

APPENDIX L

Design Criteria



NO:

ROADWAY: Waterdown Rd,
Mountain Brow Rd,
Mid-Block Rd

TYPE OF PROJECT: Preliminary Design

LENGTH: 4.5 km

LOCATION: From Craven Avenue to Dundas Street

SECTION 1

WATERDOWN ROAD WIDENING – From Craven Avenue to Mountain Brow Road

Waterdown Road

| | PRESENT CONDITIONS | DESIGN ^(a) STANDARDS | PROPOSED ^(b) STANDARDS |
|--|---------------------------|---|--------------------------------------|
| ROADWAY CLASSIFICATION | RAU 70 | UAU 60 | UAU 60 |
| MIN STOPPING SIGHT DIST | 150m | 75 - 85m | 150m |
| EQUIVALENT MIN 'K' FACTOR | ± 30 (Crest) ± 8 (Sag) | 10 - 13 (Crest) 15 - 18 (Sag - Headlight) 8 - 9 (Sag - Comfort) | 30 (Crest) 28 (Sag) |
| GRADES MAXIMUM | 7.0% | 6% (c) | 7.0% (d) |
| MINIMUM RADIUS | 185m | 120m (e) | 190m (f) |
| PAVEMENT WIDTH | 3.5m | 3.5m - 3.7m | 4 traffic lanes at 3.3m (g) |
| BOULEVARD WIDTH | N/A | 3.0m | 1.5m - 4.0m (h) |
| SIDEWALK | No Sidewalks | 1.2m min. | 4.0m (i) |
| MEDIAN WIDTH | No Median | N/A | No Median (j) |
| LANE WIDTHS (thru lane -TL) - right turn - left turn - left turn adjacent to median | No turning lanes | TL less 0.2m TL less 0.2m 3.0m min. | 3.3m 3.3m 3.0m |
| RIGHT TURN LANE - taper ratio or length - parallel length | N/A | 14:1 – 17:1 40 - 90m | 50m (k) 30m (k) |
| LEFT TURN LANE - taper ratio or length - parallel length | N/A | 15:1 – 42:1 50.4 – 62.2m | 100m (l) 30m (l) |
| R.O.W. WIDTH | 20m - 30m | 30 - 36m | 30m (m) |
| POSTED SPEED | 60 km/h | 40 - 50 km/h | 50 km/h (n) |



DRAFT PRELIMINARY DESIGN CRITERIA
CITY OF HAMILTON, CITY OF BURLINGTON
AND REGION OF HALTON

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Date: April 2009



NO:

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Mountain Brow Rd,
Mid-Block Rd

TYPE OF PROJECT: Preliminary Design

LENGTH: 4.5 km

LOCATION: From Craven Avenue to Dundas Street

Notes:

- a) Design Standards are based on City of Burlington Standards or (where necessary) TAC Geometric Design Guide for Canadian Roads (1999 Edition).
- b) The Proposed Standards meet or exceed City of Burlington Standards. The one exception is the proposed maximum grade, which City Standards stipulate should not exceed 5%. It is noted that the existing maximum grade on Waterdown Road is 7%. See note 'd' for more details.
- c) Based on rolling topography for UAU DS 60km/hr roads. (Table 2.1.3.1 of TAC).
- d) Matches existing grade south of Old Waterdown Road. The proposed 7% grade avoids impacts to an existing underground Transcanada pipeline and limits the amount of cut through this section of Waterdown Road, which is already in a cut condition.
- e) Based on maximum superelevation rate of 0.06m/m. Minimum radius for reverse crown is 220m. Minimum radius for normal crown is 1290m (Table 2.1.2.4 of TAC).
- f) Matching existing curve. Radius corresponds to a superelevation of 3%.
- g) As part of a potential construction phasing approach, a three lane cross section can also be accommodated within the proposed asphalt width. Refer to note 'j' and page 11 for typical sections.
- h) A standard boulevard width of 3m is provided on the west side of the road. A 1.5m minimum boulevard width used in areas where property is constrained, and on most segments on the east side of the road. A 4m boulevard is used on the east side of the road opposite the Eagle Heights Development.
- i) A 4m multi-use asphalt pathway is proposed throughout on the west side of the road. In areas of property constraint, the pathway width is reduced to 3.0m. A 1.5m wide east side sidewalk is proposed opposite the Eagle Heights Development. No additional west-side sidewalk is proposed.
- j) Phasing of construction to be assured by initially providing a 3-lane roadway on the 4-lane roadbed, as per City of Burlington request. Refer to typical sections (page 11) for details.
- k) Based on MTO Geometric Design Standards for Ontario Highways, Table E7-1.
- l) Based on MTO Geometric Design Standards for Ontario Highways, Table E9-1.
- m) Right-of-way width is based on City of Burlington Official Plan. Additional property may be required at some locations to account for grading lines, utility poles, illumination, etc.
- n) A reduction in posted speed is recommended to meet roadside safety clear zone requirements associated with planted boulevards, utility poles and illumination.



