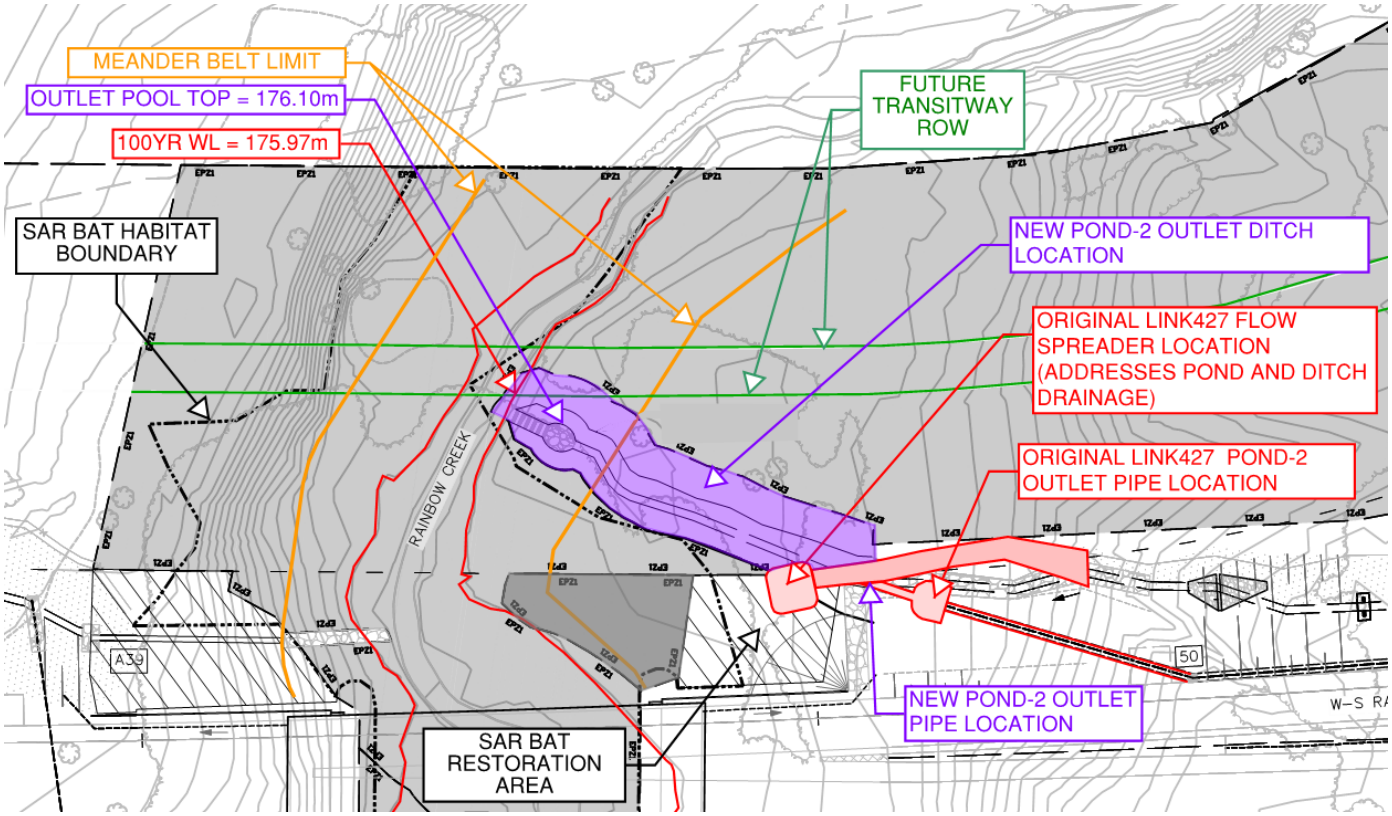
Appendix B: Agency Correspondence

To:	CJV	**Date:**	Thursday, June 27, 2019
From:	LINK427 Design Team	**No.**	MEMO-250 R1
Title:	Pond-2 Outlet Relocation		

This memorandum has been prepared to identify that there has been a change to the location of the Pond-2 outlet, the reasons for the outlet relocation and the implications on potential impacts to the environment and on future infrastructure due to the new location of the outlet.

In the design presented in DCR#4 (original LINK427 design), the outlet pipe from Pond-2 discharged to a plunge pool as shown in blue in **Figure 1**. From there, runoff was conveyed by a swale to a flow spreader shown in red in **Figure 1**. From the flow spreader, runoff was to sheet flow over vegetated surfaces, ultimately discharging to the creek. Subsequently, the 3D surface modelling for the outlet area was refined and it revealed that positive drainage could not be provided with the original outlet configuration. In order to provide positive drainage, the flow spreader would have to be relocated at a lower elevation and be moved within the EPZ2 (shown in dark grey in **Figure 1)** and within Species at Risk (SAR) bat habitat (SAR bat habitat boundary depicted by dashed line in **Figure 1**), which was not a feasible option, as the flow spreader would have been a permanent disturbance in an area (EPZ2) where only temporary disturbance is allowed. After multiple design iterations and multidisciplinary review, it was concluded that the optimal location would avoid the SAR bat habitat, the Future transitway right of way and the EPZ2 area. This optimal location is highlighted in purple in **Figure 1**.

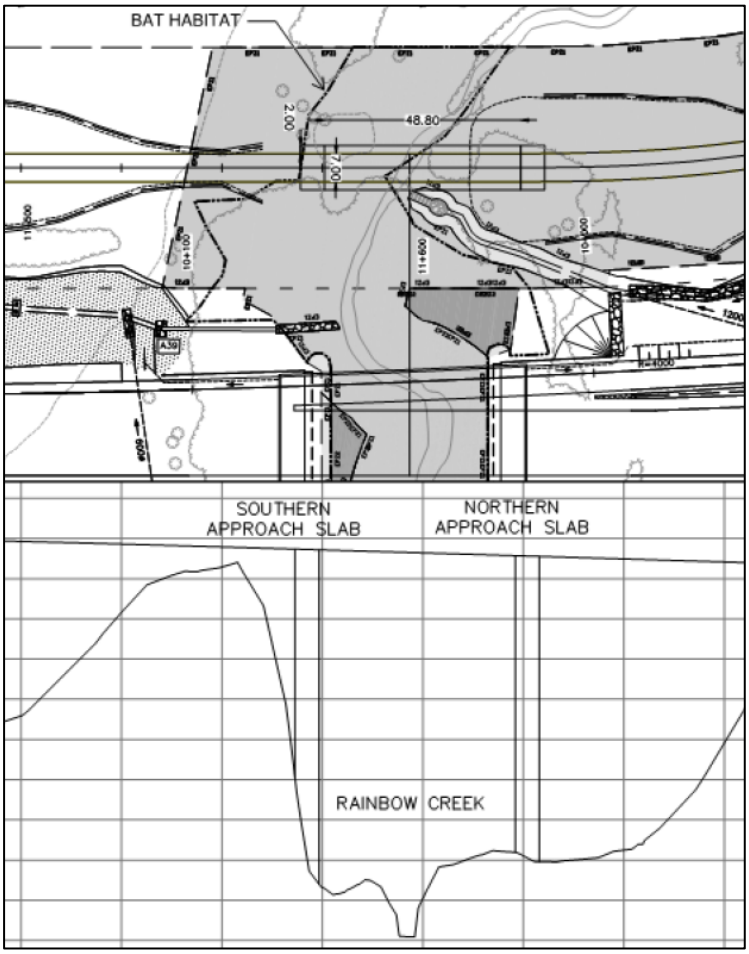
Figure 1 – Pond-2 Outlet Original and Proposed Location



As shown in **Figure 1**, the outlet pipe from Pond-2 will still discharge near the original location. Runoff will then be conveyed via a bio-swale, which directs flows to a pool at the base of the slope for increased flow retention and infiltration. Both the bio-swale and pool are lined with a mix of soil and granular materials (e.g., river stone) and covered with a biodegradable erosion control blanket (see attached stormwater management details, DWG 2213). Additionally, a high density of live staking is proposed throughout to enhance the stability of the feature through root generation. During periods of high flow, runoff will be guided downstream of the pool through a series of wattles, which will act to further regulate flows near the creek. The wattles will consist of bundles of live woody debris bundles, which should be sourced on-site, where possible. Additionally, based on input from the fluvial geomorphologists, the placement of the drainage feature has been intentionally situated away from any immediate channel meanders. A level of lateral migration is expected over the long term beyond 100 years but it is not considered significant. Bio-swale details have been included in the attachment (Stormwater management details, DWG 2213). It is worth mentioning that the relocation of Pond-2 outlet was not caused by nor will impact Pond-2 hydrology or hydraulics. Further details relating to hydraulic of the bioswale and outlet design as well as implementation and restoration recommendations are described in the Pond-2 Outlet and Drainage Feature Technical Memo by Geo Morphix attached.

