must be replaced.

8. Continue with installation of chamber sections in the build direction indicated by the arrows on the top surface of each chamber to construct the main header row. Chamber sections should fit securely on top of the sediment floor.
9. Once the main header row has been installed onto the sediment floor and the dumpster, install up to a 33? (838.2mm) O.D. manhole access drop. Use a jigsaw, reciprocating, or air saw to cut the appropriate diameter opening to accept the manhole access drop. Attach four small galvanized angle brackets equally spaced approximately ONE (1) foot up from the end of the pipe. Use half inch screws on riser pipe to fasten the 4 small galvanized brackets. It is not necessary to screw the angle brackets to the Triton chambers. The purpose of the angle brackets is to support the pipe until the backfill is placed. Insert the bottom foot of pipe into the top porthole of the chamber and backfill. Attach top of riser pipe to a cap, or to a cleanout cover assembly, as specified on the drawings. Place an access casting in a concrete pad above, once all fill is placed, for risers in pavement.
10. Locate and cut out specified side porthole diameters on all chambers of the main header row (pre–drill large enough hole to insert blade for start of cut).
11. Once all side portholes have been cut to the specified diameter, install all distribution pipes.

    NOTE: If distribution pipes do not fit tightly into side portholes, then wrap end of distribution pipe with geo–fabric to remove any slack and get a secure fit. Wrap geo–fabric ONLY on the outer wall of the distribution pipe, making sure not to obstruct any end of distribution pipe, or you can also use self expanding closed cell foam to fill in the gaps.

12. Once all distribution pipes have been properly installed in the side portholes of the main header row, set each chamber of each row aligned with their distribution pipes. Add self–expanding closed cell foam to seal gaps around pipe entering through the chambers and end caps. A minimum of 7.5" (190.5mm) clear spacing, measured between feet, is required between adjacent rows. Separate chambers and distribution fittings as necessary to maintain 7.5" (190.5mm) clear space between chamber rows. Install the end cap onto the first section of each row of chambers in the drain field. With a jigsaw, reciprocating saw, or air saw cut an opening for the distribution pipe in the applicable end caps at the specified invert height to accept the distribution pipe. Slide chamber with the installed end cap over the end of the distribution pipe. Once chamber spacing requirements are met, the rest of the chambers making up the drain field can now be installed. A minimum of 7.5?(190.5mm) spacing is required between main header row and drain field chambers.
13. Install end caps at the end of each chamber row.
14. Cut proper hole diameter on end cap to accept distribution pipe at proper invert height.
15. Install End Cap onto first section of each row of chambers in the drain field.
16. Slide chamber with installed end cap over end of distribution pipe or place chamber with installed end cap and pass distribution pipe from inside of chamber though the end cap hole into the chamber side hole. Use self–expanding closed cell foam to seal around gaps between end cap and chamber(s).

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INSTALLATION GUIDELINES PT.2

Sheet Number
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Acceptable Vehicle Loading

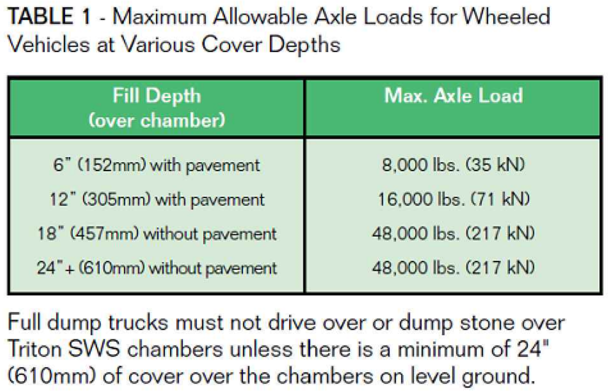

TABLE 1 - Maximum Allowable Axle Loads for Wheeled Vehicles at Various Cover Depths

Fill Depth (over chamber)	Max. Axle Load
6" (152mm) with pavement	8,000 lbs. (35 kN)
12" (305mm) with pavement	16,000 lbs. (71 kN)
18" (457mm) without pavement	48,000 lbs. (217 kN)
24"+ (610mm) without pavement	48,000 lbs. (217 kN)

Full dump trucks must not drive over or dump stone over Triton SWS chambers unless there is a minimum of 24" (610mm) of cover over the chambers on level ground.

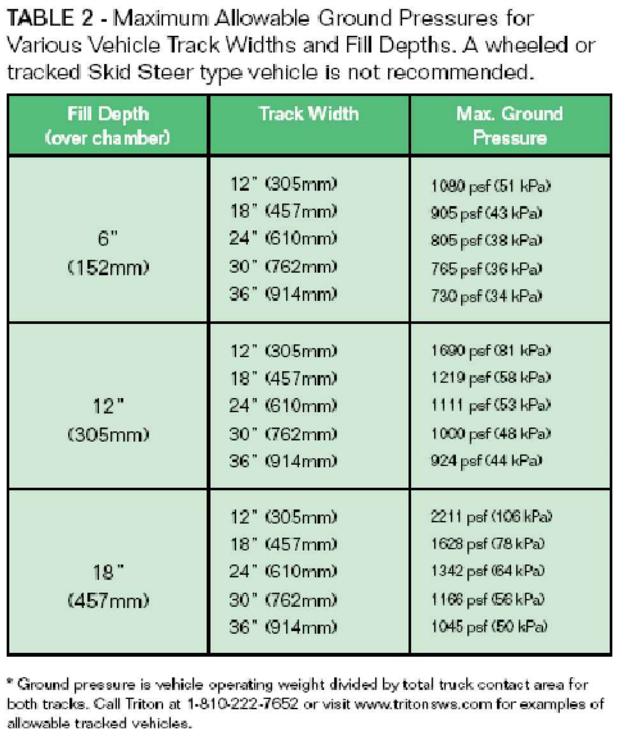

TABLE 2 - Maximum Allowable Ground Pressures for Various Vehicle Track Widths and Fill Depths. A wheeled or tracked Skid Steer type vehicle is not recommended.

Fill Depth (over chamber)	Track Width	Max. Ground Pressure
6" (152mm)	12" (305mm)	1080 psf (51 kPa)
	18" (457mm)	905 psf (43 kPa)
	24" (610mm)	805 psf (38 kPa)
	30" (762mm)	765 psf (36 kPa)
	36" (914mm)	730 psf (34 kPa)
12" (305mm)	12" (305mm)	1690 psf (81 kPa)
	18" (457mm)	1219 psf (58 kPa)
	24" (610mm)	1111 psf (53 kPa)
	30" (762mm)	1000 psf (48 kPa)
	36" (914mm)	924 psf (44 kPa)
18" (457mm)	12" (305mm)	2211 psf (106 kPa)
	18" (457mm)	1628 psf (78 kPa)
	24" (610mm)	1342 psf (64 kPa)
	30" (762mm)	1166 psf (56 kPa)
	36" (914mm)	1045 psf (50 kPa)

* Ground pressure is vehicle operating weight divided by total track contact area for both tracks. Call Triton at 1-810-222-7652 or visit www.tritonsws.com for examples of allowable tracked vehicles.

Acceptable Fill Materials

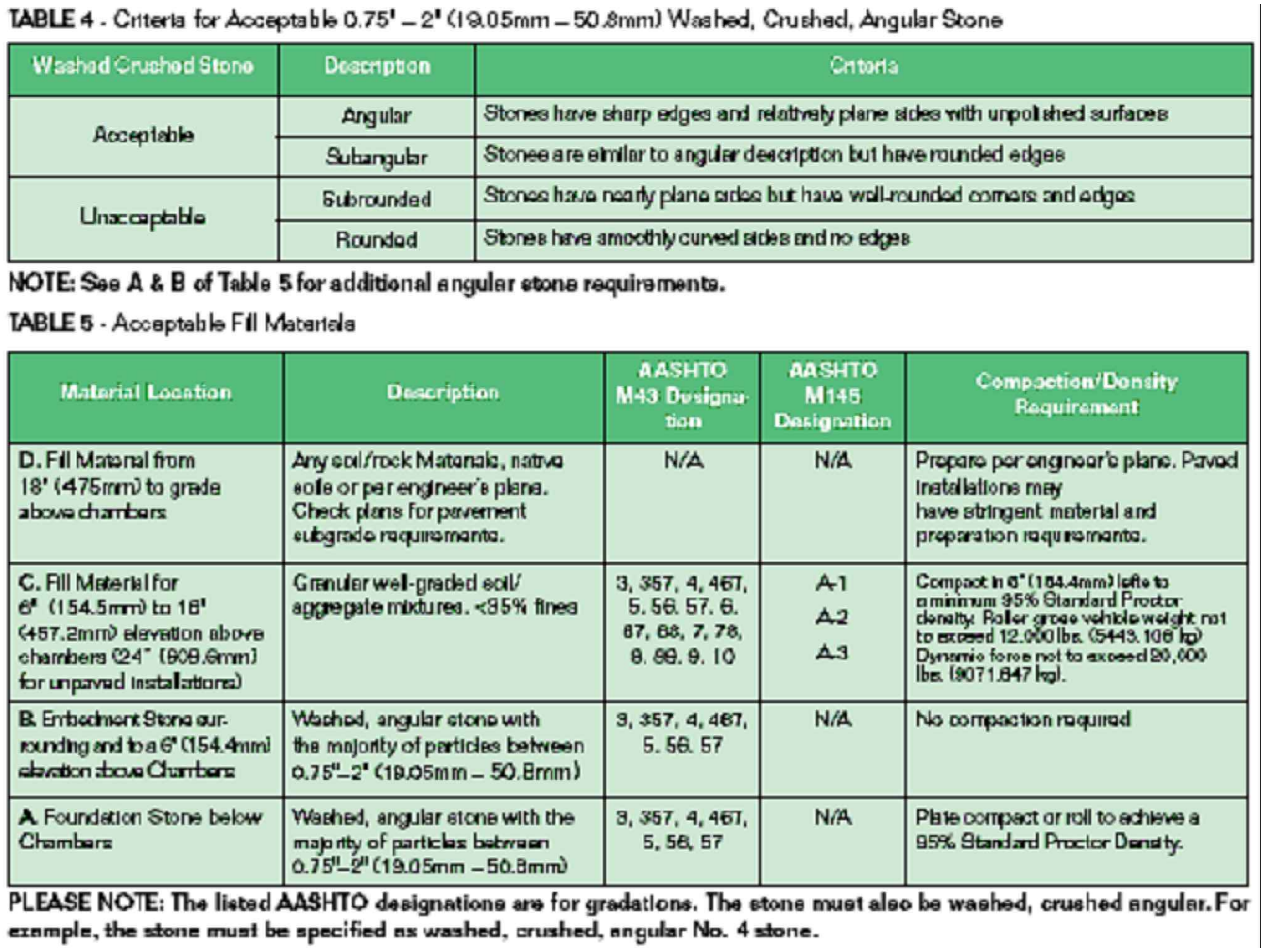

TABLE 4 - Criteria for Acceptable 0.75" – 2" (19.05mm – 50.8mm) Washed, Crushed, Angular Stone

Washed Crushed Stone	Description	Criteria
Acceptable	Angular	Stones have sharp edges and relatively plane sides with unpolished surfaces
	Subangular	Stones are similar to angular description but have rounded edges
Unacceptable	Subrounded	Stones have nearly plane sides but have well-rounded corners and edges
	Rounded	Stones have smoothly curved sides and no edges

NOTE: See A & B of Table 5 for additional angular stone requirements.

TABLE 5 - Acceptable Fill Materials

Material Location	Description	AASHTO M43 Designation	AASHTO M145 Designation	Compaction/Density Requirement
D. Fill Material from 18" (475mm) to grade above chambers	Any soil/rock Materials, native soils or per engineer's plans. Check plans for pavement subgrade requirements.	N/A	N/A	Prepare per engineer's plans. Paved installations may have stringent material and preparation requirements.
C. Fill Material for 6" (154.5mm) to 18" (457.2mm) elevation above chambers (24" (609.6mm) for unpaved installations)	Granular well-graded soil/ aggregate mixtures. <35% fines	3, 357, 4, 467, 5. 56. 57. 6. 67, 68, 7, 78, 8. 89. 9. 10	A-1 A-2 A-3	Compact in 6" (154.4mm) lifts to a minimum 95% Standard Proctor density. Roller gross vehicle weight not to exceed 12,000 lbs. (5443.108 kg) Dynamic force not to exceed 20,000 lbs. (9071.847 kg).
B. Embedment Stone surrounding and to a 6" (154.4mm) elevation above Chambers	Washed, angular stone with the majority of particles between 0.75"–2" (19.05mm – 50.8mm)	3, 357, 4, 467, 5. 56. 57	N/A	No compaction required
A. Foundation Stone below Chambers	Washed, angular stone with the majority of particles between 0.75"–2" (19.05mm – 50.8mm)	3, 357, 4, 467, 5, 56, 57	N/A	Plate compact or roll to achieve a 95% Standard Proctor Density.

PLEASE NOTE: The listed AASHTO designations are for gradations. The stone must also be washed, crushed angular. For example, the stone must be specified as washed, crushed, angular No. 4 stone.

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INSTALLATION GUIDELINES PT.3

Sheet Number
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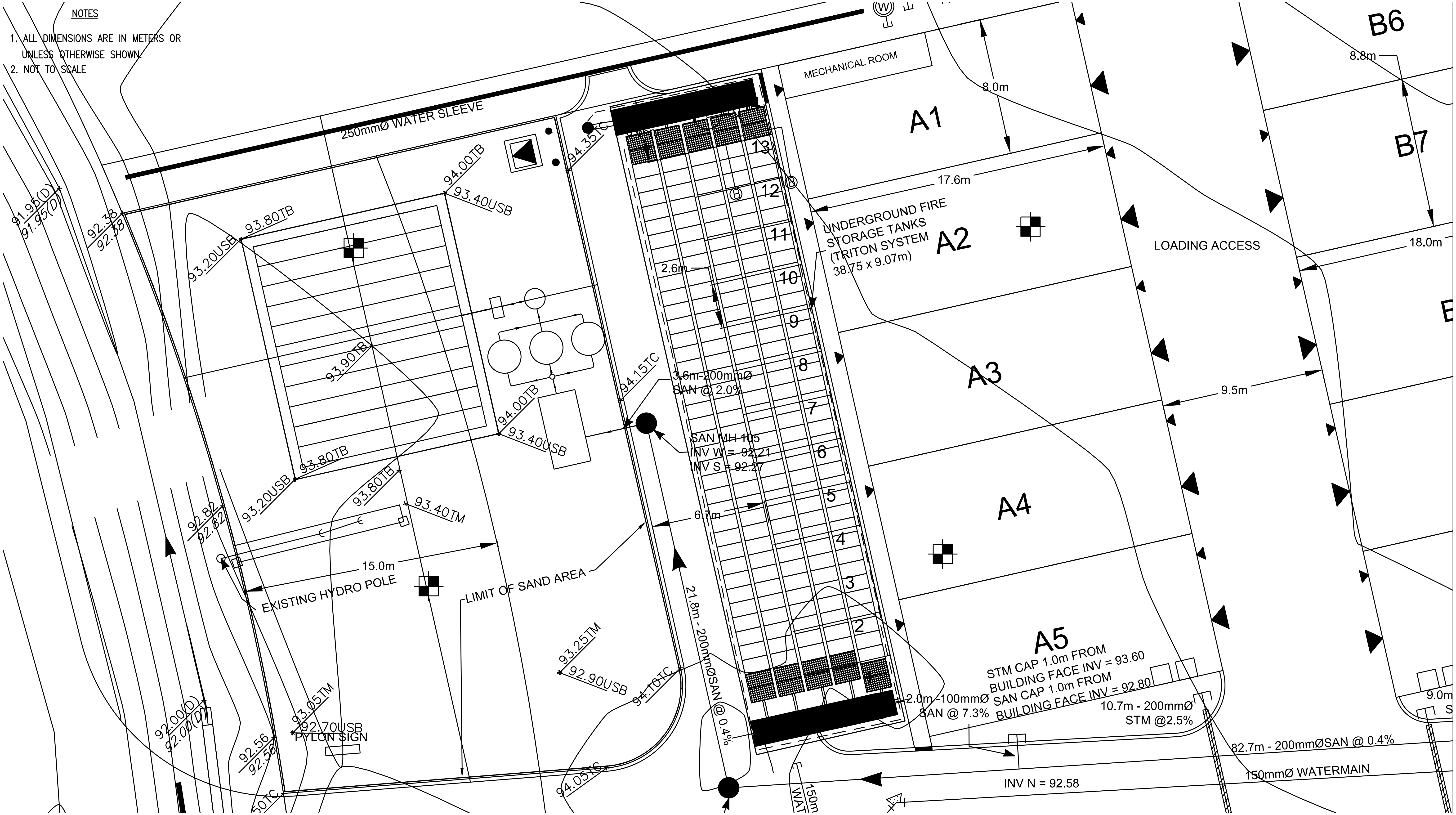

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SITE SERVING PLAN

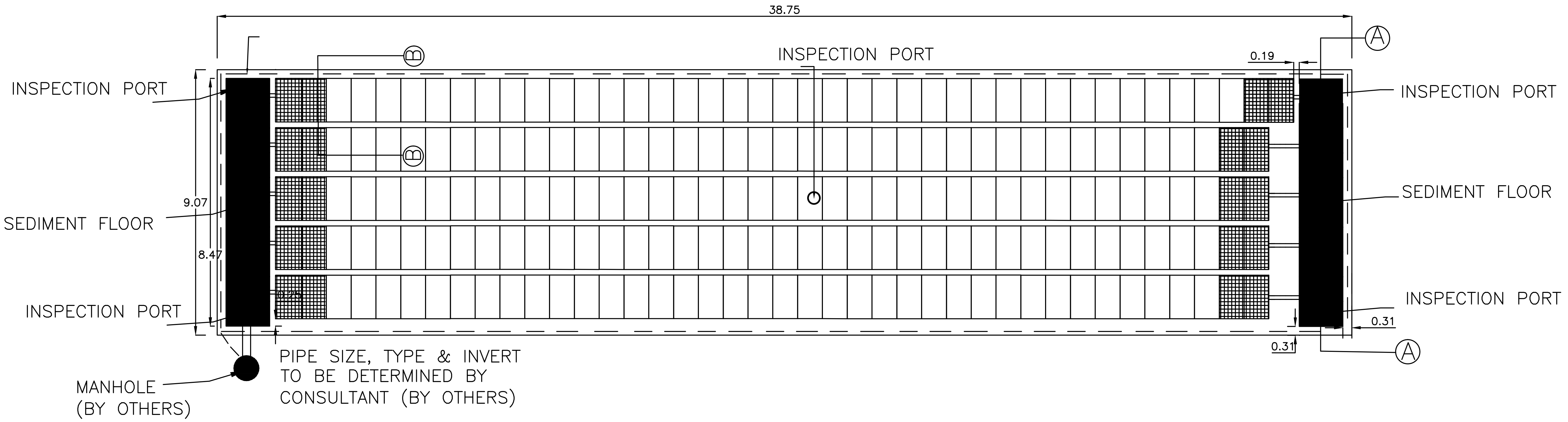
Sheet Number
6 OF 9

NOTES

1. ALL DIMENSIONS ARE IN METERS OR UNLESS OTHERWISE SHOWN.
2. NOT TO SCALE

OTTAWA–HAWTHORNE INDUSTRIAL PARK
$311m^3$ STORAGE

ITEM NUMBER	ITEM DESCRIPTION	QTY	UNITS
1	TRITON S–29 CHAMBER	221	EA
2	ENDCAP	14	EA
3	SEDIMENT FLOORS	38.28	M^2
4	TERRAFIX 360R GEOTEXTILE ($416m^2$/ROLL)	1	ROLLS
5	DISTRIBUTION PIPES (200mmø PVC)	12.81	M
6	CLEANOUT RISERS (300mmø PVC)	21.35	M
7	GEOGRID PANELS	10	EA
8	40 MIL HDPE LINER	1	EA
9	TERRAFIX 600R GEOTEXTILE ($416m^2$/ROLL)	2	EA
10	150mmø SUBDRAIN WITH SOCK	96	M



terrafix
geosynthetics inc.

