Chapter 5 – Final Project Description

407 TRANSITWAY - KENNEDY ROAD TO BROCK ROAD

MINISTRY OF TRANSPORTATION - CENTRAL REGION

5. FINAL PROJECT DESCRIPTION

The technically preferred Transitway alternative has been planned for the operation of an intermediate capacity, regional rapid transit service provided by BRT technology. The functional plan and preliminary design was developed allowing for conversion to LRT technology in the future. The EPR is seeking approval for the construction and operation of BRT. Should a conversion to LRT in the future be planned, MOECC will be consulted pursuant to Section 15 (1) of the Transit Regulation to define the assessment process that would apply.

The primary component of the Transitway infrastructure is the fully-grade separated runningway which, for BRT operation, is a two-lane runningway with paved shoulders and additional stopping lanes through station platforms. The fully fenced runningway will incorporate access for emergency response vehicles at stations and appropriate intervals

5.1. Description of the Runningway Alignment and Cross-Section

Following the alignment and station alternatives assessment described in **Chapter 4**, and the results of the detailed field investigations, the runningway alignment was defined. **Plates 01 to 28** at the end of **Chapter 5**, illustrate the preferred horizontal and vertical alignment and corresponding footprint based on the preliminary design of the facility. **Figures 5.1 to 5.6** illustrate the different typical cross-sections proposed along the runningway. **Plates 1 to 28** are included at the end of **Chapter 5**. The section below describes the alignment and proposed cross-sections of the runningway at the preliminary design level.

Kennedy Road (West Study Limit) – Markham Station

The runningway of the Kennedy Road to Brock Road Section starts just east of Kennedy Road, maintaining the alignment of the Highway 400 to Kennedy Road Section (TPAP for that section was approved by MOECC in 2011).
After crossing under Kennedy Road, the alignment raises following a 3.85% grade to cross from north to south, over the 407 ETR core lanes.
The alignment runs on a tangent between 407 ETR and the Hydro Corridor, maintaining the profile very close to surface to reach McCowan Road. This segment presents a low sloped embankment.
The runningway underpasses the McCowan – 407 ETR Interchange. The alignment continues between 407 ETR and the Hydro Corridor, maintaining a low sloped embankment to the proximity of the Markham Station located west of Markham Road.
The design speed between the crossing of Highway 407 east of Kennedy Road and the approach to Markham Station is 110 km per hour complying with the 407 Transitway standards. The design speed across Markham Station is 80 km per hour, complying with the 407 Transitway standards.

Markham Station – Ninth Line Station

The alignment in front of the proposed Markham Station is in a retained cut to reach the Transitway proposed platforms, crossing under Markham Road.
The alignment bridges over the Rouge River flood plain and maintains the vertical alignment following the profile of the Highway 407 to reach to Ninth Line Station.
The design speed between east of Markham Road and the approach to Ninth Line Station is 110 km per hour complying with the 407 Transitway standards. The design speed across Ninth Line Station is 80 km per hour, complying with the 407 Transitway standards.

Ninth Line Station – Donald Cousens Station

After under-passing Ninth Line, the alignment presents a sloped embankment, with structural rigid frame open footing culverts to cross both creeks.
Just west of Donald Cousens Parkway, the alignment bends around the 407 ETR west off-ramp crossing under Donald Cousens Parkway and providing a tangent for the Donald Cousens Station platforms.
The design speed between Ninth Line and the approach to Donald Cousens Station is 110 km per hour complying with the 407 Transitway standards. The design speed across the Donald Cousens Station is 80 km per hour, complying with the 407 Transitway standards.

Donald Cousens Station – Whites Road Station

Leaving Donald Cousens Station the alignment raises following a 5.87% grade to cross over Reesor Road, and the CP semi-abandoned Havelock rail track, as close to 407 ETR as possible to minimize effects to the environmentally sensitive property located east of Reesor Road.
East of the CP rail line, the alignment remains high to bridge over the Little Rouge Creek. The preliminary design structure over the Little Rouge, was defined in consultation and coordination with Parks Canada following the criteria of avoiding impacts to the flood plain, trails and other futures of the National Urban Park.
Alignment remains high to cross this sensitive area, minimizing effects to the Rouge National Urban Park. The alignment crosses over four tributaries of the Little Rouge with structural rigid frame open footing culverts, to reach the crossing of the York Durham Line.
After crossing under York Durham Line, the alignment continues east along the Transitway protected Corridor, mimicking the 407 ETR profile, to bridge over West Duffins Creek flood plain, under North Road, and over Duffins Creek flood plain to reach White Road Station.
The design speed between Donald Cousens Station and the approach to Whites Road Station is 110 km per hour complying with the 407 Transitway standards. The design speed across Whites Road Station is 80 km per hour, complying with the 407 Transitway standards.

Whites Road Station – Brock Road (East Study Limit)

Alignment through the White Road Station is on a flat tangent, crossing under future Whites Road extension, raising with a 2.87% grade to cross over a Duffins Creek tributary at 15+420, and then descending to cross under Sideline 24, following the Corridor Protection Study and the profile of 407 ETR.
The alignment between Sideline 24 and Urfe Creek (west of Old Brock Road) was set minimizing effects to the various Duffins Creek tributaries and to the natural environment in the area, avoiding effects on a potential archaeological site east of future Rossland Road Expansion, respecting Seaton Development Plans, and allowing an adequate crossing over the future Rossland – ETR Interchange.
After bridging over Urfe Creek, the alignment follows the Transitway protected corridor, aiming to minimize effects on the heritage sensitive property immediately west of Old Brock Road; then swings

FIGURE 5.1: FILL SECTION BETWEEN STATIONS

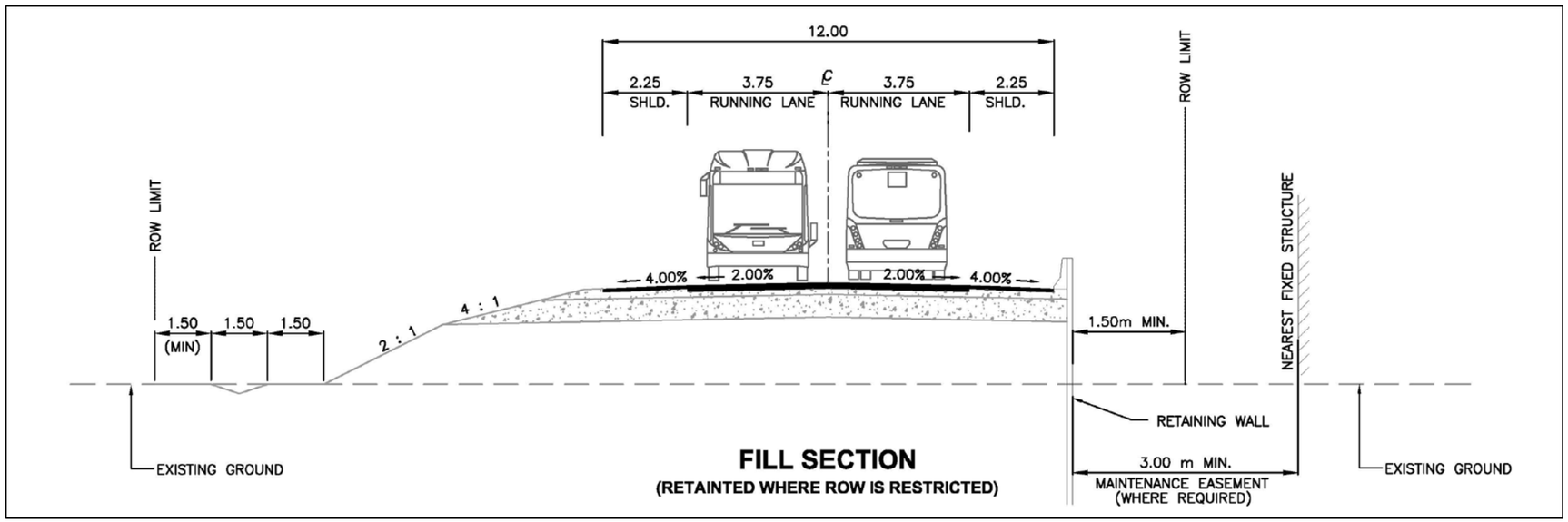


FIGURE 5.2: CUT SECTION BETWEEN STATIONS

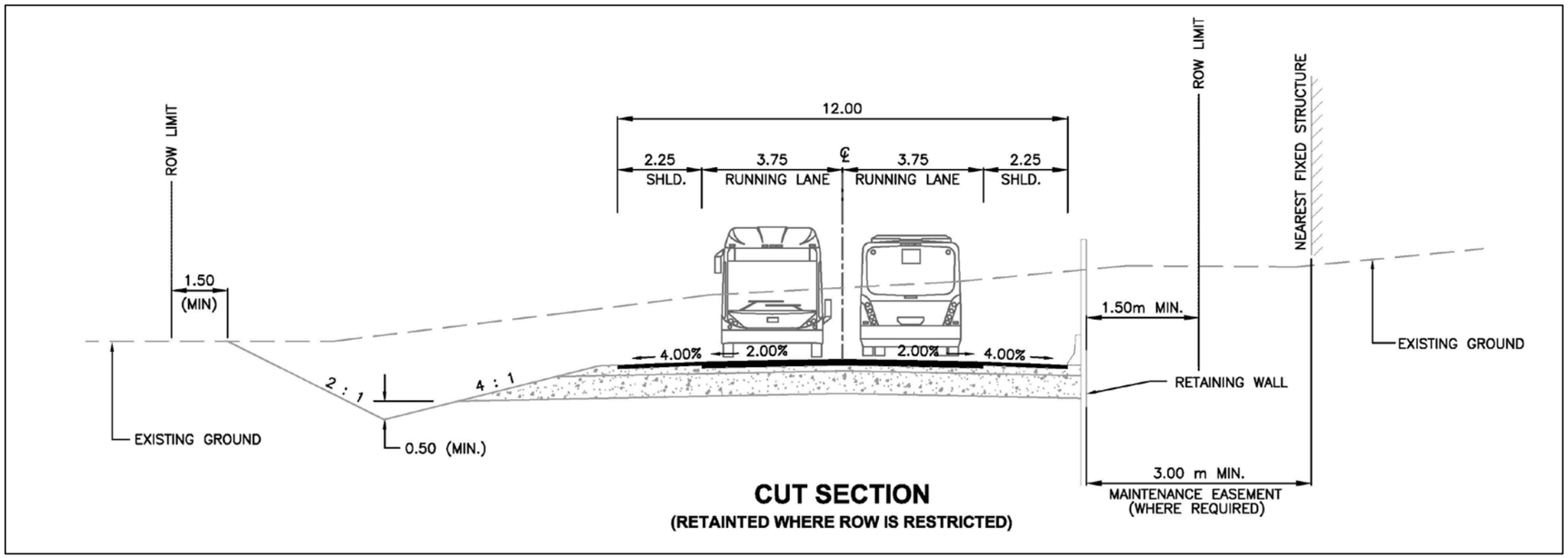


FIGURE 5.3: CROSS-SECTION THROUGH STATION PLATFORMS

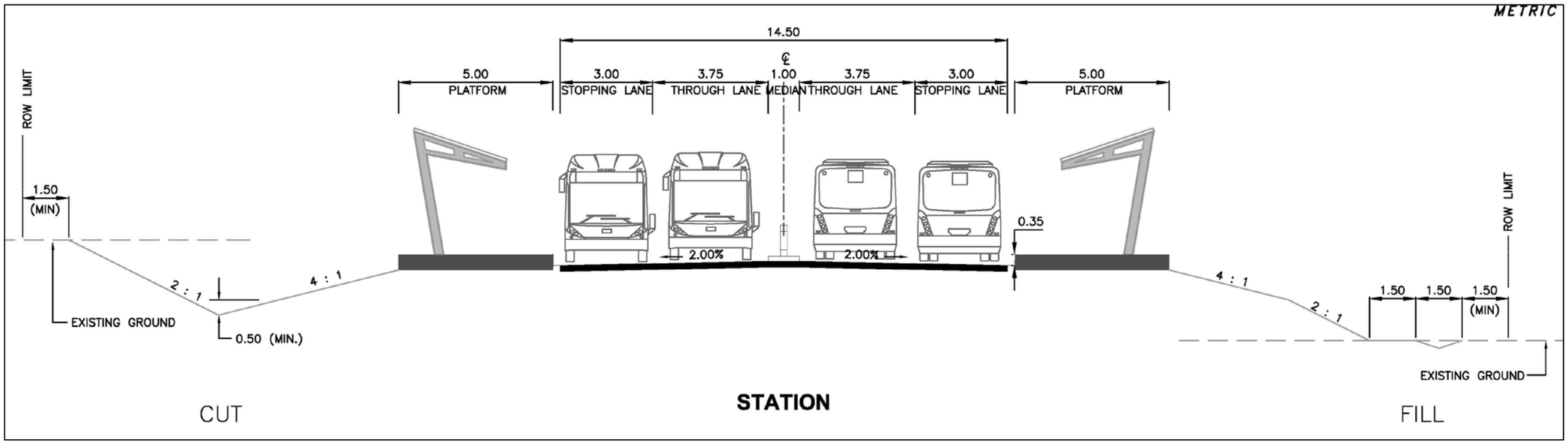


FIGURE 5.4: CROSS-SECTION AT STATION APPROACH

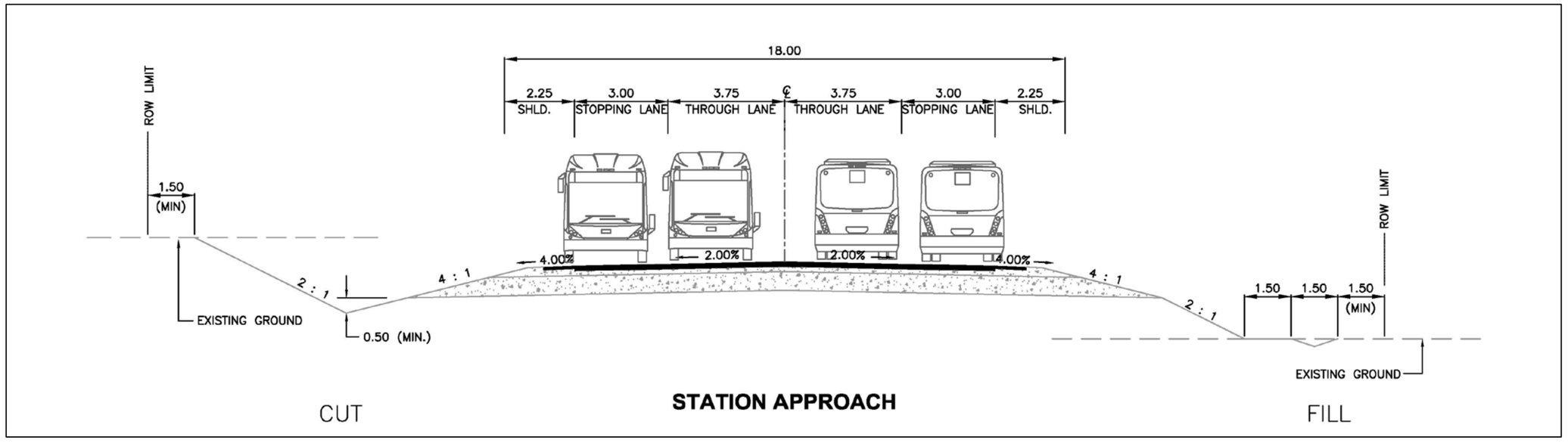


FIGURE 5.5: CROSS-SECTION ON OVERPASS

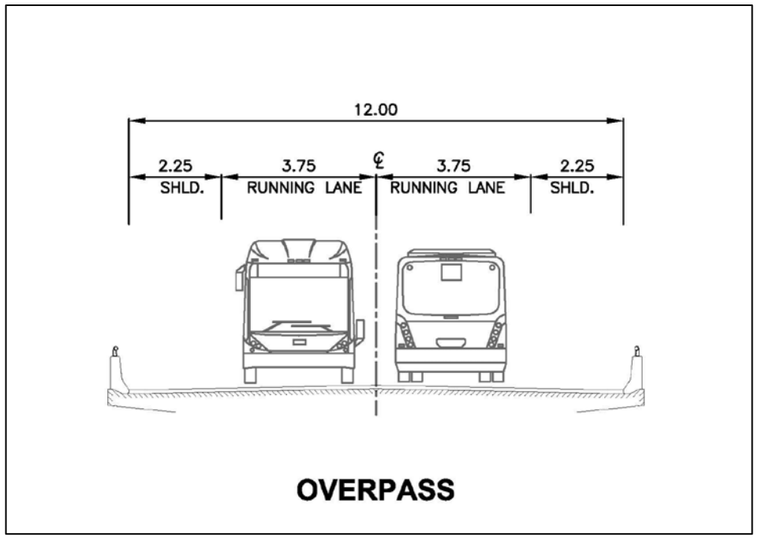
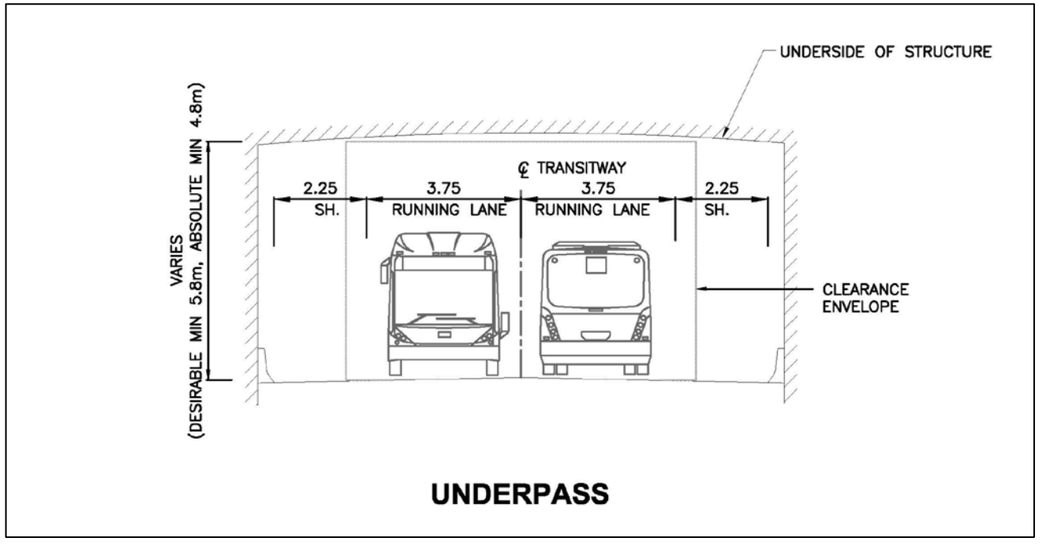


FIGURE 5.6: CROSS-SECTION THROUGH UNDERPASS



south missing the flood plain, locating the runningway and the Brock Station platforms adjacent to the Station surface facilities partially already built as a car-pool lot.
The Transitway alignment between Old Brock Road and Brock Road is much constrained by the presence of the creek that runs parallel to the runningway, the location of the Station, and the heritage buildings located west of Old Brock Road. The City plans to build a secondary recreational trail in this area, crossing the Transitway alignment just east of Old Brock Road. During Detail Design, further consideration will be given to find a compromised solution to interface both initiatives. Further consultation between MTO and the City in reference to this issues is being committed in Chapter 9 of the EPR.
Between Old Brock Road and Brock Road, two vertical alignments have been assessed, both on the same horizontal alignment. A profile bridging over Brock Road was provisionally considered for the ultimate scenario when the runningway is built east of Brock Road. Until then, the interim surface profile that connects Brock Road at grade and provides looping opportunity within the Station facility for the Transitway buses to return, will apply.
The design speed between Whites Road Station and the approach to Brock Station is 110 km per hour complying with the 407 Transitway standards. The design speed across Brock Road Station is 80 km per hour, complying with the 407 Transitway standards.
Horizontal and vertical geometry between Old Brock Road and Brock Road allows for alignment flexibility east of the Study Limit. It is recommended that Preliminary Design of Transitway Section east of Brock Road assesses various alignment options, including the use of Sideline 16 right of way, or the removal of the existing Sideline 16 culvert to minimize impacts to the hydrology and associated fish habitat in this sensitive section of Brougham Creek.

5.2. Stations

5.2.1. Conclusions and Recommendations of Station Sites Evaluation

Station Nodes Evaluation Results

As a result of the initial screening, of all existing or future ETR interchanges, only the node located at the York Durham Line Interchange was eliminated as a station location, essentially due to insignificant ridership forecast.

Station Sites Evaluation Results

The evaluation of station site locations selected in the initial screening of nodes described in Chapter 4 was conducted based on detailed environmental field investigations, traffic studies, ridership sensitivity assessments, adequate vehicular and pedestrian accessibility, transit connectivity, implementation strategy, constructability, future considerations, and discussions with stakeholders and the public, provided the following conclusions and recommendations:

Selected Station Sites:

Markham Road Station – Southwest Site
Ninth Line Station – Southwest Site
Donald Cousens Station – Southeast Site
Whites Road Station – Southwest Site
Brock Station – Southwest Site

Sites recommended to be protected for future uses:

Two sites were not considered feasible for stations; however, MTO is recommending the protection of the land for future potential uses as described below:

McCowan Road Site

McCowan Road is one of the main and busiest north-south arterials in the City of Markham with connections to important attraction sites such as the future Scarborough Subway (current SRT terminus station) and Markville Mall. While there are multiple station implementation constraints described in the evaluation of sites, it is recommended that the site east of McCowan Road be protected for a possible future park and ride facility to support potential future over-capacity issues at Kennedy Road and/or Markham Road and surrounding road network in the future.

York/Durham Line Site

The York/Durham Line site has been identified as an ideal location for potential environmental remediation due to its close proximity to the Rouge Urban National Park. Parks Canada has indicated full support of protecting the land to address appropriate mitigation measures and will be consulted in the detailed design stage when mitigation measures are identified. Parks Canada has also identified the site for possible future transit supported park access. This will be addressed when the need arises.

Rossland Road Site

Due to the several reasons described in the evaluation the site located west of the future Rossland Road will be protected for the following potential Transitway uses:

a) A site to provide for environmental mitigation measures resulting from the Transitway project. This possibility will be confirmed at the detailed design phase.

b) An interim bus garage should the Rossland Road/ 407 ETR interchange be implemented in a timely manner. Its location is ideal for a bus garage due to its proximity to the Brock Road facility which will serve as terminus station for the Kennedy-Brock Section of the Transitway. Transit Environmental Regulations will apply if this option is opted.

5.2.2. Stations Design Principles

Functional requirements and design principles that support the service design are described in Table 5.1. These principles were developed with the ultimate goal of improving the transit user experience, and shall be included in the functional specifications of the Detail Design Phase.

TABLE 5.1: STATION CONSIDERATION FACTORS AND DESIGN PRINCIPLES

COMPONENT	STATION FUNCTIONAL REQUIREMENTS AND DESIGN PRINCIPLES
Passenger	Clear, direct (single point of transfer) and / or short transfers between transit modes, services and routes by minimizing walking distances and removing physical barriers within transit stations. Stations and station areas that are universally accessible and that can accommodate the needs of all members of society in accordance with The Accessibility for Ontarians with Disabilities Act (AODA).
Active Transportation and Pedestrian Safety	Prioritized, safe and direct pedestrian and cycling routes to rapid transit stations from major destinations and regional cycling and pedestrian networks. Convenient, comfortable, direct and safe pedestrian linkages to and from all transit stations in order to support a walkable station area and promote the use of transit. A high level of pedestrian priority, safety and amenities within and around the transit facility to enhance customer comfort, safety and information.
Vehicular Facilities	Clearly marked and protected access for pedestrians and cyclists at station areas to minimize conflicts, particularly at PPUDOs, bus facilities and parking access points. PPUDO located to utilize the parking circulation system while unloading pedestrians close to the station or transit plaza. Parking lots and PPUDOs designed to promote easy navigability with sufficient queuing distances at intersections. Carpooling and alternate fuel vehicles priority parking in close proximity to the station entrance. Well-lit parking lots and station areas with unobstructed sightlines. Layby and looping bus facilities for local and regional buses entering the station. Bus stops at the crossing arterial road will also be provided for buses not entering the facility.
Station Architecture	Incorporation of ancillary uses such as coffee shops, newspaper stands or convenience retail in stations and or plazas to expand the function of the intermodal station and provide additional amenities for users. A high-quality station architecture and public realm that is sensitive to the surrounding built context and projects a clear, identifiable 407 Transitway brand and vision. Transitway bridges, structures and retaining walls as prominent visual elements with good design potential. Extensive use of glass in shelters and station areas to enhance the natural surveillance and lighting of these areas.
Station Design	Weather-protected station areas through the use of plant screens, wall canopies and heated station areas for waiting. Station and plaza oriented to maximize levels of natural lighting. Legible and permeable transit stations through consistency and clarity in station entrances and interfaces, spaces, layout and visual cues connected by barrier-free movement spaces. A unified way-finding and signage strategy to support the legibility and permeability of the transit station. Station and the Transitway elements to act as landmarks both locally and for passing transit Extending the design continuity of the transit station areas, including paving patterns, colours and materials, to adjacent sidewalks, plazas and pedestrian crossings. A high level architectural and landscape design for parking facilities to reduce its environmental impact and to improve pedestrian connections and access. Other amenities - ITS equipment, such as fare collection and passenger information systems to display service status will be accommodated Prioritization and implementation of proven and innovative sustainable energy, water, landscape and waste management practices in the design of intermodal station, transit facilities and station areas. High-quality materials in both the station and landscape design that will “stand the test of time” and continue to maintain a positive image of the system. Mitigating visual presence of parked cars by concealing them appropriately through screening, landscaping, or design treatments.
Community Effect	Facilities designed to minimize traffic and noise impacts on adjacent neighbourhoods.

5.2.3. Station Layouts

This sub-section describes the preferred alternative design for the five selected stations. The proposed station configurations were developed during the planning and preliminary design stages of the study. The final configurations of all stations will be confirmed or revised at the detailed design phase, in consultation with other agencies and transit providers.

This section provides a description of the proposed station facilities. The general criterion used to size the different station elements aimed at meeting the ridership demand for 2031. Station expansion areas were identified to accommodate parking and PPUDO for the projected demand of 2051. This criterion was achieved in stations where the available land permitted.

For sites where the available land is insufficient, the station layout is providing as many parking and PPUDO

spaces as the available land allows. The sizing and capacity allocated to the bus facilities is conceptual only since it is premature for the local and regional transit agencies to provide future requirements. The station layouts may be optimized once design requirements, particularly those relating to the provision of bus loops, are determined.

5.2.3.1. Markham Road Station

Location and Transportation Function

The station will be located to the west of Markham Road between 407 ETR and the utility corridor as shown in **Plate M-1** at the end of **Chapter 5**. A PowerStream hydro transformer station is located to the east of the station, adjacent to Markham Road.

Markham Road Station's primary function is to serve as a park and ride and PPUDO facility. It will also operate as a transit hub providing connectivity to TTC and YRT lines, and will provide local walk-in and cycle-in opportunity to residents.

Type of Facilities and Services

Markham Road Station's facilities, detailed in **Table 5.2**, will include a passenger parking area and a PPUDO (number of spaces provided for both a function of land availability, configuration of the facility and access), in addition, space for a carpool parking lot is being protected. Integration with local transit services will be achieved through a bus loop and a direct access to the Transitway (interlining). In addition, on-street bus bays will be provided on Markham Road at the station driveway and/or 407 ETR Ramp W-N/E.

The station will be fully accessible, and the station building will feature ticketing facilities, washrooms, elevators and bridge/walkway for access to both canopied platforms.

TABLE 5.2: DESIGN ELEMENTS AT MARKHAM ROAD STATION

DESIGN ELEMENTS	REQUIRED	PROVIDED
Bus Bays	TBD	6
Parking Spaces	810	776
Accessible Parking Spaces	1.5%	21
PPDUPO (linear meters)	234	216
Carpool Lot Space Protected	To be determined at the time of Detail Design.	Yes
Flexibility to add more Parking	To be determined at the time of Detail Design.	Yes
Interlining / Runningway Access	To be determined at the time of Detail Design.	Yes

Note: Parking expansion can either be under the Hydro lines or in area protected for carpooling.

Access to/Egress from the Facility

A new signalized intersection is proposed on Markham Road approximately 300 m north of the 14th Avenue intersection as illustrated in **Plate M-1**. A direct pedestrian connection will be provided to the residential community east of Markham Road. The region and municipality were consulted on the location of the access.

Pedestrian access will be provided alongside the main station access road and via a staircase just south of the 407 ETR interchange. While no active-transportation facility presently exists on Markham Road, a connecting bike path and bike shelters will be installed.

Property Required

The station will be located on the provincially owned land that is currently vacant north of the hydro corridor. Limited acquisition of land owned by PowerStream may be required for the new signalized intersection. This will need to be reviewed and confirmed at the detailed design phase based on the intersection final design. Property requirements for the station and runningway are illustrated on property plates in **Appendix O.**

5.2.3.2. Ninth Line Station

Location and Transportation Function

The station will be located west of Ninth Line, north of the Box Grove residential community as shown in **Plate N-1** at the end of **Chapter 5**. The site was protected by MTO for a station facility since the mid 1990's, prior to the approval of the residential development. At the time of approval, a warning clause was placed on title for all of the subdivision lots indicating the MTO's future plans for the 407 Transitway and station to be located between the subdivision and 407 ETR. The Transitway station site is also designated for low rise and midrise residential development in the Markham Official Plan.

Ninth Line Station's primary function is to serve as a park and ride and PPUDO facility; however, transit transfer and active transportation users are also anticipated.

Type of Facilities and Services

The station's facilities, detailed in **Table 5.3**, will include a passenger parking area, a PPUDO (number of spaces provided for both a function of land availability, configuration of the facility and access), and, potentially, a carpool parking lot. A bus loop and on-street bus bays as well as pedestrian access from Ninth Line and bike shelters will be provided. The station will be fully accessible, and a direct access from the runningway to the facility is being provided for bus interlining purposes and emergency access. The station building will feature ticketing facilities, washrooms, elevators and bridge/walkway for access to both canopied platforms.

TABLE 5.3: DESIGN ELEMENTS AT NINTH LINE STATION

DESIGN ELEMENTS	REQUIRED	PROVIDED
Bus Bays	TBD	3
Parking Spaces	670	670
Accessible Parking Spaces	1.5%	27
PPDUPO (linear meters)	324	216
Carpool Lot Space Protected	To be determined at the time of Detail Design.	Yes
Flexibility to add more Parking	To be determined at the time of Detail Design.	Yes
Interlining / Runningway Access	To be determined at the time of Detail Design.	Yes

Access to / Egress from the Facility

Vehicular access will be provided from Rouge Bank Drive and Old Ninth Line as shown in **Plate N-1**. To mitigate traffic impacts, the intersection of Rouge Bank Drive and Old Ninth Line is proposed to be signalized. The intersection of Ninth Line and Rouge Bank Drive will be modified to best respond to the traffic movements. Potential double left-turn lanes in the west approach (i.e. for the eastbound left-turn movement) will likely be needed. Functional and infrastructural road measures to improve traffic will need to be reviewed, and confirmed or modified in the Detail Design phase based on updated traffic and road network conditions. The access to and from the facility was developed in consultation with the Region and Municipality.

Due to geometric constraints, the turning circle at the northern terminus of Wood Thrush Avenue may need to be replaced with a laneway that connects to Primrose Path Crescent (just north of the residential area). This will be reviewed and confirmed at the Detail Design phase.

An optional right-in/right-out access for transit buses may be provided off Ninth Line, approximately 200 meters north of the Rouge Bank Drive intersection. Alternatively, a right-in only access could be provided for the general public at that location. This will be determined in coordination with York Region and City of Markham during the Detail Design phase.

Active transportation paths from the Box Grove neighbourhood will be determined in coordination with the residents at the Detail Design phase.

Property Required

Minor property acquisition may be required: (a) along Rouge Bank Drive between Old Ninth Line and Ninth Line; and, (b) for the optional right-in/right-out bus access only. The station site was protected under the Transitway Corridor Protection Study (1999). Property requirements for the station and runningway are illustrated on property plates in **Appendix O.**

Potential Noise and Visual Mitigation Measures

Noise mitigation measures will be included in the design following the recommendations of the Noise Study.

5.2.3.3. Donald Cousens Station

Location and Transportation Function

Donald Cousens Station will be located between Donald Cousens Parkway and Reesor Road as shown in **Plate D-1** at the end of **Chapter 5**.

The station's location and layout is affected by several constraints. One main constraint is the Provincial heritage property at 8042 Reesor Road (just south of the station). Should the heritage designation change in the future additional lands may be added to the station to provide the required parking. The other is the planned commercial development east of Donald Cousens Parkway between 407 ETR and Copper Creek Drive. The land planned for the Station Site and the proposed expansion site are both provincially owned parcels.

Donald Cousens Station will provide access to the nearby residential and commercial areas west of Donald Cousens Parkway. Development north of 407 ETR along Donald Cousens Parkway and Reesor Road is expected to increase potential station demand. YRT currently runs routes along the Parkway.

Type of Facilities and Services

The station facilities, detailed in **Table 5.4**, will include a parking lot, a PPUDO (number of spaces provided for both in function of land availability, configuration of the facility and access), a bus loop, on-street bus bays, 150 m walkway between the bus bays and the station platform, bike shelters and associated amenities. Due to the vertical profile of the runningway it will not be feasible to provide a direct connection from the runningway to the surface facility at this station.

The station will be fully accessible, and the station building will feature ticketing facilities, washrooms, elevators and bridge/walkway for access to both canopied platforms.

TABLE 5.4: DESIGN ELEMENTS AT DONALD COUSENS STATION

DESIGN ELEMENTS	REQUIRED	PROVIDED
Bus Bays	TBD	3
Parking Spaces	511	390
Accessible Parking Spaces	1.5%	10
PPDUPO (linear meters)	102	180
Carpool Lot Space Protected	To be determined at the time of Detail Design.	No
Flexibility to add more Parking	To be determined at the time of Detail Design.	No
Interlining / Runningway Access	To be determined at the time of Detail Design.	No

Access to / Egress from the Facility

To minimize property impacts, the station driveway is proposed to connect to Donald Cousens Parkway at the existing right-in/right out access of the "Smart Centers" commercial development as shown in **Plate D-1**. The access will be converted to a new signalized full-movement intersection approximately 200 meters north of the existing intersection of Donald Cousens Parkway and Copper Creek Drive. The station access road is anticipated to serve any future commercial development between Donald Cousens Parkway and Reesor Road.

The intersection of Copper Creek Drive and the "Smart Centers" roadway will require minor improvements, but is expected to continue operating at a reasonable LOS.

Pedestrian access will be alongside the main station access road and toward the 407 ETR Ramp W-N/S to facilitate access to the commercial development west of Donald Cousens Parkway (e.g., Walmart). At present cycling demand is expected to be low. However, cycling accommodations may be provided either along the station's access road or in the vicinity of the 407 ETR Ramp W-N/S.

Property Required

Some property may be required to construct the access road, to be reviewed and confirmed at the detailed design phase. Property requirements for the station and runningway are illustrated on various property drawings/plates included in **Appendix O.**

Property between Reesor Road and the CP Havelock Line is being protected for potential Station expansion to interface with GO Transit operation in case GO Transit provides passenger services on the CP line in the future.

5.2.3.4. Whites Road Station

Location and Transportation Function

Whites Road Station will be located west of the future Whites Road extension (by others) just north of the proposed South Employment Collector as illustrated in **Plate W-1** at the end of **Chapter 5**. The station area is constrained by the South Employment Collector and Whitevale Creek.

The station will be an integral component of the Seaton Development, providing access to both residential and commercial areas, as well as transit connectivity. Whites Road will accommodate a transit route (DRT), and the station will enable transfers from/to the local and regional transit network.

Type of Facilities and Services

The station facilities, detailed in **Table 5.5**, will include a parking lot, PPUDO (number of spaces provided for both a function of land availability, configuration of the facility and access), and a bus loop. In addition, on-street bus bays will be provided. To provide interlining opportunity, an access to the runningway may be feasible west of the platform. This will be addressed during detailed design when the size of the bus loop/bays facility is defined in pursuant to updated needs of the regional and local transit agencies.

The station will be fully accessible, and the station building will feature ticketing facilities, washrooms, elevators and bridge/walkway for access to both canopied platforms.

TABLE 5.5: DESIGN ELEMENTS AT WHITES ROAD STATION

DESIGN ELEMENTS	REQUIRED	PROVIDED
Bus Bays	TBD	4
Parking Spaces	720	836
Accessible Parking Spaces	1.5%	21
PPDUPO (linear meters)	250	180
Carpool Lot Space Protected	To be determined at the time of Detail Design.	No
Flexibility to add more Parking	To be determined at the time of Detail Design.	No
Interlining / Runningway Access	To be determined at the time of Detail Design.	TBD

Access to / Egress from the Facility

The main station access will be implemented at a signalized intersection on the South Employment Collector approximately 270 m west of Whites Road as shown in **Plate W-1**. A secondary right-in/right-out access for transit buses onto Whites Road will be provided approximately 150 m north of the intersection with the South Employment Collector.

Pedestrian access will be provided from Whites Road and the South Employment Collector. A bike path will connect to Whites Road, which will feature bike lanes. Paratransit requirements will be met.

Property Required

The station will be situated in land that is provincially owned and protected for the Transitway station. No additional property will be required beyond that identified in the Seaton Development Plan. Property requirements for the station and runningway are illustrated on property plates in **Appendix O.**

5.2.3.5. Brock Road Station

Location and Transportation Function

Brock Road Station will also be located within the proposed Seaton Development (City of Pickering) between the realigned Brock Road and Old Brock Road as shown in **Plate B-1** at the end of **Chapter 5**. The site is bounded by Seaton's Proposed Development to the south and by Brougham Creek to the north.

