

JANUARY 27TH, 2021

Project No. 2020-090

SELF STORAGE BUILDINGS
COUNTY ROAD 21 & 18
STORMWATER DESIGN REPORT

TOWNSHIP OF MULMUR



355310 BLUE MOUNTAINS-EUPHRASIA TOWNLINE
CLARKSBURG, ON N0H 1J0

Table of Contents

1.0	Introduction	3
2.0	Existing Site Conditions	3
2.1	Geotechnical Information	4
2.2	Existing Stormwater Infrastructure.....	5
2.2.1	Stormwater Management Approval Criteria	6
2.2.2	Existing Condition Stormwater Modelling	6
3.0	Proposed Site Plan	8
3.1	Proposed Stormwater Management Plan	9
3.1.1	Stormwater Quality Control.....	12
3.1.2	Enhanced Grass Swale	12
3.1.3	Rain Garden.....	12
3.2	Fire Flow	13
3.3	Erosion and Sediment Control	13
4.0	Conclusions	13

Drawings

- Drawing C1 – Existing Condition Plan
- Drawing C2 – General Site Plan
- Drawing C3 – Grading and Servicing Plan
- Drawing C4 – Post Development Drainage Plan
- Drawing C5 – Erosion and Sediment Control Plan
- Drawing C6 – Staging Plan
- Drawing C7 – Standard Details

Appendices

- Appendix A – Legal Plan
- Appendix B – MECP Well Record
- Appendix C – PCSWMM Existing Condition Model Output
- Appendix D – PCSWMM Proposed Condition Model Output
- Appendix E – Fire Flow Calculations and Tank Information

1.0 Introduction

CAPES Engineering Ltd. has been retained by Mr. Daniel Tosello (Alpha Storage Inc.) to prepare drawings and a stormwater management report to support Site Plan approval for the 1.6 ha site located at the north east corner of the intersection of County Road 18 (Airport Road) and County Road 21 in the rural settlement area of Randwick in the Township of Mulmur. The existing lot is vacant containing a mix of treed and open field conditions. There is currently a trailer parked on the Site accessed via an existing entrance from County Rd. 21 and a cleared path through the site. Some advertisement signs are located along the west side on the site adjacent to County Rd. 18.

It is proposed to initially construct a 445.9 m² (4,800 ft²) self storage building in the south west corner of the site. At this time, it is only proposed to construct one building, however, in the future two additional buildings all the same size as building 1 are proposed. The future buildings will be constructed one at a time with the proceeding building being constructed north of the previous building.

Access to the storage buildings will be provided by a gravel driveway utilizing the current entrance location from County Rd. 21. There will be no staff or office space located on site and buildings will not require electrical, water or sanitary connections. As per the Town request the site will require fire protection.

The site is currently zoned as Highway Commercial (CH) and no zoning alterations are required to support the proposed development. The site is not located within a regulated area of the Niagara Escarpment Commission or the Nottawasaga Valley Conservation Authority and approvals are not required from either the NEC or NVCA.

The proposed development is designed to meet the standards and guidelines of the Township of Mulmur and County of Dufferin. The purpose of this report is to provide support for Site Plan Approval from the Township of Mulmur for the proposed development.

2.0 Existing Site Conditions

The lot is legally described as Part 2 and 3, Registered Plan 7R-1725 as part of Lot 26, Concession 7 in the Township of Mulmur, County of Dufferin. The legal plan provided by the client that was originally prepared by Zubek, Emo and Patten Ltd. in 1978, is included in **Appendix A** for reference.

The site is rectangular in shape with a triangle section removed from the rectangle at the intersection of County Road 18 and County Road 21 for a sight triangle. The site has a frontage of approximately 134 m along County Road 21 and a frontage of approximately 103 m along County Road 18. Per the Township of Mulmur zoning map, the immediately adjacent lots to the north and east are zoned Countryside Area. The lot on the south east corner of the intersection is zoned Rural Residential and the small lot at the north west corner of the intersection is zoned General Commercial. The lot at the south west corner of the intersection and the lot surrounding the small lot at the north west corner are zoned Open Space.

The site is currently accessed via an existing driveway located off County Road 21. The site remains mostly treed with some sections that have been cleared mostly on the south western portion of the lot.

There is a trailer on site that is accessed via a path through the site. There is an existing well located south east of the trailer which is currently not being used.

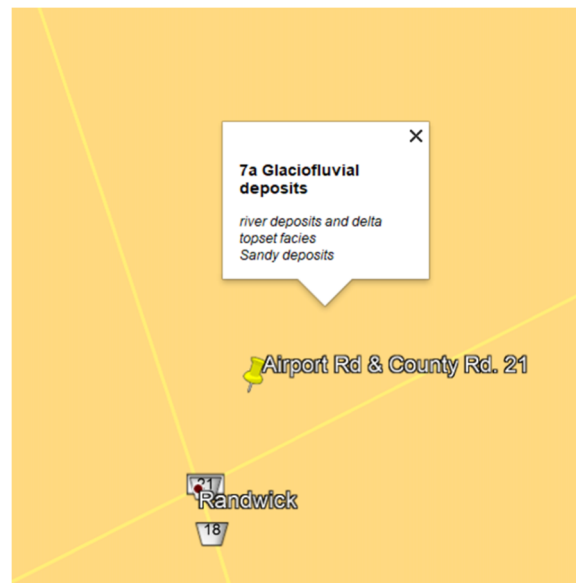
There is a steep 3-4 m high bank located at the north west corner of the lot drops into the site and the entire frontage on County Road 18 is significantly lower than the road centreline. The south east portion of the site along the County Road 21 frontage is slightly lower than County Road 21 centreline. However, east of the existing entrance the lot is raised significantly above the road centreline by 1.5-2 m with a steep bank from property line sloping down to the roadside ditch. There are numerous locations with berms and some localized low points. The overall site slopes at an average of 5% east from the high point (273.79) in the NW corner to a low area approximately at the mid point of the eastern property line. (elevation 265.96)

County Road 18 and County Road 21 are two lane paved rural roads with approximately 3.7 m wide lanes and gravel shoulders. Utilities are located overhead on both roads. The utility poles on County Road 21 are on the south side of the road and the utility poles are on the east side of County Road 18 north of the intersection and switch to the west side south of the intersection.

2.1 Geotechnical Information

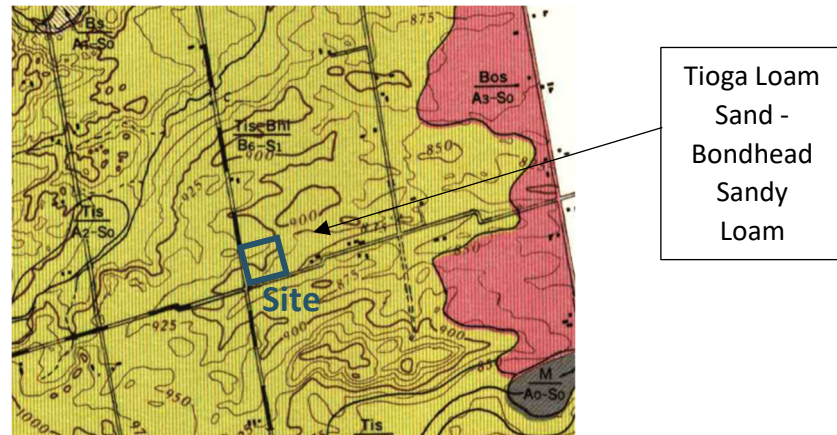
There is currently no geotechnical investigation complete for this Site. The Ontario Geological Survey (OGS) has identified the area as glaciofluvial deposits with river deposits and delta topset facies with sandy deposits. Please see the excerpt from the OGS mapping below.

Ontario Geological Survey Mapping



Soil mapping for Dufferin County from the Canada Department of Agriculture completed in 1963 identifies the area as Tioga Loam Sand-Bondhead with sandy loam to loam sand with good drainage. The site is shown in the image below overlaying the soil mapping for reference. Please note that OGS mapping supersedes the Department of Agriculture soil mapping shown below. In general, the soil mapping supports the OGS mapping identifying the area as glaciofluvial deposits.

Dufferin County Soil Mapping



The MECP Well Record for the onsite well, included in **Appendix B** for reference, indicates 0 to 2.4m below ground surface consist of sand with gravel followed by sand with clay layers from 2.4 to 7.0mbgs. Water was found at a depth of approximately 34mbgs. Other nearby wells indicate water found at a depth of 28 to 35mbgs with a sand to clayey sand layer as the surficial soil. The well records support the sandy loam soil type identified above as well as indicate groundwater is significantly below ground surface.

2.2 Existing Stormwater Infrastructure

Most of the northern property line contains a significant slope of approximately 4m in grade change at approximately a 4:1 slope. The middle area of the site is significantly flatter with localized hummocky terrain. The majority of the southern property line is elevated with a gentle slope north towards the middle area of the site and this elevated area along the southern property line slopes down towards the roadside ditch at a higher grade. The overall site slopes at an average of 4-5% easterly but the middle part of the site has a fairly flat grade before outletting into the neighbouring property.

The eastern side of County Road 18 contains no ditch and slopes from the edge of the road into the Site. The western side of County Road 18 contains a shallow ditch formed due to raised grade at property line. There is no evidence of an outlet for this ditch as it reaches the intersection, and we believe it would overflow across County Road 21 to a low area south west of the intersection.

Runoff from the north side of County Road 21, east of the intersection, drains into the site where it is at a lower elevation than the edge of the road. A shallow ditch is formed further east where the elevation at property line is higher than the road. The ditch on the north side of County Road 21 drains east

beyond the site frontage. There is no ditch along the south side of County Road 21 with flows passing into private property south of the centreline.

The overall drainage of the area occurs via overland sheet flow with limited ditching and culverts. It is anticipated that there is little runoff as infiltration occurs due to the soil type present.

2.2.1 Stormwater Management Approval Criteria

The Township of Mulmur does not have formal stormwater management criteria, however the site is within the NVCA jurisdiction (but not within a regulated area) and therefore we have generally followed the NVCA stormwater guidelines, although we do not believe the NVCA will be providing review of this site due to the size and nature of the development.

In general, the site needs to conform to the following stormwater criteria:

- Post Development peak flows must be controlled to Pre-Development levels for the 2-100 year storm events (inclusive).
- Quality control for 4 hr Chicago 25 mm storm must be provided to meet the MECF “Enhanced” level of protection (80% TSS Removal)
- Best efforts towards a water balance must be provided for the site
- A minimum of 5 mm of rainfall must be retained on site through the use of LID
- Pre-Development total phosphorous (TP) levels must be matched in the post development and best efforts to achieve an additional 20% TP reduction below pre-development.
- Erosion and Sediment Controls (ESC) must be provided for the site to reduce or eliminate sediment transport offsite during construction and until vegetation has been re-established.

2.2.2 Existing Condition Stormwater Modelling

We have utilized PCSWMM 2020 modelling software (Version 7.3.3095, SWMM version 5.0.013-5.1.015) to undertake the analysis of the existing site.

The contributing drainage area for the site was determined by using a combination of aerial imagery from County of Dufferin Mapping and a topographic survey of the site completed in 2020.

The site is 1.62 ha in size with 0% impervious area at an overall slope of 4.1%. There are external flows passing through the site from an area of approximately 2.03 ha with 16% imperviousness at an average slope of 9.1%. The external flow area includes incoming flows from the neighbouring property to the north as well as road runoff from both County Road 18 and County Road 21. These flows pass into the site and discharge with the site flow into the neighbouring property to the east.

A loamy sand soil type will be used for modeling of existing conditions for the site per available soil type information as specified above. Please refer to **Appendix C** for the Existing Condition Catchment Plan as well as the PCSWMM output summary. Below are the selected Green Ampt Parameters for the Site.

Saturated Hydraulic Conductivity (K_{fs}) = 59.8 mm/hr (Table 5.5.5 Handbook of Hydrology, 1993)

Suction Head = 61.3 mm (as per Rawls 1983)

Initial Deficit (fraction) = 0.312 (as per Rawls 1983)

Additional PCSWMM model input parameters for the Manning's roughness coefficient (n) and depression storage were determined from the USDA TR55 and UNESCO SWM Manual as follows:

Table 5.9: Manning Roughness Coefficients - Overland Flow

Cover	n
Impervious areas	0.013
Woods	
with light underbrush	0.4
with dense underbrush	0.8
Lawns	
Short grass	0.15
Dense grass	0.24
Agriculture Land	0.050-0.170

Ref: Adapted from Soil Conservation Service, Urban Hydrology for Small Watersheds, U.S. Dept. of Agriculture, Soil Conservation Service, Engineering Division, Technical Release 55, June 1986

10.2 Initial Abstraction/Depression Storage

Table 10.2: Initial abstraction/depression storage

Cover	Depth (mm)
Woods	10
Pasture/Meadow	8
Cultivated	7
Lawns	5
Wetland	12/16
Impervious areas	2

Ref: UNESCO, Manual on Drainage in Urbanized Areas, 1987.

The pervious portion of the pre-development drainage area is partially treed and partially lawn resulting in a Manning roughness coefficient of 0.24 and a depression storage of 8 mm. The impervious area is modeled with a Manning roughness coefficient of 0.013 and a depress storage of 2 mm per the tables above.

IDF Curves were obtained of the rainfall data from the Ministry of Transportation IDF Curve Look-up Tool and have been included in **Appendix C**. The IDF curves were used to model the 2-100 year 4-Hour Chicago storms and the 2-100 year 24-Hour SCS Type II storms as per NVCA guidelines. The Regional Timmins storm and the 4-Hour 25 mm Chicago (quality control) storm events were also modeled.

Please refer to **Table 1** below for a summary of the results from the model.

Table 1 – Existing Condition Modelling Results

Storm Event	Peak Flow Into Site (External Area) (m ³ /s)	Peak Flow Offsite Including Incoming External Flows Total (m ³ /s)
24 Hr SCS Type II		
2-year	0.06	0.00
5-year	0.08	0.00
10-year	0.09	0.00
25-year	0.11	0.01
50-year	0.13	0.05
100-year	0.19	0.10
4 Hr Chicago		
2-year	0.11	0.00
5-year	0.14	0.00
10-year	0.16	0.00
25-year	0.19	0.00
50-year	0.22	0.00
100-year	0.24	0.00
25 mm	0.06	0.00
Timmins	0.04	0.00

The PCSWMM summary output file for the 100 year 24-Hour SCS Type II storm has been included in **Appendix C** for reference. The remaining output files can be provided upon request in either digital or hardcopy format.

Runoff is generated by the impervious area from the external drainage area which flows onto the development site. Due to the topography of the site, the vegetative cover the runoff is largely all absorbed except for the largest storm events (25, 50 and 100 year 24-Hour SCS Type II design storms).

3.0 Proposed Site Plan

The ultimate proposed development includes 3 self storage buildings with slab on grade construction that are 445.91 m² (4,800 ft²) each. The storage buildings will be accessed via a 9.0 m wide gravel driveway around the buildings to provide emergency access. At this time only the southern-most building (Building 1) is to be constructed, however, design for the site is being included for all 3 buildings and we have provided a staging plan on **Drawing C6**.

The site will not be staffed or include an office space. The buildings do not require electrical connections or water/sanitary connections. The site will be accessed from a reconstructed driveway entrance off County Road 21.

The proposed stormwater conditions include a cut off swale to direct incoming flows from the north around the development. Incoming flows from west of the site will flow into the enhanced grass swale located along the western portion of the proposed development. The developed area overflow will be directed to the roadside ditch on the north side of County Road 21 that flows east.

3.1 Proposed Stormwater Management Plan

To support review of the stormwater management to support the Site Plan application being completed for the development of the site. We have utilized the same software for modelling of the proposed conditions as was used for the existing conditions (PCSWMM 2020 Version 7.3.3095, SWMM version 5.0.013-5.1.015).

The Green Ampt infiltration parameters used for the proposed development will be the same as the pre-development condition. In the proposed conditions the pervious areas will be a combination of treed areas and grassed areas; therefore, the Mannings n value and depression storage are calculated with regard to the proposed conditions for each subcatchment.

The proposed enhanced grassed swale is designed with reference to the document produced by the CVC/TRCA titled Low Impact Development Stormwater Management Planning and Design Guide. Certain components of the swales such as longitudinal slope, side slopes and grass cover are chosen to increase infiltration within the site.

The proposed development results in an increase of impervious area from 0% to 27% impervious (overall). The majority of the impervious area is located in the south and west areas with the north and east areas largely untouched and to remain in existing condition.

In general, a cut off swale will be provided around the north portion of the development to direct incoming flows from the north around the development towards the existing outlet along the eastern property line. This cut off swale will discharge to the large remaining pervious area east of the development via a dissipation pad. Immediately east and west of the side will be enhanced grass swales that drain the runoff from the development to the south. The western side will enter a rain garden where overflow will discharge into the roadside ditch along the north side of County Rd. 21. The eastern side will discharge directly into the roadside ditch. It is proposed to regrade a section of the County Rd. 21 ditch to allow for depth such that a culvert and cover will be achievable at the driveway location.

The rain garden will contain an emergency overflow weir that will pass the received flows from County Road 18 to the ditch on County Rd. 21. These flows have been modeled to ensure capacity in the rain garden and weir, however only runoff from on-site flows are required to be controlled. External flow is not required to be treated for either quantity or quality control.

The proposed condition model is divided into 6 subcatchments;

Subcatchments S1, S5 and S6 (combined 2.03 ha) are the external drainage areas. S1 contains the neighbouring property to the north as well as a portion of County Rd. 18 located north of the site. S1 is 1.75 ha and runoff flows south into the site where a portion will pass through a cut off swale that discharges into the pervious area on site. The remainder simply discharges to the pervious area on site and is not interrupted in the cut off swale. S5 contains a portion of runoff from County Rd. 21. S5 is 0.03ha and flows north. This flow originally discharged into the site, however, now it will be contained in the road side ditch and joins flows from the enhanced swale to the north and the driveway culvert to the west. S6 is 0.25ha and contains the County Rd. 18 ROW east of the centreline and the County Rd. 21 ROW west of the driveway to the intersection. A temporary cut off swale will be constructed during the first two phases north of the developed phase to direct the incoming flow around the development.

Subcatchment S3 is the western portion of the developed site to the western property line. At 0.32 ha in size this will receive the incoming flow from the County Rd. 18 ROW. The northwestern portion of building 1, the western half of building 2 and the south west portion of building 3 and the surrounding gravel surface are contained within subcatchment S3. The runoff will be directed to the western enhanced swale and rain garden.

Subcatchment S4 (0.28 ha) contains the flow from the east portion of building 1, east half of building 2 and the south east portion of building 3 with the surrounding gravelled areas. The pervious area south of the development and east of the driveway are included in subcatchment S4. Runoff from S4 is treated through the eastern enhanced swale before discharging into the roadside ditch east of the existing driveway.

Subcatchment S2 (1.02 ha) consists of primarily the pervious eastern portion of the site. The north half of building 3 and adjacent gravel area will be directed into this subcatchment as well. A cut off swale north of the development will direct flows to the large pervious area east of the site to infiltrate. In the most severe cases, some of the incoming flows from the north will not infiltrate and will discharge east of the site at the existing outlet location.

The cutoff swale north of the development receives a peak flow of approximately $0.16\text{m}^3/\text{s}$. Capacity of this swale is manually checked as it was modeled as an LID within PCSWMM. Within the PCSWMM model, this swale would overflow the berms if it were overcapacity but as that is not possible due to the site grading this manual calculation was performed. Please refer to **Appendix D** for the swale calculations.

Please refer to **Drawing C4** for a plan of the subcatchments detailed above and to **Drawing C6** for the staging plan and to the grading and stormwater details on the proposed Grading and Servicing Plan **Drawing C3**.

Please refer to **Table 2** for a summary of the existing and post re-development Peak Flows and to **Appendix D** for the 100 year 24-Hour SCS Type II storm PCSWMM output results.

Table 2 – Pre and Post Modelling Results

Storm Event	Peak Flow Into Site (External Area) (m ³ /s)	Existing Peak Flow Offsite Total (m ³ /s)	Peak Flow at East Outfall (m ³ /s)	Peak Flow at South Outfall (m ³ /s)	Proposed Peak Flow Offsite Total (m ³ /s)
24 Hr SCS Type II					
2-year	0.06	0.00	0.00	0.05	0.05
5-year	0.08	0.00	0.00	0.06	0.06
10-year	0.09	0.00	0.00	0.06	0.06
25-year	0.11	0.01	0.03	0.07	0.10
50-year	0.13	0.05	0.06	0.08	0.14
100-year	0.19	0.10	0.08	0.13	0.21
4 Hr Chicago					
2-year	0.11	0.00	0.00	0.07	0.07
5-year	0.14	0.00	0.00	0.08	0.08
10-year	0.16	0.00	0.00	0.09	0.09
25-year	0.19	0.00	0.00	0.11	0.11
50-year	0.22	0.00	0.01	0.12	0.13
100-year	0.24	0.00	0.02	0.13	0.15
25 mm	0.06	0.00	0.00	0.05	0.05
Timmins	0.04	0.00	0.00	0.01	0.01

In the existing conditions a significant portion of the external flows are infiltrated into the site as seen in **Table 2** above in the difference between the columns for the “Peak Flow Into Site (External Area)” and the “Existing Peak Flow Offsite Total”. For all of the design storms above, except for the 50 and 100-year SCS design storms, the proposed peak flow offsite is lower than the peak incoming flow from external areas. Therefore, for these storms, not only is the site runoff infiltrated but some of the external flows are infiltrated within the site as well.

For the 50 and 100-year SCS design storms, if the external peak flow is removed from the total proposed peak flow then the resulting flow is less than existing condition peak flow.

There is no requirement to control the Regional event but the Timmins storm peak flow also decreases from the incoming external peak flow. The regional storm is safely conveyed within the site. The 25mm quality design storm also decreases from the incoming external flows.

3.1.1 Stormwater Quality Control

Stormwater quality has been analyzed using a 25 mm 4-hour Chicago design storm. The 25 mm design storm represents 95% of all rainfall activities in an average year. By basing quality controls off of the 25 mm design storm, quality measures will be effective for most rain events in a given year.

The grass swales and the rain garden will reduce the peak outflow from the 25 mm design storm to 0.05 m³/s, or a decrease of 0.01 m³/s from the incoming external peak flow, for the proposed development of the site. Therefore, more stormwater is treated than runoff for the site. As the peak outflow is reduced to lower than the incoming flows from external areas, full treatment is achieved for TSS removal for the quality design storm (25 mm 4-Hour Chicago).

As per NVCA guidelines the elimination of the runoff during the 25 mm storm reduces the phosphorous discharge from the site to 0 and the TSS removal is 100%.

3.1.2 Enhanced Grass Swale

The enhanced grass swale used on site is designed to promote treatment of the stormwater. Per the Low Impact Development Stormwater Management Planning and Design Guide by the CVC, the following factors increase pollutant removal rates:

- Longitudinal slope <1%: The slope in the enhanced grass swale is 0.5%
- Soil infiltration rate is 15 mm/hr or greater: Per the anticipated soil conditions, the existing sandy soil is very permeable and will promote infiltration. Additional soil testing may be required by the Town or NVCA to confirm the soil infiltration rate.
- Flow velocity within channel is 0.5 m/s or less during quality design storm: The maximum velocity occurring in the swale is 0.4 m/s for the 25 mm 4-Hour Chicago design storm in the west swale and a brief period the velocity of the east swale is 0.7 m/s.
- Side slopes 3:1 or less: Side slopes in the enhanced swales are 3:1

3.1.3 Rain Garden

It is proposed to implement a rain garden within the site which is designed in general conformance with the CVC/TRCA LID Manual with 3:1 side slopes, 750 mm of filter medium (compost amended potting soil), 75 mm of mulch on the surface and will be planted with a mixture of long grasses and wildflowers to ensure a greater than 80% TSS removal.

The rain garden is located in the south west corner of the site abutting the southern property line. The entire rain garden is west of the access off County Rd. 21. The 203.62 m² facility is a maximum of 1.14 m deep including the 0.3 m freeboard. The available volume 151.7 m³ is and will operate on pure infiltration for the bottom 0.75 m and have a 1m wide overflow weir set at 0.75 m above the bottom with 3:1 side slopes. Please refer to **Appendix D** for a copy of the weir calculations. The maximum water surface elevation occurs during the 100 year SCS storm event where the water reaches a depth of 0.84 m (elevation 267.18).

3.2 Fire Flow

As per the request of the Town we have calculated the fire flow water demand for the site based on the Phase 1 and Ultimate condition using the OBC (Office of the Fire Marshal, OFM Guideline, Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code (Oct 1999)). Please refer to **Appendix E** for the calculations.

Based on the calculations the Phase 1 building will require 81,000 L of stored water to fight a fire for 30 minutes. This value does not increase for Phase 2 or 3. It is proposed to implement a single 81,000 L tank in Phase 1 which will be suitable for all 3 phases of the development. Please refer to **Appendix E** for details of a possible subsurface storage tank and dry hydrant, although there are a number of manufacturers or alternative options that would be acceptable. The final tank configuration approval is subject to review of the Building Department.

The proposed storage tank and dry hydrant are located such that the maximum unobstructed distance to the furthest opening of the building is less than 90 m. As well the fire truck can be located a maximum of 45 m from the dry hydrant and would be on the access route provided. The proposed access route is 9 m wide with a minimum clear width of 6 m. The centreline radius is 12 m for each bend and corner. The location of the tank and the proposed access route meet Ontario Building Code requirements for access route and general provisions for firefighting. Details of the access route and unobstructed distance are shown on **Drawing C2**.

The existing well on the site may be able to provide some additional fire flows. The MECP Well record indicates a recommended pumping rate of 25 GPM or 1.6 L/s, however the well currently has no electrical connection for the pump, and the recommended pump rate is far below the required rate of 60 L/s for all 4 buildings. In addition, the location of the well is not well suited to access with a fire truck.

3.3 Erosion and Sediment Control

We recommend that silt fence per OPSD 219.130 be installed along the exterior of the limit of development of the Site as shown in **Drawing C5**. These controls should remain in place and be maintained until the vegetation is re-established on the lot.

The rain gardens will need to be cleaned out following construction, the native soil scarified, and the potting soil and vegetation established.

4.0 Conclusions

It is proposed to construct 3 mini self storage buildings on the 1.6 ha currently vacant parcel of land located at the NE corner of County Rd. 18 and County Rd. 21 in the Township of Mulmur.

The buildings will be accessed by upgrading the existing entrance to the site to a gravel access road sufficient for emergency vehicle access.

The site will be constructed in Phases with Building 1 being constructed first along with the proposed stormwater controls to service that building and associated driving lane. Additional stormwater management controls will be added at each phase. The primary stormwater quality and quantity

controls for the site will be through the use of infiltration-based LID (rain gardens) and the design ensures an enhanced level of treatment and a reduction in peak flows to existing levels.

The buildings will not require electricity, or a water or sewage connection and there will be no staff on-site. The site will not have external lighting (either street or on-building) and as such will primarily be used only by day.

A subsurface fire flow storage tank and dry hydrant is proposed to service all 3 buildings and will be located west of the buildings.

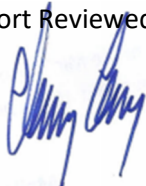
This report is intended to demonstrate the site can be constructed and serviced and will meet the County, Township and NVCA design criteria. The site will require Site Plan approval from the Township as well as approval from the County, however a permit is not required from the NVCA or NEC.

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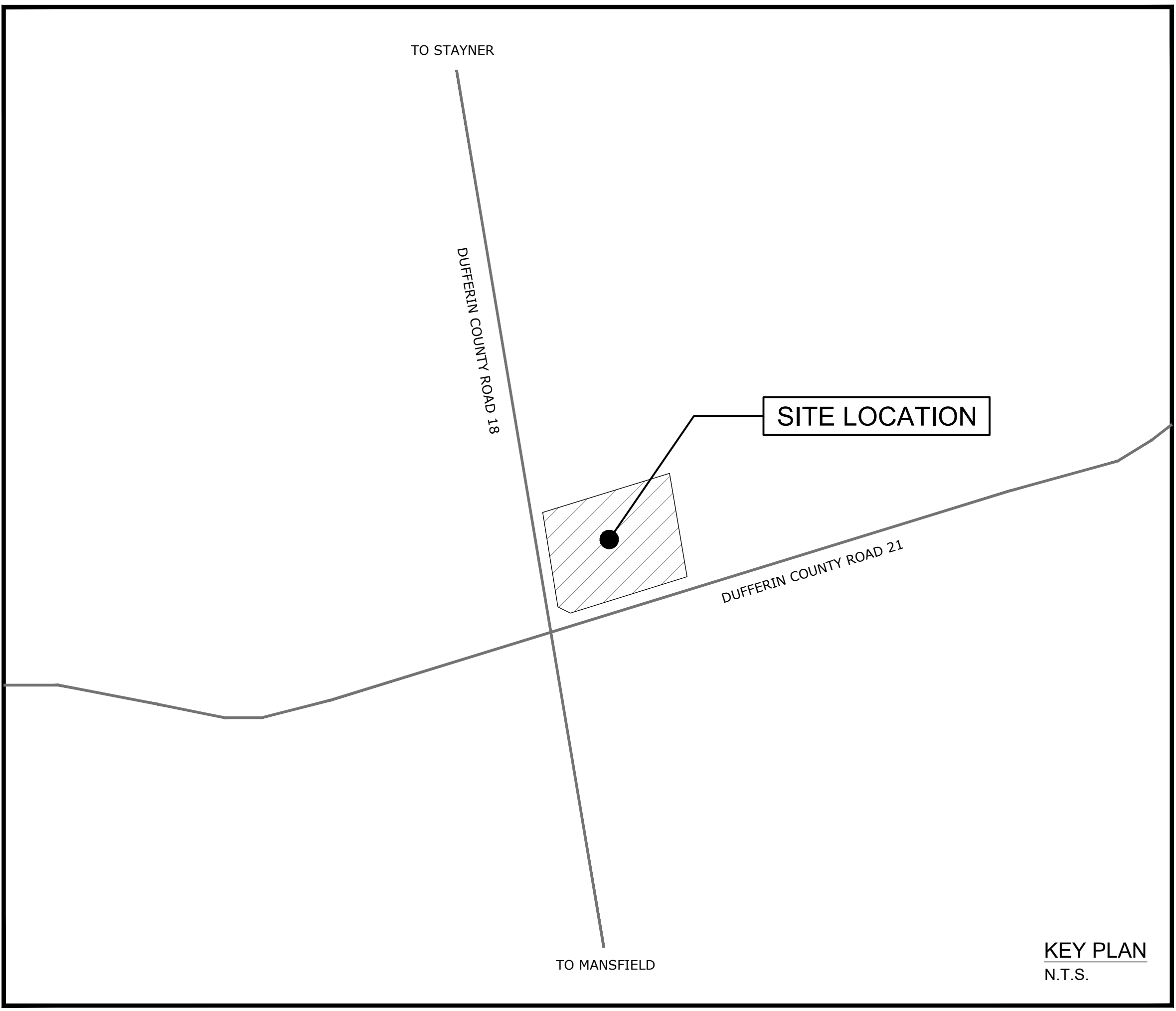


ALPHA STORAGE INC.

