# SABINA GOLD AND SILVER CORPORATION SABINA 2021 BACK RIVER ENVIRONMENT STUDY CULVERT CROSSINGS AT THE RASCAL STREAM WEST REACH 1 DETAILED DESIGN



	DRAWING LIST		
DRAWING NUMBER	DRAWING IIII E		ISSUE PURPOSE
G-001	COVER SHEET	0	ISSUED FOR CONSTRUCTIOM
C-001	GENERAL ARRANGEMENT PLAN	0	ISSUED FOR CONSTRUCTION
C-002	PRIMARY CULVERTS - PLAN AND PROFILE	0	ISSUED FOR CONSTRUCTION
C-003	PRIMARY CULVERTS - TYPICAL SECTIONS	0	ISSUED FOR CONSTRUCTION
C-004	SECONDARY CULVERT - PLAN AND PROFILE	0	ISSUED FOR CONSTRUCTION
C-005	SECONDARY CULVERT - TYPICAL SECTIONS	0	ISSUED FOR CONSTRUCTION
C-006	SPECIFICATIONS	0	ISSUED FOR CONSTRUCTION

# **HALF-SCALE**

**ISSUED FOR** 

# CONSTRUCTION

SEAL

SEAL

2021-10-26 ISSUED FOR CONSTRUCTION N.GUO M.HEAL C.VANWERKHOVEN N.SCHMIDT

YYYY-MM-DD DESCRIPTION DESIGNED PREPARED REVIEWED APPROVED

CLIENT
SABINA GOLD AND SILVER CORPORATION

CONSULTANT

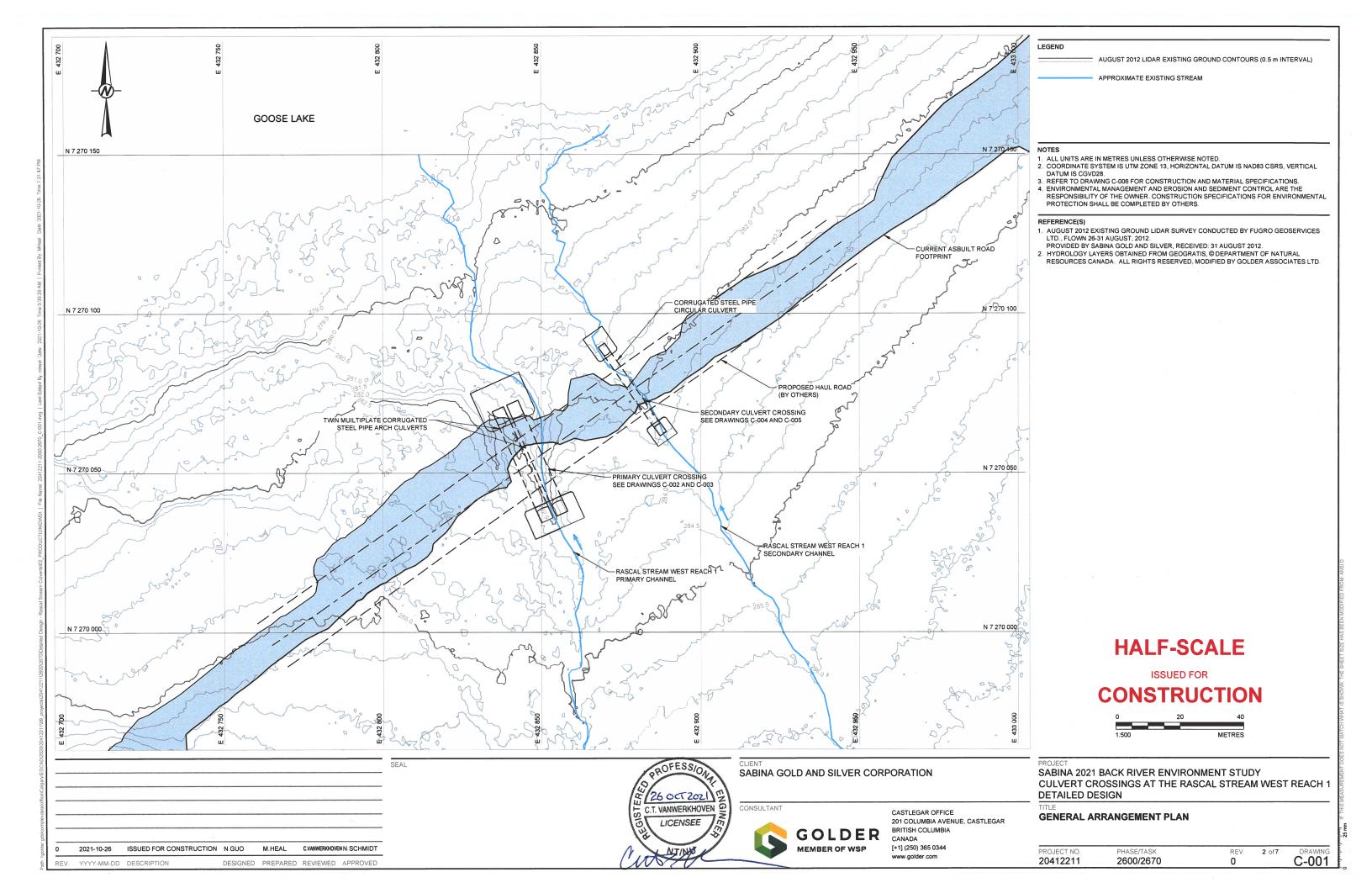


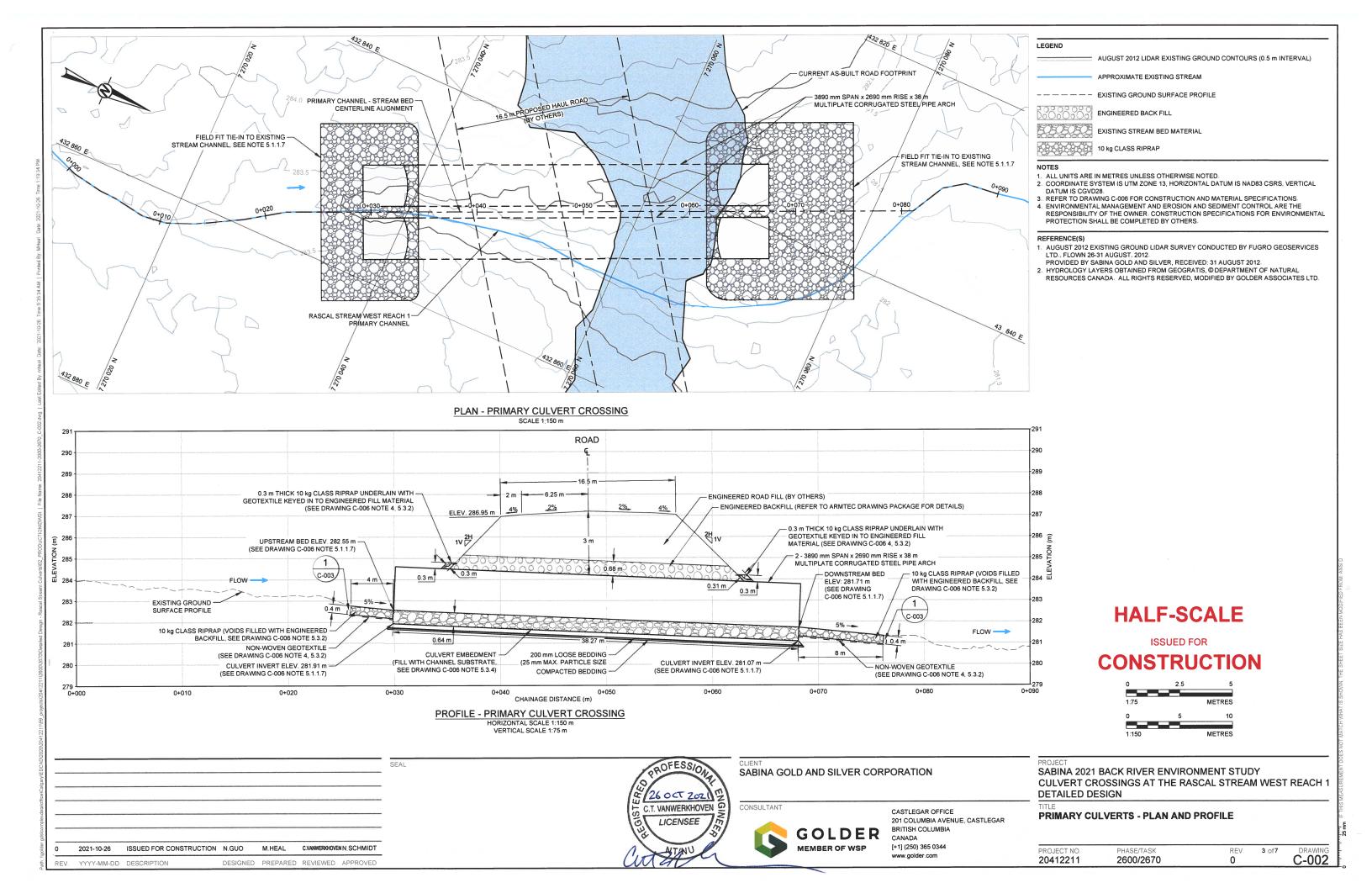
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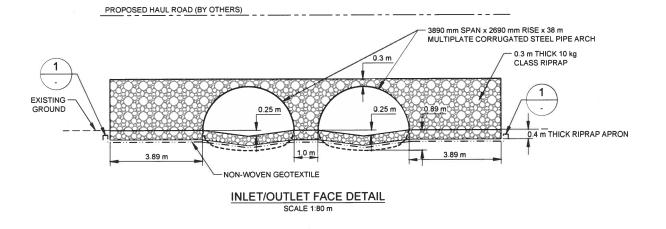
SABINA 2021 BACK RIVER ENVIRONMENT STUDY
CULVERT CROSSINGS AT THE RASCAL STREAM WEST REACH
DETAILED DESIGN

