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<b>TO:</b>	<b>CHAIR AND MEMBERS PLANNING AND ENVIRONMENT COMMITTEE</b>
<b>FROM:</b>	<b>GEORGE KOTSIFAS DIRECTOR OF BUILDING CONTROLS AND CHIEF BUILDING OFFICIAL</b>
<b>SUBJECT:</b>	<b>HIGHLAND RIDGE SANITARY TRUNK SEWER  PROPONENT: CITY OF LONDON LOCATION: 890 SOUTHDALE RD. WEST  PUBLIC PARTICIPATION MEETING ON MONDAY MAY 7, 2012 - NOT TO BE HEARD BEFORE 4:30 P.M.</b>

<b>RECOMMENDATION</b>
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That, on the recommendation of the Senior Planner, Development Services, the following actions **BE TAKEN** with respect to the Environmental Impact Study (EIS) for the Highland Ridge Sanitary Trunk Sewer (Dillon Consulting, July 2011) for the City of London:

- (a) the Environmental Impact Study **BE ENDORSED** as a basis to proceed with construction of the Highland Ridge Sanitary Trunk Sewer project, and the mitigation measures identified in Table 6 of the EIS Report be included in the contract for this project;
- (b) the recommendations for monitoring identified in Table 7 of the EIS report **BE IMPLEMENTED**, with oversight provided by a team comprised of representatives from the City of London, Upper Thames River Conservation Authority, Ministry of Natural Resources, Ministry of Environment and Dillon Consulting; and
- (c) the City Ecologist Planner **BE DIRECTED** to report back on the monitoring program within one year of substantial completion of this project, or no later than September 30, 2013.

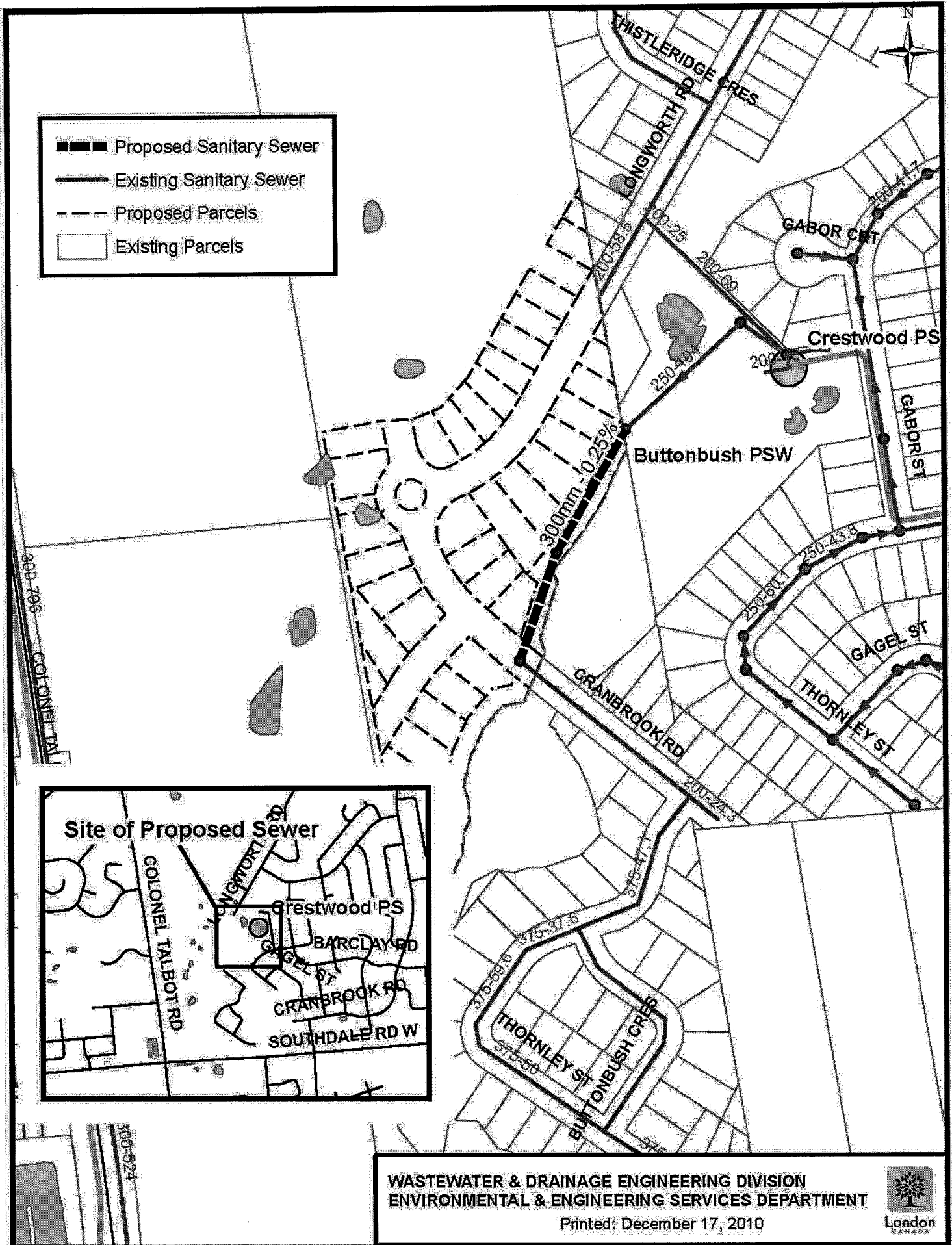
<b>PREVIOUS REPORTS PERTINENT TO THIS MATTER</b>
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**June 21, 2010** – Report to Planning Committee: "Growth Management Implementation Strategy (GMIS): 2011 Annual Review & Update"

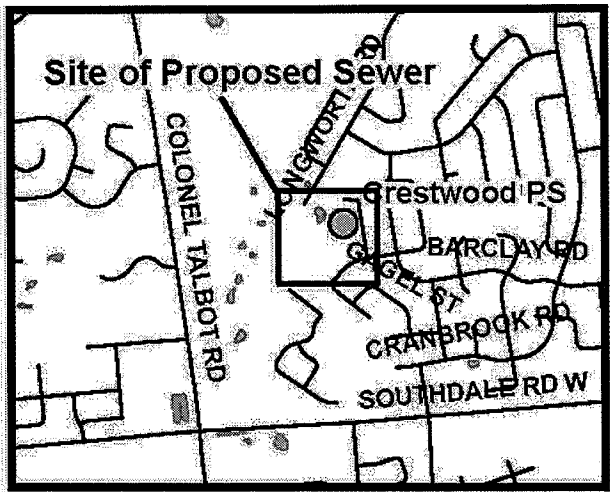
**January 17, 2011** – Report to Built & Natural Environment Committee: "Appointment of Consultant and DC By-law Budget Approval for Highland Ridge Trunk Sanitary Sewer Extension (ES2107)"

<b>RATIONALE</b>
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1. Decommissioning and removal of the Crestwood Pumping Station is consistent with long term infrastructure plans and will eliminate the potential for associated wet weather overflows into the adjacent Provincially Significant Wetland.
2. There is no reasonable alternative to locate the proposed sanitary trunk sewer in an alternate alignment due to excessive depth, and trenching constraints.
3. An Environmental Impact Study (EIS) has been prepared in accordance with the requirements in Section 15.5 of the Official Plan, and adequately addressed the mitigation of potential impacts on the Provincially Significant Wetland.



- Proposed Sanitary Sewer
- Existing Sanitary Sewer
- - - Proposed Parcels
- Existing Parcels



WASTEWATER & DRAINAGE ENGINEERING DIVISION  
 ENVIRONMENTAL & ENGINEERING SERVICES DEPARTMENT

Printed: December 17, 2010



**LOCATION MAP  
 HIGHLAND RIDGE SANITARY TRUNK SEWER**

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<b>BACKGROUND</b>
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The Highland Ridge Sanitary Trunk Sewer is a City-initiated project to construct the last link of sanitary sewer adjacent to the Highland Ridge (also known as Crestwood) subdivision. The proposed sewer alignment is within the open space buffer situated along the northern edge of the North Talbot Provincially Significant Wetland (PSW) complex, referred to as the "Buttonbush Wetland" south of Longworth Road.

The purpose of the sanitary trunk sewer is to facilitate future decommissioning of the City owned Crestwood Pumping Station, which is located immediately south of Gabor Court. The Crestwood Pumping Station was constructed as a temporary facility, and the plans to construct the sanitary trunk within the open space buffer were made prior to the Provincially Significant Wetland designation.

The alignment in the open space corridor is the only viable option to complete this sanitary trunk sewer link. It is not possible to align the sewer on Longworth Road since the sewer would be approximately 12 metres deep, requiring a significant cost, and the trench width required for installation would not allow for future sewer construction or replacement after the adjacent houses are constructed.