455 Horner Avenue
Toronto, Ontario
M8W 4W9
Tel:(416) 674–0363

REVISIONS \ ISSUE

Project Number

Date Drawn
06/27/13

Scale
N.T.S.

Designed by

Drawn by

Checked by

HAWTHORNE INDUSTRIAL PARK
OTTAWA, ONTARIO

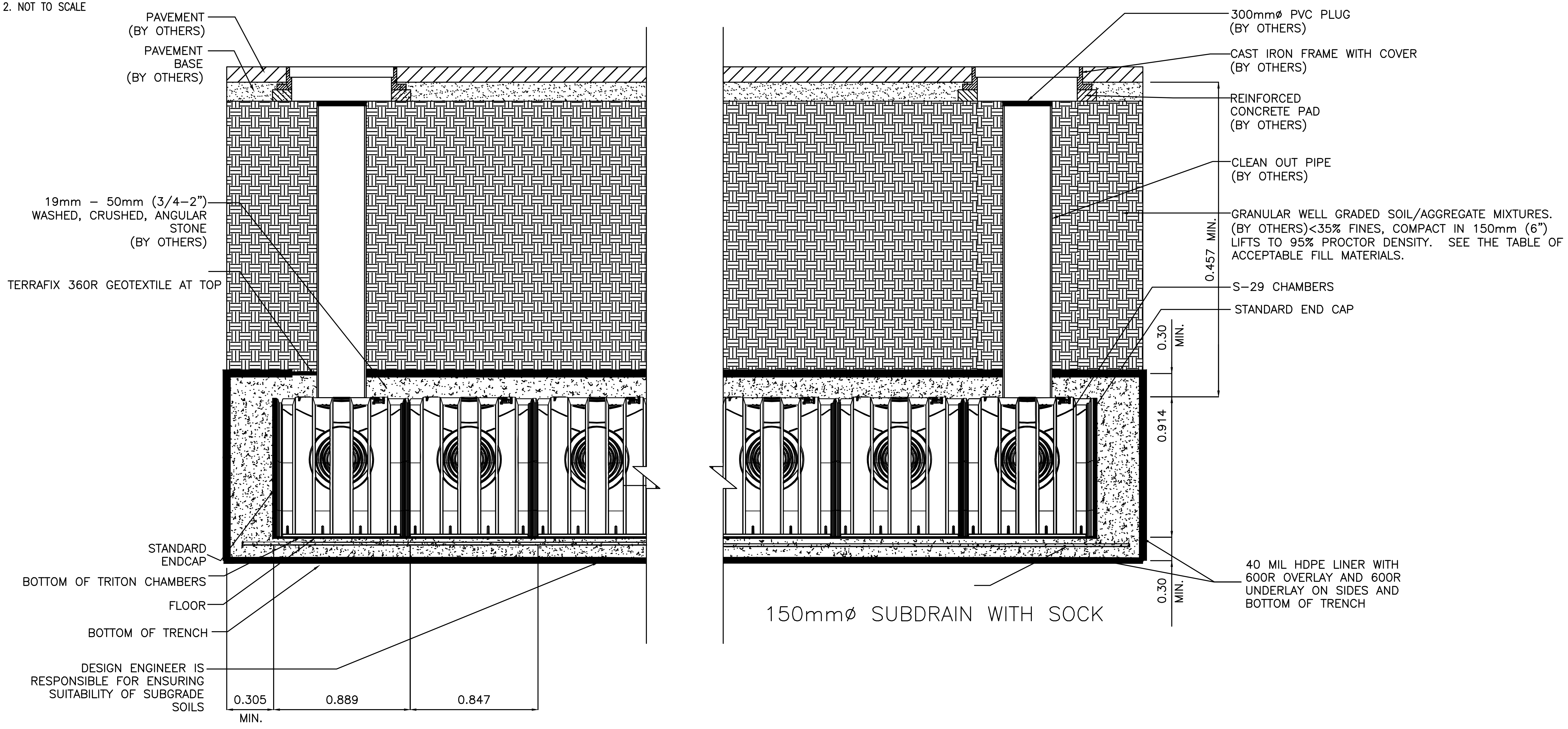
GENERAL PLAN VIEW

Sheet Number
7 OF 9

NOTES

1. ALL DIMENSIONS ARE IN METERS OR UNLESS OTHERWISE SHOWN.
2. NOT TO SCALE

SECTION A—A



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HAWTHORNE INDUSTRIAL PARK
OTTAWA, ONTARIO

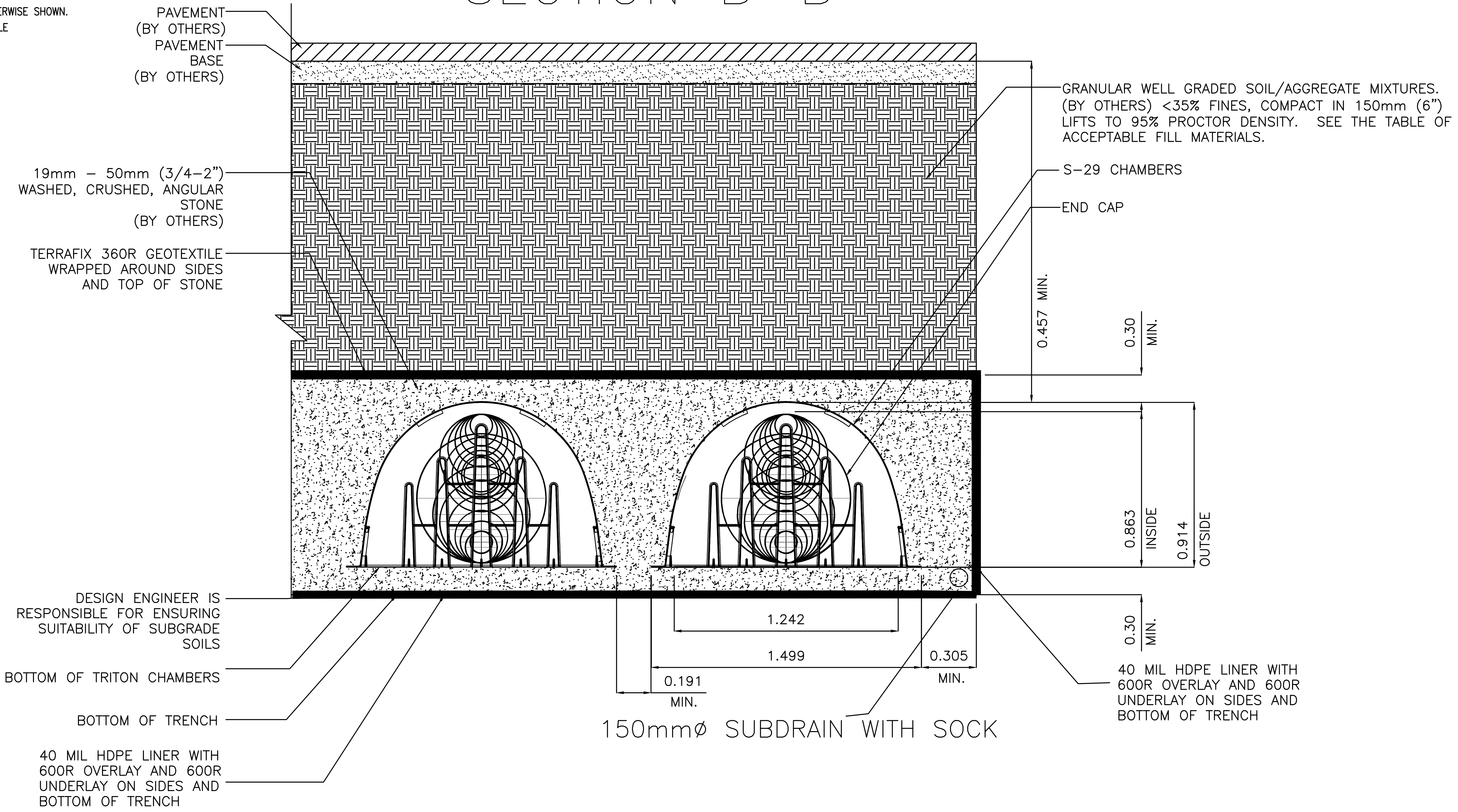
SECTION A–A

Sheet Number
8 OF 9

NOTES

1. ALL DIMENSIONS ARE IN METERS OR UNLESS OTHERWISE SHOWN.
2. NOT TO SCALE

SECTION B-B



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Checked by

HAWTHORNE INDUSTRIAL PARK
OTTAWA, ONTARIO

SECTION B-B

Sheet Number
9 OF 9

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA AND CONSERVATION AUTHORITY BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $5,000,000.00. INSURANCE POLICY TO NAME OWNERS AND ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARDSURFACE AREAS AND DIMENSIONS.
9. REFER TO SERVICING AND STORMWATER REPORT(R-2013-039) PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
10. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
11. PROVIDE LINE/PARKING PAINTING.
12. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING AS-BUILT ELEVATIONS OF ALL DESIGN GRADES SHOWN ON THIS PLAN.

GRADING NOTES:

1. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
2. MAXIMUM TERRACING GRADE TO BE 3:1 UNLESS OTHERWISE NOTED.
3. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
4. ALL CURBS SHALL BE CONCRETE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).
5. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.

PAVEMENT STRUCTURE NOTES:

REFER TO GEOTECHNICAL NOTES.

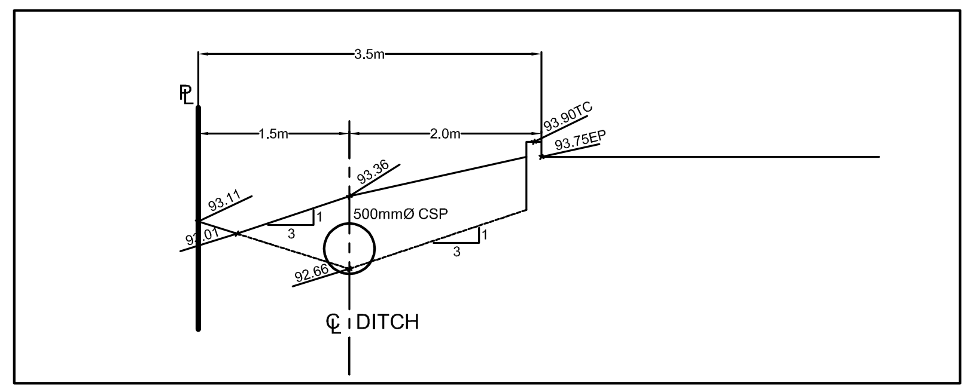
UNLESS OTHERWISE NOTED ON THE DRAWINGS THE PAVEMENT STRUCTURE IS TO BE:

▨ HEAVY DUTY ASPHALT
40mm ASPHALTIC CONCRETE
(WEAR COURSE, SUPERPAVE 12.5 OR HL3, PG 58 - 34)
40mm ASPHALTIC CONCRETE (BASE COURSE, SUPERPAVE 19.0, PG 58 - 34)
150mm GRANULAR "A"
450mm GRANULAR "B" TYPE II
680mm

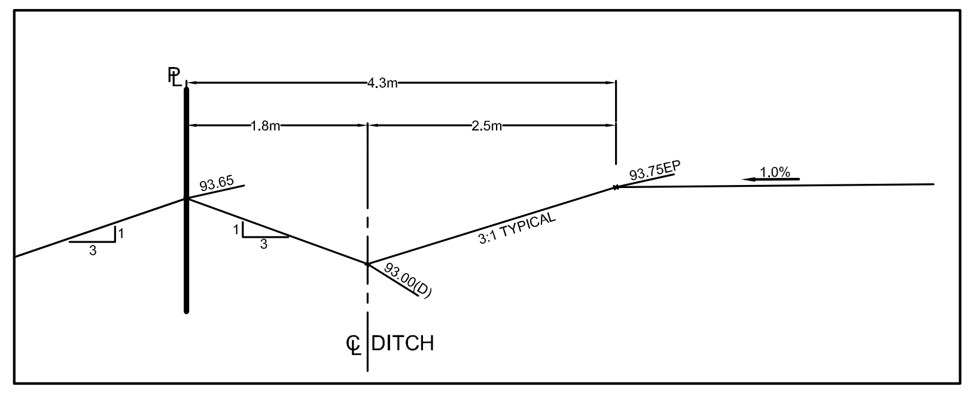
☐ PARKING AREA
50mm ASPHALTIC CONCRETE
(WEAR COURSE, SUPERPAVE 12.5 OR HL3, PG 58 - 34)
150mm GRANULAR "A"
300mm GRANULAR "B" TYPE II
500mm

GEOTECHNICAL NOTES:

1. REFER TO GEOTECHNICAL INVESTIGATION REPORT (MAY 2013), PREPARED BY HOULE CHEVRIER ENGINEERING. FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
2. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED PARKING LOT AND SEPTIC AREA AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
3. EXPOSED SUBGRADE IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF GRANULARS.
4. ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUB-EXCAVATED AND REPLACED WITH SUITABLE EARTH BORROW APPROVED BY THE GEOTECHNICAL ENGINEER.
5. THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
6. THE SUBGRADE SHOULD BE SHAPED AND CROWNED TO PROMOTE DRAINAGE OF THE ROADWAY GRANULARS.
7. FOR AREAS OF THE PARKING LOT THAT REQUIRE THE SUBGRADE TO BE RAISED. ANY MATERIALS PROPOSED FOR THIS USE MUST BE APPROVED BY THE GEOTECHNICAL ENGINEER BEFORE PLACEMENT.
8. GEOTECHNICAL INSPECTION OF SUBGRADE AND CONFIRMATION OF PAVEMENT STRUCTURE IS REQUIRED BEFORE PLACEMENT OF ANY GRANULAR MATERIAL.
9. GRANULAR MATERIALS (GRANULAR 'A' AND GRANULAR 'B') SHOULD BE COMPACTED IN ACCORDANCE WITH THE GEOTECHNICAL INVESTIGATION REPORT.



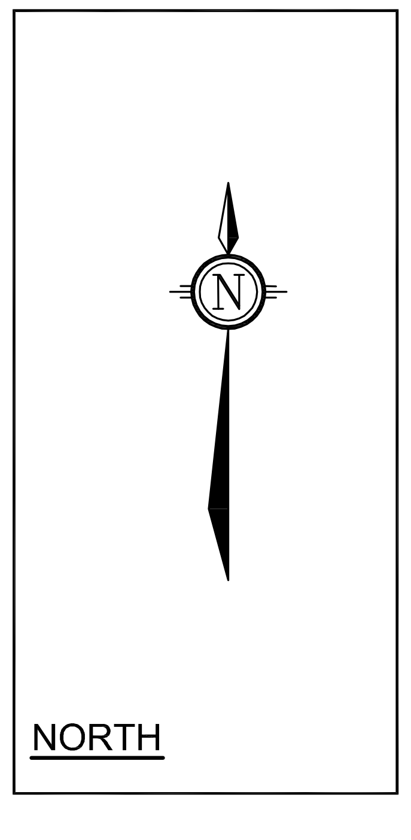
DITCH SECTION A-A
1:75



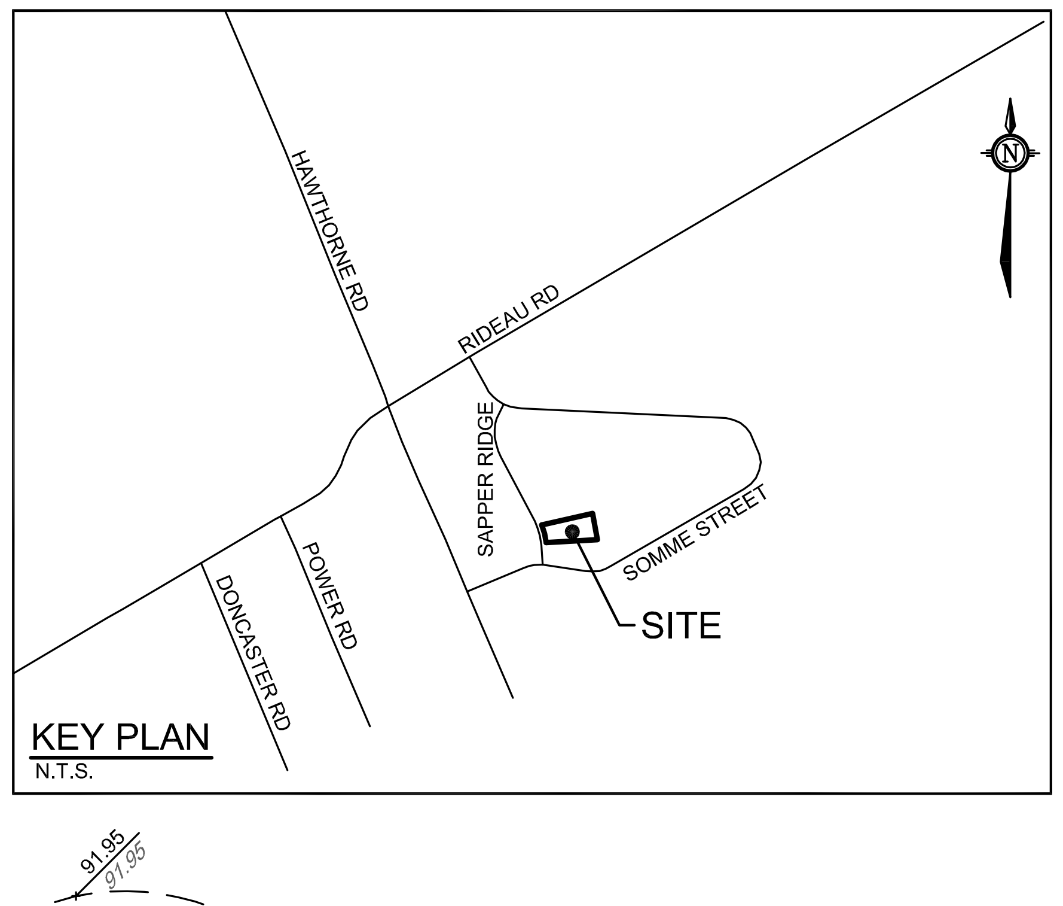
DITCH SECTION B-B
1:75

LEGEND

—— ◄——	℄ DITCH AND DIRECTION OF FLOW
– – – – –	ASPHALT EDGE (PERMALOC - SEE 112034-D1 FOR DETAILS)
127.55 127.45	PROPOSED ELEVATION EXISTING ELEVATION
127.55(D)	PROPOSED DITCH ELEVATION
TG	PROPOSED TOP OF GRATE ELEVATION
TC	TOP OF CURB
BC	BARRIER CURB
DC	DEPRESSED CURB
MC	MOUNTABLE CURB
┬┴┬┴┬	MAXIMUM 3: 1 SIDESLOPE
◄—— 2.0%	GRADE AND DIRECTION
HYD ⌖ T/FL=93.75	PROPOSED DRY HYDRANT PROPOSED TOP OF BOTTOM FLANGE
▭ DICB	PROPOSED DITCH INLET CATCHBASIN
Ⓦ	EXISTING WELL (APPROXIMATE LOCATION)
▚	TEST PIT
●	SANITARY MAINTENANCE HOLE GRATE
	PROPOSED RIP RAP



NORTH



KEY PLAN
N.T.S.