W PART LOT 26, CONCESSION 7E MINI STORAGE

DRAWING INDEX

C1	EXISTING CONDITION PLAN
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C7	STANDARD DETAILS

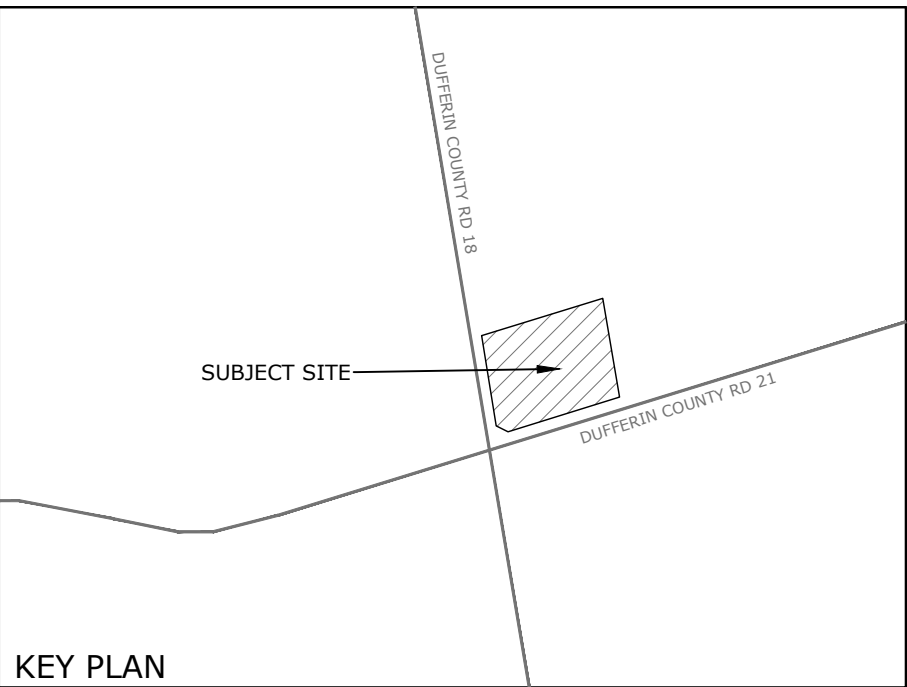


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Project No. 2020-090

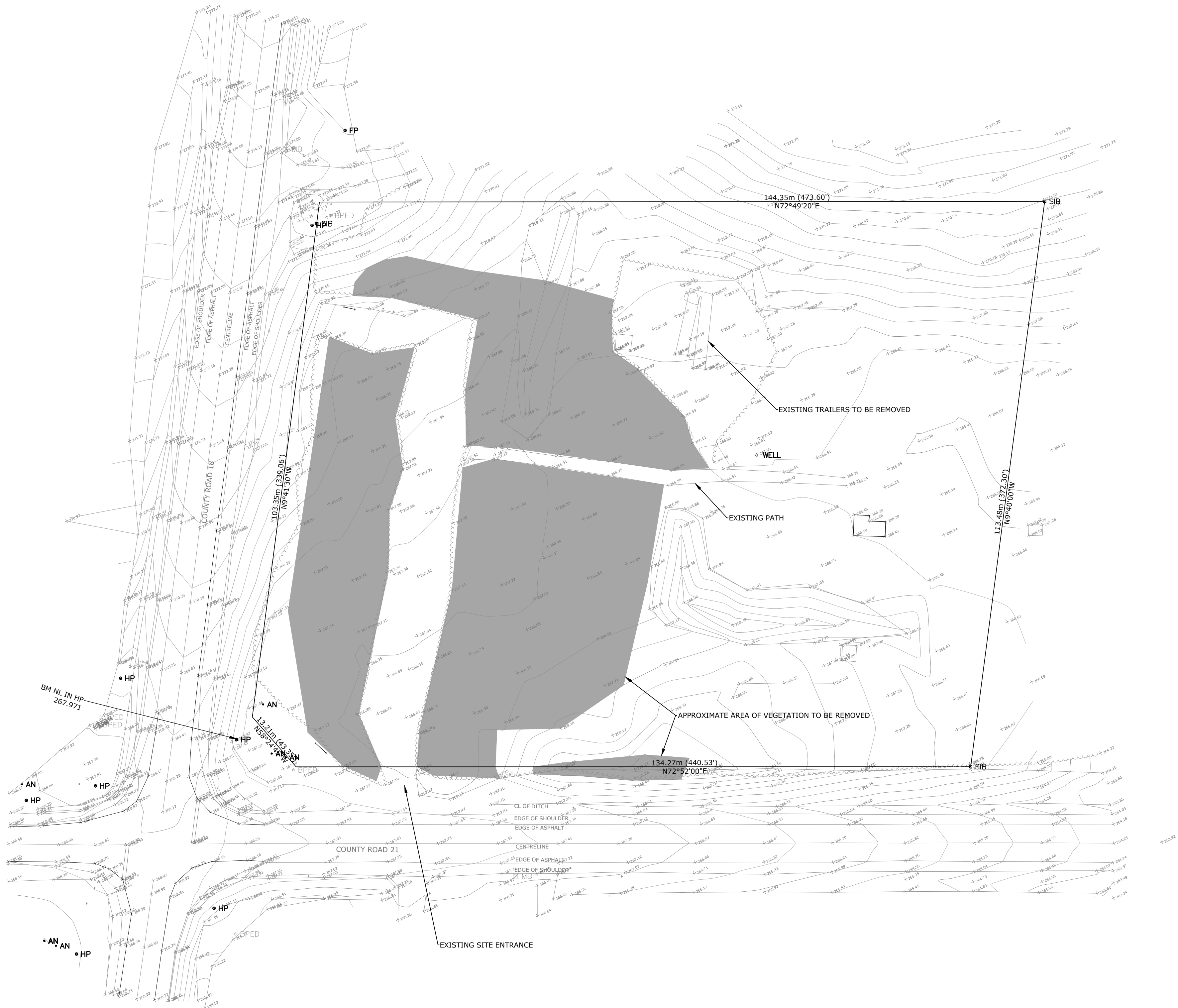
ISSUED FOR APPROVALS - 21/01/27





LEGEND

- 221.21 PROPOSED ELEVATION
+ 221.21 EXISTING ELEVATION
1 MAXIMUM 3:1 SLOPE
UNLESS OTHERWISE NOTED



RP 7R-1725 PARTS 2 & 3
CONCESSION 7 PT LOT 26
TOWNSHIP OF MULMUR
COUNTY OF DUFFERIN

- Notes
- This drawing is the exclusive property of CAPES Engineering Ltd. The reproduction of any part without express written consent of this Corporation is strictly prohibited.
 - The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to CAPES Engineering Ltd. prior to construction.
 - This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

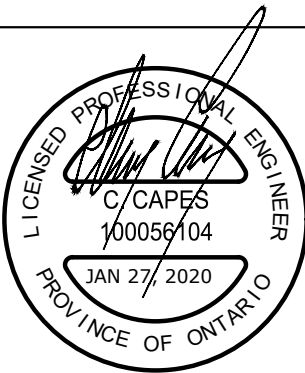
No	Revision	Date
1	ISSUED FOR APPROVALS	21/01/15
2	REISSUED FOR APPROVALS	21/01/27

NOTES:

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BENCHMARK:
NAIL IN HYDRO POLE AT SOUTH WEST CORNER OF LOT = 267.97



Client
ALPHA STORAGE INC.

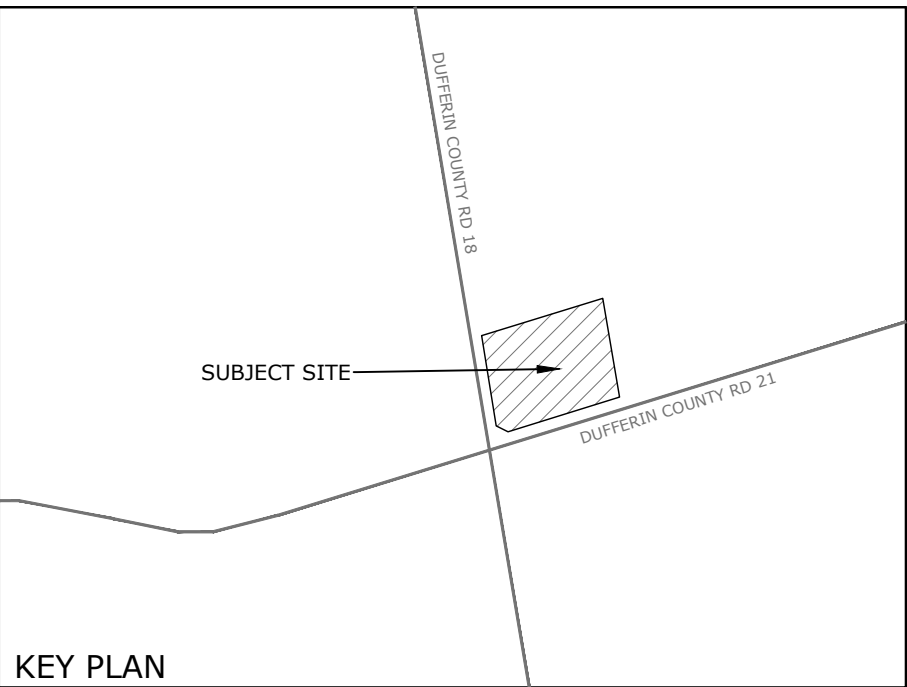


355310 BLUE MOUNTAINS - EUPHRASIA TOWNSHIP
CLARKSBURG, ON N0M 1J0
WWW.CAPESENGINEERING.COM

W PART LOT 26, CONCESSION 7E
MINI STORAGE
EXISTING CONDITION PLAN

Designed B. COLLINS	Checked C. CAPES	Date 21/01/04	Drawing No.
Project No. 2020-090	Rev No. 2		
Scale 1:500	0 5.0 10.0 20.0 30.0m		

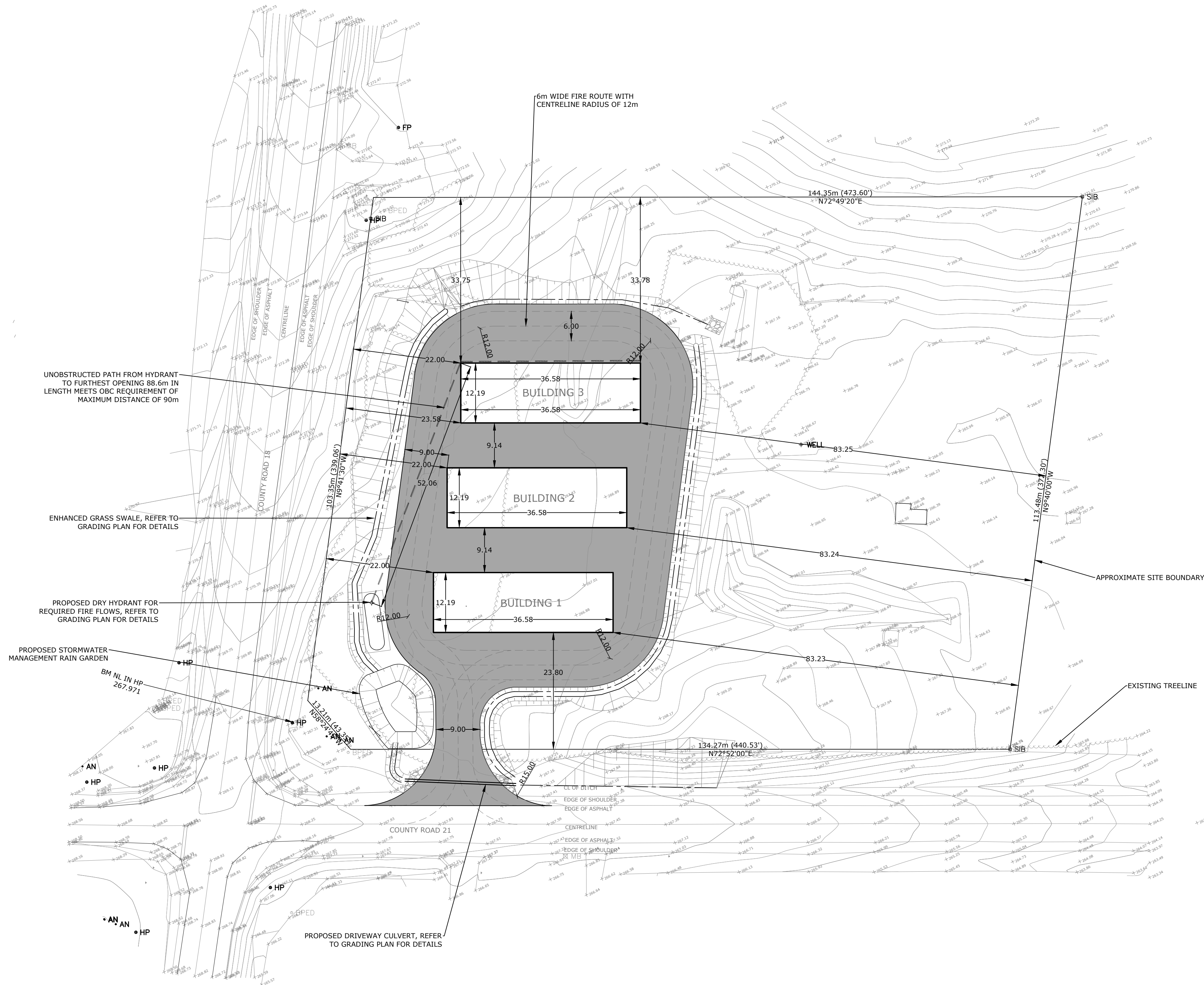
C1



LEGEND

- 221.21 PROPOSED ELEVATION
x 221.21 EXISTING ELEVATION
1 MAXIMUM 3:1 SLOPE UNLESS OTHERWISE NOTED

TOWNSHIP OF MULMUR ZONING TABLE HIGHWAY COMMERCIAL (CH) LOT PROVISIONS		
	REQUIRED	PROVIDED
MINIMUM LOT AREA (sq.m)	8,000	16,178
MINIMUM LOT FRONTAGE (m)	60.0	134.1
MINIMUM FRONT YARD (m)	15.0	23.8
MINIMUM EXTERIOR SIDE YARD (m)	15.0	22.0
MINIMUM INTERIOR SIDE YARD (m)	6.0	83.2
MINIMUM REAR YARD (m)	7.5	33.8
MAXIMUM HEIGHT (m)	10.5	3.0 (APPROX.)
MAXIMUM LOT COVERAGE (%)	25	2.8
MINIMUM LANDSCAPED OPEN SPACE (%)	15	73.2



RP 7R-1725 PARTS 2 & 3 CONCESSION 7 PT LOT 26 TOWNSHIP OF MULMUR COUNTY OF DUFFERIN

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2	REISSUED FOR APPROVALS	21/01/27

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BENCHMARK:
NAIL IN HYDRO POLE AT SOUTH WEST CORNER OF LOT = 267.97



Client
ALPHA STORAGE INC.



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CLARKSBURG, ON N0M 1J0
WWW.CAPESENGINEERING.COM

W PART LOT 26, CONCESSION 7E
MINI STORAGE
GENERAL SITE PLAN

Designed B. COLLINS	Checked C. CAPES	Date 21/01/04	Drawing No.
Project No. 2020-090	Rev No. 2		
Scale 1:500	0 5.0 10.0 20.0 30.0m		

C2

RP 7R-1725 PARTS 2 & 3
CONCESSION 7 PT LOT 26
TOWNSHIP OF MULMUR
COUNTY OF DUFFERIN

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No Revision

1 ISSUED FOR APPROVALS 21/01/15

2 REISSUED FOR APPROVALS 21/01/27

Date

NOTES:

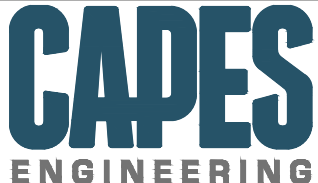
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BENCHMARK:
NAIL IN HYDRO POLE AT SOUTH WEST CORNER OF LOT = 267.97



Client
ALPHA STORAGE INC.



355310 BLUE MOUNTAINS - EUPHRASIA TOWNSHIP
CLARKSBURG, ON N0M 1J0
WWW.CAPESENGINEERING.COM

W PART LOT 26, CONCESSION 7E
MINI STORAGE
GRADING AND SERVICING PLAN

Designed B. COLLINS	Checked C. CAPES	Date 21/01/04	Drawing No.
Project No. 2020-090	Rev No. 2		
Scale 1:500	0 5.0 10.0 20.0 30.0m		

C3

NOTES

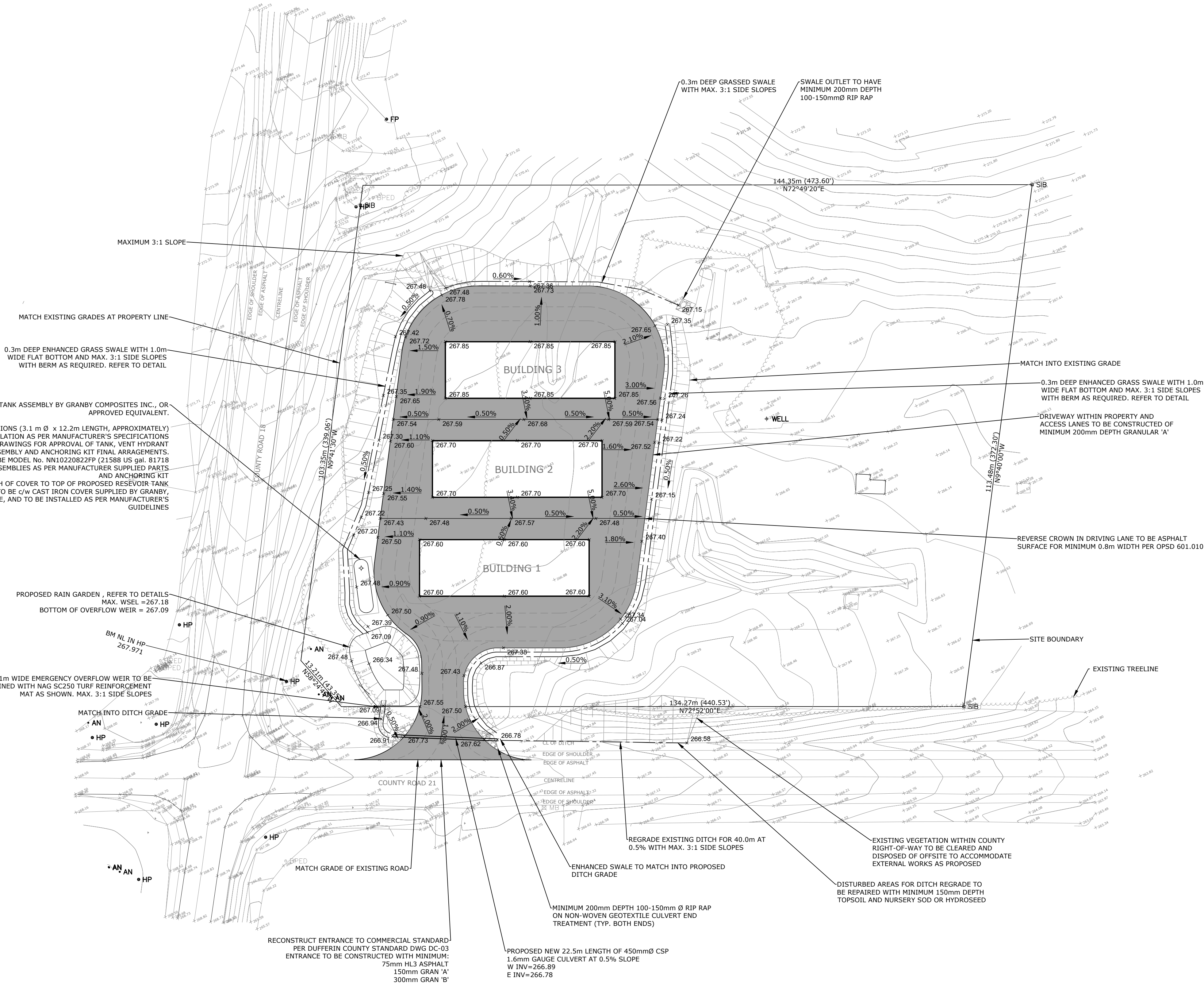
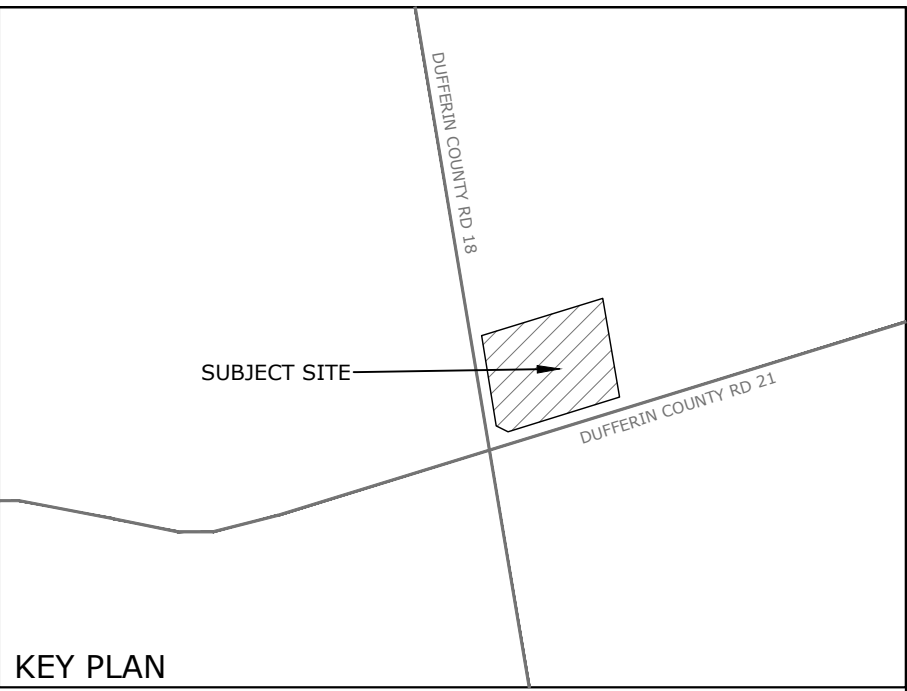
- THE OWNER/BUILDER/APPLICANT MUST OBTAIN A ROAD OCCUPANCY PERMIT FROM PUBLIC WORKS PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION WORKS.
- ALL DOWNSPOUTS, SUMP PUMP AND OTHER DRAINAGE DISCHARGE POINTS SHALL DISCHARGE ON TO A SPLASH PAD OR APPROVED EQUIVALENT.
- A COPY OF THE "ACCEPTED FOR CONSTRUCTION" LOT GRADING AND DRAINAGE PLAN IS TO BE ON SITE FOR REFERENCE AT ALL TIMES DURING CONSTRUCTION.
- SEDIMENT AND EROSION CONTROL MEASURES SHALL BE IMPLEMENTED TO PREVENT MIGRATION OF SILT AND SEDIMENT FROM THE SUBJECT LOT TO ANY ADJACENT LOT, INCLUDING MUNICIPAL RIGHT-OF-WAY. SPECIAL CARE SHALL BE TAKEN TO ENSURE THAT SILT AND SEDIMENT LADEN SURFACE WATER DOES NOT ENTER ANY WATERCOURSES OR ENVIRONMENTALLY SENSITIVE AREAS, EITHER OVERLAND OR THROUGH THE STORM DRAINAGE SYSTEM. THE OWNER/BUILDER/APPLICANT SHALL COMPLY WITH ALL DIRECTIVES ISSUED BY ANY OF THE ENVIRONMENTAL AGENCIES.
- THE OWNER/BUILDER/APPLICANT IS RESPONSIBLE FOR OBTAINING UTILITY AND SERVICING LOCATES PRIOR TO ANY WORKS.
- INTERIM GRADING MEASURES MAY BE REQUIRED DURING BUILDING CONSTRUCTION TO ENSURE THAT DRAINAGE DOES NOT ADVERSELY AFFECT THE NEIGHBORING PROPERTIES. ROUGH GRADING OF THE PROPERTY SHALL BE COMPLETED SUCH THAT DRAINAGE IS CONTAINED ON SITE OR CONTROLLED TO A POSITIVE OUTLET.
- ALL SWALES SHALL HAVE A MINIMUM DEPTH OF 150mm; 150mm DIAMETER SUBDRAINS SHALL BE PROVIDED UNDER ALL SWALES WITH GRADIENTS LESS THAN 1.0%. SUBDRAINS SHALL BE PERFORATED, CORRUGATED PIPE WITH GEOTEXTILE AND BE BEDDED IN A 300mmx300mm CLEAR STONE TRENCH WRAPPED WITH FILTER CLOTH. EXISTING VEGETATION ON SITE TO BE REMOVED AND DISPOSED OF OFF SITE BEFORE LOT GRADING WORK AS SPECIFIED.
- ALL DISTURBED AREAS ARE TO BE SODDED OVER A MINIMUM OF 150MM OF TOPSOIL OR APPROVED ALTERNATIVE GROUND COVER.
- FOOTINGS WITHIN GROUNDWATER SHALL BE A FACTOR OF STANDARD WIDTH AS PER O.B.C. SECTION 9.15.3.4.
- IN LIEU OF GROUNDWATER READINGS, SHOULD GROUNDWATER BE ENCOUNTERED DURING EXCAVATION, THE BASEMENT SLAB SHALL BE SITED MINIMUM 0.50m ABOVE OBSERVED GROUNDWATER LEVEL. ALTERNATIVELY, WATERPROOFING MEASURES AS PER THE OBC TO BE IMPLEMENTED SUBJECT TO THE APPROVAL OF THE CITY OF PICKERING BUILDING DEPARTMENT.



KEY PLAN

LEGEND

- 221.21 PROPOSED ELEVATION
- 221.21 EXISTING ELEVATION
- MAXIMUM 3:1 SLOPE UNLESS OTHERWISE NOTED



DRY HYDRANT AND FIBREGLASS TANK ASSEMBLY BY GRANBY COMPOSITES INC., OR APPROVED EQUIVALENT.