The station will function as a major transit hub and temporary terminus station for the Transitway. DRT has plans for rapid transit implementation along the corridor and local routes to serve the Seaton Development. The Station will also serve the east Seaton Development's residential and commercial areas and the growing

City of Pickering population.

Although this station represents the terminus of this section of the Transitway (interim condition), the layout permits the eventual easterly continuation of the Transitway (ultimate condition).

Type of Facilities and Services

An MTO commuter parking facility is currently being built in the selected site for the station. When the station is implemented, the facilities will be retrofitted to suit the Transitway Station layout. The station facilities, detailed in **Table 5.6**, will include a parking lot, a PPUDO (number of spaces provided for both a function of land availability, configuration of the facility and access), car-pool parking space and a bus loop. Pedestrian access will be from Street 1. Transit vehicles will have the opportunity to enter and exit the Transitway at this station (interlining) during the interim condition. Following a future easterly extension of the Transitway past Brock Road interlining access will have to take place at Old Brock Road.

The station will be fully accessible, and the station building will feature ticketing facilities, washrooms, and a canopied platform. Since the station design serves as the terminus of the Transitway during the interim condition, only one platform serving both travel directions is included in the layout.

TABLE 5.6: DESIGN ELEMENTS AT BROCK ROAD STATION

DESIGN ELEMENTS	REQUIRED	PROVIDED
Bus Bays	TBD	4
Parking Spaces	600	600 + 480 carpool/commuter parking
Accessible Parking Spaces	1.5%	27
PPDUPO (linear meters)	324	216
Carpool Lot Space Protected	To be determined at the time of Detail Design.	Yes
Flexibility to add more Parking	To be determined at the time of Detail Design.	Yes
Interlining / Runningway Access	To be determined at the time of Detail Design.	Yes (interim condition) During final condition access would be located at Old Brock Road.

Access to / Egress from the Facility

For the interim condition the station will be located at grade, while ultimately the station will be elevated (to allow the runningway to cross over Brock Road).

In the interim condition, two bus driveways will be provided, a right-in/right-out access just south of the Brougham Creek Bridge and an unsignalized full-movement access on Street 1. The full-movement bus driveway will also be used as the egress from the PPUDO.

A bike path along the north side of Street 1 will connect to Brock Road, as bike lanes are proposed as part of the Seaton Development.

In the ultimate condition, the main access to the parking lot will likely be located on Street 1 with a signalized intersection opposite Street 9. Secondary accesses may be provided on Street 1 and Old Brock Road. The ultimate design will need to be confirmed based on transportation conditions at the time the Transitway is extended to the east.

Property Required

No property requirements. Property requirements for the station and runningway are illustrated on property plates in **Appendix O.**

5.3. Structures

Since the runningway is an at-grade separated facility, a bridge or underpass was identified for every road or railway crossing. Crossings of watercourses will be bridged. There are a total of 17 new structures identified along this section of the Transitway.

5.3.1. Overpasses and Underpasses

A total of 17 new structures have been identified along the Transitway route. Bridge and underpass widths were defined based on lanes and sidewalk widths and side clearances following the *407 Transitway Design Standards* and the Geometric *Design Standards for Ontario Highways (1994)*.

Where applicable, the existing structures of the 407 ETR were used for comparison purposes, as the profile of the Transitway was designed following the profile of the Highway wherever possible. Exceptions were made at specific locations due primarily to presence of major underground utilities or natural features that prevented the runningway to cross under existing arterial roads. Factors such as capital cost, life cycle cost, durability, constructability and traffic staging, future maintenance and widening were assessed in determining the optimum solution for each road crossing structure.

The proposed crossing structures have been classified in four categories: Watercourse crossings, arterial and minor road crossings, and rail crossings.

Watercourse crossings: The crossing configuration was determined through an assessment of ecological constraints, and both hydraulic and structural requirements. A hydraulic analysis (refer to **Appendix C**) was undertaken to establish the design flood levels at the crossing, the opening required for the watercourse through the bridge and the required bridge deck clearance. This information was used to identify the preferred structure type and prepare the preliminary design. During the Detail Design phase, the actual bridge spans will be confirmed based on additional field surveying, updated hydraulic modelling, the actual shape of the section under the bridge, a detailed assessment of long-term channel movement (via meander belt

analysis), erosion effects, and provision of wildlife and fish passage.

Arterial and other minor road crossings: A grade separation in which the Transitway will pass over or under an intersecting road. As explained above, at most road crossings the Transitway is proposed to travel under the intersecting road. This category includes the on and off ramps for 407 ETR. Chapter 7 describes the conceptual construction staging of the underpasses, necessary to minimize traffic effects on the affected roadways

Rail crossing: Grade separations whereby the Transitway will grade separate a railway. The one rail crossing of the Transitway is the Havelock CP Rail crossing. Similar to road crossings, crossing over/under the track was assessed considering various operational, physical and environmental factors. In the case of the Havelock CP Line crossing, due to topographic and vertical geometric design reasons, it was determined to cross on a bridge, over the rail line. The decision to cross over the rail line was based on the existing grade differential between the rail line and 407 ETR.

Using the crossing categories described above, Table 5.7 summarizes the proposed structures for all crossings.

TABLE 5.7: PROPOSED STRUCTURES

STRUCTURE REFERENCE NO.	LOCATION	CROSSING CLASSIFICATION	PROPOSED STRUCTURE TYPE
5.1.1	Transitway over 407 ETR at Kennedy Road	** High Volume Crossing.	Not included in study. Considered to ensure that Transitway Design for eastern section is integrated with central section (Kennedy Road to 407 ETR)
.2	Transitway over McCowan Road	Arterial overpass	5-Span slab-on-trapezoidal steel box girders.
5.1.3	Transitway under Markham Road	Arterial underpass	***Single Span Reinforced Concrete Box Structure.
5.1.4	Transitway over Rouge River	Watercourse bridge	6-span Slab-on-curved steel I-Girders.
5.1.5	Transitway under Ninth Line	Arterial underpass	***Single Span Reinforced Concrete Box Structure.
5.1.6	Transitway under Donald Cousens Parkway	Arterial underpass	***Single Span Reinforced Concrete Box Structure.
5.1.7	Transitway over Reesor Road	Arterial overpass	Single span side-by-side pre-stressed concrete box girders bridge with semi-integral abutments. Span provides sufficient space for farm machinery movement.
5.1.8	Transitway over Havelock Rail Crossing – CP Rail	Rail overpass*	***Single Span Reinforced Concrete Box Structure.
5.1.9	Transitway over Little Rouge Creek	Watercourse bridge	6-span slab-on-pre-stressed concrete I - Girders Bridge. Structure provides sufficient space to accommodate RNUP trail.
5.1.10	Transitway under York Durham Line	Arterial underpass	***Single Span Reinforced Concrete Box Structure.
5.1.11	Transitway over West Duffins Creek and Seaton Trail	Watercourse bridge	7-span slab-on-Curved Steel I-Girders.
5.1.12	Transitway under North Road	Arterial overpass	***Single Span Reinforced Concrete Box Structure.
5.1.13	Transitway under– Future Whites Road	Arterial underpass	***Single Span Reinforced Concrete Box Structure.
5.1.14	Transitway under Sideline 24	Arterial underpass	***Single Span Reinforced Concrete Box Structure.
5.1.15	Transitway over Future Rossland Road.	Arterial overpass	5-Span Slab-on-Trapezoidal Steel Box Girders.
5.1.16	Transitway over URFE Creek	Watercourse bridge	Single span slab-on-pre-stressed concrete I-Girders with Integral Abutments
5.1.17	Transitway over Brock Road	Arterial overpass	***Single Span Reinforced Concrete Box Structure.

** Railway Crossing ** High Volume Crossing *** When structure supports fill otherwise use Reinforced Concrete Rigid Frame with open footing.*

5.3.2. Culverts

Within the project limits there will be a total of 14 structural culverts (summarized in Table 5.8). These culverts will be reinforced concrete open footing rigid frame structures. The main advantages for using this type of structure are:

They minimize impact on aquatic life as a temporary flow passage can be maintained between the culvert footings;
The flow is maintained in the stream during construction as works are located outside the limits of the stream; and,
Removal of water by pumping is reduced.

TABLE 5.8: PROPOSED STRUCTURAL CULVERTS

STATION	CULVERT TYPE	SIZE
1+131	Reinforced Concrete Rigid Frame Open Footing Culvert	3 m x 1.25 m
1+555	Reinforced Concrete Rigid Frame Open Footing Culvert	3 m x 1.25 m
1+737	Reinforced Concrete Rigid Frame Open Footing Culvert	3 m x 1.25 m
7+027	Reinforced Concrete Rigid Frame Open Footing Culvert	6 m x 2.5 m
7+766	Reinforced Concrete Rigid Frame Open Footing Culvert	6 m x 2.5 m

10+019	Reinforced Concrete Rigid Frame Open Footing Culvert	2.5 m x 1.25 m
10+178	Reinforced Concrete Rigid Frame Open Footing Culvert	5 m x 2.5
10+761	Reinforced Concrete Rigid Frame Open Footing Culvert	4.5 m x 2 m
12+848.55	Reinforced Concrete Rigid Frame Open Footing Culvert	6 m x 2.5 m
14+366.71	Reinforced Concrete Rigid Frame Open Footing Culvert	6 m x 2.5 m
14+823.43	Reinforced Concrete Rigid Frame Open Footing Culvert	6 m x 1.75 m
15+423.13	Reinforced Concrete Rigid Frame Open Footing Culvert	6 m x 2.0 m
16+504.9	Reinforced Concrete Rigid Frame Open Footing Culvert	6 m x 2.5 m
17+446.77	Reinforced Concrete Rigid Frame Open Footing Culvert	5 m x 2 m

5.4. Stormwater Management and Drainage

The proposed 407 Transitway runs parallel to the south of the 407 ETR from Kennedy Road in the City of Markham to east of Brock Road interchange in the City of Pickering. The 407 Transitway falls under the jurisdiction of the TRCA and crosses three watersheds: Rouge River, Petticoat Creek and Duffins Creek. The study area within the Rouge River and Petticoat Creek watersheds is predominantly located in an urban environment; however, the section located within Duffins Creek is mainly rural, with significant development planned in the upcoming years. The length of the 407 Transitway within the study limits is approximately 19.3 km and five stations including parking areas are proposed at Markham Road, Ninth Line, Donald Cousens, Whites Road and Brock Road. The Transitway crosses 49 watercourses within the study limits. Refer to the study area maps for the drainage components shown in **Figures 5.7 to 5.10**.

The complete Drainage, Hydrology, Stormwater Management and Floodplain Hydraulics Report (referred herein as "Drainage Report") is included in Appendix C of the EPR. The study focuses on the development of a drainage and SWM strategy/plan for the 407 Transitway and stations/parking areas that minimizes impacts on the existing watercourses and drainage patterns. The study activities included the following: hydrologic analysis of the Transitway to assess any negative impacts on the existing watercourses; identifying possible measures to minimize stormwater runoff impacts to fisheries, surface water, groundwater and wetlands; design of SWM ponds for each station site to provide quantity and/or quality control; creating new HEC-RAS models and updating existing models provided by TRCA to establish base models that could be used to assess the impact of the Transitway; hydraulic analysis of Transitway structures; and, reviewing and updating existing TRCA's floodplain mapping within the study area to include the Transitway to ensure no increases in water levels are expected beyond the MTO property.

5.4.1. Hydrologic Analysis and Stormwater Management Strategy

A hydrologic analysis was undertaken for the study area using Visual OttHYMO software for three different routing conditions: existing, post-development without SWM and post-development condition with SWM. Detailed modelling results are presented in Appendix D of the Drainage Report included in **Appendix C** of the EPR.

The 12-hour AES design storm was selected by TRCA for application in the Rouge River, Petticoat Creek and Duffins Creek watersheds hydrologic modelling. Additionally, the design of storage facilities designed for the purpose of this study considers both storm events, 4-hour Chicago and 12-hour AES and comparison of modelling results is summarized in several tables in the Drainage Report. The 12-hour AES remains the design storm per TRCA's hydrologic modelling of the watershed and the 4-hour Chicago was developed in Visual OttHYMO using the latest MTO Intensity-Duration-Frequency curves to comply with MTO rainfall design guidelines.

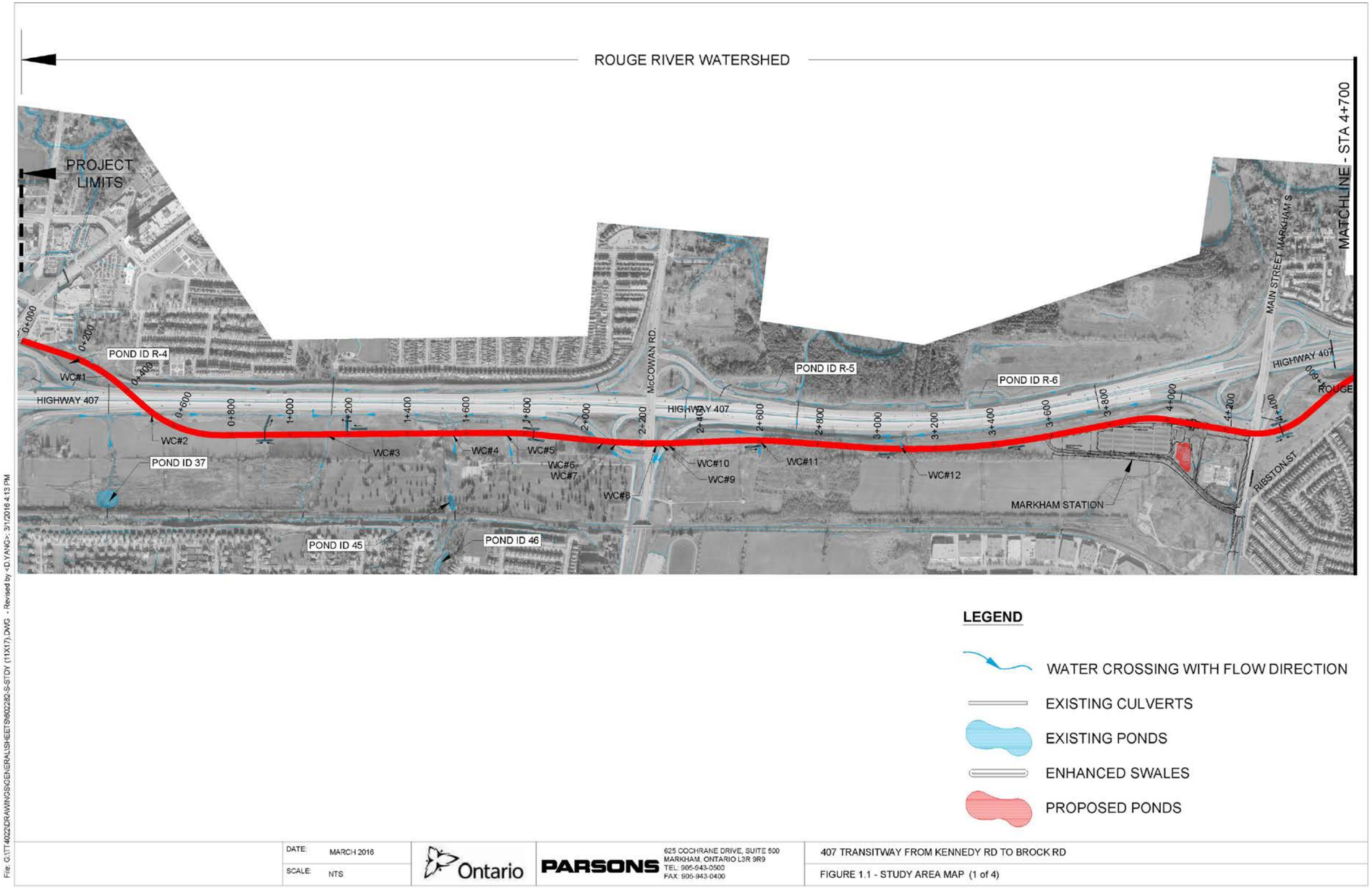
The proposed SWM strategy for the project was developed for the Transitway sub-areas as well as for the proposed stations.

5.4.1.1. Transitway Sub-Areas

The Transitway sub-areas delineated along the proposed 407 Transitway alignment are shown in Figures 4.1 and 4.2 in Appendix D of the Drainage Report. The drainage area at each transitway outlet is less than 5 ha, therefore, wet ponds are not feasible to be constructed to provide quality and quantity control for the paved area of the runningway. A treatment train approach is implemented consisting of grassed embankments to promote sheet flow, grassed swales on both sides of the Transitway and enhanced grassed swales/dry ponds located before each outlet from the Transitway. The drainage strategy of the 407 Transitway sub-areas within each subwatershed, including details related to discharge points of each swale, as well as quantity control criteria are presented in Table 4.5 in Appendix D of the Drainage Report.

Grassed swales are proposed along the entire length of the Transitway. Since the swales will follow the slope of the road, which in some instances is steep, segments of enhanced swales are proposed before any stormwater discharge to a watercourse or any other type of outlet. The enhanced swales would cover approximately 50 m in length and are designed to have a trapezoidal cross-section, flat bottom (1 m wide), 3:1 side slopes and a depth of 1.5 m. A longitudinal slope of maximum 0.2% is proposed for all swales to provide settlement of sediment and to reduce flow velocities from upstream segment. In order to increase the time of flow in the swales and to promote infiltration at the same time, two cells were designed with a 0.5 m layer of clear stone covered by 0.3 m of topsoil below the invert of the swale. The enhanced swales were designed in a form of dry ponds with a formal outlet control structure to provide quality and quantity control for transitway sub-areas. The outlet is comprised of a 100 mm perforated pipe proposed to be installed at the bottom of each swale that is further connected to a hickenbottom structure equipped with a 75 mm orifice plate. Swale details (plan view, cross-sections and longitudinal profile) are shown in SK-3 in Appendix D of the Drainage Report. Modelling results indicate that in some instances the volumes required could be less than the maximum volume provided by the swale; a smaller head would result in less discharge

FIGURE 5.7: STUDY AREA MAP (1 OF 4) – DRAINAGE COMPONENT



File: G:\TT4402\DRAWINGS\GENERAL\SHEETS\9602282-S-STDY (11X17).DWG - Revised by: <D.YANG>, 3/1/2016 4:13 PM

FIGURE 5.8: STUDY AREA MAP (2 OF 4) – DRAINAGE COMPONENT

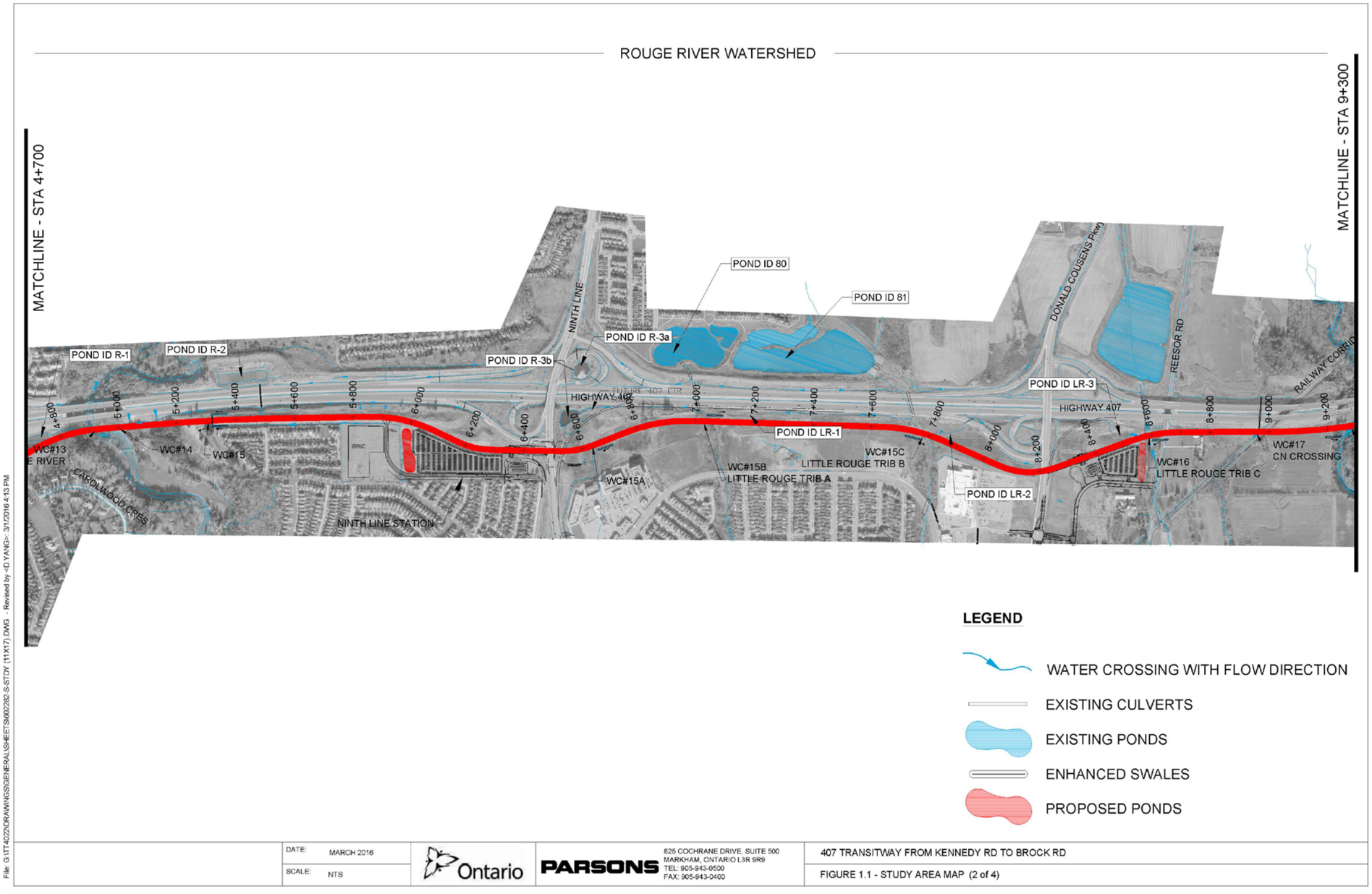


FIGURE 5.9: STUDY AREA MAP (3 OF 4) – DRAINAGE COMPONENT

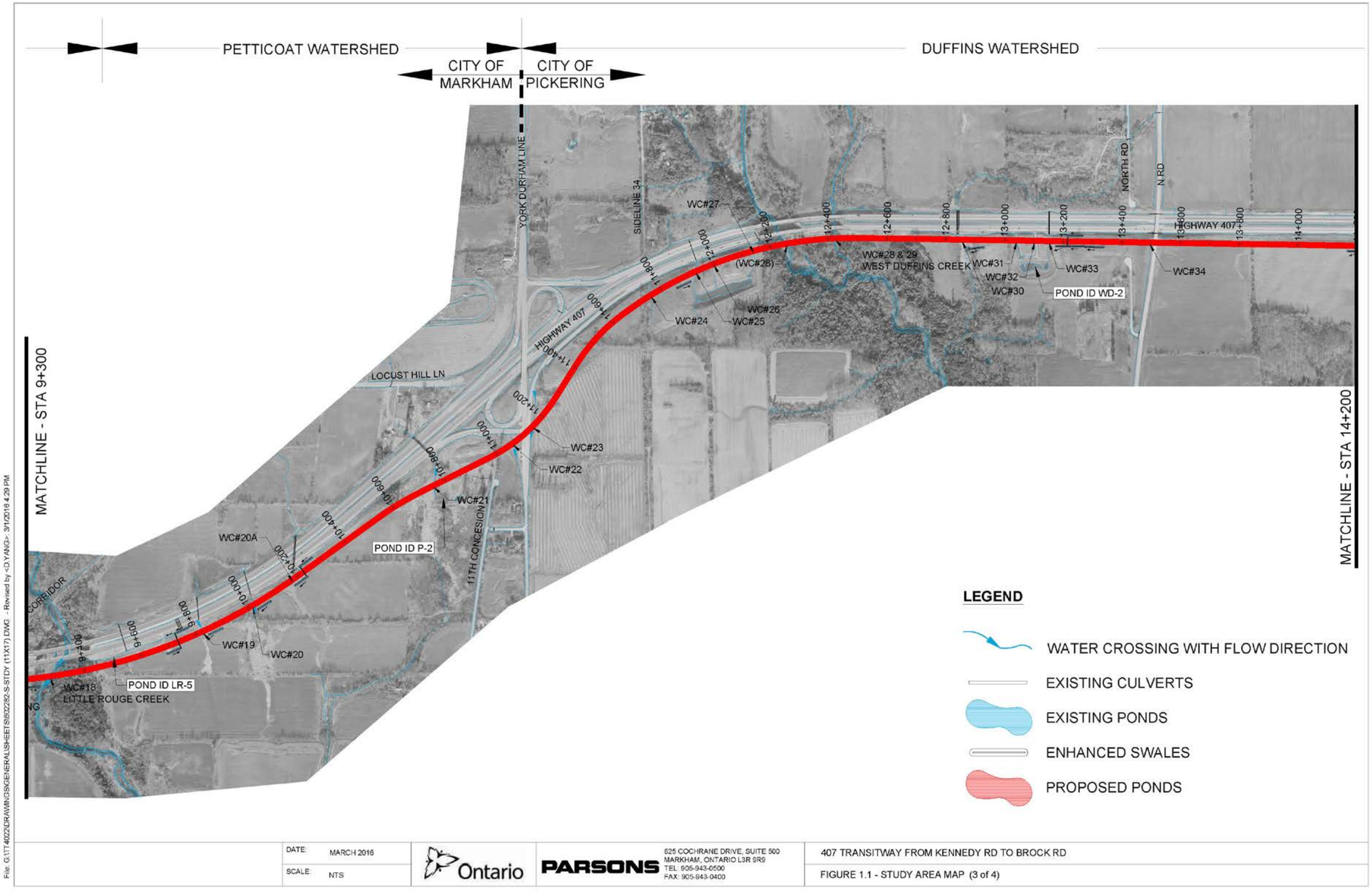
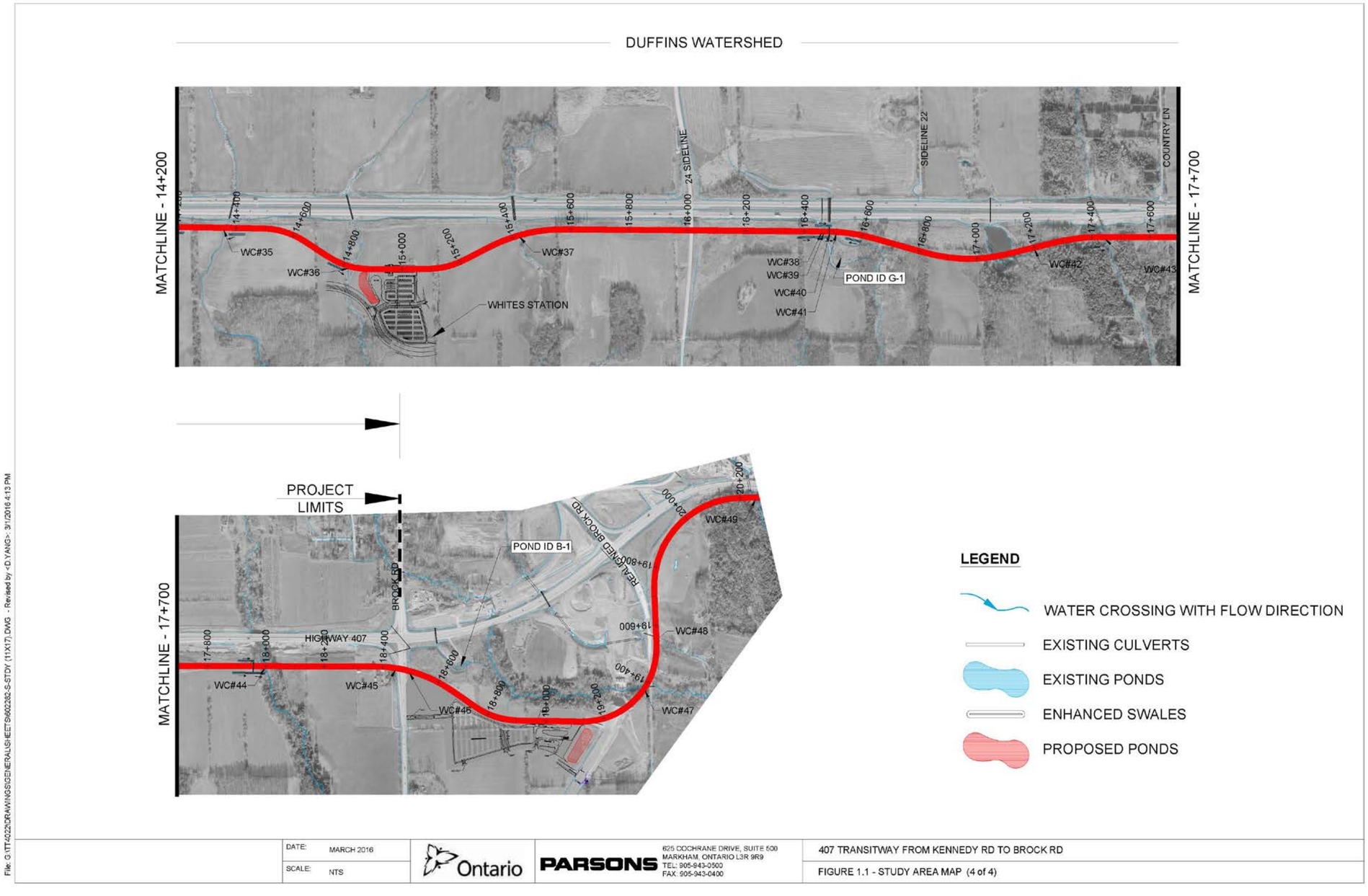


FIGURE 5.10: STUDY AREA MAP (4 OF 4) – DRAINAGE COMPONENT



at the outlet as shown in the results. The approach is considered conservative since the minimum allowable orifice is used and more storage is provided than required.

Tables 4.7, 4.8 and 4.9 in Appendix D of the Drainage Report show the quantity control strategy for each swale. Figures 4.1 and 4.2 in Appendix D of the Drainage Report show the location of all swales identified along the Transitway. In the instances where the volume required exceeds 412.5m^3, additional swales are proposed to provide the required volume (one example is ES-1 where storage required is 700m^3 therefore two swales ES-1a and ES-1b are designed to provide 825m^3 maximum storage).

Flows generated by the 25 mm Chicago 4-hour event vary between 0.001 m^3/s and 0.003 m^3/s for each swale as shown in Table 4.5 in Appendix D of the Drainage Report. Considering the swales have a maximum 0.2% longitudinal slope, velocities in the swale are approximately 0.13 m/s which is less than 0.5 m/s as required by TRCA (refer to details in the Drainage Report).

Modelling results indicate that no increases in peak flows are expected within Rouge and Petticoat Watersheds. Increases are noted within Duffins watershed (Subwatershed 8, 31 and 39) due to the extremely low allowable release rates (based on units-rates formulas) and the minimum orifice size of 75 mm at the outlet of the proposed swales, although sufficient volume is provided in the swales. The increases vary between 0.001 m^3/s and 0.004 m^3/s at the outlet of the swales compared to the allowable rates. These increases can be considered small and do not pose significant erosion/scour impacts at the outlets. Velocities could be further mitigated with vegetated outlets or energy dissipaters.

The SWM strategy recommends that flows from several enhanced swales be directed to the existing 407 ETR ditches and ultimately to existing ponds. Ponds LR-1, LR-5, WD-2 and G1 were identified as possible outlets. It is recommended that the capacity of existing 407 ETR ponds to be assessed during Detailed Design to confirm if sufficient capacity exists in the ponds for additional flows.

5.4.1.2. Proposed Stations

Five stations will be located along the proposed length of the Transitway, at the following locations: Markham Road, Ninth Line, Donald Cousens Parkway, Whites Road, and Brock Road. Parsons undertook a preliminary hydrologic analysis to determine volume requirements for SWMFs. The drainage area maps and pond details including outlet control structure schematic of all stations are included as Figures 5.1 to 5.5 in Appendix E of the Drainage Report.

The TRCA's criteria for stormwater management quality and quantity control are detailed in Table 5.9.

TABLE 5.9: STORMWATER MANAGEMENT CRITERIA

Quantity Control	Rouge and Petticoat Watersheds: match post-development peak flows to pre-development levels for all return periods analyzed (TRCA Stormwater Management Criteria, V 1.0, Aug 2012). Duffins Watershed: post-development peak flows were controlled to levels set by allowable unit flow rates based on the TRCA's Unit Flow Rate (2012 Duffins Creek Hydrology Update, Final Report, Feb. 2013).
Quality Control	Enhanced protection (Level-1) criteria to determine the minimum permanent pool size for wet pond facilities (Table 3.2 of the Stormwater Management Planning and Design Manual (MOECC, 2003).
Erosion Control	On-site retention of 5mm (all watersheds) SWM Ponds Extended Detention • 25mm attenuation for 48 hours (Rouge) (TRCA Stormwater Management Criteria, V 1.0, Aug 2012) • 25mm attenuation for 120 hours (Duffins) (Duffins Watershed – criteria for developments within Seaton Lands)
Thermal Considerations	3m permanent pool depth and others (e.g.: cooling trenches) (Guidance for Development Activities in Redside Dace Protected Habitat, MNRF V 1.1 (2014).

The SWM strategy for the stations includes wet ponds with control structures consisting of multiple orifices and/or weirs. Wet ponds were designed for each station site to provide quantity, quality and erosion and sediment control. One facility is recommended at each station in the Rouge watershed, and two facilities are recommended at each station in the Duffins watershed. The SWMFs in the Rouge watershed (at Markham Road, Ninth Line, and Donald Cousens Parkway Stations) all meet the SWM criteria identified in Table 5.9. The facilities in the Duffins watersheds meet most of the SWM criteria, with the following exceptions:

- The criteria for 120-hour retention of the 25 mm event could not be met at SWMF-4, SWMF-5, or SWMF-6 because the orifice diameter required to meet this criteria was smaller than the 75 mm minimum required to prevent clogging. During Detail Design, the feasibility of connecting SWMF-4 and SWMF-5 should be assessed in order to achieve the storage and 120-hour detention criteria for Whites Road Station.
- The feasibility of enlarging the footprint of the above-mentioned ponds to lower the hydraulic head of the orifice was investigated and it was found that the area of pond would be extremely large but there is no additional land to extend the surface area of the SWM facilities.
- Due to the presence of a high groundwater table, the target 3 m deep permanent pool could not be achieved at SWMF-7; the existing cooling trench downstream of the pond will be retained to provide additional thermal mitigation before flows from this facility are discharged to Brougham Creek.

The existing 407 ETR ponds, summarized in Table 5.10, were not modelled in the Visual OttHYMO model received from TRCA as only the design drawings were available and not the corresponding reports. However, the hydrologic analysis of the 407 Transitway was undertaken such that the peak flows from the Transitway are controlled to pre-development levels before discharging to the 407 ETR infrastructure.

TABLE 5.10: SUMMARY OF STORMWATER MANAGEMENT PONDS WITHIN THE STUDY LIMITS

STORMWATER MANAGEMENT FACILITY	LOCATION	TOTAL POND VOLUME PROVIDED (M^3)	POND VOLUME REQUIRED (M^3)	QUALITY AND QUANTITY CONTROL
1	Markham Road	4,801	4,604	yes
2	Ninth Line	6,242	4,281	yes
3	Donald Cousens	4,545	3,645	yes
4	Whites Road (*)	7,835	3,453	yes
5	Whites Road (*)	4,575	2,408	yes
6	Brock Road (*)	7,045	2,638	yes
7	Brock Road	10,771	8,269	yes

(*) oversized pond due to 3.0m permanent pool depth as per MNRF requirements.

5.4.2. Hydraulic Analysis

The 407 Transitway crosses 49 watercourses, out of which 23 are major branches of creeks (such as Lower Rouge, Little Rouge, West Duffins Creek, Brougham Creek and others) and their tributaries. The remaining watercourses were identified as minor conveyance features with small localized tributary areas that the Transitway will not affect because of grade difference. A HEC-RAS analysis was undertaken for the 23 water crossings within the study limits. A HEC-RAS model was provided by TRCA for five crossings (WC13, WC 15b, WC15C, WC18, WC28-29). As part of this assignment the TRCA's HEC-RAS models were updated to include the existing 407 ETR bridges; for the remaining 18 water crossings analyzed, the HEC-RAS model was created using the flows determined in the hydrologic analysis using 4-hour Chicago storm distribution and the MTO Intensity-Duration-Frequency curves. In addition, the regional floodline was delineated for all crossings within the study limits.

Proposed structures have been sized to ensure compliance with MTO Highway Drainage Design Standards (Jan 2008). In all cases regrading of the channels is needed and wingwalls are required to improve inlet flow conditions. Modeling results show that there are no increases in water levels beyond MTO's ROW and that small increases are limited to areas within MTO's property with the following exceptions:

WC#13, shows relatively small increases (5 cm) in Regional WL upstream of the 407 ETR; however, the design criteria are met for this structure.
WC#15A shows an increase downstream of the Transitway due to the flat topography which does not allow creek bottom re-grading; if any development is proposed in the area it is recommended to be above 180.8 m elevation (100-year WL, which is higher than the Regional level). In addition the TRCA model does not show the new development south of the 407 ETR. This needs to be considered during detailed design.
The analysis undertaken for WC#16 assumes uncontrolled flows from Pond 85, which is a conservative approach. WC#16 shows increases in WLs downstream of the proposed Donald Cousens Station; however, it is not feasible to install larger culverts size due to space constraints.
WC#28 shows relatively small increases in WLs downstream of the proposed 407 Transitway (5cm increase in WLs for the regional storm). However, the proposed Transitway bridge has a span of more than double the existing 407 ETR bridge and exceeds the MTO design criteria by far with respect to clearance and freeboard.
WC#30 shows minimum increase downstream of the Transitway (2 cm increase for the 100-year); however, the structure meets all MTO hydraulic design criteria.

