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# 12148 Albion-Vaughan Road Development – Realignment of Robinson Creek

## Detailed Design Brief

***Palmer Project #***
1604601

***Prepared For***
Aztec Restoration Inc.

January 25, 2021

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Mike Liburdi
12148 Albion Vaughan Inc.
27 Fenton Way
Brampton, ON L6P 0P4

Dear Mike Liburdi

**Re: 12148 Albion-Vaughan Road Development – Realignment of Robinson Creek**
**Project #: 1604601**

Palmer, in association with Masongsong Associates Engineering Limited (Masongsong), is pleased to provide the enclosed design brief describing the proposed designs for channel realignment along Robinson Creek in Bolton, Ontario. The design brief is accompanied by our detailed design drawing package.

The geomorphic assessment, Scoped EIS, and hydraulic assessment completed by Palmer and Masongsong informed the development of the detailed designs and should be referred to as necessary.

Should you have any questions, please do not hesitate to contact Robin McKillop at 647-795-8153 (ext. 106) or robin.mckillop@pecg.ca.

Yours truly,

Robin McKillop, M.Sc., P.Geo., CAN-CISEC
Principal, Senior Fluvial Geomorphologist

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# 1. Introduction

Palmer, in association with Masongsong Associates Engineering Limited (Masongsong), is pleased to provide 12148 Albion Vaughan Inc. with our detailed design drawing package for slight channel realignment and naturalization of Robinson Creek adjacent to a proposed residential development in the Town of Bolton (the Town) (**Appendix A**). This accompanying Design Brief provides an overview of the project background (Section 2); site conditions (Section 3); the objectives and key aspects of the design (Section 4); recommendations for monitoring (Section 6); and construction phasing and erosion and sediment control, including project work areas and access (Section 5). HEC-RAS modelling output results comparing existing and proposed conditions are provided in **Appendix B.** Also, Palmer's Scoped EIS (**Appendix C**), Erosion Hazard Assessment (**Appendix D**), and Arborist and Tree Protection Plan (**Appendix E**) have been included.

# 2. Background

Palmer and Masongsong were retained by 12148 Albion Vaughan Inc. to complete detailed channel design for a proposed residential development at 12148 Albion-Vaughan Road. Currently, the site is occupied by an abandoned residential building, a storage building, a driveway, and open space. The proposed development will consist of two 6-storey condominium units with 2 levels of underground parking. It is understood that the site will be serviced with municipal water and sanitary sewers. The site is located approximately 370 m northwest of the intersection of Albion Vaughan Road and Highway 50. As per Toronto and Region Conservation Authority's (TRCA) letter dated November 23, 2018, an Ontario Regulation 166/06 permit is required from TRCA before any channel realignment or development on the property.

# 3. Overview of Site Conditions

## 3.1 Channel Morphology

A short reach of Robinson Creek extends from the northwestern property limit downstream to the existing driveway off Highway 50 (**Figure 1**). The reach exhibits a straight planform, has no riparian vegetation (other than maintained grasses), and was realigned between 2009 and 2013. Upstream of the reach, the channel has a slightly sinuous planform and is lined by trees. Downstream of the reach, the channel essentially functions as a roadside drainage ditch. The reach-averaged bed slope through the straightened reach was estimated as 0.004 m/m from a recent property survey. Two small knickpoints, or abrupt 'steps' along the channel bed, were observed near the upstream end of the reach suggesting the profile of the channel is still actively adjusting to previous anthropogenic alterations and changes to flow and sediment supply regimes. As well, the channel has down-cut (i.e. degraded) through approximately 0.8 to 1 m of earth fill and has exposed the underlying silty clay till. As a result of the down-cutting, the cross-sections are entrenched (i.e. bankfull elevation well below top of bank) and have a low bankfull width:depth ratio

(**Table 1**). Based on the average bankfull dimensions and the surveyed channel gradient, a bankfull discharge of 0.77 $m^3/s$ was approximated for the study reach.

Furthermore, bed degradation has exposed a watermain and telecommunications cables paralleling Highway 50 (**Figure 1**). Channel entrenchment has resulted in undercut banks, bank slumping, and gullying. In general, the western bank is near vertical whereas the eastern bank has a gentler slope. Bed material was mostly coarse sands, gravel, and scattered cobble overlying a silty clay till. A decommissioned box culvert under Highway 50 was observed ~25 m west of the existing driveway. Riprap was scattered on the channel banks in the vicinity of the decommissioned culvert and the existing driveway.


***Figure 1. Study Area and Proposed Realignment***

***Table 1. Cross-sectional dimensions of Existing Channel***

| Measure | Cross-section 1 | Cross-section 2 | Cross-section 3 | Average |
|---|---|---|---|---|
| Wetted depth (m) | 0.05 | 0.15 | 0.15 | 0.12 |
| Wetted width (m) | 1.10 | 2.00 | 1.80 | 1.63 |
| Average bankfull depth (m) | 0.40 | 0.50 | 0.30 | 0.40 |
| Maximum bankfull depth (m) | 0.60 | 0.70 | 0.50 | 0.60 |
| Bankfull width (m) | 1.80 | 2.10 | 2.00 | 1.97 |
| Bankfull width:average depth | 4.50 | 4.20 | 6.67 | 5.12 |
| Top of bank depth (m) | 1.20 | 1.30 | 1.30 | 1.27 |
| Top of bank width (m) | 2.70 | 3.50 | 4.50 | 3.57 |

## 3.2 Aquatic and Terrestrial Ecology

### 3.2.1 Aquatic Habitat

Robinson Creek is a first order stream and is classified as a small riverine 'warmwater' stream (MNRF, TRCA 2005), which has been affected to a varying degree by past and present urbanization (TRCA, 2008). However, in its correspondence of November 23, 2018, the TRCA states that this reach/Robinson Creek is classified as a 'cool water' stream and that the timing window for conducting any in-water or near-water works is July 1 to September 15.

Fish community information for the specific reach is lacking; however, the Humber River Watershed Plan (TRCA, 2008) classifies Rainbow Creek as part of the Fish Management Zone 6, identifying Rainbow Darter (*Etheostoma caeruleum*) and Blackside Darter (*Percina maculata*) as target species. Data retrieved from Land Information Ontario (LIO) included the following species recorded within Robinson Creek: American Brook Lamprey (*Lethenteron appendix*), Blackchin Shiner (*Notropis heterodon*), Blacknose Dace (*Rhinichthys atratulus*), Blackside Darter (*Percina maculate*), Bluntnose Minnow (*Pimephales notatus*), Brassy Minnow (*Hybognathus hankinsoni*), Brook Stickleback (*Culaea inconstans*), Brown Bullhead (*Ameiurus nebulosus*), Cyprinidae hybrids, Common Shiner (*Luxilus cornutus*), Creek Chub (*Semolitus atromaculatus*), Emerald Shiner (*Notropis atherinoides*), Fantail Darter (*Etheostoma flabellare),* Fathead Minnow (*Pimephales promelas*), Finescale Dace (*Chrosomus neogaeus*), and Green Sunfish (*Lepomis cyanellus*). In addition, as part of background review, LGL's municipal class EA for the widening of Highway 50 was reviewed. During 2009 EA field investigations, fish habitat was confirmed downstream of the channel, within the northeast quadrant of the Highway 50 and Albion Vaughan Road intersection. Several minnows were observed, one of which was captured and identified as a Brook Stickleback. No TRCA fisheries data were available near the site or along the creek.

Data regarding benthic invertebrates within Robinson Creek were limited. According to the Humber River State of the Watershed Report – Aquatic System (TRCA, 2008), the Rainbow Creek Subwatershed has maintained sensitive benthic species despite urbanization and an unstable thermal regime. Review of the Fisheries and Oceans Canada (DFO) Aquatic at Risk Map (DFO, 2021) and correspondence with the

MNRF Aurora district office did not identify Robinson Creek as either direct or indirect habitat for aquatic SAR.

The channel wetted width is uniform and approximately 2m throughout the reach within the study area. The bankfull width is locally greater due to erosion and failing slopes, characteristic of an urban system. Along Highway 50, the channel has been straightened, and essentially functions as a roadside drainage ditch. The channel flows through a box culvert and upstream there is high proportion of cattails within the channel. Water depth was approximately 25cm at the time of the site visit, with turbid water indicative of sediment transport after the heavy rain. The channel banks throughout the entire reach within the study area consist of mowed grass, and a great proportion of slumped slopes and erosion gullies, which have led to exposed soils, with no riparian vegetation present to provide slope stability or other ecological function to the watercourse.

There were little in-stream features that provided cover or refuge for fish. Substrate in the channel consisted of sand, gravel and some scattered rubble. There were localized areas (less than 10% of the area within the study area) of in-stream aquatic vegetation – cattails. Leaf litter was present in the channel from the upstream wooded-area. No barriers to fish passage were observed, but low flow conditions in the summer months may inhibit passage. Evidence of the urban setting was present, with garbage along the stream from the adjacent road, as well as exposed service cables/pipes in one section (now removed).

The habitat quality within the study area is low and does not provide any specialized ecological function. Water quality appears to be adversely affected by the high degree of sedimentation from the exposed channel banks. There is no riparian cover, and habitat is affected by the urban setting. Improvements to the channel form could enhance the habitat function, and be conducted with no impact to any fish if appropriate mitigation measures are in place.

### 3.2.2 Terrestrial Habitat

The Subject Property predominantly supports residential buildings, including one house, a barn and manicured lawns (i.e. turfgrass) with scattered trees. At the time of the field survey, a hedgerow was present along the southeastern side of the property. The scattered trees on the property are dominated by the following species: Eastern White Pine (*Pinus strobus*), Norway Spruce (*Picea abies*) and White Spruce (*Picea glauca*).

At the time of the original field survey in 2016, the only representative vegetation community on the property was a Hedgerow 1 (HR1) that was located along the southeast property boundary. The hedgerow was dominated by ash (*Fraxinus* sp.), but has since been removed. Palmer understands that the five (5) Ash trees located along the hedgerow were removed on adjacent lands subsequent to the inventory, likely due to adjacent development. The remaining vegetation consists of a mowed lawn dominated by Kentucky Blue Grass (*Poa pratensis*).

Within the proposed developable area, a total of 34 trees and an untagged tree grouping were inventoried. There were no Species at Risk (SAR) trees observed, such as Butternut (*Juglans cinerea*). There were seven (7) White Ash (*Fraxinus americana*) trees, which are at high risk of infestation by Emerald Ash Borer

(EAB), some of which have already been infected. The most dominant species inventoried was Norway Spruce (*Picea abies*), followed by White Spruce (*Picea glauca*).

Given the urban nature of the surrounding area, wildlife habitat opportunities within the Subject Property are very limited, with wildlife expected to be present consisting of common, generalist and urban-adapted species (e.g. urban species of birds, Raccoon [*Procyon lotor*], Skunk [*Mephitis mephitis*] and Grey Squirrel [*Sciurus carolinensis*]). Although the Subject Property is bounded by two high-traffic roadways (Albion Vaughan Road and Regional Road 50), the watercourse corridor may provide some movement opportunities. At the immediate site level, habitat representation consists of the aquatic environment (seasonal) of the creek, and patches of regenerating and planted woody vegetation. There are no forest communities within or immediately adjacent to the Subject Property and therefore habitat opportunities for bats within tree cavities are limited and their presence is unlikely.

# 4. Proposed Realignment Design

## 4.1 Objectives and Approach

The ultimate objective of the proposed works detailed in the design drawing package (**Appendix A**) is a slight channel realignment to reinstate a sinuous pattern and restore natural fluvial processes while also increasing the availability and functionality of developable land within the limits of 12148 Albion Vaughan Road. The design will maximize opportunities to enhance local ecological functions. Within the property limits, Robinson Creek exhibits unstable channel morphology with poor aquatic habitat. Fluvial processes within the property are disrupted by a number of anthropogenic influences. All elements of the design are informed by the findings of the reach-scale geomorphic assessment and EIS completed by Palmer.

## 4.2 Key Design Elements

### 4.2.1 Planform

The proposed channel will have a sinuous planform with the channel centerline repositioned slightly to the southwest to increase the availability of developable land and reduce the angle at which the channel approaches the road embankment. Such a planform is generally consistent with observed morphology along nearby reference reaches. The existing channel has remained straight for at least the past half-century. Meander amplitudes will range from approximately 3 m to 5 m. The centerline was shifted by a maximum of 4.5 m, which corresponds with increased sinuosity.The proposed sinuous bankfull channel will nested within a wider 8 m wide floodway channel. The wider floodway channel is expected to accommodate future lateral adjustments. Also, the proposed planform geometry of the bankfull and floodway channel will be contained within the established meander belt width of 13 m (Palmer, 2018). Smooth tie-ins are proposed at the upstream and downstream limits of channel works.

### 4.2.2 Profile

The proposed sinuous channel will have an average gradient of approximately 0.75%, effectively matching the gradient of the existing channel. Pool-riffle bed morphology is proposed in phase with planform geometry. Riffles situated at inflection points between meanders will be approximately 0.15 m high and form pools that extend upstream along meander bends. Riffles are proposed to have downstream faces of approximately 1.5 to 3.0%, in accordance with conditions observed along the reference reach, and lengths that vary with their steepness. The crest of riffles will either backflood the toe of the next upstream riffle or accommodate a short run.

### 4.2.3 Cross-Section

The bankfull channel will have a width of approximately 4.0 m, as opposed to the current ~2 m, to accommodate the urbanized hydrologic regime and designed 2H:1V banks. Typical cross-sections will differ at riffles and pools. Riffles will be symmetric, with a maximum bankfull depth of 0.5 m and banks of 2H:1V. A slight V-crest will concentrate low flow along the centre of the channel for improved fish passage and draw energy away from the banks. Pools will be asymmetric, with a typical bankfull width and depth of 5.0 m and 0.65 m, and outer and inner banks of 2H:1V and 3H:1V, respectively. Residual (low-flow) depths will be approximately 0.15 m in the pools.

### 4.2.4 Bed and Bank Treatments

Bed material will be diverse, mimicking natural conditions observed along nearby reference reaches. Riffles will be constructed using subrounded gravelly to cobbly riverstone, whereas pools will be excavated into native substrates. Cobble keystones will be placed at the riffle crest and strategically along the upstream and downstream faces of each riffle to improve stability, diversify flow and hydraulic habitats, and improve aquatic habitat for benthic invertebrates and fish. Riffle stone will extend to the top of the bankfull channel to minimize the risk of outflanking.

Vegetated cobble revetment is proposed along the outer bank of three meanders in order to prevent the channel from migrating toward the proposed development and/or Highway 50. The remaining bends will be planted with live stakes of native willows and/or dogwoods to improve stability and accommodate minor undercutting. The cobble revetment is to be embedded slightly below the bed of the proposed channel to accommodate minor scour. The upstream end of the revetment works will be keyed into the bank to form a smooth transition and inhibit the future risk of outflanking. The interspersed vegetation will provide increased roughness, bank stability and shading.

### 4.2.5 Stone Sizing

Palmer completed stone sizing for the proposed riffle and bank treatments based on bankfull hydraulics and erosion threshold analysis of the proposed channel. For the proposed riffles, the sub-rounded stone mix will have a $D_{50}$ of 70 mm. Cobble keystones placed along the riffle crest and upstream and downstream faces of the riffles will range between 120 and 150 mm. The minimum thickness of the riffle stone will be approximately 300 mm with a slight taper (thinning) in the downstream direction (riffle crest to riffle toe).

The vegetated bank revetment will be constructed with sub-angular cobbles. A 150 mm thick Granular 'A' Filter Layer will first be placed atop the graded slope (beneath cobble revetment). The revetment will have a $D_{50}$ of 150 mm. A cobble gradation will consist of 20% 120 mm, 60% 150 mm and 20% 180 mm. The revetment should be laid in two separate layers with the voids filled with 40 - 60 mm stone (or similar sized native material) so that there are no 'steps' along the bank. The revetment should have a thickness of at least 400 mm, with a slight taper (thinning) from toward the top of bank.

### 4.2.6 Aquatic Habitat Features

To increase shading and refuge areas for fish during baseflow and bankfull conditions, large wood will be incorporated into the natural channel design. Large wood will be embedded into the bank for stability and to prevent them rafting downstream. Embedded logs are to interact with base flow and expected to contribute to localized bed scour, commonly in association with adjacent live stakes, to replicate the function of an undercut bank. The wood will provide additional bank roughness, shading and refuge during high flow events.

### 4.2.7 Riparian Planting

The floodway channel and floodplain are proposed to be naturalized and fully vegetated. Native seed mixes comprising only TRCA-approved species will be spread across all disturbed areas, apart from along the meandering channel itself. Live stakes of native willows and/or dogwoods will be incorporated into banks at select locations. Live stakes will be placed more broadly alongside the banks to improve stability and accommodate minor undercutting. Embedded logs may be incorporated into select pools for habitat diversity.

## 4.3 Channel Hydraulics

The proposed work will require minor modifications to the channel cross-sectional area; therefore, a review of the channel hydraulics was completed. The analyses ensure the proposed works do not significantly increase local regulatory flood hazards or negatively impact local channel scour conditions. The regulatory hydraulic HEC-RAS model for the Rainbow Creek watershed was received from TRCA.

The limit of construction works is located along a short 100 m section of Robinson Creek (a part of the Rainbow Creek Watershed). Several HEC-RAS cross-sections are located within the limit of works, ranging from cross-sections 2223.131 to 2223.14. The existing HEC-RAS model provided by TRCA includes flow profiles for the 2, 5, 10, 25, 50 and 100 year and regional storms (**Table 1**).

***Table 2. East Don River flow profiles***

| Flow Profile | Discharge ($m^3/s$) |
|---|---|
| 2 year | 5.74 |
| 5 year | 7.78 |
| 10 year | 9.36 |
| 25 year | 11.54 |
| 50 year | 13.25 |
| 100 year | 15.21 |
| Regional | 17.88 |

To accurately model flows along Robinson Creek, an update to the existing HEC-RAS model was completed. A topographic survey (2016) was used to update existing cross-sections within the study limits. Updates to the HEC-RAS model necessitated several refinements including the eight (8) additional cross-sections. The new cross-sections are used to assess any changes to the water surface elevations that may be affected by the works within the creek. The addition of these cross-sections increases the accuracy of assessing effects before and after the proposed works. The model was run using these cross-sections to provide a baseline or update of existing conditions and to examine proposed works.

Proposed conditions, which include additional site grading, involve widening the channel cross-section to restore and enhance the original pre-existing condition by significantly reducing the regulatory water surface elevation and flood area within the study area. The proposed channel realignment and floodplain grading will not result in a negative impact to the upstream and downstream water surface elevation

Further details regarding the existing HEC-RAS model and updates made by Masongsong are provided in **Appendix B**.

## 4.4 Design Assumptions and Limitations

A number of important assumptions and limitations of the design, some of which are explicitly stated or implied above, are worth acknowledging:

1. *Upstream tie-ins* – The upstream extents and tie into a knickpoint is intended to mitigate the risk of further bed degradation and limit the potential for scour near the propose riffle crest.. Vegetated cobble revetment is proposed at the tie-in location due to the relatively sharp bend as the channel enters the study area. The potential for more substantial planform or vertical adjustments upstream of the riffle and revetment to compromise upstream tie-ins is unavoidable.
2. *Downstream effects* – Hardening of the outer bank along several meanders will likely have the effect of slightly increasing flow velocities and transferring energy downstream. The magnitude of this effect is moderated by the inclusion of plantings and large wood within the revetment structure, although there may still be a potential for slightly increased erosion along the opposite bank immediately downstream. An additional riffle was incorporated downstream of the confluence as

Robinson Creek connects with a roadside ditch to help dissipate flow energy as it starts to parallel Highway 50. Maintaining natural (unhardened) banks in areas where infrastructure is not at risk is a deliberate means of controlling where minor adjustments may occur.

3. *Hwy 50* – The downstream extent of the proposed realignment ties in with a roadside ditch. Downstream of this confluence, Robinson Creek parallels the toe of the road embankment. To limit the potential for erosion along Highway 50, the proposed channel cross-section is wider and shallower than the existing condition. This should more evenly distribute erosive forces and improve floodplain connectivity, reducing potential for bed degradation and bank instability. Also, the reduction in bank angle (from near vertical (1H:1V) to sloped (2H:1V)) decreases the potential for erosion through scour and slumping processes.

# 5. Restoration Plan

Restoration plantings will be implemented following the completion of the watercourse realignment and construction of the proposed development. The following restoration recommendations follow the practical objectives for the revetment and the restoration methods in the TRCA Guideline for Determining Ecosystem Compensation (TRCA, 2018). Restoration efforts will aim to restore the realigned Robinson Creek and the redesigned floodplain. The species to be planted as part of the restoration efforts are native to the region and suitable to the site conditions.

### 5.1.1 Soil Amendments

Within the redesigned floodplain and flood/erosion hazard access setback, soil compaction is expected to increase due to the use of machinery within the area of disturbance. Soils can be improved after construction works by conducting the following soil amendments on disturbed upland areas (Toronto and Region Conservation Authority, 2012):

- Decompaction of subsoil to a depth of 25 cm, by tilling or scarifying the soil in a perpendicular direction to the realigned watercourse.
- Incorporation of 7 cm of compost into the soils during tilling.
- Application of 20 - 30 cm of uncompacted imported topsoil with 15% organic matter by dry weight.

### 5.1.2 In-Channel Restoration

Live stakes (branch cuttings from live shrubs) have been recommended to be placed in the bends and vegetated rock revetment portions of the Robinson Creek re-alignment. Recommended species for live stakes includes Alternate-leaved Dogwood (*Cornus alternifolia*), Red-osier Dogwood (*Cornus sericea*), Common Elderberry (*Sambucus canadensis*), Sandbar Willow (*Salix exigua*), and Bebb's Willow (*Salix bebbiana*) (**Table 1**). Live stakes are to be planted in groups of 10/species at 0.3 m on-centre spacing (Toronto and Region Conservation Authority, 2018). Live stakes are recommended to be 25 – 75 mm diameter stakes, to be hand placed between the stone revetment/rip-rap. Stakes should be buried >0.5 m below the rip-rap, ensuring placement within the soil matrix and seasonal water table. Certified soils should be used to fill the remaining space in each planting hole. Additional restoration details are provided on the

restoration drawings, presented under a separate cover as part of the project submission package. As the new bend and revetment surface is approximately 25 $m^2$, it is estimated that up to 225 live-stakes can be planted to increase wildlife cover/habitat and increase bank stability.

***Table 3. Recommended Live-Stake Restoration Species***

| Common Name | Scientific Name | Density | Quantity |
|---|---|---|---|
| Alternate-leaved Dogwood | *Cornus alternifolia* | 1 x 1 m | **50** |
| Red-osier Dogwood | *Cornus sericea* | 1 x 1 m | **40** |
| Common Elderberry | *Sambucus canadensis* | 1 x 1 m | **15** |
| Sandbar Willow | *Salix exigua* | 1 x 1 m | **60** |
| Bebb's Willow | *Salix bebbiana* | 1 x 1 m | **60** |

Palmer also recommends implementing bioengineering techniques (e.g. brush layers) and riparian plantings to help improve the shear strength of the channel banks and reduce channel migration potential. These recommendations are consistent with the erosion hazard assessment completed by Palmer (2018). The improvements to the channel form could enhance the habitat function, and be conducted with no impact to any existing fish, for example, by working within timing windows, or periods of low flow or frozen conditions (in the dry) (Section 7.2).

### 5.1.3 Floodplain and Natural Feature Setback

As the floodplain and natural feature setback (Planting Area) currently comprise anthropogenic/cultural communities, it is recommended that these lands be planted in order to enhance their buffer/protective functions for Robinson Creek.

The Planting Area is to be seeded and planted to buffer the watercourse/natural features from the development (**Figure 3**). The setback is to be seeded at a rate of 25 kgs/ha with an early succession wet meadowseed mix that aligns with the TRCA *Seed Mix Guidelines* (Toronto and Region Conservation Authority, 2004; Credit Valley Conservation Authority, 2014). The recommended Early Succession Wet Meadow Mix (CVC 6) includes:

- Bebb's Sedge (*Carex bebbii*) 5%
- Purple Stemmed Aster (*Aster puniceus*) 1%
- Fowl Bluegrass (*Poa palustris*) 25%
- Fox Sedge (*Carex vulpinoidea*) 25%
- Great Blue Lobelia (*Lobelia siphilitica*) 1%
- New England Aster (*Aster novae-angliae*) 1%
- Path Rush (*Juncus tenuis*) 3%
- Canada Goldenrod (*Solidago canadensis*) 2%
- Soft Rush (*Juncus effusus*) 5%
- Stalk-grain Sedge (*Carex stipata*) 4%
- Tall Manna Grass (*Glyceria grandis*) 2%
- Virginia Wild Rye (*Elymus virginicus*) 25%
- Wild Bergamot (*Monarda fistulosa*) 1%

To assist in establishment and promote biomass, the Planting Area should also be seeded with a nurse crop of Common Oats (*Avena sativa*) or Buckwheat (*Fagopyrum esculentu*) at a rate of 25 kgs/ha.

Subsequently, following the Enhanced Reforestation Typicals within the *Guideline for Determining Ecosystem Compensation* (Toronto and Region Conservation Authority, 2018) as a guide, the Planting Area is to be planted with trees at a density of 2.45 m x 2.45 m (6 $m^2$), and shrubs at a 1 m x 1 m (1 $m^2$) spacing. Replacement tree and species are recommended be native to TRCA's watershed, and targeted to provide *natural, self-sustaining vegetation* (Toronto and Region Conservation Authority, 2014). Plantings should be of species native and common to the TRCA watershed as well as suit the existing vegetation assemblage and site conditions. For the Subject Property and the Planting Area specifically, species should be suited to naturalization, perform well in somewhat moister conditions in full to partial sun, and be tolerant of salt spray due to their proximity to Highway 50 (Vineland Research and Innovation Centre, 2020). Based on these existing site conditions, suitable woody species may include (but are not limited to):

**Trees:**

- Silver Maple (*Acer saccharinum*)
- Paper Birch (*Betula papyrifera*)
- Hackberry (*Celtis occidentalis*)
- Tamarack (*Larix laricina*)
- Eastern Cottonwood (*Populus deltoides*)
- American Elm (*Umulus americana*) – Dutch Elm Disease resistant cultivars

**Shrubs:**

- Speckled Alder (*Alnus rugosa*)
- Red-osier Dogwood (*Cornus sericea*)
- Chokecherry (*Prunus virginiana*)
- Staghorn Sumac (*Rhus typhina*)

The natural feature setback and floodplain area to be restored is approximately 2,000 $m^2$ and the recommended planting spacing would allow planting of about 330 trees or 2,000 shrubs, or combination thereof. To provide a balance between diversity and reproduction opportunities, trees and shrubs are to be planted in groups of approximately 10 per species following the *Guideline*, at the spacing outlined above. For trees and shrubs, two to four gallon pot sizes are recommended. The planting prescription in **Table 2** has been developed following the above criteria.

### *Table 4. Example Planting Prescription*

| Common Name | Scientific Name | Quantity | Size |
|---|---|---|---|
| **Trees** | | | |
| Silver Maple | *Acer saccharinum* | 50 | 2 - 4 gallon pot |
| Paper Birch | *Betula papyrifera* | 50 | 2 - 4 gallon pot |
| Hackberry | *Celtis occidentalis* | 45 | 2 - 4 gallon pot |
| Tamarack | *Larix laricina* | 40 | 100 – 150 cm (height) |
| Eastern Cottonwood | *Populus deltoides* | 50 | 2 - 4 gallon pot |
| American Elm* | *Ulmus americana* | 45 | 2 - 4 gallon pot |
| **Shrubs** | | | |
| Speckled Alder | *Alnus rugosa* | 100 | 2 gallon pot |
| Red-osier Dogwood | *Cornus sericea* | 100 | 2 gallon pot |
| Chokecherry | *Prunus virginiana* | 50 | 2 gallon pot |
| Staghorn Sumac | *Rhus typhina* | 50 | 2 gallon pot |

* Note: Dutch Elm Disease resistant cultivars recommended.

### 5.1.4 Floodplain Buffer

It is recommended that the 10 m flood/erosion access setback be seeded and planted to further buffer the Planting Area from the development, but also allow for maintenance, emergency access and recreational/passive use of the area (**Figure 3**). The flood/erosion access setback should be seeded at a rate of 25 kgs/ha with a native grass seed mix that aligns with the TRCA *Seed Mix Guidelines* (Toronto and Region Conservation Authority, 2004). A recommended grass seed mix includes:

- Canada Wild Rye (*Elymus canadensis*) – 20%
- Switchgrass (*Panicum virgatum*) – 20%
- Fowl Bluegrass (*Poa palustris*) – 20%
- Big Bluestem (*Andropogon gerardii*) – 10%
- Little Bluestem (*Andropogon scoparius*) – 10%
- Fox Sedge (*Carex vulpinoidea*) – 10%

Similar to the Floodplain Planting Area, the 10 m setback should also be seeded with a nurse crop of Common Oats or Buckwheat at a rate of 25 kgs/ha.

### 5.1.5 Timing

Planting and seeding should be completed in the spring or fall. The spring season planting window is April to mid-May and the fall season window is mid-September to late October. Seeding should be completed immediately after the planting of woody vegetation but not during drought-prone summer months (Toronto and Region Conservation Authority, 2004). The assessment of plant stock should be conducted upon delivery to ensure that the material consists of appropriate native species in proper quantities.

All trees and woody debris removed due to site disturbance should be kept on-site and distributed throughout the site to provide wildlife habitat opportunities, away from the active flow channel, after to completion of restoration plantings. In addition, if of small enough diameter, tree material could be used as embedded woody debris to be incorporated into the channel realignment design.

### 5.1.6 Tending for Restoration Plantings

The restoration plantings will require regular watering to facilitate the establishment of young trees, which are typically highly susceptible to water stress. At a minimum, watering should occur when trees show signs of stress and during periods of natural drought conditions (e.g. if there is less than 25 mm of rain over a 30-day period during late spring to the end of summer).

# 6. Monitoring

### 6.1.1 Channel Works

Channel works that incorporate natural elements and include slight compromises on stability for ecological benefit inherently include some potential for adjustment over time. This expectation for adjustment is deliberate and desirable. Monitoring should be completed by a qualified fluvial geomorphologist and engineer during construction, in order to ensure key elements of design are implemented properly and to provide the opportunity to guide any field-fit refinements. Final approval should be given by a fluvial geomorphologist or engineer before water is re-introduced into any isolated work areas.

Post-construction monitoring should also be completed, especially following the first significant flood and during the first two or three years following construction, in order to provide an early opportunity to detect and address any deficiencies. Repeat photographs and perhaps local benchmarks to track any noteworthy erosion.

### 6.1.2 Riparian Vegetation

A two-year monitoring term is recommended for this restoration plan. Monitoring efforts should consist of the documentation and inspection of instream channel enhancement and plantings.. Planting should be documented and inspected in the first year, followed by an assessment of survivorship in the fall of the second year of the monitoring program. The inspection of plantings in the first year will document the species and numbers of trees and shrubs, including photographic records. Recommendations should be provided as required, such as the need for managing competing vegetation.

Some tree and shrub vegetation mortality is to be expected. There should be less than 10% woody vegetation mortality (90% survival is required) by the fall of the second year. If greater mortality is observed, supplemental plantings may be required.

# 7. Construction Phasing and Erosion and Sediment Control

## 7.1 Construction Timing and Phasing Plans

The channel re-alignment will be completed in three stages, which are detailed in the Erosion and Sediment Control Drawings (Appendix A). This section will briefly summarize principles of the three main stages of the construction: erosion and sediment control (also extends into subsequent stages), earthworks and realignment, and restoration.

### 7.1.1 Phase 1 – Erosion and Sediment Control

The first stage in the construction sequence is erosion and sediment control. These control measures will be implemented for all construction activities related to the channel re-alignment within and around the subject property and for all phases and stages of construction. To minimize the potential for erosion and off-site transport of sediment into surface water features and the natural environment, the project will implement Best Practices related to ESC. ESC measures used by the contractor on all construction must meet guidelines as outlined in *Erosion and Sediment Control Guideline for Urban Construction*, December 2019 (ESC Guideline), prepared by TRCA. All repairs required to ESC measures will be completed within 48 hours of notice, unless otherwise agreed by the Contractor, the regulatory authority and the environmental inspector(s). Stockpiles are to be protected immediately and, if place for longer than 45 days, temporarily stabilized.

With respect to ESC measures, the contractor must:

- Limit the duration of soil exposure and/or phase construction;
- Limit the size of disturbed area;
- Maintain overland sheet flow and avoid concentrating flow;
- Store and stockpile soil away from watercourses, drainage structures, and the top of slopes;
- Implement ESC training for contractors and construction management;
- Prepare an adaptive ESC plan;
- Assess ESC measures before and after rain and significant snowmelt events;
- Schedule work to avoid wet, windy and rainy periods and heed weather advisories; and
- Dispose and stabilize all dredged material above the high-water mark of nearby waterbodies to prevent entry in the water.

To manage sediment, any work areas to be dewatered must discharge the sediment-laden flow through a dewatering filter bag surrounded by filter sock to remove silt from the water. This operation may still result in some silty water escaping the isolated area; therefore, the filter bag will be positioned greater than 30 m from the channel banks, in area with dense ground cover vegetation. Conditions should be monitored, and construction should be halted, if the sediment discharge becomes excessive in quantity and duration, until appropriate corrective measures are taken.

Temporary coffer dams will be used to isolate and draw down water within the work area. The coffer dams and flow bypass will be constructed in accordance with DFO's Interim Code of Practice guidelines. Prior to

dewatering, fish located within the isolated area will be removed, identified, and released back into Robinson Creek in accordance with a Scientific Collectors Permit from MNRF. Adherence to a dewatering discharge management plan, involving withdrawing sump water from the isolated work area and discharging it through a filter bag (ringed with bio-log, for example) in a densely vegetated area away from the river (if possible), will ensure that highly turbid water does not enter the channel. Erosion control media (e.g. coir mesh) will be used on temporary bank/slope disturbances.

Detailed design drawings (**Appendix A**) show the design and location of environmental protection measures (e.g., sediment fences and traps, tree protection measures, etc.), and show the site controls as they relate to staging areas and stockpiling of fill materials for all phases of the project. It is to be noted that these drawings show the minimum protection required and are expected to change during construction due to weather, unforeseen conditions or scheduling changes. The ESC drawings are to be treated as "living documents". Given the dynamic nature of construction activities in association with channel realignments, it is expected that the maintenance and local reconfiguration of erosion and sediment control measures will need to continue into subsequent stages as well. The removal of the erosion and sediment controls should be done once construction is completed and sediment run-off from the construction activities has stabilized.

### 7.1.2 Stage 2 – Earthworks and Channel Work

The second stage in the construction sequence is earthworks and channel re-alignment. This stage implements dams upstream of the proposed channel re-alignment and pumps the water past the proposed re-alignment area. The purpose of this bypass is to provide a dry work area for the earthworks and channel re-alignment while maintaining the flows of the existing channel.

The general timing for the bypass is between July 1 and September 15, which is an anticipated period of low to no flow in Robinson Creek. In addition to this timing window, no rain is permitted in the 24-hour forecast from construction commencement and the pumping rate cannot exceed the 25mm rainfall flow rate. In the event flow greater than the 25mm rainfall flow rate occurs, the dams will be designed to allow the flows to overtop and flow into the centre of the channel. Temporary rock check dams and temporary bank stabilization measures must be in place prior to overtopping.

The general sequencing is as follows:

1. Install Dam in the roadside ditch upstream of confluence
2. Install Dam in the channel upstream of the confluence within the subject property.
3. Install temporary dewatering pumping system complete with filter bag and place outlet downstream of the existing driveway access.
4. Conduct earthworks operations and channel realignment
5. Install temporary Rock check dams and stabilize bank slopes
6. Remove existing driveway access and culvert.
7. Install Riffles, Revetments and all other BMPs or mitigation measures.
8. Final grading and stabilization

### 7.1.3 Stage 3 – Restoration

The third stage in the construction sequence is restoration, which aims to restore all areas affected by the earthworks and channel re-alignment. The restoration recommendations shall be implemented after the completion of the works and in accordance with the restoration drawing (**Appendix A**; Section 5). Restoriation works will be completed from the channel outward toward the lateral limits of site grading to avoid disturbance to newly seeded soils covered with erosion control blanket (e.g. loose-weave coir matting).

## 7.2 Project Work Areas and Access

Access to the site will be primarily from Albion Vaughan Road and entering along the existing residential entryway and constructed gravel access road as shown in the design drawings provided in **Appendix A**. Care should be taken to ensure construction equipment and vehicles are centred on the road; any disturbance to adjacent ground or vegetation will be the responsibility of the contractor to restore to pre-existing condition or better.

## 7.3 Spill Response Plan

The development of a spill response plan is required to avoid impacts to waterbodies in the unlikely event of a spill of a deleterious substances. At a minimum, machinery must be kept clean, washing and refuelling areas should be set back (ideally >30 m) from the watercourse, and spills must be cleaned up promptly (report any spills to the Ontario Ministry of Environment and Climate Change, DFO, and/or TRCA, as appropriate). Responses to avoid spills or contamination include:

- Stop work, contain sediment-laden water and other deleterious substances and prevent their further migration in the watercourse.
- Maintain all machinery on-site in a clean condition and free of fluid leaks.
- Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.
- Keep an emergency spill kit on site during all phases of the project.

# 8. Certification

This Design Brief was prepared and reviewed by the undersigned:

**Prepared by:** _____

Michael Brierley, M.Sc.
Fluvial Processes Specialist

**Prepared by:** _____

Austin Adams, M.Sc., E.P
Senior Ecologist

**Reviewed by:** _____

Robin McKillop, M.Sc., P.Geo., CAN-CISEC
Principal, Senior Fluvial Geomorphologist

# 9. References

Fisheries and Oceans Canada (DFO). 2021. Aquatic Species at Risk Map. Retrieved from: https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

LGL Limited. 2010. Natural Heritage Report, Municipal Class EA for improvements to Highway 50 from Rutherford Road/Castlemore Road to Mayfield Road, and Mayfield Road from High 50 to Coleraine Drive

Masongsong, 2020. Rainbow Creek Channel Re-Alignment 12148 Albion Vaughan Road, Bolton Town of Caledon, Ontario.

Ministry of Natural Resources and Forestry (MNRF) & Toronto Region Conservation Authority (TRCA). Humber River Fisheries Management Plan. Retrieved from: http://trca.on.ca/dotAsset/25855.pdf

Palmer, 2020. 12148 Albion Vaughan Road. Scoped Environmental Impact Study.

Palmer, 2018. Erosion Hazard Assessment of Robinson Creek. 21248 Albion Vaughan Road in Bolton, Town of Caledon.

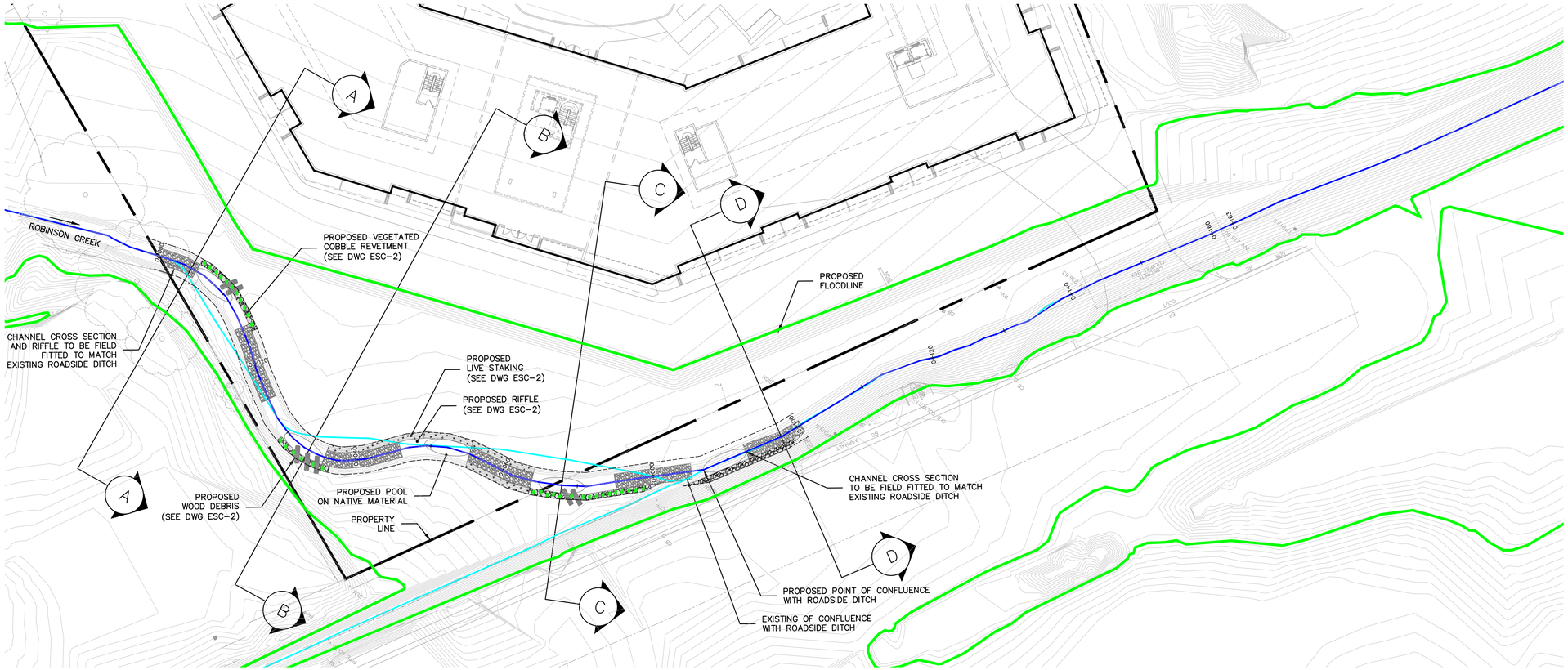
Toronto and Region Conservation Authority (TRCA), 2019. Erosion and Sediment Control Guide For Urban Construction.

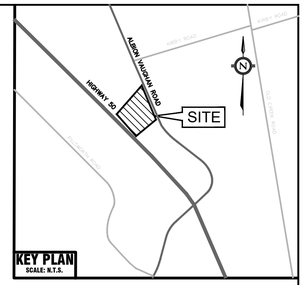
Toronto Region Conservation Authority (TRCA). 2008. Humber River State of the Watershed Report – Aquatic System. Retrieved from: http://trca.on.ca/dotAsset/82106.pdf

Toronto Region Conservation Area (TRCA). 2008. Humber River Watershed Plan. Retrieved from: http://www.trca.on.ca/dotAsset/50159.pdf

# Appendix A

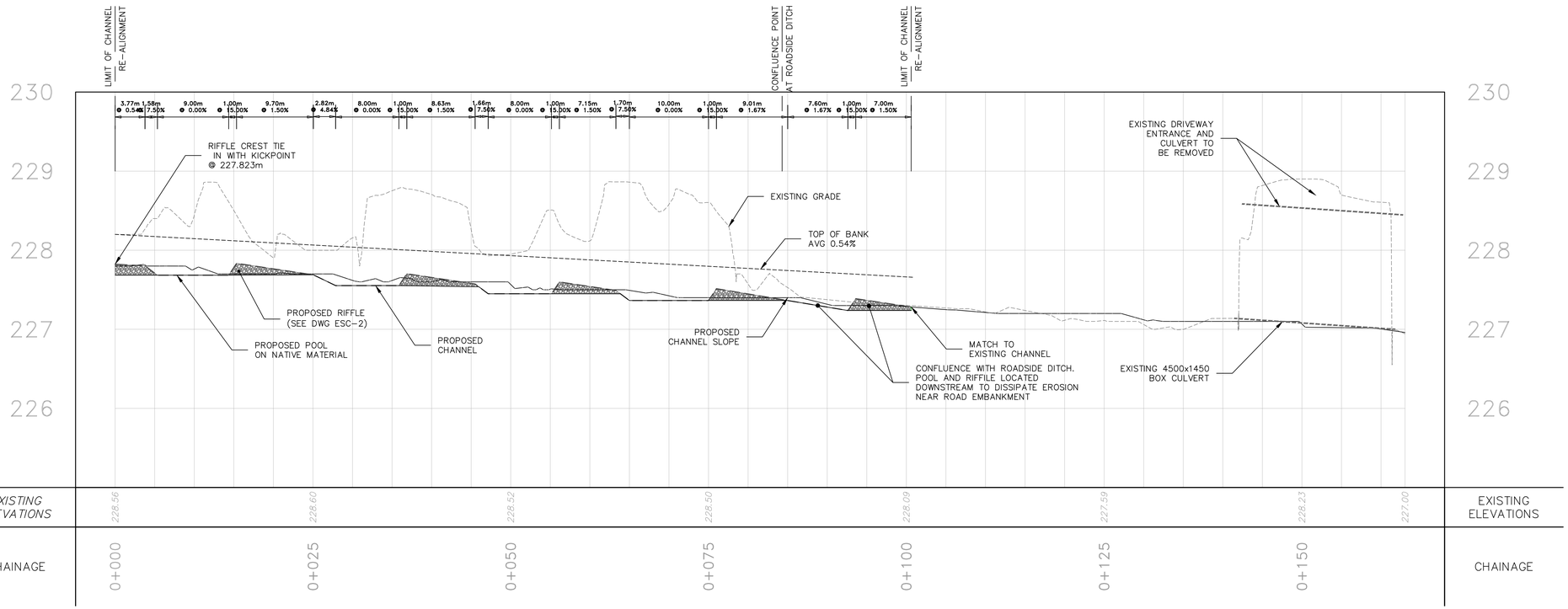
## Detailed Design Drawings




LEGEND:

- PROPERTY LINE
- BUILDING OUTLINE
- PROPOSED RAINBOW CREEK CENTRELINE
- EXISTING RAINBOW CREEK CENTRELINE
- PROPOSED REGULATORY FLOOD LINE
- CROSS SECTIONS
- 249.50 MAJOR CONTOUR
- 249.50 MINOR CONTOUR
- VEGETATED COBBLED REVETMENT
- RIFFLES
- LIVE STAKE AREA
- POOL ON NATIVE MATERIAL
- WOOD DEBRIS




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *EXISTING ELEVATIONS* | *228.56* | *228.60* | *228.52* | *228.50* | *228.09* | *227.59* | *228.23* | *227.00* | EXISTING ELEVATIONS |
| CHAINAGE | 0+000 | 0+025 | 0+050 | 0+075 | 0+100 | 0+125 | 0+150 | | CHAINAGE |

UTILITY NOTES:

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWING, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE

BENCHMARK

ELEVATIONS ARE REFERRED TO THE CITY OF BRAMPTON BENCHMARK No. 042010221, BEING A BRASS CAP IN CONCRETE APPROX. 21 m SOUTH OF CENTRELINE OF NASHVILLE ROAD AND 11 m EAST OF CENTRELINE OF REGIONAL ROAD 50, IN FRONT OF GAS STATION/COFFEE SHOP, HAVING AN ELEVATION OF 220.967 m.

| No. | DATE | REVISIONS | | |
|---|---|---|---|---|
| 1 | 01/25/21 | ISSUED TO TRCA | D.H. | |

STAMP:

STAMP:

PROJECT:

**MULTIPLE RESIDENTIAL CONDO DEVELOPMENT**

12148 ALBION VAUGHAN ROAD, TOWN OF CALEDON

CONSULTANT:

MASONGSONG ASSOCIATES
7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.msengs.ca

CONSULTANT:

Palmer

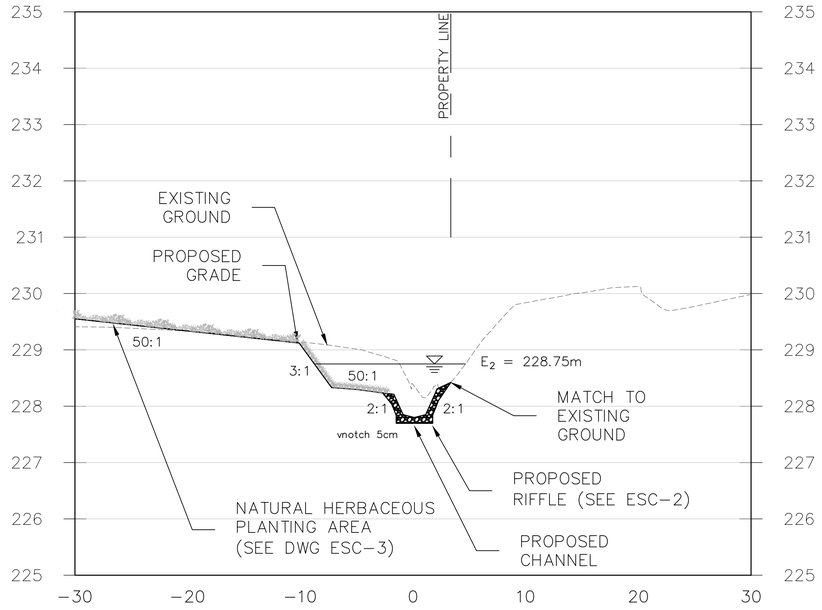
CONSERVATION AUTHORITY:

TORONTO AND REGION Conservation
*for The Living City*
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600

TITLE:

**PROPOSED CHANNEL PLAN AND PROFILE**

| | | | | |
|---|---|---|---|---|
| DESIGN | W.A. | CHECKED | D.H. | CONTRACT No. 17-849 |
| SCALE | H 1:300 V 1:30 | | | PLAN No. P1 |
| DATE | JANUARY 2021 | | | |




RIFFLE SECTION A–A

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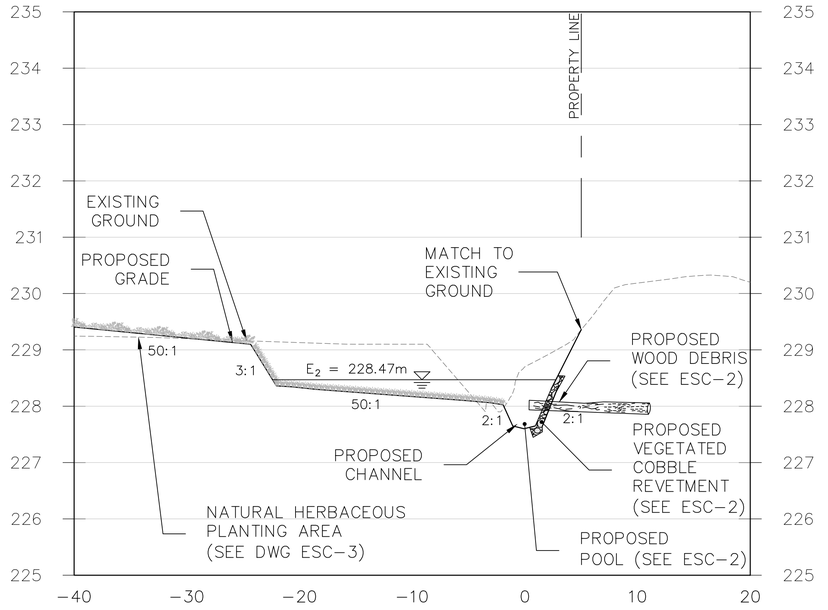


POOL SECTION B–B

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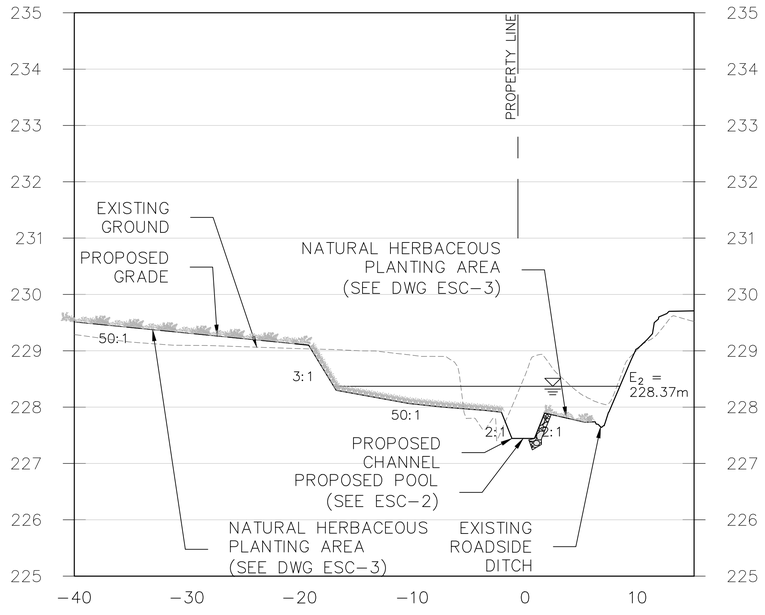


POOL SECTION C–C

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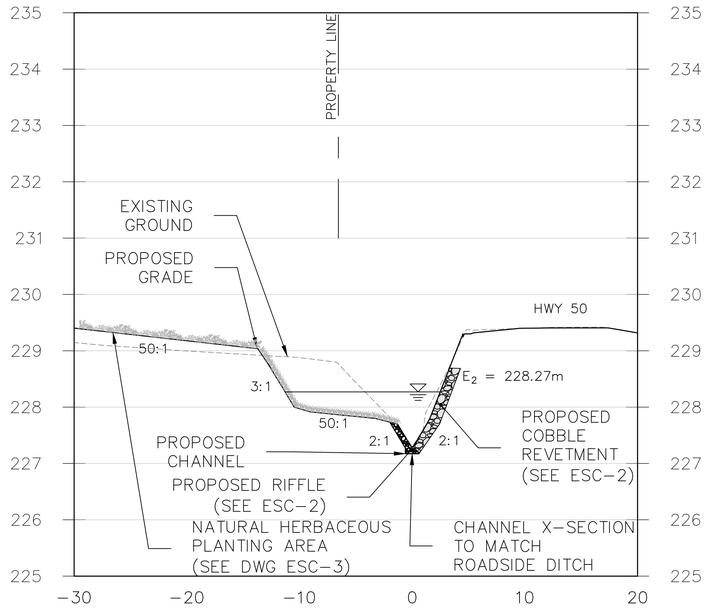


RIFFLE SECTION D–D

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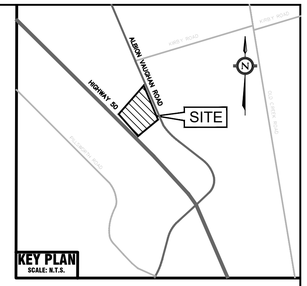


**UTILITY NOTES:**

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**BENCHMARK**

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| No. | DATE | REVISIONS | |
|---|---|---|---|
| 1 | 01/25/21 | ISSUED TO TRCA | D.H. |

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**MULTIPLE RESIDENTIAL CONDO DEVELOPMENT**

12148 ALBION VAUGHAN ROAD, TOWN OF CALEDON

CONSULTANT:

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TEN KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 0Y7 T: (905) 944-0162 www.msaeng.ca

CONSULTANT:

Palmer™

CONSERVATION AUTHORITY:

TORONTO AND REGION Conservation
*for The Living City*
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600

TITLE:

**PROPOSED CHANNEL CROSS–SECTIONS**

| | | | | |
|---|---|---|---|---|
| DESIGN | W.A. | CHECKED | D.H. | CONTRACT No. 17–849 |
| SCALE | AS SHOWN | | | PLAN No. XSEC |
| DATE | JANUARY 2021 | | | |

## ESC PHASE 1 NOTES:

1. INSTALL DOUBLE ROW HEAVY DUTY SEDIMENT CONTROL FENCE WITH STRAW BALES IN BETWEEN AROUND SITE WORK AREA AND THE PROPERTY LINE.

(1.a) THE TORONTO REGION CONSERVATION AUTHORITY, THE DEPARTMENT OF FISHERIES AND OCEANS, THE CITY OF MARKHAM, AND OTHER INTERESTED PUBLIC AGENCIES, WILL BE NOTIFIED OF SCHEDULED SITE MEETINGS. THE PROJECT TEAM WILL MAKE ITSELF AVAILABLE TO MEET ON SITE WITH THESE AGENCIES TO REVIEW CONSTRUCTION PROGRESS THROUGHOUT THE PROJECT.

(1.b) DETAILED PHOTOGRAPHIC RECORDS WILL BE KEPT THROUGHOUT THE CONSTRUCTION PROCESS.

2. INSTALL CONSTRUCTION MUD-MAT AND ESTABLISH ACCESS DRIVEWAY

3. INSTALL COFFER DAM WITH PUMP OR FLUME AND TIED-INTO THE SEDIMENT CONTROL FENCE IN THE EXISTING DITCH CHANNEL UPSTREAM OF THE CONFLUENCE WITH EXISTING ROBINSON CREEK.

4. INSTALL COFFER DAM WITH PUMP OR FLUME AND TIED-INTO THE SEDIMENT CONTROL FENCE UPSTREAM OF THE PROPOSED CHANNEL RE-ALIGNMENT

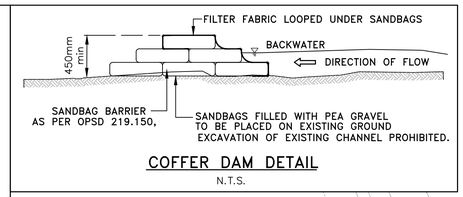
5. INSTALL TEMPORARY DEWATERING PUMPING SYSTEMS AT COFFER DAM LOCATIONS. INSTALL A FISH SCREEN AT THE PUMP INLET & FILTER BAG AT THE OUTLET FOR EROSION PROTECTION.

(1.a) DURING THE DEWATERING PROCESS, IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTROL AND MONITOR DEWATERING SYSTEM

(1.b) PUMPING RATE NOT TO EXCEED 25mm RAINFALL.

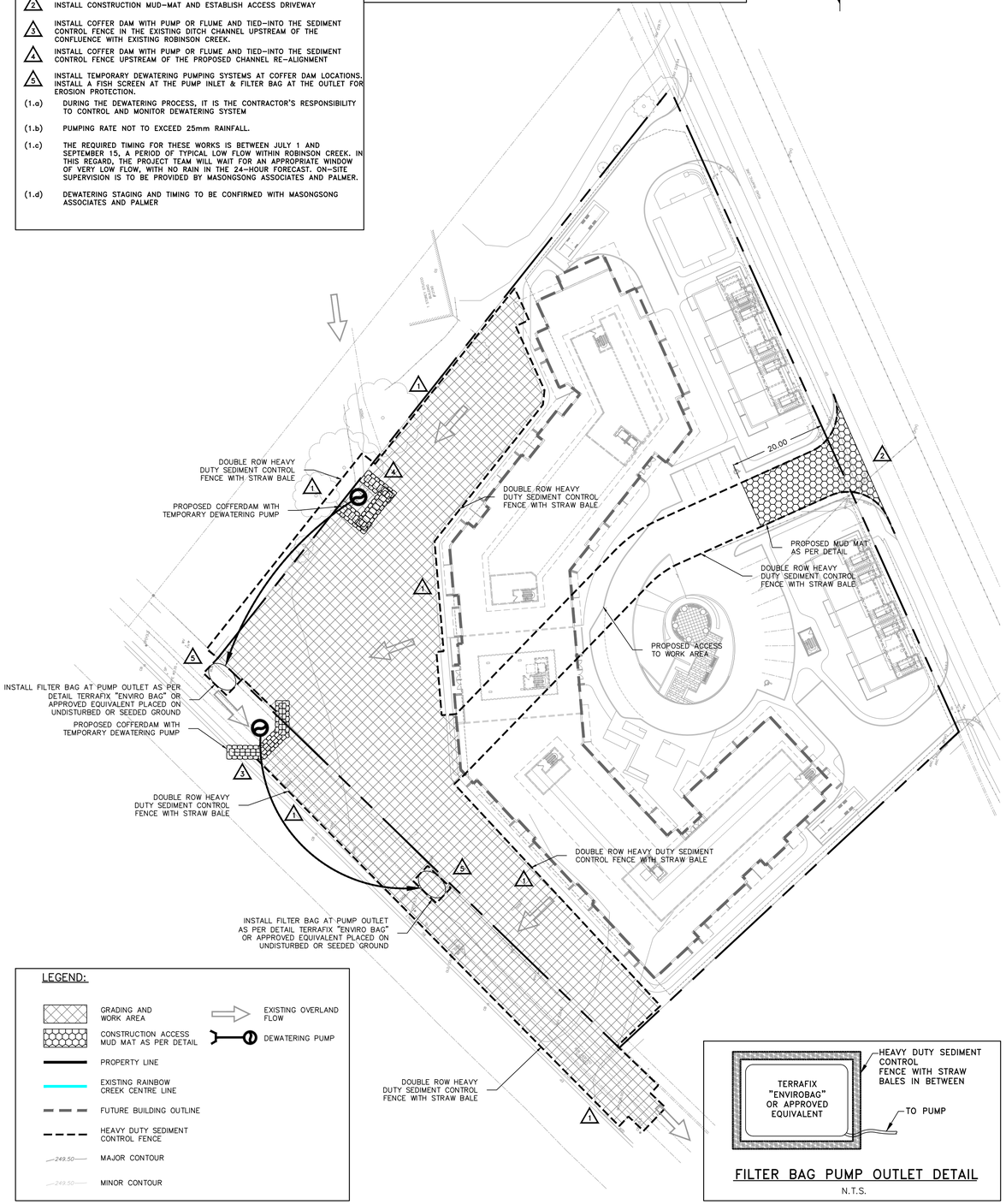
(1.c) THE REQUIRED TIMING FOR THESE WORKS IS BETWEEN JULY 1 AND SEPTEMBER 15, A PERIOD OF TYPICAL LOW FLOW WITHIN ROBINSON CREEK. IN THIS REGARD, THE PROJECT TEAM WILL WAIT FOR AN APPROPRIATE WINDOW OF VERY LOW FLOW, WITH NO RAIN IN THE 24-HOUR FORECAST. ON-SITE SUPERVISION IS TO BE PROVIDED BY MASONGSONG ASSOCIATES AND PALMER.

(1.d) DEWATERING STAGING AND TIMING TO BE CONFIRMED WITH MASONGSONG ASSOCIATES AND PALMER




### COFFER DAM DETAIL

N.T.S.




### LEGEND:

- GRADING AND WORK AREA
- CONSTRUCTION ACCESS MUD MAT AS PER DETAIL
- PROPERTY LINE
- EXISTING RAINBOW CREEK CENTRE LINE
- FUTURE BUILDING OUTLINE
- HEAVY DUTY SEDIMENT CONTROL FENCE
- 249.50 MAJOR CONTOUR
- 249.50 MINOR CONTOUR
- EXISTING OVERLAND FLOW
- DEWATERING PUMP




### FILTER BAG PUMP OUTLET DETAIL

N.T.S.

## EROSION AND SEDIMENTATION CONTROL GENERAL NOTES

PRIOR TO CONSTRUCTION OR STRIPPING TOPSOIL, THE CONTRACTOR SHALL MAKE PROVISIONS TO PROVIDE "GOOD HOUSINGKEEPING" MEASURES TO MITIGATE THE TRANSPORTATION OF SILT FROM THE SITE. THESE MEASURES SHALL INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING:

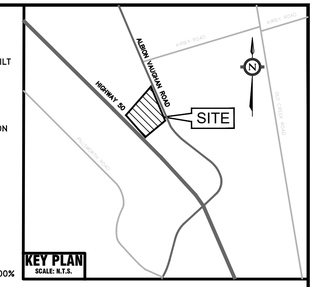
1. PROVIDE SILT FENCES AROUND THE PERIMETER OF THE SITE TO REDUCE SILT FROM LEAVING THE SITE.
2. PROVIDE SILT TRAPS AT CATCHBASINS UPON THEIR INSTALLATION TO REDUCE THE AMOUNT OF SILT ENTERING THE SEWER SYSTEM DURING CONSTRUCTION.
3. USE OF A "MUD MAD" OR TEMPORARY TRACKING CONTROL AT THE ENTRANCE OF THE SITE TO MINIMIZE MUD TRACKING FROM THE SITE. (OWNER SHALL CLEAN ADJACENT ROADS ON A REGULAR BASIS).
4. CONSTRUCT BULKHEADS IN THE DOWNSTREAM MANHOLE TO REDUCE SILT ENTERING THE STORM SEWER.
5. STABILIZE SITE AS SOON AS POSSIBLE BY RE-ESTABLISHING VEGETATIVE GROUND COVER AND AVOIDING BARE SOIL AREAS. ALL AREAS (INCLUDING STOCKPILES) WHERE SITE IMPROVEMENTS ARE NOT EXPECTED TO OCCUR IMMEDIATELY SHALL BE REVEGETATED WITH 100mm OF TOPSOIL AND HYDROSEEDED IN ACCORDANCE WITH O.P.S.D. 570 & 572
6. ALL DRAINAGE WORKS REQUIRE EROSION/SEDIMENT CONTROL SATISFACTORY TO THE APPROVAL AGENCIES DURING THE CONSTRUCTION PERIOD AND MUST BE MONITORED AND MAINTAINED ON A REGULAR BASIS TO ENSURE MAXIMUM BENEFIT AND MINIMUM SILT MIGRATION OFF-SITE.
7. ALL CONSTRUCTION VEHICLES TO ENTER AND LEAVE THE SITE AT APPROVED LOCATION ONLY AS INDICATED ON THIS PLAN.
8. ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES MAY BE REQUIRED AND SHALL BE INSTALLED AS DETERMINED BY THE CONSULTANT.
9. ALL DISTURBED OR NEWLY SEEDED AREAS TO BE COVERED BY EROSION CONTROL BLANKET (ECB) TO PROVIDE STABILIZATION UNTIL VEGETATION IS ESTABLISHED. (ECB SHALL BE 100% COCONUT FIBRE COIR MAT, FULLY BIODEGRADABLE)

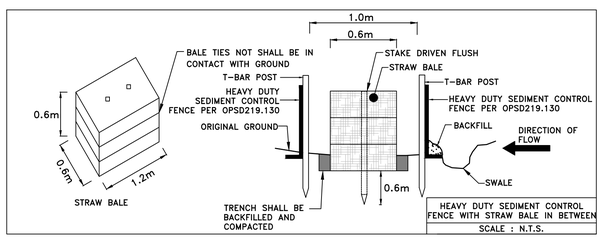
## OTHER EROSION AND SEDIMENT CONTROL NOTES:

1. PLEASE REFER TO EROSION AND SEDIMENT CONTROL GUIDELINE FOR URBAN CONSTRUCTION (TRCA, 2019) FOR THE DESIGN AND DESIGN ALTERATION OF ESC MEASURES.
2. ANY SEDIMENT SPILL FROM THE SITE SHOULD BE REPORTED TO MINISTRY OF ENVIRONMENT (SPILL ACTION CENTER) AT 1-800-268-6060.
3. THE CONTRACTOR SHALL MONITOR WEATHER FORECASTS TO ENSURE THAT THE WORKS WILL BE CONDUCTED IN FAVOURABLE WEATHER. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING ALL CONSTRUCTION EQUIPMENT AND MATERIALS THAT WOULD HAVE POTENTIAL TO CAUSE A SPILL OR OBSTRUCTION (I.E. FUEL TANKS, PORTABLE TOILETS, MACHINERY, ETC.), FROM THE 100 YEAR FLOODPLAIN IN THE CASE OF A LARGE STORM EVENT.
4. AN AFTER-HOURS CONTACT NUMBER IS TO BE VISIBLY POSTED ON-SITE FOR EMERGENCIES. ALL THE PLANS SHOULD HAVE NAME AND CONTACT INFO OF THE PERSON RESPONSIBLE FOR ESC MEASURES.
5. ALL NEAR OR IN-WATER WORKS SHALL BE COMPLETED WITHIN THE TIMING WINDOW SPECIFIED BY THE DFO, BETWEEN JULY 1 TO SEPTEMBER 15, UNLESS THE APPROPRIATE APPROVAL AGENCIES HAVE PROVIDED PRIOR WRITTEN APPROVAL TO EXTENSION OF THE TIMING WINDOW. THE CONTRACTOR SHALL PLAN AND IMPLEMENT THEIR ACTIVITIES TO ENSURE ADHERENCE TO THE TIMING WINDOW RESTRICTIONS.

## STANDARD ENVIRONMENTAL NOTES

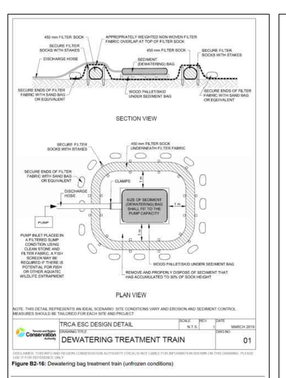
1. SEDIMENT AND EROSION CONTROL MEASURES WILL BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING THE CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE WATER.
2. THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO PREVENT SEDIMENT RELEASES TO THE NATURAL ENVIRONMENT. THE TRCA ENFORCEMENT OFFICER SHOULD BE IMMEDIATELY CONTACTED SHOULD THE EROSION AND SEDIMENT CONTROL PLANS CHANGE FRO THE APPROVED PLANS.
3. ALL EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE INSPECTED WEEKLY, AFTER EVERY RAINFALL AND SIGNIFICANT SNOW MELT EVENT, AND DAILY DURING PERIODS OF EXTENDED RAIN OR SNOWMELT.
4. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
5. ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, WILL BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE WILL BE CONDUCTED 30 METRES FROM THE WATER.
6. ALL DISTURBED AREAS WILL BE STABILIZED AND RESTORED WITH NATIVE/NON-INVASIVE SPECIFIES UPON COMPLETION OF THE WORK.
7. A REHABILITATION PLAN IS TO BE IMPLEMENTED TO RESTORE THE CONSTRUCTION SITE BACK TO ITS PRE-CONSTRUCTION STATE, OR BETTER.
8. THE CONTRACTOR SHALL MONITOR THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS WILL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITIONS. SHOULD AN UNEXPECTED STORM ARISE, THE CONTRACTOR WILL REMOVE ALL UNFIXED ITEMS FROM THE REGIONAL STORM FLOODPLAIN AND SLOPE THAT WOULD HAVE THE POTENTIAL TO CAUSE A SPILL/POLLUTION (I.E., FUEL TANKS, PORTA-POTTIES, MACHINERY) OR AN OBSTRUCTION TO FLOW (I.E. MACHINERY, EQUIPMENT). PRIOR TO FORECASTED PRECIPITATION EVENT, ALL esc MEASURES TO BE INSPECTED AND CONFIRMED TO BE IN GOOD CONDITION.
9. AN ENVIRONMENTAL MONITOR WILL ATTEND THE SITE TO INSPECT ALL NEW CONTROLS, AS WELL AS ON A REGULAR BASIS OR FOLLOWING RAIN/SNOWMELT EVENT, TO MONITOR ALL WORKS, AND IN PARTICULAR WORKS RELATED TO EROSION AND SEDIMENT CONTROLS, DEWATERING OR UNWATERING, RESTORATION AND IN- OR NEAR- WATER WORK. SHOULD CONCERNS ARISE ON SITE THE ENVIRONMENTAL MONITOR WILL CONTRACT THE TRCA ENFORCEMENT OFFICER AS WELL AS THE PROPONENT.
10. ALL DEWATERING/UNWATERING SHALL BE TREATED AND RELEASED TO THE ENVIRONMENT AT LEAST 30 METRES FROM A WATER COURSE OR WETLAND AND ALLOWED TO DRAIN ONTO DISTURBED SOILS WITHIN THE WORK AREA. THESE CONTROL MEASURES SHALL BE MONITORED FOR EFFECTIVENESS AND MAINTAINED OR REVISED TO MEET THE OBJECTIVE OF PREVENTING THE RELEASE OF SEDIMENT LADEN WATER.

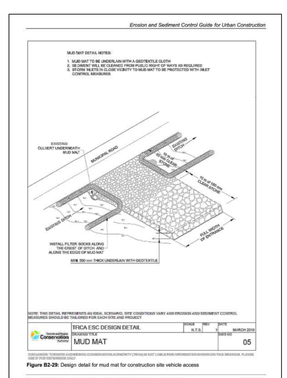


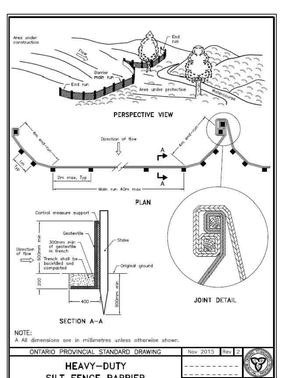




HEAVY DUTY SEDIMENT CONTROL FENCE WITH STRAW BALE IN BETWEEN

SCALE : N.T.S.




NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

HEAVY-DUTY SILT FENCE BARRIER

Nov 2015 Rev 2

OPSD 219.130

### UTILITY NOTES:

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### BENCHMARK

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| No. | DATE | REVISIONS | | |
|---|---|---|---|---|
| 1 | 01/25/21 | ISSUED TO TRCA | D.H. | |

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PROJECT:

**MULTIPLE RESIDENTIAL CONDO DEVELOPMENT**

12148 ALBION VAUGHAN ROAD, TOWN OF CALEDON

CONSULTANT:

MASONGSONG ASSOCIATES
7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7
T. (905) 944-0162
www.masong.ca

CONSULTANT:

Palmer

CONSERVATION AUTHORITY:

TORONTO AND REGION Conservation for The Living City
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600

TITLE:

**PHASE 1: EROSION AND SEDIMENT CONTROL**

| | | | |
|---|---|---|---|
| DESIGN | W.A. | CHECKED | D.H. |
| SCALE | 1:500 | | |
| DATE | JANUARY 2021 | | |

CONTRACT No. 17-849

PLAN No. ESC-1

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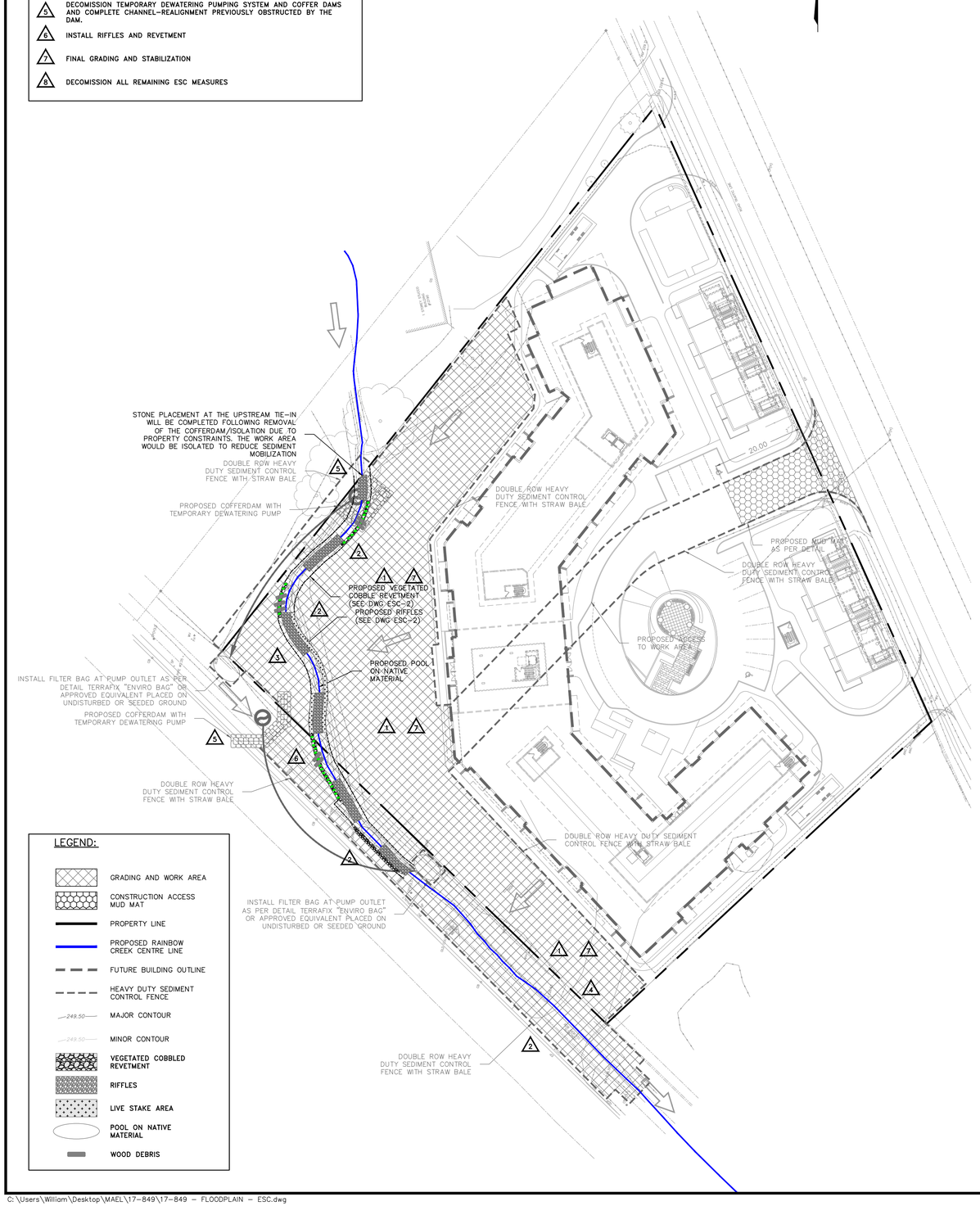
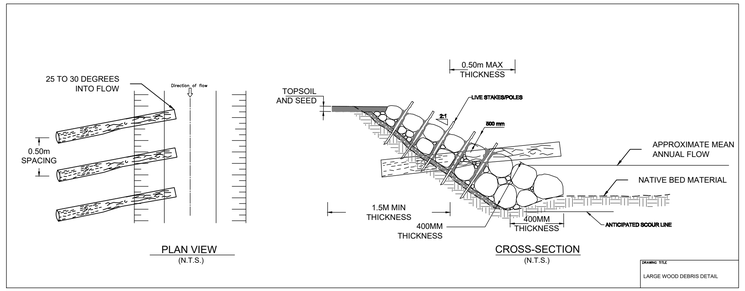
## ESC PHASE 2 NOTES:

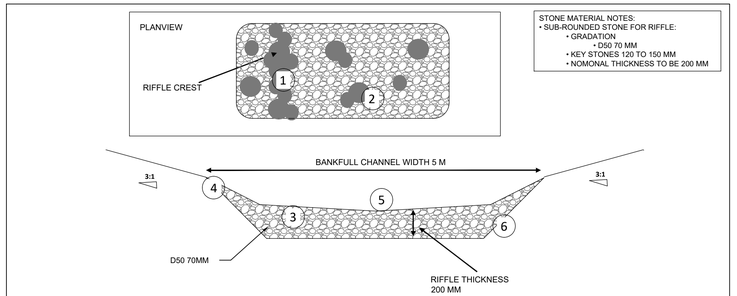
1. CONDUCT EARTHWORKS OPERATIONS
2. RE-ALIGN CHANNEL AND STABILIZE BANKS WITH TERRAFIX
3. INSTALL ROCK CHECK DAMS AND EXCAVATE POOLS IN LOCATIONS AS SHOWN
4. REMOVE EXISTING ACCESS AND CULVERT
5. DECOMISSION TEMPORARY DEWATERING PUMPING SYSTEM AND COFFER DAMS AND COMPLETE CHANNEL-REALIGNMENT PREVIOUSLY OBSTRUCTED BY THE DAM.
6. INSTALL RIFFLES AND REVETMENT
7. FINAL GRADING AND STABILIZATION
8. DECOMISSION ALL REMAINING ESC MEASURES




## LEGEND:

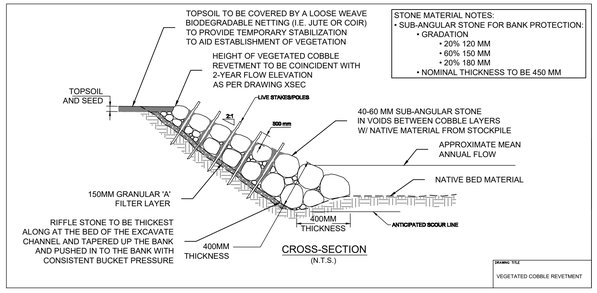
- GRADING AND WORK AREA
- CONSTRUCTION ACCESS MUD MAT
- PROPERTY LINE
- PROPOSED RAINBOW CREEK CENTRE LINE
- FUTURE BUILDING OUTLINE
- HEAVY DUTY SEDIMENT CONTROL FENCE
- 249.50 MAJOR CONTOUR
- 249.50 MINOR CONTOUR
- VEGETATED COBBLED REVETMENT
- RIFFLES
- LIVE STAKE AREA
- POOL ON NATIVE MATERIAL
- WOOD DEBRIS




PLAN NOTES:

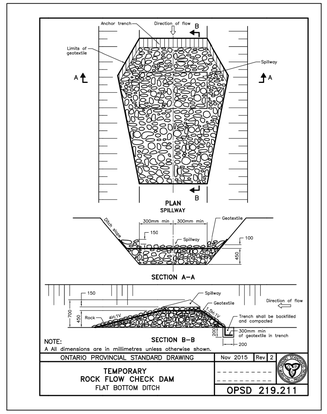
1. RIFFLE CREST FORMED WITH INTERLOCKED, 120-150 MM DIAMETER KEYSTONES FOR LONG-TERM STABILITY
2. UPSTREAM AND DOWNSTREAM FACES OF RIFFLES TO BE CONSTRUCTED WITH 40 TO 120 MM DIAMETER STONE WITH A MEDIAN DIAMETER OF 7 MM. ISOLATED 120-150 MM KEYSTONES TO BE EMBEDDED IN DOWNSTREAM FACE FOR FLOW/HABITAT DIVERSITY
3. KEYSTONES TO BE PARTLY EMBEDDED, AS NECESSARY, TO ACHIEVE DESIGNED RIFFLE CREST HEIGHT
4. RIVERSTONE TO EXTEND TO TOP OF BANK AT RIFFLES TO INHIBIT OUTFLANKING
5. CENTRE OF RIFFLE TO BE FORMED WITH SLIGHT (~5 CM) V-CREST TO MAXIMIZE LOW-FLOW DEPTH AND CONCENTRATE FLOW AWAY FROM BANKS
6. RIFFLE STONE IS TO BE THICKEST AT THE BASE OF THE BANK ALONG THE EXCAVATED CHANNEL BOTTOM AND STONE SHOULD BE TAPERED UP THE BANK

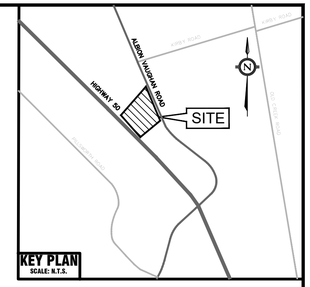



STONE MATERIAL NOTES:
• SUB-ANGULAR STONE FOR BANK PROTECTION:
• GRADATION
• 20% 120 MM
• 60% 150 MM
• 20% 180 MM
• NOMINAL THICKNESS TO BE 450 MM

VEGETATED COBBLE REVETMENT NOTES:

- SUB-ANGULAR COBBLE REVETMENT TO BE VEGETATED WITH LIVE STAKING AND POLE PLANTING
- LIVE CUTTINGS SHALL BE INSTALLED DURING COBBLE PLACEMENT TO ENSURE GOOD CONTACT WITH GROUND AND SOIL
- USE PLANTINGS BAR TO PRE-INSTALL HOLE FOR LIVE STAKES INSERTED THROUGH VOIDS BETWEEN COBBLES
- THE COBBLE REVETMENT SHALL BE CONSTRUCTED WITH WELL GRADED STONES DISTRIBUTED EVENLY THROUGHOUT THE MASS • STONES SHALL BE PLACED IN LIFTS
- STONES SHALL BE HARD, DURABLE, AND RESISTANT TO THE WEATHERING AND WATER ACTION, AND MEET SPECIFIED GRADATION
- TOE STONES TO BE FOUNDED BELOW THE CHANNEL BED TO MITIGATE AGAINST ANTICIPATED SCOUR
- COBBLE REVETMENT VOIDS SHALL BE FILLED WITH GRAVEL AND SOIL MIX (FROM STOCKPILE)
- A FILTER LAYER OF GRANULAR 'A' SHALL BE PLACED UNDER THE COBBLE REVETMENT TO PREVENT THE WASHOUT (PIPING) OF FINES THROUGH THE REVETMENT
- LENGTH OF THE CUTTINGS SHALL DEPEEND ON THE DEPTH THROUGH THE RIP RAP AND FILTER LAYER. LIVE WILLOW STAKES AND POLES CAN BE INCLUDED WITH 25-50mm DIAMETER AND LONG ENOUGH TO REACH BEYOND THE RIP RAP AND FILTER LAYER AND IN THE GROUND
- EACH LAYER OF THE COBBLE REVETMENT TO BE CAREFULLY PLACED AND COMPRESSED INTO THE BANK TO MAXIMIZE INTERLOCKING STONE
- LIVE CUTTINGS SHALL BE INSERTED IN THE RIPRAP DURING CONSTRUCTION SO THAT THE BUTT ENDS ARE IMBEDDED IN THE SOIL BEHIND THE COVER TO A DEPTH OF 0.3 - 0.5 m
- ROOTS SHALL BE FULLY BURIED IN THE SOIL MATRIX
- THE BRANCH TIPS SHOULD PROTRUDE FOR APPROXIMATELY 0.5M FROM THE STONE LAYER
- PLACE NATIVE MATERIAL OVERTOP AND WITHIN VOIDS AND AROUND LIVE STAKES
- SPREAD SEED MIX OVER FINISHED SLOPE AND PLACE EROSION CONTROL BLANKET (ECB) OVERTOP FINISHED SLOPE AND PINED IN PLACE (NO METAL OR PLASTIC). ECB TO BE 100% COCONUT FIBRE COIR MAT, FULLY BIODEGRADABLE)




**UTILITY NOTES:**

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**MULTIPLE RESIDENTIAL CONDO DEVELOPMENT**

12148 ALBION VAUGHAN ROAD, TOWN OF CALEDON


CONSULTANT:

MASONGSONG ASSOCIATES

7800 KENNEDY ROAD
UNIT 1
MARKHAM, ONTARIO
L3R 2C7
T. (905) 944-0162
www.msaeng.ca

CONSULTANT:

Palmer

CONSERVATION AUTHORITY:

TORONTO AND REGION Conservation
for The Living City
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600


TITLE:

**PHASE 2: EARTHWORKS AND CHANNEL RE-ALIGNMENT**

| | | | | | |
|---|---|---|---|---|---|
| DESIGN | W.A. | CHECKED | D.H. | CONTRACT No. | 17-849 |
| SCALE | 1:500 | | | PLAN No. | ESC-2 |
| DATE | JANUARY 2021 | | | | |

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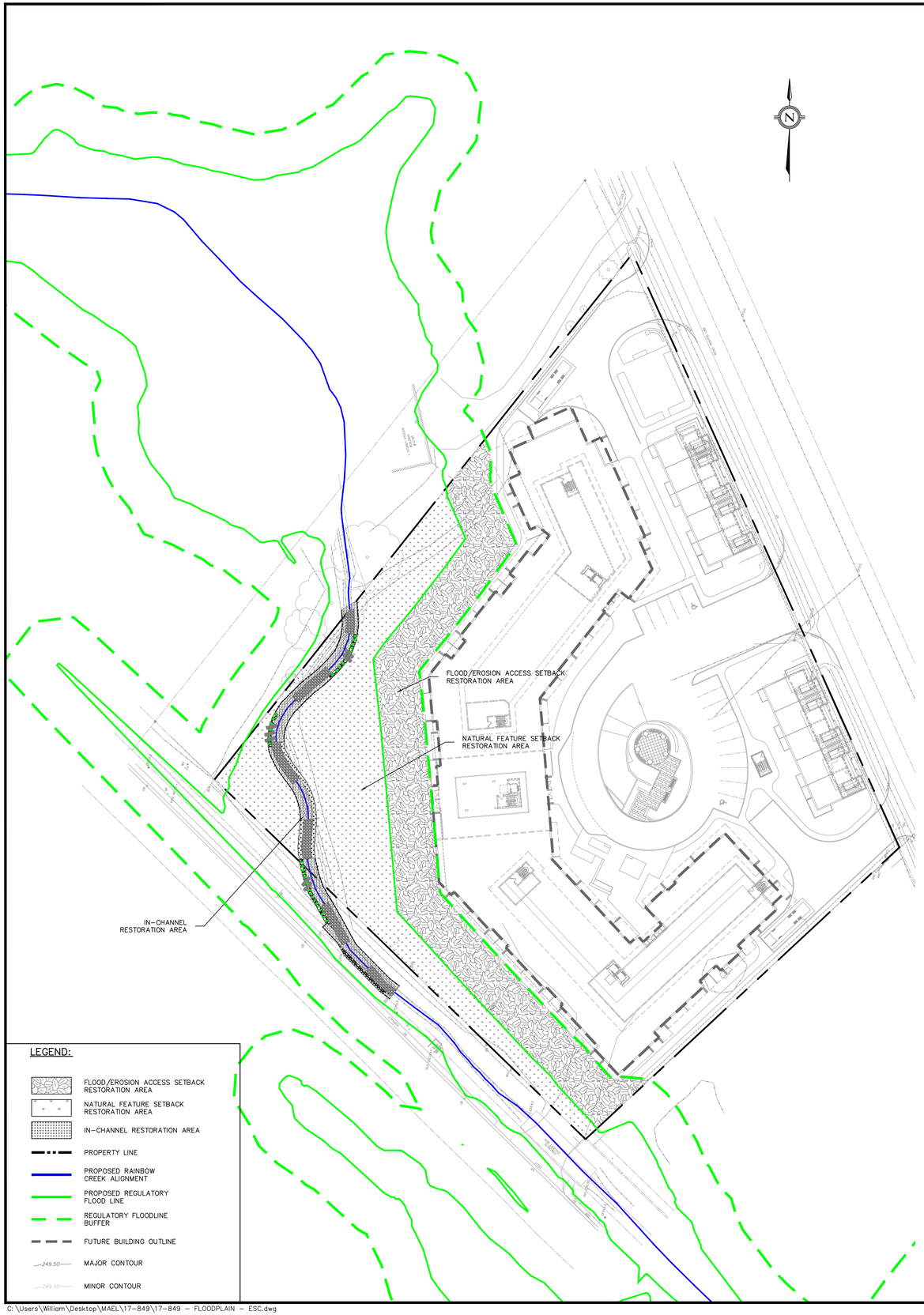



## GENERAL NOTES

- THE FOLLOWING RESTORATION RECOMMENDATIONS FOLLOW THE PRACTICAL OBJECTIVES FOR THE REVETMENT AND THE RESTORATION METHODS IN THE TRCA GUIDELINE FOR DETERMINING ECOSYSTEM COMPENSATION (TORONTO AND REGION CONSERVATION AUTHORITY, 2018).
- RESTORATION EFFORTS WILL AIM TO RESTORE THE REALIGNED ROBINSON CREEK AND THE REDESIGNED FLOODPLAIN.
- RESTORATION PLANTINGS WILL BE IMPLEMENTED FOLLOWING THE COMPLETION OF THE WATERCOURSE REALIGNMENT.
- THE SPECIES TO BE PLANTED AS PART OF THE RESTORATION EFFORTS ARE NATIVE TO THE REGION AND SUITABLE TO THE SITE CONDITIONS.
- ALL TREES AND WOODY DEBRIS FROM REMOVED DUE TO SITE DISTURBANCE SHOULD BE KEPT ON-SITE AND DISTRIBUTED THROUGHOUT THE SITE TO PROVIDE WILDLIFE HABITAT OPPORTUNITIES, AWAY FROM THE ACTIVE FLOW CHANNEL, AFTER TO COMPLETION OF RESTORATION PLANTINGS.
- IF OF SMALL ENOUGH DIAMETER, TREE MATERIAL REMOVED DURING SITE CLEARING COULD BE USED AS EMBEDDED WOODY DEBRIS TO BE INCORPORATED INTO THE CHANNEL REALIGNMENT DESIGN.

