

**PROJECT SITES**  
Scale 1:60000  
0 1500 3000  
1:60000 Meters

# WILLOW ESTATES RESILIENCY AND FLOOD MITIGATION PROGRAM



**LOCATION PLAN**  
NTS

DRAWING LIST	
SHEET NUMBER	SHEET TITLE
GENERAL	
G-001	WILLOW ESTATES DIKE LOCATION PLAN, PROJECT SITE AND DRAWING LIST
G-002	WILLOW ESTATES DIKE LEGEND
G-501	WILLOW ESTATES DIKE ACCESS RAMPS
G-502	WILLOW ESTATES DIKE TYPICAL CULVERT AND MANHOLE SECTIONS AND DETAILS
CIVIL: WILLOW ESTATES	
C-111	WILLOW ESTATES DIKE PLAN
C-112	WILLOW ESTATES DIKE PLAN AND PROFILE SHEET 1 OF 2
C-113	WILLOW ESTATES DIKE PLAN AND PROFILE SHEET 2 OF 2
C-114	WILLOW ESTATES 7TH AVENUE DITCH REALIGNMENT PLAN AND PROFILE
C-115	WILLOW ESTATES 7TH AVENUE EAST ROAD PLAN AND PROFILE
C-116	WILLOW ESTATES TREE CLEARING PLAN
C-117	WILLOW ESTATES CONCRETE CULVERT PLAN AND PROFILE
C-211	WILLOW ESTATES DIKE TYPICAL SECTIONS
C-212	WILLOW ESTATES DIKE ACCESS RAMP CULVERT SECTION
C-213	WILLOW ESTATES DIKE CULVERT SECTIONS
C-214	WILLOW ESTATES DIKE CULVERT UPGRADE AT STA 1+246 PLAN AND PROFILE
C-215	WILLOW ESTATES DIKE EXISTING DRAIN RETROFIT PLAN AND PROFILE
C-311	WILLOW ESTATES DIKE SAMPLED SECTIONS
C-411	WILLOW ESTATES SWIFT WATER RESCUE / RIVER INTAKE ACCESS ROUTE PLAN AND SECTION
LANDSCAPE DRAWINGS: WILLOW ESTATES	
L-100	WILLOW ESTATES KEY PLAN
L-101	WILLOW ESTATES LEGEND AND NOTES
L-200	WILLOW ESTATES PLANTING PLAN
L-201	WILLOW ESTATES PLANTING PLAN
L-300	WILLOW ESTATES DIKE DETAILS



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3	2022-08-05	SW	JH	LM	ISSUED FOR CONSTRUCTION

DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE RESILIENCY AND FLOOD MITIGATION PROGRAM			
WILLOW ESTATES DIKE LOCATION PLAN, PROJECT SITE AND DRAWING LIST			
Project No.	CW2384	Drawing No.	G-001
Group	WILLOW ESTATES	Rev.	3

### GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL ELEVATIONS, COORDINATES AND STATIONING ARE IN METRES UNLESS NOTED OTHERWISE.
3. COORDINATE SYSTEM FOR THIS PROJECT IS NAD 83 3TM MAP DATUM. ELEVATIONS ARE GEODETIC.
4. EXISTING GROUND CONTOURS INFORMATION WAS DERIVED FROM LIDAR (2018) AND PROVIDED BY DRUMHELLER RESILIENCY AND FLOOD MITIGATION OFFICE (DRFMO).
5. HIGH RESOLUTION AERIAL PHOTO FROM 2019 AND PROVIDED BY DRFMO.
6. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SOME UTILITY LOCATIONS MAY NOT BE ILLUSTRATED. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL UTILITY LOCATIONS AND OWNERSHIP PRIOR TO CONSTRUCTION.
7. SAMPLED SECTIONS DRAWINGS ARE PROVIDED AS A VISUAL REPRESENTATION ONLY AND ARE NOT TO BE RELIED UPON FOR CONSTRUCTION. NOT ALL PROJECT FEATURES SHOWN ON SAMPLED SECTIONS.

### MATERIAL HATCHING LEGEND

MATERIAL TYPE	SPECIFICATION	HATCH PATTERN
CONCRETE	STRUCTURAL CONCRETE	
STEEL	STEEL	
FILL	IMPERVIOUS	
	LOW PERMEABLE	
	COMMON	
	LOW TO MEDIUM PLASTICITY CLAY	
GRAVEL MATERIAL	ROAD GRAVEL	
	PITRUN GRAVEL	
	RIPRAP BEDDING GRAVEL	
	PIPE BEDDING GRAVEL	
VEGETATION	NATURAL VEGETATION	
RIPRAP	RIPRAP CLASS 1M	
	RIPRAP CLASS 1	
	RIPRAP CLASS 2	
	RIPRAP CLASS 3	
EARTH	UNDISTURBED GROUND	
	BEDROCK	
	TOPSOIL	

HATCHING LEGEND ILLUSTRATES TYPICAL MATERIALS ENCOUNTERED OR USED IN CONSTRUCTION. SOME MATERIALS ILLUSTRATED IN THIS LEGEND MAY NOT BE ENCOUNTERED OR USED IN THE CONTRACT. HATCH NOT ALWAYS SHOWN ON DRAWINGS

### LINETYPE LEGEND

- FLOW BOUNDARY 1850 cms
- LEGAL LAND LINE
- FENCE
- SANITARY SERVICE
- POWER LINE
- WATER SERVICE LINE
- GAS BURIED (NON-ERCB REGISTERED)
- 2 YEAR WATER LEVEL
- TREE LINE
- EXISTING TREE AREA LIMITS
- GEOTEXTILE
- GEOMEMBRANE

### ABBREVIATIONS

A/A	ALL AROUND	HWL	HIGH WATER LEVEL
APPROX	APPROXIMATE	MVD	MAXIMUM VIBRATED DENSITY
BC	BEGINNING OF CURVE	MIN	MINIMUM
B	BOTTOM	NF	NEAR FACE
c/c	CENTER TO CENTER	NWL	NORMAL WATER LEVEL
CL	CENTERLINE	N	NORTHING
c/w	COMPLETE WITH	PWL	PERMANENT WATER LEVEL
DIA	DIAMETER	PI	POINT OF INTERSECTION
DS	DOWNSTREAM	R	RADIUS
EF	EACH FACE	SPMDD	STANDARD PROCTOR MAXIMUM DRY DENSITY
EW	EACH WAY	SS	STAINLESS STEEL
E	EASTING	STA	STATION
EL	ELEVATION	TRM	TURF REINFORCEMENT MATS
EC	END OF CURVE	THK	THICK
EST	ESTIMATED	T	TOP
EJ	EXPANSION JOINT	TYP	TYPICAL
FF	FAR FACE	US	UPSTREAM
FSL	FULL SUPPLY LEVEL	WL	WATER LEVEL

### SYMBOL LEGEND

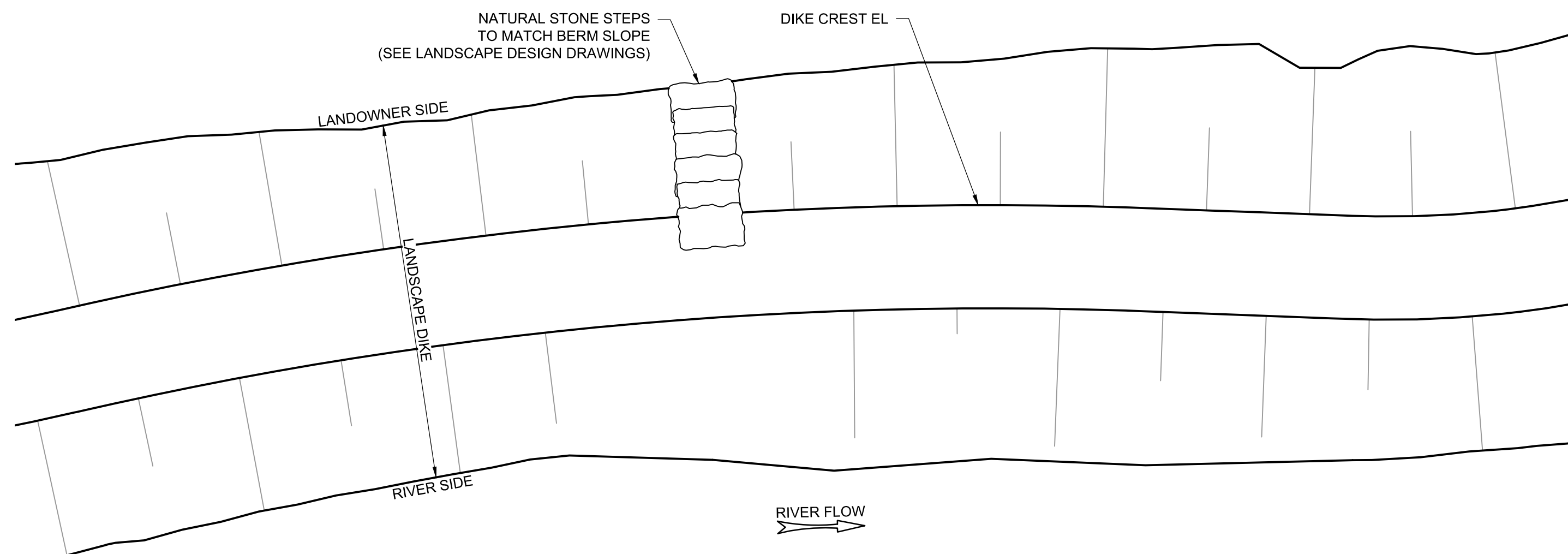
- 1850 cms WATER LEVEL
- SIDE SLOPE INDICATOR
- FLOW DIRECTION
- CULVERT
- ELEVATION MARKER
- WATER ELEVATION MARKER
- COORDINATE POINT
- DETAIL / SECTION MARKER (Top # Denotes Detail / Section Number) (Bottom # Denotes Reference Drawing Location)
- CURVE NUMBER MARKER
- RIVER CROSS SECTION STATION LABEL



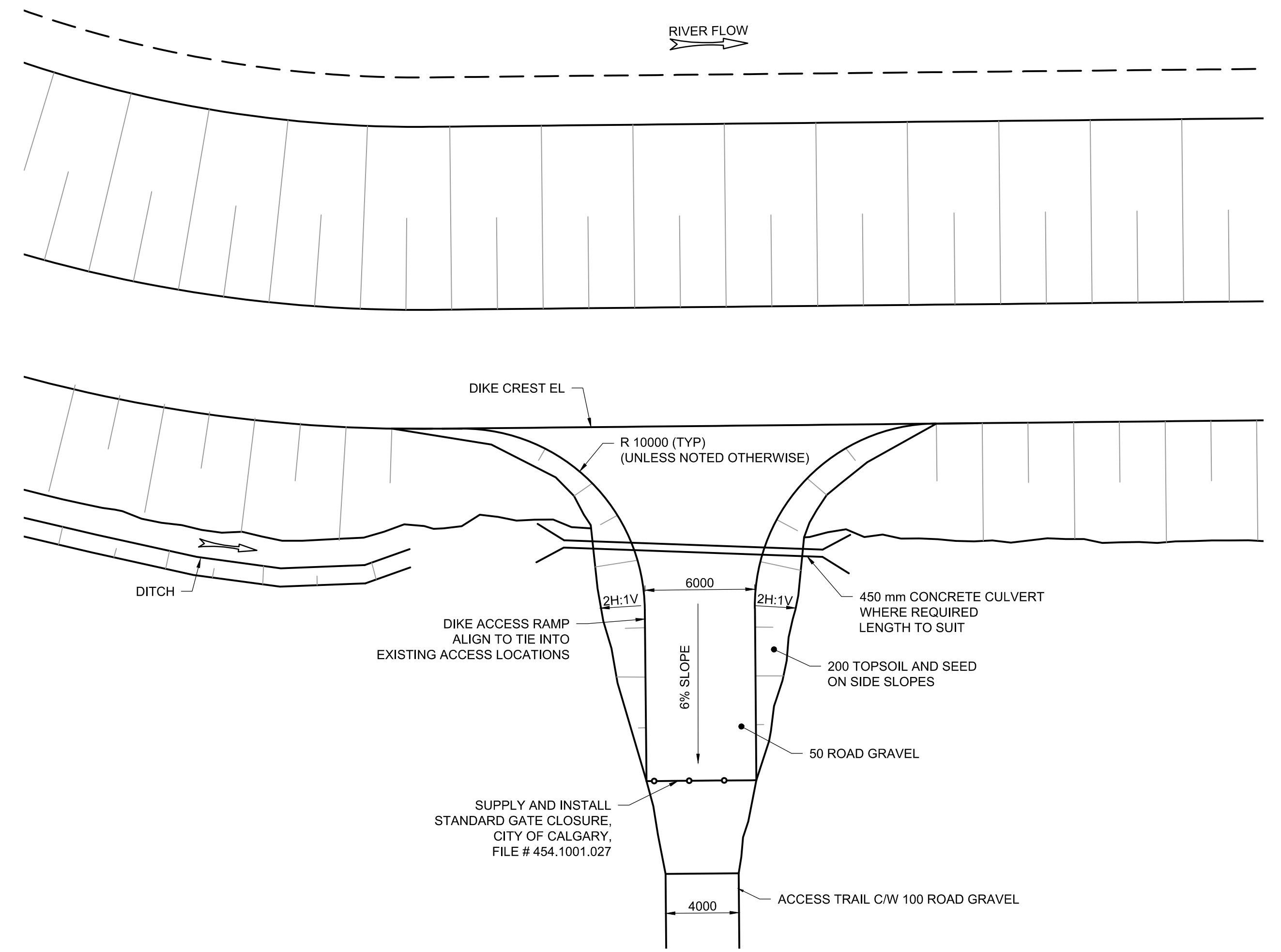
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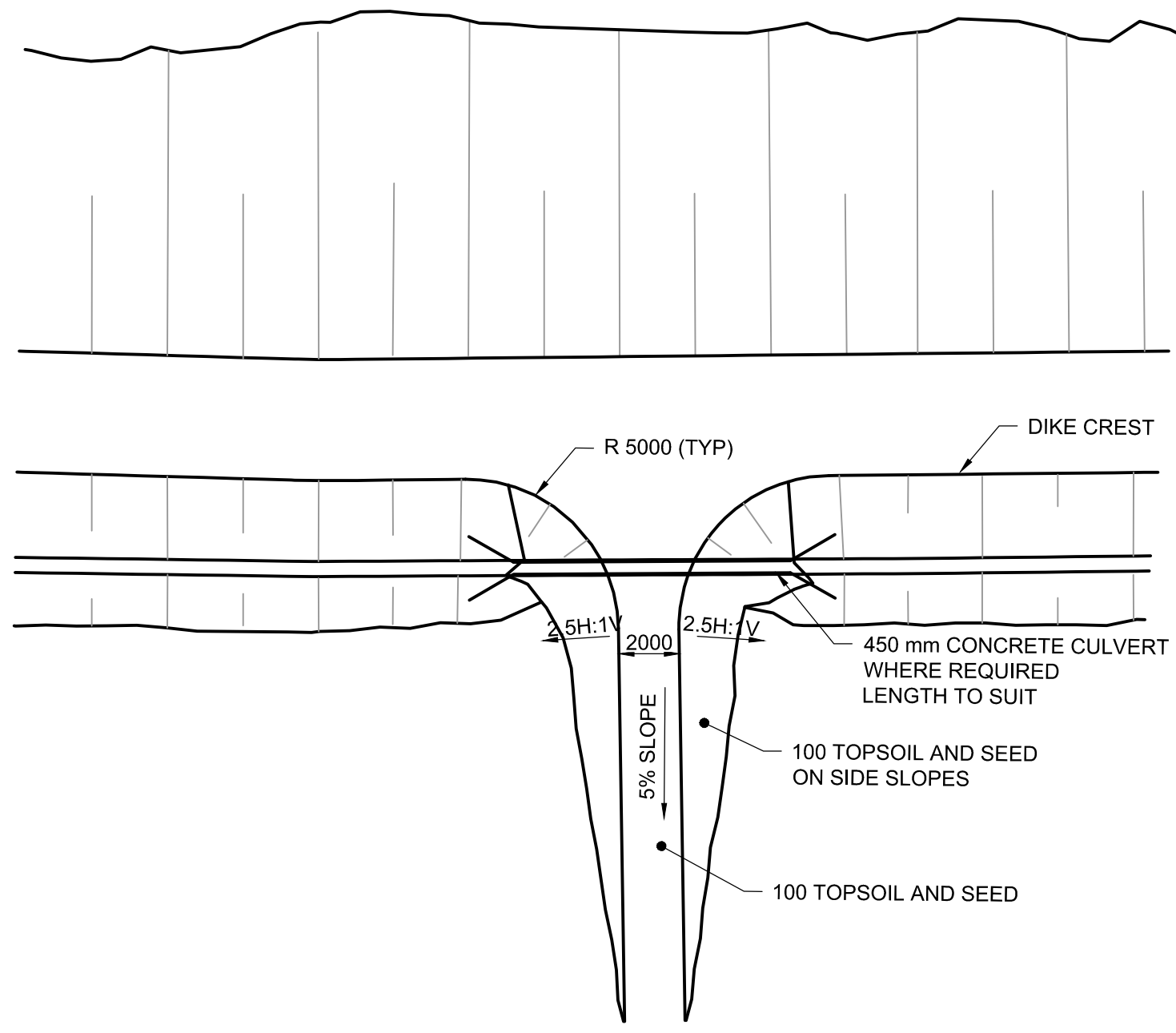
DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE RESILIENCY AND FLOOD MITIGATION PROGRAM			
WILLOW ESTATES DIKE LEGEND			
Project No.	CW2384	Drawing No.	G-002
Group	WILLOW ESTATES	Rev.	3



**TYPICAL LANDSCAPE DIKE CROSSING**  
Scale NTS



**TYPICAL DIKE ACCESS RAMP**  
Scale NTS



**TYPICAL PEDESTRIAN RAMP**  
Scale NTS



Seal:

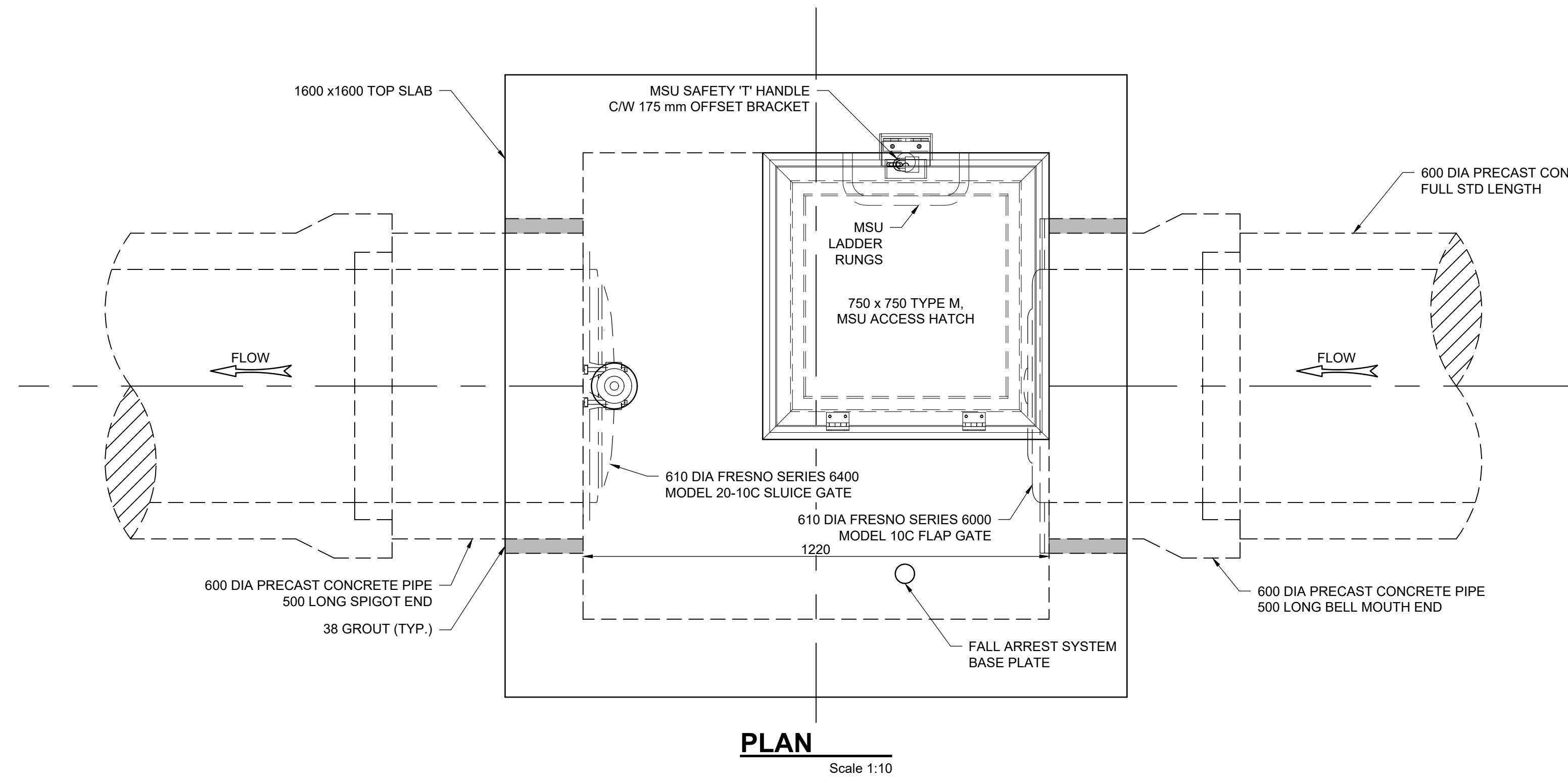
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DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE  
RESILIENCY AND FLOOD MITIGATION PROGRAM

