Edmonton Valley Line West LRT – Noise and Vibration Impact Report

City of Edmonton

Project Number: 60528911

October 24, 2018

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AECOM: 2015-04-13

Quality information

Prepared by	Checked by	Approved by
Brian Bulnes, P.Eng. Acoustic Engineer	Alan Oldfield, MEng, CEng(UK), P.Eng. Senior Acoustic Engineer	Mark Perry, P.Eng. Design Manager

Revision History

Revision	Revision date	Details	Name	Position
R0	2018-09-21	Original Document	Brian Bulnes	Acoustic Engineer
R1	2018-10-24	Revised to include noise contours	Brian Bulnes	Acoustic Engineer

Distribution List

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Prepared for:

City of Edmonton

Prepared by:

Brian Bulnes
P.Eng., Acoustic Engineer

AECOM Canada Ltd.
5080 Commerce Boulevard
Mississauga ON L4W 4P2
Canada

T: 905.238.0007
F: 905.238.0038
aecom.com

Executive Summary

AECOM Canada Ltd. (AECOM) has been retained by the City of Edmonton to update the operational noise and vibration assessment for the planned Valley Line West light rail transit (LRT) system. The proposed line within the study area runs along several major Edmonton roadways from east of Anthony Henday Drive to 101 St. NW. Additionally, eleven Traction Power Substations (TPSS) along the corridor and the Maintenance and Storage Facility (MSF), which includes its own TPSS inside the crew building, were also added to the assessment. The MSF is proposed to be located south of the Lewis Farms Transit Centre.

The proposed line contains both stationary (TPSS and MSF) and transportation (road traffic and LRT vehicles) noise sources. Stationary noise sources are subject to the Edmonton Community Standards By-Law (14600) by-law, while transportation noise sources are subject to the Edmonton Urban Traffic Noise Policy (C506A).

A review of the municipal and provincial guidelines indicated that there were no specific vibration limits for the operation of transportation and stationary noise sources. Similar to many other LRT projects in Canada, limits from the U.S. Federal Transit Administration Noise and Vibration Impact Assessment guide (the FTA guide) were used to assess vibration impacts.

Section 2 of this report corresponds to a stationary noise assessment of the TPSS and MSF within the study area.

The results of the stationary noise assessment indicate that the noise levels at the property lines (assessment location as per by-law 14600) of residential and non-residential locations are expected to comply with the applicable By-Law limits, except east of the MSF doors. However, this land is part of the transportation and utility corridor, and no further development is expected. Therefore, no mitigation is anticipated to be required.

Section 3 of this report summarizes the assessment of predicted noise impacts during operation of the LRT along the project corridor to abutting private back yards (the assessment location as per policy C506A).

Results indicate that noise mitigation should be further investigated for one receptor location (R028). Noise barrier recommendations are provided in Section 3.4, and barrier extents and location can be found in Appendix B2.

Section 4 of the report summarizes the assessment of predicted vibration impacts of the LRT along the project corridor. The vibration assessment incorporates United States Federal Transit Administration (FTA) prediction procedures and criteria.

Results indicate that vibration mitigation is recommended for multiple locations along the proposed corridor. Vibration mitigation recommendations are provided in Section 4.3. Sections of LRT track requiring vibration mitigation are shown on figures provided in Appendix B2. Vibration mitigation is not predicted to be required for the track located at the MSF.

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1. Introduction

AECOM Canada Ltd. (AECOM) has been retained by the City of Edmonton to update the operational noise and vibration assessment for the planned Valley Line West light rail transit (LRT) system. The proposed line within the study area runs along several major Edmonton roadways from east of Anthony Henday Drive to 101 St. NW. Additionally, eleven Traction Power Substations (TPSS) along the corridor and the Maintenance and Storage Facility (MSF), which includes its own TPSS inside the crew building, were also added to the assessment. The MSF is proposed to be located south of the Lewis Farms Transit Centre.

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2. LRT Operations – Stationary Source Noise Assessment

2.1 Criteria

Stationary noise sources in the City of Edmonton are subject to Part III of the Edmonton Community Standards By-Law. Sound level limits are applicable at property lines of residential and non-residential areas for day (7:00AM to 10:00PM) and night time (10:00PM to 7:00AM) periods. Table 1 summarizes the applicable sound level limits.

Table 1: Edmonton Community Standards By-law – Part III – Sound Level Limits

Time Period	Receptor Location	Residential [dBA]	Non-residential [dBA]
Daytime (7:00AM to 10:00PM)	Property Line	65	75
Night time (10:00PM to 7:00AM)	Property Line	50	60

The by-law allows for exemptions during the daytime only for noise sources operating under the following conditions at residential property lines:

1. No greater than 70 dBA lasting a total period of time not exceeding two hours in one day;
2. No greater than 75 dBA lasting a total period of time not exceeding one hour in one day;
3. No greater than 80 dBA lasting a total period of time not exceeding 30 minutes in one day;
4. No greater than 85 dBA lasting a total period of time not exceeding 15 minutes in one day;

2.2 Stationary Noise Source Summary

Project related stationary noise sources are predicted to emanate from operations of the eleven TPSS buildings along the project corridor, and the Lewis Farms Maintenance Facility (which includes a TPSS within the crew building).

The dominant TPSS related noise sources are the HVAC units (located on the sides of each TPSS building), and transformer noise breakout through the TPSS walls. Each TPSS location is designed to have an approximately 4.5 metre high wall surrounding all components. Noise emissions from the TPSS buildings were sourced from a recent LRT project located in Canada. Secondary buildings (communication, signal, electrical, and utility rooms) were assumed to only have small comfort heating equipment, and are considered negligible near any TPSS noise.

Stationary noise sources predicted to be included at the Lewis Farms Maintenance Facility include: a compressor, a standby generator (assumption of 400 kW with an outdoor weather enclosure and a residential grade muffler), on-site LRT and bus movement, and indoor maintenance and wash noise intake emitting through the northern bay doors. Noise data was obtained from similar LRT maintenance facility projects located in Canada.

Note that the standby generator is assumed to be tested for a maximum of one hour per day, during daytime hours. As such, the generator was assessed separately from other stationary noise sources as stated in the by-law exemptions mentioned in Section 2.1.

2.3 Points of Reception

The worst case (most exposed and closest) residential and non-residential properties closest to project stationary sources were included in the assessment. As the criteria are property line based, noise contour lines were generated to review all points along respective property lines. Noise receptors were placed at the property line locations with the highest noise contour levels. These receptors are listed in Table 2, along with noise impact levels.

Figures presenting the worst case receptor locations can be found in Appendix A.

2.4 Impact Assessment and Results

The stationary noise sources described in Section 2.2 were used as inputs to the noise impact model. Noise impacts were predicted using the ISO 9613-2 noise prediction algorithm, implemented in the CadnaA modeling package.

The stationary source noise impacts at worst case property line receptors are presented in Table 2. Where a non-residential receptor was more exposed (closer) to stationary source noise than a residential receptor, the closest residential and non-residential receptors were both assessed. Where a residential receptor was closer, only the residential receptor was assessed, as limits for residential receptors are more stringent. As stationary source facilities (with the exception of the standby generator) are assumed to operate 24 hours a day, the night-time limits were chosen as the overall criteria.

Table 2: Noise Assessment Results – Stationary Sources

Receptor ID	Property Line Type	Closest Stationary Source (s)	With Project Noise Levels [dBA]	Property Line Criteria (Night time) [dBA]	Exceeds Property Line Criteria? (Y/N)
RS1A	Residential	Lewis Farms Maintenance Facility – South End	45	50	N
RS1B	Residential	Lewis Farms Maintenance Facility – North End	47	50	N
RS1C	Non-Residential	Lewis Farms Maintenance Facility – North End	60	60	N
RS1D	Non-Residential[1]	Lewis Farms Maintenance Facility – East End	74	60	Y
RS2	Residential	TPSS – 86A Ave NW	46	50	N
RS3	Residential	TPSS – 182 St	35	50	N
RS4	Residential	TPSS – 169 St	41	50	N
RS5	Residential	TPSS – 89 St	48	50	N
RS6	Residential	TPSS – 156 St and 94A Ave	46	50	N
RS7A	Residential	TPSS – 156 St and Stony Plain Rd	33	50	N
RS7B	Non-Residential	TPSS – 156 St and Stony Plain Rd	46	60	N
RS8A	Residential	TPSS – 143 St	35	50	N
RS8B	Non-Residential	TPSS – 143 St	43	60	N
RS9	Residential	TPSS – Glendora Cres. NW	43	50	N
RS10A	Residential	TPSS – 123 St and Stony Plain Rd	29	50	N
RS10B	Non-Residential	TPSS – 123 St and Stony Plain Rd	43	60	N
RS11A	Residential	TPSS – 116 St and 104 Ave	17	50	N
RS11B	Non-Residential	TPSS – 116 St and 104 Ave	47	60	N
RS12A	Residential	TPSS – 107 St	38	50	N
RS12B	Non-Residential	TPSS – 107 St	46	60	N

[1] This land is part of a transportation and utility corridor, and no further development is expected.

As mentioned in Section 2.2, the standby generator was assessed separately from other sources, with an operation assumption of less than one hour per day. Generator noise impact to the nearest property line receptor is presented in Table 3. As a generator location had not been determined as of time of modeling, the generator was assumed to be located next to the maintenance building, conservatively modeled on the closest side to residential receptors.

Table 3: Noise Assessment Results – Standby Generator

Receptor ID	Property Line Type	Closest Stationary Source (s)	With Project Noise Levels [dBA]	Property Line Criteria (Night time) [dBA]	Exceeds Property Line Criteria? (Y/N)
RS1A	Residential	Lewis Farms Maintenance Facility – Standby Generator	66	75	N

2.5 Conclusions and Recommendations

The results of the stationary noise source assessment indicate that the noise levels at the property lines of occupied residential and non-residential locations are expected to comply with the applicable By-Law limits, except for a small area of exceedance east of the maintenance area doors. However, this land is part of the transportation and utility corridor, and no further development or access for recreation is expected. Therefore, no mitigation is anticipated to be required.

3. Operational Noise Assessment – Transportation Sources

3.1 Criteria

Transportation noise in the City of Edmonton is regulated by the Urban Traffic Noise Policy (C506A). The policy provides sound level limits applicable to private back yards abutting the proposed project transportation corridor. The policy sets a 24 hour equivalent sound level ($L_{eq,24hr}$) limit of 65 dBA for each back yard location. Noise attenuation will be considered for back yards with predicted noise levels exceeding this limit.

3.2 Assessment Methodology

Similar to the approved Environmental Assessment, noise impacts from transportation sources were assessed using the ISO 9613-2 noise prediction algorithm, and TNM (Federal Highway Administration Traffic Noise Model) module for roadway sources, both implemented in the CadnaA modeling package. The noise model was based on the previous Environmental Assessment model produced by Acoustical Consultants Inc., and updated by AECOM in 2013, with the following updates:

- Future LRT alignment + extended length
- Future Roadway alignments
- LRT and roadway elevations
- Updated road traffic volumes(vehicles per hour) for both:
  - Existing conditions (2017)
  - Future “with project” traffic volumes (2047)
- Additional noise receptors
- LRT wheel squeal noise
- LRT crossover noise

3.3 Sound Source Data

3.3.1 LRT Operations

Sound level data for the LRT was sourced from the existing Environmental Assessment, which used measured LRT noise data from existing Edmonton LRT operations, as well as existing LRT operations from Houston, Texas, USA. These measured levels were adjusted for changes in speed along the track alignment. Trains on this line are approximately 80 metres in length, with an average volume of 4.3 trains per hour in the daytime, and 2.6 trains per hour during the night. LRT length, speeds, and alignment were obtained from the design team.

Crossover noise was calculated using the project light rail vehicle (LRV) sound level and applying a correction for crossover noise from the *Nordic Prediction Method for Rail Traffic Noise – NORD 2000* rail noise prediction method. The project crossover noise levels were adjusted for expected duration (accounting for speed, vehicle length, and service frequency) over the assessment period.

The source noise level for wheel squeal was obtained from a measurement of a LRV operated by an Ontario-based transit agency. Similar to the crossover noise, the level was adjusted to account for the expected duration (accounting for speed, vehicle length, and service frequency) over the assessment period.

3.3.2 Road Traffic Noise

Road traffic noise levels were calculated using the TNM module implemented in CadnaA. Only roadways with substantial traffic volumes along and crossing the proposed LRT corridor were modeled. The following parameters were used as inputs to the noise model:

- Volume data (vehicles per hour)
- Traffic speed
- Road gradient
- Road width
- Heavy truck and bus percentages

Existing traffic data was sourced through the City of Edmonton, while future 2047 traffic data was provided by the design team. Future traffic data was provided as peak PM volumes, and was converted to annual average daily traffic (AADT) by multiplying by a factor of 10.

To verify the traffic noise predictions, the noise model was compared with measurements of existing noise levels. Measurements were conducted at several locations along the project corridor during the months of November and December 2017. Receptors were then modeled in these locations, and existing traffic noise levels were calculated at these receptors. The $L_{eq,24hr}$ results for both measured and calculated results were compared and can be found in Table 4.

Table 4: Comparison of Measured vs. Modeled Noise Levels - Existing Conditions

Measurement Location	Measured Noise Level ($L_{eq,\ 24hr}$) [dBA]	Calculated Noise Level ($L_{eq,\ 24hr}$) [dBA]	Difference [dBA]	Notes
M1	65.3	64.8	0.5	-
M2	57.9	60.4	2.5	-
M3	63.9	65.7	1.8	-
M4	64.5	59.6	4.9	Difference may be due to construction noise across street from monitor (Northeast corner of 142 St NW and Stony Plain Road W intersection).
M5	58.1	59.6	1.5	-
M6	61.9	57.5	4.4	Higher measured level likely due to bus stop located in front of residence (idling and accelerating bus noise).
M7	63.3	58.4	4.9	Difference likely due to noise from nearby swaying metal watering cans in the wind, located hanging on the railing of the resident's porch. Higher ground reinforcement from frozen snow surface is also a potential contributor, as well as bus acceleration noise (nearby bus stop).
M8	62.9	61.5	1.4	-
M9	64.6	61.2	3.4	Slightly higher measured level likely due to rustling tree near monitor. Hard packed snow on the lawn during monitoring may also reflect sound with greater effect than in the noise model.
M10	60	59.9	0.1	-
M11	61.9	59.8	2.1	-
M12	58.8	58.8	0	-
M13	60.3	59.8	0.5	-
M14	60.3	59.3	1	-

Results indicate that the difference in modeled and measured existing traffic noise sound levels are between 0-3 dB at 10 of the 14 monitored locations, which is considered reasonably accurate. Other discrepancies are due to localized and temporary effects. Figures displaying noise monitoring locations can be found in Appendix B1.

3.4 Impact Assessment and Results

Traffic noise levels were assessed at the worst case (most exposed, closest) back yard receptors. Figures presenting receptor locations can be found in Appendix B1.

The noise sources described in Section 3.3 were used as inputs to the noise model. The predicted existing and future (2047) noise impacts at each assessed receptor were then compared with the sound level limit described in Section 3.1. Table 5 presents the existing, future, and change in predicted 24 hour equivalent noise levels at each receptor. Noise contours of the road and LRT 24 hour equivalent noise levels have been generated and can be found in Appendix B3.

A comparison of noise level contributions between road and LRT noise is presented in Table 6. Note that decibels are added logarithmically, not arithmetically (e.g. the overall sound pressure level of 60 dBA and 54 dBA at a certain point will be 61 dBA).

Table 5: Noise Assessment Results - Transportation Noise

Receptor	Existing Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Change in Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Requirement for Noise Mitigation Investigation (>65 dBA)
R001	53.9	52.1	-1.8	No
R002	42.3	42.5	0.1	No
R003	43.2	44.1	0.8	No
R004	41.6	41.1	-0.4	No
R005	59.9	54.9	-5.0	No
R006	56.9	52.9	-4.0	No
R007	61.1	55.7	-5.4	No
R008	63.2	57.2	-6.0	No
R009	65.1	61.4	-3.7	No
R010	56.9	57.3	0.4	No
R011	64.1	59.6	-4.4	No
R012	57.6	59.5	1.8	No
R013	53.3	47.6	-5.7	No
R014	62.8	63.9	1.1	No
R015	64.2	62.4	-1.8	No
R016	58.7	54.9	-3.8	No
R017	56.7	55.6	-1.1	No
R018	58.0	49.1	-8.9	No
R019	65.3	61.3	-4.0	No
R020	66.2	62.1	-4.1	No
R021	65.1	59.7	-5.4	No
R022	65.7	61.8	-3.9	No
R023	53.7	51.5	-2.2	No
R024	59.5	56.2	-3.3	No
R025	58.9	57.8	-1.1	No
R026	62.5	58.3	-4.2	No
R027	61.3	62.4	1.1	No

Receptor	Existing Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Change in Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Requirement for Noise Mitigation Investigation (>65 dBA)
R028	65.5	**66.7**	1.2	**Yes**
R029	62.4	59.5	-2.9	No
R030	54.5	50.6	-3.9	No
R031	54.8	52.6	-2.2	No
R032	63.1	61.0	-2.1	No
R033	60.3	63.3	3.0	No
R034	66.3	63.4	-2.9	No
R035	46.6	44.8	-1.4	No
R036	64.9	60.5	-4.4	No
R037	60.3	56.6	-3.7	No
R038	65.5	61.8	-3.7	No
R039	65.4	61.7	-3.7	No
R040	62.5	58.1	-4.5	No
R041	39.9	42.9	2.8	No
R042	39.2	42.0	2.6	No
R043	40.5	45.0	4.3	No
R044	51.8	54.4	2.6	No
R045	48.4	49.9	1.5	No
R046	52.4	58.8	6.4	No
R047	51.2	56.8	5.6	No
R048	58.7	59.6	0.9	No
R049	58.8	59.2	0.4	No
R050	61.5	61.8	0.3	No
R051	59.6	60.7	1.1	No
R052	52.7	52.2	-0.5	No
R053	59.0	57.1	-1.8	No
R054	44.5	45.1	0.4	No
R055	45.5	44.2	-1.3	No
R056	42.8	42.4	-0.4	No
R057	49.7	51.7	-0.1	No
R058	49.2	50.8	-0.6	No
R059	50.7	52.5	-0.1	No
R060	47.4	49.1	-0.2	No
R061	54.4	44.4	0.0	No
R062	48.8	51.6	0.6	No
R063	53.0	55.8	0.4	No
R064	49.1	53.6	2.8	No
R065	39.2	48.3	8.7	No
R066	48.0	50.6	0.7	No
R067	35.6	45.2	9.5	No
R068	49.6	52.5	2.9	No

Receptor	Existing Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Change in Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Requirement for Noise Mitigation Investigation (>65 dBA)
R069	34.5	41.7	7.0	No
R070	46.7	51.4	4.6	No
R071	44.6	44.8	0.2	No
R072	46.0	45.1	-0.9	No
R073	57.4	56.7	-0.7	No
R074	57.5	56.5	-1.0	No
R075	46.8	46.0	-0.8	No
R076	47.1	48.1	1.0	No
R077	46.5	51.9	5.4	No
R078	42.0	45.8	4.0	No
R079	40.6	44.3	3.8	No
R080	42.7	46.5	3.8	No
R081	43.6	46.7	3.2	No
R082	40.9	40.8	0.0	No
R083	53.5	57.5	4.0	No
R084	39.8	40.6	0.9	No
R085	53.3	57.8	4.5	No
R086	36.3	39.2	2.9	No
R087	42.5	45.5	3.0	No
R088	47.1	49.6	2.5	No
R089	49.5	51.4	1.9	No
R090	40.2	43.9	3.7	No
R091	34.3	37.8	4.3	No
R092	43.5	45.6	3.2	No
R093	45.4	46.4	2.4	No
R094	59.6	61.6	2.0	No
R095	54.9	56.5	1.7	No
R096	53.4	55.0	1.6	No
R097	59.7	62.1	2.4	No
R098	55.3	56.5	1.2	No
R099	44.5	45.6	1.1	No
R100	56.4	57.3	0.9	No
R101	55.6	56.3	0.7	No
R102	60.6	61.8	1.2	No
R103	57.1	59.4	2.4	No
R104	60.4	63.7	3.3	No
R105	58.4	61.5	3.1	No
R106	57.6	60.6	3.0	No
R107	59.7	64.1	4.4	No
R108	58.3	62.3	4.0	No
R109	59.0	63.8	4.9	No

Receptor	Existing Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Change in Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Requirement for Noise Mitigation Investigation (>65 dBA)
R110	58.9	63.2	4.3	No
R111	59.3	63.7	4.5	No
R112	59.0	62.0	3.1	No
R113	59.7	62.3	3.8	No
R114	59.1	61.4	2.8	No
R115	59.3	61.4	2.3	No
R116	59.4	61.4	2.3	No
R117	60.4	61.8	1.6	No
R118	60.7	61.4	0.7	No
R119	59.2	61.8	2.1	No
R120	58.3	61.6	1.9	No
R121	55.7	57.6	1.5	No
R122	59.7	63.0	2.5	No
R123	57.3	60.9	2.8	No
R124	57.3	60.7	2.9	No
R125	58.4	61.8	3.3	No
R126	58.4	62.0	3.5	No
R127	59.3	63.7	4.3	No
R128	58.1	62.5	4.4	No
R129	55.8	60.1	4.3	No
R130	56.2	60.5	4.2	No
R131	58.9	61.8	2.9	No
R132	58.6	61.9	3.3	No
R133	58.9	62.4	3.5	No
R134	58.3	62.6	4.3	No
R135	58.1	62.9	4.8	No
R136	58.3	63.2	4.9	No
R137	59.0	64.7	5.7	No
R138	59.4	64.3	4.9	No
R139	57.6	61.1	3.5	No
R140	57.4	61.7	4.3	No
R141	58.7	61.9	3.2	No
R142	59.5	64.2	4.7	No
R143	60.0	63.0	3.0	No
R144	59.5	64.0	4.5	No
R145	60.3	63.0	2.7	No
R146	60.2	62.7	2.5	No
R147	59.6	62.6	3.2	No
R148	57.6	61.7	4.1	No
R1_2018	50.6	52.6	2	No
R2_2018	52.7	52.9	0.2	No

Receptor	Existing Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Change in Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Requirement for Noise Mitigation Investigation (>65 dBA)
W01	40.5	51.4	10.9	No
W02	44.6	51.7	7.1	No
W03	46.6	52.6	5.9	No
W04	46.8	52.0	5.3	No

Table 6: Noise Assessment Results – Comparison of LRT, Road Traffic, and Overall Noise Levels

Receptor	Future LRT Only Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Road Traffic Only Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Overall (Road Traffic + LRT) Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Highest Noise Contribution
R001	42.9	51.5	52.1	Road
R002	36.9	41.1	42.5	Road
R003	36.0	43.3	44.1	Road
R004	32.9	40.4	41.1	Road
R005	49.6	53.4	54.9	Road
R006	48.3	51.1	52.9	Road
R007	51.5	53.7	55.7	Road
R008	52.7	55.3	57.2	Road
R009	54.8	60.3	61.4	Road
R010	49.4	56.5	57.3	Road
R011	53.3	58.5	59.6	Road
R012	48.0	59.2	59.5	Road
R013	39.2	46.9	47.6	Road
R014	44.2	63.9	63.9	Road
R015	50.1	62.1	62.4	Road
R016	48.7	53.7	54.9	Road
R017	50.2	54.2	55.6	Road
R018	42.8	47.9	49.1	Road
R019	55.0	60.1	61.3	Road
R020	55.1	61.2	62.1	Road
R021	54.6	58.1	59.7	Road
R022	55.5	60.6	61.8	Road
R023	45.9	50.1	51.5	Road
R024	51.0	54.7	56.2	Road
R025	55.0	54.6	57.8	LRT – near crossover(s)
R026	55.2	55.3	58.3	Road
R027	61.6	54.8	62.4	LRT – near crossover(s)
R028	65.5	60.2	66.7	LRT – near crossover(s)
R029	57.4	55.3	59.5	LRT – near crossover(s)
R030	45.4	49.0	50.6	Road
R031	49.5	49.7	52.6	Road

Receptor	Future LRT Only Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Road Traffic Only Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Overall (Road Traffic + LRT) Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Highest Noise Contribution
R032	58.1	57.8	61.0	LRT – near crossover(s)
R033	62.7	54.1	63.3	LRT – near crossover(s)
R034	58.9	61.5	63.4	Road
R035	40.2	43.0	44.8	Road
R036	56.6	58.2	60.5	Road
R037	51.9	54.8	56.6	Road
R038	55.9	60.5	61.8	Road
R039	55.3	60.6	61.7	Road
R040	53.0	56.4	58.1	Road
R041	27.3	42.8	42.9	Road
R042	36.2	40.7	42.0	Road
R043	37.6	44.1	45.0	Road
R044	42.4	54.1	54.4	Road
R045	40.4	49.3	49.9	Road
R046	57.6	52.5	58.8	LRT – near crossover(s)
R047	55.4	51.2	56.8	LRT – near crossover(s)
R048	53.9	58.2	59.6	Road
R049	52.5	58.1	59.2	Road
R050	53.9	61.0	61.8	Road
R051	53.1	59.9	60.7	Road
R052	43.3	51.7	52.2	Road
R053	44.8	56.9	57.1	Road
R054	40.5	43.2	45.1	Road
R055	32.8	43.8	44.2	Road
R056	34.8	41.5	42.4	Road
R057	46.7	50.0	51.7	Road
R058	45.6	49.2	50.8	Road
R059	47.2	51.0	52.5	Road
R060	44.0	47.5	49.1	Road
R061	39.5	42.7	44.4	Road
R062	47.4	49.5	51.6	Road
R063	51.3	53.9	55.8	Road
R064	47.1	52.5	53.6	Road
R065	46.5	43.4	48.3	LRT – near crossover(s)
R066	44.8	49.3	50.6	Road
R067	44.1	38.7	45.2	LRT – near crossover(s)
R068	50.3	48.5	52.5	LRT – near crossover(s)
R069	39.7	37.3	41.7	LRT – near crossover(s)
R070	50.3	44.8	51.4	LRT – near crossover(s)
R071	37.9	43.8	44.8	Road

Receptor	Future LRT Only Predicted Noise Level ($L_{eq,\ 24hr}$) [dBA]	Future Road Traffic Only Predicted Noise Level ($L_{eq,\ 24hr}$) [dBA]	Future Overall (Road Traffic + LRT) Predicted Noise Level ($L_{eq,\ 24hr}$) [dBA]	Highest Noise Contribution
R072	24.5	45.1	45.1	Road
R073	28.7	56.7	56.7	Road
R074	42.1	56.4	56.5	Road
R075	30.6	45.9	46.0	Road
R076	43.2	46.4	48.1	Road
R077	50.1	47.1	51.9	LRT – near wheel squeal
R078	42.8	42.8	45.8	Approximately Equal
R079	38.5	42.9	44.3	Road
R080	43.8	43.2	46.5	LRT – near crossover(s)
R081	34.6	46.5	46.7	Road
R082	31.1	40.3	40.8	Road
R083	52.3	56.0	57.5	Road
R084	33.3	39.7	40.6	Road
R085	52.5	56.2	57.8	Road
R086	33.9	37.7	39.2	Road
R087	32.9	45.2	45.5	Road
R088	45.3	47.6	49.6	Road
R089	45.9	49.9	51.4	Road
R090	38.0	42.6	43.9	Road
R091	32.8	36.1	37.8	Road
R092	38.7	44.6	45.6	Road
R093	38.6	45.6	46.4	Road
R094	49.5	61.3	61.6	Road
R095	46.3	56.1	56.5	Road
R096	45.5	54.4	55.0	Road
R097	49.5	61.9	62.1	Road
R098	46.3	56.0	56.5	Road
R099	32.0	45.4	45.6	Road
R100	47.7	56.8	57.3	Road
R101	40.1	56.2	56.3	Road
R102	47.5	61.7	61.8	Road
R103	47.7	59.1	59.4	Road
R104	51.5	63.4	63.7	Road
R105	48.9	61.2	61.5	Road
R106	48.6	60.3	60.6	Road
R107	49.7	63.9	64.1	Road
R108	49.6	62.1	62.3	Road
R109	50.8	63.6	63.8	Road
R110	50.0	63.0	63.2	Road
R111	50.0	63.6	63.7	Road

Receptor	Future LRT Only Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Road Traffic Only Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Overall (Road Traffic + LRT) Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Highest Noise Contribution
R112	53.8	61.3	62.0	Road
R113	55.9	61.2	62.3	Road
R114	53.0	60.7	61.4	Road
R115	52.4	60.8	61.4	Road
R116	52.9	60.7	61.4	Road
R117	52.5	61.2	61.8	Road
R118	51.8	60.9	61.4	Road
R119	56.6	60.2	61.8	Road
R120	57.7	59.3	61.6	Road
R121	50.4	56.7	57.6	Road
R122	57.6	61.5	63.0	Road
R123	55.4	59.5	60.9	Road
R124	54.1	59.6	60.7	Road
R125	53.0	61.2	61.8	Road
R126	51.0	61.6	62.0	Road
R127	51.0	63.4	63.7	Road
R128	51.4	62.2	62.5	Road
R129	49.2	59.7	60.1	Road
R130	51.0	59.9	60.5	Road
R131	52.6	61.2	61.8	Road
R132	54.1	61.2	61.9	Road
R133	55.8	61.3	62.4	Road
R134	52.0	62.2	62.6	Road
R135	55.4	62.0	62.9	Road
R136	56.7	62.2	63.2	Road
R137	61.9	61.5	64.7	LRT – near crossovers
R138	56.9	63.4	64.3	Road
R139	54.1	60.2	61.1	Road
R140	51.5	61.3	61.7	Road
R141	54.4	61.1	61.9	Road
R142	52.1	63.9	64.2	Road
R143	56.7	61.9	63.0	Road
R144	51.9	63.7	64.0	Road
R145	57.2	61.6	63.0	Road
R146	57.0	61.3	62.7	Road
R147	56.5	61.3	62.6	Road
R148	36.3	61.7	61.7	Road
R1_2018	50.3	48.8	52.6	LRT – near crossover(s)
R2_2018	47.9	51.3	52.9	Road
W01	50.8	42.4	51.4	LRT – near crossover(s)

Receptor	Future LRT Only Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Road Traffic Only Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Overall (Road Traffic + LRT) Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Highest Noise Contribution
W02	50.3	46.0	51.7	LRT – near crossover(s)
W03	50.6	48.2	52.6	LRT – near wheel squeal
W04	49.4	48.6	52.0	LRT – near wheel squeal

3.5 Noise Barrier Investigation

As presented in Table 5, future transportation noise is only predicted to exceed criteria at one receptor, located at the 136 St. and Stony Plain Road intersection (R028). A noise barrier has been modeled at this receptor, and the results are presented in Table 7 below.

Table 7: Noise Assessment Results - Transportation Noise - With Mitigation

Receptor	Barrier Height (m)	Barrier Length (m)	Future Predicted Noise Level ($L_{eq, 24hr}$) [dBA]	Future Predicted Noise Level – With Noise Barrier ($L_{eq, 24hr}$) [dBA]	Change in Predicted Noise Level ($L_{eq, 24hr}$) [dBA]
R028	1.75	21	66.7	61.5	-5.2

It is predicted that a 1.75 metre high noise barrier will successfully reduce transportation noise at receptor R028 to a level noticeably below the $L_{eq,24hr}$ criteria level of 65 dBA. A figure presenting the noise barrier location and extents can be found in Appendix B2. All other receptors are not predicted to require noise mitigation per the Urban Traffic Noise Policy criteria.

3.6 Discussion and Recommendations

Results indicate that noise levels will exceed by-law criteria at one receptor location. With the recommended noise barrier from Section 3.5 implemented, noise levels at all receptors will comply with Urban Traffic Noise Policy criteria.

Any future planned double boarded privacy fencing (without gaps) from the City should reduce some noise to the yard. However, as privacy fencing of these types can greatly vary (density, height, build); the level of expected improvement is uncertain.

Although the project will comply with applicable noise level limits, please note that the Urban Traffic Noise Policy sets out criteria for a 24 hour noise energy average. When considering this 24 hour average, it was generally found that road traffic (not the LRT) was the controlling source of noise at most back yard locations. This can be seen in many of the receptors along Stony Plain Road east of 139 St. NW where levels are predicted to decrease due to a reduction in lanes and road traffic.

These results can be expected as the average LRT volumes are relatively low over the duration of the 24 hour assessment period (4.3 trains per hour during the day, 2.6 per hour during the night). As shown in Table 6, exceptions to this typically occurred where LRT crossovers or track curvature (potentially causing wheel squeal) were located near a noise sensitive receptor.

It is likely that the LRT will be noticeable at back yard receptors during pass-bys, as the LRT has a different noise characteristic when compared against traffic noise. LRT pass-bys occur as discrete events with a higher peak instantaneous noise level in comparison to road traffic noise which operates more similarly to a continuous flow.

It is also worth noting that while wheel squeal noise is not predicted to be the cause of criteria exceedance at any receptors, wheel squeal noise can especially stand out and irritate nearby residents. Lubrication of wheels is therefore recommended at track curves.

4. Operational Vibration Assessment

4.1 Guidelines and Criteria

A review of the municipal and provincial guidelines indicated that there were no specific vibration limits for the operation of stationary or transportation noise sources (road traffic and LRT vehicles). Similar to many other LRT projects in Canada, limits from the U.S. Federal Transit Administration Noise and Vibration Impact Assessment guide (the FTA guide) were used for this project. The vibration level limits used in this analysis have been presented in Table 8.

Table 8: Vibration Level Limits

Maximum Vibration Velocity Level (VdB[2])	Maximum RMS Velocity (mm/s)	Receptor Type
90	0.80	Industrial/Workshop
84	0.40	Office
78	0.20	Residential (Day)
72	0.10	Residential (Night), Operating Rooms

In addition to the receptor types mentioned in Table 8, a number of special case vibration sensitive locations were flagged for investigation. Vibration level limits for special case locations near the project line are dependent on the equipment used at the location. The FTA guide (Section 8.1, Table 8-1) sets out a general assessment limit of 65 VdB for most moderately sensitive equipment (e.g. hospitals with vibration sensitive equipment, university research operations, etc.).

4.2 Assessment Methodology

Vibration from LRT operations on the project corridor and MSF LRT track were predicted using the general vibration prediction method in the FTA guide. Relevant factors affecting vibration at the receptor included:

- Vehicle type (LRT, freight, bus)
- Vehicle speed
- Track conditions (this includes special track work, which is used to implement crossovers, frogs, etc.)
- Type of transit structure (at grade, elevated structure, etc.)
- Soil conditions

The ground was assumed to have efficient soil propagation based on the previous assessment, which noted that much of the soil in the area was clay based. In order to efficiently determine the potential need for mitigation, zones where vibration impact will exceed criteria was calculated for sections of the track based on the above inputs. Where receptors fell within these zones, mitigation was investigated based on distance to the source of vibration.

Additional investigation also took place for the following potentially vibration sensitive locations:

- Misericordia Community Hospital (16940 – 87 Avenue)
- Insight Medical Imaging – Meadowlark (200 156 St NW)
- Insight Medical Imaging – West End (9509 156 St NW)
- Insight Medical Imaging – (11560 104 Ave NW)
- Stony Plain Road Dental Plaza (149 St. NW and Stony Plain Rd NW Intersection)

[2] Reference velocity: 1 micro-inch/sec

4.3 Results and Recommendations

Vibration caused by MSF LRT movement along the site is not predicted to exceed FTA limits at nearby sensitive receptors. However, results indicate that vibration mitigation is recommended for multiple locations on the project LRT corridor. Vibration calculations are presented in Appendix C1, and sections of LRT track requiring vibration mitigation are presented in Appendix C2. To allow flexibility in mitigation design, the required reductions for each section of track are shown in Appendix C2.

Typical vibration mitigation measures and expected vibration reduction include:

- Ballast mats – 10 to 15 VdB reduction
- Resilient rail fasteners – 4 to 8 VdB reduction
- Resilient supported sleepers/ties – approximately 10 VdB reduction
- Booted sleepers/ties – approximately 10 VdB reduction
- Tire-derived aggregates – 8 to 14 VdB reduction
- Floating slab track with continuous elastomer layer – 6 to 12 VdB reduction
- Floating slab track with discrete elastomer bearing – 15 to 18 VdB reduction

The effectiveness of specific vibration mitigation measures is dependent on several factors such as the component design, installation techniques, localized soil characteristics, train axle load, and frequencies of concern. For track sections requiring greater than a 15 VdB reduction (crossover locations), moving crossovers to less sensitive locations may be worth considering. A more detailed discussion and further description of LRT vibration considerations and mitigation is provided in Appendix C2.

Table 9 provides investigation results for the additional vibration sensitive locations.

Table 9: Additional Vibration Sensitive Locations - Recommendations

Vibration Sensitive Location	Recommendation (s)
Misericordia Community Hospital	No mitigation required –Low vibration levels due to elevated track section
Insight Medical Imaging – Meadowlark	No mitigation required – Outside of vibration zone of influence
Insight Medical Imaging – West End	Mitigation required – See Appendix C2
Insight Medical Imaging – 11560 104 Ave NW	Mitigation required – See Appendix C2
Stony Plain Road Dental Plaza	Mitigation required – See Appendix C2

4.4 Conclusion

With the vibration reduction recommendations from Section 4.3 and Appendix C2 implemented, the LRT is predicted to comply with FTA guide vibration limits at nearby sensitive locations, and the special case vibration sensitive locations described in Section 4.2.

5. References

1. International Organization for Standardization, ISO 9613-2: *Acoustics - Attenuation of Sound during Propagation Outdoors Part 2: General Method of Calculation*, Geneva, Switzerland, 1996.
2. City of Edmonton, By-Law Number C506A. *Urban Traffic Noise Policy,* 2013.
3. City of Edmonton, By-Law Number 14600. *Community Standards Bylaw, Part III,* 2017.
4. Federal Transit Administration (FTA), US Department of Transportation, *Transit Noise and Vibration Impact Assessment*, Report No. FTA-VA-90-1003-06. May 2006.
5. AECOM, *SEtoW Edmonton LRT – Preliminary Design Noise and Vibration Report – West Line.* July, 2013.
6. Acoustic Consultants Inc., *Edmonton Southeast LRT Noise Impact Assessment*, October, 2010.

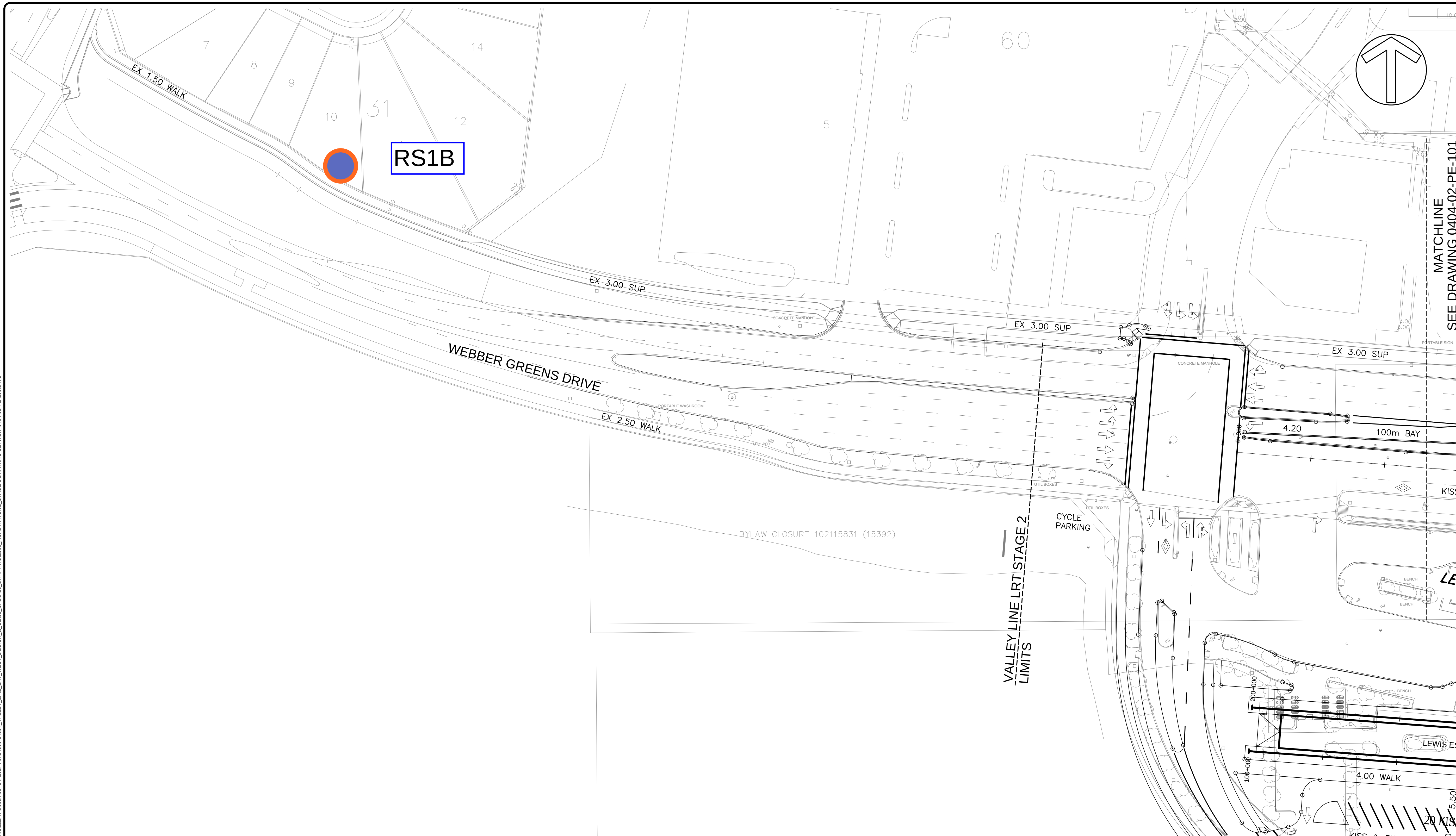
Glossary

Sound	Pressure wave travelling through a medium, such as air.
Noise	Unwanted sound.
Acoustics	The science of sound propagation and transmission.
Vibration	Oscillation of a parameter that defines the motion of a mechanical system.
Decibel, dB	A logarithmic ratio, not strictly a unit, used to describe sound levels. For sound pressure, the reference level is 20 micropascals (threshold of hearing).
Frequency	The rate at which an event is repeated. Measured in Hertz (Hz), where 1 Hz = 1 oscillation/sec. Normal human hearing extends over a range of frequencies from about 20 Hz to about 20 kHz.
Octave Band	A band of frequencies where the upper limiting frequency is twice the lower limiting frequency. Octave bands are identified by their centre-frequencies. The octave bands standardized for acoustic measurements include those centered at 31.5, 63, 125, 250, 500, 1000, 2000, 4000, & 8000 Hz.
A-Weighting Network, dBA	A frequency weighting network intended to represent the variation in the ear's ability to hear different frequencies. Overall sound levels calculated or measured using the A-weighting network are indicated by dBA rather than dB.
Sound Power Level (PWL, L_w)	A measurement of the total acoustic energy output from a noise source, per unit time. Reported and measured in decibels (dB or dBA), using a reference power of 10^{-12} Watts (0 dB).
Sound Pressure	The instantaneous difference between the air pressure produced by sound and the average barometric pressure at a given location.
Sound Pressure Level (SPL, L_p)	The ratio of the instantaneous sound pressure and a reference sound pressure of 20 µPa (0 dB). Reported and measured in decibels (dB or dBA).
L_{eq} - "Equivalent sound level"	Value of a constant sound pressure level which would result in the same total sound energy as would the measured time-varying sound pressure level over equivalent time duration. The $L_{eq,1hr}$, for example, describes the equivalent continuous sound level over a 1 hour period.
Peak Particle Velocity (PPV)	The peak signal value of an oscillating vibration velocity waveform. Can be expressed in mm/s.
Root Mean Square Velocity (RMSV)	The square root of the mean-square value of an oscillating vibration velocity waveform, where the mean-square value is obtained by squaring the value of amplitudes at each instant of time and then average these values over the sample time.

Appendices

Appendix A

Stationary Source Receptor Locations



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A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

ISL Engineering and Land Services — Consultant

A1 bar scale 1:500 0 5 15 25m

drawn by R. MULLER | designed by D. MARTIN

checked by J. MILLER | date 13-DEC-2017

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Signature
Date
PERMIT NUMBER: P 4741
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AECOM — Prime Consultant

Edmonton

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ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

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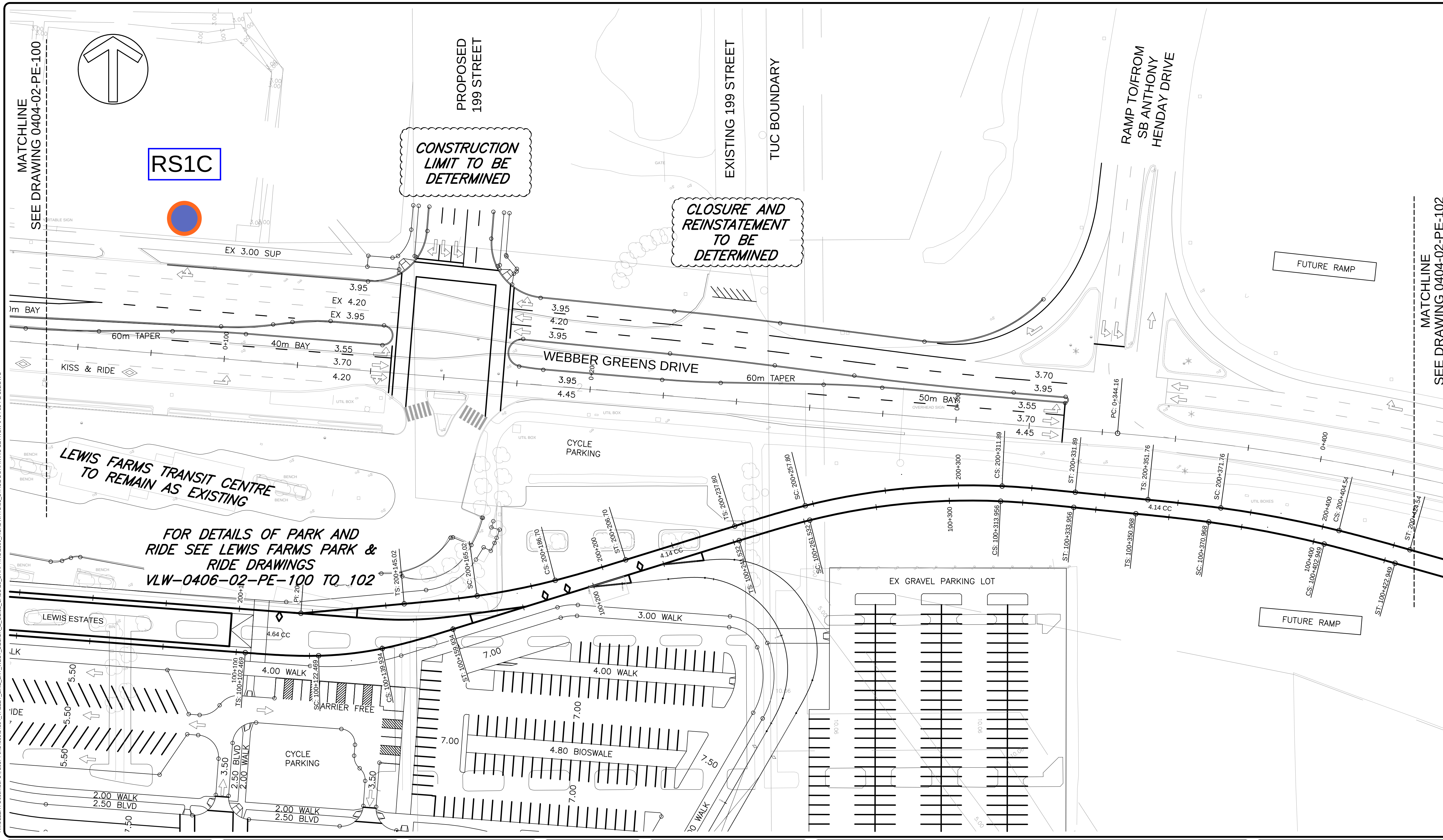

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issue data

no.	description	date	checked

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A1 bar scale 1:500 0 5 15 25m

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ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

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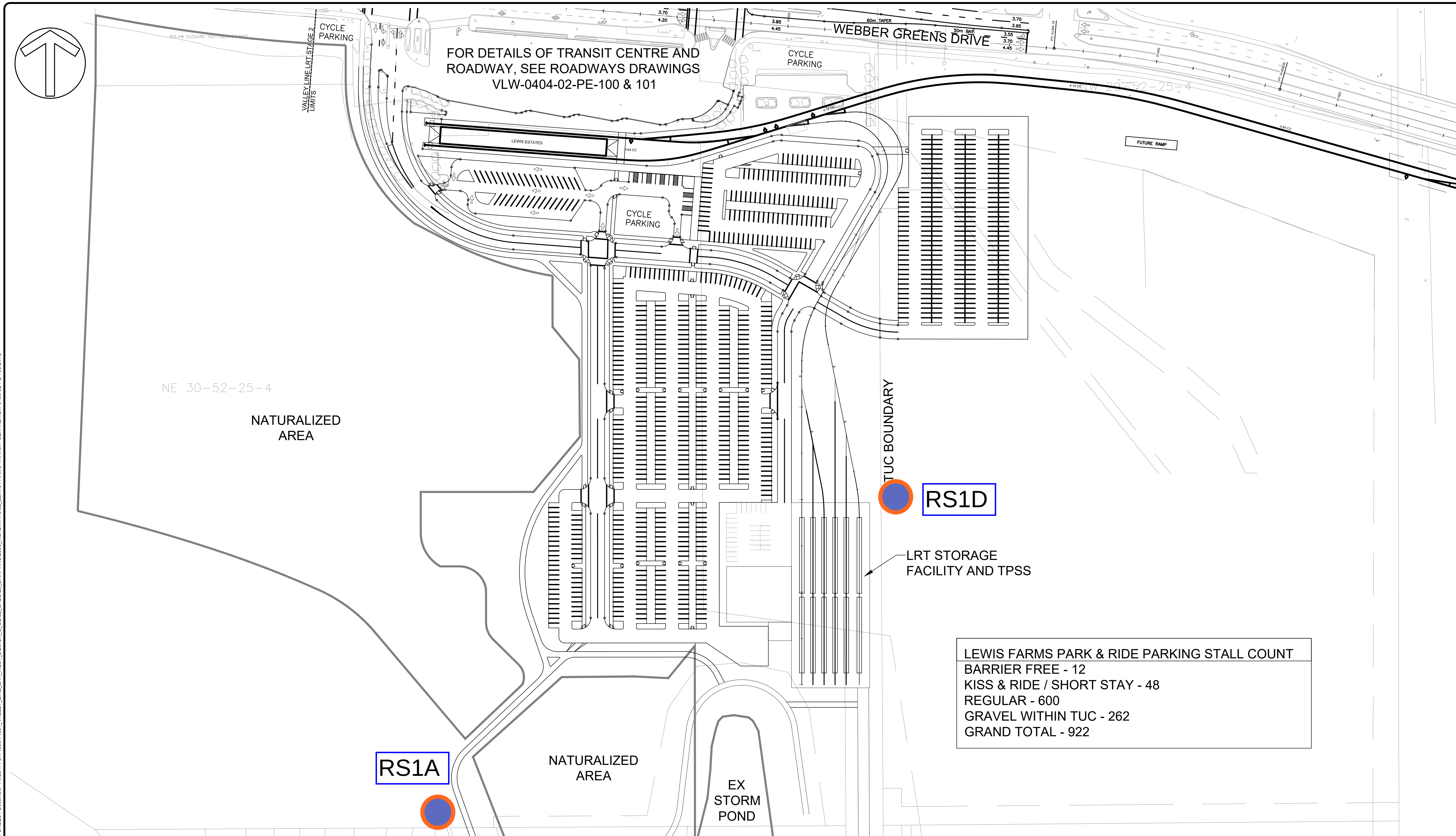

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no.	description	date	checked

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drawn by N. FORBES — designed by D. MARTIN

checked by J. MILLER — date 13-12-2017

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Date
PERMIT NUMBER: P 4741
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seal

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Edmonton

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PRELIMINARY ENGINEERING DRAWINGS
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prime consultant reviewed by F. BHANJI

drawing title

LRT CIVIL WORK
LEWIS FARMS PARK & RIDE
KEY PLAN

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0406-02-PE-100 — REV 0 — SHT 3

