Hensel Design Group INC.

Advancing Sustainable Development Solutions

July 15, 2016

Mr. David Finbow
c/o PB Holdings Limited
R.R.#2
P.O. Box K-3
Clarksburg, ON N0H 1J0

Dear Mr. Finbow:

RE: Watercourse #26 Crossing of Delphi Lane

1.0 INTRODUCTION

Hensel Design Group Inc. was retained in association with LRG Environmental to complete a fish habitat assessment of Watercourse #26 in support of a proposed culvert crossing of the watercourse. The culvert is required for a road crossing within the Neighbourhoods of Delphi Point residential development. The residential development is proceeding in phases with Phase 1A already complete. The entire development is approximately 12.89 ha in size and is situated adjacent to Highway 26 in the Town of Blue Mountains, Ontario. The entire 12.89-ha holdings are legally described as Part of Lot 26, Concession 5, Town of The Blue Mountains, County of Grey. Refer to Figure 1 for a Site Location Plan.

The future public road (Street A) will cross a defined stream channel referred to as Watercourse #26 to facilitate access to the adjacent Peaks Bay residential development to the east. Engineering drawings and hydraulic design of the proposed culvert were prepared by C.F. Crozier & Associates (Crozier), Collingwood, Ontario.

2. BACKGROUND

The subject lands were consolidated by the Developer and draft approval of the residential development was granted through the Ontario Municipal Board in 2007. The Developer is now proceeding with the detailed design of the residential development through multiple phases which reflect input received during pre-consultation discussions with the Town of The Blue Mountains, Ministry of Transportation and easterly adjacent development, Peaks Bay. An Environmental Impact Statement (EIS) prepared for the property in 2003 (Gartner Lee Ltd., 2003) referred to Watercourse #26 as Watercourse #2, but for the purpose of this report we refer to the stream as Watercourse #26.

Approval to undertake the culvert placement and stream crossing was originally granted by the Grey Sauble Conservation Authority (GSCA) in August, 2011 during a period when Conservations Authorities had a formal agreement with the Department of Fisheries and Oceans (DFO) to review work in and around water under the federal *Fisheries Act.* The GSCA permit expired in August, 2013, and the DFO agreement with the Conservation Authorities is no longer in place. Therefore, projects that have the potential to impact fish habitat are now formally reviewed by DFO.

Watercourse #26 drains approximately 130 ha of external lands and traverses the east limit of Phase 1A, ultimately discharging to Georgian Bay to the north (Crozier 2008). Drainage lands from Subwatershed 26 consist of:

- forested areas across the table lands of the Escarpment
- steep slopes of the Escarpment face and associated ski hill operations
- relatively flat lands from the toe of the Escarpment slope to Georgian Bay
- mixture of forested and residential areas.

Watercourse #26 originates at the base of the nearby ski hill approximately 200m upstream of the proposed culvert crossing and continues north about another 500 m before meeting Georgian Bay. Through the property, Watercourse #26 consists of a triangular to trapezoidal cross section, having top of bank widths ranging from 8 to 9 metres, and side slopes ranging from 3:1 to 5:1 (Crozier 2008). Given the elevation difference between the watercourse top of bank and Phase 1A lands, existing condition runoff from the Phase 1A lands flows north via sheet flow and ultimately reaches the Georgian Bay without entering Watercourse #26. Runoff that is conveyed within Watercourse #26 across the subject lands consists almost entirely of external runoff which enters the watercourse at Highway 26 which is situated about 70 m upstream of the proposed culvert. Upon development of Phase 1A, approximately 1 ha of the residential development will discharge directly to Watercourse #26 at a point upstream of the proposed watercourse crossing.

A detailed hydrologic study of Subwatershed 26 was previously prepared by Crozier (2005) for the Georgian Peaks Ski Club and was subsequently approved by The Town of The Blue Mountains and MTO. Peak flows generated from that study were used to evaluate the hydraulic conditions of Watercourse 26 to be used in culvert design, scour analysis and substrate sizing.

3. FISH HABITAT ASSESSMENT

A site reconnaissance and stream evaluation was undertaken on June 6, 2016. The watercourse was walked from Hwy 26 down to its mouth into Georgian Bay. Sections of the stream above Hwy 26 were also examined. Based on Grey Country mapping Watercourse #26 is estimated to be about 700 m in total length, from its origin at the base of the ski hills to where it enters Georgian Bay (Figure 2). The watercourse is relatively straight, and given the raised banks on either side of the stream it appears to have been dredged at some point in the past with dredge spoils forming the raised banks. The deepest water measured in the watercourse was 30 cm about 150 m below the proposed culvert crossing.

At the location of the proposed culvert crossing the stream is 1.0 -1.5 m wide and 20 cm deep (Photographs 1,2). The stream banks are quite steep and near Highway 26 the stream is about 4m below grade. As the stream flows north the gradient flattens and the stream is less incised and becomes 0.5m below grade. The channel is filled with garbage and woody debris at the culvert location as well as at several other locations along its length (Photographs 3, 4). The debris impedes water flow to some extent and would likely act as a barrier to movement of larger fish within the stream channel.

Some small fish (< 4 cm in length) were observed at a few locations in the watercourse both above and below the proposed culvert location. The fish were not abundant where they occurred and were not distributed throughout the entire watercourse.

The substrate is predominantly (> 80%) fine clay for the entire length of the watercourse (Photograph 5). There is a large concrete culvert under Hwy 26 (Photograph 6) as well as a metal culvert situated about 20 m above Hwy 26 adjacent to a parking lot (Photograph 7). Below the existing culverts there are some deposits of small broken shale and cobble rip rap that has fallen into the stream channel (Photographs 6, 7).