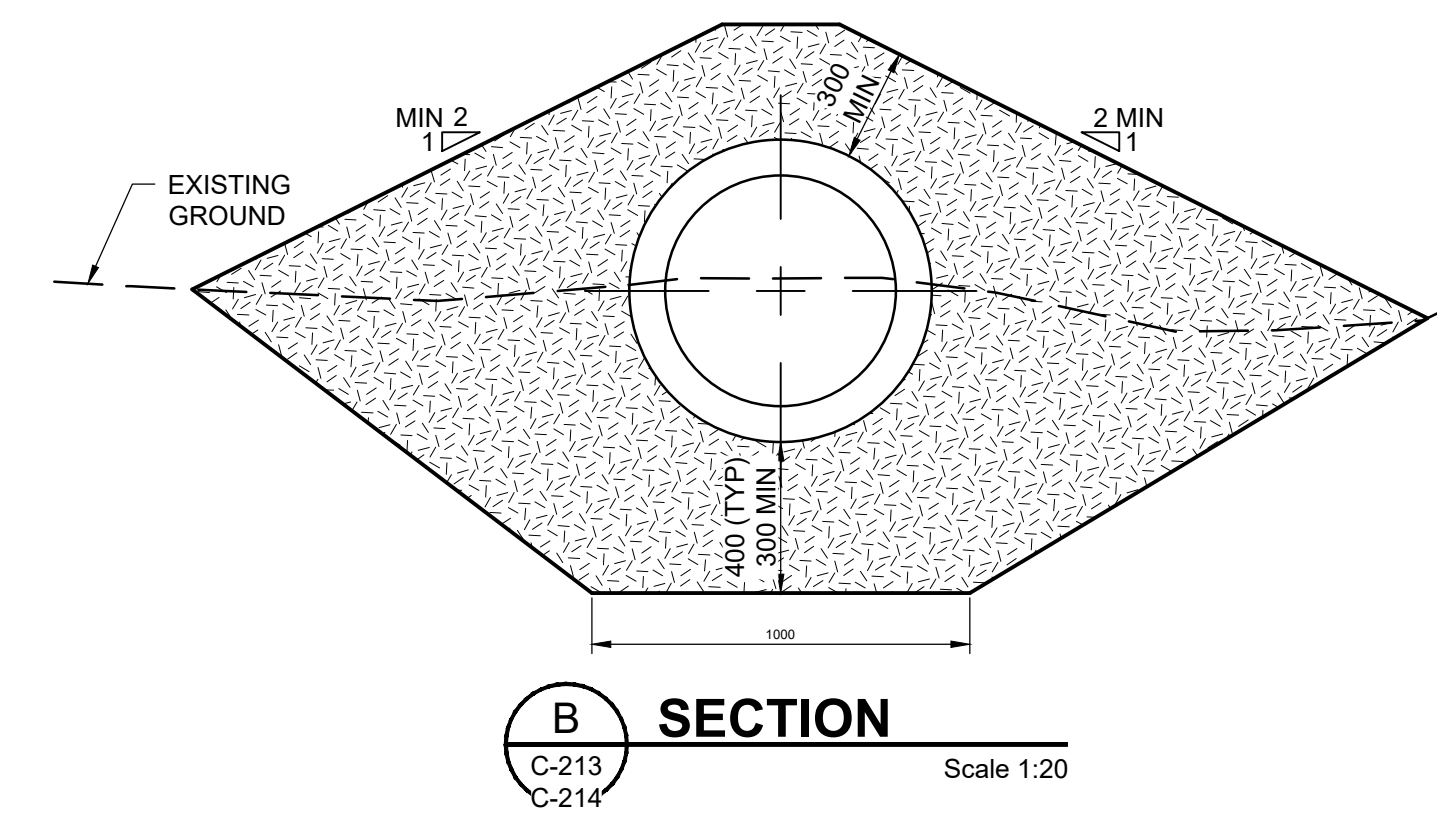
WILLOW ESTATES DIKE  
TYPICAL ACCESS RAMPS

Project No. CW2384 Drawing No. G-501 Rev. 3  
Group WILLOW ESTATES

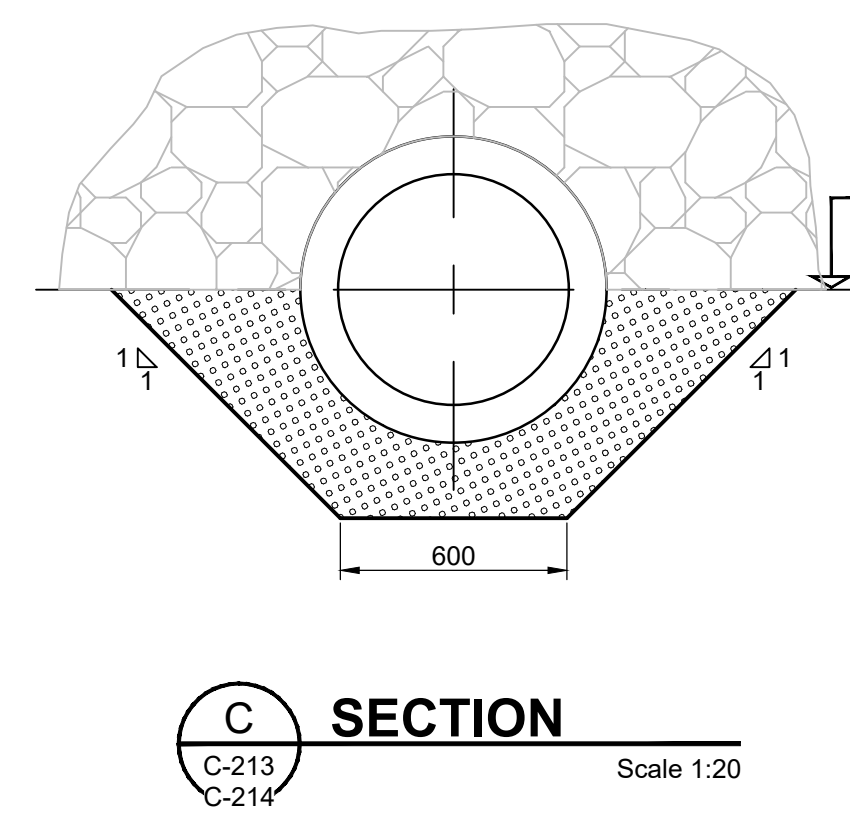
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 100  
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 millimeters  
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 At Full Size, this border measures 320 mm x 80 mm  
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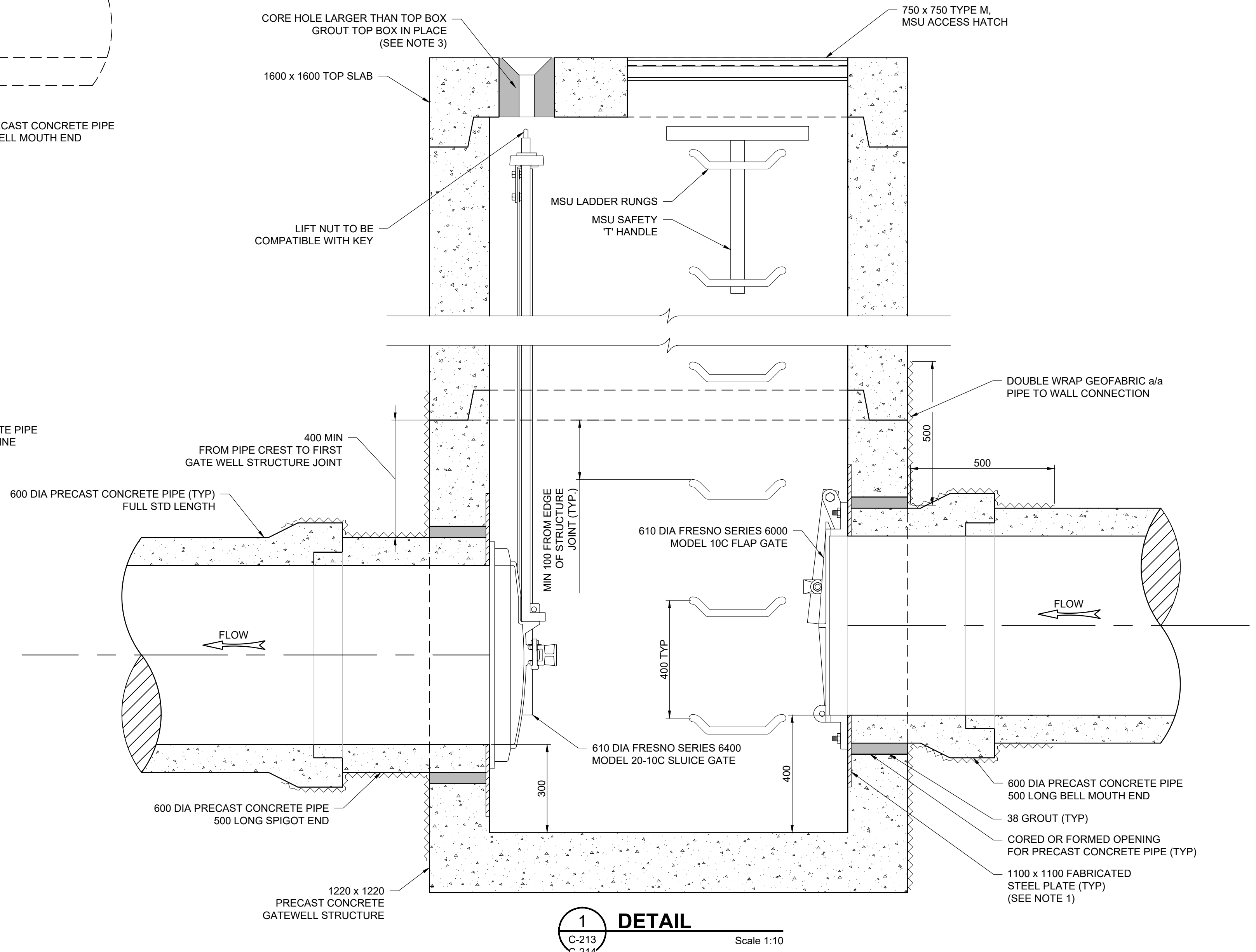
**PLAN**  
Scale 1:10



**B SECTION**  
C-213  
C-214  
Scale 1:20



**C SECTION**  
C-213  
C-214  
Scale 1:20



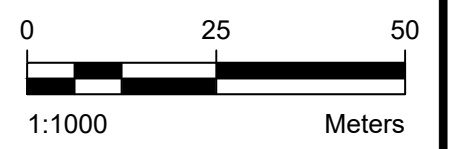
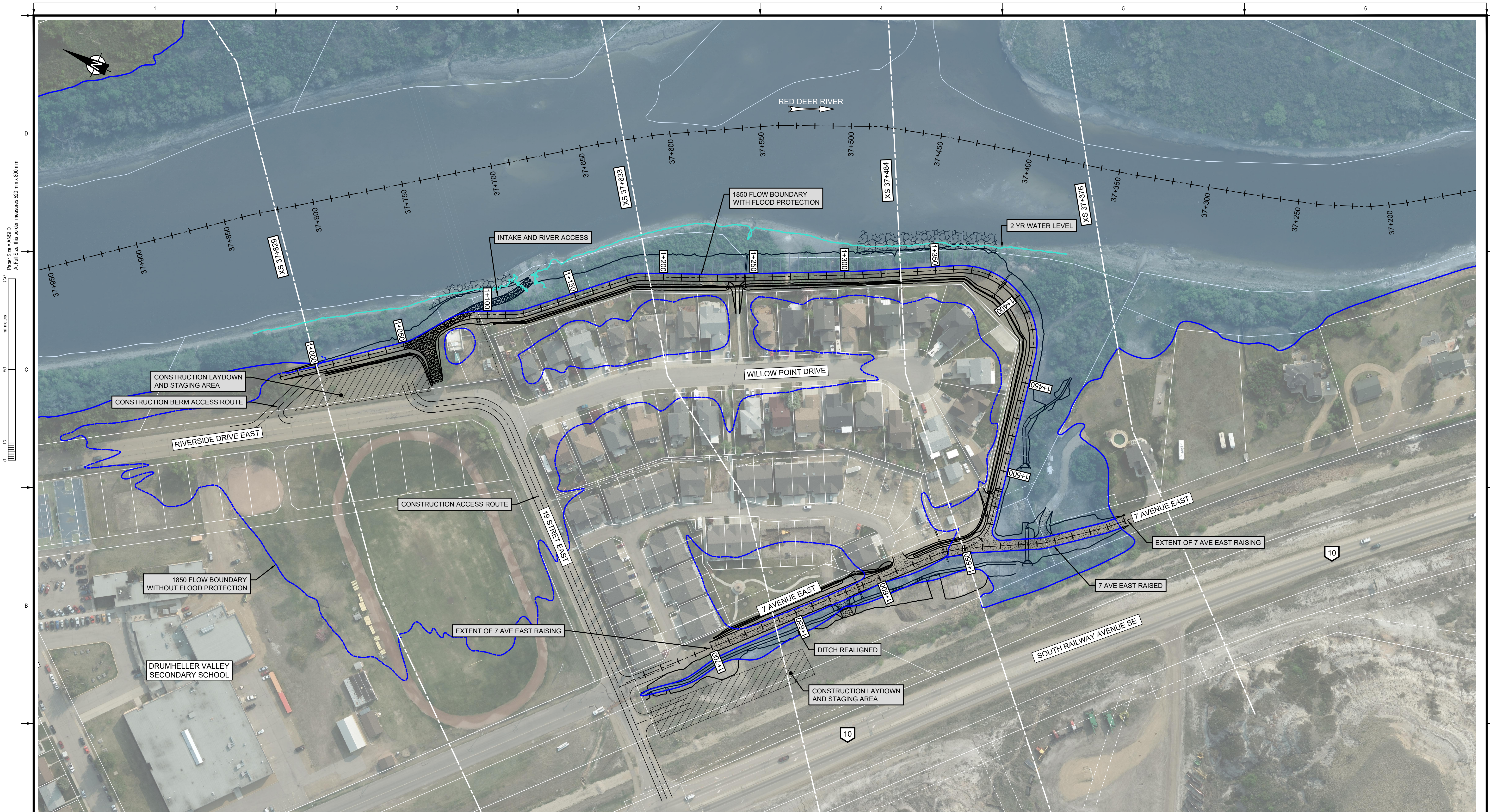
**1 DETAIL**  
C-213  
C-214  
Scale 1:10

- NOTES:**
- FABRICATED STEEL PLATE SHALL HAVE:
    - MINIMUM THICKNESS OF 12mm
    - 530 DIA ANCHOR BOLT CIRCLE
    - WELDED NELSON STUDS W/ AT LEAST 50 CENTRE TO EDGE DISTANCE
  - GATE AND LIFT SYSTEM TO BE DESIGNED FOR 26' (7.9 m) SEATING & 10' (3.1 m) UNSEATING HEAD.
  - CORED HOLE AND TOP BOX LOCATION AS SPECIFIED BY GATE AND LIFT SYSTEM SHOP DRAWINGS. NON-RISING STEM AND LIFT NUT TO BE RECESSED BELOW TOP SLAB. ACCESS TO AND OPERATION OF LIFT NUT TO BE WITH KEYED NUTS, IE. PENTAGON.
  - DRAWINGS ILLUSTRATE BASIC REQUIREMENTS. DETAILS TO BE ESTABLISHED BY CONTRACTOR AND INCLUDED ON SHOP DRAWINGS.



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<b>DRUMHELLER RESILIENCY &amp; FLOOD MITIGATION OFFICE</b>			
<b>RESILIENCY AND FLOOD MITIGATION PROGRAM</b>			
<b>WILLOW ESTATES DIKE</b>			
<b>TYPICAL CULVERT AND MANHOLE</b>			
<b>SECTIONS AND DETAILS</b>			
Project No.	CW2384	Drawing No.	
Group	WILLOW ESTATES		
		<b>G-502</b>	<b>3</b>



wood.

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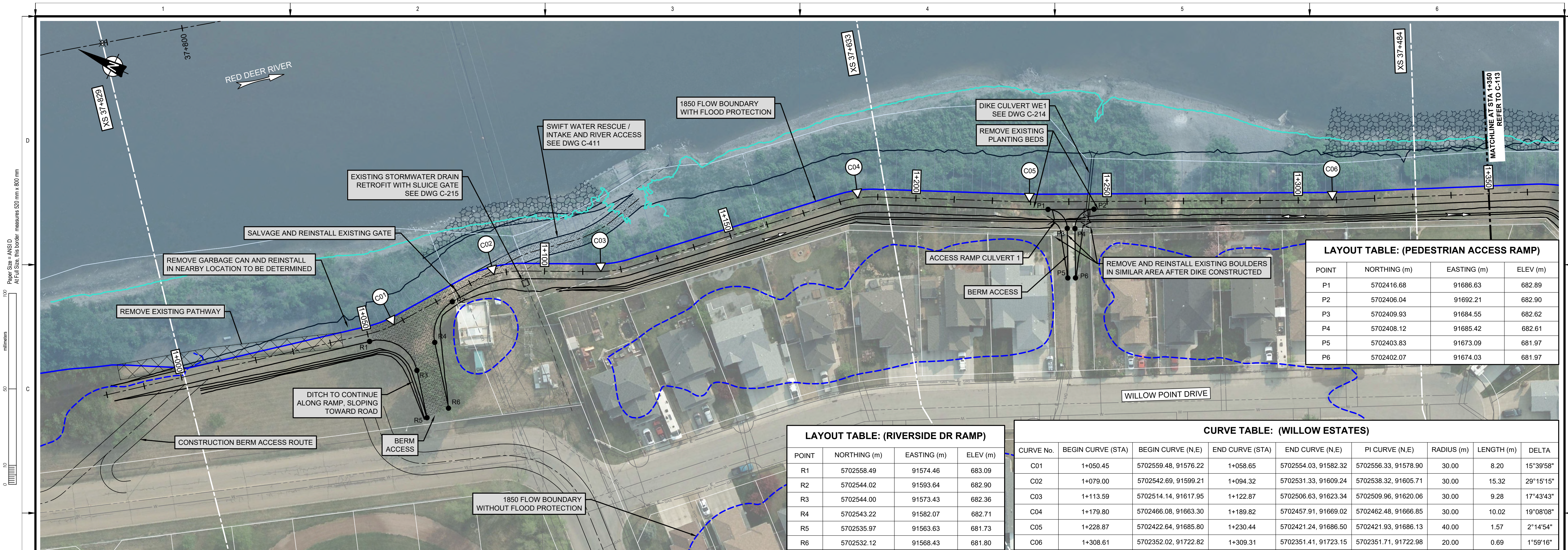
DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE  
RESILIENCY AND FLOOD MITIGATION PROGRAM

WILLOW ESTATES  
PLAN

Project No. CW2384  
Group WILLOW ESTATES

Drawing No.

