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Appendix L

Phase 3 Evaluation

L1: Construction Methodology Evaluation

L2: Shortlisted Shaft Compound Alternatives Evaluation

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L1: Construction Methodology Evaluation

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Peel Region

Kennedy Road Sanitary Trunk Sewer EA

1. Evaluation of Tunnelling Construction Methodology

A comparative evaluation has been completed for the potential trenchless (tunnelling) construction methodology using the established criteria and were rated based on their potential constraints relative to the other alternatives as follows:

- High Constraints (Least Preferred)
- Medium Constraints (Less Preferred)
- Low Constraints (Preferred)

Table 1 detail the comparative evaluation of the construction methodologies (i.e., micro-tunnel boring machine vs traditional tunnel boring machine). The evaluation is qualitative in nature and has been informed through documentation of existing conditions and analysis by discipline leads including technical considerations.

Evaluation Methodology:
This evaluation will not be based on a weighted numerical ranking system but rather the professional expertise of the project team. To ensure statistical validity, such an approach would have to strictly adhere to statistical methods that are often difficult to apply in a multi-faceted project such as a Municipal Class EA. Instead, a descriptive or qualitative evaluation was used to consider the suitability and feasibility of each alternative route. In this respect, trade-offs were made considering the advantages or disadvantages of each alternative to address the problem and opportunity statement, with the least environmental effects and the most technical benefits resulting in a higher priority and forming the rationale for the preferred tunnelling construction methodology.

Note: The evaluation is done only on the main trunk sewer. The branches at Queen Street, Bovaird Drive and Old School Road are not evaluated in this document. These branches will be constructed by micro tunneling due to the short length of those sections.

Table 1: Evaluation of Alternative Tunnel Construction Methods

	Evaluation Criteria		Segment 1: Kennedy Road from Etobicoke Creek to Vodden Street, including Queen Street from Rutherford Road to Kennedy Road		Segment 2: Vodden Street from Kennedy Road to Orangeville-Brampton Railway (OBR) and from OBR up to Bovaird Drive		Segment 3: Orangeville-Brampton Railway corridor to Old School Road and Old School Road from OBR to Hurontario Street	
Category	**Criteria**	**Description**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**
-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
Technical	Tunnelling Considerations	• Tunnel diameter	**High Constraints** • A TBM of approximate 3.0 – 3.5m external diameter would be used. The concrete pressure pipe as carrier would be installed within the tunnel and the annular space between the primary tunnel and the carrier pipe to be grouted. • Alternatively a single pass system can be used for the tunnel option – concrete segments with an inner HDPE coating. This would be similar to the single pass system for the MTBM option but with a greater number of joints to be lapped with HDPE post-installation. • Tail tunnel and starter tunnel to be constructed at launch shafts for tunneling option.	**Low Constraints** • For an MTBM the internal diameter of the concrete jacking pipes is close to or equal to the required hydraulic diameter: 2150mm and 1800mm internal diameter jacking pipes. • A single pass system (concrete jacking pipes with an HDPE inner lining) is suitable for construction of the sewer by micro tunneling, with only the annulus to be grouted. • This would result in less over-excavation. • The single pass system would require a lower consumption of materials.	**High Constraints** • A TBM of approximate 3.0 - 3.5m external diameter would be used. The concrete pressure pipe as carrier would be installed within the tunnel and the annular space between the primary tunnel and the carrier pipe to be grouted. • A longer construction program may be required for the double pass system (concrete pressure pipes installed within the larger bore). • Alternatively a single pass system can be used for the tunnel option – concrete segments with an inner HDPE coating. This would be similar to the single pass system for the MTBM option but with a	**Low Constraints** • For an MTBM the internal diameter of the concrete jacking pipes would be 1500mm internal diameter. • A single pass system (concrete jacking pipes with an HDPE inner lining) is suitable for construction of the sewer by micro tunneling, with only the annulus to be grouted. • This would result in less over-excavation. • The single pass system would require a lower consumption of materials and shorter duration for pipe installation. **Segment 2: MTBM is preferred due to smaller cross-sectional area, lower consumption of materials and single pass system.**	**High Constraints** • A TBM of approximate 3.0 - 3.5m external diameter would be used. The concrete pressure pipe as carrier would be installed within the tunnel and the annular space between the primary tunnel and the carrier pipe to be grouted. • A longer construction programme may be required for the double pass system (concrete pressure pipes installed within the larger bore). • Alternatively a single pass system can be used for the tunnel option – concrete segments with an inner HDPE coating. This would be similar to the single pass system for the MTBM option but with a greater number of	**Low Constraints** • For an MTBM the concrete jacking pipes would be 1500mm internal diameter. • A single pass system (concrete jacking pipes with an HDPE inner lining) is suitable for construction of the sewer by micro tunneling, with only the annulus to be grouted. • This would result in less over-excavation. • The single pass system would require a lower consumption of materials and shorter duration for pipe installation. **Segment 3: MTBM is preferred due to smaller cross-sectional area, lower consumption of materials and single pass system.**

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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
			Segment 1: TBM is least preferred due to the higher cross-sectional area, consumption of material and two pass system.	**Segment 1: MTBM is preferred due to smaller cross-sectional area, lower consumption of materials and single pass system.**	• greater number of joints to be lapped with HDPE post-installation. • Tail tunnel and starter tunnel to be constructed at launch shafts for tunneling option. • Upsizing the tunnel diameter to 2400 mm would impact the hydraulics and require regular flushing until the system reaches its design population. **Segment 2: TBM is least preferred due to the higher cross-sectional area, consumption of material, two pass system and requirement to flush the pipes before the design population is reached.**		• joints to be lapped with HDPE post-installation. • Tail tunnel and starter tunnel to be constructed at launch shafts for tunneling option. • Upsizing the tunnel diameter to 2400 mm would impact the hydraulics and require regular flushing until the system reaches its design population. **Segment 3: TBM is least preferred due to the higher cross-sectional area, consumption of material, two pass system and the requirement to flush the pipes before the design population is reached.**	

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Technical	Tunnelling Considerations	• Tunnel drive length • Number of shafts needed	• Tunnel drive length would be up to approximately 4900m long with TBM shaft 2 for ventilation and TBM inspection/maintenance purposes at Glidden Road. • TBM shafts 2 and 3, and the MTBM shaft on Queen Street, are at the locations of sewer connection points. • A shaft at the Queen Street intersection is not required for the TBM but is required for the connection with the Queen Street branch. • A future connection may be required at Church Street but this is to be confirmed. There may be an opportunity to make this connection at the MTBM shaft at Queen Street.	• Micro tunnel drive lengths would be up to 1200m long. • Six shafts required along Kennedy Road, not including the shaft at Etobicoke Creek by others. • Shafts K1-SHFT4 and K1-SHFT5, and the MTBM shafts on Queen Street, are at the locations of sewer connection points. • A future connection may be required at Church Street but this is to be confirmed. There may be an opportunity to make this connection at shaft K1-SHFT4 at Queen Street. **Segment 1: MTBM is less preferred shorter drive**	• Tunnel drive length would be 1860m along Vodden Street and approximately 3000m from Vodden Rd to Bovaird Dr included the section on Bovaird Dr. • A shaft along Vodden Street is not required for tunnelling but is required to form the connection to the Etobicoke Creek Trunk Sewer (ECTS), so the number of shafts along Vodden is the same for both options. • MTBM shafts on Bovaird Drive are at the location of sewer connection points. **Segment 2: TBM is preferred due to longer drive lengths, hence fewer shafts required. Number of shafts along the OBR is reduced. Number of shafts along Vodden Street is the same.**	• Micro tunnel drive lengths would be approximately 1025m and 840m long. • A shaft is required along Vodden St for the MTBM option, but this is required for a connection to the ECTS. No additional shafts required along Vodden St for the MTBM option. • Two additional shafts are required along the OBR from Vodden to Bovaird Drive West. • MTBM shafts on Bovaird Drive (OBR1-SHFT3 and B3-SHFT1) are at the location of sewer connection points. **Segment 2: MTBM is less preferred due to shorter drive lengths hence more shafts required along the OBR.**	• Tunnel drive length would be approximately 7500m from Bovaird Drive to Old School Rd and 1100m on Old School Rd from OBR to Hurontario St. • A connection point is required at the north-west end of the OBR, close to TBM shaft 7. A trenched connection would be formed from this connection point to TBM shaft 7. **Segment 3: TBM is preferred due to longer drive lengths, hence fewer shafts required.**	• Micro tunnel drive lengths would be up to 1000m long. • More shafts are required along the OBR from Vodden Street to Old School Road. • A connection point is required at the north-west end of the OBR, close to OBR2-SHFT10. A trenched connection would be formed from this connection point to OBR2-SHFT10. • Approximately half of the shafts along the OBR corridor can be restored to their original condition following completion of the micro tunneling drives, assuming the spacing between maintenance shafts is maintained between 2.0 and 2.5. This assumption would help reduce both cost and schedule. • Additionally, raising the tunnel alignment by a few

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			Segment 1: TBM is preferred due to longer drive lengths, hence fewer shafts required. But due to the requirement for an intermediate shaft and the connection at Queen St, the number of shafts is only reduced by one compared to the MTBM option.	**lengths hence more shafts required. The number of shafts required is increased by two compared to the TBM option.**				meters along the OBR corridor—from Old School Road to Bovaird Drive—could further optimize cost and schedule without affecting the environmental studies. A more detailed analysis of this proposed alignment adjustment will be included in the PDR. **Segment 3: MTBM is less preferred due to shorter drive lengths hence more shafts required along the OBR.**

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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
Technical	Tunnelling Considerations	• Shaft sizes • Shaft compound sizes	• The launch shaft would be at First Gulf Boulevard. The shaft would be 12m internal diameter. The shaft compound would be approximately 7500m^2. • The reception shaft would be at the Kennedy Road – Vodden Street intersection (Centennial Mall). The shaft would be approximately 10m internal diameter. The shaft compound size would be approximately 9000m^2. • An intermediate would be required along Kennedy Road at approximately halfway along the drive length, for ventilation and TBM inspection/maintenance. • For the shaft compounds, topsoil may have to be removed from the	• Six shafts are required along Kennedy Road to limit the drive length. • Launch shafts to be 11m internal diameter. • Reception shafts to be 8m internal diameter. • All six shafts on Kennedy Road are located on or just off Kennedy Road. • Single lane closures are required for the shafts at RONA/Sir Wilfrid Laurier PS, Queen Street and the Kennedy Road – Vodden Street intersection. • Permanent easements are required for the placement of the shafts at First Gulf Boulevard, RONA/Sir Wilfrid Laurier PS, Clarence Street and the Kennedy Road – Vodden Street intersection due to	• The launch shaft would be at Nancy McCredie Park. The shaft would be 12m internal diameter. The shaft compound would be approximately 10,000m^2. • The reception shaft would be at the Kennedy Road – Vodden Street intersection (Centennial Mall, covered under segment 1). The shaft would be approximately 10m internal diameter. The shaft compound size would be approximately 9000m^2. • A shaft at Ken Whillans Road is required for a sewer connection. This shaft is not required for tunnelling. • For the shaft compounds, topsoil may have to be removed from the compound area and	• A shaft would be at the Kennedy Road – Vodden Street intersection (Centennial Mall, covered under segment 1). • A shaft would be at on Vodden St at Ken Whillans Road. • A shaft would be at the intersection of the OBR with Vodden Street. • A shaft would be at the intersection of the OBR with Williams Parkway. • Launch shafts would be 10.5m internal diameter. • Reception shafts would be 6m internal diameter. **Segment 2: MTBM is preferred due to smaller compound area sizes required.**	• A 10m internal diameter reception shaft would be along the OBR at Red Plant Crescent. The shaft compound area would be approximately 7,500m^2. • A 12m internal diameter launch shaft would be at the intersection of the OBR and Old School Road. The shaft compound would be approximately 9,000m^2. • An intermediate shaft would be required close to the intersection of the OBR and Tim Manley Avenue. • For the shaft compounds, topsoil may have to be removed from the compound area and replaced with granular material. The larger TBM shaft compounds (and particularly the TBM launch shaft compound) require a larger area of soil to be	• Ten shafts have been included along the Orangeville Brampton Railway from Bovaird Road to Old School Road (inclusive) to limit the MTBM drives to achievable lengths. • The launch shafts would have an internal diameter of 8.5m. • The reception shafts would have an internal diameter of 6m. **Segment 3: MTBM is less preferred due to more shafts required, albeit each having a smaller compound area size.**

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			compound area and replaced with granular material. The larger TBM shaft compounds (and particularly the TBM launch shaft compound) require a larger area of soil to be replaced and then restored, which is more effort and cost. **Segment 1: Both TBM and MTBM options require similar total shaft compound areas – TBM requires fewer but larger compounds.**	placement of the shaft fully or partially within property boundaries. **Segment 1: Both TBM and MTBM options require similar total shaft compound areas – TBM requires fewer but larger compounds.**	replaced with granular material. The larger TBM shaft compounds (and particularly the TBM launch shaft compound) require a larger area of soil to be replaced and then restored, which is more effort and cost. **Segment 2: TBM is less preferred due to larger compound area sizes required.**		replaced and then restored, which is more effort and cost. **Segment 3: TBM is preferred due to fewer number of shafts.**	
Technical	Geotechnical and Hydrogeological Conditions	• Versatility in different ground conditions • Groundwater impacts on construction • Pumping requirements	• TBM is suitable for the anticipated rock and soil conditions. • TBM is effective when tunneling upgrade for drainage control, allowing groundwater to collect at the launch shaft.	• MTBM is suitable for the anticipated rock and soil conditions. • Groundwater pressure can be balanced by the face pressure of the MTBM. Dewatering required only at shaft locations.	• TBM is suitable for the anticipated rock and soil conditions. • TBM is effective when tunneling upgrade for drainage control, allowing groundwater to collect at the launch shaft.	• MTBM is suitable for the anticipated rock and soil conditions. • Groundwater pressure can be balanced by the face pressure of the MTBM. Dewatering required only at shaft locations.	• TBM is suitable for the anticipated rock and soil conditions. • TBM is effective when tunneling upgrade for drainage control, allowing groundwater to collect at the launch shaft.	• MTBM is suitable for the anticipated rock and soil conditions. • Groundwater pressure can be balanced by the face pressure of the MTBM. Dewatering required only at shaft locations.

