APPENDIX D
Footbridge Engineering Drawings

ANTHONY HENDAY DRIVE

E.L. SMITH WATER TREATMENT PLANT

TERWILLEGAR PARK

NORTH SASKATCHEWAN RIVER

LOT 1
BLOCK B
PLAN 645NY
CITY OF EDMONTON

EXISTING TERWILLEGAR PARKING LOT

PROPOSED 3.0m TRAIL

LOT 18ER
BLOCK 79
PLAN 822 0988
CITY OF EDMONTON

C. of T.
752 118 684
CITY OF EDMONTON

PROPOSED 3.0m TRAIL

LOT 1
BLOCK 1
PLAN 042 5135
EDMONTON COUNTRY CLUB LIMITED

EDMONTON COUNTRY CLUB

OLESKIW NEIGHBOURHOOD

C. of T.
902 258 905

10.00m BUFFER ZONE
30.00m PROTECTION ZONE

EXISTING OUTFALL

ARCHEOLOGICAL SITE BOUNDARY
AREA REQUIRED = 36689.650m²
Ac = 9.07 ha = 3.67
TOTAL PERIMETER = 703.529m²

TOTAL BUFFER ZONE PERIMETER
= 766.294m²

TOTAL PROTECTION ZONE PERIMETER
= 896.873m²

HENDERSON ESTATES NEIGHBOURHOOD

RABBIT HILL ROAD

RHATIGAN RIDGE NEIGHBOURHOOD

RIVERBEND ROAD

C. of T.
072 658 263 +2
CITY OF EDMONTON

C. of T.
072 658 262 +2
CITY OF EDMONTON

WOODWARD CRESCENT

LOT 67
BLOCK 21
DESCRIPTIVE PLAN 052 3991
CITY OF EDMONTON

C. of T.
072 658 262 +1
CITY OF EDMONTON

PROPOSED 3.0m TRAIL

PARCEL A
PLAN 5252 KS
CITY OF EDMONTON

PARCEL B
PLAN 5252 KS
CITY OF EDMONTON

PARCEL C
PLAN 5252 KS
CITY OF EDMONTON

FORT EDMONTON FOOTBRIDGE

NORTH SASKATCHEWAN RIVER

PLAN
1: 5000

Location Plan

NOTES:
PRELIMINARY
-NOVEMBER 2013-

PROPOSED TRAILS. . . . . .
EXISTING TRAILS . . . . . .

LEGEND

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

APPROVED FOR CONSTRUCTION
DATE

DESIGNER

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

SURVEY
JOB NO.
SCALE

DRAWN E.C. DATE m/d/yy
DESIGNED - DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
PROJECT LAND DESCRIPTION

DRAWING
TPFB-PD-LP1

GENERAL NOTES

THESE DRAWINGS ARE TO BE USED FOR PRELIMINARY COSTING ONLY.

ALL DIMENSIONS ON THE GENERAL ARRANGEMENT AND INFORMATION SHEETS ARE GIVEN IN METRES UNLESS NOTED OTHERWISE. ALL OTHER DRAWINGS ARE DIMENSIONED IN MILLIMETRES UNLESS NOTED OTHERWISE.

ALL STATIONS & ELEVATIONS ON ALL DOCUMENTS ARE INDICATED IN METRES.

RIVER BED CONTOURS, WHERE SHOWN, ARE APPROXIMATE, GENERATED FROM BATHYMETRIC DATA ACQUIRED BY STANTEC ON AUGUST 23, 2013. NOTE THAT RIVER CHANNEL CONTOURS VARY WITH TIME AS A CONSEQUENCE OF RIVER FLOWS AND THE INFORMATION PRESENTED MAY NOT BE APPLICABLE AT ANY OTHER TIME.

ALL CONTOUR INFORMATION PRESENTED HAS BEEN COMPILED FOR DESIGN PURPOSES ONLY. WHILE IT IS BELIEVED TO REASONABLY REPRESENT THE GROUND SURFACE ELEVATIONS AT THE SITE, THE ELEVATION INFORMATION PRESENTED IS NOT EXACT AND SHOULD NOT BE CONSTRUED AS GUARANTEEING THE ACTUAL GROUND ELEVATIONS AT ANY LOCATION.

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.

DESIGN CRITERIA AND LOADINGS

DESIGN STANDARD: CANADIAN HIGHWAY BRIDGE DESIGN CODE, CAN/CSA-S6-06 (REAFFIRMED 2012).
DESIGN LIFE: 75 YEARS.

LOADING

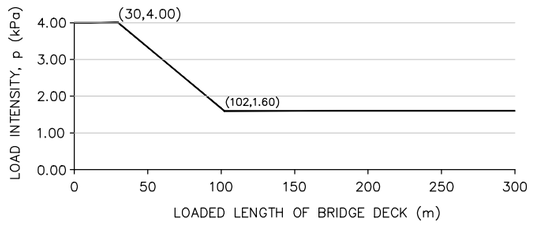
DEAD:

CAST-IN-PLACE CONCRETE =	24.0 kN/m^3
PRECAST CONCRETE =	24.5 kN/m^3
STEEL =	77.0 kN/m^3
WEARING SURFACE =	23.5 kN/m^3

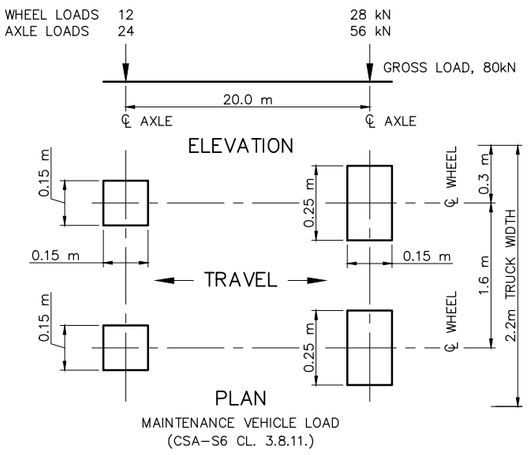
LIVE:

PEDESTRIAN LOADING – IN ACCORDANCE WITH CSA-S6, CL. 3.8.9.

CSA-S6, CL. 3.8.9 – PEDESTRIAN LIVE LOAD ON FOOTBRIDGE



MAINTENANCE VEHICLE – 80 kN GROSS LOAD IN ACCORDANCE WITH CSA-S6, CL. 3.8.11.



MAINTENANCE VEHICLE LOAD (CSA-S6 CL. 3.8.11.)

DESIGN CRITERIA AND LOADING CONT'D

BRIDGE RAILING LOADING – IN ACCORDANCE WITH CSA-S6 CL. 3.8.8.2
WIND:
DESIGN PRESSURE, Q50 = 0.45 kPa SERVICE. APPLY IN ACCORDANCE WITH CSA-S6 CL. 3.10.
THERMAL:
CSA-S6, CL. 3.9.3 SUPERSTRUCTURE TYPE C.
MAXIMUM MEAN DAILY TEMPERATURE = +28°C
MINIMUM MEAN DAILY TEMPERATURE = -40°C
MAXIMUM EFFECTIVE TEMPERATURE = 28°C + 10°C – 0.5°C = +37.5°C
MINIMUM EFFECTIVE TEMPERATURE = -40°C – 5°C + 0.5°C = -44.5°C
THERMAL COEFFICIENT OF LINEAR EXPANSION = 10 x 10^{-6}/°C
RIVER ICE ON PIERS: DESIGN IN ACCORDANCE WITH CSA-S6.
DYNAMIC ICE LOAD FROM ICE JAMMING APPLIED AT ELEVATION 619.4.
ICE STRENGTH = 1100 kPa, ICE THICKNESS = 1.1 m.
DYNAMIC ICE LOAD FROM ICE RUN APPLIED AT ELEVATION 623.1. ICE STRENGTH = 700 kPa, ICE THICKNESS = 1.1 m.
CONCRETE CREEP AND SHRINKAGE:
IN ACCORDANCE WITH CEB FIP 1990 – ANNUAL MEAN RELATIVE HUMIDITY = 50%.
SEISMIC:
CSA-S6 CL. 3.13 – Za = 0, Zv = 1, V = 0.05, A = 0.00
EARTH PRESSURES:
IN ACCORDANCE WITH THE PROJECT GEOTECHNICAL REPORT.
CONSTRUCTION LOADING: 0.5 kPa ON PRECAST DECK TOP.

DEFLECTION AND VIBRATIONS – CRITERIA AS PER SETRA TECHNICAL GUIDE FOR ASSESSMENT OF VIBRATIONAL BEHAVIOR OF FOOTBRIDGES UNDER PEDESTRIAN LOADING, OCTOBER 2006.

PRECAST CONCRETE DECK SEGMENTS

DECK SEGMENTS SHALL BE AT LEAST 180 DAYS OLD AT THE TIME OF POST-TENSIONING.

DECK SEGMENT WEIGHT SHALL BE ESTIMATED AT THE SHOP DRAWING STAGE AND NOTED ON THE SHOP DRAWINGS AND THEN SEGMENT WEIGHT SHALL BE CONFIRMED BY WEIGHING SUBSEQUENT TO CASTING.

REFER TO PRECAST DECK PANEL DRAWING FOR ADDITIONAL DETAILS.

CONCRETE

CLASS OF CONCRETE AND ITS COMPOSITION SHALL BE AS FOLLOWS:

CLASS OF CONCRETE	MINIMUM SPECIFIED COMPRESSIVE STRENGTH AT 28 DAYS (MPa)	NOMINAL MAXIMUM AGGREGATE SIZE (mm)	RANGE OF SLUMP (mm)	TOTAL AIR CONTENT (%)	MAX. WATER/ CEMENTING MATERIALS RATIO
C	35	20 TO 5	100 ± 30	5 – 8	0.40
HPC	50	14 TO 5	120 ± 30	5 – 8	0.38
PILE	30	28 TO 5	130 ± 30	4 – 7	0.42

CONCRETE SURFACE FINISH
APPLY SURFACE FINISH ON EXPOSED CONCRETE SURFACES TO 600 mm BELOW GRADE AND IN RIVER PIERS TO 600 mm BELOW LOWEST WATER LEVEL AS FOLLOWS:
CLASS 1: ORDINARY SURFACE FINISH
CLASS 3: BONDED CONCRETE FINISH WITH PIGMENTED SEALER
CLASS 5: FLOATED SURFACE FINISH, BROOMED TEXTURE

CONCRETE ELEMENTS

ELEMENT	CONCRETE CLASS	CONCRETE FINISH CLASS
TOP SURFACE OF PRECAST DECK PANELS	HPC	5
PRECAST DECK PANELS, OTHER SURFACES	HPC	3
TOP SURFACE OF CAST-IN-PLACE CLOSURE POURS	HPC	5
CAST-IN-PLACE CLOSURE POURS, OTHER SURFACES	HPC	3
TOP SURFACE OF ABUTMENT ROOF SLAB	C	5
ABUTMENT	C	3
TOP SURFACE OF PIER SHAFT	C	1
PIER SHAFT, OTHER SURFACES	C	3
PIER CAISSONS	PILE	N/A

DECK DURABILITY

THE BRIDGE DECK TOP SURFACE WILL HAVE APPROPRIATE WEARING SURFACE. OTHER SURFACES WILL HAVE AN APPROVED PIGMENTED SEALER.

REINFORCING

REINFORCING STEEL TO CONFORM TO CSA G30.18M GRADE 400, METRIC DESIGNATION. REINFORCING FOR PIERS AND ABUTMENTS TO BE UNCOATED CARBON STEEL REINFORCING.

MINIMUM CONCRETE COVER TO BE AS FOLLOWS UNLESS NOTED OTHERWISE:

PRECAST CONCRETE DECK SEGMENTS:
REINFORCING: 50 mm COVER TOP BARS
40 mm COVER SOFFIT BARS.
POST TENSIONING: COVER AS INDICATED ON DETAILS.

CAST-IN-PLACE CONCRETE OBSERVATION AREA AT PIERS, DECK SEGMENT CLOSURE POURS AND ABUTMENT ROOF SLAB:
REINFORCING: 70 mm COVER TOP BARS
50 mm COVER BOTTOM BARS.
POST TENSIONING: COVER AS INDICATED ON DETAILS.

CAISSONS
REINFORCING: 75 mm COVER

ABUTMENTS
REINFORCING: 50 mm COVER

PIER SHAFT
REINFORCING: 70 mm COVER

ALL HOOK LENGTHS AND ALL STRAIGHT LEG LENGTHS SHALL BE SIZED TO DEVELOP FULL TENSILE CAPACITY OF BAR UNLESS SPECIFICALLY NOTED OTHERWISE, IN ACCORDANCE WITH CSA-S6.

REINFORCING LAP LENGTHS SHALL BE SIZED TO TRANSFER THE FULL TENSILE CAPACITY BETWEEN LAPPING BARS, UNLESS SPECIFICALLY NOTED OTHERWISE, IN ACCORDANCE WITH CSA-S6.

PRELIMINARY
- NOVEMBER 2013-

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-

APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

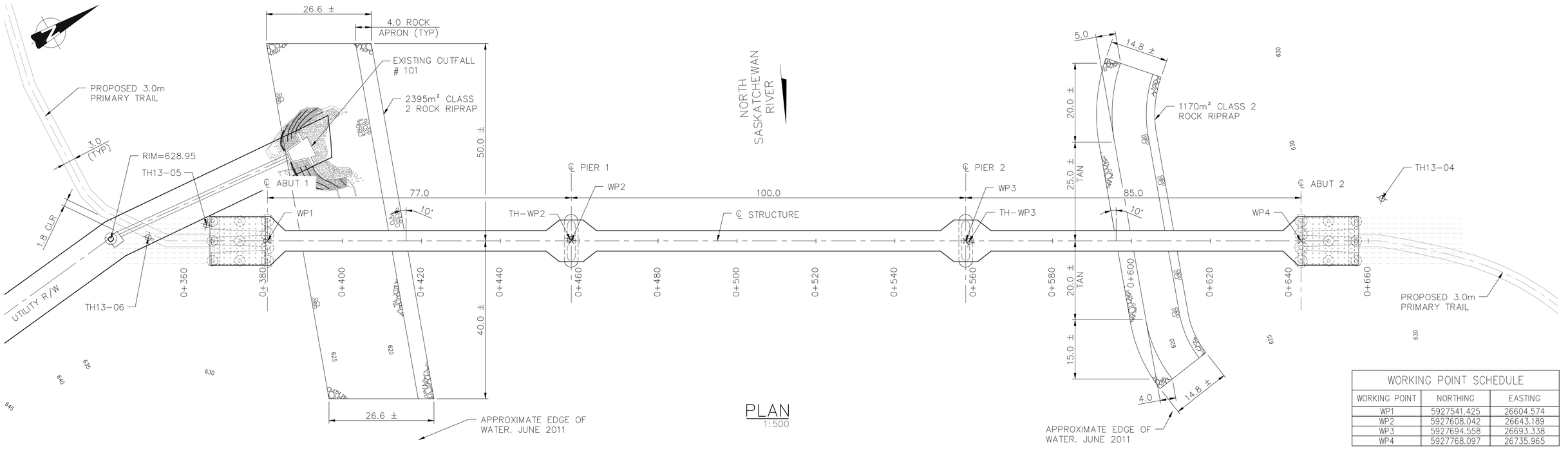
SURVEY
JOB NO. -
SCALE

DRAWN - DATE m/d/yy
DESIGNED - DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
FOOTBRIDGE DESIGN CRITERIA

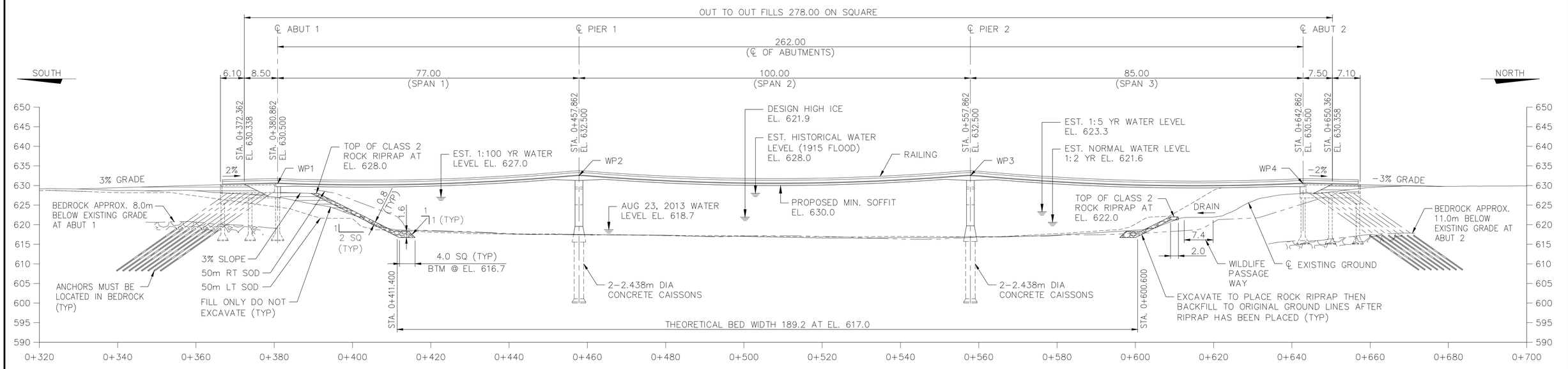
DRAWING
TPFB-PD-S01



PLAN
1:500

WORKING POINT SCHEDULE		
WORKING POINT	NORTHING	EASTING
WP1	5927541.425	26604.574
WP2	5927608.042	26643.189
WP3	5927694.558	26693.338
WP4	5927768.097	26735.965

ALL COORDINATES ARE NAD83 3TM GRID COORDINATES REFERENCED FROM CENTRAL MERIDIAN 114° W



ELEVATION
1:500

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

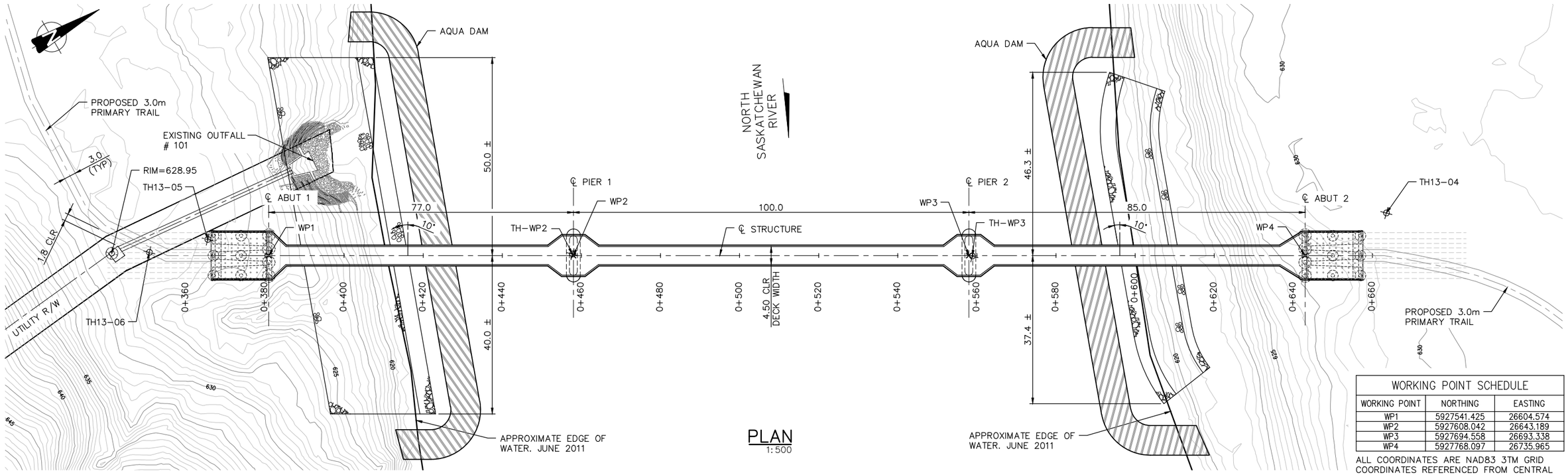
DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

SURVEY
JOB NO.
SCALE
DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
GENERAL LAYOUT

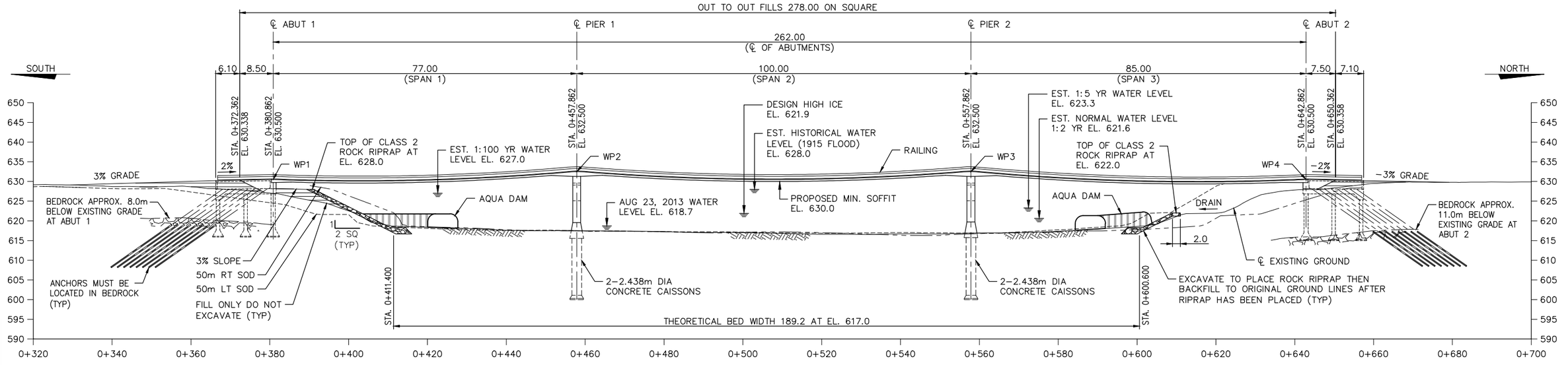
DRAWING
TPFB-PD-S02



PLAN
1:500

WORKING POINT SCHEDULE		
WORKING POINT	NORTHING	EASTING
WP1	5927541.425	26604.574
WP2	5927608.042	26643.189
WP3	5927694.558	26693.338
WP4	5927768.097	26735.965

ALL COORDINATES ARE NAD83 3TM GRID COORDINATES REFERENCED FROM CENTRAL MERIDIAN 114° W



ELEVATION
1:500

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

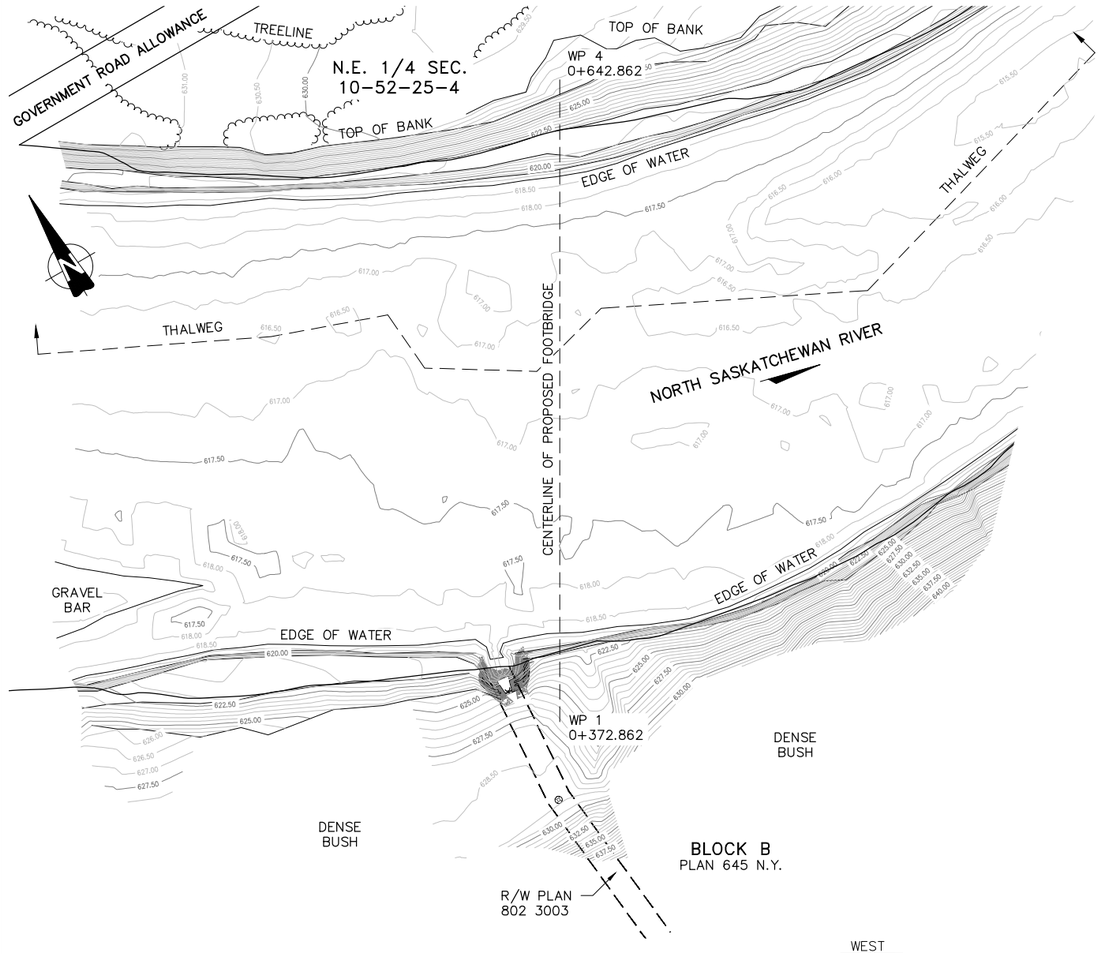
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

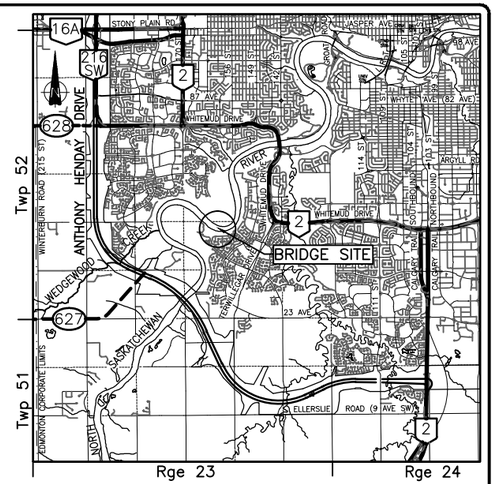
PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
ISOLATION PLAN FOR RIVER BANK

DRAWING
TPFB-PD-S02A



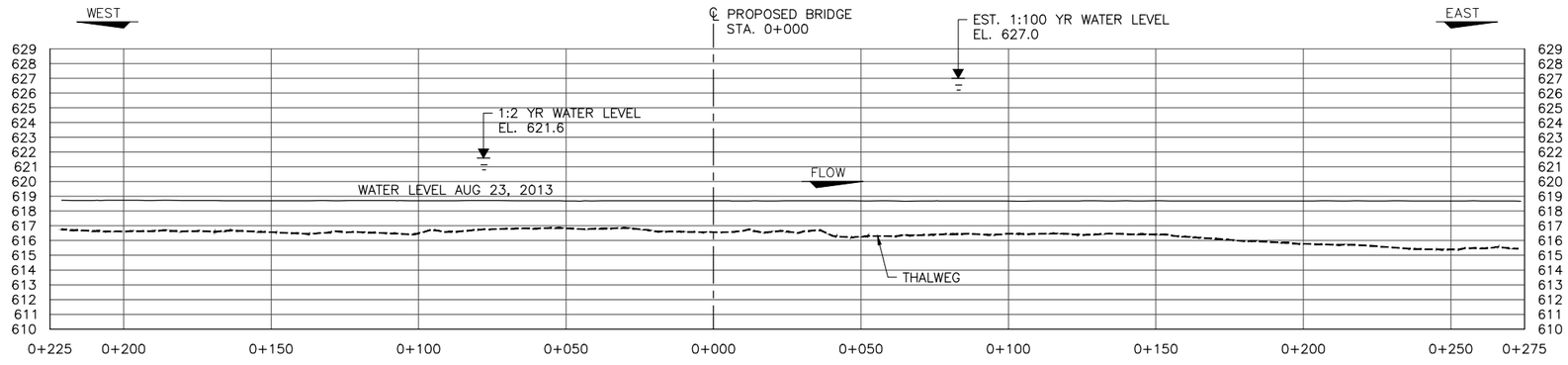
SITE PLAN
1:1250

QUANTITY ESTIMATE – TERWILLEGER PARK FOOTBRIDGE						
ITEM		UNIT	SUBSTR	SUPERSTR	TOTAL EST	AS CONST
PILING –	SUPPLY & DRIVE	m				
	SET–UP	PILE				
CONCRETE – CLASS S		m^3				
CONCRETE – CLASS SF		m^3				
CONCRETE – CLASS SF SEGMENTAL		m^3				
		m^3				
REINFORCING STEEL	PLAIN	kg				
	EPOXY COATED	kg				
	STAINLESS STEEL	kg				
POST–TENSIONING		kg				
BRIDGE DECK WATERPROOFING		m^2				
ASPHALT CONCRETE PAVEMENT – TYPE 2		m^2				
CLASS 2 RIPRAP – BANK PROTECTION ABUT 1		m^3	2253			
CLASS 2 RIPRAP – BANK PROTECTION ABUT 2		m^3	1175			



SITE MAP
1:100 000

PRIMARY HIGHWAY
MAJOR ROADS
ALL OTHER ROADS



STREAM PROFILE
H 1:1000
V 1:200

PRELIMINARY
- JANUARY 2014-

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-
APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

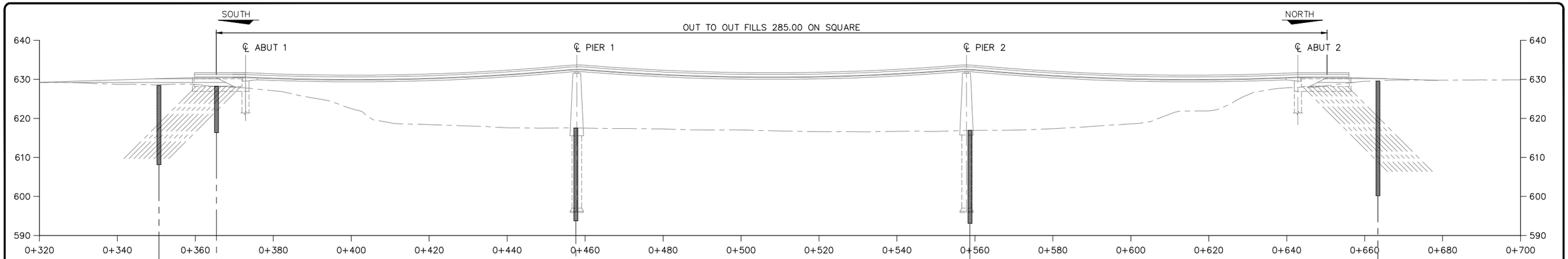
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

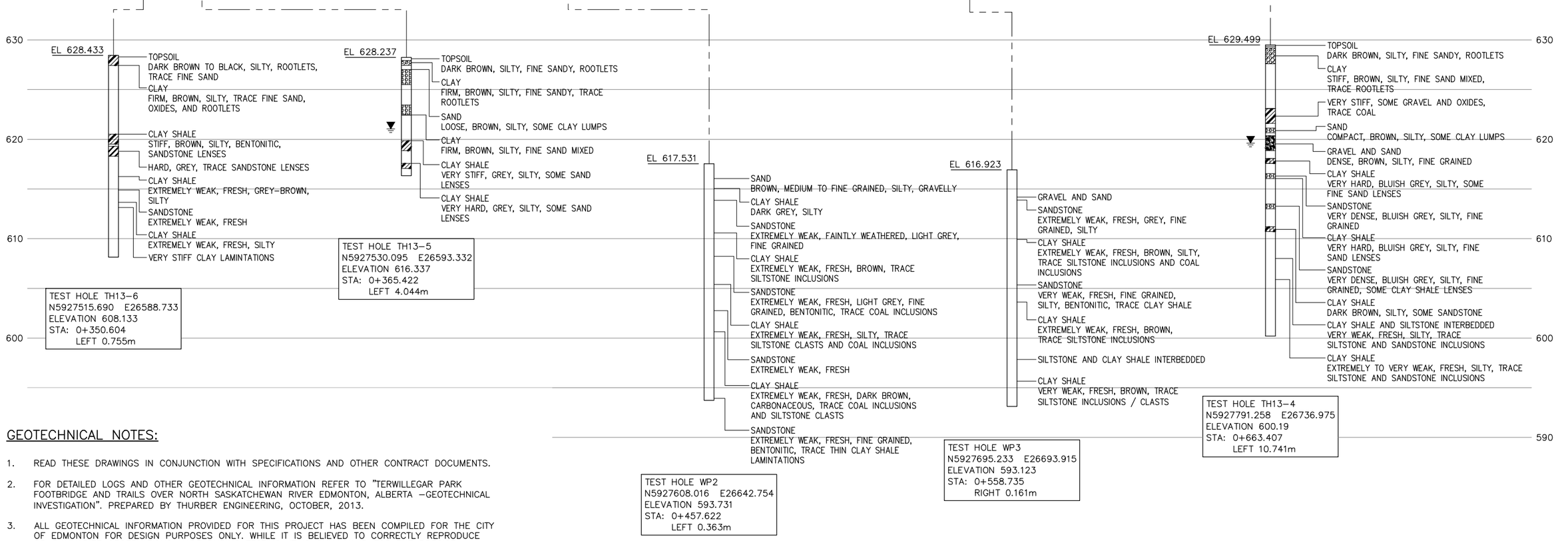
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
INFORMATION SHEET 1

DRAWING
TPFB-PD-S03



ELEVATION
1:500



GEOTECHNICAL NOTES:

1. READ THESE DRAWINGS IN CONJUNCTION WITH SPECIFICATIONS AND OTHER CONTRACT DOCUMENTS.
2. FOR DETAILED LOGS AND OTHER GEOTECHNICAL INFORMATION REFER TO "TERWILLEGAR PARK FOOTBRIDGE AND TRAILS OVER NORTH SASKATCHEWAN RIVER EDMONTON, ALBERTA –GEOTECHNICAL INVESTIGATION". PREPARED BY THURBER ENGINEERING, OCTOBER, 2013.
3. ALL GEOTECHNICAL INFORMATION PROVIDED FOR THIS PROJECT HAS BEEN COMPILED FOR THE CITY OF EDMONTON FOR DESIGN PURPOSES ONLY. WHILE IT IS BELIEVED TO CORRECTLY REPRODUCE OR SUMMARIZE OBSERVATIONS MADE DURING TESTING, IT IS ONLY VALID FOR THE PRECISE LOCATION(S) 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.

SOIL LOGS
H: 1:2000
V: 1:200

PRELIMINARY
- NOVEMBER 2013-

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-
APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

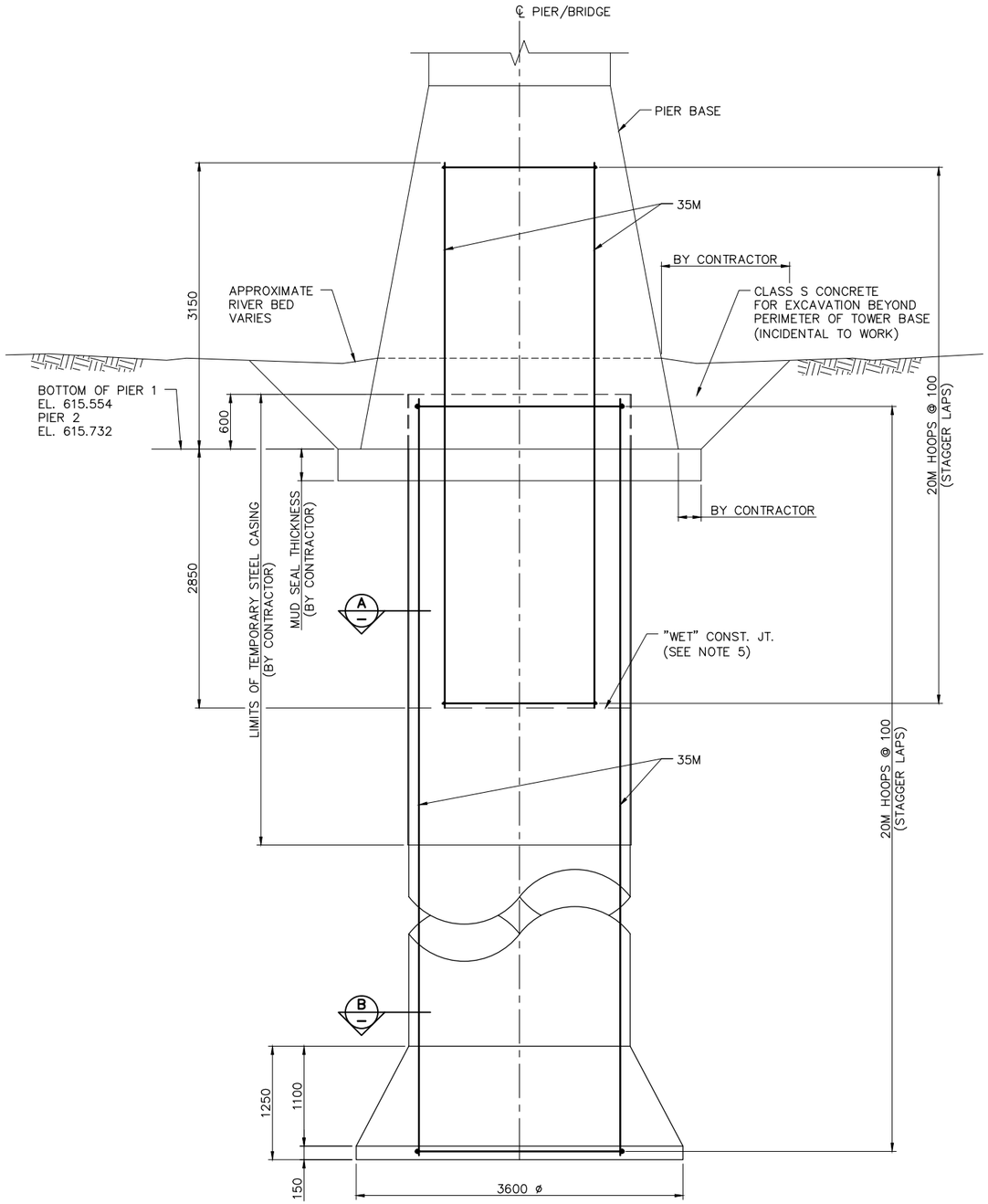
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

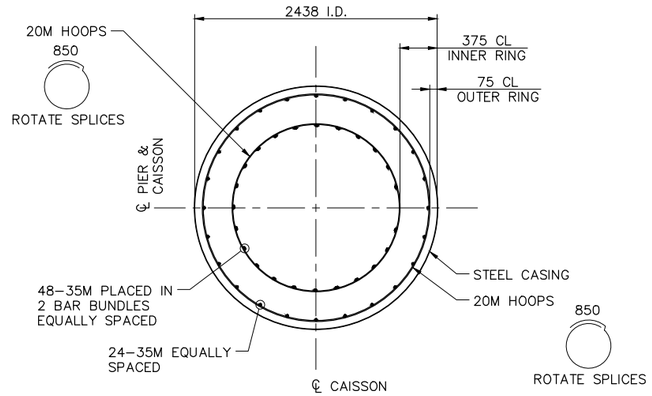
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
SOIL INFORMATION SHEET

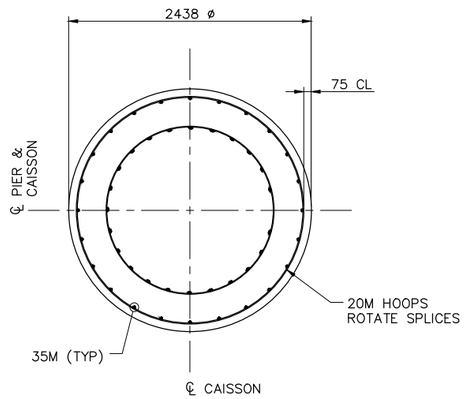
DRAWING
TPFB-PD-S04



ELEVATION
1:30



A SECTION
1:30



B SECTION
1:30

CAISSON NOTES:

1. USE 1800 SPLICE LENGTH FOR 35M BARS AND STAGGER ALL SPLICES.
2. CAISSON REINFORCING IS TO EXTEND FULL DEPTH OF DRILLED HOLE.
3. CONSTRUCTION TOLERANCE FOR ℄ CAISSON LOCATION = 150±.
4. CONCRETE – REFER TO INFORMATION SHEET.
5. CONTRACTOR SHALL PLAN WORK IN ACCORDANCE WITH THEIR METHODS AND MEANS TO REMOVE TEMPORARY CASING.