The results presented above are not expected to have negative impacts or damage private properties. Compliance to the hydraulic design standards from the MTO Drainage Manual (Jan 2008) are met aside from WC#3 and WC#15A.

The freeboard and clearance for most of the structures exceed the required amounts by more than 1 m in most instances. Therefore, there is flexibility in the future to consider climate change impacts. All proposed 407 Transitway structures have a larger span compared to the existing 407 ETR structures. **Tables 5.11 and 5.12** summarize proposed culvert/structure performance for the Rouge River and Petticoat Creek, and Duffins Creek watersheds respectively. For more detailed tables please refer to **Appendix C**.

TABLE 5.11: 407 TRANSITWAY - WATERCOURSE CROSSINGS (CULVERTS/BRIDGES) ROUGE RIVER AND PETTICOAT CREEK WATERSHED - DESIGN PARAMETERS AND STRUCTURE PERFORMANCE

GENERAL INFO		ROADWAY DATA				STRUCTURE DESIGN PARAMETERS							HYDRAULICS			CULVERT/BRIDGE PERFORMANCE					
WC#	Type	CL Station	CL Elev. (m)	Edge of Trvld Lane Elev (m)	Lowest Point on the Soffit (m)	Inverts		Length	Slope	Span x Rise	Dia	Mat	Computed HW Elevation (m)			FRBD (m)	CLRN (m)	HW/D	Compliance to Standard		
						US (m)	DS (m)	(m)	(%)	(m)	(m)		50-yr	100-yr	Regional				FRBD >1	CLRN >1	HW/D
3	Structural Culvert Rigid Frame Open Footing	1+131	180.48	179.73	--	178.50	178.25	33.00	0.8%	3 x 1.25	--	Conc	179.45	179.53	179.30	0.28	--	0.32	no	--	yes
4	Structural Culvert Rigid Frame Open Footing	1+555	181.76	181.01	--	179.20	178.92	34.00	0.8%	3 x 1.25	--	Conc	180.06	180.14	179.92	0.95	--	0.29	~	--	yes
5	Structural Culvert Rigid Frame Open Footing	1+737	182.31	181.56	--	179.50	179.35	34.00	0.4%	3 x 1.25	--	Conc	180.11	180.15	180.02	1.45	--	0.20	yes	--	yes
11	Circular Concrete Pipe	2+609	182.64	181.89	--	180.00	179.90	28.00	0.4%	--	0.800	Conc	180.27	180.31	180.68	1.62	--	0.34	no	--	yes
12	Circular Concrete Pipe	3+080	180.44	179.69	--	176.80	176.65	45.00	0.3%	--	0.800	Conc	177.14	177.18	177.70	2.55	--	0.42	yes	--	yes
13	Bridge - Rouge River	4+830 to 5+130	169.65	168.90	168.36	--	--	--	--	--	--	Conc	159.99	160.01	161.98	8.89	8.350	--	yes	yes	--
15a (*)	Structural Culvert Rigid Frame Open Footing	6+632	181.80	181.05	--	180.02	179.90	28.00	0.4%	6 x 1	--	Conc	180.63	180.68	180.47	0.42	--	0.10		--	yes
15b	Structural Culvert Rigid Frame Open Footing	7+027	188.04	187.29	--	183.50	183.35	40.00	0.4%	6 x 2.5	--	Conc	184.29	184.36	184.97	3.00	--	0.13	yes	--	yes
15c	Structural Culvert Rigid Frame Open Footing	7+766	188.89	188.14	--	184.45	184.33	47.00	0.3%	6 x 2.5	--	Conc	185.35	185.43	185.71	2.79	--	0.15	yes	--	yes
16 (*)	Structural Culvert Rigid Frame Open Footing	8+591	192.74	191.99	--	187.00	186.90	25.50	0.4%	6 x 2.5	--	Conc	188.72	188.86	188.48	3.27	--	0.29		--	yes
18	Bridge - Little Rouge	9+227 to 9+437	199.10	198.35	196.45	--	--	--	--	--	--	Conc	182.13	182.23	183.43	16.120	14.220	--	yes	yes	--
19	Structural Culvert Rigid Frame Open Footing	9+824	198.88	198.13	--	194.80	194.40	38.00	1.1%	2.5 x 1.25	--	Conc	194.88	194.89	195.01	3.25	--	0.03	yes	--	yes
20	Structural Culvert Rigid Frame Open Footing	10+019	198.88	198.13	--	195.50	195.00	45.00	1.1%	2.5 x 1.25	--	Conc	195.59	195.61	195.73	2.54	--	0.04	yes	--	yes
20a	Structural Culvert Rigid Frame Open Footing	10+178	199.91	199.16	--	196.00	195.50	36.00	1.4%	5 x 2.5	--	Conc	196.26	196.29	196.66	2.90	--	0.05	yes	--	yes
21	Structural Culvert Rigid Frame Open Footing	10+761	203.53	202.78	--	200.47	200.00	38.00	1.2%	4.5 x 2	--	Conc	200.61	200.63	200.85	2.17	--	0.03	yes	--	yes

(*) in these cases the vertical alignment of the corridor slopes to the underground and measures are needed to avoid water entering the underground portion of the corridor

TABLE 5.12: 407 TRANSITWAY - WATERCOURSE CROSSINGS (CULVERTS/BRIDGES) DUFFINS CREEK WATERSHED - DESIGN PARAMETERS AND STRUCTURE PERFORMANCE

GENERAL INFO		ROADWAY DATA				STRUCTURE DESIGN PARAMETERS						HYDRAULICS			CULVERT/BRIDGE PERFORMANCE			
WC#	Type	CL Station	CL Elev. (m)	Edge of Trvld Lane Elev (m)	Lowest Point on the Soffit (m)	Inverts		Length	Slope	Span x Rise	Mat	Computed HW Elevation (m)			FRBD (m)	Compliance to Standard		
						US (m)	DS (m)	(m)	(%)	(m)		50-yr	100-yr	Regional		FRBD >1	CLRN >1	HW/D
28 & 29	Bridge -West Duffins Creek and Tributary	12+190 to 12+495	186.27	185.52	184.06	--	--	--	--	--	Conc	176.99	177.08	178.75	8.44	--	yes	--
30	Structural Culvert Rigid Frame Open Footing	12+848.55	193.44	192.69	--	185.50	185.00	48.50	1.0%	6 x 2.5	Conc	185.74	185.76	186.11	6.95	yes	--	yes
35	Structural Culvert Rigid Frame Open Footing	14+366.71	216.54	215.79	--	213.00	212.75	33.00	0.8%	6 x 2.5	Conc	213.12	213.13	213.37	2.67	yes	--	yes
36	Structural Culvert Rigid Frame Open Footing	14+823.43	216.57	215.82	--	214.32	214.10	29.00	0.8%	6 x 1.75	Conc	214.45	214.47	214.72	1.37	yes	--	yes
37	Structural Culvert Rigid Frame Open Footing	15+423.13	221.70	220.95	--	218.70	218.40	32.00	0.9%	6 x 2	Conc	218.85	218.87	219.17	2.10	yes	--	yes
41	Structural Culvert Rigid Frame Open Footing	16+504.9	212.02	211.27	--	208.48	207.97	43.00	1.2%	6 x 2.5	Conc	208.62	208.64	208.94	2.65	yes	--	yes
43	Structural Culvert Rigid Frame Open Footing	17+446.77	200.71	199.96	--	189.55	188.93	64.00	1.0%	5 x 2	Conc	189.78	189.81	190.30	10.18	yes	--	yes
44	Bridge - Urfe Creek	17+965 to 18+007	195.93	195.18	193.76	--	--	--	--	--	Conc	189.01	189.02	189.25	6.16	--	yes	--

Note: Edge of Trvld lane = Edge of the Travelled Lane
Mat = material
Dia= diameter
HW = headwater
FRBD= freeboard
CLRN= clearance

5.5. Utility Relocation

The majority of the alignment lies on vacant strips of land located to the south of 407 ETR, consequently potential requirement of utility and municipal service relocation only occurs at the grade separation crossings with York and Durham Region's arterial roads and some local municipal roads.

Chapter 4 of this EPR includes the list of all utilities and municipal services located within the 407 Transitway footprint, while Chapter 6 includes the effects and proposed mitigation measures to the cases considered significant due to size and importance of the facility or degree of relocation difficulty and/or complexity during the construction stage. All these cases will need to be addressed during the Detail Design stage of the Transitway.

Hydro One has a list of general requirements for facilities to be built near their transmission lines to ensure the compliance of safety regulations and maintenance access to their structures. These requirements have been considered during the evaluation of alternatives and will be addressed during the Detail Design stage.

Durham Region has several proposed future water, sewer and storm lines that will be crossing the Transitway and the 407 ETR corridor. Steps will be taken to ensure that these facilities do not conflict with the Transitway design. Confirmation of the implementation and location of these services will be addressed during the Detail Design Stage.

5.6. Emergency Response Services (ERS) Considerations

Along the Transitway, access to and egress from the runningway will be available for buses and emergency response vehicles at specific locations. Such locations will occur at each Transitway station by way of a circulation road and/or a restricted access point from specific arterial roads that surround the Transitway. However, emergency response vehicles and access points will not be allowed through private property or residential neighborhoods regardless of the compatibility of the arterial road.

In order to increase the safety factor of the Transitway, the route will have access/egress points in between stations, where presence of adjacent streets will allow, and where physically possible. During the Detail Design phase, the location of these points will be defined in coordination with the corresponding municipalities. The purpose of these points will be to provide enter/exit opportunity to emergency response vehicles such as fire trucks, emergency medical response vehicles (ambulances), and police cars to the Transitway as efficiently as possible.

As several of the proposed access routes are located within the boundaries of future developments, they will need to be updated during the Detail Design stage.

5.7. Illumination

Along the runningway, illumination is being proposed only at the platforms and approaches to them. At surface or above grade sections, the Transitway will be affected by light spillage from the high mast lighting of 407 ETR which basically runs parallel to the future Transitway. Illumination is not being proposed at the proposed underpasses since they are less than 60 m long.

Illumination will be required at all of the station exterior facility components including vehicular and pedestrian access and circulation roads and paths, bus facilities, commuter and PPUDO parking facilities and station platforms; as well as interior elements such as public areas within station building, ticket/passenger information areas, pedestrian walkways and tunnels, escalators and stairwells, operations/maintenance electrical and mechanical rooms. The design criteria for exterior illumination, as well as hardware, should be in accordance with Metrolinx standards as listed in Table 5.13.

TABLE 5.13 METROLINX STANDARDS FOR ILLUMINATION

LOCATION	POLES	LUMINAIRES	ILLUMINATION LEVEL (LUX)
Transitway Platforms	6.0m Steel poles	250W HPS	50
Bus Loops, Access Roads & Platforms	12m Steel poles	250W HPS	20
Underpasses and Tunnels	NA	H.O. Fluorescent Luminaires with TS lamps 1219mm long	150

Illumination of parking areas should be in accordance with MTO standards as outlined in Table 5.14.

TABLE 5.14: MTO STANDARDS FOR ILLUMINATION OF PARKING LOTS

LOCATION	POLES & LUMINAIRES	ILLUMINATION LEVEL	UNIFORMITY	LIGHTING CONTROL
Parking lots where more than 35 vehicles park on a regular basis and there is a transit stop within or adjacent to the parking lot.	9.0m Steel poles with 250 W HPS or 25m High Mast with 400 W HPS	Full Enhanced 25 lux	Avg/Min – 3:1 Max/Min – 6:1	Adaptive lighting controls to enhance energy conservation by reducing lighting levels to 10 lux between. 11 PM and 4 AM

High mast poles should not be used at parking areas located beneath hydro transmission lines unless required Hydro One clearances can be achieved. Interior illumination will also follow GO Transit guidelines and standards and will be coordinated with the station architectural design.

5.8. Intelligent Transportation Systems

The incorporation of ITS is the application of technology to address the operational needs of transportation agencies. ITS has become synonymous with safety, cost effectiveness and operational efficiency in higher order transit systems such as that envisioned for the 407 Transitway. Pre-planning ensures that the maximum benefits can be appreciated by the widest number of users. The 407 Transitway ITS is expected to include: management of transit fare collection; common electronic payment; interactive traveler information; parking management and information; transit signal priority; real-time operations monitoring; and, passenger

security.

5.9. Landscaping

The landscape design for this new transit facility is to focus on mitigating the impacts of the corridor and station sites on the local natural and cultural environments. The design will also strive to blend the facility into the urban fabric and natural landscape surrounding the corridor and station sites.

The proposed landscape treatments for the project are to be divided in two distinct components, one for the transit corridor and the other for the station sites.

The general intent of the corridor landscape treatment is to utilize the available lands along the corridor as an opportunity to provide an ecologically diverse planted environment. The corridor provides an excellent opportunity to increase and enhance the local vegetation diversity through an ecological planting program. This is to be accomplished by planting a variety of locally native shrubs and grasses.

The landscape planting treatments are to be designed to accomplish a number of functions including: slope stabilization; compensation for vegetation removal; stream crossing/wetland restoration; providing naturalization planting; creating visual/wind buffers; and, generally improving the general aesthetics of the corridor.

The outdoor environments in the vicinity of the stations and the associated parking facilities are to be designed to optimize the aesthetics for the station sites, providing 'greening' landscape solutions in available open spaces. The landscape treatments will provide the public with a safe and pedestrian friendly environment, outdoor amenity areas, in an overall environment that is aesthetically pleasing. This is to be accomplished using a variety of landscape techniques including, a diversity of plants and other landscape materials, upgraded pedestrian paving and a coordinated 'palette' of outdoor furnishings.

Landscape related 'Green' initiatives including: permeable paving; surface water retention and green roofs; are to be implemented in appropriate areas. The landscaping around the station sites and parking facilities is designed to complement the surrounding land uses and present the station sites as a visual asset to the surrounding natural/cultural environment.

5.10. Maintenance and Storage Facility

The main Maintenance and Storage Facility approved by MOECC in 2011 as part of the 407 Transitway Central Section – Highway 400 to Kennedy Road TPAP, will serve the Kennedy Road to Broad Road section of the Transitway. The assessment process used to obtain approval for this Maintenance and Storage Facility considered the operational needs and associated effects of the proposed Transit Project described in this current EPR.

5.11. Flexibility in the Design of the Proposed Footprint

Assessment of existing environmental conditions and detailed field investigations covered an area sufficiently broad to minimize potential addenda to the TPAP in case of station facility expansions and/or variations in the footprint of the runningway and associated facilities. For all cases where further field investigations may be required during Detail Design e.g.: Archeological Stages 2, 3 and 4, conceptual alignment options were assessed to ensure alternate opportunities are feasible if necessary. If variations to the design included in this EPR are proposed in the future, Section 15.1 of the Transit Regulation would be followed.

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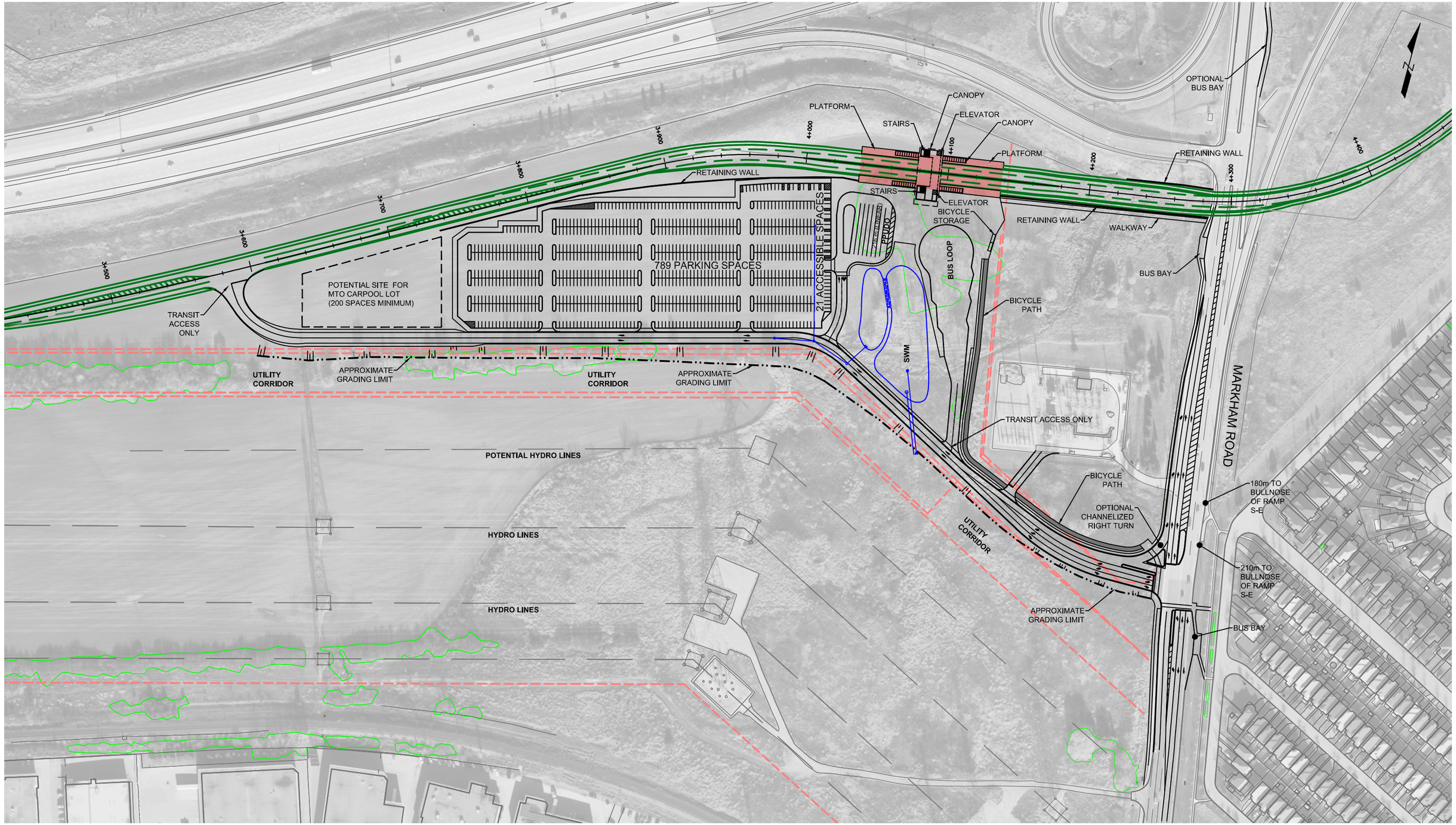

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MODIFIED: Dec. 15, 2016 – 3:25pm MODTIME

Ontario PARSONS IBI

SCALE

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Horizontal

LEGEND

- UTILITY CORRIDOR
- STORM WATER MANAGEMENT POND
- POTENTIAL SITE FOR MTO CARPOOL LOT
- GRADING LIMIIT
- EXISTING VEGETATION

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

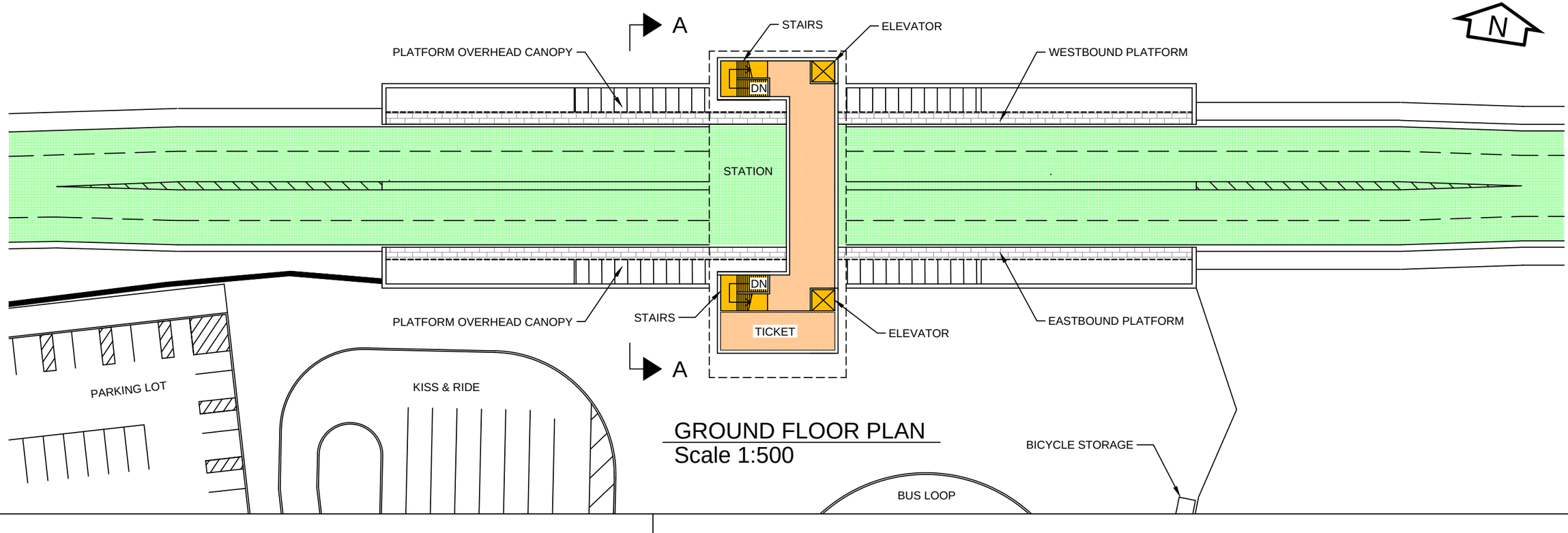
DRAWING SET

MARKHAM RD STATION PLAN

PLATE M-1

DATE

METRIC



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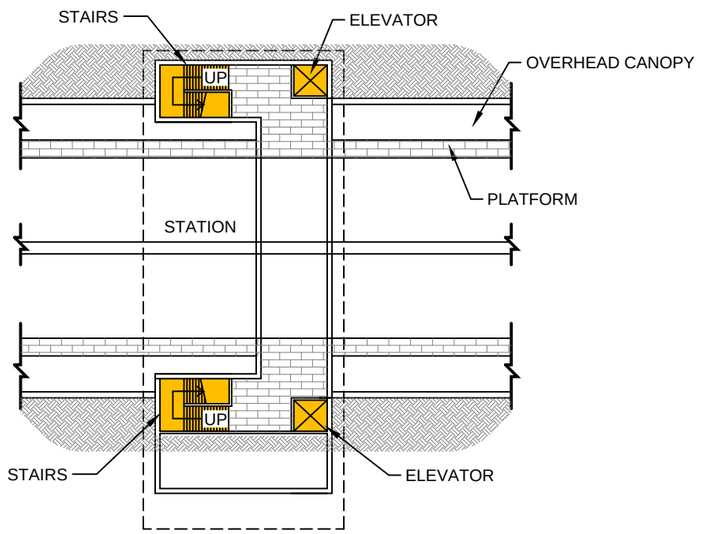

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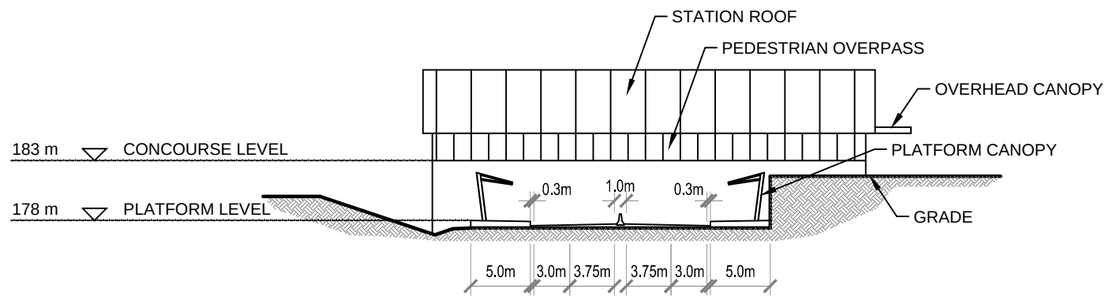

SECTION A-A
Scale 1:500

Ontario PARSONS IBI GROUP

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LEGEND

407 TRANSITWAY
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET
MARKHAM RD STATION

PLATE
M-2

DATE

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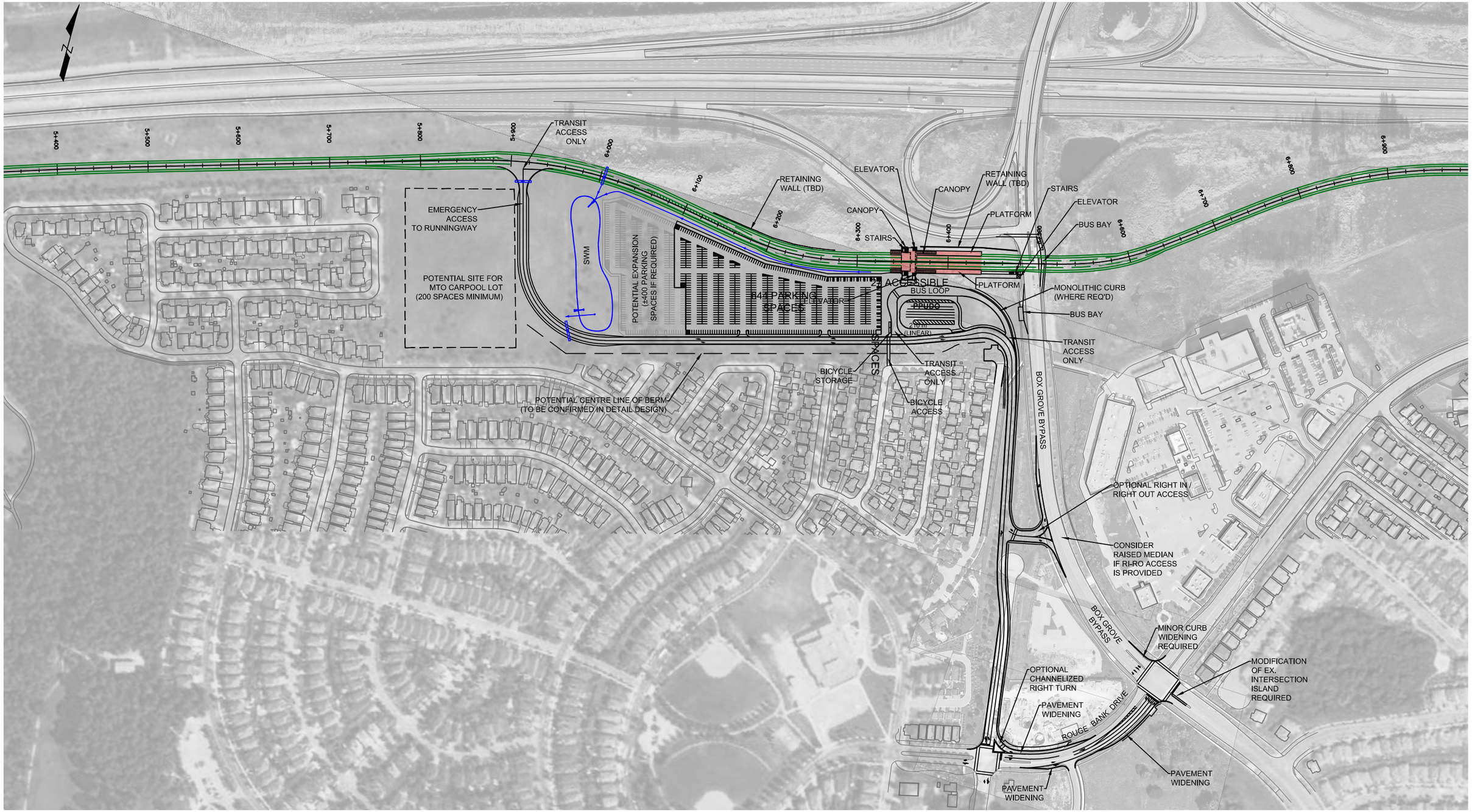

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Ontario PARSONS IBI

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LEGEND

STORM WATER MANAGEMENT POND

POTENTIAL SITE FOR MTO CARPOOL LOT

407 TRANSITWAY

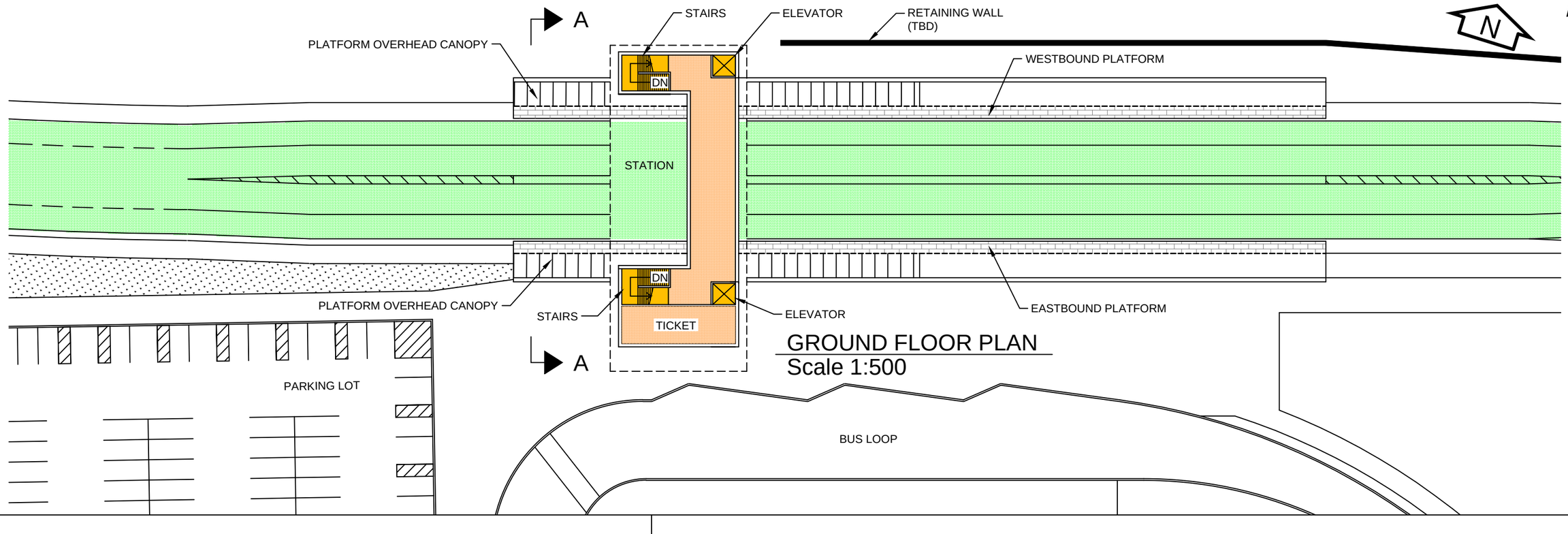
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET

NINTH LINE STATION PLAN

PLATE
N-1

DATE



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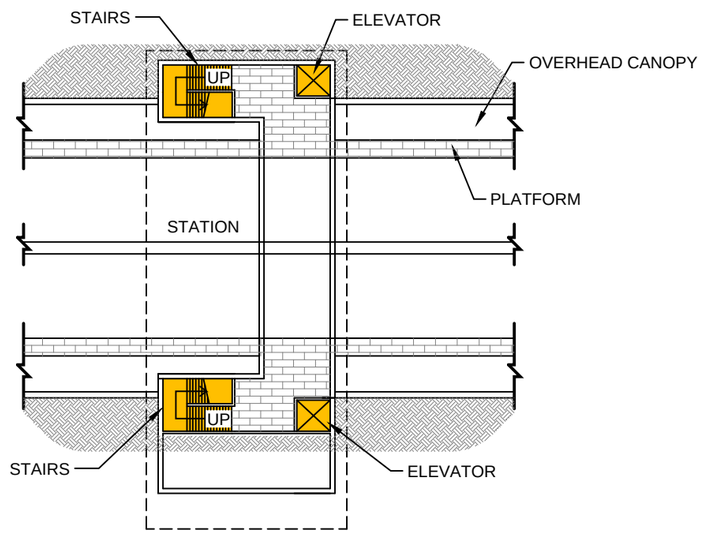

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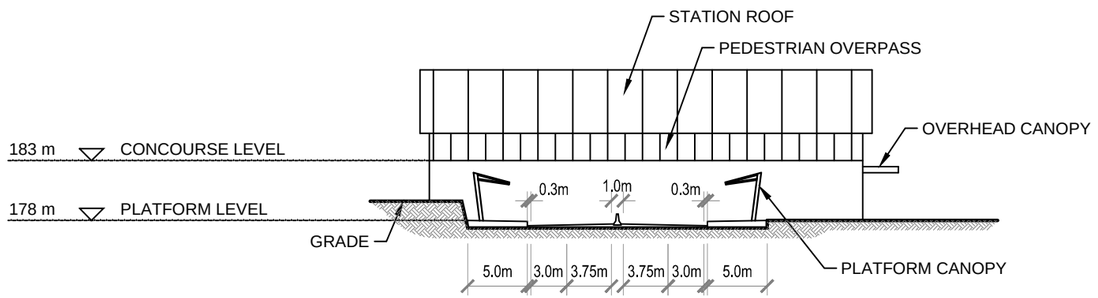

SECTION A-A
Scale 1:500

Ontario PARSONS IBI GROUP

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LEGEND

407 TRANSITWAY
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET
NINTH LINE STATION

PLATE
N-2

DATE

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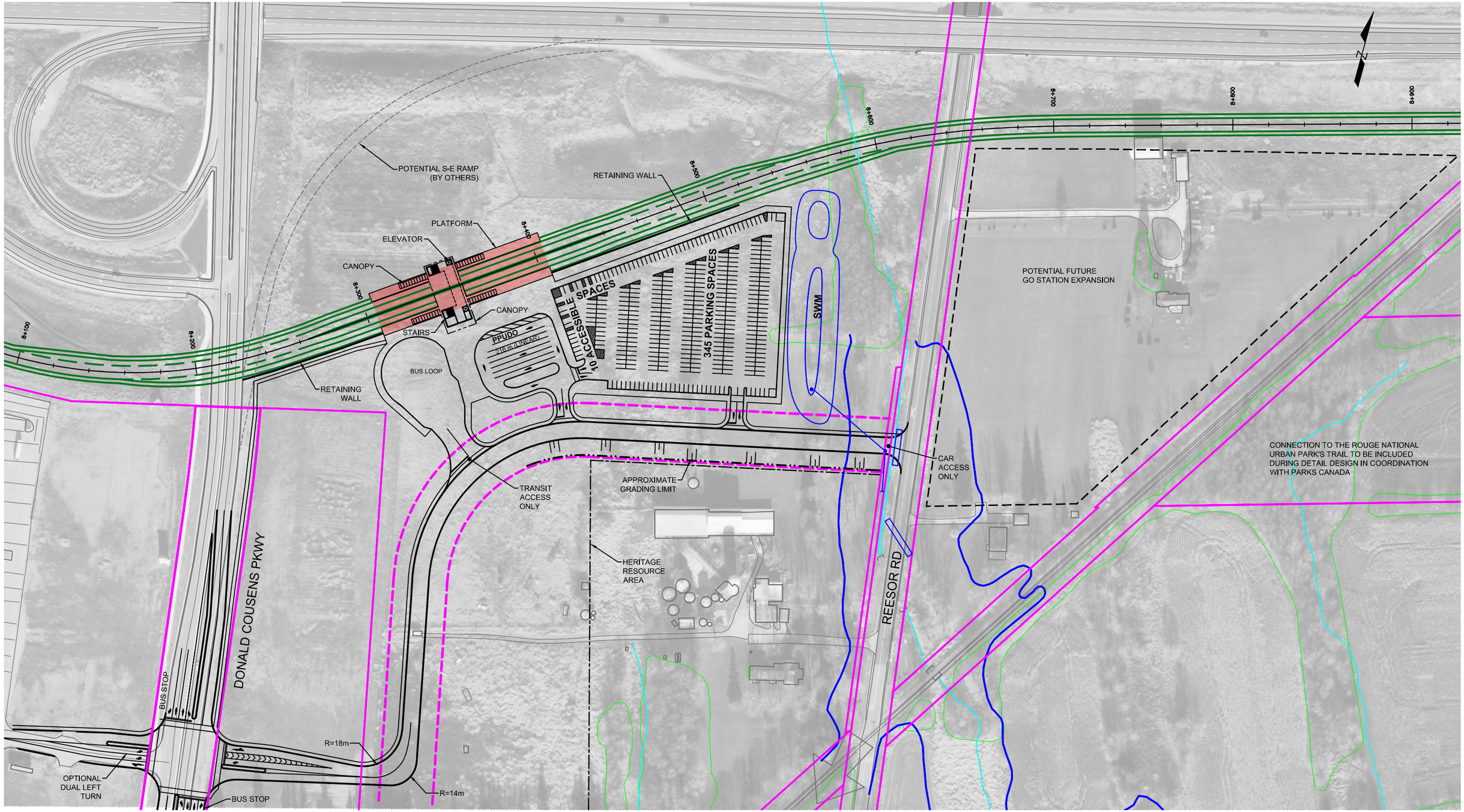

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Ontario PARSONS IBI

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LEGEND

- PROPERTY
- STORM WATER MANAGEMENT POND
- FLOOD PLAIN AREA
- STREAM
- POTENTIAL FUTURE GO STATION EXPANSION
- GRADING LIMIT
- EXISTING VEGETATION
- HERITAGE RESOURCE AREA
- PROPOSED ROAD ROW
- POTENTIAL RAMP (BY OTHERS)

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET
DONALD COUSENS PKWY STATION PLAN

