5.2.2.2. 199 Street NW, south of 23 Avenue NW (N2-011 to N2-055)

The noise levels for receptor locations backing onto 199 Street NW south of 23 Avenue NW are projected to be below 65 dBA and range from 59.9 – 62.7 dBA. The relative difference in noise levels from the Future case *with* and *without* mitigation ranges from -3.5 to -4.5 dBA.

5.2.2.3. 215 Street NW, north of Quadrant Avenue (N2-056 to N2-083)

All $L_{eq}24$ noise levels for residential receptors backing on 215 Street north of Quadrant Avenue are projected to be below 65 dBA and range from 56.3 – 58.7 dBA. The relative difference in noise levels from the Future case *with* and *without* mitigation ranges from -6.8 to -10.7 dBA which is a significant decrease in noise level.

5.2.2.4. Riverview Way, between 215 Street NW and 199 Street NW (N2-084 to N2-116)

Noise mitigation was not required for residential receptors in this area. However, certain receptor locations will benefit from the noise mitigation implemented for other areas. For example, N2-084 will benefit from the noise mitigation implemented for receptors adjacent to 215 Street NW.

5.2.3. Neighbourhood 3 Residential Development

The results of the Future Case modeling *with* mitigation for NBHD 3 indicate noise levels ranging from 54.6 – 63.7 dBA $L_{eq}24$ as presented in Table 2d & Table 2e. Since all residential receptor $L_{eq}24$ noise levels are below 65 dBA, no further mitigation will be required to meet the requirements of the City of Edmonton UTNP C506A.

Table 2d. Future Case *With* Mitigation Noise Modeling Results (Neighbourhood 3)

Receptor	$L_{eq}24$ (dBA)	Difference Relative to Future Case Leq24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)	Receptor	Difference Relative to Future Case Leq24 (dBA)	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
N3-001	62.9	-3.6	64.5	57.0	N3-034	63.5	-1.1	65.1	57.5
N3-002	62.0	-6.1	63.6	56.1	N3-035	63.7	-1.2	65.3	57.8
N3-003	62.0	-6.9	63.6	56.0	N3-036	60.1	0.0	61.6	54.4
N3-004	61.2	-7.3	62.9	55.2	N3-037	58.2	0.0	59.8	52.8
N3-005	61.2	-7.3	62.8	55.1	N3-038	57.1	0.0	58.6	51.9
N3-006	61.0	-7.5	62.6	54.9	N3-039	56.5	0.0	58.0	51.5
N3-007	60.9	-7.6	62.5	54.8	N3-040	56.2	0.0	57.6	51.2
N3-008	60.7	-7.9	62.3	54.6	N3-041	55.9	0.0	57.4	51.1
N3-009	60.6	-8.4	62.3	54.5	N3-042	55.8	0.0	57.3	51.1
N3-010	60.9	-7.4	62.6	54.8	N3-043	55.7	0.0	57.1	51.0
N3-011	60.8	-8.1	62.4	54.7	N3-044	55.6	0.0	57.0	51.0
N3-012	60.7	-8.1	62.3	54.6	N3-045	55.6	0.0	57.1	51.1
N3-013	61.0	-7.9	62.6	54.9	N3-046	55.7	0.0	57.2	51.2
N3-014	61.1	-7.6	62.7	55.0	N3-047	55.9	0.0	57.3	51.4
N3-015	60.9	-8.4	62.5	54.8	N3-048	56.2	0.0	57.6	51.7
N3-016	60.9	-8.4	62.6	54.9	N3-049	56.6	0.0	58.0	52.2
N3-017	61.6	-7.5	63.2	55.5	N3-050	57.7	0.0	59.1	53.3
N3-018	61.2	-7.5	62.8	55.2	N3-051	58.5	0.0	59.9	54.1
N3-019	61.3	-7.7	62.9	55.2	N3-052	57.3	0.0	58.7	52.9
N3-020	61.3	-7.6	62.9	55.2	N3-053	55.3	0.0	56.7	50.9
N3-021	61.6	-7.3	63.2	55.5	N3-054	54.6	0.0	56.0	50.2
N3-022	61.3	-6.7	62.9	55.3	N3-055	61.7	-3.2	63.3	55.9
N3-023	62.3	-7.5	63.9	56.2	N3-056	60.6	-3.5	62.2	54.8
N3-024	62.8	-6.9	64.4	56.7	N3-057	60.8	-3.1	62.4	55.0
N3-025	62.5	-7.0	64.1	56.4	N3-058	60.3	-3.7	61.9	54.5
N3-026	62.5	-6.5	64.1	56.5	N3-059	60.0	-3.3	61.5	54.2
N3-027	61.9	-6.6	63.5	55.9	N3-060	60.3	-3.5	61.8	54.5
N3-028	62.0	-7.2	63.6	55.9	N3-061	60.3	-3.2	61.9	54.5
N3-029	62.6	-6.7	64.2	56.5	N3-062	60.2	-3.9	61.8	54.5
N3-030	62.6	-6.8	64.2	56.5	N3-063	61.7	-3.2	63.3	56.0
N3-031	62.5	-7.1	64.1	56.4	N3-064	59.9	-4.0	61.5	54.2
N3-032	62.2	-0.9	63.8	56.2	N3-065	59.8	-3.9	61.4	54.1
N3-033	62.7	-1.2	64.3	56.7	N3-066	59.8	-3.5	61.4	54.1

Table 2e. Future Case *With* Mitigation Noise Modeling Results (Neighbourhood 3 cont.)

Receptor	L_{eq}24 (dBA)	Difference Relative to Future Case Leq24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	Difference Relative to Future Case Leq24 (dBA)	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
N3-067	59.6	-3.9	61.1	53.8		N3-099	58.9	-4.1	60.5	53.1
N3-068	59.4	-3.6	61.0	53.7		N3-100	59.1	-3.7	60.6	53.3
N3-069	59.5	-4.0	61.0	53.7		N3-101	58.9	-4.2	60.5	53.2
N3-070	59.4	-3.7	61.0	53.7		N3-102	58.9	-4.2	60.5	53.2
N3-071	59.4	-4.0	60.9	53.6		N3-103	59.1	-3.7	60.6	53.3
N3-072	59.4	-3.7	61.0	53.7		N3-104	58.9	-4.2	60.5	53.2
N3-073	59.4	-4.1	60.9	53.6		N3-105	58.9	-4.0	60.5	53.2
N3-074	59.4	-3.6	61.0	53.6		N3-106	58.9	-3.9	60.5	53.2
N3-075	59.4	-4.1	61.0	53.7		N3-107	58.9	-4.2	60.5	53.1
N3-076	59.5	-3.6	61.1	53.7		N3-108	58.9	-4.0	60.5	53.1
N3-077	60.1	-4.5	61.6	54.3		N3-109	59.0	-4.2	60.6	53.2
N3-078	61.1	-3.4	62.7	55.4		N3-110	59.2	-4.0	60.7	53.4
N3-079	61.4	-3.3	63.0	55.6		N3-111	60.1	-5.1	61.7	54.4
N3-080	60.7	-3.6	62.3	55.0		N3-112	59.5	0.0	61.1	53.8
N3-081	59.8	-3.7	61.4	54.1		N3-113	59.4	0.0	61.0	53.7
N3-082	59.5	-3.8	61.1	53.7		N3-114	61.1	0.0	62.7	55.4
N3-083	59.6	-3.7	61.2	53.8		N3-115	61.2	-0.1	62.8	55.5
N3-084	59.5	-3.7	61.0	53.7		N3-116	61.5	0.0	63.0	55.7
N3-085	59.3	-3.7	60.8	53.5		N3-117	62.0	-0.4	63.6	56.3
N3-086	59.3	-3.9	60.9	53.6		N3-118	62.2	-3.9	63.8	56.5
N3-087	59.3	-4.3	60.9	53.6		N3-119	61.5	-3.8	63.1	55.8
N3-088	59.3	-3.9	60.9	53.6		N3-120	61.1	-4.1	62.7	55.4
N3-089	59.3	-4.1	60.9	53.5		N3-121	61.3	-4.1	62.9	55.5
N3-090	59.4	-3.7	61.0	53.6		N3-122	61.1	-4.1	62.7	55.3
N3-091	60.1	-4.8	61.7	54.3		N3-123	61.0	-4.1	62.5	55.2
N3-092	59.6	-3.7	61.2	53.8		N3-124	60.9	-4.0	62.5	55.2
N3-093	58.9	-3.9	60.5	53.2		N3-125	61.1	-4.2	62.6	55.3
N3-094	58.6	-3.9	60.2	52.9		N3-126	61.2	-3.8	62.7	55.4
N3-095	59.2	-4.0	60.8	53.5		N3-127	61.3	-3.6	62.8	55.5
N3-096	59.2	-3.9	60.8	53.5		N3-128	61.5	-3.9	63.1	55.7
N3-097	59.2	-4.0	60.8	53.4		N3-129	61.3	-3.8	62.9	55.6
N3-098	59.2	-3.8	60.7	53.4		N3-130	61.7	-4.4	63.2	55.9

5.2.3.1. 23 Avenue NW, between 199 Street NW and AHD (N3-001 to N3-035)

The noise levels for receptor locations backing onto 23 Avenue NW between 199 Street NW and AHD are projected to be below 65 dBA and range from 60.6 – 63.7 dBA. The relative difference in noise levels from the Future case *with* and *without* mitigation ranges from -0.9 to -8.4 dBA.

5.2.3.2. Anthony Henday Drive, (N3-036 to N3-054)

Noise mitigation was not required for residential receptors in this area.

5.2.3.3. Riverview Way, between 23 Avenue NW and 199 Street NW (N3-055 to N3-117)

The noise levels for receptor locations backing onto Riverview Way between 23 Avenue NW and 199 Street NW are projected to be below 65 dBA and range from 58.6 – 62.0 dBA. The relative difference in noise levels from the Future case *with* and *without* mitigation ranges from 0.0 to -5.1 dBA.

5.2.3.4. 199 Street NW, north of 23 Avenue NW (N2-118 to N2-130)

As indicated in Table 2e, the noise levels for receptor locations backing onto 199 Street between 23 Avenue NW and Riverview Way are projected to be below 65 dBA and range from 60.9 – 62.2 dBA. The relative difference in noise levels from the Future case *with* and *without* mitigation ranges from -3.6 to -4.4 dBA.

5.3. Noise Barrier Description

To achieve the noise levels shown in Tables 2a – 2e and Figures 3a – 3g the following barriers were included in the model. To simplify the description of the barrier configuration, the study area has been again divided into separate sections within each neighbourhood. A breakdown of each section can be found in Figures 4a – 4f. Note that all barrier heights are relative to the **modeled existing grade** at the residential area boundary line (the location of the modeled barriers). It is also important to note that the barriers are modeled as continuous and must meet any adjacent segment with no holes or gaps. The barriers can either start/finish abruptly or slowly taper up/down after the required barrier lengths/heights are implemented. Lastly, in areas in which the barrier terminates at an adjacent road the barrier must tie-in to the rear of the residential structure (i.e. house) as shown in the figures.

5.3.1. Neighbourhood 1 Residential Development

5.3.1.1. 215 Street NW, north of 23 Avenue NW (N1-001 to N1-006)

As stipulated by the City of Edmonton's Transportation Planning a minimum of a 1.0 m berm + 1.83 m noise fence is required adjacent to designated truck routes. Therefore a 1.0 m berm + 1.83 m noise barrier is required along the property line (side or rear) adjacent to 215 Street NW. For Receptor N1-001 the barrier must wrap around approximately 10 m to the east. For Receptor N1-005, the berm/barrier must continue until it reaches the southwest corner before reducing in height to 1.83 m. It must then continue east for approximately 30 m at a height of 1.83 m.

5.3.1.2. 23 Avenue NW, between 215 Street NW and 199 Street NW (N1-006 to N1-023)

A 1.83 m barrier is required for residential receptors N1-010 to N1-021[1]. A 1.83 m barrier will also be required for the MDR lands west 203 Street NW only if there are private backyards adjacent to 23 Avenue NW or 203 Street NW. The noise model indicated that the barrier in this location must extend approximately 20 m to the west and 30 m north of the southeast corner.

5.3.1.3. 199 Street NW, north of 23 Avenue NW (N1-024 to N1-054)

A 1.83 m barrier is required for all residential receptor locations adjacent to 199 Street NW north of 23 Avenue NW.

[1] It should be noted that a barrier is technically not required for Receptors N1-019 to N1-021. The barrier was implemented in order to remain consistent with the other adjacent residential lots to the west.

5.3.1.4. 23 Avenue NW, between 199 Street NW and AHD (N1-055 to N1-063)

A 2.44 m barrier is required for all residential receptor locations adjacent to 23 Avenue NW. For Receptor N1-055, the barrier must extend approximately 10 m to the north. A 2.44 m barrier will also be required for the MDR lands east 203 Street NW only if there are private backyards adjacent to 23 Avenue NW or the adjacent collector road. The noise model indicated that the barrier in this location must extend approximately 25 m north of the southwest corner and 10 m north of the southeast corner.

5.3.2. Neighbourhood 2 Residential Development

5.3.2.1. 23 Avenue NW, between 215 Street NW and 199 Street NW (N2-001 to N2-010)

A 1.83 m barrier is required for residential receptors N2-004 to N2-010. A 1.83 m barrier will also be required for the MDR lands east 203 Street NW if there are private backyards adjacent to 23 Avenue NW or 203 Street NW. The noise model indicated that the barrier for the MDR lands would have to extend to the detached single family residential properties to the west (Receptor N2-009) and would have to wrap around to the south by approximately 70 m.

5.3.2.2. 199 Street NW, south of 23 Avenue NW (N2-011 to N2-055)

A 1.83 m barrier is required for all residential receptor locations adjacent to 199 Street NW south of 23 Avenue NW. In areas in which the barrier does not meet an adjacent segment of fence or tie-in to a residential structure the barrier must extend approximately 10 m in the opposite direction of 199 Street NW.

5.3.2.3. 215 Street NW, north of Quadrant Avenue (N2-056 to N2-083)

A 1.0 m berm + 1.83 m noise barrier is required along the property line (side or rear) adjacent to 215 Street NW. The barrier must extend approximately 10 m east in areas in which the barrier does not meet an adjacent segment of fence or tie-in to a residential structure.

5.3.2.4. Riverview Way, between 215 Street NW and 199 Street NW (N2-084 to N2-116)

Noise mitigation was not required for residential receptors in this area.

5.3.3. Neighbourhood 3 Residential Development

5.3.3.1. 23 Avenue NW, between 199 Street NW and AHD (N3-001 to N3-035)

Noise mitigation will be required for the MDR lands directly adjacent to 199 Street NW only if there are private backyards adjacent to 23 Avenue NW or 199 Street NW. The noise model indicated that the required barrier height adjacent to 199 Street is 1.83 m. The barrier must extend approximately 10 m east of the southwest corner. The required barrier height increases to 2.44 m in the northwest corner of the MDR lands and continues east until reaching the detached single family residential properties (Receptor N3-007). Continuing to the east, a 2.44 m barrier is required for all residential receptor locations directly adjacent to 23 Avenue NW. (N3-007 to N3-031). Receptors adjacent to, but further away from 23 Avenue (N3-032 to N3-035) require a 1.83 m barrier.

5.3.3.2. Anthony Henday Drive, (N3-036 to N3-054)

Noise mitigation was not required for residential receptors in this area.

5.3.3.3. Riverview Way, between 23 Avenue NW and 199 Street NW (N3-055 to N3-117)

With exception of Receptors N3-112 to N3-117, a 1.83 m barrier is required for all residential receptor locations adjacent to Riverview Way south of 23 Avenue NW. In areas in which the barrier does not meet an adjacent segment of fence or tie-in to a residential structure the barrier must extend approximately 10 m in the opposite direction of Riverview Way.

5.3.3.4. 199 Street NW, north of 23 Avenue NW (N3-118 to N3-130)

A 1.83 m barrier is required for all residential receptor locations adjacent to 199 Street NW, south of 23 Avenue NW. In areas in which the barrier does not meet an adjacent segment of fence or tie-in to a residential structure the barrier must extend approximately 10 m in the opposite direction of 199 Street NW / Quadrant Avenue.

5.4. Barrier Construction

Barrier construction can be either solid screen wood fences or masonry noise walls. If using wood materials, the fences should be, at a minimum, double boarded with no visible gaps through the fence or at the bottom and have a surface density of at least 20 kg/m^2. A sample schematic of fence construction is provided in Figure 5. For masonry noise walls, there should also be no visible gaps and the surface density must also be at least 20 kg/m^2.

If there are to be any walkways or roadways penetrating through the proposed barrier locations, then the barrier should either: a) wrap around on both sides of the opening on the inside for at least the distance from the rear property line to the structure or, b) wrap around past the opening for at least 3 equivalent opening dimensions. Both options are shown in Figure 6.

With regards to noise control, for all barriers it is possible to exchange berm height for fence height and vice-versa, as long as the centerline of the barrier does not change (i.e. it remains at the current proposed property line). The key is that the total height has to be that listed above.

6.0 Conclusion

The results of the Future Case modeling for Neighbourhood 1 indicated noise levels ranging from 61.7 - 70.8 dBA L_{eq}24. Neighbourhood 2 indicated noise levels ranging from 57.6 – 67.8 dBA L_{eq}24 while Neighbourhood 3 indicated noise levels ranging from 54.6 – 69.8 dBA L_{eq}24. As a result, noise mitigation measures were investigated for residential receptor locations above 65 dBA L_{eq}24 to lower the noise levels to below the requirements the UTNP C506A criteria.

The results of the Future Case noise modeling *with* mitigation for all 3 neighbourhoods (for residential backyard spaces that initially exceeded 65 dBA) indicated noise levels below the UTNP C506A criteria of 65 dBA L_{eq}24. A variety of barrier heights were implemented within the model to achieve the projected noise levels.

7.0 References

- City of Edmonton Urban Traffic Noise Policy (C506A), 2013
- City of Edmonton Community Standards Bylaw 14600, 2008
- *Riverview Neighbourhoods 1, 2 &3 Neighbourhood Structure Plans Transportation Impact Assessment*, prepared for Qualico Development West, Walton Development and Management LP, Sunwapta Holdings Corp., Melcor Developments Ltd. & S.P. Singh by Bunt & Associates (May 30, 2014).
- *Environmental Noise Study for Southwest Anthony Henday Drive in Edmonton, AB,* Prepared for AECOM, by aci Acoustical Consultants Inc., December 2013.
- International Organization for Standardization (ISO), *Standard 1996-1, Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures, 2003*, Geneva Switzerland.
- International Organization for Standardization (ISO), *Standard 9613-1, Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of absorption of sound by the atmosphere, 1993*, Geneva Switzerland.
- International Organization for Standardization (ISO), *Standard 9613-2, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, 1996*, Geneva Switzerland.

To be inserted once available

Figure 1. Study Area

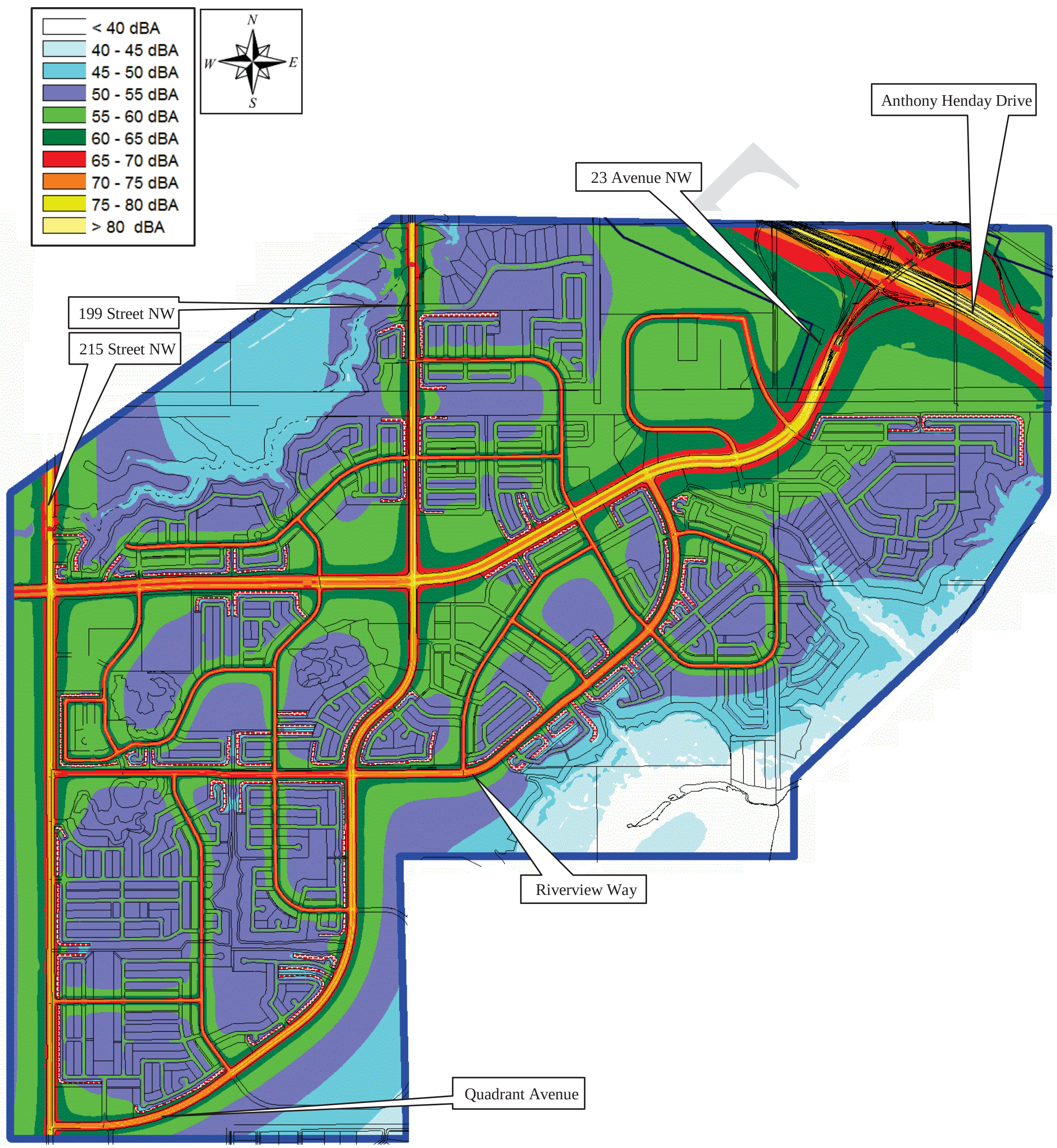


Figure 2a. Future Case L_{eq}24 Noise Levels For Entire Study Area

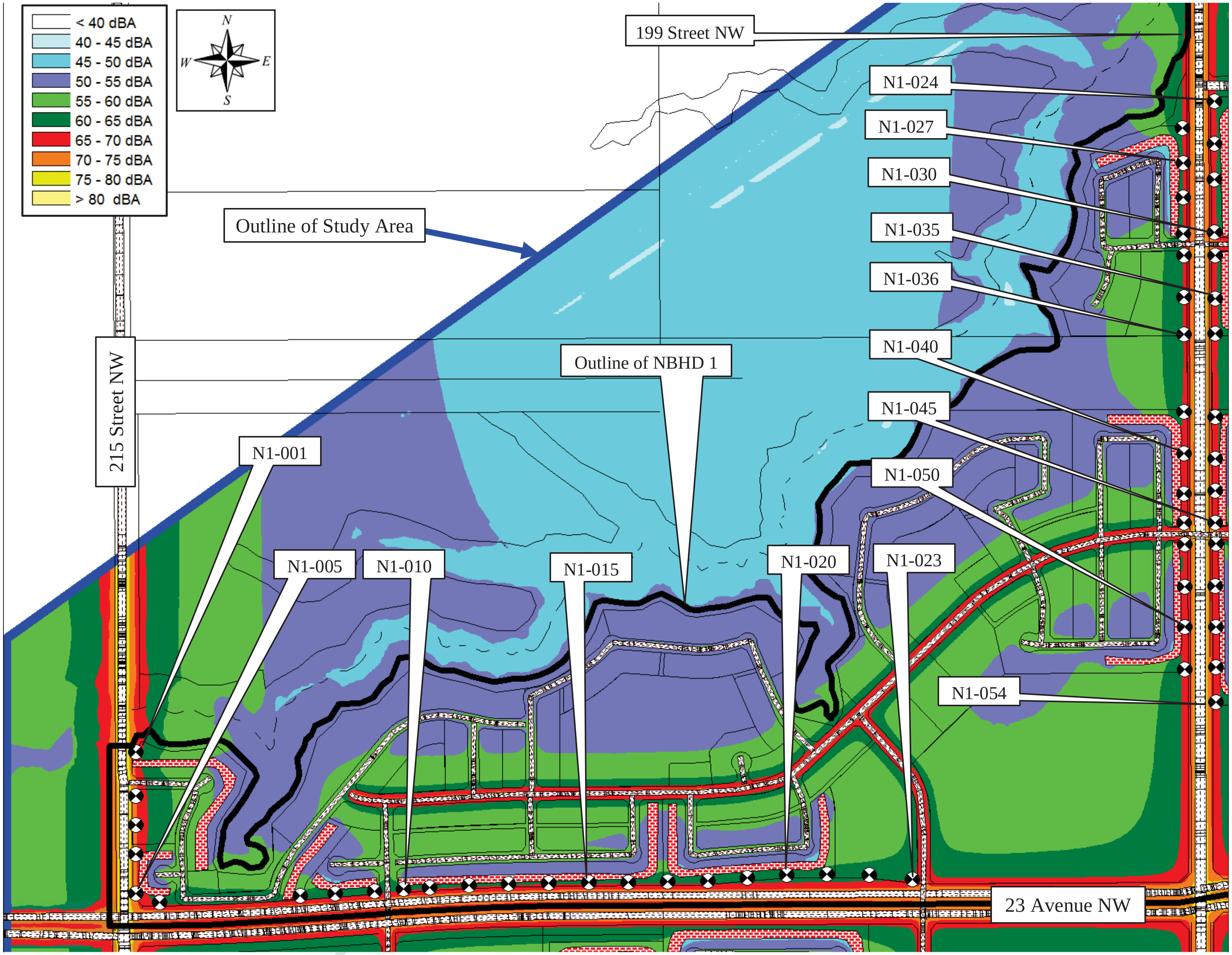


Figure 2b. Future Case L_{eq}24 Noise Levels For Neighbourhood 1 (West Side)

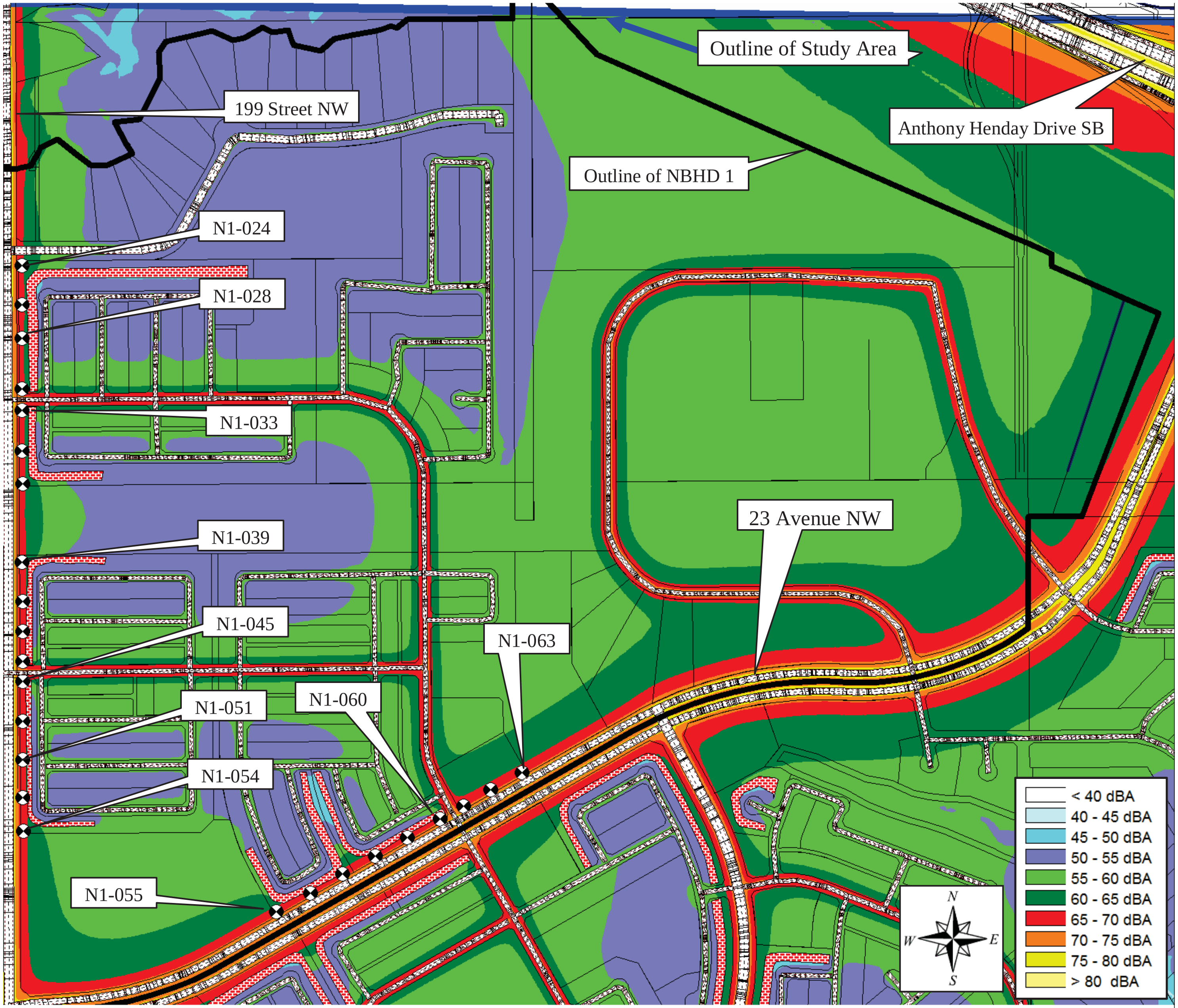


Figure 2c. Future Case L_{eq}24 Noise Levels For Neighbourhood 1 (East Side)

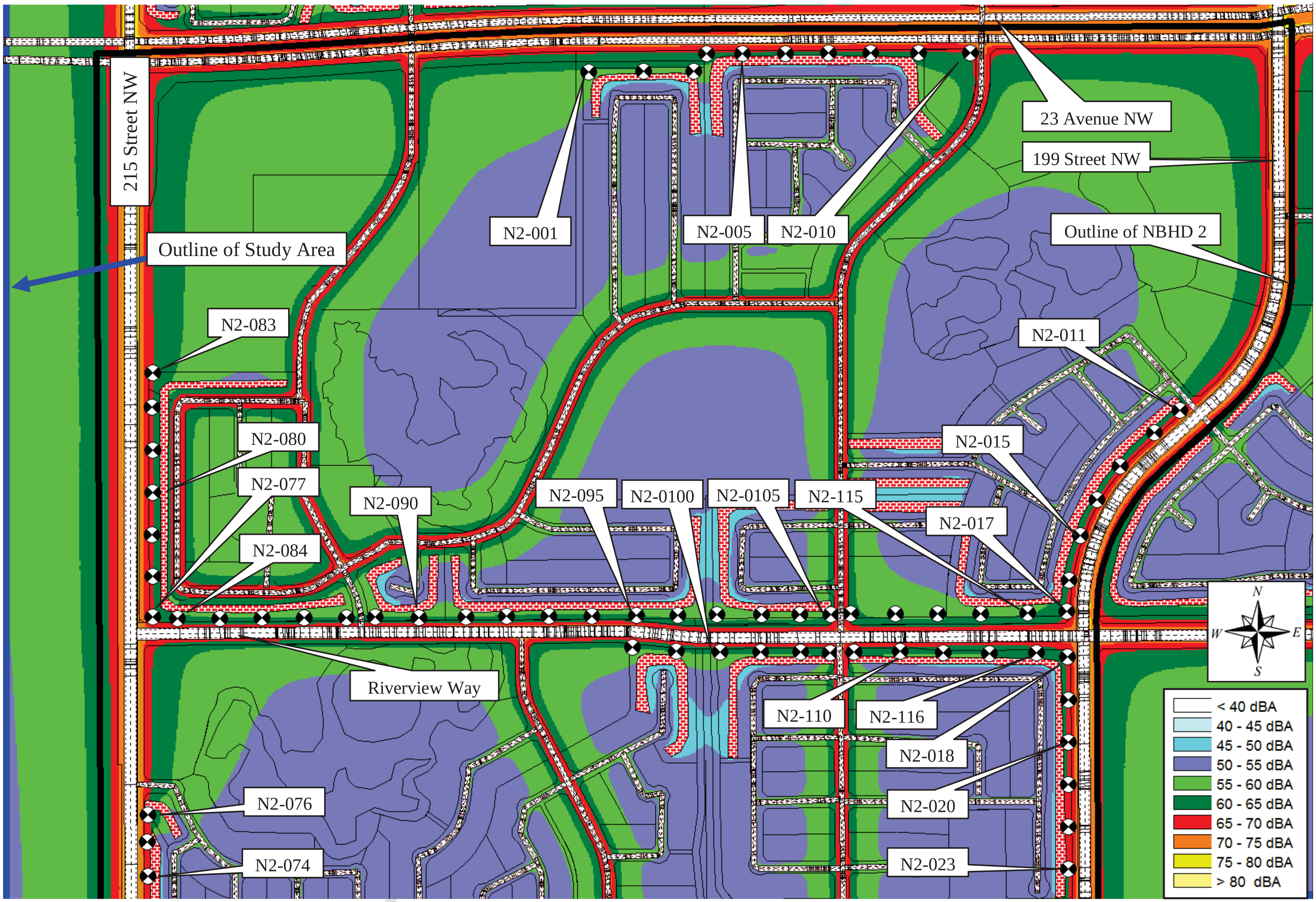


Figure 2d. Future Case L_{eq}24 Noise Levels For Neighbourhood 2 (North Side)

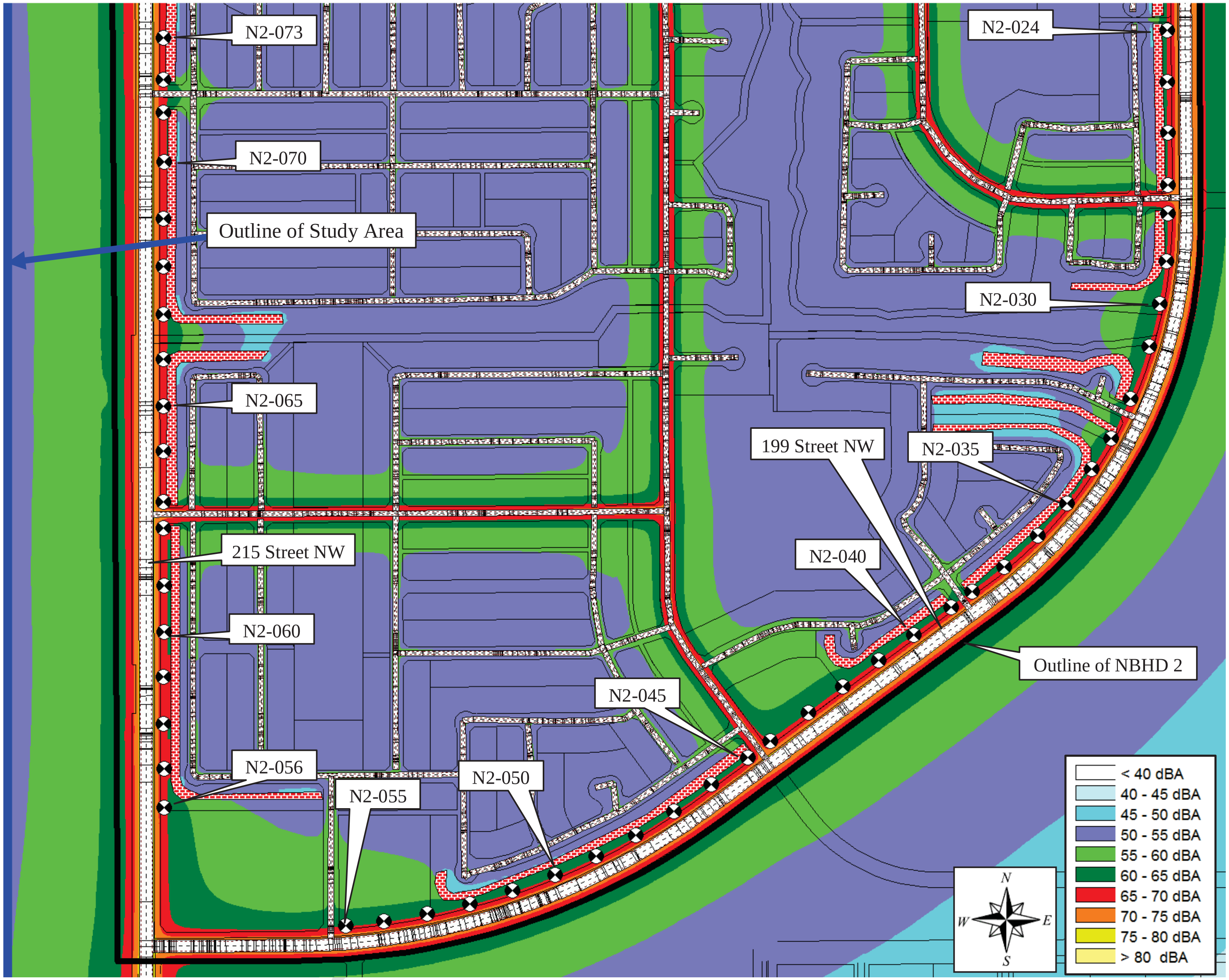


Figure 2e. Future Case L_{eq}24 Noise Levels For Neighbourhood 2 (South Side)

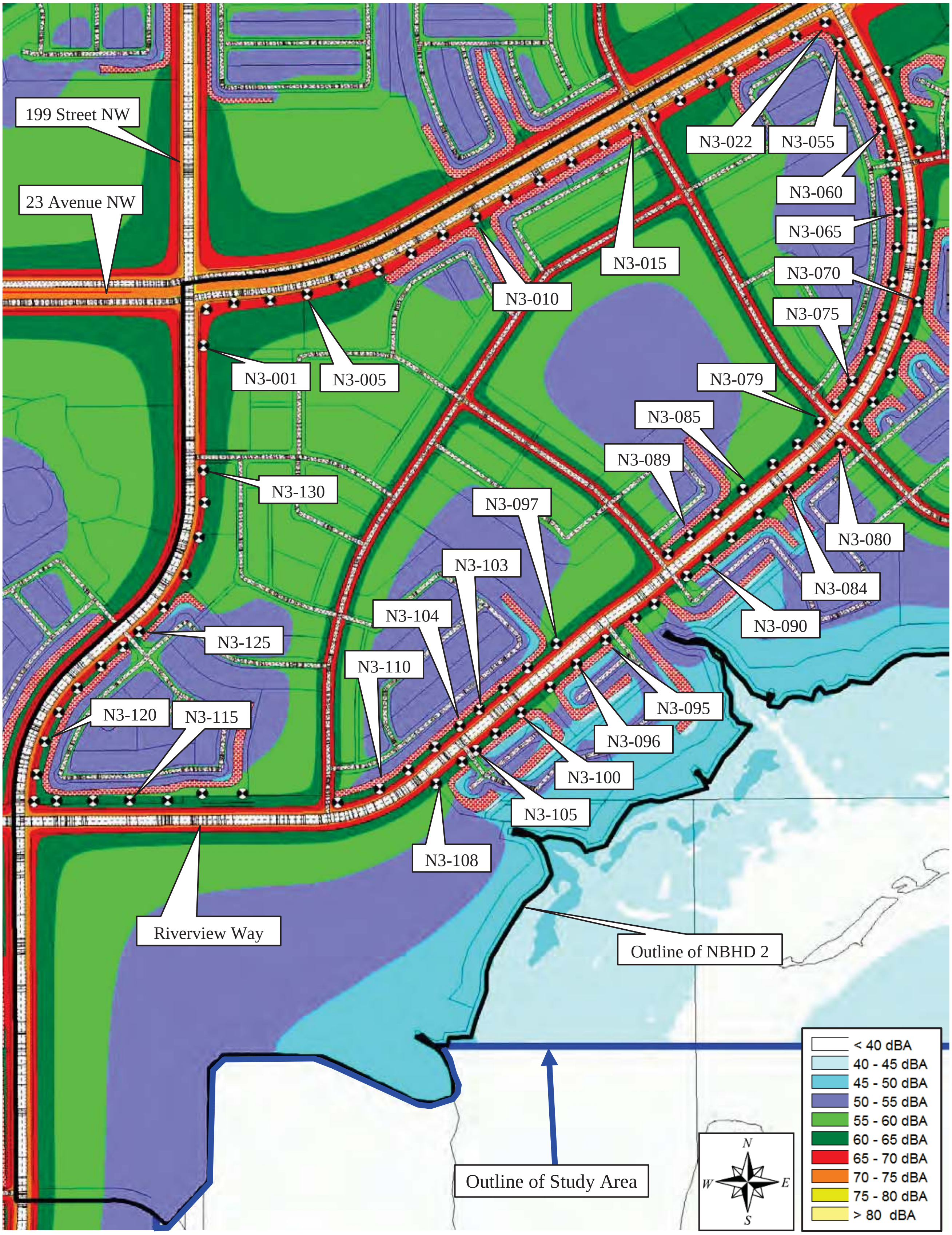


Figure 2f. Future Case L_{eq}24 Noise Levels For Neighbourhood 3 (West Side)

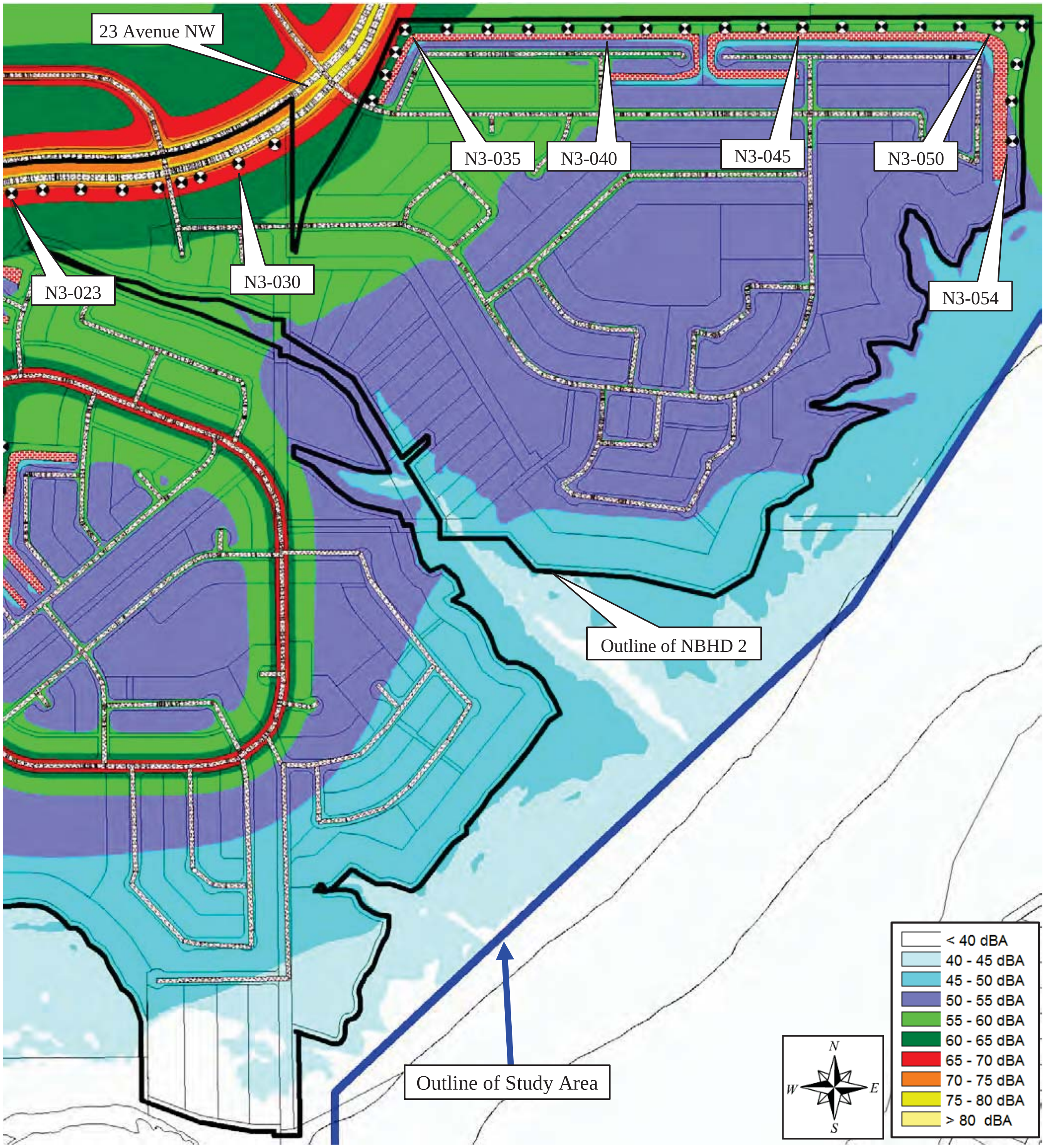


Figure 2g. Future Case L_{eq}24 Noise Levels For Neighbourhood 3 (East Side)

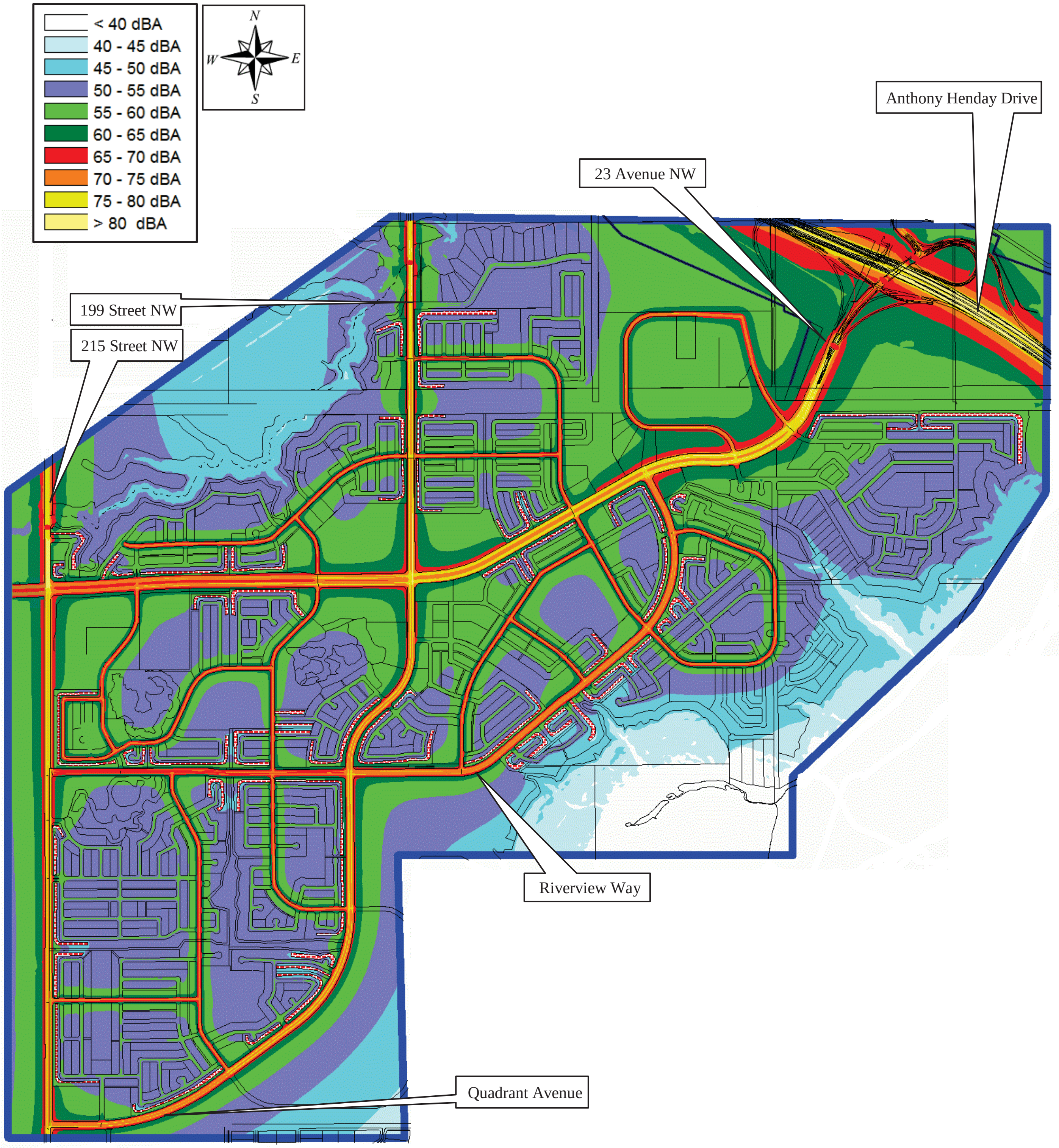


Figure 3a. Future Case *With* Mitigation L_{eq}24 Noise Levels For Entire Study Area

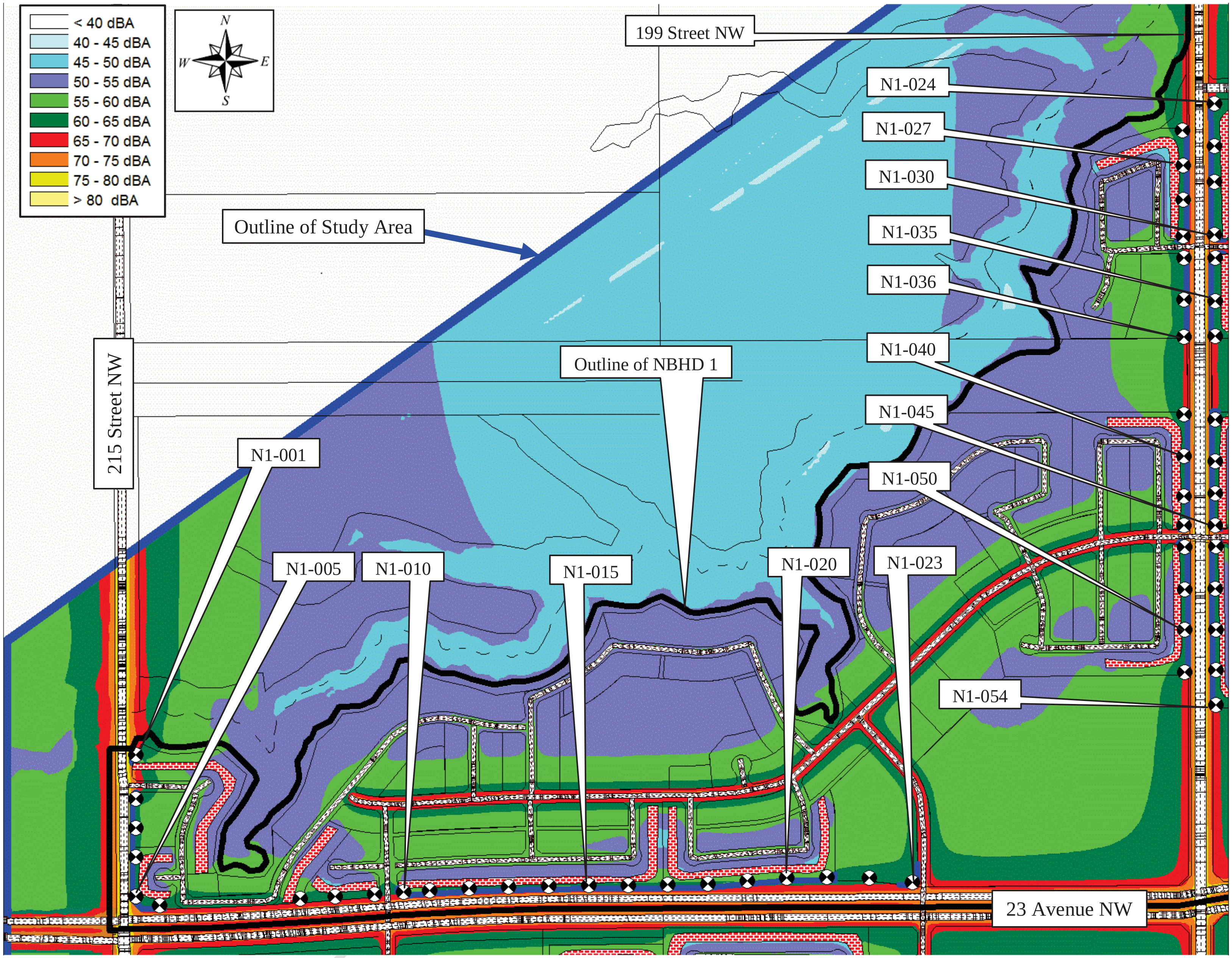


Figure 3b. Future Case *With* Mitigation L_{eq}24 Noise Levels For Neighbourhood 1 (West Side)

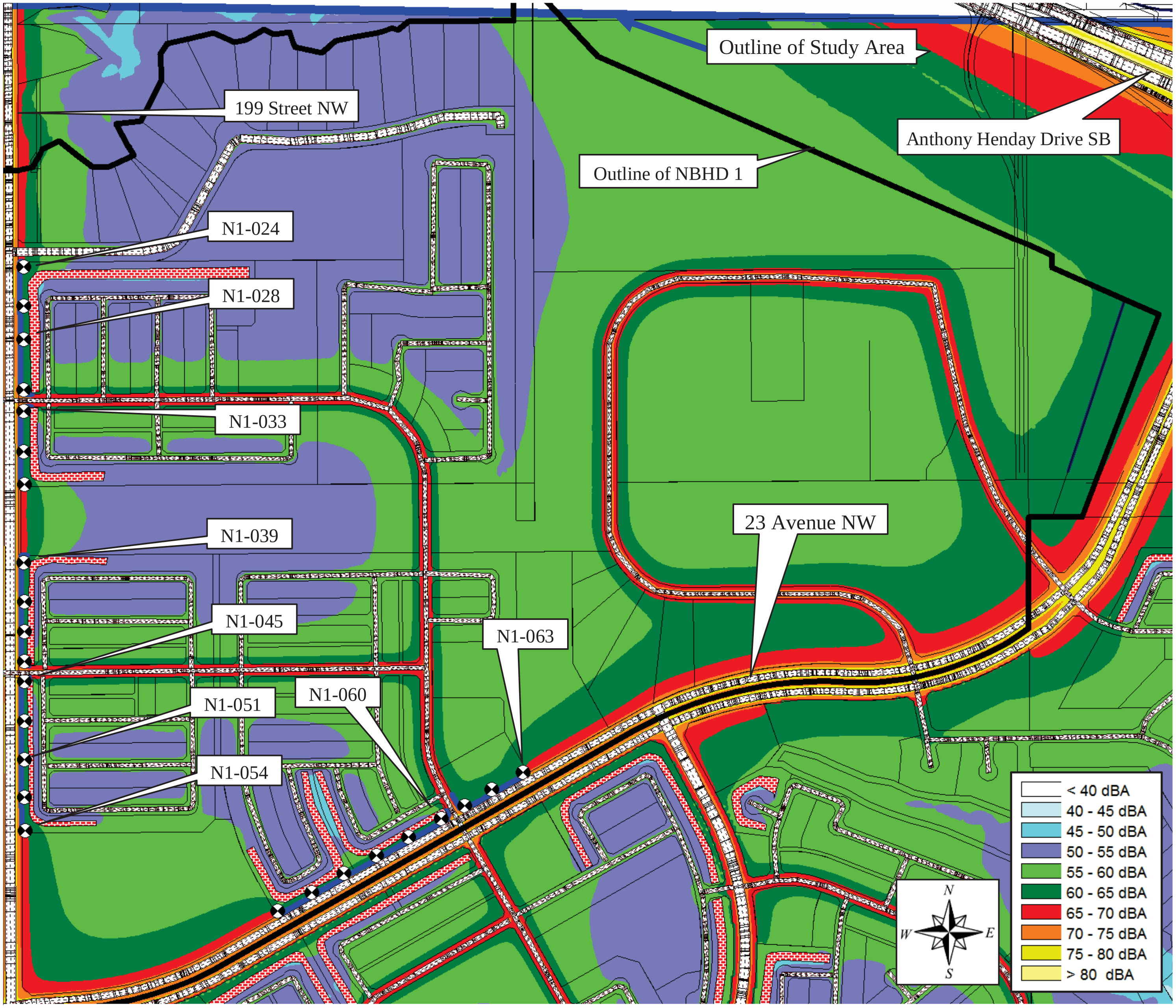


Figure 3c. Future Case *With* Mitigation L_{eq}24 Noise Levels For Neighbourhood 1 (East Side)

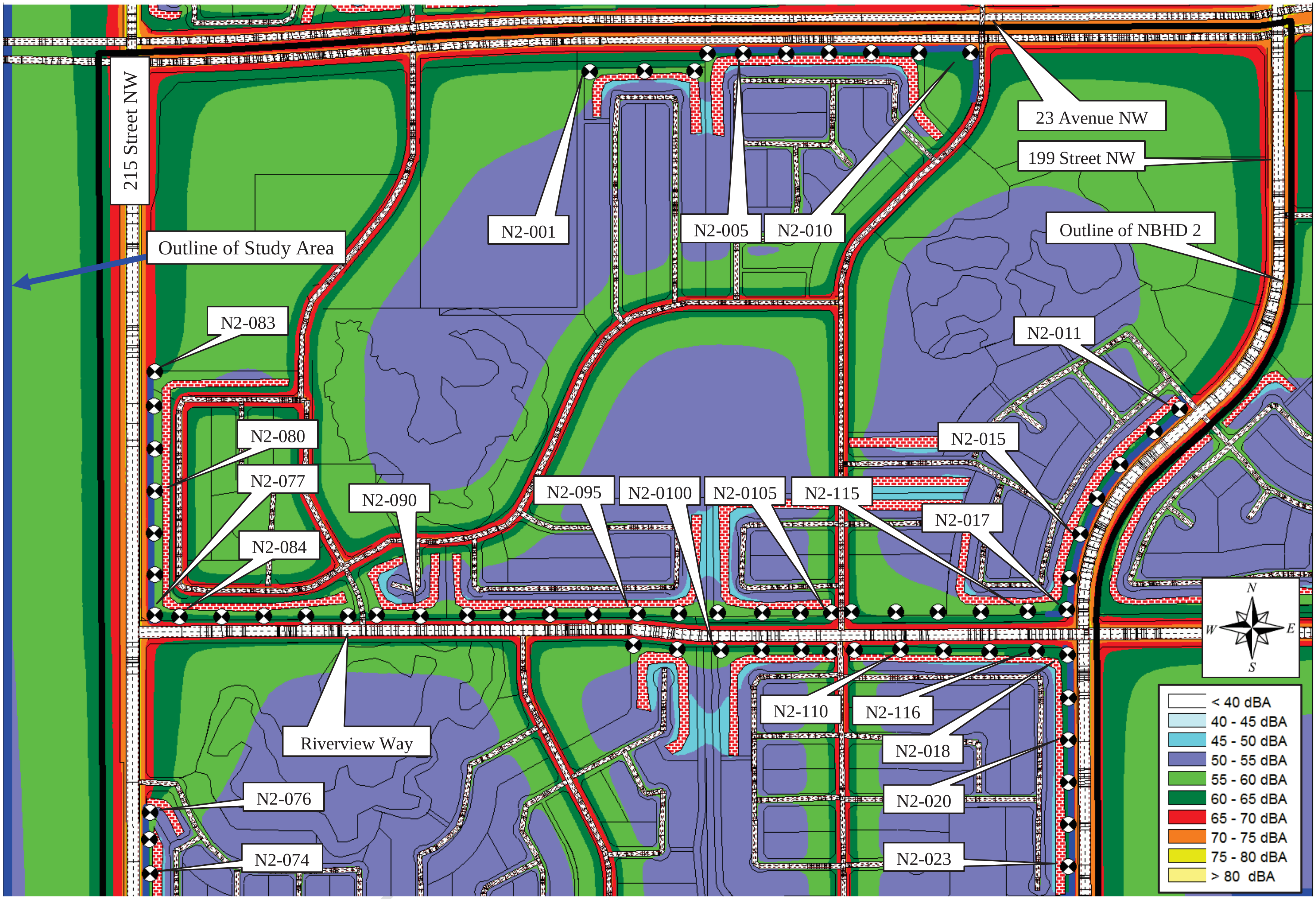


Figure 3d. Future Case *With* Mitigation L_{eq}24 Noise Levels For Neighbourhood 2 (North Side)

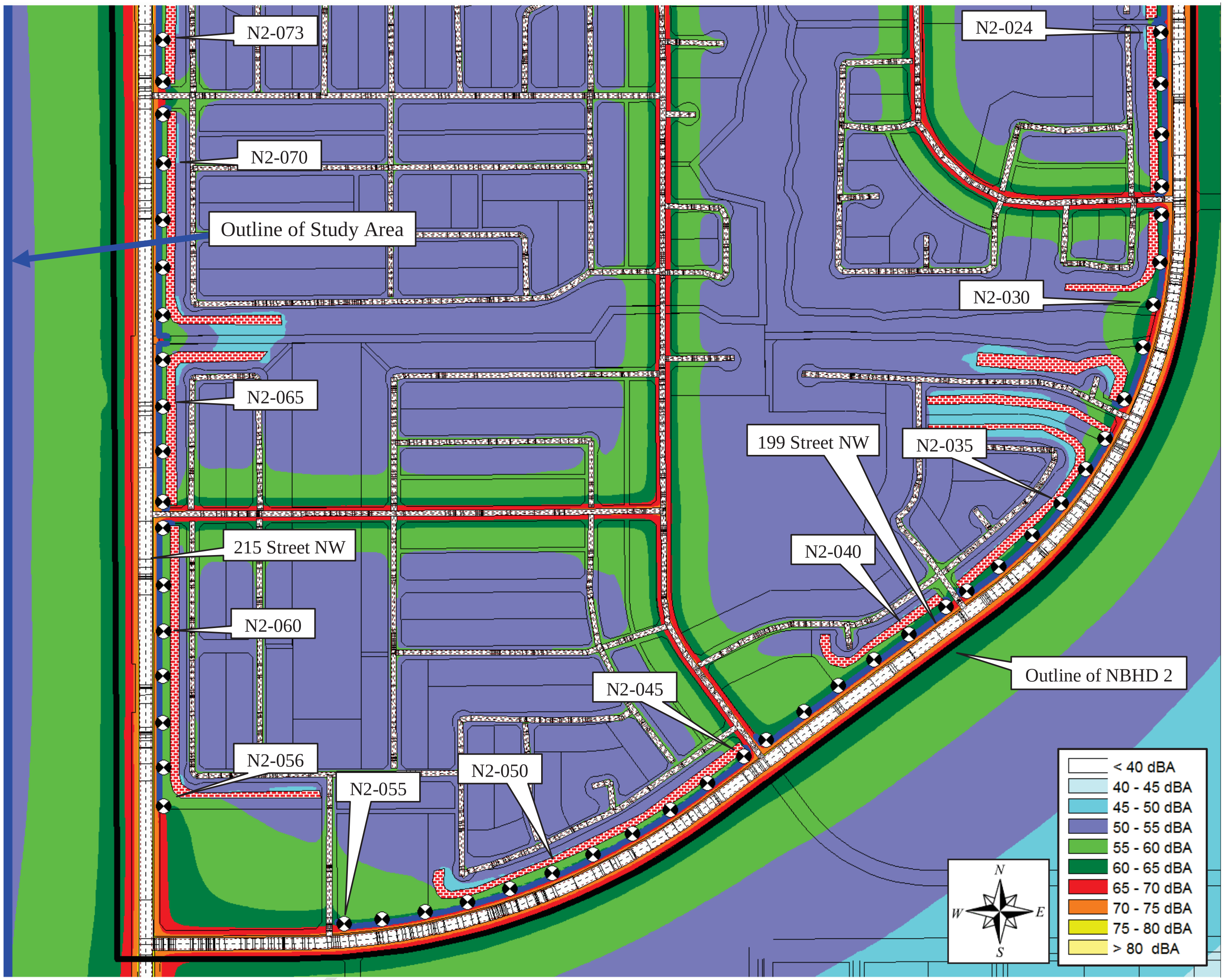


Figure 3e. Future Case *With* Mitigation L_{eq}24 Noise Levels For Neighbourhood 2 (South Side)

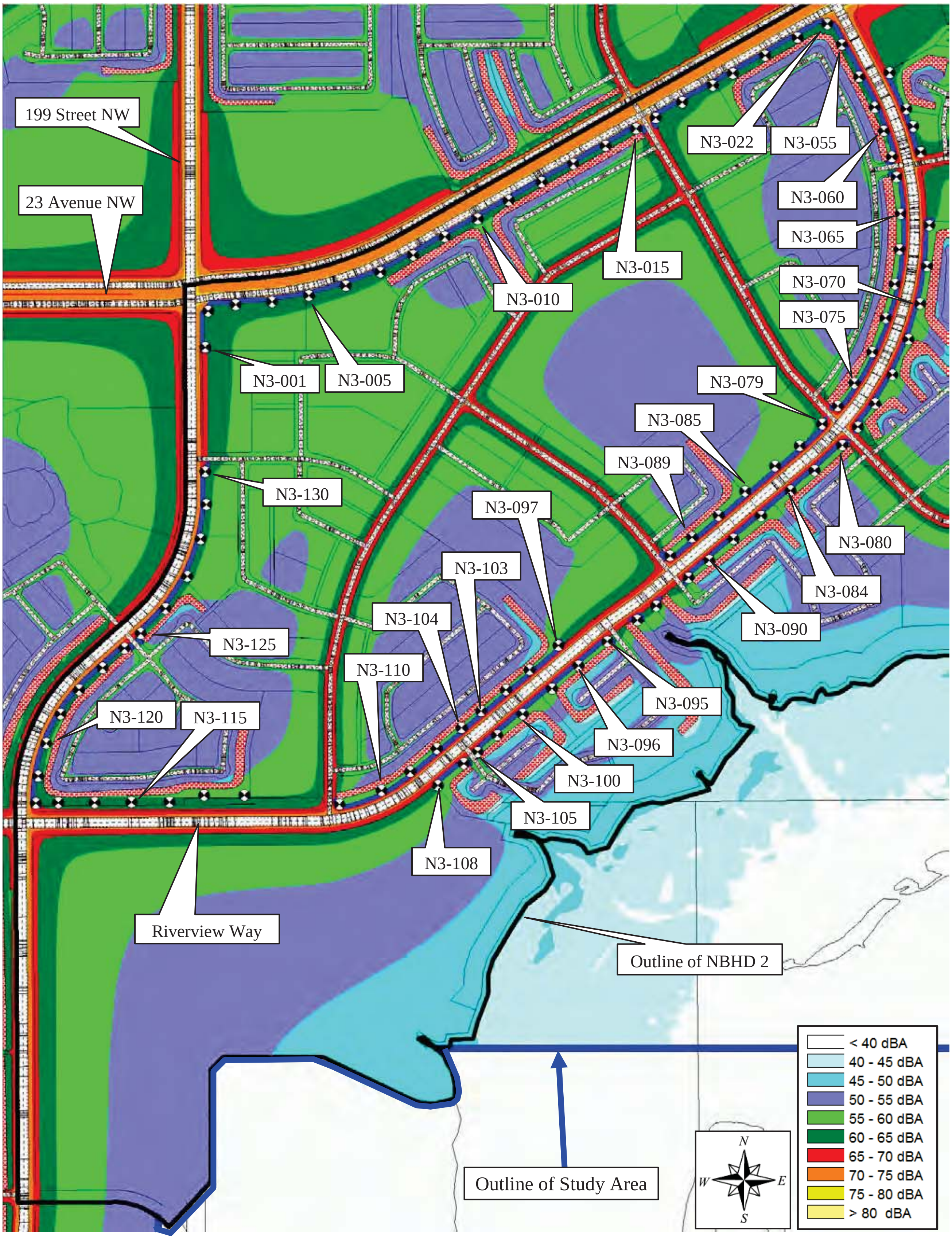


Figure 3f. Future Case *With* Mitigation L_{eq}24 Noise Levels For Neighbourhood 3 (West Side)

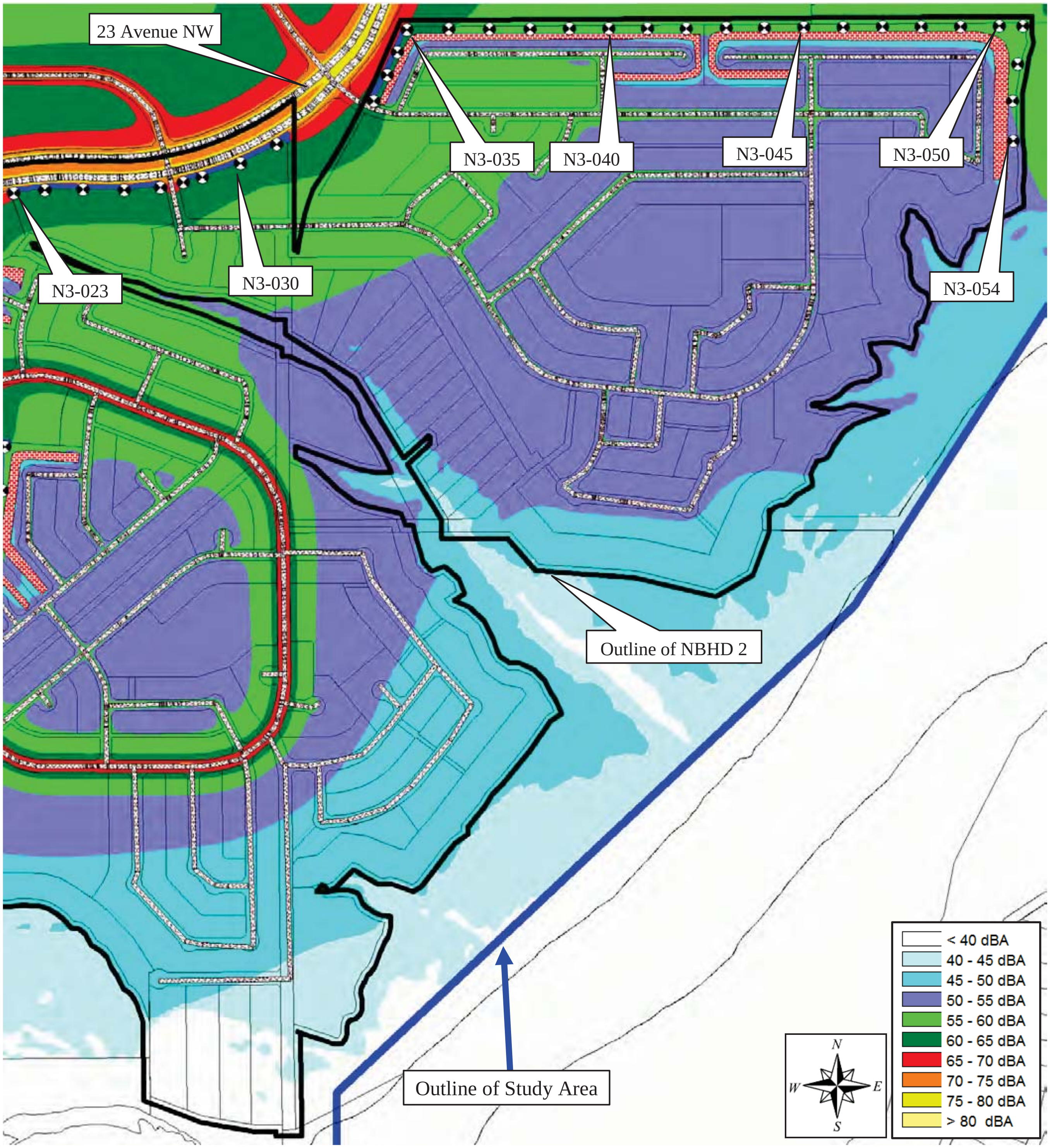


Figure 3g. Future Case *With* Mitigation L_{eq}24 Noise Levels For Neighbourhood 3 (East Side)

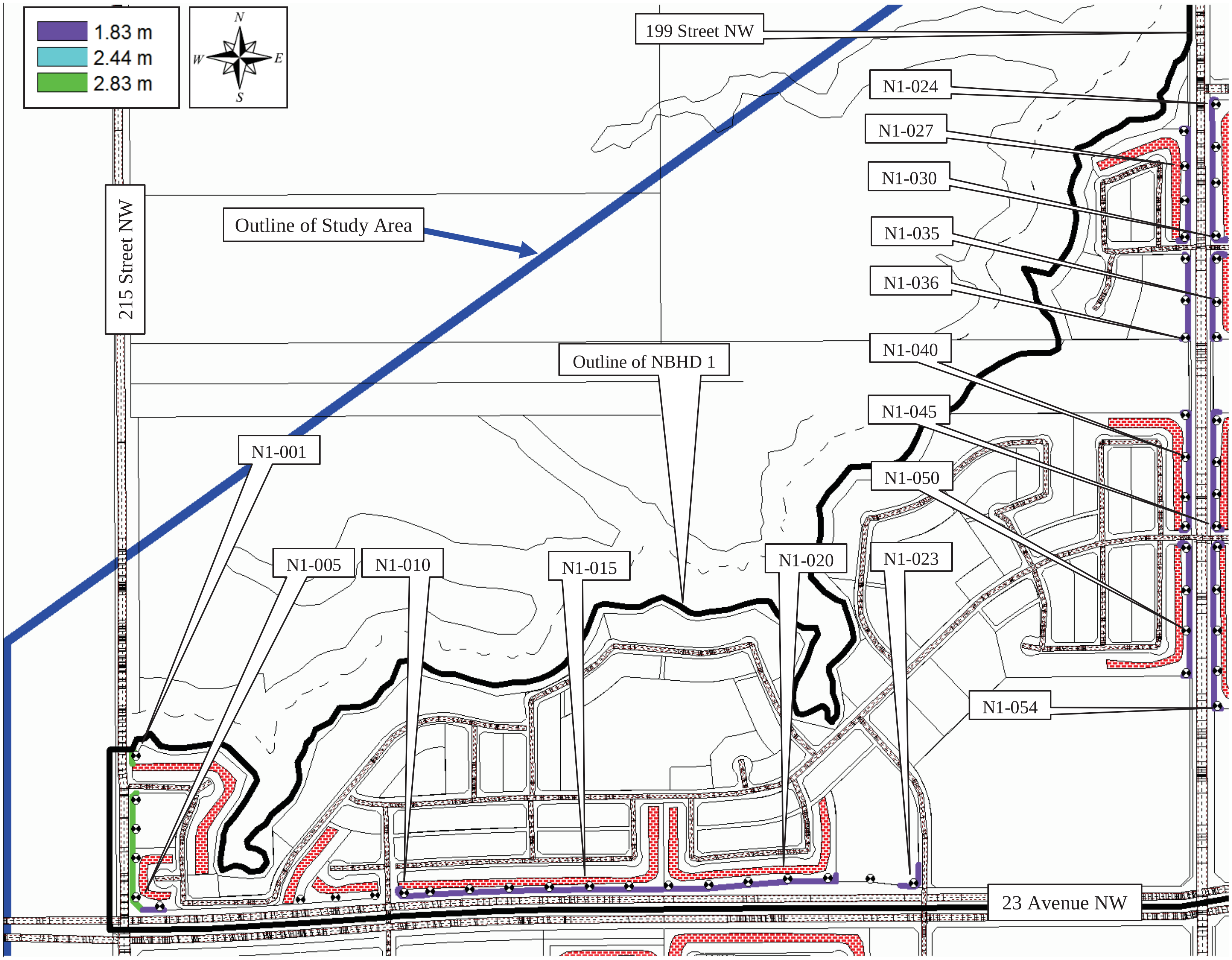


Figure 4a. Barrier Description For Neighbourhood 1 (West Side)

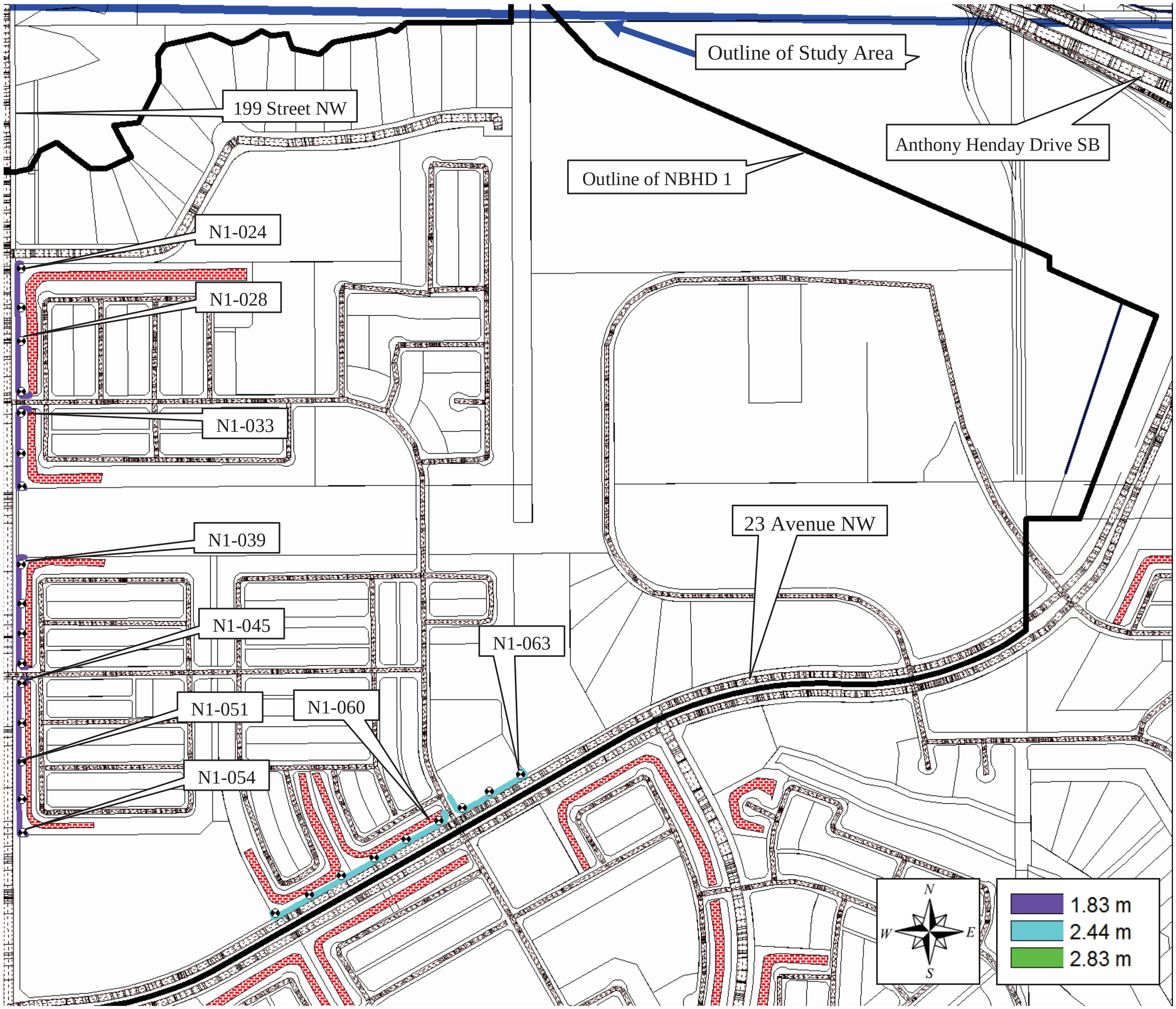


Figure 4b. Barrier Description For Neighbourhood 1 (East Side)

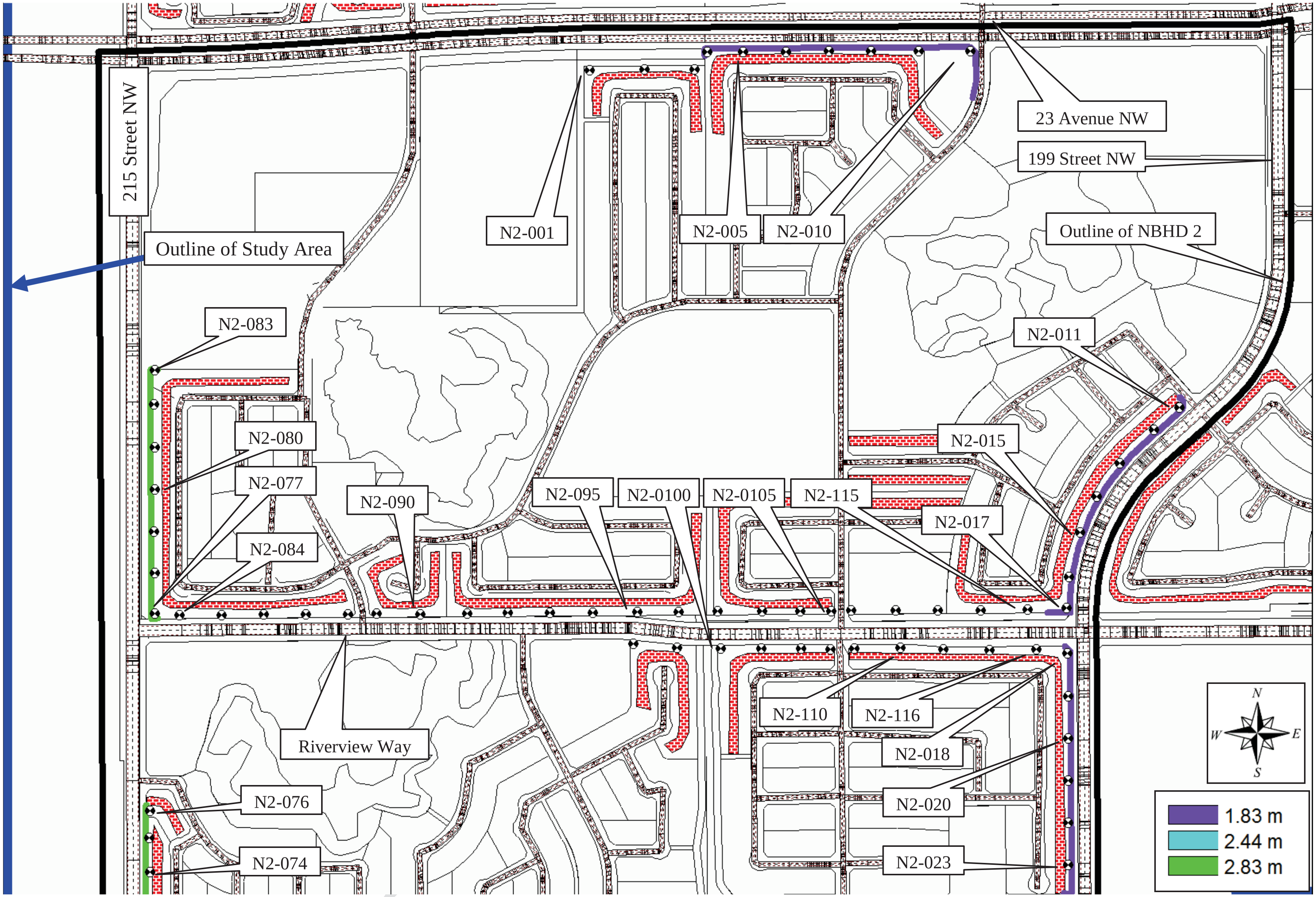


Figure 4c. Barrier Description For Neighbourhood 2 (North Side)

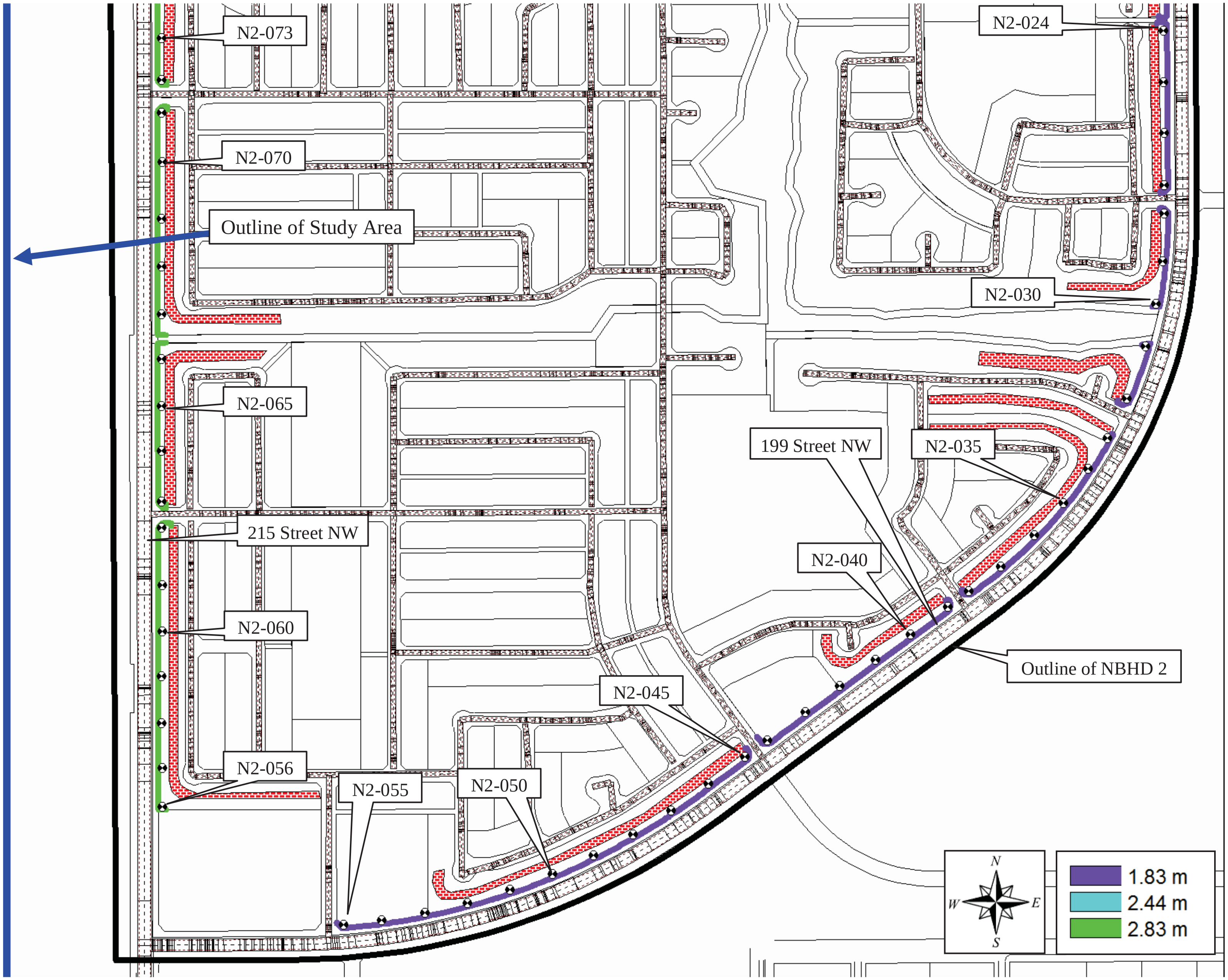


Figure 4d. Barrier Description For Neighbourhood 2 (South Side)

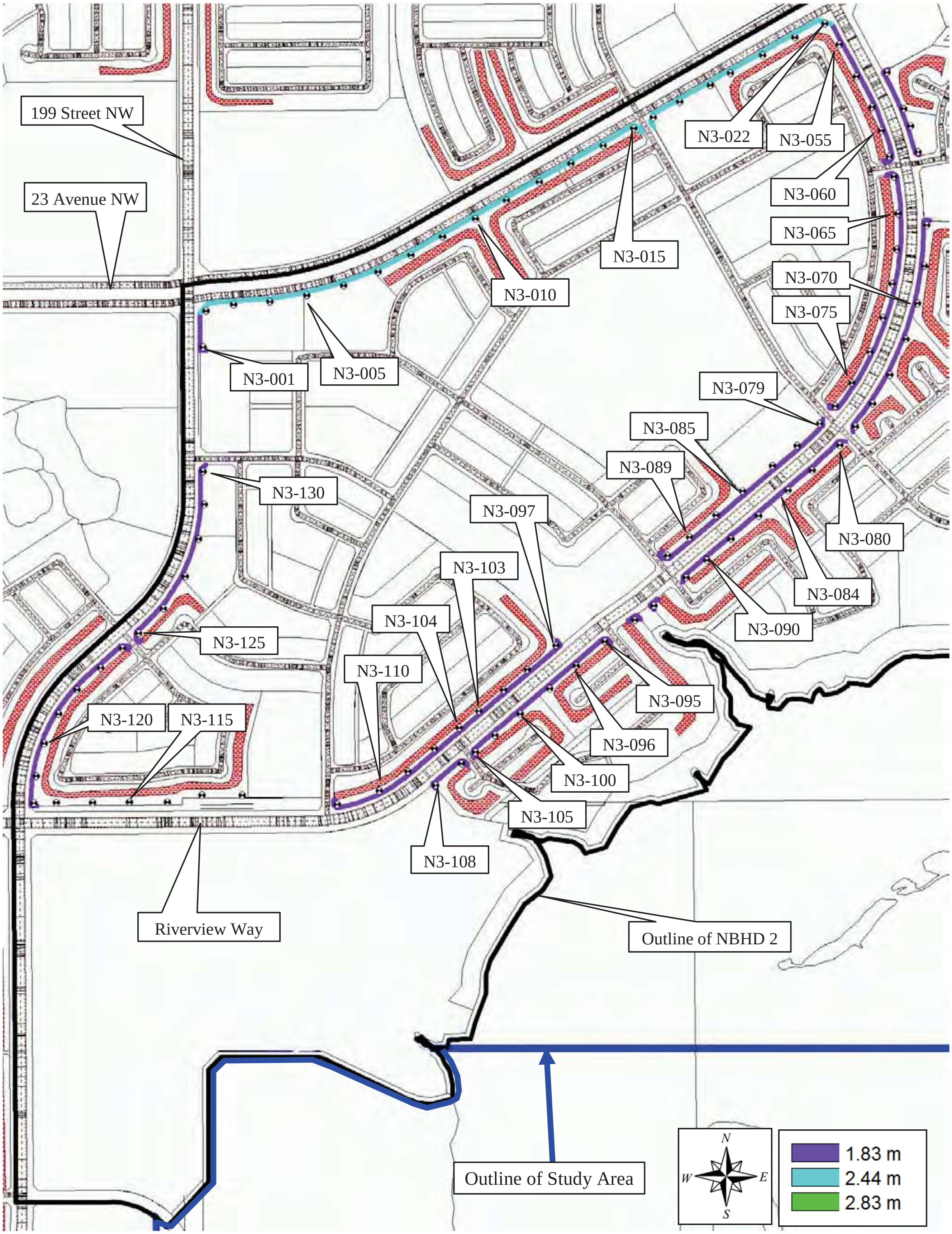


Figure 4e. Barrier Description For Neighbourhood 3 (West Side)

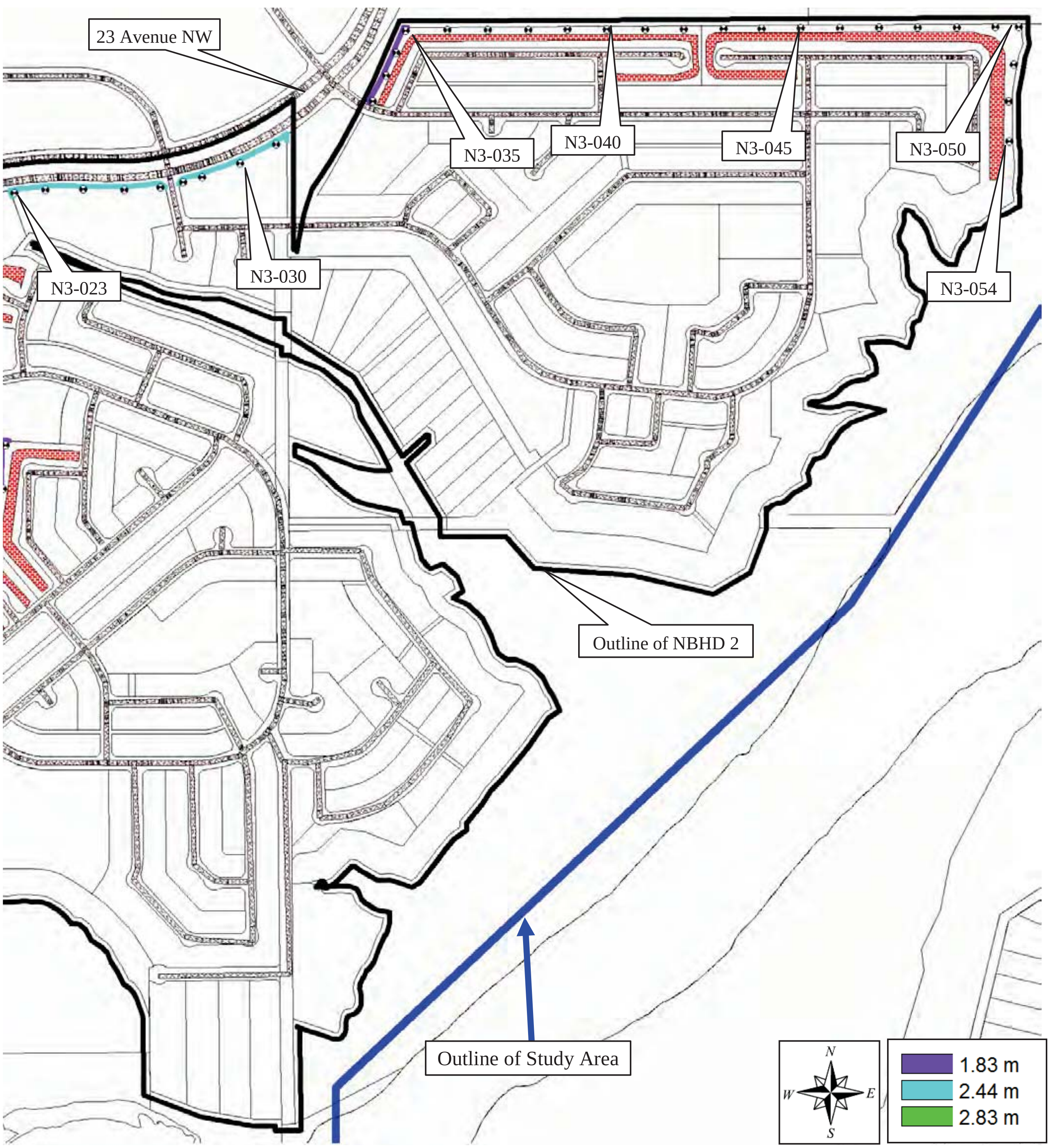


Figure 4f. Barrier Description For Neighbourhood 3 (East Side)

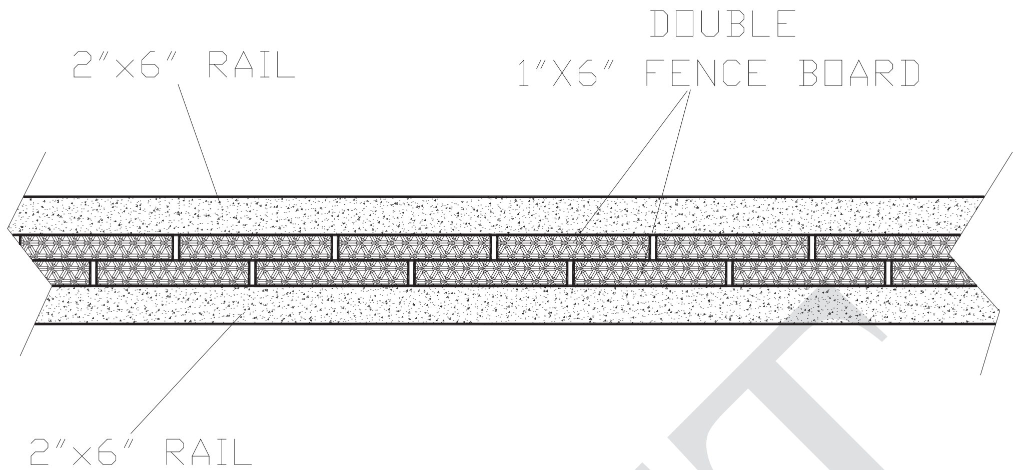


Figure 5. Minimum Recommended Wooden Fence Construction Sectional View

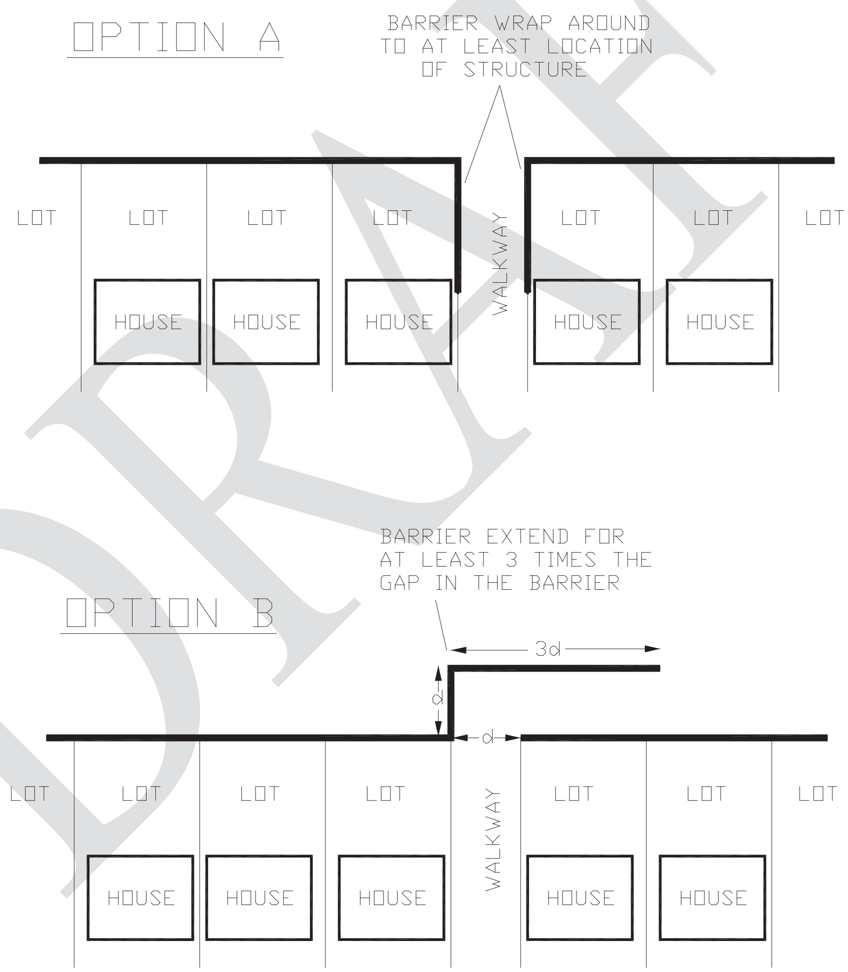


Figure 6. Minimum Recommended Walkway/Roadway Penetration Barrier Construction

Appendix I NOISE MODELING PARAMETERS

Road	Total Volume (vehicles per day	Day (Vehicles Per Hour)	Day % Heavy Vehicles	Night (Vehicles Per Hour)	Night % Heavy Vehicles	Speed (km/hr)
23 Avenue - West of AHD - WB	34878	2093	5	388	4	70
23 Avenue - West of AHD - EB	34878	2093	5	388	4	70
23 Avenue - West of 184 Street - WB	33388	2003	5	371	4	70
23 Avenue - West of 184 Street - EB	33388	2003	5	371	4	70
23 Avenue - West of 187 Street - WB	29828	1790	5	331	4	70
23 Avenue - West of 187 Street - EB	29828	1790	5	331	4	70
23 Avenue - West of Riverview Way - WB	19983	1199	5	222	4	70
23 Avenue - West of Riverview Way - EB	19983	1199	5	222	4	70
23 Avenue - West of 195 Street - WB	18448	1107	5	205	4	70
23 Avenue - West of 195 Street - EB	18448	1107	5	205	4	70
23 Avenue - West of 199 Street - WB	13498	810	5	150	4	70
23 Avenue - West of 199 Street - EB	13498	810	5	150	4	70
23 Avenue - West of 203 Street - WB	10183	611	5	113	4	70
23 Avenue - West of 203 Street - EB	10183	611	5	113	4	70
23 Avenue - West of 212 Street - WB	7438	446	5	83	4	70
23 Avenue - West of 212 Street - EB	7438	446	5	83	4	70
199 Street - South of Woodbend Wynd -	36560	2194	3	406	3	60
199 Street - South of 27 Avenue -	36930	2216	3	410	3	60
199 Street - South of 25 Avenue -	38260	2296	3	425	3	60
199 Street - South of 23 Avenue -	36610	2197	3	407	3	60
199 Street - South of 20 Avenue -	32850	1971	3	365	3	60
199 Street - South of 18 Avenue -	30000	1800	3	333	3	60
199 Street - South of Riverview Way -	35240	2114	3	392	3	60
199 Street - South of 13 Avenue -	32680	1961	3	363	3	60
199 Street - West of 209 Street -	24770	1486	3	275	3	60
199 Street - West of 212 Street -	20450	1227	3	227	3	60
Riverview Way - South of 23 Avenue -	19670	1180	3	219	3	60
Riverview Way - South of 20 Avenue -	19820	1189	3	220	3	60
Riverview Way - West of 195 Street -	20130	1208	3	224	3	60
Riverview Way - West of 196 Street -	19500	1170	3	217	3	60
Riverview Way - West of 197 Street -	22720	1363	3	252	3	60
Riverview Way - West of 199 Street -	10120	607	3	112	3	60
Riverview Way - West of 203 Street -	9290	557	3	103	3	60
Riverview Way - West of 209 Street -	7970	478	3	89	3	60
Riverview Way - West of 212 Street -	6440	386	3	72	3	60
215 Street - North of 23 Avenue -	42230	2534	5	469	5	70
215 Street - South of 23 Avenue -	32610	1957	5	362	5	70
215 Street - South of Riverview Way -	28170	1690	5	313	5	70
215 Street - South of 14 Avenue -	27320	1639	5	304	5	70
215 Street - South of 10 Avenue -	25380	1523	5	282	5	70
215 Street - South of CSC2 -	24990	1499	5	278	5	70
215 Street - South of Quadrant Avenue -	37970	2278	5	422	5	70
24 Avenue - West of 199 Street -	13200	792	2	147	2	50
24 Avenue - East of 199 Street -	11450	687	2	127	2	50
187 Street - North of 23 Avenue -	18370	1102	2	204	2	50
203 Street - North of 23 Avenue -	10050	603	2	112	2	50
203 Street - North of 23 Avenue -	10920	655	2	121	2	70
Highway 627 - East of 215 Street - WB	8280	497	4	92	4	70
Highway 627 - East of 215 Street - EB	8280	497	4	92	4	70

Road	Total Volume (vehicles per day)	Day (Vehicles Per Hour)	Day % Heavy Vehicles	Night (Vehicles Per Hour)	Night % Heavy Vehicles	Speed (km/hr)
AHD South of 62 Avenue NB	45540	2620	12.3	693	12.3	100
AHD South of 62 Avenue SB	48176	2772	12.3	733	12.3	100
AHD South of Lessard Road NB	47331	2723	11.5	720	11.5	100
AHD South of Lessard Road SB	48935	2815	11.5	745	11.5	100
AHD East of Cameron Heights Drive NB	48728	2804	11.0	742	11.0	100
AHD East of Cameron Heights Drive SB	50250	2891	11.0	765	11.0	100
AHD South of Terwillegar Drive NB	45841	2637	10.6	698	10.6	100
AHD South of Terwillegar Drive SB	47065	2708	10.6	716	10.6	100
AHD East of Rabbit Hill Road WB	47283	2720	10.0	720	10.0	100
AHD East of Rabbit Hill Road EB	49998	2877	10.0	761	10.0	100
Lessard Road East of AHD EB	7200	414	4.2	110	4.2	60
Lessard Road East of AHD WB	7950	457	4.2	121	4.2	60
Lessard Road West of AHD EB	10150	584	4.8	154	4.8	60
Lessard Road West of AHD WB	8450	486	4.8	129	4.8	60
AHD NB to Lessard Road EB Ramp	3050	175	4.0	46	4.0	70
AHD NB to Lessard Road WB Ramp	3150	181	7.0	48	7.0	70
Lessard Road WB to AHD NB Ramp	3300	190	4.1	50	4.1	70
Lessard Road WB to AHD SB Ramp	3000	173	5.2	46	5.2	60
AHD SB to Lessard Road WB Ramp	3650	210	5.5	56	5.5	70
AHD SB to Lessard Road EB Ramp	1750	101	5.9	27	5.9	70
Lessard Road EB to AHD SB Ramp	3900	224	5.7	59	5.7	70
Lessard Road EB to AHD NB Ramp	3850	222	4.1	59	4.1	60
Cameron Heights Drive South of AHD NB	3450	198	2.0	53	2.0	70
Cameron Heights Drive South of AHD SB	3300	190	2.0	50	2.0	70
Cameron Heights Drive North of AHD NB	3000	173	9.5	46	9.5	60
Cameron Heights Drive North of AHD SB	3500	201	9.5	53	9.5	60
AHD WB to Cameron Heights Drive NB Ramp	1100	63	6.0	17	6.0	60
AHD WB to Cameron Heights Drive SB Ramp	2400	138	2.0	37	2.0	60
Cameron Heights Drive SB to AHD WB Ramp	1950	112	9.9	30	9.9	60
Cameron Heights Drive SB to AHD EB Ramp	1200	69	8.6	18	8.6	60
AHD EB to Cameron Heights Drive SB Ramp	550	32	2.0	8	2.0	60
AHD EB to Cameron Heights Drive NB Ramp	1700	98	12.9	26	12.9	60
Cameron Heights Drive NB to AHD EB Ramp	2750	158	2.0	42	2.0	60
Cameron Heights Drive NB to AHD WB Ramp	500	29	2.0	8	2.0	60
170 Street South of AHD NB	18700	1076	7.4	285	7.4	70
170 Street South of AHD SB	16950	975	7.4	258	7.4	70
Terwillegar Drive North of AHD NB	17800	1024	4.2	271	4.2	70
Terwillegar Drive North of AHD SB	15750	906	4.2	240	4.2	70
AHD NB to Terwillegar Drive NB Ramp	4750	273	8.0	72	8.0	70
AHD NB to 170 Street SB Ramp	4150	239	11.4	63	11.4	70
Terwillegar Drive SB to AHD NB Ramp	4700	270	4.8	72	4.8	70
Terwillegar Drive SB to AHD SB Ramp	4400	253	8.8	67	8.8	70
AHD SB to 170 Street SB Ramp	6150	354	4.2	94	4.2	70
AHD SB to Terwillegar Drive NB Ramp	4900	282	4.3	75	4.3	70
170 Street NB to AHD SB Ramp	4550	262	13.2	69	13.2	70
170 Street NB to AHD NB Ramp	6000	345	5.2	91	5.2	70
156 Street South of AHD NB	16200	932	10.0	247	10.0	60
156 Street South of AHD SB	12400	713	10.0	189	10.0	60
Ellerslie Road East of Gateway Boulevard EB	23340	1343	4	355.3	4	60.0
Ellerslie Road East of Gateway Boulevard WB	23340	1343	4	355.3	4	60.0
Collector Roads	8000	480	3	89	3	60
Residential Streets	200	12	2	2	2	50

Appendix II THE ASSESSMENT OF ENVIRONMENTAL NOISE (GENERAL)

Sound Pressure Level

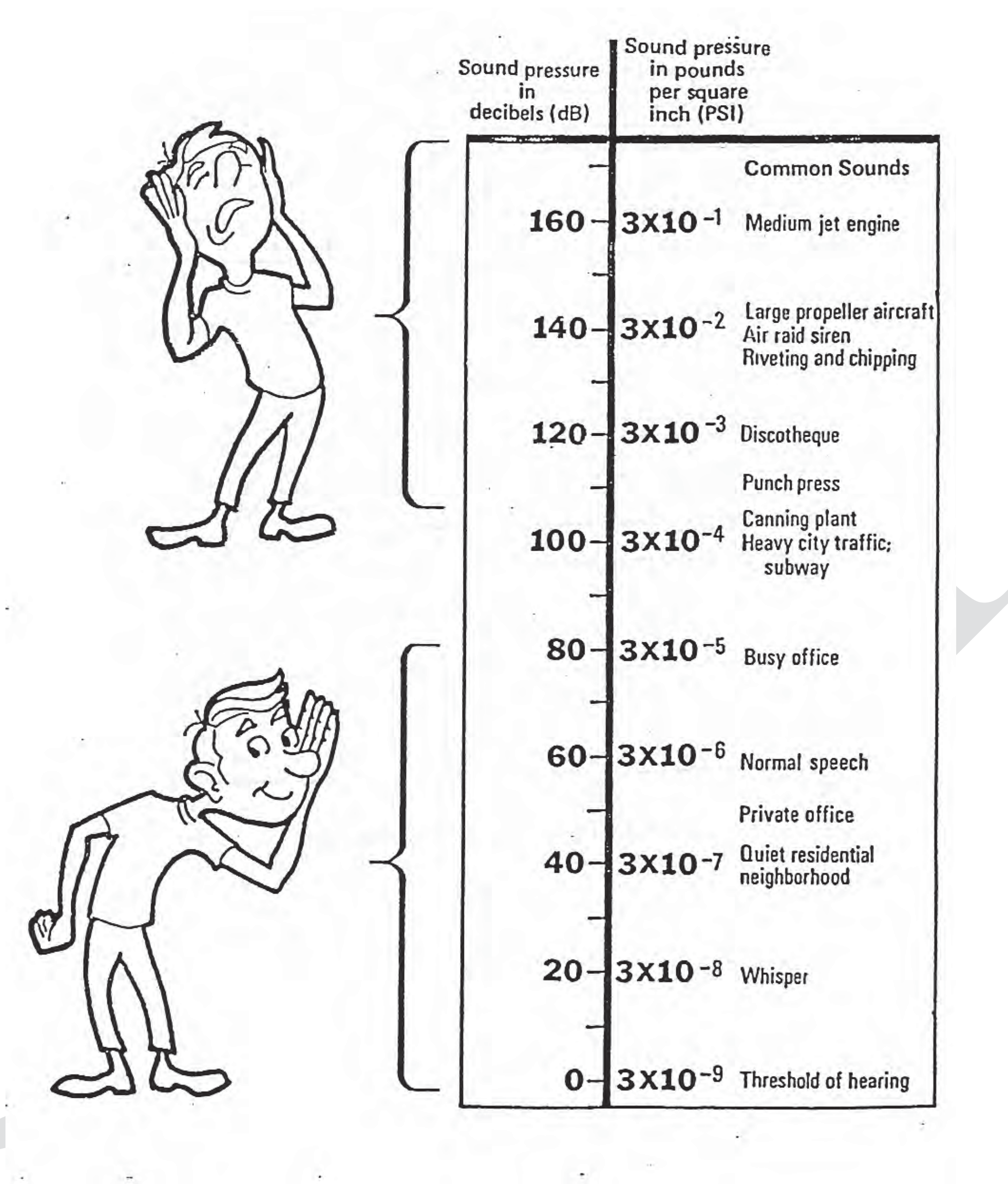
Sound pressure is initially measured in Pascal's (Pa). Humans can hear several orders of magnitude in sound pressure levels, so a more convenient scale is used. This scale is known as the decibel (dB) scale, named after Alexander Graham Bell (telephone guy). It is a base 10 logarithmic scale. When we measure pressure we typically measure the RMS sound pressure.

$$SPL = 10\log_{10}\left[\frac{P_{RMS}^{2}}{P_{ref}^{2}}\right] = 20\log_{10}\left[\frac{P_{RMS}}{P_{ref}}\right]$$

Where: SPL = Sound Pressure Level in dB
P_{RMS} = Root Mean Square measured pressure (Pa)
P_{ref} = Reference sound pressure level ($P_{ref} = 2\text{x}10^{-5}$ Pa = 20 μPa)

This reference sound pressure level is an internationally agreed upon value. It represents the threshold of human hearing for "typical" people based on numerous testing. It is possible to have a threshold which is lower than 20 μPa which will result in negative dB levels. As such, zero dB does not mean there is no sound!