PRELIMINARY
- NOVEMBER 2013-

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

APPROVED FOR CONSTRUCTION
DATE

DESIGNER

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

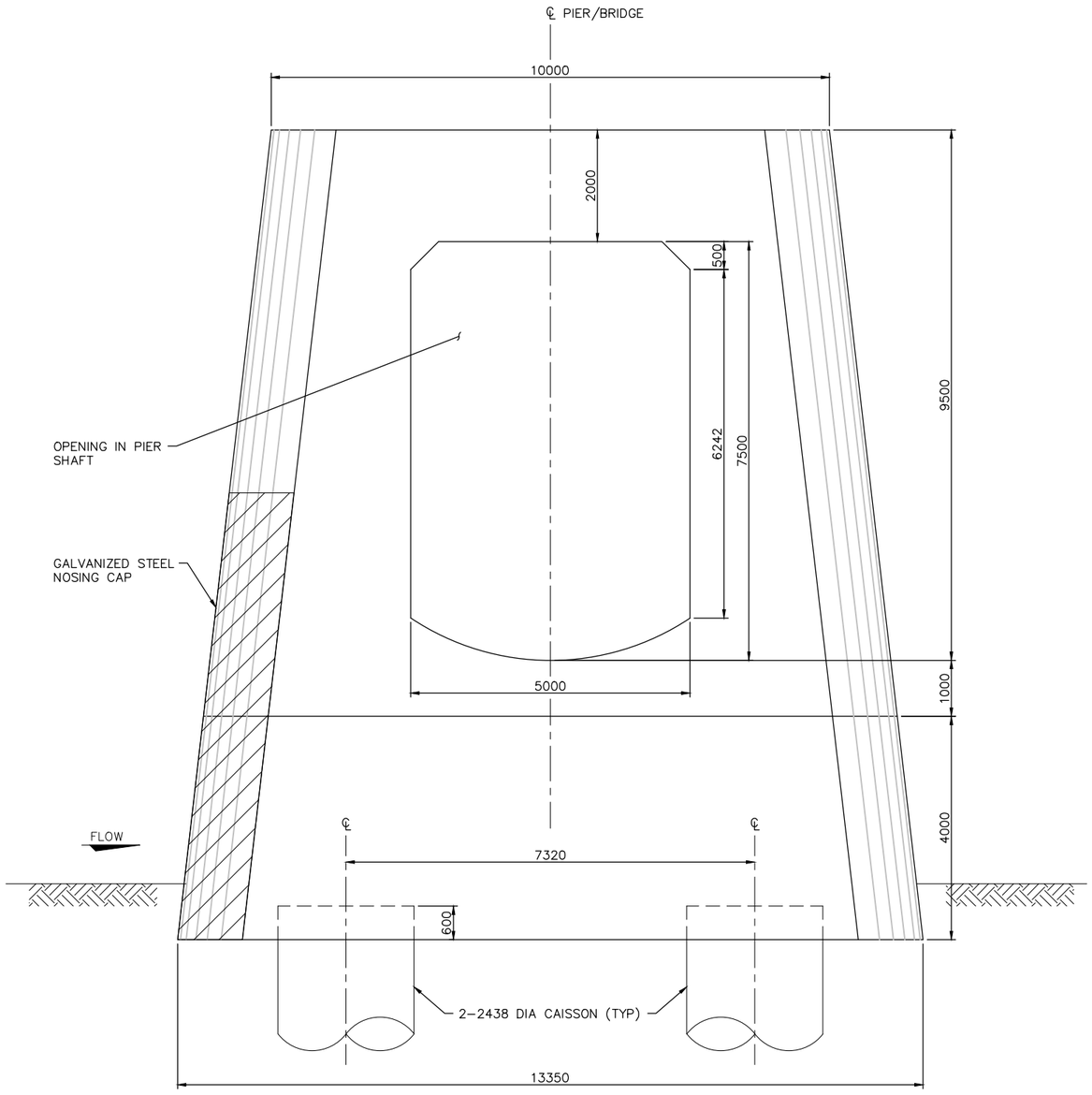
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

SURVEY
JOB NO.
SCALE

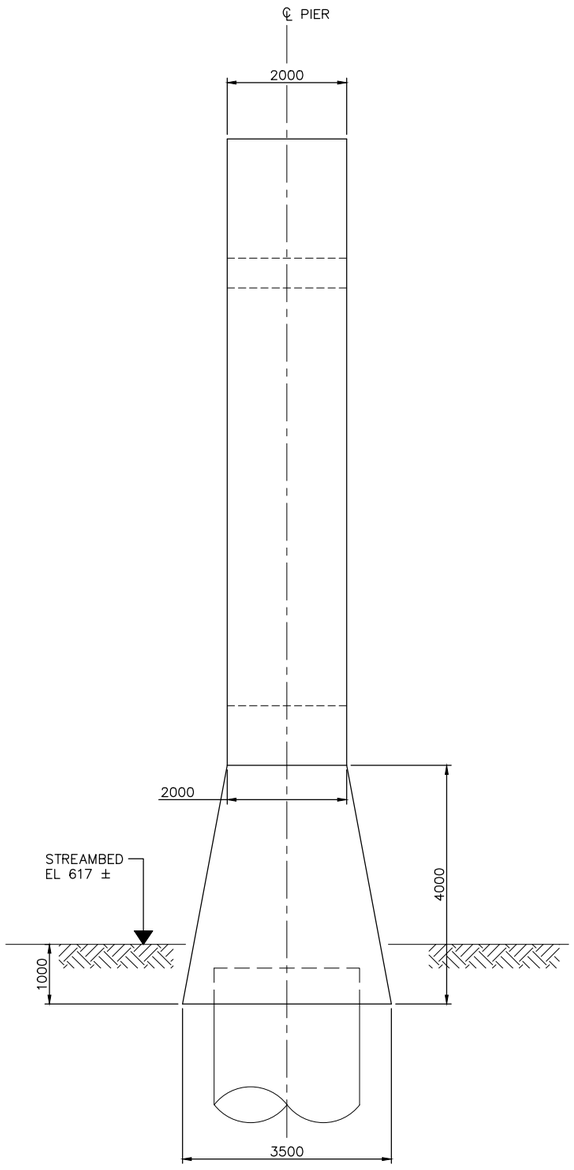
DRAWN E.C. DATE m/d/yy
DESIGNED - DATE m/d/yy
CHECKED - DATE m/d/yy

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
PIER CAISSON DETAILS

DRAWING
TPFB-PD-S05



ELEVATION OF PIER
1:50



PROFILE
1:50

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

APPROVED FOR CONSTRUCTION
DATE

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

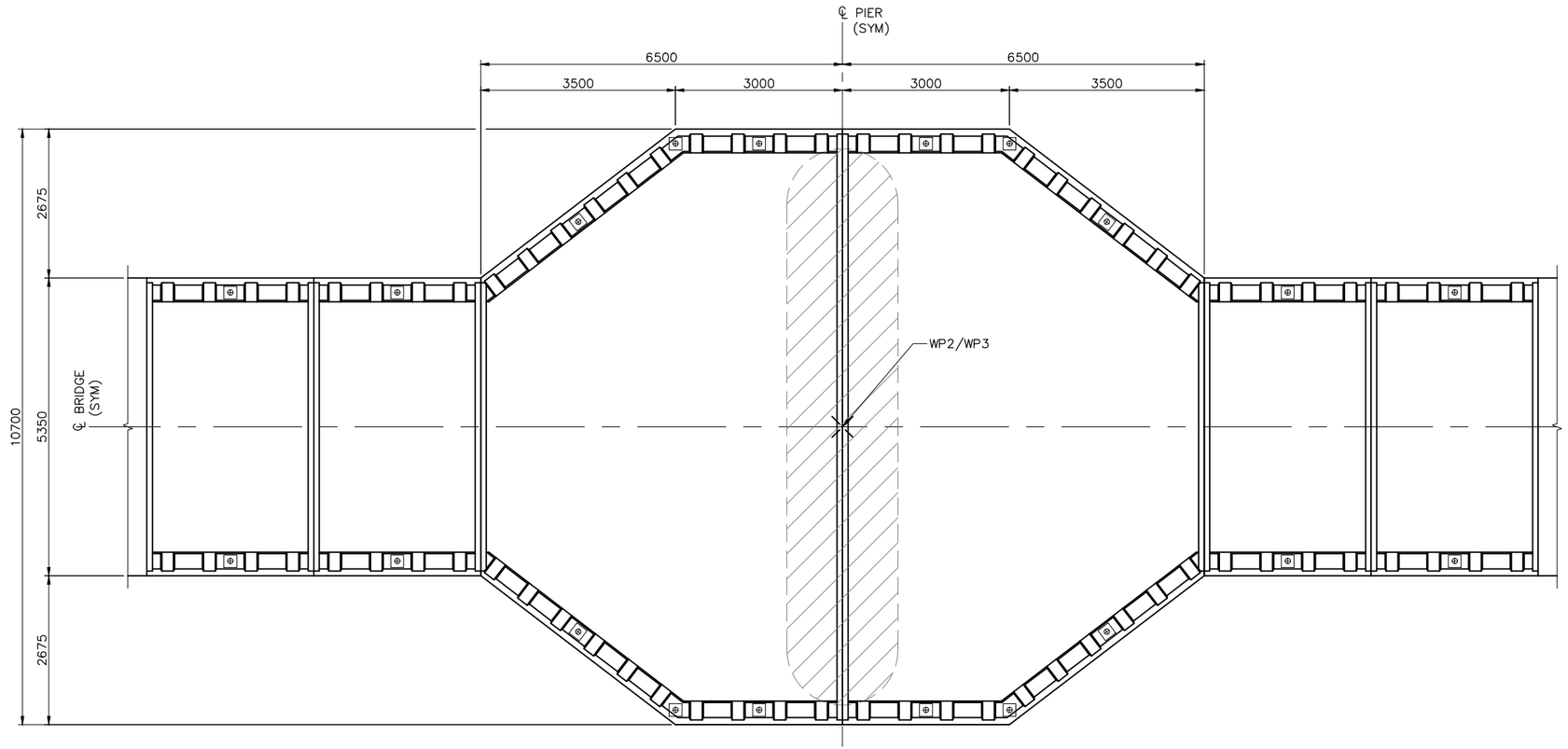
SURVEY
JOB NO.
SCALE

DRAWN E.C. DATE m/d/yy
DESIGNED - DATE m/d/yy
CHECKED - DATE m/d/yy

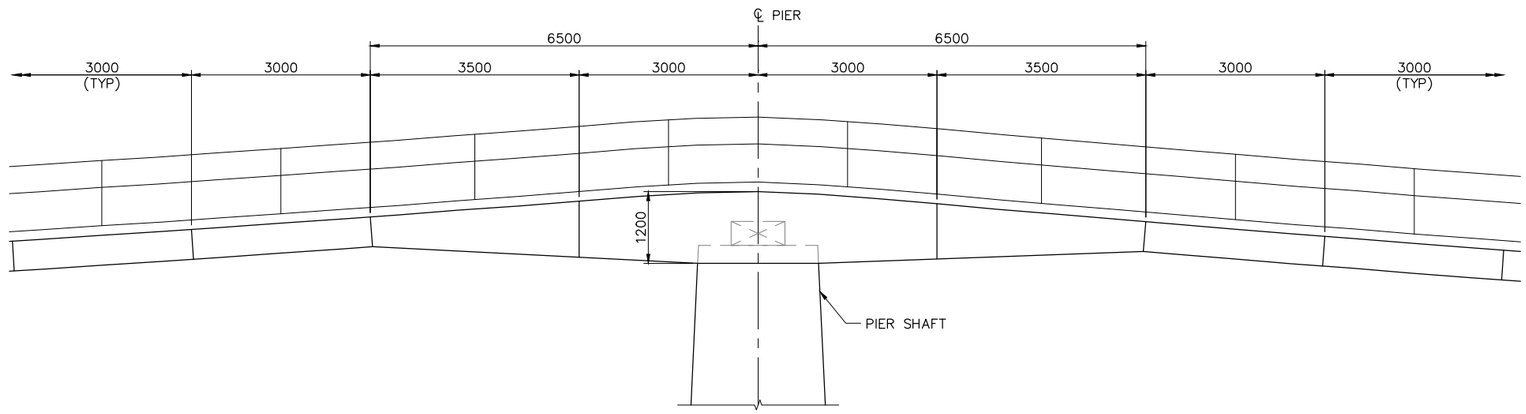
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
PIER SHAFT ELEVATION AND DETAILS

DRAWING
TPFB-PD-S06



PLAN
1:50



ELEVATION
1:50

PRELIMINARY
- NOVEMBER 2013-

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-

APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

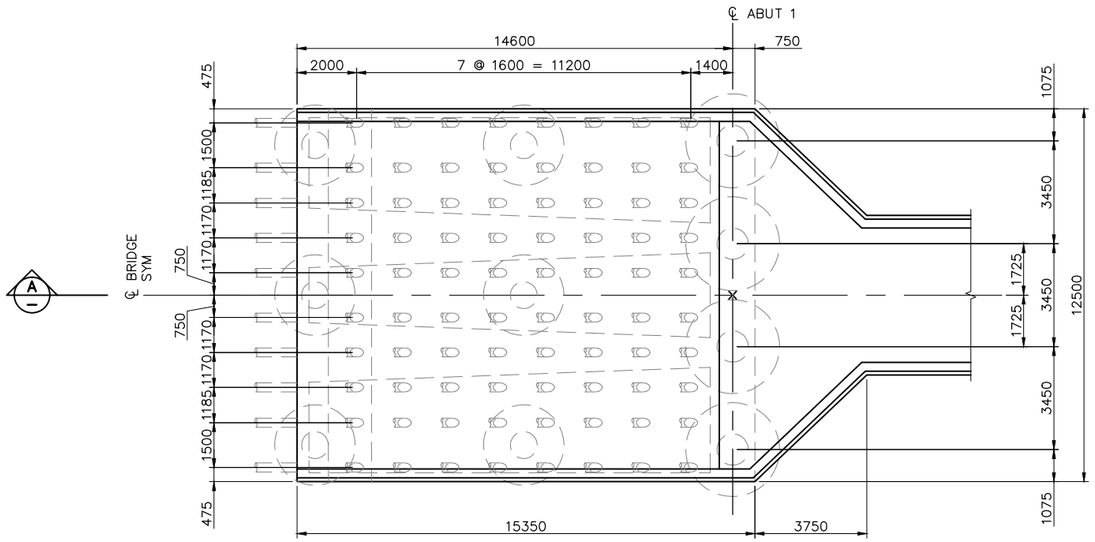
SURVEY
JOB NO.
SCALE

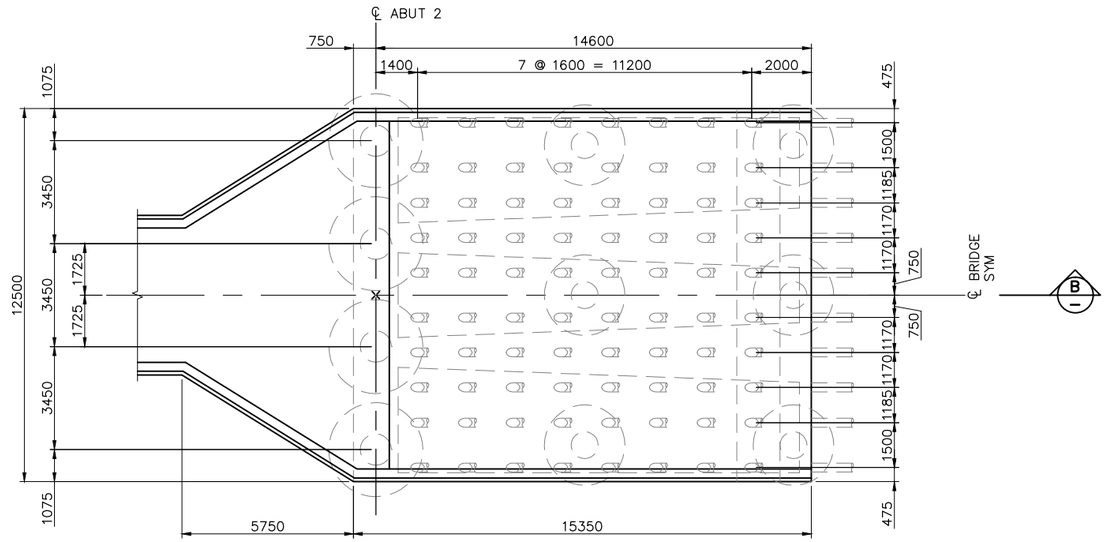
DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
PIER OBSERVATION PLATFORM

DRAWING
TPFB-PD-S07



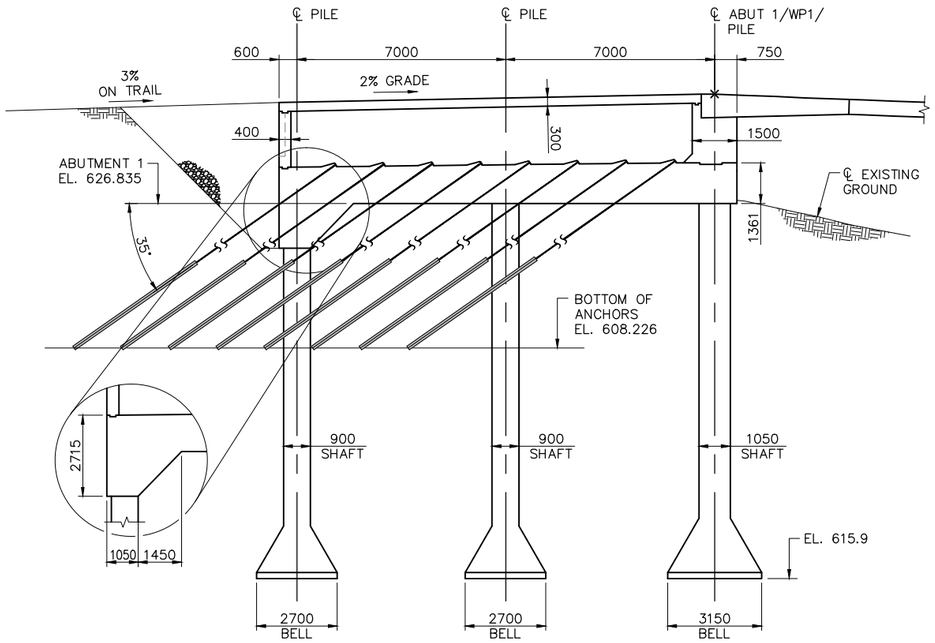


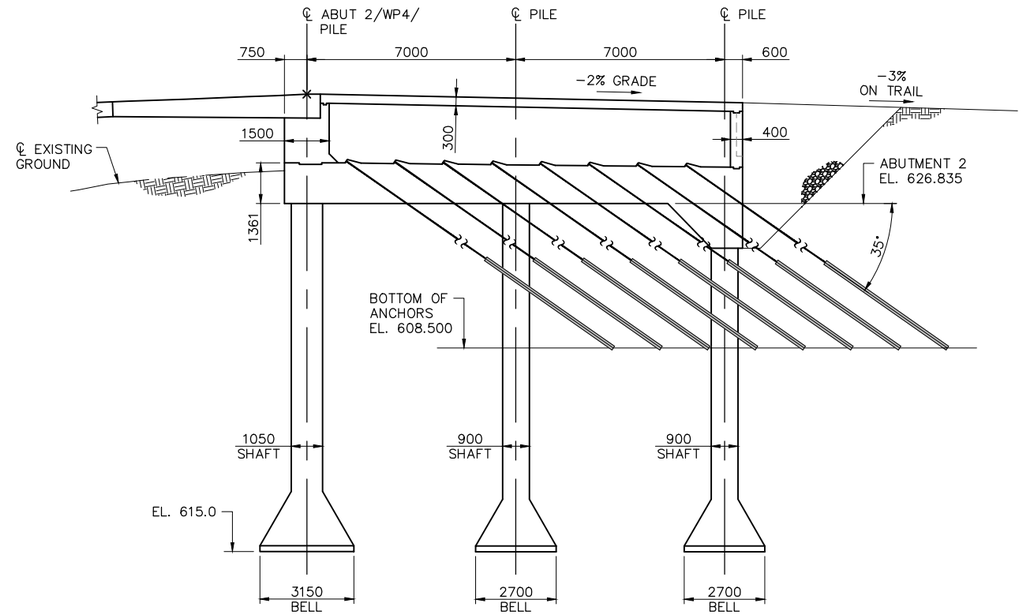
LEGEND:

℄ – GROUND ANCHORS:
ABUTMENT 1 TOTAL: 80 ANCHORS
ABUTMENT 2 TOTAL: 80 ANCHORS

PLAN
1:100

PLAN
1:100





A SECTION
1:100

B SECTION
1:100

PRELIMINARY
- JANUARY 2014-

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. –
CONTRACT NO. –

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-

APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

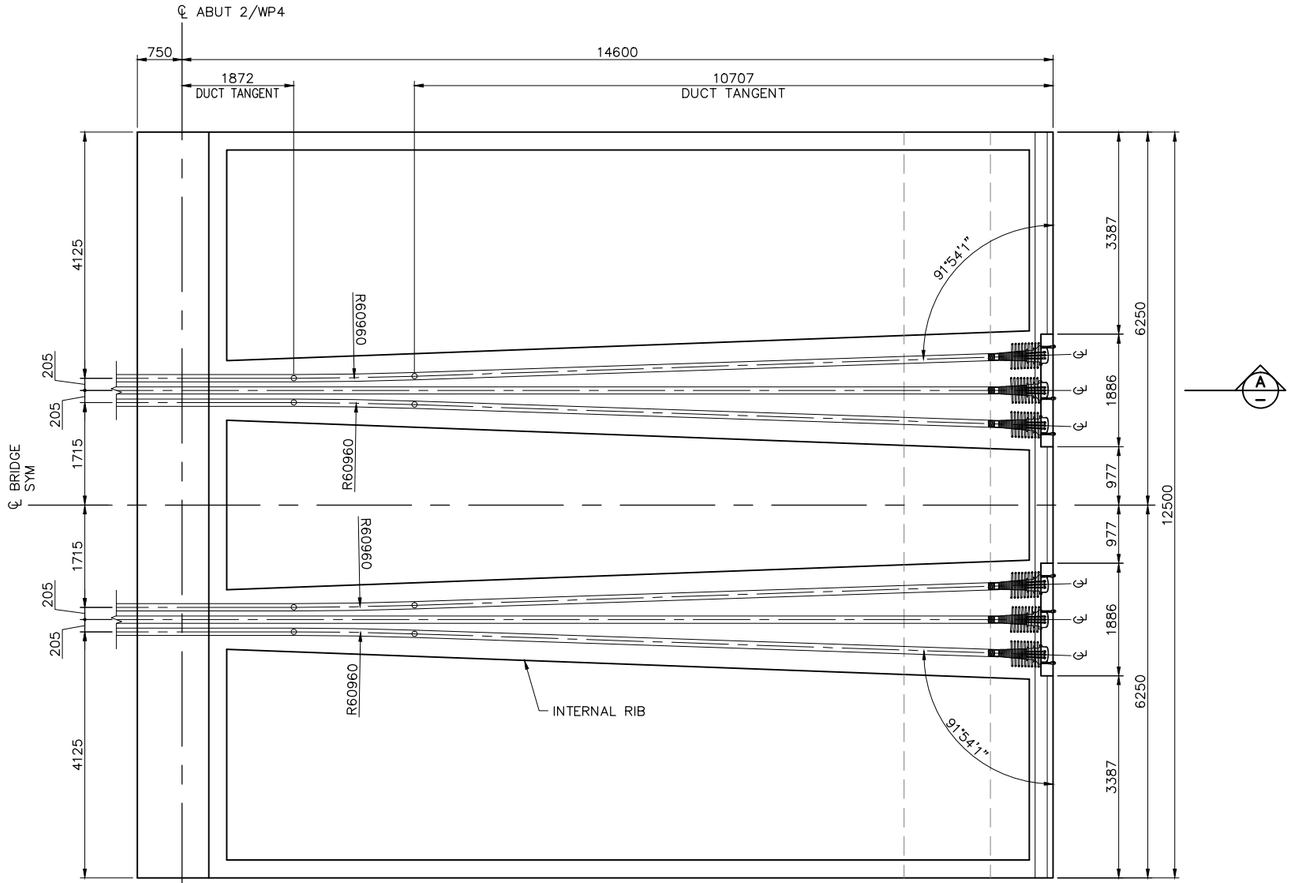
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

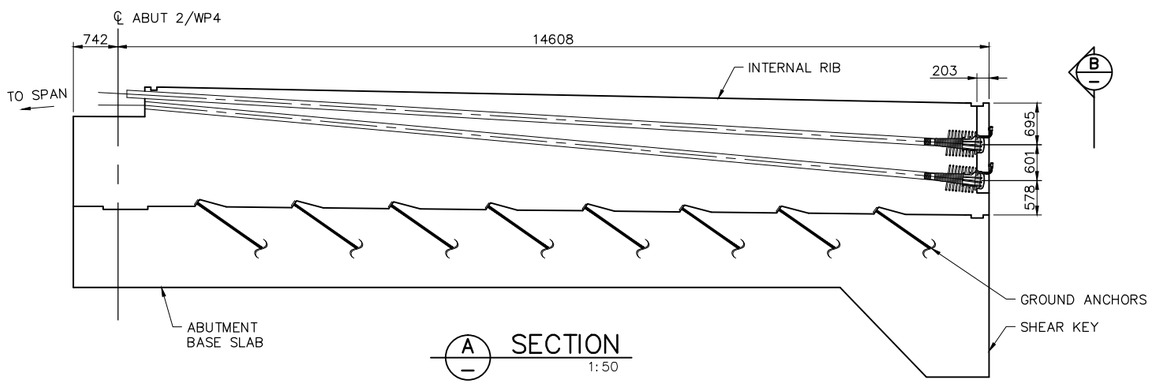
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
ABUTMENT PLAN AND SECTION

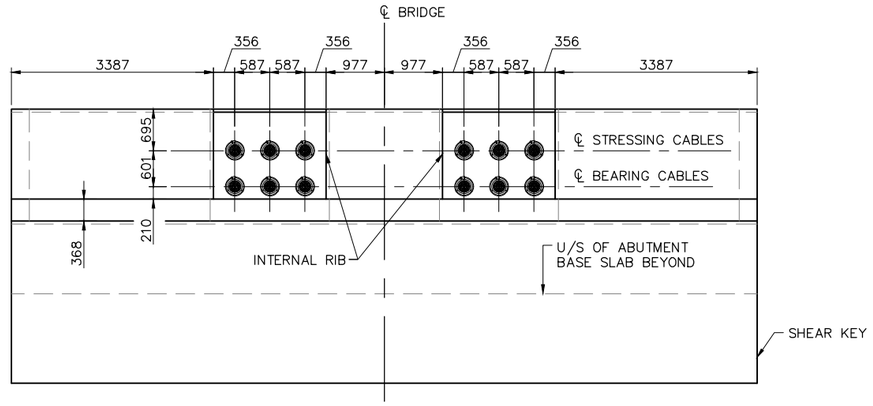
DRAWING
TPFB-PD-S08



PLAN NOTE: ABUTMENT 2 SHOWN
1:50



A SECTION
1:50



BLOCKOUT FOR POST–TENSIONING

B SECTION
1:50

PRELIMINARY
- NOVEMBER 2013-

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-

APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

SURVEY
JOB NO.
SCALE

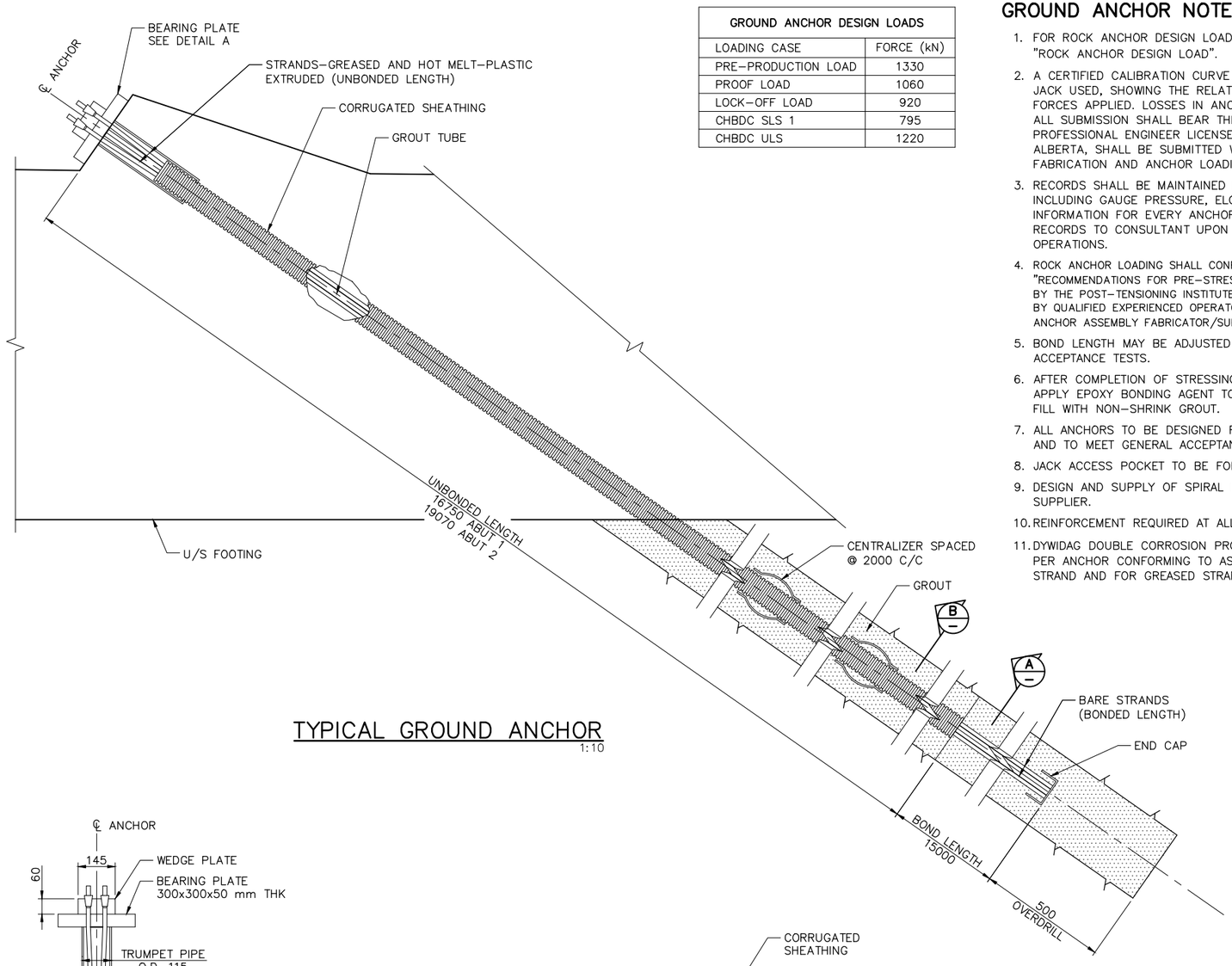
DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
ABUTMENT - POST - TENSION DETAILS

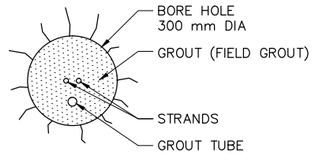
DRAWING
TPFB-PD-S09

GROUND ANCHOR DESIGN LOADS	
LOADING CASE	FORCE (kN)
PRE–PRODUCTION LOAD	1330
PROOF LOAD	1060
LOCK–OFF LOAD	920
CHBDC SLS 1	795
CHBDC ULS	1220

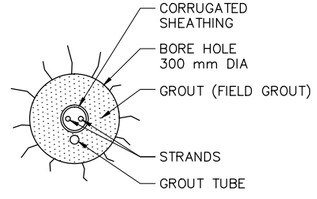


TYPICAL GROUND ANCHOR
1:10

DETAIL A
1:10



A SECTION
1:10



B SECTION
1:10

GROUND ANCHOR NOTES

1. FOR ROCK ANCHOR DESIGN LOADS PER ANCHOR, REFER TO TABLE "ROCK ANCHOR DESIGN LOAD".
2. A CERTIFIED CALIBRATION CURVE SHALL ACCOMPANY EACH HYDRAULIC JACK USED, SHOWING THE RELATIONSHIP BETWEEN GUAGE READING AND FORCES APPLIED. LOSSES IN ANCHOR FORCES SHALL BE CONSIDERED. ALL SUBMISSION SHALL BEAR THE SIGNATURE AND SEAL OF A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE PROVINCE OF ALBERTA, SHALL BE SUBMITTED WELL IN ADVANCE OF MATERIAL FABRICATION AND ANCHOR LOADING OPERATION.
3. RECORDS SHALL BE MAINTAINED FOR ALL STRESSING OPERATIONS INCLUDING GAUGE PRESSURE, ELONGATIONS AND OTHER PERTINENT INFORMATION FOR EVERY ANCHOR INSTALLED. SUBMIT THREE COPIES OF RECORDS TO CONSULTANT UPON COMPLETION OF ANCHOR INSTALLATION OPERATIONS.
4. ROCK ANCHOR LOADING SHALL CONFORM TO PROCEDURES DESCRIBED IN "RECOMMENDATIONS FOR PRE–STRESSED ROCK AND SOIL ANCHORS" PREPARED BY THE POST–TENSIONING INSTITUTE. POST TENSIONING SHALL BE EXECUTED BY QUALIFIED EXPERIENCED OPERATORS AND IN CONFORMATION OF THE ANCHOR ASSEMBLY FABRICATOR/SUPPLIER.
5. BOND LENGTH MAY BE ADJUSTED AS PER RESULTS OF GENERAL ACCEPTANCE TESTS.
6. AFTER COMPLETION OF STRESSING AND TESTING, SAND BLAST AND APPLY EPOXY BONDING AGENT TO SURFACES OF ANCHOR RECESS AND FILL WITH NON–SHRINK GROUT.
7. ALL ANCHORS TO BE DESIGNED FOR 1215 kN FACTORED TENSION LOAD AND TO MEET GENERAL ACCEPTANCE CRITERIA AS PER SPECIFICATIONS.
8. JACK ACCESS POCKET TO BE FORMED WITH NEAT LINES.
9. DESIGN AND SUPPLY OF SPIRAL REINFORCEMENT BY ANCHOR SYSTEM SUPPLIER.
10. REINFORCEMENT REQUIRED AT ALL ANCHORS. SEE DRAWING C4–6–9.
11. DYWIDAG DOUBLE CORROSION PROTECTION (DCP) – SIX (6) STRANDS PER ANCHOR CONFORMING TO ASTM 416 AND ASTM A882, FOR BARE STRAND AND FOR GREASED STRAND RESPECTIVELY.

CONSTRUCTION SEQUENCE

THE FOLLOWING IS A GENERAL DESCRIPTION OF AN APPROVED CONSTRUCTION SEQUENCE. IT IS NOT DETAILED WORK PLAN AND HIGHLIGHTS ONLY GENERAL ACTIVITIES REQUIRED COMPLETING THE WORK. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO PLAN THE WORK IN DETAIL AND THAT PLAN IS SUBJECT TO THE REVIEW AND APPROVAL OF THE CONSULTANTS.

ALL ALTERNATE SEQUENCE/PLAN WILL BE GIVEN CONSIDERATION BY THE CONSULTANT SO LONG AS THE CONTRACTOR SUBMITS A COMPLETE PROPOSAL FOR REVIEW. SUCH AN ALTERNATE SEQUENCE/PLAN MAY OR MAY NOT BE GIVEN APPROVAL BY THE CONSULTANT AND THE CONSULTANT RULING SHALL GOVERN.

1. EXCAVATE OR REPLACE THE ORIGINAL SOIL TO THE REQUIRED ELEVATION SHOWN ON DRAWINGS.
2. PLACE MUD SLAB TO PROVIDE CONTROLLED, LEVEL WORK SURFACE.
3. INSTALL PRE–PRODUCTION ROCK ANCHORS AND CARRY OUT TEST AFTER GROUT HAS ACHIEVED MINIMUM 75% OF SPECIFIED 28 DAY STRENGTH. SUBMIT TEST ANCHOR LOCATIONS FOR CONSULTANT APPROVAL. TEST LOADING SHALL BE INCREMENTALLY APPLIED TO AT LEAST TWO TIMES THE DESIGN LOAD IN ACCORDANCE WITH SECTION 8.3.1 AND 8.3.2 (POST TENSIONING INSTITUTE "RECOMMENDATIONS FOR PRESTRESSED ROCK AND SOIL ANCHORS", LATEST EDITION).
4. CONSTRUCT CAST IN PLACE CAISSONS.
5. INSTALL GROUND ANCHORS– LAY OUT, DRILL HOLE AND COMPLETE INSTALLATION OF EACH ANCHOR PRIOR TO PROCEEDING TO NEXT ANCHORS; INSTALL ALL DOUBLE CORROSION PROTECTED STRAND ANCHORS, PRESSURE INJECT GROUT IN ACCORDANCE WITH THE SPECIFICATIONS.
6. AFTER GROUT AND CONCRETE STRENGTH REACHES 75% OR MORE OF SPECIFIED 28 DAY STRENGTH, CARRY OUT LOAD TEST TO SPECIFIED PROOF LOAD AND RELEASE. FOR THOSE THAT DO NOT PASS PROOF TEST CRITERIA SEE SPECIFICATIONS FOR PROCEDURE.
7. CONSTRUCT CAST IN PLACE REINFORCED CONCRETE FOOTING, WALLS AND SHEAR KEY OF THE ABUTMENT UP TO TOP OF BASE SLAB LEVEL. BACK FILL AND COMPACT BEHIND THE SHEAR KEY TO TOP OF BASE SLAB.
8. AFTER ROCK ANCHOR GROUT AND ABUTMENT CONCRETE REACH 75% OR MORE OF SPECIFIED 28 DAY STRENGTH, STRESS ALL ANCHORS IN ROW 3 AND 7 TO THE SPECIFIED LOAD. INSTALL ANCHOR HEAD BEARING PLATE/NUTS AND PRE–LOAD EACH GROUND ANCHOR TO SPECIFIED PROOF LOAD AND LOCK –OFF EACH ANCHOR TO SPECIFIED LOCK–OFF LOAD. PROOF LOAD SHALL BE CONDUCTED ON ALL ANCHORS IN ACCORDANCE WITH SECTION 8.3.3 OF THE AFOREMENTIONED PTI DOCUMENT.
9. CONSTRUCT CAST IN PLACE FRONT WALL, BACK WALL, SIDE WALLS AND RIB WALLS AS SHOWN.
10. STRETCH THE BEARING CABLES BETWEEN THE ABUTMENTS AND OVER THE PIERS. STRESS THE REMAINING ANCHORS FOLLOWING THE AFOREMENTIONED PROCEDURE.
11. INSTALL THE PRE–CAST DECK SEGMENT STARTING FROM THE MIDDLE SPAN, PLACE DUCTS FOR STRESSING CABLES AND GROUT THE TROUGHS AFTER COMPLETION OF INSTALLATION OF ALL SEGMENTS.
12. PRESTRESS THE STRESSING CABLES AFTER TROUGH GROUT HAS ATTAINED AT LEAST 75% OR MORE OF 28 DAY SPECIFIED STRENGTH OF DECK SEGMENT CONCRETE.
13. CONSTRUCT ROOF SLAB, INSTALL HANDRAILS AND PLACE TOPPING.

MATERIAL

1. GROUND ANCHORS

   DOUBLE CORROSION PROTECTED 15.2 DIA, 7 WIRES LOW RELAXATION STRANDS TO ASTM A416 FOR BARE STRANDS AND ASTM A882 FOR GREASED STRANDS EACH ANCHOR– ASSEMBLIES COMPLETED WITH ANCHORAGE DEVICE, BONDBREAKER, CENTRALIZER, CORROSION PROTECTION AND DEBONDING SHEET, GROUT TUBES AND ALL OTHER RELATED HARDWARE. ALL ANCHORS SHALL BE SUPPLIED WITH POST–GROUTING CAPABILITY AND SHALL BE RESTRESSABLE.
2. PLATE 300W GRADE – ALL STEEL FABRICATIONS SHALL BE HOT DIP GALVANIZING IN CONFORMANCE WITH CSA G164.

PRELIMINARY
- NOVEMBER 2013-

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-

APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

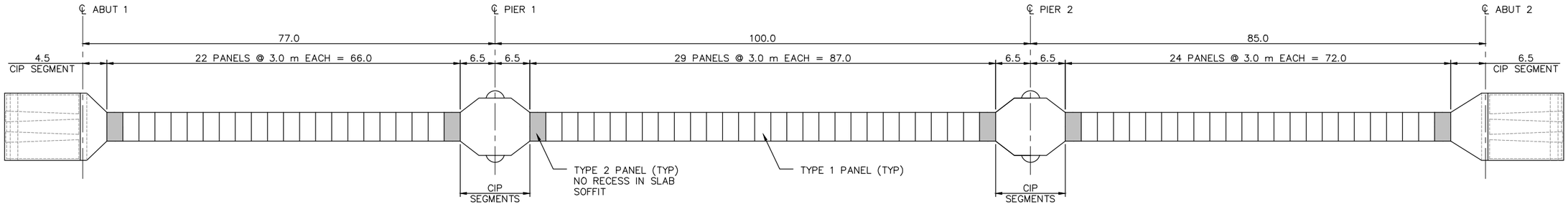
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

SURVEY
JOB NO.
SCALE

DRAWN - DATE m/d/yy
DESIGNED - DATE m/d/yy
CHECKED - DATE m/d/yy

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
ABUTMENT - GROUND ANCHOR DETAILS

DRAWING
TPFB-PD-S10



PLAN
1:400

PRELIMINARY
- JANUARY 2014 -

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-

APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

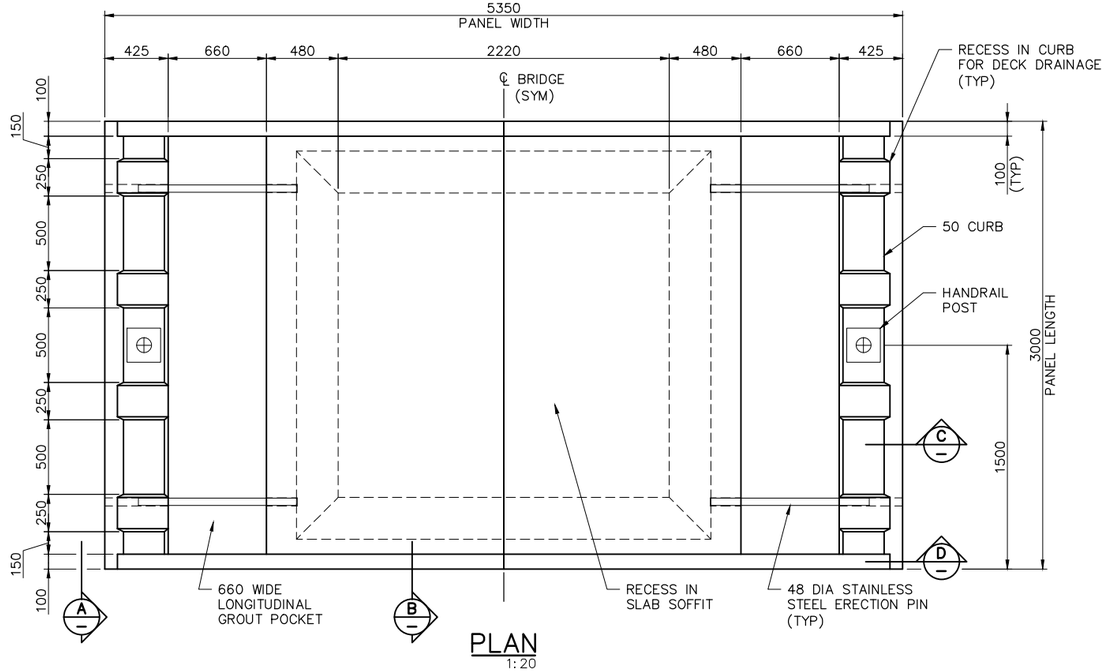
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

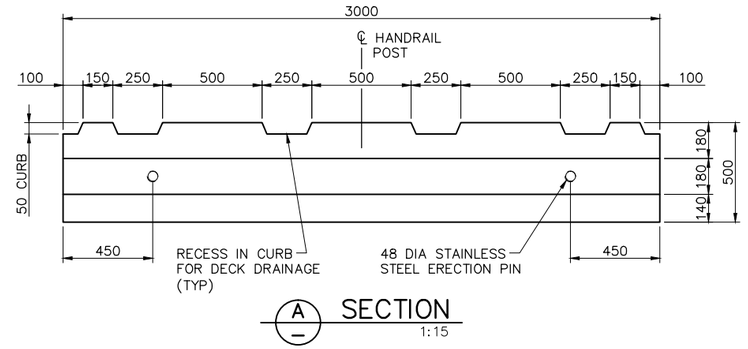
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
DECK LAYOUT

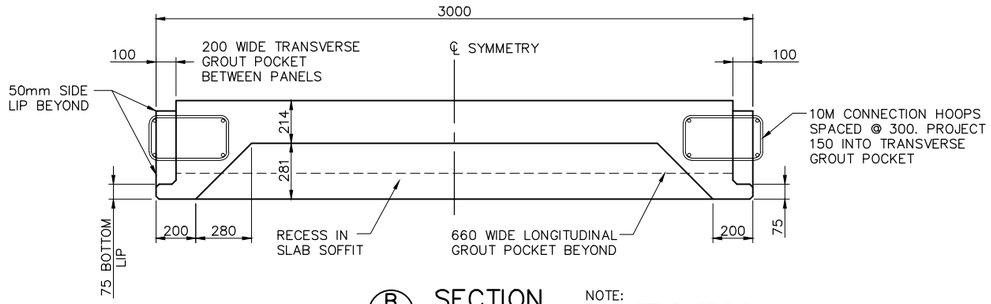
DRAWING
TPFB-PD-S11



PLAN
1:20

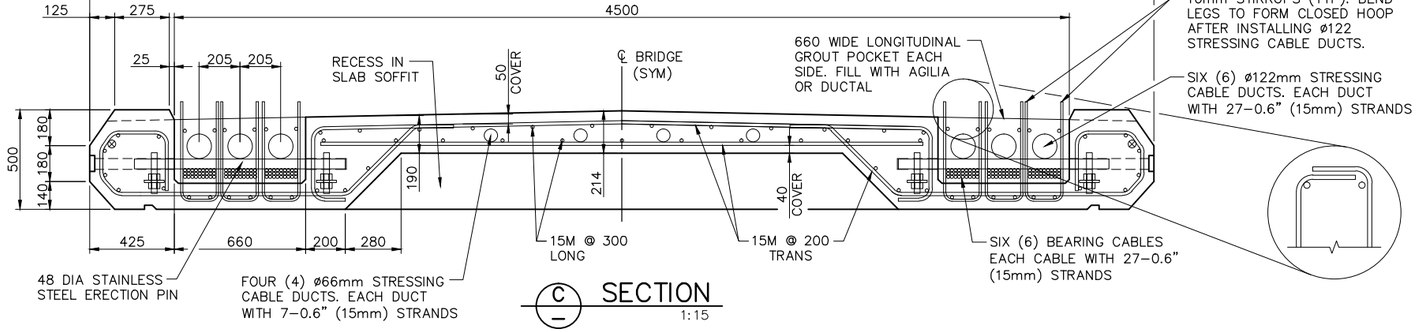


A SECTION
1:15

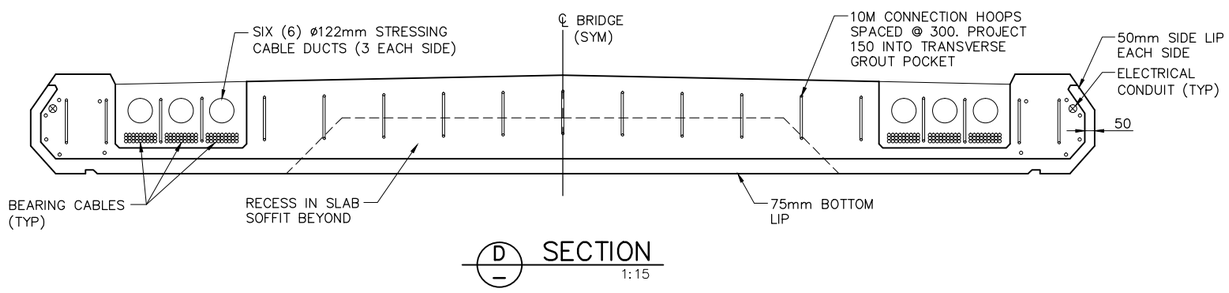


B SECTION
1:15

NOTE:
PANEL REBAR NOT SHOWN



C SECTION
1:15



D SECTION
1:15

PRECAST CONCRETE DECK PANEL NOTES:

1. STANDARD WEIGHT CONCRETE WITH NOT LESS THAN 5% AIR ENTRAINMENT (WHEN MEASURED IN PLASTIC STATE) SHALL BE USED THROUGHOUT.
2. ALL CONCRETE SHALL BE OF CLASS HPC.
3. 28 DAY COMPRESSIVE STRENGTH = 50 MPa.
4. REINFORCING STEEL SHALL CONFORM TO CAN/CSA–G30.18 GRADE 400.
5. CLEAR COVER TO REINFORCING SHALL BE AS FOLLOWS:
   - TOP OF DECK PANEL = 50mm
   - SOFFIT OF DECK PANEL = 40mm
6. PANELS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT SPECIFICATIONS FOR BRIDGE CONSTRUCTION SECTION 7 "PRECAST CONCRETE UNITS".
7. ALL EXPOSED CONCRETE CORNERS TO HAVE 20mm CHAMFER OR FILLET UNLESS NOTED OTHERWISE.
8. SANDBLAST ROUGHEN ALL GROUT POCKET SURFACES.
9. ENSURE EMBEDDED ITEMS HAVE PROPER CLEARANCE AND DO NOT INTERFERE WITH POST TENSIONING DUCTS (TYP).

