



MILLENNIUM LINE BROADWAY EXTENSION CONTROL SURVEY

The Millennium Line Broadway extension control survey was completed on January 23, 2018; the coordinate system is the same coordinate system as the previous Canada Line coordinate system.

Coordinate system.

The combined scale factor is based on two parts, an elevation scale factor and a projection scale factor. The elevation scale factor is based on an average project elevation of 50m. The projection scale factor is based on a UTM Easting of 491560.000 (Cambie & 37th).

Because the MLBE coordinate system is based on a vertical datum of 50m measured distances must be reduced to that datum to match the MLBE grid coordinates. To reduce measured horizontal distances to MLBE grid distances the measured distances must be multiplied by the following factor: (Where 6381084 is the average earth radius for the project and “EL” is the average elevation of the two points being measured.)

$$\frac{6381084}{6381084 + (EL - 50)}$$

Final UTM (HPN) coordinates were transformed to MLBE coordinate system using the following parameters.

ROTATION (UTM – MLBE):	0° 0' 0"
COMBINED SCALE FACTOR:	1.000407123789
NORTHING SHIFT:	-2420.4813
EASTING SHIFT:	-107.1140





1.0 Methodology

1.1 Phase One – GPS Framework Survey

The GPS survey used up to 6 Leica Viva GNSS or Leica System 1200 GNSS dual frequency GPS receivers running simultaneously during each data collection session. The Leica Viva and 1200 GNSS is a dual frequency GPS system with a baseline accuracy of 3mm + 0.5ppm. The GPS data from Vancouver Fire hall #1 maintained by the GVRD was also included for processing.

The Vancouver Fire hall #1 site was used for the processing of all data in Vancouver. A modified leapfrog method was used where a minimum of two of the mobile GPS units remained stationary for at least two sessions. The GPS session recording time was started when the last GPS receiver was turned on and recording lasted a minimum of 45 minutes. All GPS points have double occupancy collected at a different time of day to have different satellite geometry.

The GPS survey included 6 Canada line monuments, RTP 2209 from the Millennium Line and two HPN monuments GCM 611681 and GCM 535369

And Millennium Line Broadway extension monuments, MLBE1, MLBE4, MLBE7, MLBE8, MLBE11, MLBE13, MLBE14, MLBE19, MLBE21, MLBE25, MLBE30, MLBE32, MLBE35, MLBE37, MLBE40

1.2 Phase Two – horizontal control Survey with a precise total station

To coordinate monuments where GPS collection is not possible and establish coordinates for the 200 metre densification monuments a precise conventional traverse was run along the entire route. A Leica TS50 robotic total station was used to measure 4 sets of angles from every monument along the route to the adjacent monuments. The data from this traverse includes horizontal angles, vertical angles, and slope distances. The angular accuracy of the TS50 is 0.5 seconds for angles and 0.6mm + 1ppm for distances. The resulting files were compiled for the entire route and entered into the MicroSurvey STAR Net 9 software for the subsequent least squares adjustment.

1.3 Phase Three – Vertical control Survey Level loops

To establish precise elevations for the MLBE monuments a vertical control survey was performed using a Leica DNA03 digital level. The DNA03 is an electronic level with a standard deviation of 0.3mm per kilometer. A Leica barcoded invar staff (GPCL3) was used for the leveling to ensure the highest accuracy possible. Closed leveling loops were run through all of the MLBE monuments, 4 Canada line monuments on the Cambie Street corridor and through 2 of the GVRD HPN first order benchmarks that were spread throughout the project area. Level loop closers were reduced within the LEICA Geo Office 8.4 software.



1.4 Adjustments

1.4.1 GPS Adjustments

The least squares adjustment routine within Leica Geo Office 8.4 Processing kernel MOVE3 4.1 was used for the adjustment. A Minimally constrained adjustment was performed holding Vancouver ACP Fire hall #1. The results of the GPS adjustment were then used as the basis for the following horizontal control adjustment.

1.4.2 Horizontal Control Adjustments

The coordinates and standard deviations from the GPS adjustment were imported into MicroSurvey STAR Net 9 software for the adjustment of TS50 measurements. A weight constrained adjustment was performed on these measurements using the standard deviations for GPS coordinates that were provided by the GPS adjustment. The weight constrained adjustment is necessary to ensure that TS50 measurements (angles and distances) would be held fixed for short distances while the GPS observations would effectively be held for longer distances. This methodology is necessary because GPS measurements are less accurate than conventional measurements over short distances but considerably more accurate over long distances.

1.4.3 Electronic Level Adjustments

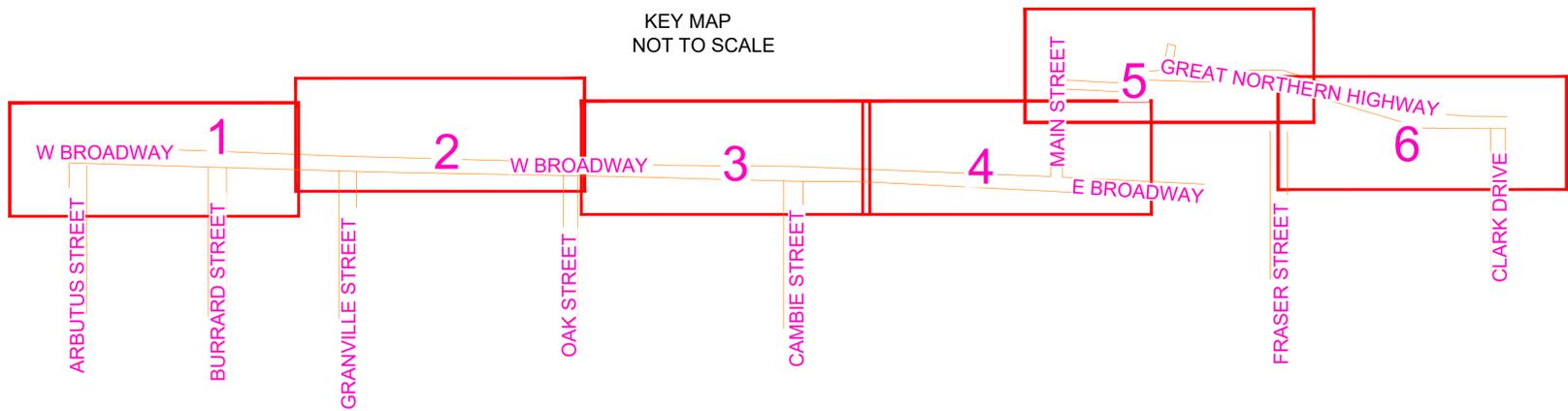
Digital level data was entered into LEICA Geo Office 8.4 software. Level loop closers were reduced holding one fixed benchmark then analyzed to the published Elevations of the 4 Canada line monuments and 2 HPN Monuments to determine if settlement has affected the benchmarks it was determined that holding Canada Line Monument RAVP318 with Published Elevation of 13.813m would be the best Elevation Match to the previous Canada Line Elevations.

McElhanney ANS/D - 16-05-22

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KEY MAP
NOT TO SCALE



LEGEND

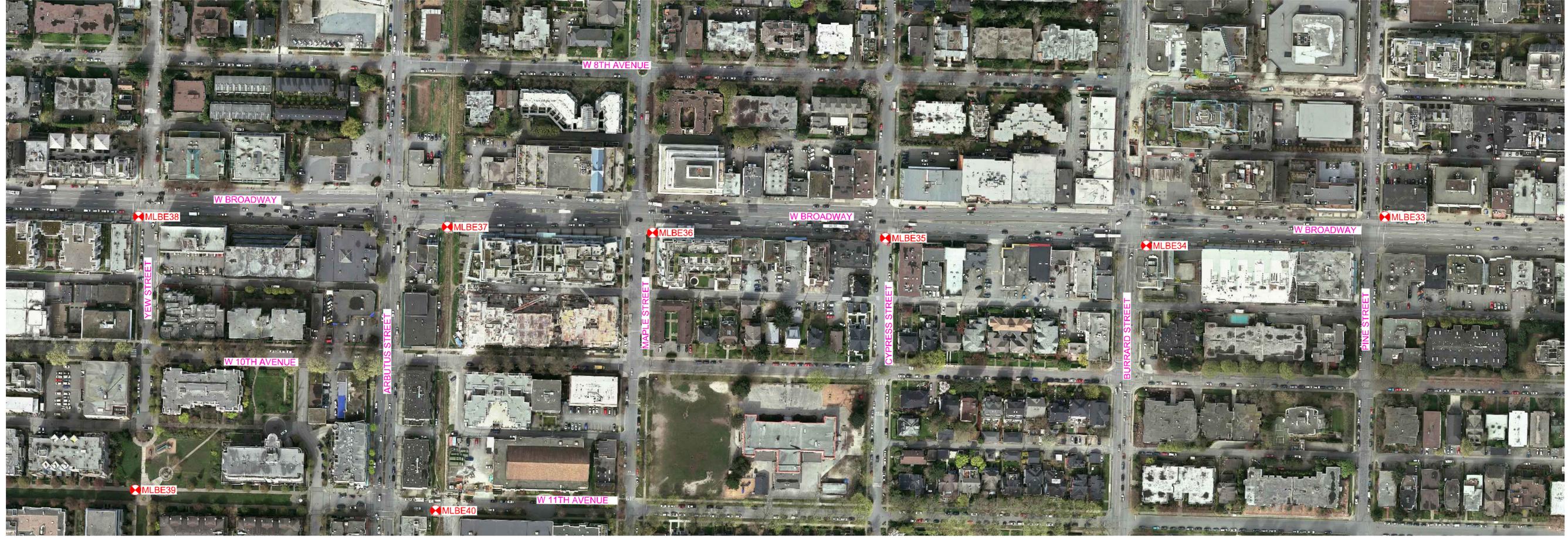


CONTROL POINT - SURVEY COMPLETED ON JANUARY 23RD, 2018.

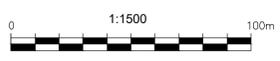
NOTES:

- THE COORDINATES FOR THE MLBE PROJECT ARE A LOCAL COORDINATE SYSTEM BASED UPON A DATUM 50m ABOVE SEA LEVEL. DRAWING DIMENSIONS EQUAL GROUND DISTANCES. FOR PRECISE SURVEY LAYOUT AND MEASUREMENTS, CORRECT DISTANCES TO AN ELEVATION 50m ABOVE SEA LEVEL. THE COORDINATE SYSTEM IS REFERENCED BY A SERIES OF MLBE MONUMENTS WITH X, Y, Z COORDINATE VALUES AND LOCATION DESCRIPTIONS.
TO CONVERT COORDINATES FROM UTM TO MLBE
FIRST, MULTIPLY BY COMBINED SCALE FACTOR OF 1.000407123789.
THEN, APPLY THE FOLLOWING SHIFT:
NORTHING=-2420.4813m
EASTING=-107.114m
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- THIS PLAN REPRESENTS FIELD SURVEY COMPLETED ON JANUARY 23, 2018.