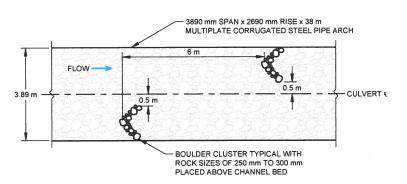
COVER SHEET

PROJECT NO. PHASE/TASK REV. 1 of 7 DRAWI	20412211	2600/2670	0		G-001
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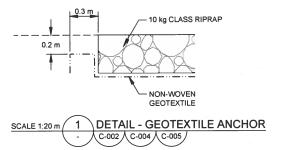








PLAN DETAIL - BOULDER CLUSTERS WITHIN
PRIMARY (TWIN) CULVERTS



# CLIENT SABINA GOLD AND SILVER CORPORATION

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# HALF-SCALE

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# CONSTRUCTION



PROJECT

LEGEND

NOTES

**BOULDER CLUSTER NOTES** 

EXISTING STREAM BED MATERIAL

ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
 REFER TO DRAWING C-006 FOR CONSTRUCTION AND MATERIAL SPECIFICATIONS.
 SEE STRUCTURAL DRAWINGS FOR BEDDING SPECIFICATIONS.
 ENVIRONMENTAL MANAGEMENT AND EROSION AND SEDIMENT CONTROL ARE THE RESPONSIBILITY OF THE OWNER. CONSTRUCTION SPECIFICATIONS FOR ENVIRONMENTAL PROTECTION SHALL BE COMPLETED BY OTHERS.

1. BOULDER CLUSTERS SHALL CONSIST OF ROCKS WITH A MEDIAN DIAMETER OF 250 TO

2. BOULDER CLUSTERS SHALL BE COMPOSED OF 5 TO 7 ROCKS ARRANGED IN A "V" SHAPE POINTED TOWARDS THE UPSTREAM DIRECTION.
3. BOULDER CLUSTERS SHALL BE PLACED EVERY 6 m ON ALTERNATING SIDES OF THE CULVERT.
4. BOULDER CLUSTERS SHALL BE OFFSET FROM THE CULVERT CENTRELINE BY 0.5 m.