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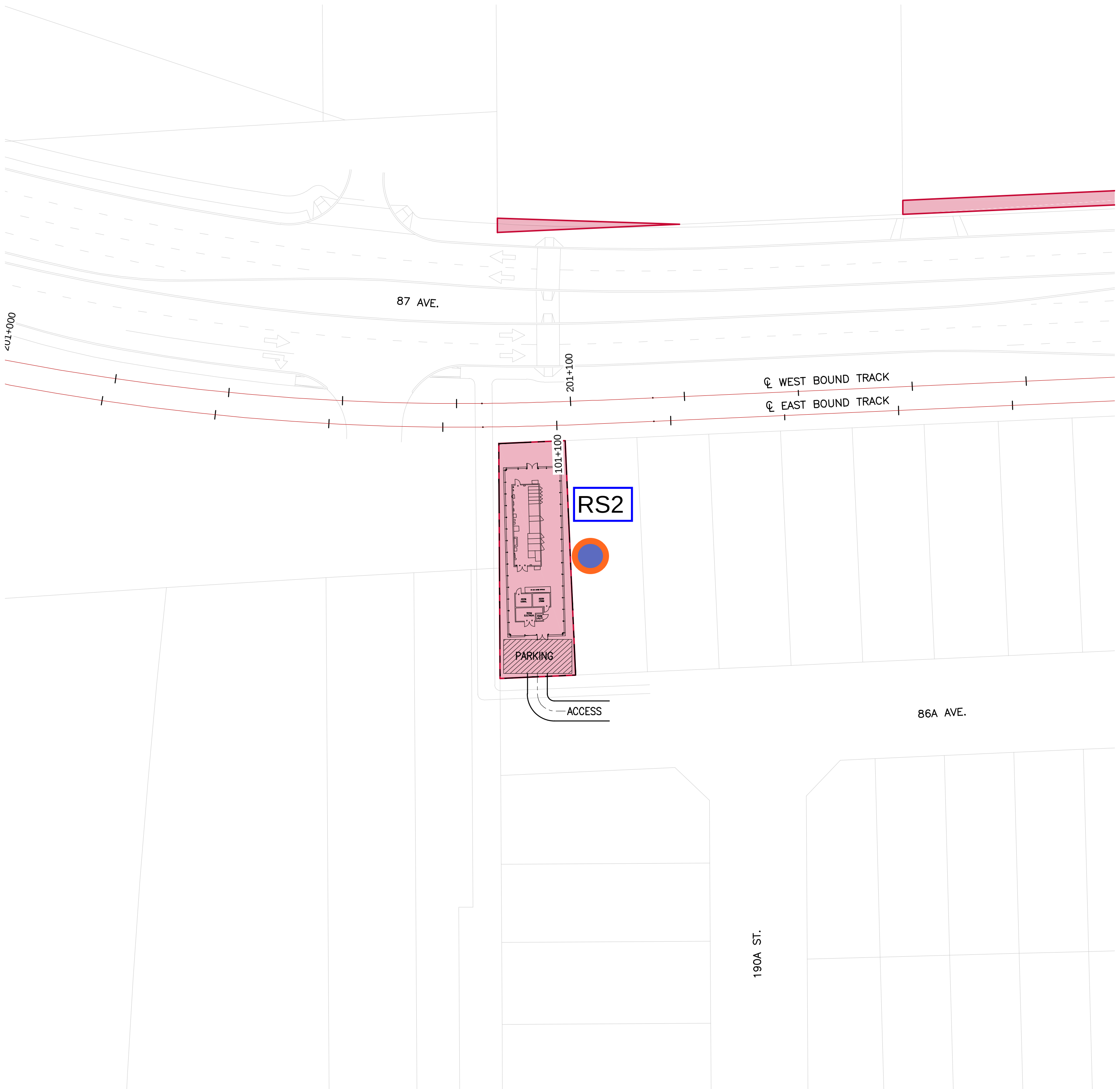

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2 PLAN 1:250 (0416-02 A101)

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- REQUIRED LAND
- EASEMENT

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A	NOT ISSUED	–	–

issue data

no.	description	date	checked

revisions

HATCH Consultant

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drawn by B. MAGUIRE

designed by B. MAGUIRE

checked by G. TURNER

date 13-12-2017

permit

consultant job no 351235

seal

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACTION POWER

TPSS LOCATION

190 ST AND 87 AVE TPSS LAYOUT

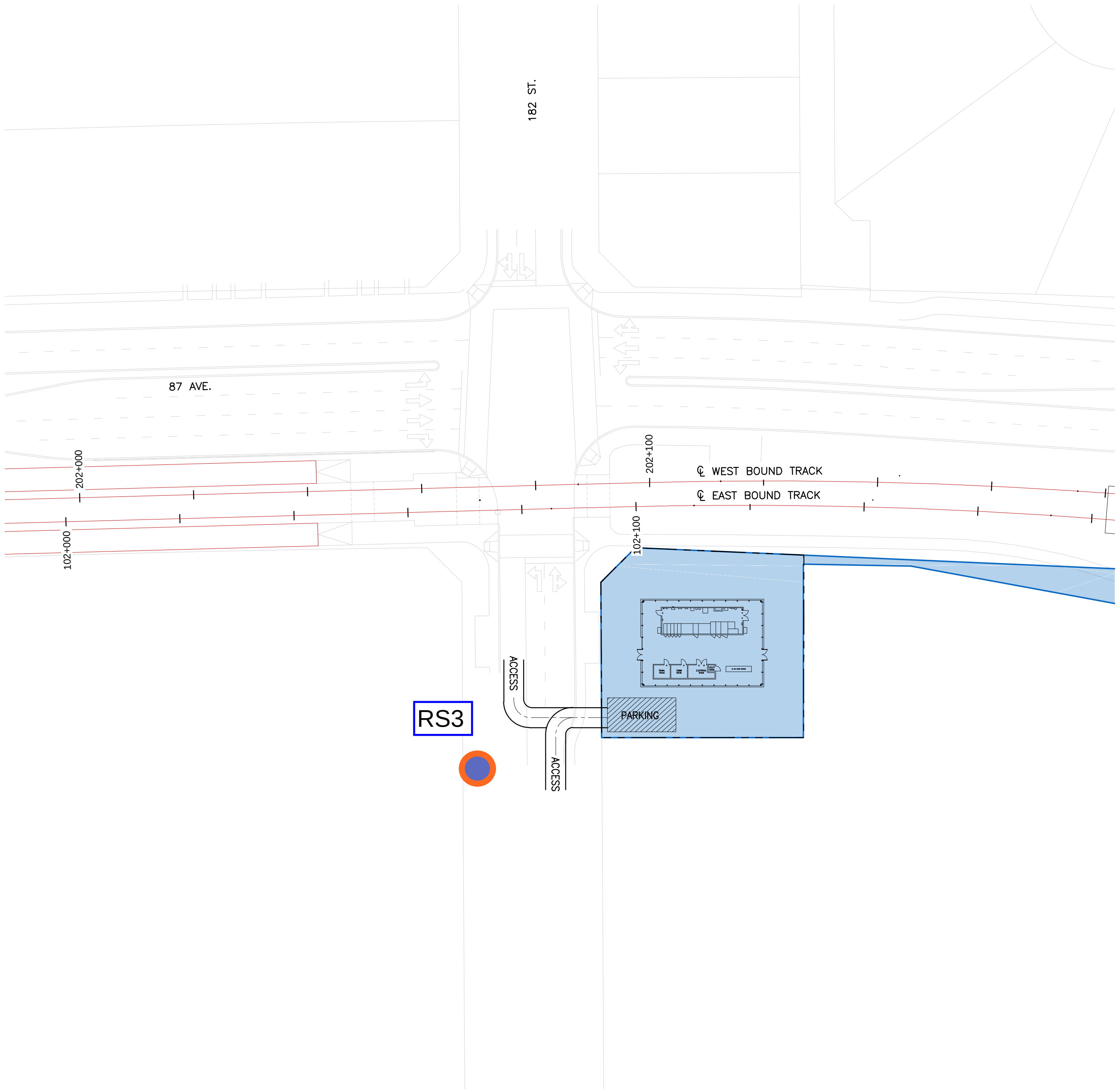
VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0416-02-PE-A101

REV 0

SHT A101



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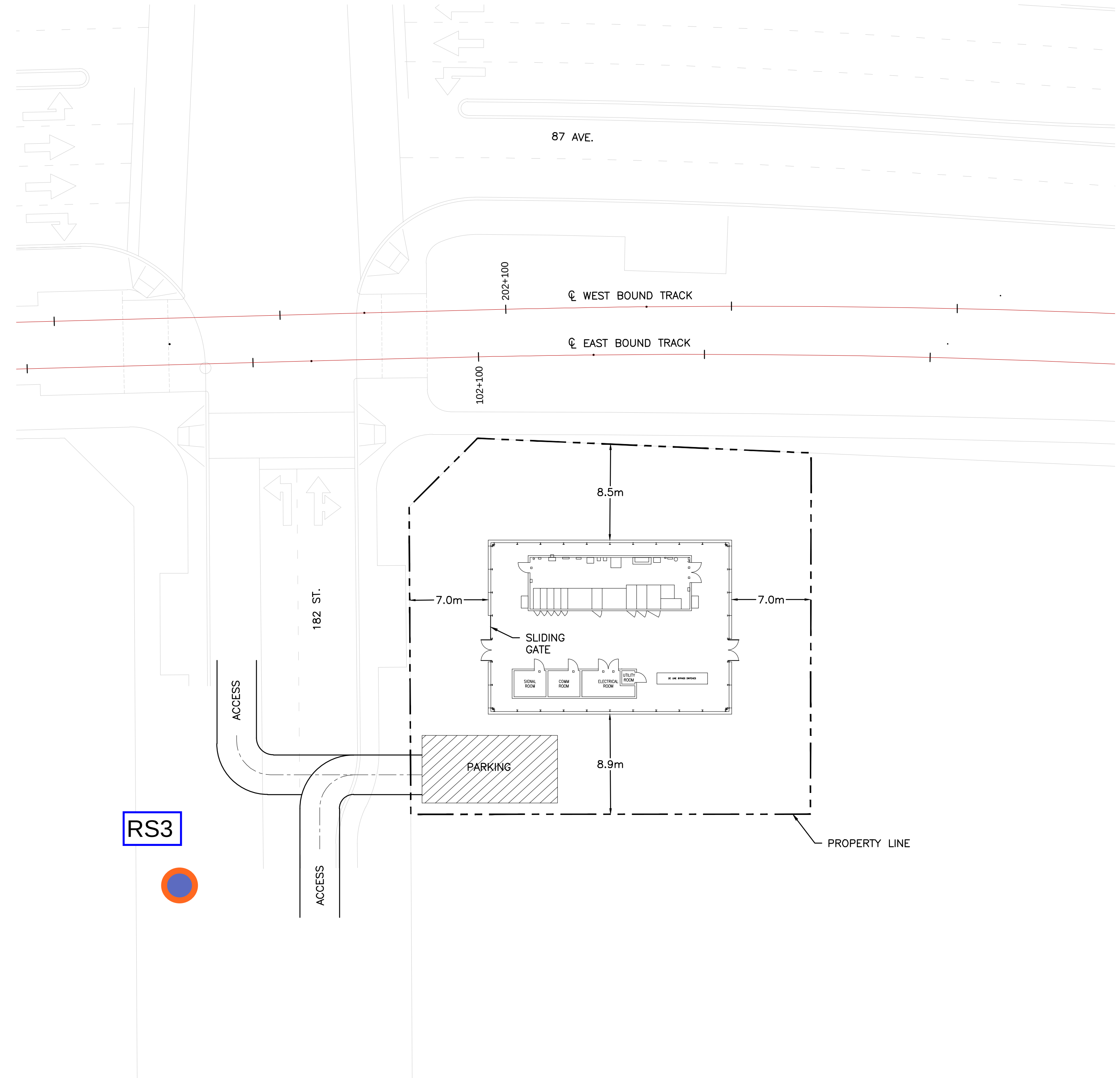

2 PLAN 1:250 (0416-02 A102)

LEGEND

- ACQUIRED LAND
- REQUIRED LAND
- EASEMENT

MAGU876894 / December 12, 2017 / C:\PWWORKING\HI\MAGU876894\D0275372\VLW-0416-02-PE.DWG

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13–12–17	G.T.
A	NOT ISSUED	–	–
	issue data		

no.	description	date	checked
	revisions		

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by B. MAGUIRE | designed by B. MAGUIRE
checked by G. TURNER | date 13–12–2017

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consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

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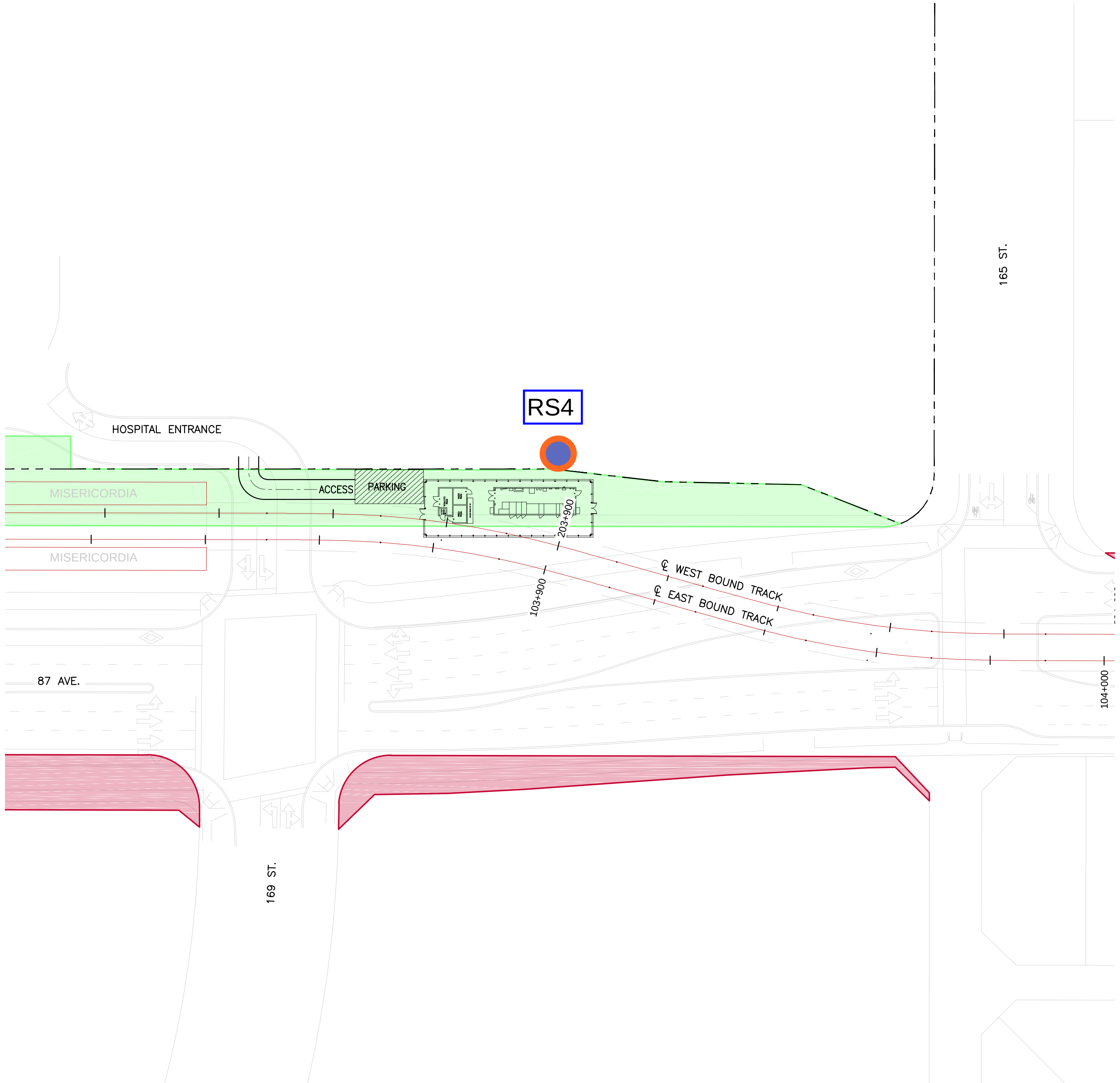
PRELIMINARY ENGINEERING DRAWINGS
NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title
LRT TRACTION POWER
TPSS LOCATION
182 ST AND 87 AVE TPSS LAYOUT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0416-02-PE-A102 | REV 0 | SHT A102



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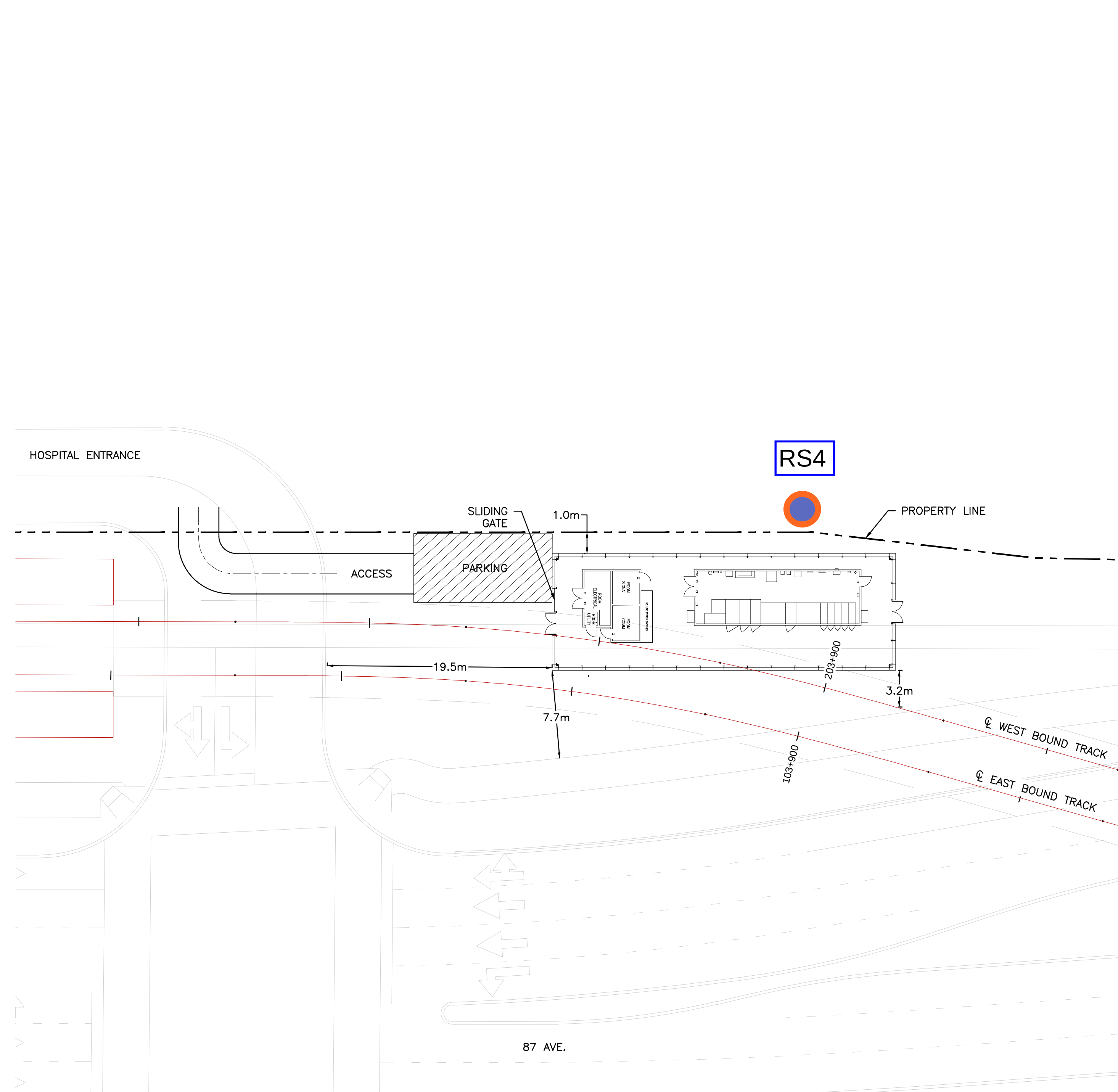
LEGEND

ACQUIRED LAND

REQUIRED LAND

EASEMENT



2 PLAN 1:250 0416-02 A103

no.	description	date	appd
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A	NOT ISSUED	–	–

issue data

no.	description	date	checked

revisions

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A1 bar scale 1:500m 0 5 15 25m

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drawing title

LRT TRACTION POWER

TPSS LOCATION

MISERICORDIA AND 87 AVE TPSS LAYOUT

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0416-02-PE-A103

REV 0

SHT A103

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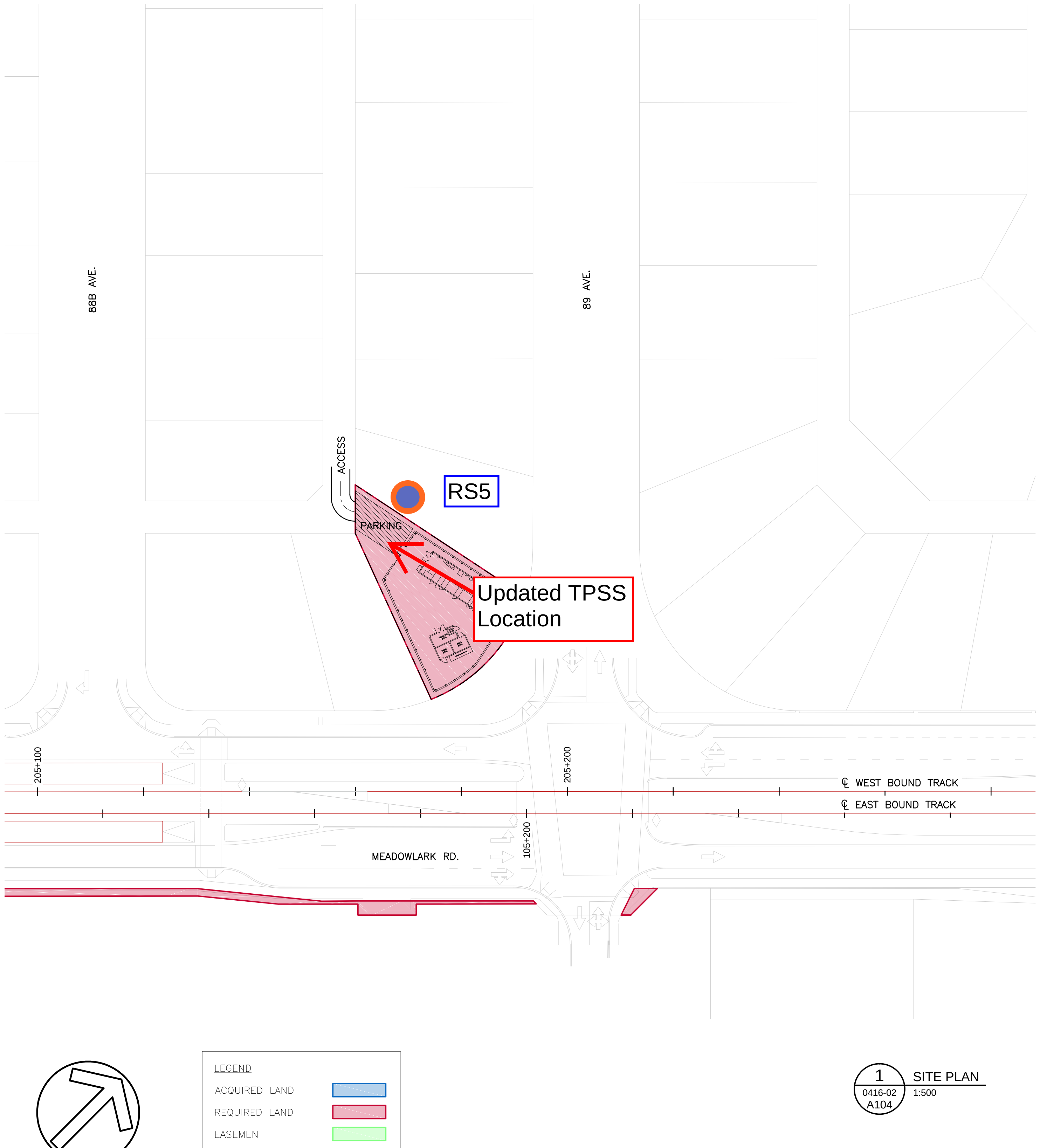

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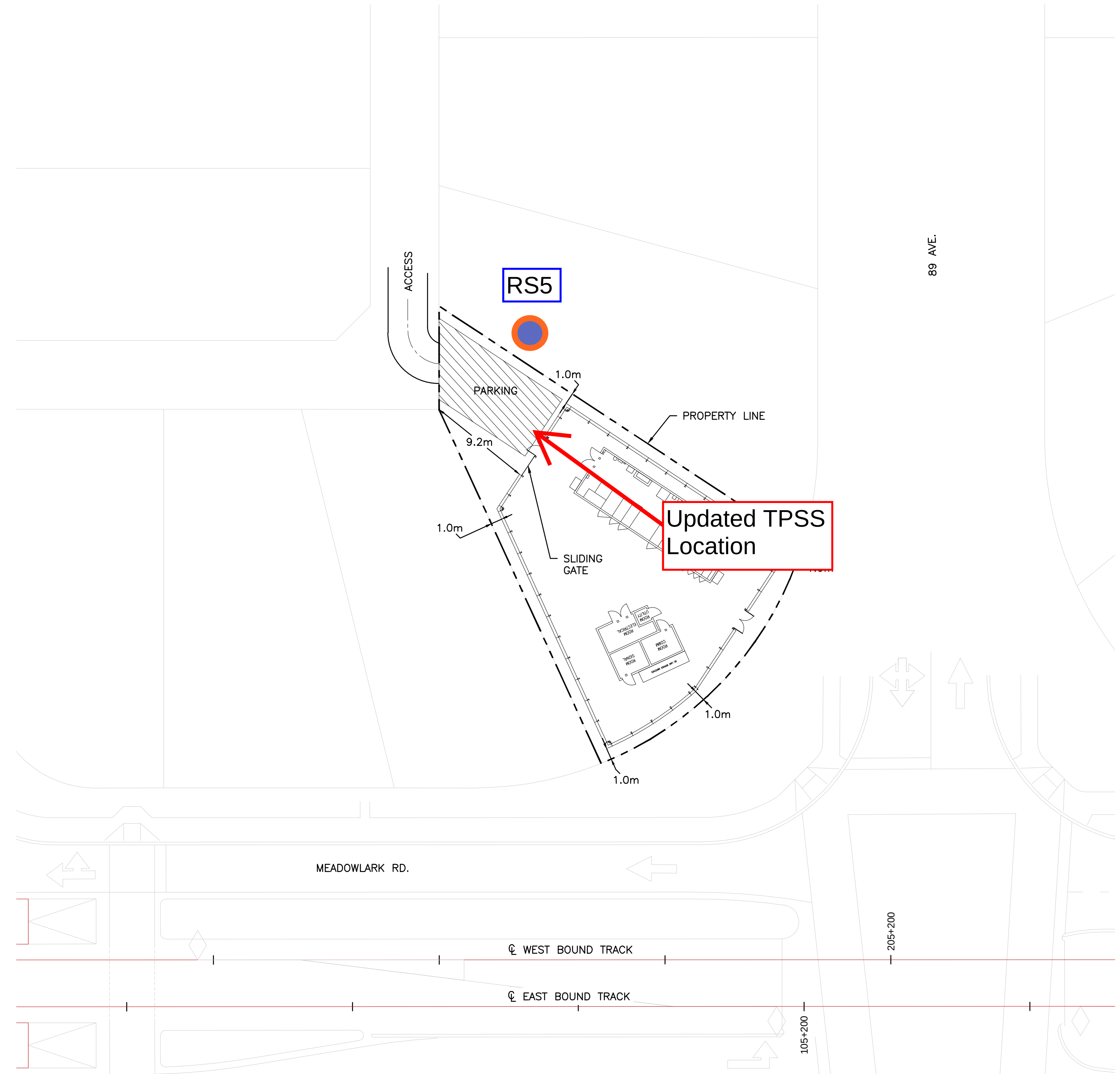

2 PLAN 1:250 (0416-02 A104)

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A	NOT ISSUED	–	–

issue data

no.	description	date	checked

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

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date 13–12–2017

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Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACTION POWER

TPSS LOCATION

MEADOWLARK RD AND 89 AVE TPSS LAYOUT

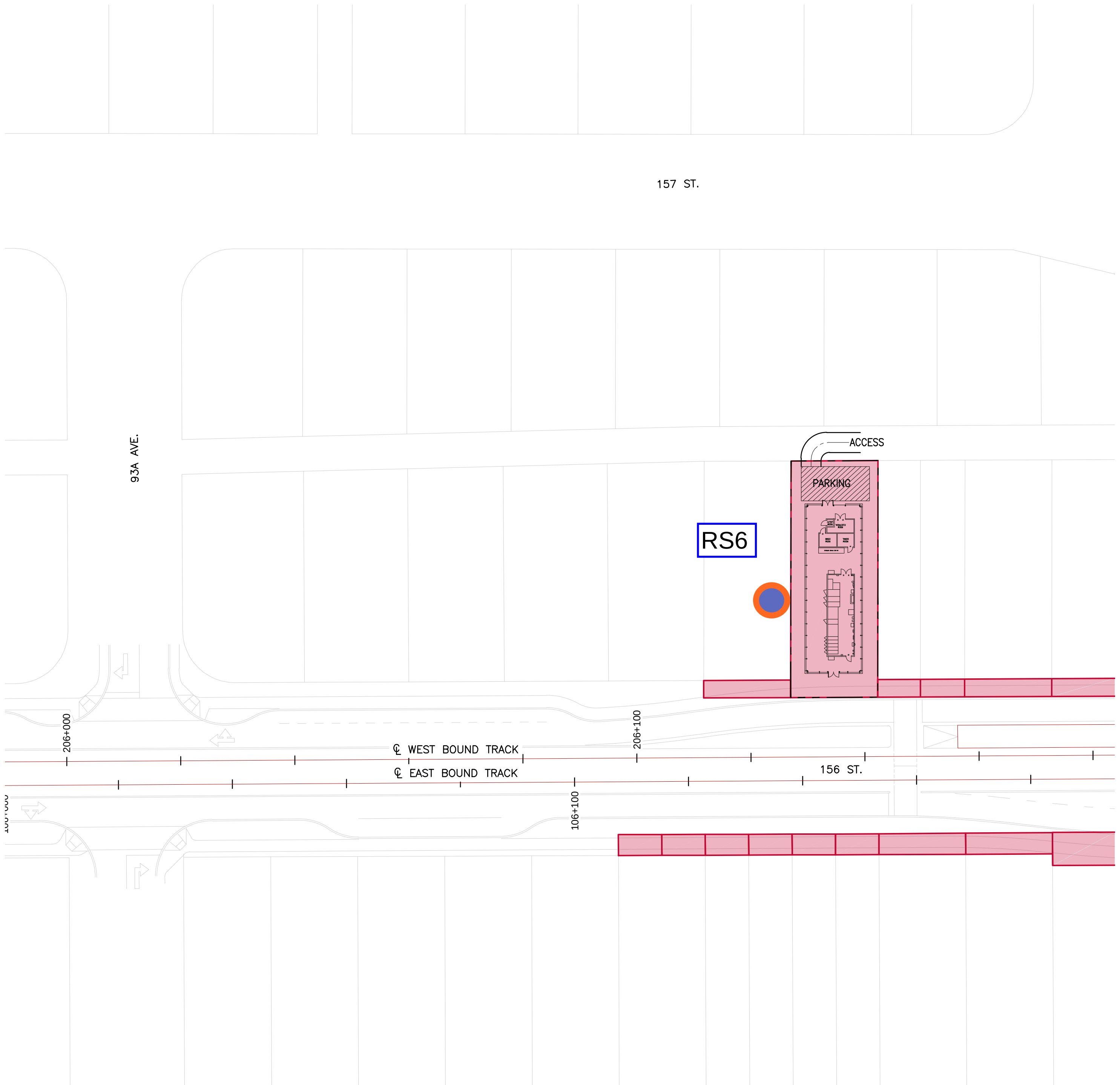
VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0416-02-PE-A104

REV 0

SHT A104



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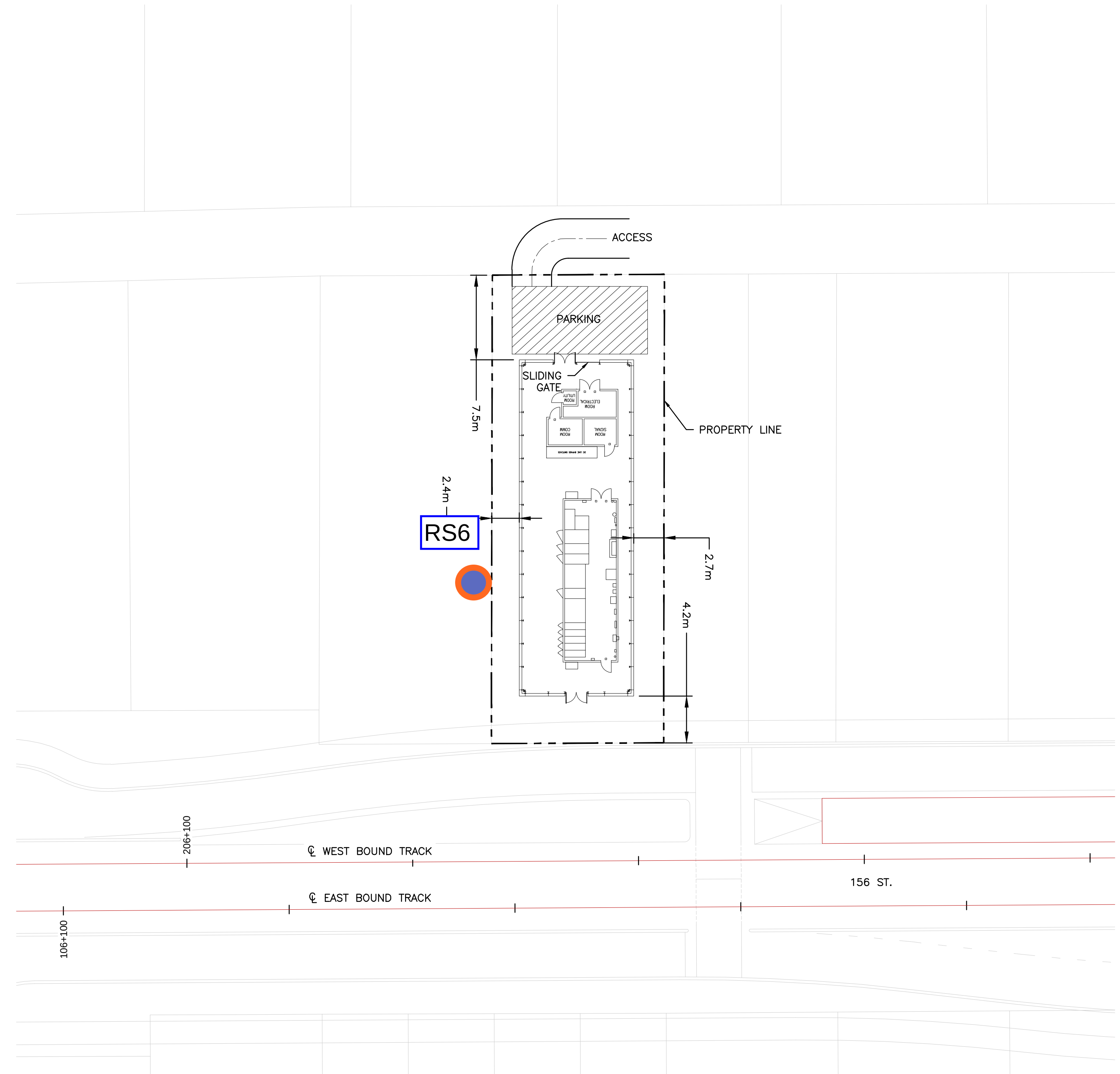

2 PLAN 1:250 0416-02 A105

LEGEND

- ACQUIRED LAND
- REQUIRED LAND
- EASEMENT

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HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

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drawing title

LRT TRACTION POWER

TPSS LOCATION

156 ST AND 94A AVE TPSS LAYOUT

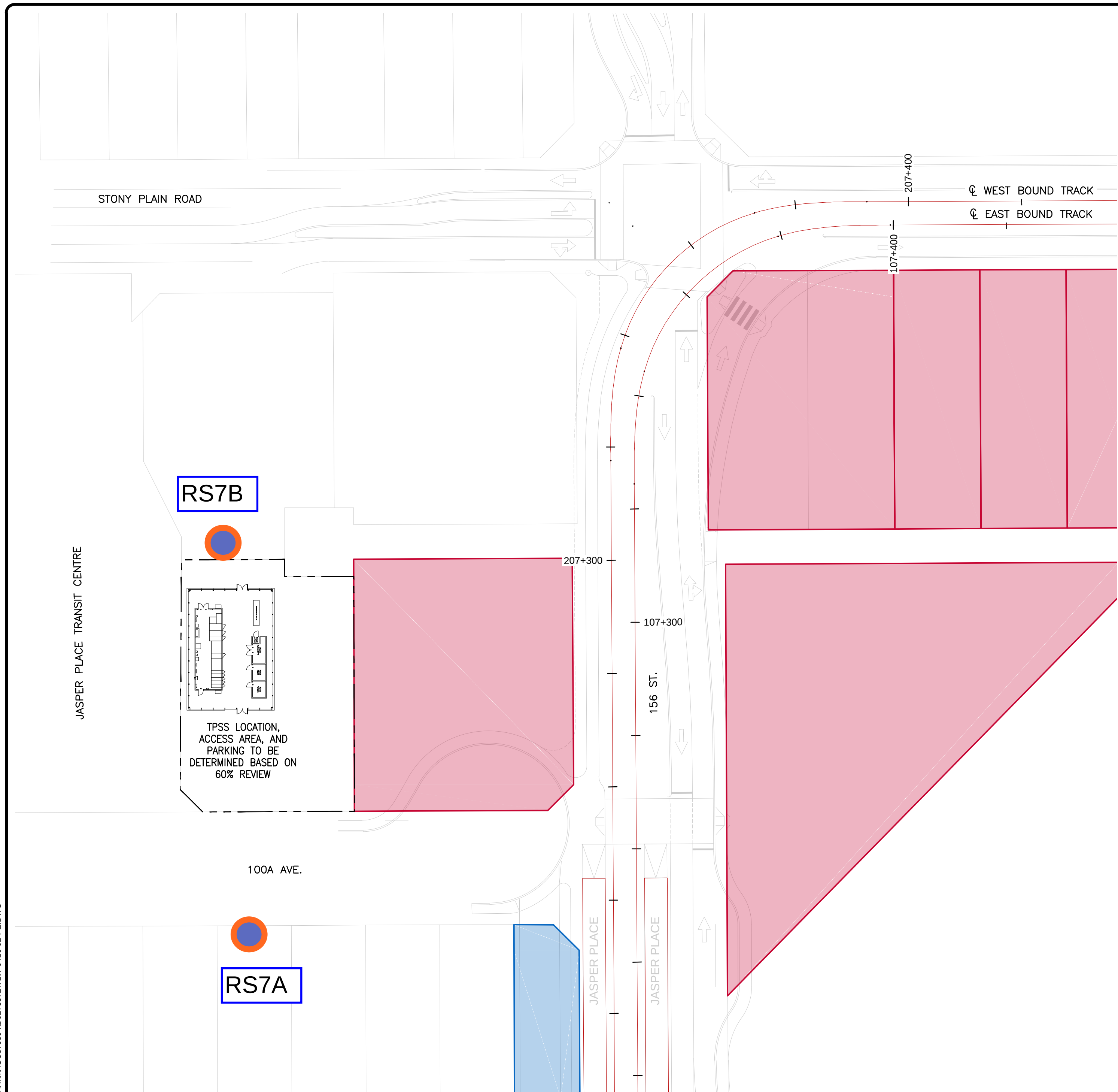
VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0416-02-PE-A105

REV 0

SHT A105



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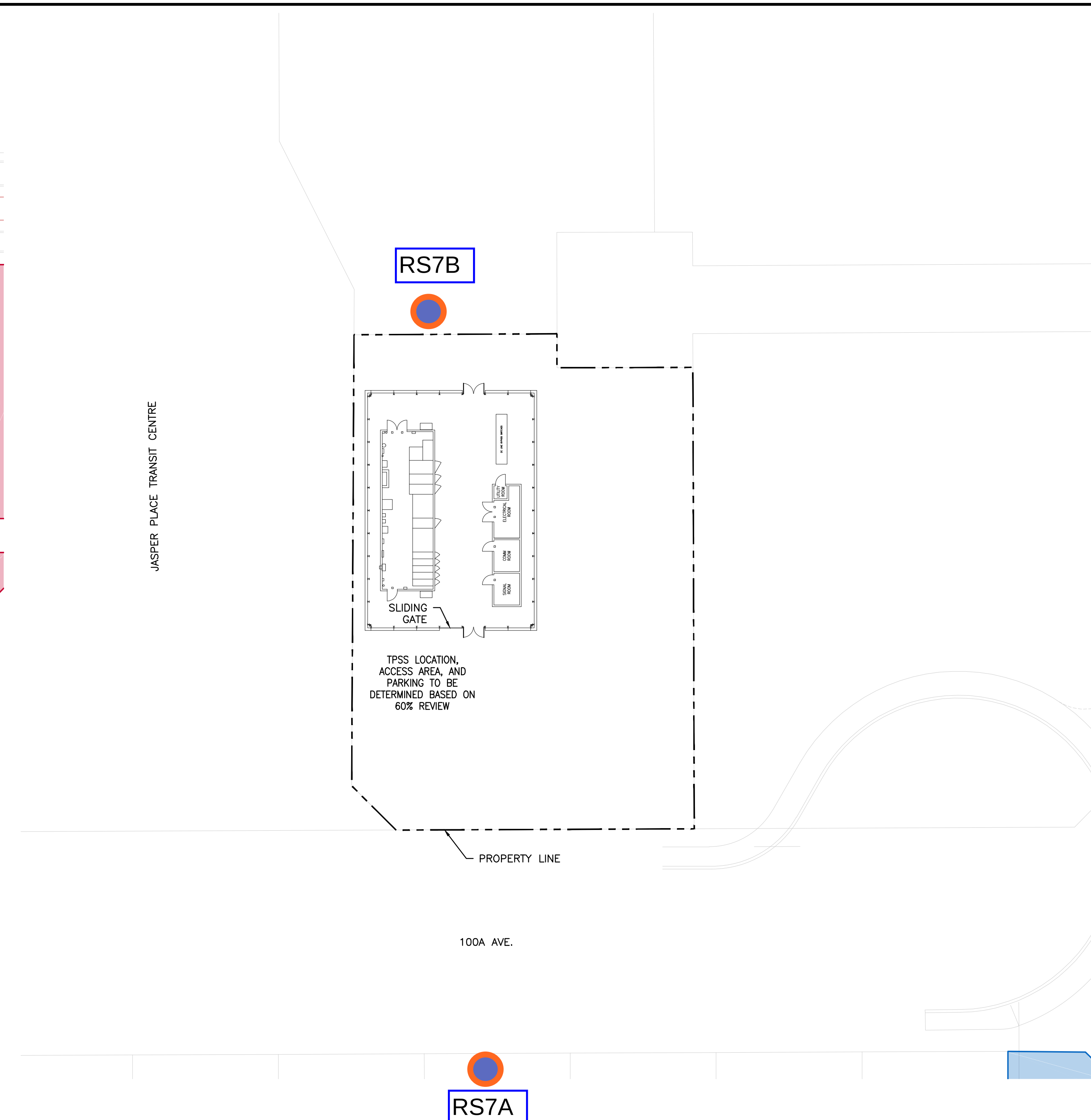

2 PLAN
0416-02 A106
1:250

LEGEND
- ACQUIRED LAND
- REQUIRED LAND
- EASEMENT

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A	NOT ISSUED	–	–

issue data

no.	description	date	checked

revisions

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PRELIMINARY ENGINEERING DRAWINGS
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prime consultant reviewed by M. PERRY

drawing title
LRT TRACTION POWER
TPSS LOCATION
156 ST AND STONY PLAIN ROAD TSPP LAYOUT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0416-02-PE-A106
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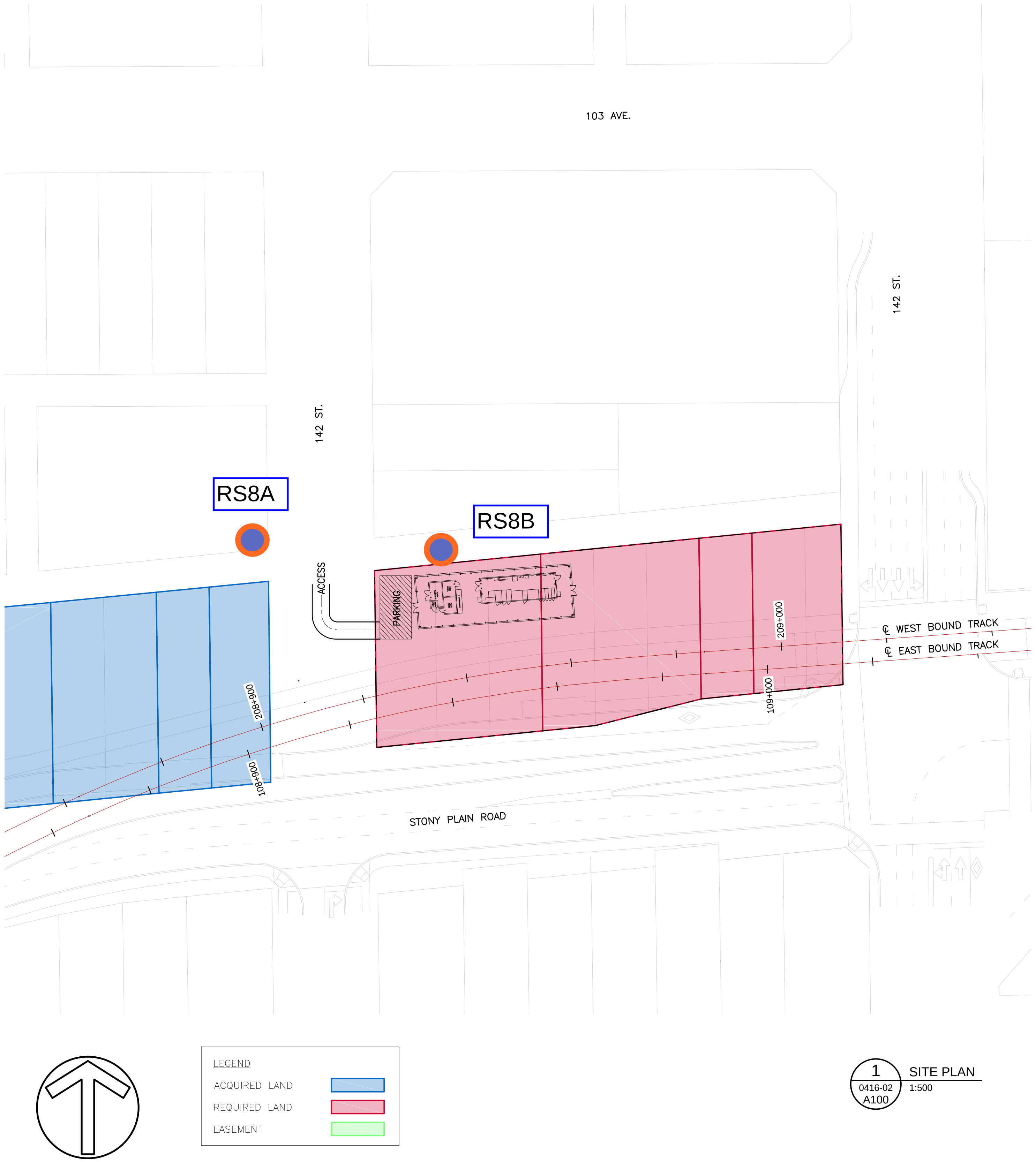

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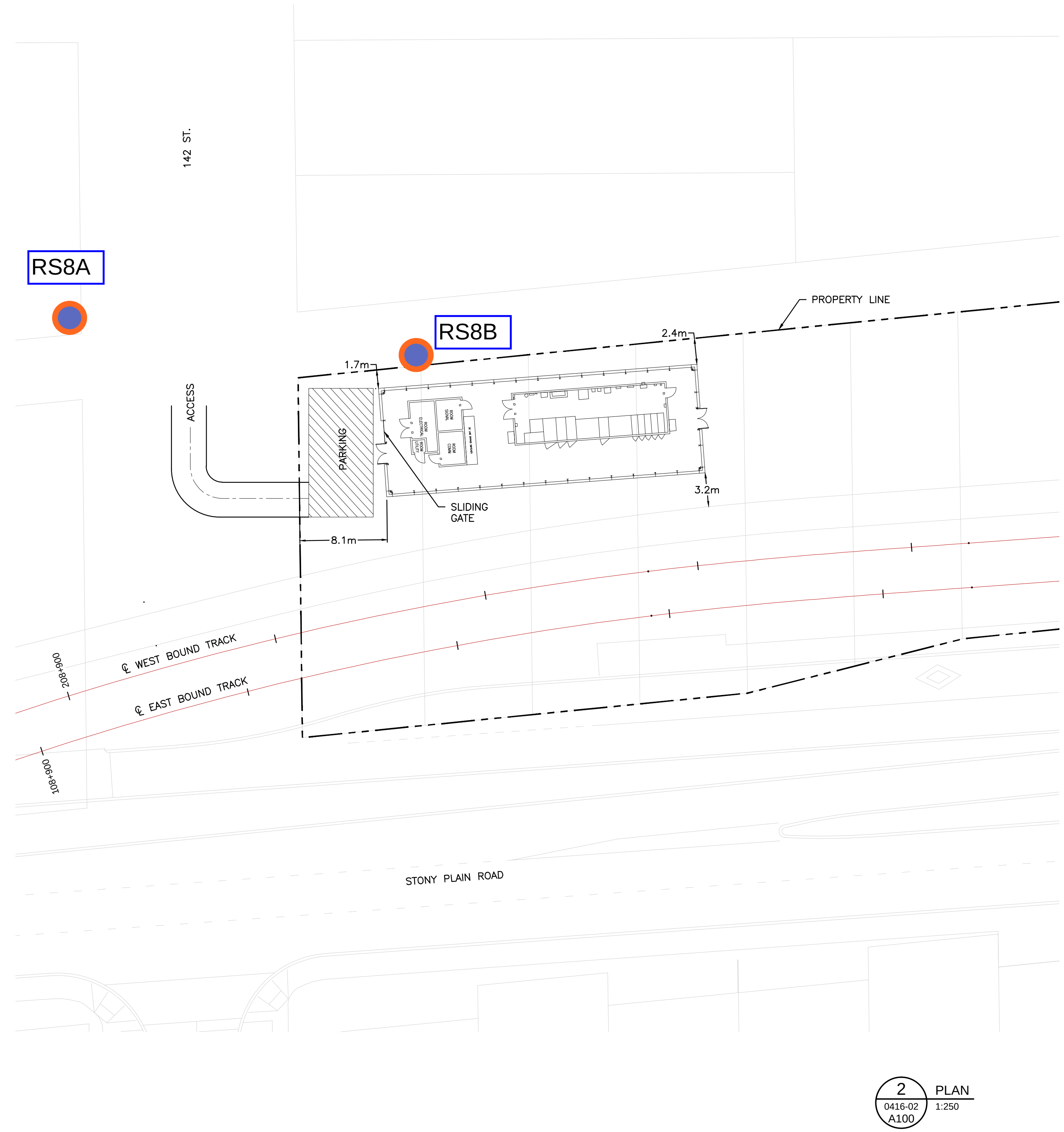

2 PLAN 1:250 (0416-02 A100)

LEGEND

- ACQUIRED LAND
- REQUIRED LAND
- EASEMENT

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A	NOT ISSUED	–	–

issue data

no.	description	date	checked

revisions

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checked by G. TURNER

date 13-12-2017

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prime consultant job no 60528911