SURVEY CONTROL RESULTS					
MONUMENT NO.	TABLET MARKING	NORTHING	EASTING	ELEVATION	DESCRIPTION
33	MLBE33	5456590.490	489669.360	33.887	BRASS CAP COUNTESUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND PINE ST
34	MLBE34	5456570.273	489499.898	36.019	BRASS CAP COUNTESUNK IN SIDEWALK - SE CORNER OF W BROADWAY AND BURRARD ST
35	MLBE35	5456575.632	489314.373	38.364	BRASS CAP COUNTESUNK IN SIDEWALK - SE CORNER OF W BROADWAY AND CYPRESS ST
36	MLBE36	5456579.417	489148.918	40.590	BRASS CAP COUNTESUNK IN SIDEWALK - SE CORNER OF W BROADWAY AND MAPLE ST
37	MLBE37	5456583.503	489002.991	38.932	BRASS CAP COUNTESUNK IN SIDEWALK - SE CORNER OF W BROADWAY AND ARBUTUS ST
38	MLBE38	5456590.730	488783.654	35.915	BRASS CAP COUNTESUNK IN SIDEWALK - SW CORNER OF W BROADWAY AND YEW ST
39	MLBE39	5456397.141	488781.344	35.003	BRASS CAP COUNTESUNK IN SIDEWALK - NW CORNER OF W 11TH AVENUE AND YEW ST
40	MLBE40	5456382.480	488994.706	40.518	BRASS CAP COUNTESUNK IN SIDEWALK - SE CORNER OF W 11TH AVENUE AND ARBUTUS ST



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ORIGINAL DWG SIZE: ANSI D (22" x 34")
ALL DIMENSIONS ARE IN METRES



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**MILLENNIUM LINE BROADWAY EXTENSION
CONTROL SURVEY**

SHEET 1 OF 6
VANCOUVER BC

Drawing No.		V-01	
Project Number	Rev.	2113-03485-00	1

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

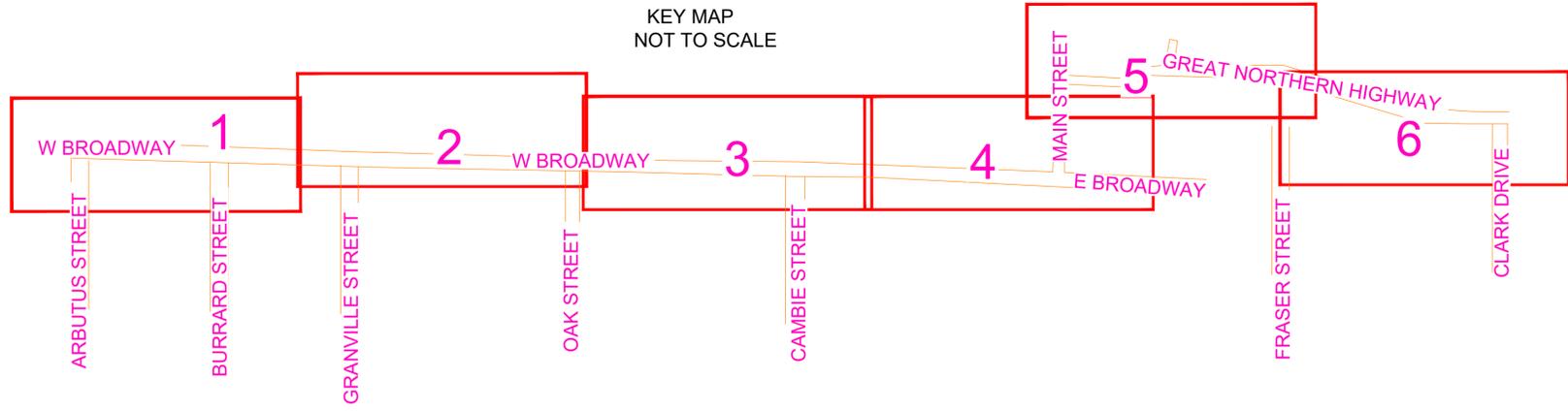
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1

KEY MAP
NOT TO SCALE



LEGEND

CONTROL POINT - SURVEY COMPLETED ON JANUARY 23RD, 2018.

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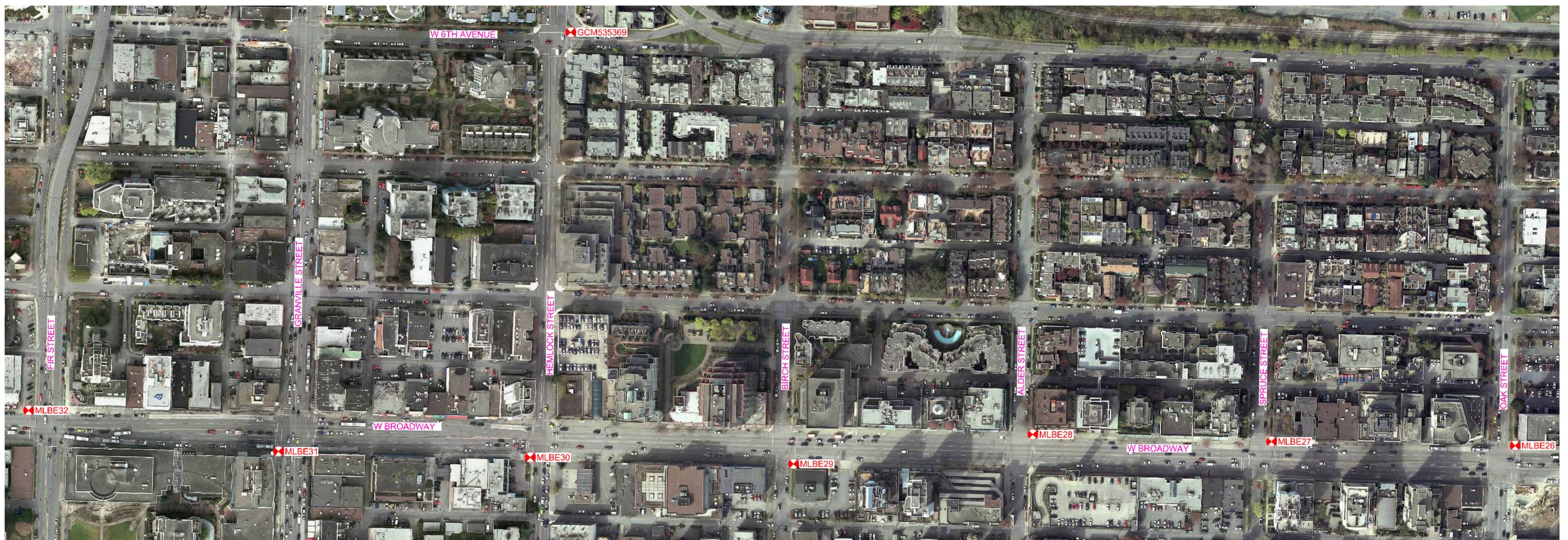
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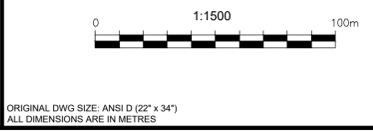
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SURVEY CONTROL RESULTS					
MONUMENT NO.	TABLET MARKING	NORTHING	EASTING	ELEVATION	DESCRIPTION
26	MLBE26	5456561.075	490892.783	41.300	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND OAK ST
27	MLBE27	5456563.954	490716.546	44.831	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND SPRUCE ST
28	MLBE28	5456569.068	490543.909	47.101	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND ALDER ST
29	MLBE29	5456547.826	490370.873	46.822	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W BROADWAY AND BIRCH ST
30	MLBE30	5456552.558	490180.441	40.736	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF W BROADWAY AND HEMLOCK ST
31	MLBE31	5456556.790	489998.388	41.774	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF W BROADWAY AND GRANVILLE ST
32	MLBE32	5456586.440	489817.583	37.285	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W BROADWAY AND FIR ST
535369	GCM535369	5456859.165	490209.678	24.055	MONUMENT WITH VALVE COVER IN THE TRAFFIC ISLAND - NE CORNER OF W 6TH AVENUE AND HEMLOCK ST



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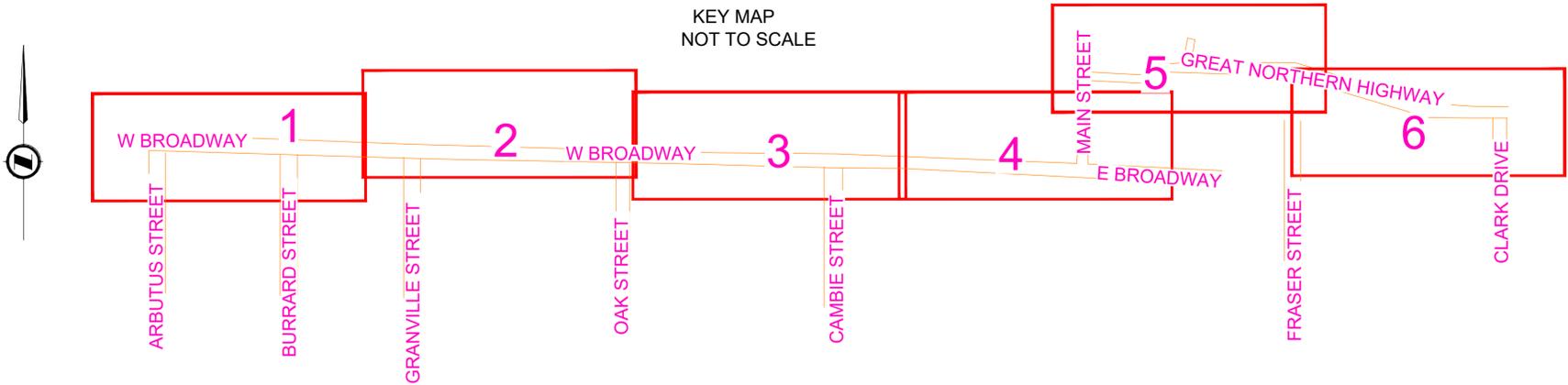
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**MILLENIUM LINE BROADWAY EXTENSION
CONTROL SURVEY**
SHEET 2 OF 6
VANCOUVER
BC

Drawing No. **V-01**
Project Number 2113-03485-00
Rev. 1

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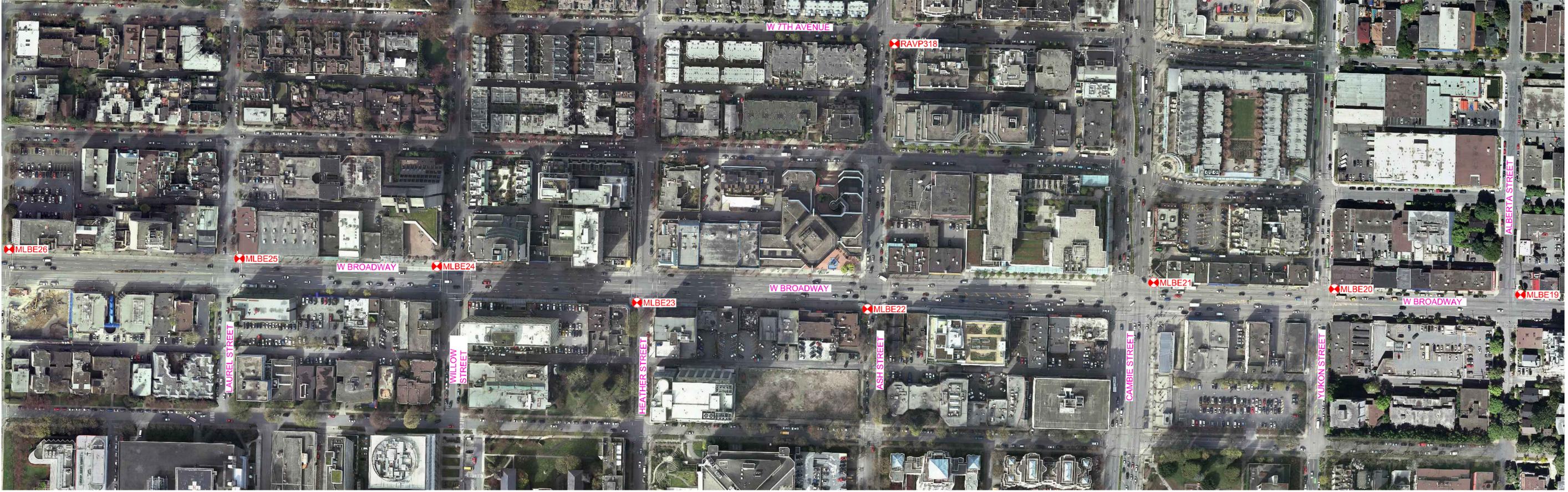


LEGEND

CONTROL POINT - SURVEY COMPLETED ON JANUARY 23RD, 2018.

