



**Landscape Composition Report
Highway 401 Planning Study
from Cobourg to Colborne
(GWP 4060-11-00)**

August 25, 2023

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Sign-off Sheet

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Introduction
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1.0 INTRODUCTION

1.1 BACKGROUND

The Ontario Ministry of Transportation (MTO) retained Stantec Consulting Ltd. (Stantec) to undertake a Planning, Preliminary Design, and Class Environmental Assessment (Class EA) Study on Highway 401 forestablishing the future footprint of Highway 401 for interim six and ultimate eight lanes, from 2 km east of Nagle Road to Percy Street (approximately 18 km) in Northumberland County, GWP 4060-11-00 (refer to Figure 1).

The purpose of this study is to identify a Recommended Plan that addresses current and future transportation needs in the study area as part of the Ministry's ongoing review of safety and operational needs for the provincial highway network. This study includes a review of existing conditions, development and evaluation of alternatives, identification of appropriate improvements, and development of environmental protection and mitigation measures. A Recommended Plan will be confirmed and designated (protected) at the completion of the study.

This Landscape Composition Report has been prepared to support project planning, by identifying areas for potential vegetation retention, potential mitigation recommendations for habitat and visual impacts, and design recommendations to address potential impacts associated with this project. The study area for this project is considered to include the proposed highway right-of-way (ROW) and the surrounding viewshed.

1.2 PURPOSE

The *Environmental Reference for Highway Design* refers to landscape composition as the “aggregate of elements in a region or area, which include but are not limited to culturally significant vegetation, views and viewsheds, topography, landform, and land use” (Ministry of Transportation Ontario, 2006: pp.5). The purpose of this Landscape Composition Report is to:

- Document natural geomorphologic landforms, waterscapes, or vistas within the viewshed of the highway.
- Review pertinent background information produced by other disciplines.
- Assess impacts to the landscape vegetation.
- Assess impacts to views and vistas.
- Recommend mitigation to minimize impacts to the adjacent landscape.



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1.3 DESCRIPTION OF PROPOSED WORKS

1.3.1 Project Overview

Highway 401 is a controlled-access 400-series provincial highway that connects southwestern Ontario (Windsor) to Quebec, a total of 830 km. The highway, along with its associated structures, was built in the 1950s and 1960s. Locally, Highway 401 connects the communities of Cobourg, Grafton, and Colborne.

The Class EA Study scope of work includes the following:

- Replacement and/or rehabilitation of bridges and structural culverts.
- Interchange modifications at Lyle Street and Percy Street.
- Establishing the Highway 401 future footprints for interim 6-lanes and ultimate 8-lanes.
- Commuter parking lot expansions or relocations.

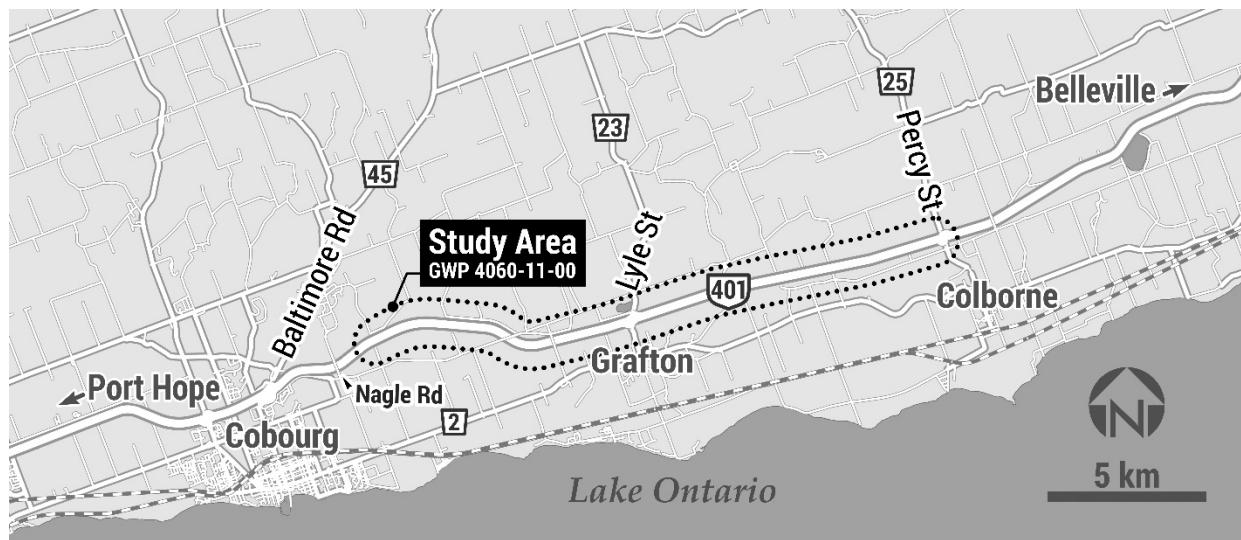


Figure 1: Study Area

Presently, many of the bridges and culverts in the study area are nearing the end of their service life and will require rehabilitation and/or replacement in the near future. In addition, the existing Highway 401 platform cannot accommodate the traffic staging required to rehabilitate or replace the bridges and structural culverts. The objective of the project is to assess the existing bridges and culverts in the study area and develop appropriate rehabilitation or replacement strategies to maintain the safe operation of the Highway 401 corridor for the current and future planning horizons.



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1.4 PREFERRED INTERCHANGE DESIGNS

Several physical aspects of the Highway 401 corridor require modification in order to effectively improve the facility to the level required. This includes considerations such as additional lanes, wider over-and-underpass structures, wider stream crossings, and modifications to interchanges. Of these highway design aspects, the interchanges have the largest potential for impacts to landscape composition. As such, the preferred interchange designs within the study area will be assessed for landscape composition impacts. There are two such interchanges within the study area: Lyle Street, and Percy Street. Please refer to Figure 1 for the location of these interchanges within the study area.

1.4.1 Lyle Street Interchange Alternatives

A total of four interchange alternatives were developed to a conceptual design stage for further assessment, one of which was screened out from further evaluation due to significant property impacts and an undesirable exit ramp layout. Through further design and stakeholder consultation, a preferred design was developed. Refer to Figure 2 for an illustration of the preferred interchange design.

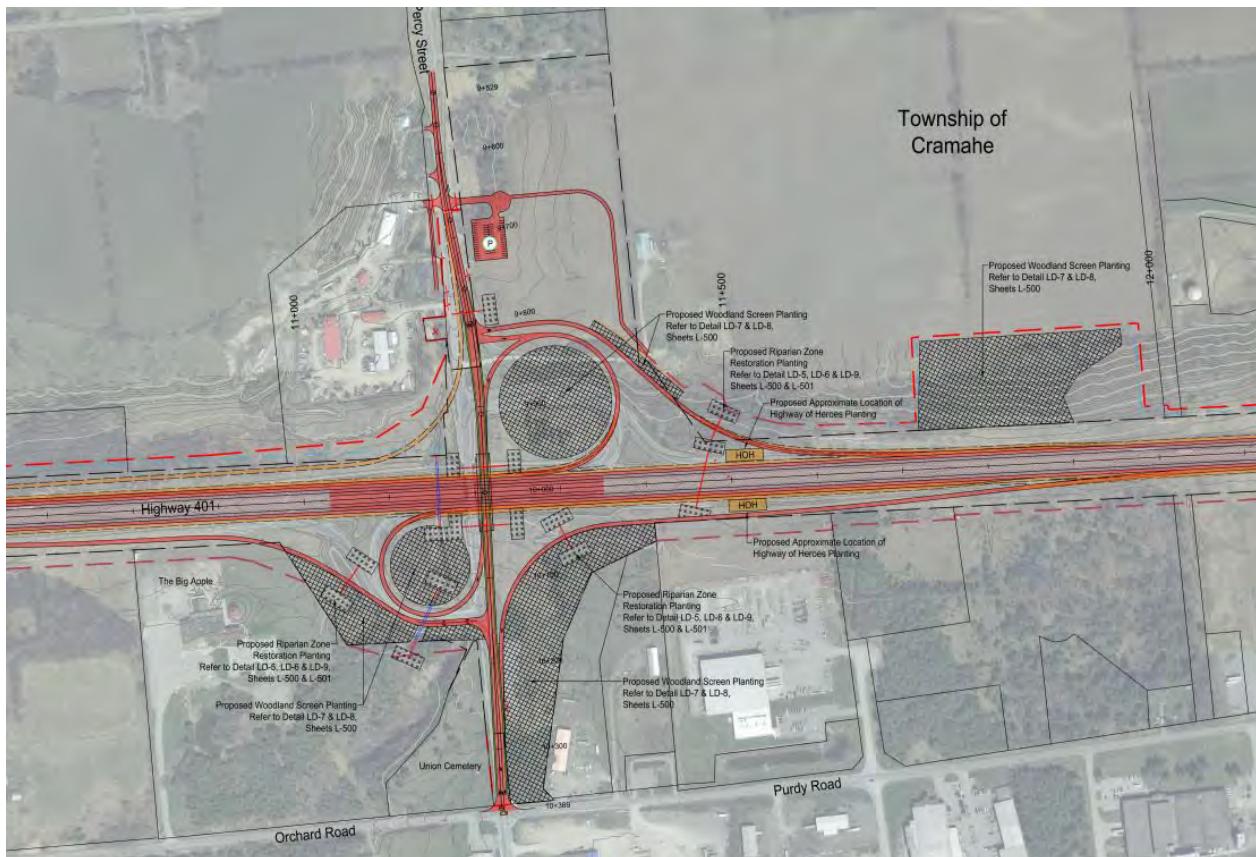


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1.4.2 Percy Street Interchange Alternatives

A total of four interchange alternatives were developed to a conceptual design stage for further assessment, one of which was screened out due to significant property impacts and an undesirable exit ramp layout. Through further design and stakeholder consultation, a preferred design was developed. Refer to Figure 3 for an illustration of the preferred interchange design.



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2.0 FIELD INVESTIGATION

2.1 METHODS

A field investigation was undertaken on December 18, 2019 by Stephanie Lapointe, BLA, and Landon Black, OALA, to identify potential landscape resources within the study area and to identify the presence or absence of significant tree species or specimens.

Potential landscape resources were visually reviewed from the nearest publicly accessible areas where they could safely be observed and cross-referenced with available GIS-based mapping tools to allow the assessment of potential landscape resources. The findings of the field investigation have been cross-referenced with the *Terrestrial Ecosystems Existing Conditions Report* (Stantec, 2022) to confirm the presence or potential presence of rare and threatened species that could not be confirmed by the field investigations, and to provide suitable compensation and mitigation recommendations for the study area.

2.2 EXISTING CONDITIONS

2.2.1 Lyle Street

2.2.1.1 Geomorphic Landforms, Waterscapes, and Vistas

Edwardson Road runs parallel to the north side of the Highway 401 corridor. North of Edwardson Road the land elevation rises several meters before levelling and eventually declining to create the depression surrounding Cranberry Lake. This small waterbody is only briefly visible through a densely vegetated strip of land between Lyle Street and the lake. The lake is not visible from the current alignment of Lyle Street or the interchange with Highway 401. Refer to Figure 4 and Figure 5.

Lyle Street drops in elevation on the south side of the Highway 401 corridor. The military crest of this landform reveals a waterscape of Lake Ontario. The breadth of the waterscapes in this location is limited by topographic features in the intervening land and by taller vegetation. There are two private residences (located approximately 75 m from the interchange with Highway 401) that are positioned to capitalize on the waterscape views. Figure 6 illustrates the available waterscapes of Lake Ontario from the south side of the Highway 401 corridor.



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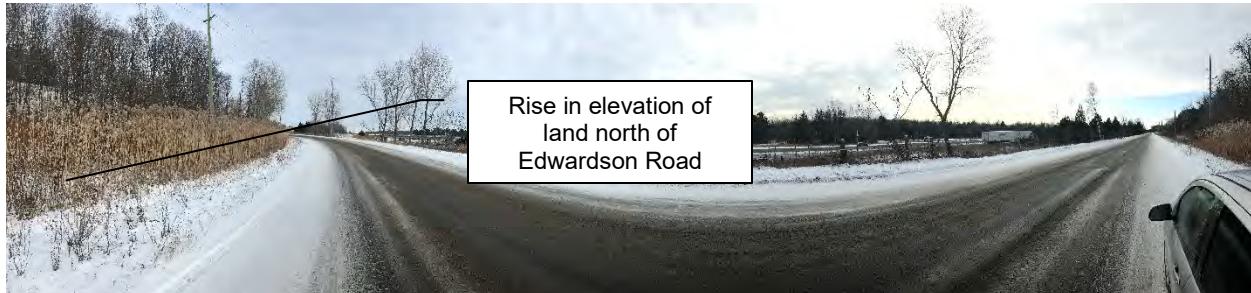


Figure 4: Highway 401 Parallel to Edwardson Road



Figure 5: Looking South Along Lyle Street North of Highway 401



Figure 6: Looking South Along Lyle Street South of Highway 401



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2.2.1.2 Natural and Anthropogenic Features

The area surrounding the Lyle Street overpass is a mixture of agricultural fields, fallow fields, woodlots, utility maintenance properties, rural residences, and a small body of water. The extent of built features in the landscape is limited to roads and associated structures, utility structures, service buildings, and private residences built immediately north and south of the overpass. A photograph showing the relative locations of the features is provided in **Appendix A**. The large utility tower and associated structures in the northwest quadrant of the intersection are the only non-aesthetic features of those discussed. The smaller associated structures are typically only observed from Edwardson Road due to the existing vegetation. The utility tower is visible from a larger radius, however similar infrastructure is a common feature of highway corridors, so the net visual impact of the tower is not imposingly negative.

2.2.1.3 Density and Proximity of Surrounding Dwellings

The density of dwellings in the Lyle Street Interchange area is low, with one agricultural property and one rural residential dwelling observed north of Highway 401, and two rural residential dwellings clustered to the south along Lyle Street. A photograph showing the relative locations of the nearest dwellings is provided in **Appendix A**.

2.2.2 Percy Street

2.2.2.1 Geomorphic Landforms, Waterscapes, and Vistas

Percy Street gradually rises in elevation north of the Highway 401 overpass, and gradually falls in elevation through the built environment south of the overpass. The rise of land north of Highway 401 is less visually important than those of the other two interchanges within the project area. Waterscapes of Lake Ontario were not observed at this site.

2.2.2.2 Natural and Anthropogenic Features

The area surrounding the Percy Street overpass is a mixture of agricultural fields, fallow fields, woodlots, industrial properties, commercial properties, and a small cemetery. The extent of built features in the landscape is limited to roads and associated structures, utility structures, service buildings, and private residences built immediately north and south of the overpass. A photograph showing the relative locations of these features is provided in **Appendix A**. These features are generally neutral in terms of individual visual impact as they are consistent with the expected character of an interchange. Under observed conditions, views to the metal recycling facility (a potentially non-aesthetic feature) in the northwest quadrant of the interchange were limited.

The most prominent man-made feature at this location is the Big Apple, a popular roadside stop for users of Highway 401. Figure 7 illustrates the view of the Big Apple available immediately south of the interchange. It should be noted that the Big Apple is more prominently visible from the highway (both eastbound and westbound lanes) and from the top of the overpass, than it is from Percy Street. Another



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significant built feature is the Union Cemetery located at the intersection of Percy Street and Orchard Road, approximately 350 m south of Highway 401.



Figure 7: Looking West to Percy Street South of Highway 401

2.2.2.3 Density and Proximity of Surrounding Dwellings

The density of dwellings in the Percy Street Interchange area is low with several commercial and industrial buildings clustered at the intersection of Orchard Road and Percy Street (south of Highway 401) and a mix of rural and agricultural dwellings north of the highway. A photograph showing the relative locations of the nearest residential dwellings is provided in **Appendix A**.

2.2.3 Scenic Composition, Arrangement, and Sequence of Landscape Features

For the length of the study area, Highway 401 acts as a visual and physical divide between Lake Ontario and the Oak Ridges Moraine, with the interchanges acting as the connection between the two landscape features. The undulating rural setting of the Oak Ridges Moraine varies in distance from the highway, but the rise in land north of the Highway 401 corridor is always visually perceivable. The topographic form of the Oak Ridges Moraine provides a rhythmic element with alternating treed slopes and agricultural fields. The existing periodic interchanges provide access to small towns and fit within this overall context with minimal intrusion.

Throughout the Highway 401 corridor in the study area the viewshed is predominantly limited to an east/west plane parallel to the Highway. This is due to the adjacent landforms as well as existing thickets, woodlands, and forests. Viewsheds open slightly where agricultural fields and meadows are the adjacent vegetation, however the most significant north/south viewsheds occur where the Highway is elevated over a ravine or a highway overpass. These areas provide more open views and possible waterscapes to Lake Ontario. Examples of open views and possible waterscapes occur at Northumberland Heights Road, Shelter Valley Road, Vernonville Road, and Boyce Road. Throughout the project corridor, built elements of the landscape, apart from roads, are infrequent except for adjacent interchanges.



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3.0 IMPACT ASSESSMENT

There are several potential construction impacts associated with the future highway footprint and interchange reconfigurations. These include vegetation and terrestrial impacts, visual impacts, and cultural heritage impacts. Each potential impact has been presented separately for analysis with additional emphasis on the interchange areas, as the concentration of built elements is greater in these locations. For the purpose of this assessment, we have assumed that all the natural areas within the ROW for each alternative will be removed to facilitate construction, except in isolated areas along the limits of the proposed modifications where preservation may be possible.

3.1 VEGETATION AND TERRESTRIAL IMPACTS

The development of any of the interchange alternatives and the future footprint of the highway corridor will result in the removal of natural vegetation cover providing habitat for plants and wildlife. A total of 212 species of vascular plants were observed within the study area, with none being identified as species at risk. The following classifications of vegetation communities were observed during the field work component of the *Terrestrial Ecosystems Existing Conditions Report* (Stantec, 2022):

- Meadows.
- Regeneration Thickets.
- Forest Communities.
- Plantation Communities.
- Swamp Communities.
- Marsh Communities.

The areas that would be impacted by the proposed interchanges were observed for significant specimen trees. Trees would be considered significant specimens in this context if they were of exceptional size, aesthetically formed, and positioned within the landscape in a manner that was visually impactful. Isolated trees and trees in hedgerows were the primary targets for assessment, while trees in woodlots were considered as a part of the larger vegetative community due to their lack of singular visual impact. No significant specimens were noted within the area of impacts for the three interchanges studied. Should it be determined that existing Highway of Hero (HOH) plantings will be impacted during the Detail Design phase, these plantings will either be relocated or reinstated if feasible in close proximity to their original locations or extending the natural canopy cover.

3.1.1 Vegetation Community Impacts

The anticipated area to be impacted for identified vegetative communities associated with the preferred design alternatives are detailed in Table 1. For the purpose of the Landscape Composition Report, the



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Terrestrial Biologists have assumed that all natural areas within the construction limits, as determined by extent of regrading, will be removed for construction. Precise limits of vegetation removal will be confirmed during Detail Design and are anticipated to be smaller than the estimates presented in this Table 1.

These areas of impact will be reassessed during the detail landscape design phase. Since the future footprint for the interim 6 lane and ultimate 8 lane configuration of the highway will likely result in a significant reduction of one or more vegetation communities, a more appropriate goal is an increase in the quality of the ecological functions of the vegetation communities. It may be possible to achieve this through strategic supplementation of forest edges, riparian corridors, and a focus on high value ecological communities. At a minimum any loss of areas of vegetation will be compensated on a 1:1 ratio.