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drawing title

LRT TRACTION POWER

TPSS LOCATION

143 ST AND STONY PLAIN ROAD TSPP LAYOUT

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0416-02-PE-A107

REV 0

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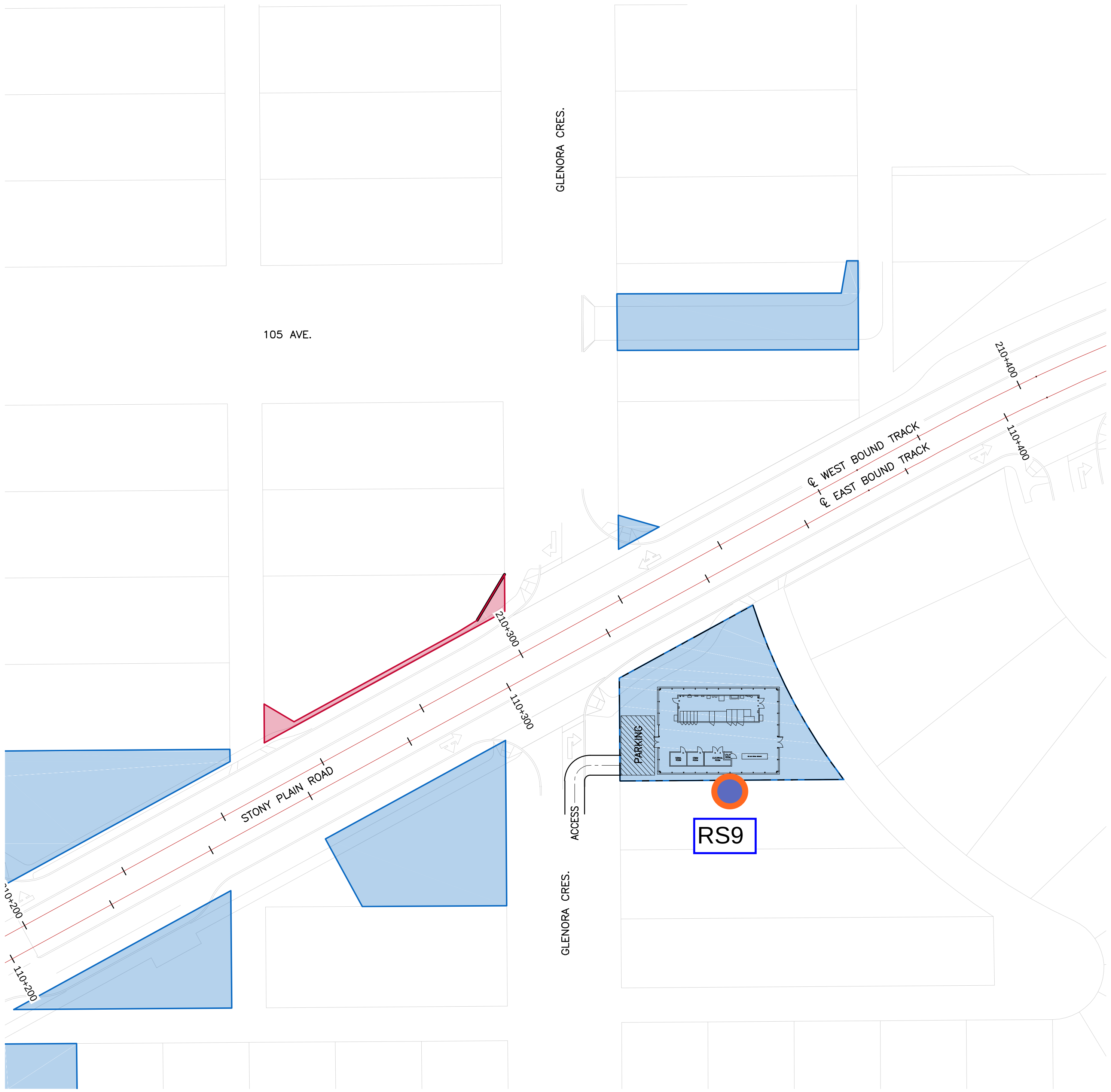

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ACQUIRED LAND
REQUIRED LAND
EASEMENT

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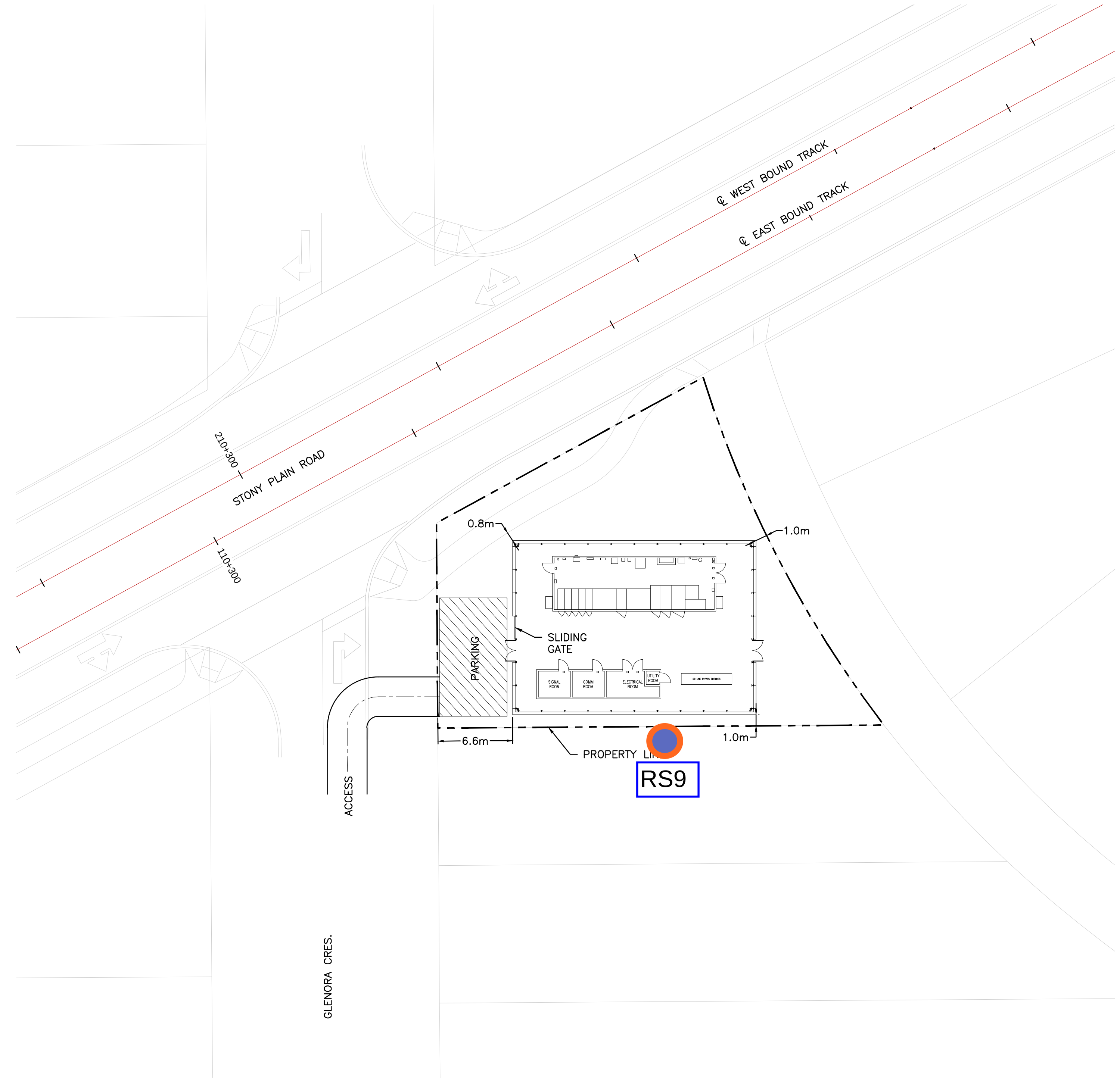
0416-02 A108



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0416-02 A108

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no.	description	date	appd
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issue data

no.	description	date	checked

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by B. MAGUIRE

designed by B. MAGUIRE

checked by G. TURNER

date 13-12-2017

permit

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

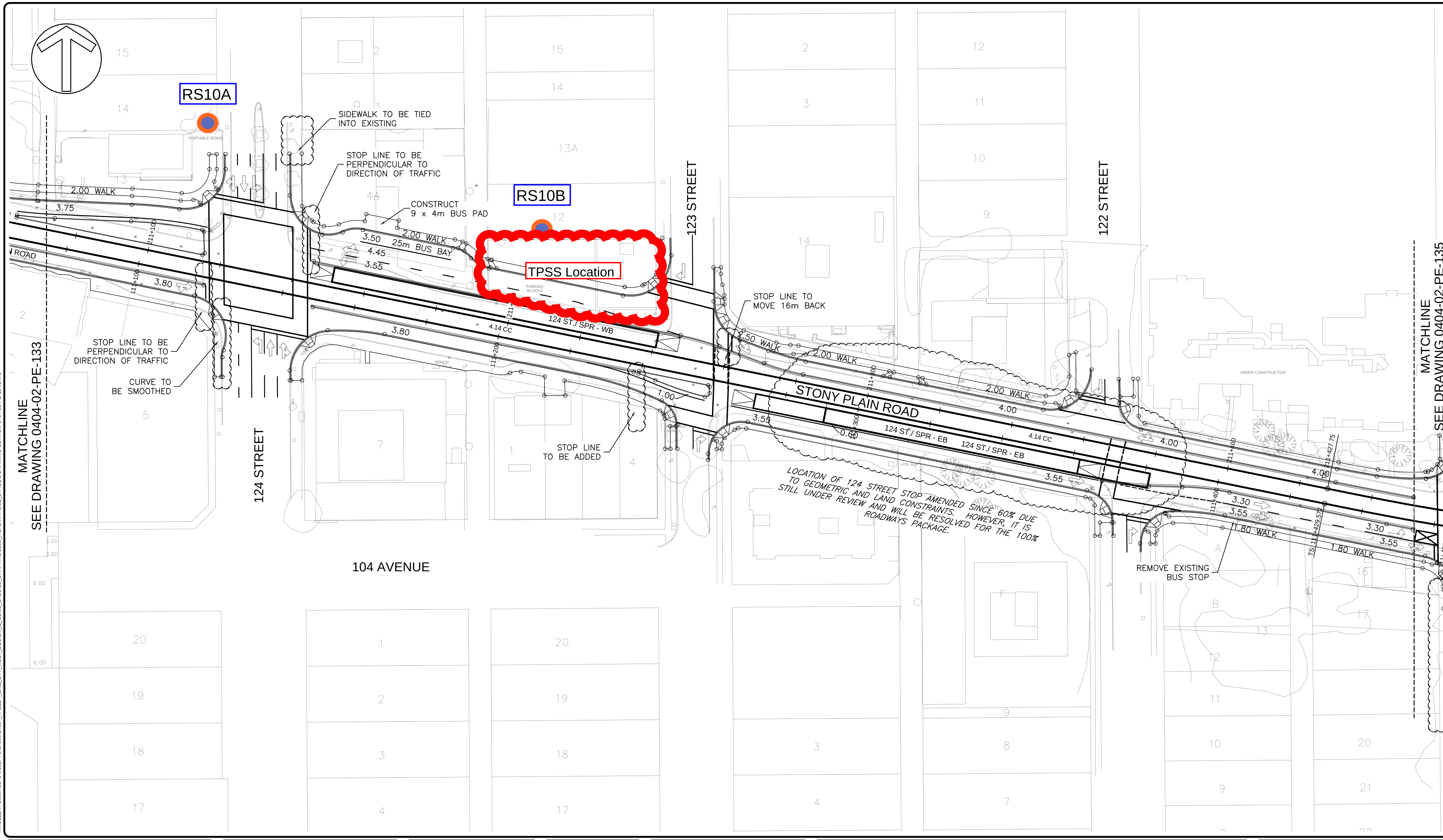
LRT TRACTION POWER
TPSS LOCATION
GLENORA CRES AND STONY PLAIN ROAD TSPP LAYOUT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0416-02-PE-A108

REV 0

SHT A108



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B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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A1 bar scale 1:500 0 5 15 25m

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designed by D. MARTIN
checked by J. MILLER
date 13-DEC-2017

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consultant job no 14854

seal

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AECOM — Prime Consultant

Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS
NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-134
REV 0
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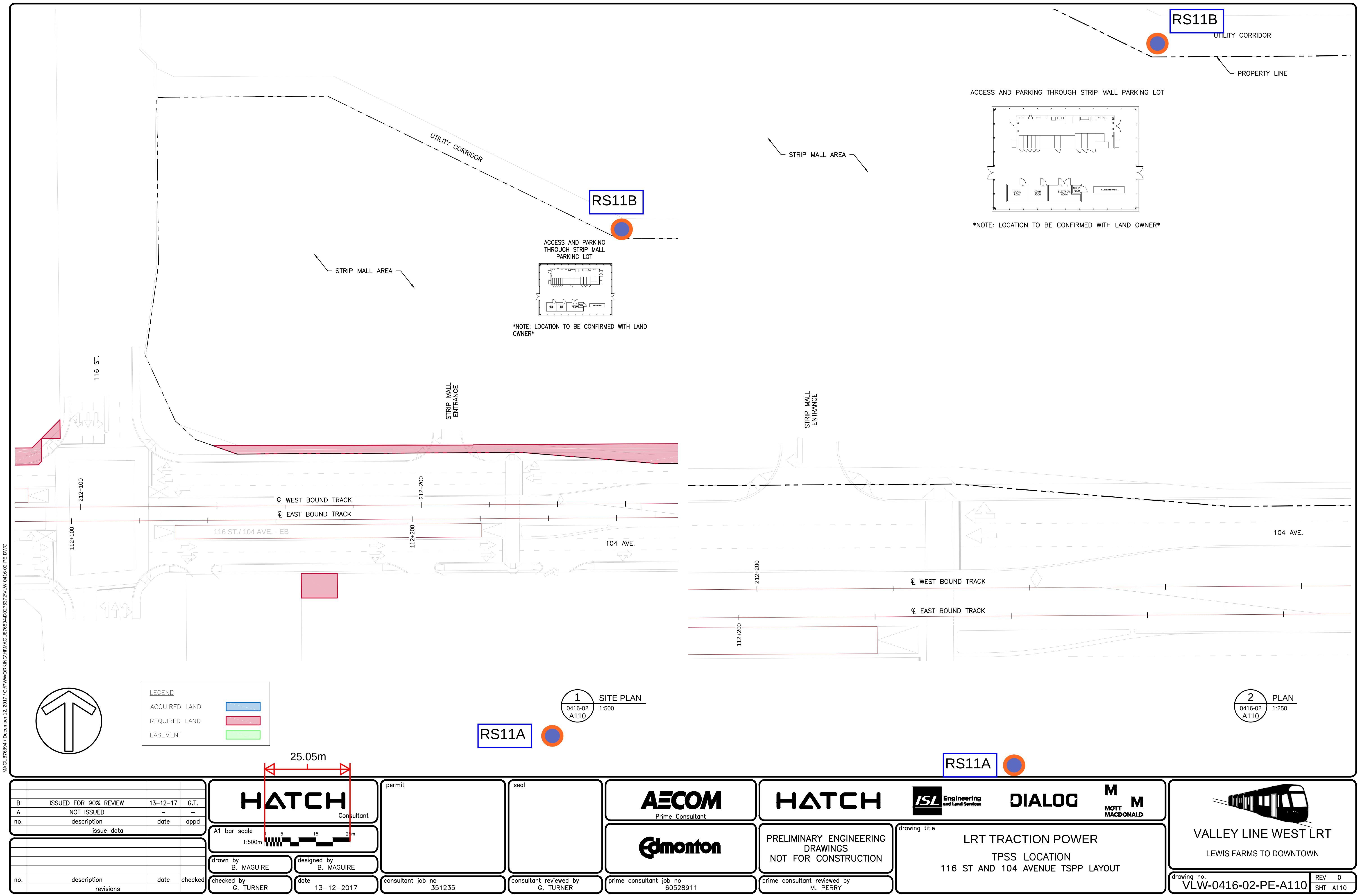

RS11B
UTILITY CORRIDOR
PROPERTY LINE
ACCESS AND PARKING THROUGH STRIP MALL PARKING LOT
STRIP MALL AREA
NOTE: LOCATION TO BE CONFIRMED WITH LAND OWNER
ACCESS AND PARKING THROUGH STRIP MALL PARKING LOT
116 ST.
STRIP MALL ENTRANCE
212+100
212+200
112+100
112+200
℄ WEST BOUND TRACK
℄ EAST BOUND TRACK
116 ST / 104 AVE. - EB
104 AVE.
LEGEND
ACQUIRED LAND
REQUIRED LAND
EASEMENT
1 SITE PLAN 0416-02 A110 1:500
2 PLAN 0416-02 A110 1:250
RS11A
25.05m
B ISSUED FOR 90% REVIEW 13-12-17 G.T.
A NOT ISSUED – –
no. description date appd
issue data
no. description date checked
revisions
HATCH Consultant
A1 bar scale 1:500m
drawn by B. MAGUIRE
designed by B. MAGUIRE
checked by G. TURNER
date 13-12-2017
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seal
consultant job no 351235
consultant reviewed by G. TURNER
AECOM Prime Consultant
Edmonton
prime consultant job no 60528911
PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION
prime consultant reviewed by M. PERRY
HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD
drawing title
LRT TRACTION POWER
TPSS LOCATION
116 ST AND 104 AVENUE TSPP LAYOUT
VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN
drawing no. VLW-0416-02-PE-A110
REV 0
SHT A110
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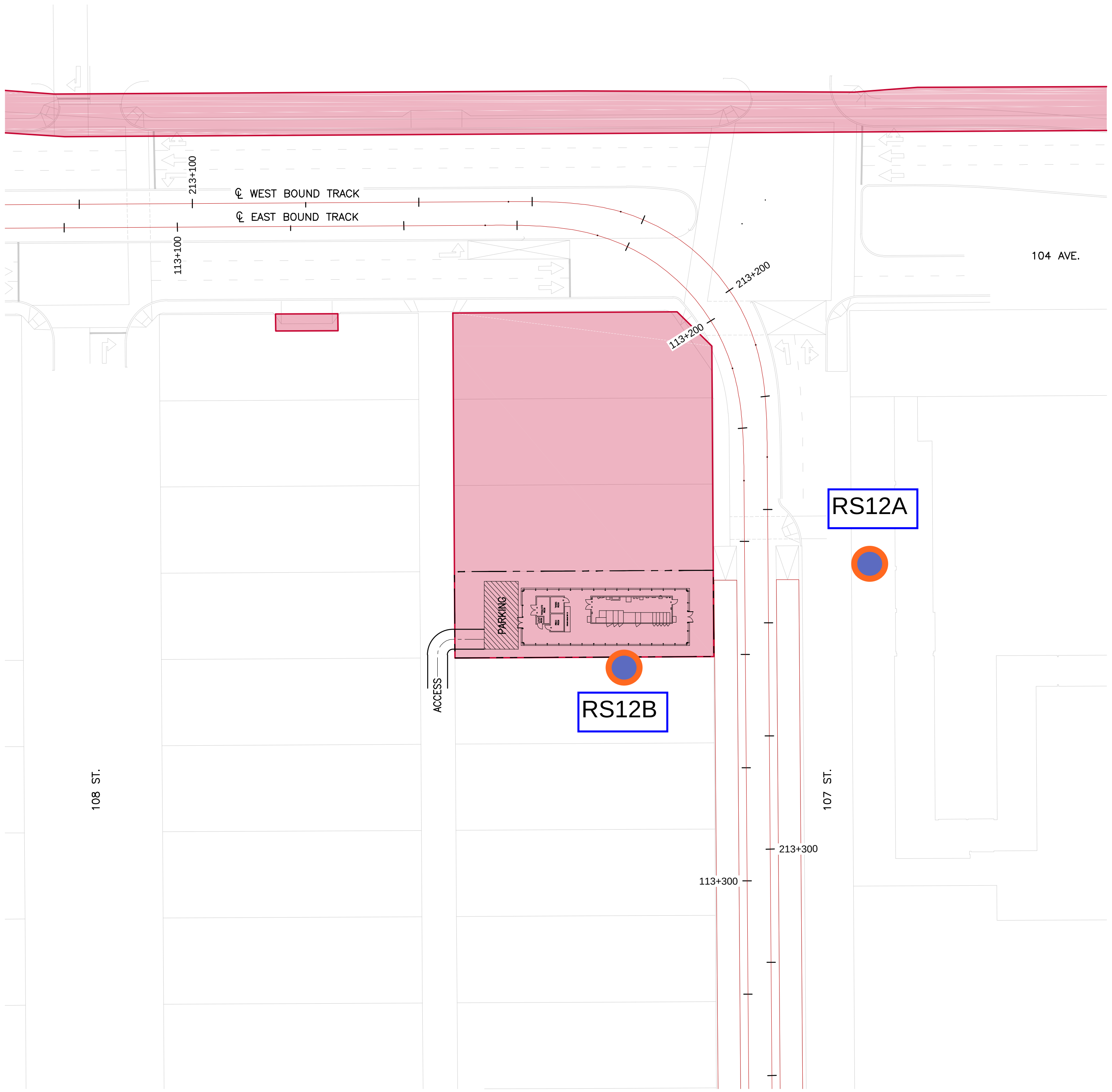

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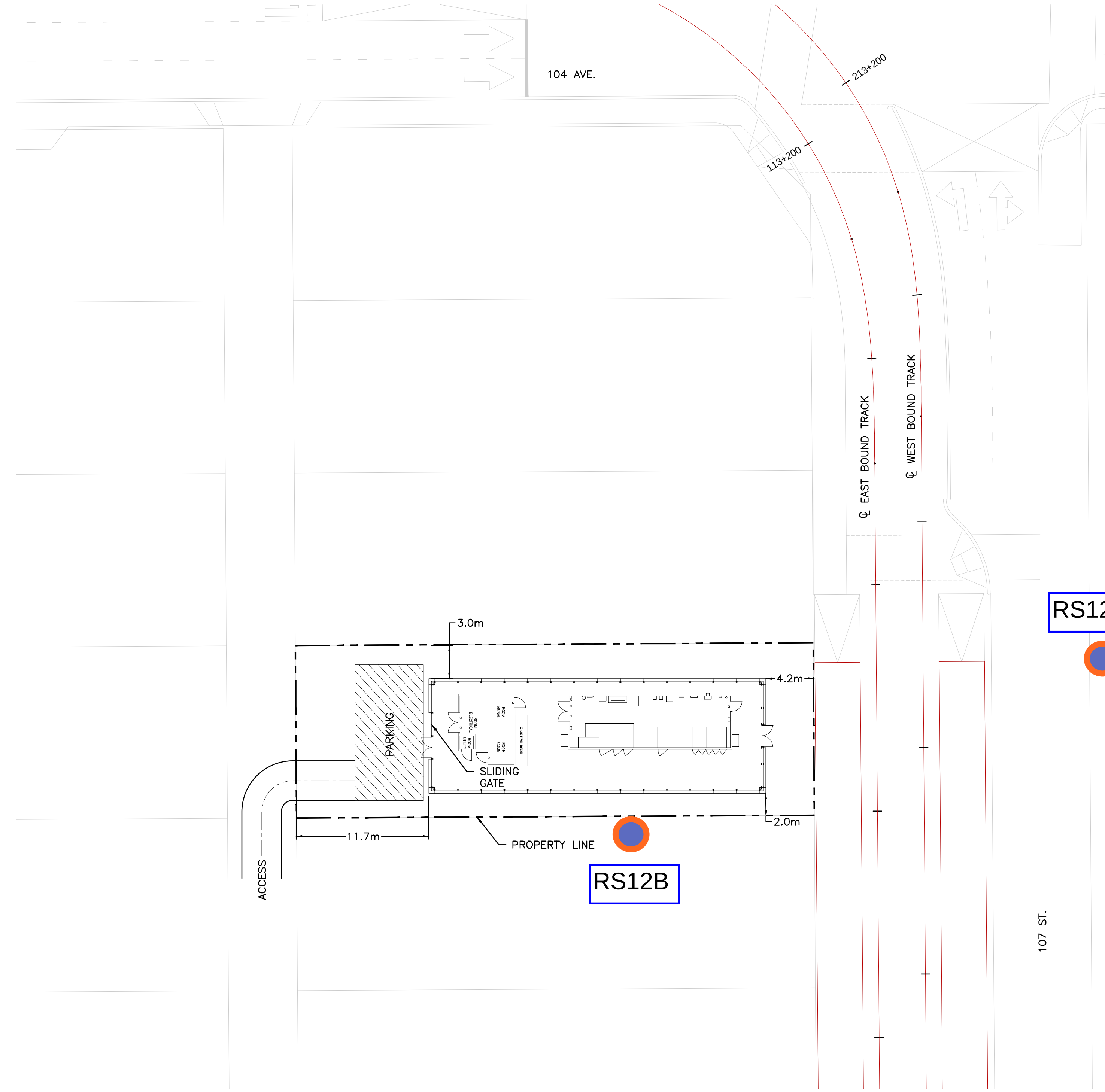

2 PLAN 1:250
0416-02 A111

LEGEND

- ACQUIRED LAND
- REQUIRED LAND
- EASEMENT

no.	description	date	appd
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issue data

no.	description	date	checked

revisions

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prime consultant reviewed by M. PERRY

drawing title
LRT TRACTION POWER
TPSS LOCATION
107 ST AND 104 AVE TSPP LAYOUT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0416-02-PE-A111
REV 0
SHT A111

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Appendix B1

Transportation Noise Receptor Map

aecom.com

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A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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A1 bar scale 1:500 — 0, 5, 15, 25m

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designed by D. MARTIN
checked by J. MILLER
date 13-DEC-2017

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The Association of Professional Engineers and Geoscientists of Alberta

consultant job no 14854

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consultant reviewed by J. MILLER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-100
REV 0
SHT 3

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A	ISSUED FOR 60% REVIEW	05-09-17	J.M.
no.	description	date	appd
	issue data		

no.	description	date	checked
	revisions		

ISL Engineering and Land Services — Consultant

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designed by D. MARTIN

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-101 REV 0 SHT 4

RMULLER / December 14, 2017 / J:\14800\14854_VALLEY_LINE_LRT_WEST_DESIGN_&_OE\02_CADD\20_DRAFTING\2300_ROADWAYS\01_STAGE 2 DRAWING SET\VLW-0404-02-PE-101.DWG

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revisions

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-102 — REV 0 — SHT 5

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A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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A1 bar scale 1:500 0 5 15 25m

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consultant job no 14854

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

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drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-103 | REV 0 | SHT 6

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revisions

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Consultant

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prime consultant reviewed by F. BHANJI

drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-104
REV 0
SHT 7

RMULLER / December 14, 2017 / J:\14800\14854_VALLEY_LINE_LRT_WEST_DESIGN_&_OE\02_CADD\20_DRAFTING\2300_ROADWAYS\01_STAGE 2 DRAWING SET\VLW-0404-02-PE-105.DWG

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

ISL Engineering and Land Services — Consultant

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checked by J. MILLER
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Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS
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prime consultant reviewed by F. BHANJI

drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-105
REV 0
SHT 8

Note: Portion of elevated track updated (June 2018) - See Figure B1-1

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13–12–17	J.M.
A	ISSUED FOR 60% REVIEW	05–09–17	J.M.

issue data

no.	description	date	checked

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drawing title: ROADWAYS ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-106 — REV 0 — SHT 9

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

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drawing title: ROADWAYS ALIGNMENT

VALLEY LINE WEST LRT — LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-107 — REV 0 — SHT 10

Note: Portion of elevated track updated (June 2018) - See Figure B1-1

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

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drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-108 | REV 0 | SHT 11

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

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ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-109 | REV 0 | SHT 12

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B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.
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issue data

no.	description	date	checked

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ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-110
REV 0
SHT 13

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

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ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13–12–17	J.M.
A	ISSUED FOR 60% REVIEW	05–09–17	J.M.

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ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-112
REV 0
SHT 15

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

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drawing title: ROADWAYS ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-113 | REV 0 | SHT 16

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

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ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-114
REV 0
SHT 17

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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revisions

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ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-115
REV 0
SHT 18

B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.
no.	description	date	appd

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no.	description	date	checked

revisions

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ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-116 | REV 0 | SHT 19

OBSOLETE; REMOVED FROM DRAWING SET

Track no longer in section - Receptors kept for continuity

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

revisions

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prime consultant job no 60528911

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ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-117
REV 0
SHT 20

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-118

REV 0
SHT 21

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no.	REV	SHT
VLW-0404-02-PE-119	0	22

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13–12–17	J.M.
A	ISSUED FOR 60% REVIEW	05–09–17	J.M.

issue data

no.	description	date	checked

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drawing title

ROADWAYS ALIGNMENT

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-120

REV 0

SHT 23

B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.
no.	description	date	appd
	issue data		

no.	description	date	checked
	revisions		

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ROADWAYS

ALIGNMENT

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-121 | REV 0 | SHT 24

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	10-11-17	J.M.

issue data

no.	description	date	checked

revisions

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drawing title: ROADWAYS ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-122 — REV 0 — SHT 25

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no.	description	date	appd
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A	ISSUED FOR 60% REVIEW	10-11-17	J.M.

issue data

no.	description	date	checked

revisions

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LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-123 | REV 0 | SHT 26

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

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ALIGNMENT

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LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-124 | REV 0 | SHT 27

B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.
no.	description	date	appd

issue data

no.	description	date	checked

revisions

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The Association of Professional Engineers and Geoscientists of Alberta

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A1 bar scale 1:500 0 5 15 25m

drawn by R. MULLER
designed by D. MARTIN
checked by J. MILLER
date 13-DEC-2017
consultant job no 14854
consultant reviewed by J. MILLER

AECOM — Prime Consultant
Edmonton

prime consultant job no 60528911
prime consultant reviewed by F. BHANJI

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS
NOT FOR CONSTRUCTION

drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-125
REV 0
SHT 28

RMULLER / December 14, 2017 / J:\14800\14854_VALLEY_LINE_LRT_WEST_DESIGN_&_OE\02_CADD\20_DRAFTING\2300_ROADWAYS\01_STAGE 2 DRAWING SET\VLW-0404-02-PE-125.DWG

RMULLER / December 14, 2017 / J:\14800\14854_VALLEY_LINE_LRT_WEST_DESIGN_&_OE\02_CADD\20_DRAFTING\2300_ROADWAYS\01_STAGE 2 DRAWING SET\VLW-0404-02-PE-126.DWG

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

revisions

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drawing title: ROADWAYS ALIGNMENT

VALLEY LINE WEST LRT — LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-126 | REV 0 | SHT 29

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

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drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-127 — REV 0 — SHT 30

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

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drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-128 — REV 0 — SHT 31

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RMULLER / December 14, 2017 / J:\14800\14854_VALLEY_LINE_LRT_WEST_DESIGN_&_OE\02_CADD\20_DRAFTING\2300_ROADWAYS\01_STAGE 2 DRAWING SET\VLW-0404-02-PE-129.DWG

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.
	issue data		

no.	description	date	checked
	revisions		

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Edmonton

prime consultant job no 60528911

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NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-129
REV 0
SHT 32

RMULLER / December 14, 2017 / J:\14800\14854_VALLEY_LINE_LRT_WEST_DESIGN_&_OE\02_CADD\20_DRAFTING\2300_ROADWAYS\01_STAGE 2 DRAWING SET\VLW-0404-02-PE-130.DWG

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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A1 bar scale 1:500 0 5 15 25m

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consultant job no 14854

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Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title: ROADWAYS ALIGNMENT

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-130 — REV 0 — SHT 33

B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.
no.	description	date	appd

issue data

no.	description	date	checked

revisions

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checked by J. MILLER — date 13-DEC-2017

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consultant job no 14854

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AECOM — Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-131 — REV 0 — SHT 34

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no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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checked by J. MILLER | date 13-DEC-2017

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Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-132 | REV 0 | SHT 35

B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.
no.	description	date	appd
	issue data		

no.	description	date	checked
	revisions		

ISL Engineering and Land Services — Consultant

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designed by D. MARTIN

checked by J. MILLER

date 13-DEC-2017

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consultant job no 14854

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consultant reviewed by J. MILLER

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Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS
NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-133

REV 0

SHT 36

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no.	description	date	appd
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A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

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consultant job no 14854

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AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-134 | REV 0 | SHT 37

RMULLER / December 14, 2017 / J:\14800\14854_VALLEY_LINE_LRT_WEST_DESIGN_&_OE\02_CADD\20_DRAFTING\2300_ROADWAYS\01_STAGE 2 DRAWING SET\VLW-0404-02-PE-135.DWG

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

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Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-135 — REV 0 — SHT 38

RMULLER / December 14, 2017 / J:\14800\14854_VALLEY_LINE_LRT_WEST_DESIGN_&_OE\02_CADD\20_DRAFTING\2300_ROADWAYS\01_STAGE 2 DRAWING SET\VLW-0404-02-PE-136.DWG

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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Edmonton

prime consultant job no 60528911

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prime consultant reviewed by F. BHANJI

drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-136 — REV 0 — SHT 39

no.	description	date	appd
B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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A1 bar scale 1:500 (0, 5, 15, 25m)

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designed by D. MARTIN

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date 13-DEC-2017

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drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-137 | REV 0 | SHT 40

no.	description	date	appd
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A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

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no.	description	date	checked

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PRELIMINARY ENGINEERING DRAWINGS
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prime consultant reviewed by F. BHANJI

drawing title

ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-138 — REV 0 — SHT 41

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no.	description	date	appd
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A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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designed by D. MARTIN
checked by J. MILLER
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Edmonton

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-139
REV 0
SHT 42

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no.	description	date	appd
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A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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Edmonton

prime consultant job no 60528911

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prime consultant reviewed by F. BHANJI

drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-140
REV 0
SHT 43

B	ISSUED FOR 90% REVIEW	13-12-17	J.M.
A	ISSUED FOR 60% REVIEW	05-09-17	J.M.
no.	description	date	appd

issue data

no.	description	date	checked

revisions

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A1 bar scale 1:500 0 5 15 25m

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designed by D. MARTIN
checked by J. MILLER
date 13-DEC-2017

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Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title
ROADWAYS
ALIGNMENT

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0404-02-PE-141
REV 0
SHT 44

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no.	description	date	appd
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A	ISSUED FOR 60% REVIEW	05-09-17	J.M.

issue data

no.	description	date	checked

revisions

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checked by J. MILLER — date 13-DEC-2017

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Date ______
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The Association of Professional Engineers and Geoscientists of Alberta

consultant job no 14854

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consultant reviewed by J. MILLER

AECOM — Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by F. BHANJI

drawing title

ROADWAYS

ALIGNMENT

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

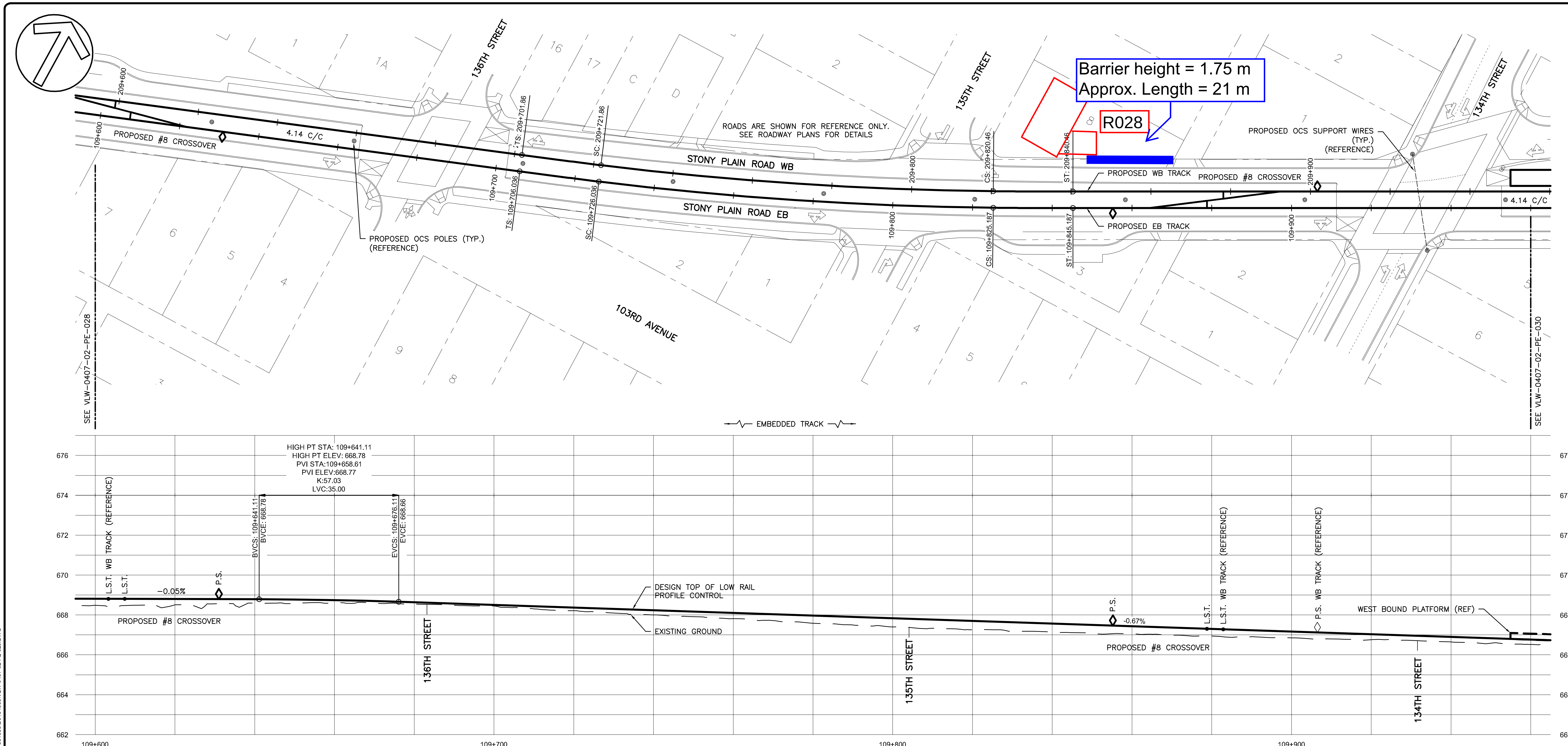
drawing no. VLW-0404-02-PE-142 — REV 0 — SHT 45

Figure B1-1 - Updated Elevated Track Section (June 2018)

Appendix B2

Transportation Noise Mitigation – Barrier Locations

aecom.com



DESIGN SPEED	55KPH																		55KPH
CHAINAGE																			
OPERATING SPEED	50KPH																		50KPH
HORIZONTAL CURVATURE	Ls=20.00m				L=99.15m R=900.00m				Ls=20.00m										
DESIGN TOP OF RAIL	668.805	668.794	668.784	668.741	668.630	668.497	668.363	668.230	668.096	667.962	667.829	667.695	667.561	667.428	667.294	667.160	667.027	666.893	666.759
EXISTING GROUND	668.48	668.50	668.59	668.60	668.54	668.44	668.21	668.00	667.81	667.58	667.40	667.26	667.14	667.05	666.94	666.85	666.76	666.64	666.52

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-029.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

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HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART
checked by N. MUXIAREPU | date 03-07-2017

permit | seal

consultant job no 351235
consultant reviewed by G. TURNER

AECOM Prime Consultant
Edmonton
prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title
LRT TRACK WORK
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 109+600 TO 109+960

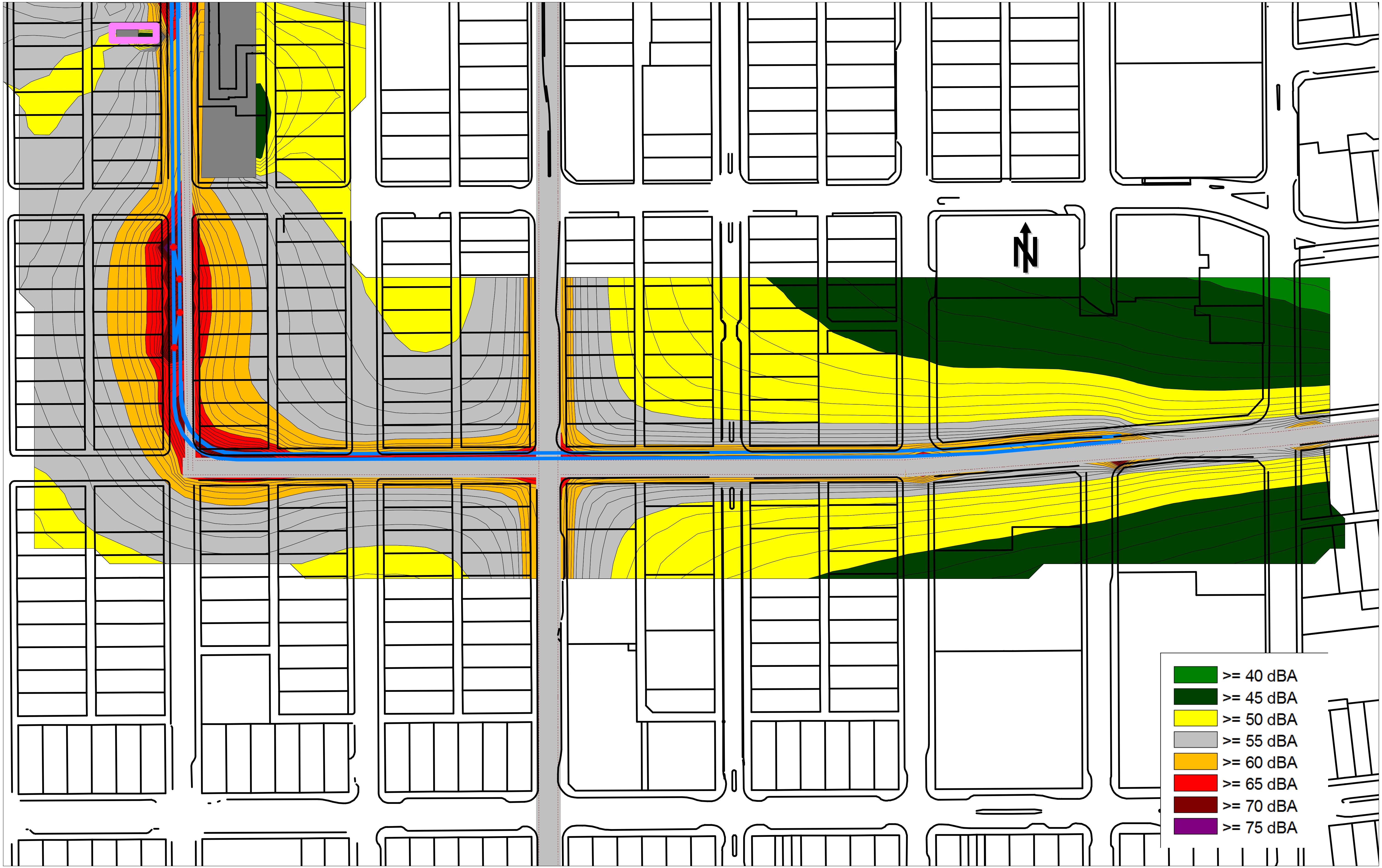
VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-029 | REV 0 | SHT 029

Appendix B3

Transportation Noise Contours

aecom.com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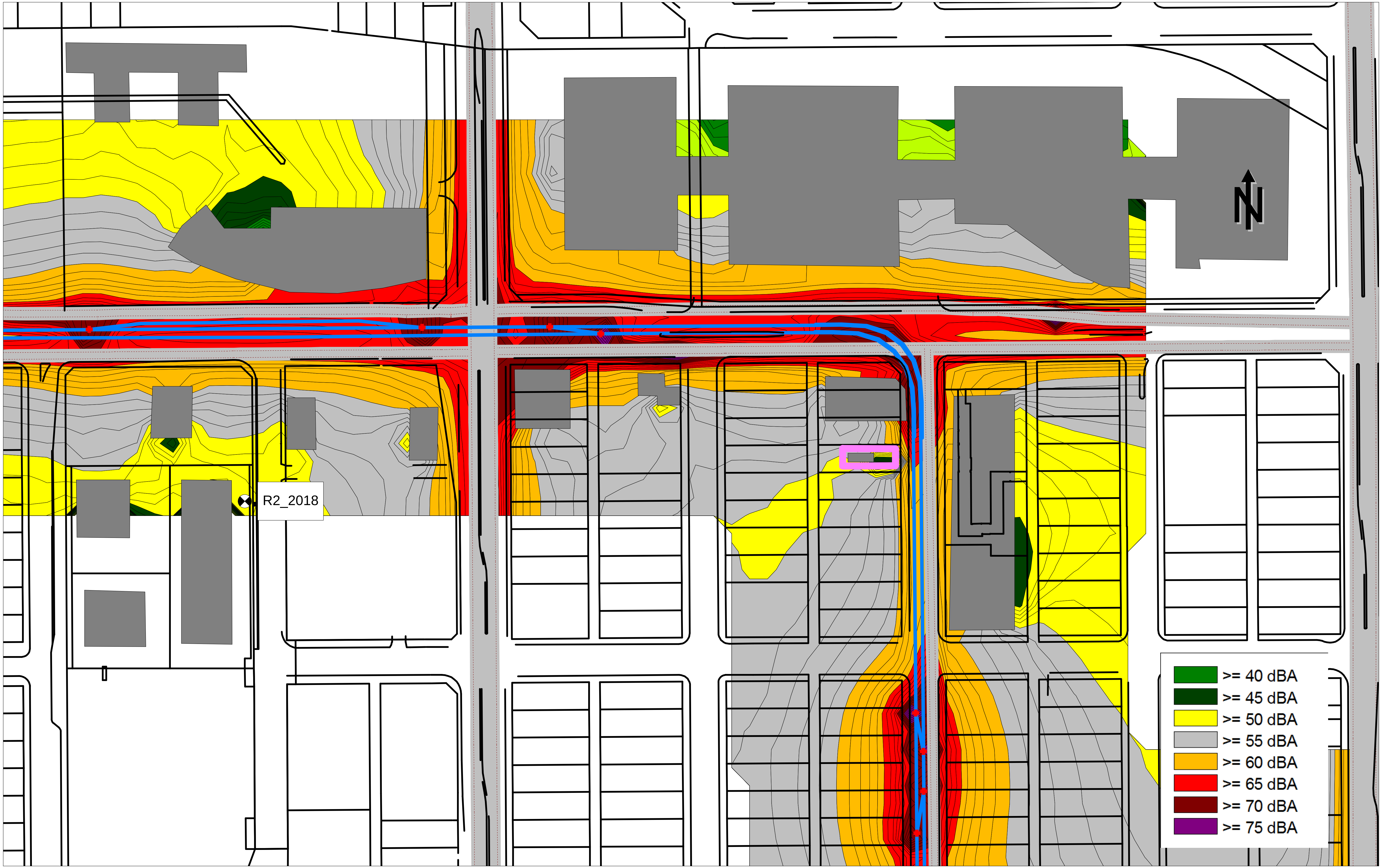

R2_2018
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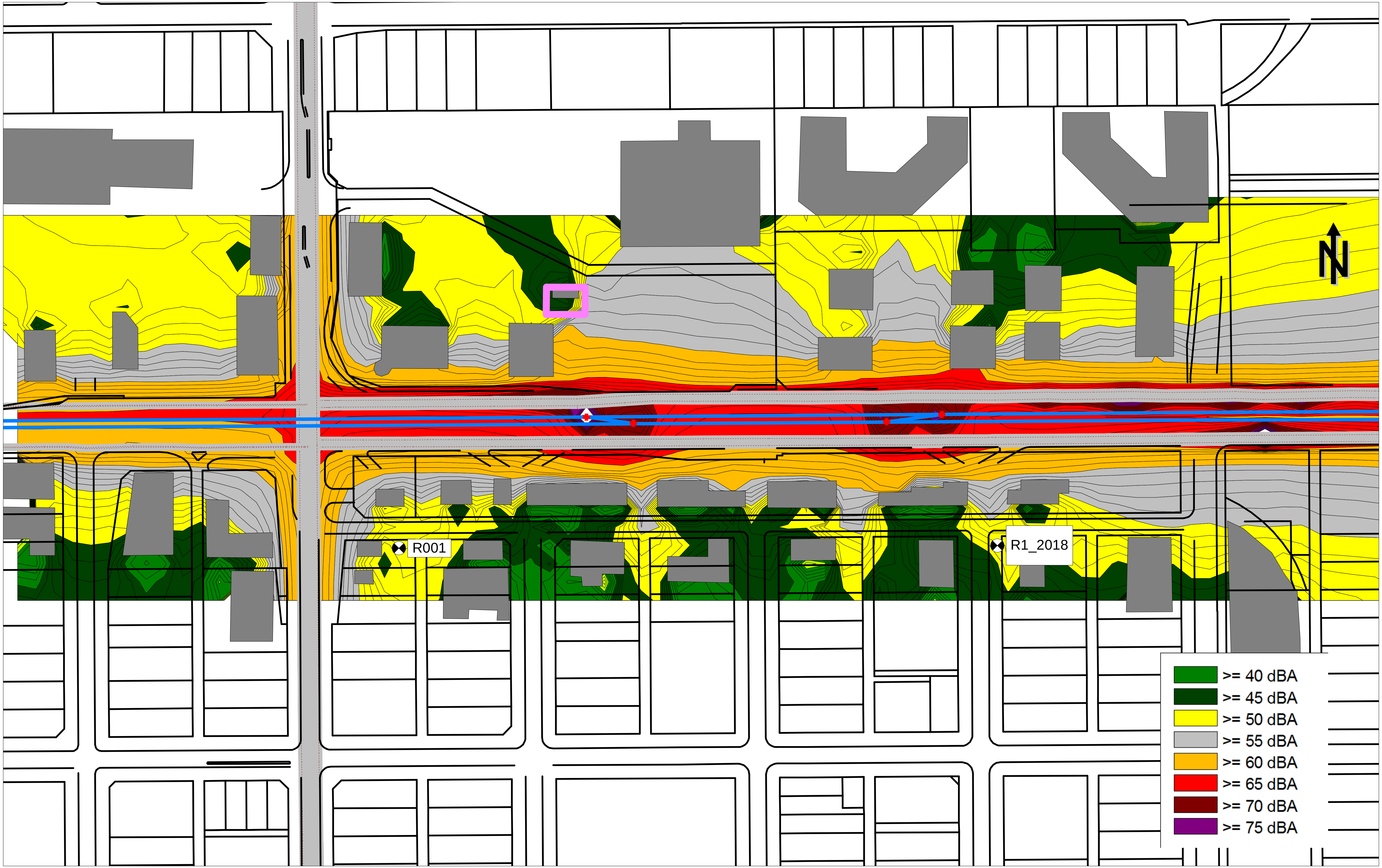
>= 75 dBA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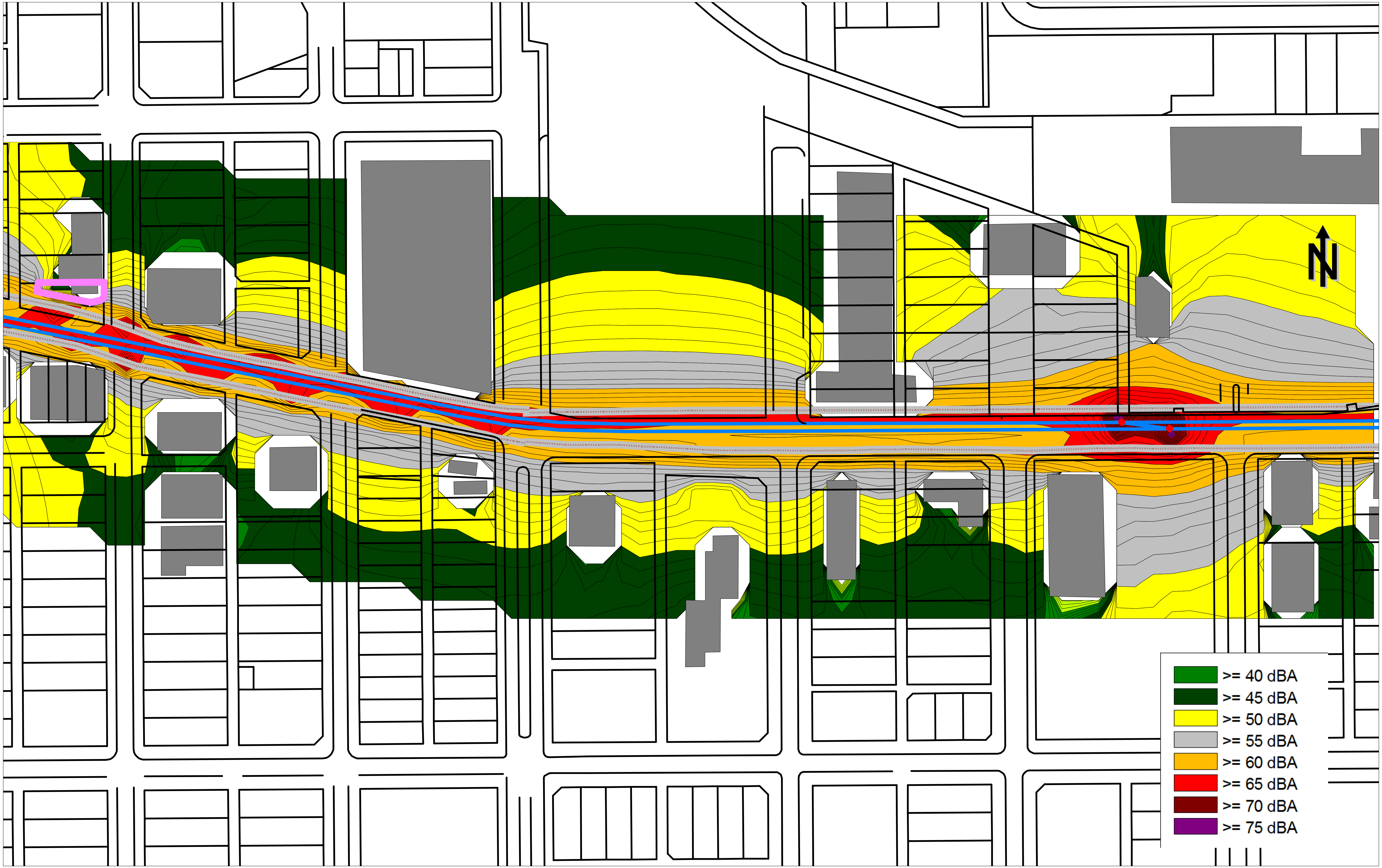
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R004
R005
R011
R009
R002
R008
R007
R010
R006
R003
R012
N
>= 40 dBA
>= 45 dBA
>= 50 dBA
>= 55 dBA
>= 60 dBA
>= 65 dBA
>= 70 dBA
>= 75 dBA