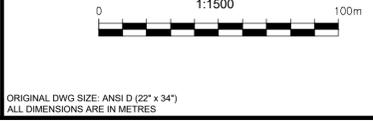
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MONUMENT NO.	TABLET MARKING	NORTHING	EASTING	ELEVATION	DESCRIPTION
20	MLBE20	5456531.266	491889.316	22.146	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND YUKON ST
21	MLBE21	5456536.107	491753.370	22.983	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND CAMBIE ST
22	MLBE22	5456516.304	491538.211	25.944	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND ASH ST
23	MLBE23	5456521.022	491364.955	29.201	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF W BROADWAY AND HEATHER ST
24	MLBE24	5456548.383	491214.334	32.327	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W BROADWAY AND WILLOW ST
25	MLBE25	5456554.065	491065.914	36.020	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W BROADWAY AND LAUREL ST
26	MLBE26	5456561.075	490892.783	41.300	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND OAK ST
318	RAVP318	5456715.161	491558.552	13.813	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W 7TH AVENUE AND ASH ST



Rev	Date	Description	Surv	Drawn	App'd
1	2018-02-02	UPDATED ELEVATIONS	AK/RS	DI	EN
0	2018-01-29	ISSUED FOR INITIAL SUBMISSION	AK/RS	DI	EN

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**MILLENIUM LINE BROADWAY EXTENSION
CONTROL SURVEY**
SHEET 3 OF 6
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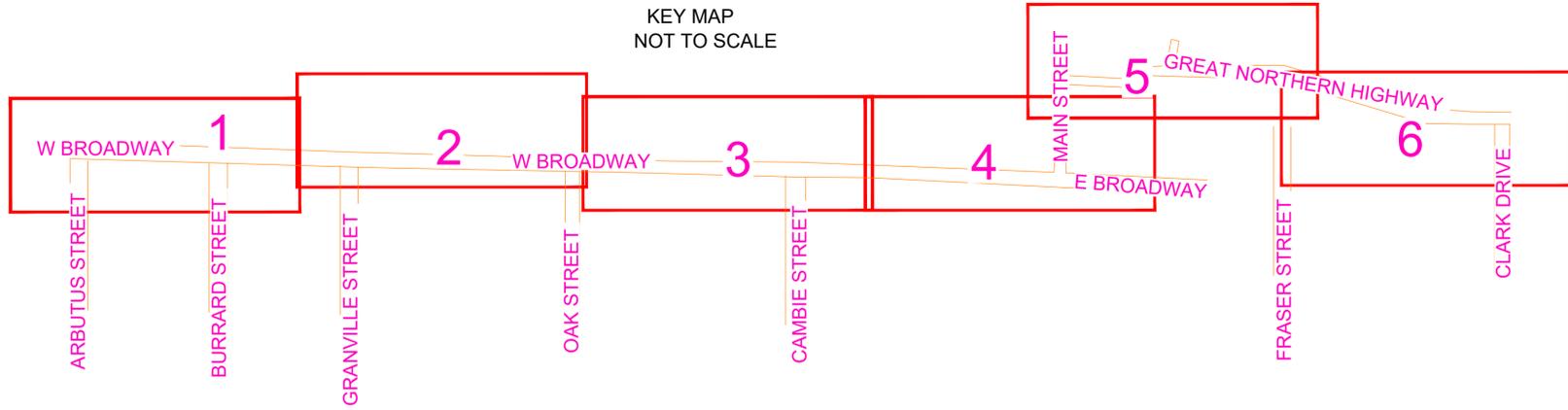
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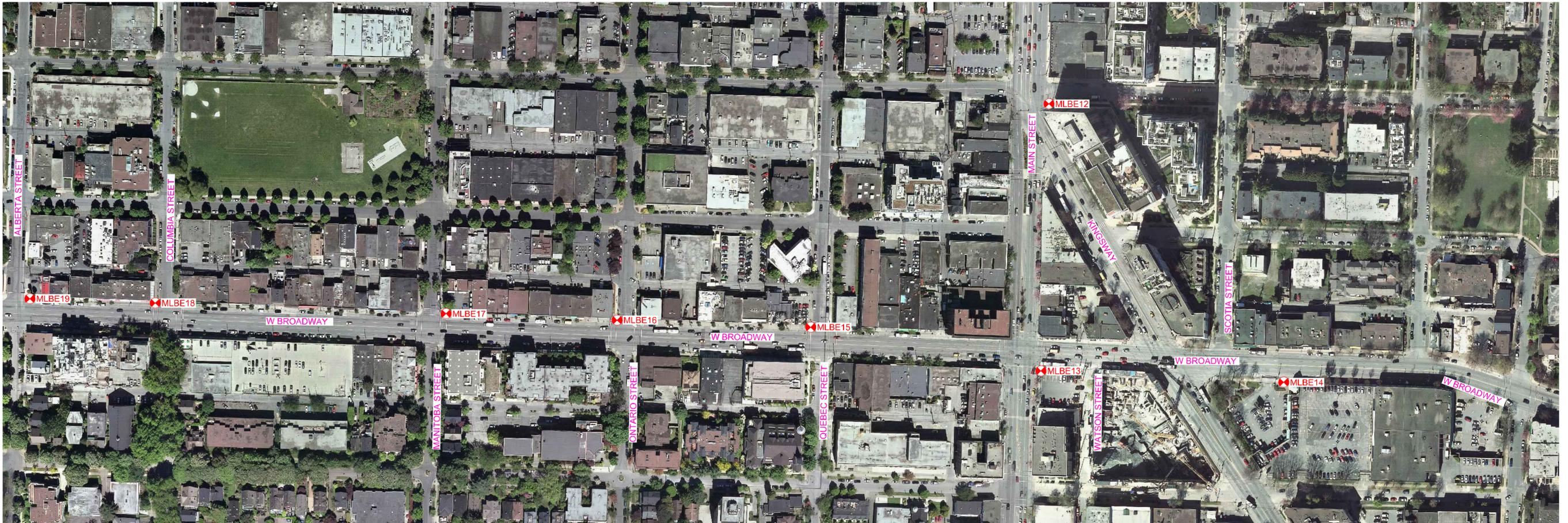
KEY MAP
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LEGEND

CONTROL POINT - SURVEY COMPLETED ON JANUARY 23RD, 2018.

SURVEY CONTROL RESULTS					
MONUMENT NO.	TABLET MARKING	NORTHING	EASTING	ELEVATION	DESCRIPTION
12	MLBE12	5456667.793	492767.022	34.359	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W 7TH AVENUE AND MAIN ST
13	MLBE13	5456474.945	492761.269	38.943	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF E BROADWAY AND MAIN ST
14	MLBE14	5456466.659	492937.059	37.589	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF E BROADWAY AND KINGSWAY
15	MLBE15	5456506.514	492594.581	38.691	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF E BROADWAY AND QUEBEC ST
16	MLBE16	5456511.584	492454.447	33.674	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W BROADWAY AND ONTARIO ST
17	MLBE17	5456516.222	492330.608	28.456	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND MANITOBA ST
18	MLBE18	5456523.950	492120.070	23.964	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W BROADWAY AND COLUMBIA ST
19	MLBE19	5456527.082	492029.308	22.716	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND ALBERTA ST



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CONTROL SURVEY**
SHEET 4 OF 6
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BC

Drawing No.

V-01

Project Number
2113-03485-00

Rev.
1

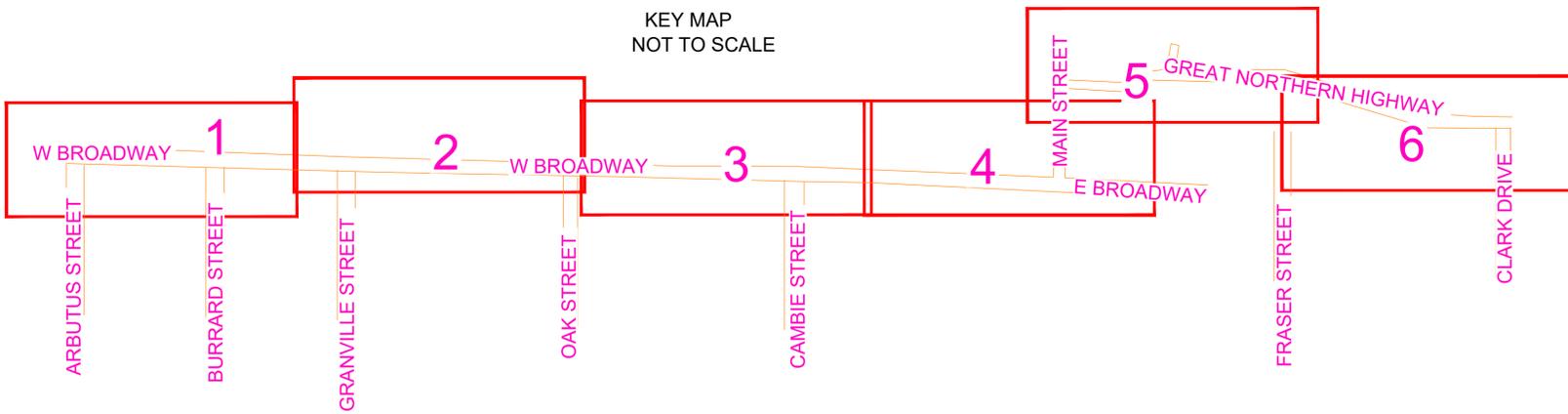
DESTROY ALL PRINTS BEARING PREVIOUS REVISION

McElhanney ANS/D - 16-05-22

DATE: 2018-02-02, 13:53 FILE: N:\Projects\3400_Series\Skytrain-UBC Control\100 DRAWINGS\101_Civil_3D Files\103485-00-1-01-RL.dwg



KEY MAP
NOT TO SCALE



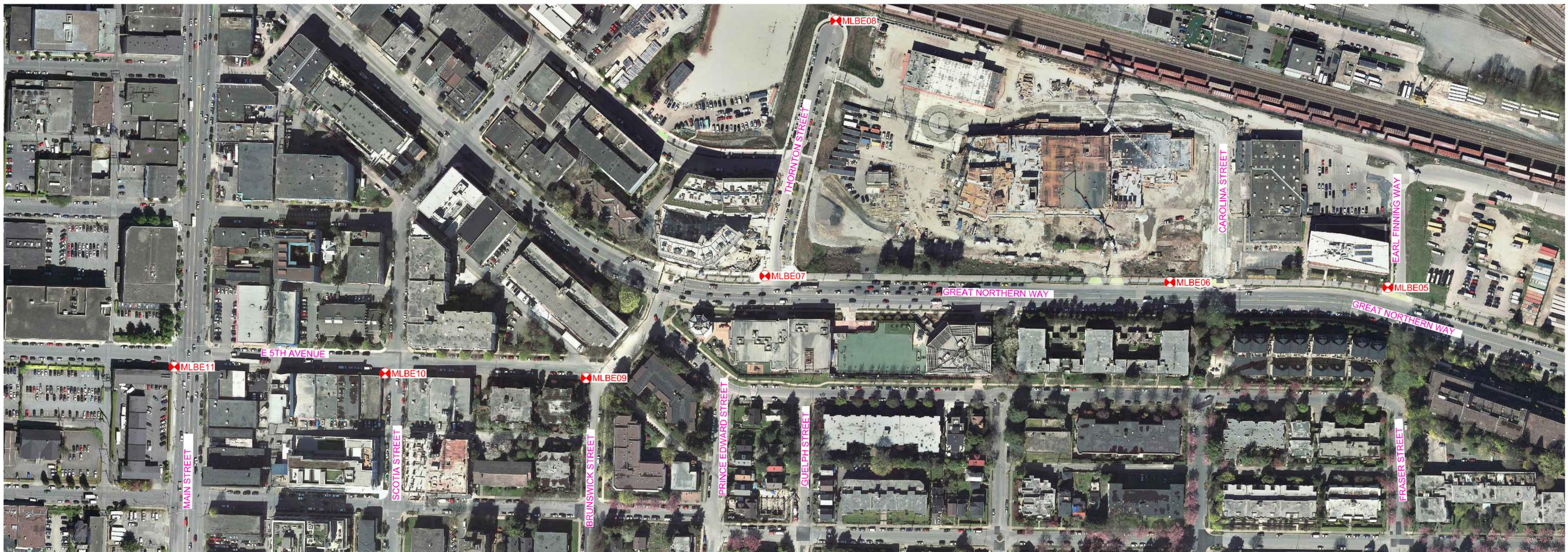
LEGEND

CONTROL POINT - SURVEY COMPLETED ON JANUARY 23RD, 2018.