An analysis was completed to demonstrate that the future Transitway construction will not be impacted by the proposed Pond-2 outlet ditch into Rainbow Creek. **Figure 2** shows a preliminary plan & profile of a potential future Transitway bridge over Rainbow Creek with a similar profile and span configuration as the Highway 427 bridges. The preliminary grading lines shown indicate that there is adequate room for conventional construction of the bridge approach and grading treatments surrounding the future abutments, with no additional work to be performed by the CA. The outlet can be relocated in the future if deemed necessary.

Figure 2 – Future Transitway Preliminary Plan and Profile



Given that the proposed Pond-2 outfall will not encroach within the 2-year flood level, there will be no new footprint within fish habitat. As a result, no detailed impact assessment is required under the Fisheries Act and the MTO/DFO/MNRF Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings as all potential impacts are anticipated to be addressed through standard construction mitigation measures which are detailed in the Fisheries Impact Assessment Report (H427-1-ENV-REP-003).

The vegetation community impacted by the new location of the drainage feature is not SAR Bat Habitat as defined by the boundary delineated in the SAR Bat Permit (Permit # AU-C-011-16) (and shown on **Figure 1**) or by the vegetation community types present in this area. The impacted habitat is a mosaic of Mineral Cultural Thicket (CUT1) and Old Field Meadow (CUM1-1). These vegetation community types do not qualify as potential SAR Bat Habitat according to the latest MNRF technical guidance documents.

Erosion and sediment control (ESC) measures and tree protection fencing will be installed at the limits of the SAR Bat Habitat to prevent unintended intrusion during construction. Therefore, there will be no changes to the SAR Bat Habitat impacts identified in the SAR Bat Permit.

There will, however, be a minor impact (approx. 25 m^2) to the corner of the SAR Bat Habitat restoration area identified in the SAR Bat Permit for the northwest quadrant as a result of grading for the swale. Unfortunately, restoration plantings cannot be placed within this corner of the SAR Bat Habitat restoration area because the tree roots could interfere with the integrity of the swale. However, the LINK427 landscape design team has determined that through a reduction in tree spacing (spacing reduced from 5-6 m on centre to 4.5 m on centre), the required number of trees (according to the SAR Bat Permit) will still fit within the SAR Bat Restoration area. This minor change to the SAR Bat Habitat restoration area will be documented in the 2019 Annual Bat SAR Monitoring Report (to be submitted to the MECP).

Overall, there are no significant negative impacts to the environment or future infrastructure anticipated due to the relocation of the Pond-2 outlet drainage feature.

Adverse Environmental Impact Mitigation Measures:

The following typical mitigation measures will be incorporated during and following construction to avoid or minimize potential environmental effects:

- Timing windows for vegetation clearing (i.e., clearing outside migratory bird nesting period [April 15 through August 15] for all vegetation and clearing outside the bat active season [April 1 through September 30] for vegetation within designated SAR bat habitat).
- ESC measures and tree protection fencing to be installed at the limits of the temporary work zone to prevent unintended impacts beyond the identified area.
- LINK427 Environmental Inspector will be on site during ESC and tree protection fence installation to ensure fencing is installed at correct location.
- LINK427 Environmental Inspector will monitor ESC measures and tree protection fence regularly to identify deficiencies or failures and ensure repair for effectiveness.
- Heavy equipment will be contained within the work area defined by the ESC measures and tree protection fencing.

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June 24, 2019

WSP
610 Chartwell Road
Oakville ON L6J 4A5

Attention: Juan Lopez

Re: Pond-2 Outlet and Drainage Feature Technical Memo
Highway 427 Extension Project
GEO Morphix Project No. PN17022

Introduction

This memo provides recommendations for the end-of-pipe treatments associated with the Stormwater Management (SWM) Pond-2 as part of the Highway 427 Extension works in the City of Vaughan. Pond-2 is situated northwest of the Langstaff Road – future Highway 427 intersection and is proposed to discharge to the Rainbow Creek valley corridor immediately west of the RAIN-3 crossing. As such, a naturalized drainage feature is proposed to convey flows from the outlet to a pocket wetland at the valley toe. The accompanying drawings in **Appendix A**. provide direction for design implementation and should be reviewed in conjunction with this memo.

Existing Condition

GEO Morphix Ltd. staff completed an inspection of Rainbow Creek valley corridor on July 7th, 2017. Additionally, a detailed geomorphic assessment was completed for the corresponding reach of Rainbow Creek on September 19th, 2018. A summary of the field observations for the relevant section of channel corridor is provided below.

The proposed Pond-2 drainage feature follows the margin of a wooded area and meadow, characterized by tall grasses. Rainbow Creek is located south of the feature and flows eastward in a generally straight manner. Channel banks were generally vegetated and stable along this stretch of the channel. Though, exposed sections of till were observed along the bank toe. Channel substrates consisted generally of gravels underlying a veneer of sand.

Bioswale and Outlet Design

In consideration of the site conditions, outlet location, and hydraulics, a drainage feature consisting of a bioswale and outlet pool was deemed to be an appropriate solution to effectively capture and convey flows towards Rainbow Creek.

The proposed bioswale and outlet are to be constructed as over-excavated depressions, which are lined with a mix of soil and granular materials to provide depressional and subsurface storage (within the interstitial space of the sediment and soil). The short-term water retention function of drainage feature helps to polish the water and moderate the discharge of water into the Rainbow Creek floodplain (in addition to the functions provided by the SWMP). During periods of high flow, runoff will be guided downstream of the outlet pool through a series of wattles, which will act to further regulate flows near

the creek. The wattles will consist of bundles of live woody stakings, which may be sourced on-site. The wattles will be installed in a leveled manner to distribute overflow as sheet flow, to limit the potential for erosion.

Sizing of the bioswale was guided by a review of flow hydraulics ranging from the 2-year to 100-year flood event. The modelled flows are provided in **Table 1**.

Table 1: SWM Pond-2 Modelled Flows

Parameters	Modelled Flood Event	
	2 Year Event	100 Year Event
In-Channel Velocity (m/s)	0.27	0.70
Discharge (m^3/s)	0.07	1.72

The bioswale was sized to convey the modelled 100-year flow from Pond-2. Following a simple Manning's approach, the discharge to be accommodated within the channel was applied to back-calculate the cross-sectional area of the channel and the corresponding channel geometry. Manning's equation is mathematically represented as:

$$V = \frac{1}{n} R^{2/3} S^{1/2} \qquad \textbf{[Eq. 1]}$$

where, V is flow velocity, d is the hydraulic radius, S is the channel gradient, and n is the Manning's roughness. Applying the 100-year discharge, the back-calculated bankfull width and depth were 4.0 m and 0.60 m. The corresponding computed bankfull flow velocity and shear stress were 1.0 m/s and 24 N/m^2, respectively.

The bioswale and outlet pool substrate will consist of a 150 mm to 200 mm riprap, to be installed to a depth of 500 mm. The stones are to be pre-mixed with topsoil to fill the interstitial space between the stones and support vegetation establishment. The proposed substrates within the bioswale and outlet pool were hydraulically-sized per the recommendations for riprap outlined in Chang (1988) and Fischenich (2001) and are expected to be stable during the 100-year flood event. Additionally, native seed and a high density of live staking is proposed throughout to enhance the stability of the feature through root generation.

The positioning of the drainage feature was established based on the potential extent of flooding and proximity to nearby channel meanders, given that it is proposed within the Rainbow Creek meander belt limits. We note that the feature is situated outside the Rainbow Creek 100-year flood mark, which is reported at an elevation of 175.97 m. Additionally, the drainage feature directs flows towards a relatively straight section of channel, where significant channel adjustment is not anticipated. For instance, the nearest meander bends are located approximately 20 m and 35 m up- and downstream. As the drainage feature will consist entirely of natural materials, there are no concerns regarding its proximity to Rainbow Creek. For instance, should the creek migrate laterally over time, it will simply encounter the prescribed natural treatment (e.g., woody-based wattles, stone, soil, and live woody plantings).