PRELIMINARY
- NOVEMBER 2013-

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-
APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

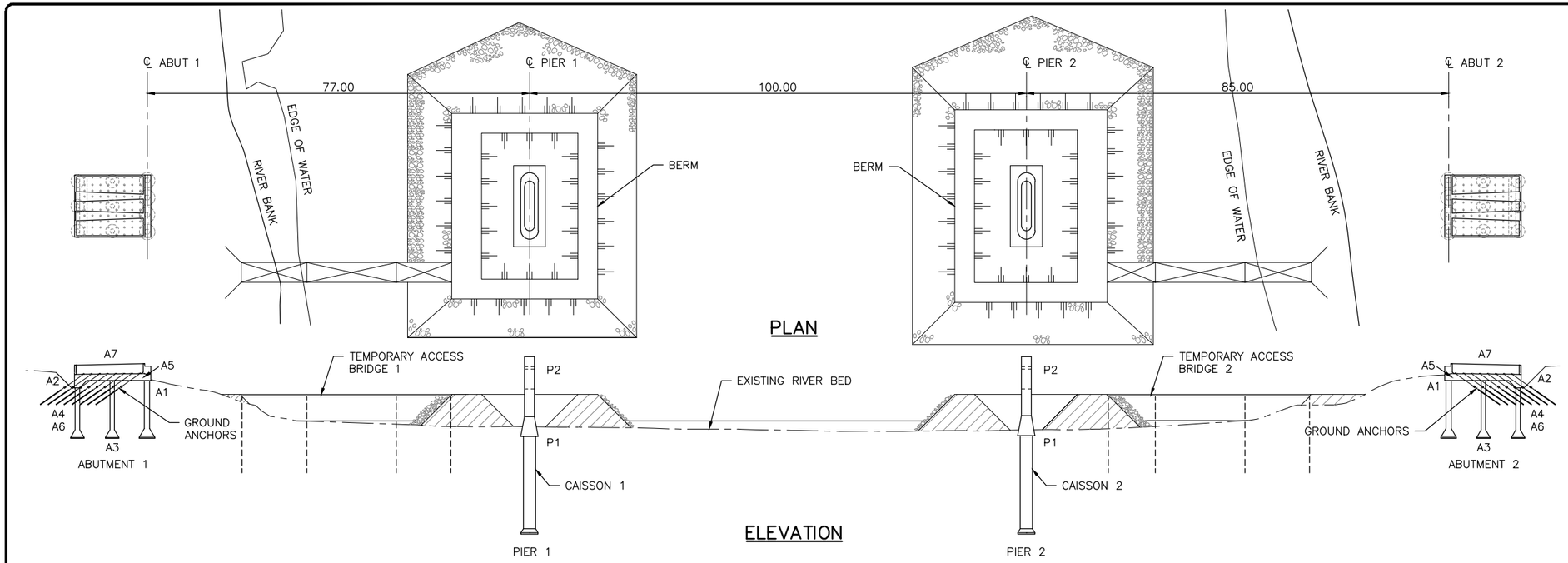
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
PRECAST DECK PANEL DETAILS

DRAWING
TPFB-PD-S12



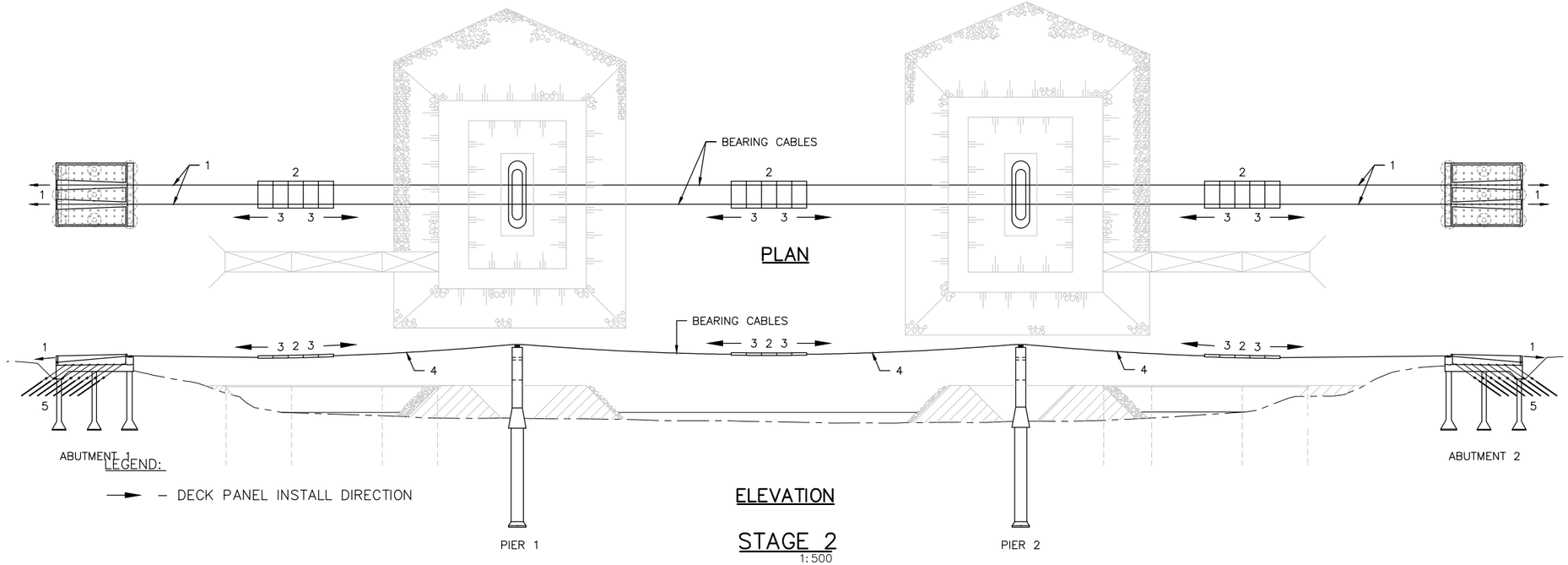
STAGE 1: ABUTMENT AND PIER CONSTRUCTION

PIER CONSTRUCTION:

P1. CONSTRUCT CIP CAISSONS.
P2. CAST PIER SHAFTS.

ABUTMENT CONSTRUCTION:

A1. EXCAVATE AND POUR MUD SLAB.
A2. DRILL, INSTALL AND TEST PRE–PRODUCTION GROUND ANCHORS.
A3. CONSTRUCT CIP CAISSONS.
A4. DRILL AND INSTALL GROUND ANCHORS.
A5. CAST ABUTMENT BASE SLAB INCLUDING GROUND ANCHOR SEATS.
A6. STRESS GROUND ANCHORS BELOW INTERNAL RIBS.
A7. CAST ABUTMENT FRONT WALL AND INTERNAL RIBS TO U/S OF ROOF SLAB.



STAGE 2: BEARING CABLE AND PRECAST DECK PANEL INSTALLATION

1. INSTALL ALL SIX BEARING CABLES. STRESS EACH CABLE TO APPROX. 4295 kN (25,765 kN TOTAL). MONITOR CABLE DEFLECTIONS DURING STRESSING TO ENSURE FINAL PROFILE IS ACHIEVED. STRESS FROM BOTH ENDS SIMULTANEOUSLY. ALTERNATE STRESSING CABLES ON EACH SIDE OF DECK. (*SEE NOTE)
2. INSTALL PRECAST DECK PANELS STARTING WITH THE LOWEST PANEL IN EACH SPAN.
3. ALTERNATE ADDING PANELS IN EACH SPAN, WORKING FROM THE LOWEST LOCATION TO THE SUPPORTS.
4. MONITOR CABLE DEFLECTIONS DURING PANEL PLACEMENT TO ENSURE FINAL PROFILE IS ACHIEVED.
5. STRESS ADDITIONAL GROUND ANCHORS.

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

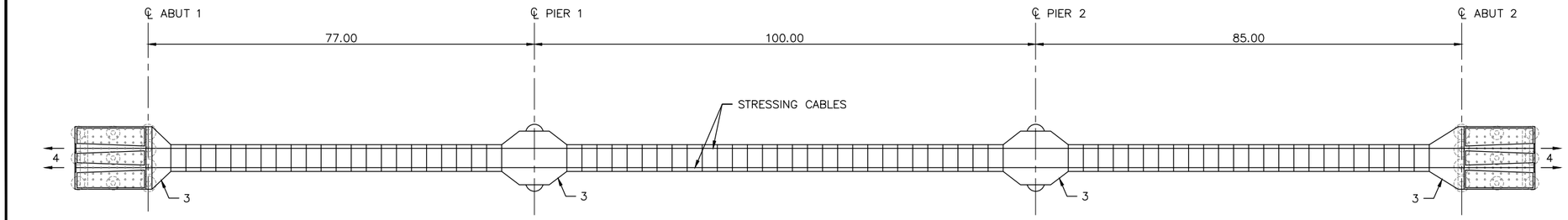
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

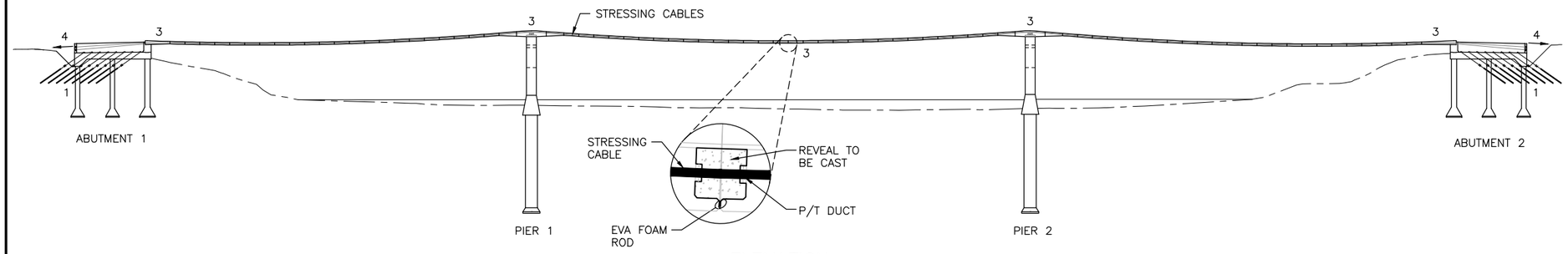
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
CONSTRUCTION SEQUENCE - SHEET 1

DRAWING
TPFB-PD-S13



PLAN

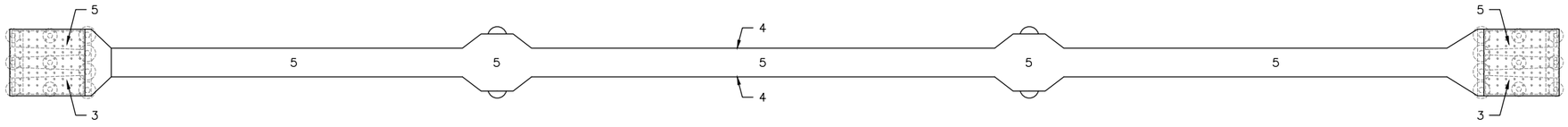


ELEVATION

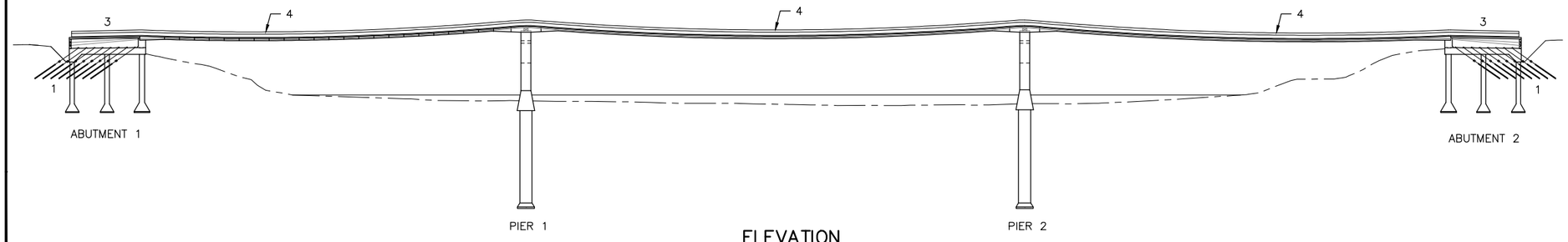
STAGE 3
1:500

STAGE 3: POST-TENSION STRESSING CABLES

1. STRESS REMAINING GROUND ANCHORS TO SPECIFIED LOAD.
2. INSTALL ALL SIX STRESSING CABLES AND DUCTS. CLOSE REBAR STIRRUPS AROUND STRESSING CABLE DUCTS. CONNECT ALL FOUR RESERVE CABLE DUCTS BETWEEN ALL PANELS. PLACE ALL FOUR RESERVE CABLES IN RESERVE CABLE DUCTS.
3. AFTER BRIDGE PROFILE HAS BEEN CONFIRMED, GROUT ALL LONGITUDINAL CABLE TROUGHS AND TRANSVERSE PANEL JOINTS. CAST CIP CLOSURE POURS AT PIER AND ABUTMENT SUPPORTS.
4. STRESS EACH STRESSING CABLE TO APPROX. 4670 kN (28,020 kN TOTAL). STRESS FROM BOTH ENDS SIMULTANEOUSLY. ALTERNATE STRESSING CABLES ON EACH SIDE OF DECK. (*SEE NOTE)



PLAN



ELEVATION

STAGE 4
1:500

STAGE 4: CONSTRUCTION

1. GROUT ALL SIX STRESSING CABLE POCKETS WITH APPROVED GROUT COMPOUND UNDER PRESSURE WITHIN ONE DAY OF ALL STRESSING BEING COMPLETED.
2. CAP ALL GROUND ANCHORS.
3. CAST ABUTMENT ROOF SLAB.
4. INSTALL HANDRAIL.
5. APPLY WEARING SURFACE ON DECK.

NOTE:
ALL CONCRETE AND GROUT MUST ACHIEVE 75% OF 28 DAY STRENGTH.

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
CONSTRUCTION SEQUENCE - SHEET 2

DRAWING
TPFB-PD-S14

LOCATION PLAN

PLAN
1: 5000

NOTES:
"FOR DISCUSSION ONLY"
PROPOSED PAVED TRAIL. . . . . .
CONSTRUCTION ACCESS OPTION 1. . . . . .
CONSTRUCTION ACCESS OPTION 2. . . . . .
CITY OF EDMONTON PROPOSED EASEMENT. . .

LEGEND

PRELIMINARY
- JANUARY 2014 -

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

APPROVED FOR CONSTRUCTION
DATE

DESIGNER

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

SURVEY
JOB NO.
SCALE

DRAWN E.C. DATE m/d/yy
DESIGNED - DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
CONSTRUCTION ACCESS OPTIONS AND LAYDOWN AREAS

DRAWING
TPFB-PD-S15

PLAN
1: 2000

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

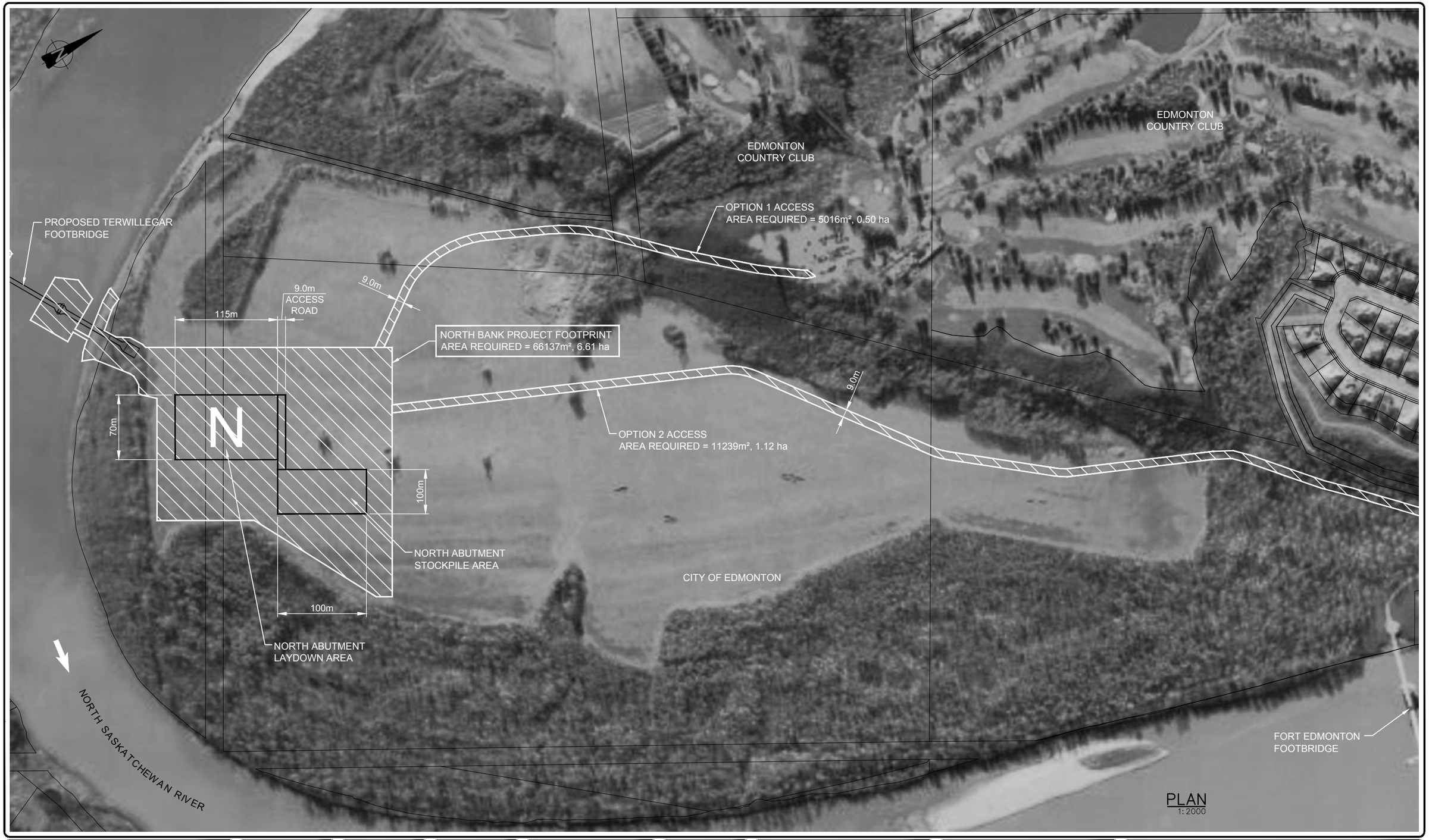
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
SOUTH BANK PROJECT FOOTPRINT

DRAWING
TPFB-PD-S15A



PLAN
1: 2000

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

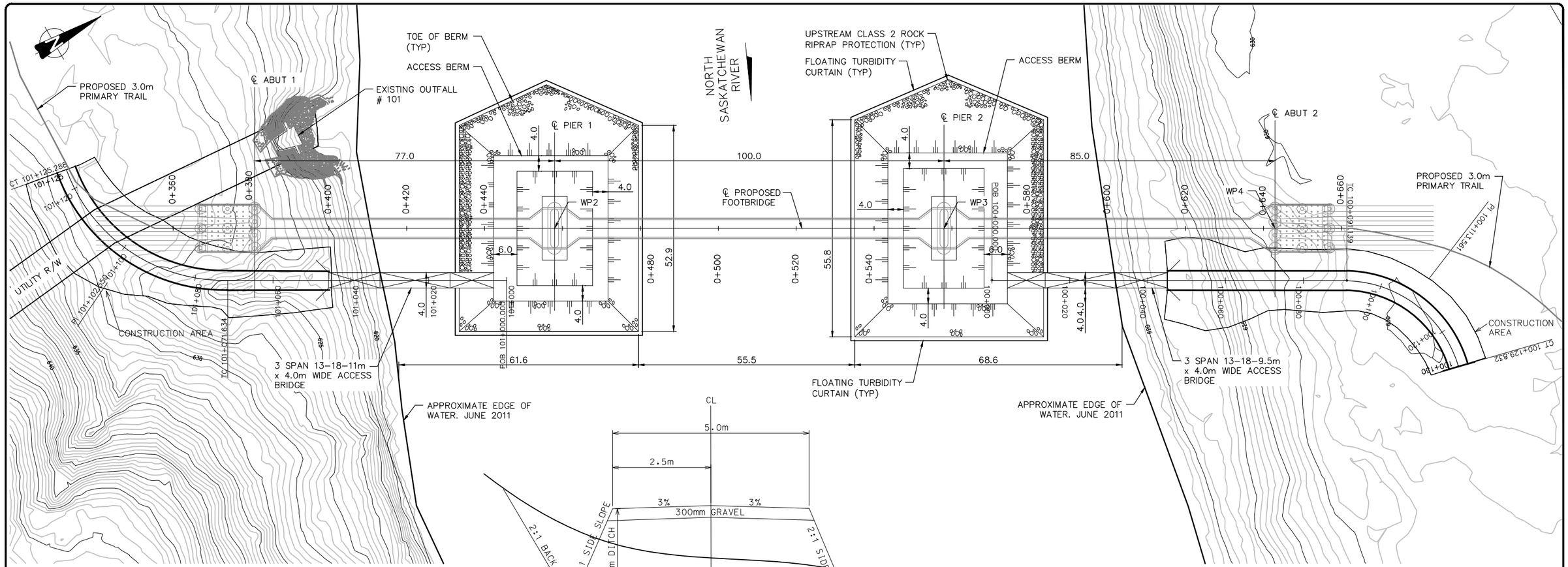
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

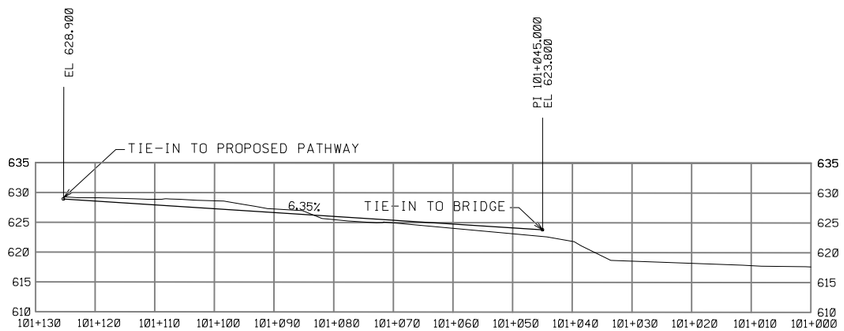
PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
NORTH BANK PROJECT FOOTPRINT

DRAWING
TPFB-PD-S15B



PLAN
1:500

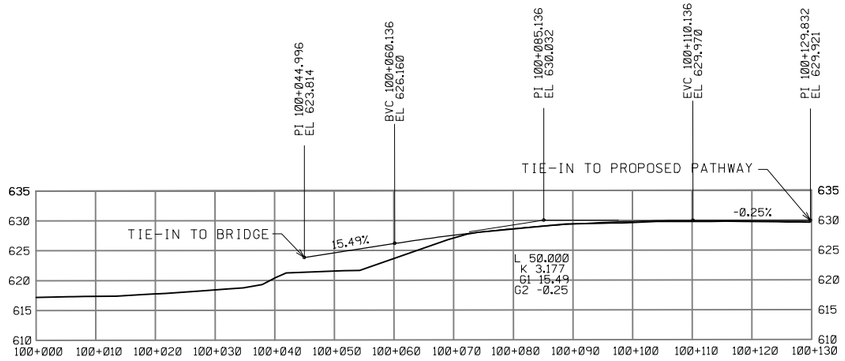
TYPICAL CROSS–SECTION
N.T.S



PROFILE
1:500

Excavation (m3)	540
Topsoil Stripping (m3)	1285
Fill (m3)	1280
GRAVEL (Tonne)	730

ESTIMATED QUANTITY



PROFILE
1:500

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

DESIGN CONSULTANT
Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

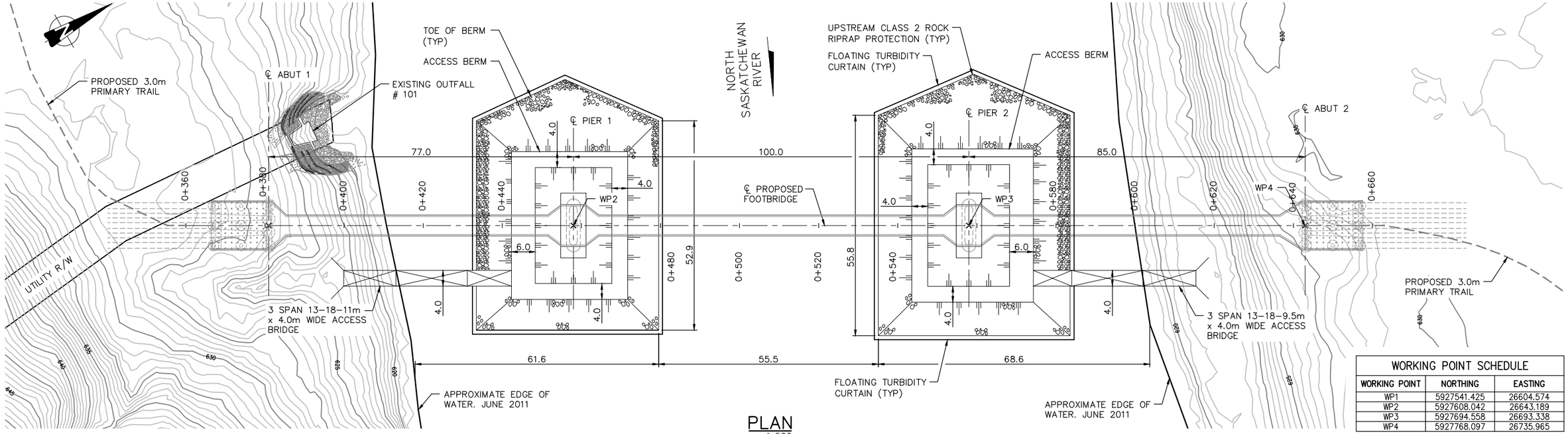
SURVEY
JOB NO.
SCALE

DRAWN ML DATE m/d/yy
DESIGNED RS DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
ACCESS ROADS - PLAN AND PROFILE

DRAWING
TPFB-PD-S16

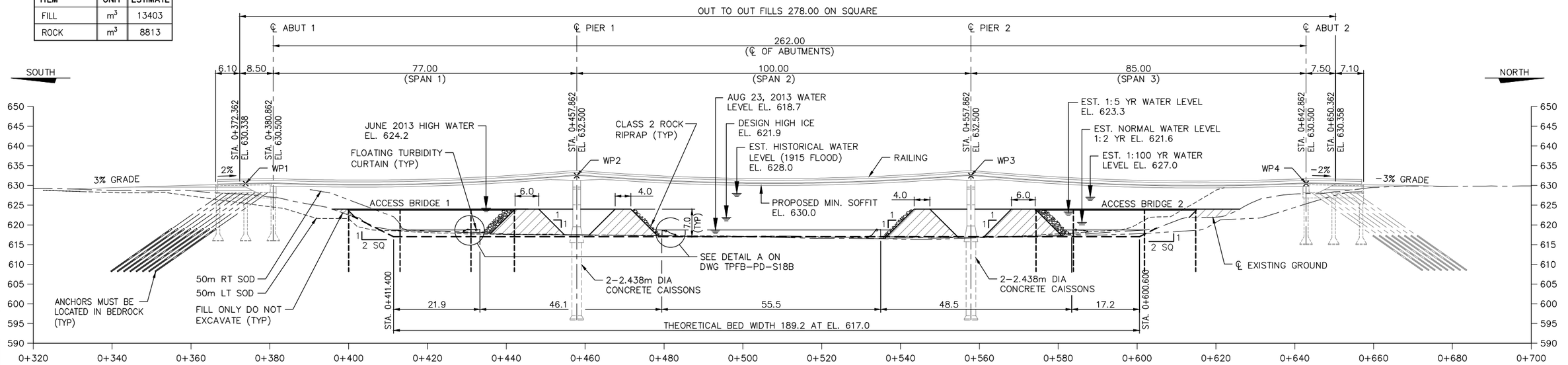


PLAN
1:500

WORKING POINT SCHEDULE		
WORKING POINT	NORTHING	EASTING
WP1	5927541.425	26604.574
WP2	5927608.042	26643.189
WP3	5927694.558	26693.338
WP4	5927768.097	26735.965

ALL COORDINATES ARE NAD83 3TM GRID COORDINATES REFERENCED FROM CENTRAL MERIDIAN 114° W

QUANTITY ESTIMATE		
ITEM	UNIT	ESTIMATE
FILL	m^3	13403
ROCK	m^3	8813



ELEVATION
1:500

NOTES:
1. ALL WATER LEVEL ELEVATIONS ARE BASED ON OPEN CHANNEL CONDITIONS WITHOUT BERMS.
2. CONTRACTOR TO DETERMINE THE ELEVATION OF THE BERMS BASED ON THEIR ANALYSIS.

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

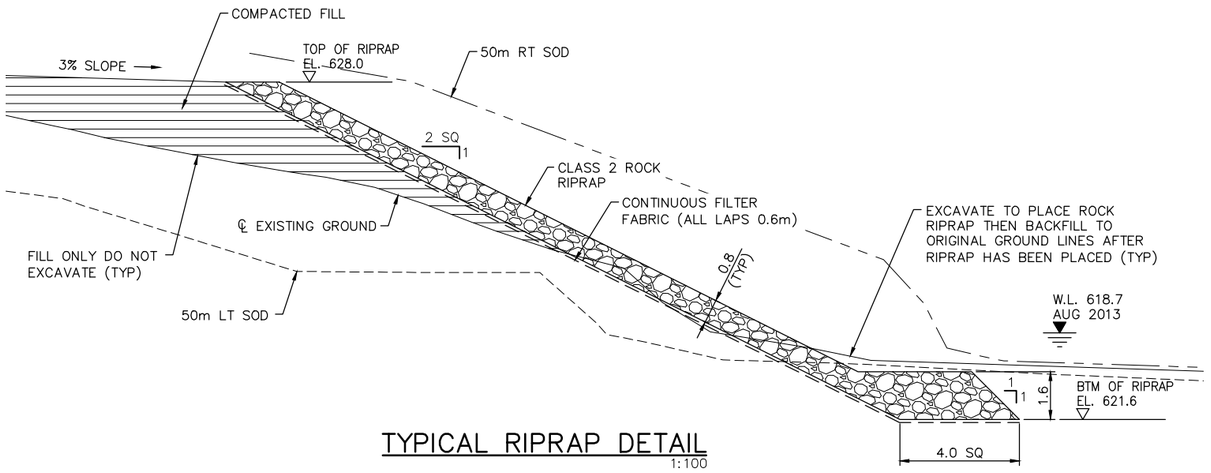
SURVEY
JOB NO.
SCALE

DRAWN E.C. DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

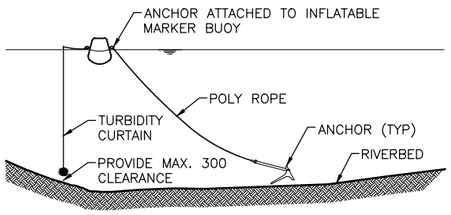
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
ISOLATION PLAN FOR INSTREAM WORKS

DRAWING
TPFB-PD-S18A



TYPICAL RIPRAP DETAIL
1:100



DETAIL A
TURBIDITY CURTAIN ANCHOR SYSTEM CONCEPT DETAIL N.T.S.

NOTE:
PROVIDE ADEQUATE FLOATATION AND ANCHORING TO ENSURE THE TURBIDITY CURTAIN WILL NOT SINK FROM WIND OR CURRENT LOADS. FLOATATION DEVICE SHALL BE COLOURED BRIGHT RED, ORANGE OR YELLOW.

FLOOD FREQUENCIES AND WATER LEVELS		
RETURN PERIOD (YEARS)	DISCHARGE (m^3/S)	*ELEVATION (m)
2	1270	621.6
5	2230	623.3
10	2940	624.3
20	3640	625.2
50	4570	626.3
100	5270	627.0
Q HISTORICAL (1915 FLOOD)	5800	628.0

*ELEVATIONS ARE BASED ON OPEN CHANNEL CONDITIONS WITHOUT BERMS

GENERAL NOTES

1. THE CONTRACTOR SHALL TAKE STEPS TO MINIMIZE TURBIDITY DURING TURBIDITY CURTAIN INSTALLATION, MAINTENANCE AND REMOVAL.

ENVIRONMENTAL NOTES

1. THE CONTRACTOR SHALL MAINTAIN A COPY OF ALL REGULATORY PERMITS/APPROVALS ON SITE AT ALL TIMES.
2. ALL EROSION PROTECTION MATERIALS USED SHALL BE CLEAN. DISPOSAL OF ANY MATERIAL OTHER THAN THOSE SPECIFIED FOR PLACEMENT WITHIN THE RIVER WILL BE STRICTLY PROHIBITED. APPROPRIATE PRECAUTIONS WILL BE TAKEN TO ENSURE THAT DELETERIOUS SUBSTANCES DO NOT ENTER THE WATERCOURSE.
3. ALL MACHINERY REQUIRED TO PERFORM THIS WORK SHALL BE SERVICED AND MAINTAINED TO PREVENT THE LEAKING OF FUELS, LUBRICANTS, HYDRAULIC FLUIDS, ETC. THE CONTRACTOR WILL BE REQUIRED TO PROVE THAT ANY EQUIPMENT THAT WILL BE WORKING IN THE WATERCOURSE HAS ONLY VEGETABLE LUBRICANTS. ALL MAINTENANCE WORK AND RE-FUELING SHALL BE PERFORMED AT LEAST 100m AWAY FROM THE NORTH SASKATCHEWAN RIVER. EVERY PRECAUTION SHALL BE TAKEN TO AVOID/CONTAIN SPILLS DURING MAINTENANCE AND RE-FUELING OF THIS EQUIPMENT.
4. DUE TO THE ON-SITE PRESENCE OF FUELS, LUBRICANTS AND HYDRAULIC FLUIDS, THE CONTRACTOR SHALL BE REQUIRED TO HAVE A SPILL CONTAINMENT KIT ON SITE AT ALL TIMES.
5. ANY SPOIL MATERIALS REMOVED DURING THE PROJECT ACTIVITIES SHOULD BE SEPARATED FROM THE RIVER BY A WELL-VEGETATED AREA AND STABILIZED IN SUCH A WAY THAT THEY DO NOT RE-ENTER THE RIVER.
6. ALL WORKS SHOULD BE UNDERTAKEN IN ACCORDANCE WITH THE "FISH HABITAT MANUAL: GUIDELINES AND PROCEDURES FOR WATERCOURSE CROSSINGS IN ALBERTA" (ALBERTA TRANSPORTATION 2001).
7. AS PER THE REQUIREMENTS OF ALBERTA ENVIRONMENT AND THE WATER ACT, IN ORDER TO REDUCE THE POTENTIAL OF THE SPREAD OF WHIRLING DISEASE IN FISH, ALL EQUIPMENT AND MACHINERY THAT HAS BEEN USED IN THE UNITED STATES SHALL BE WASHED CLEAN OF ALL MUD AND DIRT BEFORE BEING USED IN ANY ACTIVITIES IN OR NEAR STREAMS IN ALBERTA.
8. CONSTRUCTION SHALL NOT COMMENCE PRIOR TO INSTALLATION OF THE FLOATING TURBIDITY CURTAIN.
9. THE FLOATING TURBIDITY CURTAIN SHALL BE MONITORED THROUGHOUT THE COURSE OF CONSTRUCTION AND MAINTAINED AS NECESSARY.
10. THE CONTRACTOR SHALL PERFORM WORK IN ACCORDANCE WITH THE CITY OF EDMONTON EROSION AND SEDIMENTATION CONTROL GUIDELINES (2004).
11. IMPLEMENT ADEQUATE HEALTH AND SAFETY PRACTICES DURING CONSTRUCTION TO PROTECT BOTH THE PUBLIC AND THE CONTRACTORS.
12. RECLAIM ALL DISTURBED AREAS IMMEDIATELY AFTER CONSTRUCTION.
13. ANY OTHER SPECIFIC REQUESTS MADE AS A CONDITION TO ANY REGULATORY APPROVAL ISSUED FOR THE PROJECT (WILL BE MADE AVAILABLE TO THE CONTRACTOR PRIOR TO COMMENCEMENT OF CONSTRUCTION).

SPECIFICATIONS

1.0 RIP RAP GENERAL

1.1 THIS SPECIFICATION IS FOR THE SUPPLY, DELIVERY, AND INSTALLATION OF HEAVY ROCK RIP RAP. THIS WORK SHALL INCLUDE ALL NECESSARY BANK TRIMMING, EXCAVATION, AND FILL REQUIRED TO SATISFACTORILY PLACE THE ROCK RIP RAP.

SPECIFICATIONS CONT'D

2.0 ROCK MATERIAL

2.1 THE ROCK SUPPLIED SHALL BE HARD, DURABLE AND ANGULAR IN SHAPE, RESISTANT TO WEATHERING AND WATER ACTION, FREE FROM OVERBURDEN, SPOIL, SHALE OR SHALES SEAMS AND ORGANIC MATERIAL, AND SHALL MEET THE GRADATION REQUIREMENTS FOR THE CLASS SPECIFIED. NO SANDSTONE WILL BE PERMITTED FOR ALL CLASSES. THE MINIMUM DIMENSION OF ANY SINGLE ROCK SHALL BE NOT LESS THAN ONE THIRD OF ITS MAXIMUM DIMENSION. THE MINIMUM ACCEPTABLE UNIT WEIGHT OF THE ROCK IS 2.5 T/M^3. THE MATERIAL PROVIDED FOR EACH CLASS SPECIFIED SHALL HAVE A GRADATION THAT CONFORMS TO THE FOLLOWING:

		CLASS
		2
NOMINAL MASS (kg)		200
NOMINAL DIAMETER (mm)		500
NONE GREATER THAN:	kg	700
	OR mm	800
20% TO 50%	kg	300
	OR mm	600
50% TO 80%	kg	200
	OR mm	500
100% GREATER THAN:	kg	40
	OR mm	300

PERCENTAGES QUOTED ARE BY MASS.
SIZES QUOTED ARE EQUIVALENT SPHERICAL DIAMETERS, AND ARE FOR GUIDANCE ONLY.

3.0 PLACING OF ROCK

3.1 THE ROCK SHALL BE HANDLED, DUMPED OR PLACED INTO POSITION TO CONFORM TO THE SPECIFIED GRADATION AND TO THE CROSS SECTION SHOWN ON THE DRAWINGS. THE FINISHED SURFACE SHALL BE REASONABLY UNIFORM, FREE FROM BUMPS OR DEPRESSIONS, AND WITH NO EXCESSIVELY LARGE CAVITIES BELOW OR INDIVIDUAL STONES PROJECTING ABOVE THE GENERAL SURFACE.