NOTES:

- THE COORDINATES FOR THE MLBE PROJECT ARE A LOCAL COORDINATE SYSTEM BASED UPON A DATUM 50m ABOVE SEA LEVEL. DRAWING DIMENSIONS EQUAL GROUND DISTANCES FOR PRECISE SURVEY LAYOUT AND MEASUREMENTS. CORRECT DISTANCES TO AN ELEVATION 50m ABOVE SEA LEVEL. THE COORDINATE SYSTEM IS REFERENCED BY A SERIES OF MLBE MONUMENTS WITH X, Y, Z COORDINATE VALUES AND LOCATION DESCRIPTIONS.
TO CONVERT COORDINATES FROM UTM TO MLBE
FIRST, MULTIPLY BY COMBINED SCALE FACTOR OF 1.000407123789.
THEN, APPLY THE FOLLOWING SHIFT:
NORTHING=-2420.4813m
EASTING=-107.114m
TO CONVERT COORDINATES FROM MLBE TO UTM
FIRST, APPLY THE FOLLOWING SHIFT:
NORTHING=+2420.4813m
EASTING=+107.114m
THEN, DIVIDE BY THE COMBINED SCALE FACTOR OF 1.000407123789.
- ELEVATIONS ARE IN METRES AND ARE BASED ON THE HIGH PRECISION NETWORK (HPN) GEODETIC DATUM AND RAVP MONUMENTS.
- THIS PLAN REPRESENTS FIELD SURVEY COMPLETED ON JANUARY 23, 2018.

SURVEY CONTROL RESULTS					
MONUMENT NO.	TABLET MARKING	NORTHING	EASTING	ELEVATION	DESCRIPTION
5	MLBE05	5456926.614	493605.340	4.379	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF GREAT NORTHERN WAY AND EARL FINNING WAY
6	MLBE06	5456930.305	493451.013	5.299	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF GREAT NORTHERN WAY AND CAROLINA ST
7	MLBE07	5456934.771	493164.307	13.358	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF CENTRAL VALLEY GREENWAY AND THORNTON ST
8	MLBE08	5457114.823	493214.421	6.688	BRASS CAP COUNTERSUNK IN SIDEWALK - NORTH END OF THORNTON ST
9	MLBE09	5456862.872	493037.609	21.978	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF E 5TH AVENUE AND BRUNSWICK ST
10	MLBE10	5456866.010	492895.361	21.864	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF E 5TH AVENUE AND SCOTIA ST
11	MLBE11	5456870.651	492746.126	24.493	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF E 5TH AVENUE AND MAIN ST



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ORIGINAL DWG SIZE: ANSI D (22" x 34")
ALL DIMENSIONS ARE IN METRES



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858 Beatty Street
Vancouver BC
Canada V6B 1C1
Tel 604 683 8521

Approved Sealed

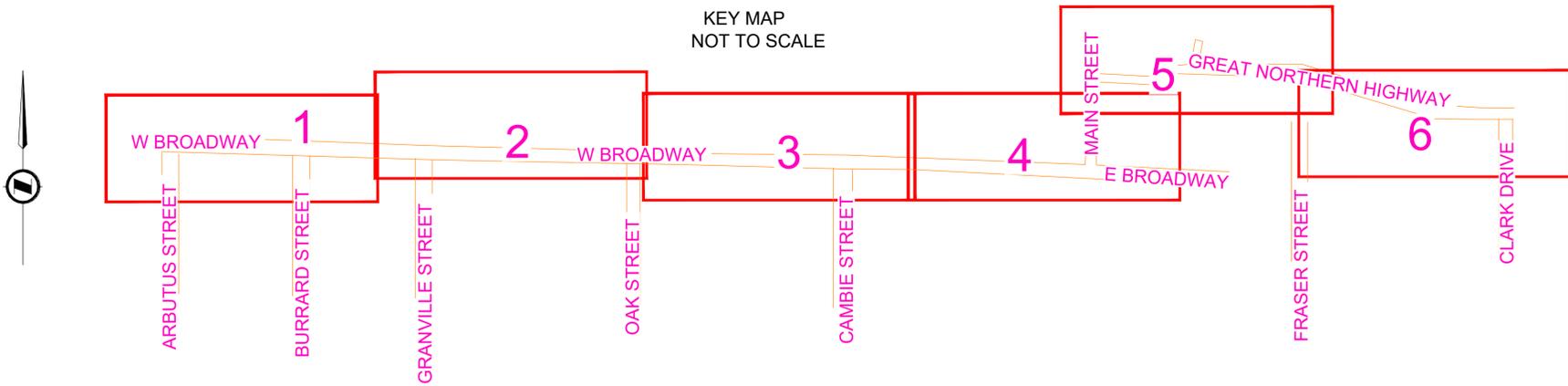
STANTEC
111 DUNSMUIR STREET #1100, VANCOUVER BC
**MILLENIUM LINE BROADWAY EXTENSION
CONTROL SURVEY**
SHEET 5 OF 6
VANCOUVER
BC

Drawing No. V-01	
Project Number 2113-03485-00	Rev. 1

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

McElhanney ANS/D - 16-05-22

DATE: 2018-02-02, 13:51 FILE: N:\Projects\3400_SantaFe-Skytrain_LBC_Contract\10.0_DRAWINGS\10.1_Civil_3D_Files\03485-00-1-01-RL.dwg

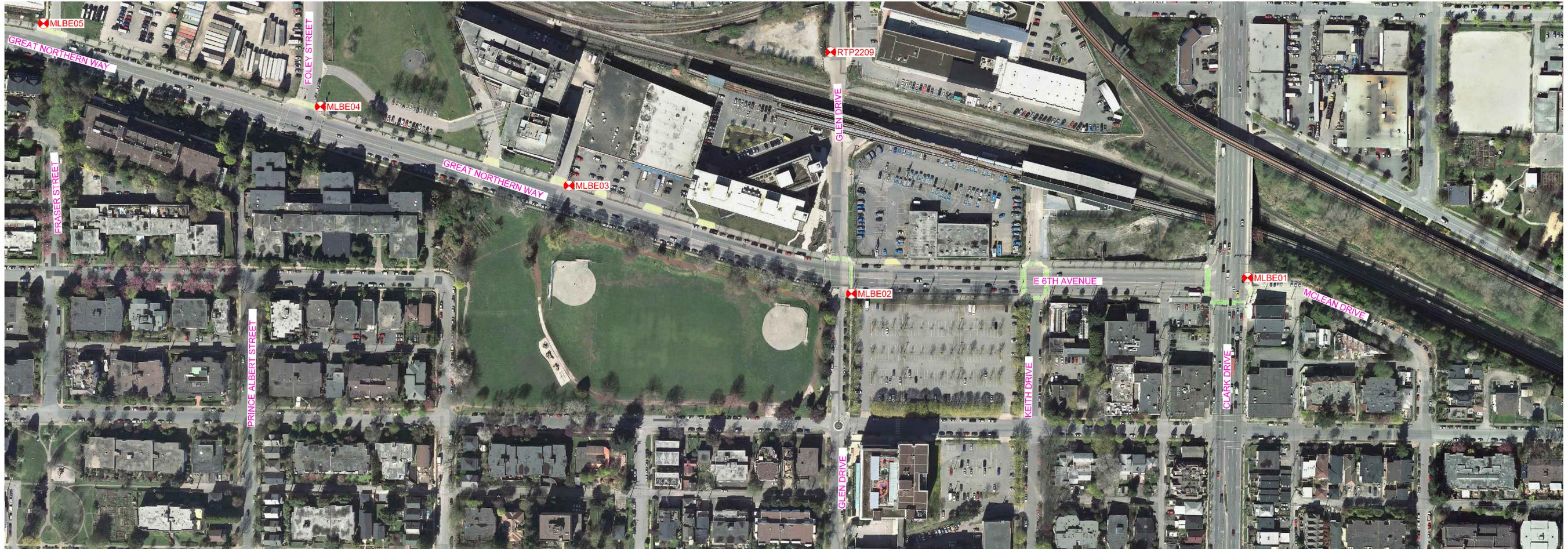


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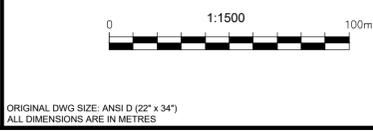
CONTROL POINT - SURVEY COMPLETED ON JANUARY 23RD, 2018.

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 - THIS PLAN REPRESENTS FIELD SURVEY COMPLETED ON JANUARY 23, 2018.

SURVEY CONTROL RESULTS					
MONUMENT NO.	TABLET MARKING	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	MLBE01	5456744.172	494471.033	21.332	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF CLARK DRIVE AND MCLEAN DRIVE
2	MLBE02	5456732.810	494186.250	5.559	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF E 6TH AVENUE AND GLEN DRIVE
3	MLBE03	5456810.278	493983.197	5.183	BRASS CAP COUNTERSUNK IN SIDEWALK - NORTH SIDE OF THE STREET, IN FRONT OF 887 GREAT NORTHERN WAY
4	MLBE04	5456866.886	493804.344	5.195	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF GREAT NORTHERN WAY AND FOLEY ST
5	MLBE05	5456926.614	493605.340	4.379	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF GREAT NORTHERN WAY AND EARL FINNING WAY
2209	RTP2209	5456905.935	494171.286	4.757	BRASS CAP COUNTERSUNK IN SIDEWALK - NORTH PART OF THE STREET, IN FRONT OF 2010 GLEN DRIVE



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McElhanney
McElhanney Consulting Services Ltd.

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Vancouver BC
Canada V6B 1C1
Tel 604 683 8521

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111 DUNSMUIR STREET #1100, VANCOUVER BC

**MILLENNIUM LINE BROADWAY EXTENSION
CONTROL SURVEY**
SHEET 6 OF 6
VANCOUVER
BC

Drawing No.	V-01
Project Number	2113-03485-00
Rev.	1

1

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

McELHANNEY CONSULTING SERVICES LTD.
 MLBE - SURVEY CONTROL COORDINATES

Rev 1

COORDINATE TRANSFORMATION PARAMETERS

MLBE coordinate system is based on a vertical datum of 50m same coordinate system as RAVP

ROTATION (UTM – MLBE)	0°0'0"	COMBINED SCALE FACTOR	1.000407123789	NORTHING SHIFT	-2420.4813	EASTING SHIFT	-107.114
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EXAMPLE	POINT	MLBE LOCAL- NORTHING	MLBE LOCAL - EASTING	UTM10 NAD83 CSRS -NORTHING	UTM10 NAD83 CSRS - EASTING
	EXAMPLE	MLBE04	5456866.886	493804.344	5457065.666
	MLBE37	5456583.503	489002.991	5456782.398	488911.057