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NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

REFER TO DETAIL PLANS 112034-D1, 112034-D2 &
EROSION AND SEDIMENT CONTROL PLAN 112034-ESC
FOR ADDITIONAL NOTES AND DETAILS

No.	REVISION	DATE	BY
2.	ISSUED FOR SITE PLAN APPROVAL	FEB 11/14	LAB
1.	ISSUED FOR DISCUSSION	MAY 1/13	DJC

SCALE
1:250

1:250
0 2 4 6 8 10

DESIGN	LAB
CHECKED	SMG
DRAWN	DJC
CHECKED	LAB
APPROVED	SMG

FOR REVIEW ONLY

L.A. BOWLEY
100081115
Feb 10 2014.

S.M. GORDON
Feb 10/14

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CITY OF OTTAWA
35 SAPPERS RIDGE - APEX SOUTH BUSINESS CENTRE

GRADING PLAN

PROJECT No.
112034B-1

REV
REV # 2

DRAWING No.
112034-GR

PLANA1.DWG - 841mmx594mm

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
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7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO ARCHITECTS' AND LANDSCAPE ARCHITECTS' DRAWINGS FOR BUILDING AND HARDSURFACE AREAS AND DIMENSIONS.
9. REFER TO SERVICING AND STORMWATER MANAGEMENT REPORT(R-2013-039) PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
10. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
11. PROVIDE LINE/PARKING PAINTING.
12. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES INDICATING ALL SERVICING AS-BUILT INFORMATION SHOWN ON THIS PLAN. AS-BUILT INFORMATION MUST INCLUDE: PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS, VALVE AND HYDRANT LOCATIONS, T/WM ELEVATIONS AND ANY ALIGNMENT CHANGES, ETC.

WATERMAIN NOTES:

1. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN STANDARD TRENCH DETAIL	W17	CITY OF OTTAWA
THERMAL INSULATION FOR WATERMAIN IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
WATERMAIN CROSSING BELOW SEWER	W25	CITY OF OTTAWA
WATERMAIN (FIRE PROTECTION)	PVC DR 18	
WATER MAIN (BUILDING SERVICE) POLYETHYLENE (PE)	160 PSI RATED	

2. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY CITY OFFICIALS.
3. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
4. PROVIDE MINIMUM 0.30m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS.
5. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, UNLESS OTHERWISE INDICATED.
6. WATER DEMAND = 8,400L/day (HOULE CHEVRIER)

150mmØ WATERMAIN TABLE - DRY HYDRANT SYSTEM

STATION	SURFACE ELEVATION	TOP OF WM ELEVATION	DESCRIPTION
1+000	93.70	91.35	PROPOSED DRY HYDRANT
1+02.1	93.76	91.35	45° HORIZONTAL BEND
1+04.2	93.76	91.35	45° HORIZONTAL BEND
1+15.9	93.88	91.35	CROSSING BELOW 200mmØ STORM SEWER (CLEARANCE = 1.85m±)
1+20.0	93.88	91.35	---
1+40.0	93.91	91.35	---
1+43.5	93.91	91.35	CROSSING BELOW 200mmØ STORM SEWER (CLEARANCE = 1.85m±)
1+55.5	93.97	91.35	45° HORIZONTAL BEND
1+57.6	93.97	91.35	45° HORIZONTAL BEND
1+60.0	93.85	91.35	PROPOSED DRY HYDRANT

150mmØ WATERMAIN TABLE (CONNECTION TO STORAGE TANKS)

STATION	SURFACE ELEVATION	TOP OF WM ELEVATION	DESCRIPTION
2+000	93.70	91.35	PROPOSED HYDRANT
2+03.0	93.92	91.35	---
2+06.0	93.95	91.35	CAP

250mmØ WATERMAIN SLEEVE TABLE

STATION	SURFACE ELEVATION	TOP OF SLEEVE	DESCRIPTION
3+000	92.33	91.40	END OF FUTURE WATERMAIN SLEEVE
3+10.0	93.80	91.40	---
3+20.0	93.90	91.40	---
3+30.0	93.90	91.40	---
3+35.5	94.00	91.40	END OF FUTURE WATERMAIN SLEEVE

*PROVIDE THERMAL INSULATION AS PER CITY OF OTTAWA DETAIL W22 WHERE COVER IS LESS THAN 2.4m

SEWER NOTES:

1. SPECIFICATIONS:

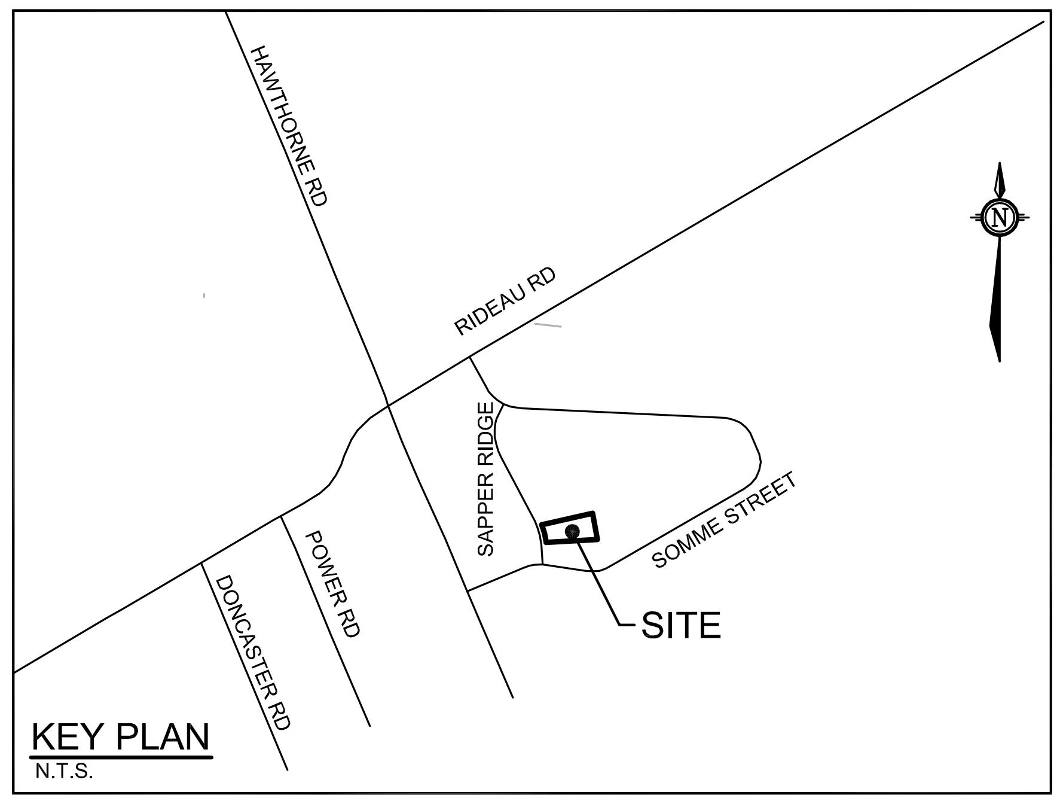
ITEM	SPEC. No.	REFERENCE
PRECAST CONCRETE MAINTENANCE HOLE, 1200mmØ	701.010	OPSD
CAST IRON, SQUARE FRAME WITH SQUARE OVERFLOW TYPE DISHED GRATE FOR CATCH BASINS, HERRING BONE OPENINGS	401.010	OPSD
SEWER TRENCH - BEDDING (GRANULAR A) COVER (GRANULAR A OR GRANULAR B TYPE I, WITH MAXIMUM PARTICLE SIZE=25mm)		
SANITARY SEWER	PVC DR 35	
STORM SEWER	PVC DR 35	

2. INSULATE ALL PIPES (SAN/STM) THAT HAVE LESS THAN 1.5m COVER WITH 50mmX1200mm HI-40 INSULATION. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
3. SERVICES ARE TO BE CONSTRUCTED TO 1.0m FROM FACE OF BUILDING AT A MINIMUM SLOPE OF 1.0% UNLESS OTHERWISE INDICATED..
4. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST xx% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
5. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTING PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL). THE CONCRETE CRADLE FOR THE PIPE CAN BE ELIMINATED.

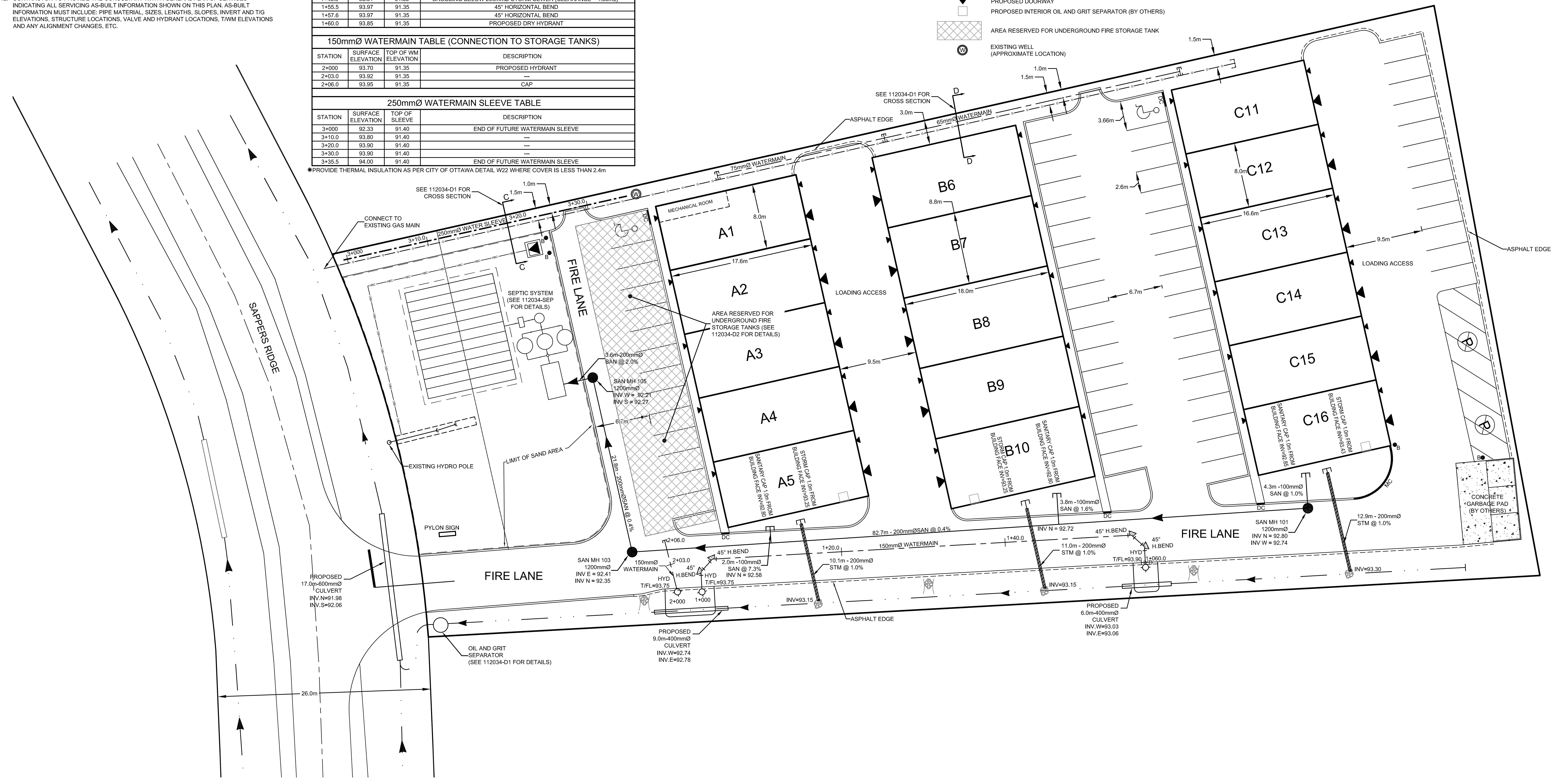
LEGEND

═	PROPOSED BARRIER CURB
DC	PROPOSED DEPRESSED CURB
MC	PROPOSED MOUNTABLE CURB
– – –	ASPHALT EDGE (PERMALOC - SEE 112034-D1 FOR DETAILS)
150mmØ	PROPOSED WATERMAIN AND DIAMETER
HYD T/FL=93.75	PROPOSED DRY HYDRANT
⊿	PROPOSED BEND AND THRUSTBLOCK 11.25°, 22.5°, 45° or TEE
SANMH 101 ●	PROPOSED SANITARY MH & SEWER
▨	PROPOSED INSULATED STORM OUTLET
◄	DIRECTION OF FLOW
━ ▪ ━	PROPOSED WATER SLEEVE (250mmØ)
B ●	PROPOSED PROTECTIVE BOLLARD
▲	TRANSFORMER (BY OTHERS)
○	EXISTING HYDRO POLE C/W GUY WIRES
HBC	PROPOSED UNDERGROUND HYDRO, BELL AND FUTURE CABLE CONDUIT
G G	PROPOSED GAS CONDUIT
✱	PROPOSED RIP RAP
▼	PROPOSED GARAGE DOOR
▼	PROPOSED DOORWAY
☐	PROPOSED INTERIOR OIL AND GRIT SEPARATOR (BY OTHERS)
▨	AREA RESERVED FOR UNDERGROUND FIRE STORAGE TANK
W	EXISTING WELL (APPROXIMATE LOCATION)

NORTH



KEY PLAN
N.T.S.



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REFER TO DETAIL PLANS 112034-D1 & 112034-D2 FOR ADDITIONAL NOTES AND DETAILS

No.	REVISION	DATE	BY
3.	ISSUED FOR SITE PLAN APPROVAL	FEB 10/14	LAB
2.	ISSUED FOR DISCUSSION	MAY 1 /13	DJC
1.	ISSUED FOR DISCUSSION	APR 10/13	DJC

SCALE
1:250

1:250
0 2 4 6 8 10

DESIGN	LAB
CHECKED	SMG
DRAWN	DJC
CHECKED	LAB
APPROVED	SMG

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
L.A. BOWLEY
100081115
Feb 10 2014.
PROVINCE OF ONTARIO

S.M. GORDON
Feb 10/14

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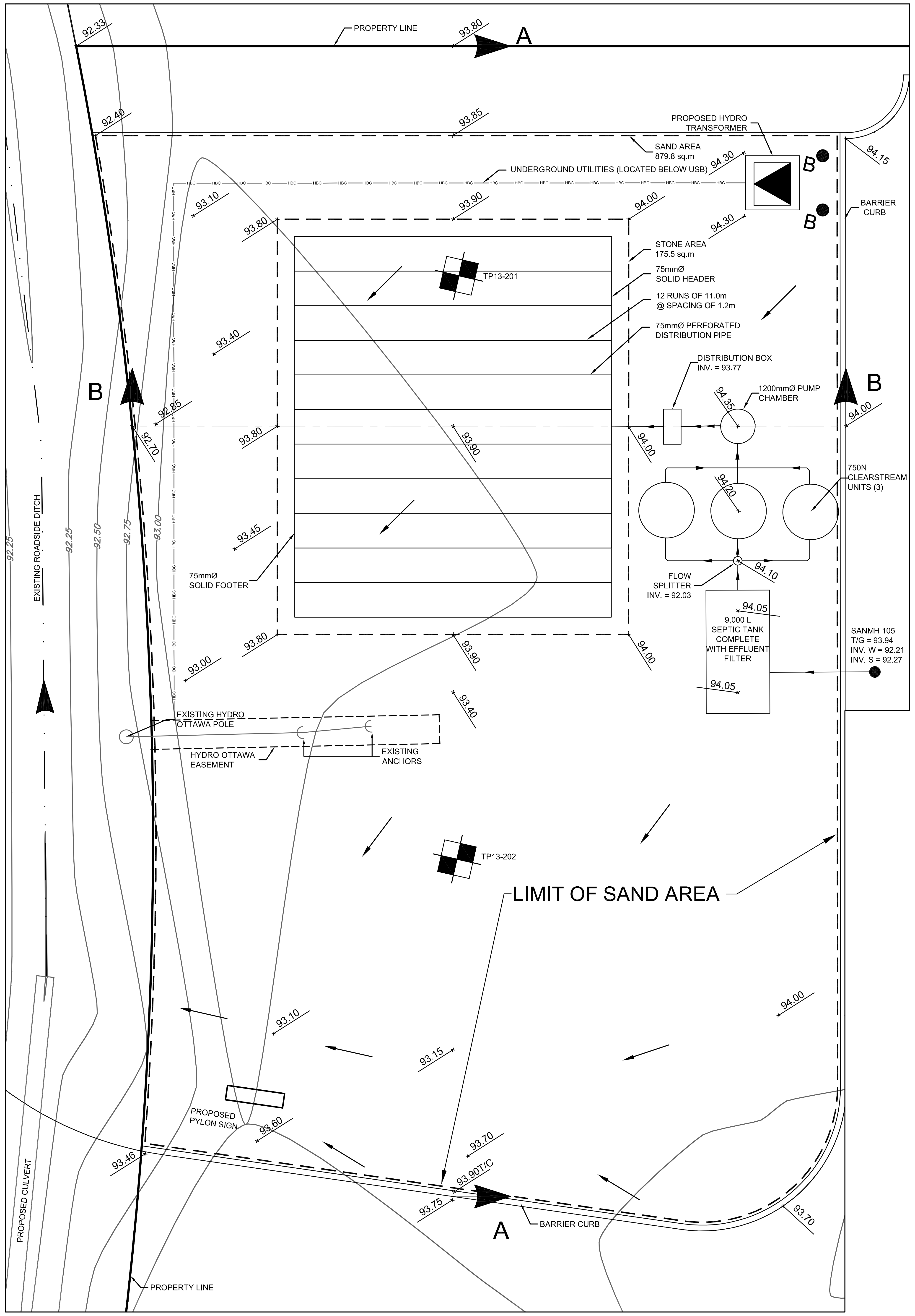
CITY OF OTTAWA
35 SAPPERS RIDGE - APEX SOUTH BUSINESS CENTRE