Table 1: Vegetation Community Impacts

Vegetation Community	ELC Code	Impacted Area (ha)	Total Impacted Area (ha) by Vegetation Community
Meadow	Linear Meadow (MEM)	80.5	80.72
	Graminoid Meadow (MEG)	0.11	
	Mowed Meadow	0.17	
Regeneration Thicket	Coniferous (THC)	0.91	8.54
	Mixed (THM)	1.88	
	Deciduous (THD)	5.75	
Forest	Coniferous (FOC)	3.10	27.30
	Mixed (FOM)	11.46	
	Deciduous (FOD)	12.74	
Plantation	Coniferous (TAGM1)	2.38	4.79
	Deciduous (TAGM3)	0.07	
	Hedgerow (HR) and other small groups of planted trees	2.34	
Swamp	Coniferous (SWC)	0.62	1.26
	Mixed (SWM)	0.63	
Marsh	Marsh (MA)	2.11	2.11
Open Water	Open Water (OA)	0.08	0.08
Agriculture	Open Agriculture (OAG)	5.84	6.32
	Shrub Agriculture (SAG)	0.48	



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Table 1: Vegetation Community Impacts

Vegetation Community	ELC Code	Impacted Area (ha)	Total Impacted Area (ha) by Vegetation Community
Developed	Residential (CVR)	1.04	84.13
	Transportation and Utilities (CVI)	82.71	
	Commercial and Institutional (CVC)	0.19	
	Cleared	1.23	
Disturbed	Disturbed	1.07	1.07
Total Impacted			217.03*

*Sum of vegetation communities may not equal the sum total impacted due to rounding

3.2 VISUAL IMPACTS

There will be visual impacts to the existing landscape resulting from the construction of the preferred design. Visual impacts have been assessed and summarized in the following sections. Our assessment of potential impacts considers the following:

- Views from the interchanges to the surrounding area, features, and points of interest.
- Views to the interchanges from the surrounding area, features, and points of interest.
- Types of potential visual impacts:
 - permanent impacts based on the crossing structure, associated structures, and changes to site lighting.
 - temporary impacts such as those caused by vehicle lights, which will fluctuate based on usage.

3.2.1 Lyle Street

3.2.1.1 Views from the Preferred Interchange

The views from the Lyle Street overpass to Lake Ontario are only open to a significant level when viewed from the southern end of the interchange. The view is otherwise restricted due to the presence of mature trees along the ridge running south of and parallel to Highway 401. Views in other directions are also predominantly constrained by mature trees. The development of the preferred interchange design is expected to open the view to Lake Ontario because the realigning of Lyle Street is proposed to reduce the curvature of the road. The realignment of Lyle Street north of the interchange is not expected to significantly impact views from the interchange.



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3.2.1.2 Views to the Preferred Interchange

Private residents are situated in close proximity to the northeast and southwest quadrants of the existing interchange. The northwest and southeast quadrants of the interchange are developed with a hydro substation, fire hall, and MTO maintenance facility, respectively. It is anticipated that the preferred interchange will improve the views for the residential properties in the southwest quadrant as the distance to the Ramp W-N/S and Lyle Street will increase. No significant impacts are anticipated for the residence in the northeast quadrant as the property has significant vegetation buffers and the proposed realignment matches the existing Lyle Street alignment near this property.

3.2.2 Percy Street

3.2.2.1 Views from the Preferred Interchange

The views from the existing interchange to Lake Ontario are currently restricted due to the presence of mature trees and topography of the landscape. Views to the Oak Ridges Moraine from the existing interchange are limited as the rise in land is more gradual than in other areas, and therefore less perceivable. Likewise, it is not anticipated that there will be any significant negative impacts on views from the interchange.

3.2.2.2 Views to the Preferred Interchange

The northeast quadrant of the existing interchange consists of agricultural land. One small field and a hedgerow separate this property from Percy Street. A treed downhill slope separates the property from Highway 401. It is anticipated that the preferred interchange design would be visible from parts of this property, especially during leaf-off seasons. It is recommended that this impact be mitigated through coniferous screen plantings along the top of the proposed retaining wall.

The northwest quadrant of the existing interchange is developed with an industrial salvage yard and two residences. Though one of these residences is proposed to be eliminated, the proposed interchange Ramp E-N/S will be placed in the direct line of site of the remaining property. This could result in vehicle headlights being directed towards the remaining residence. It is recommended that this impact be mitigated through coniferous screen plantings.

The two southern quadrants are developed with commercial and industrial buildings, both of which are set back from Percy Street. While there is no significant topographic separation between the buildings and Percy Street, mature vegetation is present. The preferred interchange would decrease the distance from the interchange to the buildings to some degree, however, the impacts are not anticipated to be significant. Refer to Section 3.3.1 for discussion of additional impacts in the southwest quadrant.

3.2.3 Highway 401 Corridor

The visual impacts of the future footprint of the Highway 401 corridor to 6 interim and 8 eventual lanes are not expected to be significant. The vegetation communities along the edges of the corridor are deeper in



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most locations than the area that would be removed to facilitate the proposed construction. Therefore, there is likely to be very little change in the existing views into the corridor and outward from the corridor.

In the locations where Highway 401 crosses ravines and highway overpasses views in the north/south plane are available and offer a broader context of the landscape. These views are more frequent in the eastern portion of the study area, in places such as the highway overpasses passes of Shelter Valley Road, Vernonville Road, and Boyce/Herron Road. Although the future footprint of the highway will have localized impacts on grading, limited impacts to the viewsheds from the highway corridor are anticipated.

3.3 CULTURAL HERITAGE CONSIDERATIONS

Highway 401 from Canadian Forces Base Trenton to Toronto has been dedicated as the *Highway of Heroes* in commemoration of the route fallen soldiers take after repatriation. There are many aspects to the commemoration of the Highway of Heroes including the Highway of Heroes Tree Campaign which endeavors to create a living tribute to the Canadian Armed Forces by planting trees along Highway 401 from Windsor to Cornwall. As part of this campaign, it is understood that the Highway of Heroes organization seeks to design commemoration sites with the appropriate mix of native species; increase wildlife habitat; and positively impact the pollinator populations along Highway 401 and associated interchanges. MTO will continue to engage with this organization to guide the trees selection and planting design process during detail design of this project. Refer to the Preliminary Restoration Planting Plans L-460 to L-465 for potential planting sites. As noted, precise locations and composition will be determined at the detail design phase as additional information, such as limits of grading will be determined at that time. Preliminary grading limits have been identified but will be confirmed during Detail Design.

3.3.1 Percy Street

The Colborne Union Cemetery is located immediately south of Ramp W-N/S, within the southwest corner of the existing Percy Street interchange. The preferred interchange is anticipated to avoid direct impacts to the cemetery. However, visual mitigation measures may be appropriate during the detail design phase to preserve the current character of the cemetery, including screening plantings of coniferous trees. The potential for saline soil and salt spray should be considered in this location while selecting plant species. Any visual screening plantings proposed in this location should be developed in coordination with a cultural heritage specialist.

3.3.2 Barnum House

The Barnum House is a designated National Heritage Site located south of Highway 401, fronting on County Road 2. The property features a creek, forest, and agricultural lands which back onto the Highway 401 corridor. The Barnum House Creek Conservation Area, a natural habitat area owned by the Lower Trent Conservation Authority, is located west of the Barnum House Natural Heritage Site.

The Highway 401 ROW is proposed to be extended onto the rear of the Barnum House property as well as the Conservation Area property. This is partially to accommodate proposed culvert and bridge works.



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No significant impacts are anticipated to the cultural heritage aspects of either property, though it is recommended that this be confirmed by a cultural heritage expert during Detail Design.



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Mitigation and Landscape Planting Recommendations
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4.0 MITIGATION AND LANDSCAPE PLANTING RECOMMENDATIONS

Based on the assessment of existing conditions and potential impacts, the following mitigation and landscape planting recommendations should be considered for implementation as part of detail design for the preferred alternative. The following mitigation and landscape planting recommendations have also referenced the Erosion and Sediment Overview Risk Assessment (ESORA) (October 13, 2020 Stantec) and the Fisheries Impact Assessment and the Terrestrial Impact Assessment Reports.

4.1 RESTORATION AND COMPENSATION

The vegetation communities impacted by the preferred interchanges and future highway footprint for the interim 6 lane and ultimate 8 lane configuration are discussed below, including challenges and recommendations regarding restoration. Strategic coordination of the restoration communities is encouraged for consideration in the Detail Design phase, such as focusing forest and woodlot compensation around watercourses to increase their benefit to cold water streams. Conceptual landscape plans are available in Appendix B along with a list of native plants (located in Appendix C) observed in the study area for consideration in the development of planting schedules.

4.1.1 Watercourse Restoration

All disturbed watercourses should be revegetated to the extent possible with the intent of providing a 30-metre wide buffer of woody vegetation (including understory) on both sides of the watercourse. Where possible, watercourse restoration efforts should be combined with woodlot and forest expansion efforts facilitated through edge planting. The intent of these recommendations is to provide shade and floodplain stability to the watercourses as many are considered cold water communities. More detailed watercourse restoration/mitigation measures are described in the Fisheries Impact Assessment and the Terrestrial Impact Assessment Reports.

Industry best practices for environmental reclamation including planting and seeding of locally significant native (higher ecologically functioning) species where existing infrastructure is being removed. Where possible, revegetation designs should attempt to connect with and enhance adjacent vegetation communities. The possibility of saline soils and salt spray should be considered as an important species selection constraint during the design development of possible vegetative screens.

Vegetation removal should be minimized to the extent possible where construction impacts cannot be avoided. Topsoil and organic matter should also be salvaged and reintroduced to any areas disturbed during construction, as appropriate. It is recommended that new seed should be introduced to disturbed substrates as soon as feasible following construction (within 15 days for areas less than 200 m from a watercourse, and 45 days for other areas). To minimize the risk of erosion, ESC fencing and other best practices should remain in place until vegetation cover is re-established.



LANDSCAPE COMPOSITION REPORT HIGHWAY 401 PLANNING STUDY FROM COBOURG TO COLBORNE (GWP 4060-11-00)

Mitigation and Landscape Planting Recommendations
August 25, 2023

4.1.2 Wetlands

The impacts to wetlands are difficult to compensate within the project sites due to the potentially significant impact of proposed grading changes. One of the most important characteristics of a wetland is a specific and sustained moisture regime. Grading and soil alterations can significantly impact the ability to sustain wetland features and functions through alterations to the moisture regime. It is recommended that the improvement of existing wetlands in the vicinity of the project site be prioritized over the creation of new wetlands within the project site, should it be required.

4.1.3 Forests, Woodlands, and Thickets

Given the age of the potentially impacted forest trees and the complex processes involved in forest habitat development, it can take a significant amount of time to regenerate comparable conditions through compensation. Thickets, however, can be compensated within the lifecycle of the project. Typically, ROW areas are maintained to be free of large woody vegetation to limit the risk of obstructions, danger from falling limbs, and impeded sightlines. For this reason, it will be difficult to find the space to compensate for woodlands, forests, and thickets within the limited project ROW. It is recommended that compensation adjacent to the ROW and areas where the ROW is extended for culverts and bridges be explored in collaboration with landowners and the Highway of Heroes Tree Campaign. Where possible this compensation should be used to extend existing forested areas and be completed in coordination with watercourse restoration efforts as indicated above.

4.1.3.1 Canopy Cover Method

The canopy cover method utilizes a calculation of the overall canopy cover area of the trees on each of the sites. Using this data, it is possible to calculate the area of removal and subsequent compensation targets. The calculation of compensation trees should be based on an assessment of a canopy area equal to their projected coverage at five years post planting. The use of five years post planting size as a metric is appropriate as a representation of trees that are established and contributing to the landscape. It is important to note that the canopy will continue to increase in size as these trees grow and further increase the total canopy cover on each of the sites.

The total proposed riparian restoration area is 6.9 ha, in addition to 16.3 ha of proposed canopy area as provided through screens and woodland fill-in and/or extensions. It is assumed that replacement trees will be planted at 50 mm caliper or 250 cm height and will have a canopy area of 7 m² based on a 1.5 m canopy radius. After 5 years growth it is assumed that the canopy radius will be 19.6 m² based on a 2.5 m canopy radius. Based on the 5-year canopy assumption, the total combined canopy area of the proposed riparian restorations, screens, and woodlands would be achieved with the planting of approximately 11,835 trees.

4.1.4 Meadows

Meadow compensation is well suited to reinstatement within a roadway ROW. Meadow re-establishment can also be accomplished quickly. It is recommended that wherever possible graded areas and all areas



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of disturbed soil be rehabilitated as meadow habitat. It is likely that the total area meadow habitat may exceed the existing conditions, both for area and quality of meadow plant species.

4.1.5 Shelter valley Pines Golf Course

At the detail design stage when both physical and visual impacts are better known landscape based mitigation methods will be proposed to limit the impact and restore to equal and/or better conditions, including aesthetic integrity.

4.2 VISUAL SCREENING

A small amount of visual screening is recommended for the north end of the Colborne Union Cemetery. Visual screening is not anticipated to be required for the Lyle Street interchange; however, it should be considered during detail design. Refer to Appendix B for preliminary design considerations for screening. Visual screening plantings should be carried out in coordination with the affected residents and maintain positive landscape viewsheds where possible. The possibility of saline soils and salt spray should be considered as an important species selection constraint during the design development of possible vegetative screens.

4.3 CULTURAL HERITAGE

Collaboration with the Highway of Heroes Tree Campaign is recommended where trees are being planted for visual screening or naturalization. The design of commemoration sites with native species, wildlife habitat, and pollinator populations along Highway 401 and associated interchanges are goals of the Tree Campaign which are consistent with the ecological recommendations of this report. Furthermore, the development of commemoration sites may develop cultural connections to the landscape in this area.

It is recommended that a cultural heritage expert be consulted on the appropriate design of screenings and naturalization plantings on or adjacent to the Union Cemetery, Barnum House National Heritage Site, and Barnum House Creek Conservation Area.



LANDSCAPE COMPOSITION REPORT HIGHWAY 401 PLANNING STUDY FROM COBOURG TO COLBORNE (GWP 4060-11-00)

Conclusions
August 25, 2023

5.0 CONCLUSIONS

The MTO retained Stantec to undertake a Planning, Preliminary Design, and Class Environmental Assessment (Class EA) Study on Highway 401 for establishing the future footprint of Highway 401 for interim six and ultimate eight lanes., from 2 km east of Nagle Road to Percy Street (County Road 25) in Northumberland County (approximately 18 km, GWP 4060-11-00).

A field and desktop analysis of the preferred highway design was completed to assess potential landscape related impacts to the adjacent properties, the surrounding communities, and users of Highway 401. A summary of the results are as follows:

- The proposed project included interchanges at Lyle Street and Percy Street and an increase in highway width to an ultimate configuration of 8 lanes.
- The field and desktop analysis found that the existing interchanges and associated structures have some connections to the surrounding landscape features of the Oak Ridges Moraine and Lake Ontario.
- The assessed impact categories for this report included visual, natural environment, and cultural heritage.
- Mitigation of the visual impacts to the Colborne Union Cemetery caused by the construction of the preferred Percy Street alternative may be required in the detail design phase to preserve the current character of the cemetery, including screening plantings of coniferous trees.
- Mitigation of the natural environment impacts are focused on the net expansion of existing woodlot and forest areas, especially where they will provide a vegetative buffer for cold water watercourses.



LANDSCAPE COMPOSITION REPORT HIGHWAY 401 PLANNING STUDY FROM COBOURG TO COLBORNE (GWP 4060-11-00)

References
August 25, 2023

6.0 REFERENCES

Lee, H., Ontario Ministry of Natural Resources. (2008). Southern Ontario Ecological Land Classification: Vegetation Type List.

Ministry of Transportation, Ontario. (2015). Environmental Reference for Highway Design.

Stantec, (2022), Terrestrial Ecosystems Existing Conditions and Impact Assessment Report (Draft) - Highway 401 Planning Study from Cobourg to Colborne (GWP 4060-11-00). Stantec Consulting Ltd.

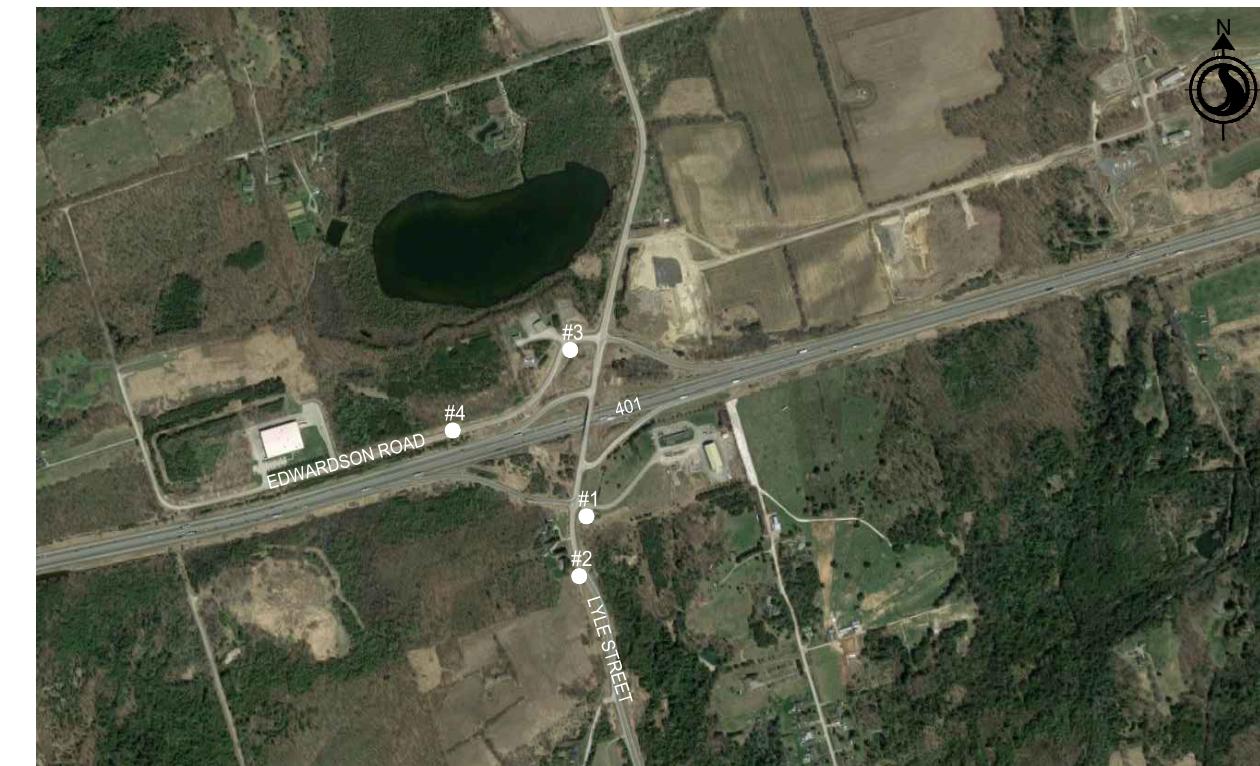


APPENDIX A:

Field Photograph Log



PERCY STREET



LYLE STREET



Photo Location #1- Percy Street



Photo Location #2- Percy Street



Photo Location #3- Percy Street



Photo Location #1- Lyle Street



Photo Location #2- Lyle Street



Photo Location #3- Lyle Street



Photo Location #4- Lyle Street

APPENDIX B:

Conceptual Landscape Plan



stantec Consulting Ltd.
10-300 Hagey Boulevard
Waterloo ON N2L 0A4
: (519) 579-4410
www.stantec.com

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Map NTS.



Township of Hamilton

1

24+500

A circular icon with a red border. Inside, a black 'S' shape is positioned vertically, with a black arrow pointing upwards from its top end. The letter 'N' is positioned above the arrow.

Proposed Riparian Zone
Restoration Planting
Refer to Detail LD-5, LD-6 & LD-9,
Sheets L-500 & L-501

PC: 23+299.7

23+500

Highway 401

SWM

Proposed Riparian Zone
Restoration Planting
Refer to Detail LD-5, LD-6 & LD-9,
Sheets L-500 & L-501

Township of Hamilton

25+000 10+000

NORTHUMBERL

Highway 401

Proposed Woodland Screen Planting
Refer to Detail LD-7 & LD-8,
Sheets L-500

RON HARDEN ROAD

Detailed description: This is an aerial map of the Township of Hamilton, showing a proposed woodland screen planting project. The map includes contour lines, roads, and a highway. A red and blue hatched area represents the proposed planting. Labels include 'TOWNSHIP OF HAMILTON', '25+000', '10+000', 'NORTHUMBERL', 'Highway 401', 'RON HARDEN ROAD', and 'Proposed Woodland Screen Planting Refer to Detail LD-7 & LD-8, Sheets L-500'. The map shows the proposed planting along the highway and road, with a red and blue hatched area indicating the planting line.