C-111 Rev. 3



**LAYOUT TABLE: (PEDESTRIAN ACCESS RAMP)**

POINT	NORTHING (m)	EASTING (m)	ELEV (m)
P1	5702416.68	91686.63	682.89
P2	5702406.04	91692.21	682.90
P3	5702409.93	91684.55	682.62
P4	5702408.12	91685.42	682.61
P5	5702403.83	91673.09	681.97
P6	5702402.07	91674.03	681.97

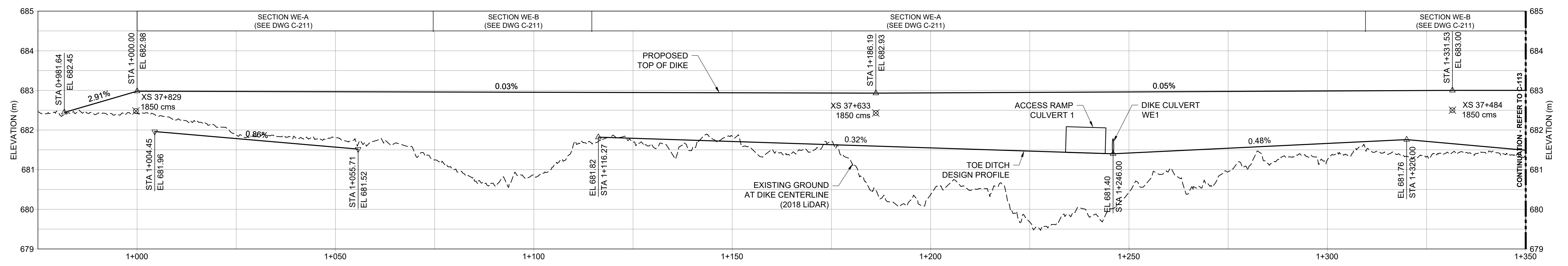
**LAYOUT TABLE: (RIVERSIDE DR RAMP)**

POINT	NORTHING (m)	EASTING (m)	ELEV (m)
R1	5702558.49	91574.46	683.09
R2	5702544.02	91593.64	682.90
R3	5702544.00	91573.43	682.36
R4	5702543.22	91582.07	682.71
R5	5702535.97	91563.63	681.73
R6	5702532.12	91568.43	681.80

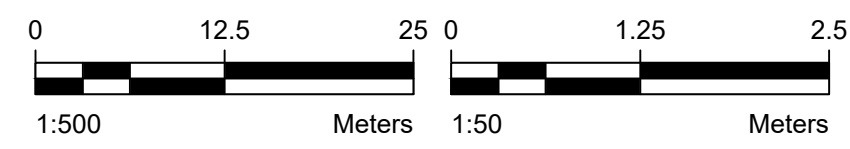
**CURVE TABLE: (WILLOW ESTATES)**

CURVE No.	BEGIN CURVE (STA)	BEGIN CURVE (N.E)	END CURVE (STA)	END CURVE (N.E)	PI CURVE (N.E)	RADIUS (m)	LENGTH (m)	DELTA
C01	1+050.45	5702559.48, 91576.22	1+058.65	5702554.03, 91582.32	5702556.33, 91578.90	30.00	8.20	15°39'58"
C02	1+079.00	5702542.69, 91599.21	1+094.32	5702531.33, 91609.24	5702538.32, 91605.71	30.00	15.32	29°15'15"
C03	1+113.59	5702514.14, 91617.95	1+122.87	5702506.63, 91623.34	5702509.96, 91620.06	30.00	9.28	17°43'43"
C04	1+179.80	5702466.08, 91663.30	1+189.82	5702457.91, 91669.02	5702462.48, 91666.85	30.00	10.02	19°08'08"
C05	1+228.87	5702422.64, 91685.80	1+230.44	5702421.24, 91686.50	5702421.93, 91686.13	40.00	1.57	2°14'54"
C06	1+308.61	5702352.02, 91722.82	1+309.31	5702351.41, 91723.15	5702351.71, 91722.98	20.00	0.69	1°59'16"

**PLAN - WILLOW ESTATES DIKE CENTERLINE**  
Scale 1:500



**PROFILE - WILLOW ESTATES DIKE CENTERLINE**  
Scale H 1:500 \ V 1:50

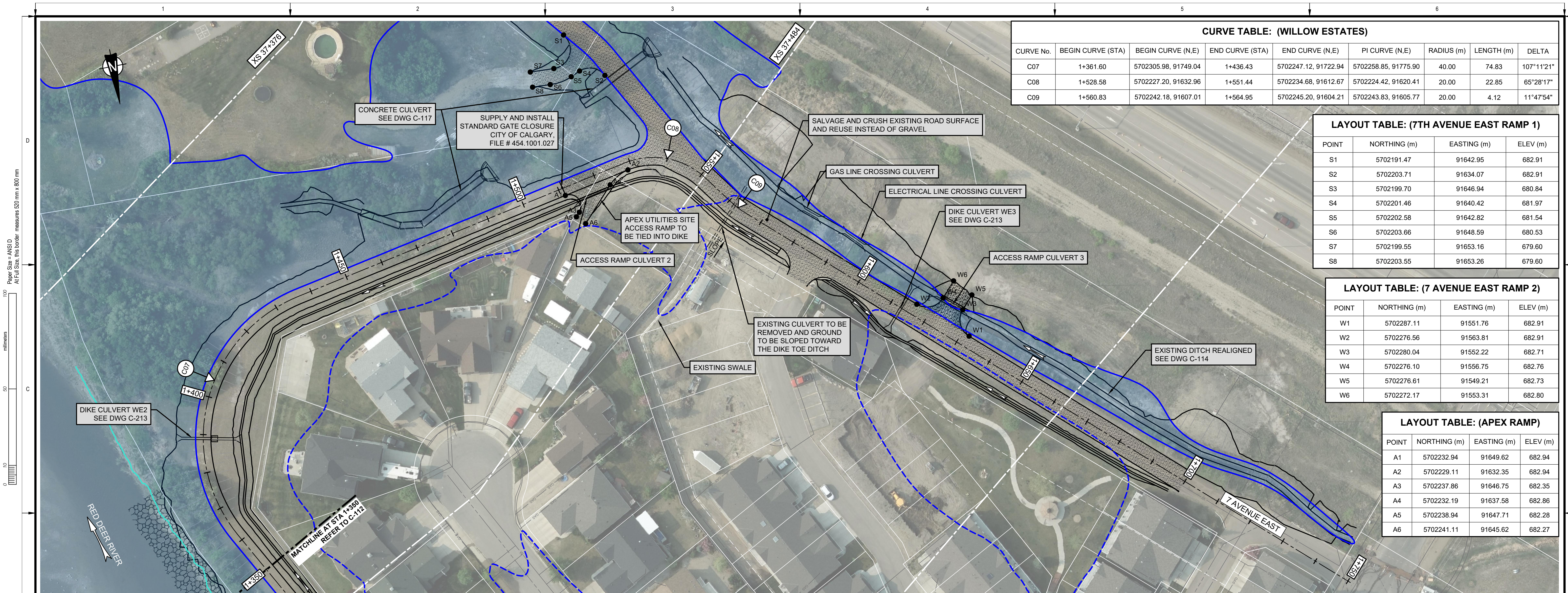


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RESILIENCY AND FLOOD MITIGATION PROGRAM

**WILLOW ESTATES DIKE**  
PLAN AND PROFILE  
SHEET 1 OF 2

Project No. **CW2384** Drawing No. **C-112** Rev. **3**  
Group **WILLOW ESTATES**



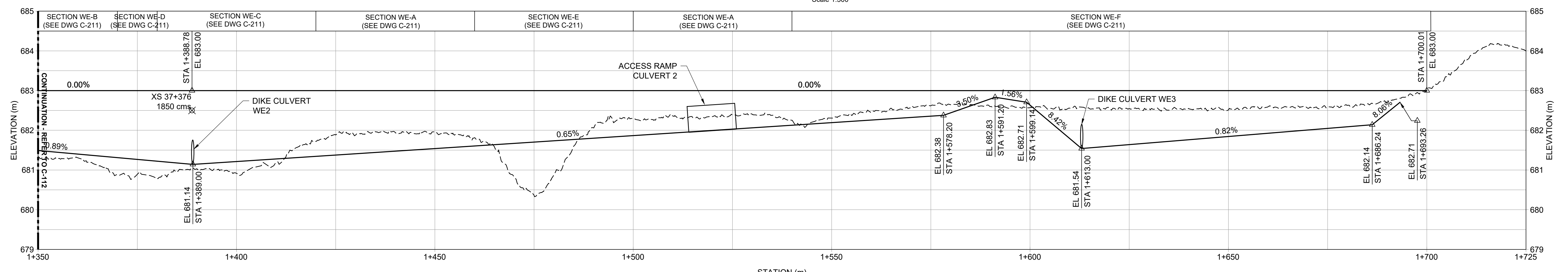
CURVE TABLE: (WILLOW ESTATES)								
CURVE No.	BEGIN CURVE (STA)	BEGIN CURVE (N,E)	END CURVE (STA)	END CURVE (N,E)	PI CURVE (N,E)	RADIUS (m)	LENGTH (m)	DELTA
C07	1+361.60	5702305.98, 91749.04	1+436.43	5702247.12, 91722.94	5702258.85, 91775.90	40.00	74.83	107°11'21"
C08	1+528.58	5702227.20, 91632.96	1+551.44	5702234.68, 91612.67	5702224.42, 91620.41	20.00	22.85	65°28'17"
C09	1+560.83	5702242.18, 91607.01	1+564.95	5702245.20, 91604.21	5702243.83, 91605.77	20.00	4.12	11°47'54"

LAYOUT TABLE: (7TH AVENUE EAST RAMP 1)			
POINT	NORTHING (m)	EASTING (m)	ELEV (m)
S1	5702191.47	91642.95	682.91
S2	5702203.71	91634.07	682.91
S3	5702199.70	91646.94	680.84
S4	5702201.46	91640.42	681.97
S5	5702202.58	91642.82	681.54
S6	5702203.66	91648.59	680.53
S7	5702199.55	91653.16	679.60
S8	5702203.55	91653.26	679.60

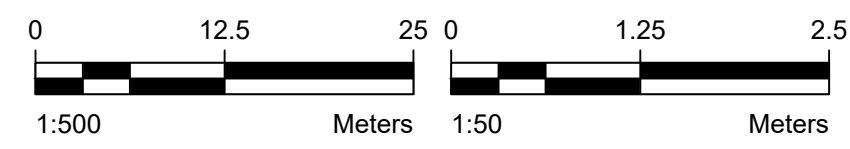
LAYOUT TABLE: (7 AVENUE EAST RAMP 2)			
POINT	NORTHING (m)	EASTING (m)	ELEV (m)
W1	5702287.11	91551.76	682.91
W2	5702276.56	91563.81	682.91
W3	5702280.04	91552.22	682.71
W4	5702276.10	91556.75	682.76
W5	5702276.61	91549.21	682.73
W6	5702272.17	91553.31	682.80

LAYOUT TABLE: (APEX RAMP)			
POINT	NORTHING (m)	EASTING (m)	ELEV (m)
A1	5702232.94	91649.62	682.94
A2	5702229.11	91632.35	682.94
A3	5702237.86	91646.75	682.35
A4	5702232.19	91637.58	682.86
A5	5702238.94	91647.71	682.28
A6	5702241.11	91645.62	682.27

**PLAN - WILLOW ESTATES DIKE CENTERLINE**  
Scale 1:500



**PROFILE - WILLOW ESTATES DIKE CENTERLINE**  
Scale H 1:500 | V 1:50

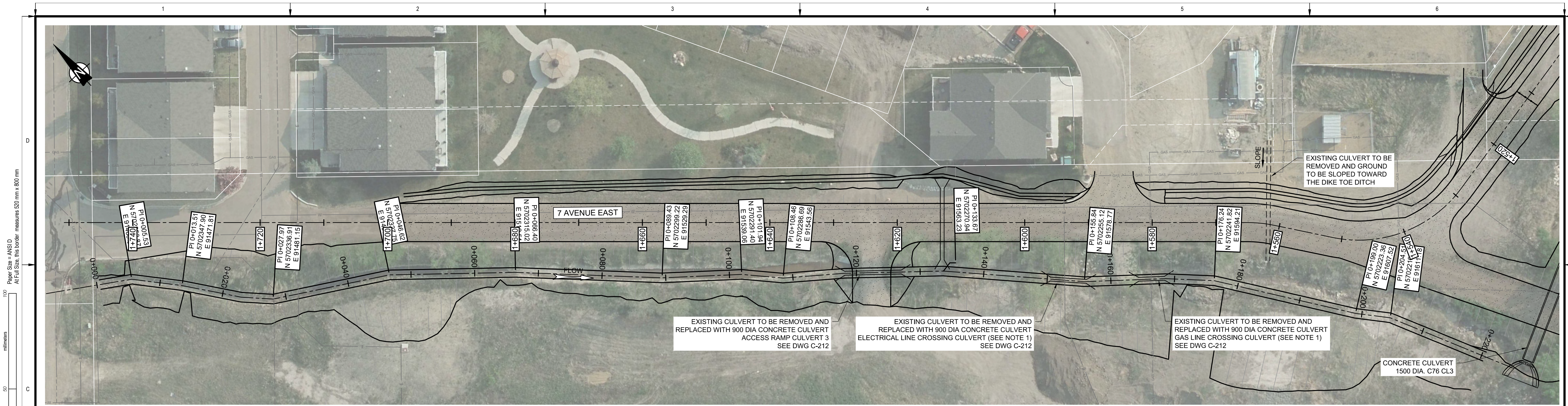


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RESILIENCY AND FLOOD MITIGATION PROGRAM

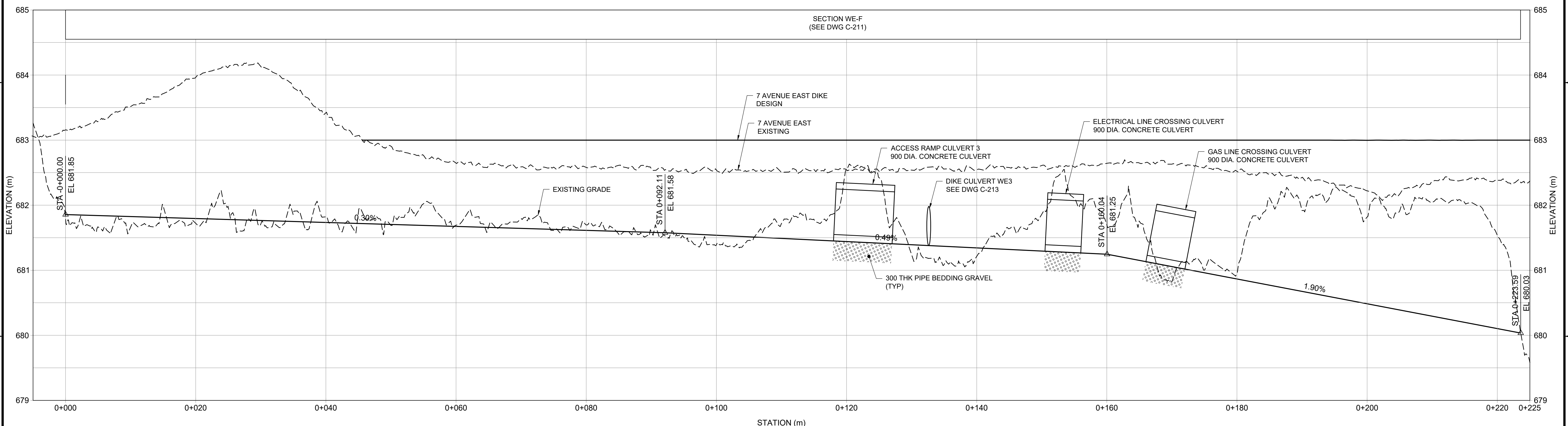
**WILLOW ESTATES DIKE**  
PLAN AND PROFILE  
SHEET 2 OF 2

Project No. **CW2384** | Drawing No. **C-113** | Rev. **3**  
Group **WILLOW ESTATES**



**PLAN - 7TH AVENUE DITCH REALIGNMENT CENTERLINE**

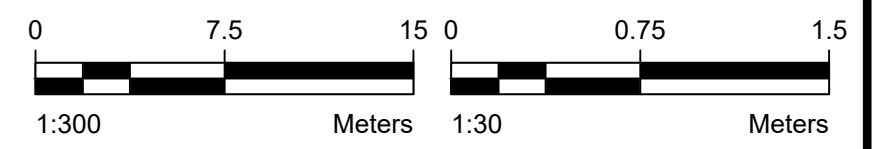
Scale 1:300



**PROFILE - 7TH AVENUE DITCH REALIGNMENT CENTERLINE**

Scale H 1:300 | V 1:30

- NOTES:
- CULVERTS OVER UTILITY LINES MAY NOT BE REQUIRED BASED ON UTILITY DEPTH OF COVER. CONTRACTOR IS RESPONSIBLE TO DAYLIGHT UTILITIES TO CONFIRM DEPTH OF COVER PRIOR TO CULVERT REMOVAL AND REPLACEMENT.



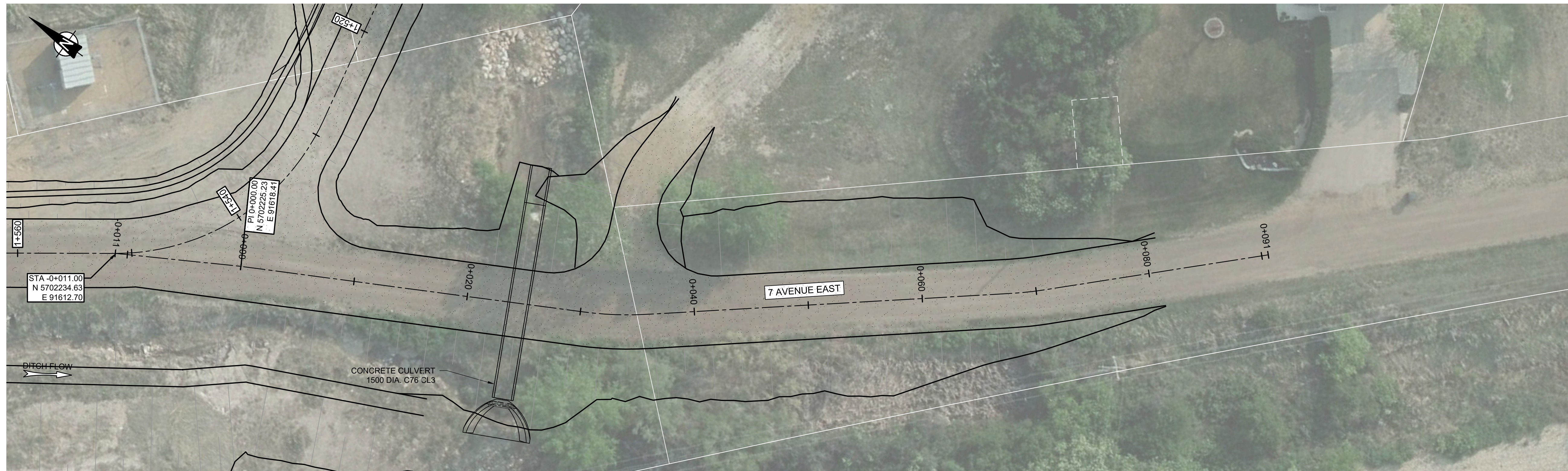
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**DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE**  
**RESILIENCY AND FLOOD MITIGATION PROGRAM**

**WILLOW ESTATES DIKE**  
**7TH AVENUE DITCH REALIGNMENT**  
**PLAN AND PROFILE**

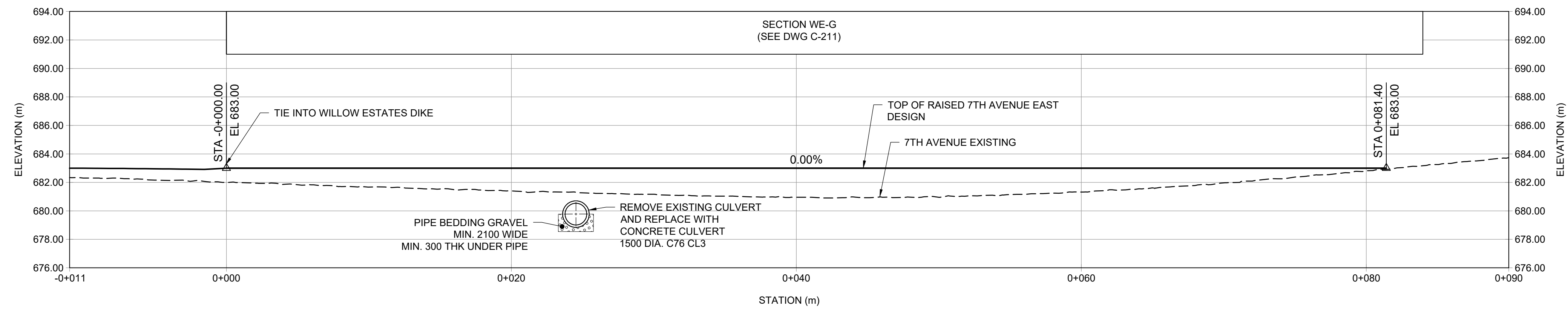
Project No. **CW2384** Drawing No. **C-114** Rev. **3**  
 Group **WILLOW ESTATES**





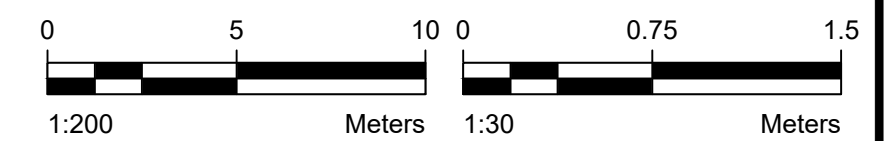
**PLAN - 7TH AVENUE EAST ROAD RAISE CENTERLINE**

Scale 1:200



**PROFILE - 7TH AVENUE EAST ROAD RAISE CENTERLINE**

Scale 1:200



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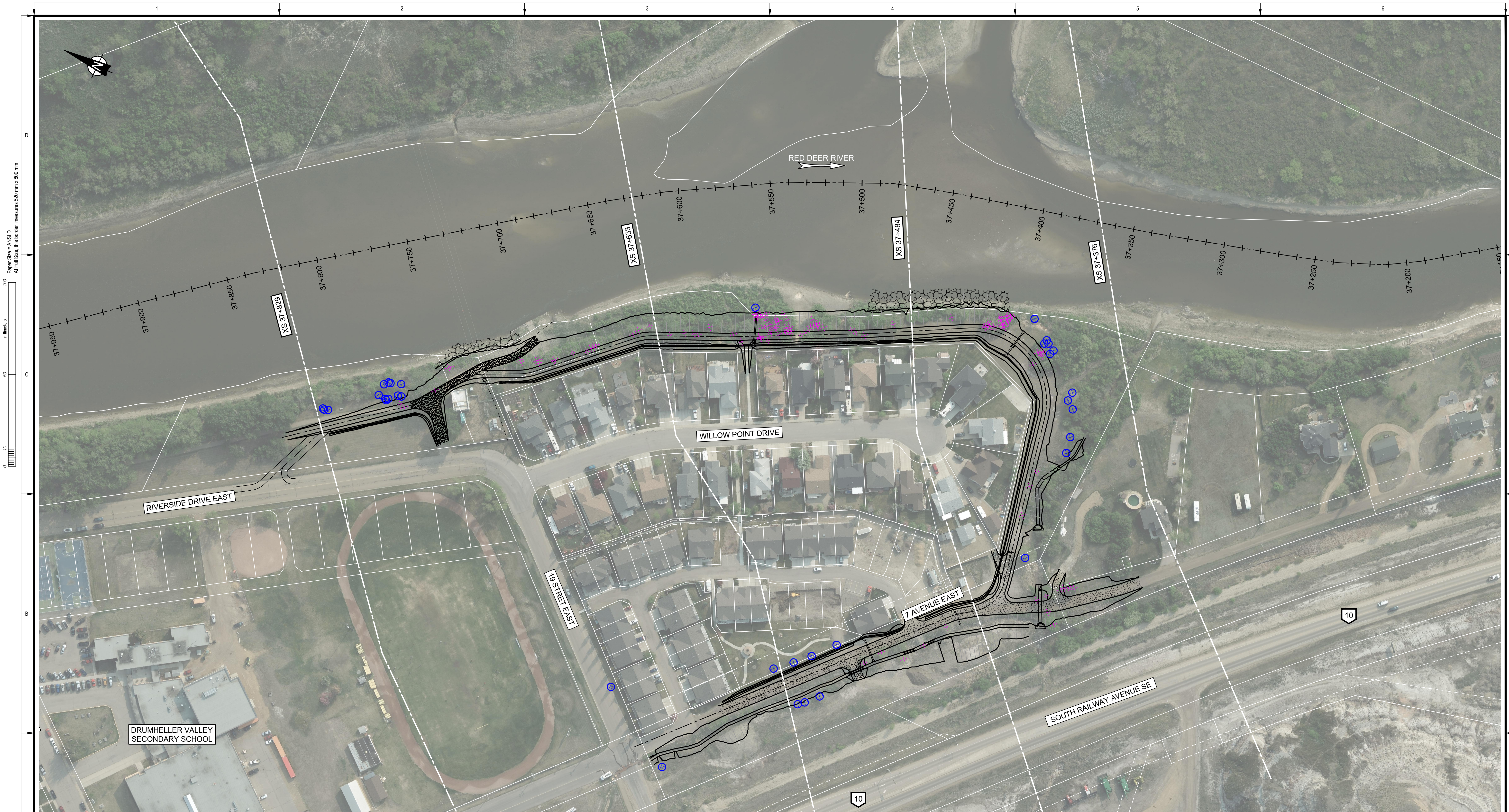
DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE  
RESILIENCY AND FLOOD MITIGATION PROGRAM

WILLOW ESTATES DIKE  
EAST 7TH AVENUE ROAD  
PLAN AND PROFILE

Project No. CW2384  
Group WILLOW ESTATES

Drawing No.