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		▪ Spoil management	• Drive along Kennedy Road would be proposed as upgrade from Etobicoke Creek to Vodden Street. If the drive along Kennedy were downgrade, continuous pumping of infiltrating groundwater would be required. • Spoil from both options may require treatment due to potential benzene contamination or support fluid. TBM has a larger excavated area for the tunnel, so a greater volume of spoil. **Segment 1: TBM and MTBM are considered equally acceptable, provided the TBM drive is upgrade.**	• Continuous concrete jacking pipe lining minimises water ingress into the micro tunnel. Low level of infiltrating groundwater anticipated. • Spoil from both options may require treatment due to potential benzene contamination or support fluid. MTBM has a smaller excavated area for the tunnel, so a lower volume of spoil. **Segment 1: TBM and MTBM are considered equally acceptable, provided the TBM drive is upgrade.**	• Drive along Vodden proposed to be downgrade, hence continuous pumping of infiltrating groundwater would be required. • Drive from Vodden Street to Red Plant Crescent along the OBR proposed to be upgrade. • Spoil from both options may require treatment due to potential benzene contamination or support fluid. TBM has a larger excavated area for the tunnel, so a greater volume of spoil. **Segment 2: TBM least preferred due to potential for groundwater ingress not draining towards the launch shaft.**	• Continuous concrete jacking pipe lining minimises water ingress into the micro tunnel. Low level of infiltrating groundwater anticipated. • Spoil from both options may require treatment due to potential benzene contamination or support fluid. MTBM has a smaller excavated area for the tunnel, so a lower volume of spoil. **Segment 2: MTBM preferred.**	• Drive from Vodden Street to Red Plant Crescent along the OBR proposed to be upgrade. • Drive from Old School Road to Red Plant Crescent along the OBR proposed to be downgrade, hence continuous pumping of infiltrating groundwater would be required. • Spoil from both options may require treatment due to potential benzene contamination or support fluid. TBM has a larger excavated area for the tunnel, so a greater volume of spoil. **Segment 3: TBM least preferred due to potential for groundwater ingress not draining towards the launch shaft.**	• Continuous concrete jacking pipe lining minimises water ingress into the micro tunnel. Low level of infiltrating groundwater anticipated. • Spoil from both options may require treatment due to potential benzene contamination or support fluid. MTBM has a smaller excavated area for the tunnel, so a lower volume of spoil. **Segment 3: MTBM preferred.**

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Technical	Tunnelling Considerations	▪ Presence of gases	• Workers are present inside TBM tunnels; higher risk if gases are encountered. The shale is known to contain pockets of methane gas and hydrogen sulphide. **Segment 1: TBM least preferred due to risk with ground gases and crew working underground.**	• An MTBM is operated remotely, thus safer in presence of gases, which are a potential hazard based on the anticipated shale geology. **Segment 1: MTBM preferred as operated remotely.**	• Workers are present inside TBM tunnels; higher risk if gases are encountered. The shale is known to contain pockets of methane gas and hydrogen sulphide. **Segment 2: TBM least preferred due to risk with ground gases and crew working underground.**	• An MTBM is operated remotely, thus safer in presence of gases, which are a potential hazard based on the anticipated shale geology. **Segment 2: MTBM preferred as operated remotely.**	• Workers are present inside TBM tunnels; higher risk if gases are encountered. The shale is known to contain pockets of methane gas and hydrogen sulphide. **Segment 3: TBM least preferred due to risk with ground gases and crew working underground.**	• An MTBM is operated remotely, thus safer in presence of gases, which are a potential hazard based on the anticipated shale geology. **Segment 3: MTBM preferred as operated remotely.**
Technical	Construction access	▪ Ease of accessing shaft locations	▪ Access to the shafts would be along Kennedy Road. ▪ Overhead cables run along the north-east side of Kennedy Road at the planned shaft location of First Gulf Boulevard. These will likely need to be relocated to enable construction access at this location. ▪ The shaft at the Kenndy Road – Vodden Street	▪ Access to the shafts would be along Kennedy Road. ▪ Overhead cables run along the north-east side of Kennedy Road and are present at the planned shaft locations of First Gulf Boulevard and Clarence Street. These will likely need to be relocated to enable construction access at these locations.	• The shafts along Vodden Street are accessible from Vodden Street. • The shaft at the intersection of the OBR and Bovaird Drive is accessible from Bovaird Drive. **Segment 2: TBM and MTBM are considered equally acceptable.**	• The shafts along Vodden Street are accessible from Vodden Street. • The shaft at the intersection of the OBR and Bovaird Drive is accessible from Bovaird Drive. • The shaft at the intersection of the OBR and Williams Parkway is accessible from Williams Parkway.	• The shaft at the intersection of the OBR and Bovaird Drive is accessible from Bovaird Drive. • The shaft on the OBR, on the other side of the OBR to Red Plant Crescent, would be accessible by the industrial access roads off Hurontario Street. • The shaft at the intersection of the OBR and Tim Manley	• The 10 shafts along the OBR from Bovaird Drive to Old School Road would be accessed from either roads intersecting the OBR or from industrial access roads off Hurontario Street. • Construction/improvement of some haul roads would be required to access shafts along the OBR (e.g., temporary access road from

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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
			intersection is close to overhead power lines. **Segment 1: TBM and MTBM are considered equally acceptable.**	▪ The shaft at the Kenndy Road – Vodden Street intersection is closed to overhead power lines. **Segment 1: TBM and MTBM are considered equally acceptable.**		**Segment 2: TBM and MTBM are considered equally acceptable.**	Avenue would be accessible from Tim Manley Avenue. • The shaft at the intersection of the OBR and Old School Road would be accessible from Old School Road. **Segment 3: TBM preferred as fewer shafts to access along the OBR.**	McLaughlin Road to OBR 2-SHFT 8 and 9). • The shaft on the OBR adjacent to the North Bay Distribution building would be accessible from the disused rail spur intersecting Van Kirk Drive and the OBR. **Segment 3: MTBM less preferred as construction/improvement of some haul roads required to access the higher number of shafts along the OBR.**
Technical	Schedule	▪ Project duration	▪ A TBM solution requires a two pass system, with the concrete pressure pipes installed within the tunnel. ▪ The annular space between the extrados of the concrete pressure pipes and the intrados of the tunnel lining would be grouted. ▪ This would likely give a longer project duration.	▪ A single pass system would likely result in a shorter construction program. ▪ More shafts are required, though these can be constructed concurrently. ▪ More shafts – more property to be required, potentially more property owners to deal with.	▪ A TBM solution requires a two pass system, with the concrete pressure pipes installed within the tunnel. ▪ The annular space between the extrados of the concrete pressure pipes and the intrados of the tunnel liner would be grouted. ▪ This would likely give a longer project duration.	▪ A single pass system would likely give a shorter construction program. ▪ More shafts are required, though these can be constructed concurrently. **Segment 2: MTBM preferred, due to single pass system .**	▪ A TBM solution requires a two pass system, with the concrete pressure pipes installed within the tunnel. ▪ The annular space between the extrados of the concrete pressure pipes and the intrados of the tunnel liner would be grouted. ▪ This would likely give a longer project duration.	▪ A single pass system would likely give a shorter construction program. ▪ More shafts are required, though these can be constructed concurrently. **Segment 3: MTBM preferred, due to single pass system .**

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			Segment 1: TBM scores equally, due to two pass system.	Potential need for expropriation. This may increase the programme before construction. **Segment 1: MTBM scores equally, due to single pass system, however construction schedule may be extended due to property acquisition for multiple shafts and need for expropriation.**	**Segment 2: TBM less preferred, due to two pass system.**		**Segment 3: TBM less preferred, due to two pass system.**	
Technical	**Evaluation Ranking**			▪ **MTBM is preferred from overall technical perspective.**		▪ **MTBM is preferred from overall technical perspective.**		▪ **MTBM is preferred from overall technical perspective.**

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Economic/ Financial	Construction costs	▪ Equipment cost ▪ Compound preparation cost ▪ Materials cost	▪ TBMs are more expensive than MTBMs. ▪ Likewise the two pass system would be higher cost than a single pass system. ▪ Market has fewer contractors for tunnels bored by TBM, hence tender process could be less competitive. ▪ TBM procurement would likely have a longer lag time. ▪ Though the lower number of shafts gives a cost reduction. **Segment 1: TBM less preferred due to higher procurement cost of the machine.**	▪ Higher number of shafts required so higher cost for shafts. ▪ Market has more micro tunneling contractors, hence tender process could be more competitive. ▪ MTBMs are readily available – should be no lag time for procurement. ▪ MTBMs are lower cost than TBMs. ▪ The single pass system would be lower cost. **Segment 1: MTBM preferred due to lower procurement cost of the machines.**	▪ TBMs are more expensive than MTBMs. ▪ The two pass system would be higher cost than a single pass system. ▪ Though the lower number of shafts gives a cost reduction. **Segment 2: TBM less preferred due to higher procurement cost of the machine.**	▪ Higher number of shafts required so higher cost for shafts. ▪ MTBMs are lower cost than TBMs. ▪ The single pass system would be lower cost. **Segment 2: MTBM preferred due to lower procurement cost of the machine.**	▪ TBMs are more expensive than MTBMs. ▪ Likewise the two pass system would be higher cost than a single pass system. ▪ Though the lower number of shafts gives a cost reduction. **Segment 3: TBM less preferred due to higher procurement cost of the machine.**	▪ Higher number of shafts required so higher cost for shafts. ▪ MTBMs are lower cost than TBMs. ▪ The single pass system would be lower cost. **Segment 3: MTBM preferred due to lower procurement cost of the machine.**

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Economic/ Technical	Ease of Maintenance Operations and Maintenance costs	▪ Operations access ▪ Maintenance needs	**Medium Constraint** ▪ Fewer shafts results in lower number of permanent manholes for maintenance. ▪ Additional shafts can be added for installation of permanent manholes – but this would remove the major benefit of TBM – fewer shafts. ▪ Maintenance of the sanitary sewer is more expensive compared to the MTBM due to spacing between the maintenance holes. **Segment 1: TBM is less preferred due to higher maintenance costs.**	**Low Constraints** ▪ Higher number of shafts – more locations where permanent manholes can be installed. Manholes can be installed approximately every 1000m if required. ▪ Higher cost to maintain permanent manholes at these shafts. Shafts can be backfilled in the permanent case to reduce maintenance costs if required. **Segment 1: MTBM is preferred due to lower maintenance costs.**	**Medium Constraint** ▪ Fewer shafts results in lower number of permanent manholes for maintenance. ▪ Additional shafts can be added for installation of permanent manholes – but this would remove the major benefit of TBM – fewer shafts. ▪ Maintenance of the sanitary sewer is more expensive compared to the MTBM due to spacing between the maintenance holes. **Segment 2: TBM is less preferred due to higher maintenance costs.**	**Low Constraints** ▪ Higher number of shafts – more locations where permanent manholes can be installed. Manholes can be installed approximately every 1000m if required. ▪ Higher number of shafts - higher cost to maintain permanent manholes at these shafts. Shafts where permanent manholes are not required can be backfilled in the permanent case to reduce maintenance costs. **Segment 2: MTBM is preferred due to lower maintenance costs.**	**Medium Constraints** ▪ Fewer shafts results in lower number of permanent manholes for maintenance. ▪ Additional shafts can be added for installation of permanent manholes – but this would remove the major benefit of TBM – fewer shafts. ▪ Maintenance of the sanitary sewer is more expensive compared to the MTBM due to spacing between the maintenance holes. **Segment 3: TBM is less preferred due to higher maintenance costs.**	**Low Constraints** ▪ Higher number of shafts – more locations where permanent manholes can be installed. Manholes can be installed approximately every 1000m if required. ▪ Higher number of shafts - higher cost to maintain permanent manholes at these shafts. Shafts where permanent manholes are not required can be backfilled in the permanent case to reduce maintenance costs . **Segment 3: MTBM is preferred due to lower maintenance costs.**
Economic/ Financial Environment	**Evaluation Ranking**			**MTBM is preferred from overall Economic perspective.**		**MTBM is preferred from overall Economic Environment perspective.**		**MTBM is preferred from overall Economic Environment perspective.**

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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
Natural Environment	Potential effects on fish and fish habitat	▪ Disruption to fish and fish habitat (e.g., in-water works)	**Low Constraints** ▪ No in-water works ▪ Limited to connection to Etobicoke Creek ECTS **Segment 1: No in-water work proposed, all segments score similarly.**	**Low Constraints** ▪ No in-water works ▪ Limited to connection to Etobicoke Creek ECTS **Segment 1: No in-water work proposed, all segments score similarly.**	**Low Constraints** ▪ No in-water works ▪ No compound adjacent to Etobicoke Creek **Segment 2: No in-water work proposed, all segments score similarly.**	**Low Constraints** ▪ No in-water works ▪ Compound V1-SHFT 1 adjacent to Etobicoke Creek **Segment 2: No in-water work proposed, all segments score similarly.**	**Low Constraints** ▪ No in-water works therefore no disruption to fish and fish habitat **Segment 3: No in-water work proposed, all segments score similarly.**	**Low Constraints** ▪ No in-water works therefore no disruption to fish and fish habitat **Segment 3: No in-water work proposed, all segments score similarly.**
Natural Environment	Potential effects on terrestrial features	▪ Loss of or disruption to natural heritage features ▪ Area within natural heritage features	**Low Constraints** ▪ TBM Shaft compounds are located either outside the Natural Heritage features or within areas of manicured lawn. A limited number of tree removals are anticipated with the construction of the TBM Shaft 1. **Segment 1: Minimal loss of vegetation and no disturbance to sensitive terrestrial habitat is anticipated. This option is**	**Low Constraints** ▪ Smaller reception shaft compounds located in developed areas and manicured lawns resulting in limited loss and disruption to terrestrial features. **Segment 1: Minimal loss of vegetation and no disturbance to sensitive terrestrial habitat is anticipated.**	**Low Constraints** ▪ Larger TBM SHAFT 4 launch shaft compound results in loss and disruption to terrestrial features, including FODM11 Naturalized Hedgerow Ecosite (Nancy McCredie Park and North Mill Parkette) ▪ Approximately 4130.55m2 of vegetation loss is anticipated **Segment 2: Minimal loss of vegetation and disruption to**	**Medium Constraints** ▪ V1 - SHFT 1 requires removal of CUP1 Deciduous Plantation ▪ Smaller OBR1 – SHFT 1 shaft compound results in less loss and disruption to terrestrial features, including FODM11 Naturalized Hedgerow Ecosite (Nancy McCredie Park) ▪ OBR1-SHFT2 and OBR-SHFT3 result in the vegetation loss from THDM3-Dry - Fresh	**High Constraints** ▪ Vegetation from the CUM1-1 Moist Old Field Meadow Type and SWD1-1 –Swamp White Oak Mineral Deciduous Swamp are anticipated from the following shafts: ▪ TBM SHAFT 7 launch shaft at OBR and Old School Road (same as OBR2 – SHFT 10) ▪ TBM SHAFT 6 (north of Tim Manley Drive) ▪ TBM SHAFT 5 reception shaft at Brampton Brick (north of Sandalwood Parkway),	**Medium Constraints** ▪ Majority of shaft compounds have minimal loss or disruption due to their urban and rural agricultural settings, and vegetation removals are contained within existing OBR ROW that generally consist of CUM1-1 Moist Old Field Meadow Type applies to: - OBR1 - SHFT 1 - OBR1 - SHFT 2 - OBR1 – SHFT 3 - OBR2 – SHFT 1 - OBR2 – SHFT 2 - OBR2 – SHFT 3