- TANK DIMENSIONS (3.1 m Ø x 12.2m LENGTH, APPROXIMATELY) INSTALLATION AS PER MANUFACTURER'S SPECIFICATIONS
- CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR APPROVAL OF TANK, VENT HYDRANT ASSEMBLY AND ANCHORING KIT FINAL ARRANGEMENTS.
- PROPOSED DRY HYDRANT TANK TO BE MODEL No. NN10220822FP (21588 US gal. 81718 liters) c/w VENT AND HYDRANT ASSEMBLIES AS PER MANUFACTURER SUPPLIED PARTS AND ANCHORING KIT
- 0.3m MINIMUM DEPTH OF COVER TO TOP OF PROPOSED RESEVOIR TANK
- MAINTENANCE ACCESS RISER TO BE c/w CAST IRON COVER SUPPLIED BY GRANBY, FLUSH WITH FINISHED GRADE, AND TO BE INSTALLED AS PER MANUFACTURER'S GUIDELINES

PROPOSED RAIN GARDEN, REFER TO DETAILS
MAX. WSEL = 267.18
BOTTOM OF OVERFLOW WEIR = 267.09

1m WIDE EMERGENCY OVERFLOW WEIR TO BE LINED WITH NAG SC250 TURF REINFORCEMENT MAT AS SHOWN. MAX. 3:1 SIDE SLOPES

RECONSTRUCT ENTRANCE TO COMMERCIAL STANDARD PER DUFFERIN COUNTY STANDARD DWG DC-03
ENTRANCE TO BE CONSTRUCTED WITH MINIMUM:
75mm HL3 ASPHALT
150mm GRAN 'A'
300mm GRAN 'B'

PROPOSED NEW 22.5m LENGTH OF 450mmØ CSP
1.6mm GAUGE CULVERT AT 0.5% SLOPE
W INV=266.89
E INV=266.78

MINIMUM 200mm DEPTH 100-150mm Ø RIP RAP ON NON-WOVEN GEOTEXTILE CULVERT END TREATMENT (TYP. BOTH ENDS)

ENHANCED SWALE TO MATCH INTO PROPOSED DITCH GRADE

REGRADE EXISTING DITCH FOR 40.0m AT 0.5% WITH MAX. 3:1 SIDE SLOPES

EXISTING VEGETATION WITHIN COUNTY RIGHT-OF-WAY TO BE CLEARED AND DISPOSED OF OFFSITE TO ACCOMMODATE EXTERNAL WORKS AS PROPOSED

DISTURBED AREAS FOR DITCH REGRADE TO BE REPAIRED WITH MINIMUM 150mm DEPTH TOPSOIL AND NURSERY SOD OR HYDROSEED

EXISTING TREELINE

SITE BOUNDARY

REVERSE CROWN IN DRIVING LANE TO BE ASPHALT SURFACE FOR MINIMUM 0.8m WIDTH PER OPSD 601.010

DRIVEWAY WITHIN PROPERTY AND ACCESS LANES TO BE CONSTRUCTED OF MINIMUM 200mm DEPTH GRANULAR 'A'

0.3m DEEP ENHANCED GRASS SWALE WITH 1.0m WIDE FLAT BOTTOM AND MAX. 3:1 SIDE SLOPES WITH BERM AS REQUIRED. REFER TO DETAIL

MATCH INTO EXISTING GRADE

144.35m (473.60')
N72°49'20"E

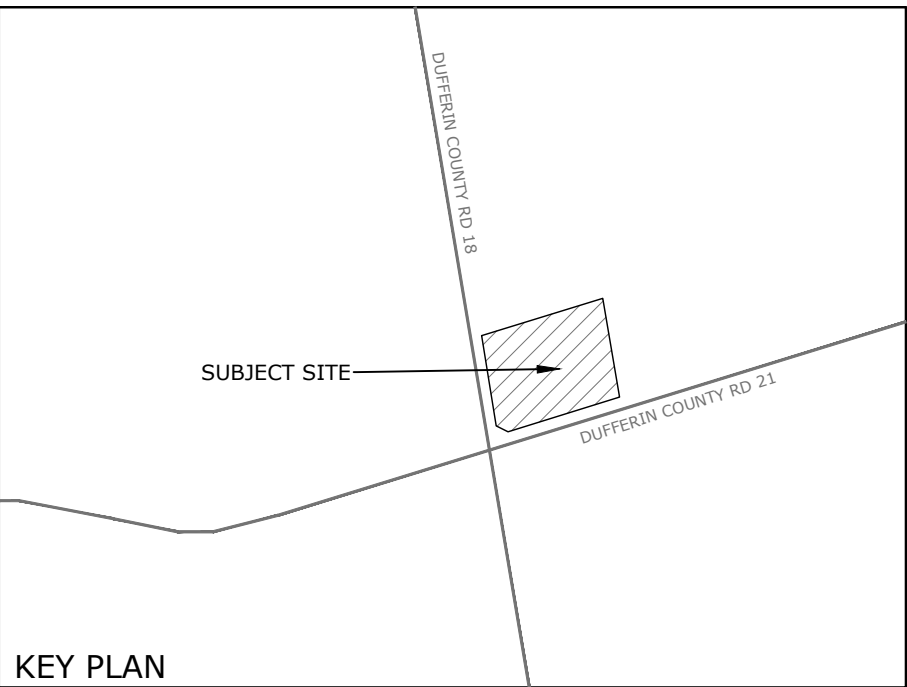
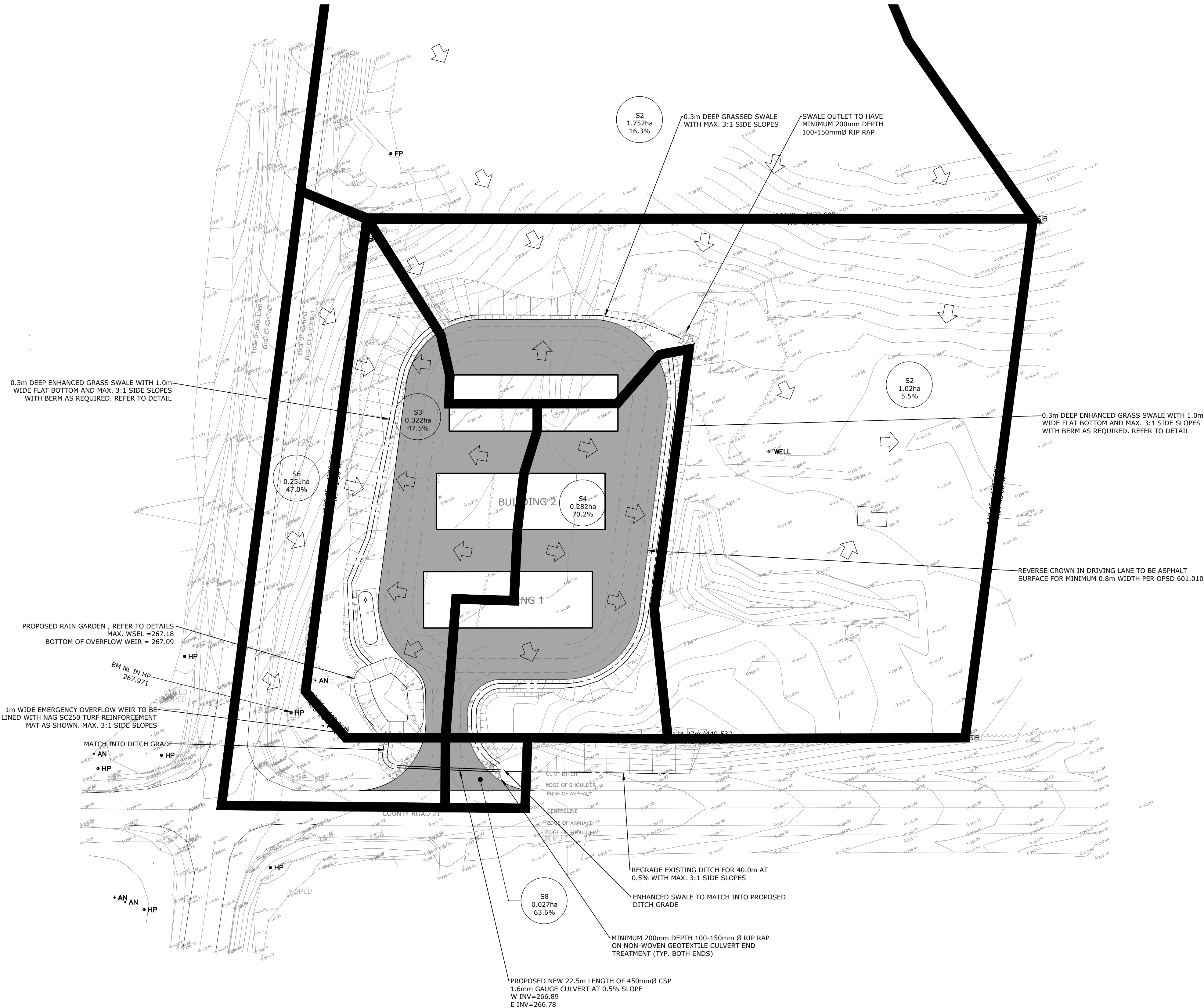
0.3m DEEP GRASSED SWALE WITH MAX. 3:1 SIDE SLOPES

SWALE OUTLET TO HAVE MINIMUM 200mm DEPTH 100-150mmØ RIP RAP

0.3m DEEP ENHANCED GRASS SWALE WITH 1.0m WIDE FLAT BOTTOM AND MAX. 3:1 SIDE SLOPES WITH BERM AS REQUIRED. REFER TO DETAIL

MATCH EXISTING GRADES AT PROPERTY LINE

MAXIMUM 3:1 SLOPE



- LEGEND
- PROPOSED ELEVATION
 - EXISTING ELEVATION
 - MAXIMUM 3:1 SLOPE UNLESS OTHERWISE NOTED
 - OVERLAND FLOW DIRECTION
 - SUBCATCHMENT NAME, AREA (ha) & % IMPERVIOUS

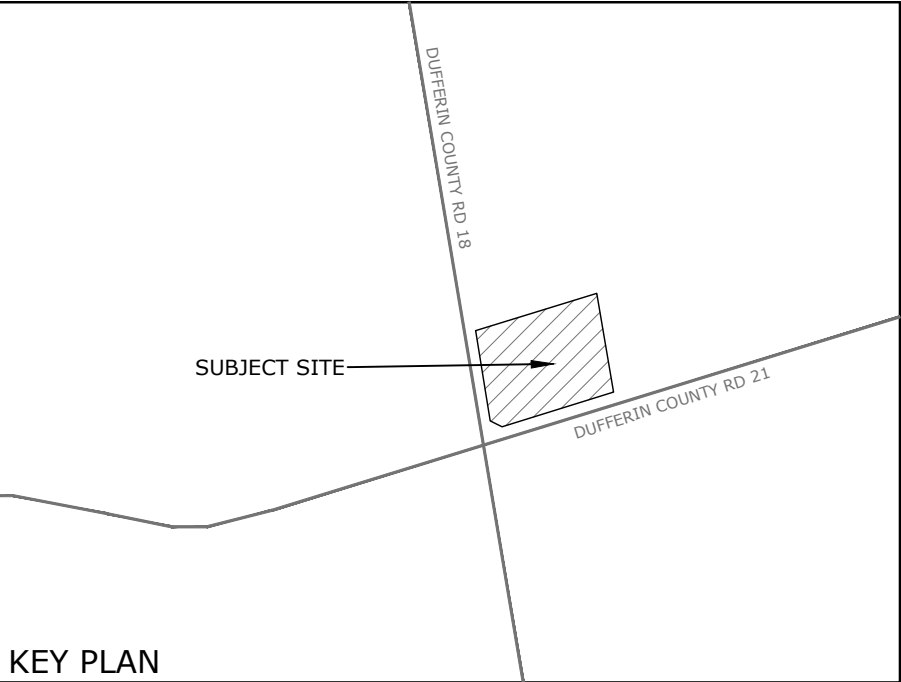
RP 7R-1725 PARTS 2 & 3
CONCESSION 7 PT LOT 26
TOWNSHIP OF MULMUR
COUNTY OF DUFFERIN

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No	Revision	Date																																		
1	ISSUED FOR APPROVALS	21/01/15																																		
2	REISSUED FOR APPROVALS	21/01/27																																		
			<div><div><div>Designed B. COLLINS</div><div>Project No. 2020-090</div><div>Scale 1:500</div></div><div><div>Checked C. CAPES</div><div>Rev No. 2</div></div><div><div>Date 21/01/04</div><div>Drawing No. C4</div></div></div> <div><div></div><div>355210 BLUE MOUNTAINS - EUPHRASIA TOWNLINE CLARKSBURG, OH NOV 1/20 WWW.CAPESENGINEERING.COM</div></div>																																	



355310 BLUE MOUNTAINS - EUPHRASIA TOWNSHIP
CLARKSBURG, ON N0M 1J0
WWW.CAPESENGINEERING.COM

0 5.0 10.0 20.0 30.0m



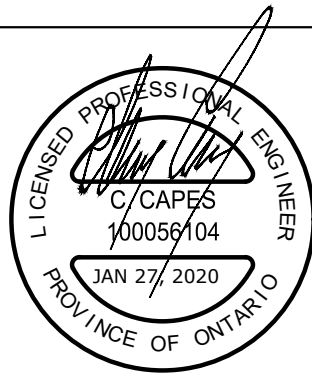
- LEGEND**
- * 221.21 PROPOSED ELEVATION
 - 221.21 EXISTING ELEVATION
 - MAXIMUM 3:1 SLOPE UNLESS OTHERWISE NOTED
 - SEDIMENT FENCE

RP 7R-1725 PARTS 2 & 3
CONCESSION 7 PT LOT 26
TOWNSHIP OF MULMUR
COUNTY OF DUFFERIN

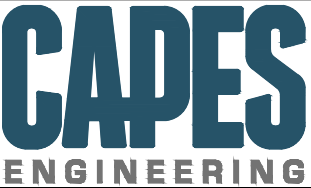
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Client
ALPHA STORAGE INC.



355310 BLUE MOUNTAINS - EUPHRASIA TOWNSHIP
CLARKSBURG, ON N0M 1J0
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W PART LOT 26, CONCESSION 7E
MINI STORAGE
EROSION & SEDIMENT CONTROL PLAN

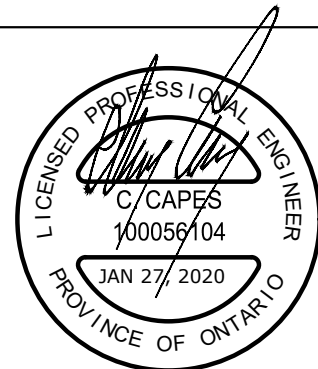
Designed B. COLLINS	Checked C. CAPES	Date 21/01/04	Drawing No.
Project No. 2020-090	Rev No. 2		C5
Scale 1:500	0 5.0 10.0 20.0 30.0m		

RP 7R-1725 PARTS 2 & 3
CONCESSION 7 PT LOT 26
TOWNSHIP OF MULMUR
COUNTY OF DUFFERIN

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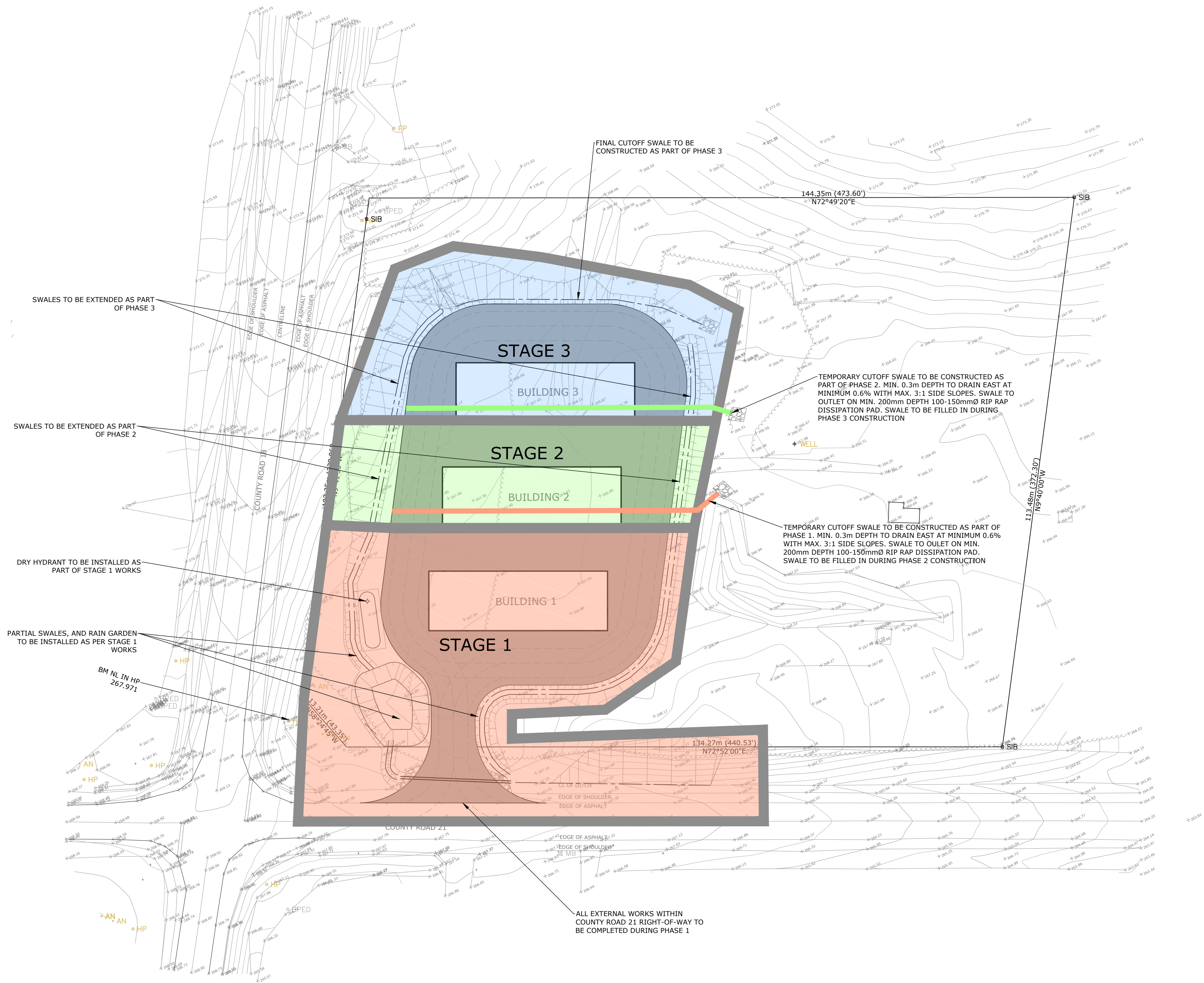
Client
ALPHA STORAGE INC.



355310 BLUE MOUNTAINS - EUPHRASIA TOWNSHIP
CLARKSBURG, ON N0M 1J0
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W PART LOT 26, CONCESSION 7E
MINI STORAGE
STAGING PLAN