>= 40 dBA
>= 45 dBA
>= 50 dBA
>= 55 dBA
>= 60 dBA
>= 65 dBA
>= 70 dBA
>= 75 dBA
R030
R028
R024
R022
R020
R016
R015
R014
R013
R019
R029
R027
R026
R025
R023
R021
R018
R017
R012
R010


R030
R031
R032
R033
R034
R035
R036
R037
R038
R039
R040
R041
R042
R043
R044
N
>= 40 dBA
>= 45 dBA
>= 50 dBA
>= 55 dBA
>= 60 dBA
>= 65 dBA
>= 70 dBA
>= 75 dBA

R051
R046
R050
R045
R049
R048
R047
R052
>= 40 dBA
>= 45 dBA
>= 50 dBA
>= 55 dBA
>= 60 dBA
>= 65 dBA
>= 70 dBA
>= 75 dBA


N
R053
>= 40 dBA
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>= 60 dBA
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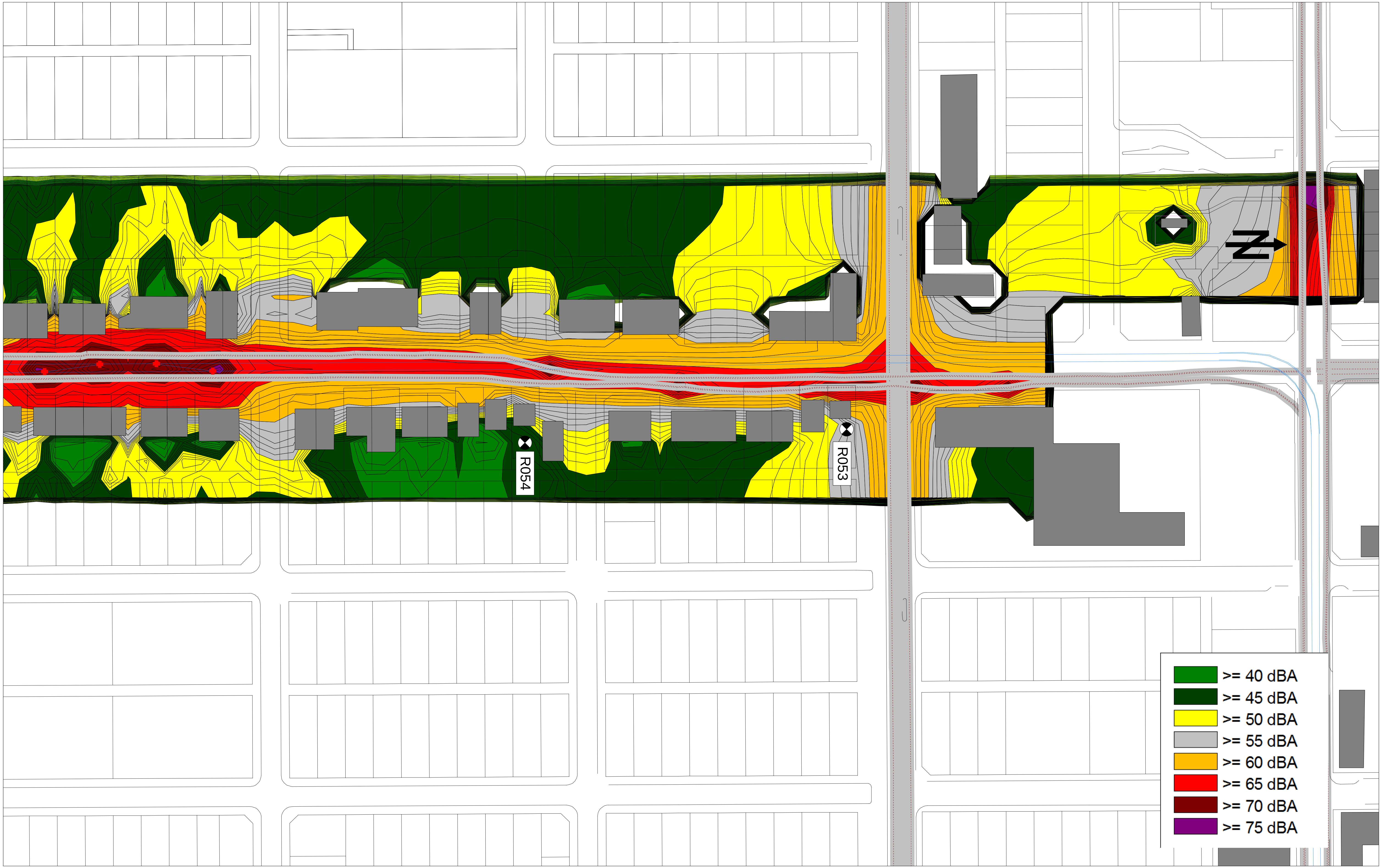
>= 70 dBA
>= 75 dBA



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R053
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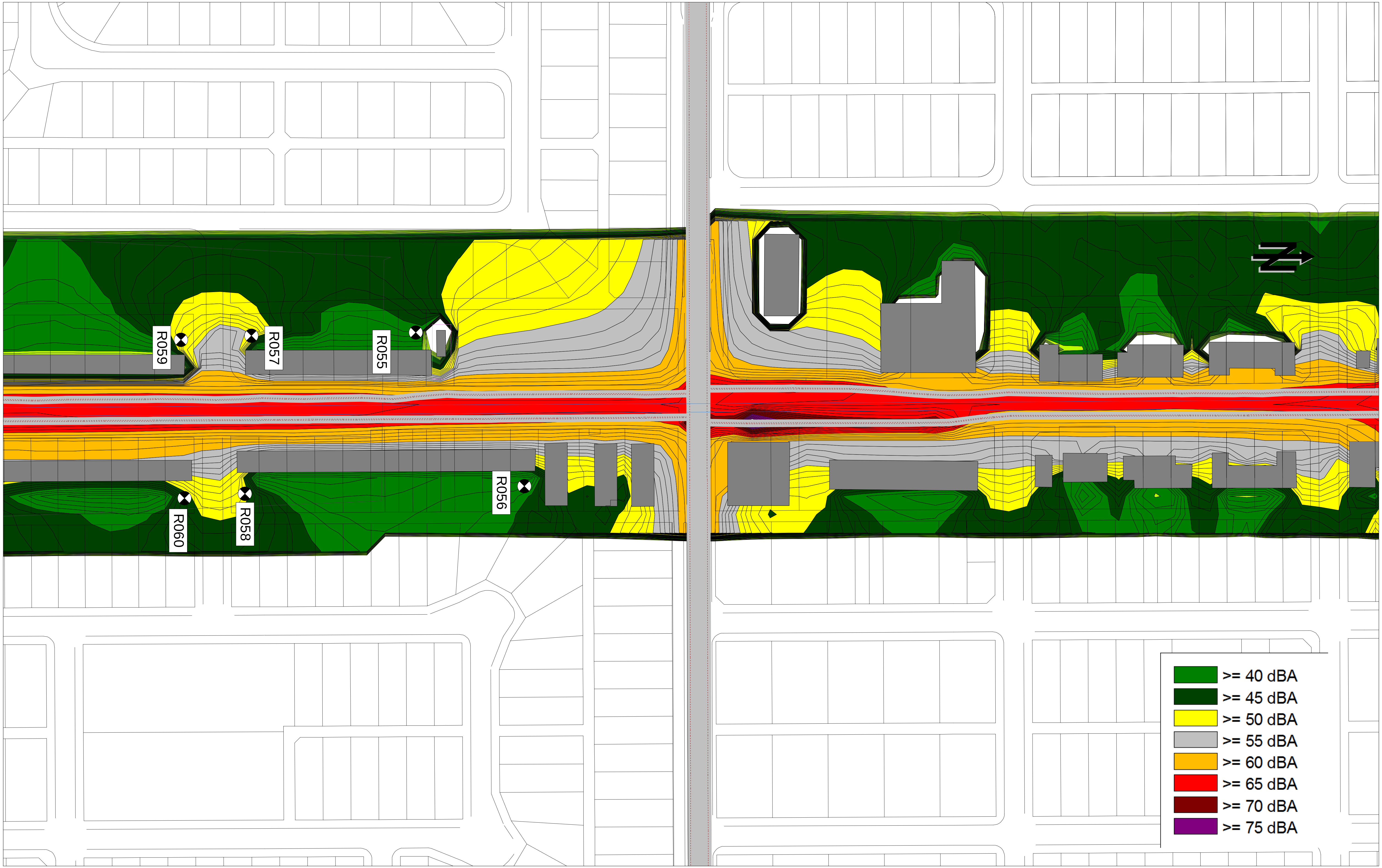
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R057
R055
R056
R060
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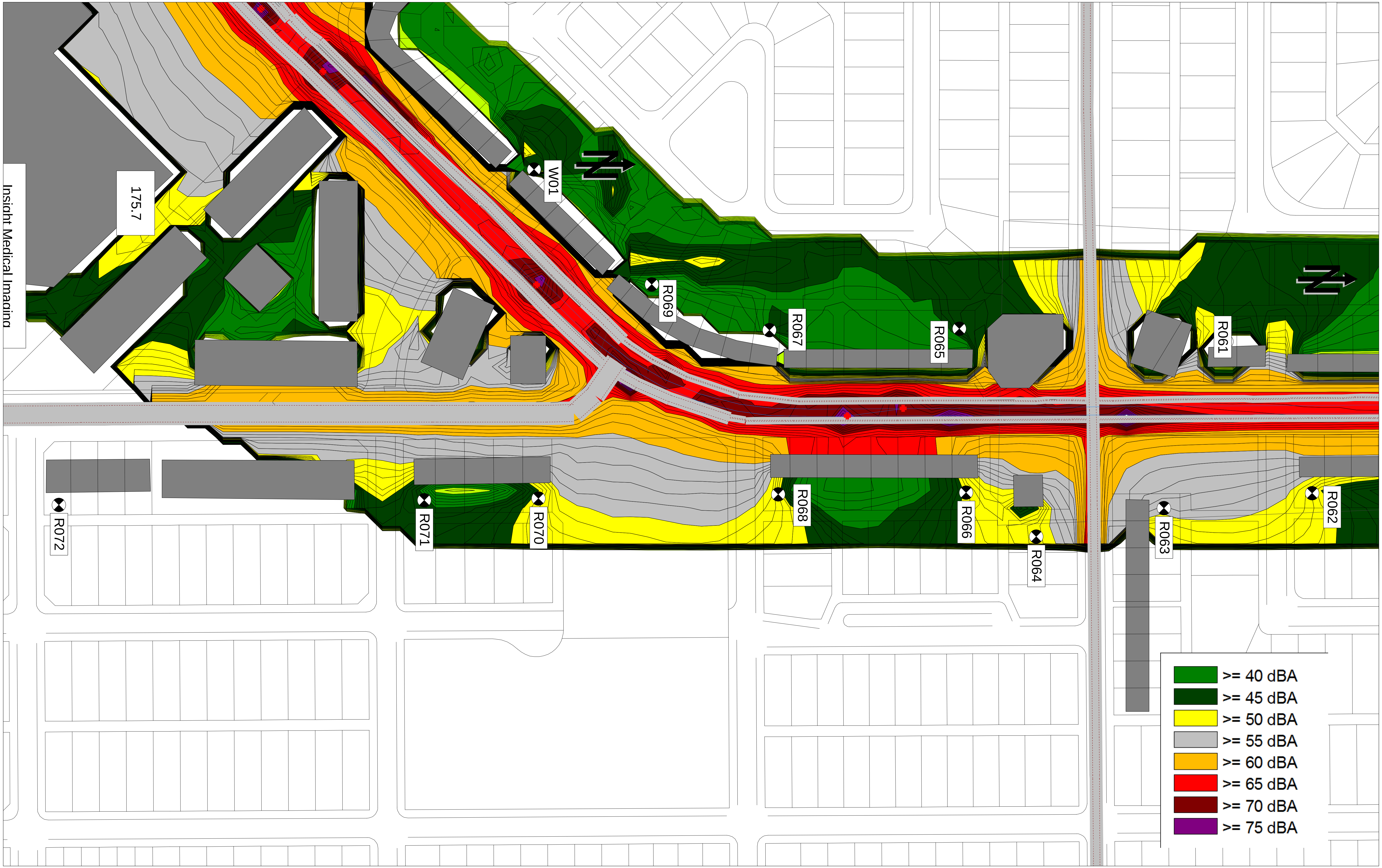
>= 75 dBA


Insight Medical Imaging
175.7
W01
R069
R067
R065
R061
R072
R071
R070
R068
R066
R064
R063
R062
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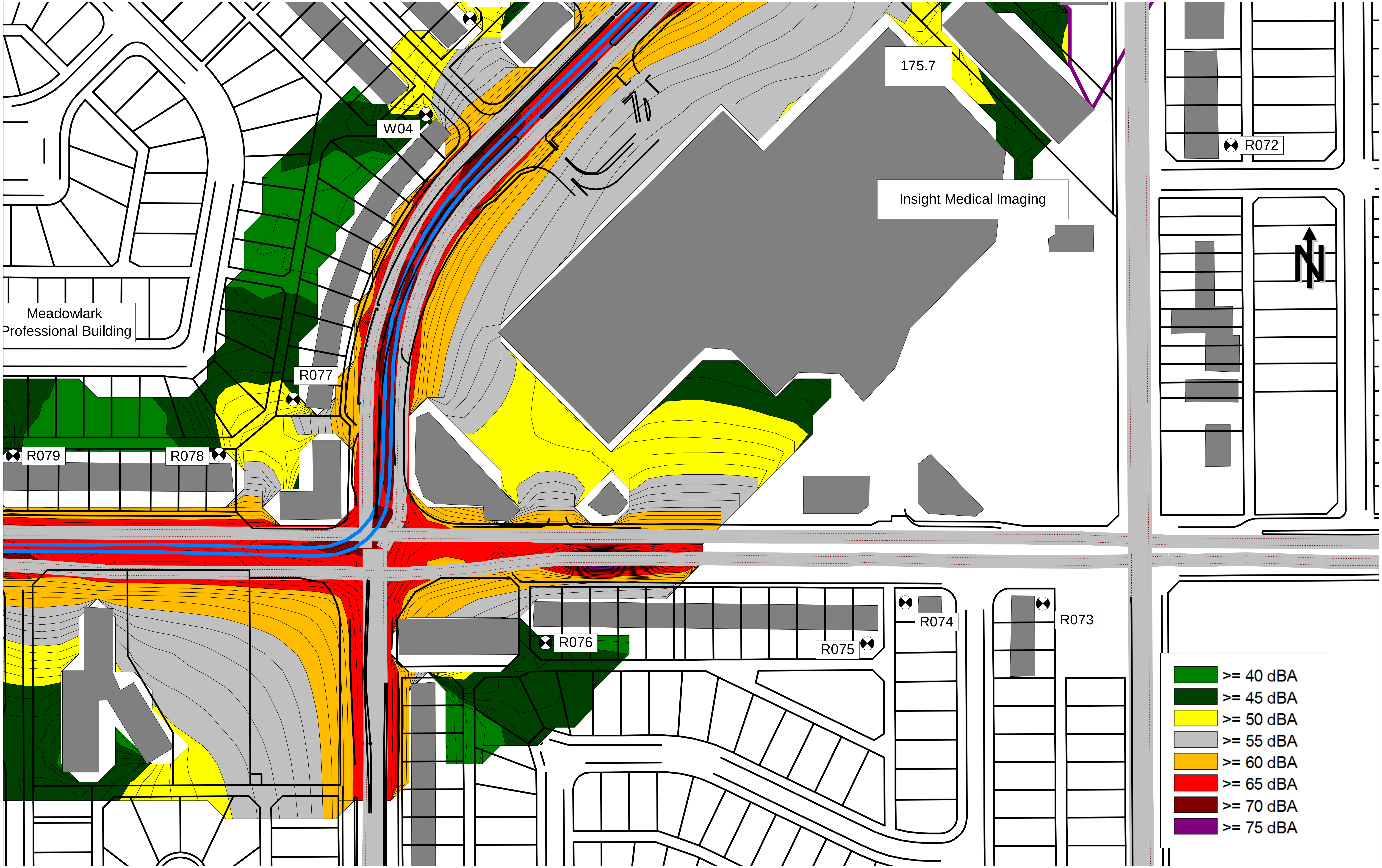
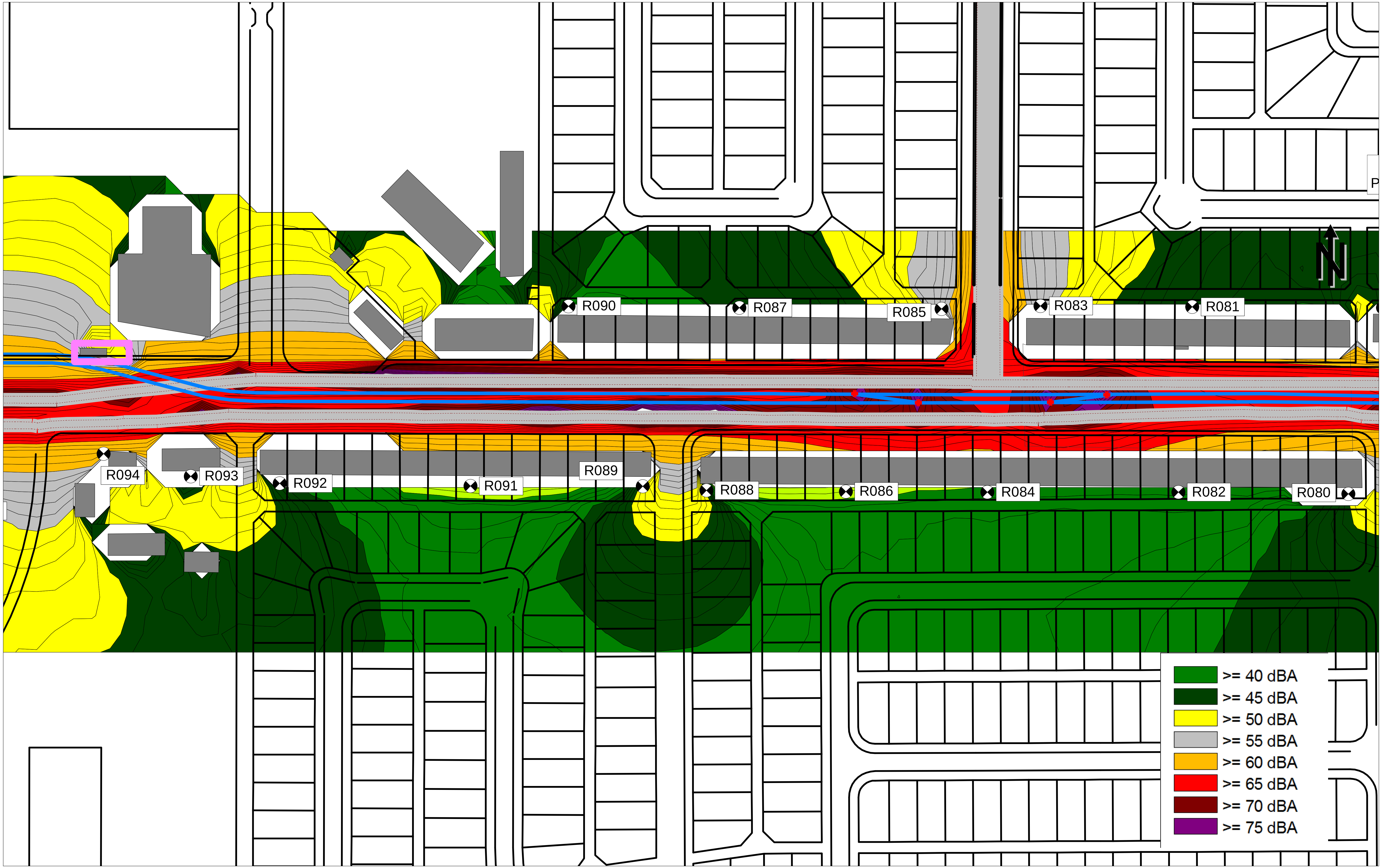
>= 70 dBA
>= 75 dBA


175.7
W04
Insight Medical Imaging
R072
Meadowlark
Professional Building
R077
R079
R078
R076
R075
R074
R073
N
>= 40 dBA
>= 45 dBA
>= 50 dBA
>= 55 dBA
>= 60 dBA
>= 65 dBA
>= 70 dBA
>= 75 dBA

W04
W03
W02
W01
R067
R069
R077
R076
R070
R071
175.7
Insight Medical Imaging
>= 40 dBA
>= 45 dBA
>= 50 dBA
>= 55 dBA
>= 60 dBA
>= 65 dBA
>= 70 dBA
>= 75 dBA


R090
R087
R085
R083
R081
R094
R093
R092
R091
R089
R088
R086
R084
R082
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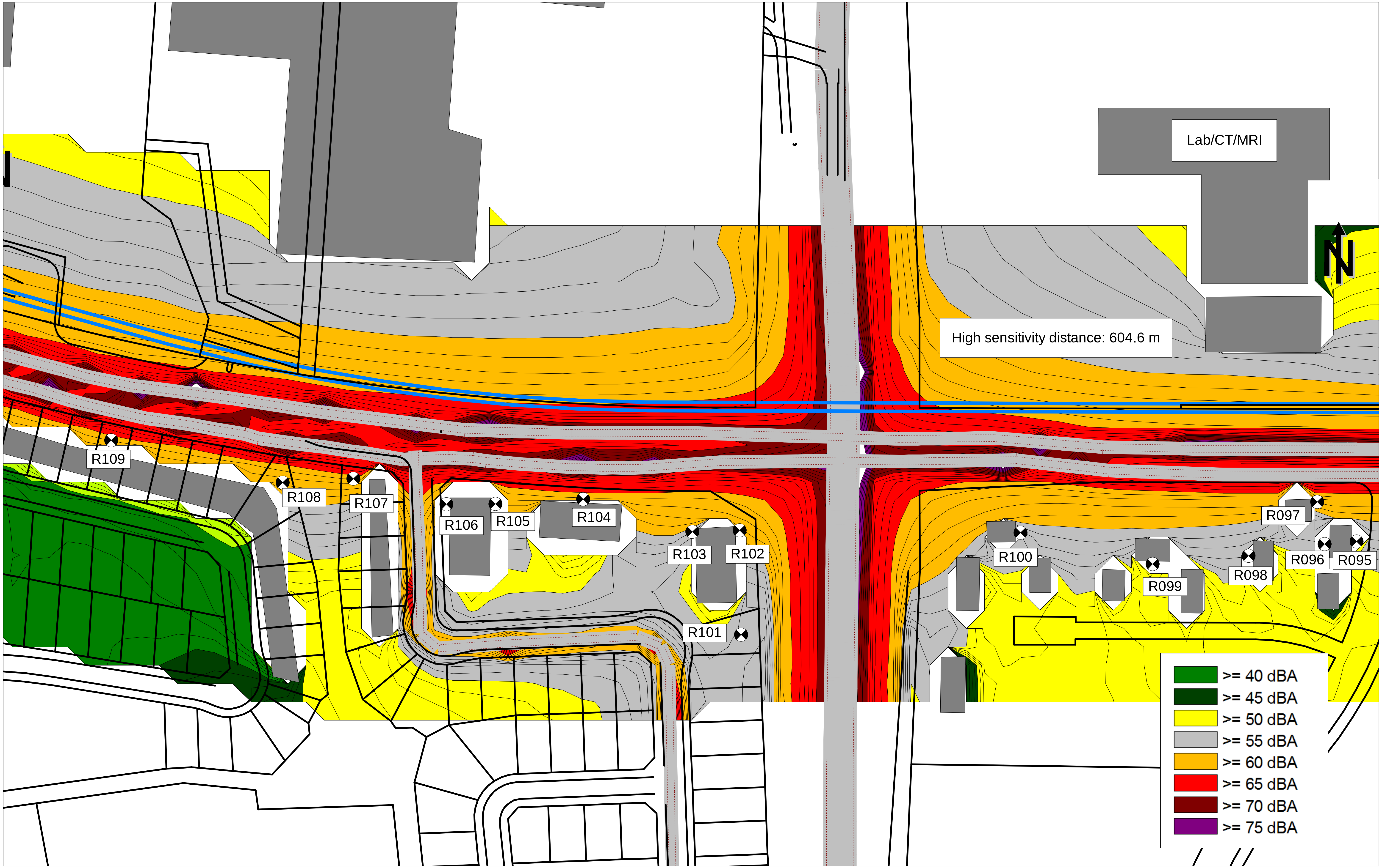
>= 70 dBA
>= 75 dBA



Lab/CT/MRI
N
High sensitivity distance: 604.6 m
R109
R108
R107
R106
R105
R104
R103
R102
R101
R100
R099
R098
R097
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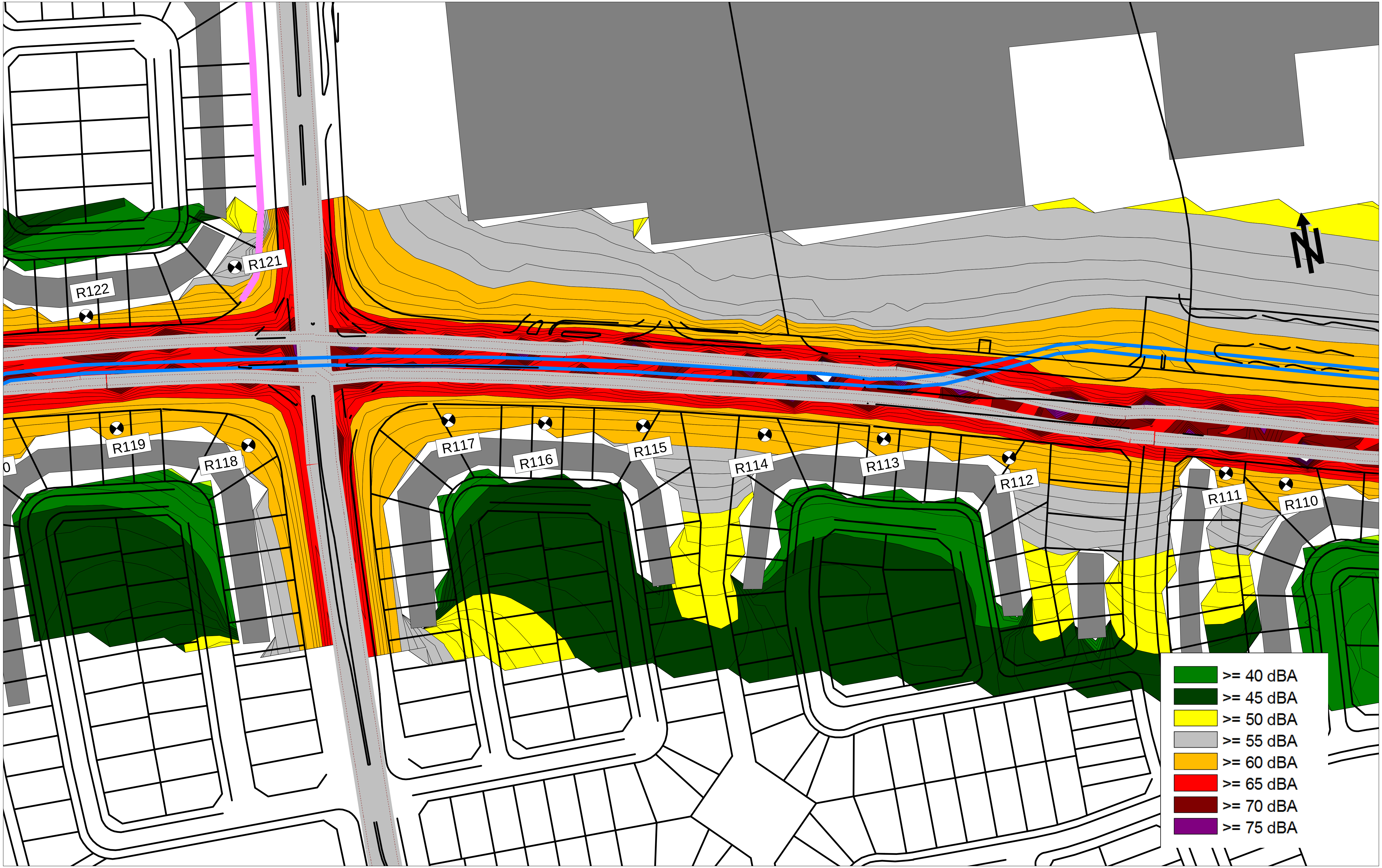
>= 75 dBA



R121
R122
R119
R118
R117
R116
R115
R114
R113
R112
R111
R110
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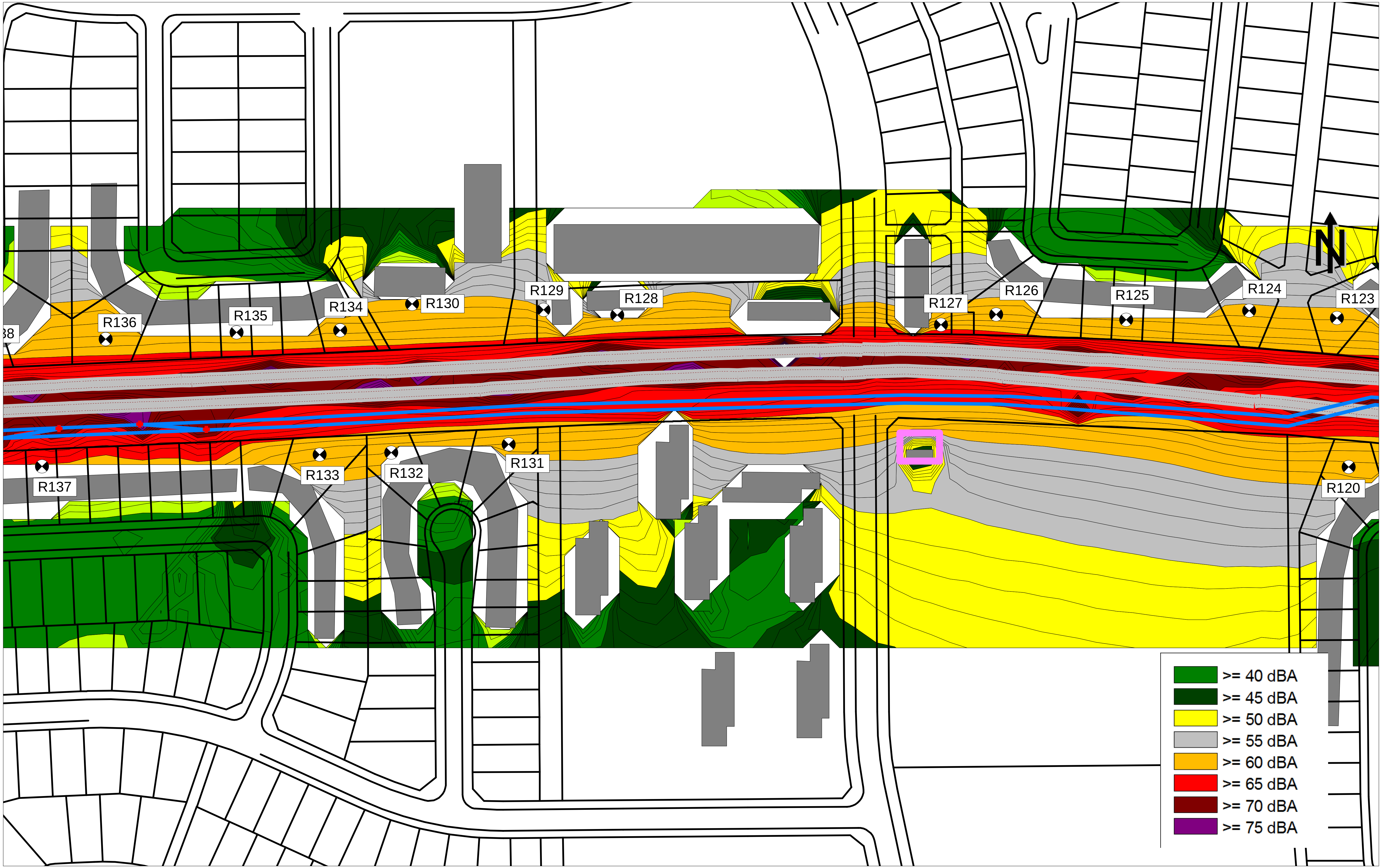
>= 70 dBA
>= 75 dBA


R136
R135
R134
R130
R129
R128
R127
R126
R125
R124
R123
R137
R133
R132
R131
R120
>= 40 dBA
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>= 50 dBA
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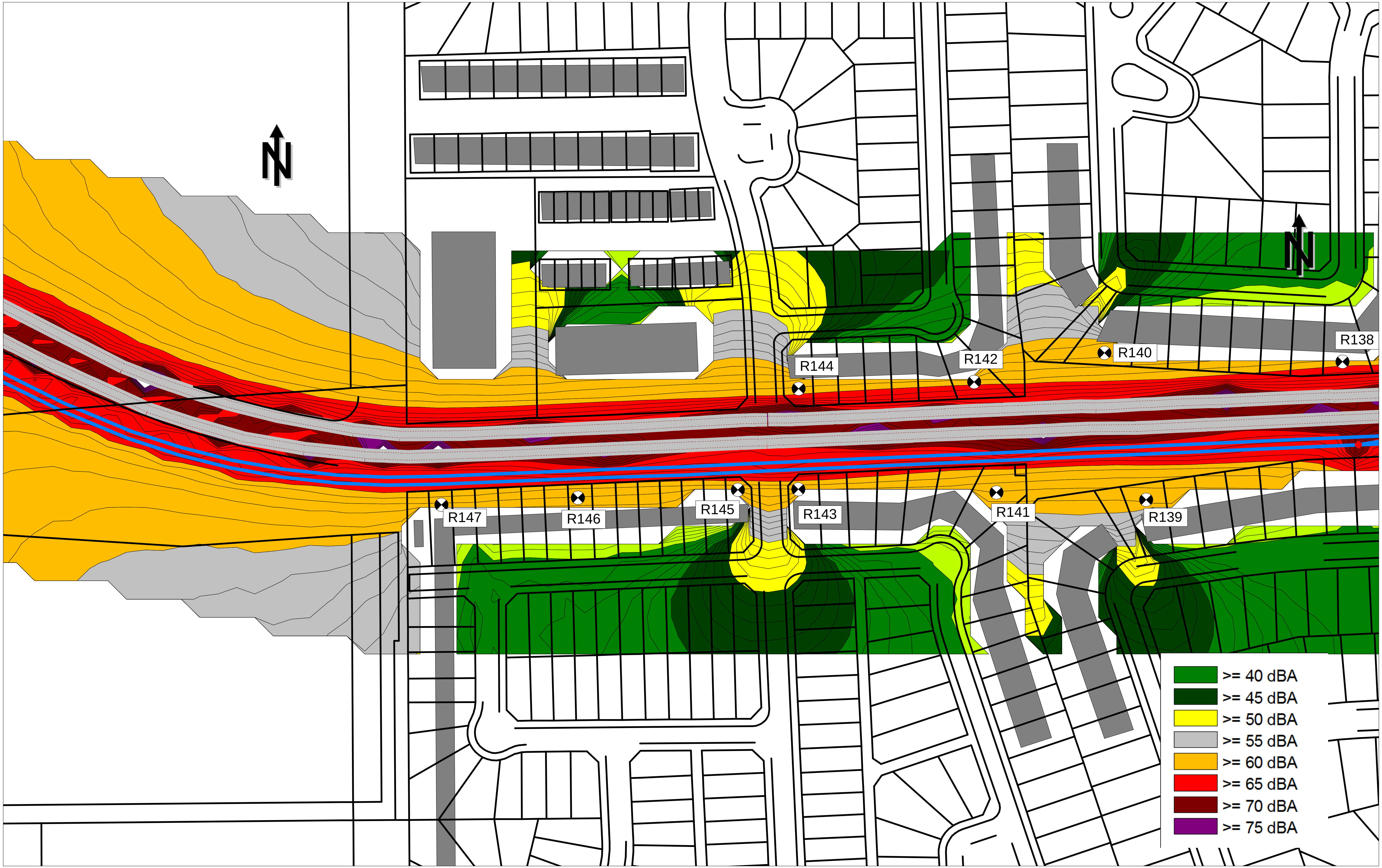
>= 75 dBA



N
N
R138
R140
R142
R144
R147
R146
R145
R143
R141
R139
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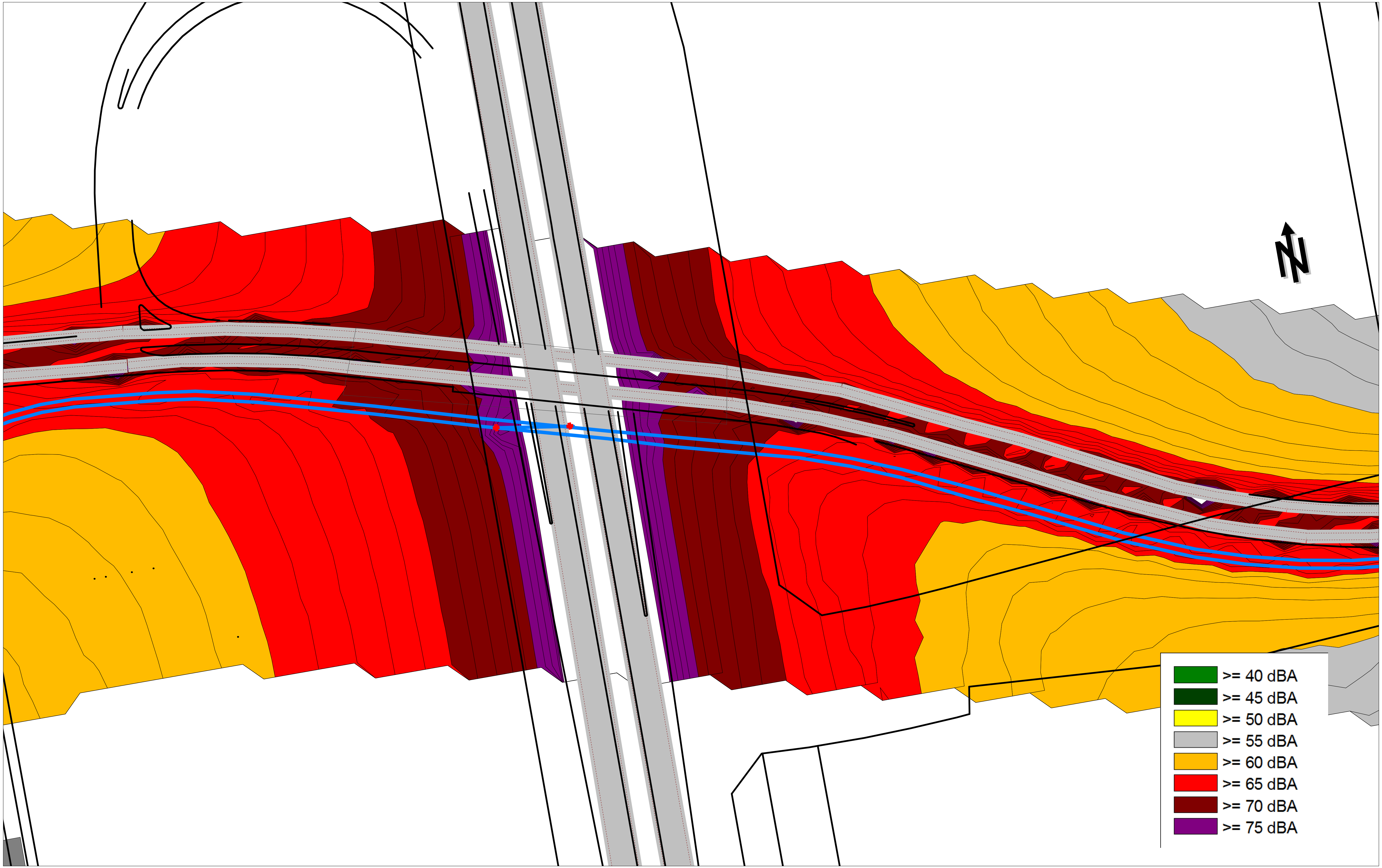
>= 70 dBA
>= 75 dBA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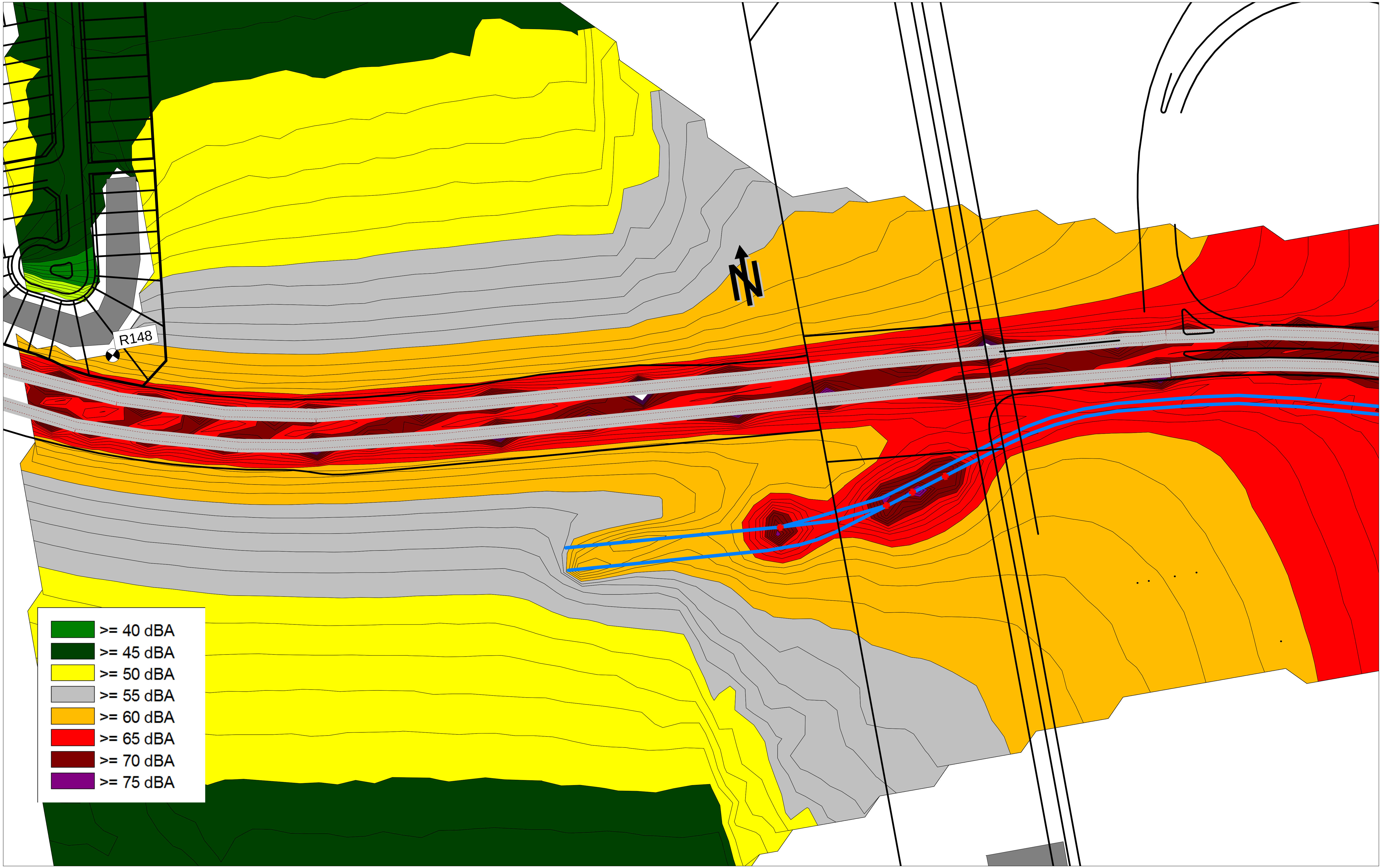
>= 75 dBA


R148
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>= 70 dBA
>= 75 dBA

AECOM

Appendix C1

Vibration Calculations

Edmonton LRT - Valley Line West

60528911

FTA Generalized Vibration Assessment - Operational Vibration Assessment

Efficient Propagation - 60 km/h

Space	Limit VdB	Limit mm/sec	Distance (ft)	Distance (m)
Industrial / Workshop	90.0	0.80	N/A	N/A
Office	84.0	0.40	29.7	9.0
Residential Day	78.0	0.20	69.1	21.0
Residential Night, Operating Rooms	72.0	0.10	138.0	42.0
High sensitivity	65.0	0.05	259.4	79.0

Efficient Propagation - 60 km/h - elevated

Space	Limit VdB	Limit mm/sec	Distance (ft)	Distance (m)
Industrial / Workshop	90.0	0.80	N/A	N/A
Office	84.0	0.40	N/A	N/A
Residential Day	78.0	0.20	13.3	4.0
Residential Night, Operating Rooms	72.0	0.10	42.8	13.0
High sensitivity	65.0	0.05	98.6	30.0

Efficient Propagation - 60 km/h - special track

Space	Limit VdB	Limit mm/sec	Distance (ft)	Distance (m)
Industrial / Workshop	90.0	0.80	52.7	16.0
Office	84.0	0.40	111.7	34.0
Residential Day	78.0	0.20	197.0	60.0
Residential Night, Operating Rooms	72.0	0.10	318.4	97.0
High sensitivity	65.0	0.05	364.0	111.0

Efficient Propagation - 50 km/h

Space	Limit VdB	Limit mm/sec	Distance (ft)	Distance (m)
Industrial / Workshop	90.0	0.80	N/A	N/A
Office	84.0	0.40	23.1	7.0
Residential Day	78.0	0.20	55.9	17.0
Residential Night, Operating Rooms	72.0	0.10	118.3	36.0
High sensitivity	65.0	0.05	223.3	68.0

Efficient Propagation - 50 km/h - elevated

Space	Limit VdB	Limit mm/sec	Distance (ft)	Distance (m)
Industrial / Workshop	90.0	0.80	N/A	N/A
Office	84.0	0.40	N/A	N/A
Residential Day	78.0	0.20	N/A	N/A
Residential Night, Operating Rooms	72.0	0.10	33.0	10.0
High sensitivity	65.0	0.05	82.2	25.0

Efficient Propagation - 50 km/h - special trackwork

Space	Limit VdB	Limit mm/sec	Distance (ft)	Distance (m)
Industrial / Workshop	90.0	0.80	42.8	13.0
Office	84.0	0.40	92.0	28.0
Residential Day	78.0	0.20	174.1	53.0
Residential Night, Operating Rooms	72.0	0.10	292.2	89.0
High sensitivity	65.0	0.05	358.0	109.0

Efficient Propagation - 25 km/h

Space	Limit VdB	Limit mm/sec	Distance (ft)	Distance (m)
Industrial / Workshop	90.0	0.80	N/A	N/A
Office	84.0	0.40	N/A	N/A
Residential Day	78.0	0.20	23.1	7.0
Residential Night, Operating Rooms	72.0	0.10	55.9	17.0
High sensitivity	65.0	0.05	131.4	40.0

Efficient Propagation - 25 km/h - special trackwork

Space	Limit VdB	Limit mm/sec	Distance (ft)	Distance (m)
Industrial / Workshop	90.0	0.80	16.6	5.0
Office	84.0	0.40	42.8	13.0
Residential Day	78.0	0.20	92.0	28.0
Residential Night, Operating Rooms	72.0	0.10	174.1	53.0
High sensitivity	65.0	0.05	308.6	94.0

Edmonton

LEWIS FARMS TO DOWNTOWN

VALLEY LINE WEST LRT

Note: Transition zones required between all changes in track mitigation and changes from normal track to mitigated track.

90% SUBMISSION

PRELIMINARY ENGINEERING DRAWINGS FOR:

LRT - TRACKWORK

DECEMBER 13, 2017

Note: For sections requiring >15 VdB of mitigation (crossovers in close promixity to residences), consider moving crossovers to less sensitive locations (commercial areas, bridges, LRT sections further from residences).

