



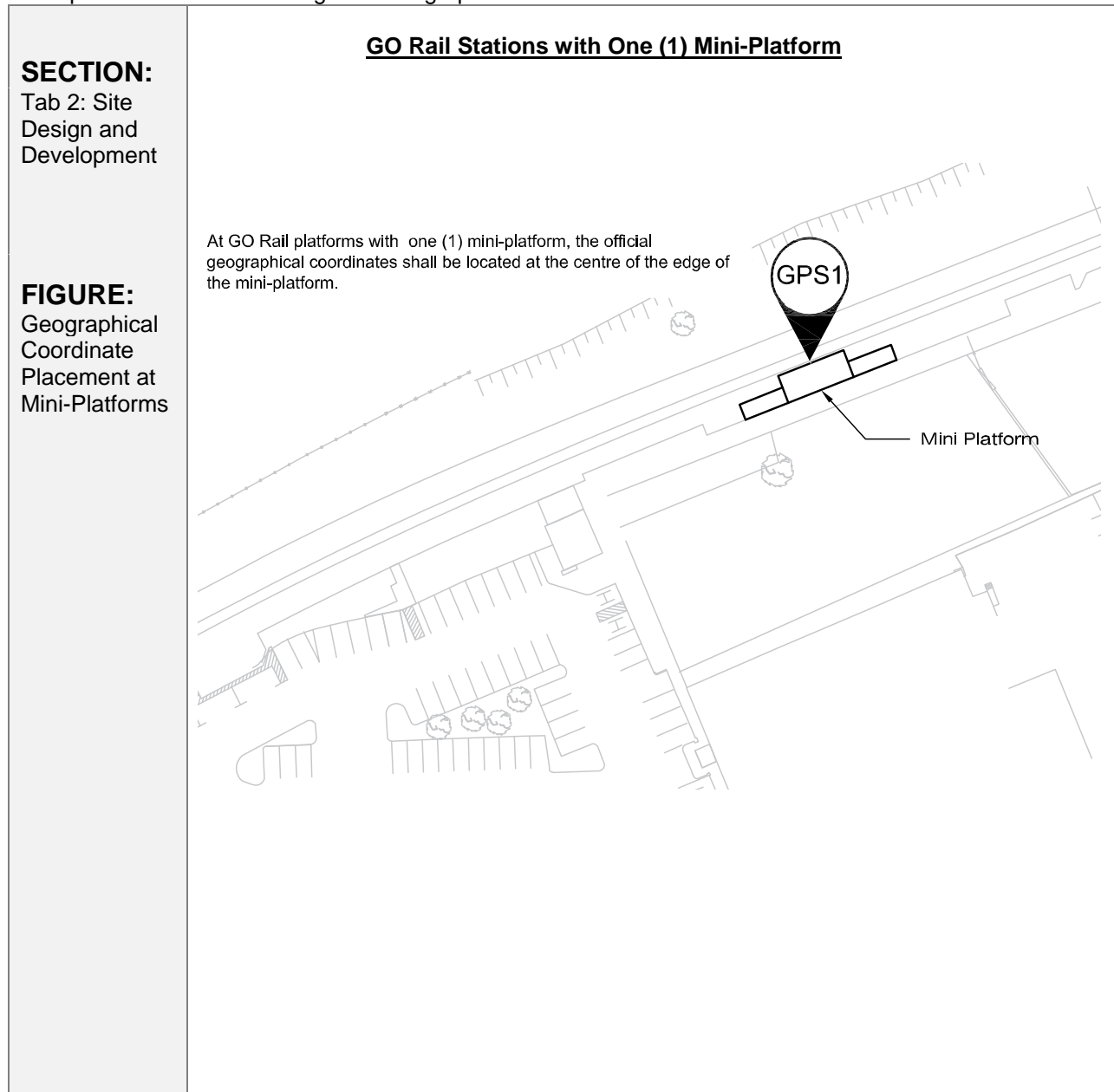
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TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT

Civil Works

STATION GEOGRAPHICAL COORDINATES

For GO Stations, the official geographical coordinates are to be located at the centre of the edge of the mini platform as outlined in figure - Geographical Coordinate Placement at Mini-Platforms:





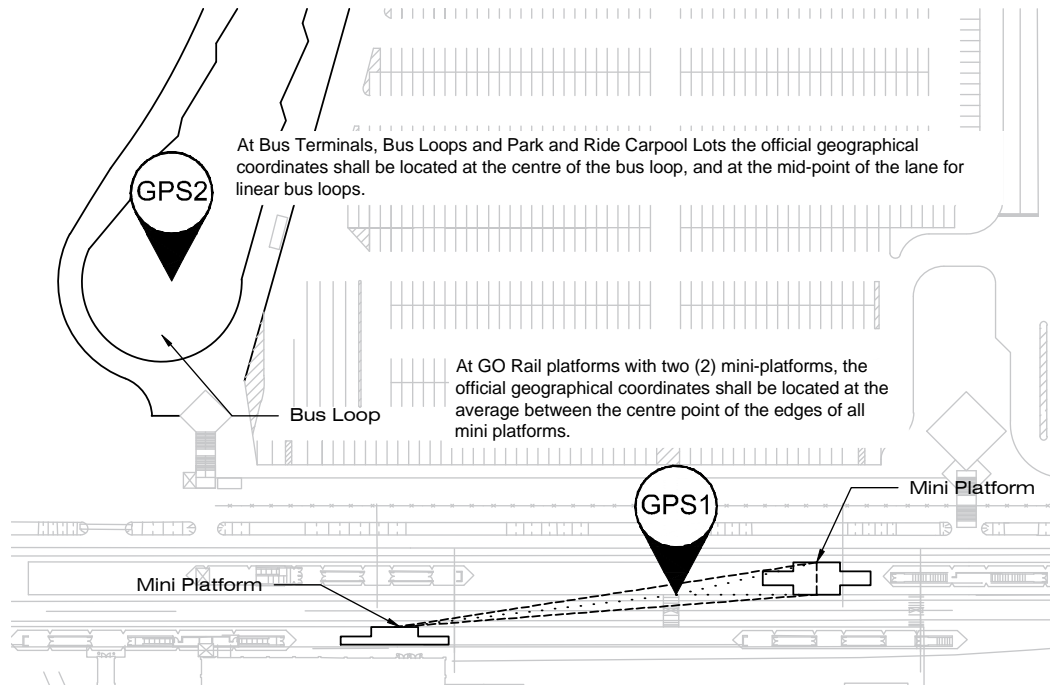
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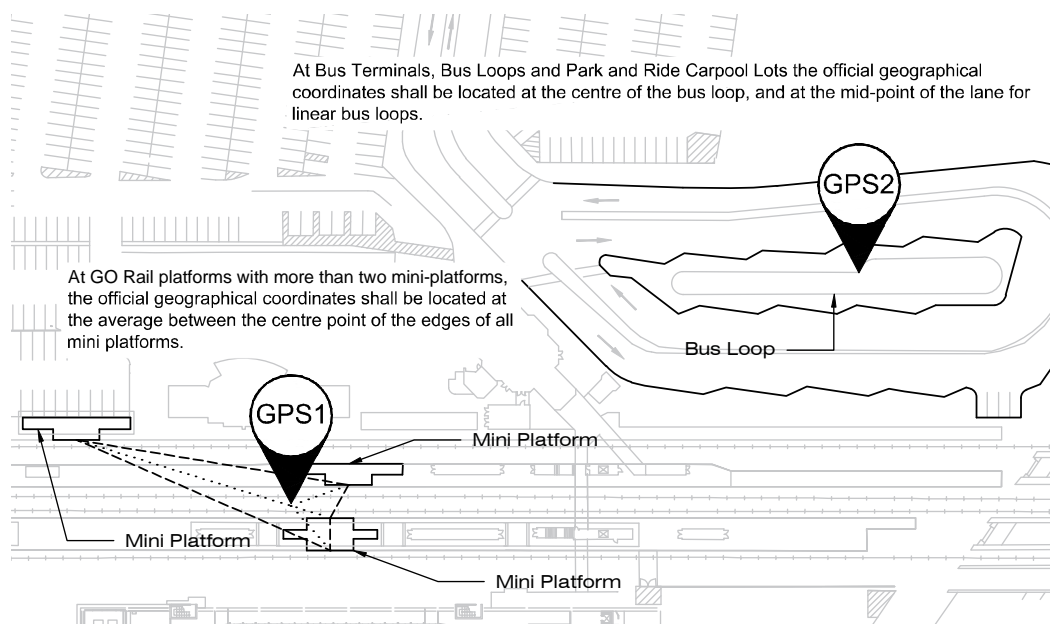
SECTION:
Tab 2: Site Design and Development