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Category	**Criteria**	**Description**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**
-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
			preferred compared to the MTBM option		**the natural heritage features is anticipated as a result construction of the TBM, and therefore TBM is preferred over MTBM.**	Deciduous Hedgerow Thicket Ecosite. ▪ Approximately 8093.87m2 of vegetation loss is anticipated **Segment 2: More loss of vegetation and disruption to natural heritage features is anticipated as a result of construction of the MTBM compared to TBM, therefore this option is less preferred than TBM.**	▪ Significant impact is anticipated on the Black Ash (Fraxinus nigra), a Species at Risk tree, due to the location of the TBM SHAFT 5. The implementation of the shaft will result in the removal of approximately 5 butternut trees and potential effects on additional trees nearby ▪ Approximately 4070.8 m2 of vegetation loss is anticipated from SWD1-1 **Segment 3: Loss of vegetation or disruption to sensitive habitat is anticipated; TBM is the least preferred option.**	- OBR2 – SHFT 4 - OBR2 – SHFT 5 - OBR2 – SHFT 6 - OBR2 – SHFT 7 - OBR2 – SHFT 8 - OBR2 -SHFT 9 - OBR2 – SHFT 10 ▪ Approximately 5643.63m2 of vegetation removal from CUM1-1, THDM3-Dry - Fresh Deciduous Hedgerow Thicket Ecosite is anticipated **Segment 3: Although vegetation loss is greater than TBM, impacts are limited to more disturbed and less sensitive natural heritage features. Therefore, from a terrestrial perspective, MTBM is the preferred option.**
Natural Environment	Potential effects on Species at Risk (SAR) and SAR habitat	▪ Loss of or disruption/disturbance to SAR or their habitats	**Low Constraints** ▪ Eleven (11) SAR may occur within 120 m of the TBM location at Kennedy	**Low Constraints** ▪ Eleven (11) SAR may occur within 120 m of the MTBM location at	**Low Constraints** ▪ A Larger TBM reception shaft compound (same area as OBR1 SHFT 1) results in	**Medium Constraints** ▪ V1 - SHFT 1 results in disruption to the SAR	**High Constraints** ▪ The TBM SHAFT 5 compound on the east side of OBR, north of Sandalwood	**Medium Constraints** ▪ All shaft compounds are within the OBR Right-of-way; however, there is

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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
			Road / First Gulf Boulevard and may be affected by construction. However, no direct impacts to SAR are anticipated with the proposed TBM shafts. **Segment 1: There are no potential effects on SAR or their habitats for this option as the TBM shafts are located outside of natural heritage features.**	Kennedy Road / First Gulf Boulevard and may be affected by construction. However, no direct impacts to SAR are anticipated with the proposed MTBM shafts. **Segment 1: There are no potential effects on SAR or their habitats for this option as the MTBM shafts are located outside of natural heritage features.**	more disruption to SAR or their habitat within FODM11 Naturalized Hedgerow Ecosite (Nancy McCredie Park and North Mill Parkette) ▪ Eleven (11) SAR may occur within 120m of the TBM and may be indirectly affected by construction: **Segment 2: There is a lower potential for SAR and SAR habitat loss, and therefore, TBM is preferred over MTBM.**	habitat present in the CUP1. ▪ OBR1 SHFT 1) results in disruption to SAR or their habitat within FODM11 Naturalized Hedgerow Ecosite (Nancy McCredie Park ▪ Eleven (11) SAR may occur within 120m of the TBM and may be indirectly affected by construction: **Segment 2: There is a greater potential for SAR and SAR habitat loss; therefore, this option is less preferred than TBM.**	Parkway, results in significant disruption to SAR or their habitat within SWD1-1 Swamp White Oak Mineral Deciduous Swamp Type ▪ Significant impact is anticipated on the Black Ash as a result of the removal of approximately 5 butternut trees and potential effects on additional trees nearby ▪ There is the potential for bat maternity colonies to be present within the vegetation. ▪ Potential amphibian breeding woodlands are also present indicated by the vernal pools located within the treed area. ▪ Eleven (11) SAR may occur within 120m of the TBM and may be indirectly affected by construction: **Segment 3: There is potential for the loss of species at risk and their habitat due to the**	potential for disruption or habitat loss as there are 10 shaft compounds in this segment. ▪ Eleven (11) SAR may occur within 120m of the TBM and may be indirectly affected by construction: **Segment 3: From a SAR perspective, MTBM is more preferred due to lower chances of the SAR or their habitat being disrupted**

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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
							construction of the TBM and therefore is less preferred than the MTBM.	
Natural Environment	Contaminated Lands	▪ Proximity to areas of Potential Environmental Concern (APEC) ▪ Soil contamination within OBR	**Low Constraints** ▪ Low potential as shaft compounds avoid known APECs **From a contamination perspective, TBM is preferred**	**Medium Constraints** ▪ Proximity to areas of contamination (APECs) due to more shaft compounds **From a contamination perspective, MTBM is less preferred**	**Low Constraints** ▪ Low potential as shaft compounds avoid known APECs **From a contamination perspective, TBM and MTBM score equally.**	**Low Constraints** ▪ Low potential as shaft compounds avoid known APECs **From a contamination perspective, TBM and MTBM score equally.**	**Low Constraints** ▪ Less potential for soil and groundwater contamination due to lower number of shaft compounds (3 shaft compounds in OBR). ▪ Lower number of shafts minimizes soil contamination management requirements **From a contamination perspective, TBM is more preferred.**	**Medium Constraints** ▪ More potential for encountering contamination due to higher number of shaft compounds (10 shaft compounds in OBR). ▪ Higher number of shafts results in higher soil contamination management requirements **From a contamination perspective, MTBM is less preferred.**
Natural Environment	Groundwater impacts	▪ Impacts to groundwater levels	**Medium Constraint** ▪ Permeability of rock and open-face of TBM can lead to lowering the groundwater table during tunnelling	**Low Constraint** ▪ Tunnelling with MTBM would not impact groundwater levels – water ingress at the face and joints would be minimal.	**Medium Constraint** ▪ Permeability of rock and open-face of TBM can lead to lowering the groundwater table during tunnelling.	**Low Constraint** ▪ Tunnelling with MTBM would not impact groundwater levels – water ingress at the face and joints would be minimal.	**Medium Constraint** ▪ Permeability of rock and open-face of TBM can lead to lowering the groundwater table during tunnelling	**Low Constraint** ▪ Tunnelling with MTBM would not impact groundwater levels – water ingress at the face and joints would be minimal.

	Evaluation Criteria		Segment 1: Kennedy Road from Etobicoke Creek to Vodden Street, including Queen Street from Rutherford Road to Kennedy Road		Segment 2: Vodden Street from Kennedy Road to Orangeville-Brampton Railway (OBR) and from OBR up to Bovaird Drive		Segment 3: Orangeville-Brampton Railway corridor to Old School Road and Old School Road from OBR to Hurontario Street	
Category	**Criteria**	**Description**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**
-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
			Segment 1: From the groundwater perspective, TBM is less preferred.	▪ Dewatering would only be during shaft construction. **Segment 1: From the groundwater perspective, MTBM is preferred.**	**Segment 2: From the groundwater perspective, TBM is less preferred.**	▪ Dewatering would only be during shaft construction. **Segment 2: From the groundwater perspective, MTBM is preferred.**	**Segment 3: From the groundwater perspective, TBM is less preferred.**	▪ Dewatering would only be during shaft construction. **Segment 3: From the groundwater perspective, MTBM is preferred.**
Natural Environment	**Evaluation Ranking**		**TBM and MTBM are equally preferred from overall Natural Environment perspective.**		**TBM is preferred from overall Natural Environment perspective**	.		**MTBM is preferred from overall Natural Environment perspective.**
Socio-Economic Environment	Number of potentially impacted sensitive receptors* during construction (e.g., increased noise, dust and vibration, reduced property access, and potential business losses related to customers avoiding trips to high traffic	Sensitive receptors include: ▪ Schools ▪ Daycares ▪ Hospitals and emergency services ▪ Nursing homes ▪ Long-term care facilities ▪ Places of worship ▪ Recreational facilities/Park	**Medium Constraints** Notable Sensitive Receptors include: ▪ Centennial Mall (227 Vodden Street East) ▪ East and West Graham Cemetery ▪ Significantly larger reception shaft at Centennial Mall will displace greater number of parking spaces for longer duration (> 2 years), results in potentially greater business losses. ▪ All shaft compounds avoid residential areas with the	**High Constraints** Notable Sensitive Receptors include: ▪ Ken Giles Recreation Centre (370 Bartley Bull Parkway) ▪ Sir Wilfrid Laurier Public School (364 Bartley Bull Parkway) ▪ Impact to Sir Wilfrid Laurier Public School (soccer field can remain in use, however, berm area is required for shaft compound).	**Low Constraint** Notable Sensitive Receptors include: ▪ Nancy McCredie Park ▪ North Mill Parkette ▪ Larger TBM SHAFT 4 compound at Nancy McCredie Park and North Mill Parkette results in more disruption to backing single family residences ▪ Larger TBM SHAFT 4 compound fully displaces Nancy McCredie Park and North Mill Parkette.	**Medium Constraint** Notable Sensitive Receptors include: ▪ Duggan Park compound ▪ Compound located immediately west of Fire Station 207 ▪ Nancy McCredie Park ▪ Smaller shaft compound at OBR1-SHFT 1 (Nancy McCredie Park) results in less disruption to backing single family residences ▪ Smaller shaft compound at OBR1-SHFT 1 displaces small area of Nancy	**Medium Constraint** Notable Sensitive Receptors include: ▪ TBM SHAFT 5 compound results in disruption to backing single family residences on west side of OBR. ▪ TBM SHAFT 5 compound results in significant disruption to Brampton Brick Limited manufacturing facility operations related to construction access through property from Hurontario Street.	**High Constraint** Notable Sensitive Receptors include: ▪ OBR1-SHFT 2 results in disruption to backing single family residences on east and west side of OBR and temporarily displaces Armbro Park ▪ OBR1-SHFT 3 results in disruption to backing single family residences on west side of OBR (south side of Bovaird) ▪ OBR2 SHFT 2 south of Sandalwood Parkway results

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Category	**Criteria**	**Description**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**
-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
	commercial areas) * Receptors refers to people, places, or things that could be affected by impacts from construction	s and community centres ▪ High traffic commercial areas ▪ Libraries ▪ Cemeteries ▪ Residential areas	exception of abutting single-family residences on west side of TBM SHAFT 1 compound and TBM SHAFT 2 at Glidden Road. **Segment 1: From a sensitive receptors perspective, TBM is preferred.**	▪ Greater impacts to businesses along Kennedy Road based on higher number of shaft compounds and access disruption. ▪ Potential access disruption to Ken Giles Recreation Centre ▪ Smaller shaft compound at Centennial Mall will displace fewer number of parking spaces (20+ spaces for one year duration). ▪ All shaft compounds avoid residential areas **Segment 1: From a sensitive receptors perspective, MTBM is least preferred.**	**Segment 2: From a sensitive receptors perspective, TBM is preferred due to fewer number of shafts.**	McCredie Park (avoids North Mill Parkette) ▪ Armbro Park compound ▪ OBR1-SHFT3 compound **Segment 2: From a sensitive receptors perspective, MTBM is less preferred due to greater number of shafts**	**Segment 3: From a sensitive receptors perspective, TBM is preferred.**	in disruption to backing single family residences on east side of OBR ▪ OBR2-SHFT 3 north of Sandalwood Parkway results in disruption to backing single family residences on east side of OBR ▪ OBR2-SHFT 5 (south of Mayfield Road) results in disruption to backing single family residences on east and west side of OBR ▪ OBR2-SHFT 6 (south side of Mayfield Road) results in disruption to backing single family residences on east and west side of OBR. **Segment 3: From a sensitive receptors perspective, MTBM is least preferred.**
Socio-Economic	Traffic and active transportation impacts during construction,	▪ Expected number of open lanes	**Low Constraints** ▪ 3 TBM shaft compounds with closure of 2 lanes (2 lanes remain open) results	**Medium Constraints** ▪ 6 MTBM shaft compounds with closure of 2 lanes (2 lanes remain open) results	**Low Constraints** ▪ 1 TBM shaft compound with closure of 1 lane (1 lane remain open) results in less	**Medium Constraints** ▪ 4 TBM shaft compounds with closure of 1 lane (1 lane remain open) results in	**Low Constraints** ▪ Impacts are similar for both methodologies (work within OBR avoids impacts to	**Low Constraints** ▪ Impacts are similar for both methodologies (work within OBR avoids impacts to