Stream cover is provided by abundant small shrubs and larger trees forming an overhead canopy for > 75% of the stream length from the proposed culvert crossing down to Georgian Bay. Emergent grasses provide some in-stream cover where the overhead canopy is more open allowing sunlight to reach the stream (Photographs 5-7).

There is a raised deposit of shale at the mouth of Watercourse #26 into Georgian Bay which is about 370 m downstream of the proposed culvert location (Photographs 8, 9). The deposit is 8-10 m in width and would represent a significant barrier to fish migration into the stream for most of the year. A small wetland is immediately west of the watercourse (Photograph 10) that provides a hydrologic connection to Georgian Bay but no clear channels that would provide fish passage were observed.

In summary, Watercourse #26 does provide fish habitat as several small cyprinnids were observed in the stream. The existing conditions render the stream as relatively low quality fish habitat due to its small size, clay substrate and abundant obstructions. However, the proposed culvert design and construction methods as outlined below have been implemented to avoid or mitigate any direct impacts to fish and fish habitat.

4. PROPOSED CULVERT DESIGN and CONSTRUCTION

A HEC-RAS hydraulic model was developed to evaluate the hydraulic conditions of Watercourse #26 and to assist with the design of a suitable culvert structure. The estimated flows for different storm events are summarized in Table 1.

Table 1: Summary of Peak Storm Flows for Watercourse 26 (from Crozier, 2008)

Storm Event	2-Year	5-Year	10-Year	25-Year	50-Year	100 Year	Regional
Peak Flow (m^3/s)	2.4	3.9	5.5	6.9	7.7	9.3	9.8

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The proposed culvert is 21 m in length consisting of 4.27 m span and 1.84 m rise multi-plate metal arch. The culvert will be open bottom providing the best natural habitat. The culvert arches will sit on reinforced concrete footings placed along both sides of the stream. Detailed engineering drawings are provided separately representing Drawings 150, 151 and 152 for Crozier Project 226-2678.

All work will be completed in the dry by installing upstream and downstream coffer dams, temporary culverts and overland spill route prior to any excavation. Native material at the culvert bed will be sub-excavated to a depth of 60 cm and native material disposed off-site. New, clean mixed substrate will be added to the culvert bottom consisting of the following:

D16: 50mm gravel
D50: 300mm cobble
D84: 350mm cobble
5-10% fine sand and gravel (< 10 mm)

A low flow channel, approximately 0.3m deep will be shaped into the new stream bottom with 5:1 side slopes. The low flow channel will extend beyond the end of the new culvert and provide a clearly defined stream channel even during times of reduced water flow. The addition of gravel and small cobble within the culvert bottom will provide natural substrate as well as diversify the stream habitat which is currently dominated by clay.

5. MITIGATION MEASURES

The following measures are recommended to minimize or avoid impacts to fish and fish habitat during construction of the new culvert:

- Any in-water construction will take place between July 1 and September 15,
- Construction materials (rocks, logs etc.) will not be taken from the shoreline or below high-water mark of the watercourse or Georgian Bay,
- All work to be performed in dry dewatered conditions,
- Stabilization works should follow the natural contour and profile of the watercourse,
- Any stockpiled materials will be stored and stabilized away from the water,
- Vehicle and equipment re-fueling and maintenance will be conducted a minimum of 30m away from the water,
- Any part of equipment entering the water should be free of fluid leaks and cleaned/degreased to prevent deleterious substances from entering the water,
- Only clean material free of fine particulates should be placed in the water,
- Sediment and erosion control measures should be implemented prior to work and maintained during the work phase, to prevent the entry of sediment into the water,
- All sediment and erosion control measures should be inspected daily to ensure they are functioning properly, and upgraded or maintained as required,
- If the sediment and erosion controls are not functioning properly, no further work should occur until the sediment and/or erosion control problem is addressed,
- All disturbed areas should be stabilized as soon as possible after construction is complete,

- Sediment and erosion control measures should be left in place until all disturbed areas in the construction area are stabilized,
- All disturbed areas should be stabilized and re-vegetated as required upon completion of work and restored to a preconstruction state or better (See Drawing L-1 Attached),
- At no time will water flow to downstream sections of the watercourse be impeded,
- Coffer dam and any accumulated silt or sediment will be removed with care once the site is stabilized,
- General erosion control notes will be part of the engineering drawings to be provided to the contractor (See Engineering Drawings by Crozier & Associates).

6. IMPACT ASSESSMENT

The existing conditions within Watercourse #26 provide fish habitat of low or marginal quality. Not with standing this fact, the methods of construction and culvert design have been developed to minimize and avoid impacts to fish and fish habitat. An in-water construction window of between July 1 and September 15 has been recommended to avoid potential sensitive spawning periods of both cold and warm water fish species.

At the location of the proposed new culvert the stream channel is currently choked with debris, garbage and woody matter. This material will be removed during construction thereby improving water flow and fish movement.

New substrate placed in the culvert bottom will provide course gravel and small cobble which is currently lacking in the stream channel thereby providing increased habitat diversity.

In summary, if the proposed recommendations and mitigation measures are followed the proposed new culvert placement can be undertaken with no impacts to fish and fish habitat. In fact there will likely be some small net improvements to fish habitat as a result of the undertaking.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Hensel Design Group Inc.