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SECTION 2

MOUNTAIN BROW ROAD WIDENING – From Waterdown Road to Mid-Block Road

Mountain Brow Road

| | PRESENT CONDITIONS | DESIGN ^(a) STANDARDS | PROPOSED ^(b) STANDARDS |
|--|--------------------------|---|---|
| ROADWAY CLASSIFICATION | RCU 60 | UAU 60 | UAU 60 |
| MIN STOPPING SIGHT DIST | 53m | 75 - 85m | 125m |
| EQUIVALENT MIN 'K' FACTOR | ± 3 (Crest) ± 5 (Sag) | 10 - 13 (Crest) 15 - 18 (Sag - Headlight) 8 - 9 (Sag - Comfort) | 20 (Crest) 8 (Sag) |
| GRADES MAXIMUM | 14% | 9% (c) | 8% (d) |
| MINIMUM RADIUS | Tangent | 120m (e) | 250m |
| PAVEMENT WIDTH | 3.35m | 3.5m - 3.7m | 2 centre lanes at 3.3m, 2 curb lanes at 3.5m |
| BOULEVARD WIDTH | N/A | 3.0m | 1.5m (f) |
| SIDEWALK WIDTH | No Sidewalks | 1.2m Min | 3.5m (g) |
| MEDIAN WIDTH | No Median | N/A | No median |
| LANE WIDTHS (thru lane -TL) - right turn - left turn - left turn adjacent to median | N/A | TL less 0.2m TL less 0.2m 3.0m min. | 3.30m 3.30m 3.00m |
| RIGHT TURN LANE - taper ratio or length - parallel length | N/A | 14:1 – 17:1 40 - 90m | 50m (h) 30m (h) |
| LEFT TURN LANE - taper ratio or length - parallel length | N/A | 15:1 – 42:1 50.4 – 62.2m | 100m (i) 30m (i) |
| R.O.W. WIDTH | 20m | 30 - 36m | 30m (j) |
| POSTED SPEED | 50 km/h | 40 - 50 km/h | 50 km/h (k) |