The alternative to constructing this sewer would be to operate the Crestwood Pumping Station as the ultimate servicing solution, which is not preferred from an ongoing operations perspective. Most importantly, the trunk sewer project will eliminate the potential for wet weather overflows from the pumping station into the adjacent wetland.

The adjacent Highland Ridge subdivision (39T-07503) was draft approved by the Ontario Municipal Board in 2009 and the owner is seeking an extension to the current lapse date of June 4, 2012. The subdivision is expected to proceed to final approval and registration this year and construction of the trunk sewer should be undertaken in conjunction with the servicing and siteworks for this subdivision.

Details of the proposed sanitary trunk sewer have previously been presented to committee and the project has been endorsed by the following resolution of Council, adopted at its session on January 24<sup>th</sup>, 2011:

*That, on the recommendation of the General Manager of Environmental and Engineering Services and City Engineer, the following actions BE TAKEN with respect to the appointment of consultants for the Highland Ridge Trunk Sanitary Sewer Extension (ES2107):*

- (a) *Dillon Consulting, 1155 North Service Road West, Unit 14, Oakville, Ontario, L6M 3E3 BE APPOINTED Consulting Engineers for the Environmental Impact Study for the Highland Ridge Trunk Sanitary Sewer in the amount of \$46,156 including contingency, excluding HST, in accordance with Section 15.2(c) and (g) of the Procurement of Goods and Services Policy;*
- (b) *Whitney Engineering, 562 Wellington Street, London, Ontario NA 3R5 BE APPOINTED Consulting Engineers for the Detailed Design of Highland Ridge Trunk Sanitary Sewer in the amount of \$8,200 including contingency, excluding HST, in accordance with Sections 15.2(c) and (g) of the Procurement of Goods and Services Policy;*
- (c) *a budget amount of \$185,000 BE APPROVED as a contingent item of the Capital Services Reserve Fund and Development Charges By-law;*
- (d) *the financing for the project BE APPROVED in accordance with the "Sources of Financing Report" attached hereto as Appendix "A";*

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- (e) *the consulting fees for the project identified in parts (a) and (b) above, BE IN ACCORDANCE with the estimates, on file, which are based upon the Fee Guideline for Professional Engineering Services, 2006, recommended by the Ontario Society of Professional Engineers; and*
- (f) *the approvals given herein BE CONDITIONAL upon the Corporation entering into a formal contract for the project. (2011-A03-00)*

The proposed sewer alignment is located within open space corridor on the Highland Ridge draft plan of subdivision, which is designated Open Space on Schedule "A" of the Official Plan and zoned Open Space (OS5). This portion of the corridor serves as a "buffer" to the adjacent Provincially Significant Wetland (PSW). The EIS was initiated pursuant to the policies in Section 15.5 of the Official Plan to address potential impacts associated with the sanitary trunk sewer alignment, which is within 120 metres of the PSW.

<b>EIS REPORT FINDINGS</b>
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A scoping meeting was conducted on October 20, 2010, prior to initiation of the EIS, to confirm the scope and work plan for the study. Representatives from City of London, Ministry of Environment (MOE), Upper Thames River Conservation Authority (UTRCA) and Ministry of Natural Resources (MNR) participated in the discussion. An issues summary checklist report was prepared, which confirmed existing environmental conditions and specific requirements for the study.

**Project Description:**

The EIS provided a description of the proposed trunk sewer project, noting that 9.5 metres of the existing 12.5 metre wide buffer vegetation immediately north of the wetland will be temporarily removed or severely disturbed during construction, leaving a 3 metre wide strip of existing vegetation along the wetland edge. The sewer will be aligned at generally positioned in the middle of the buffer corridor.

Construction of the sewer is anticipated to proceed at least 30 metres per day and take up to 10 working days to complete the construction and restoration plan. The 300mm diameter sewer will be extended from the existing manhole located south of the terminus of Longworth Road, to the existing sanitary sewer at the current northern terminus of Cranbrook Road (a manhole will be located approximately 75 metres east of Cranbrook Road). The overall length of the sewer is approximately 175 metres and the depth of excavation will be approximately 2-3 metres below the surface.

**Existing Conditions & Potential Impacts:**

The EIS report includes a detailed examination of existing environmental features and functions, as well as potential impacts associated with the proposed sewer project. Existing features and functions associated with the adjacent PSW are summarized in Table 5 of the EIS report (attached as "**Appendix 1**").

Vegetation in the study area corridor is comprised of a Gray Dogwood Deciduous Shrub Thicket Swamp. Approximately 0.175 ha. of the Gray Dogwood Deciduous Shrub Thicket and approximately 41 juvenile trees (average 6cm diameter at breast height) will be removed during construction.

The EIS states that potential impacts to the wetland hydrology are expected to be negligible due to the limited downward hydraulic gradients in the wetland and low permeability of surrounding soils. Appropriate mitigation measures have been recommended to be placed at strategic locations along the sewer, adjacent to the wetland, to further reduce the potential for lowering the groundwater table. Impacts to the surface vegetation and wildlife habitat within the buffer

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will be short term, and mitigated by the implementation of the rehabilitation plan, which will improve the function of the buffer. Other specific mitigation, restoration and monitoring recommendations have been identified in the report to determine the effectiveness of mitigation measures and the potential need to implement contingency measures.

The complete listing of potential impacts and recommended mitigation measures is outlined in Table 6 of the EIS report (attached as "**Appendix 2**").

**Review & Comment:**

An initial draft of the EIS report was completed in July 2011. This draft was circulated to agency representatives, including MNR, MOE, UTRCA, City of London and EEPAC for review and comment. Notice of the EIS report was also provided to adjacent property owners and copies of the report were made available for public review in the Westmount Branch Library as well as City Hall. No comments were received from the general public. Comments on the EIS report were provided by the MNR, MOE and UTRCA, and are summarized, as follows:

UTRCA

- On page 57, Table 7 under revegetation of buffer area it is indicated under contingency methods "*appropriate replacement of plants if a high degree of mortality occurs.*" We request clarification on this statement.
- We wish to remind the City of London that a Section 28 Permit will be required for the proposed works and recommend that Mark Snowsell, Land Use Regulations Officer be contacted regarding our submission and fee requirements for this project.

Ministry of the Environment

- It is very unlikely that groundwater plays a significant role in wetland hydrology at this site. The very low hydraulic conductivity means that the flux of groundwater into the wetland is also very limited. Site hydrology is dominated by surface water impacts.
- Even in the event that groundwater plays a more significant role in wetland hydrology, it is unlikely that installation of the sewer would cause a significant impact. Given the fine-grained soils, any impacts due to construction dewatering would be limited in extent. Once dewatering is finished, there is no reason to expect that water levels in the aquitard would not fully recover to pre-construction levels.
- Backfilling of the construction trench with granular material will create a localized high conductivity pathway for groundwater. If this pathway were to continue off-site, the trench could act as a drain, and thereby collect and convey groundwater away from the wetland. However, construction plans include the installation of low-permeability plugs along the route of the trench. Provided that these plugs are installed correctly, this will prevent the drainage effect. Over time, the static water level in the granular material should equilibrate to that which is present in the surrounding native tills. This is expected to prevent any significant change in the amount of water that may discharge to the wetland (expected to be low).
- In conclusion the ministry recommends that:
  - (i) the project team should ensure that low conductivity plugs are of suitable thickness, compaction and fill the entire depth of the excavation; and
  - (ii) as a means of confirm a lack of impact, it would be prudent to measure water levels in the on-site well/piezometer network immediately before, during and after the construction project. The report recommends daily measurements. This would be appropriate, provided that sever sets of measurements are obtained immediately prior to and after the on-site work.

Ministry of Natural Resources

- The installation of infrastructure in or directly adjacent to natural heritage features, in this case a buffer to provincially significant wetlands, is not MNR's preferred approach.
- At a December 22, 2010 meeting with MMAH and City of London staff, MNR requested copies of any studies conducted after the 2006 overflow into the PSW for the purpose of comparing impacts to the wetland from the overflow vs. the proposed infrastructure in the

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buffer, to determine which had the greater impact on the wetland. This concept was not covered in the EIS, nor were any studies provided to MNR.