GENERAL PLAN OF SERVICES

PROJECT No. 112034B-1
REV REV # 3
DRAWING No. 112034-GP

PLANA1.DWG - 841mmx594mm



AREA BED PLAN VIEW

SCALE 1:100

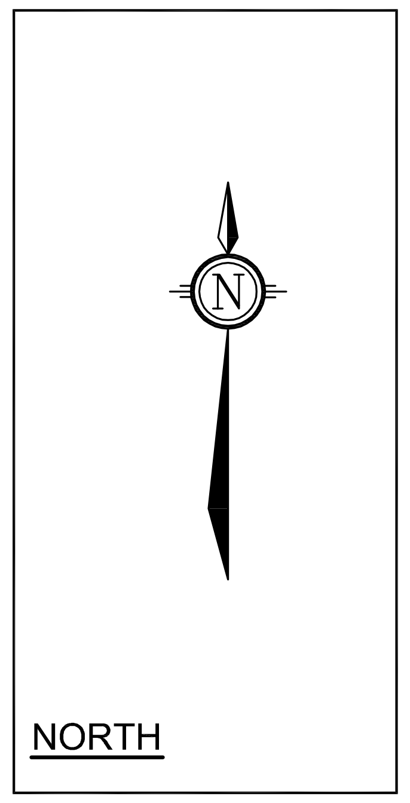
SEPTIC SYSTEM NOTES:

1. THE PROPOSED SEPTIC SYSTEM CONSISTS OF A SEPTIC TANK, THREE CLEARSTREAM PRE-TREATMENT UNITS, A LIFT PUMP AND AN AREA BED WHICH HAS BEEN DESIGNED BASED ON A SEWAGE FLOW OF 8,550 L/DAY.
2. INSTALLATION IS TO BE IN ACCORDANCE WITH CURRENT ONTARIO BUILDING CODE REQUIREMENTS, BUILDING MATERIALS EVALUATION COMMISSION AND THE ENGINEER'S BRIEF PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
3. THE OWNER IS REQUIRED TO ENTER INTO A SERVICE AND MAINTENANCE AGREEMENT FOR THE CLEARSTREAM UNITS, IN ACCORDANCE WITH ONTARIO BUILDING CODE REQUIREMENTS.
4. THE SEPTIC SYSTEM IS TO BE INSTALLED BY AN INSTALLER AUTHORIZED BY THE CLEARSTREAM MANUFACTURER.
5. THE FOLLOWING SETBACKS ARE REQUIRED:
   -TILE TO ANY DRILLED WELL = (17.0m) (min)
   -TILE TO PROPERTY LINE = (5.0m) (min)
   -STRUCTURE TO TILE = (7.0m) (min)
   -SEPTIC TANK TO ANY DRILLED WELL = 15.0m (min)
6. TANK SIZE - 9,000L (min)
7. THE SEPTIC TANK IS TO BE FITTED WITH AN EFFLUENT FILTER IN ACCORDANCE WITH MANUFACTURING SPECIFICATIONS.
8. TANK LIDS ARE TO BE LEFT ACCESSIBLE FOR PUMPING.
9. CLEARSTREAM MODEL 750N (3 UNITS REQUIRED)
10. ALL BENDS IN THE PIPE FROM THE BUILDING TO THE HEADER ARE TO BE 22.5 OR 45.0 DEGREES.
11. A MANTLE IS REQUIRED IN THE DIRECTION OF THE SURFACE DRAINAGE FLOW. IMPORTED SAND MATERIAL IS REQUIRED. IMPORTED SAND TO HAVE A PERCOLATION TIME OF 6 TO 10 MINUTES PER CENTIMETRE.
12. CONSTRUCTION TRAFFIC AND MATERIALS ARE TO BE KEPT AWAY FROM THE SEPTIC SYSTEM, INCLUDING THE MANTLE.
13. SEPTIC SYSTEM ELEVATIONS ARE NOT TO BE REVISED WITHOUT PERMISSION OF NOVATECH ENGINEERING CONSULTANTS LTD.
14. THE SEPTIC SYSTEM HAS BEEN DESIGNED TO TREAT DOMESTIC WASTE ONLY. THE FOLLOWING ARE NOT TO BE CONNECTED TO THE SEPTIC SYSTEM.
   -WATER SOFTENER
   -SUMP PUMP
   -ROOF DRAINS
   -PROCESS WATER
15. REAR FLOOR DRAINS:
   ADDITIONAL EFFLUENT OTHER THAN WATER, OIL AND GRIT IN THE REAR BAYS MUST NOT BE DISCHARGED TO THE SEPTIC SYSTEM. THIS EFFLUENT IS TO BE CAPTURED AND HAULED OFFSITE.
16. INSTALLATION OF SEPTIC SYSTEM TO BE INSPECTED BY OTTAWA SEPTIC SYSTEM OFFICE (OSSO) AND NOVATECH ENGINEERING CONSULTANTS LTD.
17. NOVATECH'S DESIGN AND INSPECTION SERVICES DO NOT RELIEVE THE SEPTIC SYSTEM INSTALLER OF THE RESPONSIBILITY FOR GUARANTEEING WORKMANSHIP AND MATERIALS.
18. THE CONTRACTOR IS RESPONSIBLE FOR SURVEYING AS-BUILT ELEVATIONS AND PROVIDING THE REQUIRED AS-BUILT INFORMATION AND DRAWINGS TO THE OSSO.

BENCHMARK

SITE BENCHMARK: NAIL IN EXISTING HYDRO OTTAWA POLE
ELEVATION = 92.45m

94.48 97.85	PROPOSED GRADE EXISTING GRADE
92.03(S)	PROPOSED SWALE INVERT
93.50INV	INVERT OF PROPOSED PIPE
TB	TOP OF SEPTIC BED
TM	TOP OF SEPTIC MANTLE
USB	UNDERSIDE OF SEPTIC BED
EP	EDGE OF PAVEMENT
TC	TOP OF CURB
FF	FINISHED FLOOR ELEVATION
Ⓦ	EXISITNG WELL ((APPROXIMATE LOCATION)
○	EXISTING HYDRO OTTAWA POLE
▚ TP13-201	APPROXIMATE TEST PIT LOCATIONS (HOULE CHEVRIER 2013)



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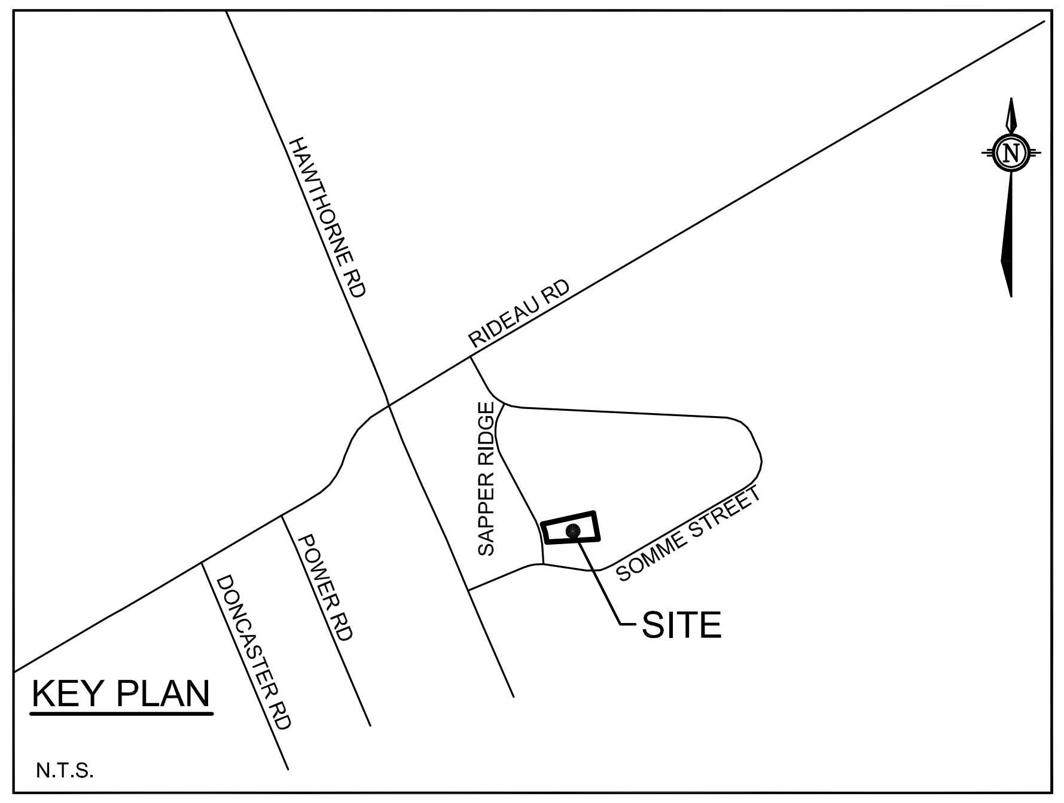
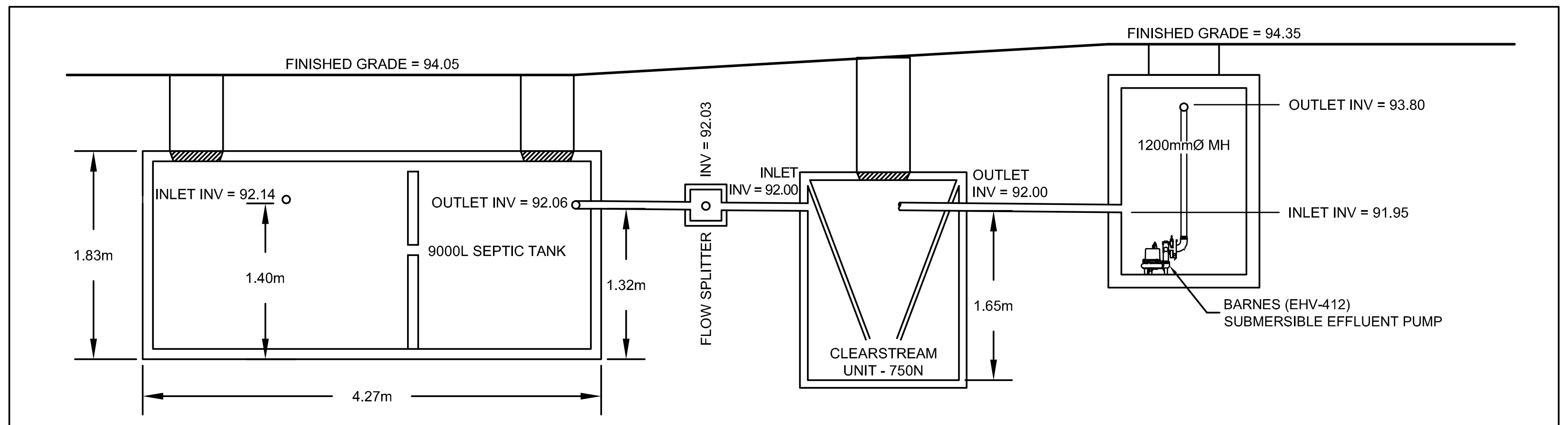


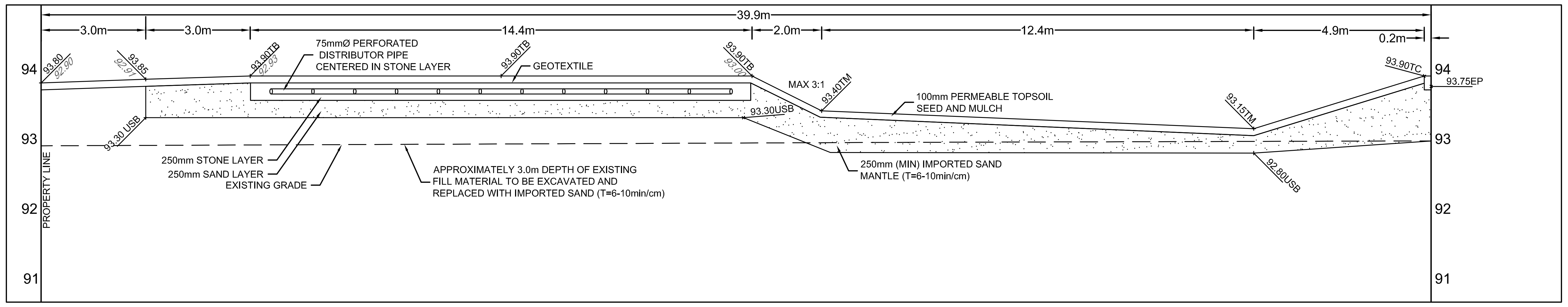
KEY PLAN

N.T.S.



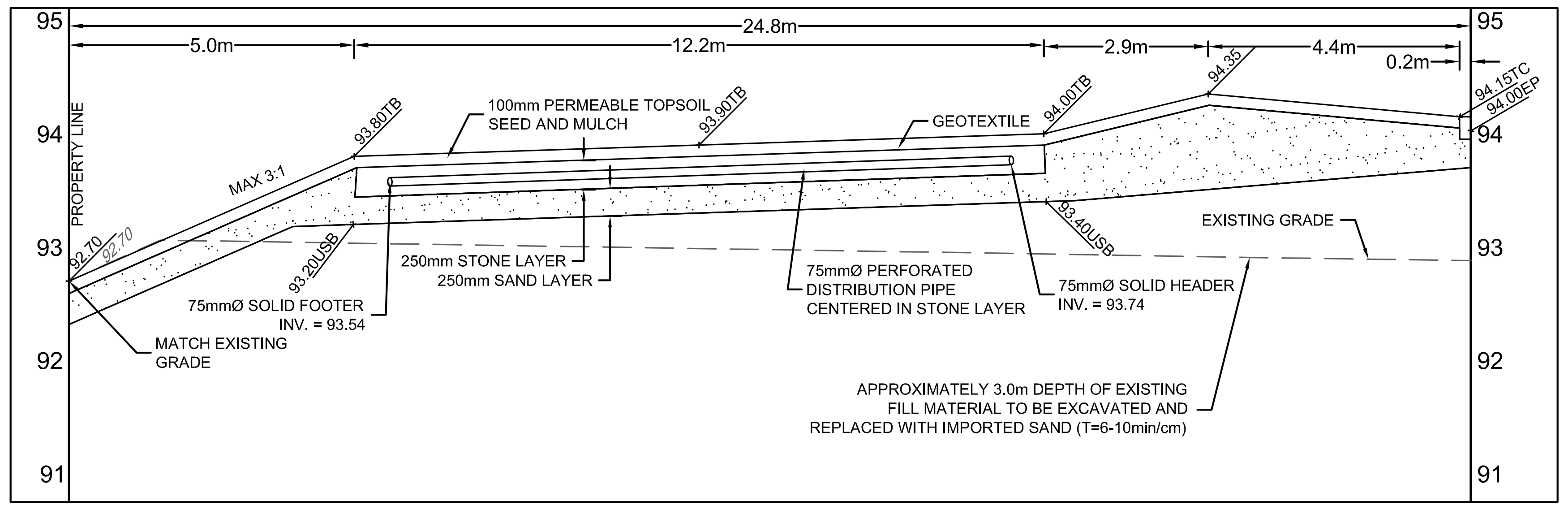
SEPTIC SYSTEM PROFILE

NTS



AREA BED CROSS SECTION A-A

H SCALE = 1:100
V SCALE = 1:50



AREA BED CROSS SECTION B-B

H SCALE = 1:100
V SCALE = 1:50

NOTE:
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No.	REVISION	DATE	BY
1.	ISSUED FOR SITE PLAN APPROVAL	FEB 10/14	LAB

SCALE
AS NOTED

DESIGN LAB
CHECKED SMG
DRAWN TGP
CHECKED LAB
APPROVED SMG

FOR REVIEW ONLY

L.A. BOWLEY
100081118
Feb 10 2014.