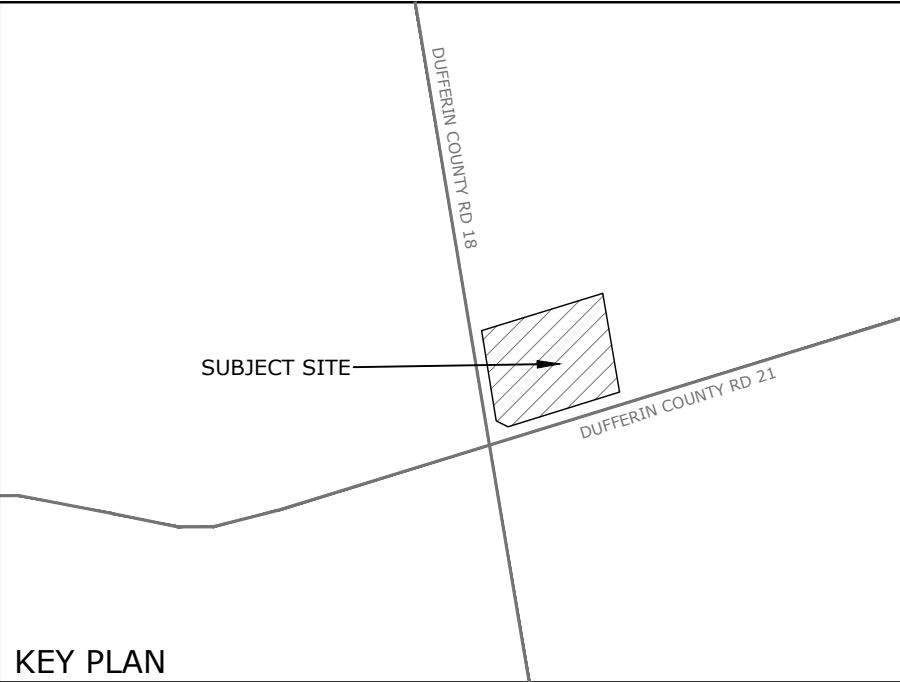
Designed B. COLLINS	Checked C. CAPES	Date 21/01/04	Drawing No.
Project No. 2020-090	Rev No. 2		C6
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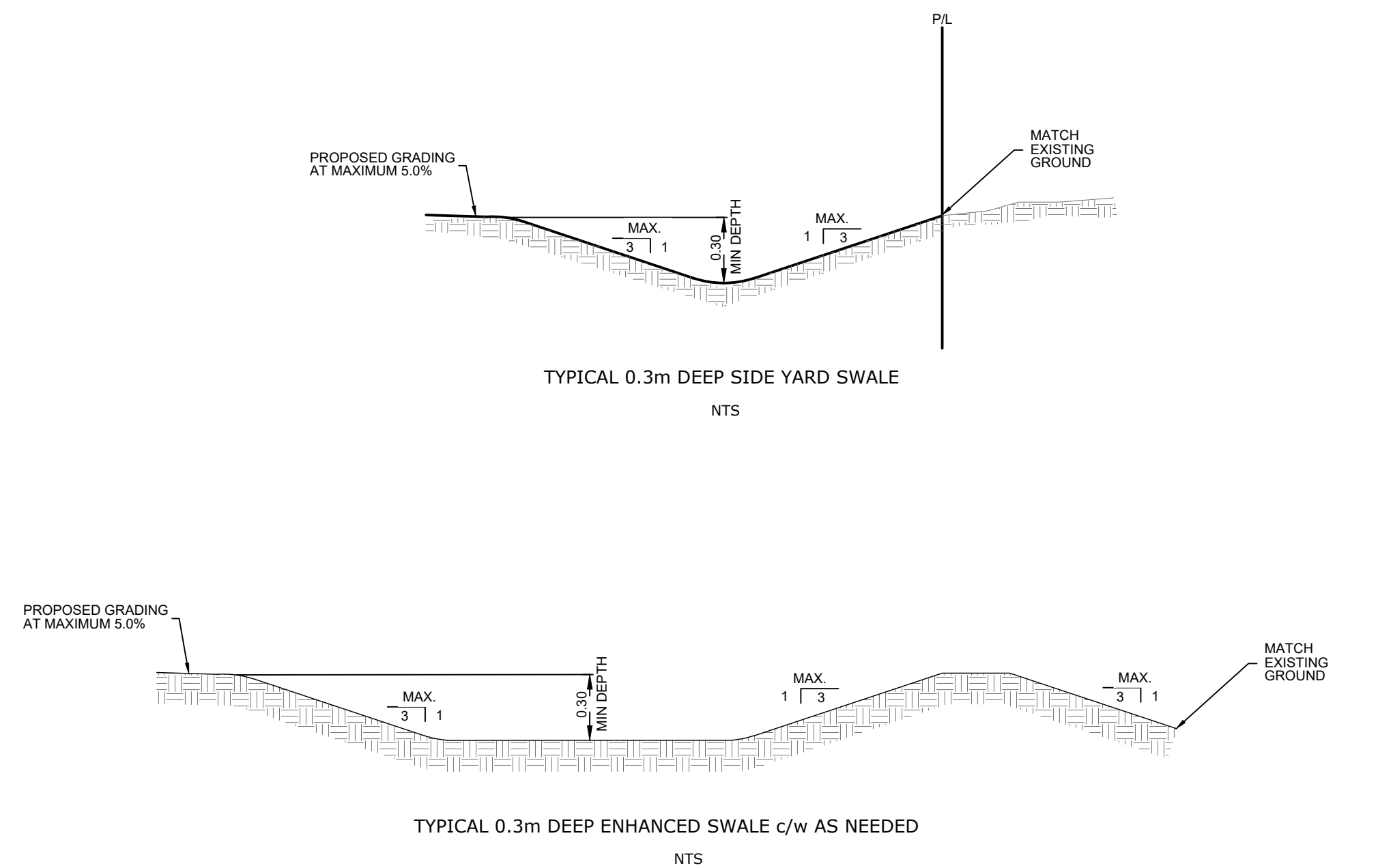
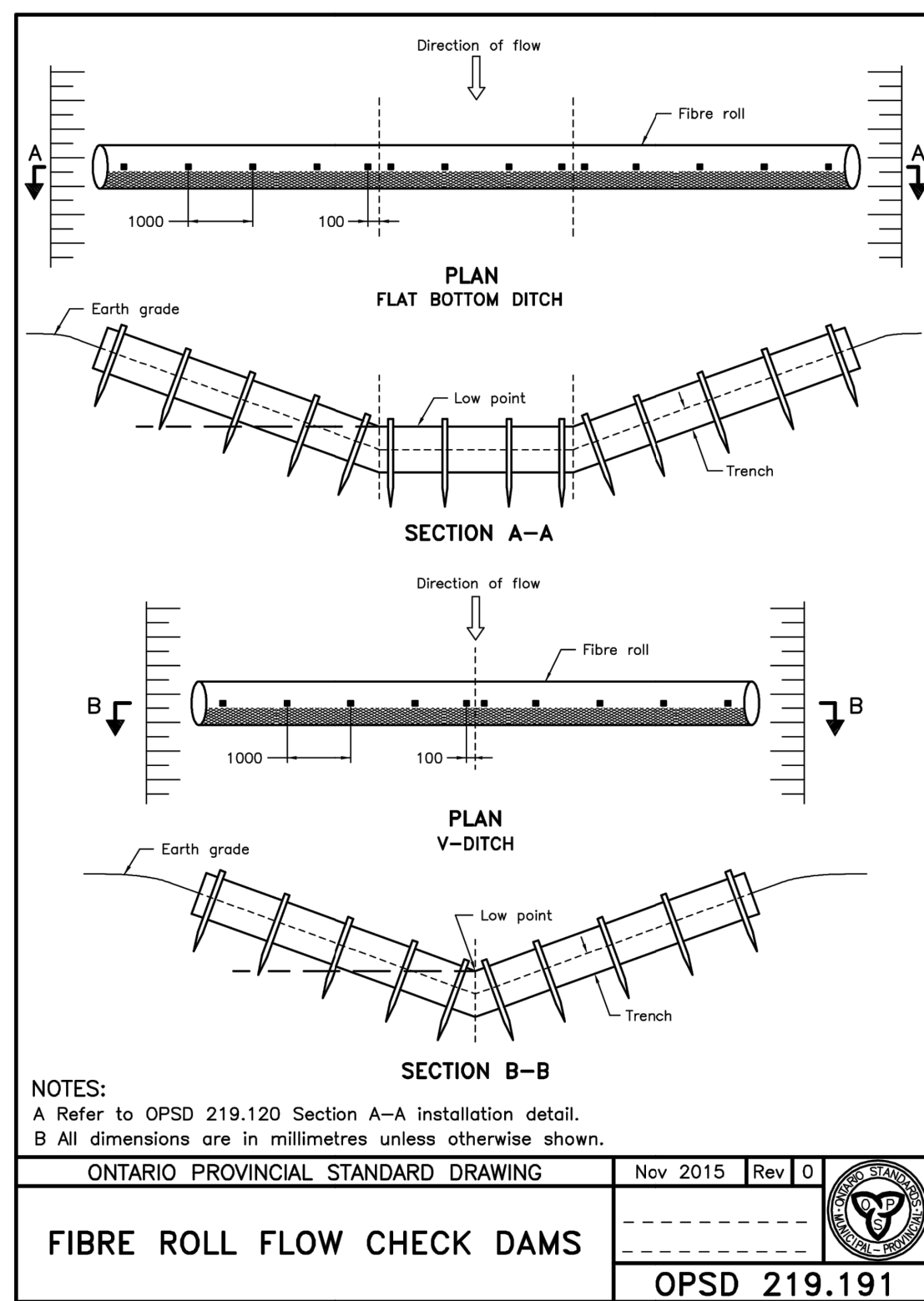
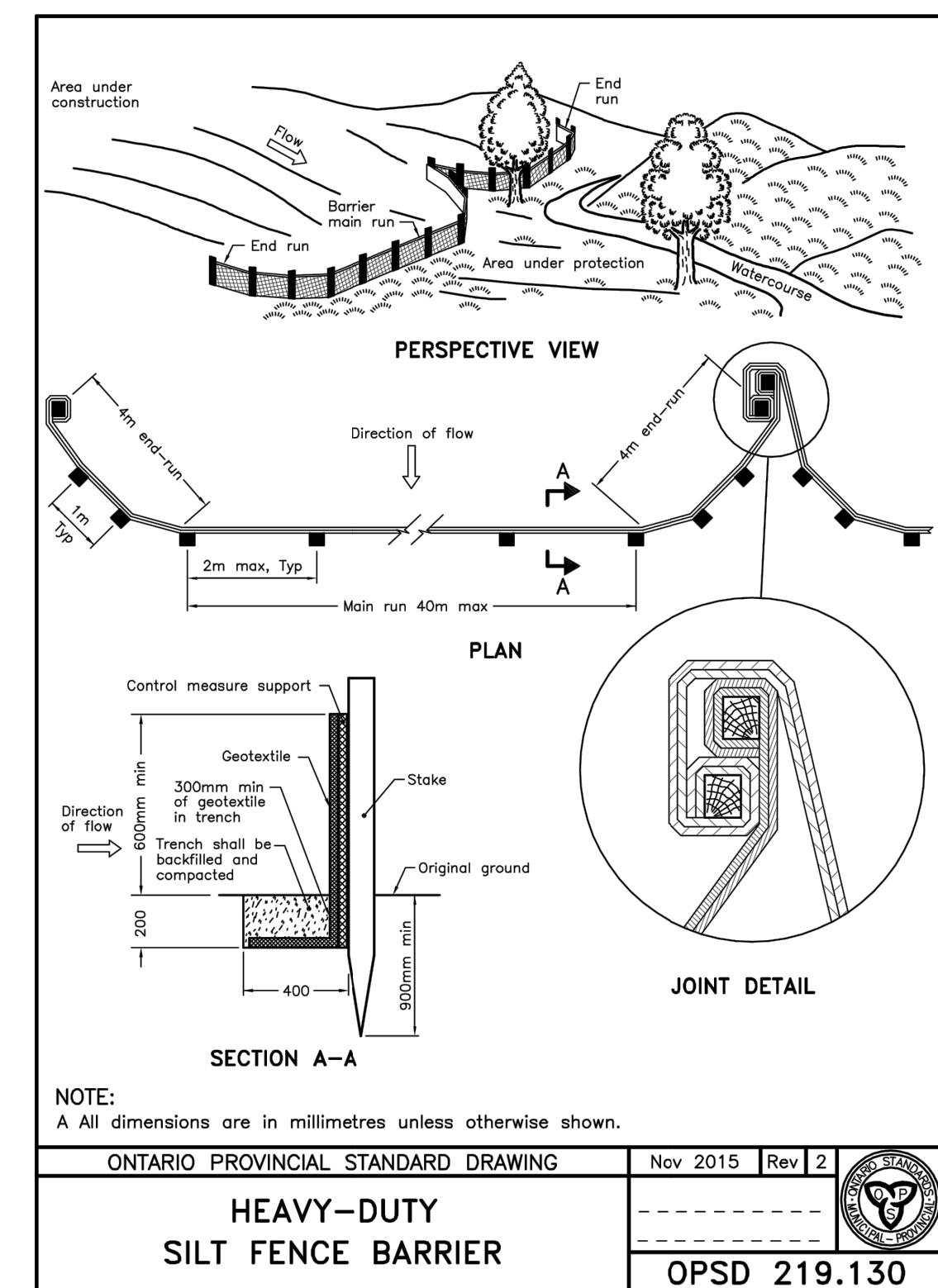
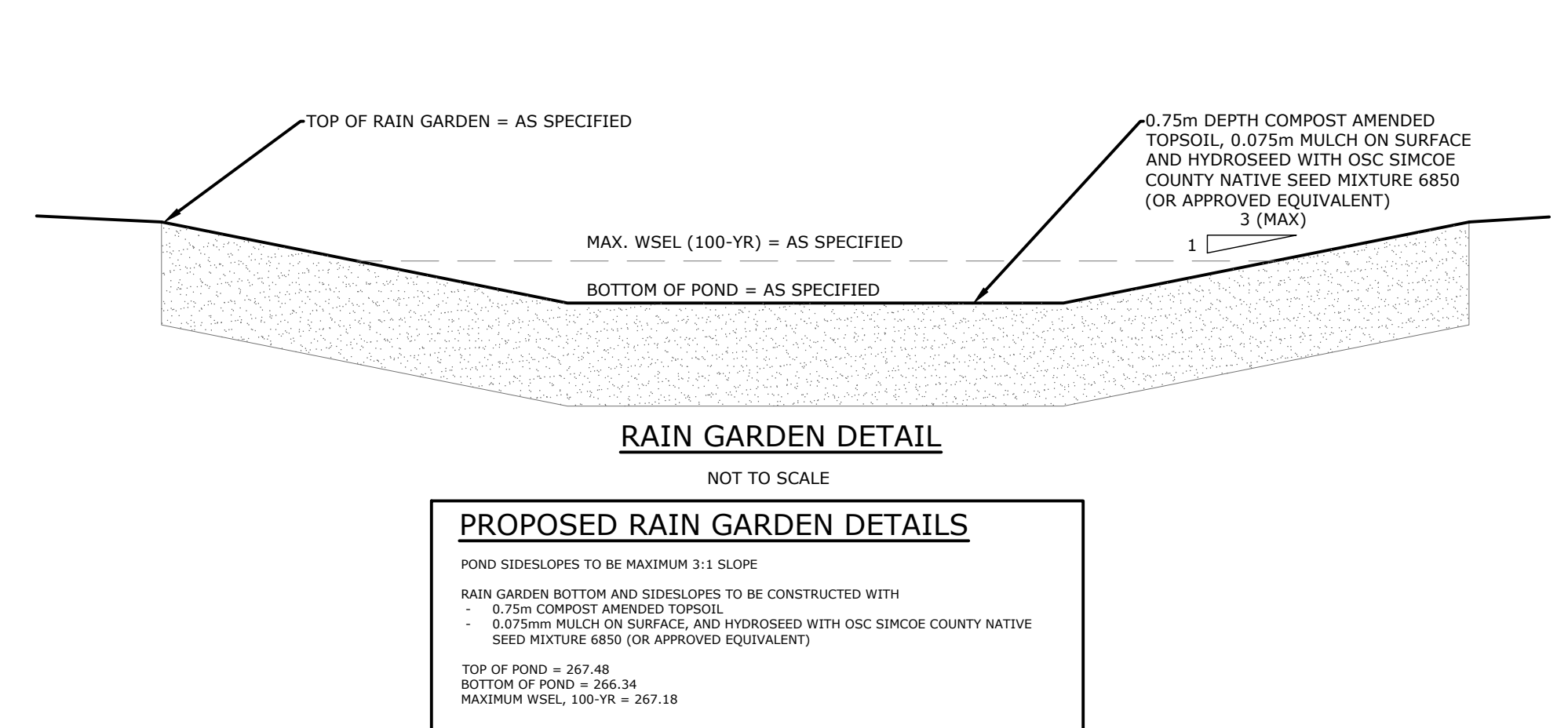
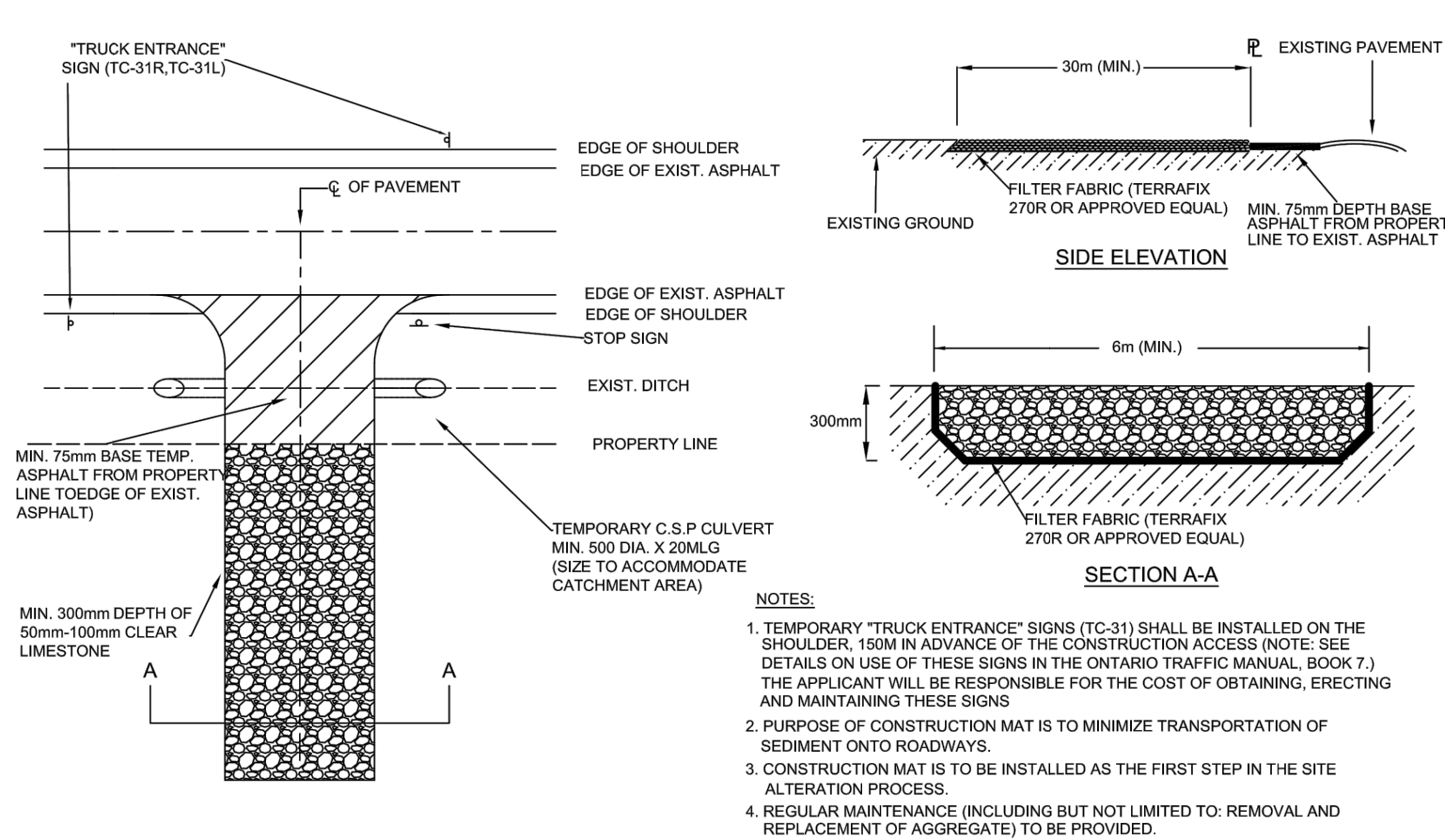
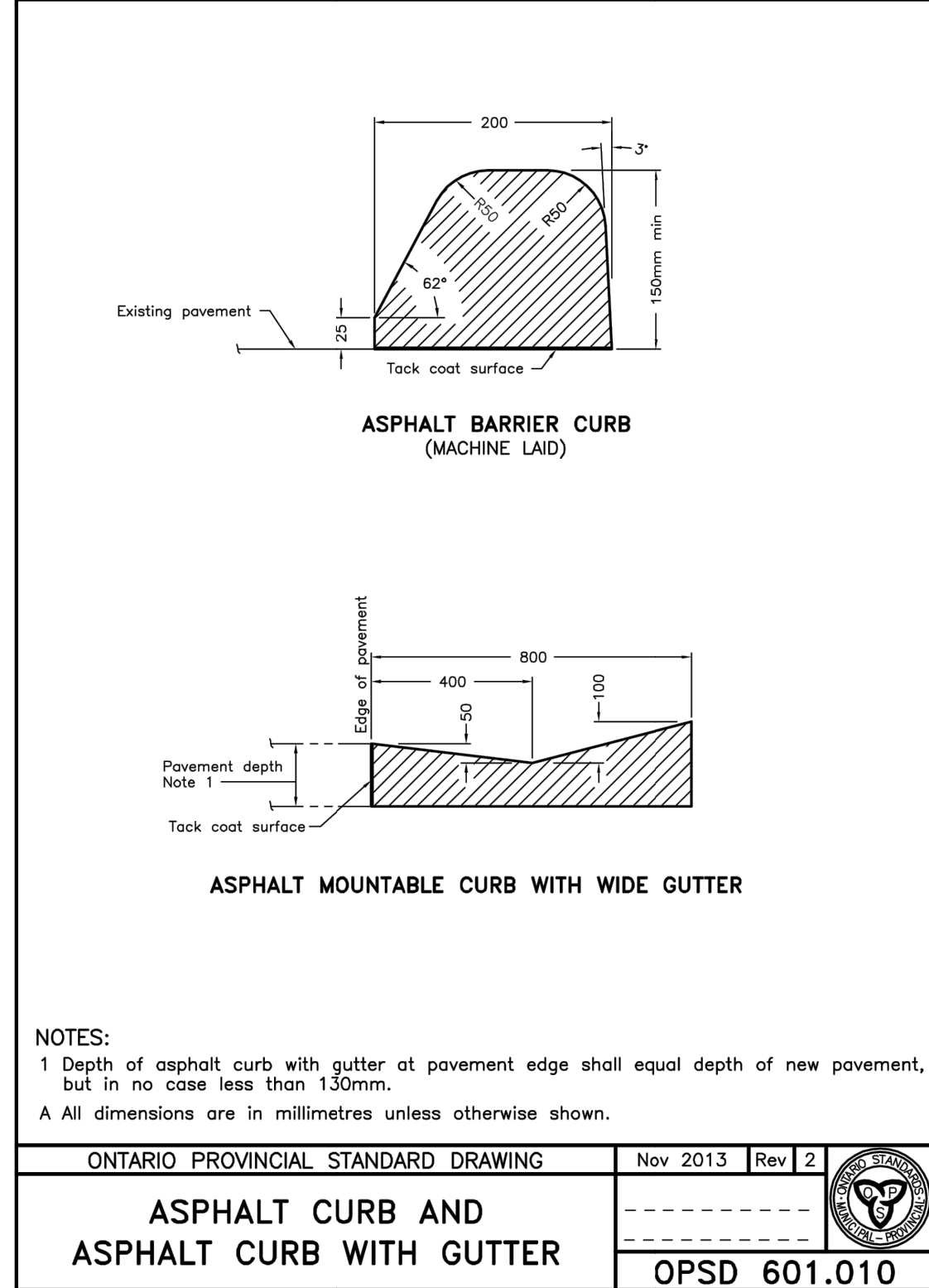
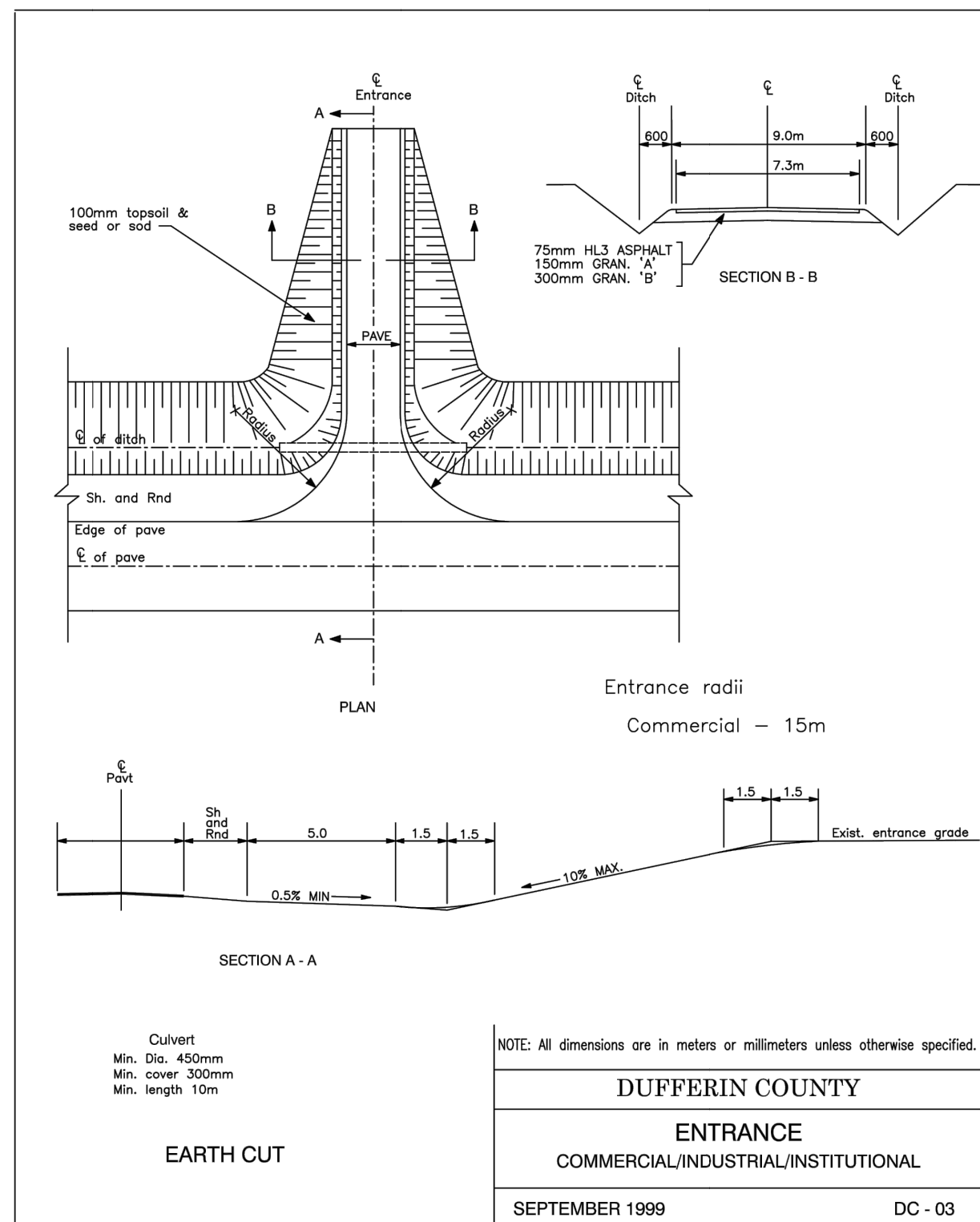


KEY PLAN

LEGEND

- * 221.21 PROPOSED ELEVATION
- 221.21 EXISTING ELEVATION
- 1 MAXIMUM 3:1 SLOPE UNLESS OTHERWISE NOTED





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	1	ISSUED FOR APPROVALS	21/01/15			
	2	REISSUED FOR APPROVALS	21/01/27			
<div>Designed B. COLLINS</div> <div>Checked C. CAPES</div> <div>Date 21/01/04</div>			<div>Drawing No.</div> <div>C7</div>			
<div>Project No. 2020-090</div> <div>Rev No. 2</div>						
<div>Scale NOT TO SCALE</div>						

Appendices

Appendix A – Legal Plan

SURVEY OF
S, CONCESSION VII E.H.S.
UR, COUNTY OF DUFFERIN

INCH = 100 FEET
MO AND PATTEN LTD.
1978

IS NOT A PLAN OF SUBDIVISION
MEANING OF THE PLANNING ACT.

PART 3 INST. M.F. 7R - 882
68426

22.63' 972.09' 549.46'

26
VII
S I O N
2, 7R - 1463
M.F. 98487

372.34' 50.43' 372.30' 372.30' N 9°40'00" W 17.14' 50.43' 575.60' 947.90'

N 72°52'00" E 549.93' 973.34' meas. (973.59' Inst. M.F. 63429)

E BETWEEN LOTS 25 AND 26 (DUFFERIN ROAD 21)

PART	LOT	CONC.	INST.	AREA
1				6.072 ac.
2	pt.26	VII EHS	M.F. 95745	3.571 ac.
3				0.427 ac.

PLAN 7R - 1725

RECEIVED AND DEPOSITED
(M.F.)

JAN 21 1980

DATE

A.T. Woodland L.R. per
A.T. WOODLAND
LAND REGISTRAR
FOR THE REGISTRY DIVISION OF
DUFFERIN (7).

I REQUIRE THIS PLAN TO BE
DEPOSITED UNDER THE
REGISTRY ACT.

Dec 20/79.
DATE

Ronald J. EMO
RONALD J. EMO

PROPERTY OF THE
REGISTRY OFFICE

NOTES

BEARINGS HEREON ARE ASTRONOMIC AND ARE REFERRED
TO THE BEARING OF THE SOUTHERLY LIMIT OF PART
3, PLAN 7R-882 ASSUMED TO BE N73°18'35"E, IN
ACCORDANCE THEREWITH.

⊕ SIB DENOTES 1" x 1" x 48" IRON SURVEY BAR
⊕ I.B. DENOTES 5/8" x 5/8" x (24") IRON SURVEY BAR
(E.H.S.) DENOTES EAST OF HURONTARIO STREET

ALL BARS SHOWN ON THIS PLAN WERE SET
DURING THE COURSE OF THE SURVEY OF
PLAN 7R-1463 UNLESS OTHERWISE INDICATED

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:
1. THIS SURVEY AND PLAN ARE CORRECT AND IN
ACCORDANCE WITH THE SURVEYS ACT AND THE
REGISTRY ACT AND THE REGULATIONS MADE
THEREUNDER.
2. THE SURVEY WAS COMPLETED JAN. 16, 1978.

DEC. 4, 1979

Ronald J. EMO
ONTARIO LAND SURVEYOR
COLLINGWOOD

Appendix B – MECP Well Record



The Ontario Water Resources Act

WATER WELL RECORD

Mark correct box with a checkmark, where applicable.

Municipality 17006 HS E. 07
10 15 22 23 24
PART 243 PA 24
on block tract survey, etc. Lot 72-27
11 EAST 26
Date completed 16 04 98
day month year

Lot 25-27

26

PP LIST E

Date completed 16 04 99

21

1 2

T M

10 12 17

18 24 25 26 30 31 47

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

[illegible]

32

41		WATER RECORD						42	
Water found at - feet		Kind of water							
10-15		1	<input type="checkbox"/> Fresh	3	<input type="checkbox"/> Sulphur	14			
2		<input type="checkbox"/> Salty	4	<input type="checkbox"/> Minerals	15				
15-18		1	<input type="checkbox"/> Fresh	3	<input type="checkbox"/> Sulphur	19			
2		<input type="checkbox"/> Salty	4	<input type="checkbox"/> Minerals	20				
20-23		1	<input type="checkbox"/> Fresh	3	<input type="checkbox"/> Sulphur	24			
2		<input type="checkbox"/> Salty	4	<input type="checkbox"/> Minerals	25				
25-28		1	<input type="checkbox"/> Fresh	3	<input type="checkbox"/> Sulphur	29			
2		<input type="checkbox"/> Salty	4	<input type="checkbox"/> Minerals	30				
30-33		1	<input type="checkbox"/> Fresh	3	<input type="checkbox"/> Sulphur	34			
		2	<input type="checkbox"/> Salty	4	<input type="checkbox"/> Minerals				
				6	<input type="checkbox"/> Gas				

CASING & OPEN HOLE RECORD				
Inside diam inches	Material	Wall thickness inches	Depth - feet	
			From	To
10-11 6 7/8	<input checked="" type="checkbox"/> Steel <input type="checkbox"/> Galvanized <input type="checkbox"/> Concrete <input type="checkbox"/> Open hole <input type="checkbox"/> Plastic	• 188	+ 2	115
17-18	<input type="checkbox"/> Steel <input type="checkbox"/> Galvanized <input type="checkbox"/> Concrete <input type="checkbox"/> Open hole <input type="checkbox"/> Plastic			
24-25	<input type="checkbox"/> Steel <input type="checkbox"/> Galvanized <input type="checkbox"/> Concrete <input type="checkbox"/> Open hole <input type="checkbox"/> Plastic			

SCREEN	Sizes of opening (Slot No.)	31-33	Diameter	34-38	Length	39-40
	8-10	6	inches	6	6 1/2	feet
	Material and type	STAINLESS STEEL			Depth at top of screen	41-44
						feet

61		PLUGGING & SEALING RECORD	
<input type="checkbox"/> Annular space		<input type="checkbox"/> Abandonment	
Depth set at - feet		Material and type (Cement grout, bentonite, etc.)	
From	To		
10-12 11	14-17 12	BENSEAL	
18-21	22-25		
28-29	30-33	80	

71	Pumping test method ¹⁰ <input type="checkbox"/> Pump <input checked="" type="checkbox"/> Bailer		Pumping rate ¹¹⁻¹⁴ 15 GPM		Duration of pumping ¹⁷⁻¹⁸ 2 Hours 15 Mins	
	Static level		Water level end of pumping		Water levels during ¹ <input checked="" type="checkbox"/> Pumping ² <input type="checkbox"/> Recovery	
	15-24 34 feet	22-24 60 feet	15 minutes ²⁶⁻²⁸ 60 feet	30 minutes ²⁹⁻³¹ 60 feet	45 minutes ³²⁻³⁴ 60 feet	60 minutes ³⁵⁻³⁷ 60 feet
	If flowing give rate ³⁸⁻⁴¹ GPM		Pump intake set at feet		Water at end of test ⁴² <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Cloudy	
	Recommended pump type <input type="checkbox"/> Shallow <input checked="" type="checkbox"/> Deep		Recommended pump setting ⁴³⁻⁴⁵ 100 feet		Recommended pump rate ⁴⁶⁻⁴⁹ 25 GPM	

FINAL STATUS OF WELL

1 ☒ Water supply
2 ☐ Observation well
3 ☐ Test hole
4 ☐ Recharge well
5 ☐ Abandoned, insufficient supply
6 ☐ Abandoned, poor quality
7 ☐ Abandoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE 55-56

1 <input checked="" type="checkbox"/> Domestic	5 <input type="checkbox"/> Commercial	9 <input type="checkbox"/> Not used
2 <input type="checkbox"/> Stock	6 <input type="checkbox"/> Municipal	10 <input type="checkbox"/> Other
3 <input type="checkbox"/> Irrigation	7 <input type="checkbox"/> Public supply	
4 <input type="checkbox"/> Industrial	8 <input type="checkbox"/> Cooling & air conditioning	

METHOD OF CONSTRUCTION 57

1 <input checked="" type="checkbox"/> Cable tool	5 <input type="checkbox"/> Air percussion	9 <input type="checkbox"/> Driving
2 <input type="checkbox"/> Rotary (conventional)	6 <input type="checkbox"/> Boring	10 <input type="checkbox"/> Digging
3 <input type="checkbox"/> Rotary (reverse)	7 <input type="checkbox"/> Diamond	11 <input type="checkbox"/> Other
4 <input type="checkbox"/> Rotary (air)	8 <input type="checkbox"/> Jetting	

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.

Hand-drawn map showing the location of a well. The map is divided into four quadrants by a vertical line and a horizontal line. The vertical line is labeled "DUFFERIN RD" and "COUNTY 18". The horizontal line is labeled "DUFFERIN COUNTY" and "RD 21". The quadrants are labeled "N" (North), "S" (South), "W" (West), and "E" (East). A well is marked with an "X" in the NE quadrant, labeled "350 FT WELL". A distance of "200 FT" is marked along the vertical line from the intersection to the well.

Name of Well Contractor	L.T.D. Well Contractor's Licence No.
MIGHTON'S WELL DRILLING	3602
Address	
RR #2 STAYNER ONT.	
Name of Well Technician	Well Technician's Licence No.
TERRY MIGHTON	T-0130
Signature of Technician/Contractor	Submission date
Kenneth S. Mighton	day 17 mo 5 yr

MINISTRY USE ONLY	Data source	58	Contractor	59-62	Date received	63-66	60
			3602		MAY 21 1999		
	Date of inspection		Inspector				
	Remarks						
	CSS.ES9						

Appendix C – PCSWMM Existing Condition Model Output

Active coordinate

44° 15' 15" N, 80° 3' 14" W (44.254167,-80.054167)

Retrieved: Sat, 02 Jan 2021 23:27:13 GMT



Oops! Something went wrong.

This page didn't load Google Maps correctly. See the JavaScript console for technical details.

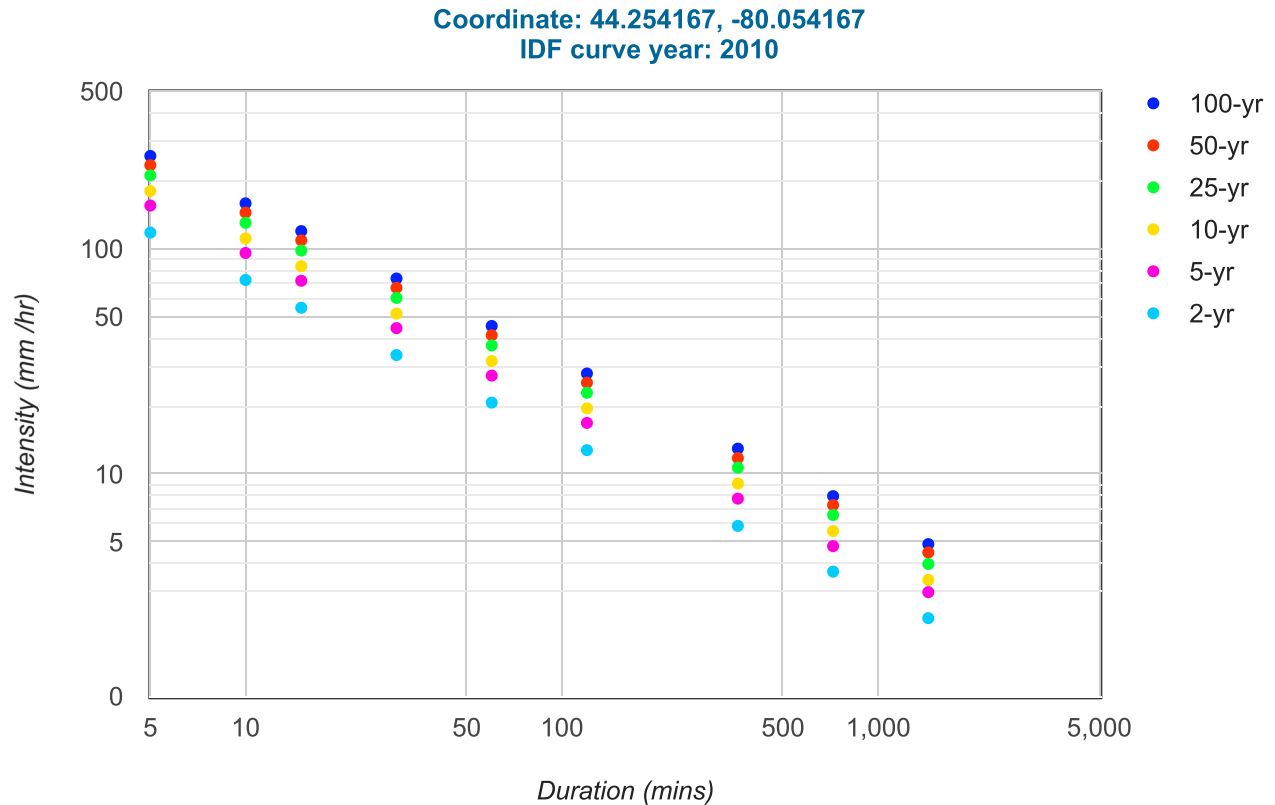
Location summary

These are the locations in the selection.