C-115 3

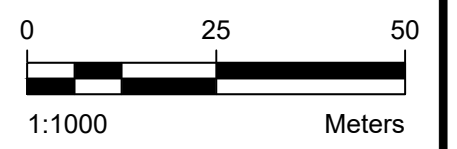


**NOTES:**

1. SMALL TREES, BUSHES, AND SHRUBS TO BE CLEARED AND GRUBBED PER DIKE FOOTPRINT AS REQUIRED
2. TOTAL TREES TO BE CLEARED: 148

**LEGEND**

- ✕ TREES TO BE CLEARED
- ⊗ TREES TO BE PRUNED OR LEFT AS-IS



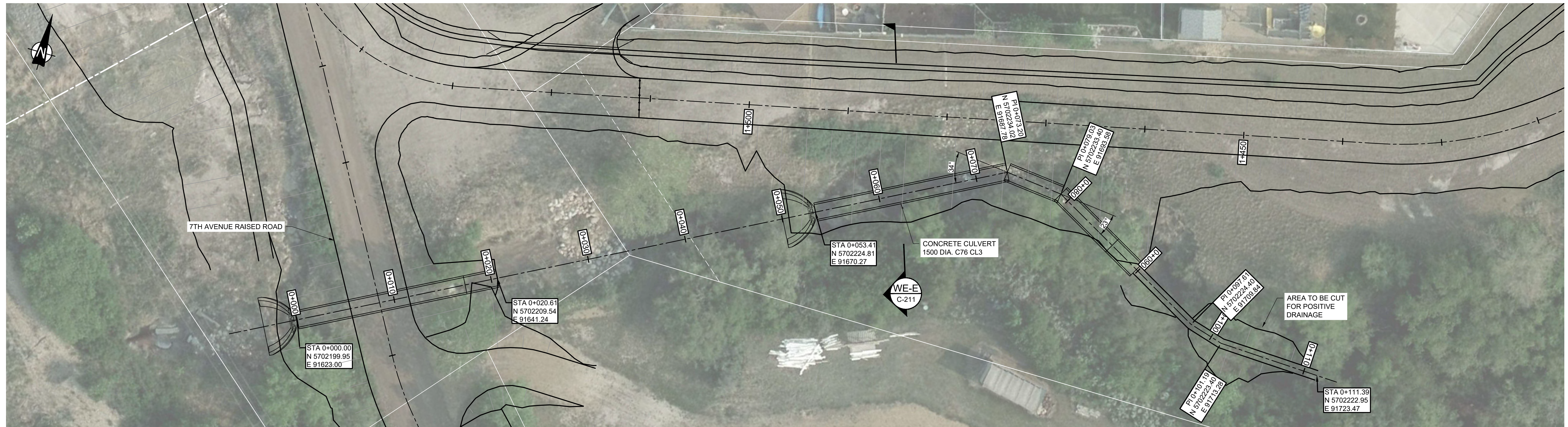
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Rev	Date	Des	Dwn	Chk	Description
0	2021-10-05	SW	JH	LM	ISSUED FOR REVIEW
1	2022-04-27	SW	JH	LM	ISSUED FOR REGULATORY REVIEW
2	2022-06-17	SW	JH	LM	ISSUED FOR TENDER
3	2022-08-05	SW	JH	LM	ISSUED FOR CONSTRUCTION

**DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE**  
**RESILIENCY AND FLOOD MITIGATION PROGRAM**

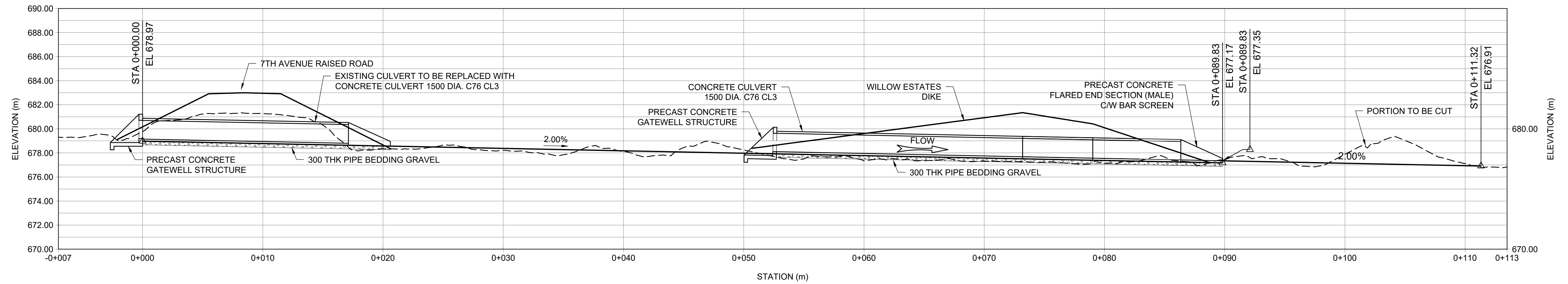
**WILLOW ESTATES DIKE**  
**TREE CLEARING**  
**PLAN**

Project No. <b>CW2384</b>	Drawing No.
Group <b>WILLOW ESTATES</b>	<b>C-116</b> <span style="float: right;">Rev. <b>3</b></span>



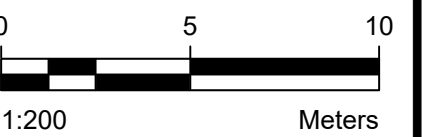
**PLAN - CONCRETE CULVERT AND GULLY CENTERLINE**

Scale 1:200



**PROFILE - CONCRETE CULVERT AND GULLY CENTERLINE**

Scale 1:200



Rev	Date	Des	Dwn	Chk	Description
0	2021-10-05	SW	JH	LM	ISSUED FOR REVIEW
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3	2022-08-05	SW	JH	LM	ISSUED FOR CONSTRUCTION

DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE  
RESILIENCY AND FLOOD MITIGATION PROGRAM

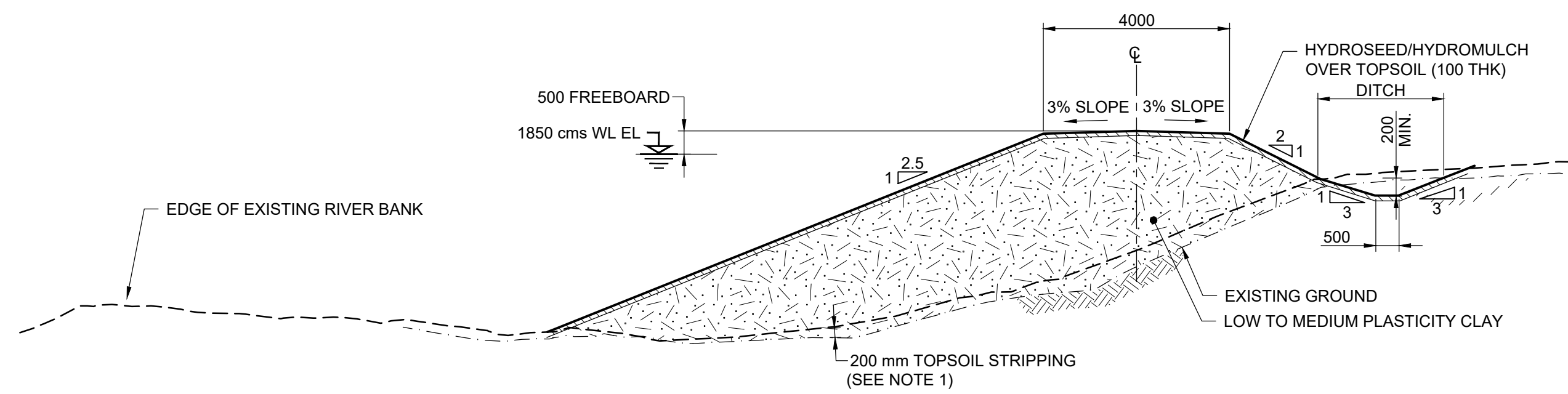
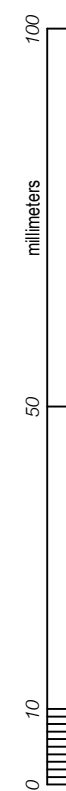
WILLOW ESTATES DIKE  
CONCRETE CULVERT  
PLAN AND PROFILE

Project No. **CW2384**  
Group **WILLOW ESTATES**

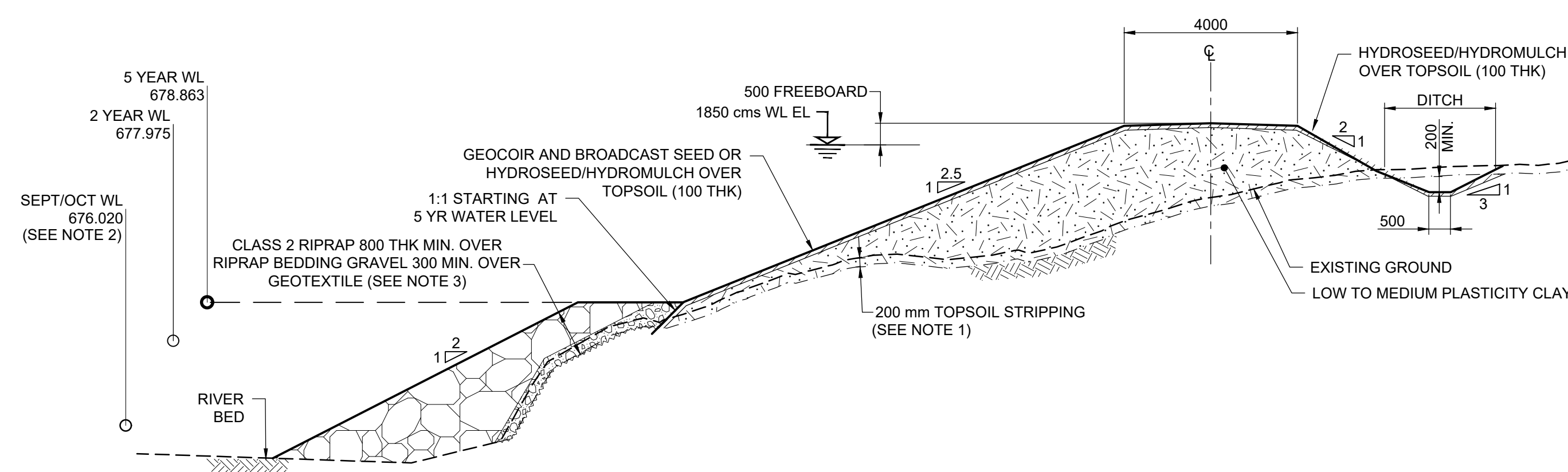
Drawing No.

**C-117** Rev. **3**

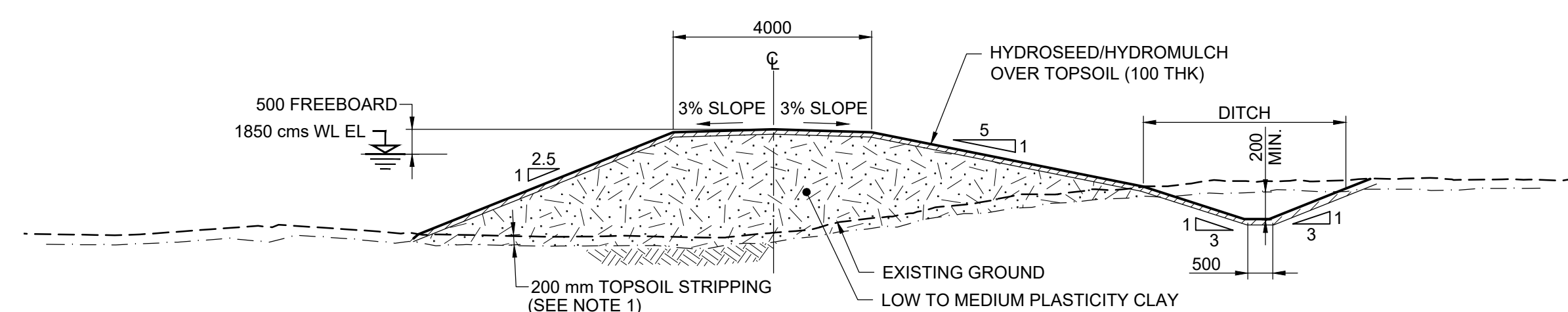
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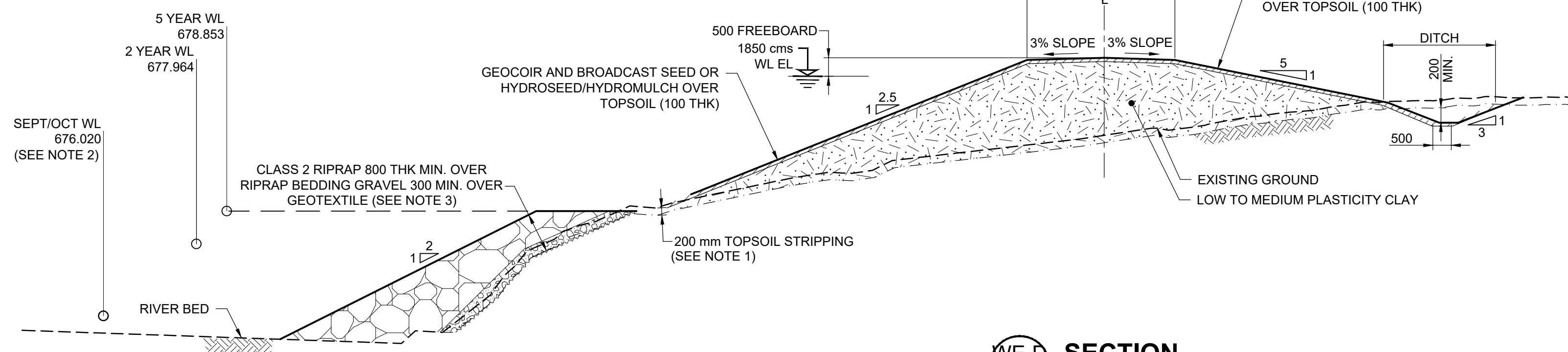
**WE-A SECTION**  
C-112  
C-113 Scale 1:100



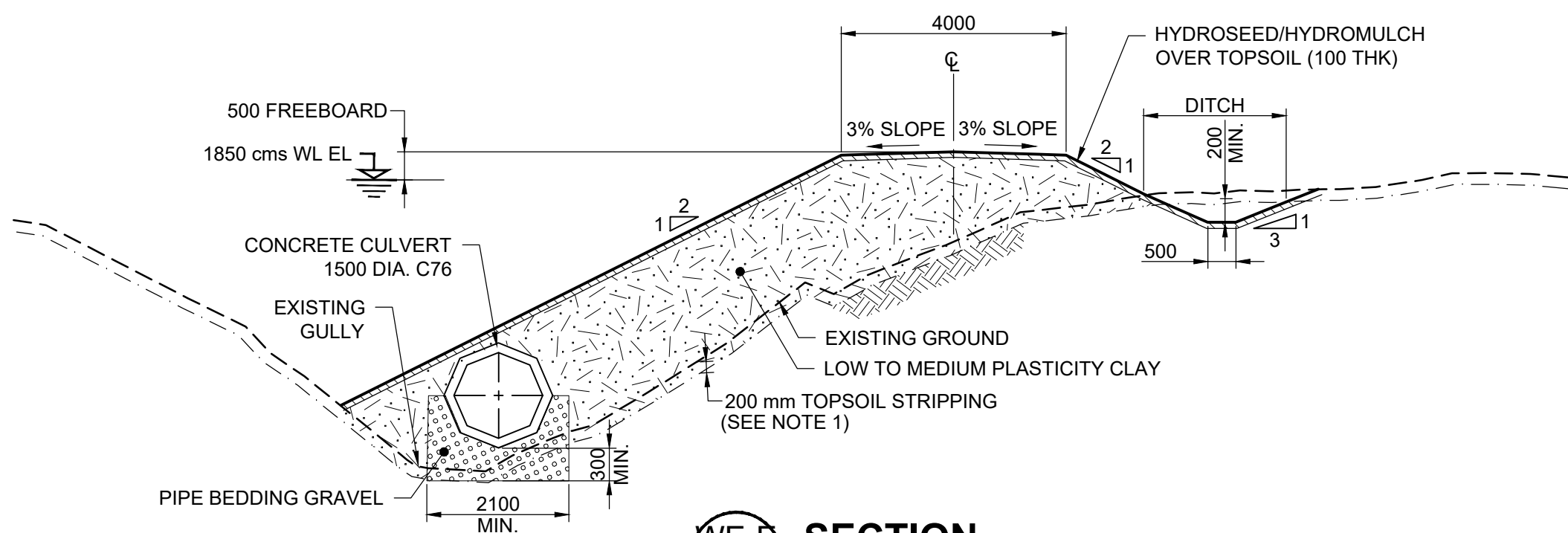
**WE-B SECTION**  
C-112  
C-113 Scale 1:100