PLATE
D-1

DATE

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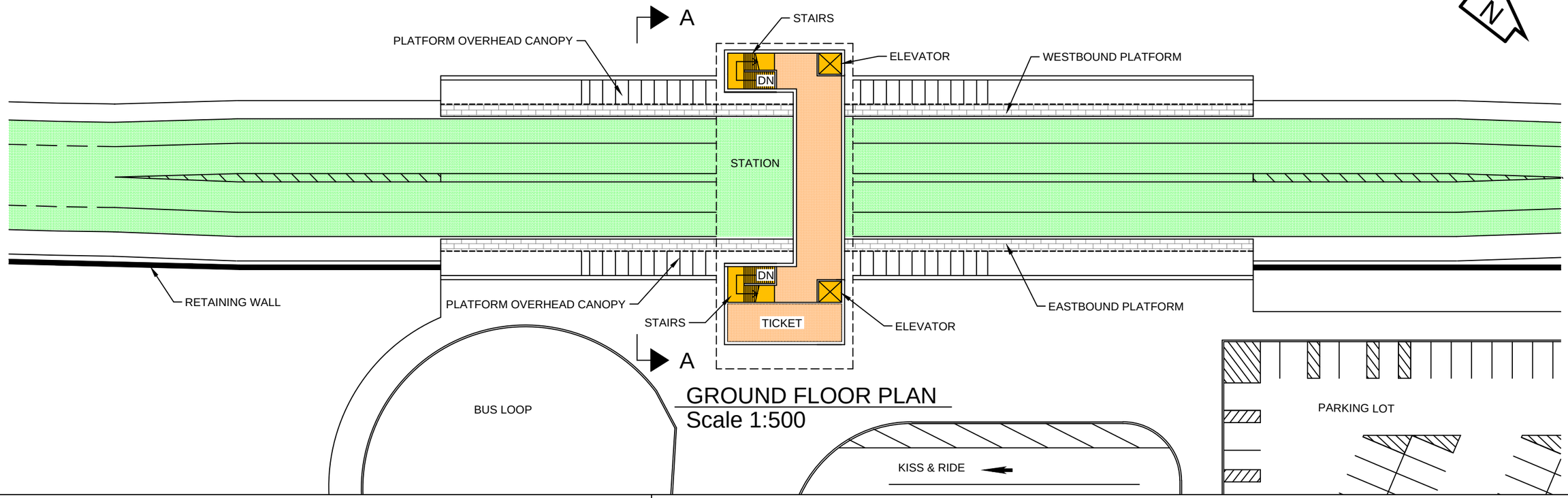

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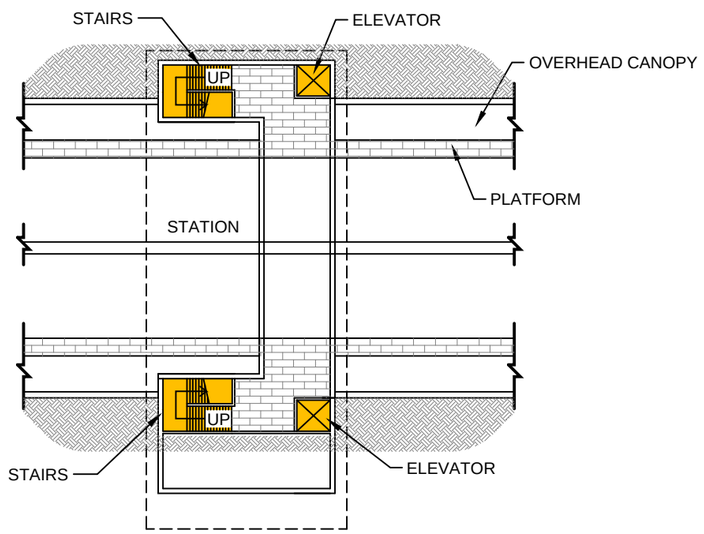

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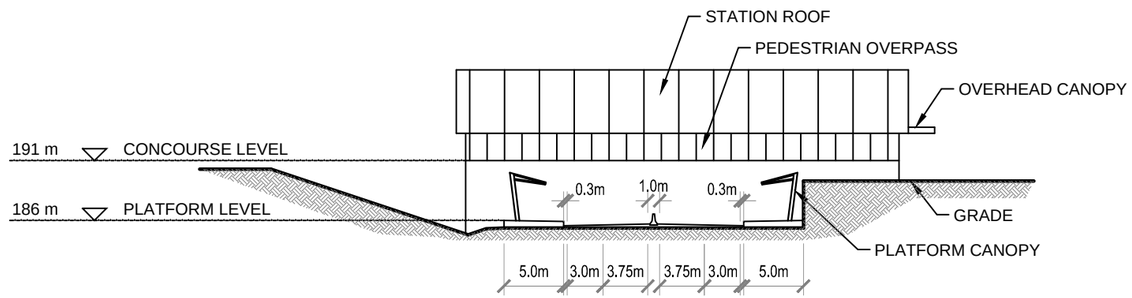

SECTION A-A
Scale 1:500

Ontario PARSONS IBI GROUP

SCALE
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Horizontal

LEGEND

407 TRANSITWAY
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET
DONALD COUSENS STATION

PLATE
D-2

DATE

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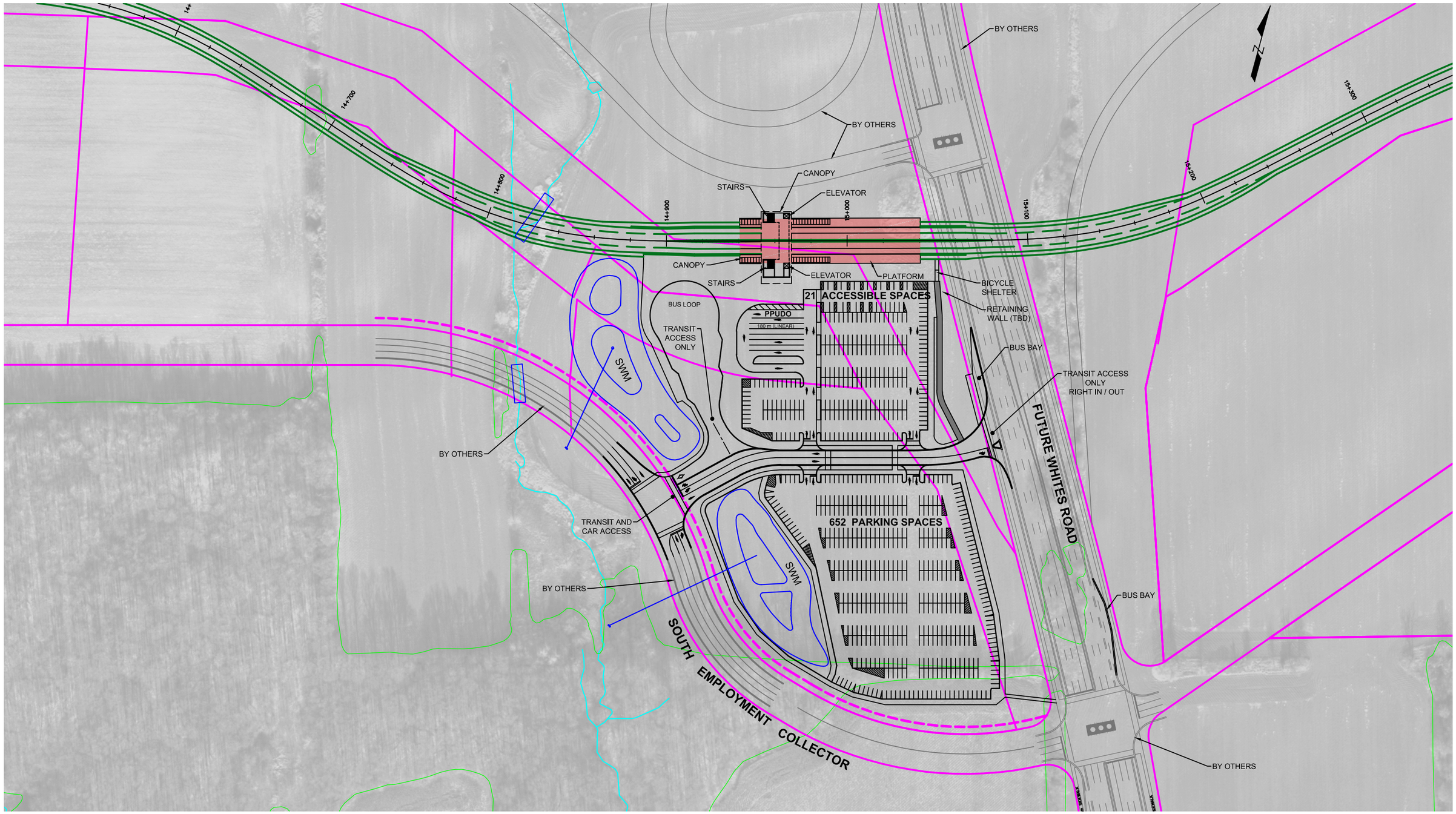

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CREATED:

Ontario PARSONS IBI

SCALE

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Horizontal

LEGEND

- PROPERTY
- PROPOSED ROAD ROW
- STORM WATER MANAGEMENT POND
- STREAM
- EXISTING VEGETATION

407 TRANSITWAY

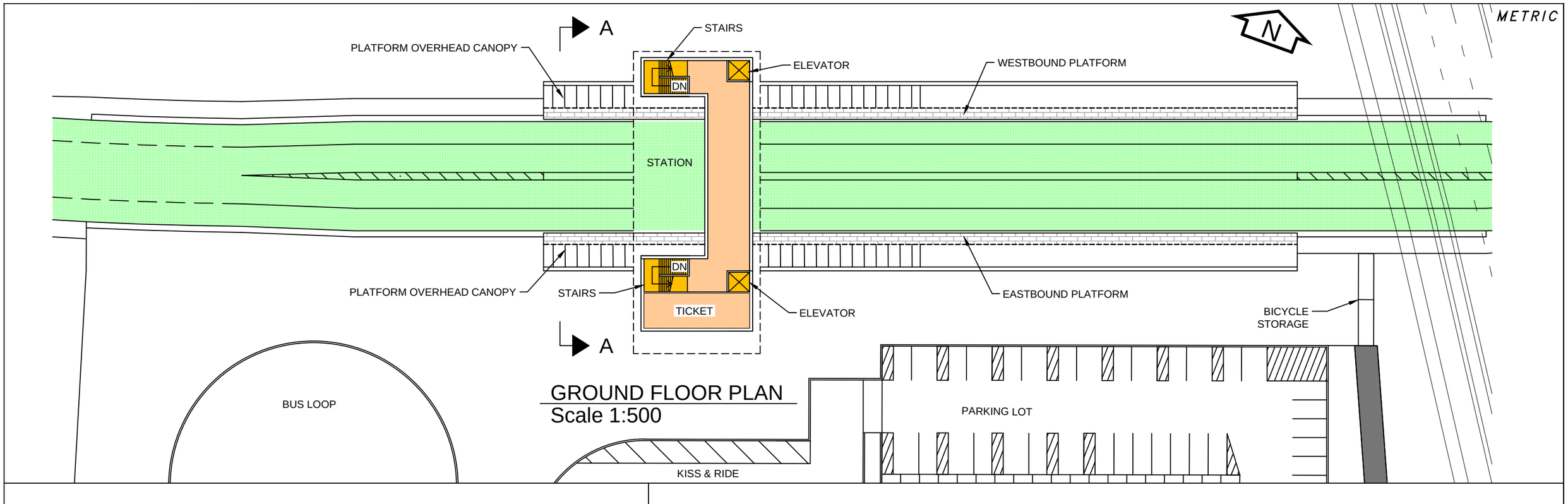
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET

WHITES ROAD STATION PLAN

PLATE
W-1

DATE



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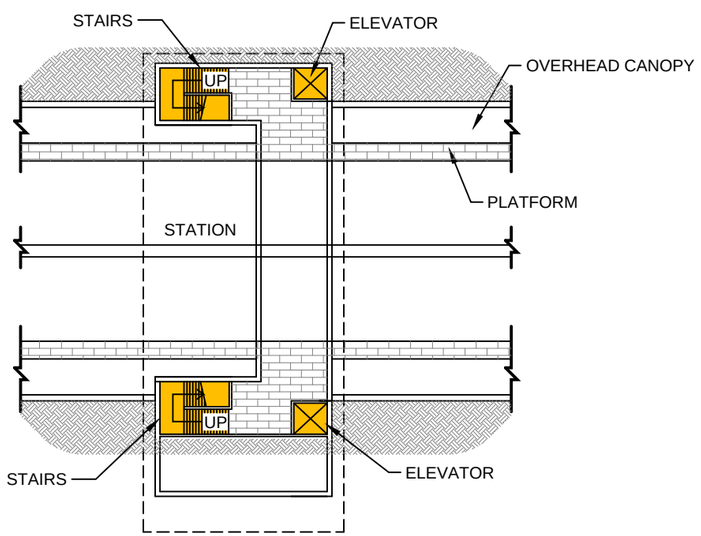

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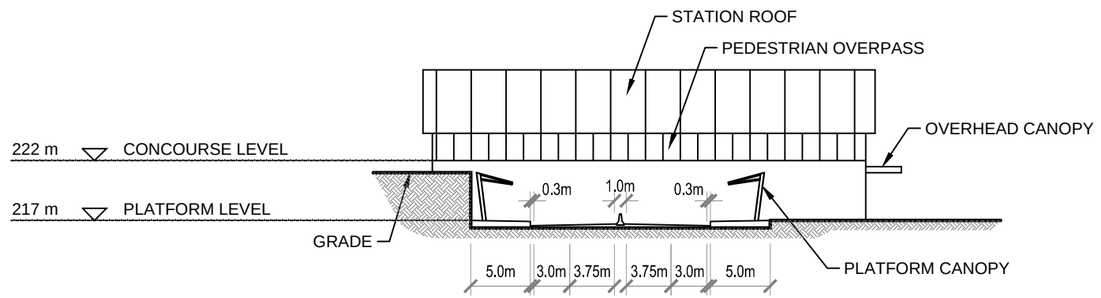

SECTION A-A
Scale 1:500

Ontario PARSONS IBI GROUP

SCALE
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LEGEND

407 TRANSITWAY
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET
WHITES ROAD STATION

PLATE
W-2

DATE

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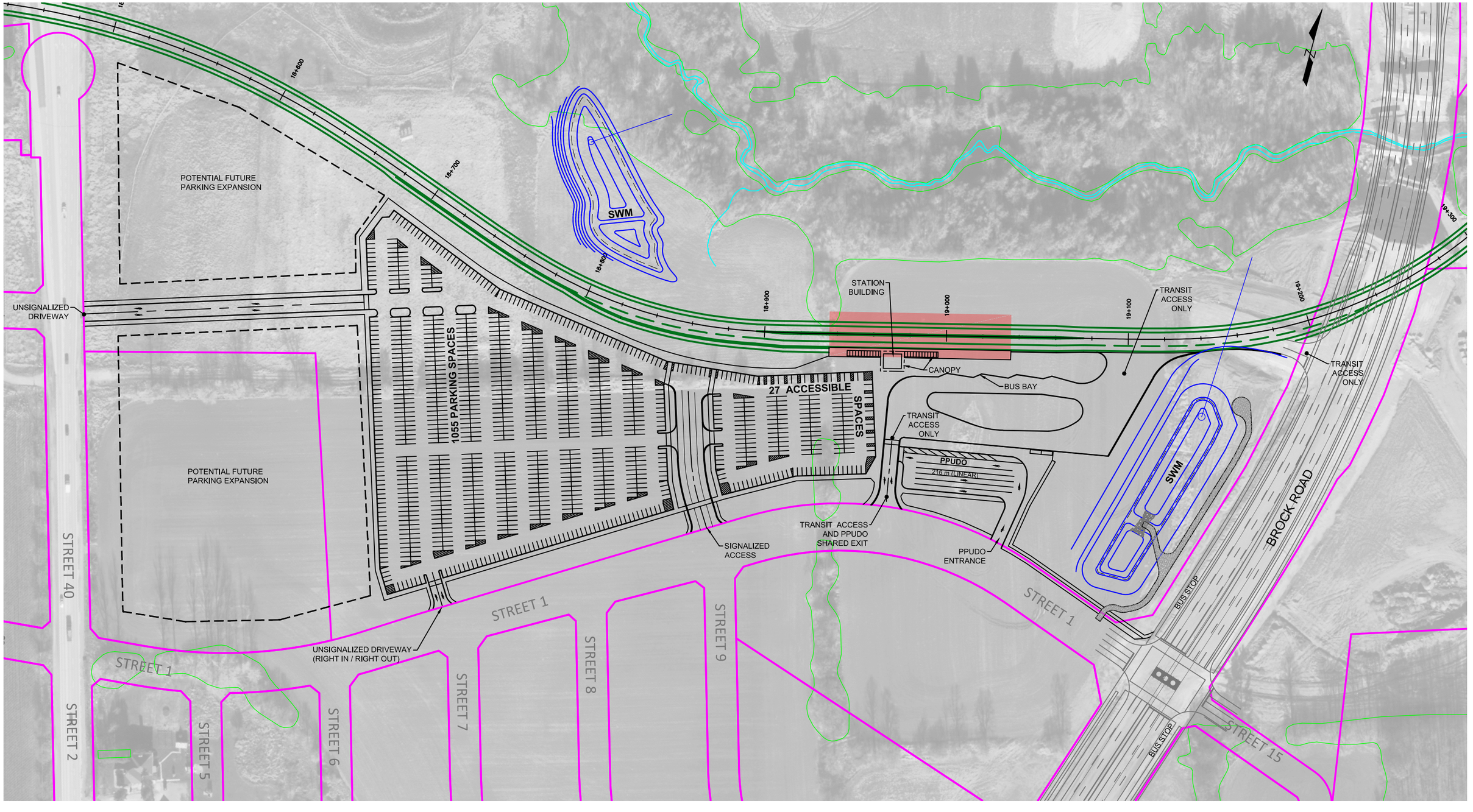

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Ontario PARSONS IBI

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LEGEND
- STORM WATER MANAGEMENT POND
- PROPERTY
- STREAM
- EXISTING VEGETATION
- POTENTIAL FUTURE PARKING EXPANSION

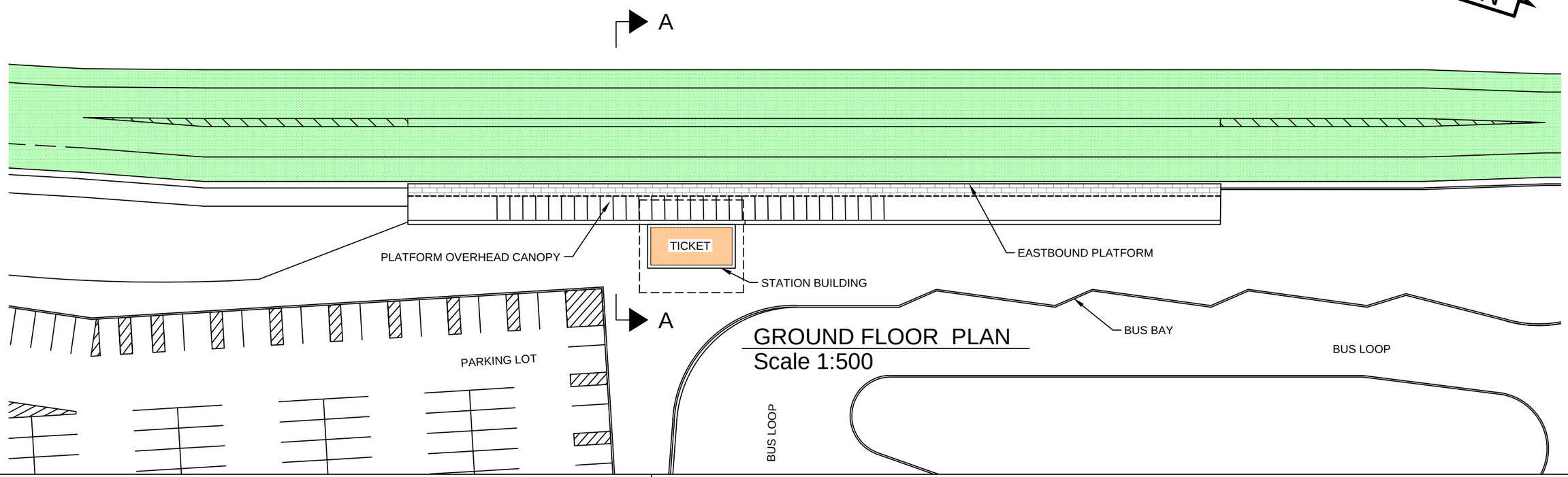
407 TRANSITWAY
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET
BROCK ROAD STATION PLAN

PLATE
B-1

DATE

METRIC



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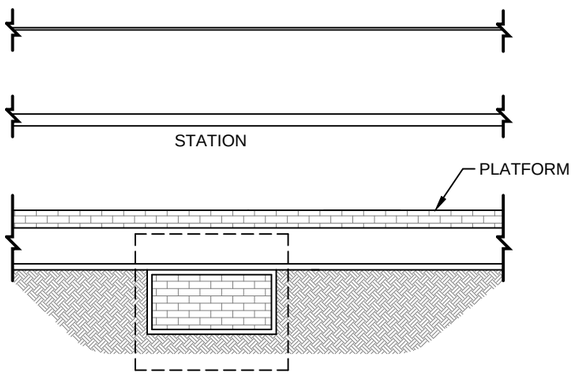

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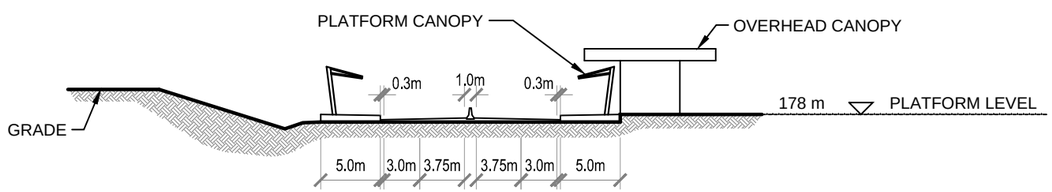

SECTION A-A
Scale 1:500

Ontario PARSONS IBI GROUP

SCALE
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LEGEND

407 TRANSITWAY
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET
BROCK ROAD STATION
INTERIM CONDITION

PLATE
B-2

DATE

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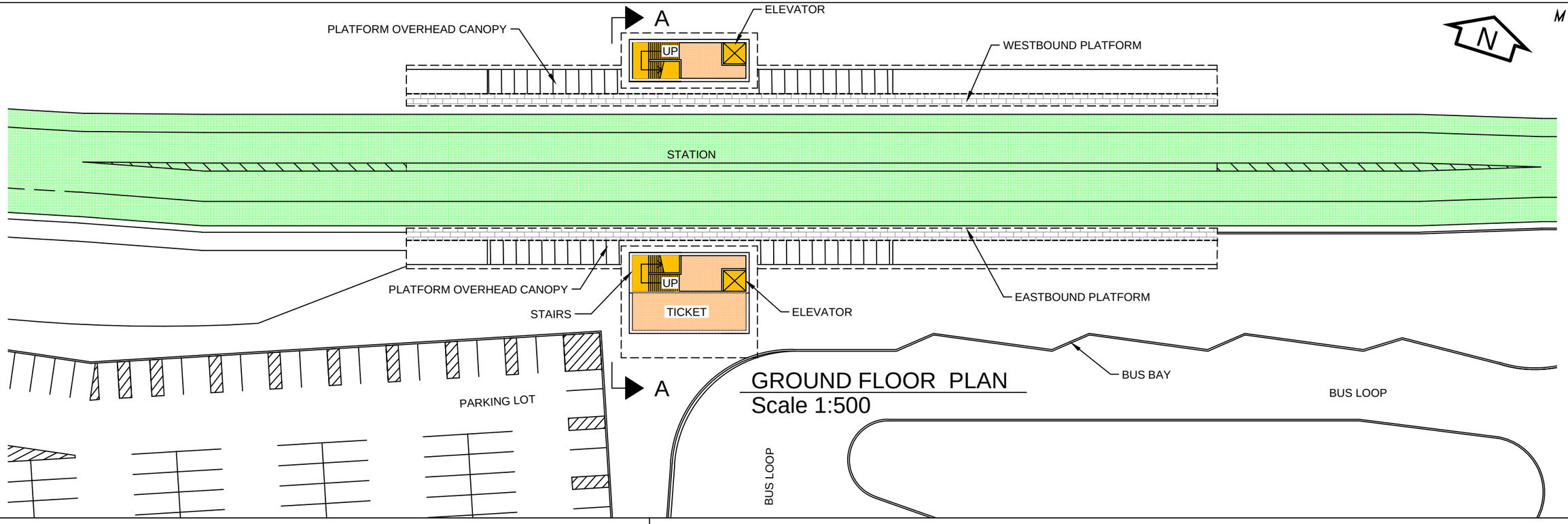

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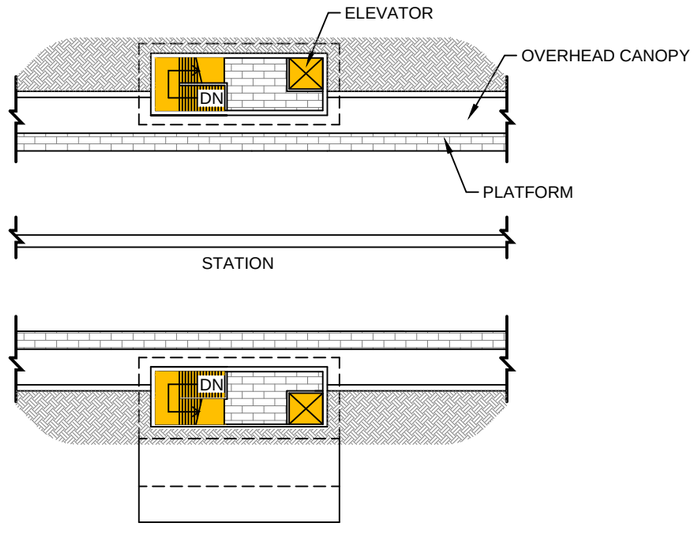

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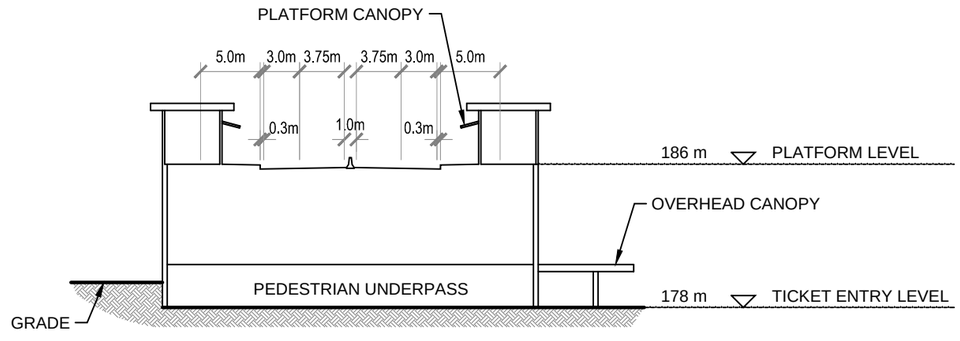

SECTION A-A
Scale 1:500

Ontario PARSONS IBI GROUP

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LEGEND

407 TRANSITWAY
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET
BROCK ROAD STATION ULTIMATE CONDITION

PLATE
B-3

DATE

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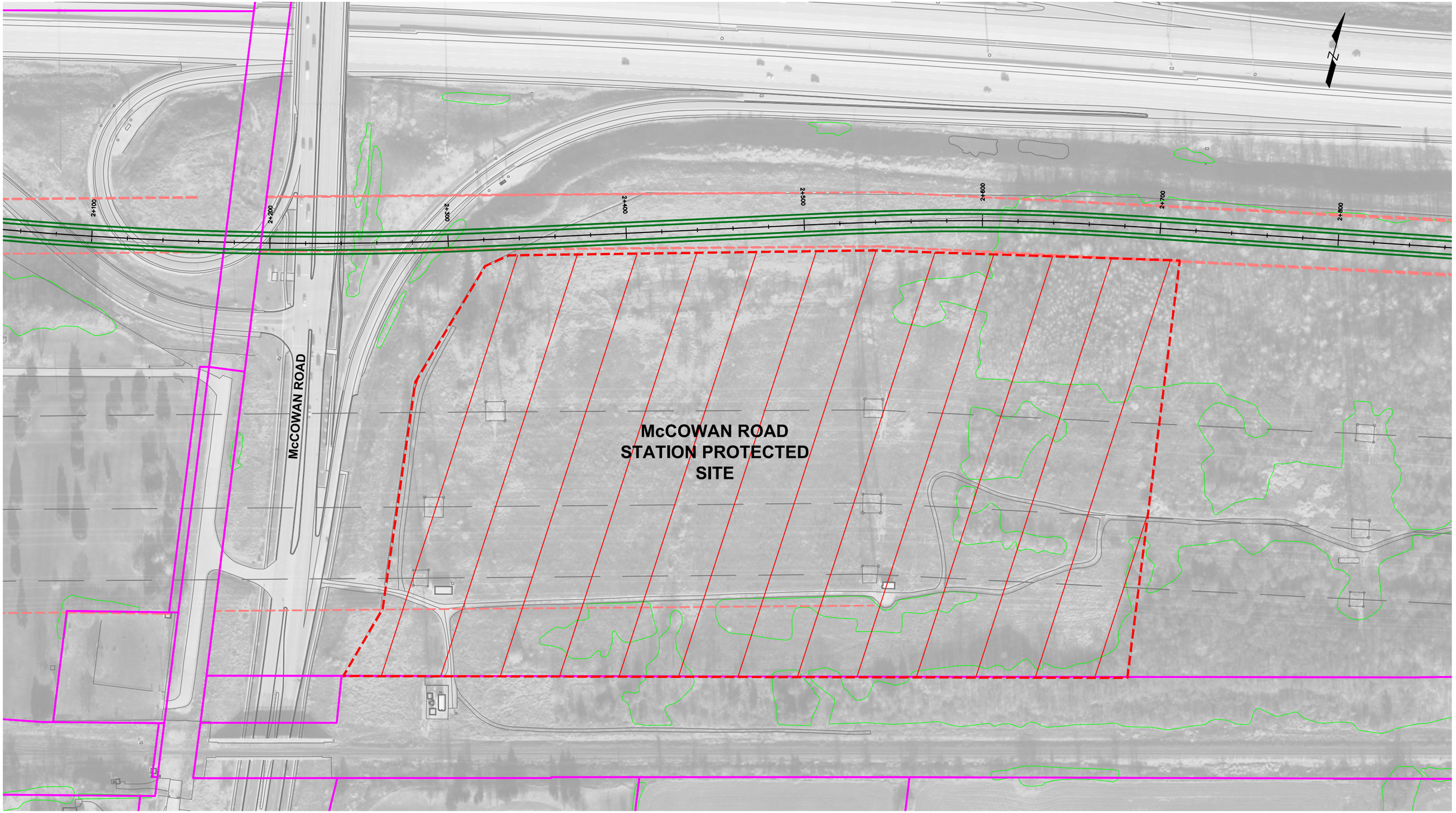

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Ontario PARSONS IBI

SCALE
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Horizontal

LEGEND
- PROPERTY
- PROTECTED SITE
- UTILITY CORRIDOR
- EXISTING VEGETATION

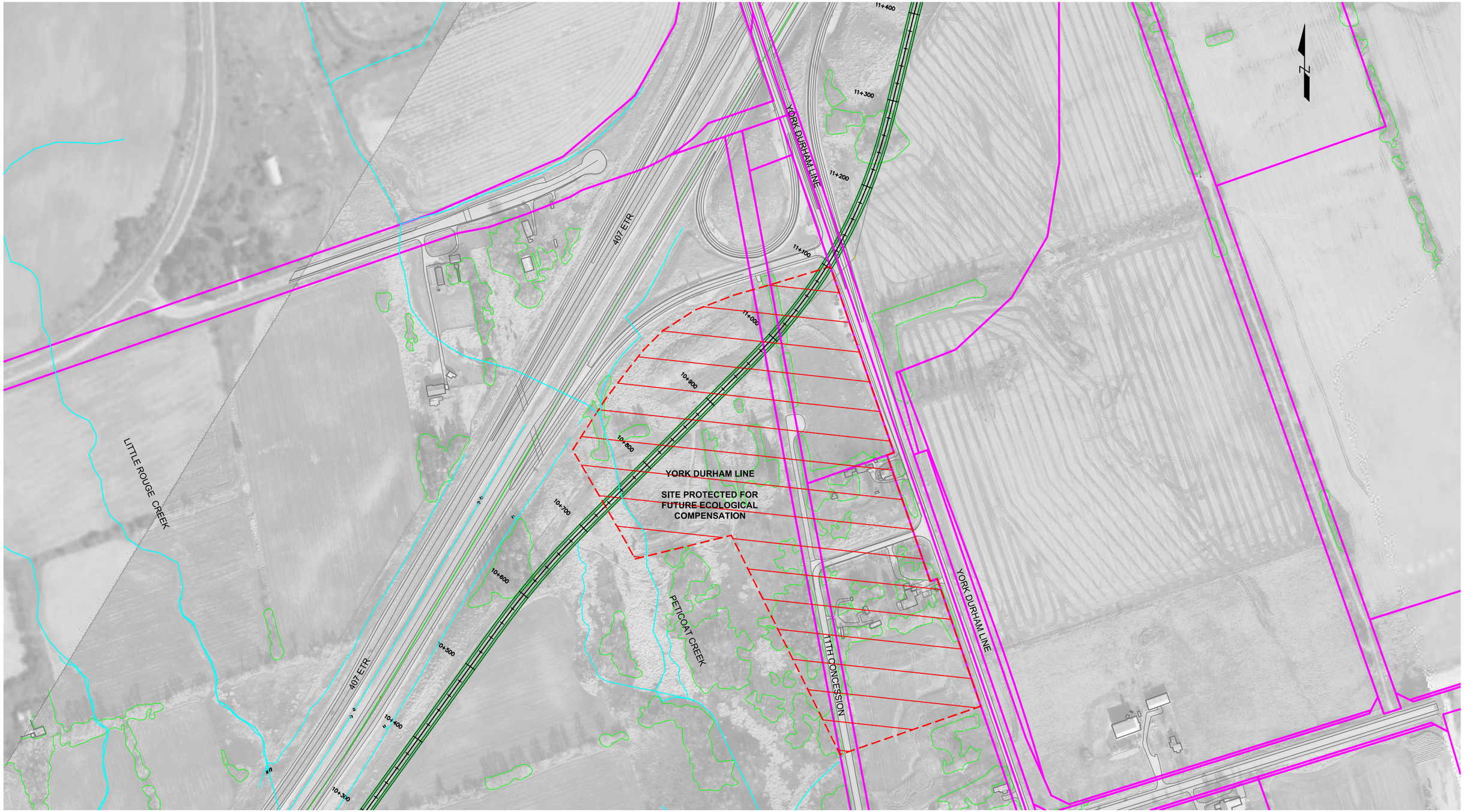
407 TRANSITWAY
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET
McCOWAN RD STATION SITE

PLATE
Mc-1

DATE

METRIC



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MODIFIED: Dec 15, 2016 – 12:09pm MODTIME
CREATED:

Ontario PARSONS IBI

SCALE
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Horizontal

LEGEND
- PROPERTY
- PROTECTED SITE
- STREAM
- EXISTING VEGETATION

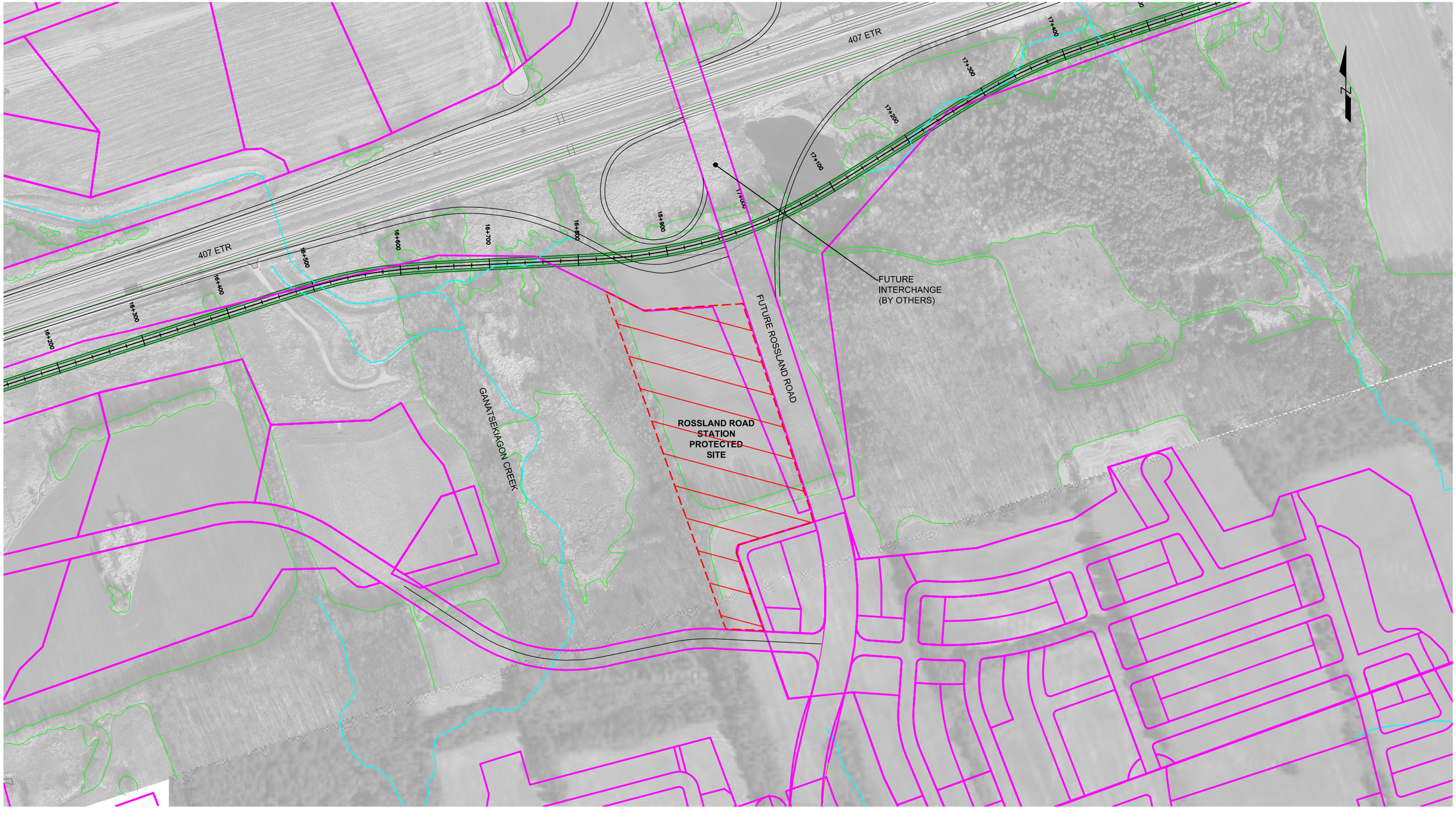
407 TRANSITWAY
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