## SOIL AMENDMENTS

WITHIN THE REDESIGNED FLOODPLAIN, INCLUDING THE NATURAL FEATURE SETBACK AND FLOOD/EROSION HAZARD ACCESS SETBACK, SOILS ARE TO BE IMPROVED AFTER CONSTRUCTION WORKS BY:

- DECOMPACTION OF SUBSOIL TO A DEPTH OF 25 CM, BY TILLING OR SCARIFYING THE SOIL IN A PERPENDICULAR DIRECTION TO THE REALIGNED WATERCOURSE.
- INCORPORATION OF 7 CM OF COMPOST INTO THE SOILS DURING TILLING.
- APPLICATION OF 20 - 30 CM OF UNCOMPACTED IMPORTED TOPSOIL WITH 15% ORGANIC MATTER BY DRY WEIGHT.

## IN-CHANNEL RESTORATION

- LIVE STAKES (BRANCH CUTTINGS FROM LIVE SHRUBS) HAVE BEEN RECOMMENDED TO BE PLACED IN THE BENDS AND VEGETATED ROCK REVETMENT PORTIONS OF THE ROBINSON CREEK RE-ALIGNMENT.
- LIVE STAKES ARE TO BE PLANTED IN GROUPS OF 10/SPECIES AT 0.3 M ON-CENTRE SPACING.
- LIVE STAKES ARE RECOMMENDED TO BE 25 - 75 MM DIAMETER STAKES, TO BE HAND PLACED BETWEEN THE STONE REVETMENT/RIP-RAP.
- STAKES SHOULD BE BURIED >0.5 M BELOW THE RIP-RAP, ENSURING PLACEMENT WITHIN THE SOIL MATRIX AND SEASONAL WATER TABLE.
- CERTIFIED SOILS SHOULD BE USED TO FILL THE REMAINING SPACE IN EACH PLANTING HOLE.

THE TIMING WINDOW FOR CONDUCTING ANY IN-WATER OR NEAR-WATER WORKS IS JULY 1 TO SEPTEMBER 15.

## LIVE STAKE RESTORATION SPECIES

| Common Name | Scientific Name | Density | Quantity |
|---|---|---|---|
| Alternate-leaved Dogwood | *Cornus alternifolia* | 1 x 1 m | **50** |
| Red-osier Dogwood | *Cornus sericea* | 1 x 1 m | **40** |
| Common Elderberry | *Sambucus canadensis* | 1 x 1 m | **15** |
| Sandbar Willow | *Salix exigua* | 1 x 1 m | **60** |
| Bebb's Willow | *Salix bebbiana* | 1 x 1 m | **60** |

## NATURAL FEATURE SETBACK RESTORATION

- THE NATURAL FEATURE SETBACK IS TO BE SEEDED AND PLANTED TO BUFFER THE WATERCOURSE/NATURAL FEATURES FROM THE DEVELOPMENT.
- THE NATURAL FEATURE SETBACK IS TO BE SEEDED AT A RATE OF 25 KGS/HA WITH AN EARLY SUCCESSION WET MEADOWSEED MIX THAT ALIGNS WITH THE TRCA SEED MIX GUIDELINES (TORONTO AND REGION CONSERVATION AUTHORITY, 2004; CREDIT VALLEY CONSERVATION AUTHORITY, 2014).
- THE EARLY SUCCESSION WET MEADOW MIX (CVC 6) INCLUDES:
- BEBB'S SEDGE (CAREX BEBBII) 5%
- PURPLE STEMMED ASTER (ASTER PUNICEUS) 1%
- FOWL BLUEGRASS (POA PALUSTRIS) 25%
- FOX SEDGE (CAREX VULPINOIDEA) 25%
- GREAT BLUE LOBELIA (LOBELIA SIPHILITICA) 1%
- NEW ENGLAND ASTER (ASTER NOVAE-ANGLIAE) 1%
- PATH RUSH (JUNCUS TENUIS) 3%
- CANADA GOLDENROD (SOLIDAGO CANADENSIS) 2%
- SOFT RUSH (JUNCUS EFFUSUS) 5%
- STALK-GRAIN SEDGE (CAREX STIPATA) 4%
- TALL MANNA GRASS (GLYCERIA GRANDIS) 2%
- VIRGINIA WILD RYE (ELYMUS VIRGINICUS) 25%
- WILD BERGAMOT (MONARDA FISTULOSA) 1%
- TO ASSIST IN ESTABLISHMENT AND PROMOTE BIOMASS, THE PLANTING AREA SHOULD ALSO BE SEEDED WITH A NURSE CROP OF COMMON OATS (AVENA SATIVA) OR BUCKWHEAT (FAGOPYRUM ESCULENTU) AT A RATE OF 25 KGS/HA.
- SUBSEQUENTLY, THE NATURAL FEATURE SETBACK IS TO BE PLANTED WITH TREES AND SHRUBS ARE IN GROUPS OF APPROXIMATELY 10/SPECIES, AT A DENSITY OF 2.45 M X 2.45 M (6 $M^2$), AND SHRUBS AT A 1 M X 1 M (1 $M^2$) SPACING.
- REPLACEMENT TREE AND SPECIES ARE RECOMMENDED BE NATIVE TO TRCA'S WATERSHED, AND TARGETED TO PROVIDE NATURAL, SELF-SUSTAINING VEGETATION (TORONTO AND REGION CONSERVATION AUTHORITY, 2014).
- THE NATURAL FEATURE SETBACK AND FLOODPLAIN AREA TO BE RESTORED IS APPROXIMATELY 2,000 $M^2$ AND THE RECOMMENDED PLANTING SPACING WOULD ALLOW PLANTING OF ABOUT 330 TREES OR 2,000 SHRUBS, OR COMBINATION THEREOF.
- BASED ON THESE EXISTING SITE CONDITIONS, THE RECOMMENDED PLANTING PRESCRIPTION INCLUDES:

## NATURAL FEATURE SETBACK TREE PLANTING PRESCRIPTION

| Common Name | Scientific Name | Quantity | Size |
|---|---|---|---|
| **Trees** | | | |
| Silver Maple | *Acer saccharinum* | 50 | 2 - 4 gallon pot |
| Paper Birch | *Betula papyrifera* | 50 | 2 - 4 gallon pot |
| Hackberry | *Celtis occidentalis* | 45 | 2 - 4 gallon pot |
| Tamarack | *Larix laricina* | 40 | 100 – 150 cm (height) |
| Eastern Cottonwood | *Populus deltoides* | 50 | 2 - 4 gallon pot |
| American Elm* | *Ulmus americana* | 45 | 2 - 4 gallon pot |
| **Shrubs** | | | |
| Speckled Alder | *Alnus rugosa* | 100 | 2 gallon pot |
| Red-osier Dogwood | *Cornus sericea* | 100 | 2 gallon pot |
| Chokecherry | *Prunus virginiana* | 50 | 2 gallon pot |
| Staghorn Sumac | *Rhus typhina* | 50 | 2 gallon pot |

* Note: Dutch Elm Disease resistant cultivars recommended.

## FLOOD/EROSION ACCESS SETBACK

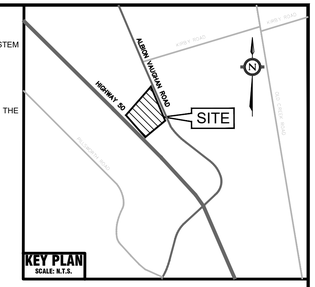
- THE 10 M FLOOD/EROSION ACCESS SETBACK IS TO BE SEEDED AT A RATE OF 25 KGS/HA WITH A NATIVE GRASS SEED MIX THAT ALIGNS WITH THE TRCA SEED MIX GUIDELINES (TORONTO AND REGION CONSERVATION AUTHORITY, 2004). THE RECOMMENDED GRASS SEED MIX INCLUDES:
- CANADA WILD RYE (ELYMUS CANADENSIS) - 20%
- SWITCHGRASS (PANICUM VIRGATUM) - 20%
- FOWL BLUEGRASS (POA PALUSTRIS) - 20%
- BIG BLUESTEM (ANDROPOGON GERARDII) - 10%
- LITTLE BLUESTEM (ANDROPOGON SCOPARIUS) - 10%
- FOX SEDGE (CAREX VULPINOIDEA) - 10%
- SIMILAR TO THE NATURAL FEATURE SETBACK PLANTING AREA, THE 10 M FLOOD/EROSION ACCESS SETBACK SHOULD ALSO BE SEEDED WITH A NURSE CROP OF COMMON OATS OR BUCKWHEAT AT A RATE OF 25 KGS/HA.

## TIMING

- PLANTING AND SEEDING SHOULD BE COMPLETED IN THE SPRING OR FALL. THE SPRING SEASON PLANTING WINDOW IS APRIL TO MID-MAY AND THE FALL SEASON WINDOW IS MID-SEPTEMBER TO LATE OCTOBER.
- THE ASSESSMENT OF PLANT STOCK SHOULD BE CONDUCTED UPON DELIVERY TO ENSURE THAT THE MATERIAL CONSISTS OF APPROPRIATE NATIVE SPECIES IN PROPER QUANTITIES.
- SEEDING SHOULD BE COMPLETED IMMEDIATELY AFTER THE PLANTING OF WOODY VEGETATION BUT NOT DURING DROUGHT-PRONE SUMMER MONTHS (TORONTO AND REGION CONSERVATION AUTHORITY, 2004).

## TENDING FOR RESTORATION PLANTINGS

- RESTORATION PLANTINGS WILL REQUIRE REGULAR WATERING TO FACILITATE THE ESTABLISHMENT OF YOUNG TREES, WHICH ARE TYPICALLY HIGHLY SUSCEPTIBLE TO WATER STRESS.
- AT A MINIMUM, WATERING SHOULD OCCUR WHEN TREES SHOW SIGNS OF STRESS AND DURING PERIODS OF NATURAL DROUGHT CONDITIONS (E.G. IF THERE IS LESS THAN 25 MM OF RAIN OVER A 30-DAY PERIOD DURING LATE SPRING TO THE END OF SUMMER).




**UTILITY NOTES:**

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**MULTIPLE RESIDENTIAL CONDO DEVELOPMENT**

12148 ALBION VAUGHAN ROAD, TOWN OF CALEDON

CONSULTANT:

MASONGSONG ASSOCIATES

7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.mawng.ca

CONSULTANT:

Palmer

CONSERVATION AUTHORITY:

TORONTO AND REGION Conservation for The Living City

5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600

TITLE:

**PHASE 3: RESTORATION**

| | | | | |
|---|---|---|---|---|
| DESIGN | W.A. | CHECKED | D.H. | CONTRACT No. 17-849 |
| SCALE | 1:500 | | | PLAN No. ESC-3 |
| DATE | JANUARY 2021 | | | |

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# Appendix B

## Hydraulic Anslysis (Masongsong, 2020)

MASONGSONG ASSOCIATES
ENGINEERING SUSTAINABLE FUTURES

25 Years of Excellence

# MEMORANDUM

**Date:** January 25, 2020 **MA-Project No**: 2017-849

**To:** Sameer Dhalla
Director, Development and Engineering Services
Toronto and Region Conservation Authority

**From:** David Hoover
Masongsong Associates Engineering Limited

**Subject:** Robinson Creek Channel Re-Alignment
12148 Albion Vaughan Road, Bolton
Town of Caledon, Ontario

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Masongsong Associates Engineering Limited (MAEL) has been retained by Aztec Restoration to prepare this technical memorandum in support of the channel re-alignment at Reach 1 of Robinson Creek, a tributary to the Humber River. The purpose of this memo is to identify the existing hydraulic conditions and to demonstrate how the proposed alignment will preserve and enhance the function of the watercourse to the satisfaction of the Toronto and Region Conservation Authority (TRCA).

The proposed re-alignment is located entirely within the property of 12148 Albion Vaughan Road and characterized by proposed site grading in support a new building. The requirement for this re-alignment was identified during the zoning by-law and site plan application process when it was discovered that the previous land use had significantly altered the site topography resulting in negative impacts to regulatory floodplain. Therefore, channel re-alignment is necessary to restore and enhance the function of the watercourse while supporting the proposed development.

The areas of concerns for Robinson Creek is identified as Reach 1 starting from River Station 2223.1 to River Station 2223.16. The lands tributary to this length of Robinson Creek is limited to the subject property.

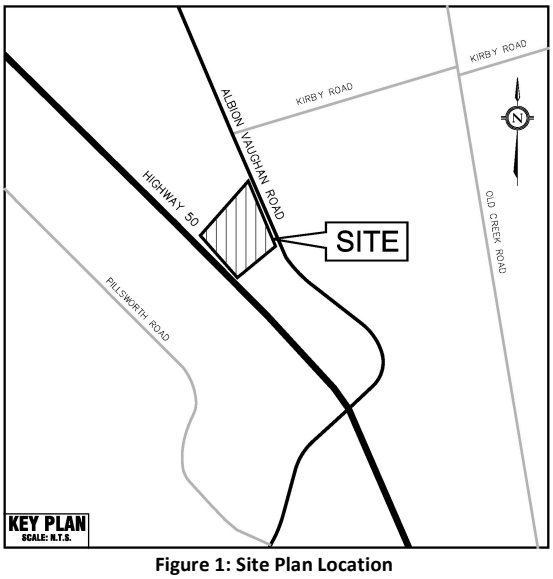

**Figure 1: Site Plan Location**

## 1. BACKGROUND

The subject property is approximately 1.3 ha (3.2 acres), bound by Highway 50 (a Peel Regional arterial roadway) to the west, and bound by Albion Vaughan Road (the designated "frontage") to the east. Directly to the north is existing rural residential and to the south is a commercial site with outdoor storage provisions. The legal description of the property is Part 1 of Lot 1, Concession 7 in the Town of Caledon. Refer to FIGURE 1 for the Site Plan Location.

## 2. HYDRAULIC MODELLING (GEOHEC-RAS) RESULTS

The hydraulic modelling results presented herein describes the channel hydraulics based on the details of the TRCA 2015 HEC RAS model, existing topography and site design where applicable. The following tasks were undertaken:

- Update the relevant cross sections for each modelling scenario based on available topographic data.
- Determine regulatory flood elevations for the pre-existing (PEX), existing (EX) and proposed (PR) scenarios
- Evaluate the results of the proposed (PR) channel re-alignment with the pre-existing (PEX) and existing (EX) scenarios

### METHODOLOGY

To achieve the modelling objectives described in the preceding section, the U.S. Army Corps of Engineers' River Analysis System (HEC-RAS) was utilized. HEC-RAS is designed to perform one-dimensional steady and unsteady flow river hydraulics calculations, sediment transport-mobile bed modelling, and water temperature analysis. The HEC-RAS software supersedes the HEC-2 river hydraulics package.

The modelling system calculates water surface profiles for steady gradually varied flow. The system can handle a full network of channels, a dendritic system, or a single river reach. The steady flow component is capable of modelling subcritical, supercritical, and mixed flow regime water surface profiles.

The basic computational procedure is based on the solution of the one-dimensional energy equation. Energy losses are evaluated by friction (Manning's equation) and contraction/expansion (coefficient multiplied by the change in velocity head). The momentum equation is utilized in situations where the water surface profile is rapidly varied. These situations include mixed flow regime calculations (i.e., hydraulic jumps), hydraulics of bridges, and evaluating profiles at river confluences (stream junctions).

This model has the ability to consider the effects of various obstructions, such as bridges, culverts, dams, weirs, and other structures in the floodplain on water levels. The steady flow system is designed for application in floodplain management, estimation of floodplain storage, and for assessing the change in water surface profiles due to channel modifications.

The model requires the following input:

- Channel geometry (low flow centerline profile and cross-sections; culvert crossing details);
- Manning’s roughness for main channel and overbank areas;
- Cumulative flow; and,
- Downstream boundary conditions.

## PRE-EXISTING CONDITIONS (PEX)

The Robinson Creek HEC-RAS was obtained from the TRCA and has been used to establish the original floodline conditions for our site, 12148 Albion Vaughan Road. The following outlines the measures taken when analyzing the pre-existing hydraulic model:

- Uses flow data from the provided TRCA HEC-RAS model (**Table 1**)

**Table 1: TRCA Flows**

| Storm Event | XS 2223.18 Flow ($m^3/s$) | XS2223.12 Flow ($m^3/s$) |
|---|---|---|
| 2-Year | 5.47 | 5.69 |
| 5-Year | 7.78 | 8.09 |
| 10-Year | 9.36 | 9.73 |
| 25-Year | 11.54 | 11.99 |
| 50-Year | 13.25 | 13.77 |
| 100-Year | 15.21 | 15.81 |
| Regional | 17.88 | 18.59 |

- Uses original geometry from the provided TRCA 2015 HEC-RAS model

The resultant water surface elevations (W.S.E.) for regulatory storm event in the pre-existing model are summarized in **Table 2**. The floodplain mapping complete with river station locations and flood line for this scenario can be found on **Drawing PEX**.

## EXISTING CONDITIONS (EX)

The existing condition model was established by updating the relevant cross sections of the Robinson Creek HEC-RAS obtained from the TRCA. The update is based on the data from a topographic survey of the existing grades which were found to be significantly altered from the original geometry in the pre-existing (PEX) scenario above. The following outlines the measures taken when analyzing the existing hydraulic model:

- Uses flow data from the provided TRCA 2015 HEC-RAS model (**Table 1**)
- Uses existing geometry and sections from the provided TRCA 2015 HEC-RAS model and then updated with the topographical survey (see below):

  - Section 2223.15
  - Section 2223.14
  - Section 2223.134
  - Section 2223.133
  - Section 2223.132
  - Section 2223.131
  - Section 2223.112
  - Section 2223.11

- Additional cross sections have been provided to increase the accuracy across the site (see below):

  - Section 2223.156
  - Section 2223.152

- Section 2223.148
- Section 2223.146
- Section 2223.145
- Section 2223.143
- Section 2223.141
- Section 2223.125

The resultant water surface elevations (W.S.E.) for regulatory storm event in the existing model are summarized in **Table 2**. The floodplain mapping complete with river station locations and flood line for this scenario can be found on **Drawing EX**.

### PROPOSED CONDITIONS (PR)

The proposed conditions model includes the projected grading for our site. The following outlines the measures taken when analyzing the proposed hydraulic model:

- Uses flow data from the provided TRCA 2013 HEC-RAS model (Table 1)
- Uses existing geometry from the Baseline Model HEC-RAS model with modifications which are as follows:
    - Section 2223.105 which represents a culvert structure has been removed from the model which as the existing culvert that serviced the driveway access is no longer required in the proposed condition.
- Uses existing geometry and sections from the provided TRCA 2015 HEC-RAS model and then updated with the proposed site grading design (see below):
    - Section 2223.15
    - Section 2223.14
    - Section 2223.134
    - Section 2223.133
    - Section 2223.132
    - Section 2223.131
    - Section 2223.112
    - Section 2223.11
- Additional cross sections have been provided to increase the accuracy across the site (see below):
    - Section 2223.156
    - Section 2223.152
    - Section 2223.148
    - Section 2223.146
    - Section 2223.145
    - Section 2223.143
    - Section 2223.141
    - Section 2223.125

The resultant water surface elevations (W.S.E.) for regulatory storm event in the proposed model are

summarized in **Table 2**. The floodplain mapping complete with river station locations and flood line for this scenario can be found on **Drawing PR**.

**Table 2: Regulatory W.S.E. For Various Scenarios**

| River Station | Regulatory W.S.E. (m) | | |
|---|---|---|---|
| | PEX | EX | PR |
| 2223.16 | 230.20 | 230.20 | 230.20 |
| 2223.156 | | 229.92 | 229.93 |
| 2223.152 | | 229.76 | 229.68 |
| 2223.15 | 229.60 | 229.80 | 229.36 |
| 2223.148 | | 229.78 | 229.33 |
| 2223.146 | | 229.79 | 229.32 |
| 2223.145 | | 229.79 | 229.32 |
| 2223.143 | | 229.78 | 229.31 |
| 2223.141 | | 229.77 | 229.19 |
| 2223.14 | 229.23 | 229.70 | 229.19 |
| 2223.134 | 229.20 | 229.56 | 229.01 |
| 2223.133 | 229.19 | 229.45 | 229.07 |
| 2223.132 | 229.18 | 229.44 | 229.07 |
| 2223.131 | 229.17 | 229.36 | 229.05 |
| 2223.13 | 229.09 | 228.87 | 229.02 |
| 2223.125 | | 228.84 | 228.98 |
| 2223.12 | 229.05 | 228.94 | 228.97 |
| 2223.11 | 228.69 | 228.68 | 228.97 |
| 2223.105 | CULVERT | CULVERT | REMOVED |
| 2223.1 | 228.44 | 228.41 | 228.94 |
| 2223.09 | 228.60 | 228.56 | 228.50 |
| 2223.08 | 227.91 | 227.88 | 228.05 |
| 2223.075 | CULVERT | CULVERT | CULVERT |
| 2223.07 | 227.73 | 227.71 | 227.71 |
| 2223.06 | 227.63 | 227.61 | 227.61 |
| 2223.05 | 226.71 | 226.69 | 226.69 |
| 2223.04 | 226.27 | 226.24 | 226.24 |
| 2223.03 | 226.00 | 225.99 | 225.99 |
| 2223.025 | CULVERT | CULVERT | CULVERT |
| 2223.02 | 225.61 | 225.61 | 225.61 |

## DISCUSSION

The regulatory water surface elevation for the pre-existing and the proposed condition is shown in **Table 3** below. The proposed channel re-alignment that only consists of site grading changes within the subject property restores and enhances the original (PEX) condition by significantly reducing the regulatory water surface elevation within this length of Robinson Creek

**Table 3: Regulatory W.S.E. For Various Scenarios**

| River Station | Regulatory W.S.E. (m) | | |
|---|---|---|---|
| | PEX | PR | Difference |
| 2223.16 | 230.20 | 230.20 | 0.00 |
| 2223.15 | 229.60 | 229.36 | -0.24 |
| 2223.14 | 229.23 | 229.19 | -0.04 |
| 2223.134 | 229.20 | 229.01 | -0.19 |
| 2223.133 | 229.19 | 229.07 | -0.12 |
| 2223.132 | 229.18 | 229.07 | -0.11 |
| 2223.131 | 229.17 | 228.05 | -0.12 |
| 2223.13 | 229.09 | 228.02 | -0.07 |
| 2223.12 | 229.05 | 228.97 | -0.08 |
| 2223.11 | 228.69 | 228.97 | 0.28 |
| 2223.105 | CULVERT | CULVERT REMOVED | - |
| 2223.1 | 228.44 | 228.94 | 0.50 |
| 2223.09 | 228.60 | 228.50 | -0.10 |
| 2223.08 | 227.91 | 228.05 | 0.14 |
| 2223.075 | CULVERT | CULVERT | - |
| 2223.07 | 227.73 | 227.71 | -0.02 |
| 2223.06 | 227.63 | 227.61 | -0.02 |
| 2223.05 | 226.71 | 226.69 | -0.02 |
| 2223.04 | 226.27 | 226.24 | -0.03 |
| 2223.03 | 226.00 | 225.99 | -0.01 |
| 2223.025 | CULVERT | CULVERT | - |
| 2223.02 | 225.61 | 225.61 | 0.00 |

Based on **Table 3** above, the water surface elevations increase under proposed conditions at Station 2223.14 and Station 2223.1, both outliers are clarified as follows:

**Station 2223.11** – The 0.28m increase in WSE is caused by different topographic data between the two conditions. Under the pre-existing condition, the channel is significantly wider at this cross section while the updated topographic survey under the proposed condition shows that this section and immediately upstream is steep and narrow. Therefore, the WSE in the pre-existing condition did not reflect actual ground conditions and does not provide an applicable comparison with the proposed model. Despite the 0.28m increase in WSE, the regulatory flood line is contained within the roadside ditch under the proposed condition as show in Drawing CP.

**Station 2223.1 & 2223.08** – The increase in WSE is the result of the removal of the culvert that was facilitating the existing driveway access. Under the pre-existing condition, the low WSE at this station is caused by the

culvert changing the flow regime from subcritical to super critical as the water passes the driveway access. The WSE at the following station is higher which demonstrates that the flows transition from supercritical back to subcritical flows. Under the proposed conditions, with the culvert removed, the WSE remains constant or is lowers than the subsequent stations which illustrate that there the flow is not constricted along the creek. Therefore, an increase is negligible given an the WSE reduction between 0.01m to 0.24m across the subject area of study including the stations immediately upstream and downstream.

In addition, the increase in WSE is also caused by different topographic data between the two conditions. Under the pre-existing conditions, the WSE is shown to spill onto Highway 50 at the approximate centerline elevation of 228.51m. In the proposed conditions, an updated topographic survey shows an approximate centerline elevation of 228.79m. The 0.28m centerline elevation difference prevents any overland spill to occur on Highway 50 which would result in an increase of WSE. Despite the increase in WSE, the regulatory flood line is contained within the roadside ditch under the proposed condition as show in Drawing CP.

With the outliers clarified, there is no actual impacts caused by the proposed channel re-alignment. The detailed HEC-RAS summary output can be found as attached. The existing and proposed HEC-RAS cross-sections can be found in the appendix.

## 3. CONCLUSIONS

In summary, the proposed channel re-alignment will reduce the floodplain on the subject property without having any negative impact to the upstream or downstream water surface elevation. The newly re-alignment channel will be designed using BMP and erosion mitigation measures to maintain the meander belt and prevent negative effects to infrastructure and property limits. Erosion and sediment control strategies are in place to perform the channel re-alignment and satisfy both TRCA and the local municipal criteria. Details for the mitigation measures and the erosion and sediment control strategies are provided in the design package prepared by Palmer.

I trust that this memorandum is complete and to the satisfaction of the TRCA. If you have any questions or concerns, please do not hesitate to contact the undersigned at 905-944-0162 ext. 230.

Respectfully Submitted,
**MASONGSONG ASSOCIATES ENGINEERING LIMITED**

David Hoover, P.Eng
*Senior Project Engineer*
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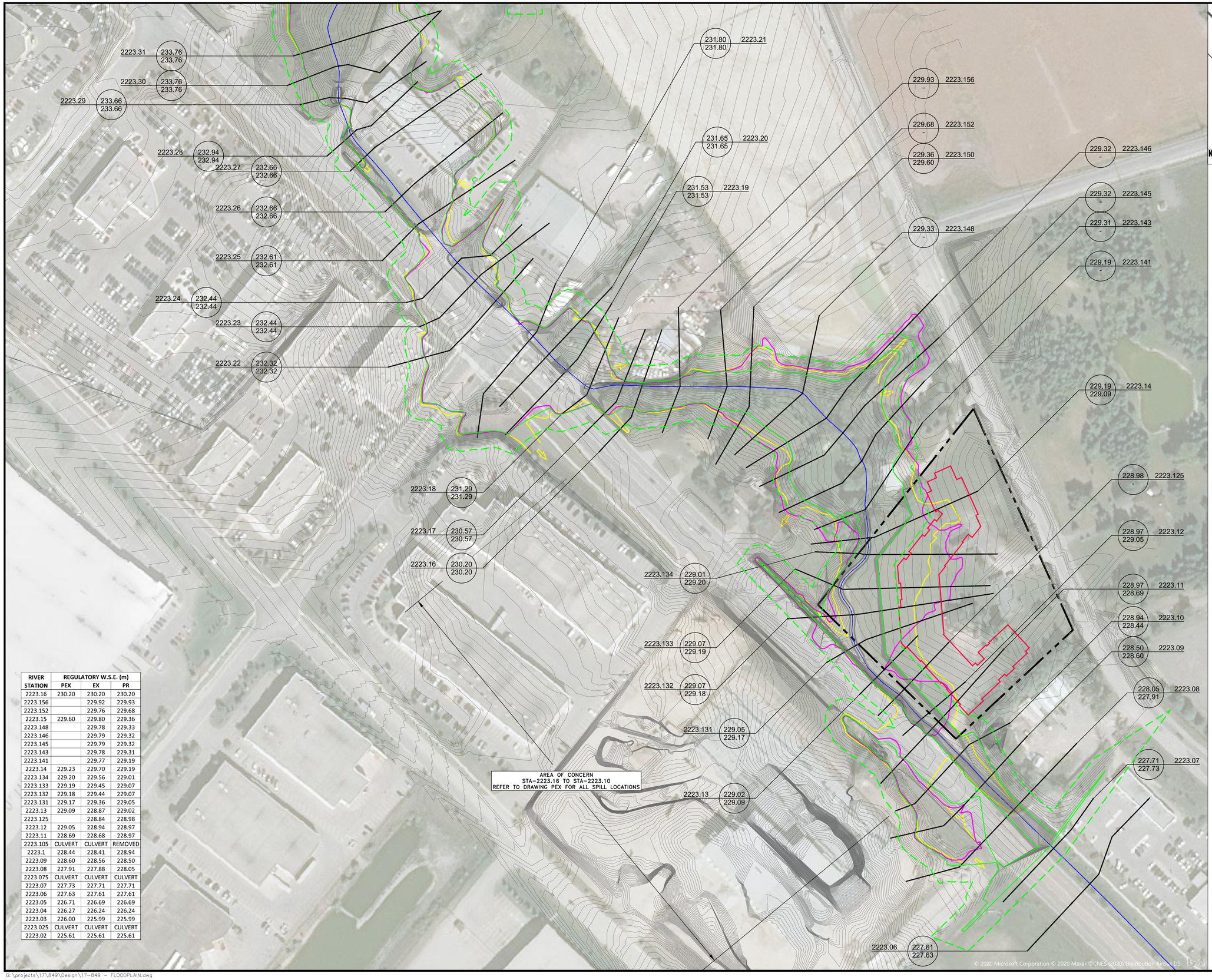
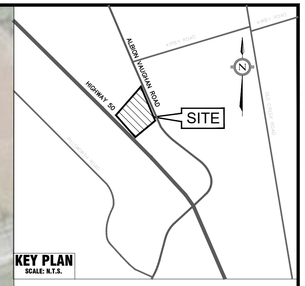
**Attachments:**
Pre-Existing Condition Plan (PEX)
Existing Condition Plan (EX)
Proposed Condition Plan (PR)
Composite Plan (CP)
Digital Model Output
Digital Modelling Files




KEY PLAN
SCALE: N.T.S.

LEGEND:

- PROPERTY LINE
- BUILDING OUTLINE
- RAINBOW CREEK CENTRELINE
- PRE-EXISTING REGULATORY FLOOD LINE (PEX)
- EXISTING REGULATORY FLOOD LINE (EX)
- PROPOSED REGULATORY FLOOD LINE (PR)
- REGULATORY FLOOD LINE SETBACK (10m)
- CROSS-SECTION LENGTH
- 249.50 MAJOR CONTOUR
- 249.50 MINOR CONTOUR
- PRE-EXISTING SPILL LOCATION

REGULATORY FLOOD ELEVATION (m)
128.77 / 128.77 — 2223.111
CROSS-SECTION STATION
PRE-EXISTING FLOOD ELEVATION
CROSS-SECTION LEADER LINE

| RIVER STATION | REGULATORY W.S.E. (m) | | |
|---|---|---|---|
| | PEX | EX | PR |
| 2223.16 | 230.20 | 230.20 | 230.20 |
| 2223.156 | | 229.92 | 229.93 |
| 2223.152 | | 229.76 | 229.68 |
| 2223.15 | 229.60 | 229.80 | 229.36 |
| 2223.148 | | 229.78 | 229.33 |
| 2223.146 | | 229.79 | 229.32 |
| 2223.145 | | 229.79 | 229.32 |
| 2223.143 | | 229.78 | 229.31 |
| 2223.141 | | 229.77 | 229.19 |
| 2223.14 | 229.23 | 229.70 | 229.19 |
| 2223.134 | 229.20 | 229.56 | 229.01 |
| 2223.133 | 229.19 | 229.45 | 229.07 |
| 2223.132 | 229.18 | 229.44 | 229.07 |
| 2223.131 | 229.17 | 229.36 | 229.05 |
| 2223.13 | 229.09 | 228.87 | 229.02 |
| 2223.125 | | 228.84 | 228.98 |
| 2223.12 | 229.05 | 228.94 | 228.97 |
| 2223.11 | 228.69 | 228.68 | 228.97 |
| 2223.105 | CULVERT | CULVERT | REMOVED |
| 2223.1 | 228.44 | 228.41 | 228.94 |
| 2223.09 | 228.60 | 228.56 | 228.50 |
| 2223.08 | 227.91 | 227.88 | 228.05 |
| 2223.075 | CULVERT | CULVERT | CULVERT |
| 2223.07 | 227.73 | 227.71 | 227.71 |
| 2223.06 | 227.63 | 227.61 | 227.61 |
| 2223.05 | 226.71 | 226.69 | 226.69 |
| 2223.04 | 226.27 | 226.24 | 226.24 |
| 2223.03 | 226.00 | 225.99 | 225.99 |
| 2223.025 | CULVERT | CULVERT | CULVERT |
| 2223.02 | 225.61 | 225.61 | 225.61 |

UTILITY NOTES:

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWING, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE

BENCHMARK

ELEVATIONS ARE REFERRED TO THE CITY OF BRAMPTON BENCHMARK No. 042010221, BEING A BRASS CAP IN CONCRETE APPROX. 21 m SOUTH OF CENTRELINE OF NASHVILLE ROAD AND 11 m EAST OF CENTRELINE OF REGIONAL ROAD 50, IN FRONT OF GAS STATION/COFFEE SHOP. HAVING AN ELEVATION OF 220.967 m.

| No. | DATE | REVISIONS | | |
|---|---|---|---|---|
| 1 | 21/01/25 | ISSUED TO TRCA | | D.H. |

STAMP:

STAMP:

PROJECT:

MULTIPLE RESIDENTIAL CONDO DEVELOPMENT

12148 ALBION VAUGHAN ROAD, TOWN OF CALEDON

CONSULTANT:

MASONGSONG ASSOCIATES

7800 KENNEDY ROAD
SUITE 201
MARKHAM, ONTARIO
L3R 5P2
T (905) 944-0162
www.msaeng.ca

CONSERVATION AUTHORITY:

TORONTO AND REGION Conservation
for The Living City
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600

TITLE:

COMPOSITE PLAN

| | | | | |
|---|---|---|---|---|
| DESIGN | W.A. | CHECKED | D.H. | CONTRACT No. 17-849 |
| SCALE | 1:1000 | | | PLAN No. CP |
| DATE | JANUARY 2021 | | | |

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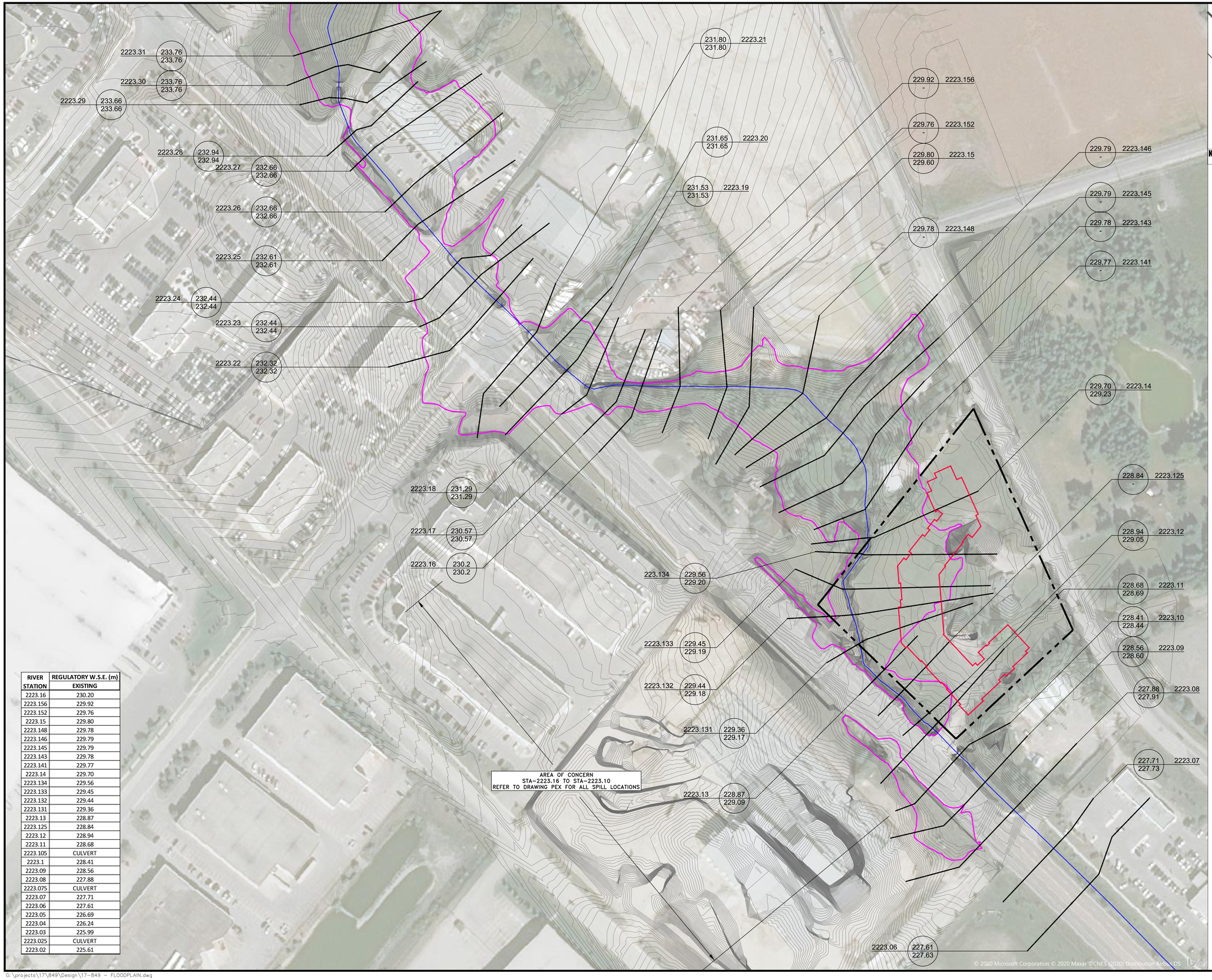
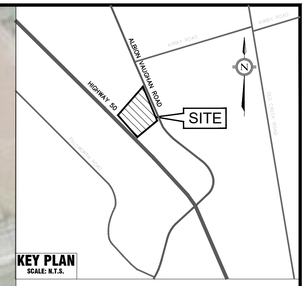



| RIVER STATION | REGULATORY W.S.E. (m) EXISTING |
|---|---|
| 2223.16 | 230.20 |
| 2223.156 | 229.92 |
| 2223.152 | 229.76 |
| 2223.15 | 229.80 |
| 2223.148 | 229.78 |
| 2223.146 | 229.79 |
| 2223.145 | 229.79 |
| 2223.143 | 229.78 |
| 2223.141 | 229.77 |
| 2223.14 | 229.70 |
| 2223.134 | 229.56 |
| 2223.133 | 229.45 |
| 2223.132 | 229.44 |
| 2223.131 | 229.36 |
| 2223.13 | 228.87 |
| 2223.125 | 228.84 |
| 2223.12 | 228.94 |
| 2223.11 | 228.68 |
| 2223.105 | CULVERT |
| 2223.1 | 228.41 |
| 2223.09 | 228.56 |
| 2223.08 | 227.88 |
| 2223.075 | CULVERT |
| 2223.07 | 227.71 |
| 2223.06 | 227.61 |
| 2223.05 | 226.69 |
| 2223.04 | 226.24 |
| 2223.03 | 225.99 |
| 2223.025 | CULVERT |
| 2223.02 | 225.61 |




KEY PLAN
SCALE: N.T.S.

LEGEND:
- PROPERTY LINE
- BUILDING OUTLINE
- RAINBOW CREEK CENTRELINE
- EXISTING REGULATORY FLOOD LINE (EX)
- CROSS-SECTION LENGTH
- 249.50 MAJOR CONTOUR
- 249.50 MINOR CONTOUR
- REGULATORY FLOOD ELEVATION (m)
- 128.77 / 128.77 2223.111 CROSS-SECTION STATION
- PRE-EXISTING FLOOD ELEVATION
- CROSS-SECTION LEADER LINE

UTILITY NOTES:

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|---|---|---|---|---|
| 1 | 21/01/25 | ISSUED TO TRCA | D.H. | |

STAMP:

STAMP:

PROJECT:
MULTIPLE RESIDENTIAL CONDO DEVELOPMENT
12148 ALBION VAUGHAN ROAD, TOWN OF CALEDON

CONSULTANT:
MASONGSONG ASSOCIATES
7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 0C7 T. (905) 944-0162 www.msaeng.ca

CONSERVATION AUTHORITY:
TORONTO AND REGION Conservation for The Living City
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600

TITLE:
EXISTING CONDITION

| DESIGN | W.A. | CHECKED | D.H. | CONTRACT No. 17-849 |
|---|---|---|---|---|
| SCALE | 1:1000 | | | PLAN No. EX |
| DATE | JANUARY 2021 | | | |

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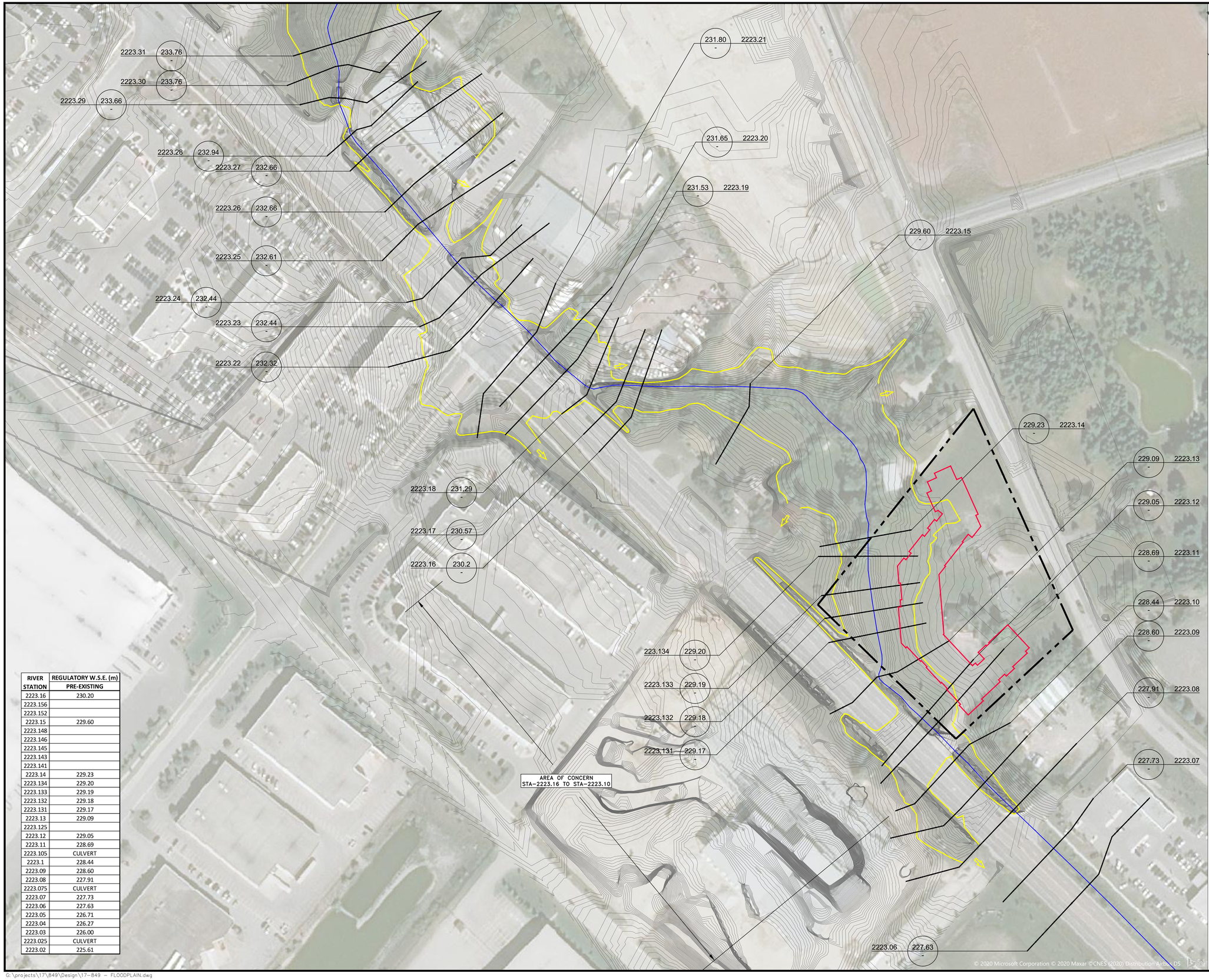


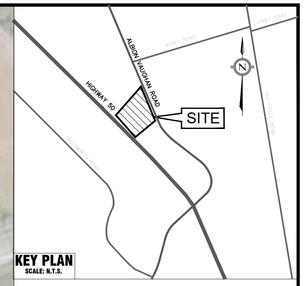


LEGEND:

- PROPERTY LINE
- BUILDING OUTLINE
- RAINBOW CREEK CENTRELINE
- PRE-EXISTING REGULATORY FLOOD LINE (PEX)
- CROSS-SECTION LENGTH
- 249.50 MAJOR CONTOUR
- 249.50 MINOR CONTOUR
- PRE-EXISTING SPILL LOCATION
- REGULATORY FLOOD ELEVATION (m)
- 128.77 - 2223.111 (CROSS-SECTION STATION)
- CROSS-SECTION LEADER LINE

| RIVER STATION | REGULATORY W.S.E. (m) PRE-EXISTING |
|---|---|
| 2223.16 | 230.20 |
| 2223.156 | |
| 2223.152 | |
| 2223.15 | 229.60 |
| 2223.148 | |
| 2223.146 | |
| 2223.145 | |
| 2223.143 | |
| 2223.141 | |
| 2223.14 | 229.23 |
| 2223.134 | 229.20 |
| 2223.133 | 229.19 |
| 2223.132 | 229.18 |
| 2223.131 | 229.17 |
| 2223.13 | 229.09 |
| 2223.125 | |
| 2223.12 | 229.05 |
| 2223.11 | 228.69 |
| 2223.105 | CULVERT |
| 2223.1 | 228.44 |
| 2223.09 | 228.60 |
| 2223.08 | 227.91 |
| 2223.075 | CULVERT |
| 2223.07 | 227.73 |
| 2223.06 | 227.63 |
| 2223.05 | 226.71 |
| 2223.04 | 226.27 |
| 2223.03 | 226.00 |
| 2223.025 | CULVERT |
| 2223.02 | 225.61 |

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BENCHMARK

ELEVATIONS ARE REFERRED TO THE CITY OF BRAMPTON BENCHMARK No. 042010221, BEING A BRASS CAP IN CONCRETE APPROX. 21 m SOUTH OF CENTRELINE OF NASHVILLE ROAD AND 11 m EAST OF CENTRELINE OF REGIONAL ROAD 50, IN FRONT OF GAS STATION/COFFEE SHOP. HAVING AN ELEVATION OF 220.967 m.

| No. | DATE | REVISIONS | | |
|---|---|---|---|---|
| 1 | 21/01/25 | ISSUED TO TRCA | D.H. | |

STAMP:

STAMP:

PROJECT:

MULTIPLE RESIDENTIAL CONDO DEVELOPMENT

12148 ALBION VAUGHAN ROAD, TOWN OF CALEDON

CONSULTANT:

MASONGSONG ASSOCIATES
7800 KENNEDY ROAD
SUITE 201
MARKHAM, ONTARIO
L3R 2C7
T. (905) 944-0162
www.msaeng.ca

CONSERVATION AUTHORITY:

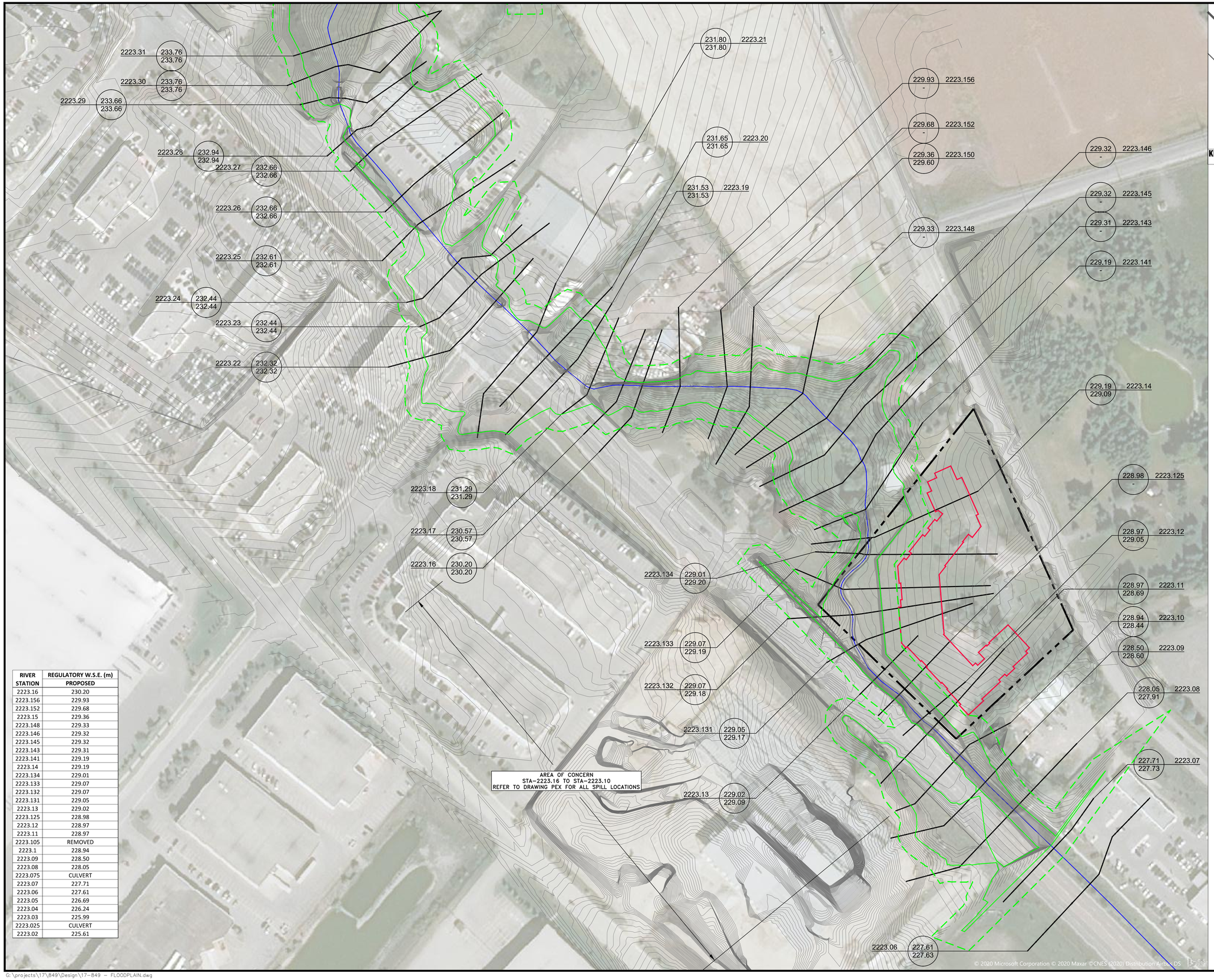
TORONTO AND REGION Conservation
for The Living City
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600

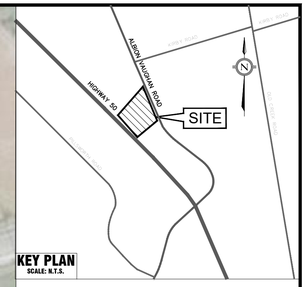
TITLE:

PRE-EXISTING CONDITION

| | | | | |
|---|---|---|---|---|
| DESIGN | W.A. | CHECKED | D.H. | CONTRACT No. 17-849 |
| SCALE | 1:1000 | | | PLAN No. PEX |
| DATE | JANUARY 2021 | | | |

G:\projects\17\849\Design\17-849 - FLOODPLAIN.dwg




LEGEND:

- PROPERTY LINE
- BUILDING OUTLINE
- RAINBOW CREEK CENTRELINE
- PROPOSED REGULATORY FLOOD LINE (PR)
- REGULATORY FLOOD LINE SETBACK (10m)
- CROSS-SECTION LENGTH
- 249.50 MAJOR CONTOUR
- 249.50 MINOR CONTOUR

128.77 / 128.77 — 2223.111
- REGULATORY FLOOD ELEVATION (m)
- CROSS-SECTION STATION
- PRE-EXISTING FLOOD ELEVATION
- CROSS-SECTION LEADER LINE

| RIVER STATION | REGULATORY W.S.E. (m) PROPOSED |
|---|---|
| 2223.16 | 230.20 |
| 2223.156 | 229.93 |
| 2223.152 | 229.68 |
| 2223.15 | 229.36 |
| 2223.148 | 229.33 |
| 2223.146 | 229.32 |
| 2223.145 | 229.32 |
| 2223.143 | 229.31 |
| 2223.141 | 229.19 |
| 2223.14 | 229.19 |
| 2223.134 | 229.01 |
| 2223.133 | 229.07 |
| 2223.132 | 229.07 |
| 2223.131 | 229.05 |
| 2223.13 | 229.02 |
| 2223.125 | 228.98 |
| 2223.12 | 228.97 |
| 2223.11 | 228.97 |
| 2223.105 | REMOVED |
| 2223.1 | 228.94 |
| 2223.09 | 228.50 |
| 2223.08 | 228.05 |
| 2223.075 | CULVERT |
| 2223.07 | 227.71 |
| 2223.06 | 227.61 |
| 2223.05 | 226.69 |
| 2223.04 | 226.24 |
| 2223.03 | 225.99 |
| 2223.025 | CULVERT |
| 2223.02 | 225.61 |

UTILITY NOTES:

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWING, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED BEFORE STARTING WORK. THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE

BENCHMARK

ELEVATIONS ARE REFERRED TO THE CITY OF BRAMPTON BENCHMARK No. 042010221, BEING A BRASS CAP IN CONCRETE APPROX. 21 m. SOUTH OF CENTRELINE OF NASHVILLE ROAD AND 11 m. EAST OF CENTRELINE OF REGIONAL ROAD 50, IN FRONT OF GAS STATION/COFFEE SHOP. HAVING AN ELEVATION OF 220.967 m.

| No. | DATE | REVISIONS | | |
|---|---|---|---|---|
| 1 | 21/01/25 | ISSUED TO TRCA | D.H. | |

STAMP:

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PROJECT:

MULTIPLE RESIDENTIAL CONDO DEVELOPMENT

12148 ALBION VAUGHAN ROAD, TOWN OF CALEDON

CONSULTANT:

MASONGSONG ASSOCIATES
7800 KENNEDY ROAD
SUITE 201
MARKHAM, ONTARIO
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www.msaeng.ca

CONSERVATION AUTHORITY:

TORONTO AND REGION Conservation
for The Living City
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600

TITLE:

PROPOSED CONDITION

| | | | | |
|---|---|---|---|---|
| DESIGN | W.A. | CHECKED | D.H. | CONTRACT No. 17-849 |
| SCALE | 1:1000 | | | PLAN No. PR |
| DATE | JANUARY 2021 | | | |