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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
Environment	including expected lane, sidewalk, trails, and bike lane closures	during construction ▪ Impact on bike lanes and sidewalks ▪ Potential for increased public scrutiny related to inconvenience of higher traffic volumes/closures	in less impacts on vehicle traffic due to fewer number of shaft compounds (3) ▪ No impact on bike lanes however, requires temporary closure of sidewalks and Etobicoke Creek Trail. ▪ Anticipate less public scrutiny related to fewer shaft compounds **Segment 1: From a traffic and active transportation perspective TBM is preferred.**	in less impacts on vehicle traffic due to fewer number of shaft compounds. ▪ No impact on bike lanes however, requires temporary closure of sidewalks and Etobicoke Creek Trail. ▪ Anticipate more public scrutiny related to more shaft compounds **Segment 1: From a traffic and active transportation perspective MTBM is less preferred.**	impacts on vehicle traffic due to fewer number of shaft compounds (3) ▪ Requires removal of recently installed bike lanes on Vodden Street at OBR ▪ Anticipate less public scrutiny related to fewer shaft compounds **Segment 2: From a traffic and active transportation perspective TBM is preferred.**	more impacts on vehicle traffic due to higher number of shaft compounds (4) ▪ Requires removal of recently installed bike lanes on Vodden Street at V1 - SHFT 1 and OBR 1-SHFT 1 ▪ Anticipate more public scrutiny due to more shaft compounds **Segment 2: From a traffic and active transportation perspective MTBM is less preferred.**	vehicle traffic and active transportation) ▪ Anticipate less public scrutiny **Segment 3: From a traffic and active transportation perspective both TBM and MTBM score equally**	vehicle traffic and active transportation) ▪ Anticipate less public scrutiny **Segment 3: From a traffic and active transportation perspective both TBM and MTBM score equally**
Socio-Economic Environment	Potential impacts on public transit during construction	▪ Impact of potential lane closures on public transit	**Low Constraints** ▪ Less impacts to public transit on Kennedy Road (three shaft compounds). **Segment 1: Fewer shafts create fewer impacts on**	**Medium Constraints** ▪ Greater impacts on public transit on Kennedy Road due to more shaft compounds (six shaft compounds)	**Low Constraints** ▪ Less impacts on public transit on Vodden Street (1 shaft compound) **Segment 2: Fewer shafts create fewer impacts on**	**Medium Constraints** ▪ More impacts on public transit on Vodden Street (four shaft compounds)	**Low Constraints** ▪ No public transit impacts: all works are limited to within OBR	**Low Constraints** ▪ No public transit impacts; all works are limited to within OBR

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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
			public transit. From public transit perspective TBM is preferred.	**Segment 1: From public transit perspective MTBM is less preferred.**	**public transit. From public transit perspective TBM is preferred.**	**Segment 2: From public transit perspective MTBM less preferred**	**Segment 3: From public transit perspective both TBM and MTBM rank equally**	**Segment 3: From public transit perspective both TBM and MTBM rank equally**
Socio-Economic Environment	Potential impacts on agricultural operations	▪ Impacts on Canada Land Inventory Class 1-3 prime agricultural lands	**Low Constraints** ▪ No impacts on Class 1-3 Prime Agricultural Lands as study area is highly urbanized with no agricultural land or operations **Segment 1: From agricultural operations perspective, both methodologies rank equally.**	**Low Constraints** ▪ No impacts on Class 1-3 Prime Agricultural Lands as study area is highly urbanized with no agricultural land or operations **Segment 1: From agricultural operations perspective, both methodologies rank equally.**	**Low Constraints** ▪ No impacts on Class 1-3 Prime Agricultural Lands as study area is highly urbanized with no agricultural land or operations **Segment 2: From agricultural operations perspective, both methodologies rank equally.**	**Low Constraints** ▪ No impacts on Class 1-3 Prime Agricultural Lands as study area is highly urbanized with no agricultural land or operations **Segment 2: From agricultural operations perspective, both methodologies rank equally.**	**Medium Constraints** ▪ Greater loss of Class 1-3 Prime Agricultural Lands related to larger TBM SHAFT 7 launch compound (note lands are subject to development application) **Segment 3: From agricultural operations perspective both methodologies rank equally.**	**Medium Constraints** ▪ Minor loss of Class 1-3 Prime Agricultural Lands related to smaller OBR 2-SHFT 10 compound, however requires access through agricultural land from McLaughlin Road to OBR 2-SHFT 8 and 9 (note lands are subject to development application) **Segment 3: From agricultural operations perspective both methodologies rank equally.**
Socio-Economic Environment	Evaluation Ranking		**Segment 1: TBM is preferred from an overall Socio-economic Environment perspective.**		**Segment 2: TBM is preferred from an overall Socio-economic Environment perspective.**		**Segment 3: TBM is preferred from an overall Socio-economic Environment perspective.**	

	Evaluation Criteria		Segment 1: Kennedy Road from Etobicoke Creek to Vodden Street, including Queen Street from Rutherford Road to Kennedy Road		Segment 2: Vodden Street from Kennedy Road to Orangeville-Brampton Railway (OBR) and from OBR up to Bovaird Drive		Segment 3: Orangeville-Brampton Railway corridor to Old School Road and Old School Road from OBR to Hurontario Street	
Category	**Criteria**	**Description**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**
-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
Cultural Environment	Potential for loss and/or disturbance to potential archaeological resources	▪ Areas requiring further archaeological assessment (e.g., Stage 2 AA) ▪	**Medium Constraints** ▪ Impact to archaeological resources and sites at TBM SHAFT 1, MTBM/TBM Connection Shaft A and TBM SHAFT 3. **Segment 1: Potential for impacts on archaeological sites and resources in undisturbed lands.**	**Medium Constraints** ▪ Potential impact to archaeological resources and sites at K1-SHAFT 1. ▪ Potential for impacts to archaeological sites and resources is low for remaining shaft locations: K1 – SHFTs 2, 3, 4, and 5 due to previous disturbance **Segment 1: Relatively high impacts to archaeological sites and resources and unmarked burials expected, but smaller overall construction footprint.**	**Medium Constraints** ▪ Impact to archaeological resources and sites due to larger compound footprint at TBM SHAFT 4 launch shaft compound (Nancy McCredie Park and North Mill Parkette). **Segment 2: Potential for impacts on archaeological sites and resources. TBM and MTBM score equally.**	**Medium Constraints** ▪ Impact to archaeological resources and sites at V1 – SHFT 1, OBR1 – SHFT 1, and OBR1 - SHFT 2. ▪ Potential for impacts to archaeological resources and sites is low at OBR1 – SHFT 3 due to previous disturbance. **Segment 2: Similar impacts to archaeological sites and resources. MTBM and TBM score equally.**	**Medium Constraints** ▪ Impact to archaeological resources and sites at TBM SHAFT 5 and 7 ▪ Potential for impacts to archaeological sites and resources is low for TBM SHAFT 6 due to previous assessment **Segment 3: Potential for impacts on archaeological sites and resources in undisturbed lands.**	**Medium Constraints** ▪ Potential for impacts to archaeological resources and sites is lower at OBR2 – SHFT 10 due to smaller compound footprint. ▪ Potential for impacts to archaeological resources and sites is low for remainder of OBR2 SHFT locations 1 through 9 due to previous disturbance within shaft footprint. ▪ Require archaeological clearance for access road from McLaughlin Road to OBR 2-SHFT 8 and 9. **Segment 3: MTBM would be preferred from an archaeological perspective for Segment 3.**
Cultural Environment	Potential effects on built heritage resources and	▪ Loss of or disruption to built heritage resources	**No Constraints** ▪ No impacts on cultural heritage resources are	**No Constraints** ▪ No impacts on cultural heritage resources are	**Low Constraints** ▪ Lower number of shafts required	**Medium Constraints** ▪ Greater number of shafts required	**Low Constraints** ▪ Lower number of shafts required	**Medium Constraints** ▪ Greater number of shafts required

	Evaluation Criteria		Segment 1: Kennedy Road from Etobicoke Creek to Vodden Street, including Queen Street from Rutherford Road to Kennedy Road		Segment 2: Vodden Street from Kennedy Road to Orangeville-Brampton Railway (OBR) and from OBR up to Bovaird Drive		Segment 3: Orangeville-Brampton Railway corridor to Old School Road and Old School Road from OBR to Hurontario Street	
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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
	cultural heritage landscapes.	and cultural heritage landscapes (e.g. loss of a historic farmhouse or significant disruption of agricultural lands of a historic farmstead)	anticipated based on the TBM footprint **Segment 1: No impacts on cultural heritage resources. TBM is equally preferred to the MTBM.**	anticipated based on the MTBM footprint **Segment 1: No impacts on cultural heritage resources. MTBM is equally preferred to the TBM.**	▪ Less impact on cultural heritage resources and landscapes [e.g., OBR (CHL 3 – applies to entire OBR corridor within Brampton and Caledon)]. **Segment 2: Less impacts on cultural heritage sites and landscapes. TBM is preferred.**	▪ More impact on cultural heritage resources and landscapes [e.g., Etobicoke Creek (CHL 2) and OBR (CHL 3 – applies to entire OBR corridor within Brampton and Caledon)]. **Segment 2: Due to greater number of shafts, more impacts to cultural heritage resources expected. MTBM is less preferred.**	▪ Less impact on cultural heritage resources and landscapes [e.g., OBR (CHL 3– applies to entire OBR corridor within Brampton and Caledon)]. **Segment 3: Less impacts on cultural heritage sites and landscapes. TBM is preferred.**	▪ More impact on cultural heritage resources and landscapes [e.g., OBR (CHL 3 – applies to entire OBR corridor within Brampton and Caledon)]. **Segment 3: Due to greater number of shafts, more impacts to cultural heritage resources expected. MTBM is less preferred.**
Cultural Environment	Evaluation Ranking		**Segment 1: TBM and MTBM are equally preferred from an overall Cultural Environment perspective**		**Segment 2: TBM is preferred from an overall Cultural Environment perspective**		**Segment 3: TBM is preferred from an overall Cultural Environment perspective**	
Legal/Jurisdictional	Property requirements	▪ Number of permanent easements ▪ Number of temporary easements ▪	**Medium Constraints** Larger permanent easements are required for the placement of the shafts at First Gulf Boulevard.	**Medium Constraints** Permanent easements are required for RONA/Sir Wilfrid Laurier PS, Clarence Street and the Kennedy Road – Vodden Street intersection due to placement of the shaft	**Medium Constraints** Permanent easement identified at diversion chamber at Etobicoke Creek STS connection.	**Medium Constraints** Permanent easement identified at diversion chamber at Etobicoke Creek STS connection.	**Low Constraint** No permanent easement identified. **Temporary Easements (3 shaft compounds)**	**Medium Constraint** No permanent easement identified. **Temporary Easements (5 shaft compounds)**

	Evaluation Criteria		Segment 1: Kennedy Road from Etobicoke Creek to Vodden Street, including Queen Street from Rutherford Road to Kennedy Road		Segment 2: Vodden Street from Kennedy Road to Orangeville-Brampton Railway (OBR) and from OBR up to Bovaird Drive		Segment 3: Orangeville-Brampton Railway corridor to Old School Road and Old School Road from OBR to Hurontario Street	
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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
			Temporary easements (3 shaft compounds) ▪ Intermediate shaft at Glidden Road. ▪ Queen Street ▪ Vodden Street/Kennedy Road shaft – ▪ Less (3) but larger temporary easement required **Segment 1: TBM ranks equally to MTBM from property perspective**	fully or partially within property boundaries. **Temporary Easements (5 shaft compounds)** ▪ Kennedy Road/First Gulf Blvd shaft ▪ K1-SHFT 2 (RONA) or K1 – SHFT 2 (Sir Wilfrid Laurier PS) ▪ Glidden Street Shaft ▪ K1 -SHFT 3 (The Brick at Clarence Street) ▪ K1 – SHFT 4 (Shoppers Drug Mart) ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road) ▪ Greater number of individual temporary but smaller easements required. **Segment 1: MTBM ranks equally to TBM from property perspective**	**Temporary Easements (3 shaft compounds)** ▪ Shaft for connection to Etobicoke Creek STS ▪ TBM SHAFT 4 (Nancy McCreedie Park and North Mill Parkette ▪ OBR1 – SHFT 3 (OBR/Bovaird) ▪ larger temporary easements required **Segment 2: TBM ranks equally to MTBM from property perspective**	**Temporary Easements (4 shaft compounds)** ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS) ▪ OBR1 – SHFT 1 (Nancy McCreedie Park) ▪ OBR1 – SHFT 2 (Williams Parkway – Ambro Park) ▪ OBR1 – SHFT 3 (OBR/Bovaird) **Segment 2: MTBM ranks equally to TBM from property perspective**	▪ TBM SHAFT 5 reception shaft, north of Sandalwood Parkway (Brampton Brick) ▪ TBM SHAFT 6 intermediate shaft (north side of Tim Manley Drive) ▪ TBM SHAFT 7 launch shaft (OBR and Old School Road) **Segment 3: TBM is preferred due to fewer but larger number of temporary easements required from private land owners (lands are currently in the planning development application process)**	▪ OBR2 - SHFT 1 (access via Van Kirk rail spur) ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless) ▪ OBR2 - SHFT 8 (access from McLaughlin Rd) ▪ OBR2 - SHFT 9 (access from McLaughlin Rd) ▪ OBR2 - SHFT 10 (OBR/Old School Road) **Segment 3: MTBM is least preferred due to large number of temporary easements required from City of Brampton and the Town of Caledon in addition to private property.**