IDF Curve: 44° 15' 15" N, 80° 3' 14" W (44.254167,-80.054167)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 44° 15' 15" N, 80° 3' 14" W (44.254167,-80.054167)

Retrieved: Sat, 02 Jan 2021 23:27:13 GMT

Data year: 2010

IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	20.8	27.4	31.8	37.3	41.4	45.5
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr⁻¹)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	118.1	72.8	54.8	33.8	20.8	12.8	5.9	3.7	2.3
5-yr	155.6	95.9	72.2	44.5	27.4	16.9	7.8	4.8	3.0
10-yr	180.6	111.3	83.8	51.6	31.8	19.6	9.1	5.6	3.4
25-yr	211.9	130.5	98.3	60.6	37.3	23.0	10.7	6.6	4.0
50-yr	235.2	144.9	109.1	67.2	41.4	25.5	11.8	7.3	4.5
100-yr	258.4	159.2	119.9	73.9	45.5	28.0	13.0	8.0	4.9

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	9.8	12.1	13.7	16.9	20.8	25.6	35.7	43.9	54.1
5-yr	13.0	16.0	18.1	22.2	27.4	33.8	47.0	57.9	71.3
10-yr	15.1	18.5	21.0	25.8	31.8	39.2	54.5	67.2	82.8
25-yr	17.7	21.8	24.6	30.3	37.3	46.0	64.0	78.8	97.1
50-yr	19.6	24.1	27.3	33.6	41.4	51.0	71.0	87.5	107.8
100-yr	21.5	26.5	30.0	36.9	45.5	56.1	78.0	96.1	118.4

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Last Modified: September 2016

Existing Condition PCSWMM Model Plan View



2020-090 Existing Condition - 100 year SCS Type II

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

Element Count

Number of rain gages 14
Number of subcatchments ... 2
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
25mmChicago	25mmChicago	INTENSITY	5 min.
Chicago_4h_100yr	Chicago_4h_100yr	INTENSITY	5 min.
Chicago_4h_10yr	Chicago_4h_10yr	INTENSITY	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	INTENSITY	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	INTENSITY	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	INTENSITY	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	INTENSITY	5 min.
SCS_Type_II_24hr_100yr	SCS_Type_II_24hr_100yr	INTENSITY	15 min.
SCS_Type_II_24hr_10yr	SCS_Type_II_24hr_10yr	INTENSITY	15 min.
SCS_Type_II_24hr_25yr	SCS_Type_II_24hr_25yr	INTENSITY	15 min.
SCS_Type_II_24hr_50yr	SCS_Type_II_24hr_50yr	INTENSITY	15 min.
SCS_Type_II_24hr_5yr	SCS_Type_II_24hr_5yr	INTENSITY	15 min.
SCS_Type_II_24r_2yr	SCS_Type_II_24r_2yr	INTENSITY	15 min.
Timmins	Timmins	CUMULATIVE	60 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	2.03	152.08	16.25	9.1000	SCS_Type_II_24hr_100yr	S2
S2	1.62	100.06	0.00	4.1000	SCS_Type_II_24hr_100yr	J1

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	264.50	0.50	0.0	
OF1	OUTFALL	264.40	0.00	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	OF1	CONDUIT	25.7	0.3896	0.0100

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	DUMMY	0.00	0.00	0.00	0.00	1	0.00

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units CMS

Process Models:

Rainfall/Runoff YES
RDII NO
Snowmelt NO
Groundwater NO
Flow Routing YES
Ponding Allowed YES

Water Quality NO
 Infiltration Method GREEN_AMPT
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 01/02/2021 00:00:00
 Ending Date 01/04/2021 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 1
 Head Tolerance 0.001500 m

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	0.432	118.398
Evaporation Loss	0.000	0.000
Infiltration Loss	0.423	115.970
Surface Runoff	0.009	2.438
Final Storage	0.001	0.181
Continuity Error (%)	-0.161	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.009	0.089
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.009	0.089
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 4.50 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging : 0.00
Time Step Frequencies :
5.000 - 3.155 sec : 100.00 %
3.155 - 1.991 sec : 0.00 %
1.991 - 1.256 sec : 0.00 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10 ⁶ ltr	Peak Runoff CMS	Runoff Coeff
S1	118.40	0.00	0.00	98.34	18.93	1.01	19.94	0.40	0.19	0.168
S2	118.40	24.96	0.00	138.04	0.00	5.49	5.49	0.09	0.10	0.038

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.00	0.00	264.50	0 00:00	0.00
OF1	OUTFALL	0.00	0.00	264.40	0 00:00	0.00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.099	0.099	0 12:00	0.089	0.089	0.000
OF1	OUTFALL	0.000	0.099	0 12:00	0	0.089	0.000

Node Surge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	48.00	0.000	0.500

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	1.37	0.037	0.099	0.089
System	1.37	0.037	0.099	0.089

Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	DUMMY	0.099	0 12:00			

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up		Down		Sub		Sup		
		Dry	Dry	Dry	Crit	Crit	Crit	Crit	Norm	Inlet
									Ltd	Ctrl

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Wed Jan 27 09:33:53 2021
Analysis ended on: Wed Jan 27 09:33:54 2021
Total elapsed time: 00:00:01

Appendix D – PCSWMM Proposed Condition Model Output

Project Name: Alpha Storage Inc.
Project No.: 2020-090
Location: Township of Mulmur
Created By: BC
Checked By: CC
Date Created: 13-Jan-21
Date Modified: 26-Jan-21



Rain Garden Outlet

Outlet Type	Elevation (m)	Head (m)	H (m)	Overflow Weir m ³ /s	Total m ³ /s	Storm Event	Max WSEL
						100 yr Chicago	267.08
BCW	267.09	0.00	0.00	0	0.000		
BCW	267.14	0.05	0.05	0.031879886	0.032		
BCW	267.19	0.10	0.10	0.099827863	0.100	100 yr SCS	267.18
BCW	267.24	0.15	0.15	0.201138243	0.201		
BCW	267.29	0.20	0.20	0.33698933	0.337		
BCW	267.34	0.25	0.25	0.509133221	0.509		
BCW	267.39	0.30	0.30	0.719457069	0.719		
BCW	267.44	0.35	0.35	0.969858681	0.970		
BCW	267.49	0.40	0.40	1.262203477	1.262		
BCW	267.54	0.45	0.45	1.598309097	1.598		
BCW	267.59	0.50	0.50	1.979940833	1.980		

Broad Crested

$$Q = C \times (2g)^{(1/2)} \times (2/3 \times L \times H^{(3/2)} + 8/15 (\tan A) \times H^{(5/2)})$$

Q = discharge over weir in cu.m /s

C = 0.86

g = gravity, 9.8 m/s²

H = height of flow over weir (depth of flow over weir)

L = Width of weir normal to flow

A = Angle of the weir channel banks

Slope (H:V)	Angle Degrees
3:1	71.56
4:1	75.96
5:1	78.69
6:1	80.54
10:1	84.29
20:1	87.14

C	0.86
L	1
A (degrees)	71.56
A (radians)	1.24893668

(Vol. III - Hydrologic Analysis and Flow Control BMP's, 2001, trapezoidal broad crested weir (emergency overflow spillway))

Project Name: Alpha Storage Inc.
Project No.: 2020-090
Location: Township of Mulmur
Created By: BC
Checked By: CC
Date Created: 25-Jan-20
Date Modified: 26-Jan-21



Cutoff Swale

SWALE	Side	SWALE	SWALE	SWALE	Swale	SWALE	SWALE	Hydraulic	Wetted	SWALE	Maximum	Maximum	Time
Shape	Slope	Length	n	depth	Bottom Width	Top width	x-sect A	Radius	Perimeter	Slope	Capacity	Velocity	To Flow
	X:1	m		m	m	m	m ²	Rh	Rh	%	m ³ /s	m/s	minutes
Triangular	3	56	0.027	0.3	na	1.8	0.27	0.14	1.90	0.6	0.21	0.78	1.19

Mannings Equation

$$Q = (1.0/n) \times A \times R_h^{(2/3)} \times S_o^{(1/2)}$$

where:
 Q = discharge through channel in m³/s
 A = cross sectional area of channel at flow depth
 R_h = wetted perimeter = By/(B+2y)
 B = Channel Width
 y = flow depth
 n = roughness coefficient = concrete = 0.015
 S_o = Channel Slope

2020-090 Post Development - 24 hour 100-year SCS Type II (Includes incoming external flows)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

Element Count

Number of rain gages 14

Number of subcatchments ... 6

Number of nodes 9

Number of links 7

Number of pollutants 0

Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
25mmChicago	25mmChicago	INTENSITY	5 min.
Chicago_4h_100yr	Chicago_4h_100yr	INTENSITY	5 min.
Chicago_4h_10yr	Chicago_4h_10yr	INTENSITY	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	INTENSITY	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	INTENSITY	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	INTENSITY	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	INTENSITY	5 min.
SCS_Type_II_24hr_100yr	SCS_Type_II_24hr_100yr	INTENSITY	15 min.
SCS_Type_II_24hr_10yr	SCS_Type_II_24hr_10yr	INTENSITY	15 min.
SCS_Type_II_24hr_25yr	SCS_Type_II_24hr_25yr	INTENSITY	15 min.
SCS_Type_II_24hr_50yr	SCS_Type_II_24hr_50yr	INTENSITY	15 min.
SCS_Type_II_24hr_5yr	SCS_Type_II_24hr_5yr	INTENSITY	15 min.
SCS_Type_II_24r_2yr	SCS_Type_II_24r_2yr	INTENSITY	15 min.
Timmins	Timmins	CUMULATIVE	60 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	1.75	131.27	16.25	9.1000	SCS_Type_II_24hr_100yr	S2
S2	1.02	88.42	5.50	3.5000	SCS_Type_II_24hr_100yr	J1
S3	0.32	81.67	47.50	3.0000	SCS_Type_II_24hr_100yr	J2

S4	0.28	80.51	70.20	1.0000	SCS_Type_II_24hr_100yr	J4
S5	0.03	19.14	63.60	2.0000	SCS_Type_II_24hr_100yr	J5
S6	0.25	129.38	47.00	10.0000	SCS_Type_II_24hr_100yr	S3

LID Control Summary

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
S2	DrySwale	1	100.80	1.80	0.99	100.00	17.60

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	264.50	0.50	0.0	
J2	JUNCTION	267.56	0.30	0.0	
J3	JUNCTION	266.91	0.82	0.0	
J4	JUNCTION	267.32	0.30	0.0	
J5	JUNCTION	266.78	0.84	0.0	
J6	JUNCTION	266.94	0.60	0.0	
OF1	OUTFALL	264.40	0.00	0.0	
OF2	OUTFALL	266.75	0.00	0.0	
J7	STORAGE	266.34	1.14	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	OF1	CONDUIT	25.7	0.3896	0.0100
C2_2	J6	J3	CONDUIT	6.1	0.4912	0.0270
C2_3	J2	J7	CONDUIT	76.2	0.6165	0.0270
C3	J4	J5	CONDUIT	118.4	0.4560	0.0270
C4	J5	OF2	CONDUIT	33.1	0.0907	0.0100
C5	J3	J5	CONDUIT	26.7	0.4860	0.0130
C2_4	J7	J6	OUTLET			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	DUMMY	0.00	0.00	0.00	0.00	1	0.00
C2_2	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.50
C2_3	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.56
C3	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.48
C4	DUMMY	0.00	0.00	0.00	0.00	1	0.00
C5	CIRCULAR	0.45	0.16	0.11	0.45	1	0.20

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units CMS

Process Models:

Rainfall/Runoff YES

RDII NO

Snowmelt NO

Groundwater NO

Flow Routing YES

Ponding Allowed YES

Water Quality NO

Infiltration Method GREEN_AMPT

Flow Routing Method DYNWAVE

Surcharge Method EXTRAN

Starting Date 01/02/2021 00:00:00

Ending Date 01/04/2021 00:00:00

Antecedent Dry Days 0.0

Report Time Step 00:01:00

Wet Time Step 00:05:00

Dry Time Step 00:05:00

Routing Time Step 5.00 sec

Variable Time Step YES

Maximum Trials 8

Number of Threads 1

Head Tolerance 0.001500 m

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	0.432	118.398
Evaporation Loss	0.000	0.000
Infiltration Loss	0.369	101.105
Surface Runoff	0.063	17.211
Final Storage	0.002	0.452
Continuity Error (%)	-0.313	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.063	0.628
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.033	0.334
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.029	0.290
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.526	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 2.49 sec

Average Time Step : 4.99 sec
 Maximum Time Step : 5.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 2.00
 Percent Not Converging : 0.00
 Time Step Frequencies :
 5.000 - 3.155 sec : 99.92 %
 3.155 - 1.991 sec : 0.08 %
 1.991 - 1.256 sec : 0.00 %
 1.256 - 0.792 sec : 0.00 %
 0.792 - 0.500 sec : 0.00 %

 Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	118.40	0.00	0.00	98.34	18.93	1.01	19.94	0.35	0.16	0.168
S2	118.40	34.34	0.00	144.01	8.23	11.05	9.10	0.09	0.09	0.060
S3	118.40	45.07	0.00	75.62	76.75	10.73	87.48	0.28	0.14	0.535
S4	118.40	0.00	0.00	34.52	82.00	0.92	82.92	0.23	0.09	0.700
S5	118.40	0.00	0.00	41.53	74.08	2.01	76.09	0.02	0.01	0.643
S6	118.40	0.00	0.00	60.38	54.72	3.06	57.78	0.15	0.07	0.488

 LID Performance Summary

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
S2	DrySwale	1144.54	0.00	238.51	927.24	0.00	0.00	0.00	-1.85

 Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.00	0.00	264.50	0 00:00	0.00
J2	JUNCTION	0.01	0.15	267.71	0 12:00	0.15
J3	JUNCTION	0.00	0.21	267.12	0 12:05	0.21
J4	JUNCTION	0.01	0.14	267.46	0 12:00	0.14
J5	JUNCTION	0.00	0.00	266.78	0 12:03	0.00
J6	JUNCTION	0.00	0.18	267.12	0 12:04	0.18
OF1	OUTFALL	0.00	0.00	264.40	0 00:00	0.00
OF2	OUTFALL	0.00	0.00	266.75	0 00:00	0.00
J7	STORAGE	0.14	0.84	267.18	0 12:04	0.84

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.085	0.085	0 12:00	0.0925	0.0925	0.000
J2	JUNCTION	0.137	0.137	0 12:00	0.281	0.281	1.899
J3	JUNCTION	0.000	0.086	0 12:04	0	0.057	0.066
J4	JUNCTION	0.087	0.087	0 12:00	0.234	0.234	-0.009
J5	JUNCTION	0.008	0.133	0 12:03	0.0204	0.242	0.010
J6	JUNCTION	0.000	0.086	0 12:04	0	0.0575	-0.060
OF1	OUTFALL	0.000	0.085	0 12:00	0	0.0925	0.000
OF2	OUTFALL	0.000	0.133	0 12:03	0	0.242	0.000
J7	STORAGE	0.000	0.128	0 12:00	0	0.212	-0.901

Node Surge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
------	------	---------------------	--------------------------------------	-----------------------------------

J1 JUNCTION 48.00 0.000 0.500

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
J7	0.014	9	0	74	0.096	63	0 12:04	0.091

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	1.76	0.038	0.085	0.093
OF2	48.95	0.003	0.133	0.242
System	25.36	0.041	0.215	0.334

Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
------	------	--------------------------	--	-----------------------------	----------------------	-----------------------

C1	DUMMY	0.085	0	12:00					
C2_2	CONDUIT	0.086	0	12:04	0.35	0.17	0.64		
C2_3	CONDUIT	0.128	0	12:00	0.71	0.23	0.43		
C3	CONDUIT	0.083	0	12:00	0.96	0.17	0.24		
C4	DUMMY	0.133	0	12:03					
C5	CONDUIT	0.086	0	12:05	3.10	0.43	0.23		
C2_4	DUMMY	0.086	0	12:04					

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C2_2	1.00	0.25	0.72	0.00	0.03	0.00	0.00	0.00	0.74	0.00
C2_3	1.00	0.34	0.00	0.00	0.01	0.00	0.00	0.65	0.00	0.00
C3	1.00	0.03	0.13	0.00	0.83	0.01	0.00	0.00	0.43	0.00
C5	1.00	0.20	0.05	0.00	0.72	0.03	0.00	0.00	0.70	0.00

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Tue Jan 26 21:20:01 2021
Analysis ended on: Tue Jan 26 21:20:01 2021
Total elapsed time: < 1 sec

Appendix E – Fire Flow Calculations and Tank Information

Project: Alpha Storage Inc.
W Part Lot 26 Con. 7E

Prepared by: C. Capes
Checked by: C. Capes
Project No: 2020-090A
Date: January 15, 2021

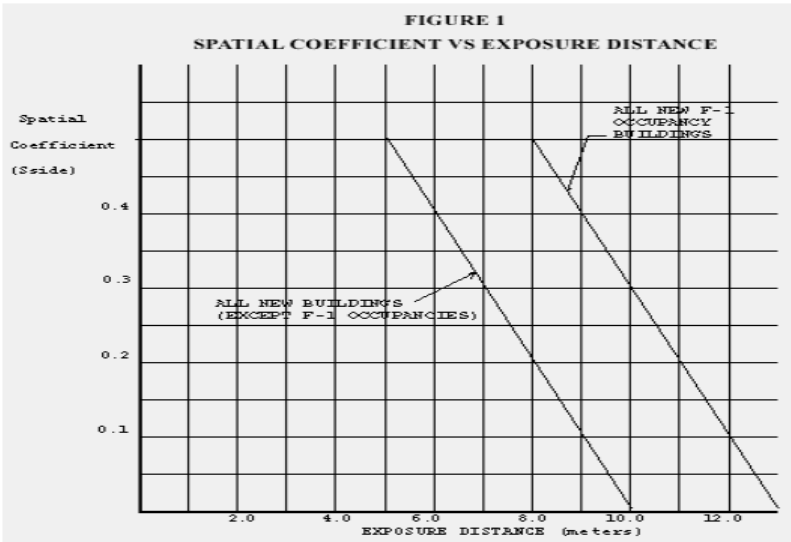
Fire Flow Calculations

Office of the Fire Marshal, OFM Guideline, Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code (Oct 1999)
Subsection 3.2.2 of the Ontario Building Code, 2012

$Q=KVS_{Total}$ where

Q = Minimum supply of water in Litres (L)
K = water supply coefficient from Table 1
V = total building volume in cubic meters
S_{Tot} = total of the spacial coefficient values from the property line exposures on all sides as obtained from the formula:
 $S_{Tot} = 1.0 + [(S_{Side1}) + (S_{Side2}) + (S_{Side3}) + \dots etc.]$

where S_{Side} values are obtained from Figure 1, as modified by Sections 6.39(e) and 6.3(f) of the OBC Guideline
S_{Tot} need not exceed 2.0



1 Building Classification:

Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches.

Water Supply Coefficient - K

Table 1 of OBC A.3.2.5.7

K = 17

Type F2, OBC Table 3.1.2.1

2 Building Volumes

Bldg.	Area	Height	Volume
	(m ²)	(m)	(m ³)
Bldg. 1	446	3.00	1338
Total			1338

Phase 1
Future Phase
Future Phase
Future Phase

Total Building Volume

3 Exposure Distances

$S_{Tot} = 1.0 + [(S_{Side1}) + (S_{Side2}) + (S_{Side3}) + \dots etc.]$

Bldg.	North	S _{Side} (N)	East	S _{Side} (E)	South	S _{Side} (S)	West	S _{Side} (W)	S _{Tot}
	(m)		(m)		(m)		(m)		
Bldg. 1	>10 m	0.00	>10m	0	>10 m	0	>10 m	0	0

Max S_{Tot}

S_{Tot} = 1.00

Max. Value = 2.0

4 Minimum Fire Water Supply

$Q=KVS_{Total}$ = 22746 Litres

5 Fire Water Supply Flow Rate

= 2700 L/min

Table 2 Required Minimum Water Supply Flow Rate (L/min), provided in the OBC A.3.2.5.7

= 45.00 L/s

6 Min. Tank Size @ 30 min. of Flow

= 81,000 L

Project: **Alpha Storage Inc.**
W Part Lot 26 Con. 7E

Prepared by: C. Capes
Checked by: C. Capes
Project No: 2020-090A
Date: January 27, 2021

Fire Flow Calculations

Office of the Fire Marshal, OFM Guideline, Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code (Oct 1999)
Subsection 3.2.2 of the Ontario Building Code, 2012

$Q = KVS_{Total}$ where

Q = Minimum supply of water in Litres (L)

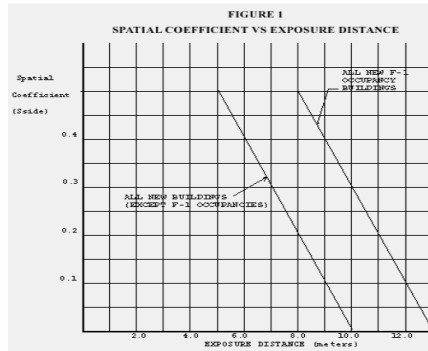
K = water supply coefficient from Table 1

V = total building volume in cubic meters

S_{Total} = total of the spatial coefficient values from the property line exposures on all sides as obtained from the formula:

$$S_{Total} = 1.0 + [(S_{Side1}) + (S_{Side2}) + (S_{Side3}) + \dots \text{etc.}]$$

where S_{Side} values are obtained from Figure 1, as modified by Sections 6.39(e) and 6.3(f) of the OBC Guideline
 S_{Total} need not exceed 2.0



1 Building Classification:

Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches.

Water Supply Coefficient - K

Table 1 of OBC A.3.2.5.7

K = 17

Type F2, OBC Table 3.1.2.1

2 Building Volumes

Bldg.	Area (m ²)	Height (m)	Volume (m ³)
Bldg. 1	446	3.00	1338
Bldg. 2	446	3.00	1338
Bldg. 3	446	3.00	1338
Total			4014

Phase 1
Future Phase
Future Phase

← Total Building Volume

3 Exposure Distances

$$S_{Total} = 1.0 + [(S_{Side1}) + (S_{Side2}) + (S_{Side3}) + \dots \text{etc.}]$$

Bldg.	North (m)	S_{Side} (N)	East (m)	S_{Side} (E)	South (m)	S_{Side} (S)	West (m)	S_{Side} (W)	S_{Total}
Bldg. 1	9.14	0.10	>10m	0	>10 m	0	>10 m	0	0.1
Bldg. 2	9.14	0.10	>10m	0	9.14	0.1	>10m	0	0.2
Bldg. 3	>10 m	0.00	>10 m	0	9.14	0.1	>10m	0	0.1

← Max S_{Total}

$$S_{Total} = 1.20$$

Max. Value = 2.0

4 Minimum Fire Water Supply

$$Q = KVS_{Total} = 81885.6 \text{ Litres}$$

5 Fire Water Supply Flow Rate

$$= 2700 \text{ L/min}$$

Table 2 Required Minimum Water Supply Flow Rate (L/min), provided in the OBC A.3.2.5.7

$$= 45.00 \text{ L/s}$$

6 Min. Tank Size @ 30 min. of Flow

$$= 81,000 \text{ L}$$



**FIBERGLASS TANKS
FOR WATER AND WATER STORAGE MANAGEMENT INDUSTRY**
Sustainable & Safe.

TABLE OF CONTENT

GRANBY COMPOSITES PRESENTATION

Advantages
Method

FIBERGLASS VS CONCRETE

SERVICE PROPOSAL

Details
Budget

FIBERGLASS TANK INSTALLATION MANUAL

- 1 • Introduction
- 2 • Preparation or requirement for installation
- 3 • Jobsite inspection
- 4 • Backfilling material
- 5 • Excavation
- 6 • Anchoring of tanks
- 7 • Underground plumbing and piping
- 8 • Installation
- 9 • Filling with water
- 10 • Plumbing and venting
- 11 • Final level of backfilling

CONTROL SHEET

TECHNICAL DRAWS

OTHER APPLICATIONS



FIBERGLASS TANKS AND SPECIALIZED EQUIPMENT

SUSTAINABLE & SAFE.

ADVANTAGES

THE BEST COMBINATION OF MATERIALS

- External structure reinforced with fiberglass polyester resin

EASY AND ECONOMICAL INSTALLATION

- 30 times lighter than concrete
- Easy to transport, install and storage tank even in regions with low population density
- Easy to handle even in restricted installation conditions
- Quick and easy installation at an affordable cost

DURABLE AND MAINTENANCE-FREE

- No corrosion, no rust
- Designed to support the weight of heavy traffic when installed to design specifications
- No need for a cathodic protection system
- No seals to replace
- Reusable

VARIABLE CAPACITY

- Range of products ranging from 5 to 150 m³ (2,000 to 40,000 US gallons)
- Simple installation of multiple tanks where high volume water needs are required
- Easy installation of several reservoirs in communicating vessels for water needs in large quantities

METHOD

INSTALL YOUR TANKS IN 4 FAST AND EASY STEPS

1. Excavate
2. Install fiberglass tank(s)
3. Install accessories
4. Backfill

THAT'S IT!

YOU NOW HAVE ECONOMICAL ACCESS TO A DURABLE AND RELIABLE RESERVOIR OF WATER FOR ALL YOUR NEEDS.



THE SMART SOLUTION

FIBERGLASS VS. CONCRETE



MORE ECONOMICAL THAN CONCRETE

The fiberglass proves much more economical in the long run. Considering all the benefits associated with the purchase, installation, maintenance and durability, fiberglass tank is a much more profitable solution, especially for systems of medium to large capacity.

MORE DURABLE THAN CONCRETE

Once installed and buried, the fiberglass tank becomes completely inert. Its durability is significantly higher and tightness remains full time. Fiberglass advantageously differs from all points of view.

No deterioration. Unlike concrete, fiberglass and contains no metal undergoes no degradation over time due to the galvanic action on the armature may degrade performance.

No internal or external corrosion. The fiberglass tank never rust since it contains no metal reinforcement. Moreover, the non-porous interior finish prevents the proliferation of algae, bacteria or microbes (MIC, microbial induced corrosion).

No structural weakness. Unlike concrete, fiberglass is non-porous material which undergoes no dilation. This stability provides a complete seal and prevents any possible cracks due to expansion and contraction over time. The unibody construction of fiberglass makes it a robust and monolithic solution that has no weakness can cause a leak.

WITHOUT MAINTENANCE, UNLIKE CONCRETE

By its monohull and impermeable nature of the fiberglass tank requires no maintenance program or waterproofing coating. Thus, it advantageously simplifies your operations.

- No special monitoring
- Insensitivity to stray electrical currents
- No seal replace
- No overlay throughout the life of the reservoir
- Total peace of mind for years to come

THE SMART SOLUTION

FIBERGLASS VS. CONCRETE



LIGHTER THAN CONCRETE

A fiberglass tank is almost 30 times lighter than a comparable* concrete tank. Forget the heavy cranes ! The economy is major.

Easy handling. This extraordinary lightness facilitates the transportation, installation and relocation. In addition, the strength and structure of the monocoque fiberglass make a product that can withstand the worst installation conditions. No assembly on site is required.

Stable. In the case where the water table would reach the tank, a system for performing offset anchoring a floating potential. Even very light tank fiberglass remains extremely stable. It is also designed for dry or flooded excavation

** Comparison based on the weight of a septic tank of 60 m³. 66 320 Kg for a concrete tank vs 2109 kg for a fiberglass tank.*

MORE SCALABLE THAN CONCRETE

The fiberglass tank facilitates connectivity complementary tanks through the principle of communicating vessels. This advantage allows you to design systems to unlimited capacity.

Variety of standard volumes up to 157 m³

Variable configurations that can adapt to the constraints of land

Design and manufacture tailored to meet the specific needs

MOST POPULAR PRODUCTS

NN08240476

12,500 gal. (US) 10,500 gal. (UK) 47,600 L
Diameter: 2,438 mm (8')
Length: 11,365 mm (37' 3 1/2")
Weight: 1,630 kg (3,594 pounds)



NN08290573

15,000 gal. (US) 12,490 gal. (UK) 56,800 L
Diameter: 2,438 mm (8')
Length: 13,551 mm (44' 5 1/2")
Weight: 2,041 kg (4,500 pounds)



NN08350687

18,000 gal. (US) 14,990 gal. (UK) 68,100 L
Diameter: 2,438 mm (8')
Length: 16,573 mm (54' 4 1/2")
Weight: 2,654 kg (6,860 pounds)



NN08390760

20,000 gal. (US) 16,665 gal. (UK) 75,700 L
Diameter: 2,438 mm (8')
Length: 18,665 mm (61' 2 7/8")
Weight: 2,880 kg (6,360 pounds)



NN10100452

12,000 gal. (US) 9,990 gal. (UK) 45,400 L
Diameter: 3,048 mm (10')
Length: 7,112 mm (23' 4")
Weight: 1,814 kg (4,000 pounds)



NN10200760

20,000 gal. (US) 16,650 gal. (UK) 75,700 L
Diameter: 3,048 mm (10')
Length: 11,391 mm (37' 4 1/2")
Weight: 2,767 kg (6,100 pounds)



NN10260950

25,000 gal. (US) 20,880 gal. (UK) 94,600 L
Diameter: 3,048 mm (10')
Length: 13,996 mm (45' 11")
Weight: 3,425 kg (7,550 pounds)



NN10321135

30,000 gal. (US) 24,980 gal. (UK) 113,600 L
Diameter: 3,048 mm (10')
Length: 16,610 mm (64' 2")
Weight: 3,969 kg (8,750 Pounds)



NN10381325

35,000 gal. (US) 29,140 gal. (UK) 132,600 L
Diameter: 3,048 mm (10')
Length: 19,113 mm (62' 8 1/2")
Weight: 4,559 kg (10,060 Pounds)



NN10441513

40,000 gal. (US) 33,310 gal. (UK) 151,400 L
Diameter: 3,048 mm (10')
Length: 21,716 mm (71' 3")
Weight: 5,262 kg (11,600 pounds)



SERVICE PROPOSAL

NAME Clayton Capes
COMPANY CAPES Engineering Ltd.
STATE ON
PHONE 7059944818
QUOTE ID: 20210115-04-P

We are pleased to submit our proposal for the provision of a new fiberglass tank.

We pledge to become a reliable, responsible partner and guide you through your projects.