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Associate Consultants

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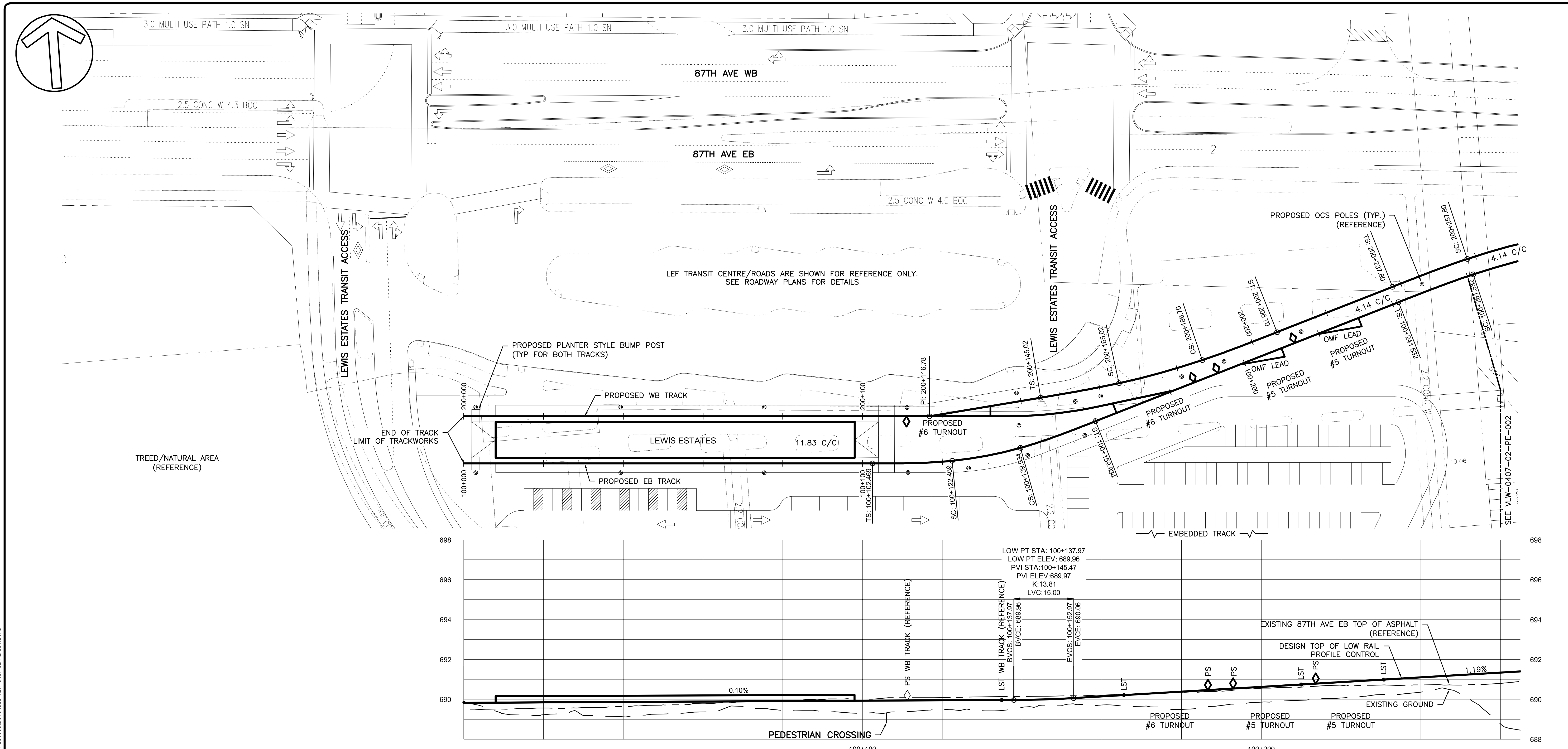

DESIGN SPEED					25KPH			80KPH				30KPH	
CHAINAGE	100+008.000	LEWIS ESTATES PLATFORM		100+098.000			100+159.934				100+241.532		
OPERATING SPEED					20KPH			25KPH				25KPH	
HORIZONTAL CURVATURE	L=102.47m				Ls=20.00m	L=17.47m R=100.00m	Ls=20.00m	L=81.60m				Ls=20.00m	
DESIGN TOP OF RAIL	689.847	689.867	689.887	689.907	689.927	689.947	689.968	690.145	690.382	690.619	690.857	691.094	691.331
EXISTING GROUND	689.23	689.13	689.37	689.45	689.30	689.51	689.59	689.71	689.50	689.85	690.07	690.36	688.76

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
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revisions

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A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART

checked by N. MUXIAREPU | date 03-07-2017

permit | seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 100+000 TO 100+260

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-001 | REV 0 | SHT 001

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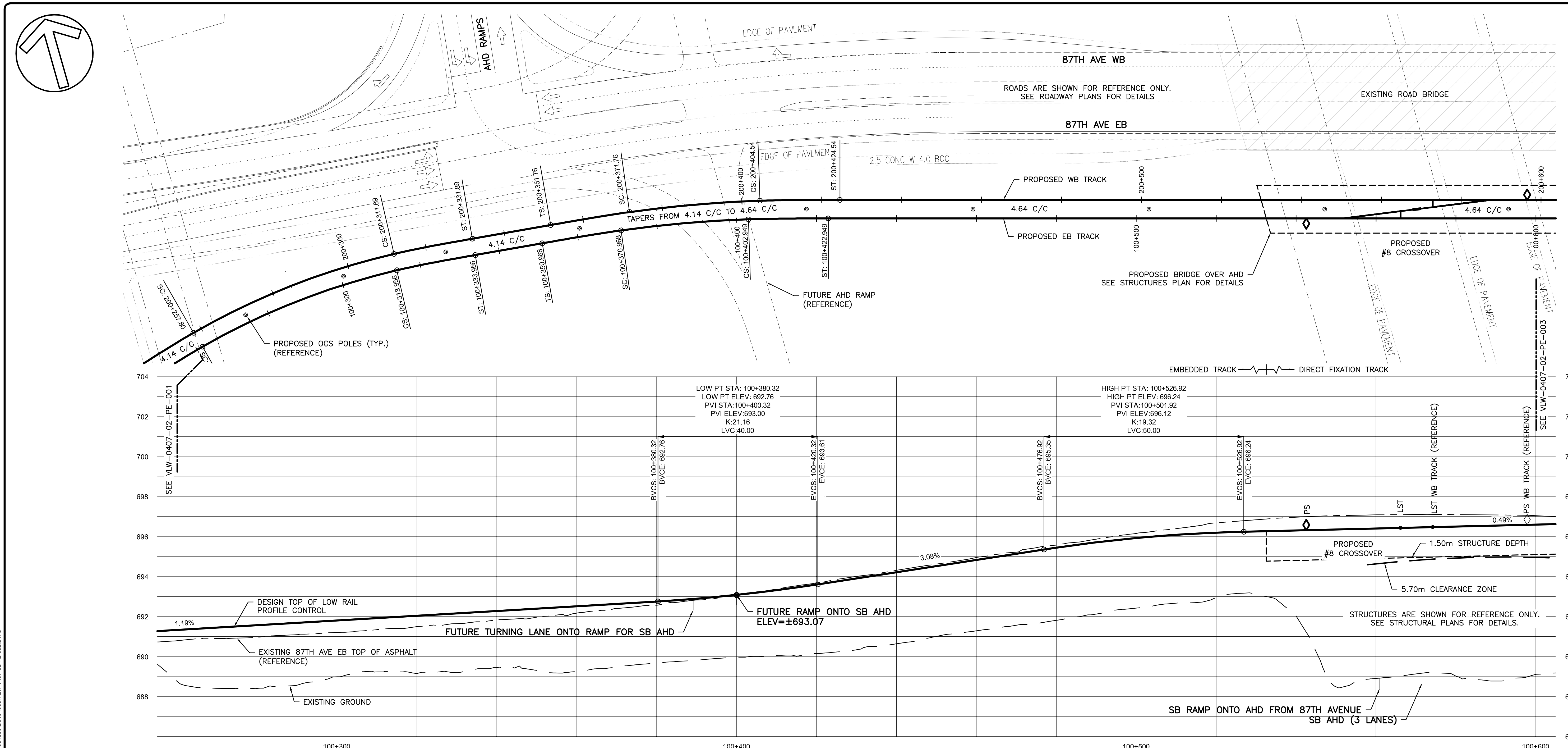

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CHAINAGE				100+333.956	100+350.968				100+422.949			100+476.920		100+526.920				
OPERATING SPEED	25KPH			25KPH	45KPH	45KPH			45KPH		55KPH		55KPH		55KPH		55KPH	
HORIZONTAL CURVATURE	L=52.42m R=180.00m			Ls=20.00m	L=17.01m	Ls=20.00m		L=31.98m R=300.00m	Ls=20.00m						L=260.55m			
DESIGN TOP OF RAIL	691.331	691.569	691.806	692.043	692.280	692.518	692.755	693.084	693.602	694.217	694.832	695.445	695.925	696.198	696.308	696.405	696.503	696.601
EXISTING GROUND	688.76	688.41	688.99	689.15	689.45	689.25	689.67	689.97	690.15	690.64	691.29	691.81	692.43	692.95	692.03	688.91	689.03	689.12

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-002.DWG

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issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

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A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART

checked by N. MUXIAREPU | date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

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prime consultant reviewed by M. PERRY

drawing title

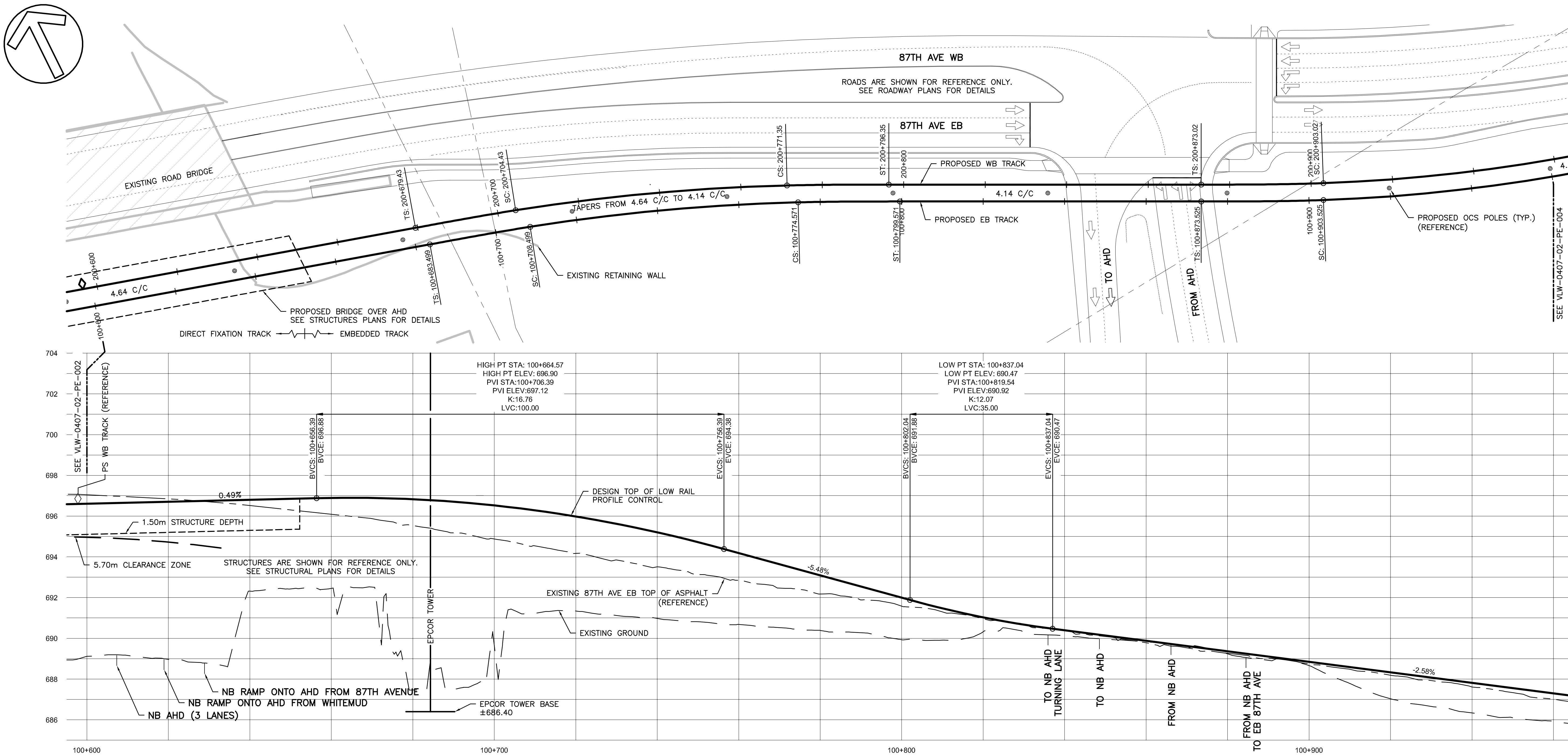
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 100+260 TO 100+600

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-002 | REV 0 | SHT 002



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CHAINAGE		100+656.390																	
OPERATING SPEED	55KPH	55KPH	55KPH									55KPH							55KPH
HORIZONTAL CURVATURE	Ls=25.00m	L=66.07m R=500.00m	Ls=25.00m	L=73.95m	Ls=30.00m														
DESIGN TOP OF RAIL	696.601	696.698	696.796	696.889	696.825	696.521	695.979	695.198	694.183	693.087	691.992	691.030	690.394	689.878	689.363	688.847	688.332	687.816	687.301
EXISTING GROUND	689.12	688.97	692.31	692.45	687.46	689.64	691.34	690.98	690.68	690.39	689.93	690.32	690.12	689.83	689.23	688.66	687.03	686.34	685.92

no.	description	date	appd
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B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

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A1 bar scale 1:500m 0 5 15 25m

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designed by C. HOFFART

checked by N. MUXIAREPU

date 03-07-2017

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consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

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prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 100+600 TO 100+960

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-003 REV 0 SHT 003

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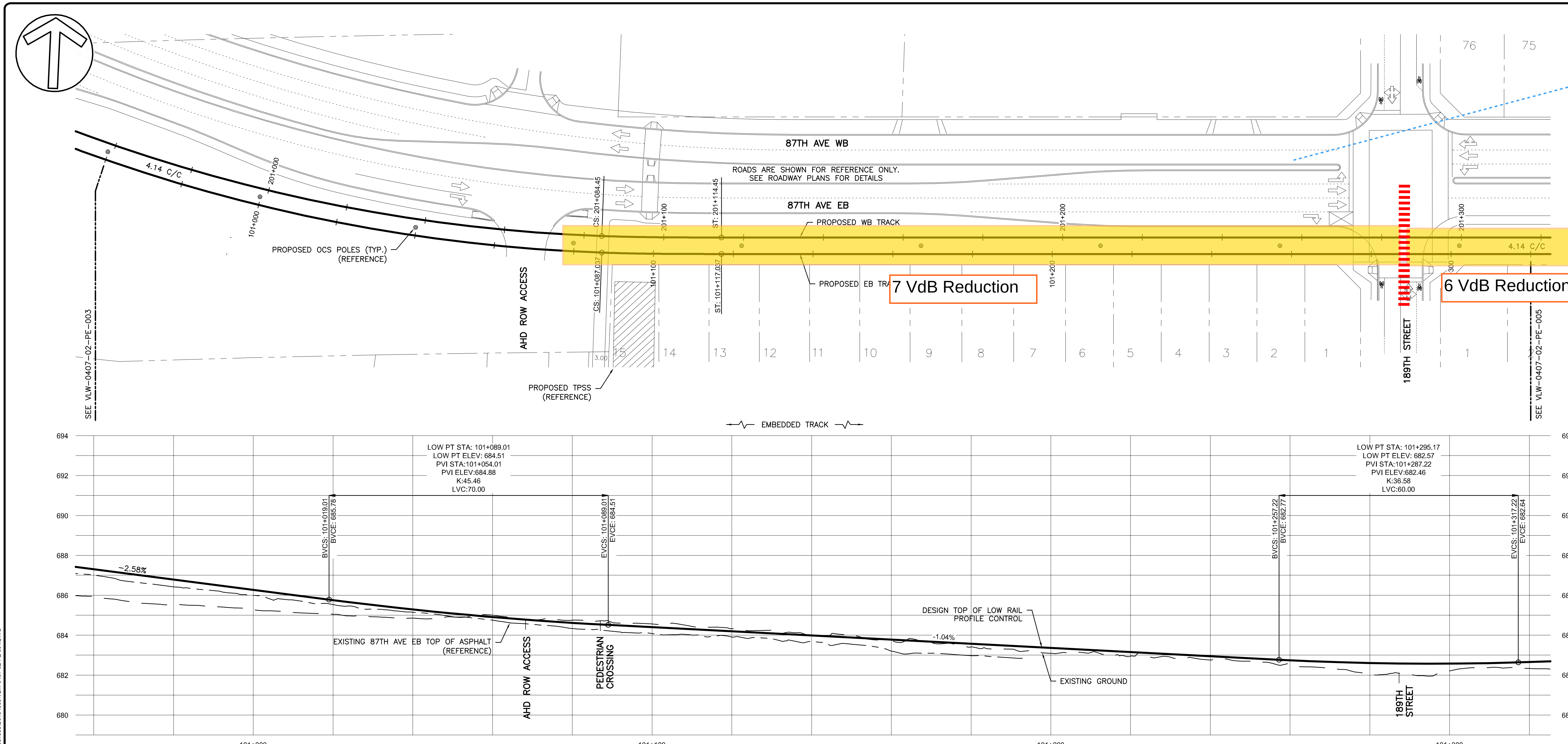

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CHAINAGE									101+117.037										
OPERATING SPEED	55KPH								55KPH										55KPH
HORIZONTAL CURVATURE			L=183.51m R=425.00m					Ls=30.00m											
DESIGN TOP OF RAIL	687.301	686.785	686.270	685.755	685.287	684.908	684.617	684.401	684.193	683.986	683.778	683.571	683.363	683.156	682.948	682.742	682.604	682.576	682.656
EXISTING GROUND	685.92	685.51	685.27	685.05	684.85	685.00	684.75	684.56	684.32	683.95	683.71	683.41	683.09	682.95	682.76	682.58	682.06	682.21	682.33

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issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH
Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART
designed by C. HOFFART
checked by N. MUXIAREPU
date 03-07-2017

permit

seal

consultant job no 351235
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prime consultant job no 60528911

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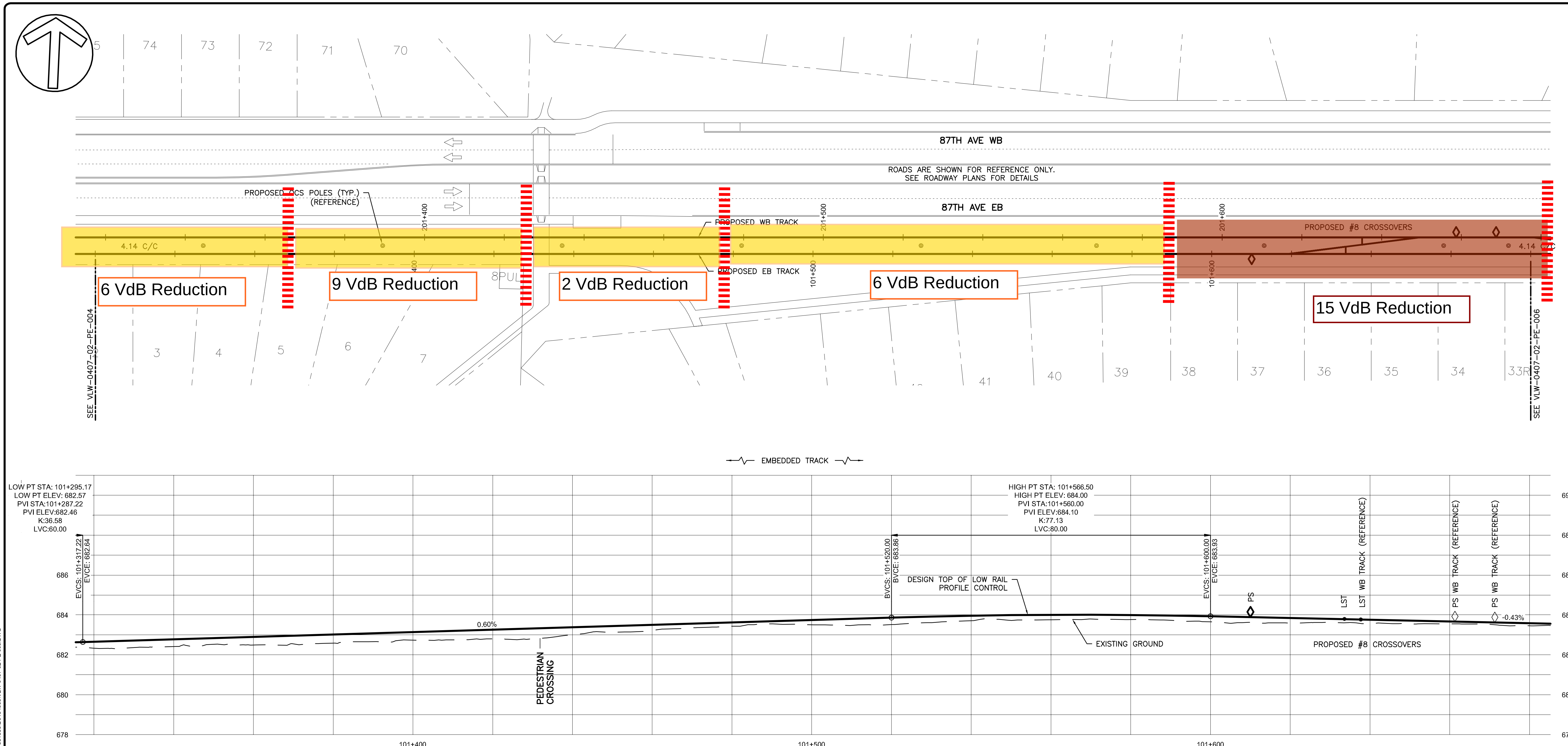
prime consultant reviewed by M. PERRY

drawing title
LRT TRACK WORK
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 100+960 TO 101+320

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-004
REV 0
SHT 004



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OPERATING SPEED	55KPH								55KPH									55KPH	
HORIZONTAL CURVATURE	L=741.69m																		
DESIGN TOP OF RAIL	682.656	682.776	682.897	683.017	683.138	683.259	683.379	683.500	683.620	683.741	683.861	683.956	683.999	683.990	683.929	683.842	683.755	683.668	683.581
EXISTING GROUND	682.33	682.41	682.49	682.58	682.73	682.79	683.01	683.22	683.43	683.50	683.51	683.70	683.75	683.76	683.65	683.59	683.57	683.55	683.45

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART

checked by N. MUXIAREPU | date 03-07-2017

permit | seal

consultant job no 351235 | consultant reviewed by G. TURNER

AECOM Prime Consultant | Edmonton

prime consultant job no 60528911

HATCH | ISL Engineering and Land Services | DIALOG | MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

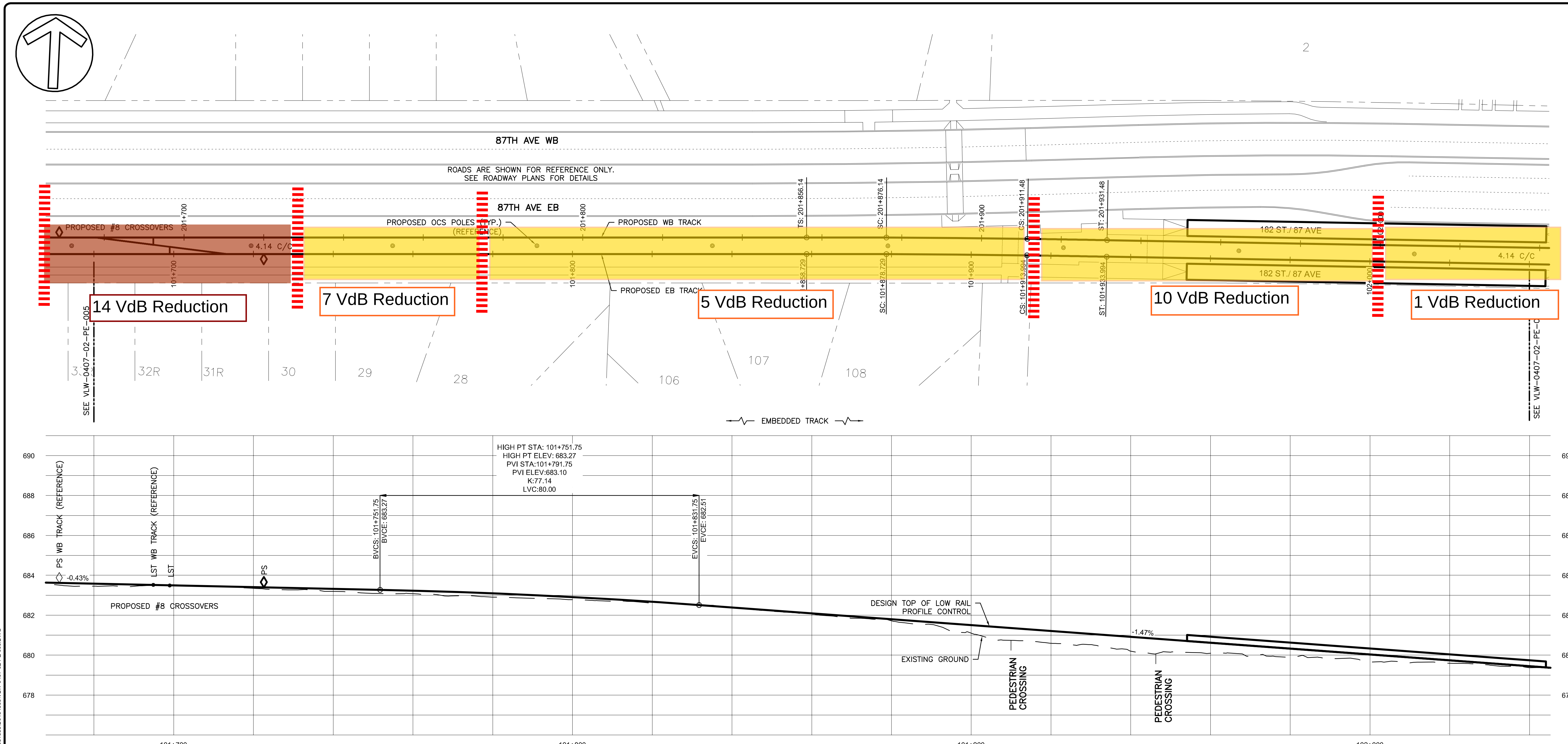
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 101+320 TO 101+680

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-005 | REV 0 | SHT 005

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-005.DWG



DESIGN SPEED	80KPH														80KPH		70KPH
CHAINAGE															101+954.110	182ND STREET/87TH AVENUE PLATFORM	102+044.110
OPERATING SPEED	55KPH														55KPH		55KPH
HORIZONTAL CURVATURE	Ls=20.00m	L=35.27m R=3100.00m	Ls=20.00m	L=151.19m													
DESIGN TOP OF RAIL	683.581	683.495	683.408	683.321	683.230	683.095	682.909	682.671	682.386	682.092	681.798	681.503	681.209	680.915	680.620	680.326	680.032	679.738	679.443
EXISTING GROUND	683.45	683.52	683.35	683.19	683.08	682.91	682.78	682.62	682.37	682.06	681.72	681.10	680.59	680.20	680.10	679.89	679.65	679.59	679.37

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART — designed by C. HOFFART

checked by N. MUXIAREPU — date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

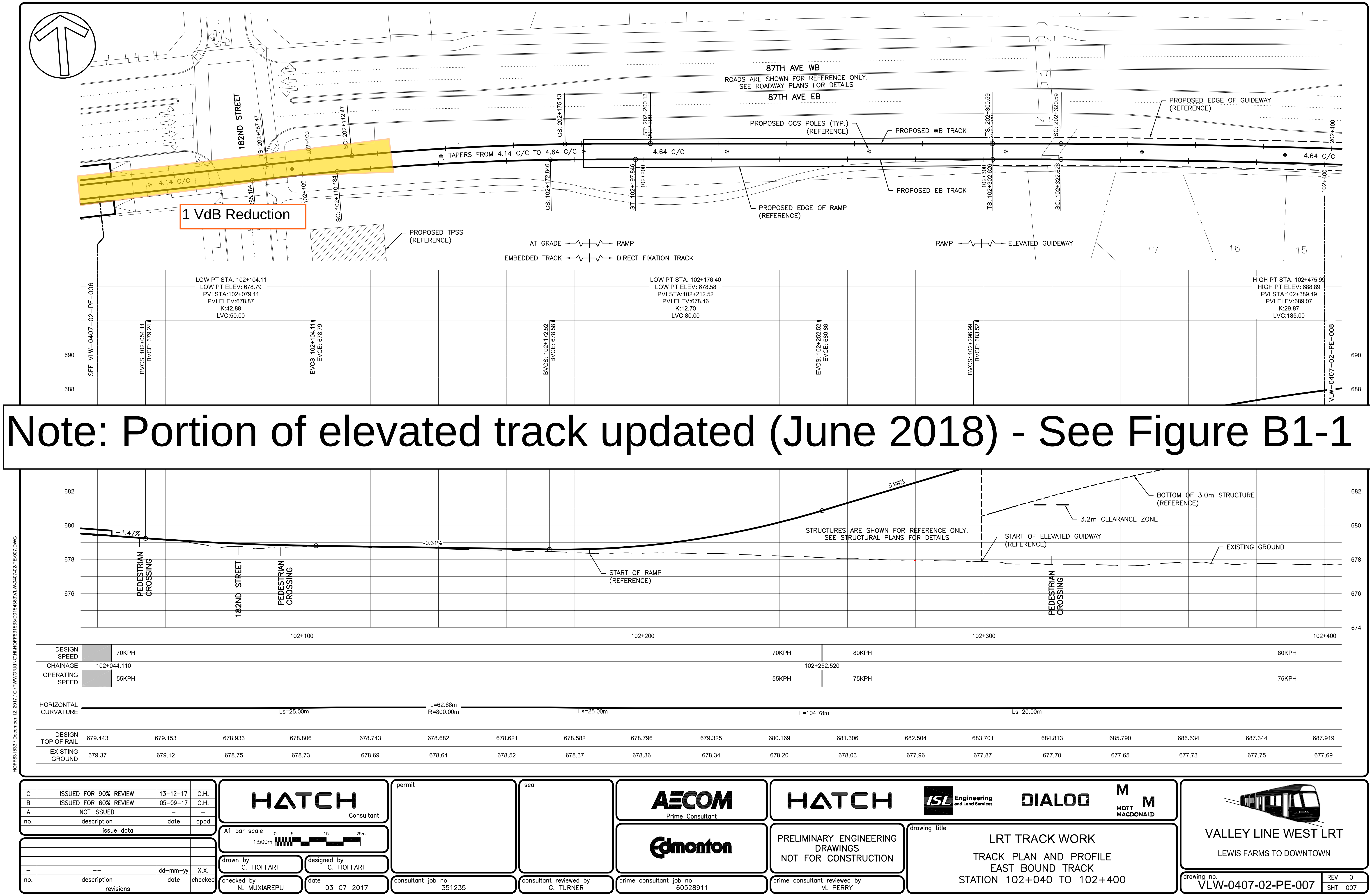
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 101+680 TO 102+040

VALLEY LINE WEST LRT

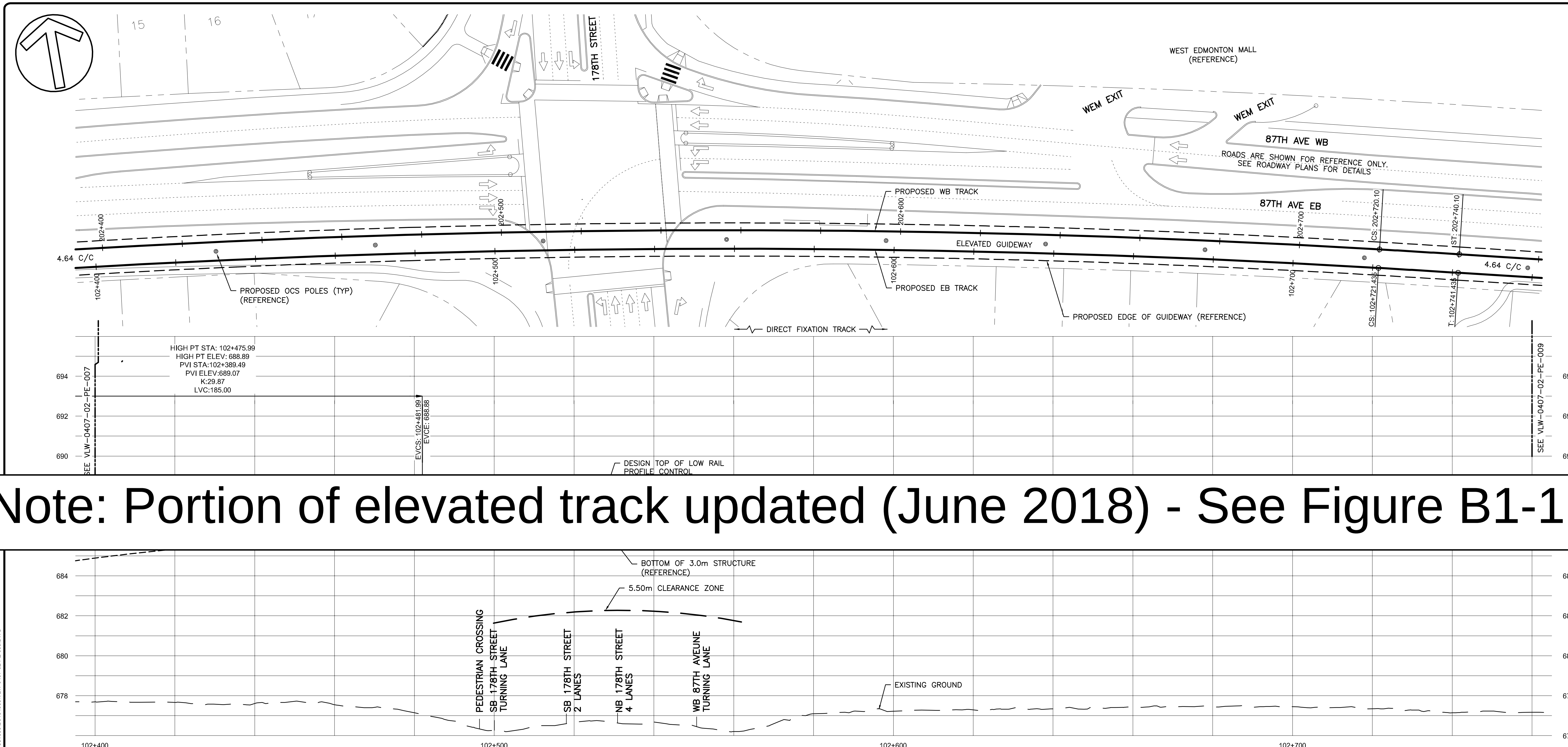
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-006 — REV 0 — SHT 006

HOFF831533 / December 12, 2017 / C:\PWWORKING\HH\HOFF831533\D0154363\VLW-0407-02-PE-006.DWG



87TH AVE WB
ROADS ARE SHOWN FOR REFERENCE ONLY.
SEE ROADWAY PLANS FOR DETAILS
87TH AVE EB
182ND STREET
1 VdB Reduction
TAPERS FROM 4.14 C/C TO 4.64 C/C
4.14 C/C
4.64 C/C
PROPOSED OCS POLES (TYP.) (REFERENCE)
PROPOSED WB TRACK
PROPOSED EB TRACK
PROPOSED EDGE OF GUIDEWAY (REFERENCE)
PROPOSED EDGE OF RAMP (REFERENCE)
PROPOSED TPSS (REFERENCE)
AT GRADE — RAMP
EMBEDDED TRACK — DIRECT FIXATION TRACK
RAMP — ELEVATED GUIDEWAY
LOW PT STA: 102+104.11
LOW PT ELEV: 678.79
PVI STA:102+079.11
PVI ELEV:678.87
K:42.88
LVC:50.00
LOW PT STA: 102+176.40
LOW PT ELEV: 678.58
PVI STA:102+212.52
PVI ELEV:678.46
K:12.70
LVC:80.00
HIGH PT STA: 102+475.99
HIGH PT ELEV: 688.89
PVI STA:102+389.49
PVI ELEV:689.07
K:29.87
LVC:185.00
SEE VLW-0407-02-PE-006
SEE VLW-0407-02-PE-008
Note: Portion of elevated track updated (June 2018) - See Figure B1-1
BOTTOM OF 3.0m STRUCTURE (REFERENCE)
3.2m CLEARANCE ZONE
STRUCTURES ARE SHOWN FOR REFERENCE ONLY.
SEE STRUCTURAL PLANS FOR DETAILS
START OF ELEVATED GUIDWAY (REFERENCE)
EXISTING GROUND
START OF RAMP (REFERENCE)
PEDESTRIAN CROSSING
182ND STREET
PEDESTRIAN CROSSING
PEDESTRIAN CROSSING
DESIGN SPEED 70KPH 70KPH 80KPH 80KPH
CHAINAGE 102+044.110 102+252.520
OPERATING SPEED 55KPH 55KPH 75KPH 75KPH
HORIZONTAL CURVATURE Ls=25.00m L=62.66m R=800.00m Ls=25.00m L=104.78m Ls=20.00m
DESIGN TOP OF RAIL 679.443 679.153 678.933 678.806 678.743 678.682 678.621 678.582 678.796 679.325 680.169 681.306 682.504 683.701 684.813 685.790 686.634 687.344 687.919
EXISTING GROUND 679.37 679.12 678.75 678.73 678.69 678.64 678.52 678.37 678.36 678.34 678.20 678.03 677.96 677.87 677.70 677.65 677.73 677.75 677.69
C ISSUED FOR 90% REVIEW 13-12-17 C.H.
B ISSUED FOR 60% REVIEW 05-09-17 C.H.
A NOT ISSUED
HATCH Consultant
AECOM Prime Consultant
Edmonton
HATCH
ISL Engineering and Land Services
DIALOG
MOTT MACDONALD
drawn by C. HOFFART
designed by C. HOFFART
checked by N. MUXIAREPU
date 03-07-2017
consultant job no 351235
consultant reviewed by G. TURNER
prime consultant job no 60528911
prime consultant reviewed by M. PERRY
PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION
LRT TRACK WORK
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 102+040 TO 102+400
VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN
drawing no. VLW-0407-02-PE-007
REV 0
SHT 007



Note: Portion of elevated track updated (June 2018) - See Figure B1-1

DESIGN SPEED	80KPH																		80KPH
CHAINAGE																			
OPERATING SPEED	75KPH																		75KPH
HORIZONTAL CURVATURE	L=398.81m R=2775.00m																	Ls=20.00m	L=32.90m
DESIGN TOP OF RAIL	687.919	688.361	688.669	688.843	688.883	688.844	688.803	688.763	688.723	688.683	688.643	688.602	688.562	688.522	688.482	688.442	688.402	688.361	688.321
EXISTING GROUND	677.69	677.66	677.61	677.55	677.15	676.27	676.66	676.69	676.21	677.09	677.22	677.29	677.34	677.42	677.45	677.45	677.34	677.14	677.17

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART

designed by C. HOFFART

checked by N. MUXIAREPU

date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 102+400 TO 102+760

VALLEY LINE WEST LRT

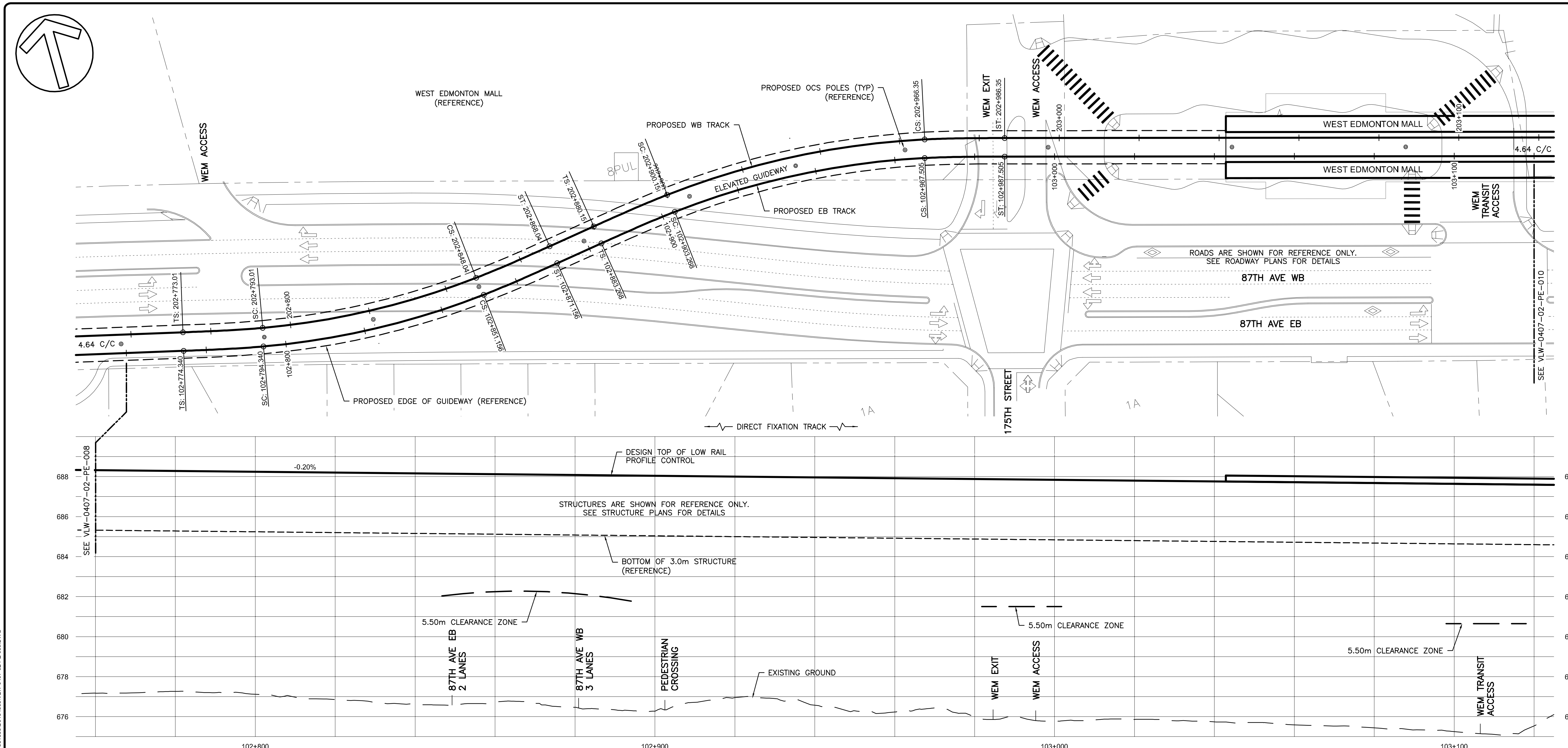
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-008

REV 0

SHT 008

HOFF831533 / December 12, 2017 / C:\PWWORKING\HIHOFF831533\D0154383\VLW-0407-02-PE-008.DWG



DESIGN SPEED	80KPH	40KPH	40KPH	
CHAINAGE	102+774.340		103+005.664	WEST EDMONTON MALL PLATFORM
OPERATING SPEED	75KPH	35KPH	35KPH	

HORIZONTAL CURVATURE: L=32.90m; Ls=20.00m; L=56.82m R=200.00m; Ls=20.00m; L=12.11m; Ls=20.00m; L=64.24m R=200.00m; Ls=20.00m; L=173.20m

DESIGN TOP OF RAIL	688.321	688.281	688.241	688.201	688.160	688.120	688.080	688.040	688.000	687.959	687.919	687.879	687.839	687.799	687.759	687.718	687.678	687.638	687.598
EXISTING GROUND	677.17	677.26	677.12	676.85	676.65	676.73	676.47	676.27	676.95	676.57	676.23	675.98	675.76	675.86	675.74	675.59	675.44	675.25	675.54

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-009.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH
Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART
designed by C. HOFFART
checked by N. MUXIAREPU
date 03-07-2017

permit

seal

consultant job no 351235
consultant reviewed by G. TURNER

AECOM
Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

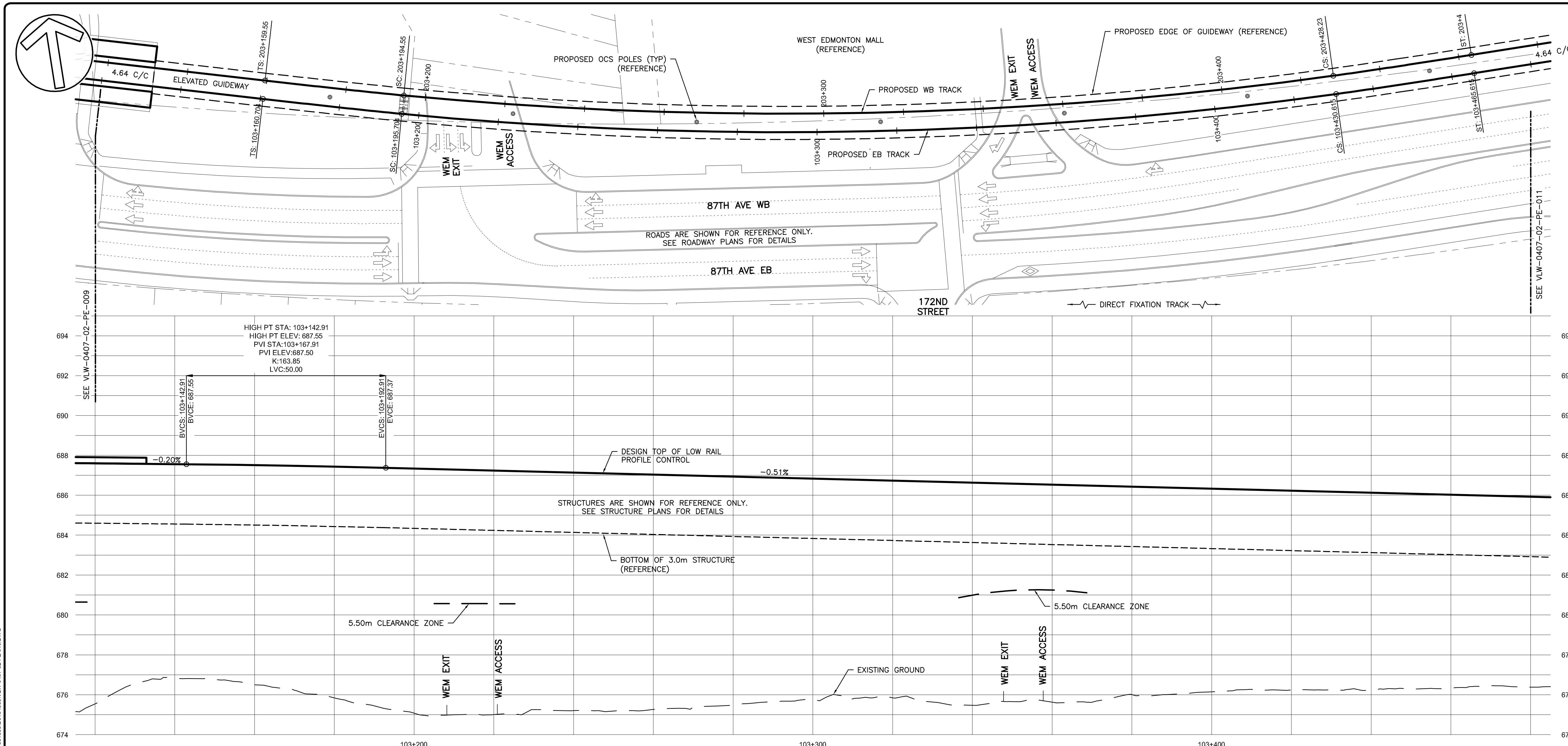
PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title
LRT TRACK WORK
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 102+760 TO 103+120

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-009
REV 0
SHT 009



DESIGN SPEED		80KPH	80KPH
CHAINAGE	103+095.664		
OPERATING SPEED		75KPH	75KPH
HORIZONTAL CURVATURE	Ls=35.00m	L=234.91m R=1004.64m	Ls=35.00m

DESIGN TOP OF RAIL	687.598	687.558	687.508	687.435	687.339	687.238	687.137	687.035	686.934	686.833	686.732	686.631	686.529	686.428	686.327	686.226	686.124	686.023	685.922
EXISTING GROUND	675.54	676.83	676.50	675.84	675.07	675.01	675.20	675.26	675.48	675.77	675.85	675.47	675.63	676.01	676.15	676.24	676.22	676.34	676.38

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-010.DWG

no.	description	date	appd
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B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH
Consultant

A1 bar scale 0 5 15 25m 1:500m

drawn by C. HOFFART | designed by C. HOFFART

checked by N. MUXIAREPU | date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM
Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH | ISL Engineering and Land Services | DIALOG | MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

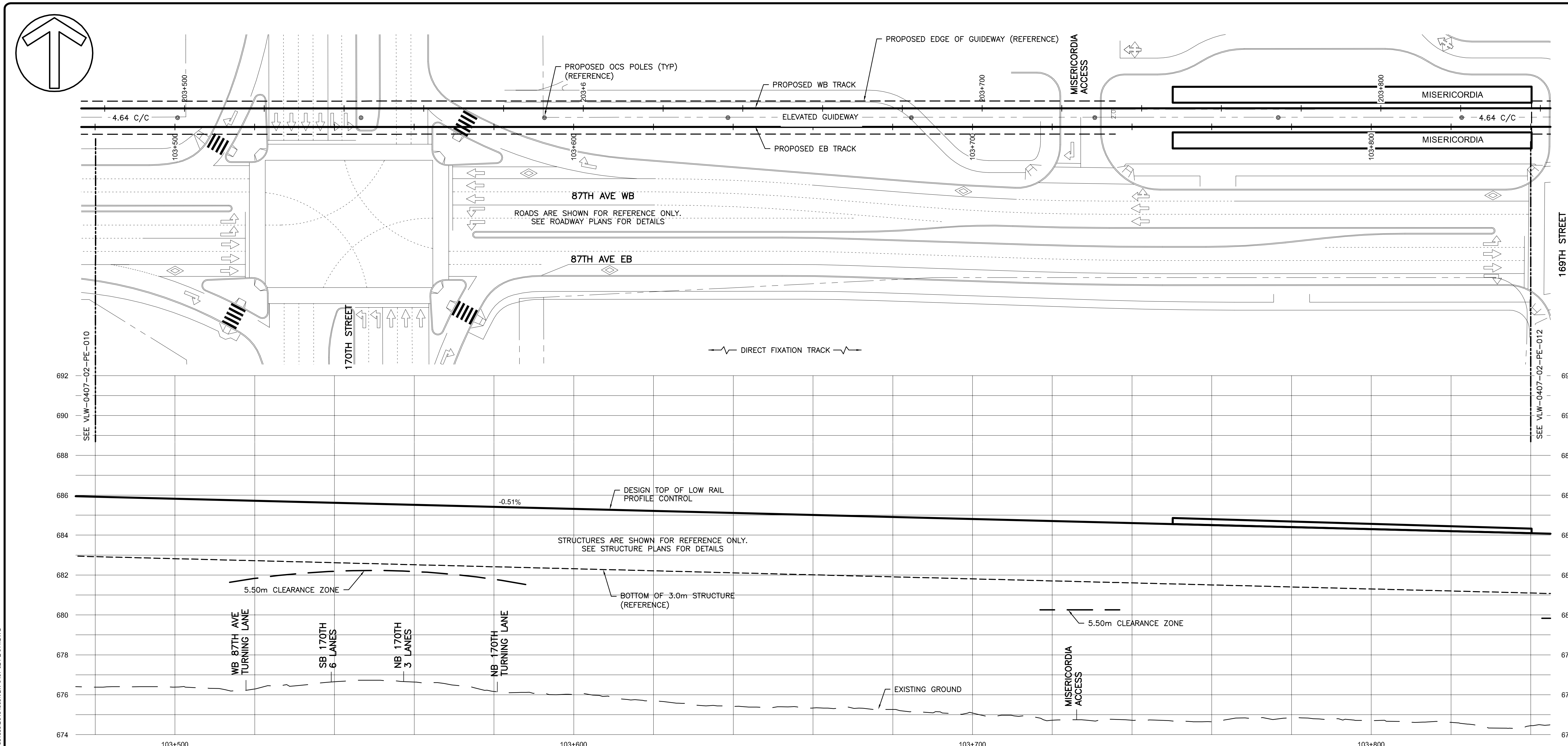
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 103+120 TO 103+480

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-010 | REV 0 | SHT 010



DESIGN SPEED	80KPH													80KPH					
CHAINAGE															103+750.203		MISERICORDIA PLATFORM		103+840.20
OPERATING SPEED	75KPH													75KPH					
HORIZONTAL CURVATURE										L=385.15m									
DESIGN TOP OF RAIL	685.922	685.821	685.720	685.618	685.517	685.416	685.315	685.214	685.112	685.011	684.910	684.809	684.707	684.606	684.505	684.404	684.303	684.201	684.100
EXISTING GROUND	676.38	676.38	676.29	676.65	676.64	676.16	676.01	675.69	675.42	675.33	675.27	675.09	674.72	674.72	674.65	674.83	674.71	674.61	674.45

HOFF831533 / December 12, 2017 / C:\PWWORKING\H\HOFF831533\D0154363\VLW-0407-02-PE-011.DWG

no.	description	date	appd
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B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART
designed by C. HOFFART
checked by N. MUXIAREPU
date 03-07-2017

permit

seal

consultant job no 351235
consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

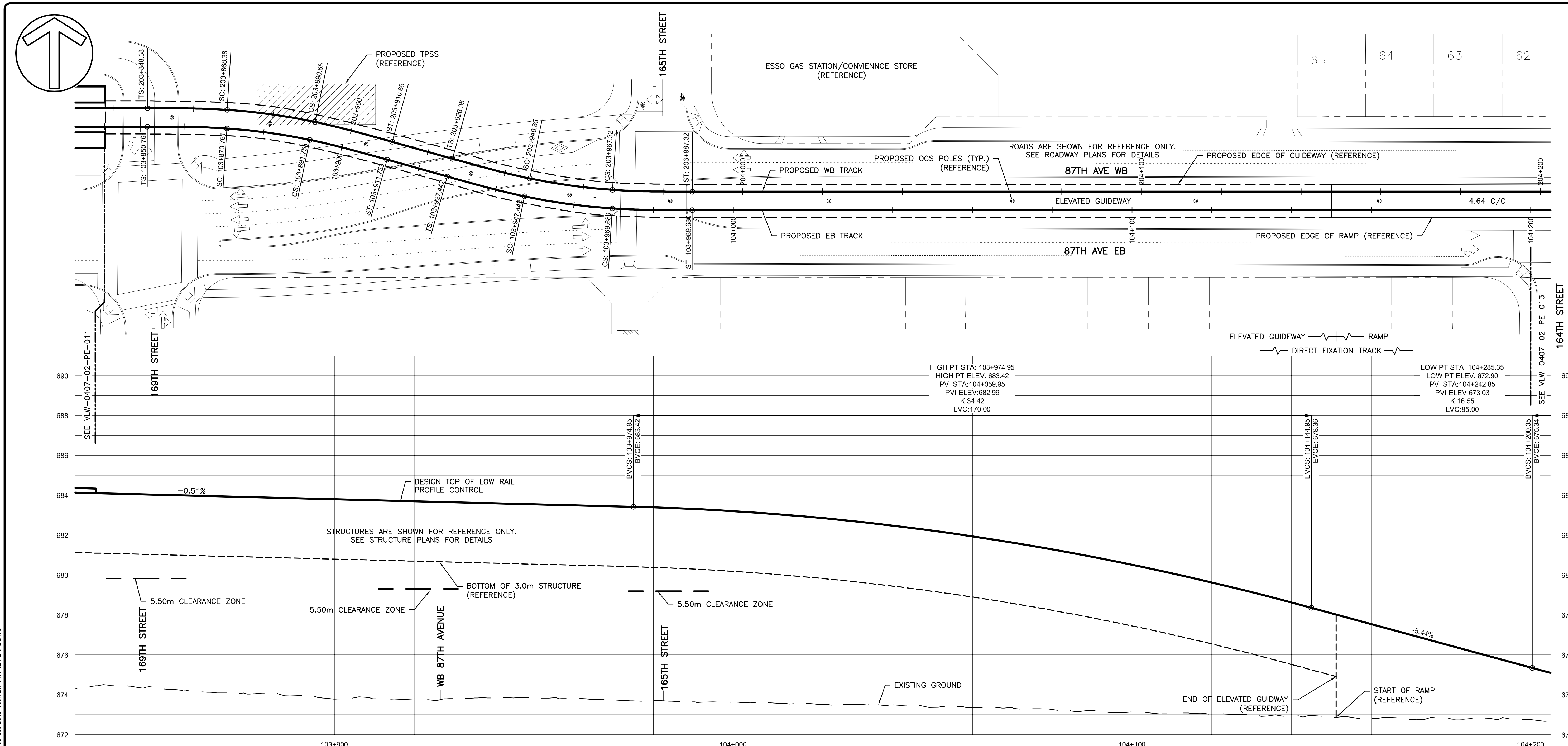
PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title
LRT TRACK WORK
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 103+480 TO 103+840