5. ROCKS SHALL BE PLACED ON TOP OF THE CHANNEL SUBSTRATE.

10 kg CLASS RIPRAP

SABINA 2021 BACK RIVER ENVIRONMENT STUDY CULVERT CROSSINGS AT THE RASCAL STREAM WEST REACH 1 DETAILED DESIGN

ITLE

**PRIMARY CULVERTS - TYPICAL SECTIONS** 

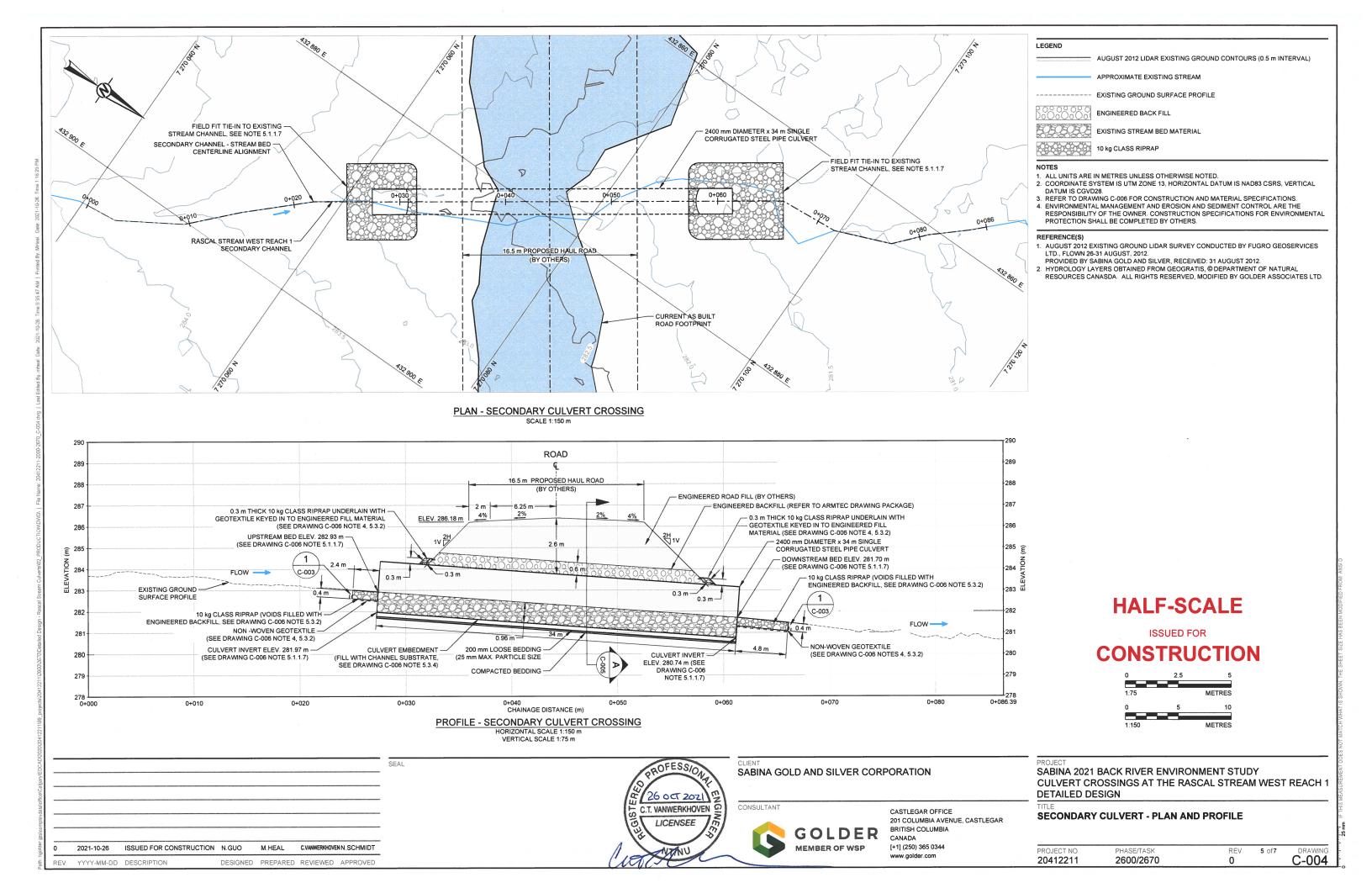
PROJECT NO.	PHASE/TASK	REV.	4 of 7	DRAWING
20412211	2600/2670	0		C-003
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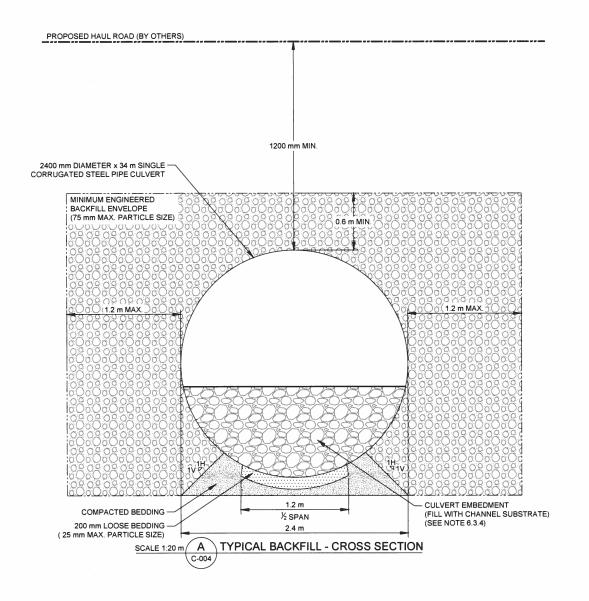
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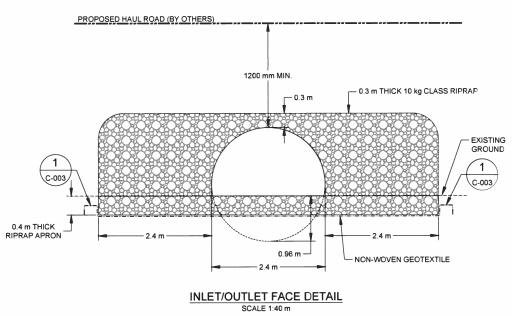
EV. YYYY-MM-DD DESCRIPTION DESIGNED PREPARED REVIEWED APPROVED

26 OCT 2021 TO CIT VANWERKHOVEN GO LICENSEE

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## LEGEND ENGINEERED BACK FILL EXISTING STREAMBED MATERIAL 10 kg CLASS RIPRAP

COMPACTED BEDDING

LOOSE BEDDING

### NOTES

ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
 REFER TO DRAWING C-006 FOR CONSTRUCTION AND MATERIAL SPECIFICATIONS.