S.M. GORDON
Feb 10/14

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CITY OF OTTAWA
35 SAPPERS RIDGE - APEX SOUTH BUSINESS CENTRE

SEPTIC SYSTEM PLAN

PROJECT No. 112034B-1
REV REV # 1
DRAWING No. 112034-SEP

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LEGEND

❂	PROPOSED TEMPORARY ROCK FLOW CHECK DAM
▨	PROPOSED STRAW BALE BARRIER
—□——	SILT FENCE
M M	MUD MAT LOCATION
— · · — ►	℄ DITCH AND DIRECTION OF FLOW
— — — — — —	ASPHALT EDGE (PERMALOC - SEE 112034-D1 FOR DETAILS)
Ⓦ	EXISTING WELL (APPROXIMATE LOCATION)

EROSION AND SEDIMENT CONTROL NOTES:

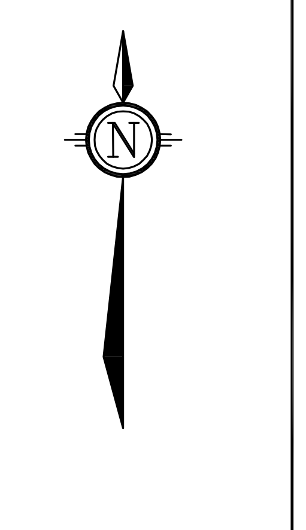
1. THE OWNER AGREES TO PREPARE AND IMPLEMENT AN EROSION AND SEDIMENT CONTROL PLAN TO THE SATISFACTION OF THE CITY OF OTTAWA, APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERNATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL SUCH AS BUT NOT LIMITED TO MAINTAIN A LIGHT DUTY SILT FENCE BARRIER AS REQUIRED.
2. SILT FENCING FOR ENTIRE PERIMETER OF SITE, SHALL BE UTILIZED TO CONTROL EROSION FROM THE SITE DURING CONSTRUCTION.
3. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
STRAW BALES	219.100	OPSD
LIGHT-DUTY SILT FENCE	219.110	OPSD
ROCK FLOW CHECK DAM	219.211	OPSD

4. MUD MATS ARE TO BE INSTALLED AND MAINTAINED AT CONSTRUCTION ACCESS POINTS TO MINIMIZE SEDIMENT TRANSFER TO EXISTING ROADWAYS.
5. ALL STREETS TO BE SWEPT REGULARLY UNTIL THE SITE IS PAVED AND IS TO CONTINUE FOR THE DURATION OF CONSTRUCTION AS REQUIRED OR AS DIRECTED BY THE ENGINEER OR CITY OF OTTAWA.
6. NO CONTROL MEASURE SHALL BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE ENGINEER.
7. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

Erosion and Sediment Control Responsibilities:

				During Construction		After Construction Prior to Final Acceptance		After Final Acceptance
	ESC Measure	Symbol	OPSD No.	Installation Responsibility	Inspection Responsibility	Inspection/Maintenance Responsibility	Removal Responsibility	Inspection/Maintenance Responsibility
Temporary Measures	Rock Flow Check Dam	❂	219.211	Developer's Contractor	Developer's Contractor	Developer	Developer's Contractor	N/A
	Light-Duty Silt Fence Barrier	—□——	219.110	Developer's Contractor	Developer's Contractor	N/A	Developer's Contractor	N/A
	Light-Duty Straw Bale Barrier	▨	219.100	Developer's Contractor	Developer's Contractor	N/A	Developer's Contractor	N/A
	Mud Mat	M M	see detail	Developer's Contractor	Developer's Contractor	N/A	Developer's Contractor	N/A
Permanent Measures	Roof Leaders Directed to Grassed Areas	N/A	N/A	Builder	Builder	Condo Association	N/A	Condo Association
	Ditches (Grading and Vegetation)	N/A	N/A	Developer's Contractor	Developer's Contractor	Municipality/Developer - Inspection Developer - Repairs Condo Association - Grass Cutting	N/A	Condo Association



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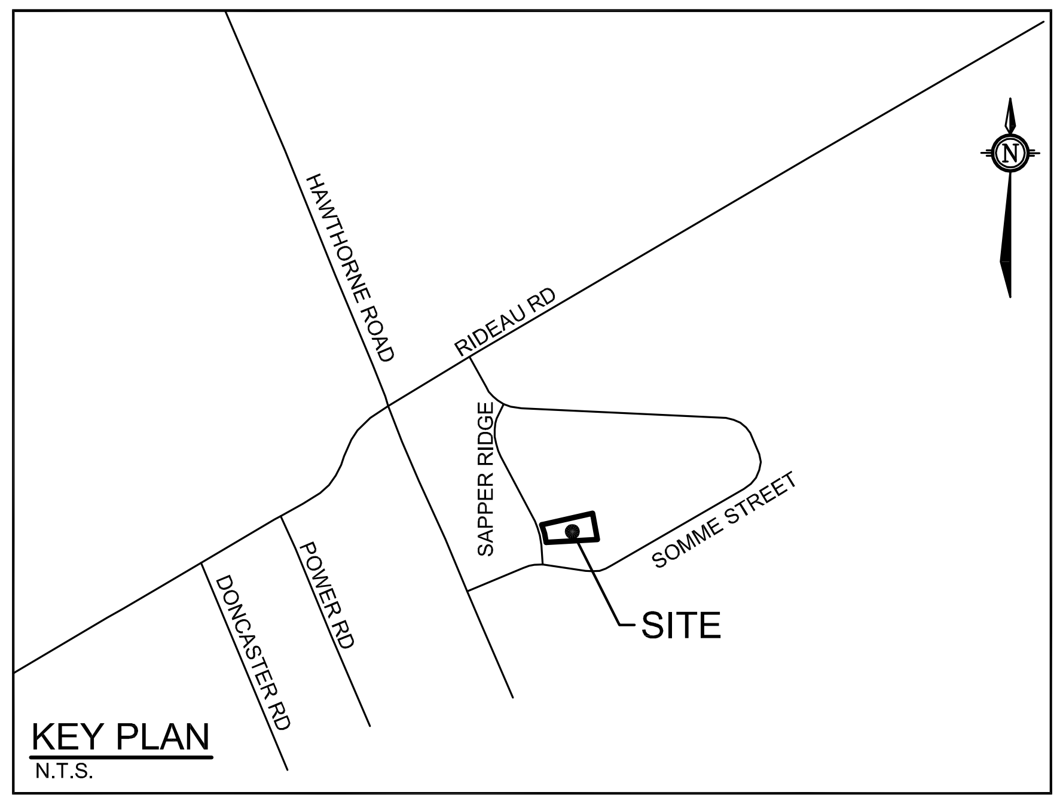
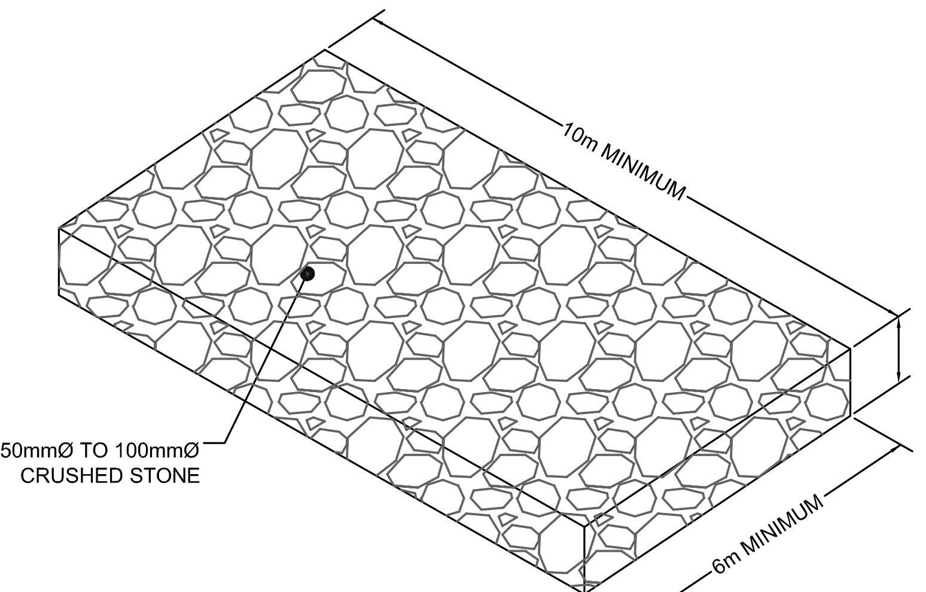
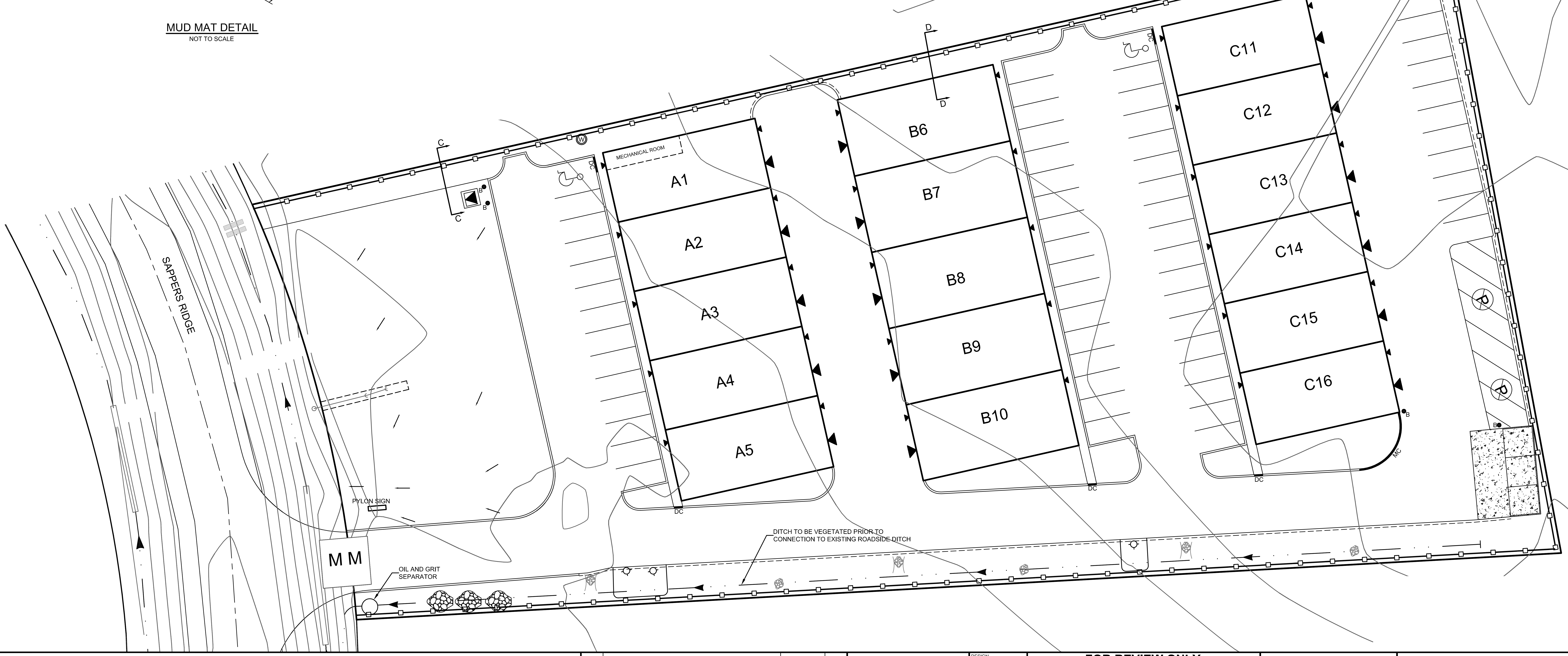


KEY PLAN
N.T.S.



MUD MAT DETAIL
NOT TO SCALE



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SCALE
1:250

DESIGN	LAB
CHECKED	SMG
DRAWN	MTM
CHECKED	LAB
APPROVED	SMG

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
L.A. BOWLEY
100081115
Feb 10 2014.
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
S.M. GORDON
Feb 10/14
PROVINCE OF ONTARIO

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CITY OF OTTAWA
35 SAPPERS RIDGE - APEX SOUTH BUSINESS CENTRE

EROSION AND SEDIMENT CONTROL PLAN

PROJECT No. 112034B-1
REV REV # 1
DRAWING No. 112034-ESC

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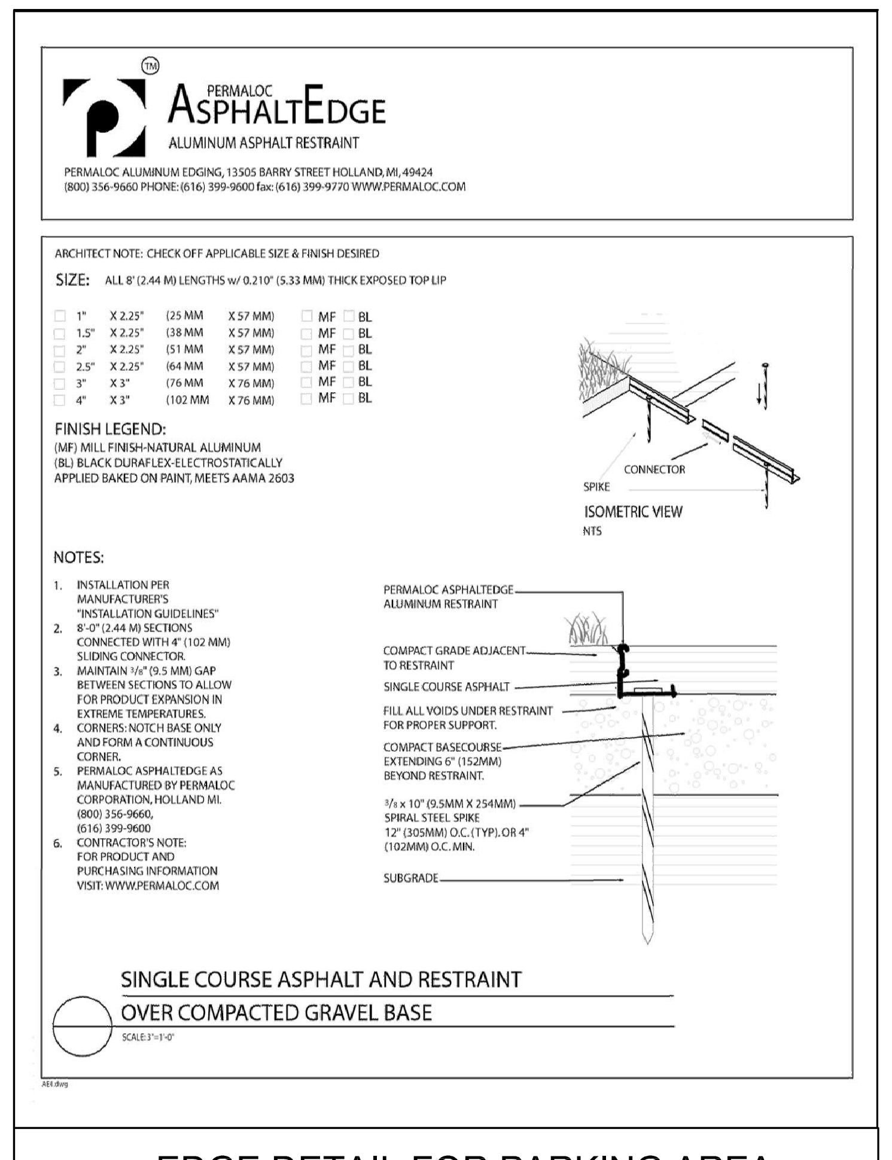

EDGE DETAIL FOR PARKING AREA
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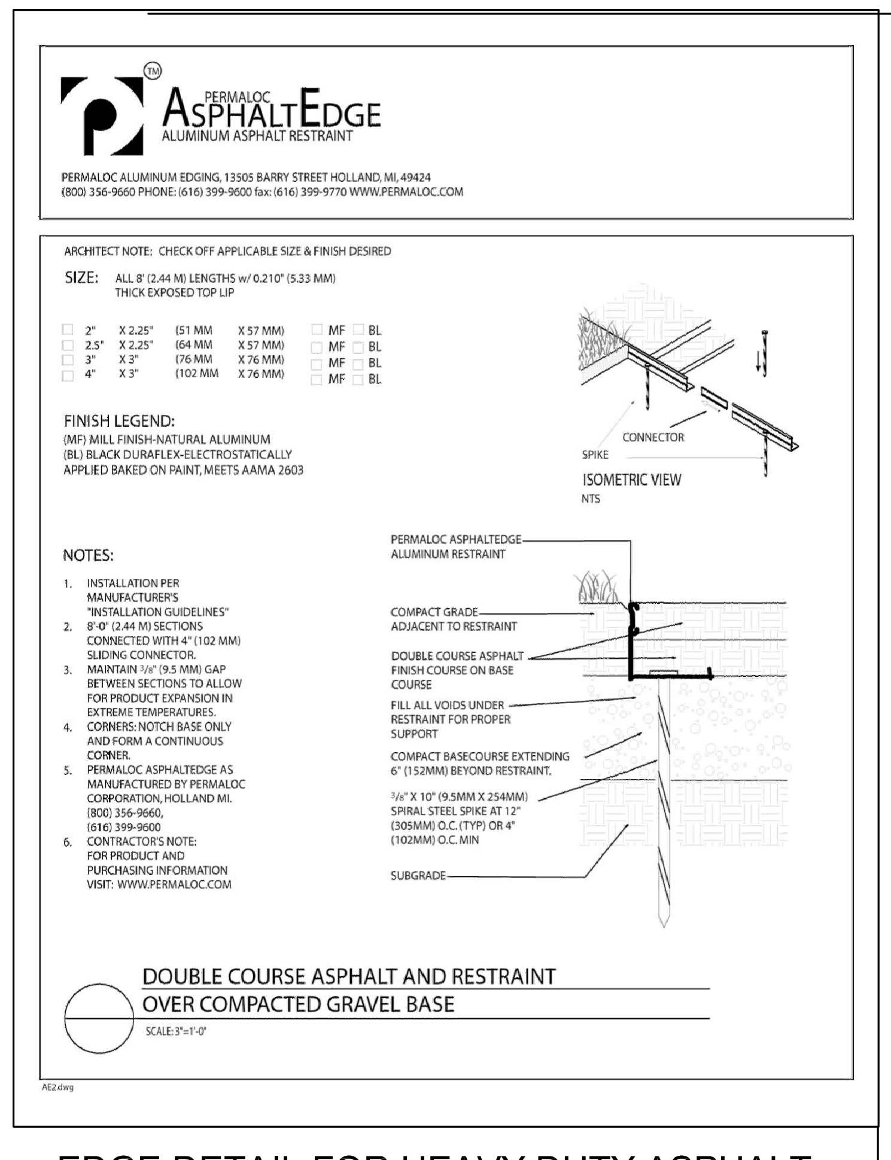