In general, a difference of 1 – 2 dB is the threshold for humans to notice that there has been a change in sound level. A difference of 3 dB (factor of 2 in acoustical energy) is perceptible and a change of 5 dB is strongly perceptible. A change of 10 dB is typically considered a factor of 2. This is quite remarkable when considering that 10 dB is 10-times the acoustical energy!


Sound pressure in decibels (dB)
Sound pressure in pounds per square inch (PSI)
Common Sounds
160 3X10 -1 Medium jet engine
140 3X10 -2 Large propeller aircraft
Air raid siren
Riveting and chipping
120 3X10 -3 Discotheque
Punch press
Canning plant
100 3X10 -4 Heavy city traffic; subway
80 3X10 -5 Busy office
60 3X10 -6 Normal speech
Private office
40 3X10 -7 Quiet residential neighborhood
20 3X10 -8 Whisper
0 3X10 -9 Threshold of hearing

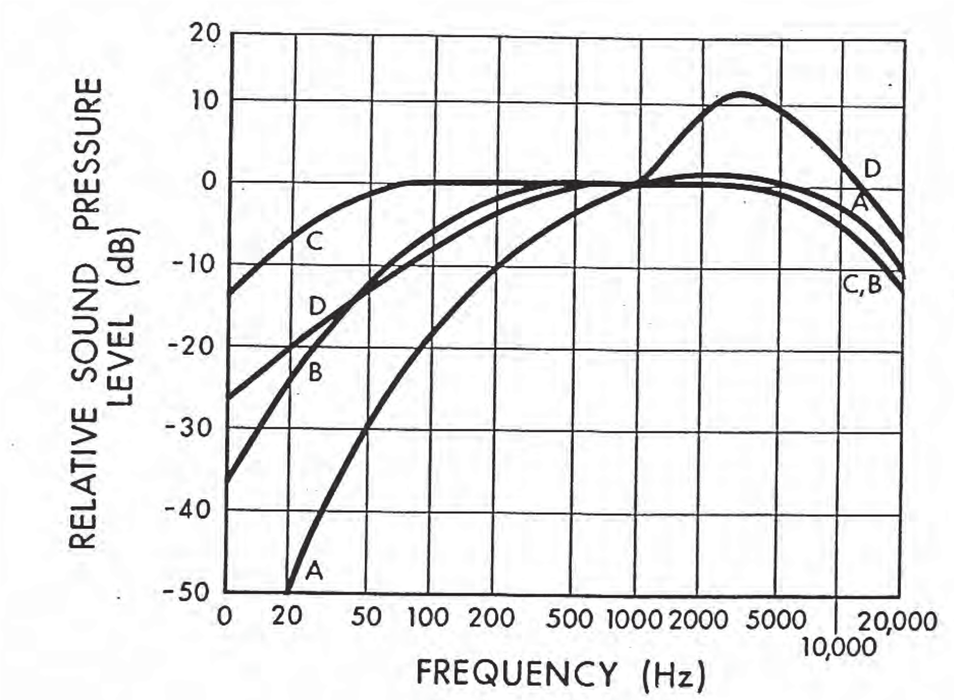
Frequency

The range of frequencies audible to the human ear ranges from approximately 20 Hz to 20 kHz. Within this range, the human ear does not hear equally at all frequencies. It is not very sensitive to low frequency sounds, is very sensitive to mid frequency sounds and is slightly less sensitive to high frequency sounds. Due to the large frequency range of human hearing, the entire spectrum is often divided into 31 bands, each known as a 1/3 octave band.

The internationally agreed upon center frequencies and upper and lower band limits for the 1/1 (whole octave) and 1/3 octave bands are as follows:

Whole Octave Lower Band Limit	Whole Octave Center Frequency	Whole Octave Upper Band Limit	1/3 Octave Lower Band Limit	1/3 Octave Center Frequency	1/3 Octave Upper Band Limit
11	**16**	22	14.1	**16**	17.8
			17.8	**20**	22.4
			22.4	**25**	28.2
22	**31.5**	44	28.2	**31.5**	35.5
			35.5	**40**	44.7
			44.7	**50**	56.2
44	**63**	88	56.2	**63**	70.8
			70.8	**80**	89.1
			89.1	**100**	112
88	**125**	177	112	**125**	141
			141	**160**	178
			178	**200**	224
177	**250**	355	224	**250**	282
			282	**315**	355
			355	**400**	447
355	**500**	710	447	**500**	562
			562	**630**	708
			708	**800**	891
710	**1000**	1420	891	**1000**	1122
			1122	**1250**	1413
			1413	**1600**	1778
1420	**2000**	2840	1778	**2000**	2239
			2239	**2500**	2818
			2818	**3150**	3548
2840	**4000**	5680	3548	**4000**	4467
			4467	**5000**	5623
			5623	**6300**	7079
5680	**8000**	11360	7079	**8000**	8913
			8913	**10000**	11220
			11220	**12500**	14130
11360	**16000**	22720	14130	**16000**	17780
			17780	**20000**	22390

Human hearing is most sensitive at approximately 3500 Hz which corresponds to the ¼ wavelength of the ear canal (approximately 2.5 cm). Because of this range of sensitivity to various frequencies, we typically apply various weighting networks to the broadband measured sound to more appropriately account for the way humans hear. By default, the most common weighting network used is the so-called "A-weighting". It can be seen in the figure that the low frequency sounds are reduced significantly with the A-weighting.



Combination of Sounds

When combining multiple sound sources the general equation is:

$$\Sigma SPL_n = 10\log_{10}\left[\sum_{i=1}^{n} 10^{\frac{SPL_i}{10}}\right]$$

Examples:

- Two sources of 50 dB each add together to result in 53 dB.
- Three sources of 50 dB each add together to result in 55 dB.
- Ten sources of 50 dB each add together to result in 60 dB.
- One source of 50 dB added to another source of 40 dB results in 50.4 dB

It can be seen that, if multiple similar sources exist, removing or reducing only one source will have little effect.

Sound Level Measurements

Over the years a number of methods for measuring and describing environmental noise have been developed. The most widely used and accepted is the concept of the Energy Equivalent Sound Level (L_{eq}) which was developed in the US (1970's) to characterize noise levels near US Air-force bases. This is the level of a steady state sound which, for a given period of time, would contain the same energy as the time varying sound. The concept is that the same amount of annoyance occurs from a sound having a high level for a short period of time as from a sound at a lower level for a longer period of time.
The L_{eq} is defined as:

$$L_{eq} = 10\log_{10}\left[\frac{1}{T}\int_0^T 10^{\frac{dB}{10}}\, dT\right] = 10\log_{10}\left[\frac{1}{T}\int_0^T \frac{P^2}{P_{ref}^2}\, dT\right]$$

We must specify the time period over which to measure the sound. i.e. 1-second, 10-seconds, 15-seconds, 1-minute, 1-day, etc. **An L_{eq} is meaningless if there is no time period associated**.

In general there a few very common L_{eq} sample durations which are used in describing environmental noise measurements. These include:

- L_{eq}24 - Measured over a 24-hour period
- L_{eq}Night - Measured over the night-time (typically 22:00 – 07:00)
- L_{eq}Day - Measured over the day-time (typically 07:00 – 22:00)
- L_{DN} - Same as L_{eq}24 with a 10 dB penalty added to the night-time

Statistical Descriptor

Another method of conveying long term noise levels utilizes statistical descriptors. These are calculated from a cumulative distribution of the sound levels over the entire measurement duration and then determining the sound level at xx % of the time.

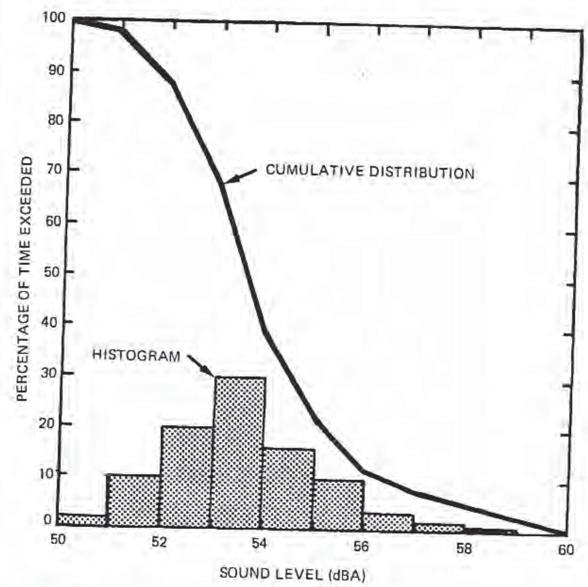


Figure 16.6 Statistically processed community noise showing histogram and cumulative distribution of A weighted sound levels.

Industrial Noise Control, Lewis Bell, Marcel Dekker, Inc. 1994

The most common statistical descriptors are:

L_{min} - minimum sound level measured

L_{01} - sound level that was exceeded only 1% of the time

L_{10} - sound level that was exceeded only 10% of the time.
- Good measure of intermittent or intrusive noise
- Good measure of Traffic Noise

L_{50} - sound level that was exceeded 50% of the time (arithmetic average)
- Good to compare to L_{eq} to determine steadiness of noise

L_{90} - sound level that was exceeded 90% of the time
- Good indicator of typical "ambient" noise levels

L_{99} - sound level that was exceeded 99% of the time

L_{max} - maximum sound level measured

These descriptors can be used to provide a more detailed analysis of the varying noise climate:

- If there is a large difference between the L_{eq} and the L_{50} (L_{eq} can never be any lower than the L_{50}) then it can be surmised that one or more short duration, high level sound(s) occurred during the time period.
- If the gap between the L_{10} and L_{90} is relatively small (less than 15 – 20 dBA) then it can be surmised that the noise climate was relatively steady.

Sound Propagation

In order to understand sound propagation, the nature of the source must first be discussed. In general, there are three types of sources. These are known as 'point', 'line', and 'area'. This discussion will concentrate on point and line sources since area sources are much more complex and can usually be approximated by point sources at large distances.

Point Source

As sound radiates from a point source, it dissipates through geometric spreading. The basic relationship between the sound levels at two distances from a point source is:

$$\therefore SPL_1 - SPL_2 = 20\log_{10}\left(\frac{r_2}{r_1}\right)$$

Where: SPL_1 = sound pressure level at location 1, SPL_2 = sound pressure level at location 2
r_1 = distance from source to location 1, r_2 = distance from source to location 2

Thus, the reduction in sound pressure level for a point source radiating in a free field is **6 dB per doubling of distance**. This relationship is independent of reflectivity factors provided they are always present. Note that this only considers geometric spreading and does not take into account atmospheric effects. Point sources still have some physical dimension associated with them, and typically do not radiate sound equally in all directions in all frequencies. The directionality of a source is also highly dependent on frequency. As frequency increases, directionality increases.

Examples (note no atmospheric absorption):

- A point source measuring 50 dB at 100m will be 44 dB at 200m.
- A point source measuring 50 dB at 100m will be 40.5 dB at 300m.
- A point source measuring 50 dB at 100m will be 38 dB at 400m.
- A point source measuring 50 dB at 100m will be 30 dB at 1000m.

Line Source

A line source is similar to a point source in that it dissipates through geometric spreading. The difference is that a line source is equivalent to a long line of many point sources. The basic relationship between the sound levels at two distances from a line source is:

$$SPL_1 - SPL_2 = 10\log_{10}\left(\frac{r_2}{r_1}\right)$$

The difference from the point source is that the '20' term in front of the 'log' is now only 10. Thus, the reduction in sound pressure level for a line source radiating in a free field is **3 dB per doubling of distance**.

Examples (note no atmospheric absorption):

- A line source measuring 50 dB at 100m will be 47 dB at 200m.
- A line source measuring 50 dB at 100m will be 45 dB at 300m.
- A line source measuring 50 dB at 100m will be 44 dB at 400m.
- A line source measuring 50 dB at 100m will be 40 dB at 1000m.

Atmospheric Absorption

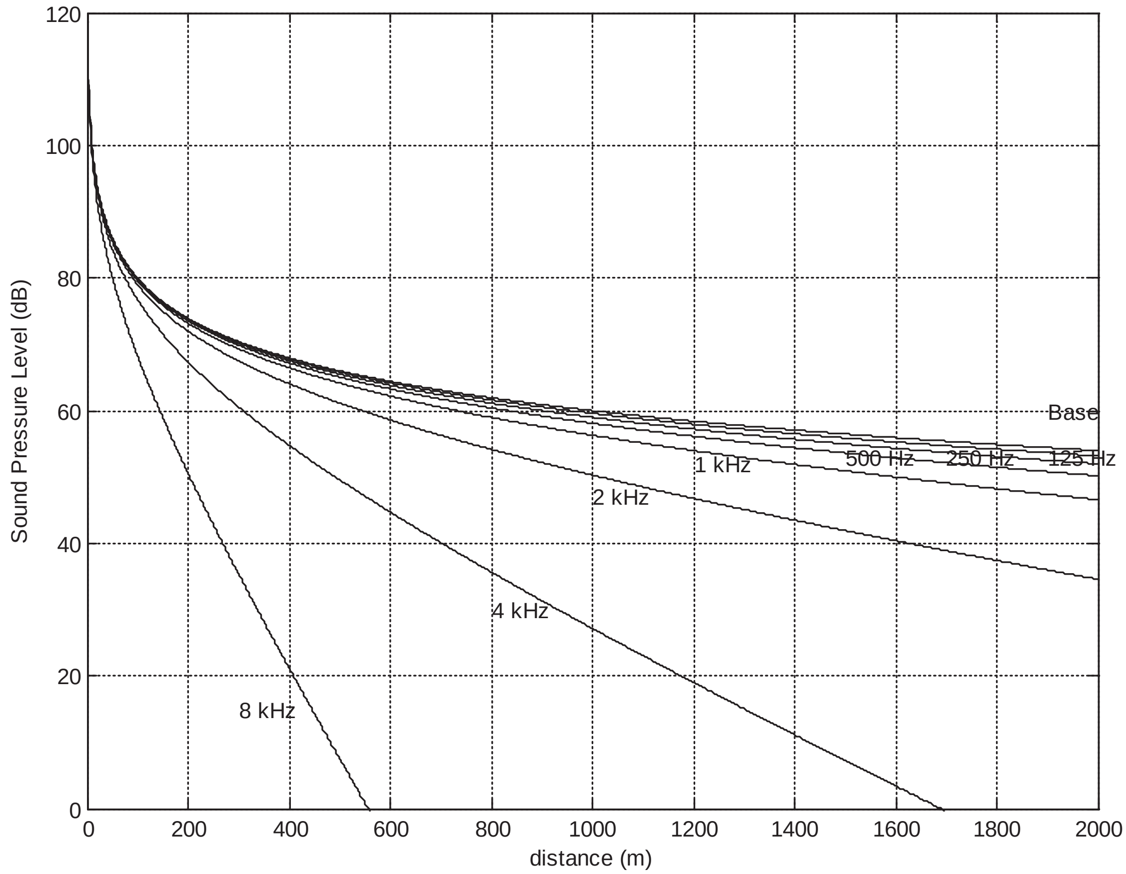
As sound transmits through a medium, there is an attenuation (or dissipation of acoustic energy) which can be attributed to three mechanisms:

1) **Viscous Effects** - Dissipation of acoustic energy due to fluid friction which results in thermodynamically irreversible propagation of sound.
2) **Heat Conduction Effects** - Heat transfer between high and low temperature regions in the wave which result in non-adiabatic propagation of the sound.
3) **Inter Molecular Energy Interchanges** - Molecular energy relaxation effects which result in a time lag between changes in translational kinetic energy and the energy associated with rotation and vibration of the molecules.

The following table illustrates the attenuation coefficient of sound at standard pressure (101.325 kPa) in units of dB/100m.

Temperature °C	Relative Humidity (%)	Frequency (Hz) 125	250	500	1000	2000	4000
30	20	0.06	0.18	0.37	0.64	1.40	4.40
	50	0.03	0.10	0.33	0.75	1.30	2.50
	90	0.02	0.06	0.24	0.70	1.50	2.60
20	20	0.07	0.15	0.27	0.62	1.90	6.70
	50	0.04	0.12	0.28	0.50	1.00	2.80
	90	0.02	0.08	0.26	0.56	0.99	2.10
10	20	0.06	0.11	0.29	0.94	3.20	9.00
	50	0.04	0.11	0.20	0.41	1.20	4.20
	90	0.03	0.10	0.21	0.38	0.81	2.50
0	20	0.05	0.15	0.50	1.60	3.70	5.70
	50	0.04	0.08	0.19	0.60	2.10	6.70
	90	0.03	0.08	0.15	0.36	1.10	4.10

- As frequency increases, absorption tends to increase
- As Relative Humidity increases, absorption tends to decrease
- There is no direct relationship between absorption and temperature
- **The net result of atmospheric absorption is to modify the sound propagation of a point source from 6 dB/doubling-of-distance to approximately 7 – 8 dB/doubling-of-distance (based on anecdotal experience)**



Atmospheric Absorption at 10°C and 70% RH

Meteorological Effects

There are many meteorological factors which can affect how sound propagates over large distances. These various phenomena must be considered when trying to determine the relative impact of a noise source either after installation or during the design stage.

Wind

- Can greatly alter the noise climate away from a source depending on direction
- Sound levels downwind from a source can be increased due to refraction of sound back down towards the surface. This is due to the generally higher velocities as altitude increases.
- Sound levels upwind from a source can be decreased due to a "bending" of the sound away from the earth's surface.
- Sound level differences of ±10dB are possible depending on severity of wind and distance from source.
- Sound levels crosswind are generally not disturbed by an appreciable amount
- Wind tends to generate its own noise, however, and can provide a high degree of masking relative to a noise source of particular interest.

Temperature

- Temperature effects can be similar to wind effects
- Typically, the temperature is warmer at ground level than it is at higher elevations.
- If there is a very large difference between the ground temperature (very warm) and the air aloft (only a few hundred meters) then the transmitted sound refracts upward due to the changing speed of sound.
- If the air aloft is warmer than the ground temperature (known as an *inversion*) the resulting higher speed of sound aloft tends to refract the transmitted sound back down towards the ground. This essentially works on Snell's law of reflection and refraction.
- Temperature inversions typically happen early in the morning and are most common over large bodies of water or across river valleys.
- Sound level differences of ±10dB are possible depending on gradient of temperature and distance from source.

Rain

- Rain does not affect sound propagation by an appreciable amount unless it is very heavy
- The larger concern is the noise generated by the rain itself. A heavy rain striking the ground can cause a significant amount of highly broadband noise. The amount of noise generated is difficult to predict.
- Rain can also affect the output of various noise sources such as vehicle traffic.

Summary

- In general, these wind and temperature effects are difficult to predict
- Empirical models (based on measured data) have been generated to attempt to account for these effects.
- Environmental noise measurements must be conducted with these effects in mind. Sometimes it is desired to have completely calm conditions, other times a "worst case" of downwind noise levels are desired.

Topographical Effects

Similar to the various atmospheric effects outlined in the previous section, the effect of various geographical and vegetative factors must also be considered when examining the propagation of noise over large distances.

Topography

- One of the most important factors in sound propagation.
- Can provide a natural barrier between source and receiver (i.e. if berm or hill in between).
- Can provide a natural amplifier between source and receiver (i.e. large valley in between or hard reflective surface in between).
- Must look at location of topographical features relative to source and receiver to determine importance (i.e. small berm 1km away from source and 1km away from receiver will make negligible impact).

Grass

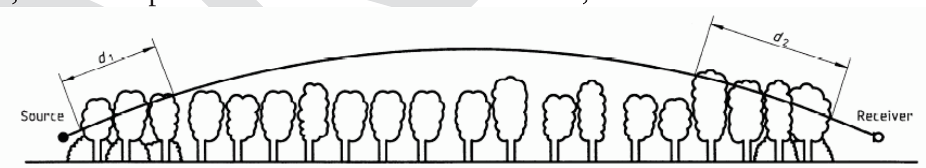
- Can be an effective absorber due to large area covered
- Only effective at low height above ground. Does not affect sound transmitted direct from source to receiver if there is line of sight.
- Typically less absorption than atmospheric absorption when there is line of sight.
- Approximate rule of thumb based on empirical data is:

$$A_g = 18\log_{10}(f) - 31 \qquad (dB/100m)$$

Where: A_g is the absorption amount

Trees

- Provide absorption due to foliage
- Deciduous trees are essentially ineffective in the winter
- Absorption depends heavily on density and height of trees
- No data found on absorption of various kinds of trees
- Large spans of trees are required to obtain even minor amounts of sound reduction
- In many cases, trees can provide an effective visual barrier, even if the noise attenuation is negligible.



NOTE — $d_f = d_1 + d_2$

For calculating d_1 and d_2, the curved path radius may be assumed to be 5 km.

Figure A.1 — Attenuation due to propagation through foliage increases linearly with propagation distance d_f through the foliage

Table A.1 — Attenuation of an octave band of noise due to propagation a distance d_f through dense foliage

Propagation distance d_f	Nominal midband frequency Hz							
m	63	125	250	500	1 000	2 000	4 000	8 000
	Attenuation, dB:							
$10 \leq d_f \leq 20$	0	0	1	1	1	1	2	3
	Attenuation, dB/m:							
$20 \leq d_f \leq 200$	0,02	0,03	0,04	0,05	0,06	0,08	0,09	0,12

Tree/Foliage attenuation from ISO 9613-2:1996

Bodies of Water

- Large bodies of water can provide the opposite effect to grass and trees.
- Reflections caused by small incidence angles (grazing) can result in larger sound levels at great distances (increased reflectivity, Q).
- Typically air temperatures are warmer high aloft since air temperatures near water surface tend to be more constant. Result is a high probability of temperature inversion.
- Sound levels can “carry” much further.

Snow

- Covers the ground for approximately 1/2 of the year in northern climates.
- Can act as an absorber or reflector (and varying degrees in between).
- Freshly fallen snow can be quite absorptive.
- Snow which has been sitting for a while and hard packed due to wind can be quite reflective.
- Falling snow can be more absorptive than rain, but does not tend to produce its own noise.
- Snow can cover grass which might have provided some means of absorption.
- Typically sound propagates with less impedance in winter due to hard snow on ground and no foliage on trees/shrubs.

Appendix III SOUND LEVELS OF FAMILIAR NOISE SOURCES

Used with Permission Obtained from ERCB Guide 38: Noise Control Directive User Guide (February 2007)

Source[1]	Sound Level (dBA)
Bedroom of a country home	30
Soft whisper at 1.5 m	30
Quiet office or living room	40
Moderate rainfall	50
Inside average urban home	50
Quiet street	50
Normal conversation at 1 m	60
Noisy office	60
Noisy restaurant	70
Highway traffic at 15 m	75
Loud singing at 1 m	75
Tractor at 15 m	78-95
Busy traffic intersection	80
Electric typewriter	80
Bus or heavy truck at 15 m	88-94
Jackhammer	88-98
Loud shout	90
Freight train at 15 m	95
Modified motorcycle	95
Jet taking off at 600 m	100
Amplified rock music	110
Jet taking off at 60 m	120
Air-raid siren	130

[1] Cottrell, Tom, 1980, *Noise in Alberta*, Table 1, p.8, ECA80 - 16/1B4 (Edmonton: Environment Council of Alberta).

SOUND LEVELS GENERATED BY COMMON APPLIANCES

Used with Permission Obtained from ERCB Guide 38: Noise Control Directive User Guide (February 2007)

Source[1]	Sound level at 3 feet (dBA)
Freezer	38-45
Refrigerator	34-53
Electric heater	47
Hair clipper	50
Electric toothbrush	48-57
Humidifier	41-54
Clothes dryer	51-65
Air conditioner	50-67
Electric shaver	47-68
Water faucet	62
Hair dryer	58-64
Clothes washer	48-73
Dishwasher	59-71
Electric can opener	60-70
Food mixer	59-75
Electric knife	65-75
Electric knife sharpener	72
Sewing machine	70-74
Vacuum cleaner	65-80
Food blender	65-85
Coffee mill	75-79
Food waste disposer	69-90
Edger and trimmer	81
Home shop tools	64-95
Hedge clippers	85
Electric lawn mower	80-90

[1] Reif, Z. F., and Vermeulen, P. J., 1979, "Noise from domestic appliances, construction, and industry," Table 1, p.166, in Jones, H. W., ed., *Noise in the Human Environment*, vol. 2, ECA79-SP/1 (Edmonton: Environment Council of Alberta).

APPENDIX J

Conceptual Bridge Planning Report &

Additional Communications

Conceptual Bridge Planning Report

E00540A

Conceptual Bridge Planning Report

Wedgewood Creek Crossing
on 199 Street NW
in the City of Edmonton

May 9, 2014

Prepared for:

CIMA+

Terrace Engineering Ltd.

Planning & Engineering
Bridges - Rivers - Roads

Introduction

The overall project involves roadway planning for an upgrade to 199 Street NW in the City of Edmonton in support of a proposed subdivision development by Walton Development and Management, Qualico Communities and Melcor in the area to the south of Wedgewood Creek. For this project Terrace Engineering Ltd. (Terrace) has been retained by CIMA+ to explore conceptual planning for replacement of the existing bridge culvert carrying Wedgewood Creek under 199 Street NW. Terrace has not yet visited the crossing site. Much of the existing site information is derived in part from a report by Golder Associates entitled "Erosion Study of Wedgewood Creek at Edmonton", dated December 2012.

Existing Bridge Culvert

Based on Alberta Transportation infrastructure records, the existing main culvert structure is a 1.8 metre diameter structural plate culvert with a 62.8 metre length built in 1952 and modified in 1968. Based on survey information provided to us by CIMA+, the roadway has an 8 metre clear roadway located about 10 metres above the stream. According to the Golder report referenced in the Introduction, there is also a 1.05 metre diameter overflow culvert located 6 metres above the streambed. The report further identifies that the main culvert has been caged with light mesh to try and address drift and beaver activity concerns. Based on photos and text in the Golder report, the cage is heavily damaged at the culvert inlet and there is a large debris field surrounding the cage. The photos of the outlet show an unsupported hanging culvert outlet bevel, with the bottom of the culvert about a foot above the downstream water level. Based on the age of the culvert, it is expected that the culvert would be replaced at the time of roadway improvements.

Golder Report Information and Recommendations Applicable to 199 Street Crossing

The Golder report carried out an extensive review of Wedgewood Creek within the City of Edmonton. The executive summary and main body of the Golder report identified a number of issues that are relevant to the crossing at 199 Street and many of these are described herein.

Wedgewood Creek is a typical North Saskatchewan River tributary that has its headwaters in the tablelands and then transitions to a deeply incised ravine as it flows towards the river. The Golder report identifies a gross drainage area of 170 km^2 for Wedgewood Creek. There are crossings of Wedgewood Creek on 215 Street, 199 Street, Anthony Henday Drive (AHD) and 184 Street (pedestrian) within the City. With the exception of the 3 span bridges at AHD, these crossings consist of smaller diameter culverts, with 1.8 metre diameter culverts at 215 and 199 Streets and twin 2 metre diameter culverts at 184 Street. Preliminary hydrotechnical investigations by Golder suggest that these existing culvert crossings are undersized for a design flood event, although it is indicated that additional work is required to determine a more accurate design flood discharge before this can be established with certainty. A brief exploration of the hydrotechnical design criteria noted in the Golder report was carried out by Terrace. An examination of the stream characteristics, such as bank height and channel width, as well as a consideration of the stream and culvert conditions at the crossings would suggest that the design flood values stated in the Golder report may be excessively conservative. For purposes of this report, it is assumed that a slightly larger culvert diameter than exists today would likely meet the hydrotechnical needs of the stream. This will need to be verified during detailed design.

However, in contrast to the above, the Golder report recommends that the culvert sizes remain unchanged to continue to provide a benefit to the ecosystem of the valley by providing flow attenuation and sediment retention. To address flow capacity issues, Golder is recommending the use of high elevation bypass culvert(s) to avoid overtopping of the roadway. This concept needs to be given further consideration before implementation as flow hydraulic issues and the culvert fill erosion that would likely occur with high level overflow culvert openings may not be desirable for 1:100 year design flow conditions. A more robust examination of design flow requirements and the resulting design flow value is required to fully assess the overflow culvert concept.

When Golder explored the Wedgewood Creek valley they encountered very high beaver activity levels and strongly recommended support for continued beaver activity. This is somewhat in conflict with the ability of a culvert to function as a conduit for both normal flows and extreme flows of Wedgewood Creek under the roadway. The current culvert inlet is screened to try and keep beaver dams and drift accumulation from blocking the entrance to the culvert, but the existing system is damaged. A more robust drift block cage should be considered if any work is carried out at this crossing so as to preserve the flow capacity of the culvert. We would also recommend that strong consideration be given to removing drift and beaver dam structures at the culvert inlet as a regular maintenance activity to allow the culvert to adequately pass flows under the roadway.

Wildlife Passage

It has been identified by others that wildlife passage opportunities under 199 Street will be a necessary component of any upgrading of 199 Street across the Wedgewood Creek valley. Based on a brief discussion with Bill Harper, Senior Wildlife Biologist with Stantec, it is our understanding that the focal wildlife species is white-tailed deer. He has provided some comments to Terrace and these are as follows:

- The City of Edmonton (2010) includes white-tailed deer as part of the "large terrestrial design group" in their wildlife passage engineering design guidelines. Recommendations for minimum wildlife crossing structure dimensions for large terrestrials is 6 m x 2.4 m, (w x h) or 3.1 m x 3.1 m, with openness index of 1.5 or higher. The openness ratio is calculated by Structure Openness Ratio = (Opening Height x Width)/Length.

- Install wildlife fencing (2.4 m high) to reduce wildlife-vehicle collisions and encourage wildlife use of the structure
- Maximize natural light, but avoid artificial lighting near structure entrances
- Human use reduces animal use, so avoid human trails through crossing structure or separate human trails from wildlife pathways.
- Reduce traffic noise inside structure and at structure entrances

Obviously an open bridge type structure can be easily designed to accommodate wildlife passage in addition to stream flows. However, this is more challenging when a very long culvert structure is required for the stream flows. Based on a brief review by Terrace, it appears that a reasonable and cost effective option to handle wildlife passage for the culvert option is to consider utilizing a separate structure for wildlife located just below the roadway surface so as to reduce overall structure length and maximize the openness.

Geotechnical Considerations

The 199 Street crossing is located across a deeper incised valley carrying Wedgewood Creek. These types of valley crossings often have geotechnical issues and considerations that affect the size and length of bridge and culvert structures, and may affect the type of structure recommended for the crossing. During our review of the site, there appears to be a possibility that a surface slide affected the sideslope of the existing culvert embankment at some point in its life. It is recommended that a geotechnical engineering study be undertaken to identify and quantify the geotechnical issues that may affect the crossing alternatives. This study should identify areas of geotechnical concern and provide reasonable assumptions for embankment slopes that can be considered for different crossing alternatives at the preliminary stage. This study should also identify future work that would be required to confirm and refine the geotechnical input that may be required for replacement and/or modifications to the crossing. In the absence of such a study, fill slopes of 3H:1V will be used to assess conceptual options with the understanding that geotechnical advise and direction will be utilized by the project proponent at a later date.

Roadway Improvement Options

The roadway improvements being developed by CIMA+ will bring the existing two lane rural roadway to a four lane divided urban arterial standard. In addition, a multi-use trail is proposed for the west side of the roadway, with a standard sidewalk on the east side. Improvements to the vertical curvature of the roadway are being considered that would raise the roadway one to two metres higher and improve the sag curve through the valley.

Wedgewood Creek Crossing Options

Several options for the crossing were considered and these options needed to address both Wedgewood Creek flows as well as wildlife passage. In general there are three types of solutions that have been identified:

- Bridge structure with or without large abutment walls
- Oversized culvert structure suitable for wildlife passage in addition to stream flows
- Culvert sized only for stream flows and a separate wildlife passage structure

The bridge structure concept has a number of issues which affect the practicality of this structure type. The high fill height results in a very long bridge, and the very large skew between the roadway alignment and the creek valley alignment makes the bridge even longer. The geotechnical stability of the valley may affect the design of the headslope and/or retaining walls and affect the size of the bridge. In addition, the Golder report recommended a culvert type structure to provide flow attenuation and sediment retention, which is not achieved with a bridge. One of the largest concerns affecting the practicality is the cost of implementing this type of solution, with additional costs in the order of $18 million compared to other feasible options.

For a bridge option, using large abutment walls or a normal headslope configuration is something that will need to be determined during more detailed design. For costing purposes at this conceptual stage a unit cost multiplied by the out to out of fills and the overall width of the bridge structure will give a representative cost. Details are as follows:

- $5500/m^2 unit cost for high bridge
- 3:1 headslopes, a 5 m bedwidth, a 6 m wildlife passageway, an average deck height of 13.5 m and a skew of 40 degrees results in an out to out of fills of 120 m
- bridge width comprises of 20.9 of roadway width, a 1.5 m sidewalk, a 4.2 m multi-use trail width (incorporating 0.6 m shy to barriers) and 4 barriers with a width of 0.5 m each resulting in an overall width of 28.6 m
- allocation of $0.2 million for removal of the existing culvert structure
- cost allowance for contingencies and engineering set at 30% additional

Thus the conceptual bridge cost is estimated to be in the order of **$25 million**.

An oversized culvert option will also have a large cost component due to its size and length. A typical culvert with the roadway fills sloping down to the bottom of the valley is not really practical for wildlife passage due to the length of culvert through which the wildlife will need to travel. A 150 m long culvert would require an opening of 45 m wide by 5 m high to achieve the required openness ration, which is not practical. Building retaining walls to shorten the culvert sufficiently for wildlife passage is likely not feasible due to geotechnical stability and cost issues. This option is not considered further within this report.

The conceptual option which shows the most promise is the use of a culvert that is sized for stream flows, with a separate wildlife passage structure higher up on the slope. The stream culvert would be built to the skew of the valley and the wildlife passageway would be built square to the roadway so as to minimize the length of structure through which wildlife must pass. The wildlife passage structure could be either a bridge type structure or a box culvert type structure. This option is explored in more detail following and is shown conceptually on Figures 1 and 2.

In order to develop this concept a number of assumptions needed to be made. Firstly it was assumed that 3:1 sideslopes are geotechnically feasible for the culvert. It was also assumed that a 2.4 m diameter culvert is sufficiently large to ensure flow capacity. Thirdly it was assumed that the use of some sort of debris catcher at the culvert inlet, combined with regular drift and beaver dam removal at the inlet, would be provided so as to maintain flow capacity. Fourthly it was assumed that a separate underpass structure located higher up on the slope would meet the needs for wildlife passage and that it would need to be quite large to meet the openness ratio requirements.

For costing purposes at this conceptual stage, the wildlife passage bridge cost can be determined using a unit cost multiplied by the out to out of fills and the overall width of the bridge structure. The stream culvert can be determined using a unit cost multiplied by the circumference and length to develop a representative cost. Details are as follows:

- $4500/m^2 unit cost for simple passageway bridge
- bridge width comprises of 20.9 of roadway width, a 1.5 m sidewalk, a 4.2 m multi-use trail width (incorporating 0.6 m shy to barriers) and 4 barriers with a width of 0.5 m each resulting in an overall width of 28.6 m
- 2:1 headslopes, an average deck height of 5 m (3.5m opening height), a 6 m bottom width (average 13 m wide opening at mid-height) results in an out to out of fills of 26 m and an opening ratio of 1.6
- wildlife bridge cost without contingency is $3.35 million
- $800/m^2 unit cost for culvert under high fill, excluding fill cost
- 2.4 m diameter SPCSP culvert (7.5 m circumference)
- 150 m culvert length along 45 degree skew
- stream culvert cost without contingency $0.9 million
- allocation of $0.2 million for removal of the existing culvert structure
- allocation of $0.3 million for fill and road work above culvert
- allocation of $0.2 million for additional environmental mitigation
- allocation of $0.1 million for drift catcher and riprap
- cost allowance for contingencies and engineering set at 30% additional

Thus the option with a culvert and separate wildlife passageway structure is estimated to cost in the order of **$7 million**.

These order of magnitude cost estimates are highly dependent upon site specific bridge/culvert geotechnical input, which has not yet been carried out. Obtaining such input will greatly assist in refining the configuration and cost.

Next Steps

This conceptual Bridge Planning Report is intended to assist in the development of an acceptable solution for crossing Wedgewood Creek and the valley. It is preliminary in nature and is subject to change and refinement as the design work progresses. Upon acceptance or refinement of the conceptual design, additional engineering work should be undertaken to design the crossing including geotechnical and hydrotechnical studies.

Closure

This study has been prepared exclusively for CIMA+ for the Conceptual Bridge Planning associated with the Wedgewood Creek Crossing on 199 Street NW in the City of Edmonton. The information and data contained herein represent our professional judgement in light of the knowledge and information available to us at the time of preparation. The information in this report is conceptual and preliminary in nature. It is therefore subject to change and refinement as the design work progresses and should not be relied upon without additional engineering design.

Except as required by law, this study and the information and data contained herein are to be treated as confidential and may be used and relied upon only by the client, who is restricted to using this information only for the purpose for which it was intended. We deny any liability whatsoever to other parties who may obtain access to this study for any injury, loss or damage suffered by such parties arising from their use of, or reliance upon, this study or any of its contents. Any use of this study by third parties, or any reliance or decisions based on it, are the responsibility of such third parties.

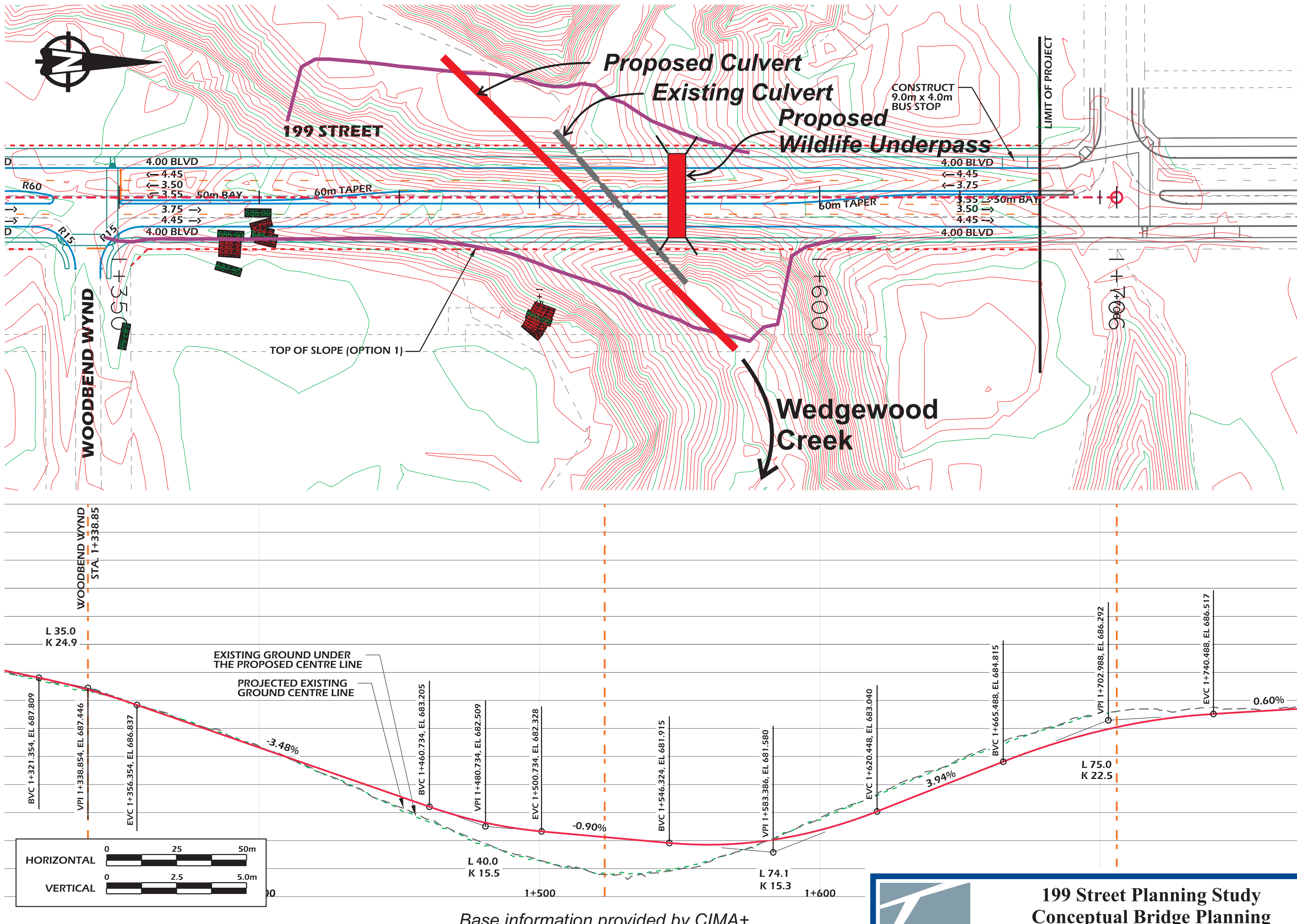
Respectfully submitted,

Terrace Engineering Ltd.

Permit to Practice Number: P 6715

Submitted in draft form: May 9, 2014
Finalized without modification: November 25, 2014

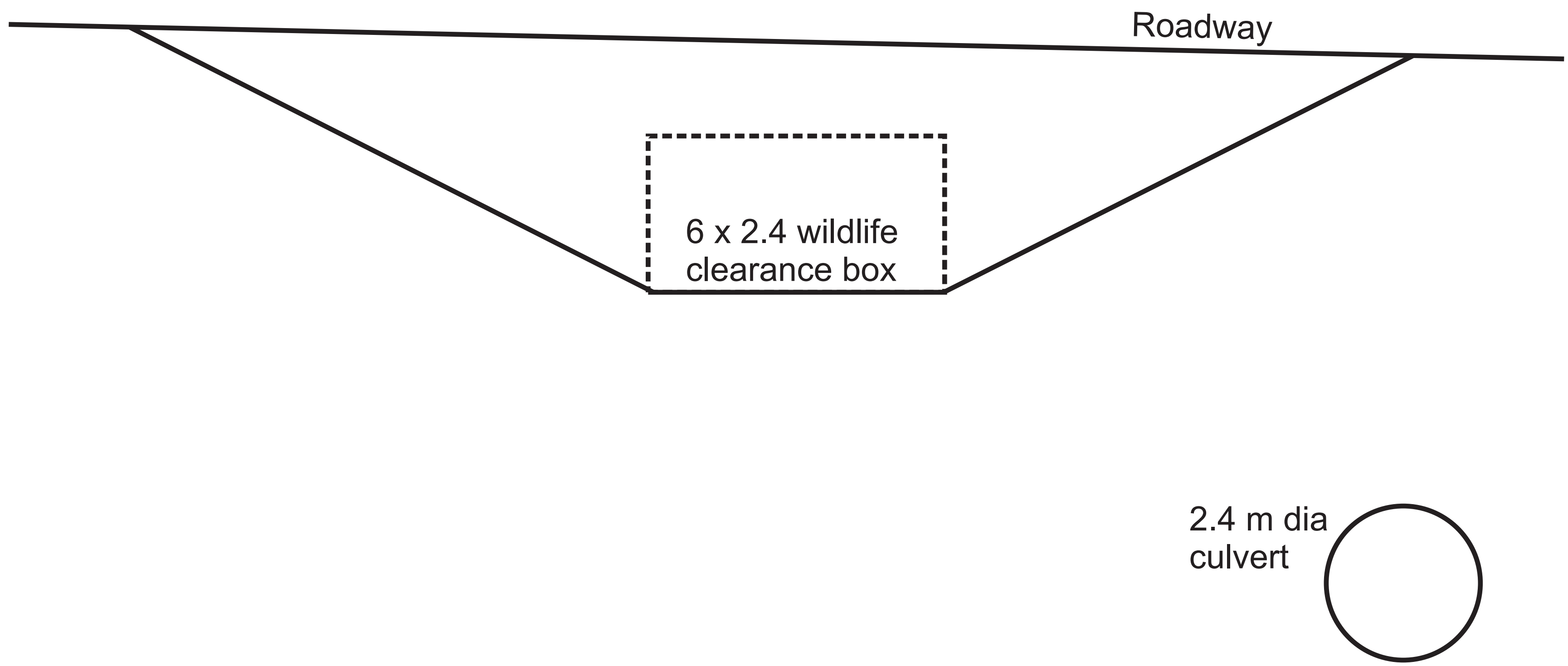
FIGURES



Terrace Engineering

199 Street Planning Study
Conceptual Bridge Planning
Culvert / Wildlife Structures

Figure 1



Terrace Engineering

199 Street Planning Study
Conceptual Bridge Planning
Culvert / Wildlife Structures
Figure 2

Additional Communications

Wildlife Passage Design Recommendations—199 Street Widening Project Within the Riverview Neighborhood

Prepared for:
Riverview Owners Group
(Qualico Communities, Walton
Development and Management
LP, Melcor Developments Ltd,
and Sunwapta Holdings
Corporation)

Prepared by:
William L. Harper, R.P.Bio.

May 20, 2014

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Appendix A Fish and Wildlife Species Summary Report (AESRD 2014)

1.0 BACKGROUND

Stantec Consulting Ltd. (Stantec) was retained by Riverview Owners Group (the Client) to provide environmental consulting services and recommendations for wildlife passage as part of the 199 Street Widening within the Riverview Neighbourhood 2 (the project). In an effort to minimize the impacts on wildlife movement from transportation infrastructure, the City of Edmonton commissioned the development of the Wildlife Passage Engineering Design Guidelines (WPEDG) (City of Edmonton 2010). The objective of these guidelines is to reduce human-wildlife conflict through improved awareness, safety, and collision reduction while also aiding in the maintenance of habitat connectivity and reduced genetic isolation.

The 199 Street Concept Planning Report determined that 22% of all vehicle collisions and 30% of collisions at midblocks (between intersections) were animal-vehicle collisions (CIMA 2014). These were attributed to the presence of white-tailed deer in the project area and the lack of wildlife passage across 199 Street at the Wedgewood Ravine (CIMA 2014).

As part of the Riverview Neighbourhood 2 development, 199 Street will be widened. The widened road, along with projected increases in traffic volume and vehicle speed, will increase the barrier effect of the road on wildlife. For these reasons, and to reduce animal-vehicle collisions, provisions for a wildlife crossing structure were considered.

2.0 PROPOSED LOCATION OF THE 199 STREET WILDLIFE CROSSING STRUCTURES

To support the development of residential neighbourhoods, 199 Street will be widened. Wildlife passage will be required as part of the road design to maintain permeability for wildlife movements.

Within the project area, 199 Street NW bisects Wedgewood Ravine approximately 150 m south of 35 Avenue (Figure 1). Wedgewood Ravine is a major ecological feature that provides both key habitat for many wildlife species and important corridors and linkages to adjacent agricultural areas, wetlands, Natural Areas, and Environmentally Sensitive Area (Ecoventure 2013).

The proposed location for the wildlife crossing structures (Figure 1) was identified as a potential location for a wildlife crossing in the Ecological Network Report (Ecoventure 2013).This ravine was also identified as a suitable location for wildlife crossing structures based on preliminary engineering considerations (Greg Eitzen, Terrace Engineering, pers. comm., 5 February 2014).

3.0 OBJECTIVES

Stantec understands that the City of Edmonton has requested specific details pertaining to wildlife passage associated with the Project at the concept stage to allow for early planning and incorporation of the ecological features into the ultimate design. In that context, the objectives of this report are:

- To identify wildlife that are present or likely to occur in the area
- To categorize wildlife in the area according to the Ecological Design Groups (EDGs) outlined in the WPEDG
- To identify target EDGs for wildlife passage mitigation
- To provide recommendations to mitigate the potential adverse effects to wildlife passage resulting from the Project

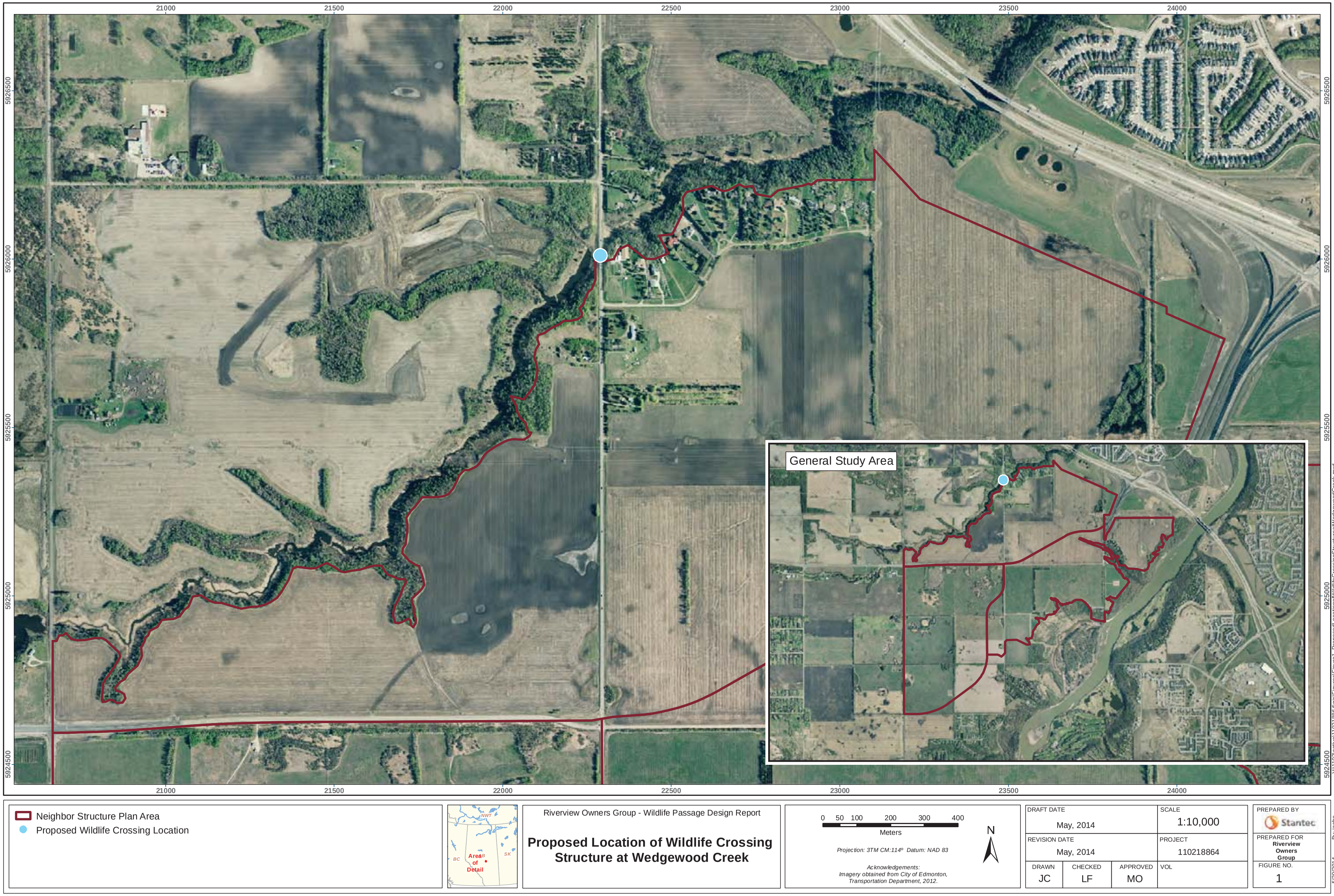
4.0 METHODS

Identification of wildlife present or likely to occur in the project area was based the Riverview Ecological Network Report (Ecoventure 2013), a search of the Fisheries and Wildlife Management Information System (FWMIS) database, and a wildlife snow-tracking survey (Stantec 2014). The wildlife species known or likely to occur in the area were then assigned to EDGs. Consistent with the WPEDG, the EDGs identified for the project area were then assessed to identify appropriate measures to mitigate adverse effects of widening 199 Street in the project area.

5.0 WILDLIFE SPECIES PRESENT AND ECOLOGICAL DESIGN GROUPS

5.1 FISH AND WILDLIFE PRESENT IN THE PROJECT AREA

A search of the FWMIS database (AESRD 2014) was performed on May 19, 2014, to identify previously recorded species occurrences in the vicinity of the project area. The search was conducted using a maximum 2 km radius from the proposed wildlife crossing. The results of an electrofishing survey of Wedgewood Creek are available for a location approximately 1800 m northeast of the project area (AESRD 2014). Two fish species, brook stickleback (*Culaea inconstans*) and fathead minnow (*Pimephales promelas*) were confirmed in Wedgewood Creek downstream of the project area in 2009 (Appendix A). No wildlife inventory records were identified within 2 km of the proposed wildlife crossing.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22500
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24000
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5925500
5926000
5926500
Neighbor Structure Plan Area
Proposed Wildlife Crossing Location
NWT
BC
SK
Area of Detail
Riverview Owners Group - Wildlife Passage Design Report
Proposed Location of Wildlife Crossing Structure at Wedgewood Creek
0 50 100 200 300 400
Meters
Projection: 3TM CM:114° Datum: NAD 83
Acknowledgements:
Imagery obtained from City of Edmonton, Transportation Department, 2012.
N
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5/20/2014
By: jacho

A wildlife snow-tracking survey conducted four kilometres south of Wedgewood Creek in March 2014 (Stantec 2014) identified six species of wintering mammals in the Project area: white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), least weasel (*Mustela nivalis*), snowshoe hare (*Lepus americanus*), and red squirrel (*Tamiasciurus hudsonicus*). Sets of deer tracks were the most abundant (n = 78), followed by snowshoe hare (n = 73), coyote (n = 41), red squirrel (n = 8), red fox (n = 3), unspecified microtine (voles, shrews and mice, n = 3), and least weasel (n = 3) (Stantec 2014).

5.2 ECOLOGICAL DESIGN GROUPS

EDGs are groupings of species that share characteristics that should be taken into account in wildlife passage planning and design. There are 11 EDGs: Large Terrestrial, Medium Terrestrial, Small Terrestrial, Amphibians, Aerial Mammals, Aquatic Species, Scavenger Birds, Birds of Prey, Water Birds, Ground Dwelling Birds, and Other Birds (City of Edmonton 2010).

The Ecological Network Report (Ecoventure 2013) identified a number of wildlife species likely to occur in association with the aspen and willow communities present in the project area (e.g., red-tailed hawk (*Buteo jamaicensis*), least flycatcher (*Empidonax minimus*), Baltimore oriole (*Icterus galbula*), red-eyed vireo(*Vireo olivaceus*), yellow warbler(*Dendroica petechia*), white-tailed deer, snowshoe hare, northern pocket gopher (*Thomomys talpoides*), and North American porcupine (*Erethizon dorsatum*). Based on this information, the FWMIS search, and the wildlife snow-tracking survey, one or more species within all 11 EDGs are predicted to occur in the project area.

Passage requirements for the Large Terrestrial, Medium Terrestrial, and Small Terrestrial EDGs are addressed in a below-grade dry culvert (Section 6.1). Passage requirements for the Medium Terrestrial, Small Terrestrial, Amphibian, and Aquatic Species EDGs are addressed in a modified drainage culvert (Section 6.2). Passage requirements for the Aerial Mammals, Scavenger Birds, Birds of Prey, Ground Dwelling Birds, Water Birds and Other Birds EDGs are addressed above-grade in the Recommendations for Reducing Bird and Bat Vehicle Collision Risk (Section 7.0).

6.0 WILDLIFE PASSAGE DESIGN RECOMMENDATIONS

Based on the WPEDG and the EDGs, it was identified that two below-grade crossing structures would be required for this area to accommodate terrestrial EDGs. A relatively large open-bottom arch culvert is proposed to accommodate the Large and Medium Terrestrial EDGs and a modified drainage culvert is proposed to accommodate the other terrestrial and aquatic EDGs. The smaller culvert would also accommodate water drainage from the Wedgewood Creek under 199 Street.

6.1 LARGE AND MEDIUM TERRESTRIAL WILDLIFE BELOW-GRADE CROSSING STRUCTURE: TYPE, SIZE AND LOCATION

Based on the WPEDG and the EDGs identified for the project area, a below-grade crossing will be required to accommodate Large Terrestrials EDG species (particularly white-tailed deer). A wildlife crossing structure designed for Large Terrestrial species will also accommodate species in the Medium Terrestrial and Small Terrestrial EDGs.

For the Large Terrestrials EDG, open bottom culverts are preferred over closed bottom culverts because species in this EDG prefer large open structures (City of Edmonton 2010). Open bottom culverts also maintain the existing soil surface. For this project, an open bottom arch dry culvert separate from the drainage culvert (see Section 6.2) is recommended since it can provide a large open structure with reduced length as it can be located higher on the fill slope to better accommodate white-tailed deer that are common in the project area.

An analysis of the effectiveness of wildlife crossing structures in Utah suggests they should be designed to be as short as possible. Schwender (2013) found that within a multivariate regression model, culvert length outperformed all other parameters, and culvert width and length together were the best predictors of successful mule deer passage. Cramer (2012) felt that when considering the metrics of wildlife crossing design, length was the most important factor, followed by width, and height was the least important consideration. Based on this analysis, Cramer (2012) recommended keeping wildlife underpasses under 37 m long.

Although measures of a structure’s width, height and length are important considerations in designing wildlife structures, Clevenger and Huijser (2011) do not recommend the use of an openness index during planning and design. They believe that underpass dimensions should be used in conjunction with other structural and environmental factors when designing appropriate wildlife crossing structures.

The 199 Street Concept Planning Report recommend designing a “structure for wildlife located just below the roadway surface so as to reduce overall structure length and maximize the openness” (Appendix G in CIMA 2014). The current conceptual design proposes an open bottom culvert 6 m x 4 m x 65 m (width x height x length) (Figure 2; CIMA 2014). As proposed this design is likely too long to allow effective passage of Large Terrestrials EDGs (e.g., white-tailed deer).

The length of the crossing structure should be shortened to facilitate its use by Large Terrestrial wildlife species. The length of the structure could be addressed in a number of ways, including:

- adjusting the position of the structures so it crosses the roadway at right angles
- divide the roadway and construct two shorter crossing structures
- increasing the use of wing-walls

Culvert length has been shown to be the strongest predictor for deer use of underpasses (Schwender 2013; Clevenger and Waltho 2005). Although wildlife crossing structures with smaller openings (6 m wide x 3.4 m high) have been found to be effective for mule deer (*Odocoileus hemionus*) in Wyoming, these structures were only 18 m long (Sawyer and LeBeau 2011).

Clevenger and Huijser's (2011) general guidelines recommend a width of >12 m and height of >4.5 m for large mammal underpasses. Preliminary design of this crossing structure should consider increasing the opening dimensions to these recommended dimensions to better address the long length of this structure.

To facilitate deer passage, approaches to both entrances should not exceed a 1:3 slope.

6.2 SMALL TERRESTRIAL AND AQUATIC WILDLIFE BELOW-GRADE CROSSING STRUCTURE: TYPE, SIZE AND LOCATION DESIGN

Based on the WPEDG and the EDGs identified for the project area, an additional below-grade crossing in conjunction with the drainage culvert will be required to accommodate Small Terrestrial, Amphibian, and Aquatic Species in the project area.

The 199 Street Concept Planning Report assumes "a slightly larger culvert diameter than exists today would likely meet the hydrotechnical needs of the stream" (CIMA 2014). Preliminary and detailed designs also need to address the passage needs for fish, amphibian and small terrestrial mammal using Wedgewood Creek.

Conceptual Design
Crossing Structure
Other Feature

Riverview Owners Group - Wildlife Passage Design Report

Conceptual Design of Wildlife Crossing Structure at Wedgewood Creek

0 5 10 20 30 40
Meters

N

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
Imagery obtained from City of Edmonton, Transportation Department, 2012.

DRAFT DATE			SCALE	PREPARED BY
May, 2014			1:1,000	Stantec
REVISION DATE			PROJECT	PREPARED FOR
May, 2014			110218864	Riverview Owners Group
DRAWN	CHECKED	APPROVED	VOL	FIGURE NO.
JC	LF	MO		2

V:\1102\active\110218864\gis\Figures\Figure2_ConceptualDesignofWildlifeCrossingStructureatWedgewoodCreek.mxd
5/20/2014 By: jacho

Installation of an appropriately-sized concrete box or round culvert is recommended in order to be consistent with other similar crossings completed within the City of Edmonton. This structure will conform to Kintsch and Cramer's (2011) "Class 1 Small Underpass", which includes drainage culverts. According to their system, this type of culvert has the potential to provide passage for the species movement guilds that include the target EDGs at this site, Small Terrestrial, Amphibians and Aquatic Species. This type of structure is considered to be adequate to allow passage of small-sized animals (City of Edmonton 2010; Clevenger and Huijser 2011; Phillips et al. 2012).

Aquatic Species EDGs are particularly sensitive to poorly designed crossing structures (City of Edmonton 2010). Issues of increased water velocity and poorly embedded structures can create a barrier to upstream movement of aquatic species. The concrete box structure should be sized and positioned appropriately to minimize flow velocities, avoid confining the channel, and be sufficiently embedded in the stream channel to provide a natural substrate at the bottom of the culvert.

The concrete box structure has an advantage over round culverts since it can be more easily modified with the addition of raised platforms to allow "dry passage" of wildlife when water is flowing in the culvert. There are also options for installation of shelves in round culverts that will allow "dry passage" of small mammals.

6.3 DETAILED DESIGN

The recommended wildlife passage design for 199 Street at Wedgewood Creek includes construction of two new below-grade crossing structures for terrestrial EDGs. As this project is just at the concept design stage, specific recommendations pertaining to wildlife passage measures and other general mitigation measures are provided below but will likely need to be refined at the detailed design stage.

- The large below-grade crossing should be designed for the largest of the Large Terrestrials EDG, in this case white-tailed deer. By designing for this group, the majority of the other EDGs should be able to use the crossing.
- The small below-grade crossing should address the fish passage needs by 1) minimizing flow velocities, 2) avoiding channel confinement, and 3) being sufficiently embedded in the stream channel to provide a natural substrate and prevent culvert perching.
- The small below-grade crossing should be modified with the addition of raised platforms to allow for dry passage of small-sized animals when water is flowing through the culvert.
- Natural substrate and native vegetation should be present at the approaches to both wildlife crossing structures. These will create a more natural appearance around the structure and, for smaller EDGs, provide security cover from predators. Rip-rap used at the entrances of the drainage culvert should be the smallest possible to prevent erosion. Debris grates should not be installed.

- Wildlife exclusion fencing should be considered in the area of the ravine, both to encourage wildlife use of the crossing structures, and to mitigate wildlife-vehicle collisions should this become an issue.
- Wildlife-friendly lighting with reduced spill and glare should be incorporated in the final design of the road. Street lighting design should avoid illuminating the entrances of the wildlife crossing structures and nearby natural features.

7.0 RECOMMENDATIONS FOR REDUCING BIRD AND BAT VEHICLE COLLISION RISK

For the avian and Aerial Mammals (i.e., bat) EDGs, it is recommended that diversionary methods be incorporated to direct the flight of the birds and bats up and over the road as these species rarely use below grade crossing structures. The following above-grade mitigation measure is recommended to reduce the risk of collisions between vehicles and the Aerial Mammals, Scavenger Birds, Birds of Prey, Water Birds and Other Birds EDGs as they fly over 199 Street:

- Use natural vegetation and tree plantings to direct the flight paths of birds and bats higher over the road, above the traffic (Tremblay 2006). This measure will also minimize the reduction in habitat created by the road right-of-way, and maintain the aesthetics of the area. To accomplish this measure, clearing of trees and vegetation should be minimized along 199 Street and tree plantings should be designed to grow taller than the highest vehicles using the road.

8.0 CLOSURE

This document entitled *Wildlife Passage Design Recommendations—199 Street Widening Project within Riverview Neighbourhood 2* was prepared by Stantec Consulting Ltd. for the account of Riverview Owners Group. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report

Stantec has endeavored to incorporate the principles of the WPEDG into the 199 Street wildlife passage design and the constraints associated with the physical site characteristics and available materials. We trust that this information is sufficient to support the submission of the initial concept and understand further refinement will be required as design progresses.

Respectfully submitted,

STANTEC CONSULTING LTD.

Reviewed by:

Bill Harper, R.P.Bio.
Senior Wildlife Biologist

Colleen Bryden, R.P.Bio.
Principal, Environmental Services

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Appendix A
Fish and Wildlife Species Summary Report
(AESRD 2014)

Alberta Environment and Sustainable Resource Development

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Created: 19-May-2014 08:15

Species present within the current extent :

Fish Inventory	Wildlife Inventory
BROOK STICKLEBACK	No records found.
FATHEAD MINNOW	

Buffer Extent

Centroid (X,Y):	Projection	Centroid: (Qtr Sec Twp Rng Mer)	Buffer Radius:
588723, 5922668	10-TM AEP Forest	NW 5 52 25 4	2 kilometers

Wildlife Contact Information

Primary Contact

Name: Curtis Stambaugh **Phone:** 780-778-7116 **Email:** Curtis.Stambaugh@gov.ab.ca **Town:**

Alternative

Name: **Phone:** **Email:** **Town:**

Fisheries Contact Information

Primary Contact

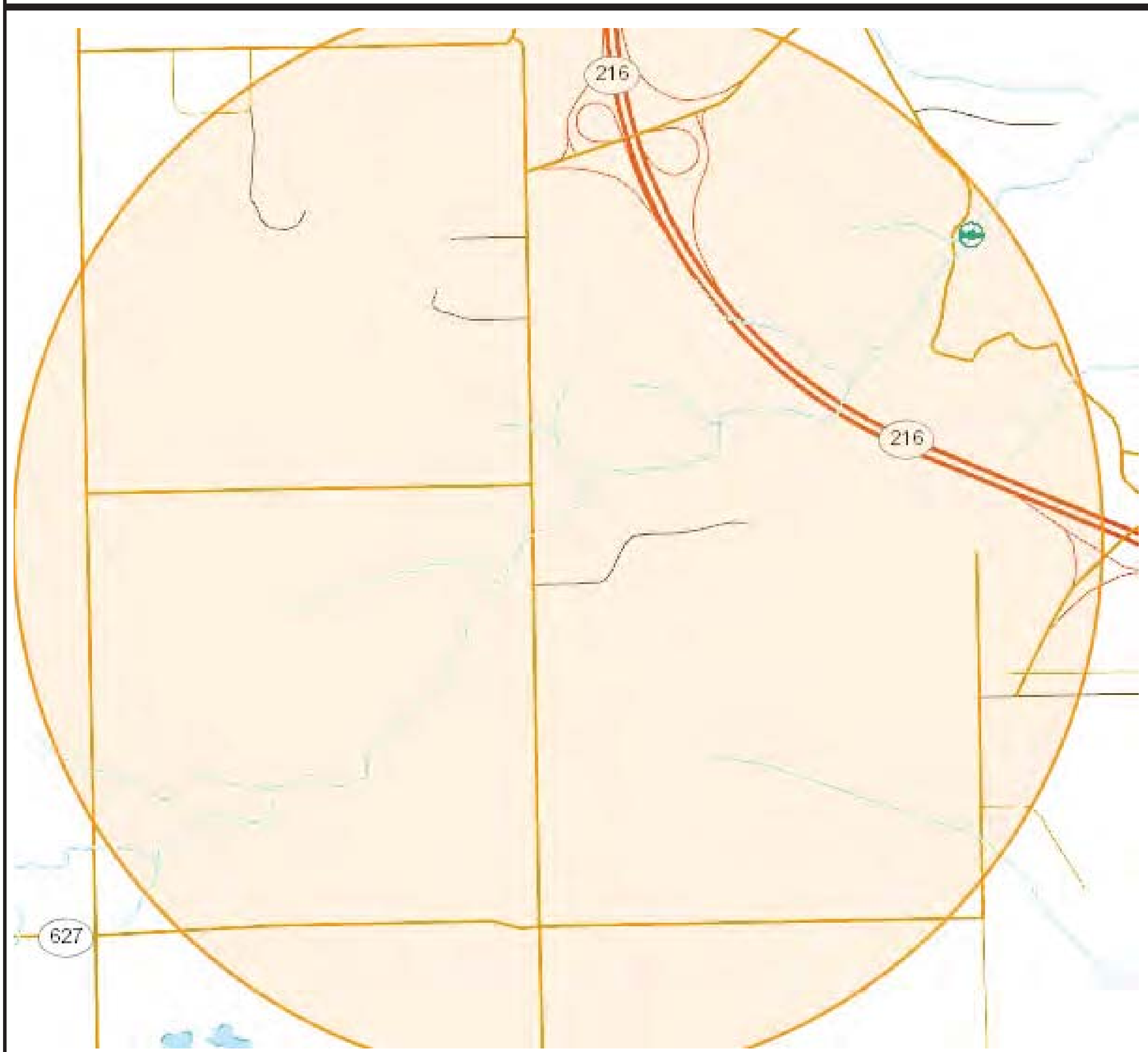
Name: Owen Watkins **Phone:** 780-960-8189 **Email:** Owen.Watkins@gov.ab.ca **Town:** Spruce Grove

Alternative

Name: Don Hildebrandt **Phone:** 780-723-8523 **Email:** Don.Hildebrandt@gov.ab.ca **Town:** Spruce Grove

19-May-2014 08:15

Map Results



THE CITY OF Edmonton TRANSPORTATION SERVICES

12TH FLOOR, CENTURY PLACE
9803 - 102A AVENUE
EDMONTON, ALBERTA
T5J 3A3
780-496-1795
FAX: 780-496-4287

August 6, 2014 File: 199 Street (23 Avenue to 35 Avenue)

CIMA+
10235 – 101 Street
Edmonton, AB T5J 3G1

Attention: Glen Campbell, P.Eng.

Subject: 199 Street (23 Avenue to 35 Avenue)
Review of Stantec Wildlife Crossing Report by Facility and Capital Planning (FCP) and Office of Biodiversity (OBD)

Dear Mr. Campbell,

Thank you for submitting the report entitled "Wildlife Passage Design Recommendations - 199 Street Widening Project Within the River Neighborhood," completed by Stantec and dated May 20, 2014. The City's Facility and Capital Planning (FCP) and Office of Biodiversity (OBD) sections have completed a review of the report; this letter provides a summary of the City's outstanding concerns and requests additional information to be provided by CIMA+ regarding the proposed two-culvert crossing treatment. Additional information is being requested in order to provide the City with the necessary background required to make an informed decision regarding the crossing treatment.

It is understood that the purpose of Stantec's study was to review and evaluate, from a wildlife passage perspective, Wedgewood Creek crossing options outlined in Terrace Engineering's (Terrrace) draft report entitled "Conceptual Bridge Planning Report, Wedgewood Creek Crossing on 199 Street NW in the City of Edmonton," dated May 9, 2014.

Stantec's report outlines support for a two-culvert wildlife passage at Wedgewood Creek; Terrace's report also considered this option to be the most desirable out of a number of potential options. However, it is the opinion of both FCP and OBD that the information provided in Stantec's report is not sufficient to clearly support that a two-culvert treatment will accommodate passage of all of the Ecological Design Groups (EDGs) that are anticipated to use the Wedgewood Creek ravine. The proposed alternative design (two-culverts) for wildlife passage should be accompanied by supporting study that shows that the passage will accommodate all of the EDGs identified. At this time, a bridge structure is the only option that is known to support all of the EDGs.

FCP and OBD are pleased with the level of effort that was taken by Stantec to identify the EDGs for this area and are in support of ensuring that the measures implemented at this location provide accommodation for all of the EDGs identified. FCP and OBD are also pleased with the recognition outlined in Stantec's report that diversionary measures are required for some EDGs (i.e. birds and bats) and that a 65 m culvert would be too long for medium to small sized mammals.

Before the City can make a final determination as to whether the two-culvert design will accommodate the EDGs identified and whether this alternative is an acceptable solution for this crossing, further information is required. We ask that the following items be addressed with, or in advance of, the next submission of the concept plan:

- Review of the impacts that wing-walls would have on the use of the crossing structures by wildlife. It is felt that overly tall and/or unnatural walls may be a perceived barrier to wildlife. Further, excess fill should be avoided (Ruediger and DiGiorgio 2006).
- The elevations of the medium and large wildlife passage culvert has not be identified in any documentation that has been provided to the City (i.e. location on the slope). Terrace's report suggests that it should be placed somewhere near the elevation of the roadway so as to minimize the passage length. OBD has expressed concern that a culvert placed near the top of the roadway may not be used by wildlife, and further their concern is drawn from the fact that there are no two-culvert crossings of similar design in place in the City.
    - The City is requesting additional evaluation of the effectiveness of a culvert placed near the roadway out of the typical travel path for the EDGs identified for this crossing. OBD suggests that the optimum culvert elevation is at the level of the natural travel corridor, which may be at the base of the ravine. It was noted that road cuts, drop offs and cliffs dissuade large mammals from using the crossings (Ruediger and DiGiorgio, 2006); these items should also be considered.
- Review of the effectiveness of comparable wildlife passages already constructed. As there are presently no two-culvert wildlife passages that have been constructed in the City; OBD would like some evidence that a two-culvert treatment would effectively accommodate the design EDGs. Furthermore, it is requested that for any case studies presented a clear comparison be provided of the crossing location along the slope with respect to the natural travel corridor.
- A review of general constructability and integration of the crossing treatment into the surrounding creek.

If you have any other questions or concerns, please do not hesitate to contact me at 780-442-4529 (Natalie.Lazurko@edmonton.ca) or Christopher Wintle at 780-496-1792. (Christopher.Wintle@edmonton.ca).

Yours truly,

NLazurko

Natalie Lazurko, P. Eng.
Senior Engineer - Facility and Capital Planning
Transportation Planning Branch

NL/ccw

CIMA+
Partners in excellence

September 19, 2014

Mr. Christopher Wintle
Project Engineer
Facility and Capital Planning
City of Edmonton
Transportation Services

Subject: 199 Street (23 Avenue to 35 Avenue)
Comments to Your Correspondence dated August 6, 2014

Dear Mr. Wintle,

Thank you for your comments on the Stantec Wildlife Crossing Report. We have reviewed all of your comments and have assembled a new conceptual design for the wildlife animal underpass taking into consideration your comments. The new concept utilizes a standard bridge cross section with an opening that is 14 m wide and 4.5 m deep under the structure. The openness factor for this crossing is calculated to be 2.20. There is also a sky light in the median between the traffic lanes to assist with light entering the underpass. For additional information on this concept refer to the 199 Street Wedgewood Ravine wildlife crossing concept plan attached to this letter.

Also to assist you with your review of this concept, below is a summary of your comments/ questions with answers or clarification.

City Comment:
It is understood that the purpose of Stantec's study was to review and evaluate, from a wildlife passage perspective, Wedgewood Creek crossing options outlined in Terrace Engineering's (Terrrace) draft report entitled "Conceptual Bridge Planning Report, Wedgewood Creek Crossing on 199 Street NW in the City of Edmonton," dated May 9, 2014.

CIMA+: Yes, this is correct

City Comment:
The proposed alternative design (two culverts) for wildlife passage should be accompanied by supporting study that shows that the passage will accommodate all of the EDGs identified. At this time, a bridge structure is the only option that is known to support all of the EDGs.

CIMA+: The new proposed wildlife underpass is now a standard bridge structure. The current concept design is considered adequate to accommodate passage of all of the EDGs identified in the area (see Appendix A).

City Comment:
Before the City can make a final determination as to whether the two-culvert design will accommodate the EDGs identified and whether this alternative is an acceptable solution for this crossing, further information is required. We ask that the following items be addressed with, or in advance of, the next submission of the concept plan:

- *Review of the impacts that wing-walls would have on the use of the crossing structures by wildlife. It is felt that overly tall and/or unnatural walls may be a perceived barrier to wildlife. Further, excess fill should be avoided (Ruediger and DiGiorgio 2006).*

CIMA+: The wing walls in the current proposed option will follow the side slopes of the roadway embankment at 3:1 side slopes. At the entrance to the underpass the wing walls will be a similar height to the sides of the underpass. Animal fencing will direct the wildlife into the underpass. The wing walls are also angled away from the underpass to open each end up of the underpass. Natural shrubs and undergrowth will over time help to disguise the wing walls. The grade into the wildlife underpass is all set at 3:1, the underpass has been located towards the center of the ravine to minimise the amount of fill/cut that is needed. The wing wall design is considered more than adequate to facilitate movement of the EDGs that this structure is designed for (see Appendix A).

City Comment

- *The elevations of the medium and large wildlife passage culvert has not been identified in any documentation that has been provided to the City (i.e. location on the slope). Terrace's report suggests that it should be placed somewhere near the elevation of the roadway so as to minimize the passage length. OBD has expressed concern that a culvert placed near the top of the roadway may not be used by wildlife, and further their concern is drawn from the fact that there are no two culvert crossings of similar design in place in the City.*

CIMA+: Road stations have been shown on the plan view of the above noted plan that are the same stations as shown on the overall 199 Street Concept Plans; this shows the approximate location of the underpass relative to the ravine. Due to the angle of 199 Street crossing the ravine, one side of the underpass is in cut and the other side is in fill. The bridge structure will be located at the road surface with the wildlife underpass opening directly below the structure. The new vertical alignment of the proposed arterial roadway follows very closely to the previous alignment, with improved vertical curves. Knowing this, with an animal underpass 4.5 m below the road surface, any wildlife that has crossed the existing roadway will now be able to cross at a lower elevation.

An evaluation of wildlife travel corridors in the vicinity of 199 Street and Wedgewood Ravine indicate most game trails (presumably deer) were along ridges at the top of the ravine (see Appendix A). The location of the open-span crossing structure is near the typical travel path of deer in the area.

City Comment

- *The City is requesting additional evaluation of the effectiveness of a culvert placed near the roadway out of the typical travel path for the EDGs identified for this crossing. OBD suggests that the optimum culvert elevation is at the level of the natural travel corridor, which may be at the base of the ravine. It was noted that road cuts, drop offs and cliffs dissuade large mammals from using the crossings (Ruediger and DiGiorgio, 2006); these items should also be considered.*

CIMA+: An evaluation of wildlife travel corridors in the vicinity of 199 Street and Wedgewood Ravine indicate most game trails were along ridges at the top of the ravine (see Appendix A). Beaver movement was observed both at the base of the ravine and at the top of the ravine. The location of the open-span crossing structure is near the typical travel path of deer in the area.

City Comment

- *Review of the effectiveness of comparable wildlife passages already constructed. As there are presently no two-culvert wildlife passages that have been constructed in the City; OBD would like some evidence that a two-culvert treatment would effectively accommodate the design EDGs. Furthermore, it is requested that for any case studies presented a clear comparison be provided of the crossing location along the slope with respect to the natural travel corridor.*

CIMA+: A comparable structure to the large open-span bridge being proposed for Wedgewood Ravine has been installed near Lake Louise, AB. This structure has been monitored since 2007, and considered a highly effective structure for facilitating passage of a wide range wildlife species in Banff National Park (see Appendix A). Clevenger et al (2001) recommend a mixed size classes of wildlife crossing structures to accommodate the greatest variety of species possible. The proposed two-culvert system is not unlike the design being employed at Ellerslie Road in Edmonton, where large terrestrial wildlife are accommodated at Whitemud Creek, 400 m from a smaller crossing structure designed for small- and medium-sized EDGs.

City Comment

- *A review of general constructability and integration of the crossing treatment into the surrounding creek.*

CIMA+: Cost estimates for the culvert and standard bridge option as shown in the attached plan are estimated at $8M. A bridge structure spanning the entire Wedgewood creek ravine is estimate at $25M. There is approximately a magnitude of 3.1 times greater in the costs of the culvert and standard bridge option to the complete bridge option. If 199 Street is staged and only two lanes are built in the initial stage, the ultimate earth works, foundations, abutments and wing walls for the animal underpass and culvert could all be constructed in the initial stage leaving only the bridge top to be constructed at a later date. The bridge girders for the final two lanes can be placed at a later time with little or no impact on the Wedgewood creek/ravine.

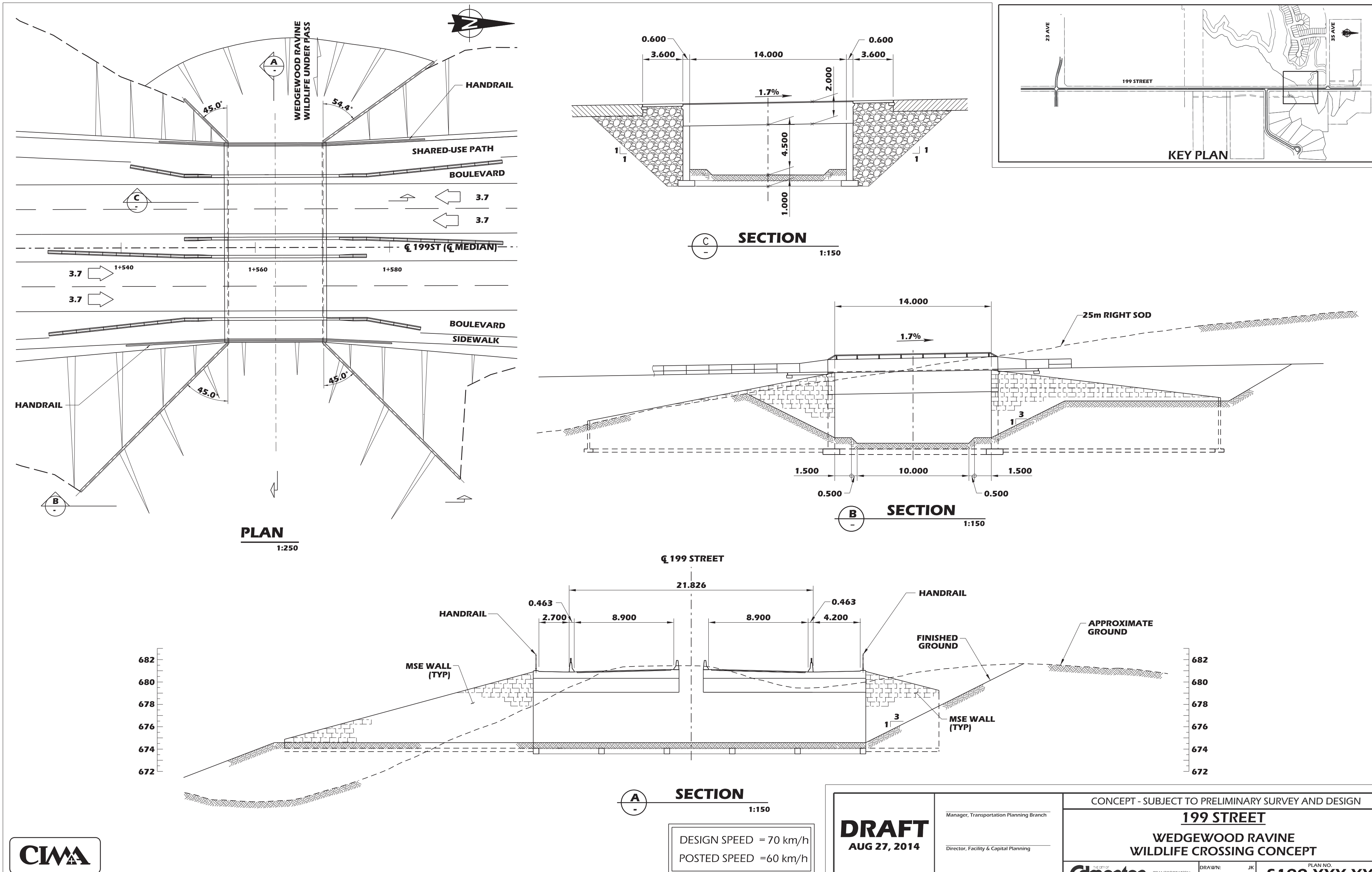
Please review the attached wildlife concept plan and the above comments and confirm if this crossing structure is adequate. If the City wishes to discuss this concept in more detail CIMA+ would be glad to attend a meeting for further discussions.

Yours sincerely,

CIMA+

Glen Campbell, P.Eng.
Project Manager, Highway Engineering

Encl.



CIMA

DRAFT
AUG 27, 2014

PERMIT TO PRACTICE P5038

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET

WEDGEWOOD RAVINE
WILDLIFE CROSSING CONCEPT

Edmonton TRANSPORTATION SERVICES

DRAWN:	JK
REVIEWED:	TW
DATE:	2014 AUG

PLAN NO.
S199-XXX-XX

PLOTTED: 05/09/2014 $TIME$

$FILE$

199 Street Bridge Layout(2D).dgn 05/09/2014 2:57:37 PM

Wildlife Passage Design —199 Street Widening Project Within Riverview Neighbourhood 1

Stantec

Prepared for:
Riverview Owners Group
(Qualico Communities, Walton Development and Management LP, Melcor Developments Ltd, and Sunwapta Holdings Corporation)

Prepared by:
William L. Harper, R.P.Bio.

1102-18864

September 19, 2014

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1.0 BACKGROUND

Stantec Consulting Ltd. (Stantec) was retained by Riverview Owners Group (the Client) to provide environmental consulting services and recommendations for wildlife passage as part of the 199 Street Widening within the Riverview Neighbourhood 1 (the Project).

As part of the Riverview Neighbourhood 1 development, 199 Street will be widened (CIMA+ 2014). The widened road, along with projected increases in traffic volume and vehicle speed, will increase the barrier effect of the road on wildlife. For these reasons, and to reduce animal-vehicle collisions, provisions for a wildlife crossing structure where 199 Street crosses the Wedgewood Ravine were considered.

2.0 OBJECTIVES

The City of Edmonton has requested additional information pertaining to wildlife passage associated with the Project (City of Edmonton 2014). The objective of this report is to evaluate the potential for the proposed wildlife crossing structures to maintain landscape permeability for the Ecological Design Groups (EDGs) predicted to occur in the area.

This report should be considered as follow-up to an earlier report on wildlife passage design dated May 20, 2014 (Stantec Consulting Ltd. 2014).

3.0 EVALUATION OF THE CONCEPTUAL DESIGN OF THE LARGE BELOW-GRADE WILDLIFE CROSSING STRUCTURE

The new concept utilises a standard bridge cross section with an opening that is 14 m wide and 4.5 m deep under the structure. The total length of the structure is estimated at 28.6 m. There is also a sky light in the median between the traffic lanes to increase natural light inside the structure.

Open-span bridge structures such as the one proposed for Wedgewood Ravine have been shown to be effective for both large wildlife (e.g., deer, bears), and a variety of smaller species (Ruediger and DiGiorgio 2007).

In Utah, analyses of the effectiveness of wildlife crossing structures confirm they should be designed to be as short as possible. Schwender (2013) found that culvert length outperformed all other parameters, and culvert width and length together were the best predictors of successful mule deer passage. As well, Cramer (2012) felt that when considering the metrics of wildlife crossing design, length was the most important factor, followed by width, and height was the least important consideration. Based on this analysis, Cramer (2012) recommended keeping wildlife underpasses under 37 m long. The estimated length of the large below-grade crossing structure at Wedgewood Ravine is 28.6 m, well within Cramer's (2012) recommendation.

Clevenger and Huijser's (2011) general guidelines recommend a width of >12 m and height of >4 m for large mammal underpasses. The dimensions of the new open-span crossing structure are 14 m wide and 4.5 high, which is above Clevenger and Huijser's (2011) recommendation.

Although measures of a structure's width, height and length are important considerations in designing wildlife structures, Clevenger and Huijser (2011) do not recommend the use of an openness index during planning and design. However, the Wildlife Passage Engineering Design Guidelines (WPEDG; City of Edmonton 2010) indicate that an "optimal passage openness" ratio of 1.5 is preferred for Large Terrestrial EDG. The openness ratio for the large below-grade crossing structure is 2.20, which is above the City of Edmonton (2010) recommendation.

A similar structure to the open-span bridge proposed for Wedgewood Ravine has recently been installed near Lake Louise in Banff National Park. Referred to as the "Island" crossing structure, it has been monitored for wildlife use since 2007 (Clevenger et al. 2009). Between April 2012 and March 2013 this structure was successfully used by 7 grizzly bears, 3 black bears, 3 wolves, 4 coyotes, 23 moose, 41 elk, and 148 deer (Clevenger et al. 2013). Total monitored use to date is 22 grizzly bears, 5 black bears, 27 wolves, 24 coyotes, 77 moose, 100 elk, and 471 deer (Clevenger et al. 2013). This is considered a high quality wildlife crossing structure within the national parks system.

In response to the comment (City of Edmonton 2014) that "*It is felt that overly tall and/or unnatural walls may be a perceived barrier to wildlife*", we were unable to find any literature that indicated negative effects of wing-walls on the effectiveness of wildlife crossing structures. To the contrary, the wildlife crossing structure handbook (Clevenger and Huijser 2011) only refer to wing-walls as encouraging and guiding animals to the entrance of wildlife crossing structures. Since wing-walls have potential to greatly reduce the overall length of a crossing structure, their presence in the proposed concept design is considered to have a positive effect on promoting wildlife use of the structure. The maximum height of the wing-walls (4.5 m) is not considered excessive.

Figure 1 **Proposed Location of the Open-Span Wildlife Crossing Structure at Wedgewood Creek**

4.0 FIELD SURVEY OF WILDLIFE MOVEMENT PATTERNS

A field survey was undertaken on September 12, 2014 between 10:30 – 14:00 hr in order to determine movement patterns of wildlife in the vicinity of the proposed wildlife crossing structure.

West of 199 Street, South of the Beaver Pond
Faint game trails (consistent with use by deer), were located along the slope above the water south of the beaver pond on the west side of 199 Street (Figure 2). These trails meandered in the forested area along the slope to an open area approximately where the proposed open-span crossing structure will be located. A single patch of deer scat was observed along this trail. There were also multiple faint trails running parallel to the 199 Street in a young aspen patch. These trails run roughly parallel to the roadway (Figure 2).

Numerous beaver trails were found running up from the water into the forested area on both sides of the beaver pond. Single sets of coyote and deer tracks were observed at the north-east end of the water body in a mud/gravel area.

West of 199 Street, North of the Beaver Pond
The slope immediately northwest of the pond is extremely steep (Figure 2). The only tracks/trails observed were those of beavers travelling up from the pond to the forested area above. The top of the slope is a crest/ridge with slopes NW and SE. A faint game trail was observed along the top of this ridge and a more active trail was observed parallel to the ridge on the northwest side. Both of these trails eventually faded out near the residential areas currently under construction. The treed area north of the pond was also searched and faint game trails associated with trampling of vegetation were observed, along with signs of human activity.

East of 199 Street, North of Wedgewood Creek
The slope along the north edge of the stream is very steep (Figure 1). No tracks/trails were observed besides beaver trails, which were very common in the area. A very faint game (presumably deer), trail was observed along the top edge of the ridge along residential fencing.

East of 199 Street, South of Wedgewood Creek
The south edge of the stream consisted of a narrow, relatively level area (less than 10 m wide), with grades sufficiently low that it is walkable. Further away from the water it became steeper with dense shrub cover and large mature trees. The only tracks/trails observed in the area were beaver trails that were abundant and well-used.

199 Street
Both edges of 199 Street were surveyed for tracks/trails crossing the roadway. The substrate was not ideal for detecting wildlife use as the roadway is paved and the sides of the road are fine gravel. No wildlife tracks or trails were observed along the roadway.

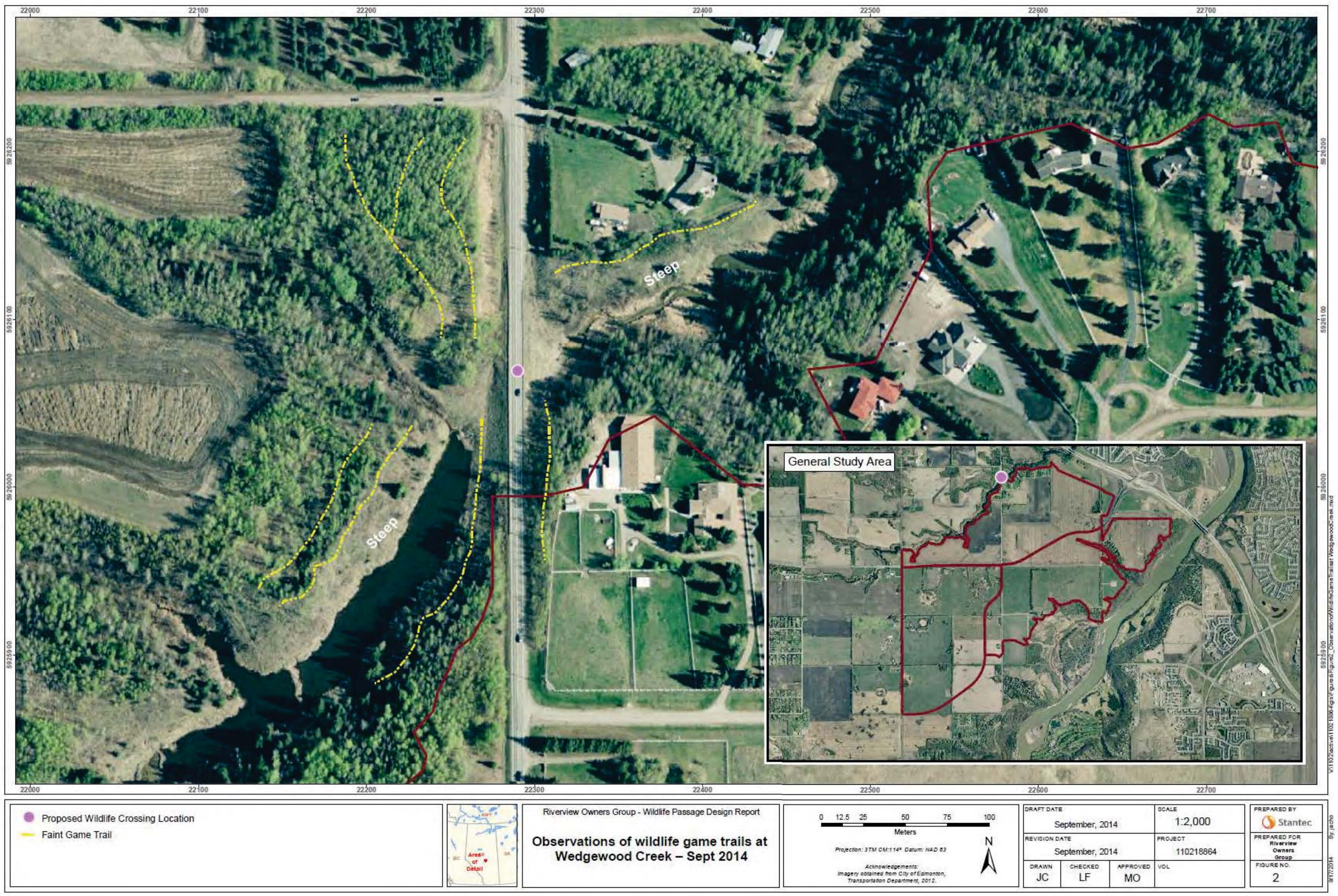

Figure 2 **Observations of Wildlife Game Trails at Wedgewood Creek – Sept 2014**

Summary of Wildlife Field Survey
Few established game trails were observed in the area, possibly from nearby active construction in the area. Most of the faint deer trails and scat observed were not in the bottom of the ravine but were higher up on the edges. This suggests that deer wouldn't be "climbing out of the ravine to go through the underpass" but rather moving along their existing routes or even descending slightly to travel under 199 Street.

5.0 CONCLUSION

The City of Edmonton (2010) has identified 11 Ecological Design Groups (EDGs) to be addressed when planning and designing wildlife passage: Large Terrestrial, Medium Terrestrial, Small Terrestrial, Amphibians, Aerial Mammals, Aquatic Species, Scavenger Birds, Birds of Prey, Water Birds, Ground Dwelling Birds, and Other Birds. It is expected that one or more species within all 11 EDGs are predicted to occur in the vicinity of Wedgewood Creek (Stantec 2014).

The current concept design is adequate to accommodate the passage requirements for all of the EDGs identified in the Stantec (2014) report. Passage requirements for the Large Terrestrial, Medium Terrestrial, and Small Terrestrial EDGs are adequately addressed in concept design for the large open-span wildlife crossing structure (Figure 1). The proposed location approximately 5 m below the roadway is near the natural travel area of deer at the top of Wedgewood Ravine.

Passage requirements for the Small Terrestrial, Amphibian, and Aquatic Species EDGs are adequately addressed in the proposed modified drainage culvert associated with Wedgewood Creek. Passage requirements for the Aerial Mammals, Scavenger Birds, Birds of Prey, Ground Dwelling Birds, Water Birds and Other Birds EDGs will be adequately addressed above-grade in the Recommendations for Reducing Bird and Bat Vehicle Collision Risk (see Stantec 2014).

6.0 CLOSURE

This document entitled *Wildlife Passage Design Recommendations—199 Street Widening Project within Riverview Neighbourhood 1* was prepared by Stantec Consulting Ltd. for the account of Riverview Owners Group. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report

Stantec has endeavored to incorporate the principles of the WPEDG into the 199 Street wildlife passage design and the constraints associated with the physical site characteristics and available materials. We trust that this information is sufficient to support the submission of the initial concept.

September 19, 2014

Respectfully submitted,

STANTEC CONSULTING LTD.

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7.0 REFERENCES

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SUSTAINABLE DEVELOPMENT **MEMORANDUM**

October 15, 2014

TO: Natalie Lazurko, P.Eng.
Transportation Planning

FROM: Catherine Shier
Ecology Unit, Parks + Biodiversity

CC: Francis Wambugu, P.Eng., MBA
Development Planning and Engineering

SUBJECT: **Comments for document titled "*199 street (23 Avenue to 35 Avenue). Comments to your correspondence date August 6, 2014)*"**

The Ecology Unit (Parks + Biodiversity) has reviewed CIMA's September 19, 2014 report titled "*199 street (23 Avenue to 35 Avenue). Comments to your correspondence date August 6, 2014*" that our office received on September 23, 2014. Thank you for the opportunity to review. We would like to offer the following comments for your consideration as design of the wildlife passage at Wedgewood Creek and 199th street proceeds:

Large Terrestrial wildlife below-grade crossing structure:
We are encouraged to see that a bridge structure is being proposed at this location. However, we have a few questions/concerns with the proposed design:

a) How does the wildlife crossing interact with the newly installed outfall west of 199th street on the north bank of the creek?
b) It is currently unclear how wildlife is intended to move west of this passage. Most notably, after going over (or around) the rip rap of the outfall (which, for access reasons, is likely to remain devoid of significant vegetation), they would need to cross over a small tributary (which is often flooded by beaver dams making passage difficult) and then up a steep slope to continue to move west.
c) Line of sight: the structure should be located at near equal contour sites on either side of the road and be angled to fit the line of the creek bottom. This would provide for a more appropriate line of sight.

There is reference in this report that the proposed structure is comparable to a large open-span bridge that was installed near Lake Louise, AB. Please note that a few important differences between the two include:

I. There is no outfall or small tributary/flooded area to design around or that impacts the functionality of the passage.

II. The line of site of the island structure is unobstructed. See Figure 1 as an example of a similar site. (Figure 1: http://www.pc.gc.ca/eng/pn-np/ab/banff/plan/transport/tch-rtc/passages-crossings/passages-structures.aspx?a=1&photo=%7B1235FE0E-46C7-464D-BA57-27876ACA7CA0%7D)

III. The Island crossing is close to perpendicular to the valley (Figure 2a) as compared to the crossing at Wedgewood where we see a crossing of about 45% (Figure 2b)

Figure 2a

Figure 2b

IV. The width of the bridge span across the Lake Louise crossing is approximately 50% or more of the valley. In the case of Wedgewood Creek it appears the width of the bridge span is 1/5th of the ravine (Note: these estimates are based on measurement estimates taken from Google Earth and are not exact).

V. I could not find details that speak to the elevation change wildlife need to traverse to use the Island crossing. However, it seems from the image above that it is not that great as one can see the creek flow through the passage as well. Also, note that the open meridian is greater than the width of each road sections. Both of these are different from what is being proposed at the Wedgewood crossing.

Small terrestrial and aquatic wildlife below-grade crossing structure
Appendix A of the report speaks to the passage requirements of small terrestrial, amphibian and aquatic EDGs being adequately addressed in the proposed modified drainage culvert. Has this culvert been modified from what was presented formerly? Please outline the difference. As outlined in the *Wildlife Passage Engineering Design Guidelines* the minimum openness ratio that the design should be aiming for is 0.4 with open bottom culverts being preferred over closed bottom structures as they incorporate natural substrate.

Given the concerns outlined above for both large and small wildlife use of the proposed passages, our office strongly encourages the installation of a wider bridge at this location which would improve the line of sight and overall functionality of the passage. We feel this request is reasonable given that:

- Three designs have been reviewed to date and none adequately address the needs of all of the targeted Ecological Design Groups;
- The unique site challenges of this location (e.g. culvert, small flooded tributary, road crossing angle, steep slope on west side of road) could be overcome by the installation of a wider bridge;
- The 199 Street arterial roadway crossing of Wedgewood Ravine is identified in the current ARA Bylaw as a bridge structure;
- The requirement for a bridge (as suggested in the ARA) is referenced in the recently approved Riverview ASP ;
- The proponent has been aware of this requirement since October 2012, where a verbal agreement was made with the Office of Biodiversity that a bridge would be constructed
- Wedgewood creek is a significant natural corridor in SW Edmonton that provides connectivity into surrounding communities;
- The request above falls in line with current City objectives on maintaining (or restoring degraded) ecological linkages, most notably the following objectives as outlined in The Way We Grow; and
- This project falls within the North Saskatchewan River Valley Bylaw Area Redevelopment Plan (Bylaw 7188). This Bylaw provides the following direction when upgrading approved transportation corridors: "*To support a transportation system which serves the needs of the City and the Plan area, yet is compatible with the parkland development and the environmental protection of the River Valley and Ravine System.*"

Thank you for the opportunity to comment. Please contact Catherine Shier at 780-442-4531 with any questions or concerns.