3. ENVIRONMENTAL MANAGEMENT AND EROSION AND SEDIMENT CONTROL ARE THE RESPONSIBILITY OF THE OWNER. CONSTRUCTION SPECIFICATIONS FOR ENVIRONMENTAL PROTECTION SHALL BE COMPLETED BY OTHERS.

# **HALF-SCALE**

**ISSUED FOR** 



26 OCT 2021 C.T. VANWERKHOVEN LICENSEE

SABINA GOLD AND SILVER CORPORATION

MEMBER OF WSP

CONSULTANT

CASTLEGAR OFFICE 201 COLUMBIA AVENUE, CASTLEGAR BRITISH COLUMBIA GOLDER [+1] (250) 365 0344 www.golder.com

SABINA 2021 BACK RIVER ENVIRONMENT STUDY CULVERT CROSSINGS AT THE RASCAL STREAM WEST REACH 1 **DETAILED DESIGN** 

**SECONDARY CULVERT - TYPICAL SECTIONS** 

PROJECT NO. PHASE/TASK 6 of 7 REV. 20412211 2600/2670

C-005 0

2021-10-26 ISSUED FOR CONSTRUCTION N.GUO M. HEAL C.VANWERKHOVEN N. SCHMIDT

DESIGNED PREPARED REVIEWED APPROVED

YYYY-MM-DD DESCRIPTION

### 1 PRIOR TO CONSTRUCTION

1.1 PRIOR TO ANY CULVERT CONSTRUCTION ACTIVITIES TAKING PLACE THE FOLLOWING SPECIFICATIONS SHALL BE FOLLOWED

### 2 ENVIRONMENTAL PROTECTION

2.1 ENVIRONMENTAL MANAGEMENT AND EROSION AND SEDIMENT CONTROL ARE THE RESPONSIBILITY OF THE OWNER. CONSTRUCTION SPECIFICATIONS FOR ENVIRONMENTAL PROTECTION DURING SITE PREPARATION, CONSTRUCTION, AND SITE CLEAN-UP SHALL BE COMPLETED BY OTHERS

### 3. QUALITY ASSURANCE INSPECTIONS

- 3.1 WORK THROUGHOUT THE ENTIRE PROJECT SHALL BE COMPLETED IN ACCORDANCE WITH THE DESIGN AND CONSTRUCTION SPECIFICATIONS IN ARMTEC'S DESIGN DRAWING PACKAGE (ARMTEC PROJECT #19-463-B), WITH ADDITIONAL QUALITY ASSURANCE INSPECTIONS SUMMARIZED BELOW:
  - 3.1.1 MINIMUM QUALITY CONTROL (QC) TESTS AND INSPECTIONS, TO BE PERFORMED BY THE CONTRACTOR, SHALL BE AS FOLLOWS:

ELEMENT	DESCRIPTION	REQUIREMENT
VISUAL	INSPECT RIPRAP AND CHANNEL SUBSTRATE	INSPECT AND DOCUMENT
INSPECTIONS	MATERIAL FOR ADHERENCE TO THE DESCRIPTIONS	MATERIAL CONDITION
	PROVIDED IN THESE SPECIFICATIONS.	BEFORE INSTALLATION.

3.1.2 CONTRACTOR SHALL CONFIRM APPROVAL OF DOCUMENTED MATERIALS WITH THE ENGINEER BEFORE PROCEEDING WITH THE WORKS.

### 4 MATERIALS

### 4.1 NON-WOVEN GEOTEXTILE

4.1.1 NON-WOVEN GEOTEXTILE SHALL HAVE MINIMUM PARAMETERS CONFORMING TO THE FOLLOWING VALUES

PARAMETER	VALUE
GRAB STRENGTH	650 N
PUNCTURE STRENGTH	275 N
BURST STRENGTH	2.1 MPa
TRAPEZOIDAL TEAR	250 N

### 4.2 RIPRAP

- 4.2.1 RIPRAP MATERIAL SHALL MEET THE FOLLOWING STANDARDS:
  - RIPRAP SHALL CONSIST OF WELL GRADED, HARD, DURABLE, AND ANGULAR ROCK WHICH MEETS THE PHYSICAL AND GRADATION REQUIREMENTS SET OUT BELOW.
  - 10 kg CLASS RIPRAP OR ROCK SHALL BE USED FOR BOTH THE CULVERT INLET AND OUTLET.
  - 10 kg CLASS RIPRAP SHALL CONFORM TO THE FOLLOWING GRADATION:

PERCENT SMALLER THAN INTERMEDIATE DIMENSION	INTERMEDIATE DIMENSION (mm)
15	90
50	200
85	285
100	350

- 431 EXCAVATED CHANNEL SUBSTRATE SHALL BE STOCKPILED FOR LATER REUSE (AS PER SPECIFICATION 5.1.1.2) AND SHALL BE KEPT FREE OF DEBRIS, OIL OR OTHER CONTAMINANTS, SNOW, AND OTHER SOURCES OF MOISTURE
- 4.4 CULVERT BACKFILL AND BEDDING
  - 4.4.1 FOR CULVERT BACKFILL AND BEDDING MATERIAL SPECIFICATIONS AND COMPACTION REQUIREMENTS, REFER TO ARMTEC'S DESIGN DRAWING PACKAGE ARMTEC PROJECT #19-463-B)

### 5 EXECUTION

### 5.1 PREPARATION OF CULVERT SITE

- 5.1.1 PRIOR TO THE CULVERT BEING INSTALLED THE FOLLOWING SHALL BE FOLLOWED:
  5.1.1.1 REMOVE LARGE STONES OR OTHER HARD MATERIALS IN THE
  - CULVERT FOUNDATION, TRENCH WALLS, AND BACKFILL THAT MAY DAMAGE OR WEAKEN THE PIPING OR IMPEDE CONSISTENT BACKFILLING OR COMPACTION. THIS SHALL INCLUDE THE REMOVAL OF ANY EXISTING, CULVERT(S) AND ASSOCIATED MATERIALS.
  - IF CHANNEL SUBSTRATES ARE TO BE REMOVED. SEPARATE AND STOCKPILE GRANULAR SUBSTRATE MATERIAL (IF PRESENT) FOR USE AS CULVERT SUBSTRATE AND IF REMAINING MATERIAL IS AVAILABLE AT COMPLETION REPLACE ALONG ANY DISTURBED STREAM AREAS, UPON COMPLETION OF PROJECT WORKS. SEPARATE EXCAVATED CHANNEL SUBSTRATE MATERIAL INTO TWO STOCKPILES:
    - 5.1.1.2.1 MATERIAL FROM THE TOP 0.3 m OF THE CHANNEL AND

  - 5.1.1.2.2 MATERIAL BELOW THE TOP 0.3 m.
    3 MATERIAL STOCKPILES PLACED ADJACENT TO ANY EXCAVATION OR EMBANKMENT SHALL BE 5.1.1.3 LIMITED TO MAXIMUM 1.2 m IN HEIGHT.
    MATERIAL STOCKPILES SHALL BE PLACED A HORIZONTAL DISTANCE AWAY FROM AN EXCAVATION
  - EQUIVALENT TO (OR GREATER THAN) THE EXCAVATION DEPTH.

    MATERIAL STOCKPILES SHALL BE KEPT FREE OF DEBRIS, OIL OR OTHER CONTAMINANTS, SNOW, 5.1.1.5
  - AND OTHER SOURCES OF MOISTURE STOCKPILES SHALL BE SIZED TO MINIMIZE SEGREGATION AND TO FACILITATE FUTURE USE
  - CULVERT ELEVATIONS NOTED ON THE DESIGN DRAWINGS ARE ESTIMATED FROM LIDAR DATA. CULVERT PLACEMENT AND INSTALLATION SHALL BE FIFLD FIT. TO REFLECT ACTUAL CONDITIONS ENCOUNTERED ON-SITE, INCLUDING BUT NOT LIMITED TO CHANGES IN ELEVATION, GRADE, SKEW, AND/OR DEPTH BASED ON THE DIRECTION OF THE ENGINEER. PLACEMENT OF THE CULVERT SHALL BE COMPLETED SUCH THAT THE LOCATION OF THE CONSTRUCTED CHANNEL BED AT THE INLET AND OUTLET OF THE CULVERT SHALL MATCH THE NATURAL CHANNEL THALWEG TO PROVIDE A STABLE CHANNEL ALLOWING FOR FISH PASSAGE, TO BE CONFIRMED BY THE ENGINEER.
  - CULVERT SLOPES DEVIATING FROM THE DESIGN DRAWINGS SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER. ALL FIELD FIT REVISIONS TO THE DESIGN SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.
- 5.2.1 EXCAVATION SAFETY AND SUITABILITY OF FOUNDATION MATERIALS SHALL BE CARRIED OUT ACCORDING TO THE ARMTEC DESIGN DRAWINGS (ARMTEC PROJECT #19-463-B) OR THE CONTRACTOR'S / OWNER'S GEOTECHNICAL ENGINEER
- 5.2.2 DURING EXCAVATION OF THE CULVERT PLACEMENT AREA, THE EXCAVATED CLEAN CHANNEL SUBSTRATE SHALL BE STOCKPILED FOR REUSE AS PER SPECIFICATION 5.1.1.2.