FIGURE:
Geographical Coordinate Placement at Mini-Platforms

GO Rail Stations with Two (2) Mini-Platforms and a Bus Loop



GO Rail Stations with More than Two (2) Mini-Platforms and a Bus Loop





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TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Civil Works

PROJECTION SYSTEM

The following Reference Datums and Grid System shall be used, in accordance with: the MTO's Engineering Survey Manual dated October 2006:

- > **Map Projection:** 3-degree Modified Transverse Mercator (MTM).
 - o MTM Zone 10
- > **Horizontal Reference Datum:** North American Datum (NAD) 1983, using the NAD83 Canadian Spatial Reference System (CSRS) adjustment.
 - o Horizontal Datum / Ellipsoid: NAD83 CSRS v.6 (epoch 2010.0) / GRS80
- > **Vertical Reference Datum:** Canadian Geodetic Vertical Datum (CGVD) 1928.
 - o Orthometric Elevation: CGVD1928:78 Adjustment

THREE-DIMENSIONAL GEODETIC CONTROL POINTS

- > All GO Stations, Bus Terminals and Park and Ride Carpool Lots shall have three-dimensional geodetic control points installed with both Vertical and Horizontal known measurements.
- > Along the rail corridors, three-dimensional geodetic control points shall be installed and the monuments placed on fixed and stable structures including: bridges, abutments, retaining walls and grade separations.
- > Control points shall be placed on a fixed and stable structure, including, station buildings, parking structures, tunnels, bridges or abutments.
- > The horizontal coordinates may be derived by suitable technologies including RTK GPS, Photogrammetry or Total Station surveys.
- > At locations with existing geodetic control points, benchmarks shall be removed and replaced during construction.
- > For new construction or expansion, geo-reference plans need to be created or updated.
- > Accuracy:
 - o Horizontal Control Points:
 - Network Accuracy of 4 cm (95% Confidence Interval) for Northing, Easting and Ellipsoid Elevation relative to the Active Control Stations.



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TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT

Civil Works

- Local Accuracy of 2 cm (95% Confidence Interval) for Northing, Easting, Ellipsoid Elevation relative to the adjoining station baselines at each location.
- Vertical Control Points:
 - Elevation values of all installed monuments to be established by precise leveling. Methodology, equipment and procedures shall comply with “Vertical Control Survey Specifications”, MTO, May 2011. Vertical accuracy shall be 1st Order.
 - Level loops to begin and end on an existing 1st Order vertical benchmark. For each existing benchmark used, a stability check shall be done prior to commencement of leveling. All existing 1st Order geodetic benchmarks adjacent to a GO station must be measured.
 - In cases where stable 1st Order benchmarks do not exist in areas adjacent to a GO station, other benchmarks may be used subject to authorization and instructions from the GO lead surveyor