Michael J. Hensel, OALA, CSLA
Senior Development Consultant

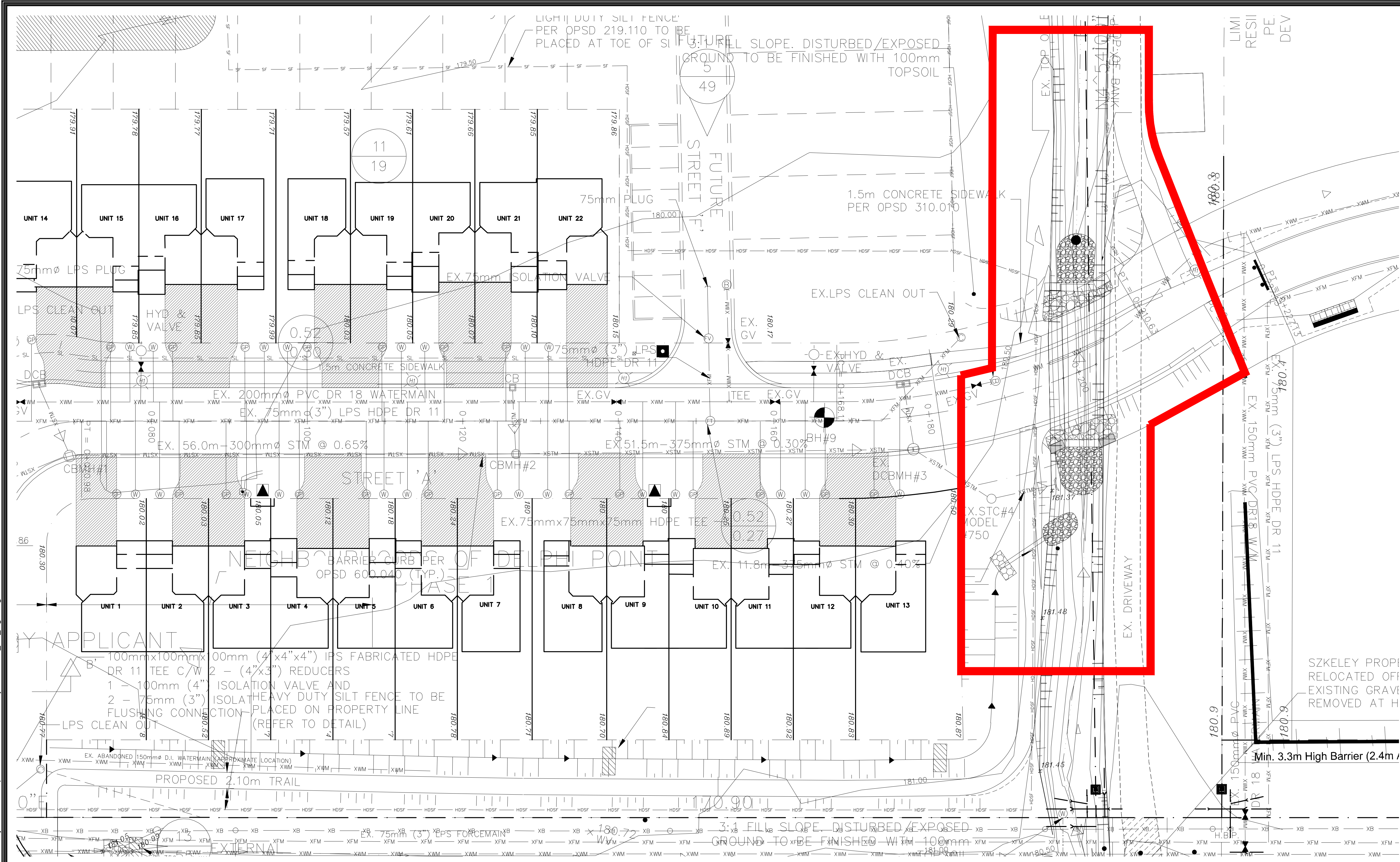
MJH:sh

Encl.

References

Crozier and Associates. 2008. Watercourse #26 Crossing Design Brief. Neighbourhood of Delphi Point. December, 2008. 14 pps plus figures.

Gartner Lee Ltd. 2003. Environmental Impact Statement. The Delphi Point Properties. Town of The Blue Mountains. 60 pps. October, 2003.



PROPOSED WORK ZONE

Scale = 1:500

Key Plan (n.t.s.)

Legend

PROPOSED WORK ZONE

No.	Revision	Date	Init

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY ERRORS OR OMISSIONS TO THE CONSULTANT BEFORE COMMENCING OR PROCEEDING WITH ANY WORK.

DO NOT SCALE THIS DRAWING.

Hensel Design Group
Advancing Sustainable Development Solutions
372 Peel St, Collingwood, Ontario, L9Y 3W4
Phone: 705-443-8394 Fax.: 705-443-8494

PROJECT
Neighbourhoods of Delphi Point
Town of Blue Mountains, Ontario

TITLE
PROPOSED WORK ZONE

SEAL

ASSOCIATION OF LANDSCAPE ARCHITECTS ONTARIO
MICHAEL J. HENSEL
OALA MEMBER

Scale:	1:500
Date:	July 2016
CAD File:	HDG_DP_Fig1
Drawn by:	CM
Checked by:	MH
Job No.:	-

Drawing No.