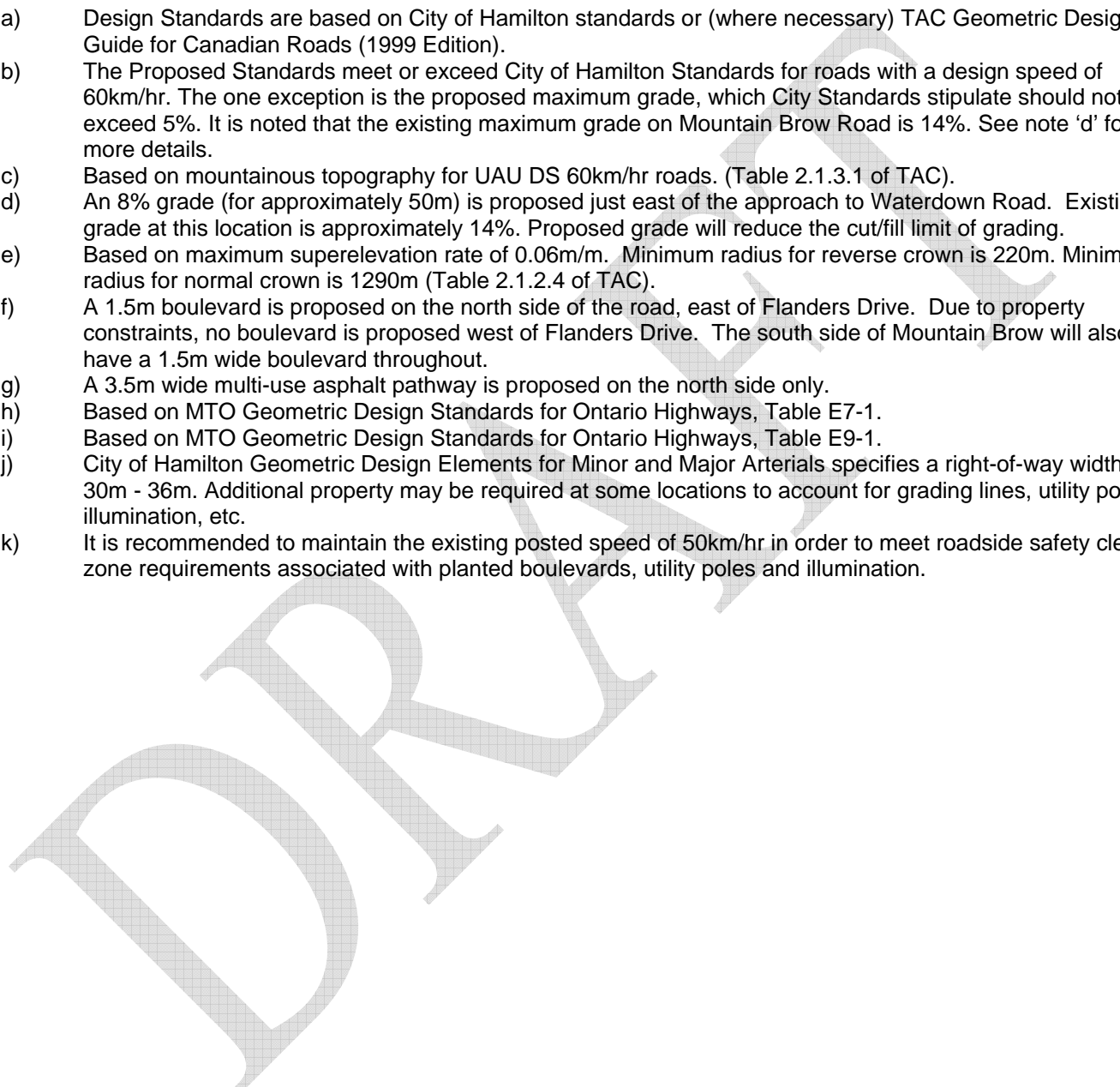


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Notes:

- a) Design Standards are based on City of Hamilton standards or (where necessary) TAC Geometric Design Guide for Canadian Roads (1999 Edition).
- b) The Proposed Standards meet or exceed City of Hamilton Standards for roads with a design speed of 60km/hr. The one exception is the proposed maximum grade, which City Standards stipulate should not exceed 5%. It is noted that the existing maximum grade on Mountain Brow Road is 14%. See note 'd' for more details.
- c) Based on mountainous topography for UAU DS 60km/hr roads. (Table 2.1.3.1 of TAC).
- d) An 8% grade (for approximately 50m) is proposed just east of the approach to Waterdown Road. Existing grade at this location is approximately 14%. Proposed grade will reduce the cut/fill limit of grading.
- e) Based on maximum superelevation rate of 0.06m/m. Minimum radius for reverse crown is 220m. Minimum radius for normal crown is 1290m (Table 2.1.2.4 of TAC).
- f) A 1.5m boulevard is proposed on the north side of the road, east of Flanders Drive. Due to property constraints, no boulevard is proposed west of Flanders Drive. The south side of Mountain Brow will also have a 1.5m wide boulevard throughout.
- g) A 3.5m wide multi-use asphalt pathway is proposed on the north side only.
- h) Based on MTO Geometric Design Standards for Ontario Highways, Table E7-1.
- i) Based on MTO Geometric Design Standards for Ontario Highways, Table E9-1.
- j) City of Hamilton Geometric Design Elements for Minor and Major Arterials specifies a right-of-way width of 30m - 36m. Additional property may be required at some locations to account for grading lines, utility poles, illumination, etc.
- k) It is recommended to maintain the existing posted speed of 50km/hr in order to meet roadside safety clear zone requirements associated with planted boulevards, utility poles and illumination.





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4.5 km

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SECTION 3

MID-BLOCK ROAD – From Mountain Brow Road to Dundas Street

Mid-Block Road

| | PRESENT CONDITIONS | DESIGN ^(a) STANDARDS | PROPOSED ^(b) STANDARDS |
|--|-----------------------|---|--|
| ROADWAY CLASSIFICATION | N/A | UAU 60 | UAU 60 |
| MIN STOPPING SIGHT DIST | N/A | 75 - 85m | 135m |
| EQUIVALENT MIN 'K' FACTOR | N/A | 10 - 13 (Crest) 15 - 18 (Sag - Headlight) 8 - 9 (Sag - Comfort) | 20 (Crest) 8 (Sag) |
| GRADES MAXIMUM | N/A | 6% (c) | 3.5% |
| MINIMUM RADIUS | N/A | 120m (d) | 160m |
| PAVEMENT WIDTH | N/A | 3.5m - 3.7m | 2 centre lanes at 3.5m, 2 curb lanes at 3.65m, 1.5m bicycle lanes (e) |
| BOULEVARD WIDTH | N/A | 3.0m | 5.0m (f) |
| SIDEWALK WIDTH | N/A | 1.2m Min | 2.0m (g) |
| MEDIAN WIDTH | N/A | N/A | No Median |
| LANE WIDTHS (thru lane -TL) - right turn - left turn - left turn adjacent to median | N/A | TL less 0.2m TL less 0.2m 3.0m min. | 3.50m 3.50m 3.25m |
| RIGHT TURN LANE - taper ratio or length - parallel length | N/A | 14:1 – 17:1 40 - 90m | 50m (h) 30m (h) |
| LEFT TURN LANE - taper ratio or length - parallel length | N/A | 15:1 – 42:1 50.4 – 62.2m | 100m (i) 30m (i) |
| R.O.W. WIDTH | N/A | 30 - 36m | 36m (j) |
| POSTED SPEED | N/A | 40 -50 km/h | 50 km/h (k) |



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- b) The Proposed Standards meet or exceed City of Hamilton Standards.
- c) Based on rolling topography for UAU DS 60km/hr roads. (Table 2.1.3.1 of TAC).
- d) Based on maximum superelevation rate of 0.06m/m. Minimum radius for reverse crown is 220m. Minimum radius for normal crown is 1290m (Table 2.1.2.4 of TAC).
- e) 1.5m bicycle lanes are proposed on both sides of the road from Dundas Street to the southern roundabout.
- f) A 5m boulevard will result in the sidewalks being approximately 1m from the ultimate property line.
- g) Sidewalk proposed on both sides of the road from Dundas Street to the southern roundabout.
- h) Based on MTO Geometric Design Standards for Ontario Highways, Table E7-1.
- i) Based on MTO Geometric Design Standards for Ontario Highways, Table E9-1.
- j) City of Hamilton Geometric Design Elements for Minor and Major Arterials specifies a right-of-way width of 30m - 36m. As this is a new development, it is recommended to protect for 36m right-of-way.
- k) A posted speed of 50km/hr is recommended in order to meet roadside safety clear zone requirements associated with planted boulevards, utility poles and illumination.
- l) Traffic islands have been introduced at the intersection of the Mid-Block Road and Dundas Street to prevent Northbound traffic from travelling past the intersection. Northbound traffic will be forced to turn east or west at Dundas Street.