EDGE DETAIL FOR HEAVY DUTY ASPHALT
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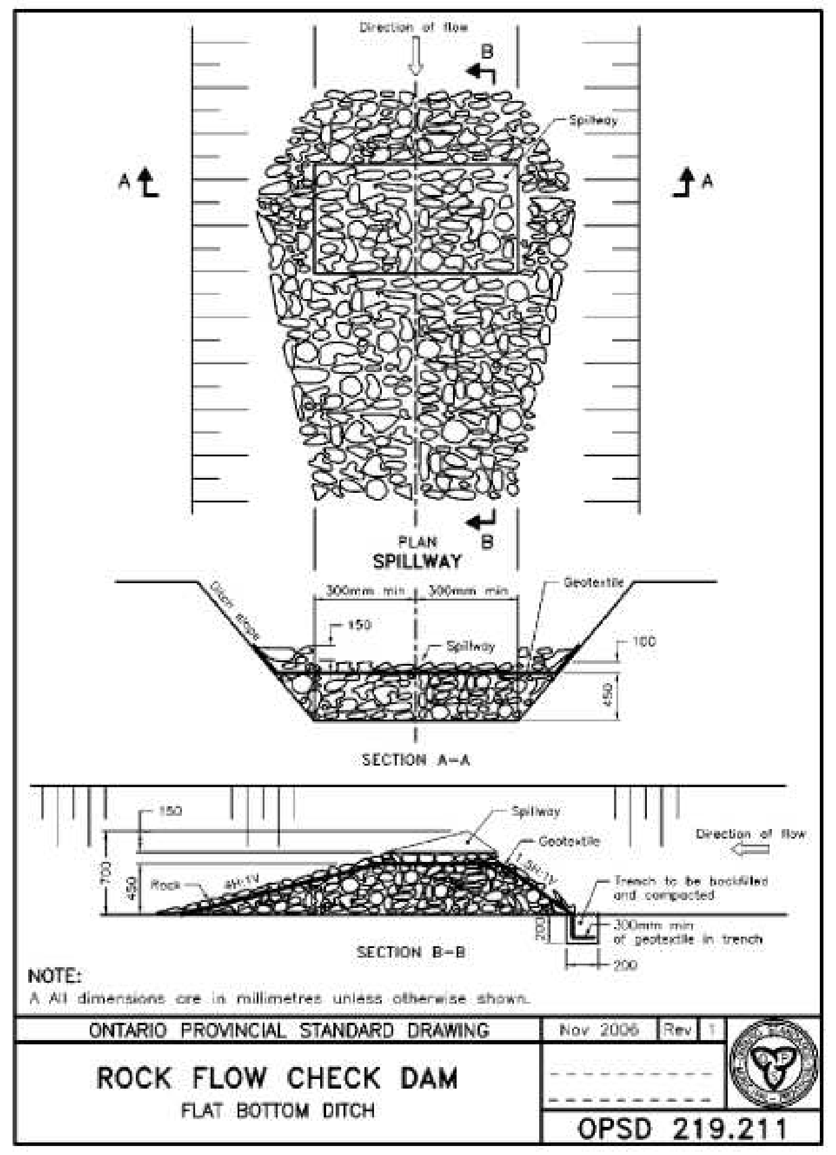
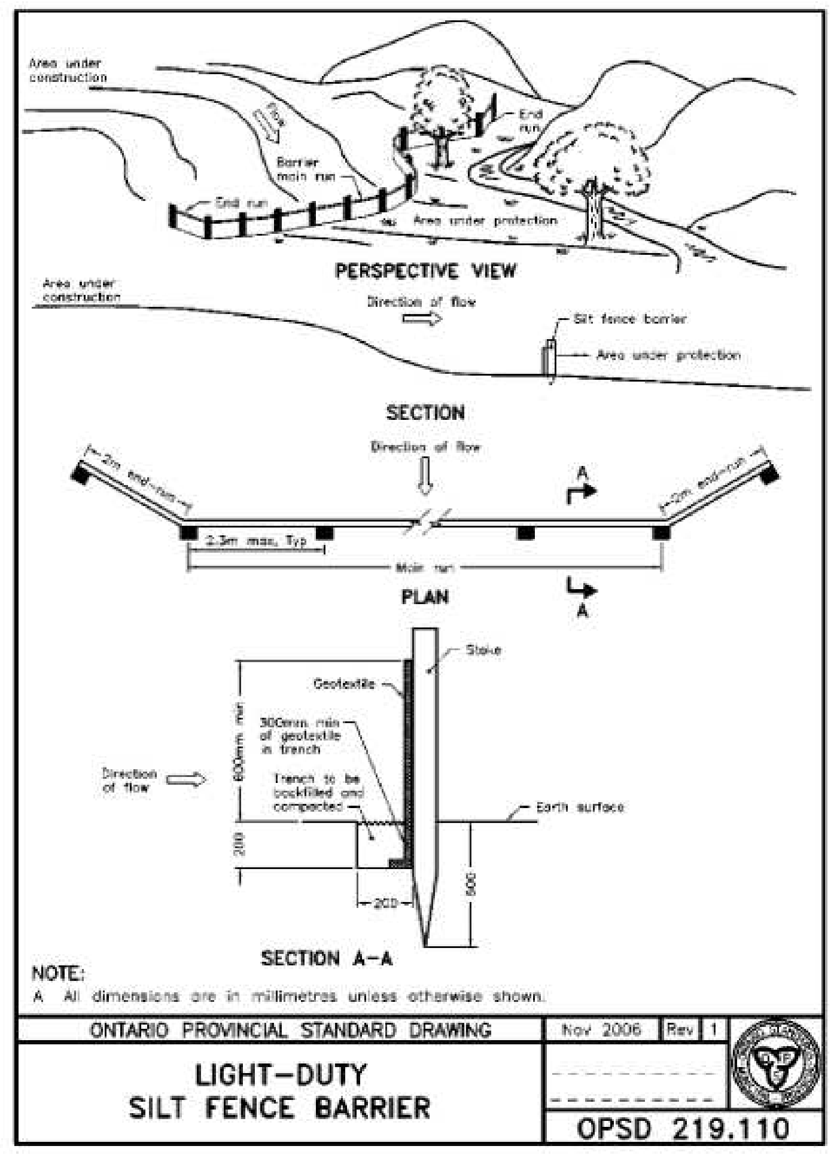
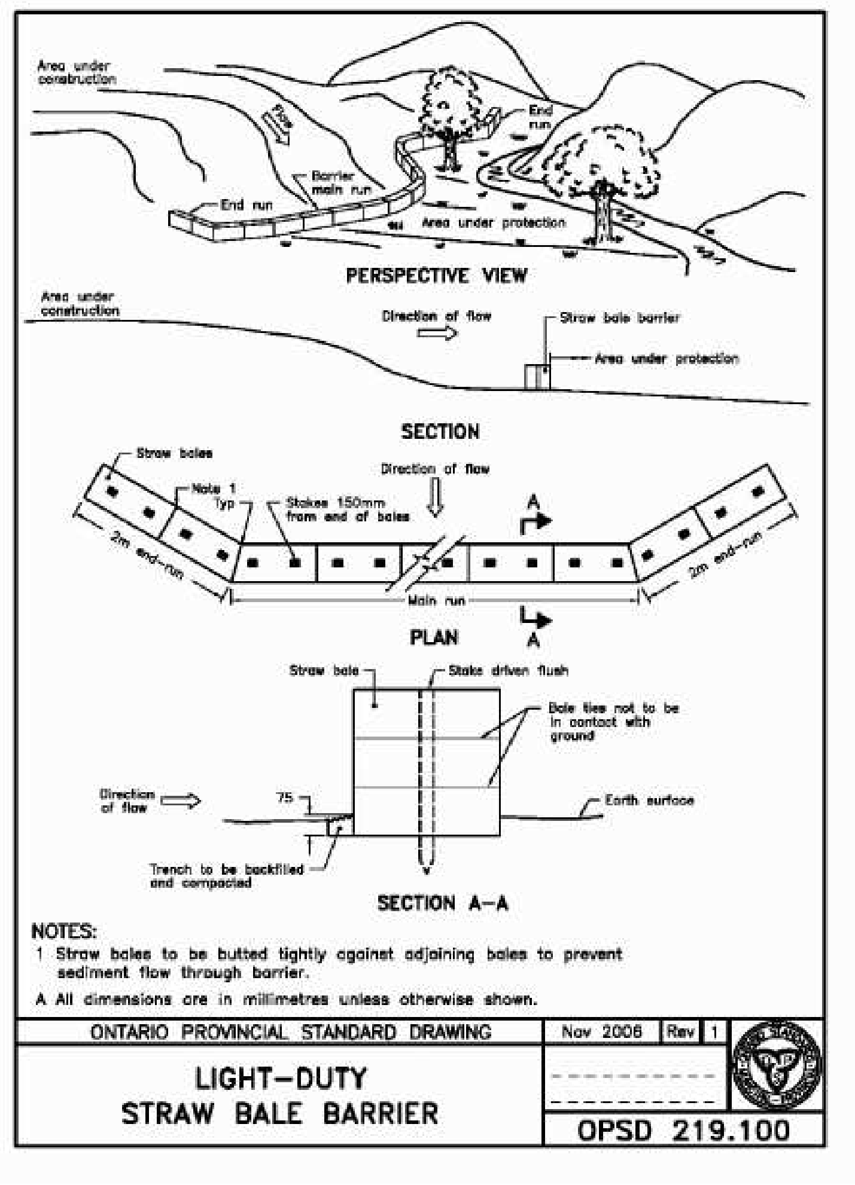
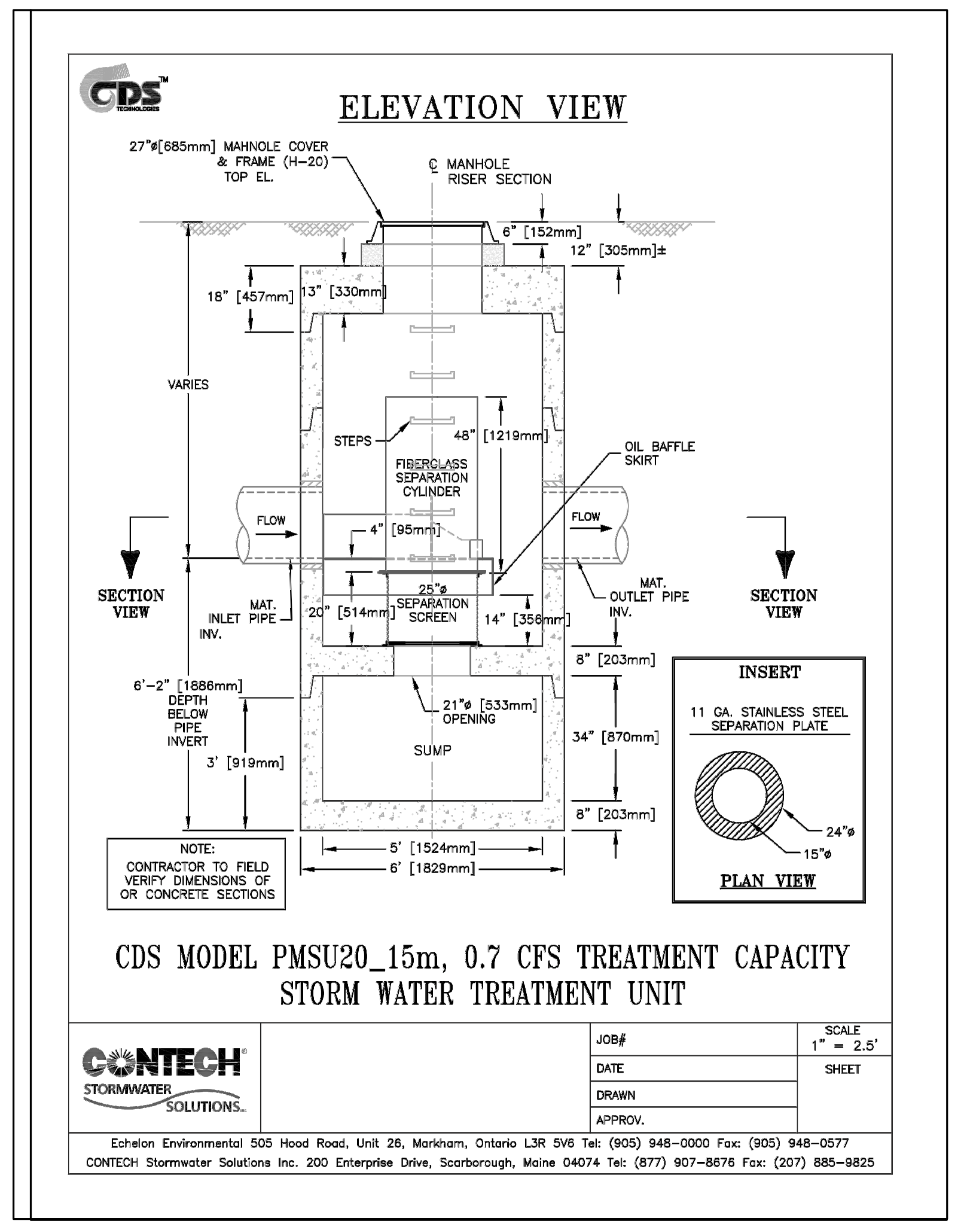
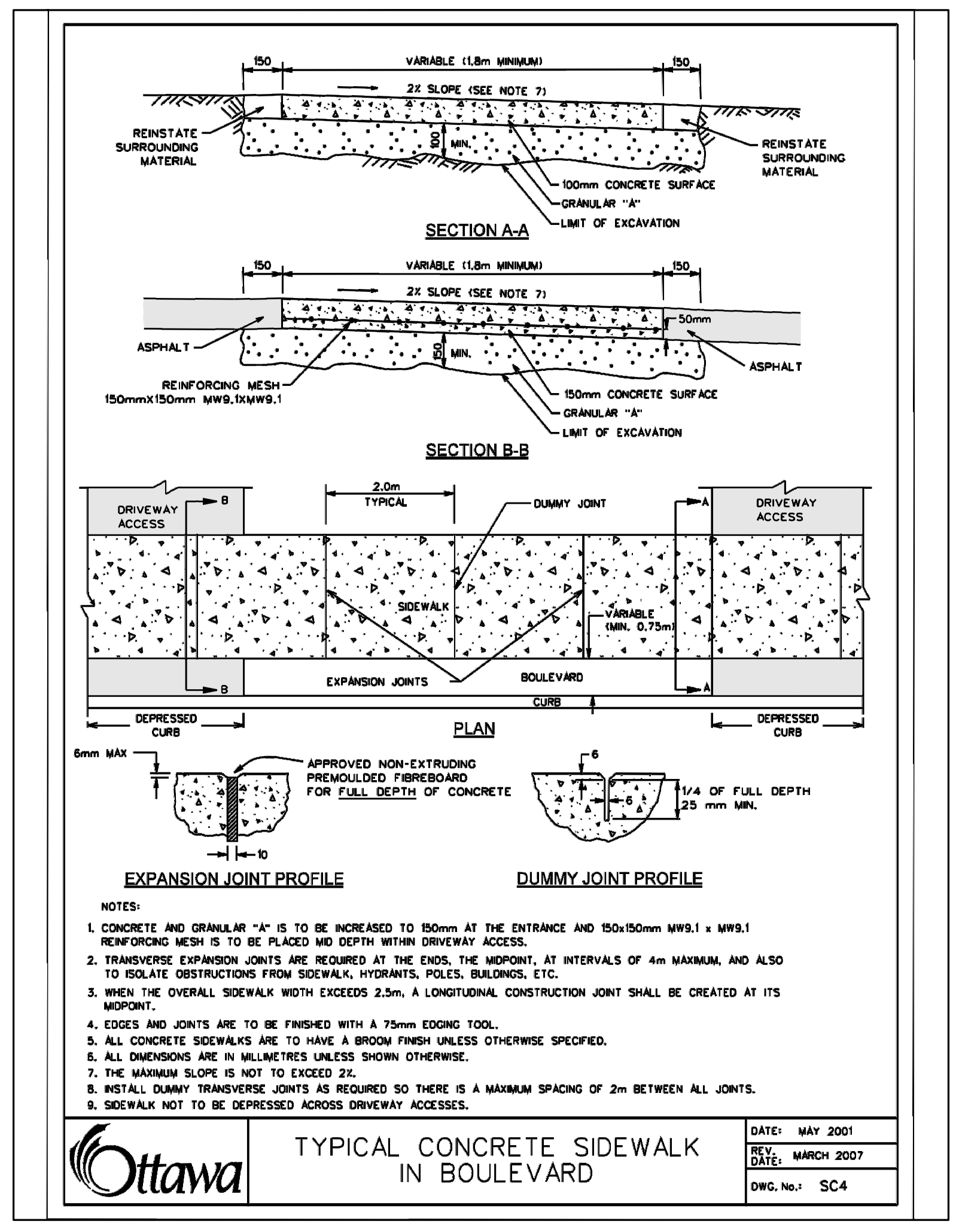
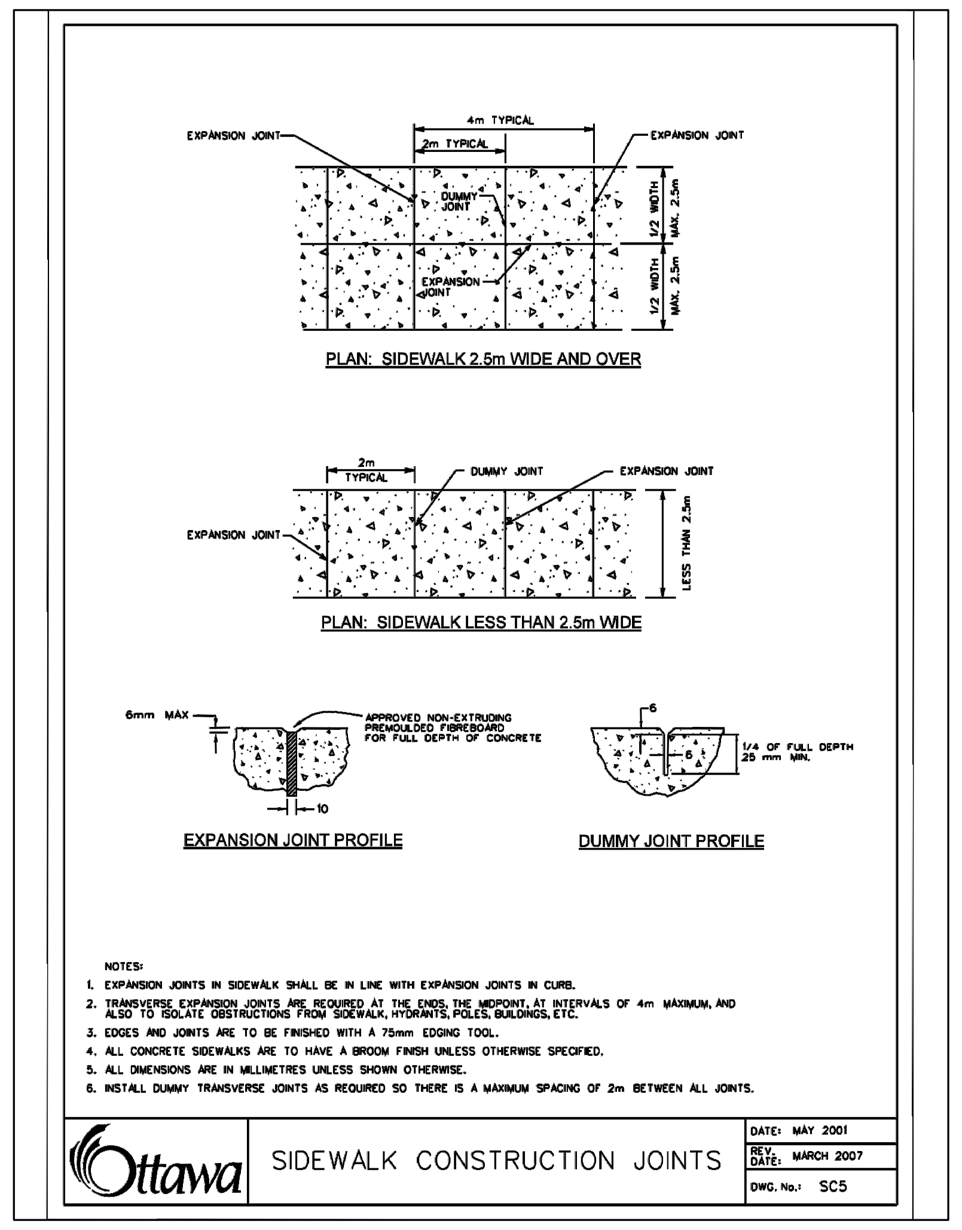