Fig 1

Date Plotted: July 15, 2016 File Location: Q:\Projects\HDG\Delphi\ACAD\DWG\HDG\July 2016\HDG_DP_Fig1.dwg

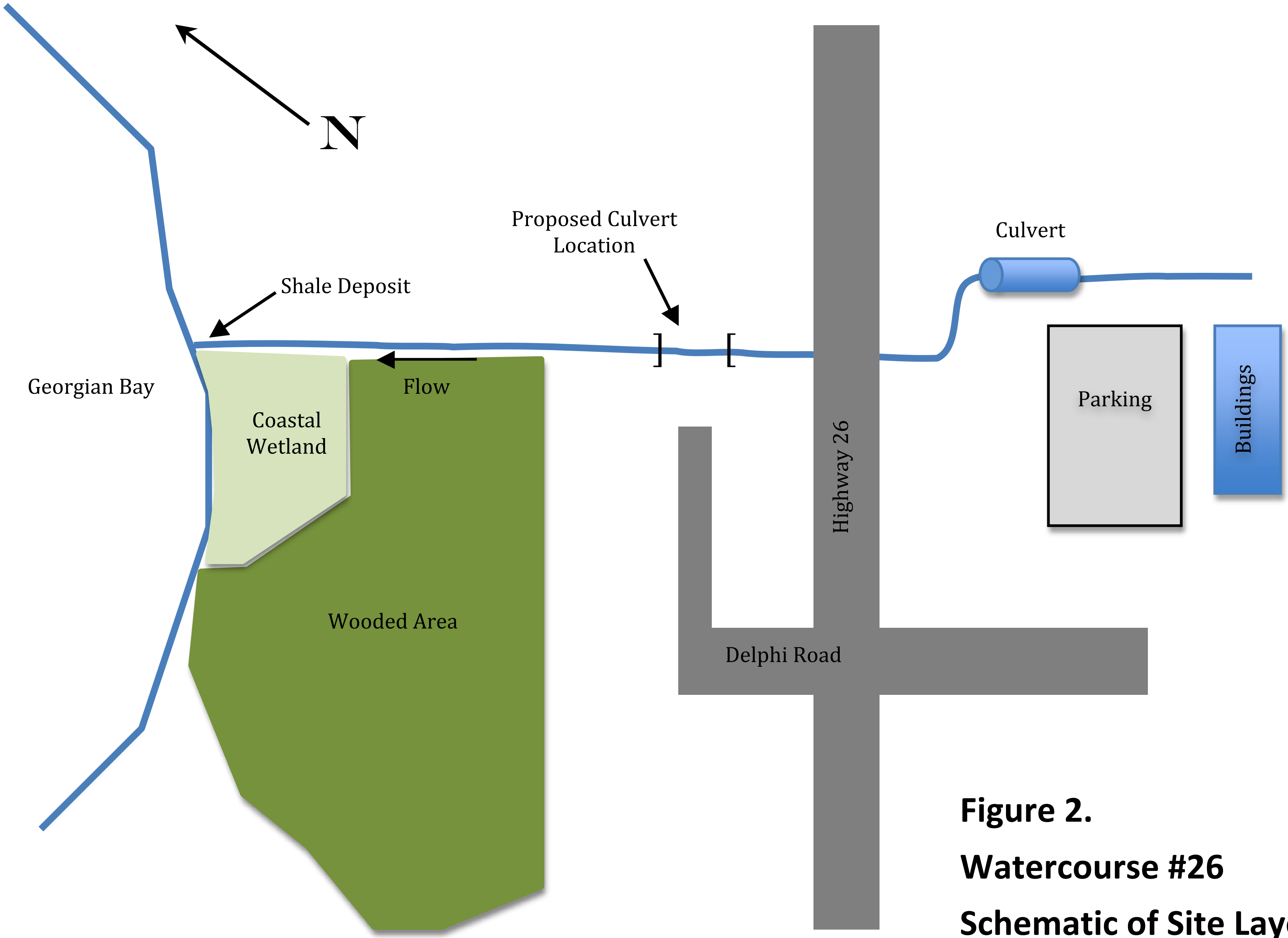
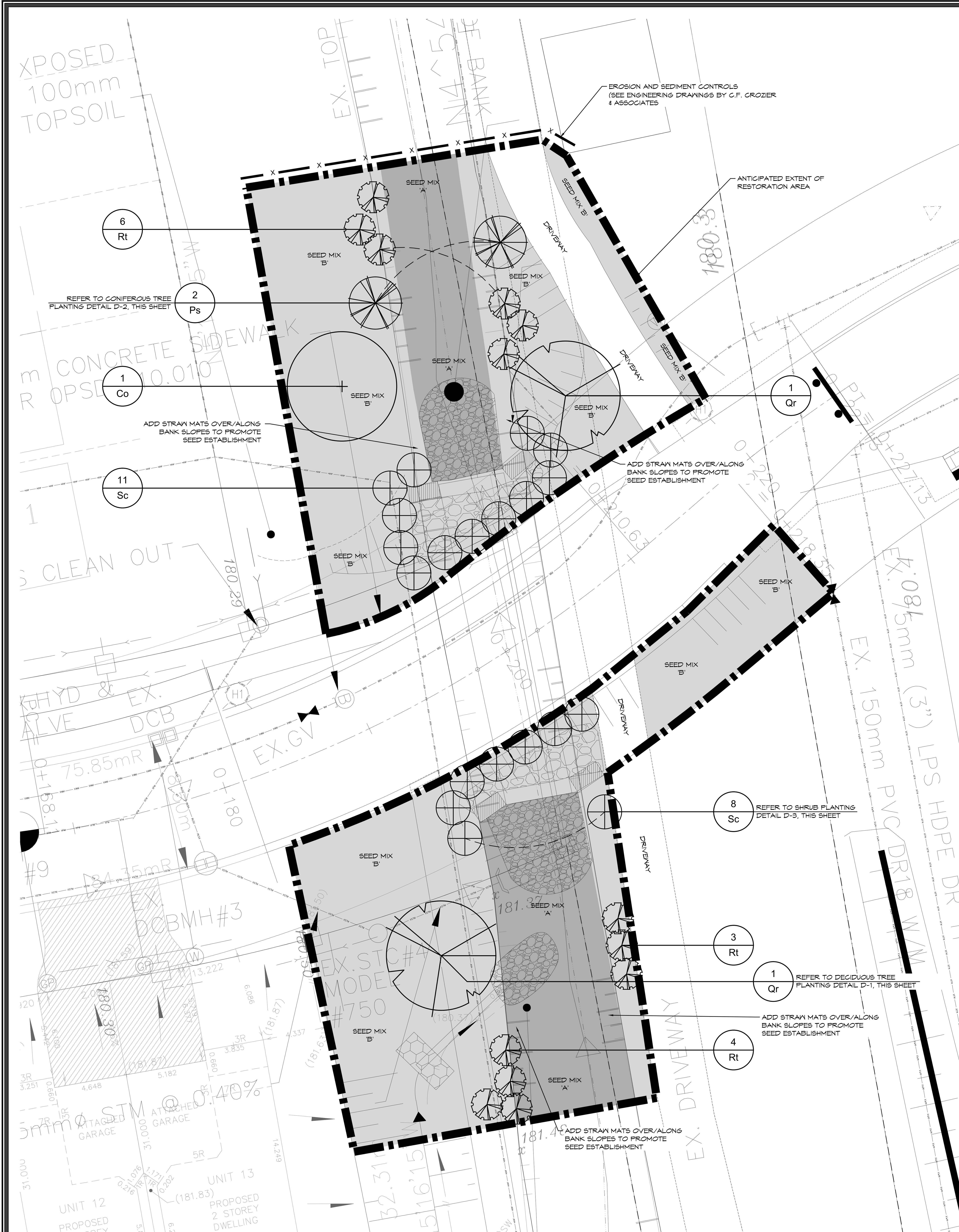