Catherine Shier
Senior Ecological Planner, Ecology unit
Parks + Biodiversity
Sustainable Development
Ph: 780-442-4531
Catherine.shier@edmonton.ca

CIMA+
Partners in excellence

November 18, 2014

Mr. Christopher Wintle
Project Engineer
Facility and Capital Planning
City of Edmonton
Transportation Services

Subject: 199 Street (23 Avenue to 35 Avenue)
Comments to Your Correspondence dated October 15, 2014

Dear Mr. Wintle,

Further to the memo dated October 15, 2014 from Catherine Shier and the site visit held on October 30, 2014. We have reviewed all of your comments and have assembled a new conceptual design for the wildlife animal underpass taking into consideration your comments. The new concept continues to utilize a standard bridge cross section with an opening that is 14 m wide and 4.5 m deep under the structure and a separate culvert for the stream crossing. The structure is now skewed at 25 degrees to the roadway to assist with the line of sight for the wildlife and the stream crossing culvert has been adjusted so the overall length is now shorter. The Skew on the bridge structure has lengthened the overall structure by 2.0m given a new openness ratio of 2.0 (see appendix A for additional comments). There will still be a “sky light” in the bridge structure in the median between the traffic lanes to assist with light entering the underpass. For additional information on this concept refer to the 199 Street Wedgewood Ravine wildlife crossing concept plan attached to this letter.

Also to assist you with your review of this concept, below is a summary of your comments/ questions with answers or clarification.

City Comment:
How does the wildlife crossing interact with the newly installed outfall west of 199th street on the north bank of the creek?

CIMA+: The manhole and outfall were in the vicinity of where the wildlife underpass crossed under 199 St. in our previous submission, the underpass crossing perpendicular to 199 Street on the west side pointing directly at the manhole. As discussed on site the alignment of the underpass has now been moved to the south and skewed such that the west side entrance/exit is approximately centered between the manhole and the outfall. The pipeline associated with the outfall is approximately 3.5 meters below grade and won’t be impacted by the cut/fill slope from the underpass.

City Comment:
It is currently unclear how wildlife is intended to move west of this passage. Most notably, after going over (or around) the rip rap of the outfall (which, for access reasons, is likely to remain devoid of significant vegetation), they would need to cross over a small tributary (which is often flooded by beaver dams making passage difficult) and then up a steep slope to continue to move west.

CIMA+: With the proposed skew angle and also some flat benching provided in the side slopes of the 199 Street embankment, the wildlife will have adequate options to continue on either side of the ravine banks to the west. Refer to appendix A for additional comments.

City Comment:
Line of sight: the structure should be located at near equal contour sites on either side of the road and be angled to fit the line of the creek bottom. This would provide for a more appropriate line of sight.

CIMA+: The underpass structure has been skewed to align closer with the angle of the ravine and to improve the line of site for the wildlife. The structure has also been moved further to the south.

City Comment:
There is reference in this report that the proposed structure is comparable to a large open-span bridge that was installed near Lake Louise, AB. (5 differences were notes, refer to the memorandum from Catherine Shier, October 15, 2014 in Appendix A)

CIMA+: Duly noted, the Lake Louise bridge structure itself is very similar in terms of engineering design to the structure shown in the concept for 199 Street. Each and every wildlife crossing structure is unique to the topographical constraints in an area and target species the structure is being designed for. In particular we have improved the “line of sight”.

City Comment
Appendix A of the report speaks to the passage requirements of small terrestrial, amphibian and aquatic EDGs being adequately addressed in the proposed modified drainage culvert. Has this culvert been modified from what was presented formerly? Please outline the difference.

CIMA+: The culvert length has been shortened from what was shown on the previous submission, the culvert length is now 112.5m long. The original conceptual bridge report suggested that this culvert be a 2.4 m diameter SPCSP culvert. In Stantec’s report Wildlife Passage Design Recommendations as a response to the above noted report, for the small terrestrial wildlife, commented that raised platforms could be installed within the culvert to accommodate this wildlife group. For additional information on this please refer to Appendix A.

City Comment

The unique site challenges of this location (e.g. culvert, small flooded tributary, road crossing angle, steep slope on west side of road) could be overcome by the installation of a wider bridge;

CIMA+: The side slopes along the Wedgewood creek ravine are all of a slope such that they could be traversable by wildlife. The current opening under the wildlife passage provides adequate openness as required in the City's guidelines. With the assistance of fencing and landscaping the underpass will function adequately. The underpass has been located such that it limits interference of the foundations under the abutments at each end of the bridge structure and the stream culvert that is directly south of the wildlife underpass and at a lower level.

The south bank of the ravine was examined as a possible location for the wildlife underpass, however the land in the south east quadrant at the raving crossing is a private landowner and the property lines follow the existing road right of way providing little or no access into a possible underpass, so this option is not a valid option.

Currently the underpass is set at 14 meters wide to allow for the structure to be constructed as a standard bridge. The revised alignment of the underpass has improved sightlines and reduced the magnitude of elevation change at each end for animal entrance/egress. For additional information on this please refer to Appendix A.

City Comment

The 199 Street arterial roadway crossing of Wedgewood Ravine is identified in the current ARA Bylaw as a bridge structure;

The requirement for a bridge (as suggested in the ARA) is referenced in the recently approved Riverview ASP ;

The proponent has been aware of this requirement since October 2012, where a verbal agreement was made with the Office of Biodiversity that a bridge would be constructed

CIMA+: A bridge structure is now proposed for the wildlife underpass.

City Comment

Wedgewood creek is a significant natural corridor in SW Edmonton that provides connectivity into surrounding communities;
• The request above falls in line with current City objectives on maintaining (or restoring degraded) ecological linkages, most notably the following objectives as outlined in The Way We Grow; and
• This project falls within the North Saskatchewan River Valley Bylaw Area Redevelopment Plan (Bylaw 7188). This Bylaw provides the following direction when upgrading approved transportation corridors: "To support a transportation system which serves the needs of the City

and the Plan area, yet is compatible with the parkland development and the environmental protection of the River Valley and Ravine System."

CIMA+: This is all valid information to be acknowledged in moving this project forward to the next design stages.

Based on all that was discussed at our site meeting on October 30, 2014, we trust that we have addressed the City's comments and concerns for the crossing of the Wedgewood Creek Ravine such that the Conceptual design can be approved and to allow commencement of the Preliminary Design phase of this project. The Preliminary Design phase will continue to refine the design and further address many of the comments that have been discussed in these communications

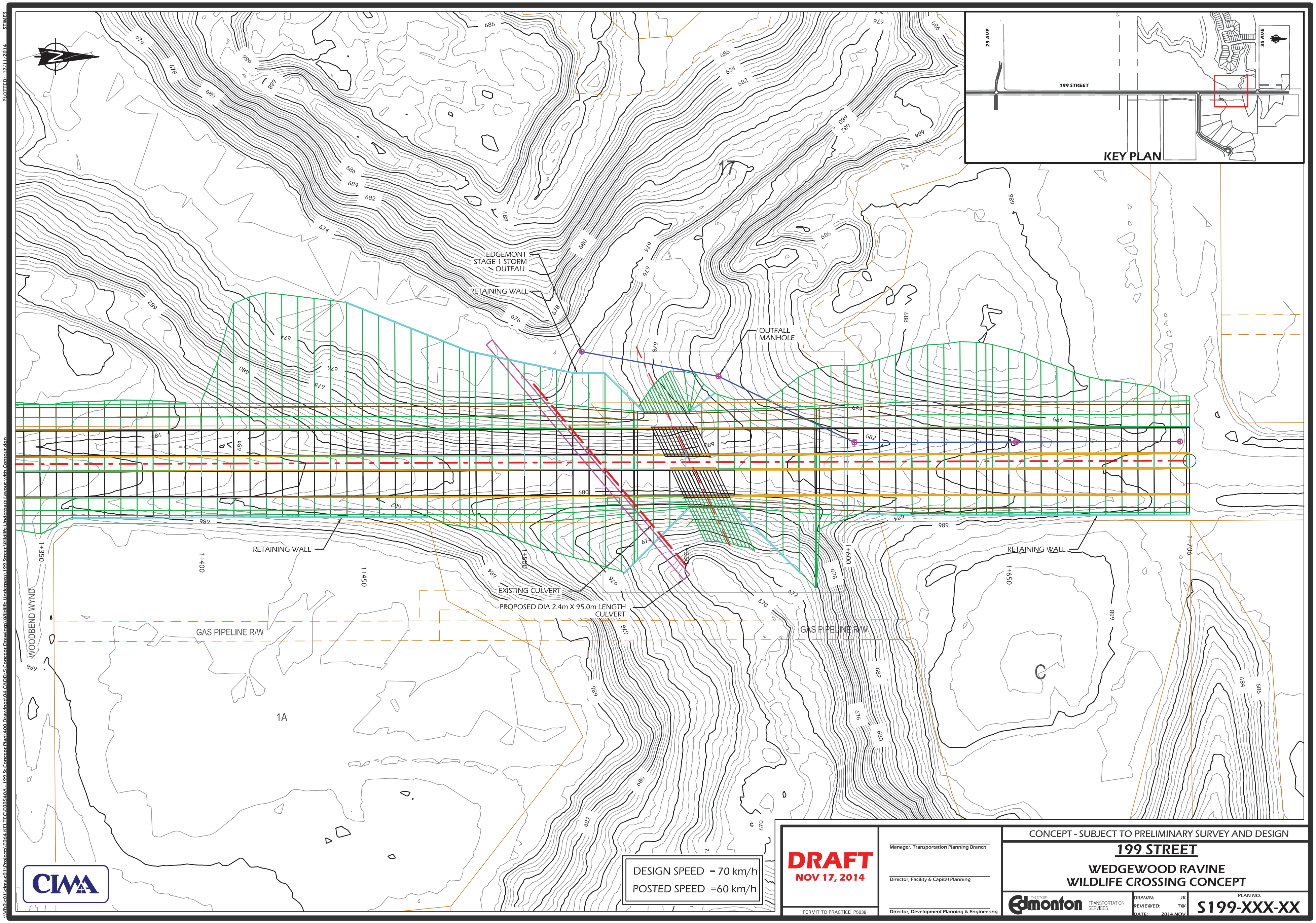
If you have any questions or concerns feel free to contact the undersigned.

Yours sincerely,

CIMA+

Glen Campbell, P.Eng.
Project Manager, Highway Engineering

Encl.
Original Bridge Concept report (May 9, 2014)
Wildlife Passage Design recommendations (May 20, 2014)
Letter from the City of Edmonton (August 6, 2014)
Letter from CIMA+ addressing City comments (Sept 19, 2014)
Wildlife Passage Design recommendations (Sept 19, 2014)
Comments from the City of Edmonton (Oct 15, 2014)
Appendix A – additional information supporting this letter.


KEY PLAN
23 AVE
199 STREET
35 AVE
EDGEMONT
STAGE 1 STORM
OUTFALL
RETAINING WALL
OUTFALL
MANHOLE
RETAINING WALL
RETAINING WALL
EXISTING CULVERT
PROPOSED DIA 2.4m X 95.0m LENGTH
CULVERT
GAS PIPELINE R/W
GAS PIPELINE R/W
WOODBEND WYND
1A
C
17
1+350
1+400
1+450
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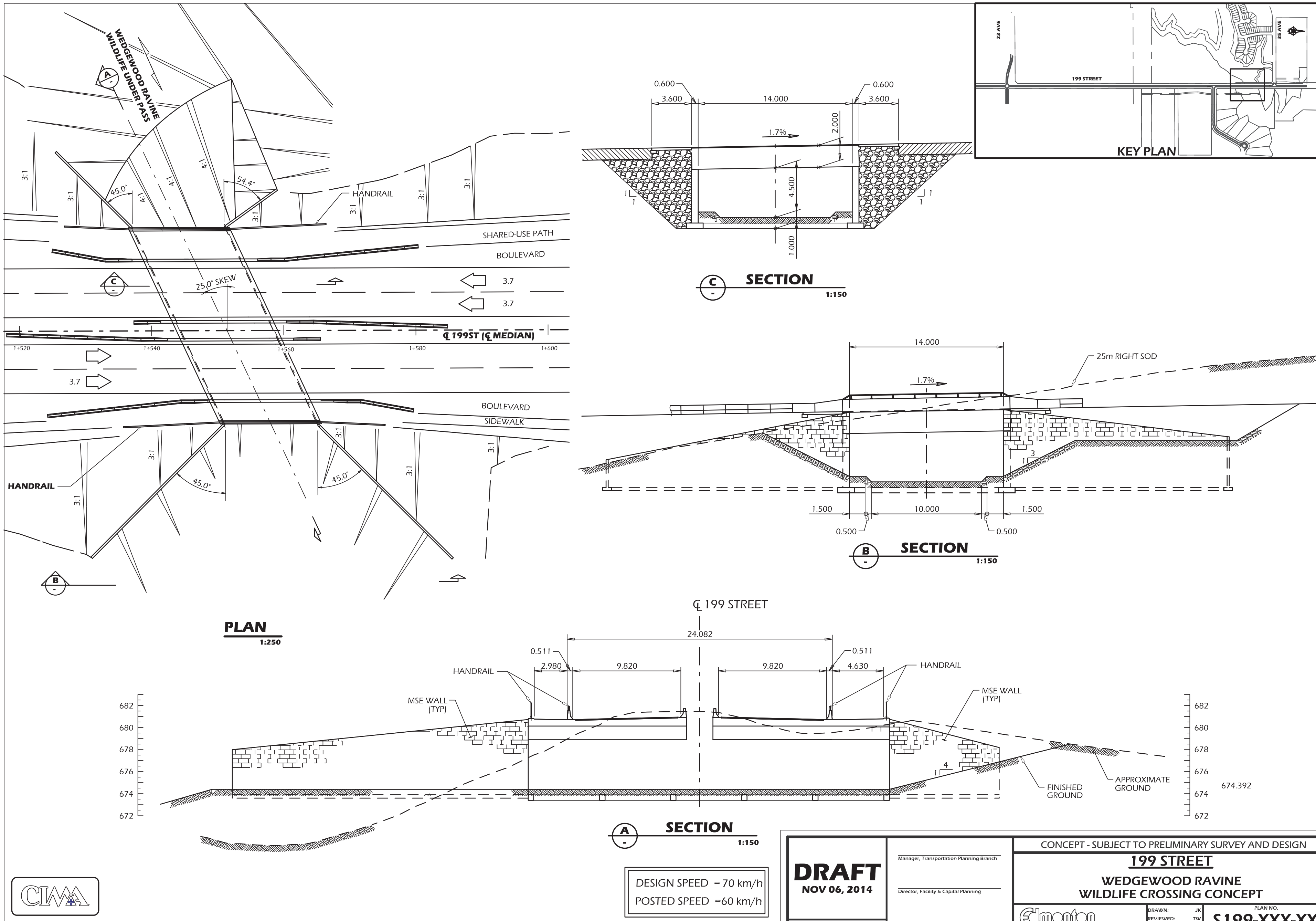
DESIGN SPEED = 70 km/h
POSTED SPEED = 60 km/h
CIMA
DRAFT
NOV 17, 2014
PERMIT TO PRACTICE P5038
Manager, Transportation Planning Branch
Director, Facility & Capital Planning
Director, Development Planning & Engineering
CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN
199 STREET
WEDGEWOOD RAVINE
WILDLIFE CROSSING CONCEPT
Edmonton
TRANSPORTATION SERVICES
DRAWN: JK
REVIEWED: TW
DATE: 2014 NOV
PLAN NO.
S199-XXX-XX



DRAFT
NOV 06, 2014

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET

WEDGEWOOD RAVINE
WILDLIFE CROSSING CONCEPT

Edmonton

DRAWN: JK
REVIEWED: TW
DATE: 2014 NOV

PLAN NO.
S199-XXX-XX

PLOTTED: 18/11/2014 $TIME$

$FILE$

Appendix A EVALUATION OF NOVEMBER 2014 CONCEPTUAL DESIGN

1.0 BACKGROUND

Stantec Consulting Ltd. (Stantec) was retained by Riverview Owners Group (the Client) to provide environmental consulting services and recommendations for wildlife passage as part of the 199 Street Widening within the Riverview Neighbourhood 1 (the Project).

As part of the Riverview Neighbourhood 1 development, 199 Street will be widened (CIMA+ 2014). The widened road, along with projected increases in traffic volume and vehicle speed, will increase the barrier effect of the road on wildlife. For these reasons, and to reduce animal-vehicle collisions, provisions for wildlife movement where 199 Street crosses the Wedgewood Ravine were considered.

2.0 OBJECTIVES

The City of Edmonton has requested additional information pertaining to wildlife passage associated with the Project (City of Edmonton 2014a and 2014b; site visit on October 30, 2014). The objective of this report is to evaluate the potential for the two proposed wildlife crossing structures to maintain landscape permeability for the Ecological Design Groups (EDGs) predicted to occur in the area, and to respond to questions/concerns outlined by the City of Edmonton (2014b).

This report should be considered as follow-up to two earlier reports on wildlife passage design dated May 20, 2014 (Stantec Consulting Ltd. 2014a) and September 18, 2014 (Stantec Consulting Ltd. 2014b).

3.0 LARGE, MEDIUM AND SMALL TERRESTRIAL WILDLIFE BELOW-GRADE WILDLIFE CROSSING STRUCTURE

The November 2014 concept design utilises a standard bridge cross section with an opening that is 14 m wide and 4.5 m deep under the structure. The total length of the structure is estimated at 30.9 m (Figure 1). There is also a “sky light” in the median between the traffic lanes to increase natural light inside the structure.

Open-span structures such as this have been shown to be effective for both large wildlife (e.g., deer, bears) and a variety of smaller species (Ruediger and DiGiorgio 2007). The dimensions of

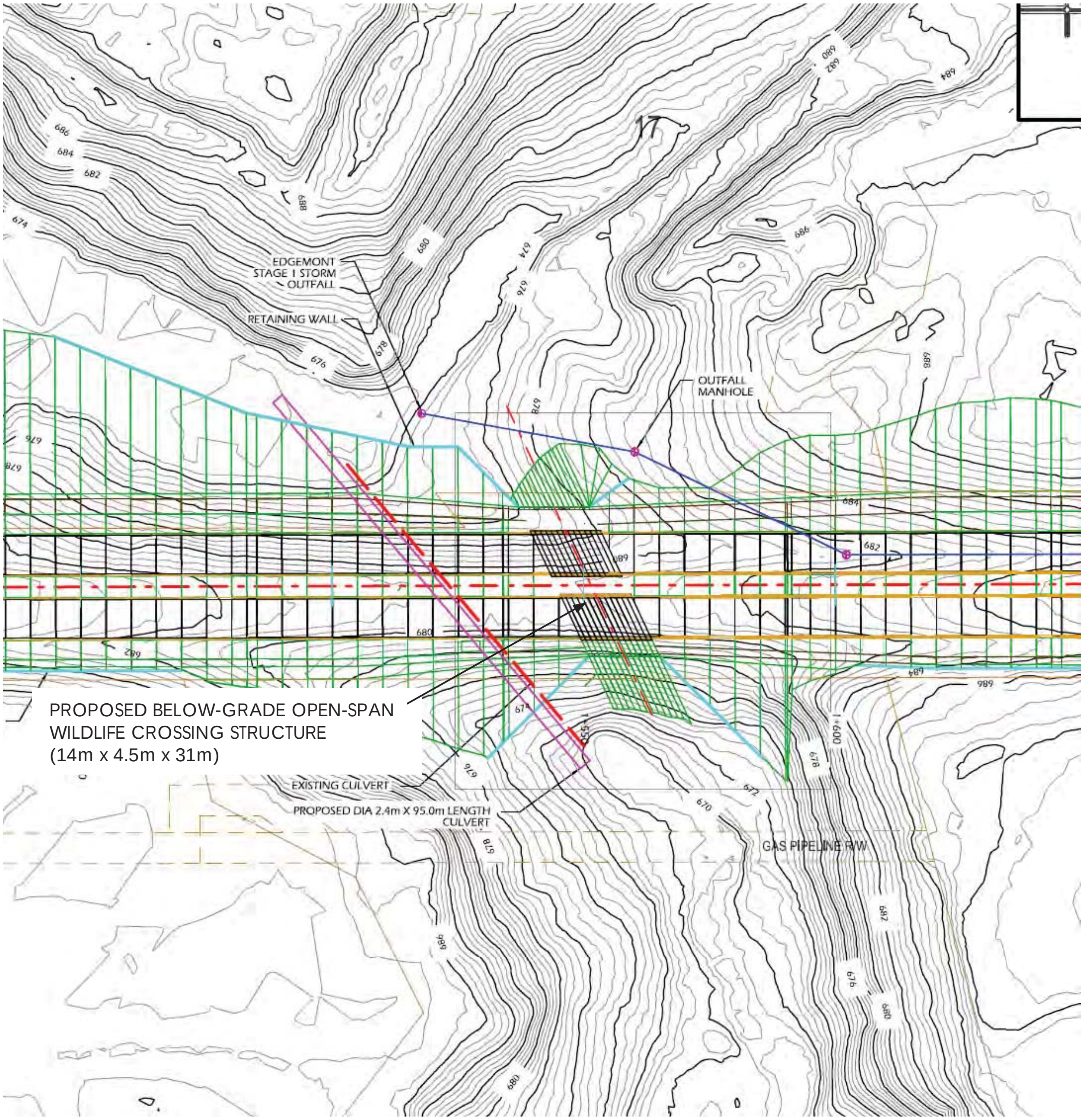


Figure 1 Wildlife Crossing Concept – Wedgewood Ravine (Draft Nov 17, 2014)

this large below-grade crossing structure is within the large animal design recommendations for length (<37 m; Cramer 2012), width (>12 m; Clevenger and Huijser 2011), and height (>4 m Clevenger and Huijser 2011).

The Wildlife Passage Engineering Design Guidelines (WPEDG; City of Edmonton 2010) indicate an "optimal passage openness" of 1.5 is preferred for the Large Terrestrial EDG. The openness index for the November 2014 concept design of the large below-grade crossing structure is 2.04, which is above the City of Edmonton (2010) recommendation. Deer appear to prefer more open underpasses, and an openness index has been used to design underpasses since the early 1970s (Reed et al. 1975). However, more recent literature questions the validity of the openness index, and Clevenger and Huijser (2011) do not recommend its use in planning and designing wildlife crossing structures. The rationale behind Clevenger and Huijser (2011) questioning the validity of the openness index is as follows:

- There is changing understanding of how openness is measured. Is it an index, a ratio, or simply a state or concept?
- Wildlife crossing structures are not always rectilinear. There is no guidance on how different shaped underpass designs (arched, circular, elliptical) affect the openness index.
- Problems have been identified with an inconsistent use of metric vs. Imperial units.
- The relationship between openness and underpass performance is likely species-specific and time dependent.
- Despite the appeal and popularity of openness indices, there has never been a critical evaluation of the measure for designing wildlife underpasses.
- Openness is highly correlated to underpass length. Similarly, the three main underpass structural measures (length, width, height) exhibit multicollinearity (they tend to be redundant and highly correlated with one another).

Clevenger and Huijser (2011) do recommend the use of underpass measures (length, width, height) in conjunction with a critical evaluation of structural factors (e.g., highway configuration) and environmental factors (e.g., habitat quality, target species) when designing wildlife crossing structures.

As indicated in the May 2014 conceptual design report (Stantec 2014a), passage requirements for Large Terrestrial, Medium Terrestrial, and Small Terrestrial EDGs will be addressed in this large below-grade crossing structure. Provision of hiding cover (e.g., tree branches and tree trunks) inside the structure will be required to encourage use of this structure by small mammals, reptiles and amphibians (Connolly-Newman 2013). Specifications for small animal hiding cover will be provided during preliminary design.

4.0 SMALL TERRESTRIAL AND AQUATIC WILDLIFE BELOW-GRADE CROSSING STRUCTURE

The November 2014 concept design proposes a 2.4 m diameter x 95 m long drainage culvert under 199 Street (Figure 1). The May 2014 conceptual design report (Stantec 2014a) suggested that passage requirements for the Small Terrestrial, Amphibian, and Aquatic Species EDGs could be addressed in the modified drainage culvert. Wood frog and boreal chorus frog have been detected in the vicinity of Wedgewood Ravine (Ecoventure 2013).

Due to the high levels of beaver activity in the area, it is very likely that modifications to the inlet and outlet of the drainage culvert will be required to prevent beavers from accessing and blocking the drainage culvert. This will preclude Medium Terrestrial EDG use of this structure.

This small below-grade crossing will be modified with the addition of a raised platform to allow for dry passage of small-sized animals when water is flowing through the culvert. Specifications for small animal dry passage will be provided during preliminary design.

5.0 RESPONSE TO CITY OF EDMONTON COMMENTS

The City of Edmonton has requested additional information pertaining to wildlife passage associated with the Project (City of Edmonton 2014b). The following is in response to the questions/concerns with the earlier conceptual design.

City Comment:

How does the wildlife crossing interact with the newly installed outfall west of 199 Street on the north bank of the creek?

Stantec: The realignment of the underpass will improve wildlife access on the west side of 199 Street . The location of the outfall is not anticipated to adversely affect wildlife use of this structure.

City Comment:

It is currently unclear how wildlife is intended to move west of this passage. Most notably, after going over (or around) the rip rap of the outfall (which, for access reasons, is likely to remain devoid of significant vegetation), they would need to cross over a small tributary (which is often flooded by beaver dams making passage difficult) and then up a steep slope to continue to move west.

Stantec: The natural topography on the west side of passage is not expected to prevent wildlife movement on the west side of the structure. Fill slopes associated with the road will require benching and a 3 m wide wildlife path to provide north-south movement. Details on wildlife paths and benching will be provided during preliminary design.

City Comment:

Line of sight: the structure should be located at near equal contour sites on either side of the road and be angled to fit the line of the creek bottom. This would provide for a more appropriate line of sight.

Stantec: Line of sight has been improved by skewing the large crossing structure 25 degrees.

City Comment:

There is reference in this report that the proposed structure is comparable to a large open-span bridge that was installed near Lake Louise, AB. (5 differences were notes, refer to the memorandum from Catherine Shier, October 15, 2014 in Appendix A)

Stantec: The proposed structure is very similar in engineering design to the large open-span bridge that was installed near Lake Louise, AB. It is expected that the proposed structure will function similarly to the Lake Louise structure for wildlife passage.

City Comment

Appendix A of the report speaks to the passage requirements of small terrestrial, amphibian and aquatic EDGs being adequately addressed in the proposed modified drainage culvert. Has this culvert been modified from what was presented formerly? Please outline the difference.

Stantec: The latest design shown in Figure 1 is shorter in length (95 m) than the previous design (approximately 150 m). Specifications for small animal dry passage will be provided during preliminary design.

City Comment

The unique site challenges of this location (e.g. culvert, small flooded tributary, road crossing angle, steep slope on west side of road) could be overcome by the installation of a wider bridge.

Stantec: The natural topography of Wedgewood Ravine does not pose a barrier to wildlife movement. The width and height of the proposed large below-grade crossing structure is more than adequate to provide wildlife passage. An earlier design 7 m wide was increased to 14 m to improve the openness of this structure. Further increases in the width of this structure are unnecessary and unwarranted.

6.0 CONCLUSION

The City of Edmonton (2010) has identified 11 Ecological Design Groups (EDGs) to be addressed when planning and designing wildlife passage: Large Terrestrial, Medium Terrestrial, Small Terrestrial, Amphibians, Aerial Mammals, Aquatic Species, Scavenger Birds, Birds of Prey, Water Birds, Ground Dwelling Birds, and Other Birds. It is expected that one or more species within all 11 EDGs are predicted to occur in the vicinity of Wedgewood Creek (Stantec 2014a).

The current concept design is adequate to accommodate the passage requirements for all of the EDGs identified in the Stantec (2014a) report. Passage requirements for the Large Terrestrial, Medium Terrestrial, and Small Terrestrial EDGs are adequately addressed in concept design for the large open-span wildlife crossing structure (Figure 1). The proposed location approximately 5 m below the roadway is near the natural travel area of deer at the top of Wedgewood Ravine that was observed during the field assessment (Stantec 2014b).

Passage requirements for the Small Terrestrial, Amphibian, and Aquatic Species EDGs are adequately addressed in the proposed modified drainage culvert associated with Wedgewood Creek. Passage requirements for the Aerial Mammals, Scavenger Birds, Birds of Prey, Ground Dwelling Birds, Water Birds and Other Birds EDGs will be adequately addressed above-grade in the Recommendations for Reducing Bird and Bat Vehicle Collision Risk (see Stantec 2014a).

7.0 CLOSURE

This evaluation of conceptual design for wildlife passage on the 199 Street Widening Project within Riverview Neighbourhood 1 was prepared by Stantec Consulting Ltd. for the Riverview Owners Group. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report

Stantec has endeavored to incorporate the principles of the WPEDG into the 199 Street wildlife passage design and the constraints associated with the physical site characteristics and available materials. We trust that this information is sufficient to support the submission of the initial concept.

Respectfully submitted,

STANTEC CONSULTING LTD.

Bill Harper

William L. Harper, M.Sc., R.P.Bio.
Senior Wildlife Biologist

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THE CITY OF Edmonton

SUSTAINABLE DEVELOPMENT **MEMORANDUM**

December 4, 2014

TO: Natalie Lazurko, P.Eng.
Transportation Planning

FROM: Catherine Shier
Ecology Unit, Parks + Biodiversity

CC: Francis Wambugu, P.Eng., MBA
Development Planning and Engineering

SUBJECT: **Comments for 199 street crossing of Wedgewood Creek (May 15, 2014 concept drawings from CIMA)**

Dear Natalie and Chris,

The Ecology Unit (Parks + Biodiversity) has reviewed CIMA's November 18, 2014 letter (Subject: *Comments to your correspondence dated October 15, 2014*) and associated attachments on the 199 street crossing of Wedgewood Creek.

We appreciate both the ability to meet with this team in the field and the additional work that they have completed in an attempt to address our office's concerns. While we are still not entirely satisfied with the line of site of the passage (and have concerns about the impact the large retaining walls will have on the "openness" of the passage) our office is comfortable approving this current concept which incorporates a dual passage system of:

a) A bridge structure that will be designed to promote large mammal passage (openness ratio of 2.0) as well as accommodation of other EDG passage requirements and
b) A culvert that allows for both aquatic and small terrestrial passage.

Moving forward to Preliminary Design, we wanted to take this opportunity to let the proponent know that the key to our support of the final design of the passages will depend on:

- Suggested changes to improve line of sight: Grading leading to (and out of) the passage should be further reviewed. We will be looking for an evaluation of other ways to improve the line of sight is maximized, for example, through potential modifications to the wing walls and additional earth work with respect to grading. As expressed in the field, our concerns lie mainly with the western opening of the passage and its steep slope, its relation to the outfall, and any restrictions that may result due to a need for maintenance access to the outfall.
- An understanding of how "open" the structure truly is: While the passage itself (4.5m x 14m) produces an openness ratio of 2.0, we are interested to know what impact, if any, such large wing walls have on the functionality of the passage (or the perception of openness by wildlife).

- Vegetation/landscaping of the wing walls and leading up to the structure to make the passage appear as natural as possible. Also, please confirm the type of maintenance access required for the outfall and how this will impact potential revegetation/restoration of the area. Is permanent access to this area required?
- Given the passage is directly under the road (and is more enclosed than a full span bridge would be), is noise to be a deterrent to wildlife use?
- An open median will be a requirement (thank you for including it) and we will be looking for the applicant to safely reduce the width of each road profile.
- Include design considerations in the bridge structure for the use of this passage for small/medium EDGs.
- Minimize light pollution.
- Ensure appropriate fencing for both wildlife and people management.
- With respect to aquatic passage, open-bottom culverts with natural substrate are preferred (both in the literature and by our office) to the option presented (2.4m corrugated pipe). Analysis on this option needs to be completed. Note also that there is conflicting information between the letter (indicates culvert length is 112.5 m long) versus the Appendix (95 m long).

In the past we have also requested the following at the appropriate drawing review phase and/or associated with the environmental review as per Bylaw 7188:

- Draft mitigation plan to address impact of construction activities on wildlife movement and use of the area (e.g. timing of construction)
- Outline potential locations for habitat restoration around proposed crossings to further offset the negative impacts of having the road widened to 4 lanes.

Thank you for the opportunity to comment. Please contact Catherine Shier at 780-442-4531 with any questions or concerns.

Catherine Shier
Senior Ecological Planner, Ecology unit
Parks + Biodiversity
Sustainable Development
Ph: 780-442-4531
Catherine.shier@edmonton.ca

APPENDIX K

Wildlife Passage Guidelines Checklist

E00540A

Appendix D – User Checklists

The checklist presented in this section is designed as a tool to highlight the important questions that must be answered when designing a wildlife passage and to provide a place to organize the information obtained during the process. Section references have been provided throughout the checklist should additional information be required for a specific question.

Some of the items that will be helpful to have in advance of completing this checklist are:

- A shadow map of the project overlain on the most recent aerial photo of the area
- Existing and future land use maps (e.g. ASP and NSP concept maps) to get an understanding of surrounding land uses
- Wildlife collision data
- Search local wildlife databases (see Section 3.2.4.1 of Guidelines)

Transportation engineers may have difficulty answering some questions with certainty. As a result, it is strongly advised that the process of designing a wildlife passage be a joint effort between both ecologists and engineers. Please note that if “unknown” or “suspected” is checked for any of the questions additional study may be required.

To ensure that a project is not delayed due to missing information, it is highly recommended that this checklist be completed and submitted to the Office of Biodiversity in conjunction with any proposed wildlife passage at concept and reconfirmed at the design phase of the project.

A) PROJECT DESCRIPTION

Project:	199 Street Concept Plan
Road Type	Arterial
Date:	November 20, 2014
Location:	199 Street from 35 Avenue to 23 Avenue in the Riverside area

A.1 CURRENT ROAD CONDITION

Current number of lanes	2	Lanes
Current Traffic Speed	80	Km/Hr
Current Traffic Volume	5600	AADT
Culverts with dry passage area	☐ Yes	■ No
Culverts without dry passage area	■ Yes	☐ No
Retaining walls	☐ Yes	■ No
Jersey barriers and/or noise barriers	☐ Yes	■ No
Number of wildlife collisions in the last 5 years	8	
Number of deer collisions in the last 5 years	N/A	
Other		

A.2 PROPOSED ROAD UPGRADES

Proposed number of lanes	4	Lanes
Proposed Traffic Speed	60	Km/Hr
Projected Traffic Volume	35650	AADT
Proposed Culverts with dry passage area	☐ Yes	■ No
Proposed Culverts without dry passage area	■ Yes	☐ No
Retaining walls	■ Yes	☐ No
Jersey barriers and/or noise barriers	■ Yes	☐ No
Other – Bridge wildlife crossing dry passage structure	■ Yes	

A.3 IDENTIFY PROPOSED LAND USE

Check any of the land uses that will apply to both the project area and adjacent area. Assess both current and future land uses. Please refer to Section 3.2.1 for additional information

Residential	■	Industrial	☐
Commercial	■	Institutional	☐
Agricultural	☐	Conserved/Natural Area	■
Rights-of-way	■	Water Bodies	■

A.4 PROJECT AREA SHADOW PLAN

Please attach project area shadow plan to this checklist

B) HABITAT DESCRIPTION

B.1 IDENTIFY ECOLOGICAL COMPONENTS WITHIN PROJECT AREA (i.e. within a 100m buffer)

Indicate whether any of the following ecological components are located in the project area and will be affected by the proposed activity. Refer to Section 3.2.2 for assistance

North Saskatchewan River (NSR)	☐ Yes	■ No
Water courses (excluding the NSR)	■ Yes	☐ No
Natural Areas (Geowest 1993, Spencer 2006)	■ Yes	☐ No
Wildlife corridors (refer to question B.3)	■ Yes	☐ No
Wetlands (natural or constructed)	☐ Yes	■ No
Lakes	☐ Yes	■ No
Woodland (i.e. a freestanding unit of trees that is >0.5 ha)	■ Yes	☐ No

B.2 IDENTIFY ECOLOGICAL COMPONENTS OF ADJACENT AREA (i.e. > 100m from project)

Indicate whether any of the following ecological components are located on land adjacent to the proposed activity. Refer to Section 3.2.2 for assistance

North Saskatchewan River (NSR)	■ Yes	☐ No
Water courses (excluding the NSR)	■ Yes	☐ No
Natural Areas (Geowest 1993, Spencer 2006)	■ Yes	☐ No
Wildlife corridors (refer to question B.3)	■ Yes	☐ No
Wetlands (natural or constructed)	■ Yes	☐ No
Lakes	☐ Yes	■ No
Woodland (i.e. a freestanding unit of trees that is >0.5 ha)	■ Yes	☐ No

B.3 IDENTIFY POTENTIAL WILDLIFE CORRIDORS

A corridor may be present if your project area contains one of the following:

Linear landscape features (Ridges, valleys, rivers, sharp breaks in vegetative cover)	■ Yes	☐ No
Identified Natural Areas (within 1 km of the project)	■ Yes	☐ No
Water bodies (wetlands, lakes, rivers, streams)	■ Yes	☐ No
Known migratory pathways	☐ Yes	■ No
Hedgerows, shelterbelts, windbreaks	■ Yes	☐ No
Greenways (a corridor of undeveloped land preserved for recreational use or environmental protection)	■ Yes	☐ No

Please note that some corridors are more important ecologically than others and will have greater wildlife use. For example, a natural riparian corridor will likely have a greater diversity and frequency of wildlife use than a greenway. Please refer to Section 3.2.2 for additional resources that may be used to identify wildlife corridors.

B.4 IDENTIFY HABITAT IN THE PROJECT AREA

Referencing the ecological components outlined above, please indicate the types of habitat located within 100m of the project area			
Riparian (interface between land and a river or stream)	■ Yes	☐ No	☐ Unknown
Permanent Water Body (Stream/Lake)	■ Yes	☐ No	☐ Unknown
Wetland/Slough/Marsh	☐ Yes	■ No	☐ Unknown
Trees or Forested Land	■Yes	☐ No	☐ Unknown
Grassland/Pasture Land/ Hay Field	■Yes	☐ No	☐ Unknown

Please note: Each habitat type identified above has a corresponding species list found in Appendix B.
If "unknown" is checked future studies will be required

B.5 IDENTIFY CONFLICTS WITH HABITAT

Wildlife-vehicle conflicts may occur if the project area involves the items listed below:			
Natural Area within 1 km	■ Yes	☐ No	☐ Unknown
Upland-Wetland Habitat is Bisected	☐ Yes	■ No	☐ Unknown
Wetland-Wetland Habitat is Bisected	☐ Yes	■No	☐ Unknown
Riparian Habitat is Bisected (i.e. North Saskatchewan River Valley and any of its Tributaries)	■Yes	☐ No	☐ Unknown
The project has high speed (>50 km/hr)	■Yes	☐ No	☐ Unknown
The project has high traffic volume (non-local roads)	■Yes	☐ No	☐ Unknown

Wildlife mitigation will likely be required if yes is checked; additional studies may be required if unknown is checked

B.6 HABITAT: SUMMARY

Will the activity have a substantial adverse effect by habitat modifications on sensitive natural areas identified in local or regional policies or regulations?	☐ Yes	■ No	☐ Unknown
Will the activity have an adverse effect on locally or provincially significant wetlands through removal, filling, hydrological interruption, or others activities?	☐ Yes	■No	☐ Unknown

*Please note: Checking 'Yes' or 'Unknown' to one or more of the questions stated above, may result in the requirement for further biological studies and/or correspondence with various governing agents to determine regulatory requirements

C) WILDLIFE

C.1 ECOLOGICAL DESIGN GROUP - EDG (i.e. major species groupings that are categorized according to the type and frequency of mitigation that will be effective)

Please identify the Ecological Design Group(s) located in the project area (Refer to Section 4.3.1)				
Large Terrestrial (e.g. moose, deer)	■ Yes	☐ No	☐ Suspected	☐ Unknown
Medium Terrestrial (e.g. coyote, rabbit)	■Yes	☐ No	☐ Suspected	☐ Unknown
Small Terrestrial (e.g. weasel, vole)	☐ Yes	☐ No	■Suspected	☐ Unknown
Amphibian (e.g. toad, salamander)	☐ Yes	■No	☐ Suspected	☐ Unknown
Aquatic (e.g. fish, mollusks)	■Yes	☐ No	☐ Suspected	☐ Unknown
Aerial Mammal (e.g. bats)	☐ Yes	☐ No	■Suspected	☐ Unknown
Scavenger Birds (e.g. raven, magpie)	☐ Yes	☐ No	■Suspected	☐ Unknown
Birds of Prey (e.g. hawks, owls)	☐ Yes	☐ No	■Suspected	☐ Unknown
Water Birds (e.g. shorebirds, waterfowl)	☐ Yes	■No	☐ Suspected	☐ Unknown
Ground Dwelling Birds (e.g. grouse)	☐ Yes	■No	☐ Suspected	☐ Unknown
Other Birds (e.g. woodpeckers, songbirds)	■Yes	☐ No	☐ Suspected	☐ Unknown

If suspected or unknown is checked, please refer to Appendix B for additional studies. Consult an ecologist for assistance.

C.2 RARE AND PROTECTED SPECIES

Please identify any rare or protected species (Red and Blue Listed or COWSEWIC Listed) (see Section 3.2.4.1 for further information on identifying species with status.)

There were no rare or protected species found in the vicinity of the Wedgewood creek crossing..

If any rare or protected species have been identified additional studies will be required to determine specific crossing requirements. Regulatory agencies must be contacted if rare or protected species are identified.

C.3 WILDLIFE NEEDS AND PREFERENCES

Please identify any specific needs that are required by the Ecological Design Group(s). (Refer to Section 4.3.2 for group information and Appendix B species information)

	Primary Habitat			Veg. cover for movement		Openness/ line of sight		Passage Type	
Ecological Design Group	Wetland	Upland	Both	Yes	No	High	Low	Wet	Dry
1) Large Terrestrial Special requirements:	☐	■	☐	■	☐	■	☐	☐	■

2)Medium Terrestrial Special requirements:	☐	■	☐	■	☐	■	☐	☐	■
3)Small Terrestrial Special requirements:	☐	■	☐	■	☐	☐	■	■	☐
4)Aquatic Special requirements: Require Stream habitat Riparian zone to be vegetated	☐	☐	☐	■	☐	☐	■	■	☐
5)Aerial Mammals Special requirements: Vegetation and tall lighting structures along the roadway will help direct bats up and over the road.	☐	■	☐	■	☐	■	☐	☐	■
6)Scavenger Birds Special requirements: Remove road kill off roadway	☐	■	☐	■	☐	■	☐	☐	■
7)Birds of Prey Special requirements: Vegetation and tall lighting structures along the roadway will help direct birds up and over the road.	☐	■	☐	■	☐	■	☐	☐	■
8) Special requirements:	☐	☐	☐	☐	☐	☐	☐	☐	☐

If any rare or protected species have been identified additional studies will be required to determine specific crossing requirements. Regulatory agencies must be contacted if rare or protected species are identified.

C.4 IDENTIFY PHYSICAL BARRIERS

Please identify the presence of any potential barriers to wildlife movement				
High traffic speed (>50 km/hr, see Section 3.3)	■ Yes	☐ No	☐ Suspected	☐ Unknown
High traffic volume (i.e. arterial roads for fast moving wildlife, local roads for slow moving wildlife, Section 3.3)	■Yes	☐ No	☐ Suspected	☐ Unknown
Perched culverts (see Section 3.3.4)	☐ Yes	■No	☐ Suspected	☐ Unknown
Insufficient water depth for aquatic passage (i.e. water is not deep enough for organism to physically pass)	☐ Yes	■No	☐ Suspected	☐ Unknown
Water velocity in excess of upstream and downstream velocity	☐ Yes	■No	☐ Suspected	☐ Unknown

Culverts without dry passage area	☐ Yes	■No	☐ Suspected	☐ Unknown
Undersized Culverts (not physically large enough to accommodate EDG or becomes blocked with debris)	☐ Yes	■No	☐ Suspected	☐ Unknown
Retaining walls	■Yes	☐ No	☐ Suspected	☐ Unknown
Traditional jersey barriers and/or noise barriers	■ Yes	☐ No	☐ Suspected	☐ Unknown
Other	☐ Yes	☐ No	☐ Suspected	☐ Unknown

Please note: These barriers will affect different EDGs in different ways. Some barriers may not be applicable to your project (e.g. Jersey barriers may not be a barrier if only Large Terrestrial species are present)

C.5 WILDLIFE AND TRANSPORTATION CONFLICTS

Will the activity have a substantial adverse effect by habitat modifications on any species with status identified in local or regional policies or regulations?	☐ Yes	■ No	☐ Unknown
Will the activity interfere with previously existing wildlife corridors?	■Yes	☐ No	☐ Unknown
Will the activity interfere with the movement of any resident or migratory fish species?	☐ Yes	■No	☐ Unknown
Will the activity interfere with the movement of any non-fish wildlife species?	■Yes	☐ No	☐ Unknown

Please note: Checking 'Yes' or 'Unknown' to one or more of the questions stated above, may result in the requirement for further biological studies and/or correspondence with various governing agents to determine regulatory requirements

C.6 WILDLIFE: SUMMARY

a) Please summarize whether a conflict will exist between the project and wildlife in the area? (Refer to Section 3.3.5) ■ Yes ☐ No

b) Can this conflict be avoided (Refer to Section 3.4)? For example, can the road be realigned to avoid the habitat feature that is attracting wildlife passage? ☐ Yes ■No

c) Is there reason to believe that providing mobility through this area will be beneficial and sustainable? If "no," please explain. ■Yes ☐ No

Wildlife mitigation will be required if "no" is checked for 3.6b or "yes" is checked for 3.6c.

D) PROPOSED SOLUTIONS

Please indicate what types of solutions will be used to mitigate for the disturbance to wildlife in the project area (include activities for before, after, and during project implementation).

Retention of existing habitat	■ Yes	☐ No
Habitat protection during construction	■Yes	☐ No
Ensuring functionality of wildlife corridors during construction	■Yes	☐ No
Wildlife passage (continue with Section E of this checklist)	■Yes	☐ No
Restoration or enhancement of existing habitat (provide initial recommendations in Section F of this guideline)	■Yes	☐ No
Management Plan	☐ Yes	■ No
Monitoring	☐ Yes	■No

Please note: plans for proposed solutions are to be described in greater detail at detailed design phase

E) POTENTIAL MITIGATION OPTIONS TO MINIMIZE WILDLIFE - TRANSPORTATION CONFLICTS

E.1 IDENTIFY APPROPRIATE MITIGATION (Section 4.0 and Checklist 12.2 of guidelines)

a) Please indicate which mitigation possibilities meet the ecological, transportation, and regulatory requirements for your project (refer to Section 4.4 and 4.5). This table corresponds to Table 4.4 and is designed to help determine what mitigation options meet the needs of wildlife and transportation as well as regulatory requirements. If an option does not meet all three then a discussion with interested parties may be required to prioritize the proposed mitigation strategy. More than one mitigation option may meet all three requirements. In this case, the best option should be chosen or a combination of several should be considered.

	Needs and/or Requirements		
Mitigation Tool (Section of Guidelines)	**Ecological**	**Transportation**	**Regulatory**
Signage and/or Reflectors (4.5.1)	■	■	☐
Fencing (4.5.2)	■	■	☐
Altered Lighting (4.5.3)	■	■	☐
Altered Sight Lines (4.5.4)	■	■	☐
Public Education (4.5.5)	■	■	☐
Traffic Calmed Areas (4.5.6)	■	☐	☐
Reduced Speed Limits (4.5.7)	■	☐	☐
Wildlife “Crosswalk” (4.5.8)	■	☐	☐
Diversionary Methods (4.5.9)	■	☐	☐
Reduce/Remove Roadkill (4.5.10)	■	■	☐
Vegetation Management (4.5.11)	■	■	☐
Noise Barriers (4.5.12)	■	☐	☐
Curb Improvements (4.5.13)	☐	☐	☐
Closed Bottom Culvert (4.5.14)	☐	☐	☐
Amphibian Tunnel (4.5.14)	☐	☐	☐
Open Bottom Culvert (4.5.14)	■	■	☐

Box Culvert (4.5.14)	☐	☐	☐
Bridges (4.5.15)	■	■	☐
Tunnel/Overpass (4.5.16)	☐	☐	☐
Passage Required for multiple species (4.6)	☐	☐	☐

b) Please identify the crossing mitigation(s) that will BEST meet all the requirements

Wildlife underpass (bridge structure for terrestrial species

Culvert for aquatic species

E.2 MITIGATION SIZE

If culvert or bridge-like structures are selected, please calculate the size of mitigation required. This will vary depending on the Ecological Design Group (EDG) and the size of the road. Use the openness calculation to help assess mitigation size (Refer to Section 4.3.3)

Openness = Height x Width / Length	Openness Ratio (m)				
	Large Terrestrial	Medium Terrestrial	Small Terrestrial	Amphibian	Aquatic
	1.5	0.4	≤0.4	0.16	Encompasses entire channel width

EDG Preferred Openness 1.5

Structure Length 31.0m

Structure Width 10.33m

Structure Height 4.5m

E.3 MITIGATION FREQUENCY

If the project area encompasses a large portion of the EDGs home range, several structures may be required to reduce vehicle-wildlife collisions and provide habitat connectivity. Please refer to Section 4.3.5 for assistance in determining if multiple structures are required and how close they must be placed.

N/A

F) IDENTIFY POTENTIAL LOCATIONS FOR HABITAT RESTORATION

Please identify any possibilities for restoration of habitat and connectivity. This could include

restoring portions of a damaged creek or re-planting trees. Refer to Section 3.2.3.
Construction activities will be closely monitored & mitigation techniques will be in place.
A new culvert will be installed.
Any trees that need to be removed for construction can be replanted.
Wildlife underpass concept has been designed, to mitigate wildlife/vehicle collisions
Open bottom wildlife passage will encourage natural habitat
Retailing walls for passage to be landscaped/vegetated or disguised with strategic plantings

G) COST-BENEFIT ANALYSIS

A cost-benefit analysis may be completed to determine the relative need for a structure. Please note that a cost-benefit analysis may not adequately reflect the value of important habitat and rare species. Please refer to Section 4.3.6 for additional information

H) REGULATORY CHECKLIST

This checklist provides a summary of common legislation that may be applicable to the project. Additional legislation may apply depending on the area. Please refer to Appendix C for additional information on regulatory requirements.

I) IMPORTANT REFERENCE TABLES

The reference tables below have been taken directly from the Wildlife Passage Engineering Design Guidelines. They are reproduced here only for ease of reference.

A single species may fall into more than one Ecological Design Group.

Table 4.1 - Species and Design Groups Summary

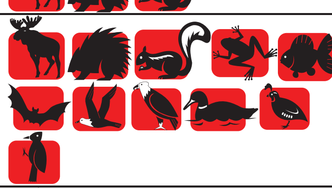
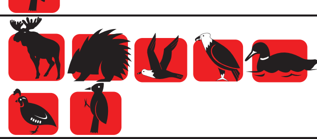
Design Group*	Example	General Habitat Information
Large Terrestrial	1. Moose ** 2. Deer	Need forested area for cover, and ungulates require considerations for grazing needs. Primary ungulate activity occurs at dawn or dusk. Ungulate activity near roads peaks during the fall and spring. Ungulates are more aggressive and less cautious during the fall rut.
Medium Terrestrial	1. Porcupine 2. Coyote 3. Rabbit	Mixture of habitat requirements: Porcupines require forested habitat; badgers require open habitat; and coyotes or hares may live in either.
Small Terrestrial	1. Mouse 2. Red Squirrel 3. Weasel	Mixture of habitat requirements: Red squirrels require forested habitat, while ground squirrels require open habitat. Weasels and some mice may inhabit either.
Amphibians	1. Canadian toad 2. Tiger salamander	Requires moist substrates and semi- permanent to temporary water for tadpole stage depending on species. Also need access between lowland and upland habitat for feeding and dispersal.
Aquatic	1. Lake Sturgeon 2. Northern Pike 3. Longnose Sucker 4. Mollusks	Need aquatic habitats with flow velocities low enough to allow for upstream movement and dispersal. Substrate in habitat must allow for cover and resting locations, and appropriate substrate may be needed for breeding. Access to overwintering habitats for most fish is essential. For mollusks, substrates must be conducive for attachment.
Aerial Mammals	1. Little Brown Bat 2. Northern Long-eared Bat	Require feeding and nesting locations with access in between. Nesting site needs vary by species. Nesting sites must remain undisturbed during winter hibernation.
Scavenger Birds	1. Raven 2. Crow 3. Magpie	Need sufficient habitat for nesting and safe foraging. Most populations are not at risk; however their overpopulation may put other species at risk.
Birds Of Prey	1. Red Tailed Hawk 2. Great Horned Owl	Requirements vary; many species require relatively undisturbed nesting sites, while others may nest near human habitation. Require safe foraging habitat, and safe migration routes and destinations.
Water Birds	1. Seasonal Ponds: Mallard, Shorebirds 2. Permanent Water: Golden Eye, Bufflehead	Require open water and/or appropriate shoreline for feeding and nesting, varying by species. Most are ground-nesting and thus require safe, undisturbed sites for nesting. Nesting habitat requirements varies by species. Require safe migration routes and destinations.

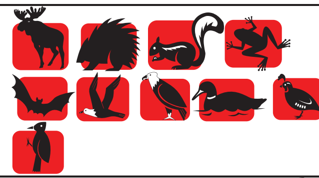
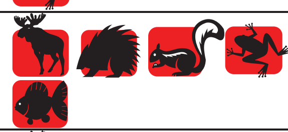
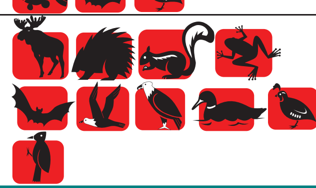
*Please be advised that these groupings are very general and that variations in requirements for each species within the design groups may exist. Also note that these groupings do not take into consideration feeding habitat, breeding habitat, or seasonality.

** Moose may be more common on the outskirts of the City while deer are more common in the river valley.

Design Group*		Example	General Habitat Information
	**Ground Dwelling Birds**	1. Gray Partridge 2. Sharp-tailed Grouse	Require safe open habitats for foraging and nesting. Nesting requires safe open grassy or shrubby areas. Require safe migration routes and destinations. Ground nesting birds should be included in this category during nesting season.
	**Other Birds**	1. Downy woodpecker (Core Forested) 2. Black Capped Chickadee (Edge/Woodland) 3. Grasshopper Sparrow (Grassland) 4. Red-winged Blackbird (Wetland)	Requirements vary significantly by species. Most species require at least some forested habitat for nesting and perching, although some are ground nesting or nest in wetland vegetation or shrubs. Most are migratory and require safe migration routes and destinations.

Table 4.4 - Mitigation Summary Table

Option	*Mitigation*	*Ecological Requirements*	*Transportation Requirements*
1	***Signage and/or Reflectors***		Lower volume roads. If it is going to be used on roads with higher volume or speed, it should be combined with other mitigation.
2	***Fencing****		Can be used on any road but may not be cost effective for minor roads.
3	***Altered Lighting****		ALL
4	***Altered Sight Lines***		Multi-use trails. May also be used if sight of human activity deters use of a crossing
5	***Public Education***		ALL
6	***Traffic Calmed Areas***		Suitable for roads with average speed below 50km/hr or in an area with high bird breeding densities.
7	***Reduced Speed Limits***		Useful in areas of high wildlife-vehicle collisions
8	***Wildlife "Crosswalk"***		Roads with low traffic volume. Should be used in conjunction with signs.

9	*Diversionary Methods*	 *Other birds using bridges as habitat*	Effective for bridges and any road with wildlife foraging along the right-of-way
10	*Reduce/Remove Road kill*		Suitable for all roads
11	*Vegetation Management*		Suitable for all roads
12	*Noise Barriers*		Roadway that is near valuable nesting habitat for birds (eg. near a wetland). Note: this will behave as a barrier to terrestrial wildlife.
13	*Curb Improvements*		Useful in all areas where small wildlife may be trapped on the road.
14	*Closed Bottom Culvert†*		Suitable for roads crossing minor drainage channels. May also be used in areas without drainage to assist small and medium terrestrials. In areas with drainage, ledges on the sides may be used to accommodate some terrestrial species.
15	*Amphibian Tunnel*		Any road running bisecting wetland-upland habitat or wetland-wetland habitat
16	*Open Bottom Culvert*****		Suitable for roads crossing minor drainage channels. May also be used in areas without drainage to assist small and medium terrestrials.
17	*Box Culvert*****		Suitable for roads crossing larger drainage channels. May also be used in areas without drainage to assist small and medium terrestrials
18	*Bridges*****		Requires grade separation
19	*Tunnel/Overpass*		Effective in sensitive natural areas, areas without grade separation, areas where the terrain on either side of the road is higher than the road.

* Should be complementary to other mitigation and not used as a stand alone treatment

** Improvements are required for more than one Ecological Design Group to benefit from this crossing

† Should only be used in areas that do not have critical fish habitat or species at risk. Stream widths must be less than 2.5 m and gradients less than 6%.

APPENDIX L

Open House Invite & Resident Comments

February 10, 2014
File: 1161102460

Dear Property Owner or Resident,

Reference: Open House Invitation – Riverview Neighbourhood Structure Plans

The Riverview Area Structure Plan (ASP) was approved by Council in July 2013. Stantec Consulting has now started work on Neighbourhood Structure Plans (NSPs) for three neighbourhoods within the Riverview area (see attached). These NSPs will provide additional details based on higher level policies in the Riverview ASP.

Stantec is pleased to invite you to attend an Open House to discuss the preliminary concepts for NSPs, review the associated planning and engineering requirements, and provide information on the planning process and timing.

Date:	Tuesday, February 25th, 2014
Time:	6:30 pm – 8:00 pm
Location:	Edmonton Petroleum Golf & Country Club 51320 Range Road 260 (Winterburn Road SW) Spruce Grove, AB T7Y 1B1

If you have any questions or comments feel free to contact Nick Dyjach at nick.dyjach@stantec.com (780-917-6683).

STANTEC CONSULTING LTD.

Nick Dyjach
Planner
(780) 917-6683
nick.dyjach@stantec.com

dn \\cd1001-c200\workgroup\1161\active\1161102460\reports\open house - feb. 25, 2014\landowner public meeting invite 7feb14.docx

Riverview Neighbourhood Structure Plan
Stakeholder Advisory Group
February 25, 2014

ATTENDEE SIGN IN SHEET

Your name and address are being collected by Stantec Consulting for future contact regarding information on the proposed application.

NAME (PLEASE PRINT)	SIGNATURE
Byron Kocera	[signature]

ADDRESS & POSTAL CODE	E-MAIL
31 River Heights Dr	KTrideals@aol

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Riverview Neighbourhood Structure Plan
February 25, 2014

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NAME (PLEASE PRINT)	SIGNATURE
GERRT Lewassen	[signature]
ADDRESS & POSTAL CODE	**E-MAIL**
104 Weed Seed Wynd	780 916 3090

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Riverview Neighbourhood Structure Plan
Stakeholder Advisory Group
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NAME (PLEASE PRINT)	SIGNATURE
Dr. S. P. Singh, Basanti Singh	B Singh

ADDRESS & POSTAL CODE	E-MAIL

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NAME (PLEASE PRINT)	SIGNATURE
PAUL YUSYPCMUK	

ADDRESS & POSTAL CODE	E-MAIL
123-205 ST SW	paul.yusypchuk@nwlr.ca

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Stakeholder Advisory Group
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NAME (PLEASE PRINT)	SIGNATURE
BRIAN DEHAAN	
ADDRESS & POSTAL CODE	**E-MAIL**
112 Grandisle Way T6M 2N7	brianandjo.dehaan@gmail.com

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Riverview Neighbourhood Structure Plan
Stakeholder Advisory Group
February 25, 2014

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NAME (PLEASE PRINT)	SIGNATURE
Stephen Madsen	[signature]
ADDRESS & POSTAL CODE	**E-MAIL**
20307 5 Ave SW, Edmonton T6M 2P4	stephenmadsen007@yahoo.com

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NAME (PLEASE PRINT)	SIGNATURE
Anne Haggett	
ADDRESS & POSTAL CODE	**E-MAIL**
47 River Hgts. Dr	

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NAME (PLEASE PRINT)	SIGNATURE
Robert Hazlett	[signature]
ADDRESS & POSTAL CODE	**E-MAIL**
47 River Hgts Dr.	

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NAME (PLEASE PRINT)	SIGNATURE
G DAVIES	

ADDRESS & POSTAL CODE	E-MAIL
15 RIVER HEIGHTS DRIVE T6M 2R1	

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NAME (PLEASE PRINT)	SIGNATURE
PETER SHUTTLE	
ADDRESS & POSTAL CODE	**E-MAIL**
136 Woodland Wynd	banff4@gmail.com

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NAME (PLEASE PRINT)	SIGNATURE
Tim Ford	

ADDRESS & POSTAL CODE	E-MAIL
City of Edmonton.	

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Riverview Neighbourhood Structure Plan
Stakeholder Advisory Group
February 25, 2014

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NAME (PLEASE PRINT)	SIGNATURE
GORDON SOMMERFELD	
ADDRESS & POSTAL CODE	**E-MAIL**

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Stakeholder Advisory Group
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NAME (PLEASE PRINT)	SIGNATURE
Nick Young - WALTON	

ADDRESS & POSTAL CODE	E-MAIL

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NAME (PLEASE PRINT)	SIGNATURE
GERARD + LORNA LEVASSEUR	
ADDRESS & POSTAL CODE	**E-MAIL**
206-53302 RR 261 SPRUCE GROVE T7Y 1A7	

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NAME (PLEASE PRINT)	SIGNATURE
Terry and Lynn Szott	[signature]

ADDRESS & POSTAL CODE	E-MAIL
3441 - 199 Street, Edmonton T6M 2N5	tszo@live.com

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Riverview Neighbourhood Structure Plan
Stakeholder Advisory Group
February 25, 2014

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NAME (PLEASE PRINT)	SIGNATURE
GLEN MILES	[signature]
ADDRESS & POSTAL CODE	**E-MAIL**
11 RIVER HEIGHTS DR T6M 2R1	RHONDAFX@TELUS.NET

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NAME (optional): G. DAVIES

ADDRESS (optional): 15 RIVER HEIGHTS DRIVE

COMMENT FORM – Riverview Neighbourhood Structure Plan

We would appreciate your comments and concerns regarding any part of the proposal.

COMMENTS: ① Firmer timelines needed re: changes to 23 Ave E
2. Area in Neighborhood 3 across from River Heights Drive. Treat exis
residences similarly to present development beside Windem
from #100 – 268. ① Houses should face existing resid
② Frontages should be similar to new lots on Windemere
namely 83'. ③ Roadway (River Heights Drive) should
Kept separate from the ring road servicing the are
nearer to the oil + gas battery.

Please leave your comments form with staff tonight; or

Fax to Stantec (780) 917-7179 – Attention: Nick Dyjach
Email to: nick.dyjach@stantec.com

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Tuesday, February 25, 2014

NAME (optional):

ADDRESS (optional):

COMMENT FORM – Riverview Neighbourhood Structure Plan

We would appreciate your comments and concerns regarding any part of the proposal.

COMMENTS:

We are on River Heights Drive
& don't want to look @ bac
of houses - very quickly cou
be ugly

Perhaps a tree line & hous
only on north of proposed new
road

RiverHeights Drive stays dedicat
to residents - No construction
vehicles

Please leave your comments form with staff tonight; or

Fax to Stantec (780) 917-7179 – Attention: Nick Dyjach
Email to: nick.dyjach@stantec.com

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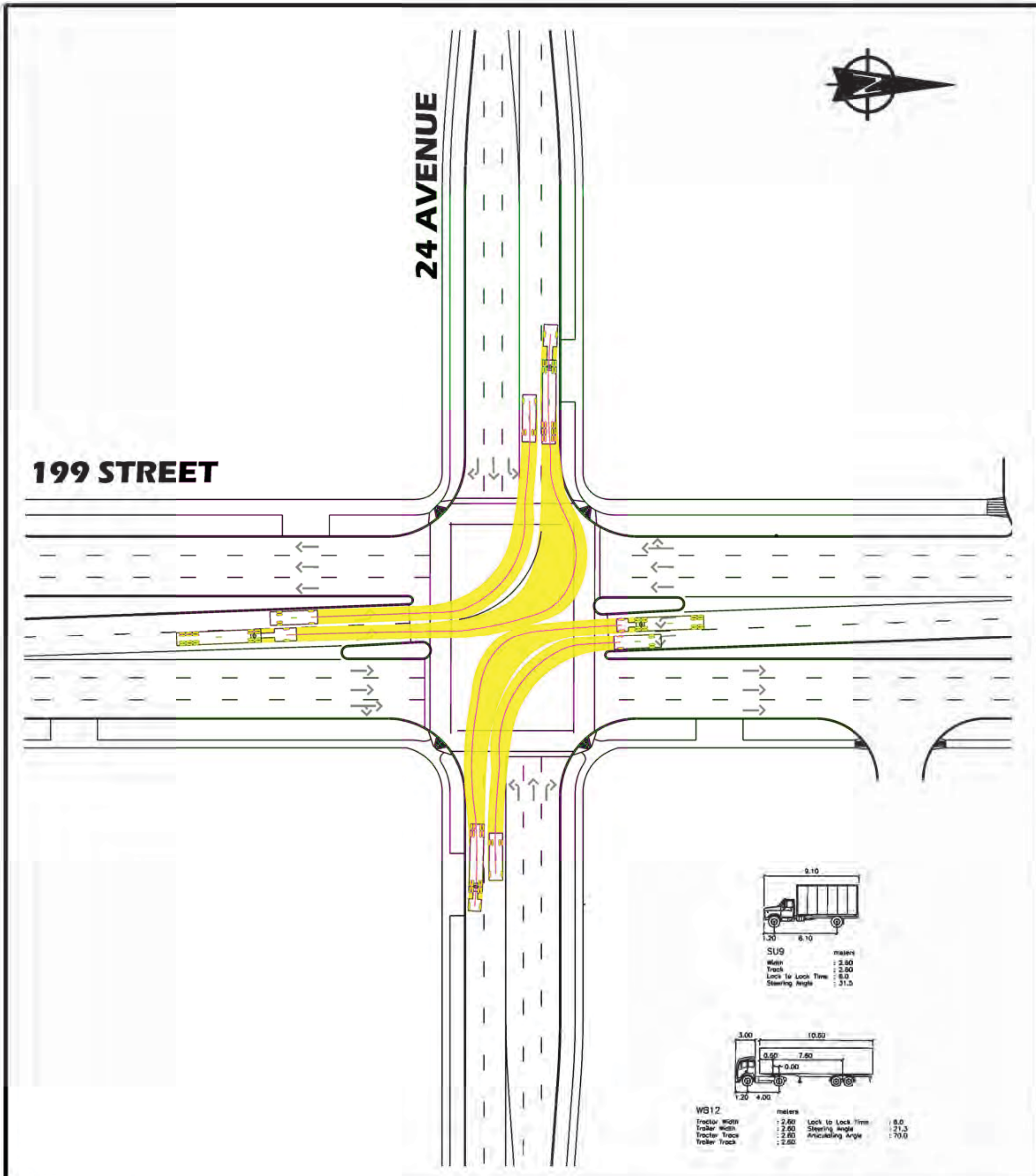
APPENDIX M

Auto Turn Sketches

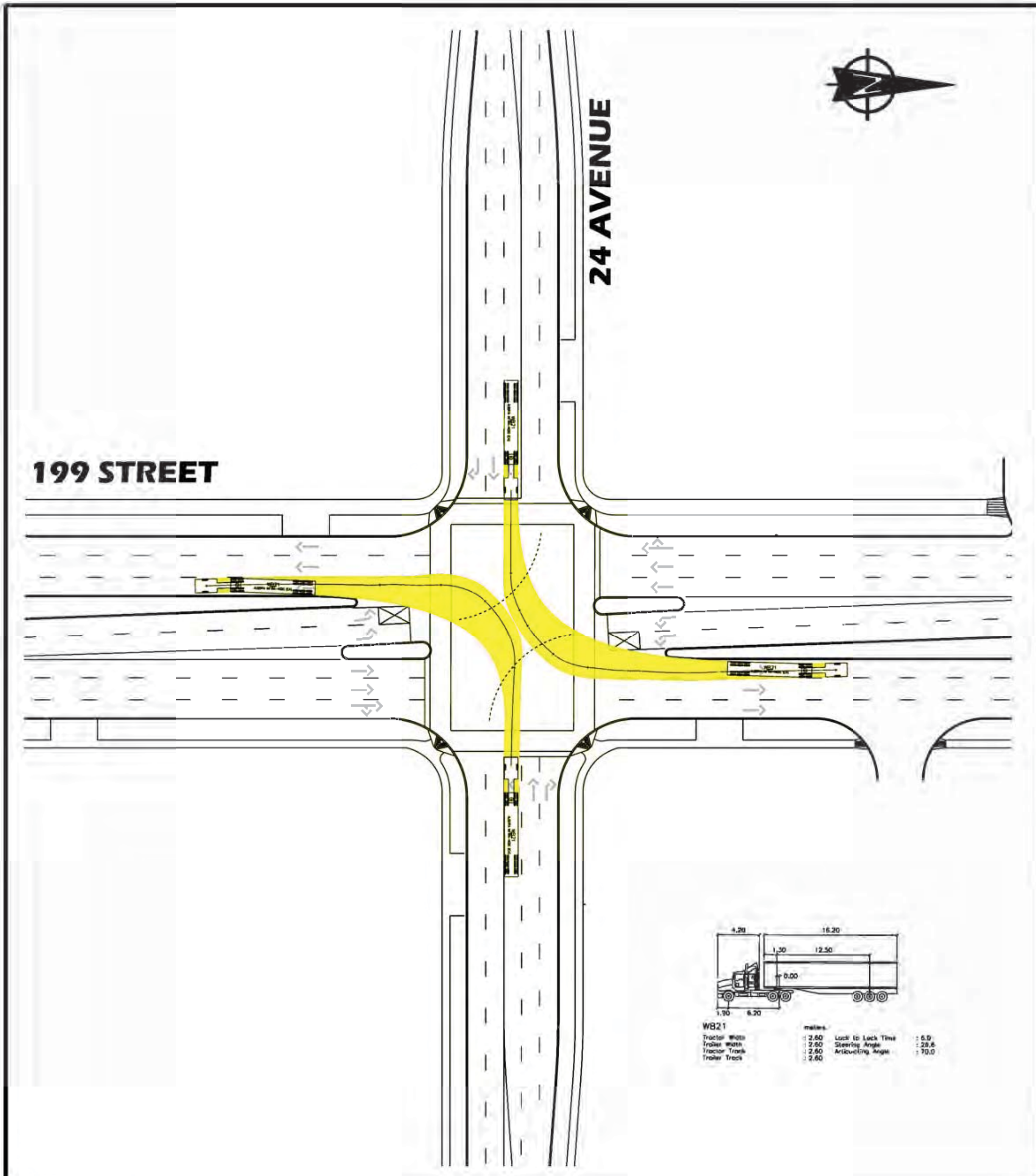


CIMA Partners in excellence

199 STREET
TURNING MOVEMENTS
24 AVENUE
(SHEET 1 OF 3)

FIGURE 1.1

0 6 12.5 25 m
SCALE

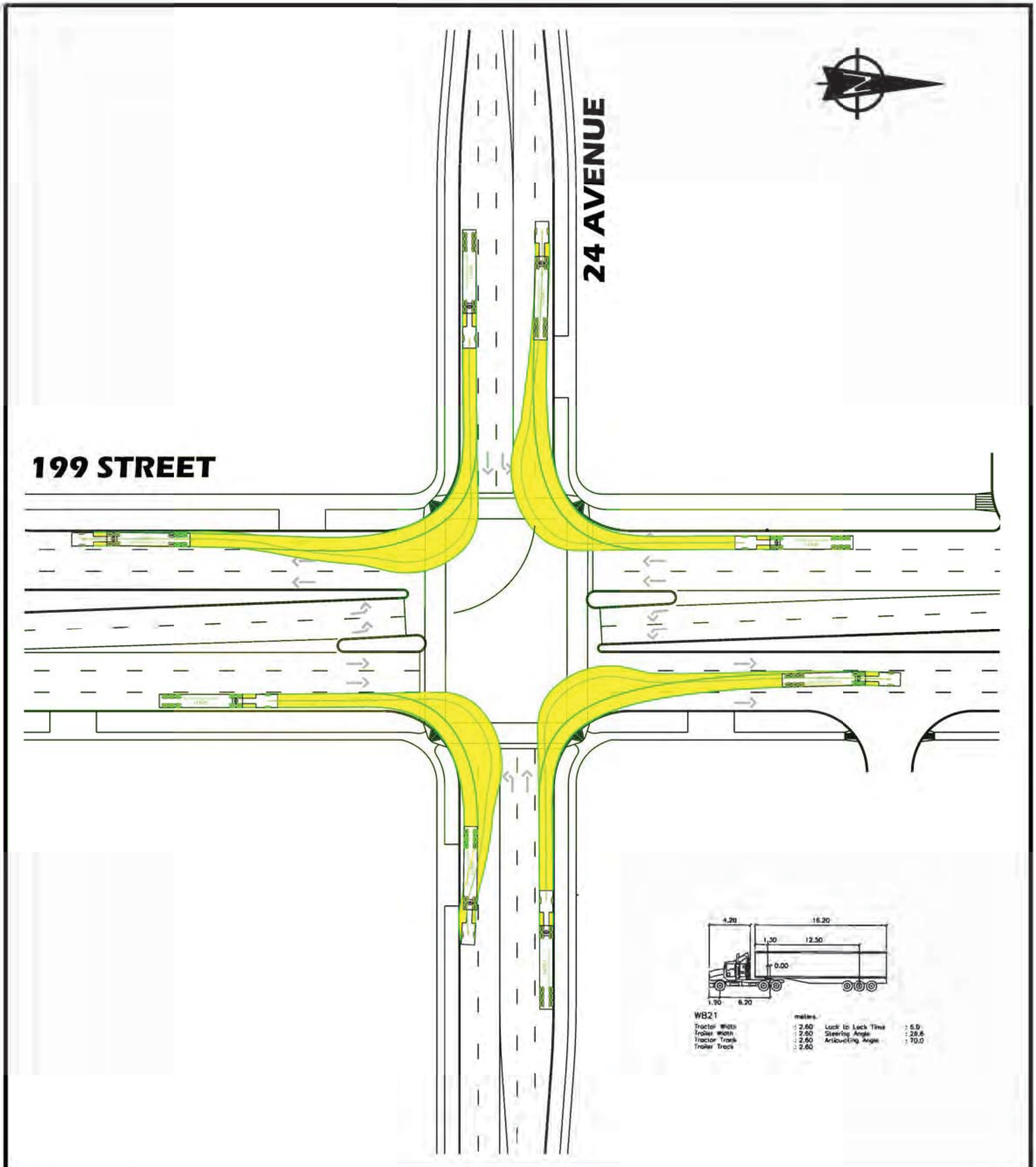


CIMA
Partners in excellence

199 STREET
TURNING MOVEMENTS
24 AVENUE
(SHEET 2 OF 3)

FIGURE 1.2

0 5 12.5 25 m
SCALE



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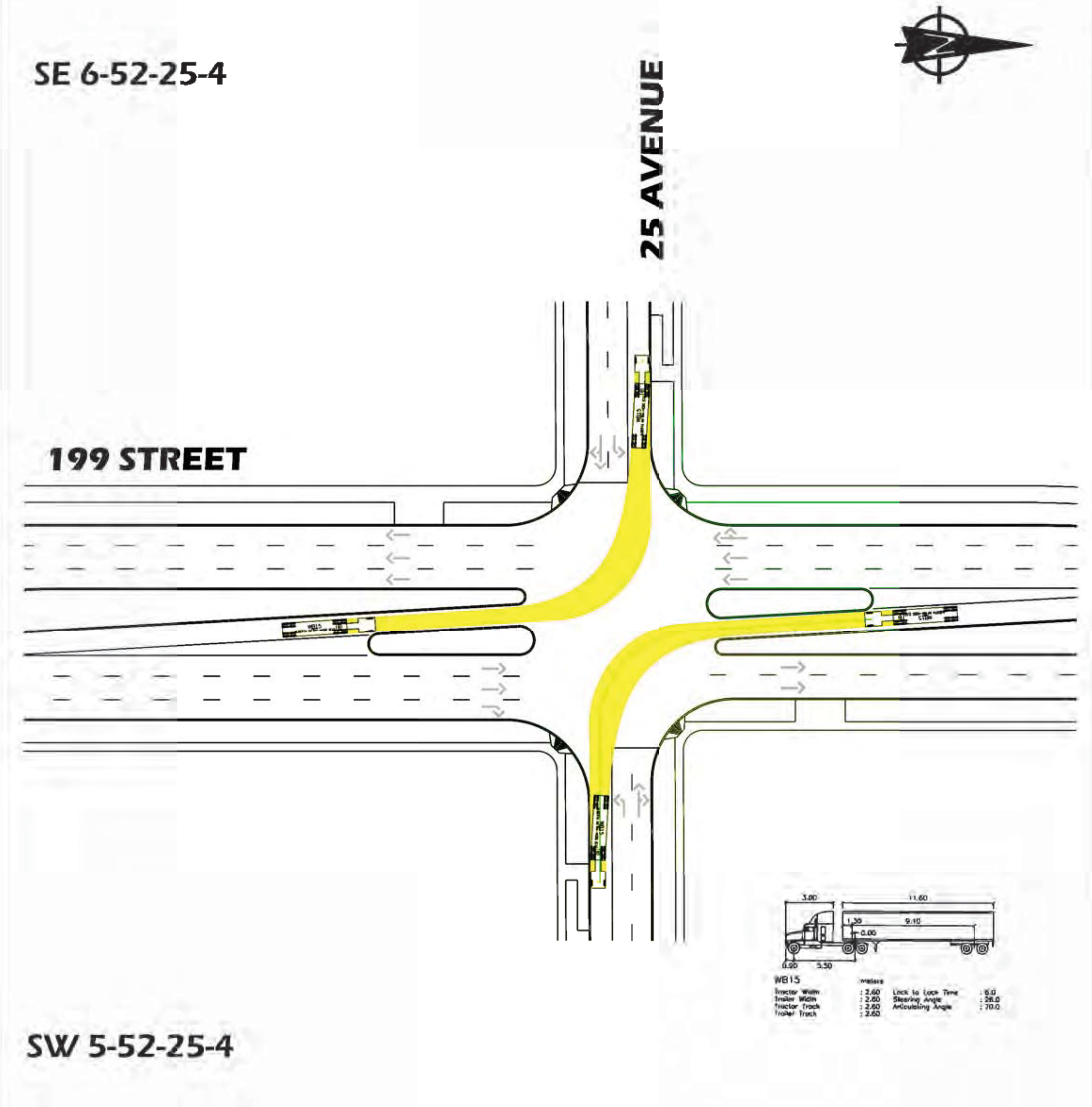
199 STREET
TURNING MOVEMENTS
24 AVENUE
(SHEET 3 OF 3)

FIGURE 1.3

0 5 12.5 25 m
SCALE



199 STREET
TURNING MOVEMENTS
25 AVENUE
(SHEET 1 OF 3)

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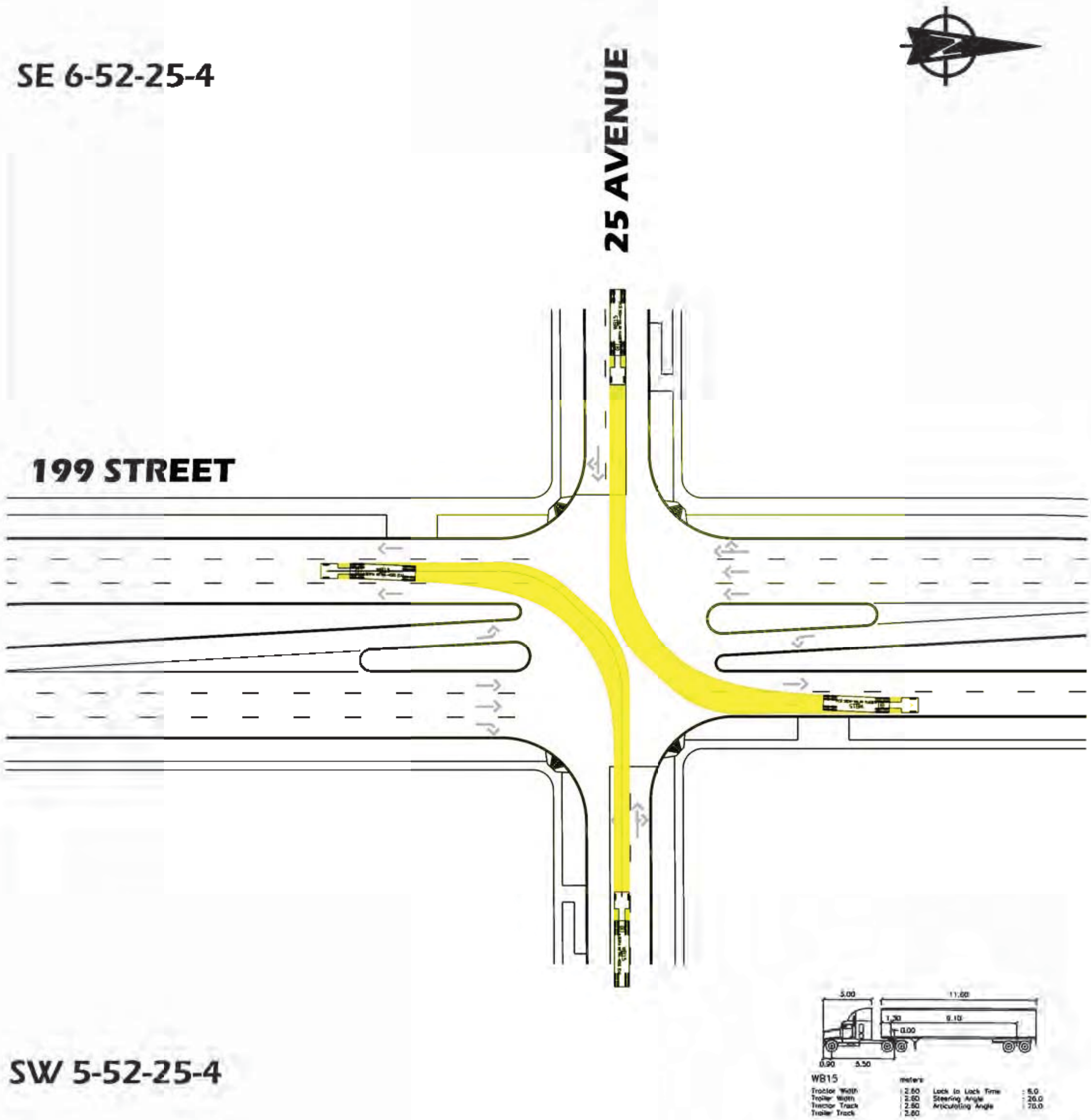
FIGURE 2.1

SCALE



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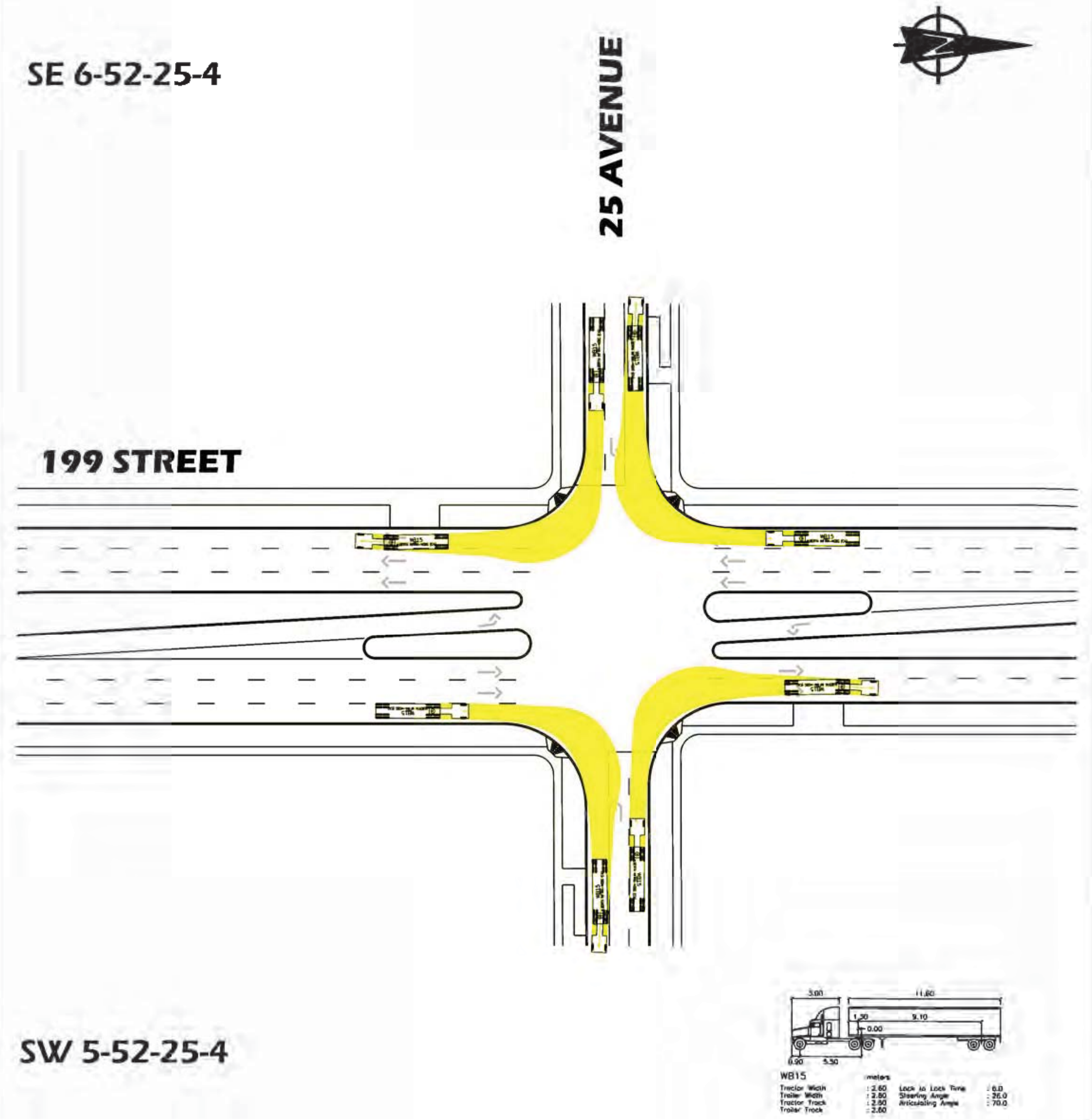
Partners in excellence

199 STREET
TURNING MOVEMENTS
25 AVENUE
(SHEET 2 OF 3)

FIGURE 2.2

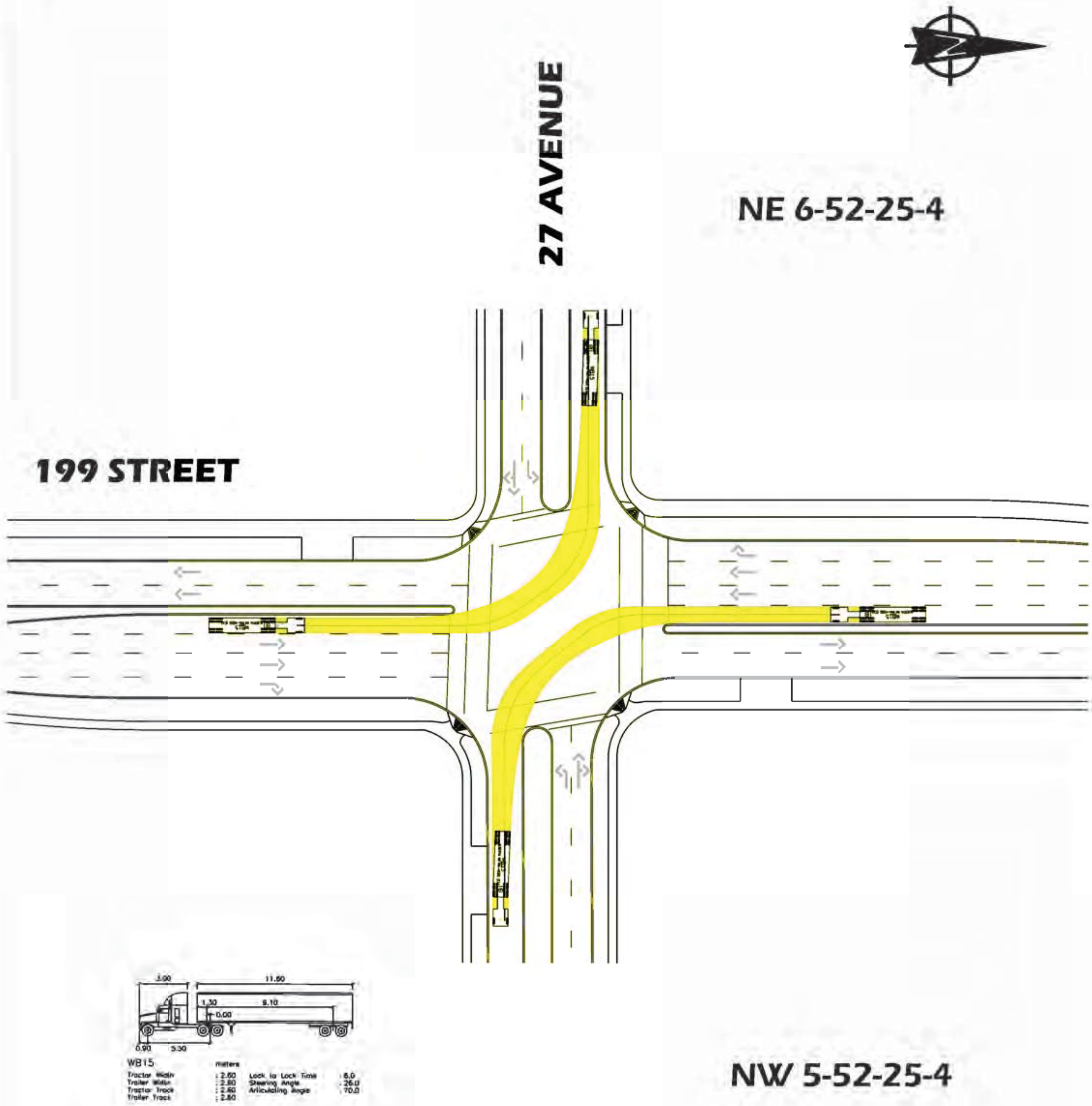
0 5 12.5 25 m
SCALE



CIMA
Partners in excellence

199 STREET
TURNING MOVEMENTS
25 AVENUE
(SHEET 3 OF 3)

FIGURE 2.3

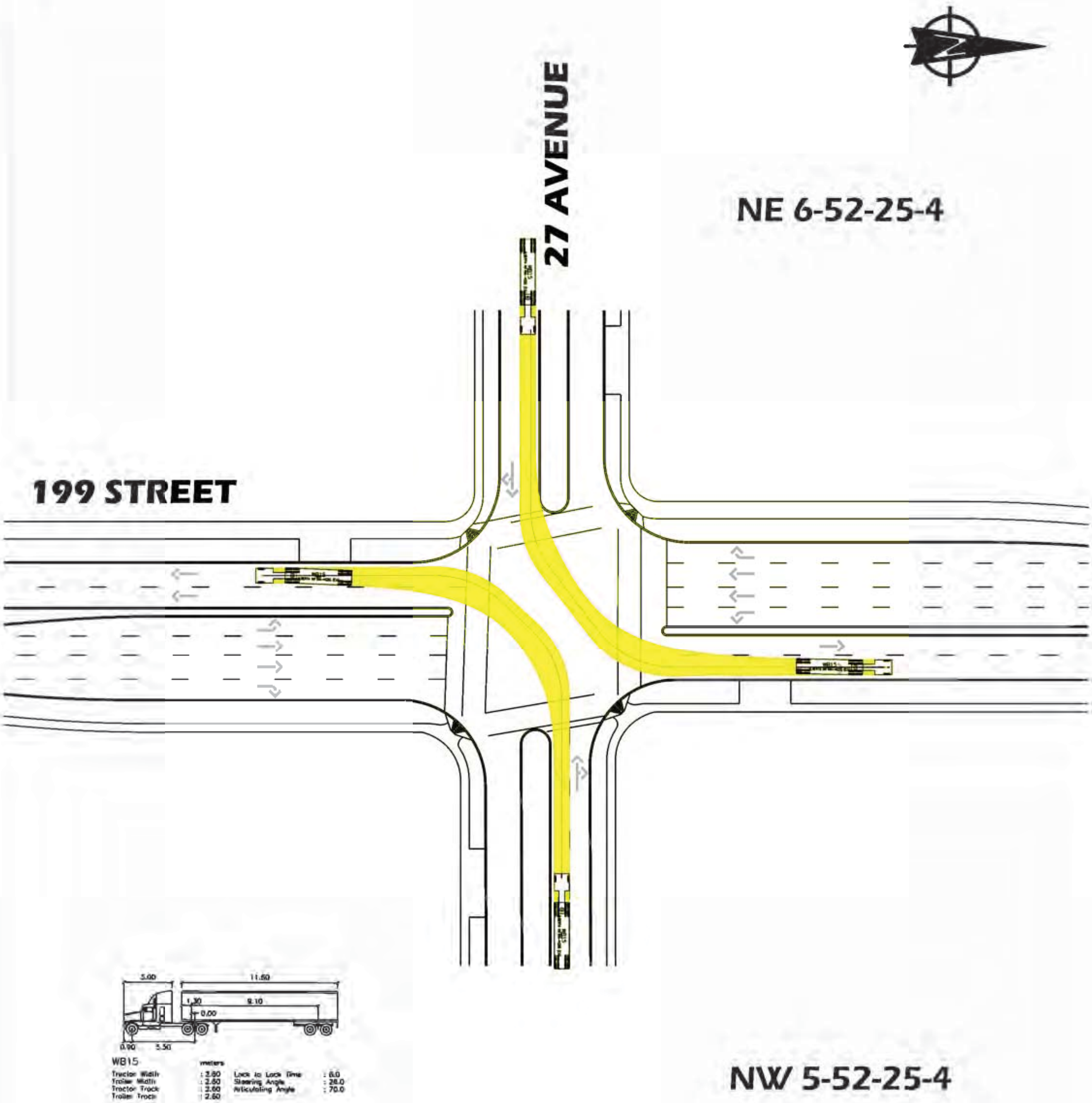


Partners in excellence

199 STREET
TURNING MOVEMENTS
27 AVENUE
(SHEET 1 OF 3)

FIGURE 3.1

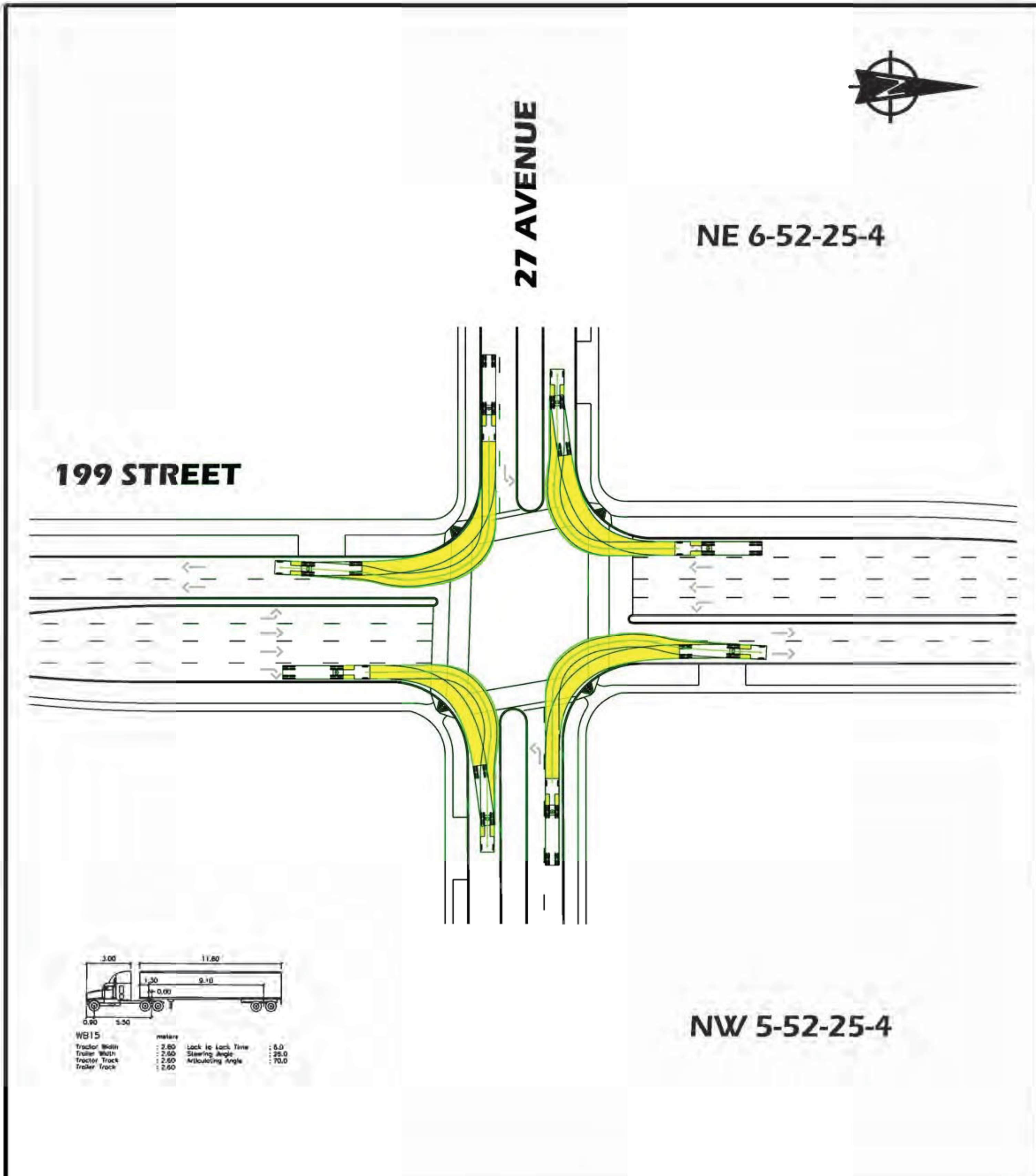
0 5 12.5 25 m
SCALE



199 STREET
TURNING MOVEMENTS
27 AVENUE
(SHEET 2 OF 3)

FIGURE 3.2

SCALE

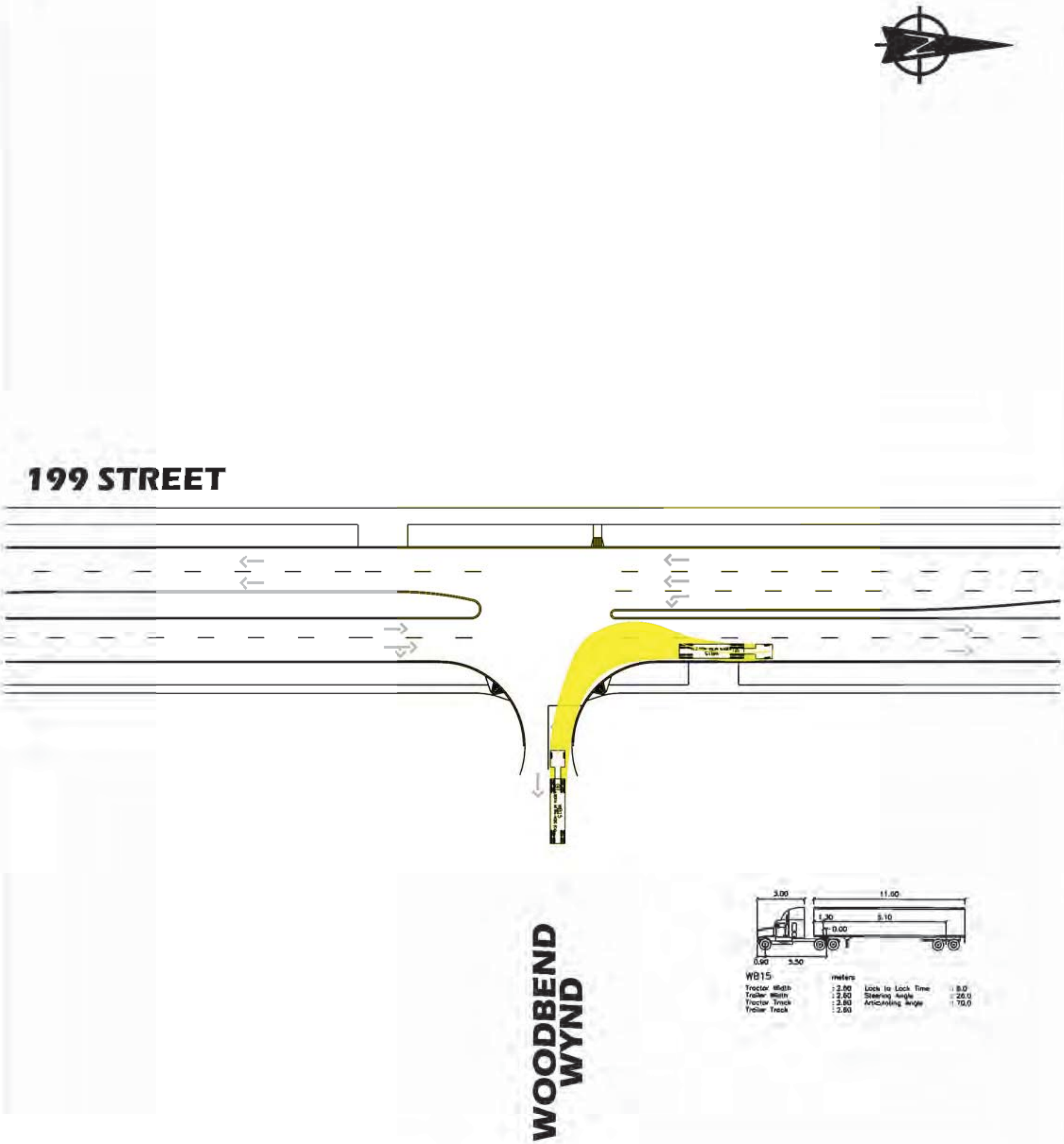


CIMA Partners in excellence

199 STREET
TURNING MOVEMENTS
27 AVENUE
(SHEET 3 OF 3)

FIGURE 3.3

0 5 12.5 25 m
SCALE

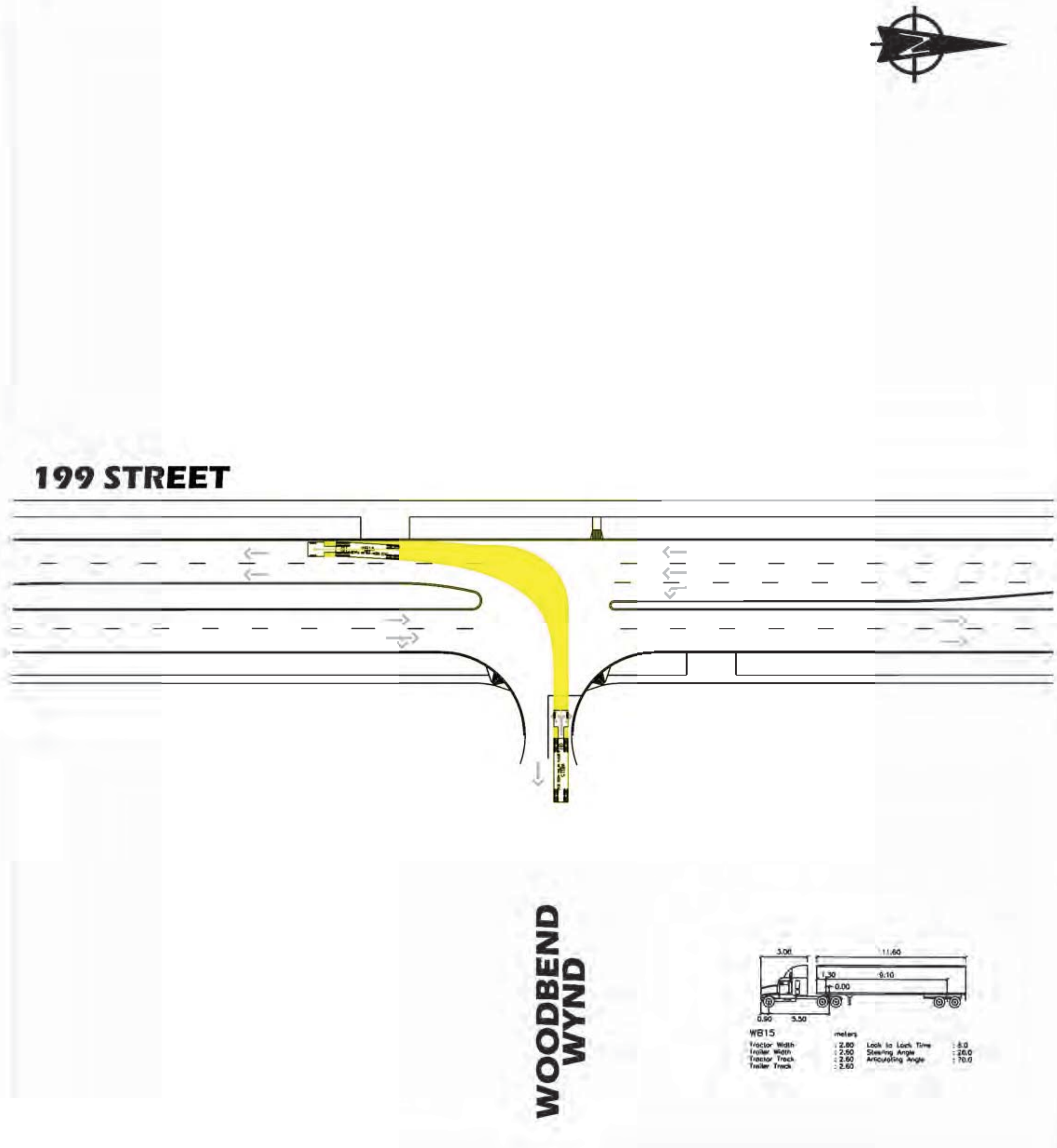


CIMA+
Partners in excellence

199 STREET
TURNING MOVEMENTS
WOODBEND WYND
(SHEET 1 OF 4)

FIGURE 4.1

0 5 12.5 25 m
SCALE

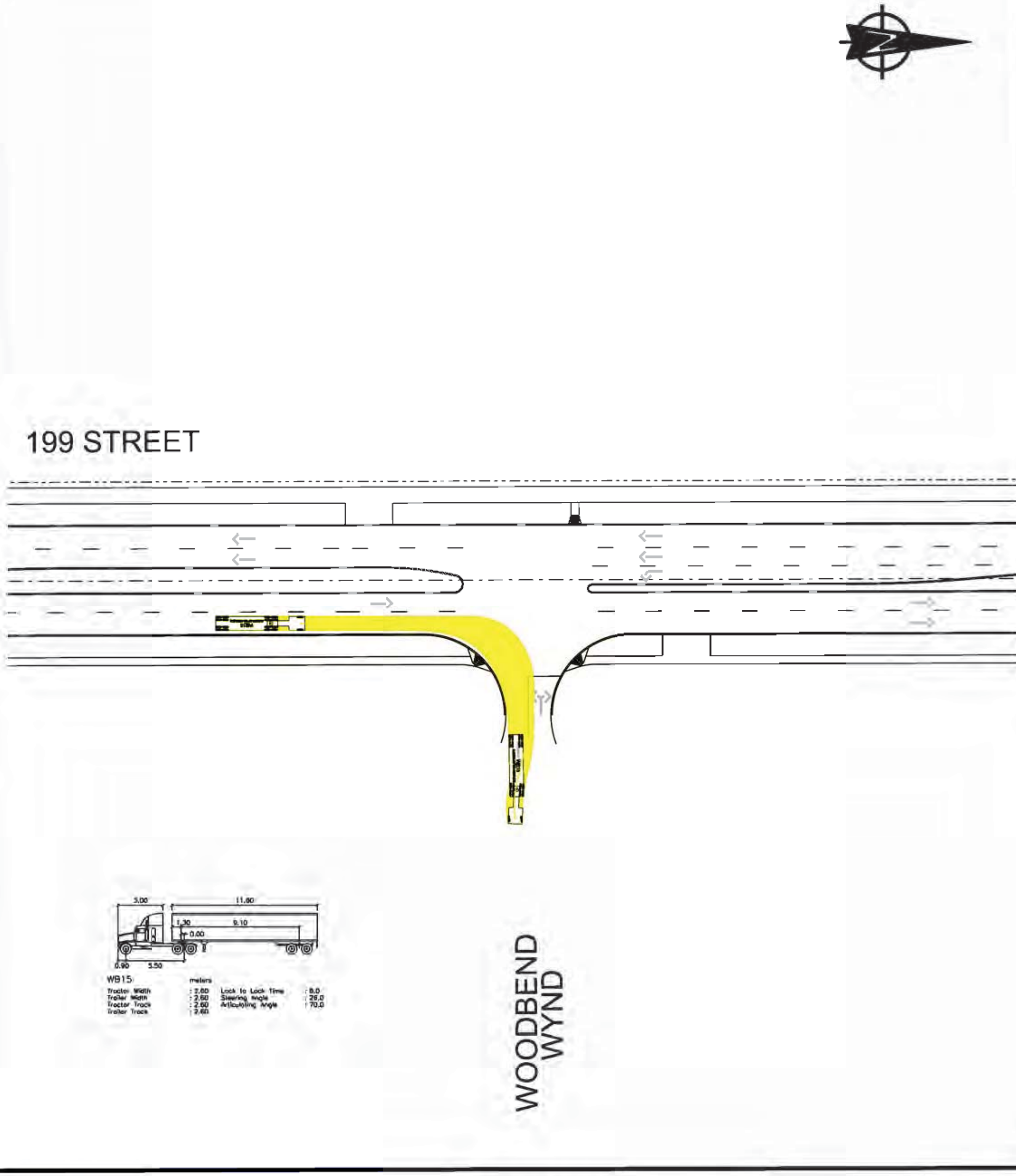


CIMA
Partners in excellence

199 STREET
TURNING MOVEMENTS
WOODBEND WYND
(SHEET 2 OF 4)

FIGURE 4.2

0 5 12.5 25 m
SCALE

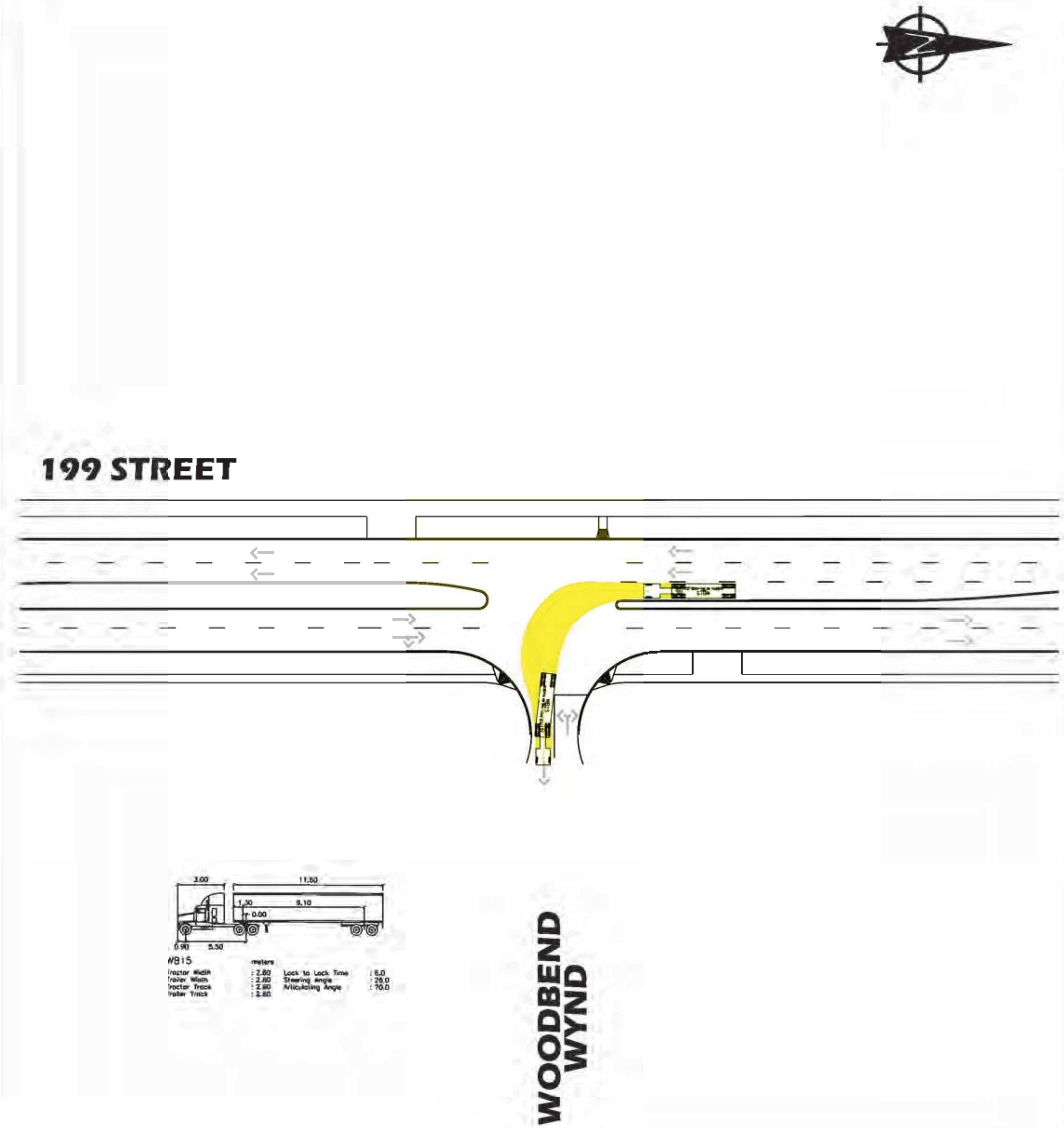


Partners in excellence

199 STREET
TURNING MOVEMENTS
WOODBEND WYND
(SHEET 3 OF 4)

FIGURE 4.3

0 5 12.5 25 m
SCALE



CIMA
Partners in excellence

199 STREET
TURNING MOVEMENTS
WOODBEND WYND
(SHEET 4 OF 4)

FIGURE 4.4

0 5 12.5 25 m
SCALE

APPENDIX N

Right-of-Way Plans

E00540A

NO	REVISIONS	BY	DATE	APP'D
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GENERAL MANAGER OF CAPITAL CONSTRUCTION — DATE