- It has been noted that the proposed sanitary trunk sewer connection will not be used for approximately 20 years; however, the adjacent draft plan of subdivision lapses in July 2012 and reworking the layout of the subdivision is a fourth option that should be considered, but was not discussed in the EIS.
- MNR requests that vegetation surveys be conducted within the proposed work area and adjacent lands for American Chestnut, Eastern Flowering Dogwood and False Hop Sedge during appropriate field survey times. The EIS field survey days are not within the appropriate timing windows to easily identify these species.
- As of July 1, 2011, the Eastern Flowering Dogwood receives regulated habitat protection under the ESA, 2007. The habitat regulation protects a 20 metre radius around each individual stem as well as any naturally vegetated area that supports the growth of Eastern Flowering Dogwood. If habitat suitability was not addressed during the 2011 field visits, it is strongly recommended that it be conducted for the project location to determine the presence of absence of regulated habitat for Eastern Flowering Dogwood.
- The qualifications of the botanist who performed the vegetation surveys should be provided with the EIS document.
- It should be clarified in the EIS that MNR staff did not go to 890 Southdale Rd. West to do specific False Hop Sedge presence/absence surveys. The field work conducted on the site related to wetland setbacks and American Badger.
- MNR requests that a construction schedule, restoration plan schedule and post construction monitoring schedule is provided to MNR to review and comment; and that the plan include some adaptive management strategies such as a survival rate for trees, shrubs and grasses (70%) so that a re-plant can take place if survival rates are below the identified threshold.
- Should the proposed development move forward, MNR suggests because of the high sensitivity of the site, that consideration is given to forming a restoration task team for this specific site – City of London Ecologist, UTRCA Biologist/Forester, MNR Biologist/Ecologist, and consultant biologist, to ensure the proper implementation and post construction monitoring of the restoration is undertaken.

*(Note: subsequent to the receipt of the MNR comments in September 2011, a site visit was conducted on October 7<sup>th</sup>, 2011, attended by representatives from the City, MNR, MOE, UTRCA and Dillon Consulting. The conclusion of this walk was that there is no evidence of Species at Risk within the study area. Wetland mapping has also been confirmed in the field, and updated on the construction drawings in the EIS report)*

#### City of London (Parks Planning)

Comments were provided by the Parks Planning Ecologist Planner in response to the EIS document and associated agency comments.

- In response to MNR questions concerning the wetland boundary and confirmation that the sanitary sewer alignment is outside of the wetland, the PSW boundary from Schedule "B1" of the Official Plan, and the PSW boundary from the most recent mapping layer that had been provided to the City by the MNR have been compared. It can be confirmed that the MNR boundary and the City boundary are virtually coincidental in the vicinity of the proposed trunk alignment. We can therefore confirm that the City of London has used the correct wetland boundary. This boundary was used to establish the buffer for the Highland Ridge Subdivision EIS and is the same boundary used in the Highland Ridge Sanitary Sewer EIS.
- In the planning files and documentation for the Highland Ridge Subdivision EIS prepared by Dillon, the limit of the wetland was staked and surveyed in the field in 2006 by Dillon Consulting staff and the City Ecologist/Planner following OWES rules and protocols. The MNR was invited to participate in this delineation, but declined. The MNR ultimately used this wetland limit and adjusted their mapping to match the City's delineation after the last OP Review. When this wetland limit was staked in 2006, it was based on the higher water levels (approximately one metre) that resulted from an incorrect installation of the Cranbrook Road culvert. Immediate concerns were raised by Parks Planning regarding the potential impact of the water level increase on the existing buttonbush and treed wetland vegetation. The

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culvert was subsequently required to be re-adjusted to restore the wetland to typical water levels. This was successfully achieved. It can therefore be safely assumed that the limit of the wetland boundary as mapped and from which the 12.5 m buffer was measured is a conservative limit.

- The restoration drawings in the EIS identify the limit of the wetland (labelled as regulatory limit – it is presumed that this limit is the same limit as the MNR wetland boundary) and these drawings demonstrate that despite the “pinch point” at the eastern edge, there is still sufficient room to install the sewer and protect the wetland from direct impact.
- The comments received from the MNR noted it is MNR’s preference that the sewer infrastructure not be located within the wetland or on the adjacent lands to the wetland. However, the PPS permits the development of infrastructure within or adjacent to a PSW. In accordance with the City of London OP policy 15.3.3 that requires completion of an EIS for any preferred infrastructure alternative located within or adjacent to a natural heritage feature, the Highland Ridge Sanitary Sewer EIS has clearly demonstrated that the location of the proposed infrastructure will not result in any loss of wetland area or direct impacts to the wetland. The EIS has also clearly demonstrated that the location of the infrastructure within the adjacent lands to the PSW will not result in any negative impacts to the wetland hydrology, or to the ecological features and functions identified on the adjacent lands.
- The restoration plan to be implemented post-construction will permit the adjacent lands to function as buffer to the wetland and protect it from development impacts, as per the approved EIS for the Highland Ridge Subdivision.
- In conclusion, the EIS is complete and has addressed MNR’s outstanding concerns. There is no reason to revisit the wetland boundary as previously surveyed. It is recommended that the consultant confirm the “regulatory limit” of the wetland, as shown on the restoration drawings, is the MNR/City limit.

<b>RECOMMENDED ACTIONS</b>
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In response to the MNR’s 2011 comments on the EIS, the City attended a site visit, with representatives from the MNR (Species at Risk staff), as well as representatives from the MOE, UTRCA, Dillon Consulting, and the City Wastewater & Drainage Engineering and Parks Planning Divisions. This visit confirmed that there was no evidence of Species at Risk within the study area.

Also, in response to the comments from MNR, the wetland mapping shown on the construction drawings in the EIS has been updated to accurately reflect the delineation of the latest wetland boundary, as identified by Land Information Ontario. Based on this updated mapping, it can be confirmed that the sanitary trunk sewer will be constructed outside the boundary of the PSW.

The potential impacts and recommended mitigation measures, identified in Table 6 of the EIS and appended to this report, provides comprehensive summary of the measures that are required to protect the natural features and ecological functions associated with the adjacent wetland. The effectiveness of the recommended mitigation measures will be identified and documented through a monitoring program, which is identified in Table 7 of the EIS and attached as “**Appendix 3**” to this report. This will allow for the implementation of contingencies, if it is determined that the mitigation measures are not having the desired effect.



As has been proposed by the MNR, this report recommends that monitoring oversight be undertaken by a team comprised of qualified representatives from the City of London, Upper Thames River Conservation Authority, Ministry of Natural Resources, Ministry of Environment and Dillon Consulting and the City of London. Having been involved in the EIS process, as well as previous studies in the area, these agencies will collectively ensure that the monitoring program is implemented with proper oversight, having regard for the protection of the Provincially Significant Wetland. The City of London Project Manager for this project should chair the monitoring committee.

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**CONCLUSION**

An Environmental Impact Study has been prepared in accordance with the provisions in Section 15.5 of the Official Plan and endorsed by the City's Ecologist Planner, to address potential impacts associated with a sanitary trunk sewer that is proposed by the City of London adjacent to a Provincially Significant Wetland. This project will allow for decommissioning of the Crestwood Pumping Station, which was constructed as a temporary facility, and is subject to periodic wet weather overflows into the PSW. The EIS identifies potential impacts and recommends mitigation measures that will protect the environmental features and ecological functions associated with the wetland. A monitoring program, which is included in the recommendations for this project, will determine the effectiveness of mitigation measures and, if necessary, identify the need for contingency measures.

<b>RECOMMENDED BY:</b>	<b>REVIEWED BY:</b>
	
<b>TERRY GRAWEY SENIOR PLANNER – DEVELOPMENT SERVICES</b>	<b>D. N. STANLAKE DIRECTOR – DEVELOPMENT PLANNING</b>
<b>SUBMITTED BY:</b>	
	
<b>GEORGE KOTSIFAS DIRECTOR OF BUILDING CONTROLS AND CHIEF BUILDING OFFICIAL</b>	

April 26, 2012  
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**"Appendix 1"**

<b>SUMMARY OF NATURAL FEATURES</b>
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**Table 5: Natural Features Identified Within the Area of the Proposed Sanitary Trunk Sewer**