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-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
Legal/Jurisdictional	Evaluation Ranking		**Segment 1: TBM is preferred from a Legal/Jurisdictional perspective**		**Segment 2: TBM is preferred from a Legal/jurisdictional perspective**		**Segment 3: TBM is preferred from a Legal/Jurisdictional perspective**	
Climate Change	Climate change mitigation	▪ Potential for generating greenhouse gas emissions	**Medium Constraints** ▪ Fewer number of shafts. ▪ Higher volume of excavated materials due to larger bore diameter. ▪ Higher truck movements for hauling of material required for TBM ▪ Longer duration of shaft occupation due to two-pass system so higher GHG emissions associated with construction period. ▪ Preliminary excavated volumes calculated as approximately 66,000 m^3 **Segment 1: TBM and MTBM score equally**	**Medium Constraints** ▪ More shafts requiring more truck movements ▪ Preliminary excavated volumes calculated as approximately 54,000 m^3 **Segment 1: MTBM and TBM score equally**	**Medium Constraints** ▪ Fewer number of shafts. ▪ Higher volume of excavated materials due to larger bore diameter. ▪ Higher truck movements for hauling of material required for TBM ▪ Longer duration of shaft occupation due to two-pass system so higher GHG emissions associated with construction period. ▪ Preliminary excavated volumes calculated as approximately 49,000 m^3 **Segment 2: TBM is less preferred**	**Low Constraints** ▪ More shafts requiring more truck movements ▪ Preliminary excavated volumes calculated as approximately 26,000 m^3 **Segment 2: MTBM is preferred from GHG perspective**	**Medium Constraints** ▪ Fewer number of shafts. ▪ Higher volume of excavated materials due to larger bore diameter. ▪ Higher truck movements for hauling of material required for TBM ▪ Longer duration of shaft occupation due to two-pass system so higher GHG emissions associated with construction period. ▪ Preliminary excavated volumes calculated as approximately 90,000 m^3 **Segment 3: TBM is less preferred**	**Low Constraints** ▪ More shafts requiring more truck movements ▪ Preliminary excavated volumes calculated as approximately 66,000 m^3 **Segment 3: MTBM is preferred from GHG perspective**
Climate Change	Climate change adaptation	▪ Vulnerability of project/ infrastructure	**Low Constraints** ▪ Avoids launch shaft compound within Toronto	**Low Constraints** ▪ Smaller reception shaft compound within Toronto	**Low Constraints**	**Medium Constraints** ▪ V1 SHFT 1 shaft compound (Duggan Park) and	**Medium Constraints** ▪ Launch shaft compound at OBR and Old School Road	**Low Constraint** ▪ Shaft compound at OBR 2-SHFT 10 at Old School Road

	Evaluation Criteria		Segment 1: Kennedy Road from Etobicoke Creek to Vodden Street, including Queen Street from Rutherford Road to Kennedy Road		Segment 2: Vodden Street from Kennedy Road to Orangeville-Brampton Railway (OBR) and from OBR up to Bovaird Drive		Segment 3: Orangeville-Brampton Railway corridor to Old School Road and Old School Road from OBR to Hurontario Street	
Category	**Criteria**	**Description**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**	**Conventional Tunnel Boring Machine (TBM)**	**Micro-Tunnel Boring Machine (MTBM)**
-	-	-	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft. 4 shaft compounds: ▪ TBM SHAFT 1: Launch shaft at Kennedy Road/First Gulf Boulevard – 5,140m^2 ▪ TBM SHAFT 2: Intermediate shaft compound at Glidden Road – 1,800m^2 ▪ Queen Street TBM shaft (Shoppers Drug Mart): 1,360m^2 ▪ TBM SHAFT 3: Vodden Street/Kennedy Road reception shaft – 9,000 m^2	• 2150mm internal diameter pipe Etobicoke Creek to Queen St; and 1800mm diameter from Queen St to Vodden St. • MTBM diameter would be 2725mm (Etobicoke Creek to Queen St) and 2150mm (Queen St to Vodden St). 6 shaft compounds: ▪ K1 – SHFT 1 (Kennedy Road/First Gulf Boulevard launch shaft) - 4600m^2 ▪ K1 – SHFT 2 (RONA or Sir Wilfrid Laurier Public School): 2,500m^2 or 1,850m^2. ▪ K1 – GLIDDENSHAFT Glidden Street Shaft: 1,800m^2 ▪ K1 -SHFT 3 (Clarence Street): 1,950m^2 ▪ K1 – SHFT 4 (Shoppers Drug Mart): 1,360m^2 ▪ K1 – SHFT 5 (Vodden Street/Kennedy Road): 1,827m	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximate 1.85km drive length from Kennedy Rd to OBR-Vodden St. • Approximate 4.5km drive within OBR from Vodden/OBR launch shaft to reception shaft located between Wanless Dr and Sandalwood Pkwy (Brampton Brick Limited property). 3 shaft compounds: ▪ TBM SHAFT 4: Launch Shaft (Nancy McCreedie Park and North Mill Parkette – 9,927m^2 ▪ Shaft for connection to Etobicoke Creek STS (Duggan Park): 4,561m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 4 shaft compounds: ▪ V1 – SHFT 1 (Duggan Park/Etobicoke Creek STS): 4,561m^2 ▪ OBR1 – SHFT 1 (Nancy McCreedie Park): 1,409m ▪ OBR1 – SHFT 2 (Williams Parkway – Armbro Park): 4,285m^2 ▪ OBR1 – SHFT 3 (OBR/Bovaird): 2,300m^2	• 2400mm internal diameter pipe. • TBM diameter would be 3.0-3.5m. • Approximately 5km drive length with an intermediate shaft at the midpoint as a maintenance hole. 3 shaft compounds: ▪ TBM SHAFT 5: Reception shaft, north of Sandalwood Parkway (Brampton Brick -7454 m^2) ▪ TBM SHAFT 6: Intermediate shaft within OBR north side of Tim Manley Drive – same location as MTBM OBR2-SHFT 7 – 980m ▪ TBM SHAFT 7: Launch shaft (OBR and Old School Road) – 9280 m^2	• 1500mm internal diameter pipe. • External diameter of MTBM would be 1810mm. 10 shaft compounds: ▪ OBR2 - SHFT 1 (Van Kirk rail spur): 1,795m^2 ▪ OBR2 - SHFT 2 (south of Sandalwood): 1,572m^2 ▪ OBR2 - SHFT 3 (north of Sandalwood): 1,595m^2 ▪ OBR2 - SHFT 4 (Burnt Elm Park/Wanless): 1,982m^2 ▪ OBR2 - SHFT 5 (south of Mayfield): 1,600m ▪ OBR2 - SHFT 6 (Mayfield): 1,930m ▪ OBR2 - SHFT 7 (north side of Tim Manley Drive): 1,770m ▪ OBR2 - SHFT 8 (north of Tim Manley Drive): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 9 (north of OBR2 - SHFT 8): 1,600m^2 (also requires access road from McLaughlin Road) ▪ OBR2 - SHFT 10 (OBR/Old School Road): 2,710m
		to climate change effects (e.g., Flooding) during construction	and Region Conservation Authority regulated area and probability of flooding **Segment 1: TBM is equally preferred due to lower risk of flooding.**	and Region Conservation Authority regulated area and probability of flooding **Segment 1: MTBM is equally preferred due to lower risk of flooding.**	▪ Avoids need for intermediate shaft at V1 SHFT 1 (Duggan Park) ▪ Connection to Etobicoke Creek STS within Toronto and Region Conservation Authority regulated area and probability of flooding **Segment 2: TBM is preferred due to lower risk of flooding.**	connection to Etobicoke Creek STS is within Toronto and Region Conservation Authority regulated area and probability of flooding increases. ▪ Connection to Etobicoke Creek STS within Toronto and Region Conservation Authority regulated area and probability of flooding **Segment 2: MTBM is less preferred.**	partially within Toronto and Region Conservation Authority regulated area (larger area compared to OBR2 – SHFT 10) and probability of flooding and is adjacent to watercourse ▪ TBM maintenance shaft (OBR2-SHFT 7) is within both Toronto and Region Conservation Authority and Credit Valley Conservation regulated area and probability of flooding. **Segment 3: TBM is less preferred.**	is partially within Toronto and Region Conservation Authority regulated area (smaller area compared to TBM launch shaft at OBR and Old School Road) and probability of flooding is lower. ▪ OBR2 – SHFT 7 is within both Toronto and Region Conservation Authority and Credit Valley Conservation regulated area and probability of flooding. **Segment 3: MTBM is preferred.**
Climate Change	Evaluation Ranking		**Segment 1: Both TBM and MTBM score similar from overall Climate Change perspective.**		**Segment 2: Both TBM and MTBM score similar from overall Climate Change perspective.**			**Segment 3: MTBM is preferred from overall Climate Change perspective.**
Overall	**Recommended Methodology? (TBM/MTBM)**		**Segment 1 recommendation: TBM and MTBM equally preferred**		**Segment 2 recommendation: MTBM**		**Segment 3 recommendation: MTBM**	

Flow
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Central Brampton

L2: Shortlisted Shaft Compound Alternatives Evaluation

AECOM

Peel Region

Kennedy Road Sanitary Trunk Sewer EA

1. Evaluation of Alternative Shaft Locations

A comparative evaluation has been completed for the potential shaft locations using the established criteria and were rated based on their potential constraints relative to the other alternatives.

Table 1 detail the comparative evaluation of the shaft locations. The evaluation is qualitative in nature and has been informed through documentation of existing conditions and analysis by discipline leads including technical considerations. The preferred shaft compound location has been identified in green.

Evaluation Methodology:

This evaluation will not be based on a weighted numerical ranking system but rather the professional expertise of the project team. To ensure statistical validity, such an approach would have to strictly adhere to statistical methods that are often difficult to apply in a multi-faceted project such as a Municipal Class EA. Instead, a descriptive or qualitative evaluation was used to consider the suitability and feasibility of each alternative. In this respect, trade-offs were made considering the advantages or disadvantages of each alternative to address the problem and opportunity statement, with the least environmental effects and the most technical benefits resulting in a higher priority and forming the rationale for the most preferred shaft locations.

Table 1: Evaluation of Alternative Tunnel Shaft Compound Locations – Segment 1

Category / Evaluation Criteria	Segment 1: Kennedy Road from Etobicoke Creek to Vodden Street, including Queen Street from Rutherford Road to Kennedy Road	
	Kennedy Road and First Gulf Boulevard – Shaft Alternatives	
	K1-SHFT1A – Northeast corner of Kennedy Rd and First Gulf Blvd (Turner Fenton Secondary School)	K1-SHFT1B – Directly north of K1-SHFT1A (Turner Fenton Secondary School)
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals)	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals)
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures and access disruptions** ■ **Impacts to agricultural resources and operations**	■ Two potential sensitive receptors impacted: – Displacement of school parking spots and public transit stop – Potential disruption to single family residences on the opposite side ■ Potential for one-lane closure on Kennedy Rd and First Gulf Blvd, including sidewalk closures. ■ No impacts to agricultural resources and operations.	■ Two potential sensitive receptors impacted: – Disruption to internal access and school drop-off area – Potential disruption to single family residences on the opposite side ■ Potential for one-lane closure on Kennedy Rd, including sidewalk closures. ■ No impacts to agricultural resources and operations.
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact on cultural heritage resources.	■ Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact on cultural heritage resources.
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ **With respect to tunnelling constraints, the K1-SHFT1A location is situated closer to the Etobicoke Creek shaft, which will be constructed by others. This proximity may offer advantages in terms of schedule and cost.** ■ **The working area at this location is larger than the alternative location at K1-SHFT1B** ■ No future connection is anticipated at this location for the current project; however, this shaft is closer to First Gulf Boulevard, which may provide an advantage for potential future connections by others. ■ Accessibility to both sites remains the same. ■ Both proposed locations present conflicts with existing overhead and underground utilities that must be addressed during the design and construction planning stages.	■ With respect to tunnelling constraints, K1-SHFT1B is farther from the Etobicoke Creek shaft compared to K1-SHFT1A, which results in a longer tunnelling drive for this option. ■ The working area at this location is smaller than the alternative location at K1-SHFT1A ■ No future connection is anticipated at this location for the current project ■ Accessibility to both sites remains the same. ■ Both proposed locations present conflicts with existing overhead and underground utilities that must be addressed during the design and construction planning stages.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**No**

Category / Evaluation Criteria	Segment 1: Kennedy Road South to Vodden Street (including Queen Street)			
	Kennedy Road South at Rambler Drive – Shaft Alternatives[1]			
	K1-SHFT2A – Sir Wilfrid Laurier Public School	K1-SHFT2B – ASL Global Logistics, AMOR Shipping and Receiving and Autobahns Freight Lines Ltd.	K1-SHFT2D – Townhouse Corporation Condominium	K1-SHFT2E – RONA Building Supplies
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals) expected.	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals) expected.	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals) expected.	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals) expected.
Socio-Economic Environment	■ Two potential sensitive receptors impacted:	■ Five to six potential sensitive receptors impacted:	■ One potential sensitive receptor impacted:	■ One potential sensitive receptor impacted:

[1] Removed Shaft K1-SHFT2C from evaluation, as the site is currently under construction by Alectra corporation.