### 5.3 CULVERT INSTALLATION

### 5.3.1 BEDDING

- - CULVERT BEDDING SHALL BE CONSTRUCTED ACCORDING TO THE ARMTEC DESIGN DRAWINGS (ARMTEC PROJECT #19-463-B) FOR THE PRIMARY (TWIN ARCH CULVERTS) CHANNEL AND AS PER DRAWINGS C-004 AND C-005 FOR THE SECONDARY CHANNEL (SINGLE ROUND CSP).
- 5.3.2 RIPRAP PLACEMENT
- WHEN PLACING THE NON-WOVEN GEOTEXTILE FILTER CLOTH AND RIPRAP THE FOLLOWING PRACTICES SHALL BE FOLLOWED:
  - NON-WOVEN GEOTEXTILE SHALL BE PLACED BENEATH BOTH THE INLET AND OUTLET RIPRAP AS SHOWN IN THE DESIGN DRAWINGS AND SHALL BE KEYED INTO THE SLOPE AT THE TOP OF THE BANKS AT A MINIMUM DISTANCE OF 0.3 m. THE GEOTEXTILE SHALL ALSO BE SEALED AND KEYED INTO THE CULVERT BEDDING MATERIAL WHERE THE RIPRAP MEETS THE CULVERT BASE AND KEYED INTO THE THALWEG WHERE RIPRAP COVERAGE BLENDS IN WITH THE NATURAL CHANNEL
  - THE CONTRACTOR SHALL EXERCISE CARE DURING RIPRAP PLACEMENT TO AVOID DAMAGE OR DISPLACEMENT OF THE NON-WOVEN GEOTEXTILE, CONSTRUCTION EQUIPMENT SHALL NOT BE PERMITTED TO OPERATE DIRECTLY ON THE SURFACE OF THE NON-WOVEN GEOTEXTILE.
    NON-WOVEN GEOTEXTILE SHALL BE PLACED TO ENSURE THERE IS A MINIMUM
  - 5.3.2.1.3
  - OVERLAP OF 0.3 m AT EACH JOINT.
    RIPRAP PLACEMENT WILL BE FIELD FIT BY THE CONTRACTOR, WHO SHALL FOLLOW THE 5.3.2.1.4 DETAILS SHOWN IN THE DESIGN DRAWINGS. RIPRAP SHALL FOLLOW THE NATURAL STREAM CHANNEL, CENTERED ON THE STREAM THALWEG AND CULVERT CENTRE.
  - RIPRAP SHALL BE PLACED UP TO A HEIGHT OF 0.3 m ABOVE THE CROWNS OF THE CULVERTS AGAINST THE ROAD EMBANKMENT AT THE CUI VERT INLET AND OUTLET. RIPRAP SHALL BE PLACED UP TO THE TOP OF BANK OF THE CHANNEL FOR THE EXTENTS
  - UPSTREAM AND DOWNSTREAM OF THE ENDS OF THE CULVERTS AS SHOWN ON THE DRAWINGS AND AS DIRECTED BY THE ENGINEER.
  - ENGINEERED BACKFILL MATERIAL AS SPECIFIED IN THE ARMTEC DRAWINGS (ARMTEC PROJECT #19-463-B) SHALL BE LAID WITHIN THE VOIDS ON THE SURFACE OF THE RIPRAP, AS DIRECTED BY THE ENGINEER.
    THE CONTRACTOR SHALL USE PLACING AND SPREADING METHODS THAT PREVENT
  - 5.3.2.1.8

### 5.3.3 CULVERT PLACEMENT

- WHEN PLACING AND INSTALLING THE PRIMARY (TWIN PIPE ARCH) CULVERT PLATES ONTO THE PREPARED BEDDING MATERIAL THE FOLLOWING PRACTICES SHALL BE FOLLOWED:
  - INSTALL AND CONSTRUCT PIPE IN GENERAL ACCORDANCE WITH THE LINES, GRADES, AND LOCATIONS SPECIFIED IN THE DESIGN DRAWING. PLATE ASSEMBLY AND CULVERT INSTALLATION SHALL BE PERFORMED ACCORDING TO
  - ARMTEC DRAWINGS AND SPECIFICATIONS (ARMTEC PROJECT #19-463-B) UPON INSTALLATION OF THE CULVERT BOTTOM PLATES AND BEFORE THE INSTALLATION OF
- THE SIDE/TOP PLATES, MACHINE PLACE CHANNEL SUBSTRATE ACCORDING TO SPECIFICATION 5.3.4.
- WHEN PLACING AND INSTALLING THE SECONDARY CULVERT ONTO THE PREPARED BEDDING MATERIAL, THE FOLLOWING PRACTICES SHALL BE FOLLOWED: INSTALL AND CONSTRUCT PIPE IN GENERAL ACCORDANCE WITH THE LINES, GRADES, AND 5.3.3.2.1 LOCATIONS SPECIFIED IN THE DESIGN DRAWING.
- LIFT OR ROLL PIPE INTO POSITION. DO NOT DROP OR DRAG PIPE OVER PREPARED BEDDING. BEGIN INSTALLATION BY LAYING CSP WITH RIVETTED END AT DOWNSTREAM END. THE OUTSIDE LAPS SHALL POINT UPSTREAM AND THE LONGITUDINAL JOINT SHALL BE ON THE
- ENSURE BOTTOM OF PIPE MAKES CONTACT WITH THE SHAPED BED FOR THE ENTIRE LENGTH OF THE PIPE