Natural Feature or Wildlife Habitat	Attributes	Composition, Including Indicator Species	Function	Features/Attributes Necessary for Persistence or Sensitive to Development	Relevance to Project
Buttonbush Mineral Thicket Swamp (Wetland)  Unit S3 of the North Talbot PSW	This swamp community is approximately 1.72 ha in size and is approximately 100 m from the nearest wetland unit in the complex	Buttonbush, Mild Water Pepper, Blue Flag Iris, Black Willow, Sedge species, Glossy Buckthorn, Red Osier Dogwood, Silver Maple, False Nettle, Gray Dogwood, Riverbank Grape and Common Buckthorn.	May include potential waterfowl nesting habitat and fish habitat (MNR 2007). Candidate wildlife habitat observed during field studies includes Bullfrog Concentration Area and Amphibian Breeding Areas.	Groundwater levels and overland surface flow need to be maintained to ensure persistence of the wetland community.	<i>Relevant</i> - Evaluated to be part of a PSW Complex by the MNR due to the occurrence of a rare species in an upland unit of the complex. This vegetation community is also considered rare in the province (SRANK 3).
Gray Dogwood Cultural Thicket(Buffer area)	This buffer area is 12.5 m in width and extends along the northwestern boundary of the Buttonbush Mineral Deciduous Thicket Swamp.	Grasses, Riverbank Grape, Gray Dogwood, Heal All, Goldenrod, Queen Anne Lace, Oxeye Daisy, Daisy Fleabane, Chrysocarpa hawthorn, Indian Hemp, Wild Bergamot, Wild Strawberry and Rough Fruited Cinquefoil, Crack Willow, Green Ash.	This area functions as a buffer between the future development of Crestwood Subdivision (Phase II) and the PSW unit identified as a Buttonbush Mineral Deciduous Thicket Swamp	No features/species of a particular size or significance were identified	<i>Relevant</i> - Not a rare vegetation community however, it is important as a buffer to the adjacent PSW complex unit
Willow Mineral Deciduous Swamp and Forb Mineral Meadow Marsh (Wetland)	These swamp/marsh communities are approximately 0.68 ha in size and are approximately 100 m from the nearest wetland unit in the complex	Jewelweed, False Nettle, Grasses, Blue Flag Lily, Monkey Flower, Gray Dogwood, Sedge spp., Crack Willow.	May include potential waterfowl nesting habitat and fish habitat (MNR 2007). Candidate wildlife habitat observed during field studies may include Amphibian Breeding Areas.	Groundwater levels and overland surface flow need to be maintained to ensure persistence of the wetland community.	<i>Not relevant</i> - This community is downstream of the Study Area.
Winter Cover for Wildlife	The MNR has assessed the North Talbot PSW as locally significant based on tree and shrub cover. No suitable ELC communities for this habitat occur in the Study Area	Available winter cover for wildlife is not available in the Study Area. Tree cover is less than 25%	Vegetative cover during winter months against deep snow	Features such as canopy closure which is greater than 60% would be required to persist to maintain this wildlife habitat.	<i>Not relevant</i>
Turtle Nesting Areas	Sandy and/or gravelly substrates with a southern orientation is preferred for nesting sites.	Midland Painted Turtle have historical occurrence records in the Study Area.	Turtle nesting habitat	None present	<i>Not relevant</i> to the project - The soils within the buffer are composed of clay, which do not provide the substrate necessary for nesting habitat. There is an opportunity for enhancement of this feature.
Turtle Over-wintering Areas	Permanent water bodies or large wetlands with adequate dissolved oxygen have potential to be utilized as over-wintering areas.	Midland Painted Turtles have historically been observed in the general Study Area The wetland area does contain over-wintering habitat in the permanently inundated wetland areas, if dissolved oxygen is sufficient	Turtle over-wintering habitat	Persistence of permanent water areas in the wetland feature will likely continue to support any turtle overwintering that occurs in the Buttonbush Mineral Deciduous Thicket Swamp.	<i>Relevant</i> - Although recent field work has not observed any turtle species this feature and continued function is important and should be retained

Natural Feature or Wildlife Habitat	Attributes	Composition, including Indicator Species	Function	Features/Attributes Necessary for Persistence or Sensitive to Development	Relevance to Project
Waterfowl Nesting Areas	Waterfowl nesting areas are associated with wetland and woodlands located in upland areas. The buffer areas east and west of Cranbrook Road, as well as drier part of the marsh communities could provide nesting habitat.	Mallards have been observed nesting and with young. Low waterfowl species diversity and low numbers of individuals were observed during breeding season surveys.	Waterfowl Nesting Area	Persistence of the wetland features available will likely continue to support any waterfowl nesting occurring in the area.	<i>Not relevant</i>
<u>Waterfowl Stopover and Staging Areas (Terrestrial)</u>	Any large open fields with sheet water from spring melt and run-off may provide suitable stopover habitat for waterfowl	No indicator species were identified during field studies. The only observed waterfowl were Mallard.	Migratory stopover	None present.	<i>Not relevant</i>
<u>Waterfowl Stopover and Staging Areas (Aquatic)</u>	The marsh communities in the general Study Area may have some potential to be used during migration as aquatic waterfowl stopover and staging areas.	No indicator species were identified during field studies. The only observed waterfowl were Mallard.	Migratory stopover	Persistence of the wetland features available will likely continue to support any waterfowl stopover or staging area that may occur within the Buttonbush Mineral Deciduous Thicket Swamp.	<i>Not relevant</i>
<u>Bullfrog Concentration Areas</u>	Associated with permanent water near the shorelines of lakes and slow-moving rivers with extensive areas of emergent shoreline vegetation	Bullfrogs were recorded calling in the Buttonbush Mineral Deciduous Thicket Swamp	Concentration area	Persistence of the wetland features and buffer areas will likely continue to support any Bullfrog concentration areas occurring in the Buttonbush Mineral Deciduous Thicket Swamp.	<i>Relevant</i>
<u>Amphibian Breeding Habitat</u>	Swamp and marsh wetland communities present that may provide suitable habitat	American Toad, Green Frog, and Northern Leopard Frog	Breeding habitat	Persistence of the wetland features available will likely continue to support any amphibian breeding from occurring in the Buttonbush Mineral Deciduous Thicket Swamp.	<i>Relevant</i>
<u>Amphibian Movement Corridor</u>	The tributary to Dingman Creek provides habitat and cover between identified breeding areas and other habitat features	American Toad, Green Frog, and Northern Leopard Frog	Movement corridor	A continuous corridor along the tributary to Dingman Creek is necessary to facilitate the movement of amphibian species between habitats.	<i>Relevant</i>

SUMMARY OF POTENTIAL IMPACTS AND MITIGATION MEASURES

"Appendix 2"

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**Table 6: Potential Impacts/Effects and Mitigation Measures for the Proposed Installation of the Highland Ridge Sanitary Trunk Sewer**

Feature	Potential Negative/Positive Impacts and Effects		Magnitude of Impact/Effect	Frequency of Impact/Effect	Duration of Impact/Effect	Mitigation Measures	Residual Effects
	Physical/ Direct Impacts	Functional/ Indirect Effects					
Gray Dogwood Cultural Thicket(Buffer area)	<p><u>During Construction</u></p> <ul style="list-style-type: none"> <li>Removal of vegetation to facilitate construction</li> </ul>	<p><u>During Construction</u></p> <ul style="list-style-type: none"> <li>Temporary removal of forage and cover habitat for wildlife utilizing vegetation in the buffer</li> <li>Decreased photosynthesis and loss of productivity from loss of vegetation species</li> <li>Increased run-off and sedimentation of exposed soil to surrounding lands</li> <li>Reduction in the filtration of surface run-off to the wetland</li> <li>Decreased shade, cover and diversity of vegetation immediately adjacent to the wetland</li> <li>Potential contravention of the <i>Migratory Bird Convention Act, 1994</i> if vegetation clearing takes place during the core bird breeding season</li> </ul>	<p><u>During Construction</u></p> <p>Area of vegetation removal is approximately 175 m x 9.5 m (0.166 hectare)</p> <p>Removal of 41 juvenile trees (average dbh of 6 cm)</p>	<p><u>During Construction</u></p> <p>Vegetation removal is limited to the construction phase.</p>	<p><u>During Construction</u></p> <p>Short-term during construction</p>	<p><u>During Construction</u></p> <ul style="list-style-type: none"> <li>Erosion and Sediment Control (ESC) measures implemented to minimize soil mobilization</li> <li>ESC structure should be monitored daily during construction to ensure that it is fully functional and any issues identified are resolved in the same day</li> <li>Locate all dewatering activities, if any, to vegetated areas away from the active construction area should pass through a filter bag to remove sediment</li> <li>Avoid localized site grading that promotes pooling of water or significantly alters patterns of surface water flow</li> <li>Vegetation clearing to take place before May 1 or after August 15 to avoid contravention of the Migratory Bird Convention Act, 1994. If vegetation removal is required during May 1 to August 15, a qualified biologist will be required to search vegetation for nest, prior to any clearing taking place. The specific nest searching program to be followed, if required, will be determined in cooperation with Environment Canada</li> </ul>	No net residual effect
	<p><u>Post-Construction</u></p> <ul style="list-style-type: none"> <li>Access road maintenance and use</li> <li>Barriers to decrease pedestrian access</li> <li>Restoration of vegetation to a native community</li> </ul>	<p><u>Post-Construction</u></p> <ul style="list-style-type: none"> <li>Infrequent maintenance of a grassed access road with a gravel sub-base (i.e., mowing, etc.)</li> <li>Decrease in pedestrian impacts</li> <li>Enhancement of wildlife diversity through construction of habitat types</li> </ul>	<p><u>Post-Construction</u></p> <p>Access road will be 25 m long and 4 m wide; turnaround will be 12 m x 6 m. Total access area is 172 m<sup>2</sup></p> <p>Vegetation restoration to occur in an area equal to what was removed (with exception to access area)</p>	<p><u>Post-Construction</u></p> <p>Access Road will only be infrequently used for servicing of the trunk sewer (bi-annually)</p>	<p><u>Post-Construction</u></p> <p>Infrequent; as required for servicing needs</p>	<p><u>Post-Construction</u></p> <ul style="list-style-type: none"> <li>Restoration of vegetation using native species and create additional wildlife habitat (i.e. turtle nesting and snake hibernacula). Buffer should be monitored monthly to ensure ESC measures remain functional until vegetation is re-established</li> <li>ESC measures should be monitored monthly post-construction and removed one-year post-construction once vegetation has stabilized</li> <li>Construction of habitat structure to improve wildlife habitat function of the buffer for wildlife species with potential to occur such as turtles and snakes</li> <li>Monitoring of buffer vegetation and constructed habitat structures monthly during the growing season for two years to ensure establishment of species planted and longevity of constructed habitat</li> </ul>	Potential for a positive residual effect