MANAGER OF ROADS DESIGN AND CONSTRUCTION — DATE

DIRECTOR OF ROADS DESIGN AND CONSTRUCTION — DATE

DRAWN: SRB — DATE

DESIGNED: SGS — DATE

CHECKED: TGW — DATE

0m 25 50 75 100

THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT

199 STREET CONCEPT

PROPERTY REQUIREMENT

DRAWING

S199 LAND 01

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DIRECTOR OF ROADS DESIGN AND CONSTRUCTION — DATE

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THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
199 STREET CONCEPT
PROPERTY REQUIREMENT

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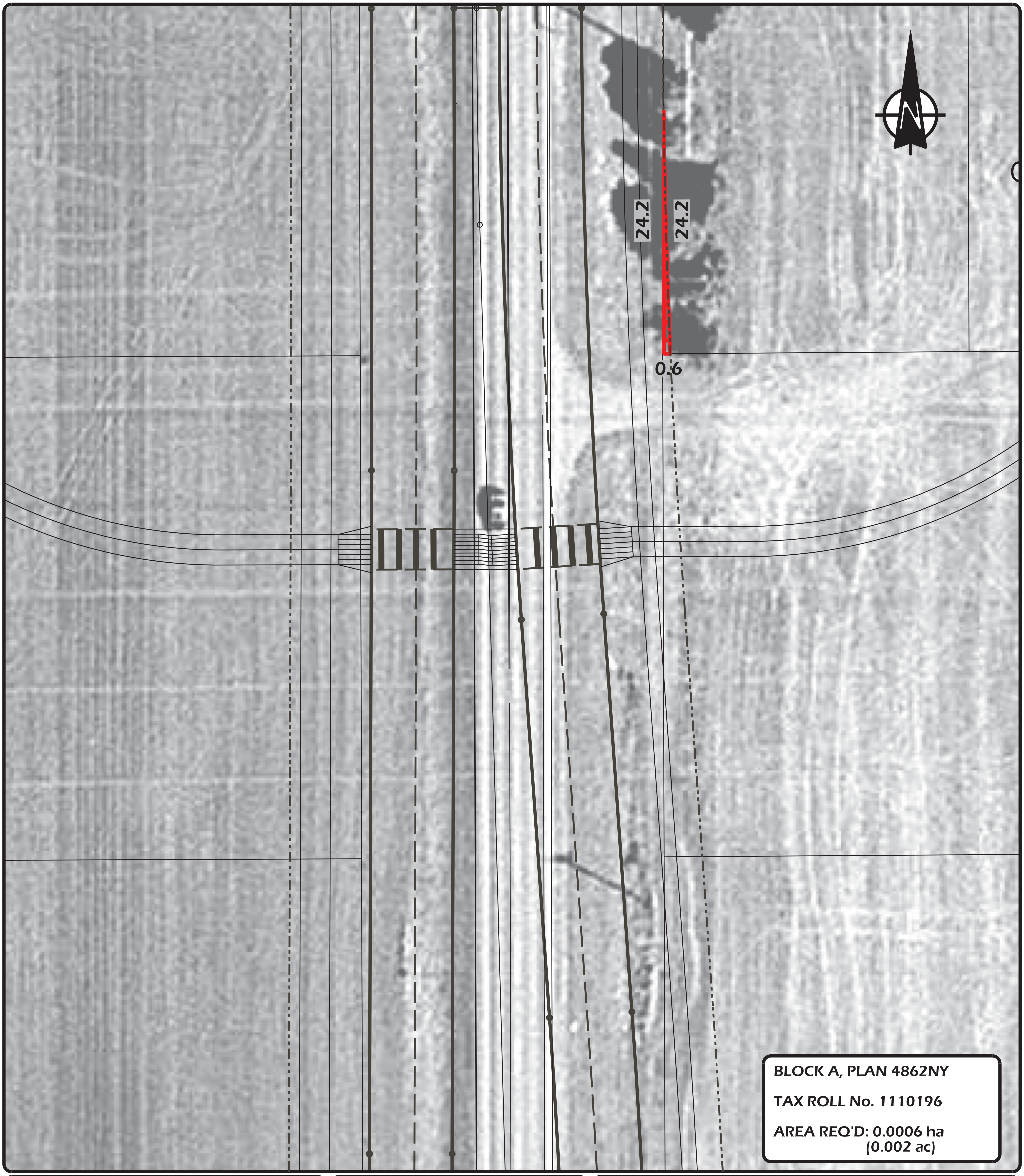

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DIRECTOR OF ROADS DESIGN AND CONSTRUCTION DATE

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DESIGNED DATE
SGS

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CHECKED DATE
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THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
199 STREET CONCEPT
PROPERTY REQUIREMENT

DRAWING
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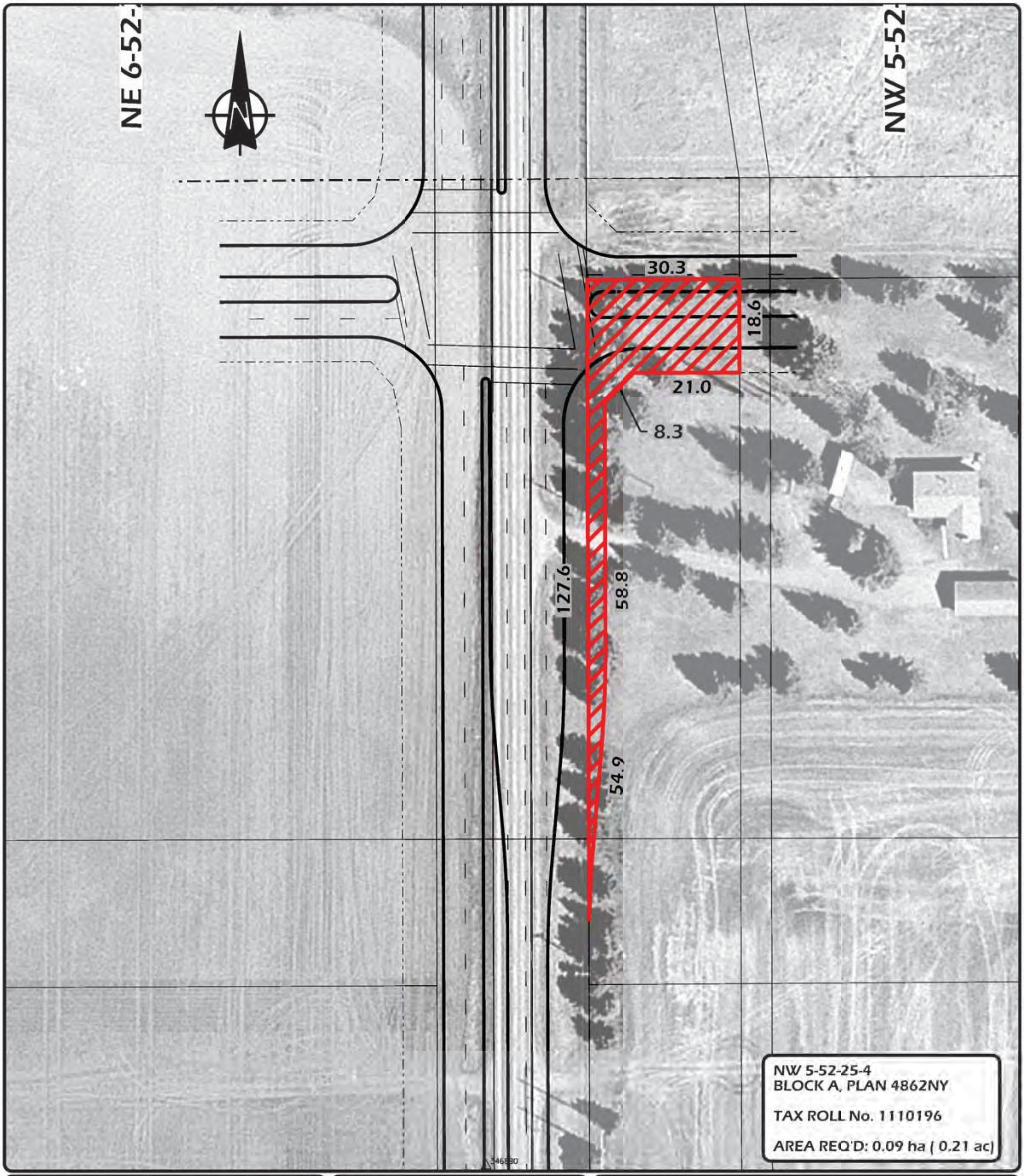

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DIRECTOR OF ROADS DESIGN AND CONSTRUCTION — DATE

DRAWN SRD — DATE

DESIGNED SGS — DATE

CHECKED TGW — DATE

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THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
199 STREET CONCEPT
PROPERTY REQUIREMENT

DRAWING
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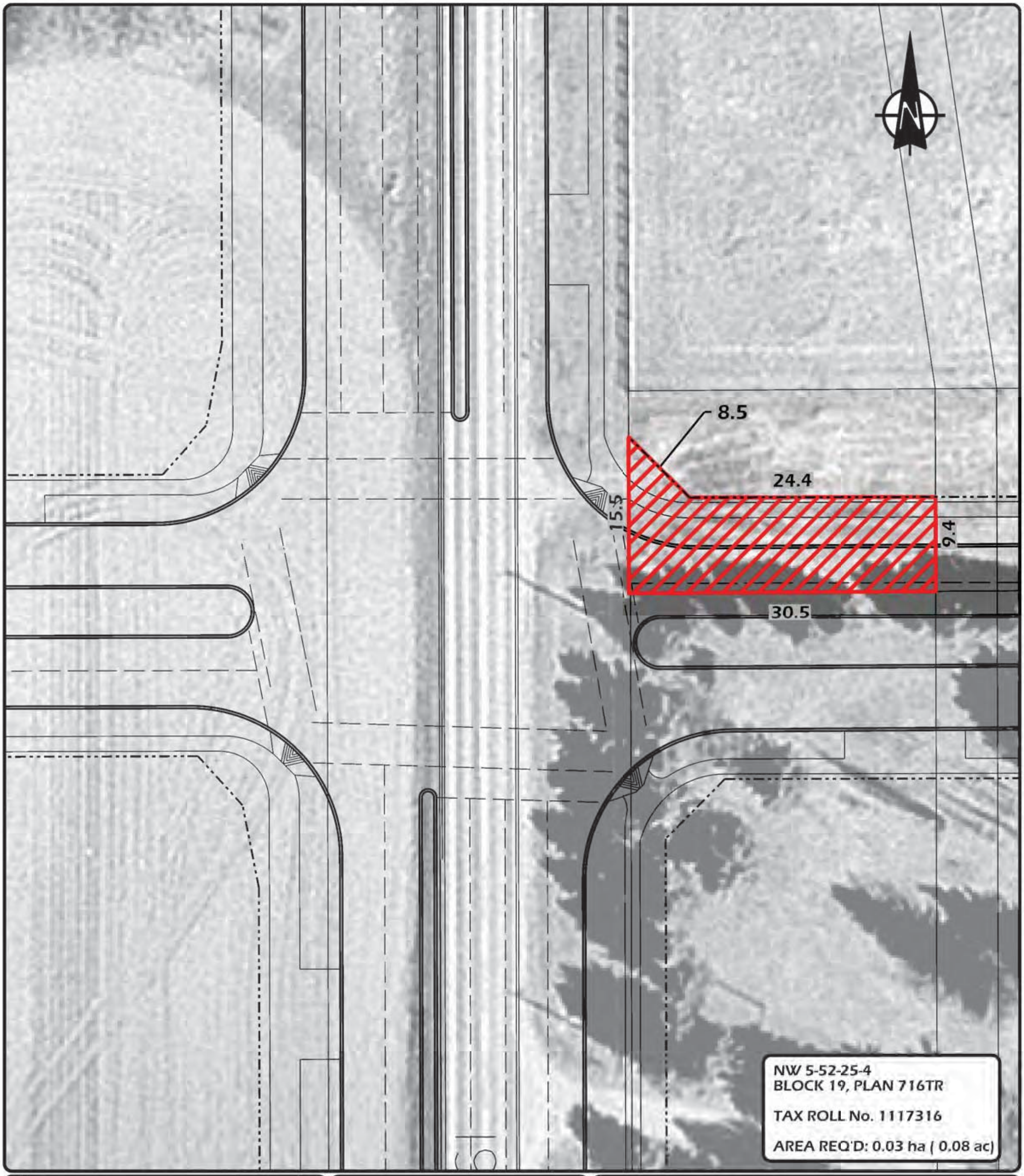

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DIRECTOR OF ROADS DESIGN AND CONSTRUCTION — DATE

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DESIGNED: SGS — DATE

CHECKED: TGW — DATE

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THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT
ROADS DESIGN AND CONSTRUCTION BRANCH

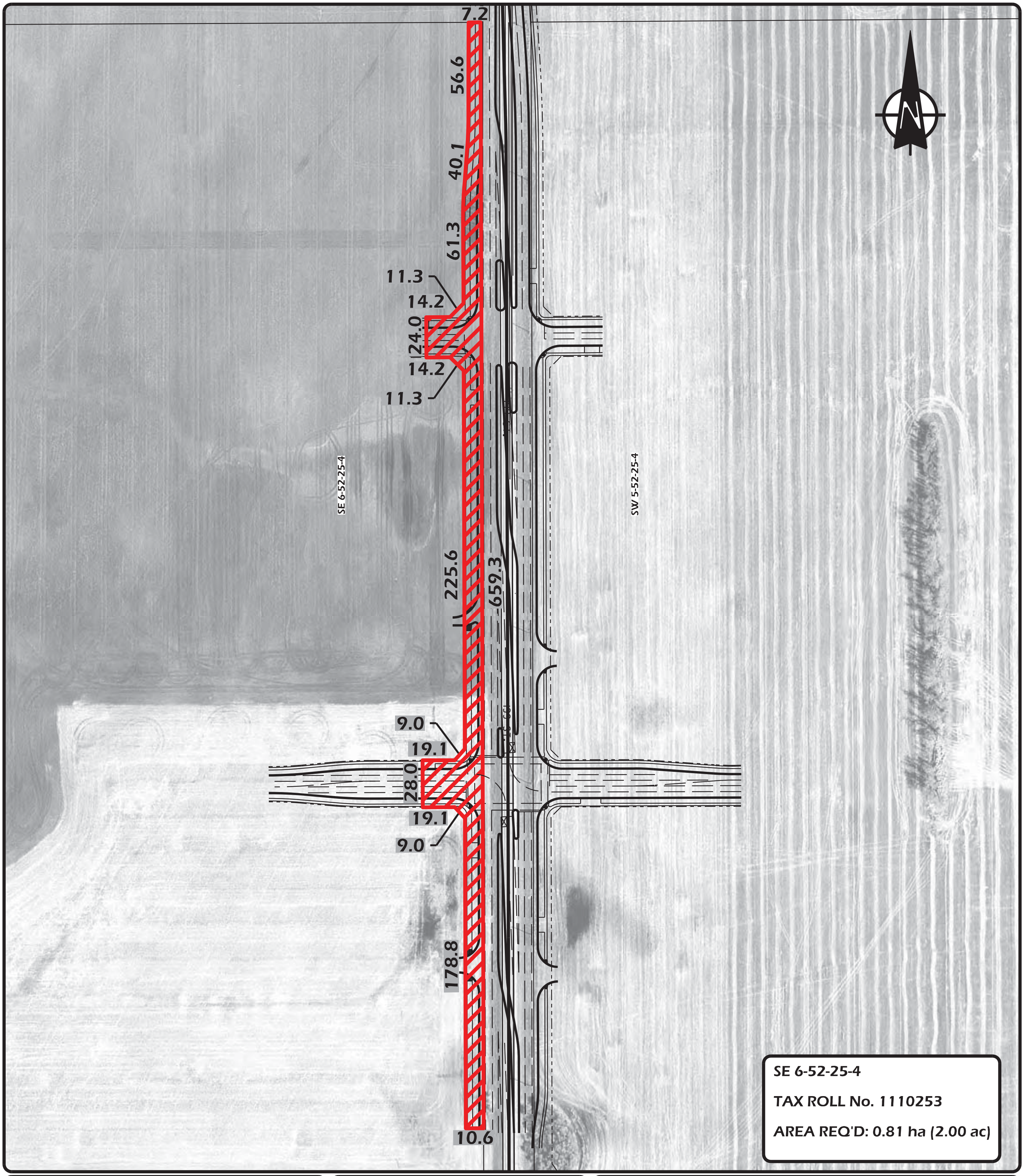
PROJECT

199 STREET CONCEPT

PROPERTY REQUIREMENT

DRAWING

S199 LAND 05



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DESIGNED SGS — DATE

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CHECKED TGW — DATE

THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT

ROADS DESIGN AND CONSTRUCTION BRANCH

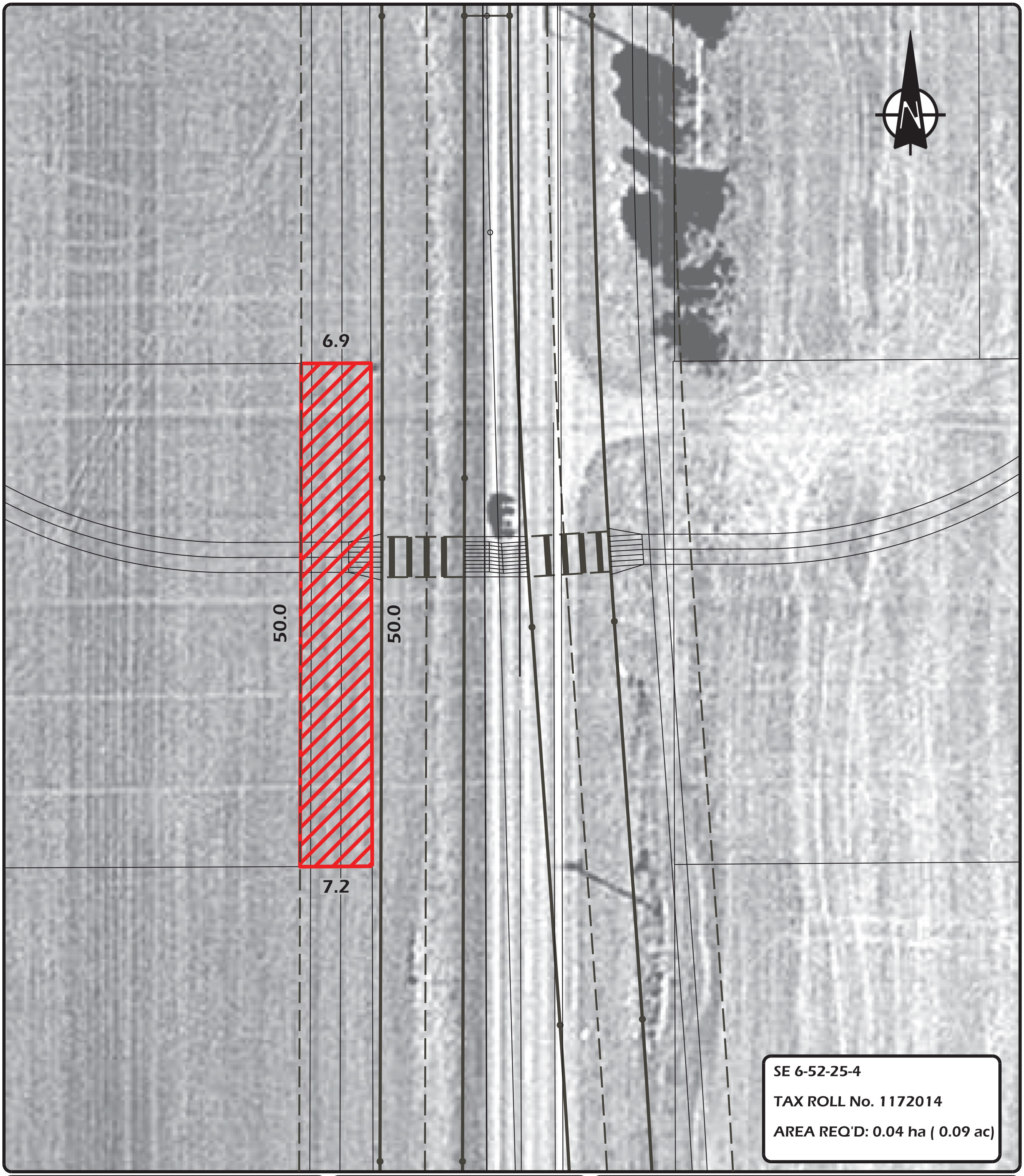
PROJECT

199 STREET CONCEPT

PROPERTY REQUIREMENT

DRAWING

S199 LAND 06



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DIRECTOR OF ROADS DESIGN AND CONSTRUCTION DATE

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DESIGNED DATE
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CHECKED DATE
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THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT

199 STREET CONCEPT

PROPERTY REQUIREMENT

DRAWING

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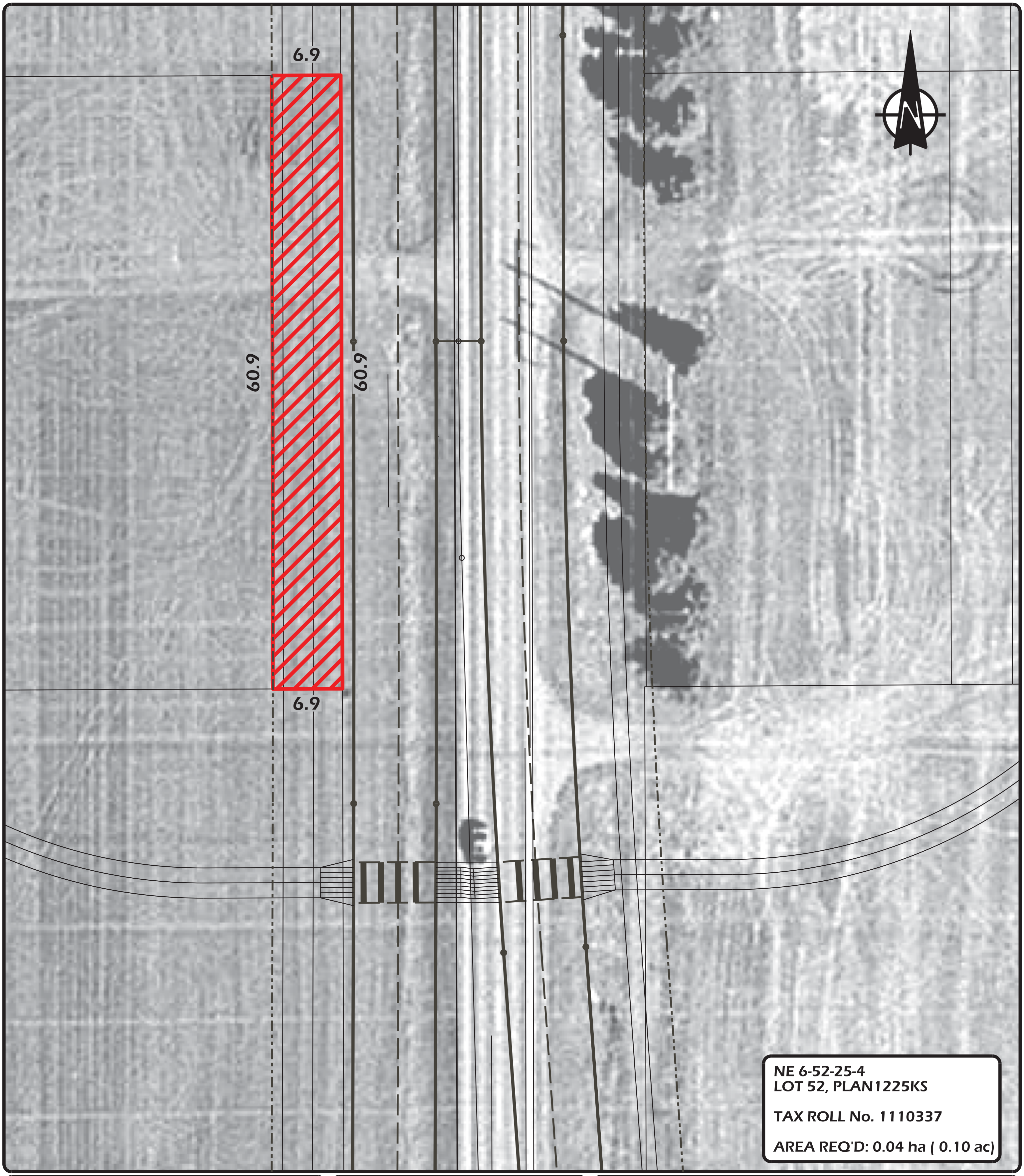

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DIRECTOR OF ROADS DESIGN AND CONSTRUCTION — DATE

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DESIGNED SGS — DATE

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CHECKED TGW — DATE

THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT

ROADS DESIGN AND CONSTRUCTION BRANCH

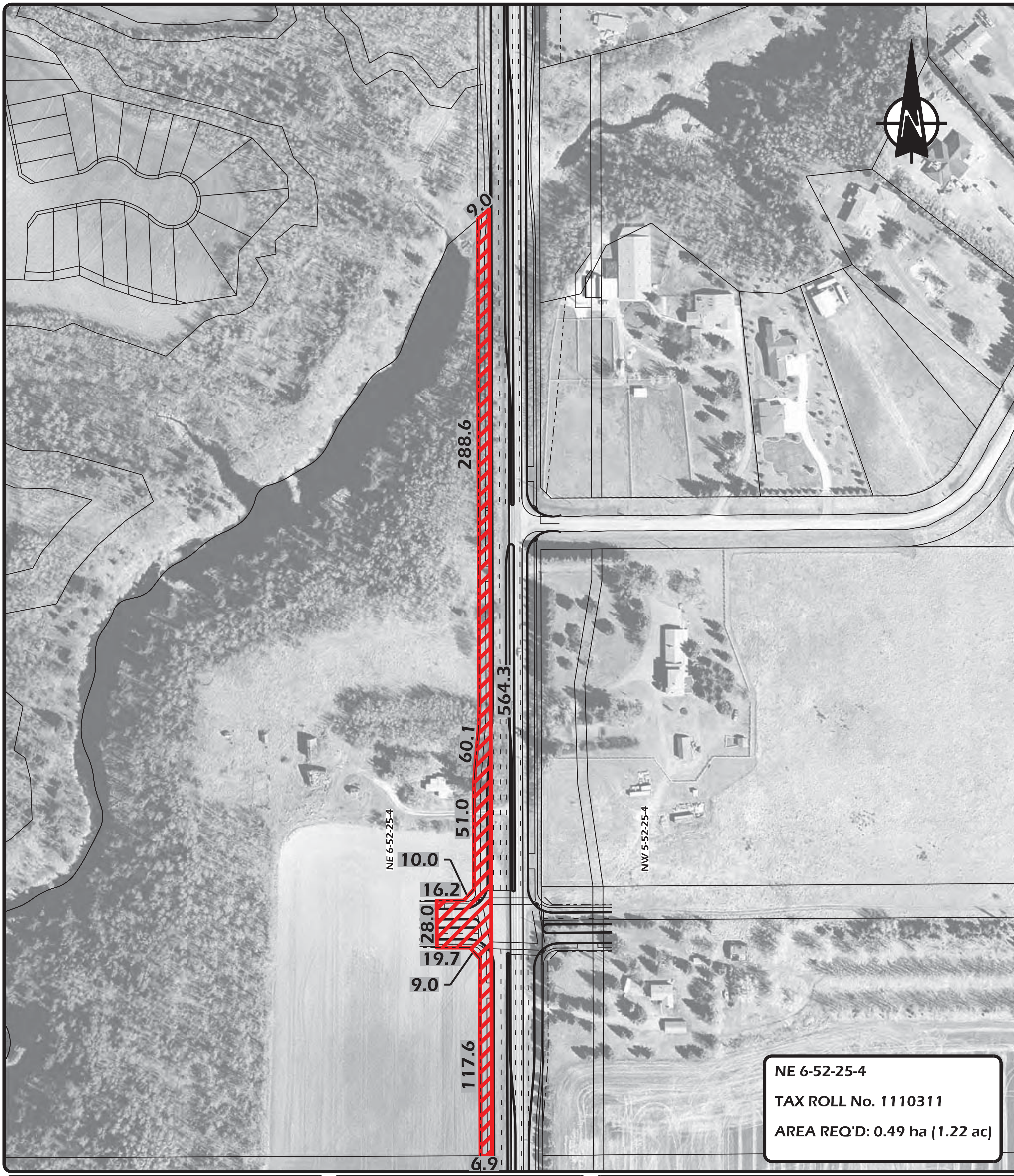
PROJECT

199 STREET CONCEPT

PROPERTY REQUIREMENT

DRAWING

S199 LAND 08



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DIRECTOR OF ROADS DESIGN AND CONSTRUCTION — DATE

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DESIGNED SGS — DATE

CHECKED TGW — DATE

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THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT

ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT

199 STREET CONCEPT

PROPERTY REQUIREMENT

DRAWING

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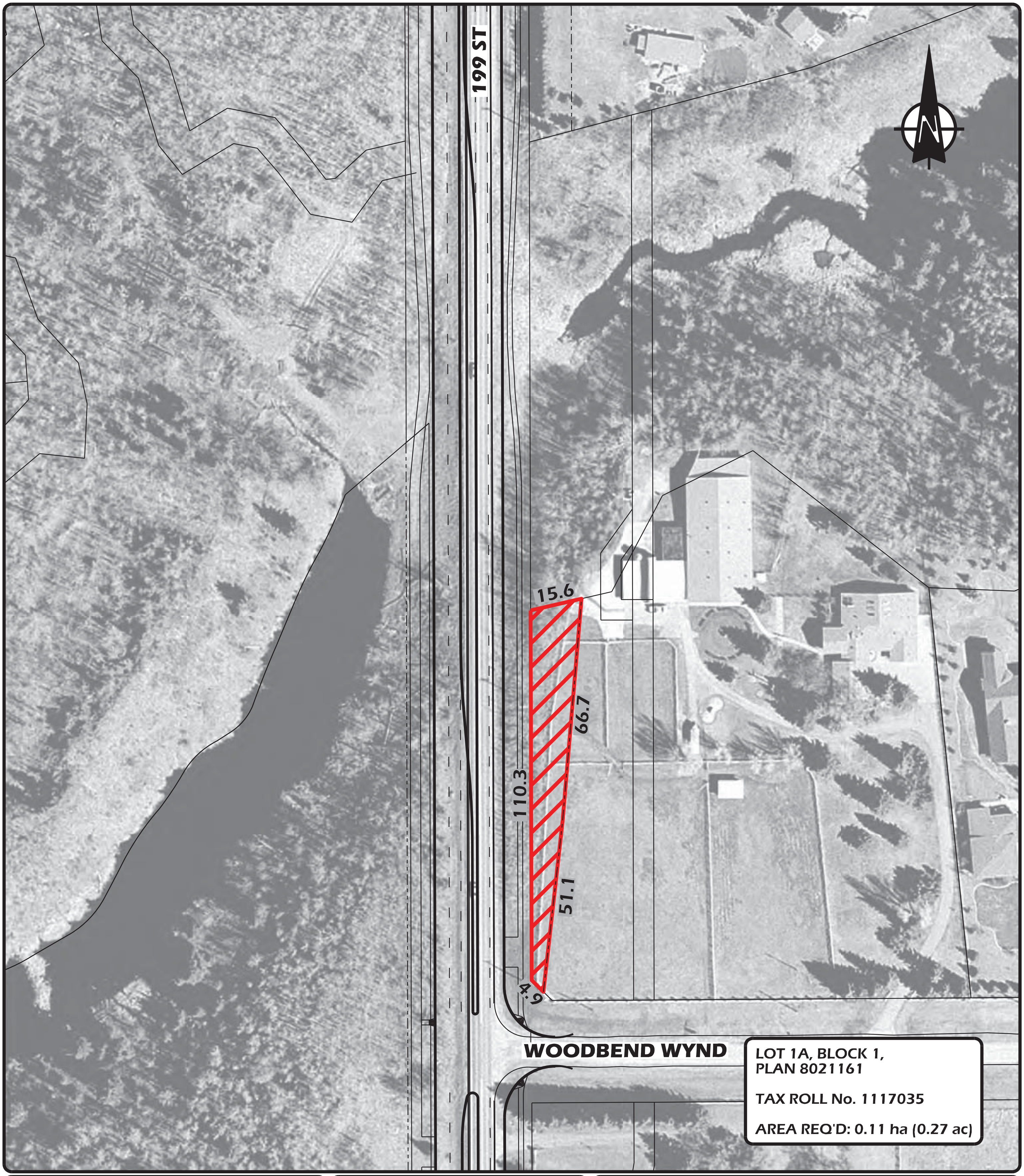

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DIRECTOR OF ROADS DESIGN AND CONSTRUCTION — DATE

DRAWN: SRD — DATE

DESIGNED: SGS — DATE

CHECKED: TGW — DATE

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THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT

ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT

199 STREET CONCEPT

PROPERTY REQUIREMENT

DRAWING

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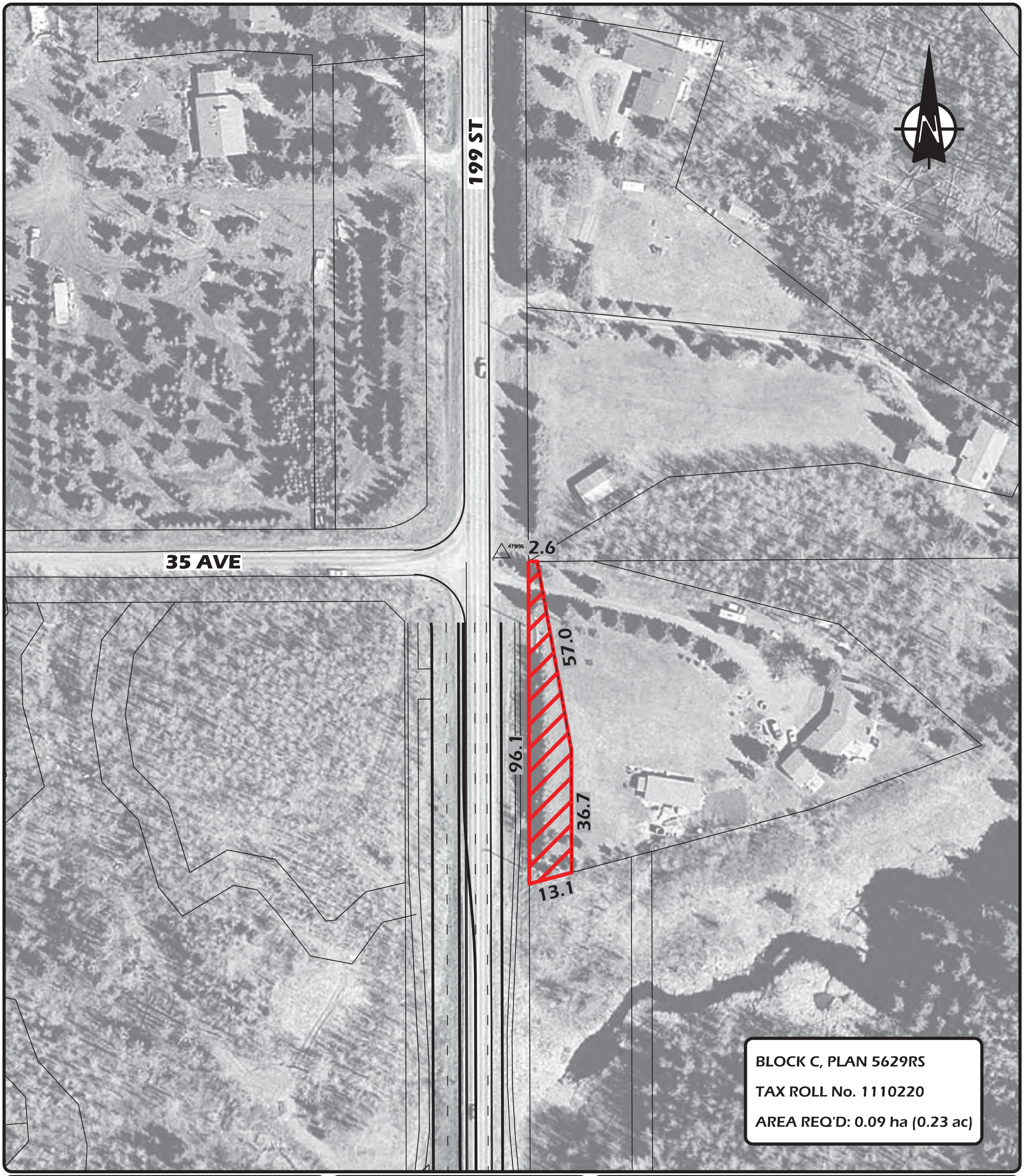

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DIRECTOR OF ROADS DESIGN AND CONSTRUCTION — DATE

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TGW	

THE CITY OF Edmonton

TRANSPORTATION SERVICES DEPARTMENT
ROADS DESIGN AND CONSTRUCTION BRANCH

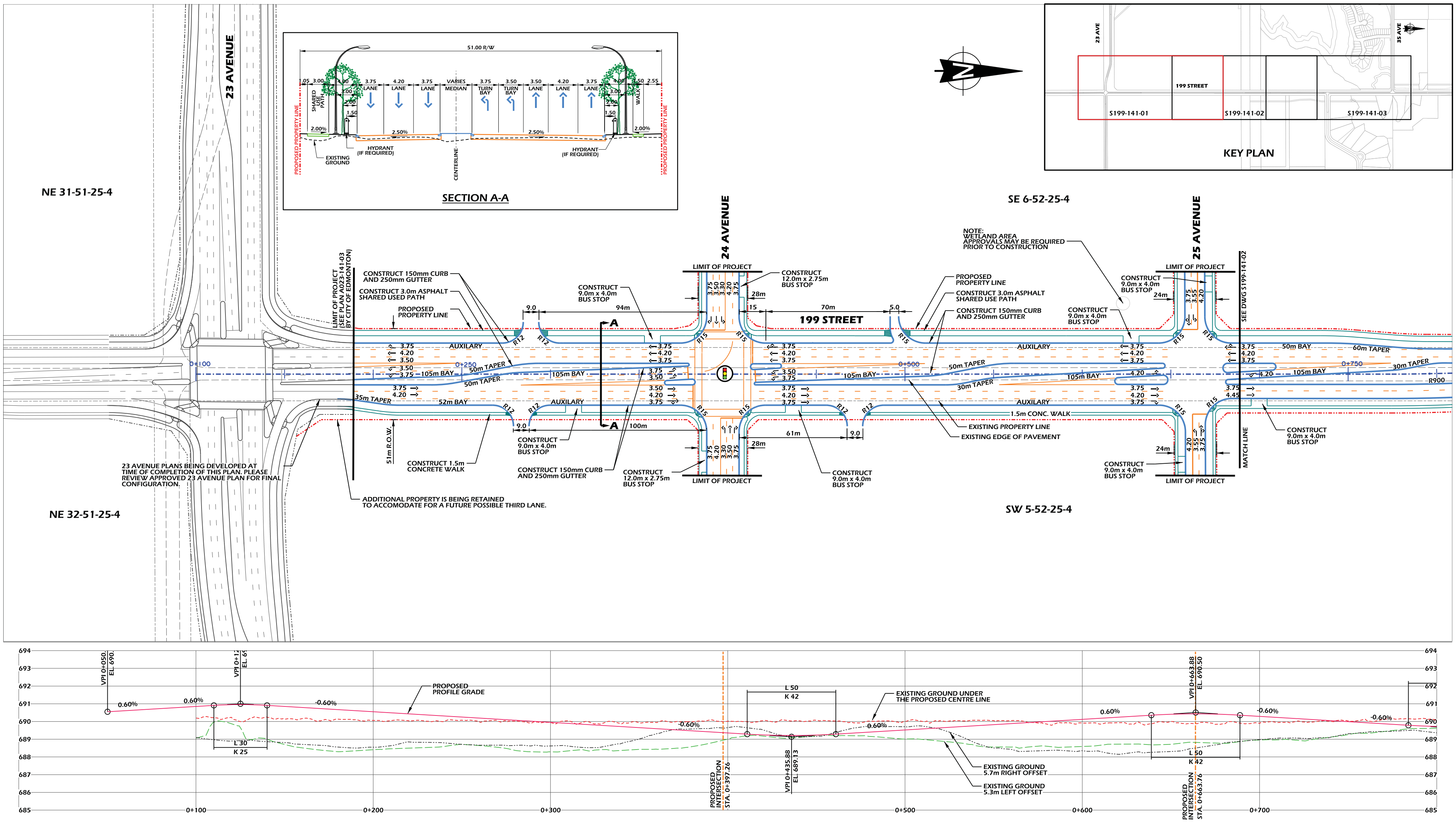
PROJECT
199 STREET CONCEPT
PROPERTY REQUIREMENT

DRAWING
S199 LAND 11

APPENDIX O

Wedgewood Creek Crossing: Retaining Wall Alternative

E00540A



DESIGN SPEED =70 km/h

POSTED SPEED =60 km/h

CIMA+

PERMIT TO PRACTICE P8204

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET

23 AVENUE TO 25 AVENUE

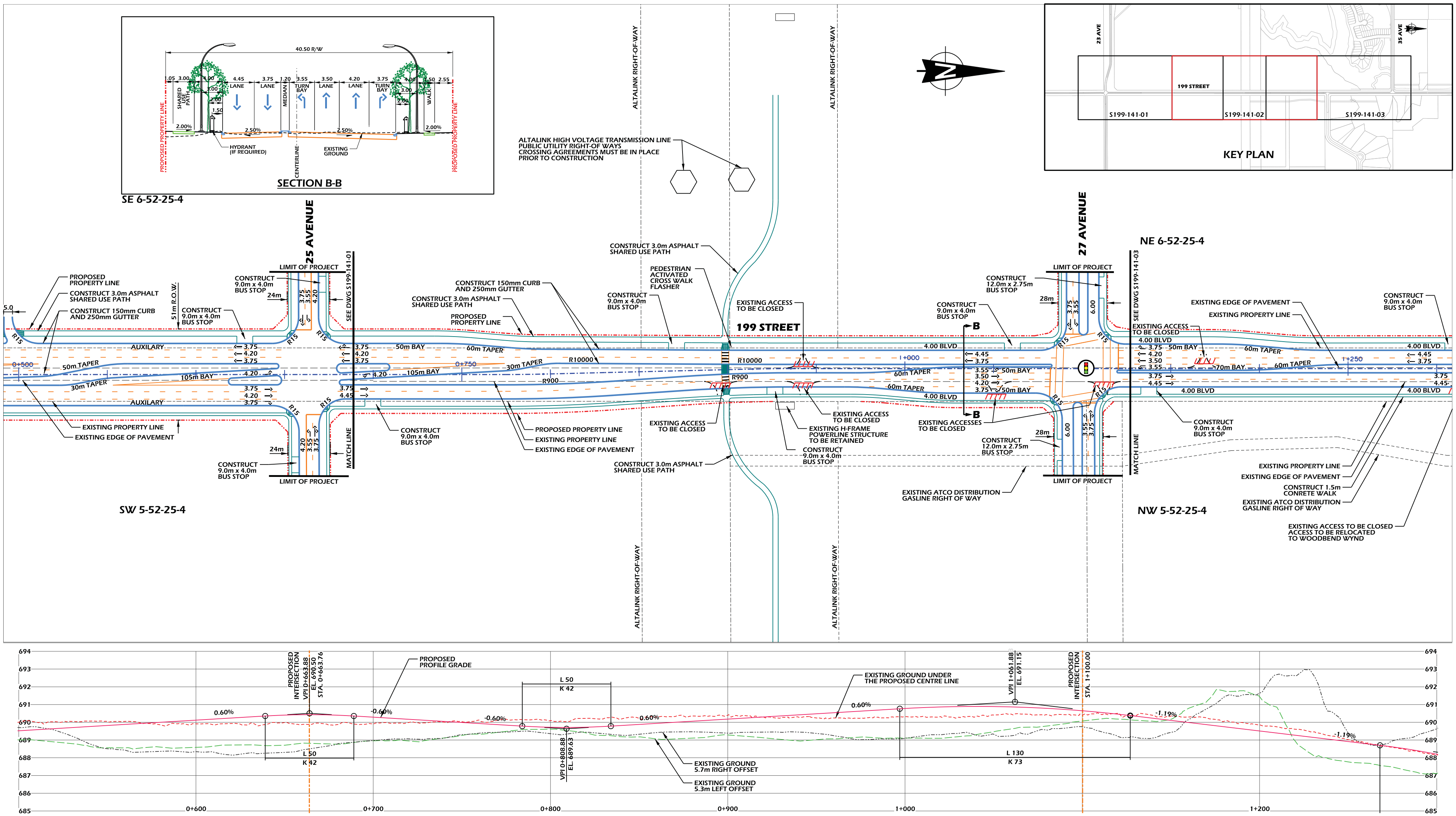
The City of Edmonton Transportation Services

DRAWN: BC
REVIEWED: TW
DATE: FEB 2015

PLAN NO. S199-141-01

PLOTTED: 2/20/2015 1:57:06 PM

L:\Projects\E064 KELTEC\E00540A - 199 St Concept Plan\400 Drawings\04 CADD\5 Concept Drawings\S199-141-01.dgn



DESIGN SPEED = 70 km/h
POSTED SPEED = 60 km/h

CIMA

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

PERMIT TO PRACTICE P8204

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET

25 AVENUE TO 27 AVENUE

Edmonton TRANSPORTATION SERVICES

DRAWN: BC
REVIEWED: TW
DATE: FEB 2015

PLAN NO. S199-141-02

L:\Projects\E064 KELTEC\E00540A - 199 St Concept Plan\400 Drawings\04 CADD\5 Concept Drawings\S199-141-02.dgn

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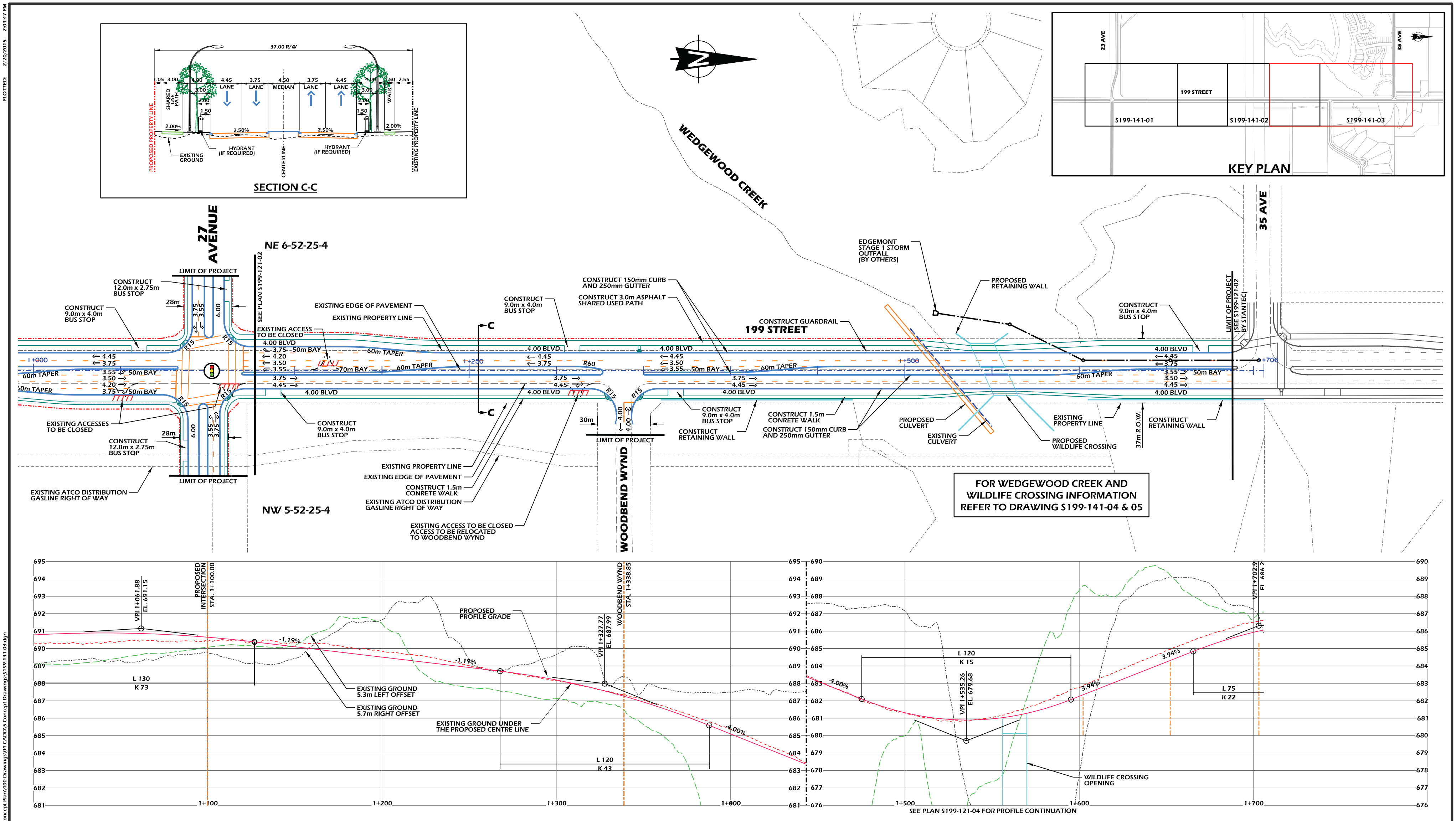

DESIGN SPEED =70 km/h
POSTED SPEED =60 km/h

CIMA

PERMIT TO PRACTICE P8204

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET

27 AVENUE TO 35 AVENUE

The City of Edmonton TRANSPORTATION SERVICES

DRAWN: BC
REVIEWED: TW
DATE: FEB 2015

PLAN NO. S199-141-03

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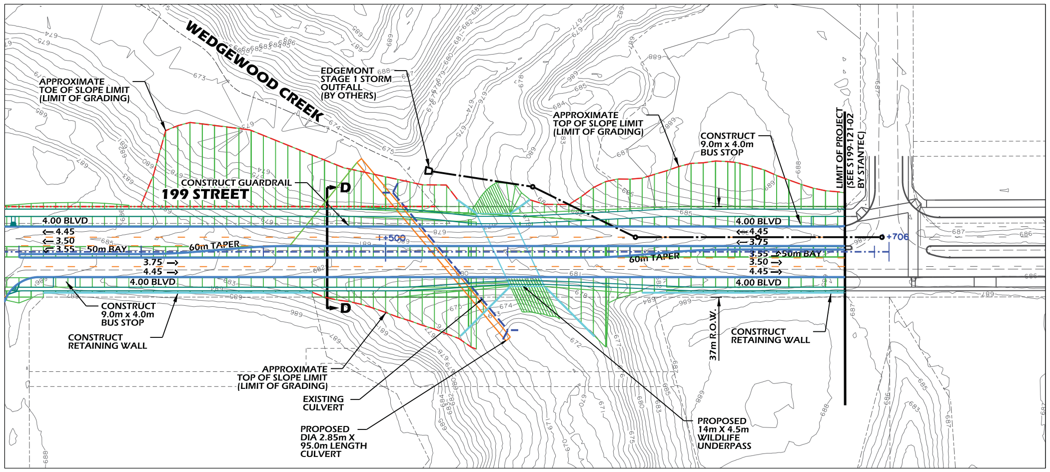

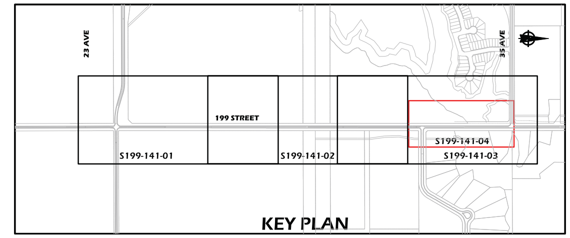

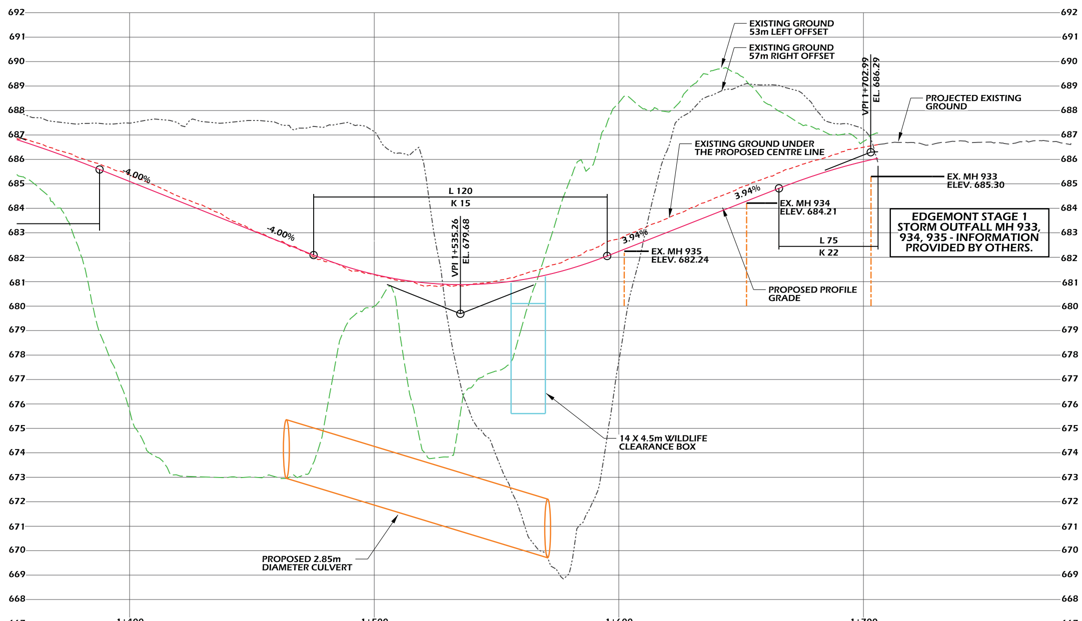

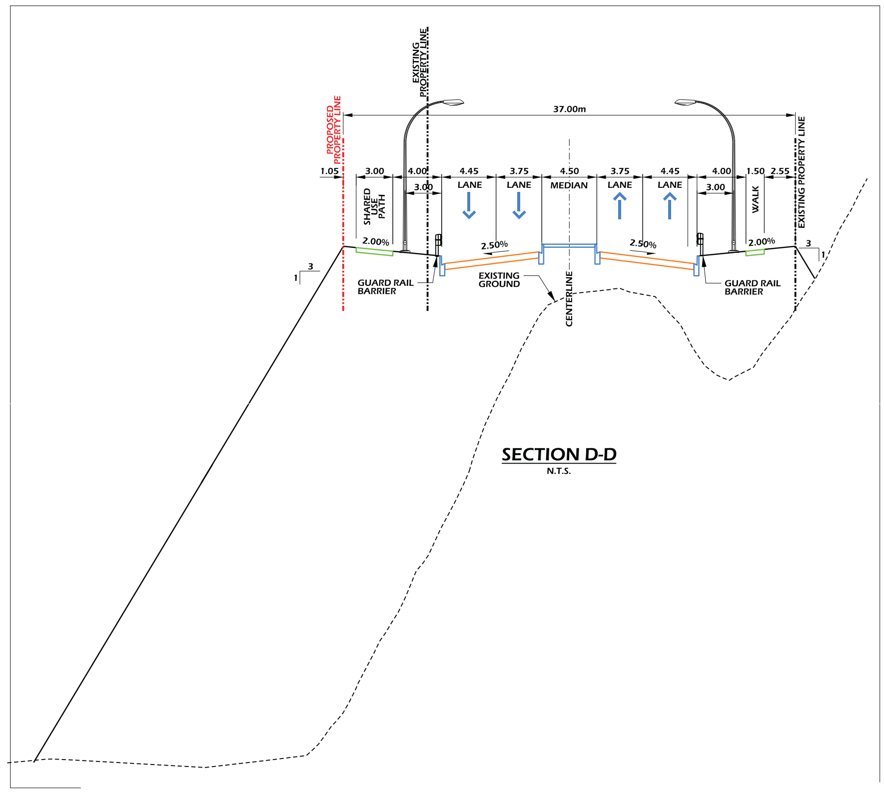

HORIZONTAL 0 25 50m
VERTICAL 0 2.5 5.0m

DESIGN SPEED = 70 km/h
POSTED SPEED = 60 km/h

CIMA

PERMIT TO PRACTICE P8204

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET

WEDGEWOOD CREEK AND WILDLIFE CROSSING INFORMATION

The City of Edmonton TRANSPORTATION SERVICES

DRAWN: BC
REVIEWED: TW
DATE: FEB 2015

PLAN NO. S199-141-04

PLOTTED: 2/20/2015 2:23:13 PM

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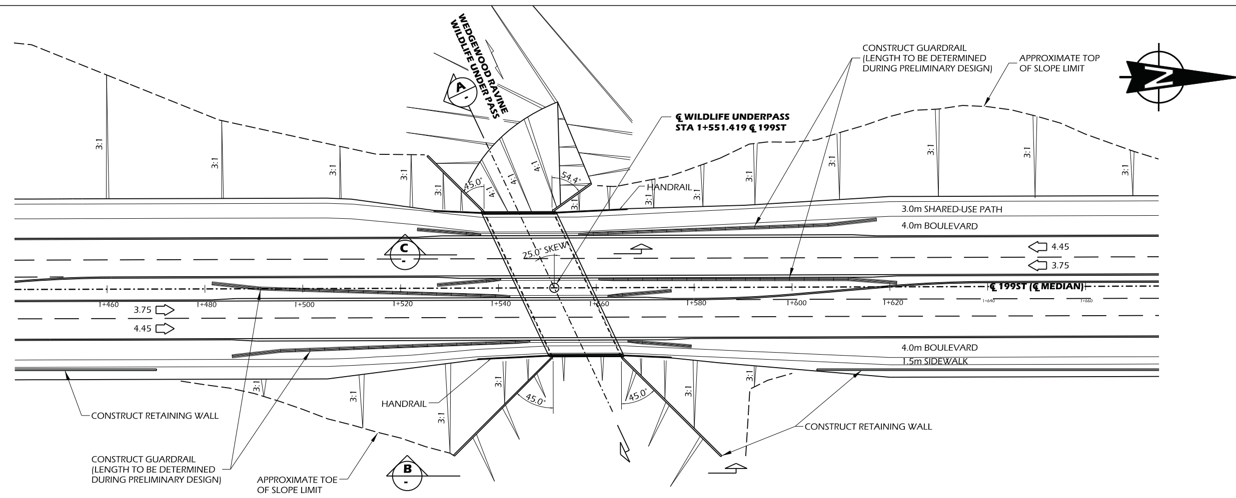

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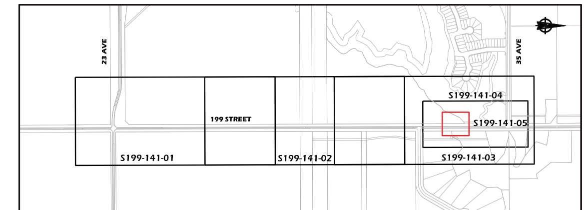

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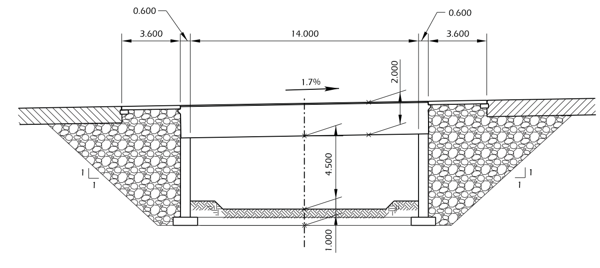

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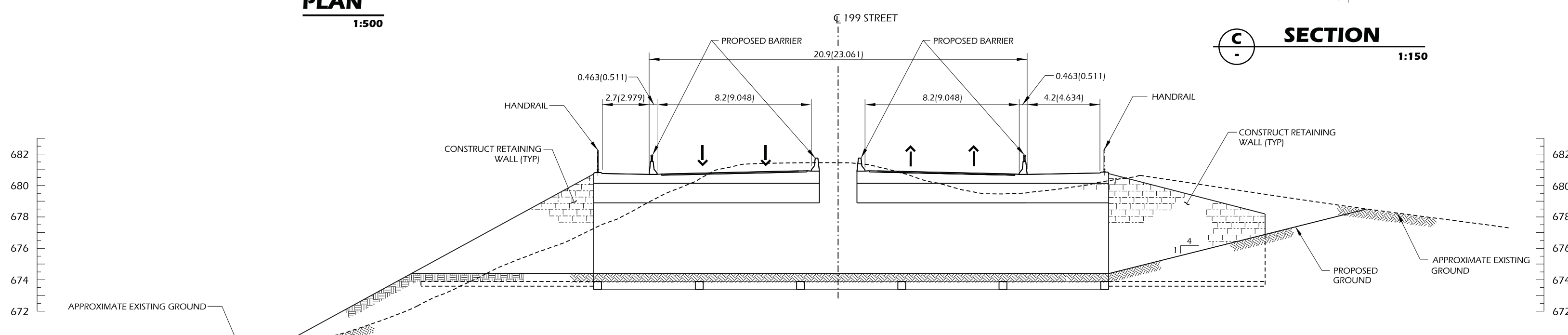

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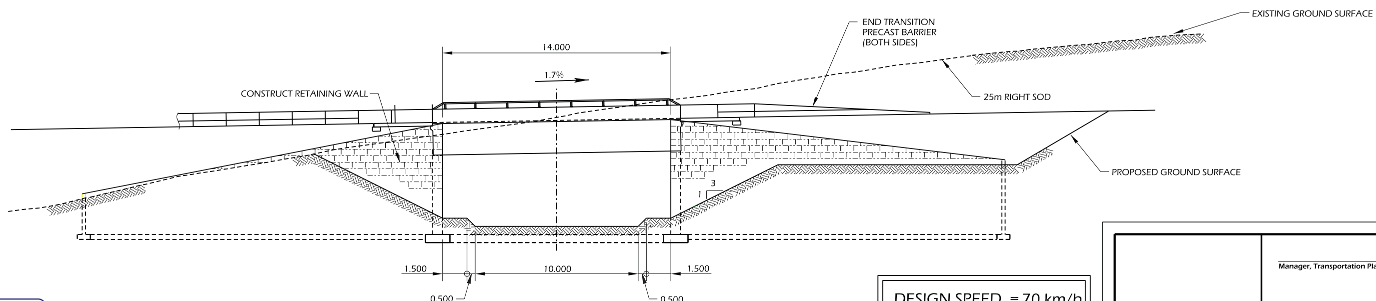

SECTION B
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DESIGN SPEED =70 km/h
POSTED SPEED =60 km/h

GENERAL NOTE

1. ALL DIMENSIONS IN METRES.
2. DIMENSIONS IN ( ) ARE MEASURED ON SKEW.
3. ADDITIONAL EPCOR POWER DUCTS TO ACCOMODATE FUTURE POWER FEEDS CROSSING THE BRIDGE STRUCTURE. TO BE INCLUDED IN THE PRELIMINARY AND DETAILED DESIGN.

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET
WEDGEWOOD RAVINE WILDLIFE CROSSING CONCEPT

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

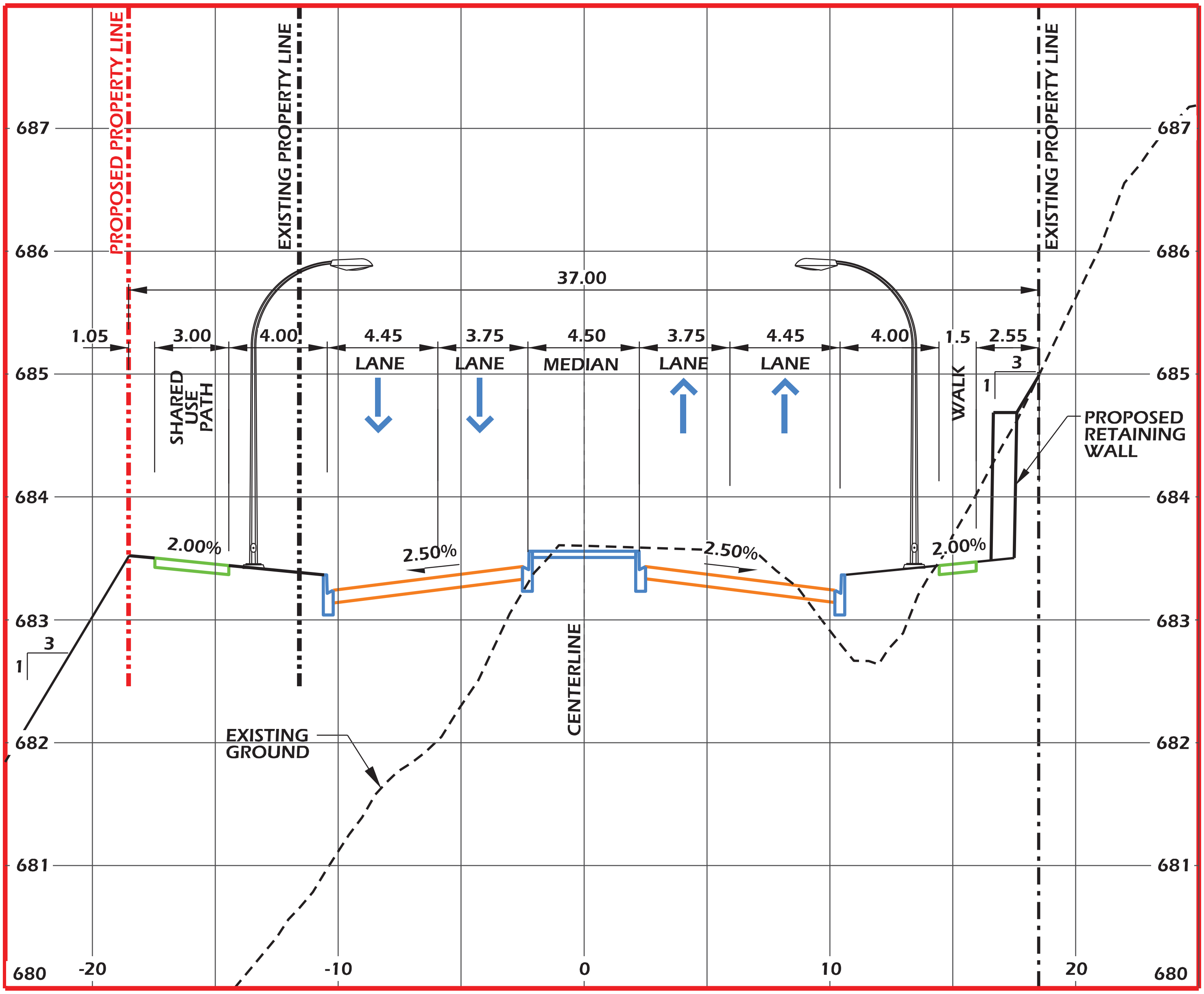
PERMIT TO PRACTICE P8204

Edmonton TRANSPORTATION SERVICES

DRAWN: JK
REVIEWED: TW
DATE: FEB 2015

PLAN NO. S199-141-05

CIMA



199 STREET - RETAINING WALL OPTION
WOODBEND WYND TO 35 AVENUE
TYPICAL SECTION

APPENDIX P

Cost Estimate

E00540A

Concept Level Estimate

Date: February 20, 2015
File: E00540A

Designed By: Ayden Smilski
Checked By: Glen Campbell

Project:	**km to**	**km =**	**length (km)**
199 Street Concept Plan (23 Avenue to 35 Avenue)	0.19	1.69	1.50

Item No.	Bid Item Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Cost
1	Straight Face Curb and Gutter	m	7,120	$160.00	$1,140,000.00
2	Shared Use Pathway (3.0 m width)	m	1,630	$140.00	$230,000.00
3	Concrete Sidewalk (1.5 m width)	m	1,630	$120.00	$200,000.00
4	Asphalt Concrete Pavement	m^2	40,970	$70.00	$2,870,000.00
5	Granular Base Course	m^2	43,820	$35.00	$1,540,000.00
6	Cement Stabilized Subgrade	m^2	43,820	$7.00	$310,000.00
7	Street Lighting	Units	60	$11,000.00	$660,000.00
8	Traffic Signalization	Intersection	2	$250,000.00	$500,000.00
9	Pedestrian Crossing Signals	Units	1	$80,000.00	$80,000.00
10	Common Excavation	m^3	36,130	$15.00	$550,000.00
11	Borrow Excavation	m^3	43,360	$25.00	$1,090,000.00
12	Wildlife Underpass	Units	1	$4,100,000.00	$4,100,000.00
13	Culvert	Units	1	$2,500,000.00	$2,500,000.00
				Sub-Total:	$15,770,000.00

Notes:
1. Wildlife underpass and culvert estimate based on conceputal bridge design report from Terrace Engineering.
2. Assumed street lights spaced every 60 m.

Estimated Construction Sub-Total		$15,770,000.00
Mobilization @	7%	$1,103,900.00
Contingencies @	10%	$1,687,390.00
Engineering		$0.00
Utilities		$0.00
Right-of-Way		$0.00
Total Estimated Project Cost		**$18,561,290.00**

APPENDIX Q

City of Edmonton Comments

E00540A

Development Planning and Engineering (DP&E) Comments and Responses

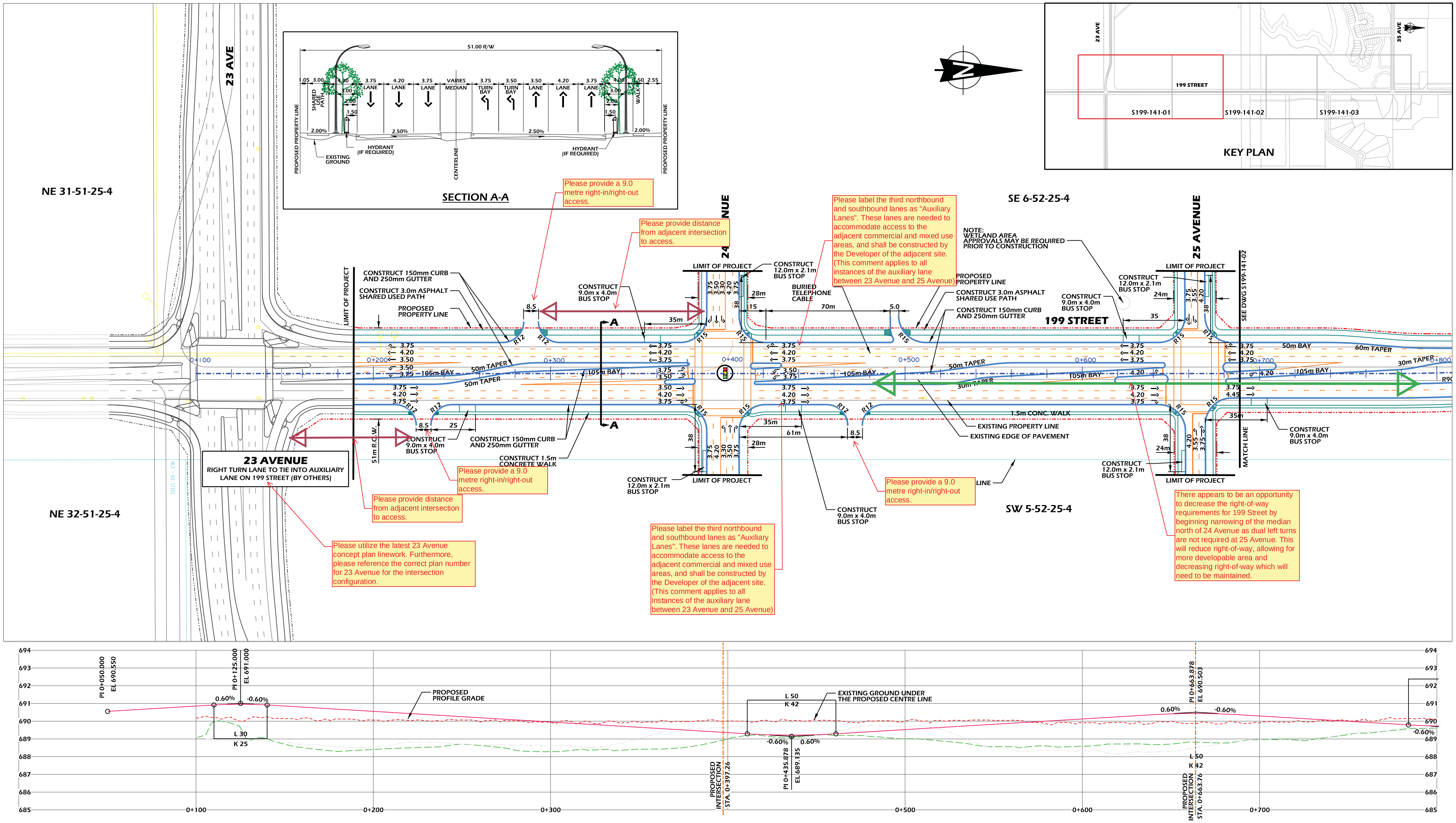
Comment Number	Comment / Type of Comment	Facility and Capital Planning (FCP) Response
	General Remarks and Comments	
DP&E 1	The right-in/right-out accesses, as well as the right-in access along 199 Street north of 23 Avenue have not been reviewed or approved by Development Planning as part of a formal development application for the site. While the general location of the accesses is acceptable (subject to the comments below), the exact location and configuration of accesses will be determined at the subdivision and development permit stage.	Acknowledged. CIMA+ to note in report.
DP&E 2	Please ensure that the wildlife crossing requirements at the Wedgewood Creek crossing have been discussed with the Urban Ecology, and that they support the proposed design.	Noted. Wildlife crossing treatment to be endorsed by OBD.
	Drawing S-199-1401-01	
DP&E 3	As the 23 Avenue concept plans are nearing completion, the latest shadow plan should be utilized for 23 Avenue. Furthermore, the appropriate 23 Avenue plan number should be referenced for the 23 Avenue/199 Street intersection.	Noted. CIMA+ to update drawing and FCP to confirm the right-turn cutoff treatment at 23 Avenue.
DP&E 4	The right-in/right-out accesses should be 9.0 metres to facilitate access by medium sized delivery vehicles, as is commonly done for commercial developments.	CIMA+ to wident access.
DP&E 5	The distances to the nearest adjacent intersections should be provided for the right-in/right-out accesses between 23 Avenue and 24 Avenue.	Acknowledged. CIMA+ to add dimension
DP&E 6	The TIA for Riverview identifies 199 Street as a four lane divided arterial roadway. The concept plans should clearly identify that the additional northbound and southbound lanes are "auxiliary lanes" that are required to facilitate access to the adjacent land uses, and do not represent a six lane divided arterial roadway. Furthermore, as these are auxiliary lanes, the Developer of the adjacent commercial and mixed use areas will be required to construct the auxiliary lanes.	Acknowledged. CIMA+ to update drawing, labelling auxillary lanes
DP&E 7	Given that single left turn lanes are adequate along 199 Street at 25 Avenue, consideration should be given to reducing the median along 199 Street north of 24 Avenue. This can reduce the right-of-way required for 199 Street, as well as the amount of road right-of-way that needs to be maintained.	Noted. CIMA+ to provided justification for slotted left turns.
	Drawing S-199-1401-02	
DP&E 8	Locating the mid-block crossing underneath the high-voltage Alta-Link transmission lines may preclude the installation of pedestrian actuated amber flashers at this location. The crossing may need to be shifted north to accommodate signal installation. This should be discussed with Alta-Link to verify clearance requirements for the power lines.	Noted. CIMA+ review comments in more detail. Please discuss with Altalink and move trail to not be under the power lines.
	Drawing S-199-1401-03	
DP&E 9	The southbound left turn bay at 27 Avenue is non-standard and exceeds the requirements outlined in the TIA. Given the possibility of higher than expected left turn volumes at this location, Development Planning supports the construction of a longer left turn bay at this location.	Noted.Turn bay shown is ok.
DP&E 10	The northbound curb lane along 199 Street at Woodbend Wynd should be identified as a through right lane, not a through only lane.	Acknowleged. CIMA+ to update drawings
DP&E 11	The westbound lane along Woodbend Wynd should be identified as a left/right turn lane, not a through lane.	Acknowleged. CIMA+ to update drawings
	Drawing S-199-1401-04 and S199-1401-05	
DP&E 12	Please ensure that the wildlife crossings have been reviewed with the Office of Biodiversity.	Wildlife passage to be endorsed by OBD.
DP&E 13	Please note that EPCOR has expressed an interest in including power ducts in the Wedgewood Creek crossing bridge structure to accommodate future power feeds. Please ensure that additional duct work is included in the preliminary and detailed design of the structure to accommodate future EPCOR installation. Please contact and coordinate with Jatinder Hayer of Great Northern Engineering Consultants Inc. (Direct: 780-490-7141, Cell: 780-920-4680 Email: hayer@gnec.ca).	Noted. CIMA+ to note this in the report.

Transportation Operations Comments and Responses

T-Ops 1	Typically, marked and signed pedestrian crosswalks are considered for installation after a pedestrian and vehicle assessment has been completed to determine if it meets the criteria for the installation of a marked crosswalk except at intersections that are controlled by an all-way stop or a traffic signal. Please remove the marked crosswalks at the intersections of 199 St and 25 Ave, Woodbend Wynd, and 35 Ave unless they are going to be controlled by an all-way stop or a traffic signal. Even though a marked crosswalk is not installed, curb ramp construction can still proceed.	Noted. Please remove crosswalks. Note a crosswalk warrant may be completed at a later date.
T-Ops 2	Is there a reason to have a wide centre lane (4.2m wide) for the segment 99 St between 23 and 25 Ave.	Noted. Outside lanes are auxillary lanes. No action required.

Sustainable Transportation Comments and Responses

ST 1	For all bus stop pads: if the pad is less than 1m from sidewalk, pour the concrete pad to the sidewalk otherwise provide a 3m walk connection at the head of the pad (as per standard drawing 4110)	Noted. CIMA+ to review all collector road stops and revise if required.
ST 2	Insure adequate clear width of sidewalk from retaining wall (min 0.6m)	CIMA+ to review and increase distance if required.
ST 3	Clarify in Prelim Plans location of handrails and guard rails.	Noted. CIMA+ to speak to requirement of hand and guardrails being reviewed during preliminary design.



HORIZONTAL 0 25 50m
VERTICAL 0 2.5 5.0m

DESIGN SPEED =70 km/h
POSTED SPEED =60 km/h

CIMA

DRAFT
DEC 9, 2014

PERMIT TO PRACTICE P5038

Manager, Transportation Planning Branch
Director, Facility & Capital Planning
Director, Development Planning & Engineering

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET
23 AVENUE TO 25 AVENUE

The City of Edmonton TRANSPORTATION SERVICES

DRAWN:	BC
REVIEWED:	TW
DATE:	DEC 2014

PLAN NO. S199-141-01

PLOTTED: 12/12/2014 11:13:59 AM
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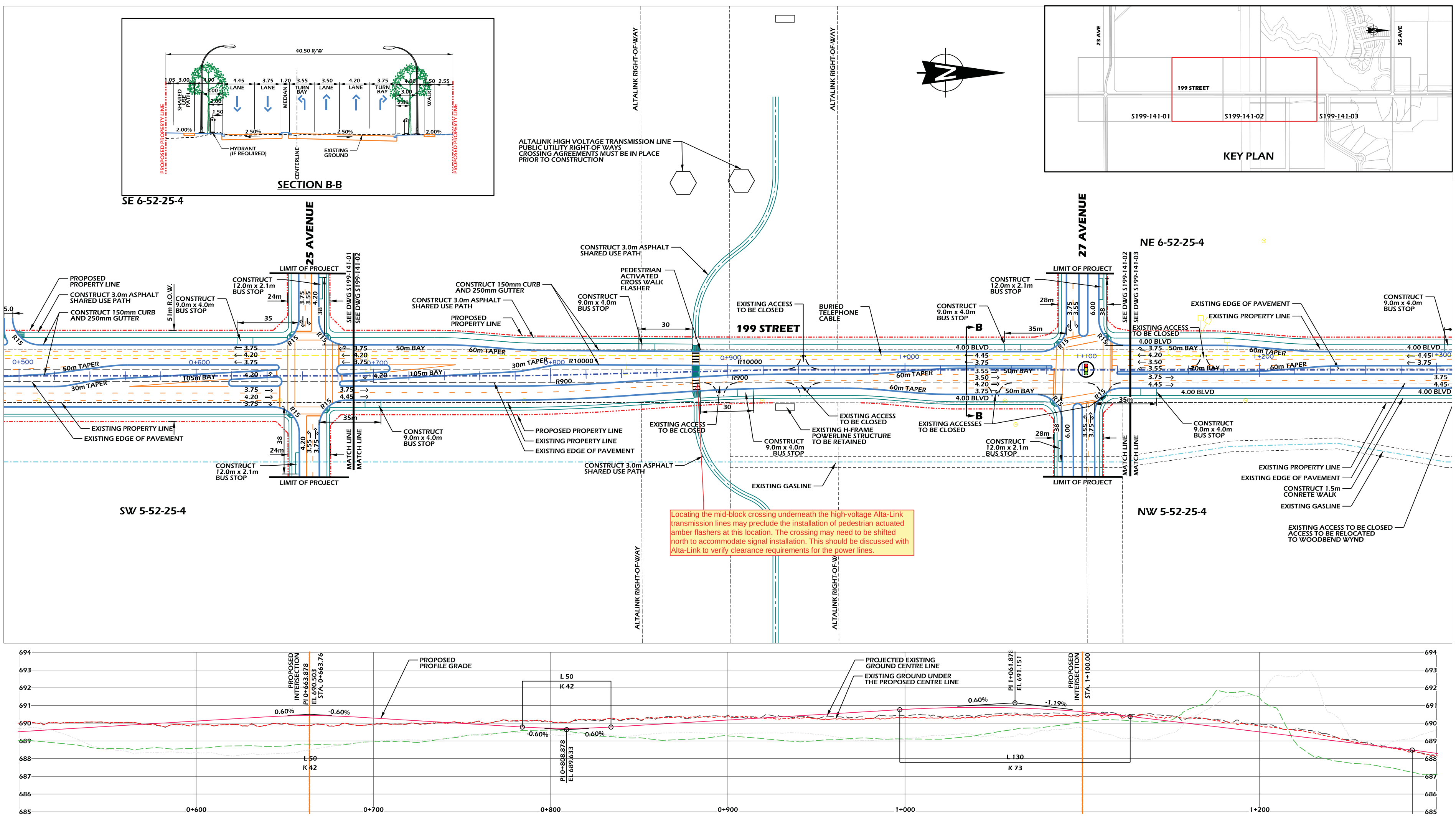

DESIGN SPEED = 70 km/h
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CIMA

DRAFT
DEC 9, 2014

PERMIT TO PRACTICE P5038

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET

25 AVENUE TO 27 AVENUE

Edmonton TRANSPORTATION SERVICES

DRAWN: BC
REVIEWED: TW
DATE: DEC 2014

PLAN NO.
S199-141-02

PLOTTED: 12/10/2014 1:41:50 PM
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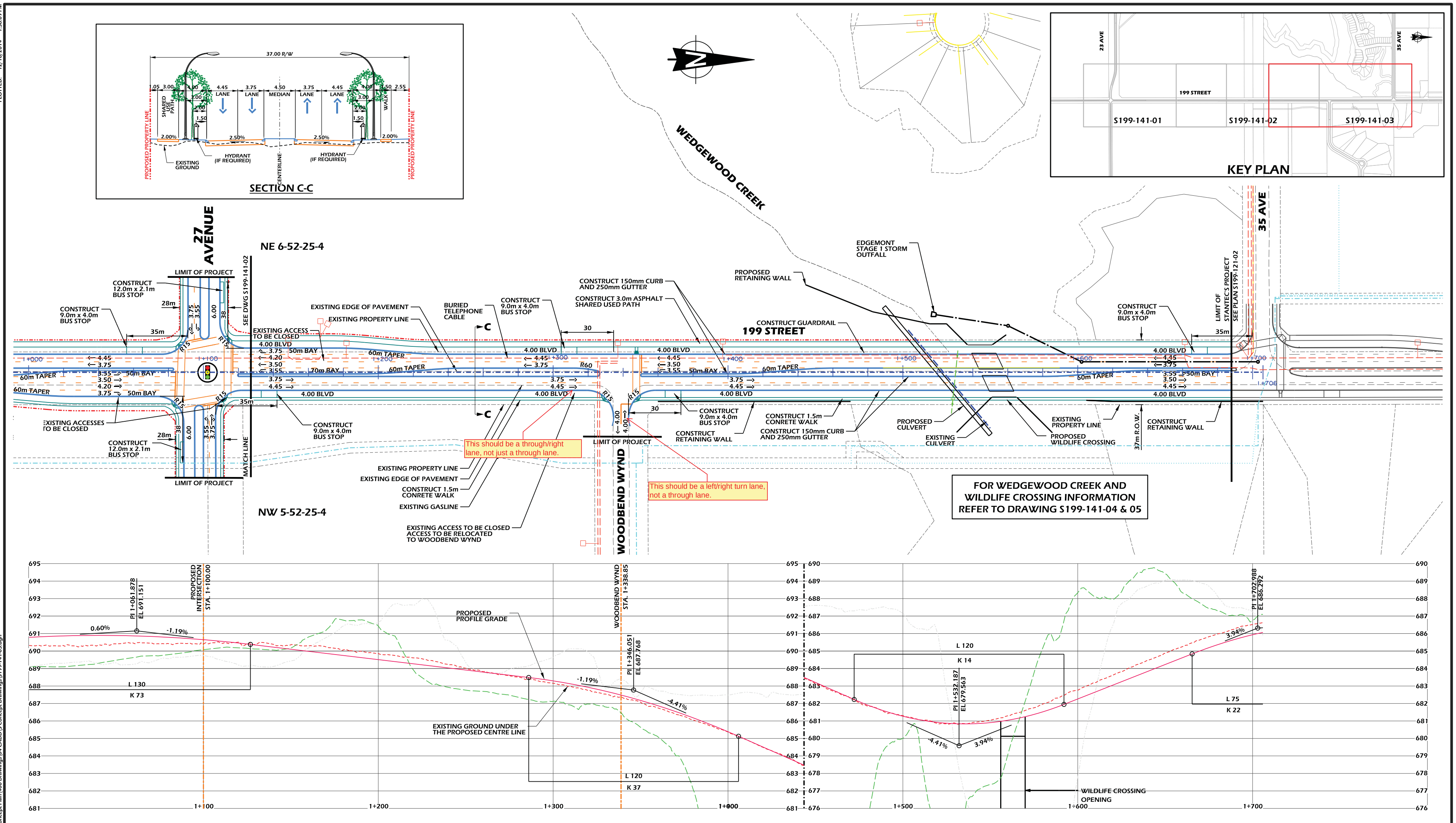

DESIGN SPEED =70 km/h
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CIMA

DRAFT
DEC 09, 2014

PERMIT TO PRACTICE P5038

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET
27 AVENUE TO 35 AVENUE

Edmonton TRANSPORTATION SERVICES

DRAWN: BC
REVIEWED: TW
DATE: DEC 2014

PLAN NO.
S199-141-03

PLOTTED: 12/10/2014 1:38:09 PM

L:\Projects\E064 KELTEC\E00540A - 199 St Concept Plan\400 Drawings\04 CADD\S Concept Drawings\S199-141-03.dgn

Christopher Wintle <christopher.wintle@edmonton.ca>

Re: 199 St Submission 2 Developer Concept Plan

1 message

Ken Karunaratne <ken.karunaratne@edmonton.ca> Fri, Jan 16, 2015 at 8:28 AM
To: Christopher Wintle <christopher.wintle@edmonton.ca>

Hi Chris,

The following are transportation Operations comments.

1.Typically, marked and signed pedestrian crosswalks are considered for installation after a pedestrian and vehicle assessment has been completed to determine if it meets the criteria for the installation of a marked crosswalk except at intersections that are controlled by an all-way stop or a traffic signal. Please remove the marked crosswalks at the intersections of 199 St and 25 Ave, Woodbend Wynd, and 35 Ave unless they are going to be controlled by an all-way stop or a traffic signal. Even though a marked crosswalk is not installed, curb ramp construction can still proceed.

2. Is there a reason to have a wide centre lane (4.2m wide) for the segment 99 St between 23 and 25 Ave.

Sorry for the delay in providing our comments.

Ken

Ken Karunaratne M.Eng., P.Eng, PTOE
Senior Traffic Engineer
Transportation Operations
City of Edmonton
15th Floor, Century Place
9803 - 102A Avenue NW
Edmonton Alberta T5J 3A3
Phone: 780-442-6435

On Wed, Jan 7, 2015 at 2:54 PM, Christopher Wintle <christopher.wintle@edmonton.ca> wrote:

> Hi Craig,
>
> Some time ago we circulated the first submission of a concept plan, being completed by CIMA+ on behalf of Walton, for 199 Street from 23 Avenue to 35 Avenue. We did not receive comments and due to unsatisfactory quality of the plans on the first submission did not follow up with and instead asked for submission 2.
>
> We have received Submission 2, and I am requesting that T-ops review and provide comments to Submission 2 as soon as possible. We would usually request two weeks, but given the stage of the study we are at I hoping to get comments to the consultant next week, so if it is possible to provide comments within a week

(by Wednesday January 14) that would be much appreciated.

The plans are attached via Google Drive.

199 Street Submission 2

Thanks,

Christopher

--
Christopher Wintle, P.Eng.
Project Engineer, Facility and Capital Planning
City of Edmonton, Transportation Services
Ph. 780-496-1792
christopher.wintle@edmonton.ca

THE CITY OF Edmonton

TRANSPORTATION SERVICES

MEMORANDUM

January 13, 2015

Your Reference: 199 St – 23 Ave to 35 Ave

TO: Christopher Wintle, P. Eng
Facility and Capital Planning
Transportation Planning Branch

FROM: Jack Niepsuj, P. Eng
Development Planning
Transportation Planning Branch

SUBJECT: Concept Plan for 199 Street, from 23 Avenue to 35 Avenue (Second Draft Submission)

Development Planning has reviewed the above drawings and has the following comments. These comments are also provided on the attached concept plans.

General Remarks:

- The right-in/right-out accesses, as well as the right-in access along 199 Street north of 23 Avenue have not been reviewed or approved by Development Planning as part of a formal development application for the site. While the general location of the accesses is acceptable (subject to the comments below), the exact location and configuration of accesses will be determined at the subdivision and development permit stage.
- Please ensure that the wildlife crossing requirements at the Wedgewood Creek crossing have been discussed with the Urban Ecology, and that they support the proposed design.

Drawing No. S199-1401-01:

- As the 23 Avenue concept plans are nearing completion, the latest shadow plan should be utilized for 23 Avenue. Furthermore, the appropriate 23 Avenue plan number should be referenced for the 23 Avenue/199 Street intersection.
- The right-in/right-out accesses should be 9.0 metres to facilitate access by medium sized delivery vehicles, as is commonly done for commercial developments.
- The distances to the nearest adjacent intersections should be provided for the right-in/right-out accesses between 23 Avenue and 24 Avenue.
- The TIA for Riverview identifies 199 Street as a four lane divided arterial roadway. The concept plans should clearly identify that the additional northbound and southbound lanes are “auxiliary lanes” that are required to facilitate access to the adjacent land uses, and do not represent a six lane divided arterial roadway. Furthermore, as these are auxiliary lanes, the Developer of the adjacent commercial and mixed use areas will be required to construct the auxiliary lanes.
- Given that single left turn lanes are adequate along 199 Street at 25 Avenue, consideration should be given to reducing the median along 199 Street north of 24 Avenue. This can reduce the right-of-way required for 199 Street, as well as the amount of road right-of-way that needs to be maintained.

Drawing No. S199-1401-02:

- Locating the mid-block crossing underneath the high-voltage Alta-Link transmission lines may preclude the installation of pedestrian actuated amber flashers at this location. The crossing may need to be shifted north to accommodate signal installation. This should be discussed with Alta-Link to verify clearance requirements for the power lines.

Drawing No. S199-1401-03:

- The southbound left turn bay at 27 Avenue is non-standard and exceeds the requirements outlined in the TIA. Given the possibility of higher than expected left turn volumes at this location, Development Planning supports the construction of a longer left turn bay at this location.
- The northbound curb lane along 199 Street at Woodbend Wynd should be identified as a through right lane, not a through only lane.
- The westbound lane along Woodbend Wynd should be identified as a left/right turn lane, not a through lane.

Drawing No. S199-1401-04 and S199-1401-05:

- Please ensure that the wildlife crossings have been reviewed with the Office of Biodiversity.
- Please note that EPCOR has expressed an interest in including power ducts in the Wedgewood Creek crossing bridge structure to accommodate future power feeds. Please ensure that additional duct work is included in the preliminary and detailed design of the structure to accommodate future EPCOR installation. Please contact and coordinate with Jatinder Hayer of Great Northern Engineering Consultants Inc. (Direct: 780-490-7141, Cell: 780-920-4680 Email: hayer@gnec.ca).

Should you require any additional information please contact Jack Niepsuj at 780-496-4127.

