Eklutna Fish & Wildlife Program

AWWU Maintenance Road and Bridges

Design Documentation Report

15% Design
Revision No. 0

McMillen

October 6, 2023

PLACEHOLDER FOR ENGINEER STAMP
Date:

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Revision Log

Revision No.	Date	Revision Description
0	October 6, 2023	15% Design – Initial Draft

1.0 Introduction

1.1 Purpose

The purpose of this report is to present the design documentation associated with the development of the Anchorage Water and Wastewater Utility (AWWU) Maintenance Road and Bridges Improvements (Project) as part of the Eklutna Fish & Wildlife Program. The design documentation report (DDR) summarizes the pertinent data, design criteria, and standards used as the basis for the 15% level of design of the Project. The DDR documents the data, criteria, and standards by engineering discipline, and provides information about the operation of the design components associated with the Project.

The information presented within this DDR will be updated throughout the design development process to reflect refinement of the Project components and facilities, and advancement of the design analysis and details.

1.2 Location

The Project site is located in Southcentral Alaska approximately 30 miles northeast of downtown Anchorage near the Native Village of Eklutna. The Project footprint spans across lands owned and managed by the State of Alaska, Eklutna Inc., and the Bureau of Land Management (BLM). As proposed, the Project involves the construction of eight new bridges along the AWWU maintenance road to cross the Eklutna River, as shown in Figure 1-1.

1.3 Background and Objectives

As part of the Eklutna Fish & Wildlife Program, Chugach Electric Association, Matanuska Electric Association, and the Municipality of Anchorage, known collectively as the Owners of the Eklutna Hydroelectric Project (Owners) are studying various means of providing water to the Eklutna River to mitigate damages to, and to enhance fish and wildlife impacted by the development of the project. A measure under careful consideration by the Owners is the implementation of a new river release structure, utilizing some of the infrastructure owned and operated by AWWU, to restore flows to the Eklutna River. With the future instream flow released into the Eklutna River, a potential risk is imposed on AWWU O&M crew who utilize the existing river crossings to maintain, repair, or inspect the buried pipeline. These river crossings may not be fordable by vehicle in their current conditions. This Project seeks to construct bridges at the locations of the river crossings to maintain access along the AWWU Maintenance Road.

1.4 Report Organization

This DDR is a record of the design effort for the Project and specifically describes the details of the design process and work effort for the improvements of the AWWU Road and Bridges. The DDR consists of a summary of the design elements, criteria, methods and approach, engineering calculations, and pertinent references. The major report sections and intended purpose are presented in Table 1-1.

Table 1-1. Major Report Sections and Purpose.

Section	Description	Purpose
1	Introduction and Background	Presents the Project purpose, location, background, objectives, and the report organization.
2	General Description	Summarizes the basic design criteria that are used as the basis of design.
3	Existing Infrastructure	Summarizes the existing infrastructure related to the Project.
4	Civil Design	Includes information related to the civil design of the realignment and gradient of the AWWU Road, including erosion and sediment control measures.
5	Structural Design	Includes information related to the structural design of the bridges.
6	References	Documents the references used in developing the design.
Appendices		
A	15% Design Drawings	Presents the 15% design drawings for the AWWU Maintenance Road and Bridges.
B	Class 4 OPCC	Presents the Class 4 Opinion of Probable Construction Costs for the AWWU Maintenance Road and Bridges.

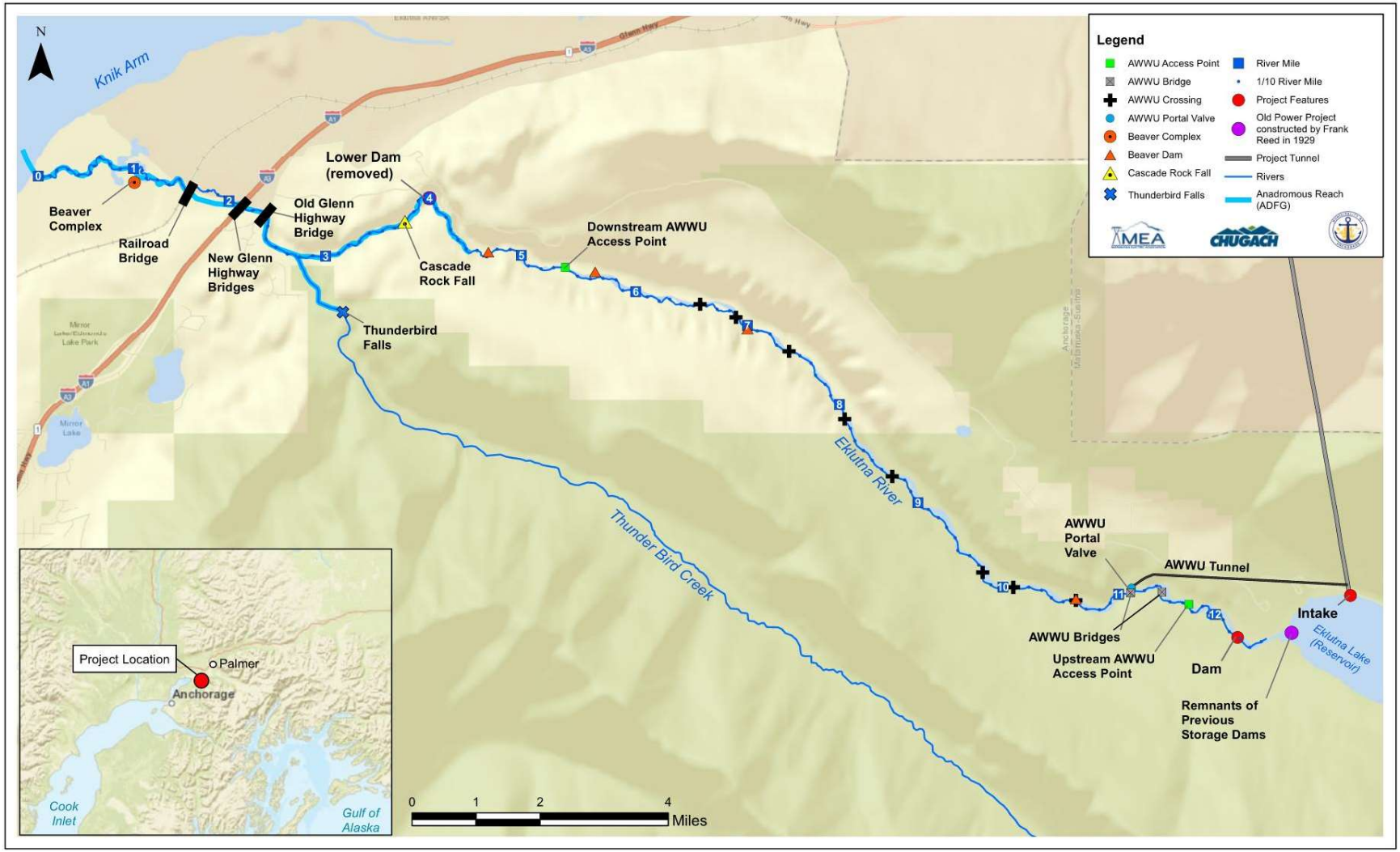

Figure 1-1. Project Overview.

2.0 General Description

2.1 General Design Criteria and Standards

General design criteria and standards for the Project include the abbreviations, survey datum, topographic mapping, references, and design standards as described below.

2.1.1 Standard List of Terms and Abbreviations

AACE	Association for Advancement of Cost Engineering
AASHTO	American Association of State Highway Transportation Officials
AC	alternating current
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASTM	American Society of Testing and Materials
AWWA	American Water Works Association
AWWU	Anchorage Water and Wastewater Utility
BMP	Best Management Practice
CADD	computer aided design and drafting
CEA	Chugach Electric Association
cfm	cubic feet per minute
cfs	cubic feet per second
CGP	Construction General Permit
DC	direct current
DDR	Design Documentation Report
DEM	Digital Elevation Model
DSM	Digital Surface Model
El.	elevation
ESC	Erosion and Sediment Control
fps	feet per second
ft	feet
GCP	Ground Control Points

GGDVLVLR	Guidelines for Geometric Design of Very Low Volume Local Roads
HDC	Hydraulic Design Criteria
HEC	Hydrologic Engineering Center
IBC	International Building Code
LiDAR	Light Detection and Ranging
MEA	Matanuska Electric Association
MGD	million gallons per day
MOA	Municipality of Anchorage
MSL	Mean Sea Level
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NGVD29	National Geodetic Vertical Datum of 1929
NVE	Native Village of Eklutna
O&M	operation and maintenance
pcf	pounds per cubic foot
PLC	programmable logic controller
psi	pounds per square-inch
SWPPP	Stormwater Pollution Prevention Plan
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
V	volt
WSEL	water surface elevation

2.2 Mapping and Imagery

2.2.1 Survey Datum

McMillen contracted NV5 Geospatial to conduct LiDAR survey flights over the Project Area on May 28, 2020, and on May 18, 2022. Both datasets were presented in the NAV88 (GEOID12B), NAD83 (2011) and were projected to the UTM Zone 6N. The data was measured in metric units. For both datasets, Ground Control Points were established by A. William Stoll (AK PLS#12041) with DOWL INC, to provide geospatial correction of the aircraft positional coordinate data and for quality assurance.

The survey vertical datum that was utilized as the basis of this Project is NAVD88 (GEOID12B) in terms of elevation with respect to Mean Sea Level (MSL). The horizontal datum was reprojected to NAD83 (2011) Alaska State Plan Zone 4. Units were converted from metric to imperial (U.S. Feet).

2.3 Topography, Bathymetric and Imagery

Both the 2020 and 2022 LiDAR data were used selectively for the topography and bathymetry of the Eklutna River to accurately depict the geometry and water depth of the Eklutna river. The 2022 Imagery dataset was used for the aerial shown on the Drawings. LiDAR and imagery specifications are detailed in Table 2-1 below.

Table 2-1. LiDAR and Imagery Specifications

Date	Type	Data	Format	Equipment
May 2020	Rasters	LiDAR DEM	0.5 Meter GeoTIFF Bare Earth	Leica ALS80
		LiDAR DSM	0.5 Meter GeoTIFF Highest Hit	Leica ALS80
	Digital Imagery	Imagery	15 Centimeters GeoTIFFs, 3-Band, 8-bit (RGB)	UltraCAM Eagle M3
May 2022	Rasters	LiDAR DEM	0.5 Meter GeoTIFF Bare Earth	Leica ALS80
		LiDAR DSM	0.5 Meter GeoTIFF Highest Hit	Leica ALS80
	Digital Imagery	Imagery	15 Centimeters GeoTIFFs, 4-Band 32-bit (RGB-Ir)	UltraCAM Eagle M3

2.4 Geotechnical Data

At the present phase of development of the proposed facilities, site specific geologic and geotechnical investigations have not been performed. The basis of the geotechnical design for the facilities associated with the lake diversion tunnel and portal valve structure is the design summary report for the Eklutna Water Project (AWWU 1985). Additional geotechnical information was obtained for the vicinity around Eklutna Dam from the technical record of design and construction (USBR 1958).

3.0 Existing Infrastructure

Existing infrastructure information was extracted from the Eklutna Hydroelectric Project Existing Infrastructure Assessment Study Report, submitted in February 2022 by McMillen Inc (McMillen 2022). For additional information relating to the infrastructure discussed and for all other infrastructure not detailed in this section, refer to that Study Report.

3.1 AWWU Access Road

The AWWU Access Road is a 6.5-mile-long gravel road following the AWWU Pipeline along the Eklutna River. The road crosses the river in ten (10) locations, two (2) of which consist of a short spanning bridge and eight (8) requiring fording the river on foot or with a vehicle to the extent possible.

Table 3-1. River Crossing Locations and Descriptions

Crossing No.[1]	River Mile	Description
1	6.5	Natural Bottom Ford
2	6.9	Natural Bottom Ford
3	7.4	Natural Bottom Ford
4	8.1	Natural Bottom Ford
5	8.7	Natural Bottom Ford
6	9.8	Natural Bottom Ford
7	10.1	Natural Bottom Ford
8	10.3	Natural Bottom Ford
9	11.1	Bridge
10	11.4	Bridge

[1]Crossing Number are label based on the distance along Eklutna River and do not correspond with crossing numbering system shown on the Drawings.

The full extent of the AWWU access road was assessed during a field visit in September 2021 to determine the current condition of the road prior to releasing flows into the river. Crossings 1 - 7 were determined to be in acceptable condition, with no signs of advanced erosion. The bridges at crossings 9 and 10 were in good condition, with no evidence of scour at the bridge abutments. Crossing No.8 at river mile 10.3 was inundated to a depth of approximately 3-feet by a beaver dam constructed along the road. A second, larger beaver dam constructed at or around river mile 7.2 was causing inundation of the roadway between river crossing 2 and 3 to a depth of approximately 3-feet.

The AWWU road provides operations and maintenance access to the portal valve shaft and the buried water conveyance pipeline along the Eklutna River and is intended to be accessible year-round under normal flow conditions along the Eklutna River. The river ford crossings

were cut to provide a uniform 4:1 slope transitioning into and out of the riverbed and surfaced to prevent significant erosion under normal flow conditions. The standard design for each river crossing, as detailed in the AWWU pipeline design drawings, can be seen in Figure 3-1.

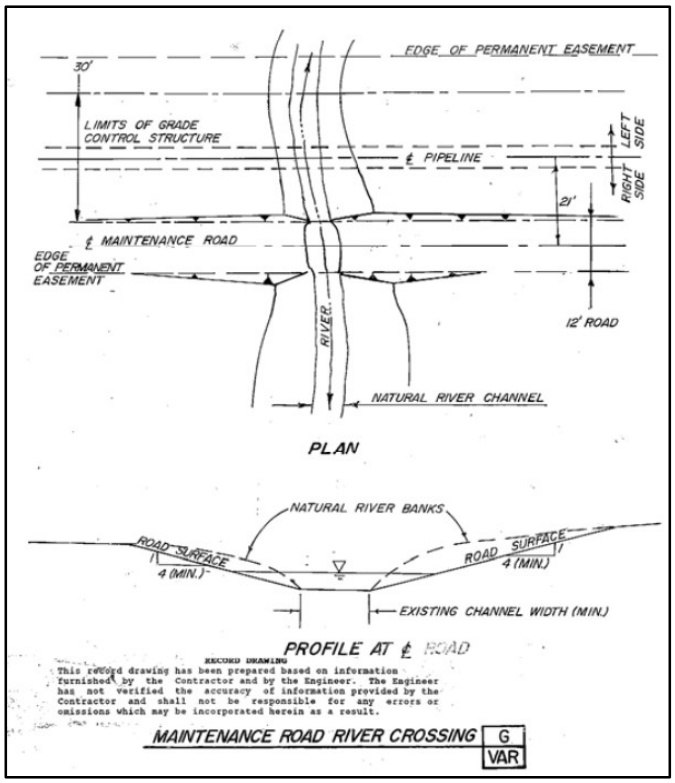

Figure 3-1. Maintenance Road River Crossing Standard Detail (AWWU 1986).

4.0 Civil Design Criteria

4.1 General Description

This section presents the civil design elements for the Access Road improvements and summarizes the civil design criteria, stormwater design, grading criteria, and the erosion and sediment control requirements during and post-construction.

4.2 Design Criteria

The Project is located in the Municipality of Anchorage in Alaska; therefore, during construction and after construction, the Project will be required to comply with all federal, state, and county standards and requirements. Given that the primary function of the existing AWWU Access Road is to provide access for maintenance of the AWWU pipeline, the design criteria for the roadway geometrics will adhere to AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads (GGDVLVLR). The Civil design elements adhered to the codes and standards administered and authorized by the following agencies and jurisdiction listed in Table 4-1.

Table 4-1. Codes and Standards

Codes & Standards	Description
AASHTO	American Association of State Highway and Transportation Officials
DOT&PF	Alaska Department of Transportation and Public Facilities
IBC	International Building Code
MOA	Municipality of Anchorage

4.2.1 Bridge Approach and Roadway Crossings

The existing natural-bottom ford crossings 1-8, listed in Table 3-1, are the locations where new bridges will be constructed. Some of the approaching alignments of the crossings have been shifted to ensure design criteria was met, but in general the proposed bridge crossings are in relatively the same location as the existing natural-bottom ford crossings. The proposed alignments were created using an iterative process which involved determining the geometry of the Eklutna River based on the topographical LiDAR data, placing the center point of the bridge such that the abutments on either side would not encroach on the existing river geometry, and tying the proposed bridge alignment back to the existing road alignment on either side of the bridge approach. See Figure 4-1 below for the proposed river crossing locations.

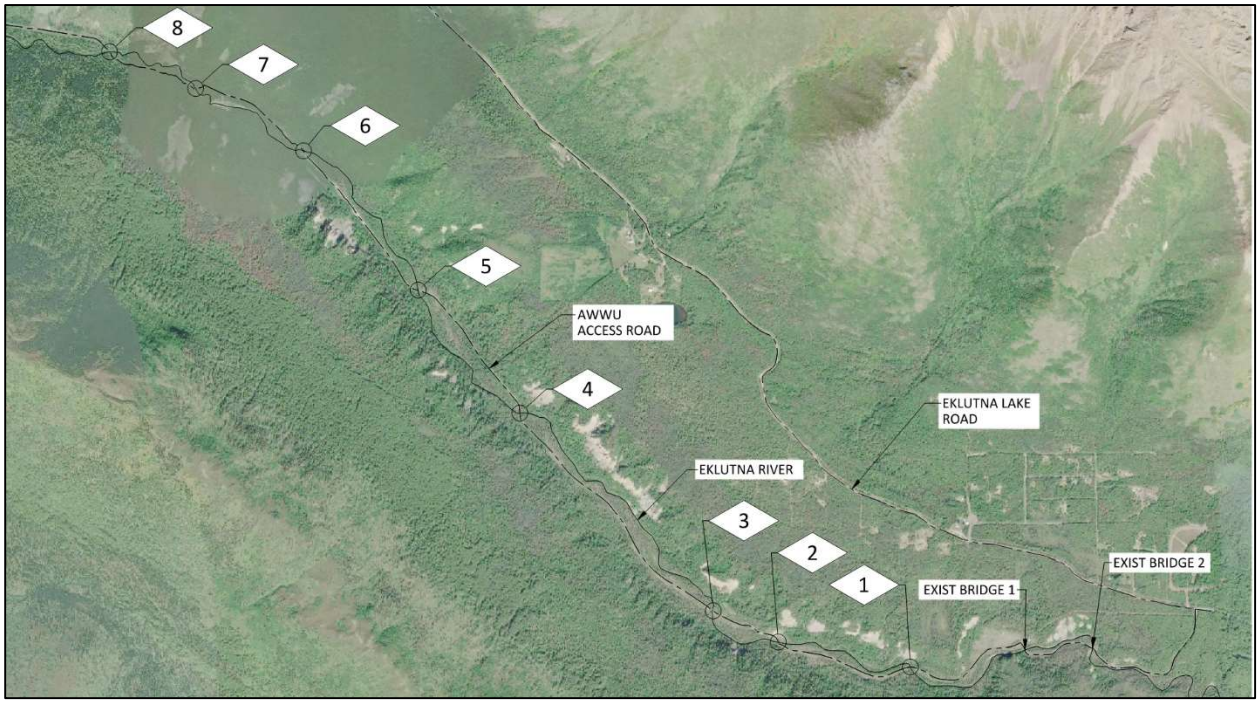

Figure 4-1. River Crossing Locations

4.2.2 Grading

The design of the grading slopes for cut and fill for the roadway section meets the requirements of the Anchorage Code of Ordinances. As required by the code, without a slope stability analysis or otherwise recommended in an approved soils engineer report, slope of fill and slope of excavation was designed to not be any steeper than safe for intended use and will not be steeper than 1 unit vertical in 2 units horizontal. The grading criteria are listed in Table 4-2.

Table 4-2. Grading Criteria

Criteria	Units	Value	Comments / Descriptions / References
Cut Slope	ft:ft	2H:1V	(Anchorage, 2023, 23.105.107.2)
Fill Slope	ft:ft	2H:1V	(Anchorage, 2023, 23.105.108.5)

4.2.3 Roadway Geometrics

The existing AWWU Maintenance Road can be classified by AASHTO as a low-speed Rural Minor Access Road due to characteristics such as the following: having a narrow road width, having a winding alignment, having periodic one-lane sections, having an unpaved surface,

being a private road, and being predominately used by familiar drivers for maintenance (AASHTO 2001, 6). The GGDVLVLR recommends selecting a design speed that will realistically represent the anticipated operating speed on the roadway being designed, additionally, for low-speed roads, the GGDVLVLR recommends selecting a design speed between 0 and 45 mph at increments of 5 mph (AASHTO 2001, 9)Due to existing characteristics of the road, and the surrounding mountainous terrain, a design speed of 15 mph was chosen for the approaches of the proposed bridge crossings. The roadway width was selected based on the required bridge width to accommodate a fully loaded construction dump truck and a 450 LC Excavator as needed for maintenance of the pipeline. All other design values for the proposed roadway geometry, summarized in Table 4-3, were chosen based on the design speed of 15 mph, surrounding mountainous terrain, and AASHTO standards.