Category / Evaluation Criteria	Segment 1: Kennedy Road South to Vodden Street (including Queen Street)			
	Kennedy Road South at Rambler Drive – Shaft Alternatives[1]			
	K1-SHFT2A – Sir Wilfrid Laurier Public School	**K1-SHFT2B – ASL Global Logistics, AMOR Shipping and Receiving and Autobahns Freight Lines Ltd.**	**K1-SHFT2D – Townhouse Corporation Condominium**	**K1-SHFT2E – RONA Building Supplies**
■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures and access disruptions** ■ **Impacts to agricultural resources and operations**	– Requires temporary partial displacement of Sir Wilfrid Laurier Public School soccer field berm (can maintain active soccer field). – Potential access disruption Ken Giles Recreational Center related to increased traffic volumes. ■ Temporary disruption to vehicular and active transportation during construction. An expected single-lane closure may disrupt traffic flow during peak hours and also includes sidewalk closures. – To minimize the impact on lane closure and 400mm watermain relocation, a permanent easement is recommended to avoid lane closures during construction. ■ No impacts to agricultural resources and operations.	■ Significant access disruption to local businesses including AMCOR, ALS Global Logistics, Geodis and Autobahn Freight Lines Ltd. for long duration ■ Temporary disruption to vehicular and active transportation during construction. – An expected single-lane closure may disrupt traffic flow during peak hours and also includes sidewalk closures. ■ No impacts to agricultural resources and operations.	– Significant disruption to adjacent residential townhouse complex located directly adjacent to shaft compound. Construction noise, dust, and vibration may impact nearby residents. – Potential access disruption to local businesses related to increased traffic volumes ■ Temporary disruption to vehicular and active transportation during construction – An expected single-lane closure may disrupt traffic flow during peak hours. ■ No impacts to agricultural resources and operations.	■ Potential access disruption to local businesses including RONA. ■ Temporary disruption to vehicular and active transportation during construction. – An expected single-lane closure and sidewalk closures may disrupt traffic flow during peak hours. ■ No impacts to agricultural resources and operations.
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Partially covered by Stage 1 AA and retaining archaeological potential. Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact on cultural heritage resources.	■ Partially covered by Stage 1 AA and retaining archaeological potential. Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact on cultural heritage resources.	■ Partially covered by Stage 1 AA and retaining archaeological potential. Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact on cultural heritage resources.	■ Partially covered by Stage 1 AA and retaining archaeological potential. Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact on cultural heritage resources
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ **From a drive length perspective, SHFT-2A and SHFT-2E are preferred locations as they provide a shorter drive to the reception shaft K1-SHFT-1A.** ■ **The working area at SHFT-2A is more preferred than SHFT-2E in terms of site setup for tunneling activities.** ■ The light pole, fire hydrants, existing 400mm watermain, and Alectra conduit will need to be relocated. ■ All the proposed working areas along Kennedy Road, including K1-SHFT2A to K1-SHFT2E, will be accessible during construction. ■ Existing 400mm WM to be relocated.	■ From a drive length standpoint, shafts SHFT-2B and SHFT-2D are less favourable options due to the longer distance to the reception shaft (K1-SHFT-1A). ■ The closure of the private access road may result in business disruptions for nearby trucking operations. The underground Alectra duct bank/conduit will also need to be relocated which the relocation process takes long time. ■ Kennedy Road, including K1-SHFT2A to K1-SHFT2E, will be accessible during construction. ■ Alectra's underground conduit requires relocation due to a conflict with the shaft location.	■ From a drive length standpoint, shafts SHFT-2B and SHFT-2D are less favourable options due to the longer distance to the reception shaft (K1-SHFT-1A). ■ Tight working area for tunnelling activities, located adjacent to a residential area ■ Vibration impacts resulting from shaft excavation and tunneling operations near residential structures may pose a risk of damage to building foundations. ■ Kennedy Road, including K1-SHFT2A to K1-SHFT2E, will be accessible during construction. ■ Existing 400mm WM to be relocated.	■ **From a drive length perspective, SHFT-2A and SHFT-2E are preferred locations as they provide a shorter drive to the reception shaft K1-SHFT-1A.** ■ The existing gas line and underground utilities, including the Alectra conduit, will need to be relocated. Relocation of conduit takes long time and complicated. ■ Kennedy Road, including K1-SHFT2A to K1-SHFT2E, will be accessible during construction. ■ Alectra's underground conduit requires relocation due to a conflict with the shaft location.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**No**	**No**	**Yes**

Category / Evaluation Criteria	Segment 1: Kennedy Road South to Vodden Street (including Queen Street)	
	Kennedy Road and Glidden Road – Shaft Alternatives	
	K1-GliddenSHFTA – Northeast corner of Glidden Rd and Kennedy Rd S (Brenntag Canada Inc.)	K1-GliddenSHFTB – Northwest corner of Kennedy Rd and Chamney Crt
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals)	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals)
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures and access disruptions** ■ **Impacts to agricultural resources and operations**	■ One potential sensitive receptors impacted: – Displacement of approximately 8-10 business parking spots – Potential disruption to single family residences on the opposite side ■ Potential for one-lane closure on Kennedy Rd S and Glidden Rd, including sidewalk closures. ■ No impacts to agricultural resources and operations.	■ Two potential sensitive receptors impacted: – Disruption to internal access and school drop-off area – Potential disruption to single family residences immediately adjacent to the shaft compound ■ Potential for one-lane closure on Kennedy Rd, including sidewalk closures. ■ No impacts to agricultural resources and operations.
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Stage 1-2 AA required. Potential for loss or disruption to archaeological resources. ■ No impact on cultural heritage resources.	■ Stage 1-2 AA required. Potential for loss or disruption to archaeological resources. ■ No impact on cultural heritage resources.
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ In terms of tunnel drive length, both alternative locations have approximately the same distance from the upstream and downstream shafts. Tunnelling from either location is feasible. ■ The working area at this location is larger than the alternative location at K1-Glidden-SHFTB ■ With respect to future connections, the K1-Glidden-SHT 1 is better positioned, as it is closer to the proposed future connection along Glidden Road. ■ Accessibility to both sites remains the same. ■ This location presents impacts on underground wet utilities and light poles.	■ In terms of tunnel drive length, both alternative locations have approximately the same distance from the upstream and downstream shafts. Tunnelling from either location is feasible. ■ Constrained working area compared to K1-GliddenSHFTA ■ With respect to future connections, the K1-Glidden-SHFT B is not located in suitable location. Lateral connection crossing the Keendy Rd is complex ■ Accessibility to both sites remains the same, however, significant lane closures and heavy traffic impacts are anticipated at K1-Glidden SHFT-B, as the required working area would impact two traffic lanes. ■ This location presents increased impacts to underground dry utility relocations, and one overhead telecommunication cable is also in conflict.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**No**

Category / Evaluation Criteria	Segment 1: Kennedy Road South to Vodden Street (including Queen Street)					
	Kennedy Rd. S. at Research Rd. – Shaft Alternatives				Kennedy Rd. S. at Queen St E. – Shaft Alternatives	
	K1-SHFT3A – Tim Hortons Plaza	K1-SHFT3B – JAGJIT Textiles and National Auto Repair	K1-SHFT3C - Kennedy Square Mall	K1-SHFT3D – The Brick; R&R Furniture and Mattress; Royal Furniture	K1-SHFT4A – Shoppers Drug Mart	K1-SHFT4B – KFC
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals).	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals).	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals).	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals).	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals).	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals).
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences,**	■ Five sensitive receptors impacted: – Potential access disruption to four local	■ Three sensitive receptors impacted: – Potential access disruption to local	■ Multiple sensitive receptors impacted: – Requires temporary partial displacement of	■ Three sensitive receptors impacted: – Requires temporary partial displacement of	■ Multiple sensitive receptors, including Shoppers Drug Mart and residential high-rise	■ Three sensitive receptors impacted including KFC, Marigold Hote and residential high-rise building:

Category / Evaluation Criteria	Segment 1: Kennedy Road South to Vodden Street (including Queen Street)					
	Kennedy Rd. S. at Research Rd. – Shaft Alternatives				Kennedy Rd. S. at Queen St E. – Shaft Alternatives	
	K1-SHFT3A – Tim Hortons Plaza	**K1-SHFT3B – JAGJIT Textiles and National Auto Repair**	**K1-SHFT3C - Kennedy Square Mall**	**K1-SHFT3D – The Brick; R&R Furniture and Mattress; Royal Furniture**	**K1-SHFT4A – Shoppers Drug Mart**	**K1-SHFT4B – KFC**
businesses, schools and recreational facilities) ■ **Traffic Impacts during Construction, including expected lane closures and access disruptions** ■ **Impacts to agricultural resources and operations**	businesses (Subway, Tim Hortons, SKN Financial, Vinayagar Villas Take Out and Catering, Ria Money Transfer Agent) related to increased traffic volumes. – Temporary partial displacement of approximately 15 to 20 shopping plaza parking spaces with available parking on site. ■ Temporary disruption to vehicular and active transportation during construction. – A single-lane closure may disrupt traffic flow during peak hours. And also includes sidewalk closures. ■ No impacts to agricultural resources and operations.	businesses (e.g., Jagjit Textiles, The Fabric Store, National Auto Repair) related to increased traffic volumes; includes temporary partial displacement of approximately 8 to 10 parking spaces for 3 businesses with limited parking available on site. ■ Temporary disruption to vehicular and active transportation during construction. – Assumed a single lane closed for construction. ■ No impacts to agricultural resources and operations.	approximately 10 shopping mall parking spaces with available parking on site. – Potential access disruption to local businesses related to increased traffic volumes. – Assumed 1-lane closed for construction in addition to relocation of north bound Brampton Transit bus stop. – A permanent easement is required to avoid lane closures and minimize disruptions to traffic signal operations. If not obtained temporary disruption to vehicular and active transportation during construction. ■ No impacts to agricultural resources and operations.	approximately 25 parking spaces with limited parking on site. – Potential access disruption to local businesses (The Brick, R&R Furniture and Mattress, Royal Furniture) related to increased traffic volumes. ■ Avoids lane closures and impacts to public transit ■ No impacts to agricultural resources and operations	building and Marigold Hotel impacted: – Requires temporary partial displacement of approximately 20 shopping plaza parking spaces with available parking on site. ■ Potential access disruption to local businesses related to increased traffic volumes. – A permanent easement is required to avoid lane closures and minimize disruptions to traffic signal operations. If not obtained temporary disruption to vehicular and active transportation during construction. – Assumed 1-lane including sidewalk closed for construction in addition to relocation of south bound Brampton Transit bus stop. ■ No impacts to agricultural resources and operations.	– Requires temporary partial displacement of approximately 20 parking spaces with limited parking available on site which makes the business not viable. ■ Potential access disruption to local businesses related to increased traffic volumes – A permanent easement is required to avoid lane closures and minimize disruptions to traffic signal operations. If not obtained temporary disruption to vehicular and active transportation during construction is expected. – Assumed 1-lane closed for construction in addition to relocation of west bound Brampton ZUM Transit bus stop (higher order transit). ■ No impacts to agricultural resources and operations
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Partially covered by Stage 1 AA and retaining archaeological potential. Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact to cultural heritage resources	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ No impact to cultural heritage resources	■ Partially covered by Stage 1 AA and retaining archaeological potential. Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact to cultural heritage resources	■ Partially covered by Stage 1 AA and retaining archaeological potential. Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact to cultural heritage resources	■ Covered by Stage 1 AA and not retaining archaeological potential. No potential for loss or disruption to archaeological resources ■ No impact to cultural heritage resources	■ Covered by Stage 1 AA and not retaining archaeological potential. No potential for loss or disruption to archaeological resources ■ No impact to cultural heritage resources
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ In terms of allowable tunnel drive length, this working area is less preferred compared to Shaft K1-SHFT3B The distance between the launch shaft (K1-SHFT-3A) and K1-SHFT-2A is approximately 1,500 m, which may pose constructability challenges depending on the ground conditions. However, the distance between K1-SHFT-2A and K1-SHFT-3B is about	■ The proposed working area is limited in size. A single-lane closure may disrupt traffic flow during peak hours. ■ The proposed working area at SHFT-3A is more suitable than SHFT-3B with respect to the available spacing and room for tunneling site setup. ■ The accessibility conditions for both alternative shaft locations SHFT3A and SHFT3B are	■ The drive length from SHFT2A to this shaft is approximately 1,700 m, which exceeds the recommended maximum drive length of 1,500 m for a 2,100 mm MTBM. ■ Accessibility to K1-SHFT-3C presents a significant challenge due to the presence of existing overhead cables along both Kennedy Road and Clarence Street. ■ Access for construction equipment would need to	■ No issues with the drive length. ■ The available working area at this location is adequate to support microtunneling operations. ■ Access to this shaft from Clarence Street is feasible; however, an overhead cable may need to be relocated or raised. ■ The shaft and maintenance hole can be constructed within the existing right-of-way and at a safe distance from the overhead cables.	■ **From a tunnel drive length standpoint, this working area is more favourable than Shaft K1-SHFT-4B, as it offers a shorter drive from K1-SHFT-3D.** ■ The working area can meet the requirements for the microtunneling. A permanent easement on boulevard is required to avoid lane closures and minimize impacts on traffic signals and right turning at this major intersection.	■ From a tunnel drive length standpoint, this working area is less favourable than Shaft K1-SHFT-4A, as it offers a longer drive from K1-SHFT-3A. ■ Shaft area might be limited to accommodate a proposed drop structure. A permanent easement is required to avoid lane closures and minimize disruptions to traffic signal operations. ■ Both SHFT A and B facilitate connections from the Queen Street

Category / Evaluation Criteria	Segment 1: Kennedy Road South to Vodden Street (including Queen Street)					
	Kennedy Rd. S. at Research Rd. – Shaft Alternatives				Kennedy Rd. S. at Queen St E. – Shaft Alternatives	
	K1-SHFT3A – Tim Hortons Plaza	**K1-SHFT3B – JAGJIT Textiles and National Auto Repair**	**K1-SHFT3C - Kennedy Square Mall**	**K1-SHFT3D – The Brick; R&R Furniture and Mattress; Royal Furniture**	**K1-SHFT4A – Shoppers Drug Mart**	**K1-SHFT4B – KFC**
	1,400 m, making it a more favourable drive length. ■ **The proposed working area at SHFT-3A is more suitable than SHFT-3B with respect to the available spacing and room for tunneling site setup.** ■ The accessibility conditions for both alternative shaft locations SHFT3A and SHFT3B are similar, with access available from Kennedy Road. ■ Existing 1350mm storm pipe to be relocated.	similar, with access available from Kennedy Road. ■ Underground utilities will need to be relocated at all three proposed locations.	be provided from Clarence Street through the McDonald access road, which is not recommended. ■ This location is not suitable for the launch or reception of the tunnel boring machine. Due to the presence of existing hydro poles with ten cables attached, this area is a less preferred option. Relocating all these overhead hydro and telecommunication cables would require significant coordination and time as the utilities owner has to design and relocate the utilities by their own pre-qualified firms. ■ Existing overhead cables to be relocated as the shaft is in conflict with the overhead cables.	■ The existing low-clearance communication cables will need to be raised to accommodate the hauling of trucks and construction machinery.	■ Both SHFT A and B facilitate connections from the Queen Street ■ Shaft is accessible from Kennedy Road. ■ Conflicting overhead and underground utilities will need to be relocated. – The bus shelter will need to be relocated, which may have a direct impact on nearby shopper businesses.	■ Shaft is accessible from Kennedy Road. ■ Conflicting overhead and underground utilities will need to be relocated. – Significant impact anticipated on the traffic light control box.
Overall: Recommended Preferred Solution? (Yes/No)	**No**	**No**	**No**	**Yes**	**Yes**	**No**