OUR QUOTE INCLUDED

• 2 X Fire Protection NN10220822FP (21588 US gal. 81718 liters)

EACH TANK INCLUDED

TANK 1

- One dry hydrant 6 inch NH or Storz tread with an elbow (as specify by your Fire Department).
- One manhole 30 inches (76.2 cm) diameter to allow internal access to the tank. This manhole will be provided with fiberglass cover and able to receive padlock to avoid unwanted intrusion.
- A manhole extension of approximately 4 feet (1.2 m) will be provide. (The exact length will be determined with your installation characteristics.)
- A foam cover will be included to prevent frosting by the manhole.
- An output of 4 inches (10 cm) on top tanks to receive the vent.
- A pipe of 6 inches (15 cm) diameter will be installed inside and outside on top tanks to receive the dry hydrant.
- Vent including Water level gauge.
- The bolts, nuts, glue and primer will be provided to install all accessories

BUDGET

OUR BUDGET PRICE

- 2 X Fire Protection NN10220822FP (21588 US gal. 81718 liters) : 73,208.00 \$ CAD
Optional Anchoring Kit : 14,179.20 \$ CAD
-

- All taxes are extra.
 - The transportation is not included.
 - This proposal is valid for a period of 90 days.
 - The lead time for delivery will be confirmed on order but should be between 4 to 6 weeks.
-

We hope all in accordance, please do not hesitate if you need further information.

Please accept our most distinguished sentiments.

L'équipe des ventes | Sales Team

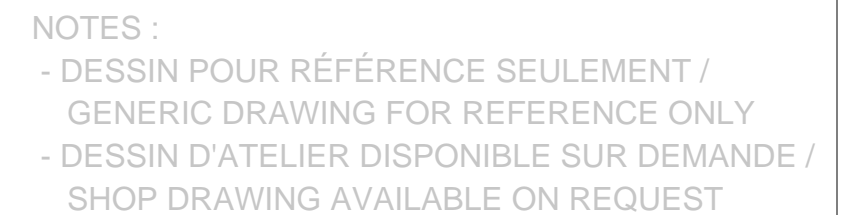
T 819 **344-2525**


info.gc@granbyindustries.com



WWW.GRANBYCOMPOSITES.COM

RÉSERVOIR DE FIBRE DE VERRE / FIBERGLASS TANK

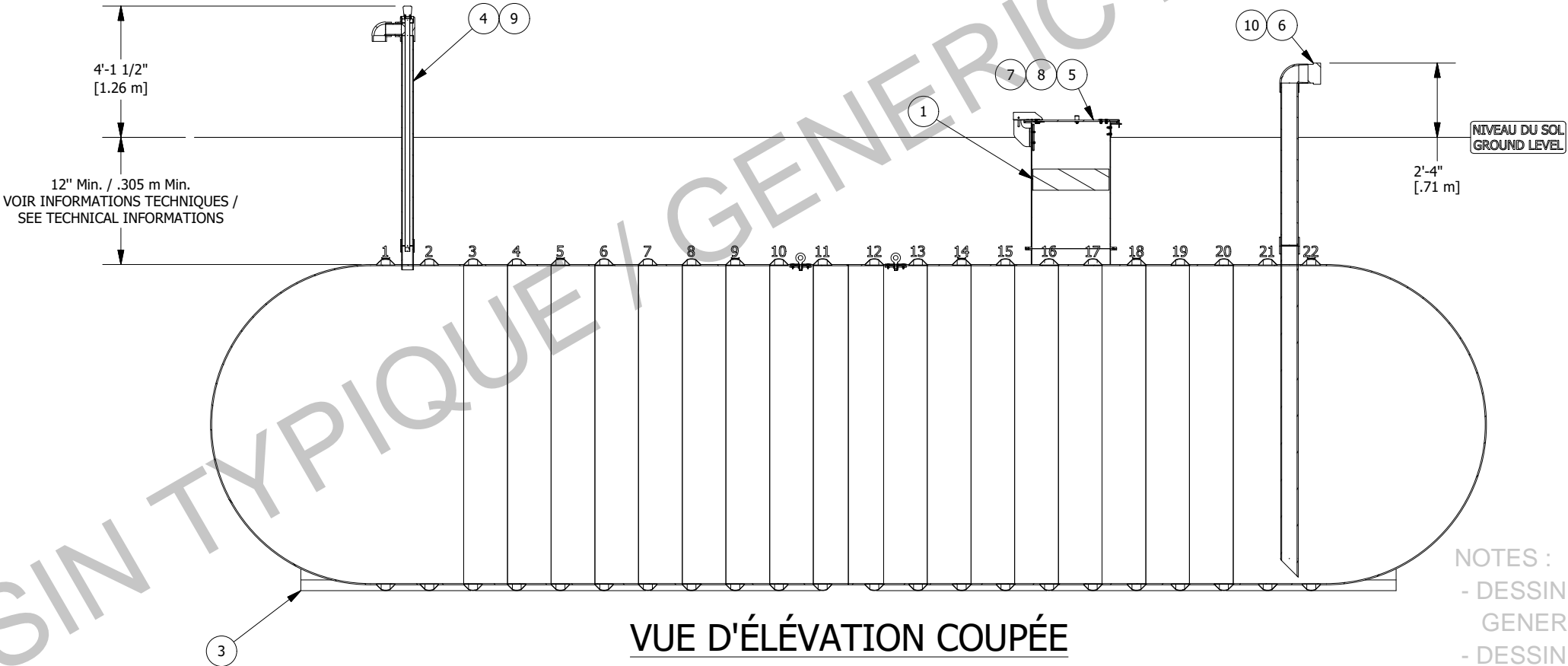
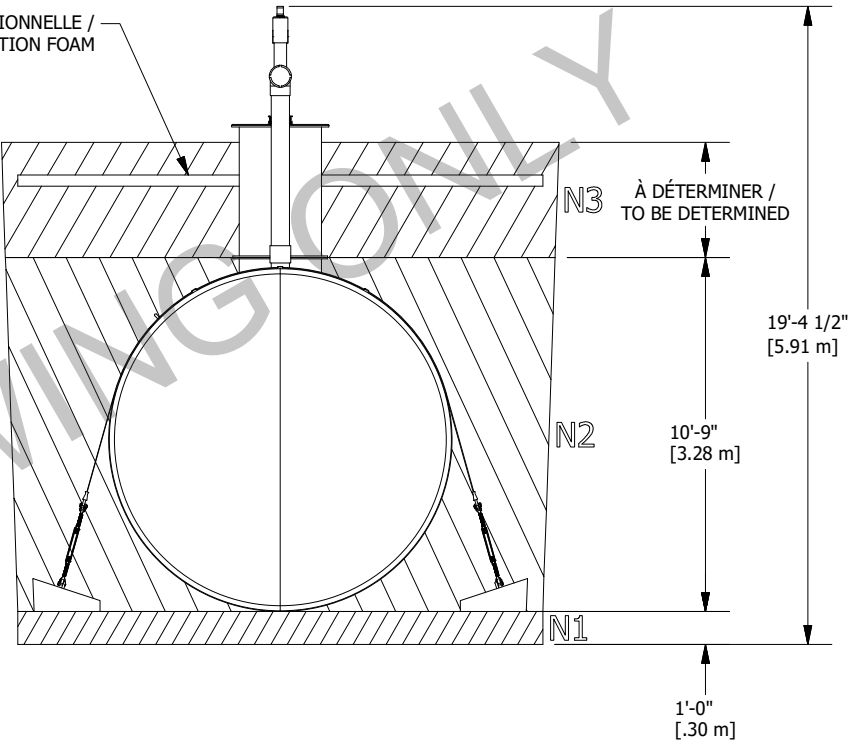


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TOLERANCES (LINÉAIRES / LINEAR) 0 OR FRAC. (X/X) -> ± 1% 0.00 -> ± 0.25" 0.0 -> ± 0.5" 0.000 -> ± 0.125"		Description de la révision / Revision description		Granby Composites Inc.		
				© 2018 Granby Composites Inc.		
TOLERANCES (ANGULAIRES / ANGULAR) 0 -> ± 2 DEG. 0.0 -> ± 0.5 DEG. 0.00 -> ± 0.1 DEG.		Dessiné par / Drawn by S. Potvin		01/03/2018		
		Approuvé par / Approved by :				
Poids / Weight : 5494 Lb / 2492 Kg				Description / Title RÉSERVOIR 10' Dia. / 81718 L / 21588 gal US - TANK		
Client		Unités / Units INCHES	Feuille / Sheet 1 / 4	# Projet Project #		

Item	Numéro de pièce / Part Number	Qté / Qty	Description	Check List
1	ADF0000001	1	FOAM 28¾" DIA. x 8" ÉP. / FACTEUR R-35	
2	ADP0000001	4	PLAQUES DE LEVAGE (Granby #AS1108) - LIFTING LUG	
3	ENSCOUR10	6	JEUX DE COURROIES ET BLOCS DE BÉTON - ANCHORING KIT	
4	EV480J	1	ENSEMBLE ÉVENT AVEC JAUGE - 4" SCH. 80 - VENT KIT WITH GAUGE	
5	GMHE30-COVER01	1	COUVERCLE DE TROU HOMME CADENASSABLE AVEC PENTURE - 30" DIA. FRP. - LOCKABLE MAN HOLE COVER WITH HINGE	
6	KB-BNH0600090	1	ENSEMBLE BORNE FONTAINE - 6"NH 90° - FIRE HYDRANT KIT	
7	MH-30 (6"L.)	1	TROU D'HOMME - 30" DIA. x 6" L. - MANHOLE	
8	MHE-30 (48"L.)	1	EXTENSION DE TROU D'HOMME - 30" DIA. x 48" L. - MANHOLE EXTENSION	
9	TP80400G01 (9"L.)	1	TUYAU PVC GRIS - 4" SCH.80 - PVC PIPE GREY	
10	TP80600G01 (125"L.)	1	TUYAU PVC GRIS COUPÉ 45° - 6" SCH.80 - PVC PIPE GREY 45° CUT	

PROPRIÉTÉS DU REMBLAI / BACKFILL PROPERTIES
N1 - GRAVILLON 1/8" À 3/4" OU PIERRE NETTE 1/2"
1/8" TO 3/4" PEA GRAVEL OR 1/2" CRUSHED STONE
N2 - REMBLAI PRIMAIRE, GRAVILLON 1/8" À 3/4" OU PIERRE NETTE 1/2"
PRIMARY BACKFILL, 1/8" TO 3/4" PEA GRAVEL OR 1/2" CRUSHED STONE
N3 - REMBLAI SECONDAIRE, SABLE GROSSIER OU GRAVIER 1 1/2" OU MOINDRE
SECONDARY BACKFILL, COARSE SAND OR GRAVEL 1 1/2" OR LESS

PAROI ISOLANTE OPTIONNELLE /
OPTIONAL INSULATION FOAM



VUE D'ÉLÉVATION COUPÉE
CUT ELEVATION VIEW

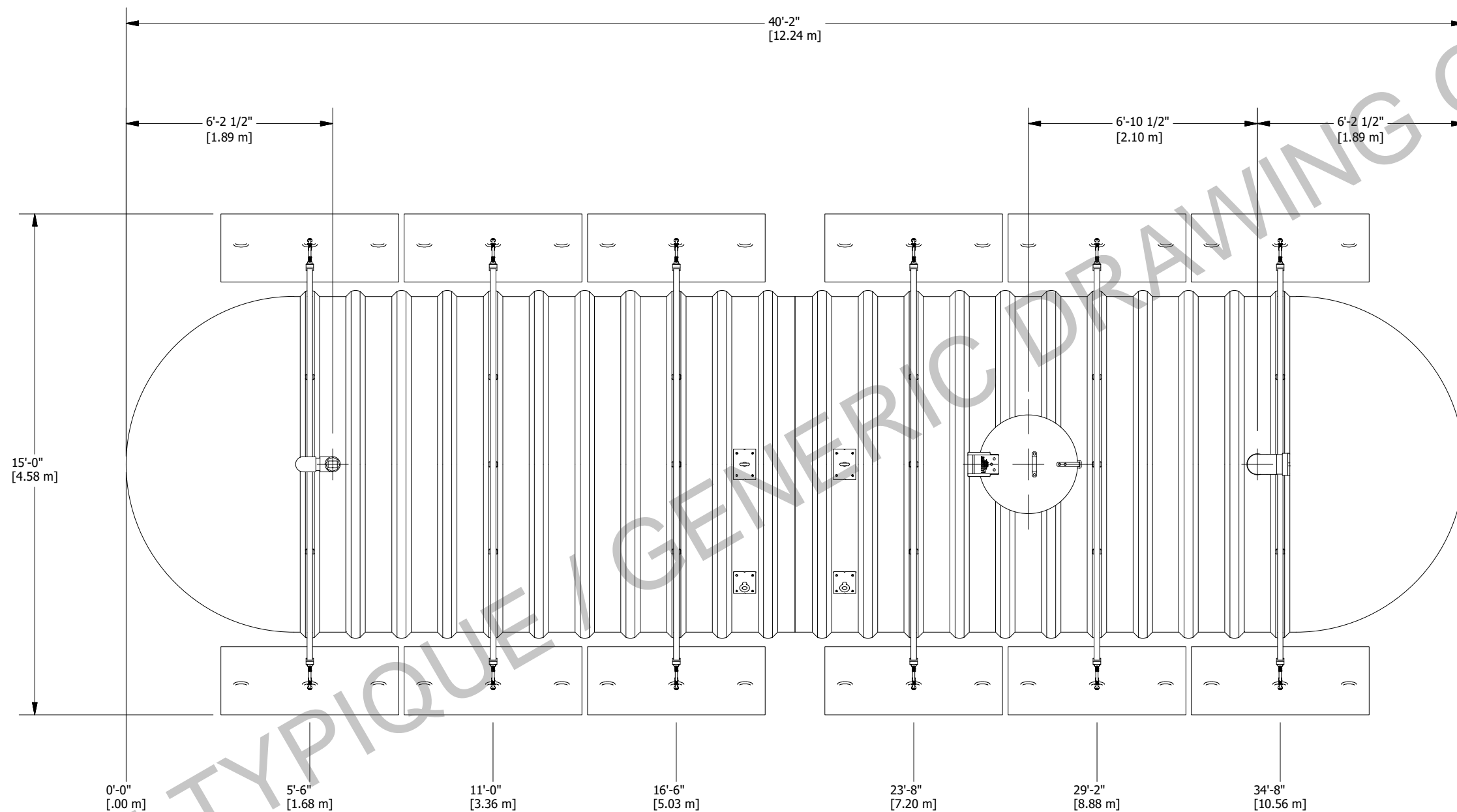
Ancrage optionel selon les conditions du terrain / Optional anchoring depending on the tank's environment

- Informations techniques / Technical informations**
- Profondeur d'enfouissement / Burial depth: Selon les conditions géotechniques d'installation / According to the geotechnical installation conditions
 - Diamètre intérieur / Inside Diameter : 120" / 3.048 m
 - (Si requis) Quantité de courroies de fibre de verre avec attaches en acier galvanisé / (If required) Quantity of fiberglass anchoring straps : 6
 - (Si requis) Quantité de blocs de béton armé / (If required) Quantity of reinforced concrete deadman anchors : 12
 - Longueur minimale requise de la chaîne pour le levage à 60° / Minimum required length of the chain for the 60° lifting : 72"
 - Évalué HS-20 à une profondeur d'enfouissement de 36 à 60 pouces , .9144 m à 1.524 m / HS-20 rated for burial depth from 36 to 60 inches , .9144 m to 1.524 m
 - Fabriqué selon les exigences ANSI-AWWA D120 / Manufactured according to ANSI-AWWA D120 requirements

Le réservoir doit être installé selon les instructions du manufacturier. / The tank must be installed in accordance with the manufacturer's instructions.

- NOTES :
- DESSIN POUR RÉFÉRENCE SEULEMENT /
GENERIC DRAWING FOR REFERENCE ONLY
 - DESSIN D'ATELIER DISPONIBLE SUR DEMANDE /
SHOP DRAWING AVAILABLE ON REQUEST


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TOLERANCES (LINÉAIRES / LINEAR) 0 OR FRAC. (X/X) -> ± 1% 0.00 -> ± 0.25" 0.0 -> ± 0.5" 0.000 -> ± 0.125"		Description de la révision / Revision description		Granby Composites Inc. © 2018 Granby Composites Inc.	
TOLERANCES (ANGULAIRES / ANGULAR) 0 -> ± 2 DEG. 0.0 -> ± 0.5 DEG. 0.00 -> ± 0.1 DEG.		Dessiné par / Drawn by S. Potvin		Format / Size B	REV 01.
Poids / Weight : 5494 Lb / 2492 Kg		Approuvé par / Approved by :		Description / Title RÉSERVOIR 10' Dia. / 81718 L / 21588 gal US - TANK	
Client		Unités / Units INCHES	Feuille Sheet 2 / 4	# Projet Project #	

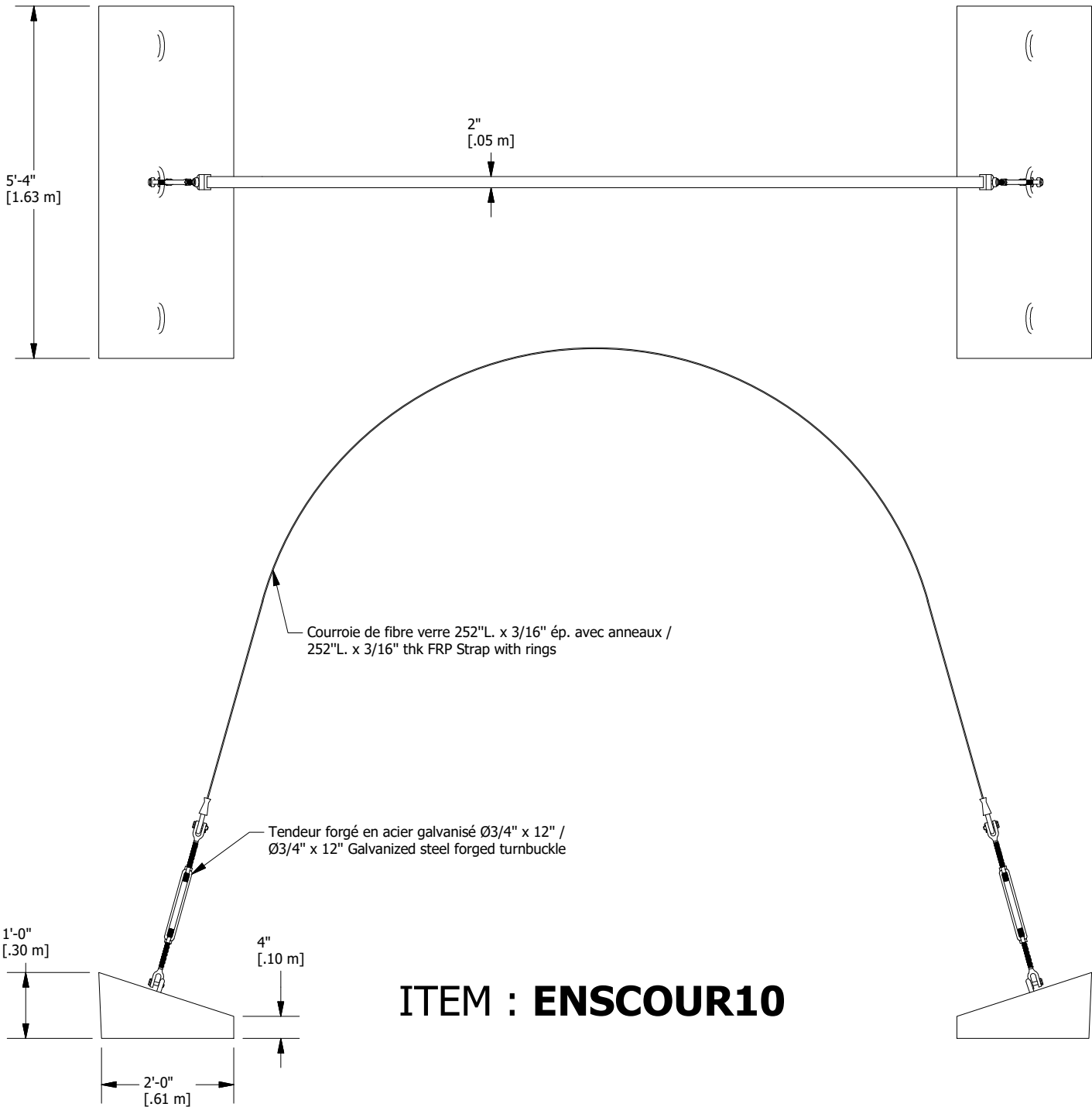


VUE DE PLAN
PLAN VIEW

NOTES :

- DESSIN POUR RÉFÉRENCE SEULEMENT /
GENERIC DRAWING FOR REFERENCE ONLY
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TOLERANCES (LINÉAIRES / LINEAR) 0 OR FRAC. (X/X) -> ± 1% 0.00 -> ± 0.25" 0.0 -> ± 0.5" 0.000 -> ± 0.125"		Description de la révision / Revision description		Granby Composites Inc. © 2018 Granby Composites Inc.		
TOLERANCES (ANGULAIRES / ANGULAR) 0 -> ± 2 DEG. 0.0 -> ± 0.5 DEG. 0.00 -> ± 0.1 DEG.				Format / Size B	No de la pièce / Part no. NN10220822FP	
Poids / Weight : 5494 Lb / 2492 Kg		Dessiné par / Drawn by S. Potvin		01/03/2018	Description / Title RÉSERVOIR 10' Dia. / 81718 L / 21588 gal US - TANK	
Client		Approuvé par / Approved by :				
		Unités / Units INCHES	Feuille Sheet 3 / 4	# Projet Project #		



Tendeur / Turnbuckle

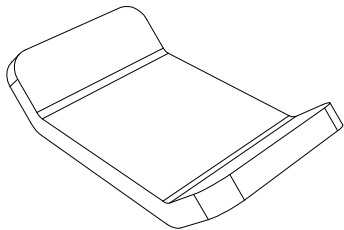
- Forgé d'acier au carbone, galvanisé à chaud / Forged carbon steel, hot-dip galvanized
- Conformément aux spécifications américaines FF-T-791B Type 1, forme 1 (cage ouverte) / In accordance with US specifications FF-T-791B Type 1, Form 1 (open cage).
- Coefficient de sécurité 5:1 / Safety factor 5:1
- Testé à 5,200 Lbs / Working load 5,200 Lbs

Bloc de béton armé / Concrete deadman anchor

- Poids : 1,093 Lbs / Weight : 1,093 Lbs
- Renforcé d'acier galvanisé / Reinforced with galvanized steel


Courroie de fibre de verre / Fiberglass strap

- Fait de fibre de verre de haute qualité / High quality fiberglass
- Testé à 20,000 Lbs / Working load 20,000 Lbs
- Résistance maximale : 45,000 Lbs / Ultimate rated 45,000 Lbs
- Muni d'anneaux en acier galvanisé / Equipped with galvanized steel rings



Guide de courroie en fibre de verre -
Fiberglass Strap Guide

Directement installé sur le réservoir -
Directly installed on the tank

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TOLERANCES (LINÉAIRES / LINEAR) 0 OR FRAC. (X/X) -> ± 1% 0.00 -> ± 0.25" 0.0 -> ± 0.5" 0.000 -> ± 0.125"		Description de la révision / Revision description		Granby Composites Inc. © 2018 Granby Composites Inc.			
TOLERANCES (ANGULAIRES / ANGULAR) 0 -> ± 2 DEG. 0.0 -> ± 0.5 DEG. 0.00 -> ± 0.1 DEG.				Format / Size	No de la pièce / Part no.		REV
Poids / Weight :		Dessiné par / Drawn by S. Potvin		B	ENSCOUR10		A.
		Approuvé par / Approved by :		Description / Title JEUX DE COURROIES ET BLOCS DE BÉTON - ANCHORING KIT			
Client		Unités / Units INCHES	Feuille Sheet 4 / 4	# Projet			

<div><div><div><div></div></div><div><div>GRANBY</div><div>COMPOSITES</div></div></div><div>CHARTRE DE CAPACITÉ POUR RÉSERVOIR NN10220822</div><div>CAPACITY CHART FOR NN10220822 TANK</div><div>janvier 3, 2018</div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>																					
Hauteur (CM)	Volume (Litres)	Hauteur (CM)	Volume (Litres)	Hauteur (CM)	Volume (Litres)	Hauteur (CM)	Volume (Litres)	Hauteur (CM)	Volume (Litres)	Hauteur (CM)	Volume (Litres)	Hauteur (CM)	Volume (Litres)	Hauteur (CM)	Volume (Litres)	Hauteur (CM)	Volume (Litres)	Hauteur (CM)	Volume (Litres)	Hauteur (CM)	Volume (Litres)
0.5	8	30.5	3901	60.5	10942	90.5	19783	120.5	29718	150.5	40190	180.5	50693	210.5	60725	240.5	69739	270.5	77058	300.5	81520
1	22	31	3998	61	11077	91	19941	121	29889	151	40366	181	50866	211	60886	241	69877	271	77161	301	81554
1.5	41	31.5	4096	61.5	11213	91.5	20100	121.5	30061	151.5	40542	181.5	51038	211.5	61046	241.5	70015	271.5	77262	301.5	81585
2	63	32	4195	62	11348	92	20259	122	30233	152	40718	182	51211	212	61205	242	70152	272	77363	302	81615
2.5	88	32.5	4295	62.5	11485	92.5	20418	122.5	30405	152.5	40895	182.5	51383	212.5	61365	242.5	70288	272.5	77463	302.5	81641
3	115	33	4396	63	11622	93	20577	123	30577	153	41071	183	51555	213	61524	243	70425	273	77563	303	81665
3.5	146	33.5	4497	63.5	11759	93.5	20737	123.5	30749	153.5	41247	183.5	51726	213.5	61682	243.5	70560	273.5	77662	303.5	81686
4	178	34	4599	64	11897	94	20897	124	30922	154	41423	184	51898	214	61841	244	70696	274	77759	304	81703
4.5	213	34.5	4702	64.5	12035	94.5	21057	124.5	31094	154.5	41599	184.5	52070	214.5	61999	244.5	70830	274.5	77857	304.5	81715
5	250	35	4805	65	12174	95	21218	125	31267	155	41775	185	52241	215	62157	245	70964	275	77953	305	81718
5.5	289	35.5	4910	65.5	12313	95.5	21379	125.5	31440	155.5	41952	185.5	52412	215.5	62314	245.5	71098	275.5	78048		
6	329	36	5015	66	12452	96	21540	126	31613	156	42128	186	52583	216	62472	246	71231	276	78143		
6.5	372	36.5	5120	66.5	12593	96.5	21701	126.5	31786	156.5	42304	186.5	52754	216.5	62629	246.5	71364	276.5	78237		
7	416	37	5227	67	12733	97	21863	127	31959	157	42480	187	52925	217	62785	247	71496	277	78330		
7.5	462	37.5	5334	67.5	12874	97.5	22025	127.5	32132	157.5	42656	187.5	53095	217.5	62941	247.5	71628	277.5	78422		
8	510	38	5442	68	13015	98	22187	128	32305	158	42832	188	53266	218	63097	248	71759	278	78513		
8.5	559	38.5	5550	68.5	13157	98.5	22350	128.5	32479	158.5	43008	188.5	53436	218.5	63253	248.5	71890	278.5	78603		
9	610	39	5660	69	13300	99	22512	129	32653	159	43184	189	53606	219	63408	249	72020	279	78693		
9.5	662	39.5	5770	69.5	13442	99.5	22675	129.5	32826	159.5	43360	189.5	53776	219.5	63564	249.5	72150	279.5	78782		
10	715	40	5880	70	13585	100	22839	130	33000	160	43536	190	53946	220	63718	250	72279	280	78869		
10.5	771	40.5	5992	70.5	13729	100.5	23002	130.5	33174	160.5	43712	190.5	54115	220.5	63873	250.5	72407	280.5	78956		
11	827	41	6104	71	13873	101	23166	131	33348	161	43888	191	54285	221	64027	251	72535	281	79042		
11.5	885	41.5	6216	71.5	14017	101.5	23330	131.5	33522	161.5	44064	191.5	54454	221.5	64180	251.5	72663	281.5	79127		
12	944	42	6330	72	14162	102	23494	132	33697	162	44240	192	54623	222	64334	252	72790	282	79211		
12.5	1005	42.5	6444	72.5	14307	102.5	23659	132.5	33871	162.5	44415	192.5	54792	222.5	64487	252.5	72916	282.5	79294		
13	1066	43	6558	73	14453	103	23823	133	34045	163	44591	193	54961	223	64639	253	73042	283	79377		
13.5	1130	43.5	6674	73.5	14599	103.5	23988	133.5	34220	163.5	44767	193.5	55129	223.5	64792	253.5	73167	283.5	79458		
14	1194	44	6789	74	14745	104	24153	134	34394	164	44942	194	55297	224	64943	254	73292	284	79538		
14.5	1259	44.5	6906	74.5	14892	104.5	24319	134.5	34569	164.5	45118	194.5	55465	224.5	65095	254.5	73416	284.5	79617		
15	1326	45	7023	75	15039	105	24484	135	34744	165	45293	195	55633	225	65246	255	73540	285	79695		
15.5	1394	45.5	7141	75.5	15187	105.5	24650	135.5	34919	165.5	45469	195.5	55801	225.5	65397	255.5	73662	285.5	79773		
16	1463	46	7259	76	15335	106	24816	136	35094	166	45644	196	55968	226	65548	256	73785	286	79849		
16.5	1533	46.5	7378	76.5	15484	106.5	24983	136.5	35269	166.5	45819	196.5	56136	226.5	65698	256.5	73907	286.5	79924		
17	1604	47	7498	77	15632	107	25149	137	35444	167	45995	197	56303	227	65847	257	74028	287	79998		
17.5	1677	47.5	7618	77.5	15781	107.5	25316	137.5	35619	167.5	46170	197.5	56470	227.5	65997	257.5	74148	287.5	80071		
18	1750	48	7739	78	15931	108	25483	138	35794	168	46345	198	56636	228	66146	258	74268	288	80143		
18.5	1825	48.5	7861	78.5	16081	108.5	25650	138.5	35969	168.5	46520	198.5	56803	228.5	66295	258.5	74388	288.5	80214		
19	1900	49	7983	79	16231	109	25817	139	36145	169	46695	199	56969	229	66443	259	74507	289	80284		
19.5	1977	49.5	8105	79.5	16382	109.5	25985	139.5	36320	169.5	46870	199.5	57135	229.5	66591	259.5	74625	289.5	80352		
20	2054	50	8228	80	16533	110	26152	140	36495	170	47045	200	57301	230	66738	260	74742	290	80419		
20.5	2133	50.5	8352	80.5	16684	110.5	26320	140.5	36671	170.5	47219	200.5	57466	230.5	66885	260.5	74859	290.5	80486		
21	2213	51	8477	81	16836	111	26489	141	36847	171	47394	201	57631	231	67032	261	74976	291	80551		
21.5	2293	51.5	8601	81.5	16988	111.5	26657	141.5	37022	171.5	47569	201.5	57796	231.5	67178	261.5	75091	291.5	80614		
22	2375	52	8727	82	17140	112	26825	142	37198	172	47743	202	57961	232	67324	262	75206	292	80677		
22.5	2457	52.5	8853	82.5	17293	112.5	26994	142.5	37374	172.5	47917	202.5	58126	232.5	67469	262.5	75321	292.5	80738		
23	2541	53	8980	83	17446	113	27163	143	37549	173	48092	203	58290	233	67614	263	75434	293	80798		
23.5	2625	53.5	9107	83.5	17600	113.5	27332	143.5	37725	173.5	48266	203.5	58454	233.5	67759	263.5	75547	293.5	80857		
24	2711	54	9234	84	17754	114	27501	144	37901	174	48440	204	58618	234	67903	264	75660	294	80914		
24.5	2797	54.5	9363	84.5	17908	114.5	27671	144.5	38077	174.5	48614	204.5	58782	234.5	68047	264.5	75772	294.5	80970		
25	2884	55	9491	85	18062	115	27841	145	38253	175	48788	205	58945	235	68191	265	75883	295	81025		
25.5	2972	55.5	9621	85.5	18217	115.5	28010	145.5	38429	175.5	48962	205.5	59108	235.5	68334	265.5	75993	295.5	81078		
26	3061	56	9751	86	18372	116	28180	146	38605	176	49135	206	59271	236	68476	266	76103	296	81130		
26.5	3151	56.5	9881	86.5	18528	116.5	28351	146.5	38781	176.5	49309	206.5	59434	236.5	68618	266.5	76212	296.5	81180		
27	3242	57	10012	87	18683	117	28521	147	38957	177	49483	207	59596	237	68760	267	76320	297	81228		
27.5	3334	57.5	10143	87.5	18840	117.5	28691	147.5	39133	177.5	49656	207.5	59758	237.5	68901	267.5	76428	297.5	81275		
28	3426	58	10275	88	18996	118	28862	148	39309	178	49829	208	59920	238	69042	268	76534	298	81320		
28.5	3519	58.5	10407	88.5	19153	118.5	29033	148.5	39485	178.5	50002	208.5	60082	238.5	69182	268.5	76641	298.5	81364		
29	3613	59	10540	89	19310	119	29204	149	39661	179	50175	209	60243	239	69322	269	76746	299	81406		
29.5	3708	59.5	10674	89.5	19467	119.5	29375	149.5	39837	179.5	50348	209.5	60404	239.5	69462	269.5	76851	299.5	81446		
30	3804	60	10808	90	19625	120	2954														