Township of Alnwick/Haldimand

This figure is an aerial view of a road alignment. The road is shown as a thick grey line, and the surrounding terrain is indicated by contour lines. A circular survey marker is located on the road, with the text 'TS: 11+100.5' and 'SC: 11+161.4' nearby. A coordinate system icon in the top right corner shows the Z-axis pointing upwards. A road profile diagram is overlaid on the terrain, showing a cross-section of the road. The profile is highlighted with red and blue colors, and a radius of curvature 'R=1200' is marked. The word 'ROAD' is written vertically on the left side of the road profile. The background shows a mix of green vegetation and brown, possibly agricultural, fields.

Highway of Heroes Planting locations are approximate and may change due to grading and other factors. Precise locations and composition will be determined at the detail design phase when

REVISION/ISSUE	APPROVED BY	APPROVAL DATE
REVISED AS PER CLIENT COMMENTS (2023.04.25)	KB	LB
REVISED AS PER CLIENT COMMENTS (2020.10.07)	JJ	DW
ISSUED FOR LCR	JJ	DW
REVISED AS PER DRAFT LCR COMMENTS	JJ	DW
ISSUED FOR DRAFT LCR	JJ	LB
vision/Issue	By	Appd
		YYYY.MM.DD

Dwn. Dsgn. Chkd. YYYY.MM.DD

nt/Project
MINISTRY OF TRANSPORTATION ONTARIO

HIGHWAY 401
TO
COBOURG TO COLBORNE

PRELIMINARY

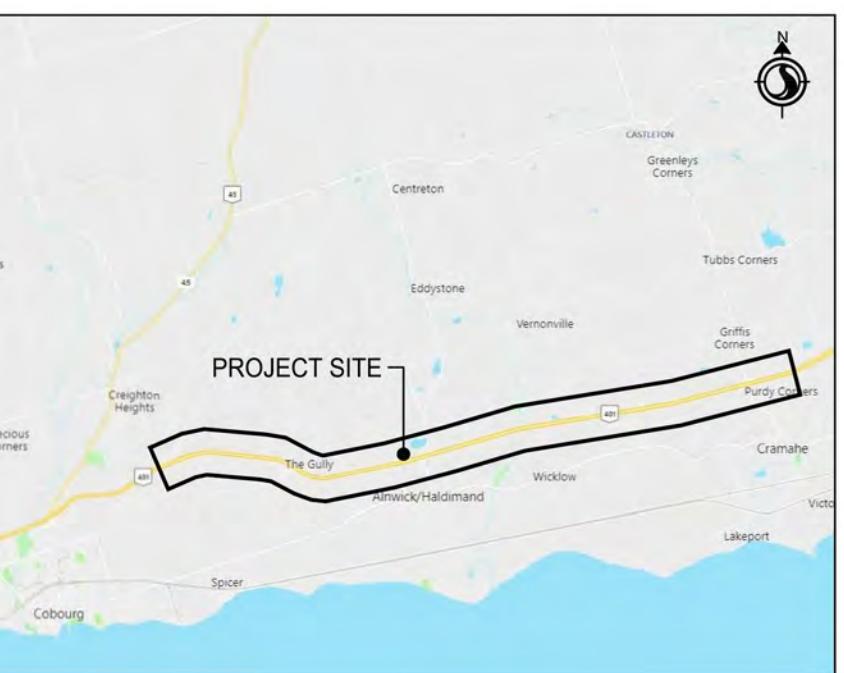
RESTORATION PLANTING PLAN

Sheet No. 5001090

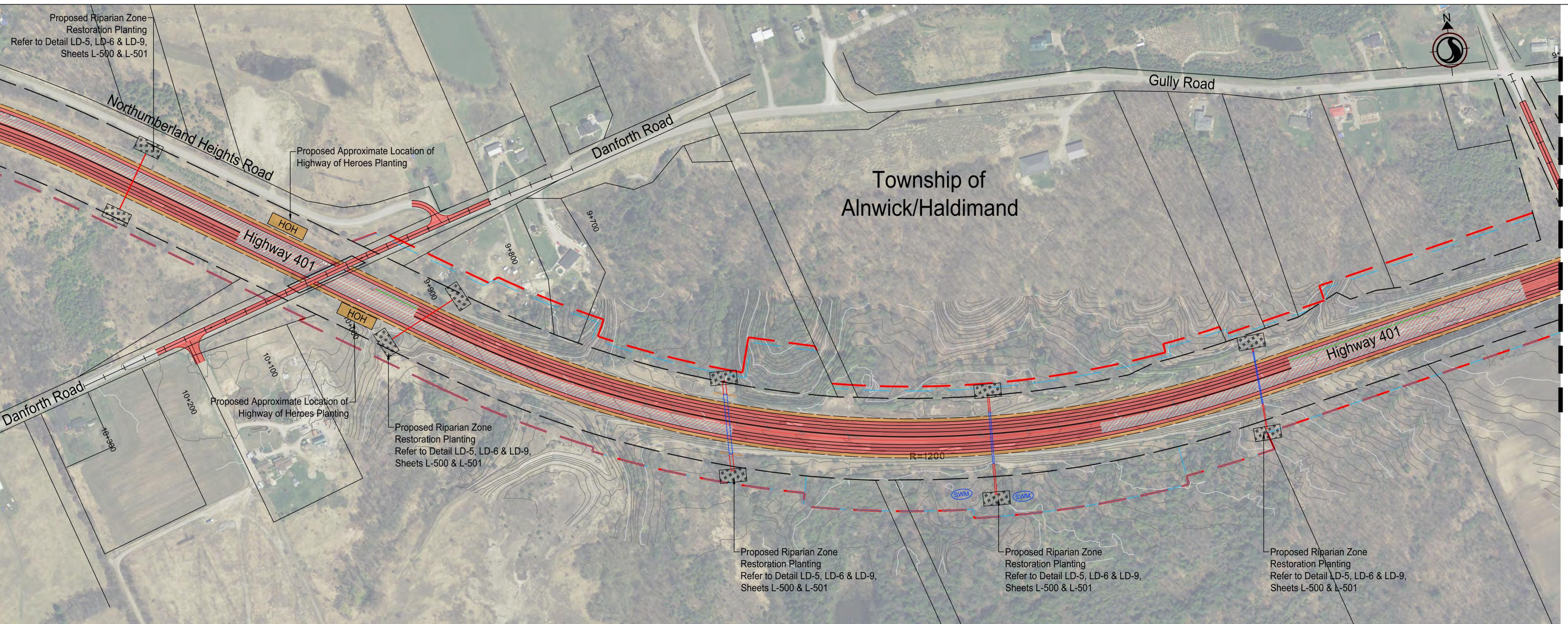
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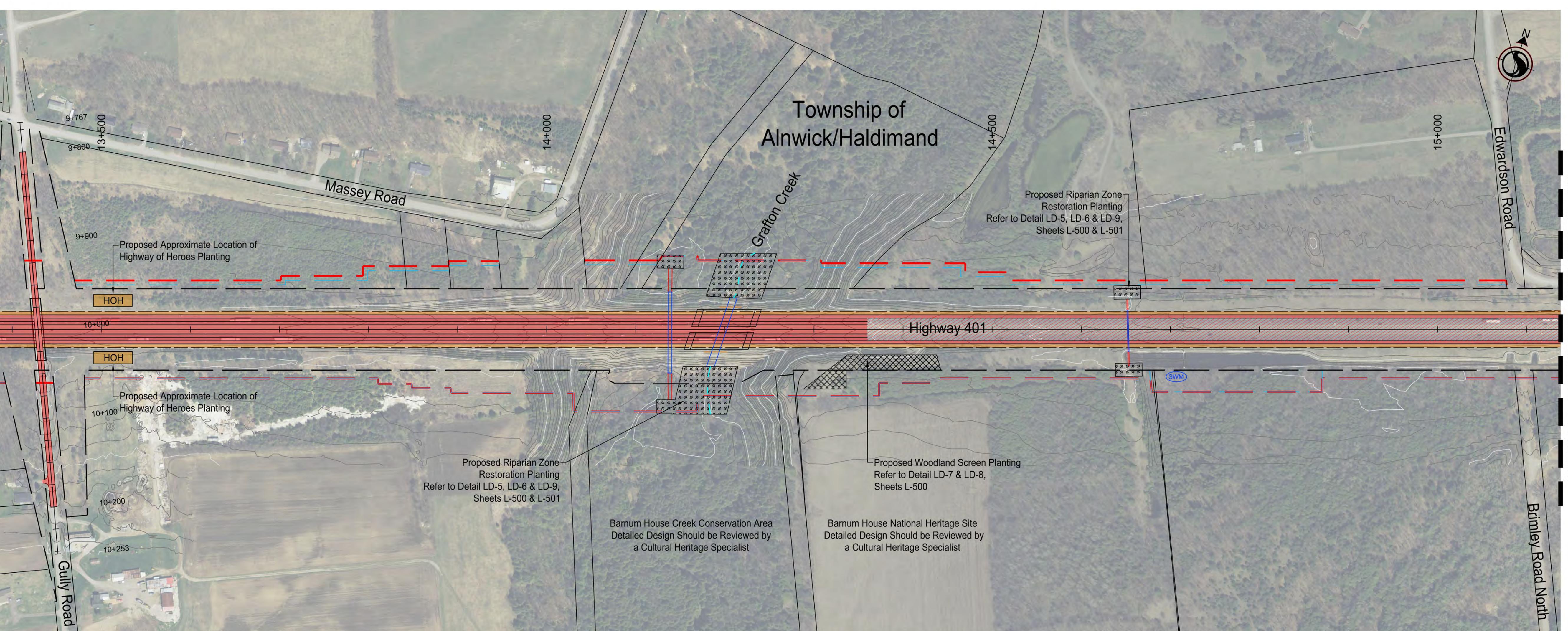


MATCHLINE - REFER TO WINDOW #2, SHEET L-460



WINDOW #3

MATCHLINE - REFER TO WINDOW #3 ABOVE



WINDOW #4

Notes

- Highway of Heroes Planting locations are approximate and may change due to grading and other factors. Precise locations and composition will be determined at the detail design phase when additional information is available.

Revision/Issue	By	Appd	YYYY.MM.DD
REvised AS PER CLIENT COMMENTS (2023.04.25)	KB	LB	2022.04.26
REvised AS PER CLIENT COMMENTS (2020.10.07)	JJ	DW	2020.11.09
ISSUED FOR LCR	JJ	DW	2020.07.23
REvised AS PER DRAFT LCR COMMENTS	JJ	DW	2020.07.22
ISSUED FOR DRAFT LCR	JJ	LB	2020.05.11

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Client/Project

Client/Project
**MINISTRY OF TRANSPORTATION ONTARIO
(MTO)**

HIGHWAY 401 COBOURG TO COLBORNE

330000

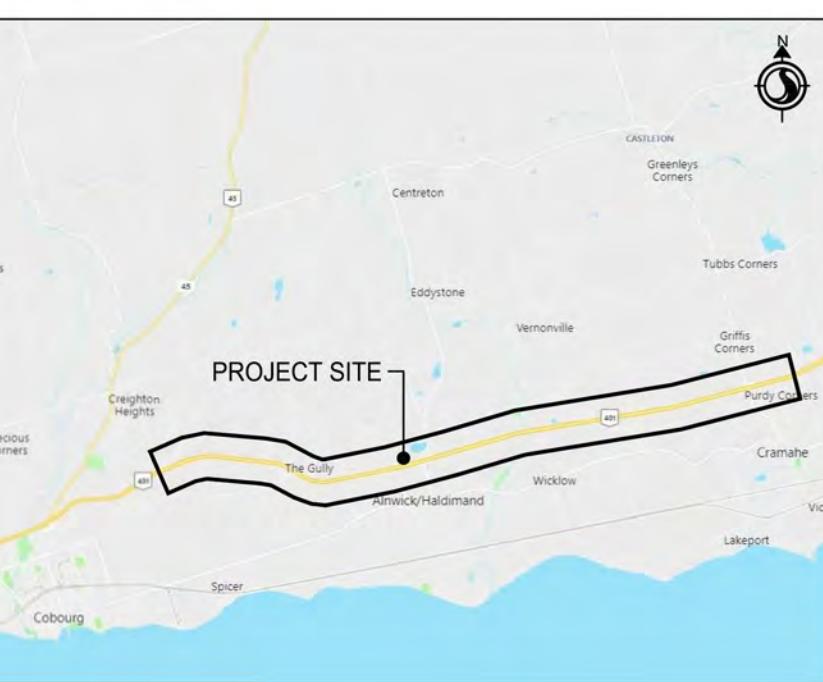
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PRELIMINARY RESTORATION PLANTING PLAN

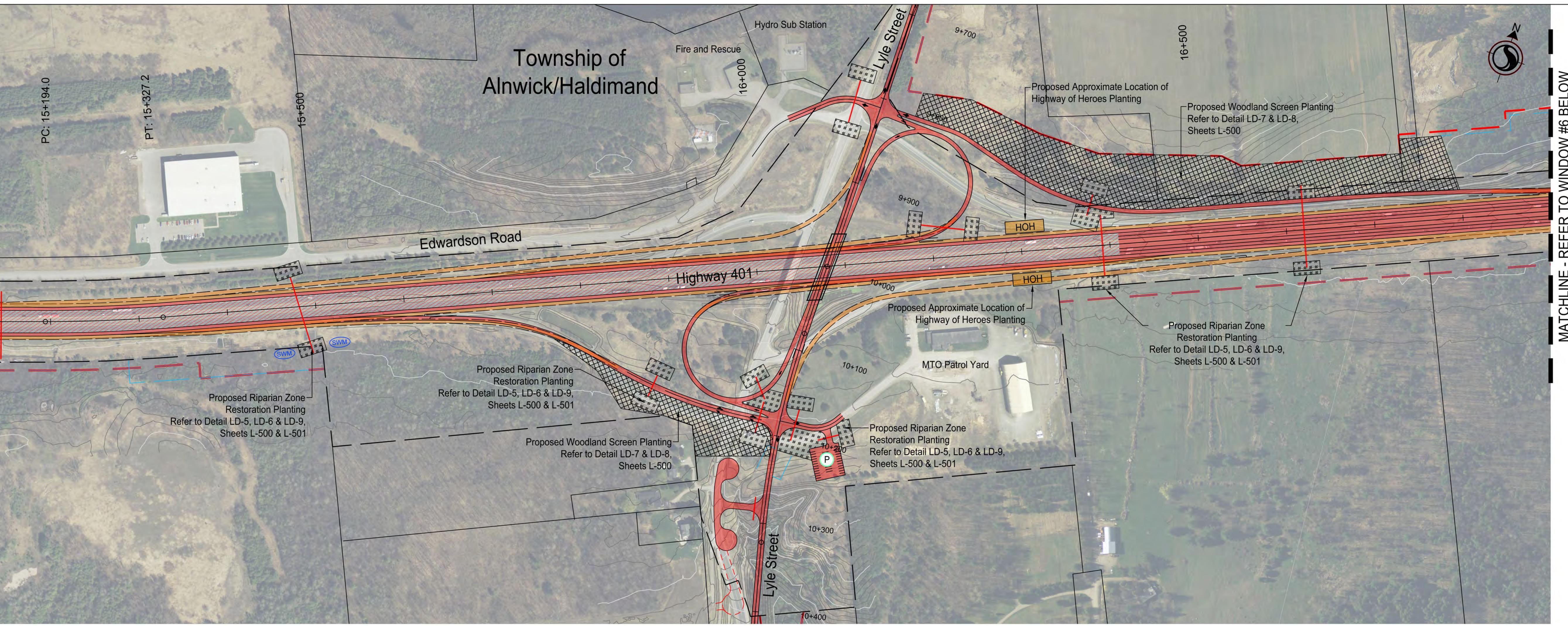
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165001090	1:2500				
Revision	Sheet	Drawing No.			

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 The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing.
 Any errors or omissions shall be reported to Stantec without delay.
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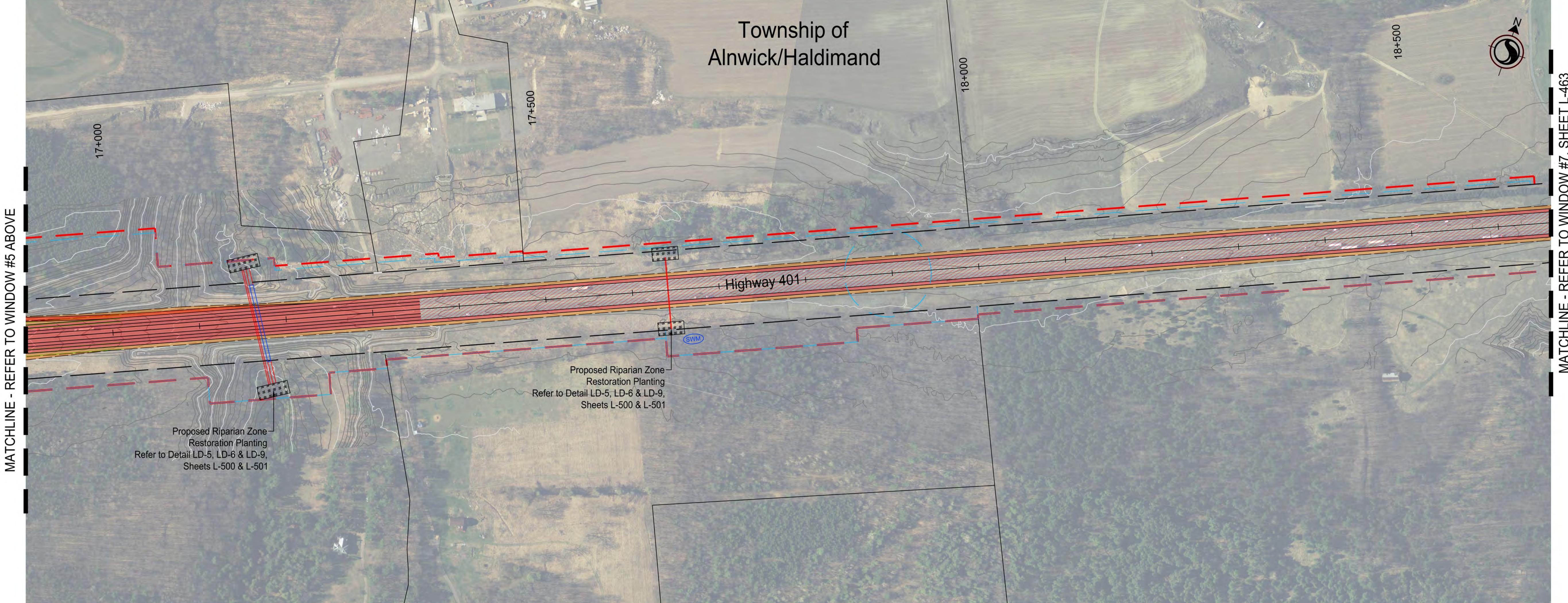
Key Map NTS.



MATCHLINE - REFER TO WINDOW #4, SHEET L-461



WINDOW #5



MATCHLINE - REFER TO WINDOW #5 ABOVE

WINDOW #6

Notes

- Highway of Heroes Planting locations are approximate and may change due to grading and other factors. Precise locations and composition will be determined at the detail design phase when additional information is available.