EX SCENARIO

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2224.08 | 2-Year | 1.98 | 242.9 | 243.41 | 243.29 | 243.44 | 0.004562 | 0.88 | 2.91 | 18.17 | 0.5 |
| REACH1 | 2224.08 | 5-Year | 2.82 | 242.9 | 243.46 | | 243.49 | 0.004518 | 0.95 | 3.78 | 18.28 | 0.5 |
| REACH1 | 2224.08 | 10-Year | 3.39 | 242.9 | 243.5 | | 243.53 | 0.003968 | 0.94 | 4.45 | 18.37 | 0.48 |
| REACH1 | 2224.08 | 25-Year | 4.27 | 242.9 | 243.55 | | 243.58 | 0.003333 | 0.93 | 5.45 | 19.67 | 0.45 |
| REACH1 | 2224.08 | 50-Year | 5.05 | 242.9 | 243.6 | | 243.63 | 0.002875 | 0.92 | 6.37 | 20.77 | 0.42 |
| REACH1 | 2224.08 | 100-Year | 5.73 | 242.9 | 243.64 | | 243.67 | 0.002465 | 0.9 | 7.28 | 22.68 | 0.4 |
| REACH1 | 2224.08 | Regional | 8.7 | 242.9 | 243.67 | 243.56 | 243.73 | 0.004438 | 1.26 | 7.93 | 24.01 | 0.54 |
| | | | | | | | | | | | | |
| REACH1 | 2224.07 | 2-Year | 1.98 | 241.78 | 242.28 | 242.25 | 242.42 | 0.011615 | 1.74 | 1.35 | 4.66 | 0.84 |
| REACH1 | 2224.07 | 5-Year | 2.82 | 241.78 | 242.39 | 242.35 | 242.54 | 0.009591 | 1.84 | 1.94 | 5.6 | 0.79 |
| REACH1 | 2224.07 | 10-Year | 3.39 | 241.78 | 242.43 | 242.41 | 242.61 | 0.010825 | 2.04 | 2.15 | 5.9 | 0.85 |
| REACH1 | 2224.07 | 25-Year | 4.27 | 241.78 | 242.47 | 242.47 | 242.7 | 0.012658 | 2.32 | 2.43 | 6.28 | 0.93 |
| REACH1 | 2224.07 | 50-Year | 5.05 | 241.78 | 242.51 | 242.49 | 242.79 | 0.014529 | 2.58 | 2.67 | 7.05 | 1 |
| REACH1 | 2224.07 | 100-Year | 5.73 | 241.78 | 242.53 | 242.49 | 242.88 | 0.016819 | 2.84 | 2.86 | 8.5 | 1.09 |
| REACH1 | 2224.07 | Regional | 8.7 | 241.78 | 242.82 | 242.82 | 242.96 | 0.005988 | 2.13 | 7.92 | 27.25 | 0.69 |
| | | | | | | | | | | | | |
| REACH1 | 2224.06 | 2-Year | 1.98 | 241.5 | 241.8 | 241.77 | 241.85 | 0.008564 | 1.05 | 2.18 | 14.02 | 0.67 |
| REACH1 | 2224.06 | 5-Year | 2.82 | 241.5 | 241.81 | 241.81 | 241.9 | 0.013985 | 1.38 | 2.36 | 14.59 | 0.86 |
| REACH1 | 2224.06 | 10-Year | 3.39 | 241.5 | 241.84 | 241.84 | 241.93 | 0.013364 | 1.44 | 2.74 | 15.75 | 0.86 |
| REACH1 | 2224.06 | 25-Year | 4.27 | 241.5 | 241.87 | 241.87 | 241.97 | 0.012868 | 1.52 | 3.29 | 17.27 | 0.85 |
| REACH1 | 2224.06 | 50-Year | 5.05 | 241.5 | 241.9 | 241.9 | 242 | 0.012577 | 1.58 | 3.75 | 18.44 | 0.86 |
| REACH1 | 2224.06 | 100-Year | 5.73 | 241.5 | 241.92 | 241.92 | 242.03 | 0.012292 | 1.62 | 4.15 | 19.41 | 0.85 |
| REACH1 | 2224.06 | Regional | 8.7 | 241.5 | 242 | 242 | 242.12 | 0.0115 | 1.78 | 5.79 | 22.98 | 0.85 |
| | | | | | | | | | | | | |
| REACH1 | 2224.05 | 2-Year | 1.98 | 241 | 241.55 | | 241.57 | 0.003705 | 0.87 | 5.85 | 55.85 | 0.45 |
| REACH1 | 2224.05 | 5-Year | 2.82 | 241 | 241.64 | | 241.65 | 0.001249 | 0.59 | 11.6 | 61.75 | 0.27 |
| REACH1 | 2224.05 | 10-Year | 3.39 | 241 | 241.66 | | 241.67 | 0.001428 | 0.65 | 12.57 | 62.93 | 0.29 |
| REACH1 | 2224.05 | 25-Year | 4.27 | 241 | 241.7 | | 241.7 | 0.001371 | 0.66 | 14.91 | 65.91 | 0.29 |
| REACH1 | 2224.05 | 50-Year | 5.05 | 241 | 241.73 | | 241.74 | 0.001275 | 0.67 | 17.11 | 69.14 | 0.28 |
| REACH1 | 2224.05 | 100-Year | 5.73 | 241 | 241.75 | | 241.76 | 0.001214 | 0.67 | 18.88 | 70.59 | 0.28 |
| REACH1 | 2224.05 | Regional | 8.7 | 241 | 241.81 | | 241.82 | 0.001559 | 0.81 | 22.8 | 73.55 | 0.32 |
| | | | | | | | | | | | | |
| REACH1 | 2224.04 | 2-Year | 1.98 | 240.5 | 241.56 | | 241.56 | 0.000003 | 0.04 | 52.64 | 116.46 | 0.01 |
| REACH1 | 2224.04 | 5-Year | 2.82 | 240.5 | 241.65 | | 241.65 | 0.000004 | 0.05 | 63.54 | 124.75 | 0.02 |
| REACH1 | 2224.04 | 10-Year | 3.39 | 240.5 | 241.66 | | 241.66 | 0.000005 | 0.06 | 65.53 | 126.21 | 0.02 |
| REACH1 | 2224.04 | 25-Year | 4.27 | 240.5 | 241.7 | | 241.7 | 0.000007 | 0.07 | 70.13 | 129.5 | 0.02 |
| REACH1 | 2224.04 | 50-Year | 5.05 | 240.5 | 241.73 | | 241.73 | 0.000008 | 0.08 | 74.32 | 132.43 | 0.03 |
| REACH1 | 2224.04 | 100-Year | 5.73 | 240.5 | 241.76 | | 241.76 | 0.00001 | 0.09 | 77.66 | 134.73 | 0.03 |
| REACH1 | 2224.04 | Regional | 8.7 | 240.5 | 241.81 | | 241.81 | 0.000019 | 0.13 | 85.12 | 139.65 | 0.04 |
| | | | | | | | | | | | | |
| REACH1 | 2224.03 | 2-Year | 1.98 | 240.5 | 241.56 | | 241.56 | 0.000002 | 0.04 | 60.33 | 71.7 | 0.01 |
| REACH1 | 2224.03 | 5-Year | 2.82 | 240.5 | 241.65 | | 241.65 | 0.000003 | 0.05 | 66.84 | 72.4 | 0.02 |
| REACH1 | 2224.03 | 10-Year | 3.39 | 240.5 | 241.66 | | 241.66 | 0.000005 | 0.06 | 67.99 | 72.52 | 0.02 |
| REACH1 | 2224.03 | 25-Year | 4.27 | 240.5 | 241.7 | | 241.7 | 0.000006 | 0.08 | 70.6 | 72.8 | 0.02 |
| REACH1 | 2224.03 | 50-Year | 5.05 | 240.5 | 241.73 | | 241.73 | 0.000008 | 0.09 | 73.01 | 90.59 | 0.03 |
| REACH1 | 2224.03 | 100-Year | 5.73 | 240.5 | 241.76 | | 241.76 | 0.00001 | 0.1 | 75.82 | 134.92 | 0.03 |
| REACH1 | 2224.03 | Regional | 8.7 | 240.5 | 241.81 | | 241.81 | 0.00002 | 0.15 | 84.82 | 179.97 | 0.04 |
| | | | | | | | | | | | | |
| REACH1 | 2224.02 | 2-Year | 1.98 | 240.27 | 241.53 | 241.06 | 241.55 | 0.002683 | 0.72 | 5.06 | 37.78 | 0.39 |
| REACH1 | 2224.02 | 5-Year | 2.82 | 240.27 | 241.63 | 241.45 | 241.64 | 0.001637 | 0.66 | 9.03 | 43.3 | 0.32 |
| REACH1 | 2224.02 | 10-Year | 3.39 | 240.27 | 241.64 | 241.48 | 241.66 | 0.002133 | 0.77 | 9.45 | 43.84 | 0.36 |
| REACH1 | 2224.02 | 25-Year | 4.27 | 240.27 | 241.67 | 241.49 | 241.69 | 0.00248 | 0.86 | 10.81 | 45.55 | 0.4 |
| REACH1 | 2224.02 | 50-Year | 5.05 | 240.27 | 241.7 | 241.56 | 241.72 | 0.00264 | 0.92 | 12.14 | 47.16 | 0.41 |
| REACH1 | 2224.02 | 100-Year | 5.73 | 240.27 | 241.71 | 241.58 | 241.74 | 0.003451 | 1.07 | 12.73 | 57.95 | 0.47 |
| REACH1 | 2224.02 | Regional | 8.7 | 240.27 | 241.7 | 241.65 | 241.78 | 0.007853 | 1.61 | 12.5 | 52.06 | 0.71 |
| | | | | | | | | | | | | |
| REACH1 | 2224.015 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2224.01 | 2-Year | 1.98 | 239.91 | 240.79 | 240.79 | 241.18 | 0.013816 | 2.77 | 0.71 | 13.22 | 1 |
| REACH1 | 2224.01 | 5-Year | 2.82 | 239.91 | 240.99 | 240.99 | 241.49 | 0.012828 | 3.12 | 0.9 | 70.95 | 1.01 |
| REACH1 | 2224.01 | 10-Year | 3.39 | 239.91 | 241.23 | 241.23 | 241.28 | 0.010802 | 1.32 | 7.66 | 88.28 | 0.75 |
| REACH1 | 2224.01 | 25-Year | 4.27 | 239.91 | 241.26 | 241.26 | 241.3 | 0.009856 | 1.33 | 9.9 | 95.37 | 0.73 |
| REACH1 | 2224.01 | 50-Year | 5.05 | 239.91 | 241.27 | 241.27 | 241.32 | 0.012063 | 1.49 | 10.46 | 96.03 | 0.81 |
| REACH1 | 2224.01 | 100-Year | 5.73 | 239.91 | 241.28 | 241.28 | 241.33 | 0.012156 | 1.53 | 11.57 | 97.66 | 0.82 |
| REACH1 | 2224.01 | Regional | 8.7 | 239.91 | 241.31 | 241.31 | 241.38 | 0.015296 | 1.82 | 14.68 | 101.35 | 0.93 |
| | | | | | | | | | | | | |
| REACH1 | 2223.56 | 2-Year | 2.46 | 239.85 | 240.63 | 240.63 | 240.69 | 0.007306 | 1.33 | 5.82 | 60.3 | 0.63 |
| REACH1 | 2223.56 | 5-Year | 3.5 | 239.85 | 240.66 | 240.66 | 240.73 | 0.00853 | 1.5 | 7.93 | 70.3 | 0.68 |
| REACH1 | 2223.56 | 10-Year | 4.21 | 239.85 | 240.68 | 240.68 | 240.74 | 0.008992 | 1.58 | 9.17 | 71.68 | 0.71 |
| REACH1 | 2223.56 | 25-Year | 5.3 | 239.85 | 240.7 | 240.7 | 240.77 | 0.00961 | 1.68 | 10.86 | 73.53 | 0.74 |
| REACH1 | 2223.56 | 50-Year | 6.27 | 239.85 | 240.72 | 240.72 | 240.79 | 0.010366 | 1.78 | 12.09 | 74.85 | 0.77 |
| REACH1 | 2223.56 | 100-Year | 7.11 | 239.85 | 240.74 | 240.74 | 240.8 | 0.009945 | 1.78 | 13.56 | 75.76 | 0.76 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.56 | Regional | 10.8 | 239.85 | 240.78 | 240.78 | 240.86 | 0.012559 | 2.11 | 16.96 | 77.17 | 0.86 |
| | | | | | | | | | | | | |
| REACH1 | 2223.55 | 2-Year | 2.46 | 239.56 | 240.53 | | 240.53 | 0.000055 | 0.18 | 28.7 | 89.38 | 0.07 |
| REACH1 | 2223.55 | 5-Year | 3.5 | 239.56 | 240.55 | | 240.55 | 0.000096 | 0.25 | 30.81 | 91 | 0.09 |
| REACH1 | 2223.55 | 10-Year | 4.21 | 239.56 | 240.56 | | 240.57 | 0.00013 | 0.29 | 31.77 | 91.74 | 0.1 |
| REACH1 | 2223.55 | 25-Year | 5.3 | 239.56 | 240.58 | | 240.59 | 0.000184 | 0.35 | 33.52 | 93.07 | 0.12 |
| REACH1 | 2223.55 | 50-Year | 6.27 | 239.56 | 240.59 | | 240.6 | 0.000237 | 0.4 | 34.8 | 94.03 | 0.14 |
| REACH1 | 2223.55 | 100-Year | 7.11 | 239.56 | 240.61 | | 240.61 | 0.000284 | 0.44 | 35.94 | 94.88 | 0.15 |
| REACH1 | 2223.55 | Regional | 10.8 | 239.56 | 240.65 | | 240.66 | 0.000509 | 0.61 | 40.21 | 97.98 | 0.2 |
| | | | | | | | | | | | | |
| REACH1 | 2223.54 | 2-Year | 2.46 | 239.55 | 240.52 | 240.44 | 240.52 | 0.003077 | 0.63 | 9.63 | 104.64 | 0.4 |
| REACH1 | 2223.54 | 5-Year | 3.5 | 239.55 | 240.54 | 240.46 | 240.55 | 0.003326 | 0.69 | 11.9 | 108.47 | 0.42 |
| REACH1 | 2223.54 | 10-Year | 4.21 | 239.55 | 240.54 | 240.48 | 240.56 | 0.00392 | 0.76 | 12.71 | 109.8 | 0.46 |
| REACH1 | 2223.54 | 25-Year | 5.3 | 239.55 | 240.56 | 240.51 | 240.57 | 0.003969 | 0.8 | 14.61 | 112.75 | 0.46 |
| REACH1 | 2223.54 | 50-Year | 6.27 | 239.55 | 240.57 | 240.52 | 240.59 | 0.00421 | 0.84 | 15.89 | 114.02 | 0.48 |
| REACH1 | 2223.54 | 100-Year | 7.11 | 239.55 | 240.58 | 240.53 | 240.6 | 0.004225 | 0.86 | 17.11 | 115.23 | 0.48 |
| REACH1 | 2223.54 | Regional | 10.8 | 239.55 | 240.62 | 240.56 | 240.64 | 0.00451 | 0.96 | 21.54 | 120.14 | 0.51 |
| | | | | | | | | | | | | |
| REACH1 | 2223.535 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.53 | 2-Year | 2.46 | 239.25 | 240.35 | 240.35 | 240.39 | 0.017504 | 1.23 | 4.77 | 51.88 | 0.88 |
| REACH1 | 2223.53 | 5-Year | 3.5 | 239.25 | 240.36 | 240.36 | 240.43 | 0.02665 | 1.57 | 5.34 | 52.68 | 1.1 |
| REACH1 | 2223.53 | 10-Year | 4.21 | 239.25 | 240.39 | 240.39 | 240.44 | 0.020291 | 1.49 | 6.84 | 55.2 | 0.98 |
| REACH1 | 2223.53 | 25-Year | 5.3 | 239.25 | 240.4 | 240.4 | 240.47 | 0.022717 | 1.65 | 7.83 | 57.61 | 1.05 |
| REACH1 | 2223.53 | 50-Year | 6.27 | 239.25 | 240.41 | 240.41 | 240.49 | 0.02635 | 1.83 | 8.39 | 58.2 | 1.13 |
| REACH1 | 2223.53 | 100-Year | 7.11 | 239.25 | 240.42 | 240.42 | 240.51 | 0.030899 | 2 | 8.67 | 58.5 | 1.23 |
| REACH1 | 2223.53 | Regional | 10.8 | 239.25 | 240.49 | 240.49 | 240.58 | 0.025569 | 2.12 | 13.26 | 75.24 | 1.16 |
| | | | | | | | | | | | | |
| REACH1 | 2223.52 | 2-Year | 2.46 | 239.15 | 239.84 | | 239.89 | 0.007794 | 1.19 | 4.14 | 24.71 | 0.65 |
| REACH1 | 2223.52 | 5-Year | 3.5 | 239.15 | 239.89 | | 239.95 | 0.008365 | 1.35 | 5.5 | 28.49 | 0.69 |
| REACH1 | 2223.52 | 10-Year | 4.21 | 239.15 | 239.97 | | 240.01 | 0.005596 | 1.23 | 7.74 | 33.94 | 0.58 |
| REACH1 | 2223.52 | 25-Year | 5.3 | 239.15 | 240.03 | | 240.08 | 0.004592 | 1.22 | 10.22 | 38.09 | 0.54 |
| REACH1 | 2223.52 | 50-Year | 6.27 | 239.15 | 240.09 | | 240.13 | 0.004002 | 1.22 | 12.32 | 40.37 | 0.51 |
| REACH1 | 2223.52 | 100-Year | 7.11 | 239.15 | 240.13 | | 240.17 | 0.003561 | 1.21 | 14.23 | 42.33 | 0.49 |
| REACH1 | 2223.52 | Regional | 10.8 | 239.15 | 240.31 | | 240.34 | 0.002607 | 1.22 | 22.16 | 49.73 | 0.43 |
| | | | | | | | | | | | | |
| REACH1 | 2223.51 | 2-Year | 2.46 | 238.75 | 239.42 | | 239.49 | 0.004433 | 1.23 | 2.61 | 8.97 | 0.54 |
| REACH1 | 2223.51 | 5-Year | 3.5 | 238.75 | 239.59 | | 239.64 | 0.00281 | 1.17 | 4.35 | 12.16 | 0.45 |
| REACH1 | 2223.51 | 10-Year | 4.21 | 238.75 | 239.57 | | 239.66 | 0.004545 | 1.46 | 4.14 | 11.86 | 0.56 |
| REACH1 | 2223.51 | 25-Year | 5.3 | 238.75 | 239.62 | | 239.73 | 0.005151 | 1.64 | 4.8 | 12.79 | 0.61 |
| REACH1 | 2223.51 | 50-Year | 6.27 | 238.75 | 239.66 | | 239.79 | 0.0057 | 1.79 | 5.32 | 13.47 | 0.65 |
| REACH1 | 2223.51 | 100-Year | 7.11 | 238.75 | 239.68 | 239.6 | 239.83 | 0.006509 | 1.94 | 5.61 | 13.84 | 0.69 |
| REACH1 | 2223.51 | Regional | 10.8 | 238.75 | 239.77 | 239.76 | 240.01 | 0.009466 | 2.51 | 6.87 | 15.41 | 0.85 |
| | | | | | | | | | | | | |
| REACH1 | 2223.5 | 2-Year | 2.46 | 238.52 | 239.44 | | 239.44 | 0.000087 | 0.25 | 22.26 | 38.66 | 0.08 |
| REACH1 | 2223.5 | 5-Year | 3.5 | 238.52 | 239.6 | | 239.6 | 0.00009 | 0.28 | 28.61 | 41.85 | 0.09 |
| REACH1 | 2223.5 | 10-Year | 4.21 | 238.52 | 239.59 | | 239.59 | 0.000135 | 0.34 | 28.18 | 41.65 | 0.11 |
| REACH1 | 2223.5 | 25-Year | 5.3 | 238.52 | 239.64 | | 239.65 | 0.000172 | 0.4 | 30.57 | 42.82 | 0.12 |
| REACH1 | 2223.5 | 50-Year | 6.27 | 238.52 | 239.69 | | 239.69 | 0.000206 | 0.45 | 32.41 | 43.71 | 0.13 |
| REACH1 | 2223.5 | 100-Year | 7.11 | 238.52 | 239.71 | | 239.72 | 0.000242 | 0.49 | 33.5 | 44.23 | 0.15 |
| REACH1 | 2223.5 | Regional | 10.8 | 238.52 | 239.81 | | 239.82 | 0.000393 | 0.66 | 38.14 | 46.36 | 0.19 |
| REACH1 | 2223.49 | 2-Year | 2.46 | 238.04 | 239.42 | 238.84 | 239.43 | 0.00119 | 0.75 | 9.06 | 38.5 | 0.29 |
| REACH1 | 2223.49 | 5-Year | 3.5 | 238.04 | 239.59 | 239.05 | 239.59 | 0.000618 | 0.63 | 15.88 | 42.53 | 0.22 |
| REACH1 | 2223.49 | 10-Year | 4.21 | 238.04 | 239.57 | 239.35 | 239.58 | 0.001013 | 0.79 | 15.11 | 42.06 | 0.28 |
| REACH1 | 2223.49 | 25-Year | 5.3 | 238.04 | 239.62 | 239.39 | 239.64 | 0.001113 | 0.87 | 17.44 | 43.46 | 0.29 |
| REACH1 | 2223.49 | 50-Year | 6.27 | 238.04 | 239.66 | 239.42 | 239.68 | 0.001211 | 0.93 | 19.22 | 44.49 | 0.31 |
| REACH1 | 2223.49 | 100-Year | 7.11 | 238.04 | 239.68 | 239.44 | 239.7 | 0.001369 | 1 | 20.18 | 45.04 | 0.33 |
| REACH1 | 2223.49 | Regional | 10.8 | 238.04 | 239.77 | 239.51 | 239.8 | 0.001914 | 1.26 | 24.39 | 47.37 | 0.39 |
| | | | | | | | | | | | | |
| REACH1 | 2223.485 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.48 | 2-Year | 2.46 | 237.92 | 238.84 | 238.84 | 239.25 | 0.015012 | 2.81 | 0.87 | 19.41 | 1.01 |
| REACH1 | 2223.48 | 5-Year | 3.5 | 237.92 | 239.05 | 239.05 | 239.56 | 0.014052 | 3.18 | 1.1 | 22.51 | 1.01 |
| REACH1 | 2223.48 | 10-Year | 4.21 | 237.92 | 239.29 | 239.29 | 239.38 | 0.009692 | 1.63 | 4.89 | 28.6 | 0.75 |
| REACH1 | 2223.48 | 25-Year | 5.3 | 237.92 | 239.32 | 239.32 | 239.42 | 0.010266 | 1.75 | 5.8 | 29.4 | 0.78 |
| REACH1 | 2223.48 | 50-Year | 6.27 | 237.92 | 239.36 | 239.36 | 239.45 | 0.009165 | 1.73 | 6.94 | 30.37 | 0.74 |
| REACH1 | 2223.48 | 100-Year | 7.11 | 237.92 | 239.36 | 239.36 | 239.48 | 0.010951 | 1.9 | 7.13 | 30.54 | 0.81 |
| REACH1 | 2223.48 | Regional | 10.8 | 237.92 | 239.45 | 239.45 | 239.58 | 0.010472 | 2.05 | 9.88 | 32.76 | 0.81 |
| | | | | | | | | | | | | |
| REACH1 | 2223.47 | 2-Year | 2.46 | 237.8 | 238.55 | | 238.55 | 0.000166 | 0.2 | 12.43 | 31.47 | 0.1 |
| REACH1 | 2223.47 | 5-Year | 3.5 | 237.8 | 238.61 | | 238.61 | 0.000209 | 0.24 | 14.39 | 31.75 | 0.12 |
| REACH1 | 2223.47 | 10-Year | 4.21 | 237.8 | 238.65 | | 238.65 | 0.000236 | 0.27 | 15.54 | 31.92 | 0.12 |
| REACH1 | 2223.47 | 25-Year | 5.3 | 237.8 | 238.69 | | 238.7 | 0.000279 | 0.31 | 17.02 | 32.13 | 0.14 |
| REACH1 | 2223.47 | 50-Year | 6.27 | 237.8 | 238.73 | | 238.73 | 0.000314 | 0.34 | 18.2 | 32.29 | 0.15 |
| REACH1 | 2223.47 | 100-Year | 7.11 | 237.8 | 238.77 | | 238.77 | 0.000328 | 0.37 | 19.41 | 32.46 | 0.15 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.47 | Regional | 10.8 | 237.8 | 238.83 | | 238.84 | 0.000552 | 0.5 | 21.41 | 32.74 | 0.2 |
| | | | | | | | | | | | | |
| REACH1 | 2223.46 | 2-Year | 2.46 | 237.57 | 238.54 | | 238.54 | 0.000047 | 0.19 | 28.54 | 44.13 | 0.06 |
| REACH1 | 2223.46 | 5-Year | 3.5 | 237.57 | 238.6 | | 238.6 | 0.000074 | 0.25 | 31.18 | 44.87 | 0.08 |
| REACH1 | 2223.46 | 10-Year | 4.21 | 237.57 | 238.64 | | 238.64 | 0.000093 | 0.28 | 32.73 | 45.31 | 0.09 |
| REACH1 | 2223.46 | 25-Year | 5.3 | 237.57 | 238.68 | | 238.68 | 0.000124 | 0.34 | 34.71 | 45.85 | 0.1 |
| REACH1 | 2223.46 | 50-Year | 6.27 | 237.57 | 238.71 | | 238.72 | 0.000153 | 0.38 | 36.29 | 46.28 | 0.11 |
| REACH1 | 2223.46 | 100-Year | 7.11 | 237.57 | 238.75 | | 238.75 | 0.000173 | 0.41 | 37.96 | 46.73 | 0.12 |
| REACH1 | 2223.46 | Regional | 10.8 | 237.57 | 238.8 | | 238.8 | 0.000339 | 0.6 | 40.17 | 47.32 | 0.17 |
| | | | | | | | | | | | | |
| REACH1 | 2223.45 | 2-Year | 4.24 | 237 | 238.54 | | 238.54 | 0.000108 | 0.38 | 30.73 | 34.87 | 0.1 |
| REACH1 | 2223.45 | 5-Year | 6.03 | 237 | 238.59 | | 238.59 | 0.000187 | 0.52 | 32.68 | 36.04 | 0.13 |
| REACH1 | 2223.45 | 10-Year | 7.26 | 237 | 238.62 | | 238.63 | 0.000249 | 0.6 | 33.8 | 36.67 | 0.15 |
| REACH1 | 2223.45 | 25-Year | 8.94 | 237 | 238.66 | | 238.67 | 0.000339 | 0.71 | 35.23 | 37.45 | 0.18 |
| REACH1 | 2223.45 | 50-Year | 10.27 | 237 | 238.69 | | 238.7 | 0.000412 | 0.8 | 36.37 | 38.06 | 0.2 |
| REACH1 | 2223.45 | 100-Year | 11.79 | 237 | 238.72 | | 238.73 | 0.0005 | 0.89 | 37.57 | 38.69 | 0.22 |
| REACH1 | 2223.45 | Regional | 13.84 | 237 | 238.76 | | 238.77 | 0.00062 | 1.01 | 39.17 | 43.32 | 0.24 |
| | | | | | | | | | | | | |
| REACH1 | 2223.44 | 2-Year | 4.24 | 236.3 | 238.53 | | 238.54 | 0.000052 | 0.25 | 27.53 | 28.51 | 0.06 |
| REACH1 | 2223.44 | 5-Year | 6.03 | 236.3 | 238.59 | | 238.59 | 0.000093 | 0.34 | 29.13 | 31.14 | 0.09 |
| REACH1 | 2223.44 | 10-Year | 7.26 | 236.3 | 238.62 | | 238.62 | 0.000124 | 0.4 | 30.36 | 49.73 | 0.1 |
| REACH1 | 2223.44 | 25-Year | 8.94 | 236.3 | 238.66 | | 238.66 | 0.00017 | 0.48 | 32.41 | 58.46 | 0.12 |
| REACH1 | 2223.44 | 50-Year | 10.27 | 236.3 | 238.69 | | 238.69 | 0.000204 | 0.53 | 34.22 | 62.97 | 0.13 |
| REACH1 | 2223.44 | 100-Year | 11.79 | 236.3 | 238.72 | | 238.73 | 0.000243 | 0.58 | 36.21 | 67.61 | 0.14 |
| REACH1 | 2223.44 | Regional | 13.84 | 236.3 | 238.76 | | 238.77 | 0.000293 | 0.65 | 38.91 | 73.42 | 0.16 |
| | | | | | | | | | | | | |
| REACH1 | 2223.43 | 2-Year | 4.24 | 236 | 236.96 | | 236.98 | 0.001029 | 0.59 | 7.19 | 13.67 | 0.26 |
| REACH1 | 2223.43 | 5-Year | 6.03 | 236 | 237.1 | | 237.12 | 0.00098 | 0.66 | 9.16 | 14.94 | 0.26 |
| REACH1 | 2223.43 | 10-Year | 7.26 | 236 | 237.18 | | 237.21 | 0.00095 | 0.71 | 10.43 | 15.57 | 0.26 |
| REACH1 | 2223.43 | 25-Year | 8.94 | 236 | 237.28 | | 237.31 | 0.00094 | 0.76 | 12 | 16.32 | 0.27 |
| REACH1 | 2223.43 | 50-Year | 10.27 | 236 | 237.35 | | 237.38 | 0.00095 | 0.81 | 13.12 | 16.83 | 0.27 |
| REACH1 | 2223.43 | 100-Year | 11.79 | 236 | 237.42 | | 237.45 | 0.000982 | 0.86 | 14.25 | 17.34 | 0.28 |
| REACH1 | 2223.43 | Regional | 13.84 | 236 | 237.49 | | 237.54 | 0.00104 | 0.93 | 15.61 | 17.92 | 0.29 |
| | | | | | | | | | | | | |
| REACH1 | 2223.42 | 2-Year | 4.24 | 236 | 236.96 | | 236.97 | 0.00032 | 0.41 | 12.04 | 22.8 | 0.15 |
| REACH1 | 2223.42 | 5-Year | 6.03 | 236 | 237.1 | | 237.11 | 0.000343 | 0.47 | 15.31 | 24.21 | 0.16 |
| REACH1 | 2223.42 | 10-Year | 7.26 | 236 | 237.18 | | 237.2 | 0.000355 | 0.51 | 17.36 | 24.8 | 0.17 |
| REACH1 | 2223.42 | 25-Year | 8.94 | 236 | 237.28 | | 237.3 | 0.000373 | 0.56 | 19.86 | 25.48 | 0.18 |
| REACH1 | 2223.42 | 50-Year | 10.27 | 236 | 237.35 | | 237.37 | 0.000391 | 0.6 | 21.62 | 25.95 | 0.18 |
| REACH1 | 2223.42 | 100-Year | 11.79 | 236 | 237.42 | | 237.44 | 0.000416 | 0.65 | 23.37 | 26.4 | 0.19 |
| REACH1 | 2223.42 | Regional | 13.84 | 236 | 237.5 | | 237.52 | 0.000454 | 0.7 | 25.44 | 26.97 | 0.2 |
| | | | | | | | | | | | | |
| REACH1 | 2223.41 | 2-Year | 4.24 | 236 | 236.96 | 236.16 | 236.97 | 0.000057 | 0.2 | 21.24 | 25.03 | 0.07 |
| REACH1 | 2223.41 | 5-Year | 6.03 | 236 | 237.1 | 236.21 | 237.1 | 0.000072 | 0.25 | 24.86 | 27.51 | 0.08 |
| REACH1 | 2223.41 | 10-Year | 7.26 | 236 | 237.19 | 236.23 | 237.19 | 0.000081 | 0.28 | 27.23 | 29.22 | 0.08 |
| REACH1 | 2223.41 | 25-Year | 8.94 | 236 | 237.29 | 236.27 | 237.29 | 0.000092 | 0.31 | 30.25 | 31.28 | 0.09 |
| REACH1 | 2223.41 | 50-Year | 10.27 | 236 | 237.35 | 236.3 | 237.36 | 0.0001 | 0.34 | 32.45 | 32.69 | 0.09 |
| REACH1 | 2223.41 | 100-Year | 11.79 | 236 | 237.42 | 236.32 | 237.43 | 0.000111 | 0.37 | 34.69 | 34.04 | 0.1 |
| REACH1 | 2223.41 | Regional | 13.84 | 236 | 237.5 | 236.36 | 237.51 | 0.000126 | 0.41 | 37.42 | 35.61 | 0.11 |
| | | | | | | | | | | | | |
| REACH1 | 2223.4 | 2-Year | 4.24 | 236 | 236.88 | 236.71 | 236.95 | 0.0048 | 1.23 | 3.58 | 8.63 | 0.55 |
| REACH1 | 2223.4 | 5-Year | 6.03 | 236 | 236.99 | 236.81 | 237.09 | 0.004862 | 1.42 | 4.62 | 9.92 | 0.58 |
| REACH1 | 2223.4 | 10-Year | 7.26 | 236 | 237.05 | 236.86 | 237.17 | 0.004992 | 1.53 | 5.35 | 13.11 | 0.59 |
| REACH1 | 2223.4 | 25-Year | 8.94 | 236 | 237.13 | 236.94 | 237.27 | 0.005128 | 1.67 | 6.56 | 19.02 | 0.61 |
| REACH1 | 2223.4 | 50-Year | 10.27 | 236 | 237.19 | 237 | 237.34 | 0.00514 | 1.76 | 7.85 | 25.61 | 0.62 |
| REACH1 | 2223.4 | 100-Year | 11.79 | 236 | 237.24 | 237.06 | 237.4 | 0.005224 | 1.85 | 9.38 | 32.26 | 0.63 |
| REACH1 | 2223.4 | Regional | 13.84 | 236 | 237.31 | 237.19 | 237.48 | 0.005104 | 1.92 | 12.05 | 42.57 | 0.63 |
| | | | | | | | | | | | | |
| REACH1 | 2223.39 | 2-Year | 4.24 | 235.68 | 236.29 | 236.29 | 236.48 | 0.017786 | 1.91 | 2.22 | 6.11 | 1.01 |
| REACH1 | 2223.39 | 5-Year | 6.03 | 235.68 | 236.4 | 236.4 | 236.62 | 0.017004 | 2.06 | 2.93 | 6.96 | 1.01 |
| REACH1 | 2223.39 | 10-Year | 7.26 | 235.68 | 236.47 | 236.47 | 236.7 | 0.016331 | 2.12 | 3.42 | 7.48 | 1 |
| REACH1 | 2223.39 | 25-Year | 8.94 | 235.68 | 236.54 | 236.54 | 236.8 | 0.015348 | 2.24 | 4.02 | 8.8 | 0.99 |
| REACH1 | 2223.39 | 50-Year | 10.27 | 235.68 | 236.6 | 236.6 | 236.87 | 0.014699 | 2.33 | 4.5 | 10.1 | 0.99 |
| REACH1 | 2223.39 | 100-Year | 11.79 | 235.68 | 236.66 | 236.66 | 236.95 | 0.013343 | 2.39 | 5.21 | 11.51 | 0.96 |
| REACH1 | 2223.39 | Regional | 13.84 | 235.68 | 236.74 | 236.74 | 237.05 | 0.012408 | 2.48 | 6.14 | 12.94 | 0.94 |
| | | | | | | | | | | | | |
| REACH1 | 2223.38 | 2-Year | 4.24 | 234.5 | 235.67 | | 235.72 | 0.001334 | 0.98 | 6.27 | 15.61 | 0.32 |
| REACH1 | 2223.38 | 5-Year | 6.03 | 234.5 | 235.91 | | 235.95 | 0.001029 | 1 | 11.22 | 26.1 | 0.29 |
| REACH1 | 2223.38 | 10-Year | 7.26 | 234.5 | 236.01 | | 236.05 | 0.001011 | 1.04 | 14.06 | 30.44 | 0.29 |
| REACH1 | 2223.38 | 25-Year | 8.94 | 234.5 | 236.05 | | 236.11 | 0.001318 | 1.21 | 15.3 | 31.87 | 0.34 |
| REACH1 | 2223.38 | 50-Year | 10.27 | 234.5 | 236.11 | | 236.17 | 0.001404 | 1.29 | 17.18 | 33.81 | 0.35 |
| REACH1 | 2223.38 | 100-Year | 11.79 | 234.5 | 236.14 | | 236.22 | 0.001665 | 1.43 | 18.39 | 37.1 | 0.38 |
| REACH1 | 2223.38 | Regional | 13.84 | 234.5 | 236.21 | | 236.29 | 0.001898 | 1.57 | 21.07 | 45.65 | 0.41 |
| | | | | | | | | | | | | |
| REACH1 | 2223.37 | 2-Year | 4.59 | 233.51 | 235.59 | 234.48 | 235.66 | 0.003026 | 1.15 | 5.1 | 16.53 | 0.44 |
| REACH1 | 2223.37 | 5-Year | 6.53 | 233.51 | 235.87 | 234.72 | 235.92 | 0.001517 | 1.02 | 10.14 | 19.56 | 0.33 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.37 | 10-Year | 7.85 | 233.51 | 235.97 | 234.87 | 236.02 | 0.001452 | 1.06 | 12.17 | 20.8 | 0.33 |
| REACH1 | 2223.37 | 25-Year | 9.68 | 233.51 | 235.99 | 235.07 | 236.06 | 0.002045 | 1.28 | 12.6 | 21.1 | 0.39 |
| REACH1 | 2223.37 | 50-Year | 11.11 | 233.51 | 236.02 | 235.22 | 236.11 | 0.00261 | 1.47 | 13.3 | 27.64 | 0.44 |
| REACH1 | 2223.37 | 100-Year | 12.75 | 233.51 | 236.03 | 235.75 | 236.14 | 0.003358 | 1.67 | 13.48 | 28.06 | 0.5 |
| REACH1 | 2223.37 | Regional | 14.97 | 233.51 | 236.06 | 235.82 | 236.2 | 0.004147 | 1.89 | 14.34 | 30.03 | 0.56 |
| | | | | | | | | | | | | |
| REACH1 | 2223.365 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.36 | 2-Year | 4.59 | 233.69 | 234.71 | 234.71 | 235.19 | 0.012752 | 3.09 | 1.49 | 7.84 | 1.01 |
| REACH1 | 2223.36 | 5-Year | 6.53 | 233.69 | 234.96 | 234.96 | 235.58 | 0.011788 | 3.47 | 1.88 | 9.06 | 1.01 |
| REACH1 | 2223.36 | 10-Year | 7.85 | 233.69 | 235.12 | 235.12 | 235.82 | 0.011302 | 3.69 | 2.13 | 11.85 | 1.01 |
| REACH1 | 2223.36 | 25-Year | 9.68 | 233.69 | 235.57 | 235.57 | 235.71 | 0.012159 | 1.79 | 6.27 | 27.22 | 0.85 |
| REACH1 | 2223.36 | 50-Year | 11.11 | 233.69 | 235.61 | 235.61 | 235.74 | 0.010727 | 1.77 | 7.37 | 30.98 | 0.81 |
| REACH1 | 2223.36 | 100-Year | 12.75 | 233.69 | 235.65 | 235.65 | 235.77 | 0.008845 | 1.71 | 8.95 | 37.82 | 0.75 |
| REACH1 | 2223.36 | Regional | 14.97 | 233.69 | 235.68 | 235.68 | 235.81 | 0.009478 | 1.83 | 9.94 | 41.35 | 0.78 |
| | | | | | | | | | | | | |
| REACH1 | 2223.35 | 2-Year | 4.59 | 233.5 | 234.13 | 234.13 | 234.35 | 0.015939 | 2.06 | 2.27 | 5.86 | 0.99 |
| REACH1 | 2223.35 | 5-Year | 6.53 | 233.5 | 234.25 | 234.25 | 234.51 | 0.014395 | 2.3 | 3.02 | 6.66 | 0.98 |
| REACH1 | 2223.35 | 10-Year | 7.85 | 233.5 | 234.32 | 234.32 | 234.62 | 0.013593 | 2.42 | 3.53 | 7.17 | 0.97 |
| REACH1 | 2223.35 | 25-Year | 9.68 | 233.5 | 234.42 | 234.42 | 234.74 | 0.012804 | 2.58 | 4.23 | 7.8 | 0.96 |
| REACH1 | 2223.35 | 50-Year | 11.11 | 233.5 | 234.49 | 234.49 | 234.84 | 0.012186 | 2.67 | 4.8 | 8.27 | 0.95 |
| REACH1 | 2223.35 | 100-Year | 12.75 | 233.5 | 234.56 | 234.56 | 234.94 | 0.011798 | 2.79 | 5.41 | 8.73 | 0.95 |
| REACH1 | 2223.35 | Regional | 14.97 | 233.5 | 234.66 | 234.66 | 235.06 | 0.011132 | 2.91 | 6.29 | 9.35 | 0.94 |
| REACH1 | 2223.34 | 2-Year | 4.59 | 233 | 233.71 | 233.52 | 233.76 | 0.003364 | 1.14 | 6.78 | 26.16 | 0.48 |
| REACH1 | 2223.34 | 5-Year | 6.53 | 233 | 233.77 | 233.63 | 233.85 | 0.004359 | 1.39 | 8.55 | 30.44 | 0.55 |
| REACH1 | 2223.34 | 10-Year | 7.85 | 233 | 233.69 | 233.69 | 233.87 | 0.011005 | 2.02 | 6.39 | 25.13 | 0.86 |
| REACH1 | 2223.34 | 25-Year | 9.68 | 233 | 233.76 | 233.76 | 233.94 | 0.010433 | 2.12 | 8.18 | 29.6 | 0.85 |
| REACH1 | 2223.34 | 50-Year | 11.11 | 233 | 233.8 | 233.8 | 233.99 | 0.010083 | 2.18 | 9.6 | 32.71 | 0.85 |
| REACH1 | 2223.34 | 100-Year | 12.75 | 233 | 233.85 | 233.85 | 234.04 | 0.009996 | 2.26 | 11.09 | 35.7 | 0.85 |
| REACH1 | 2223.34 | Regional | 14.97 | 233 | 233.92 | 233.9 | 234.1 | 0.008708 | 2.26 | 13.95 | 40.83 | 0.81 |
| | | | | | | | | | | | | |
| REACH1 | 2223.33 | 2-Year | 4.59 | 232.5 | 232.96 | 232.96 | 233.1 | 0.019521 | 1.62 | 2.83 | 10.84 | 1.01 |
| REACH1 | 2223.33 | 5-Year | 6.53 | 232.5 | 233.09 | 233.04 | 233.2 | 0.010962 | 1.52 | 4.6 | 16.97 | 0.8 |
| REACH1 | 2223.33 | 10-Year | 7.85 | 232.5 | 233.36 | | 233.41 | 0.002106 | 0.97 | 10.27 | 23.79 | 0.39 |
| REACH1 | 2223.33 | 25-Year | 9.68 | 232.5 | 233.55 | | 233.58 | 0.00125 | 0.89 | 15.08 | 28.06 | 0.31 |
| REACH1 | 2223.33 | 50-Year | 11.11 | 232.5 | 233.64 | | 233.68 | 0.001098 | 0.89 | 17.77 | 30.27 | 0.3 |
| REACH1 | 2223.33 | 100-Year | 12.75 | 232.5 | 233.69 | | 233.73 | 0.0012 | 0.96 | 19.17 | 31.36 | 0.31 |
| REACH1 | 2223.33 | Regional | 14.97 | 232.5 | 233.76 | | 233.81 | 0.001229 | 1.02 | 21.65 | 33.3 | 0.32 |
| | | | | | | | | | | | | |
| REACH1 | 2223.326 | 2-Year | 4.59 | 232 | 232.78 | | 232.79 | 0.000292 | 0.35 | 19.4 | 43.93 | 0.14 |
| REACH1 | 2223.326 | 5-Year | 6.53 | 232 | 233.12 | | 233.13 | 0.000111 | 0.29 | 35.8 | 51.38 | 0.1 |
| REACH1 | 2223.326 | 10-Year | 7.85 | 232 | 233.37 | | 233.37 | 0.000071 | 0.27 | 53.09 | 77.09 | 0.08 |
| REACH1 | 2223.326 | 25-Year | 9.68 | 232 | 233.55 | | 233.56 | 0.000058 | 0.27 | 67.59 | 79.84 | 0.07 |
| REACH1 | 2223.326 | 50-Year | 11.11 | 232 | 233.65 | | 233.65 | 0.000058 | 0.28 | 74.99 | 80.79 | 0.07 |
| REACH1 | 2223.326 | 100-Year | 12.75 | 232 | 233.69 | | 233.7 | 0.000067 | 0.31 | 78.76 | 81.28 | 0.08 |
| REACH1 | 2223.326 | Regional | 14.97 | 232 | 233.77 | | 233.77 | 0.000074 | 0.34 | 85.11 | 82.08 | 0.08 |
| | | | | | | | | | | | | |
| REACH1 | 2223.325 | 2-Year | 4.59 | 231.99 | 232.77 | 232.34 | 232.78 | 0.000369 | 0.39 | 15.35 | 30.57 | 0.16 |
| REACH1 | 2223.325 | 5-Year | 6.53 | 231.99 | 233.12 | 232.4 | 233.13 | 0.000165 | 0.36 | 29.27 | 56.97 | 0.12 |
| REACH1 | 2223.325 | 10-Year | 7.85 | 231.99 | 233.37 | 232.43 | 233.37 | 0.000089 | 0.31 | 43.83 | 60.2 | 0.09 |
| REACH1 | 2223.325 | 25-Year | 9.68 | 231.99 | 233.55 | 232.46 | 233.56 | 0.000075 | 0.31 | 55.13 | 62.59 | 0.08 |
| REACH1 | 2223.325 | 50-Year | 11.11 | 231.99 | 233.65 | 232.5 | 233.65 | 0.000076 | 0.32 | 60.96 | 64.4 | 0.08 |
| REACH1 | 2223.325 | 100-Year | 12.75 | 231.99 | 233.69 | 232.52 | 233.7 | 0.000088 | 0.36 | 63.95 | 65.52 | 0.09 |
| REACH1 | 2223.325 | Regional | 14.97 | 231.99 | 233.77 | 232.56 | 233.77 | 0.0001 | 0.39 | 69.1 | 67.39 | 0.1 |
| | | | | | | | | | | | | |
| REACH1 | 2223.324 | 2-Year | 4.59 | 231.98 | 232.77 | 232.28 | 232.78 | 0.00016 | 0.27 | 18.72 | 34.64 | 0.11 |
| REACH1 | 2223.324 | 5-Year | 6.53 | 231.98 | 233.12 | 232.32 | 233.12 | 0.000072 | 0.24 | 31.76 | 40.66 | 0.08 |
| REACH1 | 2223.324 | 10-Year | 7.85 | 231.98 | 233.37 | 232.35 | 233.37 | 0.000047 | 0.22 | 44.96 | 60.48 | 0.06 |
| REACH1 | 2223.324 | 25-Year | 9.68 | 231.98 | 233.55 | 232.38 | 233.56 | 0.000042 | 0.23 | 56.19 | 61.57 | 0.06 |
| REACH1 | 2223.324 | 50-Year | 11.11 | 231.98 | 233.65 | 232.4 | 233.65 | 0.000043 | 0.25 | 61.88 | 62.12 | 0.06 |
| REACH1 | 2223.324 | 100-Year | 12.75 | 231.98 | 233.69 | 232.43 | 233.69 | 0.000051 | 0.27 | 64.76 | 63.12 | 0.07 |
| REACH1 | 2223.324 | Regional | 14.97 | 231.98 | 233.77 | 232.46 | 233.77 | 0.000058 | 0.3 | 69.72 | 64.95 | 0.08 |
| | | | | | | | | | | | | |
| REACH1 | 2223.323 | 2-Year | 4.59 | 231.92 | 232.77 | | 232.78 | 0.000118 | 0.24 | 20.98 | 36.64 | 0.09 |
| REACH1 | 2223.323 | 5-Year | 6.53 | 231.92 | 233.12 | | 233.12 | 0.000056 | 0.22 | 34.73 | 42.61 | 0.07 |
| REACH1 | 2223.323 | 10-Year | 7.85 | 231.92 | 233.37 | | 233.37 | 0.000038 | 0.21 | 45.84 | 47.67 | 0.06 |
| REACH1 | 2223.323 | 25-Year | 9.68 | 231.92 | 233.55 | | 233.56 | 0.000036 | 0.22 | 55.59 | 58.37 | 0.06 |
| REACH1 | 2223.323 | 50-Year | 11.11 | 231.92 | 233.64 | | 233.65 | 0.000038 | 0.24 | 61.16 | 61.63 | 0.06 |
| REACH1 | 2223.323 | 100-Year | 12.75 | 231.92 | 233.69 | | 233.69 | 0.000045 | 0.26 | 64.01 | 62.16 | 0.07 |
| REACH1 | 2223.323 | Regional | 14.97 | 231.92 | 233.77 | | 233.77 | 0.000052 | 0.29 | 68.85 | 63.06 | 0.07 |
| | | | | | | | | | | | | |
| REACH1 | 2223.32 | 2-Year | 4.59 | 231.67 | 232.76 | | 232.77 | 0.000271 | 0.41 | 17.35 | 31.93 | 0.14 |
| REACH1 | 2223.32 | 5-Year | 6.53 | 231.67 | 233.11 | | 233.12 | 0.000139 | 0.38 | 29.45 | 37.12 | 0.11 |
| REACH1 | 2223.32 | 10-Year | 7.85 | 231.67 | 233.36 | | 233.37 | 0.000096 | 0.35 | 39.21 | 41.06 | 0.09 |
| REACH1 | 2223.32 | 25-Year | 9.68 | 231.67 | 233.55 | | 233.55 | 0.000091 | 0.37 | 47.02 | 44.18 | 0.09 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.32 | 50-Year | 11.11 | 231.67 | 233.64 | | 233.65 | 0.000098 | 0.4 | 51.16 | 46.26 | 0.1 |
| REACH1 | 2223.32 | 100-Year | 12.75 | 231.67 | 233.68 | | 233.69 | 0.000117 | 0.45 | 53.26 | 47.25 | 0.11 |
| REACH1 | 2223.32 | Regional | 14.97 | 231.67 | 233.76 | | 233.77 | 0.000137 | 0.5 | 56.93 | 49.78 | 0.12 |
| | | | | | | | | | | | | |
| REACH1 | 2223.31 | 2-Year | 4.59 | 231.5 | 232.76 | | 232.76 | 0.000061 | 0.23 | 29.18 | 38.27 | 0.07 |
| REACH1 | 2223.31 | 5-Year | 6.53 | 231.5 | 233.11 | | 233.11 | 0.000042 | 0.23 | 43.3 | 42.24 | 0.06 |
| REACH1 | 2223.31 | 10-Year | 7.85 | 231.5 | 233.36 | | 233.36 | 0.000033 | 0.23 | 54.85 | 56.2 | 0.06 |
| REACH1 | 2223.31 | 25-Year | 9.68 | 231.5 | 233.55 | | 233.55 | 0.000032 | 0.24 | 65.77 | 62.03 | 0.06 |
| REACH1 | 2223.31 | 50-Year | 11.11 | 231.5 | 233.64 | | 233.64 | 0.000034 | 0.26 | 71.59 | 64.84 | 0.06 |
| REACH1 | 2223.31 | 100-Year | 12.75 | 231.5 | 233.68 | | 233.69 | 0.00004 | 0.29 | 74.51 | 66.06 | 0.06 |
| REACH1 | 2223.31 | Regional | 14.97 | 231.5 | 233.76 | | 233.76 | 0.000047 | 0.32 | 79.6 | 68.01 | 0.07 |
| | | | | | | | | | | | | |
| REACH1 | 2223.3 | 2-Year | 4.59 | 231.5 | 232.76 | | 232.76 | 0.000169 | 0.42 | 28.32 | 49.64 | 0.12 |
| REACH1 | 2223.3 | 5-Year | 6.53 | 231.5 | 233.11 | | 233.11 | 0.000075 | 0.33 | 48.42 | 60.94 | 0.09 |
| REACH1 | 2223.3 | 10-Year | 7.85 | 231.5 | 233.36 | | 233.36 | 0.000045 | 0.28 | 64.45 | 66.72 | 0.07 |
| REACH1 | 2223.3 | 25-Year | 9.68 | 231.5 | 233.55 | | 233.55 | 0.00004 | 0.28 | 77.15 | 71.48 | 0.06 |
| REACH1 | 2223.3 | 50-Year | 11.11 | 231.5 | 233.64 | | 233.64 | 0.000041 | 0.3 | 83.84 | 74.62 | 0.07 |
| REACH1 | 2223.3 | 100-Year | 12.75 | 231.5 | 233.68 | | 233.68 | 0.000048 | 0.32 | 87.21 | 76.15 | 0.07 |
| REACH1 | 2223.3 | Regional | 14.97 | 231.5 | 233.76 | | 233.76 | 0.000054 | 0.35 | 93.09 | 78.75 | 0.08 |
| | | | | | | | | | | | | |
| REACH1 | 2223.29 | 2-Year | 4.59 | 231.5 | 232.61 | 232.16 | 232.72 | 0.002545 | 1.44 | 3.18 | 19.17 | 0.45 |
| REACH1 | 2223.29 | 5-Year | 6.53 | 231.5 | 232.95 | 232.33 | 233.07 | 0.002096 | 1.57 | 4.16 | 21.96 | 0.42 |
| REACH1 | 2223.29 | 10-Year | 7.85 | 231.5 | 233.19 | 232.43 | 233.32 | 0.001778 | 1.61 | 4.88 | 31.69 | 0.4 |
| REACH1 | 2223.29 | 25-Year | 9.68 | 231.5 | 233.32 | 232.57 | 233.49 | 0.002089 | 1.84 | 5.27 | 34.3 | 0.44 |
| REACH1 | 2223.29 | 50-Year | 11.11 | 231.5 | 233.35 | 232.67 | 233.57 | 0.003625 | 2.07 | 5.52 | 34.9 | 0.55 |
| REACH1 | 2223.29 | 100-Year | 12.75 | 231.5 | 233.51 | 232.78 | 233.64 | 0.002355 | 1.78 | 10.95 | 37.05 | 0.45 |
| REACH1 | 2223.29 | Regional | 14.97 | 231.5 | 233.66 | 232.91 | 233.74 | 0.001446 | 1.48 | 16.92 | 41.9 | 0.36 |
| | | | | | | | | | | | | |
| REACH1 | 2223.285 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.28 | 2-Year | 4.59 | 231.5 | 232.17 | 232.17 | 232.49 | 0.014757 | 2.52 | 1.82 | 29.02 | 1.01 |
| REACH1 | 2223.28 | 5-Year | 6.53 | 231.5 | 232.34 | 232.34 | 232.75 | 0.01367 | 2.84 | 2.3 | 31.38 | 1.01 |
| REACH1 | 2223.28 | 10-Year | 7.85 | 231.5 | 232.45 | 232.45 | 232.91 | 0.0131 | 3.01 | 2.6 | 32.16 | 1.01 |
| REACH1 | 2223.28 | 25-Year | 9.68 | 231.5 | 232.58 | 232.58 | 233.12 | 0.012531 | 3.23 | 2.99 | 32.68 | 1.01 |
| REACH1 | 2223.28 | 50-Year | 11.11 | 231.5 | 232.69 | 232.69 | 233.27 | 0.012098 | 3.38 | 3.29 | 33.16 | 1 |
| REACH1 | 2223.28 | 100-Year | 12.75 | 231.5 | 232.8 | 232.8 | 233.44 | 0.011764 | 3.54 | 3.6 | 33.67 | 1.01 |
| REACH1 | 2223.28 | Regional | 14.97 | 231.5 | 232.94 | 232.94 | 233.65 | 0.011224 | 3.73 | 4.02 | 34.37 | 1 |
| | | | | | | | | | | | | |
| REACH1 | 2223.27 | 2-Year | 4.59 | 231.1 | 231.85 | 231.75 | 231.88 | 0.00239 | 0.94 | 6.55 | 34.94 | 0.4 |
| REACH1 | 2223.27 | 5-Year | 6.53 | 231.1 | 231.91 | 231.8 | 231.95 | 0.002651 | 1.05 | 7.95 | 37.15 | 0.42 |
| REACH1 | 2223.27 | 10-Year | 7.85 | 231.1 | 231.93 | 231.84 | 231.97 | 0.003199 | 1.18 | 8.42 | 37.6 | 0.47 |
| REACH1 | 2223.27 | 25-Year | 9.68 | 231.1 | 232.18 | 231.87 | 232.2 | 0.000732 | 0.7 | 15.34 | 44.28 | 0.24 |
| REACH1 | 2223.27 | 50-Year | 11.11 | 231.1 | 232.3 | 231.89 | 232.32 | 0.000525 | 0.65 | 18.56 | 46.95 | 0.2 |
| REACH1 | 2223.27 | 100-Year | 12.75 | 231.1 | 232.45 | 231.91 | 232.46 | 0.000362 | 0.59 | 22.75 | 49.96 | 0.17 |
| REACH1 | 2223.27 | Regional | 14.97 | 231.1 | 232.66 | 231.94 | 232.68 | 0.000235 | 0.53 | 28.9 | 54.15 | 0.14 |
| | | | | | | | | | | | | |
| REACH1 | 2223.26 | 2-Year | 4.59 | 231 | 231.67 | 231.67 | 231.75 | 0.0069 | 1.48 | 4.62 | 32.19 | 0.67 |
| REACH1 | 2223.26 | 5-Year | 6.53 | 231 | 231.73 | 231.73 | 231.81 | 0.006366 | 1.54 | 6.51 | 38.06 | 0.65 |
| REACH1 | 2223.26 | 10-Year | 7.85 | 231 | 231.8 | 231.75 | 231.86 | 0.003826 | 1.29 | 8.87 | 39.62 | 0.52 |
| REACH1 | 2223.26 | 25-Year | 9.68 | 231 | 232.17 | 231.78 | 232.18 | 0.000394 | 0.56 | 21 | 47.74 | 0.18 |
| REACH1 | 2223.26 | 50-Year | 11.11 | 231 | 232.29 | 231.8 | 232.3 | 0.000293 | 0.52 | 25.1 | 50.71 | 0.16 |
| REACH1 | 2223.26 | 100-Year | 12.75 | 231 | 232.44 | 231.82 | 232.45 | 0.00021 | 0.48 | 30.36 | 54.11 | 0.14 |
| REACH1 | 2223.26 | Regional | 14.97 | 231 | 232.66 | 231.85 | 232.67 | 0.000142 | 0.44 | 38 | 59.24 | 0.11 |
| | | | | | | | | | | | | |
| REACH1 | 2223.25 | 2-Year | 4.59 | 230.5 | 231.24 | | 231.39 | 0.014808 | 1.73 | 2.66 | 5.36 | 0.78 |
| REACH1 | 2223.25 | 5-Year | 6.53 | 230.5 | 231.44 | | 231.59 | 0.011527 | 1.72 | 3.81 | 6.19 | 0.69 |
| REACH1 | 2223.25 | 10-Year | 7.85 | 230.5 | 231.59 | | 231.73 | 0.008695 | 1.64 | 4.92 | 8.13 | 0.6 |
| REACH1 | 2223.25 | 25-Year | 9.68 | 230.5 | 232.09 | | 232.15 | 0.00213 | 1.14 | 10.49 | 14.69 | 0.32 |
| REACH1 | 2223.25 | 50-Year | 11.11 | 230.5 | 232.21 | | 232.27 | 0.001964 | 1.16 | 12.37 | 16.58 | 0.32 |
| REACH1 | 2223.25 | 100-Year | 12.75 | 230.5 | 232.37 | | 232.43 | 0.001658 | 1.15 | 15.43 | 22.01 | 0.3 |
| REACH1 | 2223.25 | Regional | 14.97 | 230.5 | 232.61 | | 232.65 | 0.001114 | 1.04 | 21.64 | 28.85 | 0.25 |
| | | | | | | | | | | | | |
| REACH1 | 2223.24 | 2-Year | 4.59 | 230.2 | 231.55 | 230.87 | 231.57 | 0.001177 | 0.74 | 6.27 | 9.79 | 0.28 |
| REACH1 | 2223.24 | 5-Year | 6.53 | 230.2 | 231.85 | 231.08 | 231.87 | 0.000721 | 0.73 | 9.65 | 12.69 | 0.23 |
| REACH1 | 2223.24 | 10-Year | 7.85 | 230.2 | 232.1 | 231.19 | 232.12 | 0.000475 | 0.69 | 13.21 | 16.61 | 0.19 |
| REACH1 | 2223.24 | 25-Year | 9.68 | 230.2 | 232.28 | 231.3 | 232.3 | 0.000435 | 0.72 | 16.59 | 22.3 | 0.19 |
| REACH1 | 2223.24 | 50-Year | 11.11 | 230.2 | 232.38 | 231.37 | 232.4 | 0.000428 | 0.74 | 19.15 | 27.77 | 0.19 |
| REACH1 | 2223.24 | 100-Year | 12.75 | 230.2 | 232.41 | 231.43 | 232.44 | 0.00052 | 0.83 | 19.95 | 28.94 | 0.21 |
| REACH1 | 2223.24 | Regional | 14.97 | 230.2 | 232.44 | 231.51 | 232.48 | 0.000647 | 0.94 | 20.98 | 32.74 | 0.23 |
| | | | | | | | | | | | | |
| REACH1 | 2223.23 | 2-Year | 4.59 | 230.2 | 231.45 | 231 | 231.53 | 0.00347 | 1.23 | 3.72 | 4.91 | 0.45 |
| REACH1 | 2223.23 | 5-Year | 6.53 | 230.2 | 231.77 | 231.19 | 231.84 | 0.00217 | 1.21 | 5.68 | 7.79 | 0.38 |
| REACH1 | 2223.23 | 10-Year | 7.85 | 230.2 | 232.04 | 231.29 | 232.1 | 0.001332 | 1.11 | 8.19 | 13.11 | 0.31 |
| REACH1 | 2223.23 | 25-Year | 9.68 | 230.2 | 232.26 | 231.43 | 232.29 | 0.000732 | 0.91 | 16.14 | 41.34 | 0.23 |
| REACH1 | 2223.23 | 50-Year | 11.11 | 230.2 | 232.37 | 231.51 | 232.4 | 0.000528 | 0.81 | 21.13 | 45.4 | 0.2 |
| REACH1 | 2223.23 | 100-Year | 12.75 | 230.2 | 232.4 | 231.59 | 232.43 | 0.000604 | 0.88 | 22.45 | 49.81 | 0.22 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.23 | Regional | 14.97 | 230.2 | 232.44 | 231.71 | 232.47 | 0.000704 | 0.96 | 24.2 | 53.38 | 0.23 |
| | | | | | | | | | | | | |
| REACH1 | 2223.22 | 2-Year | 4.59 | 230.2 | 231.01 | 231.01 | 231.42 | 0.006685 | 2.81 | 1.63 | 4.09 | 1 |
| REACH1 | 2223.22 | 5-Year | 6.53 | 230.2 | 231.22 | 231.22 | 231.74 | 0.00622 | 3.17 | 2.06 | 5.1 | 1 |
| REACH1 | 2223.22 | 10-Year | 7.85 | 230.2 | 231.68 | 231.35 | 232.04 | 0.002621 | 2.63 | 2.98 | 7.87 | 0.69 |
| REACH1 | 2223.22 | 25-Year | 9.68 | 230.2 | 231.54 | 231.54 | 232.2 | 0.005653 | 3.61 | 2.68 | 6.58 | 1 |
| REACH1 | 2223.22 | 50-Year | 11.11 | 230.2 | 232.27 | 232.27 | 232.37 | 0.001991 | 1.72 | 13.62 | 61.82 | 0.52 |
| REACH1 | 2223.22 | 100-Year | 12.75 | 230.2 | 232.29 | 232.29 | 232.4 | 0.00211 | 1.79 | 15.26 | 62.63 | 0.54 |
| REACH1 | 2223.22 | Regional | 14.97 | 230.2 | 232.32 | 232.32 | 232.44 | 0.002262 | 1.89 | 17.24 | 63.6 | 0.56 |
| | | | | | | | | | | | | |
| REACH1 | 2223.215 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.21 | 2-Year | 4.59 | 230 | 230.8 | 230.8 | 231.2 | 0.006558 | 2.8 | 1.64 | 7.1 | 1 |
| REACH1 | 2223.21 | 5-Year | 6.53 | 230 | 231.02 | 231.02 | 231.52 | 0.006033 | 3.14 | 2.08 | 8.47 | 1 |
| REACH1 | 2223.21 | 10-Year | 7.85 | 230 | 231.14 | 231.14 | 231.72 | 0.005954 | 3.37 | 2.33 | 9.36 | 1.01 |
| REACH1 | 2223.21 | 25-Year | 9.68 | 230 | 231.73 | 231.73 | 231.82 | 0.002357 | 1.63 | 11.48 | 54.49 | 0.58 |
| REACH1 | 2223.21 | 50-Year | 11.11 | 230 | 231.75 | 231.75 | 231.85 | 0.002483 | 1.7 | 12.75 | 54.97 | 0.6 |
| REACH1 | 2223.21 | 100-Year | 12.75 | 230 | 231.78 | 231.78 | 231.88 | 0.002602 | 1.78 | 14.1 | 55.48 | 0.62 |
| REACH1 | 2223.21 | Regional | 14.97 | 230 | 231.8 | 231.8 | 231.91 | 0.002874 | 1.9 | 15.48 | 56 | 0.65 |
| | | | | | | | | | | | | |
| REACH1 | 2223.2 | 2-Year | 4.59 | 229.7 | 230.72 | 230.52 | 230.8 | 0.00418 | 1.26 | 3.78 | 7.96 | 0.53 |
| REACH1 | 2223.2 | 5-Year | 6.53 | 229.7 | 231.09 | 230.62 | 231.14 | 0.001458 | 1.03 | 7.63 | 13.62 | 0.34 |
| REACH1 | 2223.2 | 10-Year | 7.85 | 229.7 | 231.34 | 230.68 | 231.38 | 0.00084 | 0.91 | 11.85 | 20.27 | 0.27 |
| REACH1 | 2223.2 | 25-Year | 9.68 | 229.7 | 231.52 | 230.78 | 231.56 | 0.000687 | 0.91 | 16.43 | 33.77 | 0.25 |
| REACH1 | 2223.2 | 50-Year | 11.11 | 229.7 | 231.6 | 230.84 | 231.63 | 0.000578 | 0.87 | 22.57 | 59.21 | 0.23 |
| REACH1 | 2223.2 | 100-Year | 12.75 | 229.7 | 231.61 | 230.91 | 231.65 | 0.000721 | 0.97 | 23.19 | 60.01 | 0.25 |
| REACH1 | 2223.2 | Regional | 14.97 | 229.7 | 231.65 | 231 | 231.69 | 0.000824 | 1.06 | 25.45 | 62.98 | 0.27 |
| | | | | | | | | | | | | |
| REACH1 | 2223.19 | 2-Year | 4.59 | 229.45 | 230.46 | 230.24 | 230.69 | 0.01107 | 2.14 | 2.14 | 4.61 | 0.68 |
| REACH1 | 2223.19 | 5-Year | 6.53 | 229.45 | 230.84 | 230.44 | 231.08 | 0.00772 | 2.2 | 2.99 | 8.9 | 0.6 |
| REACH1 | 2223.19 | 10-Year | 7.85 | 229.45 | 231.08 | 230.58 | 231.33 | 0.0065 | 2.24 | 3.53 | 17.62 | 0.56 |
| REACH1 | 2223.19 | 25-Year | 9.68 | 229.45 | 231.15 | 230.74 | 231.5 | 0.008531 | 2.65 | 3.7 | 20.26 | 0.65 |
| REACH1 | 2223.19 | 50-Year | 11.11 | 229.45 | 231.55 | 230.87 | 231.61 | 0.002046 | 1.38 | 14.21 | 82.89 | 0.31 |
| REACH1 | 2223.19 | 100-Year | 12.75 | 229.45 | 231.48 | 231.48 | 231.62 | 0.004208 | 1.93 | 10.48 | 38.66 | 0.44 |
| REACH1 | 2223.19 | Regional | 14.97 | 229.45 | 231.53 | 231.53 | 231.66 | 0.004211 | 1.96 | 12.39 | 42.86 | 0.44 |
| | | | | | | | | | | | | |
| REACH1 | 2223.185 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.18 | 2-Year | 5.47 | 229.37 | 230.2 | 230.2 | 230.61 | 0.013027 | 2.86 | 1.91 | 5.64 | 1.01 |
| REACH1 | 2223.18 | 5-Year | 7.78 | 229.37 | 230.41 | 230.41 | 230.94 | 0.012044 | 3.22 | 2.42 | 6.71 | 1.01 |
| REACH1 | 2223.18 | 10-Year | 9.36 | 229.37 | 230.55 | 230.55 | 231.15 | 0.011529 | 3.42 | 2.74 | 8.58 | 1 |
| REACH1 | 2223.18 | 25-Year | 11.54 | 229.37 | 230.73 | 230.73 | 231.41 | 0.011032 | 3.67 | 3.15 | 13.53 | 1.01 |
| REACH1 | 2223.18 | 50-Year | 13.25 | 229.37 | 230.86 | 230.86 | 231.61 | 0.010569 | 3.83 | 3.46 | 17.36 | 1 |
| REACH1 | 2223.18 | 100-Year | 15.21 | 229.37 | 231.27 | 231.27 | 231.39 | 0.003796 | 1.91 | 13 | 47.37 | 0.55 |
| REACH1 | 2223.18 | Regional | 17.88 | 229.37 | 231.29 | 231.29 | 231.44 | 0.004399 | 2.08 | 14.13 | 49.64 | 0.59 |
| | | | | | | | | | | | | |
| REACH1 | 2223.17 | 2-Year | 5.47 | 228.87 | 229.99 | 229.99 | 230.24 | 0.010732 | 2.42 | 3.57 | 8.88 | 0.83 |
| REACH1 | 2223.17 | 5-Year | 7.78 | 228.87 | 230.15 | 230.15 | 230.43 | 0.010305 | 2.66 | 5.18 | 10.95 | 0.83 |
| REACH1 | 2223.17 | 10-Year | 9.36 | 228.87 | 230.24 | 230.24 | 230.54 | 0.010193 | 2.8 | 6.23 | 12.1 | 0.84 |
| REACH1 | 2223.17 | 25-Year | 11.54 | 228.87 | 230.35 | 230.35 | 230.67 | 0.010251 | 2.98 | 7.59 | 13.55 | 0.86 |
| REACH1 | 2223.17 | 50-Year | 13.25 | 228.87 | 230.43 | 230.43 | 230.76 | 0.01015 | 3.09 | 8.71 | 14.7 | 0.86 |
| REACH1 | 2223.17 | 100-Year | 15.21 | 228.87 | 230.57 | 230.57 | 230.83 | 0.007692 | 2.88 | 12.73 | 23.73 | 0.76 |
| REACH1 | 2223.17 | Regional | 17.88 | 228.87 | 230.57 | 230.57 | 230.93 | 0.010629 | 3.38 | 12.73 | 23.73 | 0.9 |
| | | | | | | | | | | | | |
| REACH1 | 2223.16 | 2-Year | 5.47 | 228.57 | 229.62 | 229.62 | 229.86 | 0.015819 | 2.16 | 2.64 | 6.95 | 0.96 |
| REACH1 | 2223.16 | 5-Year | 7.78 | 228.57 | 229.77 | 229.77 | 230.04 | 0.013418 | 2.35 | 3.81 | 9.3 | 0.93 |
| REACH1 | 2223.16 | 10-Year | 9.36 | 228.57 | 229.85 | 229.85 | 230.14 | 0.012413 | 2.45 | 4.66 | 10.69 | 0.91 |
| REACH1 | 2223.16 | 25-Year | 11.54 | 228.57 | 229.96 | 229.96 | 230.27 | 0.01143 | 2.57 | 5.88 | 12.43 | 0.89 |
| REACH1 | 2223.16 | 50-Year | 13.25 | 228.57 | 230.02 | 230.02 | 230.36 | 0.011272 | 2.68 | 6.75 | 13.6 | 0.9 |
| REACH1 | 2223.16 | 100-Year | 15.21 | 228.57 | 230.11 | 230.11 | 230.45 | 0.010562 | 2.75 | 7.95 | 15.24 | 0.88 |
| REACH1 | 2223.16 | Regional | 17.88 | 228.57 | 230.2 | 230.2 | 230.57 | 0.010078 | 2.86 | 9.52 | 17.13 | 0.87 |
| | | | | | | | | | | | | |
| REACH1 | 2223.156 | 2-Year | 5.47 | 228.6 | 229.53 | | 229.58 | 0.00195 | 1.08 | 6.3 | 12.97 | 0.38 |
| REACH1 | 2223.156 | 5-Year | 7.78 | 228.6 | 229.64 | | 229.71 | 0.002326 | 1.29 | 7.85 | 14.47 | 0.43 |
| REACH1 | 2223.156 | 10-Year | 9.36 | 228.6 | 229.7 | | 229.79 | 0.002588 | 1.42 | 8.76 | 15.3 | 0.46 |
| REACH1 | 2223.156 | 25-Year | 11.54 | 228.6 | 229.77 | | 229.87 | 0.003003 | 1.6 | 9.8 | 16.21 | 0.5 |
| REACH1 | 2223.156 | 50-Year | 13.25 | 228.6 | 229.81 | | 229.93 | 0.003352 | 1.74 | 10.51 | 16.8 | 0.53 |
| REACH1 | 2223.156 | 100-Year | 15.21 | 228.6 | 229.86 | | 230 | 0.003678 | 1.87 | 11.34 | 17.46 | 0.56 |
| REACH1 | 2223.156 | Regional | 17.88 | 228.6 | 229.92 | | 230.08 | 0.004121 | 2.05 | 12.38 | 18.29 | 0.6 |
| | | | | | | | | | | | | |
| REACH1 | 2223.152 | 2-Year | 5.47 | 228.6 | 229.3 | 229.3 | 229.47 | 0.008827 | 1.96 | 3.8 | 13.24 | 0.84 |
| REACH1 | 2223.152 | 5-Year | 7.78 | 228.6 | 229.4 | 229.4 | 229.59 | 0.00851 | 2.15 | 5.28 | 15.81 | 0.84 |
| REACH1 | 2223.152 | 10-Year | 9.36 | 228.6 | 229.46 | 229.46 | 229.66 | 0.008185 | 2.24 | 6.31 | 17.38 | 0.84 |
| REACH1 | 2223.152 | 25-Year | 11.54 | 228.6 | 229.56 | 229.53 | 229.74 | 0.007037 | 2.25 | 8.08 | 19.86 | 0.79 |
| REACH1 | 2223.152 | 50-Year | 13.25 | 228.6 | 229.67 | | 229.81 | 0.005194 | 2.1 | 10.35 | 22.7 | 0.7 |
| REACH1 | 2223.152 | 100-Year | 15.21 | 228.6 | 229.71 | | 229.87 | 0.00548 | 2.23 | 11.37 | 23.86 | 0.72 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.152 | Regional | 17.88 | 228.6 | 229.76 | 229.7 | 229.94 | 0.005939 | 2.4 | 12.6 | 25.18 | 0.76 |
| REACH1 | 2223.15 | 2-Year | 5.47 | 228.6 | 229.22 | 228.99 | 229.26 | 0.011069 | 0.83 | 7.15 | 20.61 | 0.37 |
| REACH1 | 2223.15 | 5-Year | 7.78 | 228.6 | 229.38 | 229.07 | 229.41 | 0.007909 | 0.84 | 10.88 | 28.4 | 0.33 |
| REACH1 | 2223.15 | 10-Year | 9.36 | 228.6 | 229.47 | 229.12 | 229.5 | 0.006534 | 0.83 | 13.75 | 33.31 | 0.31 |
| REACH1 | 2223.15 | 25-Year | 11.54 | 228.6 | 229.58 | 229.18 | 229.61 | 0.005262 | 0.82 | 17.85 | 38.3 | 0.28 |
| REACH1 | 2223.15 | 50-Year | 13.25 | 228.6 | 229.69 | 229.23 | 229.71 | 0.004049 | 0.78 | 22.17 | 42.69 | 0.25 |
| REACH1 | 2223.15 | 100-Year | 15.21 | 228.6 | 229.74 | 229.27 | 229.76 | 0.004228 | 0.82 | 24.31 | 44.55 | 0.26 |
| REACH1 | 2223.15 | Regional | 17.88 | 228.6 | 229.8 | 229.33 | 229.83 | 0.004506 | 0.88 | 26.92 | 46.69 | 0.27 |
| REACH1 | 2223.148 | 2-Year | 5.47 | 228.6 | 229.2 | | 229.21 | 0.000477 | 0.45 | 14.46 | 37.08 | 0.2 |
| REACH1 | 2223.148 | 5-Year | 7.78 | 228.6 | 229.36 | | 229.37 | 0.000353 | 0.46 | 20.99 | 42.62 | 0.18 |
| REACH1 | 2223.148 | 10-Year | 9.36 | 228.6 | 229.46 | | 229.47 | 0.000313 | 0.48 | 25.2 | 45.87 | 0.17 |
| REACH1 | 2223.148 | 25-Year | 11.54 | 228.6 | 229.57 | | 229.58 | 0.000282 | 0.49 | 30.71 | 49.68 | 0.17 |
| REACH1 | 2223.148 | 50-Year | 13.25 | 228.6 | 229.68 | | 229.69 | 0.000239 | 0.49 | 36.27 | 53.17 | 0.15 |
| REACH1 | 2223.148 | 100-Year | 15.21 | 228.6 | 229.73 | | 229.74 | 0.000263 | 0.53 | 38.85 | 54.72 | 0.16 |
| REACH1 | 2223.148 | Regional | 17.88 | 228.6 | 229.78 | | 229.8 | 0.000298 | 0.58 | 41.94 | 56.51 | 0.18 |
| REACH1 | 2223.146 | 2-Year | 5.47 | 228.6 | 229.2 | | 229.2 | 0.000173 | 0.26 | 22.53 | 55.79 | 0.12 |
| REACH1 | 2223.146 | 5-Year | 7.78 | 228.6 | 229.36 | | 229.36 | 0.000127 | 0.27 | 32.68 | 66.09 | 0.11 |
| REACH1 | 2223.146 | 10-Year | 9.36 | 228.6 | 229.46 | | 229.46 | 0.000112 | 0.28 | 39.22 | 70.35 | 0.1 |
| REACH1 | 2223.146 | 25-Year | 11.54 | 228.6 | 229.57 | | 229.58 | 0.000101 | 0.29 | 47.68 | 76.12 | 0.1 |
| REACH1 | 2223.146 | 50-Year | 13.25 | 228.6 | 229.68 | | 229.68 | 0.00009 | 0.29 | 57.31 | 108.69 | 0.09 |
| REACH1 | 2223.146 | 100-Year | 15.21 | 228.6 | 229.73 | | 229.73 | 0.000097 | 0.32 | 62.88 | 118.26 | 0.1 |
| REACH1 | 2223.146 | Regional | 17.88 | 228.6 | 229.79 | | 229.79 | 0.000107 | 0.34 | 69.61 | 120.69 | 0.1 |
| REACH1 | 2223.145 | 2-Year | 5.47 | 228.6 | 229.19 | | 229.2 | 0.000106 | 0.21 | 28.71 | 68.92 | 0.09 |
| REACH1 | 2223.145 | 5-Year | 7.78 | 228.6 | 229.36 | | 229.36 | 0.000079 | 0.21 | 40.92 | 78.19 | 0.08 |
| REACH1 | 2223.145 | 10-Year | 9.36 | 228.6 | 229.46 | | 229.46 | 0.000071 | 0.22 | 48.67 | 83.35 | 0.08 |
| REACH1 | 2223.145 | 25-Year | 11.54 | 228.6 | 229.57 | | 229.57 | 0.000064 | 0.23 | 58.78 | 91.29 | 0.08 |
| REACH1 | 2223.145 | 50-Year | 13.25 | 228.6 | 229.68 | | 229.68 | 0.000056 | 0.23 | 69.72 | 114.74 | 0.07 |
| REACH1 | 2223.145 | 100-Year | 15.21 | 228.6 | 229.73 | | 229.73 | 0.000061 | 0.25 | 75.48 | 120.89 | 0.08 |
| REACH1 | 2223.145 | Regional | 17.88 | 228.6 | 229.79 | | 229.79 | 0.000068 | 0.28 | 82.33 | 122.76 | 0.08 |
| REACH1 | 2223.143 | 2-Year | 5.47 | 228.6 | 229.19 | | 229.19 | 0.000079 | 0.18 | 31.15 | 67.44 | 0.08 |
| REACH1 | 2223.143 | 5-Year | 7.78 | 228.6 | 229.36 | | 229.36 | 0.000062 | 0.2 | 43.01 | 75.22 | 0.07 |
| REACH1 | 2223.143 | 10-Year | 9.36 | 228.6 | 229.46 | | 229.46 | 0.000058 | 0.21 | 50.52 | 82.18 | 0.07 |
| REACH1 | 2223.143 | 25-Year | 11.54 | 228.6 | 229.57 | | 229.57 | 0.000054 | 0.22 | 60.51 | 89.01 | 0.07 |
| REACH1 | 2223.143 | 50-Year | 13.25 | 228.6 | 229.68 | | 229.68 | 0.000047 | 0.22 | 70.6 | 98.14 | 0.07 |
| REACH1 | 2223.143 | 100-Year | 15.21 | 228.6 | 229.73 | | 229.73 | 0.000052 | 0.24 | 75.61 | 108.37 | 0.07 |
| REACH1 | 2223.143 | Regional | 17.88 | 228.6 | 229.78 | | 229.79 | 0.000059 | 0.26 | 81.76 | 110.67 | 0.08 |
| REACH1 | 2223.141 | 2-Year | 5.47 | 228.2 | 229.18 | | 229.19 | 0.000249 | 0.42 | 16.95 | 37.95 | 0.15 |
| REACH1 | 2223.141 | 5-Year | 7.78 | 228.2 | 229.35 | | 229.36 | 0.000227 | 0.46 | 24.49 | 50.63 | 0.15 |
| REACH1 | 2223.141 | 10-Year | 9.36 | 228.2 | 229.45 | | 229.45 | 0.000209 | 0.47 | 29.46 | 52.67 | 0.15 |
| REACH1 | 2223.141 | 25-Year | 11.54 | 228.2 | 229.56 | | 229.57 | 0.000196 | 0.49 | 35.77 | 56.46 | 0.14 |
| REACH1 | 2223.141 | 50-Year | 13.25 | 228.2 | 229.67 | | 229.68 | 0.000175 | 0.49 | 43.05 | 72.66 | 0.14 |
| REACH1 | 2223.141 | 100-Year | 15.21 | 228.2 | 229.72 | | 229.73 | 0.000202 | 0.54 | 46.53 | 78.65 | 0.15 |
| REACH1 | 2223.141 | Regional | 17.88 | 228.2 | 229.77 | | 229.78 | 0.000227 | 0.59 | 50.88 | 80.84 | 0.16 |
| REACH1 | 2223.14 | 2-Year | 5.47 | 228 | 229.13 | | 229.18 | 0.001717 | 0.99 | 8.13 | 21.1 | 0.35 |
| REACH1 | 2223.14 | 5-Year | 7.78 | 228 | 229.3 | | 229.34 | 0.001598 | 1.08 | 11.88 | 25.1 | 0.35 |
| REACH1 | 2223.14 | 10-Year | 9.36 | 228 | 229.39 | | 229.44 | 0.001561 | 1.13 | 14.36 | 27.8 | 0.35 |
| REACH1 | 2223.14 | 25-Year | 11.54 | 228 | 229.5 | | 229.56 | 0.001625 | 1.23 | 17.97 | 44.9 | 0.37 |
| REACH1 | 2223.14 | 50-Year | 13.25 | 228 | 229.62 | | 229.67 | 0.001304 | 1.18 | 23.71 | 49.34 | 0.33 |
| REACH1 | 2223.14 | 100-Year | 15.21 | 228 | 229.66 | | 229.71 | 0.001477 | 1.28 | 25.65 | 50.67 | 0.36 |
| REACH1 | 2223.14 | Regional | 17.88 | 228 | 229.7 | | 229.77 | 0.001734 | 1.42 | 27.84 | 52.13 | 0.39 |
| REACH1 | 2223.134 | 2-Year | 5.47 | 227.8 | 229.03 | | 229.14 | 0.003824 | 1.73 | 6.17 | 12.35 | 0.53 |
| REACH1 | 2223.134 | 5-Year | 7.78 | 227.8 | 229.13 | 228.95 | 229.3 | 0.005482 | 2.19 | 7.58 | 16.89 | 0.65 |
| REACH1 | 2223.134 | 10-Year | 9.36 | 227.8 | 229.19 | 228.99 | 229.4 | 0.006373 | 2.44 | 8.63 | 19.77 | 0.71 |
| REACH1 | 2223.134 | 25-Year | 11.54 | 227.8 | 229.26 | 229.26 | 229.51 | 0.007254 | 2.71 | 10.22 | 23.5 | 0.76 |
| REACH1 | 2223.134 | 50-Year | 13.25 | 227.8 | 229.47 | 229.47 | 229.63 | 0.004486 | 2.35 | 18.09 | 56.82 | 0.61 |
| REACH1 | 2223.134 | 100-Year | 15.21 | 227.8 | 229.51 | 229.51 | 229.68 | 0.004754 | 2.46 | 20.34 | 57.83 | 0.63 |
| REACH1 | 2223.134 | Regional | 17.88 | 227.8 | 229.56 | 229.56 | 229.73 | 0.004854 | 2.55 | 23.56 | 58.4 | 0.64 |
| REACH1 | 2223.133 | 2-Year | 5.47 | 227.8 | 229.03 | | 229.07 | 0.001379 | 0.96 | 6.71 | 11.67 | 0.32 |
| REACH1 | 2223.133 | 5-Year | 7.78 | 227.8 | 229.12 | | 229.2 | 0.001961 | 1.22 | 7.96 | 17.51 | 0.38 |
| REACH1 | 2223.133 | 10-Year | 9.36 | 227.8 | 229.18 | | 229.27 | 0.002308 | 1.37 | 9.29 | 29.29 | 0.42 |
| REACH1 | 2223.133 | 25-Year | 11.54 | 227.8 | 229.25 | 228.83 | 229.36 | 0.002696 | 1.54 | 11.74 | 42.89 | 0.46 |
| REACH1 | 2223.133 | 50-Year | 13.25 | 227.8 | 229.29 | 228.92 | 229.42 | 0.00299 | 1.67 | 13.71 | 50.68 | 0.48 |
| REACH1 | 2223.133 | 100-Year | 15.21 | 227.8 | 229.35 | 229 | 229.48 | 0.003069 | 1.74 | 16.94 | 59.7 | 0.49 |
| REACH1 | 2223.133 | Regional | 17.88 | 227.8 | 229.45 | | 229.57 | 0.002651 | 1.71 | 23.95 | 72.04 | 0.47 |
| REACH1 | 2223.132 | 2-Year | 5.47 | 228.3 | 228.86 | 228.86 | 229 | 0.025989 | 1.91 | 3.84 | 13.48 | 1.17 |
| REACH1 | 2223.132 | 5-Year | 7.78 | 228.3 | 228.94 | 228.94 | 229.11 | 0.024727 | 2.04 | 5.06 | 15.34 | 1.17 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.132 | 10-Year | 9.36 | 228.3 | 228.99 | 228.99 | 229.17 | 0.024998 | 2.16 | 5.75 | 16.23 | 1.19 |
| REACH1 | 2223.132 | 25-Year | 11.54 | 228.3 | 229.07 | 229.04 | 229.26 | 0.019251 | 2.17 | 7.28 | 21.48 | 1.08 |
| REACH1 | 2223.132 | 50-Year | 13.25 | 228.3 | 229.19 | 229.09 | 229.33 | 0.010382 | 1.89 | 11.4 | 51.25 | 0.83 |
| REACH1 | 2223.132 | 100-Year | 15.21 | 228.3 | 229.3 | | 229.4 | 0.006108 | 1.65 | 17.94 | 63.85 | 0.65 |
| REACH1 | 2223.132 | Regional | 17.88 | 228.3 | 229.44 | | 229.5 | 0.003574 | 1.43 | 27.94 | 82.49 | 0.52 |
| | | | | | | | | | | | | |
| REACH1 | 2223.131 | 2-Year | 5.47 | 227.5 | 228.51 | | 228.63 | 0.005578 | 1.53 | 3.59 | 5.53 | 0.6 |
| REACH1 | 2223.131 | 5-Year | 7.78 | 227.5 | 228.69 | | 228.84 | 0.005202 | 1.72 | 4.66 | 7.21 | 0.6 |
| REACH1 | 2223.131 | 10-Year | 9.36 | 227.5 | 228.79 | | 228.96 | 0.004942 | 1.82 | 5.67 | 11.07 | 0.6 |
| REACH1 | 2223.131 | 25-Year | 11.54 | 227.5 | 228.93 | 228.63 | 229.11 | 0.004455 | 1.89 | 7.66 | 16.59 | 0.58 |
| REACH1 | 2223.131 | 50-Year | 13.25 | 227.5 | 229.04 | 228.72 | 229.22 | 0.004059 | 1.92 | 9.92 | 28.54 | 0.56 |
| REACH1 | 2223.131 | 100-Year | 15.21 | 227.5 | 229.18 | 228.84 | 229.32 | 0.003059 | 1.8 | 16.28 | 52.4 | 0.5 |
| REACH1 | 2223.131 | Regional | 17.88 | 227.5 | 229.36 | 228.95 | 229.45 | 0.001982 | 1.58 | 26.46 | 60.15 | 0.41 |
| | | | | | | | | | | | | |
| REACH1 | 2223.13 | 2-Year | 5.47 | 227.3 | 228.32 | 228.15 | 228.48 | 0.007335 | 1.77 | 3.12 | 5.03 | 0.68 |
| REACH1 | 2223.13 | 5-Year | 7.78 | 227.3 | 228.45 | 228.3 | 228.67 | 0.008275 | 2.11 | 3.83 | 5.9 | 0.74 |
| REACH1 | 2223.13 | 10-Year | 9.36 | 227.3 | 228.52 | 228.39 | 228.79 | 0.008895 | 2.32 | 4.29 | 6.6 | 0.78 |
| REACH1 | 2223.13 | 25-Year | 11.54 | 227.3 | 228.65 | 228.52 | 228.95 | 0.008536 | 2.48 | 5.19 | 7.69 | 0.78 |
| REACH1 | 2223.13 | 50-Year | 13.25 | 227.3 | 228.74 | 228.61 | 229.07 | 0.008296 | 2.58 | 5.93 | 8.54 | 0.78 |
| REACH1 | 2223.13 | 100-Year | 15.21 | 227.3 | 228.82 | 228.71 | 229.19 | 0.008526 | 2.74 | 6.64 | 9.53 | 0.8 |
| REACH1 | 2223.13 | Regional | 17.88 | 227.3 | 228.87 | 228.83 | 229.33 | 0.009954 | 3.06 | 7.2 | 10.46 | 0.87 |
| | | | | | | | | | | | | |
| REACH1 | 2223.125 | 2-Year | 5.47 | 227.2 | 228.01 | 228.01 | 228.28 | 0.016895 | 2.3 | 2.38 | 4.45 | 1 |
| REACH1 | 2223.125 | 5-Year | 7.78 | 227.2 | 228.22 | 228.17 | 228.49 | 0.013414 | 2.32 | 3.36 | 5.18 | 0.92 |
| REACH1 | 2223.125 | 10-Year | 9.36 | 227.2 | 228.36 | 228.26 | 228.62 | 0.011242 | 2.27 | 4.12 | 5.68 | 0.85 |
| REACH1 | 2223.125 | 25-Year | 11.54 | 227.2 | 228.54 | | 228.79 | 0.008771 | 2.21 | 5.24 | 7.31 | 0.77 |
| REACH1 | 2223.125 | 50-Year | 13.25 | 227.2 | 228.67 | 228.46 | 228.91 | 0.007122 | 2.19 | 6.42 | 11.25 | 0.71 |
| REACH1 | 2223.125 | 100-Year | 15.21 | 227.2 | 228.77 | 228.55 | 229.02 | 0.006466 | 2.24 | 7.79 | 14.76 | 0.69 |
| REACH1 | 2223.125 | Regional | 17.88 | 227.2 | 228.84 | 228.68 | 229.14 | 0.007077 | 2.44 | 8.89 | 16.95 | 0.73 |
| | | | | | | | | | | | | |
| REACH1 | 2223.12 | 2-Year | 5.47 | 227 | 228 | | 228.07 | 0.002911 | 1.17 | 4.94 | 9.51 | 0.45 |
| REACH1 | 2223.12 | 5-Year | 7.78 | 227 | 228.29 | | 228.35 | 0.001739 | 1.14 | 8.04 | 12.21 | 0.37 |
| REACH1 | 2223.12 | 10-Year | 9.36 | 227 | 228.43 | | 228.49 | 0.001562 | 1.18 | 9.9 | 14.74 | 0.36 |
| REACH1 | 2223.12 | 25-Year | 11.54 | 227 | 228.61 | | 228.68 | 0.001357 | 1.22 | 13.02 | 19.73 | 0.34 |
| REACH1 | 2223.12 | 50-Year | 13.25 | 227 | 228.74 | | 228.81 | 0.001244 | 1.24 | 15.98 | 25.69 | 0.33 |
| REACH1 | 2223.12 | 100-Year | 15.21 | 227 | 228.85 | | 228.92 | 0.001185 | 1.28 | 19.08 | 28.47 | 0.33 |
| REACH1 | 2223.12 | Regional | 17.88 | 227 | 228.94 | | 229.02 | 0.001271 | 1.37 | 21.65 | 29.14 | 0.34 |
| | | | | | | | | | | | | |
| REACH1 | 2223.11 | 2-Year | 5.47 | 226.75 | 227.96 | 227.57 | 228.05 | 0.002601 | 1.33 | 4.11 | 7.68 | 0.44 |
| REACH1 | 2223.11 | 5-Year | 7.78 | 226.75 | 228.22 | 227.71 | 228.33 | 0.002264 | 1.47 | 5.29 | 10.08 | 0.43 |
| REACH1 | 2223.11 | 10-Year | 9.36 | 226.75 | 228.34 | 227.8 | 228.47 | 0.002363 | 1.6 | 5.84 | 11.91 | 0.45 |
| REACH1 | 2223.11 | 25-Year | 11.54 | 226.75 | 228.5 | 227.91 | 228.65 | 0.002459 | 1.76 | 6.54 | 18.28 | 0.47 |
| REACH1 | 2223.11 | 50-Year | 13.25 | 226.75 | 228.6 | 228 | 228.78 | 0.002564 | 1.89 | 7.02 | 28.22 | 0.48 |
| REACH1 | 2223.11 | 100-Year | 15.21 | 226.75 | 228.68 | 228.09 | 228.89 | 0.002898 | 2.07 | 7.35 | 33.19 | 0.52 |
| REACH1 | 2223.11 | Regional | 17.88 | 226.75 | 228.68 | 228.21 | 228.98 | 0.003938 | 2.42 | 7.39 | 33.71 | 0.6 |
| | | | | | | | | | | | | |
| REACH1 | 2223.105 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.1 | 2-Year | 5.47 | 226.55 | 227.97 | | 228.07 | 0.002925 | 1.36 | 4.09 | 16.14 | 0.45 |
| REACH1 | 2223.1 | 5-Year | 7.78 | 226.55 | 228.13 | | 228.27 | 0.003523 | 1.65 | 4.79 | 19.81 | 0.51 |
| REACH1 | 2223.1 | 10-Year | 9.36 | 226.55 | 228.21 | | 228.38 | 0.004023 | 1.85 | 5.15 | 21.88 | 0.55 |
| REACH1 | 2223.1 | 25-Year | 11.54 | 226.55 | 228.29 | | 228.52 | 0.004876 | 2.13 | 5.51 | 24.02 | 0.61 |
| REACH1 | 2223.1 | 50-Year | 13.25 | 226.55 | 228.33 | | 228.62 | 0.005734 | 2.36 | 5.71 | 25.16 | 0.67 |
| REACH1 | 2223.1 | 100-Year | 15.21 | 226.55 | 228.42 | | 228.75 | 0.006057 | 2.54 | 6.1 | 27.45 | 0.69 |
| REACH1 | 2223.1 | Regional | 17.88 | 226.55 | 228.41 | 228.24 | 228.87 | 0.008695 | 3.02 | 6.03 | 27.05 | 0.83 |
| | | | | | | | | | | | | |
| REACH1 | 2223.09 | 2-Year | 5.47 | 226.45 | 227.68 | 227.65 | 227.9 | 0.015498 | 2.09 | 2.62 | 15.92 | 0.92 |
| REACH1 | 2223.09 | 5-Year | 7.78 | 226.45 | 227.84 | 227.8 | 228.09 | 0.013485 | 2.23 | 3.52 | 20.84 | 0.89 |
| REACH1 | 2223.09 | 10-Year | 9.36 | 226.45 | 227.94 | 227.89 | 228.21 | 0.012248 | 2.3 | 4.15 | 24.27 | 0.87 |
| REACH1 | 2223.09 | 25-Year | 11.54 | 226.45 | 228.07 | 227.99 | 228.35 | 0.010637 | 2.36 | 5.04 | 28.29 | 0.83 |
| REACH1 | 2223.09 | 50-Year | 13.25 | 226.45 | 228.17 | 228.07 | 228.45 | 0.009175 | 2.38 | 5.91 | 31.28 | 0.78 |
| REACH1 | 2223.09 | 100-Year | 15.21 | 226.45 | 228.29 | 228.15 | 228.57 | 0.007796 | 2.37 | 7.07 | 34.72 | 0.74 |
| REACH1 | 2223.09 | Regional | 17.88 | 226.45 | 228.56 | 228.26 | 228.59 | 0.001292 | 1.12 | 32.63 | 62.82 | 0.31 |
| | | | | | | | | | | | | |
| REACH1 | 2223.08 | 2-Year | 5.47 | 226.3 | 227.16 | 227.16 | 227.48 | 0.01912 | 2.5 | 2.19 | 3.42 | 1 |
| REACH1 | 2223.08 | 5-Year | 7.78 | 226.3 | 227.36 | 227.36 | 227.71 | 0.017806 | 2.63 | 2.96 | 4.36 | 1 |
| REACH1 | 2223.08 | 10-Year | 9.36 | 226.3 | 227.47 | 227.47 | 227.85 | 0.017278 | 2.73 | 3.42 | 4.88 | 1 |
| REACH1 | 2223.08 | 25-Year | 11.54 | 226.3 | 227.58 | 227.58 | 228.02 | 0.016321 | 2.92 | 3.95 | 5.3 | 1 |
| REACH1 | 2223.08 | 50-Year | 13.25 | 226.3 | 227.66 | 227.66 | 228.14 | 0.016073 | 3.07 | 4.31 | 5.53 | 1 |
| REACH1 | 2223.08 | 100-Year | 15.21 | 226.3 | 227.76 | 227.76 | 228.28 | 0.015492 | 3.21 | 4.74 | 5.76 | 1 |
| REACH1 | 2223.08 | Regional | 17.88 | 226.3 | 227.88 | 227.88 | 228.46 | 0.014985 | 3.39 | 5.27 | 9.53 | 1 |
| | | | | | | | | | | | | |
| REACH1 | 2223.075 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.07 | 2-Year | 5.47 | 226.13 | 227.22 | 226.69 | 227.28 | 0.001706 | 1.14 | 4.79 | 6.3 | 0.35 |
| REACH1 | 2223.07 | 5-Year | 7.78 | 226.13 | 227.35 | 226.82 | 227.46 | 0.002309 | 1.44 | 5.4 | 6.95 | 0.42 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.07 | 10-Year | 9.36 | 226.13 | 227.43 | 226.92 | 227.56 | 0.002732 | 1.63 | 5.73 | 7.3 | 0.46 |
| REACH1 | 2223.07 | 25-Year | 11.54 | 226.13 | 227.51 | 227.03 | 227.69 | 0.003381 | 1.89 | 6.1 | 7.68 | 0.52 |
| REACH1 | 2223.07 | 50-Year | 13.25 | 226.13 | 227.57 | 227.11 | 227.79 | 0.00388 | 2.08 | 6.36 | 7.95 | 0.56 |
| REACH1 | 2223.07 | 100-Year | 15.21 | 226.13 | 227.63 | 227.21 | 227.9 | 0.004391 | 2.29 | 6.66 | 8.25 | 0.6 |
| REACH1 | 2223.07 | Regional | 17.88 | 226.13 | 227.71 | 227.33 | 228.04 | 0.005112 | 2.55 | 7.01 | 8.59 | 0.65 |
| | | | | | | | | | | | | |
| REACH1 | 2223.06 | 2-Year | 5.47 | 226.1 | 227.05 | 226.96 | 227.18 | 0.009301 | 1.58 | 3.45 | 7.67 | 0.75 |
| REACH1 | 2223.06 | 5-Year | 7.78 | 226.1 | 227.18 | 227.07 | 227.33 | 0.008519 | 1.71 | 4.55 | 8.41 | 0.74 |
| REACH1 | 2223.06 | 10-Year | 9.36 | 226.1 | 227.27 | 227.14 | 227.43 | 0.008203 | 1.78 | 5.25 | 8.86 | 0.74 |
| REACH1 | 2223.06 | 25-Year | 11.54 | 226.1 | 227.34 | 227.22 | 227.53 | 0.008911 | 1.95 | 5.92 | 9.26 | 0.78 |
| REACH1 | 2223.06 | 50-Year | 13.25 | 226.1 | 227.4 | 227.29 | 227.61 | 0.008982 | 2.04 | 6.51 | 9.61 | 0.79 |
| REACH1 | 2223.06 | 100-Year | 15.21 | 226.1 | 227.48 | 227.35 | 227.7 | 0.008463 | 2.08 | 7.33 | 10.87 | 0.78 |
| REACH1 | 2223.06 | Regional | 17.88 | 226.1 | 227.61 | 227.44 | 227.83 | 0.006944 | 2.07 | 8.95 | 15.19 | 0.72 |
| | | | | | | | | | | | | |
| REACH1 | 2223.05 | 2-Year | 5.47 | 225.27 | 226.21 | 226.06 | 226.33 | 0.007142 | 1.53 | 3.57 | 6.75 | 0.67 |
| REACH1 | 2223.05 | 5-Year | 7.78 | 225.27 | 226.35 | 226.19 | 226.5 | 0.007613 | 1.7 | 4.58 | 7.79 | 0.71 |
| REACH1 | 2223.05 | 10-Year | 9.36 | 225.27 | 226.43 | 226.28 | 226.59 | 0.007939 | 1.8 | 5.21 | 8.43 | 0.73 |
| REACH1 | 2223.05 | 25-Year | 11.54 | 225.27 | 226.58 | 226.37 | 226.74 | 0.006462 | 1.74 | 6.64 | 9.86 | 0.67 |
| REACH1 | 2223.05 | 50-Year | 13.25 | 225.27 | 226.65 | 226.45 | 226.82 | 0.006409 | 1.82 | 7.32 | 11.16 | 0.68 |
| REACH1 | 2223.05 | 100-Year | 15.21 | 225.27 | 226.69 | 226.52 | 226.89 | 0.007212 | 1.99 | 7.76 | 11.88 | 0.72 |
| REACH1 | 2223.05 | Regional | 17.88 | 225.27 | 226.69 | 226.6 | 226.96 | 0.009977 | 2.34 | 7.76 | 11.88 | 0.85 |
| | | | | | | | | | | | | |
| REACH1 | 2223.04 | 2-Year | 5.47 | 224.7 | 225.47 | 225.42 | 225.65 | 0.012456 | 1.89 | 2.9 | 6.14 | 0.88 |
| REACH1 | 2223.04 | 5-Year | 7.78 | 224.7 | 225.62 | 225.55 | 225.82 | 0.011221 | 2.01 | 3.88 | 6.9 | 0.85 |
| REACH1 | 2223.04 | 10-Year | 9.36 | 224.7 | 225.71 | 225.63 | 225.93 | 0.01034 | 2.05 | 4.57 | 7.4 | 0.83 |
| REACH1 | 2223.04 | 25-Year | 11.54 | 224.7 | 225.73 | 225.73 | 226.04 | 0.014805 | 2.47 | 4.67 | 7.47 | 1 |
| REACH1 | 2223.04 | 50-Year | 13.25 | 224.7 | 225.8 | 225.79 | 226.13 | 0.014477 | 2.54 | 5.21 | 7.83 | 1 |
| REACH1 | 2223.04 | 100-Year | 15.21 | 224.7 | 225.93 | 225.87 | 226.23 | 0.011248 | 2.41 | 6.32 | 8.52 | 0.89 |
| REACH1 | 2223.04 | Regional | 17.88 | 224.7 | 226.24 | 225.96 | 226.43 | 0.005113 | 1.97 | 9.24 | 10.95 | 0.63 |
| | | | | | | | | | | | | |
| REACH1 | 2223.03 | 2-Year | 5.47 | 224.2 | 224.75 | 224.75 | 225.01 | 0.015596 | 2.28 | 2.4 | 5.2 | 1 |
| REACH1 | 2223.03 | 5-Year | 7.78 | 224.2 | 224.89 | 224.89 | 225.23 | 0.01457 | 2.57 | 3.03 | 5.51 | 1 |
| REACH1 | 2223.03 | 10-Year | 9.36 | 224.2 | 224.98 | 224.98 | 225.36 | 0.013783 | 2.72 | 3.44 | 5.8 | 0.99 |
| REACH1 | 2223.03 | 25-Year | 11.54 | 224.2 | 225.24 | 225.09 | 225.56 | 0.007999 | 2.51 | 4.59 | 7.09 | 0.8 |
| REACH1 | 2223.03 | 50-Year | 13.25 | 224.2 | 225.39 | 225.17 | 225.71 | 0.006653 | 2.51 | 5.27 | 7.87 | 0.74 |
| REACH1 | 2223.03 | 100-Year | 15.21 | 224.2 | 225.54 | 225.27 | 225.87 | 0.005757 | 2.54 | 5.98 | 8.71 | 0.7 |
| REACH1 | 2223.03 | Regional | 17.88 | 224.2 | 225.99 | 225.39 | 226.25 | 0.00303 | 2.24 | 7.99 | 17.79 | 0.54 |
| | | | | | | | | | | | | |
| REACH1 | 2223.025 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.02 | 2-Year | 5.47 | 223.68 | 224.78 | 224.23 | 224.84 | 0.001404 | 1.12 | 4.88 | 7.92 | 0.34 |
| REACH1 | 2223.02 | 5-Year | 7.78 | 223.68 | 224.95 | 224.37 | 225.05 | 0.001736 | 1.37 | 5.66 | 8.9 | 0.39 |
| REACH1 | 2223.02 | 10-Year | 9.36 | 223.68 | 225.05 | 224.46 | 225.17 | 0.00198 | 1.54 | 6.08 | 9.43 | 0.42 |
| REACH1 | 2223.02 | 25-Year | 11.54 | 223.68 | 225.14 | 224.57 | 225.3 | 0.002394 | 1.77 | 6.51 | 9.97 | 0.47 |
| REACH1 | 2223.02 | 50-Year | 13.25 | 223.68 | 225.2 | 224.66 | 225.39 | 0.002779 | 1.96 | 6.77 | 10.29 | 0.51 |
| REACH1 | 2223.02 | 100-Year | 15.21 | 223.68 | 225.25 | 224.75 | 225.49 | 0.003293 | 2.18 | 6.99 | 10.57 | 0.56 |
| REACH1 | 2223.02 | Regional | 17.88 | 223.68 | 225.61 | 224.87 | 225.83 | 0.002244 | 2.07 | 8.64 | 12.66 | 0.48 |
| | | | | | | | | | | | | |
| REACH1 | 2223.01 | 2-Year | 5.47 | 223.33 | 224.78 | 224.19 | 224.81 | 0.001032 | 0.75 | 7.33 | 9.57 | 0.27 |
| REACH1 | 2223.01 | 5-Year | 7.78 | 223.33 | 224.97 | 224.32 | 225 | 0.001135 | 0.85 | 9.18 | 10.59 | 0.29 |
| REACH1 | 2223.01 | 10-Year | 9.36 | 223.33 | 225.07 | 224.4 | 225.11 | 0.001207 | 0.91 | 10.28 | 11.16 | 0.3 |
| REACH1 | 2223.01 | 25-Year | 11.54 | 223.33 | 225.18 | 224.49 | 225.23 | 0.001346 | 1 | 11.53 | 11.77 | 0.32 |
| REACH1 | 2223.01 | 50-Year | 13.25 | 223.33 | 225.24 | 224.55 | 225.3 | 0.001477 | 1.07 | 12.34 | 12.15 | 0.34 |
| REACH1 | 2223.01 | 100-Year | 15.21 | 223.33 | 225.31 | 224.63 | 225.38 | 0.001646 | 1.16 | 13.12 | 12.51 | 0.36 |
| REACH1 | 2223.01 | Regional | 17.88 | 223.33 | 225.68 | 224.72 | 225.73 | 0.000943 | 0.98 | 18.2 | 14.61 | 0.28 |
| | | | | | | | | | | | | |
| REACH1 | 2219.56 | 2-Year | 6.08 | 223.16 | 224.62 | 224.3 | 224.7 | 0.004186 | 1.25 | 4.85 | 7.84 | 0.51 |
| REACH1 | 2219.56 | 5-Year | 8.72 | 223.16 | 224.78 | 224.47 | 224.88 | 0.004572 | 1.41 | 6.19 | 9.03 | 0.54 |
| REACH1 | 2219.56 | 10-Year | 10.49 | 223.16 | 224.87 | 224.56 | 224.98 | 0.004797 | 1.5 | 7.03 | 15.54 | 0.56 |
| REACH1 | 2219.56 | 25-Year | 12.98 | 223.16 | 224.96 | 224.66 | 225.09 | 0.004883 | 1.61 | 9.55 | 33.42 | 0.58 |
| REACH1 | 2219.56 | 50-Year | 14.95 | 223.16 | 225.02 | 224.74 | 225.16 | 0.00495 | 1.69 | 11.76 | 43.58 | 0.59 |
| REACH1 | 2219.56 | 100-Year | 17.19 | 223.16 | 225.03 | 224.82 | 225.2 | 0.006278 | 1.91 | 12.12 | 44.66 | 0.66 |
| REACH1 | 2219.56 | Regional | 38.3 | 223.16 | 225.47 | 225.34 | 225.61 | 0.003765 | 1.96 | 39.5 | 96.05 | 0.55 |
| | | | | | | | | | | | | |
| REACH1 | 2219.55 | 2-Year | 6.08 | 222.82 | 223.49 | 223.49 | 223.68 | 0.017654 | 1.96 | 3.11 | 8.28 | 1.02 |
| REACH1 | 2219.55 | 5-Year | 8.72 | 222.82 | 223.61 | 223.61 | 223.83 | 0.016282 | 2.09 | 4.18 | 9.49 | 1.01 |
| REACH1 | 2219.55 | 10-Year | 10.49 | 222.82 | 223.68 | 223.68 | 223.92 | 0.015524 | 2.15 | 4.87 | 10.2 | 0.99 |
| REACH1 | 2219.55 | 25-Year | 12.98 | 222.82 | 223.77 | 223.77 | 224.02 | 0.015172 | 2.23 | 5.82 | 11.34 | 1 |
| REACH1 | 2219.55 | 50-Year | 14.95 | 222.82 | 223.83 | 223.82 | 224.1 | 0.014513 | 2.26 | 6.6 | 12.2 | 0.98 |
| REACH1 | 2219.55 | 100-Year | 17.19 | 222.82 | 223.98 | 223.89 | 224.19 | 0.009787 | 2.03 | 8.45 | 13.64 | 0.82 |
| REACH1 | 2219.55 | Regional | 38.3 | 222.82 | 224.31 | 224.31 | 224.7 | 0.013543 | 2.74 | 13.97 | 18.39 | 1 |
| | | | | | | | | | | | | |
| REACH1 | 2219.54 | 2-Year | 6.08 | 221.6 | 223.01 | | 223.01 | 0.000307 | 0.54 | 30.37 | 53.23 | 0.16 |
| REACH1 | 2219.54 | 5-Year | 8.72 | 221.6 | 223.64 | | 223.64 | 0.000071 | 0.35 | 70.93 | 74.25 | 0.08 |
| REACH1 | 2219.54 | 10-Year | 10.49 | 221.6 | 223.77 | | 223.78 | 0.000071 | 0.36 | 81.47 | 78.02 | 0.08 |
| REACH1 | 2219.54 | 25-Year | 12.98 | 221.6 | 223.9 | | 223.9 | 0.000081 | 0.4 | 91.24 | 81.26 | 0.09 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2219.54 | 50-Year | 14.95 | 221.6 | 223.97 | | 223.97 | 0.00009 | 0.44 | 97.12 | 83.15 | 0.1 |
| REACH1 | 2219.54 | 100-Year | 17.19 | 221.6 | 224.08 | | 224.08 | 0.000095 | 0.46 | 106.21 | 86.76 | 0.1 |
| REACH1 | 2219.54 | Regional | 38.3 | 221.6 | 224.23 | | 224.25 | 0.000351 | 0.93 | 120.58 | 95.4 | 0.19 |
| | | | | | | | | | | | | |
| REACH1 | 2219.53 | 2-Year | 6.08 | 220.75 | 222.79 | 221.91 | 222.93 | 0.004257 | 1.64 | 3.77 | 29.11 | 0.39 |
| REACH1 | 2219.53 | 5-Year | 8.72 | 220.75 | 223.53 | 222.19 | 223.6 | 0.003908 | 1.31 | 13.05 | 77.39 | 0.45 |
| REACH1 | 2219.53 | 10-Year | 10.49 | 220.75 | 223.74 | 222.36 | 223.76 | 0.001245 | 0.86 | 29.97 | 84.6 | 0.26 |
| REACH1 | 2219.53 | 25-Year | 12.98 | 220.75 | 223.87 | 222.59 | 223.88 | 0.000888 | 0.78 | 41.43 | 89.64 | 0.23 |
| REACH1 | 2219.53 | 50-Year | 14.95 | 220.75 | 223.94 | 222.75 | 223.96 | 0.000822 | 0.78 | 48.06 | 93.52 | 0.22 |
| REACH1 | 2219.53 | 100-Year | 17.19 | 220.75 | 224.05 | 222.93 | 224.06 | 0.000655 | 0.74 | 58.8 | 99.07 | 0.2 |
| REACH1 | 2219.53 | Regional | 38.3 | 220.75 | 224.16 | 223.82 | 224.2 | 0.002108 | 1.39 | 69.48 | 103.75 | 0.36 |
| | | | | | | | | | | | | |
| REACH1 | 2219.525 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2219.52 | 2-Year | 6.08 | 220.65 | 222.06 | 222.06 | 222.6 | 0.036297 | 3.27 | 1.86 | 1.73 | 1.01 |
| REACH1 | 2219.52 | 5-Year | 8.72 | 220.65 | 222.4 | 222.4 | 223.03 | 0.031561 | 3.51 | 2.5 | 28.88 | 0.98 |
| REACH1 | 2219.52 | 10-Year | 10.49 | 220.65 | 222.58 | 222.58 | 223.27 | 0.029527 | 3.69 | 2.89 | 43.68 | 0.97 |
| REACH1 | 2219.52 | 25-Year | 12.98 | 220.65 | 222.79 | 222.79 | 223.58 | 0.028359 | 3.96 | 3.37 | 51.48 | 0.97 |
| REACH1 | 2219.52 | 50-Year | 14.95 | 220.65 | 222.95 | 222.95 | 223.81 | 0.027236 | 4.13 | 3.73 | 59.2 | 0.97 |
| REACH1 | 2219.52 | 100-Year | 17.19 | 220.65 | 223.13 | 223.13 | 224.06 | 0.026435 | 4.32 | 4.11 | 65.57 | 0.97 |
| REACH1 | 2219.52 | Regional | 38.3 | 220.65 | 223.73 | 223.73 | 223.93 | 0.010359 | 3 | 39.03 | 98.05 | 0.66 |
| | | | | | | | | | | | | |
| REACH1 | 2219.51 | 2-Year | 6.08 | 220.5 | 222.03 | 221.82 | 222.04 | 0.003164 | 0.88 | 14.7 | 40.92 | 0.37 |
| REACH1 | 2219.51 | 5-Year | 8.72 | 220.5 | 222.11 | | 222.13 | 0.003387 | 1 | 18.41 | 43.88 | 0.39 |
| REACH1 | 2219.51 | 10-Year | 10.49 | 220.5 | 222.18 | | 222.2 | 0.003306 | 1.05 | 21.12 | 45.92 | 0.39 |
| REACH1 | 2219.51 | 25-Year | 12.98 | 220.5 | 222.25 | | 222.27 | 0.003234 | 1.11 | 24.72 | 48.36 | 0.4 |
| REACH1 | 2219.51 | 50-Year | 14.95 | 220.5 | 222.3 | | 222.33 | 0.003211 | 1.15 | 27.32 | 49.81 | 0.4 |
| REACH1 | 2219.51 | 100-Year | 17.19 | 220.5 | 222.36 | | 222.39 | 0.003171 | 1.2 | 30.26 | 51.47 | 0.4 |
| REACH1 | 2219.51 | Regional | 38.3 | 220.5 | 222.76 | | 222.8 | 0.003201 | 1.53 | 53.53 | 63.73 | 0.43 |
| | | | | | | | | | | | | |
| REACH1 | 2219.5 | 2-Year | 6.08 | 220.15 | 221.37 | 221.37 | 221.59 | 0.017409 | 2.11 | 2.98 | 7.57 | 1 |
| REACH1 | 2219.5 | 5-Year | 8.72 | 220.15 | 221.55 | 221.55 | 221.74 | 0.010483 | 2.03 | 6.04 | 23.97 | 0.82 |
| REACH1 | 2219.5 | 10-Year | 10.49 | 220.15 | 221.61 | 221.61 | 221.81 | 0.00985 | 2.11 | 7.76 | 27.46 | 0.8 |
| REACH1 | 2219.5 | 25-Year | 12.98 | 220.15 | 221.69 | 221.69 | 221.9 | 0.00954 | 2.22 | 9.97 | 31.12 | 0.81 |
| REACH1 | 2219.5 | 50-Year | 14.95 | 220.15 | 221.74 | 221.74 | 221.96 | 0.009218 | 2.29 | 11.77 | 33.79 | 0.8 |
| REACH1 | 2219.5 | 100-Year | 17.19 | 220.15 | 221.8 | 221.8 | 222.02 | 0.009181 | 2.38 | 13.6 | 36.3 | 0.81 |
| REACH1 | 2219.5 | Regional | 38.3 | 220.15 | 222.14 | 222.14 | 222.42 | 0.009219 | 2.97 | 29.44 | 54.2 | 0.85 |