JN

Attachment – 199 Street Concept Plan Comments

APPENDIX C
PROJECT SPECIFIC DETAILS

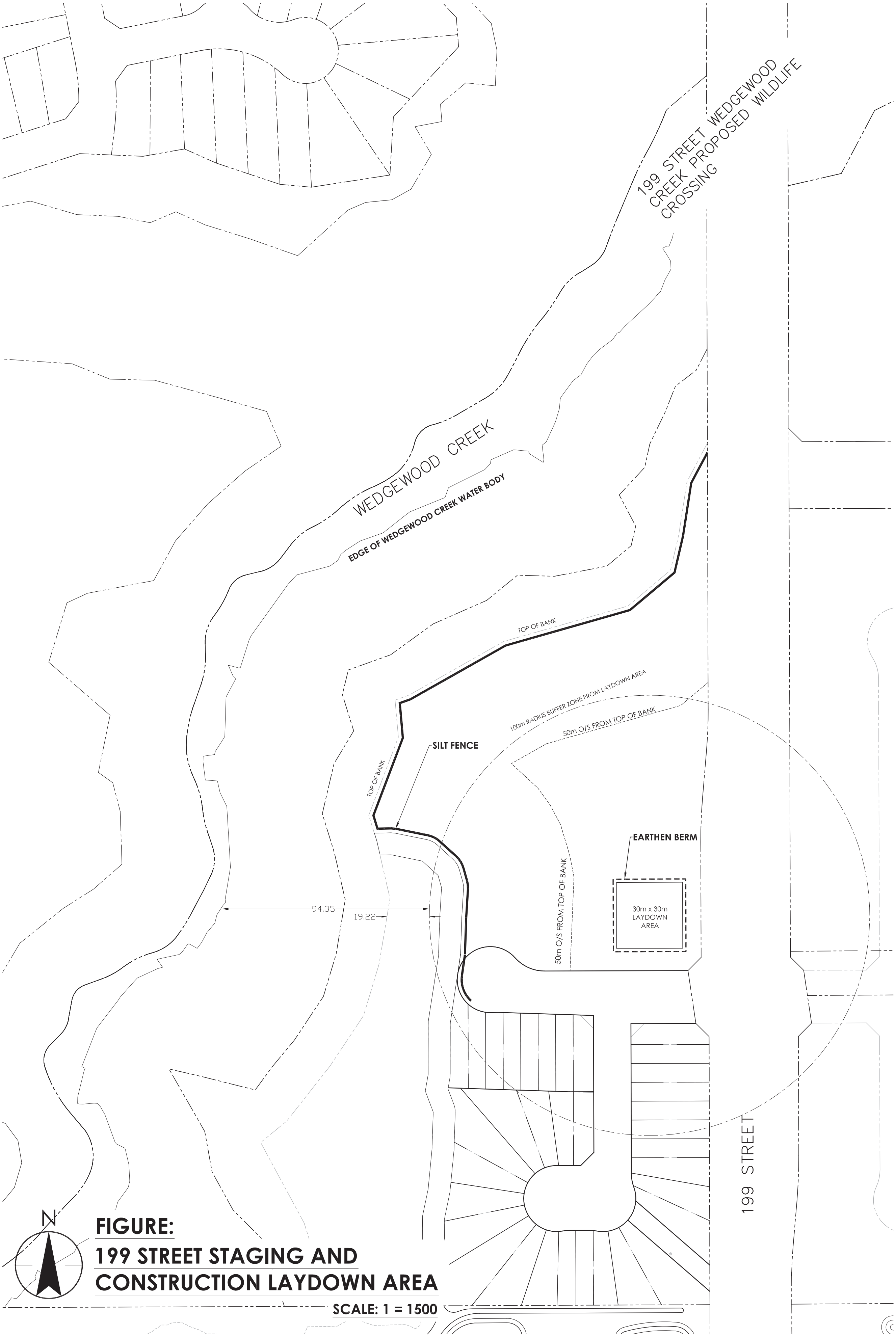


FIGURE:

199 STREET STAGING AND CONSTRUCTION LAYDOWN AREA

SCALE: 1 = 1500

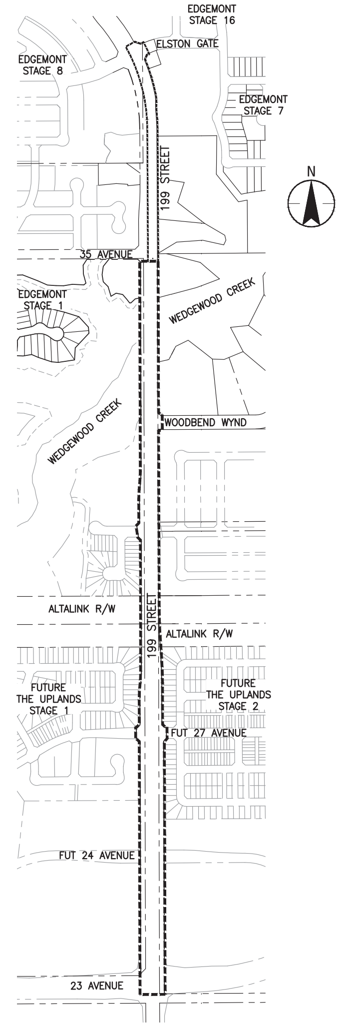
Stantec

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO
35 AVENUE

JUNE 2016

PROJECT NUMBER: 1161-103725



SUBDIVISION FILE: LDA/14-0566
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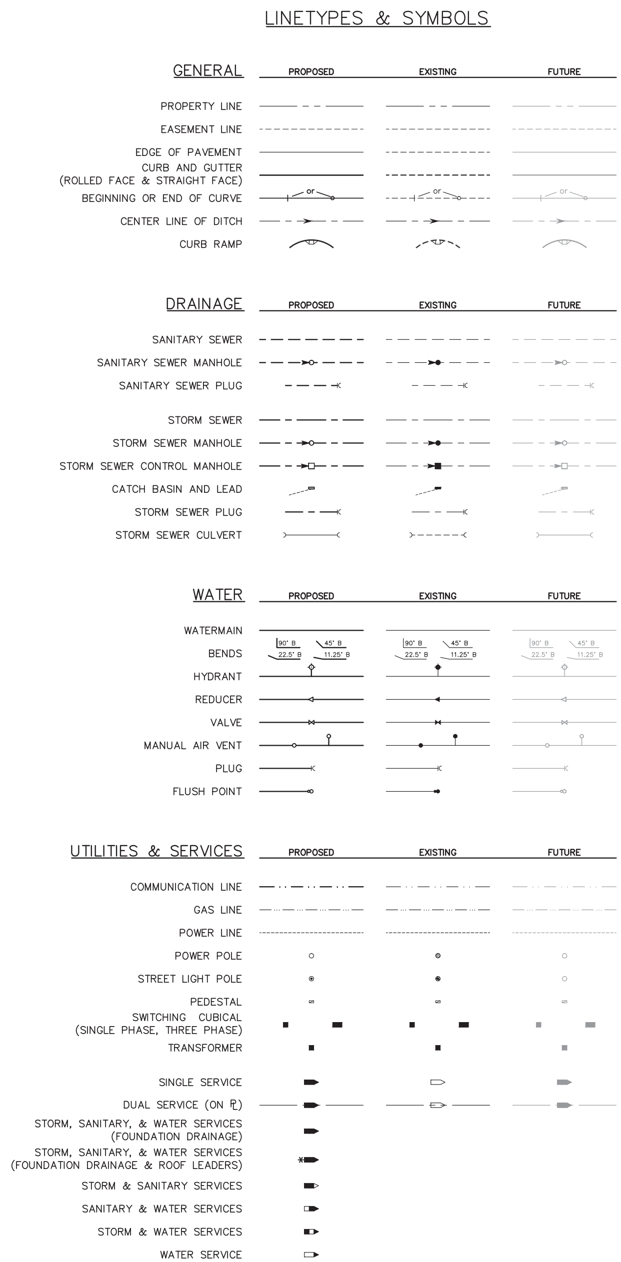

ABBREVIATIONS

AV	–	AVENUE
B	–	BEND
BLK	–	BLOCK
CB	–	CATCH BASIN
CBMH	–	CATCH BASIN MANHOLE
CC	–	CURB COCK
CL	–	CENTER LINE
c/w	–	COMPLETE WITH
CONC	–	CONCRETE
COR CUT	–	CORNER CUT (ON PROPERTY LINE)
CSP	–	CORRUGATED STEEL PIPE
DR	–	DRIVE
DWG	–	DRAWING
EL	–	ELEVATION
EX	–	EXISTING
FUT	–	FUTURE
HYD	–	HYDRANT
INV	–	INVERT
MH	–	MANHOLE
NBHD	–	NEIGHBOURHOOD
NTS	–	NOT TO SCALE
NO	–	NUMBER
O/H	–	OVERHEAD
PL	–	PROPERTY LINE
PVC	–	POLYVINYL CHLORIDE
R	–	RADIUS
RD	–	ROAD
RIM	–	MANHOLE RIM
ROW	–	RIGHT OF WAY
SAN	–	SANITARY
STD	–	STANDARD
STM	–	STORM
ST	–	STREET
TAN	–	TANGENT
TR	–	TRAIL
TYP	–	TYPICAL
U/G	–	UNDERGROUND
VERT	–	VERTICAL
WM	–	WATERMAIN

ABBREVIATIONS

BLVD	–	BOULEVARD
BOW	–	BACK OF WALK
EDL	–	EDGE OF DRIVING LANE
FOC	–	FACE OF CURB
LOG	–	LIP OF GUTTER
MED	–	MEDIAN
PVMT	–	PAVEMENT
RFCG	–	ROLLED FACE CURB & GUTTER
RF MONO	–	ROLLED FACE MONOLITHIC WALK
SFCG	–	STRAIGHT FACE CURB & GUTTER
SF MONO	–	STRAIGHT FACE MONOLITHIC WALK
SUP	–	SHARED USE PATH
TOC	–	TOP OF CURB
BC	–	BEGIN CURVE
BCCR	–	BEGIN CURVE–CURB RETURN
EC	–	END CURVE
ECCR	–	END CURVE–CURB RETURN
PI	–	TANGENT–TANGENT INTERSECT
TC	–	TANGENT–CURVE INTERSECT
PCC	–	CURVE–CURVE INTERSECT
PRC	–	REVERSE CURVE INTERSECT
CT	–	CURVE–TANGENT INTERSECT
POC	–	POINT ON CURVE
POT	–	POINT ON TANGENT
TS	–	TANGENT–SPIRAL INTERSECT
SC	–	SPIRAL–CURVE INTERSECT
CS	–	CURVE–SPIRAL INTERSECT
ST	–	SPIRAL–TANGENT INTERSECT
BVC	–	BEGIN VERTICAL CURVE
BVCS	–	BEGIN VERTICAL CURVE STATION
BVCE	–	BEGIN VERTICAL CURVE ELEVATION
EVC	–	END VERTICAL CURVE
EVCS	–	END VERTICAL CURVE STATION
EVCE	–	END VERTICAL CURVE ELEVATION
VC	–	VERTICAL CURVE
PVI	–	POINT OF VERTICAL INTERSECTION
L	–	LENGTH OF VERTICAL CURVE
A	–	ALGEBRAIC DIFFERENCE IN GRADIENTS
K	–	RATE OF CHANGE OF GRADE PER UNIT LENGTH (L\A)
e	–	SUPERELEVATION
Ls	–	LENGTH OF SPIRAL
NC	–	NORMAL CROWN
RC	–	REVERSE CROWN

Stantec

Stantec Consulting Ltd.
10160 - 112 Street
Edmonton AB Canada
Tel. 780.917.7000
www.stantec.com

Legend/Notes

Development Engineer, Sustainable Development

Approvals YY.MM

Revision	By	Appd.	YY.MM
SECOND SUBMISSION	G.R.	G.R.	16.06
FIRST SUBMISSION	G.R.	G.R.	15.12
Issued	Dsgn.	Dwn.	YY.MM

PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project
RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title
GENERAL LEGEND

Project No. 1161-103725
Scale

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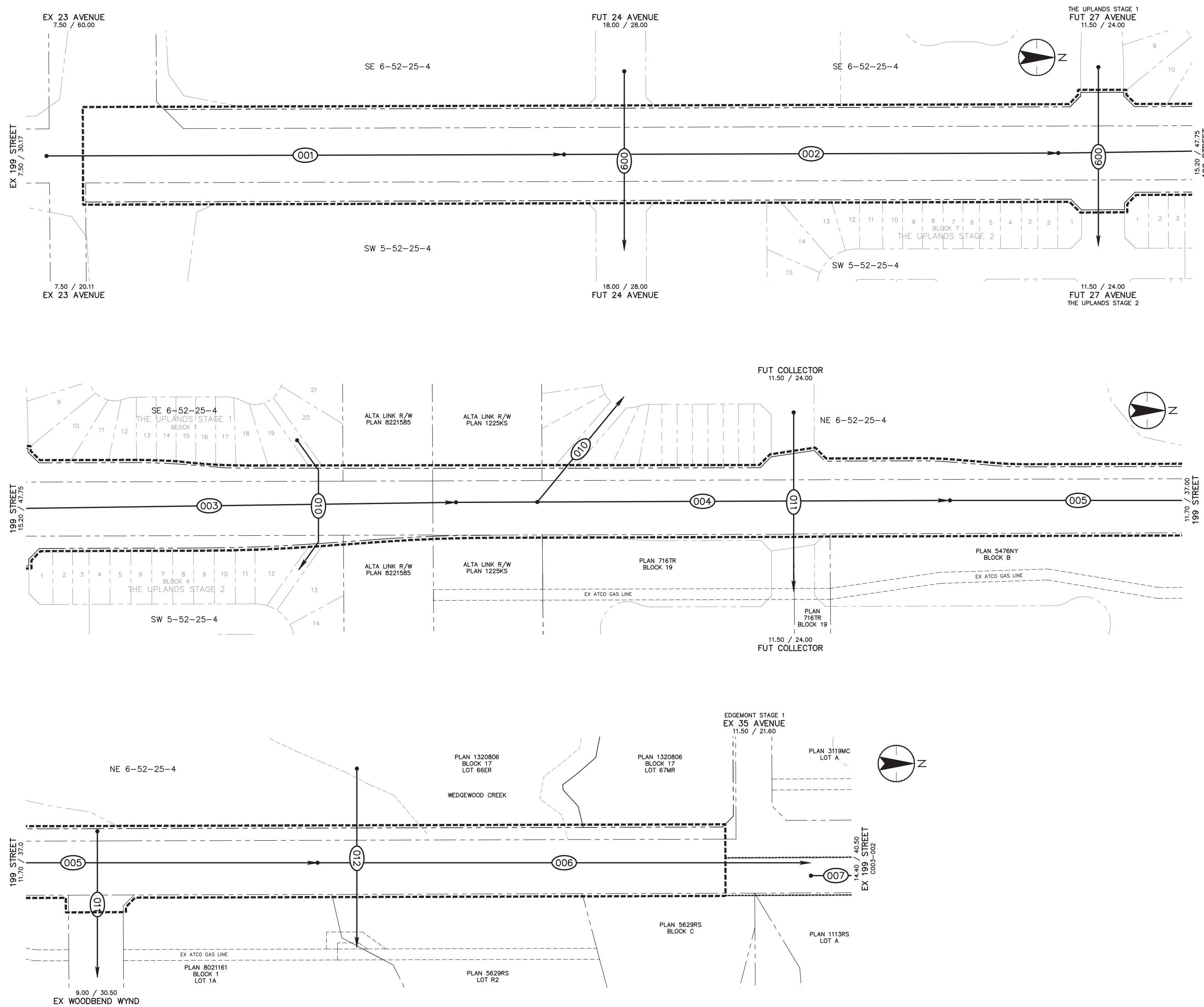
2016-6-01 11:38am BY: RRAYBURN

Drawing No.
C002-001



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Legend/Notes

PROFILE DRAWING NUMBER
001
BEGINNING OF PROFILE
PROFILE DIRECTION
LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

SEE DWG C003-002
FOR LIST OF DRAWINGS

Development Engineer, Sustainable Development

Approvals			YY.MM

Revision	By	Appd.	YY.MM
SECOND SUBMISSION	G.R.	G.R.	16.06
FIRST SUBMISSION	G.R.	G.R.	15.12
Issued	Dsgn.	Dwn.	YY.MM

PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project
RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title
INDEX PLAN

Project No.
1161-103725

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Drawing No.
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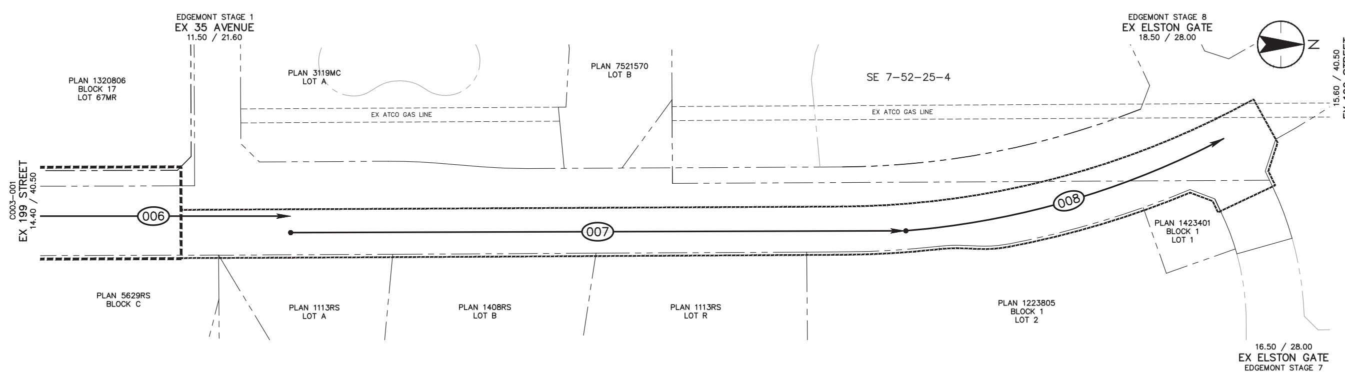

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C003-001	INDEX PLAN
C003-002	INDEX PLAN AND LIST OF DRAWINGS
C003-003	INDEX PLAN, PHASE 2
	OVERALL PLANS
C004-001	EXISTING TOPOGRAPHY AND LAND USE PLAN
C005-001	SANITARY, STORM AND WATERMAIN PLAN
C005-002	SANITARY, STORM AND WATERMAIN PLAN, OFFSITE
C005-003	SANITARY, STORM AND WATERMAIN PLAN, PHASE 2
C006-001	ROAD AND SIDEWALK PLAN
C006-002	ROAD AND SIDEWALK PLAN, PHASE 2
C007-001	ROAD GRADING PLAN
C007-002	ROAD GRADING PLAN, PHASE 2
C008-001	STORM DRAINAGE PLAN
C008-002	STORM DRAINAGE PLAN, PHASE 2
C009-001	STREET FURNITURE AND SIGNS PLAN
C009-002	STREET FURNITURE AND SIGNS PLAN, PHASE 2
C010-001	SANITARY BASIN SCHEMATIC
C011-001	STORM DRAINAGE BASIN SCHEMATIC
C012-001	APPROVED WATER NETWORK
C014-001	DRAINAGE/EPCOR WATER EASEMENT PLAN
C014-002	DRAINAGE/EPCOR WATER EASEMENT PLAN
C015-001	EROSION AND SEDIMENT CONTROL PLAN
C015-002	EROSION AND SEDIMENT CONTROL PLAN
C015-003	EROSION AND SEDIMENT CONTROL PLAN

DWG NO.	DRAWING TITLE
	ALIGNMENT
C101-001	199 STREET - STA 0+075 - STA 0+375
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C101-004	199 STREET - STA 0+900 - STA 1+200
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C101-006	199 STREET - STA 1+450 - STA 1+750
C101-013	199 STREET - STA 0+075 - STA 0+375, PHASE 2
C101-014	199 STREET - STA 0+350 - STA 0+625, PHASE 2
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C102-006	199 STREET - STA 1+450 - STA 1+750
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C103-006	199 STREET - STA 1+450 - STA 1+750
C103-013	199 STREET - STA 0+075 - STA 0+375, PHASE 2
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C105-007	199 STREET - STA 1+725 - STA 2+025, OFF-SITE SANITARY (FM)
C105-008	199 STREET - STA 2+000 - STA 2+225, OFF-SITE SANITARY (FM)
C105-009	FUT 24 AVENUE & FUT 27 AVENUE INTERSECTION CROSSING PLAN
C105-010	FUTURE WALKWAY CONNECTIONS
C105-011	FUTURE COLLECTOR & WOODBEND WYND INTERSECTION CROSSING PLAN
C105-012	WEDGEWOOD CREEK UTILITY CROSSING PLAN
C105-013	199 STREET - STA 0+075 - STA 0+375, PHASE 2
C105-014	199 STREET - STA 0+350 - STA 0+625, PHASE 2
C105-015	24 AVENUE OFF-SITE STORM, PHASE 2
C105-016	THE UPLANDS STAGE 1, SOUTH SWMF INLET OFF-SITE

DWG NO.	DRAWING TITLE
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C200-002	SECTIONS
C200-003	DETAILS
C200-004	DETAILS
C200-005	DETAILS
C200-006	DETAILS
C200-007	DETAILS
C200-008	DETAILS
	ELECTRICAL
E001-001	POWER LAYOUT & DETAILS
E001-002	POWER LAYOUT & SCHEMATIC
E001-003	LIGHTING LAYOUT & DETAILS
E001-004	LIGHTING LAYOUT & DETAILS
	GAS
G001-001	GAS PLAN
	LANDSCAPING
L001-001	OVERALL LANDSCAPE PLAN
L001-002	PHASE 1 ROADWAY LANDSCAPING CH 0+000 - CH 0+350
L001-003	PHASE 1 ROADWAY LANDSCAPING CH 0+350 - CH 0+700
L001-004	PHASE 1 ROADWAY LANDSCAPING CH 0+700 - CH 1+050
L001-005	PHASE 1 ROADWAY LANDSCAPING CH 1+050 - CH 1+450
L001-006	PHASE 1 ROADWAY LANDSCAPING CH 1+450 - CH 1+700
L001-007	OVERALL WILDLIFE PASSAGES EROSION & SEDIMENTATION CONTROL PLANS
L001-008	OVERALL WILDLIFE PASSAGES LANDSCAPE DESIGN
L001-009	WILDLIFE PASSAGES CROSS SECTION
L001-010	WILDLIFE PASSAGES LANDSCAPE DESIGN AREA A
L001-011	WILDLIFE PASSAGES LANDSCAPE DESIGN AREA B
L001-012	WILDLIFE PASSAGES LANDSCAPE DESIGN AREA C
L001-012A	ADDITIONAL SLOPE EROSION & SEDIMENT CONTROL PLAN & LANDSCAPE DESIGN
L001-013	PHASE 2 ROADWAY LANDSCAPING CH 0+100 - CH 0+350
L001-014	PHASE 2 ROADWAY LANDSCAPING CH 0+350 - CH 0+700
L001-015	LANDSCAPE DETAILS
L001-016	LANDSCAPE DETAILS
L001-017	LANDSCAPE DETAILS
	STRUCTURAL
S001-001	GENERAL LAYOUT
S001-002	INFORMATION SHEET 1
S001-003	INFORMATION SHEET 2
S001-004	SOILS INFORMATION
S001-005	PILING - SHEET 1
S001-006	ABUTMENT - SHEET 1
S001-007	ABUTMENT - SHEET 2
S001-008	ABUTMENT - SHEET 3
S001-009	GIRDER LAYOUT
S001-010	GIRDER DETAILS
S001-011	DECK - SHEET 1
S001-012	DECK - SHEET 2
S001-013	PEDESTRIAN RAIL
S001-014	MSE WALL - SHEET 1
S001-015	MSE WALL - SHEET 2
S001-016	MSE WALL - SHEET 3
S001-017	MSE WALL - SHEET 4
S001-018	MISCELLANEOUS SHEET 1
S001-019	MISCELLANEOUS SHEET 2
	CULVERT
S002-001	CULVERT LAYOUT
S002-002	CULVERT DETAILS
S002-003	MISCELLANEOUS CULVERT DETAILS

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Legend/Notes

PROFILE DRAWING NUMBER
001
BEGINNING OF PROFILE
PROFILE DIRECTION

LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

Development Engineer, Sustainable Development

Approvals YY.MM

Revision	By	Appd.	YY.MM
SECOND SUBMISSION	G.R.	G.R.	16.06
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PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title

INDEX PLAN
AND LIST OF DRAWINGS

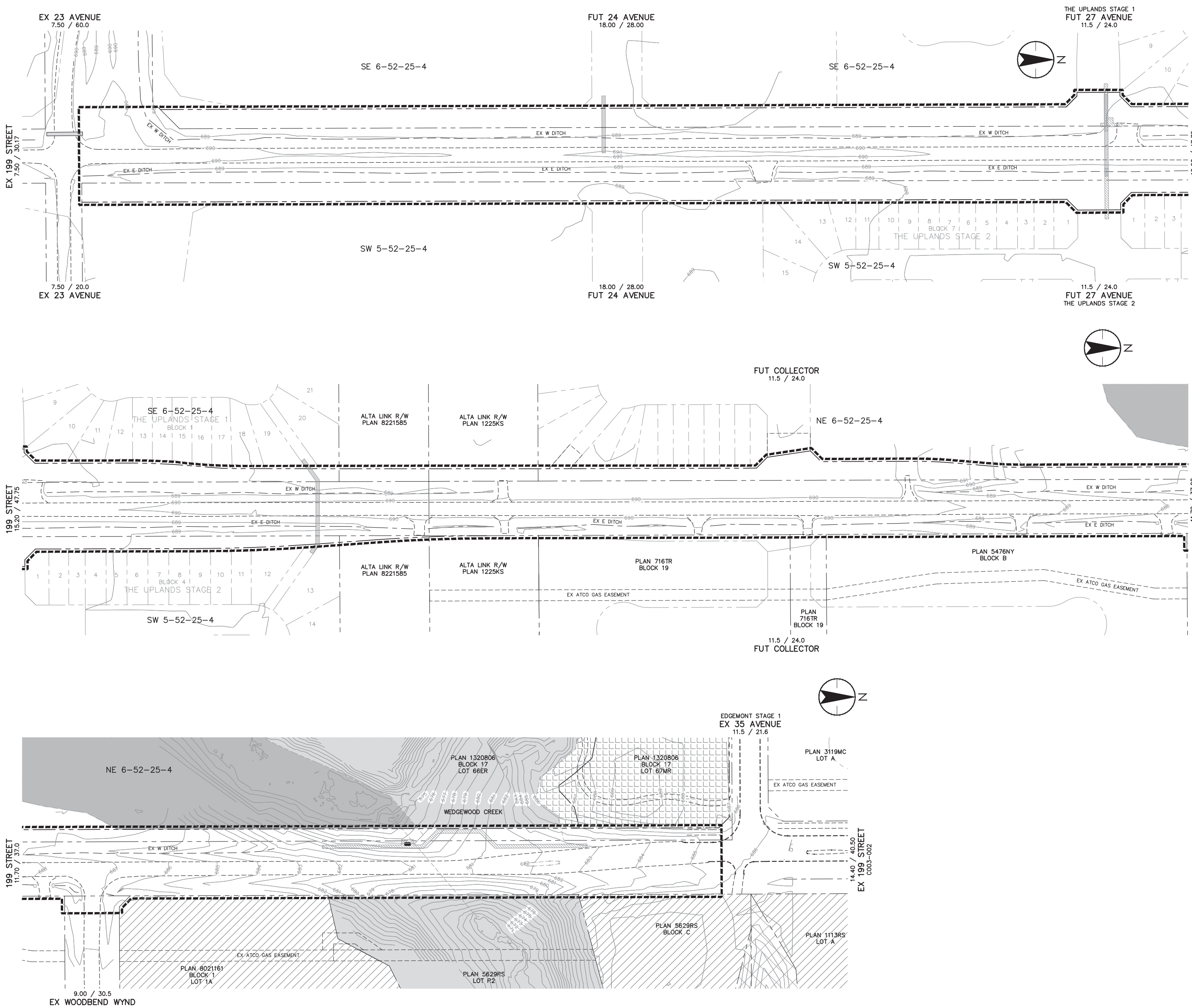
Project No.
1161-103725

Scale
1:1000 0 10 20 30 40 50

V:\1161\Active\1161103725\drawing\sheet_files\1161103725 - C003 - INDEX.dwg

2016-6-01 12:03pm BY: JGRUNINGER

Drawing No.
C003-002



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Legend/Notes

- 673 EXISTING GROUND CONTOUR
- RR (RURAL RESIDENTIAL ZONE)
- AP (PUBLIC PARKS ZONE)
- AG (AGRICULTURAL ZONE)
- A (METROPOLITAN RECREATION ZONE)
- LIMIT OF CONSTRUCTION
- DEVELOPMENT BOUNDARY

Development Engineer, Sustainable Development

Approvals | YY.MM

Revision | By | Appd. | YY.MM

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PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE

Edmonton, AB

Title

EXISTING TOPOGRAPHY
AND LAND USE PLAN

Project No. 1161-103725

Scale 1:1000 0 10 20 30 40 50

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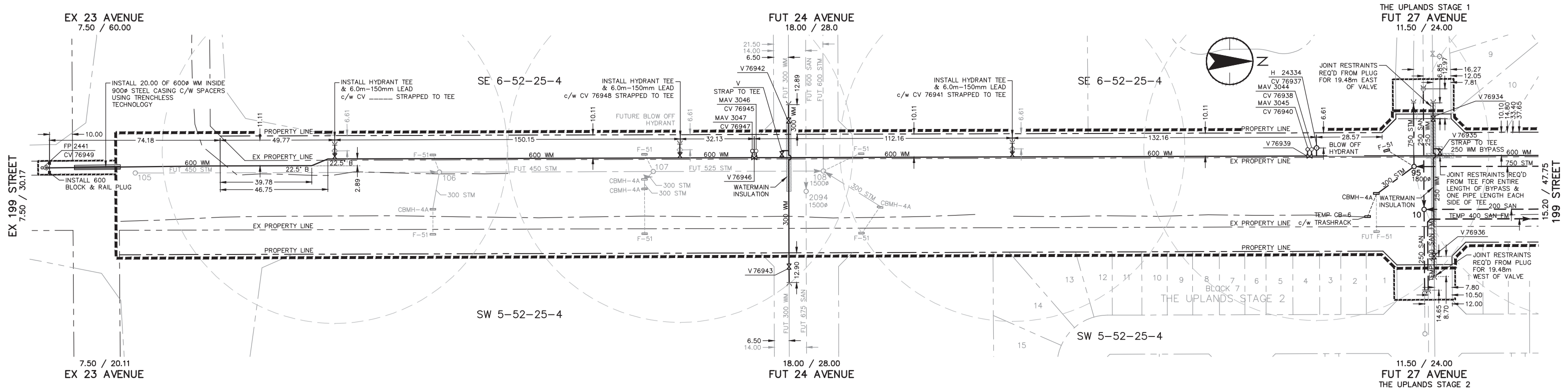
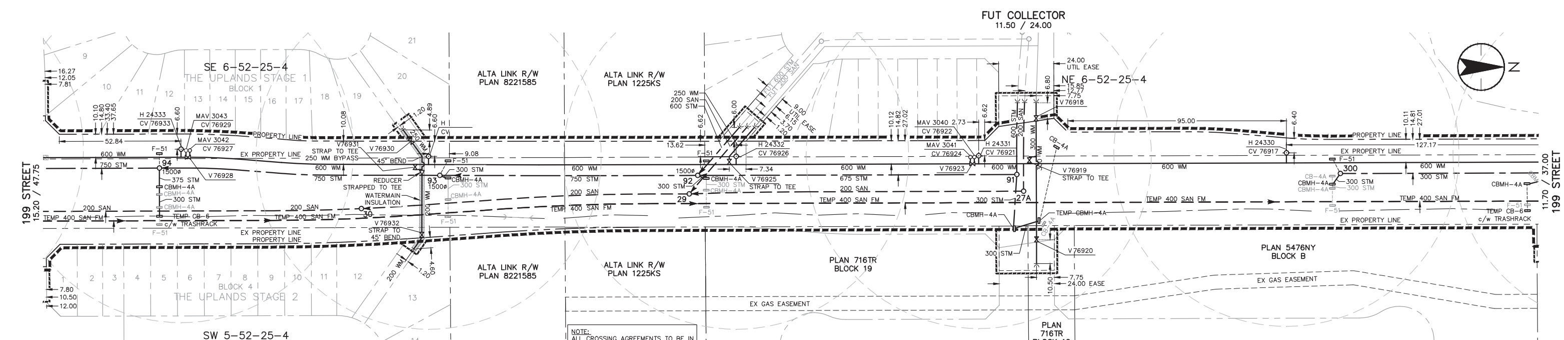
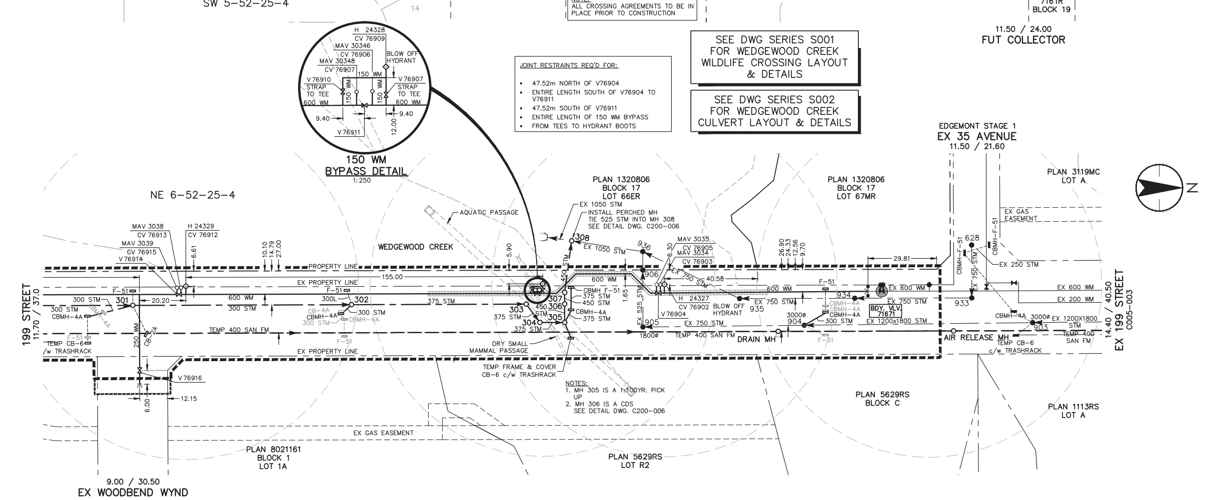
2016-6-01 10:44am BY: JGRUNINGER

Drawing No. C004-001







ADDITONAL WATER NOTES:

1. SHOP DRAWINGS FOR WATERMAIN BRIDGE AND BEND DETAILS TO BE SUPPLIED TO EPCOR WATER A MINIMUM OF 2 MONTHS PRIOR TO CONSTRUCTION FOR REVIEW AND APPROVAL. CONTACT DAVID MATHEW AT DMATHEW@EPCOR.COM FOR REVIEW.
2. ALL WATER MAINS SHALL BE TESTED AND DISINFECTED IN ACCORDANCE WITH THE GUIDELINES FOR ACCEPTANCE TESTING OF NEW WATERMAINS CONTAINED IN SECTION 02517 OF VOLUME 4 OF THE CITY OF EDMONTON DESIGN AND CONSTRUCTION STANDARDS.
3. CONSULTANT TO SUPPLY A FILLING STRATEGY TO BE REVIEWED BY EPCOR WATER SERVICES A MINIMUM OF 2 WEEKS PRIOR TO COMMENCING CONSTRUCTION. FILLING STRATEGY TO BE SUBMITTED TO WPDDOCS@EPCOR.COM. DESIGNATED TOP-UP VALVES MUST BE CLEARLY INDICATED. CONTENTS OF THE FILLING STRATEGY ARE TO BE DISCUSSED AT THE PRE-CONSTRUCTION MEETING. ALL BOUNDARY VALVES ARE TO BE CLOSED AND STOPPERED PRIOR TO COMMENCING CONSTRUCTION.
4. CONSULTANT TO SUPPLY A FLUSHING STRATEGY TO BE REVIEWED BY EPCOR WATER SERVICES A MINIMUM OF 2 WEEKS PRIOR TO COMMISSIONING OF THE WATER MAINS. FLUSHING STRATEGY TO BE SUBMITTED TO WPDDOCS@EPCOR.COM. A PRE-COMMISSIONING DISCUSSION IS TO BE HELD WITH THE CONSULTANT, CONTRACTOR, AND THE WATER INSPECTOR PRIOR TO COMMISSIONING OF WATER MAINS TO DISCUSS THE FLUSHING STRATEGY.
5. HYDRANT NO. H24334 TO BE USED FOR FLOW TESTING.
6. ALL HYDRANTS TO HAVE THE HYDRANT NUMBER AND VALVE DIMENTION PAINTED ON PRIOR TO CCC. ALL HYDRANT DOMES, NOZZLE CAPS, AND STEAMERS ARE TO BE PAINTED SAFETY BLUE USING BENJAMIN MOORE INDUSTRIAL MAINTENANCE RAPID DRY GLOSS ALKYD ENAMEL OR AN APPROVED EQUIVALENT.
7. CLOSE & STOPPER FUTURE BOUNDARY VALVES _______, _______, AND _______, PRIOR TO COMMISSIONING.
8. ALL SERVICES FROM WATER MAINS >350mm REQUIRE APPROVED SERVICE SADDLES AND HORIZONTAL GOOSE NECKS.
9. ALL JOINT RESTRAINTS TO BE WITNESSED BY AN EPCOR WATER INSPECTOR PRIOR TO BACK FILL. THRUST BLOCKS IN ACCORDANCE WITH EPCOR WATER DETAIL DRAWINGS # 2511-03, 2511-04 & 2511-13 MUST STILL BE PROVIDED FOR RESTRAINED FITTINGS.
10. USE 5° SWEEP BENDS AND/OR PIPE JOINT DEFLECTIONS TO MAINTAIN CURVED WATER MAIN ALIGNMENTS. SERVICE TAPPING OF BENT PIPES NOT PERMITTED.
11. ALL HYDRANTS TO BE WHITE DISC DESIGNATED.

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Legend/Notes

LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

1. SPECIFICATIONS FOR THE INSTALLATION & TYPE OF ALL SANITARY SEWERS, STORM SEWERS, CATCHBASINS / LEADS, WATERMAINS & LOT SERVICES ARE NOTED ON THE INDIVIDUAL PLAN PROFILES AND THE TYPICAL SECTIONS & DETAILS.
2. ALL BOUNDARY VALVE OPERATIONS MUST BE DONE WITH AN EPCOR WATER INSPECTOR PRESENT. ALL BOUNDARY VALVES >350mm MUST BE OPERATED BY AN EPCOR WATER SERVICES CREW; CONTACT WATER DISPATCH A MINIMUM OF 48 HOURS PRIOR AT 780-412-6800 AND THE EPCOR WATER INSPECTOR TO HAVE VALVES OPERATED. ALL BOUNDARY VALVE OPERATIONS ARE TO OCCUR IN A MANNER WHICH PREVENTS CONTAMINATION OF THE EXISTING WATER SUPPLY IN ADJACENT WORKS.
3. CLOSE AND STOPPER ALL BOUNDARY VALVES FOR THE DURATION OF PROJECT.
4. ALL MATERIALS AND CONSTRUCTION TO BE AS PER THE CITY OF EDMONTON DESIGN AND CONSTRUCTION STANDARDS.
5. TIE INTO EXISTING TO THE SATISFACTION OF THE CITY OF EDMONTON.
6. NO HYDRANT VALVES TO FALL WITHIN SIDEWALK.
7. USE ONLY TYPE 80 OR 90 FRAME & COVER MANHOLES ON ROADWAYS.
8. ALL CATCH BASIN LEADS ARE 250mmø UNLESS OTHERWISE NOTED.

Development Engineer, Sustainable Development

Approvals			YY.MM

Revision	By	Appd.	YY.MM
SECOND SUBMISSION	G.R.	G.R.	16.06
FIRST SUBMISSION	G.R.	G.R.	15.12
Issued	Dsgn.	Dwn.	YY.MM

PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE

Edmonton, AB

Title

SANITARY, STORM
AND WATERMAIN PLAN

Project No. 1161-103725

Scale 1:1000 0 10 20 30 40 50

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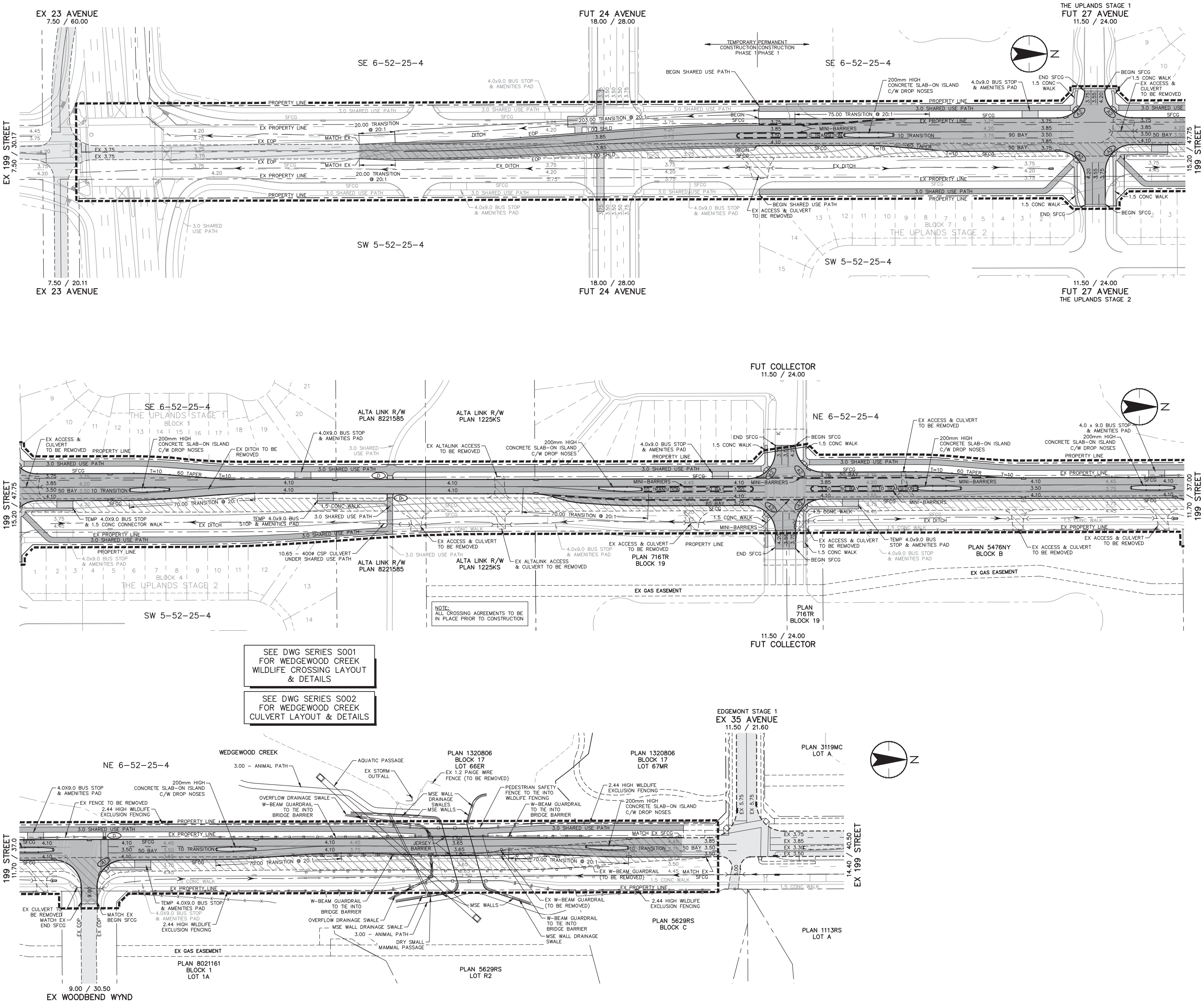
2016-6-01 10:29am BY: JGRUNINGER

Drawing No.

C005-001



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Legend/Notes

- A1 — CURB RAMP TYPE
- PAVEMENT
- EX PAVEMENT
- CONCRETE
- GRIND AND OVERLAY
- REMOVAL
- LIMIT OF CONSTRUCTION
- DEVELOPMENT BOUNDARY

1. TIE INTO EX TO THE SATISFACTION OF THE CITY OF EDMONTON.
2. ALL CURB RAMPS ARE LOCATED AT THE MIDPOINT OF CURB RETURNS UNLESS OTHERWISE NOTED.
3. WITHIN 72 HOURS OF FINAL PAVING THE CONTRACTOR WILL REQUEST A POST PAVING INSPECTION BY AN EPCOR FIELD CREW. ALL POST PAVING INSPECTIONS WILL BE REQUESTED VIA EMAIL TO WPOSTPAVING@EPCOR.COM. THE EMAIL SHOULD CONTAIN A MAP SHOWING THE PAVING LIMITS, PROPOSED DATE AND TIME FOR THE INSPECTION AND CONTACT INFORMATION SO THE INSPECTION CAN BE COORDINATED. THE EPCOR VALVE CREW, THE CONTRACTOR, AND THE ROADWAYS INSPECTOR TO ENSURE ALL VALVE CASINGS AND WATER CHAMBERS ARE TO GRADE AND FREE OF DEBRIS.
4. ALL CATCH BASINS NOT TO CONFLICT WITH ANY PORTION OF ANY CURB RAMP.

Development Engineer, Sustainable Development

Approvals YY.MM

Revision	By	Appd.	YY.MM
SECOND SUBMISSION	G.R.	G.R.	16.06
FIRST SUBMISSION	G.R.	G.R.	15.12
Issued	Dsgn.	Dwn.	YY.MM

PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project
RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title
ROAD AND SIDEWALK PLAN

Project No. 1161-103725

Scale 1:1000 0 10 20 30 40 50

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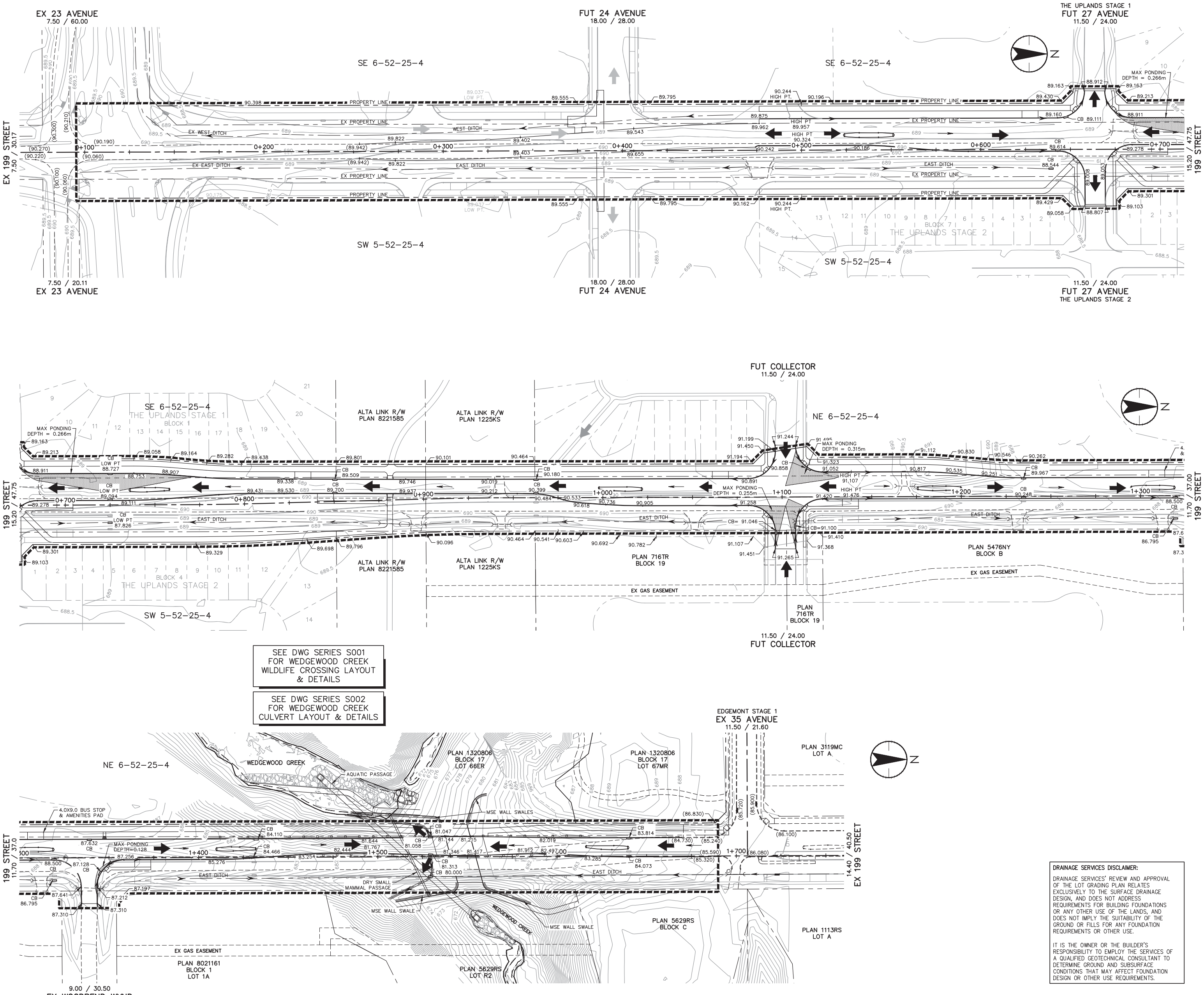
2016-6-01 11:19am BY: JGRUNINGER

Drawing No.
C006-001



DRAINAGE SERVICES DISCLAIMER:

DRAINAGE SERVICES' REVIEW AND APPROVAL OF THE LOT GRADING PLAN RELATES EXCLUSIVELY TO THE SURFACE DRAINAGE DESIGN, AND DOES NOT ADDRESS REQUIREMENTS FOR BUILDING FOUNDATIONS OR ANY OTHER USE OF THE LANDS, AND DOES NOT IMPLY THE SUITABILITY OF THE GROUND OR FILLS FOR ANY FOUNDATION REQUIREMENTS OR OTHER USE.

IT IS THE OWNER OR THE BUILDER'S RESPONSIBILITY TO EMPLOY THE SERVICES OF A QUALIFIED GEOTECHNICAL CONSULTANT TO DETERMINE GROUND AND SUBSURFACE CONDITIONS THAT MAY AFFECT FOUNDATION DESIGN OR OTHER USE REQUIREMENTS.

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Legend/Notes

DIRECTION OF MAJOR / MINOR DRAINAGE (1:100 YEAR)

LOCALIZED LOW AREA

LIMIT OF CONSTRUCTION

DEVELOPMENT BOUNDARY

Development Engineer, Sustainable Development

Approvals

Revision	By	Appd.	YY.MM
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PROJECT MANAGER: TONY CHIARELLO

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Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title

ROAD GRADING PLAN

Project No. 1161-103725

Scale 1:1000 0 10 20 30 40 50

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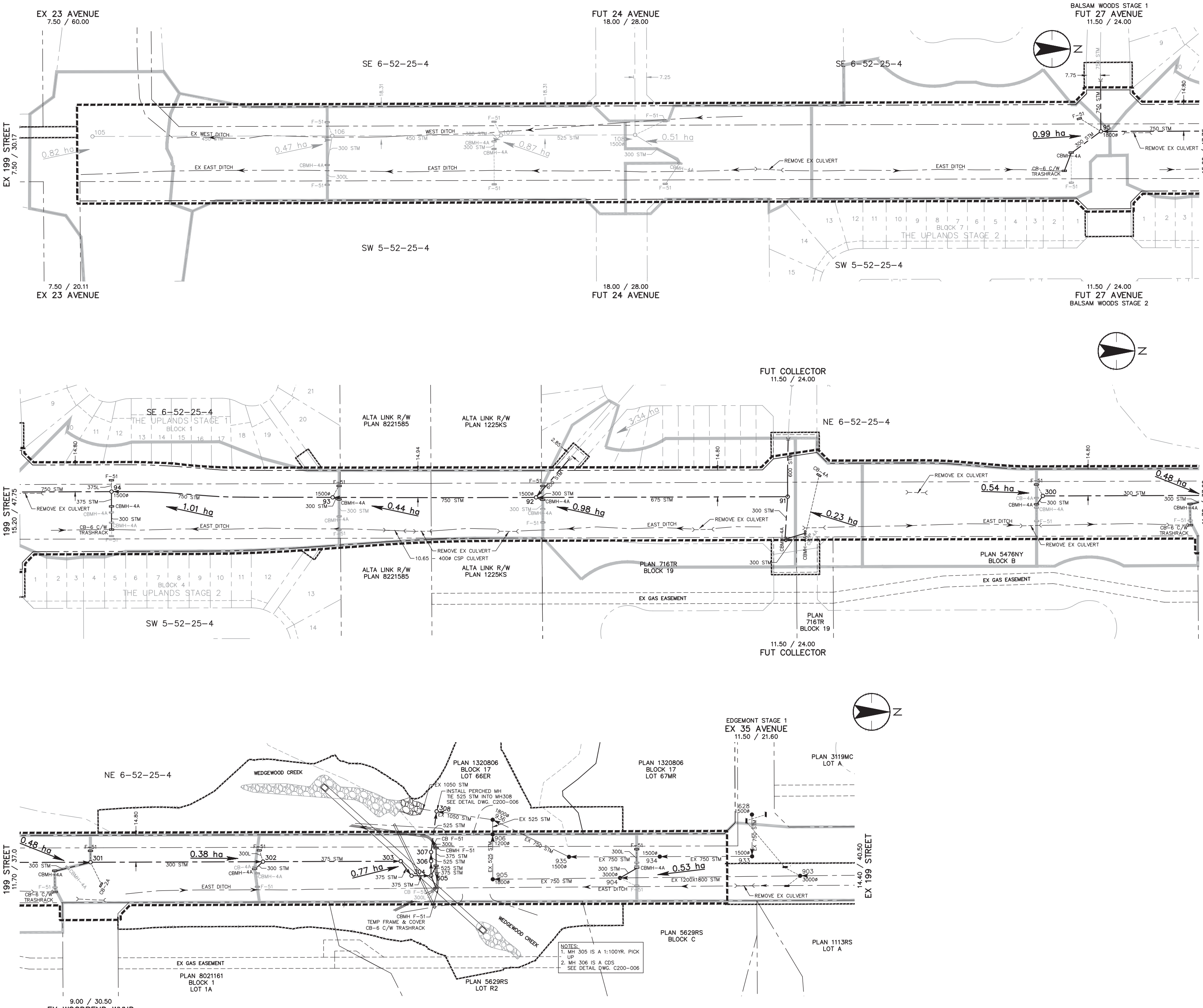
2016-6-01 10:49am BY: JGRUNINGER

Drawing No.

C007-001



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Legend/Notes

STORM DRAINAGE BOUNDARY

LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

Development Engineer, Sustainable Development

Approvals YY.MM

Revision	By	Appd.	YY.MM
SECOND SUBMISSION	G.R.	G.R.	16.06
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Issued	Dsgn.	Dwn.	YY.MM

PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project
RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title
STORM DRAINAGE PLAN

Project No. 1161-103725
Scale 1:1000 0 10 20 30 40 50

Drawing No.
C008-001

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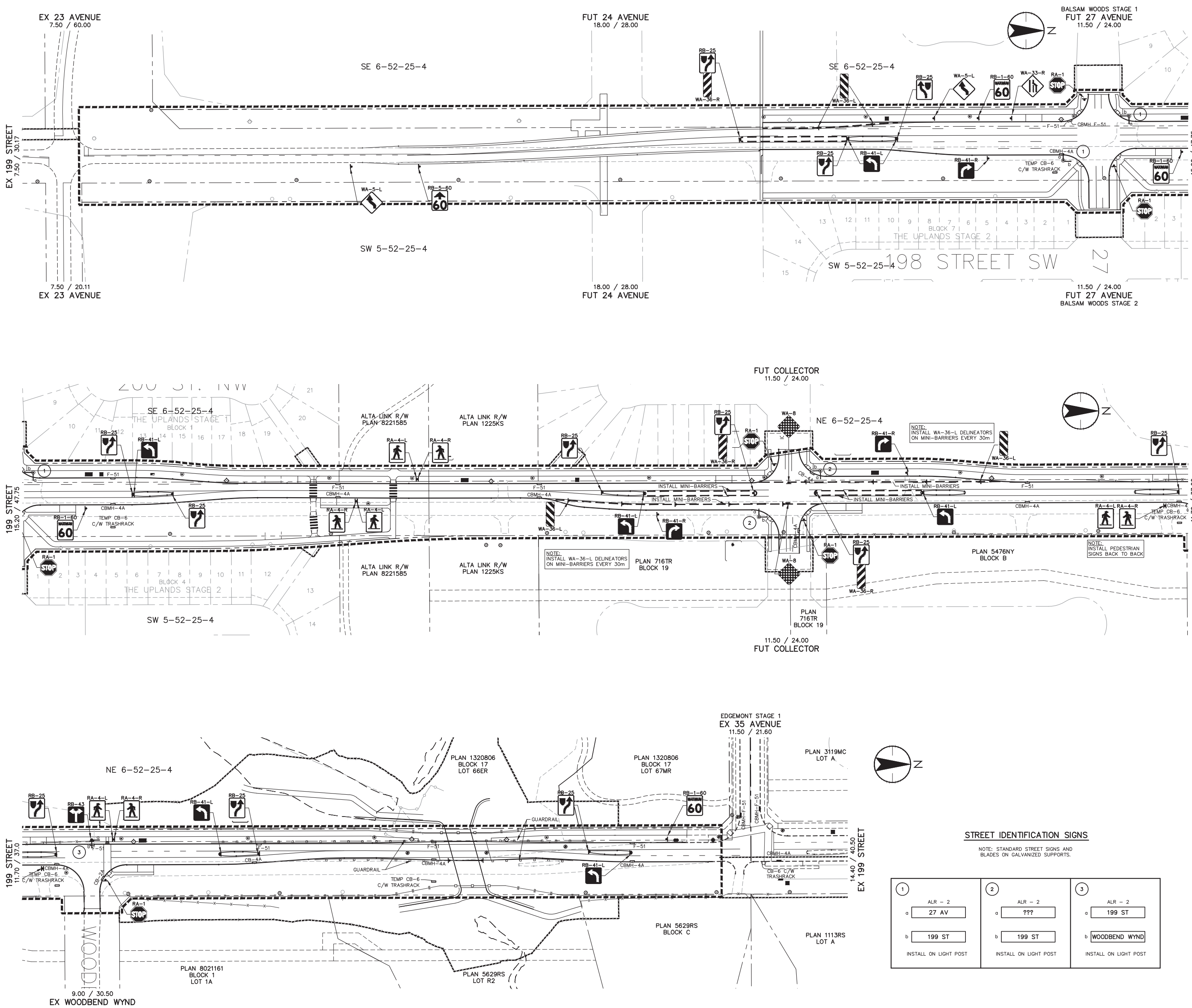
2016-6-01 11:59am BY: GRUSSELL



STREET IDENTIFICATION SIGNS

NOTE: STANDARD STREET SIGNS AND BLADES ON GALVANIZED SUPPORTS.

	1	2	3
	ALR – 2	ALR – 2	ALR – 2
a	27 AV	???	199 ST
b	199 ST	199 ST	WOODBEND WYND
	INSTALL ON LIGHT POST	INSTALL ON LIGHT POST	INSTALL ON LIGHT POST

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Legend/Notes

STREET IDENTIFICATION SIGN

LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

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PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title

STREET FURNITURE AND
SIGNS PLAN

Project No. 1161-103725

Scale 1:1000 (0 10 20 30 40 50)

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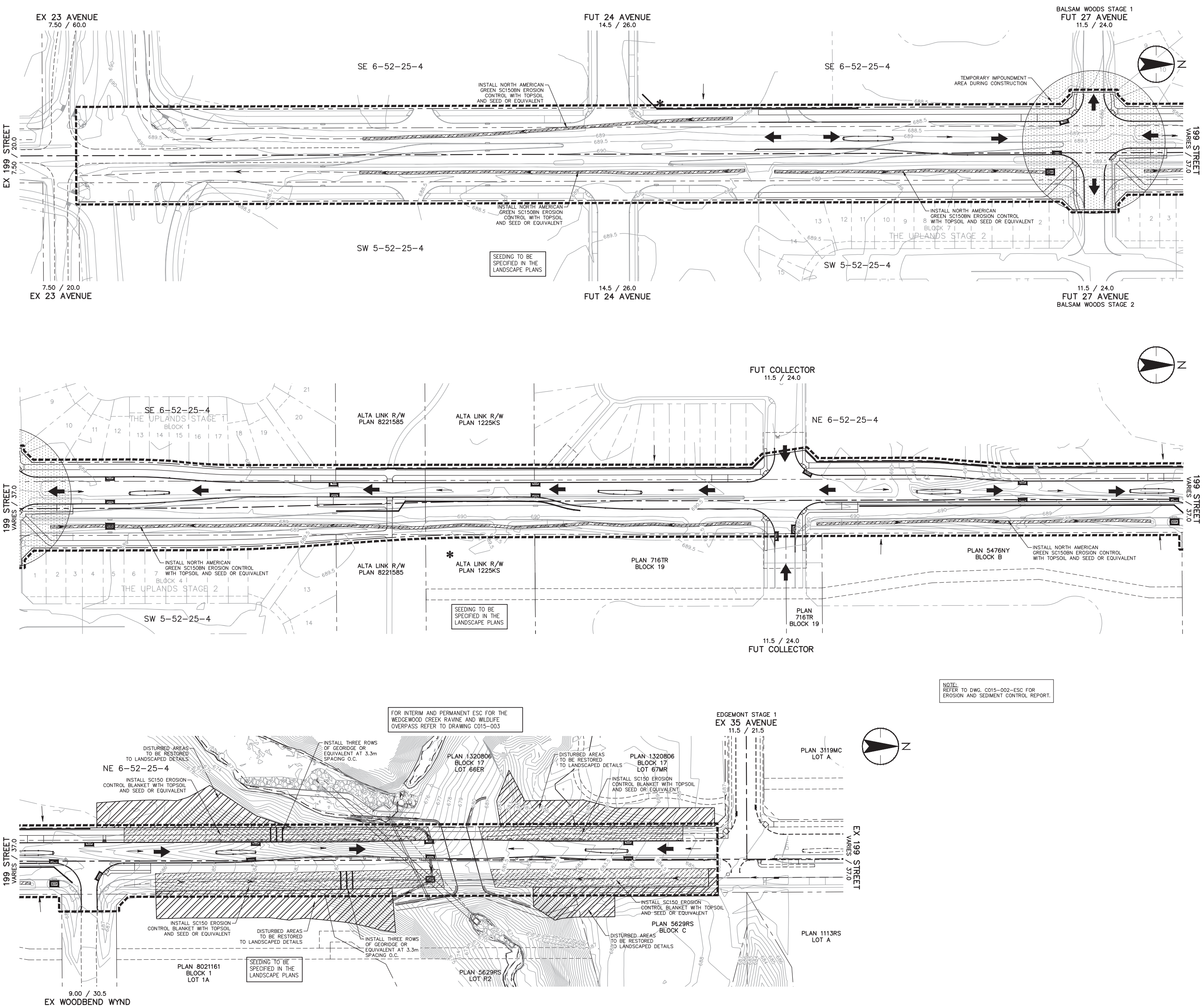
2016-6-01 11:35am BY: GRUSSELL

Drawing No.
C009-001



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Legend/Notes

- SPILL DIRECTION
- OVERLAND FLOW
- DIRECTION OF MAJOR DRAINAGE
- CATCHBASIN WITH SEDIMENT BARRIER
- * INTERIM STORM WATER DISCHARGE LOCATION
- SILT FENCE
- STRAW WATTLE
- EROSION BLANKET
- LIMIT OF CONSTRUCTION
- DEVELOPMENT BOUNDARY

1. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE ADOPTED DURING CONSTRUCTION IN ACCORDANCE WITH THE CITY OF EDMONTON EROSION AND SEDIMENTATION CONTROL GUIDELINE AND FIELD MANUAL.

Development Engineer, Sustainable Development

Approvals | YY.MM

Revision	By	Appd.	YY.MM
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PROJECT MANAGER: TONY CHIARELLO

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Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title

EROSION AND SEDIMENT CONTROL

Project No. 1161-103725

Scale 1:1000 0 10 20 30 40 50

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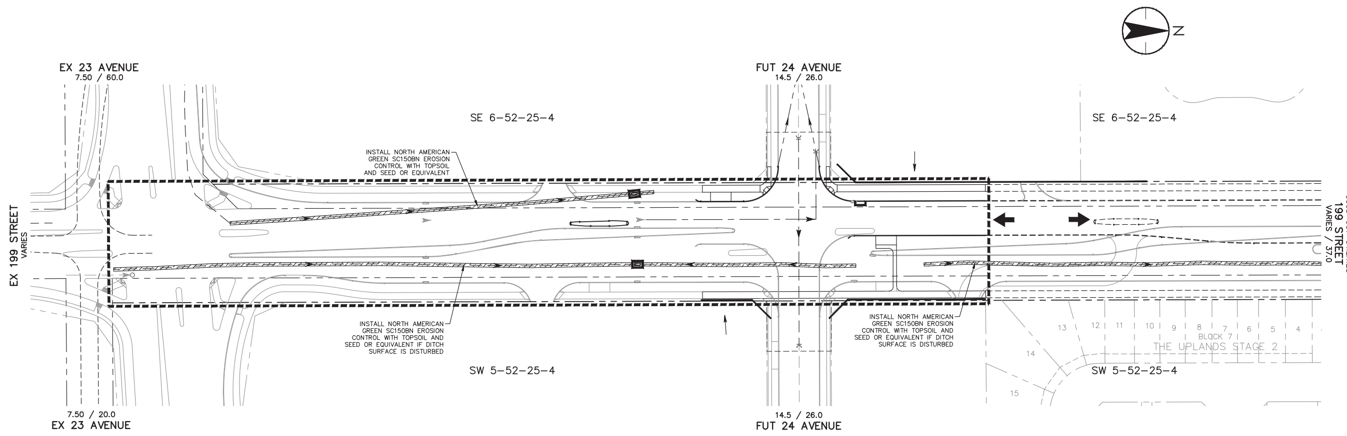
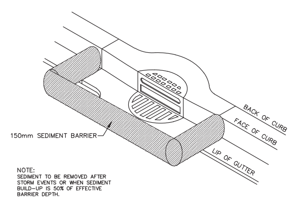
2016-6-01 9:07am BY: GRUSSELL

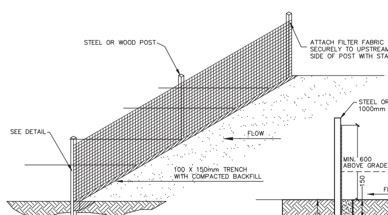
Drawing No.
C015-001

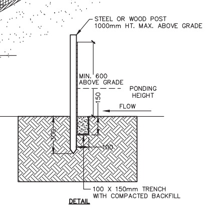




CATCH BASIN INLET SEDIMENT BARRIER DETAIL

(CB Barrier Detail)





NOTE:

1. SILT FENCE TO BE INSPECTED DURING WEEKLY SITE INSPECTIONS AND AFTER ANY PRECIPITATION.
2. FABRIC TO BE TRENCHED IN, TIGHT AND CONSISTANT BETWEEN ALL POSTS. ADD ADDITIONAL POSTS AS REQUIRED.
3. OVERALL FENCE INSTALLATION TO BE INSTALLED IN STRATEGIC SEMI-CIRCLES, WITH THE CROWN OF THE CURVE TO BE IN THE DIRECTION OF THE WATER FLOW. THE INTENT IS TO INCREASE STABLIZATION AND EFFECTIVENESS OF THE SILT FENCE.
4. ALL SEDIMENT TO BE CLEANED OUT PRIOR TO REMOVAL. AT F.A.C., ALL ACCUMULATED SEDIMENT AND ALL POSTS TO BE REMOVED AND FABRIC TO BE CUT FLUSH WITH GROUND - DO NOT PULL FENCE FABRIC FROM TRENCH.
5. SEDIMENT TO BE REMOVED BEFORE ACCUMULATION REACHES 1/3 OF FENCE HEIGHT.
6. SEDIMENT TO BE REMOVED TO AN OFFSITE LOCATION.

SILT FENCE DETAIL

(Silt Fence)

EROSION AND SEDIMENT CONTROL PLAN

1.0 PROPOSED SITE CLEARING AND GRADING

- Entire site within the development boundary will be stripped in 2015.
- Lots to be graded according to pregrades (i.e. 0.25m below design grade) therefore the lots act as temporary sediment traps. This prevents overland drainage onto roadways and adjacent existing lots.
- Low areas to be protected from spill over with properly installed silt fence or other appropriate BMP.
- Where concentrated flow is anticipated erosion control blankets, triangle silt dikes (Georidge from Nilex), or appropriate BMP will be used.
- Surface drainage or pools of storm water will be pumped to designated discharge locations as per drawing.
- Should mud tracking occur, it is the responsibility of the contractor to clean the affected roadways. The City of Edmonton has tracking traffic bylaw #5590, which prohibits tracking.

2.0 UNDERGROUND CONSTRUCTION

- Includes storm, sanitary sewers, watermain and lot services
- During underground installation if wet conditions are encountered, it is to be pumped to the designated discharge locations. Filer fabric to be wrapped around the end of the pipe at the end of each day.
- Contractor should pump surface runoff to designated discharge locations and NOT to use the storm sewer during construction.

3.0 ROADWAY CONSTRUCTION

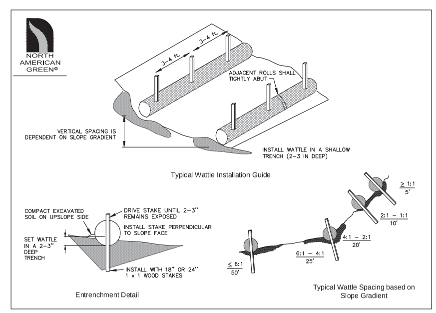
- Manhole frame and covers and catchbasin frame and covers are lowered subgrade to allow for roadway subgrade preparation.
- All runoff is managed onsite similar to the ESC for proposed site clearing and grading.
- Trapped water will be pumped to the designated discharge locations protected with silt fence.
- Contractor should pump surface runoff to designated discharge locations NOT to use the storm or sanitary sewers or catchbasins during or after construction.
- Catchbasins are raised to grade when concrete curb, gutter and sidewalks are in place.
- Temporary inlet sediment control barriers are to be installed at every onsite catchbasin and any downstream of the construction.
- Contractors are responsible to clean the affected roadways if mud tracking occurs.

4.0 LANDSCAPING AND SITE MAINTENANCE

- Boulevards to be landscaped according to landscape drawings.
- Until landscaping is completed the erosion and sediment control system will be monitored for sediment removal after storm events and during site inspection during and after construction.

Drainage services will be notified if the sediment control plan changes. Refer to the Erosion and Sediment Control report for Wedgewood Creek Crossing, prepared by Stantec, dated December 2, 2015 and the Erosion and Sediment Control report for 199 Street North of 23 Avenue to Woodbend Wynd, prepared by Stantec, dated December 2, 2015.

Straw Wattle Installation Guide



1. BEGIN AT THE LOCATION WHERE THE WATTLE IS TO BE INSTALLED BY EXCAVATING A 2-3" (5-7.5 CM) DEEP X 9" (22.9 CM) WIDE TRENCH ALONG THE CONTOUR OF THE SLOPE. EXCAVATED SOIL SHOULD BE PLACED UP-SLOPE FROM THE ANCHOR TRENCH.
2. PLACE THE WATTLE IN THE TRENCH SO THAT IT CONTOURS TO THE SOIL SURFACE. COMPACT SOIL FROM THE EXCAVATED TRENCH AGAINST THE WATTLE ON THE UPHILL SIDE. ADJACENT WATTLES SHOULD TIGHTLY ABUT.
3. SECURE THE WATTLE WITH 18-24" (45.7-61 CM) STAKES EVERY 3-4" (0.9 - 1.2 M) AND WITH A STAKE ON EACH END. STAKES SHOULD BE DRIVEN THROUGH THE MIDDLE OF THE WATTLE LEAVING AT LEAST 2-3" (5 - 7.5 CM) OF STAKE EXTENDING ABOVE THE WATTLE. STAKES SHOULD BE DRIVEN PERPENDICULAR TO SLOPE FACE.

North American Green Straw Wattles are a Best Management Practice (BMP) that offers an effective and economical alternative to silt fence and straw bales for sediment control and storm water runoff.

Guidelines are provided to assist in design, installation, and structure spacing. The guidelines may require modification due to variation in soil type, rainfall intensity or duration, and amount or runoff affecting the application site.

To maximize sediment containment with the Straw Wattle, place the initial structure at the top/crest of the slope if significant runoff is expected from above. If no runoff from above is expected, the initial Straw Wattle can be installed at the appropriate distance downhill from the top/crest of the slope. The final structure should be installed at or just beyond the bottom/toe of the slope. Wattles should be installed perpendicular to the primary direction of overland flow.

Straw Wattles are a temporary sediment control device and are not intended to replace rolled erosion control products (RECPs) or hydraulic erosion control products (HECPs). If vegetation is desired for permanent erosion control, North American Green recommends that RECPs or HECPs be used to provide effective immediate erosion control until vegetation is established. Straw Wattles may be used in conjunction with blankets, mats, and mulches as supplemental sediment and runoff control for these applications. Like all sediment control devices, the effectiveness of the Straw Wattle is dependent on storage capacity.

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Legend/Notes

SPILL DIRECTION
OVERLAND FLOW
DIRECTION OF MAJOR DRAINAGE
CATCHBASIN WITH SEDIMENT BARRIER
INTERIM STORM WATER DISCHARGE LOCATION
SILT FENCE
STRAW WATTLE
EROSION BLANKET
LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

1. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE ADOPTED DURING CONSTRUCTION IN ACCORDANCE WITH THE CITY OF EDMONTON EROSION AND SEDIMENTATION CONTROL GUIDELINE AND FIELD MANUAL.

Development Engineer, Sustainable Development

Approvals YY.MM

Revision	By	Appd.	YY.MM
SECOND SUBMISSION	G.R.	G.R.	16.06
FIRST SUBMISSION	G.R.	G.R.	15.12
Issued	Dsgn.	Dwn.	YY.MM

PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title

EROSION AND SEDIMENT CONTROL

Project No. 1161-103725

Scale 1:1000 0 10 20 30 40 50

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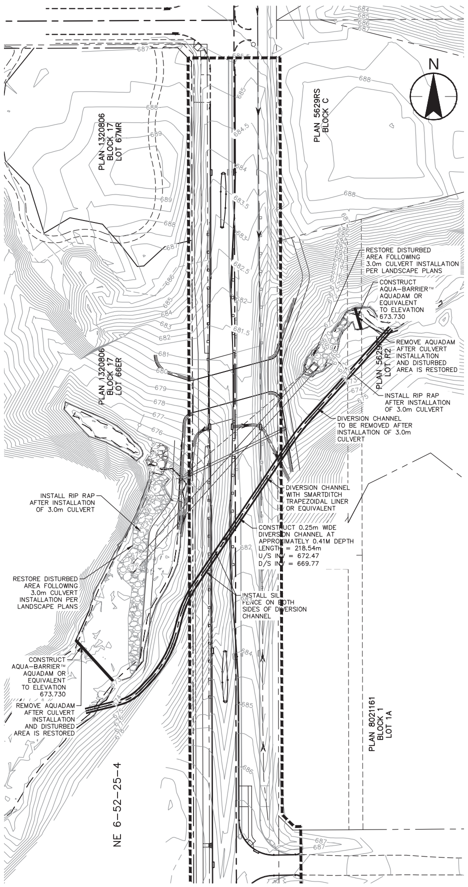
2016-6-01 9:07am BY: GRUSSELL

Drawing No. C015-002



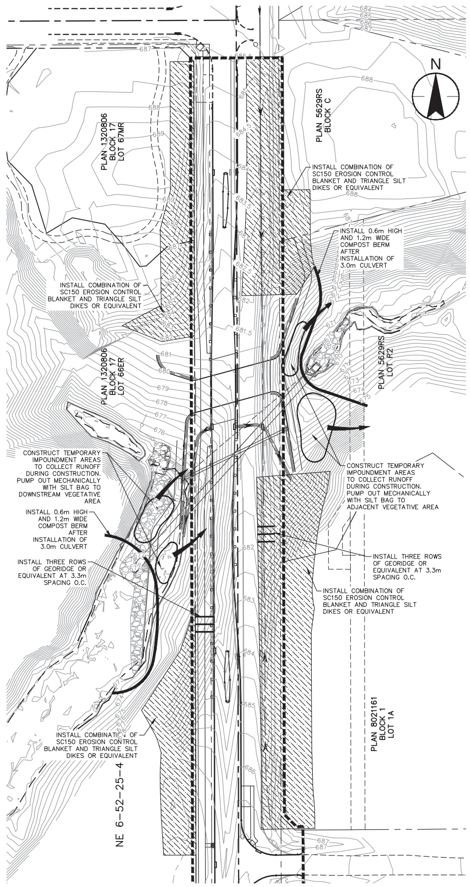
STEP 1

TENTATIVE CONSTRUCTION PROCEDURE

- INSTALL AQUA-BARRIER DAM UPSTREAM AND DOWNSTREAM TO DRY CONSTRUCTION AREA AND PREVENT SEDIMENT RELEASE.
- START REMOVING ROAD STRUCTURE AND EMBANKMENT UNTIL A CREEK DIVERSION CHANNEL CAN BE CONSTRUCTED.
- EXCAVATE WATER DIVERSION CHANNEL TO CONNECT EXISTING UPSTREAM AND DOWNSTREAM OF WEDGEWOOD CREEK USING SMARTDITCH OR EQUIVALENT PRODUCT. INSTALL SILT FENCE ON BOTH SIDES OF DIVERSION CHANNEL.
- REMOVE REMAINDER OF EXISTING ROAD STRUCTURE, EMBANKMENT, AND EXISTING CULVERT.
- INSTALL PROPOSED 3000mm DIAMETER CULVERT.
- RESTORE DISTURBED AREAS AS PER LANDSCAPE DETAILS.
- REMOVE AQUA-BARRIER DAM AND ALLOW WEDGEWOOD CREEK FLOW THROUGH THE PROPOSED 3000mm DIAMETER CULVERT.

SUMMARY OF INTERIM ESC MEASURES

- CONCENTRATED FLOW IS EXPECTED ALONG THE EXISTING SLOPES DRAINING INTO THE WEDGEWOOD CREEK RAVINE TO THE NORTH AND SOUTH OF THE PURPOSED CROSSING. DITCHES WILL BE LEFT VEGETATED FOR EROSION CONTROL. DISTURBED AREAS WILL BE BOLSTERED WITH A COMBINATION OF SC150BN EROSION CONTROL BLANKETS AND "GEORIDGE" TRIANGLE SILT DIKES IN AREAS OF EROSION POTENTIAL.
- SMARTDITCH OR SIMILAR MATERIAL WILL LINE THE BOTTOM OF THE TEMPORARY CHANNEL CREATING A SMOOTH CAUSEWAY TO REDUCE EROSION POTENTIAL.
- SILT FENCE WILL BE INSTALLED ALONG THE SMARTDITCH TO RESTRICT SEDIMENT ENTRY FROM UPSTREAM SOURCE THAT MAY ENTER THE TEMPORARY DIVERSION CHANNEL
- RESTORATION MEASURES WILL BE FOLLOWED AS SPECIFIED ON THE LANDSCAPING PLANS.
- IN THE EVENT OF RAINFALL DURING CONSTRUCTION, STANDING WATER WITHIN THE ISOLATED CONSTRUCTION ZONE WILL BE PUMPED MECHANICALLY THROUGH A SILT BAG TO ADJACENT VEGETATED AREA EAST OF THE CROSSING.



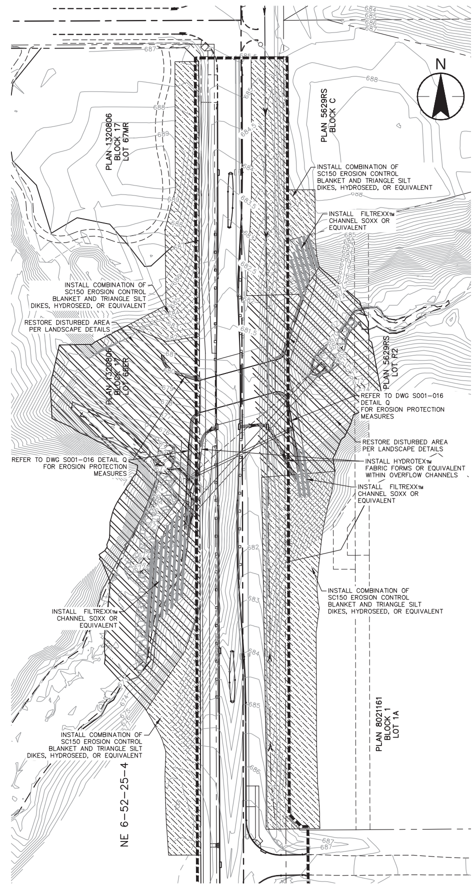
STEP 2

TENTATIVE CONSTRUCTION PROCEDURE

- CONSTRUCT 0.6m HIGH COMPOST BERMS NEAR PROPOSED 3000mm CULVERT INLET AND OUTLET TO RETAIN SEDIMENT AND ISOLATE CONSTRUCTION ZONE FROM WEDGEWOOD CREEK.
- CONSTRUCT TEMPORARY IMPOUNDMENT AREAS ADJACENT TO THE COMPOST BERM FOR INCREASED SEDIMENT RETENTION.
- BEGIN ROADWAY AND EMBANKMENT GRADING IN ADDITION TO PILE CONSTRUCTION FOR THE WILDLIFE CROSSING STRUCTURE.
- BEGIN UNDERGROUND DEEP AND SHALLOW UTILITY INSTALLATION.

SUMMARY OF INTERIM ESC MEASURES

- COMPOST BERMS WILL BE INSTALLED ABOVE THE INLET AND OUTLET OF THE CULVERT SERVICING WEDGEWOOD CREEK. ANY SURFACE RUNOFF FROM WITHIN THE CONSTRUCTION ZONE WILL BE DIRECTED TO THE BERMS BY THE NATURAL TOPOGRAPHY.
- IMPOUNDMENT AREAS WILL EXCAVATED ADJACENT TO THE COMPOST BERMS WHICH WILL ACT AS AN IMPOUNDMENT AND SEDIMENTATION RETENTION AREA. WATER WILL BE PUMPED MECHANICALLY THROUGH A SILT BAG TO AN EXISTING VEGETATED AREA EAST OF THE CROSSING TO RETURN TO WEDGEWOOD CREEK.
- DISTURBED AREAS WILL BE GRADED ROUGH AND WHERE POSSIBLE SC150BN EROSION CONTROL BLANKETS WILL BE PLACED TO PROTECT WEDGEWOOD CREEK FROM UPSTREAM SLOPE EROSION AND SEDIMENT RELEASE.



STEP 3

TENTATIVE CONSTRUCTION PROCEDURE

- REHABILITATE DISTURBED AREAS AS PER LANDSCAPE DETAILS.
- REHABILITATE AND SEED ROADWAY EMBANKMENT SIDESLOPES AND OTHER AREAS IF REQUIRED.

SUMMARY OF INTERIM ESC MEASURES

- HYDROTEX™ FABRIC FORMS OR EQUIVALENT TO BE INSTALLED WITHIN THE OVERFLOW CHANNELS UPSTREAM OF THE WILDLIFE PATH.
- FILTREXX™ CHANNEL SOXX OR EQUIVALENT TO BE INSTALLED PERPENDICULAR TO THE FLOW DIRECTION ALONG THE WIDTH OF THE WILDLIFE PATH.
- EXTENSIVE SEEDING AS DETAILED IN THE LANDSCAPE PLANS FOLLOWING FINAL GRADING WILL TAKE PLACE ALONG THE SIDE SLOPES OF THE EMBANKMENT. SC150BN EROSION CONTROL BLANKET WILL BE LAID OVER THE SEEDED AREAS TO PROTECT WASH OFF AND ALLOW SEEDS TO TAKE HOLD.
- COMPOST BERM WILL BE IN PLACE DURING CONSTRUCTION AND FINAL GRADING TO PROTECT WEDGEWOOD CREEK. THESE WILL BE REMOVED ONCE SEEDING AND EROSION CONTROL BLANKETS HAVE BEEN INSTALLED.

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Legend/Notes

- SPILL DIRECTION
- OVERLAND FLOW
- DIRECTION OF MAJOR DRAINAGE
- CATCHBASIN WITH SEDIMENT BARRIER
- INTERIM STORM WATER DISCHARGE LOCATION
- SILT FENCE
- STRAW WATTLE
- EROSION BLANKET
- LIMIT OF CONSTRUCTION
- DEVELOPMENT BOUNDARY

1. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE ADOPTED DURING CONSTRUCTION IN ACCORDANCE WITH THE CITY OF EDMONTON EROSION AND SEDIMENTATION CONTROL GUIDELINE AND FIELD MANUAL.

Development Engineer, Sustainable Development

Approvals YY.MM

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PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project
RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title
EROSION AND SEDIMENT CONTROL

Project No. 1161-103725

Scale 1:1000 0 10 20 30 40 50

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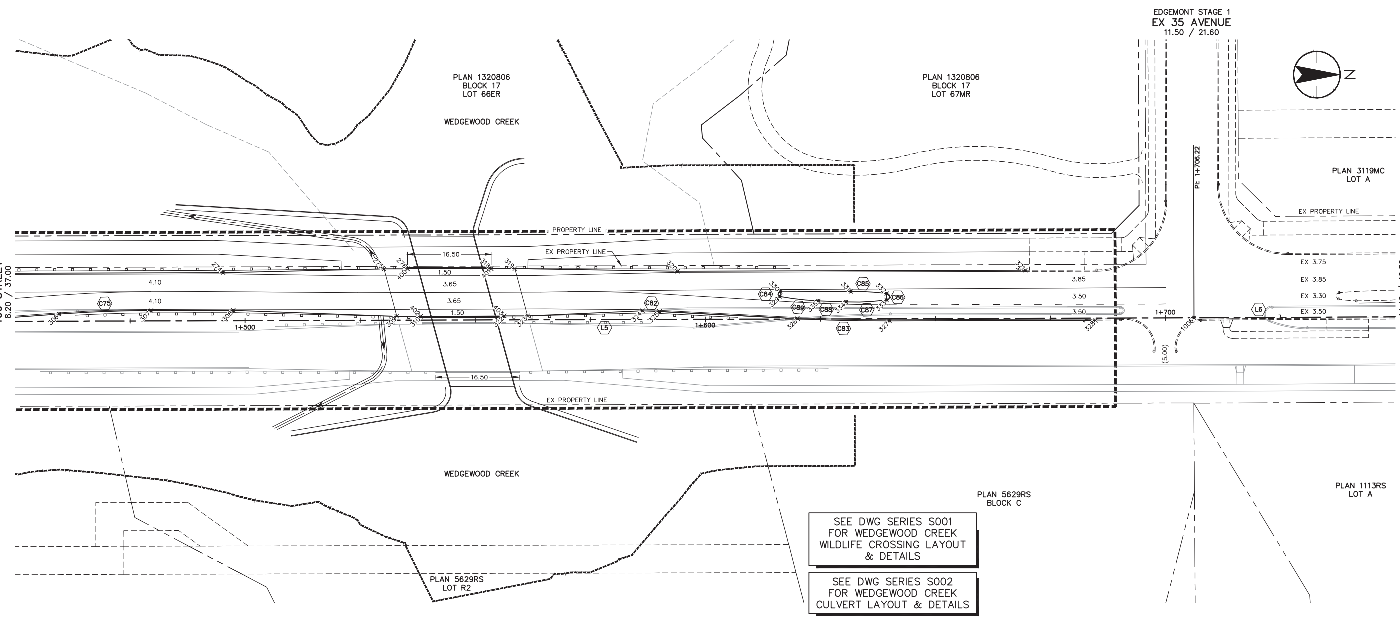
2016-6-01 9:57am BY: JGRUNINGER

Drawing No. C015-003



POINT TABLE			
POINT #	NORTHING	EASTING	DESCRIPTION
274	5926019.245	22275.912	FOC
275	5926054.253	22275.109	FOC
276	5926059.337	22275.094	FOC
306	5925983.624	22284.915	FOC
307	5926003.597	22284.157	FOC
308	5926021.464	22284.104	FOC
309	5926057.040	22285.401	FOC
310	5926062.216	22285.385	FOC
318	5926077.496	22275.040	FOC
319	5926082.672	22275.024	FOC
320	5926118.059	22275.621	FOC
321	5926193.615	22275.399	FOC
322	5926080.375	22285.331	FOC
323	5926085.460	22285.316	FOC
324	5926110.441	22284.203	FOC
325	5926114.104	22284.373	FOC
326	5926144.131	22285.913	FOC
327	5926164.117	22286.398	FOC
328	5926208.888	22286.273	FOC
329	5926140.266	22281.087	FOC
330	5926140.356	22280.095	FOC
331	5926155.712	22280.015	FOC
332	5926163.489	22280.481	FOC
333	5926163.486	22281.870	FOC
334	5926154.656	22282.283	FOC
335	5926148.630	22282.063	FOC
400	5926059.337	22275.094	JERSEY BARRIER
401	5926077.496	22275.040	JERSEY BARRIER
402	5926062.216	22285.385	JERSEY BARRIER
403	5926080.375	22285.331	JERSEY BARRIER

CURVE TABLE				
CURVE #	RADIUS	LENGTH	DELTA	TANGENT
C75	286.07	19.99	4°00'15"	10.00
C82	369.01	3.67	0°34'10"	1.83
C83	369.95	20.00	3°05'48"	10.00
C84	0.50	1.47	169°01'05"	5.20
C85	60.00	7.80	7°26'44"	3.90
C86	0.70	2.03	165°57'02"	5.68
C87	60.00	8.85	8°26'56"	4.43
C88	317.39	6.03	1°05'19"	3.02
C89	60.00	8.43	8°02'55"	4.22

199 STREET CONTROL LINE TABLE						
	START STATION	END STATION	LENGTH	RADIUS	DELTA	TANGENT
L1	0+050.00	0+774.51	724.51			
C2	0+774.51	0+795.88	21.37	894.29	1°22'08"	10.68
L3	0+795.88	0+914.11	118.23			
C4	0+914.11	0+935.63	21.52	902.25	1°22'01"	10.76
L5	0+935.63	1+706.22	770.59			
L6	1+706.22	1+977.28	271.06			
C7	1+977.28	2+371.13	393.85	374.73	60°13'08"	217.31

199 STREET CONTROL LINE POINT TABLE				
POINT #	STATION	NORTHING	EASTING	DESCRIPTION
1000	0+050.000	5924574.117	22293.918	PI
1001	0+100.000	5924624.116	22293.772	POT
1002	0+774.510	5925298.625	22291.812	PC
1003	0+795.880	5925319.988	22291.495	PT
1004	0+914.110	5925438.177	22288.327	PC
1005	0+935.630	5925459.698	22288.007	PT
1006	1+706.220	5926230.282	22285.740	PI
1007	1+977.280	5926501.341	22284.350	PC
1008	2+371.130	5926825.610	22094.077	CT

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Legend/Notes

LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

1. ALL COORDINATES, LENGTHS AND CURVE DATA ARE AT GRID LEVEL.
2. ALL DIMENSIONS ARE TO FACE OF CURB OR EDGE OF DRIVING LANE.
3. COMBINED FACTOR: 0.999803

Development Engineer, Sustainable Development YY.MM

Approvals

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SECOND SUBMISSION	G.R.	G.R.	16.06
FIRST SUBMISSION	G.R.	G.R.	15.12
Issued	Dsgn.	Dwn.	YY.MM

PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title

199 STREET
STA 1+450 - 1+750
ALIGNMENT PLAN

Project No. 1161-103725

Scale 1:500 0 5 10 15 20 25

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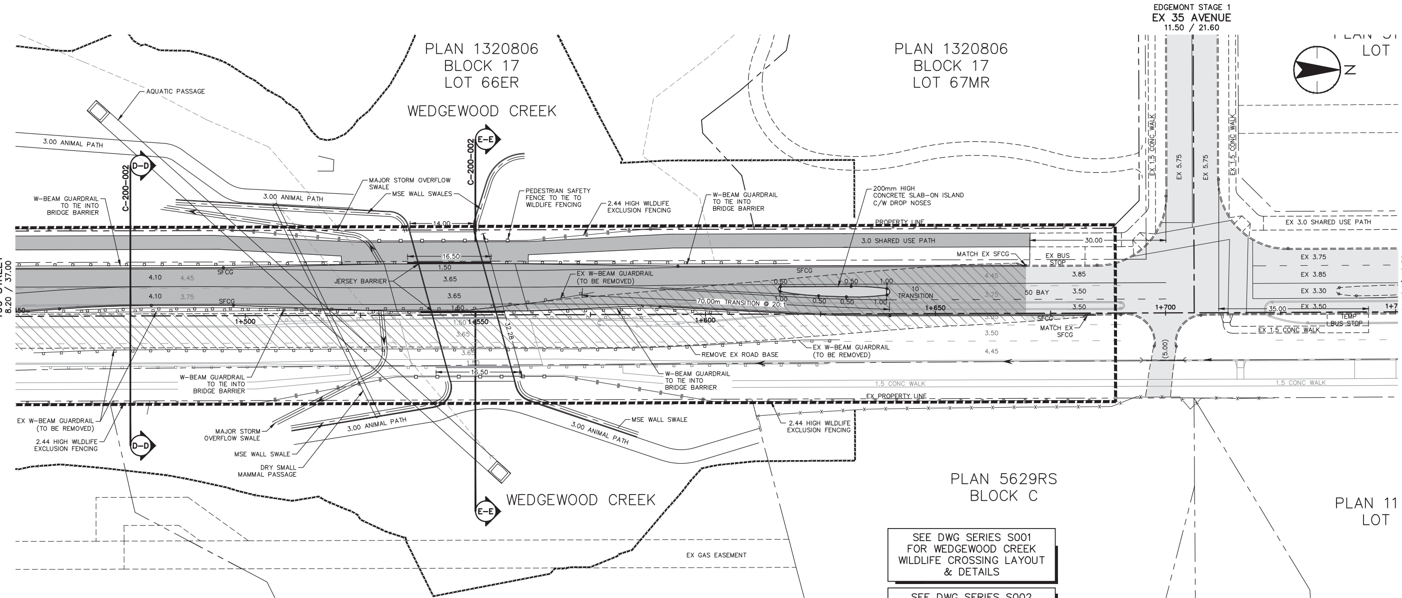
2016-6-01 11:30am BY: JGRUNINGER

Drawing No.
C101-006



SEE DWG SERIES S001 FOR WEDGEWOOD CREEK WILDLIFE CROSSING LAYOUT & DETAILS

SEE DWG SERIES S002 FOR WEDGEWOOD CREEK CULVERT LAYOUT & DETAILS

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Legend/Notes

PAVEMENT — ASPHALT

EXISTING PAVEMENT — CONCRETE

GRIND AND OVERLAY — REMOVAL

LIMIT OF CONSTRUCTION

DEVELOPMENT BOUNDARY

1. TIE INTO EX TO THE SATISFACTION OF THE CITY OF EDMONTON.
2. FINAL LIMITS OF BASE REMOVAL, CURB REPLACEMENT, AND GRINDING AT MATCH LOCATIONS TO BE FIELD DETERMINED.
3. SAW-CUT AREAS OF BASE REMOVAL / CURB REPLACEMENT.
4. ALL CURB RAMPS ARE LOCATED AT THE MIPPOINT OF CURB RETURNS UNLESS OTHERWISE NOTED.
4. ALL CATCH BASINS NOT TO CONFLICT WITH ANY PORTION OF ANY CURB RAMP.
5. RELOCATE / ADJUST CATCH BASINS TO MATCH NEW ALIGNMENT / GRADES
6. INSTALL MINI-BARRIERS 0.50m FROM PAVEMENT MARKINGS OR PROJECTED LIP OF GUTTER.

Development Engineer, Sustainable Development

Approvals YY.MM

Revision

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PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title

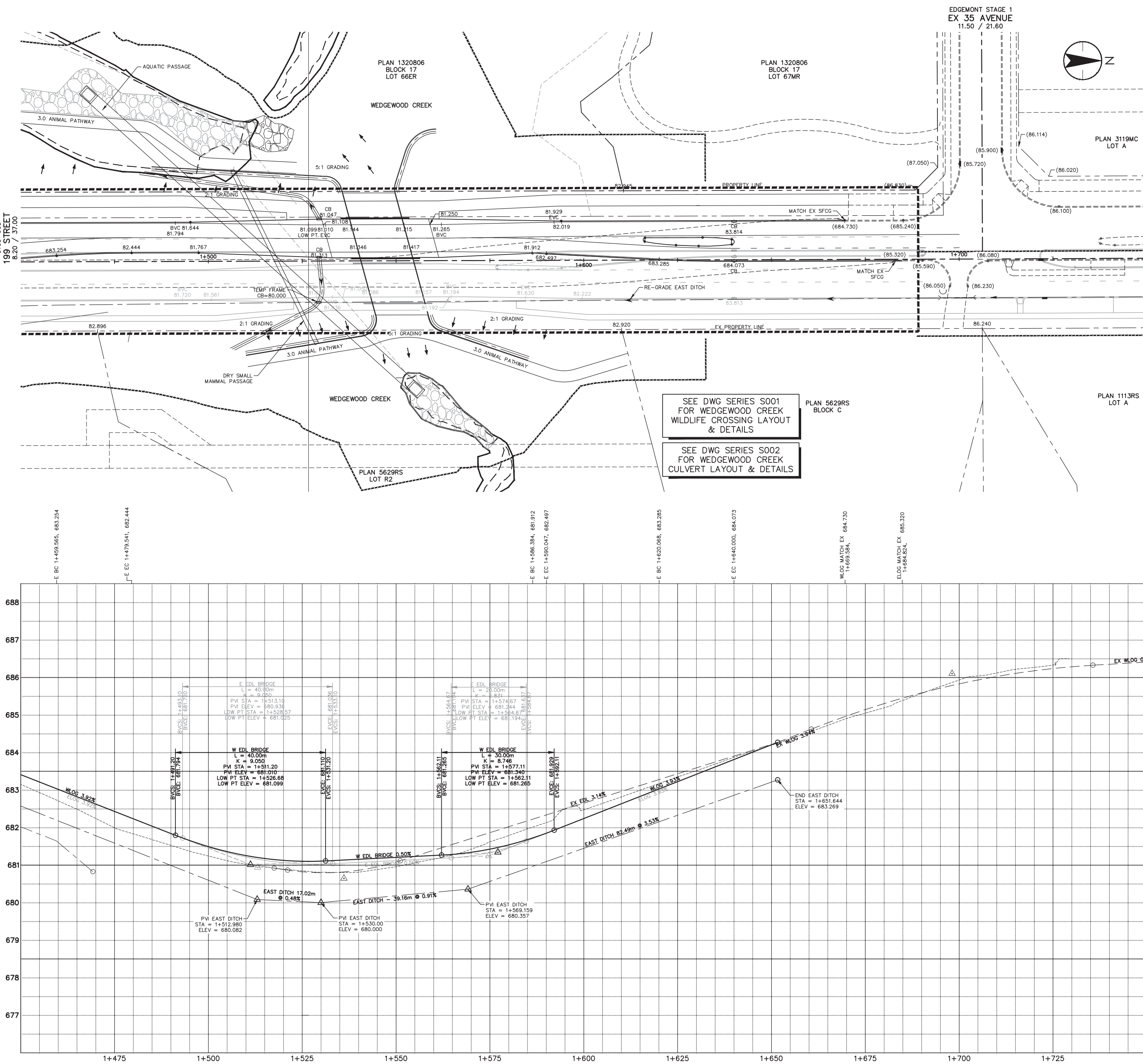
199 STREET
STA 1+450 - 1+750
DETAILS PLAN

Project No. 1161-103725

Scale 1:500 0 5 10 15 20 25

Drawing No. C102-006

2016-6-01 11:21am BY: JGRUNINGER



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Legend/Notes

LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

1. CHAINAGES ARE BASED ON CENTERLINE CONTROL.
2. ELEVATION PREFIX 600.___
3. ELEVATIONS ARE AT 10m INTERVALS, BASED ON CENTERLINE CONTROL.
4. ELEVATIONS ARE TO LIP OF GUTTER GRADES UNLESS OTHERWISE SHOWN.
5. ELEVATIONS ARE TO GEODETIC DATUM.
6. ALL CATCH BASINS IN DITCHES MUST HAVE SILT FENCES AROUND THEM.
7. EX ELEVATIONS (__.___)
8. EDL – EDGE OF DRIVING LANE
9. RTB – RIGHT TURN BAY

Development Engineer, Sustainable Development

Approvals YY.MM

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PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

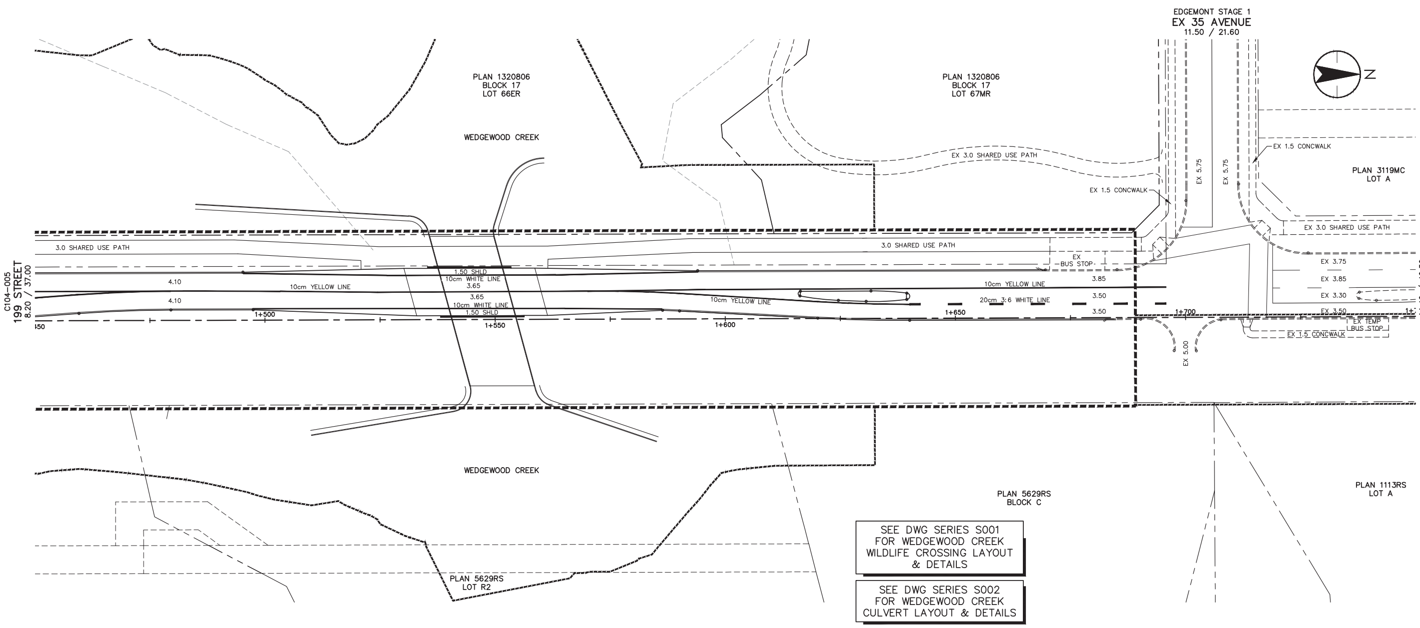
Client/Project
RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title
199 STREET
STA 1+450 - 1+750
GRADING PLAN

Project No. 1161-103725
Scale H 1:500 V 1:50

Drawing No.
C103-006



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Legend/Notes

LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

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Approvals YY.MM

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PROJECT MANAGER: TONY CHIARELLO

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Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE

Edmonton, AB

Title

199 STREET
STA 1+450 - 1+750
PAVEMENT MARKING PLAN

Project No. 1161-103725

Scale 1:500 0 5 10 15 20 25

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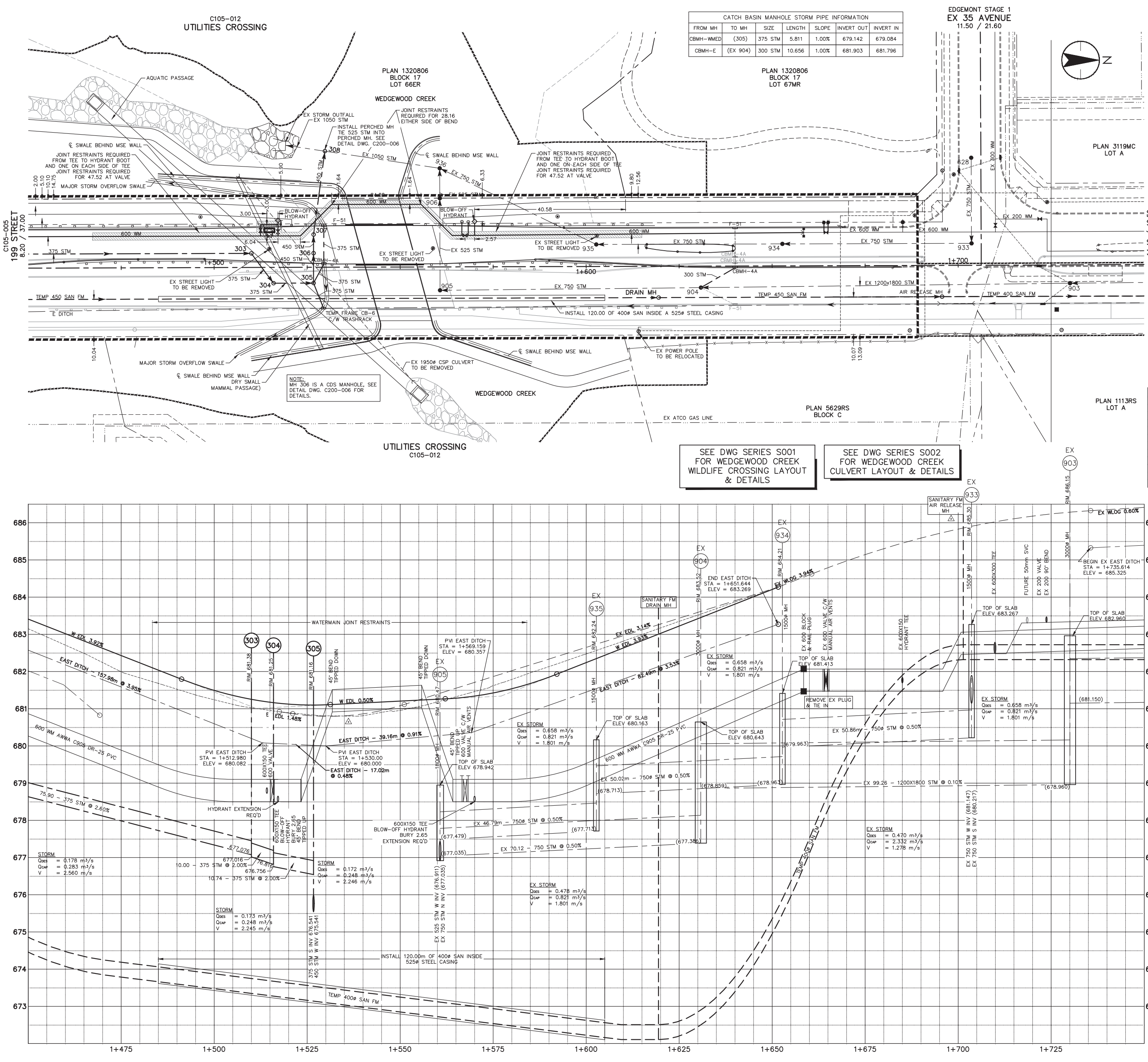
2016-6-01 11:44am BY: JGRUNINGER

Drawing No.
C104-006



CATCH BASIN MANHOLE STORM PIPE INFORMATION						
FROM MH	TO MH	SIZE	LENGTH	SLOPE	INVERT OUT	INVERT IN
CBMH–WMED	(305)	375 STM	5.811	1.00%	679.142	679.084
CBMH–E	(EX 904)	300 STM	10.656	1.00%	681.903	681.796

SEE DWG SERIES S001
FOR WEDGEWOOD CREEK
WILDLIFE CROSSING LAYOUT
& DETAILS

SEE DWG SERIES S002
FOR WEDGEWOOD CREEK
CULVERT LAYOUT & DETAILS

MIN. DEPTH OF WATERMAIN INVERT FROM:			
PIPE DIA.	L.O.G. R.F.	L.O.G. S.F.	T.O.C.
50 mm	2.83	2.76	2.89
150 mm	2.83	2.76	2.89
200 mm	2.86	2.79	2.92
250 mm	2.88	2.81	2.94
300 mm	2.91	2.84	2.97
350 mm	2.94	2.87	3.00
400 mm	2.96	2.89	3.02
450 mm	2.99	2.92	3.05
600 mm	3.07	3.00	3.13
750 mm	3.15	3.08	3.21
900 mm	3.23	3.16	3.29

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Legend/Notes

LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

1. WATERMAINS 150mm TO 300mm ARE AWWA C–900 DR–18 PVC PIPE WITH CLASS "B" BEDDING UNLESS OTHERWISE NOTED.
2. WATERMAINS 350mm AND LARGER ARE AWWA C–905 DR–25 PVC PIPE WITH CLASS "B" BEDDING UNLESS OTHERWISE NOTED.
3. APPLY APPROVED PVC WATER PIPE JOINT LUBRICANT FOR POTABLE WATER, ACCORDING TO MANUFACTURER'S RECOMMENDED APPLICATION PROCEDURES.
4. CB LEADS MUST BE A MINIMUM OF 3.0m FROM VALVE CASING.
5. ALL MATERIALS AND CONSTRUCTION TO BE AS PER THE CITY OF EDMONTON DESIGN AND CONSTRUCTION STANDARDS.
6. SANITARY SEWER PIPE SHALL BE TYPE PSM PVC SDR35 CONFORMING TO ASTM D3034, INSTALLED ACCORDING TO ASTM D2321. ALL EMBEDMENT MATERIALS SHALL BE TYPE 2, COMPACTED TO TOP OF EMBEDMENT TO 95% STANDARD PROCTOR DENSITY UNLESS OTHERWISE NOTED.
7. STORM SEWER PIPE ALTERNATIVES:
   A) CONCRETE PIPE:
   ALL CONCRETE PIPE TO BE SULPHATE RESISTANT WITH RUBBER GASKET CONFINED O–RING. BEDDING TO BE TYPE 2 UNLESS OTHERWISE NOTED.
   300mm – 525mm ASTM C14–CLIII, UNLESS OTHERWISE NOTED.
   600mm – 1800mm ASTM C76–CLIII, UNLESS OTHERWISE NOTED.
   B) PVC PIPE: (SEE NOTE 9. FOR BEDDING REQUIREMENTS)
   200mm – 525mm ASTM D3034 SDR35
   600mm – 1200mm ASTM F–679 SDR35
   PROFILE (RIBBED) CONFORMING TO CSA B182.4
8. ALL SEWER SERVICES ARE ASTM D3034 SDR35 PVC PIPE.
9. SANITARY SERVICES ARE 2.75m BELOW LOT GRADE UNLESS OTHERWISE NOTED.
10. ALL CB LEADS ARE 250mm SDR35 PVC WITH MIN. SLOPE OF 1.00% UNLESS OTHERWISE NOTED.
11. CATCHBASINS WITH A F–51, F–51G OR DK–7 FRAME AND COVER ARE 900ø. ALL OTHER CATCHBASINS ARE 600ø.
12. TIE INTO EXISTING TO THE SATISFACTION OF THE CITY OF EDMONTON.
13. OVERSIZED MANHOLE DETAIL ON DRAWING C200–005–DETAILS.