Table 4-3. Roadway Design Criteria

Criteria	Units	Value	Comments / Descriptions / References
Design Speed	mph	15	(AASHTO 2001, 9)
Roadway Width	ft	15	
Road Surface Traction Coefficient	-	0.45	Coefficient for Loose Gravel; (AASHTO 2001, 52)
Stopping Sight Distance, SSD	ft	65	(AASHTO 2001, 39)
Min. Horizontal Curve Radius	ft	60	(AASHTO 2001, 22, 50, 51)
Max. Grades[1]	%	4	(AASHTO 2011, 3-115, 3-116)
Min. K[2], Rate of Vertical Curvature for Crest Curve	-	2	(AASHTO 2001, 39)
Min. K[2], Rate of Vertical Curvature for Sag Curve[3]	-	10	(AASHTO 2011, 5-4)

[1]AASHTO do not provide a clear maximum grade value based on the existing roadway characteristics. Based on an entering speed of 15 mph, and the relatively short length of the proposed approaches, figures 3-24 and 3-25 (AASHTO 2011, 3-115, 3-116) suggest that a maximum grade of 4% will ensure that trucks can maintain speed while traveling up/down grade.
[2]K-Value is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve that will provide the minimum sight distance.
[3]There are no special guidelines for design of sag vertical curves in GGDVLVLR (AASHTO 2001, 38)

4.2.4 Roadway Section

The typical roadway section used for the design of the proposed river crossing roads consists of a 15 ft-wide gravel road with a 2% grade away from the crown on both sides. In areas where the proposed roadway will require additional fill material, the edge of the roadway will continue towards existing ground at a minimum of a 2H:1V slope. In areas where the proposed roadway will require existing material to be removed, a ditch along the edge of the road will

be cut with minimum side slopes of 2H:1V and a flow line located 6 inches below the lowest aggregate base of the road. The section design ensures that water will drain adequately off and away from the road whether existing material needs to be added or removed. See Figure 4-2 below for a depiction of the proposed typical section.

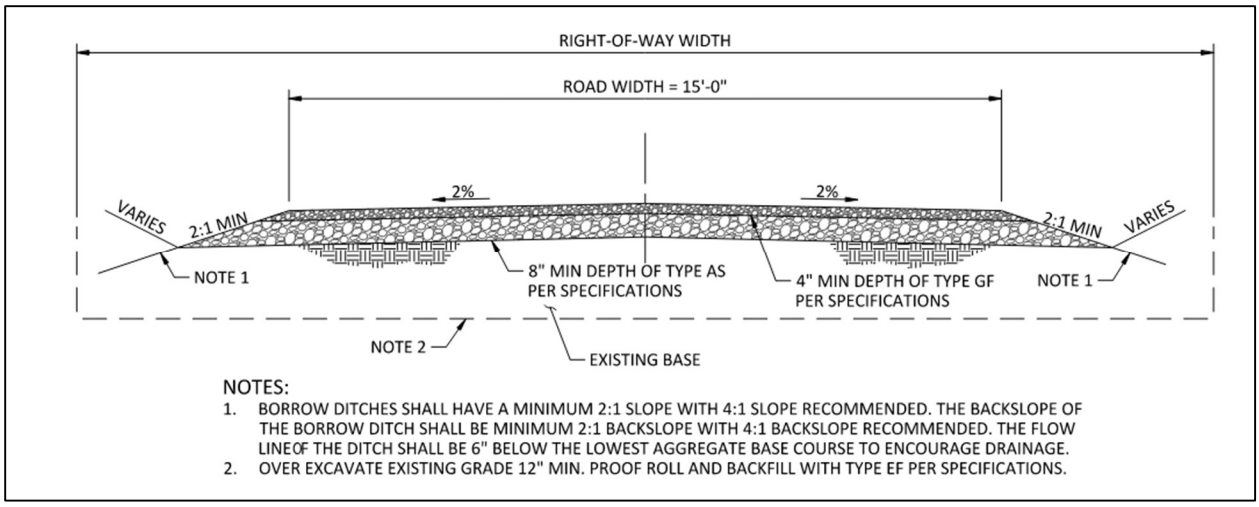

Figure 4-2. Typical Gravel Road Section

4.2.5 Stormwater Control

Stormwater control measures and facilities will be designed in compliance with MOA standards and requirements. Stormwater control measures and facilities will include surface drainage, road ditches and ditch relief culverts. The road ditches and culvert will be sized to convey the design storms listed in Table 4-4, in accordance with the guidelines set by Anchorage Stormwater Manual. Stormwater facility design criteria are listed in Table 4-5.

Table 4-4. Design Storm Criteria

Application	Design Storm	Comments / Descriptions / References
Minor Drainageway (Culverts)	10 year, 24-hour	(MOA 2017, Table 4.2-1)

Table 4-5. Stormwater Facility Criteria

Criteria	Units	Value	Comments / Descriptions / References
Min. Culvert Slope	%	0.5	(MOA 2017, 5.3.6.1)
Min. Culvert Spacing	ft	20	(MOA 2017, 5.3.6.1)
Min. Ditch Slope	%	0.5	(MOA 2017, 5.5.2)
Min. Ditch Side Slope	V:H	1:2	(MOA 2017, 5.5.2)

4.2.6 Erosion Control and Grading

Erosion and Sediment Control (ESC) measures in the drawings intend to reduce the potential for project-related activities causing erosion and sedimentation issues within the Project site or turbidity issues within the Eklutna River. These temporary and permanent construction activities may involve soil, rock, and vegetation removal, which could mobilize sediment resulting in soil erosion and/or sedimentation in the construction areas. The design will employ multiple standard control measures to prevent erosion and stream sedimentation in accordance with MOA Best Management Practices (BMP's). The drawings will serve as an aid for the contractor in developing a Stormwater Pollution Prevention Plan to obtain a construction general permit.

5.0 Structural Design Criteria

The structural design criteria apply to all design procedures to be implemented during the Project design. Structural design considerations listed in this section include detailing of Structural components, material selection, and design requirements that are intended to be incorporated into the Project.

5.1 Applicable Codes and Standards

The structural design will conform to the following reports, criteria, and industry codes and standards. The applicable version of each document is the latest edition in force unless noted otherwise. References to the specific codes and standards will be included in the applicable technical specifications as the final design documents are prepared. AASHTO is referenced for design live loads and general design methodology guidance, although the Project features are not specifically required to adhere to AASHTO design requirements.

Table 5-1. Structural Codes and Standards.

Number	Description
Building Code	
ASCE 7	ASCE 7/SEI 7-16 Minimum Design Loads for Buildings and Other Structures, 2016
Design Standards and References	
ACI 318	Building Code Requirements for Structural Concrete, 2014
ACI 350	Code Requirements for Environmental Engineering Concrete Structures, 2006
ACI 360R	Design of Slabs on Ground, 2006
AISC 360	Specification for Structural Steel Buildings, 2016
ASIC SCM	Steel Construction Manual, 14th Edition
AWS D1.1	Structural Steel Welding Code – Steel
AASHTO	AASHTO LRFD Bridge Design Specifications – 8th Edition, 2017 with CA Amendments
2018 NDS	National Design Specification for Wood Construction, 2018

5.2 Materials

Materials and standards for concrete, concrete-related materials, structural steel, and miscellaneous metals for the Project are indicated in Table 5-2.

Table 5-2. Structural Materials and Design Standards.

Component	Material and Standard
Concrete and Related	
New Concrete	Minimum 28-day Compressive Strength, f'c = 4,500 psi
Reinforcing Steel	ASTM A615, Grade 60
Adhesive Anchors	Two component epoxy, ASTM C-881 (with SS threaded anchor rod or reinforcing dowels)
Structural Steel	
Wide Flange Shapes	ASTM A992, Grade 50ksi
M, C, L shapes	ASTM A572, Grade 50ksi
Tube (HSS)	ASTM A500, Grade C. (46ksi Round / 50ksi Rect.)
Plates and Bars	ASTM A572, Grade 50ksi
High-Strength Bolts	ASTM F3125, Grade A325
Anchor Rods	ASTM F1554, Grade 50ksi (threaded) A193, Type 316 Stainless Steel
Miscellaneous Metals	
Guardrail	Galvanized steel
Wood	
Wood Bridge Components	Douglas Fir (DF) Larch No. 2 or better

5.3 Design Loads

The general load types considered in the design of the structure are summarized in Table 5-3.

Table 5-3. Structural Design Loads.

Load Type	Description
Dead	Self-weight of all permanent structural elements as well as super-imposed weight of permanent mechanical and electrical equipment and piping.
Live	Temporary loads produced by the use of the bridge structures (excluding environmental loads). This load type includes those produced by movable objects and loads on guardrails. Design basis wheel loads and axle spacing is based on an HL-93 or the equipment producing the maximum wheel loads that may be used during the construction of all Project features.
Soil	Weight of moist or buoyant soil on the structure and lateral earth pressures against surfaces retaining soil (abutments).
Wind	Wind load parallel and perpendicular to the bridge span acting over solid surfaces.
Seismic	Inertial forces produced by ground motion during a seismic event. The effects of this load type on these structures and non-structural equipment will be approximated based on the provisions of ASCE7.
Thermal	Self-straining loads due to thermal variation. Maximum and minimum temperatures for the site location will be considered.

5.3.1 Design Basis for Bridge Structures

Per AASHTO, all bridge structures will satisfy Load Factor and Resistance Design (LRFD) methodology by providing the required strength defined by the equation below:

$$R_r = \sum \eta_i \gamma_i Q_i \leq \phi R_n$$

Where:

- $R_r =$ required strength
- $\gamma_i =$ load factors per AASHTO
- $Q_i =$ load effects per structural calculations
- $\emptyset =$ resistance factor from AASHTO
- $R_n =$ nominal resistance from AAHSTO

This methodology will be applied to the design of other material types in accordance with the relevant design standards and references. Refer to the structural calculations for additional information and derivation of these equation variables for specific Project features and components.

5.3.2 Description of Bridge Structures

A single bridge design will be provided for all site locations based on the site conditions producing the most extreme forces the structure may see. The bridge design will consist of a 15’-0” wide by 32’-0” long (clear dimensions) single-span bridge that is supported by sheet pile abutments at each end. The bridges will consist of dimensional lumber wearing surface beams bearing on dimensional lumber transverse beams. The transverse beams will be through bolted to each of the three steel girders (each end and at midspan). Cross bracing will be located between the girders to provide bracing against lateral-torsional buckling in addition to acting as a diaphragm, transferring out-of-plane lateral forces.

Timber rails and scuppers will be located along each side of the bridge spans for vehicle safety and to facilitate drainage off the structure. A 6’-0” minimum clearance will be provided between the riverbed and bottom of bridge to allow for adequate freeboard.

6.0 References

AASHTO. 2011. *A Policy on Geometric Design of Highways and Streets - 6th Edition.* Washington, D.C.: AASHTO.

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Appendix A. 15% Design Drawings

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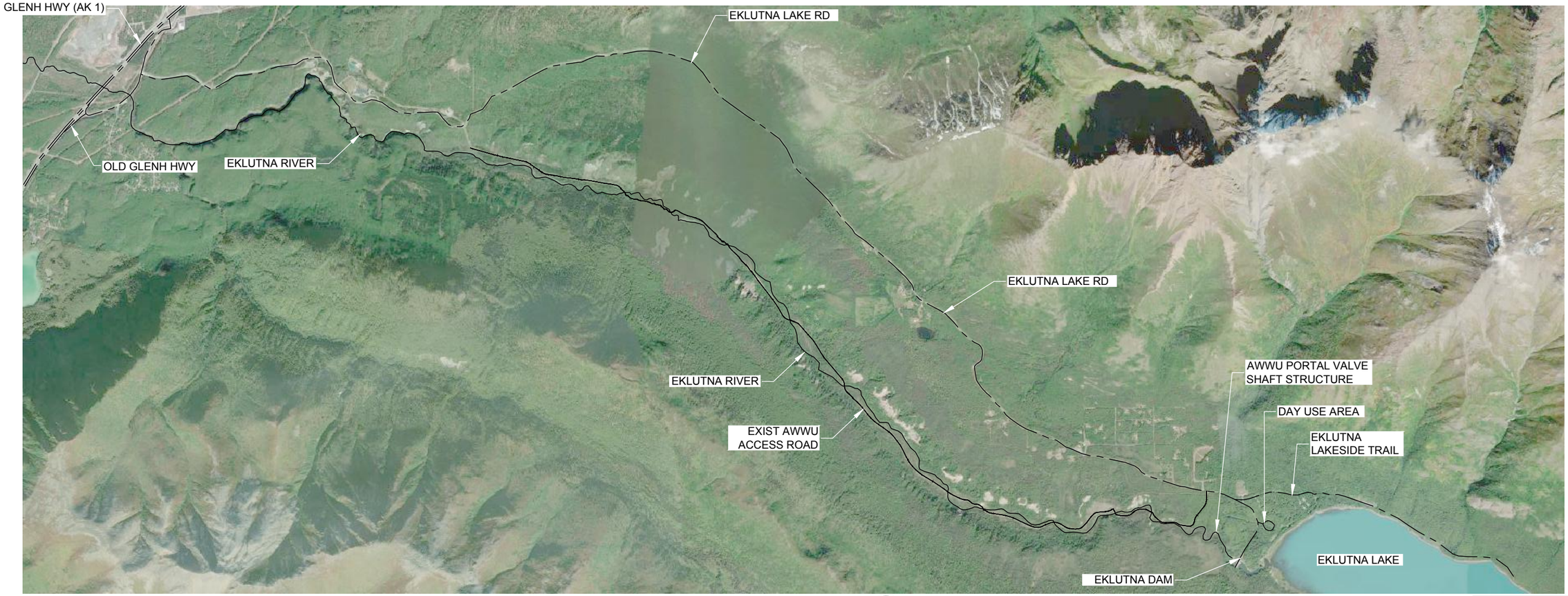
EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGE
ANCHORAGE, ALASKA

15% DESIGN
OCTOBER 2023

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES
15% DESIGN

LOCATION MAP
NTS



VICINITY MAP
NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
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CHUGACH
POWERING ALASKA'S FUTURE

MEA
MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES

LOCATION MAP AND VICINITY MAP

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G001

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G001.dwg Plot date: Sep 29, 2023 12:28pm, CAD User: HaberFlavia

DRAWING INDEX			
15% SUB*	SHEET NO.	DWG NO.	DESCRIPTION
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X	2	G002	DRAWING INDEX
X	3	G003	STANDARD ABBREVIATIONS
X	4	G004	STANDARD SYMBOLS
X	5	G005	PIPING SCHEDULE
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			EROSION AND SEDIMENT CONTROL
	7	EC001	EROSION AND SEDIMENT CONTROL KEY PLAN
	8	EC002	STANDARD EROSION AND SEDIMENT CONTROL DETAILS 1
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X	16	C102	ROAD CROSSING NO. 2 PLAN AND PROFILE
X	17	C103	ROAD CROSSING NO. 3 PLAN AND PROFILE
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X	20	C106	ROAD CROSSING NO. 6 PLAN AND PROFILE
X	21	C107	ROAD CROSSING NO. 7 PLAN AND PROFILE
X	22	C108	ROAD CROSSING NO. 8 PLAN AND PROFILE
			STRUCTURAL
X	23	GS001	STRUCTURAL GENERAL NOTES
X	24	S100	TYPICAL BRIDGE CROSSING PLAN
X	25	S101	TYPICAL BRIDGE SUBSTRUCTURE PLAN
X	26	S102	TYPICAL BRIDGE SUPERSTRUCTURE PLAN
X	27	S103	TYPICAL BRIDGE SECTIONS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
1471 Shoreline Dr. Ste 100, Boise, ID 83702 | (208) 342-4214 | mcmillen.com

CHUGACH
POWERING ALASKA'S FUTURE

MEA
MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

DRAWING INDEX

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G002

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G002.dwg Plot date: Sep 26, 2023 06:20pm, CAD User: HaberFlavia