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-011
REV 0
SHT 011



DESIGN SPEED: 35KPH | 35KPH | 80KPH | 80KPH

CHAINAGE: 103+840.203 | 103+989.680

OPERATING SPEED: 30KPH | 30KPH | 50KPH | 50KPH

HORIZONTAL CURVATURE: Ls=20.00m | L=20.99m R=150.00m | Ls=20.00m | L=15.69m | Ls=20.00m | L=22.24m R=154.64m | Ls=20.00m

DESIGN TOP OF RAIL	684.100	683.999	683.898	683.796	683.695	683.594	683.493	683.388	683.199	682.894	682.473	681.936	681.282	680.513	679.627	678.625	677.539	676.450	675.361
EXISTING GROUND	674.45	674.26	674.05	673.78	673.80	673.83	673.78	673.71	673.63	673.54	673.49	673.37	673.26	673.13	673.00	672.91	672.82	672.78	672.76

HOFF831533 / December 14, 2017 / C:\PWWORKING\HH\HOFF831533\D0154383\VLW-0407-02-PE-012.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART

checked by N. MUXIAREPU | date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH | ISL Engineering and Land Services | DIALOG | MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

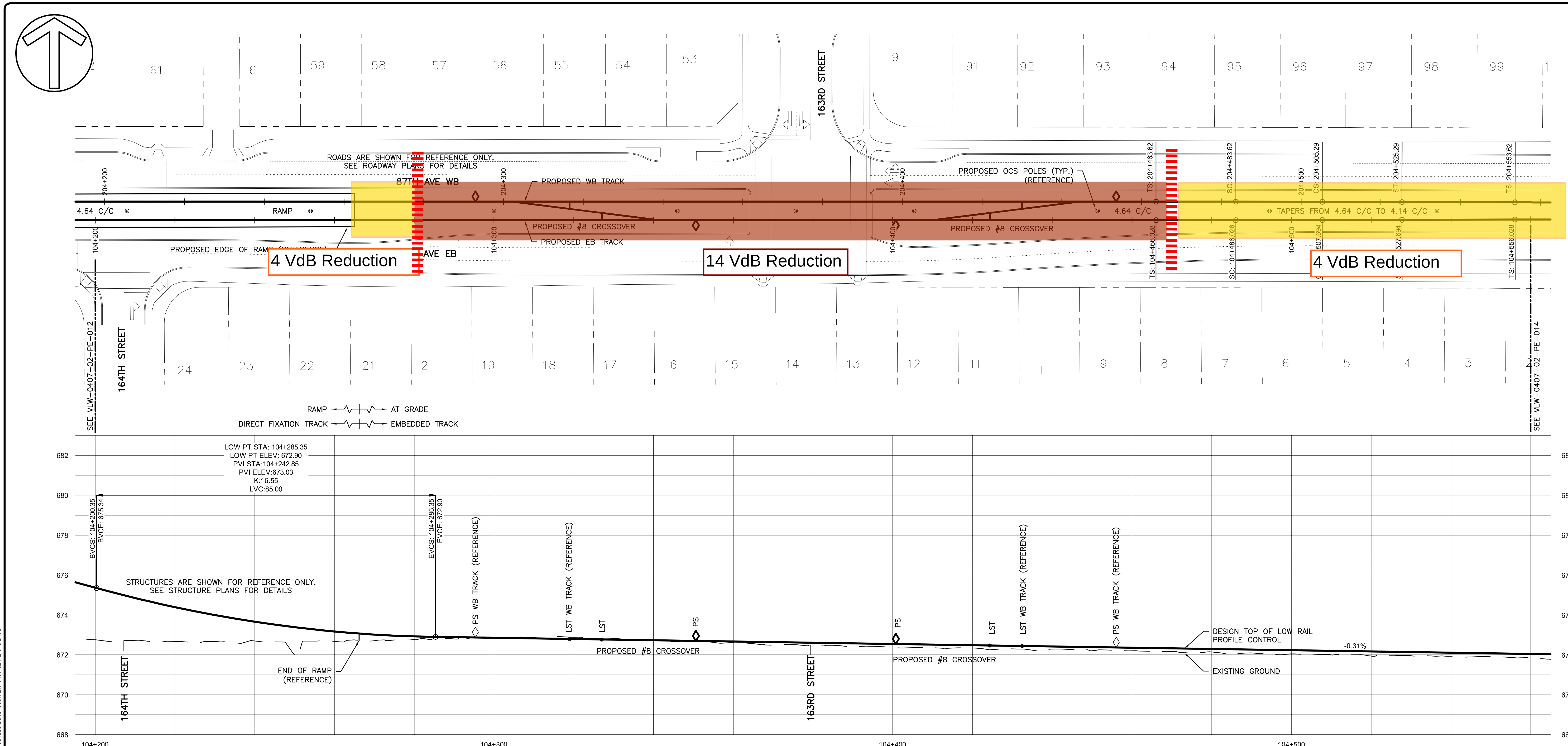
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 103+840 TO 104+200

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-012 | REV 0 | SHT 012



DESIGN SPEED	80KPH																		80KPH
CHAINAGE																			
OPERATING SPEED	50KPH																		50KPH
HORIZONTAL CURVATURE	L=476.35m														Ls=20.00m	L=21.67m R=15000.00m	Ls=20.00m	L=28.33m	Ls=
DESIGN TOP OF RAIL	675.361	674.389	673.658	673.169	672.921	672.851	672.789	672.727	672.664	672.602	672.540	672.478	672.416	672.354	672.292	672.230	672.168	672.106	672.044
EXISTING GROUND	672.76	672.67	672.69	672.66	672.77	672.88	672.87	672.72	672.61	672.48	672.38	672.34	672.29	672.20	672.14	672.04	671.94	671.93	671.86

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART — designed by C. HOFFART

checked by N. MUXIAREPU — date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

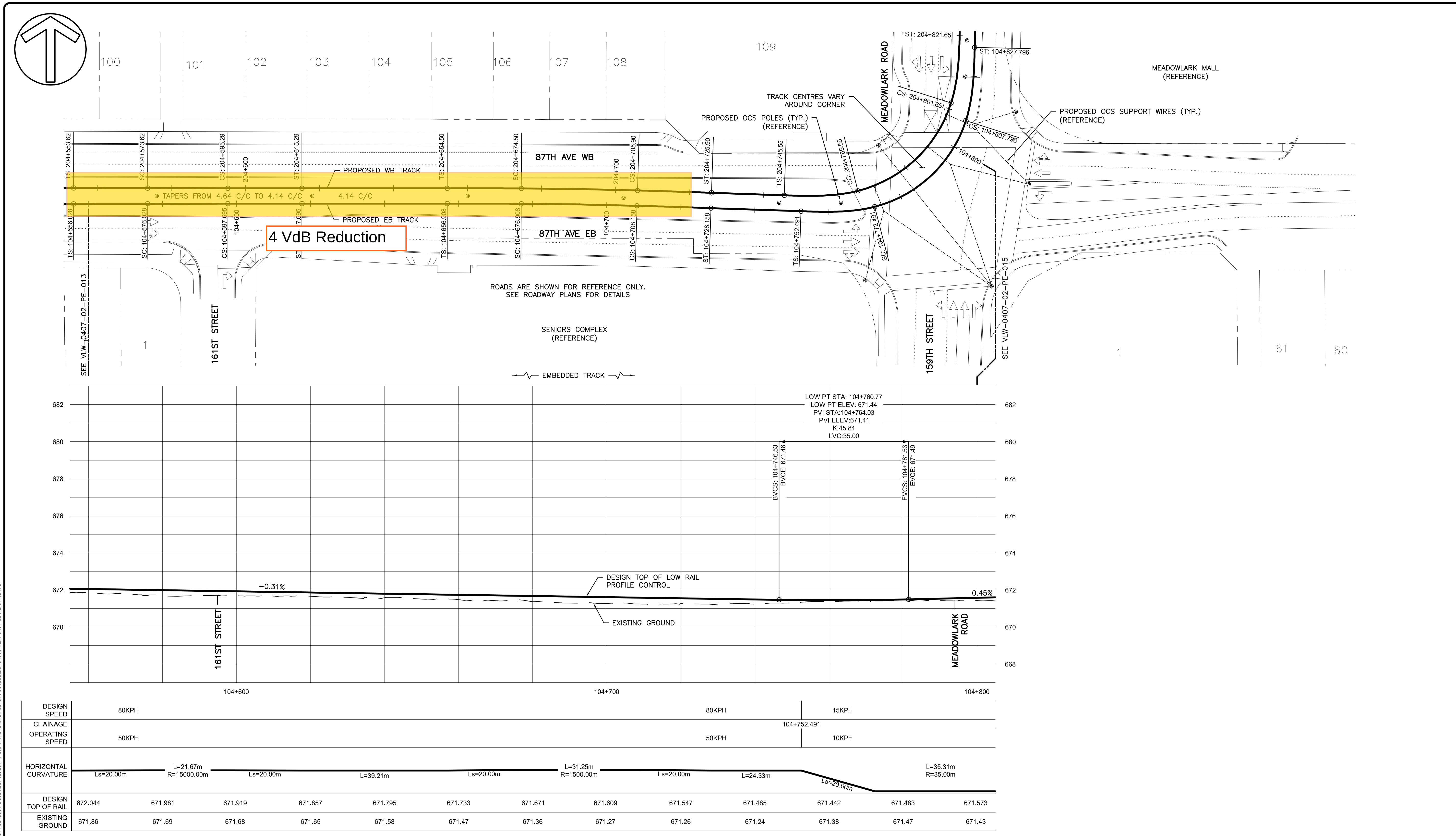
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 104+200 TO 104+560

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-013 REV 0 SHT 013

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-013.DWG



no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	--	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m

drawn by C. HOFFART — designed by C. HOFFART

checked by N. MUXIAREPU — date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

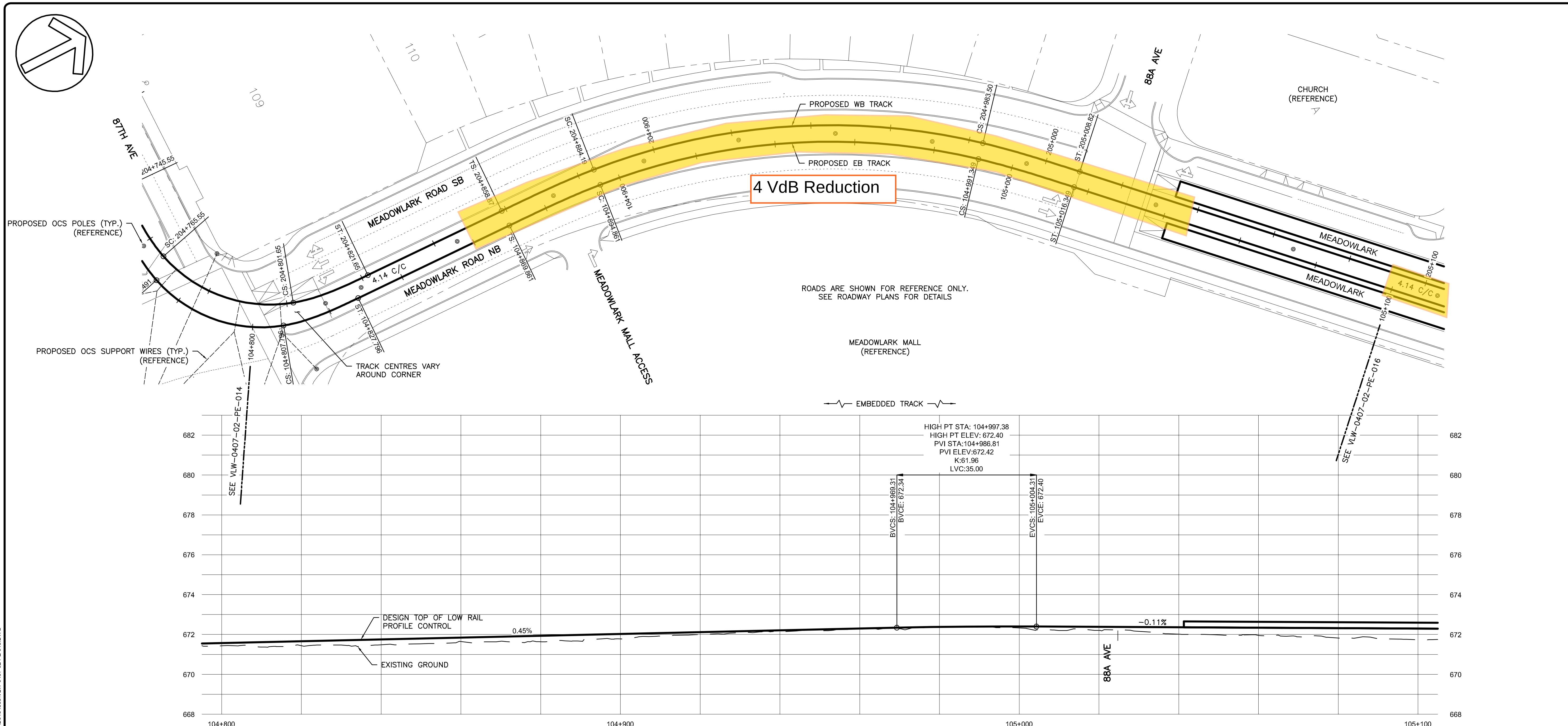
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 104+560 TO 104+800

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-014 — REV 0 — SHT 014

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-014.DWG



DESIGN SPEED	15KPH		35KPH					35KPH					35KPH			
CHAINAGE		104+827.796											105+041.282		MEADOWLARK PLATFORM	
OPERATING SPEED	10KPH		30KPH					30KPH					30KPH			
HORIZONTAL CURVATURE	Ls=20.00m		L=42.06m		Ls=25.00m			L=96.49m R=160.00m			Ls=25.00m					
DESIGN TOP OF RAIL	671.573	671.664	671.754	671.845	671.935	672.026	672.117	672.207	672.298	672.379	672.403	672.382	672.360	672.337	672.315	672.293
EXISTING GROUND	671.43	671.44	671.49	671.65	671.63	671.78	672.00	672.13	672.27	672.35	672.32	672.21	672.01	671.96	671.82	671.73

HOFF831533 / November 30, 2017 / C:\PWWORKING\H\HOFF831533\D0154363\VLW-0407-02-PE-015.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART — designed by C. HOFFART

checked by N. MUXIAREPU — date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

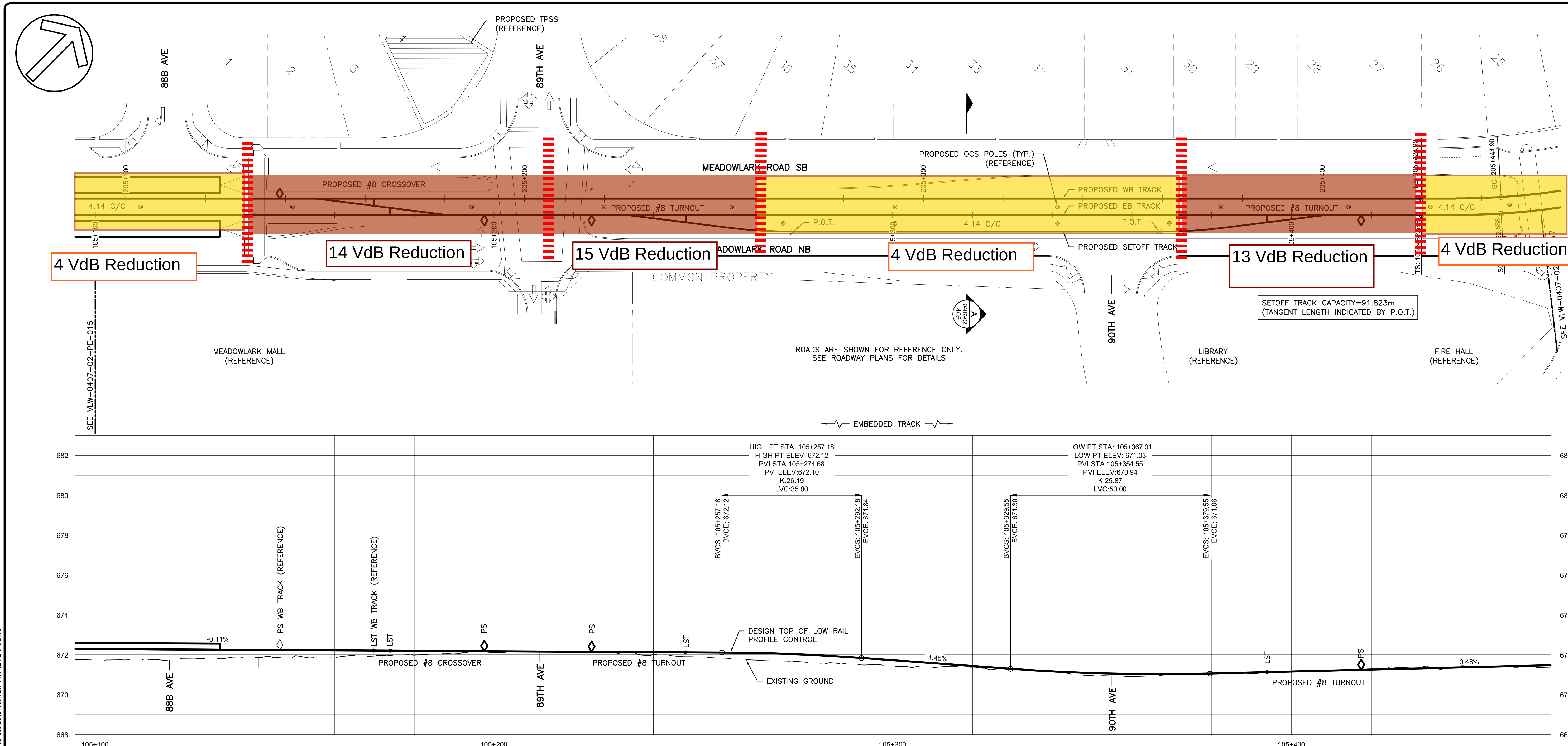
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 104+800 TO 105+100

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-015 — REV 0 — SHT 015



DESIGN SPEED	55KPH																55KPH	40KPH
CHAINAGE	105+131.282																105+432.588	
OPERATING SPEED	50KPH																50KPH	35KPH
HORIZONTAL CURVATURE	L=416.24m																	Ls=20.00m
DESIGN TOP OF RAIL	672.293	672.270	672.248	672.226	672.203	672.181	672.158	672.136	672.112	671.992	671.731	671.441	671.172	671.041	671.064	671.161	671.258	671.355	671.452
EXISTING GROUND	671.73	671.76	671.87	671.89	671.99	672.11	672.11	672.01	671.79	671.60	671.42	671.38	671.19	670.92	671.05	671.16	671.30	671.40	671.37

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART
designed by C. HOFFART
checked by N. MUXIAREPU
date 03-07-2017

permit

seal

consultant job no 351235
consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

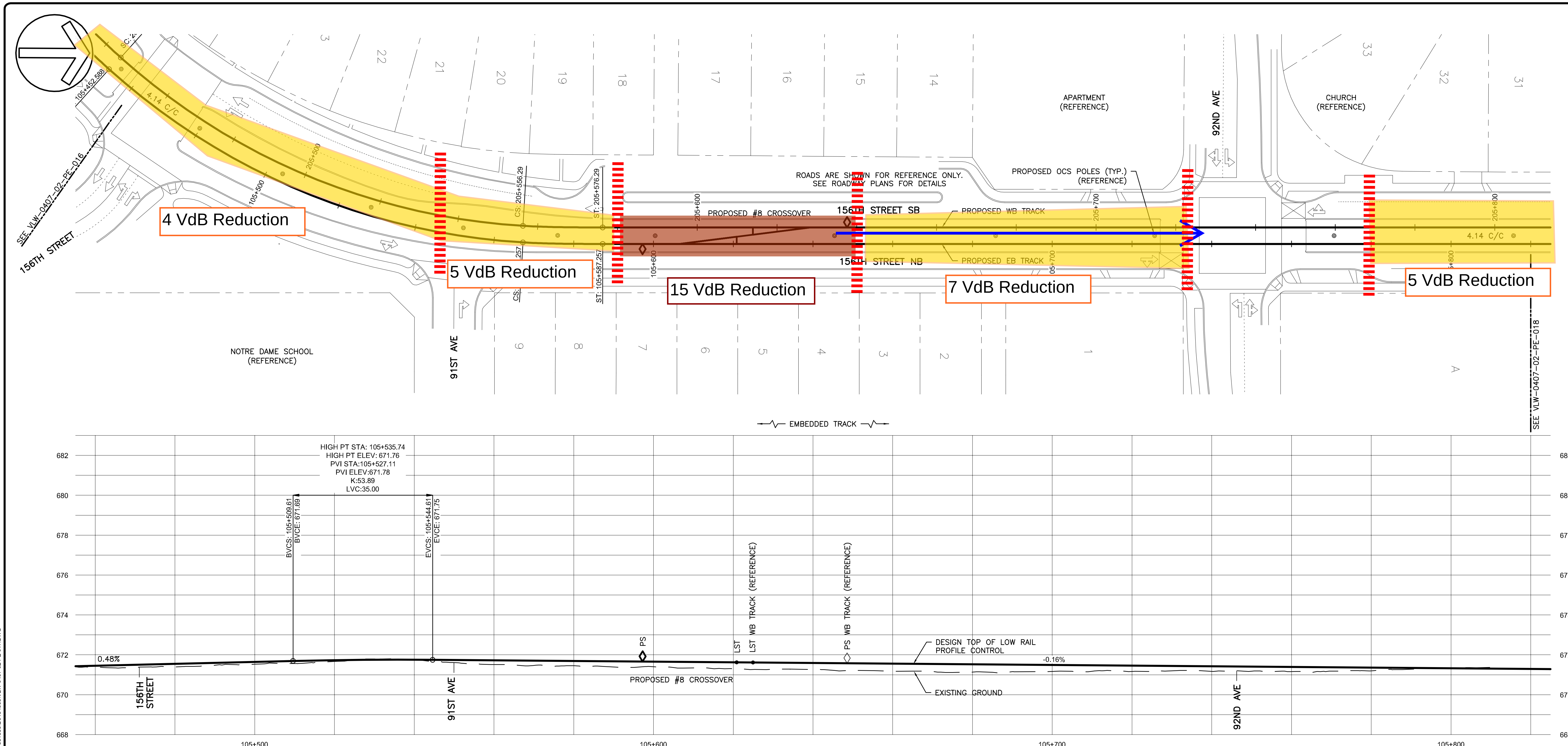
prime consultant reviewed by M. PERRY

drawing title
LRT TRACK WORK
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 105+100 TO 105+460

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-016
REV 0
SHT 016

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-016.DWG



DESIGN SPEED	40KPH · 40KPH · 55KPH · 55KPH
CHAINAGE	105+587.257
OPERATING SPEED	35KPH · 35KPH · 50KPH · 50KPH
HORIZONTAL CURVATURE	L=114.67m R=170.00m · Ls=20.00m
DESIGN TOP OF RAIL	671.452 · 671.549 · 671.646 · 671.733 · 671.754 · 671.723 · 671.690 · 671.657 · 671.624 · 671.591 · 671.558 · 671.525 · 671.492 · 671.460 · 671.427 · 671.394 · 671.361 · 671.328 · 671.295
EXISTING GROUND	671.37 · 671.39 · 671.53 · 671.67 · 671.74 · 671.51 · 671.45 · 671.40 · 671.30 · 671.26 · 671.18 · 671.14 · 671.17 · 671.17 · 671.17 · 671.16 · 671.19 · 671.35 · 671.27

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART · designed by C. HOFFART

checked by N. MUXIAREPU · date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH · ISL Engineering and Land Services · DIALOG · MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

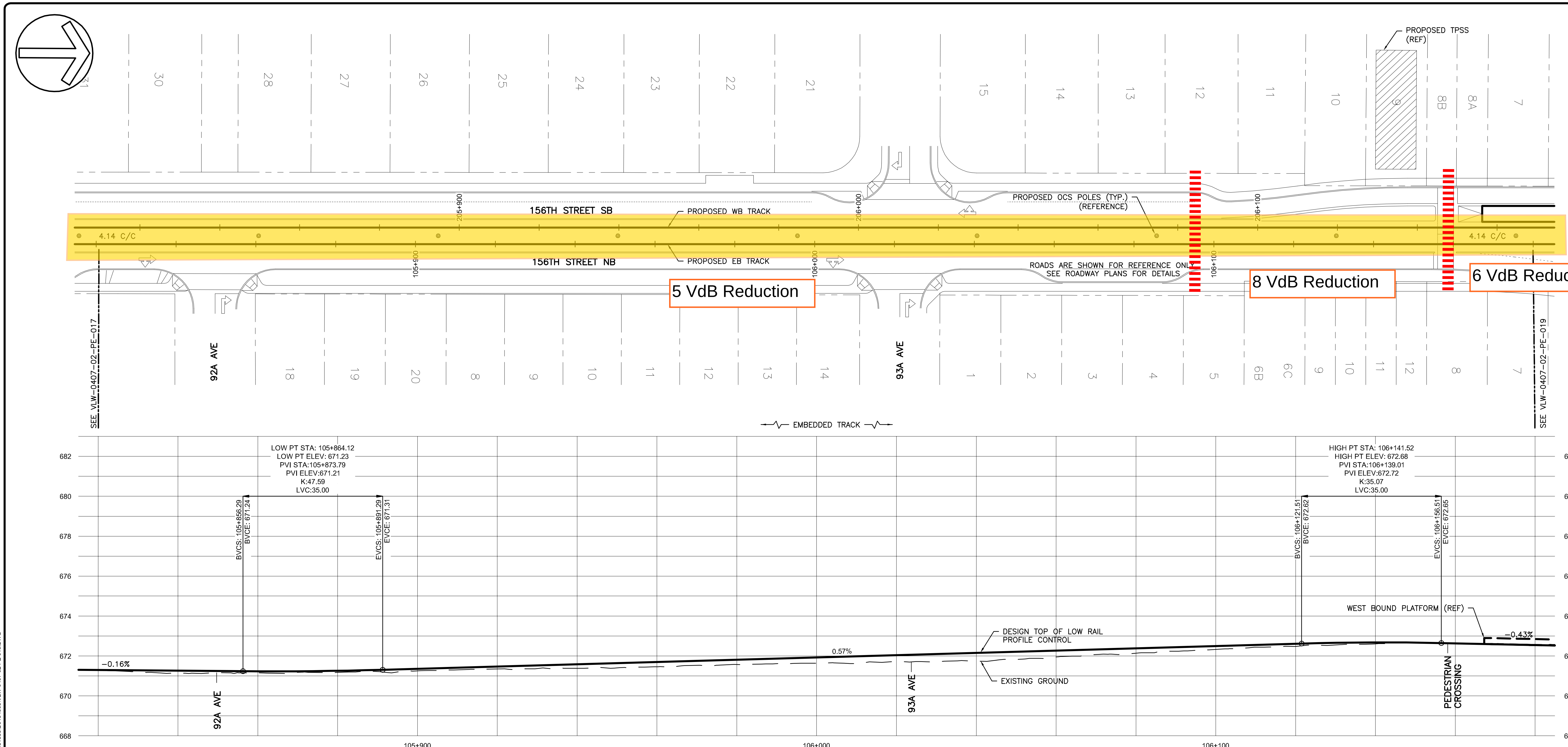
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 105+460 TO 105+820

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-017 · REV 0 · SHT 017

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-017.DWG



DESIGN SPEED	55KPH																		55KPH
CHAINAGE																			
OPERATING SPEED	50KPH																		50KPH
HORIZONTAL CURVATURE																			
DESIGN TOP OF RAIL	671.295	671.262	671.230	671.255	671.356	671.470	671.584	671.698	671.812	671.927	672.041	672.155	672.269	672.383	672.497	672.611	672.677	672.630	672.545
EXISTING GROUND	671.27	671.14	671.15	671.17	671.25	671.35	671.38	671.46	671.57	671.63	671.72	671.73	671.95	672.14	672.33	672.47	672.60	672.61	672.57

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART
designed by C. HOFFART
checked by N. MUXIAREPU
date 03-07-2017

permit

seal

consultant job no 351235
consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 105+820 TO 106+180

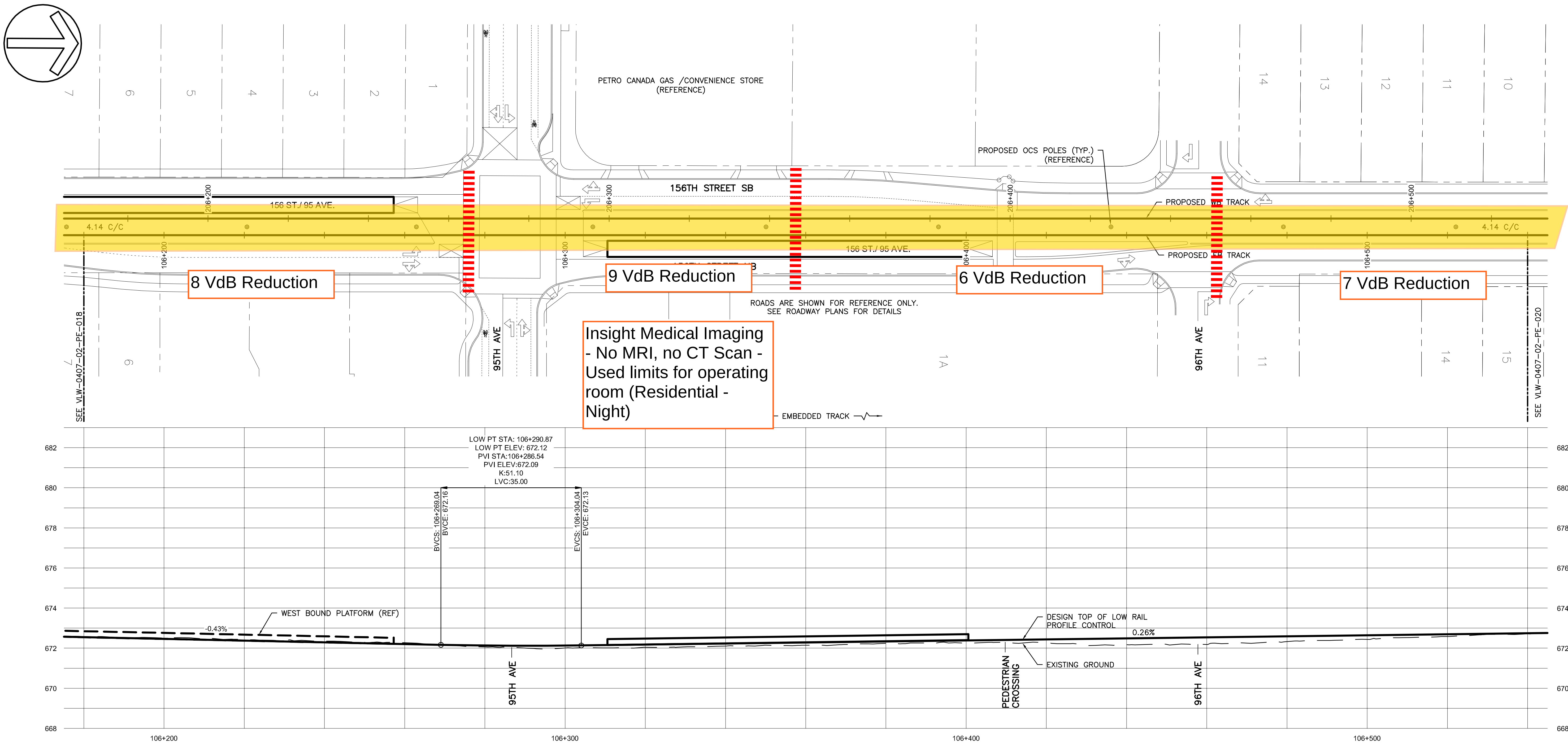
VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-018

REV 0
SHT 018

HOFF831533 / December 1, 2017 / C:\PWWORKING\HF\HOFF831533\D0154363\VLW-0407-02-PE-018.DWG



DESIGN SPEED	55KPH	55KPH		55KPH / 55KPH
CHAINAGE		106+310.556	156TH STREET/95TH AVENUE PLATFORM	106+400.556
OPERATING SPEED	50KPH	50KPH		50KPH / 50KPH
HORIZONTAL CURVATURE	L=1354.35m			

DESIGN TOP OF RAIL	672.545	672.459	672.374	672.289	672.203	672.129	672.126	672.176	672.227	672.279	672.331	672.382	672.434	672.485	672.537	672.588	672.640	672.691	672.743
EXISTING GROUND	672.57	672.51	672.42	672.35	672.27	672.06	672.01	672.04	672.10	672.14	672.24	672.25	672.26	672.17	672.18	672.33	672.43	672.58	672.71

HOFF831533 / December 1, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-019.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART

designed by C. HOFFART

checked by N. MUXIAREPU

date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 106+180 TO 106+540

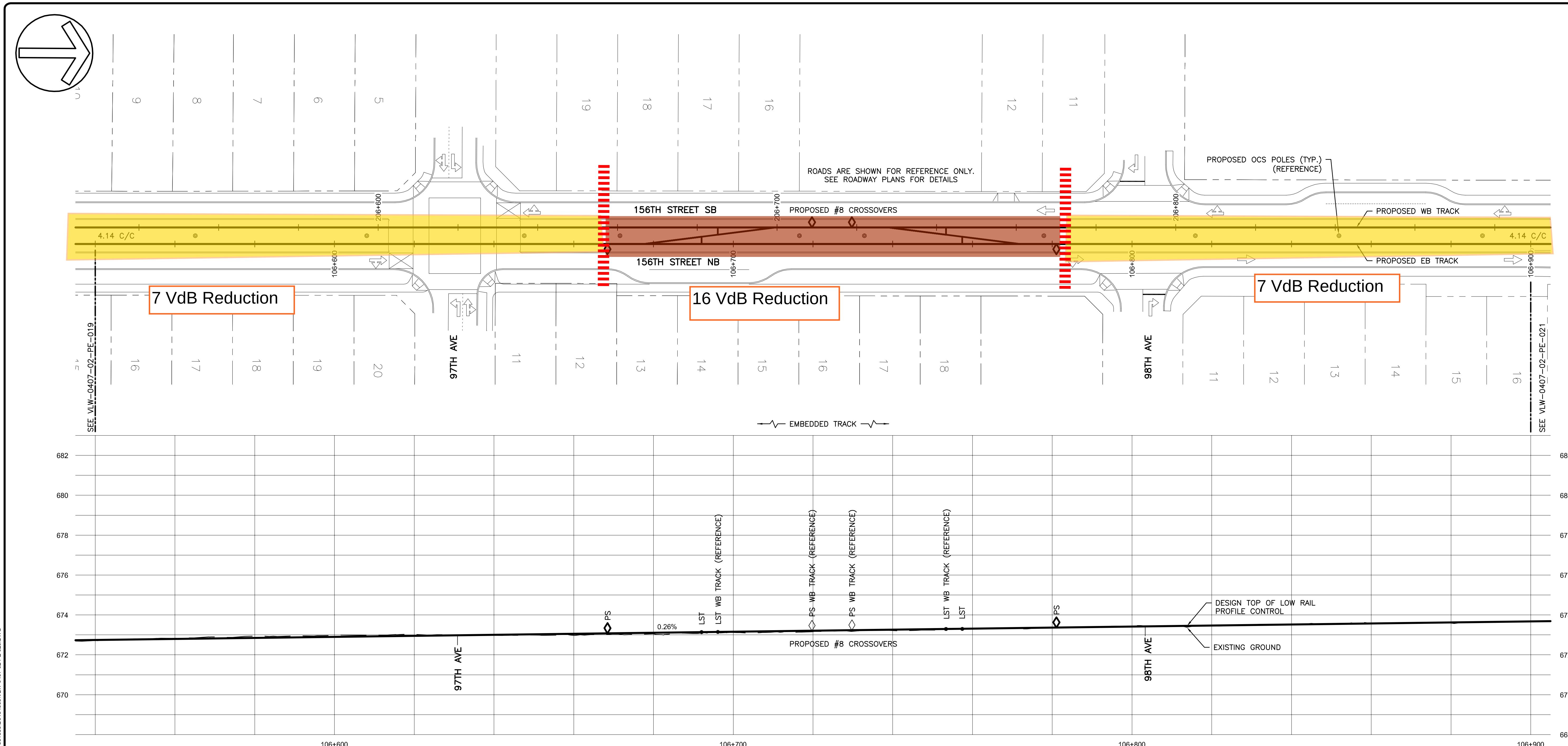
VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-019

REV 0

SHT 019



DESIGN SPEED	55KPH																55KPH
CHAINAGE																	
OPERATING SPEED	50KPH																50KPH
HORIZONTAL CURVATURE																	
DESIGN TOP OF RAIL	672.743	672.794	672.846	672.898	672.949	673.001	673.052	673.104	673.155	673.207	673.258	673.310	673.361	673.413	673.464	673.516	673.568	673.619	673.671
EXISTING GROUND	672.71	672.83	672.93	672.98	673.03	672.97	672.97	673.05	673.11	673.16	673.21	673.30	673.35	673.46	673.46	673.49	673.57	673.59	673.69

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART
designed by C. HOFFART
checked by N. MUXIAREPU
date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

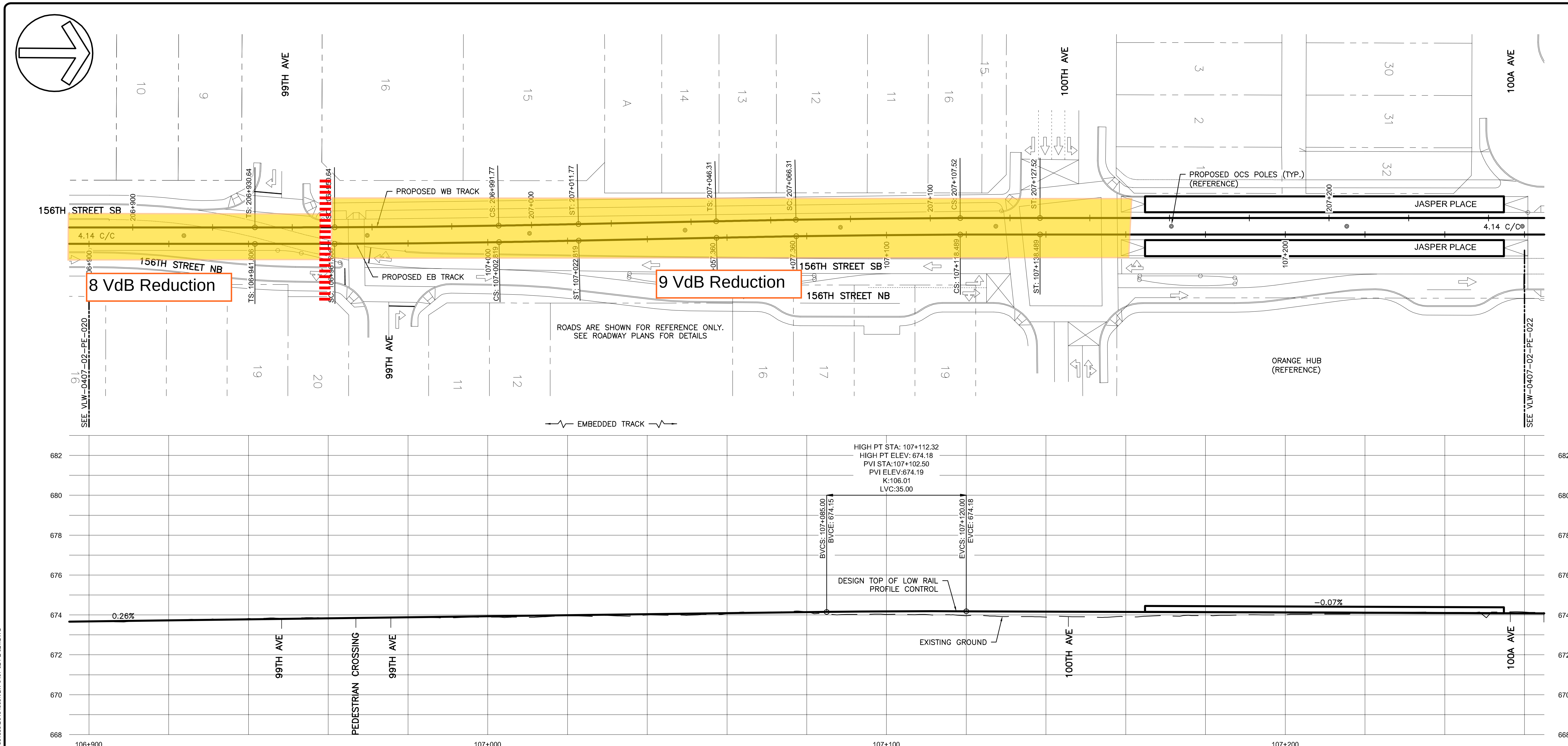
drawing title

LRT TRACK WORK
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 106+540 TO 106+900

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-020 REV 0 SHT 020

HOFF831533 / December 12, 2017 / C:\PWWORKING\HHOFF831533\D0154363\VLW-0407-02-PE-020.DWG



DESIGN SPEED	55KPH … 55KPH (107+164.840 to 107+254.840: JASPER PLACE PLATFORM) … 55KPH
CHAINAGE	107+164.840 — JASPER PLACE PLATFORM — 107+254.840
OPERATING SPEED	50KPH … 50KPH … 50KPH
HORIZONTAL CURVATURE	Ls=20.00m; L=41.21m R=3004.14m; Ls=20.00m; L=34.54m; Ls=20.00m; L=41.13m R=3000.00m; Ls=20.00m; L=185.94m

DESIGN TOP OF RAIL	673.671	673.722	673.774	673.825	673.877	673.928	673.980	674.031	674.083	674.135	674.175	674.180	674.165	674.151	674.136	674.122	674.107	674.093	674.078
EXISTING GROUND	673.69	673.74	673.82	673.85	673.86	673.88	673.95	673.99	674.06	674.16	674.03	673.96	673.89	673.91	673.97	674.01	674.07	674.13	674.14

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART
checked by N. MUXIAREPU | date 03-07-2017

permit | seal

consultant job no 351235
consultant reviewed by G. TURNER

AECOM Prime Consultant
Edmonton
prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

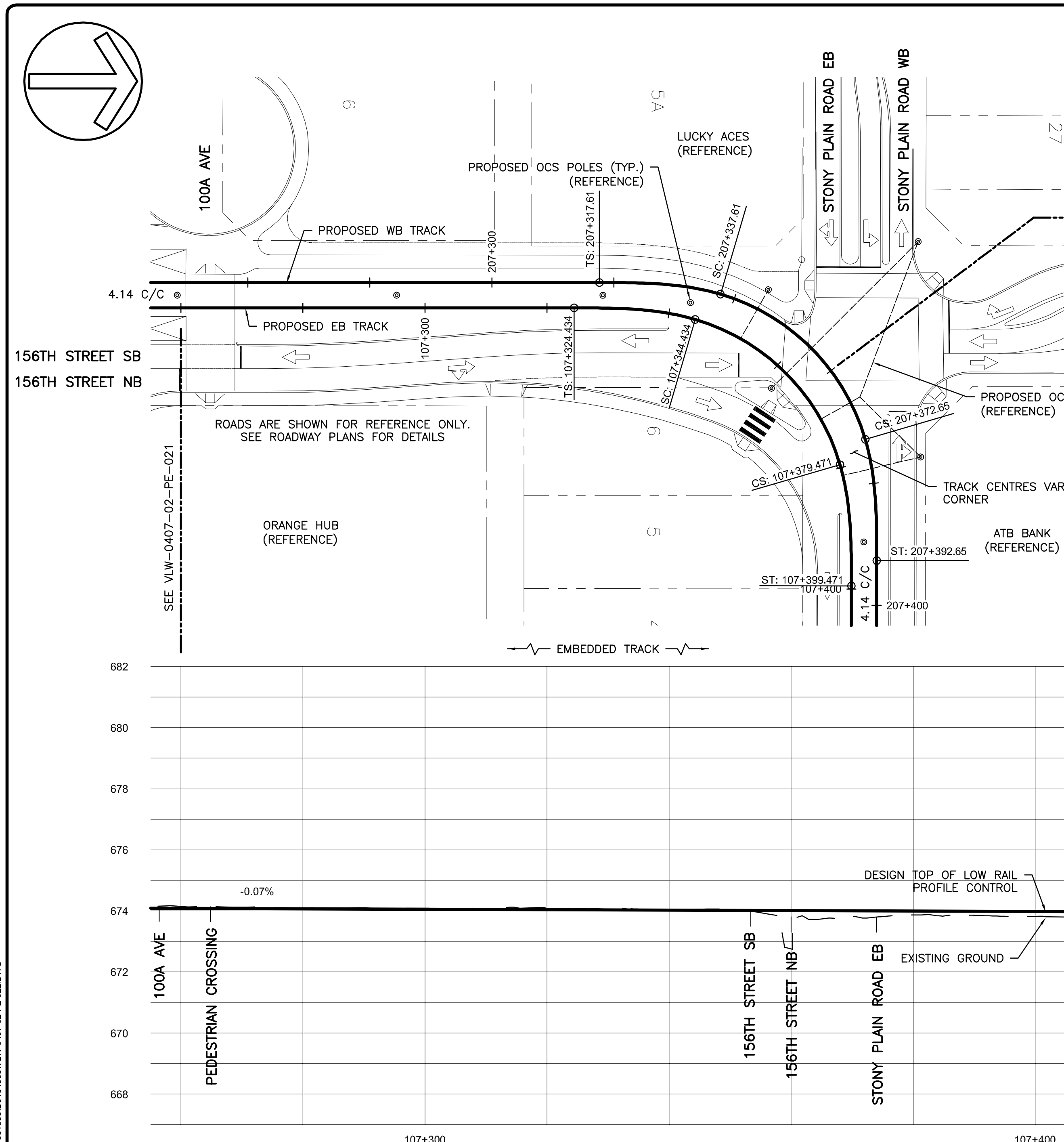
prime consultant reviewed by M. PERRY

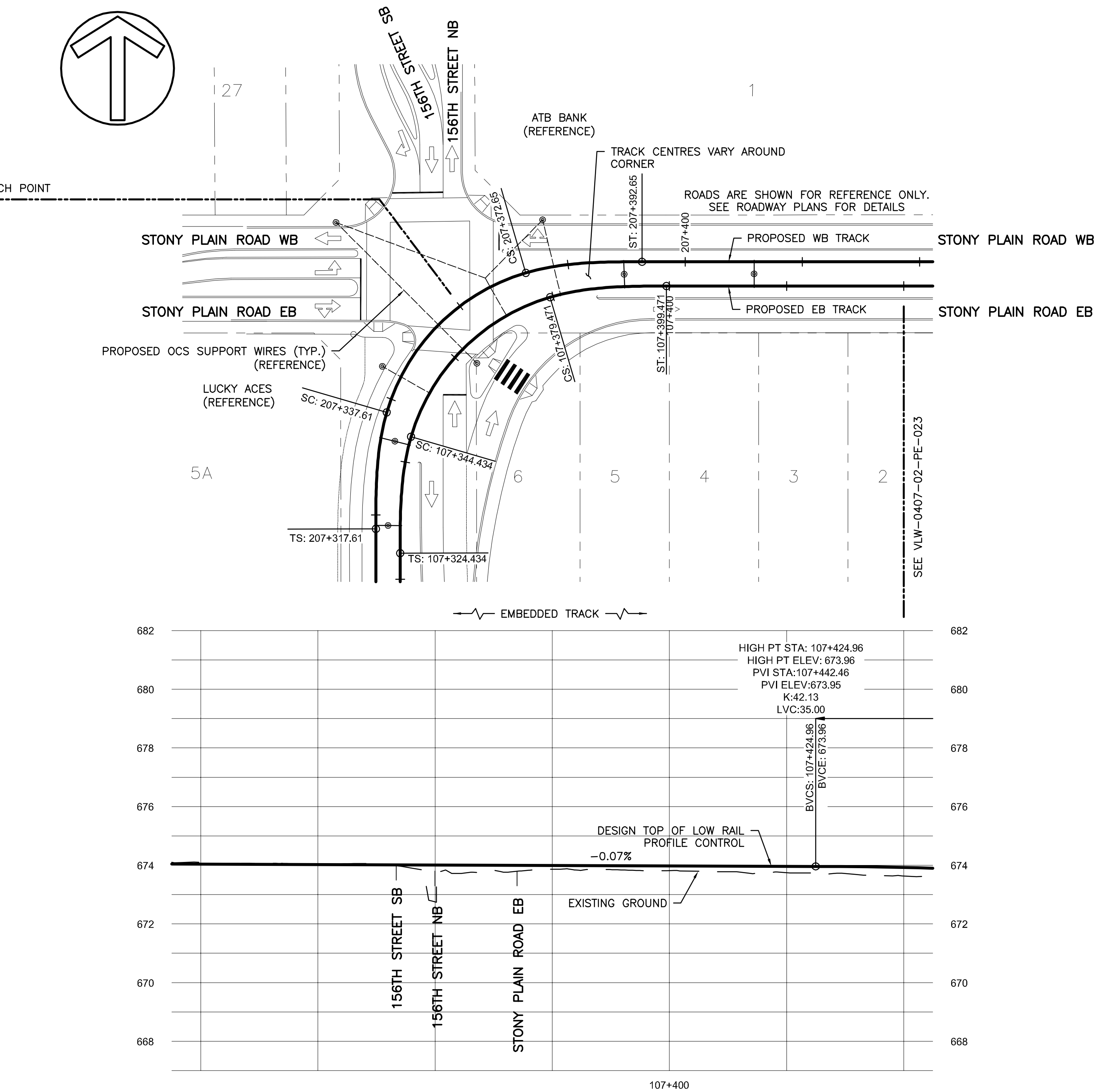
drawing title
LRT TRACK WORK
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 106+900 TO 107+260

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-021 | REV 0 | SHT 021

HOFF831533 / December 12, 2017 / C:\PWWORKING\HE\HOFF831533\D0154363\VLW-0407-02-PE-021.DWG





DESIGN SPEED	55KPH		55KPH	15KPH			15KPH	
CHAINAGE			107+324.434				107+399.471	
OPERATING SPEED	50KPH		50KPH	10KPH			10KPH	
HORIZONTAL CURVATURE				Ls=20.00m	L=35.04m R=35.00m		Ls=20.00m	
DESIGN TOP OF RAIL	674.078	674.064	674.049	674.035	674.020	674.006	673.991	673.977
EXISTING GROUND	674.14	674.09	674.08	674.09	674.04	672.75	673.86	673.82

DESIGN SPEED	55KPH	15KPH			15KPH	55KPH	
CHAINAGE	107+324.434				107+399.471		
OPERATING SPEED	50KPH	10KPH			10KPH	50KPH	
HORIZONTAL CURVATURE	Ls=20.00m	L=35.04m R=35.00m		Ls=20.00m			
DESIGN TOP OF RAIL	674.035	674.020	674.006	673.991	673.977	673.962	673.921
EXISTING GROUND	674.09	674.04	672.75	673.86	673.82	673.74	673.63