4.0 RIVER ISOLATION

4.1 SUPPLY, INSTALL AND MAINTAIN RIVER ISOLATION MEASURES, AS APPROVED BY THE ENGINEER.

4.2 THE CONTRACTOR SHALL SUPPLY ALL NECESSARY FLOATATION DEVICES, ANCHORAGES, AND OTHER MISCELLANEOUS ITEMS REQUIRED TO PROPERLY INSTALL THE RIVER ISOLATION MEASURES.

4.3 THE CONTRACTOR SHALL EMPLOY THE SERVICES OF A QUALIFIED SUPPLIER/MANUFACTURER FOR INSTALLATION AND MAINTENANCE SUPPORT.

4.4 ALL WORKS MUST CONFORM TO ALBERTA ENVIRONMENT AND SUSTAINABLE RESOURCE DEVELOPMENTS CODE OF PRACTICE FOR WATERCOURSE CROSSINGS (JUNE 2013).

4.5 THE ISOLATION METHOD MUST BE CARRIED OUT IN A MANNER THAT ISOLATES THE INSTREAM CONSTRUCTION SITE AND ELIMINATES THE FLOW OF SURFACE WATER THROUGH THE AREA OF EXCAVATION.

4.6 THE WATER DIVERTED MUST BE RETURNED TO THE WATER BODY DOWNSTREAM OF THE SITE.

4.7 ANY FISH THAT ARE FOUND WITHIN THE ISOLATED PORTION OF THE OUTFALL SITE MUST BE REMOVED, WITHOUT HARM OR DESTRUCTION, TO AN AREA OF THE WATER BODY OUTSIDE THE ISOLATED PORTION THAT IS LOCATED IMMEDIATELY ADJACENT TO THE ISOLATED PORTION.

4.8 CONTRACTOR SHALL EMPLOY THE SERVICES OF A QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST (QAES) FOR THE DEVELOPMENT OF A RIVER ISOLATION PLAN AND SUBMIT TO ENGINEER FOR REVIEW.

4.9 THE CONTRACTOR SHALL SUBMIT DAILY REPORTS PRODUCED BY THE CONTRACTOR'S QAES DURING ALL PERIODS OF RIVER ISOLATION.

4.10 THE ISOLATION METHOD SHALL BE CARRIED OUT IN ACCORDANCE WITH THE WRITTEN SPECIFICATIONS OF A QUALIFIED AQUATIC ENVIRONMENT SPECIALIST.

4.11 ANY WATER ENTERING AN INTAKE OF A BYPASS PUMPING SYSTEM MUST PASS THROUGH A SCREEN WITH OPENINGS THAT ARE NO LARGER THAN 2.54 MILLIMETERS AND AT A VELOCITY THAT DOES NOT RESULT IN THE ENTRAINMENT AND ENTRAPMENT OF FISH OR FISH FRY.

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
MISCELLANEOUS DETAILS - ISOLATION PLAN FOR INSTREAM WORKS

DRAWING
TPFB-PD-S18B

SUGGESTED CONSTRUCTION SEQUENCE FOR THE INSTALLATION OF TEMPORARY ACCESS BRIDGE – REFER TO DRAWING TPFB–PD–S18A.

- BUILD ACCESS ROAD TO RIVER BANKS AND PROTECT WITH ESC MEASURES (SEE DRAWING TPFB–PD–S16 FOR DETAILS OF ACCESS ROAD TO RIVER BANK).
- PLACE NAVIGATION WARNING SIGNS 200 m UPSTREAM AND DOWNSTREAM OF THE PROPOSED BERM LOCATION.
- PLACE FLOATING TURBIDITY CURTAIN OR OTHER APPROPRIATE TEMPORARY MEASURE AS SHOWN ON DRAWING TPFB–PD–S18A.
- STARTING AT THE RIVER BANK, DRILL AND DRIVE PILES FOR THE ABUTMENT OF THE FIRST TEMPORARY BRIDGE SPAN.
- DRILL AND DRIVE PILES FOR THE PIER OF THE FIRST TEMPORARY BRIDGE SPAN. DEPENDING ON THE TYPE AND REACH OF EQUIPMENT USED BY THE CONTRACTOR, THIS MAY BE DONE EITHER FROM THE RIVER BANK OR FROM A FLOATING BARGE.
- PLACE AND SECURE CAP BEAMS ON THE ABUTMENT AND PIER PILES WITH EQUIPMENT ON THE RIVER BANK.
- SET FIRST TEMPORARY BRIDGE SPAN ON THE CAP BEAMS AT ABUTMENT AND PIER.
- CONSTRUCTION EQUIPMENT DRIVES ON TO COMPLETED FIRST TEMPORARY BRIDGE SPAN

.

- DRILL AND DRIVE PILES FOR THE SECOND PIER; PLACE AND SECURE PIER CAP BEAM.
- PLACE THE SECOND TEMPORARY BRIDGE SPAN.
- CONSTRUCTION EQUIPMENT DRIVES ON TO COMPLETED SECOND TEMPORARY BRIDGE SPAN.
- DRILL AND DRIVE PILES FOR THE THIRD PIER; PLACE AND SECURE PIER CAP BEAM.
- PLACE THE THIRD TEMPORARY BRIDGE SPAN.
- CONSTRUCTION OF THE TEMPORARY BRIDGE ON ONE SIDE OF THE RIVER IS NOW COMPLETE.
- REPEAT SAME SEQUENCE FROM THE OPPOSITE RIVER BANK FOR CONSTRUCTING THE SECOND TEMPORARY ACCESS BRIDGE.

SUGGESTED CONSTRUCTION SEQUENCE FOR INSTALLING THE BERMS – REFER TO DRAWING TPFB–PD–S18A.

- THE EQUIPMENT TYPICALLY USED BY CONTRACTORS FOR CONSTRUCTING BERMS ARE DUMP TRUCKS, DOZERS AND EXCAVATORS.
- FROM THE TEMPORARY ACCESS BRIDGE, PLACE CLASS 2 ROCK RIPRAP PARALLEL TO THE RIVER BANK AND IN THE UPSTREAM DIRECTION TO FORM A GRANULAR FINGER BERM TO ACCESS THE UPSTREAM FACE OF THE TEMPORARY BERM.
- PLACE CLASS 2 ROCK RIPRAP IN A TRIANGULAR WEDGE SHAPED PATTERN TO FORM THE UPSTREAM FACE OF THE TEMPORARY BERM.
- FROM THE INSTREAM CORNER OF THE UPSTREAM FACE, PLACE CLASS 2 ROCK RIPRAP FOR A DISTANCE OF ABOUT 10 m IN THE DOWNSTREAM DIRECTION.
- THE ROCK RIPRAP PLACED ABOVE WILL CREATE A SHELTERED AREA WHERE THE RIVER FLOW VELOCITY WILL BE REDUCED AND WILL ALLOW FOR PLACEMENT OF THE HIGH PLASTIC CLAY MATERIAL THAT FORMS THE INNER CORE OF THE BERM.
- STARTING FROM THE TEMPORARY ACCESS BRIDGE, PLACE HIGH PLASTIC CLAY ON THE RIVER BED WORKING IN THE UPSTREAM DIRECTION.
- MONITOR THE TURBIDITY OF THE WATER. THE CONTRACTOR SHALL CARRY OUT THE QUALITY CONTROL (QC) MONITORING AND REPORT THE RESULTS TO THE CONSULTANT FOR REVIEW.
- THE CONSULTANT MAY CARRY OUT QUALITY ASSURANCE (QA) MONITORING OF THE TURBIDITY IF RESULTS FROM THE CONTRACTOR'S QC MONITORING DEEM THIS NECESSARY.
- AFTER EVERY 8 m OF CLAY PLACEMENT, PLACE A GEOTEXTILE FILTER FABRIC ON THE UPSTREAM (RIVER) FACE OF THE CLAY.
- PLACE CLASS 2 ROCK RIPRAP ON THE UPSTREAM FACE OF THE CLAY OVER THE FILTER FABRIC.
- CONTINUE PLACEMENT OF CLAY AND ROCK RIPRAP GRADUALLY IN THE UPSTREAM DIRECTION UNTIL THE SIDE OF TEMPORARY BERM CLOSEST TO AND PARALLEL TO THE RIVER BANK IS COMPLETED.
- CONTINUE BERM CONSTRUCTION BEHIND THE UPSTREAM WEDGE SHAPED ROCK RIPRAP.
- CONTINUE BERM CONSTRUCTION IN DOWNSTREAM DIRECTION TO FORM THE BERM SIDE THAT IS INSTREAM AND PARALLEL TO THE RIVER BANK.
- COMPLETE THE BERM BY CONSTRUCTING THE DOWNSTREAM FACE.

SUGGESTED CONSTRUCTION SEQUENCE FOR DISMANTLING THE BERMS – REFER TO DRAWING TPFB–PD–S18A.

- PLACE FLOATING TURBIDITY CURTAIN OR OTHER APPROPRIATE TEMPORARY MEASURE AROUND THE BERM AND BACK TO THE RIVER BANKS AS SHOWN ON DRAWING TPFB–PD–S18A. THIS PROVIDES A SHELTERED AREA TO CARRY OUT THE INSTREAM WORK.
- REMOVAL STARTS AT THE DOWNSTREAM LIMIT OF THE BERM AND IS IN REVERSE OF THE CONSTRUCTION SEQUENCE.
- THE HIGH PLASTIC CLAY ON INSIDE OF BERM IS REMOVED WITH AN EXCAVATOR AND TRUCKED OFF SITE FOR DISPOSAL.
- USING AN EXCAVATOR, COLLECT THE UPPER CLASS 2 ROCK RIPRAP THAT IS ON TOP OF THE GEOTEXTILE AND PLACE IT INTO DUMP TRUCKS.
- THE ROCK RIPRAP IS TRANSPORTED TO THE RIVER BANK AND PLACED ALONG THE BANKS ON GEOTEXTILE FILTER FABRIC FORMING THE PERMANENT RIVER BANK PROTECTION WORKS.
- REMOVE THE GEOTEXTILE.
- REMOVE THE CLAY AND DISPOSE OFF SITE.
- REMOVE REMAINING ROCK RIPRAP AND PLACE ALONG RIVER BANK.
- DECONSTRUCT THE TEMPORARY ACCESS BRIDGE BY REMOVING THE THIRD SPAN.
- REMOVE THE CAP BEAM AND THE PIER PILES.
- REPEAT DECONSTRUCTION SEQUENCE FOR THE REMAINING TWO TEMPORARY BRIDGE SPANS AND THE PIERS AND WORK BACK TOWARDS THE RIVER BANK.
- THIS SUGGESTED CONSTRUCTION SEQUENCE MAY NEED TO BE MODIFIED BASED ON WATER LEVEL AND SITE CONDITIONS. THE CONTRACTOR IS TO NOTIFY THE CONSULTANT OF ANY MAJOR CHANGES TO THE ABOVE PROCEDURE.
- REMOVE TEMPORARY MEASURES.

SUGGESTED SAFETY PLAN FOR INSTREAM WORKS

- THE CONTRACTOR SHALL DEVELOP A SAFETY PLAN FOR THE PROPOSED BRIDGE CONSTRUCTION PROJECT. THAT PLAN SHALL CONSIDER ALL FACETS OF THE BRIDGE CONSTRUCTION AND INCLUDE THE SAFETY OF THE WORKERS AS WELL AS THE GENERAL PUBLIC INCLUDING BUT NOT LIMITED TO PEDESTRIANS AND RIVER USERS. THE SAFETY PLAN SHALL BE SUBMITTED TO TRANSPORT CANADA FOR THEIR REVIEW AND APPROVAL PRIOR TO COMMENCEMENT OF OPERATIONS.
- ALL OPERATORS SHALL ATTEND THE CONTRACTOR'S SAFETY ORIENTATION BEFORE COMMENCING ANY WORK.
- ALL OPERATORS SHALL ATTEND A DAILY RISK ASSESSMENT PRIOR TO STARTING ANY ACTIVITIES.
- PERSONAL PROTECTIVE EQUIPMENT (PPE) TO BE WORN INCLUDES HARD HAT, GLOVES, GLASSES, AND SAFETY BOOTS. CERTAIN ACTIVITIES MAY REQUIRE ADDITIONAL PPE.
- IF WORKING FROM A BOAT OR BARGE, ALL OPERATORS AND SUPERVISORS MUST WEAR A PERSONAL FLOATATION DEVICE.
- LIFEBUOYS SHALL BE INSTALLED ON THE RIVER BANK BEFORE ANY WORKS COMMENCE.
- TURBIDITY CURTAIN OR OTHER APPROPRIATE TEMPORARY MEASURES/ BERMS SHALL BE INSTALLED IN THE RIVER BEFORE ANY WORKS COMMENCE.
- TURBIDITY MONITORING SHALL BE UNDERTAKEN THROUGHOUT THE DURATION OF WORKS WITHIN THE RIVER AS PER THE TURBIDITY MONITORING PLAN.

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

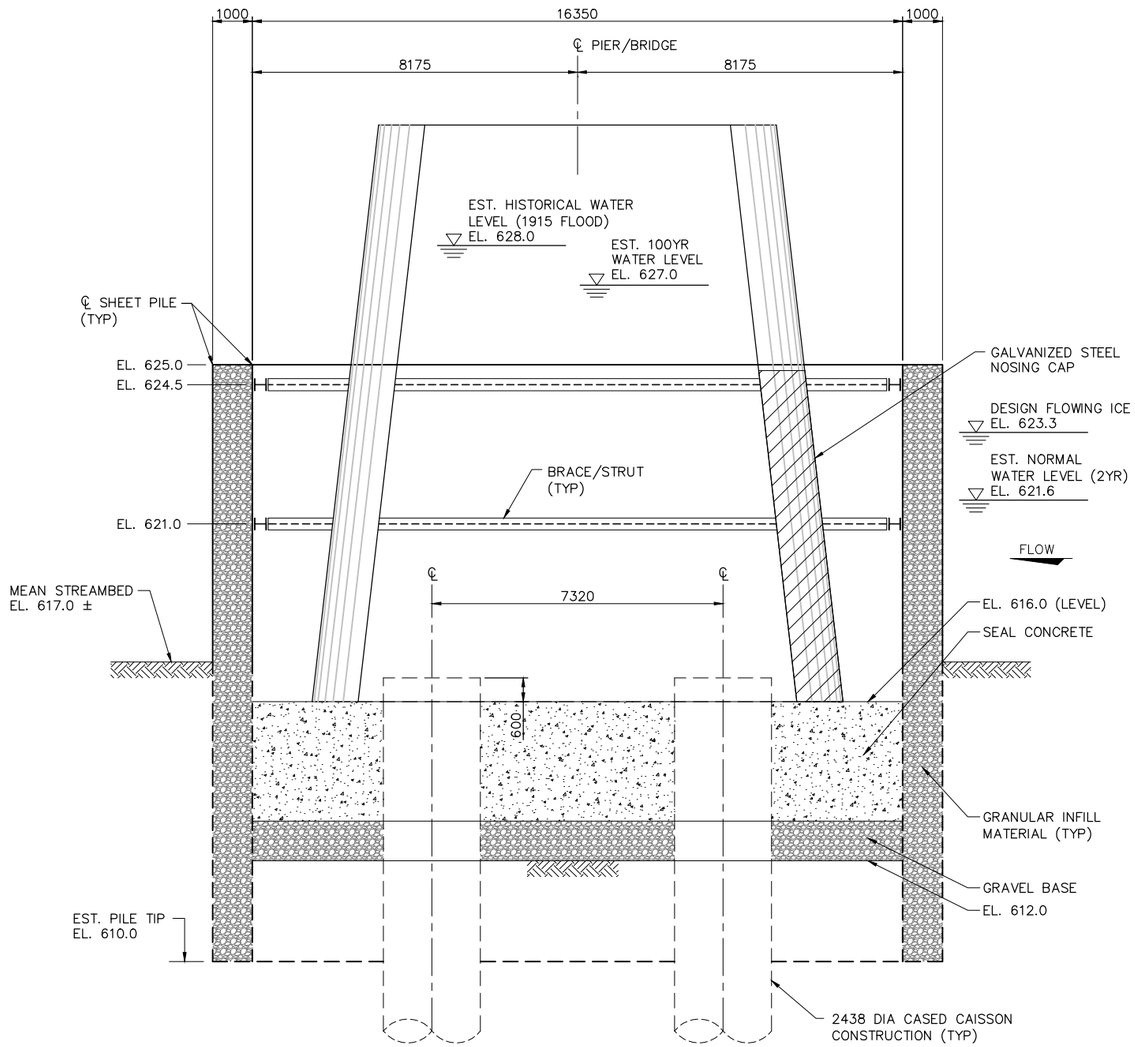
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

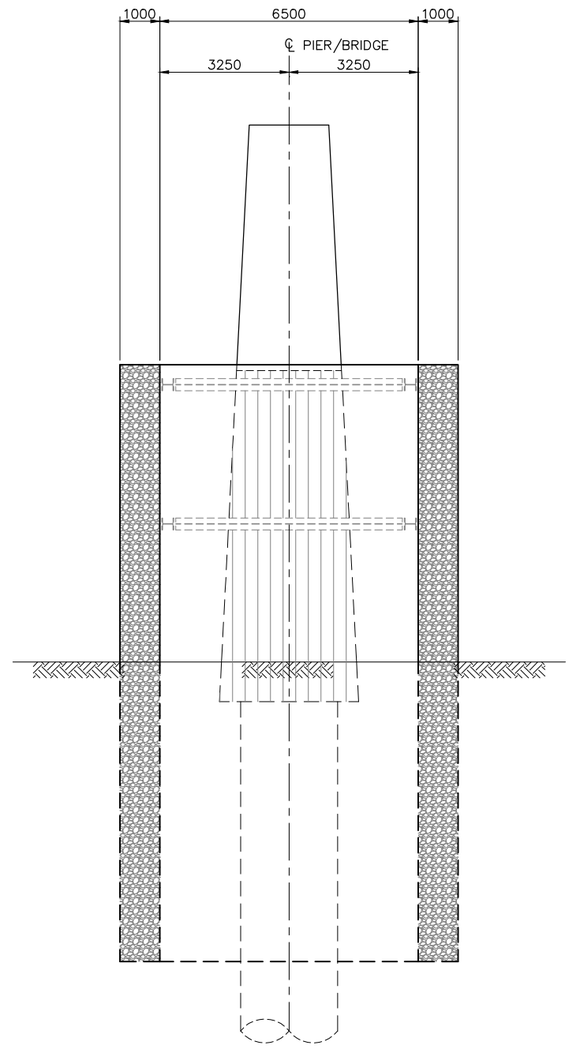
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
INFORMATION SHEET 2

DRAWING
TPFB-PD-S18C



A S19 SECTION
1:75



SIDE VIEW

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

SURVEY
JOB NO.
SCALE

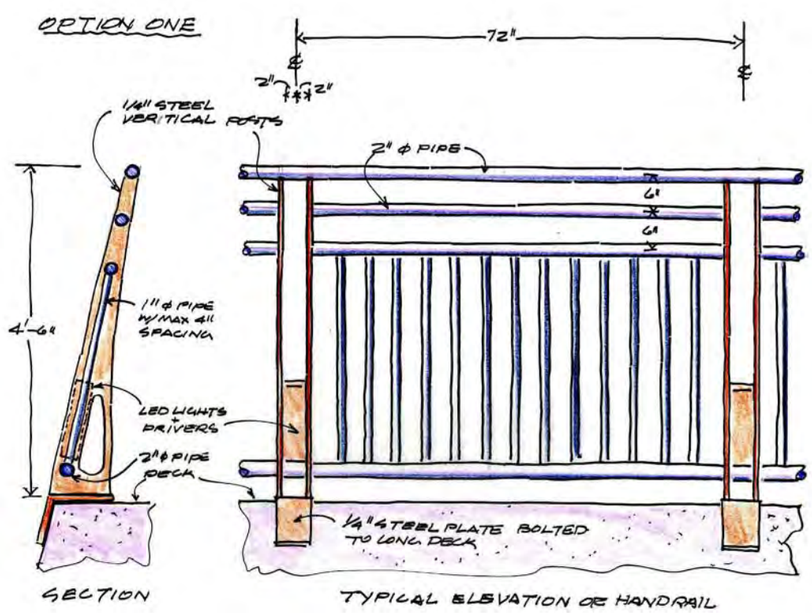
DRAWN E.C. DATE m/d/yy
DESIGNED - DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
CONSTRUCTABILITY - COFFERDAM - SHEET 2

DRAWING
TPFB-PD-S20

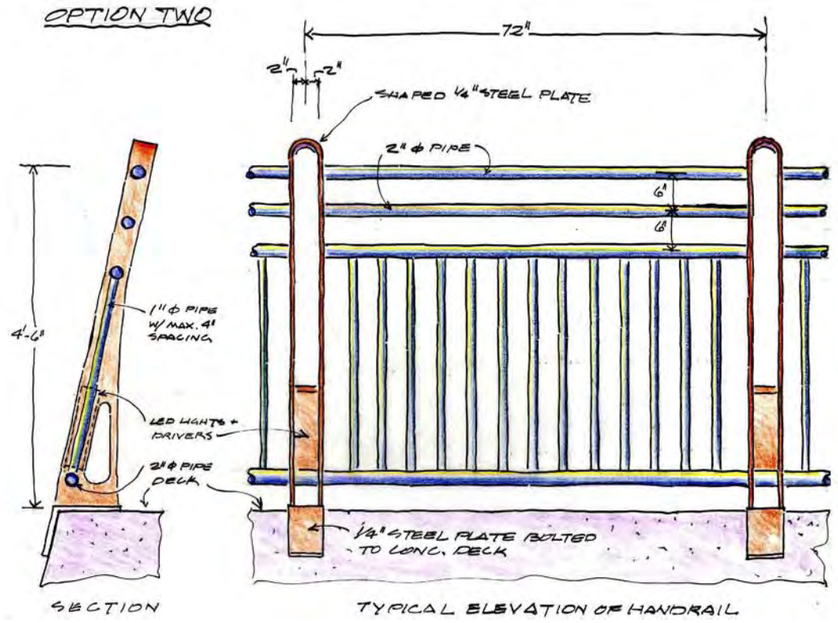
OPTION ONE



SECTION

TYPICAL ELEVATION OF HANDRAIL

OPTION TWO



SECTION

TYPICAL ELEVATION OF HANDRAIL

PRELIMINARY
- NOVEMBER 2013-

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-

APPROVED FOR CONSTRUCTION

DESIGNER

DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

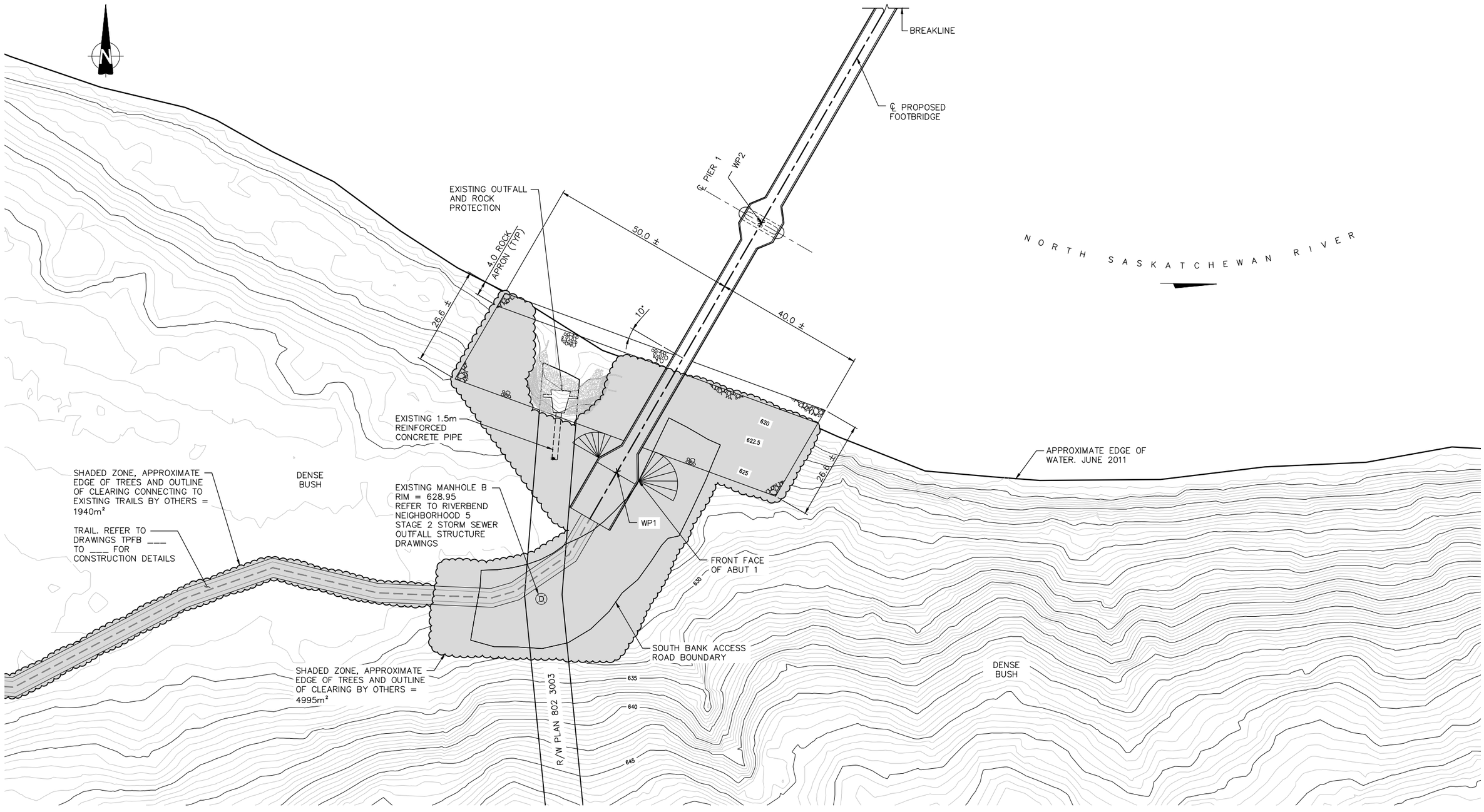
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
HANDRAIL OPTIONS

DRAWING
TPFB-PD-S21



PLAN
1:500

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

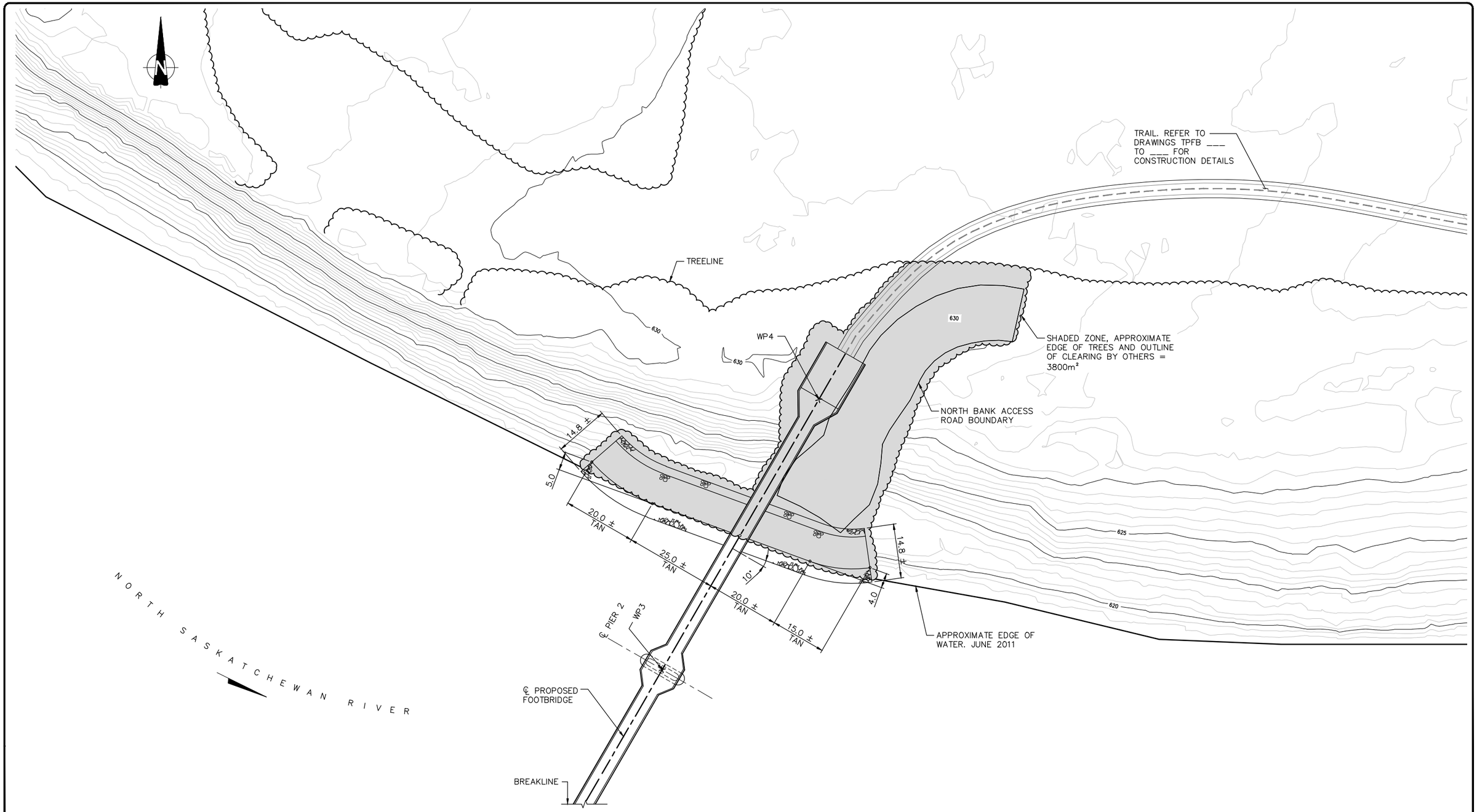
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
ABUTMENT 1 SITE AREA & CIVIL WORKS

DRAWING
TPFB-PD-TC1



PLAN
1:500

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

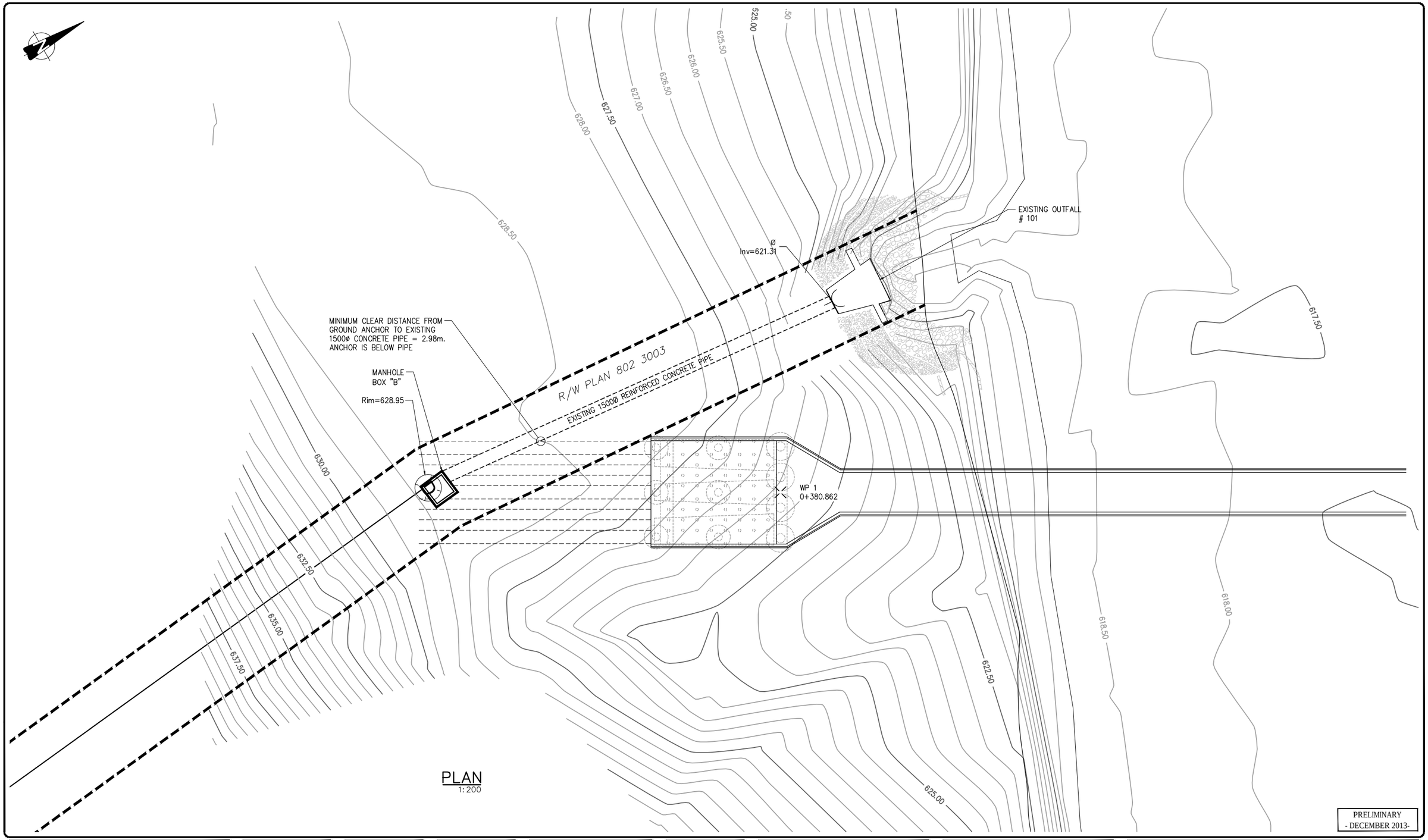
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
ABUTMENT 2 SITE AREA & CIVIL WORKS

DRAWING
TPFB-PD-TC2



PLAN
1: 200

PRELIMINARY
- DECEMBER 2013-

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY
- NOT FOR CONSTRUCTION-

APPROVED FOR CONSTRUCTION

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
SOUTH ABUTMENT - EXISTING UTILITY LAYOUT

DRAWING
TPFB-PD-U01

5. Please provide any additional comments about the Terwillegar Park Footbridge concept:

_____

_____

_____

6. Please provide any additional comments about the West End Trails concept:

_____

_____

_____

ABOUT THE EVENT

Your responses to the following questions will assist us in planning future meetings.

7. Using the following scale from 1 to 5 where 1 means Strongly Disagree and 5 means Strongly Agree. Please circle the appropriate number to indicate the extent to which you agree with each of the following statements:

	Strongly Disagree				*Strongly Agree*
• *The information presented at the event was useful and informative.*	*1*	*2*	*3*	*4*	*5*
• *The information was easy to understand.*	*1*	*2*	*3*	*4*	*5*
• *The project representatives were helpful, friendly and available to talk to me.*	*1*	*2*	*3*	*4*	*5*
• *I was able to find satisfactory answers to my questions.*	*1*	*2*	*3*	*4*	*5*
• *I have a better understanding of the project because of my attendance.*	*1*	*2*	*3*	*4*	*5*
• *Participating in this session was a good use of my time.*	*1*	*2*	*3*	*4*	*5*
• *The venue location was appropriate.*	*1*	*2*	*3*	*4*	*5*

8. Which aspects of the meeting did you find most valuable? (Please check all that apply)

☐ *Interaction with representatives* ☐ *Display boards*
☐ *Handouts* ☐ *Other (Please specify):* _____

9. How did you hear about this meeting? (Please check all that apply)

☐ *Road side signs* ☐ *Word of mouth* ☐ *Newspaper advertisement*
☐ *Flyer in mailbox* ☐ *Email* ☐ *Community league website*
☐ *City of Edmonton website* ☐ *Social Media* ☐ *Other (Please specify):* _____

Thank you!

Please leave your comment form at the welcome desk or fax to (780)425-6646 by midnight Saturday, October 5.

For more information visit Edmonton.ca/RiverValleyProjects

APPENDIX E
Erosion and Sedimentation Control Recommendations

Erosion Control for Staging, Laydown Areas and Construction Access Road

Dust Monitoring and Control

The Contractor shall control dust on the work site by spraying the construction access road, soil stockpiles and other disturbed soil areas. Water will be obtained from approved sources in accordance with the Provincial Water Act.

Site Drainage and Surface Erosion Control

Construction activities shall minimize the potential for future erosion problems by restricting clearing activity to the minimum footprint and salvaging as much of the vegetation as possible in an area. The positive outcomes of such practices include, but are not limited to, increasing surrounding soil stability in a region, preserving wildlife habitat and reducing the impact of seasonal activities such as early spring run-off events.

The following additional measures shall be taken to control surface erosion and to prevent sediment from entering adjacent water bodies.

Minimize surface disturbances

Surface soils should not be disturbed sooner than necessary to accommodate construction.

Installation of temporary silt fence

Silt fences shall be installed in areas where there is a potential for sediment run off into the river. The Silt fence shall be maintained throughout the duration of the project. Erosion control devices shall be inspected daily by site personnel, as well as monthly by the Construction Manager.

Maintenance of Sediment Traps

Maintenance of erosion control materials and structures shall be conducted as necessary. Silt or deleterious material shall be disposed of in a location a minimum of 100 m from water bodies.

Emergency Erosion Procedures

- In the event an overloading of the erosion control system should occur, due to natural causes or emergencies, a surplus of erosion and sediment control materials, spill kits, pumps and other related materials shall be kept on site throughout the duration of the Project.
- Following the overloading event, clean-up shall be conducted and redesign of the system and ECO Plan amendment shall be submitted to the Consultant for review.

Terwillegar Park Footbridge Isolation Area Options for Pier Construction

The proposed pier construction methodology for the Terwillegar Park Footbridge consists of building a dry isolation area around each pier from August 1 to September 15 during the first construction year. The dry isolation areas will be access by installing modular steel bridge supported on temporary steel pilings. Five instream isolation options were considered for the pier construction which are described below. The design of the temporary dry isolation area will be the responsibility of the Contractor and will be reviewed by Stantec. The Contractor shall design the temporary dry isolation areas with a Qualified Aquatic Environmental Specialist (QAES).

Option 1: Clay Berms, Class 2 Rock Riprap and Turbidity Curtains

This option consists of building a high plastic clay berm around each pier. Class 2 heavy rock riprap is proposed on the outside of the berms to protect them from potential erosion caused by the flow of the North Saskatchewan River. The dumping of high plastic clay material in the river may increase its turbidity. It is therefore proposed to isolate the berm areas with turbidity curtains before the high plastic clay material is dumped in the riverbed. The turbidity curtains would be secured to buoys anchored to concrete anchor blocks placed on the riverbed. Any fish that are found within the areas isolated by the turbidity curtains will be removed without harm or destruction to an area of the river outside the isolated portion that is located immediately adjacent to the isolated portion. This action will be carried out before any berm works commences. The turbidity curtains shall not be removed unless authorized by a QAES and shall be reinstalled if directed by a QAES. The isolated areas will be monitored by a QAES.

The Contractor shall take steps to minimize turbidity during turbidity curtain installation, maintenance and removal. A QAES will need to be present during the installation and removal of the turbidity curtains. They shall be monitored throughout the course of construction when installed and maintained as necessary.

Turbidity curtains are easy to install and remove. They are also less expensive than sheet pile cofferdams and water structures such as an Aqua Dam. Some limitations of the turbidity curtains are that they may cause scour in flowing areas outside the barrier, construction must proceed in the wet and some turbid water may escape the barrier. They are also susceptible to damage by fast flowing water, floating debris and boats.

Option 2: Clay Berms, Class 2 Rock Riprap, Water Structures and Turbidity Curtains

Option 2 is the same as Option 1 except that water structures such as an Aqua Dam will also be utilized to isolate the berm areas. With the use of a water structure, the berms would be built in the dry. The water in the area isolated by the water structure will be pumped out. Any water entering an intake of a pumping system must pass through a screen with openings that are no larger than 2.54 mm and at a velocity that does not result in the entrainment and entrapment of fish or fish fry. Water structures were used on the North Saskatchewan River during the construction of the Fort Edmonton Footbridge and the Highway 11A Bridge in Rocky Mountain House (BF 9847). Some limitations of water structures are that they may move in high flows, supply, installation and removal can be expensive. They may not provide a complete water tight barrier due to the typical bed material on the North Saskatchewan River. Hence, any water

that seeps in will be pumped out resulting in an additional cost for this option. The horizontal width of a water structures is around 2.5 times its height. The use of water structures would constrict the flow more than utilizing turbidity curtains. Therefore, it is proposed that only one berm would be built at a time.

Turbidity curtains will need to be installed before the water structures are installed. They shall not be removed unless authorized by a QAES and shall be reinstalled if directed by a QAES. The isolated areas will be monitored by a QAES. Water structures shall be monitored when installed and maintained as necessary.

Option 3: Clay Berms, Class 2 Rock Riprap, Turbidity Curtains and Steel Pipe Piles

Option 3 is the same as Option 1 except that steel pipes piles would be used to secure the turbidity curtains instead of concrete anchor blocks. Steel pipes piles will be less prone to move in high flowing water than concrete anchor blocks, but it will take more time to install them and will be more expensive than using concrete anchor blocks. Bedrock is within 2 m of the riverbed. Hence, installation of steel pipe piles requires pre-drilling of appropriate sized holes in the riverbed followed by driving of the pipe piles into the holes. The piles will likely have to be spaced 3 to 4 m apart to provide adequate security to the turbidity curtains. This option has more impact to the North Saskatchewan River bed compared to Option 1 and Option 2. The berms will likely be built at the same time for this option.

Turbidity curtains shall not be removed unless authorized by a QAES and shall be reinstalled if directed by a QAES. Turbidity curtains shall be monitored when installed and maintained as necessary. All work shall be monitored by a QAES.

Option 4: Sheet Pile Cofferdams and Turbidity Curtains

This option consists of using sheet pile cofferdams to build the dry isolation area around each pier. Cofferdams would be less susceptible to damage by fast flowing water, floating debris and boats than turbidity curtains and water structures. This method is currently being used at the new Walterdale Bridge construction where the work area is close to the bank but below the water level. The bedrock is very close to the river bottom at the proposed Terwillegar Park Footbridge as well at Walterdale. Bedrock is within 2 m of the riverbed at the Terwillegar Park Footbridge. Hence, installation of sheet piles requires pre-drilling of appropriate sized holes in the riverbed followed by driving of the sheet piles into the holes and then backfilling the hole with cuttings. Specialized drilling equipment will be required to construct a cofferdam at this site. Hence, Option 4 will likely be more expensive and time consuming than any other option considered. The berms will likely be built at the same time for this option.

Turbidity curtains will need to be installed before the sheet pile cofferdams are installed. They shall not be removed unless authorized by a QAES and shall be reinstalled if directed by a QAES. The isolated areas will be monitored by a QAES. Sheet pile cofferdams shall be monitored when installed and maintained as necessary.