A/C	AIR CONDITIONING
A/E	ARCHITECT/ENGINEER
A	ARCHITECTURAL (DWG DISCIPLINE), AMP
AB	ANCHOR BOLT
ABC	AGGREGATE BASE COURSE
ABAN	ABANDON
AC	ALTERNATING CURRENT
ACST	ACOUSTIC
AD	ADDENDUM, AREA DRAIN
ADDL	ADDITIONAL
ADH	ADHESIVE
ADJ	ADJUSTABLE, ADJACENT
AF	AMP FRAME, AMP FUSE
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AGGR	AGGREGATE
AIC	AMPS INTERRUPTING CAPACITY
ALIG	ALIGNMENT
ALUM	ALUMINUM
ALT	ALTERNATE, ALTITUDE
AMB	AMBIENT
ANC	ANCHOR
AP	ACCESS PANEL
APRX	APPROXIMATE
APVD	APPROVED
ARCH	ARCHITECTURAL
ASSY	ASSEMBLY
AT	AMP TRIP
ATM	ATMOSPHERE
AUTO	AUTOMATIC
AUX	AUXILIARY
AVE	AVENUE
AVG	AVERAGE
AWG	AMERICAN WIRE GAGE
AWWU	ANCHORE WATER AND WASTEWATER UTILITY
B/B	BACK TO BACK
BAL	BALANCE
BBD	BULLETIN BOARD
BC	BASE CABINET, BOTTOM CHORD, BOLT CENTER, BOLT CIRCLE
BD	BOARD
BE	BOTH ENDS, BELL END
BF	BOTH FACES, BOTTOM FACE, BLIND FLANGE, BOARD FEET
BFV	BUTTERFLY VALVE
BITUM	BITUMINOUS
BKG	BACKING
BL	BASE LINE
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BM	BENCHMARK, BEAM
BOC	BACK OF CURB
BOD	BOTTOM OF DUCT
BOG	BOTTOM OF GRILLE
BOL	BOTTOM OF LOUVER
BOP	BOTTOM OF PIPE
BOR	BOTTOM OF REGISTER
BOT	BOTTOM
BOU	BOTTOM OF UNIT
BP	BASE PLATE
BRG	BEARING
BRGP	BEARING PLATE
BRKT	BRACKET
BS	BOTH SIDES
BTU	BRITISH THERMAL UNIT
BTW	BETWEEN
BTWLD	BUTT WELD
BV	BALL VALVE
BW	BOTH WAYS
BYP	BYPASS
C TO C	CENTER TO CENTER
C&G	CURB & GUTTER
C	CHANNEL SHAPE, CENTIGRADE, CONDUIT, CIVIL (DRAWING DISCIPLINE)
CAB	CABINET
CAP	CAPACITY
CAT	CATALOG
CAV	CAVITY
CB	CATCH BASIN
CCB	CONCRETE BLOCK
CCW	COUNTER CLOCKWISE
CF	CUBIC FEET (FOOT)
CHFR	CHAMFER
CHD	CHORD
CHH	COMMUNICATION HANDHOLE
CI	CURB INLET
CIP	CAST-IN-PLACE
CIPB	CONCRETE INTERLOCKING PAVER BALLAST
CIRC	CIRCULATION, CIRCULAR
CJ	CONSTRUCTION JOINT, CONTROL JOINT
CKT	CIRCUIT
CL	CENTERLINE, CLASS, CLOSE
CLR	CLEAR
CMH	COMMUNICATION MANHOLE
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT, CONCRETE OPENING
COL	COLUMN
COM	COMMON
COMB	COMBINATION
COMM	COMMUNICATION
COMP	COMPOSITION, COMPRESSIBLE, COMPOSITE
CONC	CONCENTRIC, CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS, CONTINUED
COORD	COORDINATE
CORR	CORROSIVE, CORRUGATED
CP	CHECKER PLATE, CONTROL POINT
CPLG	COUPLING
CSK	COUNTERSINK
CTR	CENTER
CTRL	CONTROL
CU	COPPER, CUBIC
CW	CLOCKWISE
CY	CUBIC YARD
d	PENNY (NAIL MEASURE)
D	DEEP, DIFFUSER
DB	DUCT BANK, DECIBEL, DRY BULB
DBA	DEFORMED BAR ANCHOR
DBL	DOUBLE
DC	DIRECT CURRENT
DEG	DEGREE
DEG C	DEGREE CENTIGRADE
DEG F	DEGREE FAHRENHEIT
DEMO	DEMOLITION
DEP	DEPRESSED
DEPT	DEPARTMENT
DET	DETAIL
DI	DROP INLET, DUCTILE IRON
DIA	DIAMETER
DIAG	DIAGONAL, DIAGRAM
DIFF	DIFFERENTIAL, DIFFERENCE
DIM	DIMENSION
DISCH	DISCHARGE
DIST	DISTANCE, DISTRIBUTION
DIV	DIVISION
DL	DEAD LOAD
DN	DOWN
DP	DEPTH
DS	DOWN SPOUT
DT	DOUBLE TEE, DRIP TRAP ASSEMBLY
DUP	DUPLICATE
DWG	DRAWING
DWL	DOWEL
E	EAST, ELECTRICAL (DWG DISCIPLINE)
EA	EACH, EXHAUST AIR
EC	ELECTRICAL CONTRACTOR
ECC	ECCENTRIC
EDB	ELECTRICAL DUCT BANK
EE	EACH END
EF	EACH FACE
EG	EXISTING GRADE
EGL	ENERGY GRADE LINE
EFF	EFFLUENT, EFFICIENCY
EHH	ELECTRICAL HANDHOLE
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELBOW, ELEVATION
ELEC	ELECTRICAL
EMBD	EMBEDDED
EMER	EMERGENCY
EMH	ELECTRICAL MANHOLE
ENCL	ENCLOSURE
ENGR	ENGINEER
ENTR	ENTRANCE
EOP	EDGE OF PAVEMENT
EOW	EDGE OF WATER
EQ	EQUAL
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
ES	EACH SIDE, EQUAL SPACE, EMERGENCY SHOWER
ESEW	EMERGENCY SHOWER AND EYE WASH
EST	ESTIMATE
EW	EACH WAY, EMERGENCY EYE/FACE WASH
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY, EACH FACE
EWTB	EACH WAY, TOP AND BOTTOM
EXC	EXCAVATION
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION, EXPOSED
EXT	EXTERIOR, EXTERNAL, EXTENSION
F TO F	FACE TO FACE
FAB	FABRICATE
FBO	FURNISHED BY OWNER
FC	FLUSHING CONNECTION
FCA	FLANGED COUPLING ADAPTER
FCV	FIXED CONE VALVE
FD	FLOOR DRAIN
FDC	FLEXIBLE DUCT CONNECTION
FDR	FEEDER
FE	FLANGED END
FEC	FIRE EXTINGUISHER CABINET
FEXT	FIRE EXTINGUISHER
FF	FAR FACE, FACTORY FINISH, FLAT FACE
FG	FINISHED GRADE
FIG	FIGURE
FH	FIRE HYDRANT
FIN	FINISH
FL	FLOW, FLOW LINE
FLEX	FLEXIBLE
FLG	FLANGE
FLOR	FLUORESCENT
FLR	FLOOR
FLS	FLASHING, FLUSH
FND	FOUNDATION
FNC	FENCE
FO	FINISHED OPENING
FOB	FLAT ON BOTTOM
FOC	FACE OF CONCRETE, FACE OF CURB, FIBER OPTIC CABLE
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF STUDS
FOT	FLAT ON TOP
FPT	FEMALE PIPE THREAD
FR	FRAME
FRP	FIBERGLASS REINFORCED PLASTIC
FS	FLOOR SINK, FAR SIDE
FT	FEET, FOOT
FTG	FOOTING, FITTING FUR FURRED, FURRING
FURN	FURNITURE, FURNISH
FUT	FUTURE
FV	FACE VELOCITY
FW	FIELD WELD, FIRE WALL
FWD	FORWARD
FWE	FURNISHED WITH EQUIPMENT
FXTR	FIXTURE
G	GRILLE, GROUND, GENERAL (DWG DISCIPLINE)
GA	GAGE (METAL THICKNESS)
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK
GD	GUARD
GEN	GENERAL
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GL	GLASS
GP	GUY POLE
GR	GRADE
GRND	GROUND
GRTG	GRATING
GT	GREASE TRAP
GWB	GYPSUM WALLBOARD
GYP	GYPSUM HARDBOARD
H	HIGH
HB	HOSE BIB
HBD	HARDBOARD
HC	HANDICAPPED, HOLLOW CORE, HORIZONTAL CURVE
HC	HORIZONTAL CENTERLINE
HDR	HEADER
HDW	HARDWARE
HEX	HEXAGONAL
HH	HANDHOLE
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HP	HIGH POINT, HORSEPOWER
HPC	HORIZONTAL POINT OF CURVATURE
HPS	HIGH PRESSURE SODIUM
HPT	HORIZONTAL POINT OF TANGENCY
HR	HOUR
HS	HEADED STUD, HIGH STRENGTH
HSS	HOLLOW STRUCTURAL SHAPE
HT	HEIGHT
HV	HIGH VOLTAGE
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HWD	HARDWOOD
HWL	HIGH WATER LEVEL
HYD	HYDRAULIC HZ HERTZ, CYCLES PER SECOND
I	INSTRUMENTATION (DWG DISCIPLINE)
ID	INSIDE DIAMETER, INTERIOR DIMENSION
IE	INVERT ELEVATION
IF	INSIDE FACE
IH	INTAKE HOOD
IMP	IMPACT
IN	INCH
INC	INCLUDE, INCANDESCENT
INF	INFLUENT
INSTR	INSTRUMENTATION
INSUL	INSULATION
INT	INTERIOR, INTERSECTION
INTR	INTERMEDIATE, INTERIOR
INV	INVERT
IPS	IRON PIPE SIZE
IPT	INTERNAL PIPE THREAD
IRR	IRRIGATION
ISO	ISOMETRIC
JB	JUNCTION BOX
JCT	JUNCTION
JF	JOINT FILLER
JT	JOINT
K	KIP
KB	KNEE BRACE
KCMIL	THOUSAND CIRCULAR MILS
KD	KNOCK DOWN
KIUC	KAUAI ISLAND UTILITY COOPERATIVE
KO	KNOCK OUT
KSI	KIPS PER SQUARE INCH
L	ANGLE, LENGTH, LAVATORY
LAM	LAMINATE
LATL	LATERAL
LB	LAG BOLT, POUND
LDR	LEADER
LF	LINEAR FOOT
LG	LONG
LH	LEFT HAND
LIN	LINEAR
LIQ	LIQUID
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LMLU	LIQUID MARKER LECTURE UNIT
LNG	LONGITUDINAL
LOC	LOCATION
LP	LOW POINT
LPS	LOW PRESSURE SODIUM
LR	LONG RADIUS
LT	LEFT
LTD	LIMITED
LTG	LIGHTING
LTL	LINTEL
LTNG	LIGHTNING
LV	LOW VOLTAGE
LVR	LOUVER
LW	LIGHTWEIGHT
LWC	LIGHTWEIGHT CONCRETE
LWL	LOW WATER LEVEL
M	MECHANICAL (DWG DISCIPLINE)
MA	MIXED AIR
MAINT	MAINTENANCE
MAN	MANUAL
MAOP	MAXIMUM ALLOWABLE OPERATING PRESSURE
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MBR	MEMBER
MCJ	MASONRY CONTROL JOINT
MECH	MECHANICAL
MED	MEDIUM
MFR	MANUFACTURER
MH	MANHOLE, METAL HALIDE
MIN	MINIMUM
MIR	MIRROR
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MMB	MEMBRANE
MO	MASONRY OPENING
MOD	MODULAR, MODIFY
MON	MONUMENT
MPT	MALE PIPE THREAD
MSL	MEAN SEA LEVEL
MT	MOUNT
MU	MASONRY UNIT
MULL	MULLION
MV	MEDIUM VOLTAGE
MW	MONITORING WELL
N	NORTH, NEUTRAL
NA	NOT APPLICABLE
NAT	NATURAL
NC	NORMALLY CLOSED
NEG	NEGATIVE
NF	NEAR FACE, NON-FUSED
NG	NATURAL GAS
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN, NUMBER
NOM	NOMINAL
NPS	NOMINAL PIPE SIZE
NPT	NATIONAL PIPE THREAD
NS	NEAR SIDE
NTS	NOT TO SCALE
NWL	NORMAL WATER LEVEL
O TO O	OUT-TO-OUT
OA	OUTSIDE AIR, OVERALL
OC	ON CENTER
OCPD	OVER CURRENT PROTECTION DEVICE
OD	OUTSIDE DIAMETER
OH	OVERHEAD
OPNG	OPENING
OPP	OPPOSITE
OPT	OPTIONAL
ORD	OVERFLOW ROOF DRAIN
ORIG	ORIGINAL
OVFL	OVERFLOW
OVHG	OVERHANG
OZ	OUNCE
P	PAINT, PROCESS (DWG DISCIPLINE)
PAR	PARALLEL, PARAPET
PB	PANIC BAR, PULL BOX
PBD	PARTICLE BOARD
PC	POINT OF CURVE, PIECE, PRECAST
PCC	POINT OF COMPOUND CURVATURE
PCF	POUNDS PER CUBIC FOOT
PCT	PERCENT
PE	PLAIN END
PED	PEDESTAL
PEN	PENETRATION
PERF	PERFORATED
PERM	PERMANENT
PERP	PERPENDICULAR
PF	POWER FACTOR
PH	PHASE
PI	POINT OF INTERSECTION
PKG	PACKAGE
PL	PLATE, PROPERTY LINE
PLBG	PLUMBING
PLF	POUNDS PER LINEAR FOOT
PNEU	PNEUMATIC
POL	POLISH
POS	POSITIVE, POSITION
PP	POLYPROPYLENE, POWER POLE
PRC	POINT OF REVERSE CURVATURE
PREF	PREFINISHED
PREFAB	PREFABRICATED
PRELIM	PRELIMINARY
PREP	PREPARE
PRES	PRESSURE
PROP	PROPERTY
PROT	PROTECTION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PT	POINT, POINT OF TANGENCY
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PWD	PLYWOOD
PZ	PIEZOMETER
Q	RATE OF FLOW
QTR	QUARTER
QTY	QUANTITY
QUAL	QUALITY
R&R	REMOVE AND REPLACE
R&S	REMOVE AND SALVAGE
R	RADIUS, REGISTER, RISER
RA	RETURN AIR
RB	RESILIENT BASE, ROCK BERM
RCPT	RECEPTACLE
RD	ROOF DRAIN
REC	RECESS
RECD	RECEIVED
RECT	RECTANGULAR
RED	REDUCER
REF	REFERENCE
REINF	REINFORCING
REQD	REQUIRED
RESIL	RESILIENT
RET	RETAINING, RETURN
REV	REVISION, REVERSE
RFL	REFLECTED, REFLECTOR
RGS	RIGID GALVANIZED STEEL
RH	RELIEF HOOD, RIGHT HAND, RELATIVE HUMIDITY
RL	REQUIRED LAP
RND	ROUND
RNG	RENEWABLE NATURAL GAS
RO	ROUGH OPENING
ROW	RIGHT-OF-WAY
RPM	REVOLUTIONS PER MINUTE
RR	RAILROAD
RT	RIGHT
S	SOUTH, SINK, STRUCTURAL (DWG DISCIPLINE)
SA	SUPPLY AIR
SAN	SANITARY
SC	SOLID CORE
SCH	SCHEDULE
SCHEM	SCHEMATIC
SCRN	SCREEN
SE	STEEL/ALUMINUM EDGE
SEC	SECONDARY, SECONDS
SECT	SECTION
SEP	SEPARATE
SF	SQUARE FOOT
SH	SHOWER
SHT	SHEET
SHTG	SHEATHING
SIM	SIMILAR
SL	SLOPE
SLTD	SLOTTED
SLV	SLEEVE
SMLS	SEAMLESS
SOG	SLAB ON GRADE
SP	SOUNDPROOF, STANDPIPE
SPC	SPACING
SPEC	SPECIFICATION
SPLY	SUPPLY
SPT	SET POINT
SQ	SQUARE
SR	SHORT RADIUS
SS	SERVICE SINK
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STIF	STIFFENER
STIR	STIRRUP
STL	STEEL
STOR	STORAGE
STR	STRUCTURAL, STRAIGHT
SUB	SUBSTITUTE
SUC	SUCTION
SUSP	SUSPENDED
SY	SQUARE YARD
SYM	SYMBOL
SYMM	SYMMETRICAL
SYN	SYNTHETIC
SYS	SYSTEM
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
T	TILE, TREAD
TA	TEMPERED AIR
TAN	TANGENT
TBM	TEMPORARY BENCHMARK
TEMP	TEMPORARY, TEMPERATURE
THK	THICK
THRD	THREAD
THRU	THROUGH
TOB	TOP OF BOLT, TOP OF BANK, TOP OF BEAM
TOC	TOP OF CURB, TOP OF CONCRETE
TOD	TOP OF DUCT
TOF	TOP OF FOOTING
TOG	TOP OF GRATING
TOL	TOLERANCE, TOP OF LEDGER
TOM	TOP OF MASONRY
TOP	TOP OF PLATE
TOPO	TOPOGRAPHY
TOS	TOP OF SLAB, TOP OF STEEL
TOW	TOP OF WALL
TP	TELEPHONE POLE, TOE PLATE, TRAP PRIMER
TPG	TOPPING
TRANS	TRANSITION
TRD	TRENCH DRAIN
TYP	TYPICAL
U	URINAL
UG	UNDERGROUND
ULT	ULTIMATE
UNFN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UTIL	UTILITY
V	VENT, VELOCITY, VOLT
VA	VOLT AMPERE
VAC	VACUUM
VAR	VARNISH, VARIABLE, VOLT AMPERES REACTIVE
VB	VAPOR BARRIER, VINYL BASE, VALVE BOX
VC	VERTICAL CURVE
VCT	VINYL COMPOSITION TILE, VERTICAL CENTERLINE
VEL	VELOCITY
VENT	VENTILATION
VERT	VERTICAL
VS	VERSES, VAPOR SEAL
VOL	VOLUME
VPC	VERTICAL POINT OF CURVATURE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
VTR	VENT THROUGH ROOF
VWC	VINYL WALL COVERING
W/	WITH
W/O	WITHOUT
W	WATT, WEST, WIDE, WINDOW, WIRE, WIDE FLANGE BEAM
WC	WATER CLOSET, WATER COLUMN
WD	WIDTH
WF	WIDE FLANGE, WASH FOUNTAIN
WG	WIRE GLASS, WATER GAGE
WH	WALL HYDRANT, WEEP HOLE
WL	WATER LEVEL
WLD	WELDED
WM	WIRE MESH
WP	WATERPROOF, WORKING POINT
WTHP	WEATHERPROOF
WS	WATERSTOP, WATER SURFACE
WSEL	WATER SURFACE ELEVATION
WT	WEIGHT, WATER TIGHT
WWF	WELDED WIRE FABRIC
XS	EXTRA STRONG
XXS	DOUBLE EXTRA STRONG
XSECT	CROSS SECTION
YH	YARD HYDRANT
YS	YIELD STRENGTH

GENERAL NOTES:

1. THESE ABBREVIATIONS APPLY TO THE ENTIRE SET OF CONTRACT DRAWINGS.
2. LISTING OF ABBREVIATIONS DOES NOT IMPLY ALL ABBREVIATIONS ARE USED IN THE CONTRACT DRAWINGS.
3. ABBREVIATIONS SHOWN ON THIS SHEET INCLUDE VARIATIONS OF THE WORD. FOR EXAMPLE, "MOD" MAY MEAN MODIFY OR MODIFICATION; "INC" MAY MEAN INCLUDED OR INCLUDING; "REINF" MAY MEAN EITHER REINFORCE OR REINFORCING.
4. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
1471 Shoreline Dr. Ste 100, Boise, ID 83702 | (208) 342-4214 | mcmillen.com

CHUGACH
POWERING ALASKA'S FUTURE

MEA
MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

STANDARD ABBREVIATIONS

DESIGNED L.VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G003

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G003.dwg Plot date: Sep 29, 2023 01:03pm, CAD User: HaberFlavia

SHEET SYMBOLS

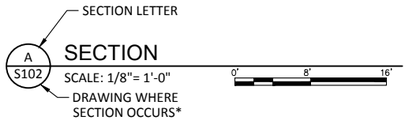
PLAN
SCALE: 1/2"= 1'-0"
0' 2' 4'

N

SECTION IDENTIFICATION

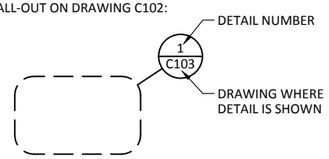
(1) SECTION CUT ON DRAWING C102:

(2) ON DRAWING C103 THIS SECTION IS IDENTIFIED AS:

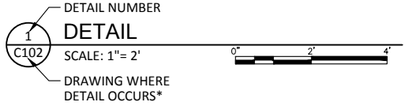


DETAIL IDENTIFICATION

(1) DETAIL CALL-OUT ON DRAWING C102:



(2) ON DRAWING C103 THIS SECTION IS IDENTIFIED AS:

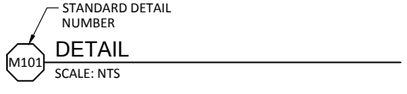


*NOTE: IF PLAN AND SECTION (OR DETAIL CALL-OUT AND DETAIL) ARE SHOWN ON SAME DRAWING. DRAWING NUMBER IS REPLACED BY A LINE.

STANDARD DETAIL IDENTIFICATION

(1) DETAIL CALL-OUT ON PLAN OR SECTION:

(2) ON DETAIL DRAWINGS, IDENTIFIED AS:



ELEVATION/IMAGE IDENTIFICATION

SITE PLAN LINE TYPES

- FENCE LINE (X — X)
- OVERHEAD POWER (P — P)
- MAJOR CONTOUR (455)
- MINOR CONTOUR (456)
- EXIST MAJOR CONTOUR (455)
- EXIST MINOR CONTOUR (456)
- EDGE OF WATERLINE
- TOE OF SLOPE (TOE)
- TOP OF BANK (TOB)
- SANITARY SEWER (SS — SS)
- STORM DRAIN (SD — SD)
- EDGE OF PAVEMENT (EP — EP)
- EDGE OF GRAVEL (EG — EG)
- WATTLE (W)
- SILT FENCE (SF — SF)
- CONSTRUCTION FENCE (CF — CF)
- GAS LINE (GAS)
- TURBIDITY CURTAIN (TC)
- IRRIGATION LINE (IRR — IRR)
- WATER LINE (WTR)
- TELEPHONE LINE (TEL)
- COMMUNICATION LINE (COM)
- OVERHEAD ELECTRICAL/POWER (OHP)
- UNDERGROUND ELECTRICAL (EUG)
- PROPERTY LINE (P/L)
- EXISTING OVERHEAD POWER LINE (OHP)
- EXISTING OVERHEAD POWER & TELEPHONE LINE (OHP&T)
- EXISTING OVERHEAD TELEPHONE LINE (T)
- EXISTING BURIED TELEPHONE LINE EVIDENCED BY PEDESTALS & WARNING PADDLES (BT)
- EXISTING FENCE LINE
- PROJECT BOUNDARY
- TREE PROTECTION FENCE
- LIMITS OF DISTURBANCE
- SHORING

SITE PLAN SYMBOLS

- ARROW INDICATES DIRECTION OF PLAN NORTH
- CONIFER TREE: FIR, SPRUCE, LARCH OR PINE, 8" DIAMETER OR LARGER.
- DECIDUOUS TREE: COTTONWOOD, HAWTHORN, ASPEN, 8" DIAMETER OR LARGER.
- MH — MANHOLE
- EB — ELECTRIC BOX
- STORM DRAIN MANHOLE
- FH — FIRE HYDRANT
- YH-X — YARD HYDRANT
- SURVEY CONTROL POINT, AS NOTED.
- POLE ANCHOR
- POWER POLE
- LIGHT POLE
- SIGN
- SURVEY HUB
- SECTION CORNER
- BENCH MARK
- EXISTING HEADWALL
- EXISTING MONITORING STATION
- X — X — EXISTING FENCE
- STATE PLANE COORDINATE MARKER
- EXISTING TREE LINE
- EXISTING BUILDING, STRUCTURES
- EXISTING SECTION CORNER MONUMENT FOUND AS DESCRIBED
- EXISTING 5/8" REBAR CONTROL POINT MONUMENT, BORING LOCATION
- W — EXISTING HOSE BIB
- EXISTING PORTABLE IRRIGATION WATER PUMP
- WELL — EXISTING 6" WATER WELL
- EXISTING ELECTRICAL OUTLET
- P — EXISTING POWER POLE
- T — EXISTING TELEPHONE PEDESTAL
- CONTROL POINT
- PUMP
- PUMP
- TP — TEST PIT LOCATION

MISCELLANEOUS SYMBOLS

- CHANGE OF PIPE MTL
- OR — END OF PIPE
- ℄ — CENTERLINE
- Ø — DIAMETER
- ∠ — ANGLE
- PL — PLATE
- ± — PLUS/MINUS

GENERAL NOTES:

1. ALL SYMBOLS ARE NOT NECESSARILY USED. THIS IS A STANDARD DRAWING SHOWING COMMON SYMBOLS ON THIS PROJECT.
2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH DRAWING FOR USAGE.