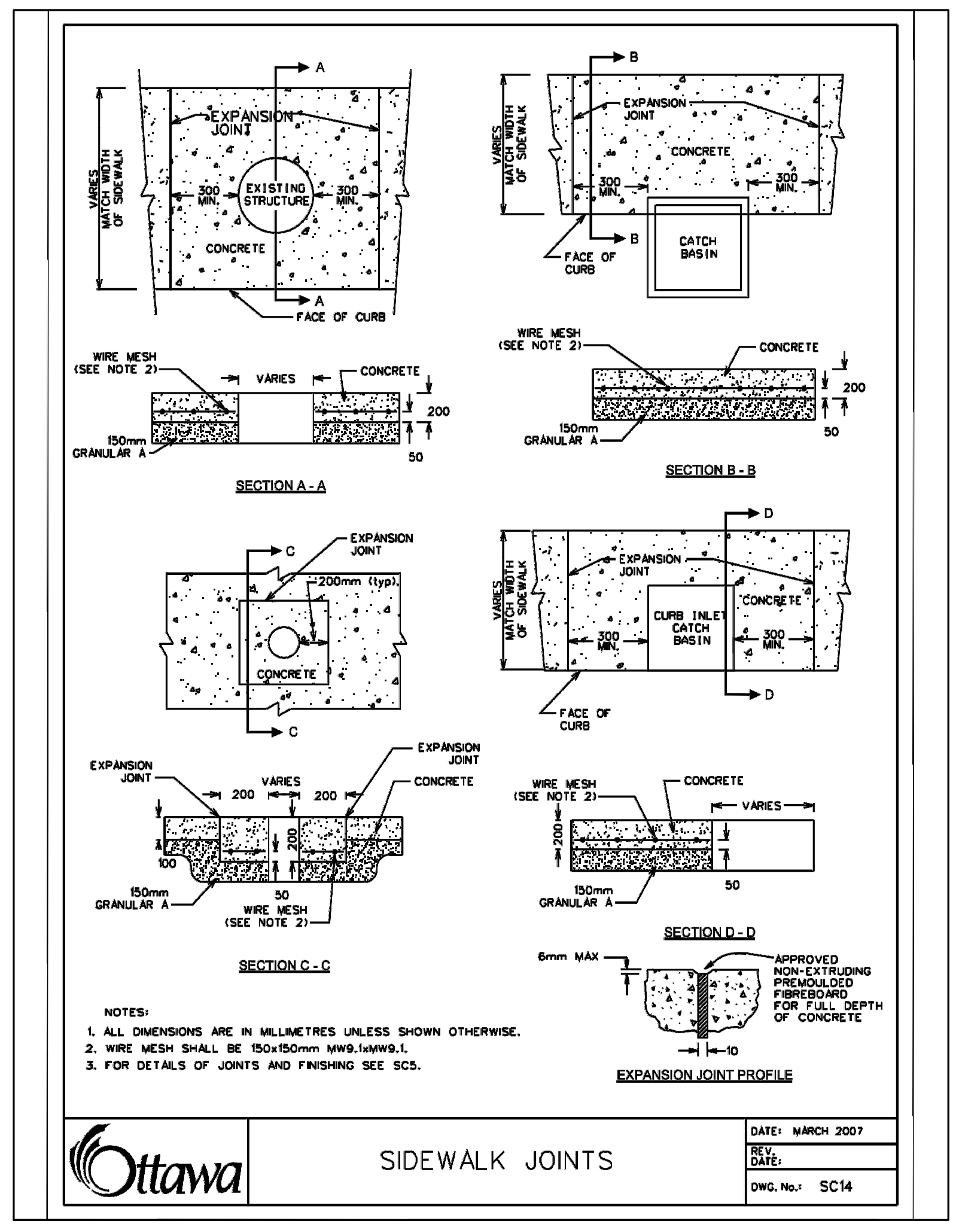


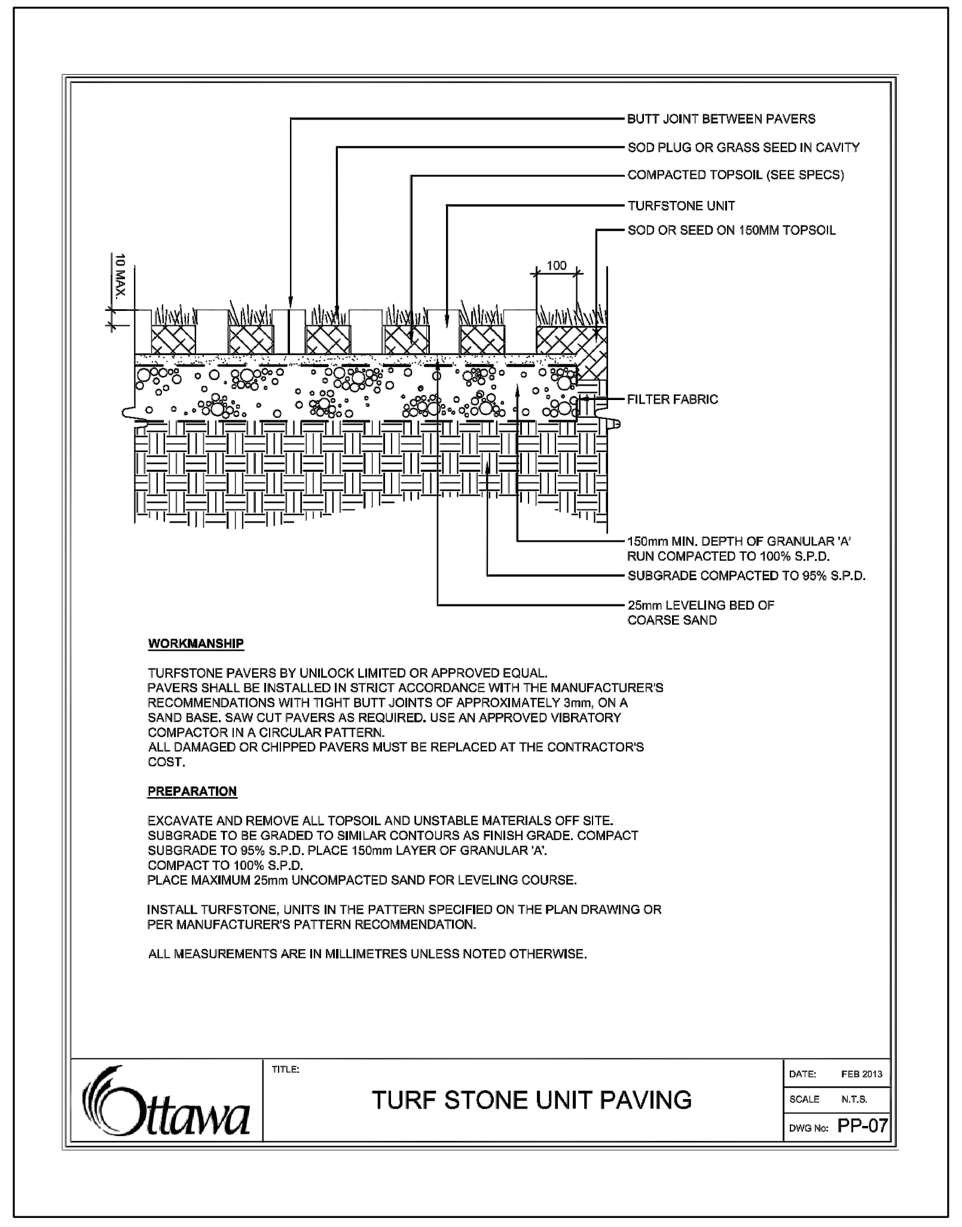


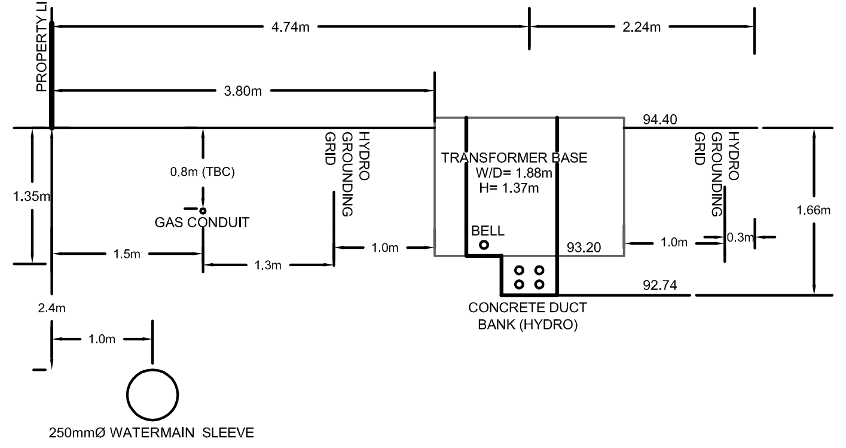




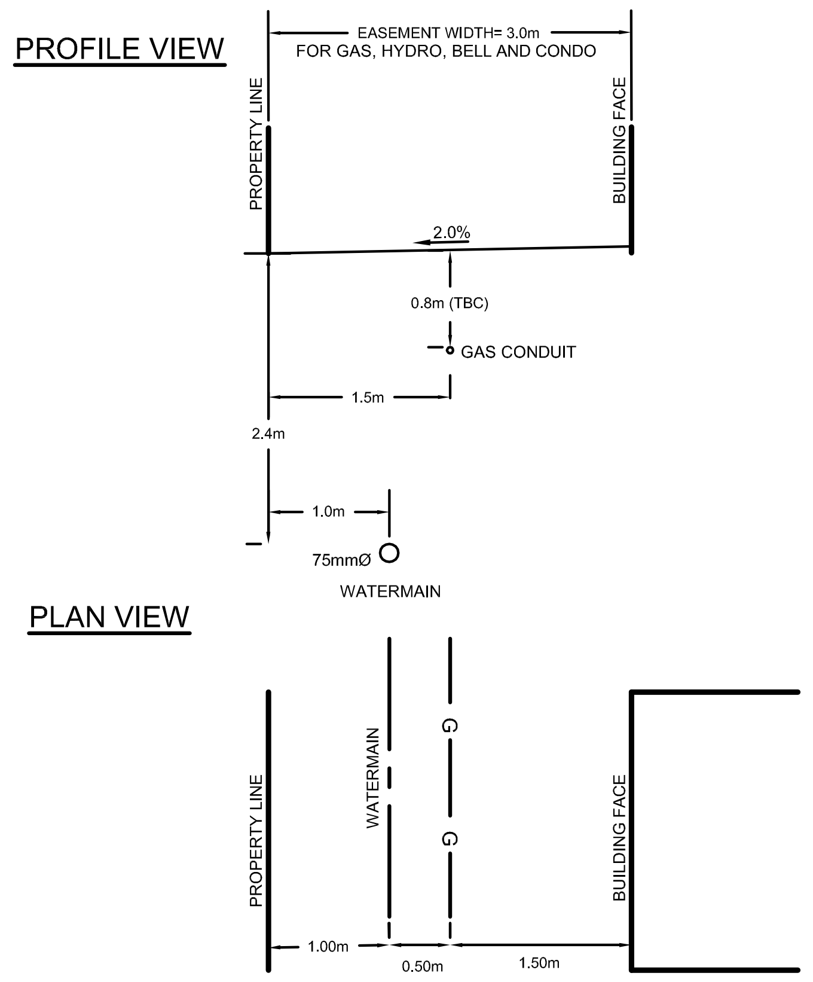








UTILITY SKETCH SECTION C-C (112034-GP)
NOT TO SCALE



UTILITY SKETCH SECTION D-D (112034-GP)
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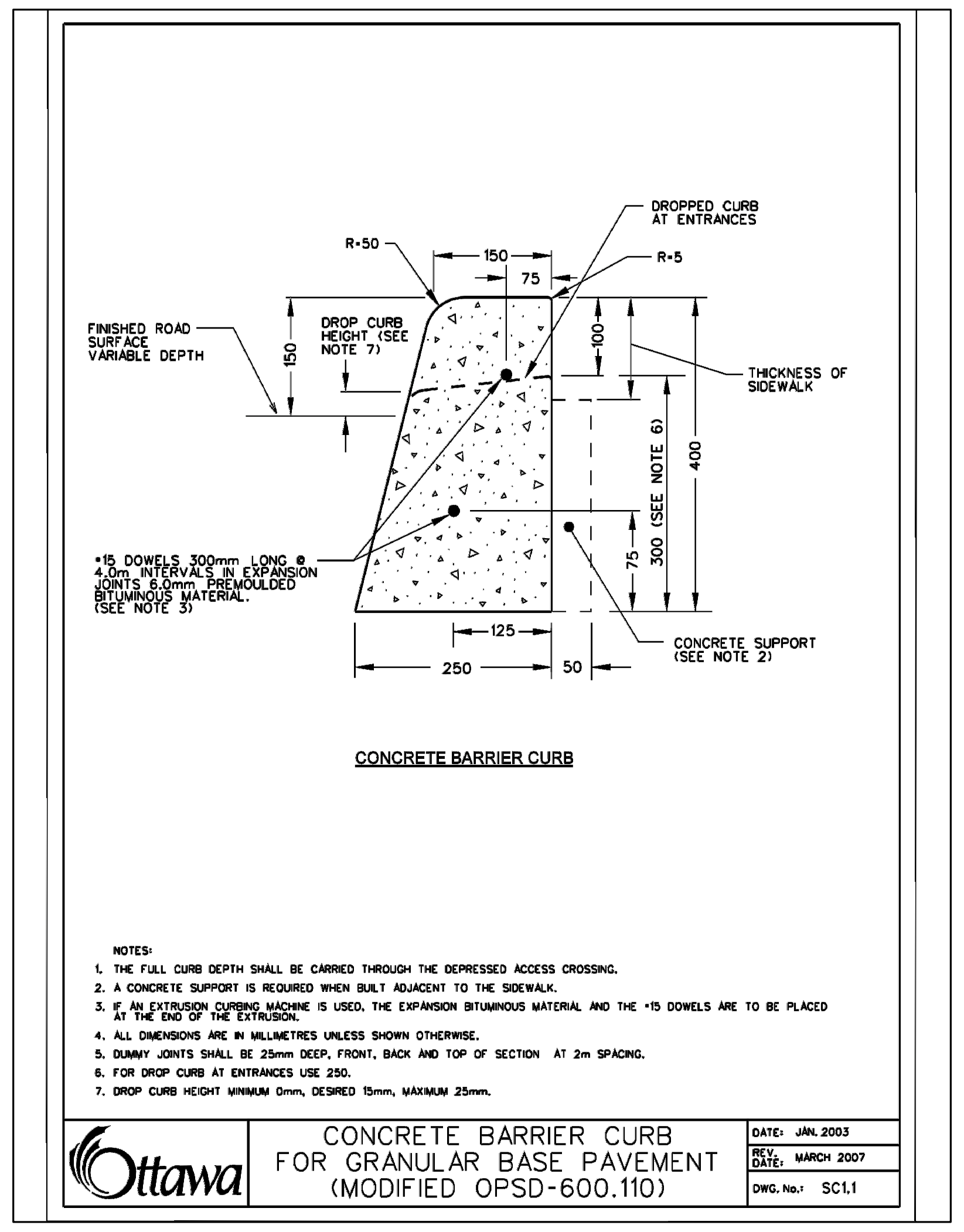