Option 5: Class 2 Rock Riprap Berms, Sheet Piles and Turbidity Curtains

This option consists of building berms with Class 2 rock riprap only (i.e. no high plastic clay material). Sheet piles would be installed in the inside of the berms to provide a dry construction area. They would be anchored around 0.5 m in the bedrock. Rock riprap is less susceptible to damage by fast flowing water, floating debris and boats than turbidity curtains, water structures and cofferdams. The sheet piles for this option will not have to be anchored as deep in the bedrock as compared to Option 4 which might save time and money. This method has not been used on any of the bridge recently constructed across the North Saskatchewan River. The berms will likely be built at the same time for this option.

Turbidity curtains will need to be installed before the Class 2 rock riprap and sheet piles are installed. They shall not be removed unless authorized by a QAES and shall be reinstalled if directed by a QAES. The isolated areas will be monitored by a QAES. The Class 2 rock riprap and sheet piles shall be monitored when installed and maintained as necessary.

Recommendation

It is proposed to have two options for the instream isolation during the pier construction. This would give an opportunity for the Contractor to select the option which he is more comfortable with. Option 1 and Option 2 are recommended as instream isolation options for the pier construction. Given the proximity of the bedrock to the riverbed, the use of sheet piles and steel pipe piles would likely be more time consuming and costly. Steel pipe piles were proposed for Option 3 while sheet piles were proposed for Option 4 and Option 5.

1.1 CONSTRUCTION ACCESS AND ABUTMENT ESC

1.1.1 Scope

South Abutment

The construction of a temporary access road including site preparation and grading, from the Rabbit Hill Road to the river top-of-bank and to Access Bridge 1 connecting to the south in-stream pier. The construction access road will follow an existing service road for the majority of its length. See drawing TPFT-PD-S15 for laydown areas.

North Abutment

The construction of a temporary access road including site preparation and grading, from the Oleskiw Lands to the river top-of-bank and to Access Bridge 2 connecting to the north in stream pier. See drawing TPFT-PD-S15 for laydown areas and potential access roads.

1.1.2 Timing

- May 1, 2014 to September 30, 2016

1.1.3 Environmental Construction Techniques

Final information and construction techniques will be included within the Eco-Plan provided by the general contractor. Suggested minimum techniques shall include:

- Restriction of construction activity to working areas as defined within the approvals and surveyed onsite.
- Contractor to consider staged construction. Contractor to only disturb lands as required, and shall leave a vegetative buffer between the working area and the river whenever possible
- Implementation of wet weather restrictions to construction activity on the access trail.
- Ensuring motorized equipment is in good working order and following proper procedures for maintenance, fueling, etc.
- Good housekeeping practices for construction activities including collection and containment of construction debris in appropriate waste and recycling containers, proper storage of fuels, lubricants, etc.

1.1.4 Interim ESC Measures

Interim ESC measures will be the responsibility of the general contractor onsite throughout the construction and maintenance periods. The Eco-Plan will incorporate the minimum suggested measure below and will be reviewed by the consultant prior to construction startup.

- Staged construction to minimize clearing areas and disturbance will be implemented. Permanent erosion and sedimentation controls, as designed by the consultant, will need to be in place prior to commencement of further disturbance beyond the confines of the current construction stage.
- Stumping of fringe trees to keep understory and existing ground vegetation intact.
- Site specific grading of access road and surrounding disturbance areas to reduce flow rates along the access road and prevent scouring.
- Check dams or permeable berms within drainage swales to reduce flow rates.
- Berms/sediment forebay/drainage forebays for containment of overland flows to help to prevent potential releases.
- Pumping procedures for dewatering of containment berm/sediment forebay/drainage forebay shall include a filter bag to an undisturbed well vegetated location an appropriate distance from the river. Full time monitoring will be required during any pumping activity.
- Straw wattle/silt fence for containment of sedimentat in runoff water and to divert overland flows away from the construction area.
- Turbidity curtain within river. Turbidity curtain shall be last line of defense, and will not be utilized for daily containment.
- Monitoring of ESC measures on a daily basis with additional inspections during and upon completion of rainfall events to ensure measures are performing as intended and are adequate. Daily inspection must be documented.
- Hydromulch of exposed surfaces if permanent ESC measures cannot be complete in a timely manner.

- ESC measures around all staging/stockpile/laydown areas prior to site use. No material shall be stored or stockpiled adjacent to the river.
- A qualified ESC specialist (CPESC) is to be retained to inspect the working areas following all stages of completed construction.
- Avoid using silt fencing reinforced with plastic or metal wherever possible, as amphibians and reptiles can become entangled in the mesh (California Coastal Commission 2012).
- All silt fencing fraying or with holes should be replaced immediately to avoid entanglement by wildlife (California Coastal Committee 2012).
- Silt fencing should be removed as soon as is practically feasible to minimize barriers to wildlife movement; however, silt fencing or other barriers should remain around open excavations to exclude wildlife from excavation areas.

1.1.5 Permanent ESC Measure

Permanent ESC measures will be designed by the consultant and be the responsibility of the general contractor onsite throughout the construction and maintenance periods.

- Re-grading of disturbed areas to preconstruction condition where possible.
- Restoration of disturbed areas with stockpiled soil, appropriate grass species, trees and shrubs.
- Hydroseed/hydromulch/erosion and sedimentation blanket of steep slopes.
- Straw wattle/silt fence to divert flows around sensitive areas.
- Ensure drainage paths/flow paths are kept to a minimum and velocity/erosion control measures are employed.
- Class 2 angular rip rap including appropriate geotextile along stream bank.
- Vegetated rip rap with pole plantings where no interference with the bridge structure
- A qualified ESC specialist (CPESC) is to be retained to inspect the working areas following all stages of completed construction.

1.2 TRAIL CONSTRUCTION ESC

1.2.1 Scope

The construction of asphalt and granular trails connecting the Fort Edmonton Footbridge to the Terwillegar Park Footbridge and to the Anthony Henday Bridge crossing trail including site preparation, grading, and drainage crossings.

1.2.2 Timing

May 30, 2014 to September 30, 2016

1.2.3 Environmental Construction Techniques

Final information and construction techniques will be included within the Eco-Plan provided by the general contractor. Suggested minimum techniques shall include:

- Restriction of construction activity to working areas as defined within the approvals and surveyed onsite.
- Implementation of wet weather restrictions to construction activity on the access trail.
- Ensuring motorized equipment is in good working order and following proper procedures for maintenance, fueling, etc.
- Good housekeeping practices for construction activities including collection and containment of construction debris in appropriate waste and recycling containers, proper storage of fuels, lubricants, etc.

1.2.4 Interim ESC Measures

Interim ESC measures will be the responsibility of the general contractor onsite throughout the construction and maintenance periods. The Eco-Plan will incorporate the minimum suggested measure below and will be reviewed by the consultant prior to construction startup.

- Staged construction to minimize clearing areas and disturbance will be implemented. Permanent erosion and sedimentation controls, as designed by the consultant, will need to be in place prior to commencement of further disturbance beyond the confines of the current construction stage.
- Stumping of fringe trees to keep understory and existing ground vegetation intact.

- Check dams or permeable berms within drainage swales to reduce flow rates.
- Straw wattle/silt fence to divert flows around sensitive areas.
- Monitoring of ESC measures on a weekly basis with additional inspections during and upon completion of rainfall events to ensure measures are performing as intended and are adequate.
- Hydromulch of exposed surfaces if permanent ESC measures cannot be complete in a timely manner.
- ESC measures around all staging/stockpile/laydown areas prior to site use.
- A qualified ESC specialist (CPESC) is to be retained to inspect the working areas following all stages of completed construction.
- Avoid using silt fencing reinforced with plastic or metal wherever possible, as amphibians and reptiles can become entangled in the mesh (California Coastal Commission 2012).
- All silt fencing fraying or with holes should be replaced immediately to avoid entanglement by wildlife (California Coastal Committee 2012).
- Silt fencing should be removed as soon as is practically feasible to minimize barriers to wildlife movement; however, silt fencing or other barriers should remain around open excavations to exclude wildlife from excavation areas.

1.2.5 Permanent ESC Measure

Permanent ESC measures will be designed by the consultant and be the responsibility of the general contractor onsite throughout the construction and maintenance periods.

- Re-grading of disturbed areas to preconstruction condition where possible.
- Restoration of disturbed areas with stockpiled soil, appropriate grass species, trees and shrubs.
- Hydroseed/hydromulch/erosion and sedimentation blanket of steep slopes.
- Straw wattle/silt fence to divert flows around sensitive areas.
- A qualified ESC specialist (CPESC) is to be retained to inspect the working areas following all stages of completed construction.

APPENDIX F
Rare Plant Survey Locations

Rare Plant Survey Locations within Terwillegar Footbridge and Trails

Site Number	Easting	Northing	Zone	Year	Survey Type & Timing
RPLJJ01	326823	5928726	12	2013	Rare Plant Summer
RPLJJ02	327014	5928761	12	2013	Rare Plant Summer
RPLJJ03	326707	5928647	12	2013	Rare Plant Summer
RPLJJ04	326888	5928536	12	2013	Rare Plant Summer
RPLJJ05	327133	5928375	12	2013	Rare Plant Summer
RPLJJ06	327143	5928045	12	2013	Rare Plant Summer
RPLJJ07	327250	5927793	12	2013	Rare Plant Summer
RPLJJ08	327104	5928760	12	2013	Rare Plant Summer
RPLJJ09	327869	5930383	12	2013	Rare Plant Summer
RPLJJ10	327941	5930190	12	2013	Rare Plant Summer
RPLJJ11	327995	5930067	12	2013	Rare Plant Summer
RPLJJ12	328134	5929626	12	2013	Rare Plant Summer
RPLJJ13	328145	5929247	12	2013	Rare Plant Summer
RPLJJ14	327682	5929073	12	2013	Rare Plant Summer
RPLJJ15	326858	5926845	12	2013	Rare Plant Summer
RPLJJ16	327043	5926867	12	2013	Rare Plant Summer
RPLJJ17	327365	5928793	12	2013	Rare Plant Summer
RSTBJS1301	328095	5929992	12	2013	Rare Plant Spring
RSTBJS1302	328176	5929904	12	2013	Rare Plant Spring
RSTBJS1303	328100	5929516	12	2013	Rare Plant Spring
RSTBJS1304	327919	5929234	12	2013	Rare Plant Spring
RSTBJS1305	327966	5929024	12	2013	Rare Plant Spring
RSTBJS1306	327615	5929059	12	2013	Rare Plant Spring
RSTBJS1307	326739	5928747	12	2013	Rare Plant Spring
RSTBJS1308	326406	5928481	12	2013	Rare Plant Spring
RSTBJS1309	326545	5928471	12	2013	Rare Plant Spring
RSTBJS1310	326955	5928638	12	2013	Rare Plant Spring
RSTBJS1311	327661	5928770	12	2013	Rare Plant Spring
RSTBJS1312	327551	5928817	12	2013	Rare Plant Spring
RSTBJS1313	327457	5928871	12	2013	Rare Plant Spring
RSTBJS1314	327321	5928822	12	2013	Rare Plant Spring

Site Number	Easting	Northing	Zone	Year	Survey Type & Timing
RSTBJS1315	327333	5928894	12	2013	Rare Plant Spring
RSTBJS1316	327046	5928792	12	2013	Rare Plant Spring
RSTBJS1317	327061	5927103	12	2013	Rare Plant Spring
RSTBJS1318	327155	5927277	12	2013	Rare Plant Spring
RSTBJS1319	327215	5927661	12	2013	Rare Plant Spring
RSTBJS1320	327147	5928030	12	2013	Rare Plant Spring
RSTBJS1321	327178	5928298	12	2013	Rare Plant Spring

APPENDIX G
Fish Habitat Assessment

Terwillegar Park Footbridge Fish Habitat Assessment of the North Saskatchewan River

Prepared for:
City of Edmonton

Prepared by:
Stantec Consulting Ltd.

1135-60353

January 31, 2014

Stantec Quality Management Program

This document entitled Terwillegar Park Footbridge Fish Habitat Assessment of the North Saskatchewan River was prepared by Stantec Consulting Ltd. for the account of the City of Edmonton.

Prepared by _____
(signature)

Shona Derlukewich, Dipl. EPt, Fisheries Biologist

Reviewed by _____
(signature)

Greg Schatz, M.Sc., P.Biol., Aquatic Biologist

Senior Reviewed by _____
(signature)

Bob Shelast, B.Sc. P.Biol., Senior Fisheries Biologist

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Executive Summary

The City of Edmonton is proposing to construct a new footbridge that will connect Terwillegar Park, located on the south side of the North Saskatchewan River (NSR), to Oleskiw Lands located on the north side of the river. The footbridge is a part of the Capital Project being undertaken by the River Valley Alliance (of which the Proponent is a participating municipality). This system will form one of the many linkages that will facilitate movement through the NSR valley for pedestrians and cyclists, and will ultimately be a portion of the trail connection system between Devon and Fort Saskatchewan.

To meet the regulatory information requirements *of the Water Act*, *Fisheries Act*, and *Navigable Waters Protection Act* (NWPA), Stantec conducted a fish and fish habitat assessment on the North Saskatchewan River in the vicinity of the proposed footbridge.

The North Saskatchewan River at the proposed crossing location is a Class C water body with a Restricted Activity Period of September 16 to July 31. The river has a regular meander in an entrenched valley through the City of Edmonton. In the vicinity of the Project area, six sport fish species, four cyprinid species and four coarse fish species were captured. Overall, the North Saskatchewan River throughout the Project area provides good quality habitat for fish.

Potential effects on the North Saskatchewan River due to footbridge construction and operation were evaluated and measures to mitigate potential Project effects and protect fish and fish habitat were recommended.

1.0 Introduction

1.1 PROJECT DESCRIPTION

The City of Edmonton is proposing to construct a new footbridge that will connect Terwillegar Park, located on the south side of the North Saskatchewan River (NSR), to Oleskiw Lands located on the north side of the river (the Project) (Appendix A, Figure 1-1). The Project area for the aquatic resources component is comprised of the section in the NSR immediately upstream and downstream from the proposed footbridge crossing (NE 10-52-25 W4M). The footbridge span preliminary design includes a precast concrete deck that provides a clear roadway width of 4.5 m across the NSR. The instream piers (2) are founded on large diameter, drilled, cast-in-place belled concrete caissons. To complete the Project under a stringent schedule, bridge design and construction will begin in early June 2014 (Stantec 2013a).

1.2 REGULATORY CONTEXT

The Federal *Fisheries Act* prohibits any unauthorized work, undertaking or activity that results in Serious Harm to fish. Serious Harm is defined as "the death of fish or any permanent alteration to, or destruction of, fish habitat" (Department of Fisheries and Oceans [DFO] 2013a). The *Fisheries Act* also prohibits the deposit of a deleterious substance of any type in water frequented by fish, or in any place under any conditions where the deleterious substance may enter such water. A deleterious substance is defined as "any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water" (DFO 2013a). Common types of deleterious substances are silt, excess nutrients, toxic contaminants, pesticides, and industrial and municipal waste discharges. Under the Fisheries Act, there is a duty to notify and report serious harm to fish or a deleterious substance deposit in any fish-bearing water bodies.

A *Fisheries Act* authorization will be required if determined that the Project will have the potential to result in Serious Harm and will be issued only if the effect(s) on fisheries are acceptable and offsetting measures will adequately compensate for the loss of fish or fish habitat. DFO will not issue an authorization if the Project is deemed to result in unacceptable harm that cannot be adequately compensated for. In this case, the proponent will be required to redesign, relocate or otherwise modify the Project.

Alberta Environment and Sustainable Resource Development's (ESRD; formerly Alberta Environment [AENV]) Code of Practice for Watercourse Crossing (CoP) provides guidelines and best management practices to follow when constructing instream footbridge piers. Compliance with the CoP under the *Water Act* is required (AENV 2007). Under the CoP, a qualified aquatic environmental specialist (QAES) must prepare an assessment of the aquatic environment in the watercourse where the proposed footbridge piers will be constructed and a description of the potential effects of the activity on the waterbody and the potential zone of impact.

The zone of impact is defined as "the area of the water body where 90% of the sediment discharged as a result of the footbridge pier construction activity will be deposited" (AENV 2001). The QAES must also provide recommendations for mitigation measures to be implemented by the proponent to minimize the effects of the activity.

ESRD has developed timing constraints on construction in and around fish bearing streams to protect various fish species during critical spawning, hatching and migration periods. These constraints have been developed on a stream-by-stream basis and have been adopted by DFO for use in Alberta. Under the CoP, these timing constraints are referred to as the "Restricted Activity Period" (RAP) which is the time period during which fish migration, fish spawning, egg incubation, fry emergence, and early fry development are likely to occur in a water body.

Based on the CoP St. Paul Management Area Map, the NSR is identified as a Class C waterbody with a restricted activity period of September 16 to July 31 (AENV 2006).

Prior to construction, advice will be sought from DFO and ESRD regarding Project design, construction methods and timing, and mitigation of potential effects on fish and fish habitat. The proponent is required to notify DFO and ESRD at least 14 days prior to the commencement of any construction.

1.3 OBJECTIVES

Since instream activities associated with the Project have the potential to result in Serious Harm to fish, an application will be submitted to DFO to determine whether an authorization to complete instream works may be required under the *Fisheries Act*.

Information required as part of the application for regulatory approval includes desktop and field assessments to describe the fish community and fish habitat within the NSR in the vicinity of the proposed footbridge location. The objectives of the desktop and field assessments were to:

- assess the fish habitat in the Project area;
- define fish species composition, relative abundance and life history stages;
- predict habitat losses and gains that may result from the Project;
- identify potential effects of the proposed Project on fish habitat and fish populations; and
- develop measures to mitigate potential effects associated with the Project.

2.0 Methodology

2.1 DESKTOP ASSESSMENT

2.1.1 Basin Overview

A desktop review collected drainage information and natural sub region characteristics.

2.1.2 Discharge

Historical flow data for the North Saskatchewan River was obtained from Water Survey of Canada (WSC Station No. 05DF001).

2.1.3 Fisheries and Wildlife Management Information System

Existing information on fisheries resources and fish habitat within the Project area was compiled and reviewed. The ESRD online Fisheries and Wildlife Management Information System (FWMIS) (ESRD 2013a) was searched to determine historical information related to fish presence in the NSR within the Project area.

A FWMIS search was conducted on June 17, 2013 to provide historical records of sensitive fish and wildlife species recorded in the vicinity of the proposed footbridge location. The information obtained from the internet mapping framework application was used to develop a five kilometer search query.

The general status of Alberta's fish species was identified for all species potentially found within the Project area. Provincial status designations range from *secure* to *sensitive*, *may be at risk* and *at risk*. Species in the "*at risk*" category have generally undergone a detailed status assessment and have been given a legal status of either *endangered* or *threatened* under Alberta's *Wildlife Act*. Subsequently, legally protected species enter the recovery planning process with a recovery plan in place within one year of designation for *endangered* species and two years for *threatened* species (ESRD 2013b).

2.1.4 Literature Review

Existing literature and previous studies conducted on the NSR were reviewed for historical fish and fish habitat information in the Project area.

2.2 FISH AND FISH HABITAT ASSESSMENT

2.2.1 Fish Habitat Assessment

A fish and fish habitat assessment was conducted on the NSR from August 27 to 29, 2013. The assessment was conducted in accordance with standard protocols outlined in the CoP (AENV 2007). The Project area extends from approximately 850 m upstream to 1,400 m downstream of the proposed footbridge location.

Fish habitat was mapped using the Large River Classification System developed by R.L. & L. Environmental Services Ltd. (O'Neil and Hildebrand 1986). This system is used for large rivers that predominantly provide minimal instream channel units such as pools, riffles, or runs. Four cross-channel transects were established at representative locations on the watercourse to document channel characteristics and fish habitat attributes within the potential zone of construction impact (Appendix A, Figure 2-1).

The following fish habitat parameters were recorded on stream survey forms:

- channel characteristics
- obstructions (e.g., log jams, beaver dams, man-made barriers, etc.) and debris
- large river habitat classification system: (Depositional (D1-3)), Erosional (E1-6), Pool (P), Unobstructed (U), Singular Island (S), and Multiple Island (M) (Appendix A)
- vegetation (instream and riparian)
- degree of stream channel confinement
- flood signs
- stage of the river

Channel widths and wetted widths were measured with a Nikon Pro Staff 5 range finder. Water depths were measured using a Faria depth transducer and a hand held GPS unit. Field water quality (pH [±0.1 units], temperature [±0.1°C], conductivity [±10 µs/cm], dissolved oxygen [±0.1 mg/L]) were measured using a hand-held YSI Water Quality Meter Professional Plus. Fish habitat type was estimated visually.

These habitat characteristics were incorporated into a physical habitat classification system that rates the quality of each bank habitat type based on physical features (*e.g.*, bank height/ stability, instream velocities, instream substrate) with respect to the life requirements of fish species (*e.g.*, rearing, spawning, overwintering). A subjective evaluation of potential critical habitats (*i.e.*, spawning, feeding, rearing, and overwintering) for fish species was made for the Project area. Digital photographs were taken showing the important habitat features.

2.2.2 Fish Community Composition

Fish species composition, relative abundance, and life history stages within the Project area at the proposed footbridge location were assessed under the authority of Alberta Fish Research License #13-3645 FRL.

Electrofishing was conducted using a Smith-Root LR-24 backpack electrofisher and boat electrofisher. Boat electrofishing was conducted from a 4.8 m aluminum boat powered by an inboard jet with a Smith-Root Model 1.5 KVA electrofisher powered by two 1,000 W portable Honda generators. Direct electrical current (DC) was transmitted into the water via a single forward-mounted boom anode (four dropper umbrella array), with the boat's hull acting as the cathode. The electrofishing system used was capable of generating an output voltage ranging from 0 to 560 VDC in at 0.1 to 10.0 A. Additional sampling methods included beach seine, minnow traps, and angling.

Sampling was conducted covering all available habitat types for an approximate length of 3 km. Captured fish were placed in an aerated holding tank until they were processed. Fish that avoided capture but were positively identified were enumerated and recorded as observed (Appendix B).

2.2.3 Species at Risk

Searches of Species at Risk databases for the Project area included:

- Species at Risk Public Registry
  (GOC 2012)
- Committee on the Status of Endangered Wildlife in Canada
  (COSEWIC 2006)
- Threatened Species listed in Alberta's Endangered Species Conservation Committee
  (ESRD 2004)
- General Status of Alberta Wild Species
  (ESRD 2013b)
- Species of Special Concern listed in Alberta's Endangered Species Conservation Committee
  (ESRD 2004)

2.2.4 Habitat Suitability

Species spawning, rearing, feeding and overwintering habitat potential are discussed within the Project area.

3.0 Results

3.1 DESKTOP ANALYSIS

3.1.1 Basin Overview

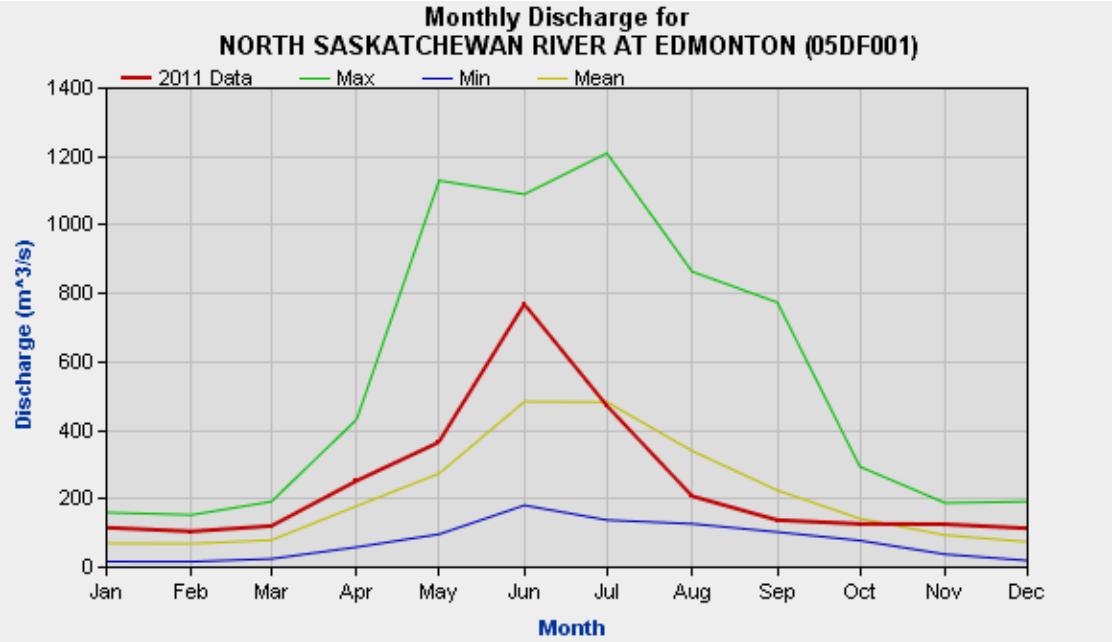
The headwaters of the NSR originate in Banff National Park from the toe of the Saskatchewan Glacier in the Columbia Icefields. Within Alberta, the river flows for over 1,000 km before it enters Saskatchewan near Lloydminster. Flow in the NSR is regulated by two dams in the upper reaches of the river. The Brazeau Dam on the Brazeau River became operational in 1965 and the Big Horn Dam on the mainstem of the NSR was opened in 1972. The drainage area of the NSR in Alberta is 57,000 km^2 and within the region of the City of Edmonton at station No. 05DF001 (WSC 2013) the drainage area is 28,100 km^2.

The section of river within the Project area lies in the Central Parkland sub-region of the Parkland Natural Region (Alberta Tourism, Parks and Recreation 2012). The Central Parkland Natural Subregion is characterized by a mix of aspen and prairie vegetation; much of it under cultivation. Black Chernozems are the dominant soil type with some Dark Gray Chernozems and significant occurrences of Solonetzic soils. Undulating till plains and hummocky uplands are the dominant landforms.

3.1.2 Discharge

Historical flow data from 1911 – 2011 (the most current data available) for the North Saskatchewan River at Edmonton (WSC Station No. 05DF001) are presented on Figure 3-1 (WSC 2013). Monthly mean discharge has an approximate range of 70 m^3/s during the winter months to 484 m^3/s during high flows in June. Based on historical data, the annual mean discharge at this station was 209 m^3/s.

Figure 3-1 Historical and 2011 Flow (m3/s) in the North Saskatchewan River at Edmonton (WSC 2013)



3.1.3 Fisheries and Wildlife Management Information System

Historical records show that 25 species of fish representing 11 families have been recorded in the NSR within a five kilometer radius of the footbridge location (Table 3.1). Sport fish species such as burbot, goldeye, mooneye, mountain whitefish, northern pike, sauger, and walleye are found in the NSR. Lake sturgeon, a sport fish species that is gaining popularity with anglers, is currently under study by Fish and Wildlife. Longnose sucker, shorthead redhorse and white suckers are the most common coarse fish species with occasional encounters of quillback, mountain suckers and silver redhorse. Brook stickleback, emerald shiner, longnose dace, lake chub, spottail shiner, trout-perch and spoonhead sculpin are the most common "minnow" species occurring in the Project area. Fathead minnow, pearl dace, and river shiner are occasionally found but are not as abundant as the aforementioned minnow species. Invasive species including goldfish and northern crayfish are found throughout the NSR and connecting tributaries.

Table 3-1 Fish and Crayfish Species Present in the NSR within a Five Kilometre Radius of the Project Area (ESRD 2013a)

Family Name	Scientific Name	Common Name	General Status in Alberta (2010)
Acipenseridae	*Acipenser fulvescens*	Lake sturgeon	Undetermined
Cyprinidae	*Notropis atherinoides*	Emerald shiner	Secure
	Pimpephales promelus	Fathead minnow	Secure
	Carassius auratus	Goldfish	Undetermined
	Couesius plumbeus	Lake chub	Secure
	Rhinichthys cataractae	Longnose dace	Secure
	Margariscus margarita	Pearl dace	Undetermined
	Notropis blennius	River shiner	Undetermined
	Notropis hudsonius	Spottail shiner	Secure
Catostomidae	*Catostomus catostomus*	Longnose sucker	Secure
	Catostomus platyrhynchus	Mountain sucker	Secure
	Carpiodes cyprinus	Quillback	Undetermined
	Moxostoma anisurum	Silver redhorse	Undetermined
	Moxostoma macrolepidotum	Shorthead redhorse	Secure
	Catostomus commersoni	White sucker	Secure
Cottidae	*Cottus ricei*	Spoonhead sculpin	May Be At Risk
Esocidae	*Esox lucius*	Northern pike	Secure
Gadidae	*Lota lota*	Burbot	Secure
Gasterosteidae	*Culaea inconstans*	Brook stickleback	Secure
Hiodontidae	*Hiodon alosoides*	Goldeye	Undetermined
	Hiodon tergisus	Mooneye	Undetermined
Percopsidae	*Percopsis omiscomaycus*	Trout-perch	Secure
Percidae	*Sander canadensis*	Sauger	Sensitive
	Sander vitreus	Walleye	Secure
Salmonidae	*Prosopium williamsoni*	Mountain whitefish	Secure
Malacostraca	*Orconectes virilis*	Northern crayfish	Undetermined

3.1.4 Literature Review

A fishery survey on the NSR upstream of Terwillegar Park conducted by Stantec Consulting Ltd. (Stantec) in fall 2011 (Stantec 2013b) captured or observed three mountain whitefish, six trout-perch, one northern pike, one longnose sucker, and one white sucker. The inventory revealed that the majority of the fish caught were juveniles. The assessment concluded that the NSR at that particular location provides high quality spawning and rearing habitat for forage and sport fish species.

The Fort Edmonton Footbridge and Trails Environmental Impact Assessment on the NSR was conducted in 2006 downstream of Terwillegar Park (CH2M HILL 2007). Fish observed in the area were burbot, emerald shiner, goldeye, lake chub, longnose sucker, longnose dace, mooneye, mountain whitefish, northern pike, spottail shiner, sauger, spoonhead sculpin, trout-perch, walleye, and white sucker. Habitat consisted of a largely homogenous run with average depths of 0.7 m.

3.2 FISH AND FISH HABITAT ASSESSMENT

3.2.1 Fish Habitat Assessment

A map illustrating fish habitat within the Project area is presented on Figure 2-1 in Appendix A and fish habitat assessment results are presented in Appendix B. Site photographs are presented in Appendix C.

Channel width averaged 210 m and wetted width averaged 190 m. Mid-channel run sections located off the right downstream bank (RDB) averaged 2 m in depth with a maximum depth of 4.0 m. Average water depths adjacent to the left downstream bank (LDB) were typically shallow (average 0.5 m) and likely related to depositional bank habitat.

The main channel was predominantly run and riffle habitat (85% and 10%, respectively) interspersed with small pools (5%). Water depths ranged from 0.4 to 1.9 m within the run habitats and 0.2 to 0.4 m in the riffle habitats. Substrate consisted of predominantly gravel and sub dominantly with fines, cobble, and boulder. Maximum water depth in pool habitat was >1.0 m. Substrate within pool habitat consisted of loosely compacted sand and fines (silt) (Appendix B). Pool habitats were of moderate depth and instream cover would provide suitable habitat for fish.

At the proposed footbridge site, the NSR is approximately 200 m wide and water depths range from 0.4 m to 1.9 m. Bank habitat consists of depositional habitat types with a substrate composition predominantly of fines. In the immediate vicinity, fish habitat is provided by water depths for feeding and migration. No suitable spawning habitat is present.

Bank habitat within the Project area consisted of armored, depositional, and erosional habitat types (Appendix A, Figure 2-1). Approximately 45% of the channel was classified as erosional habitat (E1, E4, and E5) while depositional habitat (D1 and D2) accounted for approximately 55% of the Project area. The LDB was composed of E4 (600 m), E5 (390 m), and D1 (1,600 m) habitat and the RDB was composed of D1 (1,000 m), D2 (300 m), and E1 (1,550 m) habitat.

The channel consisted of one main unobstructed channel with two singular islands (S) located upstream and downstream of the proposed footbridge location. Riffle sections were small areas located upstream of the singular islands.

The stream stage was rated at moderate flow with signs of spring flooding (eroding banks). Stream bank irregularities created minimal areas of back waters (eddies) in various locations providing fish habitat. An outfall structure located on the right downstream bank created a pool with a depth >1 m.

Field water quality measurements indicated that the NSR was well oxygenated (7.76 mg/L) during the summer assessment. A pH of 8.6 was within the Canadian Water Quality Guideline (CWQG) and Surface Water Quality Guidelines for use in Alberta (SWQGA) (CCME 2011; AENV 1999). Conductivity was 365 µs/cm and water temperature at the time of the survey was 18.7°C. Water clarity was rated as clear with a turbidity value of 4.80 NTU.

3.2.2 Fish Community Composition

During the summer survey, boat electrofishing was conducted for a total of 5,434 seconds and backpack electrofishing for a total of 937 seconds. Spottail shiners were the most abundant species captured in the Project area. Burbot, emerald shiner, longnose dace, longnose sucker, goldeye, mooneye, northern pike, shorthead redhorse, silver redhorse, spottail shiner, walleye, white sucker, and yellow perch (*Perca flavescens*) were also captured or observed during the electrofishing survey (Table 3.2). Four minnow traps were set over consecutive days (28 trap-hours) and lake chub, spottail shiner, trout-perch, white sucker, and yellow perch were captured. Backpack electrofishing and beach seining were conducted in selected areas; however, no fish were captured. Spin-cast angling occurred throughout the Project area over three days with a total effort of 15 hours. Fish captured were goldeye, northern pike, and walleye (Table 3.3).

The catch-per-unit-effort (CPUE) indicated that longnose dace, spottail shiner, and white sucker were the most abundant species captured in the Project area. Forage fish species including emerald shiner, lake chub, longnose dace, spottail shiners, and trout-perch were captured throughout the area in R1 and R3 cobbles and gravels which provided feeding, rearing, and spawning substrates. Sportfish species catch consisted of burbot, goldeye, mooneye, northern pike, and walleye. Juvenile burbot were captured in R1 habitats with boulder cover that provided feeding and rearing habitat. Adult goldeye, mooneye, northern pike, and walleye were consistently captured in pool and run habitats where water depth was >1 m.

These habitat types were near outfall structures located upstream and downstream of the Project area and provide feeding, rearing and overwintering habitat. Deep runs (R1) located downstream from the proposed bridge crossing provided feeding habitat for coarse fish including shorthead and silver redhorse. Rearing habitat for juvenile yellow perch was located upstream from the outfall location in R3 habitat with cobble and gravel substrate.

Table 3-2 Fish Species Captured and Catch-per-unit-effort (CPUE) Using Boat Electrofishing, North Saskatchewan River, August 27 to 28, 2013

Site	Beginning UTM	Ending UTM	Effort (s)	Species*	Number of Fish				*CPUE (#fish/hr.)**
					A	J	O	Total	
EL1	327027E 5929548N	327602E 5929020N	679	BURB	--	1	--	1	5.3
				EMSH	1	--	1	2	10.6
				LNDC	1	2	--	3	15.9
				LNSC	--	1	1	2	10.6
				TRPR	--	3	--	3	15.9
				WALL	1	--	--	1	5.3
				UNKN	--	--	4	4	21.2
EL2	327629E 5928836N	328252E 5929244N	1222	BURB	--	2	3	5	14.7
				LNDC	1	1	--	2	5.9
				SLRD	1	--	--	1	2.9
				SPSH	3	1	--	4	11.8
				TRPR	2	2	--	4	11.8
				WALL	2	--	--	2	5.9
				WHSC	3	1	--	4	11.8
				UNKN	--	--	5	5	14.7
EL3	328211E 5929074N	328347E 5930244N	1186	BURB	--	1	1	2	6.1
				GOLD	--	--	1	1	3.0
				LNDC	--	4	10	14	42.5
				LNSC	--	3	--	3	9.1
				NRPK	2	--	1	3	9.1
				SPSH	4	1	--	5	15.2
				TRPR	2	2	--	4	12.1
				WALL	1	--	1	2	6.1
				WHSC	1	4	10	15	45.5
				UNKN	--	--	4	4	12.1
				YLPR	--	1	4	5	15.2

Table3-2 Fish Species Captured and Catch-per-unit-effort (CPUE) Using Boat Electrofishing, North Saskatchewan River, August 27 to 28, 2013 (con't)

Site	Beginning UTM	Ending UTM	Effort (s)	Species*	Number of Fish				*CPUE (#fish/hr.)**
					A	J	O	Total	
EL4	327449E 5929105N	328222E 5929673N	1145	EMSH	2	--	5	7	22.0
				LNDC	--	1	--	1	3.1
				LNSC	--	2	--	2	6.3
				NRPK	--	--	1	1	3.1
				SPSH	3	--	20	23	72.3
				TRPR	3	2	--	5	15.7
				UNKN	--	--	2	2	6.3
EL5	328300E 5929718N	328240E 5930402N	345	LNDC	--	--	2	2	20.9
				LNSC	--	--	1	1	10.4
				SHRD	2	--	--	2	20.9
EL6	328040E 5928947N	328378E 5929813N	643	MOON	2	--	--	2	11.2
				WALL	1	--	--	1	5.6
				WHSC	5	--	3	8	44.8
				UNKN	--	--	2	2	11.2
EL7	328379E 5929833N	328334E 5930287N	214	UNKN	--	--	3	3	50.5

NOTES:

*****BURB- burbot, EMSH- emerald Shiner, GOLD- goldeye, LNDC – longnose dace, LNSC- longnose sucker, MOON- mooneye, NRPK – northern pike, SHRD- shorthead redhorse, SLRD- silver Redhorse, SPSH- spottail shiner, TRPR- trout-perch, UNKN- Unknown,WALL – walleye, WHSC - white sucker, YLPR- yellow perch.

**CPUE- Catch Per Unit Effort, A- Adult, J- Juvenile, O- Observed.

Table 3-3 Fish Species Captured Using Backpack Electrofishing, Minnow Traps, Beach Seine and Angling Methods on the North Saskatchewan River August 27 to 29, 2013

Date	Effort*	Species**	Total
14-Aug-2013	AN	GOLD	1
28-Aug-2013	AN	NRPK WALL	2 1
28-Aug-2013	AN	GOLD WALL	1 2
28-Aug-2013	BMT	No fish	0
29-Aug-2013	BMT	LKCH SPSH WHSC YLPR	2 1 2 6
28-Aug-2013	BPEF	No fish	0
28-Aug-2013	BS	No fish	0

NOTES:
* AN- Spin cast angling, BMT- Baited Minnow Trap, BPEF- Backpack Electofisher, BS- Beach Seine,
** LKCH - lake chub, SPSH- spottail shiner, WHSC- white sucker, YLPR- yellow perch.

3.2.3 Species at Risk

None of the fish species known to occur in the Project area are federally listed under the *Species at Risk Act* or provincially listed as *at risk*, *may be at risk*, or *sensitive* (ESRD 2013b). Lake sturgeon are listed as *endangered* in the Saskatchewan River basin under COSEWIC (COSEWIC 2006, GOC 2012) and *threatened* by Alberta's Endangered Species Conservation Committee (ESRD 2004). The current General Status of Alberta Wild Species report lists the status of lake sturgeon as undetermined (ESRD 2013b).

Historical fish captures within a five kilometer radius of the footbridge location include three species that are currently listed. Sauger and bull trout (*Salvelinus confluentus*) are classified as *sensitive* in the current General Status of Alberta Wild Species report (ESRD 2013b). Bull trout have also been identified as a species of Special Concern by Alberta's Endangered Species Conservation Committee (ESRD 2004). However, bull trout rarely occur in the North Saskatchewan River in the Edmonton area. Spoonhead sculpin are listed provincially as *may be at risk* but n*ot* at risk under COSEWIC

The lake sturgeon in Alberta is a unique species consisting of only two populations — one in the South Saskatchewan River system and one in the North Saskatchewan River system. The population in the North Saskatchewan River system is in a vulnerable state, consisting of possibly fewer than 1,000 fish (ESRD 2013d).

Quality habitat consists of productive shoals with areas of cobble, gravel and fine substrates. Deep pools provide rearing and feeding habitat for lake sturgeon. Overwintering also occurs in deep pools, ideally in depths over 1.5 m that do not freeze to the bottom and have an adequate oxygenated water supply (Scott 1973). Lake sturgeon spawn in the spring (April to June) and migration is active during this time. After spawning, the eggs disperse and adhere to substrates on the bottom of the river (Nelson 1992).

The sauger, often mistaken for a walleye, has a cone-shaped head, terminal mouth, and rows of dark spots on its first dorsal fin. The dorsal area of the sauger has three to four dark, mottled saddles and the ventral area is brown and white. This species is a visual predator eating smaller fish such as stickleback and cyprinids, and larger invertebrates such as crustaceans. Sauger are found only in large, turbid rivers such as the NSR and are tolerant of turbid water (Joynt 2003). Within Alberta, sauger are listed as s*ensitive*, which indicates that it is not at risk of extinction or extirpation, but may require special attention or protection to prevent it from becoming at risk (ESRD 2013d).

Spoonhead sculpin are bottom dwellers found in gravel/ cobble substrates in large rivers and lakes. Spawning occurs in the spring over cobble substrates. Minimal information is known on spoonhead sculpin in Alberta and population declines are assumed to be due to habitat degradation (ESRD 2013d). This species is susceptible to sedimentation caused by various events including heavy rainfall, spring flooding, and construction activities as it resides under cobble and gravel on the streambed.

3.2.4 Habitat Suitability

Fish habitat in the area of the proposed footbridge is good and water quality at the crossing is suitable to support fish. At the footbridge location, depositional habitat provides feeding and rearing for all fish species, but no suitable spawning habitat is present. The Project area provides feeding, rearing, and spawning habitat for forage fish such as longnose dace and lake chub in the form of instream cover and pool habitat. Sport fish such as walleye may utilize riffle sections with cobble substrate located upstream and downstream of the proposed footbridge in the spring for spawning. Capture of adult burbot, northern pike, and silver redhorse during the field assessment suggests the presence of good feeding and rearing habitat upstream and downstream of the footbridge structure. Water depths downstream of the proposed bridge provide pool habitat for various fish species. Areas of overwintering habitat exist throughout the reach and there are no barriers to fish migration.

4.0 Potential Environmental Effects and Mitigation

4.1 PROPOSED CONSTRUCTION

The proposed construction schedule for the footbridge is as follows (Stantec 2013a):

- Preparation of the construction site – June 2014
- Construct berms and temporary bridge – August 1 to September 15, 2014
- Construct piers – Winter 2014/2015
  [~3 weeks for cast-in-place concrete belled pile construction (10 piles) per abutment, 3 weeks for pier caisson (pier foundations) construction (4 caissons total), and 6 weeks for pier shaft construction (2 shafts total)]
- Construct abutments – Winter 2014 to Spring 2015
  (12 weeks to install ground anchors at each abutment assuming one drill rig)
- Remove berms – August 1 to September 15, 2015
  (Rip rap placement on upstream and downstream sections of the bridge)
- Erect the footbridge deck – June to September 2015
- Complete the footbridge – Fall 2015
- Complete permanent ESC and reclamation landscaping maintained throughout the life of the Project – Fall 2015 to Fall 2016

4.1.1 Temporary Bridge and Berm Construction

On each side of the river an access road will approach a three span temporary access bridge that will be used for construction access to build the berms for a dry worksite. The access bridges will each be supported by two sets of instream support structures that will each have three steel pipe piles of 600 mm diameter. The pipe piles will be driven into pre-drilled holes in the bedrock to a depth of 8 m. Upon removal of the piles, the pile holes will be filled with clean rock cuttings. Starting at the river bank, the contractor will drill and drive piles for the abutment of the first temporary bridge span (Appendix D. TPFB PD S18A). Depending on the type and reach of equipment used by the Contractor, this may be done either from the river bank or from a floating barge. No other support structures will be required to be placed on or within the river bed.