Restoration Recommendations

Areas disturbed during the construction of the drainage feature are to be restored to original condition with topsoil and seed. For immediate erosion protection, mechanical stabilization in the form of a biodegradable erosion control blanket (e.g., S150BN or equivalent) is proposed. The blanket should be installed in a horizontal manner across the slope parallel to the direction of flow. As the blanket will biodegrade over time, it will serve as a short-term stabilization measure. For longer-term stability, implementation of a planting plan is recommended. This includes prescription of a riparian seed mix, which consists of deep rooting native grasses and other herbaceous species to be distributed and raked into the channel banks. Finally, a high density of live staking is recommended throughout the drainage feature overbank area for added feature stability through root generation.

Recommendations for Implementation

Construction monitoring should be performed by an inspector with experience overseeing channel works, as this type of work differs considerably from engineering projects. An experienced inspector will be able to provide quick and appropriate response to issues that may arise and will ensure that construction proceeds in accordance with the approved design and contract.

We trust this letter meets your requirements. Should you have any questions, please contact the undersigned.

Respectfully submitted,

Paul Villard Ph.D., P.Geo., CAN-CISEC
Director, Principal Geomorphologist

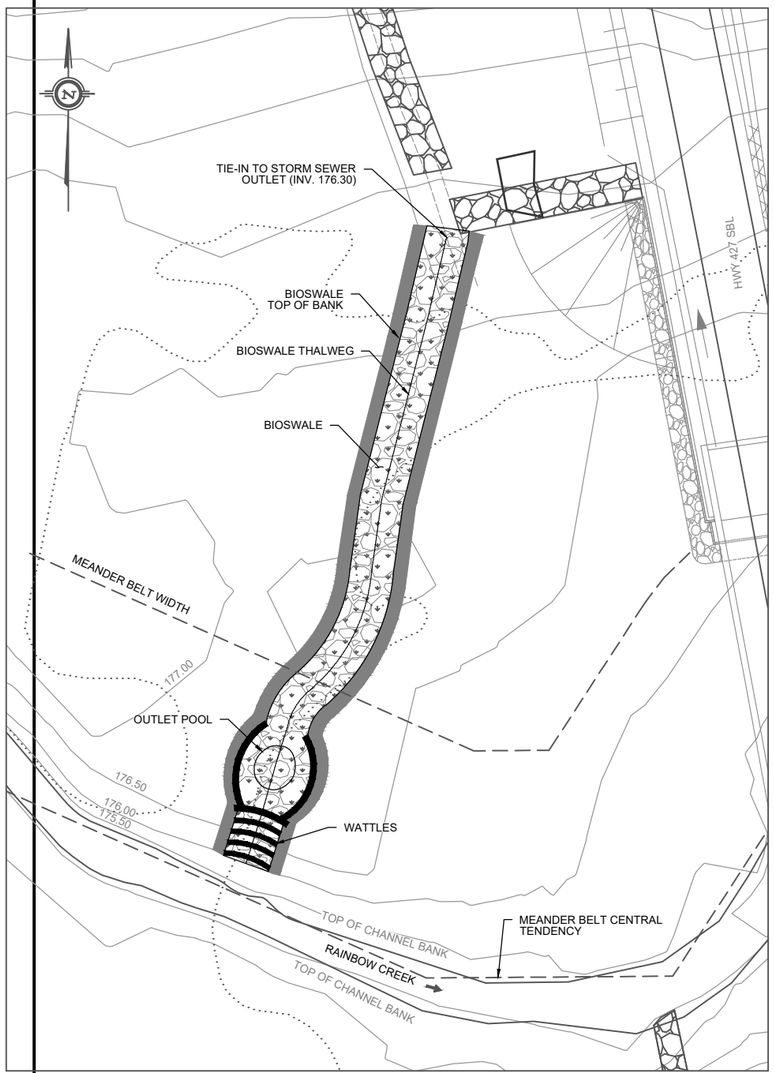
Bryce Molder, M.Sc., CAN-CISEC
River Scientist

References

Chang, H.H. 1988. Fluvial Processes in River Engineering. Transactions of the ASCE, 89: 940-984.

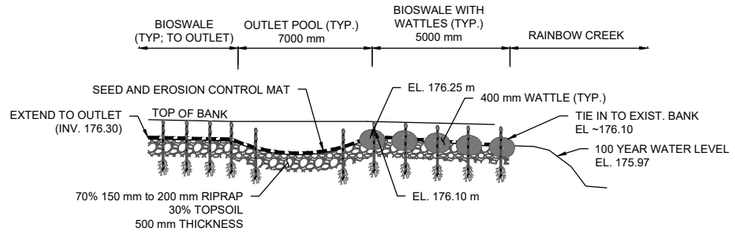
Fischenich, C. 2001. Stability Thresholds for Stream Restoration Materials. EMRRP Technical Notes Collection (ERDC TN-EMRRP-SR-29), Engineer Research and Development Center – U.S. Army. 1-10.

Appendix A
Design Drawings

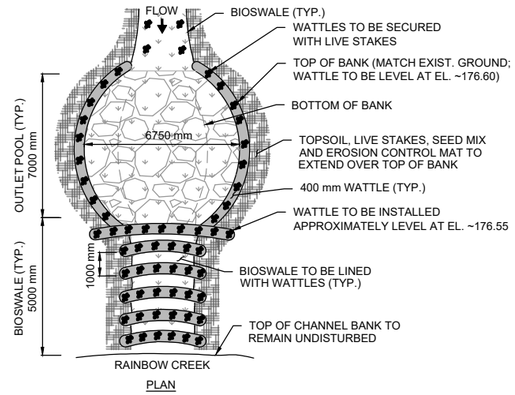


LEGEND
- BIOSWALE
- WATTLE
- TOPSOIL, SEED, AND EROSION CONTROL BLANKET

PLAN
1:500

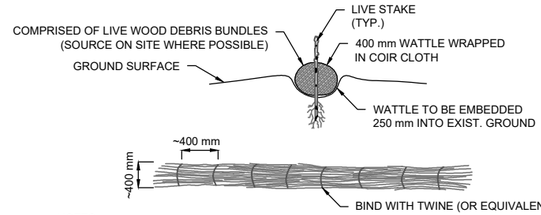


PROFILE



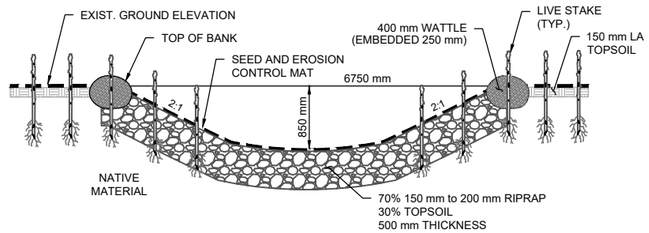
PLAN

POND 2 - DRAINAGE FEATURE
N.T.S.

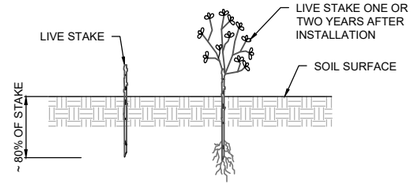


NOTES
1. WATTLE BUNDLE TO BE CONSTRUCTED WITH BRANCHES OF LIVE MIXED WILLOW SPECIES OR LIVE WOOD DEBRIS SOURCED ON-SITE.
2. DIAMETER OF WATTLE BUNDLE TO BE 400 mm.
3. TIE WATTLE BUNDLE EVERY 400 mm.
4. STAKE WATTLE AT A DENSITY OF 2 LIVE WOOD DEBRIS STAKE PER METER LENGTH.

WATTLE
N.T.S.



OUTLET POOL
N.T.S.