HOFF831533 / December 12, 2017 / C:\PWWORKING\HOFF831533\D0154363\VLW-0407-02-PE-022.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH permit Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART | checked by N. MUXIAREPU | date 03-07-2017

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH | ISL Engineering and Land Services | DIALOG | MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

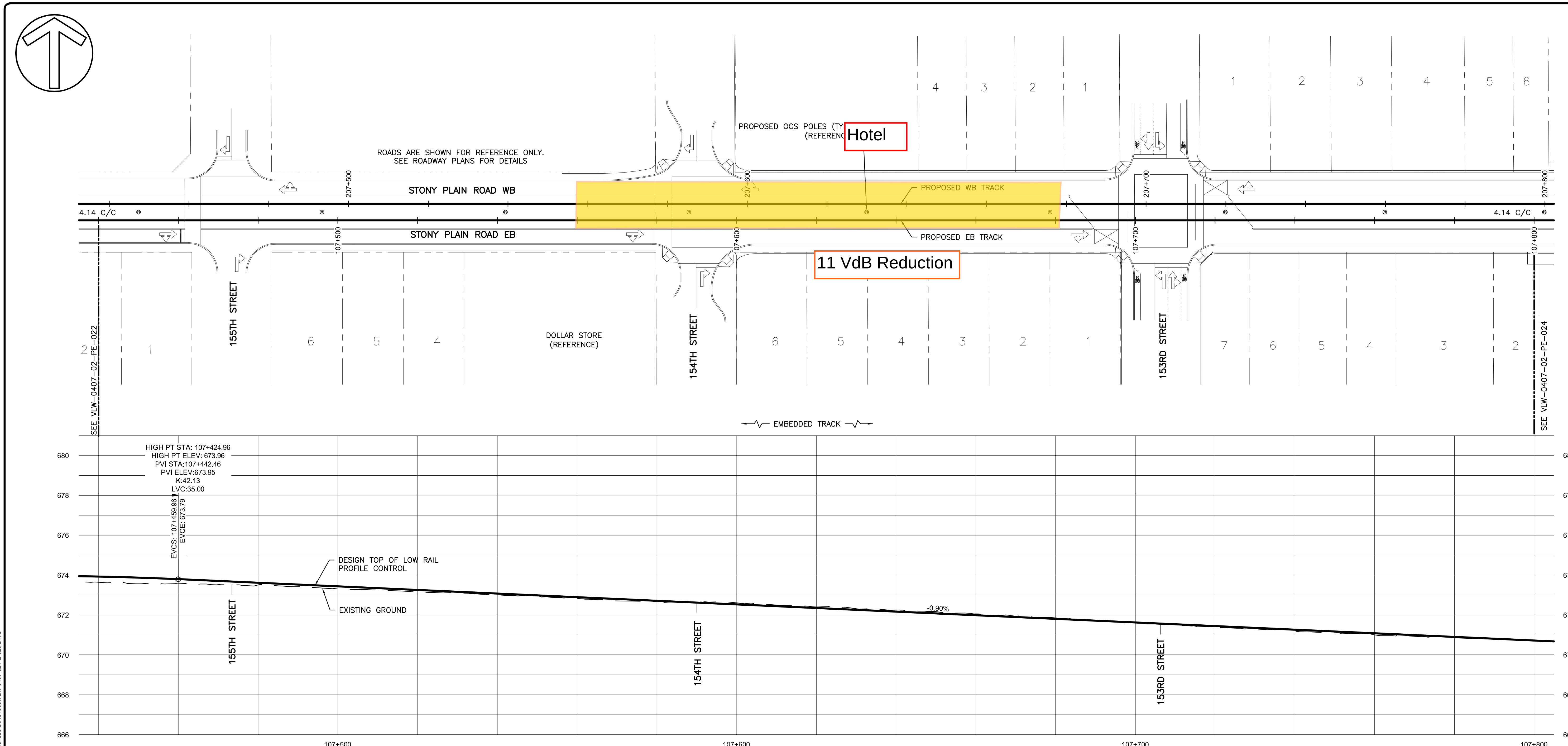
LRT TRACK WORK

TRACK PLAN AND PROFILE EAST BOUND TRACK STATION 107+260 TO 107+440

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-022 | REV 0 | SHT 022



DESIGN SPEED	55KPH																		55KPH
CHAINAGE																			
OPERATING SPEED	50KPH																		50KPH
HORIZONTAL CURVATURE	L=418.63m																		
DESIGN TOP OF RAIL	673.921	673.788	673.607	673.426	673.246	673.065	672.885	672.704	672.523	672.343	672.162	671.981	671.801	671.620	671.439	671.259	671.078	670.897	670.717
EXISTING GROUND	673.63	673.59	673.50	673.34	673.16	673.00	672.82	672.65	672.60	672.40	672.24	672.05	671.85	671.62	671.38	671.19	671.00	670.85	670.69

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART

checked by N. MUXIAREPU | date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

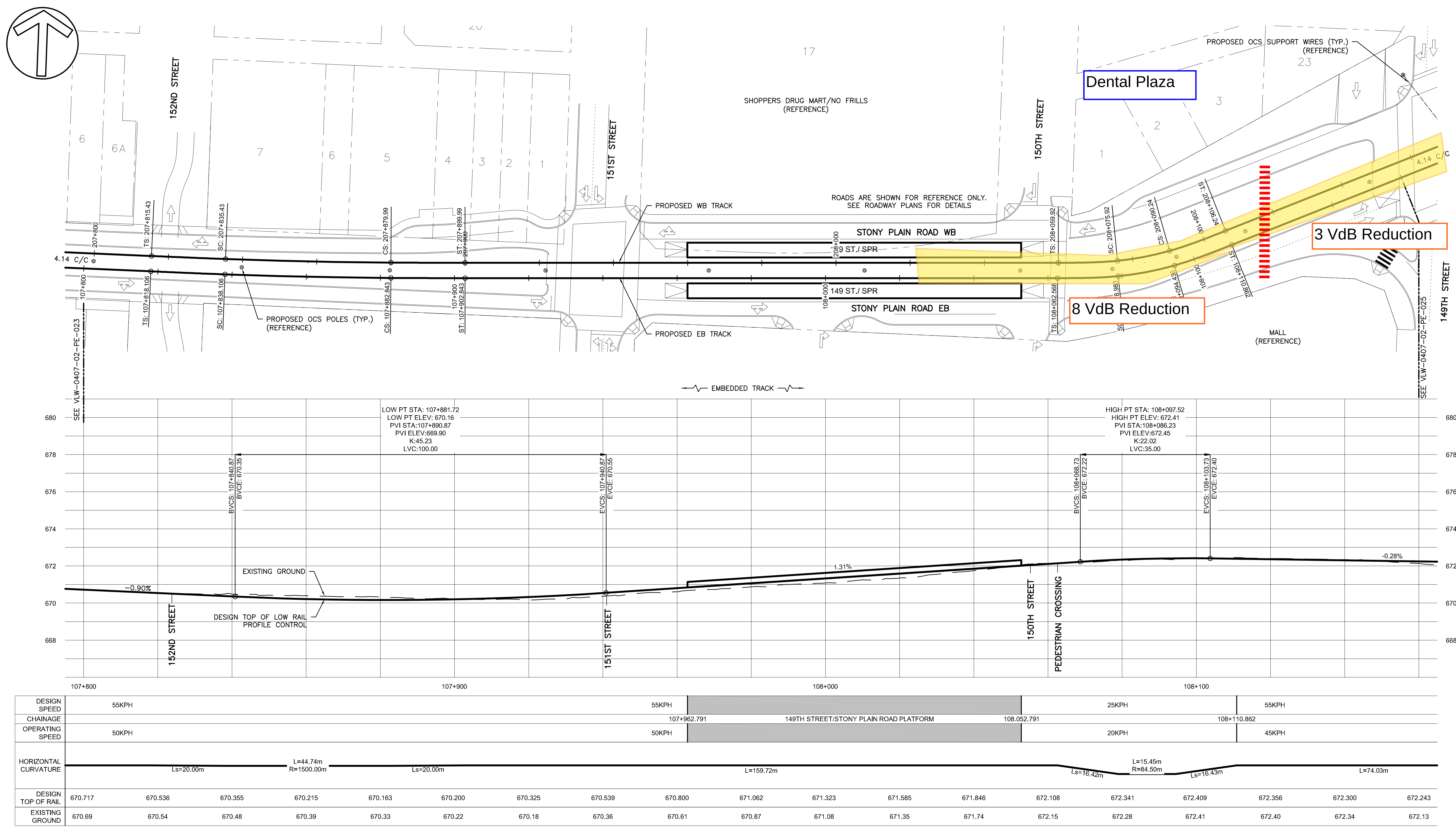
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 107+440 TO 107+800

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-023 | REV 0 | SHT 023

HOFF831533 / December 4, 2017 / C:\PWWORKING\HOFF831533\D0154363\VLW-0407-02-PE-023.DWG



no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m

drawn by C. HOFFART — designed by C. HOFFART

checked by N. MUXIAREPU — date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

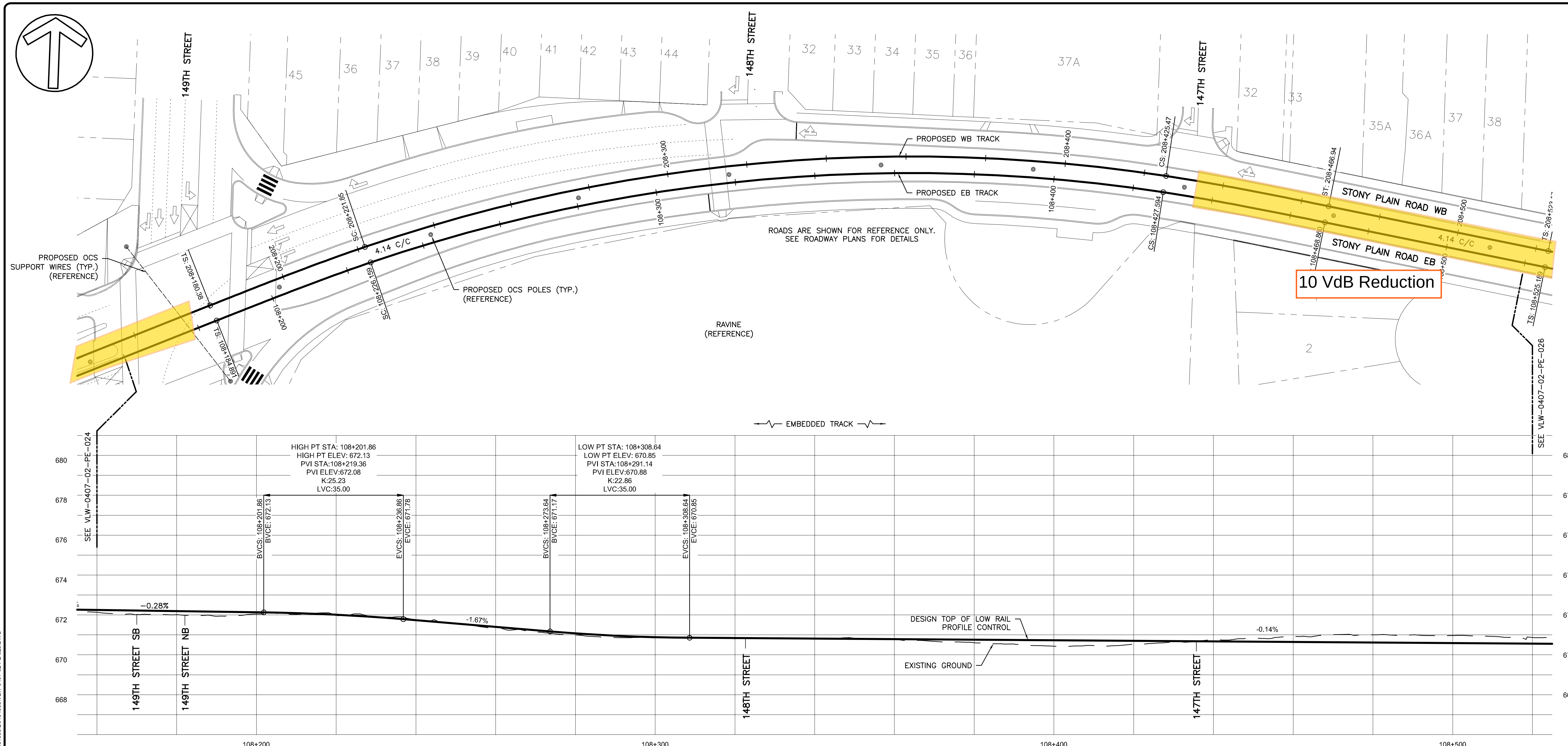
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 107+800 TO 108+160

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-024 — REV 0 — SHT 024



DESIGN SPEED	55KPH; 50KPH; 50KPH; 55KPH; 55KPH
CHAINAGE	108+184.891; 108+468.860
OPERATING SPEED	45KPH; 45KPH; 45KPH; 45KPH
HORIZONTAL CURVATURE	Ls=41.27m; L=201.44m R=420.00m; Ls=41.27m; L=56.33m

DESIGN TOP OF RAIL	672.243	672.187	672.130	672.009	671.731	671.398	671.073	670.882	670.838	670.811	670.783	670.755	670.728	670.700	670.673	670.645	670.618	670.590	670.562
EXISTING GROUND	672.13	672.01	672.04	671.98	671.75	671.34	670.99	670.85	670.81	670.81	670.77	670.60	670.43	670.54	670.74	670.92	671.00	670.96	670.87

HOFF831533 / December 4, 2017 / C:\PWWORKING\HHOFF831533\D0154363\VLW-0407-02-PE-025.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART

designed by C. HOFFART

checked by N. MUXIAREPU

date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 108+160 TO 108+520

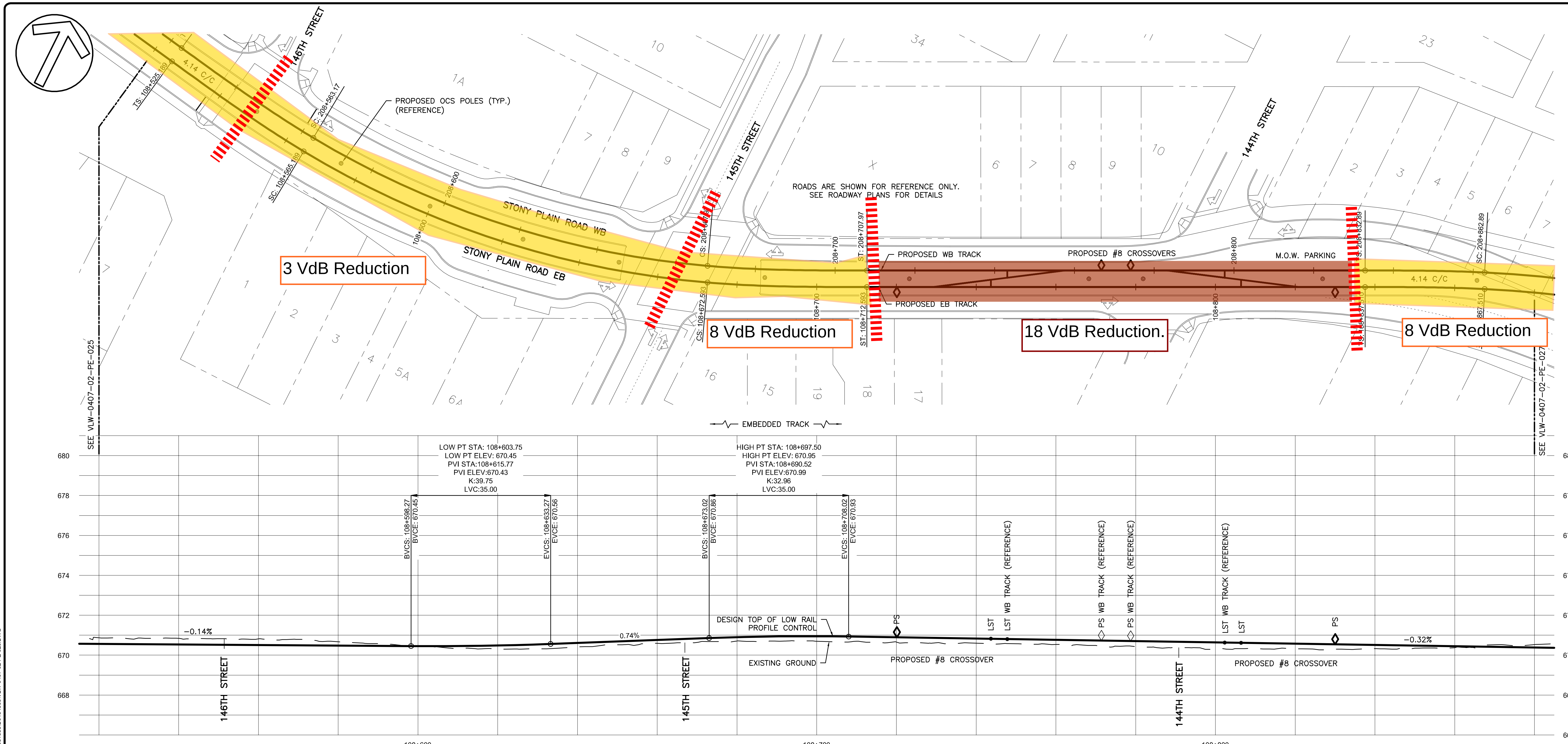
VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-025

REV 0

SHT 025



DESIGN SPEED	55KPH / 45KPH								45KPH / 55KPH							55KPH / 50KPH		
CHAINAGE	108+525.189								108+712.593							108+837.510		
OPERATING SPEED	45KPH / 40KPH								40KPH / 50KPH							50KPH / 45KPH		
HORIZONTAL CURVATURE	Ls=40.00m				L=107.40m R=235.00m				Ls=40.00m				L=124.92m				Ls=30.00m	
DESIGN TOP OF RAIL	670.562	670.535	670.507	670.480	670.453	670.484	670.610	670.759	670.900	670.946	670.892	670.828	670.764	670.700	670.636	670.573	670.509	670.445	670.381
EXISTING GROUND	670.87	670.84	670.81	670.67	670.46	670.31	670.41	670.60	670.71	670.69	670.65	670.60	670.53	670.43	670.29	670.33	670.33	670.38	670.53

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH
Prime Consultant: AECOM
Consultant: HATCH
The City of Edmonton
HATCH | ISL Engineering and Land Services | DIALOG | MOTT MACDONALD

A1 bar scale 1:500m

drawn by C. HOFFART
designed by C. HOFFART
checked by N. MUXIAREPU
date 03-07-2017
permit
seal
consultant job no 351235
consultant reviewed by G. TURNER
prime consultant job no 60528911
prime consultant reviewed by M. PERRY

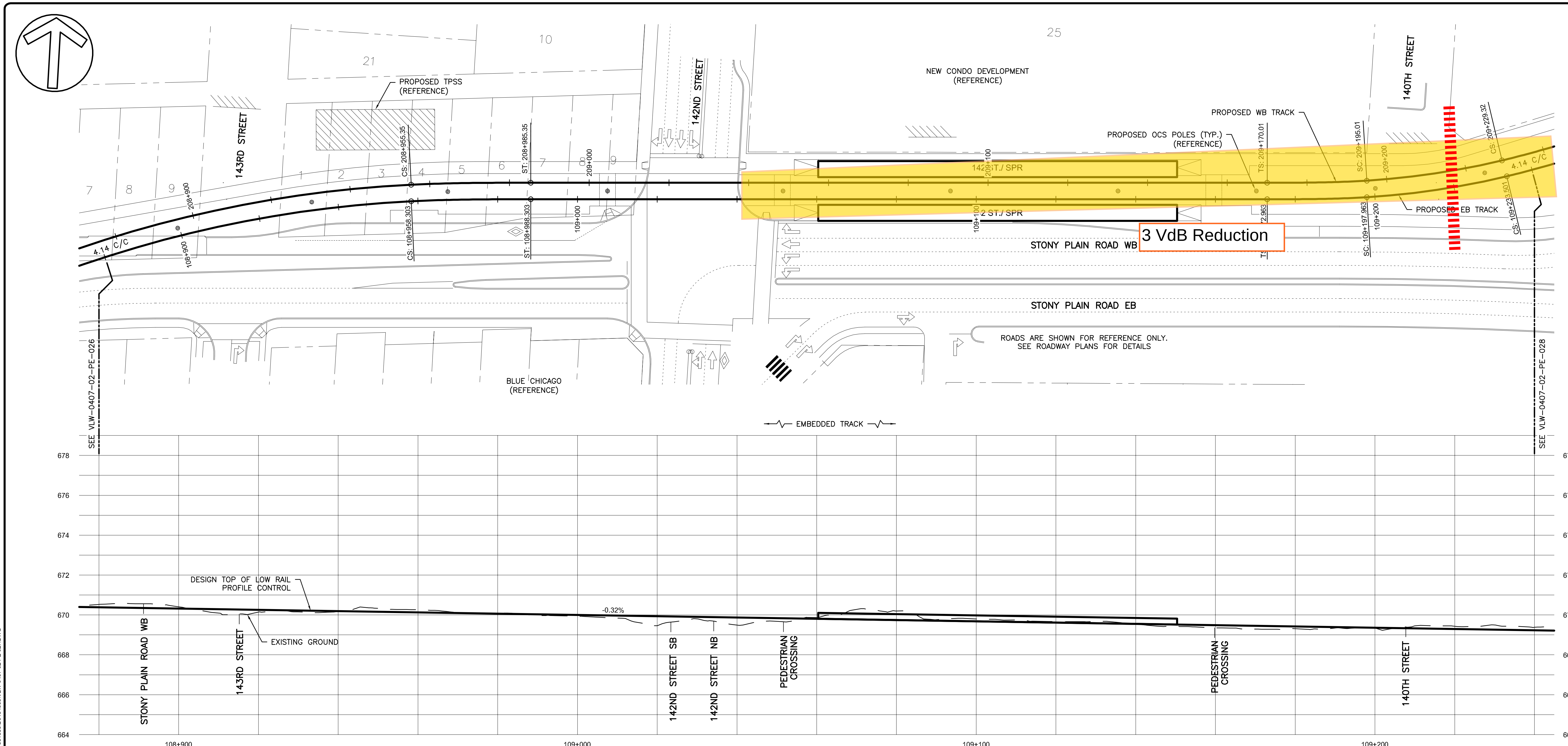
PRELIMINARY ENGINEERING DRAWINGS
NOT FOR CONSTRUCTION

drawing title
LRT TRACK WORK
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 108+520 TO 108+880

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-026
REV 0
SHT 026

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-026.DWG



DESIGN SPEED	50KPH	55KPH	55KPH		40KPH
CHAINAGE	108+908.303		109+060.377	142ND STREET/STONY PLAIN ROAD PLATFORM	109+150.377
OPERATING SPEED	45KPH		45KPH		35KPH
HORIZONTAL CURVATURE	L=90.79m R=300.00m	Ls=30.00m	L=184.66m	Ls=25.00m	L=35.54m R=204.14m

DESIGN TOP OF RAIL	670.381	670.317	670.254	670.190	670.126	670.062	669.998	669.934	669.871	669.807	669.743	669.679	669.615	669.552	669.488	669.424	669.360	669.296	669.233
EXISTING GROUND	670.53	670.41	670.14	670.18	670.25	670.09	669.94	669.46	669.49	669.86	670.20	669.80	669.66	669.55	669.35	669.31	669.34	669.43	669.38

HOFF831533 / December 12, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-027.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	NOT ISSUED	–	–

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH
Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART
designed by C. HOFFART
checked by N. MUXIAREPU
date 03-07-2017

permit

seal

consultant job no 351235
consultant reviewed by G. TURNER

AECOM
Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

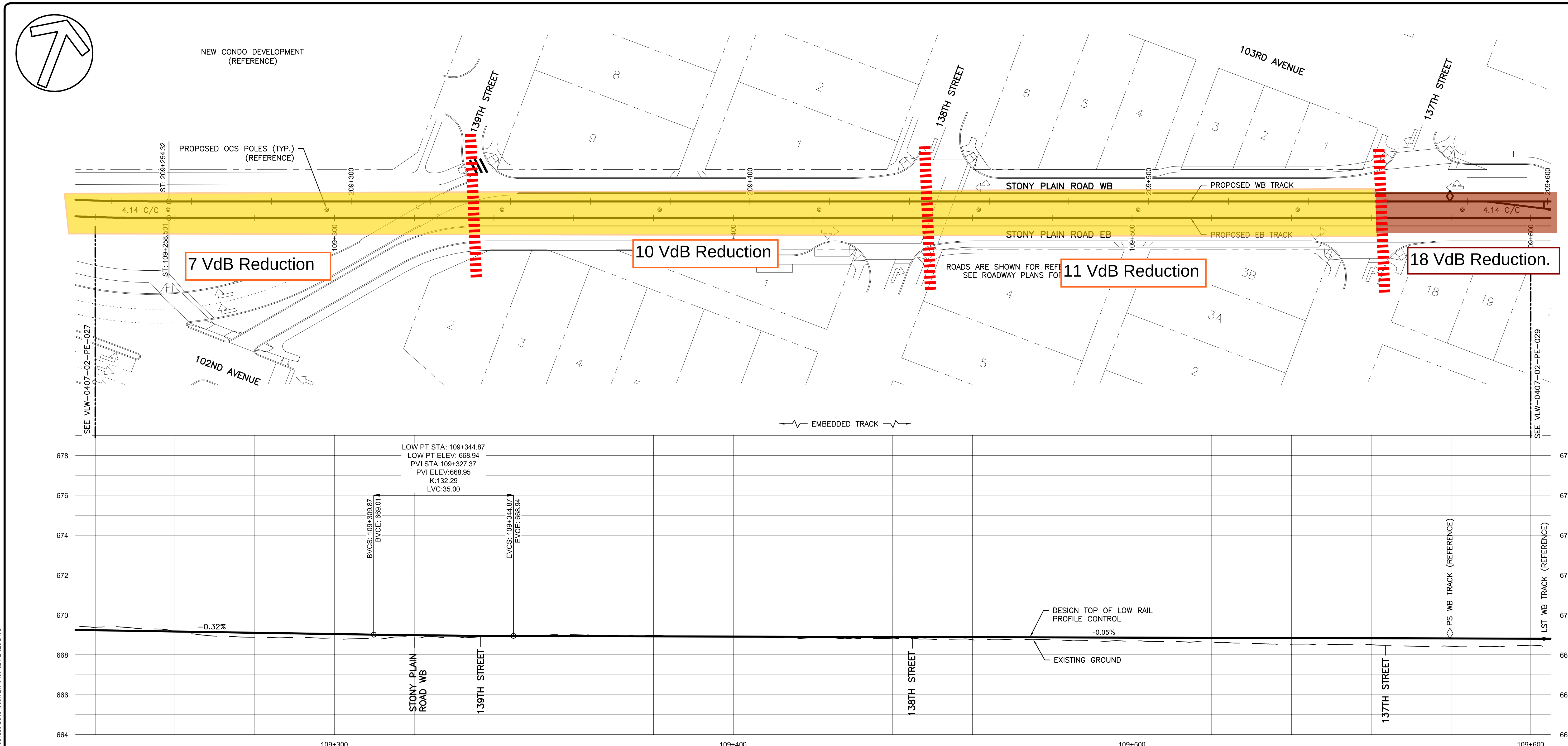
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 108+880 TO 109+240

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-027
REV 0
SHT 027



DESIGN SPEED	40KPH	55KPH																	55KPH
CHAINAGE	109+258.501																		
OPERATING SPEED	35KPH	50KPH																	50KPH
HORIZONTAL CURVATURE	Ls=25.00m	L=447.53m																	
DESIGN TOP OF RAIL	669.233	669.169	669.105	669.041	668.981	668.948	668.936	668.925	668.914	668.903	668.892	668.882	668.871	668.860	668.849	668.838	668.827	668.816	668.805
EXISTING GROUND	669.38	669.17	668.88	668.81	668.87	668.91	669.01	668.98	668.91	668.86	668.80	668.75	668.79	668.70	668.61	668.53	668.51	668.42	668.48

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART

checked by N. MUXIAREPU | date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH | ISL Engineering and Land Services | DIALOG | MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

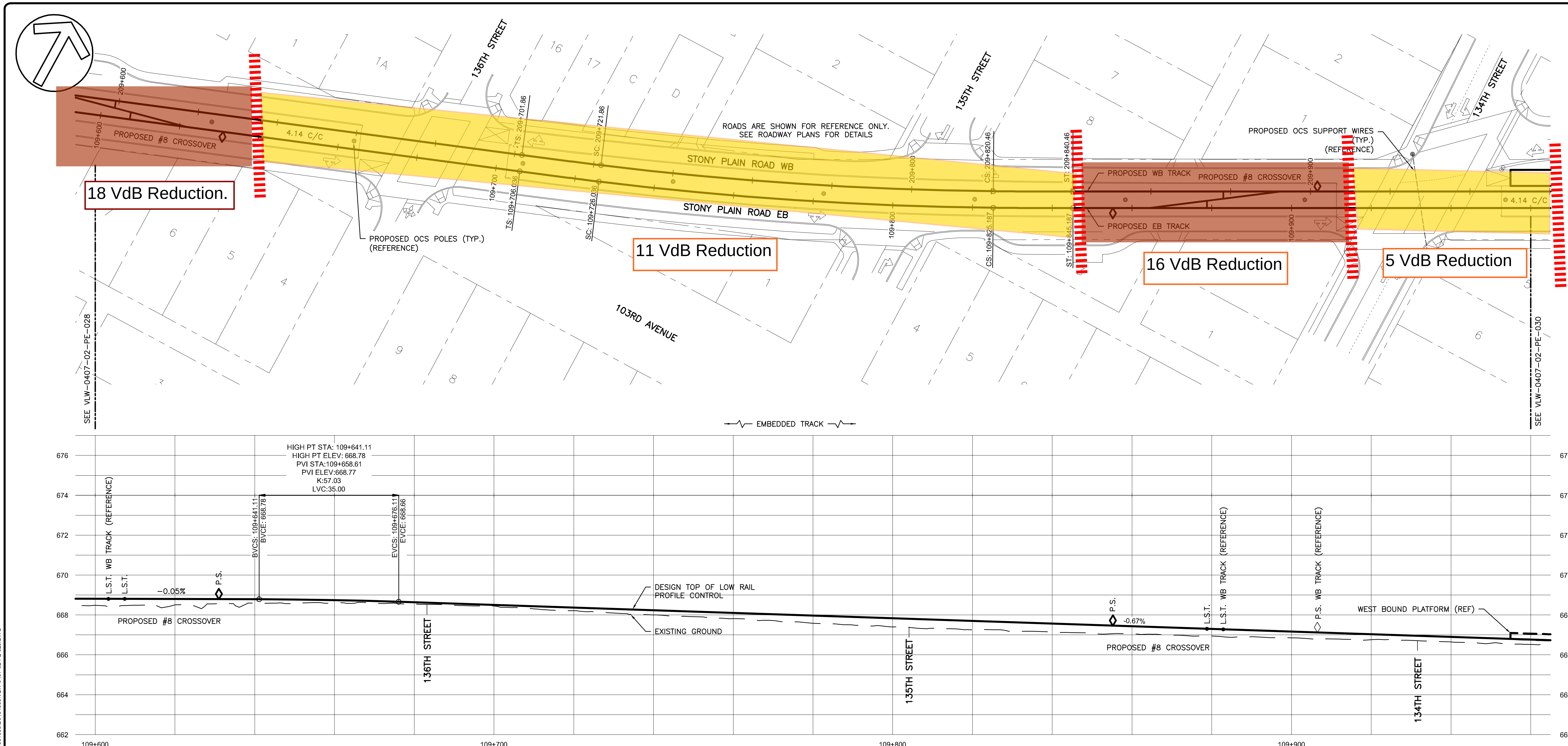
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 109+240 TO 109+600

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-028 | REV 0 | SHT 028

HOFF831533 / December 12, 2017 / C:\PWWORKING\HH\HOFF831533\D0154363\VLW-0407-02-PE-028.DWG



DESIGN SPEED	55KPH																		55KPH
OPERATING SPEED	50KPH																		50KPH
HORIZONTAL CURVATURE	Ls=20.00m; L=99.15m R=900.00m; Ls=20.00m																		
DESIGN TOP OF RAIL	668.805	668.794	668.784	668.741	668.630	668.497	668.363	668.230	668.096	667.962	667.829	667.695	667.561	667.428	667.294	667.160	667.027	666.893	666.759
EXISTING GROUND	668.48	668.50	668.59	668.60	668.54	668.44	668.21	668.00	667.81	667.58	667.40	667.26	667.14	667.05	666.94	666.85	666.76	666.64	666.52

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART — designed by C. HOFFART

checked by N. MUXIAREPU — date 03-07-2017

permit — seal

consultant job no 351235 — consultant reviewed by G. TURNER

AECOM Prime Consultant — Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

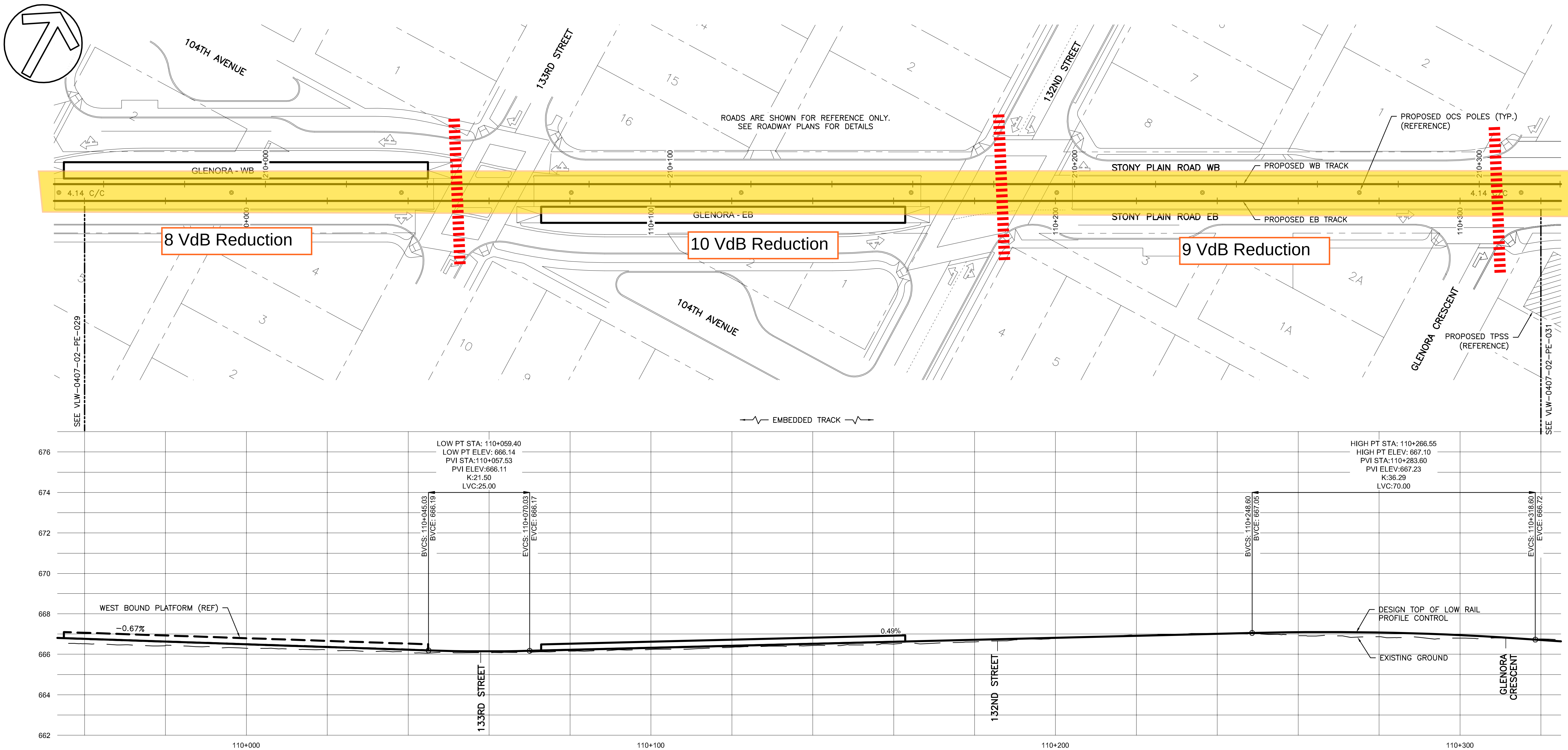
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 109+600 TO 109+960

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-029 — REV 0 — SHT 029

HOFFR31533 / December 12, 2017 / C:\PWWORKING\HI\HOFFR31533\D0154363\VLW-0407-02-PE-029.DWG



DESIGN SPEED	55KPH	55KPH	40KPH		55KPH	55KPH
CHAINAGE		110+045.030	110+072.868	GLENORA PLATFORM	110+162.868	
OPERATING SPEED	50KPH	50KPH	35KPH		50KPH	50KPH

HORIZONTAL CURVATURE: L=527.33m

DESIGN TOP OF RAIL	666.759	666.626	666.492	666.359	666.225	666.143	666.219	666.318	666.417	666.516	666.615	666.714	666.812	666.911	667.010	667.091	667.072	666.943	666.704
EXISTING GROUND	666.52	666.43	666.29	666.22	666.12	666.08	666.15	666.24	666.34	666.43	666.50	666.61	666.79	666.92	667.00	666.91	666.87	666.80	666.76

HOFF831533 / December 5, 2017 / C:\PWWORKING\H\HOFF831533\D0154363\VLW-0407-02-PE-030.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
-	--	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART

checked by N. MUXIAREPU | date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH | ISL Engineering and Land Services | DIALOG | MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

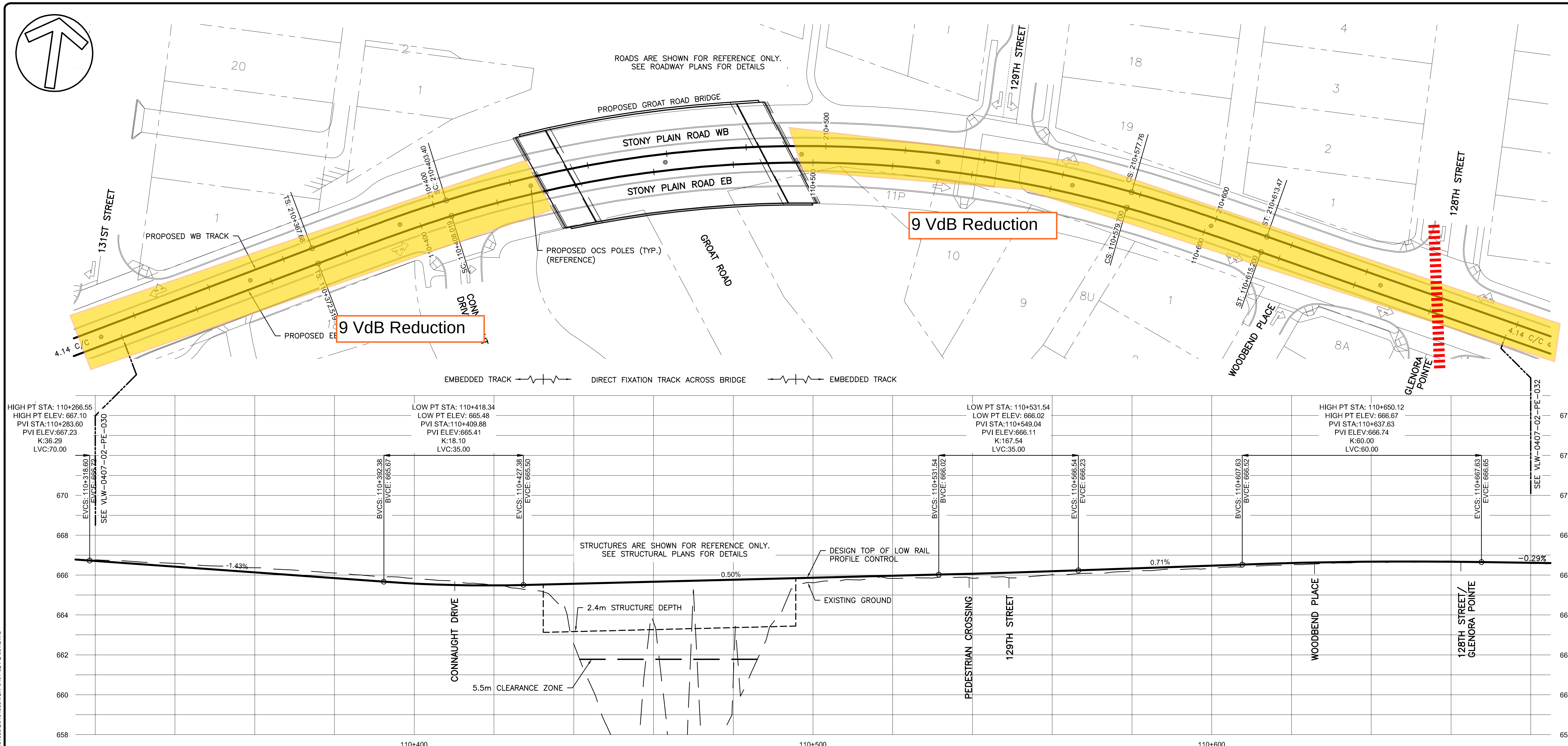
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 109+960 TO 110+320

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-030 | REV 0 | SHT 030



DESIGN SPEED	55KPH	55KPH	50KPH	50KPH	55KPH
CHAINAGE	110+372.519			110+615.200	
OPERATING SPEED	50KPH	50KPH	45KPH	45KPH	50KPH

HORIZONTAL CURVATURE: Ls=35.50m; L=171.68m R=296.00m; Ls=35.50m

DESIGN TOP OF RAIL	666.704	666.417	666.130	665.843	665.573	665.480	665.565	665.665	665.765	665.865	665.965	666.067	666.188	666.329	666.470	666.599	666.666	666.667	666.613
EXISTING GROUND	666.76	666.59	666.37	666.10	665.84	665.48	662.55	663.66	660.72	665.61	665.83	665.84	666.01	666.20	666.34	666.52	666.66	666.70	666.58

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART
checked by N. MUXIAREPU | date 03-07-2017

permit | seal

consultant job no 351235 | consultant reviewed by G. TURNER

AECOM Prime Consultant | Edmonton

prime consultant job no 60528911

HATCH | ISL Engineering and Land Services | DIALOG | MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

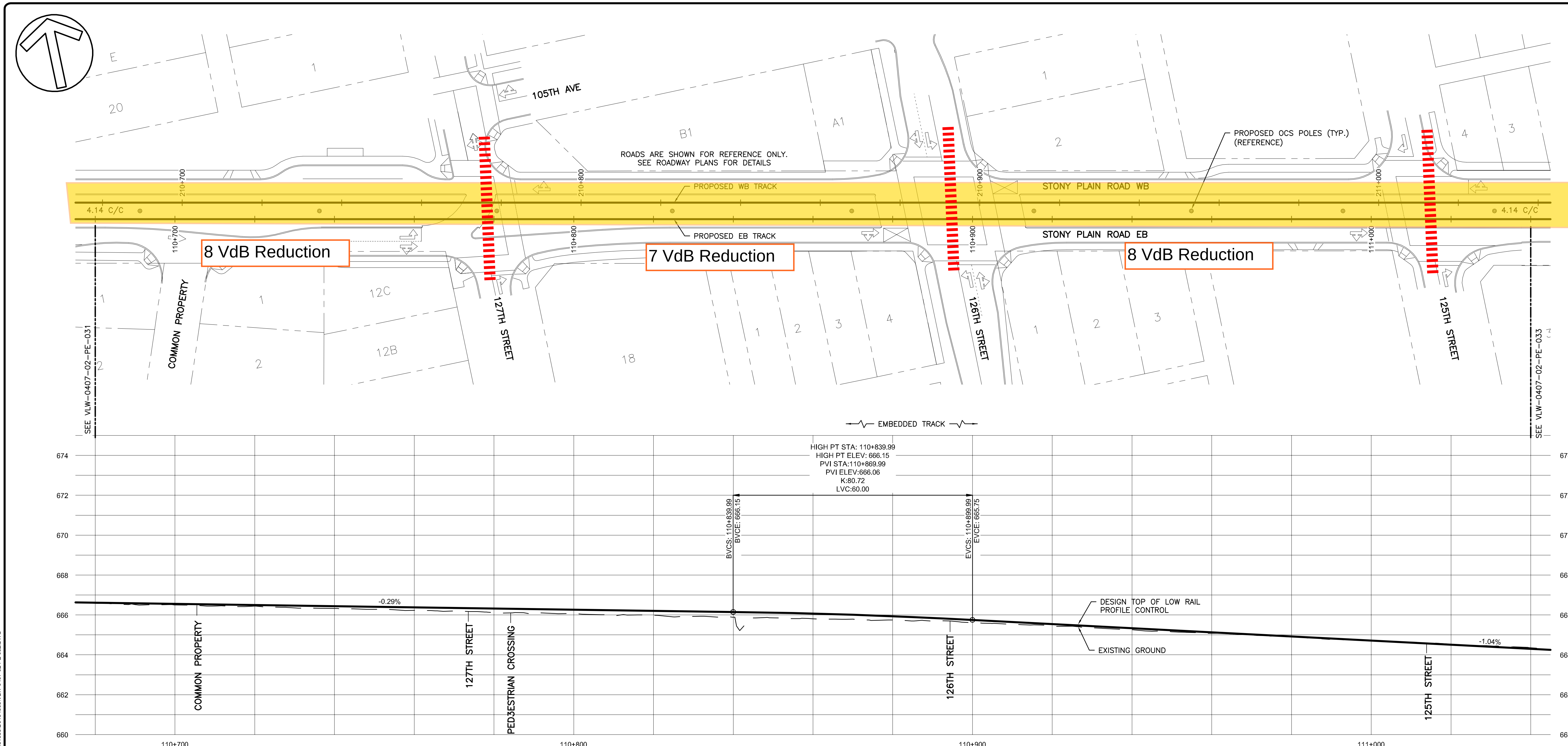
drawing title

LRT TRACK WORK
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 110+320 TO 110+680

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-031 | REV 0 | SHT 031

HOFF831533 / December 5, 2017 / C:\PWWORKING\HH\HOFF831533\D0154363\VLW-0407-02-PE-031.DWG



DESIGN SPEED	55KPH																		55KPH
CHAINAGE																			
OPERATING SPEED	50KPH																		50KPH
HORIZONTAL CURVATURE	L=814.38m																		
DESIGN TOP OF RAIL	666.613	666.555	666.497	666.438	666.380	666.321	666.263	666.205	666.146	666.063	665.930	665.748	665.541	665.334	665.127	664.920	664.713	664.506	664.299
EXISTING GROUND	666.58	666.50	666.44	666.32	666.22	666.12	666.06	665.98	665.88	665.80	665.74	665.61	665.45	665.26	665.08	664.91	664.73	664.53	664.35

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART | designed by C. HOFFART
checked by N. MUXIAREPU | date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH | ISL Engineering and Land Services | DIALOG | MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

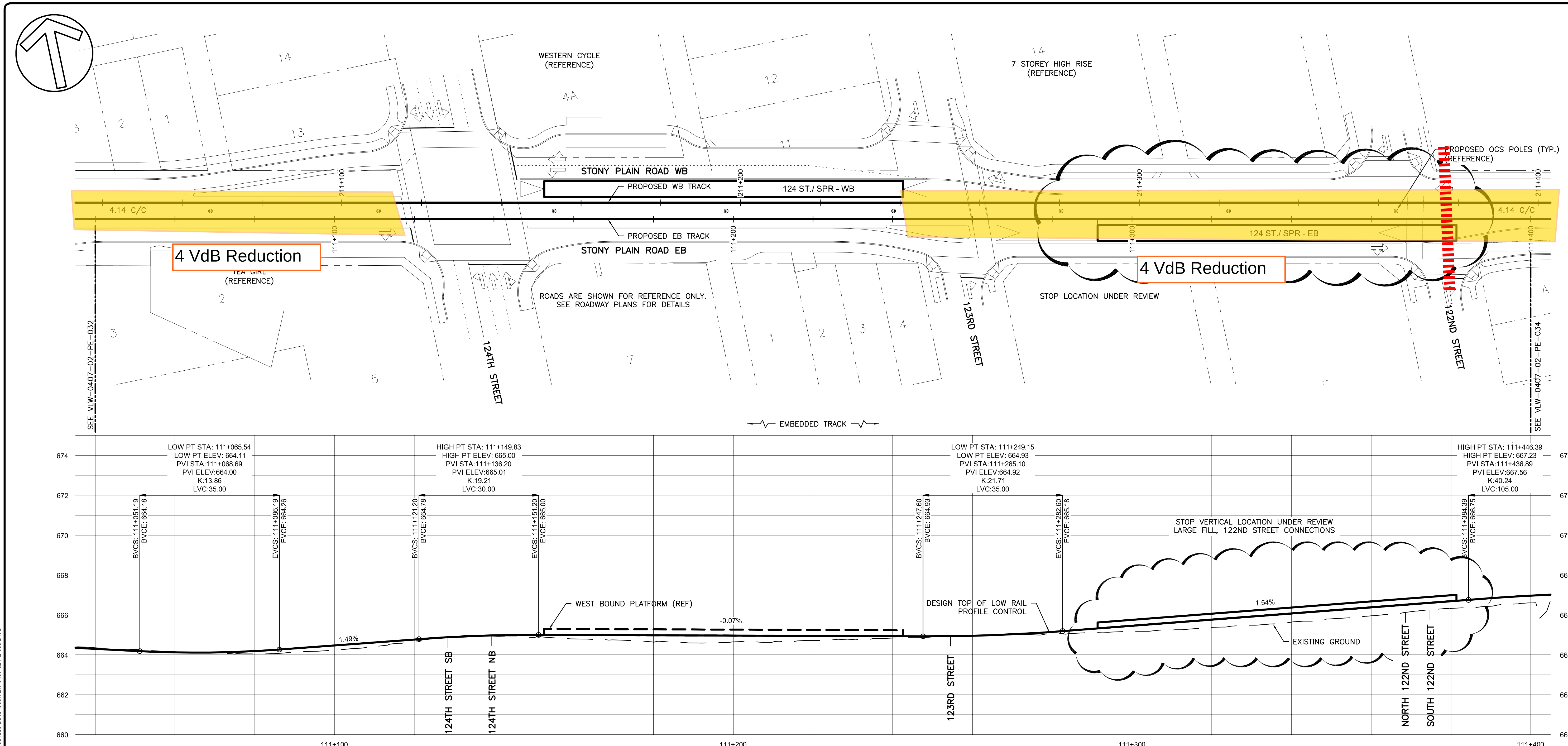
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 110+680 TO 111+040

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-032 | REV 0 | SHT 032

HOFF831533 / December 5, 2017 / C:\PWWORKING\H\HOFF831533\D0154363\VLW-0407-02-PE-032.DWG



DESIGN SPEED	55KPH	55KPH	50KPH	55KPH	55KPH	55KPH
CHAINAGE		111+121.200	111+151.200	111+291.364	124TH STREET/STONY PLAIN ROAD PLATFORM	111+381.364
OPERATING SPEED	50KPH	50KPH	45KPH	50KPH	50KPH	50KPH
HORIZONTAL CURVATURE						

DESIGN TOP OF RAIL	664.299	664.120	664.184	664.468	664.766	664.972	664.990	664.976	664.962	664.947	664.933	664.954	665.146	665.453	665.761	666.069	666.377	666.686	666.963
EXISTING GROUND	664.35	664.16	664.04	664.24	664.68	664.93	664.79	664.63	664.65	664.72	664.84	664.95	665.06	665.18	665.37	665.64	665.96	666.32	666.60

HOFF831533 / December 14, 2017 / C:\PWWORKING\HHOFF831533\D0154363\VLW-0407-02-PE-033.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART — designed by C. HOFFART

checked by N. MUXIAREPU — date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