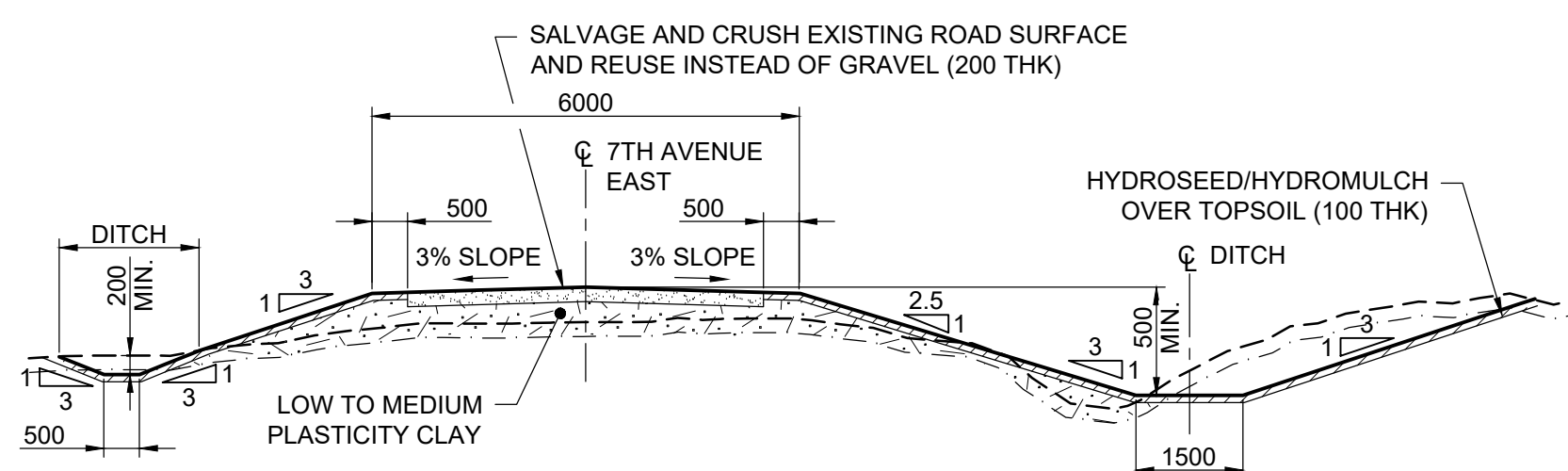
**WE-C SECTION**  
C-113 Scale 1:100



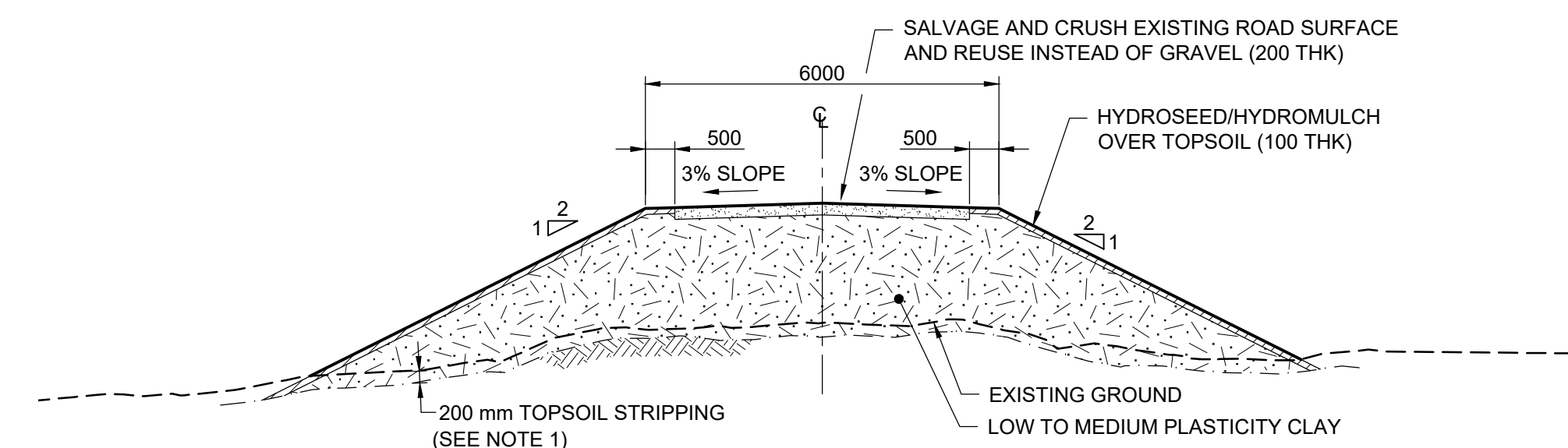
**WE-D SECTION**  
C-113 Scale 1:100



**WE-E SECTION**  
C-113 Scale 1:100

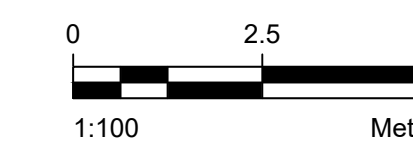


**WE-F SECTION**  
C-113  
C-114 Scale 1:100



**WE-G SECTION**  
C-115 Scale 1:100

- NOTES:**
- ADDITIONAL EXCAVATION OR KEY TRENCH MAY BE REQUIRED BASED ON SITE-SPECIFIC FACTORS AS DIRECTED BY ENGINEER.
  - SEPTEMBER AND OCTOBER AVERAGE WATER LEVELS NOTED ON THE DRAWING ARE STATISTICAL AVERAGES BASED ON HISTORICAL DATA AND ARE PROVIDED FOR INFORMATION ONLY. WATER LEVELS DURING CONSTRUCTION MAY VARY.
  - GEOTEXTILE ONLY PLACED AS DIRECTED BY THE CONSULTANT.

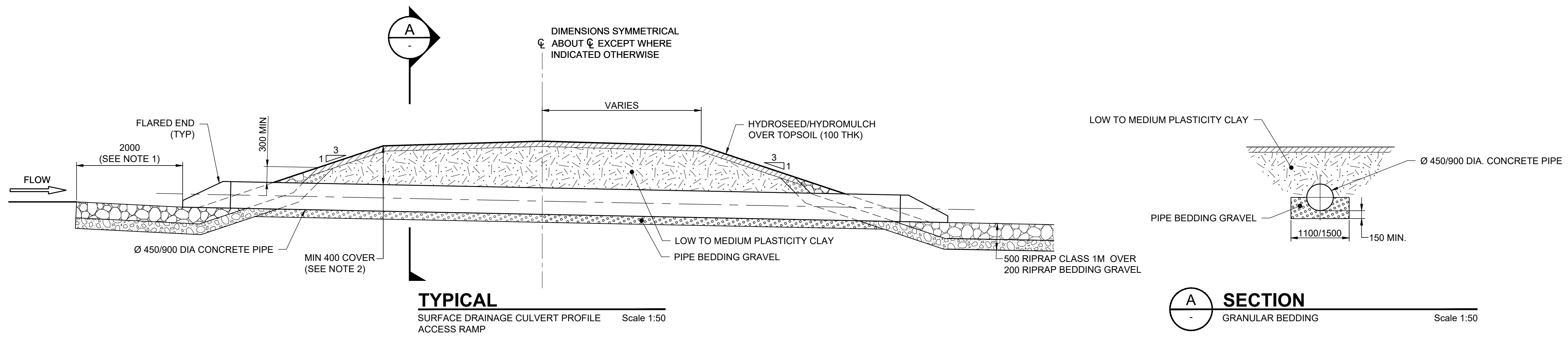


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**DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE**  
**RESILIENCY AND FLOOD MITIGATION PROGRAM**

**WILLOW ESTATES DIKE**  
**TYPICAL SECTIONS**

Project No. **CW2384** Drawing No. **C-211** Rev. **3**  
Group **WILLOW ESTATES**

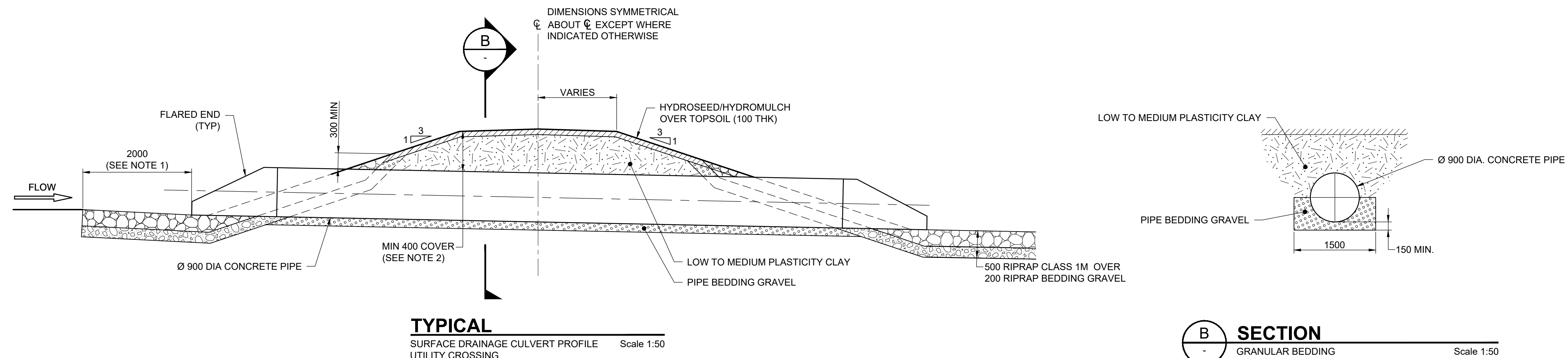


**TYPICAL**  
SURFACE DRAINAGE CULVERT PROFILE  
ACCESS RAMP Scale 1:50

**A SECTION**  
GRANULAR BEDDING Scale 1:50

WILLOW ESTATES DIKE ACCESS RAMPS - SURFACE DRAINAGE STRUCTURES LAYOUT SUMMARY											
RAMP No.	REF DWG	STA $\ell$	DIKE CREST EL	DIKE CL COORDINATE	PIPE DIA. (mm)	TOTAL LENGTH (mm)	FLARED END INLET INVERT EL	FLARED END INLET COORDINATE	FLARED END OUTLET INVERT EL	FLARED END OUTLET COORDINATE	
1	C-112	1+241	682.96	N 5702412.79, E 91690.93	450	10000	681.43	N 5702414.20, E 91684.60	681.40	N 5702405.68, E 91689.02	
2	C-113	1+520	683.00	N 5702229.27, E 91642.34	450	12000	682.03	N 5702232.47, E 91635.08	681.95	N 5702234.84, E 91646.04	

7TH AVENUE DITCH REALIGNMENT ACCESS RAMPS - SURFACE DRAINAGE STRUCTURES LAYOUT SUMMARY											
RAMP No.	REF DWG	STA $\ell$	DIKE CREST EL	DIKE CL COORDINATE	PIPE DIA. (mm)	TOTAL LENGTH (mm)	FLARED END INLET INVERT EL	FLARED END INLET COORDINATE	FLARED END OUTLET INVERT EL	FLARED END OUTLET COORDINATE	
3	C-113 / C-114	0+123	683.00	N 5702283.73, E 91560.17	900	9000	681.45	N 5702280.87, E 91551.35	681.40	N 5702275.15, E 91558.19	

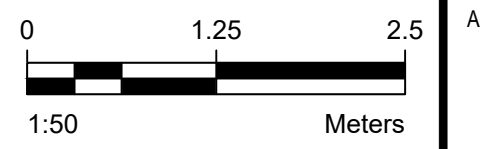


**TYPICAL**  
SURFACE DRAINAGE CULVERT PROFILE  
UTILITY CROSSING Scale 1:50

**B SECTION**  
GRANULAR BEDDING Scale 1:50

7TH AVENUE DITCH REALIGNMENT UTILITY CROSSINGS - SURFACE DRAINAGE STRUCTURES LAYOUT SUMMARY											
RAMP	REF DWG	STA $\ell$	DIKE CREST EL	DIKE CL COORDINATE	PIPE DIA. (mm)	TOTAL LENGTH (mm)	FLARED END INLET INVERT EL	FLARED END INLET COORDINATE	FLARED END OUTLET INVERT EL	FLARED END OUTLET COORDINATE	
ELECTRICAL LINE	C-114	0+153	683.00	N 5702264.19, E 91582.50	900	6000	681.29	N 5702258.57, E 91574.84	681.26	N 5702254.91, E 91579.08	
GAS LINE	C-114	0+166	683.00	N 5702255.62, E 91592.29	900	6000	681.16	N 5702249.69, E 91585.48	681.08	N 5702247.11, E 91588.66	

- NOTES:**
- TRANSITION FROM UPSTREAM AND DOWNSTREAM DITCH TO CULVERT INLET AND OUTLET OVER 2000 DISTANCE. SET CULVERT INLET AND OUTLET INVERTS 100 mm BELOW UPSTREAM AND DOWNSTREAM DITCH INVERTS.
  - PROVIDE MINIMUM 400 COVER OVER CULVERT CROWN.

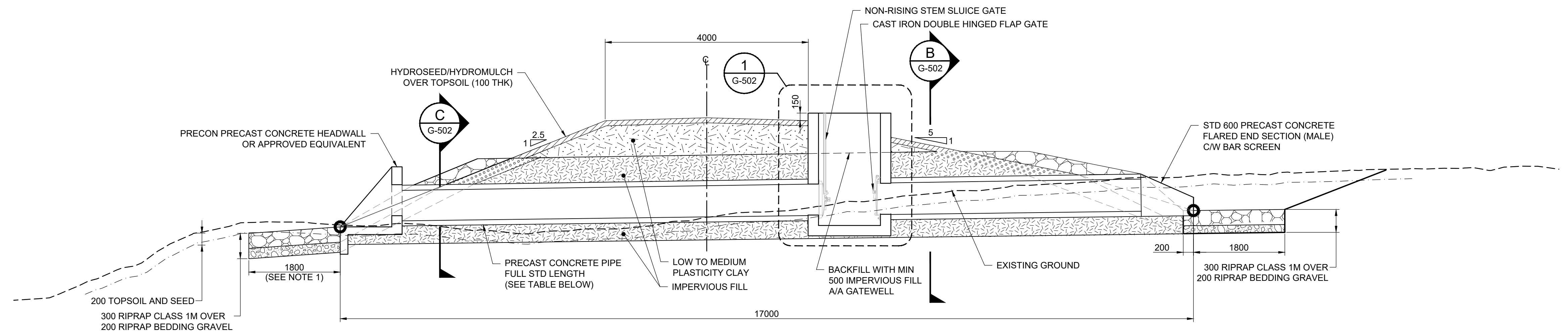


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**DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE**  
RESILIENCY AND FLOOD MITIGATION PROGRAM

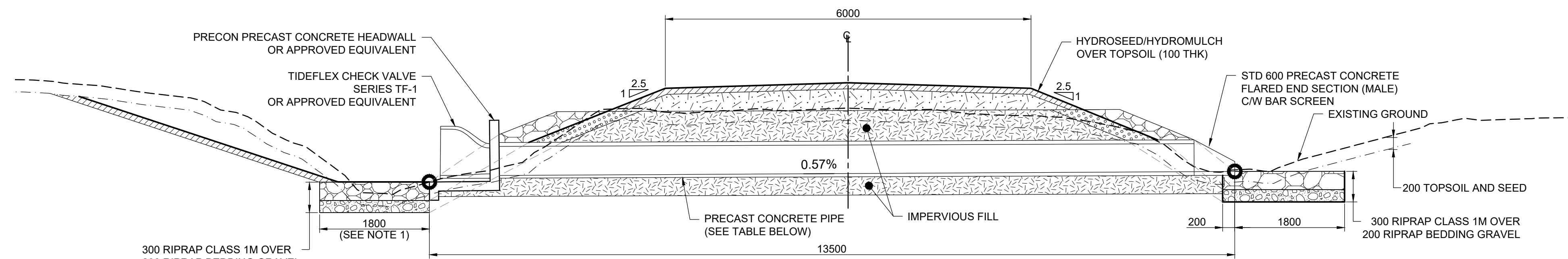
**WILLOW ESTATES**  
ACCESS RAMP AND UTILITY CROSSING CULVERT SECTIONS

Project No. **CW2384** Drawing No. **C-212** Rev. **3**  
Group **WILLOW ESTATES**



**SECTION**  
SURFACE DRAINAGE STRUCTURE Scale 1:50

WILLOW ESTATES DIKE SURFACE DRAINAGE STRUCTURES LAYOUT SUMMARY													
CULVERT No.	STA	DIKE CREST EL	DIKE CL COORDINATE	PIPE DIA. (mm)	TOTAL LENGTH (mm)	FLARED END INLET INVERT EL	FLARED END INLET COORDINATE	PIPE OUTLET INVERT EL	HEADWALL INVERT EL	HEADWALL COORDINATE	GATEWELL INLET INVERT EL	GATEWELL OUTLET INVERT EL	REF DWF
WE2	1+389	683.00	N 5702279.53, E 91753.73	600	17000	681.17	N 5702281.12, E 91744.24	680.85	680.74	N 5702278.35, E 91760.77	681.101	681.086	C-113

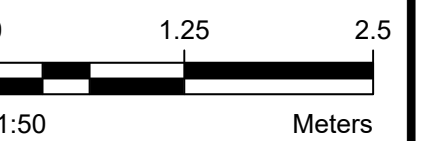


**SECTION**  
SURFACE DRAINAGE STRUCTURE Scale 1:50

WILLOW ESTATES DIKE SURFACE DRAINAGE STRUCTURES LAYOUT SUMMARY											
CULVERT No.	STA	DIKE CREST EL	DIKE CL COORDINATE	PIPE DIA. (mm)	TOTAL LENGTH (mm)	FLARED END INLET INVERT EL	FLARED END INLET COORDINATE	PIPE OUTLET INVERT EL	HEADWALL INVERT EL	HEADWALL COORDINATE	REF DWF
WE3	1+613	683.00	N 5702276.82, E 91568.06	450	13500	681.55	N 5702281.25, E 91571.96	681.27	681.38	N 5702270.76, E 91562.75	C-113

**NOTES:**

- TRANSITION FROM UPSTREAM AND DOWNSTREAM DITCH TO CULVERT INLET AND OUTLET OVER 2000 DISTANCE. SET CULVERT INLET AND OUTLET INVERTS 100 mm BELOW UPSTREAM AND DOWNSTREAM DITCH INVERTS.
- PROVIDE MINIMUM 400 COVER OVER CULVERT CROWN.



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**DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE**  
**RESILIENCY AND FLOOD MITIGATION PROGRAM**

**WILLOW ESTATES**  
**DIKE CULVERT AND MANHOLE**  
**SECTION**

Project No. **CW2384**  
Group **WILLOW ESTATES**

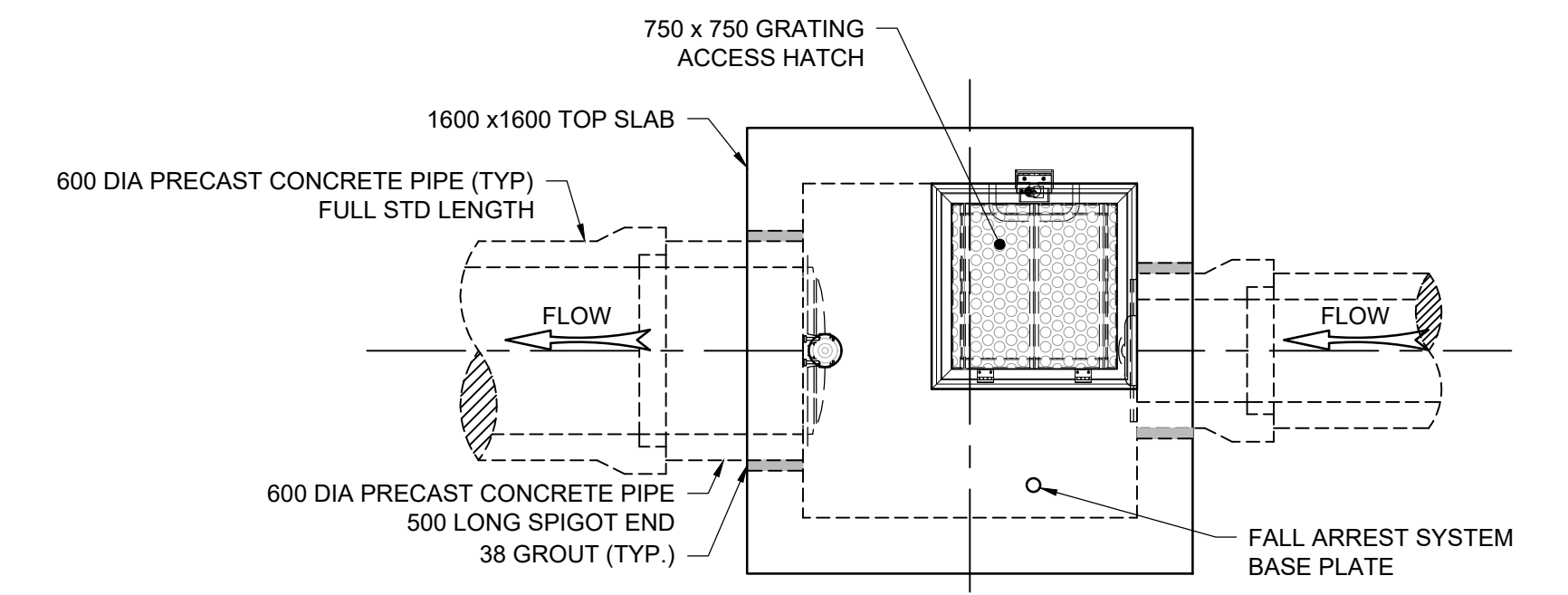
Drawing No.