DRAWING SET
YORK DURHAM LINE STATION SITE

PLATE
YD-1

DATE

METRIC



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Ontario PARSONS IBI

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Horizontal

LEGEND
- PROPERTY
- PROTECTED SITE
- EXISTING VEGETATION
- STREAM

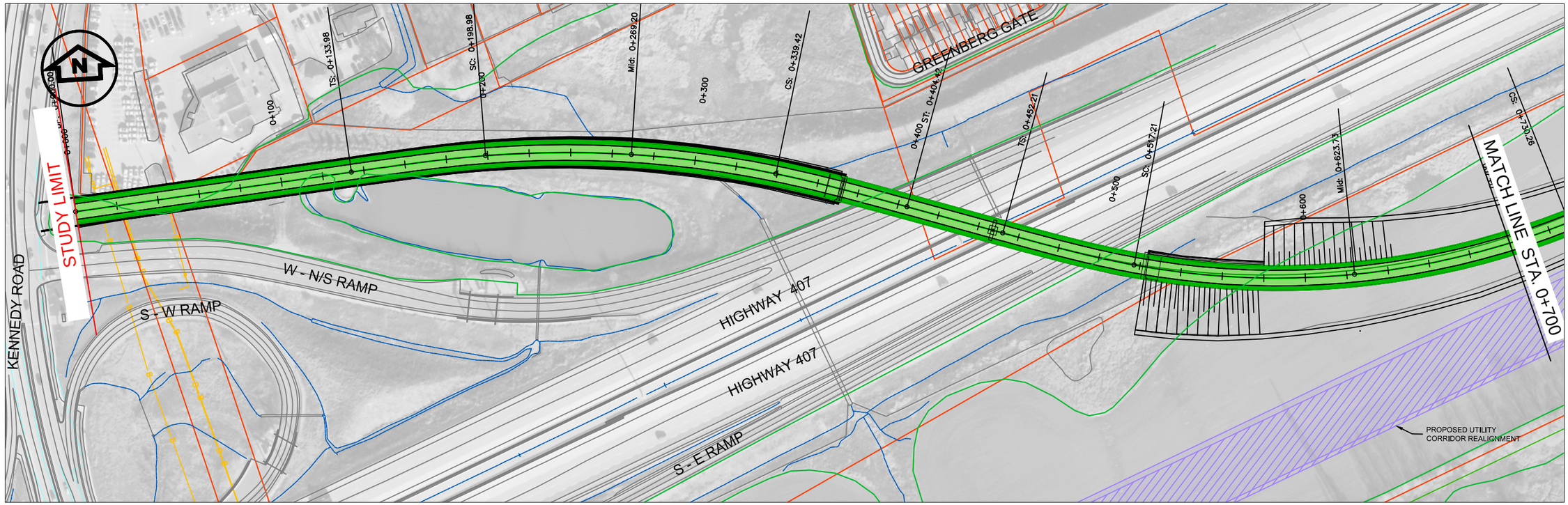
407 TRANSITWAY
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027

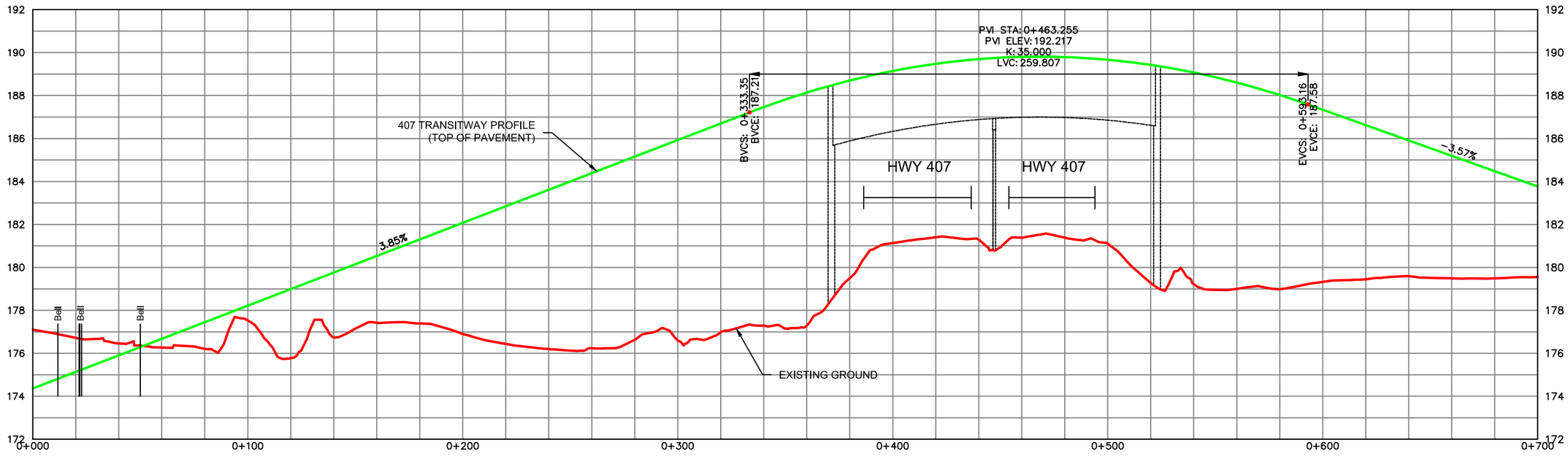
DRAWING SET
ROSSLAND RD STATION SITE

PLATE
R-1

DATE

METRIC





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MODIFIED: Dec 16, 2016 - 12:51pm
CREATED:

Ontario PARSONS IBI GROUP

SCALE

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Horizontal
1m 0 2m
Vertical

LEGEND

FILL, STATION PLATFORM, STRUCTURE, CUT, RETAINING WALL, RUNNING WAY, SHOULDER

HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

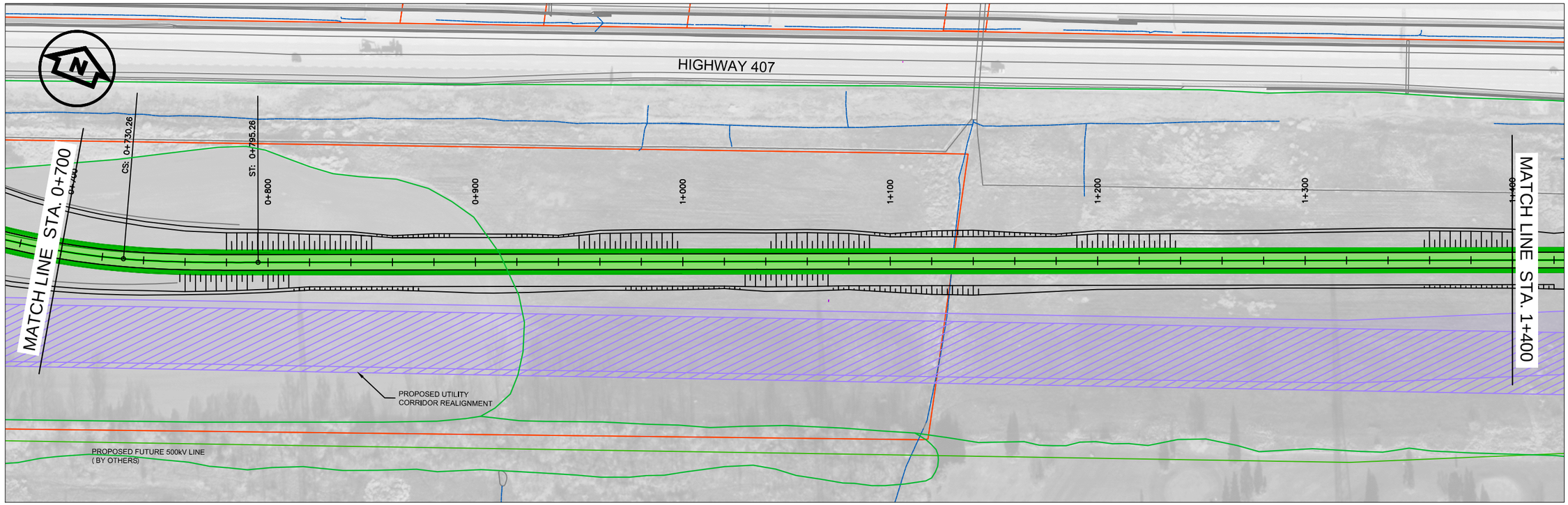
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 0+000 - STA 0+700

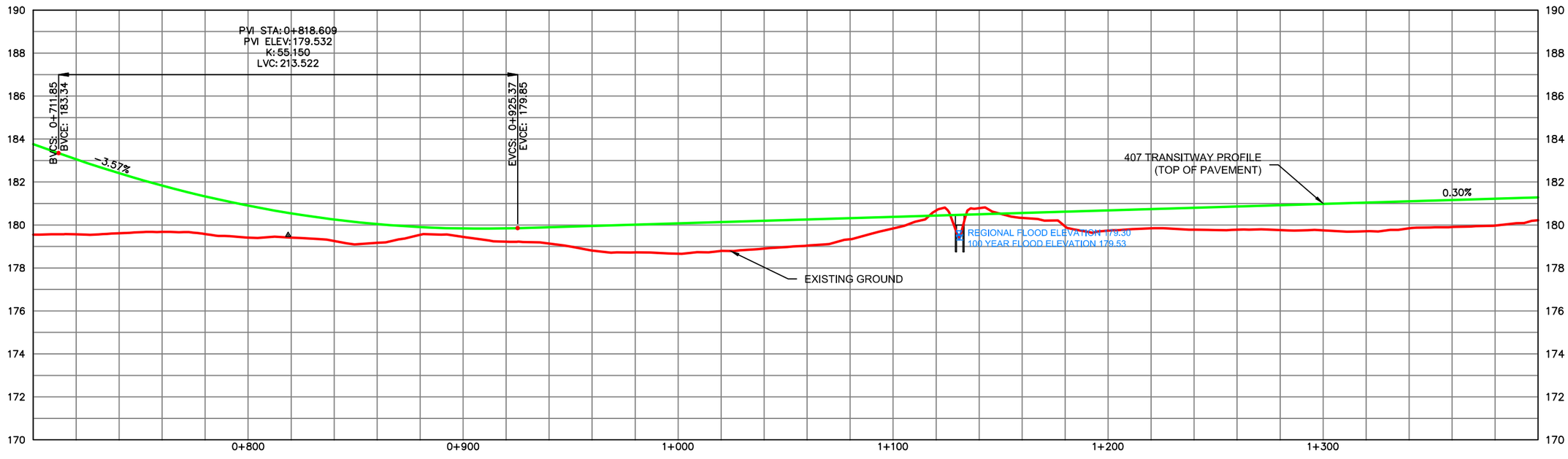
DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
01

DATE
2016/12/16

METRIC





Ontario PARSONS IBI GROUP

SCALE

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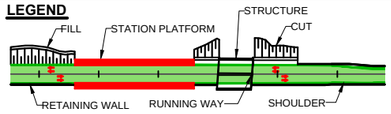
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 0+700 - STA 1+400

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
02

DATE
2016/12/16

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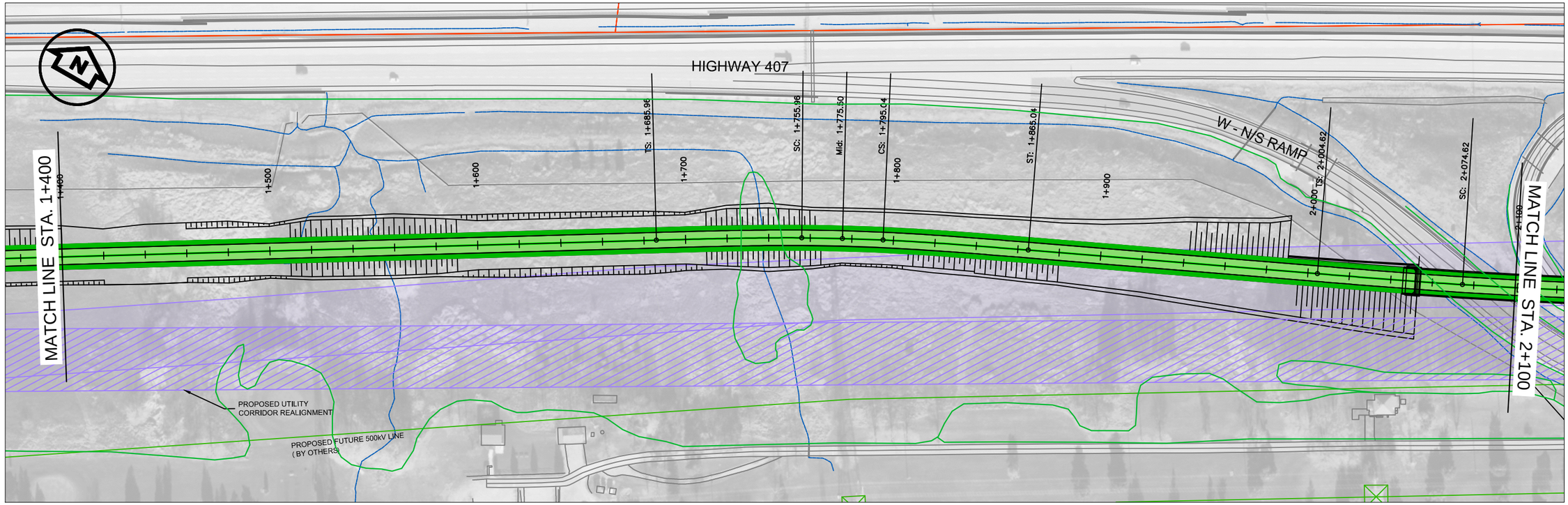

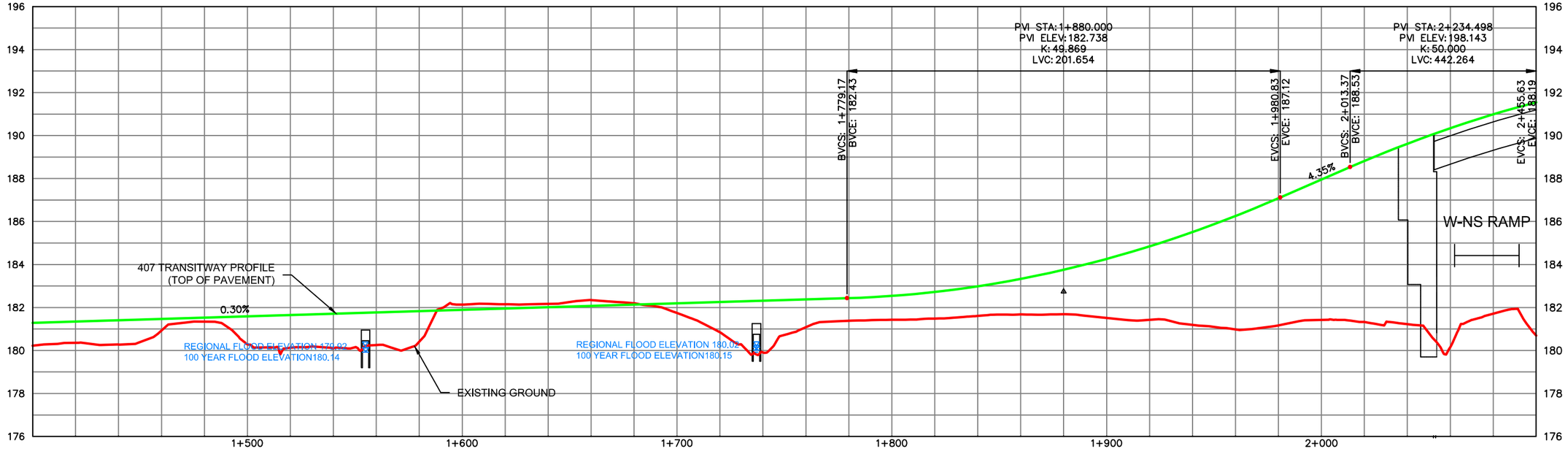

Ontario PARSONS IBI GROUP

SCALE

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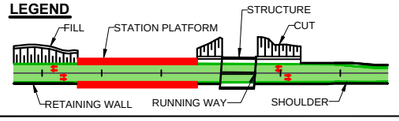
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
WATER COURSES
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 1+400 - STA 2+100

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
03

DATE
2016/12/16

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MODIFIED: Dec 16, 2016 - 1:11pm

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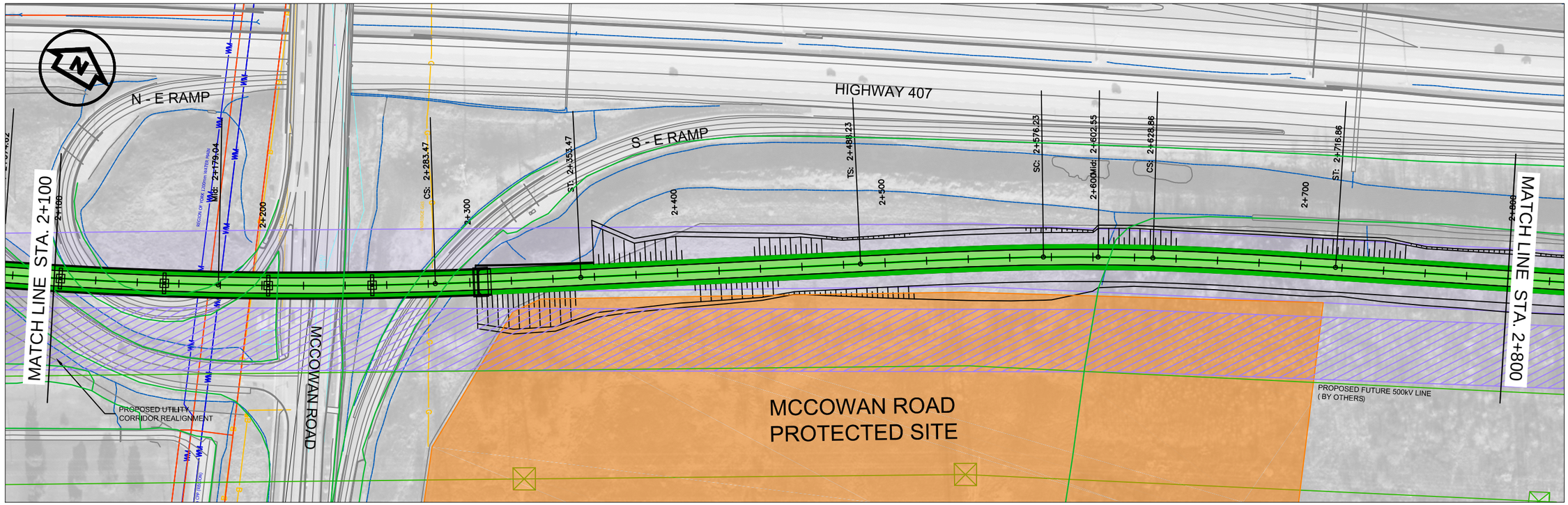

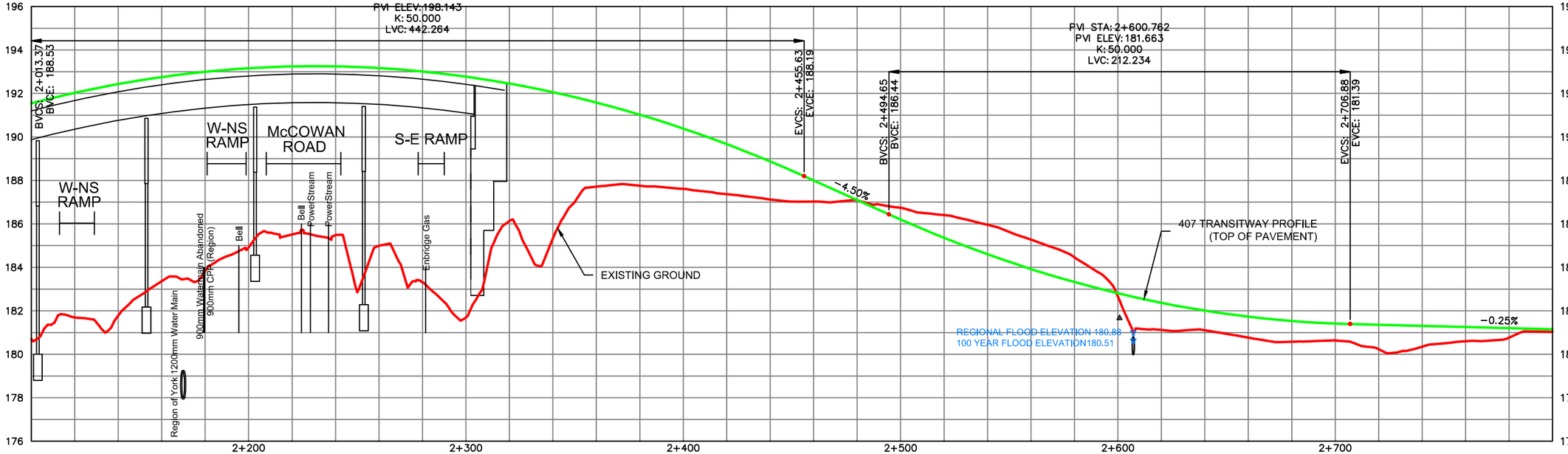

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MODIFIED: Dec 16, 2016 - 1:06pm
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Ontario PARSONS IBI GROUP

SCALE
10m 0 20m
Horizontal
1m 0 2m
Vertical

LEGEND
FILL, STATION PLATFORM, STRUCTURE, CUT, RETAINING WALL, RUNNING WAY, SHOULDER
HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

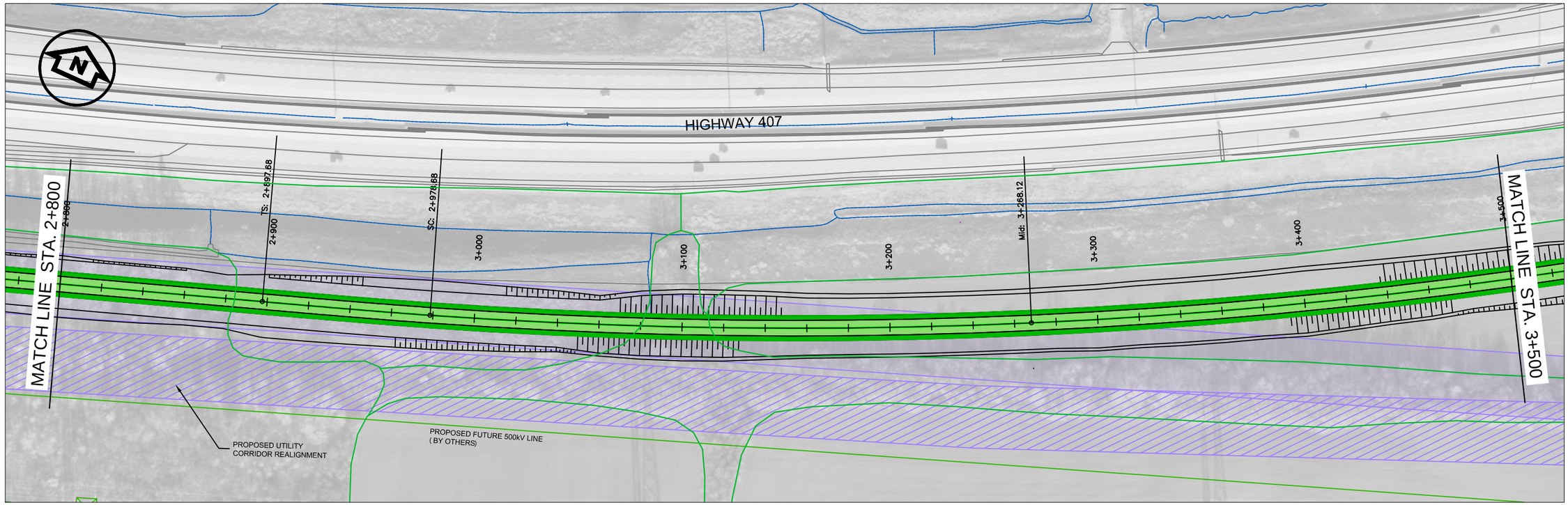
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 2+100 - STA 2+800

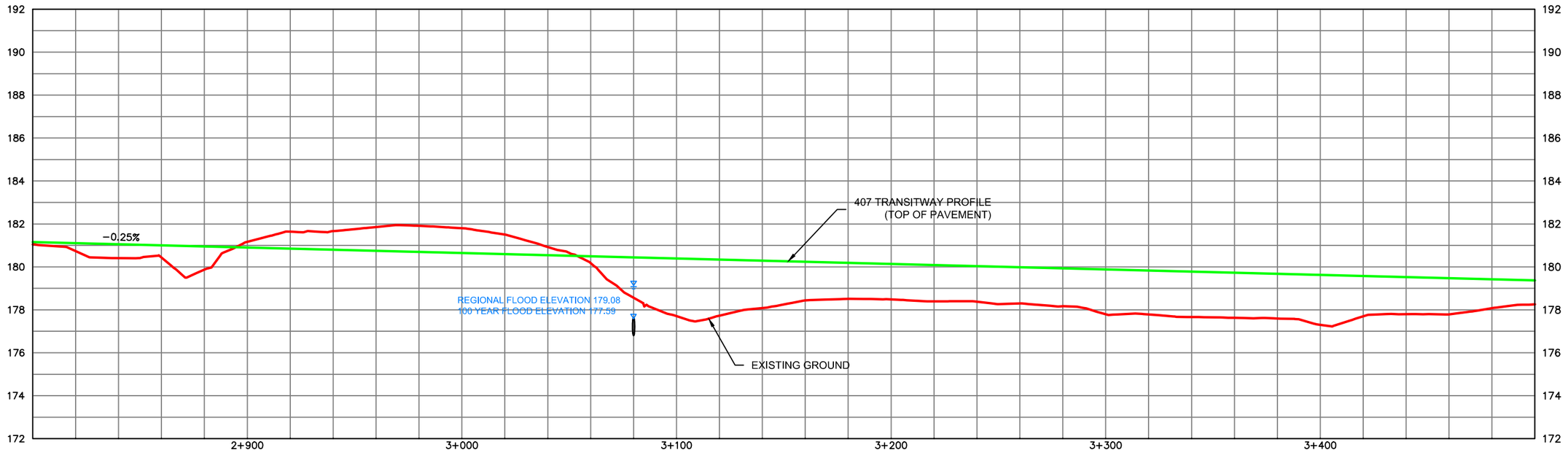
DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
04

DATE
2016/12/16

METRIC





Ontario PARSONS IBI GROUP

SCALE

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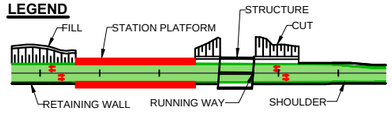
1m 0 2m — Vertical

LEGEND



HYDRO CORRIDOR — WATER COURSES

UTILITY CORRIDOR

EXISTING PROPERTY BOUNDARIES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 2+800 - STA 3+500

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE 05

DATE 2016/12/16

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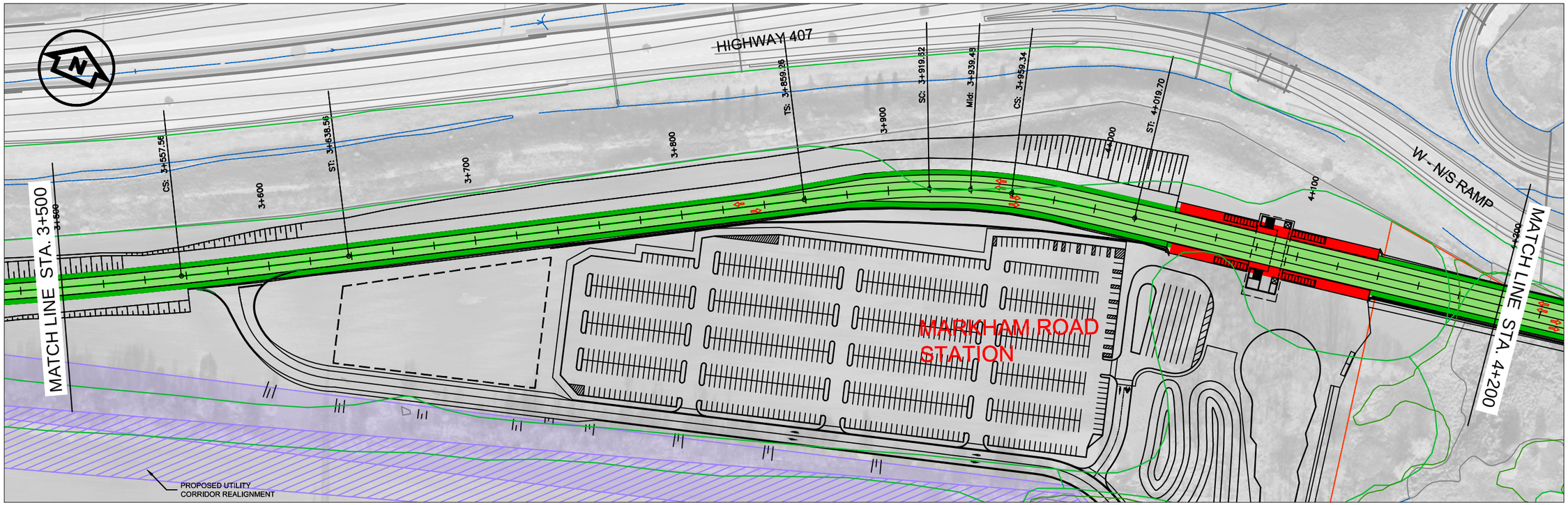

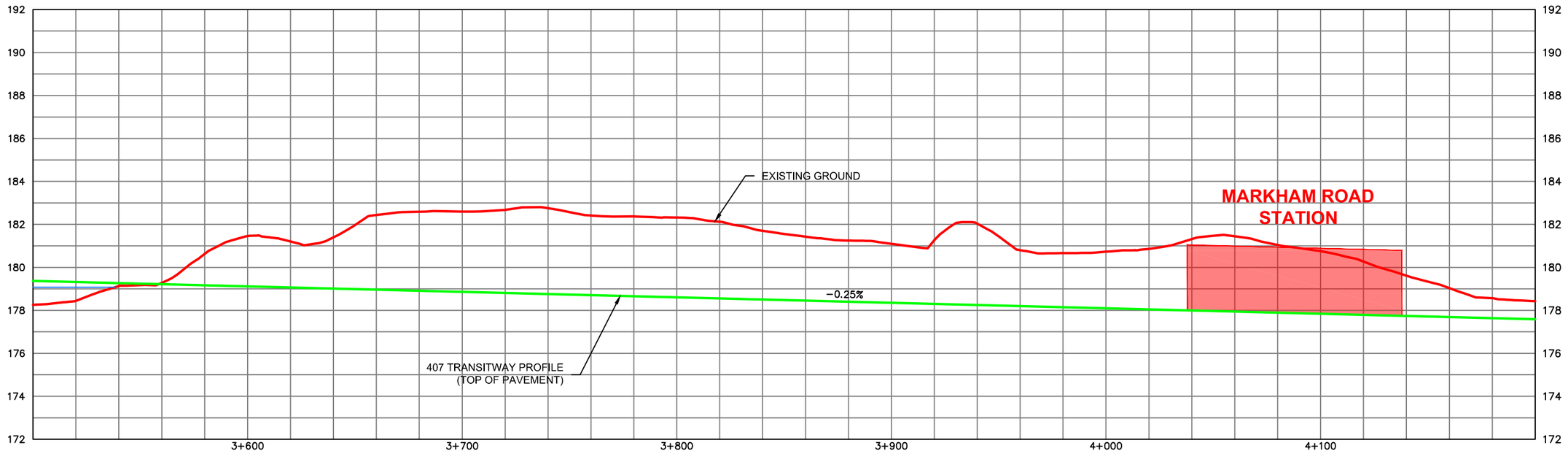

Ontario PARSONS IBI GROUP

SCALE

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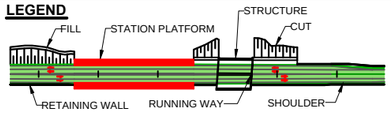
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
WATER COURSES
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 3+500 - STA 4+200

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
06

DATE
2016/12/16

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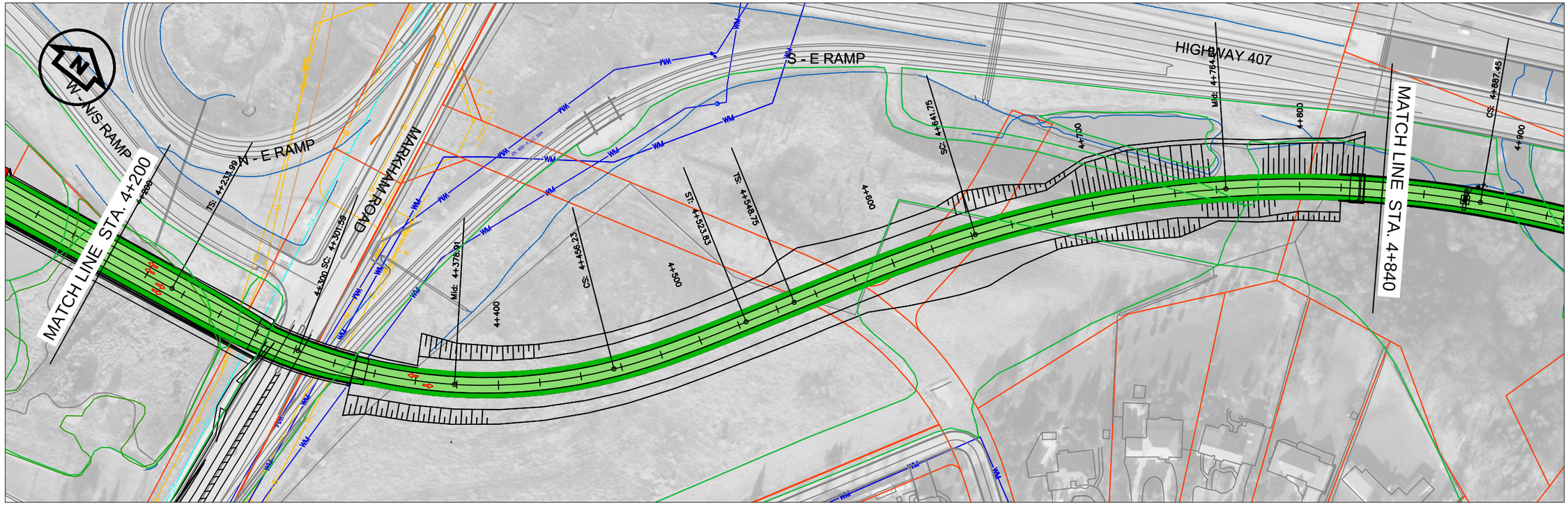

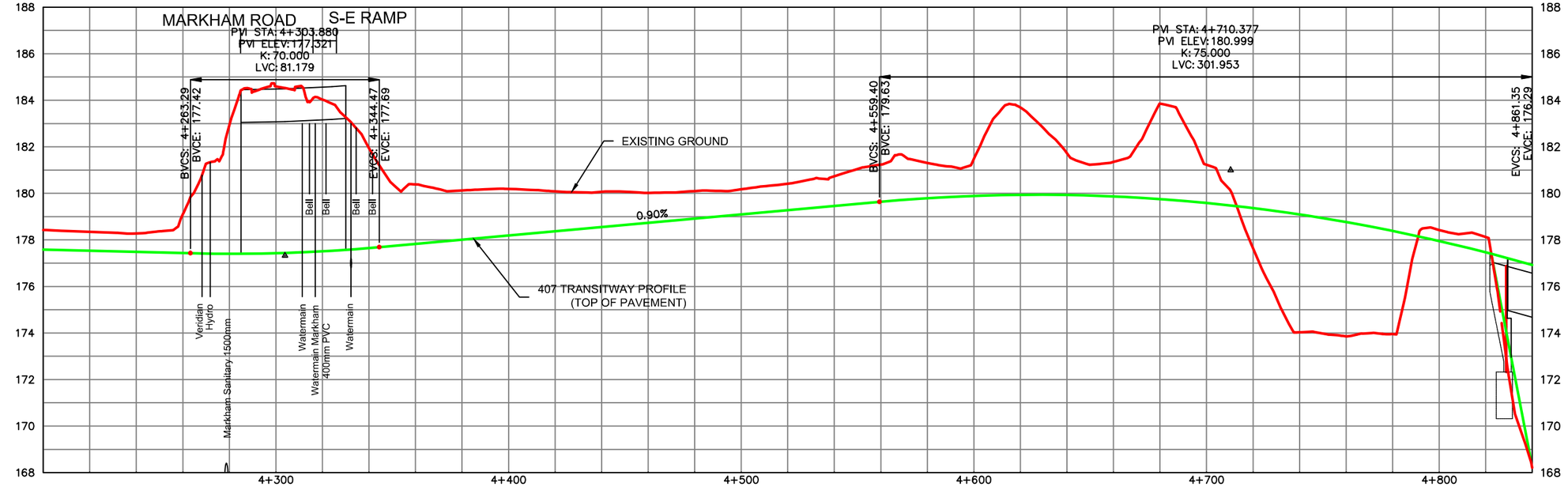

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Ontario PARSONS IBI GROUP

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Horizontal
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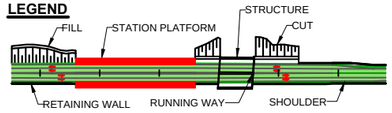
Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