Category / Evaluation Criteria	Segment 1: Kennedy Road South to Vodden Street (including Queen Street)			
	Queen St E. at Hansen Rd. – Shaft Alternatives		Queen St E. at Rutherford Rd N. – Shaft Alternatives	
	Q1-SHFT1A – Blinds to Go and Dulux Paints (northwest corner Hansen Rd. and Queen St. E.)	**Q1-SHFT1B – Scotiabank Plaza (northeast corner Hansen Rd. and Queen St. E.)**	**Q1-SHFT2A – Vacant Property (northeast corner Rutherford Rd. N. and Queen St. E.)**	**Q1-SHFT2B – AutoPark Brampton (Car Dealership, northwest corner Rutherford Rd. N. and Queen St. E.)**
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals)	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals)	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals)	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals)
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures and access disruptions**	■ Two potential sensitive receptors impacted: – Requires temporary partial displacement of approximately 10 to 15 parking spaces for 2 businesses	■ Eight to ten potential sensitive receptors (2-storey commercial plaza with multiple businesses and offices, including Scotia Bank, restaurants and pharmacy) impacted:	■ No sensitive receptor impacts expected (vacant land) ■ Temporary disruption to vehicular and active transportation during construction.	■ One potential sensitive receptor (AutoPark car Dealership) impacted: – Requires temporary loss of approximately 60 parking spaces with

Category / Evaluation Criteria	Segment 1: Kennedy Road South to Vodden Street (including Queen Street)			
	Queen St E. at Hansen Rd. – Shaft Alternatives		Queen St E. at Rutherford Rd N. – Shaft Alternatives	
	Q1-SHFT1A – Blinds to Go and Dulux Paints (northwest corner Hansen Rd. and Queen St. E.)	**Q1-SHFT1B – Scotiabank Plaza (northeast corner Hansen Rd. and Queen St. E.)**	**Q1-SHFT2A – Vacant Property (northeast corner Rutherford Rd. N. and Queen St. E.)**	**Q1-SHFT2B – AutoPark Brampton (Car Dealership, northwest corner Rutherford Rd. N. and Queen St. E.)**
■ **Impacts to agricultural resources and operations**	(Blinds to Go, Dulux Paints) with parking available ■ Potential access disruption to local businesses related to increased traffic volumes and temporary disruption to vehicular and active transportation during construction – Assumed 1-lane closed for construction in addition to relocation of west bound Brampton Transit bus stop ■ No impacts to agricultural resources and operations	– Requires temporary loss of approximately 40 parking spaces with alternative parking available in a high traffic commercial area. ■ Potential access disruption to local businesses related to increased traffic volumes and temporary disruption to vehicular and active transportation during construction – Assumed 1-lane closed for construction ■ No impacts to agricultural resources and operations	– Assumed 1-lane closed for construction ■ No impacts to agricultural resources and operations	alternative parking available for an individual business. ■ Temporary disruption to vehicular and active transportation during construction. – Assumed 1-lane closed for construction in addition to relocation of west bound ZUM Transit bus stop (higher order transit stop). ■ No impacts to agricultural resources and operations
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Partially covered by Stage 1 AA and retaining archaeological potential. Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact to cultural heritage resources	■ Partially covered by Stage 1 AA and retaining archaeological potential. Stage 1-2 AA required. Potential for loss or disruption to archaeological resources ■ No impact to cultural heritage resources	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ No impact to cultural heritage resources	■ Covered by Stage 1 AA and not retaining archaeological potential. No potential for loss or disruption to archaeological resources ■ No impact to cultural heritage resources
Technical Environment ■ **Tunnelling Constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ No tunnelling constraints ■ The useable working space at Shaft 1A and Shaft 1B are similar. ■ Connection facilitation is similar for both A and B ■ The working areas at Shaft 1A and Shaft 1B are similar. ■ Accessibility to both sites remains the same. ■ **There is fewer utility conflicts compare to the other alternative such as watermain.**	■ No tunnelling constraints ■ The useable working space at Shaft 1A and Shaft 1B are similar. ■ Connection facilitation is similar for both A and B ■ Accessibility to both sites remains the same. ■ There are more utility conflicts compare to the other alternative	■ No tunnelling constraints ■ From a technical perspective, the working areas at Shaft 2A and Shaft 2B are similar. ■ Connection to the existing 500 SAN is easier with a minimum of open cut. However, **Shaft 2A is located in an open area** with minimum utilities — it should be confirmed that no future developments are planned at this location in 2027. ■ Accessibility to both sites remains the same. ■ There is fewer utility conflicts compare to the other alternative such as traffic signal boxes	■ No tunnelling constraints ■ From a technical perspective, the working areas at Shaft 2A and Shaft 2B are similar. ■ Connection to the existing 500SAN will require more open cut on the Rutherford Rd N. ■ Accessibility to both sites remains the same. ■ The conflicting traffic signal box presents a major challenge.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**No**	**Yes**	**No**

Table 2: Evaluation of Alternative Tunnel Shaft Compound Locations– Segment 2

Category / Evaluation Criteria	Segment 2: Vodden St. to Bovaird Dr from Kennedy Rd (1800 diameter)			
	Vodden St E. near Ken Whilams Dr. – Shaft Alternatives		OBR at Vodden St W. – Shaft Alternatives	
	V1-SHFT1A – Etobicoke Creek/Duggan Park south side of Vodden St.	V1-SHFT1B – North side of Vodden St. across from Duggan Park	OBR1-SHFT1A – Nancy Mcredie Park	OBR1-SHFT1B – Vodden Park
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ Shaft is adjacent to Etobicoke Creek; no in-water works required. ■ Requires removal of CUP1 deciduous plantation. Species at Risk habitat present.	■ Shaft is adjacent to Etobicoke Creek; no in-water works required. ■ Requires removal of CUP1 deciduous plantation and CUS1 mineral cultural savannah eco-site. Species at Risk habitat present. – SHFT1B would result in greater impacts to trees and the surrounding environment, resulting in additional time and costs to restore the area.	■ No aquatic features identified. ■ Minimal loss of vegetation expected (some tree removals). Species at Risk habitat present.	■ No aquatic features identified ■ Minimal loss of vegetation expected (some tree removals). Species at Risk habitat present.
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures and access disruptions** ■ **Impacts to agricultural resources and operations**	■ Three sensitive receptors impacted: – Requires temporary closure of Etobicoke Creek Trail and temporary partial displacement of a portion of Duggan Park (can maintain 2 active baseball diamonds) – Brampton Fire Station 207 access to Vodden Street maybe disrupted by lane closure ■ An expected single-lane closure may disrupt traffic flow during peak hours. Also includes sidewalk closures. ■ No impacts to agricultural resources and operations	■ Three sensitive receptors impacted: – Potential impact to single family residences on east side of Etobicoke Creek – Requires temporary closure of Etobicoke Creek Trail – Brampton Fire Station 207 access to Vodden Street maybe disrupted by lane closure ■ An expected single-lane closure may disrupt traffic flow during peak hours. Also includes sidewalk closures. ■ No impacts to agricultural resources and operations	■ Two sensitive receptors impacted: – Potential impact to single family residences on east and west side of OBR – Requires displacement of a portion of Nancy McCredie Park (does not displace child playground area) ■ No impacts on traffic ■ No impacts to agricultural resources and operations	■ Two potential sensitive receptors impacted: – Potential impact to single family residences on east side of OBR – Requires displacement of a portion of Vodden Park open space area. Impacts are likely to be minimal. ■ No impacts on traffic ■ No impacts to agricultural resources and operations
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ No impact on cultural heritage resources or landscapes	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ No impact on cultural heritage resources or landscapes	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ Potential impact on OBR Cultural Heritage Landscape	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ Potential impact on OBR Cultural Heritage Landscape
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ **From a technical standpoint, the shafts south of Vodden Street are preferred, as they allow the tunnel alignment to remain on one side of the road. The location is suitable to position the proposed connection to existing SAN with a diversion chamber.** ■ Availability of land for both options are similar ■ The diversion chamber on the existing 1200mm is feasible for both SHFT1A and B ■ Accessibility to both sites remains the same. ■ There are no hydro poles on the south side of Vodde Street.	■ From a technical perspective, the shafts located south of Vodden Road are preferred, as they maintain the tunnel alignment on a single side of the roadway. ■ Availability of land for both options are similar ■ The diversion chamber on the existing 1200mm is feasible for both SHFT1A and B ■ Accessibility to both sites remains the same. ■ The relocation of existing Alectra and telecommunication cables, which include ten attached lines, is considered a major constraint (showstopper) for this location.	■ **From a technical standpoint, the shafts south of Vodden Road are preferred, as they allow the tunnel alignment to remain on one side of the road.** ■ Similar useable work area for both Shafts ■ No future connection at this location ■ Accessibility to both sites remains the same. ■ Existing light pole and utility box to be removed.	■ From a technical standpoint, the shafts south of Vodden Street are preferred, as they allow the tunnel alignment to remain on one side of the road. ■ Similar useable work area for both Shafts ■ No future connection at this location ■ Accessibility to both sites remains the same. ■ Existing utility box to be removed.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**No**	**Yes**	**No**

Category / Evaluation Criteria	Segment 2: OBR - Bovaird Dr to Fletcher's Creek (1800 diameter)	
	Williams Parkway at Orangeville Brampton Railway – Shaft Alternatives	
	OBR1-SHFT2A – North side of Williams Pkwy: Armbro Park	OBR1-SHFT2B – South side of Williams Pkwy at OBR: Burton Park
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals)	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals)
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures and access disruptions** ■ **Impacts to agricultural resources and operations**	■ Two potential sensitive receptors impacted: – Displacement of the soccer field at Armbro Park – Potential disruption to single family residences ■ Minimal to no impacts on traffic. ■ No impacts to agricultural resources and operations.	■ Two potential sensitive receptors impacted: – Requires potential closure or relocation of trail from Burton Park to Moore St/Burton Road – Potential disruption to single family residences ■ Minimal to no impacts on traffic. ■ No impacts to agricultural resources and operations.
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ Potential impact on OBR Cultural Heritage Landscape	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ Potential impact on OBR Cultural Heritage Landscape
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ There are no technical issues with the tunnel drive length for either option. Additional working area space is also available within Ambro Park. ■ The new Williams Parkway water main is currently under construction and runs adjacent to the proposed shaft location. ■ There is a current construction site for the new Williams Parkway road improvements at this location. If the Williams Parkway contractor can complete the construction of this shaft before mid-2028, the Region of Peel could descope the landscaping work and transfer the working area to the Kennedy Road contractor. If so, this would result in significant cost and schedule savings. ■ Accessibility to both sites remains the same. ■ An existing 400mm water main and an existing 675mm sanitary sewer are adjacent to this location but no conflict with the proposed pipe alignment and shaft location.	■ There are no technical issues with the tunnel drive length for either option. Additional working area space is also available within Ambro Park. ■ There is a property boundary across this shaft compound alternative. To avoid the existing sanitary sewer and the property boundary, the shaft location would need to be in the area between the sewer and the road. ■ Use of this shaft position avoids a potential overlap with the Region of Peel's Williams Parkway water main project and utilizes current City of Brampton William Parkway improvements work compound. But not using the construction compound on the other side of the road (at Armbro Park) does not enable the opportunity to reuse the landscaping and working area from the Williams Parkway water main project. ■ Accessibility to both sites remains the same. ■ An existing 675mm sanitary sewer is present at the proposed shaft compound, with a connection manhole at this location.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**Yes**

Category / Evaluation Criteria	Segment 2: OBR - Bovaird Dr to Fletcher's Creek (1800 diameter)	
	Bovaird Dr W. at Fletchers Creek – Shaft Alternatives	
	B3-SHFT1A – South side of Bovaird Dr. at Fletchers Creek	B3-SHFT1B – North side of Bovaird Dr. at Fletchers Creek
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ Shaft is adjacent to Fletchers Creek; no in-water works required. ■ Requires removal of CUS1 mineral cultural savannah. Species at Risk habitat present.	■ Shaft is adjacent to Fletchers Creek; no in-water works required. ■ Requires removal of CUM1-1 Dry Moist Oldfield Meadow, MAN1-12 common reed mineral meadow marsh type and CUT1 mineral cultural thicket eco-site. Species at Risk habitat present.
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures and access disruptions** ■ **Impacts to agricultural resources and operations**	■ Two potential sensitive receptors impacted: – Townhouse development immediately adjacent to east side of shaft compound. – Requires temporary closure of Fletchers Creek trail. ■ Minimal to no impacts on traffic. ■ No impacts to agricultural resources and operations.	■ No impacts to sensitive receptors anticipated ■ Minimal to no impacts on traffic. ■ No impacts to agricultural resources and operations.
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ No impact on cultural heritage resources.	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ No impact on cultural heritage resources.
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ **From a technical perspective, the shafts located south of Bovaird Drive are preferred, as they maintain the tunnel alignment on one side of the road and accommodate the future connection in this area.** ■ Availability of land for both options are similar ■ **Suitable location to connect to the existing 1200SAN STS and positioning the proposed diversion chamber. Optimal location to capture flows from the existing sewer.** ■ Accessibility to both sites remains the same. ■ There are fewer utility conflicts compared to B3-SHFT1B	■ From a technical perspective, the shafts located south of Bovaird Drive are preferred, as they maintain the tunnel alignment on one side of the road and accommodate the future connection in this area. ■ Availability of land for both options are similar ■ Not a suitable location for the diversion chamber ■ Accessibility to both sites remains the same. ■ The relocation of the existing Alectra and telecommunication cables, comprising ten attached cables, represents a significant constraint and potential showstopper for this location.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**No**