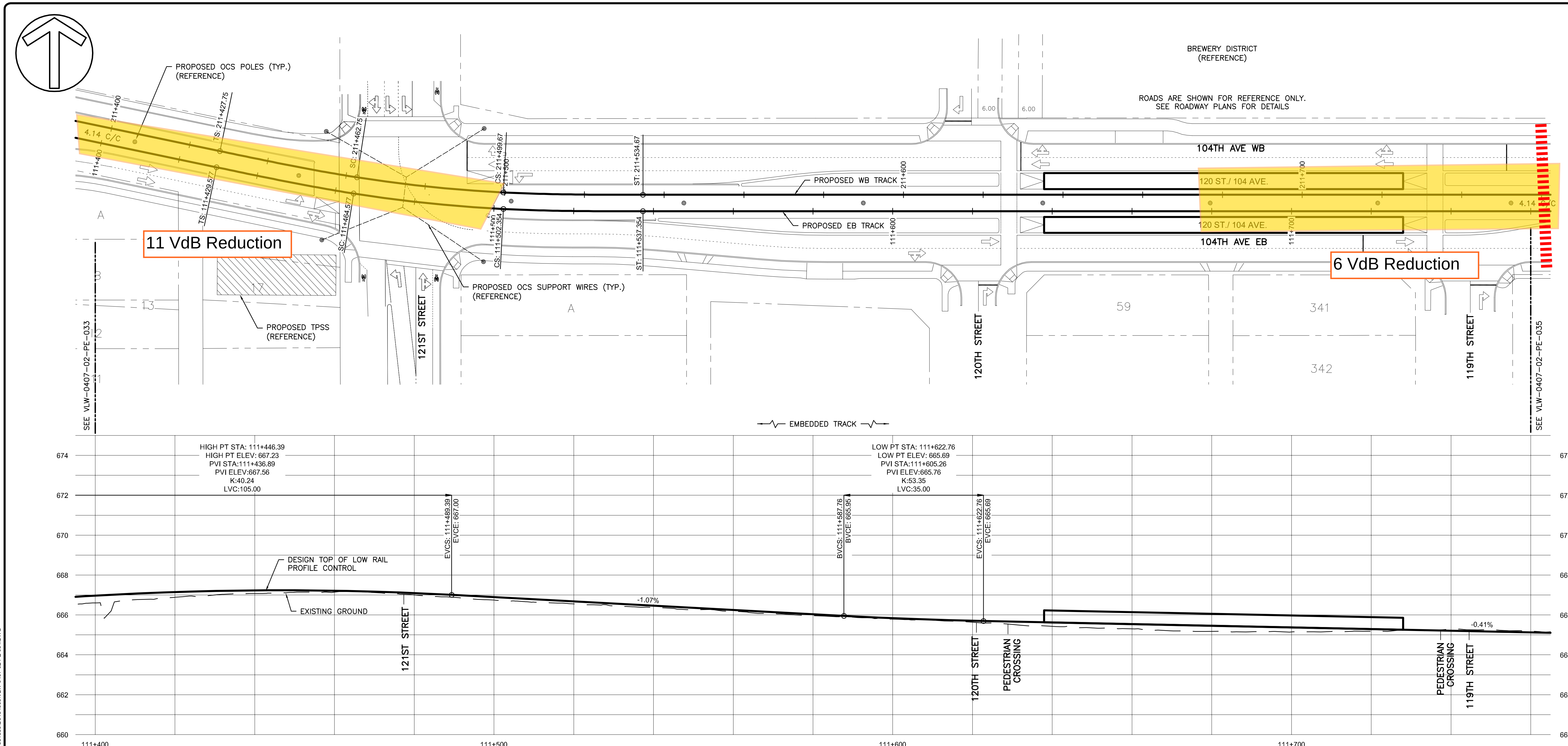
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 111+040 TO 111+400

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-033 — REV 0 — SHT 033



DESIGN SPEED	55KPH	45KPH	45KPH	55KPH	55KPH		55KPH
CHAINAGE	111+429.577		111+537.354		111+637.967	120TH STREET/104TH AVENUE PLATFORM	111+727.967
OPERATING SPEED	50KPH	40KPH	40KPH	50KPH	50KPH		50KPH

HORIZONTAL CURVATURE: Ls=35.00m; L=37.78m R=354.14m; Ls=35.00m

DESIGN TOP OF RAIL	666.963	667.144	667.226	667.208	667.090	666.888	666.674	666.460	666.246	666.033	665.833	665.703	665.620	665.537	665.454	665.372	665.289	665.207	665.124
EXISTING GROUND	666.60	666.88	667.07	667.14	667.00	666.74	666.55	666.37	666.17	665.96	665.78	665.63	665.43	665.30	665.17	665.15	665.18	665.29	665.19

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 1:500m

drawn by C. HOFFART | designed by C.HOFFART

checked by N. MUXIAREPU | date 03-07-2017

permit | seal

consultant job no 351235 | consultant reviewed by G. TURNER

AECOM Prime Consultant | Edmonton

prime consultant job no 60528911 | prime consultant reviewed by M. PERRY

HATCH | ISL Engineering and Land Services | DIALOG | MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

drawing title

LRT TRACK WORK

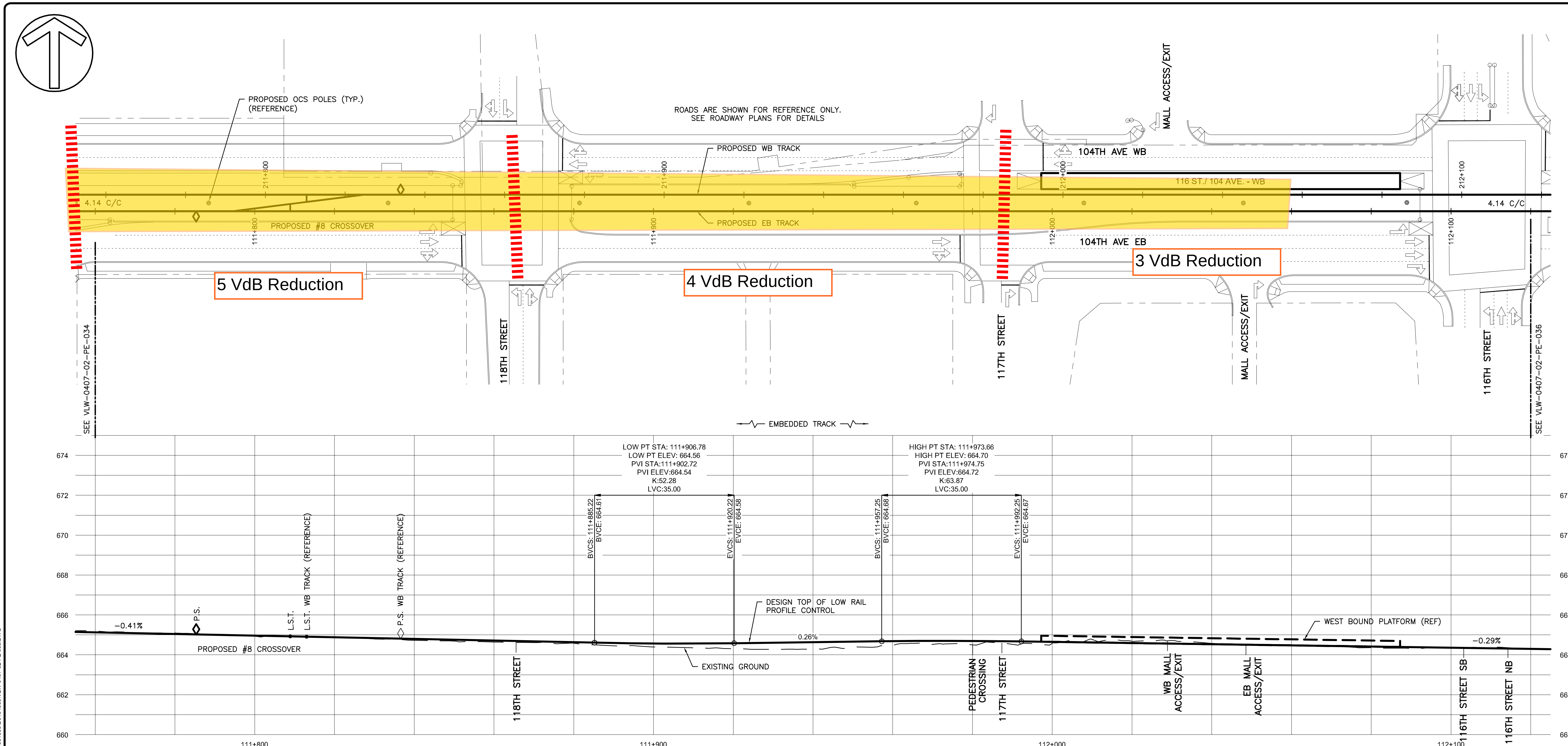
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 111+400 TO 111+760

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-034 | REV 0 | SHT 034

HOFF831533 / December 13, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-034.DWG



DESIGN SPEED	55KPH																		55KPH
CHAINAGE																			
OPERATING SPEED	50KPH																		50KPH
HORIZONTAL CURVATURE																			
DESIGN TOP OF RAIL	665.124	665.042	664.959	664.877	664.794	664.712	664.629	664.568	664.580	664.631	664.682	664.694	664.647	664.589	664.531	664.473	664.414	664.356	664.298
EXISTING GROUND	665.19	665.09	664.93	664.86	664.72	664.63	664.58	664.39	664.31	664.28	664.47	664.50	664.57	664.68	664.57	664.47	664.36	664.36	664.32

HOFF831533 / December 13, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-035.DWG

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
–	––	dd-mm-yy	X.X.

revisions

HATCH Consultant

A1 bar scale 0 5 15 25m 1:500m

drawn by C. HOFFART

designed by C.HOFFART

checked by N. MUXIAREPU

date 03-07-2017

permit

consultant job no 351235

seal

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 111+760 TO 112+120

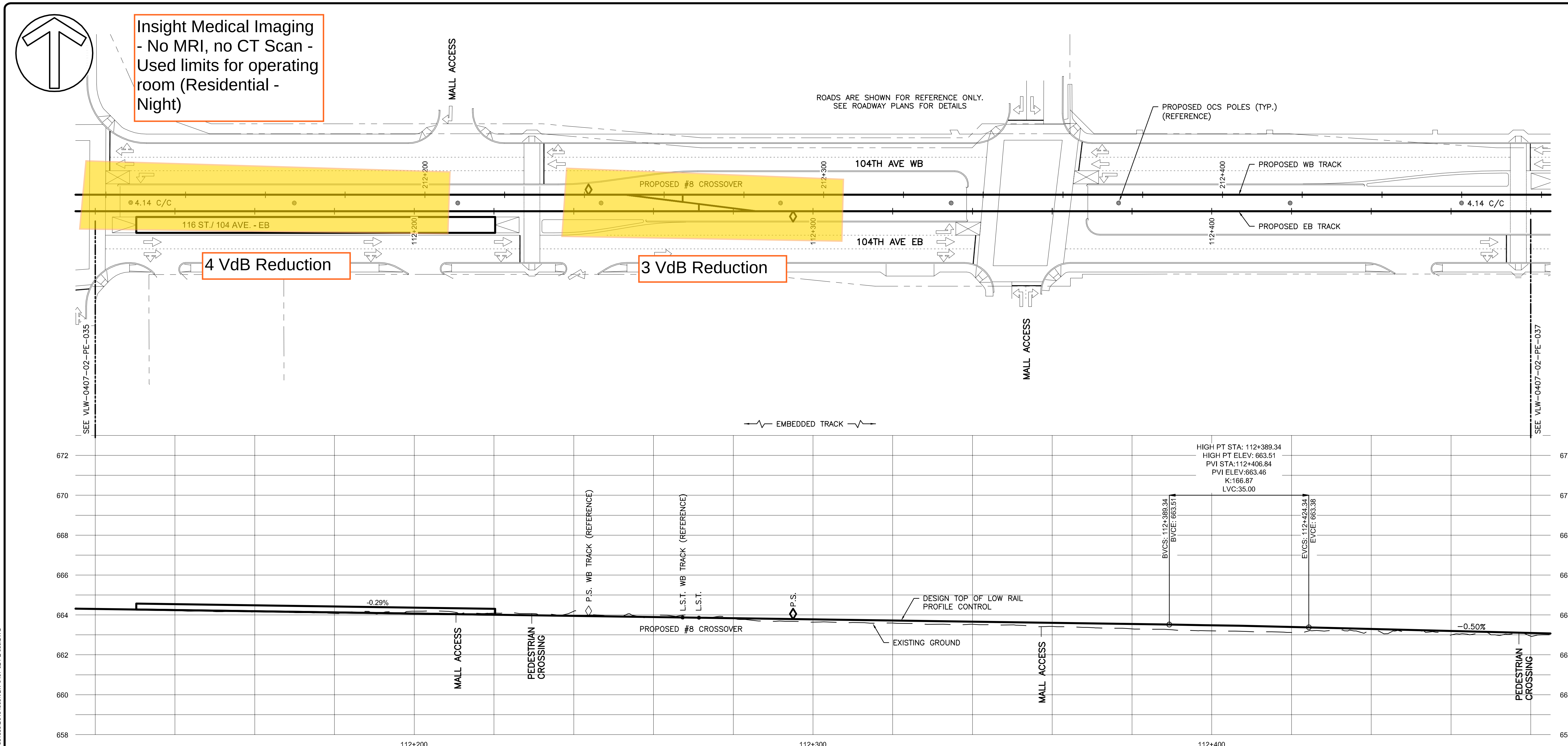
VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-035

REV 0

SHT 035



DESIGN SPEED	55KPH		55KPH	55KPH
CHAINAGE	112+130.312	116TH STREET/104TH AVENUE PLATFORM	112+220.312	
OPERATING SPEED	50KPH		50KPH	50KPH
HORIZONTAL CURVATURE	L=1617.01m			

	112+200										112+300									
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EXISTING GROUND	664.32	664.21	664.15	664.07	664.19	664.09	664.18	663.99	663.82	663.64	663.59	663.53	663.42	663.30	663.20	663.12	663.21	662.99	662.93

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no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

no.	description	date	checked
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revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

drawn by C. HOFFART — designed by C. HOFFART

checked by N. MUXIAREPU — date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

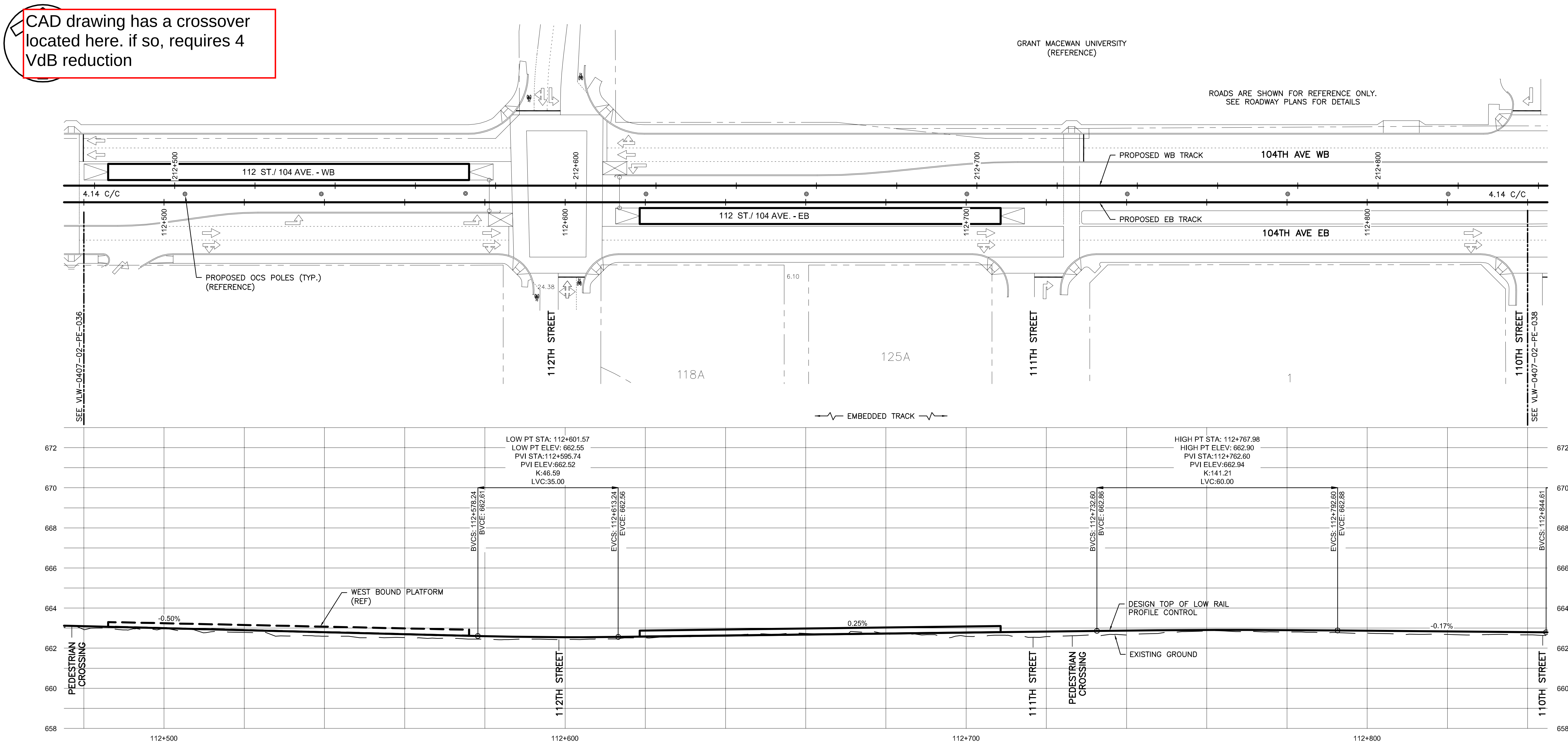
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 112+120 TO 112+480

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-036 — REV 0 — SHT 036

CAD drawing has a crossover located here. if so, requires 4 VdB reduction



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CHAINAGE							112+618.583	112TH STREET/104TH AVENUE PLATFORM				112+708.583							
OPERATING SPEED	50KPH					50KPH							50KPH					50KPH	
HORIZONTAL CURVATURE																			
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EXISTING GROUND	662.93	662.99	662.78	662.60	662.53	662.45	662.42	662.51	662.63	662.73	662.71	662.59	662.57	662.65	662.86	662.81	662.74	662.69	662.66

HOFF831533 / December 13, 2017 / C:\PWWORKING\HOFF831533\D0154363\VLW-0407-02-PE-037.DWG

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B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

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revisions

HATCH Consultant

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drawn by C. HOFFART
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Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

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prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

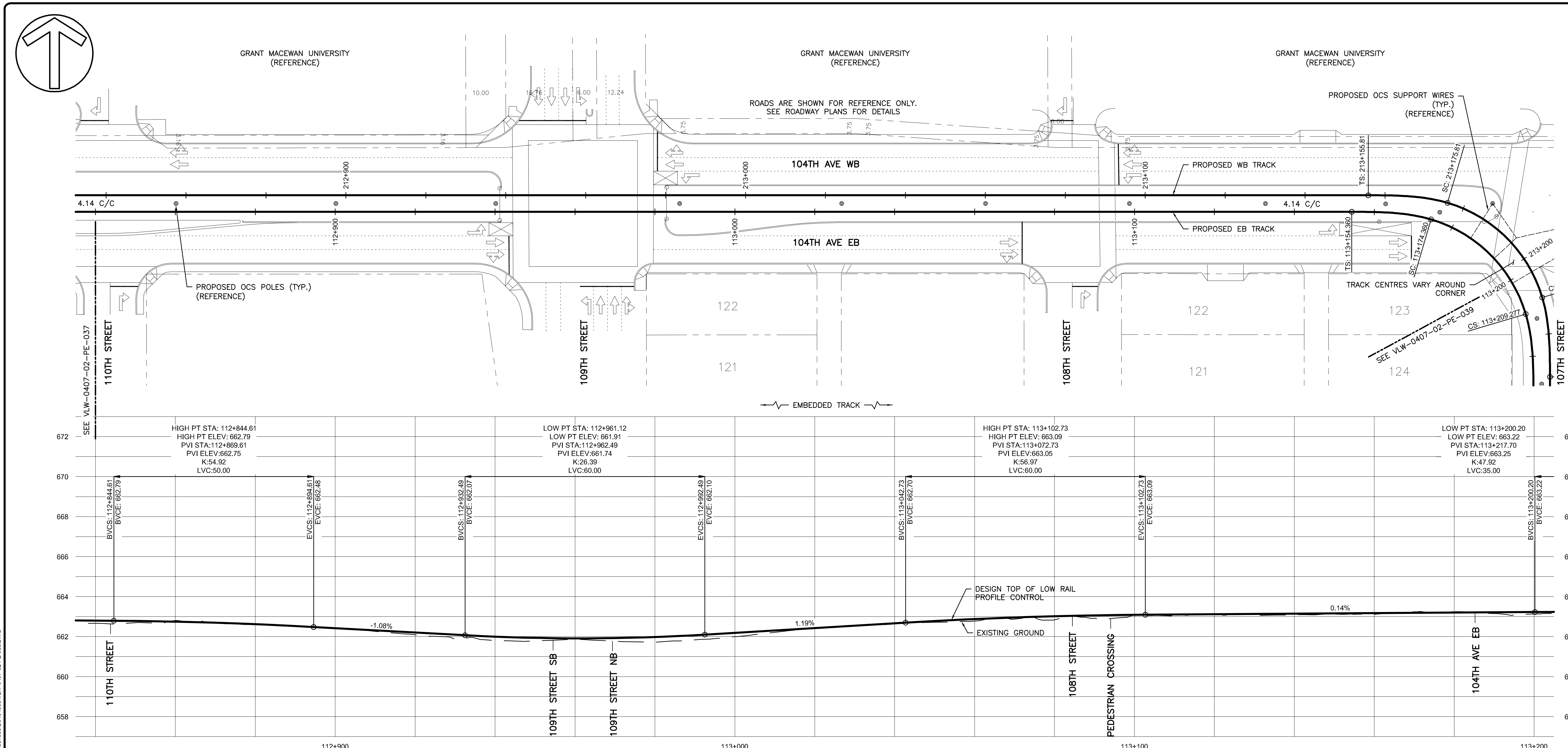
TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 112+480 TO 112+840

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-037

REV 0
SHT 037



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EXISTING GROUND	662.66	662.80	662.61	662.42	662.09	661.81	661.85	661.72	661.99	662.39	662.63	662.77	662.84	663.09	663.08	663.09	663.10	663.24	663.13

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B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

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HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

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checked by N. MUXIAREPU | date 03-07-2017

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consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

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PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

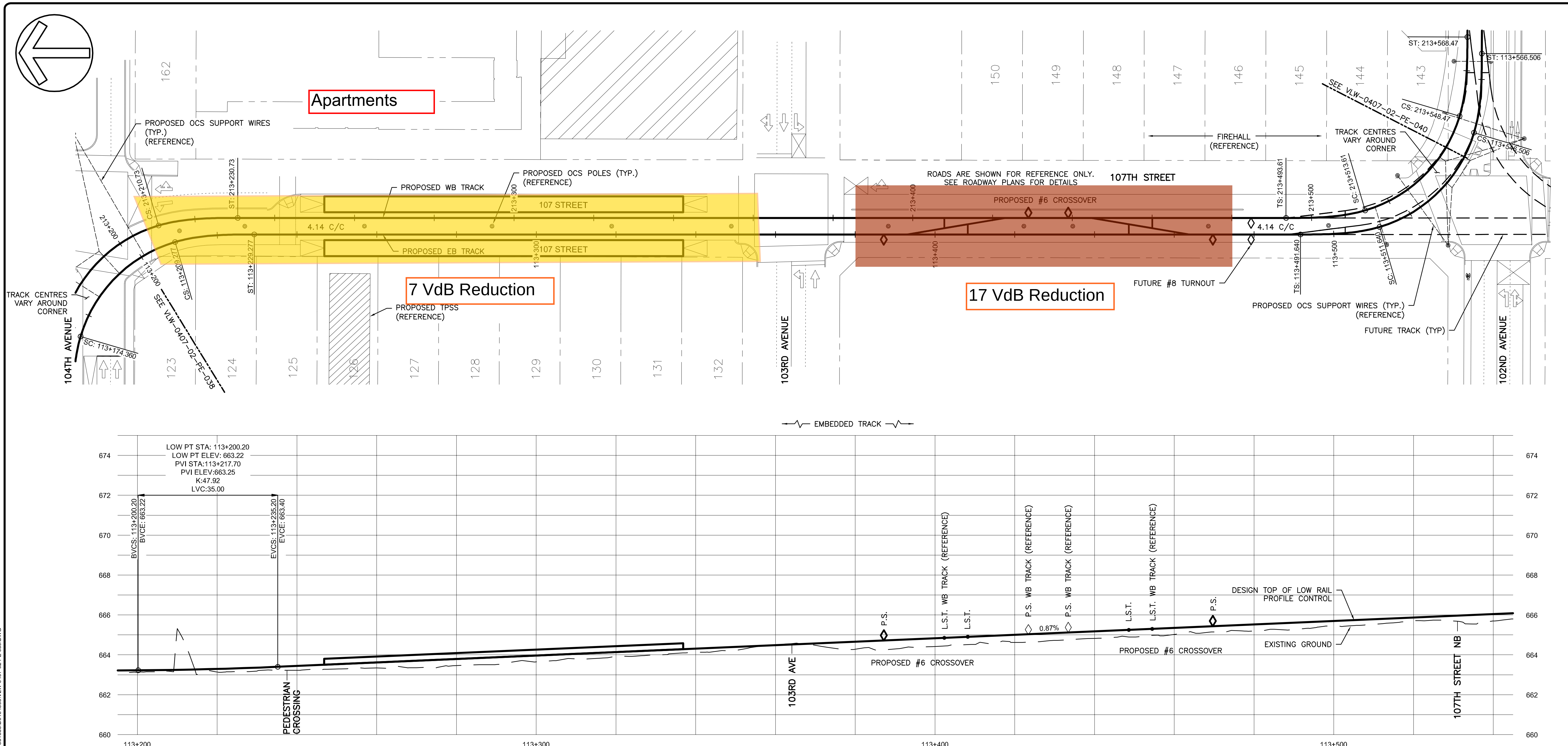
LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 112+840 TO 113+200

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-038 | REV 0 | SHT 038



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EXISTING GROUND	663.13	663.14	663.22	663.34	663.46	663.65	663.93	664.13	664.49	664.28	664.42	664.62	664.82	665.02	665.19	665.45	665.70	665.69

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

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revisions

HATCH Consultant

A1 bar scale 1:500m

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checked by N. MUXIAREPU — date 03-07-2017

permit — seal

consultant job no 351235 — consultant reviewed by G. TURNER

AECOM Prime Consultant — Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

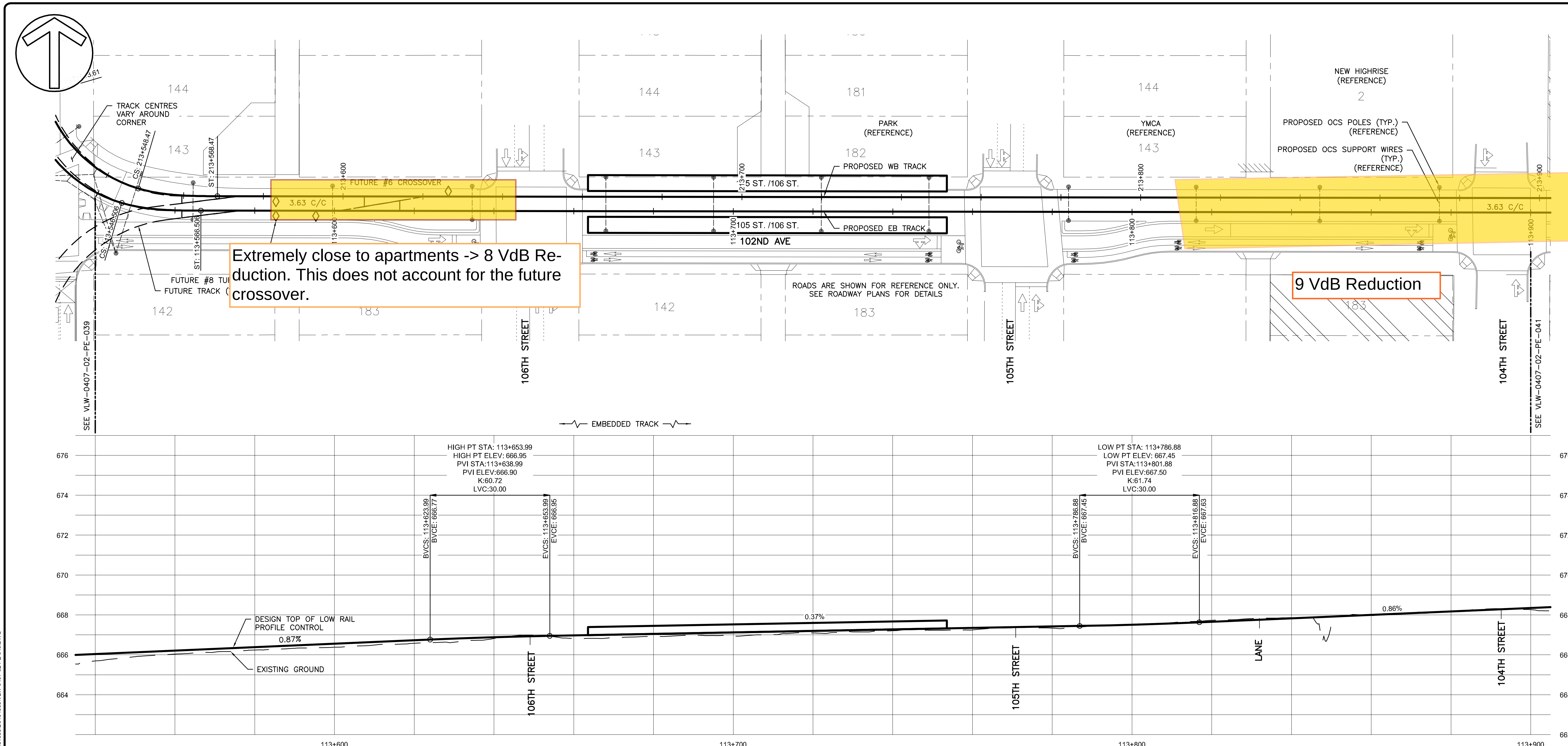
drawing title

LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 113+200 TO 113+540

VALLEY LINE WEST LRT
LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-039 — REV 0 — SHT 039



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OPERATING SPEED	10KPH	30KPH	30KPH		30KPH	30KPH													
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EXISTING GROUND	665.69	666.04	666.24	666.38	666.58	666.82	666.82	666.92	666.95	667.10	667.21	667.25	667.33	667.53	667.72	667.86	667.97	668.17	668.26

no.	description	date	appd
C	ISSUED FOR 90% REVIEW	13-12-17	C.H.
B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

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revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

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checked by N. MUXIAREPU — date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH ISL Engineering and Land Services DIALOG MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 113+540 TO 113+900

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-040 REV 0 SHT 040

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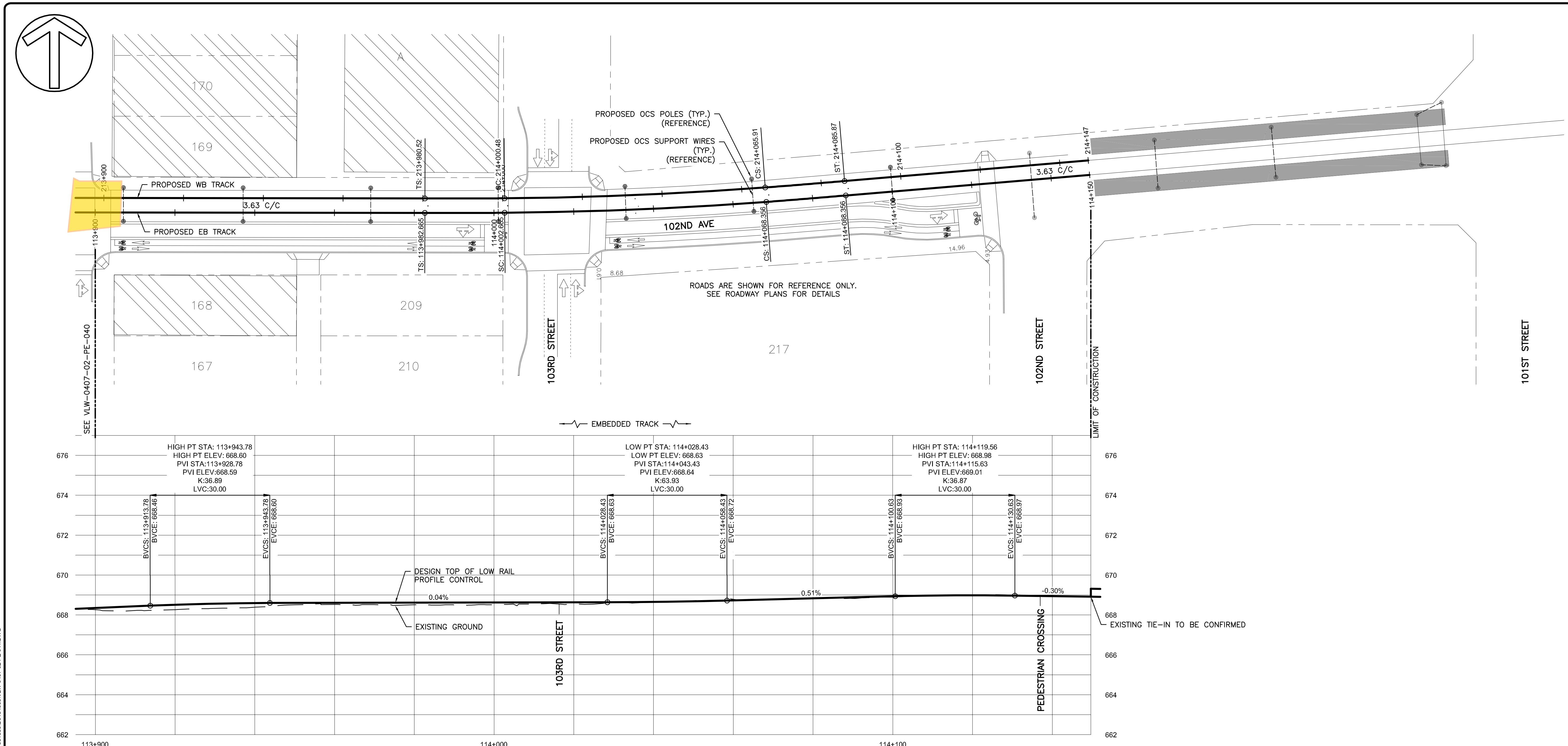

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CHAINAGE													
OPERATING SPEED	30KPH												30KPH
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EXISTING GROUND	668.26	668.26	668.39	668.52	668.51	668.50	668.55	668.67	668.78	668.84	668.89	669.00	668.97

HOFF831533 / December 13, 2017 / C:\PWWORKING\HI\HOFF831533\D0154363\VLW-0407-02-PE-041.DWG

no.	description	date	appd
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B	ISSUED FOR 60% REVIEW	05-09-17	C.H.
A	ISSUED FOR 60% REVIEW	12-07-17	C.H.

issue data

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revisions

HATCH Consultant

A1 bar scale 1:500m 0 5 15 25m

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checked by N. MUXIAREPU — date 03-07-2017

permit

seal

consultant job no 351235

consultant reviewed by G. TURNER

AECOM Prime Consultant

Edmonton

prime consultant job no 60528911

HATCH — ISL Engineering and Land Services — DIALOG — MOTT MACDONALD

PRELIMINARY ENGINEERING DRAWINGS NOT FOR CONSTRUCTION

prime consultant reviewed by M. PERRY

drawing title

LRT TRACK WORK

TRACK PLAN AND PROFILE
EAST BOUND TRACK
STATION 113+900 TO 114+149.68

VALLEY LINE WEST LRT

LEWIS FARMS TO DOWNTOWN

drawing no. VLW-0407-02-PE-041 — REV 0 — SHT 041

GROUND BORNE VIBRATION MITIGATION

Railway traffic is a source of ground borne vibration. Irregularities and imperfections in the rails and wheels produce dynamic vehicle track interaction forces that in turn generate stress waves in the supporting soil. Stress waves in the soil interact with foundations of adjacent buildings causing them to vibrate. This causes the floors, walls and ceilings to vibrate. Worn (or flat) wheels and tracks will increase vibration levels. Furthermore, special trackwork such as switches also increase the level of vibration. The impact from ground borne vibration from rail transit systems manifests in three main effects:

- Perceptible vibrations which are physically perceived by humans,
- Noise caused by vibrating items in buildings such as the rattling of windows and shaking of items on shelves or hanging on walls.
- Low frequency noises (rumbling noise or ground borne noise) caused by ground borne vibration radiating from vibrating room surfaces and perceived by the human ear as sound.

The key elements of the vibration environment can be described with the Source-Path-Receiver concept shown in Figure 1. The source of vibration is the train wheels rolling on the rails that create vibration energy transmitted through the tracks into the ground. The path taken by vibrations is through the ground and into nearby buildings. The receivers are people or vibration-sensitive activities in the buildings into which the vibrations pass. Vibrations are influenced by variables such as the:

- Speed of the train;
- Vehicle suspension;
- Condition of the wheels and track;
- Track support system;
- Depth and geology of the soil layering;
- Construction of the track and tunnel;
- Depth of tunnel and distance away from it;
- Type and construction of the building where the receiver of the vibration is positioned;
- Interior acoustical absorption.

The purpose of vibration mitigation is to minimize the adverse effects that the project ground borne vibration will have on sensitive land uses. Following the Source-Path-Receiver concept, there are essentially three main mitigation strategies for vibration control:

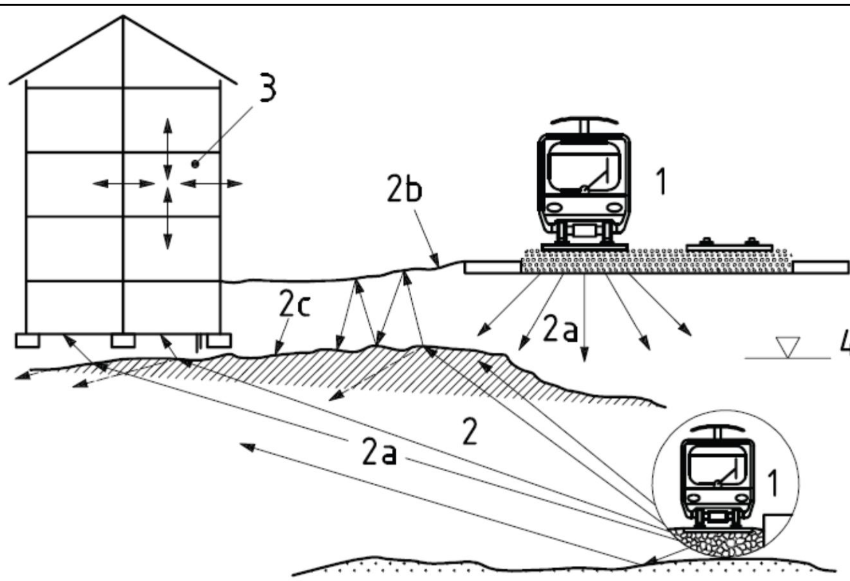
1. **Controlling vibration at the source:** Reduction of noise and vibration at source can be achieved by isolating the track superstructure, eliminating the running surface discontinuities, regular maintenance of the rail running surface, regular wheel re-profiling, selecting the appropriate type of rail vehicle, and reducing the speed of rail vehicles. Rail vibration isolation can be achieved through the installation of resilient rail fasteners, resilient supported ties, booted ties, tire-derived aggregate, ballast mats or floating slabs. Such rail and track vibration isolation system increase the elasticity of the track superstructure and provide a reduction in transmitted vibration.

2. **Controlling the transmission of vibration:** Distance is one of the most effective mitigation measures against noise and vibration, although geological make-up and terrain also have an effect. Annoyance from railway vibrations is inversely proportional to distance from railway tracks. In new developments, locating the sensitive land use away from the railway lines can reduce vibration effects. For existing structures, ground vibrations from rail operations can also be reduced through the installation of trenches between the line and the receivers in a similar

manner to noise barriers. Trenches can be either left open or filled with an alternative material if open trenches are considered undesirable. Note that trenches would only be effective in reducing vibration from above ground (surface) rail operations and will not typically have any effect on vibration generated by underground railways.

3. **Controlling vibration at the receiver:** In some circumstances, it is practical to modify the impacted building to reduce the vibration levels. Special building methods can be used to modify ground-borne vibration being transmitted into the building structure such as isolation of foundation and footings using resilient elements and rubber bearing pads or springs. Vibration isolation of buildings generally consists of supporting the building foundation on elastomer pads similar to bridge bearing pads. This approach is particularly important for shared-use facilities such as office space above a transit station or terminal. Vibration isolation of buildings is rarely an option for existing buildings. Normal applications are possible only for new construction. Alternatively, the floor upon which the vibration-sensitive equipment is located could be stiffened and isolated from the remainder of the building or the equipment could be locally isolated from the floor and building.

Figure 1 Ground-borne Vibrations from Trains Example of Source, Propagation and Receiver System (Source: ISO 14837)



Key

1 source

2 propagation:
- 2 a body waves (compression, shear)
- 2 b surface waves (e.g. Rayleigh, Love)
- 2 c interface waves (e.g. Stoneley)

3 receiver (vibration, re-radiated noise)

4 water table

NOTE The components of the system comprising source, propagation and receiver are interdependent.

SYSTEM-WIDE OPERATIONAL VIBRATION MITIGATION

One of the most effective forms of ground borne vibration mitigation is to attempt to reduce vibration at the source. Source vibration reduction can be normally accomplished through vehicle specifications. There are several additional operational measures that can reduce vibration levels at the source. Table A provides a list of operational and maintenance measures that should be performed on a regular basis and the benefit that each of the measures would provide. It is recommended to implement a system wide vibration reduction strategy as shown in Table A. These strategies are effective in reducing the vibration generation in the first space. For example, problems with rough wheels or rails can increase vibration levels by as much as 20 VdB in extreme cases, negating the effects of even the most effective vibration control measures. It is rare that practical vibration control measures will provide more than 15 to 20 VdB attenuation. Therefore, maintenance procedures can significantly reduce ground borne noise and vibration.

Table A: System-Wide Light Rails Operational Mitigation

Operational Measure	System Benefit
Rail Grinding and Replacement	As rails wear, both noise and vibration levels from light rail operations can increase. By grinding or replacing worn rails, noise and vibration levels will remain at the projected levels. Rail grinding or replacement is normally performed every 3 to 5 years.
Wheel Truing and Replacement	Wheel truing is a method of grinding down flat spots (commonly called “wheel flats”) on the vehicle wheels. Flat spots occur primarily because of hard braking. When flat spots occur they can cause increases in both the noise and vibration levels produced by the light rail vehicles.
Vehicle Specifications and Maintenance	Rail vehicle should have low unsprung weight, soft primary suspension, minimum metal-on-metal contact between moving parts of the truck (bogie), and smooth wheels that are perfectly round. A limit for the vertical resonance frequency of the primary suspension should be included in the specifications for any new vehicle. Vehicle maintenance includes performing scheduled and general maintenance on items such as suspension system, brakes, wheels, and slip-slide detectors. Keeping the mechanical systems on the light rail vehicles in top condition will also help to maintain the projected levels of noise and vibration.
Operator Training	Operators should be trained to operate light rail vehicles at speeds to avoid “hard-braking,” which can cause wheel flats and damage the track. Furthermore, by training operators to identify potential wheel flats and other mechanical problems with the trains, proper maintenance can be performed in a timely manner.

Operational Measure	System Benefit
Location and Design of Special Trackwork	Turnouts are a major source of vibration impact when they are located in sensitive areas because the impacts of vehicle wheels over rail gaps at track turnout locations increases ground borne vibration by about 10 VdB. Careful review of crossover and turnout locations during the preliminary engineering stage to minimize potential vibration impacts. When feasible, relocate special trackwork to a less vibration-sensitive area. If turnouts cannot be relocated away from sensitive areas, install spring frogs to eliminate gaps at crossovers and help reduce vibration levels.

SITE SPECIFIC VIBRATION MITIGATION MEASURES

In addition to the overall strategy a number of methods have been developed to control ground-borne vibrations. Vibration is generally treated by reducing the dynamic forces associated with the source or with isolation techniques. The source may be isolated from the ground or structure, thereby reducing vibration propagation towards receiver buildings. Another alternative is to make adjustments to the vibration transmission path by the use of trenches to control ground borne vibration, to reduce surface waves, analogous to controlling airborne noise with sound barriers. Alternatively, structures and buildings may be isolated from sources.

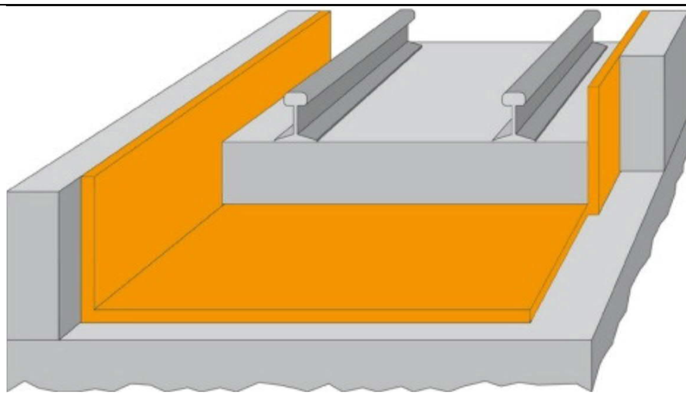
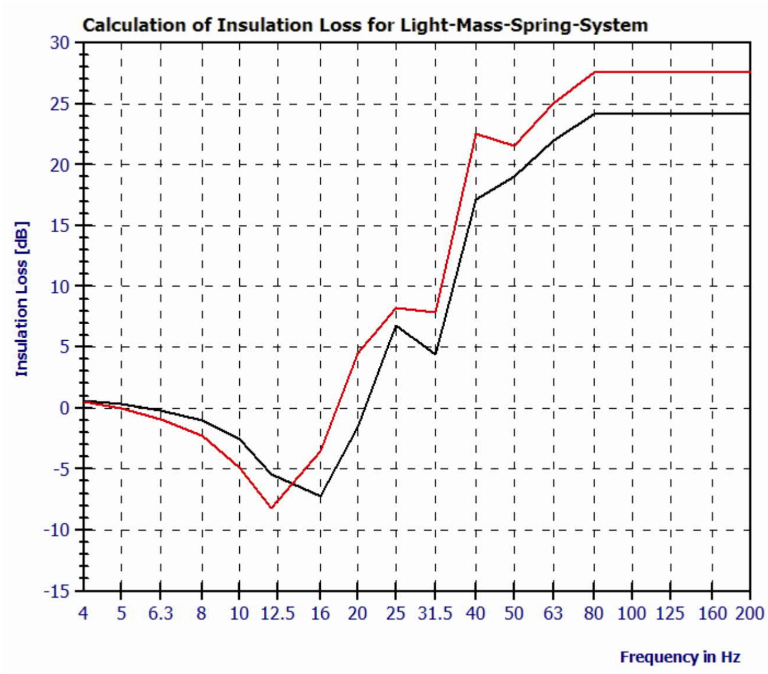
The actual values of building vibration induced by sources are a function of the vibration characteristics of the source, ground conditions, building foundations and building construction material and techniques. To be effective, all of these measures must be optimized for the frequency spectrum of the vibration. The common vibration mitigation methods are presented in Table B. Given that the track and vehicles are in good condition, the options for further reductions can be achieved by implementing one or more of the listed measures on specific segments of the alignment where it is needed. The reduction in ground borne vibration provided by these measures is strongly dependent on the frequency content of the vibration, soil properties and the design and support of the track. Different conceptual vibration isolating track designs are depicted in Figure 2. The degree of vibration impact will determine the extent of mitigation required and the mix of vibration control measures to be adopted as a mitigation strategy.

Where vibration mitigation affects stiffness of the track support (ex. Ballast mats), the static deflection of the track under the load of the train will be greater than the static deflection of conventionally supported track. At the connections to standard track, some sort of smooth transition is required in order to avoid impulsive forces that could be very damaging to the subgrade, and cause impulsive ground vibration, discomfort to passengers and rapid fatigue damage to the track components themselves.

Table B: Site specific Vibration Mitigation Measures

Mitigation Measure	Description
Ballast Mats	A ballast mat consists of a rubber or other type of elastomer pad that is placed under the ballast. Depending on the soil properties, an asphalt or concrete layer under the ballast may be required. Ballast mats are less effective if placed directly on the soil or the sub-ballast. Most applications of this procedure are found in tunnels or on bridges. Ballast mats can provide 10 to 15 VdB attenuation at frequencies above 25 to 30 Hz.

Mitigation Measure	Description
Resilient Rail Fasteners	Resilient fasteners are used to fasten the rails to the ties or to the concrete track slabs. By making use of fasteners that are less stiff in the vertical direction, it is possible to reduce the ground-borne vibration by as much as 4 to 8 VdB at frequencies above 30 to 40 Hz. Premium fasteners cost approximately $300 per track-foot, about 6 times the cost of standard fasteners.
Resilient supported sleepers/ties	Resiliently supported tie systems involve attaching thick rubber pads directly to the underside of ties in ballast. By making use of rubber pads between the ties and the foundation it is possible to reduce the vibration by at least 10 VdB. The rails are fastened directly to the concrete ties using standard rail clips.
Booted sleepers/ties	Booted sleeper systems consist of concrete sleepers surrounded by elastic boots that are molded into the concrete slab of the track. These perform in the same way as resilient supported sleepers/ties but the design is integrated with a slab track. They are particularly appropriate for transit systems with vibration problems in the 20 to 30 Hz range and are typically effective in reducing vibration by 10 VdB.
Tire-Derived Aggregate	Also known as shredded tires, a typical Tire-Derived Aggregate (TDA) installation consists of an underlayment of 300 mm of nominally 75 mm size tire shreds or chips wrapped with filter fabric, covered with 300 mm of sub-ballast and 300 mm of ballast above that to the base of the ties. This type of mitigation can only be used on ballast and tie track. Tests suggest that the vibration-attenuation properties of this treatment are midway between that of ballast mats and floating slab track. While this is a low-cost option, it has only recently been installed on two U.S. light rail transit systems—in San Jose and Denver—and its long-term performance is unknown.
Floating slab track	Floating slabs consist of a “floating concrete rail slab” sitting within a concrete trough separated by an elastic quality polyurethane foam sheet or other resilient material. The slab and sheet act as a **light mass spring system**. In high load situations, or where a high reduction in vibration is required, the ROW slab can be supported by resilient pads (or steel coil springs) on a concrete foundation. This second engineered option is more expensive and generally used in very specific circumstances. The tracks are then mounted on or within the floating slab depending on the need for direct fixation or embedded rail. Vibration mitigation can be improved by selecting isolation materials for the rail fixing. This mitigation method may provide up to a 15 VdB reduction in vibration. The design frequency of typical continuous or double-tie floating slabs is 16Hz. However, the isolation frequency of low-frequency floating slabs may be on the order of 5 – 8Hz.

Mitigation Measure	Description
	 *Associated schematic of a typical Light Mass Spring System*  *Associated schematic of a typical Light Mass Spring System*
Trenches	A trench can be an effective vibration barrier if it changes the propagation characteristics of the soil. It can be open or solid. Open trenches can be filled with materials such as styrofoam. Solid barriers can be constructed with sheet piling, rows of drilled shafts filled with either concrete or a mixture of soil and lime, or concrete poured into a trench.

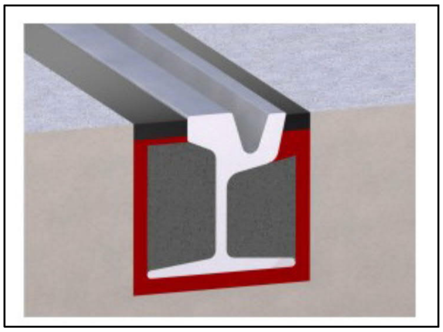
Mitigation Measure	Description
Building Modifications	For existing buildings, if vibration-sensitive equipment is affected by train vibration, the floor upon which the vibration-sensitive equipment is located could be stiffened and isolated from the remainder of the building. For new buildings, the building foundation should be supported by elastomer pads similar to bridge bearing pads.
Embedded Rail	Embedded rail is set into the surface of the right of way (ROW). The system generally consists of a concrete slab with a rubber booted rail cast within the slab itself. More traditionally, in freeze thaw conditions, the rail is set into a rebated pocket in the concrete and the pocket is filled with a polyurethane grout. Both the rubber booted option and the polyurethane grout options inherently reduce vibration by acting as a floating track. Performance varies depending on the supplier of the embedded rail system.  ***Associated schematic of a typical embedded rail detail***
Flange Bearing Frog	Flange bearing frogs (FBF), or jump frogs, have been successfully used to reduce both noise and vibration by enabling the wheel's flange to run along the frog groove, thus lifting the train tread off the rail as it progresses past the rail gap at the switch point location. Although historically used in rail yards, the FBF is becoming more commonly used in light rail mainline operations when speed and geometry permits.  ***Associated schematic of a typical Flange Bearing Frog***

Figure 2 Different conceptual vibration isolating track designs (Source: ISO 14837)