**C-213** Rev. **3**

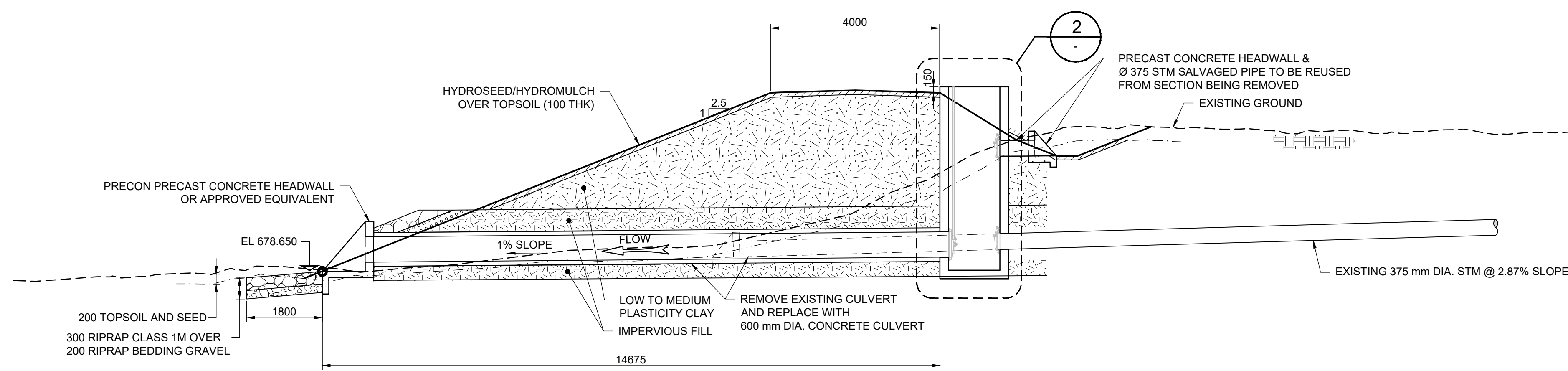
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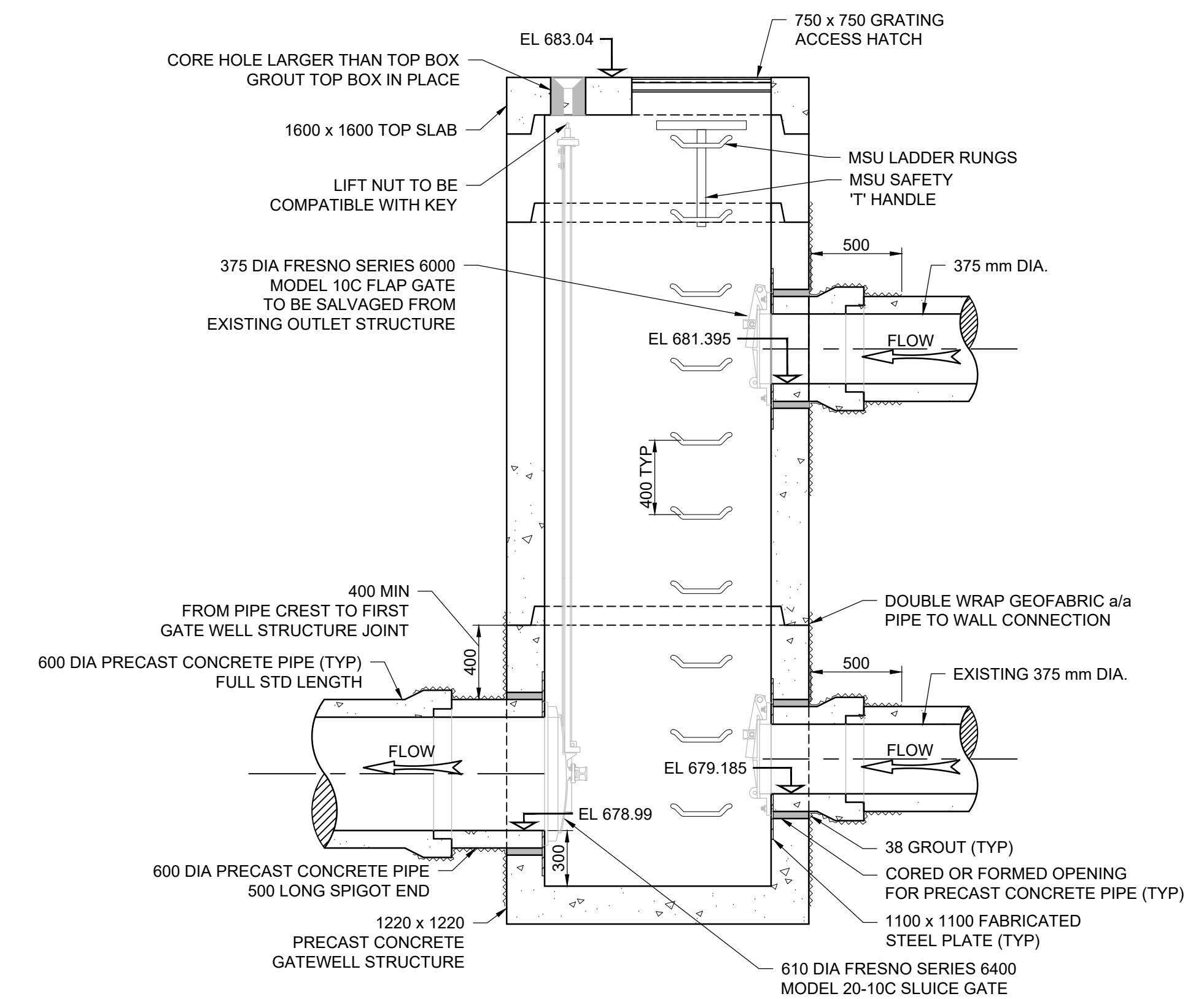
**PLAN - CULVERT UPGRADE AT STA 1+246**  
Scale 1:75



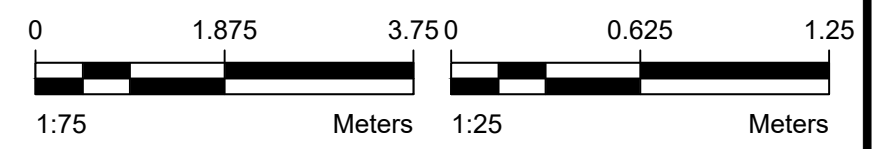
**1** **DETAIL**  
MANHOLE PLAN  
Scale 1:205



**PROFILE - CULVERT UPGRADE AT STA 1+246**  
Scale 1:75



**2** **DETAIL**  
MANHOLE SECTION  
Scale 1:25

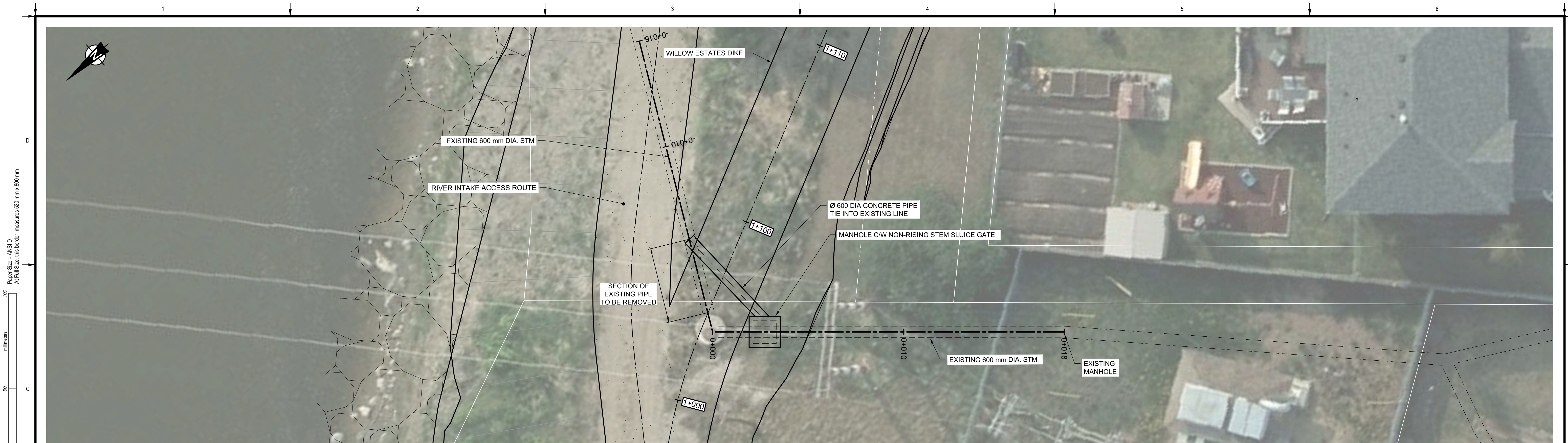


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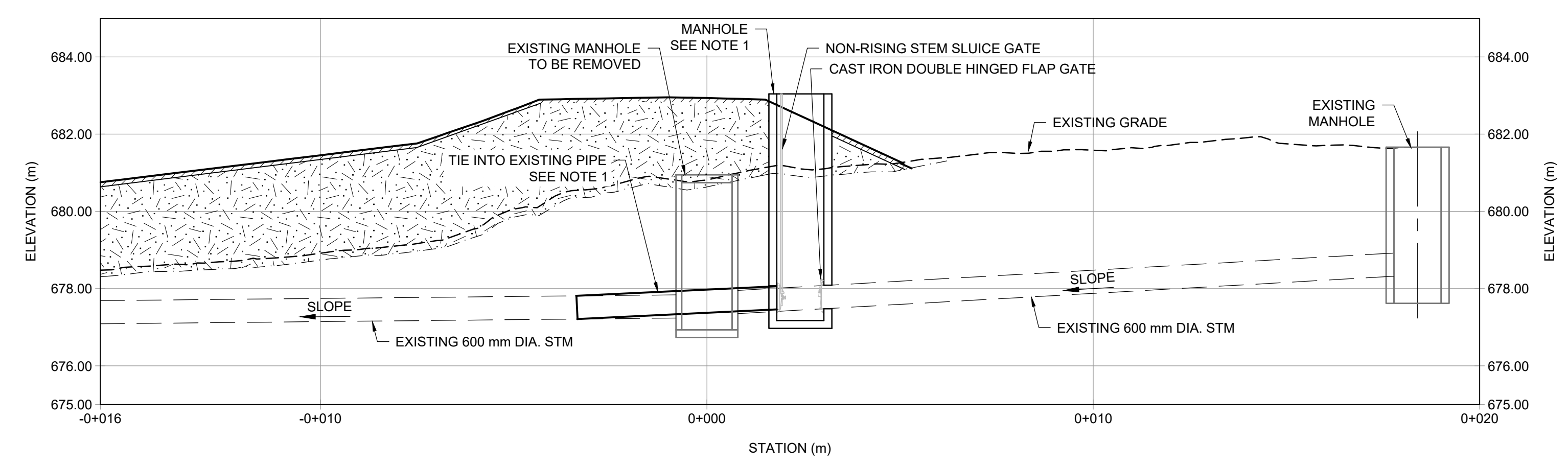
**DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE**  
**RESILIENCY AND FLOOD MITIGATION PROGRAM**

**WILLOW ESTATES DIKE**  
**CULVERT UPGRADE AT STA 1+246**  
**PLAN AND PROFILE**

Project No. **CW2384** Drawing No. **C-214** Rev. **3**  
 Group **WILLOW ESTATES**

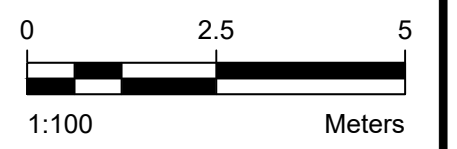


**PLAN - EXISTING DRAIN RETROFIT**  
Scale 1:100



**PROFILE - EXISTING DRAIN RETROFIT**  
Scale 1:100

**NOTES:**  
1. CONTRACTOR SHALL CONFIRM EXISTING PIPE INVERT ELEVATIONS PRIOR TO CONSTRUCTING.

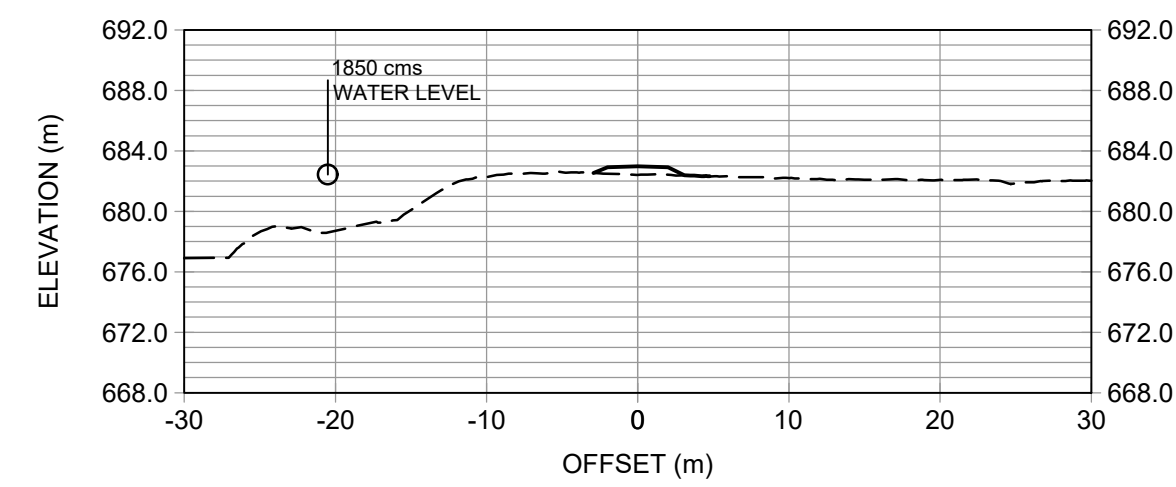


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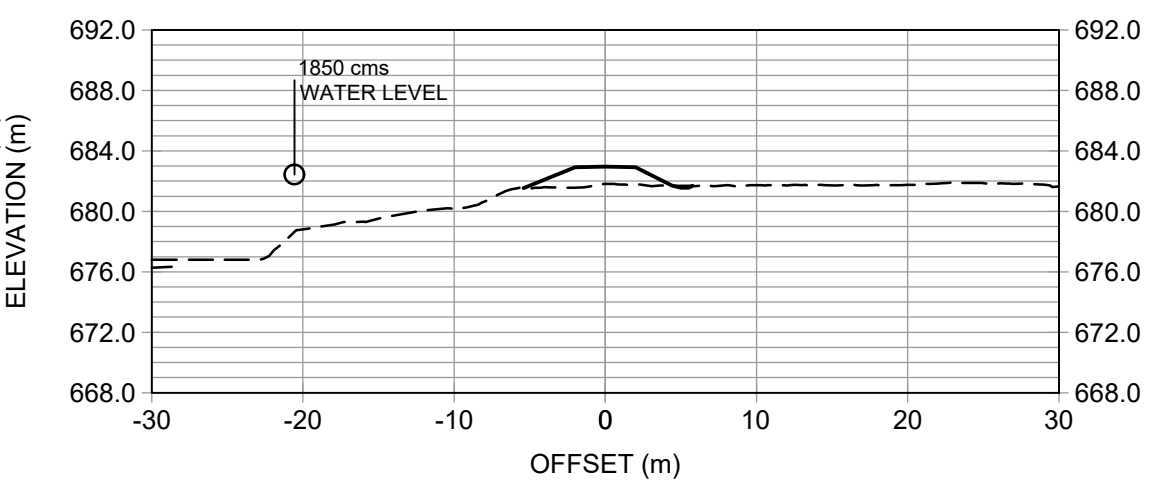
DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE RESILIENCY AND FLOOD MITIGATION PROGRAM			
WILLOW ESTATES DIKE EXISTING DRAIN RETROFIT PLAN AND PROFILE			
Project No.	CW2384	Drawing No.	
Group	WILLOW ESTATES		<b>C-215</b> <b>3</b>