Feature	Potential Negative/Positive Impacts and Effects		Magnitude of Impact/Effect	Frequency of Impact/Effect	Duration of Impact/Effect	Mitigation Measures	Residual Effects
	Physical/ Direct Impacts	Functional/ Indirect Effects					
Groundwater	<u>During Construction</u> <ul style="list-style-type: none"> <li>Reduction in the watertable levels through construction dewatering</li> <li>Changes to surrounding soil permeability</li> <li>Contamination of groundwater source</li> </ul>	<u>During Construction</u> <ul style="list-style-type: none"> <li>Disruption in groundwater inputs to the adjacent wetland</li> <li>Decline in the quality of groundwater entering into the wetland</li> <li>Impacts to the vegetation in the wetland dependent on water levels. Buttonbush species may fail to thrive.</li> </ul>	<u>During Construction</u> Limited based on attributes of soils, timing of construction and materials used in the construction of the sanitary trunk sewer	<u>During Construction</u> Limited based on short construction schedule (10 days) and seasonal conditions of watertable elevation.	<u>During Construction</u> Short-term (10 days)	<ul style="list-style-type: none"> <li>Where feasible, construction should occur between the end of June and mid-October, when the watertable elevation is expected to be at a seasonal low</li> <li>If removal of water is required, discharge water should pass through a filter bag to remove sediment</li> <li>Store equipment used in the construction and installation of the sanitary trunk sewer as far from the construction area as possible to minimize interaction with groundwater</li> <li>Inspect machinery and materials prior to use for leaks, debris and other deleterious substances that may impair groundwater quality</li> <li>Water levels in the wetland and in the adjacent monitoring wells should be recorded daily during construction</li> </ul>	No net residual effect
	<u>Post-Construction</u> <ul style="list-style-type: none"> <li>Reduction of water contribution to wetland as a result of adding granular material within sewer trench</li> <li>Sewer leakage resulting in contamination of local aquifers</li> </ul>	<u>Post-Construction</u> <ul style="list-style-type: none"> <li><u>Decline in water levels in wetland</u></li> <li>Decline in the quality of groundwater entering into the wetland</li> <li>Impacts to restored vegetation community from reduced water levels</li> </ul>	<u>Post-Construction</u> Limited based on the attributes of soil in the area adjacent to the sewer trench and as a result of the materials used in construction,	<u>Post-Construction</u> Limited potential during seasonal high water levels	<u>Post-Construction</u> Limited potential during the operation of sewer	<ul style="list-style-type: none"> <li>Use of low permeable plugs placed at various areas of the sewer, including the upstream, midstream and downstream manhole locations. Low permeability plugs should extend above the seasonal high water level</li> <li>Sanitary trunk sewer to be composed of watertight PVC pipe</li> <li>Water levels in the wetland and in the adjacent monitoring wells should be recorded monthly for one year post-construction</li> </ul>	No net residual effect

Feature	Potential Negative/Positive Impacts and Effects		Magnitude of Impact/Effect	Frequency of Impact/Effect	Duration of Impact/Effect	Mitigation Measures	Residual Effects
	Physical/ Direct Impacts	Functional/ Indirect Effects					
Buttonbush Mineral Thicket Swamp (Wetland)	<p><u>During Construction</u></p> <ul style="list-style-type: none"> <li>Reduction of water contribution to wetland as a result of adding granular material within sewer trench</li> </ul>	<p><u>During Construction</u></p> <ul style="list-style-type: none"> <li>Removal of Gray Dogwood Cultural Thicket will result in removal of the majority of the wetland buffer and may lead to increased erosion, sedimentation and turbidity of water and smothering of wetland/aquatic vegetation</li> <li>Soil compaction effecting roots of larger plants/trees along the 3m edge of wetland boundary to be retained</li> <li>Changes in contours in the buffer area with associated increase/decreased surface runoff</li> <li>Increased inputs of nutrients and contaminants to wetland vegetation</li> <li>Loss/avoidance of wildlife habitat due to removal of adjacent buffer vegetation and from construction disturbances,</li> <li>Loss of food/foraging source(s),</li> <li>Changes in wildlife species composition and abundance;</li> <li>Potential change in hydrology of wetland units if groundwater is impacted</li> </ul>	<p><u>During Construction</u></p> <p>Limited to wetland edge adjacent to the construction area for the sanitary trunk sewer</p>	<p><u>During Construction</u></p> <p>Once during construction</p>	<p><u>During Construction</u></p> <p>During construction until vegetation is re-established in buffer (one growing season)</p>	<ul style="list-style-type: none"> <li>Erosion and Sediment Control (ESC) measures, including use of filter bag during dewatering of any excavation areas</li> <li>ESC structure should be monitored daily to ensure that it is fully functional and any issues identified are resolved in the same day</li> <li>All dewatering passed through a filter bag will be redirected away from the wetland area and upstream stormwater management ponds and allowed to naturally infiltrate into remaining vegetated areas</li> <li>Water levels in the wetland and in the adjacent monitoring wells should be recorded daily during construction</li> <li>Where necessary, soils de-compaction should occur in areas adjacent to retained vegetation</li> <li>Localized site grading immediately after construction can be rough but no areas of pooling water or significantly alters patterns of surface water flow should be created</li> </ul>	Minimal net residual effect as a result of wildlife disturbance during the 10 day construction window
	<p><u>Post-Construction</u></p> <ul style="list-style-type: none"> <li>Reduction of water contribution to wetland as a result of adding granular material within sewer trench</li> </ul>	<p><u>Post-Construction</u></p> <ul style="list-style-type: none"> <li>Possible continued erosion, sedimentation and turbidity of water and smothering of wetland/aquatic vegetation</li> <li>Potential change in hydrology of wetland units if groundwater is impacted</li> <li>Wetland buffer will consist of a diversity of wildlife habitat</li> <li>Enhancement of buffer area through native plantings and wildlife habitat creation may increase species diversity</li> </ul>	<p><u>Post-Construction</u></p> <p>Edge vegetation along northern boundary of wetland and water levels in the entire wetland</p>	<p><u>Post-Construction</u></p> <p>Permanent – enhancement of buffer</p> <p>Once post-construction - sedimentation</p> <p>Limited potential during seasonal high water levels - Hydrology</p>	<p><u>Post-Construction</u></p> <p>Enhancement of buffer – long-term</p> <p>Sedimentation - 1 growing season post-construction</p> <p>Hydrology - Limited potential during the operation of sewer</p>	<ul style="list-style-type: none"> <li>Wetland edge should be monitored to identify areas of potential soil mobilization/loading until vegetation is re-established</li> <li>ESC measures should be monitored monthly and removed one-year post-construction once vegetation has stabilized</li> <li>Use of low permeable plugs placed at various areas of the sewer, including the upstream, midstream and downstream manhole locations. Low permeability plugs should extend above the seasonal high water level</li> <li>Water levels in the wetland and in the adjacent monitoring wells should be recorded monthly for one year post-construction to ensure low permeable plugs are functioning as intended</li> <li>Sanitary trunk sewer to be composed of watertight PVC pipe</li> </ul>	No net residual effect