HATCH SYMBOLS

- ROCK, TYPE AS NOTED (PLAN/SECTION)
- BED ROCK
- EXISTING GRADE (SECTION)
- NEW SOIL (SECTION)
- CONCRETE EXISTING (SECTION/PLAN)
- CONCRETE 1ST STAGE (SECTION/PLAN)
- CONCRETE 2ND STAGE (SECTION/PLAN)
- SAND, GROUT (PLAN/SECTION)
- STEEL (SECTION)
- GRATING (PLAN)
- MASONRY (PLAN)
- WOOD, SIZE/TYPE AS NOTED (PLAN)
- WOOD, SIZE/TYPE AS NOTED (SECTION)
- RIP RAP (PLAN/SECTION)
- RIGID INSULATION (SECTION)
- ASPHALT CONCRETE PAVEMENT SURFACE (PLAN/SECTION)
- GRASS/VEGETATION (PLAN)
- BATT INSULATION (SECTION)
- NEW CONSTRUCTION
- EXISTING
- EXISTING TO BE REMOVED OR DEMOLISHED
- CLEARING AND GRUBBING
- ASPHALT
- GRASS/VEGETATION
- GRAVEL

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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MEA
MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES

STANDARD SYMBOLS

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G004

JOB NO: 000000

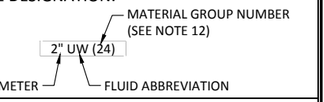
Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G004.dwg Plot date: Sep 26, 2023 06:21pm, CAD User: HaberFlavia

FLUID ABBREVIATION	FUNCTION	ALLOWABLE PIPING MATERIAL GROUP NO. (SEE NOTE 1 AND 4)				FIELD TEST REQUIREMENTS (SEE NOTE 3 AND NOTE 4)		
	THIS LIST MAY INCLUDE FLUIDS NOT USED IN THIS PROJECT	EXPOSED PIPING (SEE NOTE 14)		BURIED PIPING (SEE NOTE 13)		MINIMUM TEST PRESSURE PSI	TEST MEDIUM	LEAKAGE ALLOWANCE (SEE NOTE 2)
		3" DIA AND SMALLER	4" DIA AND LARGER	3" DIA AND SMALLER	4" DIA AND LARGER			
COMMONLY USED FUNCTIONS								
SDR	STORM DRAIN	--	21	--	21	NOTE 6	WATER	(C)

PIPING MATERIAL SCHEDULE (SEE NOTE 1)

GROUP NO.	PIPE MATERIAL	FITTINGS / JOINTS	LININGS AND COATINGS (SEE NOTE 13)
21	CORRUGATED METAL PIPE, GALVANIZED, AASHTO M36 (TYP SERVICE - DRAINAGE & CULVERTS)	FOR COUPLING AND END-PROTECTORS, SEE SPEC 02567	NO APPLICABLE

TYPICAL PIPE DESIGNATION:



NOTES:

NOTE 1
ALTHOUGH SEVERAL PIPE MATERIAL GROUPS MAY BE LISTED ON THIS SHEET FOR A GIVEN FLUID SERVICE, CONTRACTOR SHALL PROVIDE ONLY THE PIPE MATERIAL GROUP SHOWN ON THE DRAWINGS AND SPECIFIED FOR THAT FLUID SERVICE.

NOTE 2
LEAKAGE ALLOWANCE IS AS FOLLOWS
A. PIPES SO DESIGNATED SHALL SHOW ZERO LEAKAGE.
B. PIPES SO DESIGNATED SHALL SHOW ZERO LEAKAGE FOR UNBURIED PIPE AND NOT MORE THAN 0.02 GALLON PER HOUR PER INCH DIAMETER PER 100 FEET OF BURIED PIPE.
C. PIPES SO DESIGNATED SHALL NOT SHOW A LEAKAGE OF MORE THAN 0.15 GALLON PER HOUR PER INCH OF DIAMETER PER 100 FEET OF PIPE.
D. PIPES SO DESIGNATED SHALL NOT SHOW A LOSS OF PRESSURE OF MORE THAN 5 PERCENT.
E. PIPE SO DESIGNATED SHALL NOT SHOW A LOSS OF VACUUM OF MORE THAN 4 INCHES MERCURY COLUMN.

NOTE 3
FOR FIELD TEST PROCEDURES AND ADDITIONAL TEST REQUIREMENTS, SEE PIPING SECTION OF SPECIFICATIONS.

NOTE 4
NO SUBSTITUTIONS U.N.O. IN THE SPECIFICATIONS.

NOTE 5
PIPING GROUP FUNCTION SHOWN THUS * SHALL BE INSULATED PER SPECIFICATIONS.

NOTE 6
STATIC WATER TEST WITH SURFACE 5 FEET ABOVE HIGH POINT OF PIPE.

NOTE 7
INSPECTION AND TESTING SHALL BE IN ACCORDANCE WITH APPLICABLE PLUMBING CODE.

NOTE 8
NO APPARENT LEAKS UNDER NORMAL OPERATING CONDITIONS.

NOTE 9
INSPECTION AND TESTING SHALL BE IN ACCORDANCE WITH APPLICABLE NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS.

NOTE 10
PIPING MATERIALS SHALL BE IN ACCORDANCE WITH NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS.

NOTE 11
FOR VALVES 4" AND LARGER SEE VALVE SCHEDULE FOR SPECIAL VALVES SEE SPECIFICATIONS.

NOTE 12
CHANGE IN PIPING MATERIAL GROUP NUMBER IS INDICATED THUS: ——◆

NOTE 13
FOR FULL PIPE LINING AND COATING REQUIREMENTS, SEE SPECIFICATIONS.

NOTE 14
EXPOSED OUTDOOR PIPING SHALL BE PAINTED IN ACCORDANCE WITH SPECIFICATIONS. COLORS TO BE SELECTED BY OWNER.

NOTE 15
NATURAL GAS BURIED PIPE SHALL BE POLYETHYLENE BASED PIPE IN ACCORDANCE W/ LOCAL GAS UTILITY PIPE REQUIREMENTS FOR PRESSURE GAS SERVICE.

NOTE 16
ALL FISH RELEASE PIPE BENDS SHALL HAVE A MINIMUM RADIUS OF 5 TIMES THE PIPE DIAMETER. FITTINGS FOR FISH RELEASE PIPE SHALL BE OF THE SAME MATERIAL AS THE PIPING. ALL FISH RELEASE PIPING SHALL BE FREE OF BURRS AND ROUGH SURFACES. ALL PIPING JOINTS SHALL BE SMOOTH AND FREE OF SURFACE BLEMISHES.

NOTE 17
FOR HDPE PIPING THE SIZE OF PIPE SHOWN ON DRAWING CALL-OUTS SHALL BE THE MINIMUM INSIDE DIAMETER. PIPE WALL THICKNESS SHALL BE PER DR RATING REQUIREMENT.

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NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES
PIPING SCHEDULE

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G005

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G005.dwg Plot date: Sep 26, 2023 06:22pm, CAD User: HaberFlavia

SHEET NOTES:

1. VERTICAL DATUM: NORTH AMERICA VERTICAL DATUM 88 (NAVD88) GEOID12B, US FEET.
2. HORIZONTAL DATUM: NAD83(2011) ALASKA STATE PLANE ZONE 4, US FEET.
3. 2020 LIDAR AND IMAGERY MAPPING WERE PERFORMED BY NV5 LLC, (FORMERLY KNOWN AS QUANTUM SPATIAL INC.) ON MAY, 2020.
4. 2022 LIDAR AND IMAGERY MAPPING WERE BY PERFORMED BY NV5 LLC. ON MAY, 2022.
5. GROUND CONTROL POINTS (GCP) WERE ESTABLISHED FOR GEOSPATIAL CORRECTION BY A. WILLIAM STOLL, PLS #12041 WITH DOWL INC. ON MAY 2020 AND JUNE 2022 RESPECTIVELY FOR BOTH LIDAR AND IMAGERY MAPPING PERIODS.
6. 2022 IMAGERY MAPPING ARE 4-BAND, 32-BIT RGB-IR GEOTIFF WITH 0.15 METER GROUND SAMPLE DISTANCE VIA VEXCEL ULTRA CAM EAGLE ON A TWIN ENGINE, FIXED WING AIRCRAFT.
7. ROAD CROSSING NO. 2 THROUGH NO. 1

   2022 LIDAR - 0.5 METER GEOTIFFS BASE EARTH DIGITAL ELEVATION MODEL (DEM)

8. ROAD CROSSING NO. 2 THROUGH NO. 8

   2022 LIDAR - 0.5 METER GEOTIFFS BASE EARTH DIGITAL ELEVATION MODEL (DEM)

EXIST RIVER CROSSING				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	2707503.60	1782922.84	759.77	ROAD CROSSING NO. 1
2	2707969.40	1780453.05	718.65	ROAD CROSSING NO. 2
3	2708552.28	1779237.95	698.21	ROAD CROSSING NO. 3
4	2712247.39	1775622.06	622.01	ROAD CROSSING NO. 4
5	2714544.84	1773722.77	576.10	ROAD CROSSING NO. 5
6	2717147.47	1771578.34	527.11	ROAD CROSSING NO. 6
7	2718313.63	1769561.00	494.88	ROAD CROSSING NO. 7
8	2718994.84	1767954.17	452.36	ROAD CROSSING NO. 8

PROJECT SITE PLAN
SCALE: 1"=750'

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WARNING
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EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES
PROJECT SITE PLAN

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G006

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G006.dwg Plot date: Sep 29, 2023 02:18pm, CAD User: HaberFlavia

GENERAL PROJECT NOTES:

1. ALL CONSTRUCTION ACTIVITIES SHALL BE PERFORMED IN COMPLIANCE WITH 1991 FISH AND WILDLIFE SERVICE (1991 AGREEMENT).
2. ALL CONSTRUCTION ACTIVITIES SHALL COMPLY WITH AWWU AND ADNR STANDARDS AND REQUIREMENTS.
3. ALL CONSTRUCTION ACTIVITIES SHALL BE PERFORMED IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL STANDARDS FOR THE PROJECT.

GENERAL CIVIL NOTES:

1. EXISTING TOPOGRAPHY, STRUCTURES AND SITE FEATURES ARE SHOWN SCREENED AND/OR LIGHT-LINED. NEW FINISH GRADE, STRUCTURES, AND SITE FEATURES ARE SHOWN UNSCREENED AND HEAVY LINED.
2. VERTICAL DATUM: NAVD88, GEOID12B, US FEET.
3. HORIZONTAL DATUM: ALASKA STATE PLANE ZONE 4 NAD83(2011), US FEET.
4. ELEVATIONS GIVEN ARE TO FINISH GRADE UNLESS OTHERWISE SHOWN.
5. SLOPE UNIFORMLY BETWEEN CONTOURS AND SPOT ELEVATIONS SHOWN.

GENERAL CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL ATTEND A PRE-CONSTRUCTION CONFERENCE (OR AN ON-SITE MEETING) WITH THE PROJECT REPRESENTATIVE PRIOR TO THE START OF WORK.
2. THE CONTRACTOR SHALL NOTIFY THE PROJECT REPRESENTATIVE WHEN MATERIALS ARE ON SITE OR AN INSPECTION OF THE WORK IS REQUIRED. NO WORK MAY BEGIN ON ANY PROJECT WITHOUT TWENTY-FOUR (24) HOUR PRIOR NOTICE.
3. CONTRACTOR SHALL FURNISH PROOF THAT ALL MATERIALS INSTALLED ON THIS PROJECT MEET THE REQUIREMENTS OF THE CONTRACT DRAWINGS AND SPECIFICATIONS.
4. ANY DEVIATION FROM THE APPROVED PLANS AND SPECIFICATION MUST HAVE A DESIGN ENGINEER AND OWNER APPROVAL IN WRITING PRIOR TO CONSTRUCTION.
5. UNLESS OTHERWISE NOTED, ALL DISTURBED SURFACES SHALL BE RETURNED TO ORIGINAL OR BETTER CONDITIONS.
6. MAINTAIN, RELOCATE OR REPLACE EXISTING SURVEY MONUMENTS, CONTROL POINTS, AND STAKES WHICH ARE DISTURBED OR DESTROYED. PERFORM THE WORK TO PRODUCE THE SAME LEVEL OF ACCURACY AS THE ORIGINAL MONUMENT(S) IN A TIMELY MANNER, AND AT THE CONTRACTOR'S EXPENSE.
7. THE CONTRACTOR SHALL KEEP CONSTRUCTION ACTIVITIES WITHIN THE SITE BOUNDARIES FOR THIS PROJECT AS SHOWN. THIS INCLUDES, BUT IS NOT LIMITED TO, VEHICLES AND EQUIPMENT, STOCKPILED CUT MATERIAL, AND FILL MATERIAL UNLESS OTHERWISE APPROVED BY OWNER.
8. ALL CONTRACTORS, INCLUDING SUBCONTRACTOR WORKING WITHIN THE PROJECT BOUNDARIES ARE RESPONSIBLE FOR COMPLIANCE WITH ALL APPLICABLE SAFETY LAWS AND STANDARDS.
9. ONLY PLAN SETS STAMPED “ISSUED FOR CONSTRUCTION” SHALL BE USED BY THE PROJECT CONTRACTOR(S).
10. THE CONTRACTOR SHALL KEEP ON SITE AT ALL TIMES A COPY OF THE APPROVED CONSTRUCTION PLANS AND RECORD THE ACTUAL LOCATIONS OF THE CONSTRUCTED WORK AND ANY UTILITIES ENCOUNTERED. THE CONTRACTOR SHALL PROVIDE THESE LOCATIONS TO BE SUBMITTED TO AS PART OF THE RECORD DRAWINGS PER SPECIFICATIONS.
11. UNLESS NOTED OTHERWISE, THE CONTRACTOR(S) SHALL REMOVE ALL OBSTRUCTIONS, BOTH ABOVE AND BELOW GROUND, AS REQUIRED FOR CONSTRUCTION OF THE PROPOSED IMPROVEMENTS. THIS SHALL INCLUDE CLEARING AND GRUBBING WHICH CONSISTS OF CLEARING THE GROUND SURFACE OF ALL TREES, STUMPS, BRUSH, UNDERGROWTH, HEDGES, HEAVY GROWTH OF GRASS OR WEEDS, FENCES, STRUCTURES, DEBRIS, RUBBISH, AND SUCH MATERIAL, WHICH IN THE OPINION OF CONTRACTING OFFICER, IS UNSUITABLE FOR THE FOUNDATION OF CONSTRUCTED WORKS. ALL MATERIAL NOT SUITABLE FOR FUTURE USE ON SITE SHALL BE DISPOSED OF AT OWNER APPROVED LOCATIONS.

GENERAL EXISTING UTILITIES AND STRUCTURE NOTES:

1. EXISTING UNDERGROUND UTILITIES AND STRUCTURES WERE OBTAINED FROM AVAILABLE RECORDS. CONTRACTOR SHALL FIELD VERIFY DEPTH AND LOCATION PRIOR TO EXCAVATION. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES AND STRUCTURES NOT SHOWN OR NOT IN THE LOCATION SHOWN. THE CONTRACTOR SHALL VERIFY ALL LOCATIONS AND ELEVATIONS AND SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT UTILITIES OR STRUCTURES SHOWN OR NOT SHOWN.
2. THE CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES AND STRUCTURES DURING CONSTRUCTION. IF EXISTING UTILITIES (GAS, ELECTRIC, POTABLE WATER, ETC.) ARE IN CONFLICT WITH THE WORK, CONTRACTOR SHALL CONTACT THE ENGINEER.
3. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL LOCATE ALL EXIST UTILITIES AND STRUCTURES IN AND AROUND THE AREAS OF NEW CONSTRUCTION. THE CONTRACTOR SHALL POTHOLE FOR EXIST UTILITIES PRIOR TO SUBMITTAL OF SHOP DRAWINGS, FOR POINTS OF CONNECTIONS.
4. THE CONTRACTOR SHALL CONTACT THE UTILITY AGENCIES FOR THE FIELD LOCATION OF UTILITIES AT LEAST 72 HOURS PRIOR TO THE START OF CONSTRUCTION. A DIG ALERT IDENTIFICATION NUMBER MUST BE ISSUED BEFORE A PERMIT TO EXCAVATE WILL BE VALID.
5. THE CONTRACTOR SHALL REPAIR ALL EXISTING SURFACES, UTILITIES, BUILDINGS AND FOUNDATIONS IMPACTED BY CONSTRUCTION.

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0	10/6/23	SPE	15% DESIGN

WARNING
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EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES

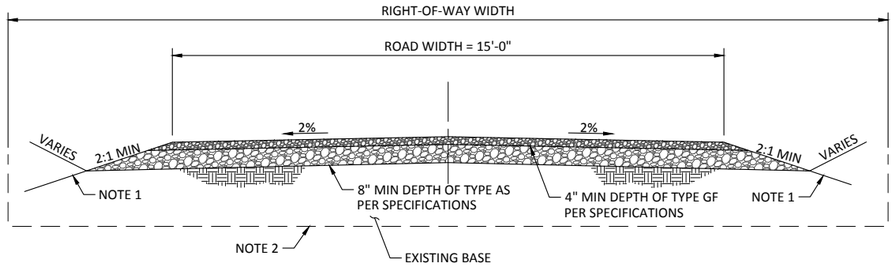
CIVIL GENERAL NOTES

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
GC001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\GC001.dwg Plot date: Sep 29, 2023 02:18pm, CAD User: HaberFlavia



NOTES:
1. BORROW DITCHES SHALL HAVE A MINIMUM 2:1 SLOPE WITH 4:1 SLOPE RECOMMENDED. THE BACKSLOPE OF THE BORROW DITCH SHALL BE MINIMUM 2:1 BACKSLOPE WITH 4:1 BACKSLOPE RECOMMENDED. THE FLOW LINE IF THE DITCH SHALL BE 6" BELOW THE LOWEST AGGREGATE BASE COURSE TO ENCOURAGE DRAINAGE.
2. OVER EXCAVATE EXISTING GRADE 12" MIN. PROOF ROLL AND BACKFILL WITH TYPE EF PER SPECIFICATIONS.

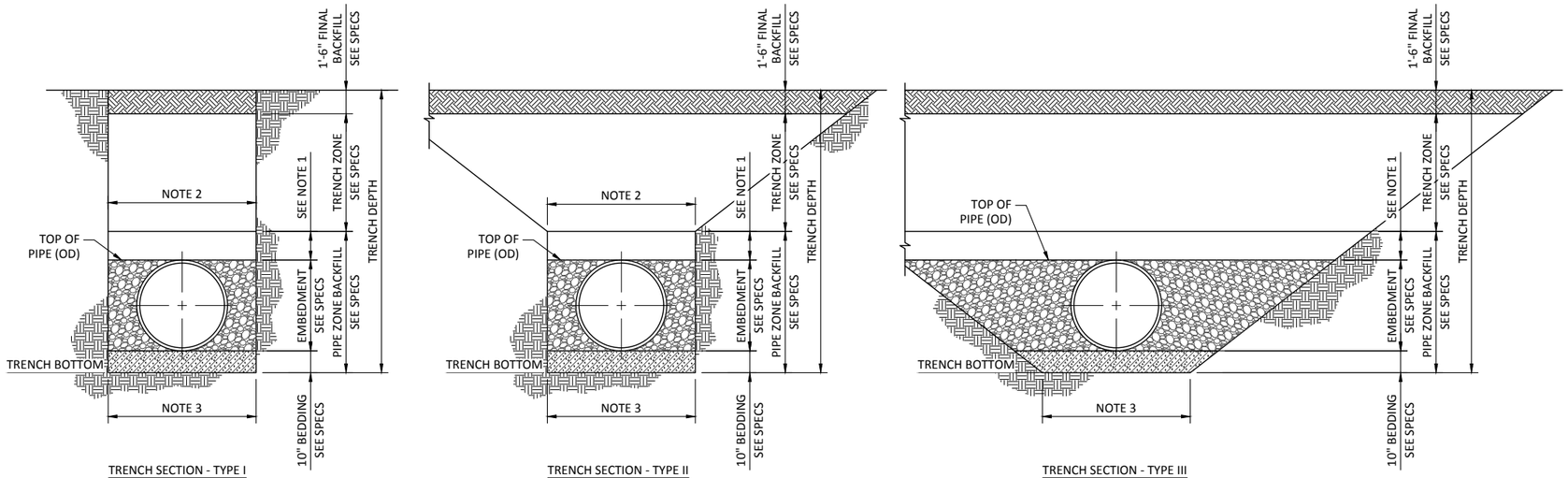
TYPICAL GRAVEL ROAD SECTION

SCALE: NTS

C137

A. FLEXIBLE PIPE REFERS TO ALL STEEL, DUCTILE-IRON, AND PLASTIC PIPES.
B. TYPICAL TRENCH SECTIONS (I, II AND III) ARE TO BE USED ONLY WHERE STABLE, COMPACT SOIL CONDITIONS EXIST. IF BOULDERS OR LARGE OBSTRUCTIONS ARE ENCOUNTERED, TRENCH SECTIONS MAY BE DEEPER OR WIDER THAN SHOWN. THE ENGINEER SHALL BE ADVISED SHOULD THIS OCCUR.
C. THE NEED FOR PROTECTIVE SYSTEMS AND EXCAVATION SLOPES SHALL BE DETERMINED CONSIDERING APPLICABLE LOCAL, STATE AND FEDERAL (OSHA) SAFETY STANDARDS AND REGULATIONS, AND GEOTECHNICAL CONSULTANTS' RECOMMENDATIONS.
D. PROTECTIVE SYSTEMS SHALL BE DESIGNED AND BUILT IN ACCORDANCE WITH THE APPLICABLE LOCAL, STATE AND FEDERAL (OSHA) SAFETY STANDARDS AND REGULATIONS.
E. SUPPORTING DOCUMENTATION SHALL BE SUBMITTED TO THE ENGINEER REGARDING PIPE DESIGN AND COMPLIANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL (OSHA) SAFETY STANDARDS.
F. UNSUPPORTED VERTICAL AND/OR SLOPING TRENCH WALL SLOPES SHALL NOT BE STEEPER THAN ALLOWED BY APPLICABLE LOCAL, STATE AND FEDERAL (OSHA) SAFETY STANDARDS AND REGULATIONS, UNLESS SUPPORTING DOCUMENTATION IS SUBMITTED, ACCORDING TO AFOREMENTIONED SAFETY STANDARDS.
G. TRENCH SECTIONS OTHER THAN THE TYPICAL SECTIONS SHOWN MAY BE UTILIZED PROVIDED THEY COMPLY WITH APPLICABLE LOCAL, STATE AND FEDERAL (OSHA) SAFETY STANDARDS AND REGULATIONS. DOCUMENTATION SUPPORTING THIS COMPLIANCE AND PIPE DESIGN CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER.
H. IF OVER-EXCAVATION DUE TO POOR FOUNDATION MATERIAL IS ORDERED BY THE ENGINEER, THE BACKFILL MATERIAL SHALL BE ACCORDING TO THE EARTHWORK SECTION OF THE SPECIFICATIONS ARTICLE ENTITLED, "FILL AND BACKFILL MATERIAL REQUIREMENTS."
I. IF DURING CONSTRUCTION, THE WATER TABLE IS DISCOVERED TO BE ABOVE THE TRENCH BOTTOM, THE ENGINEER SHALL BE NOTIFIED, AND APPROPRIATE DEWATERING SHALL BE IMPLEMENTED TO LOWER THE WATER LEVEL BELOW THE TRENCH BOTTOM. THE BACKFILL MATERIAL SHALL BE ACCORDING TO THE EARTHWORK SECTIONS OF THE SPECIFICATIONS, OR AS ORDERED BY THE ENGINEER.