MONUMENT NO.	TABLET MARKING	MLBE LOCAL- NORTHING	MLBE LOCAL - EASTING	ELEVATION	DESCRIPTION
1	MLBE01	5456744.172	494471.033	21.332	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF CLARK DRIVE AND MCLEAN DRIVE
2	MLBE02	5456732.810	494186.250	5.559	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF E 6TH AVENUE AND GLEN DRIVE
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6	MLBE06	5456930.305	493451.013	5.299	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF GREAT NORTHERN WAY AND CAROLINA ST
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8	MLBE08	5457114.823	493214.421	6.688	BRASS CAP COUNTERSUNK IN SIDEWALK - NORTH END OF THORNTON ST
9	MLBE09	5456862.872	493037.609	21.978	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF E 5TH AVENUE AND BRUNSWICK ST
10	MLBE10	5456866.010	492895.361	21.864	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF E 5TH AVENUE AND SCOTIA ST
11	MLBE11	5456870.651	492746.126	24.493	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF E 5TH AVENUE AND MAIN ST
12	MLBE12	5456667.793	492767.022	34.359	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W 7TH AVENUE AND MAIN ST
13	MLBE13	5456474.945	492761.269	38.943	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF E BROADWAY AND MAIN ST
14	MLBE14	5456466.659	492937.059	37.589	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF E BROADWAY AND KINGSWAY
15	MLBE15	5456506.514	492594.581	38.691	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF E BROADWAY AND QUEBEC ST
16	MLBE16	5456511.584	492454.447	33.674	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W BROADWAY AND ONTARIO ST
17	MLBE17	5456516.222	492330.608	28.456	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND MANITOBA ST
18	MLBE18	5456523.950	492120.070	23.964	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W BROADWAY AND COLUMBIA ST
19	MLBE19	5456527.082	492029.308	22.716	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND ALBERTA ST
20	MLBE20	5456531.266	491889.316	22.146	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND YUKON ST
21	MLBE21	5456536.107	491753.370	22.983	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND CAMBIE ST
22	MLBE22	5456516.304	491538.211	25.944	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND ASH ST
23	MLBE23	5456521.022	491364.955	29.201	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF W BROADWAY AND HEATHER ST
24	MLBE24	5456548.383	491214.334	32.327	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W BROADWAY AND WILLOW ST
25	MLBE25	5456554.065	491065.914	36.020	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W BROADWAY AND LAUREL ST
26	MLBE26	5456561.075	490892.783	41.300	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND OAK ST
27	MLBE27	5456563.954	490716.546	44.831	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND SPRUCE ST
28	MLBE28	5456569.068	490543.909	47.101	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND ALDER ST
29	MLBE29	5456547.826	490370.873	46.822	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W BROADWAY AND BIRCH ST
30	MLBE30	5456552.558	490180.441	40.736	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF W BROADWAY AND HEMLOCK ST
31	MLBE31	5456556.790	489998.388	41.774	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF W BROADWAY AND GRANVILLE ST
32	MLBE32	5456586.440	489817.583	37.285	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W BROADWAY AND FIR ST
33	MLBE33	5456590.490	489669.360	33.887	BRASS CAP COUNTERSUNK IN SIDEWALK - NE CORNER OF W BROADWAY AND PINE ST
34	MLBE34	5456570.273	489499.898	36.019	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W BROADWAY AND BURRARD ST
35	MLBE35	5456575.632	489314.373	38.364	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W BROADWAY AND CYPRESS ST
36	MLBE36	5456579.417	489148.918	40.590	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W BROADWAY AND MAPLE ST
37	MLBE37	5456583.503	489002.991	38.932	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W BROADWAY AND ARBUTUS ST
38	MLBE38	5456590.730	488783.654	35.915	BRASS CAP COUNTERSUNK IN SIDEWALK - SW CORNER OF W BROADWAY AND YEW ST
39	MLBE39	5456397.141	488781.344	35.003	BRASS CAP COUNTERSUNK IN SIDEWALK - NW CORNER OF W 11TH AVENUE AND YEW ST
40	MLBE40	5456382.480	488994.706	40.518	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W 11TH AVENUE AND ARBUTUS ST
318	RAVP318	5456715.161	491558.552	13.813	BRASS CAP COUNTERSUNK IN SIDEWALK - SE CORNER OF W 7TH AVENUE AND ASH ST
2209	RTP2209	5456905.935	494171.286	4.757 Rev 1	BRASS CAP COUNTERSUNK IN SIDEWALK - NORTH PART OF THE STREET, IN FRONT OF 2010 GLEN DRIVE
535369	GCM535369	5456859.165	490209.678	24.055 Rev 1	MONUMENT WITH VALVE COVER IN TRAFFIC ISLAND - NE CORNER OF W 6TH AVENUE AND HEMLOCK ST

MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: RAVP318		Tablet Marking: 318
Type of Monument: Brass Cap		
Northing: 5456715.161	Easting: 491558.552	Elevation: 13.813
Description: Brass Cap countersunk in sidewalk – SE corner of W 7 th Avenue and Ash Street.		



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: RTP2209		Tablet Marking: RTP2209	
Type of Monument: Brass Cap			
Northing: 5456905.935		Easting: 494171.286	
Elevation: 4.757			
Description: Brass Cap countersunk in sidewalk – North part of the street, in front of 2010 Glen Drive.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: GCM535369		Tablet Marking: GCM535369	
Type of Monument: Monument with valve cover			
Northing: 5456859.165		Easting: 490209.678	Elevation: 24.055
Description: Monument with valve cover in the traffic island – NE corner of W 6 th Avenue and Hemlock Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE1		Tablet Marking: MLBE1	
Type of Monument: Brass Cap			
Northing: 5456744.172	Easting: 494471.033	Elevation: 21.332	
Description: Brass Cap in sidewalk – NW corner at Clark Drive and E 6 th Avenue.			



MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE2		Tablet Marking: MLBE2	
Type of Monument: Brass Cap			
Northing: 5456732.810		Easting: 494186.250	
Elevation: 5.559			
Description: Brass Cap in sidewalk – SE corner at Great Northern Way and Glen Drive.			



MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE3		Tablet Marking: MLBE3	
Type of Monument: Brass Cap			
Northing: 5456810.278		Easting: 493983.197	Elevation: 5.183
Description: Brass Cap in sidewalk –Great Northern Way.			



MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE4		Tablet Marking: MLBE4	
Type of Monument: Brass Cap			
Northing: 5456866.886		Easting: 493804.344	
Elevation: 5.195			
Description: Brass Cap in sidewalk –NE corner at Great Northern Way and Foley Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE5		Tablet Marking: MLBE5	
Type of Monument: Brass Cap			
Northing: 5456926.614		Easting: 493605.340	
Elevation: 4.379			
Description: Brass Cap in sidewalk –NW corner at Great Northern Way and Earl Finning Way.			



MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE6		Tablet Marking: MLBE6	
Type of Monument: Brass Cap			
Northing: 5456930.305		Easting: 493451.013	Elevation: 5.299
Description: Brass Cap in sidewalk –NW corner at Great Northern Way and Carolina Street.			



MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE7		Tablet Marking: MLBE7	
Type of Monument: Brass Cap			
Northing: 5456934.771		Easting: 493164.307	Elevation: 13.358
Description: Brass Cap in sidewalk –NW corner at Great Northern Way and Thornton Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE8		Tablet Marking: MLBE8	
Type of Monument: Brass Cap			
Northing: 5457114.823		Easting: 493214.421	
Elevation: 6.688			
Description: Brass Cap in the end of Thornton Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE9		Tablet Marking: MLBE9	
Type of Monument: Brass Cap			
Northing: 5456862.872		Easting: 493037.609	Elevation: 21.978
Description: Brass Cap in sidewalk –SW corner at E 5 th Avenue and Brunswick Street.			



MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE10		Tablet Marking: MLBE10	
Type of Monument: Brass Cap			
Northing: 5456866.010		Easting: 492895.361	Elevation: 21.864
Description: Brass Cap in sidewalk –SW corner at E 5 th Avenue and Scotia Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

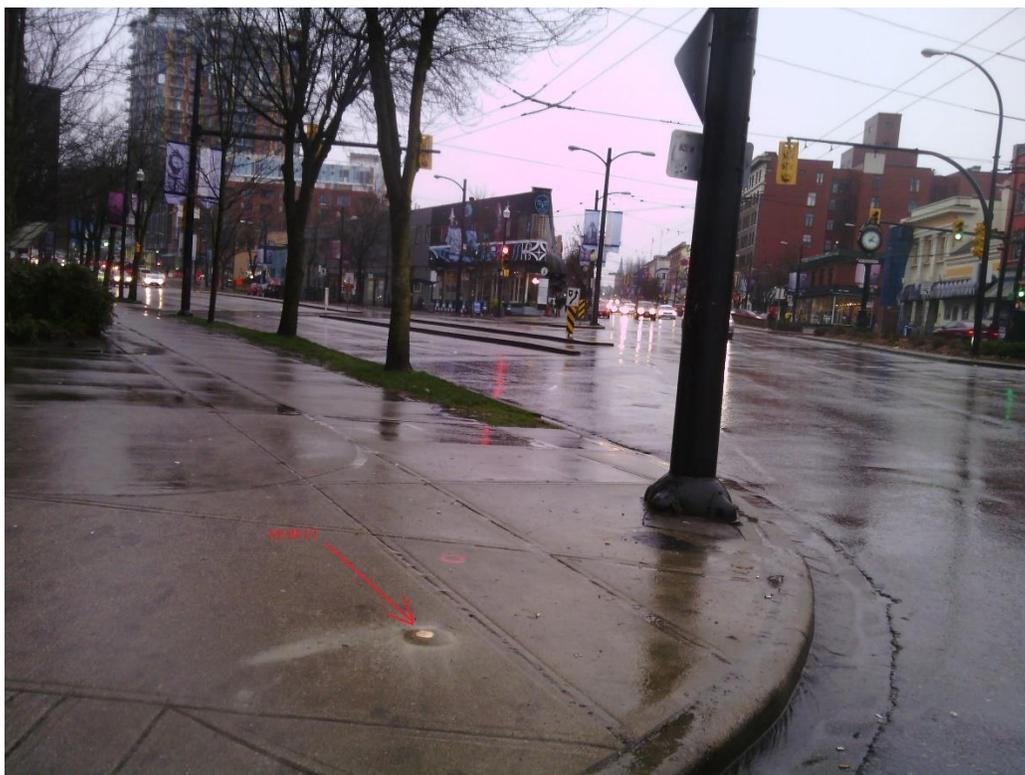
Station name: MLBE11		Tablet Marking: MLBE11	
Type of Monument: Brass Cap			
Northing: 5456870.651		Easting: 492746.126	Elevation: 24.493
Description: Brass Cap SW corner at Main Street and E 5 th Avenue.			



VANCOUVER/VANCOUVER RAPID TRANSIT

DESCRIPTION OF CONTROL STATION

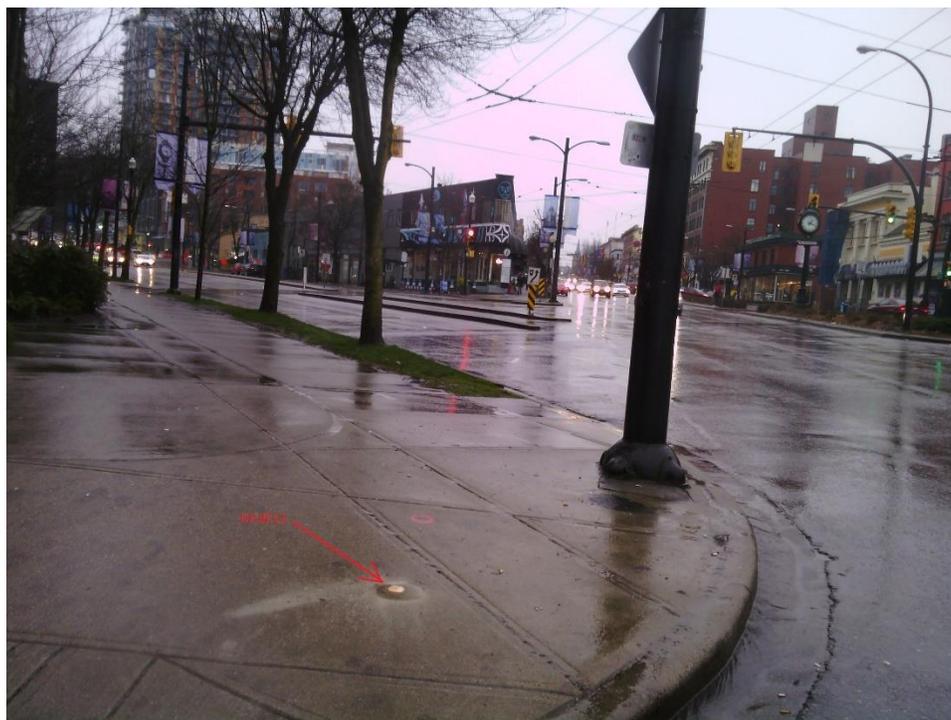
Station name: MLBE12		Tablet Marking: MLBE12	
Type of Monument: Brass Cap			
Northing: 5456667.793		Easting: 492767.022	
Elevation: 34.359			
Description: Brass Cap in sidewalk –SE corner at Main Street and E 7 th Avenue.			