PEX SCENARIO

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2224.08 | 2-Year | 1.98 | 242.9 | 243.41 | 243.29 | 243.44 | 0.004562 | 0.88 | 2.91 | 18.17 | 0.5 |
| REACH1 | 2224.08 | 5-Year | 2.82 | 242.9 | 243.46 | | 243.49 | 0.004518 | 0.95 | 3.78 | 18.28 | 0.5 |
| REACH1 | 2224.08 | 10-Year | 3.39 | 242.9 | 243.5 | | 243.53 | 0.003968 | 0.94 | 4.45 | 18.37 | 0.48 |
| REACH1 | 2224.08 | 25-Year | 4.27 | 242.9 | 243.55 | | 243.58 | 0.003333 | 0.93 | 5.45 | 19.67 | 0.45 |
| REACH1 | 2224.08 | 50-Year | 5.05 | 242.9 | 243.6 | | 243.63 | 0.002875 | 0.92 | 6.37 | 20.77 | 0.42 |
| REACH1 | 2224.08 | 100-Year | 5.73 | 242.9 | 243.64 | | 243.67 | 0.002465 | 0.9 | 7.28 | 22.68 | 0.4 |
| REACH1 | 2224.08 | Regional | 8.7 | 242.9 | 243.67 | 243.56 | 243.73 | 0.004438 | 1.26 | 7.93 | 24.01 | 0.54 |
| REACH1 | 2224.07 | 2-Year | 1.98 | 241.78 | 242.28 | 242.25 | 242.42 | 0.011615 | 1.74 | 1.35 | 4.66 | 0.84 |
| REACH1 | 2224.07 | 5-Year | 2.82 | 241.78 | 242.39 | 242.35 | 242.54 | 0.009591 | 1.84 | 1.94 | 5.6 | 0.79 |
| REACH1 | 2224.07 | 10-Year | 3.39 | 241.78 | 242.43 | 242.41 | 242.61 | 0.010825 | 2.04 | 2.15 | 5.9 | 0.85 |
| REACH1 | 2224.07 | 25-Year | 4.27 | 241.78 | 242.47 | 242.47 | 242.7 | 0.012658 | 2.32 | 2.43 | 6.28 | 0.93 |
| REACH1 | 2224.07 | 50-Year | 5.05 | 241.78 | 242.51 | 242.49 | 242.79 | 0.014529 | 2.58 | 2.67 | 7.05 | 1 |
| REACH1 | 2224.07 | 100-Year | 5.73 | 241.78 | 242.53 | 242.49 | 242.88 | 0.016819 | 2.84 | 2.86 | 8.5 | 1.09 |
| REACH1 | 2224.07 | Regional | 8.7 | 241.78 | 242.82 | 242.82 | 242.96 | 0.005988 | 2.13 | 7.92 | 27.25 | 0.69 |
| REACH1 | 2224.06 | 2-Year | 1.98 | 241.5 | 241.8 | 241.77 | 241.85 | 0.008564 | 1.05 | 2.18 | 14.02 | 0.67 |
| REACH1 | 2224.06 | 5-Year | 2.82 | 241.5 | 241.81 | 241.81 | 241.9 | 0.013985 | 1.38 | 2.36 | 14.59 | 0.86 |
| REACH1 | 2224.06 | 10-Year | 3.39 | 241.5 | 241.84 | 241.84 | 241.93 | 0.013364 | 1.44 | 2.74 | 15.75 | 0.86 |
| REACH1 | 2224.06 | 25-Year | 4.27 | 241.5 | 241.87 | 241.87 | 241.97 | 0.012868 | 1.52 | 3.29 | 17.27 | 0.85 |
| REACH1 | 2224.06 | 50-Year | 5.05 | 241.5 | 241.9 | 241.9 | 242 | 0.012577 | 1.58 | 3.75 | 18.44 | 0.86 |
| REACH1 | 2224.06 | 100-Year | 5.73 | 241.5 | 241.92 | 241.92 | 242.03 | 0.012292 | 1.62 | 4.15 | 19.41 | 0.85 |
| REACH1 | 2224.06 | Regional | 8.7 | 241.5 | 242 | 242 | 242.12 | 0.0115 | 1.78 | 5.79 | 22.98 | 0.85 |
| REACH1 | 2224.05 | 2-Year | 1.98 | 241 | 241.55 | | 241.57 | 0.003705 | 0.87 | 5.85 | 55.85 | 0.45 |
| REACH1 | 2224.05 | 5-Year | 2.82 | 241 | 241.64 | | 241.65 | 0.001249 | 0.59 | 11.6 | 61.75 | 0.27 |
| REACH1 | 2224.05 | 10-Year | 3.39 | 241 | 241.66 | | 241.67 | 0.001428 | 0.65 | 12.57 | 62.93 | 0.29 |
| REACH1 | 2224.05 | 25-Year | 4.27 | 241 | 241.7 | | 241.7 | 0.001371 | 0.66 | 14.91 | 65.91 | 0.29 |
| REACH1 | 2224.05 | 50-Year | 5.05 | 241 | 241.73 | | 241.74 | 0.001275 | 0.67 | 17.11 | 69.14 | 0.28 |
| REACH1 | 2224.05 | 100-Year | 5.73 | 241 | 241.75 | | 241.76 | 0.001214 | 0.67 | 18.88 | 70.59 | 0.28 |
| REACH1 | 2224.05 | Regional | 8.7 | 241 | 241.81 | | 241.82 | 0.001559 | 0.81 | 22.8 | 73.55 | 0.32 |
| REACH1 | 2224.04 | 2-Year | 1.98 | 240.5 | 241.56 | | 241.56 | 0.000003 | 0.04 | 52.64 | 116.46 | 0.01 |
| REACH1 | 2224.04 | 5-Year | 2.82 | 240.5 | 241.65 | | 241.65 | 0.000004 | 0.05 | 63.54 | 124.75 | 0.02 |
| REACH1 | 2224.04 | 10-Year | 3.39 | 240.5 | 241.66 | | 241.66 | 0.000005 | 0.06 | 65.53 | 126.21 | 0.02 |
| REACH1 | 2224.04 | 25-Year | 4.27 | 240.5 | 241.7 | | 241.7 | 0.000007 | 0.07 | 70.13 | 129.5 | 0.02 |
| REACH1 | 2224.04 | 50-Year | 5.05 | 240.5 | 241.73 | | 241.73 | 0.000008 | 0.08 | 74.32 | 132.43 | 0.03 |
| REACH1 | 2224.04 | 100-Year | 5.73 | 240.5 | 241.76 | | 241.76 | 0.00001 | 0.09 | 77.66 | 134.73 | 0.03 |
| REACH1 | 2224.04 | Regional | 8.7 | 240.5 | 241.81 | | 241.81 | 0.000019 | 0.13 | 85.12 | 139.65 | 0.04 |
| REACH1 | 2224.03 | 2-Year | 1.98 | 240.5 | 241.56 | | 241.56 | 0.000002 | 0.04 | 60.33 | 71.7 | 0.01 |
| REACH1 | 2224.03 | 5-Year | 2.82 | 240.5 | 241.65 | | 241.65 | 0.000003 | 0.05 | 66.84 | 72.4 | 0.02 |
| REACH1 | 2224.03 | 10-Year | 3.39 | 240.5 | 241.66 | | 241.66 | 0.000005 | 0.06 | 67.99 | 72.52 | 0.02 |
| REACH1 | 2224.03 | 25-Year | 4.27 | 240.5 | 241.7 | | 241.7 | 0.000006 | 0.08 | 70.6 | 72.8 | 0.02 |
| REACH1 | 2224.03 | 50-Year | 5.05 | 240.5 | 241.73 | | 241.73 | 0.000008 | 0.09 | 73.01 | 90.59 | 0.03 |
| REACH1 | 2224.03 | 100-Year | 5.73 | 240.5 | 241.76 | | 241.76 | 0.00001 | 0.1 | 75.82 | 134.92 | 0.03 |
| REACH1 | 2224.03 | Regional | 8.7 | 240.5 | 241.81 | | 241.81 | 0.00002 | 0.15 | 84.82 | 179.97 | 0.04 |
| REACH1 | 2224.02 | 2-Year | 1.98 | 240.27 | 241.53 | 241.06 | 241.55 | 0.002683 | 0.72 | 5.06 | 37.78 | 0.39 |
| REACH1 | 2224.02 | 5-Year | 2.82 | 240.27 | 241.63 | 241.45 | 241.64 | 0.001637 | 0.66 | 9.03 | 43.3 | 0.32 |
| REACH1 | 2224.02 | 10-Year | 3.39 | 240.27 | 241.64 | 241.48 | 241.66 | 0.002133 | 0.77 | 9.45 | 43.84 | 0.36 |
| REACH1 | 2224.02 | 25-Year | 4.27 | 240.27 | 241.67 | 241.49 | 241.69 | 0.00248 | 0.86 | 10.81 | 45.55 | 0.4 |
| REACH1 | 2224.02 | 50-Year | 5.05 | 240.27 | 241.7 | 241.56 | 241.72 | 0.00264 | 0.92 | 12.14 | 47.16 | 0.41 |
| REACH1 | 2224.02 | 100-Year | 5.73 | 240.27 | 241.71 | 241.58 | 241.74 | 0.003451 | 1.07 | 12.73 | 57.95 | 0.47 |
| REACH1 | 2224.02 | Regional | 8.7 | 240.27 | 241.7 | 241.65 | 241.78 | 0.007853 | 1.61 | 12.5 | 52.06 | 0.71 |
| REACH1 | 2224.015 | | Culvert | | | | | | | | | |
| REACH1 | 2224.01 | 2-Year | 1.98 | 239.91 | 240.79 | 240.79 | 241.18 | 0.013816 | 2.77 | 0.71 | 13.22 | 1 |
| REACH1 | 2224.01 | 5-Year | 2.82 | 239.91 | 240.99 | 240.99 | 241.49 | 0.012828 | 3.12 | 0.9 | 70.95 | 1.01 |
| REACH1 | 2224.01 | 10-Year | 3.39 | 239.91 | 241.23 | 241.23 | 241.28 | 0.010802 | 1.32 | 7.66 | 88.28 | 0.75 |
| REACH1 | 2224.01 | 25-Year | 4.27 | 239.91 | 241.26 | 241.26 | 241.3 | 0.009856 | 1.33 | 9.9 | 95.37 | 0.73 |
| REACH1 | 2224.01 | 50-Year | 5.05 | 239.91 | 241.27 | 241.27 | 241.32 | 0.012063 | 1.49 | 10.46 | 96.03 | 0.81 |
| REACH1 | 2224.01 | 100-Year | 5.73 | 239.91 | 241.28 | 241.28 | 241.33 | 0.012156 | 1.53 | 11.57 | 97.66 | 0.82 |
| REACH1 | 2224.01 | Regional | 8.7 | 239.91 | 241.31 | 241.31 | 241.38 | 0.015296 | 1.82 | 14.68 | 101.35 | 0.93 |
| REACH1 | 2223.56 | 2-Year | 2.46 | 239.85 | 240.63 | 240.63 | 240.69 | 0.007306 | 1.33 | 5.82 | 60.3 | 0.63 |
| REACH1 | 2223.56 | 5-Year | 3.5 | 239.85 | 240.66 | 240.66 | 240.73 | 0.00853 | 1.5 | 7.93 | 70.3 | 0.68 |
| REACH1 | 2223.56 | 10-Year | 4.21 | 239.85 | 240.68 | 240.68 | 240.74 | 0.008992 | 1.58 | 9.17 | 71.68 | 0.71 |
| REACH1 | 2223.56 | 25-Year | 5.3 | 239.85 | 240.7 | 240.7 | 240.77 | 0.00961 | 1.68 | 10.86 | 73.53 | 0.74 |
| REACH1 | 2223.56 | 50-Year | 6.27 | 239.85 | 240.72 | 240.72 | 240.79 | 0.010366 | 1.78 | 12.09 | 74.85 | 0.77 |
| REACH1 | 2223.56 | 100-Year | 7.11 | 239.85 | 240.74 | 240.74 | 240.8 | 0.009945 | 1.78 | 13.56 | 75.76 | 0.76 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.56 | Regional | 10.8 | 239.85 | 240.78 | 240.78 | 240.86 | 0.012559 | 2.11 | 16.96 | 77.17 | 0.86 |
| REACH1 | 2223.55 | 2-Year | 2.46 | 239.56 | 240.53 | | 240.53 | 0.000055 | 0.18 | 28.7 | 89.38 | 0.07 |
| REACH1 | 2223.55 | 5-Year | 3.5 | 239.56 | 240.55 | | 240.55 | 0.000096 | 0.25 | 30.81 | 91 | 0.09 |
| REACH1 | 2223.55 | 10-Year | 4.21 | 239.56 | 240.56 | | 240.57 | 0.00013 | 0.29 | 31.77 | 91.74 | 0.1 |
| REACH1 | 2223.55 | 25-Year | 5.3 | 239.56 | 240.58 | | 240.59 | 0.000184 | 0.35 | 33.52 | 93.07 | 0.12 |
| REACH1 | 2223.55 | 50-Year | 6.27 | 239.56 | 240.59 | | 240.6 | 0.000237 | 0.4 | 34.8 | 94.03 | 0.14 |
| REACH1 | 2223.55 | 100-Year | 7.11 | 239.56 | 240.61 | | 240.61 | 0.000284 | 0.44 | 35.94 | 94.88 | 0.15 |
| REACH1 | 2223.55 | Regional | 10.8 | 239.56 | 240.65 | | 240.66 | 0.000509 | 0.61 | 40.21 | 97.98 | 0.2 |
| REACH1 | 2223.54 | 2-Year | 2.46 | 239.55 | 240.52 | 240.44 | 240.52 | 0.003077 | 0.63 | 9.63 | 104.64 | 0.4 |
| REACH1 | 2223.54 | 5-Year | 3.5 | 239.55 | 240.54 | 240.46 | 240.55 | 0.003326 | 0.69 | 11.9 | 108.47 | 0.42 |
| REACH1 | 2223.54 | 10-Year | 4.21 | 239.55 | 240.54 | 240.48 | 240.56 | 0.00392 | 0.76 | 12.71 | 109.8 | 0.46 |
| REACH1 | 2223.54 | 25-Year | 5.3 | 239.55 | 240.56 | 240.51 | 240.57 | 0.003969 | 0.8 | 14.61 | 112.75 | 0.46 |
| REACH1 | 2223.54 | 50-Year | 6.27 | 239.55 | 240.57 | 240.52 | 240.59 | 0.00421 | 0.84 | 15.89 | 114.02 | 0.48 |
| REACH1 | 2223.54 | 100-Year | 7.11 | 239.55 | 240.58 | 240.53 | 240.6 | 0.004225 | 0.86 | 17.11 | 115.23 | 0.48 |
| REACH1 | 2223.54 | Regional | 10.8 | 239.55 | 240.62 | 240.56 | 240.64 | 0.00451 | 0.96 | 21.54 | 120.14 | 0.51 |
| REACH1 | 2223.535 | | Culvert | | | | | | | | | |
| REACH1 | 2223.53 | 2-Year | 2.46 | 239.25 | 240.35 | 240.35 | 240.39 | 0.017504 | 1.23 | 4.77 | 51.88 | 0.88 |
| REACH1 | 2223.53 | 5-Year | 3.5 | 239.25 | 240.36 | 240.36 | 240.43 | 0.02665 | 1.57 | 5.34 | 52.68 | 1.1 |
| REACH1 | 2223.53 | 10-Year | 4.21 | 239.25 | 240.39 | 240.39 | 240.44 | 0.020291 | 1.49 | 6.84 | 55.2 | 0.98 |
| REACH1 | 2223.53 | 25-Year | 5.3 | 239.25 | 240.4 | 240.4 | 240.47 | 0.022717 | 1.65 | 7.83 | 57.61 | 1.05 |
| REACH1 | 2223.53 | 50-Year | 6.27 | 239.25 | 240.41 | 240.41 | 240.49 | 0.02635 | 1.83 | 8.39 | 58.2 | 1.13 |
| REACH1 | 2223.53 | 100-Year | 7.11 | 239.25 | 240.42 | 240.42 | 240.51 | 0.030899 | 2 | 8.67 | 58.5 | 1.23 |
| REACH1 | 2223.53 | Regional | 10.8 | 239.25 | 240.49 | 240.49 | 240.58 | 0.025569 | 2.12 | 13.26 | 75.24 | 1.16 |
| REACH1 | 2223.52 | 2-Year | 2.46 | 239.15 | 239.84 | | 239.89 | 0.007794 | 1.19 | 4.14 | 24.71 | 0.65 |
| REACH1 | 2223.52 | 5-Year | 3.5 | 239.15 | 239.89 | | 239.95 | 0.008365 | 1.35 | 5.5 | 28.49 | 0.69 |
| REACH1 | 2223.52 | 10-Year | 4.21 | 239.15 | 239.97 | | 240.01 | 0.005596 | 1.23 | 7.74 | 33.94 | 0.58 |
| REACH1 | 2223.52 | 25-Year | 5.3 | 239.15 | 240.03 | | 240.08 | 0.004592 | 1.22 | 10.22 | 38.09 | 0.54 |
| REACH1 | 2223.52 | 50-Year | 6.27 | 239.15 | 240.09 | | 240.13 | 0.004002 | 1.22 | 12.32 | 40.37 | 0.51 |
| REACH1 | 2223.52 | 100-Year | 7.11 | 239.15 | 240.13 | | 240.17 | 0.003561 | 1.21 | 14.23 | 42.33 | 0.49 |
| REACH1 | 2223.52 | Regional | 10.8 | 239.15 | 240.31 | | 240.34 | 0.002607 | 1.22 | 22.16 | 49.73 | 0.43 |
| REACH1 | 2223.51 | 2-Year | 2.46 | 238.75 | 239.42 | | 239.49 | 0.004433 | 1.23 | 2.61 | 8.97 | 0.54 |
| REACH1 | 2223.51 | 5-Year | 3.5 | 238.75 | 239.59 | | 239.64 | 0.00281 | 1.17 | 4.35 | 12.16 | 0.45 |
| REACH1 | 2223.51 | 10-Year | 4.21 | 238.75 | 239.57 | | 239.66 | 0.004545 | 1.46 | 4.14 | 11.86 | 0.56 |
| REACH1 | 2223.51 | 25-Year | 5.3 | 238.75 | 239.62 | | 239.73 | 0.005151 | 1.64 | 4.8 | 12.79 | 0.61 |
| REACH1 | 2223.51 | 50-Year | 6.27 | 238.75 | 239.66 | | 239.79 | 0.0057 | 1.79 | 5.32 | 13.47 | 0.65 |
| REACH1 | 2223.51 | 100-Year | 7.11 | 238.75 | 239.68 | 239.6 | 239.83 | 0.006509 | 1.94 | 5.61 | 13.84 | 0.69 |
| REACH1 | 2223.51 | Regional | 10.8 | 238.75 | 239.77 | 239.76 | 240.01 | 0.009466 | 2.51 | 6.87 | 15.41 | 0.85 |
| REACH1 | 2223.5 | 2-Year | 2.46 | 238.52 | 239.44 | | 239.44 | 0.000087 | 0.25 | 22.26 | 38.66 | 0.08 |
| REACH1 | 2223.5 | 5-Year | 3.5 | 238.52 | 239.6 | | 239.6 | 0.00009 | 0.28 | 28.61 | 41.85 | 0.09 |
| REACH1 | 2223.5 | 10-Year | 4.21 | 238.52 | 239.59 | | 239.59 | 0.000135 | 0.34 | 28.18 | 41.65 | 0.11 |
| REACH1 | 2223.5 | 25-Year | 5.3 | 238.52 | 239.64 | | 239.65 | 0.000172 | 0.4 | 30.57 | 42.82 | 0.12 |
| REACH1 | 2223.5 | 50-Year | 6.27 | 238.52 | 239.69 | | 239.69 | 0.000206 | 0.45 | 32.41 | 43.71 | 0.13 |
| REACH1 | 2223.5 | 100-Year | 7.11 | 238.52 | 239.71 | | 239.72 | 0.000242 | 0.49 | 33.5 | 44.23 | 0.15 |
| REACH1 | 2223.5 | Regional | 10.8 | 238.52 | 239.81 | | 239.82 | 0.000393 | 0.66 | 38.14 | 46.36 | 0.19 |
| REACH1 | 2223.49 | 2-Year | 2.46 | 238.04 | 239.42 | 238.84 | 239.43 | 0.00119 | 0.75 | 9.06 | 38.5 | 0.29 |
| REACH1 | 2223.49 | 5-Year | 3.5 | 238.04 | 239.59 | 239.05 | 239.59 | 0.000618 | 0.63 | 15.88 | 42.53 | 0.22 |
| REACH1 | 2223.49 | 10-Year | 4.21 | 238.04 | 239.57 | 239.35 | 239.58 | 0.001013 | 0.79 | 15.11 | 42.06 | 0.28 |
| REACH1 | 2223.49 | 25-Year | 5.3 | 238.04 | 239.62 | 239.39 | 239.64 | 0.001113 | 0.87 | 17.44 | 43.46 | 0.29 |
| REACH1 | 2223.49 | 50-Year | 6.27 | 238.04 | 239.66 | 239.42 | 239.68 | 0.001211 | 0.93 | 19.22 | 44.49 | 0.31 |
| REACH1 | 2223.49 | 100-Year | 7.11 | 238.04 | 239.68 | 239.44 | 239.7 | 0.001369 | 1 | 20.18 | 45.04 | 0.33 |
| REACH1 | 2223.49 | Regional | 10.8 | 238.04 | 239.77 | 239.51 | 239.8 | 0.001914 | 1.26 | 24.39 | 47.37 | 0.39 |
| REACH1 | 2223.485 | | Culvert | | | | | | | | | |
| REACH1 | 2223.48 | 2-Year | 2.46 | 237.92 | 238.84 | 238.84 | 239.25 | 0.015012 | 2.81 | 0.87 | 19.41 | 1.01 |
| REACH1 | 2223.48 | 5-Year | 3.5 | 237.92 | 239.05 | 239.05 | 239.56 | 0.014052 | 3.18 | 1.1 | 22.51 | 1.01 |
| REACH1 | 2223.48 | 10-Year | 4.21 | 237.92 | 239.29 | 239.29 | 239.38 | 0.009692 | 1.63 | 4.89 | 28.6 | 0.75 |
| REACH1 | 2223.48 | 25-Year | 5.3 | 237.92 | 239.32 | 239.32 | 239.42 | 0.010266 | 1.75 | 5.8 | 29.4 | 0.78 |
| REACH1 | 2223.48 | 50-Year | 6.27 | 237.92 | 239.36 | 239.36 | 239.45 | 0.009165 | 1.73 | 6.94 | 30.37 | 0.74 |
| REACH1 | 2223.48 | 100-Year | 7.11 | 237.92 | 239.36 | 239.36 | 239.48 | 0.010951 | 1.9 | 7.13 | 30.54 | 0.81 |
| REACH1 | 2223.48 | Regional | 10.8 | 237.92 | 239.45 | 239.45 | 239.58 | 0.010472 | 2.05 | 9.88 | 32.76 | 0.81 |
| REACH1 | 2223.47 | 2-Year | 2.46 | 237.8 | 238.55 | | 238.55 | 0.000166 | 0.2 | 12.43 | 31.47 | 0.1 |
| REACH1 | 2223.47 | 5-Year | 3.5 | 237.8 | 238.61 | | 238.61 | 0.000209 | 0.24 | 14.39 | 31.75 | 0.12 |
| REACH1 | 2223.47 | 10-Year | 4.21 | 237.8 | 238.65 | | 238.65 | 0.000236 | 0.27 | 15.54 | 31.92 | 0.12 |
| REACH1 | 2223.47 | 25-Year | 5.3 | 237.8 | 238.69 | | 238.7 | 0.000279 | 0.31 | 17.02 | 32.13 | 0.14 |
| REACH1 | 2223.47 | 50-Year | 6.27 | 237.8 | 238.73 | | 238.73 | 0.000314 | 0.34 | 18.2 | 32.29 | 0.15 |
| REACH1 | 2223.47 | 100-Year | 7.11 | 237.8 | 238.77 | | 238.77 | 0.000328 | 0.37 | 19.41 | 32.46 | 0.15 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.47 | Regional | 10.8 | 237.8 | 238.83 | | 238.84 | 0.000552 | 0.5 | 21.41 | 32.74 | 0.2 |
| REACH1 | 2223.46 | 2-Year | 2.46 | 237.57 | 238.54 | | 238.54 | 0.000047 | 0.19 | 28.54 | 44.13 | 0.06 |
| REACH1 | 2223.46 | 5-Year | 3.5 | 237.57 | 238.6 | | 238.6 | 0.000074 | 0.25 | 31.18 | 44.87 | 0.08 |
| REACH1 | 2223.46 | 10-Year | 4.21 | 237.57 | 238.64 | | 238.64 | 0.000093 | 0.28 | 32.73 | 45.31 | 0.09 |
| REACH1 | 2223.46 | 25-Year | 5.3 | 237.57 | 238.68 | | 238.68 | 0.000124 | 0.34 | 34.71 | 45.85 | 0.1 |
| REACH1 | 2223.46 | 50-Year | 6.27 | 237.57 | 238.71 | | 238.72 | 0.000153 | 0.38 | 36.29 | 46.28 | 0.11 |
| REACH1 | 2223.46 | 100-Year | 7.11 | 237.57 | 238.75 | | 238.75 | 0.000173 | 0.41 | 37.96 | 46.73 | 0.12 |
| REACH1 | 2223.46 | Regional | 10.8 | 237.57 | 238.8 | | 238.8 | 0.000339 | 0.6 | 40.17 | 47.32 | 0.17 |
| REACH1 | 2223.45 | 2-Year | 4.24 | 237 | 238.54 | | 238.54 | 0.000108 | 0.38 | 30.73 | 34.87 | 0.1 |
| REACH1 | 2223.45 | 5-Year | 6.03 | 237 | 238.59 | | 238.59 | 0.000187 | 0.52 | 32.68 | 36.04 | 0.13 |
| REACH1 | 2223.45 | 10-Year | 7.26 | 237 | 238.62 | | 238.63 | 0.000249 | 0.6 | 33.8 | 36.67 | 0.15 |
| REACH1 | 2223.45 | 25-Year | 8.94 | 237 | 238.66 | | 238.67 | 0.000339 | 0.71 | 35.23 | 37.45 | 0.18 |
| REACH1 | 2223.45 | 50-Year | 10.27 | 237 | 238.69 | | 238.7 | 0.000412 | 0.8 | 36.37 | 38.06 | 0.2 |
| REACH1 | 2223.45 | 100-Year | 11.79 | 237 | 238.72 | | 238.73 | 0.0005 | 0.89 | 37.57 | 38.69 | 0.22 |
| REACH1 | 2223.45 | Regional | 13.84 | 237 | 238.76 | | 238.77 | 0.00062 | 1.01 | 39.17 | 43.32 | 0.24 |
| REACH1 | 2223.44 | 2-Year | 4.24 | 236.3 | 238.53 | | 238.54 | 0.000052 | 0.25 | 27.53 | 28.51 | 0.06 |
| REACH1 | 2223.44 | 5-Year | 6.03 | 236.3 | 238.59 | | 238.59 | 0.000093 | 0.34 | 29.13 | 31.14 | 0.09 |
| REACH1 | 2223.44 | 10-Year | 7.26 | 236.3 | 238.62 | | 238.62 | 0.000124 | 0.4 | 30.36 | 49.73 | 0.1 |
| REACH1 | 2223.44 | 25-Year | 8.94 | 236.3 | 238.66 | | 238.66 | 0.00017 | 0.48 | 32.41 | 58.46 | 0.12 |
| REACH1 | 2223.44 | 50-Year | 10.27 | 236.3 | 238.69 | | 238.69 | 0.000204 | 0.53 | 34.22 | 62.97 | 0.13 |
| REACH1 | 2223.44 | 100-Year | 11.79 | 236.3 | 238.72 | | 238.73 | 0.000243 | 0.58 | 36.21 | 67.61 | 0.14 |
| REACH1 | 2223.44 | Regional | 13.84 | 236.3 | 238.76 | | 238.77 | 0.000293 | 0.65 | 38.91 | 73.42 | 0.16 |
| REACH1 | 2223.43 | 2-Year | 4.24 | 236 | 236.96 | | 236.98 | 0.001029 | 0.59 | 7.19 | 13.67 | 0.26 |
| REACH1 | 2223.43 | 5-Year | 6.03 | 236 | 237.1 | | 237.12 | 0.00098 | 0.66 | 9.16 | 14.94 | 0.26 |
| REACH1 | 2223.43 | 10-Year | 7.26 | 236 | 237.18 | | 237.21 | 0.00095 | 0.71 | 10.43 | 15.57 | 0.26 |
| REACH1 | 2223.43 | 25-Year | 8.94 | 236 | 237.28 | | 237.31 | 0.00094 | 0.76 | 12 | 16.32 | 0.27 |
| REACH1 | 2223.43 | 50-Year | 10.27 | 236 | 237.35 | | 237.38 | 0.00095 | 0.81 | 13.12 | 16.83 | 0.27 |
| REACH1 | 2223.43 | 100-Year | 11.79 | 236 | 237.42 | | 237.45 | 0.000982 | 0.86 | 14.25 | 17.34 | 0.28 |
| REACH1 | 2223.43 | Regional | 13.84 | 236 | 237.49 | | 237.54 | 0.00104 | 0.93 | 15.61 | 17.92 | 0.29 |
| REACH1 | 2223.42 | 2-Year | 4.24 | 236 | 236.96 | | 236.97 | 0.00032 | 0.41 | 12.04 | 22.8 | 0.15 |
| REACH1 | 2223.42 | 5-Year | 6.03 | 236 | 237.1 | | 237.11 | 0.000343 | 0.47 | 15.31 | 24.21 | 0.16 |
| REACH1 | 2223.42 | 10-Year | 7.26 | 236 | 237.18 | | 237.2 | 0.000355 | 0.51 | 17.36 | 24.8 | 0.17 |
| REACH1 | 2223.42 | 25-Year | 8.94 | 236 | 237.28 | | 237.3 | 0.000373 | 0.56 | 19.86 | 25.48 | 0.18 |
| REACH1 | 2223.42 | 50-Year | 10.27 | 236 | 237.35 | | 237.37 | 0.000391 | 0.6 | 21.62 | 25.95 | 0.18 |
| REACH1 | 2223.42 | 100-Year | 11.79 | 236 | 237.42 | | 237.44 | 0.000416 | 0.65 | 23.37 | 26.4 | 0.19 |
| REACH1 | 2223.42 | Regional | 13.84 | 236 | 237.5 | | 237.52 | 0.000454 | 0.7 | 25.44 | 26.97 | 0.2 |
| REACH1 | 2223.41 | 2-Year | 4.24 | 236 | 236.96 | 236.16 | 236.97 | 0.000057 | 0.2 | 21.24 | 25.03 | 0.07 |
| REACH1 | 2223.41 | 5-Year | 6.03 | 236 | 237.1 | 236.21 | 237.1 | 0.000072 | 0.25 | 24.86 | 27.51 | 0.08 |
| REACH1 | 2223.41 | 10-Year | 7.26 | 236 | 237.19 | 236.23 | 237.19 | 0.000081 | 0.28 | 27.23 | 29.22 | 0.08 |
| REACH1 | 2223.41 | 25-Year | 8.94 | 236 | 237.29 | 236.27 | 237.29 | 0.000092 | 0.31 | 30.25 | 31.28 | 0.09 |
| REACH1 | 2223.41 | 50-Year | 10.27 | 236 | 237.35 | 236.3 | 237.36 | 0.0001 | 0.34 | 32.45 | 32.69 | 0.09 |
| REACH1 | 2223.41 | 100-Year | 11.79 | 236 | 237.42 | 236.32 | 237.43 | 0.000111 | 0.37 | 34.69 | 34.04 | 0.1 |
| REACH1 | 2223.41 | Regional | 13.84 | 236 | 237.5 | 236.36 | 237.51 | 0.000126 | 0.41 | 37.42 | 35.61 | 0.11 |
| REACH1 | 2223.4 | 2-Year | 4.24 | 236 | 236.88 | 236.71 | 236.95 | 0.0048 | 1.23 | 3.58 | 8.63 | 0.55 |
| REACH1 | 2223.4 | 5-Year | 6.03 | 236 | 236.99 | 236.81 | 237.09 | 0.004862 | 1.42 | 4.62 | 9.92 | 0.58 |
| REACH1 | 2223.4 | 10-Year | 7.26 | 236 | 237.05 | 236.86 | 237.17 | 0.004992 | 1.53 | 5.35 | 13.11 | 0.59 |
| REACH1 | 2223.4 | 25-Year | 8.94 | 236 | 237.13 | 236.94 | 237.27 | 0.005128 | 1.67 | 6.56 | 19.02 | 0.61 |
| REACH1 | 2223.4 | 50-Year | 10.27 | 236 | 237.19 | 237 | 237.34 | 0.00514 | 1.76 | 7.85 | 25.61 | 0.62 |
| REACH1 | 2223.4 | 100-Year | 11.79 | 236 | 237.24 | 237.06 | 237.4 | 0.005224 | 1.85 | 9.38 | 32.26 | 0.63 |
| REACH1 | 2223.4 | Regional | 13.84 | 236 | 237.31 | 237.19 | 237.48 | 0.005104 | 1.92 | 12.05 | 42.57 | 0.63 |
| REACH1 | 2223.39 | 2-Year | 4.24 | 235.68 | 236.29 | 236.29 | 236.48 | 0.017786 | 1.91 | 2.22 | 6.11 | 1.01 |
| REACH1 | 2223.39 | 5-Year | 6.03 | 235.68 | 236.4 | 236.4 | 236.62 | 0.017004 | 2.06 | 2.93 | 6.96 | 1.01 |
| REACH1 | 2223.39 | 10-Year | 7.26 | 235.68 | 236.47 | 236.47 | 236.7 | 0.016331 | 2.12 | 3.42 | 7.48 | 1 |
| REACH1 | 2223.39 | 25-Year | 8.94 | 235.68 | 236.54 | 236.54 | 236.8 | 0.015348 | 2.24 | 4.02 | 8.8 | 0.99 |
| REACH1 | 2223.39 | 50-Year | 10.27 | 235.68 | 236.6 | 236.6 | 236.87 | 0.014699 | 2.33 | 4.5 | 10.1 | 0.99 |
| REACH1 | 2223.39 | 100-Year | 11.79 | 235.68 | 236.66 | 236.66 | 236.95 | 0.013343 | 2.39 | 5.21 | 11.51 | 0.96 |
| REACH1 | 2223.39 | Regional | 13.84 | 235.68 | 236.74 | 236.74 | 237.05 | 0.012408 | 2.48 | 6.14 | 12.94 | 0.94 |
| REACH1 | 2223.38 | 2-Year | 4.24 | 234.5 | 235.67 | | 235.72 | 0.001334 | 0.98 | 6.27 | 15.61 | 0.32 |
| REACH1 | 2223.38 | 5-Year | 6.03 | 234.5 | 235.91 | | 235.95 | 0.001029 | 1 | 11.22 | 26.1 | 0.29 |
| REACH1 | 2223.38 | 10-Year | 7.26 | 234.5 | 236.01 | | 236.05 | 0.001011 | 1.04 | 14.06 | 30.44 | 0.29 |
| REACH1 | 2223.38 | 25-Year | 8.94 | 234.5 | 236.05 | | 236.11 | 0.001318 | 1.21 | 15.3 | 31.87 | 0.34 |
| REACH1 | 2223.38 | 50-Year | 10.27 | 234.5 | 236.11 | | 236.17 | 0.001404 | 1.29 | 17.18 | 33.81 | 0.35 |
| REACH1 | 2223.38 | 100-Year | 11.79 | 234.5 | 236.14 | | 236.22 | 0.001665 | 1.43 | 18.39 | 37.1 | 0.38 |
| REACH1 | 2223.38 | Regional | 13.84 | 234.5 | 236.21 | | 236.29 | 0.001898 | 1.57 | 21.07 | 45.65 | 0.41 |
| REACH1 | 2223.37 | 2-Year | 4.59 | 233.51 | 235.59 | 234.48 | 235.66 | 0.003026 | 1.15 | 5.1 | 16.53 | 0.44 |
| REACH1 | 2223.37 | 5-Year | 6.53 | 233.51 | 235.87 | 234.72 | 235.92 | 0.001517 | 1.02 | 10.14 | 19.56 | 0.33 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.37 | 10-Year | 7.85 | 233.51 | 235.97 | 234.87 | 236.02 | 0.001452 | 1.06 | 12.17 | 20.8 | 0.33 |
| REACH1 | 2223.37 | 25-Year | 9.68 | 233.51 | 235.99 | 235.07 | 236.06 | 0.002045 | 1.28 | 12.6 | 21.1 | 0.39 |
| REACH1 | 2223.37 | 50-Year | 11.11 | 233.51 | 236.02 | 235.22 | 236.11 | 0.00261 | 1.47 | 13.3 | 27.64 | 0.44 |
| REACH1 | 2223.37 | 100-Year | 12.75 | 233.51 | 236.03 | 235.75 | 236.14 | 0.003358 | 1.67 | 13.48 | 28.06 | 0.5 |
| REACH1 | 2223.37 | Regional | 14.97 | 233.51 | 236.06 | 235.82 | 236.2 | 0.004147 | 1.89 | 14.34 | 30.03 | 0.56 |
| | | | | | | | | | | | | |
| REACH1 | 2223.365 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.36 | 2-Year | 4.59 | 233.69 | 234.71 | 234.71 | 235.19 | 0.012752 | 3.09 | 1.49 | 7.84 | 1.01 |
| REACH1 | 2223.36 | 5-Year | 6.53 | 233.69 | 234.96 | 234.96 | 235.58 | 0.011788 | 3.47 | 1.88 | 9.06 | 1.01 |
| REACH1 | 2223.36 | 10-Year | 7.85 | 233.69 | 235.12 | 235.12 | 235.82 | 0.011302 | 3.69 | 2.13 | 11.85 | 1.01 |
| REACH1 | 2223.36 | 25-Year | 9.68 | 233.69 | 235.57 | 235.57 | 235.71 | 0.012159 | 1.79 | 6.27 | 27.22 | 0.85 |
| REACH1 | 2223.36 | 50-Year | 11.11 | 233.69 | 235.61 | 235.61 | 235.74 | 0.010727 | 1.77 | 7.37 | 30.98 | 0.81 |
| REACH1 | 2223.36 | 100-Year | 12.75 | 233.69 | 235.65 | 235.65 | 235.77 | 0.008845 | 1.71 | 8.95 | 37.82 | 0.75 |
| REACH1 | 2223.36 | Regional | 14.97 | 233.69 | 235.68 | 235.68 | 235.81 | 0.009478 | 1.83 | 9.94 | 41.35 | 0.78 |
| | | | | | | | | | | | | |
| REACH1 | 2223.35 | 2-Year | 4.59 | 233.5 | 234.13 | 234.13 | 234.35 | 0.015939 | 2.06 | 2.27 | 5.86 | 0.99 |
| REACH1 | 2223.35 | 5-Year | 6.53 | 233.5 | 234.25 | 234.25 | 234.51 | 0.014395 | 2.3 | 3.02 | 6.66 | 0.98 |
| REACH1 | 2223.35 | 10-Year | 7.85 | 233.5 | 234.32 | 234.32 | 234.62 | 0.013593 | 2.42 | 3.53 | 7.17 | 0.97 |
| REACH1 | 2223.35 | 25-Year | 9.68 | 233.5 | 234.42 | 234.42 | 234.74 | 0.012804 | 2.58 | 4.23 | 7.8 | 0.96 |
| REACH1 | 2223.35 | 50-Year | 11.11 | 233.5 | 234.49 | 234.49 | 234.84 | 0.012186 | 2.67 | 4.8 | 8.27 | 0.95 |
| REACH1 | 2223.35 | 100-Year | 12.75 | 233.5 | 234.56 | 234.56 | 234.94 | 0.011798 | 2.79 | 5.41 | 8.73 | 0.95 |
| REACH1 | 2223.35 | Regional | 14.97 | 233.5 | 234.66 | 234.66 | 235.06 | 0.011132 | 2.91 | 6.29 | 9.35 | 0.94 |
| REACH1 | 2223.34 | 2-Year | 4.59 | 233 | 233.71 | 233.52 | 233.76 | 0.003364 | 1.14 | 6.78 | 26.16 | 0.48 |
| REACH1 | 2223.34 | 5-Year | 6.53 | 233 | 233.77 | 233.63 | 233.85 | 0.004359 | 1.39 | 8.55 | 30.44 | 0.55 |
| REACH1 | 2223.34 | 10-Year | 7.85 | 233 | 233.69 | 233.69 | 233.87 | 0.011005 | 2.02 | 6.39 | 25.13 | 0.86 |
| REACH1 | 2223.34 | 25-Year | 9.68 | 233 | 233.76 | 233.76 | 233.94 | 0.010433 | 2.12 | 8.18 | 29.6 | 0.85 |
| REACH1 | 2223.34 | 50-Year | 11.11 | 233 | 233.8 | 233.8 | 233.99 | 0.010083 | 2.18 | 9.6 | 32.71 | 0.85 |
| REACH1 | 2223.34 | 100-Year | 12.75 | 233 | 233.85 | 233.85 | 234.04 | 0.009996 | 2.26 | 11.09 | 35.7 | 0.85 |
| REACH1 | 2223.34 | Regional | 14.97 | 233 | 233.92 | 233.9 | 234.1 | 0.008708 | 2.26 | 13.95 | 40.83 | 0.81 |
| | | | | | | | | | | | | |
| REACH1 | 2223.33 | 2-Year | 4.59 | 232.5 | 232.96 | 232.96 | 233.1 | 0.019521 | 1.62 | 2.83 | 10.84 | 1.01 |
| REACH1 | 2223.33 | 5-Year | 6.53 | 232.5 | 233.09 | 233.04 | 233.2 | 0.010962 | 1.52 | 4.6 | 16.97 | 0.8 |
| REACH1 | 2223.33 | 10-Year | 7.85 | 232.5 | 233.36 | | 233.41 | 0.002106 | 0.97 | 10.27 | 23.79 | 0.39 |
| REACH1 | 2223.33 | 25-Year | 9.68 | 232.5 | 233.55 | | 233.58 | 0.00125 | 0.89 | 15.08 | 28.06 | 0.31 |
| REACH1 | 2223.33 | 50-Year | 11.11 | 232.5 | 233.64 | | 233.68 | 0.001098 | 0.89 | 17.77 | 30.27 | 0.3 |
| REACH1 | 2223.33 | 100-Year | 12.75 | 232.5 | 233.69 | | 233.73 | 0.0012 | 0.96 | 19.17 | 31.36 | 0.31 |
| REACH1 | 2223.33 | Regional | 14.97 | 232.5 | 233.76 | | 233.81 | 0.001229 | 1.02 | 21.65 | 33.3 | 0.32 |
| | | | | | | | | | | | | |
| REACH1 | 2223.326 | 2-Year | 4.59 | 232 | 232.78 | | 232.79 | 0.000292 | 0.35 | 19.4 | 43.93 | 0.14 |
| REACH1 | 2223.326 | 5-Year | 6.53 | 232 | 233.12 | | 233.13 | 0.000111 | 0.29 | 35.8 | 51.38 | 0.1 |
| REACH1 | 2223.326 | 10-Year | 7.85 | 232 | 233.37 | | 233.37 | 0.000071 | 0.27 | 53.09 | 77.09 | 0.08 |
| REACH1 | 2223.326 | 25-Year | 9.68 | 232 | 233.55 | | 233.56 | 0.000058 | 0.27 | 67.59 | 79.84 | 0.07 |
| REACH1 | 2223.326 | 50-Year | 11.11 | 232 | 233.65 | | 233.65 | 0.000058 | 0.28 | 74.99 | 80.79 | 0.07 |
| REACH1 | 2223.326 | 100-Year | 12.75 | 232 | 233.69 | | 233.7 | 0.000067 | 0.31 | 78.76 | 81.28 | 0.08 |
| REACH1 | 2223.326 | Regional | 14.97 | 232 | 233.77 | | 233.77 | 0.000074 | 0.34 | 85.11 | 82.08 | 0.08 |
| | | | | | | | | | | | | |
| REACH1 | 2223.325 | 2-Year | 4.59 | 231.99 | 232.77 | 232.34 | 232.78 | 0.000369 | 0.39 | 15.35 | 30.57 | 0.16 |
| REACH1 | 2223.325 | 5-Year | 6.53 | 231.99 | 233.12 | 232.4 | 233.13 | 0.000165 | 0.36 | 29.27 | 56.97 | 0.12 |
| REACH1 | 2223.325 | 10-Year | 7.85 | 231.99 | 233.37 | 232.43 | 233.37 | 0.000089 | 0.31 | 43.83 | 60.2 | 0.09 |
| REACH1 | 2223.325 | 25-Year | 9.68 | 231.99 | 233.55 | 232.46 | 233.56 | 0.000075 | 0.31 | 55.13 | 62.59 | 0.08 |
| REACH1 | 2223.325 | 50-Year | 11.11 | 231.99 | 233.65 | 232.5 | 233.65 | 0.000076 | 0.32 | 60.96 | 64.4 | 0.08 |
| REACH1 | 2223.325 | 100-Year | 12.75 | 231.99 | 233.69 | 232.52 | 233.7 | 0.000088 | 0.36 | 63.95 | 65.52 | 0.09 |
| REACH1 | 2223.325 | Regional | 14.97 | 231.99 | 233.77 | 232.56 | 233.77 | 0.0001 | 0.39 | 69.1 | 67.39 | 0.1 |
| | | | | | | | | | | | | |
| REACH1 | 2223.324 | 2-Year | 4.59 | 231.98 | 232.77 | 232.28 | 232.78 | 0.00016 | 0.27 | 18.72 | 34.64 | 0.11 |
| REACH1 | 2223.324 | 5-Year | 6.53 | 231.98 | 233.12 | 232.32 | 233.12 | 0.000072 | 0.24 | 31.76 | 40.66 | 0.08 |
| REACH1 | 2223.324 | 10-Year | 7.85 | 231.98 | 233.37 | 232.35 | 233.37 | 0.000047 | 0.22 | 44.96 | 60.48 | 0.06 |
| REACH1 | 2223.324 | 25-Year | 9.68 | 231.98 | 233.55 | 232.38 | 233.56 | 0.000042 | 0.23 | 56.19 | 61.57 | 0.06 |
| REACH1 | 2223.324 | 50-Year | 11.11 | 231.98 | 233.65 | 232.4 | 233.65 | 0.000043 | 0.25 | 61.88 | 62.12 | 0.06 |
| REACH1 | 2223.324 | 100-Year | 12.75 | 231.98 | 233.69 | 232.43 | 233.69 | 0.000051 | 0.27 | 64.76 | 63.12 | 0.07 |
| REACH1 | 2223.324 | Regional | 14.97 | 231.98 | 233.77 | 232.46 | 233.77 | 0.000058 | 0.3 | 69.72 | 64.95 | 0.08 |
| | | | | | | | | | | | | |
| REACH1 | 2223.323 | 2-Year | 4.59 | 231.92 | 232.77 | | 232.78 | 0.000118 | 0.24 | 20.98 | 36.64 | 0.09 |
| REACH1 | 2223.323 | 5-Year | 6.53 | 231.92 | 233.12 | | 233.12 | 0.000056 | 0.22 | 34.73 | 42.61 | 0.07 |
| REACH1 | 2223.323 | 10-Year | 7.85 | 231.92 | 233.37 | | 233.37 | 0.000038 | 0.21 | 45.84 | 47.67 | 0.06 |
| REACH1 | 2223.323 | 25-Year | 9.68 | 231.92 | 233.55 | | 233.56 | 0.000036 | 0.22 | 55.59 | 58.37 | 0.06 |
| REACH1 | 2223.323 | 50-Year | 11.11 | 231.92 | 233.64 | | 233.65 | 0.000038 | 0.24 | 61.16 | 61.63 | 0.06 |
| REACH1 | 2223.323 | 100-Year | 12.75 | 231.92 | 233.69 | | 233.69 | 0.000045 | 0.26 | 64.01 | 62.16 | 0.07 |
| REACH1 | 2223.323 | Regional | 14.97 | 231.92 | 233.77 | | 233.77 | 0.000052 | 0.29 | 68.85 | 63.06 | 0.07 |
| | | | | | | | | | | | | |
| REACH1 | 2223.32 | 2-Year | 4.59 | 231.67 | 232.76 | | 232.77 | 0.000271 | 0.41 | 17.35 | 31.93 | 0.14 |
| REACH1 | 2223.32 | 5-Year | 6.53 | 231.67 | 233.11 | | 233.12 | 0.000139 | 0.38 | 29.45 | 37.12 | 0.11 |
| REACH1 | 2223.32 | 10-Year | 7.85 | 231.67 | 233.36 | | 233.37 | 0.000096 | 0.35 | 39.21 | 41.06 | 0.09 |
| REACH1 | 2223.32 | 25-Year | 9.68 | 231.67 | 233.55 | | 233.55 | 0.000091 | 0.37 | 47.02 | 44.18 | 0.09 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.32 | 50-Year | 11.11 | 231.67 | 233.64 | | 233.65 | 0.000098 | 0.4 | 51.16 | 46.26 | 0.1 |
| REACH1 | 2223.32 | 100-Year | 12.75 | 231.67 | 233.68 | | 233.69 | 0.000117 | 0.45 | 53.26 | 47.25 | 0.11 |
| REACH1 | 2223.32 | Regional | 14.97 | 231.67 | 233.76 | | 233.77 | 0.000137 | 0.5 | 56.93 | 49.78 | 0.12 |
| | | | | | | | | | | | | |
| REACH1 | 2223.31 | 2-Year | 4.59 | 231.5 | 232.76 | | 232.76 | 0.000061 | 0.23 | 29.18 | 38.27 | 0.07 |
| REACH1 | 2223.31 | 5-Year | 6.53 | 231.5 | 233.11 | | 233.11 | 0.000042 | 0.23 | 43.3 | 42.24 | 0.06 |
| REACH1 | 2223.31 | 10-Year | 7.85 | 231.5 | 233.36 | | 233.36 | 0.000033 | 0.23 | 54.85 | 56.2 | 0.06 |
| REACH1 | 2223.31 | 25-Year | 9.68 | 231.5 | 233.55 | | 233.55 | 0.000032 | 0.24 | 65.77 | 62.03 | 0.06 |
| REACH1 | 2223.31 | 50-Year | 11.11 | 231.5 | 233.64 | | 233.64 | 0.000034 | 0.26 | 71.59 | 64.84 | 0.06 |
| REACH1 | 2223.31 | 100-Year | 12.75 | 231.5 | 233.68 | | 233.69 | 0.00004 | 0.29 | 74.51 | 66.06 | 0.06 |
| REACH1 | 2223.31 | Regional | 14.97 | 231.5 | 233.76 | | 233.76 | 0.000047 | 0.32 | 79.6 | 68.01 | 0.07 |
| | | | | | | | | | | | | |
| REACH1 | 2223.3 | 2-Year | 4.59 | 231.5 | 232.76 | | 232.76 | 0.000169 | 0.42 | 28.32 | 49.64 | 0.12 |
| REACH1 | 2223.3 | 5-Year | 6.53 | 231.5 | 233.11 | | 233.11 | 0.000075 | 0.33 | 48.42 | 60.94 | 0.09 |
| REACH1 | 2223.3 | 10-Year | 7.85 | 231.5 | 233.36 | | 233.36 | 0.000045 | 0.28 | 64.45 | 66.72 | 0.07 |
| REACH1 | 2223.3 | 25-Year | 9.68 | 231.5 | 233.55 | | 233.55 | 0.00004 | 0.28 | 77.15 | 71.48 | 0.06 |
| REACH1 | 2223.3 | 50-Year | 11.11 | 231.5 | 233.64 | | 233.64 | 0.000041 | 0.3 | 83.84 | 74.62 | 0.07 |
| REACH1 | 2223.3 | 100-Year | 12.75 | 231.5 | 233.68 | | 233.68 | 0.000048 | 0.32 | 87.21 | 76.15 | 0.07 |
| REACH1 | 2223.3 | Regional | 14.97 | 231.5 | 233.76 | | 233.76 | 0.000054 | 0.35 | 93.09 | 78.75 | 0.08 |
| | | | | | | | | | | | | |
| REACH1 | 2223.29 | 2-Year | 4.59 | 231.5 | 232.61 | 232.16 | 232.72 | 0.002545 | 1.44 | 3.18 | 19.17 | 0.45 |
| REACH1 | 2223.29 | 5-Year | 6.53 | 231.5 | 232.95 | 232.33 | 233.07 | 0.002096 | 1.57 | 4.16 | 21.96 | 0.42 |
| REACH1 | 2223.29 | 10-Year | 7.85 | 231.5 | 233.19 | 232.43 | 233.32 | 0.001778 | 1.61 | 4.88 | 31.69 | 0.4 |
| REACH1 | 2223.29 | 25-Year | 9.68 | 231.5 | 233.32 | 232.57 | 233.49 | 0.002089 | 1.84 | 5.27 | 34.3 | 0.44 |
| REACH1 | 2223.29 | 50-Year | 11.11 | 231.5 | 233.35 | 232.67 | 233.57 | 0.003625 | 2.07 | 5.52 | 34.9 | 0.55 |
| REACH1 | 2223.29 | 100-Year | 12.75 | 231.5 | 233.51 | 232.78 | 233.64 | 0.002355 | 1.78 | 10.95 | 37.05 | 0.45 |
| REACH1 | 2223.29 | Regional | 14.97 | 231.5 | 233.66 | 232.91 | 233.74 | 0.001446 | 1.48 | 16.92 | 41.9 | 0.36 |
| | | | | | | | | | | | | |
| REACH1 | 2223.285 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.28 | 2-Year | 4.59 | 231.5 | 232.17 | 232.17 | 232.49 | 0.014757 | 2.52 | 1.82 | 29.02 | 1.01 |
| REACH1 | 2223.28 | 5-Year | 6.53 | 231.5 | 232.34 | 232.34 | 232.75 | 0.01367 | 2.84 | 2.3 | 31.38 | 1.01 |
| REACH1 | 2223.28 | 10-Year | 7.85 | 231.5 | 232.45 | 232.45 | 232.91 | 0.0131 | 3.01 | 2.6 | 32.16 | 1.01 |
| REACH1 | 2223.28 | 25-Year | 9.68 | 231.5 | 232.58 | 232.58 | 233.12 | 0.012531 | 3.23 | 2.99 | 32.68 | 1.01 |
| REACH1 | 2223.28 | 50-Year | 11.11 | 231.5 | 232.69 | 232.69 | 233.27 | 0.012098 | 3.38 | 3.29 | 33.16 | 1 |
| REACH1 | 2223.28 | 100-Year | 12.75 | 231.5 | 232.8 | 232.8 | 233.44 | 0.011764 | 3.54 | 3.6 | 33.67 | 1.01 |
| REACH1 | 2223.28 | Regional | 14.97 | 231.5 | 232.94 | 232.94 | 233.65 | 0.011224 | 3.73 | 4.02 | 34.37 | 1 |
| | | | | | | | | | | | | |
| REACH1 | 2223.27 | 2-Year | 4.59 | 231.1 | 231.85 | 231.75 | 231.88 | 0.00239 | 0.94 | 6.55 | 34.94 | 0.4 |
| REACH1 | 2223.27 | 5-Year | 6.53 | 231.1 | 231.91 | 231.8 | 231.95 | 0.002651 | 1.05 | 7.95 | 37.15 | 0.42 |
| REACH1 | 2223.27 | 10-Year | 7.85 | 231.1 | 231.93 | 231.84 | 231.97 | 0.003199 | 1.18 | 8.42 | 37.6 | 0.47 |
| REACH1 | 2223.27 | 25-Year | 9.68 | 231.1 | 232.18 | 231.87 | 232.2 | 0.000732 | 0.7 | 15.34 | 44.28 | 0.24 |
| REACH1 | 2223.27 | 50-Year | 11.11 | 231.1 | 232.3 | 231.89 | 232.32 | 0.000525 | 0.65 | 18.56 | 46.95 | 0.2 |
| REACH1 | 2223.27 | 100-Year | 12.75 | 231.1 | 232.45 | 231.91 | 232.46 | 0.000362 | 0.59 | 22.75 | 49.96 | 0.17 |
| REACH1 | 2223.27 | Regional | 14.97 | 231.1 | 232.66 | 231.94 | 232.68 | 0.000235 | 0.53 | 28.9 | 54.15 | 0.14 |
| | | | | | | | | | | | | |
| REACH1 | 2223.26 | 2-Year | 4.59 | 231 | 231.67 | 231.67 | 231.75 | 0.0069 | 1.48 | 4.62 | 32.19 | 0.67 |
| REACH1 | 2223.26 | 5-Year | 6.53 | 231 | 231.73 | 231.73 | 231.81 | 0.006366 | 1.54 | 6.51 | 38.06 | 0.65 |
| REACH1 | 2223.26 | 10-Year | 7.85 | 231 | 231.8 | 231.75 | 231.86 | 0.003826 | 1.29 | 8.87 | 39.62 | 0.52 |
| REACH1 | 2223.26 | 25-Year | 9.68 | 231 | 232.17 | 231.78 | 232.18 | 0.000394 | 0.56 | 21 | 47.74 | 0.18 |
| REACH1 | 2223.26 | 50-Year | 11.11 | 231 | 232.29 | 231.8 | 232.3 | 0.000293 | 0.52 | 25.1 | 50.71 | 0.16 |
| REACH1 | 2223.26 | 100-Year | 12.75 | 231 | 232.44 | 231.82 | 232.45 | 0.00021 | 0.48 | 30.36 | 54.11 | 0.14 |
| REACH1 | 2223.26 | Regional | 14.97 | 231 | 232.66 | 231.85 | 232.67 | 0.000142 | 0.44 | 38 | 59.24 | 0.11 |
| | | | | | | | | | | | | |
| REACH1 | 2223.25 | 2-Year | 4.59 | 230.5 | 231.24 | | 231.39 | 0.014808 | 1.73 | 2.66 | 5.36 | 0.78 |
| REACH1 | 2223.25 | 5-Year | 6.53 | 230.5 | 231.44 | | 231.59 | 0.011527 | 1.72 | 3.81 | 6.19 | 0.69 |
| REACH1 | 2223.25 | 10-Year | 7.85 | 230.5 | 231.59 | | 231.73 | 0.008695 | 1.64 | 4.92 | 8.13 | 0.6 |
| REACH1 | 2223.25 | 25-Year | 9.68 | 230.5 | 232.09 | | 232.15 | 0.00213 | 1.14 | 10.49 | 14.69 | 0.32 |
| REACH1 | 2223.25 | 50-Year | 11.11 | 230.5 | 232.21 | | 232.27 | 0.001964 | 1.16 | 12.37 | 16.58 | 0.32 |
| REACH1 | 2223.25 | 100-Year | 12.75 | 230.5 | 232.37 | | 232.43 | 0.001658 | 1.15 | 15.43 | 22.01 | 0.3 |
| REACH1 | 2223.25 | Regional | 14.97 | 230.5 | 232.61 | | 232.65 | 0.001114 | 1.04 | 21.64 | 28.85 | 0.25 |
| | | | | | | | | | | | | |
| REACH1 | 2223.24 | 2-Year | 4.59 | 230.2 | 231.55 | 230.87 | 231.57 | 0.001177 | 0.74 | 6.27 | 9.79 | 0.28 |
| REACH1 | 2223.24 | 5-Year | 6.53 | 230.2 | 231.85 | 231.08 | 231.87 | 0.000721 | 0.73 | 9.65 | 12.69 | 0.23 |
| REACH1 | 2223.24 | 10-Year | 7.85 | 230.2 | 232.1 | 231.19 | 232.12 | 0.000475 | 0.69 | 13.21 | 16.61 | 0.19 |
| REACH1 | 2223.24 | 25-Year | 9.68 | 230.2 | 232.28 | 231.3 | 232.3 | 0.000435 | 0.72 | 16.59 | 22.3 | 0.19 |
| REACH1 | 2223.24 | 50-Year | 11.11 | 230.2 | 232.38 | 231.37 | 232.4 | 0.000428 | 0.74 | 19.15 | 27.77 | 0.19 |
| REACH1 | 2223.24 | 100-Year | 12.75 | 230.2 | 232.41 | 231.43 | 232.44 | 0.00052 | 0.83 | 19.95 | 28.94 | 0.21 |
| REACH1 | 2223.24 | Regional | 14.97 | 230.2 | 232.44 | 231.51 | 232.48 | 0.000647 | 0.94 | 20.98 | 32.74 | 0.23 |
| | | | | | | | | | | | | |
| REACH1 | 2223.23 | 2-Year | 4.59 | 230.2 | 231.45 | 231 | 231.53 | 0.00347 | 1.23 | 3.72 | 4.91 | 0.45 |
| REACH1 | 2223.23 | 5-Year | 6.53 | 230.2 | 231.77 | 231.19 | 231.84 | 0.00217 | 1.21 | 5.68 | 7.79 | 0.38 |
| REACH1 | 2223.23 | 10-Year | 7.85 | 230.2 | 232.04 | 231.29 | 232.1 | 0.001332 | 1.11 | 8.19 | 13.11 | 0.31 |
| REACH1 | 2223.23 | 25-Year | 9.68 | 230.2 | 232.26 | 231.43 | 232.29 | 0.000732 | 0.91 | 16.14 | 41.34 | 0.23 |
| REACH1 | 2223.23 | 50-Year | 11.11 | 230.2 | 232.37 | 231.51 | 232.4 | 0.000528 | 0.81 | 21.13 | 45.4 | 0.2 |
| REACH1 | 2223.23 | 100-Year | 12.75 | 230.2 | 232.4 | 231.59 | 232.43 | 0.000604 | 0.88 | 22.45 | 49.81 | 0.22 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.23 | Regional | 14.97 | 230.2 | 232.44 | 231.71 | 232.47 | 0.000704 | 0.96 | 24.2 | 53.38 | 0.23 |
| | | | | | | | | | | | | |
| REACH1 | 2223.22 | 2-Year | 4.59 | 230.2 | 231.01 | 231.01 | 231.42 | 0.006685 | 2.81 | 1.63 | 4.09 | 1 |
| REACH1 | 2223.22 | 5-Year | 6.53 | 230.2 | 231.22 | 231.22 | 231.74 | 0.00622 | 3.17 | 2.06 | 5.1 | 1 |
| REACH1 | 2223.22 | 10-Year | 7.85 | 230.2 | 231.68 | 231.35 | 232.04 | 0.002621 | 2.63 | 2.98 | 7.87 | 0.69 |
| REACH1 | 2223.22 | 25-Year | 9.68 | 230.2 | 231.54 | 231.54 | 232.2 | 0.005653 | 3.61 | 2.68 | 6.58 | 1 |
| REACH1 | 2223.22 | 50-Year | 11.11 | 230.2 | 232.27 | 232.27 | 232.37 | 0.001991 | 1.72 | 13.62 | 61.82 | 0.52 |
| REACH1 | 2223.22 | 100-Year | 12.75 | 230.2 | 232.29 | 232.29 | 232.4 | 0.00211 | 1.79 | 15.26 | 62.63 | 0.54 |
| REACH1 | 2223.22 | Regional | 14.97 | 230.2 | 232.32 | 232.32 | 232.44 | 0.002262 | 1.89 | 17.24 | 63.6 | 0.56 |
| | | | | | | | | | | | | |
| REACH1 | 2223.215 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.21 | 2-Year | 4.59 | 230 | 230.8 | 230.8 | 231.2 | 0.006558 | 2.8 | 1.64 | 7.1 | 1 |
| REACH1 | 2223.21 | 5-Year | 6.53 | 230 | 231.02 | 231.02 | 231.52 | 0.006033 | 3.14 | 2.08 | 8.47 | 1 |
| REACH1 | 2223.21 | 10-Year | 7.85 | 230 | 231.14 | 231.14 | 231.72 | 0.005954 | 3.37 | 2.33 | 9.36 | 1.01 |
| REACH1 | 2223.21 | 25-Year | 9.68 | 230 | 231.73 | 231.73 | 231.82 | 0.002357 | 1.63 | 11.48 | 54.49 | 0.58 |
| REACH1 | 2223.21 | 50-Year | 11.11 | 230 | 231.75 | 231.75 | 231.85 | 0.002483 | 1.7 | 12.75 | 54.97 | 0.6 |
| REACH1 | 2223.21 | 100-Year | 12.75 | 230 | 231.78 | 231.78 | 231.88 | 0.002602 | 1.78 | 14.1 | 55.48 | 0.62 |
| REACH1 | 2223.21 | Regional | 14.97 | 230 | 231.8 | 231.8 | 231.91 | 0.002874 | 1.9 | 15.48 | 56 | 0.65 |
| | | | | | | | | | | | | |
| REACH1 | 2223.2 | 2-Year | 4.59 | 229.7 | 230.72 | 230.52 | 230.8 | 0.00418 | 1.26 | 3.78 | 7.96 | 0.53 |
| REACH1 | 2223.2 | 5-Year | 6.53 | 229.7 | 231.09 | 230.62 | 231.14 | 0.001458 | 1.03 | 7.63 | 13.62 | 0.34 |
| REACH1 | 2223.2 | 10-Year | 7.85 | 229.7 | 231.34 | 230.68 | 231.38 | 0.00084 | 0.91 | 11.85 | 20.27 | 0.27 |
| REACH1 | 2223.2 | 25-Year | 9.68 | 229.7 | 231.52 | 230.78 | 231.56 | 0.000687 | 0.91 | 16.43 | 33.77 | 0.25 |
| REACH1 | 2223.2 | 50-Year | 11.11 | 229.7 | 231.6 | 230.84 | 231.63 | 0.000578 | 0.87 | 22.57 | 59.21 | 0.23 |
| REACH1 | 2223.2 | 100-Year | 12.75 | 229.7 | 231.61 | 230.91 | 231.65 | 0.000721 | 0.97 | 23.19 | 60.01 | 0.25 |
| REACH1 | 2223.2 | Regional | 14.97 | 229.7 | 231.65 | 231 | 231.69 | 0.000824 | 1.06 | 25.45 | 62.98 | 0.27 |
| | | | | | | | | | | | | |
| REACH1 | 2223.19 | 2-Year | 4.59 | 229.45 | 230.46 | 230.24 | 230.69 | 0.01107 | 2.14 | 2.14 | 4.61 | 0.68 |
| REACH1 | 2223.19 | 5-Year | 6.53 | 229.45 | 230.84 | 230.44 | 231.08 | 0.00772 | 2.2 | 2.99 | 8.9 | 0.6 |
| REACH1 | 2223.19 | 10-Year | 7.85 | 229.45 | 231.08 | 230.58 | 231.33 | 0.0065 | 2.24 | 3.53 | 17.62 | 0.56 |
| REACH1 | 2223.19 | 25-Year | 9.68 | 229.45 | 231.15 | 230.74 | 231.5 | 0.008531 | 2.65 | 3.7 | 20.26 | 0.65 |
| REACH1 | 2223.19 | 50-Year | 11.11 | 229.45 | 231.55 | 230.87 | 231.61 | 0.002046 | 1.38 | 14.21 | 82.89 | 0.31 |
| REACH1 | 2223.19 | 100-Year | 12.75 | 229.45 | 231.48 | 231.48 | 231.62 | 0.004208 | 1.93 | 10.48 | 38.66 | 0.44 |
| REACH1 | 2223.19 | Regional | 14.97 | 229.45 | 231.53 | 231.53 | 231.66 | 0.004211 | 1.96 | 12.39 | 42.86 | 0.44 |
| | | | | | | | | | | | | |
| REACH1 | 2223.185 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.18 | 2-Year | 5.47 | 229.37 | 230.2 | 230.2 | 230.61 | 0.013027 | 2.86 | 1.91 | 5.64 | 1.01 |
| REACH1 | 2223.18 | 5-Year | 7.78 | 229.37 | 230.41 | 230.41 | 230.94 | 0.012044 | 3.22 | 2.42 | 6.71 | 1.01 |
| REACH1 | 2223.18 | 10-Year | 9.36 | 229.37 | 230.55 | 230.55 | 231.15 | 0.011529 | 3.42 | 2.74 | 8.58 | 1 |
| REACH1 | 2223.18 | 25-Year | 11.54 | 229.37 | 230.73 | 230.73 | 231.41 | 0.011032 | 3.67 | 3.15 | 13.53 | 1.01 |
| REACH1 | 2223.18 | 50-Year | 13.25 | 229.37 | 230.86 | 230.86 | 231.61 | 0.010569 | 3.83 | 3.46 | 17.36 | 1 |
| REACH1 | 2223.18 | 100-Year | 15.21 | 229.37 | 231.27 | 231.27 | 231.39 | 0.003796 | 1.91 | 13 | 47.37 | 0.55 |
| REACH1 | 2223.18 | Regional | 17.88 | 229.37 | 231.29 | 231.29 | 231.44 | 0.004399 | 2.08 | 14.13 | 49.64 | 0.59 |
| | | | | | | | | | | | | |
| REACH1 | 2223.17 | 2-Year | 5.47 | 228.87 | 229.99 | 229.99 | 230.24 | 0.010732 | 2.42 | 3.57 | 8.88 | 0.83 |
| REACH1 | 2223.17 | 5-Year | 7.78 | 228.87 | 230.15 | 230.15 | 230.43 | 0.010305 | 2.66 | 5.18 | 10.95 | 0.83 |
| REACH1 | 2223.17 | 10-Year | 9.36 | 228.87 | 230.24 | 230.24 | 230.54 | 0.010193 | 2.8 | 6.23 | 12.1 | 0.84 |
| REACH1 | 2223.17 | 25-Year | 11.54 | 228.87 | 230.35 | 230.35 | 230.67 | 0.010251 | 2.98 | 7.59 | 13.55 | 0.86 |
| REACH1 | 2223.17 | 50-Year | 13.25 | 228.87 | 230.43 | 230.43 | 230.76 | 0.01015 | 3.09 | 8.71 | 14.7 | 0.86 |
| REACH1 | 2223.17 | 100-Year | 15.21 | 228.87 | 230.57 | 230.57 | 230.83 | 0.007692 | 2.88 | 12.73 | 23.73 | 0.76 |
| REACH1 | 2223.17 | Regional | 17.88 | 228.87 | 230.57 | 230.57 | 230.93 | 0.010629 | 3.38 | 12.73 | 23.73 | 0.9 |
| | | | | | | | | | | | | |
| REACH1 | 2223.16 | 2-Year | 5.47 | 228.57 | 229.62 | 229.62 | 229.86 | 0.015819 | 2.16 | 2.64 | 6.95 | 0.96 |
| REACH1 | 2223.16 | 5-Year | 7.78 | 228.57 | 229.77 | 229.77 | 230.04 | 0.013418 | 2.35 | 3.81 | 9.3 | 0.93 |
| REACH1 | 2223.16 | 10-Year | 9.36 | 228.57 | 229.85 | 229.85 | 230.14 | 0.012413 | 2.45 | 4.66 | 10.69 | 0.91 |
| REACH1 | 2223.16 | 25-Year | 11.54 | 228.57 | 229.96 | 229.96 | 230.27 | 0.01143 | 2.57 | 5.88 | 12.43 | 0.89 |
| REACH1 | 2223.16 | 50-Year | 13.25 | 228.57 | 230.02 | 230.02 | 230.36 | 0.011272 | 2.68 | 6.75 | 13.6 | 0.9 |
| REACH1 | 2223.16 | 100-Year | 15.21 | 228.57 | 230.11 | 230.11 | 230.45 | 0.010562 | 2.75 | 7.95 | 15.24 | 0.88 |
| REACH1 | 2223.16 | Regional | 17.88 | 228.57 | 230.2 | 230.2 | 230.57 | 0.010078 | 2.86 | 9.52 | 17.13 | 0.87 |
| | | | | | | | | | | | | |
| REACH1 | 2223.15 | 2-Year | 5.47 | 228.5 | 229.39 | 228.96 | 229.4 | 0.001826 | 0.57 | 11.7 | 29.46 | 0.22 |
| REACH1 | 2223.15 | 5-Year | 7.78 | 228.5 | 229.46 | 229.04 | 229.48 | 0.00252 | 0.71 | 14.03 | 34.51 | 0.26 |
| REACH1 | 2223.15 | 10-Year | 9.36 | 228.5 | 229.5 | 229.09 | 229.53 | 0.002991 | 0.8 | 15.44 | 37.38 | 0.28 |
| REACH1 | 2223.15 | 25-Year | 11.54 | 228.5 | 229.52 | 229.15 | 229.56 | 0.004165 | 0.95 | 16.1 | 38.4 | 0.33 |
| REACH1 | 2223.15 | 50-Year | 13.25 | 228.5 | 229.53 | 229.2 | 229.58 | 0.005242 | 1.07 | 16.46 | 38.95 | 0.38 |
| REACH1 | 2223.15 | 100-Year | 15.21 | 228.5 | 229.56 | 229.24 | 229.62 | 0.005805 | 1.16 | 17.83 | 40.81 | 0.4 |
| REACH1 | 2223.15 | Regional | 17.88 | 228.5 | 229.61 | 229.31 | 229.67 | 0.006393 | 1.25 | 19.74 | 43.12 | 0.42 |
| | | | | | | | | | | | | |
| REACH1 | 2223.14 | 2-Year | 5.47 | 228.5 | 228.73 | 228.73 | 228.81 | 0.021354 | 1.27 | 4.32 | 25.82 | 0.99 |
| REACH1 | 2223.14 | 5-Year | 7.78 | 228.5 | 228.83 | | 228.89 | 0.009611 | 1.06 | 7.36 | 31.71 | 0.7 |
| REACH1 | 2223.14 | 10-Year | 9.36 | 228.5 | 228.9 | | 228.95 | 0.006774 | 0.98 | 9.52 | 35.21 | 0.6 |
| REACH1 | 2223.14 | 25-Year | 11.54 | 228.5 | 229.01 | | 229.05 | 0.003487 | 0.84 | 13.81 | 42.08 | 0.45 |
| REACH1 | 2223.14 | 50-Year | 13.25 | 228.5 | 229.09 | | 229.12 | 0.002368 | 0.79 | 17.11 | 43.19 | 0.39 |
| REACH1 | 2223.14 | 100-Year | 15.21 | 228.5 | 229.14 | | 229.18 | 0.002081 | 0.8 | 19.51 | 43.83 | 0.37 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.14 | Regional | 17.88 | 228.5 | 229.21 | 229.25 | 0.001839 | 0.82 | 22.56 | 44.62 | 0.35 |
| | | | | | | | | | | | |
| REACH1 | 2223.134 | 2-Year | 5.47 | 228.17 | 228.69 | 228.72 | 0.003122 | 0.85 | 7.17 | 25.29 | 0.44 |
| REACH1 | 2223.134 | 5-Year | 7.78 | 228.17 | 228.79 | 228.83 | 0.002684 | 0.92 | 10.09 | 30.05 | 0.42 |
| REACH1 | 2223.134 | 10-Year | 9.36 | 228.17 | 228.86 | 228.9 | 0.002466 | 0.96 | 12.18 | 33.16 | 0.41 |
| REACH1 | 2223.134 | 25-Year | 11.54 | 228.17 | 228.98 | 229.02 | 0.001845 | 0.95 | 16.4 | 38.16 | 0.37 |
| REACH1 | 2223.134 | 50-Year | 13.25 | 228.17 | 229.06 | 229.1 | 0.001613 | 0.95 | 19.56 | 42.31 | 0.35 |
| REACH1 | 2223.134 | 100-Year | 15.21 | 228.17 | 229.11 | 229.15 | 0.001624 | 1 | 21.86 | 43.36 | 0.35 |
| REACH1 | 2223.134 | Regional | 17.88 | 228.17 | 229.18 | 229.23 | 0.001639 | 1.06 | 24.81 | 44.52 | 0.36 |
| | | | | | | | | | | | |
| REACH1 | 2223.133 | 2-Year | 5.47 | 228 | 228.67 | 228.68 | 0.001009 | 0.56 | 10.34 | 27.51 | 0.26 |
| REACH1 | 2223.133 | 5-Year | 7.78 | 228 | 228.78 | 228.8 | 0.001019 | 0.65 | 13.57 | 32.36 | 0.27 |
| REACH1 | 2223.133 | 10-Year | 9.36 | 228 | 228.84 | 228.87 | 0.00101 | 0.69 | 15.86 | 35.81 | 0.27 |
| REACH1 | 2223.133 | 25-Year | 11.54 | 228 | 228.97 | 228.99 | 0.000832 | 0.7 | 20.64 | 42.47 | 0.25 |
| REACH1 | 2223.133 | 50-Year | 13.25 | 228 | 229.05 | 229.07 | 0.000765 | 0.72 | 24.25 | 47.29 | 0.25 |
| REACH1 | 2223.133 | 100-Year | 15.21 | 228 | 229.1 | 229.13 | 0.000807 | 0.77 | 26.85 | 50.82 | 0.26 |
| REACH1 | 2223.133 | Regional | 17.88 | 228 | 229.17 | 229.2 | 0.000848 | 0.82 | 30.35 | 53.01 | 0.26 |
| | | | | | | | | | | | |
| REACH1 | 2223.132 | 2-Year | 5.47 | 228 | 228.66 | 228.67 | 0.000918 | 0.53 | 10.62 | 26.23 | 0.24 |
| REACH1 | 2223.132 | 5-Year | 7.78 | 228 | 228.76 | 228.78 | 0.000934 | 0.62 | 13.63 | 29.55 | 0.26 |
| REACH1 | 2223.132 | 10-Year | 9.36 | 228 | 228.83 | 228.85 | 0.000931 | 0.66 | 15.68 | 31.62 | 0.26 |
| REACH1 | 2223.132 | 25-Year | 11.54 | 228 | 228.96 | 228.98 | 0.000772 | 0.67 | 19.85 | 35.43 | 0.24 |
| REACH1 | 2223.132 | 50-Year | 13.25 | 228 | 229.04 | 229.06 | 0.00072 | 0.7 | 22.85 | 39.43 | 0.24 |
| REACH1 | 2223.132 | 100-Year | 15.21 | 228 | 229.09 | 229.12 | 0.000769 | 0.75 | 24.99 | 42.5 | 0.25 |
| REACH1 | 2223.132 | Regional | 17.88 | 228 | 229.15 | 229.19 | 0.000829 | 0.81 | 27.89 | 46.34 | 0.26 |
| | | | | | | | | | | | |
| REACH1 | 2223.131 | 2-Year | 5.47 | 228 | 228.64 | 228.66 | 0.001131 | 0.58 | 10.28 | 27.55 | 0.27 |
| REACH1 | 2223.131 | 5-Year | 7.78 | 228 | 228.75 | 228.77 | 0.001126 | 0.67 | 13.46 | 31.79 | 0.28 |
| REACH1 | 2223.131 | 10-Year | 9.36 | 228 | 228.82 | 228.84 | 0.001107 | 0.71 | 15.69 | 34.45 | 0.28 |
| REACH1 | 2223.131 | 25-Year | 11.54 | 228 | 228.94 | 228.97 | 0.000885 | 0.72 | 20.42 | 40.01 | 0.26 |
| REACH1 | 2223.131 | 50-Year | 13.25 | 228 | 229.02 | 229.05 | 0.000814 | 0.74 | 23.9 | 45.66 | 0.25 |
| REACH1 | 2223.131 | 100-Year | 15.21 | 228 | 229.08 | 229.11 | 0.000859 | 0.79 | 26.33 | 47.99 | 0.26 |
| REACH1 | 2223.131 | Regional | 17.88 | 228 | 229.14 | 229.17 | 0.000913 | 0.85 | 29.53 | 50.91 | 0.27 |
| | | | | | | | | | | | |
| REACH1 | 2223.13 | 2-Year | 5.47 | 227.99 | 228.43 | 228.43 | 228.57 | 0.014403 | 1.73 | 3.39 | 11.99 | 0.92 |
| REACH1 | 2223.13 | 5-Year | 7.78 | 227.99 | 228.51 | 228.51 | 228.68 | 0.013974 | 1.92 | 4.42 | 13.53 | 0.93 |
| REACH1 | 2223.13 | 10-Year | 9.36 | 227.99 | 228.66 | 228.56 | 228.77 | 0.006447 | 1.59 | 6.9 | 19.31 | 0.66 |
| REACH1 | 2223.13 | 25-Year | 11.54 | 227.99 | 228.85 | 228.63 | 228.92 | 0.003097 | 1.33 | 11.28 | 26.61 | 0.48 |
| REACH1 | 2223.13 | 50-Year | 13.25 | 227.99 | 228.95 | 228.68 | 229.01 | 0.002475 | 1.29 | 14.02 | 30.4 | 0.44 |
| REACH1 | 2223.13 | 100-Year | 15.21 | 227.99 | 228.99 | 228.73 | 229.06 | 0.002601 | 1.36 | 15.47 | 32.08 | 0.46 |
| REACH1 | 2223.13 | Regional | 17.88 | 227.99 | 229.05 | 228.79 | 229.13 | 0.002754 | 1.46 | 17.39 | 34.71 | 0.47 |
| | | | | | | | | | | | |
| REACH1 | 2223.12 | 2-Year | 5.69 | 227.02 | 228.17 | | 228.23 | 0.001724 | 1.11 | 6.54 | 12.15 | 0.37 |
| REACH1 | 2223.12 | 5-Year | 8.09 | 227.02 | 228.44 | | 228.5 | 0.001332 | 1.15 | 10.42 | 17.32 | 0.34 |
| REACH1 | 2223.12 | 10-Year | 9.73 | 227.02 | 228.62 | | 228.68 | 0.001083 | 1.15 | 14.09 | 25.51 | 0.31 |
| REACH1 | 2223.12 | 25-Year | 11.99 | 227.02 | 228.8 | | 228.86 | 0.000969 | 1.18 | 18.79 | 35.42 | 0.3 |
| REACH1 | 2223.12 | 50-Year | 13.77 | 227.02 | 228.9 | | 228.96 | 0.00095 | 1.21 | 22.92 | 59.99 | 0.3 |
| REACH1 | 2223.12 | 100-Year | 15.81 | 227.02 | 228.94 | | 229.01 | 0.001074 | 1.31 | 25.37 | 61.25 | 0.32 |
| REACH1 | 2223.12 | Regional | 18.59 | 227.02 | 228.99 | | 229.07 | 0.001198 | 1.41 | 28.7 | 63.02 | 0.34 |
| | | | | | | | | | | | |
| REACH1 | 2223.11 | 2-Year | 5.69 | 226.75 | 228.18 | 227.29 | 228.22 | 0.000601 | 0.89 | 6.41 | 9.64 | 0.24 |
| REACH1 | 2223.11 | 5-Year | 8.09 | 226.75 | 228.43 | 227.44 | 228.49 | 0.000702 | 1.07 | 7.56 | 15.9 | 0.26 |
| REACH1 | 2223.11 | 10-Year | 9.73 | 226.75 | 228.6 | 227.53 | 228.67 | 0.000739 | 1.17 | 8.32 | 27.97 | 0.27 |
| REACH1 | 2223.11 | 25-Year | 11.99 | 226.75 | 228.75 | 227.64 | 228.84 | 0.002779 | 1.32 | 9.54 | 57.67 | 0.44 |
| REACH1 | 2223.11 | 50-Year | 13.77 | 226.75 | 228.89 | 227.73 | 228.95 | 0.001655 | 1.12 | 18.12 | 63.96 | 0.35 |
| REACH1 | 2223.11 | 100-Year | 15.81 | 226.75 | 228.93 | 227.83 | 228.99 | 0.001692 | 1.16 | 20.87 | 65.63 | 0.36 |
| REACH1 | 2223.11 | Regional | 18.59 | 226.75 | 228.99 | 227.95 | 229.05 | 0.001688 | 1.2 | 24.62 | 67.84 | 0.36 |
| | | | | | | | | | | | |
| REACH1 | 2223.105 | | Culvert | | | | | | | | |
| | | | | | | | | | | | |
| REACH1 | 2223.1 | 2-Year | 5.69 | 226.55 | 228.14 | | 228.18 | 0.002161 | 0.79 | 7.18 | 20.21 | 0.2 |
| REACH1 | 2223.1 | 5-Year | 8.09 | 226.55 | 228.35 | | 228.4 | 0.002943 | 1 | 8.08 | 25.47 | 0.24 |
| REACH1 | 2223.1 | 10-Year | 9.73 | 226.55 | 228.46 | | 228.53 | 0.003458 | 1.13 | 8.6 | 28.47 | 0.26 |
| REACH1 | 2223.1 | 25-Year | 11.99 | 226.55 | 228.6 | | 228.68 | 0.004162 | 1.3 | 9.22 | 36.37 | 0.29 |
| REACH1 | 2223.1 | 50-Year | 13.77 | 226.55 | 228.8 | 227.53 | 228.84 | 0.005328 | 1.06 | 17.27 | 58.21 | 0.27 |
| REACH1 | 2223.1 | 100-Year | 15.81 | 226.55 | 228.86 | | 228.9 | 0.004467 | 1 | 21.09 | 59.48 | 0.25 |
| REACH1 | 2223.1 | Regional | 18.59 | 226.55 | 228.95 | 227.75 | 228.98 | 0.003505 | 0.91 | 26.17 | 61.13 | 0.22 |
| | | | | | | | | | | | |
| REACH1 | 2223.09 | 2-Year | 5.69 | 226.9 | 227.74 | 227.74 | 227.97 | 0.118387 | 2.16 | 2.96 | 19.6 | 0.9 |
| REACH1 | 2223.09 | 5-Year | 8.09 | 226.9 | 227.88 | 227.88 | 228.14 | 0.106847 | 2.35 | 4.03 | 24.38 | 0.89 |
| REACH1 | 2223.09 | 10-Year | 9.73 | 226.9 | 227.96 | 227.96 | 228.24 | 0.102156 | 2.47 | 4.73 | 27.46 | 0.89 |
| REACH1 | 2223.09 | 25-Year | 11.99 | 226.9 | 228.05 | 228.05 | 228.36 | 0.096398 | 2.59 | 5.68 | 30.57 | 0.88 |
| REACH1 | 2223.09 | 50-Year | 13.77 | 226.9 | 228.13 | 228.13 | 228.45 | 0.093041 | 2.68 | 6.42 | 32.31 | 0.87 |
| REACH1 | 2223.09 | 100-Year | 15.81 | 226.9 | 228.2 | 228.2 | 228.54 | 0.090939 | 2.78 | 7.21 | 34.1 | 0.87 |
| REACH1 | 2223.09 | Regional | 18.59 | 226.9 | 228.29 | 228.29 | 228.66 | 0.088066 | 2.89 | 8.28 | 36.37 | 0.87 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.08 | 2-Year | 5.69 | 226.3 | 227.27 | 226.85 | 227.36 | 0.002168 | 1.3 | 4.38 | 5.1 | 0.42 |
| REACH1 | 2223.08 | 5-Year | 8.09 | 226.3 | 227.44 | 226.99 | 227.57 | 0.002573 | 1.58 | 5.13 | 5.2 | 0.47 |
| REACH1 | 2223.08 | 10-Year | 9.73 | 226.3 | 227.54 | 227.08 | 227.7 | 0.002807 | 1.74 | 5.59 | 5.32 | 0.5 |
| REACH1 | 2223.08 | 25-Year | 11.99 | 226.3 | 227.71 | 227.2 | 227.89 | 0.002813 | 1.89 | 6.33 | 5.65 | 0.51 |
| REACH1 | 2223.08 | 50-Year | 13.77 | 226.3 | 227.84 | 227.29 | 228.04 | 0.002719 | 1.98 | 6.95 | 8.52 | 0.51 |
| REACH1 | 2223.08 | 100-Year | 15.81 | 226.3 | 227.99 | 227.37 | 228.21 | 0.002629 | 2.07 | 7.62 | 11.68 | 0.51 |
| REACH1 | 2223.08 | Regional | 18.59 | 226.3 | 228.04 | 227.51 | 228.33 | 0.0033 | 2.37 | 7.85 | 34.87 | 0.57 |
| REACH1 | 2223.075 | | Culvert | | | | | | | | | |
| REACH1 | 2223.07 | 2-Year | 5.69 | 226.13 | 227.23 | 226.7 | 227.3 | 0.001763 | 1.17 | 4.85 | 6.37 | 0.36 |
| REACH1 | 2223.07 | 5-Year | 8.09 | 226.13 | 227.37 | 226.85 | 227.48 | 0.00239 | 1.48 | 5.47 | 7.02 | 0.43 |
| REACH1 | 2223.07 | 10-Year | 9.73 | 226.13 | 227.44 | 226.94 | 227.59 | 0.002839 | 1.68 | 5.8 | 7.37 | 0.47 |
| REACH1 | 2223.07 | 25-Year | 11.99 | 226.13 | 227.52 | 227.05 | 227.72 | 0.003518 | 1.94 | 6.17 | 7.75 | 0.53 |
| REACH1 | 2223.07 | 50-Year | 13.77 | 226.13 | 227.59 | 227.14 | 227.82 | 0.004018 | 2.14 | 6.44 | 8.03 | 0.57 |
| REACH1 | 2223.07 | 100-Year | 15.81 | 226.13 | 227.65 | 227.23 | 227.93 | 0.004558 | 2.35 | 6.74 | 8.33 | 0.61 |
| REACH1 | 2223.07 | Regional | 18.59 | 226.13 | 227.73 | 227.36 | 228.08 | 0.005363 | 2.63 | 7.07 | 8.66 | 0.67 |
| REACH1 | 2223.06 | 2-Year | 5.69 | 226.1 | 227.06 | 226.97 | 227.19 | 0.009201 | 1.6 | 3.56 | 7.74 | 0.75 |
| REACH1 | 2223.06 | 5-Year | 8.09 | 226.1 | 227.2 | 227.08 | 227.35 | 0.008438 | 1.72 | 4.69 | 8.51 | 0.74 |
| REACH1 | 2223.06 | 10-Year | 9.73 | 226.1 | 227.28 | 227.15 | 227.45 | 0.008316 | 1.81 | 5.37 | 8.94 | 0.75 |
| REACH1 | 2223.06 | 25-Year | 11.99 | 226.1 | 227.36 | 227.24 | 227.56 | 0.008914 | 1.97 | 6.08 | 9.36 | 0.78 |
| REACH1 | 2223.06 | 50-Year | 13.77 | 226.1 | 227.42 | 227.31 | 227.64 | 0.008913 | 2.05 | 6.71 | 9.72 | 0.79 |
| REACH1 | 2223.06 | 100-Year | 15.81 | 226.1 | 227.51 | 227.37 | 227.73 | 0.008262 | 2.09 | 7.6 | 11.62 | 0.77 |
| REACH1 | 2223.06 | Regional | 18.59 | 226.1 | 227.63 | 227.46 | 227.85 | 0.006956 | 2.1 | 9.24 | 15.88 | 0.72 |
| REACH1 | 2223.05 | 2-Year | 5.69 | 225.27 | 226.22 | 226.07 | 226.35 | 0.007193 | 1.55 | 3.67 | 6.86 | 0.68 |
| REACH1 | 2223.05 | 5-Year | 8.09 | 225.27 | 226.36 | 226.21 | 226.51 | 0.007692 | 1.72 | 4.7 | 7.91 | 0.71 |
| REACH1 | 2223.05 | 10-Year | 9.73 | 225.27 | 226.45 | 226.29 | 226.62 | 0.007649 | 1.78 | 5.45 | 8.67 | 0.72 |
| REACH1 | 2223.05 | 25-Year | 11.99 | 225.27 | 226.6 | 226.39 | 226.76 | 0.00647 | 1.76 | 6.81 | 10.19 | 0.67 |
| REACH1 | 2223.05 | 50-Year | 13.77 | 225.27 | 226.66 | 226.46 | 226.84 | 0.006513 | 1.86 | 7.49 | 11.45 | 0.68 |
| REACH1 | 2223.05 | 100-Year | 15.81 | 225.27 | 226.69 | 226.54 | 226.91 | 0.007576 | 2.05 | 7.84 | 11.99 | 0.74 |
| REACH1 | 2223.05 | Regional | 18.59 | 225.27 | 226.71 | 226.62 | 226.99 | 0.009982 | 2.37 | 7.99 | 12.18 | 0.85 |
| REACH1 | 2223.04 | 2-Year | 5.69 | 224.7 | 225.48 | 225.43 | 225.67 | 0.012325 | 1.9 | 2.99 | 6.21 | 0.87 |
| REACH1 | 2223.04 | 5-Year | 8.09 | 224.7 | 225.64 | 225.57 | 225.84 | 0.010998 | 2.01 | 4.02 | 7.01 | 0.85 |
| REACH1 | 2223.04 | 10-Year | 9.73 | 224.7 | 225.71 | 225.65 | 225.94 | 0.011087 | 2.12 | 4.58 | 7.41 | 0.86 |
| REACH1 | 2223.04 | 25-Year | 11.99 | 224.7 | 225.75 | 225.75 | 226.06 | 0.014634 | 2.49 | 4.82 | 7.57 | 0.99 |
| REACH1 | 2223.04 | 50-Year | 13.77 | 224.7 | 225.83 | 225.82 | 226.15 | 0.013938 | 2.53 | 5.43 | 7.97 | 0.98 |
| REACH1 | 2223.04 | 100-Year | 15.81 | 224.7 | 225.99 | 225.89 | 226.26 | 0.010193 | 2.33 | 6.78 | 8.89 | 0.85 |
| REACH1 | 2223.04 | Regional | 18.59 | 224.7 | 226.27 | 225.99 | 226.47 | 0.004975 | 1.99 | 9.59 | 11.23 | 0.63 |
| REACH1 | 2223.03 | 2-Year | 5.69 | 224.2 | 224.76 | 224.76 | 225.04 | 0.015521 | 2.31 | 2.46 | 5.23 | 1 |
| REACH1 | 2223.03 | 5-Year | 8.09 | 224.2 | 224.91 | 224.91 | 225.25 | 0.01446 | 2.61 | 3.11 | 5.55 | 1 |
| REACH1 | 2223.03 | 10-Year | 9.73 | 224.2 | 225.02 | 225 | 225.39 | 0.012479 | 2.68 | 3.63 | 6 | 0.95 |
| REACH1 | 2223.03 | 25-Year | 11.99 | 224.2 | 225.28 | 225.11 | 225.6 | 0.007557 | 2.51 | 4.78 | 7.31 | 0.78 |
| REACH1 | 2223.03 | 50-Year | 13.77 | 224.2 | 225.43 | 225.2 | 225.75 | 0.006369 | 2.52 | 5.46 | 8.09 | 0.73 |
| REACH1 | 2223.03 | 100-Year | 15.81 | 224.2 | 225.59 | 225.3 | 225.92 | 0.005554 | 2.56 | 6.18 | 9 | 0.7 |
| REACH1 | 2223.03 | Regional | 18.59 | 224.2 | 226 | 225.42 | 226.27 | 0.003238 | 2.32 | 8.01 | 17.91 | 0.56 |
| REACH1 | 2223.025 | | Culvert | | | | | | | | | |
| REACH1 | 2223.02 | 2-Year | 5.69 | 223.68 | 224.78 | 224.24 | 224.85 | 0.001516 | 1.16 | 4.89 | 7.93 | 0.36 |
| REACH1 | 2223.02 | 5-Year | 8.09 | 223.68 | 224.95 | 224.38 | 225.06 | 0.001879 | 1.43 | 5.66 | 8.9 | 0.41 |
| REACH1 | 2223.02 | 10-Year | 9.73 | 223.68 | 225.04 | 224.48 | 225.17 | 0.002146 | 1.6 | 6.08 | 9.42 | 0.44 |
| REACH1 | 2223.02 | 25-Year | 11.99 | 223.68 | 225.14 | 224.59 | 225.31 | 0.002601 | 1.84 | 6.5 | 9.96 | 0.49 |
| REACH1 | 2223.02 | 50-Year | 13.77 | 223.68 | 225.19 | 224.68 | 225.41 | 0.003031 | 2.04 | 6.75 | 10.27 | 0.53 |
| REACH1 | 2223.02 | 100-Year | 15.81 | 223.68 | 225.24 | 224.77 | 225.5 | 0.003604 | 2.27 | 6.96 | 10.53 | 0.58 |
| REACH1 | 2223.02 | Regional | 18.59 | 223.68 | 225.61 | 224.89 | 225.84 | 0.002459 | 2.16 | 8.6 | 12.61 | 0.5 |
| REACH1 | 2223.01 | 2-Year | 5.69 | 223.33 | 224.79 | 224.2 | 224.82 | 0.001111 | 0.77 | 7.35 | 9.58 | 0.28 |
| REACH1 | 2223.01 | 5-Year | 8.09 | 223.33 | 224.97 | 224.34 | 225.01 | 0.001223 | 0.88 | 9.19 | 10.6 | 0.3 |
| REACH1 | 2223.01 | 10-Year | 9.73 | 223.33 | 225.07 | 224.41 | 225.11 | 0.001302 | 0.95 | 10.29 | 11.16 | 0.31 |
| REACH1 | 2223.01 | 25-Year | 11.99 | 223.33 | 225.18 | 224.51 | 225.23 | 0.001452 | 1.04 | 11.53 | 11.77 | 0.34 |
| REACH1 | 2223.01 | 50-Year | 13.77 | 223.33 | 225.24 | 224.58 | 225.31 | 0.001595 | 1.12 | 12.34 | 12.15 | 0.35 |
| REACH1 | 2223.01 | 100-Year | 15.81 | 223.33 | 225.31 | 224.65 | 225.38 | 0.001779 | 1.2 | 13.12 | 12.51 | 0.38 |
| REACH1 | 2223.01 | Regional | 18.59 | 223.33 | 225.68 | 224.74 | 225.73 | 0.001023 | 1.02 | 18.18 | 14.6 | 0.29 |
| REACH1 | 2219.56 | 2-Year | 6.08 | 223.16 | 224.62 | 224.3 | 224.7 | 0.004186 | 1.25 | 4.85 | 7.84 | 0.51 |
| REACH1 | 2219.56 | 5-Year | 8.72 | 223.16 | 224.78 | 224.47 | 224.88 | 0.004572 | 1.41 | 6.19 | 9.03 | 0.54 |
| REACH1 | 2219.56 | 10-Year | 10.49 | 223.16 | 224.87 | 224.56 | 224.98 | 0.004797 | 1.5 | 7.03 | 15.54 | 0.56 |
| REACH1 | 2219.56 | 25-Year | 12.98 | 223.16 | 224.96 | 224.66 | 225.09 | 0.004883 | 1.61 | 9.55 | 33.42 | 0.58 |
| REACH1 | 2219.56 | 50-Year | 14.95 | 223.16 | 225.02 | 224.74 | 225.16 | 0.00495 | 1.69 | 11.76 | 43.58 | 0.59 |
| REACH1 | 2219.56 | 100-Year | 17.19 | 223.16 | 225.03 | 224.82 | 225.2 | 0.006278 | 1.91 | 12.12 | 44.66 | 0.66 |
| REACH1 | 2219.56 | Regional | 38.3 | 223.16 | 225.47 | 225.34 | 225.61 | 0.003765 | 1.96 | 39.5 | 96.05 | 0.55 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2219.55 | 2-Year | 6.08 | 222.82 | 223.49 | 223.49 | 223.68 | 0.017654 | 1.96 | 3.11 | 8.28 | 1.02 |
| REACH1 | 2219.55 | 5-Year | 8.72 | 222.82 | 223.61 | 223.61 | 223.83 | 0.016282 | 2.09 | 4.18 | 9.49 | 1.01 |
| REACH1 | 2219.55 | 10-Year | 10.49 | 222.82 | 223.68 | 223.68 | 223.92 | 0.015524 | 2.15 | 4.87 | 10.2 | 0.99 |
| REACH1 | 2219.55 | 25-Year | 12.98 | 222.82 | 223.77 | 223.77 | 224.02 | 0.015172 | 2.23 | 5.82 | 11.34 | 1 |
| REACH1 | 2219.55 | 50-Year | 14.95 | 222.82 | 223.83 | 223.82 | 224.1 | 0.014513 | 2.26 | 6.6 | 12.2 | 0.98 |
| REACH1 | 2219.55 | 100-Year | 17.19 | 222.82 | 223.98 | 223.89 | 224.19 | 0.009787 | 2.03 | 8.45 | 13.64 | 0.82 |
| REACH1 | 2219.55 | Regional | 38.3 | 222.82 | 224.31 | 224.31 | 224.7 | 0.013543 | 2.74 | 13.97 | 18.39 | 1 |
| | | | | | | | | | | | | |
| REACH1 | 2219.54 | 2-Year | 6.08 | 221.6 | 223.01 | | 223.01 | 0.000307 | 0.54 | 30.37 | 53.23 | 0.16 |
| REACH1 | 2219.54 | 5-Year | 8.72 | 221.6 | 223.64 | | 223.64 | 0.000071 | 0.35 | 70.93 | 74.25 | 0.08 |
| REACH1 | 2219.54 | 10-Year | 10.49 | 221.6 | 223.77 | | 223.78 | 0.000071 | 0.36 | 81.47 | 78.02 | 0.08 |
| REACH1 | 2219.54 | 25-Year | 12.98 | 221.6 | 223.9 | | 223.9 | 0.000081 | 0.4 | 91.24 | 81.26 | 0.09 |
| REACH1 | 2219.54 | 50-Year | 14.95 | 221.6 | 223.97 | | 223.97 | 0.00009 | 0.44 | 97.12 | 83.15 | 0.1 |
| REACH1 | 2219.54 | 100-Year | 17.19 | 221.6 | 224.08 | | 224.08 | 0.000095 | 0.46 | 106.21 | 86.76 | 0.1 |
| REACH1 | 2219.54 | Regional | 38.3 | 221.6 | 224.23 | | 224.25 | 0.000351 | 0.93 | 120.58 | 95.4 | 0.19 |
| | | | | | | | | | | | | |
| REACH1 | 2219.53 | 2-Year | 6.08 | 220.75 | 222.79 | 221.91 | 222.93 | 0.004257 | 1.64 | 3.77 | 29.11 | 0.39 |
| REACH1 | 2219.53 | 5-Year | 8.72 | 220.75 | 223.53 | 222.19 | 223.6 | 0.003908 | 1.31 | 13.05 | 77.39 | 0.45 |
| REACH1 | 2219.53 | 10-Year | 10.49 | 220.75 | 223.74 | 222.36 | 223.76 | 0.001245 | 0.86 | 29.97 | 84.6 | 0.26 |
| REACH1 | 2219.53 | 25-Year | 12.98 | 220.75 | 223.87 | 222.59 | 223.88 | 0.000888 | 0.78 | 41.43 | 89.64 | 0.23 |
| REACH1 | 2219.53 | 50-Year | 14.95 | 220.75 | 223.94 | 222.75 | 223.96 | 0.000822 | 0.78 | 48.06 | 93.52 | 0.22 |
| REACH1 | 2219.53 | 100-Year | 17.19 | 220.75 | 224.05 | 222.93 | 224.06 | 0.000655 | 0.74 | 58.8 | 99.07 | 0.2 |
| REACH1 | 2219.53 | Regional | 38.3 | 220.75 | 224.16 | 223.82 | 224.2 | 0.002108 | 1.39 | 69.48 | 103.75 | 0.36 |
| REACH1 | 2219.525 | | Culvert | | | | | | | | | |
| REACH1 | 2219.52 | 2-Year | 6.08 | 220.65 | 222.06 | 222.06 | 222.6 | 0.036297 | 3.27 | 1.86 | 1.73 | 1.01 |
| REACH1 | 2219.52 | 5-Year | 8.72 | 220.65 | 222.4 | 222.4 | 223.03 | 0.031561 | 3.51 | 2.5 | 28.88 | 0.98 |
| REACH1 | 2219.52 | 10-Year | 10.49 | 220.65 | 222.58 | 222.58 | 223.27 | 0.029527 | 3.69 | 2.89 | 43.68 | 0.97 |
| REACH1 | 2219.52 | 25-Year | 12.98 | 220.65 | 222.79 | 222.79 | 223.58 | 0.028359 | 3.96 | 3.37 | 51.48 | 0.97 |
| REACH1 | 2219.52 | 50-Year | 14.95 | 220.65 | 222.95 | 222.95 | 223.81 | 0.027236 | 4.13 | 3.73 | 59.2 | 0.97 |
| REACH1 | 2219.52 | 100-Year | 17.19 | 220.65 | 223.13 | 223.13 | 224.06 | 0.026435 | 4.32 | 4.11 | 65.57 | 0.97 |
| REACH1 | 2219.52 | Regional | 38.3 | 220.65 | 223.73 | 223.73 | 223.93 | 0.010359 | 3 | 39.03 | 98.05 | 0.66 |
| | | | | | | | | | | | | |
| REACH1 | 2219.51 | 2-Year | 6.08 | 220.5 | 222.03 | 221.82 | 222.04 | 0.003164 | 0.88 | 14.7 | 40.92 | 0.37 |
| REACH1 | 2219.51 | 5-Year | 8.72 | 220.5 | 222.11 | | 222.13 | 0.003387 | 1 | 18.41 | 43.88 | 0.39 |
| REACH1 | 2219.51 | 10-Year | 10.49 | 220.5 | 222.18 | | 222.2 | 0.003306 | 1.05 | 21.12 | 45.92 | 0.39 |
| REACH1 | 2219.51 | 25-Year | 12.98 | 220.5 | 222.25 | | 222.27 | 0.003234 | 1.11 | 24.72 | 48.36 | 0.4 |
| REACH1 | 2219.51 | 50-Year | 14.95 | 220.5 | 222.3 | | 222.33 | 0.003211 | 1.15 | 27.32 | 49.81 | 0.4 |
| REACH1 | 2219.51 | 100-Year | 17.19 | 220.5 | 222.36 | | 222.39 | 0.003171 | 1.2 | 30.26 | 51.47 | 0.4 |
| REACH1 | 2219.51 | Regional | 38.3 | 220.5 | 222.76 | | 222.8 | 0.003201 | 1.53 | 53.53 | 63.73 | 0.43 |
| | | | | | | | | | | | | |
| REACH1 | 2219.5 | 2-Year | 6.08 | 220.15 | 221.37 | 221.37 | 221.59 | 0.017409 | 2.11 | 2.98 | 7.57 | 1 |
| REACH1 | 2219.5 | 5-Year | 8.72 | 220.15 | 221.55 | 221.55 | 221.74 | 0.010483 | 2.03 | 6.04 | 23.97 | 0.82 |
| REACH1 | 2219.5 | 10-Year | 10.49 | 220.15 | 221.61 | 221.61 | 221.81 | 0.00985 | 2.11 | 7.76 | 27.46 | 0.8 |
| REACH1 | 2219.5 | 25-Year | 12.98 | 220.15 | 221.69 | 221.69 | 221.9 | 0.00954 | 2.22 | 9.97 | 31.12 | 0.81 |
| REACH1 | 2219.5 | 50-Year | 14.95 | 220.15 | 221.74 | 221.74 | 221.96 | 0.009218 | 2.29 | 11.77 | 33.79 | 0.8 |
| REACH1 | 2219.5 | 100-Year | 17.19 | 220.15 | 221.8 | 221.8 | 222.02 | 0.009181 | 2.38 | 13.6 | 36.3 | 0.81 |
| REACH1 | 2219.5 | Regional | 38.3 | 220.15 | 222.14 | 222.14 | 222.42 | 0.009219 | 2.97 | 29.44 | 54.2 | 0.85 |