TRAFFIC DATA:

| Location: | Distance Km | Existing AADT | 2021 AADT | % COMM |
|--|-------------|---------------|-----------|--------|
| Waterdown Road, From Hwy 403 to Mountain Brow Road | 2.4Km | 7,500 | 19,000 | 4% |
| Mountain Brow Road, From Waterdown Road to King Road | 1.6Km | 1,500 | 11,000 | 4% |
| Mid-Block Road, From Mountain Brow Road to Dundas Street | 0.9Km | N/A | 11,000 | 4% |

REMARKS:

1) Scope of Work

The Waterdown/Aldershot Transportation Master Plan identified the need for additional north-south capacity within the study area. The following improvements will be carried out as part of this project:

- a) Widening of Waterdown Road from Craven Avenue to Mountain Brow Road from a 2-lane section to a 4-lane urban



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- cross section with a west side multi-use asphalt pathway.
- b) Widening of Mountain Brow Road from Waterdown Road to Mid-Block Road to a 4-lane urban cross section with a north side multi-use asphalt pathway.
- c) Construction of a new north-south, 4-lane urban connection road (Mid-Block Road) from Mountain Brow Road to Dundas Street. This new road will have dedicated on-road bicycle lanes.

2) Limits of Project

In broad terms, the project limits are from Craven Avenue in the south to Dundas Street in the north. Specifically, the south project limit is the north leg of the future widened Craven Avenue intersection with Waterdown Road. The north project limit is the intersection between the new Mid-Block Road and Dundas Street. The project is situated in the City of Burlington and the City of Hamilton.

3) Adjacent Projects/History

- A number of residential developments are planned for this area as shown on the attached key plan. These are identified as Waterdown North, Upcountry and Waterdown South.
- The City of Burlington and MTO are finalizing a design to improve the interchange of Waterdown Road with Highway 403. As part of this work, North Service Road will be realigned to intersect Waterdown Road further north from its current location.

4) Property

Some sections along Waterdown Road already have a 30m road allowance. Property will likely be required at various locations throughout this corridor for grading purposes and to accommodate landscaping, utility poles and illumination. A property request plan will be generated that identifies specific property requirements.

Property will be required on the north and south sides along Mountain Brow Road in order to accommodate a 4-lane urban cross section. A property request plan will be generated that identifies specific property requirements.

A new 36m right-of way will be protected as part of the Waterdown South development process for the new Mid-Block connection Road.

5) Illumination

Full illumination will be provided throughout, as this will become an urban section with a multi-use pathway on the west side and a local sidewalk on the east side. As part of the detailed design, consideration should be given to the joint use of utility poles with luminaires for road lighting to reduce the amount of pole lines and potential obstacles on the roadside.

6) Traffic Signals

The existing traffic signals at Waterdown Road and North Service Road will be reconstructed as part of the City of Burlington and MTO's Highway 403/Waterdown Road interchange improvement project.

As part of this project, new traffic signals will be required at the following locations:

- Waterdown Road / Mountain Brow Road



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- Mid-Block Road / Dundas Street

7) Structures

It is expected that the following structural work will be required:

- Retaining walls will be required on the east side of Waterdown Road from approximately Station 40+240 to Station 40+500.
- Retaining walls will be required on the east side of Waterdown Road from approximately Station 42+180 to Station 42+300.
- A new structure will be required at the new Mid-Block Road crossing of Grindstone Creek, immediately south of Dundas Street. The type of structure, length of span, and size of opening are to be determined by the developer and verified by the project team.
- Extensions, replacement or new culverts may be required along Waterdown Road, Mountain Brow Road, and the new Mid-Block Road to ensure continued positive drainage.