3. REVISED AS PER CLIENT COMMENTS	(2023.04.25)	KB	LB	2022.04.26
2. REVISED AS PER CLIENT COMMENTS	(2020.10.07)	JJ	DW	2020.11.09
ISSUED FOR LCR		JJ	DW	2020.07.23
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ISSUED FOR DRAFT LCR		JJ	LB	2020.05.11

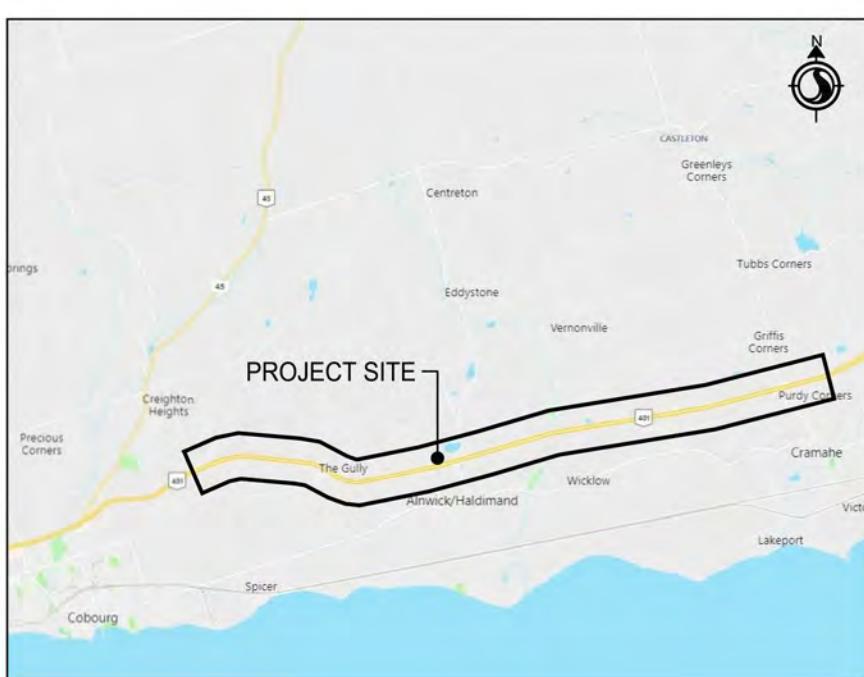
Revision/Issue	By	Appd	YYYY.MM.DD
File Name: 165001090_L-PS	JJ	LB	2020.05.05

Permit-Seal

Client/Project
 MINISTRY OF TRANSPORTATION ONTARIO (MTO)

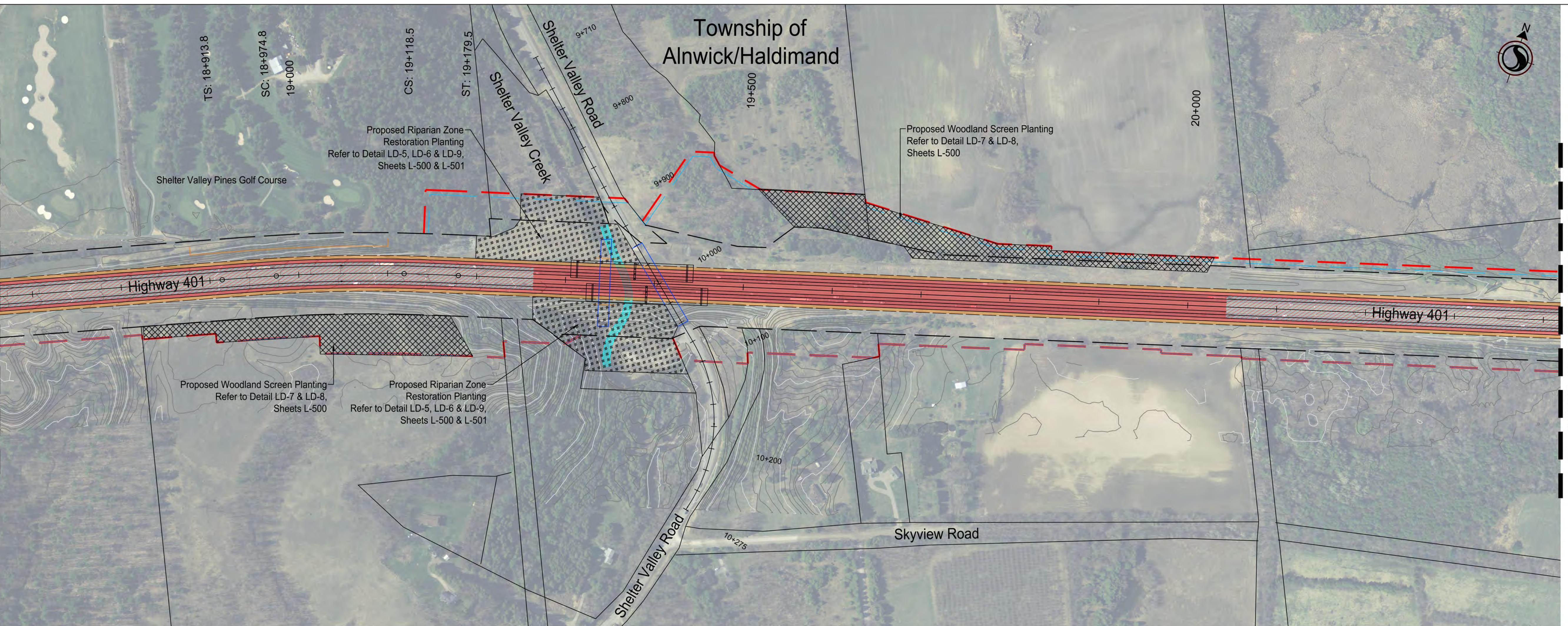
HIGHWAY 401
 COBOURG TO COLBORNE
 COBOURG-COLBORNE, ON

Title
 PRELIMINARY
 RESTORATION PLANTING PLAN

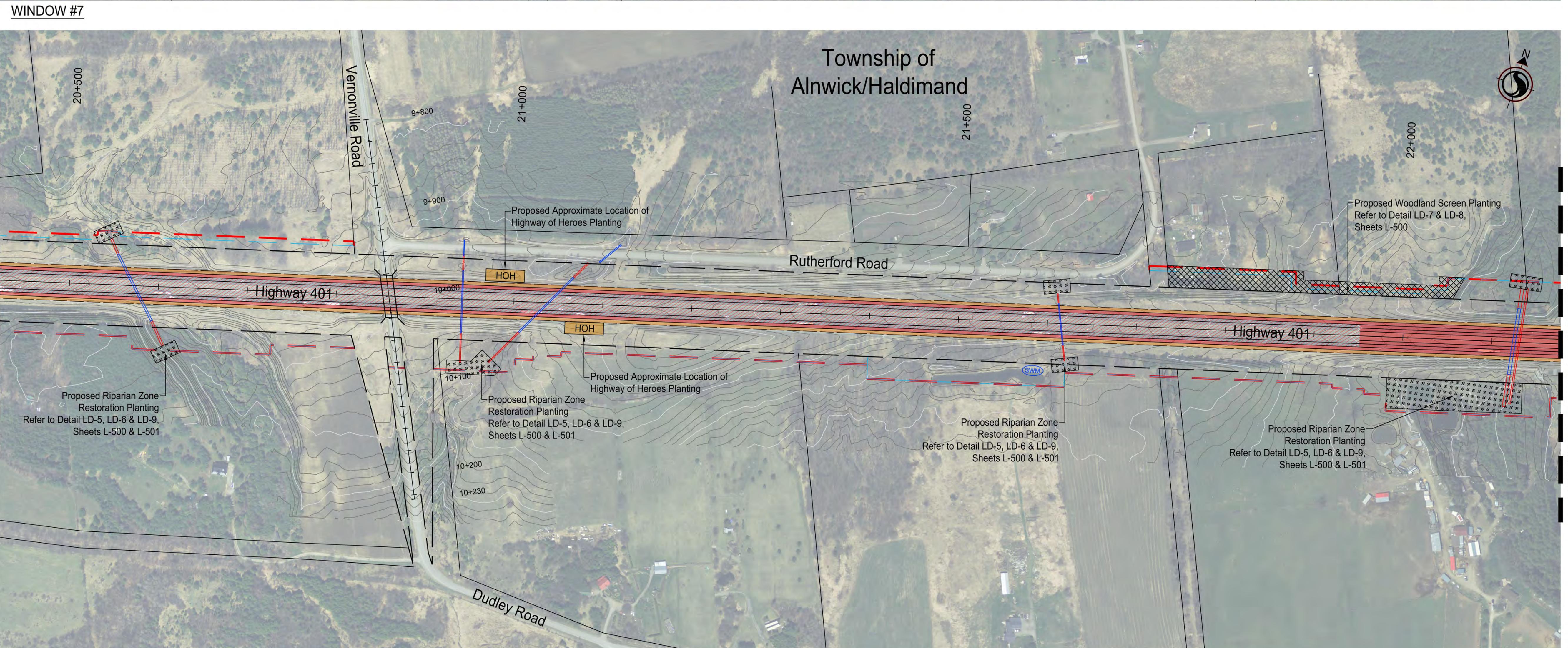


Legend	Existing MTO Right-Of-Way
Red Hatched	New Roadway - Interim (Future 6-lanes)
Blue Hatched	Rehabilitate Existing Roadway - Interim (Future 6-lanes)
Yellow Hatched	Property Required - Interim (Future 6-lanes)
Black Dashed	New Roadway - Ultimate (Future 8-lanes)
Red Dashed	Property Required - Ultimate (Future 8-lanes)
Blue Line	Existing Culvert
Red Line	New Culvert or Culvert Extension
Red X	Existing Driveway to be Closed
Blue X	Property Acquisition
SWM	Potential Stormwater Management Facility
Yellow Line	Stream/Creek (Approximate)
Proposed Retaining Wall	Proposed Retaining Wall
P	Proposed Carpool Lot
Green Line	Municipal Township Boundary
Property Fabric	Property Fabric (Approximate based on Assessment Mapping)
Black Dotted	Proposed Riparian Restoration Zone Planting
Black Cross-hatched	Proposed Woodland Screen Planting
Orange Box	HOH
	Proposed Highway of Heroes Planting

MATCHLINE - REFER TO WINDOW #6, SHEET L-462



MATCHLINE - REFER TO WINDOW #8 BELOW



MATCHLINE - REFER TO WINDOW #7 ABOVE

MATCHLINE - REFER TO WINDOW #9, SHEET L-464

Notes

- Highway of Heroes Planting locations are approximate and may change due to grading and other factors. Precise locations and composition will be determined at the detail design phase when additional information is available.

3. REVISED AS PER CLIENT COMMENTS (2020.04.25)	KB	LB	2022.04.26
2. REVISED AS PER CLIENT COMMENTS (2020.10.07)	JJ	DW	2020.11.09
ISSUED FOR LCR	JJ	DW	2020.07.23
1. REVISED AS PER DRAFT LCR COMMENTS	JJ	L8	2020.07.22
ISSUED FOR DRAFT LCR	By	Appd	2020.05.11

Revision/Issue

File Name: 165001090.L-PS JJ Dwn. L8 2020.05.05 YYYY.MM.DD

Dwn. Dign. Chkd. YYYY.MM.DD

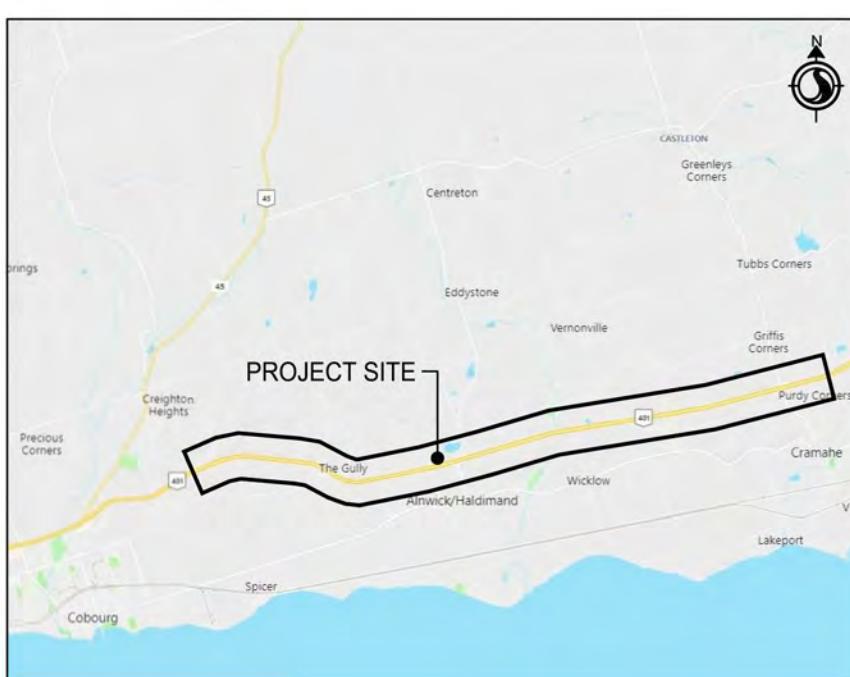
Permit-Seal

 Client/Project
 MINISTRY OF TRANSPORTATION ONTARIO (MTO)

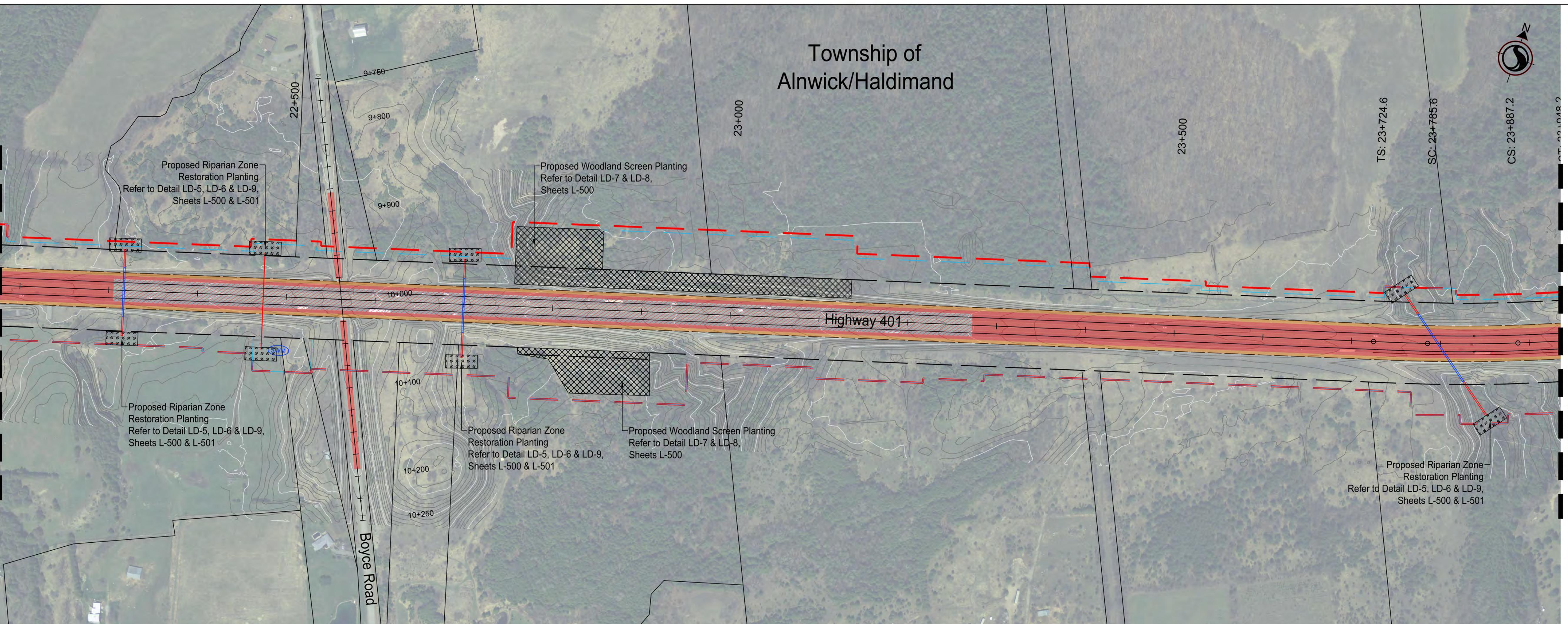
 HIGHWAY 401
 COBOURG TO COLBORNE
 COBOURG-COLBORNE, ON

 Title
 PRELIMINARY
 RESTORATION PLANTING PLAN

 Project No. 165001090 Scale 1:2500
 Revision Sheet Drawing No.
 3 4 of 8 L-463

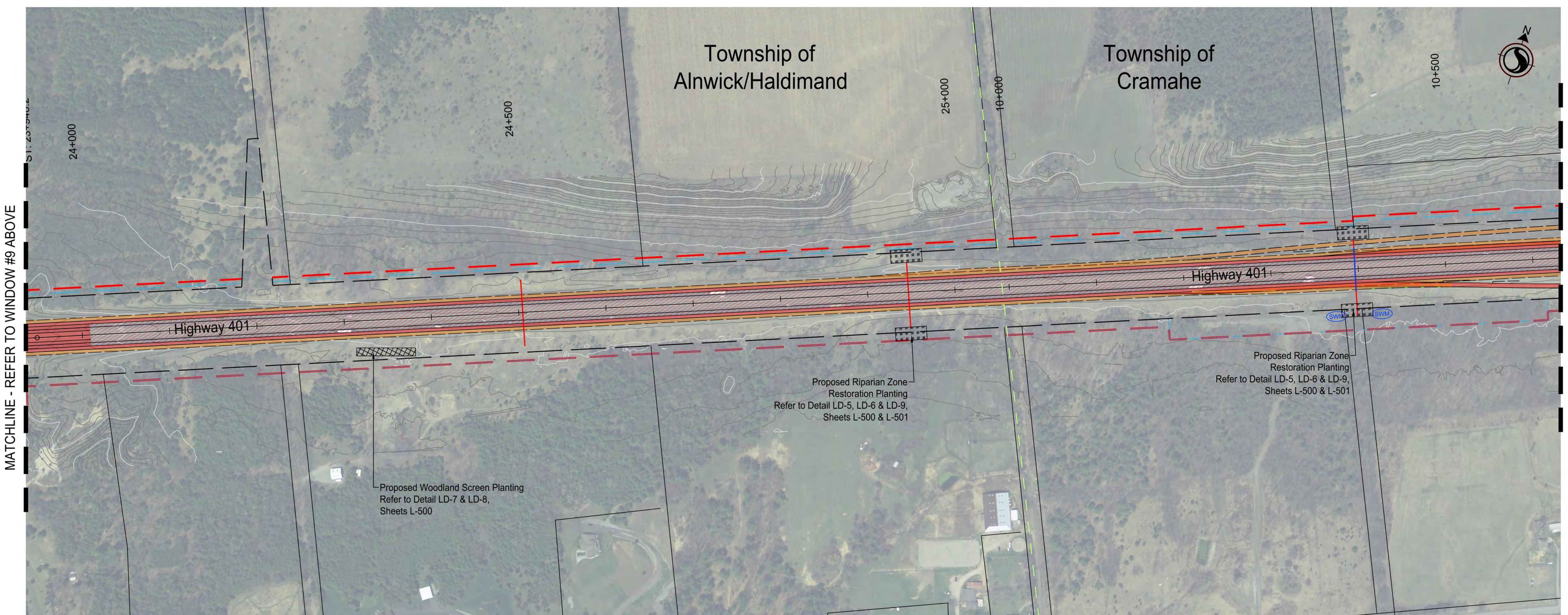


MATCHLINE - REFER TO WINDOW #8, SHEET L-463



WINDOW #9

MATCHLINE - REFER TO WINDOW #9 ABOVE



WINDOW #10

Notes

- Highway of Heroes Planting locations are approximate and may change due to grading and other factors. Precise locations and composition will be determined at the detail design phase when additional information is available.