Development Engineer, Sustainable Development

Approvals YY.MM

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PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project

RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title

199 STREET
STA 1+450 - 1+750
UTILITIES PLAN

Project No. 1161-103725

Scale H 1:500 V 1:50

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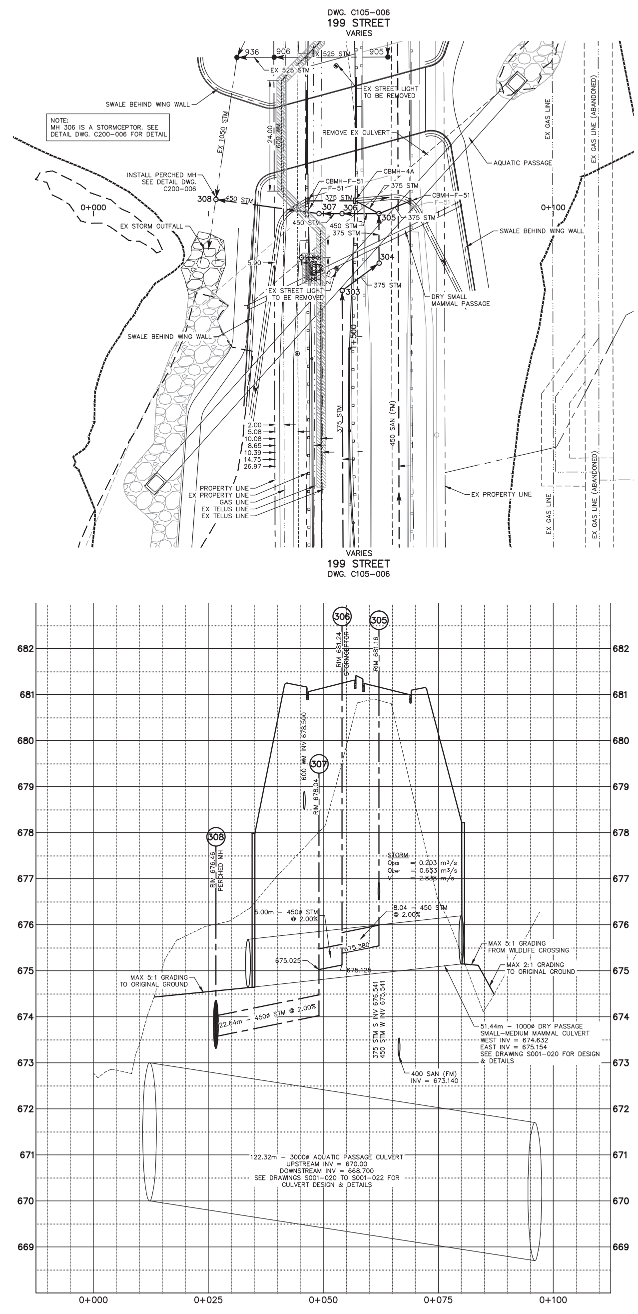
2016-6-01 11:37am BY: AWOHLMUTH

Drawing No. C105-006



MIN. DEPTH OF WATERMAIN INVERT FROM:			
PIPE DIA.	L.O.G. R.F.	L.O.G. S.F.	T.O.C.
50 mm	2.83	2.76	2.89
150 mm	2.83	2.76	2.89
200 mm	2.86	2.79	2.92
250 mm	2.88	2.81	2.94
300 mm	2.91	2.84	2.97
350 mm	2.94	2.87	3.00
400 mm	2.96	2.89	3.02
450 mm	2.99	2.92	3.05
600 mm	3.07	3.00	3.13
750 mm	3.15	3.08	3.21
900 mm	3.23	3.16	3.29

N

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Legend/Notes

LIMIT OF CONSTRUCTION
DEVELOPMENT BOUNDARY

1. WATERMAINS 150mm TO 300mm ARE AWWA C-900 DR-18 PVC PIPE WITH CLASS "B" BEDDING UNLESS OTHERWISE NOTED.
2. WATERMAINS 350mm AND LARGER ARE AWWA C-905 DR-25 PVC PIPE WITH CLASS "B" BEDDING UNLESS OTHERWISE NOTED.
3. APPLY APPROVED PVC WATER PIPE JOINT LUBRICANT FOR POTABLE WATER, ACCORDING TO MANUFACTURER'S RECOMMENDED APPLICATION PROCEDURES.
4. CB LEADS MUST BE A MINIMUM OF 3.0m FROM VALVE CASING.
5. ALL MATERIALS AND CONSTRUCTION TO BE AS PER THE CITY OF EDMONTON DESIGN AND CONSTRUCTION STANDARDS.
6. SANITARY SEWER PIPE SHALL BE TYPE PSM PVC SDR35 CONFORMING TO ASTM D3034, INSTALLED ACCORDING TO ASTM D2321. ALL EMBEDMENT MATERIALS SHALL BE TYPE 2, COMPACTED TO TOP OF EMBEDMENT TO 95% STANDARD PROCTOR DENSITY UNLESS OTHERWISE NOTED.
7. STORM SEWER PIPE ALTERNATIVES:
   A) CONCRETE PIPE:
   ALL CONCRETE PIPE TO BE SULPHATE RESISTANT WITH RUBBER GASKET CONFINED O-RING. BEDDING TO BE TYPE 2 UNLESS OTHERWISE NOTED.
   300mm – 525mm ASTM C14-CLIII, UNLESS OTHERWISE NOTED.
   600mm – 1800mm ASTM C76-CLIII, UNLESS OTHERWISE NOTED.
   B) PVC PIPE: (SEE NOTE 9. FOR BEDDING REQUIREMENTS)
   200mm – 525mm ASTM D3034 SDR35
   600mm – 1200mm ASTM F-679 SDR35
   PROFILE (RIBBED) CONFORMING TO CSA B182.4
8. ALL SEWER SERVICES ARE ASTM D3034 SDR35 PVC PIPE.
9. SANITARY SERVICES ARE 2.75m BELOW LOT GRADE UNLESS OTHERWISE NOTED.
10. ALL CB LEADS ARE 250mm SDR35 PVC WITH MIN. SLOPE OF 1.00% UNLESS OTHERWISE NOTED.
11. CATCHBASINS WITH A F-51, F-51G OR DK-7 FRAME AND COVER ARE 900ø. ALL OTHER CATCHBASINS ARE 600ø.
12. TIE INTO EXISTING TO THE SATISFACTION OF THE CITY OF EDMONTON.
13. OVERSIZED MANHOLE DETAIL ON DRAWING C200-XXX-DETAILS.

Development Engineer, Sustainable Development
Approvals YY.MM

Revision By Appd. YY.MM

SECOND SUBMISSION	G.R.	G.R.	16.06
FIRST SUBMISSION	G.R.	G.R.	15.12
Issued	Dsgn.	Dwn.	YY.MM

PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project
RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title
WEDGEWOOD CREEK
UTILITIES CROSSING PLAN

Project No. 1161-103725

Scale H 1:500 V 1:50 0 5 10 15 20 25 0 0.5 1.0 1.5 2.0 2.5

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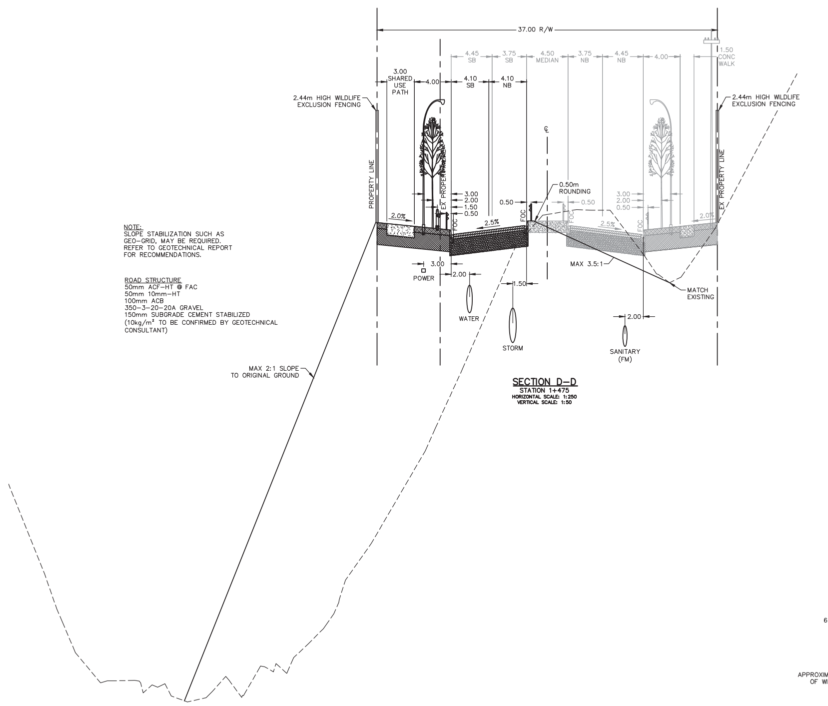
2016-6-01 12:02pm BY: AWOHLMUTH

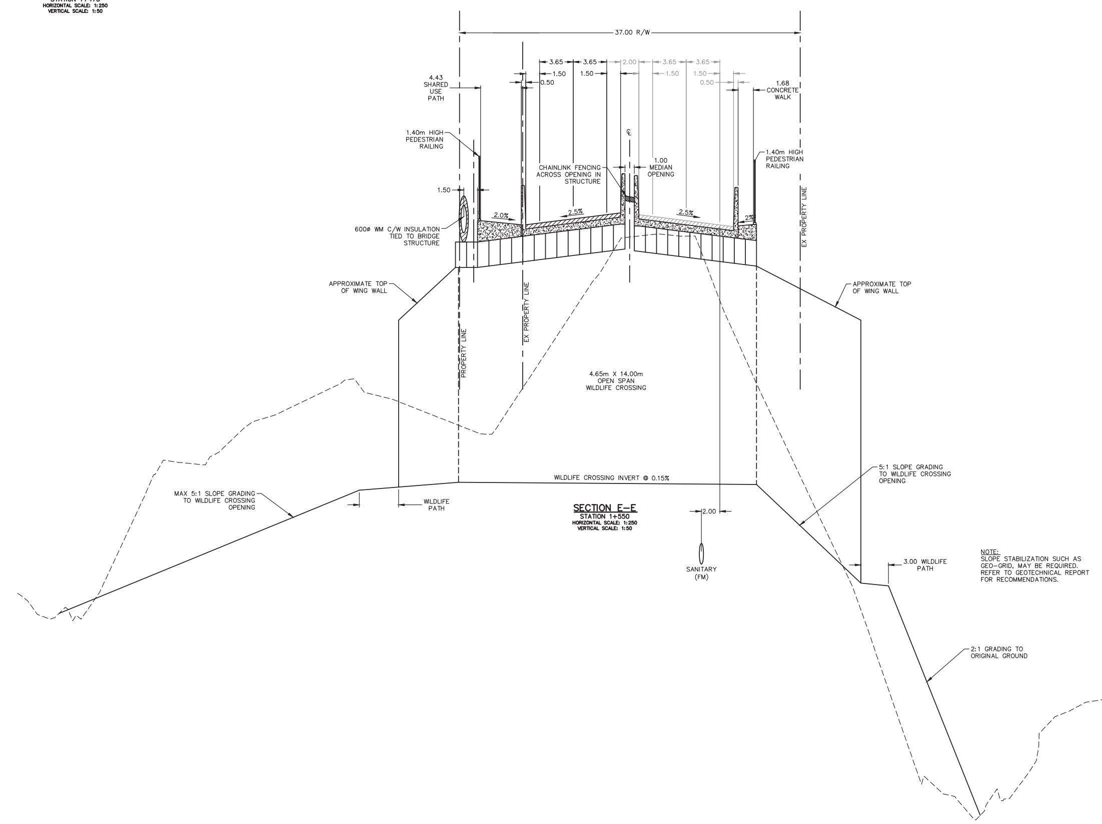
Drawing No. C105-012



NOTE:
SLOPE STABILIZATION SUCH AS GEO-GRID, MAY BE REQUIRED. REFER TO GEOTECHNICAL REPORT FOR RECOMMENDATIONS.

ROAD STRUCTURE
50mm ACF-HT @ FAC
50mm 10mm-HT
100mm ACB
350-3-20-20A GRAVEL
150mm SUBGRADE CEMENT STABILIZED
(10kg/m² TO BE CONFIRMED BY GEOTECHNICAL CONSULTANT)

SECTION D-D
STATION 1+475
HORIZONTAL SCALE: 1:250
VERTICAL SCALE: 1:50



SECTION E-E
STATION 1+550
HORIZONTAL SCALE: 1:250
VERTICAL SCALE: 1:50

NOTE:
SLOPE STABILIZATION SUCH AS GEO-GRID, MAY BE REQUIRED. REFER TO GEOTECHNICAL REPORT FOR RECOMMENDATIONS.

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Legend/Notes

Development Engineer, Sustainable Development

Approvals			YY.MM
Revision	By	Appd.	YY.MM
SECOND SUBMISSION	G.R.	G.R.	16.06
FIRST SUBMISSION	G.R.	G.R.	15.12
Issued	Dsgn.	Dwn.	YY.MM

PROJECT MANAGER: TONY CHIARELLO

Permit-Seal

Client/Project
RIVERVIEW LAND COMPANY LTD.

199 STREET
23 AVENUE TO 35 AVENUE
Edmonton, AB

Title
SECTIONS

Project No. 1161-103725

Scale

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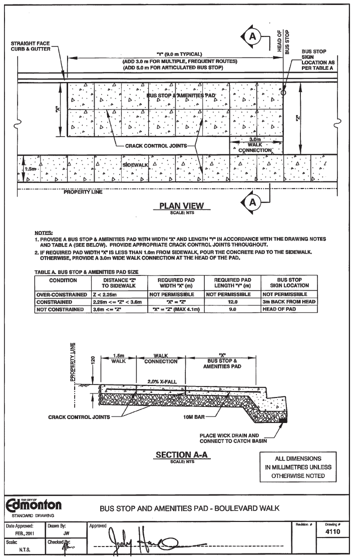
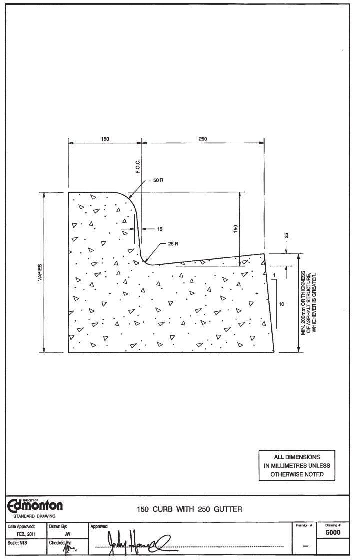
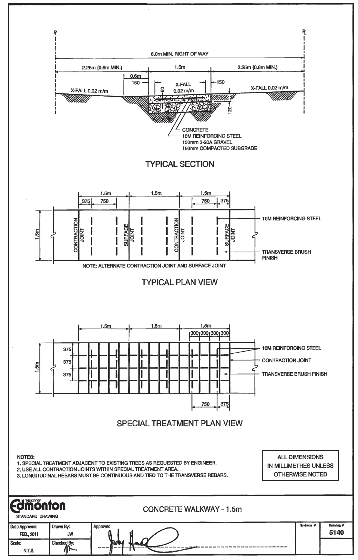
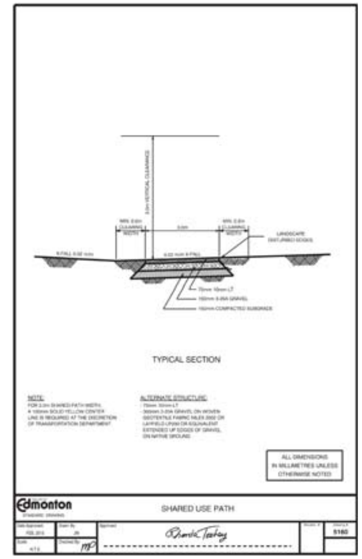
2016-6-01 10:56am BY: AWOHLMUTH

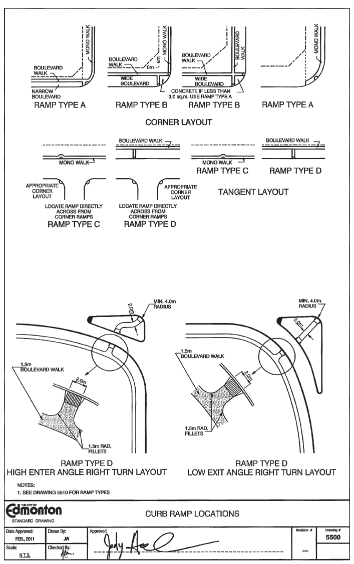
Drawing No.
C200-002

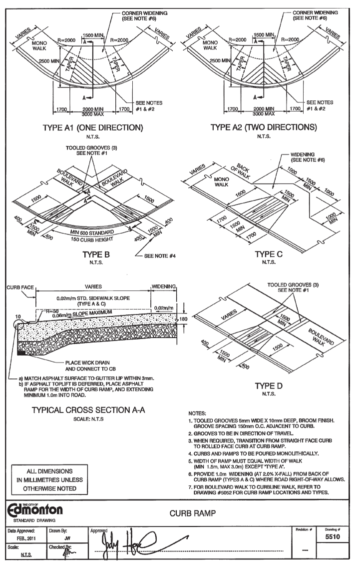


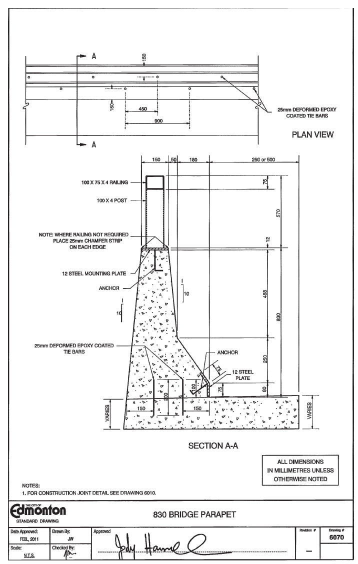


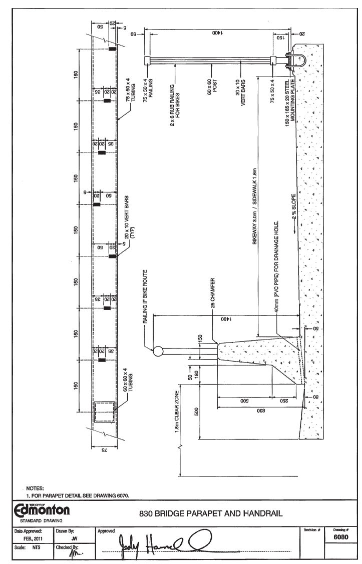












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Approvals YY.MM

Revision By Appd. YY.MM

1.	FIRST SUBMISSION	G.R.	T.C.	15.12
Issued		By	Appd.	YY.MM

PROJECT MANAGER: T. CHIARELLO DESIGN: G.R. DRAWN: G.R.

Permit-Seal

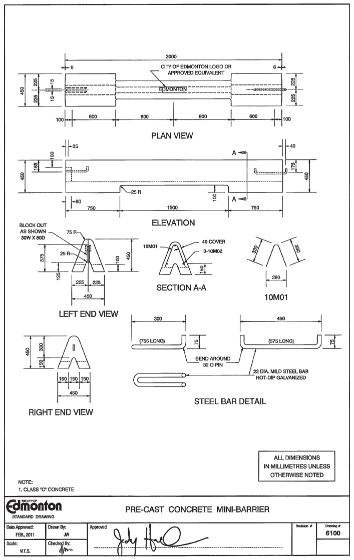
Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

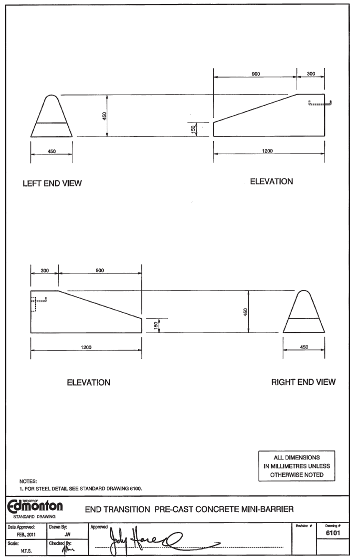
199 STREET
23 AVENUE NW TO 35 AVENUE NW
Edmonton, AB

Title
DETAILS

Project No. 1161-103725 Scale

Drawing No. C200-003





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Revision By Appd. YY.MM

1. FIRST SUBMISSION	G.R.	T.C.	15.12

Issued By Appd. YY.MM

PROJECT MANAGER: T. CHIARELLO DESIGN: G.R. DRAWN: G.R.

Permit-Seal

Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
23 AVENUE NW TO 35 AVENUE NW
Edmonton, AB

Title
DETAILS

Project No. 1161-103725
Scale

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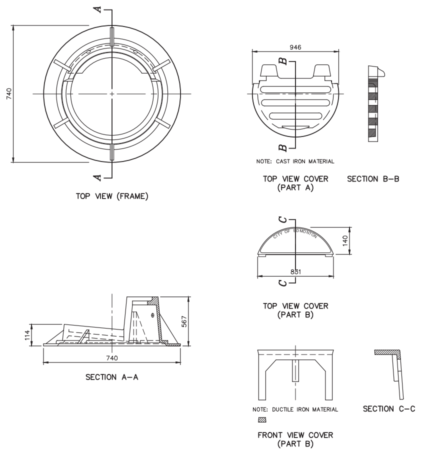
2015-12-04 10:20am BY: GRUSSELL

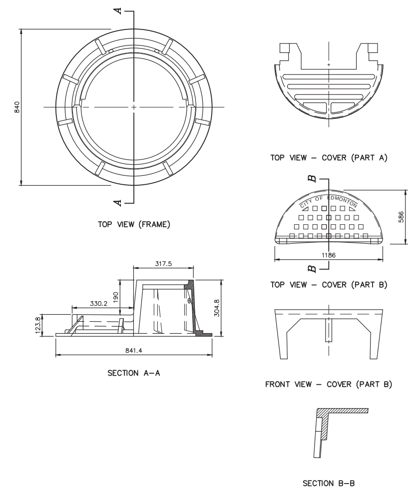
Drawing No.
C200-004



MATERIAL:
FRAME: GRAY IRON CLASS 30B
COVER: PART A IRON CLASS 30B
PART B DUCTILE IRON GRADE 65-45-12

TWO PIECE TYPE 2A GRATING AND FRAME

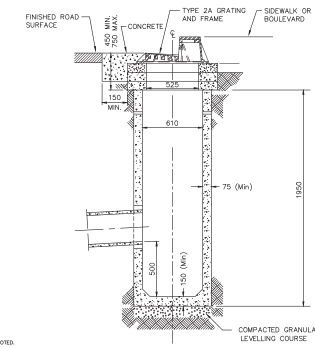
(CED7040)



MATERIAL:
FRAME: GRAY IRON CLASS 30B
COVER: PART A IRON CLASS 30B
PART B DUCTILE IRON GRADE 65-45-12

TWO PIECE TYPE 4A GRATING AND FRAME

(CED7041)

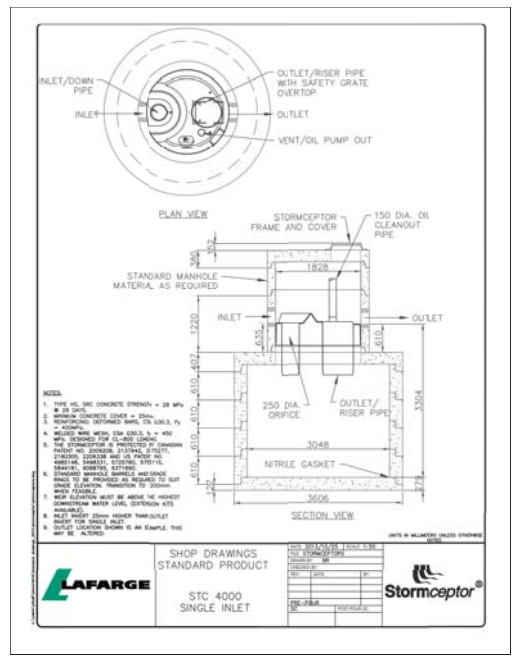


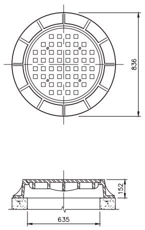
ALL DIMENSIONS ARE GIVEN IN MILLIMETRES UNLESS OTHERWISE NOTED.

NOTES:
1. RUBBER GASKET, KENT SEAL OR EQUIVALENT TO BE INSTALLED BETWEEN BARREL, ALL SHOULDER AND NECK RINGS AND CATCH BASIN FRAME.
2. ALL ROUGH JOINTS SHALL BE POINTED WITH MORTAR TO ENSURE SMOOTHNESS.
3. ALL CATCH BASIN COMPONENTS TO BE IN ACCORDANCE WITH ASTM C478.

STANDARD 600 CATCH BASIN WITH TYPE 2A GRATING AND FRAME

(CED7005)



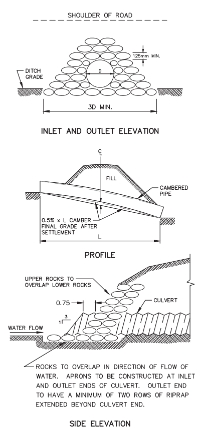


MATERIAL:
FRAME: GRAY IRON CLASS 30B
COVER: GRAY IRON CLASS 30B

TYPE 6A COVER AND FRAME

(CED7043)

PROCEDURE:
PLACE ROCKS INTO POSITION BY RAMMING AND PACKING AGAINST EACH OTHER TO FORM A CLOSELY MOULDED AND UNIFORM LAYER AVERAGING NOT LESS THAN 125mm IN THICKNESS. PLACE ROCKS IN STAGGERED PATTERN SUCH THAT ANY ROCK (EXCEPT AT THE BOTTOM) WILL REST ON TWO OR MORE OTHER ROCKS.



NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

CULVERT END RIPRAP

(CED7062)

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Development Engineer, Sustainable Development

Approvals YY.MM

Revision	By	Appd.	YY.MM
1. FIRST SUBMISSION	G.R.	T.C.	15.12
Issued	By	Appd.	YY.MM

PROJECT MANAGER: T. CHIARELLO DESIGN: G.R. DRAWN: G.R.

Permit-Seal

Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
23 AVENUE NW TO 35 AVENUE NW
Edmonton, AB

Title
DETAILS

Project No. 1161-103725
Scale

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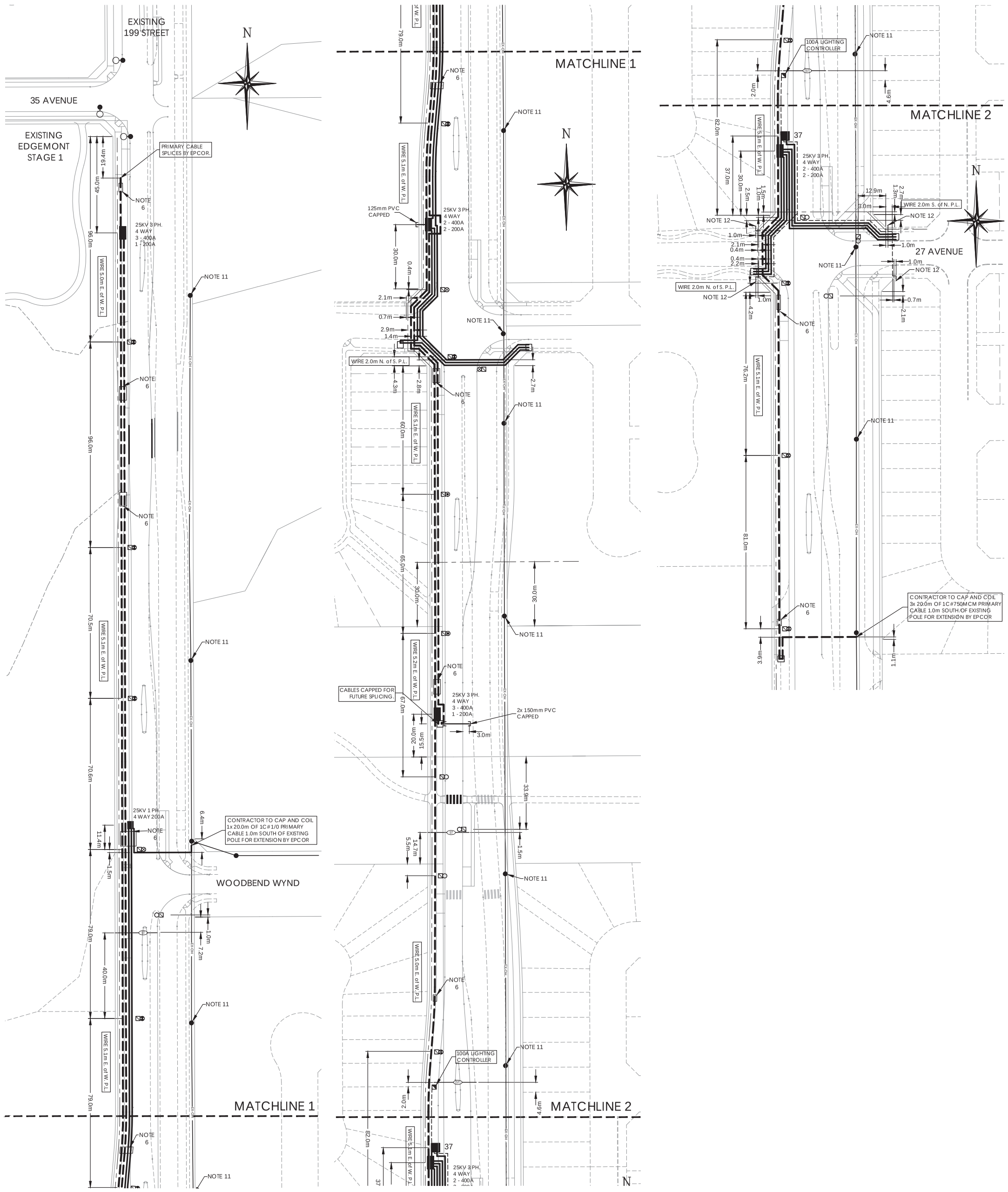
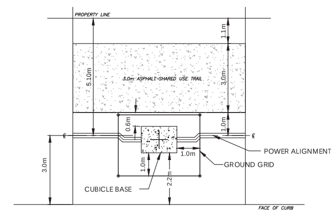
2015-12-04 10:20am BY: GRUSSELL

Drawing No.
C200-006

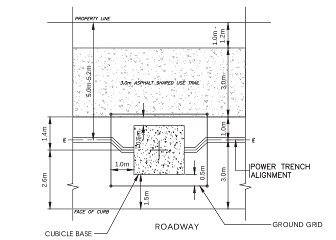


LEGEND

- PRIMARY CABLE (3x 1/C#750MCM CU. EPR CN), 28KV
- PRIMARY CABLE (1/C#1/0 AL. TRXLPE CN), 25KV
- 100A SEC. SERVICE CABLE USEB90 (2/C#1/0 AL. XLPE CN)
- ATCO GAS LINE
- GAS CROSSING SLEEVE SIZE (IN mm)
- PADMOUNT TRANSFORMER (14400-120/240V)
- SWITCHING CUBICLE
- EXISTING O/H POLE
- EXISTING STREET LIGHT POLE
- CHANNEL SPH SERIES COMMUNICATION PEDESTAL (COLOR TO MATCH POLE COLOR AS PER TELUS DRAWING) S - SHAW PEDESTAL T - TELUS PEDESTAL
- SHAW CABLE POWER SUPPLY PEDESTAL LOCATION
- SC — EPCOR APPROVED SHAW POWER SERVICE CABLE USEB90 (2/C #4 AL. XPLE CN)
- TEMPORARY TRANSFORMER PRECAST BASE. SEE NOTE 8.
- STREET LIGHTING CROSSING - REFER TO LIGHTING LAYOUT DRAWING
- STREET LIGHT POLE
- 100A LIGHTING CONTROL CABINET



25kV, 1 PHASE CUBICLE & GROUNDING DETAIL
N.T.S.



25kV, 400A, 3 PHASE CUBICLE & GROUNDING DETAIL
N.T.S.

PRELIMINARY
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RECORD DRAWING ACCEPTANCE

EPCOR Distribution

Contractor

Signature Date

NOTES

1. SEE TYPICAL ROAD CROSS-SECTIONS FOR TRANSFORMER, STREET LIGHTING AND TRENCH ALIGNMENTS.
2. ALL ROAD CROSSING DUCTS TO EXTEND FROM TRENCH LINE TO TRENCH LINE. ROAD CROSSING TO MAINTAIN A 3.0m CLEARANCE FROM ALL FIRE HYDRANTS, MANHOLES, CATCHBASINS AND VALVES.
3. AT EPCOR CONNECTION POINTS, CABLE TO BE CAPPED AND SAND BACKFILLED (SPLICES TO BE MADE BY OTHERS).
4. NO TREES TO BE LOCATED WITHIN 1.0m OF POWER CABLE.
5. ALL TRANSFORMER GROUND RODS TO BE INSTALLED VERTICALLY AND AS FAR AS POSSIBLE FROM WATER INFRASTRUCTURE.
6. CABLE TO BE RUN IN WOOD TROUGH FOR 3.0m (1.5m ON EITHER SIDE OF HYDRANT OR VALVE).
7. REFER TO THE CITY OF EDMONTON DESIGN AND CONSTRUCTION STANDARDS MANUAL FOR ADDITIONAL SPECIFICATIONS AND DETAILS NOT SHOWN ON THIS PLAN.
8. CAP AND SEAL WITH SUITABLE HEAT SHRINK ALL PRIMARY AND STREET LIGHTING CABLES IN PRECAST TRANSFORMER BASE. PROVIDE SECURE METAL COVER OVER ACCESS HOLE.
9. ALL POWER TRENCHES IN CITY BOULEVARD MUST BE COMPACTED AND CERTIFIED BY A GEOTECHNICAL ENGINEER AS PER SECTION 02318 - TRENCH AND BACKFILL OF VOLUME 2 - ROADWAYS DESIGN AND CONSTRUCTION SPECIFICATIONS.
10. TRENCH ALIGNMENT ON CUT CORNERS SHALL BE 3.0m FROM PROPERTY LINE UNLESS OTHERWISE INDICATED.
11. EPCOR TO REMOVE EXISTING WOOD POWER POLE AND ASSOCIATED OVERHEAD CONDUCTORS ONCE NEW UNDERGROUND PRIMARY IS ENERGIZED.
12. CAP AND COIL 5.0m OF 2/c#2 AL. FOR FUTURE ENTRANCE WALL SERVICE.

Development Engineer, Sustainable Development

Approvals YY.MM.DD

#	DESCRIPTION	BY		YY-MM-DD
Revision		By	Appd.	YY.MM.DD
1	PRELIMINARY SUBMISSION	MG		15-12-02
Issued		By	Appd.	YY.MM.DD

Permit-Seal

DES ENGINEERING LTD.

PERMIT No. P3757

Client/Project

RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET - RIVERVIEW
PHASE 1

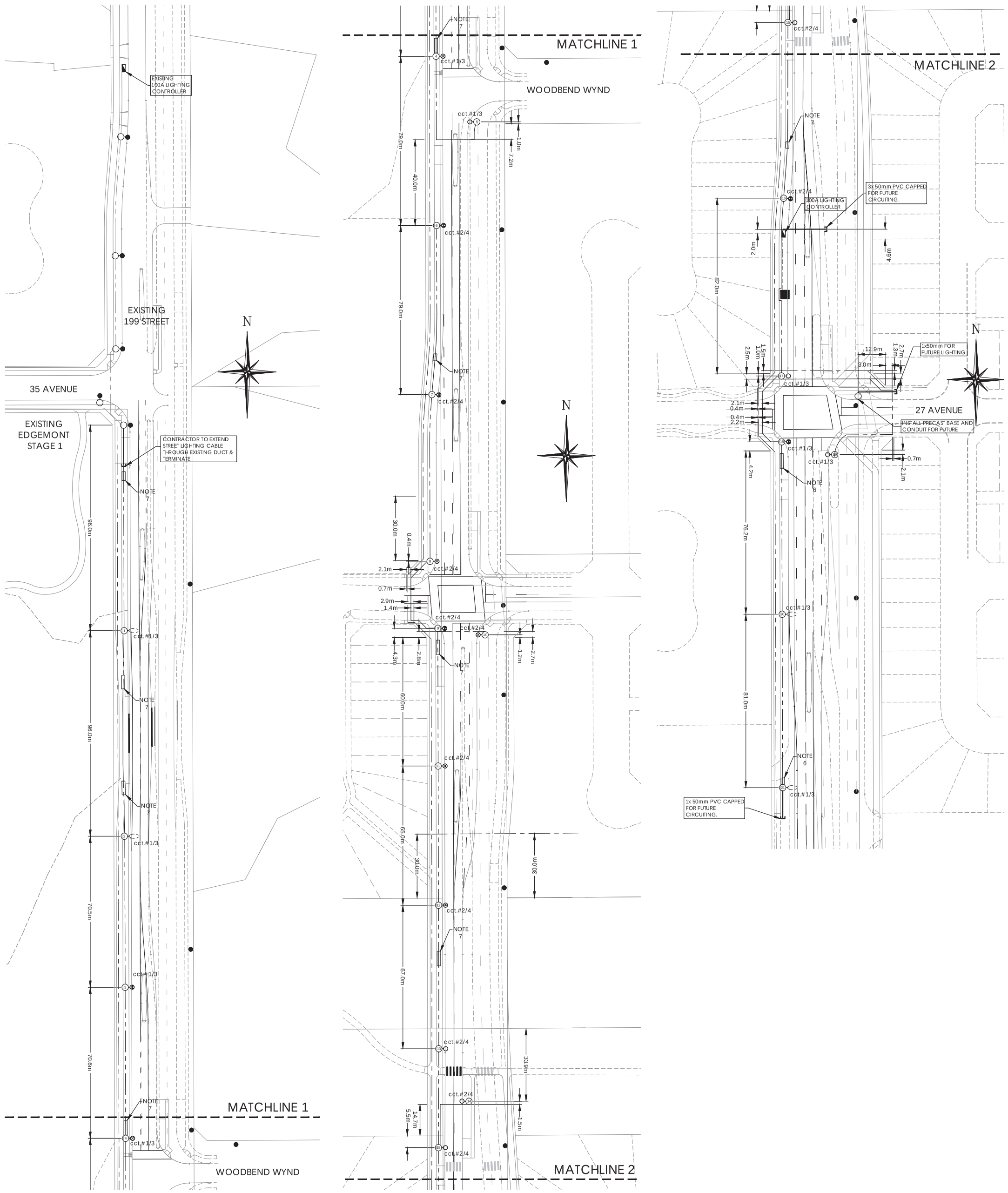
Edmonton, AB

Title

OVERALL POWER LAYOUT
AND DETAILS
Drawing 1 of 4

Project No.	Scale	Drawing No.
STN-0265	1:1000	E001-001

BY: MGOOBER



LEGEND

- ATCO GAS LINE
- 100A SEC. SERVICE CABLE USEB90 (2/C#1/0 AL. XLPE CN)
- STREET LIGHT WIRE (2/C#6 CU. TECK90)
- cct# — INDICATES STREET LIGHT CIRCUIT
- 1 — INDICATES POLE NUMBER FOR COORDINATE REFERENCE
- EXISTING STREET LIGHT POLE
- PADMOUNT TRANSFORMER
- 100A LIGHTING CONTROL CABINET
- 158W LED LUMINAIRE C/W 43'-0"(13.1m) GALVANIZED DAVIT POLE ON A POURED IN PLACE BASE, SEE NOTE 1.
- 158W LED LUMINAIRE C/W 30'-0"(9.1m) GALVANIZED DAVIT POLE ON A PRECAST BASE, SEE NOTE 1.
- 135W LED LUMINAIRE C/W 43'-0"(13.1m) GALVANIZED DAVIT POLE ON A POURED IN PLACE BASE, SEE NOTE 2.
- 135W LED LUMINAIRE C/W 30'-0"(9.1m) GALVANIZED DAVIT POLE ON A PRECAST BASE, SEE NOTE 2.
- 117W LED LUMINAIRE C/W 43'-0"(13.1m) GALVANIZED DAVIT POLE ON A POURED IN PLACE BASE, SEE NOTE 3.

NOTES

1. LUMINAIRE TO BE IP66, 158W LED, 240V, TYPE II DISTRIBUTION, LED ROADWAY CAT. #NXT-72M-0-7-2ES-7-GY-3-G-UL-X-PU AND SHORTING CAP #LRL65055-LF
2. LUMINAIRE TO BE IP66, 135W LED, 240V, TYPE II DISTRIBUTION, LED ROADWAY CAT. #NXT-72M-0-7-2ES-6-GY-3-G-UL-X-PU AND SHORTING CAP #LRL65055-LF
3. LUMINAIRE TO BE IP66, 117W LED, 240V, TYPE II DISTRIBUTION, LED ROADWAY CAT. #NXT-72M-0-7-2ES-5-GY-3-G-UL-X-PU AND SHORTING CAP #LRL65055-LF

PANEL SCHEDULE A - DISTRIBUTION ENCLOSURE
EXISTING CONTROLLER BASE - W. SIDE OF 199 STREET, N. OF 35 AVENUE

CCT.	DESCRIPTION	LOAD	BREAKER	A	B	BREAKER	LOAD	DESCRIPTION	CCT.
1, 3	CCT. #1/3	5.48A	2P-15A			2P-15A	2.40A	EX - CCT. #2/4	2, 4
5									6
7									8
9									10
11									12
13									14
15									16
17	CONTROL CIRCUIT		1P-15A			1P-15A		DUPLEX OUTLET	18
	TOTAL	5.48A		A	B		2.40A	TOTAL	

PANEL VOLTAGE 120/240V PANEL AMPERAGE 60A PHASE 1Ø WIRE 3W

PANEL SCHEDULE A - DISTRIBUTION ENCLOSURE
W. SIDE OF 199 STREET, N. OF 27 AVENUE

CCT.	DESCRIPTION	LOAD	BREAKER	A	B	BREAKER	LOAD	DESCRIPTION	CCT.
1, 3	CCT. #1/3	4.69A	2P-15A			2P-15A	6.23A	CCT. #2/4	2, 4
5									6
7									8
9									10
11									12
13									14
15									16
17	CONTROL CIRCUIT		1P-15A			1P-15A		DUPLEX OUTLET	18
	TOTAL	4.69A		A	B		6.23A	TOTAL	

PANEL VOLTAGE 120/240V PANEL AMPERAGE 60A PHASE 1Ø WIRE 3W

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LIGHTING SPECIFICATIONS

1. REFER TO THE CITY OF EDMONTON ROAD AND WALKWAY LIGHTING MANUAL CONSTRUCTION AND MATERIALS STANDARDS FOR ADDITIONAL SPECIFICATIONS AND DETAILS NOT SHOWN ON THIS PLAN.
2. ALL ROAD CROSSING TO EXTEND FROM TRENCHLINE TO TRENCHLINE UNLESS OTHERWISE NOTED. ROAD CROSSING TO MAINTAIN A 3.0m CLEARANCE FROM ALL FIRE HYDRANTS, MANHOLES, CATCHBASINS AND VALVES.
3. ALL ROAD CROSSING DUCTWORK TO BE 50mm RIGID PVC AS PER THE CITY OF EDMONTON ROAD AND WALKWAY LIGHTING MANUAL CONSTRUCTION AND MATERIALS STANDARDS.
4. NO TREES TO BE LOCATED WITHIN 3.5m OF STREET LIGHT POLES AND 1.0m OF POWER CABLE. MINIMUM CLEARANCES TO BE MAINTAINED FROM EXISTING BURIED CABLE, WATER, SANITARY, STORM AND GAS.
5. POLE POWDER COATING TO BE BY AN APPROVED C.O.E. POWDER COATING FACILITY.
6. REFER TO DRAWINGS 3.15 AND 3.16 (ROAD AND WALKWAY LIGHTING CONSTRUCTION AND MATERIALS STANDARDS 2013) FOR BONDING REQUIREMENTS.
7. CABLE TO BE RUN IN 50mm RIGID PVC IN WOOD TROUGH FOR 3.0m (1.5m ON EITHER SIDE OF HYDRANT OR VALVE).
8. ALL CABLING TO BE INSTALLED IN OPEN TRENCH UNLESS OTHERWISE INDICATED.
9. ALL POWER TRENCHES UNDER SEPARATE SIDEWALK MUST BE COMPACTED AS WELL AS CERTIFIED BY A GEOTECHNICAL ENGINEER.
10. LIGHTING CONTROL CABINET TO MEET SECTION 2.9.1 AS PER THE CITY OF EDMONTON ROAD AND WALKWAY LIGHTING MANUAL CONSTRUCTION AND MATERIALS STANDARDS (REFER TO DETAIL DRAWINGS E4.6 TO E4.11).
11. AS PER EPCOR WATER REQUEST: ALL TRANSFORMER GROUND RODS TO BE INSTALLED VERTICALLY AND AS FAR AS POSSIBLE FROM WATER INFRASTRUCTURE.

Development Engineer, Sustainable Development YY.MM.DD
Approvals

# DESCRIPTION	BY	YY-MM-DD
Revision	By Appd.	YY.MM.DD

# DESCRIPTION	BY	YY-MM-DD
1 PRELIMINARY SUBMISSION	MG	15-12-02
Issued	By Appd.	YY.MM.DD

Permit-Seal

DES ENGINEERING LTD.
PERMIT No. P3757

Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET - RIVERVIEW
PHASE 1
Edmonton, AB

Title
OVERALL LIGHTING LAYOUT
AND DETAILS
Drawing 3 of 4

Project No. STN-0265
Scale 1:1000

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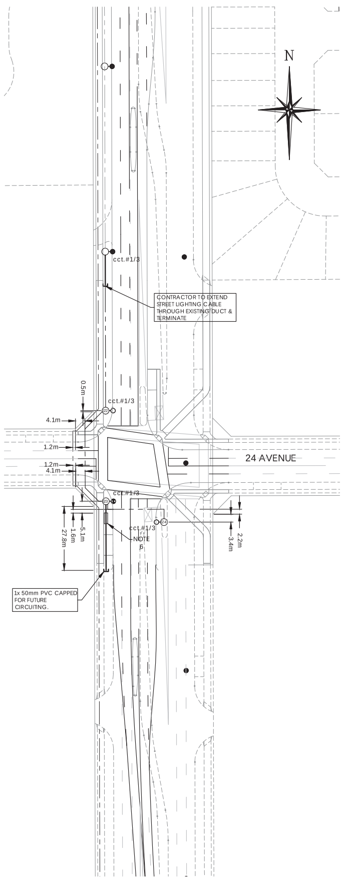
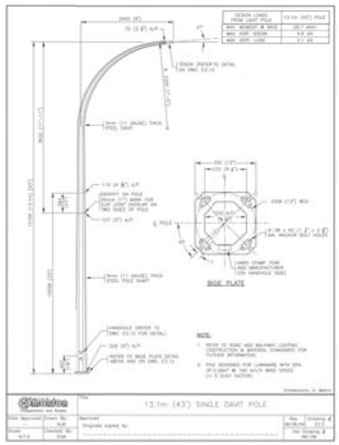
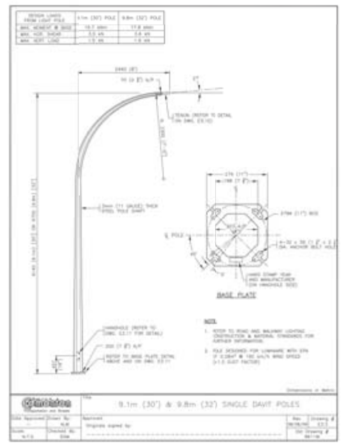
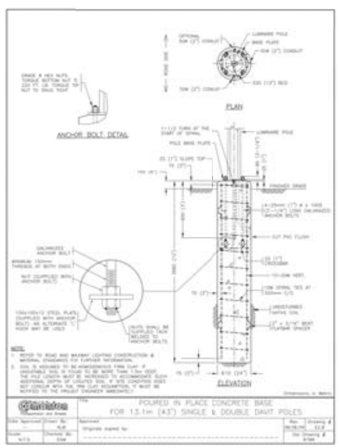
BY: MGODBER

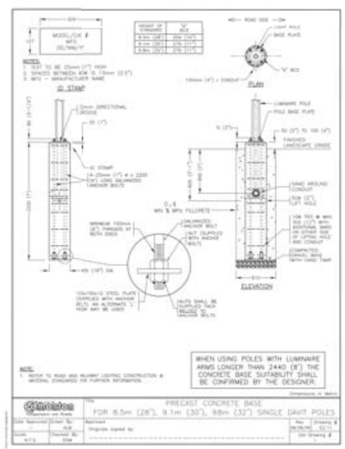
Drawing No. E001-003











PRELIMINARY
NOT FOR CONSTRUCTION

LEGEND

- ATCO GAS LINE
- 100A SEC. SERVICE CABLE USEB90 (2/C #1/0 AL. XLPE CN)
- STREET LIGHT WIRE (2/C #6 CU. TECK90)
- cct# INDICATES STREET LIGHT CIRCUIT
- INDICATES POLE NUMBER FOR COORDINATE REFERENCE
- EXISTING STREET LIGHT POLE
- PADMOUNT TRANSFORMER
- 100A LIGHTING CONTROL CABINET
- 135W LED LUMINAIRE C/W 43'-0"(13.1m) GALVANIZED DAVIT POLE ON A POURED IN PLACE BASE, SEE NOTE 1.
- 135W LED LUMINAIRE C/W 30'-0"(9.1m) GALVANIZED DAVIT POLE ON A PRECAST BASE, SEE NOTE 1.

NOTES

1. LUMINAIRE TO BE IP66, 135W LED, 240V, TYPE II DISTRIBUTION, LED ROADWAY CAT. #NXT-72M-0-7-2ES-6-GY-3-G-UL-X-PU AND SHORTING CAP #LRL65055-LF

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LIGHTING SPECIFICATIONS

1. REFER TO THE CITY OF EDMONTON ROAD AND WALKWAY LIGHTING MANUAL CONSTRUCTION AND MATERIALS STANDARDS FOR ADDITIONAL SPECIFICATIONS AND DETAILS NOT SHOWN ON THIS PLAN.
2. ALL ROAD CROSSING TO EXTEND FROM TRENCHLINE TO TRENCHLINE UNLESS OTHERWISE NOTED. ROAD CROSSING TO MAINTAIN A 3.0m CLEARANCE FROM ALL FIRE HYDRANTS, MANHOLES, CATCHBASINS AND VALVES.
3. ALL ROAD CROSSING DUCTWORK TO BE 50mm RIGID PVC AS PER THE CITY OF EDMONTON ROAD AND WALKWAY LIGHTING MANUAL CONSTRUCTION AND MATERIALS STANDARDS.
4. NO TREES TO BE LOCATED WITHIN 3.5m OF STREET LIGHT POLES AND 1.0m OF POWER CABLE. MINIMUM CLEARANCES TO BE MAINTAINED FROM EXISTING BURIED CABLE, WATER, SANITARY, STORM AND GAS.
5. POLE POWDER COATING TO BE BY AN APPROVED C.O.E. POWDER COATING FACILITY.
6. REFER TO DRAWINGS 3.15 AND 3.16 (ROAD AND WALKWAY LIGHTING CONSTRUCTION AND MATERIALS STANDARDS 2013) FOR BONDING REQUIREMENTS.
7. CABLE TO BE RUN IN 50mm RIGID PVC IN WOOD TROUGH FOR 3.0m (1.5m ON EITHER SIDE OF HYDRANT OR VALVE).
8. ALL CABLING TO BE INSTALLED IN OPEN TRENCH UNLESS OTHERWISE INDICATED.
9. ALL POWER TRENCHES UNDER SEPARATE SIDEWALK MUST BE COMPACTED AS WELL AS CERTIFIED BY A GEOTECHNICAL ENGINEER.
10. LIGHTING CONTROL CABINET TO MEET SECTION 2.9.1 AS PER THE CITY OF EDMONTON ROAD AND WALKWAY LIGHTING MANUAL CONSTRUCTION AND MATERIALS STANDARDS (REFER TO DETAIL DRAWINGS E4.6 TO E4.11).
11. AS PER EPCOR WATER REQUEST: ALL TRANSFORMER GROUND RODS TO BE INSTALLED VERTICALLY AND AS FAR AS POSSIBLE FROM WATER INFRASTRUCTURE.

Development Engineer, Sustainable Development

Approvals — YY.MM.DD

#	DESCRIPTION	BY	Appd.	YY-MM-DD

Revision

1	PRELIMINARY SUBMISSION	MG		15-12-02

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Permit-Seal

PERMIT No. P3757

Client/Project

RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET - RIVERVIEW
PHASE 2
Edmonton, AB

Title

OVERALL LIGHTING LAYOUT
AND DETAILS
Drawing 4 of 4

Project No. PHASE 2 — Scale 1:1000

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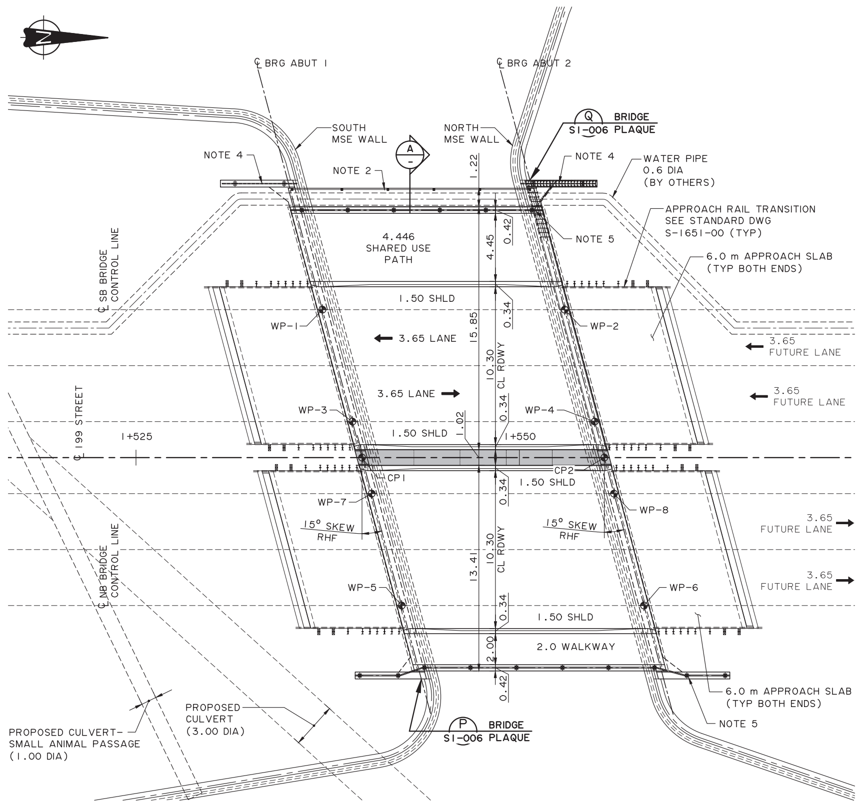
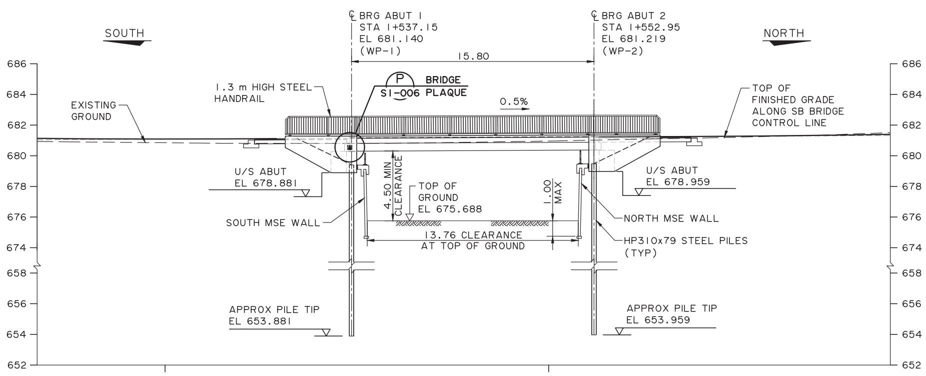
BY: MGODBER

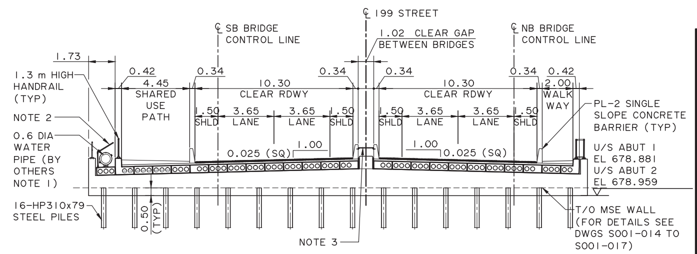
Drawing No. E001-004



PLAN
1:150



ELEVATION
LOOKING WEST 1:150



SECTION
A 1:150

NOTES:

1. FOR WATER PIPE SUPPORT ON GIRDER G1 (GIRDER LAYOUT ON DWG S09) REFER TO DETAILS ON DWG S001-018
2. FOR WATER PIPE SAFETY COVER ALONG GIRDER G1 REFER TO DETAILS ON DWG S001-018
3. FOR GRATING COVER BETWEEN SB AND NB BRIDGES REFER TO DETAILS ON DWG S001-019
4. FOR SAFETY RAILING ALONG WEST WINGWALLS ON ABUT 1 AND ABUT 2 REFER TO DETAILS ON DWG S001-019
5. PEDESTRIAN HANDRAIL. FOR POST SPACING AND DETAILS REFER TO DWG S001-011 & S001-013
6. FOR MSE WALL LAYOUT AND DETAILS REFER TO DWGS S001-014 TO S001-017
7. FOR PROPOSED CULVERTS REFER TO DWGS S002-001 TO S002-003
8. PLAN ON DWG S001-001 TO BE READ IN CONJUNCTION WITH SITE PLAN ON DWG S001-002

INDEX

SHEET	DESCRIPTION	DRAWING
22	CULVERTS - MISCELLANEOUS DETAILS	S002-003
21	CULVERTS - INFORMATION SHEET 1	S002-002
20	CULVERTS - GENERAL LAYOUT	S002-001
19	MISCELLANEOUS - SHEET 2	S001-019
18	MISCELLANEOUS - SHEET 1	S001-018
17	MSE WALL - SHEET 4	S001-017
16	MSE WALL - SHEET 3	S001-016
15	MSE WALL - SHEET 2	S001-015
14	MSE WALL - SHEET 1	S001-014
13	PEDESTRIAN HANDRAIL	S001-013
12	DECK - SHEET 2	S001-012
11	DECK - SHEET 1	S001-011
10	GIRDER DETAILS	S001-010
9	GIRDER LAYOUT	S001-009
8	ABUTMENT DETAILS - SHEET 3	S001-008
7	ABUTMENT DETAILS - SHEET 2	S001-007
6	ABUTMENT DETAILS - SHEET 1	S001-006
5	PILE LAYOUT	S001-005
4	SOIL INFORMATION	S001-004
3	INFORMATION SHEET 2	S001-003
2	INFORMATION SHEET 1	S001-002
1	GENERAL LAYOUT	S001-001

WORK POINT COORDINATES

	STATION	ELEVATION	NORTHING	EASTING
WP-1	1+537.15	681.140	5926061.185	22276.588
WP-2	1+552.95	681.219	5926076.985	22276.541
WP-3	1+539.11	681.332	5926063.162	22283.882
WP-4	1+554.91	681.411	5926078.962	22283.835
WP-5	1+542.32	681.166	5926066.413	22295.872
WP-6	1+558.12	681.245	5926082.213	22295.826
WP-7	1+540.37	681.338	5926064.435	22288.578
WP-8	1+556.17	681.417	5926080.235	22288.532
CP1	1+539.736	-	5926063.799	22286.230
CP2	1+555.536	-	5926079.599	22286.183

REFERENCE DRAWINGS

DESCRIPTION	DRAWING
INSTALLATION OF LARGE STEEL PIPES	S-1418
DECK WATERPOOFING SYSTEM WITH 80 mm TWO-COURSE HOT-MIX ASPHALT CONCRETE PAVEMENT	S-1443
W-BEAM STRONG POST TL-3 FLEAT 350 ENERGY ABSORBING TERMINAL	RDG-B1.5
PL-2 SINGLE SLOPE CONCRETE BRIDGE BARRIER APPROACH RAIL TRANSITION DETAILS	S-1651
PL-2 SINGLE SLOPE CONCRETE BRIDGE BARRIER DETAILS	S-1650
STANDARD SLC COMPOSITE BRIDGES SLC 510 PRESTRESSED CONCRETE GIRDERS - INTERIOR GIRDER	S-1774
STANDARD SLC COMPOSITE BRIDGES SLC 510 PRESTRESSED CONCRETE GIRDERS - DECK DETAILS SHEET 2	S-1773
STANDARD SLC COMPOSITE BRIDGES SLC 510 PRESTRESSED CONCRETE GIRDERS - DECK DETAILS SHEET 1	S-1772
STANDARD SLC COMPOSITE BRIDGES SLC 510 PRESTRESSED CONCRETE GIRDERS - SUPERSTRUCTURE LAYOUT	S-1771

NOTE:
ALL ALBERTA TRANSPORTATION STANDARD DRAWINGS SHALL BE THE LATEST, CURRENT VERSION

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Notes

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Approvals YY.MM

Revision By Appd. YY.MM

Issued	By	Appd.	YY.MM
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FIRST SUBMISSION	R.C.	T.C.	15.12.04

PROJECT MANAGER: D.H./T.C. DESIGN: R.C. DRAWN: J.D.C.

Permit-Seal

Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
GENERAL LAYOUT

Project No. 1161-103725
Scale

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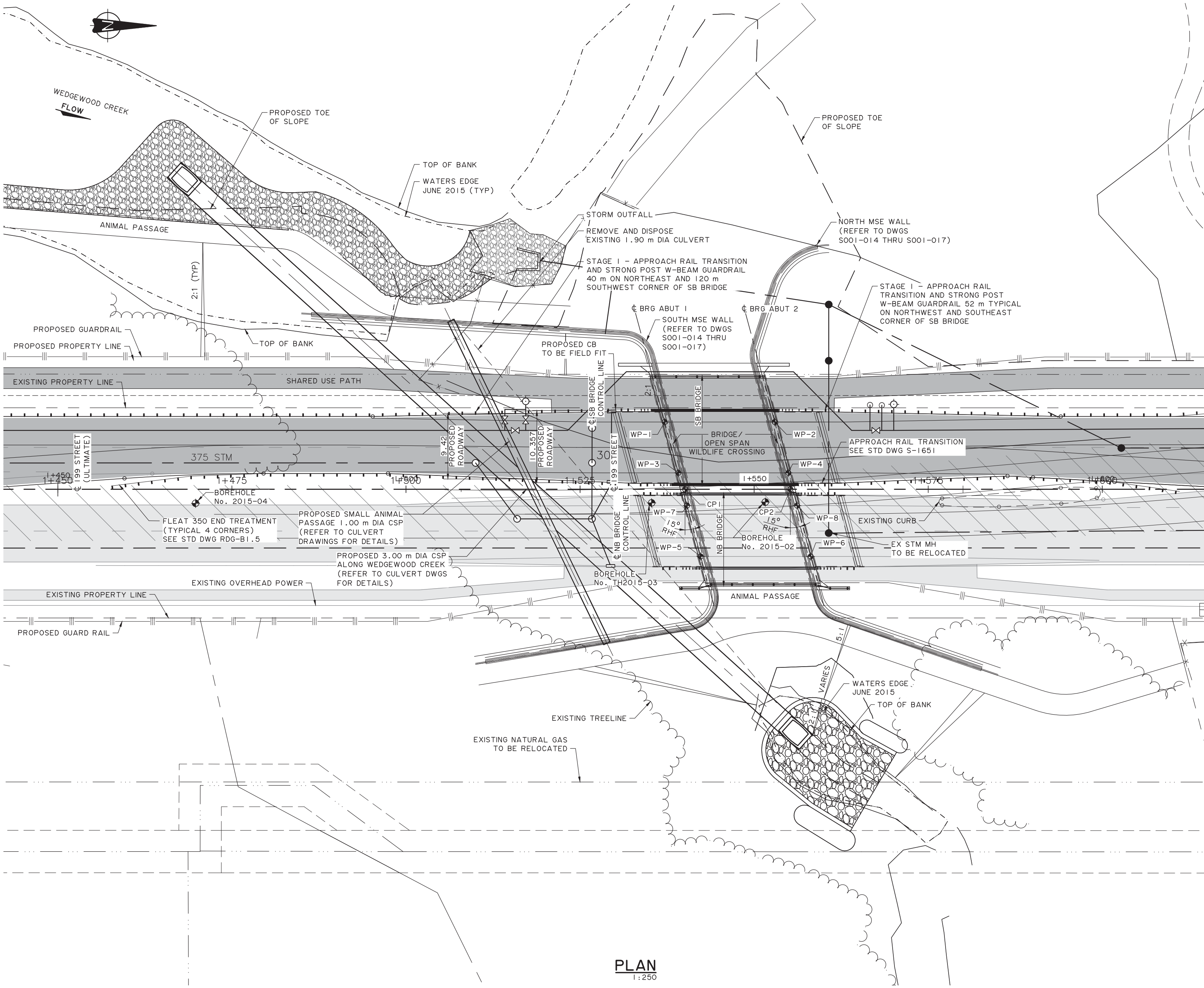
Drawing No. S001-001



PLAN
1:250

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- PROPOSED ROAD / SUP
- FUTURE ROAD / SUP
- EXISTING ROAD REMOVALS

Notes

- DIMENSIONS ARE GIVEN IN METRES UNLESS NOTED OTHERWISE
- STRUCTURAL DESIGN IN ACCORDANCE WITH CAN/CSA S6-14 AND CL 800 DESIGN LIVE LOAD
- ROADWAY DESIGN STANDARD RURAL COLLECTOR -209-70
- CULVERT ASSEMBLY, BACKFILL AND OTHER TYPICAL DETAILS SHALL BE IN ACCORDANCE WITH THIS DWG, STD DWG S-1418-03 AND SECTION 18 OF THE SPECIFICATION FOR BRIDGE CONSTRUCTION
- THE INFORMATION AND OR SPECIFICATIONS INCLUDED ON THIS PLAN MEET THE STANDARDS SPECIFIED IN SECTION (c) AND (d) OF PART 1 OF SCHEDULE 2 OF THE ALBERTA WATER ACT CODE OF PRACTICE FOR WATERCOURSE CROSSING
- UTILITY LINE LOCATIONS TO BE CONFIRMED WITH DRAWINGS C005-103, C008-001, AND C105-006

Development Engineer, Sustainable Development

Approvals YY.MM

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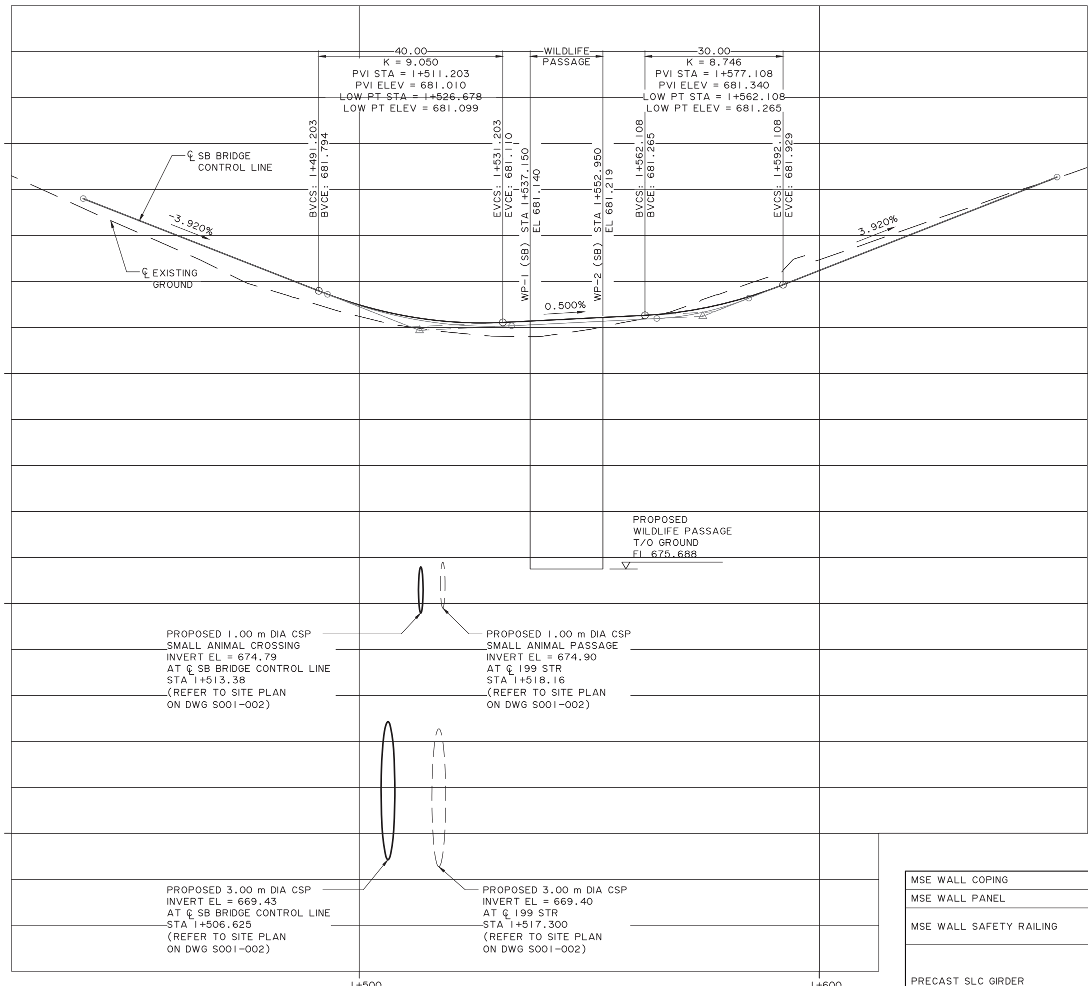
199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
INFORMATION SHEET 1

Project No. 1161-103725 Scale

Drawing No. S001-002



SOUTH

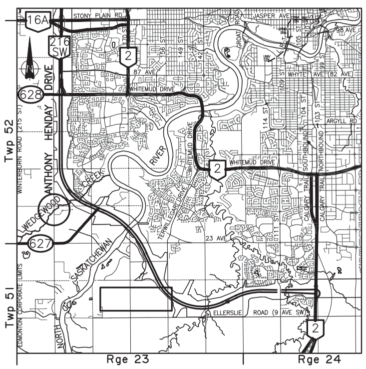
ROADWAY PROFILE

HOR 1:500
VERT 1:50

NORTH

NOTE:

- REFER TO GRATING PLAN C103-006 FOR FULL ROADWAY PROFILE
- ℄ SB BRIDGE CONTROL LINE ON DRAWING S001-003 = ℄ W EDL ON DRAWING C103-006
  EDL - EDGE OF DRIVING LANE
- INVERT ELEVATIONS FOR 1.00 m DIA CSP (SMALL ANIMAL PASSAGE) TO BE CONFIRMED FOR CONSTRUCTION



SITE MAP

1:100 000

- PRIMARY HIGHWAY 1-216
- SECONDARY HIGHWAY 500-986
- LOCAL ROAD

SURVEY BY

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CONTROL POINTS

- ASCM 346890 N 5925450.255 E 22286.026 EL 689.519
- ASCM 479196 N 5926232.759 E 22296.323 EL 686.154

NOTES

- ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
- ROADWAY DESIGN STANDARD URBAN ARTERIAL ROAD DESIGN SPEED 70 km/h
- DESIGN SPECIFICATION: CAN/CSA S6-14 WITH CL800 DESIGN LIVE LOAD

ITEM		UNIT	SUBSTR	SUPERSTR	TOTAL EST	AS CONST
MSE WALL COPING		m	205		205	
MSE WALL PANEL		m²	880		880	
MSE WALL SAFETY RAILING	750 m HIGH	m	66		66	
	1070 m HIGH	m	140		140	
PRECAST SLC GIRDER	EXTERIOR (GI)	UNIT		1	1	
	INTERIOR	UNIT		18	18	
	BARRIER	UNIT		4	4	
	CURB	UNIT		2	2	
APPROACH RAIL TRANSITION		UNIT		4	4	
W-BEAM GUARDRAIL		m		264	264	
FLEAT 350 END TREATMENT		UNIT		4	4	
WATERPROOFING SYSTEM		m²		795	795	
WEARING SURFACE: TYPE H2 ACP (80 mm)		tonnes		125	125	
CONCRETE - CLASS HPC		m³	185		185	
CONCRETE - CLASS C		m³	85		85	
REINFORCING STEEL	STAINLESS	kg	11 597		11 597	
	PLAIN	kg	18 528		18 528	
PILING - HP310x79	SUPPLY & DRIVE	m	816		816	
	SET-UP	PILE	32		32	

QUANTITY ESTIMATE

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RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
INFORMATION SHEET 2

Project No. 1161-103725
Scale

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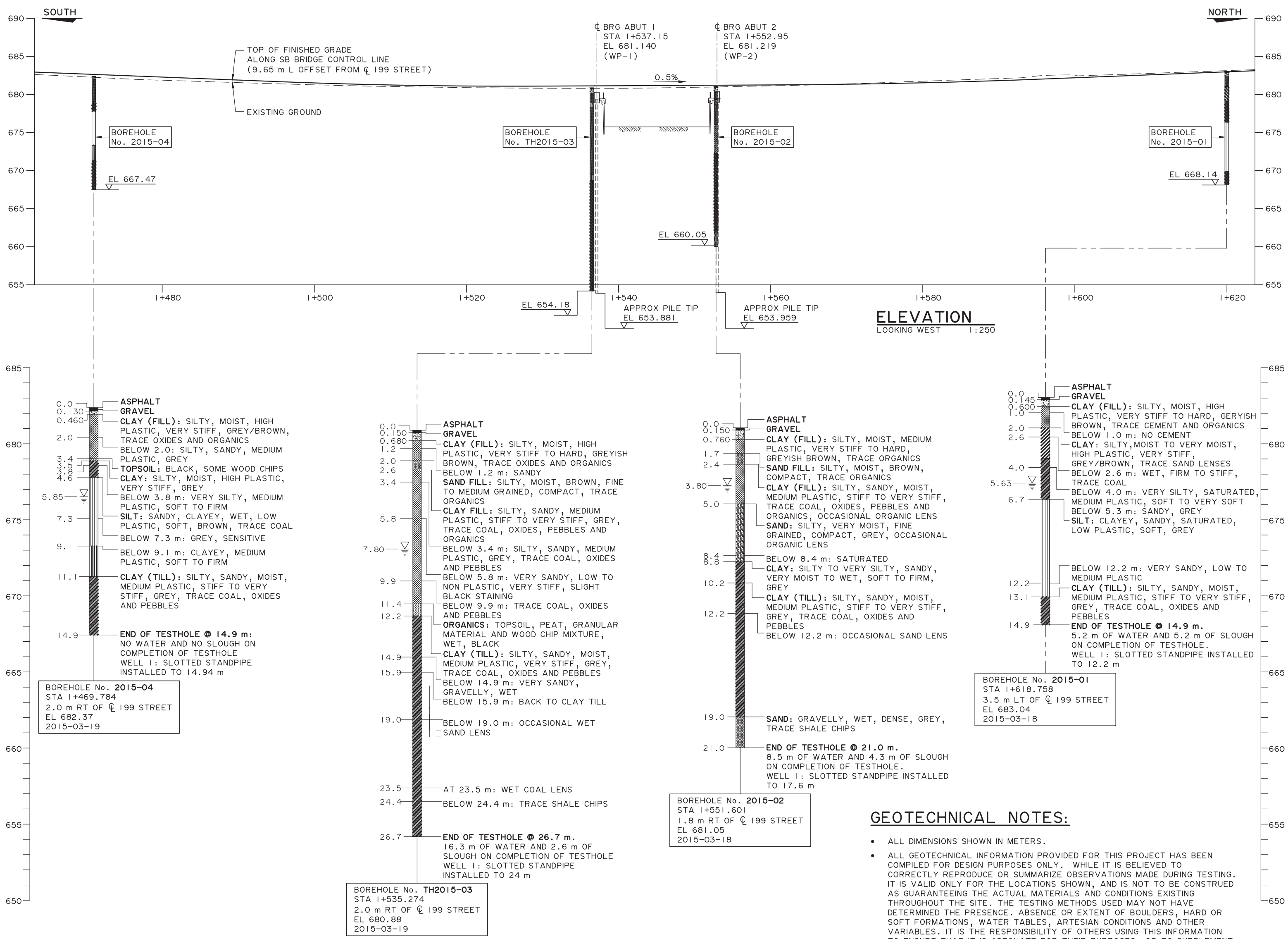

GEOTECHNICAL NOTES:

- ALL DIMENSIONS SHOWN IN METERS.
- ALL GEOTECHNICAL INFORMATION PROVIDED FOR THIS PROJECT HAS BEEN COMPILED FOR DESIGN PURPOSES ONLY. WHILE IT IS BELIEVED TO CORRECTLY REPRODUCE OR SUMMARIZE OBSERVATIONS MADE DURING TESTING, IT IS VALID ONLY FOR THE LOCATIONS SHOWN, AND IS NOT TO BE CONSTRUED AS GUARANTEEING THE ACTUAL MATERIALS AND CONDITIONS EXISTING THROUGHOUT THE SITE. THE TESTING METHODS USED MAY NOT HAVE DETERMINED THE PRESENCE, ABSENCE OR EXTENT OF BOULDERS, HARD OR SOFT FORMATIONS, WATER TABLES, ARTESIAN CONDITIONS AND OTHER VARIABLES. IT IS THE RESPONSIBILITY OF OTHERS USING THIS INFORMATION TO ENSURE THAT IT IS ADEQUATE FOR THEIR PURPOSES, OR TO SUPPLEMENT IT WITH ADDITIONAL INFORMATION
- INFORMATION SHOWN ON THESE DRAWINGS IS FOR DESIGN PURPOSES COMPILED FOR THIS SPECIFIC PROJECT ONLY AND IS FOR THE BENEFIT OF THE CLIENT ONLY
- THE BOREHOLE RECORDS SHOWN ON THIS DRAWING HAVE BEEN SUMMARIZED FROM THE 'PROPOSED 199TH STREET UPGRADES-STAGE 1 UNDERGROUND UTILITIES, DEEP FILL CULVERT AND WILDLIFE CROSSING 35TH AVENUE TO WOODBEND WYND NW EDMONTON, ALBERTA (REPORT NO. 6004-38)' PREPARED BY HOGGAN ENGINEERING & TESTING (1980) LTD. MAY, 2015

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199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
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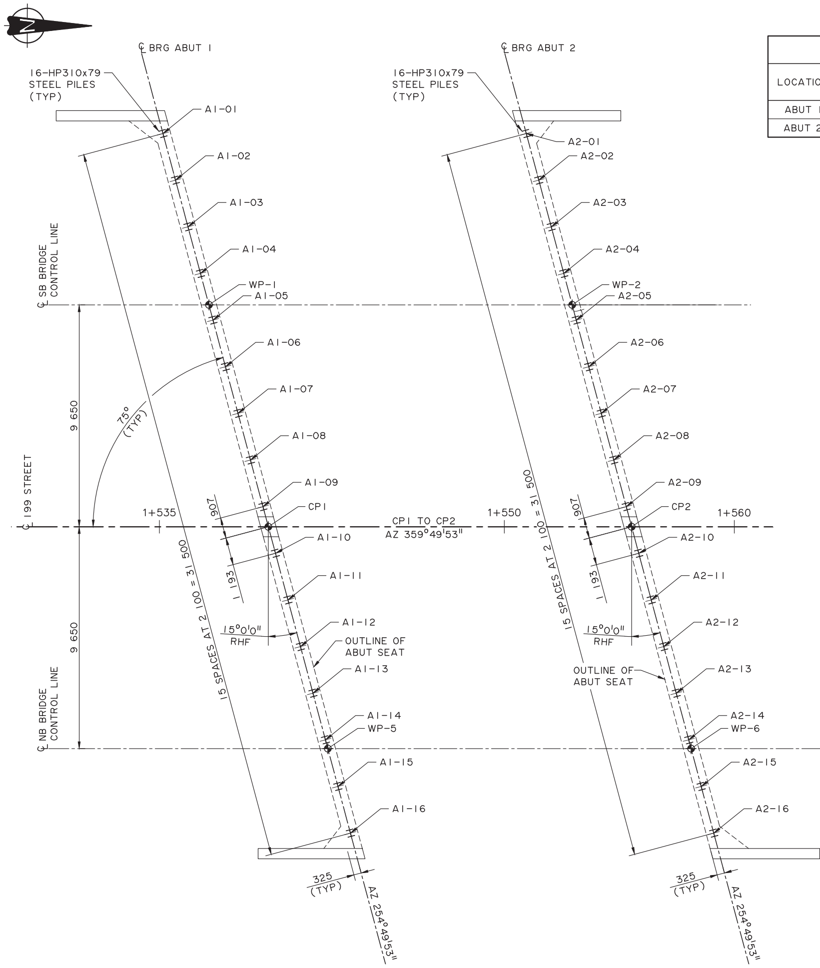
Title
WEDGEWOOD CREEK WILDLIFE CROSSING
SOIL INFORMATION

Project No. 1161-103725
Scale
Drawing No. S001-004

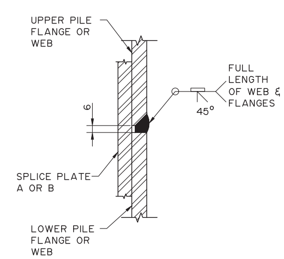


PILING LAYOUT

1:100

PILE SCHEDULE

LOCATION	AZIMUTH	CUT-OFF ELEVATION	TIP ELEVATION	PILE LENGTH (m)
ABUT 1	254°49'53"	679.381	653.881	25.5
ABUT 2	254°49'53"	679.459	653.959	25.5



SECTION

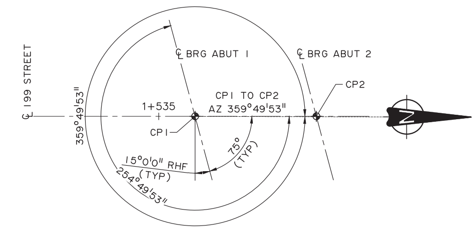
NTS

PILE NOTES:

- ABUTMENT PILES SHALL BE STEEL HP310x79. STEEL H PILING SHALL MEET THE REQUIREMENT OF SPECIFICATION ASTM A36 OR CSA40.21M 350W.
- ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF CURRENT AWS SPECIFICATIONS D1.5.
- PILE SHALL BE DRIVEN TO THE TIP ELEVATIONS AS SHOWN ON THE PILE SCHEDULE OR LOWER TO, ACHIEVE THE BEARING CAPACITIES TO RESIST THE LOAD BELOW:

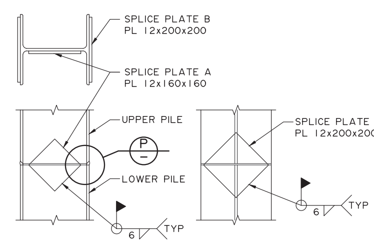
PILE LOAD:	SLS (kN)	ULS (kN)
ABUT 1	574	750
ABUT 2	574	750

- ANY VOIDS DEVELOPED IN THE VICINITY OF THE PILES DURING INSTALLATION SHALL BE BACKFILLED WITH GRANULAR FILL OR GROUT TO MAINTAIN THE LATERAL GROUND RESISTANCE.
- PILE TOLERANCES SHALL BE AS PER ALBERTA TRANSPORTATION SPECIFICATION FOR BRIDGE CONSTRUCTION EXCEPT THAT ABUTMENT PILES SHALL NOT BE OUT OF SPECIFIED POSITION MORE THAN 50 mm.
- THE PILE BEARING CAPACITIES SHALL BE ESTIMATED BY THE BEARING FORMULAS INDICATED IN SECTION 3, FOUNDATION AND PILES, OF THE LATEST ALBERTA TRANSPORTATION SPECIFICATIONS FOR BRIDGE CONSTRUCTION.
- PERFORMANCE SPECIFICATION FOR THE TYPE OF HAMMER TO BE USED SHALL BE PROVIDED BY THE CONTRACTOR. THE CONTRACTOR IS REQUIRED TO DEMONSTRATE THAT THE HAMMER IS PERFORMING WITHIN THE SPECIFIED LIMIT.



BRIDGE GEOMETRY PLAN

1:300



SPLICE NOTES:

1. PILE ENDS SPLICED SHALL BE FLAME CUT USING A STEEL GUIDE TO OBTAIN A SQUARE AND EVEN CUT. BEVEL CUTS SHALL BE MADE AT 45°
2. SPLICE PLATES A & B SHALL BE WELDED TO THE UPPER PILE BEFORE POSITIONING IT
3. THE UPPER PILE SHALL BE POSITIONED ON AND THE SPLICE PLATES WELDED TO THE LOWER PILE; BUTT WELDS SHALL THEN BE MADE
4. FIELD WELDING SHALL BE IN ACCORDANCE WITH SECTION 13.4 OF ALBERTA TRANSPORTATION SPECIFICATIONS FOR BRIDGE CONSTRUCTION

H-PIPE PILE SPLICE

NTS

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Notes

Development Engineer, Sustainable Development

Approvals YY.MM

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Permit-Seal

Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
PILE LAYOUT

Project No. 1161-103725 | Scale

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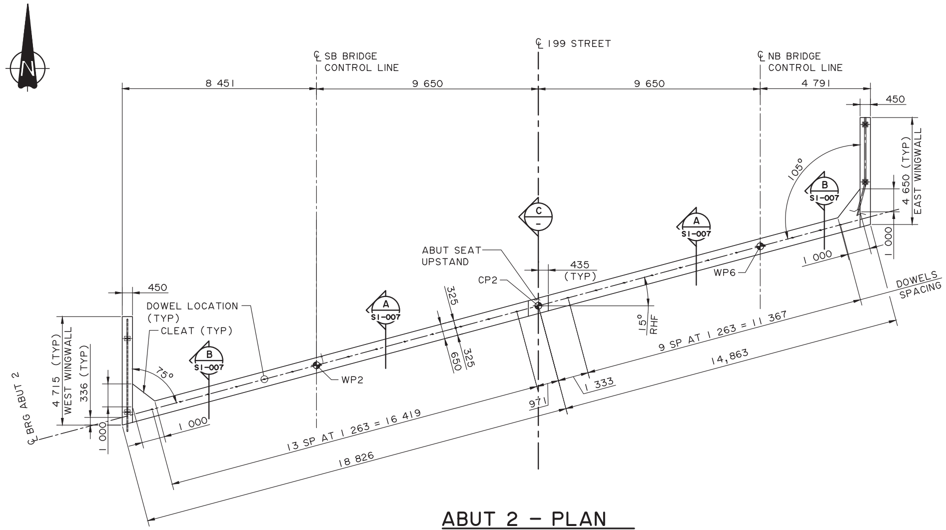
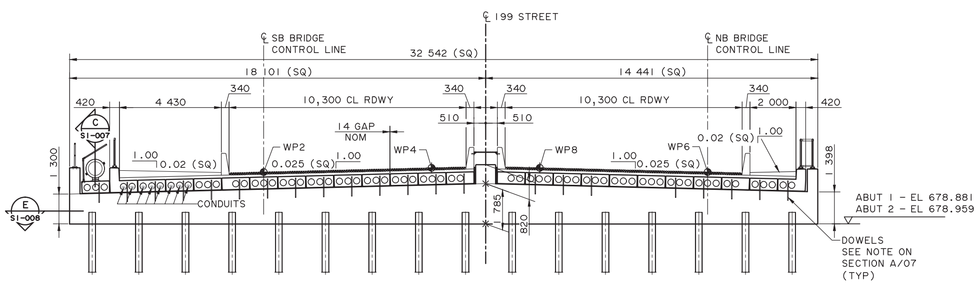
Drawing No. S001-005



ABUT 2 – PLAN

1:100



ABUT 2 – ELEVATION

1:100

NOTES:

- ABUT 2 – PLAN AND ELEVATION SHOWN
- ABUT 1 – PLAN AND ELEVATION: OPP HAND, SIMILAR
- APPROACH SLABS NOT SHOWN FOR CLARITY. FOR APPROACH SLAB LAYOUT AND GEOMETRY REFER TO DECK PLAN ON DRAWING S001-011
- MSE WALL – NOT SHOWN FOR CLARITY, REFER TO DRAWINGS S001-014 TO S001-016 FOR PLAN AND DETAILS
- FOR CONDUITS LOCATION AND DETAILS REFER TO GIRDER PLAN AND PVC CONDUIT DETAIL A ON DRAWING S001-009

NOTES:

- ROADWAY ELEVATIONS SPECIFIED ELSEWHERE ARE GIVEN TO TOP OF CENTERLINE ROADWAY

CONSTRUCTION NOTES:

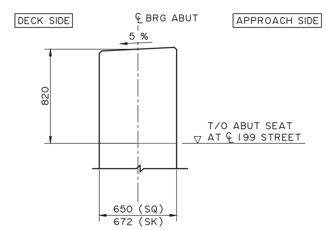
- ALL CORNERS SHALL HAVE A 20 mm CHAMFER OR FILLET UNLESS NOTED OTHERWISE
- CONTRACTOR SHALL FIELD VERIFY SITE CONDITION AGAINST DESIGN DIMENSIONS AND ELEVATIONS. NOTIFY ENGINEER OF DISCREPANCIES FOR POSSIBLE RE-EVALUATION

BACKFILL:

- THE CONTRACTOR MAY ELECT TO ERECT THE GIRDERS PRIOR TO BACKFILLING. IN THIS CASE, THE BACKFILLING MAY COMMENCE IMMEDIATELY AFTER GIRDERS ARE SECURELY IN PLACE

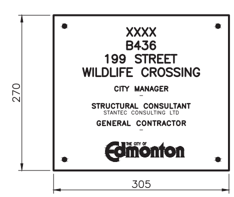
MATERIALS:

- ALL CIP CONCRETE SHALL BE CLASS C EXCEPT DECK, BARRIERS, SIDEWALK, AND APPROACH SLABS.
- GIRDER DOWELS SHALL BE FABRICATED FROM SMOOTH ROUND BAR STOCK CONFORMING TO CSA G40.21M – 300W.
- ALL STEEL PLATE AND SHAPES SHALL CONFORM TO THE THE REQUIREMENTS OF CSA G40.21M GRADE 350W UNLESS NOTED OTHERWISE
- ALL WELDING SHALL CONFORM TO THE CURRENT AWS SPECIFICATION D1.5. AND ALBERTA TRANSPORTATION SPECIFICATION FOR BRIDGE CONSTRUCTION
- ELASTOMERIC PADS SHALL BE 60 HARDNESS AND SHALL CONFORM TO SECTION 18 "BEARING DEVICES" DIVISION II OF THE AASHTO DESIGN STANDARD
- BEARING DOWEL HOLE GROUT TO BE SIKA 212 WITH A MINIMUM 28 DAY STRENGTH = 40 MPa



C – SECTION

1:20



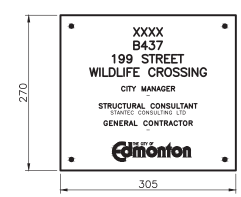
P NB BRIDGE PLAQUE DETAIL

S1-001

N.T.S.

NOTE:

- NB BRIDGE PLAQUE SHALL BE LOCATED ON THE SOUTHEAST WINGWALL AT ABUTMENT 1
- XXXX SHALL BE REPLACED WITH YEAR OF CONSTRUCTION COMPLETION



Q SB BRIDGE PLAQUE DETAIL

S1-001, S1-008

N.T.S.

NOTE:

- SB BRIDGE PLAQUE SHALL BE LOCATED ON THE NORTHWEST WINGWALL AT ABUTMENT 2
- XXXX SHALL BE REPLACED WITH YEAR OF CONSTRUCTION COMPLETION

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Approvals YY.MM

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Permit-Seal

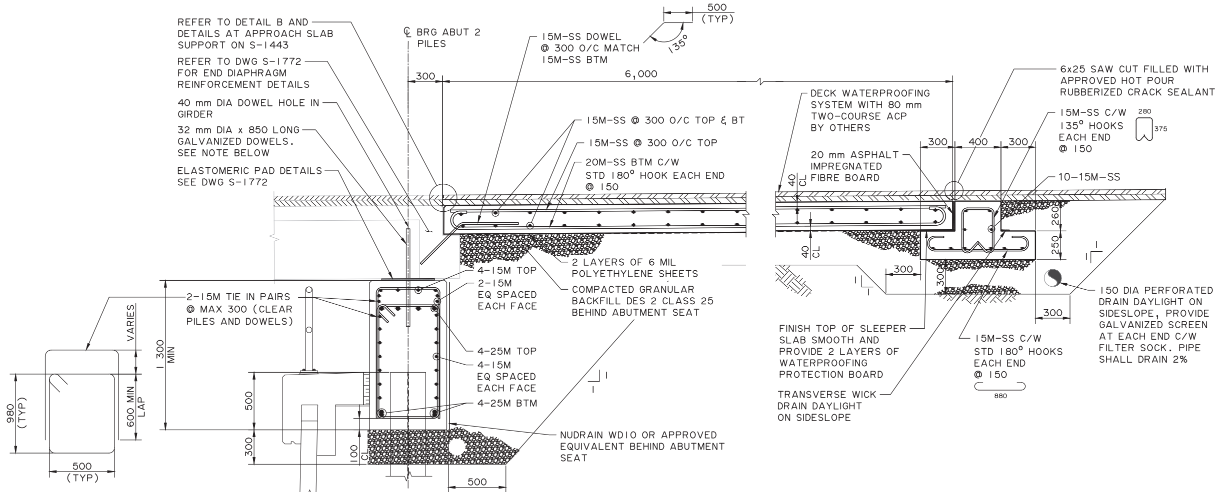
Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
ABUTMENT DETAILS - SHEET 1

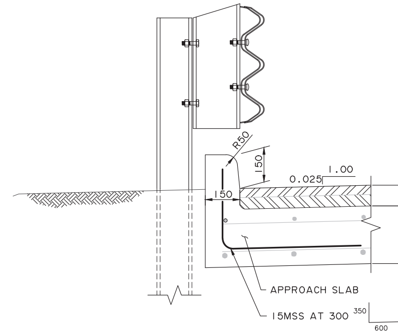
Project No. 1161-103725 Scale

Drawing No.
S001-006

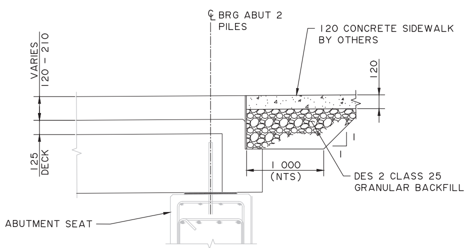


NOTE:
PROVIDE 38 mm DIA x 400 DEEP HOLES FOR THE DOWELS. HOLES SHALL BE DRILLED IN THE ABUTMENT SEAT AFTER THE GIRDERS HAVE BEEN ERECTED. SET DOWELS IN ABUTMENT SEAT WITH SIKA 212 FLOWABLE GROUT OR APPROVED EQUIVALENT. PLUG TOP OF HOLE IN GIRDER PRIOR TO DECK POUR.

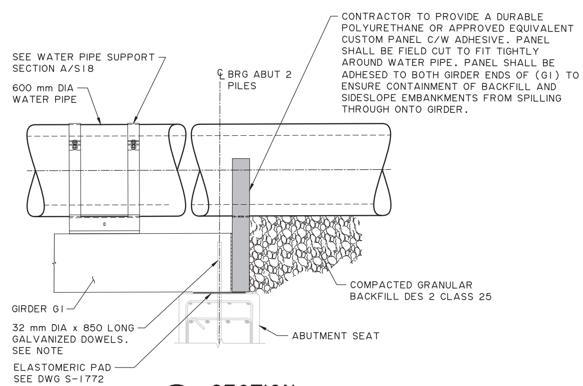
A SECTION S1-006, S1-011 1:20



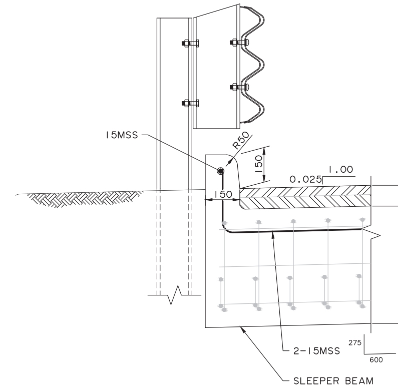
D SECTION S1-011 1:10



B SECTION S1-006, S1-011 1:20



C SECTION S1-006 1:20



E SECTION S1-011 1:10

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EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
ABUTMENT DETAILS - SHEET 2

Project No. 1161-103725 Scale

W:\active\1161103725\detailed_design\drawings\1161103725_S001-007 ABUTMENT - SHEET 2.dwg
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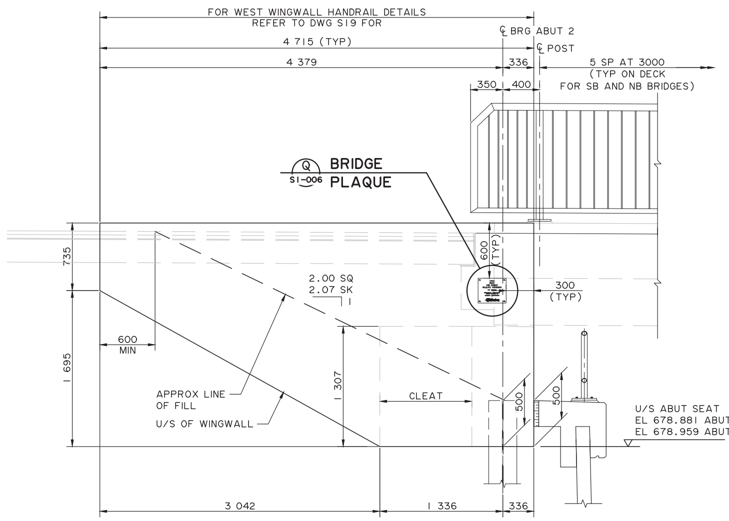
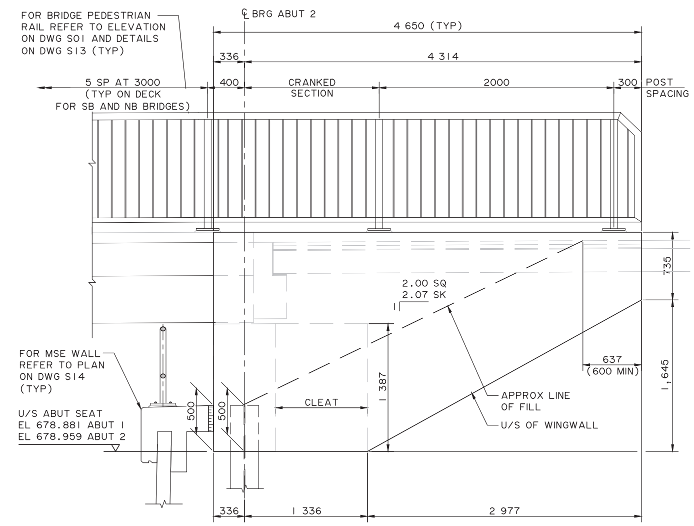
Drawing No. S001-007



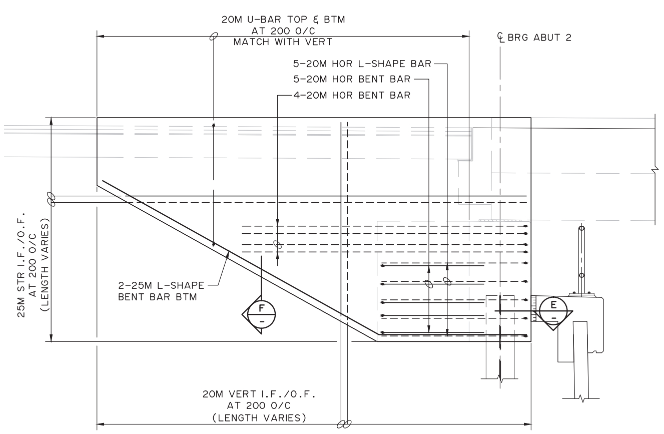
ABUTMENT 2 - WEST WINGWALL ELEVATION

ABUT 2 SHOWN, ABUT 1 OPPOSITE HAND (SIMILAR)
WEST WINGWALL HANDRAIL NOT SHOWN FOR CLARITY
1:25



ABUTMENT 2 - EAST WINGWALL ELEVATION

ABUT 2 SHOWN, ABUT 1 OPPOSITE HAND (SIMILAR)
1:25

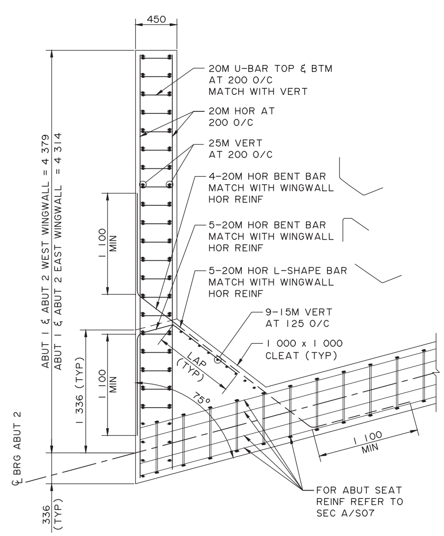


ABUTMENT 2 - WEST WINGWALL REINFORCEMENT

1:25

NOTES:

- ABUT 2 EAST WINGWALL REINFORCEMENT SIMILAR
- ABUT 1 REINFORCEMENT FOR WEST AND EAST WINGWALL SIMILAR



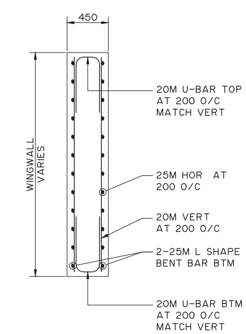
E ABUT 2 - SECTION

-, S1-006
1:25

- WEST CLEAT REBAR SHOWN (75°)

EAST CLEAT REBAR SIMILAR (105°) REFER TO ABUT 2 PLAN ON S06

- ABUT 1 CLEATS REBAR SIMILAR



F SECTION

1:25

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199 STREET
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Title
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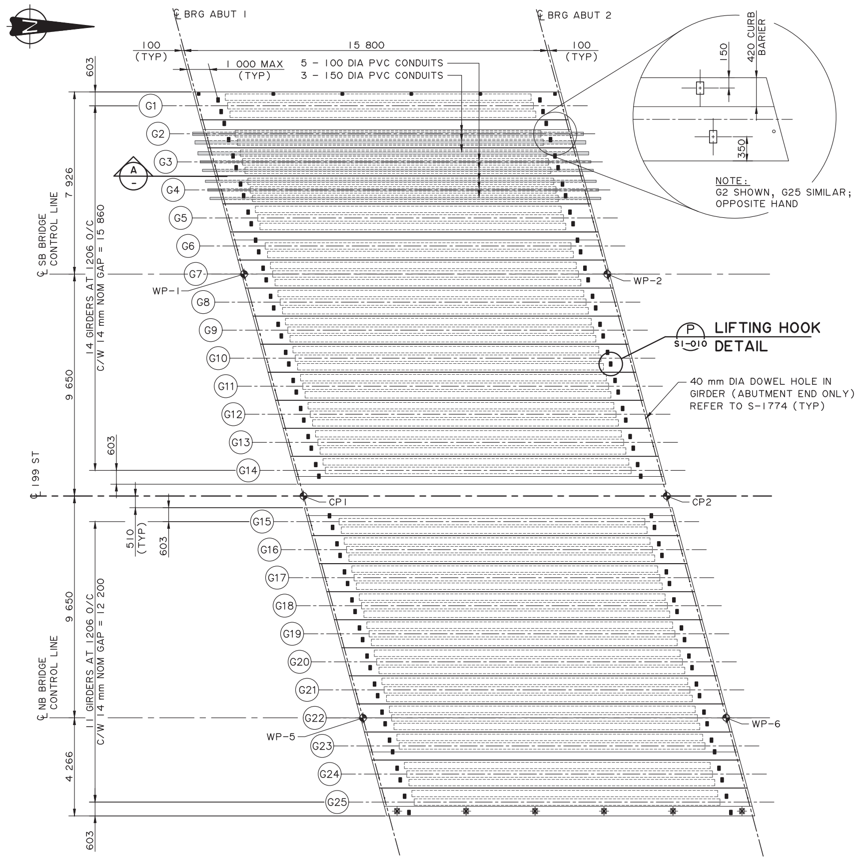
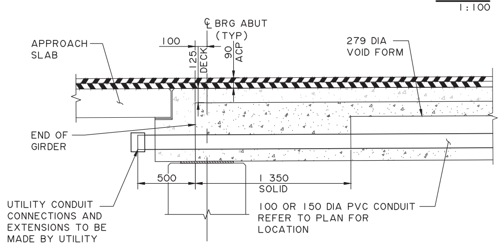
ABUTMENT DETAILS - SHEET 3

Project No. 1161-103725
Scale

Drawing No. S001-008



PLAN
1:100



A
PVC CONDUIT DETAIL 1:20
ABUT 1 SHOWN
ABUT 2 SIMILAR

GIRDER NOTES:

- DESIGN SPECIFICATION CAN/CSA-S6-14
- LIVE LOAD: CL-800 PLUS DLA (ONE WHEEL LINE PER GIRDER)
- DESIGN DEAD LOAD (kN/m):

SPAN	INTERIOR GIRDER (GIRDER LINES G1, G3-G5, G7-G13, G16-24)	G2, G25 CURB GIRDER	G6, G14, G15, G23 BARRIER GIRDER		125 mm DECK	90 mm ACP	SIDEWALK
			GIRDER	BARRIER			
16 m	11.26	15.65	11.26	7.39	4.40	2.60	7.98

MATERIALS:

- STANDARD WEIGHT SILICA FUME CONCRETE WITH 5% TO 8% AIR ENTRAINMENT (WHEN MEASURED IN PLASTIC STATE) SHALL BE USED THROUGHOUT.
- ALL CONCRETE SHALL CONTAIN 10% CONDENSED SILICA FUME BY WEIGHT OF CEMENT (+/- 0.5%) CONFORMING TO CSA A3001 FOR A TYPE SF SUPPLEMENTARY CEMENTING MATERIAL.
- CONCRETE COMPRESSIVE STRENGTH:
  - 28 DAY 50 MPa
  - AT RELEASE 35 MPa
- WELDED WIRE REINFORCING STEEL SHALL CONFORM TO CSA G30.15 GRADE 480W.
- REINFORCING STEEL SHALL CONFORM TO CAN/CSA-30.18 GRADE 400.
- REINFORCING STEEL BEING WELDED SHALL CONFORM TO CAN/CSA-30.18 GRADE 400W.
- PRESTRESSING STEEL SHALL CONFORM TO ASTM A-416M
  - 15.2 DIA - 7 WIRE LOW-RELAXATION STRAND (fpu = 1860 MPa)
  - JACKING LOAD: 201 kN/STRAND
  - DESIGN LOAD AFTER LOSSES: 165 kN/STRAND
- SUFFIX LETTER "CR" ON BAR MARKS INDICATED ON THE DRAWINGS AND AT STANDARD DRAWING S-1774 DENOTES CORROSION RESISTANT BARS WHICH SHALL BE SOLID STAINLESS STEEL REINFORCEMENT. SOLID STAINLESS STEEL REINFORCEMENT SHALL FOLLOW THE UNITED NUMBERING SYSTEM (UNS) DESIGNATIONS S31653, S31603, S31803, S30400 OR S32304 MEETING THE REQUIREMENTS OF ASTM A276 AND A955/A955M. THE MINIMUM YIELD STRENGTH SHALL BE 420 MPa, DEVELOP TO 400 MPa.
- GIRDER DOWELS SHALL CONFORM TO THE REQUIREMENTS OF CSA G40.21M GRADE 300W AND HOT-DIPPED GALVANIZED AFTER FABRICATION.
- GALVANIZING SHALL CONFORM TO THE CURRENT ASTM A123/A123M AND ASTM F2329.
- BEARING PADS SHALL CONSIST OF NEOPRENE 60 HARDNESS AND SHALL CONFORM TO AASHTO GRADE 5.
- SUBMIT PRECAST GIRDER SHOP DRAWINGS FOR REVIEW AND APPROVAL PRIOR TO FABRICATION.