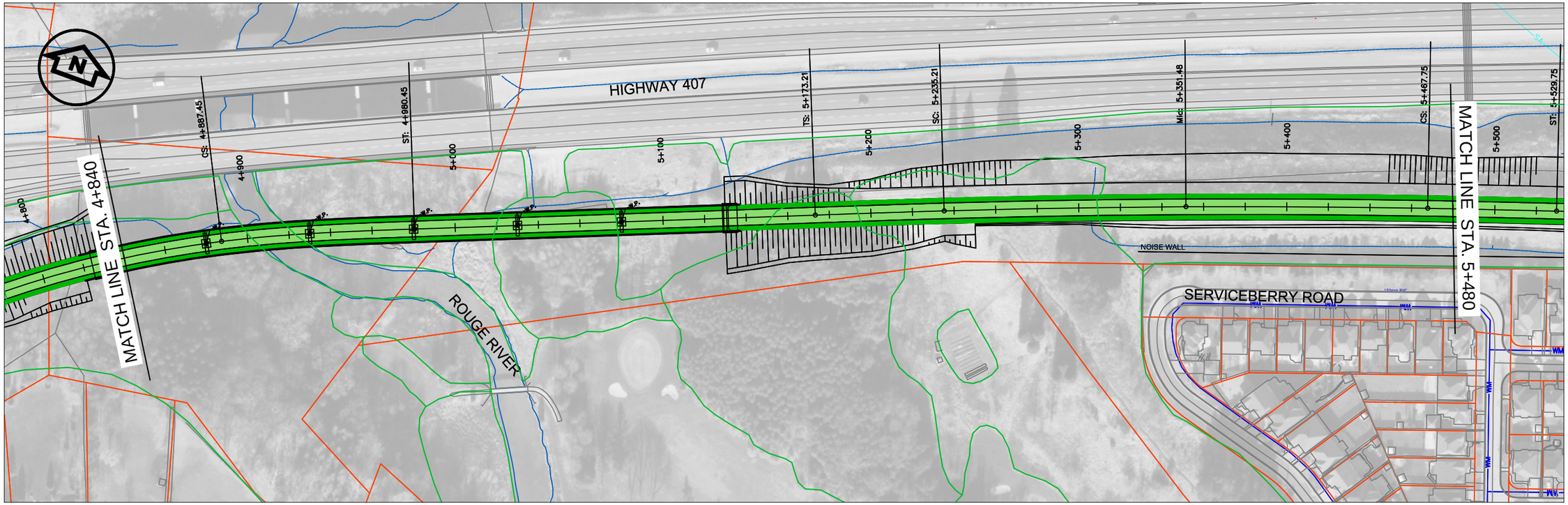
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 4+200 - STA 4+840

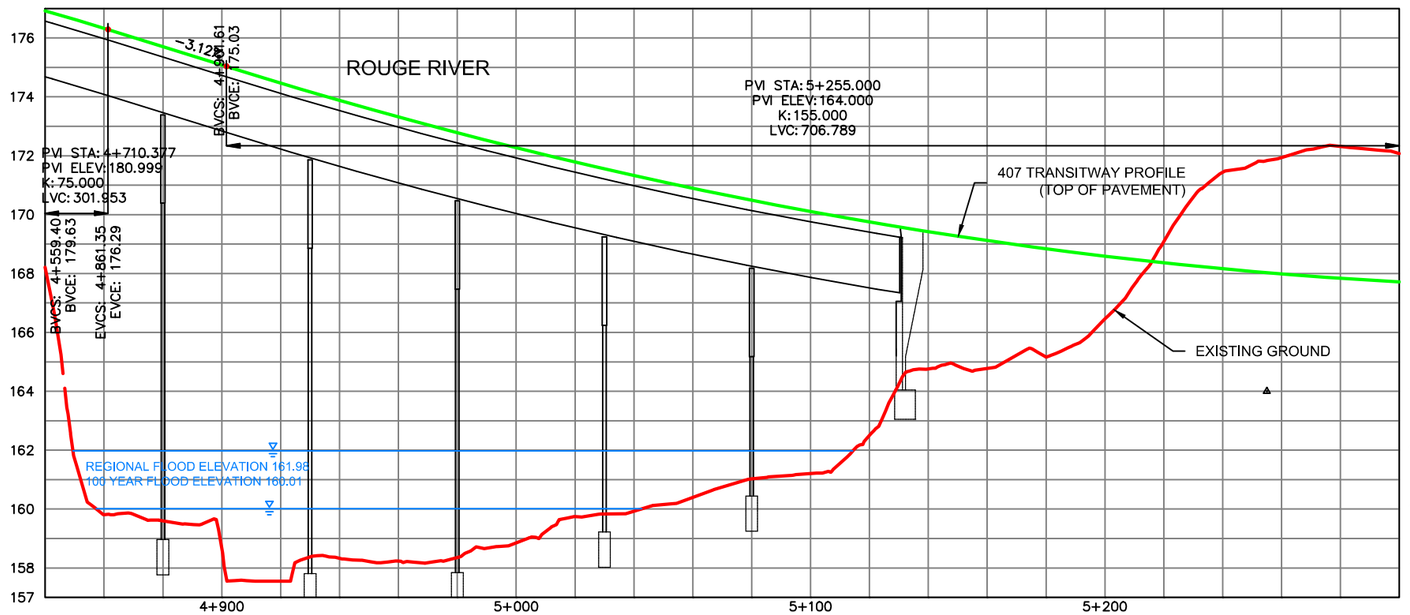
DRAWING SET
ALIGNMENT
PLAN & PROFILE

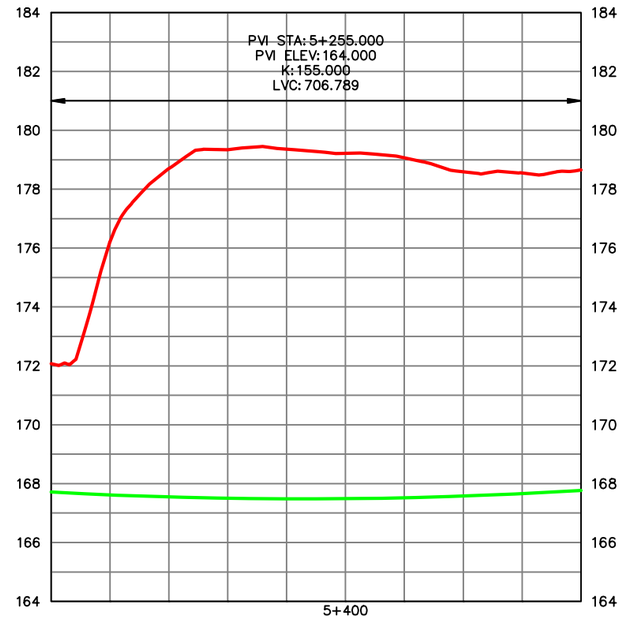
PLATE
07

DATE
2016/12/16

METRIC







Ontario PARSONS IBI GROUP

SCALE

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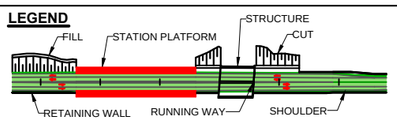
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 4+840 - STA 5+480

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
08

DATE
2016/12/16

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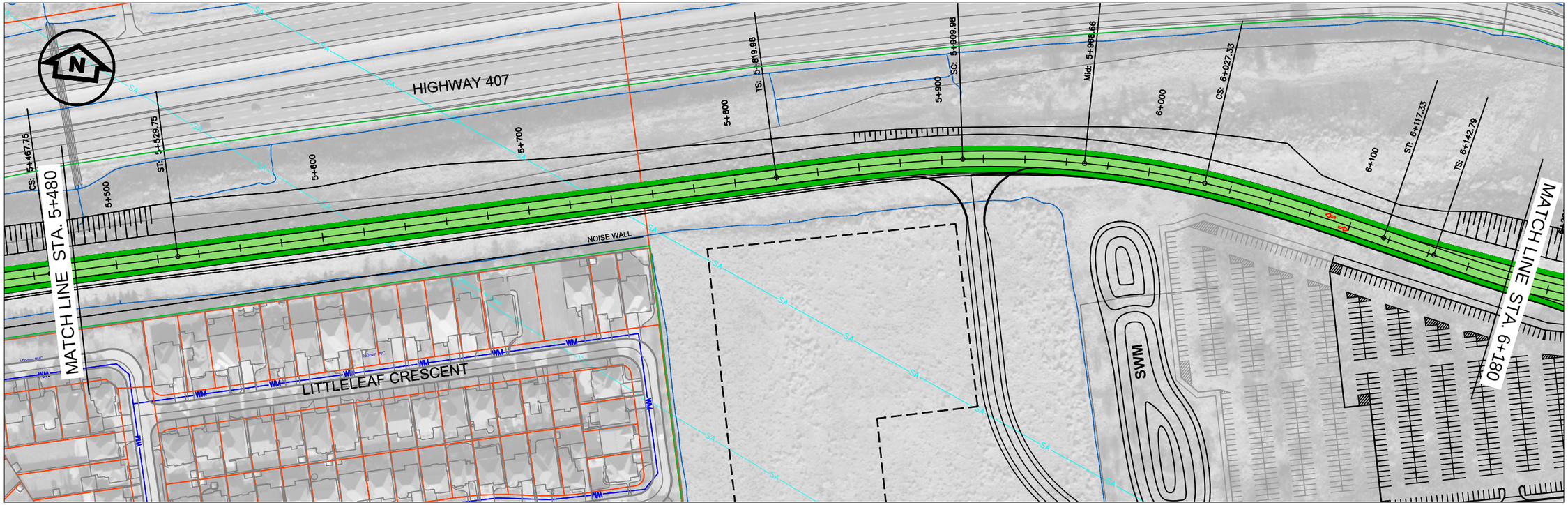

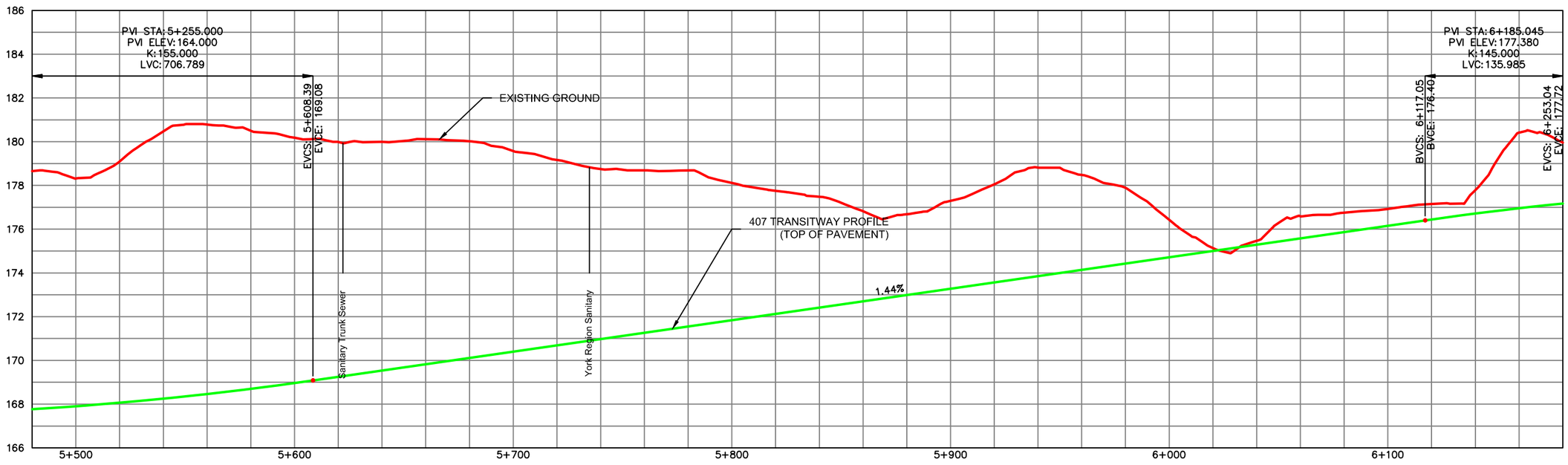

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Ontario PARSONS IBI GROUP

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Horizontal
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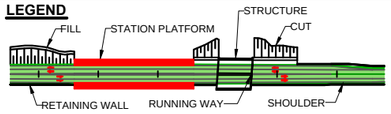
Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

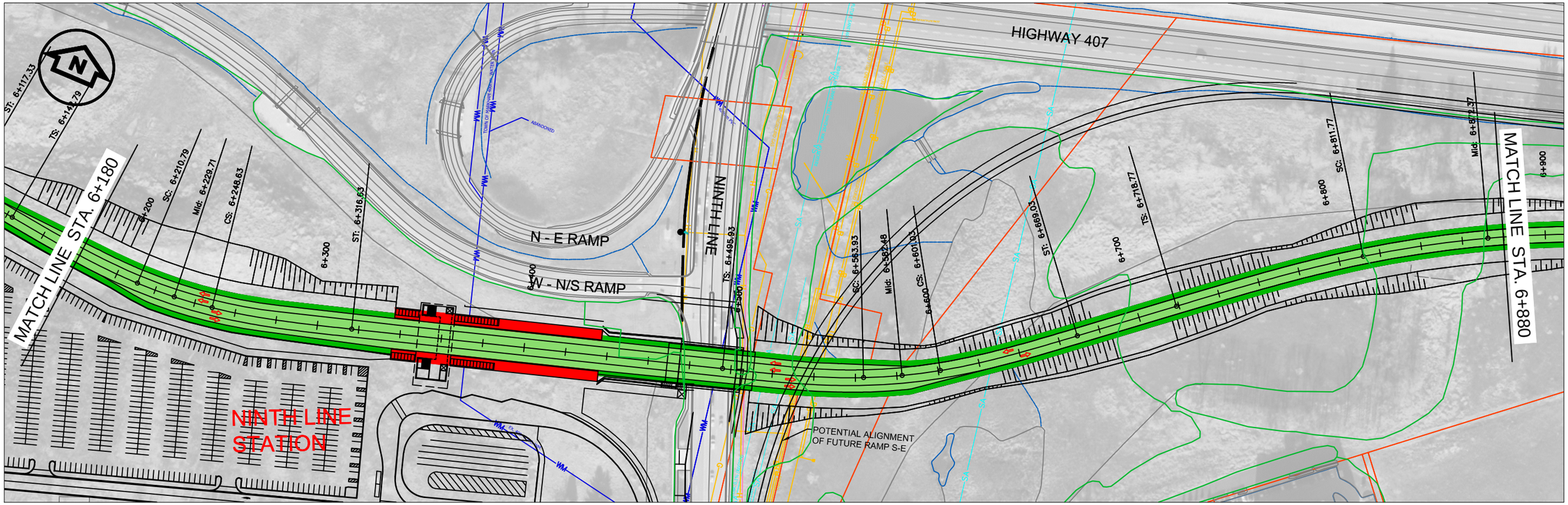
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 5+480 - STA 6+180

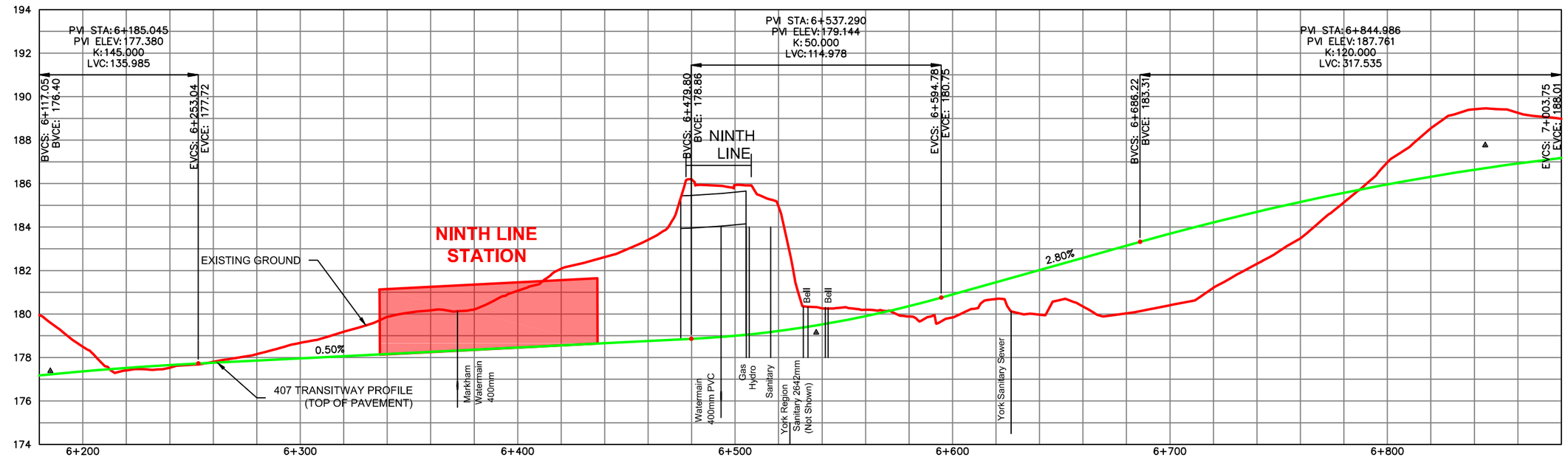
DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
09

DATE
2016/12/16

METRIC





Ontario PARSONS IBI GROUP

SCALE

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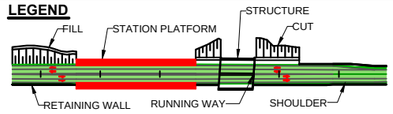
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 6+180 - STA 6+880

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
10

DATE
2016/12/16

DRAWING NAME: J:\TOR\TT4022 - 407 Transitway, Phase 2\TT\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 06-10_ST.dwg
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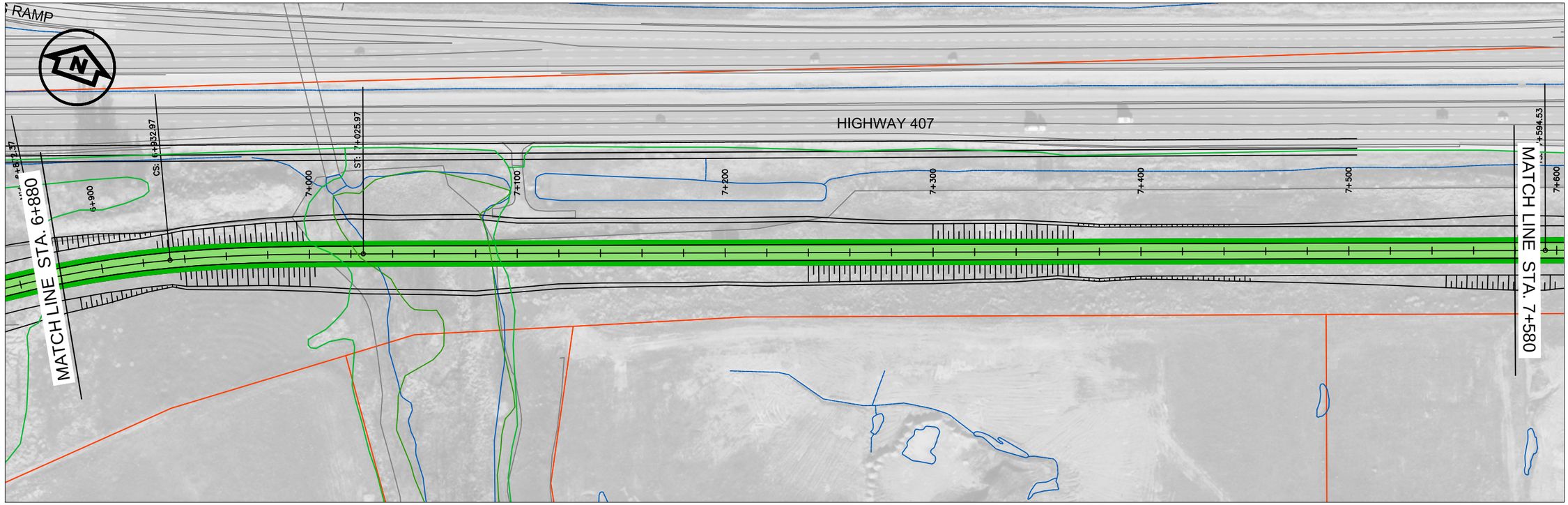

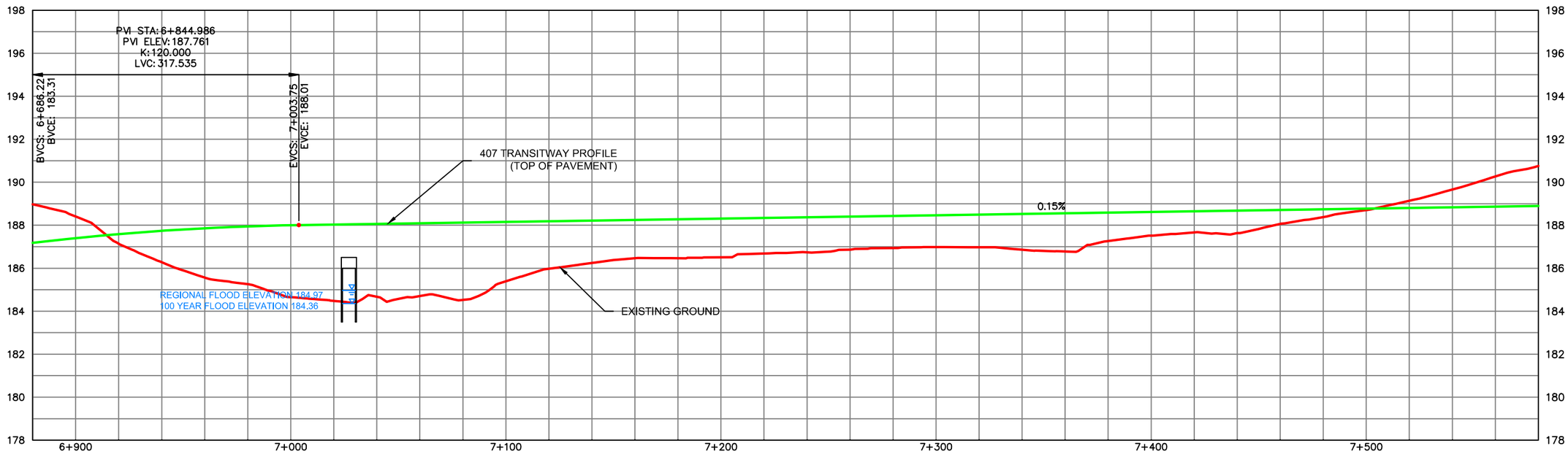

SCALE

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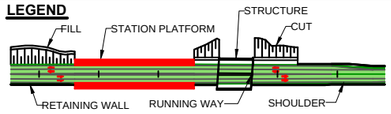
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
WATER COURSES
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 6+880 - STA 7+580

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
11

DATE
2016/12/16

DRAWING NAME: J:\TOR\IT4022 - 407 Transitway, Phase 2\TS\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 11-15_ST.dwg
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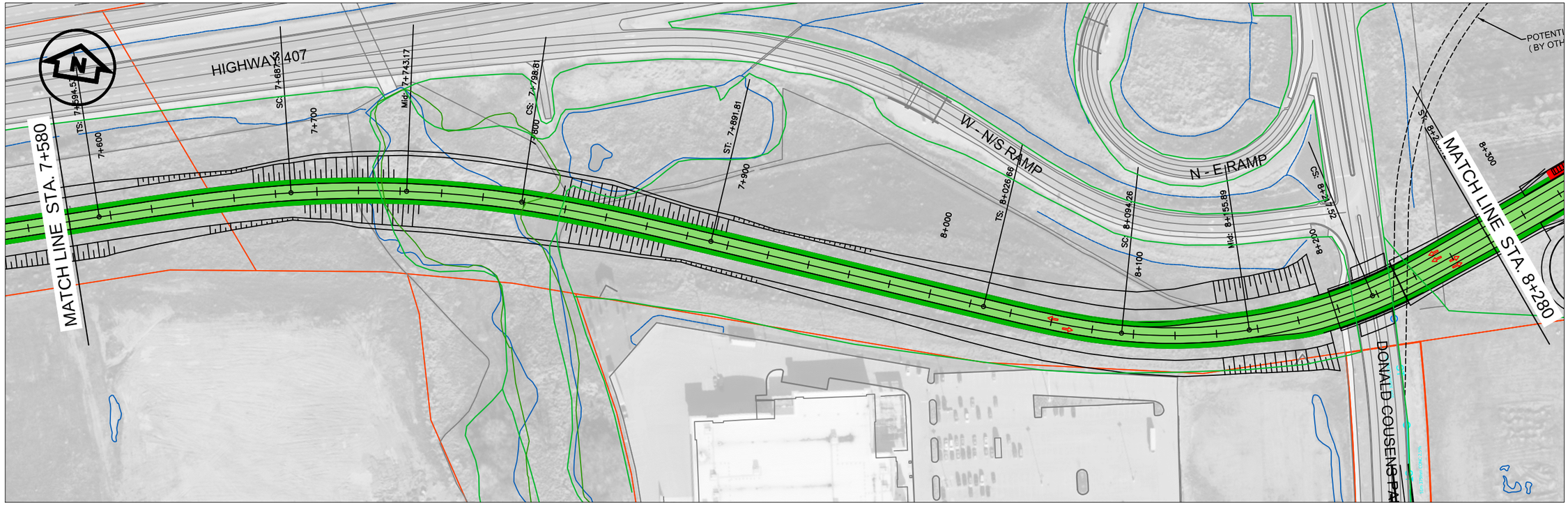

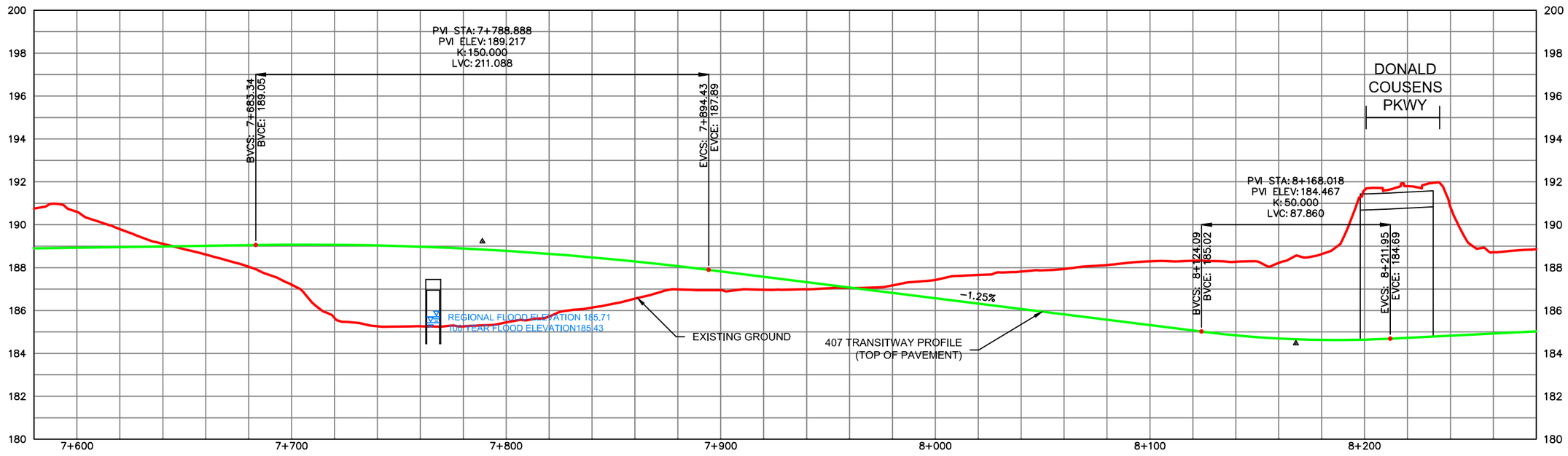

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MODIFIED: Dec 16, 2016 - 2:16pm
CREATED:

Ontario PARSONS IBI GROUP

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Horizontal
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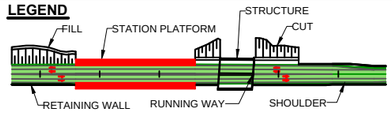
Vertical

LEGEND



HYDRO CORRIDOR
WATER COURSES
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES

407 TRANSITWAY

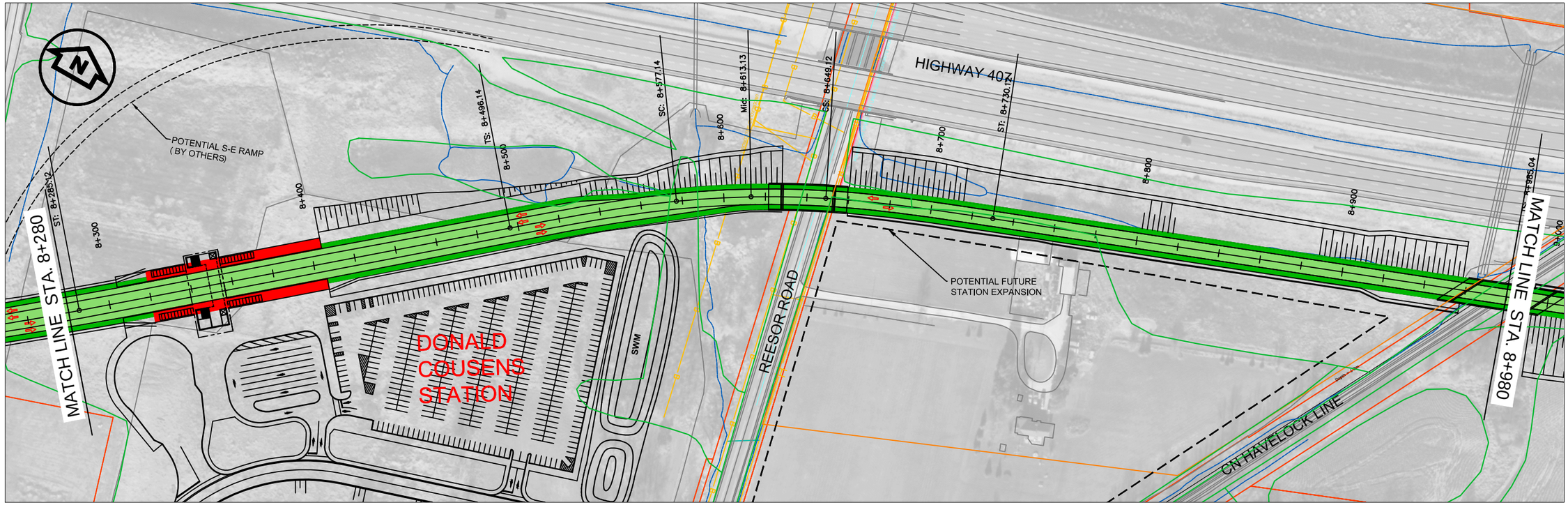
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 7+580 - STA 8+280

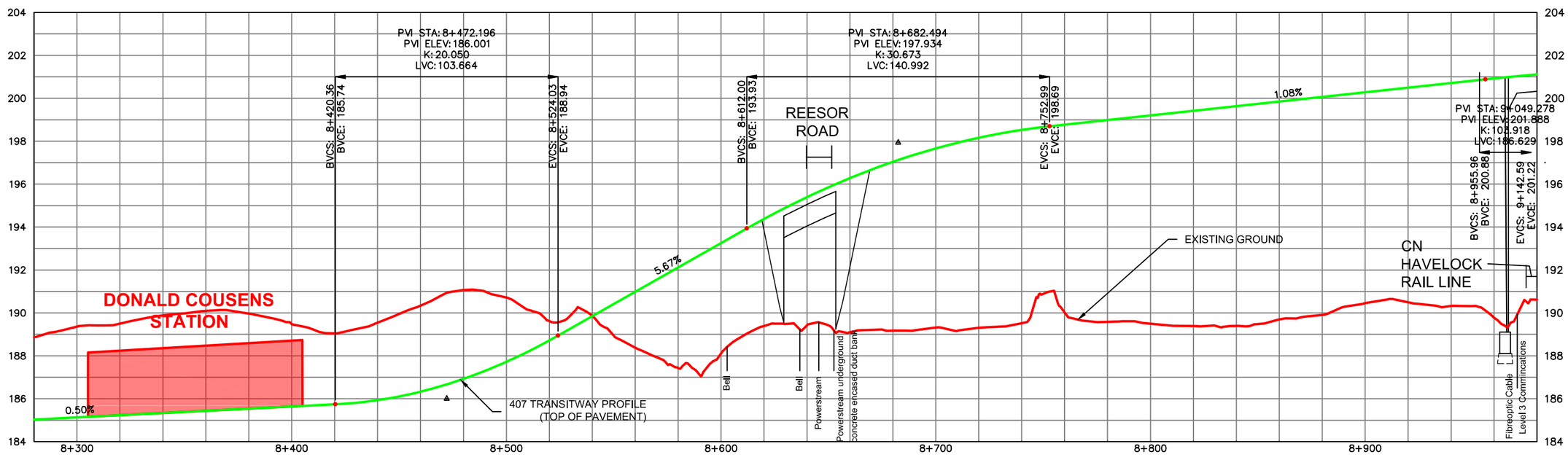
DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
12

DATE
2016/12/16

METRIC





Ontario PARSONS IBI GROUP

SCALE

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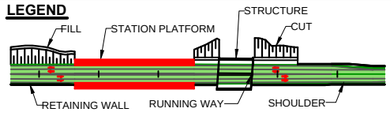
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
WATER COURSES
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 8+280 - STA 8+980

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
13

DATE
2016/12/16

DRAWING NAME: J:\TOR\IT4022 - 407 Transitway, Phase 2\TS\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 11-15_ST.dwg
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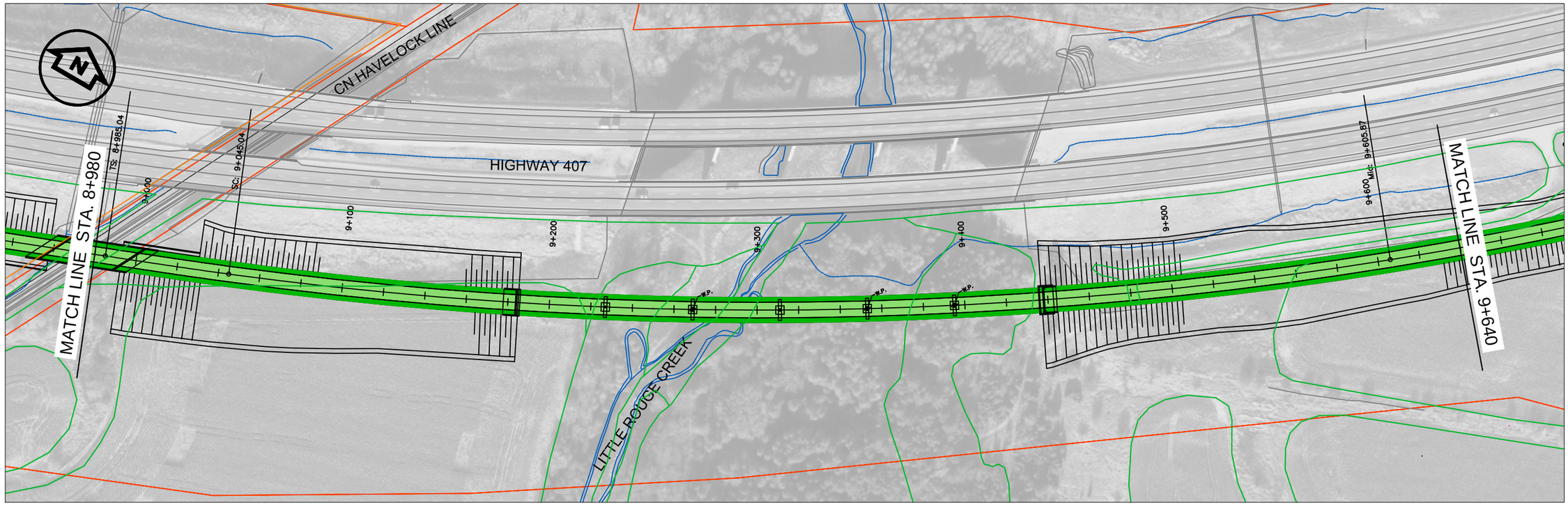