Figure 2.

Watercourse #26

Schematic of Site Layout

Not to Scale



LANDSCAPE PLAN
Scale = 1:150

PROPOSED PLANTING MATERIAL

KEY	QUANTITY	COMMON NAME	BOTANICAL NAME	SIZE	CONDITION	REMARKS
DECIDUOUS TREES						
Co	1	Hackberry	Celtis occidentalis	45mm cal.	W.B.	
Qr	2	Red Oak	Quercus rubra	45mm cal.	W.B.	
	3	TOTAL NUMBER OF TREES				
CONIFEROUS TREES						
Ps	2	White Pine	Pinus strobus	100cm ht.	F.P.	
	2	TOTAL NUMBER OF TREES				
SHRUBS						
Rt	18	Staghorn Sumac	Rhus typhina	2 gal.	Pot	
Sc	15	Red Berried Elder	Sambucus racemosa	2 gal.	Pot	
	33	TOTAL NUMBER OF SHRUBS				

SEED MIX 'A' AREA ($240m^2$)

SEED MIX A - FACW WETLAND MEADOW MIXTURE

QUANTITY		MIX TYPE
10%	-	NEW ENGLAND ASTER
1%	-	HEATH ASTER
1%	-	ZIG ZAG ASTER
5%	-	LURID SEDGE
25%	-	FOX SEDGE
25%	-	VIRGINIA WILD RYE
1%	-	SPOTTED JOE PYE WEED
1%	-	BONESET
1%	-	CANADA GOLDENROD
5%	-	FOWL MANAGRASS
1%	-	BLUE LOBELIA
24%	-	BLUE VERVAIN
		SEED @ $250g/90m^2$

- SEEDING RATE FOR ABOVE: 20 - 25Kg (18 - 22lbs/acre)
- NURSE CROP FOR ABOVE: OATS (AVENA SATIVA) - APPLY HYDROSEED USING A MULCH SLURRY WITH ADHESIVE AT A RATE OF 34Kg/ha (30lbs/acre).

MAINTAINING SEEDED AREAS

MONITOR GROWTH OF DESIRED SPECIES VERSUS WEEDS. REMOVE WEEDS. MOWING TO A 15cm HEIGHT (6") HEIGHT IS RECOMMENDED TO TOP-OFF AGGRESSIVE WEEDS AND GIVE DESIRABLE VEGETATION THE OPPORTUNITY TO GROW. MOST COMPETITION THE FIRST SEASON WILL BE FROM ANNUAL WEEDS. MOWING TOO CLOSE AND OVER FERTILIZING THE PLANTING WILL EXASPERATE WEED PROBLEMS. SECOND YEAR CARE REQUIRES YOU TO CONTROL AGGRESSIVE WEEDS WITH SPOT SPRAYING, HAND WEEDING OR MOWING. MOWING DURING DORMANCY, (LATE FALL) OR EARLY SPRING IS RECOMMENDED.

SEED MIX SUPPLIER (or equivalent):
Ontario Seed Company
P.O. Box 7
Waterloo, Ontario, N2J 3Z6
Ph: (519) 886-0557