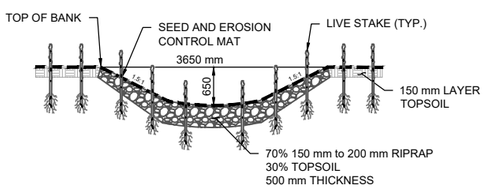


SPECIES AND QUANTITIES

COMMON NAME	SCIENTIFIC NAME	QTY	CONDITION
RED OSIER DOGWOOD	*Cornus stolonifera*	200	1 m, BARE ROOT
SLENDER WILLOW	*Salix petiolaris*	200	1 m, BARE ROOT
SHINING WILLOW	*Salix lucida*	200	1 m, BARE ROOT
NANNYBERRY	*Viburnum lentago*	200	1 m, BARE ROOT

NOTES
1. QUANTITY TO BE DETERMINED BASED ON AREA OF DISTURBANCE TO BE RESTORED
2. LIVE SHOULD BE FROM AT MINIMUM 2-YEAR OLD STOCK.
3. LIVE STAKES ARE TO BE INSTALLED AT A DENSITY OF 4 STAKES PER SQUARE METRE, OR 2 PER LINEAR METER WITHIN WATTLES.
4. LIVE STAKES SHOULD BE PRE-SOAKED (SUBMERGED IN WATER) FOR AT LEAST 24 HOURS AFTER HARVESTING AND IMMEDIATELY BEFORE INSTALLATION.
5. LIVE STAKES SHOULD NOT BE STORED FOR A PERIOD LONGER THAN 2 DAYS, UNLESS THEY ARE BEING SOAKED.
6. THE CONTRACTOR SHALL PROTECT PLANT MATERIALS FROM DRYING FROM THE TIME OF HARVEST UNTIL INSTALLED.
7. LIVE STAKES ARE TO BE A MINIMUM OF 25 mm IN DIAMETER AND CUT TO A LENGTH OF 1000 mm.
8. CUT ANGLE AT THE BOTTOM OF THE STAKE AND FLAT ON THE TOP.
9. TRIM ALL SIDE BRANCHES WHILE TAKING CARE NOT TO DAMAGE THE BARK.
10. INSTALL STAKES WITH BUDS POINTING UPWARDS AND THICKER STEM IN THE BED.
11. LIVE STAKES SHOULD BE INSTALLED USING A LARGE RUBBER MALLET.
12. 80% OF THE STAKE IS TO BE BELOW SURFACE.
13. TAMP THE LIVE STAKE INTO THE GROUND AT RIGHT ANGLE TO THE SURFACE.
14. IN COMPACT SOIL A PILOT HOLE SHOULD BE USED TO LIMIT DAMAGE TO THE STAKES.
15. IF USING A PILOT HOLE REPACK SOIL AROUND THE LIVE STAKE.
16. LIVE STAKES SHOULD STAND FIRM FROM THE SOIL FOLLOWING INSTALLATION.
17. ALL STAKES NOT PLANTED TO THE SPECIFICATIONS ABOVE WILL BE REPLACED AT THE CONTRACTOR'S EXPENSE.

LIVE STAKE
N.T.S.



BIOSWALE
N.T.S.

RIPARIAN SEED MIX

COMMON NAME	SPECIES	% OF MIX
FOWL MANNA GRASS	*Glyceria striata*	2
FOWL BLUEGRASS	*Poa palustris*	30
FOX SEDGE	*Carex vulpinoidea*	30
PATH RUSH	*Juncus tenuis*	8
VIRGINIA WILD RYE	*Elymus virginicus*	30

NOTES
1. APPLY SEED MIX AT A RATE OF 25 kg PER HECTARE.
2. SEEDING SHALL OVERLAP ADJACENT GROUND COVER BY 300 mm.
3. APPLY COMMON OAT (AVENA SATIVA) NURSE CROP AT A RATE OF 22 kg PER HECTARE.
4. WATER SOIL AFTER SEED APPLICATION.

NO.	DATE	REVISIONS	BY	CHK	LEAD. DISC.	PROJ. MAN.

SCALE :

CONSULTANT

	NAME (PRINT)	INIT.	DATE
DESIGNED	JUAN LOPEZ	J.L.	
DRAWN	JAMIE HUANG	J.H.	
CHECKED	JUAN LOPEZ	J.L.	
APPROVED LEAD. ENGINEER	JUAN LOPEZ	J.L.	
APPROVED PROJ. MANAGER	PETER BAMFORTH	P.B.	

Ontario

link427
LOCAL | INTEGRATED | NEIGHBOURLY | KNOWLEDGEABLE

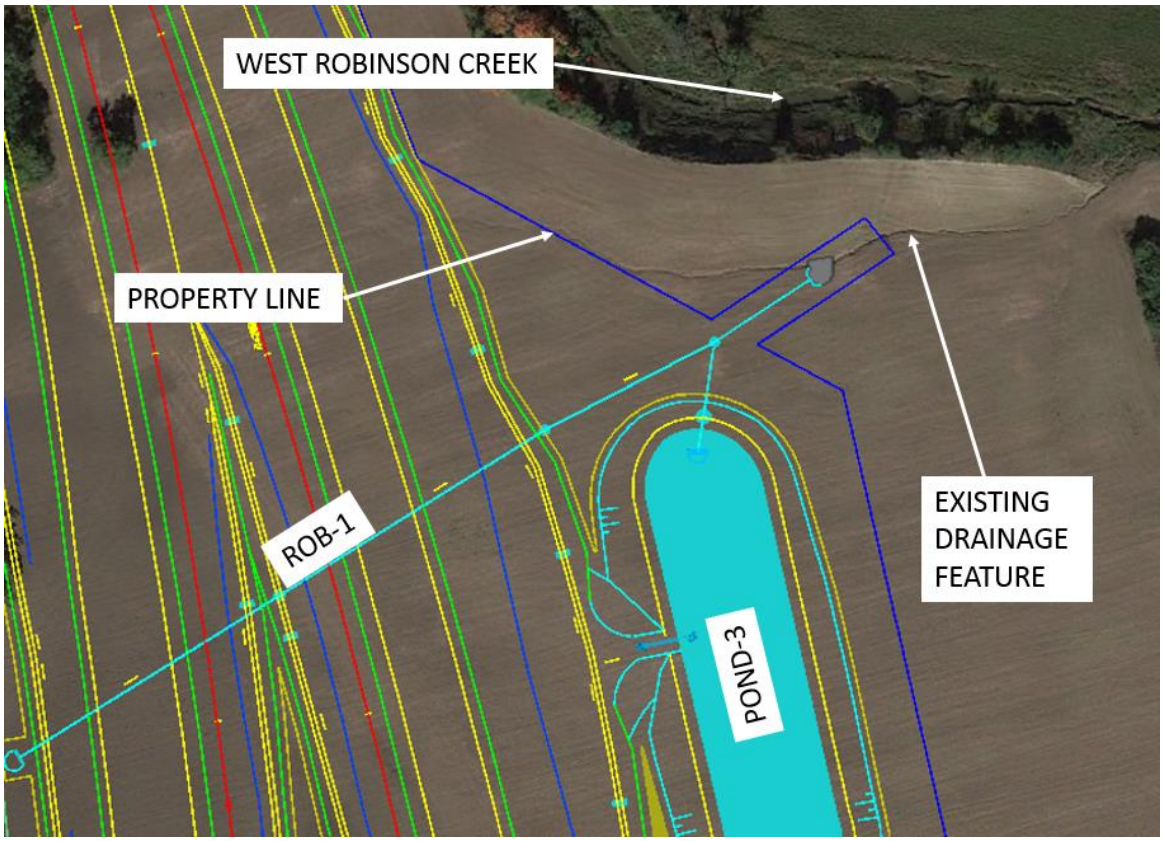
TITLE
HWY 427 EXPANSION
STORMWATER MANAGEMENT DETAILS

PROJECT ID.	STAGE INDENTIFIER	DESIGN PACKAGE NUMBER	DISCIPLINE	STRUCTURE NUMBER	DOCUMENT TYPE	DRAWING NUMBER	REVISION NUMBER
H427-D	N	6	WAT	000	DWG	2213	B

To:	CJV	**Date:**	Monday, July 8, 2019
From:	LINK427 Design Team	**No.**	MEMO-255 R1
Title:	Pond-3 Outlet Temporary Works		

This memorandum has been prepared to present the permanent and temporary works required to avoid erosion impacts on the existing drainage feature that will receive drainage from ROB-1 and Pond-3 as shown in **Figure 1**.

Figure 1 – Site Details



Prior to the commencement of construction, the existing drainage area that outlets to the "existing drainage feature" north of Pond 3 shown in **Figure 1** above was much smaller than currently designed. The MTO EA design (RCD) established an external catchment area for ROB-1 that included lands which previously drained to a feature south of Pond 3. As a result of the increased catchment area and flow from Pond 3 entering the existing drainage feature, it has been determined that without design improvements, significant erosion can be expected.

The Pond-3 outlet drainage feature as designed in the RCD passes through a farmer's field and has a significant slope to it. The difference in elevation between the invert of the outlet discharge location and West Robinson Creek is more than 6 m within a 100 m stretch. Compounding this, the flows that contribute to this drainage feature will be increased significantly by the addition of the external catchment runoff that now drains to it through the crossing culvert ROB-1. Geomorphological analysis of the velocities indicate that this external catchment greatly increases the erosion potential in the drainage feature compared to the existing conditions. It was concluded that in order to avoid erosion to the existing drainage feature it is necessary to either stabilize the gully through armoring, or through increased storage within the pond. Unfortunately, Pond-3 is not able to control the peak flows to pre-development conditions for the external catchment drainage in addition to the highway drainage. As a result, it will be necessary to provide protection along approximately 100 m of the drainage feature, from the Pond outlet location continuously down to West Robinson Creek.