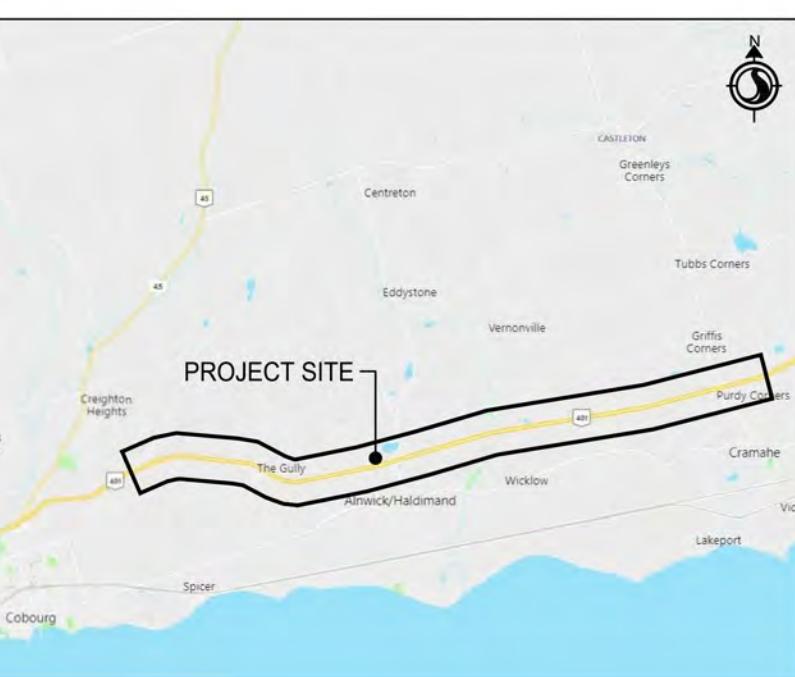
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2. REVISED AS PER CLIENT COMMENTS (2020.10.07)	JJ	DW	2020.11.09
ISSUED FOR LCR	JJ	DW	2020.07.23
1. REVISED AS PER DRAFT LCR COMMENTS	JJ	DW	2020.07.22
ISSUED FOR DRAFT LCR	JJ	LB	2020.05.11
Revision/Issue	By	Appd	YYYY.MM.DD
File Name: 165001090.L-PS	JJ	LB	2020.05.05
	Dwn.	Dign.	YYYY.MM.DD

Permit-Seal

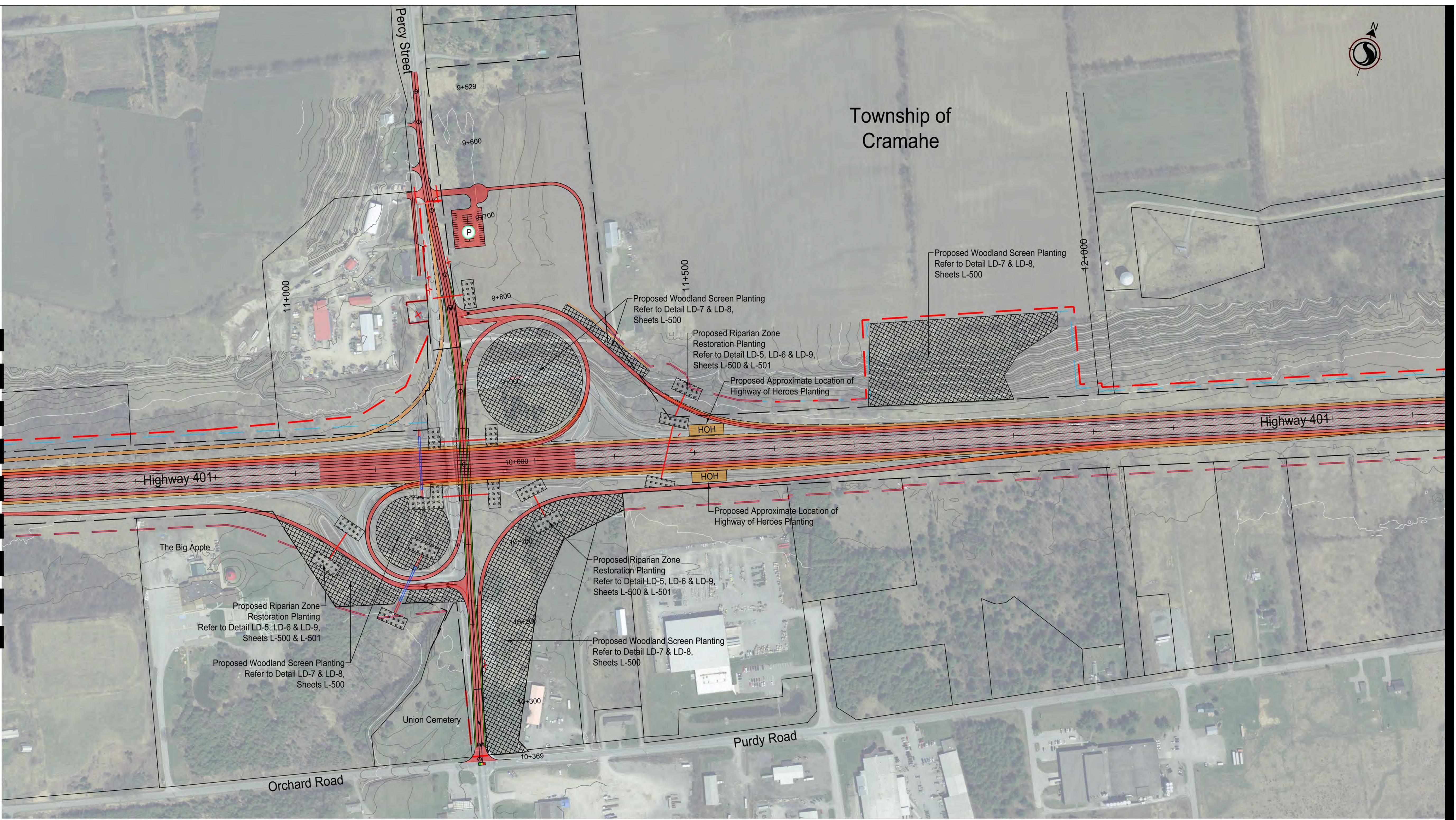
 Client/Project
 MINISTRY OF TRANSPORTATION ONTARIO (MTO)

 HIGHWAY 401
 COBOURG TO COLBORNE
 COBOURG-COLBORNE, ON

 Title
 PRELIMINARY
 RESTORATION PLANTING PLAN



MATCHLINE - REFER TO WINDOW #10, SHEET L-464



WINDOW #11

 Client/Project
 MINISTRY OF TRANSPORTATION ONTARIO
 (MTO)

 HIGHWAY 401
 COBOURG TO COLBORNE
 COBOURG-COLBORNE, ON

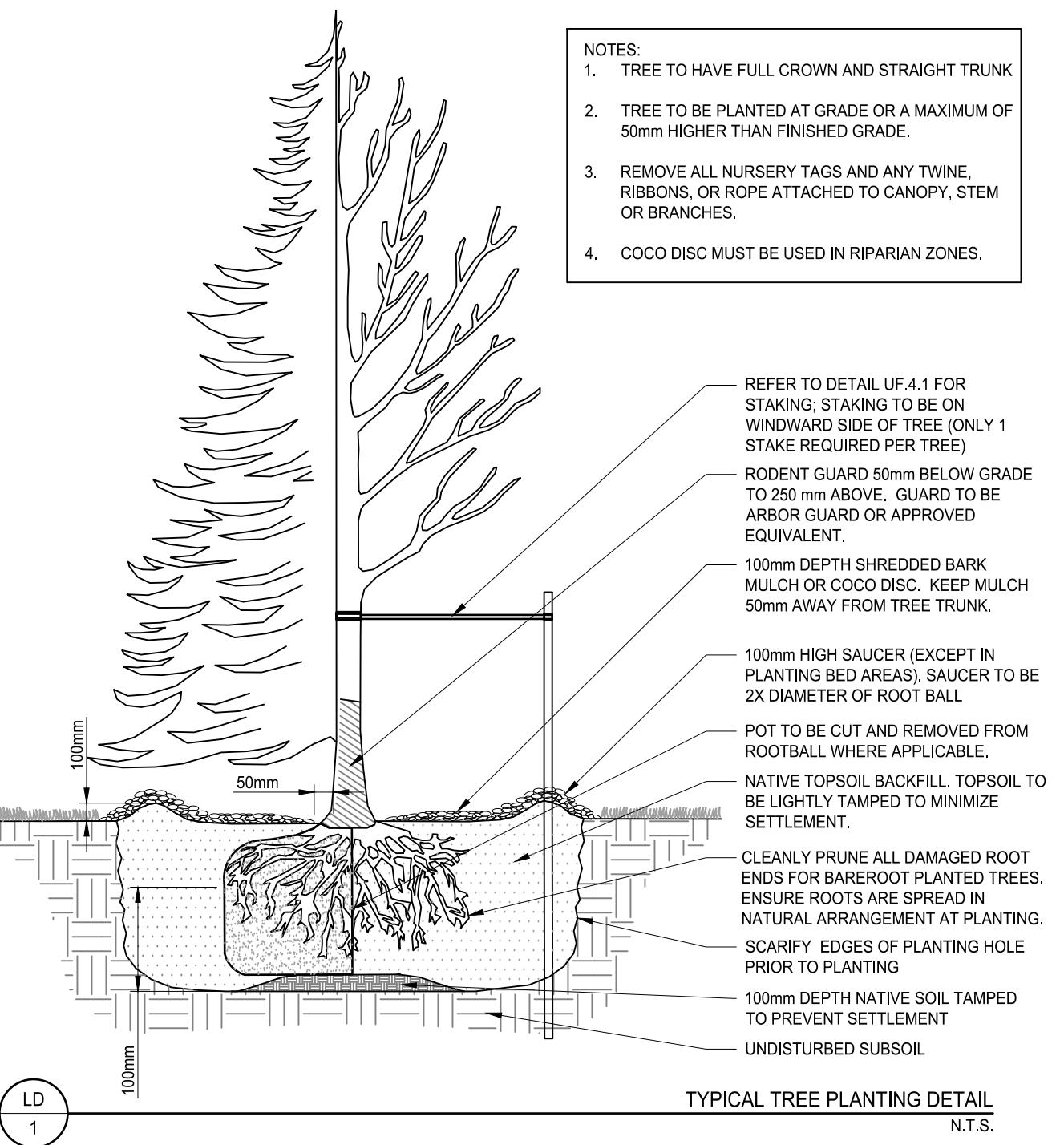
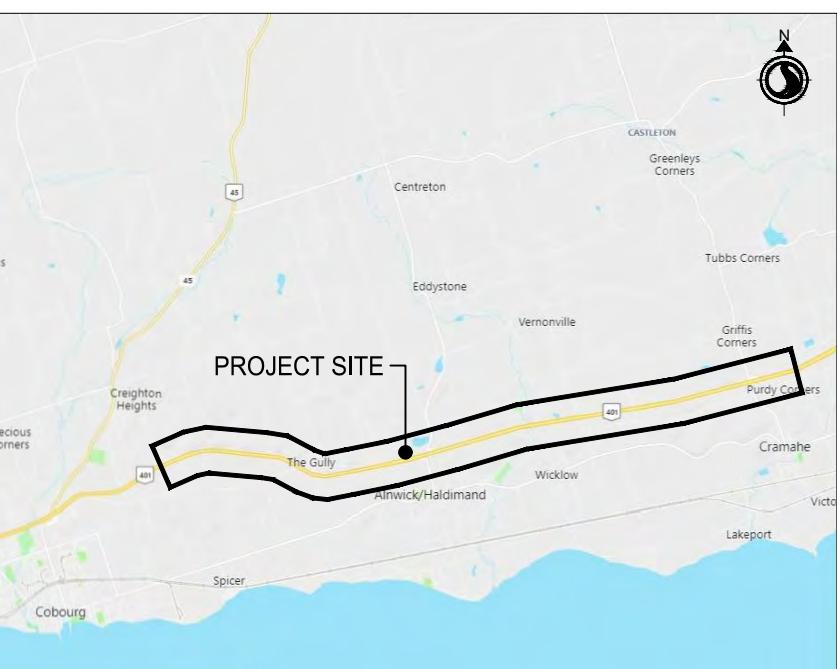
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 RESTORATION PLANTING PLAN

 Project No. 165001090 Scale 1:2500
 Revision 3 Sheet 6 of 8 Drawing No. L-465

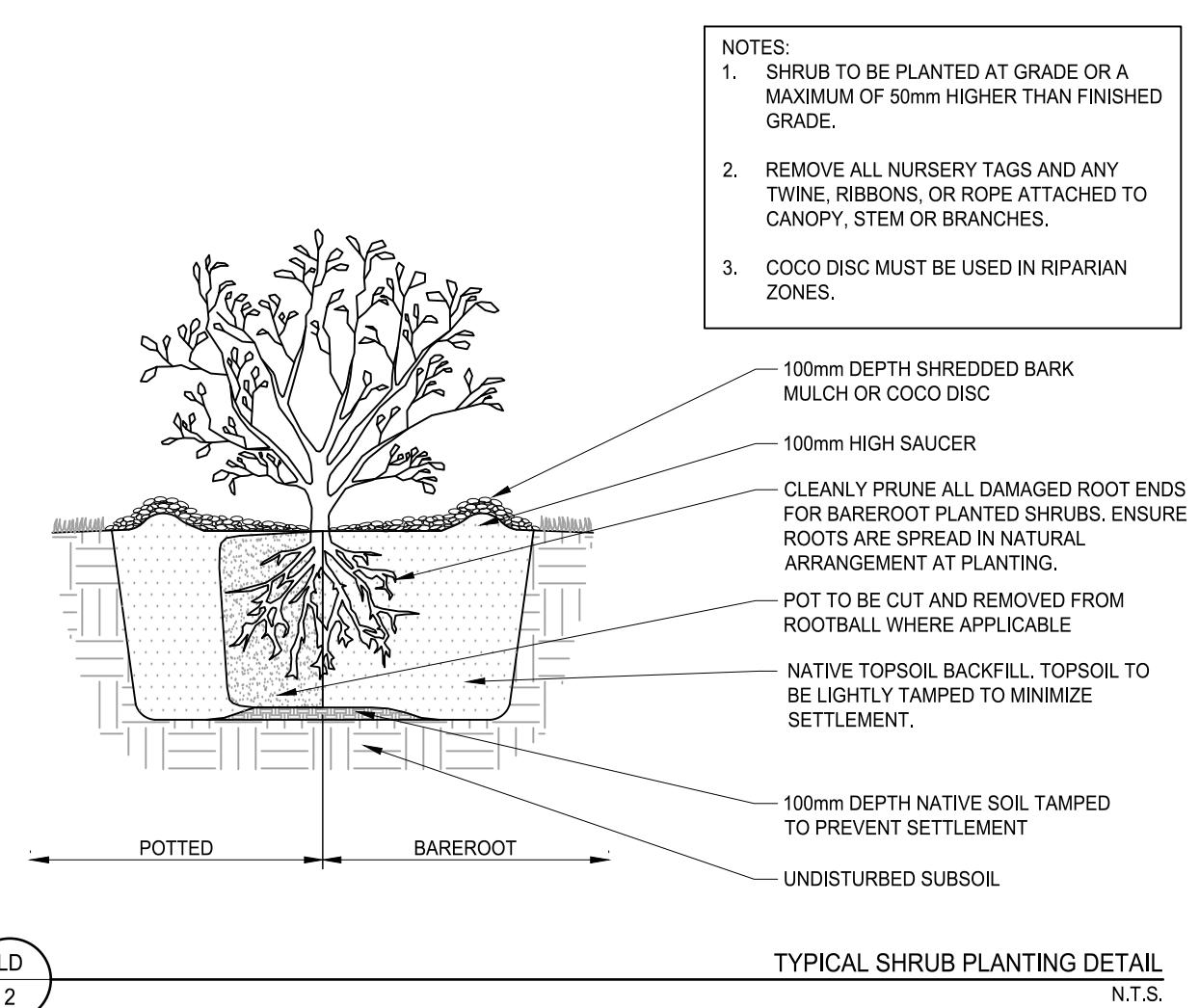
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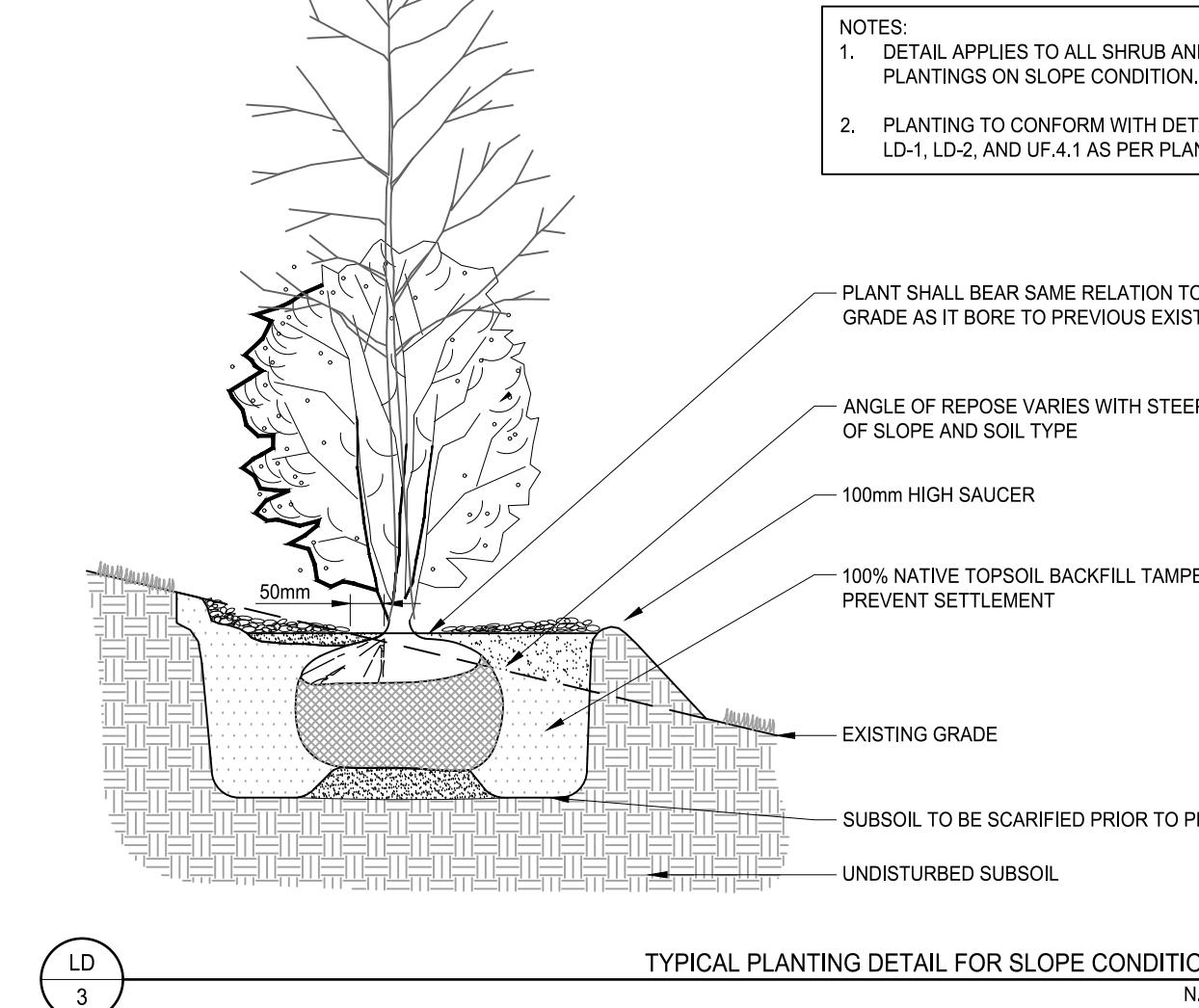
3 6 of 8 L-465