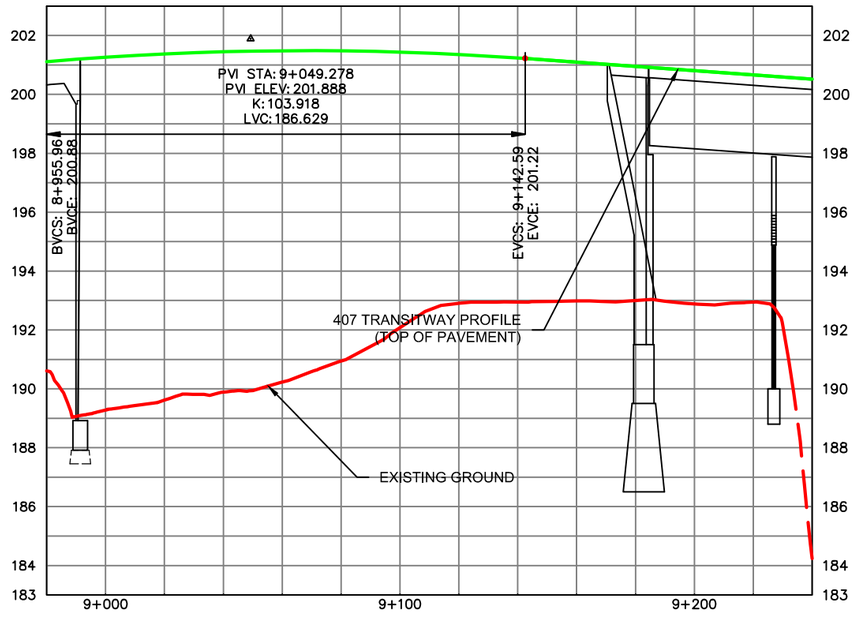

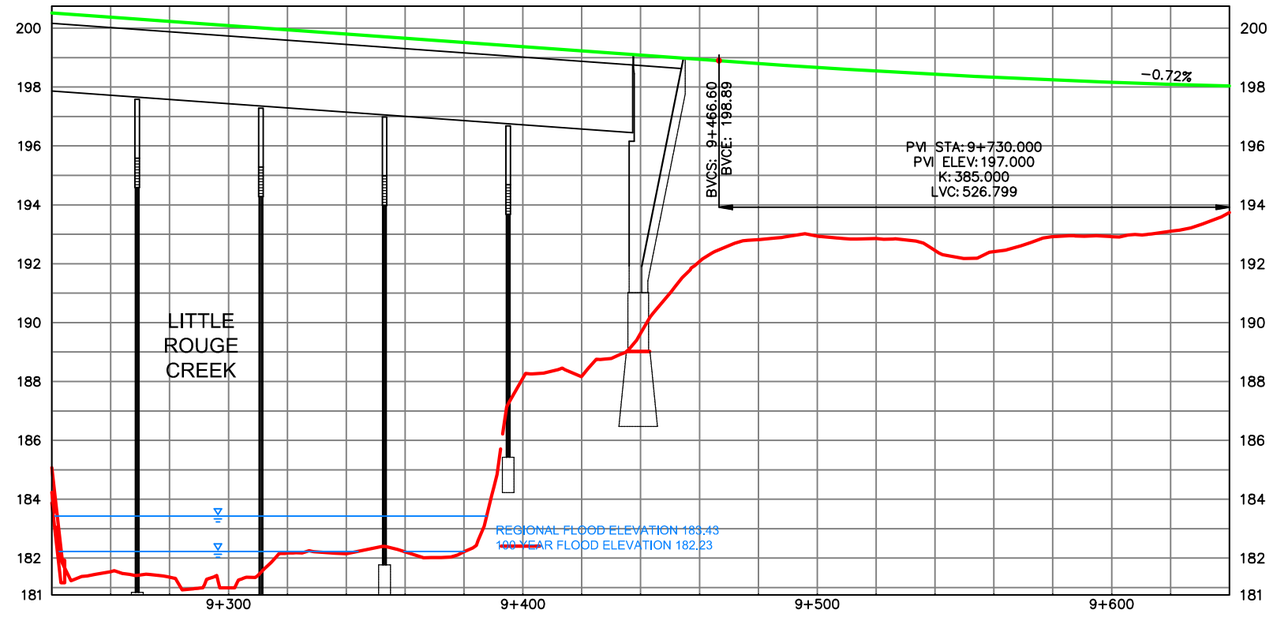

Ontario PARSONS IBI GROUP

SCALE

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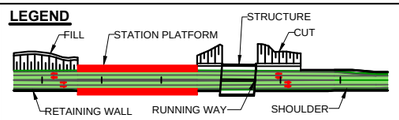
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 8+980 - STA 9+640

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
14

DATE
2016/12/16

DRAWING NAME: J:\TOR\TT4022 - 407 Transitway, Phase 2\TT\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 11-15_ST.dwg
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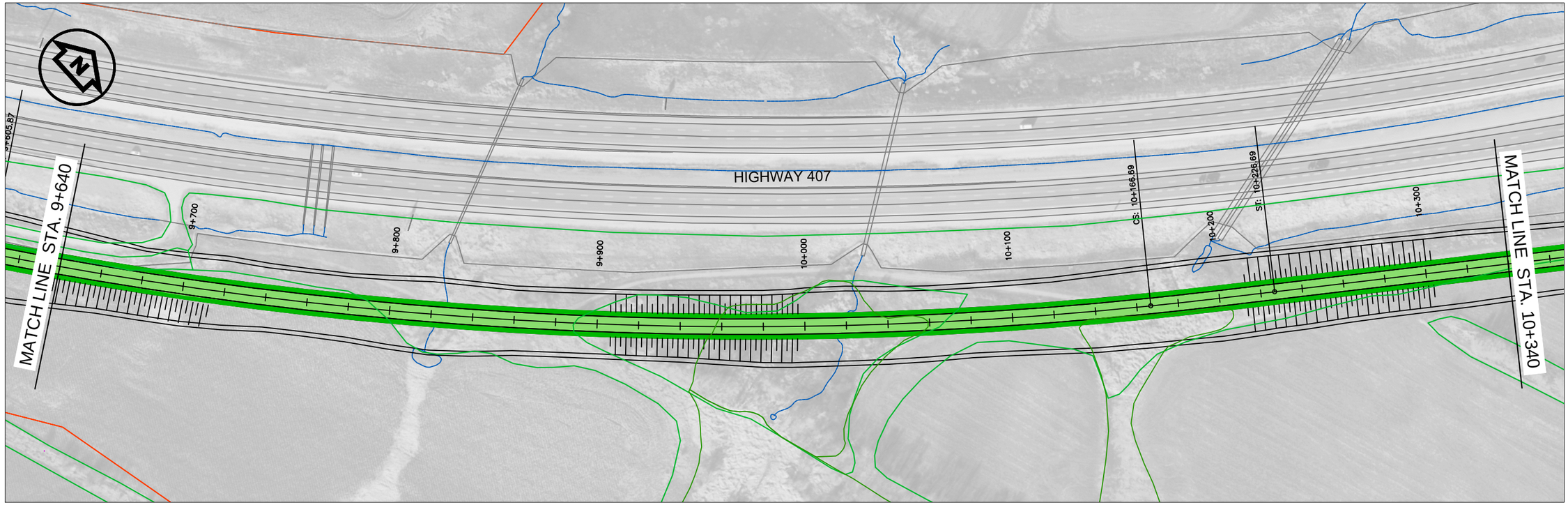

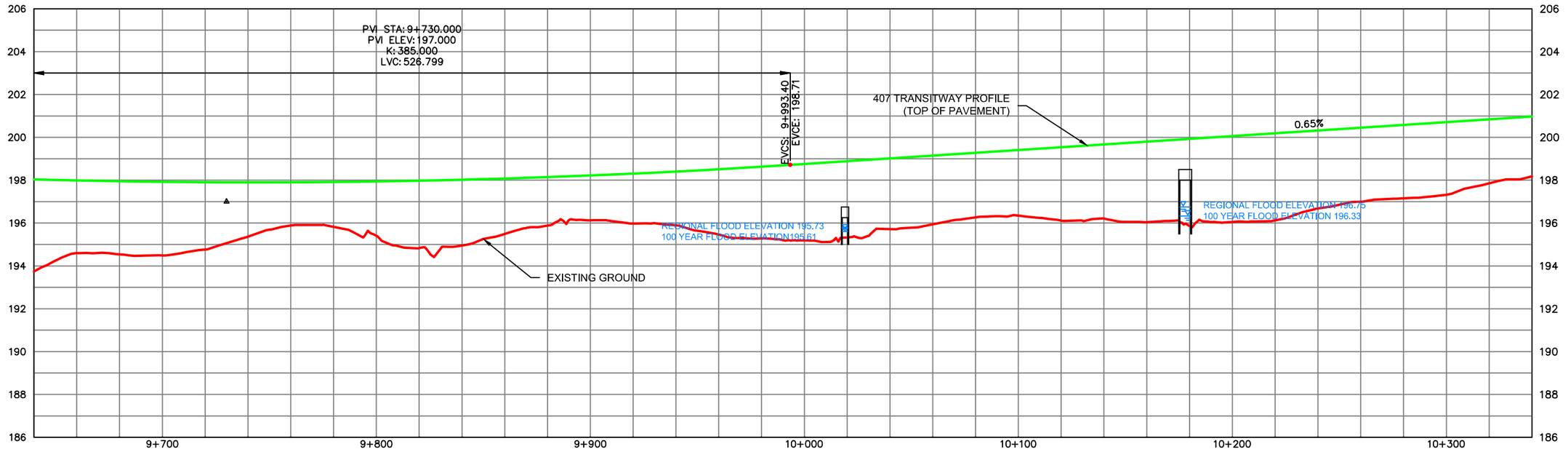

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MODIFIED: Dec 16, 2016 – 2:42pm
CREATED:

Ontario PARSONS IBI GROUP

SCALE

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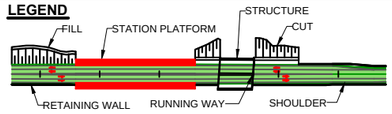
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
WATER COURSES
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES

407 TRANSITWAY

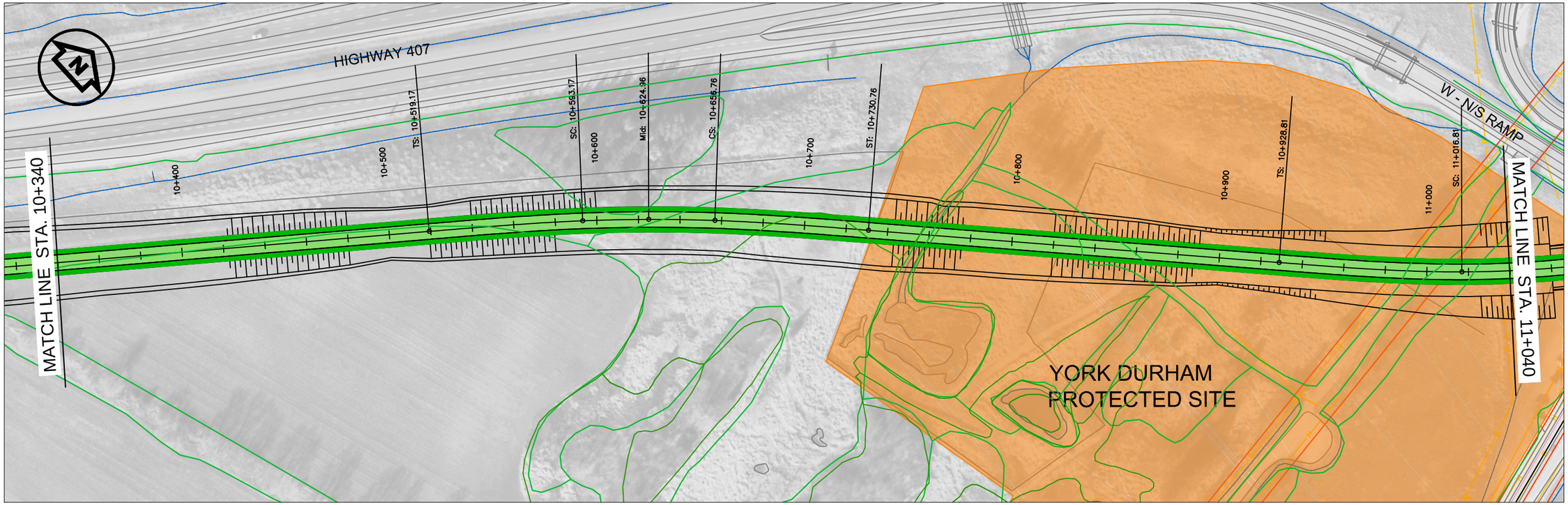
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 9+640 - STA 10+340

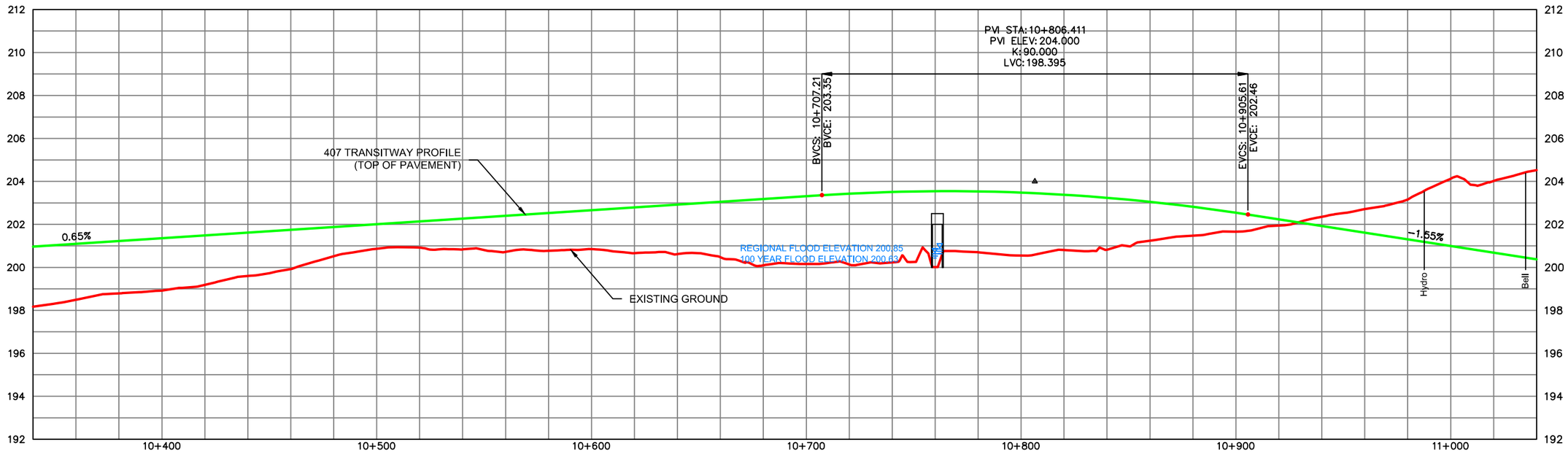
DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
15

DATE
2016/12/16

METRIC





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MODIFIED: Dec 16, 2016 – 2:55pm
CREATED:

Ontario PARSONS IBI GROUP

SCALE

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Horizontal
1m 0 2m
Vertical

LEGEND

FILL, STATION PLATFORM, STRUCTURE, CUT, RETAINING WALL, RUNNING WAY, SHOULDER

HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

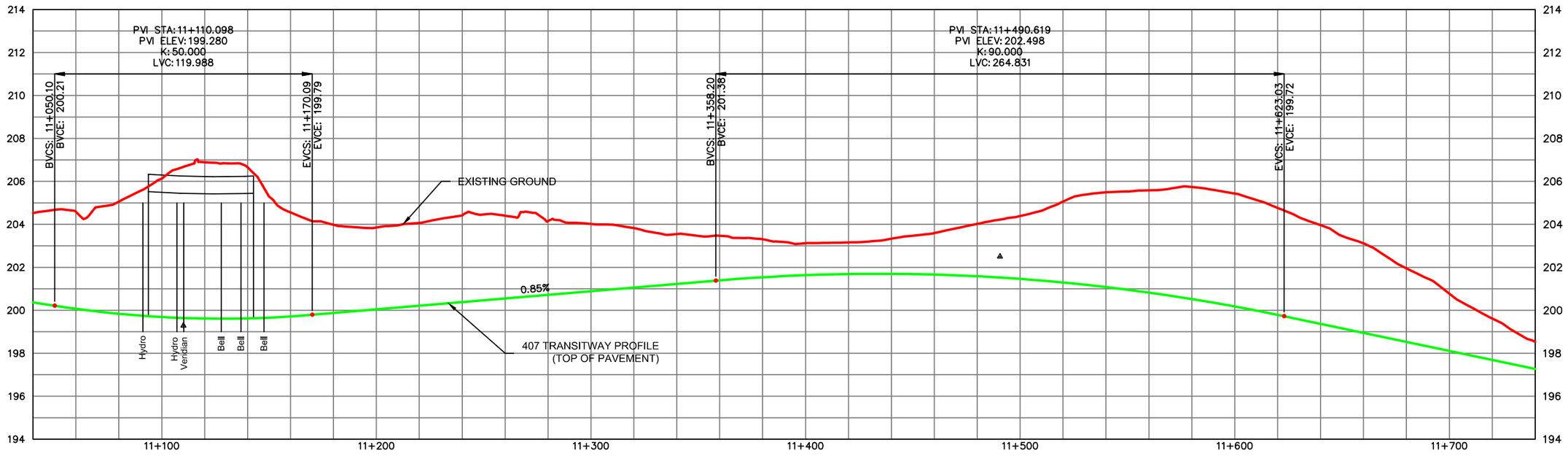
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 10+340 - STA 11+040

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
16

DATE
2016/12/16

METRIC



Ontario PARSONS IBI GROUP

SCALE

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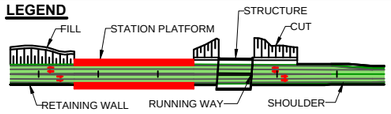
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 11+040 - STA 11+740

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
17

DATE
2016/12/16

DRAWING NAME: J:\TOR\TT4022 - 407 Transitway, Phase 2\TT\5 General\02 - Drawings\01 - CAD\06 - Plotes\PLATES 16-20_ST.dwg
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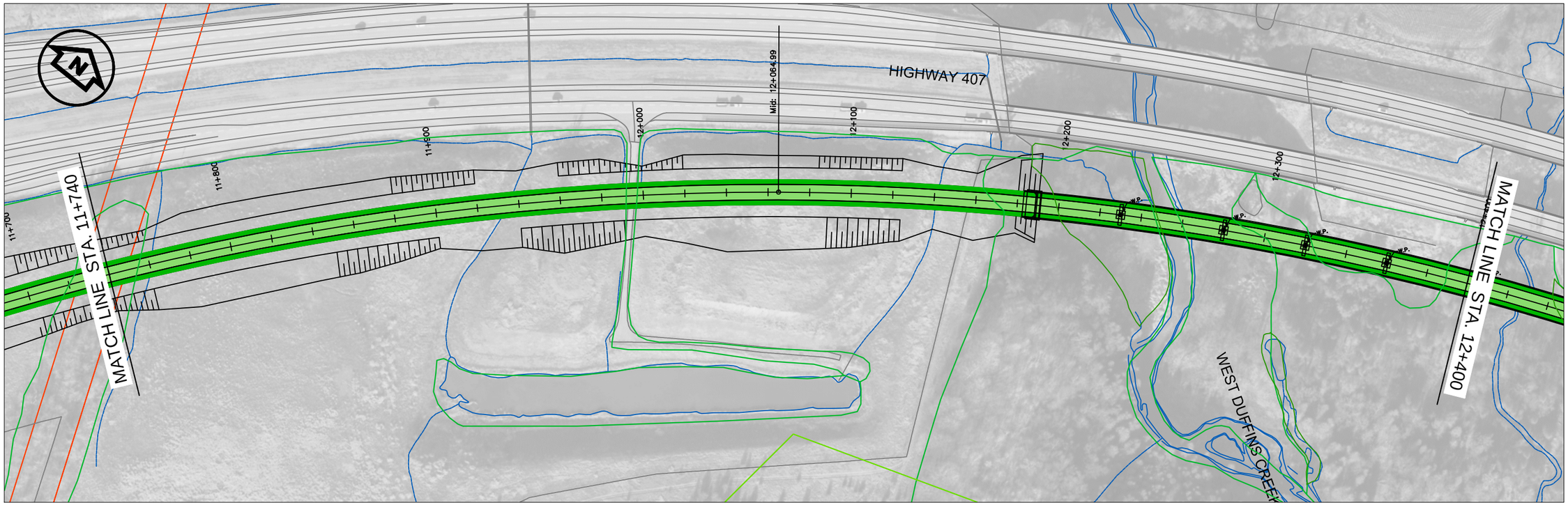

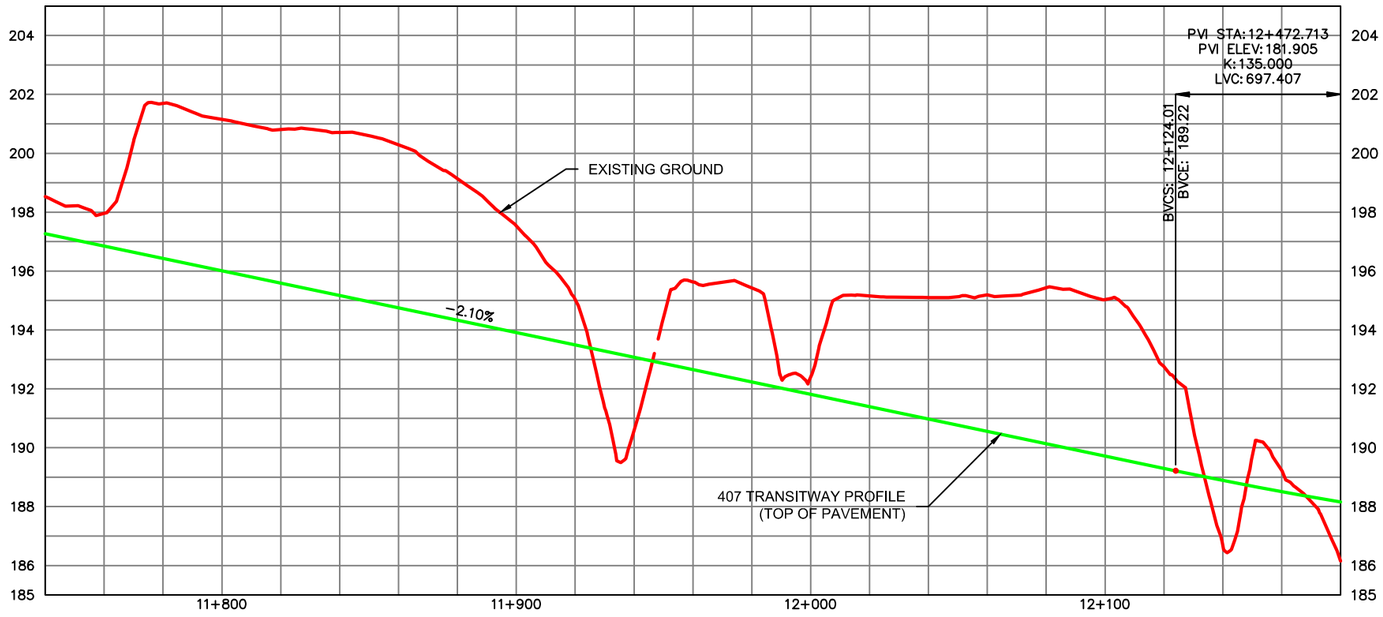

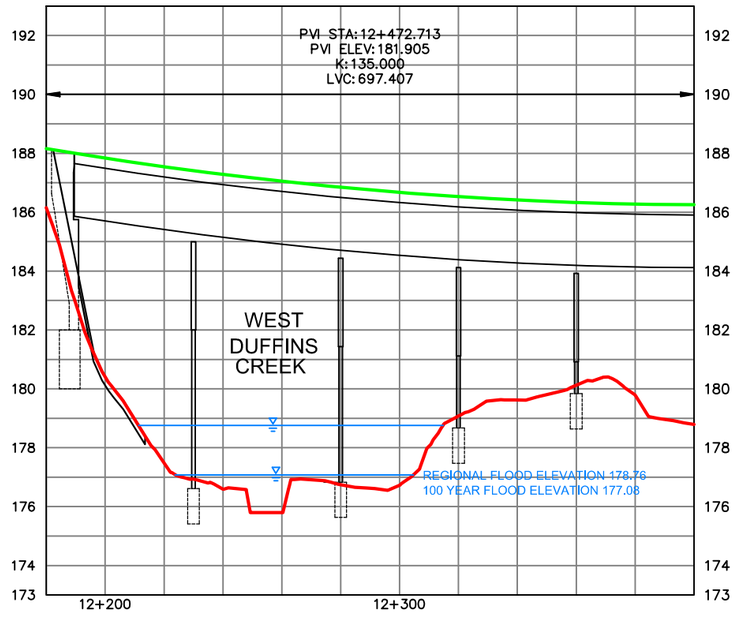

Ontario PARSONS IBI GROUP

SCALE

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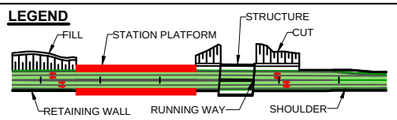
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 11+740 - STA 12+400

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
18

DATE
2016/12/16

DRAWING NAME: J:\TOR\TT4022 - 407 Transitway, Phase 2\TT\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 16-20_ST.dwg
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MODIFIED: Dec 16, 2016 - 3:11pm

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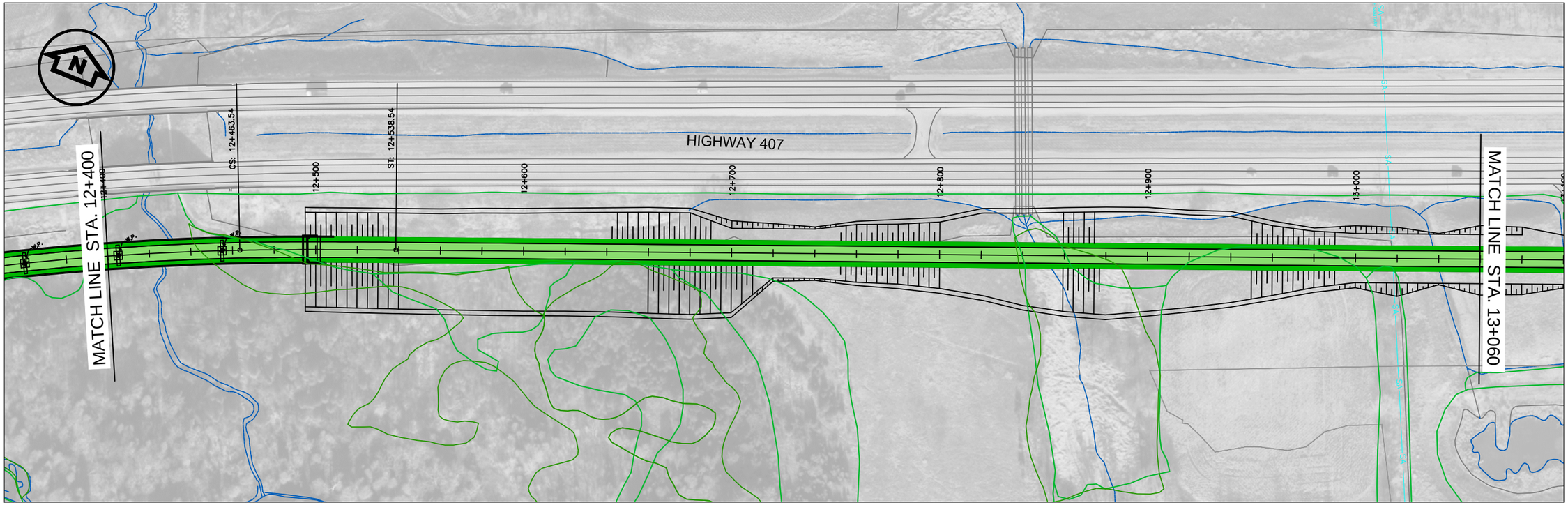

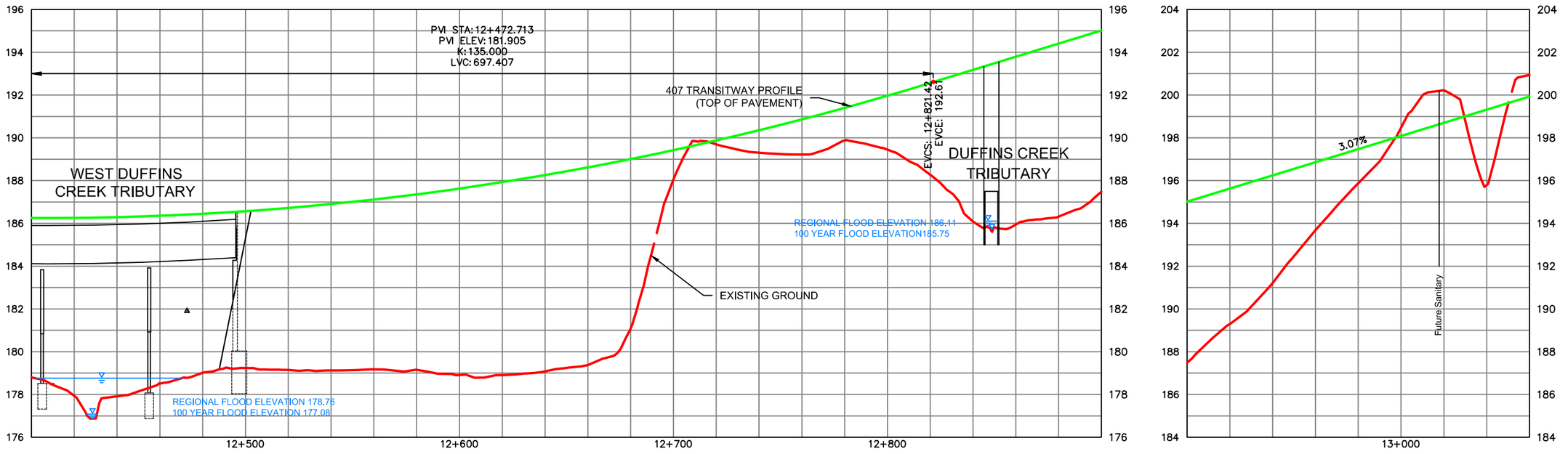

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Ontario PARSONS IBI GROUP

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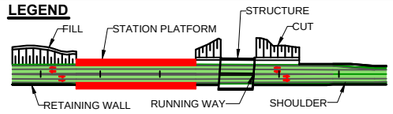
Vertical

LEGEND



HYDRO CORRIDOR
WATER COURSES
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES

407 TRANSITWAY

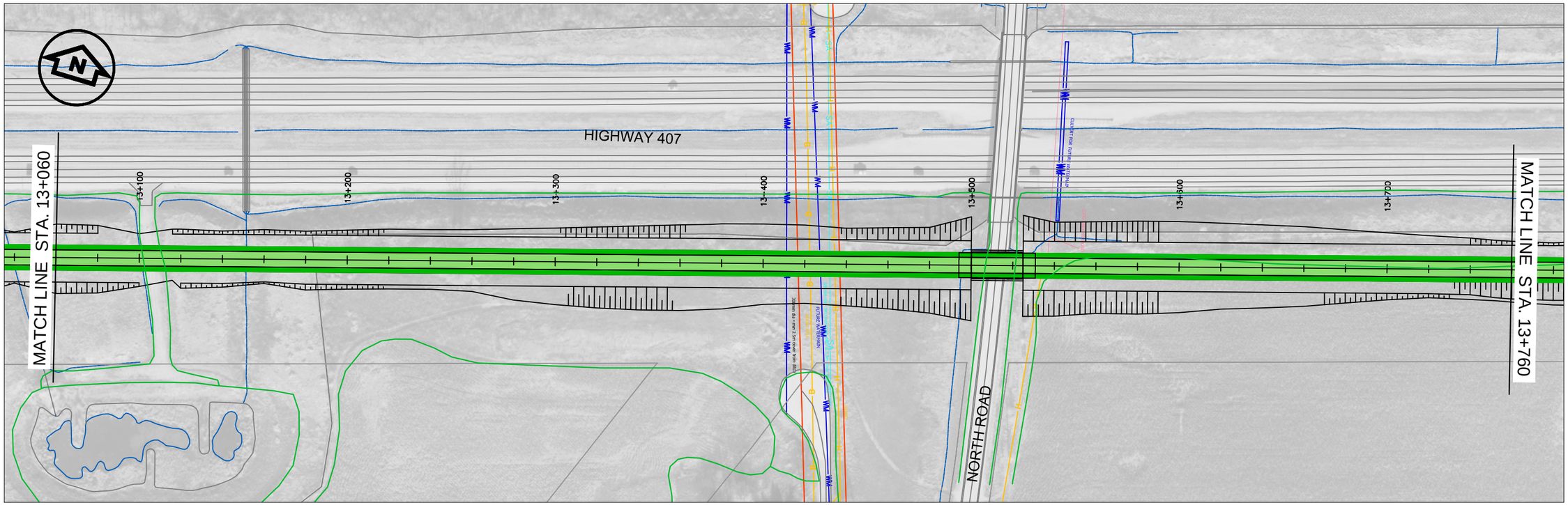
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 12+400 - STA 13+060

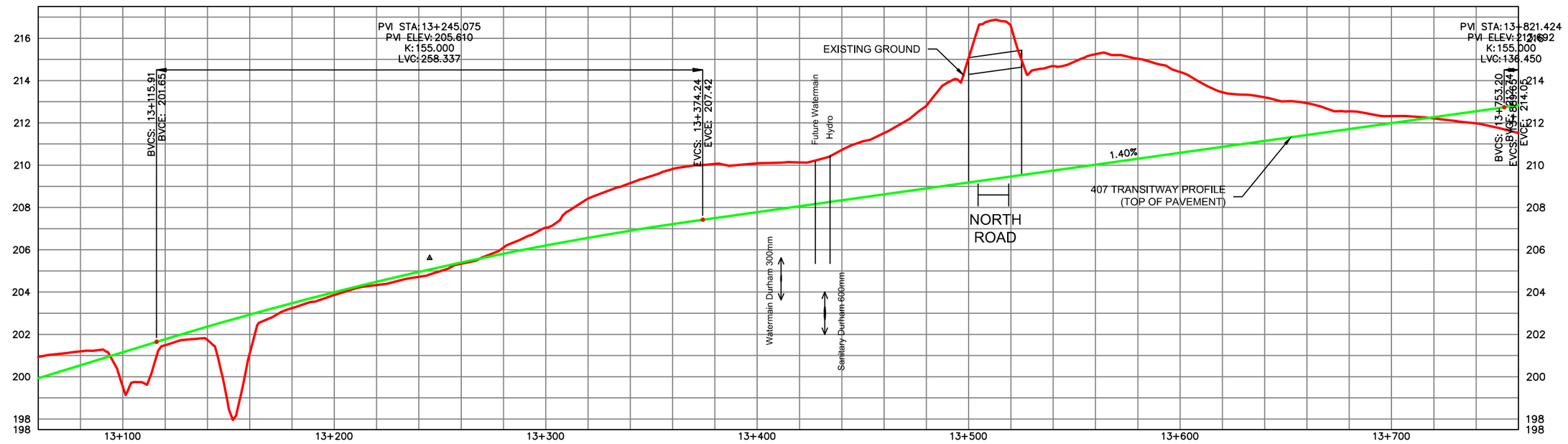
DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
19

DATE
2016/12/16

METRIC





Ontario PARSONS IBI GROUP

SCALE

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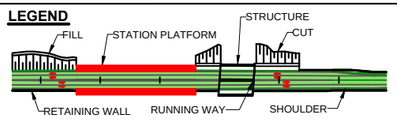
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 13+060 - STA 13+760

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
20

DATE
2016/12/16

DRAWING NAME: J:\TOR\TT4022 - 407 Transitway, Phase 2\TT\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 16-20_ST.dwg
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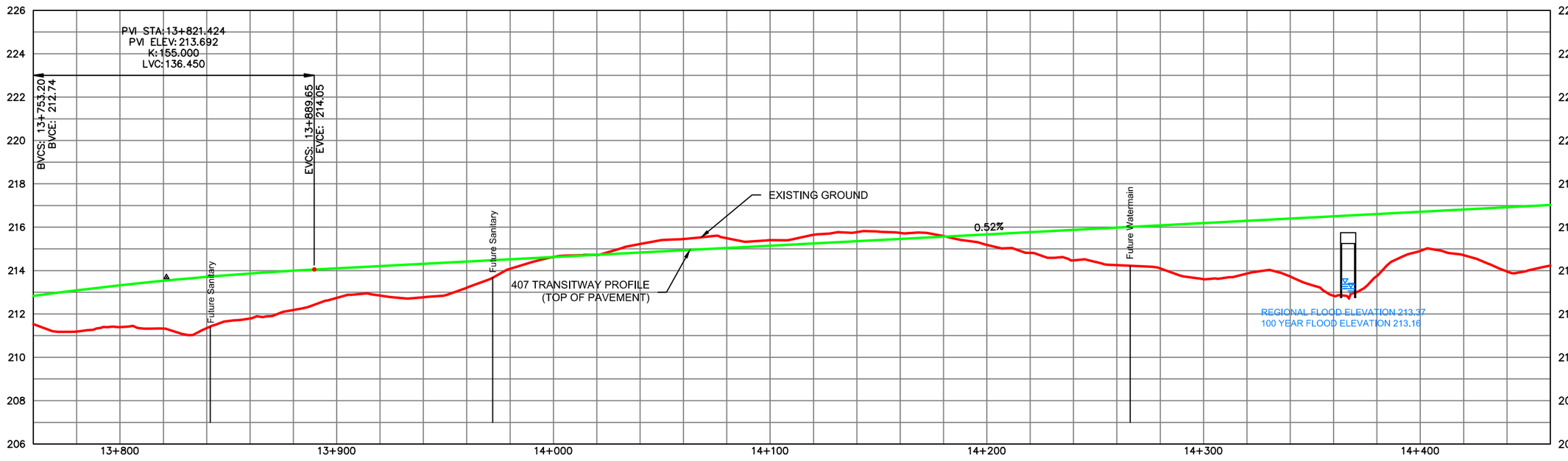

Ontario PARSONS IBI GROUP

SCALE

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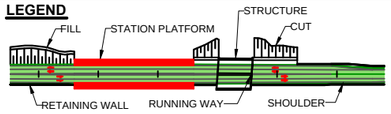
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
WATER COURSES
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 13+760 - STA 14+460