Approximately 100 m of the channel that requires stabilization is located outside of the MTO Right of Way (ROW). While land is acquired, an interim solution is necessary.

This interim solution will consist of a retention basin located on the west side of the highway alignment upstream of ROB-1 to temporarily store runoff from the ROB-1 catchment area (see DWG-2200). A 525 mm sewer will be placed at the retention basin outlet and will discharge to the proposed Ditch Inlet Manhole (DIMH-119), which will be equipped with a 275 mm orifice plate placed at the upstream end of ROB-1 to control release rates. Additionally, the Pond-3 outlet design has been modified to over-control release rates so that the sum of flows at ROB-1 and Pond-3 outlet match pre-development peak flows (see **Table 1** for more details). Location details of the temporary retention basin and DIMH-119 structure are included DWG 2200 in the **Attachment**. The temporary retention basin will be seeded with a cultural meadow mix, and SWM pond seed mix for enhancement and erosion control.

Table 1 below presents the existing peak flows, the proposed controlled peak flows using the temporary basin and over controlling release rates from Pond-3 and the difference between post- and pre-development peak flows at the drainage feature. The results show that with the proposed measures, peak flows at the existing channel will be slightly lower than in the existing conditions.

Table 1 – Existing and Proposed Peak Flows Comparison

Return Period	Existing Conditions		Proposed Conditions		Difference (Prop. Ex.)	
	Area (ha)	Peak Flow (m^3/s)	Area (ha)	Peak Flow (m^3/s)	Area (ha)	Peak Flow (m^3/s)
2 YR	6.00	0.107	28.66	0.097	22.66	-0.010
5 YR		0.174		0.126		-0.048
10 YR		0.221		0.161		-0.060
25 YR		0.286		0.226		-0.060
50 YR		0.335		0.277		-0.058
100 YR		0.386		0.346		-0.040

A process to acquire the necessary property to be able to armor the existing drainage feature has been initiated; details on the property to be acquired and the proposed drainage feature cross-sections can be found in DWGs 2201 and 2202A in the **Attachment.**

Based on the presented analysis, it can be concluded that by implementing the proposed temporary retention basin and making modifications to the Pond-3 outlet, peak flows can be controlled to pre-development conditions until such time as the property is obtained to allow armoring of the drainage feature all the way to the watercourse. Once the drainage feature has been constructed and stabilized the temporary retention basin will be removed and the new drainage feature utilized. Restoration of the outfall channel following reinforcement will include naturalized plantings and native seed mix.

Channel Design

In consideration of the site conditions, outlet location, and hydraulics, a cascade design was deemed to be an appropriate solution to capture and convey flows from the outlet downslope to West Robinson Creek.

The cascade was sized to convey the modelled 100-year peak flow from Pond-3. Following a simple Manning's approach, the discharge to be accommodated within the channel was applied to back-calculate the cross-sectional area of the channel and the corresponding channel geometry. Manning's equation is mathematically represented as:

$$V = \frac{1}{n} R^{2/3} S^{1/2} \qquad \text{[Eq. 1]}$$

where, v is flow velocity, R is the hydraulic radius, S is the channel gradient, and n is the Manning's roughness coefficient. Applying the 100-year discharge, the back-calculated bankfull width and depth were 1.3 m and 0.15 m. The corresponding computed bankfull flow velocity and shear stress were 1.7 m/s and 82 N/m^2, respectively.

The cascade will consist of a stone mix ranging from 150 mm to 300 mm in diameter, with Granular 'B' to fill the interstitial space between the larger substrates. Cascade keystones will consist of 300 mm diameter stone. The proposed substrates within the cascade were hydraulically-sized per the recommendations for gravels/cobbles outlined in Chang (1988) and Fischenich (2001) and are expected to be stable during the 100-year flood event. Additionally, native seed and a high density of live staking is proposed throughout to enhance the stability of the feature through root generation.

Environmental Impacts

Overall, it was also determined that the interim and ultimate solutions do not result in harm to the environment.

Impacts to vegetation and wildlife habitat will be very minor. The majority of the outlet will be constructed within an active agricultural field (i.e., no EPZ or identified SAR habitat impacts). There is potential for minor impacts to a narrow band of riparian vegetation along West Robinson Creek where the outlet will tie into the existing channel bank; however, these potential riparian vegetation impacts will be further reviewed and documented in a Fish and Fish Habitat Impact Assessment Report and restoration planting will be undertaken as noted below.

An assessment of the impacts to fish and fish habitat in West Robinson Creek will be required at its convergence with West Robinson Creek. Through the design of the armored connection to West Robinson Creek the outlet will be sculped into the existing channel bank and will not result in an encroachment into the channel (see DWGs 2201 and 2202A in the **Attachment**). As such, this work would be considered an alternation of the existing fish habitat and is not anticipated to result in serious harm. Once the design is completed, a formal assessment under the Fisheries Act will be undertaken.

The temporary SWM pond will be seeded with a cultural meadow mix, and the SWM pond seed mix for enhancement and erosion control. Restoration of the outfall channel following reinforcement will include naturalized plantings and native seed mix.

Mitigation Measures

The following standard mitigation measures will be incorporated during and following construction. These and other measures will be documented in the Future Fish and Fish Habitat Impact Assessment Report.

- Timing window for vegetation clearing will be applied (i.e., clearing outside migratory bird nesting period [April 15 through August 15]).
- ESC measures and tree protection fencing to be installed at the limits of the temporary work zone to prevent unintended impacts beyond the identified area.
- LINK427 Environmental Inspector will monitor ESC measures and tree protection fence regularly to identify deficiencies or failures and ensure repair for effectiveness.
- Heavy equipment will be contained within the work area defined by the ESC measures and tree protection fencing.

References

Chang, H.H. 1988. Fluvial Processes in River Engineering. Transactions of the ASCE, 89: 940-984.

Fischenich, C. 2001. Stability Thresholds for Stream Restoration Materials. EMRRP Technical Notes Collection (ERDC TN-EMRRP-SR-29), Engineer Research and Development Center – U.S. Army. 1-10.

NOTES:
1. FOR DETAILS ON EROSION CONTROL AND WORK AT ROB-1, REFER TO DSMP DRAWINGS (H427-2-ENV-REP-002)
2. FOR DETAILS ON PLANTINGS AND SEED MIX AT POND 3, REFER TO PACKAGE 11 (DWG 2026)

TEMPORARY DETENTION BASIN

RIGHT OF WAY LIMIT

FUTURE TRANSITWAY

ENVIRONMENTAL PROTECTION ZONE

POND BOTTOM: 188.18m
100-YR WATER LEVEL: 189.45m

P-TEMP, 525mmø
12.9m @ 1.2%

OPSD-701.011
1500mmø MH 119
TOP FRAME ELEV. 189.99m
W INV. 188.03m (825mmø)
E INV. 188.03m (825mmø)
GRATE PER OPSD 403.010

P03-3, 825 mm
95.3m @ 1.0%

OPSD-701.013
2400mmø MH 120
TOP FRAME ELEV. 192.16m
W INV. 187.09m (825mmø)
E INV. 187.07m (825mmø)

ROB-1

R=3496.13

A=375

R=10

A60

U101

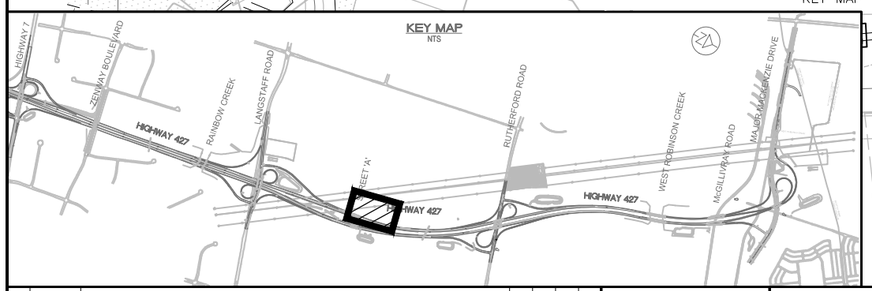
119

120

12+900
9+800
13+000
9+700
11+100
11+200

SEE DWG. 2201

KEY MAP



NO.	DATE	REVISIONS	BY	CHK	LEAD. DISC.	PROJ. MAN.
A	19/05/02	90% SUBMISSION TO CA				

SCALE :
5m 0 10m
Metres
HORIZONTAL

CONSULTANT

	NAME (PRINT)	INIT.	DATE
DESIGNED	JUAN LOPEZ		
DRAWN	JAMIE HUANG		
CHECKED	JUAN LOPEZ		
APPROVED LEAD ENGINEER	JUAN LOPEZ		
APPROVED PROJ. MANAGER	PETER BAMFORTH		