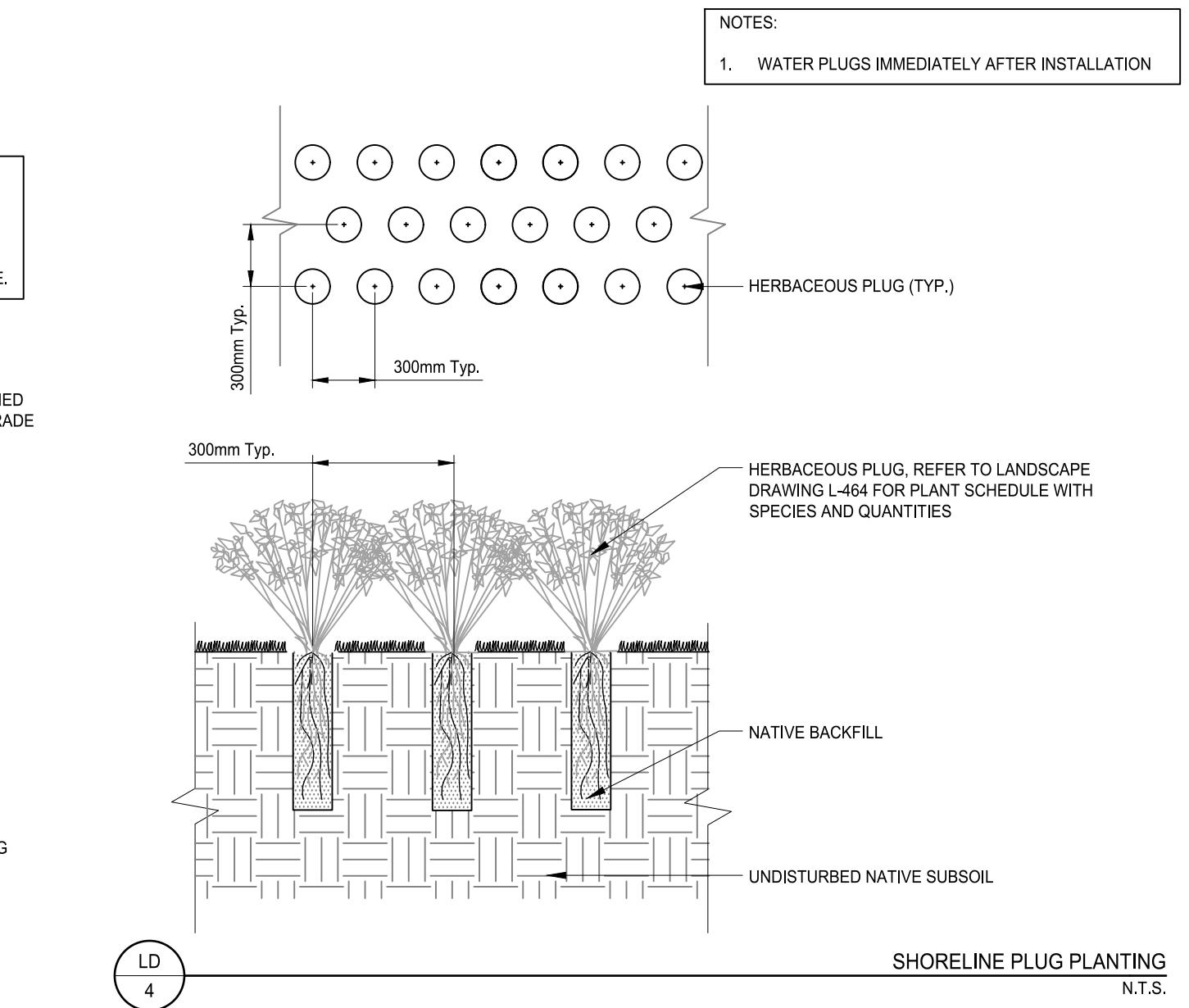
TYPICAL TREE PLANTING DETAIL
N.T.S.



TYPICAL SHRUB PLANTING DETAIL
N.T.S.



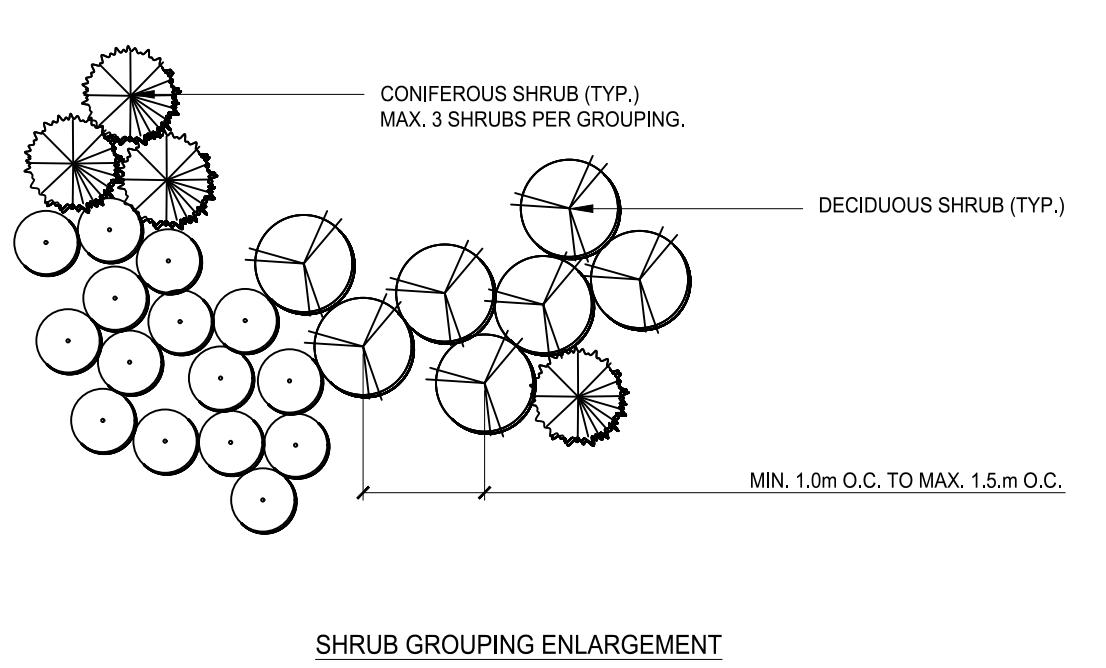
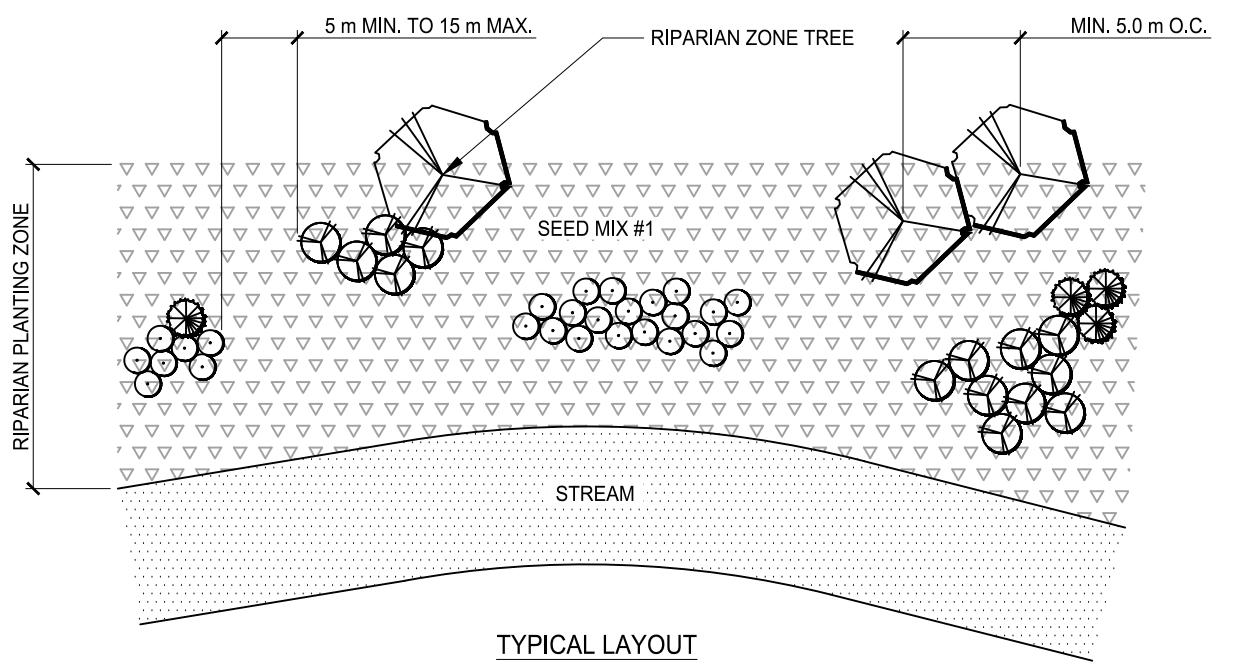
TYPICAL PLANTING DETAIL FOR SLOPE CONDITIONS
N.T.S.



SHORELINE PLUG PLANTING
N.T.S.

RIPARIAN PLANTING ZONE LAYOUT:

- NO MORE THAN 35% OF ANY SINGLE GENUS AND 20% OF ANY SINGLE SPECIES SHALL BE THROUGHOUT THE ENTIRE RIPARIAN PLANTING ZONE.
- SHRUBS WILL BE PLANTED A MINIMUM OF 1.0 m APART UP TO A MAXIMUM OF 1.5 m ON CENTRE.
- SHRUBS ARE TO BE PLANTED IN GROUPINGS OF 5 TO 30 SHRUBS, WITH A MINIMUM OF 3 DIFFERENT SPECIES PER GROUPING. PLANTING TO MIMIC A NATURAL LAYOUT AND HAVE SOME GAPS BETWEEN GROUPINGS.
- SHRUBS SHOULD BE PLANTED IN APPROPRIATE MOISTURE REGIMES TO PROMOTE AND SUSTAIN HEALTHY GROWTH.
- TREES TO BE LOCATED A MINIMUM OF 5.0 m FROM POINT BAR FEATURES AND AREAS WHERE FREQUENT FLOODING CAN BE EXPECTED. TREES SHOULD BE PLANTED IN A SINGULAR LAYOUT OR GROUPED TO THREE MAXIMUM PER CLUSTER AS SPACE PERMITS.
- ALL TREES TO BE SPACED MINIMUM OF 6.0 m ON CENTRE.
- SEED MIX #1 - CREEK BANK SEED MIX (#8215) TO BE APPLIED THROUGHOUT THE RIPARIAN PLANTING ZONE.
- REFER TO DRAWINGS L-463 TO L-465 FOR PROPOSED EXTENTS OF RIPARIAN PLANTING ZONES AND SPECIES REQUIREMENTS.

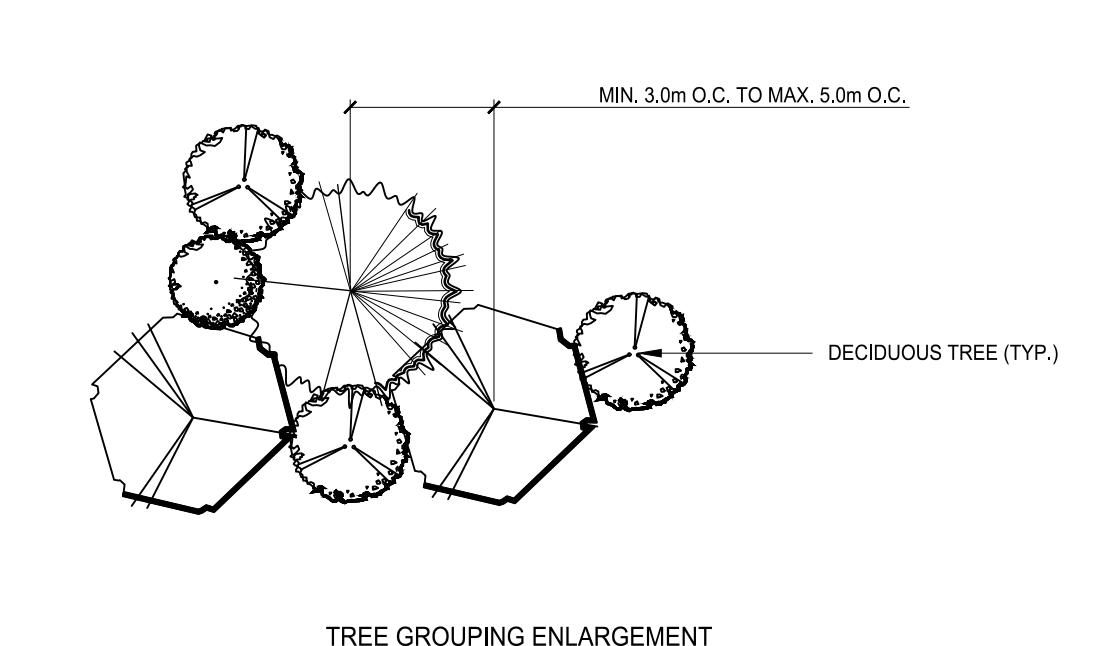
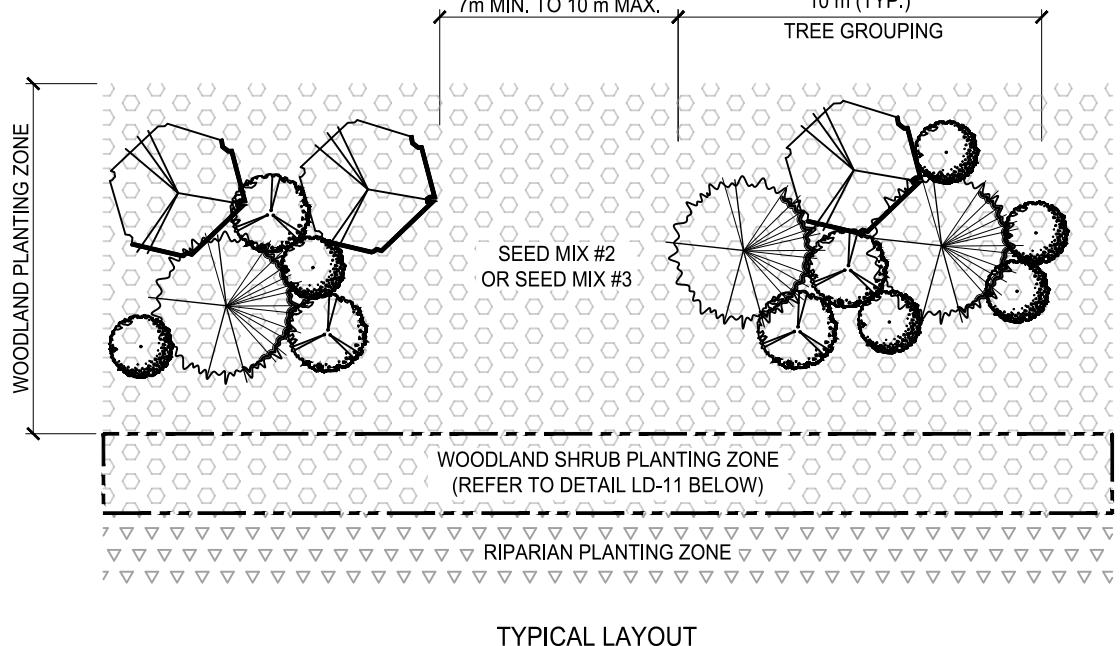


TYPICAL RIPARIAN PLANTING ZONE LAYOUT
N.T.S.

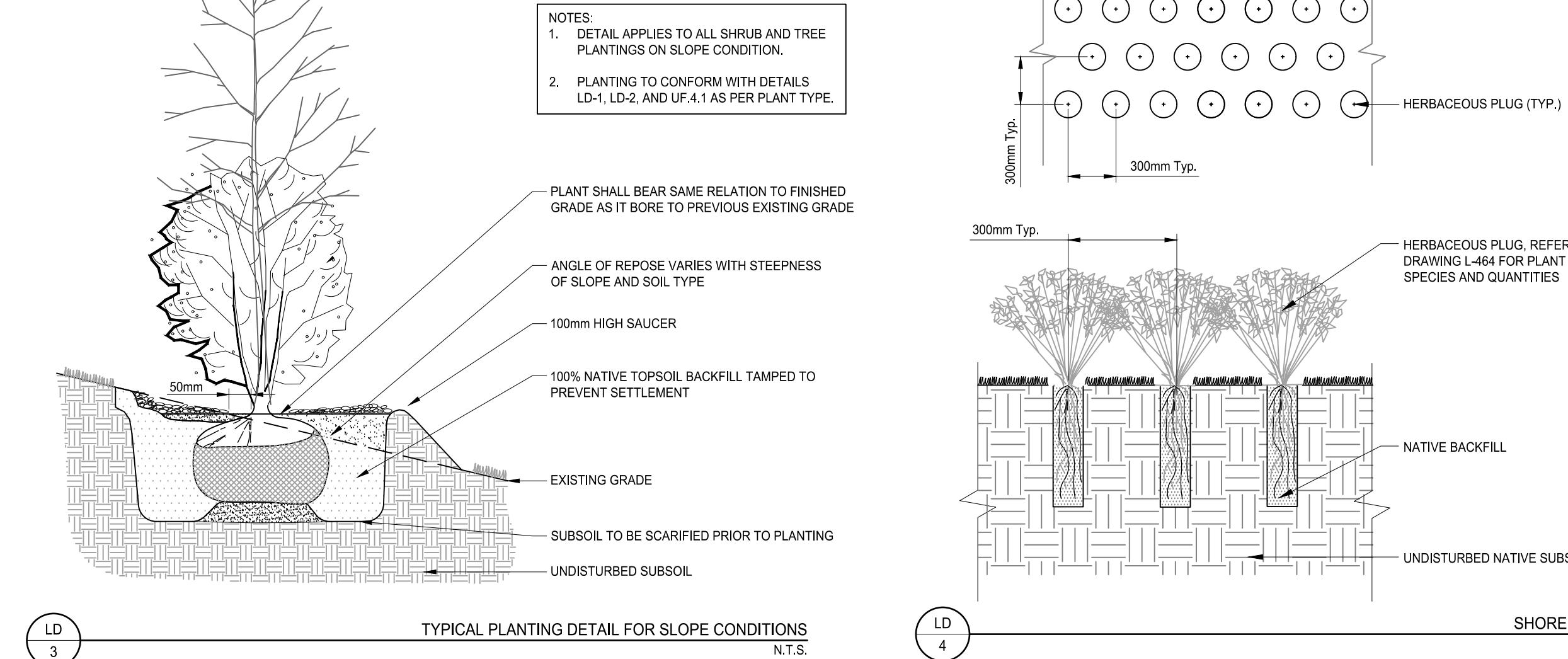
WOODLAND SCREEN PLANTING ZONE LAYOUT:

REFORESTATION HAS BEEN DESIGNED TO CREATE A MIXED AGE WOODLAND USING A COMBINATION OF EARLY SUCCESSIONAL AND UPLAND SPECIES. TREES WILL BE PLANTED IN A RANDOM PATTERN WITH A MIX OF SPECIES USING THE FOLLOWING CRITERIA:

- NO MORE THAN 35% OF ANY SINGLE GENUS AND 20% OF ANY SINGLE SPECIES SHALL BE THROUGHOUT THE ENTIRE WOODLAND PLANTING ZONE AT ALL SITES.
- TREES WILL BE PLANTED A MINIMUM OF 3.0 m APART UP TO A MAXIMUM OF 5.0 m ON CENTRE.
- TREES ARE TO BE PLANTED IN GROUPINGS OF FIVE TO SEVEN TREES, WITH A MINIMUM OF 3 DIFFERENT SPECIES PER GROUPING AND 50% CONIFEROUS. PLANTING TO MIMIC A NATURAL LAYOUT AND HAVE SOME GAPS BETWEEN TREES WITH VARIED SPACING THROUGHOUT.
- TREES SHOULD BE PLANTED IN APPROPRIATE MOISTURE REGIMES TO PROMOTE AND SUSTAIN HEALTHY GROWTH.
- OPEN AREAS (SUN EXPOSURE) TO BE SEDED WITH MIX #2 - OSC NATIVE UPLAND FORAGE AND MEADOW MIX (#8140).
- AREAS ADJACENT TO EXISTING VEGETATION (SHADE CONDITION) TO BE SEDED WITH MIX #3 - OSC WOODLAND MIX (#8275).
- REFER TO DRAWINGS L-463 TO L-465 FOR PROPOSED EXTENTS OF WOODLAND PLANTING ZONES AND SPECIES REQUIREMENTS.