8) Private/Commercial Entrances

There are a number of residential entrances along Waterdown Road and Mountain Brow Road. There are no commercial entrances. Of the residential entrances, two cannot be maintained due to the close proximity to the road and resulting driveway grade. These are the driveways to # 1917 Waterdown Road, # 2000 Waterdown Road. A proposal to relocate the #2000 driveway needs to be further assessed at the detailed design phase. All driveways must be maintained open at all times during construction.

9) Utilities

Several underground and above ground utilities will be impacted as a result of this project. The assessment of utility relocation requirements has been initiated; however, the following agencies will need to be contacted during the detailed design phase to arrange for (and review) their relocation design in support of the proposed works:

| Utility Agency | Contact Name | Phone Number |
|-------------------------------|---------------------|--------------------------|
| Horizon Utilities Corporation | Mr. Sam Zaghloul | (905) 522-6611 Ext. 2265 |
| Hydro One Networks Inc. | Mr. Brian McCormick | (416) 345-5000 |
| Burlington Hydro Inc. | Mr. Peter German | (905) 332-2348 |
| Fibrewired Burlington Hydro | Mr. Frank Lasowski | (905) 332-2255 |
| Union Gas | Mr. Brad Davies | (905) 548-3400, Ext. 604 |
| Enbridge Consumers Gas | Ms. Ann Newman | (519) 339-0503 |
| Cogeco Cable | Mr. Dave Watters | (905) 548-8004 |
| Bell Canada | Mr. Jing Dong | (905) 415-0602, Ext. 222 |

10) Pipe Lines

A Transcanada Pipeline crosses Waterdown Road south of Old Waterdown Road at approximately Station 41+660. This pipeline appears to be located in an easement through private residential property. No conflicts have been identified.



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11) Drainage

Drainage on Waterdown Road is generally conveyed via roadside ditches. A section of Waterdown Road from south of Old Waterdown Road to Mountain Brow Road has been urbanized (mountable curbs) and is equipped with a storm sewer/catchbasin system. The capacity of this sewer system will be reviewed to determine whether the existing sewer pipe can be used or needs to be replaced with a larger size pipe.

Drainage along Mountain Brow Road is also currently conveyed via roadside ditches. As part of the Waterdown South development, stormwater management ponds will be constructed to handle and treat runoff from the development. It is expected that SWM ponds will be sized to accept runoff from the new Mid-Block Road.

It is proposed to urbanize the entire corridor as part of this project. As such, drainage will be conveyed via a stormsewer/catchbasin system. Small roadside ditches may still be required in areas where the proposed road sits higher than the adjacent land. Stormwater management facilities will be required to address water quality and quantity issues.

12) Streetscaping and Urban Design

A preliminary streetscaping plan will be generated as part of this study. The plan will take into account the concept of clear zone safety, and will reflect any restrictions imposed by utility companies regarding location and height of trees in the vicinity of their power lines.

13) Environmental Assessment

This study has been prepared according to the requirements of the Municipal Class EA (June 2000). The proposed improvements are classified as a "Schedule C" project in the Municipal Class EA. An Environmental Study Report (ESR) will be prepared as part of this study.

14) Closures

Temporary road closures may be required during construction. A conceptual staging plan will be developed as part of this study and should be refined as part of the detailed design prior to construction. All Emergency Service providers are to be contacted during the design and construction phase to ensure they are aware of any potential temporary closures.