Feature	Potential Negative/Positive Impacts and Effects		Magnitude of Impact/Effect	Frequency of Impact/Effect	Duration of Impact/Effect	Mitigation Measures	Residual Effects
	Physical/ Direct Impacts	Functional/ Indirect Effects					
Turtle Overwintering Area	<u>During Construction</u> <ul style="list-style-type: none"> <li>No direct impacts</li> </ul>	<u>During Construction</u> <ul style="list-style-type: none"> <li>Increased inputs of nutrients and contaminants to wetland vegetation</li> <li>Increased nutrient input or changes in shading may alter dissolved oxygen levels</li> <li>Potential change in hydrology of wetland units if groundwater is impacted</li> </ul>	Expected to be none. If negative effects occur they may range from localized to widespread through the wetland community	Once during construction	During construction until vegetation is re-established in buffer (one growing season)	<ul style="list-style-type: none"> <li>All dewatering will be redirected away from the wetland area and upstream stormwater management ponds and allowed to naturally infiltrate into remaining vegetated areas</li> <li>Water levels in the wetland and in the adjacent monitoring wells should be recorded daily during construction</li> <li>ESC structure should be monitored daily to ensure that it is fully functional and any issues identified are resolved in the same day</li> </ul>	No net residual effect
	<u>Post-Construction</u> <ul style="list-style-type: none"> <li>No direct impacts</li> </ul>	<u>Post-Construction</u> <ul style="list-style-type: none"> <li>Decline in the quantity/quality of groundwater entering the wetland</li> <li>Decline/alteration of dissolved oxygen levels</li> </ul>	Expected to be none. If negative effects occur they may range from localized to widespread through the wetland community	Not anticipated to occur	Short-term, if at all	<ul style="list-style-type: none"> <li>Water levels in the wetland and in the adjacent monitoring wells should be recorded monthly for one year post-construction to ensure low permeable plugs are functioning as intended</li> <li>Aquatic vegetation visually monitored monthly during growing season to determine if increased aquatic plant growth is occurring as a potential result of increased nutrients/ changes in shade conditions in the wetland</li> <li>ESC measures should be monitored monthly and removed one-year post-construction once vegetation has stabilized</li> <li>Use of low permeable plugs placed at various areas of the sewer, including the upstream, midstream and downstream manhole locations. Low permeability plugs should extend above the seasonal high water level</li> <li>Sanitary trunk sewer is composed of watertight PVC pipe</li> </ul>	No net residual effect
Bullfrog Concentration Areas & Amphibian Breeding Habitat	<u>During Construction</u> <ul style="list-style-type: none"> <li>No direct impacts</li> </ul>	<u>During Construction</u> <ul style="list-style-type: none"> <li>Potential for change in water levels and quality of permanent wetland area due to construction dewatering</li> <li>Potential for depreciation of habitat quality</li> <li>Increased surface runoff</li> <li>Increased inputs of nutrients and contaminants to wetland vegetation when wetland buffer is removed</li> <li>Loss of species or avoidance of habitat by species due to construction disturbance</li> </ul>	Limited to incidental	Once during construction	10 days during construction	<ul style="list-style-type: none"> <li>All dewatering will be redirected away from the wetland area and upstream stormwater management ponds and allowed to naturally infiltrate into remaining vegetated areas</li> <li>Water levels in the wetland and in the adjacent monitoring wells should be recorded daily during construction</li> <li>ESC structure should be monitored daily to ensure that it is fully functional and any issues identified are resolved in the same day</li> <li>If feasible, undertake construction outside of the breeding season for Bullfrogs and other amphibians to avoid disruption (breeding season extends from April 15 – June 30)</li> </ul>	No net residual effect
	<u>Post-Construction</u> <ul style="list-style-type: none"> <li>No direct impacts</li> </ul>	<u>Post-Construction</u> <ul style="list-style-type: none"> <li>Decline in the quantity/quality of groundwater entering the wetland</li> </ul>	Expected to be none. If negative effects occur they may range from localized to widespread through the	Not anticipated to occur	Short-term, if at all	<ul style="list-style-type: none"> <li>Water levels in the wetland and in the adjacent monitoring wells should be recorded monthly for one year post-construction to ensure low permeable plugs are functioning as intended</li> <li>Use of low permeable plugs placed at various areas of the sewer, including the upstream, midstream and downstream manhole locations. Low permeability plugs should extend above the seasonal high water level</li> <li>Sanitary trunk sewer to be composed of watertight PVC pipe</li> </ul>	No net residual effect



Feature	Potential Negative/Positive Impacts and Effects		Magnitude of Impact/Effect	Frequency of Impact/Effect	Duration of Impact/Effect	Mitigation Measures	Residual Effects
	Physical/ Direct Impacts	Functional/ Indirect Effects					
			wetland community			<ul style="list-style-type: none"> <li>ESC measures should be monitored monthly and removed one-year post-construction once vegetation has stabilized</li> </ul>	
<u>Amphibian Movement Corridor</u>	<u>During Construction</u> <ul style="list-style-type: none"> <li>No direct impacts</li> </ul>	<u>During Construction</u> <ul style="list-style-type: none"> <li>Loss of species or avoidance of habitat by species due to construction disturbance</li> <li>Potential for depreciation of habitat quality through the removal of the Gray Dogwood Thicket buffer</li> </ul>	Limited incidental to	Once during construction	10 days during construction	<ul style="list-style-type: none"> <li>ESC structure should be monitored daily to ensure that it is fully functional and any issues identified are resolved in the same day</li> <li>ESC measures should be designed in a manner and using material sufficient to guide amphibians away from the construction zone</li> <li>Where amphibians are found in the construction zone they should be handled appropriately and released into the wetland area</li> </ul>	No net residual effect
	<u>Post-Construction</u> <ul style="list-style-type: none"> <li>No direct impacts</li> </ul>	<u>Post-Construction</u> <ul style="list-style-type: none"> <li>Potential for change in water levels and quality of permanent wetland and Dingman Creek Tributary area due to groundwater impacts</li> </ul>	Limited incidental to	Not anticipated to occur	Short-term, if at all	<ul style="list-style-type: none"> <li>Restoration of vegetation and improvement of wildlife habitat in the buffer area will maintain continuous habitat features along the tributary to Dingman Creek</li> <li>Water levels in the wetland and in the adjacent monitoring wells should be recorded monthly for one year post-construction to ensure low permeable plugs are functioning as intended</li> <li>ESC measures should be monitored monthly and removed one-year post-construction once vegetation has stabilized</li> </ul>	No net residual effect

**GENERAL NOTES**

**1. PRE-CONSTRUCTION ACTIVITIES:**

- Quantities of materials are estimates only and the Contractor is responsible to review site and verify quantities in situ.
- The location of all underground and above ground utilities and structures is not necessarily shown on the contract drawings, and the accuracy of the location and elevation of such utilities and/or structures (where shown) is not guaranteed. Prior to commencing construction, the Contractor shall verify the exact location and elevation of such utilities and/or structures and shall assume the liabilities of damaging the utilities.
- No water work to begin on a Friday or prior to rainfall forecasted within 48 hours if work cannot be stabilized within the same day.
- No in-water work is permitted.
- No work within regulated wetland.
- Fuel tanks are to have proper protection as per environmental requirements.
- Refueling and equipment maintenance to be completed on paved portion of Cranbrook cul-de-sac to avoid site contamination.
- All machines and equipment to be cleaned of excess oil and grease before beginning work near the wetland.
- Temporary staging and stockpiling of materials and equipment to occur in areas south of Cranbrook Road only, as identified on Drawing REST-2. Existing debris, garbage, or dump sites within the project work area should be removed to an approved disposal site. This activity should be documented with photos.
- Contractor should supply and maintain portable toilet and trash receptacles on flat paved surface of Cranbrook cul-de-sac for the duration of the project.
- Temporary access to off-road areas of project site should be by way of mud-trapping aggregate ramps of 100-200mm stone. Clean and maintain all existing public road surfaces of construction mud or sediment.