VANCOUVER/VANCOUVER RAPID TRANSIT

DESCRIPTION OF CONTROL STATION

Station name: MLBE13		Tablet Marking: MLBE13	
Type of Monument: Brass Cap			
Northing: 5456474.945		Easting: 492761.269	
Elevation: 38.943			
Description: Brass Cap in sidewalk –SE corner at Main Street and E Broadway.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

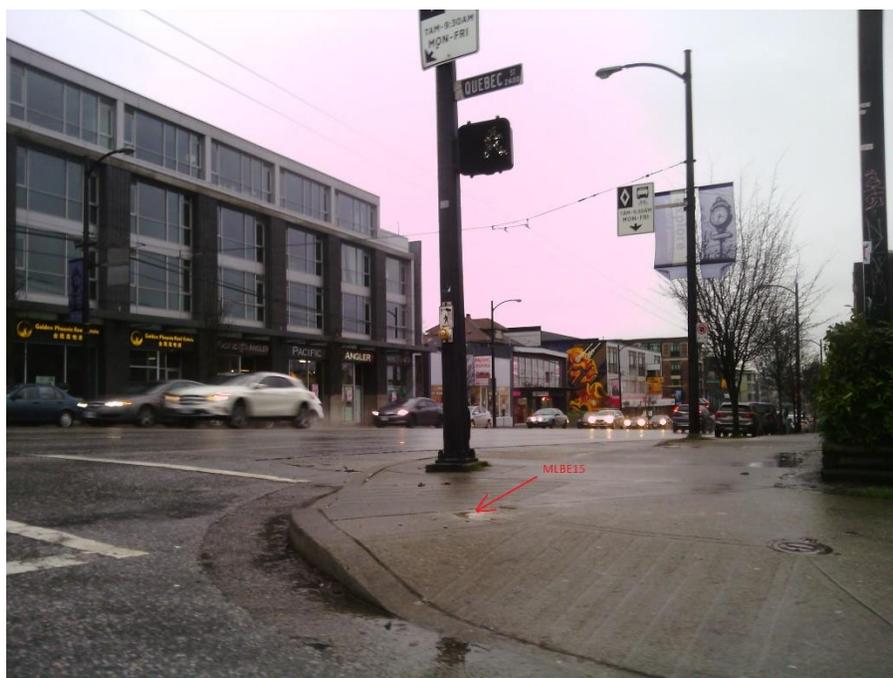
Station name: MLBE14		Tablet Marking: MLBE14	
Type of Monument: Brass Cap			
Northing: 5456466.659		Easting: 492937.059	Elevation: 37.589
Description: Brass Cap in sidewalk –S side of Broadway between Scotia Street and Brunswick Street.			



MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE15		Tablet Marking: MLBE15	
Type of Monument: Brass Cap			
Northing: 5456506.514		Easting: 492594.581	Elevation: 38.691
Description: Brass Cap in sidewalk –SW corner of Broadway and Quebec Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE16		Tablet Marking: MLBE16	
Type of Monument: Brass Cap			
Northing: 5456511.584		Easting: 492454.447	
Elevation: 33.674			
Description: Brass Cap in sidewalk –SW corner of Broadway and Ontario Street.			



MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE17		Tablet Marking: MLBE17	
Type of Monument: Brass Cap			
Northing: 5456516.222		Easting: 492330.608	
Elevation: 28.456			
Description: Brass Cap in sidewalk –SW corner of Broadway and Manitoba Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE18		Tablet Marking: MLBE18
Type of Monument: Brass Cap		
Northing: 5456523.950	Easting: 492120.070	Elevation: 23.964
Description: Brass Cap in sidewalk –SW corner of Broadway and Columbia Street.		



MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

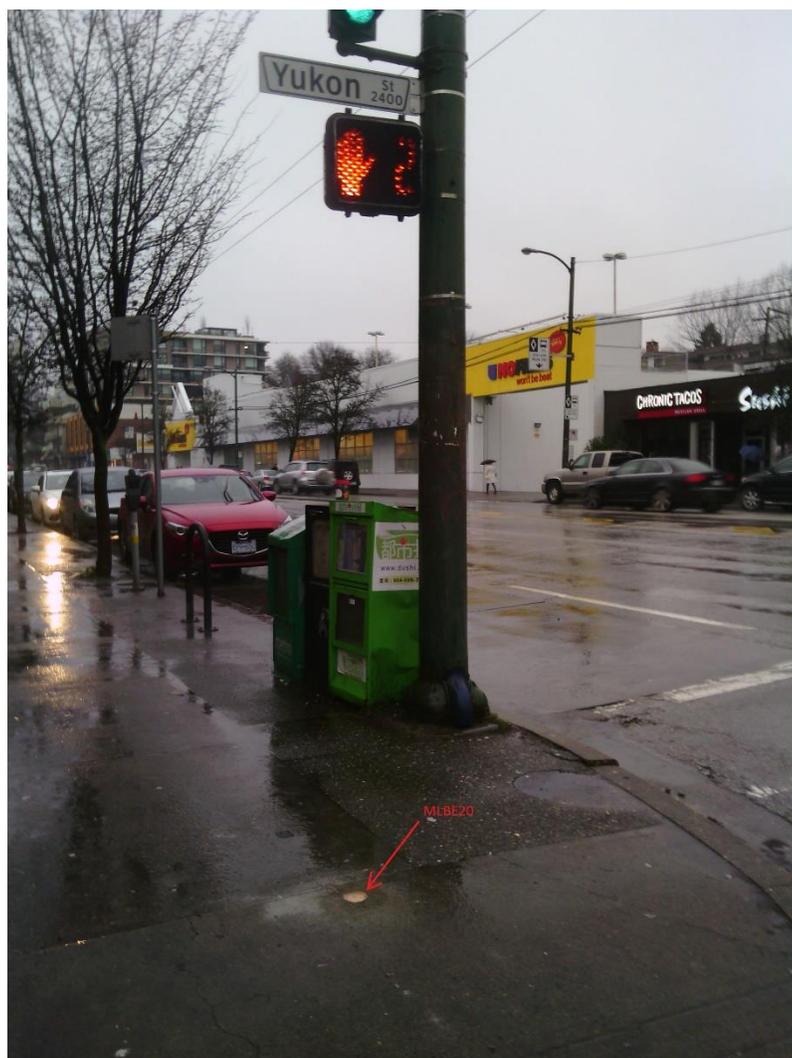
Station name: MLBE19		Tablet Marking: MLBE19	
Type of Monument: Brass Cap			
Northing: 5456527.082		Easting: 492029.308	
Elevation: 22.716			
Description: Brass Cap in sidewalk –NE corner of Broadway and Alberta Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

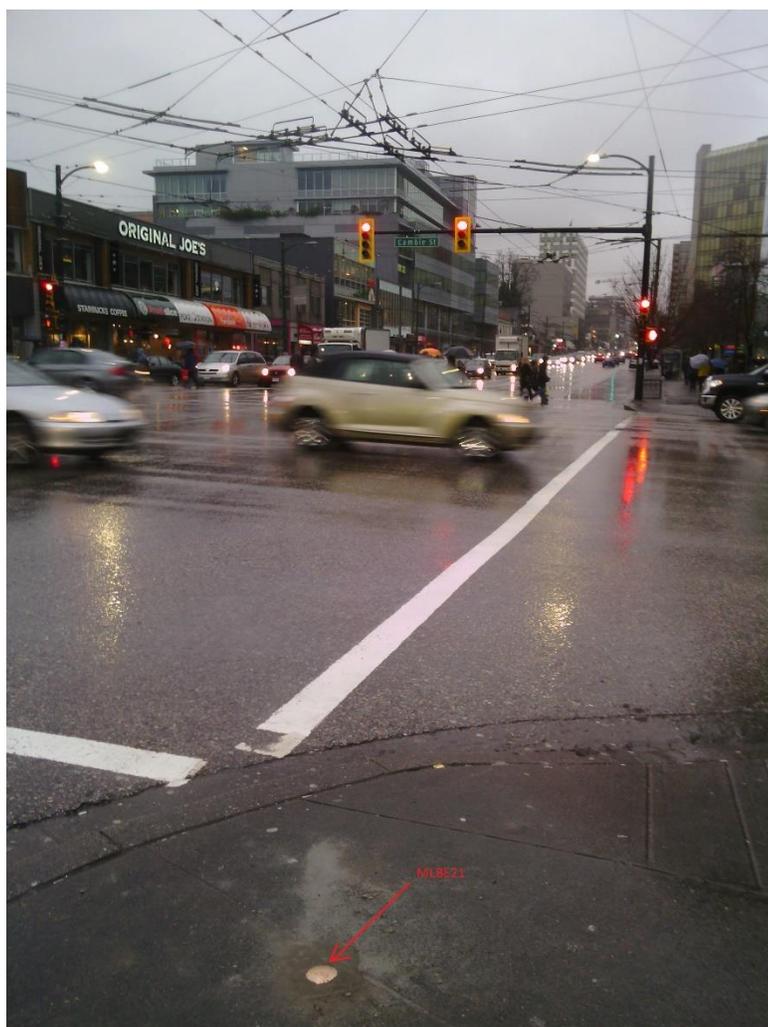
Station name: MLBE20		Tablet Marking: MLBE20
Type of Monument: Brass Cap		
Northing: 5456531.266	Easting: 491889.316	Elevation: 22.146
Description: Brass Cap in sidewalk –NE corner of Broadway and Yukon Street.		



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

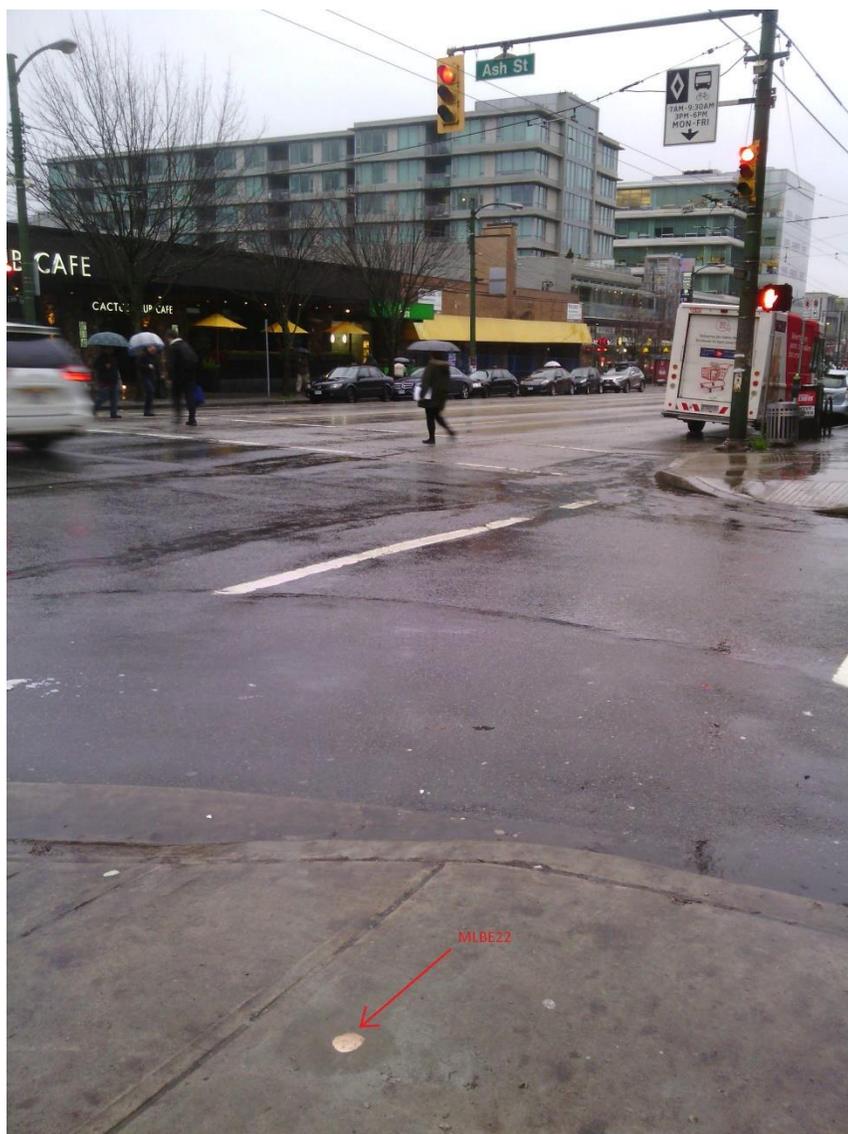
Station name: MLBE21		Tablet Marking: MLBE21	
Type of Monument: Brass Cap			
Northing: 5456536.107		Easting: 491753.370	
Elevation: 22.983			
Description: Brass Cap in sidewalk –NE corner of Broadway and Cambie Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