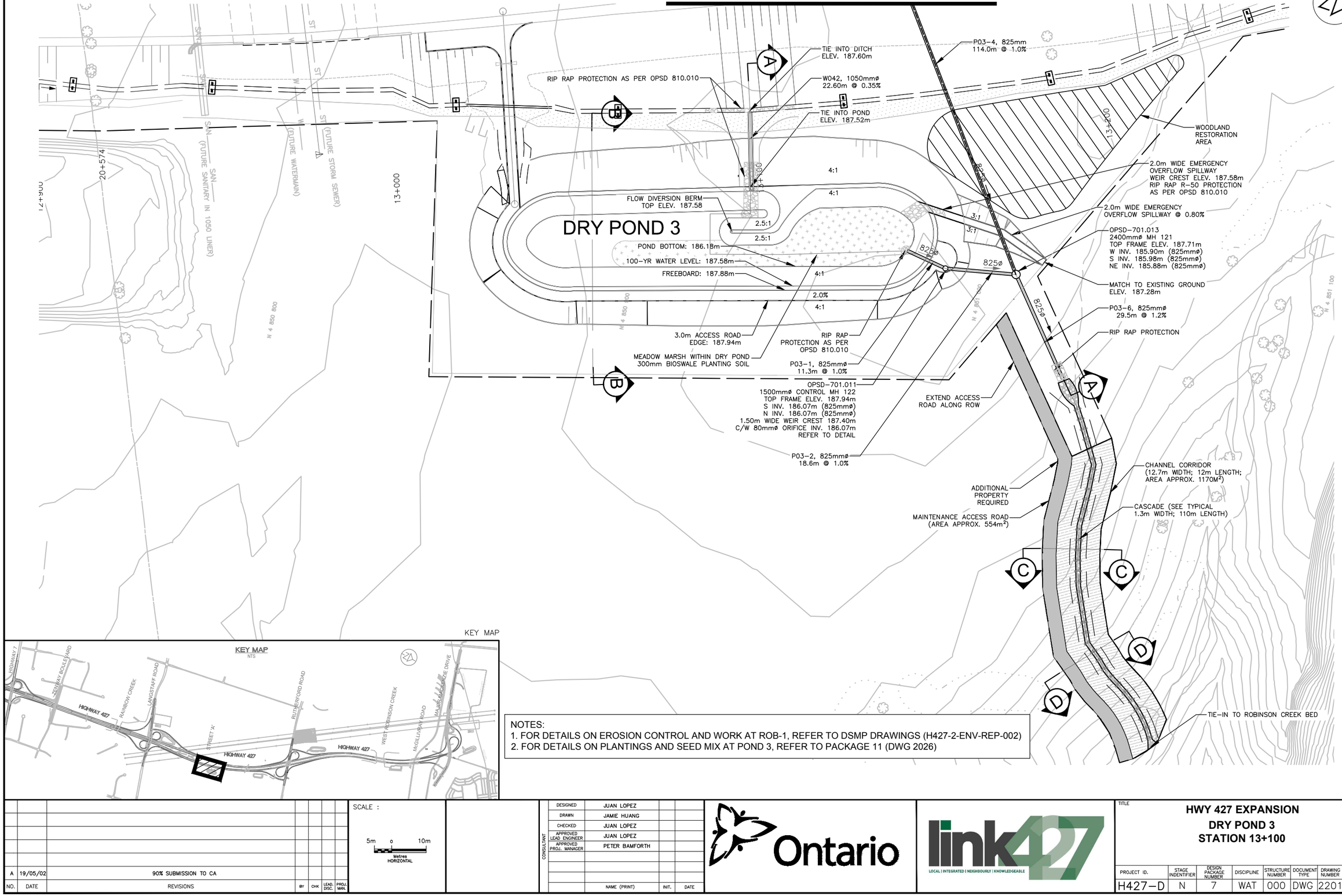
Ontario

link427
LOCAL | INTEGRATED | NEIGHBOURLY | KNOWLEDGEABLE

TITLE
HWY 427 EXPANSION
TEMPORARY DETENTION BASIN AND ROB-1 CROSSING

PROJECT ID.	STAGE INDENTIFIER	DESIGN PACKAGE NUMBER	DISCIPLINE	STRUCTURE NUMBER	DOCUMENT TYPE	DRAWING NUMBER	REVISION NUMBER
H427-D	N	7	WAT	000	DWG	2200	A

SEE DWG. 2200



KEY MAP

NOTES:
1. FOR DETAILS ON EROSION CONTROL AND WORK AT ROB-1, REFER TO DSMP DRAWINGS (H427-2-ENV-REP-002)
2. FOR DETAILS ON PLANTINGS AND SEED MIX AT POND 3, REFER TO PACKAGE 11 (DWG 2026)

NO.	DATE	REVISIONS	BY	CHK	LEAD. DISC.	PROJ. MAN.
A	19/05/02	90% SUBMISSION TO CA				

SCALE :
5m 0 10m
Metres
HORIZONTAL

CONSULTANT

	NAME (PRINT)	INIT.	DATE
DESIGNED	JUAN LOPEZ		
DRAWN	JAMIE HUANG		
CHECKED	JUAN LOPEZ		
APPROVED LEAD ENGINEER	JUAN LOPEZ		
APPROVED PROJ. MANAGER	PETER BAMFORTH		

Ontario

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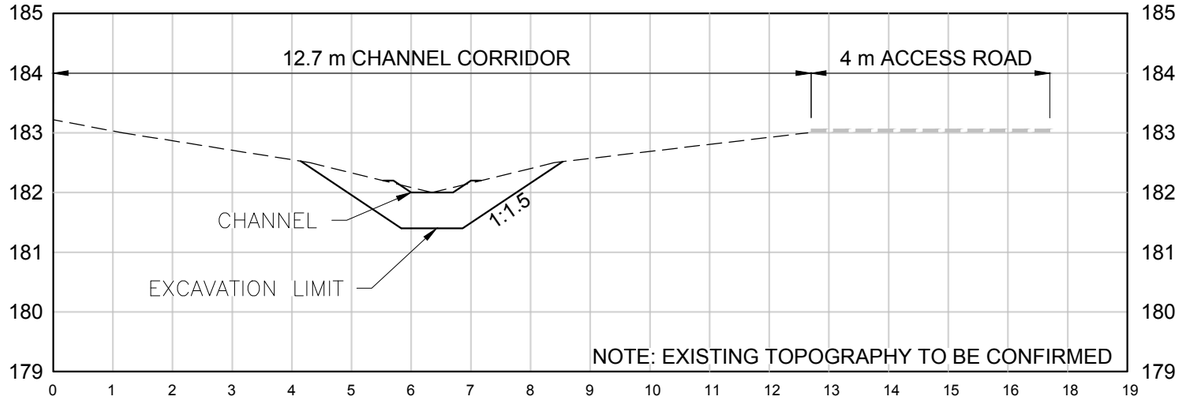
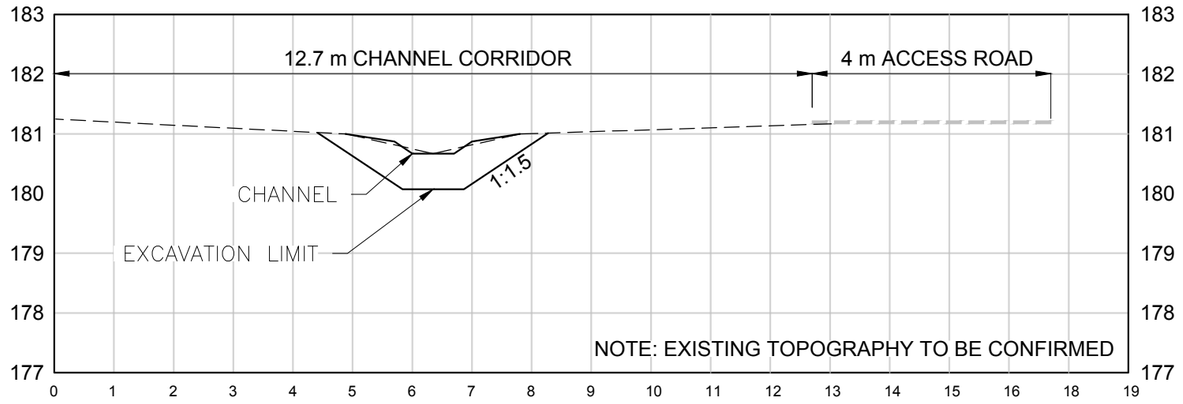
LOCAL | INTEGRATED | NEIGHBOURLY | KNOWLEDGEABLE