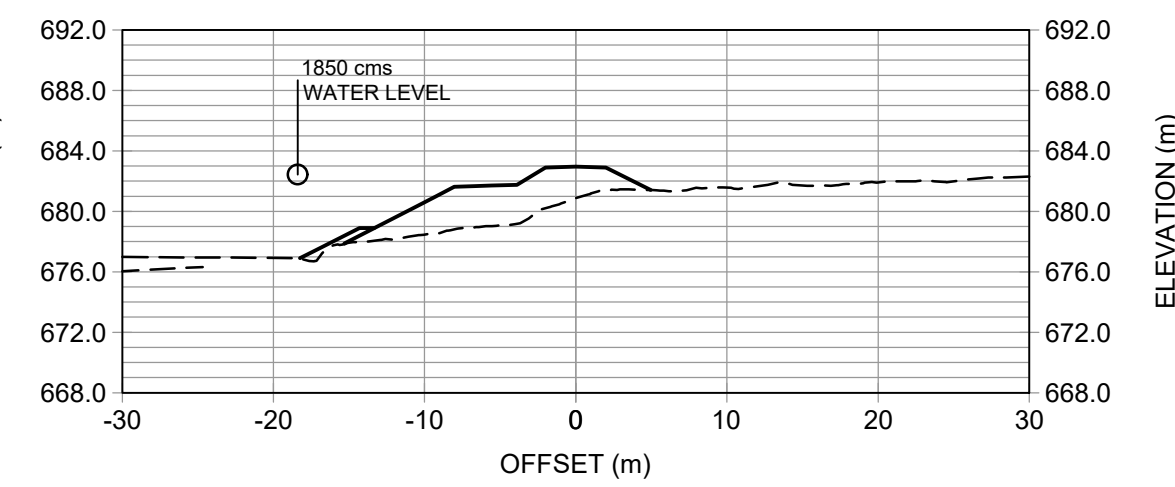
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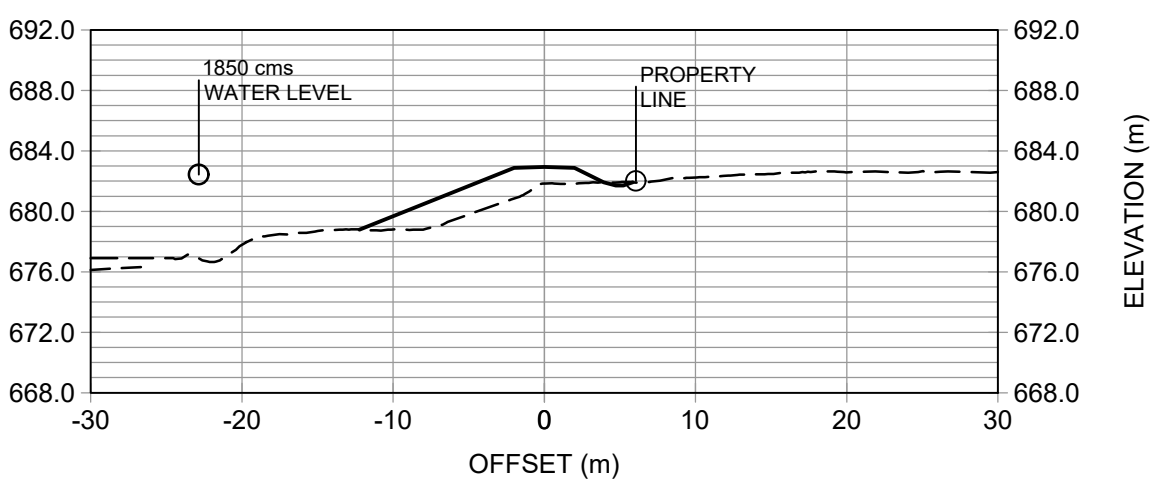
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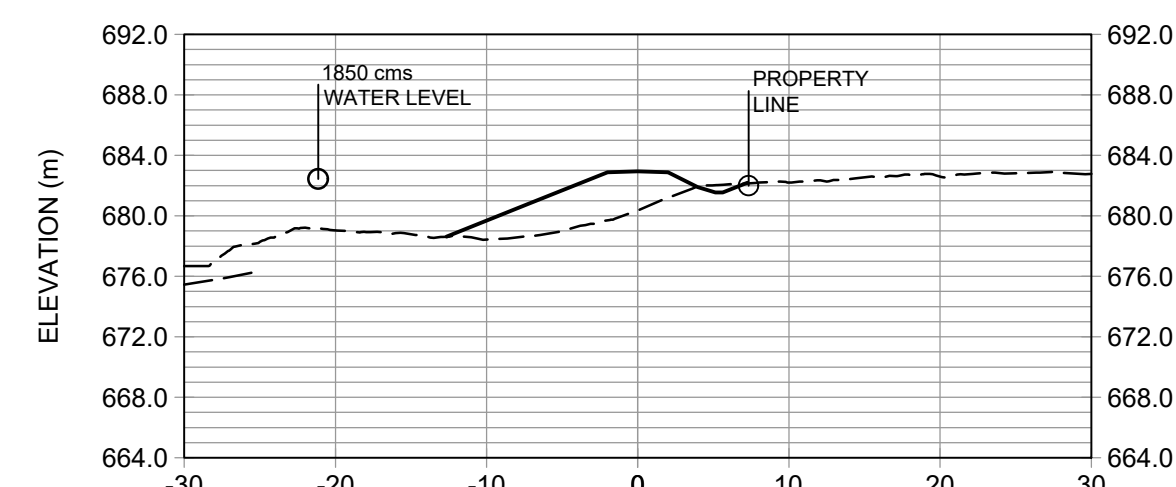
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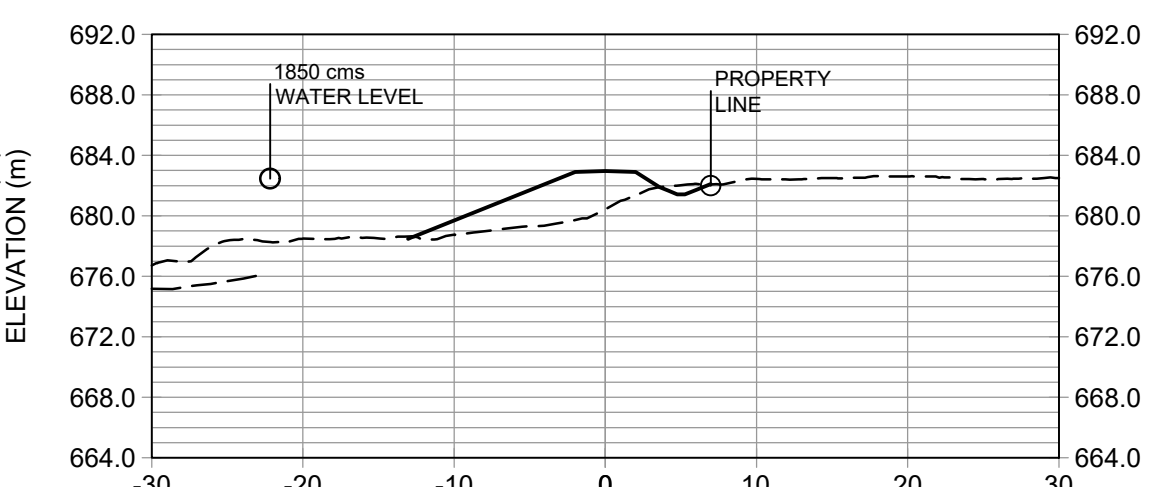
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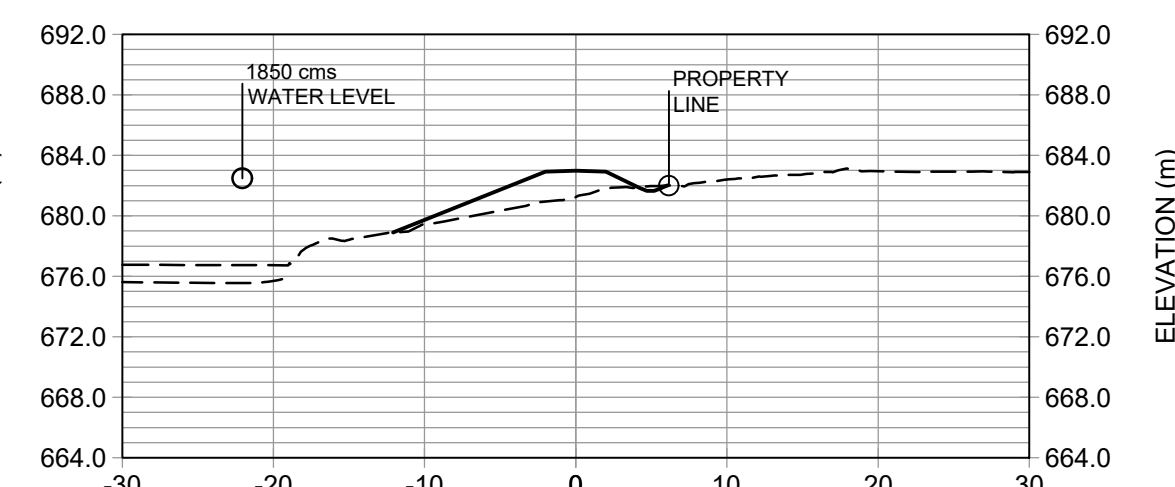
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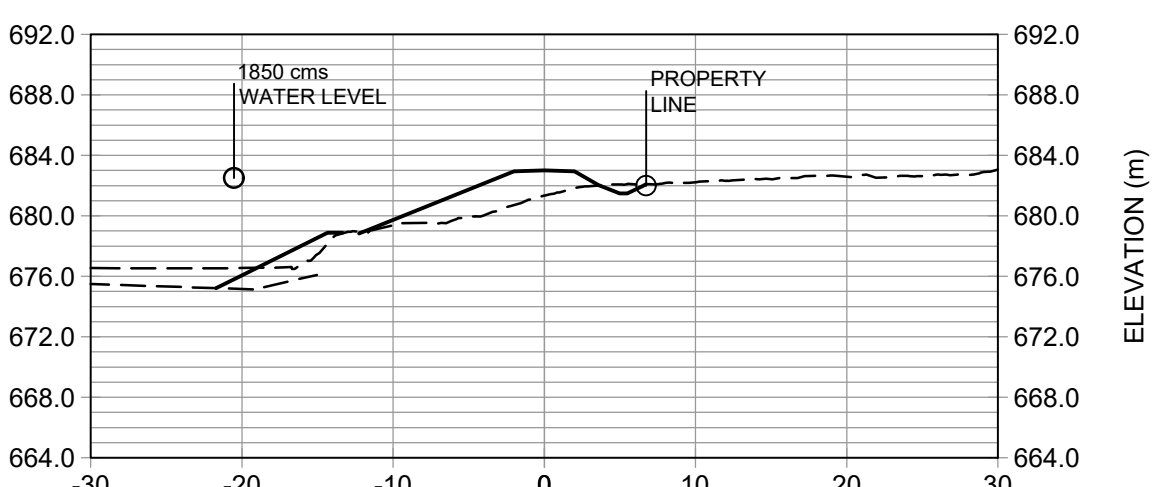
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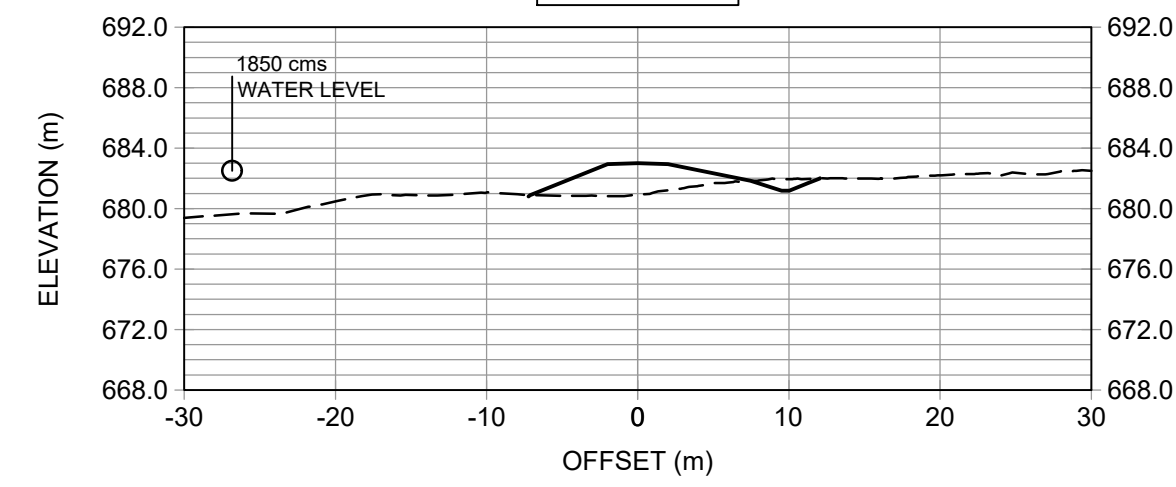
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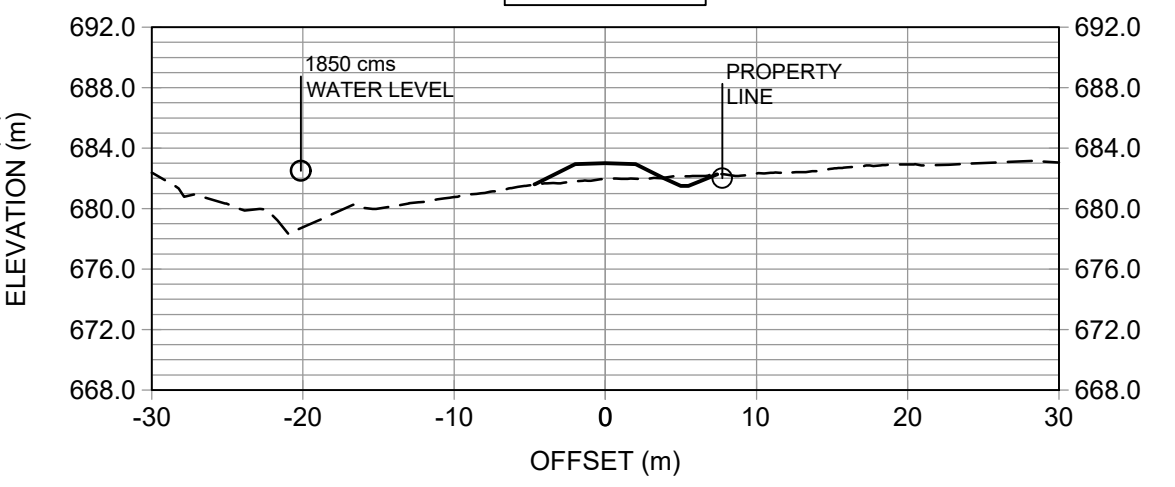
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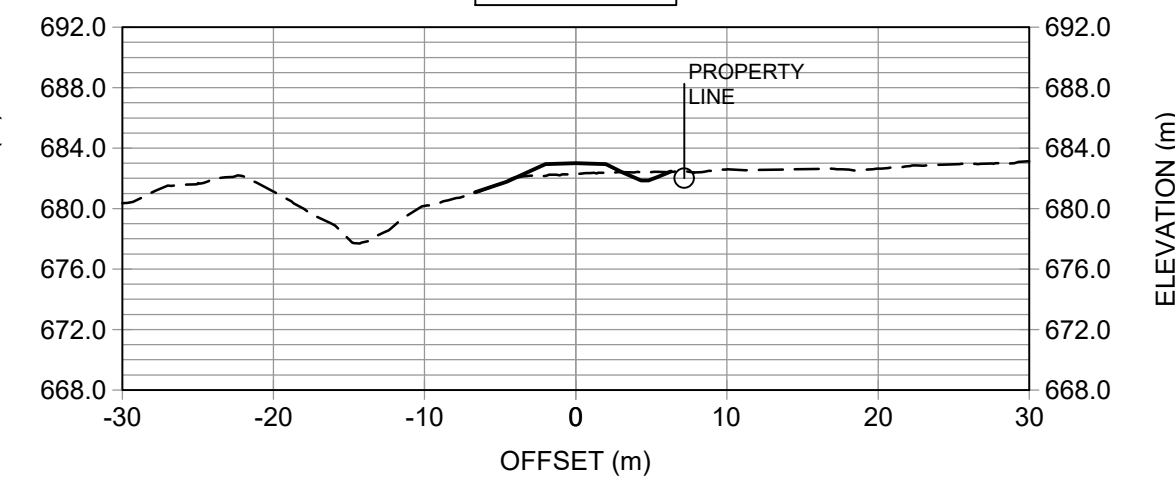
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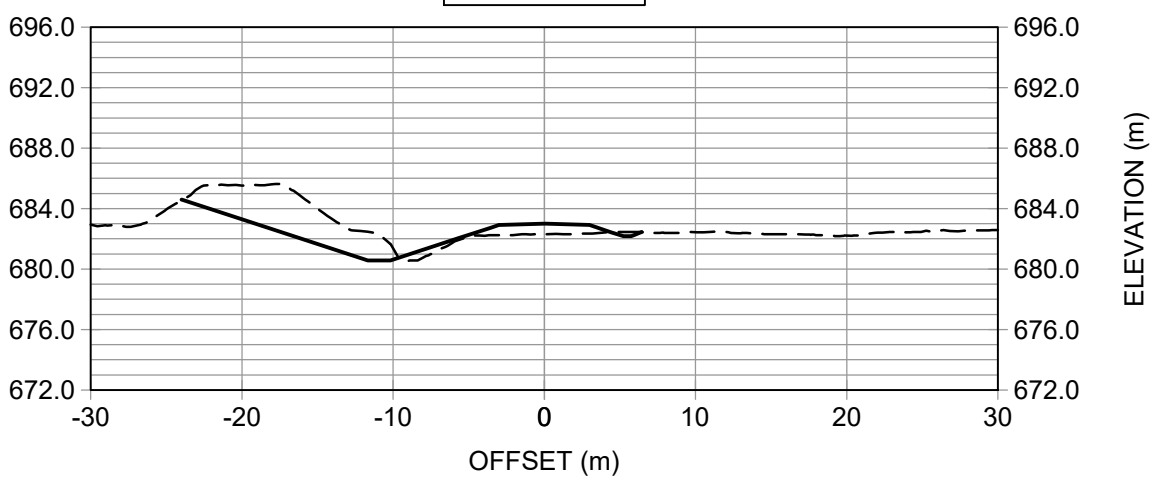
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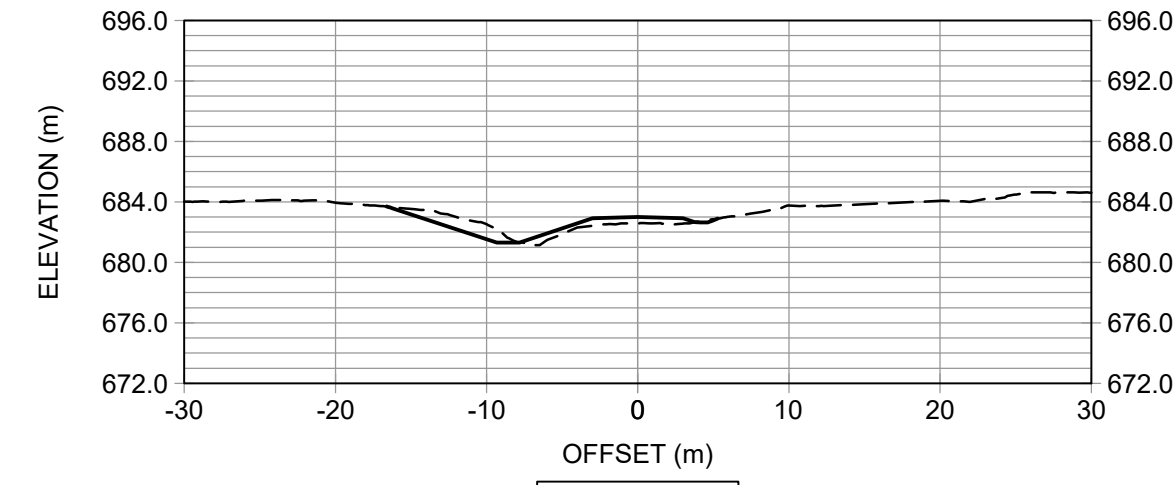
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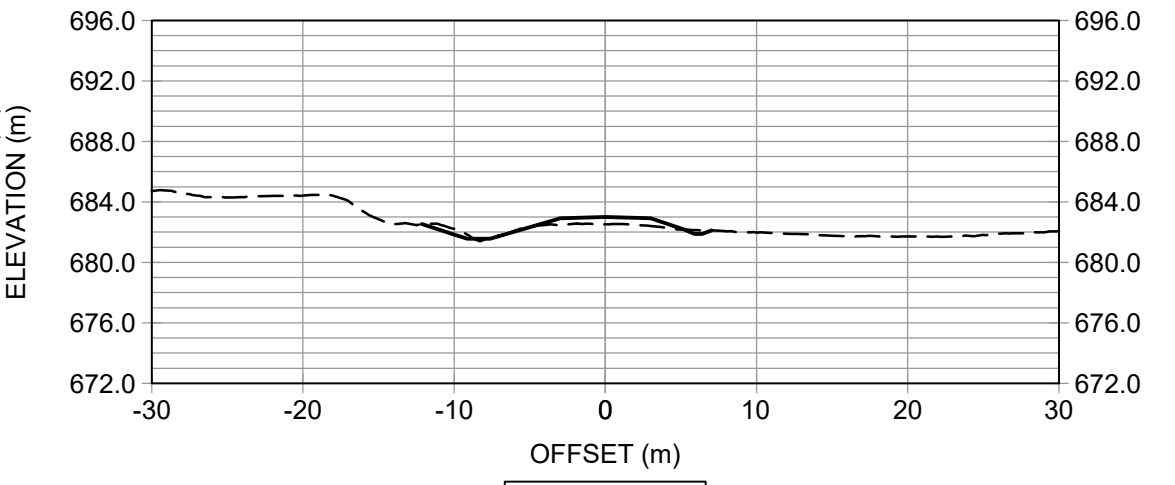
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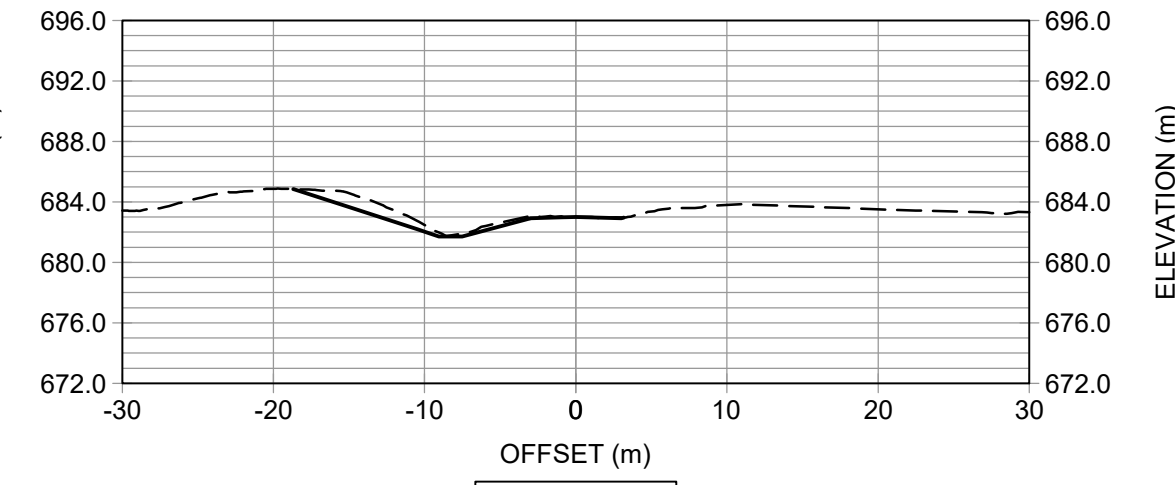
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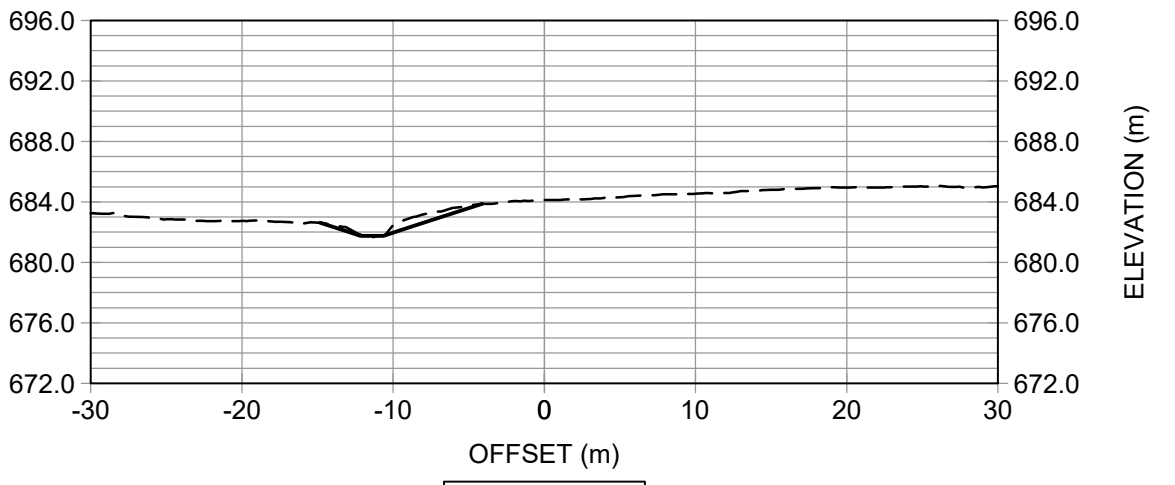
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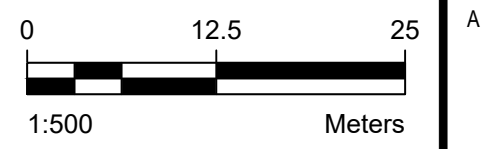
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Seal:

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**DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE**  
**RESILIENCY AND FLOOD MITIGATION PROGRAM**

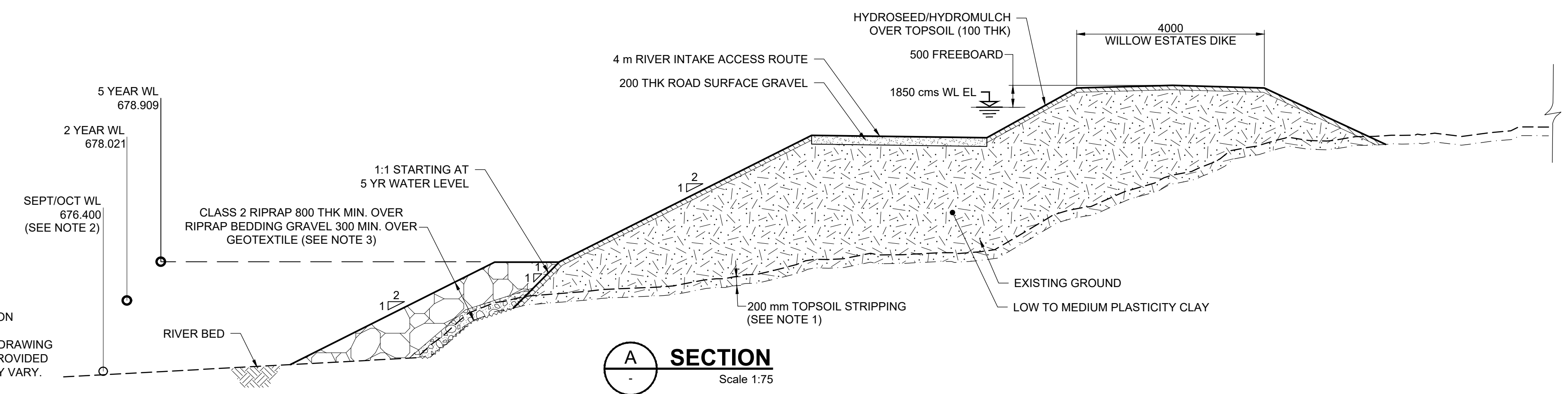
**WILLOW ESTATES**  
**SAMPLED SECTIONS**

Project No. <b>CW2384</b>	Drawing No.
Group <b>WILLOW ESTATES</b>	<b>C-311</b> <b>3</b>