NO:

ROADWAY:

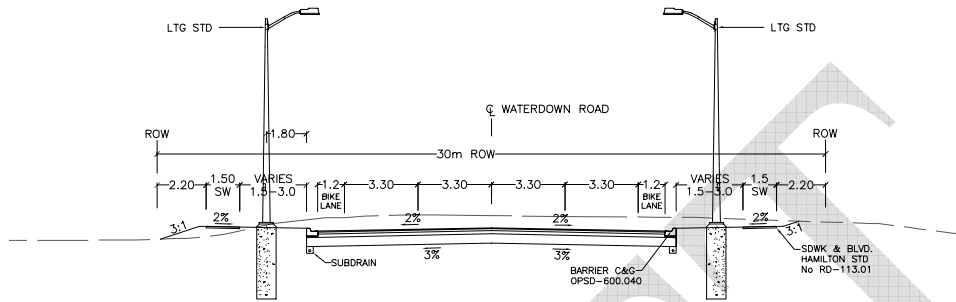
Waterdown Rd,
Mountain Brow Rd,
Mid-Block Rd

TYPE OF PROJECT: Preliminary Design

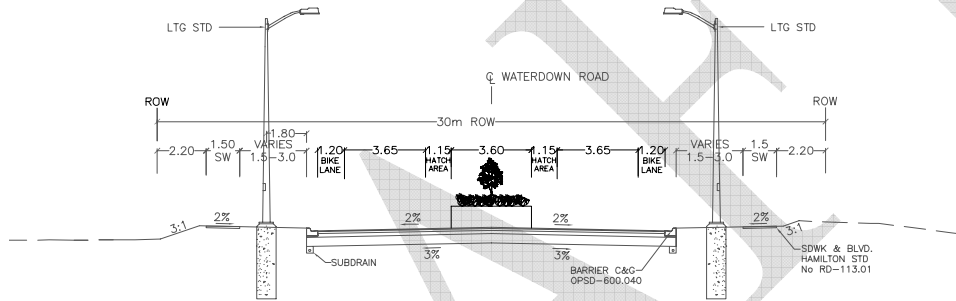
LENGTH:

4.5 km

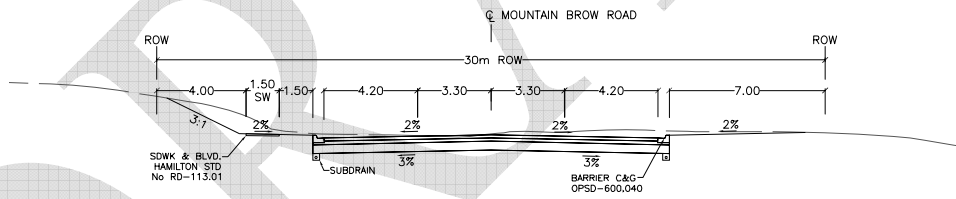
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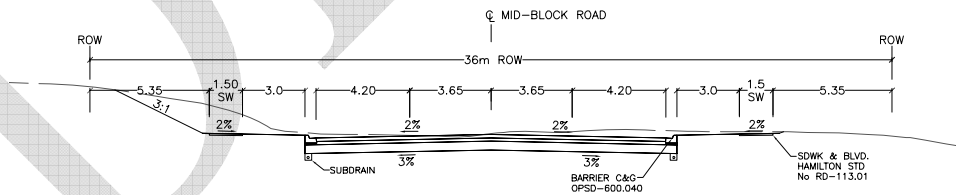
TYPICAL WATERDOWN ROAD URBAN SECTION
FROM NORTH SERVICE ROAD TO MOUNTAIN BROW ROAD



TYPICAL WATERDOWN ROAD 3-LANE INTERIM URBAN SECTION
FROM NORTH SERVICE ROAD TO MOUNTAIN BROW ROAD



TYPICAL MOUNTAIN BROW ROAD URBAN SECTION
FROM WATERDOWN ROAD TO MID BLOCK ROAD



TYPICAL MID-BLOCK ROAD URBAN SECTION
FROM MOUNTAIN BROW ROAD TO DUNDAS STREET

Typical Sections



NO:

ROADWAY:

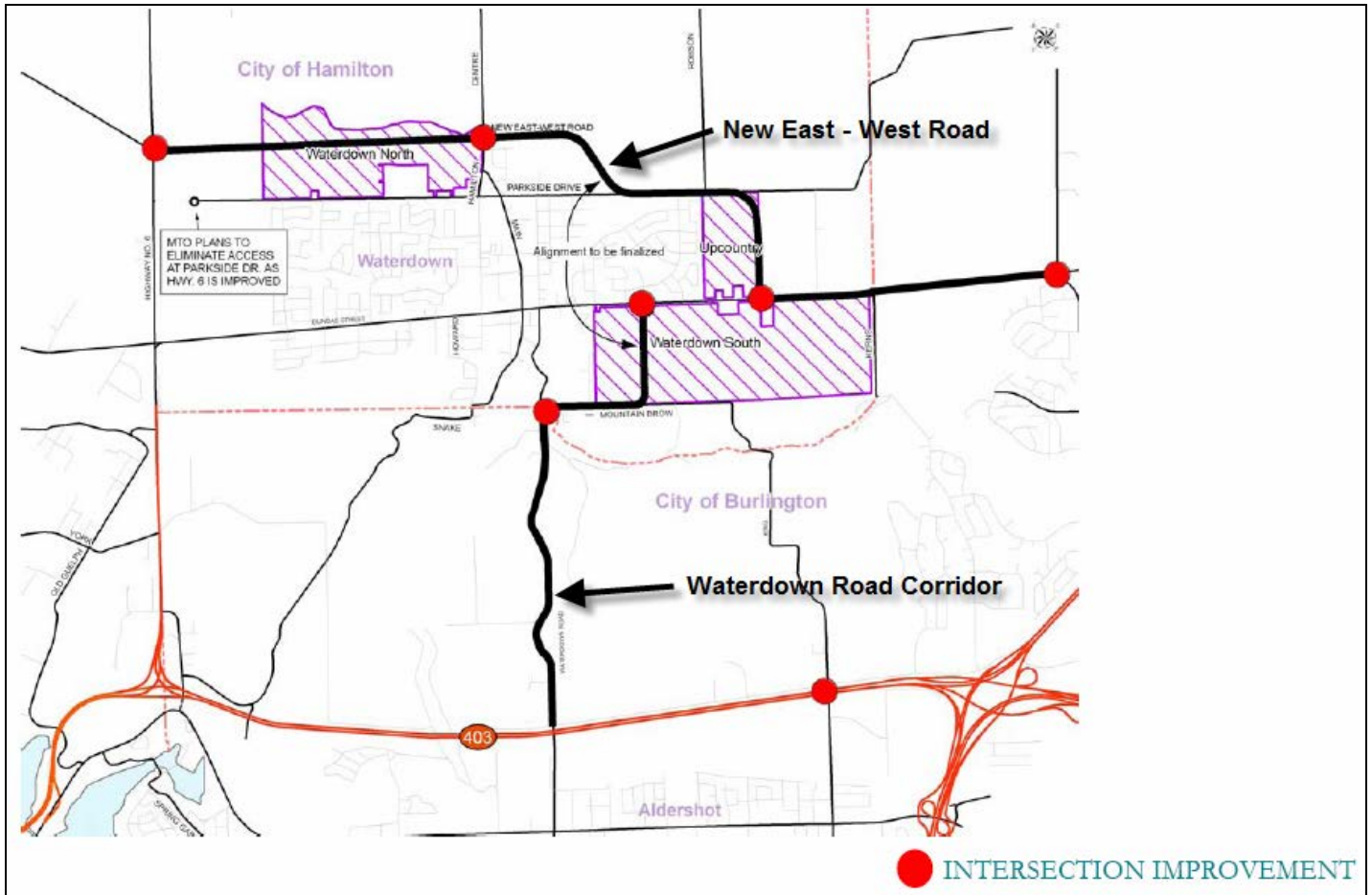
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Key Map