TITLE
HWY 427 EXPANSION
DRY POND 3
STATION 13+100

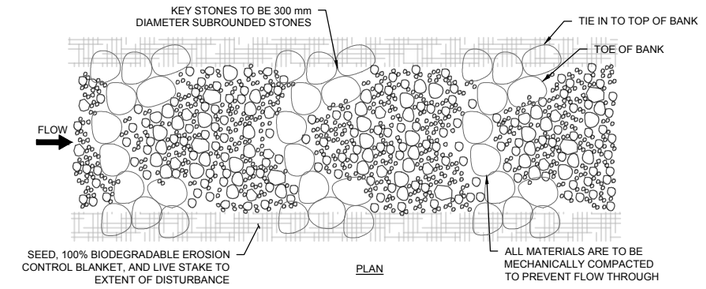
PROJECT ID.	STAGE INDENTIFIER	DESIGN PACKAGE NUMBER	DISCIPLINE	STRUCTURE NUMBER	DOCUMENT TYPE	DRAWING NUMBER	REVISION NUMBER
H427-D	N	7	WAT	000	DWG	2201	A



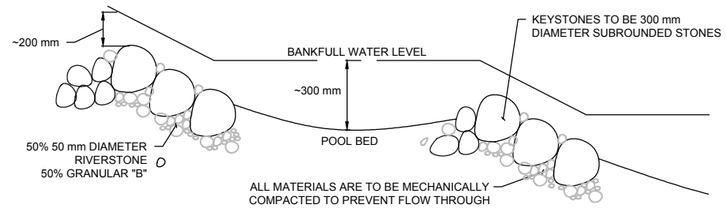
OUTLET CHANNEL C-C



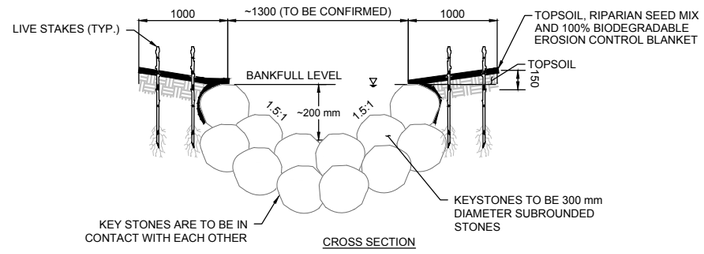
OUTLET CHANNEL D-D



PLAN



PROFILE



CROSS SECTION

TYPICAL CASCADE
N.T.S.

NO.	DATE	REVISIONS	BY	CHK	LEAD. DISC.	PROJ. MAN.
A	19/05/02	90% SUBMISSION TO CA				

SCALE :

0.5m 0 1m
Metres VERTICAL

0.5m 0 1m
Metres HORIZONTAL

CONSULTANT				
DESIGNED	JUAN LOPEZ			
DRAWN	JAMIE HUANG			
CHECKED	JUAN LOPEZ			
APPROVED LEAD ENGINEER	JUAN LOPEZ			
APPROVED PROJ. MANAGER	PETER BAMFORTH			
	NAME (PRINT)	INIT.	DATE	

Ontario

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TITLE

HWY 427 EXPANSION

POND 3
OUTLET CHANNEL DETAIL

PROJECT ID.	STAGE INDENTIFIER	DESIGN PACKAGE NUMBER	DISCIPLINE	STRUCTURE NUMBER	DOCUMENT TYPE	DRAWING NUMBER	REVISION NUMBER
H427-D	N	7	WAT	000	DWG	2202A	A

Zhao, Ray

From: Heaton, Mark (MNRF) <mark.heaton@ontario.ca>
Sent: Thursday, June 27, 2019 10:01 AM
To: Jack Cembalisty
Cc: Copeland, Christopher J. (MTO); van Kessel, Karl; Woo, Michael; pneals@link427.com
Subject: RE: Pond-5 Design

Thanks Jack

Looks good.

Regards

Mark Heaton
OMNRF Aurora

From: Jack Cembalisty <jack.c@link427cjv.com>
Sent: June 25, 2019 11:21 AM
To: Heaton, Mark (MNRF) <mark.heaton@ontario.ca>
Cc: Copeland, Christopher J. (MTO) <Christopher.Copeland@ontario.ca>; karl.vankessel@wsp.com; michael.woo@wsp.com; pneals@link427.com
Subject: RE: Pond-5 Design

Mark:

See responses to your questions from our specialist below in green, and the details of the cofferdam arrangement as requested. Took a bit to get the cofferdam drawing so I don't think we have responded to you on your questions yet. Apologies if I've duplicated the responses.

Call if you have any questions.

Thanks.

Jack Cembalisty
Environmental Quality Manager
LINK427
1 ROYAL GATE BOULEVARD | UNIT "G"| WOODBRIDGE | ON | L4L 8Z7 | CANADA
TELEPHONE: 416 577 2946

From: Heaton, Mark (MNRF) [mailto:mark.heaton@ontario.ca]
Sent: Wednesday, May 22, 2019 11:15 AM
To: Jack Cembalisty
Cc: Copeland, Christopher J. (MTO); karl.vankessel@wsp.com; michael.woo@wsp.com; pneals@link427.com
Subject: RE: Pond-5 Design

Hello Jack

A few comments:

1. 1500mm outlet pipe should be discharging at centre of existing gully feature. Should outlet a few meters further downstream to take full advantage of the existing gully feature.

Discharging to centre of gully is ideal. However, this is not possible due to the proximity to the property limits. As such, the proposed rock treatment spills into the existing gully (hence the oblong shape of the treatment) to help guide flows along that pathway.

2. Change rip rap to equivalent sized river stone. River stone to extend from outfall to bed of creek.

Drawings will be updated to show river stone.

3. Need to see the coffer dam detail for construction.

Attached.

4. Use pussy willow, sandbar willow and red osier dogwood for live stakes and potted stock. These work best for the purpose intended. Winterberry and gray dogwood not appropriate.

Design will be updated accordingly.

Have your geomorphologist look at the design too.
The proposed design was recommended by the Geomorphologist.

Regards

Mark Heaton
OMNRF Aurora

From: Jack Cembalisty <jack.c@link427cjv.com>
Sent: April 10, 2019 11:37 AM
To: Heaton, Mark (MNRF) <mark.heaton@ontario.ca>
Cc: Copeland, Christopher J. (MTO) <Christopher.Copeland@ontario.ca>; karl.vankessel@wsp.com; michael.woo@wsp.com; pneals@link427.com
Subject: Pond-5 Design

Mark

See attached Pond-5 outlet design drawing for your review and comment.

If you have any questions feel free to give myself or anyone on the team a call.

Thanks.

Jack Cembalisty
Environmental Quality Manager

LINK427
1 ROYAL GATE BOULEVARD | UNIT "G" | WOODBRIDGE | ON | L4L 8Z7 | CANADA
TELEPHONE: 416 577 2946

Toronto and Region Conservation Authority

CFN 51838

July 15, 2019

BY E-MAIL ONLY (jack.c@link427cjv.com)

Mr. Jack Cembalisty
Environmental Quality Manager
Link427
1 Royal Gate Boulevard- Unit G
Woodbridge, ON
L4L 827

Dear Mr. Cembalisty,

Re: Response to Submission "Draft Vegetation Restoration and Landscape Plan - Rev D"
Highway 427 Expansion Project, between Highway 7 and Major MacKenzie Drive
LINK427 Design and Construct
Humber River Watershed; City of Vaughan; Regional Municipality of York

Toronto and Region Conservation Authority (TRCA) received the Vegetation Restoration and Landscape Plan - Rev D report (VRP) including the report (dated May 2019) and appendices for the above-noted Highway 427 Expansion Project (Project) on June 26, 2019.

Staff understand that the draft "D" of the Vegetation Restoration and Landscape Plan (VRP) has been submitted for review as per the Service Level Agreement (SLA). The submitted Vegetation Restoration and Landscape Plan (VRP) Draft "D" has been updated to reflect ongoing design development. The eight (8) Restoration Areas where natural heritage features are affected by the proposed works have been updated to capture detailed landscape restoration required at these sites.

Staff has completed their review of the above-noted document and comments are provided in Appendix A.

Should you have any questions or require any additional information please contact me at extension 5759 or at suzanne.bevan@trca.ca.