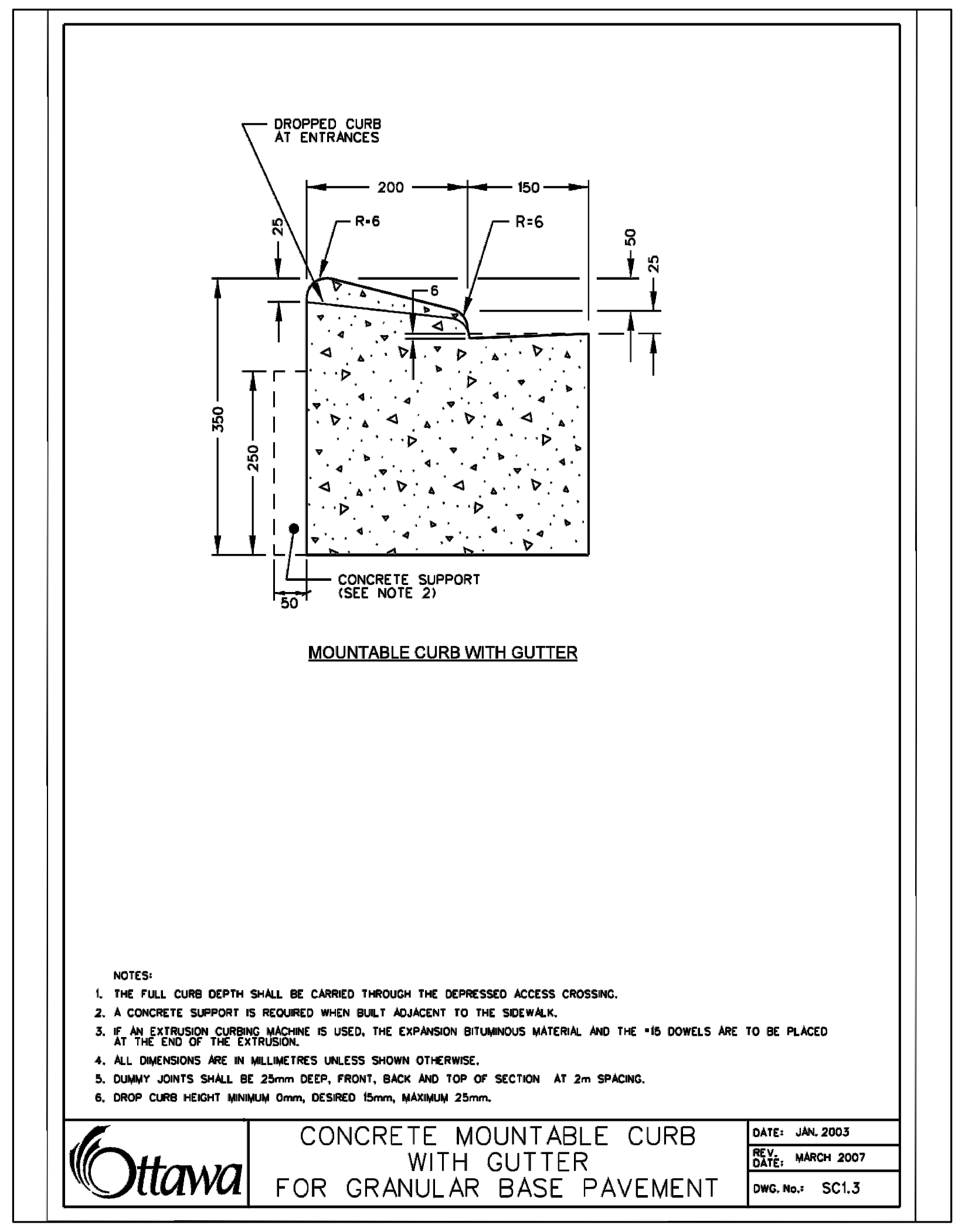

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SCALE
AS SHOWN

DESIGN -
CHECKED -
DRAWN TGP
CHECKED -
APPROVED -

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CITY OF OTTAWA
35 SAPPERS RIDGE - APEX SOUTH BUSINESS CENTRE

DETAIL PLAN

PROJECT No. 112034B-1
REV REV # 1
DRAWING No. 112034-D1

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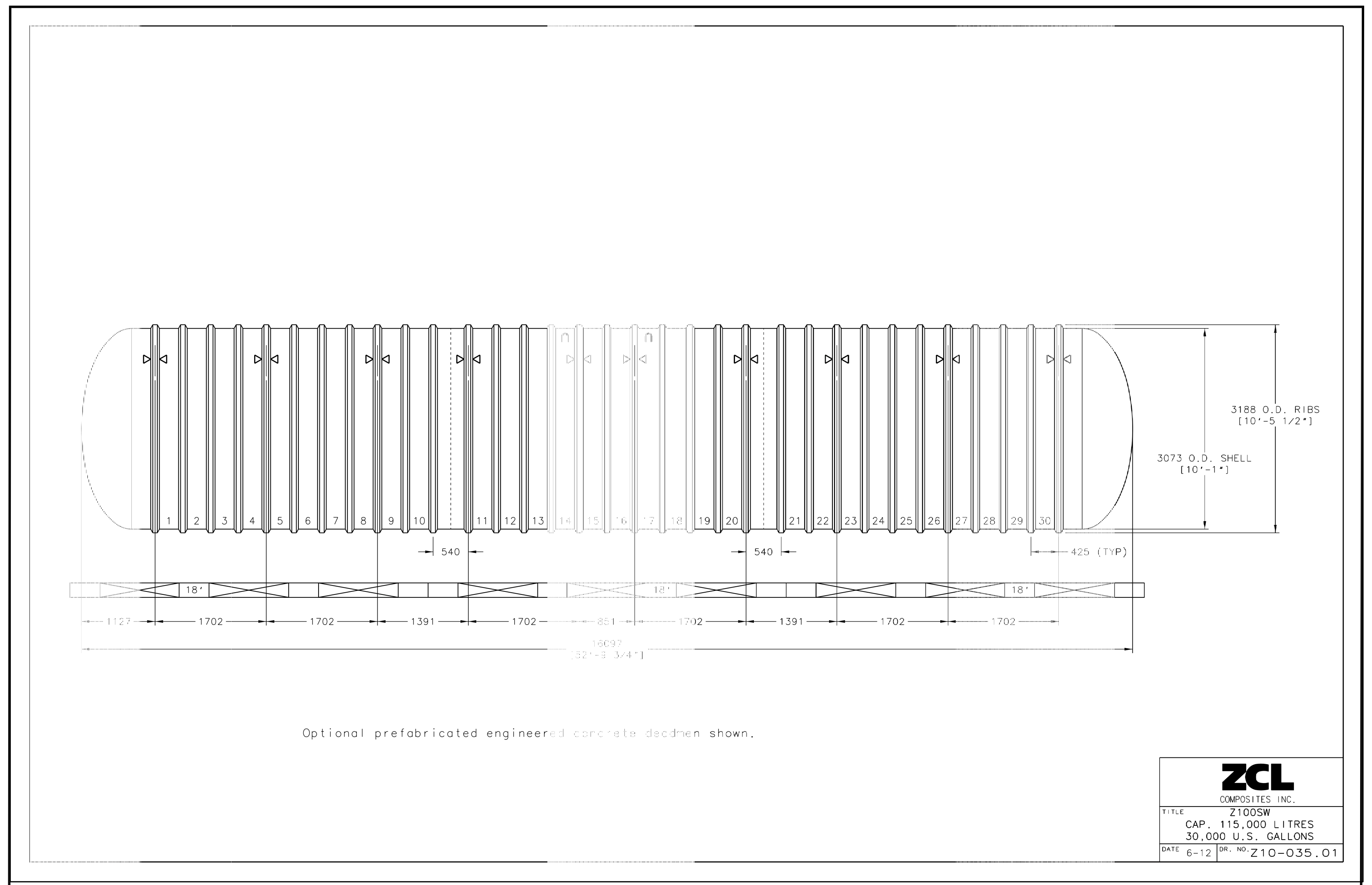
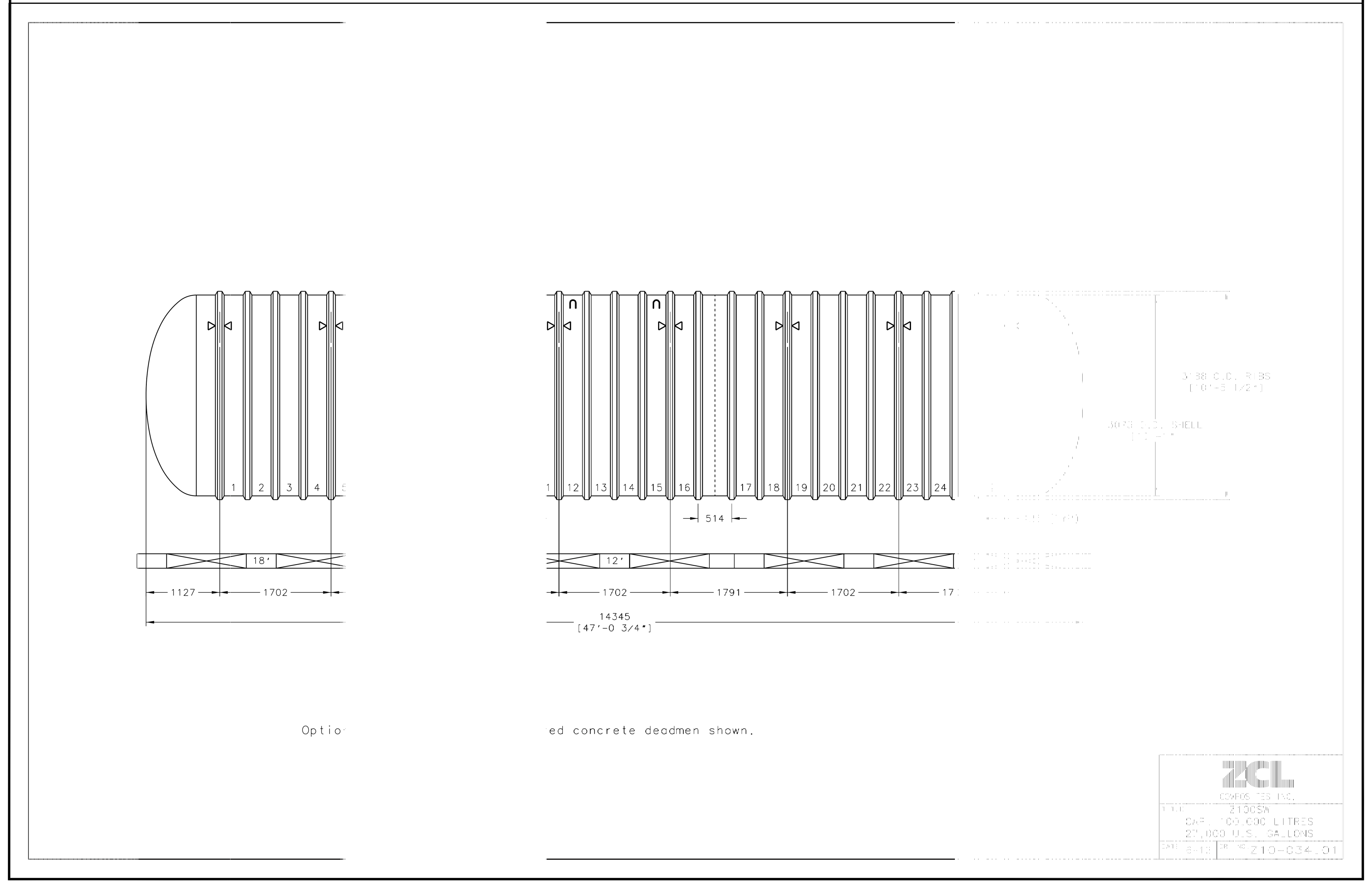
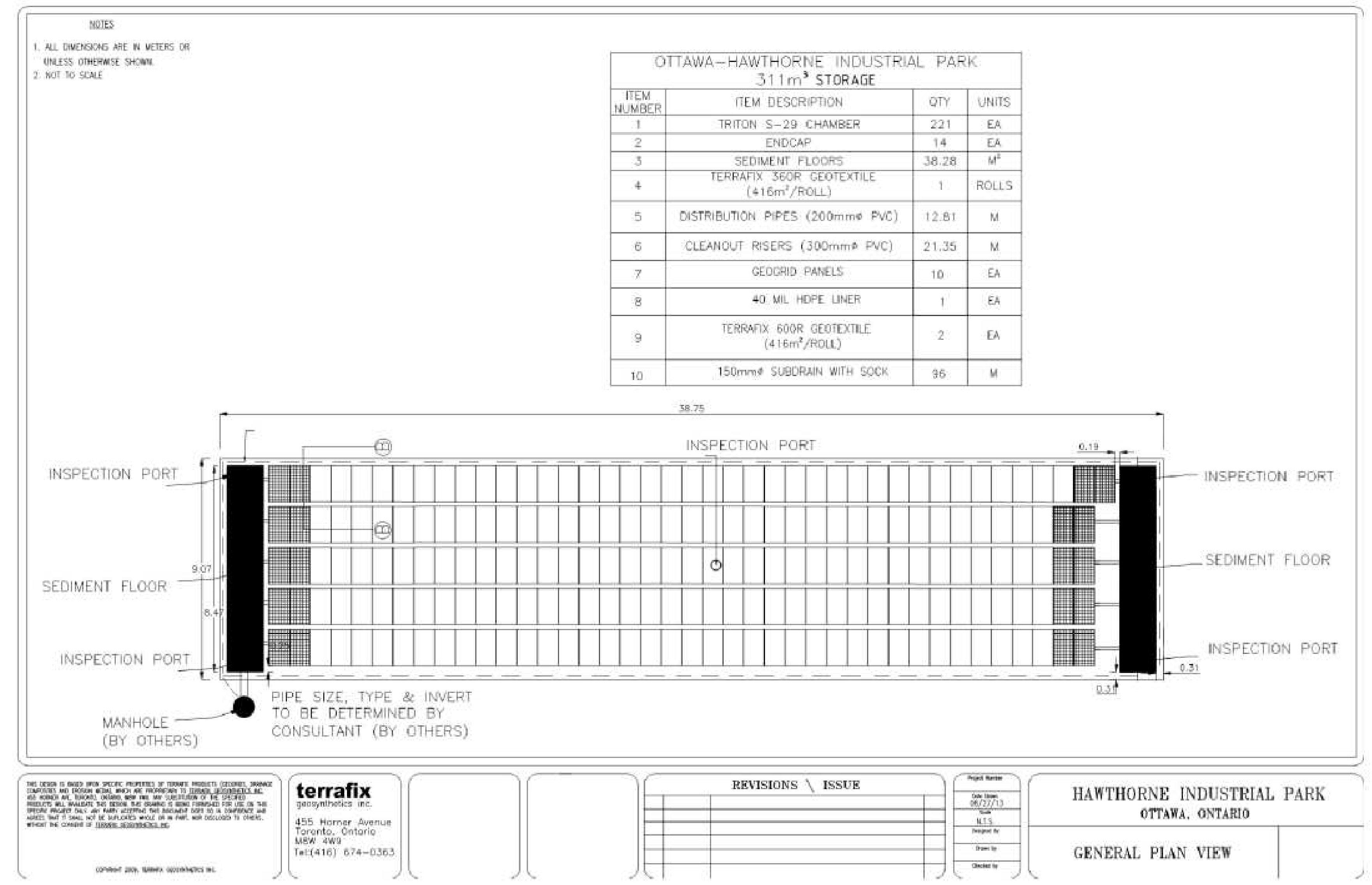


UNDERGROUND FIRE STORAGE TANK OPTION 1





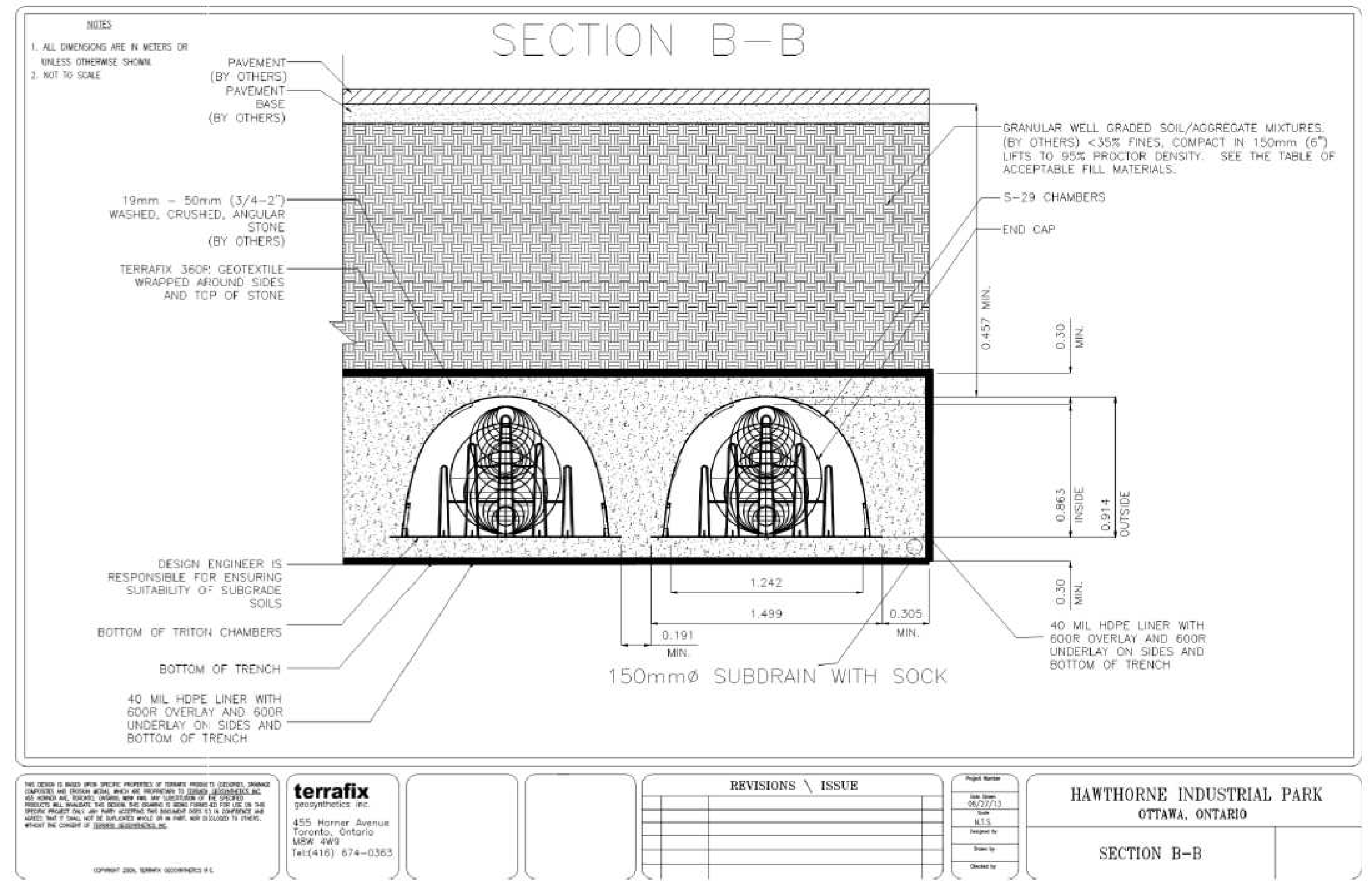
NOTES

1. ALL DIMENSIONS ARE IN METERS OR UNLESS OTHERWISE SHOWN.
2. NOT TO SCALE

OTTAWA–HAWTHORNE INDUSTRIAL PARK
311m³ STORAGE

ITEM NUMBER	ITEM DESCRIPTION	QTY	UNITS
1	TRITON S-29 CHAMBER	221	EA
2	ENDCAP	14	EA
3	SEDIMENT FLOORS	38.28	M²
4	TERRAFIX 360R GEOTEXTILE (416m²/ROLL)	1	ROLLS
5	DISTRIBUTION PIPES (200mmø PVC)	12.81	M
6	CLEANOUT RISERS (300mmø PVC)	21.35	M
7	GEOGRID PANELS	10	EA
8	40 MIL HDPE LINER	1	EA
9	TERRAFIX 600R GEOTEXTILE (416m²/ROLL)	2	EA
10	150mmø SUBDRAIN WITH SOCK	36	M

UNDERGROUND FIRE STORAGE TANK OPTION 2



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CITY OF OTTAWA
35 SAPPERS RIDGE - APEX SOUTH BUSINESS CENTRE

DETAIL PLAN

PROJECT No.
112034B-1
REV
REV # 1
DRAWING No.
112034-D2

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