PROPOSED SCENARIO

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2224.08 | 2-Year | 1.98 | 242.9 | 243.41 | 243.29 | 243.44 | 0.004562 | 0.88 | 2.91 | 18.17 | 0.5 |
| REACH1 | 2224.08 | 5-Year | 2.82 | 242.9 | 243.46 | | 243.49 | 0.004518 | 0.95 | 3.78 | 18.28 | 0.5 |
| REACH1 | 2224.08 | 10-Year | 3.39 | 242.9 | 243.5 | | 243.53 | 0.003968 | 0.94 | 4.45 | 18.37 | 0.48 |
| REACH1 | 2224.08 | 25-Year | 4.27 | 242.9 | 243.55 | | 243.58 | 0.003333 | 0.93 | 5.45 | 19.67 | 0.45 |
| REACH1 | 2224.08 | 50-Year | 5.05 | 242.9 | 243.6 | | 243.63 | 0.002875 | 0.92 | 6.37 | 20.77 | 0.42 |
| REACH1 | 2224.08 | 100-Year | 5.73 | 242.9 | 243.64 | | 243.67 | 0.002465 | 0.9 | 7.28 | 22.68 | 0.4 |
| REACH1 | 2224.08 | Regional | 8.7 | 242.9 | 243.67 | 243.56 | 243.73 | 0.004438 | 1.26 | 7.93 | 24.01 | 0.54 |
| REACH1 | 2224.07 | 2-Year | 1.98 | 241.78 | 242.28 | 242.25 | 242.42 | 0.011615 | 1.74 | 1.35 | 4.66 | 0.84 |
| REACH1 | 2224.07 | 5-Year | 2.82 | 241.78 | 242.39 | 242.35 | 242.54 | 0.009591 | 1.84 | 1.94 | 5.6 | 0.79 |
| REACH1 | 2224.07 | 10-Year | 3.39 | 241.78 | 242.43 | 242.41 | 242.61 | 0.010825 | 2.04 | 2.15 | 5.9 | 0.85 |
| REACH1 | 2224.07 | 25-Year | 4.27 | 241.78 | 242.47 | 242.47 | 242.7 | 0.012658 | 2.32 | 2.43 | 6.28 | 0.93 |
| REACH1 | 2224.07 | 50-Year | 5.05 | 241.78 | 242.51 | 242.49 | 242.79 | 0.014529 | 2.58 | 2.67 | 7.05 | 1 |
| REACH1 | 2224.07 | 100-Year | 5.73 | 241.78 | 242.53 | 242.49 | 242.88 | 0.016819 | 2.84 | 2.86 | 8.5 | 1.09 |
| REACH1 | 2224.07 | Regional | 8.7 | 241.78 | 242.82 | 242.82 | 242.96 | 0.005988 | 2.13 | 7.92 | 27.25 | 0.69 |
| REACH1 | 2224.06 | 2-Year | 1.98 | 241.5 | 241.8 | 241.77 | 241.85 | 0.008564 | 1.05 | 2.18 | 14.02 | 0.67 |
| REACH1 | 2224.06 | 5-Year | 2.82 | 241.5 | 241.81 | 241.81 | 241.9 | 0.013985 | 1.38 | 2.36 | 14.59 | 0.86 |
| REACH1 | 2224.06 | 10-Year | 3.39 | 241.5 | 241.84 | 241.84 | 241.93 | 0.013364 | 1.44 | 2.74 | 15.75 | 0.86 |
| REACH1 | 2224.06 | 25-Year | 4.27 | 241.5 | 241.87 | 241.87 | 241.97 | 0.012868 | 1.52 | 3.29 | 17.27 | 0.85 |
| REACH1 | 2224.06 | 50-Year | 5.05 | 241.5 | 241.9 | 241.9 | 242 | 0.012577 | 1.58 | 3.75 | 18.44 | 0.86 |
| REACH1 | 2224.06 | 100-Year | 5.73 | 241.5 | 241.92 | 241.92 | 242.03 | 0.012292 | 1.62 | 4.15 | 19.41 | 0.85 |
| REACH1 | 2224.06 | Regional | 8.7 | 241.5 | 242 | 242 | 242.12 | 0.0115 | 1.78 | 5.79 | 22.98 | 0.85 |
| REACH1 | 2224.05 | 2-Year | 1.98 | 241 | 241.55 | | 241.57 | 0.003705 | 0.87 | 5.85 | 55.85 | 0.45 |
| REACH1 | 2224.05 | 5-Year | 2.82 | 241 | 241.64 | | 241.65 | 0.001249 | 0.59 | 11.6 | 61.75 | 0.27 |
| REACH1 | 2224.05 | 10-Year | 3.39 | 241 | 241.66 | | 241.67 | 0.001428 | 0.65 | 12.57 | 62.93 | 0.29 |
| REACH1 | 2224.05 | 25-Year | 4.27 | 241 | 241.7 | | 241.7 | 0.001371 | 0.66 | 14.91 | 65.91 | 0.29 |
| REACH1 | 2224.05 | 50-Year | 5.05 | 241 | 241.73 | | 241.74 | 0.001275 | 0.67 | 17.11 | 69.14 | 0.28 |
| REACH1 | 2224.05 | 100-Year | 5.73 | 241 | 241.75 | | 241.76 | 0.001214 | 0.67 | 18.88 | 70.59 | 0.28 |
| REACH1 | 2224.05 | Regional | 8.7 | 241 | 241.81 | | 241.82 | 0.001559 | 0.81 | 22.8 | 73.55 | 0.32 |
| REACH1 | 2224.04 | 2-Year | 1.98 | 240.5 | 241.56 | | 241.56 | 0.000003 | 0.04 | 52.64 | 116.46 | 0.01 |
| REACH1 | 2224.04 | 5-Year | 2.82 | 240.5 | 241.65 | | 241.65 | 0.000004 | 0.05 | 63.54 | 124.75 | 0.02 |
| REACH1 | 2224.04 | 10-Year | 3.39 | 240.5 | 241.66 | | 241.66 | 0.000005 | 0.06 | 65.53 | 126.21 | 0.02 |
| REACH1 | 2224.04 | 25-Year | 4.27 | 240.5 | 241.7 | | 241.7 | 0.000007 | 0.07 | 70.13 | 129.5 | 0.02 |
| REACH1 | 2224.04 | 50-Year | 5.05 | 240.5 | 241.73 | | 241.73 | 0.000008 | 0.08 | 74.32 | 132.43 | 0.03 |
| REACH1 | 2224.04 | 100-Year | 5.73 | 240.5 | 241.76 | | 241.76 | 0.00001 | 0.09 | 77.66 | 134.73 | 0.03 |
| REACH1 | 2224.04 | Regional | 8.7 | 240.5 | 241.81 | | 241.81 | 0.000019 | 0.13 | 85.12 | 139.65 | 0.04 |
| REACH1 | 2224.03 | 2-Year | 1.98 | 240.5 | 241.56 | | 241.56 | 0.000002 | 0.04 | 60.33 | 71.7 | 0.01 |
| REACH1 | 2224.03 | 5-Year | 2.82 | 240.5 | 241.65 | | 241.65 | 0.000003 | 0.05 | 66.84 | 72.4 | 0.02 |
| REACH1 | 2224.03 | 10-Year | 3.39 | 240.5 | 241.66 | | 241.66 | 0.000005 | 0.06 | 67.99 | 72.52 | 0.02 |
| REACH1 | 2224.03 | 25-Year | 4.27 | 240.5 | 241.7 | | 241.7 | 0.000006 | 0.08 | 70.6 | 72.8 | 0.02 |
| REACH1 | 2224.03 | 50-Year | 5.05 | 240.5 | 241.73 | | 241.73 | 0.000008 | 0.09 | 73.01 | 90.59 | 0.03 |
| REACH1 | 2224.03 | 100-Year | 5.73 | 240.5 | 241.76 | | 241.76 | 0.00001 | 0.1 | 75.82 | 134.92 | 0.03 |
| REACH1 | 2224.03 | Regional | 8.7 | 240.5 | 241.81 | | 241.81 | 0.00002 | 0.15 | 84.82 | 179.97 | 0.04 |
| REACH1 | 2224.02 | 2-Year | 1.98 | 240.27 | 241.53 | 241.06 | 241.55 | 0.002683 | 0.72 | 5.06 | 37.78 | 0.39 |
| REACH1 | 2224.02 | 5-Year | 2.82 | 240.27 | 241.63 | 241.45 | 241.64 | 0.001637 | 0.66 | 9.03 | 43.3 | 0.32 |
| REACH1 | 2224.02 | 10-Year | 3.39 | 240.27 | 241.64 | 241.48 | 241.66 | 0.002133 | 0.77 | 9.45 | 43.84 | 0.36 |
| REACH1 | 2224.02 | 25-Year | 4.27 | 240.27 | 241.67 | 241.49 | 241.69 | 0.00248 | 0.86 | 10.81 | 45.55 | 0.4 |
| REACH1 | 2224.02 | 50-Year | 5.05 | 240.27 | 241.7 | 241.56 | 241.72 | 0.00264 | 0.92 | 12.14 | 47.16 | 0.41 |
| REACH1 | 2224.02 | 100-Year | 5.73 | 240.27 | 241.71 | 241.58 | 241.74 | 0.003451 | 1.07 | 12.73 | 57.95 | 0.47 |
| REACH1 | 2224.02 | Regional | 8.7 | 240.27 | 241.7 | 241.65 | 241.78 | 0.007853 | 1.61 | 12.5 | 52.06 | 0.71 |
| REACH1 | 2224.015 | | Culvert | | | | | | | | | |
| REACH1 | 2224.01 | 2-Year | 1.98 | 239.91 | 240.79 | 240.79 | 241.18 | 0.013816 | 2.77 | 0.71 | 13.22 | 1 |
| REACH1 | 2224.01 | 5-Year | 2.82 | 239.91 | 240.99 | 240.99 | 241.49 | 0.012828 | 3.12 | 0.9 | 70.95 | 1.01 |
| REACH1 | 2224.01 | 10-Year | 3.39 | 239.91 | 241.23 | 241.23 | 241.28 | 0.010802 | 1.32 | 7.66 | 88.28 | 0.75 |
| REACH1 | 2224.01 | 25-Year | 4.27 | 239.91 | 241.26 | 241.26 | 241.3 | 0.009856 | 1.33 | 9.9 | 95.37 | 0.73 |
| REACH1 | 2224.01 | 50-Year | 5.05 | 239.91 | 241.27 | 241.27 | 241.32 | 0.012063 | 1.49 | 10.46 | 96.03 | 0.81 |
| REACH1 | 2224.01 | 100-Year | 5.73 | 239.91 | 241.28 | 241.28 | 241.33 | 0.012156 | 1.53 | 11.57 | 97.66 | 0.82 |
| REACH1 | 2224.01 | Regional | 8.7 | 239.91 | 241.31 | 241.31 | 241.38 | 0.015296 | 1.82 | 14.68 | 101.35 | 0.93 |
| REACH1 | 2223.56 | 2-Year | 2.46 | 239.85 | 240.63 | 240.63 | 240.69 | 0.007306 | 1.33 | 5.82 | 60.3 | 0.63 |
| REACH1 | 2223.56 | 5-Year | 3.5 | 239.85 | 240.66 | 240.66 | 240.73 | 0.00853 | 1.5 | 7.93 | 70.3 | 0.68 |
| REACH1 | 2223.56 | 10-Year | 4.21 | 239.85 | 240.68 | 240.68 | 240.74 | 0.008992 | 1.58 | 9.17 | 71.68 | 0.71 |
| REACH1 | 2223.56 | 25-Year | 5.3 | 239.85 | 240.7 | 240.7 | 240.77 | 0.00961 | 1.68 | 10.86 | 73.53 | 0.74 |
| REACH1 | 2223.56 | 50-Year | 6.27 | 239.85 | 240.72 | 240.72 | 240.79 | 0.010366 | 1.78 | 12.09 | 74.85 | 0.77 |
| REACH1 | 2223.56 | 100-Year | 7.11 | 239.85 | 240.74 | 240.74 | 240.8 | 0.009945 | 1.78 | 13.56 | 75.76 | 0.76 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.56 | Regional | 10.8 | 239.85 | 240.78 | 240.78 | 240.86 | 0.012559 | 2.11 | 16.96 | 77.17 | 0.86 |
| | | | | | | | | | | | | |
| REACH1 | 2223.55 | 2-Year | 2.46 | 239.56 | 240.53 | | 240.53 | 0.000055 | 0.18 | 28.7 | 89.38 | 0.07 |
| REACH1 | 2223.55 | 5-Year | 3.5 | 239.56 | 240.55 | | 240.55 | 0.000096 | 0.25 | 30.81 | 91 | 0.09 |
| REACH1 | 2223.55 | 10-Year | 4.21 | 239.56 | 240.56 | | 240.57 | 0.00013 | 0.29 | 31.77 | 91.74 | 0.1 |
| REACH1 | 2223.55 | 25-Year | 5.3 | 239.56 | 240.58 | | 240.59 | 0.000184 | 0.35 | 33.52 | 93.07 | 0.12 |
| REACH1 | 2223.55 | 50-Year | 6.27 | 239.56 | 240.59 | | 240.6 | 0.000237 | 0.4 | 34.8 | 94.03 | 0.14 |
| REACH1 | 2223.55 | 100-Year | 7.11 | 239.56 | 240.61 | | 240.61 | 0.000284 | 0.44 | 35.94 | 94.88 | 0.15 |
| REACH1 | 2223.55 | Regional | 10.8 | 239.56 | 240.65 | | 240.66 | 0.000509 | 0.61 | 40.21 | 97.98 | 0.2 |
| | | | | | | | | | | | | |
| REACH1 | 2223.54 | 2-Year | 2.46 | 239.55 | 240.52 | 240.44 | 240.52 | 0.003077 | 0.63 | 9.63 | 104.64 | 0.4 |
| REACH1 | 2223.54 | 5-Year | 3.5 | 239.55 | 240.54 | 240.46 | 240.55 | 0.003326 | 0.69 | 11.9 | 108.47 | 0.42 |
| REACH1 | 2223.54 | 10-Year | 4.21 | 239.55 | 240.54 | 240.48 | 240.56 | 0.00392 | 0.76 | 12.71 | 109.8 | 0.46 |
| REACH1 | 2223.54 | 25-Year | 5.3 | 239.55 | 240.56 | 240.51 | 240.57 | 0.003969 | 0.8 | 14.61 | 112.75 | 0.46 |
| REACH1 | 2223.54 | 50-Year | 6.27 | 239.55 | 240.57 | 240.52 | 240.59 | 0.00421 | 0.84 | 15.89 | 114.02 | 0.48 |
| REACH1 | 2223.54 | 100-Year | 7.11 | 239.55 | 240.58 | 240.53 | 240.6 | 0.004225 | 0.86 | 17.11 | 115.23 | 0.48 |
| REACH1 | 2223.54 | Regional | 10.8 | 239.55 | 240.62 | 240.56 | 240.64 | 0.00451 | 0.96 | 21.54 | 120.14 | 0.51 |
| | | | | | | | | | | | | |
| REACH1 | 2223.535 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.53 | 2-Year | 2.46 | 239.25 | 240.35 | 240.35 | 240.39 | 0.017504 | 1.23 | 4.77 | 51.88 | 0.88 |
| REACH1 | 2223.53 | 5-Year | 3.5 | 239.25 | 240.36 | 240.36 | 240.43 | 0.02665 | 1.57 | 5.34 | 52.68 | 1.1 |
| REACH1 | 2223.53 | 10-Year | 4.21 | 239.25 | 240.39 | 240.39 | 240.44 | 0.020291 | 1.49 | 6.84 | 55.2 | 0.98 |
| REACH1 | 2223.53 | 25-Year | 5.3 | 239.25 | 240.4 | 240.4 | 240.47 | 0.022717 | 1.65 | 7.83 | 57.61 | 1.05 |
| REACH1 | 2223.53 | 50-Year | 6.27 | 239.25 | 240.41 | 240.41 | 240.49 | 0.02635 | 1.83 | 8.39 | 58.2 | 1.13 |
| REACH1 | 2223.53 | 100-Year | 7.11 | 239.25 | 240.42 | 240.42 | 240.51 | 0.030899 | 2 | 8.67 | 58.5 | 1.23 |
| REACH1 | 2223.53 | Regional | 10.8 | 239.25 | 240.49 | 240.49 | 240.58 | 0.025569 | 2.12 | 13.26 | 75.24 | 1.16 |
| | | | | | | | | | | | | |
| REACH1 | 2223.52 | 2-Year | 2.46 | 239.15 | 239.84 | | 239.89 | 0.007794 | 1.19 | 4.14 | 24.71 | 0.65 |
| REACH1 | 2223.52 | 5-Year | 3.5 | 239.15 | 239.89 | | 239.95 | 0.008365 | 1.35 | 5.5 | 28.49 | 0.69 |
| REACH1 | 2223.52 | 10-Year | 4.21 | 239.15 | 239.97 | | 240.01 | 0.005596 | 1.23 | 7.74 | 33.94 | 0.58 |
| REACH1 | 2223.52 | 25-Year | 5.3 | 239.15 | 240.03 | | 240.08 | 0.004592 | 1.22 | 10.22 | 38.09 | 0.54 |
| REACH1 | 2223.52 | 50-Year | 6.27 | 239.15 | 240.09 | | 240.13 | 0.004002 | 1.22 | 12.32 | 40.37 | 0.51 |
| REACH1 | 2223.52 | 100-Year | 7.11 | 239.15 | 240.13 | | 240.17 | 0.003561 | 1.21 | 14.23 | 42.33 | 0.49 |
| REACH1 | 2223.52 | Regional | 10.8 | 239.15 | 240.31 | | 240.34 | 0.002607 | 1.22 | 22.16 | 49.73 | 0.43 |
| | | | | | | | | | | | | |
| REACH1 | 2223.51 | 2-Year | 2.46 | 238.75 | 239.42 | | 239.49 | 0.004433 | 1.23 | 2.61 | 8.97 | 0.54 |
| REACH1 | 2223.51 | 5-Year | 3.5 | 238.75 | 239.59 | | 239.64 | 0.00281 | 1.17 | 4.35 | 12.16 | 0.45 |
| REACH1 | 2223.51 | 10-Year | 4.21 | 238.75 | 239.57 | | 239.66 | 0.004545 | 1.46 | 4.14 | 11.86 | 0.56 |
| REACH1 | 2223.51 | 25-Year | 5.3 | 238.75 | 239.62 | | 239.73 | 0.005151 | 1.64 | 4.8 | 12.79 | 0.61 |
| REACH1 | 2223.51 | 50-Year | 6.27 | 238.75 | 239.66 | | 239.79 | 0.0057 | 1.79 | 5.32 | 13.47 | 0.65 |
| REACH1 | 2223.51 | 100-Year | 7.11 | 238.75 | 239.68 | 239.6 | 239.83 | 0.006509 | 1.94 | 5.61 | 13.84 | 0.69 |
| REACH1 | 2223.51 | Regional | 10.8 | 238.75 | 239.77 | 239.76 | 240.01 | 0.009466 | 2.51 | 6.87 | 15.41 | 0.85 |
| | | | | | | | | | | | | |
| REACH1 | 2223.5 | 2-Year | 2.46 | 238.52 | 239.44 | | 239.44 | 0.000087 | 0.25 | 22.26 | 38.66 | 0.08 |
| REACH1 | 2223.5 | 5-Year | 3.5 | 238.52 | 239.6 | | 239.6 | 0.00009 | 0.28 | 28.61 | 41.85 | 0.09 |
| REACH1 | 2223.5 | 10-Year | 4.21 | 238.52 | 239.59 | | 239.59 | 0.000135 | 0.34 | 28.18 | 41.65 | 0.11 |
| REACH1 | 2223.5 | 25-Year | 5.3 | 238.52 | 239.64 | | 239.65 | 0.000172 | 0.4 | 30.57 | 42.82 | 0.12 |
| REACH1 | 2223.5 | 50-Year | 6.27 | 238.52 | 239.69 | | 239.69 | 0.000206 | 0.45 | 32.41 | 43.71 | 0.13 |
| REACH1 | 2223.5 | 100-Year | 7.11 | 238.52 | 239.71 | | 239.72 | 0.000242 | 0.49 | 33.5 | 44.23 | 0.15 |
| REACH1 | 2223.5 | Regional | 10.8 | 238.52 | 239.81 | | 239.82 | 0.000393 | 0.66 | 38.14 | 46.36 | 0.19 |
| REACH1 | 2223.49 | 2-Year | 2.46 | 238.04 | 239.42 | 238.84 | 239.43 | 0.00119 | 0.75 | 9.06 | 38.5 | 0.29 |
| REACH1 | 2223.49 | 5-Year | 3.5 | 238.04 | 239.59 | 239.05 | 239.59 | 0.000618 | 0.63 | 15.88 | 42.53 | 0.22 |
| REACH1 | 2223.49 | 10-Year | 4.21 | 238.04 | 239.57 | 239.35 | 239.58 | 0.001013 | 0.79 | 15.11 | 42.06 | 0.28 |
| REACH1 | 2223.49 | 25-Year | 5.3 | 238.04 | 239.62 | 239.39 | 239.64 | 0.001113 | 0.87 | 17.44 | 43.46 | 0.29 |
| REACH1 | 2223.49 | 50-Year | 6.27 | 238.04 | 239.66 | 239.42 | 239.68 | 0.001211 | 0.93 | 19.22 | 44.49 | 0.31 |
| REACH1 | 2223.49 | 100-Year | 7.11 | 238.04 | 239.68 | 239.44 | 239.7 | 0.001369 | 1 | 20.18 | 45.04 | 0.33 |
| REACH1 | 2223.49 | Regional | 10.8 | 238.04 | 239.77 | 239.51 | 239.8 | 0.001914 | 1.26 | 24.39 | 47.37 | 0.39 |
| | | | | | | | | | | | | |
| REACH1 | 2223.485 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.48 | 2-Year | 2.46 | 237.92 | 238.84 | 238.84 | 239.25 | 0.015012 | 2.81 | 0.87 | 19.41 | 1.01 |
| REACH1 | 2223.48 | 5-Year | 3.5 | 237.92 | 239.05 | 239.05 | 239.56 | 0.014052 | 3.18 | 1.1 | 22.51 | 1.01 |
| REACH1 | 2223.48 | 10-Year | 4.21 | 237.92 | 239.29 | 239.29 | 239.38 | 0.009692 | 1.63 | 4.89 | 28.6 | 0.75 |
| REACH1 | 2223.48 | 25-Year | 5.3 | 237.92 | 239.32 | 239.32 | 239.42 | 0.010266 | 1.75 | 5.8 | 29.4 | 0.78 |
| REACH1 | 2223.48 | 50-Year | 6.27 | 237.92 | 239.36 | 239.36 | 239.45 | 0.009165 | 1.73 | 6.94 | 30.37 | 0.74 |
| REACH1 | 2223.48 | 100-Year | 7.11 | 237.92 | 239.36 | 239.36 | 239.48 | 0.010951 | 1.9 | 7.13 | 30.54 | 0.81 |
| REACH1 | 2223.48 | Regional | 10.8 | 237.92 | 239.45 | 239.45 | 239.58 | 0.010472 | 2.05 | 9.88 | 32.76 | 0.81 |
| | | | | | | | | | | | | |
| REACH1 | 2223.47 | 2-Year | 2.46 | 237.8 | 238.55 | | 238.55 | 0.000166 | 0.2 | 12.43 | 31.47 | 0.1 |
| REACH1 | 2223.47 | 5-Year | 3.5 | 237.8 | 238.61 | | 238.61 | 0.000209 | 0.24 | 14.39 | 31.75 | 0.12 |
| REACH1 | 2223.47 | 10-Year | 4.21 | 237.8 | 238.65 | | 238.65 | 0.000236 | 0.27 | 15.54 | 31.92 | 0.12 |
| REACH1 | 2223.47 | 25-Year | 5.3 | 237.8 | 238.69 | | 238.7 | 0.000279 | 0.31 | 17.02 | 32.13 | 0.14 |
| REACH1 | 2223.47 | 50-Year | 6.27 | 237.8 | 238.73 | | 238.73 | 0.000314 | 0.34 | 18.2 | 32.29 | 0.15 |
| REACH1 | 2223.47 | 100-Year | 7.11 | 237.8 | 238.77 | | 238.77 | 0.000328 | 0.37 | 19.41 | 32.46 | 0.15 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.47 | Regional | 10.8 | 237.8 | 238.83 | | 238.84 | 0.000552 | 0.5 | 21.41 | 32.74 | 0.2 |
| | | | | | | | | | | | | |
| REACH1 | 2223.46 | 2-Year | 2.46 | 237.57 | 238.54 | | 238.54 | 0.000047 | 0.19 | 28.54 | 44.13 | 0.06 |
| REACH1 | 2223.46 | 5-Year | 3.5 | 237.57 | 238.6 | | 238.6 | 0.000074 | 0.25 | 31.18 | 44.87 | 0.08 |
| REACH1 | 2223.46 | 10-Year | 4.21 | 237.57 | 238.64 | | 238.64 | 0.000093 | 0.28 | 32.73 | 45.31 | 0.09 |
| REACH1 | 2223.46 | 25-Year | 5.3 | 237.57 | 238.68 | | 238.68 | 0.000124 | 0.34 | 34.71 | 45.85 | 0.1 |
| REACH1 | 2223.46 | 50-Year | 6.27 | 237.57 | 238.71 | | 238.72 | 0.000153 | 0.38 | 36.29 | 46.28 | 0.11 |
| REACH1 | 2223.46 | 100-Year | 7.11 | 237.57 | 238.75 | | 238.75 | 0.000173 | 0.41 | 37.96 | 46.73 | 0.12 |
| REACH1 | 2223.46 | Regional | 10.8 | 237.57 | 238.8 | | 238.8 | 0.000339 | 0.6 | 40.17 | 47.32 | 0.17 |
| | | | | | | | | | | | | |
| REACH1 | 2223.45 | 2-Year | 4.24 | 237 | 238.54 | | 238.54 | 0.000108 | 0.38 | 30.73 | 34.87 | 0.1 |
| REACH1 | 2223.45 | 5-Year | 6.03 | 237 | 238.59 | | 238.59 | 0.000187 | 0.52 | 32.68 | 36.04 | 0.13 |
| REACH1 | 2223.45 | 10-Year | 7.26 | 237 | 238.62 | | 238.63 | 0.000249 | 0.6 | 33.8 | 36.67 | 0.15 |
| REACH1 | 2223.45 | 25-Year | 8.94 | 237 | 238.66 | | 238.67 | 0.000339 | 0.71 | 35.23 | 37.45 | 0.18 |
| REACH1 | 2223.45 | 50-Year | 10.27 | 237 | 238.69 | | 238.7 | 0.000412 | 0.8 | 36.37 | 38.06 | 0.2 |
| REACH1 | 2223.45 | 100-Year | 11.79 | 237 | 238.72 | | 238.73 | 0.0005 | 0.89 | 37.57 | 38.69 | 0.22 |
| REACH1 | 2223.45 | Regional | 13.84 | 237 | 238.76 | | 238.77 | 0.00062 | 1.01 | 39.17 | 43.32 | 0.24 |
| | | | | | | | | | | | | |
| REACH1 | 2223.44 | 2-Year | 4.24 | 236.3 | 238.53 | | 238.54 | 0.000052 | 0.25 | 27.53 | 28.51 | 0.06 |
| REACH1 | 2223.44 | 5-Year | 6.03 | 236.3 | 238.59 | | 238.59 | 0.000093 | 0.34 | 29.13 | 31.14 | 0.09 |
| REACH1 | 2223.44 | 10-Year | 7.26 | 236.3 | 238.62 | | 238.62 | 0.000124 | 0.4 | 30.36 | 49.73 | 0.1 |
| REACH1 | 2223.44 | 25-Year | 8.94 | 236.3 | 238.66 | | 238.66 | 0.00017 | 0.48 | 32.41 | 58.46 | 0.12 |
| REACH1 | 2223.44 | 50-Year | 10.27 | 236.3 | 238.69 | | 238.69 | 0.000204 | 0.53 | 34.22 | 62.97 | 0.13 |
| REACH1 | 2223.44 | 100-Year | 11.79 | 236.3 | 238.72 | | 238.73 | 0.000243 | 0.58 | 36.21 | 67.61 | 0.14 |
| REACH1 | 2223.44 | Regional | 13.84 | 236.3 | 238.76 | | 238.77 | 0.000293 | 0.65 | 38.91 | 73.42 | 0.16 |
| | | | | | | | | | | | | |
| REACH1 | 2223.43 | 2-Year | 4.24 | 236 | 236.96 | | 236.98 | 0.001029 | 0.59 | 7.19 | 13.67 | 0.26 |
| REACH1 | 2223.43 | 5-Year | 6.03 | 236 | 237.1 | | 237.12 | 0.00098 | 0.66 | 9.16 | 14.94 | 0.26 |
| REACH1 | 2223.43 | 10-Year | 7.26 | 236 | 237.18 | | 237.21 | 0.00095 | 0.71 | 10.43 | 15.57 | 0.26 |
| REACH1 | 2223.43 | 25-Year | 8.94 | 236 | 237.28 | | 237.31 | 0.00094 | 0.76 | 12 | 16.32 | 0.27 |
| REACH1 | 2223.43 | 50-Year | 10.27 | 236 | 237.35 | | 237.38 | 0.00095 | 0.81 | 13.12 | 16.83 | 0.27 |
| REACH1 | 2223.43 | 100-Year | 11.79 | 236 | 237.42 | | 237.45 | 0.000982 | 0.86 | 14.25 | 17.34 | 0.28 |
| REACH1 | 2223.43 | Regional | 13.84 | 236 | 237.49 | | 237.54 | 0.00104 | 0.93 | 15.61 | 17.92 | 0.29 |
| | | | | | | | | | | | | |
| REACH1 | 2223.42 | 2-Year | 4.24 | 236 | 236.96 | | 236.97 | 0.00032 | 0.41 | 12.04 | 22.8 | 0.15 |
| REACH1 | 2223.42 | 5-Year | 6.03 | 236 | 237.1 | | 237.11 | 0.000343 | 0.47 | 15.31 | 24.21 | 0.16 |
| REACH1 | 2223.42 | 10-Year | 7.26 | 236 | 237.18 | | 237.2 | 0.000355 | 0.51 | 17.36 | 24.8 | 0.17 |
| REACH1 | 2223.42 | 25-Year | 8.94 | 236 | 237.28 | | 237.3 | 0.000373 | 0.56 | 19.86 | 25.48 | 0.18 |
| REACH1 | 2223.42 | 50-Year | 10.27 | 236 | 237.35 | | 237.37 | 0.000391 | 0.6 | 21.62 | 25.95 | 0.18 |
| REACH1 | 2223.42 | 100-Year | 11.79 | 236 | 237.42 | | 237.44 | 0.000416 | 0.65 | 23.37 | 26.4 | 0.19 |
| REACH1 | 2223.42 | Regional | 13.84 | 236 | 237.5 | | 237.52 | 0.000454 | 0.7 | 25.44 | 26.97 | 0.2 |
| | | | | | | | | | | | | |
| REACH1 | 2223.41 | 2-Year | 4.24 | 236 | 236.96 | 236.16 | 236.97 | 0.000057 | 0.2 | 21.24 | 25.03 | 0.07 |
| REACH1 | 2223.41 | 5-Year | 6.03 | 236 | 237.1 | 236.21 | 237.1 | 0.000072 | 0.25 | 24.86 | 27.51 | 0.08 |
| REACH1 | 2223.41 | 10-Year | 7.26 | 236 | 237.19 | 236.23 | 237.19 | 0.000081 | 0.28 | 27.23 | 29.22 | 0.08 |
| REACH1 | 2223.41 | 25-Year | 8.94 | 236 | 237.29 | 236.27 | 237.29 | 0.000092 | 0.31 | 30.25 | 31.28 | 0.09 |
| REACH1 | 2223.41 | 50-Year | 10.27 | 236 | 237.35 | 236.3 | 237.36 | 0.0001 | 0.34 | 32.45 | 32.69 | 0.09 |
| REACH1 | 2223.41 | 100-Year | 11.79 | 236 | 237.42 | 236.32 | 237.43 | 0.000111 | 0.37 | 34.69 | 34.04 | 0.1 |
| REACH1 | 2223.41 | Regional | 13.84 | 236 | 237.5 | 236.36 | 237.51 | 0.000126 | 0.41 | 37.42 | 35.61 | 0.11 |
| | | | | | | | | | | | | |
| REACH1 | 2223.4 | 2-Year | 4.24 | 236 | 236.88 | 236.71 | 236.95 | 0.0048 | 1.23 | 3.58 | 8.63 | 0.55 |
| REACH1 | 2223.4 | 5-Year | 6.03 | 236 | 236.99 | 236.81 | 237.09 | 0.004862 | 1.42 | 4.62 | 9.92 | 0.58 |
| REACH1 | 2223.4 | 10-Year | 7.26 | 236 | 237.05 | 236.86 | 237.17 | 0.004992 | 1.53 | 5.35 | 13.11 | 0.59 |
| REACH1 | 2223.4 | 25-Year | 8.94 | 236 | 237.13 | 236.94 | 237.27 | 0.005128 | 1.67 | 6.56 | 19.02 | 0.61 |
| REACH1 | 2223.4 | 50-Year | 10.27 | 236 | 237.19 | 237 | 237.34 | 0.00514 | 1.76 | 7.85 | 25.61 | 0.62 |
| REACH1 | 2223.4 | 100-Year | 11.79 | 236 | 237.24 | 237.06 | 237.4 | 0.005224 | 1.85 | 9.38 | 32.26 | 0.63 |
| REACH1 | 2223.4 | Regional | 13.84 | 236 | 237.31 | 237.19 | 237.48 | 0.005104 | 1.92 | 12.05 | 42.57 | 0.63 |
| | | | | | | | | | | | | |
| REACH1 | 2223.39 | 2-Year | 4.24 | 235.68 | 236.29 | 236.29 | 236.48 | 0.017786 | 1.91 | 2.22 | 6.11 | 1.01 |
| REACH1 | 2223.39 | 5-Year | 6.03 | 235.68 | 236.4 | 236.4 | 236.62 | 0.017004 | 2.06 | 2.93 | 6.96 | 1.01 |
| REACH1 | 2223.39 | 10-Year | 7.26 | 235.68 | 236.47 | 236.47 | 236.7 | 0.016331 | 2.12 | 3.42 | 7.48 | 1 |
| REACH1 | 2223.39 | 25-Year | 8.94 | 235.68 | 236.54 | 236.54 | 236.8 | 0.015348 | 2.24 | 4.02 | 8.8 | 0.99 |
| REACH1 | 2223.39 | 50-Year | 10.27 | 235.68 | 236.6 | 236.6 | 236.87 | 0.014699 | 2.33 | 4.5 | 10.1 | 0.99 |
| REACH1 | 2223.39 | 100-Year | 11.79 | 235.68 | 236.66 | 236.66 | 236.95 | 0.013343 | 2.39 | 5.21 | 11.51 | 0.96 |
| REACH1 | 2223.39 | Regional | 13.84 | 235.68 | 236.74 | 236.74 | 237.05 | 0.012408 | 2.48 | 6.14 | 12.94 | 0.94 |
| | | | | | | | | | | | | |
| REACH1 | 2223.38 | 2-Year | 4.24 | 234.5 | 235.67 | | 235.72 | 0.001334 | 0.98 | 6.27 | 15.61 | 0.32 |
| REACH1 | 2223.38 | 5-Year | 6.03 | 234.5 | 235.91 | | 235.95 | 0.001029 | 1 | 11.22 | 26.1 | 0.29 |
| REACH1 | 2223.38 | 10-Year | 7.26 | 234.5 | 236.01 | | 236.05 | 0.001011 | 1.04 | 14.06 | 30.44 | 0.29 |
| REACH1 | 2223.38 | 25-Year | 8.94 | 234.5 | 236.05 | | 236.11 | 0.001318 | 1.21 | 15.3 | 31.87 | 0.34 |
| REACH1 | 2223.38 | 50-Year | 10.27 | 234.5 | 236.11 | | 236.17 | 0.001404 | 1.29 | 17.18 | 33.81 | 0.35 |
| REACH1 | 2223.38 | 100-Year | 11.79 | 234.5 | 236.14 | | 236.22 | 0.001665 | 1.43 | 18.39 | 37.1 | 0.38 |
| REACH1 | 2223.38 | Regional | 13.84 | 234.5 | 236.21 | | 236.29 | 0.001898 | 1.57 | 21.07 | 45.65 | 0.41 |
| | | | | | | | | | | | | |
| REACH1 | 2223.37 | 2-Year | 4.59 | 233.51 | 235.59 | 234.48 | 235.66 | 0.003026 | 1.15 | 5.1 | 16.53 | 0.44 |
| REACH1 | 2223.37 | 5-Year | 6.53 | 233.51 | 235.87 | 234.72 | 235.92 | 0.001517 | 1.02 | 10.14 | 19.56 | 0.33 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.37 | 10-Year | 7.85 | 233.51 | 235.97 | 234.87 | 236.02 | 0.001452 | 1.06 | 12.17 | 20.8 | 0.33 |
| REACH1 | 2223.37 | 25-Year | 9.68 | 233.51 | 235.99 | 235.07 | 236.06 | 0.002045 | 1.28 | 12.6 | 21.1 | 0.39 |
| REACH1 | 2223.37 | 50-Year | 11.11 | 233.51 | 236.02 | 235.22 | 236.11 | 0.00261 | 1.47 | 13.3 | 27.64 | 0.44 |
| REACH1 | 2223.37 | 100-Year | 12.75 | 233.51 | 236.03 | 235.75 | 236.14 | 0.003358 | 1.67 | 13.48 | 28.06 | 0.5 |
| REACH1 | 2223.37 | Regional | 14.97 | 233.51 | 236.06 | 235.82 | 236.2 | 0.004147 | 1.89 | 14.34 | 30.03 | 0.56 |
| | | | | | | | | | | | | |
| REACH1 | 2223.365 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.36 | 2-Year | 4.59 | 233.69 | 234.71 | 234.71 | 235.19 | 0.012752 | 3.09 | 1.49 | 7.84 | 1.01 |
| REACH1 | 2223.36 | 5-Year | 6.53 | 233.69 | 234.96 | 234.96 | 235.58 | 0.011788 | 3.47 | 1.88 | 9.06 | 1.01 |
| REACH1 | 2223.36 | 10-Year | 7.85 | 233.69 | 235.12 | 235.12 | 235.82 | 0.011302 | 3.69 | 2.13 | 11.85 | 1.01 |
| REACH1 | 2223.36 | 25-Year | 9.68 | 233.69 | 235.57 | 235.57 | 235.71 | 0.012159 | 1.79 | 6.27 | 27.22 | 0.85 |
| REACH1 | 2223.36 | 50-Year | 11.11 | 233.69 | 235.61 | 235.61 | 235.74 | 0.010727 | 1.77 | 7.37 | 30.98 | 0.81 |
| REACH1 | 2223.36 | 100-Year | 12.75 | 233.69 | 235.65 | 235.65 | 235.77 | 0.008845 | 1.71 | 8.95 | 37.82 | 0.75 |
| REACH1 | 2223.36 | Regional | 14.97 | 233.69 | 235.68 | 235.68 | 235.81 | 0.009478 | 1.83 | 9.94 | 41.35 | 0.78 |
| | | | | | | | | | | | | |
| REACH1 | 2223.35 | 2-Year | 4.59 | 233.5 | 234.13 | 234.13 | 234.35 | 0.015939 | 2.06 | 2.27 | 5.86 | 0.99 |
| REACH1 | 2223.35 | 5-Year | 6.53 | 233.5 | 234.25 | 234.25 | 234.51 | 0.014395 | 2.3 | 3.02 | 6.66 | 0.98 |
| REACH1 | 2223.35 | 10-Year | 7.85 | 233.5 | 234.32 | 234.32 | 234.62 | 0.013593 | 2.42 | 3.53 | 7.17 | 0.97 |
| REACH1 | 2223.35 | 25-Year | 9.68 | 233.5 | 234.42 | 234.42 | 234.74 | 0.012804 | 2.58 | 4.23 | 7.8 | 0.96 |
| REACH1 | 2223.35 | 50-Year | 11.11 | 233.5 | 234.49 | 234.49 | 234.84 | 0.012186 | 2.67 | 4.8 | 8.27 | 0.95 |
| REACH1 | 2223.35 | 100-Year | 12.75 | 233.5 | 234.56 | 234.56 | 234.94 | 0.011798 | 2.79 | 5.41 | 8.73 | 0.95 |
| REACH1 | 2223.35 | Regional | 14.97 | 233.5 | 234.66 | 234.66 | 235.06 | 0.011132 | 2.91 | 6.29 | 9.35 | 0.94 |
| REACH1 | 2223.34 | 2-Year | 4.59 | 233 | 233.71 | 233.52 | 233.76 | 0.003364 | 1.14 | 6.78 | 26.16 | 0.48 |
| REACH1 | 2223.34 | 5-Year | 6.53 | 233 | 233.77 | 233.63 | 233.85 | 0.004359 | 1.39 | 8.55 | 30.44 | 0.55 |
| REACH1 | 2223.34 | 10-Year | 7.85 | 233 | 233.69 | 233.69 | 233.87 | 0.011005 | 2.02 | 6.39 | 25.13 | 0.86 |
| REACH1 | 2223.34 | 25-Year | 9.68 | 233 | 233.76 | 233.76 | 233.94 | 0.010433 | 2.12 | 8.18 | 29.6 | 0.85 |
| REACH1 | 2223.34 | 50-Year | 11.11 | 233 | 233.8 | 233.8 | 233.99 | 0.010083 | 2.18 | 9.6 | 32.71 | 0.85 |
| REACH1 | 2223.34 | 100-Year | 12.75 | 233 | 233.85 | 233.85 | 234.04 | 0.009996 | 2.26 | 11.09 | 35.7 | 0.85 |
| REACH1 | 2223.34 | Regional | 14.97 | 233 | 233.92 | 233.9 | 234.1 | 0.008708 | 2.26 | 13.95 | 40.83 | 0.81 |
| | | | | | | | | | | | | |
| REACH1 | 2223.33 | 2-Year | 4.59 | 232.5 | 232.96 | 232.96 | 233.1 | 0.019521 | 1.62 | 2.83 | 10.84 | 1.01 |
| REACH1 | 2223.33 | 5-Year | 6.53 | 232.5 | 233.09 | 233.04 | 233.2 | 0.010962 | 1.52 | 4.6 | 16.97 | 0.8 |
| REACH1 | 2223.33 | 10-Year | 7.85 | 232.5 | 233.36 | | 233.41 | 0.002106 | 0.97 | 10.27 | 23.79 | 0.39 |
| REACH1 | 2223.33 | 25-Year | 9.68 | 232.5 | 233.55 | | 233.58 | 0.00125 | 0.89 | 15.08 | 28.06 | 0.31 |
| REACH1 | 2223.33 | 50-Year | 11.11 | 232.5 | 233.64 | | 233.68 | 0.001098 | 0.89 | 17.77 | 30.27 | 0.3 |
| REACH1 | 2223.33 | 100-Year | 12.75 | 232.5 | 233.69 | | 233.73 | 0.0012 | 0.96 | 19.17 | 31.36 | 0.31 |
| REACH1 | 2223.33 | Regional | 14.97 | 232.5 | 233.76 | | 233.81 | 0.001229 | 1.02 | 21.65 | 33.3 | 0.32 |
| | | | | | | | | | | | | |
| REACH1 | 2223.326 | 2-Year | 4.59 | 232 | 232.78 | | 232.79 | 0.000292 | 0.35 | 19.4 | 43.93 | 0.14 |
| REACH1 | 2223.326 | 5-Year | 6.53 | 232 | 233.12 | | 233.13 | 0.000111 | 0.29 | 35.8 | 51.38 | 0.1 |
| REACH1 | 2223.326 | 10-Year | 7.85 | 232 | 233.37 | | 233.37 | 0.000071 | 0.27 | 53.09 | 77.09 | 0.08 |
| REACH1 | 2223.326 | 25-Year | 9.68 | 232 | 233.55 | | 233.56 | 0.000058 | 0.27 | 67.59 | 79.84 | 0.07 |
| REACH1 | 2223.326 | 50-Year | 11.11 | 232 | 233.65 | | 233.65 | 0.000058 | 0.28 | 74.99 | 80.79 | 0.07 |
| REACH1 | 2223.326 | 100-Year | 12.75 | 232 | 233.69 | | 233.7 | 0.000067 | 0.31 | 78.76 | 81.28 | 0.08 |
| REACH1 | 2223.326 | Regional | 14.97 | 232 | 233.77 | | 233.77 | 0.000074 | 0.34 | 85.11 | 82.08 | 0.08 |
| | | | | | | | | | | | | |
| REACH1 | 2223.325 | 2-Year | 4.59 | 231.99 | 232.77 | 232.34 | 232.78 | 0.000369 | 0.39 | 15.35 | 30.57 | 0.16 |
| REACH1 | 2223.325 | 5-Year | 6.53 | 231.99 | 233.12 | 232.4 | 233.13 | 0.000165 | 0.36 | 29.27 | 56.97 | 0.12 |
| REACH1 | 2223.325 | 10-Year | 7.85 | 231.99 | 233.37 | 232.43 | 233.37 | 0.000089 | 0.31 | 43.83 | 60.2 | 0.09 |
| REACH1 | 2223.325 | 25-Year | 9.68 | 231.99 | 233.55 | 232.46 | 233.56 | 0.000075 | 0.31 | 55.13 | 62.59 | 0.08 |
| REACH1 | 2223.325 | 50-Year | 11.11 | 231.99 | 233.65 | 232.5 | 233.65 | 0.000076 | 0.32 | 60.96 | 64.4 | 0.08 |
| REACH1 | 2223.325 | 100-Year | 12.75 | 231.99 | 233.69 | 232.52 | 233.7 | 0.000088 | 0.36 | 63.95 | 65.52 | 0.09 |
| REACH1 | 2223.325 | Regional | 14.97 | 231.99 | 233.77 | 232.56 | 233.77 | 0.0001 | 0.39 | 69.1 | 67.39 | 0.1 |
| | | | | | | | | | | | | |
| REACH1 | 2223.324 | 2-Year | 4.59 | 231.98 | 232.77 | 232.28 | 232.78 | 0.00016 | 0.27 | 18.72 | 34.64 | 0.11 |
| REACH1 | 2223.324 | 5-Year | 6.53 | 231.98 | 233.12 | 232.32 | 233.12 | 0.000072 | 0.24 | 31.76 | 40.66 | 0.08 |
| REACH1 | 2223.324 | 10-Year | 7.85 | 231.98 | 233.37 | 232.35 | 233.37 | 0.000047 | 0.22 | 44.96 | 60.48 | 0.06 |
| REACH1 | 2223.324 | 25-Year | 9.68 | 231.98 | 233.55 | 232.38 | 233.56 | 0.000042 | 0.23 | 56.19 | 61.57 | 0.06 |
| REACH1 | 2223.324 | 50-Year | 11.11 | 231.98 | 233.65 | 232.4 | 233.65 | 0.000043 | 0.25 | 61.88 | 62.12 | 0.06 |
| REACH1 | 2223.324 | 100-Year | 12.75 | 231.98 | 233.69 | 232.43 | 233.69 | 0.000051 | 0.27 | 64.76 | 63.12 | 0.07 |
| REACH1 | 2223.324 | Regional | 14.97 | 231.98 | 233.77 | 232.46 | 233.77 | 0.000058 | 0.3 | 69.72 | 64.95 | 0.08 |
| | | | | | | | | | | | | |
| REACH1 | 2223.323 | 2-Year | 4.59 | 231.92 | 232.77 | | 232.78 | 0.000118 | 0.24 | 20.98 | 36.64 | 0.09 |
| REACH1 | 2223.323 | 5-Year | 6.53 | 231.92 | 233.12 | | 233.12 | 0.000056 | 0.22 | 34.73 | 42.61 | 0.07 |
| REACH1 | 2223.323 | 10-Year | 7.85 | 231.92 | 233.37 | | 233.37 | 0.000038 | 0.21 | 45.84 | 47.67 | 0.06 |
| REACH1 | 2223.323 | 25-Year | 9.68 | 231.92 | 233.55 | | 233.56 | 0.000036 | 0.22 | 55.59 | 58.37 | 0.06 |
| REACH1 | 2223.323 | 50-Year | 11.11 | 231.92 | 233.64 | | 233.65 | 0.000038 | 0.24 | 61.16 | 61.63 | 0.06 |
| REACH1 | 2223.323 | 100-Year | 12.75 | 231.92 | 233.69 | | 233.69 | 0.000045 | 0.26 | 64.01 | 62.16 | 0.07 |
| REACH1 | 2223.323 | Regional | 14.97 | 231.92 | 233.77 | | 233.77 | 0.000052 | 0.29 | 68.85 | 63.06 | 0.07 |
| | | | | | | | | | | | | |
| REACH1 | 2223.32 | 2-Year | 4.59 | 231.67 | 232.76 | | 232.77 | 0.000271 | 0.41 | 17.35 | 31.93 | 0.14 |
| REACH1 | 2223.32 | 5-Year | 6.53 | 231.67 | 233.11 | | 233.12 | 0.000139 | 0.38 | 29.45 | 37.12 | 0.11 |
| REACH1 | 2223.32 | 10-Year | 7.85 | 231.67 | 233.36 | | 233.37 | 0.000096 | 0.35 | 39.21 | 41.06 | 0.09 |
| REACH1 | 2223.32 | 25-Year | 9.68 | 231.67 | 233.55 | | 233.55 | 0.000091 | 0.37 | 47.02 | 44.18 | 0.09 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.32 | 50-Year | 11.11 | 231.67 | 233.64 | | 233.65 | 0.000098 | 0.4 | 51.16 | 46.26 | 0.1 |
| REACH1 | 2223.32 | 100-Year | 12.75 | 231.67 | 233.68 | | 233.69 | 0.000117 | 0.45 | 53.26 | 47.25 | 0.11 |
| REACH1 | 2223.32 | Regional | 14.97 | 231.67 | 233.76 | | 233.77 | 0.000137 | 0.5 | 56.93 | 49.78 | 0.12 |
| | | | | | | | | | | | | |
| REACH1 | 2223.31 | 2-Year | 4.59 | 231.5 | 232.76 | | 232.76 | 0.000061 | 0.23 | 29.18 | 38.27 | 0.07 |
| REACH1 | 2223.31 | 5-Year | 6.53 | 231.5 | 233.11 | | 233.11 | 0.000042 | 0.23 | 43.3 | 42.24 | 0.06 |
| REACH1 | 2223.31 | 10-Year | 7.85 | 231.5 | 233.36 | | 233.36 | 0.000033 | 0.23 | 54.85 | 56.2 | 0.06 |
| REACH1 | 2223.31 | 25-Year | 9.68 | 231.5 | 233.55 | | 233.55 | 0.000032 | 0.24 | 65.77 | 62.03 | 0.06 |
| REACH1 | 2223.31 | 50-Year | 11.11 | 231.5 | 233.64 | | 233.64 | 0.000034 | 0.26 | 71.59 | 64.84 | 0.06 |
| REACH1 | 2223.31 | 100-Year | 12.75 | 231.5 | 233.68 | | 233.69 | 0.00004 | 0.29 | 74.51 | 66.06 | 0.06 |
| REACH1 | 2223.31 | Regional | 14.97 | 231.5 | 233.76 | | 233.76 | 0.000047 | 0.32 | 79.6 | 68.01 | 0.07 |
| | | | | | | | | | | | | |
| REACH1 | 2223.3 | 2-Year | 4.59 | 231.5 | 232.76 | | 232.76 | 0.000169 | 0.42 | 28.32 | 49.64 | 0.12 |
| REACH1 | 2223.3 | 5-Year | 6.53 | 231.5 | 233.11 | | 233.11 | 0.000075 | 0.33 | 48.42 | 60.94 | 0.09 |
| REACH1 | 2223.3 | 10-Year | 7.85 | 231.5 | 233.36 | | 233.36 | 0.000045 | 0.28 | 64.45 | 66.72 | 0.07 |
| REACH1 | 2223.3 | 25-Year | 9.68 | 231.5 | 233.55 | | 233.55 | 0.00004 | 0.28 | 77.15 | 71.48 | 0.06 |
| REACH1 | 2223.3 | 50-Year | 11.11 | 231.5 | 233.64 | | 233.64 | 0.000041 | 0.3 | 83.84 | 74.62 | 0.07 |
| REACH1 | 2223.3 | 100-Year | 12.75 | 231.5 | 233.68 | | 233.68 | 0.000048 | 0.32 | 87.21 | 76.15 | 0.07 |
| REACH1 | 2223.3 | Regional | 14.97 | 231.5 | 233.76 | | 233.76 | 0.000054 | 0.35 | 93.09 | 78.75 | 0.08 |
| | | | | | | | | | | | | |
| REACH1 | 2223.29 | 2-Year | 4.59 | 231.5 | 232.61 | 232.16 | 232.72 | 0.002545 | 1.44 | 3.18 | 19.17 | 0.45 |
| REACH1 | 2223.29 | 5-Year | 6.53 | 231.5 | 232.95 | 232.33 | 233.07 | 0.002096 | 1.57 | 4.16 | 21.96 | 0.42 |
| REACH1 | 2223.29 | 10-Year | 7.85 | 231.5 | 233.19 | 232.43 | 233.32 | 0.001778 | 1.61 | 4.88 | 31.69 | 0.4 |
| REACH1 | 2223.29 | 25-Year | 9.68 | 231.5 | 233.32 | 232.57 | 233.49 | 0.002089 | 1.84 | 5.27 | 34.3 | 0.44 |
| REACH1 | 2223.29 | 50-Year | 11.11 | 231.5 | 233.35 | 232.67 | 233.57 | 0.003625 | 2.07 | 5.52 | 34.9 | 0.55 |
| REACH1 | 2223.29 | 100-Year | 12.75 | 231.5 | 233.51 | 232.78 | 233.64 | 0.002355 | 1.78 | 10.95 | 37.05 | 0.45 |
| REACH1 | 2223.29 | Regional | 14.97 | 231.5 | 233.66 | 232.91 | 233.74 | 0.001446 | 1.48 | 16.92 | 41.9 | 0.36 |
| | | | | | | | | | | | | |
| REACH1 | 2223.285 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.28 | 2-Year | 4.59 | 231.5 | 232.17 | 232.17 | 232.49 | 0.014757 | 2.52 | 1.82 | 29.02 | 1.01 |
| REACH1 | 2223.28 | 5-Year | 6.53 | 231.5 | 232.34 | 232.34 | 232.75 | 0.01367 | 2.84 | 2.3 | 31.38 | 1.01 |
| REACH1 | 2223.28 | 10-Year | 7.85 | 231.5 | 232.45 | 232.45 | 232.91 | 0.0131 | 3.01 | 2.6 | 32.16 | 1.01 |
| REACH1 | 2223.28 | 25-Year | 9.68 | 231.5 | 232.58 | 232.58 | 233.12 | 0.012531 | 3.23 | 2.99 | 32.68 | 1.01 |
| REACH1 | 2223.28 | 50-Year | 11.11 | 231.5 | 232.69 | 232.69 | 233.27 | 0.012098 | 3.38 | 3.29 | 33.16 | 1 |
| REACH1 | 2223.28 | 100-Year | 12.75 | 231.5 | 232.8 | 232.8 | 233.44 | 0.011764 | 3.54 | 3.6 | 33.67 | 1.01 |
| REACH1 | 2223.28 | Regional | 14.97 | 231.5 | 232.94 | 232.94 | 233.65 | 0.011224 | 3.73 | 4.02 | 34.37 | 1 |
| | | | | | | | | | | | | |
| REACH1 | 2223.27 | 2-Year | 4.59 | 231.1 | 231.85 | 231.75 | 231.88 | 0.00239 | 0.94 | 6.55 | 34.94 | 0.4 |
| REACH1 | 2223.27 | 5-Year | 6.53 | 231.1 | 231.91 | 231.8 | 231.95 | 0.002651 | 1.05 | 7.95 | 37.15 | 0.42 |
| REACH1 | 2223.27 | 10-Year | 7.85 | 231.1 | 231.93 | 231.84 | 231.97 | 0.003199 | 1.18 | 8.42 | 37.6 | 0.47 |
| REACH1 | 2223.27 | 25-Year | 9.68 | 231.1 | 232.18 | 231.87 | 232.2 | 0.000732 | 0.7 | 15.34 | 44.28 | 0.24 |
| REACH1 | 2223.27 | 50-Year | 11.11 | 231.1 | 232.3 | 231.89 | 232.32 | 0.000525 | 0.65 | 18.56 | 46.95 | 0.2 |
| REACH1 | 2223.27 | 100-Year | 12.75 | 231.1 | 232.45 | 231.91 | 232.46 | 0.000362 | 0.59 | 22.75 | 49.96 | 0.17 |
| REACH1 | 2223.27 | Regional | 14.97 | 231.1 | 232.66 | 231.94 | 232.68 | 0.000235 | 0.53 | 28.9 | 54.15 | 0.14 |
| | | | | | | | | | | | | |
| REACH1 | 2223.26 | 2-Year | 4.59 | 231 | 231.67 | 231.67 | 231.75 | 0.0069 | 1.48 | 4.62 | 32.19 | 0.67 |
| REACH1 | 2223.26 | 5-Year | 6.53 | 231 | 231.73 | 231.73 | 231.81 | 0.006366 | 1.54 | 6.51 | 38.06 | 0.65 |
| REACH1 | 2223.26 | 10-Year | 7.85 | 231 | 231.8 | 231.75 | 231.86 | 0.003826 | 1.29 | 8.87 | 39.62 | 0.52 |
| REACH1 | 2223.26 | 25-Year | 9.68 | 231 | 232.17 | 231.78 | 232.18 | 0.000394 | 0.56 | 21 | 47.74 | 0.18 |
| REACH1 | 2223.26 | 50-Year | 11.11 | 231 | 232.29 | 231.8 | 232.3 | 0.000293 | 0.52 | 25.1 | 50.71 | 0.16 |
| REACH1 | 2223.26 | 100-Year | 12.75 | 231 | 232.44 | 231.82 | 232.45 | 0.00021 | 0.48 | 30.36 | 54.11 | 0.14 |
| REACH1 | 2223.26 | Regional | 14.97 | 231 | 232.66 | 231.85 | 232.67 | 0.000142 | 0.44 | 38 | 59.24 | 0.11 |
| | | | | | | | | | | | | |
| REACH1 | 2223.25 | 2-Year | 4.59 | 230.5 | 231.24 | | 231.39 | 0.014808 | 1.73 | 2.66 | 5.36 | 0.78 |
| REACH1 | 2223.25 | 5-Year | 6.53 | 230.5 | 231.44 | | 231.59 | 0.011527 | 1.72 | 3.81 | 6.19 | 0.69 |
| REACH1 | 2223.25 | 10-Year | 7.85 | 230.5 | 231.59 | | 231.73 | 0.008695 | 1.64 | 4.92 | 8.13 | 0.6 |
| REACH1 | 2223.25 | 25-Year | 9.68 | 230.5 | 232.09 | | 232.15 | 0.00213 | 1.14 | 10.49 | 14.69 | 0.32 |
| REACH1 | 2223.25 | 50-Year | 11.11 | 230.5 | 232.21 | | 232.27 | 0.001964 | 1.16 | 12.37 | 16.58 | 0.32 |
| REACH1 | 2223.25 | 100-Year | 12.75 | 230.5 | 232.37 | | 232.43 | 0.001658 | 1.15 | 15.43 | 22.01 | 0.3 |
| REACH1 | 2223.25 | Regional | 14.97 | 230.5 | 232.61 | | 232.65 | 0.001114 | 1.04 | 21.64 | 28.85 | 0.25 |
| | | | | | | | | | | | | |
| REACH1 | 2223.24 | 2-Year | 4.59 | 230.2 | 231.55 | 230.87 | 231.57 | 0.001177 | 0.74 | 6.27 | 9.79 | 0.28 |
| REACH1 | 2223.24 | 5-Year | 6.53 | 230.2 | 231.85 | 231.08 | 231.87 | 0.000721 | 0.73 | 9.65 | 12.69 | 0.23 |
| REACH1 | 2223.24 | 10-Year | 7.85 | 230.2 | 232.1 | 231.19 | 232.12 | 0.000475 | 0.69 | 13.21 | 16.61 | 0.19 |
| REACH1 | 2223.24 | 25-Year | 9.68 | 230.2 | 232.28 | 231.3 | 232.3 | 0.000435 | 0.72 | 16.59 | 22.3 | 0.19 |
| REACH1 | 2223.24 | 50-Year | 11.11 | 230.2 | 232.38 | 231.37 | 232.4 | 0.000428 | 0.74 | 19.15 | 27.77 | 0.19 |
| REACH1 | 2223.24 | 100-Year | 12.75 | 230.2 | 232.41 | 231.43 | 232.44 | 0.00052 | 0.83 | 19.95 | 28.94 | 0.21 |
| REACH1 | 2223.24 | Regional | 14.97 | 230.2 | 232.44 | 231.51 | 232.48 | 0.000647 | 0.94 | 20.98 | 32.74 | 0.23 |
| | | | | | | | | | | | | |
| REACH1 | 2223.23 | 2-Year | 4.59 | 230.2 | 231.45 | 231 | 231.53 | 0.00347 | 1.23 | 3.72 | 4.91 | 0.45 |
| REACH1 | 2223.23 | 5-Year | 6.53 | 230.2 | 231.77 | 231.19 | 231.84 | 0.00217 | 1.21 | 5.68 | 7.79 | 0.38 |
| REACH1 | 2223.23 | 10-Year | 7.85 | 230.2 | 232.04 | 231.29 | 232.1 | 0.001332 | 1.11 | 8.19 | 13.11 | 0.31 |
| REACH1 | 2223.23 | 25-Year | 9.68 | 230.2 | 232.26 | 231.43 | 232.29 | 0.000732 | 0.91 | 16.14 | 41.34 | 0.23 |
| REACH1 | 2223.23 | 50-Year | 11.11 | 230.2 | 232.37 | 231.51 | 232.4 | 0.000528 | 0.81 | 21.13 | 45.4 | 0.2 |
| REACH1 | 2223.23 | 100-Year | 12.75 | 230.2 | 232.4 | 231.59 | 232.43 | 0.000604 | 0.88 | 22.45 | 49.81 | 0.22 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.23 | Regional | 14.97 | 230.2 | 232.44 | 231.71 | 232.47 | 0.000704 | 0.96 | 24.2 | 53.38 | 0.23 |
| | | | | | | | | | | | | |
| REACH1 | 2223.22 | 2-Year | 4.59 | 230.2 | 231.01 | 231.01 | 231.42 | 0.006685 | 2.81 | 1.63 | 4.09 | 1 |
| REACH1 | 2223.22 | 5-Year | 6.53 | 230.2 | 231.22 | 231.22 | 231.74 | 0.00622 | 3.17 | 2.06 | 5.1 | 1 |
| REACH1 | 2223.22 | 10-Year | 7.85 | 230.2 | 231.68 | 231.35 | 232.04 | 0.002621 | 2.63 | 2.98 | 7.87 | 0.69 |
| REACH1 | 2223.22 | 25-Year | 9.68 | 230.2 | 231.54 | 231.54 | 232.2 | 0.005653 | 3.61 | 2.68 | 6.58 | 1 |
| REACH1 | 2223.22 | 50-Year | 11.11 | 230.2 | 232.27 | 232.27 | 232.37 | 0.001991 | 1.72 | 13.62 | 61.82 | 0.52 |
| REACH1 | 2223.22 | 100-Year | 12.75 | 230.2 | 232.29 | 232.29 | 232.4 | 0.00211 | 1.79 | 15.26 | 62.63 | 0.54 |
| REACH1 | 2223.22 | Regional | 14.97 | 230.2 | 232.32 | 232.32 | 232.44 | 0.002262 | 1.89 | 17.24 | 63.6 | 0.56 |
| | | | | | | | | | | | | |
| REACH1 | 2223.215 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.21 | 2-Year | 4.59 | 230 | 230.8 | 230.8 | 231.2 | 0.006558 | 2.8 | 1.64 | 7.1 | 1 |
| REACH1 | 2223.21 | 5-Year | 6.53 | 230 | 231.02 | 231.02 | 231.52 | 0.006033 | 3.14 | 2.08 | 8.47 | 1 |
| REACH1 | 2223.21 | 10-Year | 7.85 | 230 | 231.14 | 231.14 | 231.72 | 0.005954 | 3.37 | 2.33 | 9.36 | 1.01 |
| REACH1 | 2223.21 | 25-Year | 9.68 | 230 | 231.73 | 231.73 | 231.82 | 0.002357 | 1.63 | 11.48 | 54.49 | 0.58 |
| REACH1 | 2223.21 | 50-Year | 11.11 | 230 | 231.75 | 231.75 | 231.85 | 0.002483 | 1.7 | 12.75 | 54.97 | 0.6 |
| REACH1 | 2223.21 | 100-Year | 12.75 | 230 | 231.78 | 231.78 | 231.88 | 0.002602 | 1.78 | 14.1 | 55.48 | 0.62 |
| REACH1 | 2223.21 | Regional | 14.97 | 230 | 231.8 | 231.8 | 231.91 | 0.002874 | 1.9 | 15.48 | 56 | 0.65 |
| | | | | | | | | | | | | |
| REACH1 | 2223.2 | 2-Year | 4.59 | 229.7 | 230.72 | 230.52 | 230.8 | 0.00418 | 1.26 | 3.78 | 7.96 | 0.53 |
| REACH1 | 2223.2 | 5-Year | 6.53 | 229.7 | 231.09 | 230.62 | 231.14 | 0.001458 | 1.03 | 7.63 | 13.62 | 0.34 |
| REACH1 | 2223.2 | 10-Year | 7.85 | 229.7 | 231.34 | 230.68 | 231.38 | 0.00084 | 0.91 | 11.85 | 20.27 | 0.27 |
| REACH1 | 2223.2 | 25-Year | 9.68 | 229.7 | 231.52 | 230.78 | 231.56 | 0.000687 | 0.91 | 16.43 | 33.77 | 0.25 |
| REACH1 | 2223.2 | 50-Year | 11.11 | 229.7 | 231.6 | 230.84 | 231.63 | 0.000578 | 0.87 | 22.57 | 59.21 | 0.23 |
| REACH1 | 2223.2 | 100-Year | 12.75 | 229.7 | 231.61 | 230.91 | 231.65 | 0.000721 | 0.97 | 23.19 | 60.01 | 0.25 |
| REACH1 | 2223.2 | Regional | 14.97 | 229.7 | 231.65 | 231 | 231.69 | 0.000824 | 1.06 | 25.45 | 62.98 | 0.27 |
| | | | | | | | | | | | | |
| REACH1 | 2223.19 | 2-Year | 4.59 | 229.45 | 230.46 | 230.24 | 230.69 | 0.01107 | 2.14 | 2.14 | 4.61 | 0.68 |
| REACH1 | 2223.19 | 5-Year | 6.53 | 229.45 | 230.84 | 230.44 | 231.08 | 0.00772 | 2.2 | 2.99 | 8.9 | 0.6 |
| REACH1 | 2223.19 | 10-Year | 7.85 | 229.45 | 231.08 | 230.58 | 231.33 | 0.0065 | 2.24 | 3.53 | 17.62 | 0.56 |
| REACH1 | 2223.19 | 25-Year | 9.68 | 229.45 | 231.15 | 230.74 | 231.5 | 0.008531 | 2.65 | 3.7 | 20.26 | 0.65 |
| REACH1 | 2223.19 | 50-Year | 11.11 | 229.45 | 231.55 | 230.87 | 231.61 | 0.002046 | 1.38 | 14.21 | 82.89 | 0.31 |
| REACH1 | 2223.19 | 100-Year | 12.75 | 229.45 | 231.48 | 231.48 | 231.62 | 0.004208 | 1.93 | 10.48 | 38.66 | 0.44 |
| REACH1 | 2223.19 | Regional | 14.97 | 229.45 | 231.53 | 231.53 | 231.66 | 0.004211 | 1.96 | 12.39 | 42.86 | 0.44 |
| | | | | | | | | | | | | |
| REACH1 | 2223.185 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.18 | 2-Year | 5.47 | 229.37 | 230.2 | 230.2 | 230.61 | 0.013027 | 2.86 | 1.91 | 5.64 | 1.01 |
| REACH1 | 2223.18 | 5-Year | 7.78 | 229.37 | 230.41 | 230.41 | 230.94 | 0.012044 | 3.22 | 2.42 | 6.71 | 1.01 |
| REACH1 | 2223.18 | 10-Year | 9.36 | 229.37 | 230.55 | 230.55 | 231.15 | 0.011529 | 3.42 | 2.74 | 8.58 | 1 |
| REACH1 | 2223.18 | 25-Year | 11.54 | 229.37 | 230.73 | 230.73 | 231.41 | 0.011032 | 3.67 | 3.15 | 13.53 | 1.01 |
| REACH1 | 2223.18 | 50-Year | 13.25 | 229.37 | 230.86 | 230.86 | 231.61 | 0.010569 | 3.83 | 3.46 | 17.36 | 1 |
| REACH1 | 2223.18 | 100-Year | 15.21 | 229.37 | 231.27 | 231.27 | 231.39 | 0.003796 | 1.91 | 13 | 47.37 | 0.55 |
| REACH1 | 2223.18 | Regional | 17.88 | 229.37 | 231.29 | 231.29 | 231.44 | 0.004399 | 2.08 | 14.13 | 49.64 | 0.59 |
| | | | | | | | | | | | | |
| REACH1 | 2223.17 | 2-Year | 5.47 | 228.87 | 229.99 | 229.99 | 230.24 | 0.010732 | 2.42 | 3.57 | 8.88 | 0.83 |
| REACH1 | 2223.17 | 5-Year | 7.78 | 228.87 | 230.15 | 230.15 | 230.43 | 0.010305 | 2.66 | 5.18 | 10.95 | 0.83 |
| REACH1 | 2223.17 | 10-Year | 9.36 | 228.87 | 230.24 | 230.24 | 230.54 | 0.010193 | 2.8 | 6.23 | 12.1 | 0.84 |
| REACH1 | 2223.17 | 25-Year | 11.54 | 228.87 | 230.35 | 230.35 | 230.67 | 0.010251 | 2.98 | 7.59 | 13.55 | 0.86 |
| REACH1 | 2223.17 | 50-Year | 13.25 | 228.87 | 230.43 | 230.43 | 230.76 | 0.01015 | 3.09 | 8.71 | 14.7 | 0.86 |
| REACH1 | 2223.17 | 100-Year | 15.21 | 228.87 | 230.57 | 230.57 | 230.83 | 0.007692 | 2.88 | 12.73 | 23.73 | 0.76 |
| REACH1 | 2223.17 | Regional | 17.88 | 228.87 | 230.57 | 230.57 | 230.93 | 0.010629 | 3.38 | 12.73 | 23.73 | 0.9 |
| | | | | | | | | | | | | |
| REACH1 | 2223.16 | 2-Year | 5.47 | 228.57 | 229.62 | 229.62 | 229.86 | 0.015819 | 2.16 | 2.64 | 6.95 | 0.96 |
| REACH1 | 2223.16 | 5-Year | 7.78 | 228.57 | 229.77 | 229.77 | 230.04 | 0.013418 | 2.35 | 3.81 | 9.3 | 0.93 |
| REACH1 | 2223.16 | 10-Year | 9.36 | 228.57 | 229.85 | 229.85 | 230.14 | 0.012413 | 2.45 | 4.66 | 10.69 | 0.91 |
| REACH1 | 2223.16 | 25-Year | 11.54 | 228.57 | 229.96 | 229.96 | 230.27 | 0.01143 | 2.57 | 5.88 | 12.43 | 0.89 |
| REACH1 | 2223.16 | 50-Year | 13.25 | 228.57 | 230.02 | 230.02 | 230.36 | 0.011272 | 2.68 | 6.75 | 13.6 | 0.9 |
| REACH1 | 2223.16 | 100-Year | 15.21 | 228.57 | 230.11 | 230.11 | 230.45 | 0.010562 | 2.75 | 7.95 | 15.24 | 0.88 |
| REACH1 | 2223.16 | Regional | 17.88 | 228.57 | 230.2 | 230.2 | 230.57 | 0.010078 | 2.86 | 9.52 | 17.13 | 0.87 |
| | | | | | | | | | | | | |
| REACH1 | 2223.157 | 2-Year | 5.47 | 228.6 | 229.52 | | 229.58 | 0.001954 | 1.08 | 6.25 | 12.9 | 0.38 |
| REACH1 | 2223.157 | 5-Year | 7.78 | 228.6 | 229.63 | | 229.71 | 0.002321 | 1.29 | 7.79 | 14.44 | 0.43 |
| REACH1 | 2223.157 | 10-Year | 9.36 | 228.6 | 229.7 | | 229.78 | 0.00257 | 1.41 | 8.69 | 15.28 | 0.46 |
| REACH1 | 2223.157 | 25-Year | 11.54 | 228.6 | 229.77 | | 229.87 | 0.002863 | 1.57 | 9.88 | 16.31 | 0.49 |
| REACH1 | 2223.157 | 50-Year | 13.25 | 228.6 | 229.82 | | 229.94 | 0.003097 | 1.68 | 10.71 | 16.99 | 0.51 |
| REACH1 | 2223.157 | 100-Year | 15.21 | 228.6 | 229.87 | | 230 | 0.003381 | 1.81 | 11.57 | 17.68 | 0.54 |
| REACH1 | 2223.157 | Regional | 17.88 | 228.6 | 229.93 | | 230.08 | 0.003762 | 1.97 | 12.66 | 18.59 | 0.57 |
| | | | | | | | | | | | | |
| REACH1 | 2223.153 | 2-Year | 5.47 | 228.6 | 229.29 | 229.29 | 229.46 | 0.010353 | 1.95 | 3.74 | 13.04 | 0.83 |
| REACH1 | 2223.153 | 5-Year | 7.78 | 228.6 | 229.39 | 229.39 | 229.58 | 0.009971 | 2.13 | 5.18 | 15.61 | 0.84 |
| REACH1 | 2223.153 | 10-Year | 9.36 | 228.6 | 229.45 | 229.45 | 229.64 | 0.009584 | 2.22 | 6.19 | 17.2 | 0.83 |
| REACH1 | 2223.153 | 25-Year | 11.54 | 228.6 | 229.52 | 229.52 | 229.73 | 0.00976 | 2.37 | 7.35 | 18.88 | 0.85 |
| REACH1 | 2223.153 | 50-Year | 13.25 | 228.6 | 229.57 | 229.57 | 229.78 | 0.009718 | 2.46 | 8.28 | 20.14 | 0.86 |
| REACH1 | 2223.153 | 100-Year | 15.21 | 228.6 | 229.62 | 229.62 | 229.84 | 0.009519 | 2.53 | 9.39 | 21.55 | 0.86 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.153 | Regional | 17.88 | 228.6 | 229.68 | 229.68 | 229.91 | 0.009471 | 2.64 | 10.78 | 23.19 | 0.86 |
| | | | | | | | | | | | | |
| REACH1 | 2223.151 | 2-Year | 5.47 | 228.6 | 229.11 | | 229.17 | 0.005102 | 1.1 | 5.18 | 16.67 | 0.56 |
| REACH1 | 2223.151 | 5-Year | 7.78 | 228.6 | 229.17 | | 229.26 | 0.006293 | 1.34 | 6.23 | 18.72 | 0.63 |
| REACH1 | 2223.151 | 10-Year | 9.36 | 228.6 | 229.21 | | 229.32 | 0.007017 | 1.48 | 6.88 | 20.02 | 0.68 |
| REACH1 | 2223.151 | 25-Year | 11.54 | 228.6 | 229.25 | 229.18 | 229.38 | 0.0079 | 1.66 | 7.76 | 21.91 | 0.73 |
| REACH1 | 2223.151 | 50-Year | 13.25 | 228.6 | 229.28 | 229.22 | 229.43 | 0.008373 | 1.78 | 8.48 | 23.36 | 0.76 |
| REACH1 | 2223.151 | 100-Year | 15.21 | 228.6 | 229.32 | 229.27 | 229.49 | 0.00844 | 1.87 | 9.48 | 25.42 | 0.77 |
| REACH1 | 2223.151 | Regional | 17.88 | 228.6 | 229.36 | 229.33 | 229.55 | 0.009093 | 2.02 | 10.54 | 27.61 | 0.81 |
| | | | | | | | | | | | | |