INSTALLATION MANUAL WATER TANK

TABLE OF CONTENTS

Table of contents

1.	INTRODUCTION	1
1.1.	SECURITY	1
1.2.	GÉNÉRAL.....	2
1.3.	DEFINITIONS	2
2.	PREPARATION FOR INSTALLATION	2
2.1.	GENERAL.....	2
3.	BACKFILL MATERIAL	5
3.1.	GENERAL.....	5
4.	EXCAVATION PARAMETERS.....	8
4.1.	GENERAL.....	8
4.2.	EXCAVATION DEPTH	9
4.3.	ONSITE CIRCULATION	9
4.4	Unstable Soil.....	9
4.4.	GEOTEXTILE MEMBRANE.....	10
4.5.	Multiple tank Installation in the same trench.....	10
5.	TANK ANCHORAGE	10
5.1.	ANCHORAGE WEIGHINGS.....	10
5.2.	ANCHORAGE SLAB	11
5.3.	FATENING BELTS AND IDLERS.....	11
6.	INSTALLATION	12
6.1.	GENERALITIES	12
6.2.	INSTALLATION IN DRY SETTING	12
6.3.	INSTALLATION IN FLOODED SETTING.....	13
7.	INSTALLATION OF MANHOLE EXTENSION.....	13
7.1.	GENERALITIES	13
7.2.	EXTENSION WITH FIBERGLASS LID WITH HINGE OR BOLTED.....	14
7.3.	EXTENSIONS WITH CAST IRON LIDS	15
8.	INSTALLATION OF PLUMBING AND ELECTRICAL CONDUIT	15
8.1.	GENERALITIES	15
8.2.	INTERNAL PLUMBING.....	16
8.3.	EXTERNAL PLUMBING	16

TABLE OF CONTENTS

8.4.	TANK VENTILATION	16
9.	APPLICATION FOR FIRE SAFETY/DRY HYDRANT	18
9.2.	Dry hydrant installation with plumbing parallel to the ground	18
10.	CUSTOMER SERVICE	18
	CONTROL SHEET	19

- IMPORTANT -

REFER TO THE INSTALLATION MANUAL



DO NOT BACKFILL WITH SAND

FOR MORE INFORMATION
819-344-2525

INSTALLATION MANUAL OF FIBERGLASS TANK

We recommend to read and apply all recommendations included in this document and in the approved project drawings before installing the tank(s). The tank's approved drawings contain complementary information to this manual and must be applied as well.

Not following these instructions could void and cancel our obligations under the limited guaranty of the referred tank, lead to a malfunction of the tank, lead to material damages and serious injuries or death.

TO THE CONTRACTOR: Before tank installation, read attentively the Installation Manual, the approved drawings and the Control Sheet. Following the installation, deliver a copy of all those documents to the owner.

TO THE OWNER: After the tank Installation, keep in a safe place a copy of the Installation Manual, the Approved Drawings and Control Sheet.

1. INTRODUCTION

1.1. SECURITY

1.1.1. Before the installation of the tank, we strongly recommend you carefully read the Installation Manual, the approved drawings and the Control Sheet (named Manual hereinafter). The Owner, the Contractor and the Operator all have the responsibility to conform to the current standards and regulations relative to the installation and operation of such equipment.

1.1.2. No instructions or procedure in the Manual or the approved drawings must be interpreted in a way to endanger the security of health of the workers or damage the environment.

1.1.3. The following annotations will be presented all along this Manual to alert you of risks inherent of the installation of the tank.

CAUTION

Follow the instructions and applicable regulations.

1.1.4. Keep this Manual in an accessible location onsite so you can refer to it when needed.

1.1.5. Working at the bottom and around an excavation site carries risks. The contractor must conform to the applicable regulations and requirements of the territory where the installation is being made.

1.1.6. The activity of operation of equipment without surveillance can lead to severe injuries or property damage.

WARNING

Indicates a potentially dangerous situation, which, if not controlled, can cause serious injuries.

ATTENTION

Indicates a potentially dangerous situation, which, if not controlled, can cause minor injuries.

1.2. GÉNÉRAL

WARNING

Do not use sand for as primary foundation or backfill. Only use approved backfill material. Consult Section 3 of this manual as well as the approved drawings of the project.

1.2.1. It is important to follow the procedures and directives described in this Manual to ensure an secure and adequate installation of the Granby Composites inc. fiberglass underground tank (named "tank" hereinafter). Non-compliance of the procedures and directives will cancel the Granby Composites inc. warranty and may result in the breakage of the tank, injuries or property damages.

1.2.2. The Granby Composites inc. warranty is exclusively applied to a tank installed in compliance with the procedures and directives described in the Manual. Because Granby Composites inc. cannot control all parameters on the project site; its responsibility is limited to its written warranty.

1.2.3. The Manual is available on demand to the technical department of Granby Composites inc. It is the Owner's responsibility to keep this Manual and control sheet to eventually refer to customer service.

1.2.4. Use the control sheet for installation (included in the annex) to validate each of the tank's installation steps. Keep a copy of the filled control sheet in a safe place, as well as any correspondence, certification and acceptance of tasks related to the tank. Each tank necessitates it's own control sheet. Visit our website to access, if needed, supplemental copies of the control sheet.

1.2.5. The owner and the Contractor must keep a copy of that sheet in a safe place to ensure the validity of the warranty. The absence of the control sheet may result in the cancelation of the warranty.

1.2.6. To conform to all relevant rules, standards and certifications in the region of installation. Such as:

- Building regulations
- Occupational health and safety
- Certifications
- Environment laws and rules
- Municipal laws
- Industry standards

1.2.7. Federal, provincial and municipal laws and regulations have precedence on Granby Composites inc. advice.

1.2.8. A written authorization by Granby Composites inc. is necessary to derogate, in any way, the installation's instructions described in this Manual.

1.2.9. Any correspondence relative to derogations of the installation's instructions must be kept to validate warranty claim.

1.2.10. If you have any questions, or if you encounter any situation that is not described in this Manual, please contact the Granby Composites inc. technical service team 819-344-2525.

1.3. DEFINITIONS

1.3.1. For terms and accessories relative to the Granby Composites inc. tank/equipment described in this Manual, refer to Figure 1

1.3.2. . This diagram may only be used for terminology purposes.

2. PREPARATION FOR INSTALLATION

2.1. GENERAL

2.1.1. All Granby Composites inc. tanks have been leak tested in factory before being loaded on the truck. A secondary and complete visual inspection with pictures is done after loading. Unloading and handling must be done with particular care not to drop or damage the tank.

WARNING

The client, the contractor and the person unloading the material are responsible for checking that the lifting equipment are adequate. Non-compliance of these instructions may result in severe injuries or damaging the tank.

WARNING

Do not release the transport belt before the tank is solidly hooked to the lifting equipment by the lifting rings. Non-compliance of these instructions may result in severe injuries or damaging the tank.

WARNING

Always use stop blocks for stocking the tank. The tank is heavy and has a large contact surface. The tank can easily roll if the ground is sloped and can be moved by the wind. Moving tank can lead to severe injuries and damage the tank.

2.1.2. Before unloading or installing the tank in it's final location, perform the following steps:

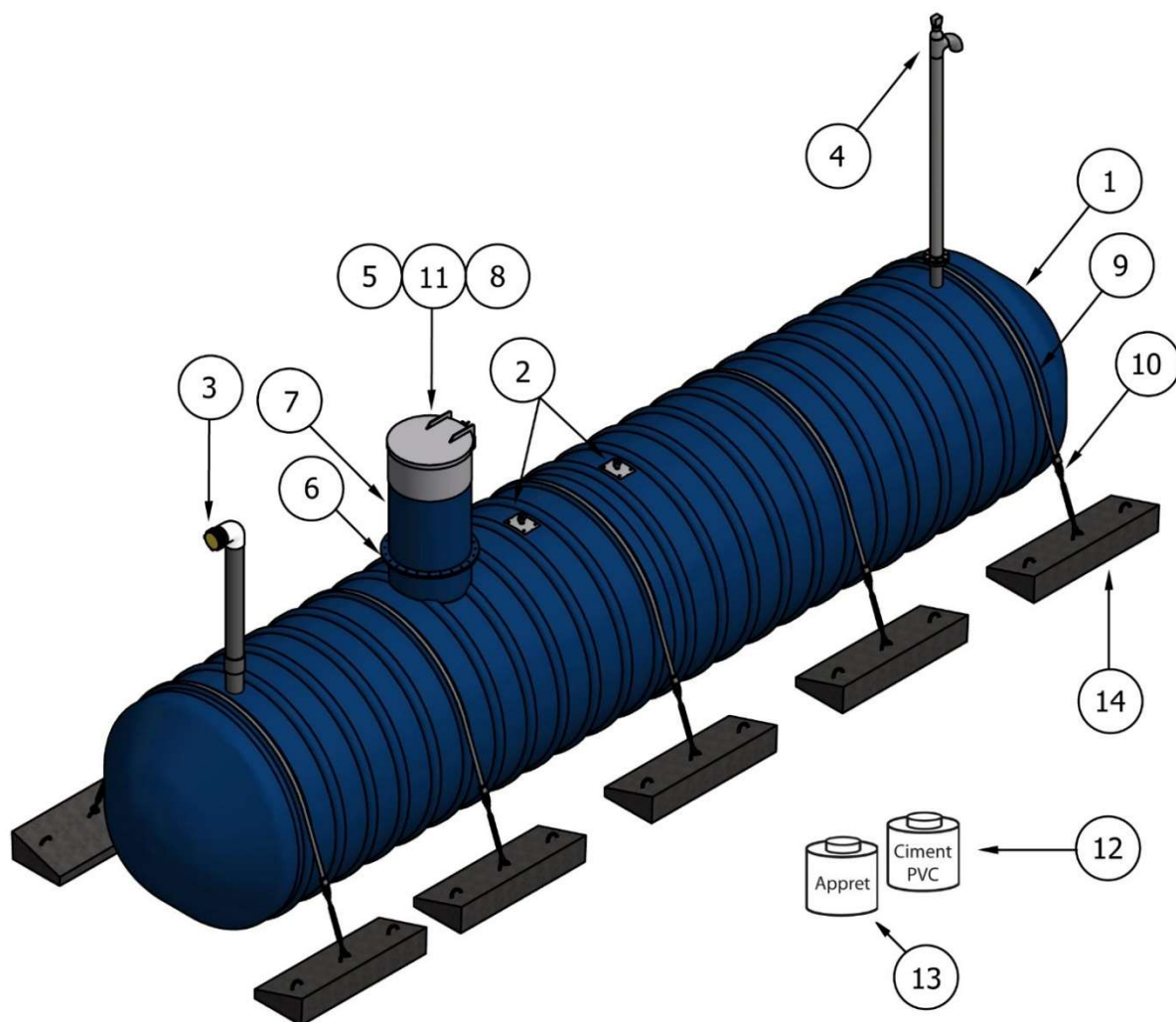
2.1.2.1. Complete a visual inspection of the exterior of the tank to ensure that no damage was done during the loading and transportation. Specifically look for cracks, holes or severe scratches.

2.1.2.2. Verify the material list.

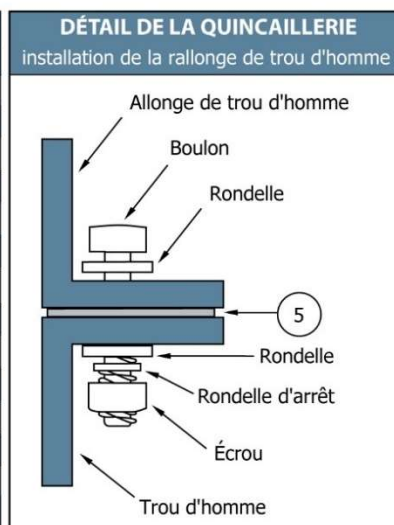
2.1.2.3. Sign the shipping note to confirm the tank and components have all been shipped and are in good condition. If damages are noticed, you must immediately notify the carrier and Granby Composites inc. before unloading the tank.

2.1.2.4. Granby Composites inc. assumes no responsibility for the unloading, the handling or stocking of the tank on the installation site. Ensure that all lifting tools used are compliant with lifting this load. Refer to the approved drawings or the tank's rating plate to know it's specific weight and select the appropriate handling equipment.

Figure 1



LISTE DES PIÈCES			
#	Qté	#Pièce	DESCRIPTION
1	1	NN	RÉSERVOIR DE FIBRE DE VERRE
2	2	ADP0000001	ANNEAUX DE LEVAGE
3	1	BNH	BORNE FONTAINE
4	1	EV	ÉVENT
5	1		JOINT D'ÉTANCHÉITÉ
6	1	MH	TROU D'HOMME
7	1	MHE	ALLONGE / EXTENSION DE TROU D'HOMME
8			QUINCAILLERIE (VOIR LE DÉTAIL)
9			COURROIES
10			TENDEUR
11	1	MH-COVER	COUVERCLE DE TROU HOMME CADENASSABLE
12			COLLE
13			APPRÊT
14			BLOCS DE BÉTON



2.1.2.5. Select a firm and level surface to settle the tank on. Ensure that the surface is rock free, clean of any object that could damage the surface.

2.1.3. When lifting the tank, respect the lifting angle and follow security recommendations. (See Figure 2)

Figure 2



2.1.3.1. Use the lifting rings located on the top of the tank to unload and install the tank.

WARNING

Do not use chains or cables rolled around the tank to lift and manipulate the tank.

2.1.3.2. Use a fixed guide rope on each extremities of the tank to guide the lifting axis if necessary.

Figure 3



2.1.3.3. Do not roll the tank on itself to move the tank.

2.1.3.4. When handling a tank with plumbing accessories located at its bottom, take supplemental precautions to not damage the equipment when handling.

If the tank is temporarily stored onsite before final installation, be sure to firmly anchor it with stop blocks under the tank such as wooden beams, tires or other to prevent turnover. (see Figure 4)

2.1.4. Use ropes and holds if necessary.

Figure 4



WARNING

Safely attach the tank before handling or lifting. Only use adequate equipment that respects current hoisting standards. Non-compliance can lead to severe injuries.

WARNING

While handling or lifting the tank, avoid being in part or completely under it. Non-compliance can lead to severe injuries.

CAUTION

If the tank needs to pass a water leak test, it must be supported by backfill material up to a minimum of half of its height. Non-compliance of that recommendation can damage the tank.

2.1.5. If damage is detected on the tank, do not install or proceed to repair it. Contact immediately the technical service of Granby Composites inc. 819-344-2525.

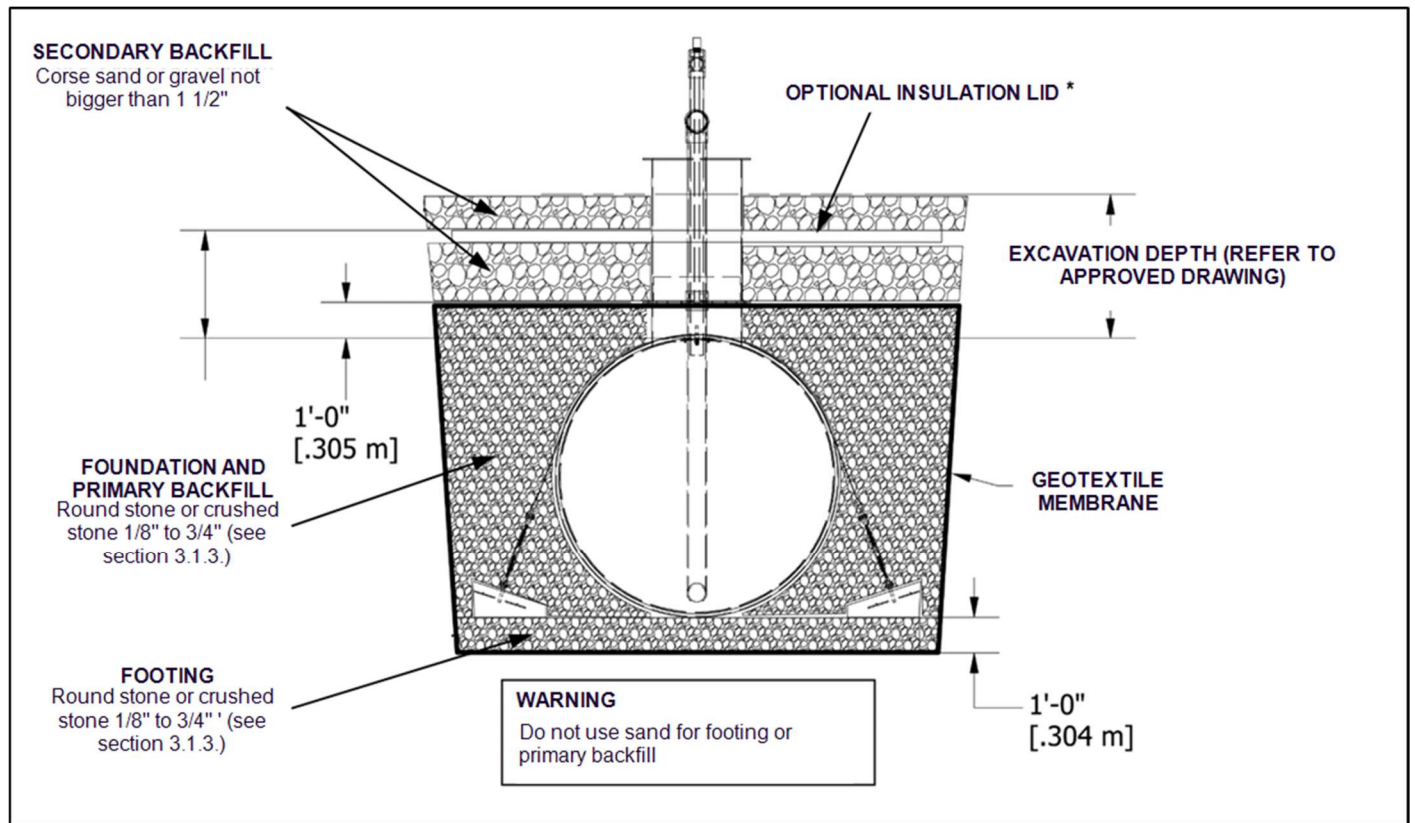
3. BACKFILL MATERIAL

3.1. GENERAL

3.1.1. The Granby Composites inc. tanks/equipment must be installed by the recommended methods. Figure 4 illustrates a cut-away view of the installation of the tank. The approved drawings offer specific information of your project.

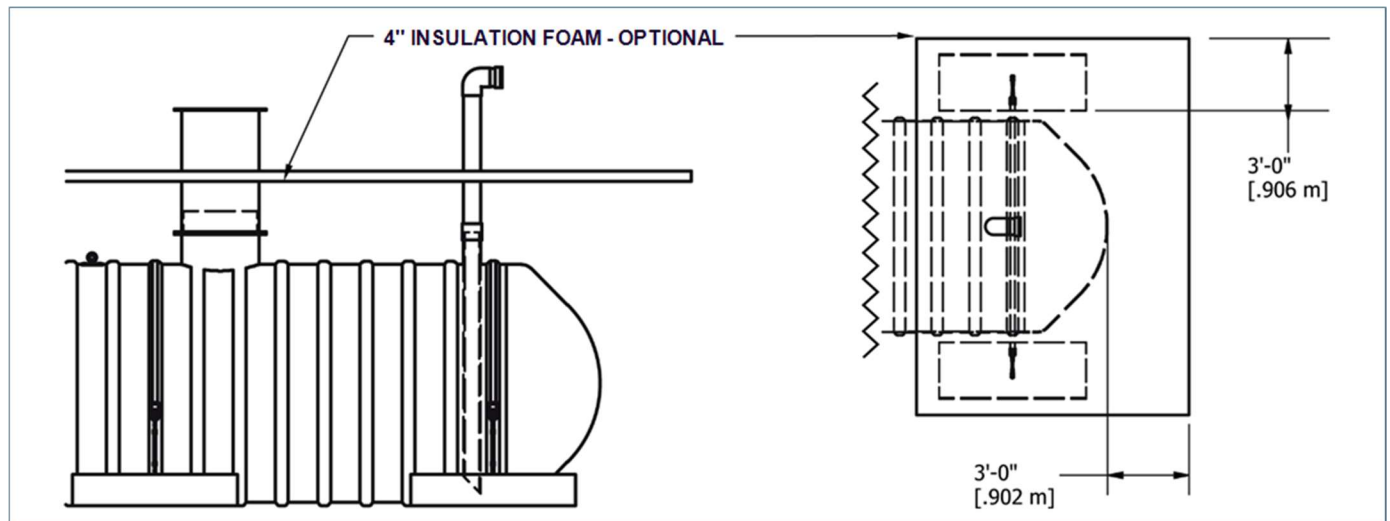
3.1.2. The use of material and minimal depth of backfill, without authorization, other than the ones prescribed and approved by Granby Composites inc. would cause the cancellation of the warranty. The function of the foundation and primary backfill is to offer a constant support on the entire perimeter of the tank and to guarantee there is no empty space around it. Furthermore, the characteristics of the backfill material must ensure no empty space around it is created in time by the eventual percolation of water through the primary backfill. The installation of geotextile fabric allows water to circulate freely both ways, while not allowing the native soil and secondary backfill to mix with the primary backfill.

Figure 5



CAUTION

The decision to use or not the Styrofoam is entirely the responsibility of the client, who must advise Granby Composites inc. to ensure the floating calculations are respected.



CAUTION

The use of other materials to backfill than the ones recommended can lead to tank damage.

WARNING

Do not use sand for the foundation or primary backfill.

3.1.3. The approved backfill material must respect the following specifications:

3.1.3.1. The material must be washed, ice-free, snow-free or of any other rubble.

3.1.3.2. The material must conform to the specifications of ASTM C-33, ASTM D-488 et AASHTO M-43.

3.1.3.3. **Foundation and primary backfill**: round stone or crushed stone.

A) Gravel (round stone) : The tank requires a clean aggregate, naturally round, the granules must be of #6, #67 or #7 dimensions. The size of the stones and their percentage must respect the limitations of the following chart:

Percentage of round stones

Passing through the sieve

ASTM C33	Stone	Stone	Stone
Dimension no.	#6	#67	#7
25 mm (1 inch)	100%	100%	---
19 mm (3/4 inch)	90 to 100%	90 to 100%	100%
12.5 mm (1/2 inch)	10 to 55%	---	90 to 100%
9.5 mm (3/8 inch)	0 to 15%	20 to 55%	40 to 70%
4.75 mm (0.187 inch)	0 to 5%	0 to 10%	0 to 15%
2.36 mm (0.094 inch)	---	0 to 5%	0 to 5%

B) Crushed stones: Alternate with crushed stones made of granules of no.7 or no.8 dimensions. The aggregate must be washed or sieved to eliminate fine particles. The size of the stones and their percentage must respect the limitations of the following chart:

Percentage of crushed stones

Passing through the sieve

ASTM C33	Stone	Stone
Dimension no	#7	#8
25 mm (1 inch)	---	---
19 mm (3/4 inch)	100%	---
12.5 mm (1/2 inch)	90 to 100%	100%
9.5 mm (3/8 inch)	40 to 70%	85 to 100%
4.75 mm (0.187 inch)	0 to 15%	10 to 30%
2.36 mm (0.094 inch)	0 to 5%	0 to 10%

3.1.3.4. Secondary backfill:

You can use the same type of backfill as for the primary backfill and foundation. You can also use coarse sand or gravel containing pebbles, of which the dimensions do not exceed 38mm (1 1/2 inch). The backfill must be clean, flow freely and must not contain large stones, roots, organic material, rubble, ice or snow. The backfill material cannot be icy or contain clusters of iced material during the entire duration of the backfilling.

3.1.4. Refer to section 4 "Excavation parameters" and the approved project drawings for all backfill particularities.

3.1.5. If the prescribed material in this Manual is not available, contact the technical service of Granby Composites inc. to evaluate alternatives and the approval process of the material

4. EXCAVATION PARAMETERS

WARNING

Follow the guidelines of the competent authority, building standards, laws and regulation for the excavation and trench project. Ground subsidence can lead to severe injuries or death.

4.1. GENERAL

4.1.1. The contractor must take all precautions necessary to protect the workers onsite, particularly within the excavations. These precautions must include, but are not limited to:

4.1.1.1. Localise and protect all public infrastructures (aqueduct, sewers, electricity or pipeline) located in proximity of the excavation before beginning the project.

4.1.1.2. Consider the surrounding structures before choosing the location of the installation to avoid weakening the pre-existing structures. The tank excavation must not be located in the

zone defined by a 45-degree angle starting from sole of the surrounding structure.

4.1.1.3. Prevent workers from fumes that could arise from the excavation.

4.1.1.4. Protect the workers from risks associated with the accumulation of water at the bottom of the excavation.

4.1.1.5. The minimal clearance distance between walls and extremities of the tank and the walls of the excavation must be of 900mm (36 inches)

4.1.1.6. Establish a security perimeter around the excavation to prevent undesired intrusions.

4.1.1.7. Inspect, at least once a day, the excavation and its perimeter.

4.1.1.8. For further information concerning the excavation project, refer to the local applicable requirements.

4.2. EXCAVATION DEPTH

4.2.1. The minimal depth of an excavation is usually influenced by the presence or absence of underground water and by the presence or absence of onsite circulation. These dimensions are critical to assure an acceptable installation of the tank and our clearly indicated on the approved drawings.

WARNING

In no time the weight of a truck or any equipment is allowed above the tank during the installation and as long as the conditions of section 6 are all respected. By not respecting this warning, you could induce injuries or damage to the tank.

4.2.2. Groundwater

4.2.2.1. It is imperative that each installation location be evaluated regarding the risk of elevating local groundwater.

4.2.2.2. It is the owner's responsibility to foresee sufficient cover weights or an appropriate anchoring system.

4.2.2.3. On request, Granby Composites inc. can deliver an anchoring system, installation drawings and calculations of buoyancy to ensure the tank's stability, in conditions where the groundwater is of ground level.

WARNING

Not foreseeing for appropriate cover weights and/or anchoring system can induce damages and breakdown of the tank and/or the property.