**PLAN - RIVER INTAKE ACCESS ROUTE**

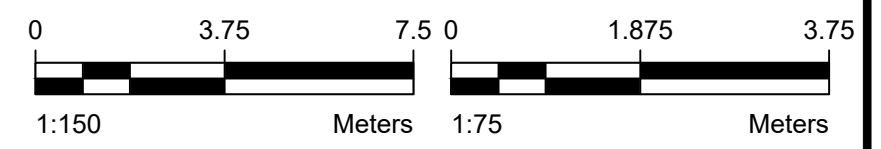
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**A SECTION**

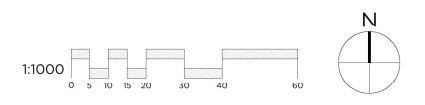
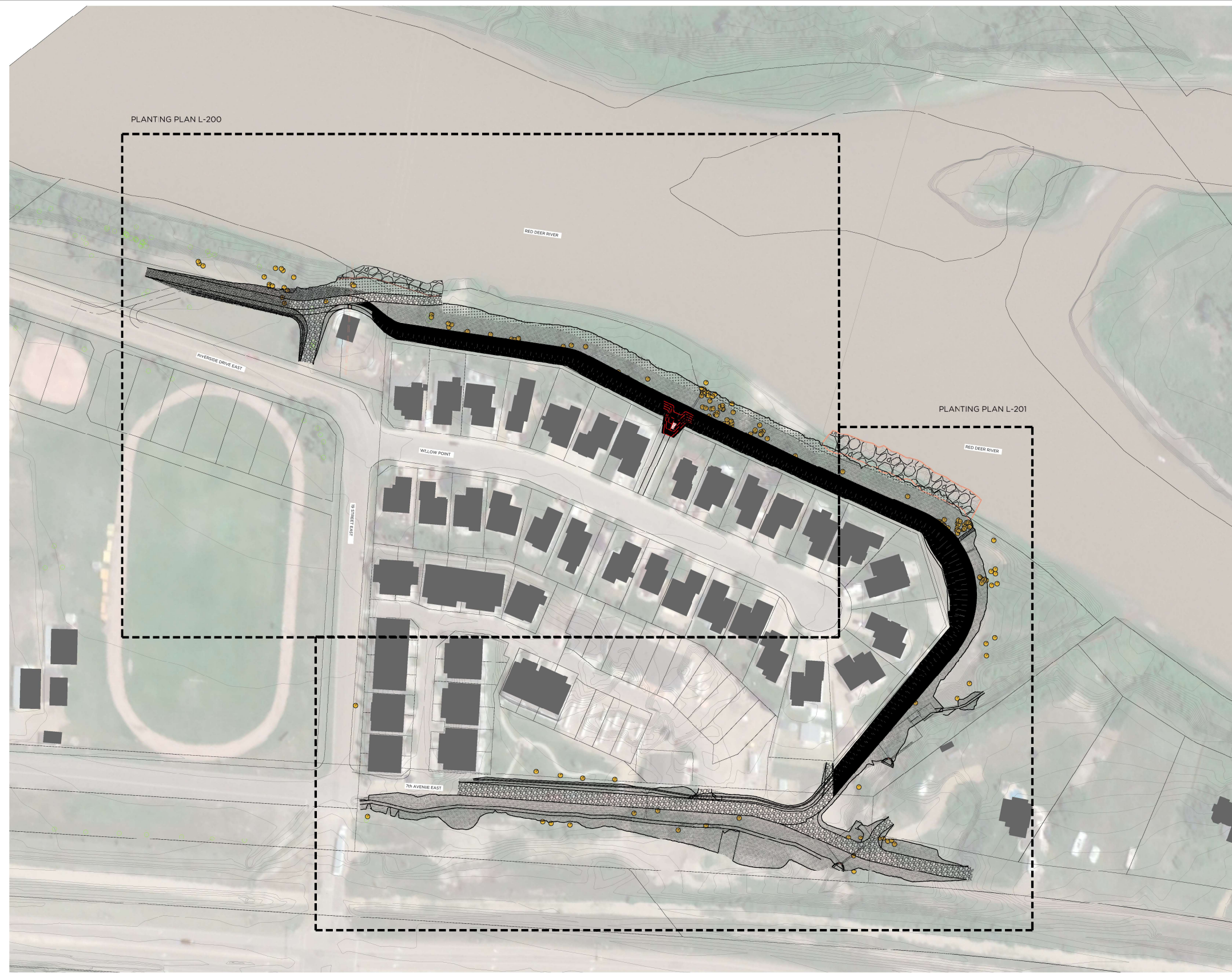
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- NOTES:**
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  2. SEPTEMBER AND OCTOBER AVERAGE WATER LEVELS NOTED ON THE DRAWING ARE STATISTICAL AVERAGES BASED ON HISTORICAL DATA AND ARE PROVIDED FOR INFORMATION ONLY. WATER LEVELS DURING CONSTRUCTION MAY VARY.
  3. GEOTEXTILE ONLY PLACED AS DIRECTED BY THE CONSULTANT.



Rev	Date	Des	Dwn	Chk	Description
0	2021-10-05	SW	JH	LM	ISSUED FOR REVIEW
1	2022-04-27	SW	JH	LM	ISSUED FOR REGULATORY REVIEW
2	2022-06-17	SW	JH	LM	ISSUED FOR TENDER
3	2022-08-05	SW	JH	LM	ISSUED FOR CONSTRUCTION

<b>DRUMHELLER RESILIENCY &amp; FLOOD MITIGATION OFFICE</b>	
<b>RESILIENCY AND FLOOD MITIGATION PROGRAM</b>	
<b>WILLOW ESTATES DIKE</b>	
<b>SWIFT WATER RESCUE / RIVER INTAKE ACCESS ROUTE</b>	
<b>PLAN AND SECTION</b>	
Project No. <b>CW2384</b>	Drawing No. <b>C-411</b>
Group <b>WILLOW ESTATES</b>	Rev. <b>3</b>



**A1 KEY PLAN**

L-100 Scale 1:1000



Seal:

Rev	Date	Des	Dwn	Chk	Description
A	2021-08-25	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW
B	2021-11-08	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW 2
C	2022-06-16	CMC	CMC	CMC	ISSUED FOR TENDER

Rev	Date	Des	Dwn	Chk	Description


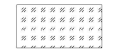




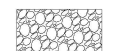

**DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE**  
**RESILIENCY AND FLOOD MITIGATION PROGRAM**

**WILLOW ESTATES**  
**KEY PLAN**

Project No.	<b>CW2384</b>	Drawing No.	<b>L-100</b>	Rev.	<b>B</b>
Group	<b>WILLOW ESTATES</b>				

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## Landscaping Legend

-  proposed boulder steps
-  seed mix 1 - wet tolerant mix - refer to specifications
-  seed mix 2A - upland mix - refer to specifications
-  seed mix 3 - top of berm - refer to specifications
-  manicured sod
-  wood mulch
-  gravel surface - refer to engineering drawings
-  rip rap - refer to engineering drawings

## Seeding Notes

1. Ensure seed mixture is free of any weed seeds listed as "Prohibited Noxious" or "Noxious" under the Weed Control Act and seeds of other species that will interfere with the growth of the specified seed mixture.
2. Sow at the rate indicated with Seed Mixes, during calm weather and when soil moisture content is adequate for germination.
3. For slopes 2:1 or flatter areas to be seeded that are easily accessible apply seed using a mechanical dry spread "Brillion" Seeder that places seed at specified depth and rate and rolls in a single operation.
4. For steeper than 2:1 slopes or slopes that are not easily accessible use manually operated broadcast seeder.
5. Sow seed in two directions, 50% of seed in one direction and remaining 50% of seed at right angles to first seeding pattern, using same method of seeding.
6. Cover broadcasted seed by hand raking and ATV harrowing-in.
7. Optimal seeding periods for native grasses:
  - 7.1. Mid to late May, early June - no later than June 15th.
  - 7.2. Late September - after first hard frost when plants go dormant. Do not seed near end of season until the risk of seed germination is low. Seed that germinates and does not fully establish prior to end of growing season will likely not overwinter.
8. Water the seeded areas after seeding to achieve germination and a uniform stand of grass. The Owner will determine the watering schedule and will provide the Contractor with at least 24 hours advance notice to commence watering seeded areas.
9. Apply water uniformly to seeded areas without causing displacement or erosion of the materials and topsoil.
10. Minimize travel on seeded surfaces.
11. Use watering equipment and techniques authorized by the Owner.

## Seed Mix Schedule

- .1 **Wet Tolerant Seed Mix 1** – Below 1:2 year high water mark – Application Rate of 58 kg / ha.

Site Characteristics	
Seeding Method	broadcast
Habitat Type	wetland
Natural Subregion	Dry Mixedgrass
Incorporation Method	ATV Harrow or hand rake
Depth of Incorporation	5 cm to 10 cm

Botanical Name	Common Name	Target Cover	% of Seed Mix (PLS)	Kg Required (PLS)
<i>Deschampsia caespitosa</i>	Tufted Hairgrass	25%	3%	1.97
<i>Pascopyrum smithii</i> / <i>Agropyron smithii</i>	Western Wheatgrass	20%	32%	18.60
<i>Bromus carinatus</i>	Mountain Brome	5%	10%	5.68
<i>Elymus trachycaulus</i> / <i>Agropyron trachycaulum</i> var.	Slender Wheatgrass	10%	11%	6.39
<i>Elymus canadensis</i>	Canada Wildrye	15%	23%	13.34
<i>Spartina pectinata</i>	Alkali Cordgrass	25%	21%	11.66

- .1 Cover Crop for Wet Tolerant Seed Mix 1: Add a cover crop of Beckmannia Syzigachne (Slough Grass) at 5kg / ha in areas of highwater erosion prone areas.

- .1 **Upland Seed Mix 2A** – Upland Areas - Application Rate of 58 kg / ha.

Site Characteristics	
Seeding Method	broadcast
Habitat Type	deciduous forest
Natural Subregion	Dry Mixedgrass
Incorporation Method	ATV Harrow or hand rake
Depth of Incorporation	5 cm to 10 cm

Botanical Name	Common Name	Target Cover	% of Seed Mix (PLS)	Kg Required (PLS)
<i>Elymus lanceolatus</i> / <i>Agropyron dasystachyum</i>	Northern Wheatgrass	15%	16%	9.30
<i>Pascopyrum smithii</i> / <i>Agropyron smithii</i>	Western Wheatgrass	20%	30%	17.36
<i>Elymus trachycaulus</i> / <i>Agropyron trachycaulum</i> var.	Slender Wheatgrass	10%	10%	5.97
<i>Bouteloua gracilis</i>	Blue Grama	10%	2%	0.88
<i>Elymus canadensis</i>	Canada Wildrye	10%	14%	8.30
<i>Nassella viridula</i> / <i>Stipa viridula</i>	Green Needlegrass	25%	27%	15.82
<i>Koeleria macrantha</i>	Junegrass	10%	1%	0.58

- .1 Cover Crop for Upland Seed Mix 2: Add a cover crop of *Lolium multiflorum* (Annual Ryegrass) at 5kg / ha for entirety of Upland Seed Mix areas.

- .1 **Top of Berm Seed Mix 3** – Top of Berm - Application rate of 50 kg/ha.

Site Characteristics	
Seeding Method	Broadcast or manual
Habitat Type	Deciduous forest
Natural Subregion	Dry Mixedgrass
Incorporation Method	ATV Harrow or hand rake
Depth of Incorporation	5 cm to 10 cm

Botanical Name	Common Name	Target Cover	% of Seed Mix (PLS)	Kg Required (PLS)
<i>Elymus lanceolatus</i> / <i>Agropyron dasystachyum</i>	Northern Wheatgrass	23%	46%	22.91
<i>Pascopyrum smithii</i> / <i>Agropyron smithii</i>	Western Wheatgrass	10%	23%	11.16
<i>Bouteloua gracilis</i>	Blue Grama	20%	6%	2.83
<i>Hesperostipa comata</i> / <i>Stipa comata</i>	Needle and Thread	2%	4%	2.13
<i>Poa sandbergii</i>	Sandberg Bluegrass	15%	6%	3.07
<i>Nassella viridula</i> / <i>Stipa viridula</i>	Green Needlegrass	5%	9%	4.24
<i>Koeleria macrantha</i>	Junegrass	23%	4%	2.13
<i>Dalea purpurea</i>	Purple Prairie Clover	2%	2%	1.02

- .1 Cover Crop for Top of Berm Seed Mix 3: Add a cover crop of *Lolium multiflorum* (Annual Ryegrass) at 5kg / ha for entirety of Top of Berm Seed Mix areas.

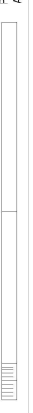


Rev	Date	Des	Dwn	Chk	Description
A	2021-08-25	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW
B	2021-11-03	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW 2
C	2022-04-02	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW 3
D	2022-06-16	CMC	CMC	CMC	ISSUED FOR TENDER

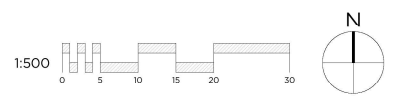
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RESILIENCY AND FLOOD MITIGATION PROGRAM

WILLOW ESTATES  
LEGEND AND NOTES

Project No. CW2384 Drawing No. L-101 Rev. B  
Group WILLOW ESTATES



MATCHLINE - REFER TO DRAWING L-201



**A1 PLANTING PLAN**  
 L-200 Scale 1:500



Rev	Date	Des	Dwn	Chk	Description
A	2021-08-25	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW
B	2021-11-03	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW 2
C	2022-04-02	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW 3
D	2022-06-16	CMC	CMC	CMC	ISSUED FOR TENDER

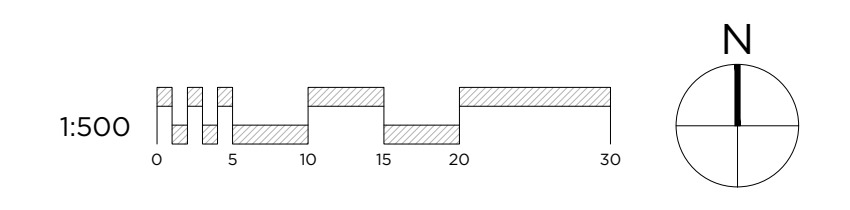
Rev	Date	Des	Dwn	Chk	Description

**DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE**  
**RESILIENCY AND FLOOD MITIGATION PROGRAM**

**WILLOW ESTATES**  
**PLANTING PLAN**

Project No. **CW2384**      Drawing No. **L-200**      Rev. **B**  
 Group **WILLOW ESTATES**

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**A1 PLANTING PLAN**

L-201 Scale 1:500



Seal:

Rev	Date	Des	Dwn	Chk	Description
A	2021-08-25	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW
B	2021-11-03	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW 2
C	2022-04-02	CMC	CMC	CMC	ISSUED FOR DRAFT REVIEW 3
D	2022-06-16	CMC	CMC	CMC	ISSUED FOR TENDER
E	2022-08-04	CMC	CMC	CMC	ISSUED FOR CHANGE ORDER

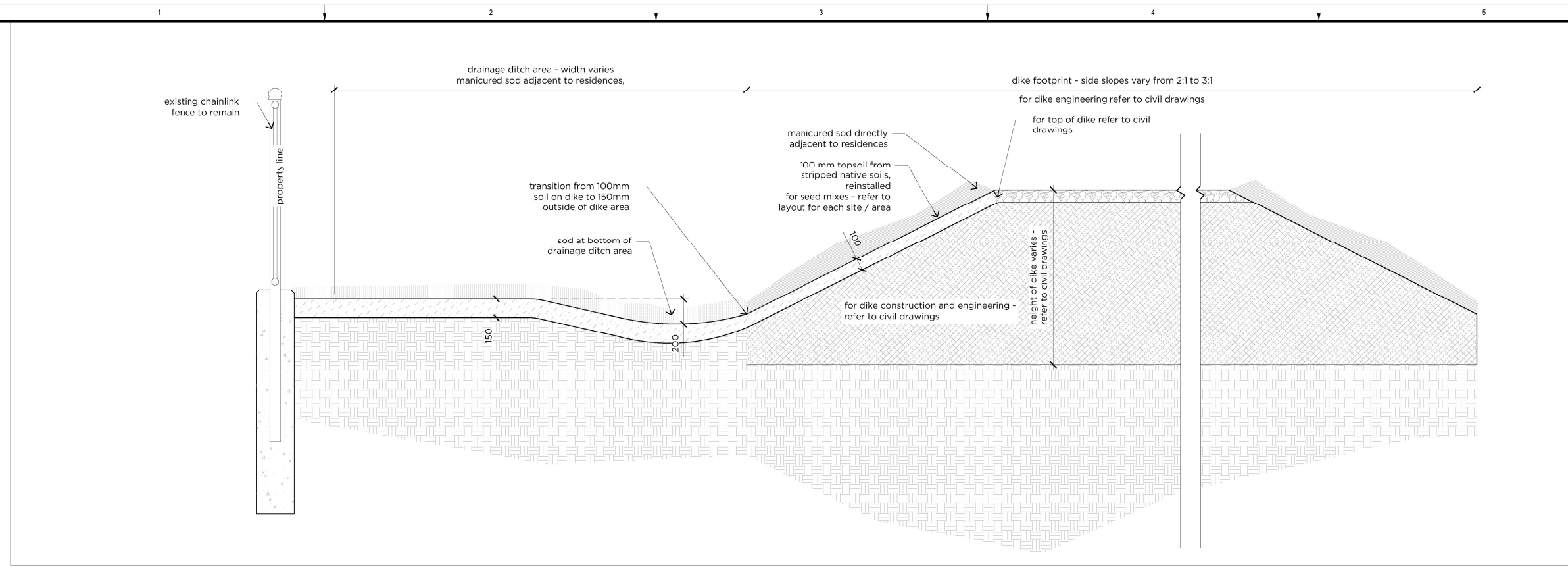
Rev	Date	Des	Dwn	Chk	Description

**DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE  
RESILIENCY AND FLOOD MITIGATION PROGRAM**

**WILLOW ESTATES  
PLANTING PLAN**

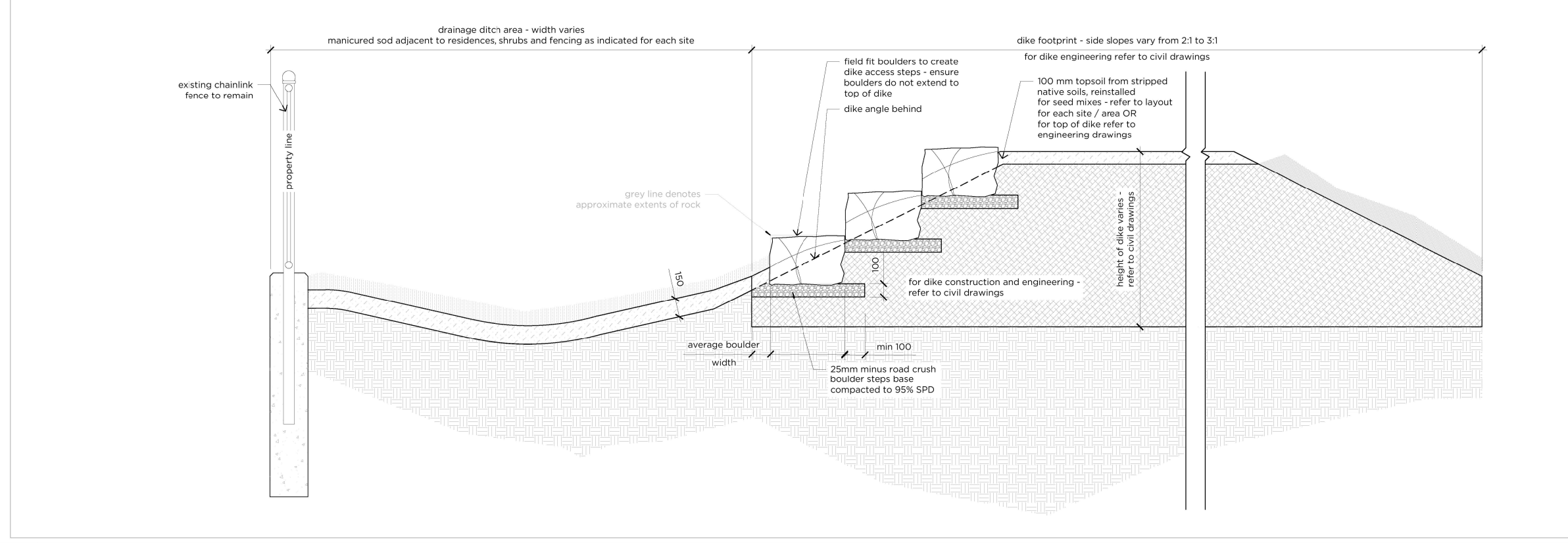
Project No.	<b>CW2384</b>	Drawing No.	<b>L-201</b>	Rev.	<b>B</b>
Group	<b>WILLOW ESTATES</b>				

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**B1 SHRUB PLANTING WITH FENCING SECTION**

L-300 Scale 1:20



**A1 DIKE ACCESS STEP SECTION**

L-300 Scale 1:20



Rev	Date	Des	Dwn	Chk	Description
A	2022-06-16	CMC	CMC	CMC	ISSUED FOR TENDER

Rev	Date	Des	Dwn	Chk	Description

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 RESILIENCY AND FLOOD MITIGATION PROGRAM  
 WILLOW ESTATES DIKE  
 DETAILS

Project No. CW2384  
 Group WILLOW ESTATES  
 Drawing No. L-300  
 Rev B