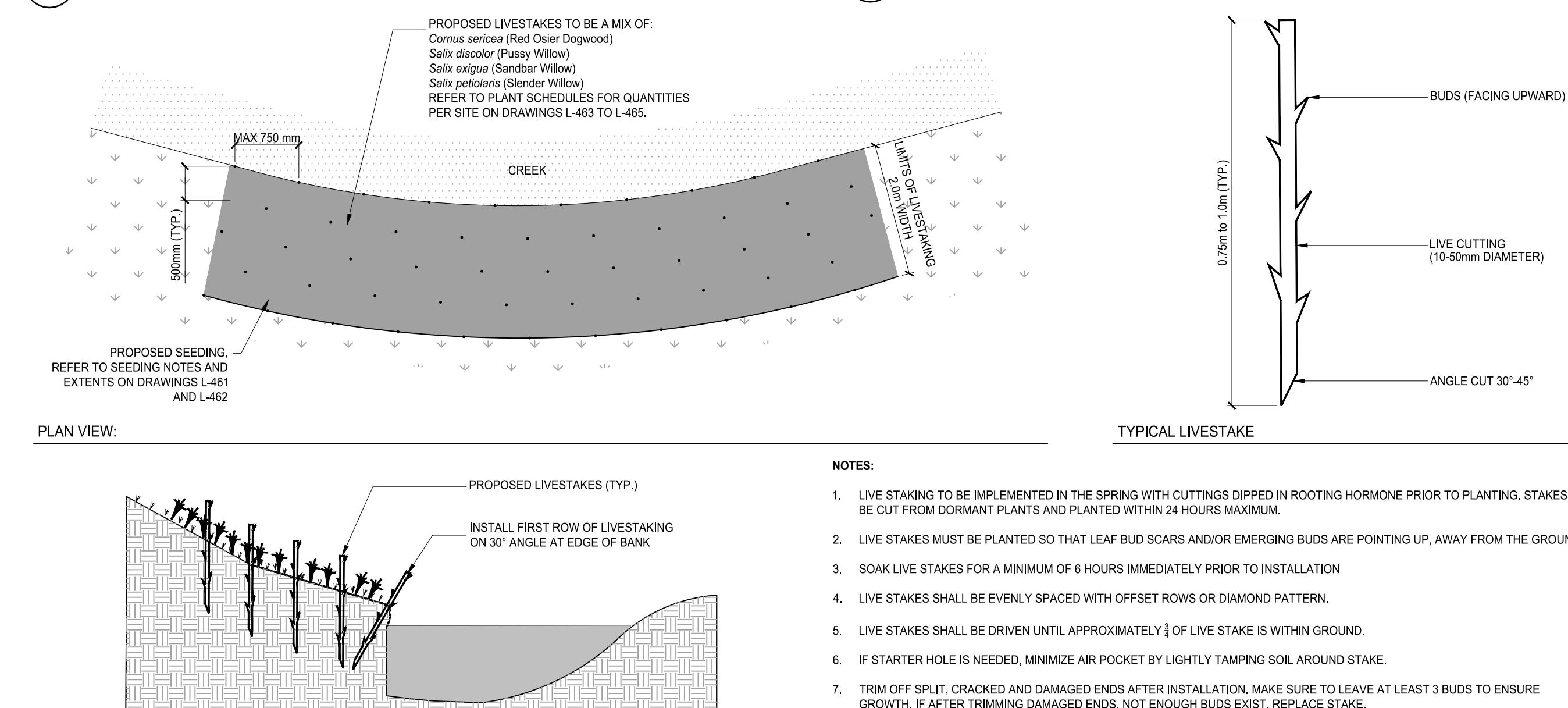


TYPICAL WOODLAND NUCLEATION PLANTING ZONE LAYOUT
N.T.S.



TYPICAL PLANTING DETAIL FOR SLOPE CONDITIONS
N.T.S.

SHORELINE PLUG PLANTING
N.T.S.



NOTES:

- LIVE STAKING TO BE IMPLEMENTED IN THE SPRING WITH CUTTINGS DIPPED IN ROOTING HORMONE PRIOR TO PLANTING. STAKES TO BE CUT FROM DORMANT PLANTS AND PLANTED WITHIN 24 HOURS MAXIMUM.
- LIVE STAKES MUST BE PLANTED SO THAT LEAF BUD SCARS AND/OR EMERGING BUDS ARE POINTING UP, AWAY FROM THE GROUND.
- SOAK LIVE STAKES FOR A MINIMUM OF 6 HOURS IMMEDIATELY PRIOR TO INSTALLATION.
- LIVE STAKES SHALL BE EVENLY SPACED WITH OFFSET ROWS OR DIAMOND PATTERN.
- LIVE STAKES SHALL BE DRIVEN UNTIL APPROXIMATELY $\frac{1}{3}$ OF LIVE STAKE IS WITHIN GROUND.
- IF STARTER HOLE IS NEEDED, MINIMIZE AIR POCKET BY LIGHTLY TAMPING SOIL AROUND STAKE.
- TRIM OFF SPLIT, CRACKED AND DAMAGED ENDS AFTER INSTALLATION, MAKE SURE TO LEAVE AT LEAST 3 BUDS TO ENSURE GROWTH. IF AFTER TRIMMING DAMAGED ENDS, NOT ENOUGH BUDS EXIST, REPLACE STAKE.
- STAKING MAY BE REQUIRED THROUGH MATTING, WOOD DEBRIS, ROCK OR COMPACTED SOILS. A STARTER HOLE MAY BE REQUIRED.
- LIVE STAKES SHALL BE INSTALLED IN ALL AREAS WITH WOOD DEBRIS TOE PROTECTION AND ALONG BOTH SIDES OF RIFLES.

TYPICAL LIVESTAKE LAYOUT AND INSTALLATION
N.T.S.

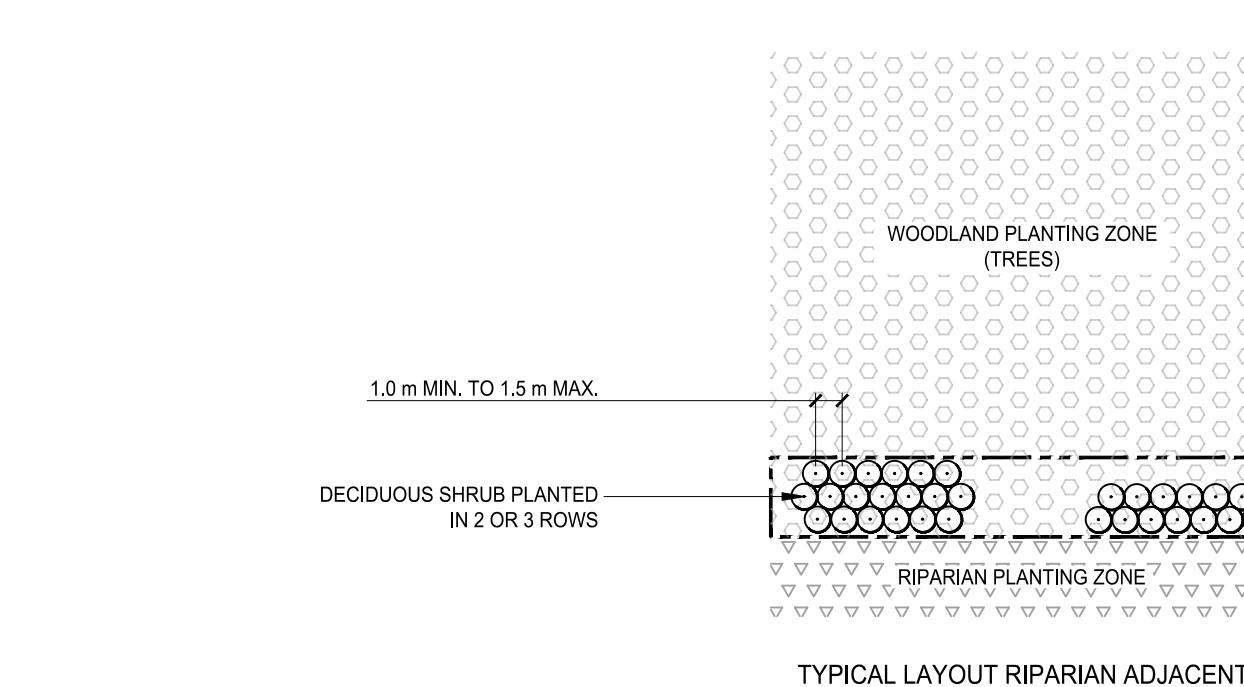
ELEVATION VIEW:

TYPICAL LIVESTAKE LAYOUT AND INSTALLATION
N.T.S.

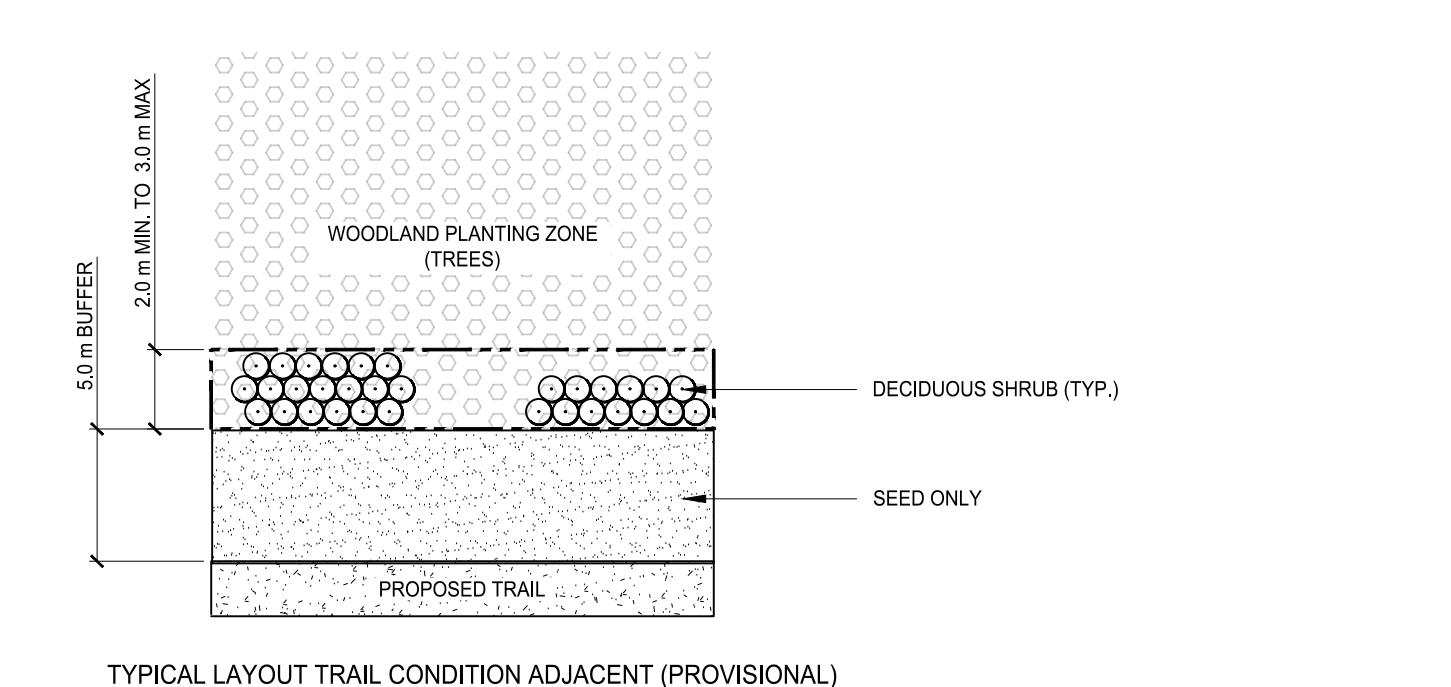
WOODLAND SHRUB PLANTING ZONE LAYOUT:

WOODLAND SHRUB PLANTING ZONE HAS BEEN DESIGNED TO CREATE A FOREST EDGE USING UPLAND SHRUB SPECIES. ALL SPECIES WILL BE NATIVE TO THE REGION AND SHALL BE SOURCED FROM LOCAL NURSERIES TO PROMOTE AND MAINTAIN THE LOCAL GENETIC STOCK.

- NO MORE THAN 35% OF ANY SINGLE GENUS AND 20% OF ANY SINGLE SPECIES SHALL BE THROUGHOUT THE ENTIRE WOODLAND SHRUB PLANTING ZONE.
- SHRUBS WILL BE PLANTED A MINIMUM OF 1.0 m APART UP TO A MAXIMUM OF 1.5 m ON CENTRE.
- SHRUBS ARE TO BE PLANTED IN GROUPINGS OF 5 TO 30 SHRUBS, WITH A MINIMUM OF 2 DIFFERENT SPECIES PER GROUPING. PLANTING TO MIMIC A NATURAL LAYOUT AND HAVE SOME GAPS BETWEEN SHRUBS WITH VARIED SPACING THROUGHOUT.
- WOODLAND SHRUBS TO BE PLANTED IN GROUPINGS OF 2 TO 3 ROWS WIDE.
- SHRUBS SHOULD BE PLANTED IN APPROPRIATE MOISTURE REGIMES TO PROMOTE AND SUSTAIN HEALTHY GROWTH.
- SEED MIX #2 - NATIVE UPLAND FORAGE AND MEADOW MIX (#8140) TO BE APPLIED THROUGHOUT THE WOODLAND SHRUB PLANTING ZONE.
- REFER TO DRAWINGS L-463 TO L-465 FOR PROPOSED EXTENTS OF WOODLAND PLANTING ZONES AND SPECIES REQUIREMENTS.



TYPICAL LAYOUT RIPARIAN ADJACENT



TYPICAL LAYOUT TRAIL CONDITION ADJACENT (PROVISIONAL)

TYPICAL WOODLAND SHRUB PLANTING ZONE LAYOUT
N.T.S.

Notes

- Highway of Heroes Planting locations are approximate and may change due to grading and other factors. Precise locations and composition will be determined at the detail design phase when additional information is available.

3. REVISED AS PER CLIENT COMMENTS (2023.04.25)	K8	LB	2022.04.26
2. REVISED AS PER CLIENT COMMENTS (2020.10.07)	JJ	DW	2020.11.09
ISSUED FOR LCR	JJ	DW	2020.07.23
1. REVISED AS PER DRAFT LCR COMMENTS ISSUED FOR DRAFT LCR	JJ	DW	2020.07.22
By Appd	Appd	YYYY.MM.DD	

Revision/Issue

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Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

File Name: 165001090.LD-OT	JJ	LB	2020.05.05
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File Name: 165001090.LD-OT	JJ	LB	2020.05.05
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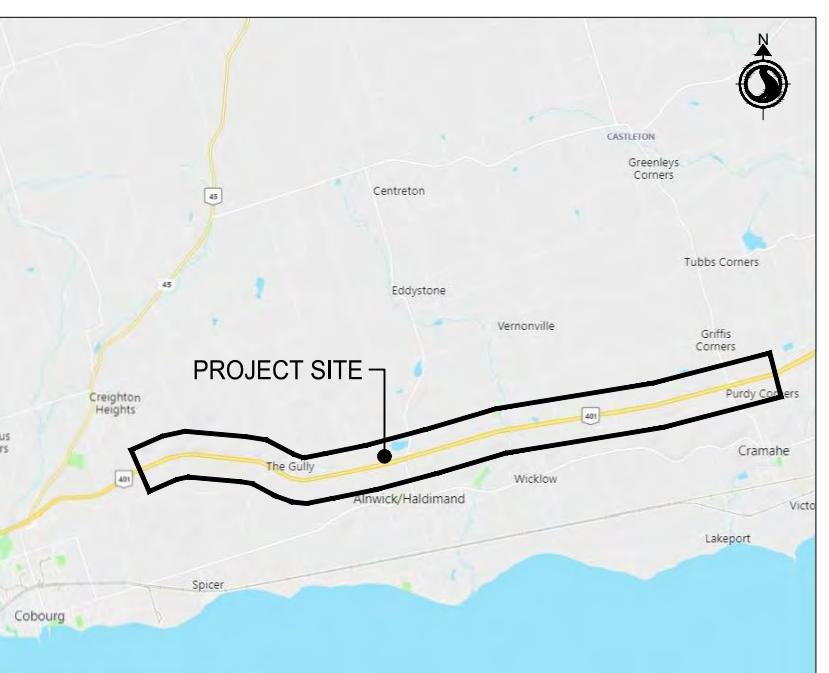
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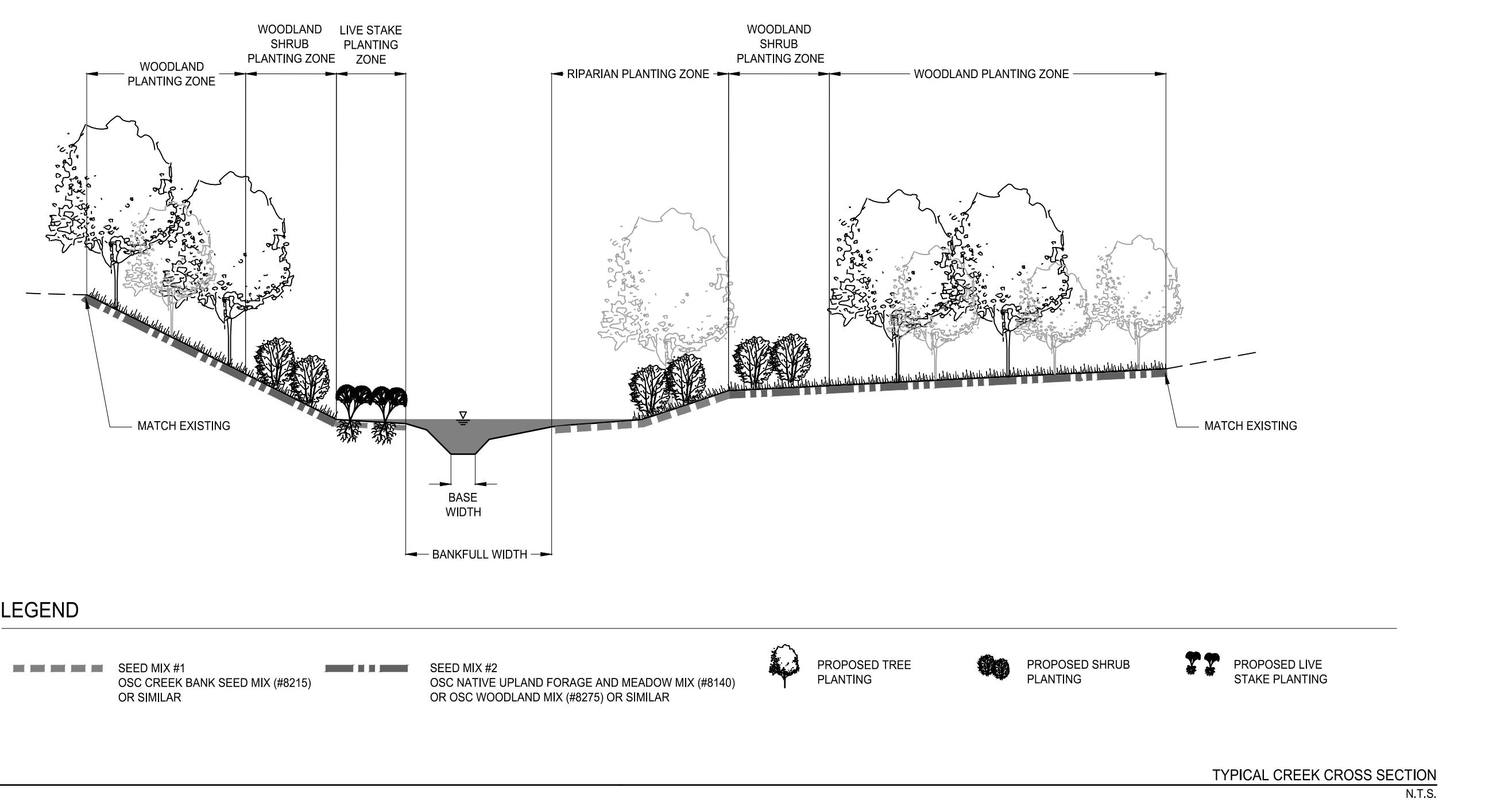
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File Name: 165001090.LD-OT	JJ	LB	2020.05.05

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Legend



LD
9

GENERAL NOTES

- Any ambiguity in the drawings, specifications or details are to be reported to the Landscape Architect for direction. These drawings shall not be used for construction unless stamped and signed by the Landscape Architect. The Contractor is not to proceed in uncertainty. The limits of work are to be clearly understood by the Contractor prior to any work taking place on the site.
- All dimensions are in meters unless otherwise noted. The drawings may be scaled for approximate layout. The Contractor is to verify all dimensions on the drawing(s) and report any discrepancies to the Landscape Architect.
- The Contractor is to locate and mark all infrastructure and utilities prior to any excavation work or planting on the site. Do not plant directly above underground utilities or infrastructure unless approved by the Landscape Architect. The Contractor is responsible for the coordination and maintenance of all utility/infrastructure located for the duration of the Contract.
- The Contractor shall supply all materials in quantities sufficient to complete work shown on these drawings. The Contractor is not to substitute materials, products or quantities without prior written consent of the Landscape Architect.
- The Contractor is to take all necessary precautions to protect all existing site features unless specified for removal/demolition. This includes all survey bars, stakes, monuments and sediment barriers. The Contractor is responsible for any damages incurred during construction and must make all necessary restorations and repairs to original or better condition.
- All existing trees, shrubs, and herbaceous plants beyond the limit of work are to be protected from construction damage. This includes but is not limited to not storing construction materials or fuel within the drip-line of an existing tree, not altering existing grades or compacting soil around protected vegetation and taking care not to disturb or expose the roots of any existing trees. The Contractor is responsible for all protection or hoarding measures of all existing trees and vegetation to be preserved within or adjacent to construction work limits.
- Contractor is responsible for the removal of all debris, garbage and surplus materials on site related to their contract or work and must keep the site in a clean, safe, useable condition at all times or as directed by the Contract Administrator.