CLEAR COVER (UNLESS NOTED OTHERWISE):

- REINFORCING STEEL - MIN 30 mm (EXCEPT G1, MIN 50 mm ON TOP)
- PRESTRESSING STRANDS - MIN 50 mm

FABRICATION:

- ALL EXPOSED CONCRETE CORNERS TO HAVE 20 mm CHAMFER OR FILLET.
- UNDERSIDE OF GIRDER AT BEARING LOCATION SHALL HAVE A CLASS 1 FINISH AND THE OUT-OF-FLATNESS SHALL NOT EXCEED 3 mm.
- GIRDER SUPPORT LOCATIONS DURING STORAGE, LIFTING AND TRANSPORTATION SHALL BE THE RESPONSIBILITY OF THE GIRDER FABRICATOR.
- REINFORCE BAR EXCEED 300 mm ABOVE DECK LEVEL IN GIRDER G3 AND G11 SHOULD BE CAPPED FOR SAFETY.

ERECTION:

- PROVISIONS FOR LIFTING AND HANDLING ARE THE RESPONSIBILITY OF THE SUPPLIER; ENSURE THAT THE SUPPORT IS ADEQUATE FOR ERECTION.
- LIFTING FORCE AT EACH HOOK MUST BE VERTICAL AT ALL TIMES.
- GIRDER TOP SURFACE MUST BE LEVEL AT ALL TIMES.
- THE CONTRACTOR SHALL ENSURE THAT ALL GIRDERS ARE APPROPRIATELY SUPPORTED DURING ALL ASPECTS OF HANDLING AND ERECTION.
- AFTER GIRDER CONNECTORS ARE INSTALLED, ALL LIFTING HOOKS SHALL BE CUT OFF AND EDGES GROUND SMOOTH.
- MINIMUM AGE FOR GIRDER BEFORE ERECTION SHALL BE 28 DAYS.

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Permit-Seal

Client/Project
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199 STREET
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EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
GIRDER LAYOUT

Project No. 1161-103725
Scale

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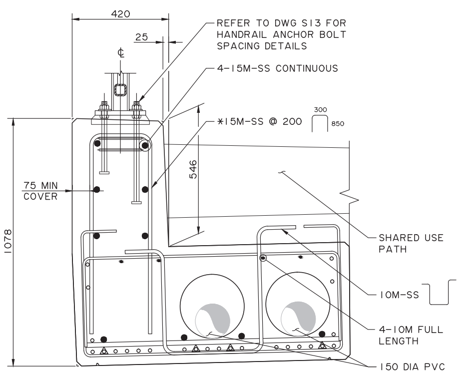
2016-6-01 1:04pm BY: MBUCZYNSKA

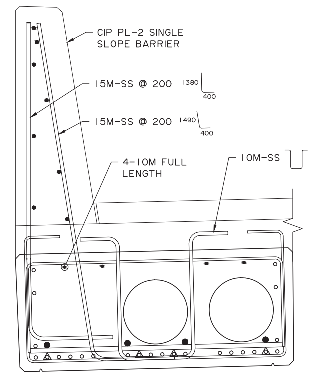
Drawing No.
S001-009



CURB BARRIER – (G2) GIRDER SECTION
1:10

TOTAL ∘ 24 STRAIGHT STRANDS
NOTE: ⚠ 4-DEBONDED STRANDS
1600 mm FROM GIRDER END

NOTE:
- *ADDITION 1-15M-SS AT THE END OF CURB BY ABUTMENTS
- 150 DIA PVC CONDUITS APPLICABLE FOR GIRDER LINE G2 REFER TO GIRDER PLAN ON S09 FOR CONDUIT LOCATIONS

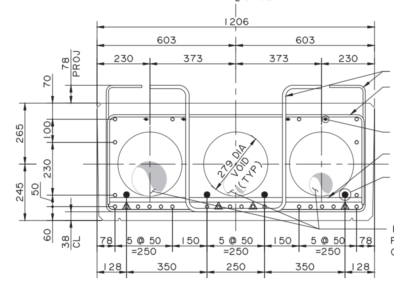


EXTERIOR BARRIER – GIRDER SECTION
1:10

TOTAL ∘ 24 STRAIGHT STRANDS
NOTE: ⚠ 4-DEBONDED STRANDS
1600 mm FROM GIRDER END

NOTE:
- APPLICABLE FOR GIRDER LINES G6, G14, G15, G23

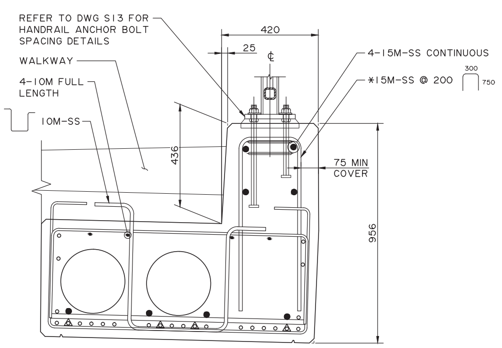
NOTES:
- REFER TO STD DWG S-1774-08 FOR STIRRUP SPACING AND REINFORCEMENT DETAILS
- ALL CR REBAR SHALL BE STAINLESS STEEL



TYPICAL INTERIOR GIRDER SECTION
1:10

TOTAL ∘ 26 STRAIGHT STRANDS
NOTE: ⚠ 4-DEBONDED STRANDS
1600 mm FROM GIRDER END

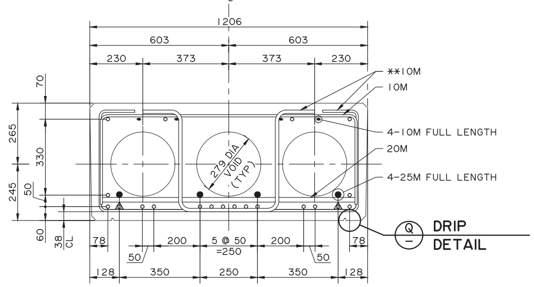
NOTE:
- APPLICABLE FOR GIRDER LINES G3-G5, G7-G13, G16-G22, G24
- 100 AND 150 DIA PVC CONDUITS APPLICABLE FOR GIRDER LINES G3 & G4, REFER TO GIRDER PLAN ON S09 FOR CONDUIT LOCATIONS



CURB BARRIER – (G25) GIRDER SECTION
1:10

TOTAL ∘ 24 STRAIGHT STRANDS
NOTE: ⚠ 4-DEBONDED STRANDS
1600 mm FROM GIRDER END

NOTE:
- *ADDITION 1-15M-SS AT THE END OF CURB BY ABUTMENTS

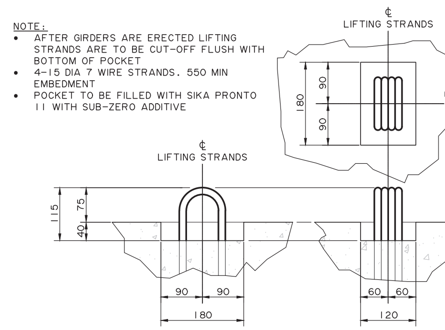


(G1) – GIRDER SECTION
1:10

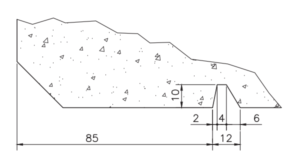
TOTAL ∘ 20 STRAIGHT STRANDS
NOTE: ⚠ 2-DEBONDED STRANDS
1400 mm FROM GIRDER END

NOTE:
- **10M BAR WITH NO PROJECTION. MINIMUM COVER 50 mm
- REFER TO STD DWG S-1774-08 FOR STIRRUP SPACING AND REINFORCEMENT DETAILS. FOR GIRDER (G1), G1503 IS TO BE EXCLUDED
- PIPE SUPPORT AND SAFETY COVER FOR WATER PIPE NOT SHOWN FOR CLARITY SEE DETAILS ON DWG S18

NOTE:
- AFTER GIRDERS ARE ERECTED LIFTING STRANDS ARE TO BE CUT-OFF FLUSH WITH BOTTOM OF POCKET
- 4-15 DIA 7 WIRE STRANDS. 550 MIN EMBEDMENT
- POCKET TO BE FILLED WITH SIKA PRONTO 11 WITH SUB-ZERO ADDITIVE



P / S1-009 LIFTING HOOK DETAIL
1:5



Q / – DRIP DETAIL
1:1

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GIRDER DETAILS

Project No. 1161-103725 Scale

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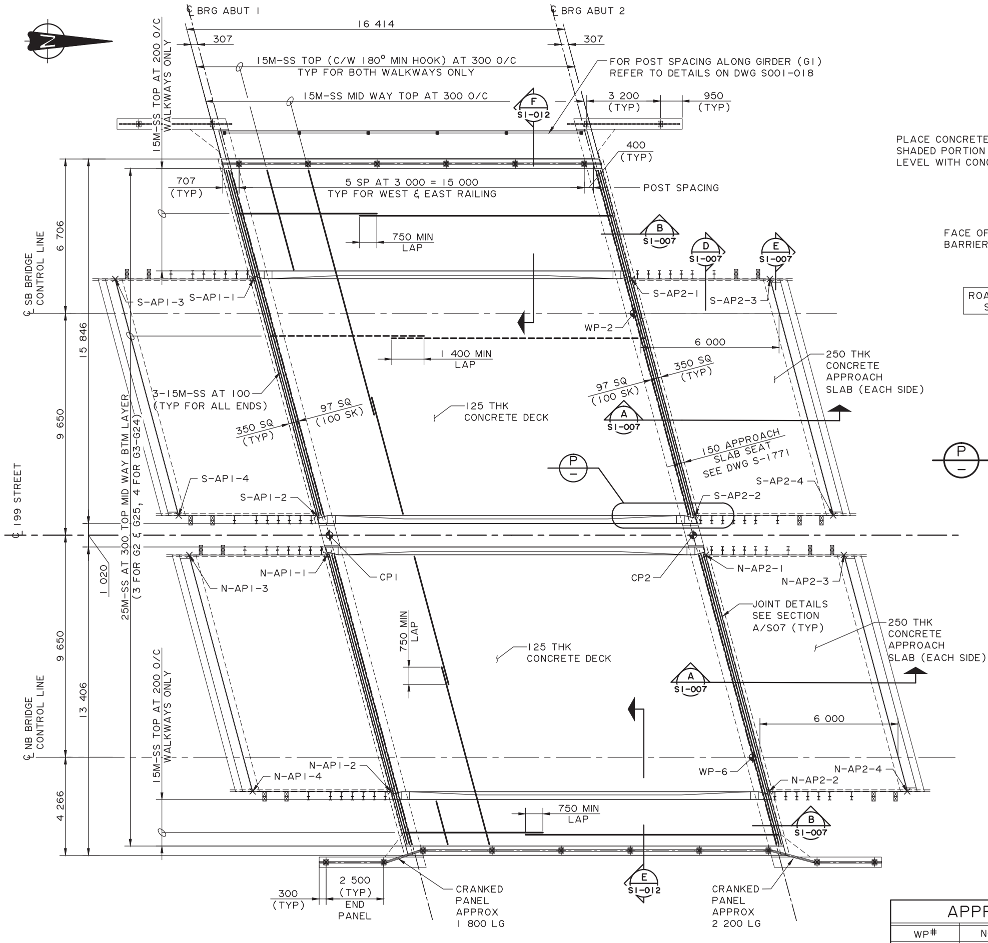
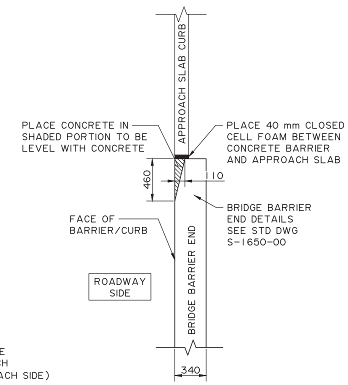
2016-6-01 1:04pm BY: JDELCARMEN

Drawing No.
S001-010



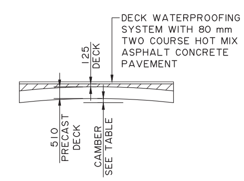
DECK AND APPROACH SLAB REINFORCEMENT PLAN
1:100



BARRIER/CURB TRANSITION PLAN
NTS

DECK NOTES:

- CONCRETE DECK, CURB, BARRIERS, AND SIDEWALK SHALL BE CLASS HPC CONCRETE
- BLACK REINFORCING STEEL SHALL CONFORM TO CSA STANDARD 30.18 GRADE 400
- ALL CIP CONCRETE REINFORCING STEEL SHALL HAVE 50 CLEAR COVER UNLESS NOTED OTHERWISE
- EXTERIOR FACES OF CONCRETE BARRIERS SHALL BE GIVEN A CLASS 3 FINISH AND PIGMENTED SEALER AS PER THE SPECIFICATIONS FOR BRIDGE CONSTRUCTION, ALL OTHER CONCRETE FINISHES SHALL BE AS SPECIFIED IN THE SPECIFICATIONS FOR BRIDGE CONSTRUCTION
- BARRIERS SHALL BE POURED BEFORE SIDEWALK POUR.
- ALL EXPOSED CORNERS SHALL HAVE A 20 mm CHAMFER OR FILLET UNLESS NOTED OTHERWISE
- SOLID STAINLESS STEEL REINFORCING BARS SHALL BE USED FOR ALL TOP MAT DECK STEEL AND ALL REINFORCING IN THE MEDIAN, BARRIERS, CURB AND SIDEWALK SLAB.
- SOLID STAINLESS STEEL REINFORCING BARS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A276 AND A955M AND SHALL BE DEFORMED STAINLESS STEEL MEETING THE MATERIAL REQUIREMENTS OF A151 GRADE 316LN, 2205, 2101, 2304, OR UNS S24100(XM28). THE MINIMUM YIELD STRENGTH SHALL BE 420 MPa, DEVELOPED TO 400 MPa.
- LENGTH OF DECK BEYOND ABUTMENT CENTERLINE AND LENGTH OF BARRIER AND MEDIAN JOINT SPACING SHOWN AT 15°C. CONTRACTOR TO CORRECT FOR TEMPERATURE VARIATION BY MAINTAINING EQUAL LENGTH JOINT SPACING
- HARDWARE FOR CONNECTION BETWEEN CONCRETE BARRIER AND THRIE BEAM BARRIER TO BE INSTALLED DURING CONSTRUCTION OF BRIDGE ABUTMENTS. POST AND THRIE BEAM NOT TO BE INSTALLED UNTIL AFTER ROADWAY ACP IS PLACED
- PROVIDE WEEP TUBES AT LOW POINTS INDICATED ON THE DECK PLAN AS PER S-1443.
- FOR ACP WEARING SURFACE, DECK CONCRETE FINISH SHALL BE CLASS 4. CURB BLOCKOUT FINISHES TO MATCH PRECAST GIRDERS.



CAMBER DIAGRAM
NTS

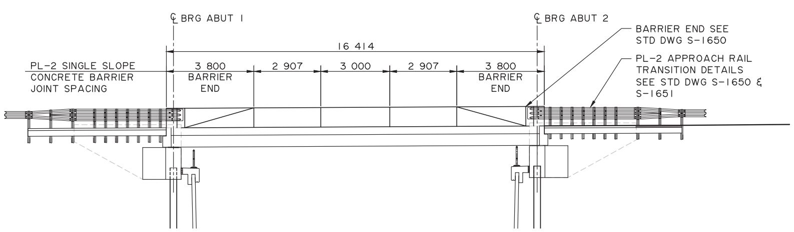
NOTES:
- NET CAMBER VALUES ARE ESTIMATED VALUES ONLY. ACTUAL VALUES MAY VARY ACCORDING TO VARIATIONS IN PRESTRESS LOSSES AND PROPERTIES OF CONCRETE
- FIELD ADJUST AS REQUIRED BY RAISING OR LOWERING GRADE LINE TO MAINTAIN MINIMUM DECK THICKNESS

CAMBER TABLE

DEFLECTION (-) OR CAMBER (+)	16 m GIRDER	
	INTERIOR	CURB
AT TRANSFER	22	28
CURB	-	-18
CAMBER GROWTH BEFORE DECK	0	4
125 DECK + 90 ACP	-17	-4
NET CAMBER	14	10

APPROACH SLAB WORK POINTS

WP#	NORTHING	EASTING	ELEVATION	LOCATION
N-AP1-1	5626063.714	22287.090	681.372	NB BRIDGE
N-AP1-2	5926066.498	22297.356	681.129	NB BRIDGE
N-AP1-3	5926057.715	22287.109	681.342	NB BRIDGE
N-AP1-4	5926060.498	22297.374	681.099	NB BRIDGE
N-AP2-1	5926080.149	22287.041	681.454	NB BRIDGE
N-AP2-2	5926082.933	22297.309	681.211	NB BRIDGE
N-AP2-3	5926086.149	22287.023	681.484	NB BRIDGE
N-AP2-4	5926088.933	22297.291	681.241	NB BRIDGE
S-AP1-1	5926060.464	22275.100	681.099	SB BRIDGE
S-AP1-2	5926063.249	22285.372	681.370	SB BRIDGE
S-AP1-3	5926054.464	22275.118	681.069	SB BRIDGE
S-AP1-4	5926057.250	22285.394	681.340	SB BRIDGE
S-AP2-1	5926076.898	22275.051	681.181	SB BRIDGE
S-AP2-2	5926079.683	22285.323	681.452	SB BRIDGE
S-AP2-3	5926082.900	22275.037	681.211	SB BRIDGE
S-AP2-4	5926085.683	22285.305	681.482	SB BRIDGE



PL-2 BARRIER ELEVATION
(TYP) 1:100

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PROJECT MANAGER: D.H./T.C. DESIGN: R.C. DRAWN: J.D.C.

Permit-Seal

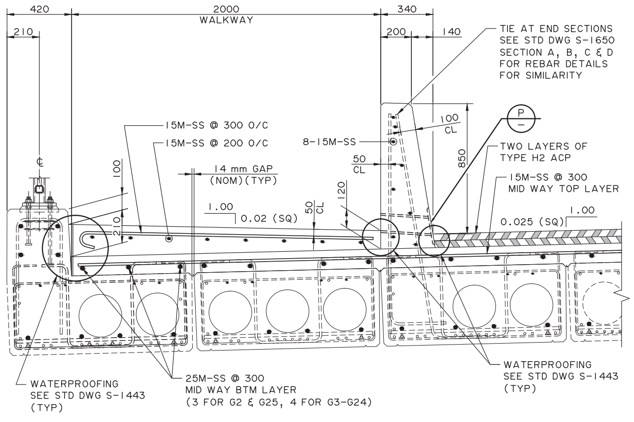
Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

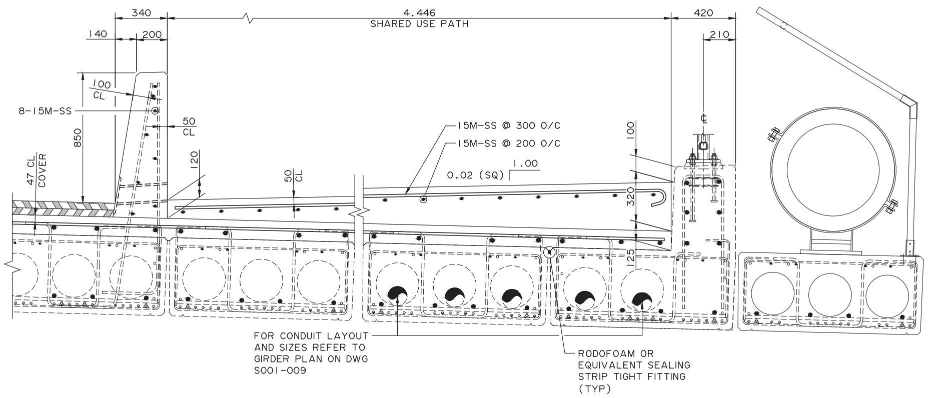
Title
WEDGEWOOD CREEK WILDLIFE CROSSING
DECK - SHEET 1

Project No. 1161-103725 Scale

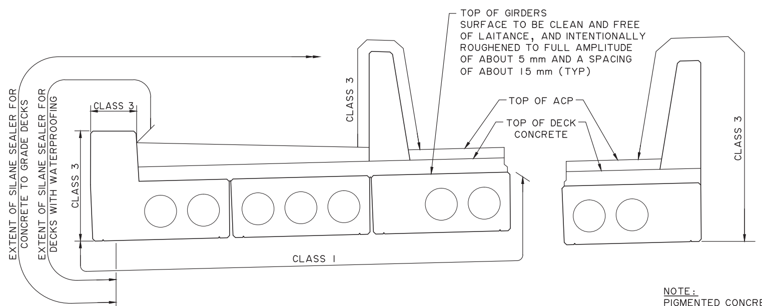
Drawing No. S001-011



E SECTION S1-011 1:15

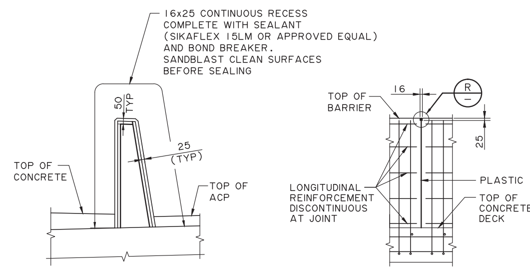


F SECTION S1-011 1:15

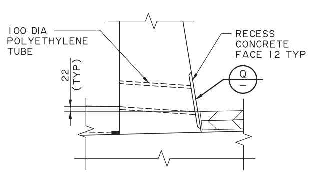


PRECAST GIRDER/BARRIER FINISHES 1:20

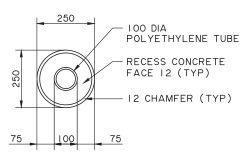
NOTE:
PIGMENTED CONCRETE SEALER
SHALL BE APPLIED OVER CLASS 3
FINISHES. COLOR OF PIGMENT SHALL
BE "CONCRETE PRECAST"



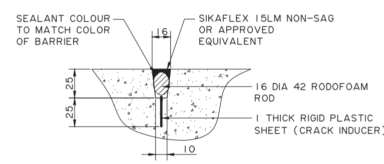
BARRIER JOINT DETAIL 1:20



DRAIN THROUGH BARRIER DETAIL 1:10
SPACED AT 3 m
10 REQUIRED



Q DETAIL 1:10



NOTE:
AFTER THE ENTIRE DECK HAS BEEN CAST, THE CONCRETE BARRIER SHALL BE PLACED CONTINUOUSLY WITH FORMED CONTROL JOINTS AT MAX 3000. AT CONTROL JOINT, LONGITUDINAL REINFORCEMENT SHALL BE DISCONTINUOUS AND HAVE 50 CONCRETE COVER FROM THE CENTERLINE OF THE JOINTS

R DETAIL 1:2

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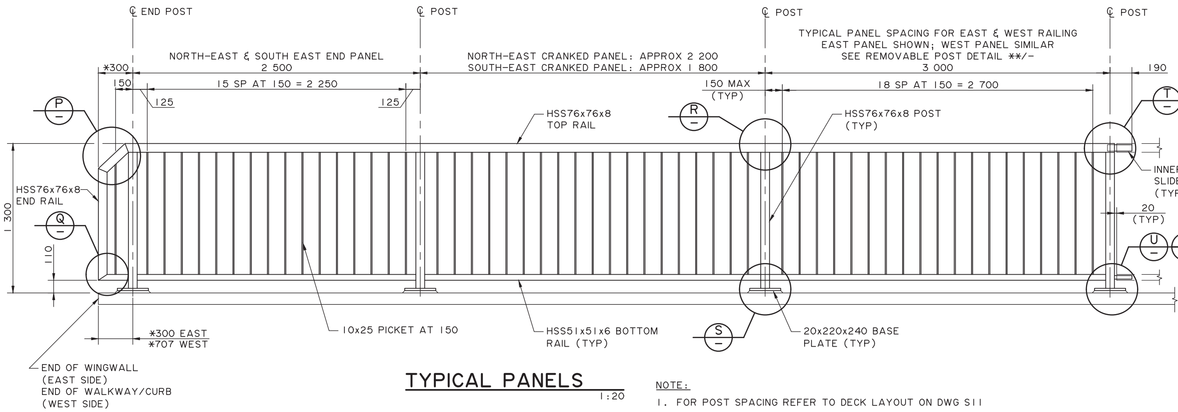
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
DECK - SHEET 2

Project No. 1161-103725
Scale

W:\active\1161103725\detailed_design\drawings\1161103725_S001-012 DECK_SHEET 2.dwg
2016-6-01 1:05pm BY: MBUCZYNSKA

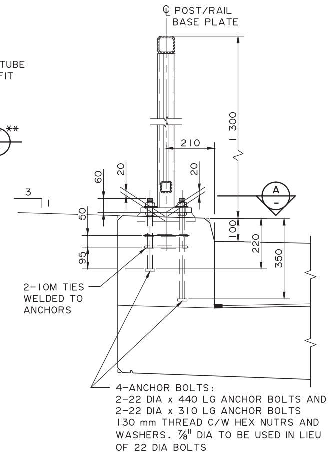
Drawing No.
S001-012



TYPICAL PANELS
1:20

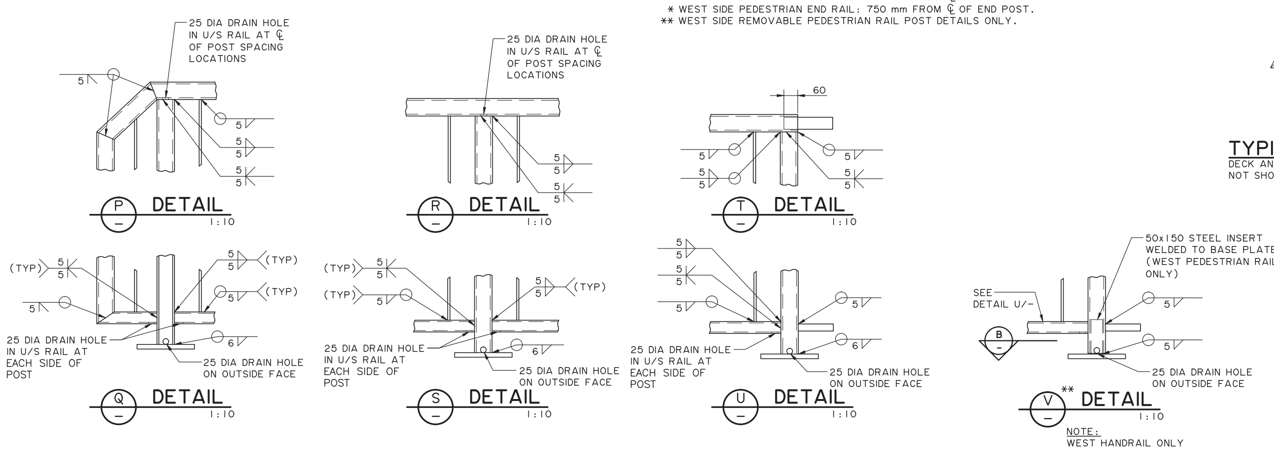
NOTE:

1. FOR POST SPACING REFER TO DECK LAYOUT ON DWG S11
2. * EAST SIDE PEDESTRIAN END RAIL: 300 mm FROM ℄ OF END POST.
   * WEST SIDE PEDESTRIAN END RAIL: 750 mm FROM ℄ OF END POST.
   ** WEST SIDE REMOVABLE PEDESTRIAN RAIL POST DETAILS ONLY.



TYPICAL RAILING SECTION
1:10

DECK AND SIDEWALK REINFORCEMENT NOT SHOWN FOR CLARITY



FABRICATION

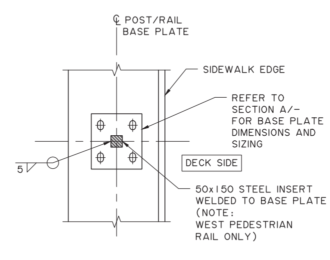
- ALL WORK SHALL BE IN ACCORDANCE WITH ALBERTA TRANSPORTATION SPECIFICATIONS FOR BRIDGE CONSTRUCTION (LATEST EDITION)
- ALL STEEL SHALL BE STRUCTURAL STEEL IN ACCORDANCE WITH CSA G40.21 GRADE 350W, EXCEPT STRUCTURAL TUBING SHALL CONFORM TO ASTM A500B. ANCHOR BOLTS SHALL CONFORM TO ASTM A307
- ANCHOR BOLTS SHALL BE 22 DIA. EACH BOLT SHALL BE C/W HEX NUT, THIN NUT AND 5 THICK REGULAR OR SPECIAL WASHER AS NOTED, AND SHALL BE THREADED FOR 130 mm. IF IMPERIAL SIZE ANCHOR BOLTS ARE PROVIDED, 7/8" DIA SHALL BE USED IN LIEU OF 22 DIA. ALL BOLT HOLES SHALL BE DRILLED 2 mm LARGER THAN THE SPECIFIED BOLT DIAMETER
- ALL WELDS SHALL CONFORM TO AWS D1.5. ALL WELDS SHALL BE GROUND SMOOTH
- PROVIDE VENT AND DRAIN HOLES IN ALL MEMBERS
- ALL METAL FABRICATIONS, INCLUDING RAILING COMPONENTS, BASE PLATES, ANCHOR BOLTS, NUTS, WASHERS AND TIES SHALL BE HOT DIPPED GALVANIZED TO ASTM A123 AFTER FABRICATION. GALVANIZING ON MATING SURFACES TO HAVE UNIFORM THICKNESS TO ENSURE SLIDING FIT
- HANDRAIL FABRICATOR SHALL MAKE ALLOWANCE FOR ROADWAY GRADE TO ENSURE CORRECT POST SPACING AND VERTICAL ALIGNMENT OF THE POSTS AND PICKETS
- CONTRACTOR SHALL ADJUST RAIL LENGTH TO ACCOMMODATE ROADWAY GRADE BY CHANGING THE 300 mm DIMENSION AT THE ENDS OF THE HANDRAIL
- POSTS SHALL BE FABRICATED WITH TUBE SEAM TO THE OUTSIDE. RAILS SHALL BE FABRICATED WITH TUBE SEAM ON THE BOTTOMS
- THE BOTTOM SURFACE OF THE BASE PLATES SHALL BE COATED BY AN APPROVED COATING SYSTEM, SUITABLE FOR APPLICATION ON GALVANIZED STEEL, TO PREVENT CONTACT BETWEEN THE ZINC AND THE GROUT. THE COLOR SHALL BE MEDIUM GRAY
- ALL EXPOSED CUT TUBE ENDS SHALL BE GROUND SMOOTH

ERECTION

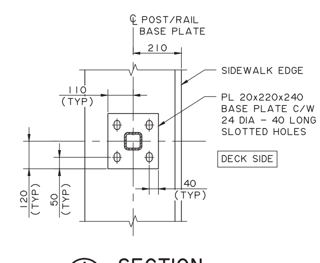
- ALL POSTS SHALL BE VERTICAL
- ALL DIMENSIONS ARE MEASURED PARALLEL TO TOP OF CURB AND ALONG CENTERLINE OF ANCHOR BOLT ASSEMBLIES
- LINE AND ELEVATION OF RAIL SHALL BE SET BY INSTRUMENT

HAND RAILING NOTES

- RAIL AND POST DESIGN MEETS CSA/CAN-S6-14 FOR BICYCLE RAILING



B SECTION 1:10



A SECTION 1:10

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Permit-Seal

Client/Project

RIVERVIEW HEIGHTS ESTATES LTD.

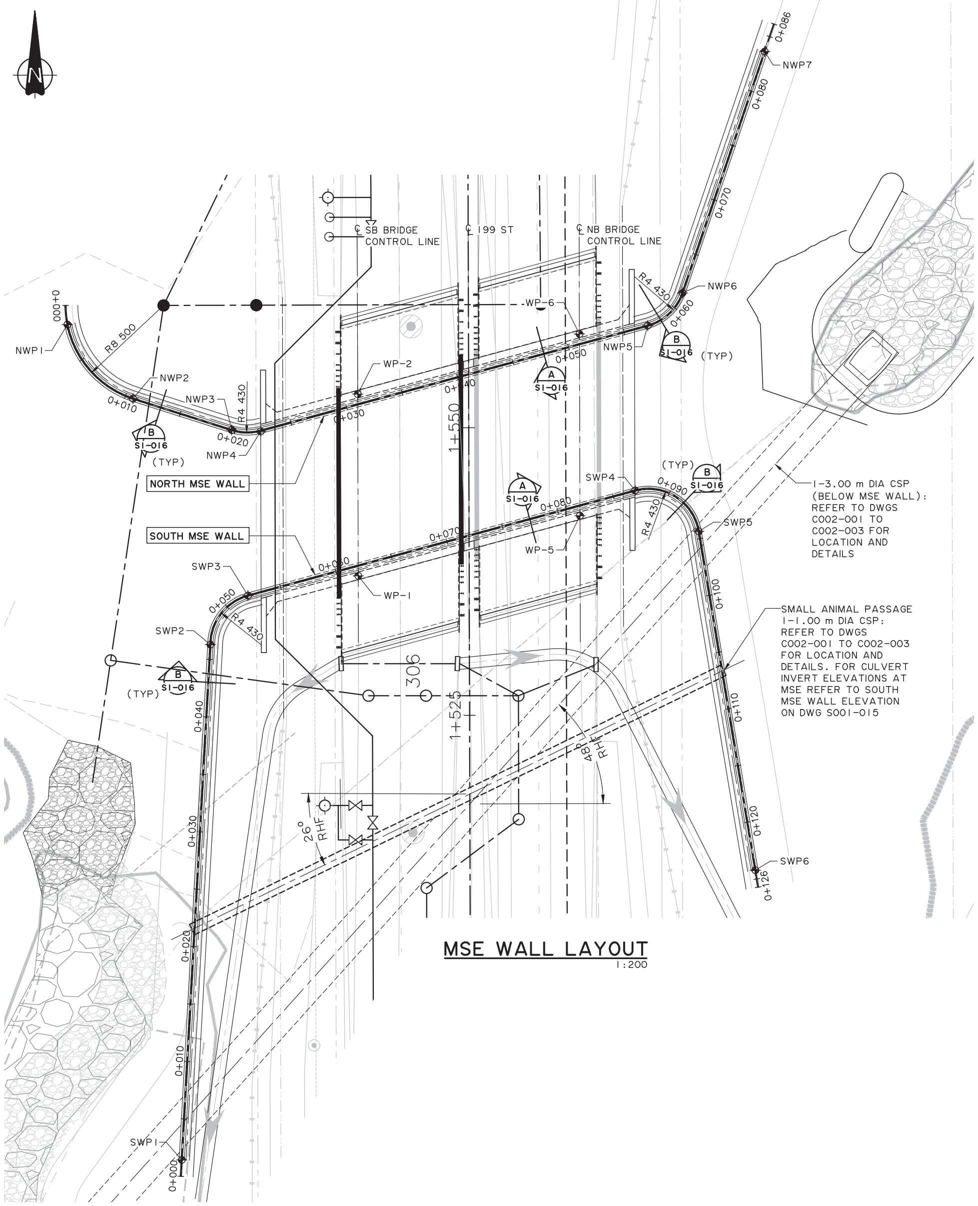
199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title

WEDGEWOOD CREEK WILDLIFE CROSSING
PEDESTRIAN HANDRAIL

Project No. 1161-103725 Scale

Drawing No. S001-013



MSE WALL LAYOUT
1:200

NOTES:

- FOR PILE LAYOUT REFER TO SHEET S001-005
- THE MSE WALL DESIGN AND CONSTRUCTION SHALL FOLLOW THE LATEST VERSION OF "SPECIFICATION FOR BRIDGE CONSTRUCTION" FROM ALBERTA TRANSPORTATION
- MSE WALL SUPPLIER SHALL PROVIDE DETAILED DESIGN/SHOP DRAWINGS WHICH ARE TO SHOW HOW THE MSE WALL INTERFACES WITH THE STRUCTURE AND MEETS THE DESIGN REQUIREMENTS. THESE DRAWINGS SHALL BE SUBJECT TO REVIEW BY THE ENGINEER FOR COMPLIANCE WITH THESE DESIGN REQUIREMENTS
- PRECAST PANEL AND ATTACHMENT DETAIL SHALL BE DESIGNED TO ACCOMMODATE THE RESIDUAL SETTLEMENT OF PANEL AFTER INSTALLATION. REFER TO GEOTECHINCAL REPORT

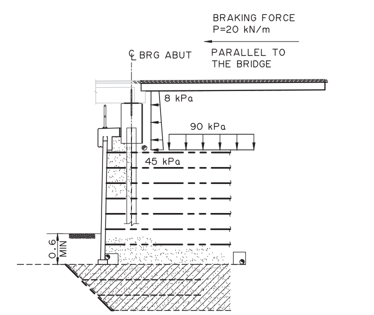
QUANTITY

ITEM		UNIT	SOUTH ABUTMENT 1	NORTH ABUTMENT 2
HANDRAIL	750 mm HIGH	m	33	33
	1070 mm HIGH	m	90	50
MSE WALL PANEL		m^2	550	330

MSE WORKING POINT TABLE

WP	NORTHING	EASTING	ELEVATION
SWP1	5926010.411	22261.236	678.926
SWP2	5926055.208	22263.725	679.394
SWP3	5926059.470	22266.995	679.394
SWP4	5926068.601	22300.675	679.394
SWP5	5926065.056	22306.203	679.394
SWP6	5926035.595	22311.131	677.313
NWP1	5926083.031	22251.286	677.429
NWP2	5926076.590	22257.000	679.030
NWP3	5926073.860	22265.579	679.393
NWP4	5926073.738	22268.100	679.496
NWP5	5926082.936	22301.761	679.496
NWP6	5926085.784	22304.796	679.496
NWP7	5926106.771	22311.943	676.688

NOTE: MSE WORKING POINTS PROVIDED AT TOP COPING



HORIZONTAL LOADS TO MSE WALL FROM ABUTMENT BACKFILL AND SUPERSTRUCTURE
NTS

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199 STREET
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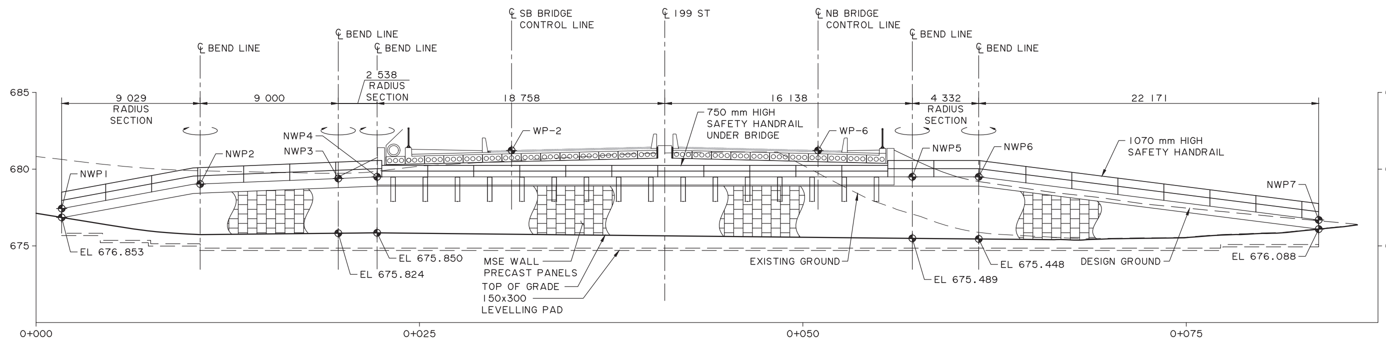
EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
MSE WALL - SHEET 1

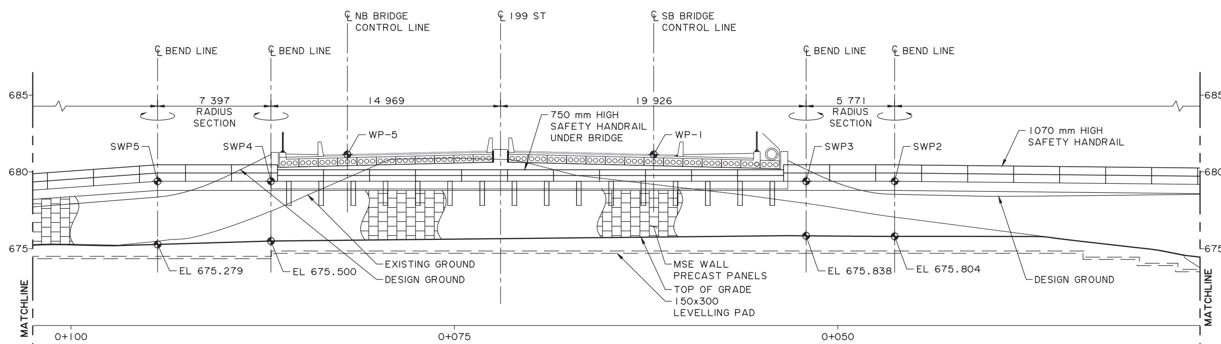
Project No. 1161-103725 Scale

Drawing No. S001-014



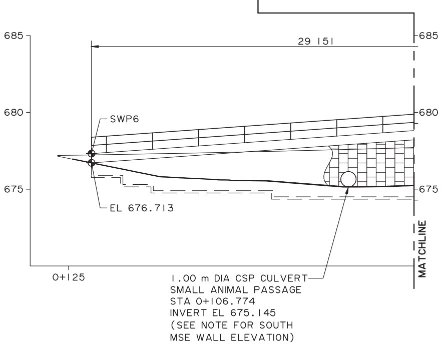
NORTH MSE WALL ELEVATION

LOOKING NORTH 1:100



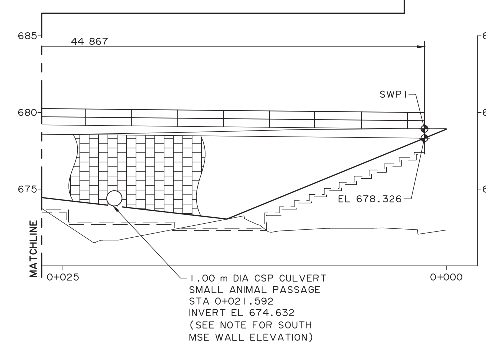
SOUTH MSE WALL ELEVATION

LOOKING SOUTH 1:100



NOTE:

- LOCATION OF 1.00 m CSP CULVERT (SMALL ANIMAL PASSAGE) CONFIRM WITH SITE PLAN ON DWG S001-002 AND CULVERTS - GENERAL LAYOUT ON DWG S002-001
- INVERT ELEVATIONS FOR 1.00 m CSP CULVERT (SMALL ANIMAL PASSAGE) TO BE CONFIRMED FOR CONSTRUCTION



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EDMONTON, AB

Title

WEDGEWOOD CREEK WILDLIFE CROSSING
MSE WALL - SHEET 2

Project No. 1161-103725

Scale

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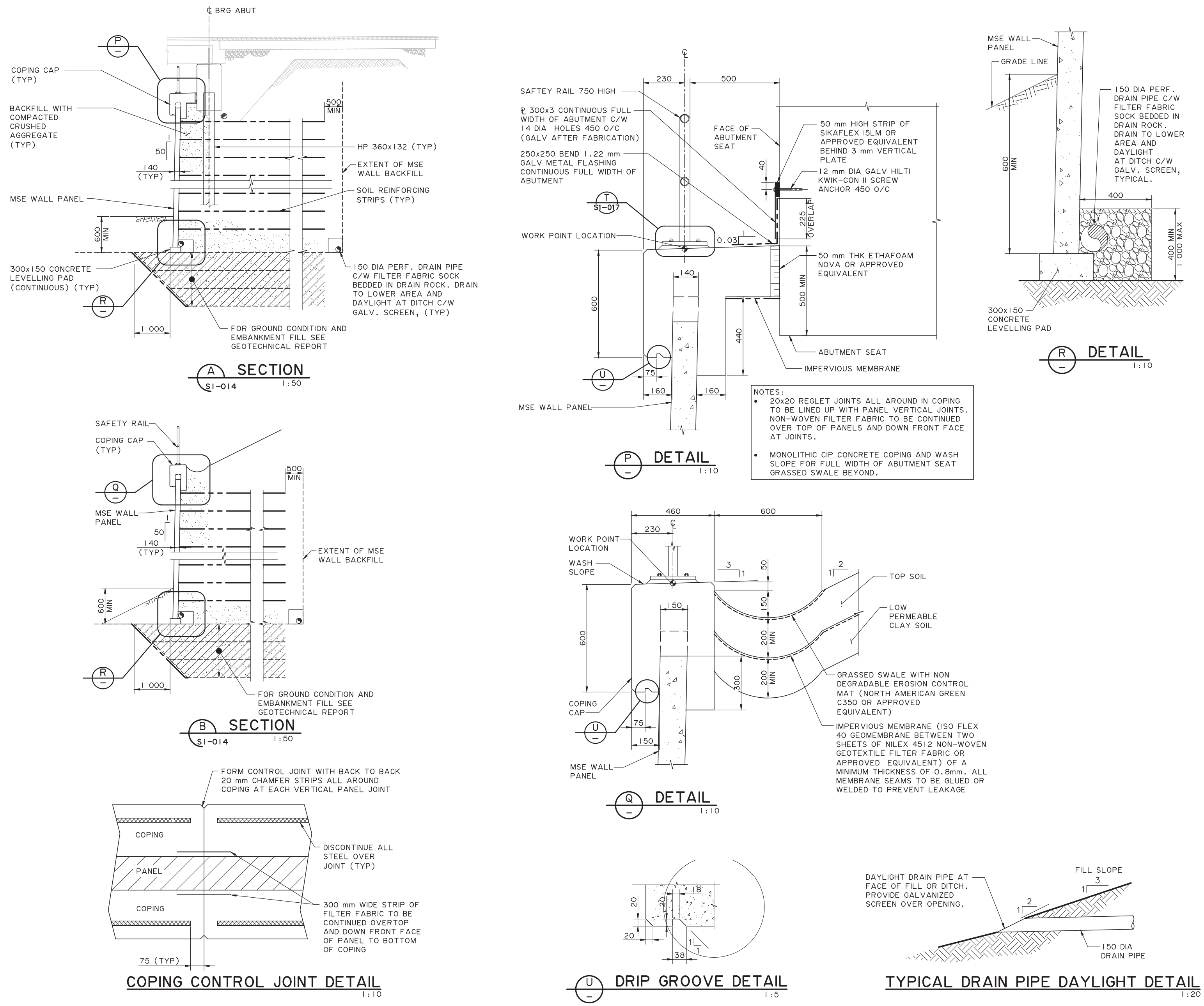
Drawing No. S001-015



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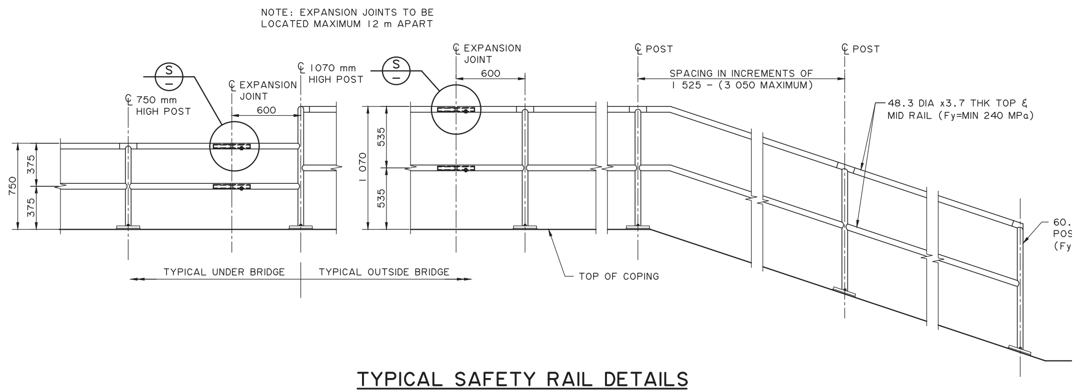
Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

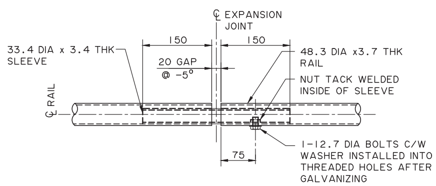
Title
WEDGEWOOD CREEK WILDLIFE CROSSING
MSE WALL - SHEET 3

Project No. 1161-103725
Scale

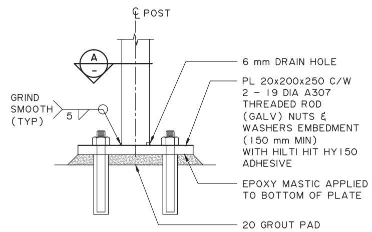
Drawing No. S001-016



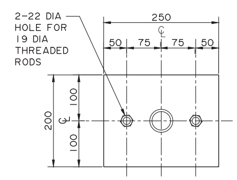
TYPICAL SAFETY RAIL DETAILS
NOTE: ALL MATERIALS TO BE HOT DIPPED GALVANIZED
1:20



S DETAIL
1:5



T SECTION
S1-016
1:5



A SECTION
1:5

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199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
MSE WALL - SHEET 4

Project No. 1161-103725
Scale

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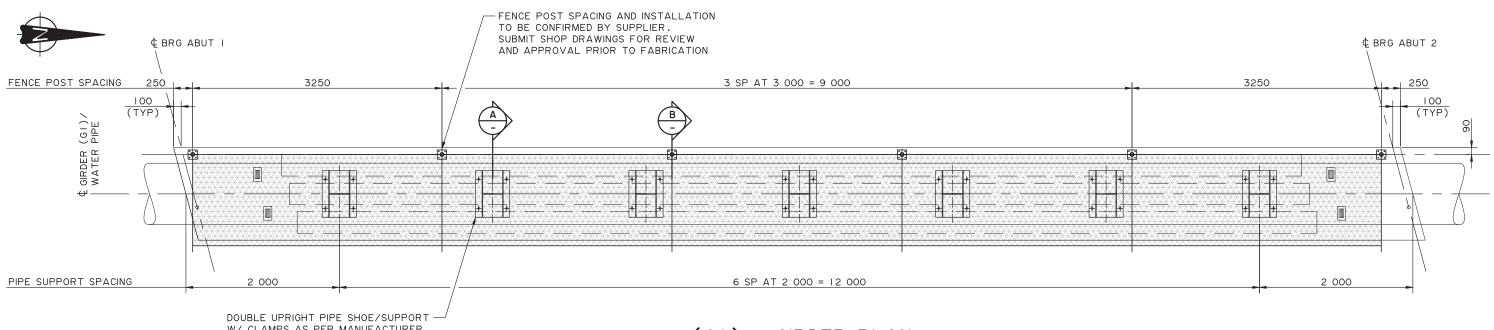
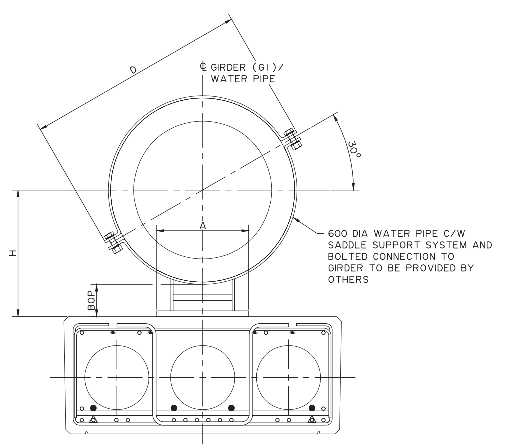
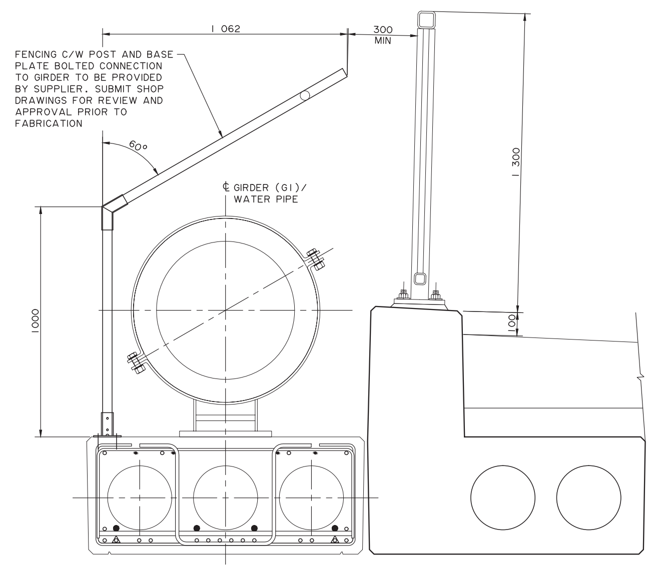
Drawing No.
S00-017



(GI) - GIRDER PLAN
1:30



A WATER PIPE SUPPORT
1:10



B SAFETY COVER FOR WATER PIPE ALONG GIRDER (GI)
1:10

NOTES:

1. PIPE SUPPORT ANCHORAGE ON GIRDER GI TO BE INSTALLED DURING THE FABRICATION OF GIRDER. SUBMIT SHOP DRAWINGS FOR REVIEW AND APPROVAL PRIOR TO FABRICATION
2. SAFETY COVER BASE PLATE ANCHORAGE ON GIRDER GI TO BE INSTALLED DURING THE FABRICATION OF GIRDER. SUBMIT SHOP DRAWINGS FOR REVIEW AND APPROVAL PRIOR TO FABRICATION

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Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

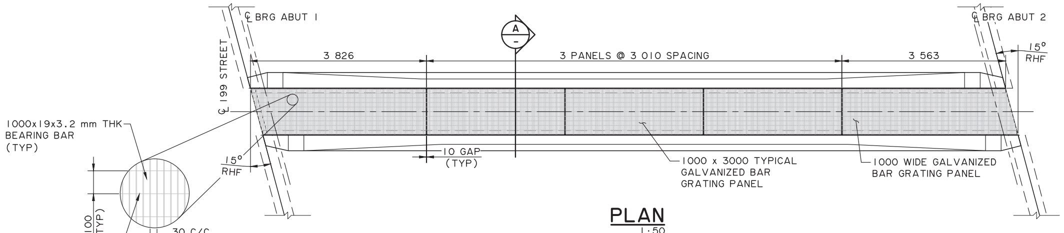
199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
MISCELLANEOUS SHEET 1

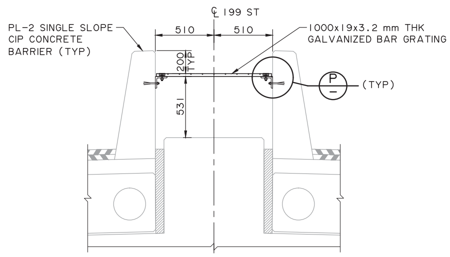
Project No. 1161-103725 Scale

2016-6-01 1:07pm BY: MBUCZYNSKA

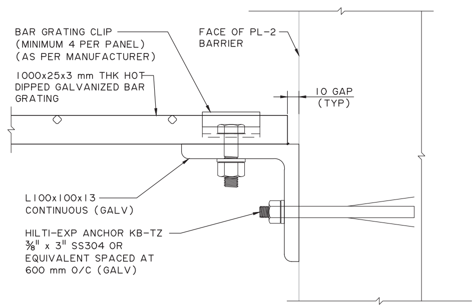
Drawing No.
S001-018



PLAN
1:50



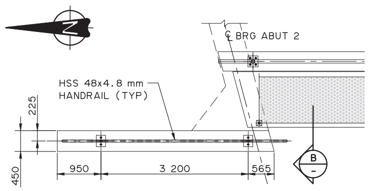
A SECTION
1:20



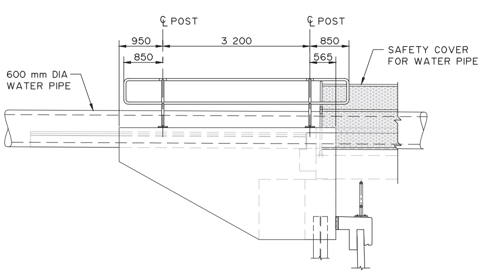
P DETAIL
1:2

GRATING COVER BETWEEN SB & NB BRIDGES

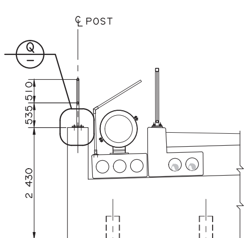
- BAR GRATING DESIGN LOAD
  - SAFE UNIFORM LOAD = 4 kPa



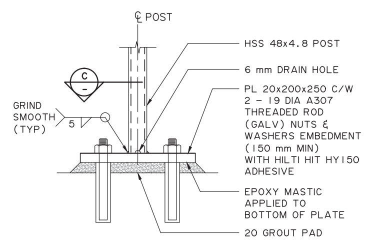
PLAN
1:50



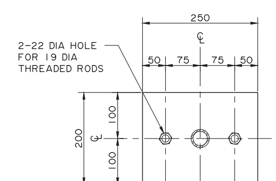
SAFETY RAILING ALONG WEST WINGWALL
1:50
ABUT 2 SHOWN
ABUT 1 OPPOSITE HAND; SIMILAR



B SECTION
1:50



Q DETAIL
1:5



C SECTION
1:5

Stantec

Stantec Consulting Ltd.
10160 - 112 Street
Edmonton AB Canada
Tel. 780.917.7000
www.stantec.com

Legend

Notes

Development Engineer, Sustainable Development

Approvals YY.MM

Revision | By | Appd. | YY.MM

Issued	By	Appd.	YY.MM
SECOND SUBMISSION	R.C.	T.C.	16.06.01
FIRST SUBMISSION	R.C.	T.C.	15.12.04

PROJECT MANAGER: D.H./T.C. DESIGN: R.C. DRAWN: J.D.C.

Permit-Seal

Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK WILDLIFE CROSSING
MISCELLANEOUS SHEET 2

Project No. 1161-103725
Scale

Drawing No.
S001-019

SURVEY BY

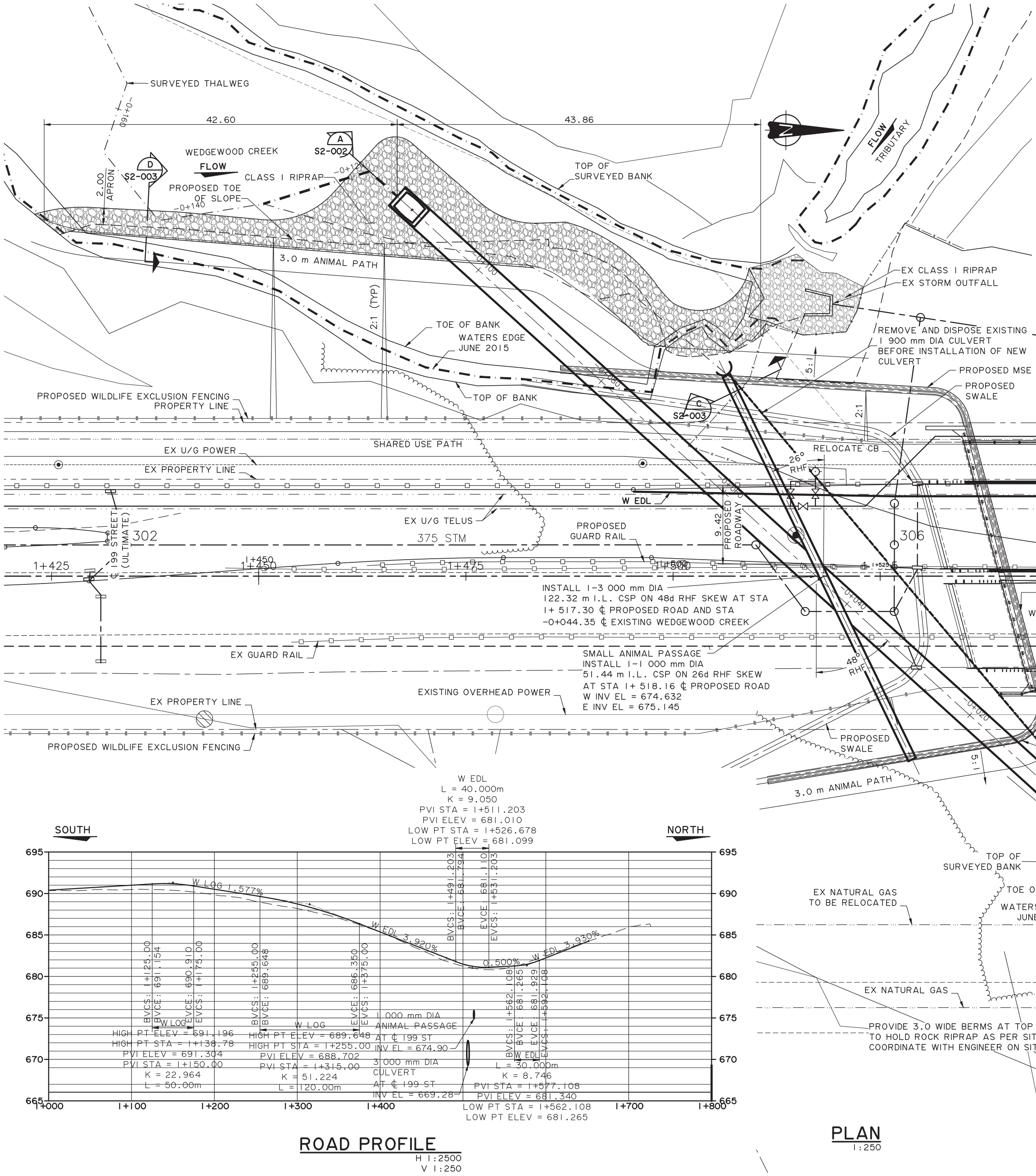
STANTEC CONSULTING LTD., UNDER THE DIRECTION OF KEVIN MACLEOD, JUNE 18-22, 2015

HYDROTECHNICAL DATA

- DRAINAGE AREA = 56 km²
- DESIGN DISCHARGE = 14 m³/s
- MEAN OUTLET VELOCITY AT PROPOSED CULVERT FOR DESIGN DISCHARGE = 2.6 m/s
- AVERAGE SURVEYED CHANNEL SLOPE = 0.011 m/m

PROPOSED STRUCTURES

- 1 – 3000 mm DIA CSP CULVERT, 122.32 m INVERT LENGTH, WITH 125 x 26 mm CORRUGATION PROFILE, 4.2 mm WALL LOCATED AT STA 1+517.62 ℄ PROPOSED ROADWAY WITH A GALVANIZED COATING OF 610 g/m²
- 1 – 1000 mm DIA CSP CULVERT, 51.44 m INVERT LENGTH, WITH 68 x 13 mm CORRUGATION PROFILE, 1.6 mm WALL LOCATED AT STA 1+507.92 ℄ PROPOSED ROADWAY WITH A GALVANIZED COATING OF 610 g/m²



ROAD PROFILE

H 1:2500
V 1:250

PLAN

1:250

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Notes

- DIMENSIONS ARE GIVEN IN METRES UNLESS NOTED OTHERWISE
- STRUCTURAL DESIGN IN ACCORDANCE WITH CAN/CSA S6-14 AND CL 800 DESIGN LIVE LOAD
- ROADWAY DESIGN STANDARD CITY OF EDMONTON DESIGN AND CONSTRUCTION STANDARDS, VOLUME 2 ROADWAYS, MAY 2015
  - STANDARD URBAN ARTERIAL ROAD
  - DESIGN SPEED 70 km/h
- CULVERT ASSEMBLY, BACKFILL AND OTHER TYPICAL DETAILS SHALL BE IN ACCORDANCE WITH THIS DWG, STD DWG S-1418-03 AND SECTION 18 OF THE SPECIFICATION FOR BRIDGE CONSTRUCTION
- REFER TO ROADWAY DRAWING C103-006 FOR ROADWAY PROFILES
- EDL – EDGE OF DRIVING LANE

Development Engineer, Sustainable Development

Approvals YY.MM

Revision	By	Appd.	YY.MM
SECOND SUBMISSION	AM	TC	16.06.01
FIRST SUBMISSION	AM	TC	15.12
Issued	By	Appd.	YY.MM

PROJECT MANAGER: DH / TC DESIGN: AM DRAWN: TD

Permit-Seal

Client/Project

RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title

WEDGEWOOD CREEK
CULVERTS - GENERAL LAYOUT

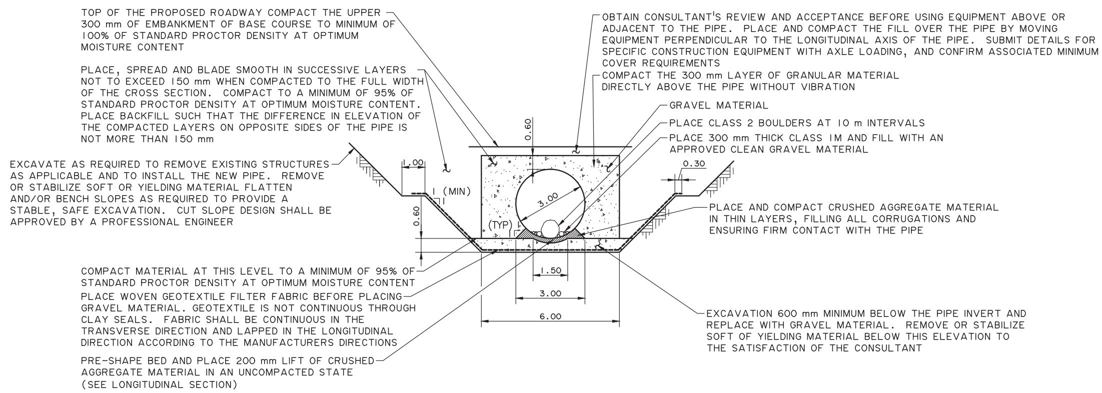
Project No. 1161-103725

Scale 1:250 0 2.5 7.5 12.5m

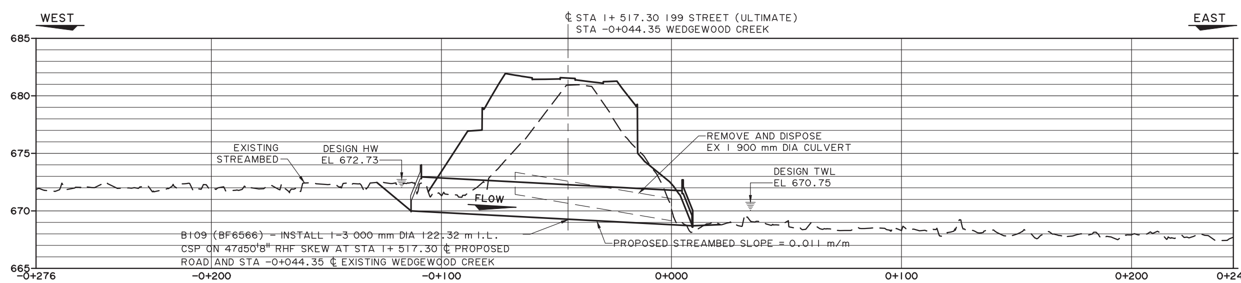
Drawing No. S002-001

SUPPLY OF 3 000mm DIA CSP	m	122.32	
ASSEMBLY OF 3 000mm DIA CSP	m	122.32	
CONCRETE END TREATMENT	-		
* CONCRETE - CLASS B	m³	10.8	
* REINFORCING STEEL	kg	900	
EXCAVATION - STRUCTURAL	m³	1215	
BACKFILL	-		
* PITRUN GRAVEL MATERIAL - DES 6, CL 80	m³	1955	
* CRUSHED AGGREGATE MATERIAL - DES 2, CL 40	m³	90	
* CLAY SEALS	m³	375	
* WOVEN GEOTEXTILE FILTER FABRIC	m²	1445	
HEAVY ROCK RIPRAP - CLASS 1M	m³	45	
HEAVY ROCK RIPRAP - CLASS 1	m³	230	
HEAVY ROCK RIPRAP - CLASS 2	m³	140	
NON-WOVEN GEOTEXTILE FILTER FABRIC	m²	210	
CLASS 2 BOULDERS	ea	12	
ITEM	UNIT	ESTIMATE	AS CONST

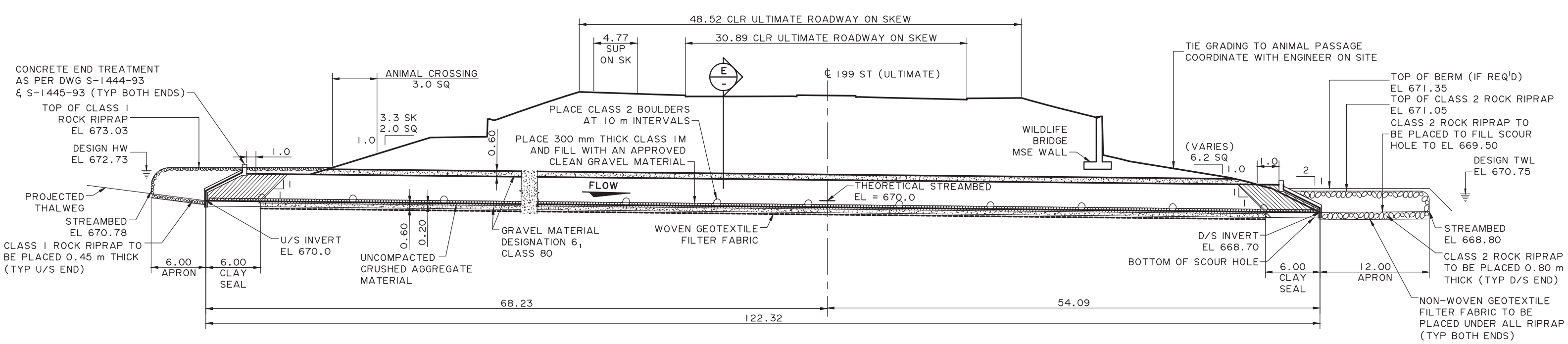
QUANTITY ESTIMATE



E SECTION - BACKFILL
1:100



STREAM PROFILE
LOOKING NORTH
H 1:1000
V 1:200



WEST A S2-001 LONGITUDINAL SECTION EAST
LOOKING NORTH 1:250

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Legend

Notes

Development Engineer, Sustainable Development

Approvals YY.MM

Revision	By	Appd.	YY.MM
SECOND SUBMISSION	AM	TC	16.06.01
FIRST SUBMISSION	AM	TC	15.12
Issued	By	Appd.	YY.MM

PROJECT MANAGER: DH / TC DESIGN: AM DRAWN: TD

Permit-Seal

Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

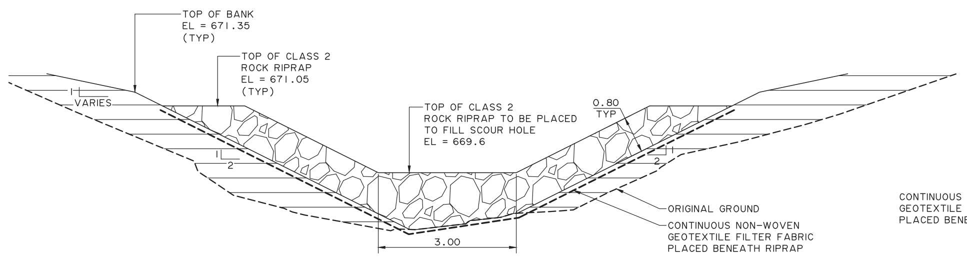
199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK
CULVERT - INFORMATION SHEET

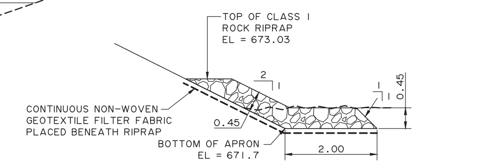
Project No. 1161-103725 Scale VARIES

W:\active\1161103725\detailed_design\drawings\1161103725_S002-S002 CULVERT DETAILS.dwg
2016-6-01 1:09pm BY: TDRESSLER

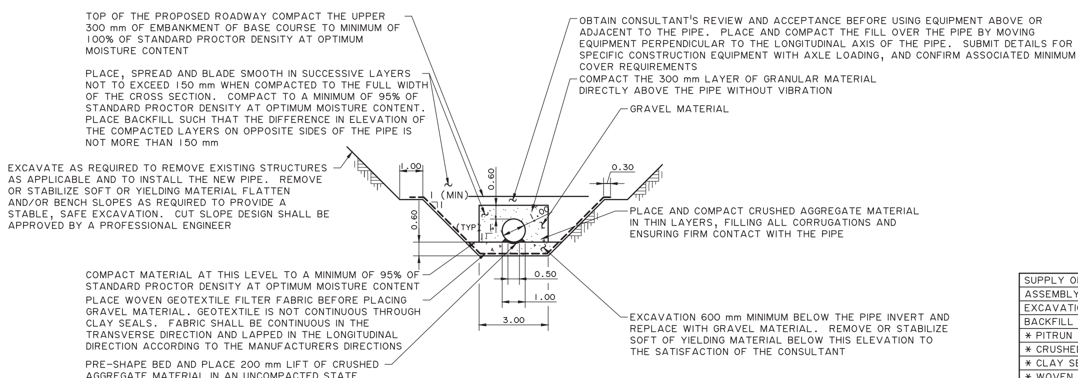
Drawing No.
S002-002



B TYPICAL BANK PROTECTION
S2-001 DOWNSTREAM 1:50



D TYPICAL BANK PROTECTION
S2-001 UPSTREAM 1:50



C SECTION - BACKFILL
S2-001 1:100

ITEM	UNIT	ESTIMATE	AS CONST
SUPPLY OF 1 000mm DIA CSP	m	51.44	
ASSEMBLY OF 1 000mm DIA CSP	m	51.44	
EXCAVATION - STRUCTURAL	m³	145	
BACKFILL	-		
* PITRUN GRAVEL MATERIAL - DES 6, CL 80	m³	135	
* CRUSHED AGGREGATE MATERIAL - DES 2, CL 40	m³	40	
* CLAY SEALS	m³	35	
* WOVEN GEOTEXTILE FILTER FABRIC	m²	555	

QUANTITY ESTIMATE

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Notes

Development Engineer, Sustainable Development

Approvals YY.MM

Revision By Appd. YY.MM

Issued	By	Appd.	YY.MM
SECOND SUBMISSION	AM	TC	16.06.01
FIRST SUBMISSION	AM	TC	15.12

PROJECT MANAGER: DH / TC DESIGN: AM DRAWN: TD

Permit-Seal

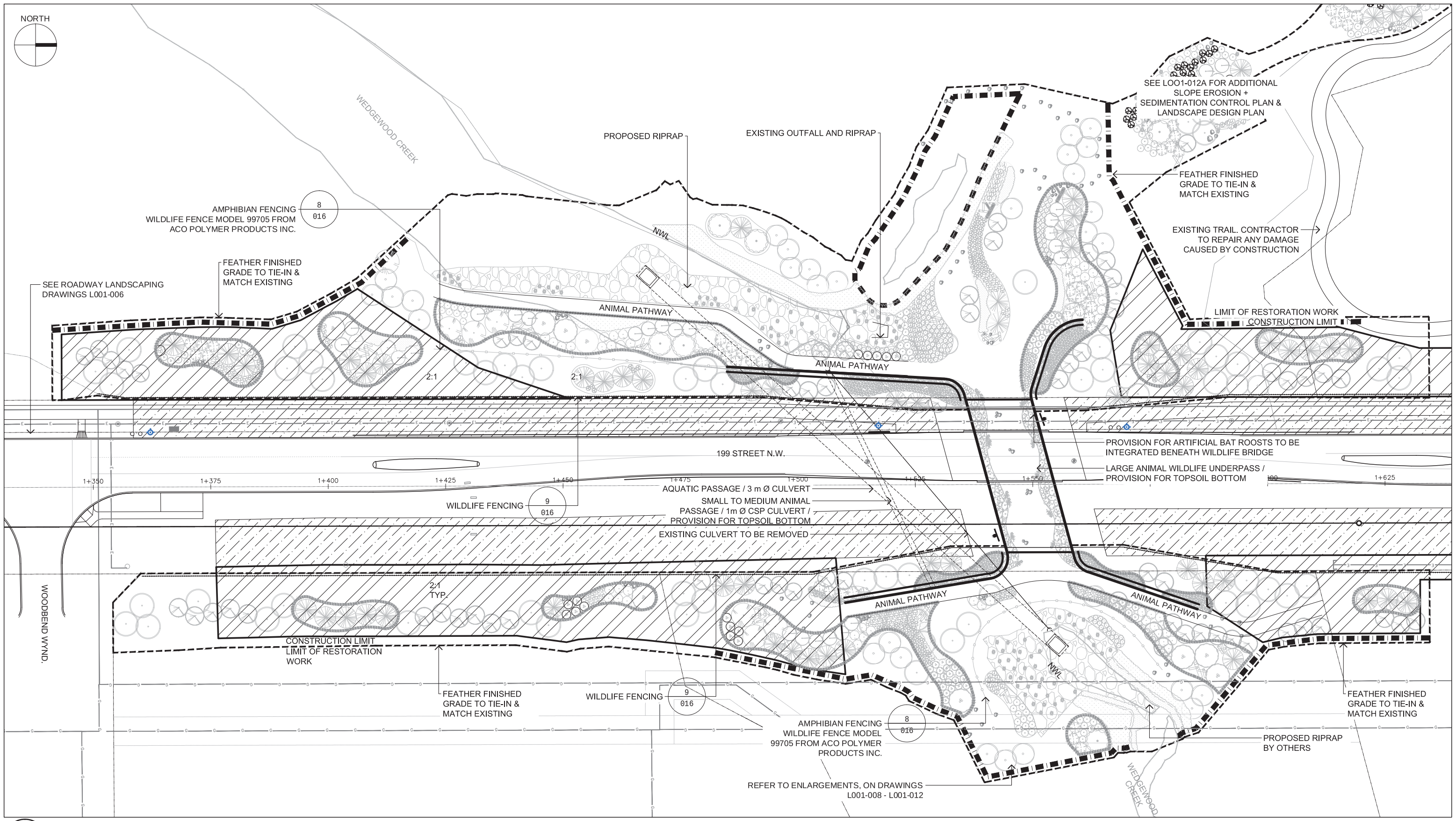
Client/Project
RIVERVIEW HEIGHTS ESTATES LTD.

199 STREET
N. OF 23 AVENUE TO S. OF 35 AVENUE
EDMONTON, AB

Title
WEDGEWOOD CREEK
CULVERT - MISCELLANEOUS DETAILS

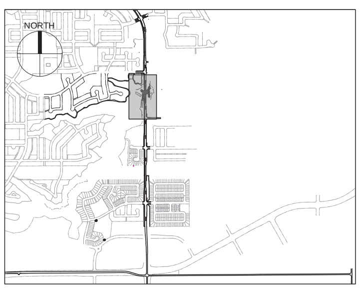
Project No. 1161-103725
Scale VARIES

Drawing No.
S002-003



1/007 **OVERALL WILDLIFE PASSAGES EROSION CONTROL PLAN**
SCALE: 1:500

0 5 10 15 20 25m



KEY PLAN
NTS

GENERAL LEGEND

- CONSTRUCTION LIMIT
- PROPERTY LINE
- ELECTRICAL
- SANITARY
- STORM
- WATER
- GAS
- FIRE HYDRANT
- LIGHT STANDARDS

LANDSCAPE LEGEND

- LIMIT OF RESTORATION WORK. FEATHER ALL FINISHED GRADES TO MEET EXISTING
- NATURALIZED HYDROSEED MIX
- SHORELINE FRINGE PERENNIAL / GRASS MIX
- FLOOD FRINGE PERENNIAL / GRASS MIX
- UPLAND PERENNIAL MIX
- 4/016 HABITAT LOG PILES
- 3/016 WILDLIFE UNDERPASS BOULDERS
- 3 INTERPRETIVE
- 1/016 FIELDSTONE BOULDERS. HARVESTED FROM SITE
- 2/016 ROOT WADS
- WILDLIFE FENCING
- AMPHIBIAN FENCING
- RIPRAP
- TREE PROTECTION FENCING
- SC150 EROSION CONTROL BLANKET, BY NILEX OR APPROVED EQUIVALENT. PROVIDED WHEN ENGINEERING CONSTRUCTION IS COMPLETED. PLANT BEDS TO BE CUT IN.
- SC150BN EROSION CONTROL BLANKET. TO BE INSTALLED IN CONJUNCTION WITH LANDSCAPE CONSTRUCTION
- STRAW WATTLES TO BE INSTALLED IN CONJUNCTION WITH LANDSCAPE CONSTRUCTION TO HOLD MULCH IN BEDS. ALSO TO BE INSTALLED PARALLEL TO SLOPES AS NOTED ON DRAWINGS FOR SEDIMENT AND RUNOFF CONTROL.

PLANT LEGEND

- WSP - WHITE SPRUCE
- WBR - WHITE BIRCH
- TRA - TREMBLING ASPEN
- BSP - BALSAM POPLAR
- sas - SASKATOON
- jun - COMMON EFFUSA JUNIPER
- red - RED OSIER DOGWOOD
- beh - BEAKED HAZELNUT
- shc - SHRUBBY CINQUEFOIL
- coc - CHOKECHERRY
- ngo - NORTHERN GOOSEBERRY
- ros - WILD PRICKLY ROSE
- crr - COMMON RED RASPBERRY
- shw- SHINING WILLOW
- puw - PUSSY WILLOW
- sib - SILVER BUFFALOBERRY
- wes - WESTERN SNOWBERRY
- lbc - LOWBUSH CRANBERRY
- hbc - HIGHBUSH CRANBERRY
- wwc - WESTERN WHITE CLEMATIS
- wil - SANDBAR WILLOW WHIPS

ISSUE DATES

DATE	DESCRIPTION	BY
2015/12/04	1ST SUBMISSION	P.R.
	ISSUED FOR EIA REVIEW	
	FOR APPROVAL	
	FOR TENDER	
	FOR CONSTRUCTION	
	AS-BUILT	

REVISIONS

NO.	DATE	DESCRIPTION	APPROVED BY:
A	2015/12/11	REVISED AS PER PRE-CIRC COMMENTS	P.R.
B	2015/06/01	REVISED AS PER CoE COMMENTS	P.R.

CONSTRUCTION RECORD
CONTRACTOR
STARTED COMPLETED
SURVEYOR
INSPECTOR INITIALS
CCC DATE

CITY OF EDMONTON APPROVED

SCALE:

DESIGNED BY:	T.C.	DATE:	11/15
DRAWN BY:	T.C./W.P./J.T./A.K.	DATE:	11/15
CHECKED BY:	T.T./E.L.M.	DATE:	11/15
APPROVED BY:	P.R.	DATE:	12/15

PERMITS/APPROVALS | DATE

PERMIT TO PRACTICE

THE CITY OF EDMONTON

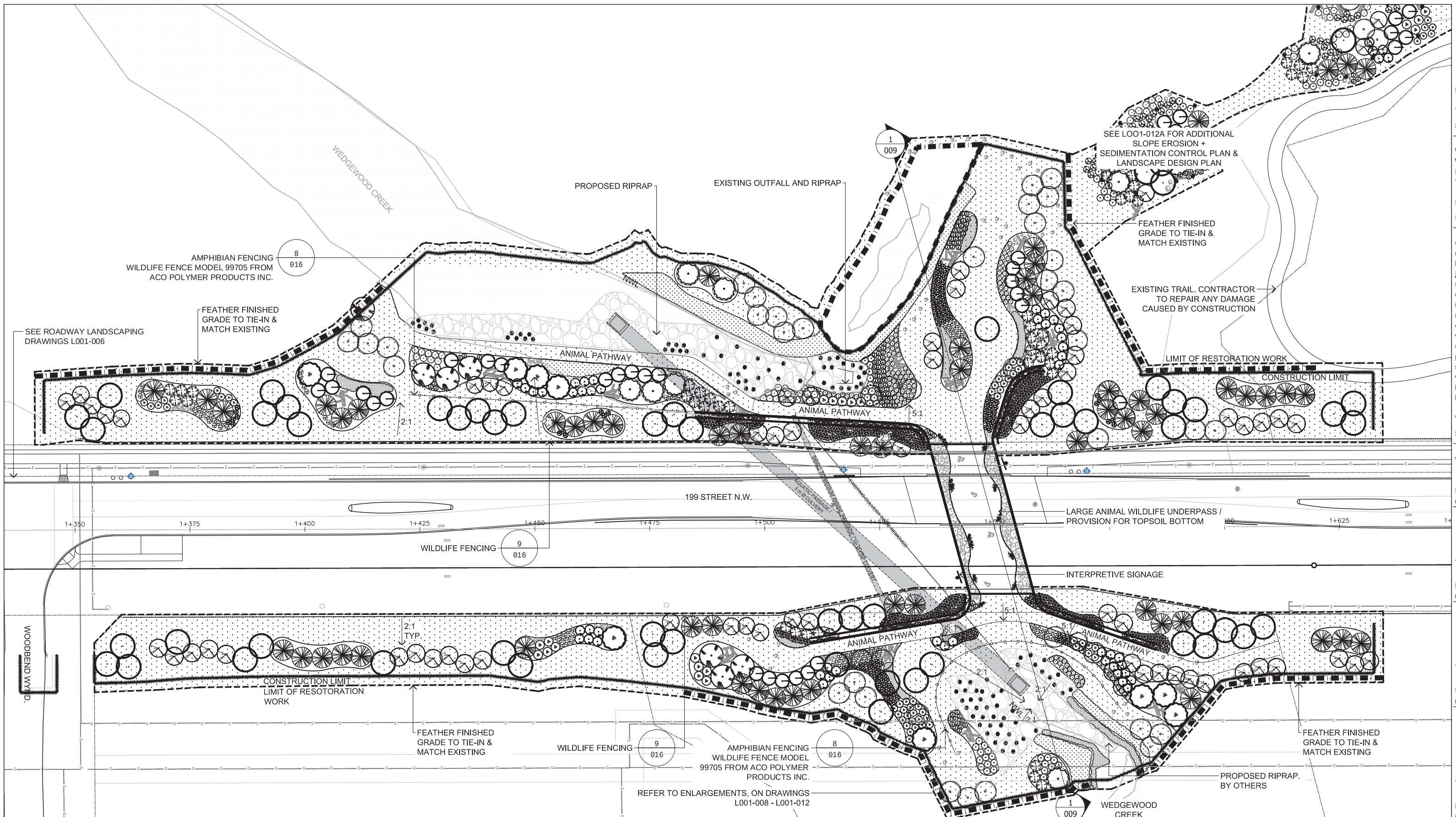
RIVERVIEW HEIGHTS ESTATES LTD.

MMM GROUP
#200, 10576 - 113 Street
Edmonton, AB T5H 3H5
t: 780.423.4123
f: 780.426.0659
www.mmm.ca

199 STREET NW
23 AVENUE NW TO 35 AVENUE NW

OVERALL WILDLIFE PASSAGES
EROSION & SEDIMENT CONTROL PLAN

PROJECT NO. 5115046-000
DRAWING NO. L001-007
REVISION B
SHEET 07



1 / 008 OVERALL WILDLIFE PASSAGES LANDSCAPE DESIGN

SCALE: 1:500

0 5 10 15 20 25m

RIVERVIEW WILDLIFE PASSAGES PLANT SCHEDULE (Quantities exclude Additional Slope Planting)

TREES

SYM	QTY	Botanical Name	Common Name	Size	Root	Mature Plant Size (Ht. x Wd.)
WSP	47	*Picea glauca*	White Spruce	2.5m HT.	B&B	15.0 x 9.0m
WBR	47	*Betula papyrifera*	White Birch	50mm Cal.	B&B	12.0 x 7.0m
BSP	38	*Populus balsamifera*	Balsam Poplar	50mm Cal.	B&B	15.0 x 10.0m
TRA	51	*Populus tremuloides*	Trembling Aspen	50mm Cal.	B&B	10.0 x 5.0m

SHRUBS

SYM	QTY	Botanical Name	Common Name	Size	Root	Mature Plant Size (Ht. x Wd.)
sas	28	*Amelanchier alnifolia*	Saskatoon	#05	Potted	3.0 x 2.0m
red	10	*Cornus sericera ssp. Sericea*	Red Osier Dogwood	#05	Potted	2.0 x 2.0m
beh	6	*Corylus cornuta*	Beaked Hazelnut	#05	Potted	2.5 x 5.0m
jun	177	*Juniperus communis 'Effusa'*	Common Effusa Juniper	#03	Potted	0.3 x 1.5m
shc	100	*Potentilla fruiticosa*	Shrubby Cinquefoil	#03	Potted	1.0 x 1.0m
coc	9	*Prunus virginiana*	Common Chokecherry	#05	Potted	5.0 x 3.0m
ngo	96	*Ribes oxyacanthoides*	Northern Gooseberry	#03	Potted	1.0 x 1.0m
ros	121	*Rosa acicularis*	Prickly Rose	#03	Potted	1.0 x 1.0m
crr	16	*Rubus idaeus*	Common Red Raspberry	#03	Potted	1.5 x 1.5m
wil	87	*Salix interior*	Sandbar Willow	1m long	Whips	2.0 x 2.0m
shw	5	*Salix lucida*	Shining Willow	#05	Potted	4.0 x 2.0m
puw	32	*Salix discolor*	Pussy Willow	#03	Potted	3.0 x 1.4m
sib	32	*Shepherdia canadensis*	Canada Buffaloberry	#05	Potted	4.0 x 3.0m
wes	69	*Symphoricarpos occidentalis*	Western Snowberry	#03	Potted	1.0 x 1.0m
lbc	33	*Vibrunum edule*	Lowbush Cranberry	#03	Potted	1.5 x 1.5m
hbc	7	*Viburnum opulus*	Highbush Cranberry	#03	Potted	3.0 x 2.0m

VINES

SYM	QTY	Botanical Name	Common Name	Size	Root	Mature Plant Size (Ht. x Wd.)
wwc	17	*Clematis ligustifolia*	Western White Clematis	#01	Potted	0.10 x 5.0m

SHORELINE FRINGE PERENNIAL/GRASS MIX

(%)	Common Name
40	Awned Sedge (*Carex atherodes*)
30	Small-fruited Bulrush (*Scirpus microcarpus*)
15	Common Horsetail (*Equisetum arvense*)
15	Meadow Horsetail (*Equisetum pratense*)

TOTAL AREA TO BE SEEDED - 327m²

FLOOD FRINGE PERENNIAL/GRASS MIX

(%)	Common Name
25	Tall Lungwort (*Mertensia paniculata*)
20	Silverweed (*Potentilla anserina*)
20	Common Horsetail (Equisetum arvense)
20	Wild Mint (*Mentha arvensis*)
15	Northern Bedstraw (*Galium boreale*)

TOTAL AREA TO BE SEEDED - 595m²

UPLAND PERENNIAL MIX

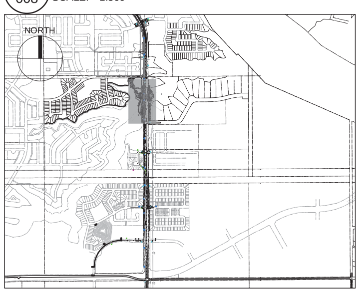
(%)	Common Name
20	Western Showy Aster (*Aster conspicuus*)
20	Smooth Aster (*Aster laevis*)
15	Common Yarrow (*Achillea millefolium*)
15	Wild strawberry (*Fragaria virginiana*)
15	Canada Goldenrod (*Solidago canadensis*)
15	Wild Vetch (*Vicia americana*)

TOTAL AREA TO BE SEEDED - 98m²

HYDROSEED - NATIVE SEED MIX

(%)	Common Name
20	Slender Wheatgrass (*Agropyron trachycaulum*)
15	Northern Wheatgrass (*Agropyron dasystachyum*)
15	Canada Wild Rye (*Elymus canadensis*)
15	Marsh Reed Grass (*Calamagrostis canadensis*)
10	Fringed Brome (*Bromus ciliatus*)
10	Hay Sedge (*Carex siccata*)
10	Bronze Sedge (*Carex aenea*)
5	Western Wheatgrass (*Pascopyrum smithii*)

TOTAL HYDROSEED AREA - 10460m²



KEY PLAN

NTS

GENERAL LEGEND

- CONSTRUCTION LIMIT
- PROPERTY LINE
- ELECTRICAL
- SANITARY
- STORM
- WATER
- GAS
- FIRE HYDRANT
- LIGHT STANDARDS
- 4/016 HABITAT LOG PILES
- 3/016 WILDLIFE UNDERPASS BOULDERS
- 3/017 INTERPRETIVE SIGNAGE

LANDSCAPE LEGEND

- LIMIT OF RESTORATION WORK. FEATHER ALL FINISHED GRADES TO MEET EXISTING
- NATURALIZED HYDROSEED MIX
- SHORELINE FRINGE PERENNIAL / GRASS MIX
- FLOOD FRINGE PERENNIAL / GRASS MIX
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- 1/016 FIELDSTONE BOULDERS. HARVESTED FROM SITE
- 2/016 ROOT WADS
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- AMPHIBIAN FENCING
- RIPRAP
- TREE PROTECTION FENCING

PLANT LEGEND

- WSP - WHITE SPRUCE
- WBR - WHITE BIRCH
- TRA - TREMBLING ASPEN
- BSP - BALSAM POPLAR
- sas - SASKATOON
- jun - COMMON EFFUSA JUNIPER
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- coc - CHOKECHERRY
- ngo - NORTHERN GOOSEBERRY
- ros - WILD PRICKLY ROSE
- crr - COMMON RED RASPBERRY
- shw- SHINING WILLOW
- puw - PUSSY WILLOW
- sib - SILVER BUFFALOBERRY
- wes - WESTERN SNOWBERRY
- lbc - LOWBUSH CRANBERRY
- hbc - HIGHBUSH CRANBERRY
- wwc - WESTERN WHITE CLEMATIS
- WHIP PLANTINGS - REFER TO PLANT LIST THIS SHEET

ISSUE DATES

DATE	DESCRIPTION	BY
2015/12/04	1ST SUBMISSION	P.R.
	ISSUED FOR EIA REVIEW	
	FOR APPROVAL	
	FOR TENDER	
	FOR CONSTRUCTION	
	AS-BUILT	

REVISIONS

NO.	DATE	DESCRIPTION	APPROVED BY:
A	2015/12/11	REVISED AS PER PRE-CIRC COMMENTS	P.R.
B	2015/06/01	REVISED AS PER CoE COMMENTS	P.R.

CONSTRUCTION RECORD — CONTRACTOR / STARTED / COMPLETED / SURVEYOR / INSPECTOR / INITIALS / CCC DATE

CITY OF EDMONTON APPROVED

SCALE:			
DESIGNED BY:	T.C.	DATE:	11/15
DRAWN BY:	T.C./W.P./J.T./A.K.	DATE:	11/15
CHECKED BY:	T.T./E.L.M.	DATE:	11/15
APPROVED BY:	P.R.	DATE:	12/15
PERMITS/APPROVALS		DATE	

PERMIT TO PRACTICE

THE CITY OF EDMONTON

RIVERVIEW HEIGHTS ESTATES LTD.

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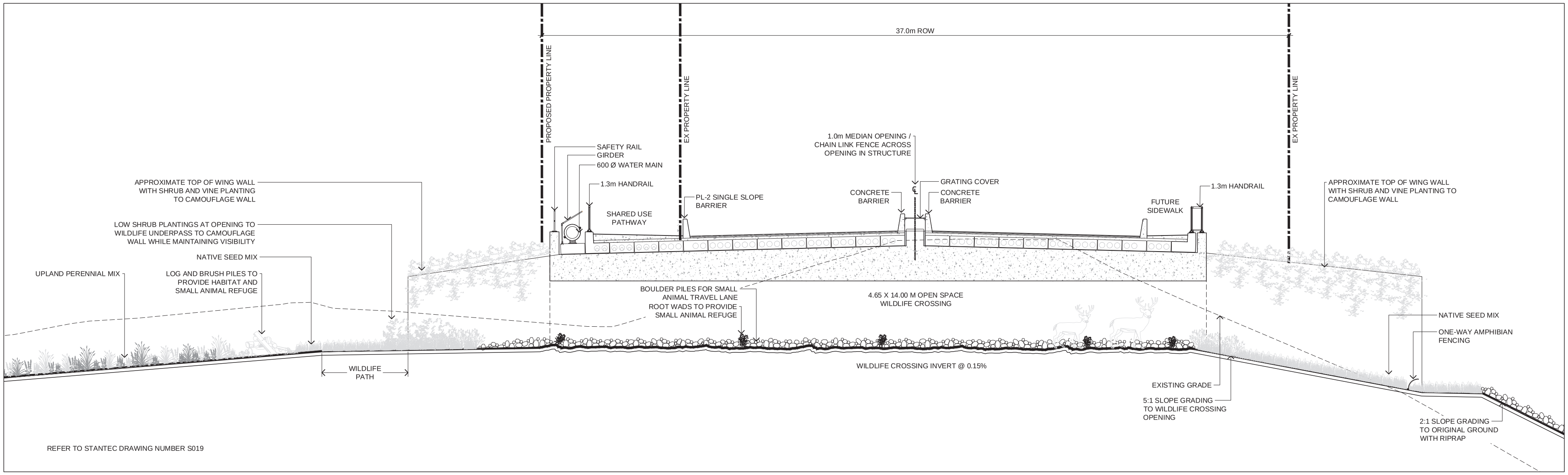
f: 780.426.0659
www.mmm.ca

199 STREET NW
23 AVENUE NW TO 35 AVENUE NW

OVERALL WILDLIFE PASSAGES
LANDSCAPE DESIGN

PROJECT NO. 5115046-000
DRAWING NO. L001-008
REVISION B
SHEET 08



1/009 **CROSS SECTION OF WILDLIFE UNDERPASS**
SCALE: 1:100

0 1 2 3 4 5m

ISSUE DATES

DATE	DESCRIPTION	BY
2015/12/04	1ST SUBMISSION	P.R.
	ISSUED FOR EIA REVIEW	
	FOR APPROVAL	
	FOR TENDER	
	FOR CONSTRUCTION	
	AS-BUILT	

REVISIONS

NO.	DATE	DESCRIPTION	APPROVED BY:
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B	2015/06/01	REVISED AS PER CoE COMMENTS	P.R.

CONSTRUCTION RECORD
—
CONTRACTOR
STARTED COMPLETED
SURVEYOR
INSPECTOR INITIALS
CCC DATE

CITY OF EDMONTON APPROVED

SCALE:			
DESIGNED BY:	T.C.	DATE:	11/15
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PERMIT TO PRACTICE

THE CITY OF EDMONTON

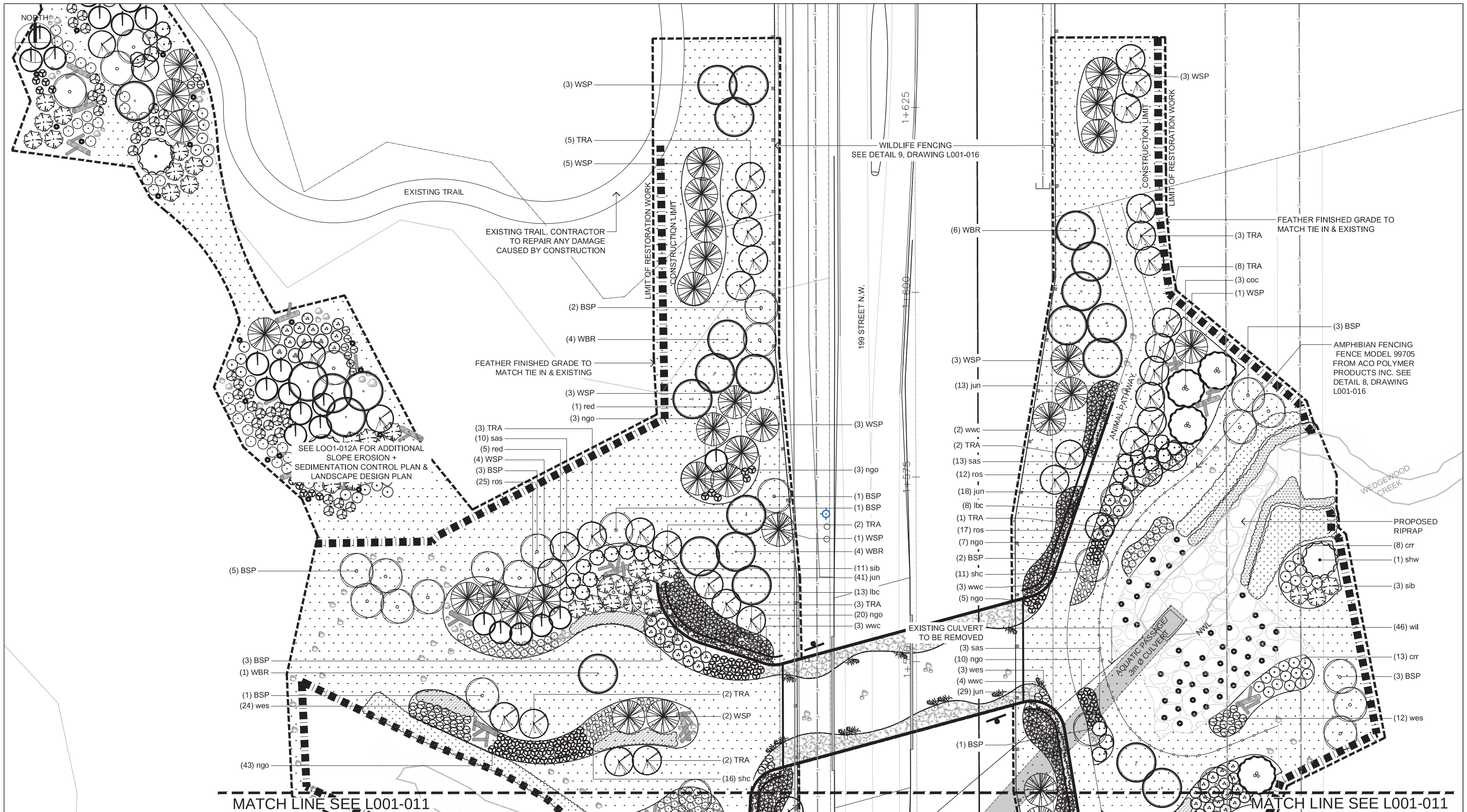
RIVERVIEW HEIGHTS ESTATES LTD.