| REACH1 | 2223.146 | 2-Year | 5.47 | 228.6 | 229 | | 229.02 | 0.003831 | 0.71 | 7.7 | 30.19 | 0.45 |
| REACH1 | 2223.146 | 5-Year | 7.78 | 228.6 | 229.06 | | 229.09 | 0.003692 | 0.81 | 9.69 | 32.33 | 0.46 |
| REACH1 | 2223.146 | 10-Year | 9.36 | 228.6 | 229.1 | | 229.14 | 0.003562 | 0.86 | 11.03 | 33.65 | 0.46 |
| REACH1 | 2223.146 | 25-Year | 11.54 | 228.6 | 229.16 | | 229.2 | 0.003192 | 0.9 | 13.11 | 35.77 | 0.45 |
| REACH1 | 2223.146 | 50-Year | 13.25 | 228.6 | 229.21 | | 229.26 | 0.002784 | 0.91 | 15.07 | 37.63 | 0.42 |
| REACH1 | 2223.146 | 100-Year | 15.21 | 228.6 | 229.28 | | 229.32 | 0.002311 | 0.91 | 17.66 | 39.88 | 0.4 |
| REACH1 | 2223.146 | Regional | 17.88 | 228.6 | 229.33 | | 229.38 | 0.002307 | 0.96 | 19.78 | 41.63 | 0.4 |
| | | | | | | | | | | | | |
| REACH1 | 2223.143 | 2-Year | 5.47 | 228.6 | 228.94 | | 228.96 | 0.002329 | 0.54 | 10.22 | 42.26 | 0.35 |
| REACH1 | 2223.143 | 5-Year | 7.78 | 228.6 | 229.01 | | 229.03 | 0.00213 | 0.58 | 13.36 | 46.13 | 0.34 |
| REACH1 | 2223.143 | 10-Year | 9.36 | 228.6 | 229.06 | | 229.08 | 0.001855 | 0.6 | 15.64 | 48.26 | 0.33 |
| REACH1 | 2223.143 | 25-Year | 11.54 | 228.6 | 229.13 | | 229.15 | 0.001497 | 0.61 | 19.16 | 51.81 | 0.3 |
| REACH1 | 2223.143 | 50-Year | 13.25 | 228.6 | 229.19 | | 229.21 | 0.001232 | 0.61 | 22.42 | 55.3 | 0.28 |
| REACH1 | 2223.143 | 100-Year | 15.21 | 228.6 | 229.27 | | 229.29 | 0.000983 | 0.6 | 26.68 | 60.38 | 0.26 |
| REACH1 | 2223.143 | Regional | 17.88 | 228.6 | 229.32 | | 229.34 | 0.000972 | 0.63 | 30.06 | 63.78 | 0.26 |
| | | | | | | | | | | | | |
| REACH1 | 2223.141 | 2-Year | 5.47 | 228.6 | 228.92 | | 228.93 | 0.001817 | 0.47 | 11.67 | 50.5 | 0.31 |
| REACH1 | 2223.141 | 5-Year | 7.78 | 228.6 | 228.99 | | 229.01 | 0.001448 | 0.5 | 15.8 | 58.3 | 0.29 |
| REACH1 | 2223.141 | 10-Year | 9.36 | 228.6 | 229.05 | | 229.06 | 0.001235 | 0.51 | 18.91 | 61.14 | 0.27 |
| REACH1 | 2223.141 | 25-Year | 11.54 | 228.6 | 229.12 | | 229.13 | 0.000977 | 0.52 | 23.63 | 64.71 | 0.25 |
| REACH1 | 2223.141 | 50-Year | 13.25 | 228.6 | 229.18 | | 229.2 | 0.000798 | 0.51 | 27.86 | 67.72 | 0.23 |
| REACH1 | 2223.141 | 100-Year | 15.21 | 228.6 | 229.26 | | 229.27 | 0.000638 | 0.5 | 33.18 | 72.14 | 0.21 |
| REACH1 | 2223.141 | Regional | 17.88 | 228.6 | 229.32 | | 229.33 | 0.000637 | 0.53 | 37.22 | 75.37 | 0.21 |
| | | | | | | | | | | | | |
| REACH1 | 2223.138 | 2-Year | 5.47 | 228.6 | 228.88 | | 228.89 | 0.001621 | 0.44 | 12.46 | 52.81 | 0.29 |
| REACH1 | 2223.138 | 5-Year | 7.78 | 228.6 | 228.97 | | 228.98 | 0.001269 | 0.46 | 17.08 | 57.03 | 0.27 |
| REACH1 | 2223.138 | 10-Year | 9.36 | 228.6 | 229.02 | | 229.03 | 0.001061 | 0.46 | 20.38 | 59.71 | 0.25 |
| REACH1 | 2223.138 | 25-Year | 11.54 | 228.6 | 229.1 | | 229.11 | 0.000802 | 0.46 | 25.32 | 63.3 | 0.22 |
| REACH1 | 2223.138 | 50-Year | 13.25 | 228.6 | 229.17 | | 229.18 | 0.000645 | 0.45 | 29.68 | 66.38 | 0.21 |
| REACH1 | 2223.138 | 100-Year | 15.21 | 228.6 | 229.25 | | 229.26 | 0.000513 | 0.45 | 35.07 | 70 | 0.19 |
| REACH1 | 2223.138 | Regional | 17.88 | 228.6 | 229.31 | | 229.32 | 0.000517 | 0.48 | 38.97 | 72.5 | 0.19 |
| | | | | | | | | | | | | |
| REACH1 | 2223.134 | 2-Year | 5.47 | 228.2 | 228.66 | 228.64 | 228.78 | 0.012603 | 1.52 | 3.89 | 15.79 | 0.85 |
| REACH1 | 2223.134 | 5-Year | 7.78 | 228.2 | 228.79 | | 228.89 | 0.007466 | 1.46 | 6.14 | 19.1 | 0.69 |
| REACH1 | 2223.134 | 10-Year | 9.36 | 228.2 | 228.87 | | 228.96 | 0.006091 | 1.46 | 7.62 | 20.84 | 0.64 |
| REACH1 | 2223.134 | 25-Year | 11.54 | 228.2 | 228.96 | | 229.06 | 0.00502 | 1.47 | 9.75 | 25.18 | 0.6 |
| REACH1 | 2223.134 | 50-Year | 13.25 | 228.2 | 229.05 | | 229.13 | 0.004002 | 1.43 | 12.12 | 30.43 | 0.54 |
| REACH1 | 2223.134 | 100-Year | 15.21 | 228.2 | 229.15 | | 229.22 | 0.002972 | 1.35 | 15.55 | 36.27 | 0.48 |
| REACH1 | 2223.134 | Regional | 17.88 | 228.2 | 229.19 | | 229.28 | 0.003267 | 1.47 | 17.15 | 38.23 | 0.51 |
| | | | | | | | | | | | | |
| REACH1 | 2223.131 | 2-Year | 5.47 | 227.9 | 228.67 | | 228.69 | 0.00143 | 0.84 | 10.19 | 24.01 | 0.32 |
| REACH1 | 2223.131 | 5-Year | 7.78 | 227.9 | 228.8 | | 228.82 | 0.00133 | 0.91 | 13.3 | 25.36 | 0.31 |
| REACH1 | 2223.131 | 10-Year | 9.36 | 227.9 | 228.88 | | 228.9 | 0.001302 | 0.95 | 15.21 | 26.15 | 0.32 |
| REACH1 | 2223.131 | 25-Year | 11.54 | 227.9 | 228.97 | | 229 | 0.001256 | 1 | 17.76 | 26.98 | 0.32 |
| REACH1 | 2223.131 | 50-Year | 13.25 | 227.9 | 229.06 | | 229.08 | 0.001157 | 1.01 | 20.06 | 27.65 | 0.31 |
| REACH1 | 2223.131 | 100-Year | 15.21 | 227.9 | 229.15 | | 229.18 | 0.001045 | 1.01 | 22.81 | 28.39 | 0.3 |
| REACH1 | 2223.131 | Regional | 17.88 | 227.9 | 229.19 | | 229.23 | 0.001244 | 1.13 | 24 | 28.69 | 0.32 |
| | | | | | | | | | | | | |
| REACH1 | 2223.129 | 2-Year | 5.47 | 227.8 | 228.48 | 228.48 | 228.65 | 0.010394 | 2 | 3.56 | 11.09 | 0.82 |
| REACH1 | 2223.129 | 5-Year | 7.78 | 227.8 | 228.58 | 228.58 | 228.78 | 0.010354 | 2.22 | 4.76 | 12.27 | 0.84 |
| REACH1 | 2223.129 | 10-Year | 9.36 | 227.8 | 228.64 | 228.64 | 228.85 | 0.010356 | 2.34 | 5.51 | 12.82 | 0.85 |
| REACH1 | 2223.129 | 25-Year | 11.54 | 227.8 | 228.77 | | 228.96 | 0.007491 | 2.22 | 7.36 | 14.32 | 0.75 |
| REACH1 | 2223.129 | 50-Year | 13.25 | 227.8 | 228.89 | | 229.05 | 0.005671 | 2.1 | 9.12 | 15.55 | 0.66 |
| REACH1 | 2223.129 | 100-Year | 15.21 | 227.8 | 229.01 | | 229.15 | 0.004479 | 2.01 | 11.06 | 16.61 | 0.6 |
| REACH1 | 2223.129 | Regional | 17.88 | 227.8 | 228.89 | 228.89 | 229.18 | 0.010623 | 2.86 | 9.02 | 15.49 | 0.91 |
| | | | | | | | | | | | | |
| REACH1 | 2223.125 | 2-Year | 5.47 | 227.6 | 228.4 | | 228.42 | 0.001353 | 0.84 | 10.53 | 25.13 | 0.31 |
| REACH1 | 2223.125 | 5-Year | 7.78 | 227.6 | 228.58 | | 228.6 | 0.000913 | 0.79 | 15.25 | 26.76 | 0.26 |
| REACH1 | 2223.125 | 10-Year | 9.36 | 227.6 | 228.7 | | 228.72 | 0.000737 | 0.77 | 18.54 | 27.68 | 0.24 |
| REACH1 | 2223.125 | 25-Year | 11.54 | 227.6 | 228.85 | | 228.87 | 0.000605 | 0.77 | 22.82 | 29.07 | 0.22 |
| REACH1 | 2223.125 | 50-Year | 13.25 | 227.6 | 228.96 | | 228.97 | 0.000549 | 0.77 | 25.9 | 30.03 | 0.21 |
| REACH1 | 2223.125 | 100-Year | 15.21 | 227.6 | 229.07 | | 229.08 | 0.000496 | 0.77 | 29.48 | 35.05 | 0.21 |
| REACH1 | 2223.125 | Regional | 17.88 | 227.6 | 228.98 | | 229.01 | 0.000918 | 1.01 | 26.65 | 30.26 | 0.28 |
| | | | | | | | | | | | | |
| REACH1 | 2223.122 | 2-Year | 5.47 | 227.6 | 228.38 | | 228.39 | 0.001217 | 0.75 | 12.83 | 39.16 | 0.29 |
| REACH1 | 2223.122 | 5-Year | 7.78 | 227.6 | 228.57 | | 228.58 | 0.000597 | 0.62 | 20.53 | 40.39 | 0.21 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.122 | 10-Year | 9.36 | 227.6 | 228.7 | 228.7 | 0.000437 | 0.58 | 25.59 | 41.17 | 0.19 |
| REACH1 | 2223.122 | 25-Year | 11.54 | 227.6 | 228.85 | 228.86 | 0.000333 | 0.56 | 31.96 | 42.15 | 0.17 |
| REACH1 | 2223.122 | 50-Year | 13.25 | 227.6 | 228.95 | 228.96 | 0.000292 | 0.55 | 36.44 | 42.83 | 0.16 |
| REACH1 | 2223.122 | 100-Year | 15.21 | 227.6 | 229.07 | 229.08 | 0.000258 | 0.55 | 41.47 | 47.22 | 0.15 |
| REACH1 | 2223.122 | Regional | 17.88 | 227.6 | 228.98 | 228.99 | 0.000488 | 0.72 | 37.48 | 42.99 | 0.2 |
| | | | | | | | | | | | |
| REACH1 | 2223.119 | 2-Year | 5.47 | 227.4 | 228.36 | 228.38 | 0.000621 | 0.63 | 13.13 | 23.13 | 0.21 |
| REACH1 | 2223.119 | 5-Year | 7.78 | 227.4 | 228.56 | 228.57 | 0.000508 | 0.65 | 17.71 | 23.97 | 0.2 |
| REACH1 | 2223.119 | 10-Year | 9.36 | 227.4 | 228.68 | 228.7 | 0.000456 | 0.66 | 20.73 | 24.51 | 0.19 |
| REACH1 | 2223.119 | 25-Year | 11.54 | 227.4 | 228.84 | 228.85 | 0.000416 | 0.69 | 24.52 | 25.2 | 0.19 |
| REACH1 | 2223.119 | 50-Year | 13.25 | 227.4 | 228.94 | 228.95 | 0.000401 | 0.71 | 27.19 | 25.67 | 0.19 |
| REACH1 | 2223.119 | 100-Year | 15.21 | 227.4 | 229.05 | 229.07 | 0.000384 | 0.73 | 30.23 | 29.77 | 0.18 |
| REACH1 | 2223.119 | Regional | 17.88 | 227.4 | 228.95 | 228.98 | 0.000702 | 0.94 | 27.55 | 25.73 | 0.25 |
| | | | | | | | | | | | |
| REACH1 | 2223.116 | 2-Year | 5.47 | 227.3 | 228.32 | 228.35 | 0.001678 | 1 | 7.9 | 14.12 | 0.35 |
| REACH1 | 2223.116 | 5-Year | 7.78 | 227.3 | 228.52 | 228.55 | 0.001356 | 1.04 | 10.79 | 15.1 | 0.33 |
| REACH1 | 2223.116 | 10-Year | 9.36 | 227.3 | 228.64 | 228.68 | 0.001209 | 1.06 | 12.72 | 15.72 | 0.31 |
| REACH1 | 2223.116 | 25-Year | 11.54 | 227.3 | 228.8 | 228.83 | 0.001096 | 1.09 | 15.19 | 16.49 | 0.31 |
| REACH1 | 2223.116 | 50-Year | 13.25 | 227.3 | 228.9 | 228.94 | 0.001054 | 1.13 | 16.93 | 17.08 | 0.3 |
| REACH1 | 2223.116 | 100-Year | 15.21 | 227.3 | 229.02 | 229.05 | 0.000983 | 1.15 | 19.21 | 22.88 | 0.3 |
| REACH1 | 2223.116 | Regional | 17.88 | 227.3 | 228.88 | 228.95 | 0.002051 | 1.56 | 16.55 | 16.89 | 0.42 |
| | | | | | | | | | | | |
| REACH1 | 2223.114 | 2-Year | 5.47 | 227.2 | 228.26 | 228.31 | 0.00254 | 1.22 | 6.23 | 11.66 | 0.43 |
| REACH1 | 2223.114 | 5-Year | 7.78 | 227.2 | 228.47 | 228.52 | 0.001968 | 1.24 | 8.74 | 12.77 | 0.39 |
| REACH1 | 2223.114 | 10-Year | 9.36 | 227.2 | 228.6 | 228.65 | 0.001727 | 1.26 | 10.44 | 13.47 | 0.38 |
| REACH1 | 2223.114 | 25-Year | 11.54 | 227.2 | 228.75 | 228.81 | 0.001551 | 1.3 | 12.6 | 14.31 | 0.36 |
| REACH1 | 2223.114 | 50-Year | 13.25 | 227.2 | 228.86 | 228.92 | 0.001461 | 1.33 | 14.2 | 17.04 | 0.36 |
| REACH1 | 2223.114 | 100-Year | 15.21 | 227.2 | 228.98 | 229.03 | 0.001329 | 1.34 | 16.5 | 22.02 | 0.35 |
| REACH1 | 2223.114 | Regional | 17.88 | 227.2 | 228.77 | 228.9 | 0.003505 | 1.97 | 12.87 | 14.41 | 0.55 |
| | | | | | | | | | | | |
| REACH1 | 2223.111 | 2-Year | 5.47 | 227.1 | 228.23 | 228.27 | 0.001631 | 1.03 | 7.43 | 12.68 | 0.35 |
| REACH1 | 2223.111 | 5-Year | 7.78 | 227.1 | 228.45 | 228.48 | 0.001319 | 1.07 | 10.26 | 13.8 | 0.33 |
| REACH1 | 2223.111 | 10-Year | 9.36 | 227.1 | 228.58 | 228.62 | 0.001187 | 1.1 | 12.13 | 14.5 | 0.32 |
| REACH1 | 2223.111 | 25-Year | 11.54 | 227.1 | 228.74 | 228.78 | 0.001088 | 1.14 | 14.51 | 16.62 | 0.31 |
| REACH1 | 2223.111 | 50-Year | 13.25 | 227.1 | 228.84 | 228.89 | 0.001027 | 1.16 | 16.54 | 20.93 | 0.3 |
| REACH1 | 2223.111 | 100-Year | 15.21 | 227.1 | 228.97 | 229.01 | 0.000924 | 1.16 | 19.63 | 34.02 | 0.29 |
| REACH1 | 2223.111 | Regional | 17.88 | 227.1 | 228.73 | 228.83 | 0.002676 | 1.78 | 14.39 | 16.31 | 0.48 |
| | | | | | | | | | | | |
| REACH1 | 2223.11 | 2-Year | 5.47 | 227.1 | 228.22 | 228.25 | 0.002911 | 0.77 | 7.14 | 12.14 | 0.32 |
| REACH1 | 2223.11 | 5-Year | 7.78 | 227.1 | 228.43 | 228.47 | 0.003236 | 0.78 | 9.93 | 15.14 | 0.31 |
| REACH1 | 2223.11 | 10-Year | 9.36 | 227.1 | 228.57 | 228.6 | 0.004025 | 0.77 | 12.18 | 19.51 | 0.31 |
| REACH1 | 2223.11 | 25-Year | 11.54 | 227.1 | 228.73 | 228.76 | 0.00381 | 0.72 | 15.97 | 27.66 | 0.3 |
| REACH1 | 2223.11 | 50-Year | 13.25 | 227.1 | 228.84 | 228.87 | 0.003274 | 0.68 | 19.55 | 37.13 | 0.3 |
| REACH1 | 2223.11 | 100-Year | 15.21 | 227.1 | 228.97 | 228.98 | 0.003245 | 0.59 | 25.89 | 64.83 | 0.3 |
| REACH1 | 2223.11 | Regional | 17.88 | 227.1 | 228.71 | 228.78 | 0.009868 | 1.16 | 15.46 | 26.29 | 0.48 |
| | | | | | | | | | | | |
| REACH1 | 2223.1 | 2-Year | 5.47 | 227 | 228.18 | 228.21 | 0.001278 | 0.93 | 11.02 | 21.03 | 0.31 |
| REACH1 | 2223.1 | 5-Year | 7.78 | 227 | 228.39 | 228.43 | 0.001056 | 0.98 | 16.25 | 26.77 | 0.3 |
| REACH1 | 2223.1 | 10-Year | 9.36 | 227 | 228.53 | 228.56 | 0.000947 | 1 | 20.02 | 30.42 | 0.28 |
| REACH1 | 2223.1 | 25-Year | 11.54 | 227 | 228.69 | 228.72 | 0.000802 | 1 | 26.45 | 50.2 | 0.27 |
| REACH1 | 2223.1 | 50-Year | 13.25 | 227 | 228.81 | 228.84 | 0.000639 | 0.94 | 33.26 | 58.55 | 0.24 |
| REACH1 | 2223.1 | 100-Year | 15.21 | 227 | 228.94 | 228.96 | 0.000485 | 0.86 | 40.98 | 61.09 | 0.21 |
| REACH1 | 2223.1 | Regional | 17.88 | 227 | 228.53 | 228.64 | 0.003417 | 1.9 | 20.13 | 30.54 | 0.54 |
| | | | | | | | | | | | |
| REACH1 | 2223.09 | 2-Year | 5.47 | 226.9 | 227.78 | 227.78 | 228.06 | 0.01262 | 2.47 | 3.26 | 20.79 | 0.94 |
| REACH1 | 2223.09 | 5-Year | 7.78 | 226.9 | 227.95 | 227.95 | 228.28 | 0.011511 | 2.72 | 4.67 | 27.24 | 0.93 |
| REACH1 | 2223.09 | 10-Year | 9.36 | 226.9 | 228.05 | 228.05 | 228.41 | 0.011115 | 2.87 | 5.62 | 30.43 | 0.93 |
| REACH1 | 2223.09 | 25-Year | 11.54 | 226.9 | 228.17 | 228.17 | 228.57 | 0.010722 | 3.05 | 6.93 | 33.48 | 0.93 |
| REACH1 | 2223.09 | 50-Year | 13.25 | 226.9 | 228.26 | 228.26 | 228.68 | 0.010527 | 3.18 | 7.93 | 35.65 | 0.93 |
| REACH1 | 2223.09 | 100-Year | 15.21 | 226.9 | 228.35 | 228.35 | 228.8 | 0.010442 | 3.32 | 9.04 | 37.89 | 0.94 |
| REACH1 | 2223.09 | Regional | 17.88 | 226.9 | 228.5 | 228.5 | 228.55 | 0.002101 | 1.61 | 30.97 | 41.5 | 0.43 |
| | | | | | | | | | | | |
| REACH1 | 2223.08 | 2-Year | 5.47 | 226.3 | 227.26 | 226.83 | 227.34 | 0.002125 | 1.27 | 4.3 | 5.09 | 0.42 |
| REACH1 | 2223.08 | 5-Year | 7.78 | 226.3 | 227.42 | 226.97 | 227.54 | 0.002526 | 1.54 | 5.04 | 5.19 | 0.47 |
| REACH1 | 2223.08 | 10-Year | 9.36 | 226.3 | 227.52 | 227.06 | 227.67 | 0.002755 | 1.71 | 5.49 | 5.28 | 0.49 |
| REACH1 | 2223.08 | 25-Year | 11.54 | 226.3 | 227.67 | 227.18 | 227.85 | 0.002839 | 1.87 | 6.17 | 5.58 | 0.51 |
| REACH1 | 2223.08 | 50-Year | 13.25 | 226.3 | 227.8 | 227.26 | 228 | 0.002745 | 1.96 | 6.77 | 7.27 | 0.51 |
| REACH1 | 2223.08 | 100-Year | 15.21 | 226.3 | 227.95 | 227.35 | 228.16 | 0.002654 | 2.05 | 7.43 | 10.96 | 0.51 |
| REACH1 | 2223.08 | Regional | 17.88 | 226.3 | 228.05 | 227.47 | 228.31 | 0.003039 | 2.28 | 7.86 | 34.96 | 0.55 |
| | | | | | | | | | | | |
| REACH1 | 2223.075 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | |
| REACH1 | 2223.07 | 2-Year | 5.47 | 226.13 | 227.22 | 226.69 | 227.28 | 0.001706 | 1.14 | 4.79 | 6.3 | 0.35 |
| REACH1 | 2223.07 | 5-Year | 7.78 | 226.13 | 227.35 | 226.82 | 227.46 | 0.002309 | 1.44 | 5.4 | 6.95 | 0.42 |
| REACH1 | 2223.07 | 10-Year | 9.36 | 226.13 | 227.43 | 226.92 | 227.56 | 0.002732 | 1.63 | 5.73 | 7.3 | 0.46 |
| REACH1 | 2223.07 | 25-Year | 11.54 | 226.13 | 227.51 | 227.03 | 227.69 | 0.003381 | 1.89 | 6.1 | 7.68 | 0.52 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2223.07 | 50-Year | 13.25 | 226.13 | 227.57 | 227.11 | 227.79 | 0.00388 | 2.08 | 6.36 | 7.95 | 0.56 |
| REACH1 | 2223.07 | 100-Year | 15.21 | 226.13 | 227.63 | 227.21 | 227.9 | 0.004391 | 2.29 | 6.66 | 8.25 | 0.6 |
| REACH1 | 2223.07 | Regional | 17.88 | 226.13 | 227.71 | 227.33 | 228.04 | 0.005112 | 2.55 | 7.01 | 8.59 | 0.65 |
| | | | | | | | | | | | | |
| REACH1 | 2223.06 | 2-Year | 5.47 | 226.1 | 227.05 | 226.96 | 227.18 | 0.009301 | 1.58 | 3.45 | 7.67 | 0.75 |
| REACH1 | 2223.06 | 5-Year | 7.78 | 226.1 | 227.18 | 227.07 | 227.33 | 0.008519 | 1.71 | 4.55 | 8.41 | 0.74 |
| REACH1 | 2223.06 | 10-Year | 9.36 | 226.1 | 227.27 | 227.14 | 227.43 | 0.008203 | 1.78 | 5.25 | 8.86 | 0.74 |
| REACH1 | 2223.06 | 25-Year | 11.54 | 226.1 | 227.34 | 227.22 | 227.53 | 0.008911 | 1.95 | 5.92 | 9.26 | 0.78 |
| REACH1 | 2223.06 | 50-Year | 13.25 | 226.1 | 227.4 | 227.29 | 227.61 | 0.008982 | 2.04 | 6.51 | 9.61 | 0.79 |
| REACH1 | 2223.06 | 100-Year | 15.21 | 226.1 | 227.48 | 227.35 | 227.7 | 0.008463 | 2.08 | 7.33 | 10.87 | 0.78 |
| REACH1 | 2223.06 | Regional | 17.88 | 226.1 | 227.61 | 227.44 | 227.83 | 0.006944 | 2.07 | 8.95 | 15.19 | 0.72 |
| | | | | | | | | | | | | |
| REACH1 | 2223.05 | 2-Year | 5.47 | 225.27 | 226.21 | 226.06 | 226.33 | 0.007142 | 1.53 | 3.57 | 6.75 | 0.67 |
| REACH1 | 2223.05 | 5-Year | 7.78 | 225.27 | 226.35 | 226.19 | 226.5 | 0.007613 | 1.7 | 4.58 | 7.79 | 0.71 |
| REACH1 | 2223.05 | 10-Year | 9.36 | 225.27 | 226.43 | 226.28 | 226.59 | 0.007939 | 1.8 | 5.21 | 8.43 | 0.73 |
| REACH1 | 2223.05 | 25-Year | 11.54 | 225.27 | 226.58 | 226.37 | 226.74 | 0.006462 | 1.74 | 6.64 | 9.86 | 0.67 |
| REACH1 | 2223.05 | 50-Year | 13.25 | 225.27 | 226.65 | 226.45 | 226.82 | 0.006409 | 1.82 | 7.32 | 11.16 | 0.68 |
| REACH1 | 2223.05 | 100-Year | 15.21 | 225.27 | 226.69 | 226.52 | 226.89 | 0.007212 | 1.99 | 7.76 | 11.88 | 0.72 |
| REACH1 | 2223.05 | Regional | 17.88 | 225.27 | 226.69 | 226.6 | 226.96 | 0.009977 | 2.34 | 7.76 | 11.88 | 0.85 |
| | | | | | | | | | | | | |
| REACH1 | 2223.04 | 2-Year | 5.47 | 224.7 | 225.47 | 225.42 | 225.65 | 0.012456 | 1.89 | 2.9 | 6.14 | 0.88 |
| REACH1 | 2223.04 | 5-Year | 7.78 | 224.7 | 225.62 | 225.55 | 225.82 | 0.011221 | 2.01 | 3.88 | 6.9 | 0.85 |
| REACH1 | 2223.04 | 10-Year | 9.36 | 224.7 | 225.71 | 225.63 | 225.93 | 0.01034 | 2.05 | 4.57 | 7.4 | 0.83 |
| REACH1 | 2223.04 | 25-Year | 11.54 | 224.7 | 225.73 | 225.73 | 226.04 | 0.014805 | 2.47 | 4.67 | 7.47 | 1 |
| REACH1 | 2223.04 | 50-Year | 13.25 | 224.7 | 225.8 | 225.79 | 226.13 | 0.014477 | 2.54 | 5.21 | 7.83 | 1 |
| REACH1 | 2223.04 | 100-Year | 15.21 | 224.7 | 225.93 | 225.87 | 226.23 | 0.011248 | 2.41 | 6.32 | 8.52 | 0.89 |
| REACH1 | 2223.04 | Regional | 17.88 | 224.7 | 226.24 | 225.96 | 226.43 | 0.005113 | 1.97 | 9.24 | 10.95 | 0.63 |
| | | | | | | | | | | | | |
| REACH1 | 2223.03 | 2-Year | 5.47 | 224.2 | 224.75 | 224.75 | 225.01 | 0.015596 | 2.28 | 2.4 | 5.2 | 1 |
| REACH1 | 2223.03 | 5-Year | 7.78 | 224.2 | 224.89 | 224.89 | 225.23 | 0.01457 | 2.57 | 3.03 | 5.51 | 1 |
| REACH1 | 2223.03 | 10-Year | 9.36 | 224.2 | 224.98 | 224.98 | 225.36 | 0.013783 | 2.72 | 3.44 | 5.8 | 0.99 |
| REACH1 | 2223.03 | 25-Year | 11.54 | 224.2 | 225.24 | 225.09 | 225.56 | 0.007999 | 2.51 | 4.59 | 7.09 | 0.8 |
| REACH1 | 2223.03 | 50-Year | 13.25 | 224.2 | 225.39 | 225.17 | 225.71 | 0.006653 | 2.51 | 5.27 | 7.87 | 0.74 |
| REACH1 | 2223.03 | 100-Year | 15.21 | 224.2 | 225.54 | 225.27 | 225.87 | 0.005757 | 2.54 | 5.98 | 8.71 | 0.7 |
| REACH1 | 2223.03 | Regional | 17.88 | 224.2 | 225.99 | 225.39 | 226.25 | 0.00303 | 2.24 | 7.99 | 17.79 | 0.54 |
| | | | | | | | | | | | | |
| REACH1 | 2223.025 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2223.02 | 2-Year | 5.47 | 223.68 | 224.78 | 224.23 | 224.84 | 0.001404 | 1.12 | 4.88 | 7.92 | 0.34 |
| REACH1 | 2223.02 | 5-Year | 7.78 | 223.68 | 224.95 | 224.37 | 225.05 | 0.001736 | 1.37 | 5.66 | 8.9 | 0.39 |
| REACH1 | 2223.02 | 10-Year | 9.36 | 223.68 | 225.05 | 224.46 | 225.17 | 0.00198 | 1.54 | 6.08 | 9.43 | 0.42 |
| REACH1 | 2223.02 | 25-Year | 11.54 | 223.68 | 225.14 | 224.57 | 225.3 | 0.002394 | 1.77 | 6.51 | 9.97 | 0.47 |
| REACH1 | 2223.02 | 50-Year | 13.25 | 223.68 | 225.2 | 224.66 | 225.39 | 0.002779 | 1.96 | 6.77 | 10.29 | 0.51 |
| REACH1 | 2223.02 | 100-Year | 15.21 | 223.68 | 225.25 | 224.75 | 225.49 | 0.003293 | 2.18 | 6.99 | 10.57 | 0.56 |
| REACH1 | 2223.02 | Regional | 17.88 | 223.68 | 225.61 | 224.87 | 225.83 | 0.002244 | 2.07 | 8.64 | 12.66 | 0.48 |
| | | | | | | | | | | | | |
| REACH1 | 2223.01 | 2-Year | 5.47 | 223.33 | 224.78 | 224.19 | 224.81 | 0.001032 | 0.75 | 7.33 | 9.57 | 0.27 |
| REACH1 | 2223.01 | 5-Year | 7.78 | 223.33 | 224.97 | 224.32 | 225 | 0.001135 | 0.85 | 9.18 | 10.59 | 0.29 |
| REACH1 | 2223.01 | 10-Year | 9.36 | 223.33 | 225.07 | 224.4 | 225.11 | 0.001207 | 0.91 | 10.28 | 11.16 | 0.3 |
| REACH1 | 2223.01 | 25-Year | 11.54 | 223.33 | 225.18 | 224.49 | 225.23 | 0.001346 | 1 | 11.53 | 11.77 | 0.32 |
| REACH1 | 2223.01 | 50-Year | 13.25 | 223.33 | 225.24 | 224.55 | 225.3 | 0.001477 | 1.07 | 12.34 | 12.15 | 0.34 |
| REACH1 | 2223.01 | 100-Year | 15.21 | 223.33 | 225.31 | 224.63 | 225.38 | 0.001646 | 1.16 | 13.12 | 12.51 | 0.36 |
| REACH1 | 2223.01 | Regional | 17.88 | 223.33 | 225.68 | 224.72 | 225.73 | 0.000943 | 0.98 | 18.2 | 14.61 | 0.28 |
| | | | | | | | | | | | | |
| REACH1 | 2219.56 | 2-Year | 6.08 | 223.16 | 224.62 | 224.3 | 224.7 | 0.004186 | 1.25 | 4.85 | 7.84 | 0.51 |
| REACH1 | 2219.56 | 5-Year | 8.72 | 223.16 | 224.78 | 224.47 | 224.88 | 0.004572 | 1.41 | 6.19 | 9.03 | 0.54 |
| REACH1 | 2219.56 | 10-Year | 10.49 | 223.16 | 224.87 | 224.56 | 224.98 | 0.004797 | 1.5 | 7.03 | 15.54 | 0.56 |
| REACH1 | 2219.56 | 25-Year | 12.98 | 223.16 | 224.96 | 224.66 | 225.09 | 0.004883 | 1.61 | 9.55 | 33.42 | 0.58 |
| REACH1 | 2219.56 | 50-Year | 14.95 | 223.16 | 225.02 | 224.74 | 225.16 | 0.00495 | 1.69 | 11.76 | 43.58 | 0.59 |
| REACH1 | 2219.56 | 100-Year | 17.19 | 223.16 | 225.03 | 224.82 | 225.2 | 0.006278 | 1.91 | 12.12 | 44.66 | 0.66 |
| REACH1 | 2219.56 | Regional | 38.3 | 223.16 | 225.47 | 225.34 | 225.61 | 0.003765 | 1.96 | 39.5 | 96.05 | 0.55 |
| | | | | | | | | | | | | |
| REACH1 | 2219.55 | 2-Year | 6.08 | 222.82 | 223.49 | 223.49 | 223.68 | 0.017654 | 1.96 | 3.11 | 8.28 | 1.02 |
| REACH1 | 2219.55 | 5-Year | 8.72 | 222.82 | 223.61 | 223.61 | 223.83 | 0.016282 | 2.09 | 4.18 | 9.49 | 1.01 |
| REACH1 | 2219.55 | 10-Year | 10.49 | 222.82 | 223.68 | 223.68 | 223.92 | 0.015524 | 2.15 | 4.87 | 10.2 | 0.99 |
| REACH1 | 2219.55 | 25-Year | 12.98 | 222.82 | 223.77 | 223.77 | 224.02 | 0.015172 | 2.23 | 5.82 | 11.34 | 1 |
| REACH1 | 2219.55 | 50-Year | 14.95 | 222.82 | 223.83 | 223.82 | 224.1 | 0.014513 | 2.26 | 6.6 | 12.2 | 0.98 |
| REACH1 | 2219.55 | 100-Year | 17.19 | 222.82 | 223.98 | 223.89 | 224.19 | 0.009787 | 2.03 | 8.45 | 13.64 | 0.82 |
| REACH1 | 2219.55 | Regional | 38.3 | 222.82 | 224.31 | 224.31 | 224.7 | 0.013543 | 2.74 | 13.97 | 18.39 | 1 |
| | | | | | | | | | | | | |
| REACH1 | 2219.54 | 2-Year | 6.08 | 221.6 | 223.01 | | 223.01 | 0.000307 | 0.54 | 30.37 | 53.23 | 0.16 |
| REACH1 | 2219.54 | 5-Year | 8.72 | 221.6 | 223.64 | | 223.64 | 0.000071 | 0.35 | 70.93 | 74.25 | 0.08 |
| REACH1 | 2219.54 | 10-Year | 10.49 | 221.6 | 223.77 | | 223.78 | 0.000071 | 0.36 | 81.47 | 78.02 | 0.08 |
| REACH1 | 2219.54 | 25-Year | 12.98 | 221.6 | 223.9 | | 223.9 | 0.000081 | 0.4 | 91.24 | 81.26 | 0.09 |
| REACH1 | 2219.54 | 50-Year | 14.95 | 221.6 | 223.97 | | 223.97 | 0.00009 | 0.44 | 97.12 | 83.15 | 0.1 |
| REACH1 | 2219.54 | 100-Year | 17.19 | 221.6 | 224.08 | | 224.08 | 0.000095 | 0.46 | 106.21 | 86.76 | 0.1 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REACH1 | 2219.54 | Regional | 38.3 | 221.6 | 224.23 | | 224.25 | 0.000351 | 0.93 | 120.58 | 95.4 | 0.19 |
| | | | | | | | | | | | | |
| REACH1 | 2219.53 | 2-Year | 6.08 | 220.75 | 222.79 | 221.91 | 222.93 | 0.004257 | 1.64 | 3.77 | 29.11 | 0.39 |
| REACH1 | 2219.53 | 5-Year | 8.72 | 220.75 | 223.53 | 222.19 | 223.6 | 0.003908 | 1.31 | 13.05 | 77.39 | 0.45 |
| REACH1 | 2219.53 | 10-Year | 10.49 | 220.75 | 223.74 | 222.36 | 223.76 | 0.001245 | 0.86 | 29.97 | 84.6 | 0.26 |
| REACH1 | 2219.53 | 25-Year | 12.98 | 220.75 | 223.87 | 222.59 | 223.88 | 0.000888 | 0.78 | 41.43 | 89.64 | 0.23 |
| REACH1 | 2219.53 | 50-Year | 14.95 | 220.75 | 223.94 | 222.75 | 223.96 | 0.000822 | 0.78 | 48.06 | 93.52 | 0.22 |
| REACH1 | 2219.53 | 100-Year | 17.19 | 220.75 | 224.05 | 222.93 | 224.06 | 0.000655 | 0.74 | 58.8 | 99.07 | 0.2 |
| REACH1 | 2219.53 | Regional | 38.3 | 220.75 | 224.16 | 223.82 | 224.2 | 0.002108 | 1.39 | 69.48 | 103.75 | 0.36 |
| | | | | | | | | | | | | |
| REACH1 | 2219.525 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| REACH1 | 2219.52 | 2-Year | 6.08 | 220.65 | 222.06 | 222.06 | 222.6 | 0.036297 | 3.27 | 1.86 | 1.73 | 1.01 |
| REACH1 | 2219.52 | 5-Year | 8.72 | 220.65 | 222.4 | 222.4 | 223.03 | 0.031561 | 3.51 | 2.5 | 28.88 | 0.98 |
| REACH1 | 2219.52 | 10-Year | 10.49 | 220.65 | 222.58 | 222.58 | 223.27 | 0.029527 | 3.69 | 2.89 | 43.68 | 0.97 |
| REACH1 | 2219.52 | 25-Year | 12.98 | 220.65 | 222.79 | 222.79 | 223.58 | 0.028359 | 3.96 | 3.37 | 51.48 | 0.97 |
| REACH1 | 2219.52 | 50-Year | 14.95 | 220.65 | 222.95 | 222.95 | 223.81 | 0.027236 | 4.13 | 3.73 | 59.2 | 0.97 |
| REACH1 | 2219.52 | 100-Year | 17.19 | 220.65 | 223.13 | 223.13 | 224.06 | 0.026435 | 4.32 | 4.11 | 65.57 | 0.97 |
| REACH1 | 2219.52 | Regional | 38.3 | 220.65 | 223.73 | 223.73 | 223.93 | 0.010359 | 3 | 39.03 | 98.05 | 0.66 |
| | | | | | | | | | | | | |
| REACH1 | 2219.51 | 2-Year | 6.08 | 220.5 | 222.03 | 221.82 | 222.04 | 0.003164 | 0.88 | 14.7 | 40.92 | 0.37 |
| REACH1 | 2219.51 | 5-Year | 8.72 | 220.5 | 222.11 | | 222.13 | 0.003387 | 1 | 18.41 | 43.88 | 0.39 |
| REACH1 | 2219.51 | 10-Year | 10.49 | 220.5 | 222.18 | | 222.2 | 0.003306 | 1.05 | 21.12 | 45.92 | 0.39 |
| REACH1 | 2219.51 | 25-Year | 12.98 | 220.5 | 222.25 | | 222.27 | 0.003234 | 1.11 | 24.72 | 48.36 | 0.4 |
| REACH1 | 2219.51 | 50-Year | 14.95 | 220.5 | 222.3 | | 222.33 | 0.003211 | 1.15 | 27.32 | 49.81 | 0.4 |
| REACH1 | 2219.51 | 100-Year | 17.19 | 220.5 | 222.36 | | 222.39 | 0.003171 | 1.2 | 30.26 | 51.47 | 0.4 |
| REACH1 | 2219.51 | Regional | 38.3 | 220.5 | 222.76 | | 222.8 | 0.003201 | 1.53 | 53.53 | 63.73 | 0.43 |
| | | | | | | | | | | | | |
| REACH1 | 2219.5 | 2-Year | 6.08 | 220.15 | 221.37 | 221.37 | 221.59 | 0.017409 | 2.11 | 2.98 | 7.57 | 1 |
| REACH1 | 2219.5 | 5-Year | 8.72 | 220.15 | 221.55 | 221.55 | 221.74 | 0.010483 | 2.03 | 6.04 | 23.97 | 0.82 |
| REACH1 | 2219.5 | 10-Year | 10.49 | 220.15 | 221.61 | 221.61 | 221.81 | 0.00985 | 2.11 | 7.76 | 27.46 | 0.8 |
| REACH1 | 2219.5 | 25-Year | 12.98 | 220.15 | 221.69 | 221.69 | 221.9 | 0.00954 | 2.22 | 9.97 | 31.12 | 0.81 |
| REACH1 | 2219.5 | 50-Year | 14.95 | 220.15 | 221.74 | 221.74 | 221.96 | 0.009218 | 2.29 | 11.77 | 33.79 | 0.8 |
| REACH1 | 2219.5 | 100-Year | 17.19 | 220.15 | 221.8 | 221.8 | 222.02 | 0.009181 | 2.38 | 13.6 | 36.3 | 0.81 |
| REACH1 | 2219.5 | Regional | 38.3 | 220.15 | 222.14 | 222.14 | 222.42 | 0.009219 | 2.97 | 29.44 | 54.2 | 0.85 |

| STATION CONVERSION | | |
|---|---|---|
| **PR** | **to** | **EX** |
| 2223.157 | to | 2223.156 |
| 2223.153 | to | 2223.152 |
| 2223.151 | to | 2223.150 |
| 2223.146 | to | 2223.148 |
| 2223.143 | to | 2223.146 |
| 2223.141 | to | 2223.145 |
| 2223.138 | to | 2223.143 |
| 2223.134 | to | 2223.141 |
| 2223.131 | to | 2223.140 |
| 2223.129 | to | 2223.134 |
| 2223.125 | to | 2223.133 |
| 2223.122 | to | 2223.132 |
| 2223.119 | to | 2223.131 |
| 2223.116 | to | 2223.130 |
| 2223.114 | to | 2223.125 |
| 2223.111 | to | 2223.120 |

*THIS TABLE IS USED TO CONVERT STATION FROM THE PROPOSED CONDITION TO EXISTING CONDITION DUE TO UPDATES TO THE TOPOGRAPHY, CROSS SECTION AND NEW SECTIONS

# Appendix C

## Scoped EIS (Palmer, 2020)

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

# 12148 Albion Vaughan Road

## Scoped Environmental Impact Study

***Palmer Project #***
160461

***Prepared For***
12148 Albion Vaughn Inc.

December 23, 2020

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

December 23, 2020

Mike Liburdi
12148 Albion Vaughn Inc.
27 Fenton Way
Brampton ON
L6P 0P4

Dear Mr. Liburdi:

**Re: 12148 Albion Vaughan Road – Scoped Environmental Impact Study**
**Project #: 160461**

Palmer is pleased to submit the following Scoped Environmental Impact Study for the proposed housing development located at 12148 Albion Vaughan Road in Bolton, Town of Caledon.

Based on the findings and recommendations of the report, it is our opinion that with the implementation of the mitigation measures as provided in this report, the proposed development is environmentally feasible and no negative impacts to the natural environment are expected. Please let us know if you have question or comments on this submission.

Yours truly,

**Prepared By:**

Austin Adams, M.Sc., EP.
Sr. Terrestrial Ecologist,
ISA Certified Arborist #ON-2000A

**Approved By:**

Dirk Jana, B.Sc.
Principal, Senior Ecologist

# Table of Contents

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## List of Appendices

# 1. Introduction

## 1.1 Overview

Palmer was retained to complete a Scoped Environmental Impact Study (EIS) for the proposed housing development to be located at 12148 Albion Vaughan Road in Bolton, Town of Caledon (the Subject Property; **Figure 1**). A development application consisting of 240 apartment units in two adjoining towers central to the property, and 20 townhomes in two blocks along Albion Vaughan Road is proposed for the entire Subject Property. As part of the proposed development, the portion of Robinson Creek through the property will also be re-aligned, stabilized and enhanced.

The Subject Property is located within the Main Humber River watershed, under the jurisdiction of the Toronto and Region Conservation (TRCA). The property currently supports residential buildings, including one house, a barn and manicured lawns with scattered trees. Robinson Creek, a headwater tributary of the Humber River, enters the property at the northwest corner and runs southward along the western edge. Immediately adjacent lands include a residential property to the north and a commercial property to the south. A small treed riparian area is present within the residential property to the north. Albion Vaughan Road and Regional Road 50 border the Subject Property to the east and west, respectively. No designated natural heritage areas such as Provincially Significant Wetlands, Areas of Natural and Scientific Interest or Environmentally Sensitive Features have been identified within or immediately adjacent to the Subject Property. The watercourse and its associated flood limit are regulated under the TRCA Ontario Regulation 166/06.

The Town of Caledon Official Plan requires that development applications identify and evaluate elements of its ecosystem framework on or adjacent to properties that may be subject to impacts by a proposed development. These elements include Natural Core Areas, Natural Corridors, Supportive Natural Systems, and Natural Linkages, as described in Table 3.1 of the Official Plan. Known Natural Core Areas and Natural Corridors are mapped as Environmental Policy Area (EPA) on Official Plan Schedule C (Bolton Land Use Plan). None are mapped on the Subject Property. The Town of Caledon Official Plan schedules show the property as within a Special Residential land use designation.

Palmer has also completed an Erosion Hazard Assessment of Robinson Creek (Palmer Environmental Consulting Group, 2018). This assessment was conducted to identify infrastructure and property limits that are potentially at risk from fluvial geomorphological processes and to provide recommendations to improve the geomorphological form and function of Robinson Creek.

## 1.2 Scope of Work and Objectives

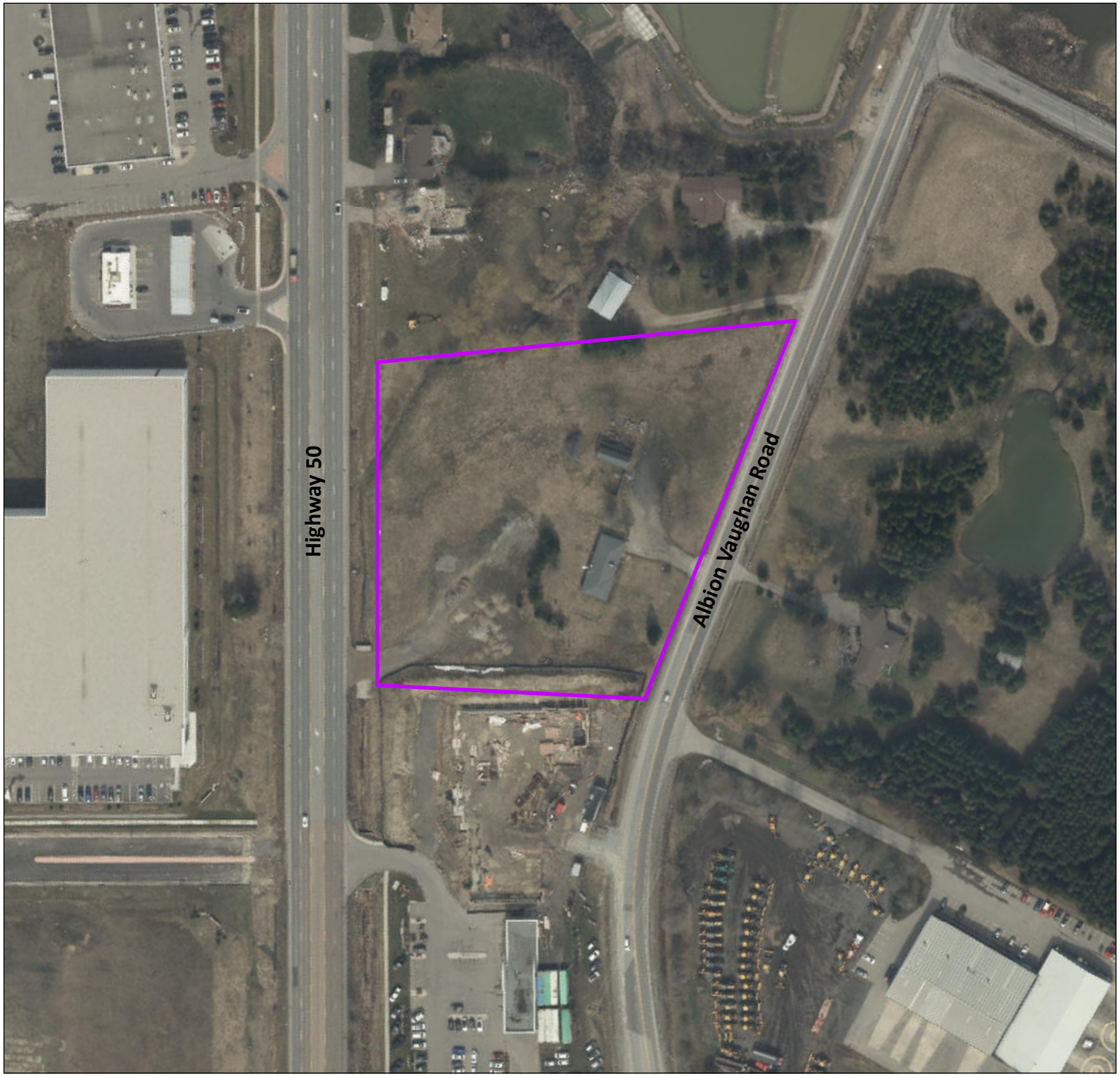
This scoped EIS addresses environmental considerations identified in the guiding policy documents for this area, namely the Region of Peel Official Plan (December 2018), Town of Caledon Official Plan (April 2018 Consolidation), and the TRCA EIS guidelines (2007) and associated policies.

The objectives of the EIS are to inventory and evaluate the existing natural heritage features and ecological functions within and adjacent to the Subject Property, determine an appropriate development limit for the

protection of these features, where applicable, and/or recommend mitigation measures to address potential impacts.

The following items are addressed as part of this scoped EIS report, in accordance with policies of the TRCA and other regulating authorities.

- Documentation of the existing conditions and associated natural heritage features and constraints on the Subject Property.
- A summary of the applicable environmental policies and regulatory requirements.
- Identification of the potential impacts of the project on existing natural heritage features.
- A discussion of the proposed mitigation measures for potential direct and indirect impacts to existing natural heritage features and functions.




**OVERVIEW**


## LEGEND

SUBJECT PROPERTY (1.57 ha)
*12148 Albion Vaughan Road, Bolton, Town of Caledon*

N

0 20 40 60 80
METRES

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
SCALE: 1:2,000

DATA SOURCES: Imagery provided York Region (2018). Watercourse (edited) provided by Ontario Hydro Network. Overview basemap: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

**Project:** 12148 Albion Vaughan
**Client:** Aztec Restoration

PREPARED BY:
Palmer

DRAWN: B. Elder
CHECKED: A. Adams
PROJECT: 160461
DATE: Nov 25, 2020

# Site Location

**FIGURE 1**

Document Path: G:\Shared drives\Projects 2016\16046 - Aztec Restoration\1604601 - 12148 Albion Vaughan Inc\Mapping\mxd\160461_Figure1_StudyArea.mxd

# 2. Environmental Policy

## 2.1 Provincial Policy Statement 2020

Policy 2.1 of the Provincial Policy Statement (PPS) (2020) provides direction to regional and local municipalities regarding planning policies for the protection and management of natural heritage features and resources. The 2020 PPS defines eight types of natural heritage features and adjacent areas, and provides planning policies for each (Ontario Ministry of Municipal Affairs and Housing, 2020):

Policy 2.1 of the 2020 PPS provides direction to regional and local municipalities regarding planning policies for the protection and management of natural heritage features and resources. The 2020 PPS defines eight natural heritage features and provides planning policies for each.

***2.1.4*** *Development and site alteration shall not be permitted in:*
*a) significant wetlands in Ecoregions 5E, 6E and 7E; and*
*b) significant coastal wetlands.*

***2.1.5*** *Development and site alteration shall not be permitted in:*
*a) significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E;*
*b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River);*
*c) significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River);*
*d) significant wildlife habitat;*
*e) significant areas of natural and scientific interest; and*
*f) coastal wetlands in Ecoregions 5E, 6E and 7E that are not subject to policy 2.1.4(b)*

*unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.*

***2.1.6*** *Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.*

***2.1.7*** *Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.*

***2.1.8*** *Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5 and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.*

Each of these natural heritage features is afforded varying levels of protection subject to guidelines, and in some cases, regulations.

## 2.2 Region of Peel Official Plan (December 2018 Consolidation)

The Region of Peel Official Plan (OP) was adopted by Regional Council on July 11, 1996. It was approved with modification by the Ministry of Municipal Affairs and Housing in 1996 (Region of Peel, 2018). Portions

of the plan are under appeal at the Ontario Municipal Board (OMB). The Region's new OP was consolidated in December 2018.

The Subject Property is within a Rural Service Centre designated area within the Regional Structure of Peel, as designated by Official Plan Schedule D.

The natural heritage features in Peel Region are protected by its Greenlands System, which consists of Core Areas, Natural Areas and Corridors, and Potential Natural Areas and Corridors. Schedule A Core Area of the Greenlands System shows none of these designated areas as occurring within or immediately adjacent to the Subject Property.

## 2.3 Town of Caledon Official Plan (2018)

The existing Town of Caledon Official Plan (Consolidated in April 2018), includes detailed land use policies for the Bolton Core Area Secondary Plan (Town of Caledon, 2018). As shown in Official Plan Schedule C – Bolton Land Use Plan, the Subject Property is within a Special Residential designation.

As described in the Official Plan,

> *A Special Residential designation may be used to recognize certain existing residential areas within or immediately adjacent to settlements that are subject to site-specific policy provisions.*

The Official Plan identifies that ecosystem components identified as Natural Core and Natural Corridors represent the fundamental biological and physical building blocks of ecosystems in the Town. In addition to being subject to the general environmental policies and performance measures of the Plan, these lands are designated Environmental Policy Area and are subject to detailed land use policies.

No Environmental Policy Areas have been designated within or adjacent to the Subject Property.

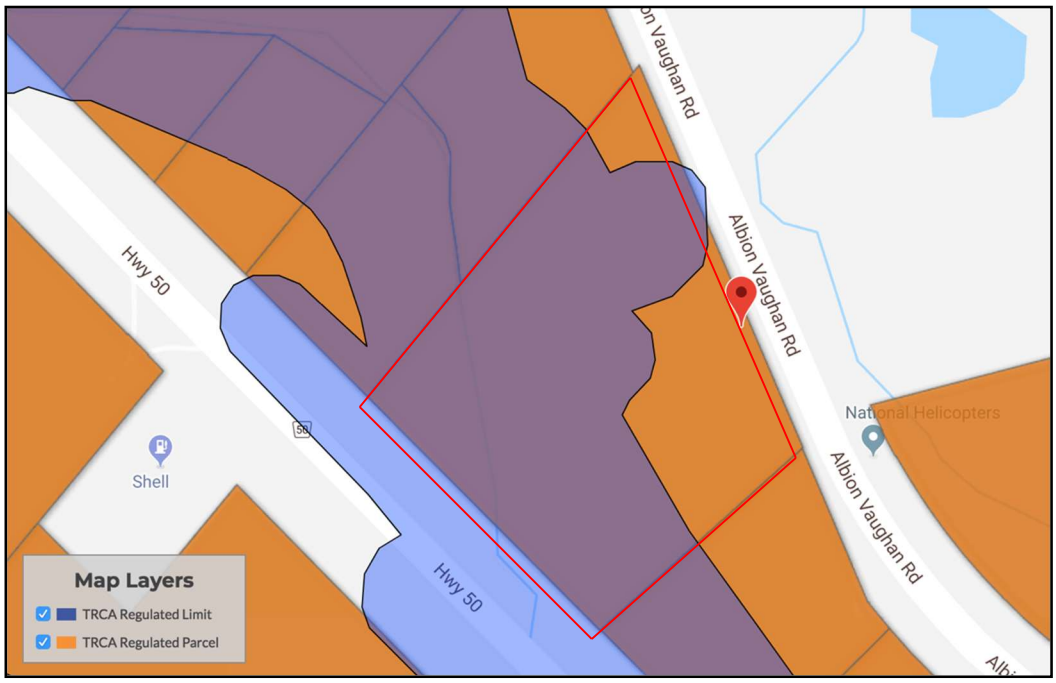
## 2.4 TRCA Regulations and Policies

Relevant TRCA regulations and policies include the following:

- Ontario Regulation 166/06 – *Development, Interference with Wetlands and Alternation to Shorelines and Watercourses*. Through this regulation, TRCA regulates activities in natural and hazardous areas (e.g., areas in and near rivers, streams. Floodplains, wetlands and slopes and shorelines).

- *The Living City Policies* (Toronto and Region Conservation Authority, 2014) and associated Planning and Development Procedural Manual (Toronto and Region Conservation Authority, 2008). These documents present TRCA's planning and permit review practices and technical guidelines. Relevant policies will be discussed in applicable sections of this report.

The Subject Property occurs within area regulated by TRCA in accordance with O. Reg. 166/06. The TRCA regulation limits are shown in **Map A** below, associated with the watercourse and its flood limit through the property.




***Map A. TRCA Regulated Area in the vicinity of the Subject Property***

## 2.5 Endangered Species Act (2007)

Species designated as Endangered or Threatened by the Committee on the Status of Species at Risk in Ontario (COSSARO) are listed as Species at Risk in Ontario (SARO). These Species at Risk (SAR) and their habitats (e.g. areas essential for breeding, rearing, feeding, hibernation and migration) are afforded legal protection under the *Endangered Species Act* (ESA) (Government of Ontario, 2007).

The protection provisions for species and their habitat within the *ESA* apply only to those species listed as Endangered or Threatened on the SARO list, being Ontario Regulation 230/08 of the ESA. Species listed as Special Concern may be afforded protection through policy instruments respecting significant wildlife habitat (e.g. the PPS) as defined by the Province or other relevant authority, or other protections contained in Official Plan policies.

## 2.6 Migratory Birds Convention Act (1994)

The *Migratory Birds Convention Act*, MBCA (1994) and Migratory Birds Regulations, MBR (2014) protect most species of migratory birds and their nests and eggs anywhere they are found in Canada. General prohibitions under the MBCA and MBR protect migratory birds, their nests and eggs and prohibit the deposit of harmful substances in waters / areas frequented by them. The MBR includes an additional prohibition against incidental take, which is the inadvertent harming or destruction of birds, nests or eggs.

Compliance with the MBCA and MBR is best achieved through due diligence, which identifies potential risk based on a site- specific analysis in consideration of the Avoidance Guidelines and Best Management Practices information on the Environment Canada website.

# 3. Study Approach

The approach to the study has been scoped in consideration of existing site conditions, applicable policy and feedback received through agency consultation.

## 3.1 Background Review

As part of this study, Palmer initiated agency consultation and reviewed relevant background material to provide a focus to field investigations and ensure compliance with regulations and policy. Background review included the collection and review of relevant mapping and reports, including Official Plans and the Natural Heritage Information Centre (NHIC) Make-a-map application for species occurrences and designated area mapping. The TRCA and the Ministry of Natural Resources and Forestry (MNRF) Aurora District office were contacted for natural heritage information for the Subject Property and local area.

## 3.2 Agency Consultation

As part of the natural environment review and assessment, agency consultation has been on-going and has included the following:

- **Terms of Reference.** A Terms of Reference (TOR) for the project was submitted to the TRCA for review and approval. The TOR was based on correspondence previously provided to the client and data gathered from the Palmer site visits. The TRCA indicated that they had no objections to the outlined TOR in correspondence dated November 23, 2018.
- **Study Area Natural Heritage Information**. The TRCA and Ministry of Natural Resources and Forestry (MNRF) Aurora District office, were both contacted for natural heritage information in the local area. Data and records were obtained from both agencies.

It is noted that since correspondence took place in 2018, the responsibility for SAR and associated administration of the *Endangered Species Act* has transferred from the MNRF to the Ministry of Environment, Conservation and Parks (MECP).

## 3.3 Ecological Surveys

Palmer ecologists undertook field investigations to conduct an assessment of vegetation, conduct a tree inventory, characterize aquatic habitat, assess physical terrain characteristics, and provide an assessment of the ecological features and functions within the Subject Property. Survey methods are described below.

### 3.3.1 Vegetation

The vegetation communities on the property were investigated following the Ecological Land Classification (ELC) System for Southern Ontario (Lee, et al., 1998), within the Subject Property.

A fall season botanical survey was completed on November 7, 2016 by traversing the Subject Property and recording species observed. Identified vascular plants were checking for their status at local, regional and

provincial levels. Local plant rarity status is based on TRCA species L-ranks (Toronto and Region Conservation Authority, 2019). Provincial plant status was based on the *Rare Vascular Plants of Ontario* (Oldham & Brinker, 2009) and the NHIC database.

### 3.3.2 Tree Inventory

A tree inventory for the Subject Property was completed by a Certified Arborist on November 7, 2016. The tree inventory was completed for all trees (all measured greater than 5 centimetres (cm) diameter at breast height (DBH)) within the Subject Property. The tree inventory was guided by The Town of Caledon *Development Standards, Polices & Guidelines* (Town of Caledon, 2009). Information collected for the inventory included species names, tree tag number, DBH, location and an assessment of health and condition.

Searches for Butternut (*Juglans cinerea*), an Endangered tree, were completed during the tree inventory.

### 3.3.3 Wildlife

Based on the agreed upon terms of reference, breeding bird and breeding amphibian surveys were not conducted due to the lack of potential habitat opportunities for these species on the Subject Property. Rather, habitat quality and opportunities were assessed generally while conducting the vegetation classification and vegetation inventory. Any observed wildlife, or evidence of wildlife, including nests, tracks, or scat, were recorded.

### 3.3.4 Aquatic Habitat

The Subject Property was visited on November 29th, 2016 by a qualified fish biologist. The aquatic habitat was characterized along Robinson Creek within the property. Observations such as substrate composition, signs of groundwater seepage or upwellings, aquatic vegetation, riparian vegetation, woody debris, barrier to fish passage and spawning habitat were recorded. The weather was cloudy with some rain, air temperature 12°C, with approximately 10 millimetres (mm) of rain received in the preceding day.

### 3.3.5 Species at Risk

For the purposes of this report, Species at Risk (SAR) include species listed as Endangered, Threatened or Special Concern under Ontario's *ESA.*

Prior to fieldwork, existing SAR records were queried through correspondence with the MNRF Aurora district and the NHIC database. Habitat opportunities for SAR on the Subject Property were then assessed by comparing habitat preferences of species deemed to have potential to occur, against current site conditions. The SAR identified by MNRF as being recorded in the vicinity of the Subject Property, those noted during the NHIC search, and others known through professional experience to have potential to occur in urban environments were considered in the assessment.

# 4. Existing Conditions

## 4.1 Site Description

The Subject Property predominately supports residential buildings, including one house, a barn and manicured lawns with scattered trees. One watercourse (Robinson Creek) enters the property at the northwest and runs southward along the west edge. Immediately adjacent lands include a residential property to the north and commercial to the south. A small treed riparian area is present within the residential property to the north. Albion Vaughan Road and Regional Road 50 flank the Subject Property to the east and west respectively.

## 4.2 Physiography

The Subject Property is located in the southeastern corner of Bolton, within the Town of Caledon. The property is between Regional Road 50 and Albion Vaughan Road, just north of the intersection of these roads. The terrain of the Subject Property is relatively flat.

The Subject Property is located along the northern limit of the Peel Plain physiographic region (Chapman & Putnam, 1984). This area is a relatively flat glaciolacustrine clay plain that extends across the York, Peel, and Halton Regions. The region was influenced by the succession of changing levels of glacial Lake Peel, whose sediments occur throughout the lows in the till plain. The surface of this region therefore consists of lake sediments, or till. Topography in this region generally varies between level and gently rolling, and gradually slopes towards Lake Ontario. The Subject Property is located in Ecoregion 7E (Crins, Gray, Uhlig, & Wester, 2009).