SuzannEM:Sevan
Senior Planner
Infrastructure Planning and Permits | Development and Engineering Services

Attached: Appendix A - TRCA Comments

BY E-MAIL
cc:
LINK427: Paul Neals, (pneals@link427.com)
MTO: Chris Copeland, (Christopher.copeland@ontario.ca)
MECP: Emilee O'Leary, (Emilee.oleary@ontario.ca)
TRCA: Coreena Smith, Senior Manager, Development Planning and Permits

APPENDIX A: TRCA COMMENTS

ITEM	TRCA COMMENTS (July 15, 2019)
1.	Proposed seed mix Type 9 Cultural Meadow Seed Mix as stated on pg. 44 of the VRP contains non-native invasive species, and as such should be replaced with either native species, or non-invasive species. Please revise.
2.	Please provide tree and shrub restoration at the Humber river crossing (Dwg. 2001).
3.	Please provide tree and shrub plantings for the pond situated west of Pond 03 (Dwg. 2012).
4.	Tree and shrub densities should be increased at all creek and river crossings to provide shade to the watercourses. Please revise the plans so that shrubs are spaced at 1.0 m on centre, and trees at 5 m on centre, with 60% coverage over the entire area. For additional information, please refer to TRCA's Post Construction Restoration Guidelines available at: https://trca.ca/app/uploads/2016/02/Post-Construction_Restoration_Guidelines_July_2004.pdf
5.	All dry ponds should have tree and shrub densities increased to provide adequate shading. Densities should meet TRCA's Post Construction Restoration Guidelines.
6.	All wet pond planting plans should be revised to meet TRCA's Stormwater Management Pond Planting Guidelines, specifically, tree and shrub densities need to be increased, and aquatic species need to be installed within the wet cell. Please revise.

Shukla, Shveta

From: Paul Neals <pneals@link427.com>
Sent: July-11-19 2:24 PM
To: Sisson, Jennifer
Cc: van Kessel, Karl; Jack Cembalisty
Subject: FW: H427-TRE-00626 – MNRF - Vegetation Restoration and Landscape Plan rev D - Issued for Review - Due by July 09, 2019

Follow Up Flag: Follow up
Flag Status: Flagged

Jenn

Below are MNRF's comments.

Paul

From: Heaton, Mark (MNRF) <mark.heaton@ontario.ca>
Sent: Wednesday, July 10, 2019 4:11 PM
To: Phuong (Ann) Hoang <ann.h@link427cjv.com>
Cc: Aitor Arbesu <aitor.a@link427cjv.com>; Tom O'Callaghan <tom.o@link427cjv.com>; Paul Neals <pneals@link427.com>; Sean Mcmillan <sean.m@link427cjv.com>; Colin McAllister <colin.m@link427cjv.com>; Jack Cembalisty <jack.c@link427cjv.com>; Karl Van Kessel <karl.vk@link427cjv.com>; Copeland, Christopher J. (MTO) <Christopher.Copeland@ontario.ca>; Connor Macisaac <connor.m@link427cjv.com>; Pedro M. González Rodrigo <pedro.g@link427cjv.com>
Subject: RE: H427-TRE-00626 – MNRF - Vegetation Restoration and Landscape Plan rev D - Issued for Review - Due by July 09, 2019

Thank you Ann

Reviewed document. A few comments:

- Ensure all Endangered Species Act references (including reporting of species at risk and ESA permit implementation) reference Ministry of Environment, Conservation and Parks (MECP) as the lead agency instead of MNRF
- Did not see mention of proposed removal of existing dam on Robinson Creek, (drawings, landscape plan)
- Winterberry proposed in SWM facilities is probably best replaced with Nannyberry. While winterberry will grow in dry soil, it is more of a wetland swamp species.

Otherwise, document looked great.

Regards

Mark Heaton
OMNRF Aurora

From: Phuong (Ann) Hoang <ann.h@link427cjv.com>
Sent: June 25, 2019 10:59 AM
To: Heaton, Mark (MNRF) <mark.heaton@ontario.ca>
Cc: Aitor Arbesu <aitor.a@link427cjv.com>; Tom O'Callaghan <tom.o@link427cjv.com>; Paul Neals (pneals@link427.com) (pneals@link427.com) <pneals@link427.com>; Sean Mcmillan <sean.m@link427cjv.com>; Colin McAllister <colin.m@link427cjv.com>; Jack Cembalisty <jack.c@link427cjv.com>; Karl Van Kessel <karl.vk@link427cjv.com>; Copeland, Christopher J. (MTO) <Christopher.Copeland@ontario.ca>; Connor Macisaac <connor.m@link427cjv.com>; Pedro M. González Rodrigo <pedro.g@link427cjv.com>
Subject: H427-TRE-00626 – MNRF - Vegetation Restoration and Landscape Plan rev D - Issued for Review - Due by July 09, 2019

Hi Mark,

Please note that this Transmittal is for **REVIEW** and it's due by **July 09, 2019.**

SharePoint Location:
https://doc.dragados-usa.com/highway427/Sub%20Contractors/MNRF/H427-TRE-00626

Best Regards,

Ann Hoang
Document Control
DRAGADOS CANADA | A world of excellence, a community of partners
Tel: +1-647-952-4029
Cell: +1-647-285-3848
1 Royal Gate Blvd l Woodbridge l ON l L4L 8Z7

From: Heaton, Mark (MNRF) [mailto:mark.heaton@ontario.ca]
Sent: October-02-19 11:56 AM
To: van Kessel, Karl <Karl.vanKessel@wsp.com>
Cc: Cembalisty, Jack <jack.c@link427cjv.com>; Colin McAllister <colin.m@link427cjv.com>; Tom O'Callaghan <tom.o@link427cjv.com>; Copeland, Christopher J. (MTO) <Christopher.Copeland@ontario.ca>; Docherty, Emma <Emma.Docherty@aecom.com>
Subject: RE: Summary of MNRF Phone Conversation

Thank you Karl

Summary is accurate

From: van Kessel, Karl <Karl.vanKessel@wsp.com>
Sent: October 2, 2019 11:48 AM
To: Heaton, Mark (MNRF) <mark.heaton@ontario.ca>
Cc: Cembalisty, Jack <jack.c@link427cjv.com>; Colin McAllister <colin.m@link427cjv.com>; Tom O'Callaghan <tom.o@link427cjv.com>; Copeland, Christopher J. (MTO) <Christopher.Copeland@ontario.ca>; Docherty, Emma <Emma.Docherty@aecom.com>
Subject: Summary of MNRF Phone Conversation

Mark,

Thank-you for the phone call this morning. I have summarized the content and conclusions of our discussion below. Please review and let me know if you agree. If I have missed anything, please let me know.

- Mark Heaton was provided with the Geomorphix Technical Memo (dated September 4, 2019) prior to the call via e-mail (September 17, 2019).
- Mark confirmed he reviewed the memo and that he has no concerns.

- Mark recommended the existing structure be referred to as a ‘culvert’ and not a ‘dam’ and asked that the memo be revised.
- Mark asked about the approach to decommissioning of the existing concrete culvert. Karl explained that the top of the culvert has already been removed. LINK will remove half of the concrete side walls would be removed, but the bottom of the culvert and the lower parts of the side walls would remain in place in order to maintain the structural integrity of the berm during construction. LINK would then backfill the culvert with suitable soil material to ensure that the berm remains structurally sound for the long term. Plantings would then be installed on the surface to stabilize and integrate the backfilled section in with the rest of the existing berm. Mark asked to have this detailed in a memo. Karl suggested that the decommissioning could be added to the notes on page 2 of the drawing in the Technical Memo, or include the detail in the DSMP for the crossing.
- Mark asked for a description of the dewatering and construction staging proposed. Karl explained that the DSMP would detail each stage of construction, including dewatering activities, as well as the ESC measures to be installed. Mark agreed.
- **ACTION: LINK to update the Geomorphix Technical Memo and prepare a DSMP for the site and send to Mark for review.**
- Karl informed Mark that the new channel, structure removal and site rehabilitation work at this location is included in the final DCR (#5). Karl explained that the approach presented in the Technical Memo would be summarized in the DCR, which would include a simplified version of the drawing from the Technical Memo. Karl stated that the LINK fisheries specialist would summarize the potential fisheries impacts and mitigation measures, and the appropriate commitments would be made regarding fisheries approvals. Mark agreed. No concerns.

Thank-you,

Karl

Karl van Kessel, MES (Plng), MCIP, RPP

Director
Environmental Management Planning and Compliance

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F+ (905) 882-0055

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L3T 0A1 Canada

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