NOTES:
1. 6" MIN FOR PIPE DIAMETER < 24"
   12" MIN FOR PIPE DIAMETER > 24"
2. MAX TRENCH WIDTH @ TOP OF PIPE:
   O.D. + 36" FOR, 18" & LARGER PIPE O.D.
   O.D. + 24" FOR LESS THAN 18" PIPE O.D.
3. MIN TRENCH BOTTOM WIDTH =
   O.D. + 24" FOR MECHANICAL COMPACTION



TRENCH SECTION FLEXIBLE PIPE

SCALE: NTS

C601

PRELIMINARY
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EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES
STANDARD CIVIL DETAILS 1

DESIGNED L.VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
GC002

JOB NO: 000000

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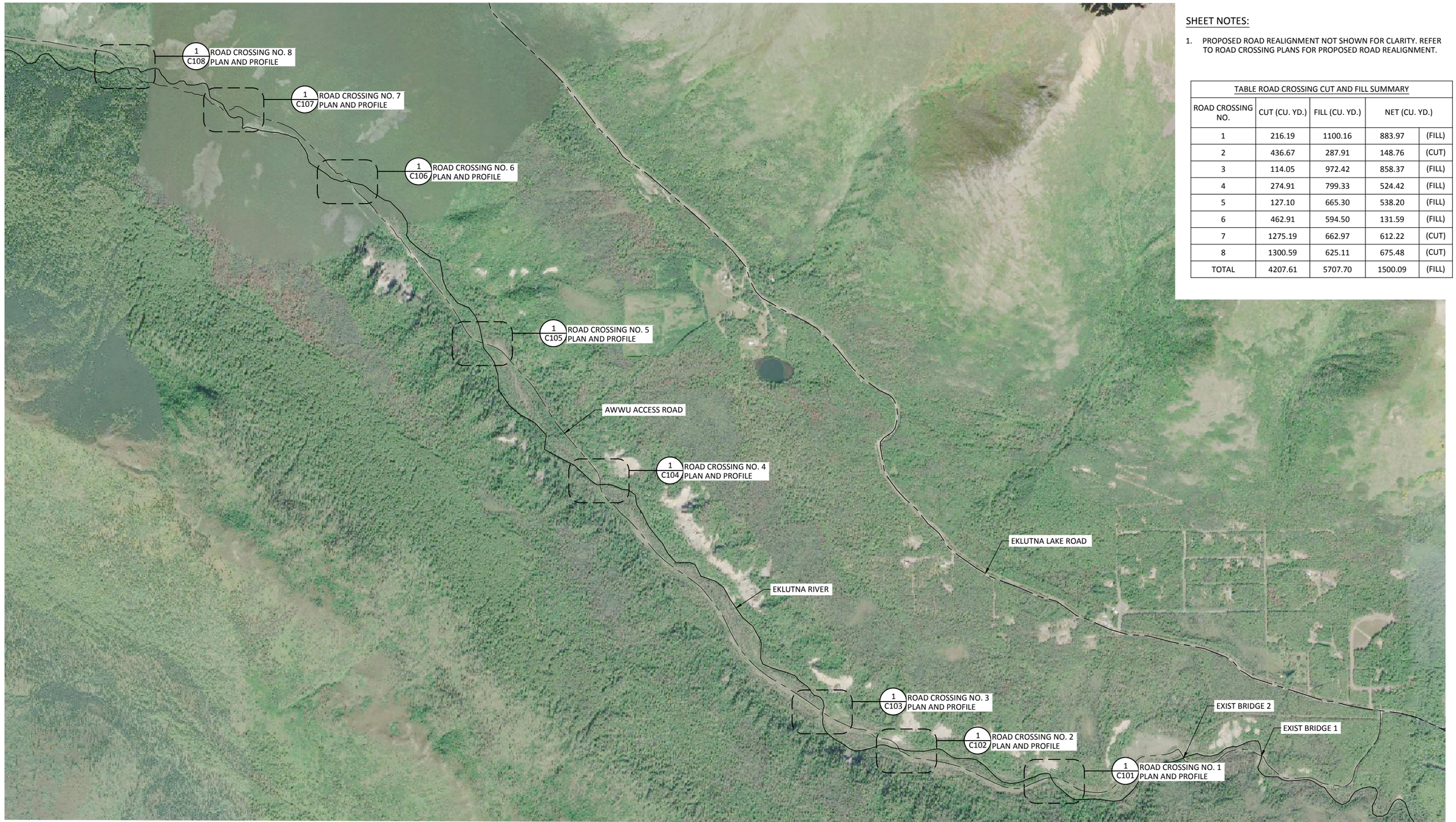

SHEET NOTES:

1. PROPOSED ROAD REALIGNMENT NOT SHOWN FOR CLARITY. REFER TO ROAD CROSSING PLANS FOR PROPOSED ROAD REALIGNMENT.

TABLE ROAD CROSSING CUT AND FILL SUMMARY

ROAD CROSSING NO.	CUT (CU. YD.)	FILL (CU. YD.)	NET (CU. YD.)	
1	216.19	1100.16	883.97	(FILL)
2	436.67	287.91	148.76	(CUT)
3	114.05	972.42	858.37	(FILL)
4	274.91	799.33	524.42	(FILL)
5	127.10	665.30	538.20	(FILL)
6	462.91	594.50	131.59	(FILL)
7	1275.19	662.97	612.22	(CUT)
8	1300.59	625.11	675.48	(CUT)
TOTAL	4207.61	5707.70	1500.09	(FILL)

OVERALL SITE KEY PLAN

SCALE: 1"=750'

N

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AWWU MAINTENANCE ROAD AND BRIDGES

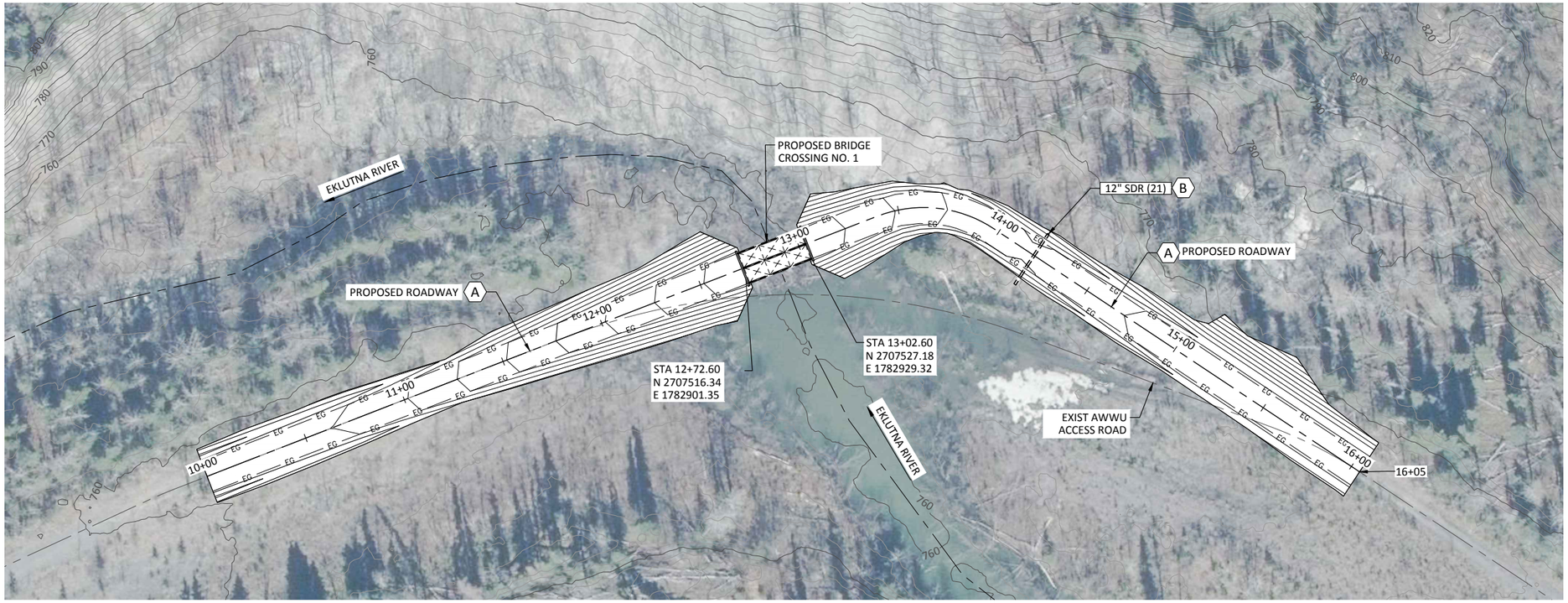
OVERALL SITE KEY PLAN AND EARTHWORK QUANTITIES

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
C001

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C001.dwg Plot date: Sep 29, 2023 02:18pm, CAD User: HaberFlavia



1 / C001 ROAD CROSSING NO. 1 PLAN

SCALE: 1"= 30'

0" 30' 60'

N

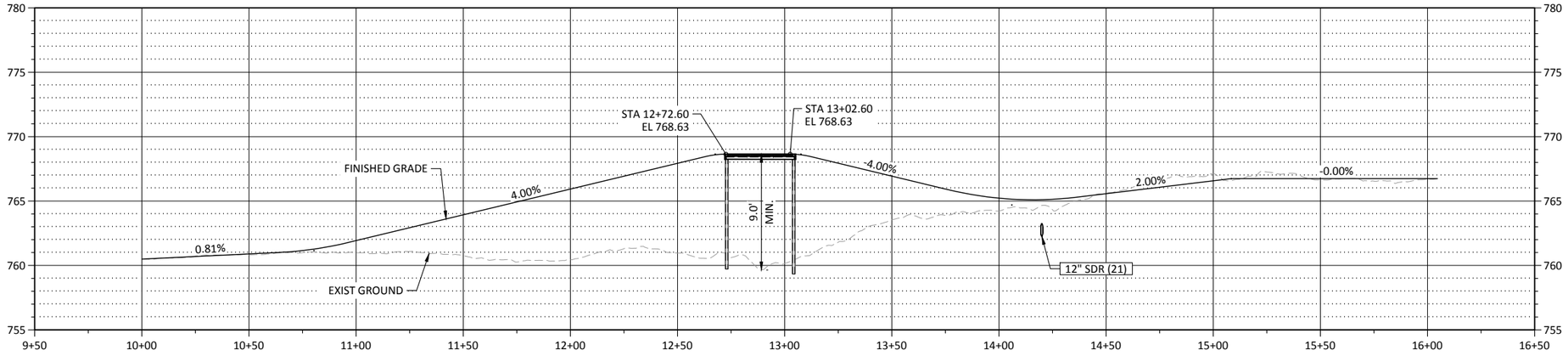
SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

B INSTALL 12 INCH CULVERT PER STD DETAIL C601.



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

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EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 1
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

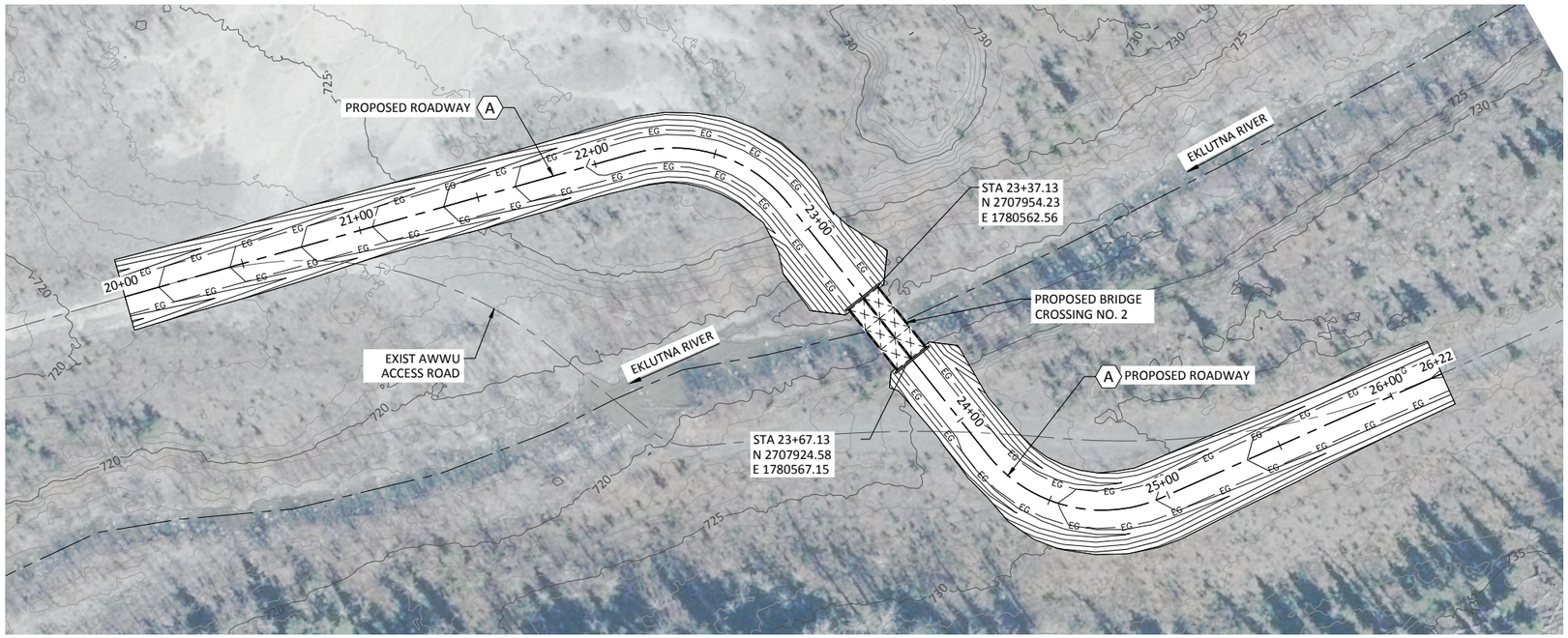
PROJECT DATE 10/6/23

DRAWING

C101

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C101.dwg Plot date: Sep 29, 2023 01:50pm, CAD User: HaberFlavia

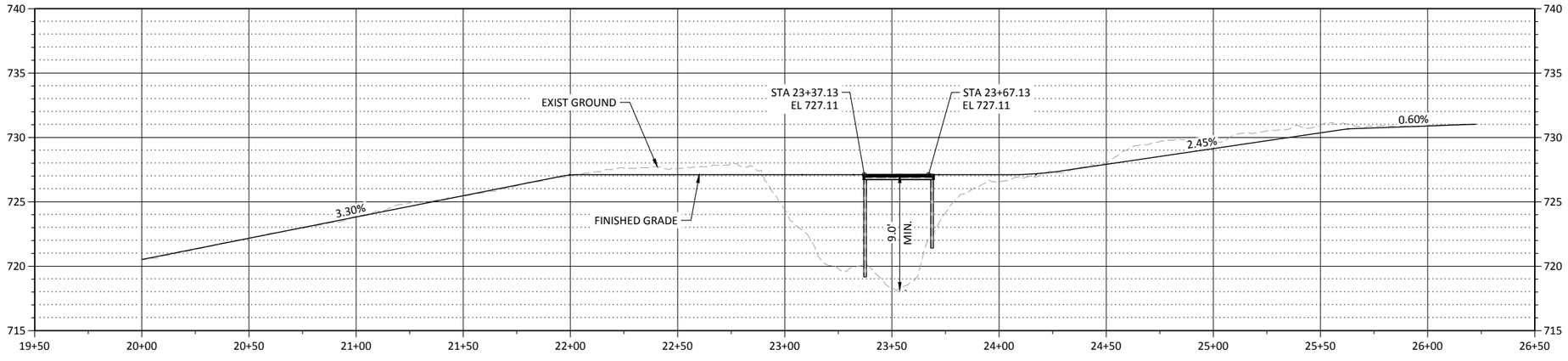


1 / C001 ROAD CROSSING NO. 2 PLAN

SCALE: 1"= 30'

0" 30' 60'

N



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 2
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

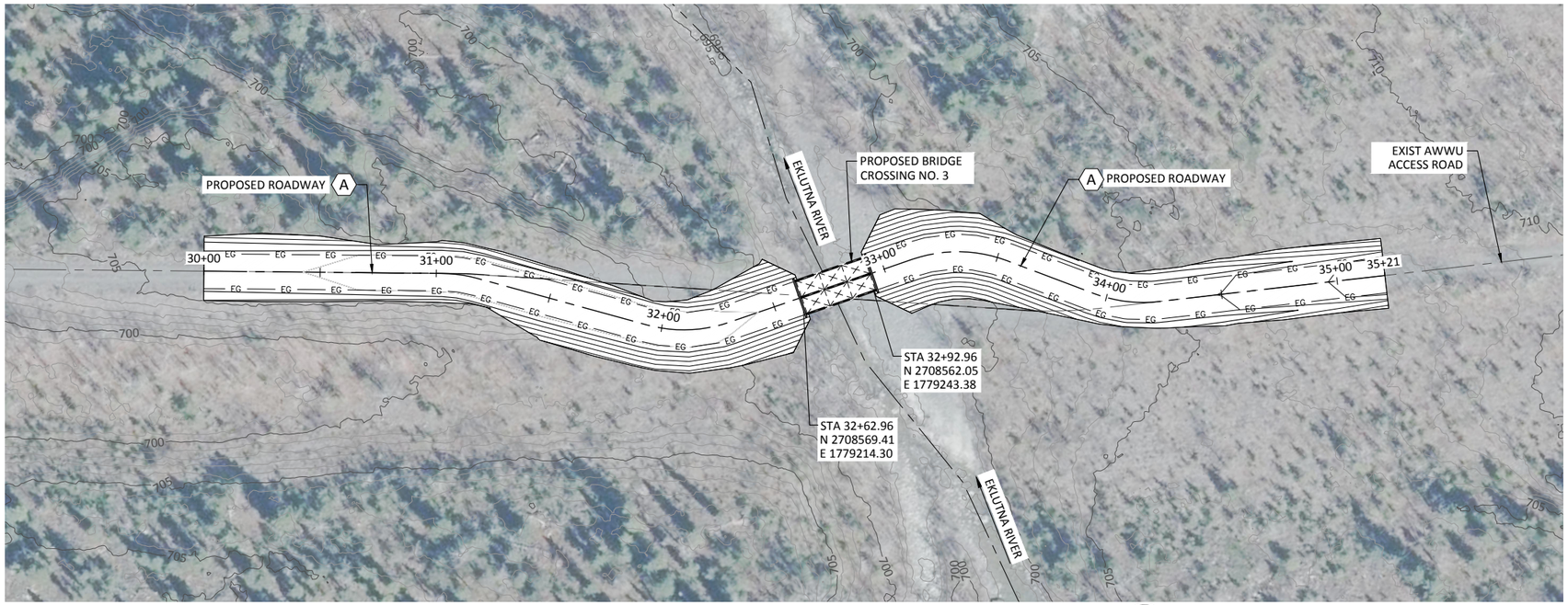
CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

C102

JOB NO: 000000



1 / C001 ROAD CROSSING NO. 3 PLAN

SCALE: 1"= 30'

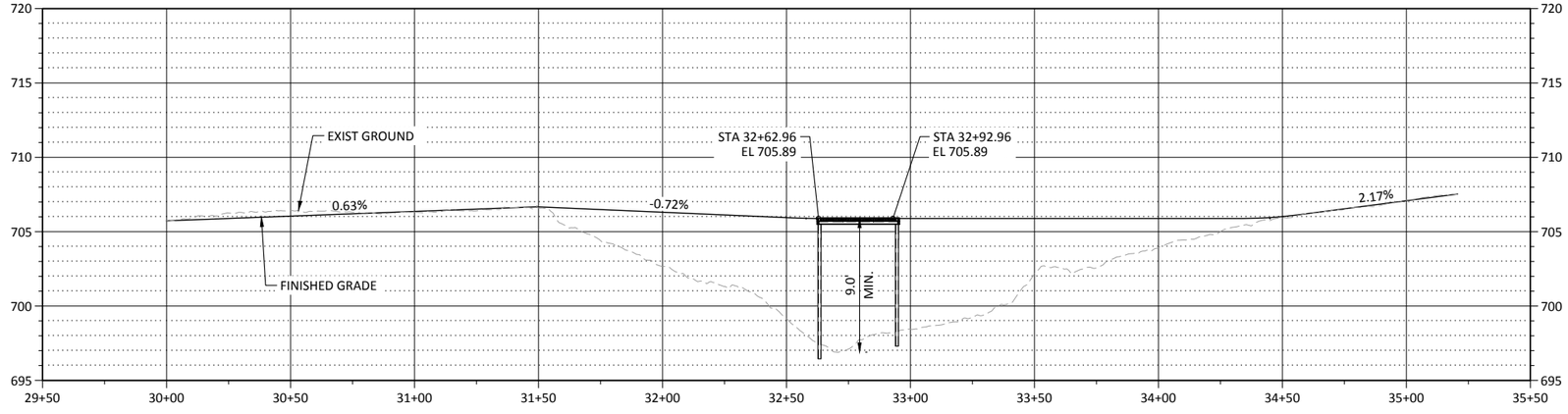
0" 30' 60'

SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 3
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

C103

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C103.dwg Plot date: Sep 29, 2023 12:00pm, CAD User: HaberFlavia

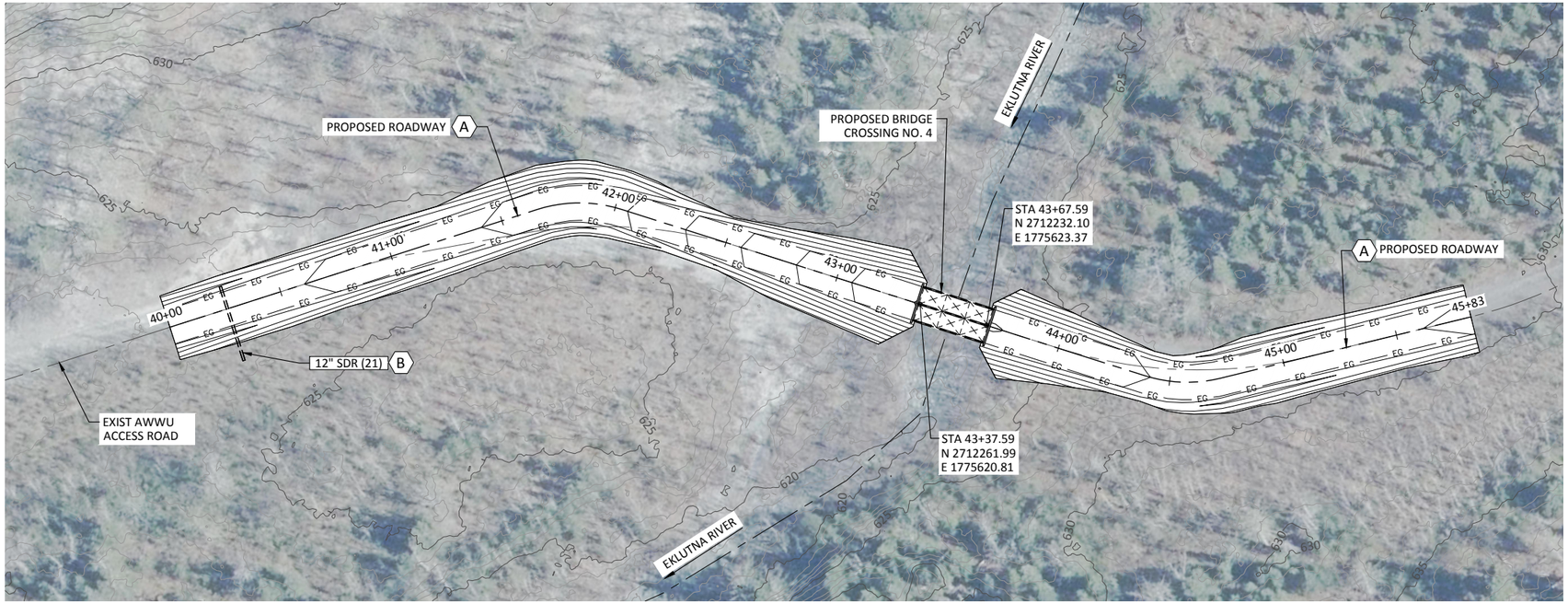
SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

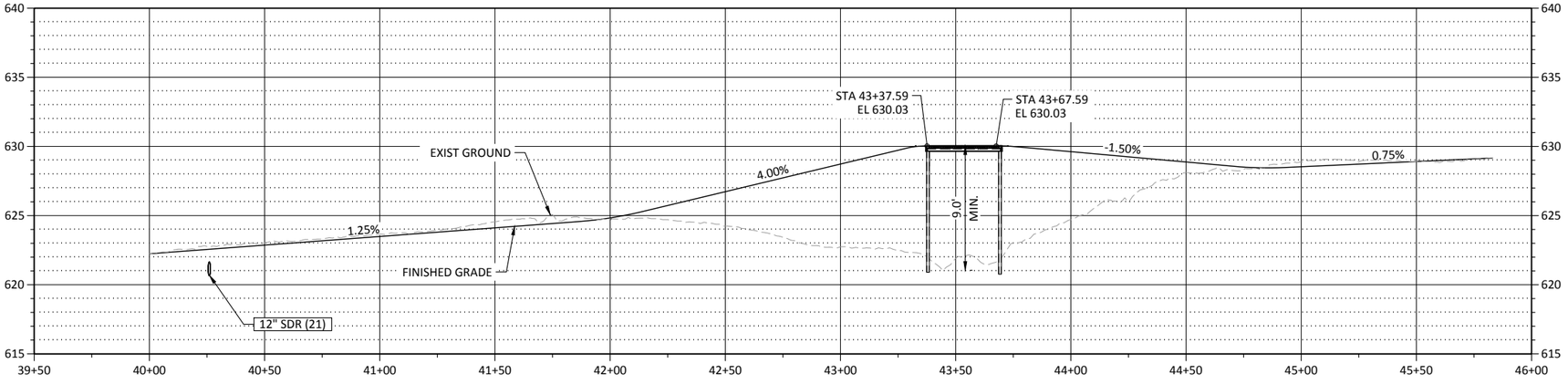
A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

B INSTALL 12 INCH CULVERT PER STD DETAIL C601.



1 / C001 ROAD CROSSING NO. 4 PLAN

SCALE: 1"= 30'



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

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EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 4
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

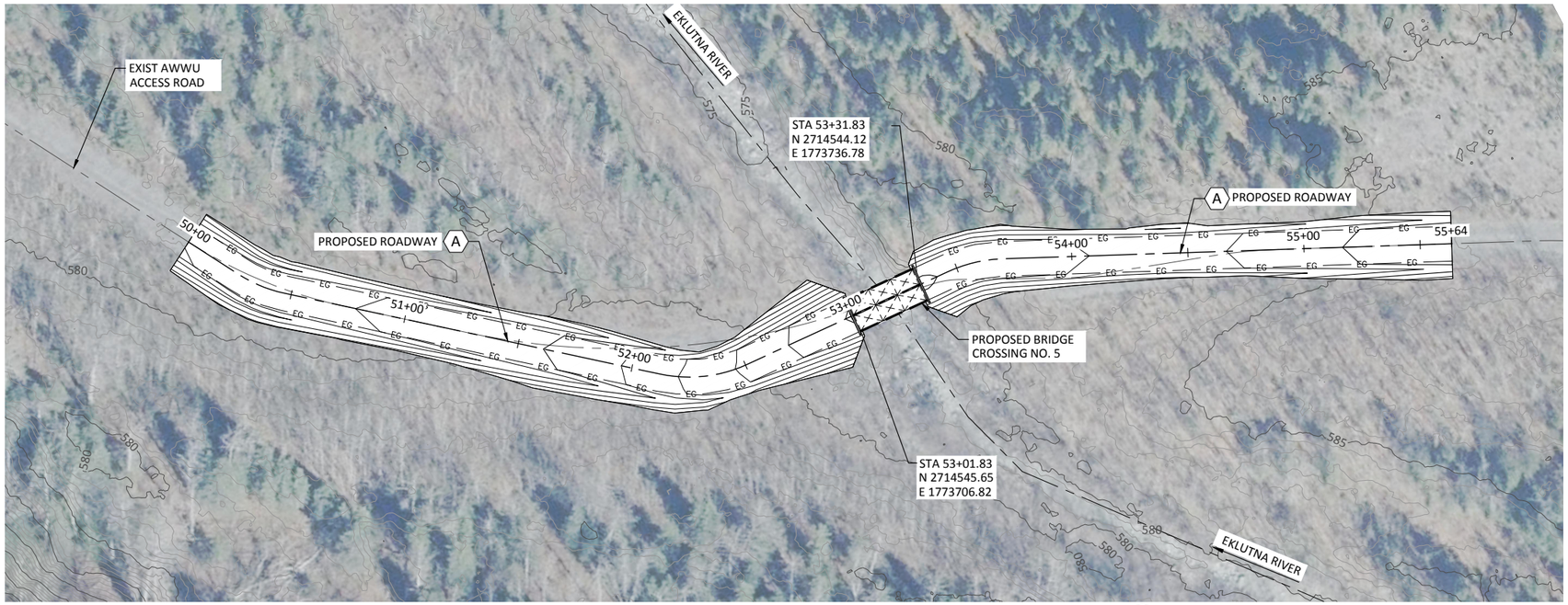
PROJECT DATE 10/6/23

DRAWING

C104

JOB NO: 000000

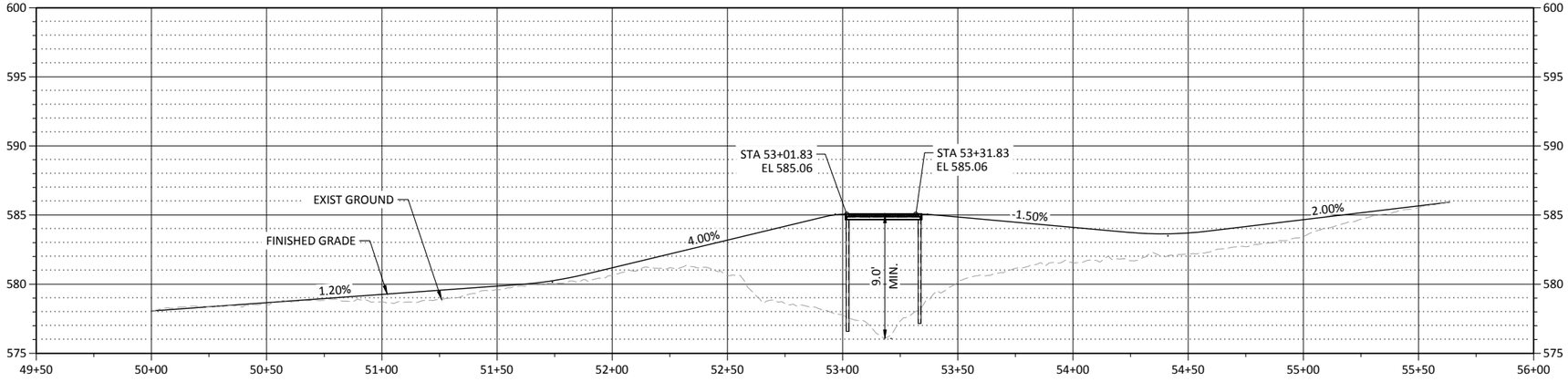
Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C104.dwg Plot date: Sep 29, 2023 12:00pm, CAD User: HaberFlavia



1 C001 ROAD CROSSING NO. 5 PLAN

SCALE: 1"= 30'

0" 30' 60'



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 5
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

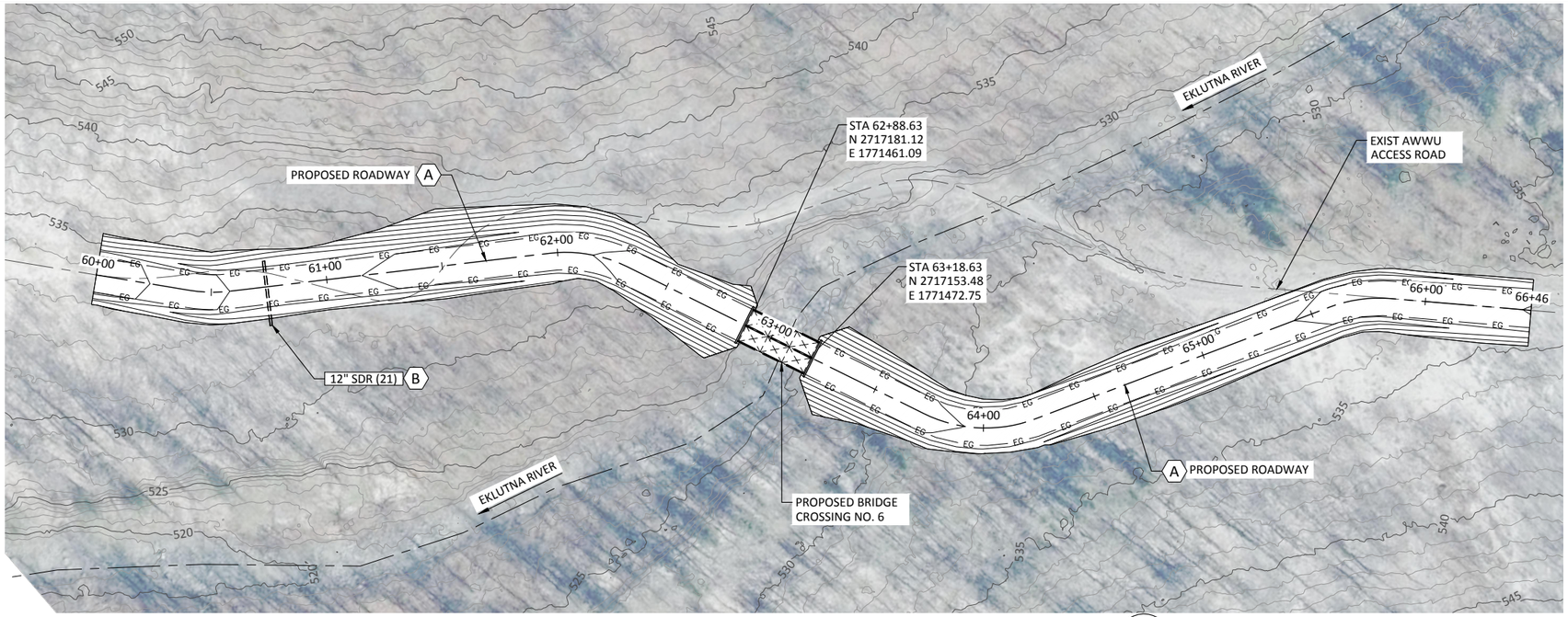
PROJECT DATE 10/6/23

DRAWING

C105

JOB NO: 000000

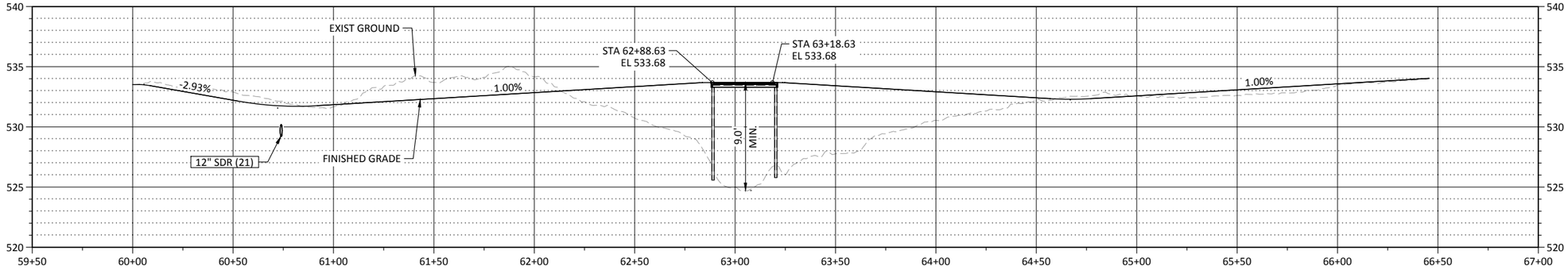
Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C105.dwg Plot date: Sep 29, 2023 12:02pm, CAD User: HaberFlavia



1 / C001 ROAD CROSSING NO. 6 PLAN

SCALE: 1"= 30'

0" 30' 60'



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

B INSTALL 12 INCH CULVERT PER STD DETAIL C601.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 6
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

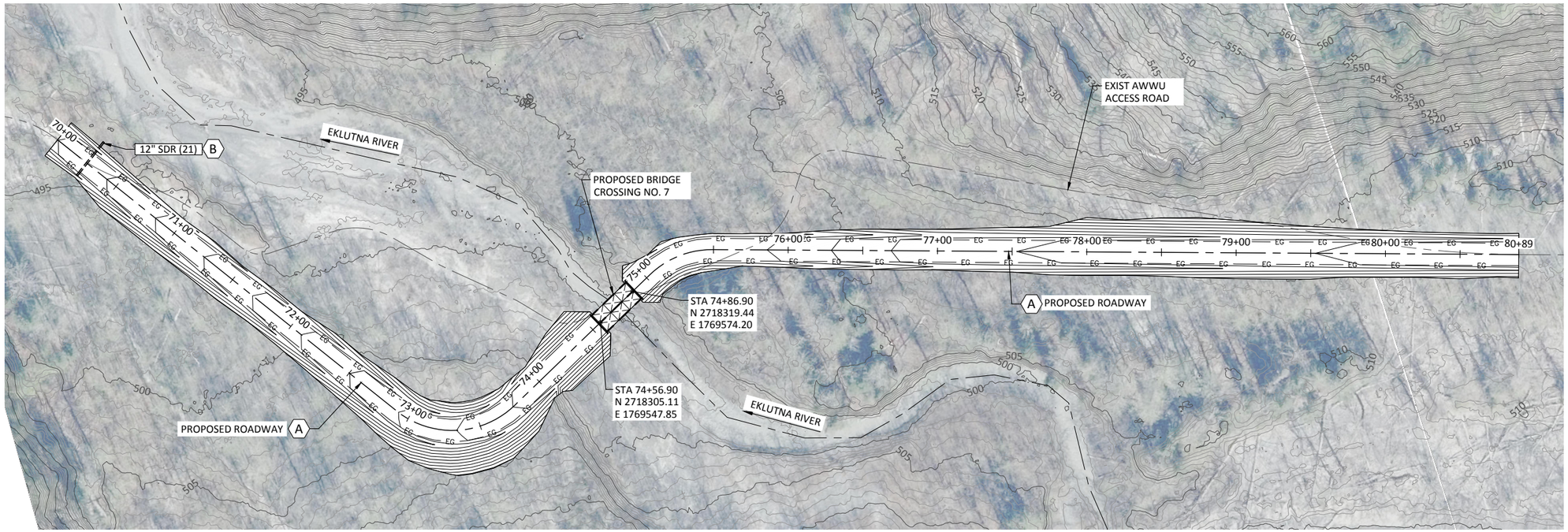
PROJECT DATE 10/6/23

DRAWING

C106

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C106.dwg Plot date: Sep 29, 2023 01:39pm, CAD User: HaberFlavia



1 / C001 ROAD CROSSING NO. 7 PLAN

SCALE: 1"= 40'

0" 40' 80'

N

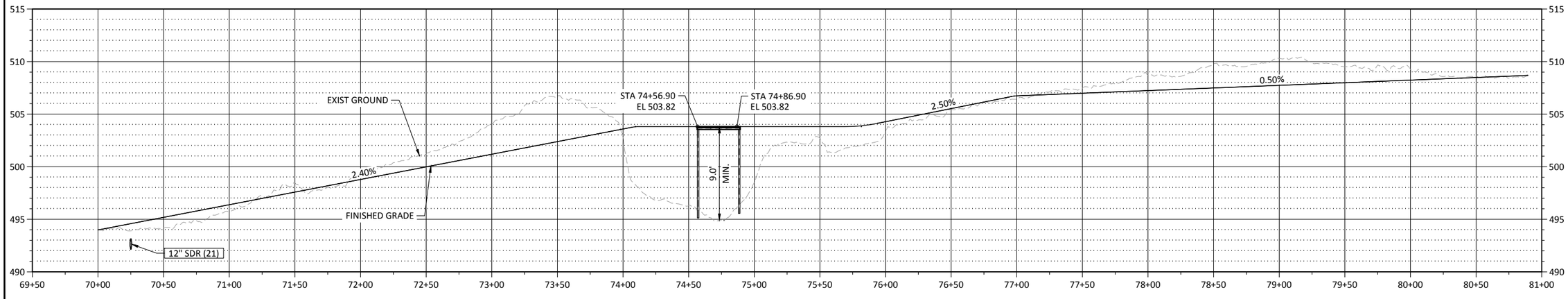
SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

B INSTALL 12 INCH CULVERT PER STD DETAIL C601.