## 4.3 Vegetation

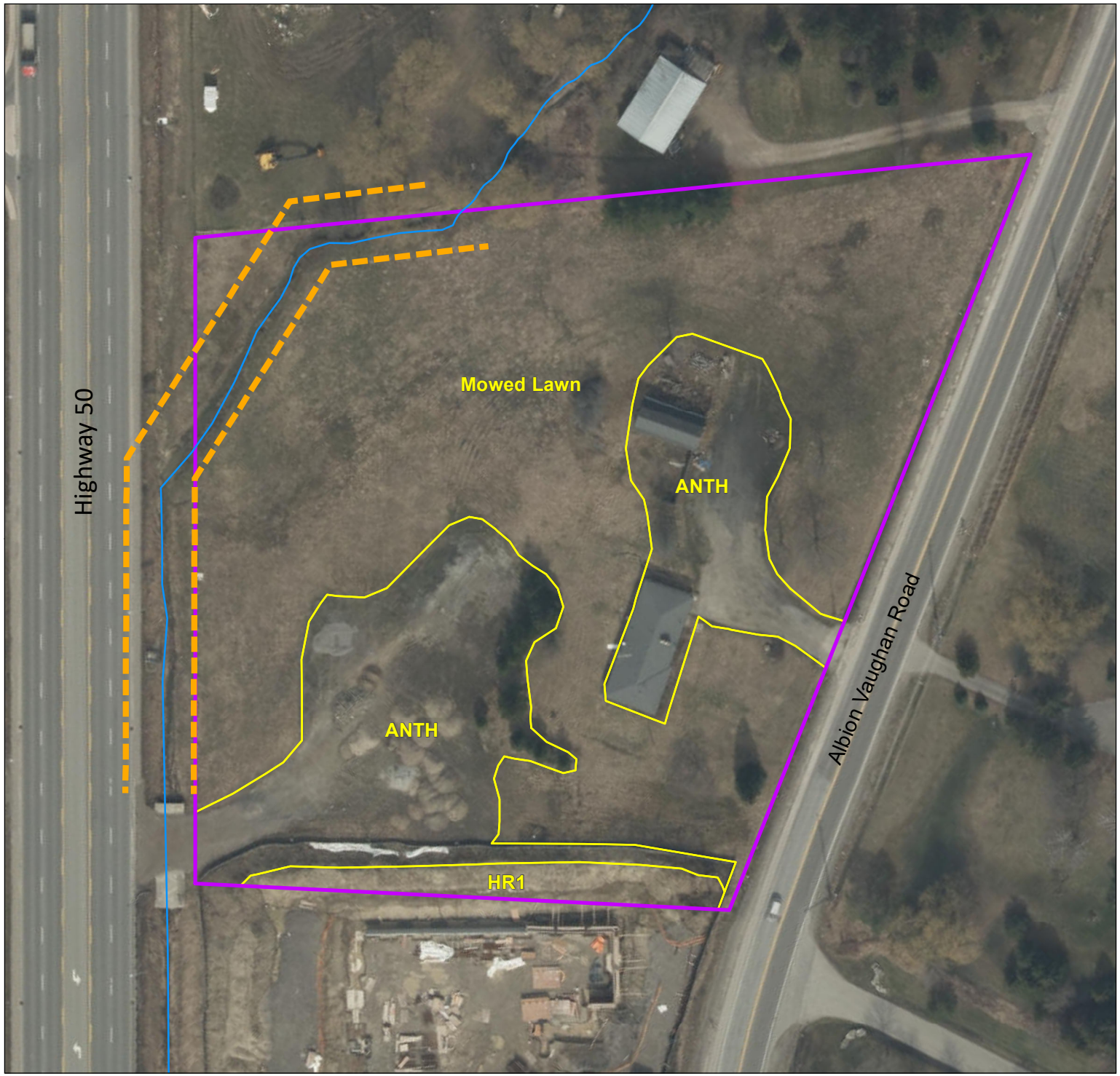
### 4.3.1 Vegetation Communities

The Subject Property predominately supports residential buildings, including one house, a barn and manicured lawns (i.e. turfgrass) with scattered trees. At the time of the field survey, a hedgerow was present along the southeastern side of the property (**Figure 2**). The scattered trees on the property are dominated by the following species: Eastern White Pine (*Pinus strobus*), Norway Spruce (*Picea abies*) and White Spruce (*Picea glauca*).

At the time of the original field survey in 2016, the only representative vegetation community on the property was a Hedgerow 1 (HR1) that was located along the southeast property boundary. The hedgerow was dominated by ash (*Fraxinus* sp.), but has since been removed. Palmer understands that the five (5) Ash trees located along the hedgerow were removed on adjacent lands subsequent to the inventory, likely due to adjacent development. The remaining vegetation consists of a mowed lawn dominated by Kentucky Blue Grass (*Poa pratensis*).

### 4.3.2 Tree Inventory

Within the proposed developable area, a total of 34 trees and an untagged tree grouping were inventoried. There were no Species at Risk (SAR) trees observed, such as Butternut (*Juglans cinerea*). There were seven (7) White Ash (*Fraxinus americana*) trees, which are at high risk of infestation by Emerald Ash Borer (EAB), some of which have already been infected. The most dominant species inventoried was Norway Spruce (*Picea abies*), followed by White Spruce (*Picea glauca*). All data collected during the tree inventory and a Tree Preservation Plan is provided in **Appendix A**.




**OVERVIEW**


## LEGEND

- SUBJECT PROPERTY (1.57 ha)
  *12148 Albion Vaughan Road, Bolton, Town of Caledon*
- ELC COMMUNITY
- WATERCOURSE
- MEANDER BELT BOUNDARY

**ELC COMMUNITIES**

*Terrestrial*

HR1 - Hedgerow 1

ANTH - Anthropogenic

N

0 10 20 30 40

METRES

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

SCALE: 1:1,000

DATA SOURCES: Imagery provided York Region (2018). Watercourse (edited) provided by Ontario Hydro Network. Overview basemap: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

**Project:** 12148 Albion Vaughan

**Client:** Aztec Restoration

PREPARED BY:

Palmer

DRAWN: B. Elder
CHECKED: A. Adams
PROJECT: 1604601
DATE: Nov 25, 2020

# Existing Environmental Conditions

**FIGURE 2**

Document Path: G:\Shared drives\Projects 2016\16046 - Aztec Restoration\1604601 - 12148 Albion Vaughan Inc\Mapping\mxd\160461_Figure2_ELC.mxd

## 4.4 Wildlife

Given the urban nature of the surrounding area, wildlife habitat opportunities within the Subject Property are very limited, with wildlife expected to be present consisting of common, generalist and urban-adapted species (e.g. urban species of birds, Raccoon [*Procyon lotor*], Skunk [*Mephitis mephitis*] and Grey Squirrel [*Sciurus carolinensis*]). Although the Subject Property is bounded by two high-traffic roadways (Albion Vaughan Road and Regional Road 50), the watercourse corridor may provide some movement opportunities. At the immediate site level, habitat representation consists of the aquatic environment (seasonal) of the creek, and patches of regenerating and planted woody vegetation.

## 4.5 Aquatic Habitat

The watercourse (Robinson Creek) that runs through the Subject Property is a tributary of Rainbow Creek, part of the Main Humber River watershed. Fish community information for the specific reach is lacking, but Rainbow Creek is characterized by warm water habitats that have been affected to varying degree by past and present urbanization (Toronto and Region Conservation Authority, 2008). However, in their correspondence of November 23, 2018, the TRCA state that this reach/Robinson Creek is classified as a 'cool water' stream and the timing window for conducting any in-water or near-water works is July 1 to September 15.

The channel wetted width is uniform and approximately 1.5 metres (m) throughout the reach within the Subject Property (**Photo 1**). The bankfull width is greater in sections due to erosion and failing slopes, providing evidence of a "flashy" system (i.e., quick increase in flows following rain events/spring melt), see **Photo 2**. Erosion hazard assessment studies conducted for this project show a history of channel re-alignment within the Subject Property (Palmer Environmental Consulting Group, 2018). The limits of this channel are thus defined by the meanderbelt limit, as outlined in the aforementioned study (**Figure 2**). Within the property limits, there are observed instabilities along Robinson Creek that are a response to historical and recent channel realignments as well as upstream urban development (changes to flow regime and sediment supply).

Along Regional Road 50, the channel has also been straightened, and essentially functions as a roadside drainage ditch (**Photo 3**). The channel flows under a box culvert and upstream there is high proportion of cattails (*Typha* sp.) within the channel. Water depth was approximately 25 cm at the time of the site visit, with turbid water indicative of sediment transport after the heavy rain. The channel banks throughout the entire reach within the Subject Property consisted of mowed grass, and a great proportion of slumped slopes and erosion gullies, which had led to exposed soils, with no riparian vegetation present to provide slope stability or other ecological function to the watercourse.

There were little in-stream features that provided cover or refuge for fish. Substrate in the channel consisted of sand, gravel and some scattered rubble. There were localized areas (less than 10% of the area within the Subject Property) of in-stream aquatic vegetation – cattails. Leaf litter was present in the channel from the upstream wooded-area. No barriers to fish passage were observed, but low flow conditions are likely in the summer months. Evidence of the urban setting was present, with garbage along the stream from the adjacent road, as well as exposed service cables/pipes in one section (**Photo 4**).

Review of the Fisheries and Oceans Canada (DFO) Aquatic Species at Risk Map (Fisheries and Oceans Canada, 2020) and correspondence with the MNRF Aurora district did not identify Robinson Creek as either direct or indirect habitat for aquatic SAR (**Appendix B**).

***Photograph 1. Channel along Regional Road 50 showing slumping of the slopes and erosion gullies***

*Photograph 2. Typical slope slumping and erosion observed along the entire channel*

***Photograph 3. Tributary as it joins the roadside drainage ditch, showing exposed sands and soil***

***Photograph 4. Exposed service cables/pipes at the tributary as it joins the drainage ditch along Regional Road 50***

Fish community sampling was not conducted and there would appear to be direct connection to up- and down-stream reaches, at least during periods of high flow. The presence of fish can therefore not be discounted, even if only present on a seasonal basis. However, the habitat quality in the reach in the Subject Property is low and does not provide any specialized ecological function. Water quality appears to be adversely affected by the high degree of sedimentation from the exposed channel banks and proximity to an urban roadway and stormwater runoff. There is no riparian cover, and habitat is affected by the urban setting and flash flood system.

## 4.6 Species at Risk

The MNRF was contacted during the original background review in 2016 for information on SAR occurrences or potential presence in and surrounding the Subject Property. The MNRF identified the potential for SAR bat habitats in tree cavities, including for:

- Eastern Small-footed Myotis (*Myotis leibii*);
- Little Brown Myotis (*Myotis lucifugus*);
- Northern Myotis (*Myotis septentrionalis*): and
- Tri-coloured bat (*Perimyotis subflavus*).

Habitat on the Subject Property was screened against the requirements of these SAR bat species to determine the likelihood of their presence.

In correspondence with the MECP, it was recommended that the on-site barn be screened for Barn Swallow (*Hirundo rustica*) prior to removal (**Appendix B**). No rare species records where previously identified for the Subject Property or adjacent lands, through a search of the NHIC database.

**SAR Bats**

Populations of several bat species have been in decline in recent years due to the spread of a fungal pathogen known as “white nose syndrome”. This includes the above listed species, which are all listed as *Endangered* under the ESA and are afforded general habitat protection.

Eastern Small-footed Myotis will roost in a variety of habitats, including in or under rocks, in rock outcrops, in buildings, under bridges or in caves, mines or hollow trees (Ministry of Natural Resources and Forestry, 2017). Little Brown Myotis often select attics, abandoned buildings and barns for summer colonies where they can raise their young (Ministry of Natural Resources and Forestry, 2018). Northern Myotis bats are associated with a range of forests, choosing to roost under loose bark and in the cavities of trees (Ministry of Natural Resources and Forestry, 2018). They may also roost in anthropogenic structures. Tri-colored Bat is found in a variety of forested habitats during the summer. It forms day roosts and maternity colonies in older forest and occasionally in barns or other structures. It forages over water and along streams in the forest (Ministry of Natural Resources and Forestry, 2017).

From professional experience, summer maternal roosting habitat, representing one of the most sensitive life stages for bats, is generally the focus of protection efforts on the part of MNRF/MECP in regard to the ESA requirements for these species. The other primary concern is winter hibernation habitat; however,

these habitats primarily include caves and old mines, none of which are present in the vicinity of the Subject Property.

There are no forest communities within or immediately adjacent to the Subject Property and therefore habitat opportunities for bats within tree cavities are limited and their presence is unlikely. In addition, as of 2018, the home and barn were still actively occupied and used, making the potential for use of these structures by bats unlikely.

**Barn Swallow**

The barn swallow is a threatened species, is found throughout southern Ontario, and can range into the north as long as suitable nesting locations can be found. These birds prefer to nest within human made structures such as barns, bridges, and culverts. Barn swallow nests are cup-shaped and made of mud; they are typically attached to horizontal beams or vertical walls underneath an overhang. A significant decline in populations of this species has been documented since the mid-1980s, which is thought to be related to a decline in prey. Since the barn swallow is an aerial insectivore, this species relies on the presence of flying insects at specific times during the year. Changes in building practices and materials may also be having an impact on this species (Ministry of Natural Resources and Forestry, 2019).

The barn on-site has the potential to be used by this species, and a screening for nest structures should be completed prior to demolition.

# 5. Assessment of Significance

## 5.1 Designated Natural Areas

Designated areas are environmentally significant features that are identified by provincial or local authorities, such as provincial plan areas (e.g., Greenbelt Plan), Provincially Significant Wetlands, Areas of Natural and Scientific Interest, and components of regional or municipal natural heritage systems or other significant areas identified in municipal Official Plans.

No Provincially Significant Wetlands (PSW), Areas of natural and Scientific Interest (ANSI), or Environmentally Sensitive Features occur on or immediately adjacent to the Subject Property. Official Plan schedules show no 'Core Areas' of the Region of Peel within or adjacent to the Subject Property (Regional Official Plan Schedule A) or 'Environmental Policy Areas' of the Town of Caledon (Town Official Plan Schedule C).

Guidance for identifying and evaluating natural features and determining constraints is provided by Official Plan policies, the Natural Heritage Reference Manual (Ontario Ministry of Natural Resources, 2010), and the TRCA regulations and policy. A summary and evaluation of the potential significance, functions and sensitivity of existing features on the Subject Property is provided below.

## 5.2 Aquatic Habitat and Stream Corridor

The aquatic assessment (Section 4.5) demonstrates that Robinson Creek provides limited opportunities for fish habitat. This section of the creek is characterized by low riparian cover and minimal in-stream features that provide refuge for fish. The erosion hazard assessment of the creek shows a history of anthropogenic re-alignment within the Subject Property (Palmer, 2018). The current limits of this stream feature are defined by the meanderbelt, as defined within the 2018 Palmer study and illustrated on **Figure 2**.

## 5.3 Wetlands

Based on field investigations, no wetland communities were identified within or directly adjacent to the Subject Property.

## 5.4 Woodlands

Criteria for determining woodland significance are provided in the Region of Peel Official Plan and in the *Natural Heritage Reference Manual* (Ontario Ministry of Natural Resources, 2010).

No forest or woodland vegetation communities were identified within the Subject Property. The treed riparian area to the north of the Subject Property is not identified as part of the Greenlands System by the Region of Peel or Environmental Policy area on Official Plan Schedule C – Bolton Land Use Plan for the Town of Caledon.

### 5.4.1 Tableland Vegetation

The Town of Caledon Woodlands by-law protects Caledon's Woodlands and promotes good forestry practices. The Town does not have a Tree By-law applicable to individual trees that occur outside of woodland communities. The Subject Property does contain several trees for which compensation is recommended. The recommended replacement ratio is provided in the Arborist Report (**Appendix A**).

## 5.5 Species at Risk

There are limited habitat opportunities for SAR bats associated with the existing building structures (house and barn) and trees. However, provided the proposed development demolition activities are completed when bats are inactive (i.e., between October 1st and March 31st), these activities are unlikely to result in an impact to these species. There is also a limited opportunity for Barn Swallow to be actively using the on-site barn. A screening for nest structures should be completed prior to demolition.

## 5.6 Significant Wildlife Habitat

Significant Wildlife Habitat (SWH) is considered a significant feature in Provincial, Regional, and Municipal policies. Significant Wildlife Habitat (SWH) is defined by the MNRF in the Significant Wildlife Habitat Technical Guide (Ontario Ministry of Natural Resources, 2000) and includes the following broad categories:

- seasonal concentration areas;
- rare vegetation communities or specialised habitats for wildlife;
- habitats of species of conservation concern, excluding the habitats of endangered and threatened species; and
- animal movement corridors

Criteria for the identification of these features are provided in the *Significant Wildlife Habitat Criteria Schedules For Ecoregion 7E* (Ontario Ministry of Natural Resources and Forestry, 2015). These criteria were used to screen wildlife habitat within the study area for potentially significant wildlife habitat.

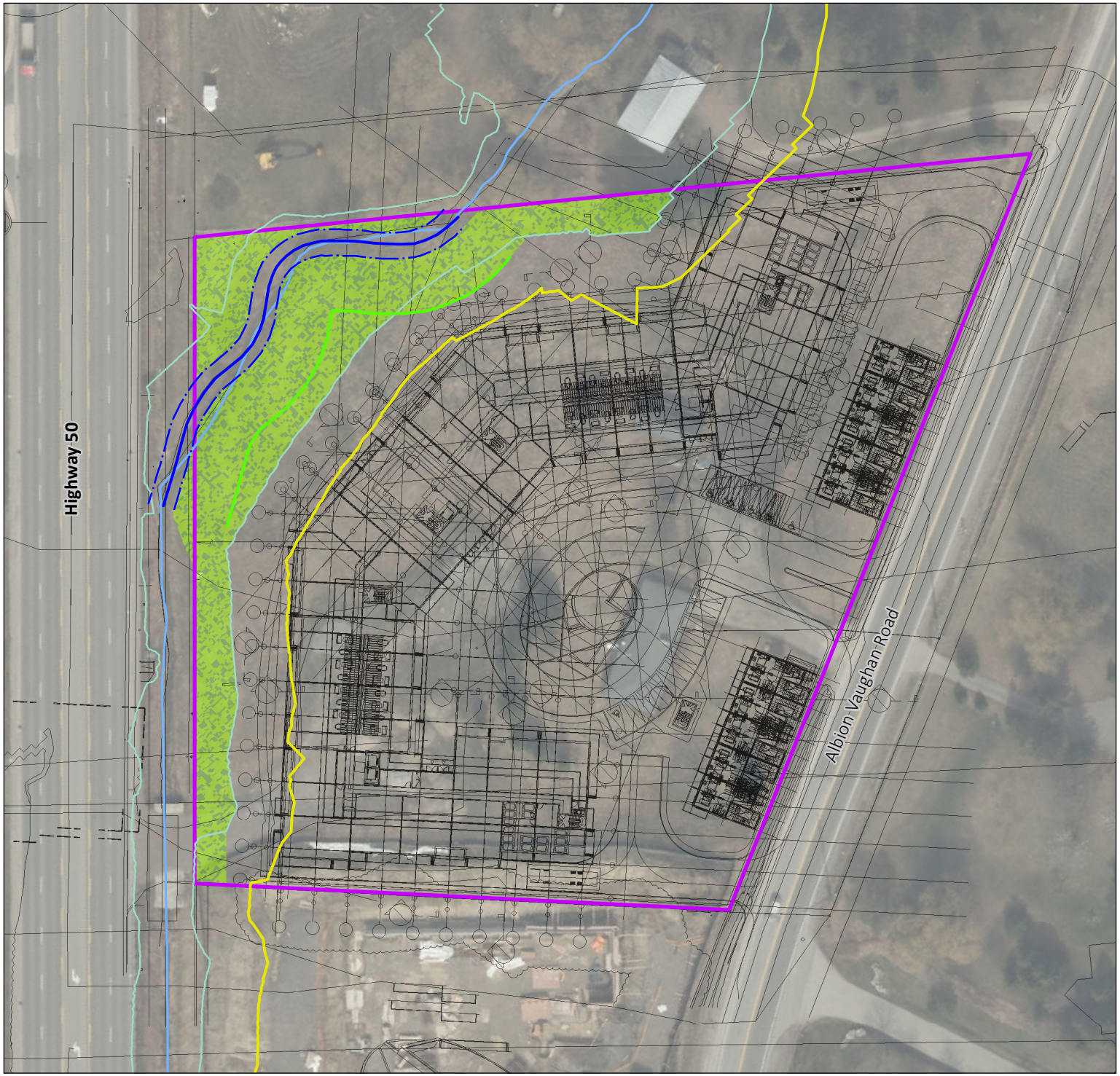
The potential for SWH on-site is limited, as natural vegetation features on the Subject Property are limited in size and function. In the immediate area of the proposed development, habitat opportunities consist of the predominately unvegetated creek corridor through the Subject Property and small treed riparian area to the north. No rare vegetation communities within the proposed construction areas have been identified. Potential suitable breeding amphibian habitat is limited to the existing creek corridor, but is not large enough nor contain the still, ponded waters necessary to qualify as SWH for these species.

# 6. Development Concept

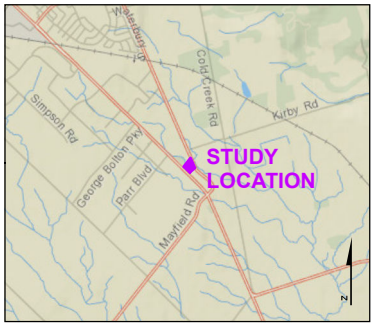
The proposed site plan is shown on **Figure 3** and provides an illustration of the proposed development overtop of the environmental constraints to allow for an assessment of the environmental feasibility of the proposed site plan with associated property access and future building envelopes in consideration of site constraints.

The proposal for the Subject Property includes the demolition of the existing buildings and the development of 240 apartment units in two adjoining towers central to the property, and 20 townhomes in two blocks along Albion Vaughan Road. Access is proposed via Albion Vaughan Road. Two levels of subsurface parking is proposed centrally in the Subject Property, while above ground visitor parking stalls are proposed to ring the underground parking entrance.

The portion of Robinson Creek within the property is proposed to be realigned in order to maximize the developable area and improve flood storage.




## OVERVIEW




## LEGEND

- RE-ALIGNED WATERCOURSE (CENTRELINE)
- BANKFULL CHANNEL WIDTH
- 10 M NATURAL FEATURE SETBACK
- FLOODPLAIN LIMIT
- 10 M FLOODPLAIN SETBACK
- EXISTING WATERCOURSE (CENTRELINE)
- SITE PLAN
- PLANTING AREA
- SUBJECT PROPERTY

N

0 10 20 30 40
METRES

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
SCALE: 1:1,000

DATA SOURCES: Imagery provided York Region (2018). Watercourse (edited) provided by Ontario Hydro Network. Overview basemap: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

**Project:** 12148 Albion Vaughan
**Client:** Aztec Restoration

PREPARED BY:
Palmer

DRAWN: B. Elder
CHECKED: A. Adams
PROJECT: 1604601
DATE: Nov 25, 2020

# Proposed Development and Environmental Constraints

# FIGURE 3

Document Path: G:\Shared drives\Projects 2016\16046 - Aztec Restoration\1604601 - 12148 Albion Vaughan Inc\Mapping\mxd\160461_Figure3_Constraints.mxd

# 7. Impact Assessment and Proposed Mitigation

Given the location of the proposed development within a property currently supporting existing residential buildings, ancillary structures, paved area and manicured lawn, there is no natural vegetation removal required. The only impacts to vegetation of the proposed development include the removal of planted landscape trees and shrubs. Of the 34 inventoried trees, the results indicate that 24 trees and a tree grouping will require removal to support the proposed development plan. The removal of these trees has a limited potential to affect wildlife habitat (e.g. nests) within these trees.

The portion of Robinson Creek within the property is proposed to be realigned has been designed to address the observed instabilities in the current alignment and also improve channel form and function, ecological functions and fish habitat. The surrounding floodplain will also be redesigned to increase flood capacity. There is the potential for sedimentation from both the development construction area and the channel realignment works to enter Robinson Creek during construction. Appropriate sediment and erosion control measures will therefore be required.

The realignment of Robinson Creek, floodplain creation and grading required for the development will require a restoration plan that enhances the green spaces of the property and controls the potential for colonization by invasive species.

## 7.1 Watercourse Feature Buffer

Buffers are generally defined as vegetated areas of land between development areas and sensitive natural features within which no or very limited site alteration may occur. These buffers function to protect the features by way of creating a biophysical barrier between an adjacent land use, such as a development, and the natural feature.

In accordance with TRCA's *Living City Policies* (2014) and based on the findings of this EIS, a 10 m natural feature setback is recommended to buffer the realigned watercourse, as defined by the designed Bankfull Width in this instance (**Figure 3**). It is also recommended that the required 10 m natural feature buffer be expanded to include the re-designed floodplain to protect the re-aligned watercourse and its associated functions from impacts associated with the proposed development. This extension will also serve to increase the flood infiltration capacity and provide wildlife habitat potential of the area.

The 10 m natural feature setback and designed floodplain have been combined to create a proposed Planting Area (**Figure 3**). It is recommended that the buffer is planted and restored with *native, self-sustaining vegetation* in consultation with the agencies. In order to extend the potential natural area and functions, the 10 m flood and erosion hazard setback are proposed to be planted with native species, but allow for hazard access and recreational use of the area.

As part of the development it is proposed that the Planting Area and flood/erosion hazard setback be enhanced through a restoration plan as outlined in Section 7.4. The overall goal is to restore and increase natural vegetation cover within the realigned watercourse riparian corridor and improve quality and function

of this feature. As all of the existing area is currently vegetated solely with manicured lawns (i.e. turfgrass), the restoration objective is to provide a naturally vegetated buffer to protect and enhance the feature and its ecological functions.

The Planting Area has also been identified as a location to compensate for the trees to be removed for the project (**Appendix A**).

## 7.2 In-Water Work

Construction of the Robinson Creek channel realignment should be completed "in the dry". The dewatering trap should be placed no less than 30 m away from the receiving waterbody and pumped into a densely vegetated receiving area. If a densely vegetated area is not available, coir matting or functionally similar materials should be utilized.

### 7.2.1 Dam-and-Pump

All in-channel work should be completed in-the-dry through the implementation of a dam-and-pump approach to safely by-pass streamflow around the work area, which will be isolated between temporary cofferdams. The natural flow regime should be maintained for any diversion works. Any minor through-flow or seepage that accumulates within the isolated work area should be collected in a sump and pumped via a small-diameter pipe into a nearby filter bag, which will be set back from the channel and allowed to drain passively through existing riparian vegetation. All in-channel work should be supervised by an environmental monitor and techniques for site isolation and siltation control should be confirmed with the on-site environmental monitor. The isolated works area is to be monitored for trapped fish. If fish are identified, a qualified ecologist should capture and relocate fish trapped from within the isolated area before excavation can begin. A fish collection permit will be required for any capture and relocation of fish.

### 7.2.2 Fish Protection

Though the potential to encounter fish is considered low (Section 4.5), the construction of the stream realignment will require activities to ensure the protection of fish, in compliance with the Federal *Fisheries Act*. Measures must be taken to avoid harm to fish and fish habitat. For the project, this will involve limiting any in-water work to specific timing windows and relocating any fish trapped within the channel realignment area prior to putting it "on-line". Specifically:

- In water construct works are to conform to timing windows for in-water works. As the fish community in Robinson Creek is classified as a 'cool water' stream and the timing window for conducting any in-water or near-water works is July 1 to September 15. Thus, no in-water work will occur between the restriction periods for southern Ontario, being September 16 to June 30, subject to confirmation with the MNRF and the TRCA.
- Fish removal (salvage) will be required pumping out the channel realignment work area. Prior to construction, a License to Collect Fish for Scientific Purposes will be required from the MNRF, in order to proceed with the proposed works and fish removal. Fish removal must be completed by a qualified ecologist, and fish salvaged must be relocated downstream of the construction area.

- Any non-native species encountered during the fish salvage will be euthanized and disposed of using appropriate methods. The euthanization of non-native, invasive species is a standard practice and is generally included as a condition of the License to Collect Fish permit.
- Should the channel realignment work area flood, a second fish salvage may need to occur.

## 7.3 Erosion and Sediment Control

Erosion and Sediment Control (ESC) must be considered for the two construction activities, namely the construction of the development and also the re-alignment of Robinson Creek. For the construction of the development, ESC measures are recommended to be placed (at minimum) at the Planting Area limit (**Figure 3**), that encompasses the newly designed floodplain and watercourse setbacks. For the re-alignment of Robinson Creek, ESC measures should look to limit the opportunities for sediment to be introduced into the upstream and downstream reaches.

An ESC plan will be developed for both stages of the project. The following erosion and sediment control recommendations are provided for incorporation into the final ESC Plan:

- To minimize the potential for erosion and off-site transport of sediment into surface drainage areas and the natural environment, the project will implement Best Practices related to ESC. ESC measures used by the contractor on all construction should meet guidelines as outlined in *Erosion and Sediment Control Guideline for Urban Construction,* (2006) (ESC Guideline), prepared by the Greater Golden Horseshoe Area Conservation Authorities (GGHACA), or equivalent standards.
- ESC measures should be installed prior to beginning work and maintained in working order throughout all stages of the proposed construction activities and remain in place until the buffer and enhancement plantings have been completed.
- All exposed and newly constructed surfaces should be stabilized using appropriate means in accordance with the characteristics of the exposed soils. These surfaces should be fully stabilized and re-vegetated as quickly as possible following the completion of the works, with native vegetation ground cover. Revegetation and sodding recommendations would include use of TRCA seed mixes.
- No sediment, sediment-laden water or deleterious substances are to be discharged into Robinson Creek at any time.;
- All ESC measures will be inspected daily including after every rainfall, cleaned, maintained and/or adjusted accordingly to ensure sediment does not enter the creek at any time.
- No machinery or equipment will be maintained or refueled within 30 m of the creek.
- Any equipment, stockpiled material or construction material will be stored a minimum of 30 m from the creek and in a manner that prevents sediment or deleterious substances from entering the creek.
- Any dewatering (if required) is to be filtered to remove sediment prior to discharging to a well vegetated area at least 30 m from Robinson Creek.

## 7.4 Restoration Plan

Restoration plantings will be implemented following the completion of the watercourse realignment and construction of the proposed development. The following restoration recommendations follow the practical objectives for the revetment and the restoration methods in the TRCA Guideline for Determining Ecosystem Compensation (Toronto and Region Conservation Authority, 2018). Restoration efforts will aim to restore

the realigned Robinson Creek and the redesigned floodplain. The species to be planted as part of the restoration efforts are native to the region and suitable to the site conditions.

### 7.4.1 Soil Amendments

Within the redesigned floodplain and flood/erosion hazard access setback, soil compaction is expected to increase due to the use of machinery within the area of disturbance. Soils can be improved after construction works by conducting the following soil amendments on disturbed upland areas (Toronto and Region Conservation Authority, 2012):

- Decompaction of subsoil to a depth of 25 cm, by tilling or scarifying the soil in a perpendicular direction to the realigned watercourse.
- Incorporation of 7 cm of compost into the soils during tilling.
- Application of 20 - 30 cm of uncompacted imported topsoil with 15% organic matter by dry weight.

### 7.4.2 In-Channel Restoration

Live stakes (branch cuttings from live shrubs) have been recommended to be placed in the bends and vegetated rock revetment portions of the Robinson Creek re-alignment. Recommended species for live stakes includes Alternate-leaved Dogwood (*Cornus alternifolia*), Red-osier Dogwood (*Cornus sericea*), Common Elderberry (*Sambucus canadensis*), Sandbar Willow (*Salix exigua*), and Bebb's Willow (*Salix bebbiana*) (**Table 1**). Live stakes are to be planted in groups of 10/species at 0.3 m on-centre spacing (Toronto and Region Conservation Authority, 2018). Live stakes are recommended to be 25 – 75 mm diameter stakes, to be hand placed between the stone revetment/rip-rap. Stakes should be buried >0.5 m below the rip-rap, ensuring placement within the soil matrix and seasonal water table. Certified soils should be used to fill the remaining space in each planting hole. Additional restoration details are provided on the restoration drawings, presented under a separate cover as part of the project submission package. As the new bend and revetment surface is approximately 25 $m^2$, it is estimated that up to 225 live-stakes can be planted to increase wildlife cover/habitat and increase bank stability.

***Table 1: Recommended Live-Stake Restoration Species***

| Common Name | Scientific Name | Density | Quantity |
|---|---|---|---|
| Alternate-leaved Dogwood | *Cornus alternifolia* | 1 x 1 m | **50** |
| Red-osier Dogwood | *Cornus sericea* | 1 x 1 m | **40** |
| Common Elderberry | *Sambucus canadensis* | 1 x 1 m | **15** |
| Sandbar Willow | *Salix exigua* | 1 x 1 m | **60** |
| Bebb's Willow | *Salix bebbiana* | 1 x 1 m | **60** |

Palmer also recommends implementing bioengineering techniques (e.g. brush layers) and riparian plantings to help improve the shear strength of the channel banks and reduce channel migration potential. These recommendations are consistent with the erosion hazard assessment completed by Palmer (Palmer, 2018). The improvements to the channel form could enhance the habitat function, and be conducted with no impact to any existing fish, for example, by working within timing windows, or periods or low flow or frozen conditions (in the dry) (Section 7.2).

### 7.4.3 Floodplain and Natural Feature Setback

As the floodplain and natural feature setback (Planting Area) are currently comprised of anthropogenic/cultural communities, it is recommended that these lands be planted in order to enhance their buffer/protective functions for Robinson Creek.

The Planting Area is to be seeded and planted to buffer the watercourse/natural features from the development (**Figure 3**). The setback is to be seeded at a rate of 25 kgs/ha with an early succession wet meadowseed mix that aligns with the TRCA *Seed Mix Guidelines* (Toronto and Region Conservation Authority, 2004; Credit Valley Conservation Authority, 2014). The recommended Early Succession Wet Meadow Mix (CVC 6) includes:

- Bebb's Sedge (*Carex bebbii*) 5%
- Purple Stemmed Aster (*Aster puniceus*) 1%
- Fowl Bluegrass (*Poa palustris*) 25%
- Fox Sedge (*Carex vulpinoidea*) 25%
- Great Blue Lobelia (*Lobelia siphilitica*) 1%
- New England Aster (*Aster novae-angliae*) 1%
- Path Rush (*Juncus tenuis*) 3%
- Canada Goldenrod (*Solidago canadensis*) 2%
- Soft Rush (*Juncus effusus*) 5%
- Stalk-grain Sedge (*Carex stipata*) 4%
- Tall Manna Grass (*Glyceria grandis*) 2%
- Virginia Wild Rye (*Elymus virginicus*) 25%
- Wild Bergamot (*Monarda fistulosa*) 1%

To assist in establishment and promote biomass, the Planting Area should also be seeded with a nurse crop of Common Oats (*Avena sativa*) or Buckwheat (*Fagopyrum esculentu*) at a rate of 25 kgs/ha.

Subsequently, following the Enhanced Reforestation Typicals within the *Guideline for Determining Ecosystem Compensation* (Toronto and Region Conservation Authority, 2018) as a guide, the Planting Area is to be planted with trees at a density of 2.45 m x 2.45 m (6 $m^2$), and shrubs at a 1 m x 1 m (1 $m^2$) spacing. Replacement tree and species are recommended be native to TRCA's watershed, and targeted to provide *natural, self-sustaining vegetation* (Toronto and Region Conservation Authority, 2014). Plantings should be of species native and common to the TRCA watershed as well as suit the existing vegetation assemblage and site conditions. For the Subject Property and the Planting Area specifically, species should be suited to naturalization, perform well in somewhat moister conditions in full to partial sun, and be tolerant of salt spray due to their proximity to Highway 50 (Vineland Research and Innovation Centre, 2020). Based on these existing site conditions, suitable woody species may include (but are not limited to):

**Trees:**

- Silver Maple (*Acer saccharinum*)
- Paper Birch (*Betula papyrifera*)
- Hackberry (*Celtis occidentalis*)
- Tamarack (*Larix laricina*)
- Eastern Cottonwood (*Populus deltoides*)

- American Elm (*Umulus americana*) – Dutch Elm Disease resistant cultivars

**Shrubs:**

- Speckled Alder (*Alnus rugosa*)
- Red-osier Dogwood (*Cornus sericea*)
- Chokecherry (*Prunus virginiana*)
- Staghorn Sumac (*Rhus typhina*)

The natural feature setback and floodplain area to be restored is approximately 2,000 $m^2$ and the recommended planting spacing would allow planting of about 330 trees or 2,000 shrubs, or combination thereof. To provide a balance between diversity and reproduction opportunities, trees and shrubs are to be planted in groups of approximately 10 per species following the *Guideline*, at the spacing outlined above. For trees and shrubs, two to four gallon pot sizes are recommended. The planting prescription in **Table 2** has been developed following the above criteria.

***Table 2: Example Planting Prescription***

| Common Name | Scientific Name | Quantity | Size |
|---|---|---|---|
| **Trees** | | | |
| Silver Maple | *Acer saccharinum* | 50 | 2 - 4 gallon pot |
| Paper Birch | *Betula papyrifera* | 50 | 2 - 4 gallon pot |
| Hackberry | *Celtis occidentalis* | 45 | 2 - 4 gallon pot |
| Tamarack | *Larix laricina* | 40 | 100 – 150 cm (height) |
| Eastern Cottonwood | *Populus deltoides* | 50 | 2 - 4 gallon pot |
| American Elm* | *Ulmus americana* | 45 | 2 - 4 gallon pot |
| **Shrubs** | | | |
| Speckled Alder | *Alnus rugosa* | 100 | 2 gallon pot |
| Red-osier Dogwood | *Cornus sericea* | 100 | 2 gallon pot |
| Chokecherry | *Prunus virginiana* | 50 | 2 gallon pot |
| Staghorn Sumac | *Rhus typhina* | 50 | 2 gallon pot |

* Note: Dutch Elm Disease resistant cultivars recommended.

### 7.4.4 Floodplain Buffer

It is recommended that the 10 m flood/erosion access setback be seeded and planted to further buffer the Planting Area from the development, but also allow for maintenance, hazard access and recreational/passive use of the area (**Figure 3**). The flood/erosion access setback should be seeded at a rate of 25 kgs/ha with a native grass seed mix that aligns with the TRCA *Seed Mix Guidelines* (Toronto and Region Conservation Authority, 2004). A recommended grass seed mix includes:

- Canada Wild Rye (*Elymus canadensis*) – 20%
- Switchgrass (*Panicum virgatum*) – 20%
- Fowl Bluegrass (*Poa palustris*) – 20%
- Big Bluestem (*Andropogon gerardii*) – 10%
- Little Bluestem (*Andropogon scoparius*) – 10%
- Fox Sedge (*Carex vulpinoidea*) – 10%

Similar to the Floodplain Planting Area, the 10 m setback should also be seeded with a nurse crop of Common Oats or Buckwheat at a rate of 25 kgs/ha.

### 7.4.5 Timing

Planting and seeding should be completed in the spring or fall. The spring season planting window is April to mid-May and the fall season window is mid-September to late October. Seeding should be completed immediately after the planting of woody vegetation but not during drought-prone summer months (Toronto and Region Conservation Authority, 2004). The assessment of plant stock should be conducted upon delivery to ensure that the material consists of appropriate native species in proper quantities.

All trees and woody debris from removed due to site disturbance should be kept on-site and distributed throughout the site to provide wildlife habitat opportunities, away from the active flow channel, after to completion of restoration plantings. In addition, if of small enough diameter, tree material could be used as embedded woody debris to be incorporated into the channel realignment design.

### 7.4.6 Tending for Restoration Plantings

The restoration plantings will require regular watering to facilitate the establishment of young trees, which are typically highly susceptible to water stress. At a minimum, watering should occur when trees show signs of stress and during periods of natural drought conditions (e.g. if there is less than 25 mm of rain over a 30-day period during late spring to the end of summer).

## 7.5 Species at Risk and Migratory Birds

Provided the demolition and tree removal activities for the proposed development occur over the fall to early spring period (i.e., October to early April), the activities are unlikely to result in a direct impact to SAR bats or migratory birds. In the unlikely event that SAR bats or other SAR species are encountered, work will stop and the MECP will be contacted for direction.

In order to avoid potential impacts to bat species, all tree removals and demolition activities should be completed outside the bat maternity roost season and general activity period of **April 1 to September 30** for southern Ontario (Ontario Ministry of Natural Resources, 2011; Ministry of Natural Resources, 1984). To avoid potential harm to migratory birds, any vegetation removal (including tree removal) should be conducted outside the C2 Area breeding bird timing window of **April 15 to August 31** (i.e. vegetation removal to occur between September 1 to April 14) (Government of Canada, 2019). Potential habitat is expected to be enhanced following the restoration efforts within the Subject Property.

By avoiding demolition and tree clearing within the combined **April 1 to September 30** timing window, potential impacts to both breeding birds and roosting bats should be avoided. In the event that demolition or tree removal must be completed within the restricted timing window, a qualified biologist must screen the area for active nests and roosting activity. Compensation for trees lost is discussed in Section 7.4 and **Appendix A** of this report. A letter has been submitted to the MECP to confirm the timing windows and mitigation for the proposed activities.

Prior to demolition, the on-site barn should be screened for Barn Swallow nest structures by a qualifies biologist. If nest structures are observed, a SAR registration under the ESA should be completed, and appropriate mitigation implemented (**Appendix B**). This process is described at: https://www.ontario.ca/page/alter-structure-habitat-barn-swallow. The demolition of the barn should also take place during the **April 1 to September 30** timing window.

# 8. Policy Conformity

**Provincial and Municipal Policy**

According to the Provincial Policy Statement, Region of Peel and Town of Caledon OP policies, development is generally prohibited within significant natural heritage features as defined in those policies. Due to its current limited fish habitat opportunities and stream quality, the realignment of Robinson Creek and the restoration of the floodplain and natural feature setback will create a *net gain in environmental quality on the natural feature and its ecological functions*. Additionally, Robinson Creek has been adequately setback from the post-construction limits of the proposed development to ensure protection under these policies and other relevant policies (e.g. TRCA *Living City Policies*). The results of our assessment indicate no other significant natural heritage features are present on the Subject Property. Thus, the development as proposed is considered to conform to the abovementioned policies.

***Endangered Species Act***

The mitigation measures proposed in Section 7.5 should avoid contravention of the ESA in the unlikely event SAR are present, including bats, birds, and Barn Swallow specifically.

***Migratory Birds Convention Act* (MBCA)**

Works with potential MBCA implications will occur during the construction phase of the project when the Subject Property is cleared and grubbed of vegetation. Compliance with the MBCA may be achieved using the following due diligence approach:

- Proponent awareness of the MBCA and the potential for bird nesting in the area and for inadvertent impacts to migratory birds, nests and eggs.
- Avoiding vegetation removal within the “regional nesting period” for this area (generally mid-April to end of August).

***Conservation Authorities Act***

The Subject Property falls within the jurisdiction of the Toronto Region Conservation Authority (TRCA). Robinson Creek within the Subject Property and its associated flood limit are regulated under the TRCA O.Reg. 166/06 – *Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*. As the Subject Property is within TRCA regulated lands and a realignment of the creek is proposed, an application under Ont. Reg. 166/06 is required.

The proposed development is setback at minimum 10 m from the bankfull width of the realigned creek, and restoration/naturalization of both this area and the entire redesigned floodplain has been proposed (the Planting Area). Restoration proposed is designed to be comprised of *native, self-sustaining vegetation*. The Planting Area will be further buffered by planting the flood/erosion hazard setback with a native grass seed mix. With the proposed mitigation, the project will create a net environmental gain, and is considered to be in conformity with the *Living City Policies* (Toronto and Region Conservation Authority, 2014).

# 9. Conclusions

The findings of our study are the result of a background review, an ecological field survey, and an analysis of data using current scientific understanding of the ecology of the area and natural heritage policy requirements. We have evaluated the environmental sensitivities, constraints and development opportunities of the Subject Property, which are described in this report and illustrated on **Figure 2** and **Figure 3**.

Based on the results of the EIS it is our professional opinion that the proposed development is environmentally feasible and would not result in a negative impact to the natural heritage features provided that the recommended mitigation and enhancement measures described in this report are implemented. Restoration of the realigned creek and redesigned floodplain is expected to result in a net gain in environmental quality of the watercourse system and adjacent lands.

# 10. Certification

This report was prepared, reviewed and approved by the undersigned:

*Prepared By:*

Austin Adams, M.Sc., EP.
Sr. Terrestrial Ecologist,
ISA Certified Arborist #ON-2000A

*Reviewed By:*

Dirk Janas, B.Sc.
Principal, Senior Ecologist

# 11. References

Chapman, L. J., & Putnam, D. F. (1984). *The Physiography of Southern Ontario - Third Edition. Ontario.*

Credit Valley Conservation Authority. (2014). *Credit Valley Conservation Seed Mixes - Version 1.1 August 2014.* Retrieved from Credit Valley Conservation Authority: https://cvc.ca/wp-content/uploads/2013/05/planning-seedmix-flyer-may-20131.pdf

Crins, W. J., Gray, P. A., Uhlig, P. W., & Wester, M. C. (2009). *The Ecosystems of Ontario, Part 1: Ecozones and Ecoregions.* Peterborough, Ontario: Ontario Ministry of Natural Resources. Retrieved from https://www.ontario.ca/page/ecosystems-ontario-part-1-ecozones-and-ecoregions

Fisheries and Oceans Canada. (2020). *Aquatic Species at Risk Map*. Retrieved from Fisheries and Oceans Canada: http://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

Government of Canada. (1994). Migratory Birds Convention Act, 1994 (S.C. 1994, c. 22). Retrieved from http://laws-lois.justice.gc.ca/eng/acts/m-7.01/

Government of Canada. (2019). *Nesting Zones*. Retrieved from Government of Canada - Environment and Climate Change: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#_zoneC_calendar

Government of Ontario. (2007). Endangered Species Act, 2007, S.O. 2007, c. 6. Retrieved from https://www.ontario.ca/laws/statute/07e06

Greater Golden Horseshoe Conservation Authorities. (2006). *Erosion and Sediment Control Guidelines for Urban Construction.* Retrieved from www.trca.on.ca/dotAsset/40035.pdf

Lee, H. T., Bakowsky, W. D., Riley, J., Bowles, J., Puddister, M., Uhlig, P., & McMurray, S. (1998). *Ecological Land Classification for Southern Ontario: First Approximation and its Application.* Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch.

Ministry of Natural Resources. (1984). *Habitat Management Guidelines for Bats in Ontario.* Retrieved from Ontario Ministry of Natural Resources and Forestry: file:///C:/Users/Austin%20Adams/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/guide-bats%20(1).pdf

Ministry of Natural Resources and Forestry. (2017). *Eastern small-footed myotis.* Retrieved from Ministry of Natural Resources and Forestry: https://www.ontario.ca/page/eastern-small-footed-myotis

Ministry of Natural Resources and Forestry. (2017). *Tri-coloured Bat.* Retrieved from Ministry of Natural Resources and Forestry: https://www.ontario.ca/page/tri-colored-bat

Ministry of Natural Resources and Forestry. (2018). *Little Brown Myotis.* Retrieved from Ministry of Natural Resources and Forestry: https://www.ontario.ca/page/little-brown-myotis

Ministry of Natural Resources and Forestry. (2018). *Northern Myotis.* Retrieved from Ministry of Natural Resources and Forestry: https://www.ontario.ca/page/northern-myotis

Ministry of Natural Resources and Forestry. (2019). *Barn Swallow.* Retrieved from ontario.ca: https://www.ontario.ca/page/barn-swallow

Oldham, M. J., & Brinker, S. R. (2009). *Rare Vascular Plants of Ontario, Fourth Edition.* Peterborough, Ontario: Natural Heritage Information Centre, Ministry of Natural Resources.

Ontario Ministry of Municipal Affairs and Housing. (2020). *Provincial Policy Statement, 2020.* Toronto, ON. doi:ISBN 978-1-4606-3522-3

Ontario Ministry of Natural Resources. (2000). *Significant Wildlife Habitat Technical Guide.* Peterborough: Queen’s printer for Ontario. Retrieved from https://www.ontario.ca/document/guide-significant-wildlife-habitat

Ontario Ministry of Natural Resources. (2010). *Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition.* Toronto: Queen's Printer for Ontario. Retrieved from http://cloca.ca/resources/Outside%20documents/Natural%20Heritage%20Policies%20of%20the%20Provincial%20Policy%20Statement%20MNR%202010.pdf

Ontario Ministry of Natural Resources. (2011). *Bats and Bat Habitats: Guidelines for Wind Power Projects.* Queen‟s Printer for Ontario. Retrieved from https://www.ontario.ca/document/bats-and-bat-habitats-guidelines-wind-power-projects

Ontario Ministry of Natural Resources and Forestry. (2015). *Significant Wildlife Habitat Criteria Schedules For Ecoregion 7E.* Peterborough: Regional Operations Division, Southern Region Resources Section.

Palmer Environmental Consulting Group. (2018). *Erosion hazard assessment of Robinson Creek, 12148 Albion Vaughan Road in Bolton, Town of Caledon.* Submitted to 12148 Albion Vaughan Inc.

Region of Peel. (2018). *Region of Peel Official Plan. Decemeber 2018 Consolidation.* Retrieved from Region of Peel: http://www.peelregion.ca/planning/officialplan/index.htm

Toronto and Region Conservation Authority. (2004). *Seed Mix Guidelines.* Retrieved from http://trca.on.ca/dotAsset/40025.pdf

Toronto and Region Conservation Authority. (2008). *Humber River State of the Watershed Report – Aquatic System.*

Toronto and Region Conservation Authority. (2008). *Planning and Development Procedural Manual.* Retrieved from Toronto and Region Conservation Authority: https://trca.ca/planning-permits/procedural-manual-and-technical-guidelines/

Toronto and Region Conservation Authority. (2012). *Preserving and Restoring Healthy Soil: Best Practices for Urban Construction.* Retrieved from Toronto and Region Conservation Authority: https://trca.ca/planning-permits/procedural-manual-and-technical-guidelines/

Toronto and Region Conservation Authority. (2014). *The Living Cities Policies*. Retrieved from Toronto and Region Conservation Authority: https://trca.ca/planning-permits/living-city-policies/

Toronto and Region Conservation Authority. (2018, June). *Guideline for Determining Ecosystem Compensation.* Retrieved from Toronto and Region Conservation Authority: https://laserfiche.trca.ca/WebLink/0/edoc/1499894/Guideline%20for%20Determining%20Ecosystem%20Compensation,%20June%202018.pdf

Toronto and Region Conservation Authority. (2019). *2019 Flora Ranks and Scores*. Retrieved from Toronto and Region Conservation Authority: https://s3-ca-central-1.amazonaws.com/trcaca/app/uploads/2019/07/08142613/2019_Flora_Ranks__Scores.pdf

Town of Caledon. (2009). *Development Standards, Policies and Guidelines.* Retrieved from https://www.caledon.ca/en/townhall/resources/DevelopmentStandardsPoliciesGuidelines.pdf

Town of Caledon. (2018). *Town of Caledon Official Plan, April 2018 Consolidation.* Retrieved from Town of Caledon: https://www.caledon.ca/en/townhall/officialplan.asp

Vineland Research and Innovation Centre. (2020). *Eastern Canada Tree Species Selector*. Retrieved from Vineland Research and Innovation Centre: https://www.greeningcanadianlandscape.ca/tree-species-selector/eastern-canada-tree-species#

# Appendix A

## Arborist Report and Tree Preservation Plan

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

December 23, 2020

Mike Liburdi
12148 Albion Vaughn Inc.
27 Fenton Way
Brampton ON
L6P 0P4

Dear Mike Liburdi:

**Re: Arborist Report and Tree Preservation Plan for 12148 Albion Vaughan Road, Bolton (PECG#160461)**

## 1. Introduction

Palmer has completed an Arborist Report for the proposed development of 12148 Albion Vaughan Road, in the community of Bolton, Town of Caledon, Region of Peel (the Subject Property).

Currently, residential buildings, including one house, a barn and manicured lawns with scattered trees occupy the Subject Property (**Figure 1**). Robinson Creek, a headwater tributary of Humber River, enters the property at the northwest corner and runs southward along the western edge, lying within the Toronto and Region Conservation Authority (TRCA) Regulatory Floodplain.

This report includes an assessment of applicable policy, methods and results of the tree inventory completed within the Subject Property, and the identification of trees to be retained and trees to be removed. Recommendations for tree removals, replacement tree species and planting locations are also provided in this report as well as recommended tree protection measures for trees to be retained.

## 2. Guidance Documents

This Arborist Report and Tree Preservation Plan is guided by The Town of Caledon *Development Standards, Polices & Guidelines* (Town of Caledon, 2009), supplemented by the City of Toronto *Tree Protection Policy and Specifications for Construction Near Trees* (2016). The Town of Caledon document guides the content of the report and details the standards for tree protection measures. Where additional construction management and monitoring guidance was required, the City of Brampton *Tableland Tree Assessment Guidelines* (2018) were employed, employing standards from the nearest neighbouring municipality.

## 3. Methods

A tree inventory was completed for trees within and adjacent to the area proposed for development on the Subject Property. The tree inventory was completed by a Certified Arborist on November 7, 2016.

Information collected during the inventory includes species name, tree tag number, diameter at breast height (DBH), location, a general health assessment, and notes on tree trunk and canopy conditions.

# 4. Results

## 4.1 Tree Inventory

The tree inventory comprised 34 individual trees, with an additional grouping of untagged Eastern White Cedar trees. The inventory included 14 trees and one (1) grouping which were native species (43%), nine (26%) trees that were non-native, and 11 (31%) trees were identified to the genus only. There were 32 trees identified as live, two (2) individual dead trees and a grouping of dead trees on the Subject Property (**Table 1**). The inventory included 11 (31%) trees which were deciduous species and 24 (69%) trees that were coniferous species. The trees identified as dead were not tagged during this inventory. All are trees commonly found and/or planted in southern Ontario landscapes. There were no Species at Risk (SAR) trees observed, such as Butternut (*Juglans cinerea*); although there were several trees at high risk of disease or infestation, including Ash species (*Fraxinus* sp.). Complete tree inventory details are provided in **Appendix A.** The locations of inventoried trees are shown on **Figure 2**.

***Table 1. Summary of Tree Inventory Results***

| Scientific Name | Common Name | Total Number |
|---|---|---|
| *Acer* x *freemanii** | Freeman's Maple | 1 |
| *Fraxinus sp.* | Ash Species | 7 |
| *Juglans* sp. | Walnut Species | 2 |
| *Malus* sp. | Apple Species | 1 |
| *Picea* sp. | Spruce Species | 1 |
| *Picea abies* | Norway Spruce | 8 |
| *Picea glauca** | White Spruce | 7 |
| *Picea pungens* | Blue Spruce | 1 |
| *Pinus strobus** | Eastern White Pine | 6 |
| *Thuja occidentalis** | Eastern White Cedar | 1 Grouping |
| **Total** | | **35** |

*Native species

## 4.2 Trees to be Retained

A total of five (5) trees are proposed to be retained (**Table 2**). All six are Eastern White Pine, a native species. These trees are considered to be in good to fair health and are located along the northwestern property boundary of the Subject Property (**Figure 2**).

***Table 2. Trees Proposed to be Retained***

| Scientific Name | Common Name | Good to Fair Health | Poor Health | Total Count |
|---|---|---|---|---|
| *Pinus strobus** | Eastern White Pine | 5 | 0 | 5 |

| | | | |
|---|---|---|---|
| **Total trees to be retained** | **5** | **0** | **5** |

### 4.3 Trees to be Removed

A total of 24 inventoried trees and a tree grouping are proposed to be removed to accommodate the proposed development (**Table 3**). This includes ten (42%) trees of which are native, nine (38%) trees are non-native and six (20%) trees were identified to the genus only. The trees proposed to be removed are scattered throughout the Subject Property (**Figure 2**). Most of these trees were observed to be in good to fair health; however, there were several ash trees that were affected by Emerald Ash Borer (*Agrilus planipennis*) and in poor health. There was also a grouping of dead Eastern White Cedar in the northern portion of the Subject Property. Palmer understands that the five (5) Ash trees located along the hedgerow at the southeastern property boundary were removed subsequent to the inventory (between 2016 and 2018), likely due to adjacent development (**Figure 2, Table 3**). It is assumed that removal conditions have been previously obtained from the municipality for these trees; therefore, these trees will not be proposed for compensation.

***Table 3. Trees Proposed to be Removed***

| Scientific Name | Common Name | Fair to Good Health | Poor Health | Dead** | Total Count |
|---|---|---|---|---|---|
| **Trees to be Removed** | | | | | |
| *Acer* x *freemanii** | Freeman's Maple | 1 | 0 | 0 | 1 |
| *Fraxinus* sp. | Ash | 1 | 0 | 1 | 2 |
| *Juglans* sp. | Walnut | 2 | 0 | 0 | 2 |
| *Malus* sp. | Apple | 1 | 0 | 0 | 1 |
| *Picea* sp. | Spruce | 0 | 0 | 1 | 1 |
| *Picea abies* | Norway Spruce | 8 | 0 | 0 | 8 |
| *Picea glauca** | White Spruce | 6 | 1 | 0 | 7 |
| *Picea pungens* | Blue Spruce | 1 | 0 | 0 | 1 |
| *Pinus strobus** | Eastern White Pine | 1 | 0 | 0 | 1 |
| *Thuja occidentalis** | Eastern White Cedar | 0 | 0 | 1 Grouping | 1 |
| | *Subtotal* | *21* | *1* | *3* | *25* |
| **Trees Removed Subsequent to Inventory (2016 – 2018)** | | | | | |
| *Fraxinus* sp. | Ash | 4 | 1 | 0 | 5 |
| | *Subtotal* | *4* | *1* | *0* | *5* |
| **Total** | | **24** | **2** | **3** | **29** |

*Native species

**Dead trees in various stages of decay.

# 5. Tree Preservation Plan

## 5.1 Tree Protection

The specifications for tree protection are detailed on the Tree Preservation Plan (**Figure 2**), including the locations of required tree protection fencing. The Tree Preservation Plan is intended to act in concert with this Arborist Report; it is expected that the recommendations of both instruments be implemented within construction drawings and/or Site Plans for the project. The five trees proposed to be retained will be protected by tree protection fencing, which is to be placed at minimum beyond the dripline as determined as per the Town of Caledon *Development Standards, Polices & Guidelines* (Town of Caledon, 2009).

The recommended fencing locations encompass the Tree Protection Zones (TPZ) of the trees to be retained, providing protection from potential damage during construction activities such as the use of machinery near trees and branches, and stockpiling of materials over the root zone. The TPZ have been defined by radii that follow the Tree Protection Zone criteria outlined in the *Tree Protection Policy and Specifications for Construction Near Trees* (City of Toronto, 2016). The TPZ has been used as a conservative measure of the dripline requirements, per the Town of Caledon Specifications.

### *5.1.1 Tree Protection Fencing*

Tree protection fencing is to consist of rigid snow fencing complete with iron "T" bars placed at a maximum of 2.4 metres (m) on-centre (maximum spacing) as per Town of Caledon Tree Protection Standard #707 (**Appendix B**). Snow fencing is to be 1.2 m high. Prior to the start of any site work, the Contractor shall supply and install tree protection barriers around each tree or group of trees designated to be protected (**Figure 2**), or as directed by the Consulting Arborist or Landscape Architect, and the Town (Town of Caledon, 2009).

Tree fencing, as a minimum, is to be located at the outer limit of the dripline of the tree (**Figure 2**). The dripline is defined as the outside edge of the tree canopy. The TPZ for each tree has been provided in this report as a conservative and quantifiable measure of the dripline. No fill, machinery, chemicals, fuel or materials are to be placed within the protective barrier. No re-grading, including filling or excavation, is to take place within the protected area. If required, all underbrush that is to be removed from within the protective barriers must be cleared by hand. The method of removal of brush from the protected area is to be approved by the Town (Town of Caledon, 2009).

General construction specifications in relation to trees are also detailed on the Tree Preservation Plan (**Figure 2**). These specifications provide additional details regarding tree protection fencing and their management.

### *5.1.2 Tree Removals*

All trees to be removed should be felled into the Subject Property so as to avoid damage to adjacent trees and property. While most trees to be removed can be root-pulled as necessary to accommodate development, **Tree 390** (**Figure 2**) should be cut and the stump ground to below surface in order to protect the roots of adjacent trees.

# 6. Compensation Plantings

## 6.1 Tree Removal and Compensation

A total of 22 live trees are to be removed as a result of the project (**Table 4, Figure 3**). It is recommended that a tree compensation ratio of 2:1 be implemented, resulting in 44 trees to be planted. Planting and restoration efforts will aim to restore the natural areas where disturbances have occurred as a result of anthropogenic disturbance.

***Table 4: Recommended Tree Removal and Compensation***

| | Compensation Ratio (2:1) | Total |
|---|---|---|
| **Total number of tree removals** | 21 | **21** |
| **Total number of replacement trees** | 44 | **44** |

## 6.2 Tree Species

To match with the restoration activities on the Subject Property as outlined in the Environmental Impact Study (EIS) for the proposed development (Palmer, 2020), the following tree species and composition are proposed to be planted in compensation (**Table 5**). While other species can be considered, another planting criterion should be selecting only native trees to increase the quality and character of the overall natural heritage system. Selecting Ash species should be avoided (at present) due to the advance of Emerald Ash Borer (EAB) in Ontario.

***Table 5: Proposed Compensation Tree Species***

| Tree/Shrub Species | Quantity | Recommended Size |
|---|---|---|
| Silver Maple (Acer saccharinum) | 10 | 2 – 4 gallon pot |
| Tamarack (*Larix laricina*) | 10 | 100 - 150 cm wire basket |
| Paper Birch (*Betula papyrifera*) | 10 | 2 – 4 gallon pot |
| Hackberry (*Celtis occidentalis*) | 12 | 2 – 4 gallon pot |

The sizes proposed in **Table 5** are reflective of the sizes recommended for ecosystem naturalization, as outlined in the *Guideline for Determining Ecosystem Compensation* (Toronto and Region Conservation Authority, 2018).

## 6.3 Planting Location

The replacement trees are proposed to be planted on the Subject Property. As outlined in the EIS for the proposed development, the restoration Planting Area surrounding Robinson Creek is able to accommodate approximately 330 trees, far in excess of the proposed tree compensation.

The proposed Planting Area includes areas between Robinson Creek and the proposed development along the western boundary of the Subject Property (**Figure 2**). Trees planted adjacent to the stream should be able to tolerate some sun and moist soils along the stream riparian zone.

This tree compensation plan should be incorporated into the landscaping plan for the Project. Trees should be planted a minimum of 2.45 m x 2.45 m from each other and any proposed development structure or feature.

## 7. Management and Monitoring Phase

The following general management and monitoring actions are submitted to help ensure the protection of the trees to be retained on the Subject Property.

### 7.1 Pre-Construction Phase

The tree protection fencing erected should be inspected by a Certified Arborist. Any pruning or trimming of trees necessary to accommodate the fencing should be completed by a Certified Arborist using good arboricultural practices. All trees to be removed should be felled into the Subject Property so as to avoid damage to adjacent trees and property.

### 7.2 Construction Phase

Tree protection fencing should be maintained throughout the project and regularly inspected for damage by construction personnel. Any damage will be reported to the construction supervisor and repaired immediately. Any build up of sediments at tree bases will be removed as part of fencing repairs. All plant material damaged as a result of improper installation or maintenance of protective barriers must be replaced with material of equal value, at the cost of the Developer.

### 7.3 Post-Construction Phase

The removal of tree protection barriers should only be initiated once all construction activities have been completed and landscaping has been initiated. Planting of compensation trees as per Section 6 will be initiated as part of restoration activities. Planting will occur solely during the spring or fall planting seasons when establishment is most successful; being April 15 - July 1, and September 15 – November 15, respectively.

## 8. Closure

We trust that this letter provides sufficient guidance for the incorporation of tree protection measures into the relevant construction drawings and site plans for the proposed development of 12148 Albion Vaughan Road. Should you need any further clarification concerning this letter, please contact the undersigned at 647-461-2372 or austin.adams@pecg.ca.

Yours truly,

**Prepared By:**

Austin Adams, M.Sc., EP
Sr. Ecologist, ISA Certified Arborist ON-2000A

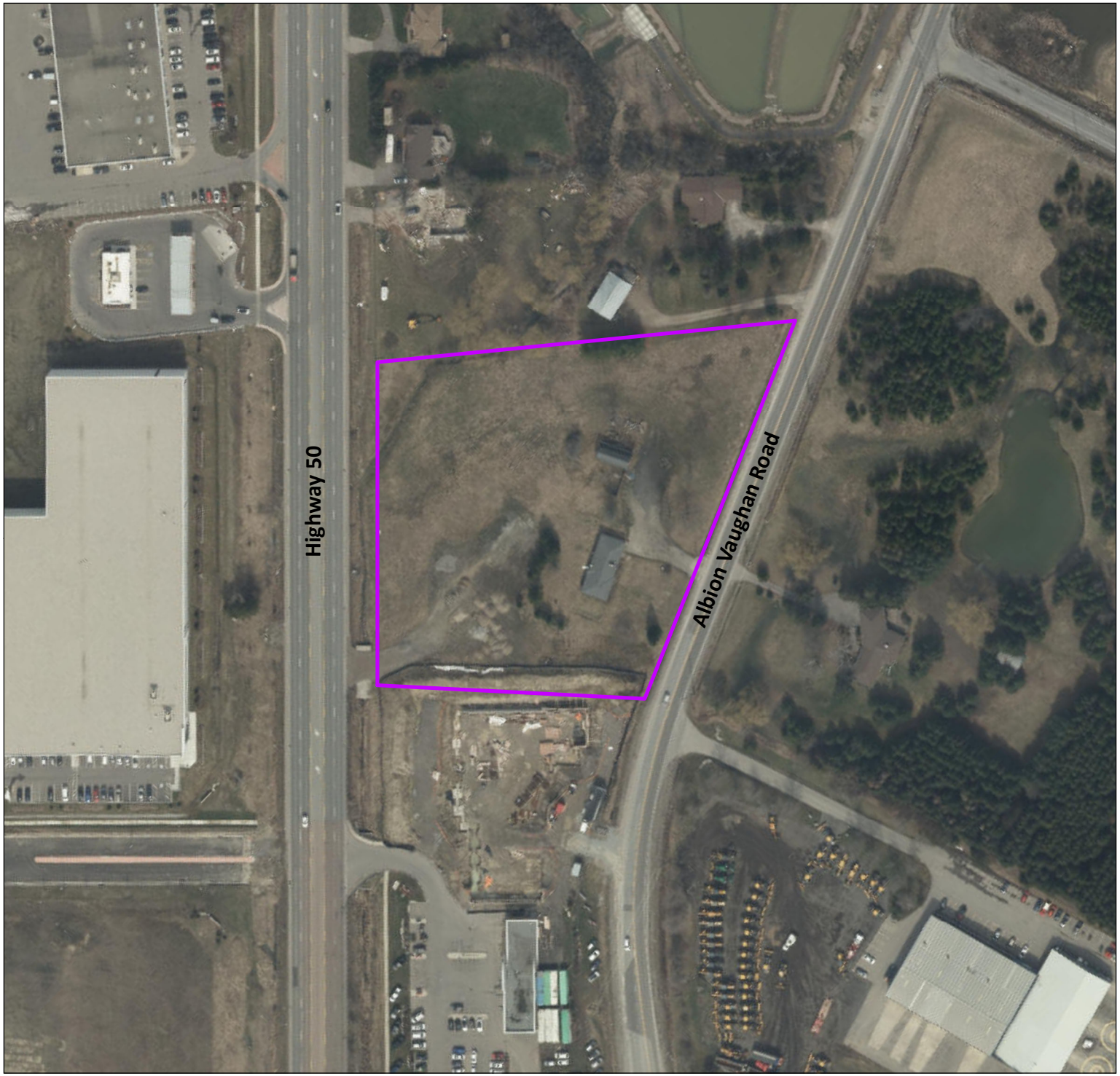
## References

City of Toronto. (2016). *Tree Protection Policy and Specifications for Construction Near Trees.* Toronto. Retrieved from https://www.toronto.ca/data/parks/pdf/trees/tree-protection-specs.pdf

City of Brampton. (2018). *Tableland Tree Assessment Guidelines.* Retrieved July 5, 2018, from http://www.brampton.ca/EN/Business/planning-development/guidelines-manuals/Documents/Tableland_Tree_Assessment_Guidelines.pdf

Palmer. (2020). 12148 Albion Vaughan Road - Scoped Environmental Impact Study. Prespared for 12148 Albion Vaughan Inc.

Town of Caledon. (2009). *Development Standards, Policies and Guidelines.* Retrieved from https://www.caledon.ca/en/townhall/resources/DevelopmentStandardsPoliciesGuidelines.pdf




**OVERVIEW**


## LEGEND

SUBJECT PROPERTY (1.57 ha)
*12148 Albion Vaughan Road, Bolton, Town of Caledon*

N

0 20 40 60 80
METRES

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
SCALE: 1:2,000

DATA SOURCES: Imagery provided York Region (2018). Watercourse (edited) provided by Ontario Hydro Network. Overview basemap: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

**Project:** 12148 Albion Vaughan
**Client:** Aztec Restoration

PREPARED BY:
Palmer

DRAWN: B. Elder
CHECKED: A. Adams
PROJECT: 160461
DATE: Nov 25, 2020

# Site Location

**FIGURE 1**

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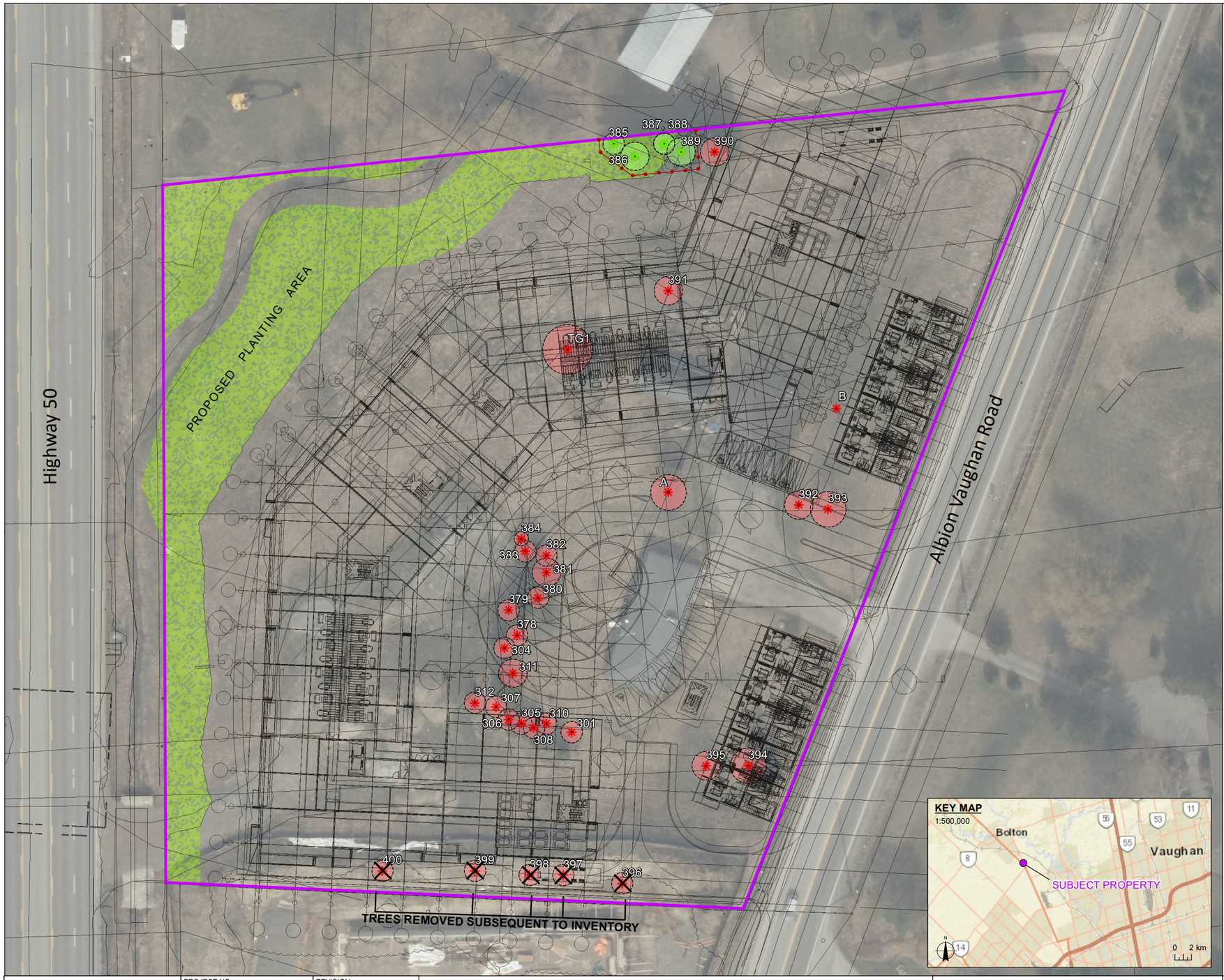






**TREE PRESERVATION SPECIFICATIONS**

**GENERAL NOTES**

• THIS TREE PROTECTION PLAN IS DESIGNED TO WORK IN CONCERT WITH THE ARBORIST REPORT FOR THE PROJECT.
• PRIOR TO COMMENCEMENT OF ANY SITE ACTIVITY, THE TREE PROTECTION FENCING AND/OR BARRIERS SPECIFIED ON THIS PLAN MUST BE INSTALLED.
• TREE PROTECTION FENCING AND/OR BARRIERS MUST REMAIN IN EFFECTIVE CONDITION UNTIL ALL SITE ACTIVITIES INCLUDING LANDSCAPING ARE COMPLETE. IT MUST NOT BE REMOVED WITHOUT THE WRITTEN AUTHORIZATION OF THE CONSULTING LANDSCAPE ARCHITECT OR ARBORIST AND THE TOWN.

**TREE PROTECTION AND FENCING**

• ALL EXISTING TREES THAT ARE DESIGNATED TO REMAIN, MUST BE FULLY PROTECTED WITH TREE PROTECTION FENCING IN ACCORDANCE WITH TOWN OF CALEDON. TREE PROTECTION FENCING IS BE CONSTRUCTED OUTSIDE THE DRIPLINE OF TREES TO BE PROTECTED AND TO CONSIST OF RIGID SNOW FENCING COMPLETE WITH IRON "T" BARS PLACED AT A MAXIMUM OF 2.4 METRES (M) ON-CENTRE (MAXIMUM SPACING). SNOW FENCING IS TO BE 1.2 M HIGH.
• PRIOR TO THE START OF ANY SITE WORK, THE CONTRACTOR SHALL SUPPLY AND INSTALL TREE PROTECTION BARRIERS AROUND EACH TREE DESIGNATED ON THE TREE PROTECTION PLAN/SITE PLAN TO BE PROTECTED. THE CONSULTING LANDSCAPE ARCHITECT OR ARBORIST IS TO PROVIDE WRITTEN CONFIRMATION TO THE TOWN OF CALEDON STATING THAT ALL TREE PRESERVATION MEASURES HAVE BEEN PERFORMED PRIOR TO THE ISSUANCE OF A TOPSOIL STRIPPING AND GRADING PERMIT.
• TREE PROTECTION ZONES ARE TO INCLUDE SIGNS (AS PER BELOW) AT REGULAR INTERVALS ON THE FENCING. THE SIGNS ARE TO BE 40 CM X 60 CM AND MADE OF WHITE CORRUGATED PLASTIC BOARD OR EQUIVALENT MATERIAL.

TREE PROTECTION ZONE (TPZ)

ALL CONSTRUCTION RELATED ACTIVITIES, INCLUDING GRADE ALTERATION, EXCAVATION, SOIL COMPACTION, ANY MATERIALS OR EQUIPMENT STORAGE, DISPOSAL OF LIQUID AND VEHICULAR TRAFFIC ARE NOT PERMITTED WITHIN THIS TPZ.

THIS TREE PROTECTION BARRIER MUST REMAIN IN GOOD CONDITION AND MUST NOT BE REMOVED OR ALTERED WITHOUT AUTHORIZATION OF CITY OF BRAMPTON PLANNING AND INFRASTRUCTURE SERVICES. CONCERNS OR INQUIRIES REGARDING THIS TPZ CAN BE DIRECTED TO CALEDON DEVELOPMENT AND PLANNING AT 905.584.2272 X 4291

NO CONSTRUCTION EQUIPMENT OR MOTORIZED VEHICLES ARE PERMITTED WITHIN THE TREE PROTECTION ZONE AND ALL TREE PROTECTION ZONES MUST REMAIN UNDISTURBED AT ALL TIMES. THE FOLLOWING ACTIVITIES ARE ALSO PROHIBITED WITHIN THE TREE PROTECTION ZONES:
- ANY CONSTRUCTION;
- ALTERING OF GRADE BY BACKFILLING, ADDING FILL, EXCAVATING, TRENCHING OR DISTURBANCE OF ANY KIND;
- TOPSOIL STORAGE OR STOCKPILING OF MATERIALS, EQUIPMENT, SOIL, CONSTRUCTION WASTE OR DEBRIS; AND
- DISPOSAL OF ANY LIQUIDS.

• IN THE EVENT THAT ANY WORK BE REQUIRED WITHIN THE TREE PROTECTION ZONES, THE CONSULTING LANDSCAPE ARCHITECT MUST ADVISE THE TOWN OF CALEDON DEVELOPMENT AND PLANNING DEPARTMENT A MINIMUM OF 48 HOURS PRIOR TO COMMENCING ANY SPECIFIED WORK.
• TREE PROTECTION FENCING IS TO BE INSPECTED REGULARLY BY CONSTRUCTION PERSONNEL TO ENSURE IT IS PERFORMING ITS INTENDED FUNCTION. IF ANY SECTION IS FOUND TO BE DAMAGED OR NON-FUNCTIONAL, IT SHOULD BE REPLACED IMMEDIATELY.
• TO AVOID SOIL COMPACTION, MACHINERY OPERATION IS TO STAY WITHIN THE WORK AREA AND AVOID THE AREA DELINEATED BY THE TREE PROTECTION FENCING.

**UNFORESEEN TREE AND ROOT PRUNING**

• IF ANY DAMAGE OCCURS TO TREES, INCLUDING BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK, IT MUST BE REPORTED TO THE CONSULTING ARBORIST IMMEDIATELY SO THAT MITIGATION MEASURES CAN BE PROMPTLY IMPLEMENTED.

**UNFORESEEN TREE REMOVAL**

• TREES THAT WERE DESIGNATED FOR PRESERVATION BUT HAVE DIED OR HAVE BEEN DAMAGED BEYOND REPAIR WILL BE REMOVED AND REPLACED BY THE DEVELOPER WITH TREES OF A SIZE AND SPECIES AS APPROVED BY THE TOWN OF CALEDON DEVELOPMENT AND PLANNING DEPARTMENT.
• IN THE EVENT OF REMOVAL, TO AVOID INTERFERENCE WITH THE EGGS, NESTS OR YOUNG OF BIRDS PROTECTED UNDER THE FEDERAL MIGRATORY BIRDS CONVENTION ACT (GOVERNMENT OF CANADA, 1994), REMOVALS SHOULD NOT OCCUR FROM APRIL 1 TO AUGUST 1 OF ANY GIVEN YEAR. IDEALLY, REMOVAL SHOULD OCCUR FROM AUGUST THROUGH DECEMBER TO AVOID INTERFERENCE WITH ALL NESTING BIRDS. SHOULD REMOVAL BE REQUIRED WITHIN THE APRIL 1 TO AUGUST 1 BREEDING PERIOD, A QUALIFIED AVIAN BIOLOGIST SHOULD CONDUCT A THOROUGH SURVEY IMMEDIATELY PRIOR TO THE DESIRED TREE REMOVAL DATE TO CONFIRM PRESENCE OR ABSENCE OF PROTECTED SPECIES. IF PROTECTED SPECIES ARE PRESENT, REMOVAL CANNOT OCCUR WITHOUT A PERMIT FROM THE CANADIAN WILDLIFE SERVICE.

PREPARED BY: Palmer

| | | | |
|---|---|---|---|
| PROJECT NO. | 1604601 | REVISION: | 2 |
| DATE: | Nov 25, 2020 | SCALE: | 1:700 |
| DRAWN: | BE | DATUM: | NAD 1983 |
| CHECKED: | AA | PROJECTION: | UTM zone 17 |

LEGEND:
- Tree to be retained
- Tree to be removed
- Subject Property
- Critical Root Protection Zone - Retained
- Critical Root Protection Zone - Removed
- Tree Protection Fencing

0 10 20 30 40
metres

CLIENT: Aztec Restoration
PROJECT: 12148 Albion Vaughan

**Fig. 2 - Tree Preservation Plan**

Document Path: G:\Shared drives\Projects 2016\16046 - Aztec Restoration\1604601 - 12148 Albion Vaughan Inc\Mapping\mxd\160461_Figure2_TPP.mxd

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

# Appendix A

- Tree Inventory

**Appendix A. Tree Inventory**

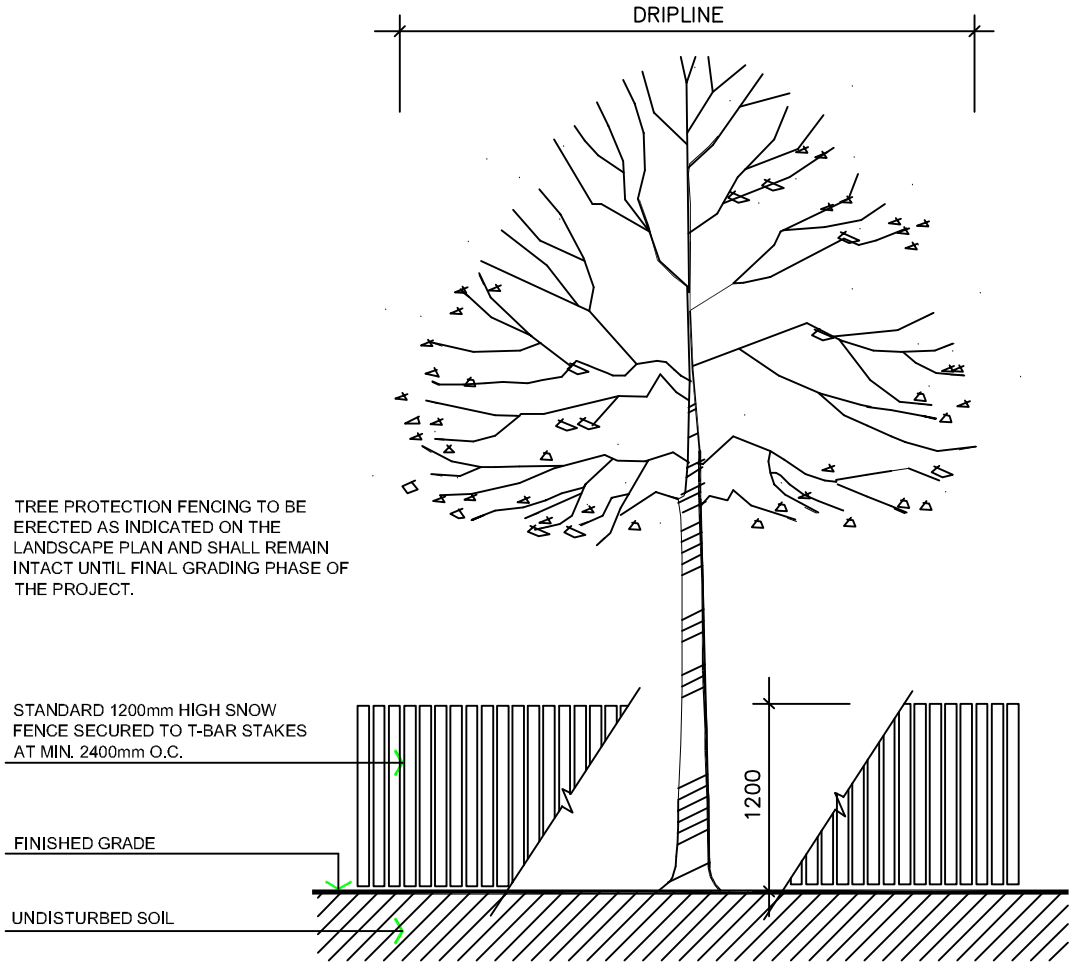
| Tree ID | UTM | Common Name | Species Name | # of trunks | DBH (cm) | Effective DBH (cm)* | Tree Protection Zone (m) | Health/ Condition | Recommendation | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 400 | 604618, 4856207 | Ash sp. | *Fraxinus* sp. | 1 | 21.5 | 21.5 | 1.8 | F | previously removed | 3 stems, 2 cut, EAB |
| 399 | 604629, 4856218 | Ash sp. | *Fraxinus* sp. | 1 | 23.6 | 23.6 | 1.8 | F | previously removed | EAB, large wound at base |
| 398 | 604636, 4856224 | Ash sp. | *Fraxinus* sp. | 1 | 22 | 22 | 1.8 | F | previously removed | No signs of decay or wounds, EAB |
| 397 | 604640, 4856228 | Ash sp. | *Fraxinus* sp. | 1 | 27.7 | 27.7 | 1.8 | F | previously removed | Significant branch dieback, piece of fence through tree, epicormic branching |
| 396 | 604648, 4856234 | Ash sp. | *Fraxinus* sp. | 1 | 21.2 | 21.2 | 1.8 | P | previously removed | EAB, epicormic branching, top is broken, branch dieback |
| 395 | 604644, 4856258 | Apple sp. | *Malus* sp. | 1 | 39.5 | 39.5 | 2.4 | G | remove | Callused wound on trunk, slight lean, good canopy vigour |
| 394 | 604649, 4856263 | Blue Spruce | *Picea pungens* | 1 | 42.5 | 42.5 | 3 | G | remove | Lower branches pruned |
| 393 | 604628, 4856303 | Walnut sp. | *Juglans* sp. | 1 | 48.6 | 48.6 | 3 | G | remove | |
| 392 | 604624, 4856300 | Walnut sp. | *Juglans* sp. | 1 | 35 | 35 | 2.4 | G | remove | Minor branch dieback |
| A, No tag | 604607, 4856286 | Spruce sp. | *Picea* sp.. | 1 | 44.6 | 44.6 | 3 | Dead | remove | Woodpecker damage, beetle holes |
| 391 | 604583, 4856310 | Freeman's Maple | *Acer* x *freemanii* | 1 | 32.7 | 32.7 | 2.4 | G | remove | Minor epicormics, possible butt rot, mechanical damage at base, good canopy |
| B, No tag | 604617, 4856316 | Ash sp. | *Fraxinus* sp. | 1 | N/A | N/A | N/A | Dead | remove | Top broken, codominant stems |
| 390 | 604572, 4856332 | Eastern White Pine | *Pinus strobus* | 1 | 34.5 | 34.5 | 2.4 | G | remove | |
| 389 | 604568, 4856328 | Eastern White Pine | *Pinus strobus* | 1 | 34.2 | 34.2 | 2.4 | G | retain | Top broken |
| 388 | 604565, 4856327 | Eastern White Pine | *Pinus strobus* | 1 | 25 | 25 | 1.8 | G | retain | |

| Tree ID | UTM | Common Name | Species Name | # of trunks | DBH (cm) | Effective DBH (cm)* | Tree Protection Zone (m) | Health/ Condition | Recommendation | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 387 | 604565, 4856327 | Eastern White Pine | *Pinus strobus* | 1 | 26.3 | 26.3 | 1.8 | G | retain | |
| 386 | 604563, 4856322 | Eastern White Pine | *Pinus strobus* | 1 | 37 | 37 | 2.4 | G | retain | |
| 385 | 604559, 4856321 | Eastern White Pine | *Pinus strobus* | 1 | 28.7 | 28.7 | 1.8 | G | retain | |
| No tag, TG1 | 604578, 4856291 | Eastern White Cedar | *Thuja occidentalis* | ~50 | ~10 | 70 | 4.2 | Dead | remove | Majority of stems ≤10 cm dbh, width 5 m, approx. 50 stems. Surrounded by thicket of buckthorn. |
| 384 | 604595, 4856263 | Ash sp. | *Fraxinus* sp. | 1 | 6.5 | 6.5 | 1.2 | G | remove | |
| 383 | 604597, 4856262 | Norway Spruce | *Picea abies* | 1 | 19 | 19 | 1.8 | G | remove | |
| 382 | 604600, 4856264 | Norway Spruce | *Picea abies* | 1 | 14.7 | 14.7 | 1.8 | G | remove | |
| 381 | 604602, 4856262 | Norway Spruce | *Picea abies* | 1 | 33 | 33 | 2.4 | G | remove | |
| 380 | 604604, 4856258 | Norway Spruce | *Picea abies* | 1 | 19.8 | 19.8 | 1.8 | G | remove | |
| 379 | 604602, 4856253 | Norway Spruce | *Picea abies* | 1 | 19 | 19 | 1.8 | G | remove | |
| 378 | 604606, 4856251 | Norway Spruce | *Picea abies* | 1 | 14 | 14 | 1.8 | G | remove | |
| 304 | 604606, 4856248 | Norway Spruce | *Picea abies* | 1 | 12.5 | 12.5 | 1.8 | G | remove | |
| 311 | 604610, 4856246 | Norway Spruce | *Picea abies* | 1 | 30.8 | 30.8 | 2.4 | G | remove | Lower branches pruned |
| 312 | 604609, 4856238 | White Spruce | *Picea glauca* | 1 | 12.9 | 12.9 | 1.8 | G | remove | |
| 307 | 604612, 4856240 | White Spruce | *Picea glauca* | 1 | 18 | 18 | 1.8 | G | remove | |
| 306 | 604615, 4856240 | White Spruce | *Picea glauca* | 1 | 14.2 | 14.2 | 1.8 | G | remove | |
| 305 | 604617, 4856241 | White Spruce | *Picea glauca* | 1 | 17.5 | 17.5 | 1.8 | G | remove | |
| 308 | 604619, 4856242 | White Spruce | *Picea glauca* | 1 | 16.9 | 16.9 | 1.8 | F | remove | Top broken |
| 310 | 604620, 4856244 | White Spruce | *Picea glauca* | 1 | 17 | 17 | 1.8 | G | remove | |
| 301 | 604624, 4856246 | White Spruce | *Picea glauca* | 1 | 14 | 14 | 1.8 | P | remove | Top broken, majority of leaves dead. |

* Effective DBH calculated as the square root of the sum of squares for all tree stems.
**Dead trees in various stages of decay.