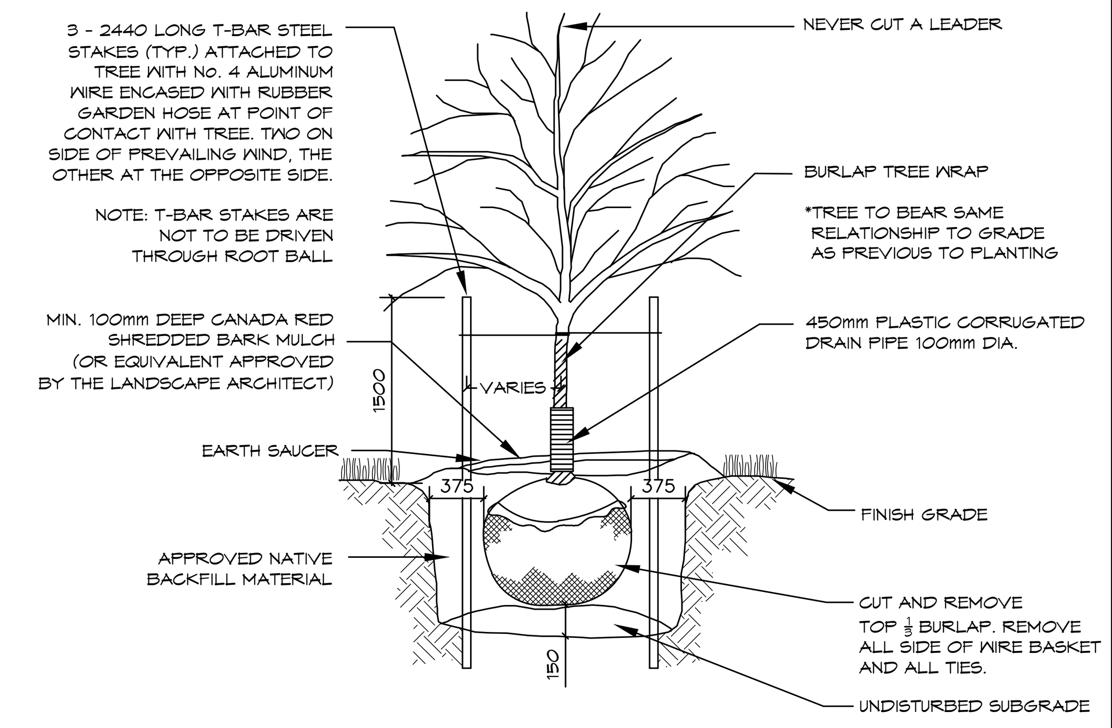
SEED MIX 'B' AREA ($810m^2$)

SEED MIX B - NATIVE PRAIRIE MEADOW MIX

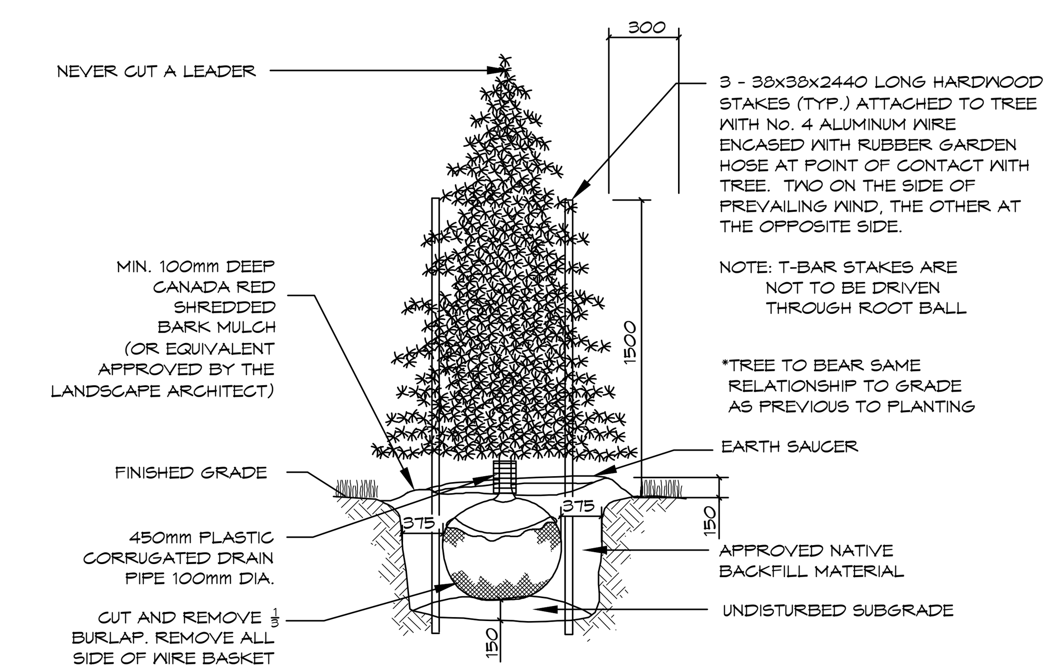
QUANTITY		MIX TYPE
2%	-	BEARDTONGUE
7%	-	BLACK EYED SUSAN
4%	-	COMMON MILKWEED
1%	-	EARLY GOLDENROD
20%	-	FOWL BLUEGRASS
20%	-	INDIANGRASS
30%	-	LITTLE BLUESTEM
1%	-	NEW ENGLAND ASTER
1%	-	SHOWY TICK TREFOIL
12%	-	SWITCHGRASS
1%	-	WHITE VERVAIN
1%	-	WILD BERGAMOT
	*	SEED @ $125g/45m^2$

GENERAL NOTES:

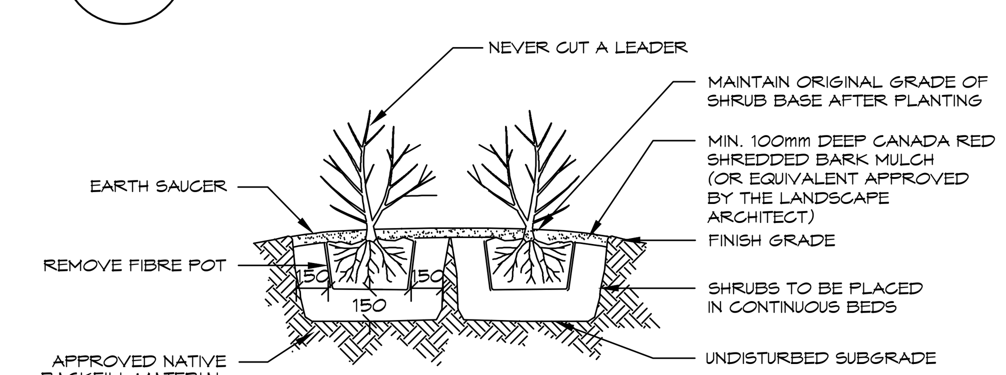
1. ALL WORKMANSHIP TO THE STANDARDS OF THE ONTARIO LANDSCAPE CONTRACTORS ASSOCIATION.
2. ALL PLANT MATERIAL SHALL BE STAKED FOR LOCATION BY LANDSCAPE ARCHITECT.
3. BACKFILL IS TO CONSIST OF SOIL NATIVE TO THE SITE OR GENERAL SOIL TYPE/CLASS NATIVE TO THE SITE OR AS SPECIFIED ON THE PLANTING DETAILS SHOWN ON SHEET L-3.
4. ALL TREES SHALL HAVE AN EARTH SAUCER AT ITS BASE WITH A DIAMETER AS LARGE AS EXCAVATED AREA TO RETAIN WATER.
5. ALL BURLAP SHALL BE CUT AND BURIED BELOW SURFACE DURING PLANTING.
6. CONTRACTOR SHALL MAINTAIN ALL LANDSCAPE AREAS UNTIL OWNER'S ACCEPTANCE OF PROJECT.
7. UNLESS OTHERWISE STATED, ALL WORK SHALL CONFORM TO THE LANDSCAPE ONTARIO SPECIFICATIONS STANDARDS.
8. SPREAD MULCH TO A MINIMUM 75mm COMPACTED DEPTH ON ALL TREE PITS AND PLANTING BEDS.
9. STAKING OF TREES SHALL BE AS PER DETAIL DRAWINGS PROVIDED. ALTERNATIVE METHODS MAY BE ACCEPTABLE WITH THE APPROVAL OF THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
10. REPORT ALL DISCREPANCIES IN WRITING TO THE LANDSCAPE ARCHITECT.
11. CONTRACTOR TO LOCATE ALL UNDERGROUND UTILITIES.
12. SUBMIT A WRITTEN GUARANTEE TO THE EFFECT THAT ALL PLANTS ACCEPTED DURING THE PERIOD OF JANUARY 1st TO JULY 15th SHALL BE GUARANTEED UNTIL JULY 15th THE SECOND FOLLOWING YEAR. PLANTS ACCEPTED DURING THE PERIOD OF AUGUST 15th TO DECEMBER 31st SHALL BE GUARANTEED FOR TWO YEARS FROM THE DATE OF ACCEPTANCE. THE GUARANTEE PERIODS LISTED ABOVE SHALL APPLY TO ALL "NURSERY GROWN" PLANTS.
13. ALL MATERIALS TO BE APPROVED BY LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
14. CHECK AND VERIFY ALL DIMENSIONS AND QUANTITIES PRIOR TO COMMENCEMENT OF WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE LANDSCAPE ARCHITECT. ANY SUBSTITUTIONS ARE TO BE APPROVED BY THE LANDSCAPE ARCHITECT.
15. PLANTING BEDS ARE TO BE MOUNDED A MINIMUM 75mm.
16. ALL GRADES NOT TO EXCEED 3:1 SLOPE UNLESS OTHERWISE NOTED.
17. FINAL INSPECTION AND ACCEPTANCE OF PLANTING WORK SHALL COINCIDE WITH THE FINAL INSPECTION AND ACCEPTANCE OF ALL WORK INCLUDED IN THE CONTRACT.
18. AT THE TIME OF FINAL INSPECTION ALL PLANTS SHALL BE IN A HEALTHY, VIGOUROUS GROWING CONDITION, PLANTED IN FULL ACCORDANCE WITH DRAWINGS AND CONDITIONS.
19. ALL PLANTINGS AND HARD LANDSCAPE FEATURES ARE TO BE STAKED OUT ON SITE AND APPROVED BY THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION. ANY DEVIATIONS FROM THE APPROVED LANDSCAPE PLANS REQUIRE PRIOR TOWN OF BLUE MOUNTAINS APPROVAL.
20. PLANTINGS ARE TO BE WATERED REGULARLY DURING GROWING SEASON UNTIL ALL PLANTINGS HAVE ESTABLISHED AND ARE IN A HEALTHY, VIGOUROUS GROWING CONDITION.
21. ALL SEEDING AREAS ON THE PLANS ARE TO RECEIVE 100mm TOPSOIL AND ALL PLANTING AREAS 300mm TOPSOIL DEPTH.
29. ALL PLANT MATERIAL MUST CONFORM TO THE CANADIAN STANDARDS FOR NURSERY STOCK AND MUST BE GUARANTEED FOR A MINIMUM PERIOD OF 24 MONTHS FOLLOWING ACCEPTANCE OF THE WORK BY THE TOWN OF BLUE MOUNTAINS.
30. SITE PLAN AND GRADING BY C.F. CROZIER & ASSOCIATES.
31. SEE ENGINEERING DRAWINGS BY C.F. CROZIER & ASSOCIATES.