**2. SEDIMENT AND EROSION CONTROL ACTIVITIES:**

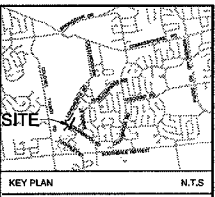
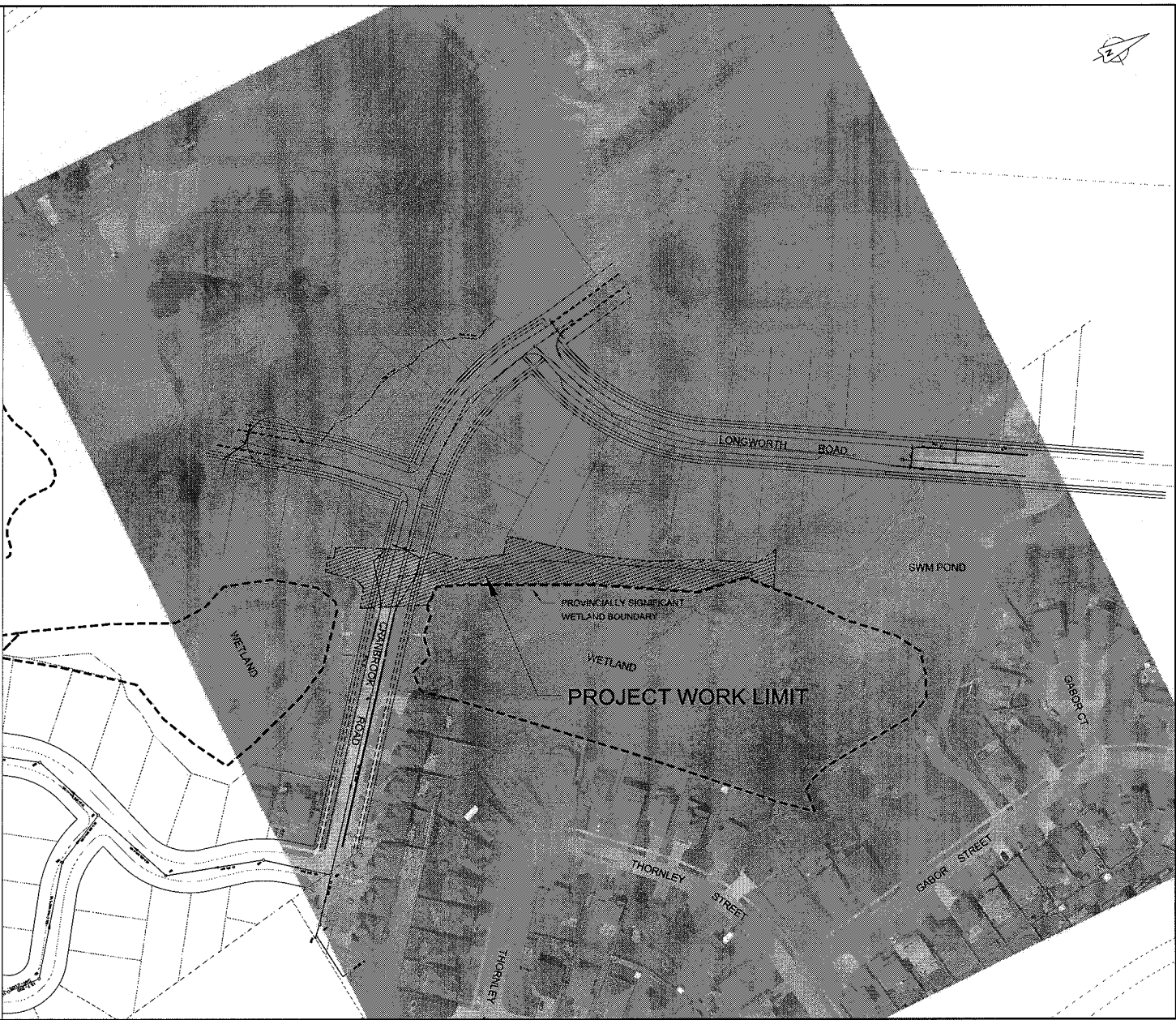
- Contractor to install and maintain double-walled silt fence with high visibility blaze orange fence attached to "work" side. Refer to Drawing REST-2 for location and REST-4, D-8 for details. Layout to be approved by Contract Administrator prior to commencement of work.
- Excavate only the amount of trench section that can be backfilled and finished to a rough grade condition in one day. Do not leave open excavations overnight.
- Stabilize all completed soil surfaces with specified seed mixtures (refer to Drawing REST-3). Do not wait for shrub/tree planting - establish stabilized grass cover immediately.

**3. DE-WATERING ACTIVITIES:**

- Pump dirty water from excavations into silt sacs as indicated on plan. Do not pump any water into wetland or existing stormwater pond facility (refer to Drawing REST-2).

**4. RESTORATION ACTIVITIES:**

- Habitat structures such as woody debris haul-outs, trail closures and hibernaculum should be constructed of natural materials selected for this purpose from clearing and grubbing operations. Some inorganic materials sourced from construction debris may be appropriate for use - Contract Administrator will approve all habitat structure materials during pre-construction meeting.
- The Contractor is encouraged to supply and install pot-in-pot or container grown nursery materials wherever available to avoid fall planting of spring-dug materials.
- All plant material is specified for the highest degree of native or locally indigenous content therefore no substitutions will be accepted. The local area supports a large number of nurseries and landscape material suppliers. The Contractor is encouraged to make good use of the local supply chain to provide the most suitable materials in support of a sustainable and cost competitive project.
- The Contractor must supply trees grown from seed zone stock certified to be Zone 37 according to Canadian Seed Zone mapping (NRC).
- Preserve healthy soils by protecting existing root zones from compaction due to equipment activity or material staging. As a minimum requirement, all imported topsoil cover shall meet the Provincial Ministry of the Environment soil quality standard for "urban park land use" as published in Contaminated Sites Regulation (CSR). The Contractor will provide samples of imported soils to confirm the quality of import materials. All imported soils that do not meet the criteria will have to be removed and replaced with suitable quality backfill at the Contractor's expense.
- Bulk packaged soil admixtures containing freeze dried inoculum of mycorrhizal fungi, appropriate to the tree or shrub species being planted, should be used during planting operations. Apply MYKE PRO for Trees and Shrubs as per manufacturer's instructions in the specified restoration area.  
Available from:  
Premier Tech Biotechnologies, 1 Avenue Premier, Riviere-du-Loup, QUEBEC, G5R 6C1, 1 (800) 606-6926. www.usemyke.com.
- Fertilizer used during maintenance shall be dry, with an analysis of 20% nitrogen, 20% phosphoric acid and 20% potash. Do not use liquid fertilizer. All fertilizer shall be supplied in bags bearing the manufacturer's label indicating mass and analysis.



KEY PLAN N.T.S.

**Conditions of Use**  
Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.  
Do not scale dimensions from drawing.  
Do not modify drawing, reuse it, or use it for purposes other than those intended or for its preparation without prior written permission from Dillon Consulting Limited.



NO.	REVISION	DATE	BY
1	DRAFT REVIEW TO CLIENT	2012.02.15	AME
2	REVISION TO PROVINCIALLY SIGNIFICANT WETLAND BOUNDARY	2012.02.15	AME
3	PROVINCIALLY SIGNIFICANT WETLAND BOUNDARY UPDATED	2012.02.15	AME
4	REVISION TO PROVINCIALLY SIGNIFICANT WETLAND BOUNDARY	2012.02.15	AME

DESIGN: DCW  
DRAWN: AME  
CHECKED BY: DCW  
DATE: 2012.02.15  
SCALE: 1:1000

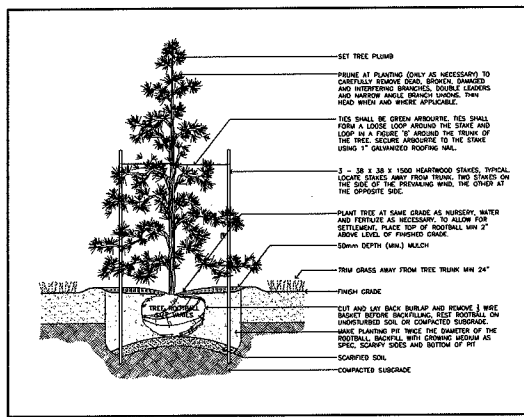
HIGHLAND RIDGE SANITARY TRUNK SEWER EIS

**PROJECT PLAN**

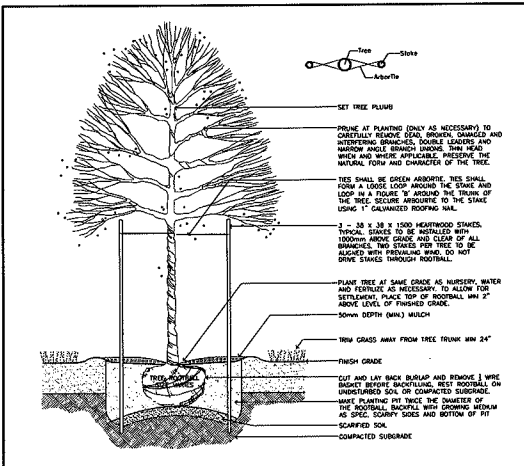
PROJECT NO. 11-4795  
SHEET NO. REST-1



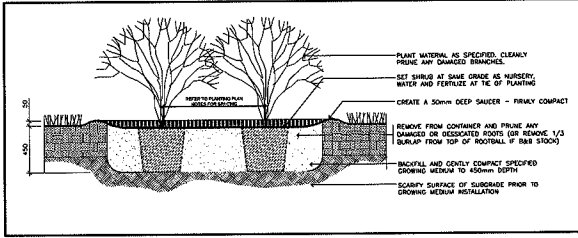




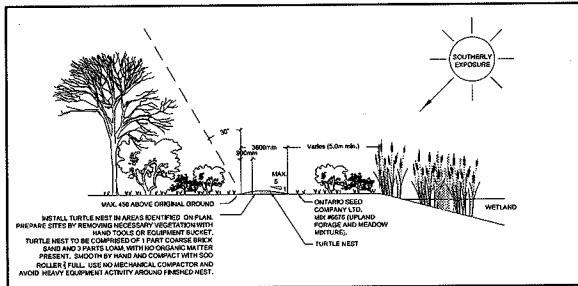
**D1 CONIFEROUS TREE PLANTING**  
REST-4 NTS