# Appendix B

- **Town of Caledon Standard #707 – Tree Preservation**




SPECIFICATIONS FOR THE PROTECTION AND PRESERVATION OF EXISTING VEGETATION:

1. PRIOR TO ISSUANCE OF THE BUILDING PERMIT, ALL EXISTING TREES THAT ARE TO BE PRESERVED SHALL BE FULLY PROTECTED WITH HOARDING (IE SNOW FENCING) OUTSIDE THEIR 'DRIPLINES', TO THE SATISFACTION OF THE TOWN.
2. GROUPS OF TREES AND OTHER EXISTING PLANTINGS TO BE PROTECTED SHALL BE TREATED IN A LIKE MANNER WITH HOARDING AROUND THE ENTIRE CLUMP(S).
3. AREAS WITHIN THE PROTECTIVE FENCING SHALL REMAIN UNDISTURBED AND SHALL NOT BE USED FOR THE STORAGE OF BUILDING MATERIALS OR EQUIPMENT.NO CONTAMINANTS SHALL BE DUMPED OR FLUSHED WHERE FEEDER ROOTS OF TREES EXIST.
4. PRUNE BRANCHES TO REMOVE DAMAGED LIMBS ONLY. DO NOT DAMAGE LEADERS. ALL CUTS OVER 25mm SHALL BE TREATED IN ACCORDANCE WITH APPROPRIATE HORTICULTURAL PRACTICES AS APPROVED BYTHE TOWN.
6. CUTTING OF ROOTS OR CHANGING OF GRADES AROUND EXISTING TREES TO BE PRESERVED WILL NOT BE PERMITTED WITHOUT THE APPROVAL OF THE PUBLIC WORKS AND ENGINEERING DEPARTMENT.
7. TREES THAT HAVE DIED, OR HAVE BEEN DAMAGED BEYOND REPAIR SHALL BE REPLACED AT THE DEVELOPER'S EXPENSE, WITH TREES OF A SIZE AND SPECIES APPROVED BY THE TOWN.
8. IF TREES ARE BEING ADVERSLY AFFECTED BY CONSTRUCTION, A WATERING AND FERTILIZING PROGRAM IS TO BE SET UP TO THE SATISFACTION OF THE TOWN.
9. TREE PRESERVATION FENCE TO BE INSPECTED BY THE CONSULTING LANDSCAPE ARCHITECT AND APPROVED PRIOR TO CONSTRUCTION COMMENCING.

TOWN OF CALEDON

TREE PRESERVATION

| NO. | REVISION | APR'D | DATE |
|---|---|---|---|
| 2 | STANDARD No. 1135 NOW 707, NOTES EDIT | | JUNE 08 |
| 1 | NOTE NO. 9 ADDED | | MARCH 08 |

APR'D: C.C. | DATE: JUNE 08

DRAWN: abal | SCALE: NTS

STANDARD No. 707

# Appendix B

## Correspondence

## Austin Adams

**From:** Eplett, Megan (MECP) <Megan.Eplett@ontario.ca> on behalf of Eplett, Megan (MECP)
**Sent:** December 10, 2020 1:41 PM
**To:** Austin Adams
**Subject:** RE: Proposed SAR Mitigation - 12148 Albion Vaughan Road, Town of Bolton

Hi Austin,

If nests are found and will be removed the rules in regulation for the online registration should be followed. More info can be found here: https://www.ontario.ca/page/alter-structure-habitat-barn-swallow.

Thanks,

Megan

**Megan Eplett | Management Biologist | Permissions and Compliance | Species at Risk Branch | Ontario Ministry of Environment, Conservation and Parks**
**50 Bloomington Road, Aurora, Ontario, L4G 0L8 | Phone: 289-221-1794 |**
**Email:** megan.eplett@ontario.ca

---

**From:** Austin Adams <austin.adams@pecg.ca>
**Sent:** Thursday, December 10, 2020 1:31 PM
**To:** Eplett, Megan (MECP) <Megan.Eplett@ontario.ca>
**Subject:** RE: Proposed SAR Mitigation - 12148 Albion Vaughan Road, Town of Bolton



Thanks Megan,

The report went to the client in draft – When finalizing, I'll build in a requirement for a nest sweep prior to clearance. Including, if nests are found to create a habitat offsetting plan, coordinating with the MECP. Fair enough?

Regards,
**Austin Adams**, M.Sc., EP
Senior Ecologist

Palmer

**| t** (647) 461 2372 **| e** austin.adams@pecg.ca

Learn More:
**www.pecg.ca**

---

**From:** Eplett, Megan (MECP) <Megan.Eplett@ontario.ca>
**Sent:** December 10, 2020 12:47 PM
**To:** Austin Adams <austin.adams@pecg.ca>
**Subject:** RE: Proposed SAR Mitigation - 12148 Albion Vaughan Road, Town of Bolton

Hello Austin,

Apologies for the delay in response regarding this file. I've reviewed the memo you submitted pertaining to bats. Provided the removals during the appropriate timing window impacts to species at risk bats are not anticipated.

Please note as the proposed development includes the removal of a barn, this should be searched for presence/evidence of Barn Swallow if not done already.

Thanks,

Megan

**Megan Eplett | Management Biologist | Permissions and Compliance | Species at Risk Branch | Ontario Ministry of Environment, Conservation and Parks**
**50 Bloomington Road, Aurora, Ontario, L4G 0L8 | Phone: 289-221-1794 |**
**Email:** megan.eplett@ontario.ca

---

**From:** Austin Adams <austin.adams@pecg.ca>
**Sent:** November 25, 2020 1:36 PM
**To:** Species at Risk (MECP) <SAROntario@ontario.ca>
**Subject:** FW: Proposed SAR Mitigation - 12148 Albion Vaughan Road, Town of Bolton



Hello,

I don't think we ever heard about this memo; could someone please respond? It's ben over a year. In one sentence, for mitigation we propose an avoidance timing window of **May 1 to October 31** for tree removals regarding potential SAR Bats. Does that seem appropriate?

The Site in question is a 1.6 ha plot on the Bolton fringe. It is a cleared, developed lot, with only 5 trees that are of a potential DBH size to contain potential Bat Roosting.

Regards,
**Austin Adams**, M.Sc., EP
Senior Ecologist

Palmer

**| t** (647) 461 2372 **| e** austin.adams@pecg.ca

Learn More:
**www.pecg.ca**

---

**From:** Austin Adams <austin.adams@pecg.ca>
**Sent:** November 25, 2020 11:19 AM
**To:** Jeff Andersen <jeff.andersen@ontario.ca>
**Subject:** RE: Proposed SAR Mitigation - 12148 Albion Vaughan Road, Town of Bolton

Toronto and Region Conservation Authority

November 23, 2018 CFN: 56935.04

**BY E-MAIL: ruis@maeng.ca**
Rui Song, Masongsong Associates
7800 Kennedy Road, Suite 201
Markham, Ontario
L3R 2C7

Dear Mr. Song:

**Re: TRCA Concept Development Application**
**12148 Albion Vaughan Road, Caledon**
**Owner: Mike Liburdi – Albion-Vaughan (12148) Inc.**

Thank you for the opportunity to review this Concept Development application (received on October 15, 2018). This letter will outline how the subject property is affected by the policies and programs of the Toronto and Region Conservation Authority's (TRCA) Development, Interference with Wetlands and Alternations to Shorelines and Watercourses Regulation (Ontario Regulation 166/06, as amended) as well as TRCA's Living City Policies for Planning and Development in the Watersheds of the TRCA (LCP). This letter will also outline TRCA staff's response to the proposed conceptual development proposal.

## Purpose of the Application

Based on our review of the conceptual plans submitted, it is our understanding that the purpose of this application is to investigate the feasibility realigning a watercourse located on the subject property in order to facilitate a residential development.

## Applicable TRCA Regulations and Policies

**Ontario Regulation 166/06 (as amended):**

The subject property is within TRCA's Regulated Area as it is traversed by a stream corridor associated with the Humber River Watershed. In accordance with Ontario Regulation 166/06, as amended (Development, Interference with Wetlands and Alteration to Shorelines and Watercourses), a permit is required from the TRCA prior to any of the following works taking place:

a) straightening, changing, diverting or interfering in any way with the existing channel of a river, creek, stream or watercourse, or for changing or interfering in any way with a wetland;
b) development, if in the opinion of the Authority, the control of flooding, erosion, dynamic beaches or pollution or the conservation of land may be affected by the development.

Development is defined as:

i) the construction, reconstruction, erection or placing of a building or structure of any kind,

ii) any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure,
iii) site grading,
iv) the temporary or permanent placing, dumping or removal of any material originating on the site or elsewhere.

**TRCA's Living City Policies:**
As noted above, the subject property is traversed by stream corridor. To ensure development is appropriately setback from the limit of natural features and their associated hazards, TRCA typically requires a minimum 10 metre buffer, which is considered part of the stream corridor, be established from the greater of the following constraints:

- The physical Top of Bank (TOB);
- The Regulatory Floodplain (i.e. greater of the Regional Storm or 100 Year Flood event standards);
- The limit of the Long Term Stable Top of Bank (LTSTOB);
- The meander belt of the watercourse; or
- The limit of contiguous vegetation associated with the valley corridor; or

**Application Background**
Based on TRCA's review of the materials submitted in support of this application, it is our understanding that in recent years, the section of the stream corridor traversing the subject property had been realigned by a previous landowner. The landowner did not consult proper authorities prior to conducting the works and as such, the watercourse is significantly narrower and contains less volume than the previous condition. This has ultimately led to negative impacts from an ecology perspective as natural channel design methods were not implemented. Furthermore, as the channel now has less capacity, the property is subject to increased levels of flooding.

**Application-Specific Comments**
As the highly altered state of the stream corridor has led to a decrease in ecological function and flood storage capacity, it is TRCA opinion that a realignment of the channel traversing the subject lands can be entertained. However, the realignment must follow natural channel design principles as well as improve flooding conditions.

**General:**
1. Please note that a design brief as well as relevant figures/drawings must be prepared for the proposed realigned channel. Please refer to TRCA's Channel Modification Requirements for more information:
   - https://trca.ca/app/uploads/2016/02/CHANNEL_MODIFICATION_REQUIREMENTS.pdf.

2. Once an appropriate route/design has been selected for the watercourse, all applicable limits (i.e. meander belt, Regulatory Floodplain etc.) should be plotted on the development design drawings. As noted above, TRCA policies require that development must be setback a minimum of 10 metres from the outermost limit of a stream corridor.

**Planning Ecology:**

3. TRCA Planning Ecology staff reviewed the Terms of Reference (ToR) provided for the Environmental Impact Study (EIS) (prepared by Palmer Environmental, dated November 15, 2018) and have no concerns with the proposed scoping. Please note that the EIS should be included within the above noted design brief (or as an attachment to the document).

4. Please note that this watercourse is classified as a 'cool water' stream and the timing window for conducting any in-water or near-water works is July 1-September 15.

5. Furthermore, the Ministry of Natural of Resources and Forestry (MNRF) should also be consulted as this watercourse may be deemed to be contributing Redside Dace habitat. Please provide all correspondence from the MNRF within the requisite design brief.

**Water Resources Engineering:**

6. The cut and fill approach submitted in support of this application is consisted with TRCA's Cut-Fill Guidelines. However, as TRCA's current floodplain modelling does not account for the recent channel realignment completed by the previous property owner; a hydraulic model must be created for this "revised existing" condition. As such, please cut the new cross sections (2223.131, 2223.132, 2223.133 and 2223.134) using existing ground conditions/elevations and include them in a revised (or refined) existing HEC RAS model. Once the revised model is run, it can be compared with that of the proposed condition. It must be demonstrated that there will be no negative impacts in water surface elevations at each cross section (or upstream and downstream of the subject site) as a result of the proposed channel realignment. A summary table comparing the resulting water surface elevations for all return periods along with a digital copy of the HEC RAS model including existing (pre-channel realignment completed by previous property owner), revised existing (post-channel realignment completed by previous property owner) and proposed condition must be submitted in separate files. This information should be included within (or as an attachment to) the requisite design brief.

7. Recommendations provided within the Erosion Hazard Assessment memo prepared by Palmer Consulting (dated May 3, 2017) should be included in the proposed channel realignment.

**PERMITTING**

As noted above, the subject property is located within TRCA's Regulated Area. On this basis, a TRCA permit is required from this Authority prior to the proposed works commencing on the subject site, pursuant to Ontario Regulation 166/06, as amended. Details with respect to permit submission requirements are available at our website (https://trca.ca/planning-permits/apply-for-a-permit/).

**RECOMMENDATION**

Please be advised that this letter outlines TRCA's position with regards to the formal Concept Development application submitted for the subject property. Based on the above noted comments, we have no fundamental objection to the realignment of the stream corridor traversing the subject property provided natural channel design principles are implemented. Furthermore, the proposed condition should clearly result in a net ecological gain as well as demonstrate that no negative impacts to flooding will occur. As part of any development

proposal for the site, it is also our expectation that appropriate buffers from the realigned feature will be provided.

I trust these comments are of assistance. Should you have any further questions or comments, please do not hesitate to contact the undersigned.

Sincerely,

Nick Cascone, M.Sc.Pl
Planner
Planning and Development
ncascone@trca.on.ca
Extension 5927

NC/

PALMER
ENVIRONMENTAL
CONSULTING
GROUP INC.

*74 Berkeley Street, Toronto, ON, M5A 2W7 t 647-795-8153*

October 23, 2018

Nick Cascone
Planner I, Planning and Development
Toronto and Region Conservation Authority
101 Exchange Avenue,
Vaughan, ON, L4K 5R6
ncascone@trca.on.ca

Dear Nick,

**Re: Terms of Reference for Scoped Environmental Impact Study at 12148 Albion Vaughan Road, Bolton, Town of Caledon, ON**

---

## Introduction

Palmer Environmental Consulting Group (PECG) is pleased to provide the following proposed Terms of Reference (TOR) for the completion of a Scoped Environmental Impact Study (EIS) located at 12148 Albion Vaughan Road in Bolton, Town of Caledon.

The subject property is currently occupied by residential and commercial buildings, including one barn, and manicured lawn with scattered trees. One watercourse (Rainbow Creek) enters the property at the northwest and runs southward along the west edge. Immediately adjacent lands include a residential property to the north and commercial to the south. A small wooded riparian area is present within the residential property to the north. Albion Vaughan Rd and Regional Road 50 flank the property to the east and west, respectively.

The objectives of the scoped EIS are to inventory and evaluate any existing natural heritage features and ecological functions present within and adjacent to the subject property, determine an appropriate development limit for protection of these features, where applicable, and/or recommend mitigation measures to address potential impacts. PECG has prepared the following TOR for review and approval by Toronto and Region Conservation Authority (TRCA) to guide the Scoped EIS completion.

## Background

The Town of Caledon Official Plan requires that development applications identify and evaluate elements of its ecosystem framework on or adjacent to the subject property that may be impacted by the development. These include Natural Core Areas, Natural Corridors, Supportive Natural Systems, and Natural Linkages, as described further in Table 3.1 of the Official Plan. Known Natural Core Areas and Natural Corridors are mapped as EPA on Official Plan Schedule C (Bolton Land Use Plan). None are shown on the subject property. A preliminary search of available background data indicates no designated areas such as Provincially Significant Wetlands, Areas of natural and Scientific Interest, or Environmentally Sensitive Features are known from or immediately adjacent to the site. The watercourse and associated flood limit is regulated under TRCA's O. Reg. 166/06 under the Conservation Authorities Act.

## Proposed Scope of Work

### 1. Background Information Review and Desktop Assessment

A thorough background review will be conducted as part of the Scoped EIS. Documents reviewed will include background information relating to the site's biological and physical resources including records for Species at Risk. Natural heritage mapping and associated environmental policies areas at the provincial, regional and local levels will be identified. We will also consult with TRCA and Ministry of Natural Resources and Forestry (MNRF) regarding any other records they may have of Species at Risk on or near the subject property.

### 2. Field Investigations

The following field investigations have been completed / are proposed by PECG to describe the conditions of the on-site environmental features:

a. Ecological Communities Assessment
The ecological communities comprising the subject property will be described in accordance with Ecological Land Classification of Southern Ontario (ELC) protocols. The ELC will include inventory of vegetation and description of soils.

b. Fish Habitat Characterization
A characterization of Rainbow Creek was completed November 29, 2016 on the property to generally characterize fish habitat within the watercourse.

c. Species at Risk (SAR) Screening
Conduct a SAR screening for potential habitat opportunities (e.g., Barn Swallow) or occurrences on site (e.g., Butternut).

d. Tree Inventory and Preservation Plan
A tree inventory has been conducted on the property on November 7, 2016. A Preservation Plan will be prepared consistent with the municipal and agency requirements.

In addition, all observations of incidental wildlife will be recorded during each of PECG's site visits.

### 3. Reporting

A written report will be prepared for circulation to the TRCA and Town of Bolton as part of the application being completed by the proponent. The final report will provide a summary of relevant policy and background information reviewed and a description of site conditions and results of field investigations. The report will provide an assessment of potential impacts from the proposed works on existing natural heritage features, as well as a discussion of suitable measures for mitigation of these impacts (i.e. development setbacks, timing recommendations, etc.). The report will also provide ecological input to other disciplines (e.g., engineering, hydrogeology).

## Closing

We trust that the proposed TOR for completion of a Scoped EIS at 12148 Albion Vaughan Road in Bolton, fulfills the TRCA's requirements.

Please feel free to contact me at 647 795 8153 ext.110 if you have any questions.

Yours truly,
**Palmer Environmental Consulting Group Inc.**

Jason Cole, M.Sc.
Partner

# Appendix D

## Erosion Hazard Assessment (Palmer, 2018)

PALMER
ENVIRONMENTAL
CONSULTING
GROUP INC.

374 Wellington Street West, Suite 3, Toronto, ON M5V 1E3 t 647-795-8153

# Memorandum

Date: May 3, 2017

Project #: 160461

To: Mike Liburdi
12148 Albion Vaughan Inc.

From: Dan McParland, M.Sc., P.Geo. and Robin McKillop, M.Sc., P.Geo.

cc: Jason Cole, M.Sc., P.Geo.

Re: Erosion Hazard Assessment of Robinson Creek
12148 Albion Vaughan Road in Bolton, Town of Caledon

## 1. Introduction

Palmer Environmental Consulting Group Inc. (PECG) is pleased to provide 12148 Albion Vaughan Inc. with our erosion hazard assessment of Robinson Creek at 12148 Albion Vaughan Road, in Bolton, Town of Caledon (**Figure 1**), in order to support its planned development of residential units on the property. Within the property limits of 12148 Albion Vaughan Road, Robinson Creek has been historically realigned and straightened, with the most recent realignment occurring between 2009 and 2013. As such, PECG delineated an erosion hazard zone (i.e. meander belt) according to Toronto and Region Conservation Authority (TRCA) protocols from a downstream surrogate reach that had a more natural, meandering planform. Furthermore, infrastructure and property limits that are potentially at risk from fluvial geomorphological processes were identified, and recommendations to improve the geomorphological form and function of Robinson Creek are provided.

A summary of methods (Section 2) is followed by an overview of the physical setting and historical changes (Section 3); a description of the Robinson Creek channel morphology at 12148 Albion Vaughan Road (Section 4); a characterization of the erosion hazards within the property (Section 5); an overview of potential channel enhancement opportunities (Section 6); and our final conclusions and recommendations (Section 7). Field photographs referenced in the text below, as well as additional illustrative ones, are included in **Appendix A**.

## 2. Methods

The fluvial geomorphology of Robinson Creek was assessed through a combination of desktop and field investigations. We reviewed a number of important background information sources for the study area, including TRCA's Humber River State of the Watershed Report – Fluvial Geomorphology (2008a) and

Geology and Groundwater Resources (2008b); existing Ontario Geological Survey surficial geology and bedrock mapping (Ontario Geological Survey, 2014a,b); and HEC-RAS flood modelling data for the Robinson Creek catchment. Historical aerial photography provided by Ecolog ERIS from 1946 and recent aerial photography/satellite imagery from Google Earth (2004, 2006, 2009, 2013, 2015, 2016) provided a basis for characterizing historical channel conditions and forecasting future channel adjustments along Robinson Creek. Additional historical aerial photography from the second half of the 20th century was not acquired because it would not have provided any additional insight into natural fluvial processes along the straightened channel.

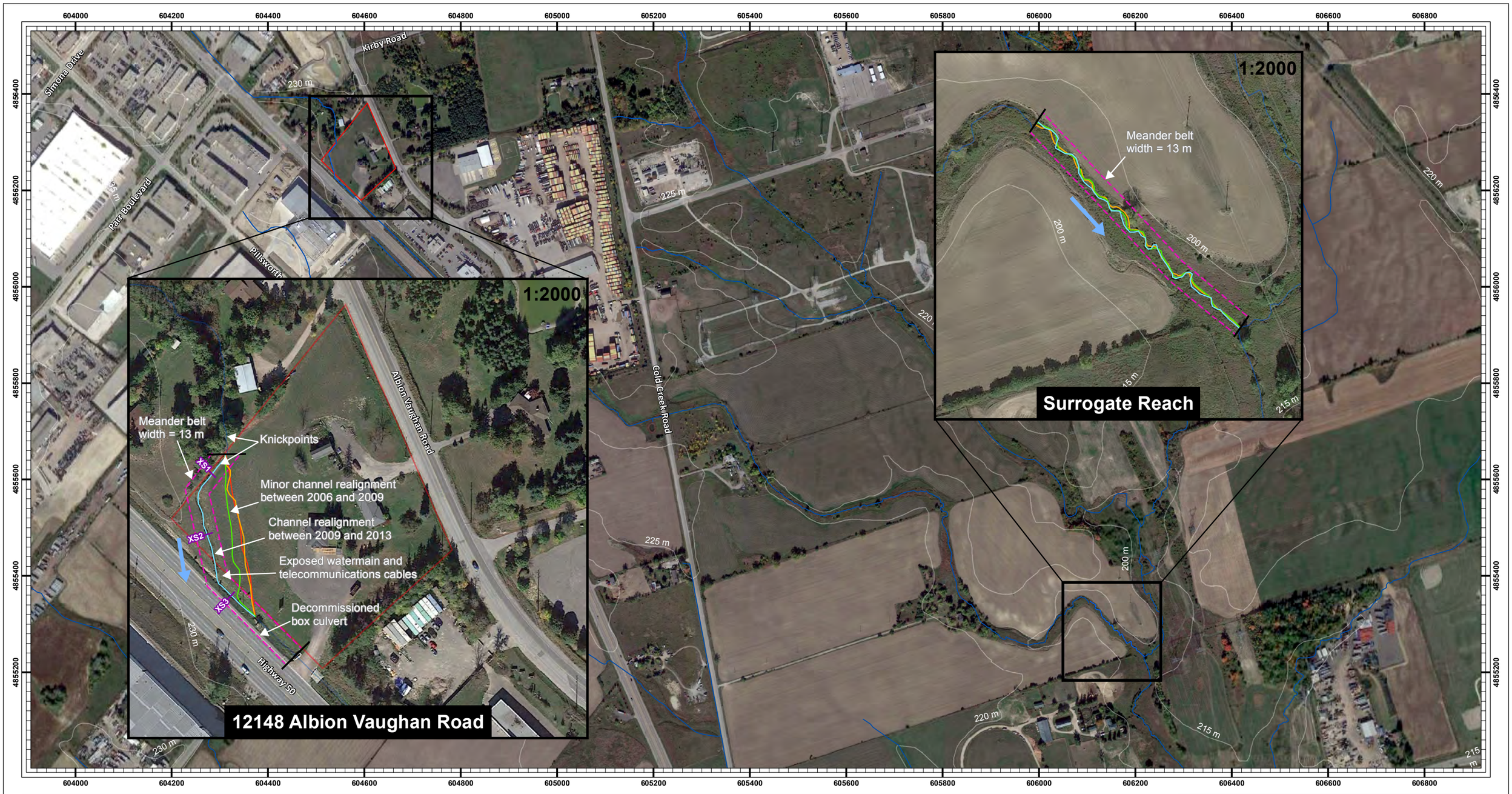
Field reconnaissance was completed on February 9, 2017 by qualified PECG staff. The majority of the channel had ice cover, and a significant rain event occurred on February 7th (15.4 mm of rain was recorded at Toronto's Pearson International Airport). The purpose of the visit was to observe channel conditions, examine patterns and processes of local erosion, and ground truth aerial photograph-based interpretations in order to delineate an erosion hazard zone and inform any possible channel enhancement opportunities. Three 'rapid' cross-sections were measured along Robinson Creek within the property to approximate bankfull and top of bank dimensions (**Figure 1**).

The existing erosion hazard zone (i.e. meander belt) was delineated within the study area, following TRCA's *Belt Width Delineation Procedures* (Parish Geomorphic, 2004), in order to inform predictions of future erosion along Robinson Creek at 12148 Albion Vaughan Road. Within the study site, Robinson Creek has been historically straightened (before 1946) and recently realigned, such that it no longer encompasses its natural meandering corridor. As such, a downstream reach of Robinson Creek displaying a meandering planform was used as a surrogate for the straightened/realigned study reach. The surrogate reach, located ~2 km downstream of 12148 Albion Vaughan Road, was straightened prior to 1946 but has since readopted a more natural meandering planform (**Figure 1**). The meander belt of the surrogate reach was established by delineating and then buffering the meander belt axis until the boundary lines encompassed all meanders. The final meander belt was delineated through a further, parallel set-back of the boundary lines by the average bankfull width as well as a 10% factor of safety to account for potential future changes in the hydrological regime associated with upstream land use and climate change.

As a further check of the delineated meander belt for the surrogate reach, an empirical meander belt width formula developed by TRCA (Parish Geomorphic, 2004) was applied to the study reach:

$$Meander\ belt\ width = 8.32 \times \ln\left(A_w \times 9806 \times Q_{bf} \times S\right) - 14.83$$

where $A_w$ is the drainage area of the channel, $Q_{bf}$ is the bankfull discharge, and $S$ is the slope of the watercourse. $A_w$ was determined from TRCA contour data and site survey data provided to PECG by Masongsong Associates Engineering Ltd., $S$ was approximated from a recent property survey (June 2016) of 12148 Albion Vaughan Road, and $Q_{bf}$ was established from observed bankfull dimensions during field reconnaissance and $S$.




**Client:** Aztec Restoration Inc.

**Project:** 12148 Albion Vaughan Road

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
DESIGNED: D. McParland
CHECKED: R. McKillop
PROJECT: 151071
UPDATED: Apr 26, 2017

## LEGEND

- CROSS SECTION
- REACH BREAK
- MEANDER BELT BOUNDARY
- FLOW DIRECTION
- WATERCOURSE (OHN)
- CONTOUR (5 m INTERVAL)
- SUBJECT PROPERTY

**Historical Channel Centrelines**

- 2016
- 2009
- 2004
- 1946

NOTE: Additional years of aerial photography reviewed qualitatively but excluded from quantitative analyses due to poor quality imagery or georeferencing.

N

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

SCALE: 1:7500

0 100 200 300 400

METRES

# Study Area and Erosion Hazard Limit

# FIGURE 1

DATA SOURCES: Imagery ©2017 Google (Cnes/Spot Image, DigitalGlobe, First Base Solutions). Watercourses provided by Ontario Hydro Network (OHN) - 2015. Contours provided by Ontario MNR - 2015. This map contains information licenced under the Open Government Licence, Ontario.

Document Path: C:\Egnyte\Shared\Projects\Active\160461 - Aztec Restoration\160461 - 12148 Albion Vaughan Inc\Mapping\mxd\160461_Figure1_Erosion.mxd

## 3. Physical Setting & Historical Changes

Robinson Creek, a headwater tributary of Humber River, originates on the drumlinized till plain of the South Slope and drains southward along the gently sloping, bevelled Peel-Markham till plain to its confluence with Rainbow Creek north of Highway 7 in Vaughan (Ontario Geological Survey, 2014a; Cole Engineering, 2014). The drainage network of Robinson Creek is a typical branched drainage network, with relatively straight, southward-flowing watercourses on an erosion-resistant till surface of uniform slope. Within the subject property, Robinson Creek is a 2$^{nd}$-order stream with an upstream drainage area of ~1.8 hectares (TRCA, 2008a). Boreholes on the property revealed the topsoil ranged in thickness from 3 to 30 cm. Below the topsoil, earth fill ranged in thickness from 0.6 and 1.1 m. The earth fill was underlain by silty clay till and silty clay that was laminated with sand and silt deposits (Soil Engineers Ltd., 2017). Overburden thickness is greater than 100 m within and near the study site (Ontario Geological Survey, 2014b, TRCA, 2008b).

Historically, agriculture was the dominant land use within the current boundaries of the Town of Bolton. In the 1946 aerial photograph, the majority of natural vegetation in the Robinson Creek catchment had been removed and the stream channels had been realigned and straightened, including within the property limits of 12148 Albion Vaughan Road. Upstream urban development has occurred since 1946 and has accelerated over the past two decades. Currently, the upstream catchment is mostly urbanized leading to rapid hydrological response to upstream runoff, which contributes to channel instability (Crozier & Associates, 2014).

In the 2004 Google Earth imagery, Robinson Creek had a nearly identical planform to the channel alignment observed in the 1946 aerial photograph, indicating the straightened planform remained unchanged within the study area for over half a century (**Figure 1**). Between August 2006 and August 2009, the channel was realigned and shifted slightly west and the riparian vegetation was cleared within the property limits. A more significant realignment westward occurred between August 2009 and September 2013 within the subject property.

## 4. Description of Channel Morphology

A short reach of Robinson Creek extends from the northwestern property limit downstream to the existing driveway off Highway 50 (**Figure 1**). The reach exhibits a straight planform, has no riparian vegetation (other than maintained grasses), and was realigned between 2009 and 2013. Upstream of the reach, the channel has a slightly sinuous planform and is lined by trees (**Photo 1**). Downstream of the reach, the channel essentially functions as a roadside drainage ditch (**Photo 12**). The reach-averaged bed slope through the straightened reach was estimated as 0.004 m/m from a recent property survey. Two small knickpoints, or abrupt ‘steps’ along the channel bed, were observed near the upstream end of the reach suggesting the profile of the channel is still actively adjusting to previous anthropogenic alterations and changes to flow and sediment supply regimes. As well, the channel has down-cut (i.e. degraded) through approximately 0.8 to 1 m of earth fill and has exposed the underlying silty clay till. As a result of the down-cutting, the cross-sections are entrenched (i.e. bankfull elevation well below top of bank) and have a low bankfull width:depth ratio (**Table 1**). Based on the average bankfull dimensions and the surveyed channel gradient, a bankfull discharge of 0.77 m$^3$/s was approximated for the study reach.

**Table 1. Cross-sectional dimensions**

| Measure | Cross-section 1 | Cross-section 2 | Cross-section 3 | Average |
|---|---|---|---|---|
| Wetted depth (m) | 0.05 | 0.15 | 0.15 | 0.12 |
| Wetted width (m) | 1.10 | 2.00 | 1.80 | 1.63 |
| Average bankfull depth (m) | 0.40 | 0.50 | 0.30 | 0.40 |
| Maximum bankfull depth (m) | 0.60 | 0.70 | 0.50 | 0.60 |
| Bankfull width (m) | 1.80 | 2.10 | 2.00 | 1.97 |
| Bankfull width:average depth | 4.50 | 4.20 | 6.67 | 5.12 |
| Top of bank depth (m) | 1.20 | 1.30 | 1.30 | 1.27 |
| Top of bank width (m) | 2.70 | 3.50 | 4.50 | 3.57 |

Furthermore, bed degradation has exposed a watermain and telecommunications cables running parallel to Highway 50 (**Photo 7**, **Figure 1**). Channel entrenchment has resulted in undercut banks, bank slumping, and gullying (**Photos 3** and **4**). In general, the western bank is near vertical whereas the eastern bank has a gentler slope (**Photo 5**). Bed material was mostly coarse sands, gravel, and scattered cobble overlying a silty clay till. A decommissioned box culvert under Highway 50 was observed ~25 m west of the existing driveway (**Photo 10**, **Figure 1**). Riprap was scattered on the channel banks in the vicinity of the decommissioned culvert and the existing driveway.

## 5. Erosion Hazard Limits

Robinson Creek is within an *unconfined* setting within the subject property, so its erosion hazard limits are defined based on its meander belt width (MNR, 2001).

### 5.1 Meander Belt Width

A preliminary meander belt width of 9 m was delineated for the surrogate reach based on the 2004, 2009, and 2016 planforms. The 1946 planform was not used in the delineation because it was unnaturally straight and based on poor quality (resolution) aerial photography. The final meander belt width for the surrogate reach is 13 m, which includes the addition of the bankfull width of the surrogate reach (2.4 m) and a 10% factor of safety for future changes in the hydrological regime (**Figure 1**). The delineated meander belt for the surrogate reach was similar to the empirically derived meander belt width for the subject reach (18 m), which suggests the surrogate reach is an appropriate proxy.

### 5.2 At-risk Property and Infrastructure

The recently realigned channel has actively down-cut through earth fill, which has led to widespread bed scour and bank destabilization within the subject property. The following could be at risk from future channel degradation and/or channel migration:

- *Western property line* – Bank instability and lateral channel adjustment could lead to the channel migrating past the western property limit into the adjoining property.

- *Highway 50* – Bank instability and lateral channel adjustment could undermine the Highway 50 embankment.
- *Buried utilities* – Continued bed degradation and lateral channel adjustment could continue to expose and, potentially, compromise an existing watermain and telecommunications cables parallel to Highway 50.

## 6. Channel Enhancement Opportunities

Within the property limits of 12148 Albion Vaughan Road, observed instabilities along Robinson Creek are a response to historical and recent channel realignments as well as upstream urban development (changes to flow regime and sediment supply). Several opportunities to enhance the fluvial geomorphological form and function of Robinson Creek are worth considering:

- *Natural, meandering planform* – A more sinuous planform would increase the channel length (decrease channel gradient), which would reduce the severity of bed degradation and bank undercutting processes.
- *Wider, shallower cross-section* – Erosive forces would be more evenly distributed across a wider and shallower cross-section (width:depth ratio > 10), which would reduce bed degradation and bank instability.
- *Lower bank angle* – A reduction in bank angle would decrease the potential for erosion through scour (fluvial) and slumping (geotechnical) processes.
- *Bioengineering on banks* – Application of bioengineering techniques (e.g. brush layer) would help protect the channel banks from fluvial erosion and slumping, and would reduce flow velocities.
- *Riparian vegetation* – The rooting systems of riparian vegetation would increase the shear strength of the channel banks.

The channel enhancement opportunities identified above would not only improve the fluvial geomorphological form and function of Robinson Creek but would also improve the ecological function of the Robinson Creek channel corridor.

## 7. Conclusions

Robinson Creek, a headwater tributary of Humber River, no longer exhibits a natural, sinuous planform within the property limits of 12148 Albion Vaughan Road due to historical channel realignment and straightening. The most significant realignments occurred before 1946 and between 2009 and 2013. The recently realigned channel has quickly down-cut through earth fill, resulting in widespread bed scour and collapsing banks. Furthermore, a watermain and telecommunications cables parallel to Highway 50 have been exposed as a result of the bed degradation. Due to the historical and recent channel realignment, a downstream sinuous surrogate reach was used to quantify the erosion hazard limits (i.e. meander belt) for the realigned watercourse according to TRCA protocols. A meander belt width of 13 m, which includes

a 10% factor of safety for potential future changes in the hydrological regime, was established for Robinson Creek within the study site.

Consideration should be given to implementing one or more fluvial geomorphological enhancement opportunities that would help reduce tractive forces along the channel bed and toes of the banks. Furthermore, bioengineering techniques (e.g. brush layers) and riparian plantings would help improve the shear strength of the channel banks and reduce channel migration potential.

## References

Cole Engineering, 2014. Rainbow Creek Master Plan Update Study. Prepared for The City of Vaughan, June 2014.

Crozier & Associates Inc., 2014. Functional Servicing, Preliminary Stormwater Management Report. Prepared for Bolton Gateway Developments Inc., Town of Caledon, and Region of Peel, January 2014.

Ontario Geological Survey, 2014a. Surficial Geology, Southern Ontario, Google Earth layer, accessed online Oct. 20, 2016: http://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth/surficial-geology.

Ontario Geological Survey, 2014b. Paleozoic Geology, Southern Ontario, Google Earth layer, accessed online Oct. 20, 2016: http://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth/paleozoic-geology.

Ontario Ministry of Natural Resources (MNR), 2001. Great Lakes – St. Lawrence River System and Large Inland Lakes. Technical Guides for Flooding, Erosion, and Dynamic Beaches in Support of Natural Hazards Policies 3.1 of the Provincial Policy Statement. Watershed Science Centre, Trent University.

Parish Geomorphic, 2004. Belt Width Delineation Procedures. Prepared for Toronto and Region Conservation Authority, September 27, 2001 (Revised January 30, 2004).

Soil Engineers Ltd., 2017. A Geotechnical Investigation for Proposed Residential Development – 12148 Albion-Vaughan Road, Town of Caledon. Reference No. 1609-S145, January 2017.

Toronto and Region Conservation Authority, 2008a. Humber River State of the Watershed Report – Fluvial Geomorphology, 29 p.

Toronto and Region Conservation Authority, 2008b. Humber River State of the Watershed Report – Geology and Groundwater Resources, 84 p.

PALMER
ENVIRONMENTAL
CONSULTING
GROUP INC.

# Appendix A

## Photograph Log

# Photograph Log

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

| Client Name: | Project No. | Site Location: |
|---|---|---|
| Aztec Restoration | 160461 | 12148 Albion Vaughan Rd., Bolton, ON |

| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 1 | 2/10/2017 | North (upstream) |

**Description**

Looking upstream at knickpoint in adjacent property


| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 2 | 2/10/2017 | Northeast (upstream) |

**Description**

Looking upstream along northwest boundary of property

# Photograph Log

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

| Client Name: | Project No. | Site Location: |
|---|---|---|
| Aztec Restoration | 160461 | 12148 Albion Vaughan Rd., Bolton, ON |

| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 3 | 2/10/2017 | South (downstream) |

**Description**

Exposed cut-bank


| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 4 | 2/10/2017 | South (downstream) |

**Description**

Bank slumping

# Photograph Log

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

| Client Name: | Project No. | Site Location: |
|---|---|---|
| Aztec Restoration | 160461 | 12148 Albion Vaughan Rd., Bolton, ON |

| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 5 | 2/10/2017 | South (downstream) |

**Description**

Gently sloping east bank and near-vertical west bank


| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 6 | 2/10/2017 | North (upstream) |

**Description**

Exposed west bank

# Photograph Log

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

| Client Name: | Project No. | Site Location: |
|---|---|---|
| Aztec Restoration | 160461 | 12148 Albion Vaughan Rd., Bolton, ON |

| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 7 | 2/10/2017 | South (downstream) |

**Description**

Exposed watermain and telecommunication cables


| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 8 | 2/10/2017 | Northwest (upstream) |

**Description**

Confluence with Highway 50 drainage ditch (middle)

# Photograph Log

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

| Client Name: | Project No. | Site Location: |
|---|---|---|
| Aztec Restoration | 160461 | 12148 Albion Vaughan Rd., Bolton, ON |

| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 9 | 2/10/2017 | Southeast (downstream) |

**Description**

Channel flowing parallel to Highway 50


| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 10 | 2/10/2017 | Southeast (downstream) |

**Description**

Old Highway 50 box culvert crossing and riprap on banks

# Photograph Log

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

| Client Name: | Project No. | Site Location: |
|---|---|---|
| Aztec Restoration | 160461 | 12148 Albion Vaughan Rd., Bolton, ON |

| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 11 | 2/10/2017 | Northwest (upstream) |

**Description**

Looking upstream from driveway


| Photo #: | Date. | Direction Photo Taken |
|---|---|---|
| 12 | 2/10/2017 | Southeast (downstream) |

**Description**

Looking downstream from driveway

# Appendix E

## Arborist Report and Tree Protection Plan (Palmer, 2020)

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

December 23, 2020

Mike Liburdi
12148 Albion Vaughn Inc.
27 Fenton Way
Brampton ON
L6P 0P4

Dear Mike Liburdi:

**Re: Arborist Report and Tree Preservation Plan for 12148 Albion Vaughan Road, Bolton (PECG#160461)**

## 1. Introduction

Palmer has completed an Arborist Report for the proposed development of 12148 Albion Vaughan Road, in the community of Bolton, Town of Caledon, Region of Peel (the Subject Property).

Currently, residential buildings, including one house, a barn and manicured lawns with scattered trees occupy the Subject Property (**Figure 1**). Robinson Creek, a headwater tributary of Humber River, enters the property at the northwest corner and runs southward along the western edge, lying within the Toronto and Region Conservation Authority (TRCA) Regulatory Floodplain.

This report includes an assessment of applicable policy, methods and results of the tree inventory completed within the Subject Property, and the identification of trees to be retained and trees to be removed. Recommendations for tree removals, replacement tree species and planting locations are also provided in this report as well as recommended tree protection measures for trees to be retained.

## 2. Guidance Documents

This Arborist Report and Tree Preservation Plan is guided by The Town of Caledon *Development Standards, Polices & Guidelines* (Town of Caledon, 2009), supplemented by the City of Toronto *Tree Protection Policy and Specifications for Construction Near Trees* (2016). The Town of Caledon document guides the content of the report and details the standards for tree protection measures. Where additional construction management and monitoring guidance was required, the City of Brampton *Tableland Tree Assessment Guidelines* (2018) were employed, employing standards from the nearest neighbouring municipality.

## 3. Methods

A tree inventory was completed for trees within and adjacent to the area proposed for development on the Subject Property. The tree inventory was completed by a Certified Arborist on November 7, 2016.

Information collected during the inventory includes species name, tree tag number, diameter at breast height (DBH), location, a general health assessment, and notes on tree trunk and canopy conditions.

# 4. Results

## 4.1 Tree Inventory

The tree inventory comprised 34 individual trees, with an additional grouping of untagged Eastern White Cedar trees. The inventory included 14 trees and one (1) grouping which were native species (43%), nine (26%) trees that were non-native, and 11 (31%) trees were identified to the genus only. There were 32 trees identified as live, two (2) individual dead trees and a grouping of dead trees on the Subject Property (**Table 1**). The inventory included 11 (31%) trees which were deciduous species and 24 (69%) trees that were coniferous species. The trees identified as dead were not tagged during this inventory. All are trees commonly found and/or planted in southern Ontario landscapes. There were no Species at Risk (SAR) trees observed, such as Butternut (*Juglans cinerea*); although there were several trees at high risk of disease or infestation, including Ash species (*Fraxinus* sp.). Complete tree inventory details are provided in **Appendix A.** The locations of inventoried trees are shown on **Figure 2**.

***Table 1. Summary of Tree Inventory Results***

| Scientific Name | Common Name | Total Number |
|---|---|---|
| *Acer* x *freemanii** | Freeman's Maple | 1 |
| *Fraxinus sp.* | Ash Species | 7 |
| *Juglans* sp. | Walnut Species | 2 |
| *Malus* sp. | Apple Species | 1 |
| *Picea* sp. | Spruce Species | 1 |
| *Picea abies* | Norway Spruce | 8 |
| *Picea glauca** | White Spruce | 7 |
| *Picea pungens* | Blue Spruce | 1 |
| *Pinus strobus** | Eastern White Pine | 6 |
| *Thuja occidentalis** | Eastern White Cedar | 1 Grouping |
| **Total** | | **35** |

*Native species

## 4.2 Trees to be Retained

A total of five (5) trees are proposed to be retained (**Table 2**). All six are Eastern White Pine, a native species. These trees are considered to be in good to fair health and are located along the northwestern property boundary of the Subject Property (**Figure 2**).

***Table 2. Trees Proposed to be Retained***

| Scientific Name | Common Name | Good to Fair Health | Poor Health | Total Count |
|---|---|---|---|---|
| *Pinus strobus** | Eastern White Pine | 5 | 0 | 5 |

| | | | |
|---|---|---|---|
| **Total trees to be retained** | **5** | **0** | **5** |

### 4.3 Trees to be Removed

A total of 24 inventoried trees and a tree grouping are proposed to be removed to accommodate the proposed development (**Table 3**). This includes ten (42%) trees of which are native, nine (38%) trees are non-native and six (20%) trees were identified to the genus only. The trees proposed to be removed are scattered throughout the Subject Property (**Figure 2**). Most of these trees were observed to be in good to fair health; however, there were several ash trees that were affected by Emerald Ash Borer (*Agrilus planipennis*) and in poor health. There was also a grouping of dead Eastern White Cedar in the northern portion of the Subject Property. Palmer understands that the five (5) Ash trees located along the hedgerow at the southeastern property boundary were removed subsequent to the inventory (between 2016 and 2018), likely due to adjacent development (**Figure 2, Table 3**). It is assumed that removal conditions have been previously obtained from the municipality for these trees; therefore, these trees will not be proposed for compensation.

***Table 3. Trees Proposed to be Removed***

| Scientific Name | Common Name | Fair to Good Health | Poor Health | Dead** | Total Count |
|---|---|---|---|---|---|
| **Trees to be Removed** | | | | | |
| *Acer* x *freemanii** | Freeman's Maple | 1 | 0 | 0 | 1 |
| *Fraxinus* sp. | Ash | 1 | 0 | 1 | 2 |
| *Juglans* sp. | Walnut | 2 | 0 | 0 | 2 |
| *Malus* sp. | Apple | 1 | 0 | 0 | 1 |
| *Picea* sp. | Spruce | 0 | 0 | 1 | 1 |
| *Picea abies* | Norway Spruce | 8 | 0 | 0 | 8 |
| *Picea glauca** | White Spruce | 6 | 1 | 0 | 7 |
| *Picea pungens* | Blue Spruce | 1 | 0 | 0 | 1 |
| *Pinus strobus** | Eastern White Pine | 1 | 0 | 0 | 1 |
| *Thuja occidentalis** | Eastern White Cedar | 0 | 0 | 1 Grouping | 1 |
| | *Subtotal* | *21* | *1* | *3* | *25* |
| **Trees Removed Subsequent to Inventory (2016 – 2018)** | | | | | |
| *Fraxinus* sp. | Ash | 4 | 1 | 0 | 5 |
| | *Subtotal* | *4* | *1* | *0* | *5* |
| **Total** | | **24** | **2** | **3** | **29** |

*Native species

**Dead trees in various stages of decay.

# 5. Tree Preservation Plan

## 5.1 Tree Protection

The specifications for tree protection are detailed on the Tree Preservation Plan (**Figure 2**), including the locations of required tree protection fencing. The Tree Preservation Plan is intended to act in concert with this Arborist Report; it is expected that the recommendations of both instruments be implemented within construction drawings and/or Site Plans for the project. The five trees proposed to be retained will be protected by tree protection fencing, which is to be placed at minimum beyond the dripline as determined as per the Town of Caledon *Development Standards, Polices & Guidelines* (Town of Caledon, 2009).

The recommended fencing locations encompass the Tree Protection Zones (TPZ) of the trees to be retained, providing protection from potential damage during construction activities such as the use of machinery near trees and branches, and stockpiling of materials over the root zone. The TPZ have been defined by radii that follow the Tree Protection Zone criteria outlined in the *Tree Protection Policy and Specifications for Construction Near Trees* (City of Toronto, 2016). The TPZ has been used as a conservative measure of the dripline requirements, per the Town of Caledon Specifications.

### *5.1.1 Tree Protection Fencing*

Tree protection fencing is to consist of rigid snow fencing complete with iron "T" bars placed at a maximum of 2.4 metres (m) on-centre (maximum spacing) as per Town of Caledon Tree Protection Standard #707 (**Appendix B**). Snow fencing is to be 1.2 m high. Prior to the start of any site work, the Contractor shall supply and install tree protection barriers around each tree or group of trees designated to be protected (**Figure 2**), or as directed by the Consulting Arborist or Landscape Architect, and the Town (Town of Caledon, 2009).

Tree fencing, as a minimum, is to be located at the outer limit of the dripline of the tree (**Figure 2**). The dripline is defined as the outside edge of the tree canopy. The TPZ for each tree has been provided in this report as a conservative and quantifiable measure of the dripline. No fill, machinery, chemicals, fuel or materials are to be placed within the protective barrier. No re-grading, including filling or excavation, is to take place within the protected area. If required, all underbrush that is to be removed from within the protective barriers must be cleared by hand. The method of removal of brush from the protected area is to be approved by the Town (Town of Caledon, 2009).

General construction specifications in relation to trees are also detailed on the Tree Preservation Plan (**Figure 2**). These specifications provide additional details regarding tree protection fencing and their management.

### *5.1.2 Tree Removals*

All trees to be removed should be felled into the Subject Property so as to avoid damage to adjacent trees and property. While most trees to be removed can be root-pulled as necessary to accommodate development, **Tree 390** (**Figure 2**) should be cut and the stump ground to below surface in order to protect the roots of adjacent trees.

# 6. Compensation Plantings

## 6.1 Tree Removal and Compensation

A total of 22 live trees are to be removed as a result of the project (**Table 4, Figure 3**). It is recommended that a tree compensation ratio of 2:1 be implemented, resulting in 44 trees to be planted. Planting and restoration efforts will aim to restore the natural areas where disturbances have occurred as a result of anthropogenic disturbance.

***Table 4: Recommended Tree Removal and Compensation***

| | Compensation Ratio (2:1) | Total |
|---|---|---|
| **Total number of tree removals** | 21 | **21** |
| **Total number of replacement trees** | 44 | **44** |

## 6.2 Tree Species

To match with the restoration activities on the Subject Property as outlined in the Environmental Impact Study (EIS) for the proposed development (Palmer, 2020), the following tree species and composition are proposed to be planted in compensation (**Table 5**). While other species can be considered, another planting criterion should be selecting only native trees to increase the quality and character of the overall natural heritage system. Selecting Ash species should be avoided (at present) due to the advance of Emerald Ash Borer (EAB) in Ontario.

***Table 5: Proposed Compensation Tree Species***

| Tree/Shrub Species | Quantity | Recommended Size |
|---|---|---|
| Silver Maple (Acer saccharinum) | 10 | 2 – 4 gallon pot |
| Tamarack (*Larix laricina*) | 10 | 100 - 150 cm wire basket |
| Paper Birch (*Betula papyrifera*) | 10 | 2 – 4 gallon pot |
| Hackberry (*Celtis occidentalis*) | 12 | 2 – 4 gallon pot |

The sizes proposed in **Table 5** are reflective of the sizes recommended for ecosystem naturalization, as outlined in the *Guideline for Determining Ecosystem Compensation* (Toronto and Region Conservation Authority, 2018).

## 6.3 Planting Location

The replacement trees are proposed to be planted on the Subject Property. As outlined in the EIS for the proposed development, the restoration Planting Area surrounding Robinson Creek is able to accommodate approximately 330 trees, far in excess of the proposed tree compensation.

The proposed Planting Area includes areas between Robinson Creek and the proposed development along the western boundary of the Subject Property (**Figure 2**). Trees planted adjacent to the stream should be able to tolerate some sun and moist soils along the stream riparian zone.

This tree compensation plan should be incorporated into the landscaping plan for the Project. Trees should be planted a minimum of 2.45 m x 2.45 m from each other and any proposed development structure or feature.

## 7. Management and Monitoring Phase

The following general management and monitoring actions are submitted to help ensure the protection of the trees to be retained on the Subject Property.

### 7.1 Pre-Construction Phase

The tree protection fencing erected should be inspected by a Certified Arborist. Any pruning or trimming of trees necessary to accommodate the fencing should be completed by a Certified Arborist using good arboricultural practices. All trees to be removed should be felled into the Subject Property so as to avoid damage to adjacent trees and property.

### 7.2 Construction Phase

Tree protection fencing should be maintained throughout the project and regularly inspected for damage by construction personnel. Any damage will be reported to the construction supervisor and repaired immediately. Any build up of sediments at tree bases will be removed as part of fencing repairs. All plant material damaged as a result of improper installation or maintenance of protective barriers must be replaced with material of equal value, at the cost of the Developer.

### 7.3 Post-Construction Phase

The removal of tree protection barriers should only be initiated once all construction activities have been completed and landscaping has been initiated. Planting of compensation trees as per Section 6 will be initiated as part of restoration activities. Planting will occur solely during the spring or fall planting seasons when establishment is most successful; being April 15 - July 1, and September 15 – November 15, respectively.

## 8. Closure

We trust that this letter provides sufficient guidance for the incorporation of tree protection measures into the relevant construction drawings and site plans for the proposed development of 12148 Albion Vaughan Road. Should you need any further clarification concerning this letter, please contact the undersigned at 647-461-2372 or austin.adams@pecg.ca.

Yours truly,

**Prepared By:**

Austin Adams, M.Sc., EP
Sr. Ecologist, ISA Certified Arborist ON-2000A

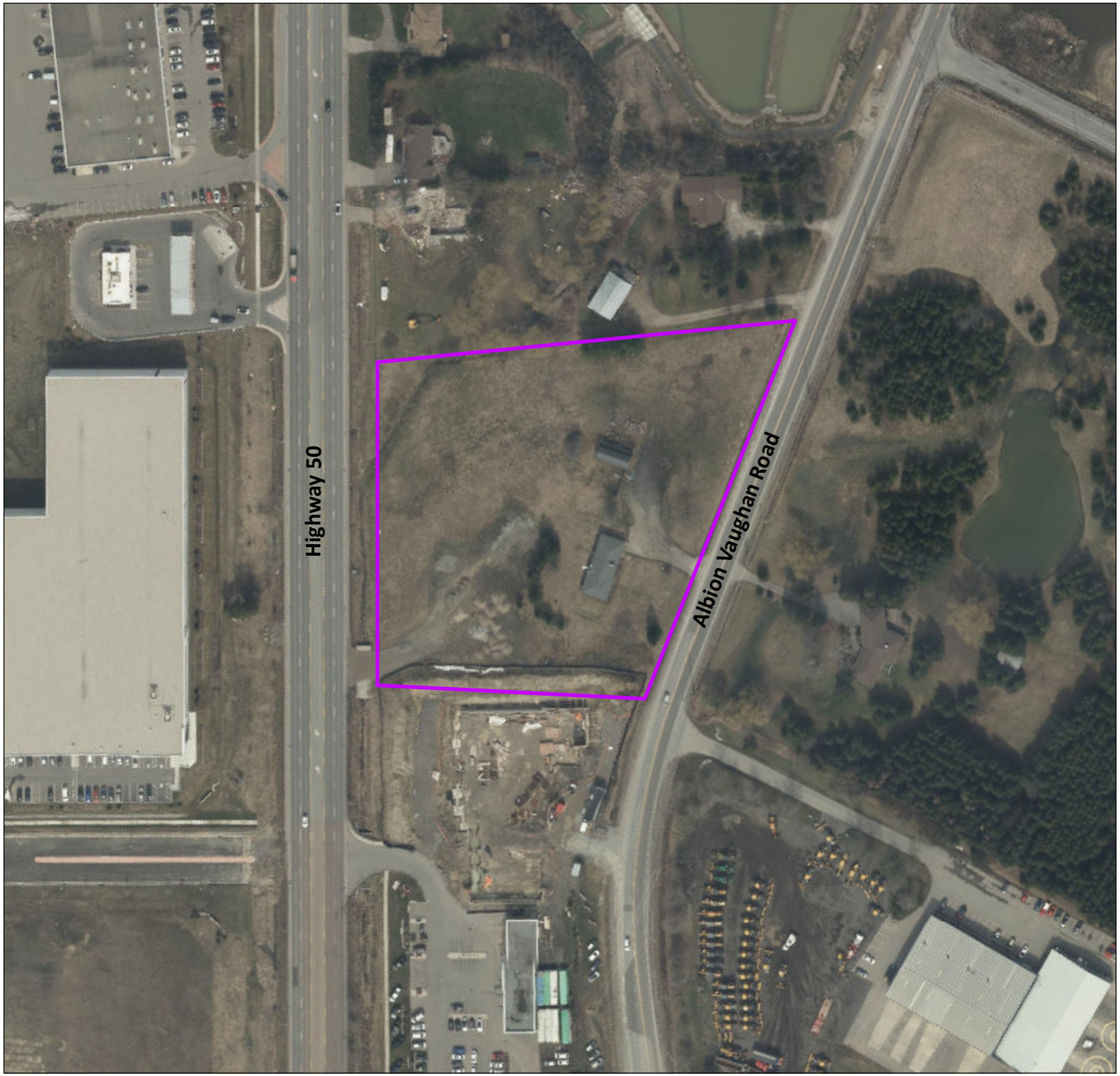
## References

City of Toronto. (2016). *Tree Protection Policy and Specifications for Construction Near Trees.* Toronto. Retrieved from https://www.toronto.ca/data/parks/pdf/trees/tree-protection-specs.pdf

City of Brampton. (2018). *Tableland Tree Assessment Guidelines.* Retrieved July 5, 2018, from http://www.brampton.ca/EN/Business/planning-development/guidelines-manuals/Documents/Tableland_Tree_Assessment_Guidelines.pdf

Palmer. (2020). 12148 Albion Vaughan Road - Scoped Environmental Impact Study. Prespared for 12148 Albion Vaughan Inc.

Town of Caledon. (2009). *Development Standards, Policies and Guidelines.* Retrieved from https://www.caledon.ca/en/townhall/resources/DevelopmentStandardsPoliciesGuidelines.pdf




**OVERVIEW**


## LEGEND

SUBJECT PROPERTY (1.57 ha)
*12148 Albion Vaughan Road, Bolton, Town of Caledon*

N

0 20 40 60 80
METRES

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
SCALE: 1:2,000

DATA SOURCES: Imagery provided York Region (2018). Watercourse (edited) provided by Ontario Hydro Network. Overview basemap: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

**Project:** 12148 Albion Vaughan
**Client:** Aztec Restoration

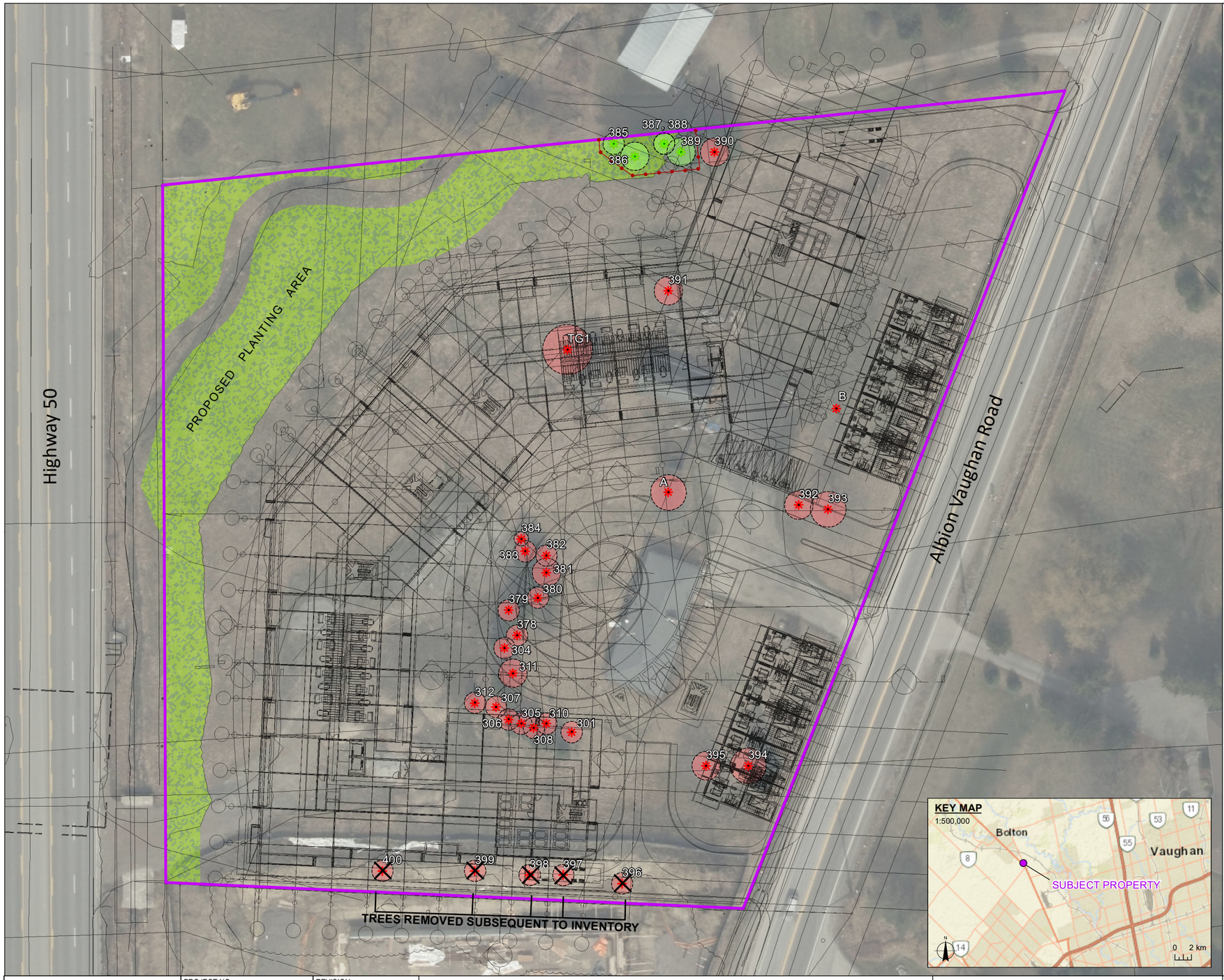
PREPARED BY:
Palmer

DRAWN: B. Elder
CHECKED: A. Adams
PROJECT: 160461
DATE: Nov 25, 2020

# Site Location

**FIGURE 1**

Document Path: G:\Shared drives\Projects 2016\16046 - Aztec Restoration\1604601 - 12148 Albion Vaughan Inc\Mapping\mxd\160461_Figure1_StudyArea.mxd







**TREE PRESERVATION SPECIFICATIONS**

**GENERAL NOTES**

• THIS TREE PROTECTION PLAN IS DESIGNED TO WORK IN CONCERT WITH THE ARBORIST REPORT FOR THE PROJECT.
• PRIOR TO COMMENCEMENT OF ANY SITE ACTIVITY, THE TREE PROTECTION FENCING AND/OR BARRIERS SPECIFIED ON THIS PLAN MUST BE INSTALLED.
• TREE PROTECTION FENCING AND/OR BARRIERS MUST REMAIN IN EFFECTIVE CONDITION UNTIL ALL SITE ACTIVITIES INCLUDING LANDSCAPING ARE COMPLETE. IT MUST NOT BE REMOVED WITHOUT THE WRITTEN AUTHORIZATION OF THE CONSULTING LANDSCAPE ARCHITECT OR ARBORIST AND THE TOWN.

**TREE PROTECTION AND FENCING**

• ALL EXISTING TREES THAT ARE DESIGNATED TO REMAIN, MUST BE FULLY PROTECTED WITH TREE PROTECTION FENCING IN ACCORDANCE WITH TOWN OF CALEDON. TREE PROTECTION FENCING IS BE CONSTRUCTED OUTSIDE THE DRIPLINE OF TREES TO BE PROTECTED AND TO CONSIST OF RIGID SNOW FENCING COMPLETE WITH IRON "T" BARS PLACED AT A MAXIMUM OF 2.4 METRES (M) ON-CENTRE (MAXIMUM SPACING). SNOW FENCING IS TO BE 1.2 M HIGH.
• PRIOR TO THE START OF ANY SITE WORK, THE CONTRACTOR SHALL SUPPLY AND INSTALL TREE PROTECTION BARRIERS AROUND EACH TREE DESIGNATED ON THE TREE PROTECTION PLAN/SITE PLAN TO BE PROTECTED. THE CONSULTING LANDSCAPE ARCHITECT OR ARBORIST IS TO PROVIDE WRITTEN CONFIRMATION TO THE TOWN OF CALEDON STATING THAT ALL TREE PRESERVATION MEASURES HAVE BEEN PERFORMED PRIOR TO THE ISSUANCE OF A TOPSOIL STRIPPING AND GRADING PERMIT.
• TREE PROTECTION ZONES ARE TO INCLUDE SIGNS (AS PER BELOW) AT REGULAR INTERVALS ON THE FENCING. THE SIGNS ARE TO BE 40 CM X 60 CM AND MADE OF WHITE CORRUGATED PLASTIC BOARD OR EQUIVALENT MATERIAL.

TREE PROTECTION ZONE (TPZ)

ALL CONSTRUCTION RELATED ACTIVITIES, INCLUDING GRADE ALTERATION, EXCAVATION, SOIL COMPACTION, ANY MATERIALS OR EQUIPMENT STORAGE, DISPOSAL OF LIQUID AND VEHICULAR TRAFFIC ARE NOT PERMITTED WITHIN THIS TPZ.

THIS TREE PROTECTION BARRIER MUST REMAIN IN GOOD CONDITION AND MUST NOT BE REMOVED OR ALTERED WITHOUT AUTHORIZATION OF CITY OF BRAMPTON PLANNING AND INFRASTRUCTURE SERVICES. CONCERNS OR INQUIRIES REGARDING THIS TPZ CAN BE DIRECTED TO CALEDON DEVELOPMENT AND PLANNING AT 905.584.2272 X 4291

NO CONSTRUCTION EQUIPMENT OR MOTORIZED VEHICLES ARE PERMITTED WITHIN THE TREE PROTECTION ZONE AND ALL TREE PROTECTION ZONES MUST REMAIN UNDISTURBED AT ALL TIMES. THE FOLLOWING ACTIVITIES ARE ALSO PROHIBITED WITHIN THE TREE PROTECTION ZONES:
- ANY CONSTRUCTION;
- ALTERING OF GRADE BY BACKFILLING, ADDING FILL, EXCAVATING, TRENCHING OR DISTURBANCE OF ANY KIND;
- TOPSOIL STORAGE OR STOCKPILING OF MATERIALS, EQUIPMENT, SOIL, CONSTRUCTION WASTE OR DEBRIS; AND
- DISPOSAL OF ANY LIQUIDS.

• IN THE EVENT THAT ANY WORK BE REQUIRED WITHIN THE TREE PROTECTION ZONES, THE CONSULTING LANDSCAPE ARCHITECT MUST ADVISE THE TOWN OF CALEDON DEVELOPMENT AND PLANNING DEPARTMENT A MINIMUM OF 48 HOURS PRIOR TO COMMENCING ANY SPECIFIED WORK.
• TREE PROTECTION FENCING IS TO BE INSPECTED REGULARLY BY CONSTRUCTION PERSONNEL TO ENSURE IT IS PERFORMING ITS INTENDED FUNCTION. IF ANY SECTION IS FOUND TO BE DAMAGED OR NON-FUNCTIONAL, IT SHOULD BE REPLACED IMMEDIATELY.
• TO AVOID SOIL COMPACTION, MACHINERY OPERATION IS TO STAY WITHIN THE WORK AREA AND AVOID THE AREA DELINEATED BY THE TREE PROTECTION FENCING.

**UNFORESEEN TREE AND ROOT PRUNING**

• IF ANY DAMAGE OCCURS TO TREES, INCLUDING BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK, IT MUST BE REPORTED TO THE CONSULTING ARBORIST IMMEDIATELY SO THAT MITIGATION MEASURES CAN BE PROMPTLY IMPLEMENTED.

**UNFORESEEN TREE REMOVAL**

• TREES THAT WERE DESIGNATED FOR PRESERVATION BUT HAVE DIED OR HAVE BEEN DAMAGED BEYOND REPAIR WILL BE REMOVED AND REPLACED BY THE DEVELOPER WITH TREES OF A SIZE AND SPECIES AS APPROVED BY THE TOWN OF CALEDON DEVELOPMENT AND PLANNING DEPARTMENT.
• IN THE EVENT OF REMOVAL, TO AVOID INTERFERENCE WITH THE EGGS, NESTS OR YOUNG OF BIRDS PROTECTED UNDER THE FEDERAL MIGRATORY BIRDS CONVENTION ACT (GOVERNMENT OF CANADA, 1994), REMOVALS SHOULD NOT OCCUR FROM APRIL 1 TO AUGUST 1 OF ANY GIVEN YEAR. IDEALLY, REMOVAL SHOULD OCCUR FROM AUGUST THROUGH DECEMBER TO AVOID INTERFERENCE WITH ALL NESTING BIRDS. SHOULD REMOVAL BE REQUIRED WITHIN THE APRIL 1 TO AUGUST 1 BREEDING PERIOD, A QUALIFIED AVIAN BIOLOGIST SHOULD CONDUCT A THOROUGH SURVEY IMMEDIATELY PRIOR TO THE DESIRED TREE REMOVAL DATE TO CONFIRM PRESENCE OR ABSENCE OF PROTECTED SPECIES. IF PROTECTED SPECIES ARE PRESENT, REMOVAL CANNOT OCCUR WITHOUT A PERMIT FROM THE CANADIAN WILDLIFE SERVICE.

PREPARED BY: Palmer

| | | | |
|---|---|---|---|
| PROJECT NO. | 1604601 | REVISION: | 2 |
| DATE: | Nov 25, 2020 | SCALE: | 1:700 |
| DRAWN: | BE | DATUM: | NAD 1983 |
| CHECKED: | AA | PROJECTION: | UTM zone 17 |

LEGEND:
- Tree to be retained
- Tree to be removed
- Subject Property
- Critical Root Protection Zone - Retained
- Critical Root Protection Zone - Removed
- Tree Protection Fencing

0 10 20 30 40
metres

CLIENT: Aztec Restoration
PROJECT: 12148 Albion Vaughan

**Fig. 2 - Tree Preservation Plan**

Document Path: G:\Shared drives\Projects 2016\16046 - Aztec Restoration\1604601 - 12148 Albion Vaughan Inc\Mapping\mxd\160461_Figure2_TPP.mxd

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

# Appendix A

- Tree Inventory

**Appendix A. Tree Inventory**

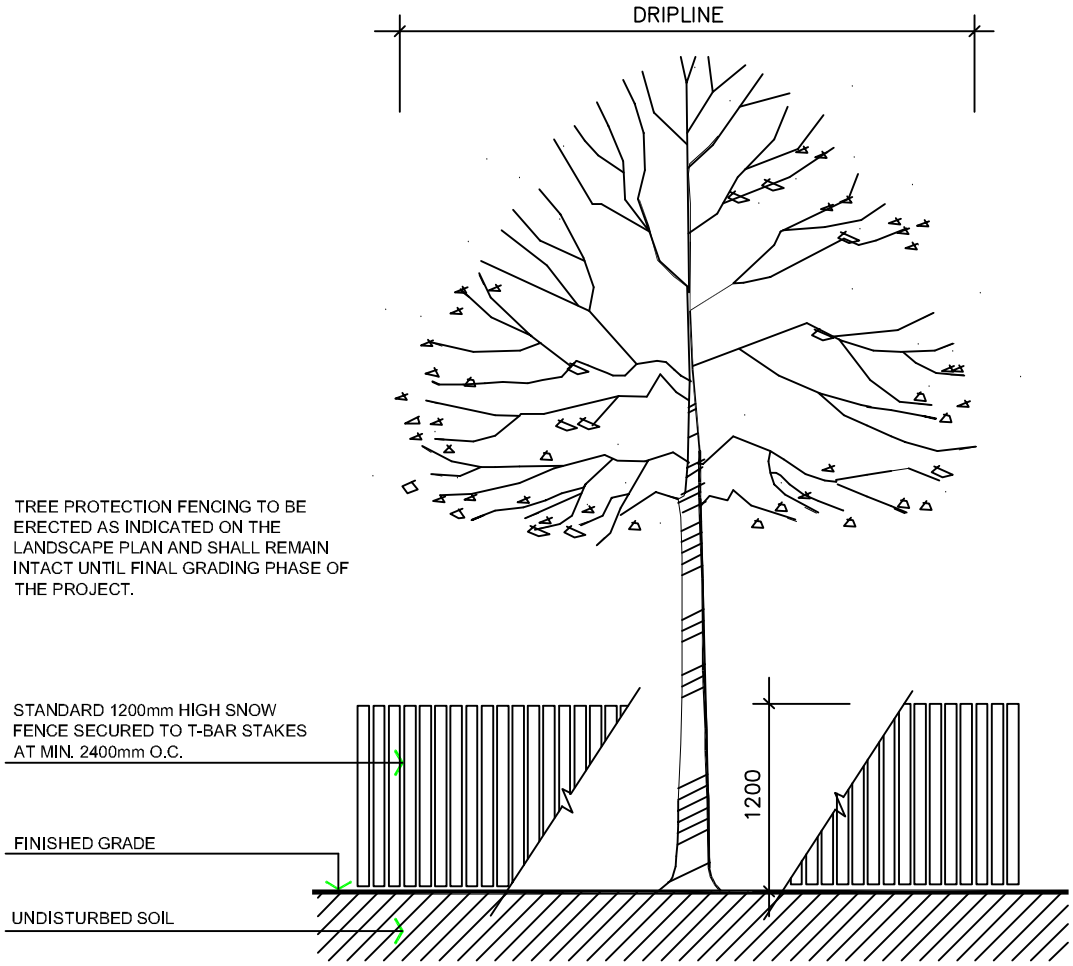
| Tree ID | UTM | Common Name | Species Name | # of trunks | DBH (cm) | Effective DBH (cm)* | Tree Protection Zone (m) | Health/ Condition | Recommendation | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 400 | 604618, 4856207 | Ash sp. | *Fraxinus* sp. | 1 | 21.5 | 21.5 | 1.8 | F | previously removed | 3 stems, 2 cut, EAB |
| 399 | 604629, 4856218 | Ash sp. | *Fraxinus* sp. | 1 | 23.6 | 23.6 | 1.8 | F | previously removed | EAB, large wound at base |
| 398 | 604636, 4856224 | Ash sp. | *Fraxinus* sp. | 1 | 22 | 22 | 1.8 | F | previously removed | No signs of decay or wounds, EAB |
| 397 | 604640, 4856228 | Ash sp. | *Fraxinus* sp. | 1 | 27.7 | 27.7 | 1.8 | F | previously removed | Significant branch dieback, piece of fence through tree, epicormic branching |
| 396 | 604648, 4856234 | Ash sp. | *Fraxinus* sp. | 1 | 21.2 | 21.2 | 1.8 | P | previously removed | EAB, epicormic branching, top is broken, branch dieback |
| 395 | 604644, 4856258 | Apple sp. | *Malus* sp. | 1 | 39.5 | 39.5 | 2.4 | G | remove | Callused wound on trunk, slight lean, good canopy vigour |
| 394 | 604649, 4856263 | Blue Spruce | *Picea pungens* | 1 | 42.5 | 42.5 | 3 | G | remove | Lower branches pruned |
| 393 | 604628, 4856303 | Walnut sp. | *Juglans* sp. | 1 | 48.6 | 48.6 | 3 | G | remove | |
| 392 | 604624, 4856300 | Walnut sp. | *Juglans* sp. | 1 | 35 | 35 | 2.4 | G | remove | Minor branch dieback |
| A, No tag | 604607, 4856286 | Spruce sp. | *Picea* sp.. | 1 | 44.6 | 44.6 | 3 | Dead | remove | Woodpecker damage, beetle holes |
| 391 | 604583, 4856310 | Freeman's Maple | *Acer* x *freemanii* | 1 | 32.7 | 32.7 | 2.4 | G | remove | Minor epicormics, possible butt rot, mechanical damage at base, good canopy |
| B, No tag | 604617, 4856316 | Ash sp. | *Fraxinus* sp. | 1 | N/A | N/A | N/A | Dead | remove | Top broken, codominant stems |
| 390 | 604572, 4856332 | Eastern White Pine | *Pinus strobus* | 1 | 34.5 | 34.5 | 2.4 | G | remove | |
| 389 | 604568, 4856328 | Eastern White Pine | *Pinus strobus* | 1 | 34.2 | 34.2 | 2.4 | G | retain | Top broken |
| 388 | 604565, 4856327 | Eastern White Pine | *Pinus strobus* | 1 | 25 | 25 | 1.8 | G | retain | |

| Tree ID | UTM | Common Name | Species Name | # of trunks | DBH (cm) | Effective DBH (cm)* | Tree Protection Zone (m) | Health/ Condition | Recommendation | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 387 | 604565, 4856327 | Eastern White Pine | *Pinus strobus* | 1 | 26.3 | 26.3 | 1.8 | G | retain | |
| 386 | 604563, 4856322 | Eastern White Pine | *Pinus strobus* | 1 | 37 | 37 | 2.4 | G | retain | |
| 385 | 604559, 4856321 | Eastern White Pine | *Pinus strobus* | 1 | 28.7 | 28.7 | 1.8 | G | retain | |
| No tag, TG1 | 604578, 4856291 | Eastern White Cedar | *Thuja occidentalis* | ~50 | ~10 | 70 | 4.2 | Dead | remove | Majority of stems ≤10 cm dbh, width 5 m, approx. 50 stems. Surrounded by thicket of buckthorn. |
| 384 | 604595, 4856263 | Ash sp. | *Fraxinus* sp. | 1 | 6.5 | 6.5 | 1.2 | G | remove | |
| 383 | 604597, 4856262 | Norway Spruce | *Picea abies* | 1 | 19 | 19 | 1.8 | G | remove | |
| 382 | 604600, 4856264 | Norway Spruce | *Picea abies* | 1 | 14.7 | 14.7 | 1.8 | G | remove | |
| 381 | 604602, 4856262 | Norway Spruce | *Picea abies* | 1 | 33 | 33 | 2.4 | G | remove | |
| 380 | 604604, 4856258 | Norway Spruce | *Picea abies* | 1 | 19.8 | 19.8 | 1.8 | G | remove | |
| 379 | 604602, 4856253 | Norway Spruce | *Picea abies* | 1 | 19 | 19 | 1.8 | G | remove | |
| 378 | 604606, 4856251 | Norway Spruce | *Picea abies* | 1 | 14 | 14 | 1.8 | G | remove | |
| 304 | 604606, 4856248 | Norway Spruce | *Picea abies* | 1 | 12.5 | 12.5 | 1.8 | G | remove | |
| 311 | 604610, 4856246 | Norway Spruce | *Picea abies* | 1 | 30.8 | 30.8 | 2.4 | G | remove | Lower branches pruned |
| 312 | 604609, 4856238 | White Spruce | *Picea glauca* | 1 | 12.9 | 12.9 | 1.8 | G | remove | |
| 307 | 604612, 4856240 | White Spruce | *Picea glauca* | 1 | 18 | 18 | 1.8 | G | remove | |
| 306 | 604615, 4856240 | White Spruce | *Picea glauca* | 1 | 14.2 | 14.2 | 1.8 | G | remove | |
| 305 | 604617, 4856241 | White Spruce | *Picea glauca* | 1 | 17.5 | 17.5 | 1.8 | G | remove | |
| 308 | 604619, 4856242 | White Spruce | *Picea glauca* | 1 | 16.9 | 16.9 | 1.8 | F | remove | Top broken |
| 310 | 604620, 4856244 | White Spruce | *Picea glauca* | 1 | 17 | 17 | 1.8 | G | remove | |
| 301 | 604624, 4856246 | White Spruce | *Picea glauca* | 1 | 14 | 14 | 1.8 | P | remove | Top broken, majority of leaves dead. |

* Effective DBH calculated as the square root of the sum of squares for all tree stems.
**Dead trees in various stages of decay.

# Appendix B

- **Town of Caledon Standard #707 – Tree Preservation**




SPECIFICATIONS FOR THE PROTECTION AND PRESERVATION OF EXISTING VEGETATION:

1. PRIOR TO ISSUANCE OF THE BUILDING PERMIT, ALL EXISTING TREES THAT ARE TO BE PRESERVED SHALL BE FULLY PROTECTED WITH HOARDING (IE SNOW FENCING) OUTSIDE THEIR 'DRIPLINES', TO THE SATISFACTION OF THE TOWN.
2. GROUPS OF TREES AND OTHER EXISTING PLANTINGS TO BE PROTECTED SHALL BE TREATED IN A LIKE MANNER WITH HOARDING AROUND THE ENTIRE CLUMP(S).
3. AREAS WITHIN THE PROTECTIVE FENCING SHALL REMAIN UNDISTURBED AND SHALL NOT BE USED FOR THE STORAGE OF BUILDING MATERIALS OR EQUIPMENT.NO CONTAMINANTS SHALL BE DUMPED OR FLUSHED WHERE FEEDER ROOTS OF TREES EXIST.
4. PRUNE BRANCHES TO REMOVE DAMAGED LIMBS ONLY. DO NOT DAMAGE LEADERS. ALL CUTS OVER 25mm SHALL BE TREATED IN ACCORDANCE WITH APPROPRIATE HORTICULTURAL PRACTICES AS APPROVED BYTHE TOWN.
6. CUTTING OF ROOTS OR CHANGING OF GRADES AROUND EXISTING TREES TO BE PRESERVED WILL NOT BE PERMITTED WITHOUT THE APPROVAL OF THE PUBLIC WORKS AND ENGINEERING DEPARTMENT.
7. TREES THAT HAVE DIED, OR HAVE BEEN DAMAGED BEYOND REPAIR SHALL BE REPLACED AT THE DEVELOPER'S EXPENSE, WITH TREES OF A SIZE AND SPECIES APPROVED BY THE TOWN.
8. IF TREES ARE BEING ADVERSLY AFFECTED BY CONSTRUCTION, A WATERING AND FERTILIZING PROGRAM IS TO BE SET UP TO THE SATISFACTION OF THE TOWN.
9. TREE PRESERVATION FENCE TO BE INSPECTED BY THE CONSULTING LANDSCAPE ARCHITECT AND APPROVED PRIOR TO CONSTRUCTION COMMENCING.

TOWN OF CALEDON

TREE PRESERVATION

| NO. | REVISION | APR'D | DATE |
|---|---|---|---|
| 2 | STANDARD No. 1135 NOW 707, NOTES EDIT | | JUNE 08 |
| 1 | NOTE NO. 9 ADDED | | MARCH 08 |

APR'D: C.C. | DATE: JUNE 08

DRAWN: abal | SCALE: NTS

STANDARD No. 707