PROFILE

SCALE: HORIZ 1"= 40'

VERT 1"= 5'

0" 40' 80'

0" 5' 10'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 7
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

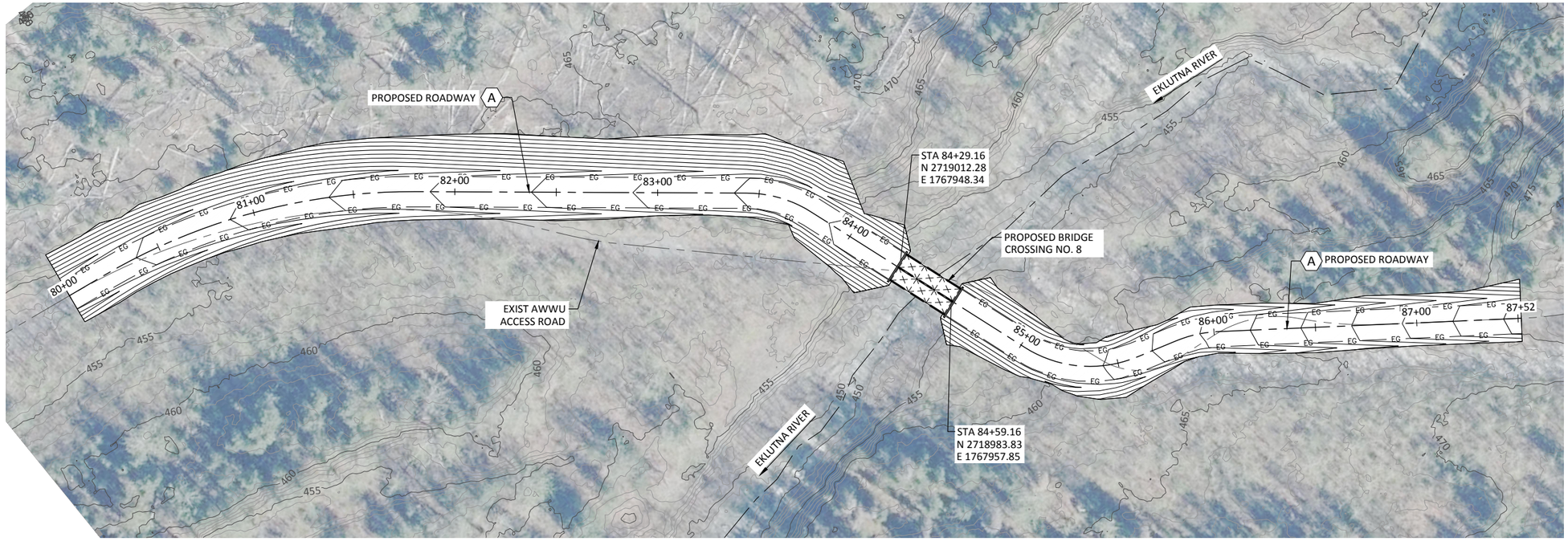
PROJECT DATE 10/6/23

DRAWING

C107

JOB NO: 000000

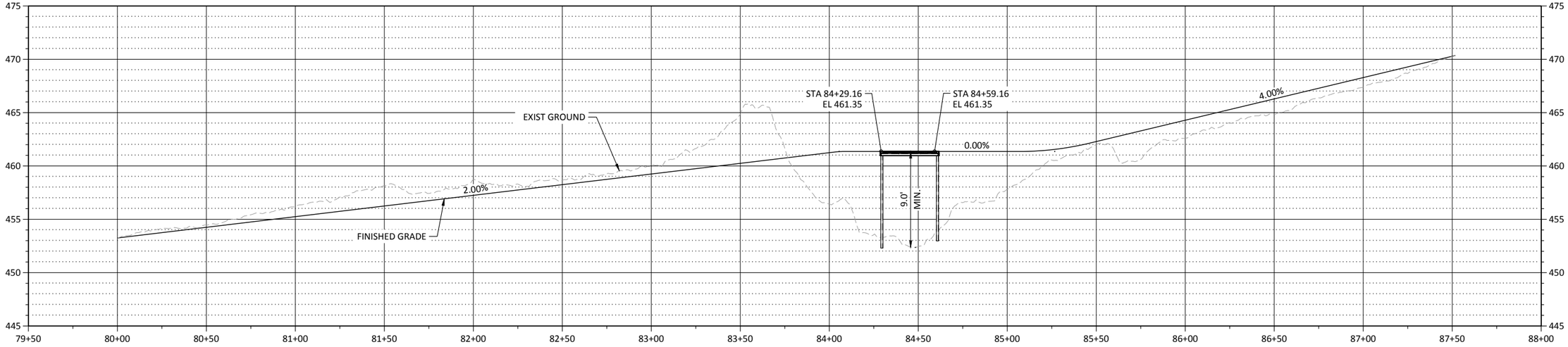
Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C107.dwg Plot date: Sep 29, 2023 01:57pm, CAD User: HaberFlavia



1 C001 ROAD CROSSING NO. 8 PLAN

SCALE: 1"= 30'

0" 30' 60'



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 8
PLAN AND PROFILE

DESIGNED L.VO

DRAWN F. HABER

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

C108

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C108.dwg Plot date: Sep 29, 2023 12:07pm, CAD User: HaberFlavia

GENERAL STRUCTURAL NOTES:
THE FOLLOWING NOTES ARE GENERAL AND APPLY TO THE ENTIRE PROJECT, UNLESS SPECIFICALLY NOTED OTHERWISE (UNO)

1) GENERAL:

A. CONSTRUCTION DOCUMENTS:
   1. THE CONTRACTOR SHALL REVIEW THE APPROVED CONTRACT DOCUMENTS AND NOTIFY THE ENGINEER OF ANY ERRORS OR DISCREPANCIES PRIOR TO THE START OF CONSTRUCTION.
   2. THE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY IF ANY UNIDENTIFIED EXISTING UNDERGROUND UTILITIES ARE DISCOVERED.
   3. THE STRUCTURAL CONTRACT DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT ARE NOT LIMITED TO, BRACING AND/OR SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC.
   4. UNDER NO CIRCUMSTANCES CAN STRUCTURAL COMPONENTS BE SUBSTITUTED, OMITTED, OR ALTERED FROM THE APPROVED SET OF CONSTRUCTION DOCUMENTS WITHOUT WRITTEN APPROVAL FROM THE ENGINEER.

B. DIMENSIONS AND NOTATIONS:
   1. WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED DIMENSIONS. DO NOT SCALE DRAWINGS.
   2. ABBREVIATIONS USED ON THE APPROVED CONSTRUCTION DOCUMENTS SHALL BE CONSIDERED TYPICAL ABBREVIATIONS FOR THE INDUSTRY. THE CONTRACTOR SHALL BE RESPONSIBLE TO NOTIFY THE ENGINEER IMMEDIATELY OF ANY ABBREVIATIONS THAT ARE UNKNOWN TO THE CONTRACTOR.

C. TYPICAL NOTES AND DETAILS:
   1. SPECIFIC NOTES AND DETAILS SHALL TAKE PRECEDENCE OVER STANDARD TYPICAL NOTES AND DETAILS.
   2. STANDARD TYPICAL NOTES AND DETAILS ARE TO BE USED WHEN REFERRED TO OR WHEN NO OTHER MORE RESTRICTIVE OR DIFFERENT DETAILS ARE SHOWN ON THE DRAWINGS.
   3. WORK NOT PARTICULARLY SHOWN OR SPECIFIED SHALL BE THE SAME AS SIMILAR PARTS THAT ARE SHOWN OR SPECIFIED.

D. CODE REQUIREMENTS:
   1. ALL WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF REGULATING AGENCIES WHICH MAY HAVE AUTHORITY OVER ANY PORTION OF THE WORK.
   2. SPECIFICATIONS, CODES AND STANDARDS NOTED SHALL BE OF THE LATEST APPROVED ISSUE, INCLUDING SUPPLEMENTS, UNLESS NOTED OTHERWISE.
   3. MINIMUM UNIFORM (BLANKET) ROOF SNOW LOAD, AS DEFINED BY LOCAL BUILDING OFFICIAL OR STATE, SHALL BE DESIGNED FOR.

2) CODES, STANDARDS, AND REFERENCES:

A. ASCE 7-16: MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES
B. ACI 318-14: BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE
C. ACI 350-06: CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES
D. AISC 360-16 SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS
E. 2018 INTERNATIONAL BUILDING CODE (IBC)

3) FOUNDATIONS AND GEOTECHNICAL:

A. GEOTECHNICAL DESIGN CRITERIA IS BASED ON THE RECOMMENDATIONS DOCUMENTED IN THE DESIGN DOCUMENTATION REPORT:

4) NON-SHRINK GROUT:
A. ALL GROUT WORK SHALL CONFORM TO THE LATEST EDITION OF ACI 301.
B. FORMWORK: DESIGN, ERECT, SUPPORT, BRACE AND MAINTAIN FORMWORK TO SUPPORT VERTICAL, LATERAL, STATIC AND DYNAMIC LOADS THAT MIGHT BE APPLIED UNTIL STRUCTURE CAN SUPPORT SUCH LOADS.

5) STRUCTURAL AND MISCELLANEOUS STEEL:

A. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING ASTM STANDARDS:

a)	WIDE FLANGE SHAPES	A992, GR 50 GALV
b)	OTHER SHAPES, PLATES, ANGLES AND BARS	A36 GALV
c)	STEEL PIPE	A53, GRADE B GALV
d)	HOLLOW STRUCTURAL SECTIONS	A500, GRADE B GALV

B. WELDS: PROVIDE 70KSI LOW HYDROGEN ELECTRODE OR PROCESS IN ACCORDANCE WITH AWS A5.1.
C. BOLTS, U.N.O.:
   1. STAINLESS STEEL: ASTM A193, GRADE 8, CLASS 2, AISI TYPE 316
D. DRILL AND EPOXY ANCHOR BOLTS:
   1. STAINLESS STEEL: ASTM A193, GRADE 8, CLASS 2, AISI, TYPE 316 OR EQUAL APPROVED BY ENGINEER
E. EPOXY BOLT OR EXPANSION BOLT SUBSTITUTIONS FOR EMBEDDED BOLTS IS PROHIBITED WITHOUT WRITTEN CONSENT FROM THE ENGINEER.
F. UNLESS NOTED OTHERWISE ON THE DRAWINGS, ALL EPOXY BOLTS SHALL BE AS SPECIFIED.
G. ALL STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH THE AISC CODE OF STANDARD PRACTICE, EXCEPT AS MODIFIED IN THESE NOTES AND THE PROJECT SPECIFICATIONS.

6) ROUGH CARPENTRY:

A. STANDARDS AND REFERENCES

ROUGH CARPENTRY CONSTRUCTION SHALL COMPLY WITH THE FOLLOWING IN ADDITION TO THE STANDARDS AND REFERENCES LISTED IN GENERAL NOTE 2:

NDS	ANSI/AWC - NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION, 2015 EDITION
SDPWS	ANSI/AWC - SPECIAL DESIGN PROVISIONS FOR WIND AND SEISMIC, 2015 EDITION

B. MATERIALS

1. LUMBER GRADE – STRUCTURAL FRAMING LUMBER SHALL BE DOUGLAS FIR -LARCH, NO. 2 OR BETTER UNLESS OTHERWISE INDICATED. REFER TO ARCH FOR TIMBER SIDING MATERIAL SPECIFICATION.

2. MOISTURE CONTENT - STRUCTURAL WOOD MEMBERS SHALL HAVE A MAXIMUM MOISTURE CONTENT OF 19 PERCENT AND NOT LESS THAN ONE PERCENT.

3. PRESERVATIVE TREATMENT – WOOD SHALL BE PRESERVATIVE TREATED IN ACCORDANCE WITH AWPA STANDARD U1 AND M4 FOR THE SPECIES, PRODUCT, PRESERVATIVE AND END USE. PRESERVATIVE TREATED WOOD SHALL BE MARKED PER IBC SECTION 2303.1.9.1.

4. CONNECTORS AND FASTENERS – WOOD CONSTRUCTION CONNECTORS AND FASTENERS SHALL BE GALVANIZED.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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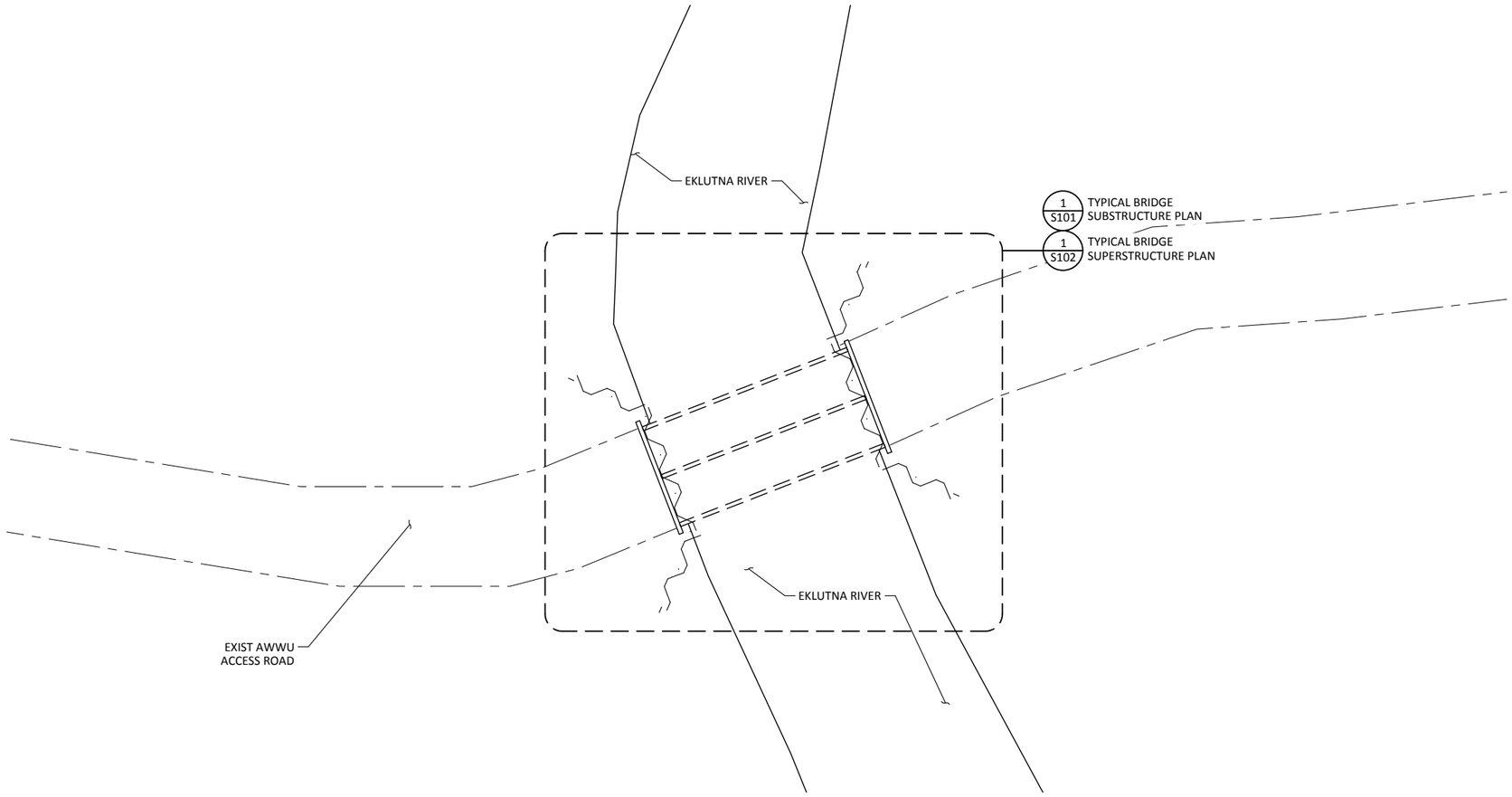
EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES
STRUCTURAL GENERAL NOTES

DESIGNED K. HEINDEL
DRAWN F. HABER
CHECKED C. BY
PROJECT DATE 10/6/23

DRAWING
GS001

JOB NO: 0000000



TYPICAL BRIDGE CROSSING PLAN

SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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AWWU MAINTENANCE ROAD AND BRIDGES

TYPICAL BRIDGE CROSSING PLAN

DESIGNED K. HEINDEL
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

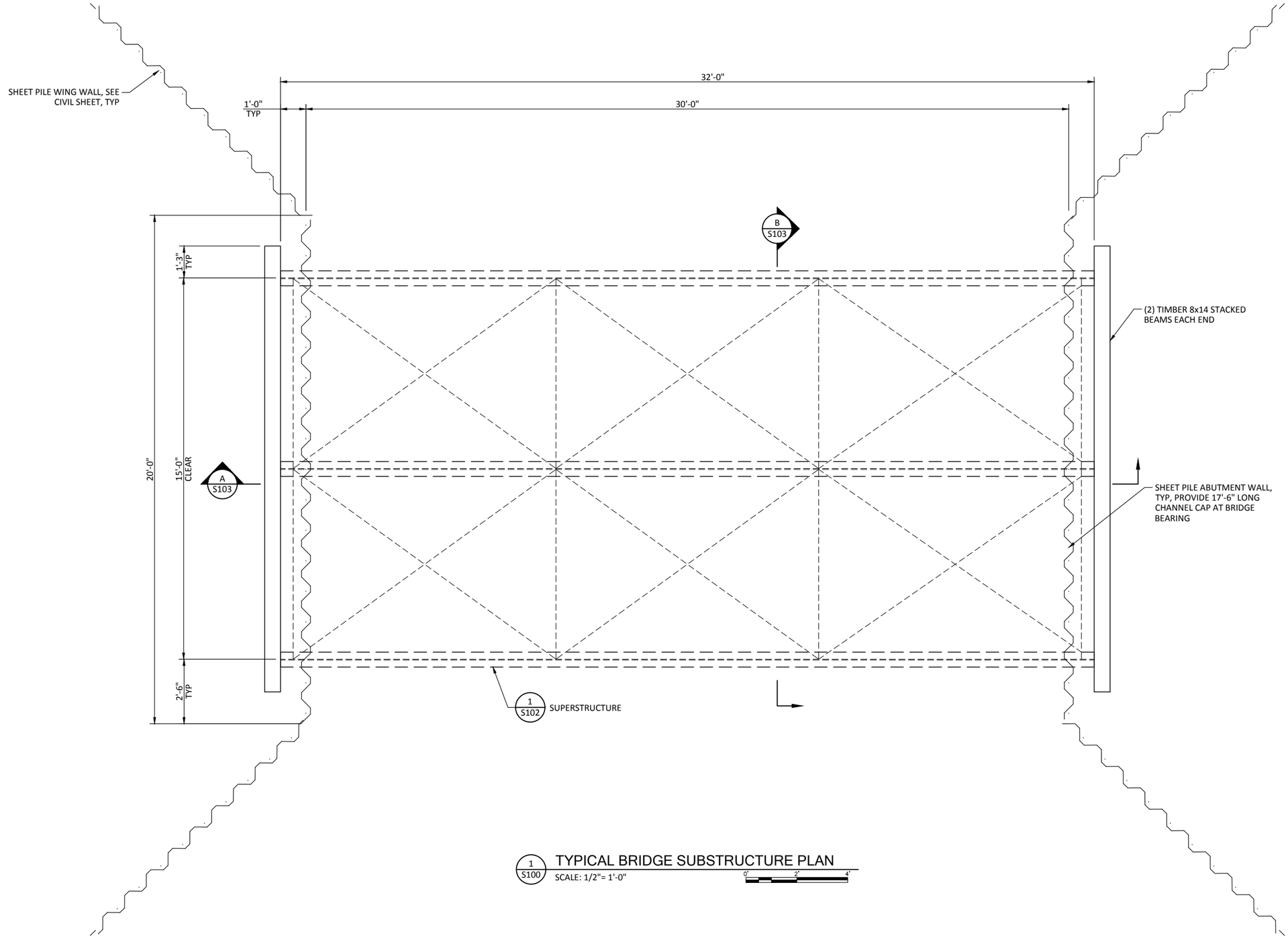
DRAWING
S100

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\S100.dwg Plot date: Sep 27, 2023 08:13pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



1 S100 TYPICAL BRIDGE SUBSTRUCTURE PLAN

SCALE: 1/2"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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AWWU MAINTENANCE ROAD AND BRIDGES

TYPICAL BRIDGE SUBSTRUCTURE PLAN

DESIGNED K. HEINDEL
DRAWN J. HOLT
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING

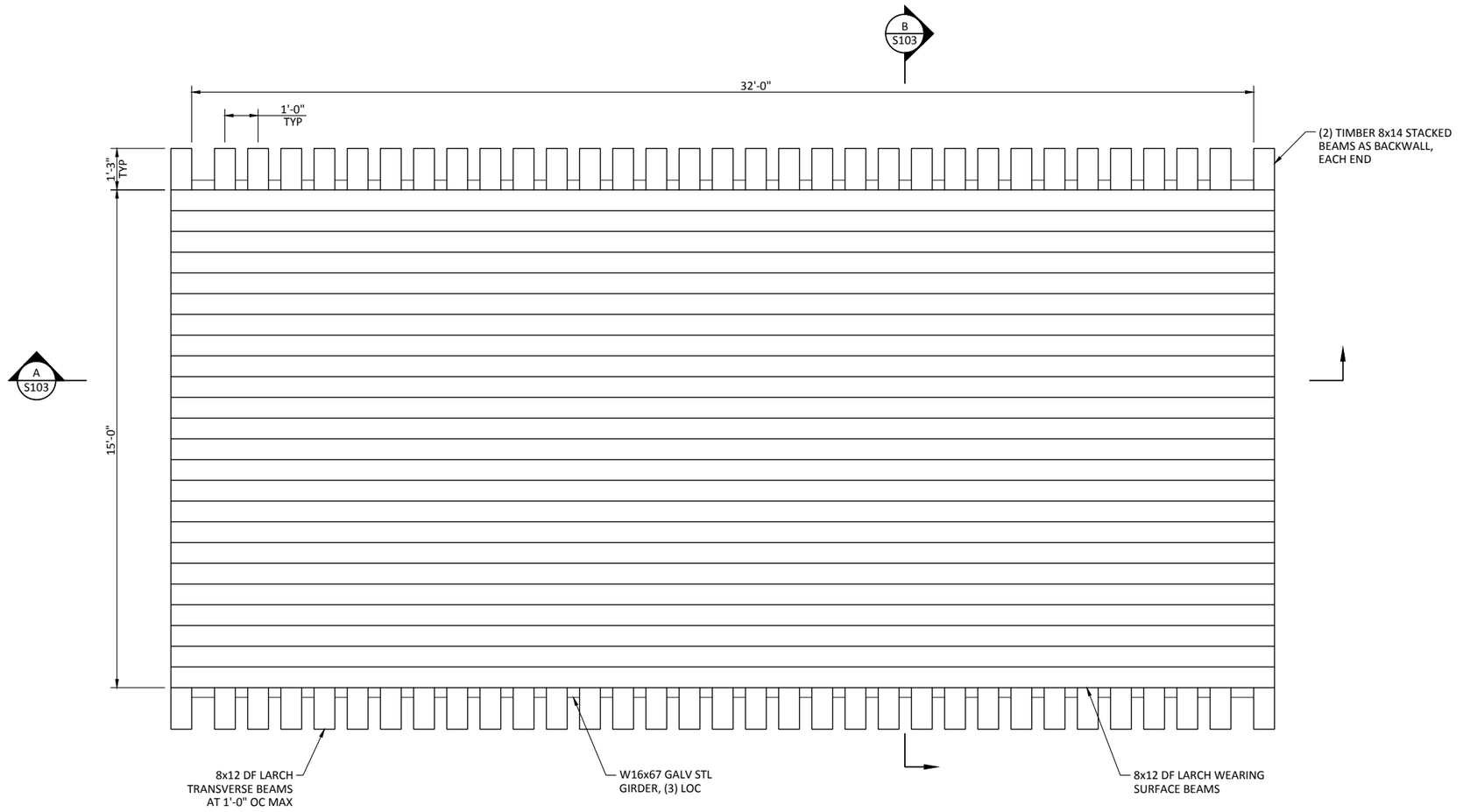
S101

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\S101.dwg Plot date: Sep 27, 2023 08:17pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. INTERIOR W16x67 GALV STL GIRDER AND BRACING NOT SHOWN FOR CLARITY.