Table 3: Evaluation of Alternative Tunnel Shaft Compound Locations – Segment 3

Category / Evaluation Criteria	OBR at Wanless Dr.		OBR 500m north of Bovaird to Old School Road and OBR	
	Wanless Dr. at OBR – Shaft Alternatives		Mayfield Rd. at OBR – Shaft Alternatives	
	OBR2-SHFT4A – Southwest corner of Wanless and OBR (Burnt Elm Park)	**OBR2-SHFT4B Northwest corner of Wanless and OBR (SWM pond)**	**OBR2-SHFT6A – South side of Mayfield Rd. (Beside Chingacousy Lions Club Water Tower Park)**	**OBR2-SHFT6B – North Side of Mayfield Rd.**
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals).	■ No aquatic features identified ■ Loss of vegetation (more tree removals).	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals within Chingacousy Lions Club Water Tower Park).	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals).
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures and access disruptions** ■ **Impacts to agricultural resources and operations**	■ No sensitive receptor impacts ■ Minimal to no impacts to traffic. ■ No impacts to agricultural resources and operations.	■ Single family residences located on east side of OBR will experience disruption from construction activities ■ Minimal to no impacts to traffic. ■ No impacts to agricultural resources and operations.	■ One potential sensitive receptor impacted: – May require small displacement of a portion of Chingacousy Lions Club Water Tower Park (non active area). ■ Minimal to no impacts to traffic. ■ No impacts to agricultural resources and operations.	■ One potential sensitive receptor impacted: – Potential impact to single family residences on east side of shaft compound. ■ Minimal to no impacts to traffic. ■ No impacts to agricultural resources and operations.
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ Potential impact on OBR Cultural Heritage Landscape	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ Potential impact on OBR Cultural Heritage Landscape	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ Potential impact on OBR Cultural Heritage Landscape	■ Partially covered by Stage 1 AA and retaining archaeological potential. Stage 1 AA required. Potential for loss or disruption to archaeological resources ■ Potential impact on OBR Cultural Heritage Landscape.
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ There are no constraints related to the tunnel drive length. ■ Existing trees will need to be removed to provide adequate space for the working area. – The site will need to be graded to create a suitable working area, as there is a steep slope leading toward the pond. The ground may also need to be stabilized before heavy equipment arrives on site. ■ There is no future connection at this location ■ **Avoids relocation of hydro and telecommunications cables (north side of Wanless Drive).** – The existing electrical box will need to be removed.	■ There are no constraints related to the tunnel drive length. ■ Existing trees will need to be removed to provide adequate space for the working area. ■ There is no future connection at this location ■ Accessibility is dependent on the permanent removal of the telecommunications cables. During operations, trucks must be able to access the working area, and the low-clearance cables will need to be permanently relocated. ■ The existing cables are in conflict with the working area. Trucking and crane operations adjacent to live hydro cables pose potential safety risks, and the shaft should be far away from the existing cables. – Furthermore, once the shaft is constructed, the cables would need to be reinstated to their original location, which is both costly and time-consuming. – The existing electrical box will need to be removed.	■ No tunnelling constraints with respect to drive length. – **the impact of ongoing road extension works (e.g., removal of new structures constructed by others) are less and therefore Shaft 6A is more preferred** ■ Similar usable work area for both shaft options. Both shafts are located within the OBR easement. ■ There is no future connection at this location ■ Accessibility to both sites remains the same. ■ For both options, the existing overhead cables must be relocated.	■ No tunnelling constraints with respect to drive length. – the impact of ongoing road extension works (e.g., removal of new structures constructed by others) are greater and therefore Shaft 6B is less preferred ■ Similar usable work area for both shaft options. Both shafts are located within OBR easement. ■ There is no future connection at this location ■ Accessibility to both sites remains the same. ■ For both options, the existing overhead cables must be relocated.

Category / Evaluation Criteria	OBR at Wanless Dr.		OBR 500m north of Bovaird to Old School Road and OBR	
	Wanless Dr. at OBR – Shaft Alternatives		Mayfield Rd. at OBR – Shaft Alternatives	
	OBR2-SHFT4A – Southwest corner of Wanless and OBR (Burnt Elm Park)	OBR2-SHFT4B Northwest corner of Wanless and OBR (SWM pond)	OBR2-SHFT6A – South side of Mayfield Rd. (Beside Chingacousy Lions Club Water Tower Park)	OBR2-SHFT6B – North Side of Mayfield Rd.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**No**	**Yes**	**No**

Category / Evaluation Criteria	Segment 3: OBR from Bovaird Dr to Old School Road (1500 diameter)	
	OBR and Tim Manely Ave. – Shaft Alternatives	
	OBR2-SHFT7A North side of Tim Manley Ave.	OBR2-SHFT7B South side of Tim Manley Ave.
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals).	■ No aquatic features identified ■ Significant tree removals (woodlot area) required and significant impacts to SAR habitat
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures and access disruptions** ■ **Impacts to agricultural resources and operations**	■ No sensitive receptors impacted. ■ Minimal to no impacts on traffic. ■ No impacts to agricultural resources and operations.	■ South side of Tim Manely Ave. is currently being developed (residences will be adjacent to shaft compound when construction occurs). ■ Minimal to no impacts on traffic. ■ No impacts to agricultural resources and operations.
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ Potential impact on OBR Cultural Heritage Landscape	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources ■ Potential impact on OBR Cultural Heritage Landscape
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ With respect to the tunnel drive length from the upstream and downstream shafts, both alternative shaft locations are feasible. However, the shaft on the south side is preferred due to its shorter distance to OBR2–SHFT6. ■ The size of the temporary working area at both alternative locations is similar. ■ There is no future connection at this location; however, future connections will be feasible to the shafts on either the north or south side of Tim Manley Avenue. ■ Accessibility to both sites from Tim Manley Avenue remains the same. ■ Tim Manley Avenue is currently under construction, and there are no utilities within the proposed shaft area in the OBR corridor.	■ With respect to the tunnel drive length from the upstream and downstream shafts, both alternative shaft locations are feasible. However, the shaft on the south side is preferred due to its shorter distance to OBR2–SHFT6. ■ The size of the temporary working area at both alternative locations is similar. ■ There is no future connection at this location; however, future connections will be feasible to the shafts on either the north or south side of Tim Manley Avenue. ■ Accessibility to both sites from Tim Manley Avenue remains the same. ■ Tim Manley Avenue is currently under construction, and there are no utilities within the proposed shaft area in the OBR corridor.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**No**

Category / Evaluation Criteria	Segment 3: OBR from Bovaird Dr to Old School Road (1500 diameter)			
	Old School Rd. at the OBR – Shaft Alternatives			
	OBR2-SHFT10A – Southeast corner of Old School Rd. and OBR	**OBR2-SHFT10B – Northeast corner of Old School Rd. and OBR**	**OBR2-SHFT10C – Northwest corner of Old School Rd. and OBR**	**OBR2-SHFT10D – Southwest corner of Old School Rd. and OBR**
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ Site is adjacent to a watercourse. ■ Minimal loss of vegetation (some tree removals) expected.	■ Site adjacent to watercourse ■ Minimal loss of vegetation (some tree removals) expected.	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals) expected.	■ No aquatic features identified ■ Minimal loss of vegetation (some tree removals) expected.
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures** ■ **Impacts to agricultural resources and operations**	■ No impacts on sensitive receptors. Site is subject to current development application. ■ An expected single-lane closure on Old School Road may disrupt traffic flow during peak hours. ■ Temporary displacement of agricultural field for shaft compound – Existing field access can be used to access compound location.	■ No impacts on sensitive receptors ■ An expected single-lane closure on Old School Road may disrupt traffic flow during peak hours. ■ Temporary displacement of agricultural field for shaft compound	■ No impacts on sensitive receptors ■ An expected single-lane closure on Old School Road may disrupt traffic flow during peak hours. ■ Temporary displacement of agricultural field for shaft compound.	■ No impacts on sensitive receptors ■ An expected single-lane closure on Old School Road may disrupt traffic flow during peak hours. ■ Temporary displacement of agricultural field for shaft compound.
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources. ■ Potential impact on OBR Cultural Heritage Landscape.	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources. ■ Potential impact on OBR Cultural Heritage Landscape.	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources. ■ Potential impact on OBR Cultural Heritage Landscape.	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources. ■ Potential impact on OBR Cultural Heritage Landscape.
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ **OBR2-SHFT10A is preferred due to its favorable drive length, and the geometry of the tunnel alignment.** ■ The working area remains unchanged across all options. ■ There is no future connection at this location ■ Accessibility to both sites remains the same. ■ Existing overhead cables to be relocated.	■ This shaft is less preferred compared to OBR2-SHFT10A due to its longer drive length and less favorable alignment geometry. ■ The working area remains unchanged across all options. ■ There is no future connection at this location ■ Accessibility to both sites remains the same. ■ The need to relocate existing overhead cables at OBR2-10B and OBR2-10C presents a significant constraint and potential showstopper for these alternatives.	■ This shaft is less preferred compared to OBR2-SHFT10A due to its drive length and alignment geometry. ■ The working area remains unchanged across all options. ■ There is no future connection at this location ■ Accessibility to both sites remains the same. ■ The need to relocate existing overhead cables at OBR2-10B and OBR2-10C presents a significant constraint and potential showstopper for these alternatives.	■ OBR2-SHFT10D is the second preferred option compared to OBR2-SHFT10A, based on drive length, site accessibility, and alignment geometry. ■ The working area remains unchanged across all options. ■ There is no future connection at this location ■ Accessibility to both sites remains the same. ■ Existing overhead cables to be relocated.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**No**	**No**	**No**

Category / Evaluation Criteria	Segment 3: Old School Road from OBR to Hurontario St (1500 diameter)				
	Near 2748 Old School Rd. – Shaft Alternatives		Old School Rd at Hurontario St. (Highway 10) – Shaft Alternatives		
	OS1-SHFT1A – South side Old School Rd. between OBR and Hurontario St.	**OS1-SHFT1B – North side Old School Rd. between OBR and Hurontario St**	**OS1-SHFT2A – South side of Old School Rd. 235m east of Hurontario St. (ARGO Development)**	**OS1-SHFT2B – Northeast corner of Hurontario St. and Old School Rd.**	**OS1-SHFT2D – Southwest corner of Hurontario St. and Old School Rd.**
Natural Environment ■ **Potential impacts on aquatic features** ■ **Potential Impacts to Natural Heritage Resources including Species at Risk**	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals) expected.	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals) expected.	■ No aquatic features identified. ■ Site is already cleared of vegetation to facilitate development	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals) expected.	■ No aquatic features identified. ■ Minimal loss of vegetation (some tree removals) expected.
Socio-Economic Environment ■ **Impacts to Sensitive Receptors (e.g. residences, businesses, schools and recreational facilities)** ■ **Traffic Impacts during Construction, including expected lane closures** ■ **Impacts to agricultural resources and operations**	■ No impacts on sensitive receptors: – Site is subject to current development application ■ An expected single-lane closure on Old School Road may disrupt traffic flow during peak hours. ■ Temporary displacement of agricultural field for shaft compound	■ One potential sensitive receptor impacted: – Site is adjacent to three single family residences ■ An expected single-lane closure on Old School Road may disrupt traffic flow during peak hours. ■ Temporary displacement of agricultural field for shaft compound	■ No impacts on sensitive receptors. ■ An expected single-lane closure on Old School Road may disrupt traffic flow during peak hours. ■ No impact to agricultural resources or operations (Site is under development by ARGO) and development application is already approved.	■ No impacts on sensitive receptors. ■ An expected single-lane closure on Old School Road may disrupt traffic flow during peak hours. ■ Temporary displacement of agricultural fields for shaft compound.	■ In close proximity to a single family residence and a business. ■ An expected single-lane closure on Old School Road may disrupt traffic flow during peak hours. ■ Temporary displacement of agricultural fields for shaft compound. ○ Site is in the early stages of the development application and may facilitate easier easements.
Cultural Environment ■ **Potential for loss of or disruption to Archaeological resources** ■ **Potential for loss of or disruption to Built Heritage Resources and/or Cultural Heritage Landscapes**	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources. ■ No impact on built heritage resources or cultural heritage landscapes.	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources. ■ Potential impact to built heritage resource (CHL 7: 2788 Old School Road).	■ Covered by Stage 1 AA however archaeological potential no longer applies as landowner has archaeological clearance. ■ Impacts on built heritage resources and cultural heritage landscapes is not anticipated.	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources. ■ No impact to built heritage resources and cultural heritage landscapes.	■ Covered by Stage 1 AA and retaining archaeological potential. Stage 2 AA required. Potential for loss or disruption to archaeological resources. ■ No impact to built heritage resources and cultural heritage landscapes.
Technical Environment ■ **Tunneling constraints** ■ **Limitations on useable work area (land availability)** ■ **Facilitates connections** ■ **Accessibility** ■ **Known utility conflicts**	■ **OS1-SHFT1A is the preferred option due to its alignment as all manholes can remain on the east side of Old School Rd.** ■ The working area remains unchanged across all options. ■ There is no future connection in this area. ■ Accessibility to both sites remains the same. ■ **There are no overhead cables.**	■ OS1-SHFT1B is the less preferred option due to its alignment on the north side of Old School Rd. ■ The working area remains unchanged across all options. ■ There is no future connection in this area. ■ Accessibility to both sites remains the same. ■ The relocation of the existing Alectra and telecommunication cables represents a significant constraint and potential showstopper for this location.	■ **OS1-SHFT2A is the preferred option due to its alignment as all manholes can remain on the south side of Old School Rd.** ■ The working area remains unchanged across all options. ■ There is a future connection at this location ■ Accessibility to all sites remains the same. ■ There are fewer utility conflicts compared to OS1-SHFT2B. ■ Avoids trenchless crossing of Hurontario Street compared to OS1-SHFT2D.	■ OS1-SHFT2B is less preferred option due to its alignment as all manholes will be located on the north side of Old School Rd. ■ The working area remains unchanged across all options. ■ There is a future connection at this location ■ Accessibility to all sites remains the same. ■ The relocation of the existing Alectra and telecommunication cables represents a significant constraint and potential showstopper for this location.	■ **OS1-SHFT2D is also preferred due to its alignment as all manholes can remain on the south side of Old School Rd.** ■ The working area remains unchanged across all options. ■ There is a future connection at this location ■ Accessibility to all sites remains the same. ■ There are fewer utility conflicts compared to OS1-SHFT2A and B. ■ Requires trenchless crossing of Hurontario Street to facilitate connection to development on east side of Hurontario Street.
Overall: Recommended Preferred Solution? (Yes/No)	**Yes**	**No**	**Yes**	**No**	**Yes**