- 5.3.3.2.5 MATCH CORRUGATIONS OR INDENTATIONS OF COUPLERS WITH PIPE SECTIONS BEFORE
- TAP COUPLERS FIRMLY AS THEY ARE BEING TIGHTENED, TO TAKE UP SLACK AND ENSURE
- 5.3.3.2.7 INSERT AND TIGHTEN BOLTS TO PRODUCT SPECIFICATIONS SET OUT BY CULVERT MANUFACTURER
- 5.3.3.2.8 REPAIR SPOTS WHERE DAMAGE HAS OCCURRED TO SPELTER COATING BY APPLYING TWO COATS OF ASPHALT PAINT OR TWO COATS OF ZINC RICH PAINT AS APPLICABLE, TO MATCH PIPE COATING.
- CHANNEL SUBSTRATE PLACEMENT
  - FOR THE PRIMARY CULVERTS, UPON INSTALLATION OF THE CULVERT BOTTOM PLATES AND BEFORE THE INSTALLATION OF THE SIDE/TOP PLATES, MACHINE PLACE CHANNEL SUBSTRATE (BOTTOM CHANNEL SUBSTRATE MATERIAL FIRST, AND THEN TOP 0.3 m CHANNEL SUBSTRATE MATERIAL) INSIDE THE CULVERT AS INDICATED ON DRAWINGS C-002 AND C-003
- FOR THE SECONDARY (SINGLE ROUND CSP) CULVERT, HAND PLACE CHANNEL SUBSTRATE (BOTTOM CHANNEL SUBSTRATE MATERIAL FIRST, AND THEN TOP 0.3 m CHANNEL SUBSTRATE
- MATERIAL) INSIDE THE CULVERT AS INDICATED ON DRAWINGS C-004 AND C-005. SUBSTRATE SHALL BE KEPT CLEAN AND DRY, AND SOURCES OF MOISTURE SHALL NOT BE
- ALLOWED TO ACCUMULATE ON OR WITHIN THE SUBSTRATE.
  THE SURFACE OF THE BACKFILLED SUBSTRATE WITHIN THE CULVERTS SHALL CONFORM TO THE 5.3.4.4 DIMENSIONS ON DRAWINGS C-003 AND C-005.
- 5.3.5 BOULDER CLUSTER PLACEMENT
  - FOR THE PRIMARY CULVERTS, AFTER INSTALLATION OF THE CULVERT CHANNEL SUBSTRATE AND BEFORE THE INSTALLATION OF THE SIDE/TOP PLATES, PLACE BOULDER CLUSTERS AS INDICATED
- 5.3.6 BACKFILL AND FILL PLACEMENT FILL SHALL BE PLACED ACCORDING TO ARMTEC DRAWINGS AND SPECIFICATIONS (ARMTEC
- PROJECT #19-463-B) OR THE CONTRACTOR'S / OWNER'S GEOTECHNICAL ENGINEER
- ROADWAY SURFACE
- 5.3.7.1 FINAL ROADWAY SURFACE GEOMETRY TO BE DETERMINED BY THE OWNER.
- 5.3.8 COMPLETION OF WORKS
- ONCE THE CULVERT HAS BEEN INSTALLED AND ALL BACKFILLING AND RIPRAP PLACEMENT HAS BEEN COMPLETED, THE FOLLOWING SHALL BE COMPLETED:
  - ENVIRONMENTAL MANAGEMENT AND EROSION AND SEDIMENT CONTROL MEASURES SHALL BE COMPLETED AS DIRECTED BY OTHERS.
  - INSPECTIONS SHALL BE COMPLETED AND AS-BUILT MEASUREMENTS AND OBSERVATIONS FOR THE CULVERT AND FINAL ROADWAY SURFACE SHALL BE TAKEN.

# HALF-SCALE

**ISSUED FOR** 

CULVERT CROSSINGS AT THE RASCAL STREAM WEST REACH 1

# CONSTRUCTION

SABINA 2021 BACK RIVER ENVIRONMENT STUDY



SABINA GOLD AND SILVER CORPORATION

CONSULTANT

GOLDER MEMBER OF WSP

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**SPECIFICATIONS** 

**DETAILED DESIGN** 

PROJECT NO PHASE/TASE 20412211 2600/2670

7 of 7 C-006

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