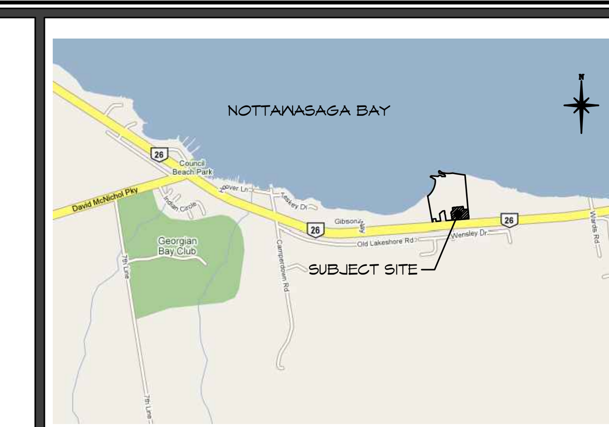
D-1 DECIDUOUS TREE PLANTING DETAIL
\- N.T.S.



D-2 CONIFEROUS TREE PLANTING DETAIL
\- N.T.S.

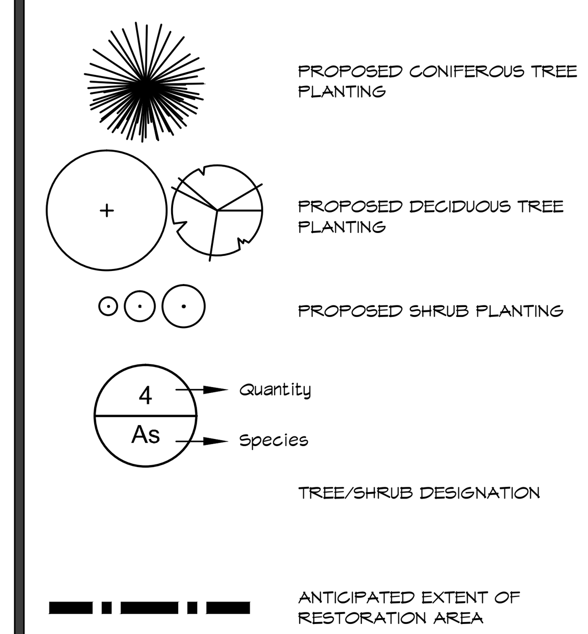


D-2 SHRUB PLANTING DETAIL
\- N.T.S.



Key Plan (n.t.s.)

Legend



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No.	Revision	Date	Init
1	FIRST SUBMISSION	July 15-16	MH

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY ERRORS OR OMISSIONS TO THE CONSULTANT BEFORE COMMENCING OR PROCEEDING WITH ANY WORK.

DO NOT SCALE THIS DRAWING.

Hensel Design Group INC.
Advancing Sustainable Development Solutions
372 Peel St, Collingwood, Ontario, L9Y 3W4
Phone: 705-443-8394 Fax.: 705-443-8494

PROJECT
NEIGHBOURHOODS OF DELPHI POINT
Town of Blue Mountains, Ontario

TITLE
LANDSCAPE PLAN

SEAL

SEAL
ASSOCIATION OF LANDSCAPE ARCHITECTS ONTARIO
MICHAEL J. HENSEL
OALA
MEMBER

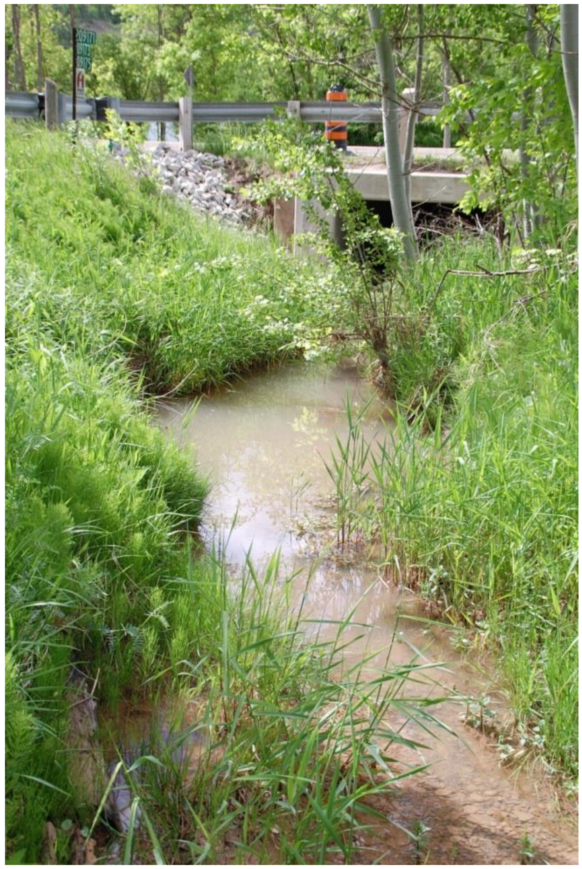
Scale: 1:150	DRAWING No. L-1
Date: July 2016	
CAD File: HDG-DP-L-1	
Drawn by: CM	
Checked by: MH	
Job No.: -	SHEET 1 OF 1

Michael J. Hensel, OALA, CSLA   DATE

Photographs 1, 2. Watercourse #26 at site of proposed culvert crossing.

Photographs 3, 4. Showing garbage and woody debris in stream channel.

Photograph 5. Fine clay forms majority of the substrate and banks.



Photograph 6. Looking upstream to existing culvert under Hwy 26. Some small broken shale as substrate in foreground.

Photograph 7. Smaller gravel and slate substrate at culvert above Hwy. 26 with some larger cobble rip rap.

Photograph 8. Shale deposit at mouth of Watercourse #26 at Georgian Bay, looking upstream.

Photograph 9. Shale deposit at mouth of Watercourse #26 looking toward Geogian Bay.

Photograph 10. Small wetland to west of Watercourse #26 providing some hydrologic connection to Georgian Bay.