The temporary bridges will provide the main access to the berms that will be constructed to provide instream work enclosures for construction of the two piers. Pier 1 and Pier 2 berms are as described (Appendix D. TPFB PD S18A):

Pier 1 berm:

- Width (perpendicular to water flow): 46.1 m
- Length (to tip of rock on triangle: 63.5 m
- Length (to start of triangular section): 52.9 m
- Total Area including triangular section: 2683.0 m^2
- Total area without triangular section: 2438.7 m^2

Pier 2 berm:

- Width (perpendicular to water flow): 48.5 m
- Length (to tip of rock on triangle: 66.1 m
- Length (to start of triangular section): 55.8 m
- Total Area including triangular section: 2956.1 m^2
- Total Area without triangular section: 2706.3 m^2

Prior to the construction of berms, it is recommended that floating silt curtains are installed. The silt curtains will be anchored to the riverbed with large concrete blocks and will be suspended from floating buoys. It is the responsibility of the contractor to determine the number of anchors and buoys to hold the silt curtain in place. Once the floating silt curtains are installed, construction of the berms will begin. The core of the berms will be non-dispersive high plastic, clay. The clay shall have 80% passing through a #200 sieve, a liquid limit greater than 50, permeability of 10 or less, and compacted to a minimum of 93% of the maximum laboratory density per ATT-23/96. The clay will be protected from scouring by the NSR with non-woven filter fabric and Class 2 rock riprap (Appendix D, TPFB-PD-S18A, and TPFB-PD-S18C).

4.1.2 Pier Construction

Each pier will be constructed parallel to the river flow and will be 13.35 m long and 3.50 m wide for basal footprints of 44.1 m^2 each. The cast in place concrete caissons have a diameter of 2438 mm. The bottoms of the caissons have a bell diameter of 3600 mm and will be founded into the bedrock approximately 17 m below the riverbed (Appendix D, TPFB-PD-S05). The pier shafts have a width of 2 m and a length of 10 m at the underside of the footbridge deck (Appendix D, TPFB-PD-S06). The base of the pier will be placed approximately 1.0 m below the surveyed river bed elevation of 617 m. The upstream and downstream faces of the pier are semi-circular in shape (Appendix D, TPFB PD S06).

4.1.3 Rock Riprap Placement

During removal of the instream berms, the Class 2 rock riprap used to armor the berms will be removed and used for protection of the river bank upstream and downstream of the bridge abutments. Bathymetric surveys are proposed before and after the removal of the structures to ensure all riprap is removed from the river. The protected area that will be covered with riprap on the right downstream bank (South) extends 50 m upstream and 40 m downstream of the south abutment (720.0 m^2 of rock with a volume of 755.0 m^3 will be placed below the estimated normal water level) (Appendix D, TPFB-PD-S02A). The protected area that will be covered with riprap on the left downstream bank (North) extends 45 m upstream and 35 m downstream from the north abutment (650.5 m^2 of rock with a volume of 670.0 m^3 will be below the estimated normal water level) (Appendix D, TPFB-PD-S02A). Rock riprap used for protection of the river bank upstream and downstream of the bridge abutments will have a total area of 1,370.5 m^2.

An Aqua Dam has been recommended to be placed parallel to the shoreline of the NSR to allow water to be pumped out of the area on each side of the NSR that will be protected with riprap (Appendix D, TPFB-PD-S02A). A floating silt curtain will be suspended within the NSR, on the outside edge of the Aqua Dam, prior to installation of the Aqua Dam. If water is passing under the Aqua Dam it will be pumped through a screen to a well-vegetated area and allowed to flow back towards the NSR. The Aqua Dam and floating silt curtain will be removed prior to the start of ice formation on the NSR, because ice will damage these ESC measures beyond repair.

The extent of riprap upstream and downstream of each abutment has been designed to provide slope stability and to prevent erosion in the area. The riprap apron will extend downslope to the riverbed and will be keyed into the river bed to a depth of 1 m (Appendix D, TPFB PD S02A).

4.2 POTENTIAL ENVIRONMENTAL EFFECTS

Instream activities associated with the Project can affect fish and fish habitat in the NSR in several ways:

- Direct habitat alteration through channel modifications with temporary bridges, berm structures, and pier structures installed instream.
- Fish entrapment in the isolated berm area.
- Fish entrainment on water pumps.
- Increases in suspended sediment levels during installation of the berms (footbridge pier pilings).
- Stream flow disruption within the channel during construction.

Instream activities have the potential to affect fish habitat, including spawning, rearing, feeding, and overwintering areas. These activities also have the potential to result in unauthorized activities under the federal *Fisheries Act* known as "Serious Harm". See section 1.2 Regulatory Context for more information.

Isolation methods such as berms are used to isolate instream construction areas and prevent the transport of construction-related deleterious substances (sediments) downstream. Fish may become trapped within the isolated area and subject to high sediment levels or dewatering. Pumps used for dewatering isolated areas or maintaining downstream flows during construction activities have the potential to result in fish mortality if fish are unable to swim away from the intake and become entrained within the inlet of the pipe or hose (DFO 1995).

An increase in suspended sediment in the NSR due to erosion and sediment release from the Project area can directly or indirectly effect fish populations. Fine sediments have a long-term effect on fish habitat when they settle out on the substrate filling in interstitial spaces and smothering spawning beds (Grant *et al.* 1986). The infill of the channel bed reduces the capacity of the waterway to accept greater flows, thus increasing susceptibility to flooding. High gradient streams are less susceptible to sedimentation because of their high capacity to flush introduced sediment. Fine sediments can increase fish mortality by causing inflammation of the gill membranes or by adhering to mucous on the gill and providing a substrate for bacterial gill infections (Lynch *et al.* 1977).

Sedimentation and turbidity can indirectly affect fish by reducing primary productivity, destroying the habitat of fish food organisms, increasing the drift rate of benthic organisms (Lynch et al. 1977), and reducing the abundance of benthic organisms (Culp and Davies 1983).

Stream flow disruption can impede the ability of fish to move or migrate within the channel to feed, escape predation, reproduce, or to reach suitable habitat for sustaining survival. Addition of anthropogenic barriers to fish movement adversely effects fish populations by restricting habitat availability.

4.3 RECOMMENDED MITIGATION

The mitigation measures for potential effects associated with footbridge construction will include the reclamation of disturbed areas along the river valley, armouring of upstream and downstream sections of banks with rip rap, and the implementation of temporary erosion and sediment control (ESC) measures. During construction, the appropriate ESC measures will be used to isolate the construction area and prevent deleterious substances from entering the main channel of the NSR. ESC measures may include the use of silt fencing, straw wattles, and erosion control blankets. The type and exact location of temporary ESC measures will depend on site conditions at the time of construction.

To minimize potential effects to fish and fish habitat, the following mitigation measures are recommended:

- The contractor is required to develop an Environmental Construction Operations (ECO) plan, which will be required by the Proponent to include items for all in-stream work and monitoring during construction and comply with Federal, Provincial and Municipal legal and regulatory requirements. The ECO plan should include a spill contingency plan and the construction crew's review of the document.
- Machinery will be operated from in a manner that minimizes disturbance to the banks. It should arrive clean and be maintained and free from leaks.
- As per the requirements of ESRD (ESRD 2013c) and the *Water Act*, in order to reduce the potential of the spread of Whirling Disease in fish, all equipment and machinery that has been used in other provinces in Canada and the United States, shall be washed clean of all mud and dirt before being used in any activities in or near streams in Alberta. All machinery required to perform this work shall be serviced and maintained within a designated staging/laydown area at least 100 m away from the stream bank, to prevent the leaking of fuels, lubricants, and hydraulic fluids. All maintenance work and refueling shall be performed within the staging/laydown area. Every precaution will be taken to avoid/contain spills during maintenance and refueling of this equipment.
- Due to the on-site presence of fuels, lubricants and hydraulic fluids, the Contractor shall be required to have a spill containment kit on site at all times.
- The contractor will maintain a copy of all regulatory permits and approvals on site at all times.
- Effective sediment or erosion control measures should be installed before starting work in order to prevent the transport of sediment into the NSR. Sediment control measures should be inspected and repaired regularly. Sediment and erosion control measures should be maintained until complete re-vegetation of disturbed areas is achieved.
- All erosion protection materials used shall be clean. Disposal of any material other than those specified for placement within the river will be strictly prohibited. Appropriate precautions will be taken to ensure that deleterious substances do not enter the watercourse.

- Placement of Class 2 rock riprap will temporarily affect habitat upstream and downstream of each river bank. However, these areas are eroding and slumping on the right downstream bank. Armoring will help to prevent further bank erosion and provide boulder cover for fish species. Therefore, minimal habitat loss is anticipated with the Class 2 riprap placement.
- All riprap should be clean and free of fines (silt) or washed prior to installation.
- Due to the potential for sediment release into the NSR, water quality (i.e., turbidity) should be monitored by a QAES during instream works. The QAES may provide recommendations for isolation and guideline values for increases in turbidity according to CCME guidelines.
- The Canadian Council of Ministers of the Environment (CCME) suggest that total suspended solid (TSS) increases should not exceed 10 mg/L when background suspended solids levels are <100 mg/L (CCME 2011). TSS can be monitored during construction throughout the year as part of a sediment release monitoring plan. Appropriate contingency measures for the release of sediment would be outlined in the monitoring plan.
- Cast-in-place concrete has the potential to leach toxins if exposed to water prior to curing. Cast-in-place concrete should be allowed to cure for at least 48 hours before contact with fish-bearing waters. Berm maintenance is critical to diverting flow and creating a dry work site. In addition, a tarp should be erected to cover the concrete in the event that significant precipitation occurs.
- Water pumps used for dewatering must be fitted with intake screens in order to protect fish from being taken into pumps and harmed (DFO 1995). The pumps will be screened with a minimum mesh opening of 2.54 mm and run at velocities that prevent the entrainment of fish.
- During the dewatered phase, water will be pumped to an off-stream area where sediment will settle out before it returns to the River. Water will be directed in a manner to dissipate the energy and prevent erosion at the outlet. This process will be monitored by a QAES and fish rescue will be completed prior to pumping to return any trapped fish to an area of the river unaffected by the proposed construction works.
- Minimal disruption to stream flow will occur as the footbridge pier construction will be confined to a small portion of the channel in two locations. This permits a significant portion of the river channel to remain unobstructed minimizing the potential for creating a velocity barrier to fish (Appendix D, TPFB PD S18A).
- The NSR is identified under the CoP as a Class C water body with a restricted activity period (RAP) of September 16 to July 31 (AENV 2006). No instream construction should occur during this period to protect fish and fish habitat unless the appropriate mitigation measures are applied. Discussions are required with ESRD and DFO if the contractor requires instream works to occur inside the RAP
- Mitigation techniques also include prior to and during construction, which is implemented into the bridge construction design includes construct of the temporary bridges to the isolation berms. This minimizes the footprint of the temporary berm structures thus reducing potential fish habitat effects.

4.4 OFFSETTING PLAN AND HABITAT ENHANCEMENT

This Offsetting Plan considers changes to the habitat protection provisions of the *Fisheries Act* that took effect on November 25, 2013. The aim of these new provisions is to provide for the sustainability and ongoing productivity of commercial, recreational, and Aboriginal fisheries. In the case where serious harm to a fishery is unavoidable after the implementation of avoidance and mitigation measures, offsetting measures are required to counterbalance the harm.

DFO has developed the Fisheries Productivity Investment Policy (DFO 2013b) to provide guidance to proponents for developing effective measures to offset serious harm to fish. The guidelines outline the proponent's role in supporting and enhancing the sustainability and ongoing productivity of commercial, recreational, and Aboriginal fisheries and define the responsibility to protect the fishery and offset any residual harm that may result from a project.

After the completion of the Terwillegar Park Footbridge, including the implementation of mitigation measures, there will potentially be harmful alterations to instream areas of the NSR as described in Section 5.1. The temporary affects total 5,639.1 m^2 of fish habitat that will be temporarily altered by instream berm structures. The alterations will result in the temporary loss of fish habitat I for approximately one year. The structures will be removed after completion of the construction of the two pier structures.

Bank stabilization will consist of rock riprap used for protection of the river bank upstream and downstream of the bridge abutments will result in temporary effects of 1,370.5 m^2.

The permanent effects total 88 m^2 of fish habitat removed as a result of the construction of two instream bridge piers. To ensure that the offset measures match the potential loss in productive habitat, the habitat will be offset at a 2:1 ratio, resulting in the need to offset for 176 m^2 of fish habitat.

A number of offsetting measures are proposed to counterbalance the unavoidable alterations to fish habitat in the NSR. These measures will be discussed with DFO and ESRD and can include localized improvements to habitats with erosional issues located upstream and downstream from the bridge abutments.

The placement of boulder clusters along the rock riprap in areas with fine substrate and homogenous habitat would provide habitat diversity and overall potentially improve habitat functionality. The rock could provide effective cover in the interstitial spaces, a beneficial substrate for aquatic invertebrates, algae growth, and velocity cover. However, placement of this rock may impede navigation.

In addition, enhancing the natural river features in erosional habitats with root wad structures along the riprap could provide fish habitat in forms of cover and velocity refugia. This provides rearing and feeding habitat for species residing throughout the project area including habitat creation for northern pike.

Habitat enhancement in tributaries to the NSR is another offsetting technique that could be provided in Wedgewood Creek located upstream of the Fort Edmonton footbridge on the left downstream bank. This could provide an enhancement of spawning habitat in the mouth of the tributary or access to those habitats. As stated in the policy "In situations where offsets are realized away from the project site, a robust rationale is required and should be communicated to potentially affected parties (DFO 2013b)". This will require additional applications and delay the project. Costs associated with this task will be elevated due to the location and access of construction equipment in the vicinity of Wedgewood Creek and may not be feasible with the schedule of construction activities for the Project.

These measures will meet the four guiding principles identified in the Fisheries Productivity Investment Policy:

- they balance the potential negative effects from the pier footings by creating habitat diversity in the area of at the crossings. Bridge access will improve the recreational fisheries along the easily accessible route,
- they provide benefits that will last as long as the improvements remain, and will support generations of fish and users of the fishery and,
- they provide effective reduction of footprints in designs phases before construction activities occur.

Should discussion with DFO, ESRD and Transport Canada result in the choice of providing habitat offsets at an alternate location (i.e., in a tributary stream or other location on the NSR), it is understood that an addendum to this report or additional study may be required to meet the requirements of the City of Edmonton.

5.0 Summary and Conclusions

Based on a review of the available fish and fish habitat information and the preliminary footbridge design plans for the Project, minimal potential effects on fish and fish habitat have been identified. Loss of fish habitat will require formal applications to DFO and ESRD prior to commencing construction. The final design of the Project is deemed to result in a loss of habitat, and a fish habitat offsetting proposal is included as part of the application package to DFO and ESRD. Adopting the recommended mitigation measures to reduce fish entrainment and entrapment and suspended sediment inputs will minimize the effects of the Project on fish and fish habitat.

6.0 Closure

This report provides an evaluation of selected environmental conditions associated with the Project area, and is based on the information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

Recommendations made within this report consist of Stantec's professional opinion as of the time of the writing of this report, and are based solely on the scope of the work described in the report, the limited data available, and the results of the work. They are not a certification of the Project area's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the exclusive use of the Client identified herein, and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party used of this report.

Since the purpose of this report was to identify site conditions that may pose an environmental risk to aquatic life, the identification of non-environmental risks to structure or people within the Project area is beyond the scope of this assessment.

7.0 Literature Cited

Alberta Environment (AENV). 1999. Surface Water Quality Guidelines for Use in Alberta. Environmental Assurance Division, Science and Standards Branch, Alberta Environment. Available at: http://environment.gov.ab.ca/info/library/5713.pdf. Accessed November 2013.

Alberta Environment (AENV). 2001 (as amended). Guide to the Code of Practice for Watercourse Crossings, Including Guidelines for Complying With The Code of Practice. Queen's Printer, Edmonton, Alberta.

Alberta Environment Sustainable Resource Development (ESRD). 2004. Report of Alberta's Endangered Species Conservation Committee. Alberta Environment and Alberta Sustainable Resource Development. Available at: http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/SpeciesAtRiskPublicationsWebResources/SpeciesAtRiskGeneral/documents/SAR-AlbertaESCCreport-Jun2004.pdf. Accessed October 2013.

Alberta Environment (AENV). 2006. Code of Practice - St. Paul Management Area Map. November 2006. Alberta Queen's Printer, 2006.

Alberta Environment (AENV). 2007. Code of Practice for Watercourse Crossings made under the Water Act and the Water (Ministerial) Regulation. Amended February 2007. 15 p + Schedules.

Alberta Environment and Sustainable Resource Development (ESRD). 2010. Wild Species Status Search. Available at: htttp://srd.alberta.ca/FishWildlife/SpeciesAtRisk /GeneralStatusOfAlbertaWildSpecies/GeneralStatusOfAlbertaWildSpecies2010/SearchForWildSpeciesStatus.aspx. Accessed October 2013.

Alberta Environment and Sustainable Resource Development (ESRD). 2013a. Fish and Wildlife Management Information System (FWMIS) Internet Mapping Tool. Available at: http://xnet.env.gov.ab.ca/imf/imf.jsp?site=fw_mis_pub. Accessed October 2013.

Alberta Environment Sustainable Resource Development (ESRD). 2013b. The General Status of Alberta Wild Species 2010. Available at: http://srd.alberta.ca/FishWildlife/SpeciesAtRisk /GeneralStatusOfAlbertaWildSpecies/GeneralStatusOfAlbertaWildSpecies2010/SearchForWildSpeciesStatus.aspx. Accessed October 2013.

Alberta Environment Sustainable Resource Development (ESRD). 2013c. Common Wildlife Diseases & Parasites. Available at: http://srd.alberta.ca/FishWildlife/WildlifeDiseases /Default.aspx. Accessed November, 2013.

Literature Cited
January 31, 2014

Alberta Environment Sustainable Resource Development (ESRD). 2013d. Fisheries Management. Lake Sturgeon Management Plan. Available at: http://srd.alberta.ca/FishWildlife /FisheriesManagement/LakeSturgeonManagementPlan/Default.aspx. Accessed December 2013.

Alberta Transportation. 2009. Fish Habitat Manual: Guidelines & Procedures for Watercourse Crossings in Alberta. Government of Alberta. Edmonton, Alberta. Revised August 2009. Available at: http://www.transportation.alberta.ca/Content/docType245/ Production/Complete_Fish_Habitiat_Manual.pdf. Accessed November, 2013

Alberta Tourism, Parks and Recreation. 2012. Available at: http://www.tpr.alberta.ca/parks /heritageinfocentre/naturalregions/default.aspx. Accessed November, 2013

Anderson, P.G., B.R. Taylor and G. Balch. 1995. Quantifying the effects of sediment release on fish and their habitats. Prepared for the Department of Fisheries and Oceans, Habitat Management, Eastern B.C. Unit and Alberta, by Golder Associates Ltd. Report No. 952-2207. 142 pp + App.

Canadian Council of Ministers of the Environment (CCME). 2011. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Summary Table, Canadian Environmental Quality Guidelines. Winnipeg, Manitoba.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2006. Lake Sturgeon Saskatchewan River Populations. Available at: http://www.cosewic.gc.ca/eng/sct1/ searchdetail_e.cfm?id=955&StartRow=1&boxStatus=All&boxTaxonomic=All&location=All &change=All&board=All&commonName=Lake%20Sturgeon&scienceName=&returnFlag =0&Page=1. Accessed November, 2013.

CH2MHILL Canada Limited. 2007. Fort Edmonton Footbridge and Trails Environmental Impact Assessment. Prepared for the City of Edmonton. Edmonton, Alberta

Culp, J.M. and R.W. Davies. 1983. An assessment of the effects of streambank clear-cutting on macroinvertebrate communities in a managed watershed. Can. Tech. Rep. Fish Aquat. Sci. 1208: xv + 115 p.

Department of Fisheries and Oceans (DFO). 1995. Freshwater Intake End-of-Pipe Fish Screen Guidelines. Communication Directorate Fisheries and Oceans Canada. DFO/5080. Ottawa, Ontario, Canada.

Department of Fisheries and Oceans (DFO). 2013a. *Changes to the Fisheries Act*. Available at: http://www.dfo-mpo.gc.ca/habitat/changes-changements/index-eng.htm#c7. Accessed October, 2013.

Department of Fisheries and Oceans (DFO). 2013b. Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting. Prepared by Department of Fisheries and Oceans November 2013. Available at: http://www.dfo-mpo.gc.ca/pnw-ppe/offsetting-guide-compensation/offsetting-guide-compensation-eng.pdf Accessed January 2014.

Government of Canada. 2012. The Species at Risk Public Registry. Available at: http://www.sararegistry.gc.ca/sar/index/default_e.cfm?stype=species&lng=e&index=1&cosid=&common=&scientific=&population=&taxid=3&locid=0&desid=0&schid=0&desid2=0& . Accessed November, 2013.

Grant, J.W., J. Englert and B.F. Bietz. 1986. Application of a method for assessing the impact of watershed practices: effects of logging on salmonid standing crops. North American Journal of Fisheries Management 6: 24 - 31.

Joynt, A. and M. Sullivan. 2003 Fish of Alberta. Lone Pine Publishing, Edmonton.

Lynch, J.A., E.S. Corbett and R. Hoopes. 1977. Implications of forest management practices on the aquatic environment. Fisheries 2(2): 16 - 22.

O'Neil, J. and Hildebrand, L. 1986. Fishery Resources Upstream of the Oldman River Dam. Prepared for Alberta Environment by R.L. &L. Environmental Services Ltd. Edmonton, Alberta.

Nelson J.S. and M.J. Paetz. 1992. The Fishes of Alberta. University of Alberta Press, Edmonton, Alberta.

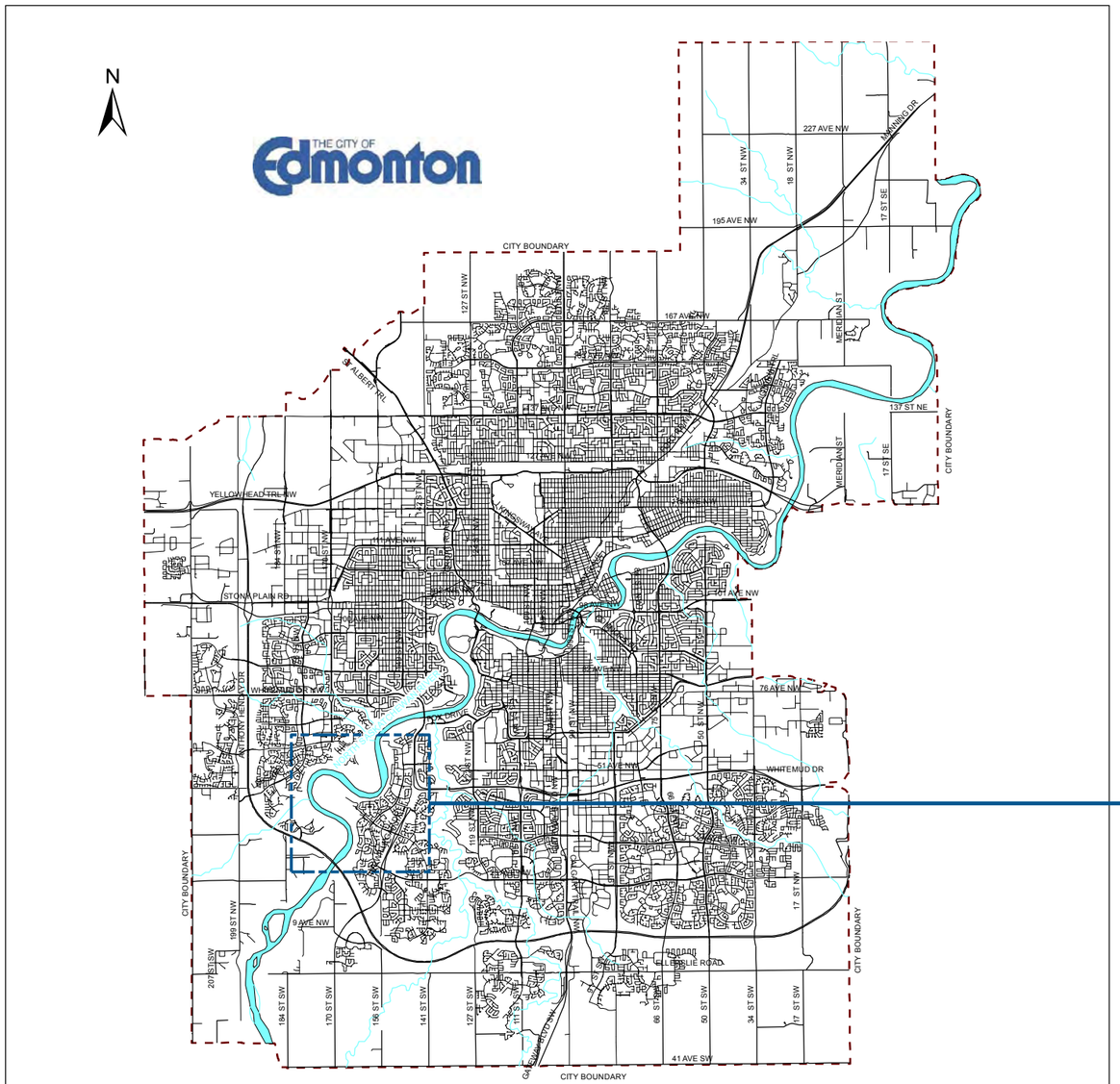
Scott, W.B. and E.J. Crossman, 1973. Freshwater fishes of Canada. Bull. Fish. Res. Board Can. 184:1-966.

Stantec Consulting Ltd. 2013a. Terwillegar Park Footbridge and Trails- Preliminary Design Draft Report. Prepared for City of Edmonton.

Stantec Consulting Ltd. 2013b. North Saskatchewan River Fish Habitat Assessment, Keswick Storm Outfall. Prepared for MLC Group Inc.

Water Survey of Canada (WSC). 2013. North Saskatchewan River at Edmonton (05DF001). Available at: http://www.wsc.ec.gc.ca/applications/H2O/graph-eng.cfm?station=05DF001&report=monthly&data=flow&year=2011&yearb=&yeare=. Accessed December 2013.

Appendix A
Site Location, Fish Habitat Map and Classification



LOCATION PLAN
SCALE 1:200,000

Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Fig1_1_Site_Location11X17.mxd
1/20/2014 jacho

January, 2014
1102-19011

Stantec

Projection: 3TM CM:114° Datum:NAD83
Imagery obtained from City of Edmonton, Transportation Department, 2012.

Legend
- Study area
- Road
- Section

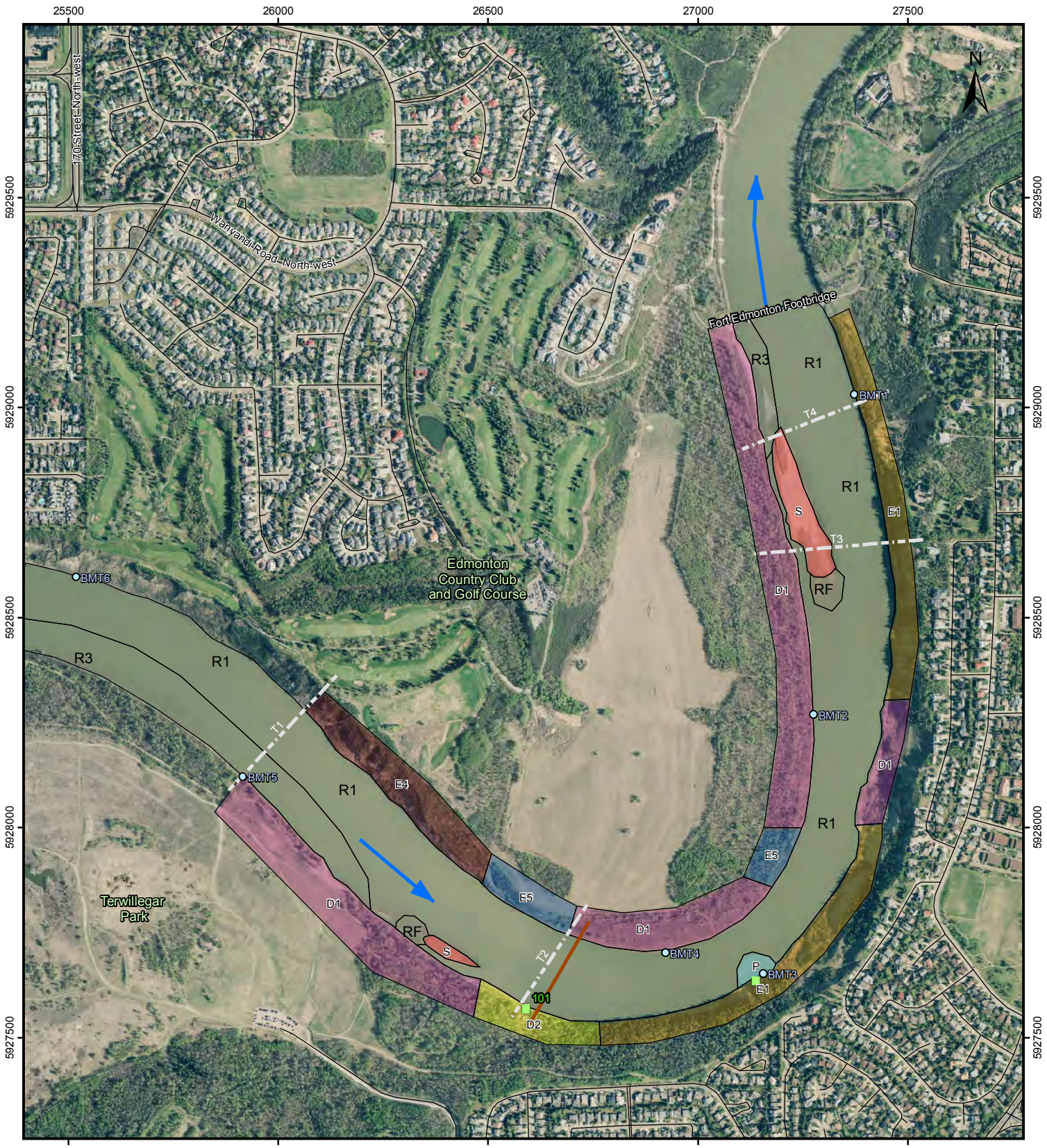
Site Description
Portions of NW 3, NE 10 & SE 15-52-25 W4M
Edmonton, Alberta

Scale
1:25,000
0 500 1,000 1,500 2,000 2,500 Metres
This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGER PARK FOOTBRIDGE AND TRAILS
GEOTECHNICAL INVESTIGATION

Figure No.
1-1

Title
SITE LOCATION PLAN



Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Fig2_1_Fisheries_Habitat_Map.mxd
2014 - 01 - 20 By:jacho

January, 2014
1135-60353

Stantec

Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from City of Edmonton Transportation, 2012

- Existing Outfall
- Baited Minnow Trap (BMT1-BMT6)
- Flow Direction
- Transects (T1-T4)
- Alignment Trail (June 2013)
- Approximate Bridge Location
- Road
- Singular Island (S)
- Pool (P)

Depositional
- D1
- D2
- R Run (R1,R3 RF)
- RF Riffle

Erosional
- E1
- E4
- E5

Note: See Appendix Table 2. for more information on habitat descriptions

1:12,500 0 150 300 450 600 750 Metres

This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS FISHERIES HABITAT

Figure No.
2-1

Title
FISHERIES HABITAT MAP

Large River Channel Unit and Habitat Classification (R.L. & L. 1992)

Type	Symbol	Description
		Channel Type
Unobstructed Channel	U	Single main channel, no permanent islands, side bars occasionally present, limited development of exposed mid-channel bars at low flow.
Singular Island	S	Two channels around single, permanent island, generally extensive side and mid-channel bars often present at low flow
Multiple Island	M	More than two channels and permanent islands, generally extensive side and mid-channel bars at low flow.
		Bank Habitat Type
Armoured/ Stable	A1	Largely stable and at repose; cobble/small boulder/gravel predominant; uniform shoreline configuration; bank velocities low-moderate; instream/overhead cover limited to substrate and turbidity
	A2	Cobble/large boulder predominant; irregular shoreline due to cobble boulder outcrops producing BW habitats, bank velocity low (BW)/moderate; instream/overhead cover from depth, substrate and turbidity
	A3	Similar to A2 with more boulder/bedrock; very irregular shoreline; bank velocities moderate-high with low velocity BW/eddy pools providing instream cover; overhead cover from depth/turbidity
	A4	Artificial riprap substrates consisting of angular boulder-sized fill; often associated with high velocity areas; shoreline usually regular; instream cover from substrate; overhead cover from depth/turbulence
Canyon	C1	Banks formed by valley walls; cobble/boulder bedrock; stable at bank-water interface; typically deep/high velocity water offshore; abundant cover from substrate/bank irregularities
	C2	Steep, stable bedrock banks; regular shoreline; moderate-deep/moderate fastwater offshore; occasionally cover from bedrock fractures
	C3	Banks formed by valley walls; primarily fines with some gravel/cobble at base; moderately eroded bank-water interface; moderate-high velocities; no instream cover
Depositional	D1	Low relief, gently sloping bank; shallow/slow offshore; primarily fines; instream cover absent or consisting of shallow depressions or embedded cobble/boulder; generally associated with bars
	D2	Similar to D1 with gravel/cobble substrate; some areas of higher velocity producing riffles; instream/overhead cover provided by substrate/turbulence; often associated with bars/shoals
	D3	Similar to D2 with coarser substrates (cobble/boulder); boulder often imbedded; moderate-high velocities offshore; instream cover abundant from substrate; overhead cover from turbulence
Erosional	E1	High, steep eroded banks with terraced profile; unstable; fines; moderate-high offshore velocity; deep immediately offshore; instream/overhead cover from submerged bank materials/vegetation/depth
	E2	Similar to E1 without a large amount of instream vegetation; offshore depths shallower
	E3	High, steep eroding banks; loose till deposits (gravel/cobble/sand); moderate-high velocities and depths; instream cover limited to substrate roughness; overhead cover provided by turbidity
	E4	Steep, eroding/slumping highwall bank; primarily fines; moderate-high depths/velocities; instream cover limited to occasional BW formed by bank irregularities; overhead cover from depth/turbidity
	E5	Low, steep banks, often terraced; fines; low velocity; shallow-moderate; no instream cover; overhead cover from turbidity
	E6	Low slumping/eroding bank; substrate either cobble/gravel or silt with cobble/gravel patches; moderate depths; moderate-high velocities; instream cover from abundant debris and boulders; overhead cover from depth/turbidity/overhanging vegetation

Large River Channel Unit and Habitat Classification (R.L. & L. 1992)

Type	Symbol	Description
		Channel Features
Pool	P	Pools are deeper and wider than channel units immediately above or below it and are usually formed by the scouring or plunging action of water. Sub-surface velocities are slow (water surface may be fast and turbulent depending on formative feature) and the substrate usually composed of fines or small gravel.
Tributary Confluence	TC	Confluence area of tributary entering mainstem. Classified at time of survey according to flow and wetted width at mouth.
	TC1	Intermittent or ephemeral stream.
	TC2	Flowing, width < 5 m.
	TC3	Flowing, width 5 - 15 m.
	TC4	Flowing, width 16 - 30 m.
	TC5	Flowing, width 31 - 60 m.
	TC6	Flowing, width > 60 m.
Shoal	SH	Shallow (< 1 m), submerged areas in mid-channel or associated with depositional areas around islands/side bars.
	SHC	Submerged area with coarse substrate.
	SHF	Submerged area with fine substrate.
Backwater	BW	Shallow pool habitat found along channel margins, caused by eddy scour (exhibits reverse flow direction) around a boulder, root wad or log obstruction. Substrate is typically small (silt to small cobble) and the velocity slower than the main channel.
Rapid	RP	Steps and pocket pools common, cobble/boulder substrate with some exposed boulders at lower flows. Considerable turbulence, some whitewater, fast velocity (> 0.5 m/s), 4-7% slope.
Snye	SN	Discrete section of non-flowing water connected to a flowing channel only at its downstream end; generally formed in a side channel or behind a peninsula.
Slough	SL	Non-flowing waterbody isolated from flowing waters except during flood events; oxbows.
Debris Pile	DP	Accumulation of woody debris; generally located on island tip, heads of side channels, stream meanders; provides excellent instream cover for fish.

Channel Unit Classification for Small Rivers or Streams (adapted from R.L. & L. 1992, Overton et. al 1997, Armantrout 1998; Arend 1999)

Channel Unit	Class	Map Symbol	Description
Falls		FL	Highly turbulent whitewater caused by water free-falling over a vertical drop. Falls formed from a full spanning flow obstruction, often bedrock. Slope < 100%.
Cascade		CS	Series of small falls or steps and pools; stepped longitudinal profile. Substrate of bedrock or boulder accumulations. Highly turbulent, high velocity, > 7% slope, mainly whitewater.
Rapid		RP	Steps and pocket pools common, cobble/boulder substrate with some exposed boulders at lower flows. Considerable turbulence, some whitewater, fast velocity (> 0.5 m/s), 4-7% slope.
Riffle		RF	Partially to totally submerged pebble to cobble substrate, causing moderate turbulence and ripples, little to no whitewater (some whitewater at points of constriction), moderate velocity (0.2 to 0.5 m/s), usually < 0.5 m depth, 1 - 4% slope.
Run			Runs are typically deep, slow to swift flowing sections (> 0.2 m/s), with a gravel to boulder substrate. Defined thalweg, moderate slope and with no surface turbulence. Run units are differentiated into three classes, based on depth.
	1	R1	Deepest run (> 1 m), slow to fast water velocity, coarse substrate (cobble to boulder), high instream cover from substrate and depth.
	2	R2	Moderate depth (0.6 - 1.0 m), slow to fast water velocity, coarse substrate (cobble to boulder), moderate instream cover from substrate and depth.
	3	R3	Shallowest depth (0.3 - 0.6 m), slow to fast water velocity, coarse substrate (gravel to cobble), low instream cover.
Glide		GL	Glides are shallow (< 0.3 m deep), wide, slow flowing (< 0.2 m/s), non-turbulent and lack a defined thalweg. Substrate is usually silt/sand but may sometimes consist of gravel to small cobble. Featureless with low instream cover.
Sheet		ST	Shallow water reach that flows uniformly over smooth bedrock. Non-turbulent.
Pool			Pools are deeper and wider than channel units immediately above or below it and are usually formed by the scouring or plunging action of water. Sub-surface velocities are slow (water surface may be fast and turbulent depending on formative feature) and the substrate usually composed of fines or small gravel.
	1	P1	High quality pool habitat based on depth and size. High instream cover from instream features (i.e., logs/boulders) and depth (> 1.2 m deep), provides overwintering habitat.
	2	P2	Shallower than P1 (0.6 - 1.2 m deep), moderate to high instream cover, not suitable for overwintering but provides juvenile and adult fish rearing habitat during open water.
	3	P3	Shallow (< 0.6 m deep) and small, low instream cover. Not suitable for overwintering or adult holding habitat but may provide rearing habitat for juvenile fish during open water.
Step Pool		SP	Series of pools separated by short riffles or cascades. Generally found in high gradient, confined mountain streams dominated by boulder substrate. The length of the turbulent water cannot exceed the mean wetted width; otherwise, classify the pools and turbulent water separately.
Dam			Includes pools and impoundments formed behind complete or nearly complete channel blockage. Four types of dams are beaver, debris, landslide or weir (man-made). Dams tend to accumulate more sediment/organic debris than scour pools.
	1-3	IP 1-3	Identify as class 1, 2 or 3 using pool criteria.
Backwater		BW	Shallow pool habitat found along channel margins, caused by eddy scour (exhibits reverse flow direction) around a boulder, root wad or log obstruction. Substrate is typically small (silt to small cobble) and the velocity slower than the main channel.
Syne		SN	Discrete section of non-flowing water connected to a flowing channel only at its downstream end; generally formed in a side channel or behind a peninsula.
Boulder Garden		BG	Substantial occurrence of large boulders providing significant instream cover; always in association with an overall channel unit such as a riffle (RF/BG) or run (e.g., R1/BG).