4.2.2.4. Excavation depth and minimum overlay specified in the approved drawings and in the buoyancy calculations are the required minimum to compensate for the buoyancy of the tank in cases of high levels of groundwater.

4.2.2.5. Additional cover weights may be necessary due to safety or operational requirements if demanded by local authority.

5.2.2.6 Tank installations with no circulation must be covered by 30cm (12 inches) minimum of backfill at all times.

WARNING

Tank installations with no circulation; make sure that the zone located above the tank will be protected to prevent any circulation of vehicles on the tank.

4.3. ONSITE CIRCULATION

4.3.1. In case your tank is subject to circulation (load H-20), the backfill layover material must be a minimum height of 900mm (3 feet). This layover allows for circulation above the tank while respecting the minimal indications off sections 4 and 6 of backfilling.

4.3.2. The maximal weight of vehicles is alleged. The structure of the roadway above the primary coating must be conceived depending on the use for which it is targeted, while respecting minimal requirements of this manual. Any roadway design that respects maximal loads conveyed to the tank according to backfilling requirements of this manual can be installed above the tank. The design of the roadway structure is the responsibility of the owner or contractor.

4.3.3. The maximal depth of the burying site of the tank must not exceed a maximal overlay of 2,100mm (82 inches) of material. Contact you sales agent from Granby Composites inc. for particular cases that requires a deeper depth than prescribed by this Manual.

4.4 Unstable Soil

4.3.4. Granby Composites inc. recommends the owner to call on a professional engineer to evaluate precautions to execute in case of unstable soil (bog, sandpit, burying site, soft clay, underground spring, etc.).

4.3.5. The clearance between the excavation wall and the tank must be increased to 900mm (36 inches) minimum, reaching the half of the tank's diameter if one of these two criteria is met;

- Soil cohesion inferior to 35,9 kPa (750 lb/pi2)

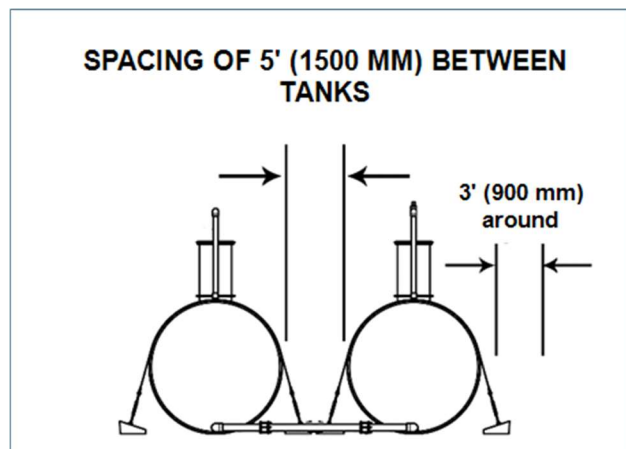
- Bearing capacity inferior to 167 kPa (3,500 lb/pi2).

4.3.6. The installation of a reinforced concrete slab under the tank as foundation may be required in addition to the bedrock of 30cm (12 inches) of primary backfill.

Figure 6



Figure 7



4.4. GEOTEXTILE MEMBRANE

4.4.1. The Owner or the appointed technical representative by the Owner is responsible of the decision to use or not a geotextile or other filtrating membrane depending on the type of backfill material used. Geotextile allows water to flow while preventing migration of fine particles from the overlaying material and backfilling material use to coat the tank. The geotextile helps protect the integrity of the backfill material that coats the tank.

4.4.2. Granby Composites inc. recommends using geotextile in the following situations:

- Between the primary and secondary backfill;
- Zones with changing groundwater or affected by tide cycles;
- Zones affected by unstable soil;
- Tank partially submerged in silty soil.

4.4.3. Polyethylene membranes (geo-membrane) are not considered as adequate and effective for the prescribed use of this section. For more information on geotextile specifications and installation instructions, refer to your geotextile furnisher.

4.5. Multiple tank Installation in the same trench

4.5.1. The minimum spacing between two tanks in the same trench can be of 46cm (18 inches) if the site does not require anchorage weighing or if the use of a reinforced concrete slab as an anchoring system creates this minimal gap.

4.5.2. The minimum spacing of 1.5m (5 feet) is required when the anchorage weightings system described in section 5 is used.

5. TANK ANCHORAGE

CAUTION

As mentioned in section 4.2.2, Granby Composites inc. recommends that every installation site be carefully evaluated in function of the potential that the tank rises due to underground water. Failure to anchor tank in conditions that requires it can lead to irreparable damages to the tank and its surroundings.

5.1. ANCHORAGE WEIGHINGS

5.1.1. The anchorage weighing is composed of prefabricated blocks specially conceived by Granby Composites inc.

5.1.2. Its disposition must be conform to the approved drawings of the concerned project and lay on the primary backfill of the tank.

5.1.3. The number of anchors is decided by the diameter of the tank, the number of access wells coming back up to surface, height of the groundwater, the minimal water level inside the tank and the depth at which the tank is laid.

5.1.4. Anchorage weighing must be laid at the bottom of the excavation of which the longitudinal axis is parallel to the tank. The weighing must be positioned outside of the shade projected by the tank and in agreement with the dimensions indicates on the approved drawings.

5.1.5. Each tank must have its own anchorage weighing.

5.1.6. If indicated by the approved drawings, a weighing can have two anchor straps.

5.1.7. Exclusively use anchorage weighing provided by Granby Composites inc.

5.2. ANCHORAGE SLAB

5.2.1. An anchorage slab is typically a foundation made of reinforced concrete, located under the primary backfill of the tank.

5.2.2. Its total length must minimally be the same length as the tank.

5.2.3. The minimal thickness of the slab must be of 200mm (8 inches).

5.2.4. The slab's width must exceed 450mm (18 inches) of the tank's perimeter.

5.2.5. Prepare one anchorage point for each attach strap.

5.2.6. All anchorage points must be strong enough to hold the buoyancy thrust of the tank.

5.2.7. The layover weight above the tank must be decided by buoyancy calculations of the tank. Contact Granby Composites inc. technical service in that respect.

5.3. FASTENING BELTS AND IDLERS

5.3.1. Exclusively use the fastening belts provided by Granby Composites inc. to anchor the tank.


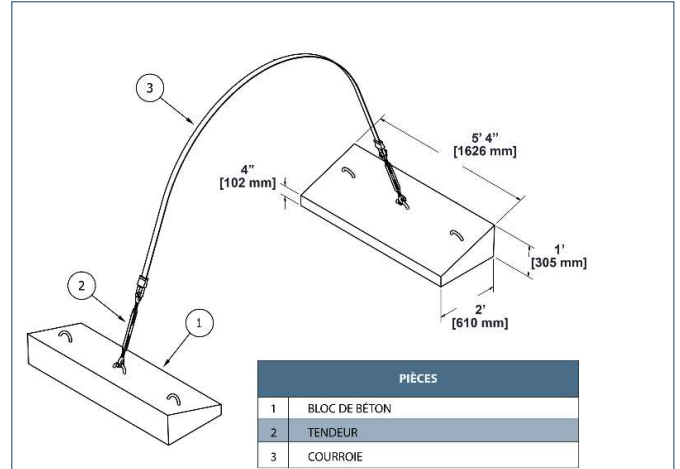
5.3.2. The position of the fastening belts on each tank is indicated by this arrow sign  or by enhancements.

Figure 8



WARNING

Any other type of attachment would cancel the warranty. Do not use chains, cables or any other type of straps to retain the tank.



5.3.3. Straps must be used at each of the identified spots for this purpose.

CAUTION

Never position the straps between the braces of the tank. Non-compliance of adequate positioning of the straps can damage the tank.

5.3.4. To install the turnbuckle, remove the pin, remove the retaining rod, thread the retaining rod and replace the pin. The turnbuckle must be well aligned with the strap. (See Figure 9)

CAUTION

All exposed metal in the anchorage system must be treated against corrosion (coating or galvanizing)

5.3.5. Equally spread the tension by tightening all straps uniformly until they are all tense, without distorting the tank.

5.3.6. Measure the inside diameter of the tank before and after tightening the turnbuckles to validate there was no distortion caused by tightening the straps. (See section 6.2.8)

Figure 9



6. INSTALLATION

CAUTION

The use of any other different backfill material than recommended can induce damages to the tank.

WARNING

Do not use sand for the foundation or primary backfill.

6.1. GENERALITIES

6.1.1. All safety measures mentioned in this section of this Manual must be applied all along the installation process as well as all safety codes of relevant jurisdiction.

6.1.2. Only use approved backfill material (section 3).

6.1.3. Do not mix native soil with the foundation material and primary backfill

6.1.4. Do not use native soil or sand as foundation or primary backfill.

6.1.5. Be sure to take note of each sections of this manual as well as the approved drawings of your project and keep them for consultation during the installation.

6.2. INSTALLATION IN DRY SETTING

6.2.1. Prepare a foundation of a minimal thickness of 300mm (12 inches) composed of primary backfill material specified in section 3.1.3.3. The foundation should be smooth and level. The bottom of the excavation must be stable and made of undisturbed soil.

6.2.2. If the tank is fitted with a sump or bottom connection, dig a deep enough hole at the bottom of the excavation of sufficient

dimensions to fit the sump or bottom connection as well as a minimum spacing of 30cm (12 inches) all around to allow the primary backfill. Refer to the approved drawings.

6.2.3. In case a clean slab or a anchorage slab is required, a foundation of a minimum depth of 300mm (12 inches) composed of primary backfill material specified in section 3.1.3.3. must be placed above either one.

CAUTION

Never install a Granby Composites inc. tank directly on a concrete slab, on beams or cradles, or on the native soil.

6.2.4. Refer to section 2 for adequate use of lifting equipment while handling the tank; refer to section 3 for backfill material, and section 4 for the excavation parameters and geotextile membrane installation.

6.2.5. If the tank needs an anchor point, install the anchorage weighing according to the approved drawings. They must be centered with the axis of the tank and cannot, in no time, be located in the shade projected on the ground by the tank

6.2.6. Once the tank is in place, make sure it is level by levelling the foundation. Make sure to respect the minimal distances between the walls of the excavation and the tank.

6.2.7. Measure the inside diameter of the tank to ensure that no deformation occurs during the handling phase of the installation. Note the measure in the control sheet.

6.2.8. If the tank needs an anchor, install the straps and turnbuckles. Refer to section 5 for procedure. Note for a second time the inside diameter after tightening the turnbuckles and straps. Validate that the deflection is inferior than the allowed deflection on the chart of 10.

Figure 10

Deflection chart

Diam. Tank	(cm)	(inch)
6 FEET	1.9	3/4
8 FEET	2.9	1 - 1/8
10 FEET	3.8	1 - 3/4

6.2.9. Backfill using the primary backfill. Evenly dispose around the tank a first 300mm (12 inches) of backfill material. With the help of a non-metallic piece of equipment (wood piece 2 X 4), push the backfill material under the tank so it can be evenly supported on all its surface. Make sure that no empty space is created within the backfill. Avoid hitting the tank with the equipment while backfilling.

CAUTION

The primary backfill material must be as described in section 3 of this manual, and be pushed by hand to eliminated any empty space under the tank. If there is a empty space under the tank, or if the tank moved during the backfilling, it may be necessary to remove the tank and reinstall it. Non-compliance of the paragraph can damage the tank or cause other material damages.

6.2.10. Repeat step 6.2.9. With another layer of 300mm (12 inches) of backfill. Refer to section 7 for the installation process of accessories, plumbing and of the manhole.

6.2.11. If a secondary backfill material and/or geotextile membrane is used on the perimeter of the installation, it must be placed and compacted at the same time as the primary backfill.

6.2.12. Once the base of the tank is well backfilled and supported, complete the backfill all the way over the tank. Continue backfilling by layers of 300mm (12 inches) and push the material under the sidewall of the tank and under the braces to eliminate the empty spaces and ensure the necessary stability. Keep shelling by hand if needed for each layer of backfill at least until the midway up the walls of the tank. Complete the backfill with 300mm (12 inches) above the tank with the approved primary backfill material.

6.2.13. Take the third measure of the inside diameter of the tank. Be sure that the deflection observed is inferior to the allowed number on the chart of figure 10.

6.2.14. Proceed to the installation of the manhole (manhole extension, see section 7) ,vent and complete the connection of plumbing (see section 8).

6.2.15. Be sure that plumbing shut-off valves are closed and tight. Fill the tank with water above the mechanical joints of the manhole extension. Make a reference mark of the water level in the manhole extension. Let the water rest for a minimum of 24 hours and then validate the water level compared to the reference mark. If a gap greater than 2.5cm (1 inch) is observed, proceed to a leak verification of all joints.

6.2.16. Continue to backfill until you reach ground level or the foundation of the asphalt or concrete layover.

6.2.17. Take the fourth lecture of the inside diameter of the tank. Make sure that the deflection is always inferior to the deflection allowed in the chart of Figure .

6.2.18. Complete the installation of concrete or asphalt. Make sure the height of the layover on the tank is in accordance with the approved drawings of your project.

6.2.19. Complete the tank installation verification list (see annex)

6.3. INSTALLATION IN FLOODED SETTING

6.3.1. It is necessary to pump out all water of the excavation and to maintain it dry during the entire installation process.

6.3.2. Repeat section 6.2. Procedure by applying the following instructions:

6.3.3. During the realisation of step 6.2.6. During the positioning or levelling of the tank, weigh down the tank with water until it sits firmly on the foundation. The level of water added must never be over 300mm (12 inches) of the level of water present within the excavation or the level of the primary backfill until the backfill is finished.

WARNING

Never take out the water of the tank in a flooded setting if the backfilling is not yet complete and the layover height as not yet been confirmed by competent staff. Non-compliance will lead to a potentially dangerous situation, which, if not controlled, can lead to severe injuries and important damages to the tank and property.

7. INSTALLATION OF MANHOLE EXTENSION

7.1. GENERALITIES

7.1.1. There is a wide variety of models and dimensions of manhole extensions. Important instructions are to be found in the approved drawings of this manual.

7.1.2. Waterproofing of the tank was tested in the production facility before shipping. It is the client's or it's representative's responsibility to install the manhole extension(s) and validate if they are also waterproof before burying.

7.1.3. Verify in the approved drawing if there is a predefined orientation for the manhole extension in function of the opening of the cover and/or plumbing or electrical connections. If that is the case, be sure to align the two V shaped marks that you will find, one on the flange of the manhole and the other one on the inferior flange of the extension.

7.1.4. An assembly kit is provided with each extensions shipped. This kit contains bolts and nuts, washers, locking washer and bitumen gasket joint.

CAUTION

The flexibility and tightness of the bitumen gasket joint is greatly affected by temperature. If it is impossible to ensure a temperature above 18° C (65° F) during installation, we recommend using liquid silicone caulk as a joint.

7.1.5. The gasket joint must be located between the to flange surfaces and inside the circle created by the bolts.

7.1.6. Carefully align the holes of the two pieces. Install the material as indicated in Figure and progressively tighten until the gasket is completely tight (Figure).

Figure 11

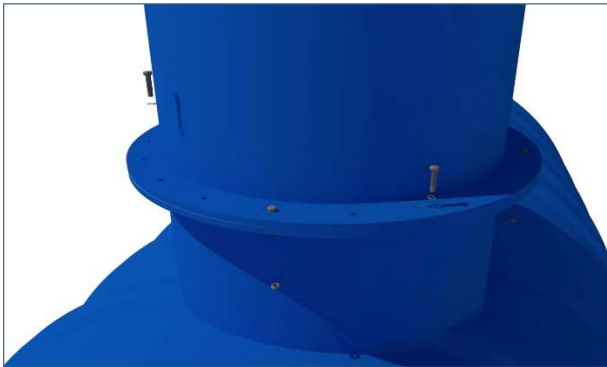
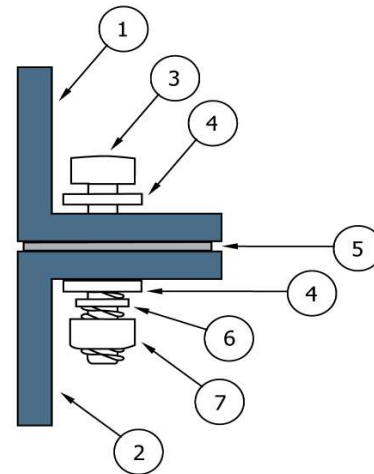


Figure 12



#	Parts
1	MAN HOLE EXTENSION
2	MAN HOLE
3	BOLT
4	WASHER
5	GASKET
6	LOCK WASHER
7	NUT

7.1.7. Refer to section 6.2.15 to verify the tightness of the assembly before burying.

7.1.8. Refer to section 8 for plumbing installation and for electricity on the manhole extension if that is the case.

7.2. EXTENSION WITH FIBERGLASS LID WITH HINGE OR BOLTED

7.2.1. The minimum height of the top of the cover with regard to the ground must be 30cm (12 inches). We recommend installing markers close to the extension of the manhole when it is located somewhere where snow may cover the top on lid.

WARNING

Manhole extensions with fiberglass lids are not made to support weight. Non-compliance of this warning can lead to a potentially dangerous situation which, if not controlled, can lead to severe injuries and important damages to the tank and property.

7.2.2. The fiberglass covers with hinge have system that allows for a standard lock. It is the owner's responsibility to provide the lock and make sure it is locked at all times.

7.2.3. Bolted fiberglass covers require a set of keys 9/16" to remove it. It is essential that the use of this type of cover is located in a restricted access point.

Figure 13



7.3. EXTENSIONS WITH CAST IRON LIDS

7.3.1. Cast iron lids are used in cases where vehicle circulation is allowed. These lids respect loading standards HS-20 (32 000 lb/axle – 14 545 kg/ axle).

7.3.2. The type and height of the secondary backfill must respect at all times the instructions of the installation drawing approved for the project. Refer to the "Installation guide for adjustable cast iron manhole" for your installation. If at any time you have questions about the approved drawings, contact the person responsible for your project or the technical services of Granby Composites inc.

Figure 10



WARNING

Cast iron manhole extensions are made for circulation, but may never transfer load onto the tank. Non-compliance of this warning can lead to a potentially dangerous situation which, if not controlled, can lead to severe injuries and important damages to the tank and property.

7.3.3. The joint between the cast iron lid and the fiberglass manhole extension is made to allow free movement (without constraint) of one into the other. Secondary backfill must be carefully executed to ensure the round geometry of the extremity of the fiberglass extension. Be sure the 90° cross measures of the diameters are equal to avoid an oval shape.

7.3.4. It is the reinforced concrete or asphalt and the foundation of the roadway (total capacity 20T/s.m. (4 000 lb/ft²)) That must take the load of the circulation on the cover and its iron base.

7.3.5. It must be noted that cast iron lids are not 100% waterproof.

7.3.6. Waterproof cast iron covers are available on special order.

8. INSTALLATION OF PLUMBING AND ELECTRICAL CONDUIT

8.1. GENERALITIES

8.1.1. The internal and external plumbing of the tank required a certified plumber in accordance with the valid rules and regulations must achieve onsite.

8.1.2. The pipes and electrical connections of the tank required a certified electrician in accordance with the valid rules and regulations must achieve onsite.

8.2. INTERNAL PLUMBING

8.2.1. The internal plumbing must finish with a 45 degree angle cut and be further than 4 inches away from the wall of the tank for plumbing of 6 inches and less of diameter, and further than 6 inches from the wall for plumbing of 8 inches and more of diameter.

8.2.2. The internal plumbing must be supported and protected by non-metallic or stainless steel equipment.

WARNING

Never pierce or modify the tank without the written authorization Granby Composites inc.

8.3. EXTERNAL PLUMBING

8.3.1. All connections to the tank that are parallel to the ground must be flexible to allow movements and misalignment of the tank's plumbing.

8.3.2. Particular attention must be paid in order to not constrict the tank during the backfilling operation of the plumbing by assuring it is well supported.

8.3.3. It is the owner's responsibility to protect plumbing from the freeze or any movement caused by freezing cycles.

CAUTION

The tank must be isolate from all external plumbing when doing a pressure test. A pressure test on the external plumbing could lead to malfunction of the tank, serious injuries or death.

8.4. TANK VENTILATION

8.4.1. The fiberglass tank is designed to operate at atmospheric pressure. Refer to the approved drawings for the position, configuration and dimensions of the vents required for your project.

CAUTION

The tank and its compartments must be adequately vented to avoid creating a vacuum or pressure when filling or emptying. If not appropriately vented the tank or the compartment could lead to malfunction of the tank, serious injuries or death.

8.4.2. The tank's vents dimensions must be sufficient to allow to maintain atmospheric pressure at all times.

8.4.3. PVC vent with water level gauge

Figure 11



8.4.3.1. A vent with water level gauge can be installed to inform the user in a general way of the tank water level. This gauge cannot, in no way, be used to evaluate in a quantities way the volume of water in the tank. The water volume chart must be used for this purpose.

8.4.3.2. The gauge fleet is adjusted in factory in function of the eventual length of the vent as you have received it, ready to be installed on top of the tank. Reducing or increasing the length of the vent would result in incorrect reading.

8.4.3.3. The fleet is fixed inside the plumbing so it is protected during transport. During the installation of the water level gauge, liberate the fleet and let it gently descend inside the tank before attaching the vent.

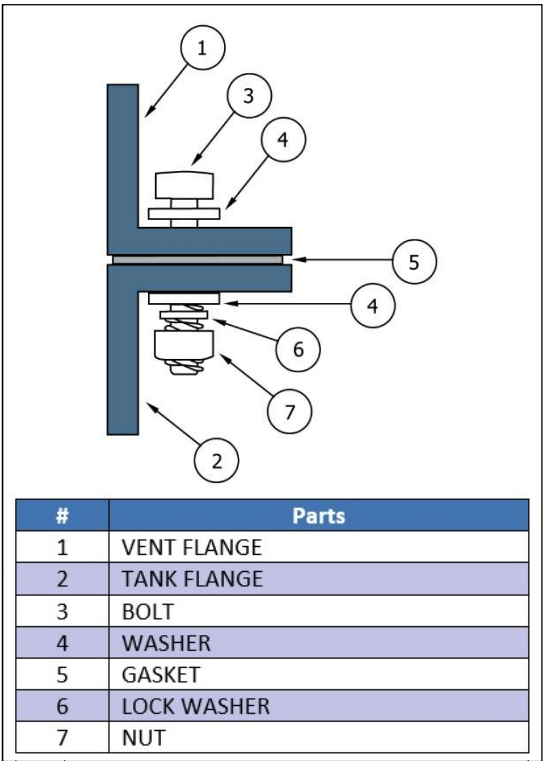
8.4.3.4. Be sure that the fleet's rope does not touch the glue, which could lead to malfunction of the gauge.

8.4.4. Stainless steel vent with water level gauge

Figure 12



Figure 14



8.4.4.1. Follow indication of articles 8.4.3.1 à 8.4.3.3.

8.4.4.2. Remove the temporary protective plate on the base of the vent Figure 13. Place the base of the vent on the flange of the tank.

8.4.4.3. Install the hardware (Figure 14).

Figure 13



9. APPLICATION FOR FIRE SAFETY/DRY HYDRANT

9.1.1. In the use of the tank for fire safety, the dry hydrant can be directly installed on a diving tube within the tank and installed in factory, or retrieved from the diving tube, or on a conduit located at the bottom of the tank. Refer to the approved drawings for all information.

Figure 15



9.1.2. Refer to section 8 for general instructions on plumbing installation.

9.1.3. Referring to the approved drawings, locate the diving tube or the connection at the bottom of the tank intended for the installation of the dry hydrant.

9.1.4. Installation on the tank's diving tube

9.1.4.1. Once a part of the plumbing between the dry hydrant and the diving tube of the tank is parallel to ground, certain restrictions apply. In that situation, move forward to section 9.2 for more instructions.

9.1.4.2. Once the dry hydrant is vertically installed and directly onto the diving tube of the tank, it is not required to use a flexible connection.

9.1.4.3. Refer to the approved drawings and the ground level plus the desired height of the outlet of the dry hydrant. Cut the extremity of the opposite side of the connection ring of the pipe delivered with the tank.

9.1.4.4. Install the dry hydrant. If all the pieces fit well together, glue them with the primer and cement for PVC.

9.2. Dry hydrant installation with plumbing parallel to the ground

9.2.1. A flexible and watertight fitting must be installed at the beginning of an horizontal section of plumbing either after an 90 degree elbow on the diving tube or to a fitting at the bottom of the tank. Refer to the approved drawings.

9.2.2. All horizontal sections of the plumbing must have a little slope to them to allow full drainage towards the tank or towards the dry hydrant if it is inferior to the bottom of the tank.

9.2.3. The plumbing parts that may contain resting water must be protected against freezing if it is located at a higher level than the normal freezing level of your region.

9.2.4. To adjust the appropriate height for the Installation of the dry hydrant, refer to the approved drawings of the project and refer to the ground level plus the desired height for the outlet of the dry hydrant.

10. CUSTOMER SERVICE

If you have any questions, do not hesitate to contact our customer service agents:

1 (819) 344-2525

info.gc@granbyindustries.com



CONTROL SHEET

FIBERGLASS TANK GRANBY COMPOSITES INC.

DISPLAY THIS CONTROL SHEET AND KEEP IT WITH ALL CORRESPONDANCE RELATIVE TO THE INSTALLATION OF THE TANK

DATE OF INSTALLATION: _____ SERIAL # OF THE TANK: _____

OWNER: _____

NO. APPROVED PLAN: _____ Rev. no. _____

ADDRESS OF INSTALLATION: _____

CONTRACTOR: _____

PROJECT SUPERVISOR: _____

1- PREPARATION FOR INSTALLATION

VERIFIED BY : _____

A. Visual Inspection: no damage evidence (hole, crack, sinking) on the tank. _____

B. Excavation: dimensions of the bottom: _____ Width : _____ Length : _____ Height : _____

C. Bottom of excavation: ☐ Dry ☐ Reinforced concrete slab
☐ Flooded ☐ Other _____

D. Backfill material

1- Foundation: ☐ Gravel or ☐ Crushed stone or ☐ Other _____

2- Primary backfill: ☐ Gravel or ☐ Crushed stone or ☐ Other _____

3- Secondary backfill: ☐ Gravel or ☐ Crushed stone or ☐ Other _____

E. Geotextile used: Type: _____

1 - Under the foundation: ☐ Yes ☐ No

2 - Between primary backfill and native soil: ☐ Yes ☐ No

3 - Between primary and secondary backfill: ☐ Yes ☐ No

F. Anticipated circulation HS20: ☐ Yes ☐ No

G. Anchorage system required: ☐ Yes ☐ No

1 - Concrete blocks Granby Composites inc. no. AAB1224X64 Quantity: _____

2 - Straps Granby Composites no. AAC _____ Quantity: _____

3 - Idlers Granby Composites no. AAT1200001 Quantity: _____

4 - Reinforced concrete slab: Length: _____ Width: _____ Thickness : _____

2- DURING THE INSTALLATION

VERIFIED BY :

- A. Foundation level 300 mm (12 inches) of primary backfill material _____
- B. Space between the tanks: Tank are distanced as specified in the manual _____
- C. Visual inspection: no evidence of damage after handling _____
1st internal diameter measure to write down in chart #1 _____
- D. Anchor straps: place as specified with tension _____
- E. 2nd internal diameter measure to write down in chart #1 (Measure #1 – Measure #2) = Bending = _____
Observed bending inferior to maximal allowed (see manual G.C.) ☐ Yes ☐ No _____
- F. Implantation of the primary backfill carefully pushed under the tank to avoid any vacuum _____
- G. Complete the implantation of the primary backfill to 30 cm (12 inches) above the tank _____
- H. Installation of flexible joints between the connection of the tank and all horizontal conduits _____
- I. 3rd internal diameter measure to write down in chart #1 (Measure #1 – Measure #3) = Bending = _____
Observed bending inferior to maximal allowed (see manual G.C.) ☐ Yes ☐ No _____
- J. Installation of manhole extensions according to the approved drawings and manuals _____
- K. Hydrostatic test / water level 30 cm above the manhole extension joint (see manual)
Leaks detected after 24H ☐ Yes ☐ No _____
- L. Implantation of the secondary backfill to reach the required covering height described in approved drawings _____
- M. Protection against freeze for the tank or conduits located above freezing line ☐ Yes ☐ No _____
If answer is no : justification ; _____
- N. Asphalt or reinforced concrete slab according to approved drawings ☐ Yes ☐ No _____
- O. Secondary backfill as required in the approved drawings for circulation HS-20 ☐ Yes ☐ No _____

A. 4TH internal diameter measure to write down in chart #1 (Measure #1 – Measure #4) = Bending = _____
 Observed bending inferior to maximal allowed (see manual G.C.) ☐ Yes ☐ No _____

Comments: _____

CHART #1			
1 st measure =		Reference	Flexion
2 nd measure =		(1 st – 2 nd)	
3 rd measure =		(1 st – 3 rd)	
4 th measure =		(1 st – 4 th)	



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OTHER APPLICATIONS

We offer you a wide range of options regarding your underground storage projects. Our products are well suited to respond to the diversified mandates of our clients, whose needs vary based on the market and business sector. Our team of experts develops, manufactures and distributes fiberglass tanks and specialized equipment, whether it's for fire protection, rainwater, potable water or an alternative to a waste water system.



**FIRE
PROTECTION**



RAINWATER



**POTABLE
WATER**



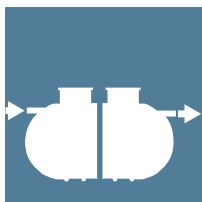
STORMWATER



**OUTFITTERS
CAMP**



WASH WATER



**GREASE
INTERCEPTORS**



**ANIMAL FEED BULK
STORAGE TANKS**



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BUILDINGS**



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SAP**



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