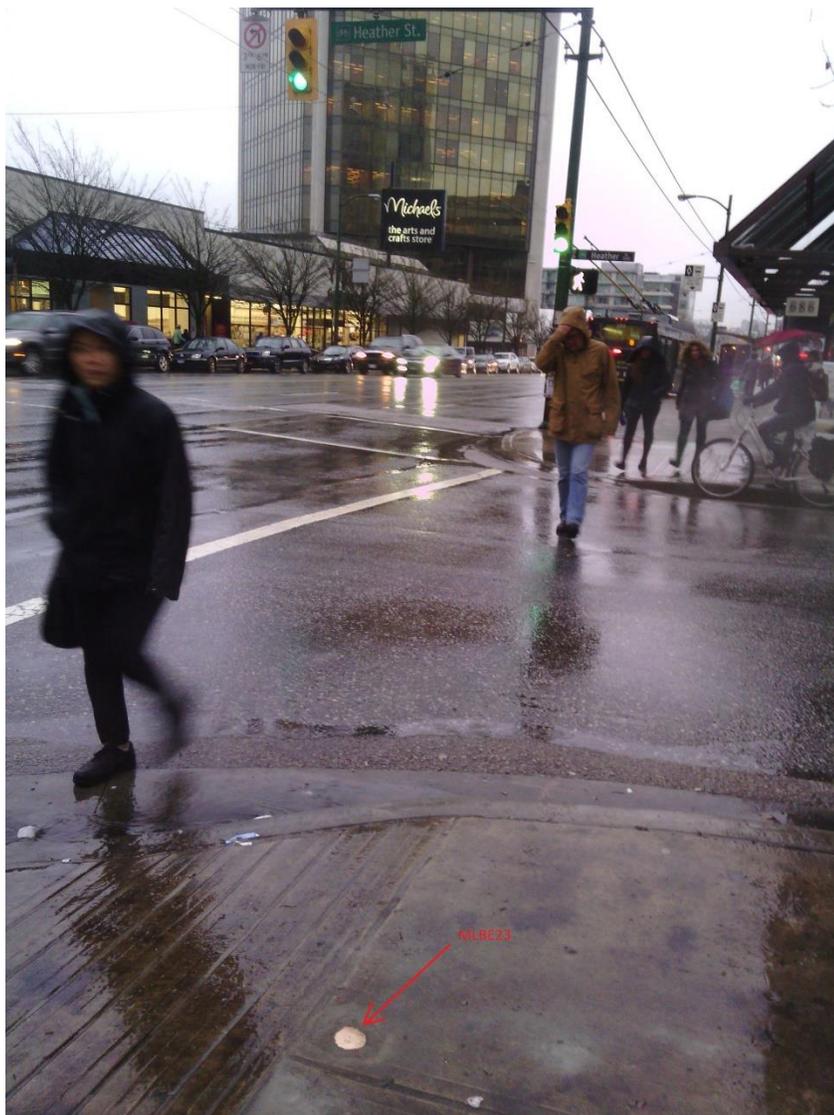
Station name: MLBE22		Tablet Marking: MLBE22	
Type of Monument: Brass Cap			
Northing: 5456516.304		Easting: 491538.211	Elevation: 25.944
Description: Brass Cap in sidewalk –SW corner of Broadway and Ash Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

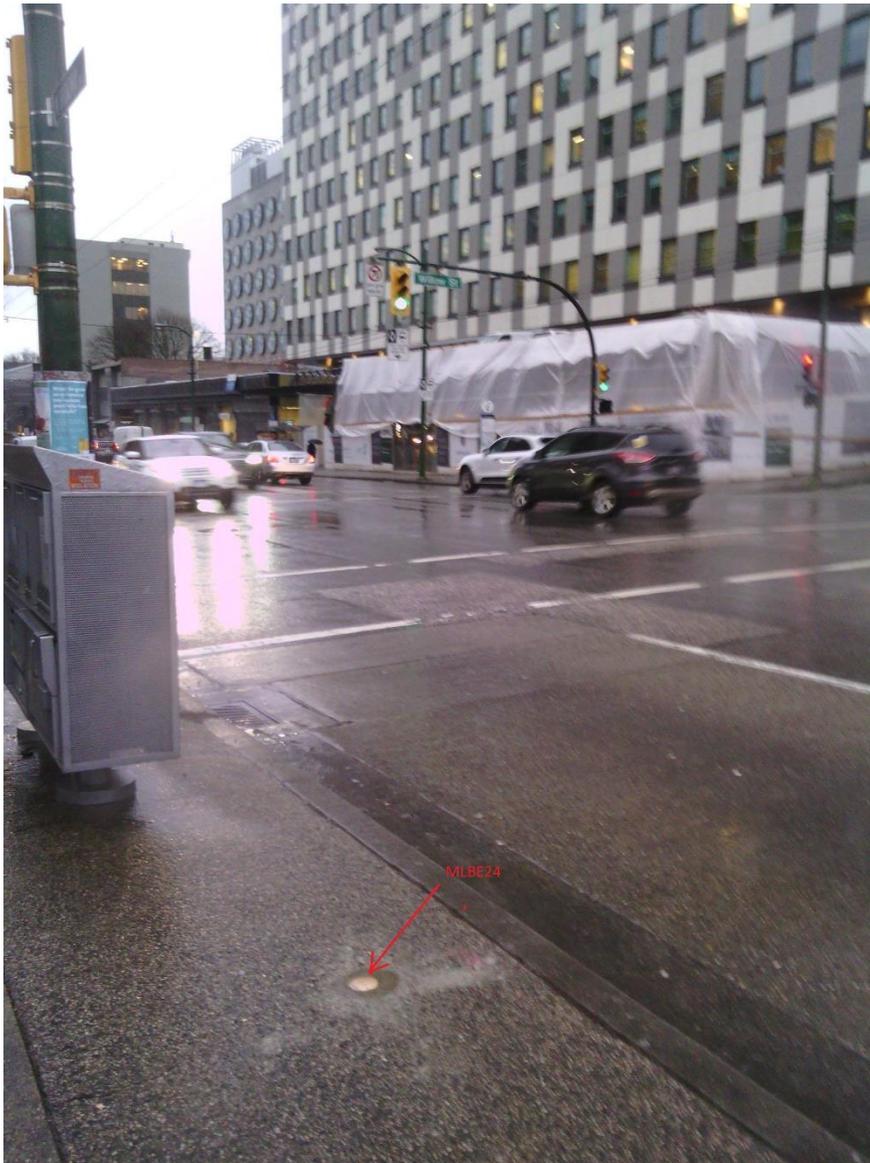
Station name: MLBE23		Tablet Marking: MLBE23	
Type of Monument: Brass Cap			
Northing: 5456521.022		Easting: 491364.955	
Elevation: 29.201			
Description: Brass Cap in sidewalk –SW corner of Broadway and Heather Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

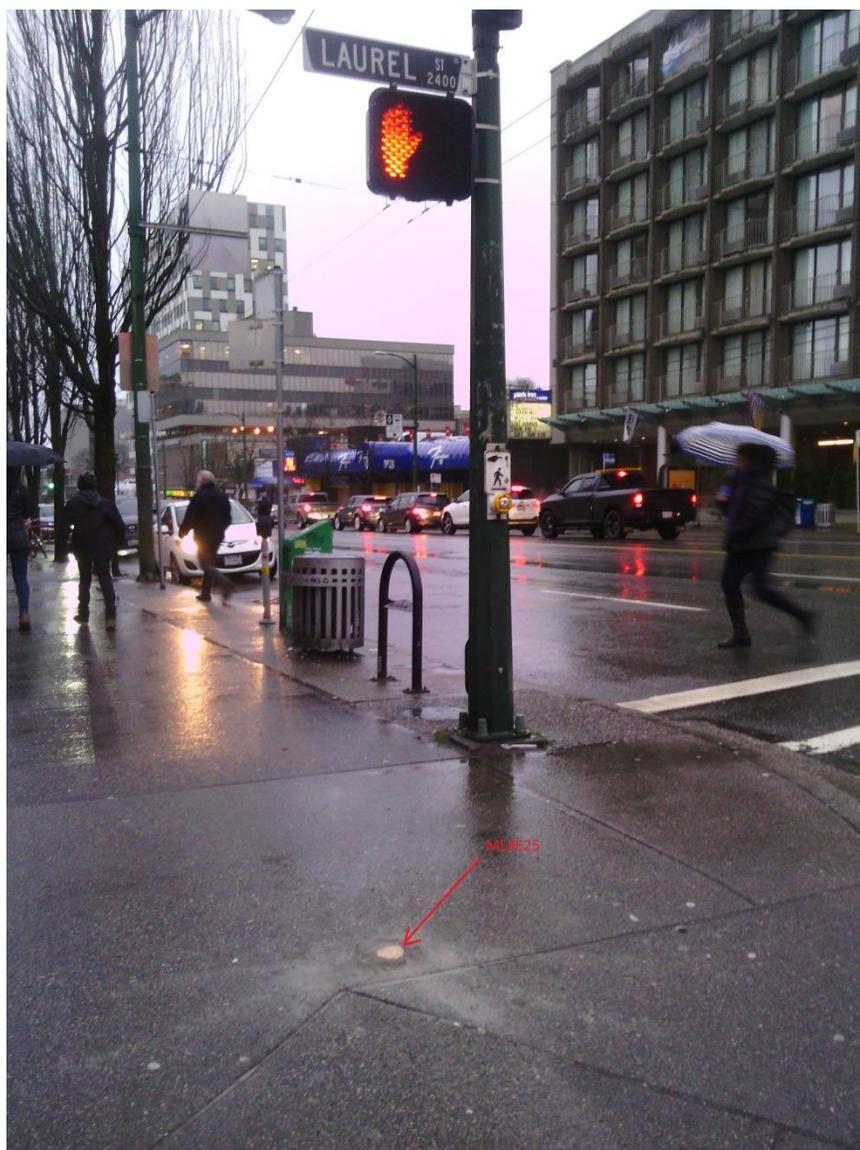
Station name: MLBE24		Tablet Marking: MLBE24	
Type of Monument: Brass Cap			
Northing: 5456548.383		Easting: 491214.334	Elevation: 32.327
Description: Brass Cap in sidewalk –NW corner of Broadway and Willow Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE25		Tablet Marking: MLBE25
Type of Monument: Brass Cap		
Northing: 5456554.065	Easting: 491065.914	Elevation: 36.020
Description: Brass Cap in sidewalk –NE corner of Broadway and Laurel Street.		



MILLENNIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

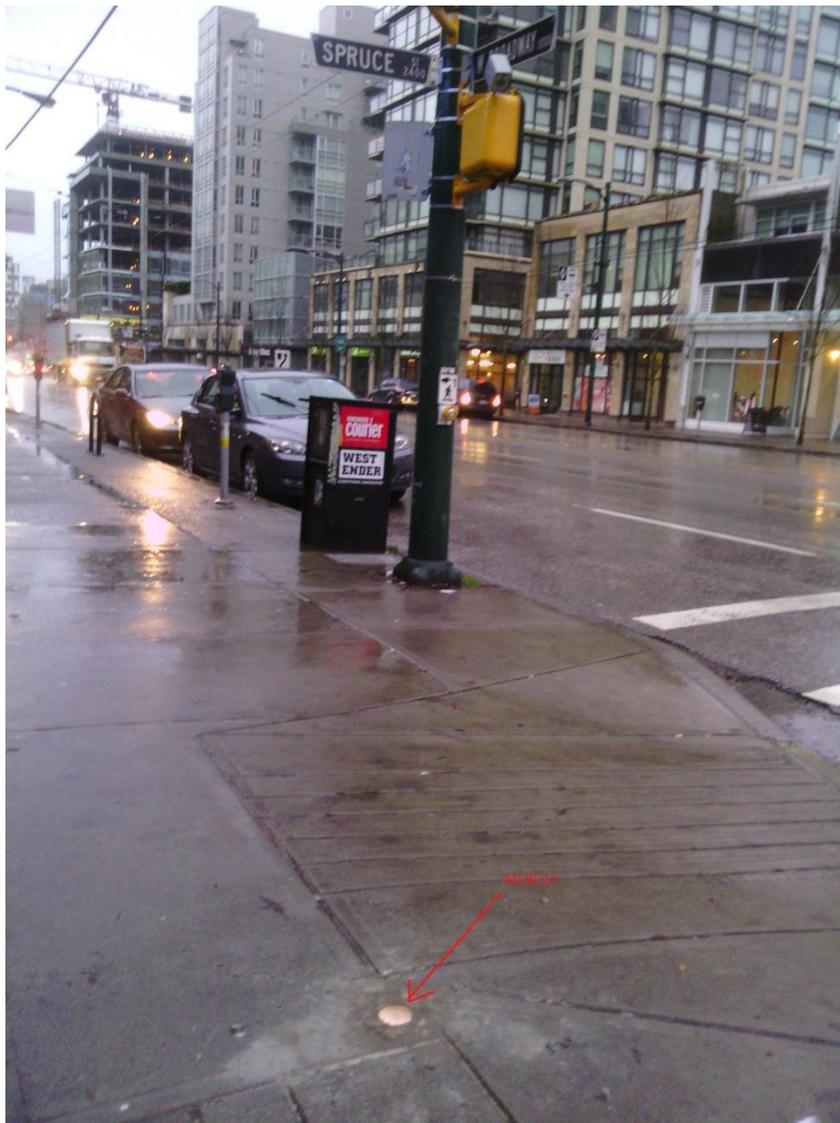
Station name: MLBE26		Tablet Marking: MLBE26	
Type of Monument: Brass Cap			
Northing: 5456561.075		Easting: 490892.783	Elevation: 41.300
Description: Brass Cap in sidewalk –NE corner of Broadway and Oak Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

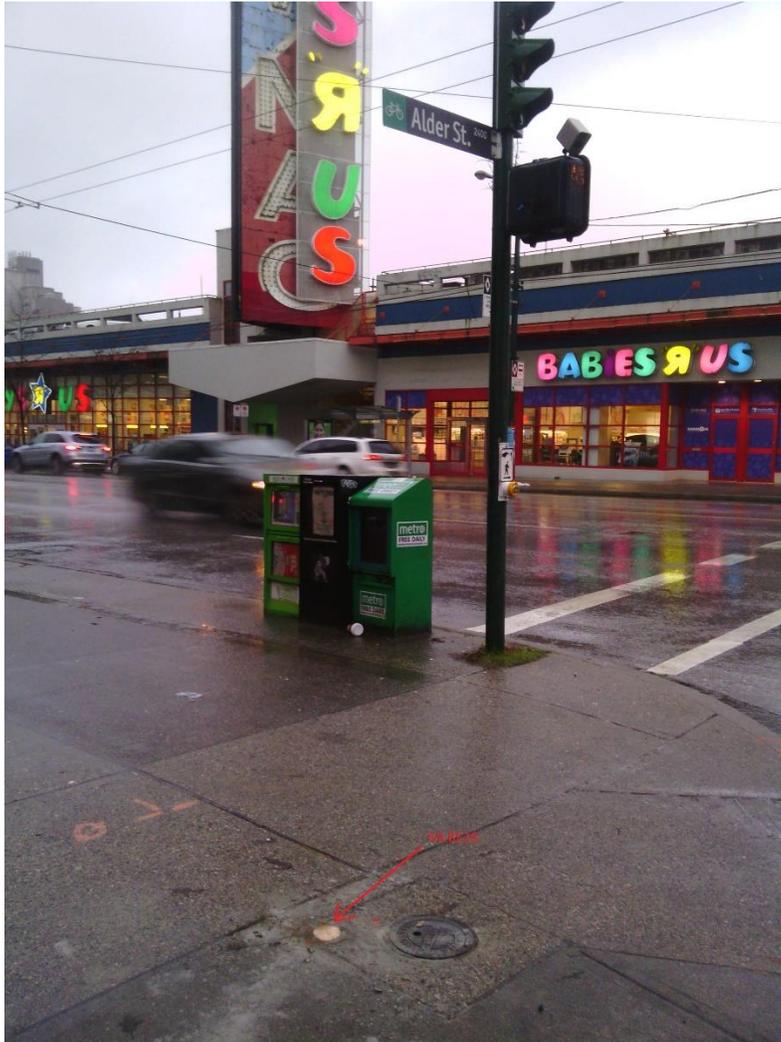
Station name: MLBE27		Tablet Marking: MLBE27	
Type of Monument: Brass Cap			
Northing: 5456563.954		Easting: 490716.546	Elevation: 44.831
Description: Brass Cap in sidewalk –NE corner of Broadway and Spruce Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE28		Tablet Marking: MLBE28	
Type of Monument: Brass Cap			
Northing: 5456569.068		Easting: 490543.909	Elevation: 47.101
Description: Brass Cap in sidewalk –NE corner of Broadway and Alder Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE29		Tablet Marking: MLBE29	
Type of Monument: Brass Cap			
Northing: 5456547.826		Easting: 490370.873	Elevation: 46.822
Description: Brass Cap in sidewalk –SE corner of Broadway and Birch Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE30		Tablet Marking: MLBE30	
Type of Monument: Brass Cap			
Northing: 5456552.558		Easting: 490180.441	
Elevation: 40.736			
Description: Brass Cap in sidewalk –SW corner of Broadway and Hemlock Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE31		Tablet Marking: MLBE31	
Type of Monument: Brass Cap			
Northing: 5456556.790		Easting: 489998.388	
Elevation: 41.774			
Description: Brass Cap in sidewalk –SW corner of Broadway and Granville Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE32		Tablet Marking: MLBE32	
Type of Monument: Brass Cap			
Northing: 5456586.440		Easting: 489817.583	
Elevation: 37.285			
Description: Brass Cap in sidewalk –NW corner of Broadway and Fir Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE33		Tablet Marking: MLBE33	
Type of Monument: Brass Cap			
Northing: 5456590.490		Easting: 489669.360	
Elevation: 33.887			
Description: Brass Cap in sidewalk –NE corner of Broadway and Pine Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE34		Tablet Marking: MLBE34	
Type of Monument: Brass Cap			
Northing: 5456570.273		Easting: 489499.898	Elevation: 36.019
Description: Brass Cap in sidewalk –NE corner of Broadway and Burrard Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE35		Tablet Marking: MLBE35	
Type of Monument: Brass Cap			
Northing: 5456575.632		Easting: 489314.373	Elevation: 38.364
Description: Brass Cap in sidewalk –NE corner of Broadway and Cypress Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE36		Tablet Marking: MLBE36	
Type of Monument: BRASS CAP			
Northing: 5456579.417		Easting: 489148.918	Elevation: 40.590
Description: Brass Cap in sidewalk –SE corner of Broadway and Maple Street			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

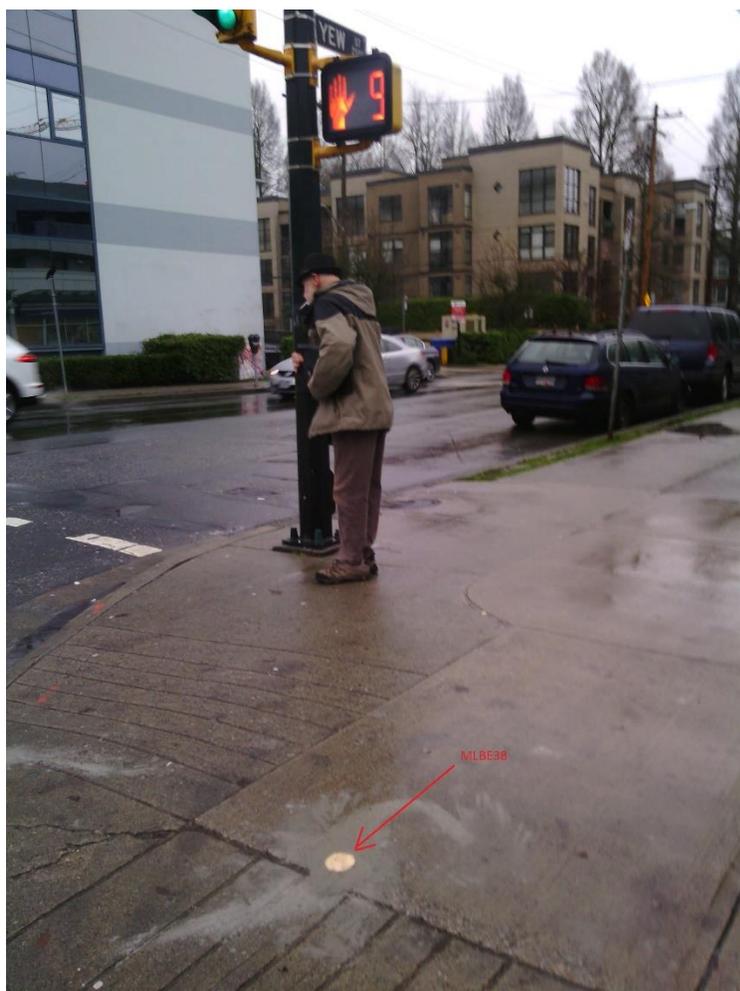
Station name: MLBE37		Tablet Marking: MLBE37	
Type of Monument: Brass Cap			
Northing: 5456583.503		Easting: 489002.991	Elevation: 38.932
Description: Brass Cap in sidewalk –SE corner of Broadway and Arbutus Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE38		Tablet Marking: MLBE38	
Type of Monument: Brass Cap			
Northing: 5456590.730		Easting: 488783.654	
Elevation: 35.915			
Description: Brass Cap in sidewalk –SE corner of Broadway and Yew Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE39		Tablet Marking: MLBE39	
Type of Monument: Brass Cap			
Northing: 5456397.141		Easting: 488781.344	
Elevation: 35.003			
Description: Brass Cap in sidewalk –SE corner of W 11 th Avenue and Yew Street.			



MILLENIUM LINE BROADWAY EXTENSION

DESCRIPTION OF CONTROL STATION

Station name: MLBE40		Tablet Marking: MLBE40	
Type of Monument: Brass Cap			
Northing: 5456382.480		Easting: 488994.706	
Elevation: 40.518			
Description: Brass Cap in sidewalk –SE corner of W 11 th Avenue and Arbutus Street.			