Appendix B
Field Survey Data

Terwillegar Park Footbridge (TPFB)- Fish Habitat Assessment- Fishing Efforts

Project #:	1135-60353	Date:	27-29 Aug-2013	Crew:	SD, DM, RK	Access:	Truck/ boat	Page: 1
Watercourse:	North Saskatchewan River	Fish Research License:	13-3645	Water Clarity:	Clear			

SAMPLE EVENTS

Event #	Gear*	UTM (Start)		UTM (End)		Start Date / Time	End Date / Time	Comments/Location
		Easting	Northing	Easting	Northing			
1	EF	327027	5929548	327602	5929020	27-Aug-13	27-Aug-13	
2	EF	327629	5928836	328252	5929244	27-Aug-13	27-Aug-13	
3	EF	328211	5929074	328347	5930244	27-Aug-13	27-Aug-13	
4	MT	328353	5930290	--	--	2013/08/28 10:15:00	2013/08/28 14:32:00	No fish caught, on right downstream bank
5	MT	328223	5929533	--	--	2013/08/28 10:22:00	2013/08/28 14:35:00	No fish caught, on left downstream bank
6	MT	328078	5928921	--	--	2013/08/28 10:32:00	2013/08/28 14:00:00	No fish caught, on right downstream bank
7	MT	327847	5928980	--	--	2013/08/28 10:37:00	2013/08/28 14:43:00	No fish caught, on left downstream bank
8	MT	326859	5929442	--	--	2013/08/28 10:52:00	2013/08/28 14:46:00	No fish caught, on right downstream bank
9	MT	326482	5929933	--	--	2013/08/28 11:01:00	2013/08/28 14:49:00	No fish caught, on left downstream bank
10	EF	327449	5929105	328222	5929673	28-Aug-13	28-Aug-13	
11	EF	328300	5929718	328240	5930402	28-Aug-13	28-Aug-13	
12	EF	328040	5928947	328378	5929813	28-Aug-13	28-Aug-13	
13	EF	328379	5929833	328334	5930287	29-Aug-13	29-Aug-13	
14	AN	327681	5928844	328176	5930347	29-Aug-13	29-Aug-13	
15	AN	327907	5928942	--	--	14-Aug-13	14-Aug-13	
16	AN	328301	5929209	--	--	14-Aug-13	14-Aug-13	
17	BS	328260	5930002	--	--	28-Aug-13	28-Aug-13	
18	BS	327415	5928958	--	--	28-Aug-13	28-Aug-13	
19	EB	327415	5928963	327369	5929000	28-Aug-13	28-Aug-13	
20	AN	328283	5929829	--	--	28-Aug-13	28-Aug-13	
21	EB	328282	5929827	--	--	28-Aug-13	28-Aug-13	
22	AN	328310	5929364	328349	5929491	28-Aug-13	28-Aug-13	
23	AN	328324	5929431	328324	5929431	28-Aug-13	28-Aug-13	
4	MT	328353	5930290	--	--	2013/08/28 14:32:00	2013/08/29 10:51:00	No fish caught, on right downstream bank
5	MT	328223	5929533	--	--	2013/08/28 14:35:00	2013/08/29 10:59:00	No fish caught, on left downstream bank
6	MT	328078	5928921	--	--	2013/08/28 14:00:00	2013/08/29 11:04:00	Right downstream bank
7	MT	327847	5928980	--	--	2013/08/28 14:43:00	2013/08/29 11:21:00	No fish caught, on left downstream bank
8	MT	326859	5929442	--	--	2013/08/28 14:46:00	2013/08/29 11:26:00	Right downstream bank
9	MT	326482	5929933	--	--	2013/08/28 14:49:00	2013/08/29 11:58:00	No fish caught, on left downstream bank

***Gear Code**: EF - Boat Electrofisher EB - Backpack Electrofisher SN - Seine MT - Minnow Trap AN - Angling

Terwillegar Park Footbridge (TPFB)- Fish Habitat Assessment- Fishing Efforts

Project #:	1135-60353	Date:	27-29 Aug-2013	Crew:	SD, DM, RK	Access:	Truck/ boat	Page: 2
Watercourse:	North Saskatchewan River	Fish Research License:	13-3645	Water Clarity:	Clear			

SAMPLE EVENTS

Event #	Gear*	UTM (Start)		UTM (End)		Start Date / Time	End Date / Time	Comments/Location
		Easting	Northing	Easting	Northing			
4	MT	328353	5930290	--	--	2013/08/29 10:51:00	2013/08/29 14:38:00	No fish caught, on right downstream bank
5	MT	328223	5929533	--	--	2013/08/29 10:59:00	2013/08/29 14:50:00	No fish caught, on left downstream bank
6	MT	328078	5928921	--	--	2013/08/29 11:04:00	2013/08/29 15:00:00	No fish caught, on right downstream bank
7	MT	327847	5928980	--	--	2013/08/29 11:21:00	2013/08/29 15:02:00	No fish caught, on left downstream bank
8	MT	326859	5929442	--	--	2013/08/29 11:26:00	2013/08/29 15:07:00	Right downstream bank
9	MT	326482	5929933	--	--	2013/08/29 11:58:00	2013/08/29 15:12:00	No fish caught, on left downstream bank

ADDITIONAL ELECTROFISHING INFORMATION

Event #	Gear*	Anode Type	Total Effort (seconds)	Distance Fished (m)	Frequency (Hz)	Current (amps)	Range (Low)	Additional Comments
1	EF	Booms	679	780	60	4-5	50-500	One anode array
2	EF	Booms	1222	75	60	4-5	50-500	One anode array
3	EF	Booms	1186	1200	60	4-5	50-500	One anode array
10	EF	Booms	1145	950	60	4-5	50-500	One anode array
11	EF	Booms	345	680	60	4-5	50-500	One anode array
12	EF	Booms	643	950	60	4-5	50-500	One anode array
13	EF	Booms	214	950	60	4-5	50-500	One anode array
19	EB	Pole	304	40	30	--	50-500	Volts 200
21	EB	Pole	633	200	60	--	50-500	Volts 300

Event #	Gear*	Angler Count	Time Fished (hrs.)	Number of Lines	Angling method	Electronic device	Lure	Additional Comments
6	AN	3	4.5	3	Drifting (Boat)	Depth Sounder	Jig	
13	AN	2	1	2	Drifting (Boat)	Depth Sounder	Jig	
9	AN	2	0.5	2	Casting (Boat)	Depth Sounder	Jig	
14	AN	3	3.5	3	Drifting (Boat)	Depth Sounder	Jig	
15	AN	2	1	2	Jigging (Boat)	Depth Sounder	Jig	
16	AN	2	2	2	Casting (Boat)	Depth Sounder	Spoon	
16	AN	1	0.5	1	Still fishing (Boat)	Depth Sounder	Crankbait	
20	AN	2	1	2	Drifting (Boat)	Depth Sounder	Spoon	
22	AN	2	0.5	2	Drifting (Boat)	Depth Sounder	Spoon	
23	AN	2	1	2	Drifting (Boat)	Depth Sounder	Spoon	

***Gear Code**: EF - Boat Electrofisher EB - Backpack Electrofisher SN - Seine MT - Minnow Trap AN - Angling

Terwillegar Park Footbridge (TPFB)- Fish Habitat Assessment- Fish Capture Data

Project #:	1135-60353	Watercourse:	North Saskatchewan River	Date:	27-29 Aug, 2013	Crew:	SD, DM, RK	Page: 1

CATCH DATA								
Event #	Sample #	Species	Length (mm)	Weight (g)	Sex†	‡Life Stage	Observed	Comments
1	1	WALL	491	1006	U	A	--	
1	2	EMSH	76	4	U	A	1	
1	3	BURB	75	3	U	YOY	--	
1	4	TRPR	54	2	U	J	--	
1	5	LNSC	128	25	U	J	1	
1	6	TRPR	47	2	U	J	--	
1	7	TRPR	49	2	U	J	--	
1	8	LNDC	55	1	U	J	--	
1	9	LNDC	62	2	U	A	--	
1	10	LNDC	52	1	U	J	--	
1	11	UNKN	--	--	--	--	5	
2	12	SLRD	569	2397	U	A	--	
2	13	WHSC	475	1300	U	A	--	
2	14	WALL	485	1243	U	A	--	
2	15	WHSC	355	734	U	A	--	
2	16	WHSC	316	401	U	A	--	
2	17	WALL	426	547	U	A	--	
2	18	BURB	175	34	U	J	--	
2	19	SPSH	65	4	U	A	--	
2	20	BURB	150	18	U	J	3	Dorsal fin eroded
2	21	TRPR	54	2	U	A	--	
2	22	TRPR	46	1	U	A	--	
2	23	SPSH	66	4	U	A	--	
2	24	TRPR	46	1	U	J	--	
2	25	SPSH	66	4	U	A	--	
2	26	TRPR	46	1	U	J	--	
2	27	LNDC	62	2	U	A	--	
2	28	SPSH	45	1	U	J	--	
2	29	WHSC	54	1	U	F	--	

CATCH DATA								
Event #	Sample #	Species	Length (mm)	Weight (g)	Sex	‡Life Stage	Observed	Comments
2	31	LNDC	38	1	U	F	--	
2	32	UNKN	--	--	--	--	5	
3	33	NRPK	405	--	U	A	1	
3	34	WALL	489	1110	U	A	1	
3	35	WHSC	443	1105	U	A	10	
3	36	NRPK	331	--	U	A	--	
3	37	WHSC	65	3	U	J	--	
3	38	YLPR	53	2	U	J	--	
3	39	LNSC	131	24	U	J	--	
3	40	SPSH	76	4	U	A	--	
3	41	BURB	131	15	U	J	1	
3	42	LNDC	55	--	U	J	--	
3	43	LNSC	135	30	U	J	--	
3	44	SPSH	66	3	U	A	--	
3	45	TRPR	65	3	U	A	--	
3	46	TRPR	53	2	U	A	--	
3	47	WHSC	100	10	U	J	--	
3	48	LNDC	59	2	U	J	10	
3	49	LNSC	93	8	U	J	--	
3	50	TRPR	53	2	U	J	--	
3	51	WHSC	46	--	U	F	--	
3	52	LNDC	66	2	U	J	--	
3	53	SPSH	50	1	U	J	--	
3	54	WHSC	66	3	U	J	--	
3	55	SPSH	72	4	U	A	--	
3	56	SPSH	70	4	U	A	--	
3	57	LNDC	56	1	U	J	--	
3	58	TRPR	49	--	U	J	--	
3	59	UNKN	--	--	--	--	4	

BURB- burbot, EMSH- emerald Shiner, GOLD- goldeye, LNDC – longnose dace, LNSC- longnose sucker, MOON- mooneye, NRPK – northern pike, SHRD- shorthead redhorse, SLRD- silver redhorse, SPSH- spottail shiner, TRPR- trout-perch, UNKN- unknown, WHSC - white sucker, YLPR- yellow perch.

†**Sex**: M - Male F - Female Unknown ‡**Life Stage**: A- Adult J- Juvenile/ Immature YOY- Young of the Year F- Fry

Terwillegar Park Footbridge (TPFB)- Fish Habitat Assessment- Fish Capture Data

Project #:	1135-60353	Watercourse:	North Saskatchewan River	Date:	27-29 Aug, 2013	Crew:	SD, DM, RK	Page: 2

CATCH DATA								
Event #	Sample #	Species	Length (mm)	Weight (g)	Sex†	‡Life Stage	Observed	Comments
10	60	TRPR	65	4	U	A	--	
10	61	SPSH	80	6	U	A	20	
10	62	SPSH	71	3	U	A	--	
10	63	EMSH	75	3	U	A	--	
10	64	EMSH	84	5	U	A	5	
10	65	LNSC	200	86	U	J	--	
10	66	TRPR	59	3	U	J	--	
10	67	LNSC	66	4	U	F	--	
10	68	SPSH	69	3	U	A	--	
10	69	TRPR	64	3	U	A	--	
10	70	TRPR	62	3	U	A	--	
10	71	TRPR	54	2	U	J	--	
10	72	TRPR	51	2	U	J	--	
10	73	LNDC	50	2	U	J	--	
10	74	TRPR	48	2	U	J	--	
10	75	NRPK	--	--	--	--	1	
10	76	UNKN	--	--	--	--	2	
11	77	LNSC	--	--	--	--	1	
11	78	LNDC	--	--	--	--	2	
11	79	SHRD	405	922	U	A	--	
11	80	SHRD	351	548	U	A	--	
12	81	MOON	305	400	U	A	--	
12	82	WHSC	408	947	U	A	3	
12	83	MOON	275	298	U	A	--	
12	84	WHSC	442	1432	U	A	--	
12	85	WALL	441	727	U	A	--	
12	86	WHSC	465	1351	U	A	--	
12	87	WHSC	385	788	U	A	--	
12	88	WHSC	450	1235	U	A	--	

CATCH DATA								
Event #	Sample #	Species	Length (mm)	Weight (g)	Sex†	‡Life Stage	Observed	Comments
12	89	UNKN	--	--	--	--	2	
4	90	NRPK	--	--	--	--	1	
6	91	UNKN	--	--	--	F	2	
6	92	TRPR	51	1	U	A	--	
8	93	LKCH	81	8	U	A	--	
8	94	LKCH	86	7	U	A	--	
8	95	WHSC	53	1	U	F	--	
8	96	YLPR	52	1	U	YOY	--	
8	97	SPSH	69	5	U	A	--	
8	98	YLPR	53	1	U	YOY	--	
8	99	YLPR	54	1	U	YOY	--	
8	100	YLPR	55	1	U	YOY	--	
8	101	YLPR	57	1	U	YOY	--	
8	102	WHSC	45	1	U	YOY	--	
8	103	YLPR	45	1	U	YOY	--	
6	104	WALL	366	504	U	A	--	
6	105	NRPK	530	805	U	A	--	
6	106	NRPK	555	1169	U	A	--	
13	107	GOLD	335	483	U	A	--	Red eye/ fins
9	108	WALL	485	1051	U	A	--	
9	109	WALL	595	2256	U	A	--	
16	110	GOLD	360	1000	U	A	--	

BURB- burbot, EMSH- emerald Shiner, GOLD- goldeye, LNDC – longnose dace, LNSC- longnose sucker, MOON- mooneye, NRPK – northern pike, SHRD- shorthead redhorse, SLRD- silver redhorse, SPSH- spottail shiner, TRPR- trout-perch, UNKN- unknown, WHSC - white sucker, YLPR- yellow perch.

†**Sex**: M - Male F - Female Unknown ‡**Life Stage**: A- Adult J- Juvenile/ Immature YOY- Young of the Year F- Fry

Terwillegar Park Footbridge (TPFB)- Fish Habitat Assessment- Habitat and Transect Data

Watercourse:	North Saskatchewan River			Project #:	1135-60353
Crew:	SD, DM, RK	Date:	29-Aug-13	Page:	1

CHANNEL MEASUREMENTS					
TRANSECT		T1 (↑850 m)	T2 (Bridge)	T3 (↓1100 m)	T4 (↓1400 m)
GPS- Waypoint ID		74	97	134	118
Easting		326863	327504	328353	328406
Northing		5929445	5928884	5930272	5929934
Channel Width (m)		230	220	220	220
Wetted Width (m)		220	200	215	185
Depth Profile	Depth at LDB+25%	0.9	1.7	0.8	0.8
	Depth at LDB+50%	1.0	1.3	0.9	1.3
	Depth at LDB+75%	0.6	1.1	0.7	0.8
	Max. Depth (m)	1.9	1.9	1.5	1.7
Habitat Unit (instream)		Run	Run	Run	Run
WATER QUALITY					
Date (DD:MMM:YY)		27-Aug-13	--	--	27-Aug-13
Time (HH:MM)		13:40	--	--	17:50
Temp (°C)		18.7	--	--	19.5
Sp.Cond (µS/cm)		365	--	--	366
pH		8.6	--	--	8.6
DO (mg/L)		7.67	--	--	*
Turbidity (NTU)		4.81	--	--	4.91
INSTREAM SUBSTRATE					
Comp. (% of Transect Area)	Organics	--	--	--	--
	Fines (<2mm)	20	30	20	20
	Small Gravel (2-16mm)	30	20	40	50
	Large Gravel (17-64mm)	30	30	20	20
	Cobble (65-256mm)	15	20	15	5
	Boulder (>256mm)	5	0	5	5
	Bedrock	--	--	--	--
Embeddedness		Low <25%	Medium 25-50%	Low <25%	Low <25%

RIVER BANKS								
Bank (Left/ Right)	L	R	L	R	L	R	L	R
Bank Stability	unstable	stable	stable	stable	stable	unstable	stable	unstable
Bank Materials	fines, small gravels		fines, small gravels		fines, small gravels		fines, small gravels	
Habitat Unit (*large river)	E4	D1	D1	D2	D1	E1	D1	E1

CHANNEL CHARACTERISTICS	
Pattern	Regular meandering
Islands	Occasional
Bars	Side Bar
Coupling	Coupled
Confinement	Entrenched
Stage	Medium, Large permanent watercourse

* See Appendix A. for classification information

* Dissolved Oxygen probe malfunction

Appendix C
Photographs

Photo 1. Transect 1 (850 m upstream) facing left downstream bank (east) (August 29, 2013).

Photo 2. Facing upstream (west) to proposed bridge location (August 29, 2013).

Photo 3. Facing downstream (north) to riffle and singular island. Fort Edmonton Pedestrian Bridge downstream (August 29, 2013).

Photo 4. Facing downstream to left bank (Northeast), D1 habitat (August 29, 2013).

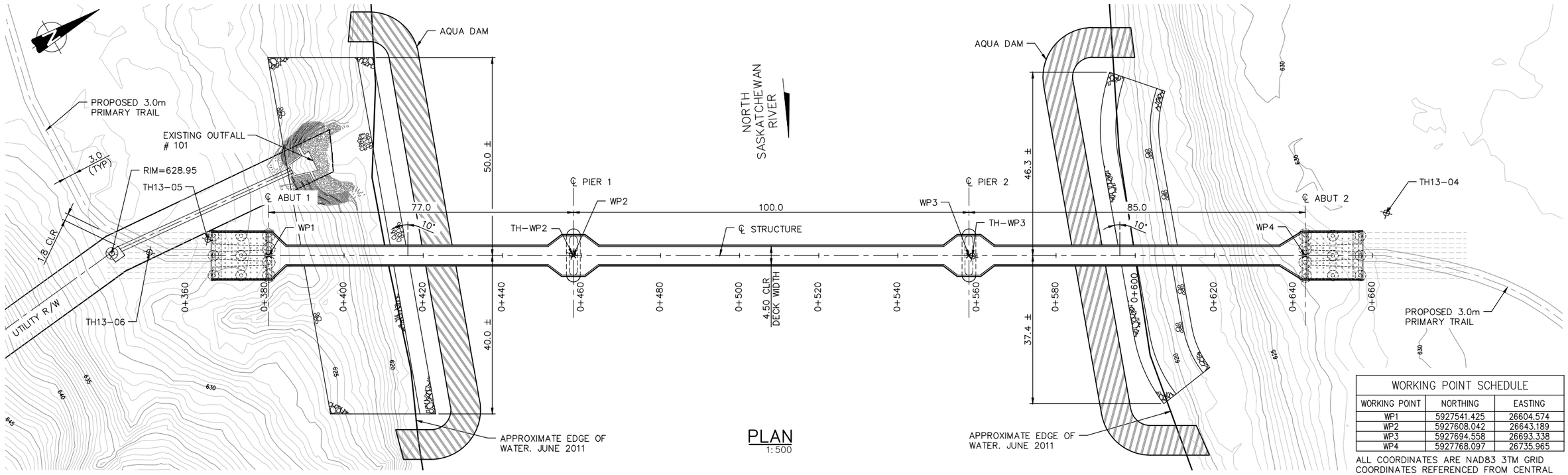
Photo 5. Facing downstream from proposed bridge location to right downstream bank, E1 habitat (August 29, 2013).

Photo 6. Silver redhorse (*Moxostoma anisurum*) caught downstream of the proposed bridge location with boat electrofishing (August 29, 2013).

Photo 7. Mooneye (*Hiodon tergisus*) caught downstream of proposed bridge location with boat electrofishing (August 29, 2013).

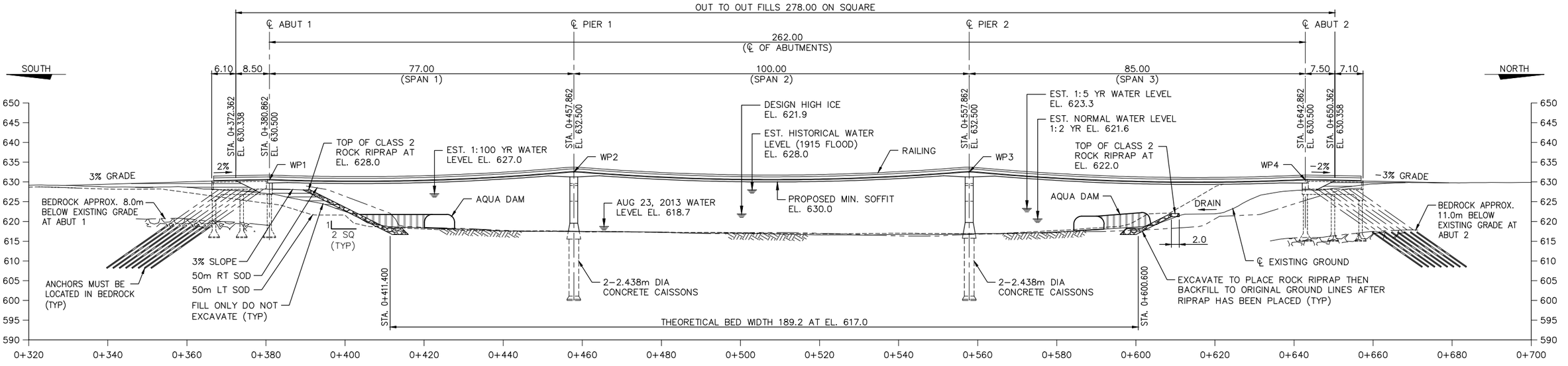
Photo 8. Juvenile yellow perch (*Perca flavescens*) caught upstream of the proposed bridge location with baited minnow traps (August 29, 2013).

Appendix D
Preliminary Footbridge Design Plans



WORKING POINT SCHEDULE		
WORKING POINT	NORTHING	EASTING
WP1	5927541.425	26604.574
WP2	5927608.042	26643.189
WP3	5927694.558	26693.338
WP4	5927768.097	26735.965

ALL COORDINATES ARE NAD83 3TM GRID COORDINATES REFERENCED FROM CENTRAL MERIDIAN 114° W



ELEVATION
1:500

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

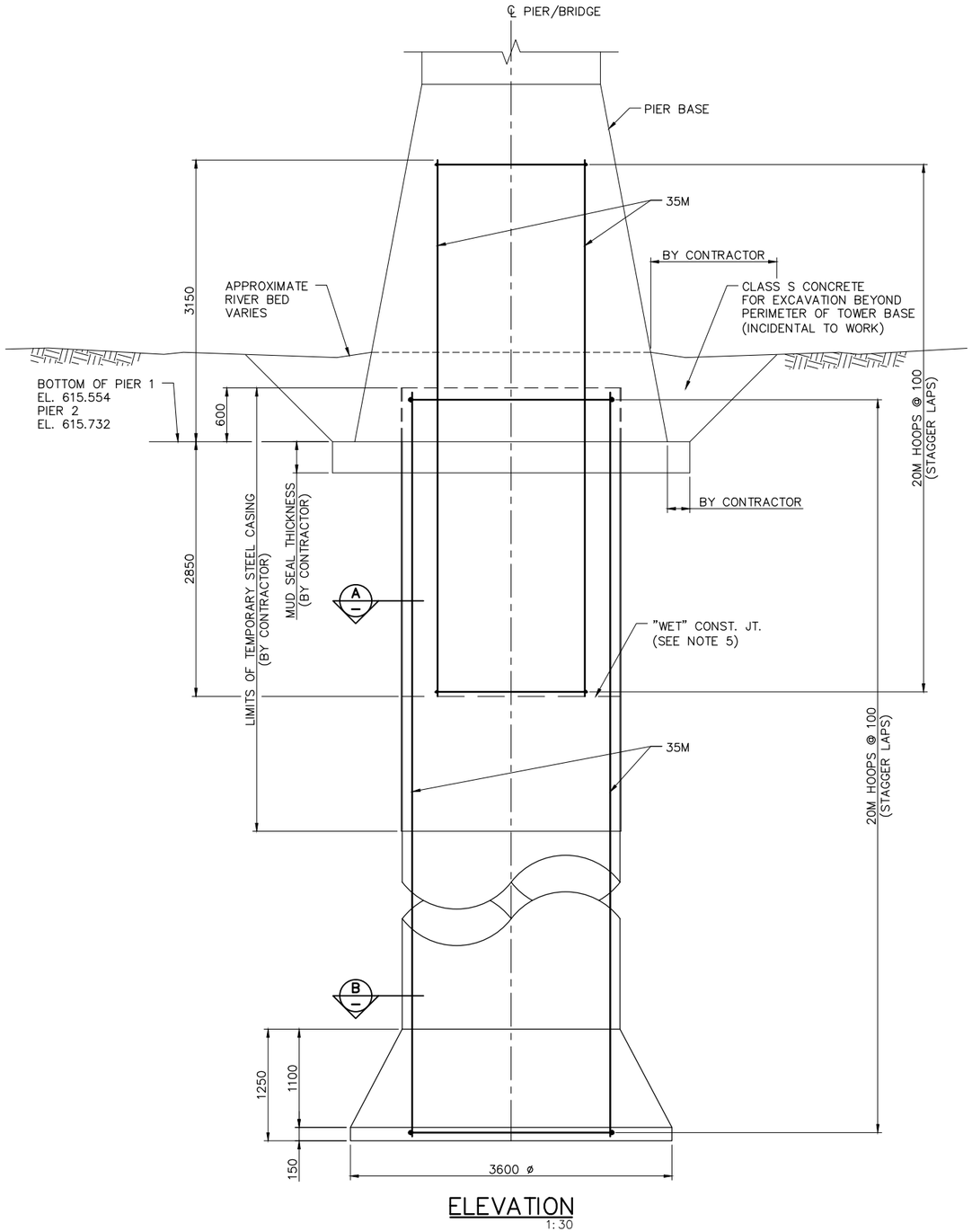
SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

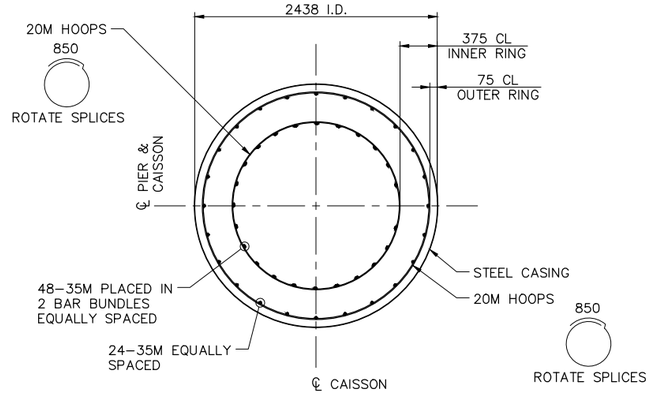
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
ISOLATION PLAN FOR RIVER BANK

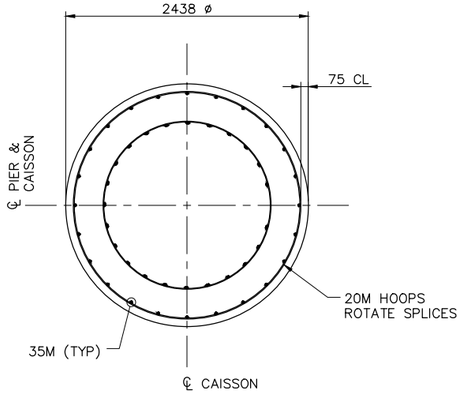
DRAWING
TPFB-PD-S02A



ELEVATION
1:30



A SECTION
1:30



B SECTION
1:30

CAISSON NOTES:

1. USE 1800 SPLICE LENGTH FOR 35M BARS AND STAGGER ALL SPLICES.
2. CAISSON REINFORCING IS TO EXTEND FULL DEPTH OF DRILLED HOLE.
3. CONSTRUCTION TOLERANCE FOR ℄ CAISSON LOCATION = 150±.
4. CONCRETE – REFER TO INFORMATION SHEET.
5. CONTRACTOR SHALL PLAN WORK IN ACCORDANCE WITH THEIR METHODS AND MEANS TO REMOVE TEMPORARY CASING.

PRELIMINARY
- NOVEMBER 2013-

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

APPROVED FOR CONSTRUCTION
DATE

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

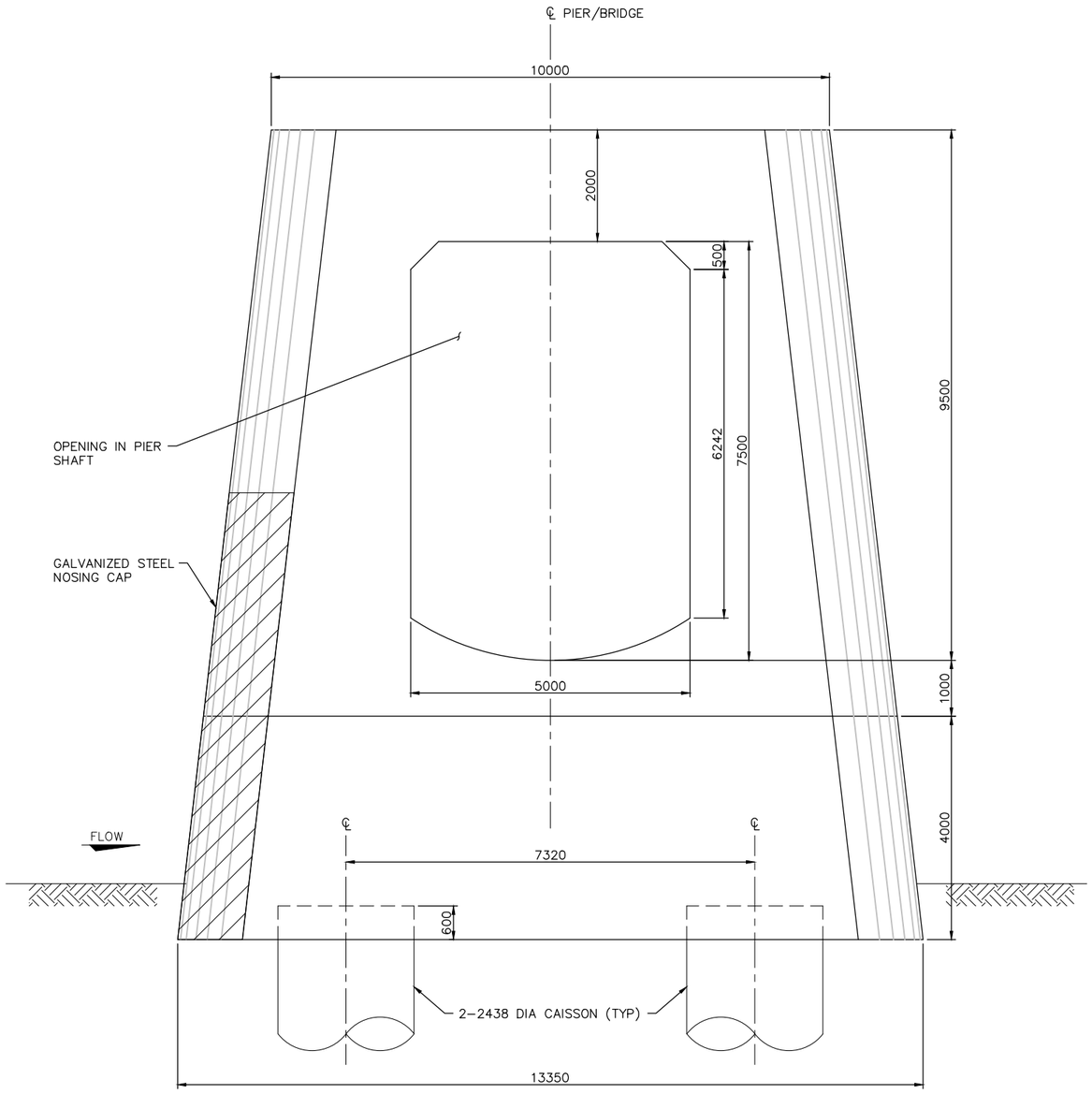
SURVEY
JOB NO.
SCALE

DRAWN E.C. DATE m/d/yy
DESIGNED - DATE m/d/yy
CHECKED - DATE m/d/yy

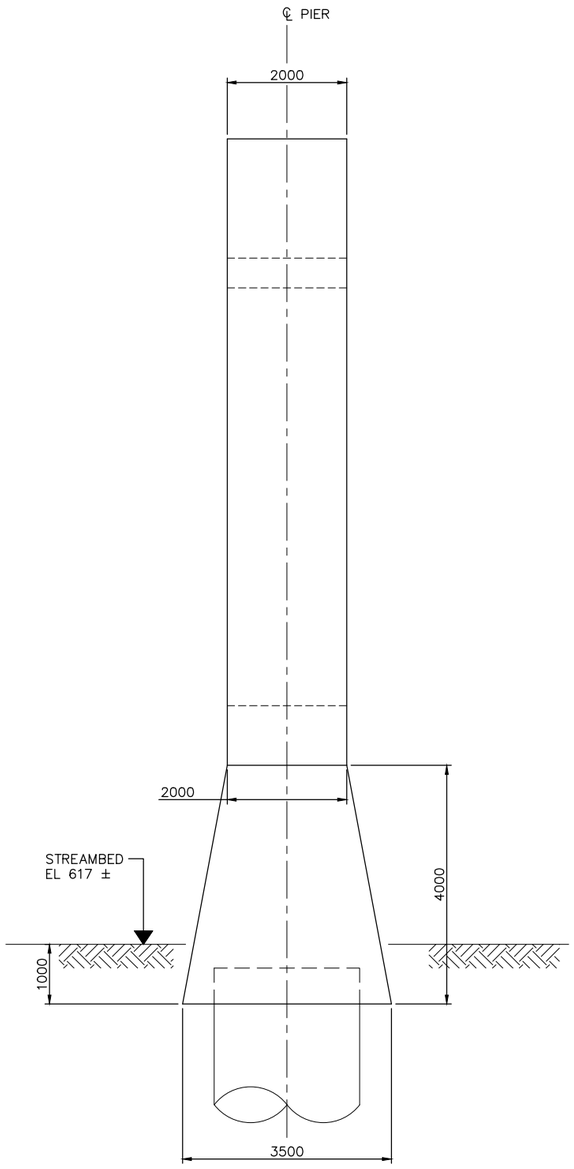
THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
PIER CAISSON DETAILS

DRAWING
TPFB-PD-S05



ELEVATION OF PIER
1:50



PROFILE
1:50

NO.	REVISIONS	BY	DATE	APPD
7				
6				
5				
4				
3				
2				
1				

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

PROGRAM NO. -
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

APPROVED FOR CONSTRUCTION
DATE

DESIGNER

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

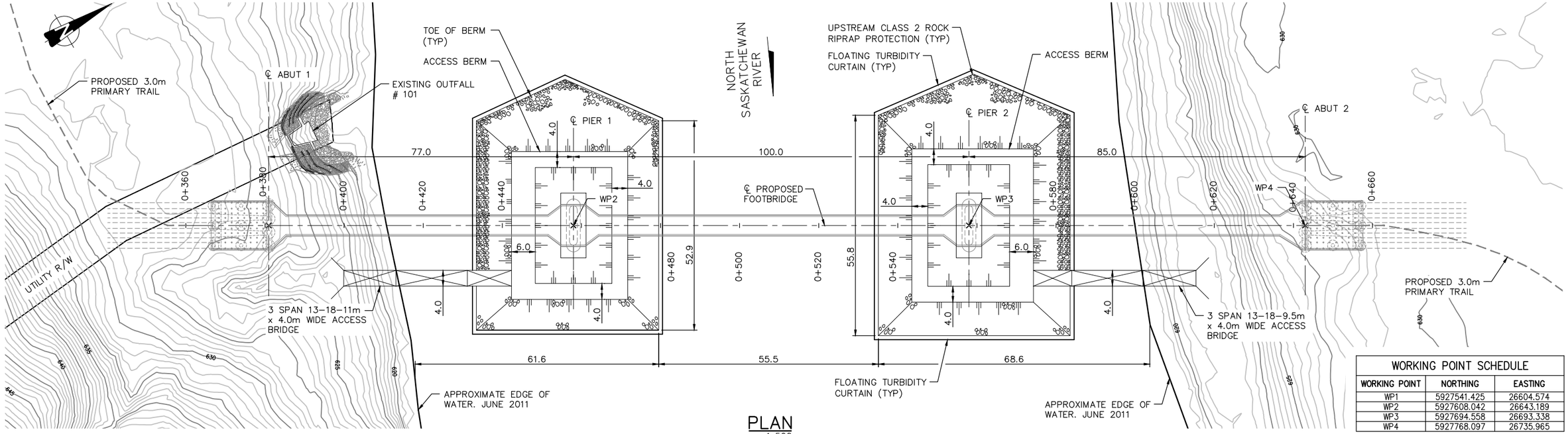
SURVEY
JOB NO.
SCALE

DRAWN E.C. DATE m/d/yy
DESIGNED - DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
PIER SHAFT ELEVATION AND DETAILS

DRAWING
TPFB-PD-S06

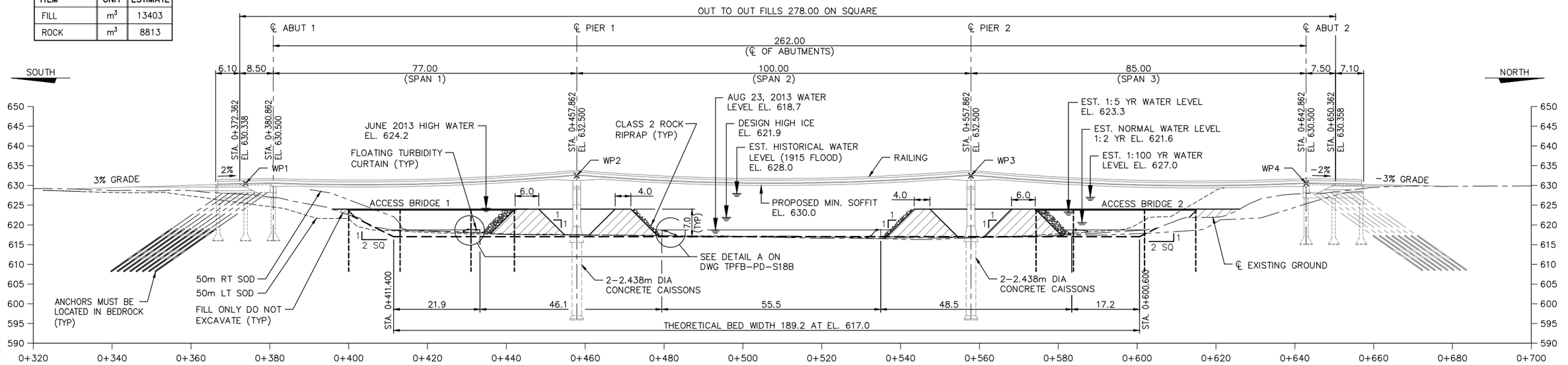


PLAN
1:500

WORKING POINT SCHEDULE		
WORKING POINT	NORTHING	EASTING
WP1	5927541.425	26604.574
WP2	5927608.042	26643.189
WP3	5927694.558	26693.338
WP4	5927768.097	26735.965

ALL COORDINATES ARE NAD83 3TM GRID COORDINATES REFERENCED FROM CENTRAL MERIDIAN 114° W

QUANTITY ESTIMATE		
ITEM	UNIT	ESTIMATE
FILL	m^3	13403
ROCK	m^3	8813



ELEVATION
1:500

NOTES:
1. ALL WATER LEVEL ELEVATIONS ARE BASED ON OPEN CHANNEL CONDITIONS WITHOUT BERMS.
2. CONTRACTOR TO DETERMINE THE ELEVATION OF THE BERMS BASED ON THEIR ANALYSIS.

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

SURVEY
JOB NO.
SCALE

DRAWN E.C. DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
ISOLATION PLAN FOR INSTREAM WORKS

DRAWING
TPFB-PD-S18A

SUGGESTED CONSTRUCTION SEQUENCE FOR THE INSTALLATION OF TEMPORARY ACCESS BRIDGE – REFER TO DRAWING TPFB–PD–S18A.

- BUILD ACCESS ROAD TO RIVER BANKS AND PROTECT WITH ESC MEASURES (SEE DRAWING TPFB–PD–S16 FOR DETAILS OF ACCESS ROAD TO RIVER BANK).
- PLACE NAVIGATION WARNING SIGNS 200 m UPSTREAM AND DOWNSTREAM OF THE PROPOSED BERM LOCATION.
- PLACE FLOATING TURBIDITY CURTAIN OR OTHER APPROPRIATE TEMPORARY MEASURE AS SHOWN ON DRAWING TPFB–PD–S18A.
- STARTING AT THE RIVER BANK, DRILL AND DRIVE PILES FOR THE ABUTMENT OF THE FIRST TEMPORARY BRIDGE SPAN.
- DRILL AND DRIVE PILES FOR THE PIER OF THE FIRST TEMPORARY BRIDGE SPAN. DEPENDING ON THE TYPE AND REACH OF EQUIPMENT USED BY THE CONTRACTOR, THIS MAY BE DONE EITHER FROM THE RIVER BANK OR FROM A FLOATING BARGE.
- PLACE AND SECURE CAP BEAMS ON THE ABUTMENT AND PIER PILES WITH EQUIPMENT ON THE RIVER BANK.
- SET FIRST TEMPORARY BRIDGE SPAN ON THE CAP BEAMS AT ABUTMENT AND PIER.
- CONSTRUCTION EQUIPMENT DRIVES ON TO COMPLETED FIRST TEMPORARY BRIDGE SPAN
.
- DRILL AND DRIVE PILES FOR THE SECOND PIER; PLACE AND SECURE PIER CAP BEAM.
- PLACE THE SECOND TEMPORARY BRIDGE SPAN.
- CONSTRUCTION EQUIPMENT DRIVES ON TO COMPLETED SECOND TEMPORARY BRIDGE SPAN.
- DRILL AND DRIVE PILES FOR THE THIRD PIER; PLACE AND SECURE PIER CAP BEAM.
- PLACE THE THIRD TEMPORARY BRIDGE SPAN.
- CONSTRUCTION OF THE TEMPORARY BRIDGE ON ONE SIDE OF THE RIVER IS NOW COMPLETE.
- REPEAT SAME SEQUENCE FROM THE OPPOSITE RIVER BANK FOR CONSTRUCTING THE SECOND TEMPORARY ACCESS BRIDGE.

SUGGESTED CONSTRUCTION SEQUENCE FOR INSTALLING THE BERMS – REFER TO DRAWING TPFB–PD–S18A.

- THE EQUIPMENT TYPICALLY USED BY CONTRACTORS FOR CONSTRUCTING BERMS ARE DUMP TRUCKS, DOZERS AND EXCAVATORS.
- FROM THE TEMPORARY ACCESS BRIDGE, PLACE CLASS 2 ROCK RIPRAP PARALLEL TO THE RIVER BANK AND IN THE UPSTREAM DIRECTION TO FORM A GRANULAR FINGER BERM TO ACCESS THE UPSTREAM FACE OF THE TEMPORARY BERM.
- PLACE CLASS 2 ROCK RIPRAP IN A TRIANGULAR WEDGE SHAPED PATTERN TO FORM THE UPSTREAM FACE OF THE TEMPORARY BERM.
- FROM THE INSTREAM CORNER OF THE UPSTREAM FACE, PLACE CLASS 2 ROCK RIPRAP FOR A DISTANCE OF ABOUT 10 m IN THE DOWNSTREAM DIRECTION.
- THE ROCK RIPRAP PLACED ABOVE WILL CREATE A SHELTERED AREA WHERE THE RIVER FLOW VELOCITY WILL BE REDUCED AND WILL ALLOW FOR PLACEMENT OF THE HIGH PLASTIC CLAY MATERIAL THAT FORMS THE INNER CORE OF THE BERM.
- STARTING FROM THE TEMPORARY ACCESS BRIDGE, PLACE HIGH PLASTIC CLAY ON THE RIVER BED WORKING IN THE UPSTREAM DIRECTION.
- MONITOR THE TURBIDITY OF THE WATER. THE CONTRACTOR SHALL CARRY OUT THE QUALITY CONTROL (QC) MONITORING AND REPORT THE RESULTS TO THE CONSULTANT FOR REVIEW.
- THE CONSULTANT MAY CARRY OUT QUALITY ASSURANCE (QA) MONITORING OF THE TURBIDITY IF RESULTS FROM THE CONTRACTOR'S QC MONITORING DEEM THIS NECESSARY.
- AFTER EVERY 8 m OF CLAY PLACEMENT, PLACE A GEOTEXTILE FILTER FABRIC ON THE UPSTREAM (RIVER) FACE OF THE CLAY.
- PLACE CLASS 2 ROCK RIPRAP ON THE UPSTREAM FACE OF THE CLAY OVER THE FILTER FABRIC.
- CONTINUE PLACEMENT OF CLAY AND ROCK RIPRAP GRADUALLY IN THE UPSTREAM DIRECTION UNTIL THE SIDE OF TEMPORARY BERM CLOSEST TO AND PARALLEL TO THE RIVER BANK IS COMPLETED.
- CONTINUE BERM CONSTRUCTION BEHIND THE UPSTREAM WEDGE SHAPED ROCK RIPRAP.
- CONTINUE BERM CONSTRUCTION IN DOWNSTREAM DIRECTION TO FORM THE BERM SIDE THAT IS INSTREAM AND PARALLEL TO THE RIVER BANK.
- COMPLETE THE BERM BY CONSTRUCTING THE DOWNSTREAM FACE.