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
21

DATE
2016/12/19

DRAWING NAME: J:\TOR\TT4022 - 407 Transitway, Phase 2\TT\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 21-25_ST.dwg
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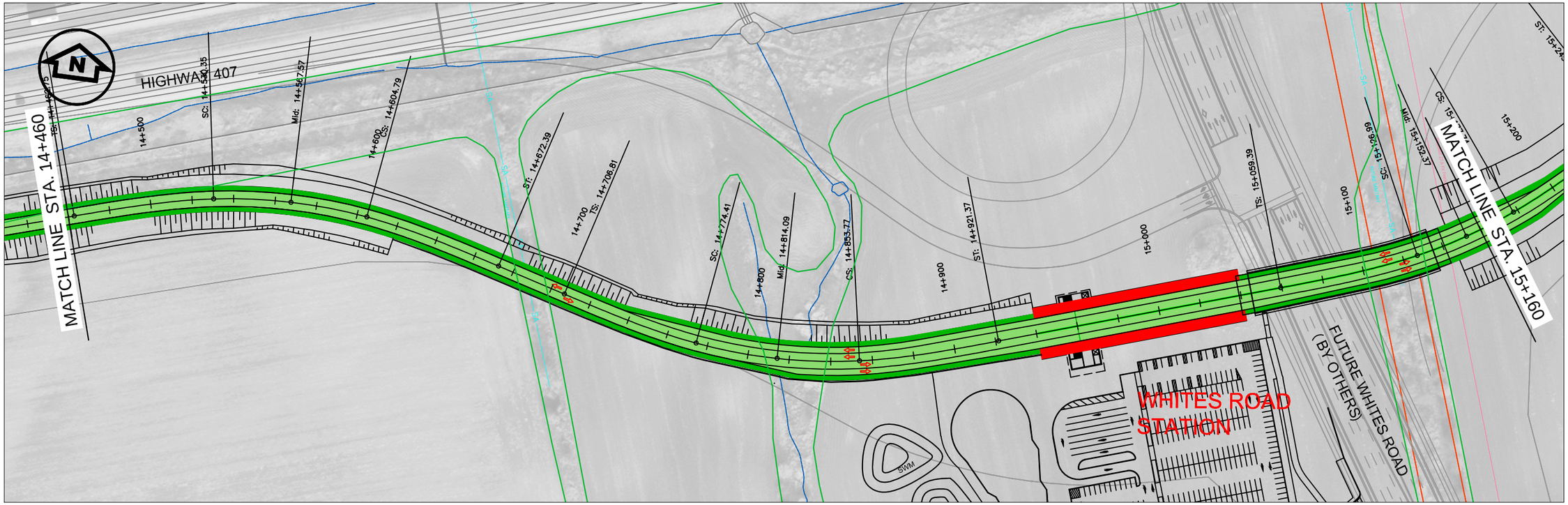

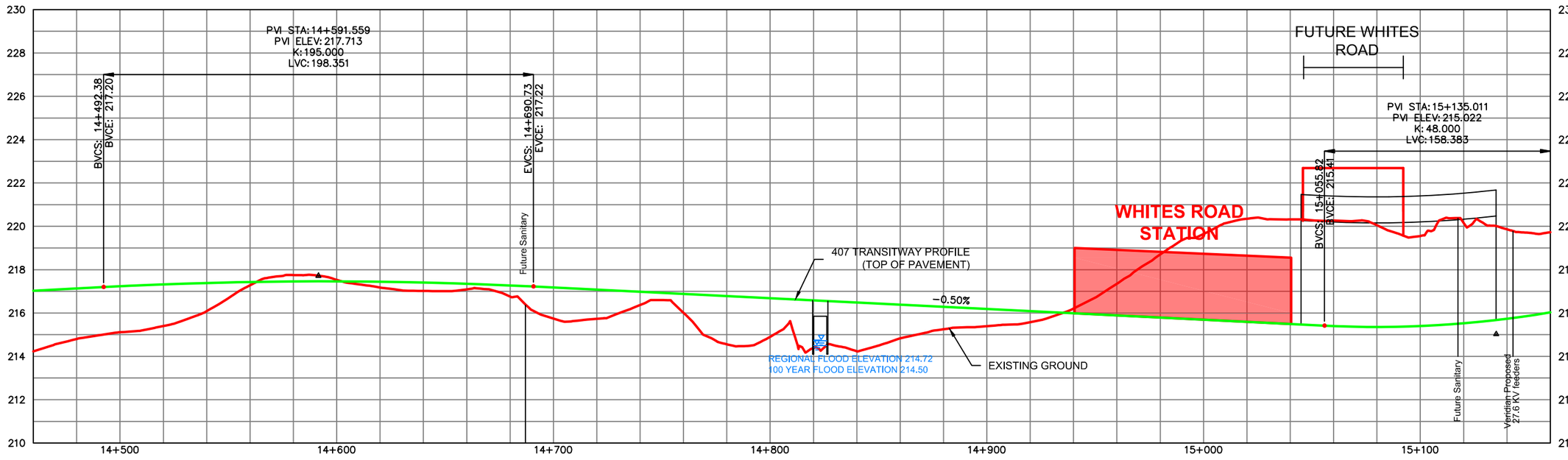

Ontario PARSONS IBI GROUP

SCALE

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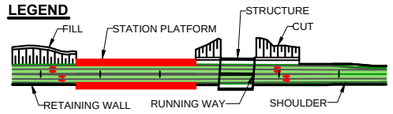
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
WATER COURSES
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 14+460 - STA 15+160

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
22

DATE
2016/12/19

DRAWING NAME: J:\TOR\TT4022 - 407 Transitway, Phase 2\TT\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 21-25_ST.dwg
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MODIFIED: Dec 19, 2016 - 4:07pm

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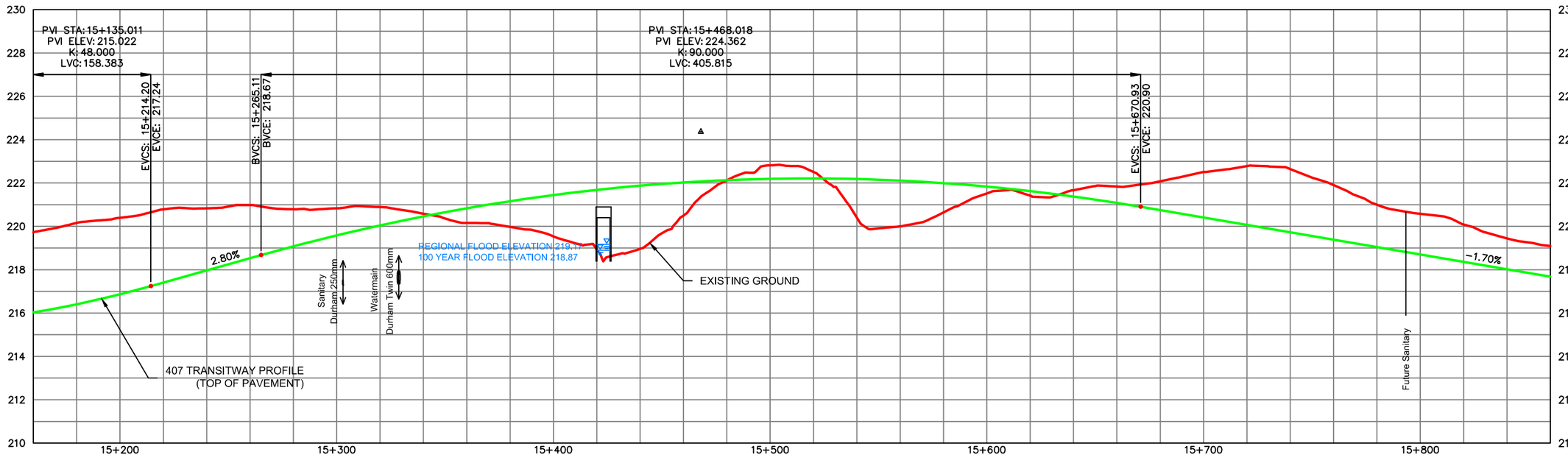

Ontario PARSONS IBI GROUP

SCALE

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Horizontal
1m 0 2m
Vertical

LEGEND

FILL, STATION PLATFORM, STRUCTURE, CUT, RETAINING WALL, RUNNING WAY, SHOULDER

HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 15+160 - STA 15+860

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE
23

DATE
2016/12/19

DRAWING NAME: J:\TOR\TT4022 - 407 Transitway, Phase 2\TT\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 21-25_ST.dwg
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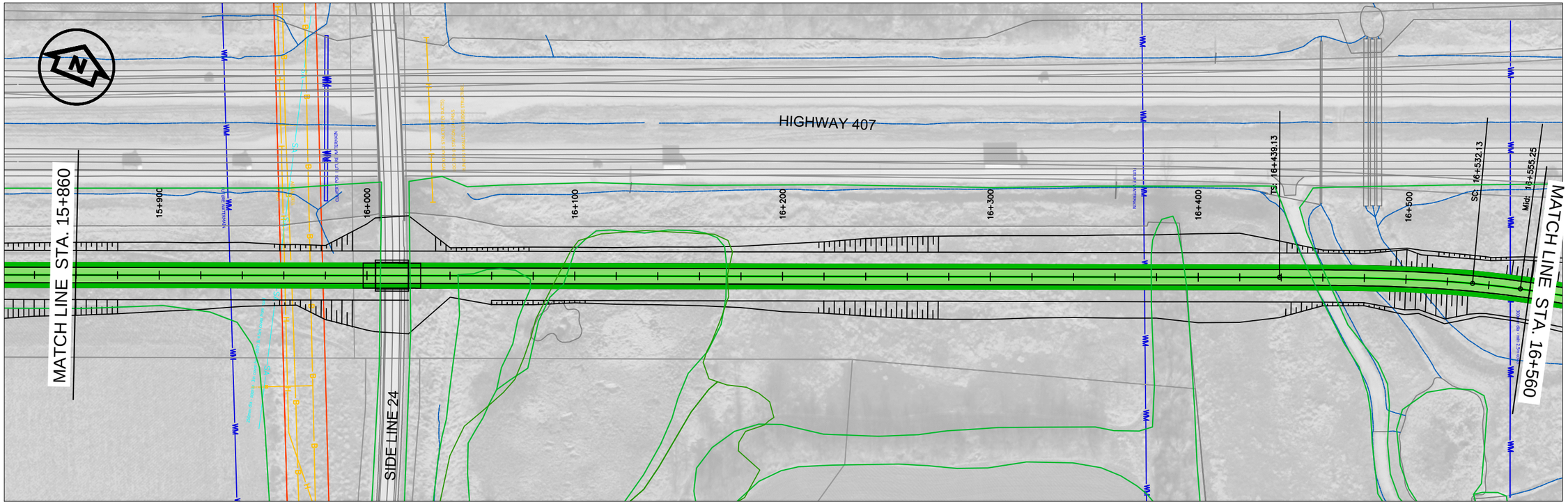

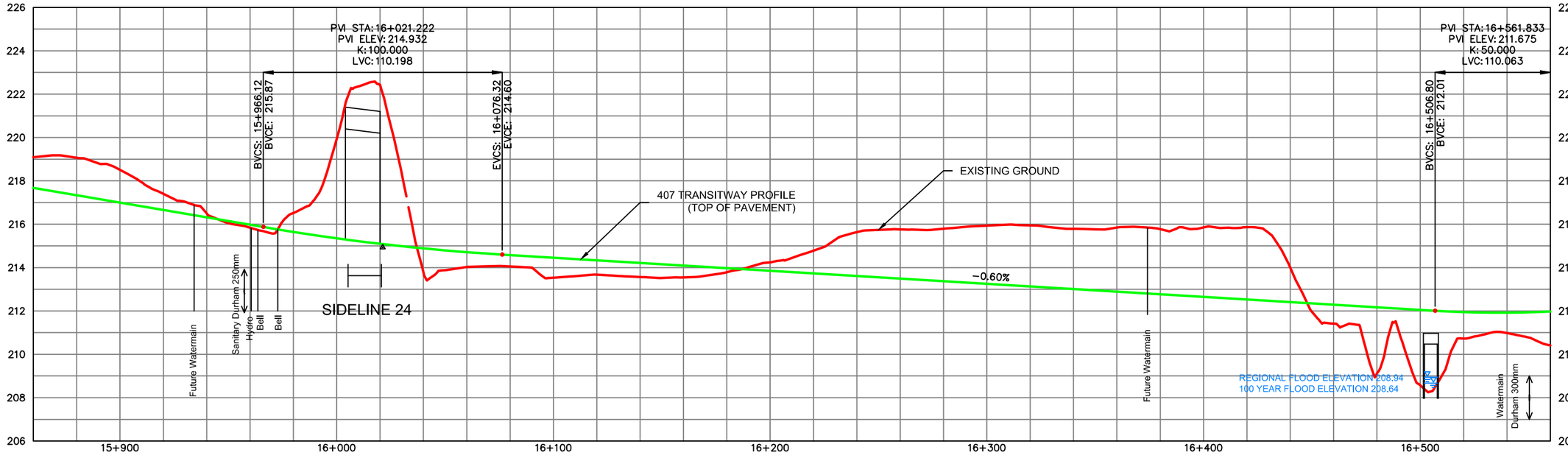

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MODIFIED: Dec 19, 2016 – 4:20pm
CREATED:

Ontario PARSONS IBI GROUP

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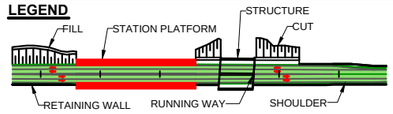
1m 0 2m — Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

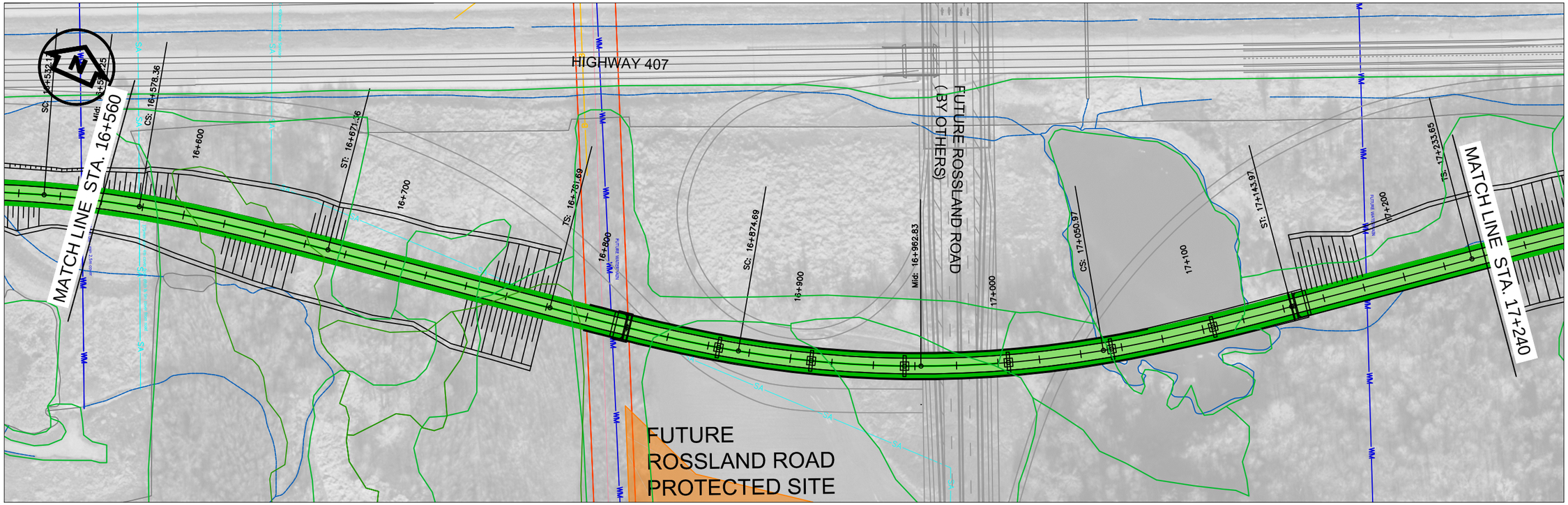
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 15+860 - STA 16+560

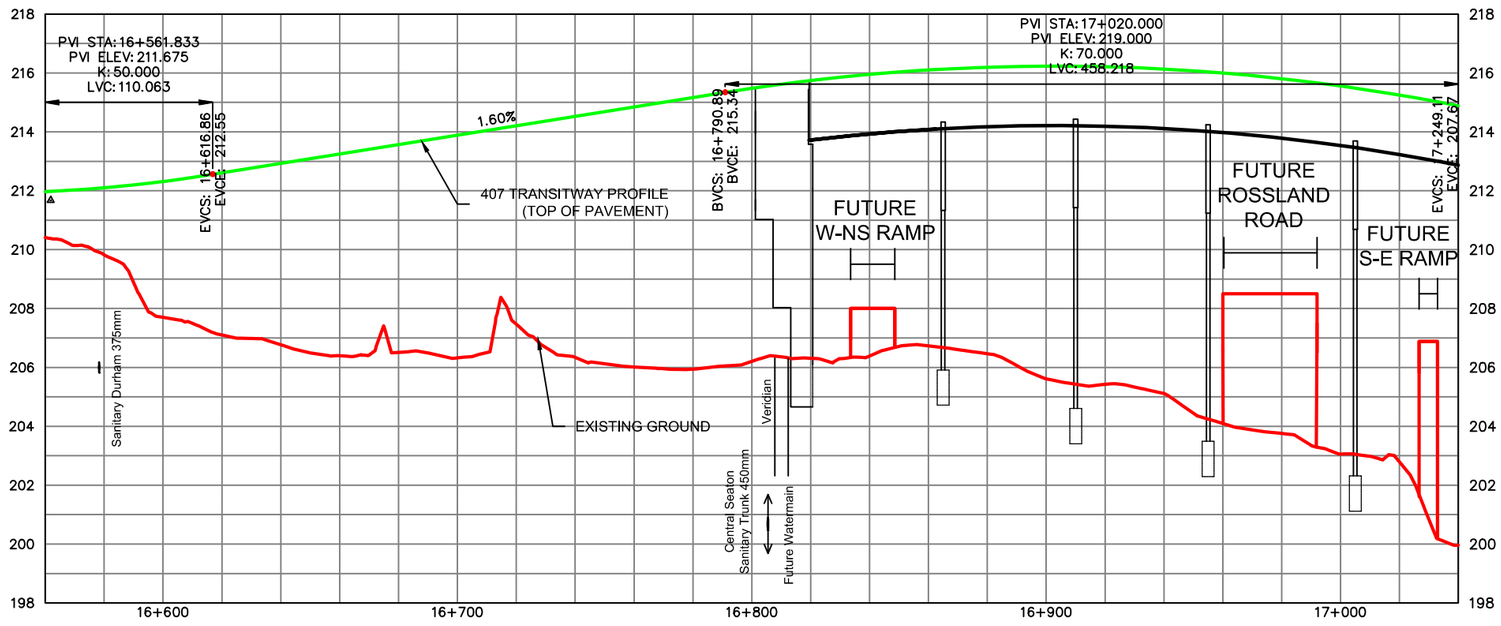
DRAWING SET
ALIGNMENT
PLAN & PROFILE

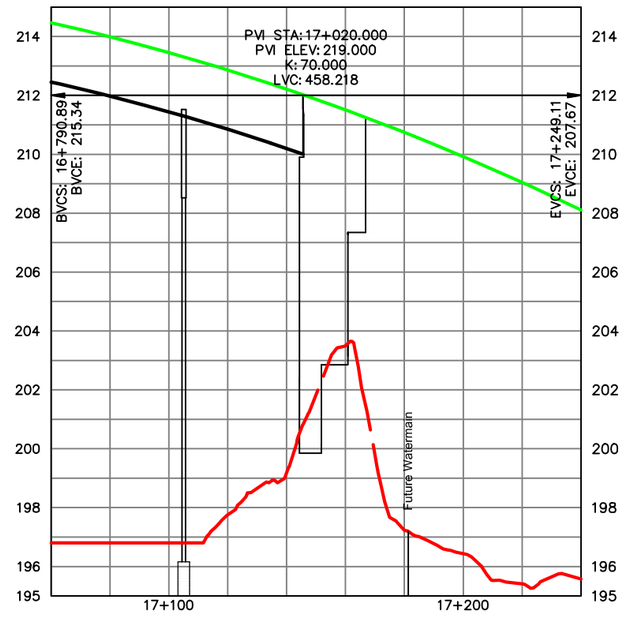
PLATE
24

DATE
2016/12/19

METRIC







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CREATED:
MODIFIED: Dec 19, 2016 – 4:26pm

Ontario PARSONS IBI GROUP

SCALE
10m 0 20m Horizontal
1m 0 2m Vertical

LEGEND
FILL, STATION PLATFORM, STRUCTURE, CUT, RETAINING WALL, RUNNING WAY, SHOULDER
HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

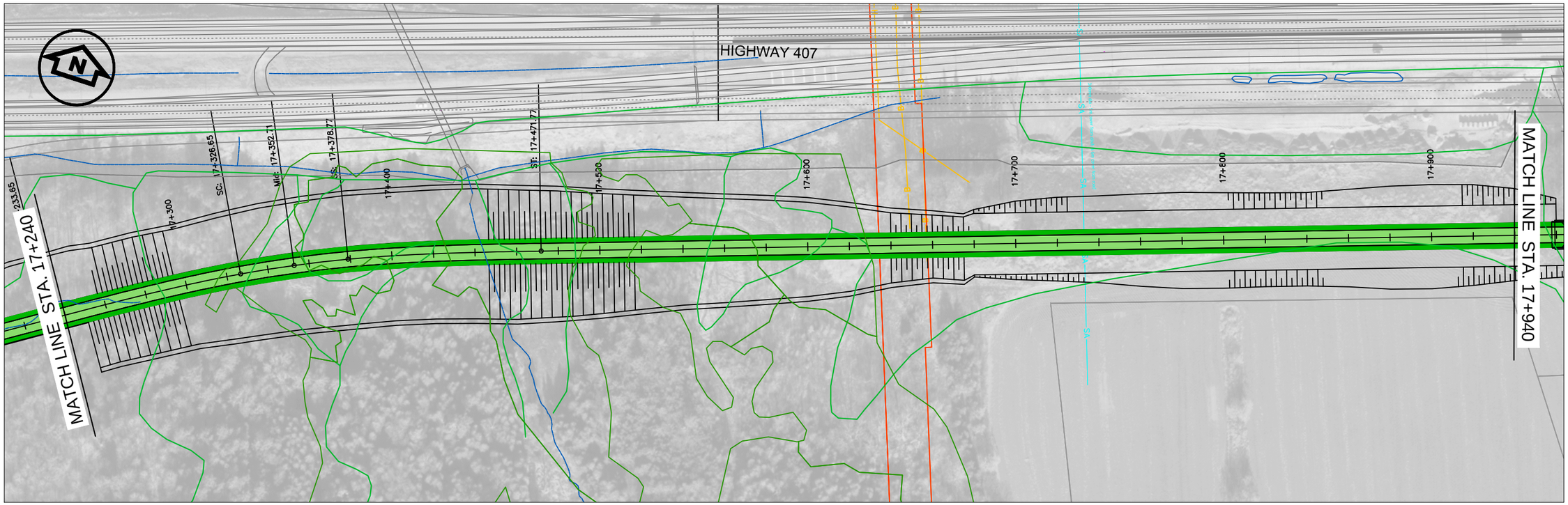
EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 16+560 - STA 17+240

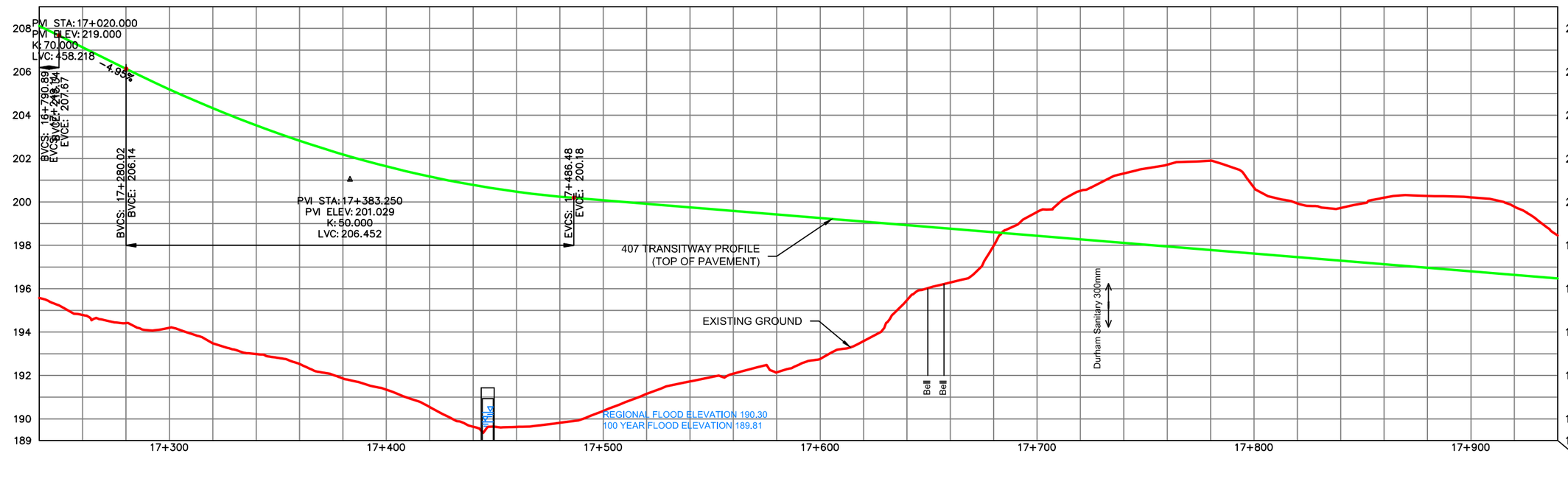
DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE 25

DATE 2016/12/19

METRIC





Ontario PARSONS IBI GROUP

SCALE

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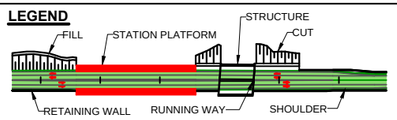
Horizontal
1m 0 2m
Vertical

LEGEND



HYDRO CORRIDOR
UTILITY CORRIDOR
EXISTING PROPERTY BOUNDARIES
WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 17+240 - STA 17+940

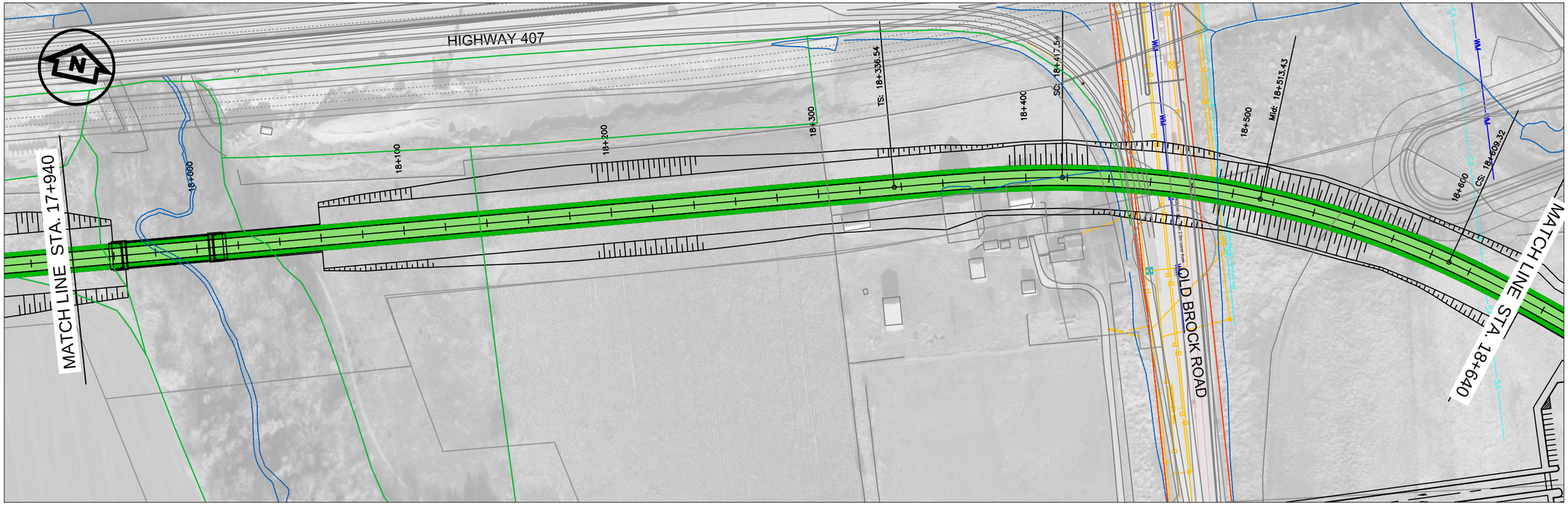
DRAWING SET
ALIGNMENT
PLAN & PROFILE

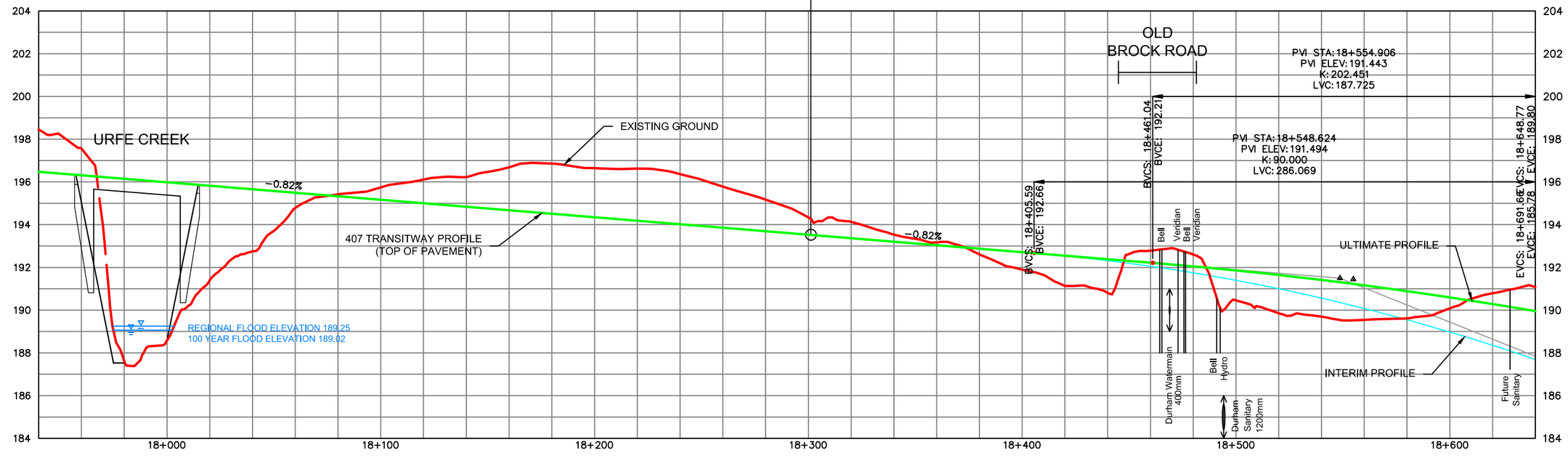
PLATE
26

DATE
2016/12/19

DRAWING NAME: J:\TOR\TT4022 - 407 Transitway, Phase 2\TT\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 26-28_ST.dwg
CREATED:
MODIFIED: Dec 19, 2016 - 4:53pm

METRIC





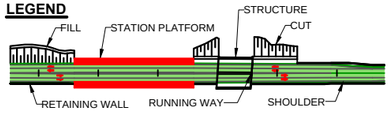
Ontario PARSONS IBI GROUP

SCALE

10m 0 20m Horizontal

1m 0 2m Vertical

LEGEND



HYDRO CORRIDOR

UTILITY CORRIDOR

EXISTING PROPERTY BOUNDARIES

WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 17+940 - STA 18+640

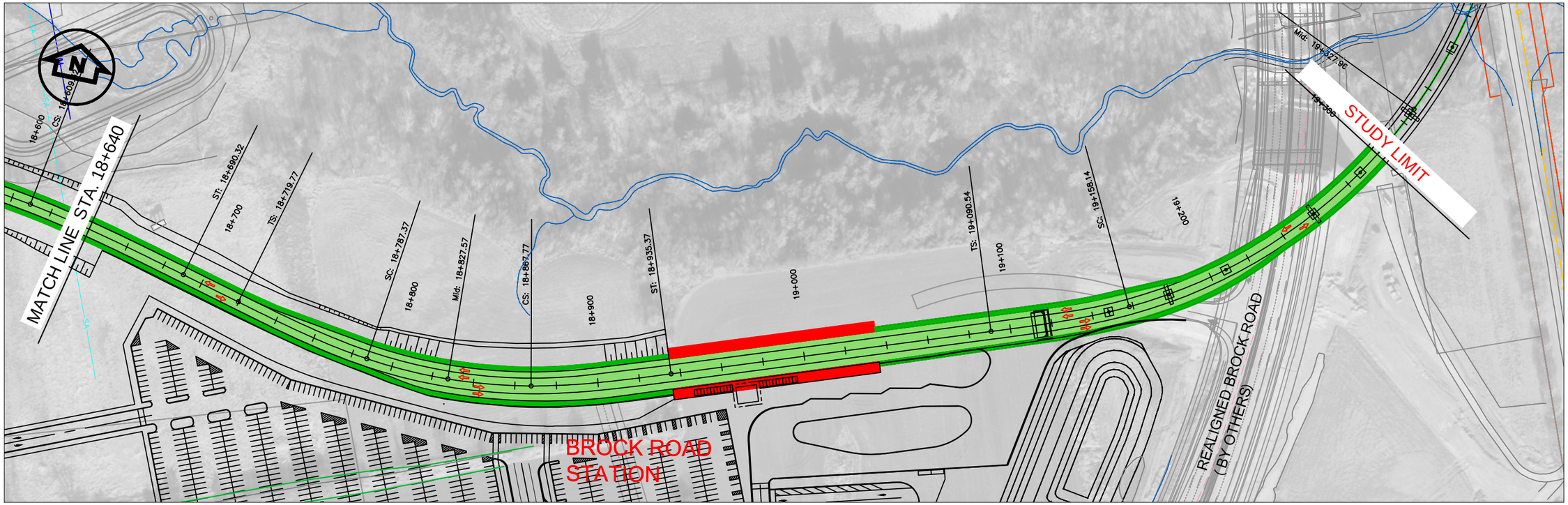
DRAWING SET
ALIGNMENT
PLAN & PROFILE

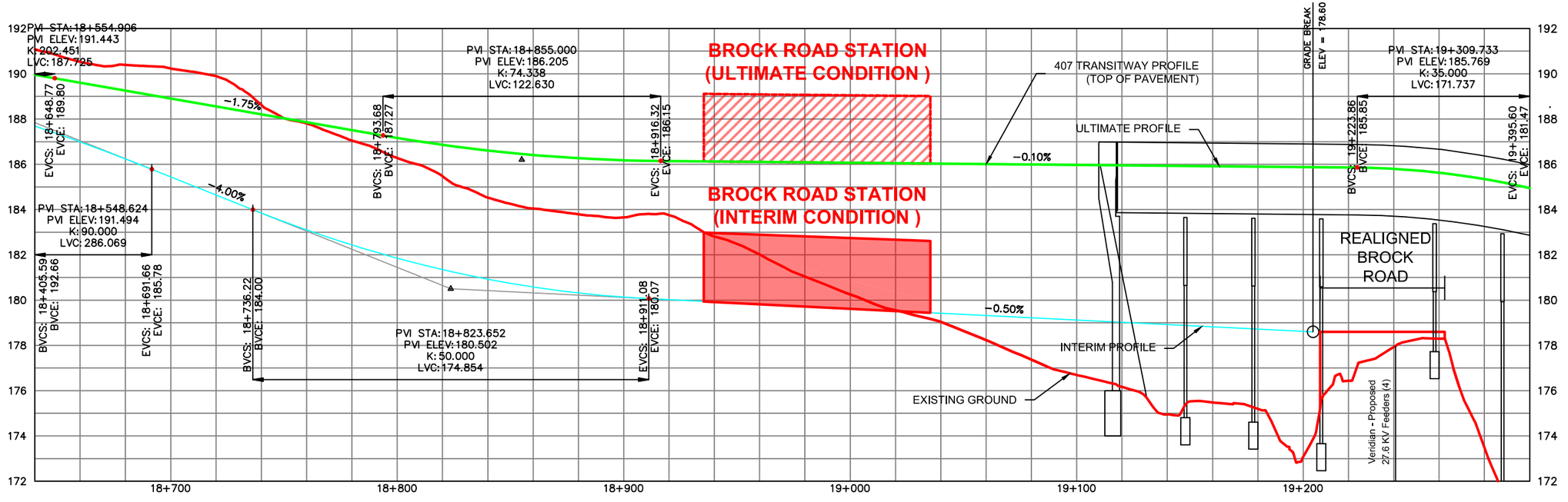
PLATE
27

DATE
2016/12/19

DRAWING NAME: J:\TOR\TT4022 - 407 Transitway, Phase 2\TT\5 General\02 - Drawings\01 - CAD\06 - Plates\PLATES 26-29_ST.dwg
CREATED:
MODIFIED: Dec 19, 2016 - 5:05pm

METRIC





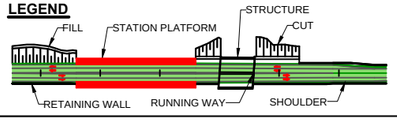
Ontario PARSONS IBI GROUP

SCALE

10m 0 20m — Horizontal

1m 0 2m — Vertical

LEGEND



HYDRO CORRIDOR

UTILITY CORRIDOR

EXISTING PROPERTY BOUNDARIES

WATER COURSES

407 TRANSITWAY

EAST OF KENNEDY ROAD TO EAST OF BROCK ROAD
G.W.P. 132-00-03 CA 2013-E-0027
STA 18+640 - STA 19+300

DRAWING SET
ALIGNMENT
PLAN & PROFILE

PLATE 28

DATE 2016/12/19

DRAWING NAME: J:\TOR\IT4022 – 407 Transitway, Phase 2\TS\5 General\02 – Drawings\01 – CAD\06 – Plates\PLATES 26-29_ST.dwg
CREATED:
MODIFIED: Dec 19, 2016 – 5:12pm