MMM GROUP
#200, 10576 - 113 Street
Edmonton, AB T5H 3H5
t: 780.423.4123
f: 780.426.0659
www.mmm.ca

199 STREET NW
23 AVENUE NW TO 35 AVENUE NW

WILDLIFE UNDERPASS CROSS SECTION

PROJECT NO. 5115046-000
DRAWING NO. L001-009
REVISION B
SHEET 09



1 / 010 **WILDLIFE PASSAGES LANDSCAPE DESIGN - AREA A, LOWER SLOPE AND MID-SLOPE**

SCALE: 1:300

GENERAL LEGEND

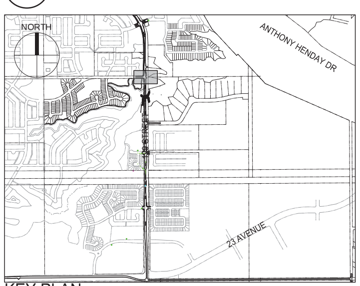
CONSTRUCTION LIMIT
PROPERTY LINE
ELECTRICAL
SANITARY
STORM
WATER
GAS
FIRE HYDRANT
LIGHT STANDARDS

LANDSCAPE LEGEND

LIMIT OF RESTORATION WORK. FEATHER ALL FINISHED GRADES TO MEET EXISTING
NATURALIZED HYDROSEED MIX
SHORELINE FRINGE PERENNIAL / GRASS MIX
FLOOD FRINGE PERENNIAL / GRASS MIX
UPLAND PERENNIAL MIX
4/016 HABITAT LOG PILES
3/016 WILDLIFE UNDERPASS BOULDERS
1/016 FIELDSTONE BOULDERS. HARVESTED FROM SITE
2/016 ROOT WADS
WILDLIFE FENCING
AMPHIBIAN FENCING
RIPRAP
TREE PROTECTION FENCING

PLANT LEGEND

- WSP - WHITE SPRUCE
- WBR - WHITE BIRCH
- TRA - TREMBLING ASPEN
- BSP - BALSAM POPLAR
- sas - SASKATOON
- jun - COMMON EFFUSA JUNIPER
- red - RED OSIER DOGWOOD
- beh - BEAKED HAZELNUT
- shc - SHRUBBY CINQUEFOIL
- coc - CHOKECHERRY
- ngo - NORTHERN GOOSEBERRY
- ros - WILD PRICKLY ROSE
- crr - COMMON RED RASPBERRY
- shw- SHINING WILLOW
- puw - PUSSY WILLOW
- sib - SILVER BUFFALOBERRY
- wes - WESTERN SNOWBERRY
- lbc - LOWBUSH CRANBERRY
- hbc - HIGHBUSH CRANBERRY
- wwc - WESTERN WHITE CLEMATIS
- wil - SANDBAR WILLOW WHIPS



KEY PLAN

NTS

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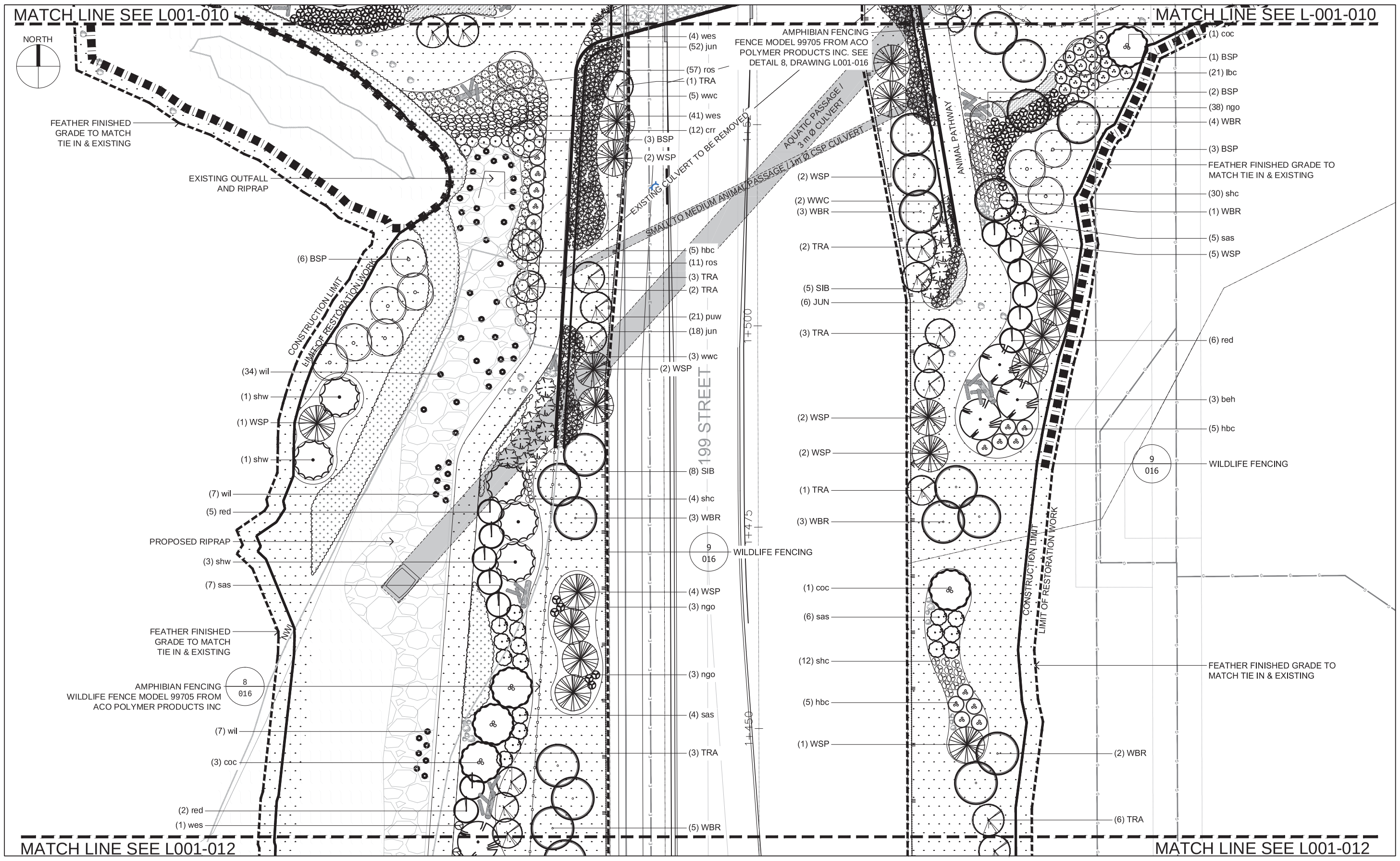
199 STREET NW
23 AVENUE NW TO 35 AVENUE NW

WILDLIFE PASSAGES LANDSCAPE DESIGN
AREA A AND SLOPE PLANTING

PROJECT NO.	REVISION	SHEET
5115046-000	B	10

DRAWING NO. L001-010



1 / 011 **WILDLIFE PASSAGES LANDSCAPE DESIGN - AREA B**

SCALE: 1:300

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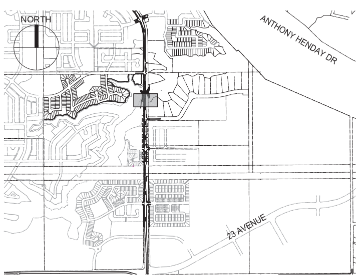

KEY PLAN

NTS

GENERAL LEGEND

- CONSTRUCTION LIMIT
- PROPERTY LINE
- ELECTRICAL
- SANITARY
- STORM
- WATER
- GAS
- FIRE HYDRANT
- LIGHT STANDARDS

LANDSCAPE LEGEND

- LIMIT OF RESTORATION WORK. FEATHER ALL FINISHED GRADES TO MEET EXISTING
- NATURALIZED HYDROSEED MIX
- SHORELINE FRINGE PERENNIAL / GRASS MIX
- FLOOD FRINGE PERENNIAL / GRASS MIX
- UPLAND PERENNIAL MIX
- 4/016 HABITAT LOG PILES
- 3/016 WILDLIFE UNDERPASS BOULDERS
- 3/017 INTERPRETIVE SIGNAGE
- 1/016 FIELDSTONE BOULDERS. HARVESTED FROM SITE
- 2/016 ROOT WADS
- WILDLIFE FENCING
- AMPHIBIAN FENCING
- RIPRAP
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199 STREET NW
23 AVENUE NW TO 35 AVENUE NW

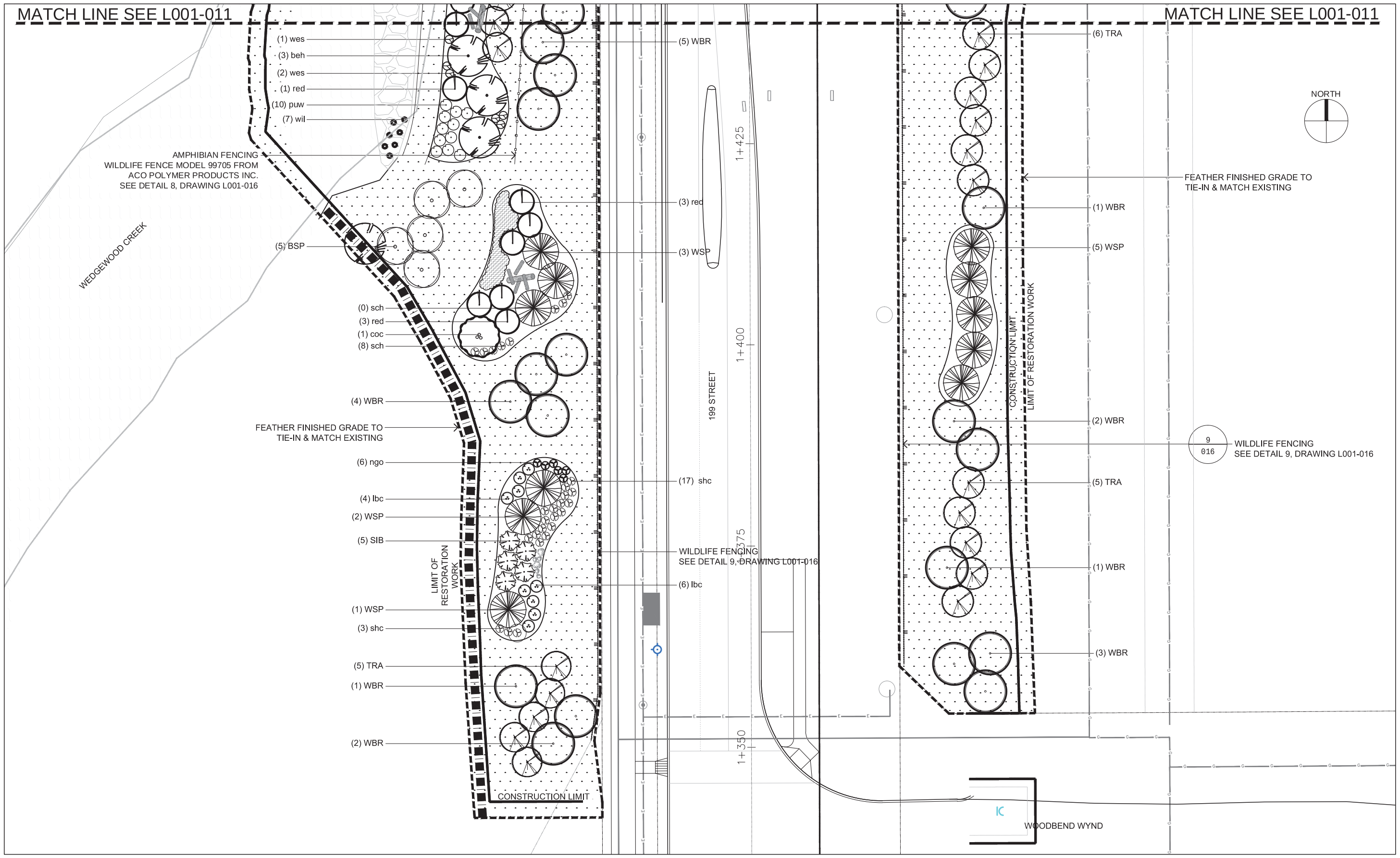
WILDLIFE PASSAGES LANDSCAPE DESIGN AREA B

PROJECT NO. 5115046-000

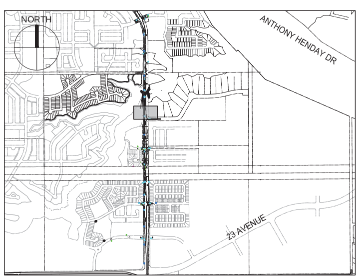
DRAWING NO. L001-011

REVISION B

SHEET 11



1
012
WILDLIFE PASSAGES LANDSCAPE DESIGN - AREA C
SCALE: 1:300



KEY PLAN

NTS

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- CONSTRUCTION LIMIT
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- FIRE HYDRANT
- LIGHT STANDARDS
- 4/016 HABITAT LOG PILES
- 3/016 WILDLIFE UNDERPASS BOULDERS
- 3/017 INTERPRETIVE SIGNAGE

LANDSCAPE LEGEND

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- WHIP PLANTINGS - REFER TO PLANT LIST THIS SHEET

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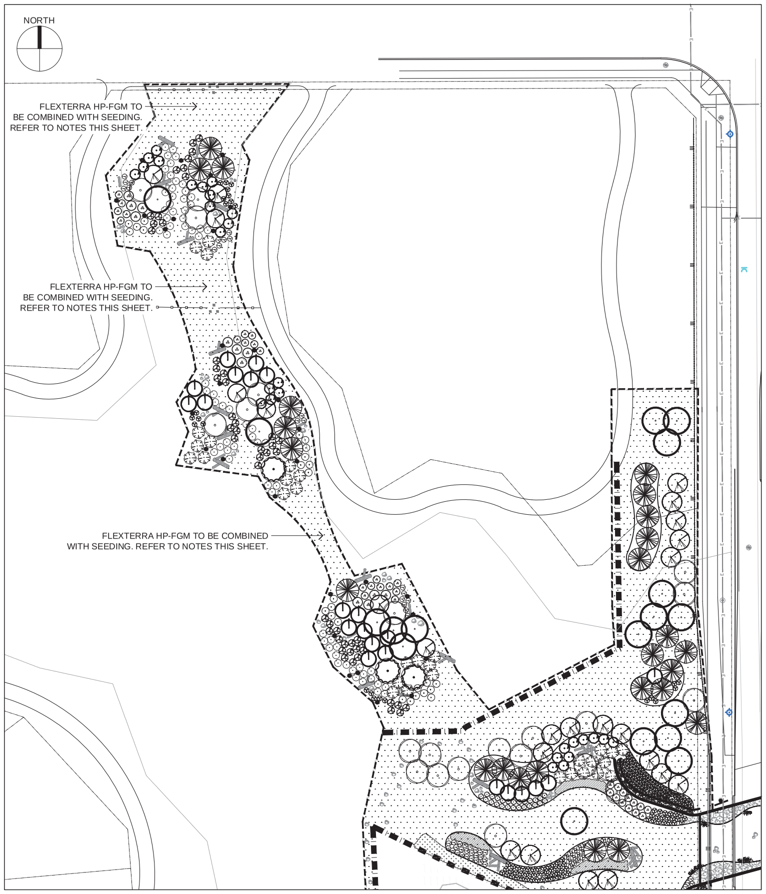
WILDLIFE PASSAGES LANDSCAPE DESIGN
AREA C

PROJECT NO. 5115046-000
DRAWING NO. L001-012
REVISION B
SHEET 12



1 012A **ADD. SLOPE EROSION + SEDIMENTATION CONTROL PLAN**
SCALE: 1:300

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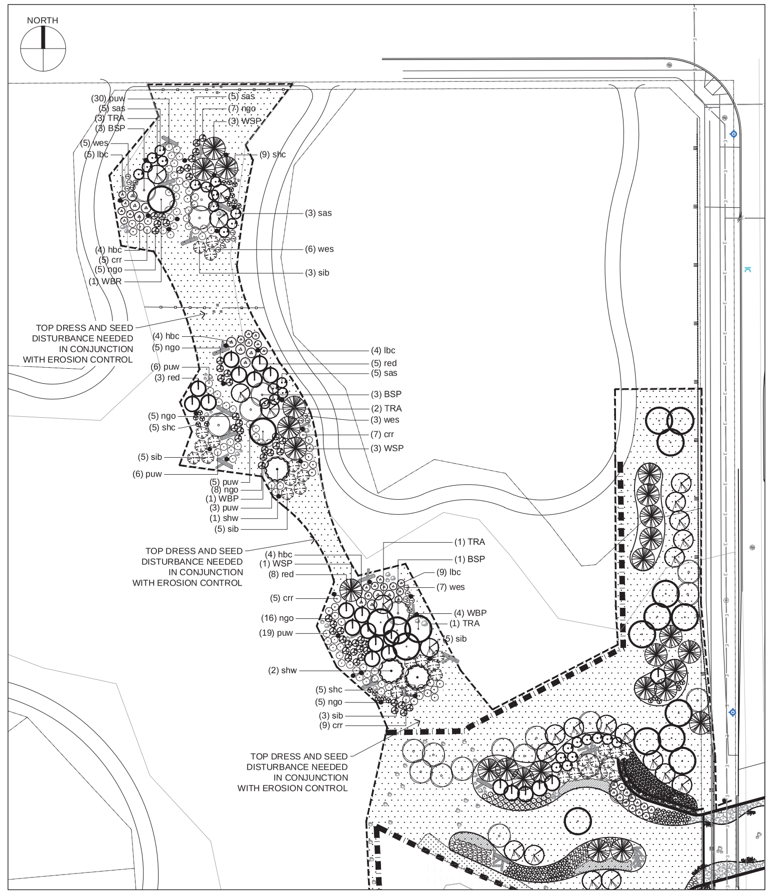


1 012A **ADD. SLOPE LANDSCAPE DESIGN PLAN**
SCALE: 1:300

0 5 10 15 20 25m

RIVERVIEW ADDITIONAL SLOPE PLANT SCHEDULE (THIS SHEET ONLY)

TREES

SYM	QTY	Botanical Name	Common Name	Size	Root	Mature Plant Size (Ht. x Wd.)
WSP	8	*Picea glauca*	White Spruce	2.5m Ht.	B&B	15.0 x 5.0m
WBR	6	*Betula papyrifera*	White Birch	50mm Cal.	B&B	12.0 x 7.0m
BPR	7	*Populus balsamifera*	Balsam Poplar	50mm Cal.	B&B	15.0 x 10.0m
TRA	7	*Populus tremuloides*	Trembling Aspen	50mm Cal.	B&B	10.0 x 5.0m

SHRUBS

SYM	QTY	Botanical Name	Common Name	Size	Root	Mature Plant Size (Ht. x Wd.)
sas	18	*Amelanchier alnifolia*	Saskatoon	#05	Potted	3.0 x 2.0m
red	16	*Cornus sericera ssp. Sericea*	Red Osier Dogwood	#05	Potted	2.0 x 2.0m
shc	14	*Potentilla fruiticosa*	Shrubby Cinquefoil	#03	Potted	1.0 x 1.0m
ngo	46	*Ribes oxyacanthoides*	Northern Gooseberry	#03	Potted	1.0 x 1.0m
crr	17	*Rubus idaeus*	Common Red Raspberry	#03	Potted	1.5 x 1.5m
shw	1	*Salix lucida*	Shining Willow	#05	Potted	4.0 x 2.0m
puw	69	*Salix discolor*	Pussy Willow	#03	Potted	3.0 x 1.4m
sib	24	*Shepherida canadensis*	Canada Buffaloberry	#05	Potted	4.0 x 3.0m
wes	21	*Symphoricarpos occidentalis*	Western Snowberry	#03	Potted	1.0 x 1.0m
lbc	18	*Vibrunum edule*	Lowbush Cranberry	#03	Potted	1.5 x 1.5m
hbc	8	*Viburnum opulus*	Highbush Cranberry	#03	Potted	3.0 x 2.0m

WHIP PLANTING

SYM	QTY	Botanical Name	Common Name	Size	Root	Mature Plant Size (Ht. x Wd.)
-	50%	Picea glauca	White Spruce	10mm Cal.	80-100cm Ht. Plug	15.0m x 5.0m
-	50%	*Populus tremuloides*	Trembling Aspen	10mm Cal.	80-100cm Ht. Plug	10.0 x 5.0m

HYDROSEED - NATIVE SEED MIX

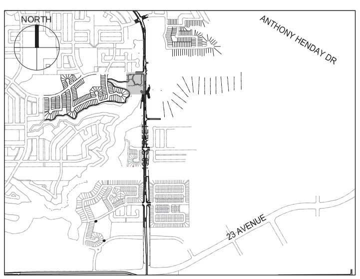
(%)	Common Name
20	Slender Wheatgrass (*Agropyron trachycaulum*)
15	Northern Wheatgrass (*Agropyron dasystachyum*)
15	Canada Wild Rye (*Elymus canadensis*)
15	Marsh Reed Grass (*Calamagrostis canadensis*)
10	Fringed Brome (*Bromus ciliatus*)
10	Hay Sedge (*Carex siccata*)
10	Bronze Sedge (*Carex aenea*)
5	Western Wheatgrass (*Pascopyrum smithii*)

TOTAL HYDROSEED AREA - 95m²

FLEXTERRA HP-FGM BY PROFILE

1. APPLY 50% OF SEED TO SITE ON PREPARED GROUNDCOVER. FINE GRADING NOT NEEDED, SITE CONDITION TO BE ROUGH AND LOOSE.
2. CONTRACTOR TO PLACE A TEST SECTION OF 3M BY 6M PRIOR TO FULL APPLICATION. MANUFACTURER REPRESENTATIVE AND LANDSCAPE ARCHITECT TO BE PRESENT FOR TEST TO CONFIRM APPLICATION IS CONSISTENT WITH SITE CONDITIONS.
3. APPLY SPECIFIED PRESCRIPTIVE AGRONOMIC FORMULATIONS ALONG WITH 50% OF SEED WITH A SMALL AMOUNT OF HP-FGM FOR VISUAL METERING.
4. MIX BALANCE OF SEED AND APPLY HP-FGM A RATE OF 23 KILOGRAMS PER 473 LITERS OF WATER OVER FRESHLY SEEDED SURFACES. CONFIRM LOADING RATES WITH EQUIPMENT MANUFACTURER. DO NOT LEAVE SEEDED SURFACES UNPROTECTED, ESPECIALLY IF PRECIPITATION IS IMMINENT.*

*ASSUMES APPLICATION OF 3,400KG/HA TO 3,900KG/HA FOR SLOPE OF 3:1 OR LESS.



KEY PLAN

NTS

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23 AVENUE NW TO 35 AVENUE NW

ADD. SLOPE EROSION + SEDIMENTATION CONTROL PLAN & LAND. DESIGN

PROJECT NO.	REVISION	SHEET
5115046-000		
DRAWING NO. L001-012A	B	12A

2016/06/01
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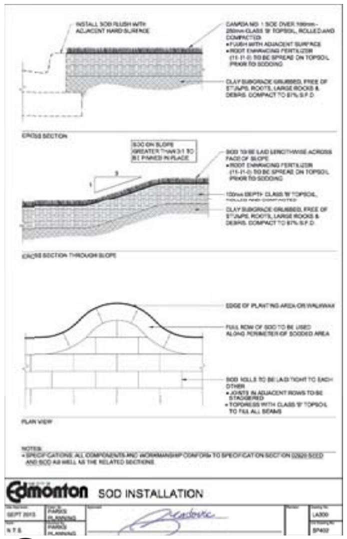
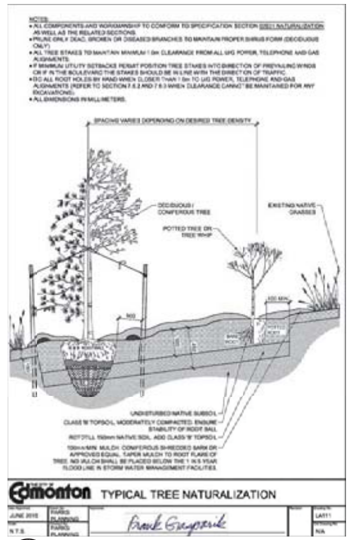
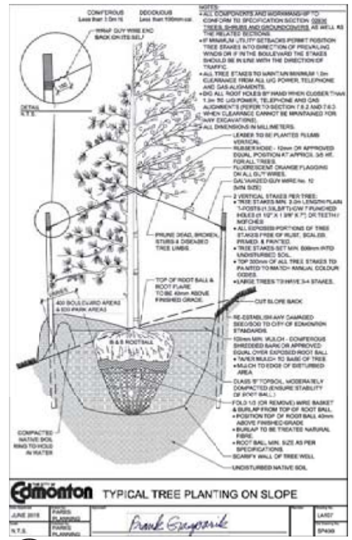


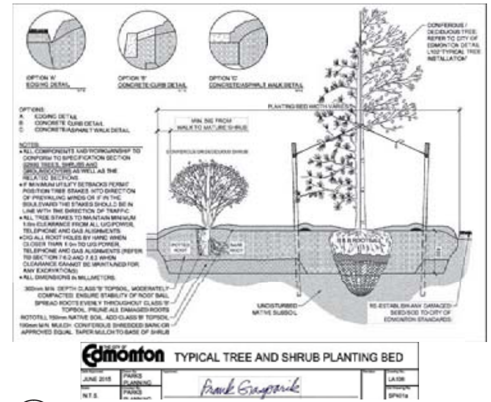
1 / 015 **SOD INSTALLATION**
SCALE: N.T.S.



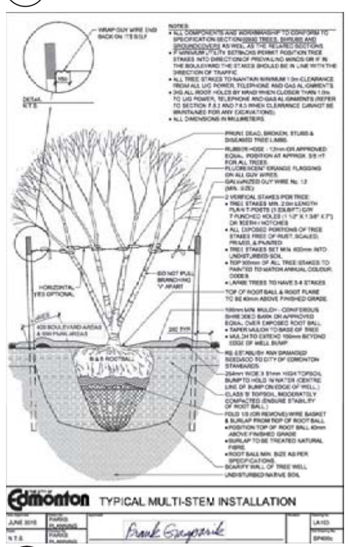
2 / 015 **TYPICAL TREE NATURALIZATION**
SCALE: N.T.S.



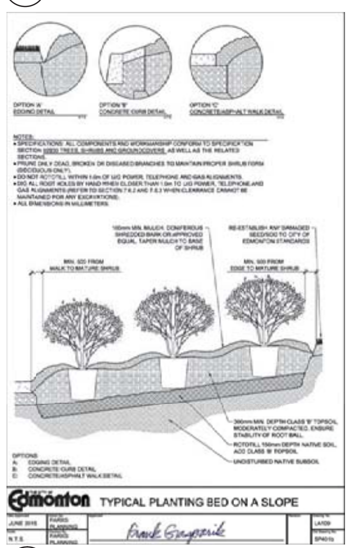
3 / 015 **TYPICAL TREE PLANTING ON SLOPE**
SCALE: N.T.S.



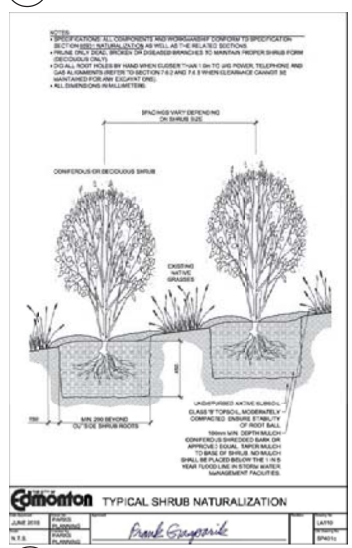
4 / 015 **TYPICAL TREE AND SHRUB PLANTING BED**
SCALE: N.T.S.



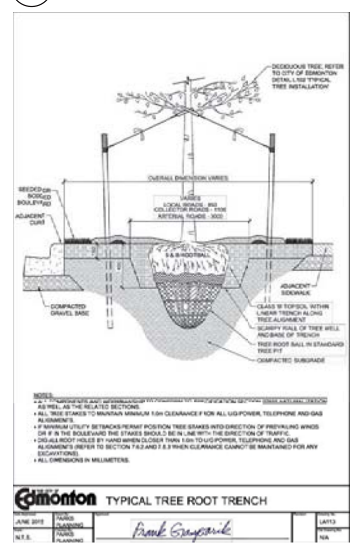
6 / 015 **TYPICAL MULTI-STEM INSTALLATION**
SCALE: N.T.S.



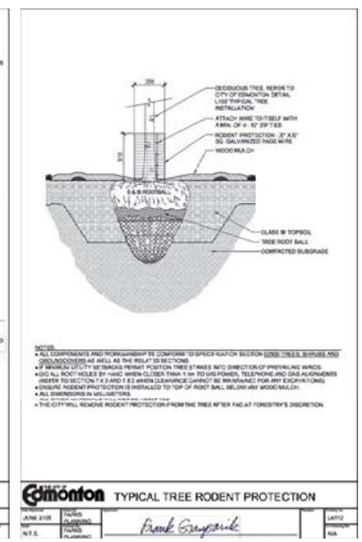
6 / 015 **TYPICAL PLANTING BED ON A SLOPE**
SCALE: N.T.S.



7 / 015 **TYPICAL SHRUB NATURALIZATION**
SCALE: N.T.S.



8 / 015 **TYPICAL TREE ROOT TRENCH**
SCALE: N.T.S.



9 / 015 **TYPICAL TREE RODENT PROTECTION**
SCALE: N.T.S.

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LANDSCAPE DETAILS

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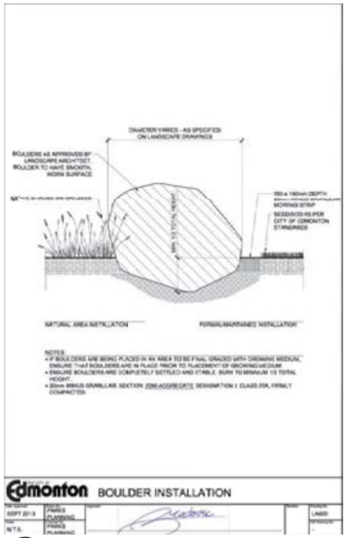
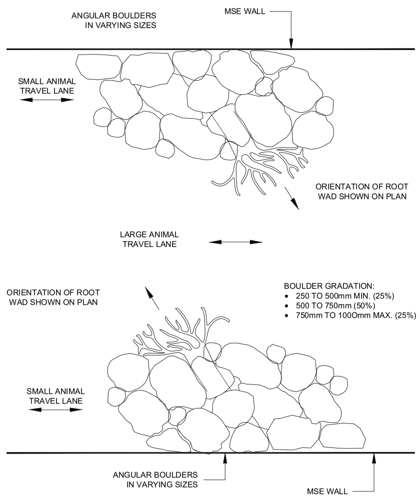
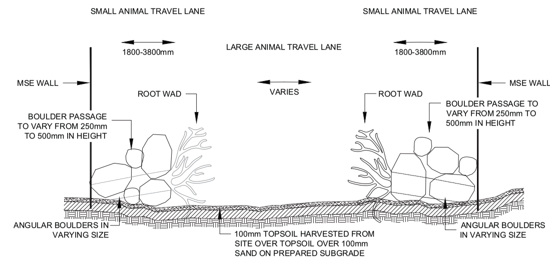


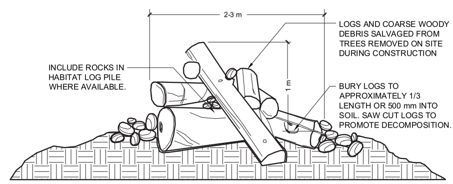
1 TYPICAL BOULDER INSTALLATION
016 SCALE: N.T.S.



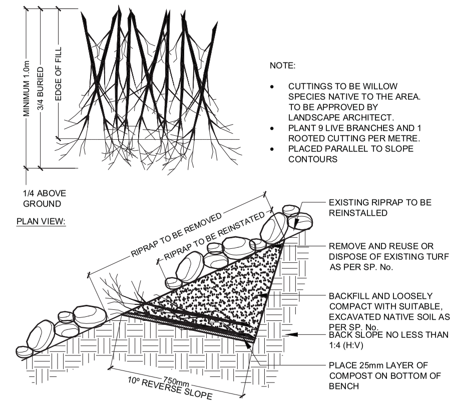
2 ROOT WAD DETAIL - PLAN VIEW
016 SCALE: N.T.S.



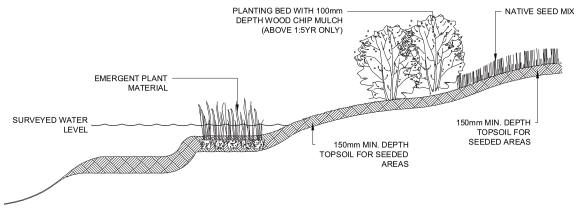
3 ROOT WAD DETAIL - SECTION VIEW
016 SCALE: N.T.S.



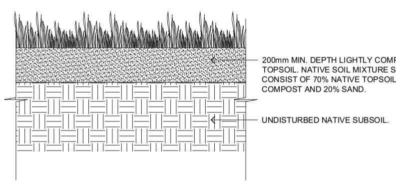
4 HABITAT LOG PILE
016 SCALE: N.T.S.



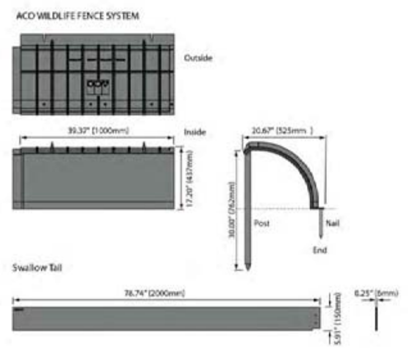
5 CRIB WALL DETAIL
016 SCALE: N.T.S.



6 SHORELINE PLANTING DETAIL
016 SCALE: N.T.S.

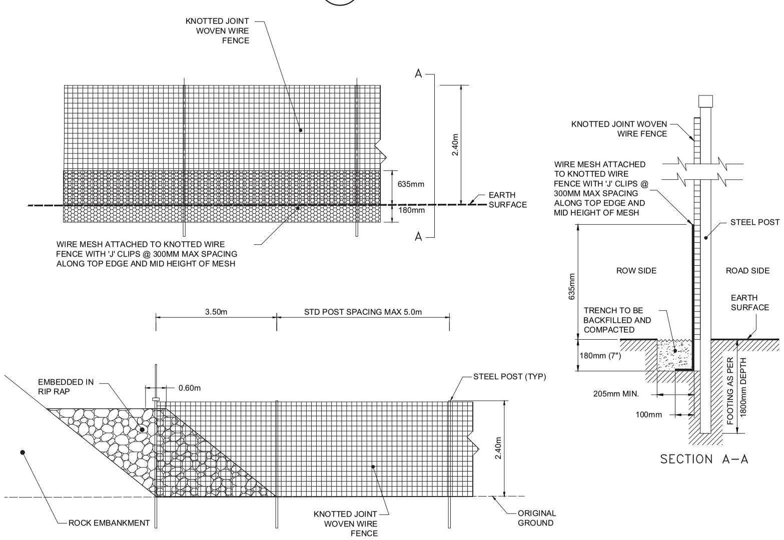


7 NATURALIZED SEEDING DETAIL
016 SCALE: N.T.S.



NOTES:
- CLEAR AND LEVEL GROUND IN 3.0m WIDE STRIP ALONG PROPOSED LINE OF FENCE. PEG OUT AND CHECK LINE OF FENCE IN ADVANCE OF FENCE CONSTRUCTION.
- SUPPORT POSTS MUST BE SET AT AN ABOVE GROUND HEIGHT OF 400mm. ENSURE POSTS ARE VERTICAL.
- POSTION BASE PLATE FLAT ON GROUND AND ELIMINATE ANY GAPS BY ADDING OR REMOVING SOIL ALONG BASE. ADJACENT PANELS SHOULD OVERLAP AND BE SCREWED TO SUPPORT POSTS. SECURE BASE OF EACH PANEL WITH NAILS.
- BASE OF EACH PANEL SHOULD BE COVERED IN COMPACTED SOIL. BACKFILL TO EXTEND 10 TO 12 INCHES ABOVE BASE PLATE AND SLOPE GRADUALLY AWAY FROM FENCE TO GROUND LEVEL.
- JOINTS BETWEEN PANELS SHOULD BE WATERTIGHT TO PREVENT ERODING. OVERGROWN VEGATION SHOULD BE CUT BACK OR REMOVED TO PREVENT ANIMALS USING IT TO CLIMB OVER.

8 AMPHIBIAN FENCE
016 SCALE: N.T.S.



9 WILDLIFE FENCE
016 SCALE: N.T.S.

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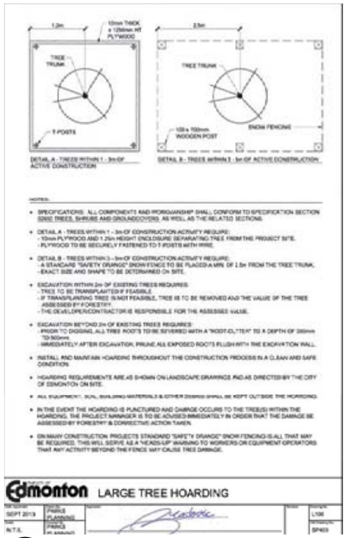
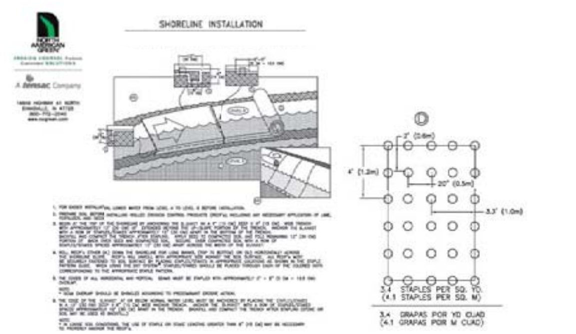
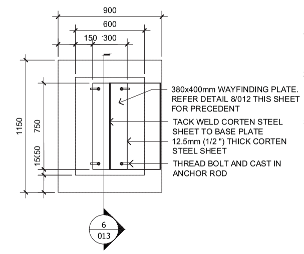
2016/06/01



1 / 017 **LARGE TREE HOARDING**
SCALE: N.T.S.

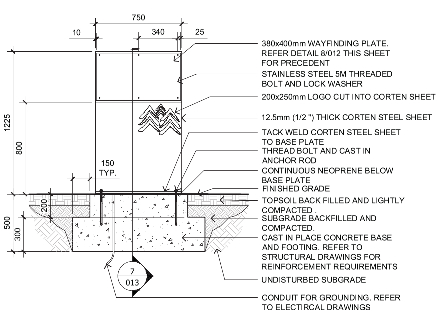


2 / 017 **EROSION CONTROL BLANKET INSTALLATION DETAIL & STAPLE PATTERN**
SCALE: N.T.S.

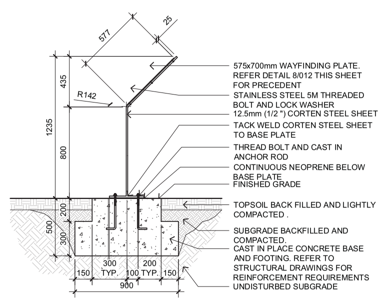


3 / 017 **INTERPRETIVE SIGN PLAN**
SCALE: 1:20

NOTES:
1. ALL FITTINGS AND FASTENERS TO BE PAINTED TO MATCH CORTEN STEEL COLOUR, TOUCH UP PAINT AFTER INSTALLATION.
2. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR APPROVAL PRIOR TO CONSTRUCTION. MAXIMIZE SHOP FABRICATION TO MINIMIZE FIELD WELDS.
3. SITE VERIFY AND FIELD MEASURE TO CONFIRM ALL DIMENSIONS PRIOR TO START OF WORK.
4. ALL WELDS TO BE CONTINUOUS, STRUCTURALLY SOUND AND GROUND SMOOTH PRIOR TO PAINTING.



4 / 017 **INTERPRETIVE SIGN ELEVATION**
SCALE: 1:20



5 / 017 **INTREPRETIVE SIGN SECTION**
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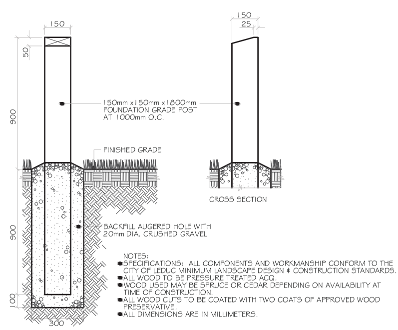

6 / 017 **TIMBER BOLLARD**
SCALE: 1:10

7 / 017 **FLEXTERRA LOADING AND APPLICATION RATE**
SCALE: N.T.S.

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LANDSCAPE DETAILS

PROJECT NO. 5115046-000
DRAWING NO. L001-017
REVISION B
SHEET 17

APPENDIX D
SUPPORTING DOCUMENTATION

INTER-OFFICE MEMO

To:	Marc Obert	Date:	January 15, 2016
From:	Erin Mastre/ Tara Callaghan	Job No.:	5115046-000
Subject:	199 Street Wildlife Crossing Restoration Brief	CC:	Tony Chiarello (Stantec) Tara Callaghan (MMM)

Key to the design of the Wedgewood Creek Wildlife Crossing was an understanding of basic principles of landscape ecology, connecting patches of habitat via a habitat corridor within the matrix of urban development. The City of Edmonton has identified 11 Ecological Design Groups (EDGs) that may be targeted in the design of wildlife passage (Chisholm et al., 2010). It was anticipated that species from all EDGs could be present within the Wedgewood Creek area. As a result, a general approach rather than a species-specific approach has been taken in the landscape design.

Where existing parcels of vegetation exist, trees and shrub plantings have been proposed adjacent to them to connect and strengthen the Wedgewood Creek corridor. Shrub and tree selection draws largely from a comprehensive species list provided in the Environmental Impact Assessment (EIA) Report prepared for the project area by Stantec (May 2015). Some additional species native to the Edmonton area have also been included. Common Effusa Juniper (Juniper communis 'Effusa') were placed above retaining walls leading to the wildlife passage to create a dense mass that will discourage animal movement above walls, year-round. Western White Clematis (Clematis ligustifolia) was also planted in this area, with the intention that it will trail over the wall edges to help camouflage them.

Shrubby Cinqeufoil (Potentilla fruticosa) was added to increase the variety of shrubs under 1m in height. Finally, Pussy Willow (Salix discolor) and Sandbar Willow (Salix interior) were included to increase variety along the creek edge.Perennial seed mixes specific to different hydric zones (Shoreline, Fringe and Upland mixes) were developed using various forbs listed in the comprehensive species list of the EIA, as well as the following species native to the Edmonotn area: Awned Sedge (Carex atherodes), Small-fruited Bulrush (Scirpus microcarpus), Silverweed (Potentilla anserina), Wild Mint (Mentha arvensis), Common Yarrow (Achillea millefolium), Canada Goldenrod (Solidago canadensis), Canada Wild Rye (Elymus canadensis), Marsh Reed Grass (Calamagrostis canadensis), Fringed Brome (Bromus ciliatus), Bronze Sedge (Carex aenea), Western Wheatgrass (Pascopyrum smithii).

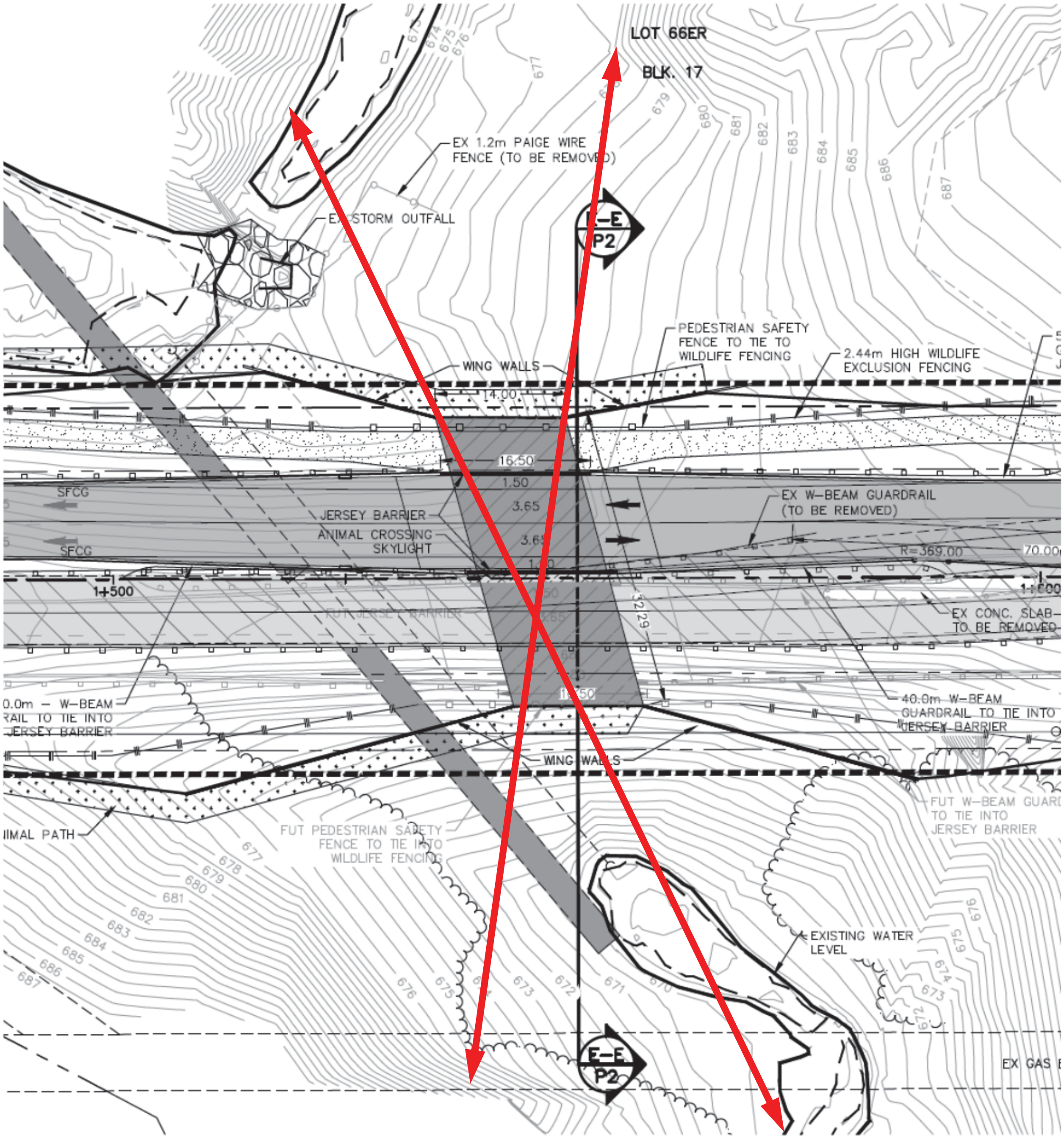
To encourage animal movement toward the small to medium animal passage, mixed shrub corridors that provide coverage and protection for animals have been designed to meander from undisturbed areas to the passage entry. Brush and logs piles were placed in a random fashion throughout the project area to create instant and additional habitat and offer refuge from predators. Within the small to medium animal passage, provision for a topsoil bottom was given as it is provides more comfort for animal movement than that of a cold concrete base. Concrete wing walls from the crossing will be neutrally stained in 'Davis Colour Green Slate 3LBS 3685'.

For larger animal movement, Stantec Engineering has allowed for pathways that lead to the wildlife underpass. To attract large animals to the pathways, fruiting shrubs such as Saskatoon (Amelanchier alnifolia) and Northern Gooseberry (Ribes oxyacanthoides), and other native shrubs commonly foraged on by deer such as Willows (Salix spp.) are to be planted along it. Willow whips planted within the riprap along the west pathway also serve to stabilize the creek edge.

To maintain sightlines for larger animals to the wildlife underpass, only shrubs less than 1m in height were planted directly in front of the underpass. Within the underpass itself, provision for a topsoil bottom was given as this is the preferred substrate for large animal movement. Root wads and boulders have been integrated along the edges of the underpass to provide protection and refuge to smaller animals while serving to camouflage the interior walls and bring a more natural aesthetic to the corridor. Artificial bat roosts have also been proposed, to be integrated on the underside of the bridge to encourage bats to cross under the road rather than above. Alternatively, large tree species have been proposed above the bridge to encourage birds to cross over 199 Street at a height that will not intercept vehicles.

Lastly, in addition to the wildlife fencing that is proposed along 199 Street, we have included an amphibian fence at a lower elevation. Considering that amphibian migration occurs between dry and wet habitats rather than along a moist corridor such as the creek edge, efforts to prevent amphibian movement toward the road edge were made. While silt fencing is a common method used for such an application, we specified ACO one-way fencing as it requires less maintenance and upkeep and has a more discrete appearance. This simple fence system allows small to large animals to move freely across the fence while restricting amphibian movement upslope above the fence toward the roadway, instead limiting it to one direction toward the creek.

Sources:
Chisholm, M., Bates, A., Vriend, D. and Cooper, D. 2010. City of Edmonton Wildlife Passage Engineering Design Guidelines. Stantec Consulting Ltd.



Sight-lines associated with the 15 degree skew

Wedgewood Creek Crossing at 199 Street NE 6-52-25-W4 and NW 5-52-25-W4, Edmonton, AB

Hydrotechnical Summary Report

Prepared for: Qualico Communities

Prepared by: Stantec Consulting Ltd.

August 2015

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1.0 Introduction

Stantec Consulting Ltd. (Stantec) was engaged by Qualico Communities to complete the hydrotechnical investigation for a proposed culvert replacement located at 199 street over Wedgewood Creek Edmonton, Alberta. The overall project includes the widening of a roadway on 199 street in support of a development for Riverview Neighborhoods 1, 2 and 3.

This report provides a hydrotechnical summary for the proposed culvert replacement. The hydrotechnical assessment was carried out to determine the impact of the design flood i.e. 1:100 year flood on the proposed culvert replacement options. For the purpose of this report, the Wedgewood Creek will be referred to as the “WWC”.

2.0 Site Description

The proposed Wedgewood Creek (WWC) crossing is located at 199 street, within NE 6-52-25-W4 and NW 5-52-25-W4, Edmonton, Alberta (53°28'1.46"N, 113°39'51.69"W). WWC is a North Saskatchewan River (NSR) tributary that has its headwaters in the tablelands and then transition to a deeply incised ravine as it flows towards river. This crossing is situated approximately 3.3 km upstream of WWC confluence with North Saskatchewan River (NSR). The existing structure at WWC crossing consists of a single 1.8 m diameter x 68.6 long Structural Plate Corrugated Steel Pipe (SPCSP) culvert installed at approximately 40° RHF skew with roadway centerline. The Anthony Henday Drive (AHD) i.e. highway 216 bridge is located approximately 1.4 km along WWC, downstream of 199 street crossing. Figure A1 given in Appendix A shows approximate location of WWC crossing at 199 street.

3.0 Hydrotechnical

The proposed Wedgewood Creek (WWC) crossing is located at 199 street. WWC is a North Saskatchewan River (NSR) tributary that has its headwaters in the tablelands and then transition to a deeply incised ravine as it flows towards river. The most of the drainage area, contributing flows to the proposed site is relatively flat and is characterized by farming fields, vegetated land, small lakes and interconnected ponds (during high runoff periods). The watercourse at and in the vicinity of proposed crossing has high beaver activity and there are several beaver dams along WWC. During design flood these beaver dams would act as weirs and design flood would pass over them. From 215 street to 184 street all WWC crossings appear to be undersized for design flood except AHD bridge. The high beaver activity and undersized culvert crossings has resulted in ponded water along WWC.

There are no Water Survey Canada (WSC) stream flow measurement gauges on the WWC. Figure A1 given in Appendix A shows approximate location of WSC gauges in vicinity of study area. Based on Golder Associates Ltd. December 2012 report the drainage area contributing to the WSC gauge Whitemud Creek Near Ellerslie (i.e. number 05DF006) is similar in basin characteristics to the drainage area contributing flow to the proposed WWC crossing. The 05DF006 gauge has a drainage area of 330.4 km^2 and is located approximately 8.0 km south west of the proposed crossing. The Golder Associates Ltd. December 2012 report has estimated the drainage area at the proposed crossing to be 170 km^2. The 05DF006 gauge has been in service since 1969 to the present time. This gauge provides 47 years of hydrometric data record. The maximum instantaneous discharge recorded at this gauge was 114 m^3/s on April 23, 1974 with unit discharge of 0.35 m^3/s/km^2.

In order to determine the design (i.e. 1:100 year) flood for WWC crossing at 199 street, a literature and database review for various crossings in the vicinity of study site was conducted. A site visit was carried out on June 18, 2015 as part of this study. Hydraulic analysis of the channel was also conducted.

Components of the hydrotechnical assessment described above assisted in determining the design (1:100 year) flood and associated water level elevation. This hydrotechnical assessment is in accordance with current hydrotechnical design practices.

3.1 SITE VISIT INFORMATION AND REVIEW OF AVAILABLE INFORMATION

There are no stream flow measurement gauges on the Wedgewood creek. There are several stream crossings over the Wedgewood in the vicinity of the 199 street crossing. A site visit on June 18, 2015 was conducted by Claudine Girouard and Arshed Mahmood of Stantec. Appendix B provides site visit photos taken on June 18, 2015.

3.1.1 Site visit information

- The existing WWC crossing at 199 street is a 1.8 m diameter x 68.6 m long (based on Stantec June 18, 2015 survey information) SPCSP culvert. During site visit Stantec was unable to locate 1.05 m diameter overflow culvert installed in roadway embankment as mentioned in Golder Associate Ltd 2012 report.
- WWC has very high beaver activity and high beaver activity was found along WWC reach between 215 street and Anthony Henday Drive (AHD) crossings during site visit (See site visit photos given in Appendix B)
- Debris is accumulated around cage at culvert inlet and has resulted in a considerably reduced culvert flow capacity (see Photos # 15 and 16 given in appendix B). Culvert inlet and cage at inlet are heavily damaged. This suggests that this culvert requires

maintenance at regular intervals. Debris catcher cage contributes to the debris accumulation and eventually becomes another dam at the culvert inlet if debris is not removed. A debris catcher is one solution but only works with regular culvert maintenance and debris removal to keep culvert functioning.

- Water is ponding upstream of culvert since culvert flow capacity is reduced due to beaver dam and debris accumulation around inlet cage. During Stantec site visit, water was flowing in culvert with depth of flow of 0.1 m measured at culvert inlet. Bed material observed at culvert invert was silt.

- There is a large beaver dam approximately; 200 m upstream of existing culvert inlet (See site visit photo # 22, given in Appendix B). This top of dam is approximately 1.2 m above June 18, 2015 downstream water level and approximately 2 m above the lowest channel bed elevation. A dam break during a catastrophic flood event would release significant amount of debris and water.

- A tributary and the City of Edmonton's outfall structure discharge into the WWC just north of existing culvert inlet. A beaver dam was observed at mouth of this tributary. Tributary is flowing along left (north) bank north of outfall structure (See site visit photos given in Appendix B) and there is sign of an old slump along WWC left (north) bank at mouth of tributary.

- Most of the channel reach in vicinity of 199 crossing is impacted by a high level of beaver activity. Channel bed width and top width are wider than natural channel due to bank slumping because of ponding resulting from beaver activity. There are signs of active bank erosion along WWC downstream of existing 199 street crossing (See site visit Photo # 25 given in Appendix B). Surveyed section approximately, 50 m downstream of culvert outlet was used for hydraulic analysis due to its proximity to natural channel section (See site visit Photo # 33 given in Appendix B). Scour hole and ponding due to beaver dam was observed at culvert downstream end (See site visit Photos # 28 and 29 given in Appendix B). Scour hole at culvert downstream end suggests that existing 1.8 m diameter culvert is under sized for design flood.

- WWC bed width at a section under Anthony Henday Drive (AHD) was measured at 2 m. This section appears to be representative of natural creek section that is not impacted by beaver activity (See site visit Photo # 38, given in Appendix B). This section was utilized to carryout Channel Flow Capacity Analysis.

3.1.2 Review of available information pertinent to this study

3.1.2.1 Alberta Transportation (AT) Hydrotechnical Information System (HIS)

Location of relevant AT BFs (Bridge Files) crossing along WWC are shown on Figure A2 given in Appendix A. Table-1 given below provides relevant AT BFs information that was utilized for hydrotechnical assessment of 199 street crossing.

Table-1: AT Relevant BFs Information from HIS

AT BF No.	eBMS Structue ID	Hwy	Location	Year Built	Structure Type	Bridge Spans/ No of Pipes	Length of Structure (m)	Pipe Diameter/ Bridge Width (m)	Height of roadway from Streambed (m)	Drainage Area to Crossing (km2)
70768	NA	60:2:20.923		UNKNOWN			0.0			12
08470	NA	Range Road 261	WINTERBURN	1990	MP	2	36.0	1.8	4.8	38
07061	NA	627:4:20.518	WINTERBURN	1981	SPE	1	70.7	1.7	9	39
09167	NA	627:4:18.125	WINTERBURN	1982	SPE	1	52.4	1.7	4	20
09168	NA	627:4:17.419	WINTERBURN	1982	SPE	1	53.0	1.7	5	18
06566	B109	199 Street	EDMONTON/627	1952	SP	1	62.8	1.8	8.8	56
02329	B144	215 Street	EDMONTON	1961	SP	1	37.8	1.8	5.8	50
85012N	B318	216:6:12.699	ANTHONY HENDAY DRIVE	2005	NU	3	135.0	41.5		58
85012S	B319	216:6:12.718	ANTHONY HENDAY DRIVE	2005	NU	3	135.0	41.5		58
07417	B021	184 Street	EDMONTON	1931	MP	2	24.4	1.8	2.3	62

Based on HIS information provided in Table-1, drainage area contributing flow to WWC crossing at 199 street is 56 km^2.

3.1.2.2 Erosion Study for Wedgwood Creek at Edmonton dated December 2012, Golder Associates Ltd.

The Golder Associates Ltd. December 2012 report has presented detailed review of WWC in vicinity of 199 street crossing. Summary of information relevant to 199 street crossing is presented below:

- The WWC gross drainage area (GDA) contributing flow at mouth was determined to be approximately 170 km^2 with effective drainage area (EDA) of 147 km^2 (See Figure A3, given in Appendix A). Most (90 %) of the drainage area is located beyond City of Edmonton limit at 215 street in Parkland County and Stony Plain Indian Reserves and consists of residential developments and agricultural lands.

- The report also documented WWC watershed flood frequency analysis for maximum instantaneous discharge at the mouth. This flood frequency analysis summary is provided in Table-2 given below.

Table-2: Flood Frequency Analysis for Wedgewood Creek Watershed

Return Period (Years)	Maximum Instantaneous Discharge (MID) at the Mouth (m^3/s)			*Future Maximum Instantaneous Unit discharge (q)= Future MID (m^3/s)/GDA(km^2)
	Historical	Existing	Future (Existing and Development)	
2	6.2	5.8	6.9	0.04
5	13.0	12.3	14.5	0.09
10	19.4	18.3	21.6	0.13
20	27.4	25.9	30.5	0.18
25	30.5	28.7	33.9	0.20
50	41.5	39.1	46.1	0.27
100	55.6	52.4	61.8	0.36

* Table 2 is from Golder Associates Ltd. December 2012 report and * Denotes calculations by Stantec.

- The report has mentioned that existing WWC crossings at 215 street, 199 street and 184 street are undersized and recommend that any of these crossings replacement plan must consider the benefits of flow attenuation and sediment storage provided by the existing undersized culverts as well as effects on the ecosystem in the WWC valley.
- It was recommended in this report to support beaver activity and preserving undersized culverts at 215 street, 199 street and 184 street crossings with installation of overflow culverts to handle catastrophic floods. It was also recommended to install or repair beaver deterrence measures such as culvert cages or tree fencing in locations where ponded water is a threat to infrastructure.

3.1.2.3 Riverview Area Master Plan dated March 2013, Stantec

The pertinent information of this report is presented below:

Based on the proposed concept presented in this report, approximately 220 ha (2.2 km^2) of the Riverview area will drain into WWC; the remaining watershed will drain into the North Saskatchewan River through existing creeks/ravines located within the basin. The allowable discharge rates used were 2.5 L/s/ha (0.25 $m^3/s/km^2$) and 5.0 L/s/ha (0.5 m3/s/km^2) for WWC and North Saskatchewan River (NSR).

3.1.2.4 Conceptual Bridge Planning Report Wedgewood Creek Crossing on 199 Street NW in the City of Edmonton Edmonton dated May 2014, Terrace Engineering Lid.

Terrace Engineering Ltd. has presented three structure options to accommodate creek flow and wildlife passage at 199 street crossing over WWC. Summary of these options is presented below:

- Bridge structure with or without large abutment walls: Terrace Engineering estimated a bridge, 28.6 m overall width x 120 m long out to out of fills and estimated conceptual bridge cost in the order of $25 million.

- Oversized culvert structure suitable for wildlife passage in addition to stream flows: This option was not explored further due to cost associated with culvert size and length.

- Culvert sized only for stream flows and a separate wildlife passage structure: Terrace suggested 2.4 m diameter SPCSP culvert to accommodate creek flow and separate bridge with 28.6 m overall width x 26 m long out to out of fills to accommodate wildlife passage. The cost estimate for this option was in the order of $7 million.

3.1.2.5 Riverview 199 Street Drainage System at Wedgewood Creek dated March 2015, Stantec:

The pertinent information of this report is presented below:

Implementation of storage and releasing at a controlled outflow was reviewed in this report. An underground storage pipe was recommended in this report due to the limited space and geometry available, and proximity to the WWC. A controlled outlet flow rate of 35 l/s/ha (0.35 $m^3/s/km^2$) was selected in conformance with the design parameters used for existing Edgemont 199 street storage.

3.2 DRAINAGE AREA CONTRIBUTING FLOW TO SITE ASSESSMENT

The proposed Wedgewood Creek (WWC) crossing is located at 199 street. WWC is a North Saskatchewan River (NSR) tributary that has its headwaters in the tablelands and then transition to a deeply incised ravine as it flows towards river. Most of the drainage area, contributing flows to the proposed site is relatively flat and is characterized by farming fields, vegetated land, small lakes and interconnected ponds (during high runoff periods).

The Golder Associates Ltd. December 2012 report has determined WWC gross drainage area (GDA) contributing flow at mouth to be approximately 170 km^2 with effective drainage area (EDA) of 147 km^2 (See Figure A3, given in Appendix A). This report also mentioned that most (90 %) of the drainage area is located beyond City of Edmonton limit at 215 street in Parkland

County and Stony Plain Indian Reserves and consists of residential developments and agricultural lands.

Based on Stantec's past working experience in WWC watershed area (City of Edmonton and Parkland County), engineering judgment, and;

Stantec's review of WWC watershed area (See Figures A1, A2, A3 and A4 given in Appendix A) using:

- Google Earth Pro Tool;
- Alberta Environment and Parks Flood Hazard Mapping Tool;
- Toporama Mapping Tool and;
- Information presented above including AT's HIS etc.

The effective drainage contributing flow to WWC crossing at 199 street identified by Golder report appears to be higher based on following considerations:

- Drainage area estimated in Golder report can be divided into two components due to land features: west of highway 60 and; east of highway 60.
- Drainage area component West of highway 60 is relatively flat and is characterized by agriculture land, residential areas, several wooded areas, some marsh areas, several small (intermittent and some permanent) lakes and interconnected ponds (during high runoff periods). WWC watercourse is not well defined west of highway 60. This is a major component of total WWC drainage area as estimated in Golder report. Due to presence of these land features, this component of area would have adequate internal storage and would provide minimum surface runoff during design flood event.
- Most of flow to site is contributed by drainage area component east of highway 60 due to its land feature and creek is well defined deeply incised ravine as it flows towards river.
- Based on HIS information provided in Table-1, drainage area contributing flow to WWC crossing at 199 street is 56 km^2. Based on land features of component of drainage area west of highway 60, the effective drainage area of 56 km^2 appears to be correct. HIS information provided in Table-1 also shows that there is no bridge file structure (i.e. equal or larger than 1.5 m diameter culvert) under highway 60.

Based on Stantec's past working experience in WWC watershed area (City of Edmonton and Parkland County), engineering judgment, review of above information presented in this section of report and considering the natural channel stream characteristics (See Site visit Photo # 38 given in Appendix B) the recommended effective drainage area contributing flow to WWC crossing at 199 street is 56 km^2.

3.3 BASIN RUNOFF POTENTIAL METHOD

The Basin Runoff Potential Method is a hydrotechnical tool developed by Alberta Transportation to help determine the 1: 100 year design discharge. The formula provided by Alberta Transportation's Technical Standards Branch to determine the maximum runoff potential:

$$\mathrm{Q} = \mathrm{q} \times \mathrm{DA}$$

Where

Q = Basin Runoff Potential (m^3/s)

q = Unit Runoff Potential ($m^3/s/km^2$), this parameter is based on AT's Basin Runoff Potential Map, past experience in the area (City of Edmonton and Parkland County) and engineering judgment.

q_1 = 0.55 $m^3/s/km^2$, based on AT's Basin Runoff Potential Map for this area

q_2 = 0.25 $m^3/s/km^2$, based on past experience in the area (City of Edmonton and Parkland County), information provided in Section 3.1 of this report and engineering judgment.

DA = drainage area (km^2) = 56 km^2, this is drainage area contributing flows to site is based on information provided in Section 3.2 of this report.

Based on past experience in the area (City of Edmonton and Parkland County) , engineering judgment, the Basin Runoff Potential method and its sensitivity estimated the design flood to be in a range of 14 – 30.8 m^3/s.

3.4 CHANNEL CAPACITY METHOD

Alberta Transportation's (AT) Channel Capacity method was used to calculate the channel capacity of WWC natural section. WWC bed width at a section under Anthony Henday Drive (AHD) was measured at 2 m. Creek at this section appears to be representative of natural creek section and is not impacted by beaver activity (See site visit Photo # 38, given in Appendix B). This section was utilized to carryout Channel Flow Capacity Analysis. Based on site visit and surveyed channel morphology, the Channel Capacity method and its sensitivity analysis estimated the design flood to be in a range of 9 - 13 m^3/s with a depth of flow in a range of 1.2 – 1.5 m and a velocity of flow in a range of 2.9 – 3.2 m/s. Details of the analysis are included in the Appendix C.

3.5 CHANNEL HYDRAULIC ANALYSIS

The WWC channel section approximately 50 m downstream of the 199 street crossing was modeled by utilizing Alberta Transportation's HydroChan software and is based on surveyed section (see Appendix E for the survey information). Manning's "n" for the main channel and floodway were estimated for crossing based on the site visit and engineering judgment. Rating curve based on surveyed cross-section was analyzed hydraulically to determine a design discharge and associated flood stage. Based on this analysis, the average capacity of the channel resulted in a flow of range 19.6 – 31.35 m^3/s with a depth of flow range of 1.5-1.8 m and a main channel average velocity in the range of 2.5 – 2.6 m/s. This surveyed section is somewhat impacted by high beaver activity. Channel bed width and top width are wider than natural channel due to bank slumping because of ponding resulting from beaver activity (See site visit photo given in Appendix B). Design flood quantities would be higher based on this section. Details of the analysis are included in the Appendix C.

3.6 RECOMMENDED DESIGN AND CHECK DISCHARGE PARAMETERS

Based on a review of the above methods, engineering calculations, experience and engineering judgment, the following design and check discharge parameters for the sizing of the hydraulic structure for Wedgewood Creek crossing at 199 street are recommended.

- The Q_{Design} flood was estimated to be 14 m^3/s with a depth of flow of 1.3 m and a main channel average velocity of 2.4 m/s.
- Based on AT's guidelines $Q_{fish\ passage}$ was estimated to be 1.4 m^3/s with a depth of flow of 0.5 m and a main channel average velocity of 1.2 m/s.
- Based on AT's Basin Runoff Potential Method, the estimated flow of 30.8 m^3/s with a depth of flow of 1.8 m and a main channel average velocity of 2.6 m/s was utilized as Q_{Check1} flood.
- Based on Golder Associates Ltd work (December 2012 report), the maximum instantaneous discharge of 61.8 m^3/s with a depth of flow of 2.3 m in main channel and a main channel average velocity of 2.8 m/s was utilized as Q_{Check2} flood.

4.0 Structure Hydraulics

The following three structures options are proposed to replace the existing one 1.8 m diameter closed bottom Structural Plate Corrugated Steel Pipe (SPCSP):

a) One 3.0 m diameter closed bottom Corrugated Steel Pipe (CSP) Culvert

b) One 3.05 m diameter closed bottom Structural Plate Corrugated Steel Pipe (SPCSP) and

c) One 3.0 m Span x 2.4 m Rise Concrete Box Culvert.

An open bottom with 6 m span x 3m span x 117.5 long Deep Corrugated Steel Arch culvert option was also reviewed briefly. Based on Stantec experience on similar structure, this option will have a large cost component due to its length and size and geotechnical considerations. This option is not further considered in this report.

All other culvert options that were considered in this report would be designed with burial depth to accommodate fish passage. This would provide a bedwidth within the culvert similar to bedwidth in natural channel.

The hydraulic analysis for the existing one 1.8 m diameter closed bottom SPCSP and three proposed structure options assessed are provided in the following sections.

4.1 EXISTING ONE 1.8 M DIAMETER CLOSED BOTTOM STRUCTURAL PLATE CORRUGATED STEEL PIPE (SPCSP)

The design and check discharges have been analyzed hydraulically through the existing single 1.8 m diameter closed bottom Structural Plate Corrugated Steel Pipe (SPCSP) culvert for WWC crossing at 199 street under existing conditions. Alberta Transportation’s Hydro Culv software was used for the hydraulic analysis.

Existing single 1.8 m diameter SPCSP culverts was modeled with existing conditions (culvert invert length of 68.6 m, culvert centerline invert elevation of 671.41 m, no pipe burial depth and a 3.3 % slope) for the design and check discharges. These existing culvert measurements are based on Stantec June 2015 survey.

Under these conditions, existing pipe would flow full under a head of 8.3 m at pipe inlet for 1:100 year design flow. See Sketch SK-1 in Appendix F for hydraulic details.

The velocity for fish passage flow through the existing single 1.8 m diameter SPCSP culvert are higher than the velocity calculated for the natural channel and there is also hydraulic jump at pipe downstream end.

Table-3 summarizes the hydraulics of the proposed structures.

Table-3: Hydraulics of Existing 1-1.8 m Diameter SPCSP Culvert

1-1.8 m Diameter SPCSP Culvert							
Flow	**Natural Channel**			**Proposed Culvert**			
	Flow (m^3/s)	**Depth (m)**	**Velocity (m/s)**	**Pipe Upstream Depth of Flow [(1)] (m)**	**Mean Velocity at Inlet (m/s)**	**Mean Velocity at Outlet (m/s)**	**Freeboard and Comments (m)**
Q_{design}	14	1.3	2.4	8.2	5.5	5.5	Flowing full
$Q_{fish\ passage}$	1.4	0.5	1.2	0.9	2.0	2.3	0.9 and Jump at pipe end
Q_{check1}	30.8	1.8	2.6	42.6	12.1	12.1	Flowing full and most likely road embankment will fail due to overtopping
Q_{check2}	61.8	2.3	2.8	171.7	24.3	24.3	Flowing full most likely road embankment will fail due to overtopping

Note: [(1)] Depth of flow is above the streambed elevation at the upstream culverts end.

Details of the hydraulic results are included in Appendix D.

This option is not recommended.

4.2 SINGLE 3.0 M DIAMETER CLOSED BOTTOM CORRUGATED STEEL PIPE (CSP)

The design and check discharges have been analyzed hydraulically through the proposed single 3.0 m diameter closed bottom Corrugated Steel Pipe (CSP) culvert for WWC crossing at 199 street. Alberta Transportation's Hydro Culv software was used for the hydraulic analysis.

Proposed single 3.0 m diameter CSP culvert and proposed wild life passage bridge (14 m wide x 32 m long x 4.5 high) were modelled. Proposed CSP culvert was modelled with an invert length of 117.5 m with a theoretical streambed centerline elevation of 670.0 m and a pipe burial depth of 0.75 m on a 1.4 % slope. Proposed bridge was modelled with a theoretical streambed centerline elevation of 675.85 m. Both structures were modelled for the design and check discharges and downstream boundary conditions.

Under these conditions, proposed pipe would flow with a freeboard of 0.3 m for design flow (1:100 year). During extreme floods (Qcheck1 and Qcheck2), wildlife passage bridge would provide adequate hydraulic opening to pass these floods without overtopping roadway embankment. See Sketch SK-2 in Appendix F for hydraulic details.

The velocity for fish passage flow through the proposed single 3.0 m diameter SPCSP culvert is higher than the velocity calculated for the natural channel for same flow. Installation of Class 1M rock (max size 300 mm) with pitrun gravel substrate is warranted at culvert invert for fish passage. Class 2 boulders would also be installed at 10 m spacing to interlock substrate and to minimize its movement.

Class 2 (max size 800 mm) heavy rock riprap on the upstream and downstream ends of the culvert is warranted for erosion and scour protection. Table-4 summarizes the hydraulic parameters of the proposed structures.

Table-4: Hydraulics of Existing 1-3.0 m Diameter CSP Culvert

1-3.0 m Diameter CSP Culvert							
Flow	**Natural Channel**			**Proposed Culvert with Substrate Installed**			
	Flow (m^3/s)	**Depth (m)**	**Velocity (m/s)**	**Pipe Upstream Depth of Flow (1) (m)**	**Mean Velocity at Inlet (m/s)**	**Mean Velocity at Outlet (m/s)**	**Freeboard and Comments (m)**
Q_{design}	14	1.3	2.4	2.7	2.6	2.4	0.3
$Q_{fish\ passage}$	1.4	0.5	1.2	0.8	1.4	0.5	2.2
Q_{check1}	30.8	1.8	2.6	6.4	3.6	3.6	Pipe Flowing Full and Flow in Wildlife Bridge
Q_{check2}	61.8	2.3	2.8	7.5	3.8	3.8	Pipe Flowing Full and Flow in Wildlife Bridge

Note: (1) Depth of flow is above the streambed elevation at the upstream culverts end.

Details of the hydraulic results are included in Appendix D.

4.3 SINGLE 3.05 M DIAMETER CLOSED BOTTOM STRUCTURAL PLATE CORRUGATED STEEL PIPE (SPCSP)

The design and check discharges have been analyzed hydraulically through the proposed single 3.05 m diameter closed bottom Structural Plate Corrugated Steel Pipe (SPCSP) culvert for WWC crossing at 199 street. Alberta Transportation's Hydro Culv software was used for the hydraulic analysis.

Proposed single 3.05 m diameter SPCSP culvert and proposed wild life passage bridge (14 m wide x 32 m long x 4.5 high) were modeled. Proposed SPCSP culvert was modelled with an invert length of 117.5 m with a theoretical streambed centerline elevation of 670.0 m and a pipe burial depth of 0.75 m on a 1.4 % slope. Proposed bridge was modelled with a theoretical streambed centerline elevation of 675.85 m. Both structures were modelled for the design and check discharges and downstream boundary conditions.

Under these conditions, proposed pipe would flow with a freeboard of 0.3 m for design flood (1:100 year). During extreme floods (Qcheck1 and Qcheck2), wildlife passage bridge would provide adequate hydraulic opening to pass these floods without overtopping roadway embankment. See Sketch SK-3 in Appendix F for hydraulic details.

The velocity for fish passage through the proposed single 3.0 m diameter SPCSP culverts is higher than the velocity calculated for the natural channel for same flow. Installation of Class 1M rock (max size 300 mm) with pitrun gravel substrate is warranted at culvert invert for fish passage. Class 2 boulders would also be installed at 10 m spacing to interlock substrate and to minimize its movement.

Class 2 (max size 800 mm) heavy rock riprap on the upstream and downstream ends of the culverts is warranted for erosion and scour protection.

Table-5 summarizes the hydraulic parameters of the proposed structures.

Table-5: Hydraulics of Existing 1-3.05 m Diameter SPCSP Culvert

1-3.05 m Diameter SPCSP Culvert							
Flow	Natural Channel			Proposed Culvert with Substrate Installed			
	Flow (m^3/s)	Depth (m)	Velocity (m/s)	Pipe Upstream Depth of Flow [(1)] (m)	Mean Velocity at Inlet (m/s)	Mean Velocity at Outlet (m/s)	Freeboard and Comments (m)
Q_{design}	14	1.3	2.4	2.7	2.6	2.3	0.35
$Q_{fish\ passage}$	1.4	0.5	1.2	0.8	1.4	0.5	2.3
Q_{check1}	30.8	1.8	2.6	6.3	3.6	3.7	Pipe Flowing Full and Flow in Wildlife Bridge
Q_{check2}	61.8	2.3	2.8	7.4	3.8	3.8	Pipe Flowing Full and Flow in Wildlife Bridge

Note: [(1)] Depth of flow is above the streambed elevation at the upstream culverts end.

Details of the hydraulic results are included in Appendix D.

4.4 SINGLE 3.0 M SPAN BY 2.4 M RISE CONCRETE BOX CULVERT

The design and check discharges have been analyzed hydraulically through the proposed single 3.0 m span x 2.4 m rise concrete box culvert for WWC crossing at 199 street. Alberta Transportation's Hydro Culv software was used for the hydraulic analysis.

Proposed one 3.0 m span x 2.4 m rise concrete box culvert and proposed wild life passage bridge (14 m wide x 32 m long x 4.5 high) were modeled. Proposed concrete box culvert was modelled with an invert length of 117.5 m with a theoretical streambed centerline elevation of 670.0 m and a pipe burial depth of 0.6 m on a 1.4 % slope. Proposed bridge was modelled with a theoretical streambed centerline elevation of 675.85 m. Both structures were modelled for the design and check discharges and downstream boundary conditions.

Under these conditions, proposed concrete box culvert would flow full for design flood (1:100 year). During extreme floods (Qcheck1 and Qcheck2), wildlife passage bridge would provide adequate hydraulic opening to pass these floods without overtopping roadway embankment. See Sketch SK-4 in Appendix F for hydraulic details.

The velocities for fish passage through the proposed single 3.0 m span x 2.4 m rise concrete box culvert are higher than the velocity calculated for the natural channel. Installation of Class 1M rock (max size 300 mm) with pitrun gravel substrate is warranted at culvert invert for fish passage. Class 2 boulders would also be installed at 10 m spacing to interlock substrate and to minimize its movement.

Class 2 (max size 800 mm) heavy rock riprap on the upstream and downstream ends of the culvert is warranted for erosion and scour protection.

Table-6 summarizes the hydraulic parameters of the proposed structures.

Table-6: Hydraulics of 1-3.0 m Span x 2.4 m Rise Concrete Box Culvert

Culvert1-3.0 m Span x 2.4 m Rise Concrete Box Culvert							
Flow	Natural Channel			Proposed Culvert with Substrate Installed			
	Flow (m^3/s)	Depth (m)	Velocity (m/s)	Pipe Upstream Depth of Flow (1) (m)	Mean Velocity at Inlet (m/s)	Mean Velocity at Outlet (m/s)	Freeboard and Comments (m)
Q_{design}	14	1.3	2.4	2.6	2.4	2.1	Pipe Flowing Full with no Freeboard
$Q_{fish\ passage}$	1.4	0.5	1.2	0.7	1.2	0.4	1.9
Q_{check1}	30.8	1.8	2.6	6.4	3.4	3.4	Pipe Flowing Full and Flow in Wildlife Bridge
Q_{check2}	61.8	2.3	2.8	7.5	3.6	3.6	Pipe Flowing Full and Flow in Wildlife Bridge

Note: (1) Depth of flow is above the streambed elevation at the upstream culverts end.

Details of the hydraulic results are included in Appendix D.

5.0 Rock Protection Works

The material provided for Class 1M and Class 2 heavy rock riprap shall have a gradation that conforms to the following given in Table 7.

Table-7: Specification of Class 2 Rock Riprap (Source: Alberta Transportation)

Description	Units	Class 1M	Class 2
Nominal Mass Nominal Diameter	Kg or mm	7 175	200 500
Not greater than	Kg or mm	40 300	700 800
20 % to 50%	Kg or mm	10 200	300 600
50% to 80%	Kg or mm	7 175	200 500
100% greater than:	Kg or mm	3 125	40 300

6.0 Environmental Considerations

It has been identified by others that WWC crossing at 199 street would require to accommodate both aquatic and small terrestrial animal passage through proposed culvert. Stantec has reviewed to design culvert crossing to accommodate both aquatic and small terrestrial animal passage.

Based on Wedgewood Creek Road Crossing 199 Street: Fish Habitat Assessment report dated December 2014, prepared by Stantec, the fish habitat in Wedgewood crossing is rated as moderate for forage fish species. WWC crossing at 199 street would be designed for fish passage.

Based on high beaver dam activity and wood debris in Wedgewood creek, it appears that construction of a shelf along culvert length with ramp at culvert inlet to assist movement of small terrestrial animals through culvert would cause maintenance issues and would also cause an accumulation of debris at culvert inlet. Based on discussion with Bill Harper, Senior Wildlife Biologist of Stantec, a single 1.0 m diameter CSP culvert invert would be installed above design flood elevation (See Sketches 2, 3 and 4 given in Appendix F). This single 1.0 m diameter culvert would be solely dedicated to small terrestrial animal passage.

The site considered is not navigable in vicinity of 199 proposed crossing according to the watercourse features, presence of high beaver dam activity and several undersized crossings.

Due to high beaver dam activity in area WWC crossing at 199 street would be designed to accommodate debris passage through crossing opening crossing hydraulic opening would be designed with freeboard for design flood. This freeboard would help debris passage through this crossing. The option to install cage at culvert inlet would require regular maintenance and debris removal for design flow passage through culvert. From site visit (See site visit photos in Appendix B), it is evident that culvert is not performing at its full capacity due to debris accumulation around debris catcher cage at culvert inlet. The existing cage is damaged due to debris. This suggests that this culvert requires maintenance and debris removal at regular intervals. Debris catcher cage contributes to the debris accumulation and eventually becomes another dam at the culvert inlet if debris is not removed. A debris catcher is one solution but only works with regular culvert maintenance and debris removal to keep culvert functioning. Stantec would recommend not installing debris catcher cage at culvert inlet to avoid debris accumulation and would recommend designing culvert with some freeboard. Stantec also recommend regular maintenance and large debris removal from culvert inlet to keep it working at its full hydraulic capacity.

7.0 Geotechnical

Hoggan Engineering & Testing (1980) Ltd. was retained for undertaking the geotechnical investigations for this project. Hoggan Engineering & Testing (1980) Ltd. drilled five test holes 2015-01 to 2015-05 in vicinity of WWC crossing at 199 street crossing. The subsurface condition generally consists of clay fill overlaying sand and/or lacustrine high plastic clay underlain by silt. The final soil encountered in testholes was clay till. Geotechnical report received from Hoggan Engineering & Testing (1980) Ltd. is included in Appendix G.

As part of the Geotechnical Investigation, Hoggan Engineering & Testing (1980) Ltd. completed soil analysis for this site and an assessment of corrosion potential. The conductivity of water was reported 586 μS/cm (equaling resistivity 1706.5 ohm-cm). The pH of the water was 8.09. According to the "CSP Durability Guide" by the National Corrugated Steel Pipe Association, a single galvanized coating 610g/m^2 culvert with a culvert wall thickness of 1.6 mm is considered acceptable for these conditions for more than 75 year average invert service life of CSP (80 years). For this culvert we are recommending culvert wall thickness of 3.5 mm for CSP and 4.0 mm for SPCSP. Soil and water analysis excerpts are given in geotechnical report included in the Appendix G.

8.0 Structure Options

Options investigated for the proposed crossing are; 1-3000 mm diameter round corrugated steel culvert (CSP), 1-3050 mm diameter round structural plate corrugated steel culvert (SPCSP) and 1-3000 mm span x 2400 mm rise box concrete box culvert.

A summary of the structures under consideration are summarized below:

8.1 OPTION A – SINGLE 3000 MM DIAMETER CLOSED BOTTOM CORRUGATED STEEL PIPE (CSP)

A single 3000 mm CSP culvert with an invert length in the order of 117.5 m under a fill in order of 9.1 m at 1.4 % slope would be installed on 40^{o} RHF skew to the roadway centerline. Due to high fill load, a wall thickness of 3.5 mm would be required to meet the structural capacity requirements. Hydraulics point of view, that culvert accommodates design flood with some freeboard to accommodate debris flow. With the provision of Class 1M rock (maximum size 300 mm) with pitrun gravel and Class 2 (maximum size 800 mm at spacing of 10 m) boulders on the culvert invert, culvert would provide fish passage. A separate single 1.0 m diameter CSP culvert with an invert length in the order of 92.5 m under a fill in order of 6.6 m at 0.5 % slope would be installed on 40^{o} RHF skew to the roadway centerline. This single 1.0 m diameter culvert would be solely dedicated to small terrestrial animal passage. Guardrail for the culvert option is warranted based on the provision of 2:1 sideslopes.

8.2 OPTION B – SINGLE 3050 MM DIAMETER CLOSED BOTTOM STRUCTURAL PLATE CORRUGATED STEEL PIPE (SPCSP)

A single 3050 mm SPCSP culvert with an invert length in the order of 117.5 m under a fill in order of 9.1 m at 1.4 % slope would be installed on 40^{o} RHF skew to the roadway centerline. Due to high fill load, a wall thickness of 4.0 mm would be required to meet the structural capacity requirements. Hydraulics point of view, that culvert accommodates design flow with some freeboard to accommodate debris. With the provision of Class 1M rock (with maximum size 300 mm) with pitrun gravel and Class 2 (maximum size 800 mm at spacing of 10 m) on the culvert invert, culvert would provide fish passage. A separate single 1.0 m diameter CSP culvert with an invert length in the order of 92.5 m under a fill in order of 6.6 m at 0.5 % slope would be installed on 40^{o} RHF skew to the roadway centerline. This single 1.0 m diameter culvert would be solely dedicated to small terrestrial animal passage. Guardrail for the culvert option is warranted based on the provision of 2:1 sideslopes.

8.3 OPTION C – SINGLE 3000 MM SPAN BY 2400 MM RISE CONCRETE BOX CULVERT

A single 3000 mm span x 2400 mm rise concrete box culvert with an invert length in the order of 117.5 m under a fill in order of 9.3 m at 1.4 % slope would be installed on 40° RHF skew to the roadway centerline. Hydraulics point of view, that culvert accommodates design flood with no freeboard. With the provision of Class 1M (maximum size 300 mm) pitrun gravel and Class 2 (maximum size 800 mm at spacing of 10 m) on the culvert invert, culvert would provide fish passage. A separate single 1.0 m diameter CSP culvert with an invert length in the order of 92.5 m under a fill in order of 6.6 m at 0.5 % slope would be installed on 40^{o} RHF skew to the roadway centerline. This single 1.0 m diameter culvert would be solely dedicated to small terrestrial animal passage. Guardrail for the culvert option is warranted based on the provision of 2:1 sideslopes.

9.0 Opinion of Probable Cost

The estimated contract cost (within +/- 25 %) for this project including 15 % contingency is summarized below in Table-8. Other project costs such as, wildlife passage bridge, utility relocation, traffic accommodation during construction, common fill, slope erosion control measures and additional right of way etc. are not included. Small animal passage culvert cost is included in estimated cost. Details of the cost estimate are included in the Appendix H.

Table-8: Opinion of Probable Cost including 15% Contingency

Description	Probable Cost Estimate
A Single 3000 mm diameter closed bottom CSP culvert with a 117.5 m invert length	$ 906,000
A Single 3050 mm diameter closed bottom SPCSP culvert with a 117.5 m invert length	$ 1,178,000
A Single 3000 mm span x 2400 mm rise concrete box culvert with a 117.5 m invert length	$ 1,605,000

10.0 Detailed Design Considerations

Based on information provided in above sections of this report, the following items will need to be incorporated into the detailed design:

- Outfall operation and WWC tributary flows at upstream end.
- North bank stability (old slump) at upstream end.
- Geotechnical recommendations
- Roadway geomatics
- Design flow, fish passage, large animal passage and small animal passage
- Beaver dam activity and its impacts on culvert flows and environment.
- Downstream WWC scour and erosion
- Constructability issues will need to be considered and addressed for chosen structure option during the detailed design stage.

11.0 Recommendation

Considering cost, technical feasibility, installation, hydraulic performance and long term functionality, it is recommended to proceed with the detail design of Option 1 (Single 3000 mm diameter closed bottom corrugated steel pipe (CSP)) for the Wedgewood Creek Crossing at 199 street culvert replacement. Option 1 provides adequate hydraulic capacity for design flood with some freeboard to assist in accommodating debris passage. It would also provide fish passage. Option 1 would also facilitate an easy and fast installation of the new structure.

Stantec would also recommend regular maintenance and debris removal from culvert inlet to keep it working at its full hydraulic capacity.

It is evident that existing 1.8 m diameter SPCSP culvert is not performing at its full capacity due to debris accumulation around debris catcher cage at culvert inlet. The existing cage is damaged due to debris. Debris catcher cage contributes to the debris accumulation and eventually becomes another dam at the culvert inlet if debris is not removed. A debris catcher is one solution but only works with regular culvert maintenance and debris removal to keep culvert functioning. Considering all the pros and cons of a debris catcher, Stantec is not recommending a debris catcher cage at proposed culvert inlet.

Based on discussion with Bill Harper, Senior Wildlife Biologist of Stantec, it is also recommended that a single 1.0 m diameter CSP culvert be designed. This culvert would be solely dedicated to small terrestrial animal passage and the culvert invert would be installed above design flood elevation (See Sketches 2, 3, 4 given in Appendix F).

11.0 Closing

We would be pleased to discuss the recommendations provided in this report with Qualico Communities at your earliest convenience.

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S. Bridge Planning Engineer

This report was prepared by Stantec Consulting Ltd. for the Wedgewood Creek crossing at 199 street, Edmonton, Alberta. The material in it reflects Stantec's judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Stantec accepts no responsibility for damages, if any suffered by any third party as a result of decisions made or actions based on this report.

APPENDICES

APPENDIX A

TOPOGRAPHIC MAPS AND DRAINAGE AREA ASSESSMENT

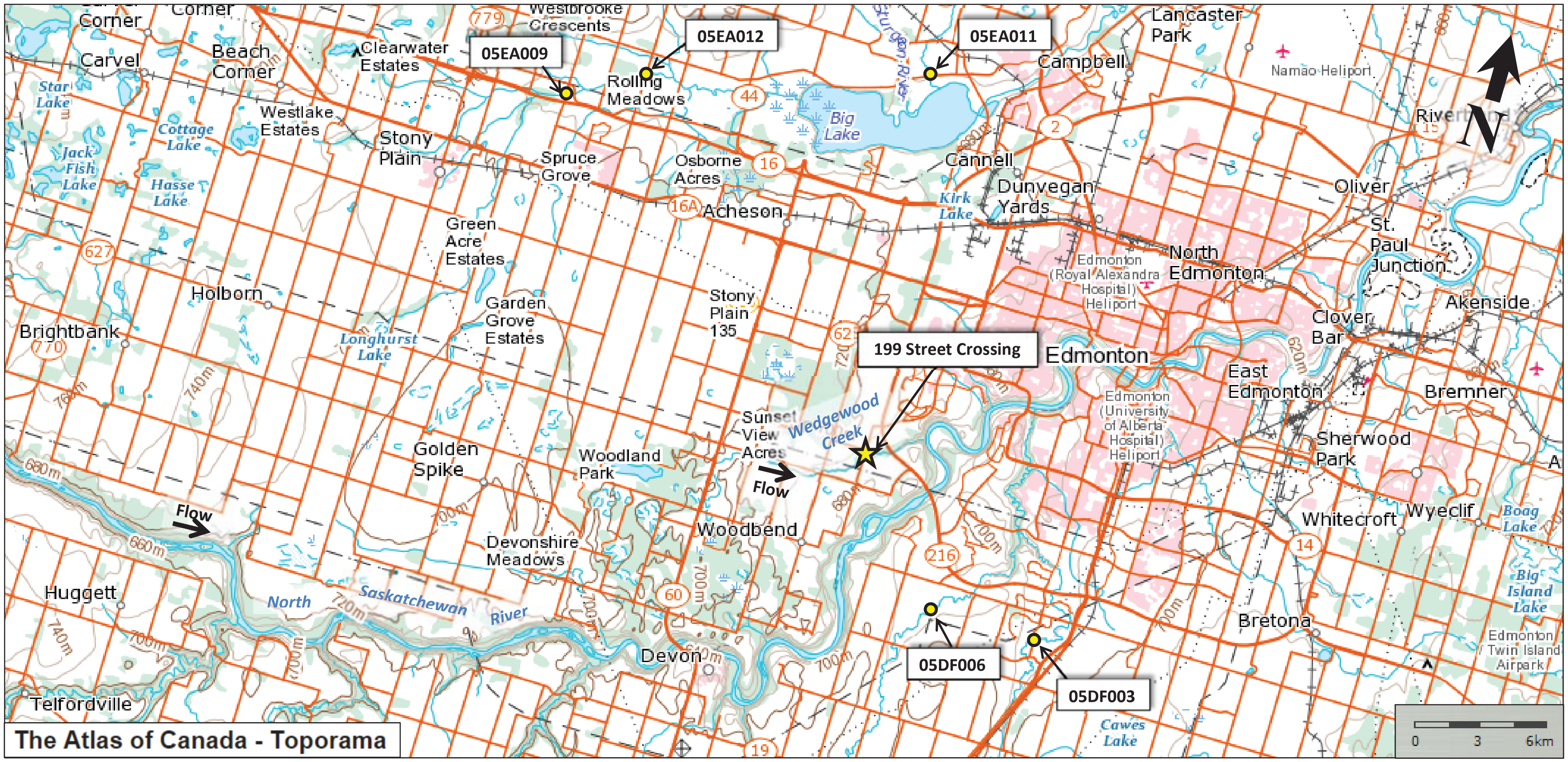

Figure A1 Approximate location of Wedgewood Creek crossing at 199 street and relevant WSC gauges in vicinity of study reach.

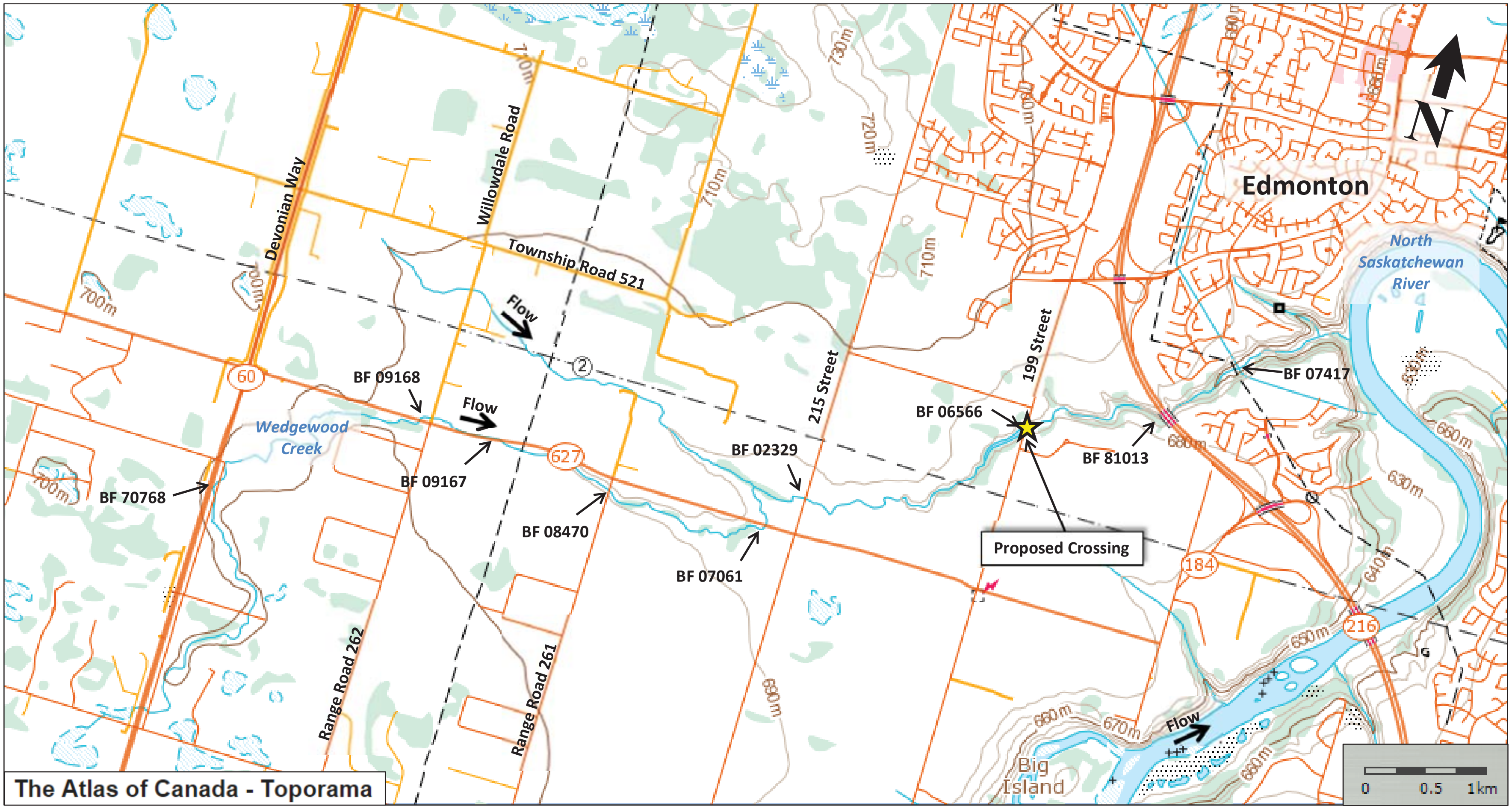

Figure A2 Location of relevant AT BFs along Wedgewood Creek in study reach.

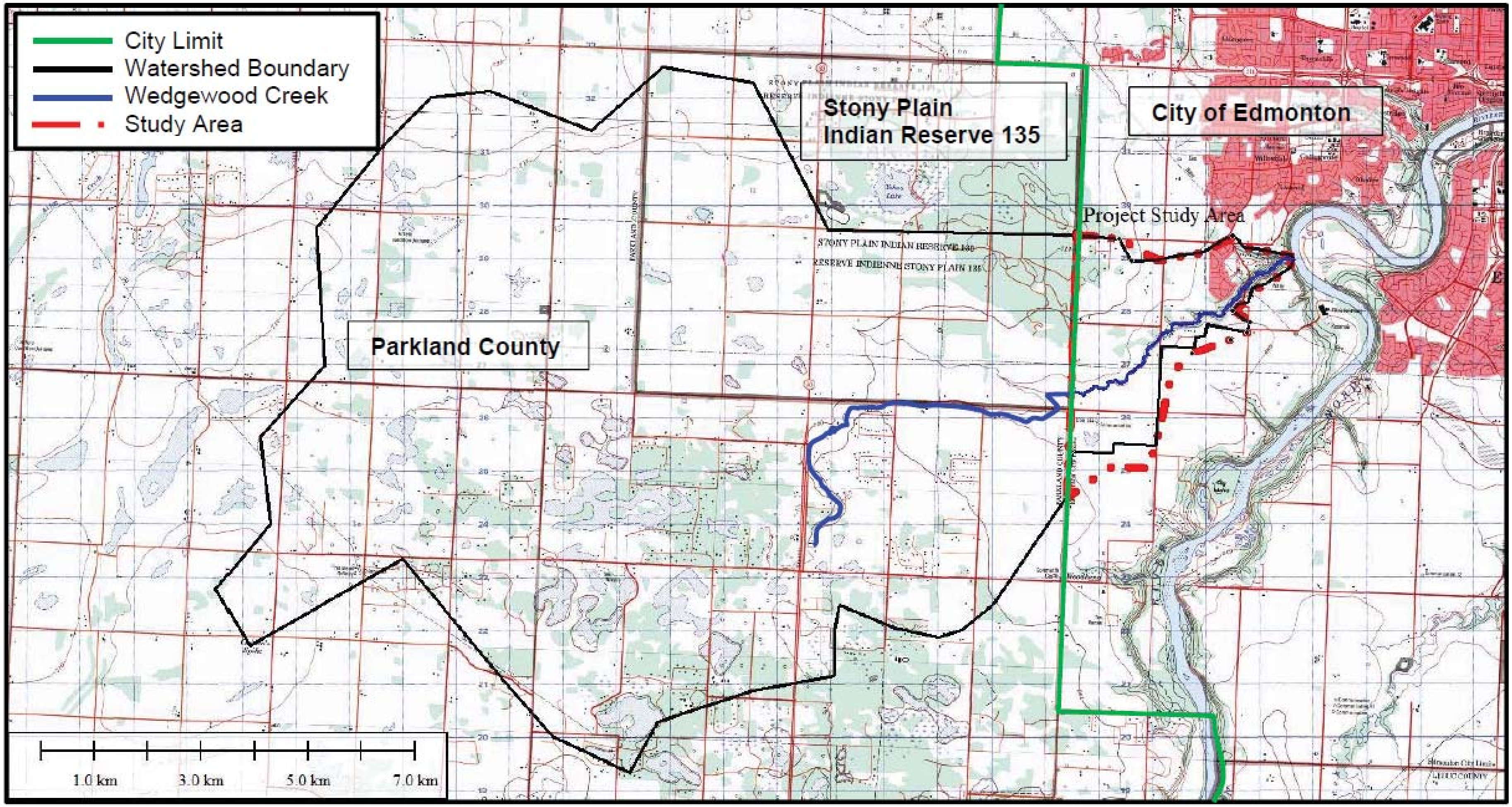

Figure A3 Wedgewood Creek watershed boundary from Golder Associates Ltd. 2012 report.

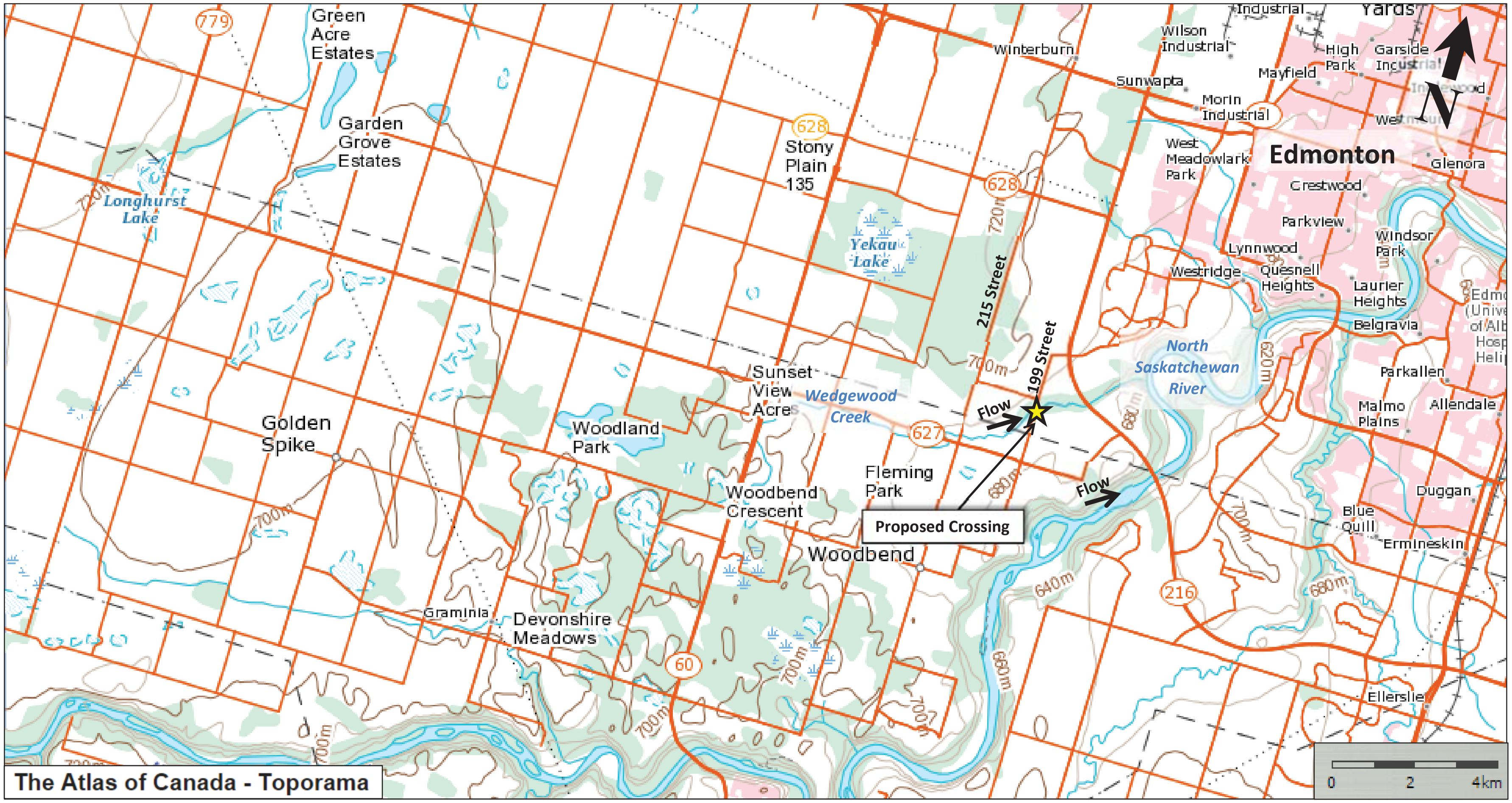

Figure A4 Contour map showing Wedgewood Creek watershed.

APPENDIX B

JUNE 18, 2015 SITE VISIT PHOTOS

Photo 1: Looking upstream at upstream end of Culvert

Photo 2: Looking upstream at upstream end of Culvert
Note: Debris accumulation

Photo 3: Looking upstream at upstream end of Culvert

Photo 4: Looking at outfall and its bank protection north of upstream end of culvert
Note: Left bank sign of old slumping

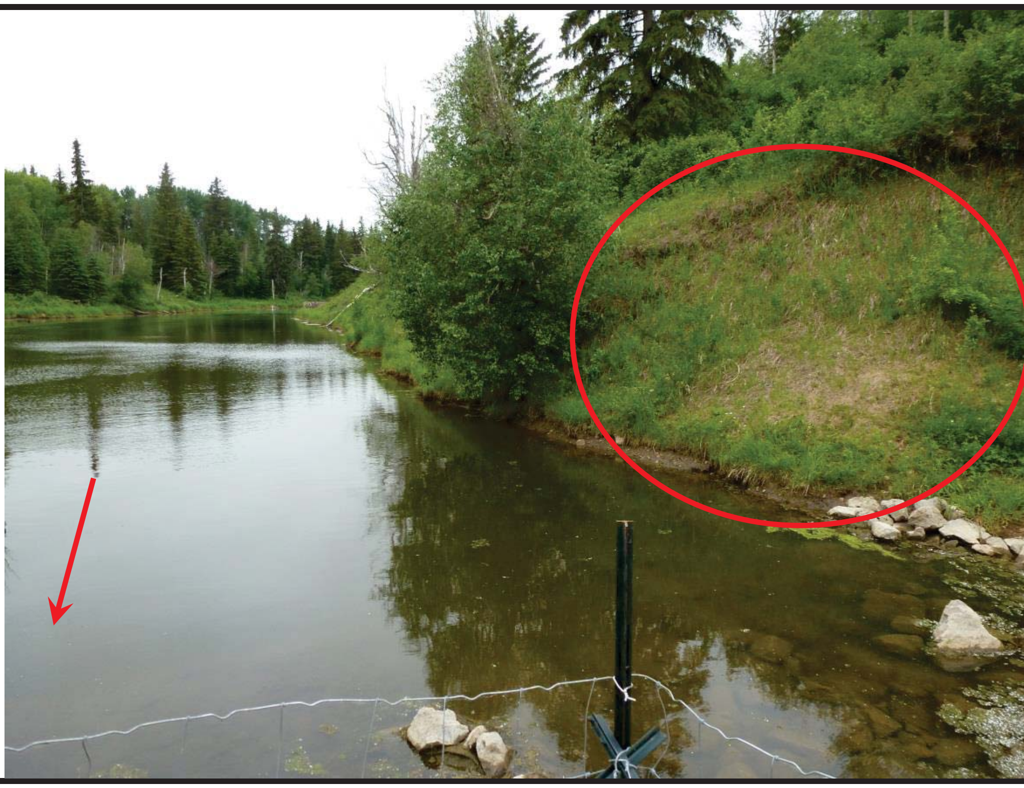

Photo 5: Looking at outfall and its bank protection north of upstream end of culvert
Note: Left (north) bank sign of old slumping

Photo 6: Looking at outfall and its bank protection north of upstream end of culvert
Note: Beaver dam at mouth of tributary joining Wedgewood creek

Photo 7: :Looking at upstream end of the culvert Note: Beaver dam, debris catcher and accumulation of debris at upstream end of culvert. Please also note slope of right (south) bank slope.

Photo 8: Looking at outfall and its bank protection north of upstream end of culvert

Photo 9 : Looking at outfall and its bank protection north of upstream end of culvert Note: Beaver dam at mouth of tributary joining Wedgewood creek

Photo 10: Looking at erosion control measures along upstream (west) side slope

Photo 11: Looking downstream at outfall

Note: Extent of Class 1 rock protection provided at outfall outlet.

Photo 12: Looking downstream at upstream end of existing culvert
Note: Beaver dam, debris catcher and accumulation of debris at upstream end of culvert.

Photo 13: Looking upstream at tributary joining Wedgewood Creek upstream of crossing along left (north) bank north of outfall

Photo 14: Looking at beaver dam on tributary upstream of crossing along left (north) bank

Photo 15: Looking at debris at upstream end of culvert

Photo 16: : Looking at debris at upstream end of culvert