SUGGESTED CONSTRUCTION SEQUENCE FOR DISMANTLING THE BERMS – REFER TO DRAWING TPFB–PD–S18A.

- PLACE FLOATING TURBIDITY CURTAIN OR OTHER APPROPRIATE TEMPORARY MEASURE AROUND THE BERM AND BACK TO THE RIVER BANKS AS SHOWN ON DRAWING TPFB–PD–S18A. THIS PROVIDES A SHELTERED AREA TO CARRY OUT THE INSTREAM WORK.
- REMOVAL STARTS AT THE DOWNSTREAM LIMIT OF THE BERM AND IS IN REVERSE OF THE CONSTRUCTION SEQUENCE.
- THE HIGH PLASTIC CLAY ON INSIDE OF BERM IS REMOVED WITH AN EXCAVATOR AND TRUCKED OFF SITE FOR DISPOSAL.
- USING AN EXCAVATOR, COLLECT THE UPPER CLASS 2 ROCK RIPRAP THAT IS ON TOP OF THE GEOTEXTILE AND PLACE IT INTO DUMP TRUCKS.
- THE ROCK RIPRAP IS TRANSPORTED TO THE RIVER BANK AND PLACED ALONG THE BANKS ON GEOTEXTILE FILTER FABRIC FORMING THE PERMANENT RIVER BANK PROTECTION WORKS.
- REMOVE THE GEOTEXTILE.
- REMOVE THE CLAY AND DISPOSE OFF SITE.
- REMOVE REMAINING ROCK RIPRAP AND PLACE ALONG RIVER BANK.
- DECONSTRUCT THE TEMPORARY ACCESS BRIDGE BY REMOVING THE THIRD SPAN.
- REMOVE THE CAP BEAM AND THE PIER PILES.
- REPEAT DECONSTRUCTION SEQUENCE FOR THE REMAINING TWO TEMPORARY BRIDGE SPANS AND THE PIERS AND WORK BACK TOWARDS THE RIVER BANK.
- THIS SUGGESTED CONSTRUCTION SEQUENCE MAY NEED TO BE MODIFIED BASED ON WATER LEVEL AND SITE CONDITIONS. THE CONTRACTOR IS TO NOTIFY THE CONSULTANT OF ANY MAJOR CHANGES TO THE ABOVE PROCEDURE.
- REMOVE TEMPORARY MEASURES.

SUGGESTED SAFETY PLAN FOR INSTREAM WORKS

- THE CONTRACTOR SHALL DEVELOP A SAFETY PLAN FOR THE PROPOSED BRIDGE CONSTRUCTION PROJECT. THAT PLAN SHALL CONSIDER ALL FACETS OF THE BRIDGE CONSTRUCTION AND INCLUDE THE SAFETY OF THE WORKERS AS WELL AS THE GENERAL PUBLIC INCLUDING BUT NOT LIMITED TO PEDESTRIANS AND RIVER USERS. THE SAFETY PLAN SHALL BE SUBMITTED TO TRANSPORT CANADA FOR THEIR REVIEW AND APPROVAL PRIOR TO COMMENCEMENT OF OPERATIONS.
- ALL OPERATORS SHALL ATTEND THE CONTRACTOR'S SAFETY ORIENTATION BEFORE COMMENCING ANY WORK.
- ALL OPERATORS SHALL ATTEND A DAILY RISK ASSESSMENT PRIOR TO STARTING ANY ACTIVITIES.
- PERSONAL PROTECTIVE EQUIPMENT (PPE) TO BE WORN INCLUDES HARD HAT, GLOVES, GLASSES, AND SAFETY BOOTS. CERTAIN ACTIVITIES MAY REQUIRE ADDITIONAL PPE.
- IF WORKING FROM A BOAT OR BARGE, ALL OPERATORS AND SUPERVISORS MUST WEAR A PERSONAL FLOATATION DEVICE.
- LIFEBUOYS SHALL BE INSTALLED ON THE RIVER BANK BEFORE ANY WORKS COMMENCE.
- TURBIDITY CURTAIN OR OTHER APPROPRIATE TEMPORARY MEASURES/ BERMS SHALL BE INSTALLED IN THE RIVER BEFORE ANY WORKS COMMENCE.
- TURBIDITY MONITORING SHALL BE UNDERTAKEN THROUGHOUT THE DURATION OF WORKS WITHIN THE RIVER AS PER THE TURBIDITY MONITORING PLAN.

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1				

PROGRAM NO. -
CONTRACT NO. -

NO.	ISSUE	BY	DATE
4	-		
3	-		
2	-		
1	-		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

Stantec

PRELIMINARY- NOT FOR CONSTRUCTION
JANUARY 2014

DESIGNER
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ROADWAYS DESIGN AND CONSTRUCTION DATE
MANAGER OF ROADWAYS DESIGN AND CONSTRUCTION DATE

SURVEY
JOB NO.
SCALE

DRAWN EC DATE m/d/yy
DESIGNED MM DATE m/d/yy
CHECKED - DATE m/d/yy

THE CITY OF Edmonton
TRANSPORTATION SERVICES
ROADS DESIGN AND CONSTRUCTION BRANCH

PROJECT
TERWILLEGAR PARK FOOTBRIDGE & TRAILS
NORTH SASKATCHEWAN RIVER
INFORMATION SHEET 2

DRAWING
TPFB-PD-S18C

APPENDIX H
Historical Aerial Photographs

Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Historical_Figures_1949.mxd February, 2014
2014 - 02 - 06 jacho 1135-60353

Stantec

Legend

Study Area

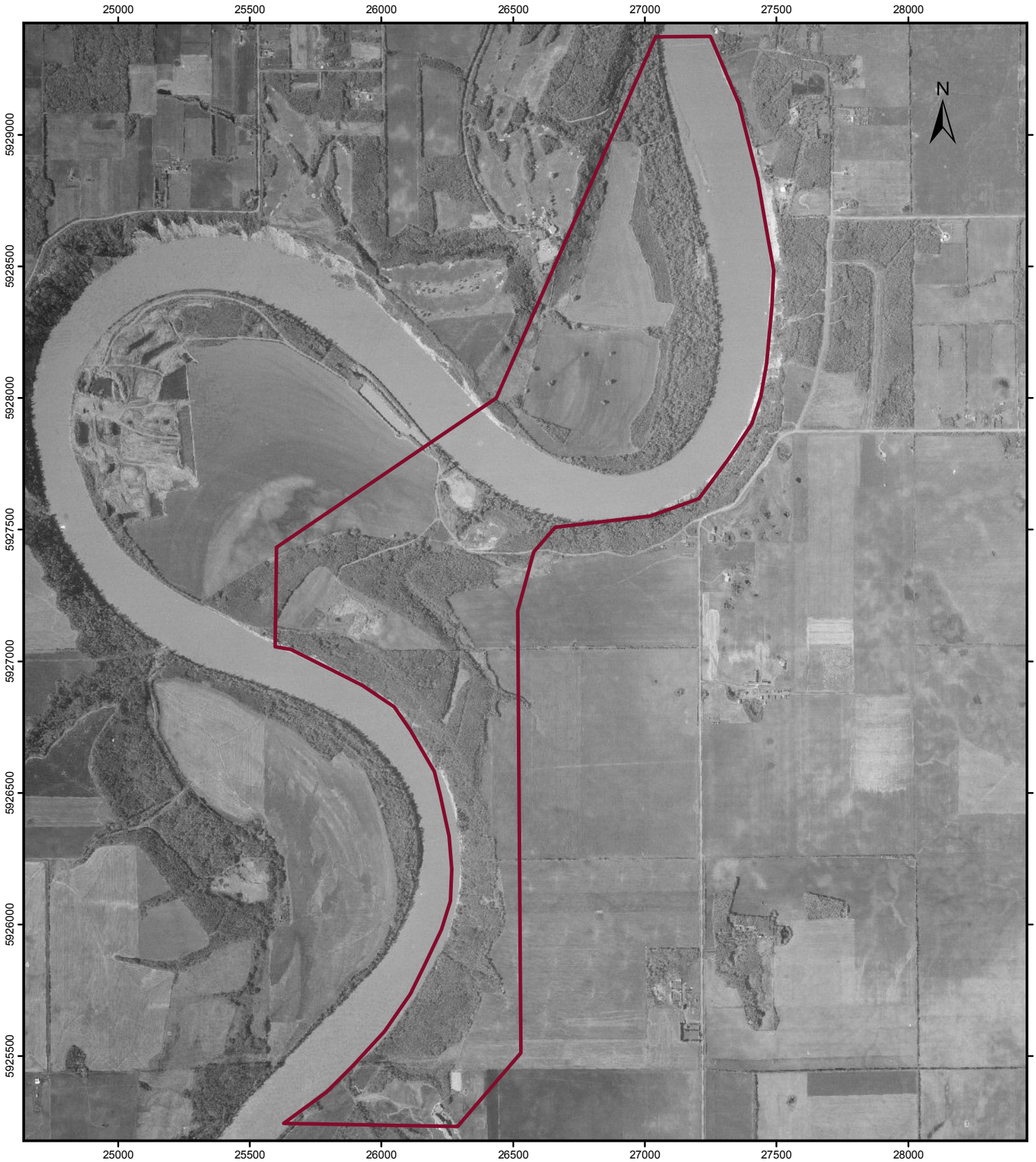
Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from Alberta Sustainable Resource Development, AS136-60, 1949

0 250 500 750 1,000
1:20,000 Metres
This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT

Figure No.
1949

Title
HISTORICAL AERIAL PHOTOGRAPH REVIEW



Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Historical_Figures_1962.mxd
2014 - 02 - 06 jacho

February, 2014
1135-60353

Stantec

Legend

Study Area

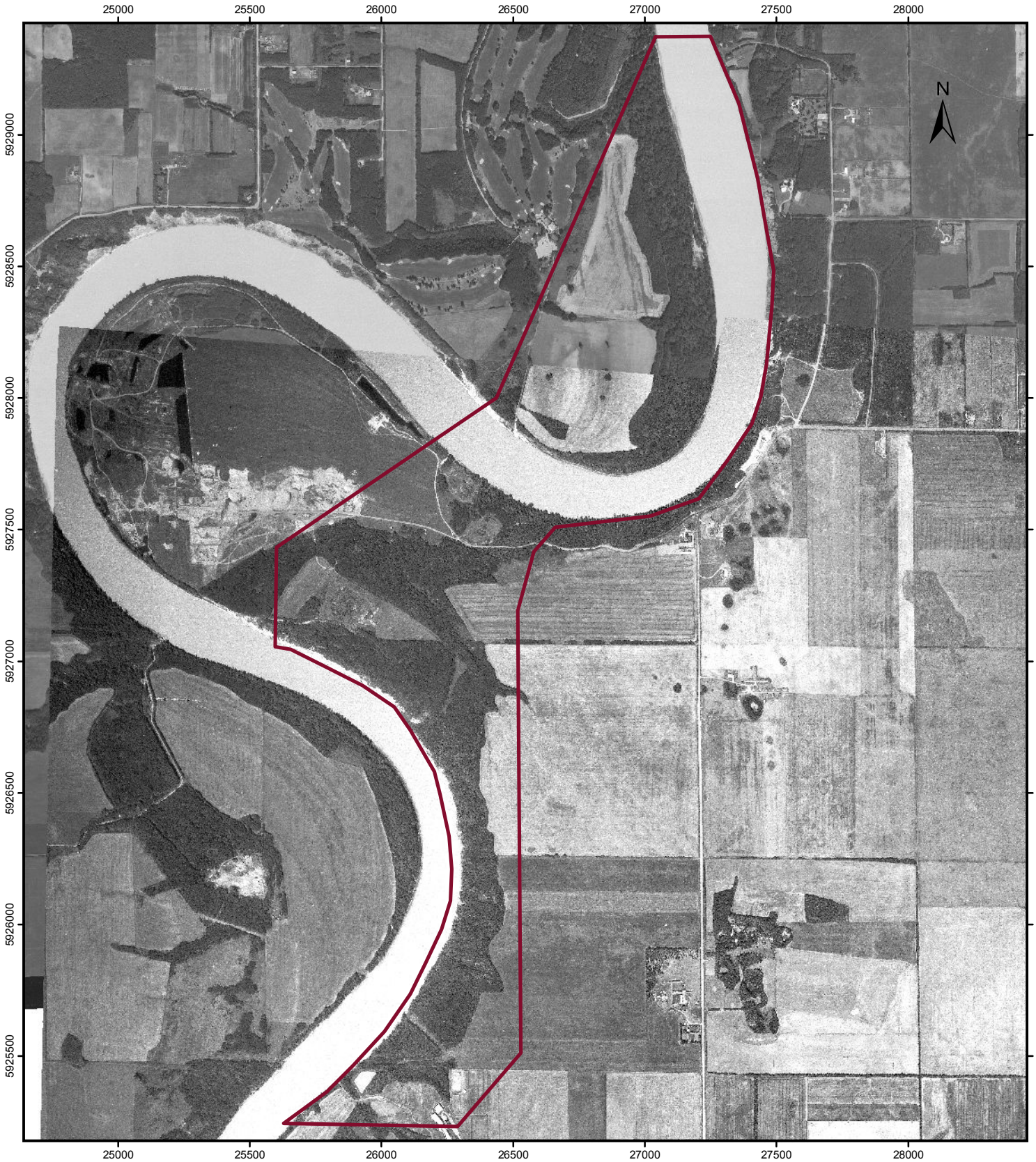
Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from Alberta Sustainable Resource Development, AS818-16, 1962

1:20,000 0 250 500 750 1,000 Metres
This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT

Figure No.
1962

Title
HISTORICAL AERIAL PHOTOGRAPH REVIEW



Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Historical_Figures_1967.mxd
2014 - 02 - 06 jacho

February, 2014
1135-60353

Stantec

Legend

Study Area

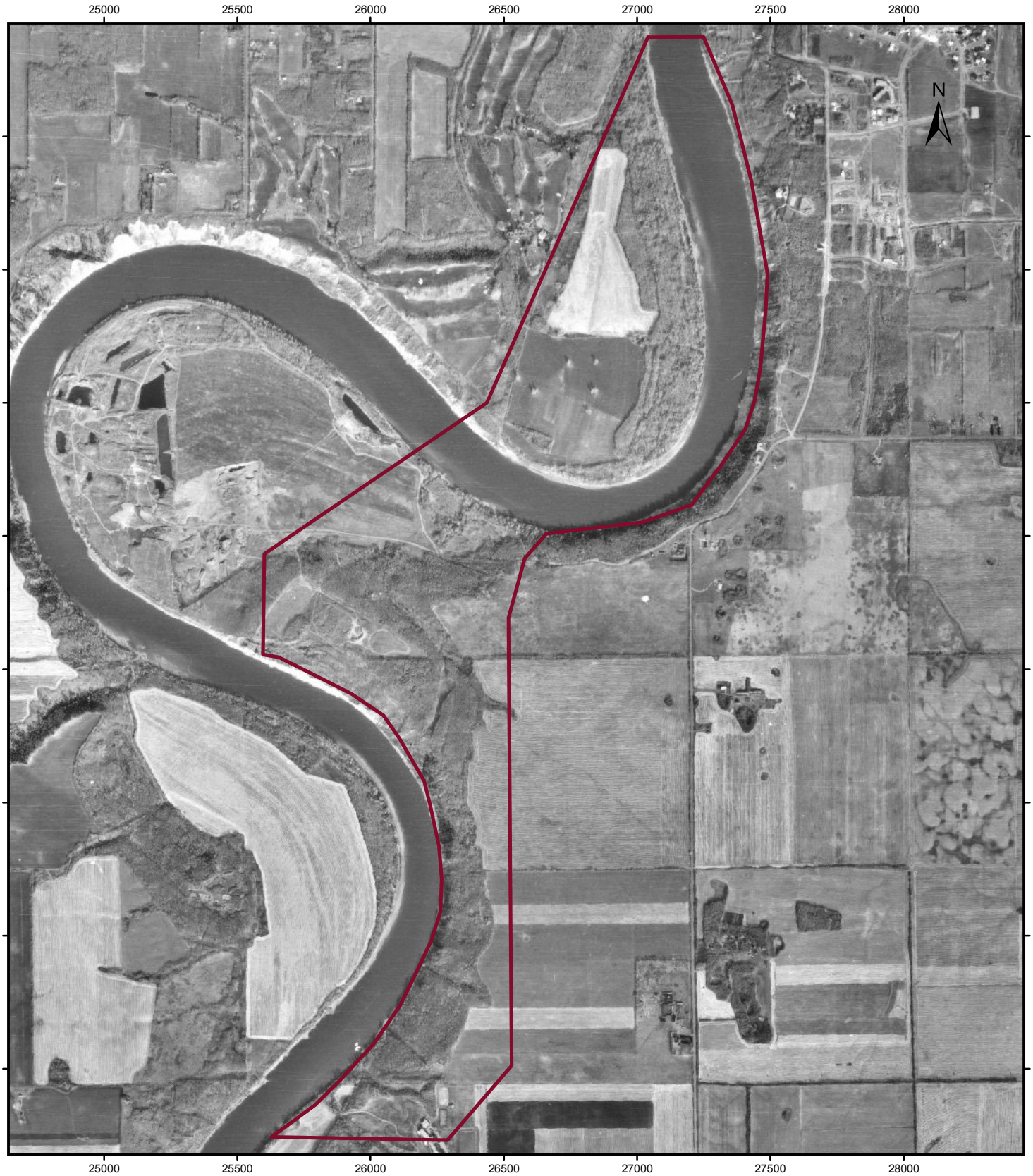
Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from Alberta Sustainable Resource Development, AS979-45, AS979-115 1967

1:20,000
0 250 500 750 1,000 Metres
This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT

Figure No.
1967

Title
HISTORICAL AERIAL PHOTOGRAPH REVIEW



Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Historical_Figures_1972.mxd
2014 - 02 - 06 jacho

February, 2014
1135-60353

Stantec

Legend

Study Area

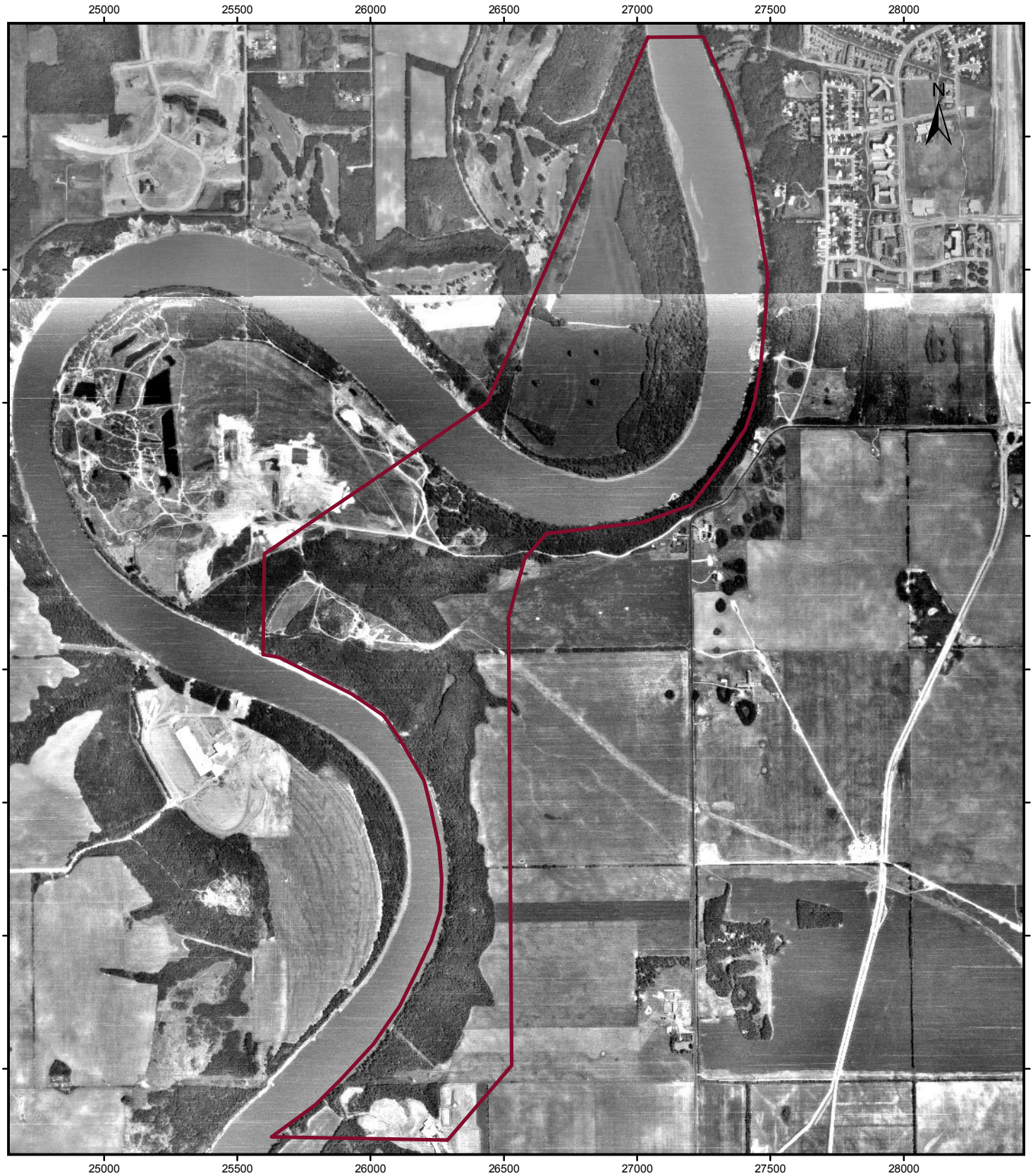
Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from Alberta Sustainable Resource Development, AS1207-47, 1972

0 250 500 750 1,000
1:20,000 Metres
This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT

Figure No.
1972

Title
HISTORICAL AERIAL PHOTOGRAPH REVIEW



Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Historical_Figures_1977.mxd
2014 - 02 - 06 jacho

February, 2014
1135-60353

Stantec

Legend

Study Area

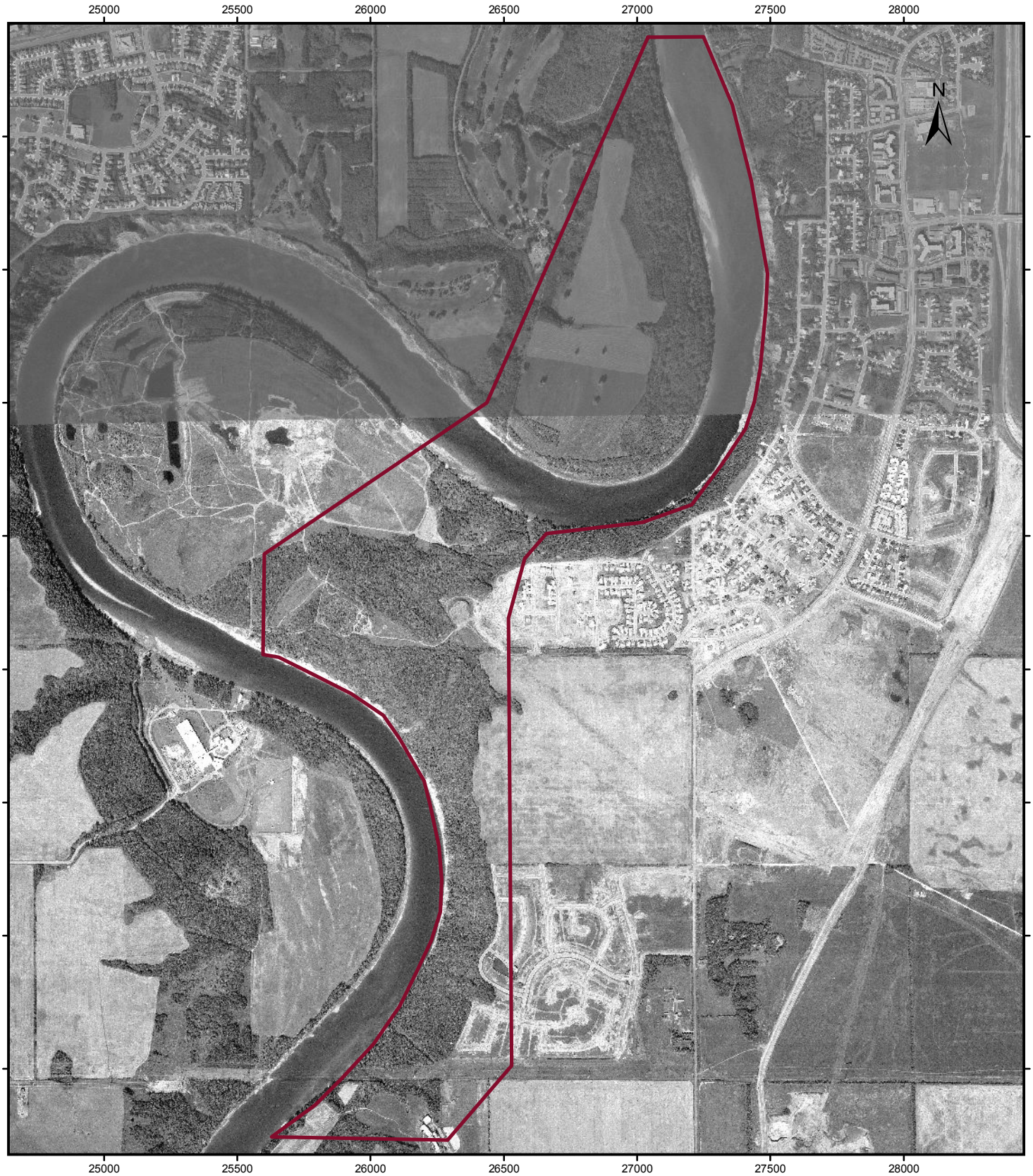
Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from Alberta Sustainable Resource Development, AS1592-39, AS1592-95, 1977

1:20,000 0 250 500 750 1,000 Metres
This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT

Figure No.
1977

Title
HISTORICAL AERIAL PHOTOGRAPH REVIEW



Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Historical_Figures_1982.mxd
2014 - 02 - 06 jacho

February, 2014
1135-60353

Stantec

Legend

Study Area

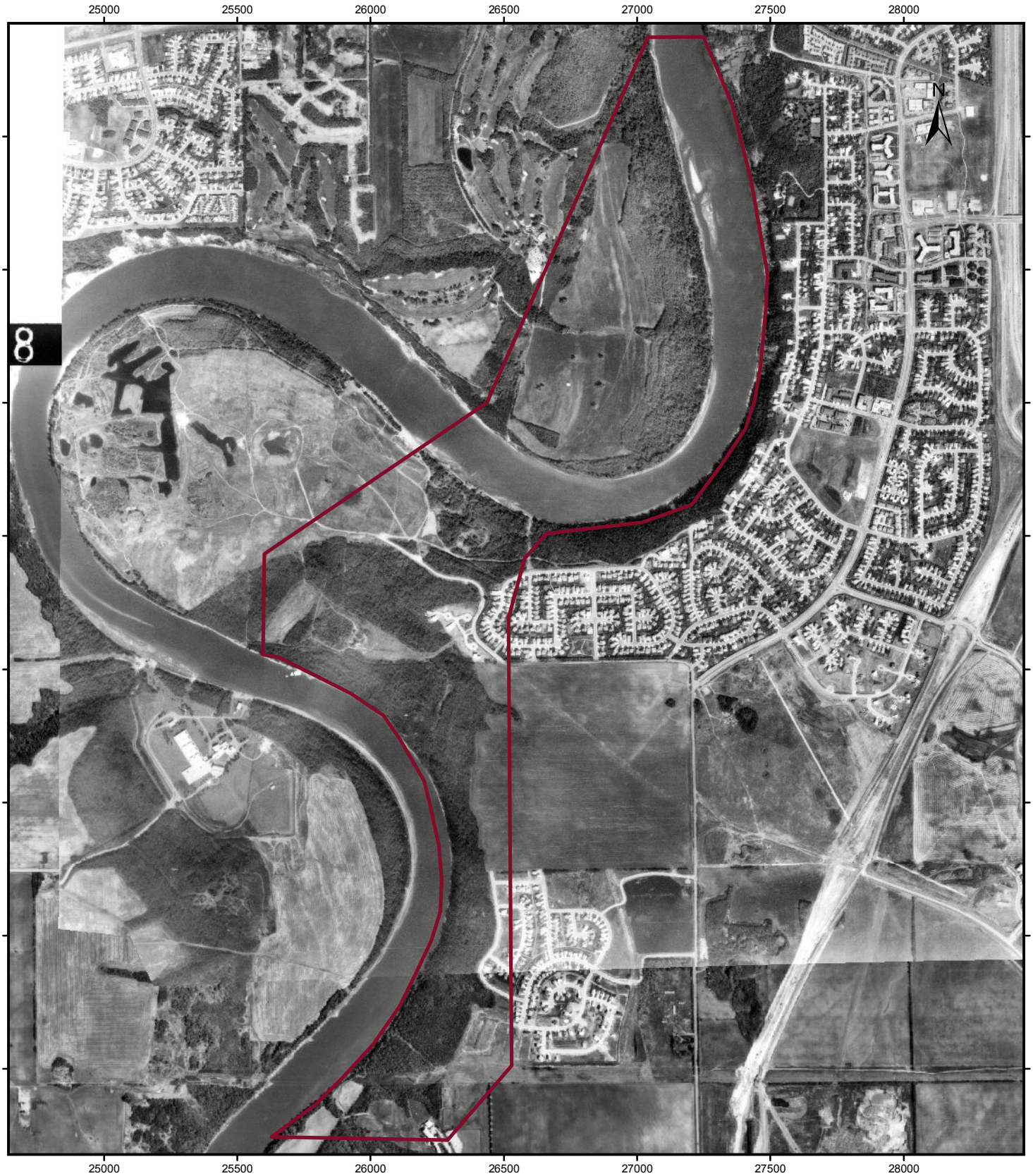
Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from Alberta Sustainable Resource Development, AS2648-196, AS2648-71,1982

0 250 500 750 1,000
1:20,000 Metres
This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT

Figure No.
1982

Title
HISTORICAL AERIAL PHOTOGRAPH REVIEW



Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Historical_Figures_1987.mxd
2014 - 02 - 06 jacho

February, 2014
1135-60353

Stantec

Legend

Study Area

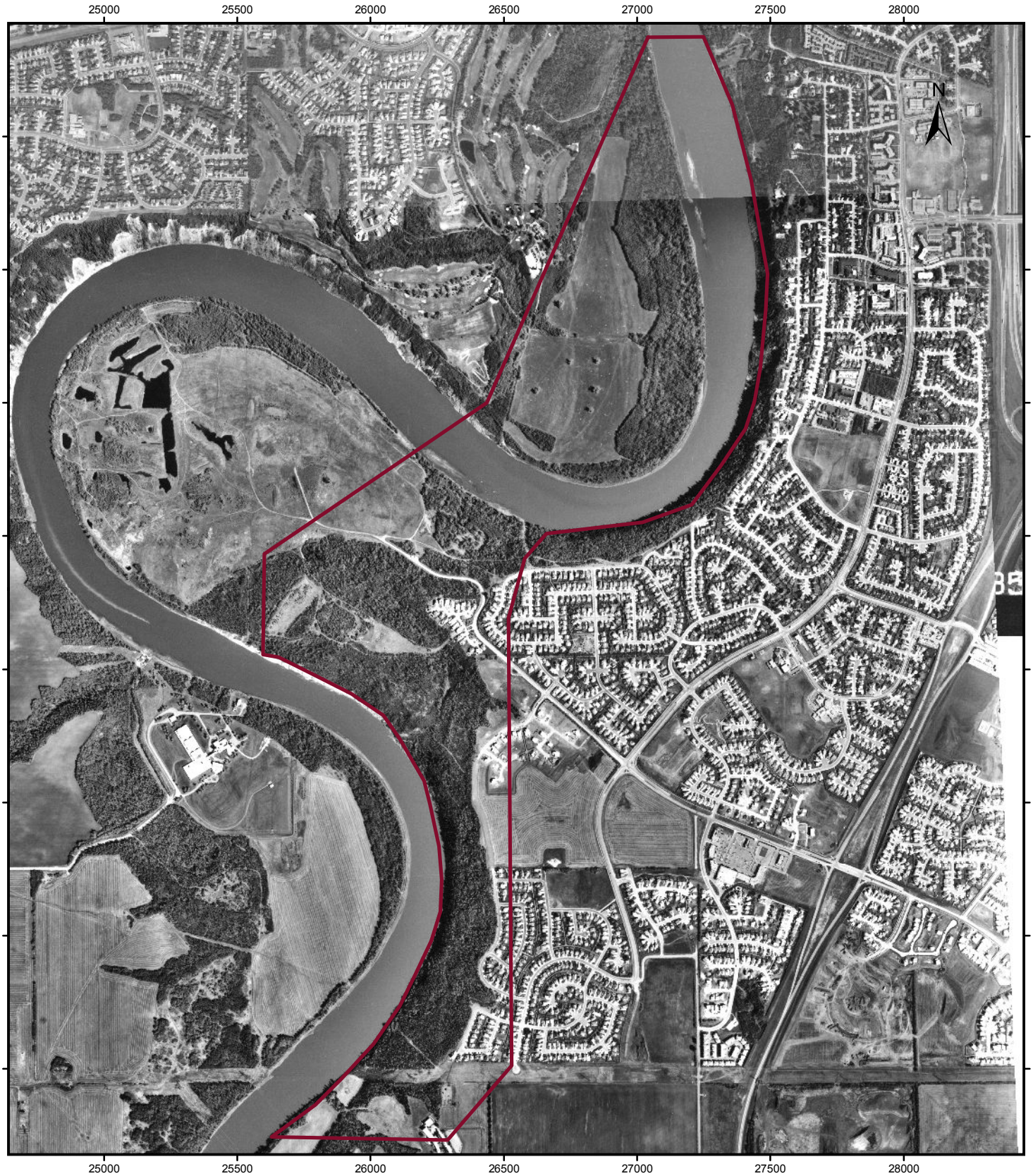
Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from Alberta Sustainable Resource Development, AS3590-40, AS3590-170, 1987

0 250 500 750 1,000
1:20,000 Metres
This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT

Figure No.
1987

Title
HISTORICAL AERIAL PHOTOGRAPH REVIEW



Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Historical_Figures_1993.mxd
2014 - 02 - 06 jacho

February, 2014
1135-60353

Stantec

Legend

Study Area

Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from Alberta Sustainable Resource Development, AS4383-211, AS4385-36, 1993

1:20,000

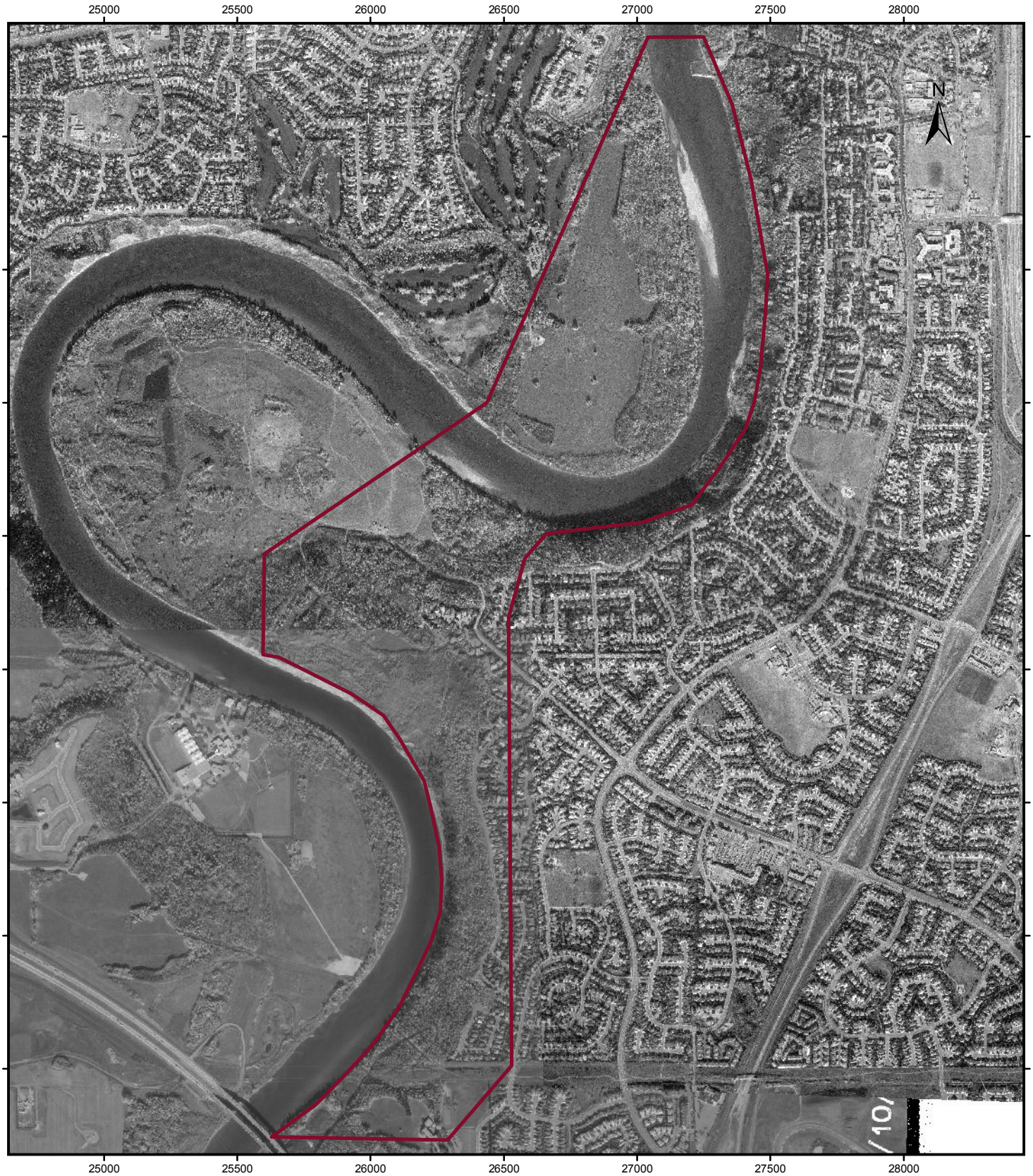
0 250 500 750 1,000 Metres

This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT

Figure No.
1993

Title
HISTORICAL AERIAL PHOTOGRAPH REVIEW



Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Historical_Figures_2008.mxd
2014 - 02 - 06 jacho

February, 2014
1135-60353

Stantec

Legend

Study Area

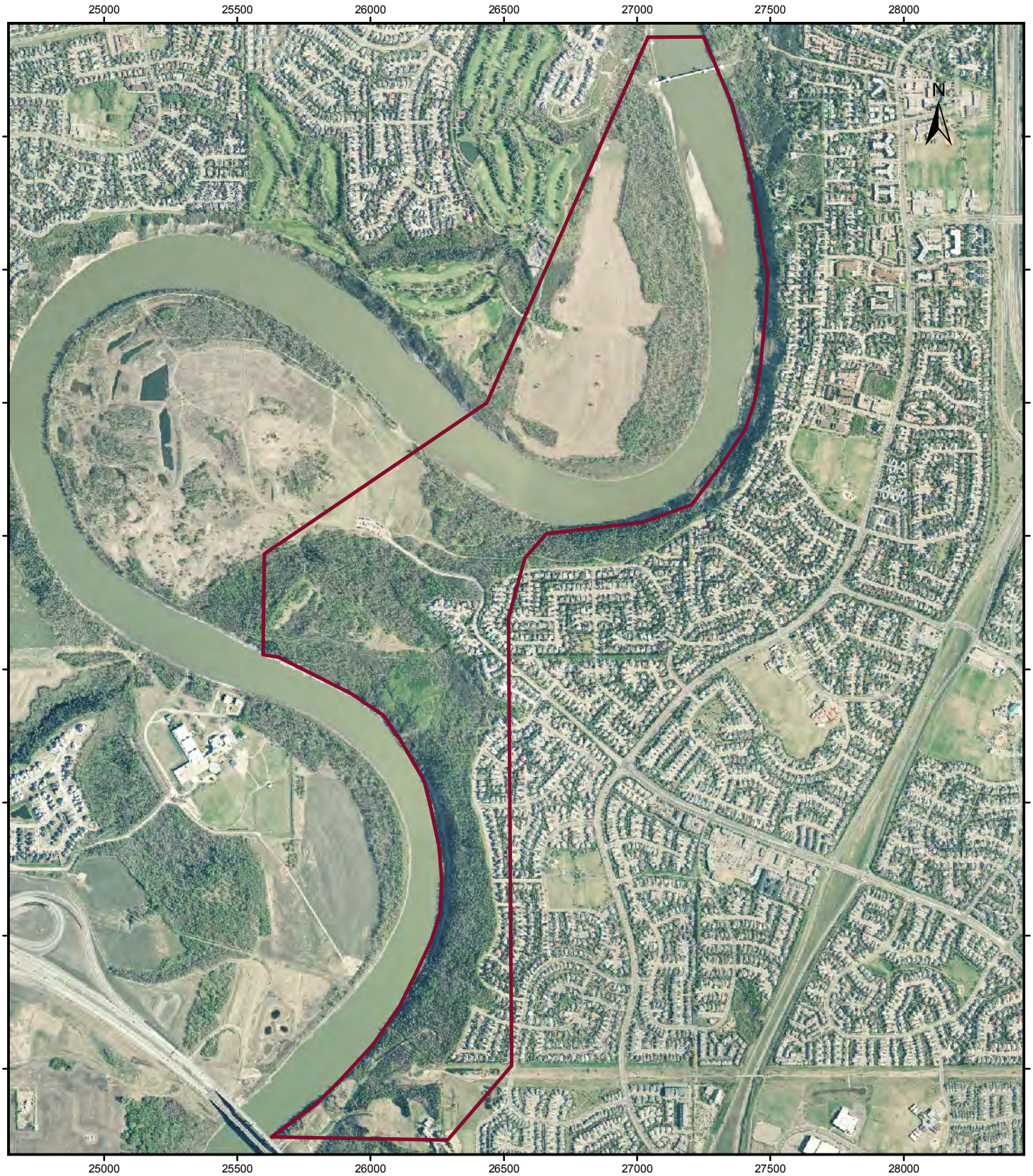
Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from Alberta Sustainable Resource Development, AS5462B-20, AS5462B-22, AS5461B-256 2008

0 250 500 750 1,000
1:20,000 Metres
This map is for reference purposes only

Client/Project
CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT

Figure No.
2008

Title
HISTORICAL AERIAL PHOTOGRAPH REVIEW



Q:\Clients\City_of_Edmonton\Terwillegar_Footbridge\Figures\Historical_Figures_2012.mxd February, 2014

2014 - 02 - 06 jacho 1135-60353

Stantec

Legend

Study Area

Projection: 3TM CM:114° Datum: NAD 83
Imagery obtained from City of Edmonton Transportation 2012

0 250 500 750 1,000

1:20,000 Metres

This map is for reference purposes only

Client/Project

CITY OF EDMONTON
TERWILLEGAR PARK FOOTBRIDGE AND TRAILS MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT

Figure No.

2012

Title

HISTORICAL AERIAL PHOTOGRAPH REVIEW