1 S100 TYPICAL BRIDGE SUBSTRUCTURE PLAN

SCALE: 1/2"= 1'-0"

0' 2' 4'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
1471 Shoreline Dr. Ste 100, Boise, ID 83702 | (208) 342-4214 | mcmillen.com

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

TYPICAL BRIDGE SUPERSTRUCTURE PLAN

DESIGNED K. HEINDEL
DRAWN J. HOLT
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING

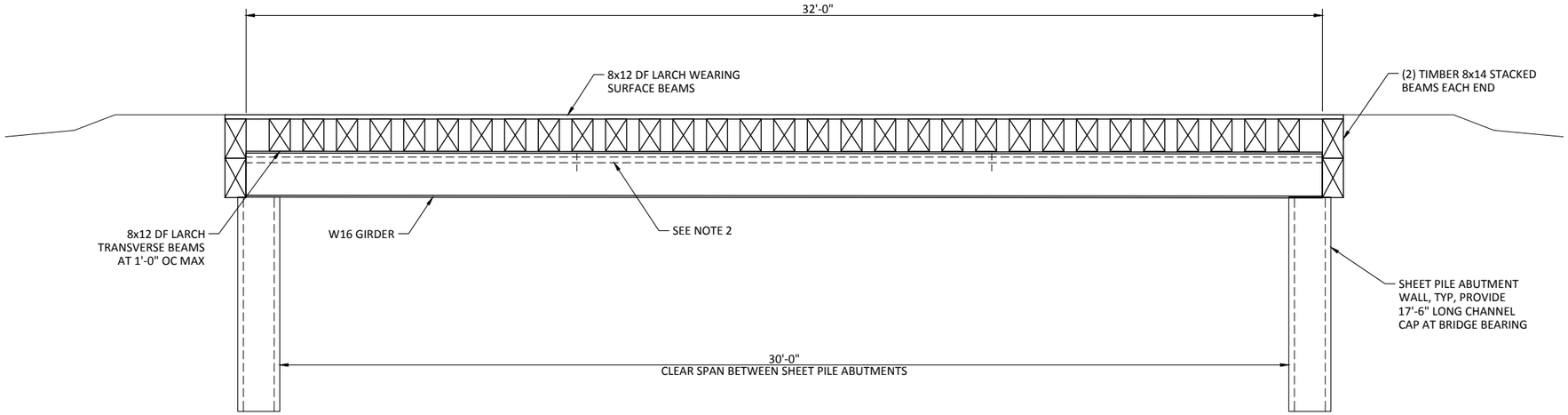
S102

JOB NO: 000000

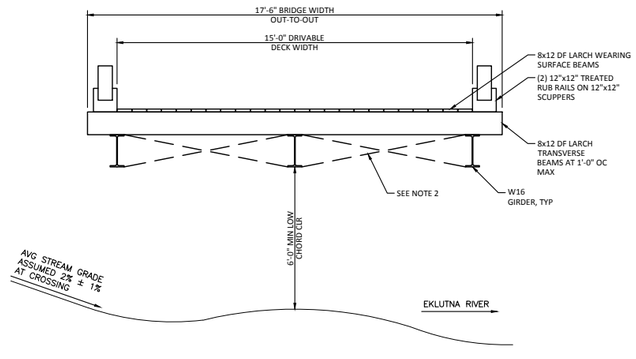
Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\S102.dwg Plot date: Sep 27, 2023 08:18pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. INTERIOR GALV STL BRACING TO BE DETERMINED.



A S101 BRIDGE SECTION
SCALE: 1/2"= 1'-0"



B S101 BRIDGE SECTION
SCALE: 1/2"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

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EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES

TYPICAL BRIDGE SECTIONS

DESIGNED K. HEINDEL
DRAWN J. HOLT
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
S103

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\S103.dwg Plot date: Sep 27, 2023 08:19pm, CAD User: HaberFlavia

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Appendix B. Class 4 Opinion of Probable Construction Costs

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Technical Memorandum			
To:	Mike Brodie, P.E. Chugach Electric Association	Project:	Eklutna Fish & Wildlife Project
From:	Sean P. Ellenson, P.E. McMillen, Inc	cc:	Curtis Neibaur McMillen, Inc
Prepared by:	Paul Rader McMillen, Inc	Job No.:	22-028
Date:	October 6, 2023		
Subject:	Class 4 Opinion of Probable Construction Costs – AWWU Maintenance Road and Bridges		

Revision Log

Revision No.	Date	Revision Description
0	October 6, 2023	Initial Draft

1.0 Introduction

1.1 Purpose

This technical memorandum (TM) presents a summary of the Opinion of Probable Construction Costs (OPCC) for the AWWU Maintenance Road and Bridges as part of the Eklutna Fish & Wildlife Project. The OPCC estimates are based on the 15% Design drawing package dated October 6, 2023.

1.2 Background

The Eklutna Hydroelectric Project (Project) is located in Southcentral Alaska approximately 30 miles northeast of downtown Anchorage near the Native Village of Eklutna (NVE). The Project was originally constructed by the Federal government in the 1950s but was later sold to, and is currently owned by, the Municipality of Anchorage (MOA), Chugach Electric Association, Inc. (Chugach), and the Matanuska Electric Association (MEA), collectively the “Project Owners”. As part of the sale of the Project, the current Project Owners entered into the 1991 Fish and Wildlife Agreement (1991 Agreement) with the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the State of Alaska (the Parties). The 1991 Agreement requires the Project Owners to develop and propose to the Governor of Alaska (Governor) a program to protect, mitigate damages to, and enhance fish and wildlife impacted by the development of the Project.

In development of the program, the Project Owners have met with various stakeholders to identify protection, mitigation, and enhancement measures that may be implemented within the Project study area. These measures were incorporated into a Phase 1 Engineering Feasibility Study which advanced the preliminary design, estimated capital expenditures, and determined operations and maintenance costs for each alternative for the purposes of evaluation. Selected measures from the Phase 1 Engineering Feasibility Study have been advanced to a Phase 2 Engineering Feasibility Study which includes a 15% level of design and a Class 4 OPCC.

1.3 Estimation Preparation

McMillen has utilized historical cost data from similarly technical projects which we have designed or constructed as a self-performing general contractor, as the basis of our Class 4 OPCC estimate. Appropriate overhead and profit markups have been included below the subtotal to account for the competitive bidders' markups, they are likely to apply on their bid prices. A 20% contingency has been included at this stage to account for details and minor project features which are not yet included in the project documents at the 15% Design level of detail. The contingency value may be reduced in future versions of the OPCC estimate, as the project design is advanced.

General requirement and mobilization costs are estimated at 12% and 8% of construction activity costs based on historical project ranges. Overhead and profit markups have been included at 10% and 5% respectively of direct construction costs. The estimate is in 2023 dollars. No escalation is included in the pricing. This OPCC estimate is consistent with a Class 4 estimate as defined by the AACE classification system, as shown in Figure 1-1 and 1-2. For the purposes of this project, McMillen has utilized the accuracy range of -30% to +50%.

CLASS 4 ESTIMATE	
Description: Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Typically, engineering is from 1% to 15% complete, and would comprise at a minimum the following: plant capacity, block schematics, indicated layout, process flow diagrams (PFDs) for main process systems, and preliminary engineered process and utility equipment lists. **Level of Project Definition Required:** 1% to 15% of full project definition. **End Usage:** Class 4 estimates are prepared for a number of purposes, such as but not limited to, detailed strategic planning, business development, project screening at more developed stages, alternative scheme analysis, confirmation of economic and/or technical feasibility, and preliminary budget approval or approval to proceed to next stage.	**Estimating Methods Used:** Class 4 estimates virtually always use stochastic estimating methods such as equipment factors, Lang factors, Hand factors, Chilton factors, Peters-Timmerhaus factors, Guthrie factors, the Miller method, gross unit costs/ratios, and other parametric and modeling techniques. **Expected Accuracy Range:** Typical accuracy ranges for Class 4 estimates are -15% to -30% on the low side, and +20% to +50% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances. **Effort to Prepare (for US$20MM project):** Typically, as little as 20 hours or less to perhaps more than 300 hours, depending on the project and the estimating methodology used. **ANSI Standard Reference Z94.2-1989 Name:** Budget estimate (typically -15% to + 30%). **Alternate Estimate Names, Terms, Expressions, Synonyms:** Screening, top-down, feasibility, authorization, factored, pre-design, pre-study.

Figure 1-1: Class 4 Estimate Description

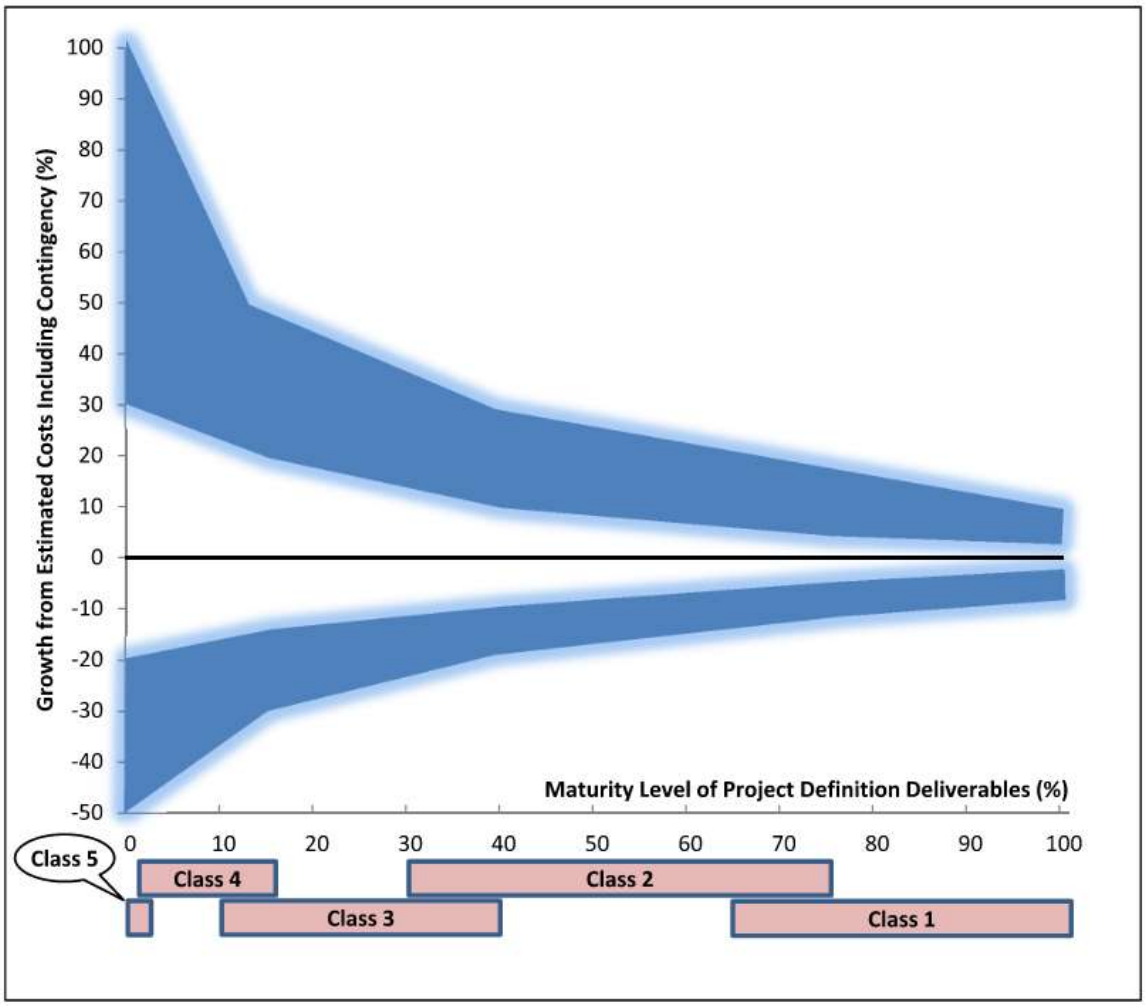

Figure 1-2: Variable in Accuracy Ranges (AACE 69R-12)

2.0 Project Cost Estimate

This OPCC estimate is consistent with a Class 4 estimate as defined by the Association for the Advancement of Cost Engineering (AACE) standard practice 69R-12. The maturity level of the project definition warrants a wide range of potential growth as the project design progresses. The Eklutna feasibility OPCC is based on 15% Design Drawings.

2.1 Cost Assumptions and Qualifications

The cost estimate was primarily developed utilizing costs from past projects and estimates. Below is a summary of the cost basis including any assumptions necessary for cost estimating purposes at this stage of design.

Common Cost Basis:

- General requirement and mobilization costs are based on a typical percentage of total direct construction costs: 12% and 8% respectively.
- Overhead & profit are added to direct construction costs at 10% and 5% respectively.
- A 20% contingency is added to the costs which is a typical contingency at the early concept phase of a project.
- Site access and laydown areas were all based on a unit price of $160k per acre for 0.3 acres.
- Excavation spoils can be disposed of nearby the location of excavation or re-used as fill material for the new bridge approaches.

Phase 2 Engineering
AWWU Maintenance Road and Bridges

Line Item	Item	Quantity	Unit	Unit Cost	Total Cost	Total
01	**DIVISION 01 INDIRECTS**					**$543,718**
	Mobilization and Establishment of Site Infrastructure	8	%	0.08	$217,487	
	Contractor General Requirements (Percentage of Direct Cost)	12	%	0.12	$326,231	
02	**SITE CONSTRUCTION AND ACCESS ROADS**	**8**			**$20,092**	**$160,736**
	Site Access - Construct Laydown Areas, Turnarounds and Crane Pads	0.1	ACRE	$160,736.40	$20,092	
03	**CIVIL WORKS - GRADING**	**1**			**$368,276**	**$368,276**
	Crossing #1 - Site Clearing and Grading	2,667	SY	$3.00	$8,001	
	Crossing #1 - Excavation	217	CY	$20.00	$4,340	
	Crossing #1 - Approach Ramp Fill Material	1,100	CY	$37.50	$41,250	
	Crossing #1 - Culvert Supply amd Install, 12"	29	LF	$50.00	$1,450	
	Crossing #2 - Site Clearing and Grading	2,667	SY	$3.00	$8,001	
	Crossing #2 - Excavation	437	CY	$20.00	$8,740	
	Crossing #2 - Approach Ramp Fill Material	288	CY	$37.50	$10,800	
	Crossing #3 - Site Clearing and Grading	2,667	SY	$3.00	$8,001	
	Crossing #3 - Excavation	114	CY	$20.00	$2,280	
	Crossing #3 - Approach Ramp Fill Material	973	CY	$37.50	$36,488	
	Crossing #4 - Site Clearing and Grading	2,667	SY	$3.00	$8,001	
	Crossing #4 - Excavation	275	CY	$20.00	$5,500	
	Crossing #4 - Approach Ramp Fill Material	800	CY	$37.50	$30,000	
	Crossing #4 - Culvert Supply amd Install, 12"	34	LF	$50.00	$1,700	
	Crossing #5 - Site Clearing and Grading	2,667	SY	$3.00	$8,001	
	Crossing #5 - Excavation	127	CY	$20.00	$2,540	
	Crossing #5 - Approach Ramp Fill Material	665	CY	$37.50	$24,938	
	Crossing #6 - Site Clearing and Grading	2,667	SY	$3.00	$8,001	
	Crossing #6 - Excavation	463	CY	$20.00	$9,260	
	Crossing #6 - Approach Ramp Fill Material	595	CY	$37.50	$22,313	
	Crossing #6 - Culvert Supply amd Install	28	LF	$50.00	$1,400	
	Crossing #7 - Site Clearing and Grading	2,667	SY	$3.00	$8,001	
	Crossing #7 - Excavation	1,275	CY	$20.00	$25,500	
	Crossing #7 - Approach Ramp Fill Material	663	CY	$37.50	$24,863	
	Crossing #7 - Culvert Supply amd Install	29	LF	$50.00	$1,450	
	Crossing #8 - Site Clearing and Grading	2,667	SY	$3.00	$8,001	
	Crossing #8 - Excavation	1,301	CY	$20.00	$26,020	
	Crossing #8 - Approach Ramp Fill Material	625	CY	$37.50	$23,438	
04	**AWWU BRIDGES**	**8**			**$273,697**	**$2,189,576**
	Steel Sheetpile Abutments, 20-ft Height, 44-ft length (qty = 2)	1760	SF	$75.00	$132,000	
	Steel Girder W16x67, 32-ft length, Qty = 3, Supply and Install	6432	LB	$6.00	$38,592	
	Steel Cross Bracing 6x6x1/2 Galv Angle, Supply and Install	3680	LB	$7.00	$25,760	
	Transverse Timber Beams, 8x12 DF Larch, 17.5 FT Length	31	EA	$880.00	$27,280	
	Timber Deck Beams, 8x12 DF Larch, 24 EA x 34 FT Length	510	SF	$81.50	$41,565	
	High Hub Rails (Qty = 2)	100	LF	$85.00	$8,500	
	Project Subtotal (without Division 01)					**$2,718,588**
	Project Subtotal					**$3,262,305**

AACE International CLASS 4 Cost Estimate - Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically prepared for a number of purposes, such as but not limited to, detailed strategic planning, business case development, project screening at more developed stages, alternative scheme analysis, confirmation of economic and/or technical feasibility, selection of a feasible alternative and preliminary budget approval to proceed to next stage of the project (definition phase). Typically, engineering is from 1% to 15% complete, and would comprise at a minimum the following: Feasibility design for several alternative layouts to include design criteria, generation capacity, feasibility level drawings, preliminary one-line diagrams, and comprehensive user requirements. Class 4 estimates generally use stochastic estimating methods such as cost/capacity graphs or curves and factors, historical data and other parametric and modeling techniques. Typical accuracy ranges for Class 4 estimates are -15% to -30% on the low side, and +20% to +50% on the high side, depending on the technological complexity of the project, appropriate reference information, and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks.

Project: Eklutna Phase 2 Engineering
Location: AK

Direct Construction Cost

Item	Direction Construction Cost		Amount
01	DIVISION 01 INDIRECTS		$543,718
02	SITE CONSTRUCTION AND ACCESS ROADS		$160,736
03	CIVIL WORKS - GRADING		$368,276
04	AWWU BRIDGES		$2,189,576
	Total Construction Cost		**$3,262,305**
	Overhead		
	GC Overhead and Profit	15.00%	$489,346
	Construction Bonds	1.25%	$46,896
	Total - Overhead		**$536,241**
	Direct Cost Contingency		
	*Overall Project Contingency:	20.00%	$759,709
	Total - Contingency		**$759,709**
	Taxes		
	AK Sales Tax	0.00%	$0
	Total - Taxes		**$0**
	Median Construction Price - Direct and Indirect		**$4,558,256**
	Total Construction Price Range (-30% to +50%)		**$3,190,779 to $6,837,384**

Notes:
All costs based on 2023 Construction Dollars
Does not include: interest during construction, legal, financing, or administration costs.
* Overall Project Contingency is set at 20% due to the current level of project definition and it may be reduced at later stages of design.