SEEDING NOTES

- Seed areas per OPSS 804 unless otherwise specified in Contract or on Contract drawings.
- Single directional spreading of seed mix is not acceptable.
- All seeding of disturbed areas must occur immediately upon completion of the grading work, weather permitting. Seeding operations must be completed between spring thaw and June 15th or between August 15th and October 15th unless otherwise approved by Landscape Architect.
- Surface to be uniformly cultivated to a minimum depth of 100mm and shall not have surface stones greater than 25mm diameter.
- All topsoil compacted during construction activities is to be scarified or tilled to a minimum depth of 100mm to the satisfaction of the Landscape Architect prior to seed application. Surface shall not have stones greater than 25mm diameter present.
- Contractor shall be responsible for any damage to site during seed application or warranty works and shall restore damaged areas to original condition.
- Contractor shall ensure adequate soil moisture levels to ensure proper germination and will provide watering as required per weather and seasonal conditions. Throughout the warranty period, seeding shall be watered as required to establish weed-free, healthy establishment of groundcover.
- Contractor shall repair and reseed dead or bare spots prior to Final Acceptance. At Final Acceptance, seeded areas shall be uniform, free of ruts erosion and/or bare and dead spots, free of weeds, and have 90% cover minimum of germinated perennial seed for final acceptance.

NATURALIZED AREAS ONLY:

- All seeding works will be warranted for a period of two years following inspection and written notice of start of warranty period as determined and provided by the Landscape Architect. Seeded areas to have a minimum of 90% permanent seed catch at the end of the warranty period.
- Control invasive or noxious weeds throughout the warranty period. Do not apply herbicides or other chemical controls without the approval of the Contract Administrator. All chemical treatment to be completed by a Licensed Applicator in accordance with the Ontario Pesticide Act.

PLANTING NOTES

- The Contractor must notify the Landscape Architect prior to the commencement of any planting. The Contractor shall supply all plants and materials in quantities sufficient to complete the work shown on this drawing. Any discrepancies between quantities shall be reported to the Landscape Architect.
- All landscape works will be warranted for a period of two years following inspection and written notice of start of warranty period as determined and provided by the Landscape Architect. Plant material, which is not in a healthy, vigorous growing condition at the end of the warranty period, shall be replaced to the satisfaction of the Landscape Architect / Owner.
- The Landscape Architect reserves the right to extend Contractor's warranty responsibilities for an additional year if, at the end of initial warranty period, leaf development and growth is not sufficient to ensure future survival as determined by the Landscape Architect.
- The Contractor is to identify with Landscape Architect/Owner any maintenance requirements necessary for warranty purposes.
- Plant materials specified for this project will conform to the Canadian Nursery Landscape Association (C.N.L.A.) for size, variety and condition as indicated on the plant schedule shown on these drawings. Any plant materials which do not conform will be promptly removed from the site and replaced by the Contractor at no additional cost to the project.
- The Landscape Architect is to be contacted for inspection and written approval prior to plant material arriving on site. The Landscape Architect reserved the right to reject any plant materials that have not been inspected and approved.
- The Landscape Architect reserves the right to refuse acceptance of any plant displaying poor growth habits, injury or disease. Any plant material that is rejected by the Landscape Architect will be promptly removed from the site and replaced with material of acceptable quality at no additional charge to the project.
- Plant materials collected from wild sources will not be accepted without written approval of the Landscape Architect. The Landscape Architect reserves the right to require that supplier invoices be submitted for inspection and approval prior to acceptance.
- On-site layout of the plant materials to be approved by the Landscape Architect prior to installation. Minor field adjustments to plant material locations may be necessary to respond to the locations of existing plants and site conditions. The Contractor to review with Landscape Architect where relocations are necessary. The Contractor must receive approval from Landscape Architect prior to installation.
- Plants are not to be installed during extreme heat, drought, or other undesirable conditions. Thoroughly water all plants immediately after installation. The Contractor shall regularly monitor site conditions and water as required to ensure healthy growth conditions throughout the duration of the warranty period.
- Do not plant directly in centerline of drainage swales or depression areas. Where proposed planting locations conflict with constructed swales or low-lying wet areas, contact Landscape Architect for direction.
- All trees and shrubs are to be planted in accordance with the planting details shown on this drawing.
- Topsoil: Each source of topsoil, imported or native to be approved by Landscape Architect prior to use. Submit topsoil analysis/test results to Landscape Architect prior to order or delivery to site. Testing to be in accordance with Contract specifications.
- Mulch: to be spread uniformly around the base of trees and shrubs to a minimum depth of 100 mm. Do not place mulch in direct contact with trunk or stem(s). Allow a 100 mm mulch free zone at trunk/stems. Shrubs to be in continuously mulched planting beds unless otherwise specified.
- The Contractor is to remove dead or damaged branches on trees or shrubs. All pruning shall be performed in accordance with standard horticultural practices and appropriate timing for each species.
- All stakes and associated ties are to be removed after the first full growing season. Rodent guards are to be removed at the conclusion of the warranty period.

Notes

- Highway of Heroes Planting locations are approximate and may change due to grading and other factors. Precise locations and composition will be determined at the detail design phase when additional information is available.

3. REVISED AS PER CLIENT COMMENTS (2023.04.25)	KB	LB	2022.04.26
2. REVISED AS PER CLIENT COMMENTS (2020.10.07)	JJ	DW	2020.11.09
ISSUED FOR LCR	JJ	DW	2020.07.23
1. REVISED AS PER DRAFT LCR COMMENTS	JJ	DW	2020.07.22
ISSUED FOR DRAFT LCR	JJ	LB	2020.05.11

Revision/Issue By Appd YYYY.MM.DD

File Name: 165001090.L-0T JJ LB 2020.05.05

Dwn. Dsgn. Chkd. YYYY.MM.DD

Permit-Seal

Client/Project
MINISTRY OF TRANSPORTATION ONTARIO (MTO)

HIGHWAY 401
COBOURG TO COLBORNE

COBOURG-COLBORNE, ON

Title
PRELIMINARY
RESTORATION DETAILS AND NOTES

Project No. Scale
165001090 AS NOTED

Revision Sheet Drawing No.
3 8 of 8 L-501

APPENDIX C:

Native Vascular Plants List

NATIVE VASCULAR PLANT LIST

Plant species observed in Highway 401 Right-of-Way and adjacent natural features.

Scientific Name	Common Name	Establishment Means	Coefficient of Conservatism	OWES Wetland Plant Species	Provincial Status (S-rank)
PTERIDOPHYTES (FERNS & FERN ALLIES)					
<i>Equisetum arvense</i>	field horsetail	native	0	T	S5
<i>Equisetum hyemale</i> ssp. <i>affine</i>	common scouring-rush	native	2	T	S5
<i>Equisetum variegatum</i>	variegated scouring-rush	native	5	I	S5
<i>Matteuccia struthiopteris</i>	ostrich fern	native	5	T	S5
<i>Onoclea sensibilis</i>	sensitive fern	native	4	I	S5
<i>Pteridium aquilinum</i>	eastern bracken fern	native	2		S5
<i>Thelypteris palustris</i> var. <i>pubescens</i>	eastern marsh fern	native	5	I	S5
GYMNOSPERMS (CONIFERS)					
<i>Juniperus communis</i>	ground juniper	native	4		S5
<i>Juniperus virginiana</i>	eastern red cedar	native			S5
<i>Larix laricina</i>	tamarack	native	7	I	S5
<i>Picea glauca</i>	white spruce	native	6	T	S5
<i>Pinus resinosa</i>	red pine	native	8		S5
<i>Pinus strobus</i>	eastern white pine	native	4	T	S5
<i>Thuja occidentalis</i>	eastern white cedar	native	4	T	S5
<i>Tsuga canadensis</i>	eastern hemlock	native	7	T	S5
ANGIOSPERMS (DICOTS)					
<i>Acer ×freemanii</i>	Freeman maple	native	5	I	S5
<i>Acer negundo</i>	Manitoba maple	native	0	T	S5
<i>Acer saccharinum</i>	silver maple	native	5	I	S5
<i>Acer saccharum</i>	sugar maple	native	4		S5
<i>Agalinis tenuifolia</i>	slender agalinis	native	7		S4S5
<i>Alnus incana</i> ssp. <i>rugosa</i>	speckled alder	native	6	I	S5
<i>Ambrosia artemisiifolia</i>	common ragweed	native	0		S5
<i>Amphicarpaea bracteata</i>	American hog peanut	native	4	T	S5
<i>Anemone acutiloba</i>	sharp-lobed hepatica	native	6		S5
<i>Anemone cylindrica</i>	long-headed anemone	native	7		S4
<i>Anemone virginiana</i>	Virginia anemone	native	4		S5
<i>Apocynum androsaemifolium</i>	spreading dogbane	native	3		S5
<i>Apocynum cannabinum</i>	hemp dogbane	native			S5
<i>Asclepias syriaca</i>	common milkweed	native	0		S5
<i>Asclepias tuberosa</i>	butterfly milkweed	native	8		S4
<i>Betula papyrifera</i>	paper birch	native		T	S5
<i>Bidens cernua</i>	nodding beggarticks	native	2	I	S5
<i>Bidens frondosa</i>	devil's beggarticks	native	3	I	S5

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Plant species observed in Highway 401 Right-of-Way and adjacent natural features.

Scientific Name	Common Name	Establishment Means	Coefficient of Conservatism	OWES Wetland Plant Species	Provincial Status (S-rank)
<i>Carya cordiformis</i>	bitternut hickory	native	6		S5
<i>Cicuta maculata</i>	spotted water-hemlock	native	6	I	S5
<i>Circaea canadensis</i>	enchanter's nightshade	native	3		S5
<i>Cornus alternifolia</i>	alternate-leaved dogwood	native	6		S5
<i>Cornus racemosa</i>	grey dogwood	native	2	T	S5
<i>Cornus stolonifera</i>	red-osier dogwood	native	2	I	S5
<i>Crataegus</i> spp.	hawthorn species				
<i>Desmodium canadense</i>	Canada tick-trefoil	native	5		S4
<i>Echinocystis lobata</i>	wild cucumber	native	3	T	S5
<i>Erigeron canadensis</i>	Canada horseweed	native	0		S5
<i>Erigeron strigosus</i>	rough fleabane	native	0		S5
<i>Eupatorium perfoliatum</i>	common boneset	native	2	I	S5
<i>Euthamia graminifolia</i>	grass-leaved goldenrod	native	2		S5
<i>Eutrochium maculatum</i>	spotted Joe Pye weed	native	3	I	S5
<i>Fagus grandifolia</i>	American beech	native	6		S4
<i>Fragaria vesca</i>	woodland strawberry	native	4		S5
<i>Fraxinus americana</i>	white ash	native	4		S4
<i>Fraxinus pennsylvanica</i>	red ash	native	3	T	S4
<i>Hieracium</i> spp.	hawkweed species				
<i>Hydrophyllum virginianum</i>	Virginia waterleaf	native	6		S5
<i>Impatiens capensis</i>	spotted jewelweed	native	4	I	S5
<i>Laportea canadensis</i>	Canada wood nettle	native	6	T	S5
<i>Lycopus americanus</i>	American water-horehound	native	4	I	S5
<i>Lycopus uniflorus</i>	northern water-horehound	native	5	I	S5
<i>Mentha canadensis</i>	Canada mint	native	3	I	S5
<i>Monarda fistulosa</i>	wild bergamot	native	6		SU
<i>Oenothera</i> cf. <i>biennis</i>	common evening primrose	native	0		S5
<i>Ostrya virginiana</i>	ironwood	native	4		S5
<i>Parthenocissus</i> cf. <i>vitacea</i>	thicket creeper	native	3		S5
<i>Physalis heterophylla</i>	clammy ground-cherry	native	3		S4
<i>Podophyllum peltatum</i>	May-apple	native	5		S5
<i>Populus balsamifera</i>	balsam poplar	native	4	T	S5
<i>Populus deltoides</i> ssp. <i>deltoides</i>	eastern cottonwood	native	4	T	S5
<i>Populus grandidentata</i>	large-toothed aspen	native	5		S5
<i>Populus tremuloides</i>	trembling aspen	native		T	S5
<i>Prunus pensylvanica</i>	pin cherry	native	3		S5
<i>Prunus virginiana</i>	chokecherry	native	2		S5

NATIVE VASCULAR PLANT LIST

Plant species observed in Highway 401 Right-of-Way and adjacent natural features.

Scientific Name	Common Name	Establishment Means	Coefficient of Conservatism	OWES Wetland Plant Species	Provincial Status (S-rank)
<i>Quercus rubra</i>	northern red oak	native	6		S5
<i>Ratibida pinnata</i>	grey-headed coneflower	native	9		S3
<i>Rhus typhina</i>	staghorn sumac	native	1		S5
<i>Ribes cynosbati</i>	eastern prickly gooseberry	native	4		S5
<i>Rosa cf. blanda</i>	smooth rose	native	3		S5
<i>Rubus idaeus</i> ssp. <i>strigosus</i>	American red raspberry	native	0		S5
<i>Rubus occidentalis</i>	black raspberry	native	2		S5
<i>Rubus odoratus</i>	purple-flowering raspberry	native	3		S5
<i>Rudbeckia hirta</i>	black-eyed Susan	native	0		S5
<i>Salix amygdaloides</i>	peach-leaved willow	native	6	T	S5
<i>Salix bebbiana</i>	Bebb's willow	native	4	I	S5
<i>Salix discolor</i>	pussy willow	native	3	I	S5
<i>Salix eriocephala</i>	cottony willow	native	4	T	S5
<i>Salix interior</i>	sandbar willow	native	3	T	S5
<i>Salix petiolaris</i>	meadow willow	native	3	I	S5
<i>Sambucus canadensis</i>	common elderberry	native	5	T	S5
<i>Sanguinaria canadensis</i>	bloodroot	native	5		S5
<i>Silene antirrhina</i>	sleepy catchfly	native	3		S5
<i>Solidago canadensis</i>	Canada goldenrod	native	1		S5
<i>Solidago flexicaulis</i>	zigzag goldenrod	native	6		S5
<i>Solidago gigantea</i>	giant goldenrod	native	4	T	S5
<i>Solidago nemoralis</i>	grey-stemmed goldenrod	native	2		S5
<i>Spiraea alba</i>	white meadowsweet	native	3	I	S5
<i>Symphyotrichum ericoides</i>	white heath aster	native			S5
<i>Symphyotrichum lanceolatum</i>	white panicled aster	native	3	I	S5
<i>Symphyotrichum lateriflorum</i>	calico aster	native	3	T	S5
<i>Symphyotrichum novae-angliae</i>	New England aster	native	2		S5
<i>Symphyotrichum puniceum</i>	purple-stemmed aster	native	6	I	S5
<i>Symphyotrichum urophyllum</i>	arrow-leaved aster	native	6		S4
<i>Thalictrum dioicum</i>	early meadow-rue	native	5		S5
<i>Tilia americana</i>	basswood	native	4		S5
<i>Toxicodendron radicans</i>	western poison ivy	native	5	T	S5
<i>Ulmus americana</i>	white elm	native	3	T	S5
<i>Urtica dioica</i> ssp. <i>gracilis</i>	slender stinging nettle	native	2	T	S5
<i>Verbena hastata</i>	blue vervain	native	4	I	S5
<i>Verbena stricta</i>	hoary vervain	native	7		S4
<i>Viburnum lentago</i>	nannyberry	native	4	T	S5

NATIVE VASCULAR PLANT LIST

Plant species observed in Highway 401 Right-of-Way and adjacent natural features.

Scientific Name	Common Name	Establishment Means	Coefficient of Conservatism	OWES Wetland Plant Species	Provincial Status (S-rank)
<i>Vitis riparia</i>	riverbank grape	native	0		S5
ANGIOSPERMS (MONOCOTS)					
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	native	5	T	S5
<i>Carex albursina</i>	white bear sedge	native	7		S5
<i>Carex bebbii</i>	Bebb's sedge	native	3	I	S5
<i>Carex brevior</i>	short-beaked sedge	native	7		S4S5
<i>Carex cristatella</i>	crested sedge	native	3	I	S5
<i>Carex flava</i>	yellow sedge	native	5	I	S5
<i>Carex granularis</i>	limestone meadow sedge	native	3	T	S5
<i>Carex hitchcockiana</i>	Hitchcock's sedge	native	6		S5
<i>Carex hystericina</i>	porcupine sedge	native	5	I	S5
<i>Carex retrorsa</i>	retrorse sedge	native	5	I	S5
<i>Carex rosea</i>	rosy sedge	native	5		S5
<i>Carex spp.</i>					
<i>Carex vulpinoidea</i>	fox sedge	native	3	I	S5
<i>Echinochloa cf. muricata</i>	rough barnyard grass	native	4	I	S5
<i>Elymus hystrix</i>	bottlebrush grass	native	5		S5
<i>Eragrostis</i> sp.	lovegrass species				
<i>Glyceria striata</i>	ridged mannagrass	native	3	I	S5
<i>Hordeum jubatum</i>	foxtail barley	native			S5
<i>Juncus alpinoarticulatus</i>	alpine rush	native	5	I	S5
<i>Juncus articulatus</i>	jointed rush	native	5	I	S5
<i>Juncus bufonius</i>	toad rush	native	1	T	S5
<i>Juncus dudleyi</i>	Dudley's rush	native	1	T	S5
<i>Juncus torreyi</i>	Torrey's rush	native	3	T	S5
<i>Maianthemum canadense</i>	large false Solomon's seal	native	4		S5
<i>Maianthemum stellatum</i>	starry false Solomon's seal	native	6		S5
<i>Panicum capillare</i>	common panicgrass	native	0		S5
<i>Phalaris arundinacea</i>	reed canarygrass	native	0	T	S5
<i>Schoenoplectus tabernaemontani</i>	soft-stemmed bulrush	native	5	I	S5
<i>Scirpus atrovirens</i>	dark-green bulrush	native	3	T	S5
<i>Scirpus cyperinus</i>	common woolly bulrush	native	4	I	S5
<i>Scirpus pendulus</i>	hanging bulrush	native	3	I	S5
<i>Trillium grandiflorum</i>	white trillium	native	5		S5