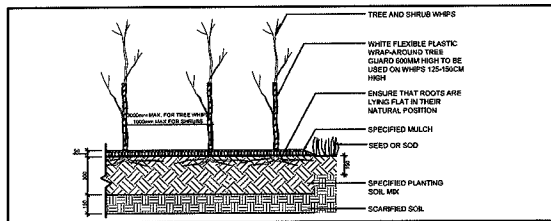
**D2 DECIDUOUS TREE PLANTING**  
REST-4 NTS



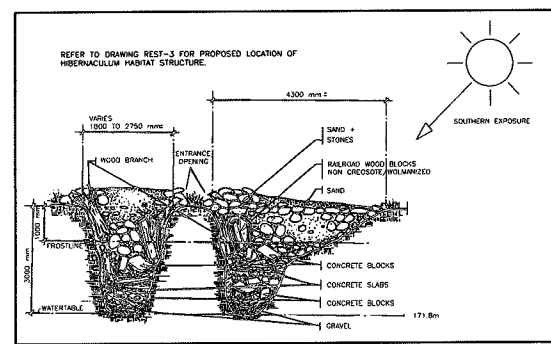
**D3 SHRUB PLANTING**  
REST-4 NTS



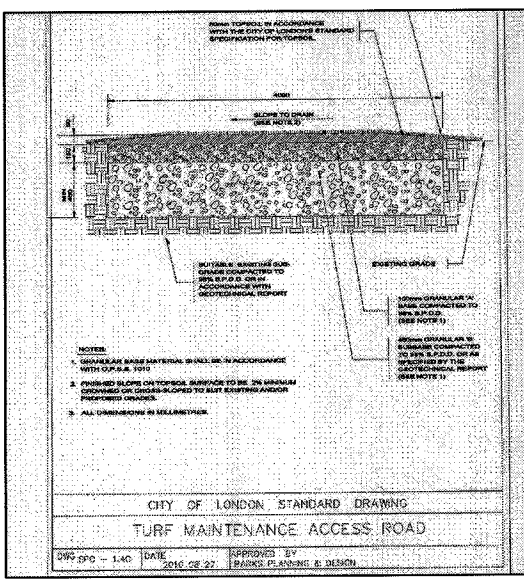
**D6 TURTLE HABITAT SCHEMATIC SECTION**  
REST-4 NTS



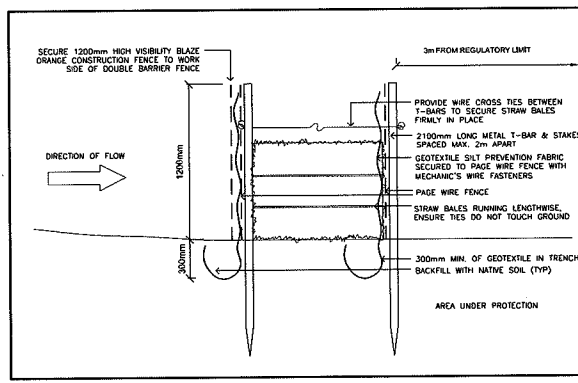
**D4 WHIP PLANTING (POTTED OR BARE ROOT)**  
REST-4 NTS



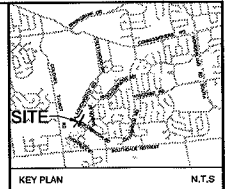
**D5 SNAKE HIBERNACULUM SCHEMATIC SECTION**  
REST-4 NTS



**D7 TURF MAINTENANCE ACCESS ROAD**  
REST-4 NTS

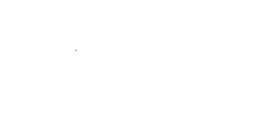
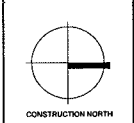


**D8 HIGH VISIBILITY DOUBLE WALLED SILT FENCE**  
REST-4 NTS



KEY PLAN N.T.S.

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3	DRAWING CHECKED BY	2012.02.15	DCW
4	DRAWING DESIGNED BY	2012.02.15	DCW
5	DRAWING CHECKED BY	2012.02.15	AME
6	DRAWING DESIGNED BY	2012.02.15	AME
7	DRAWING CHECKED BY	2012.02.15	AME
8	DRAWING DESIGNED BY	2012.02.15	AME

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4	DRAWING DESIGNED BY	2012.02.15	DCW
5	DRAWING CHECKED BY	2012.02.15	AME
6	DRAWING DESIGNED BY	2012.02.15	AME
7	DRAWING CHECKED BY	2012.02.15	AME
8	DRAWING DESIGNED BY	2012.02.15	AME

HIGHLAND RIDGE SANITARY TRUNK SEWER EIS  
**DETAILS**

PROJECT NO. 11-4795  
SHEET NO. REST-4

Agenda Item #

Page #

HRST/EIS  
T. Grawey

**"Appendix 3"**

**SUMMARY OF MONITORING RECOMMENDATIONS**

**Table 7: Monitoring Recommendations for Potential Environment Effects Resulting from the Installation of the Highland Ridge Sanitary Sewer Trunk**

Mitigation Measure	Performance Objective	Monitoring Strategy & Methods	Monitoring Locations	Frequency & Duration	Reporting Requirements	Contingency Methods
Water level Monitoring	Prevent disturbance to provincially significant wetland unit, amphibian breeding, concentration and corridor habitat	Monitor the groundwater and wetland water levels during and post-construction	Well locations and in the wetland	<ul style="list-style-type: none"> <li>▪ Daily during construction</li> <li>▪ Monthly for one year post-construction</li> </ul>	Water level log compiled for each monitoring event	Stop all construction if significant impacts to water levels recorded during construction. Notify appropriate agencies if effects are documented post-construction.
Erosion and Sediment Control Measures	Prevent disturbance to provincially significant wetland unit, amphibian breeding, concentration and corridor habitat	Monitor the effectiveness of the E&SC measures buffer fencing	All areas where high visibility double-walled silt fence is installed	<ul style="list-style-type: none"> <li>▪ Daily during construction</li> <li>▪ After rain events 10 mm or greater</li> <li>▪ Post-construction monitoring to occur monthly until vegetation is re-established</li> </ul>	ESC inspection checklist log compiled for each monitoring event	Repair as soon as possible upon notification of breach in E&SC structure and buffer fencing  Appropriate replacement of plants if a high degree of sedimentation occurs

Mitigation Measure	Performance Objective	Monitoring Strategy & Methods	Monitoring Locations	Frequency & Duration	Reporting Requirements	Contingency Methods
Revegetation of Buffer Area	Re-establish wetland buffer vegetation post-construction	Monitor the re-establishment of buffer vegetation during the course of one growing season	Throughout the buffer area	Post-construction monitoring to occur annually for three years or until vegetation is re-established, whichever is longer	Vegetation inspection checklist log compiled for each monitoring event	Appropriate replacement of plants if a high degree of mortality occurs
Aquatic Plant Monitoring	Prevent increase growth of aquatic plants due to nutrient loading	Visually monitor aquatic plants to determine if increased nutrients are contributing to increased growth	In the wetland where water level monitoring occurs	Monthly during the growing season for three years or until or until vegetation is re-established, whichever is longer	Vegetation inspection checklist log compiled for each monitoring event	Improved ESC measures if it is determined that nutrient loading is contributing to excessive aquatic plant growth
Creation of Wildlife Habitat Features	Assess the longevity and utilization of wildlife habitat features created as part of the buffer restoration plan	Monitor any inhabitation of wildlife features created during the breeding and/or hibernation season.	At constructed habitat features	Annually for three years post-construction in the appropriate season for breeding or hibernation	Yearly memo to summarize evidence of habitat use by target species	Assess the need for additional or possible alternative habitat features within the buffer in consultation with agencies if wildlife are not found to be using the habitat created